DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
78327RRF.002A1

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

(*) Identification of item tested	Precision Prime 24/7 optical heart rate sensor
(*) Trademark	Polar
(*) Model and /or type reference	Model name: 5T Commercial name: Polar 360
Other identification of the product	FCC ID: INW5T IC: 6248A-5T
(*) Features	Bluetooth LE HW version: 007108819 SW version: 0.2.59
Applicant	Polar Electro Oy Professorintie 5 90440, Kempele, FINLAND
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 3 (August 2023). 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 Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456)
Date of issue	2024-08-01
Report template No	FDT08_25 (*) "Data provided by the client"

Index

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 Spectral Density
Peak Power	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.

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 ≤ ± 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 ≤ ± 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 ≤ ± 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 ≤ ± 0,80 dB
Power Spectral Density: Measurement uncertainty ≤ ± 0,99 dB
6dB Bandwidth: Measurement uncertainty ≤ ± 2,84 %
Occupied Channel Bandwidth: Measurement uncertainty ≤ ± 1,17 %
Conducted Band-edge spurious emissions: Measurement uncertainty ≤ ± 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 Precision Prime 24/7 optical heart rate sensor with Bluetooth LE connectivity.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	78327_7.1	Heart rate sensor	5T	--	2024-02-15	Element Under Test
S/01	78327_5.1	USB charging cable	--	--	2024-02-15	Element Under Test
S/01	78327_8.1	Bracelet	--	--	2024-02-15	Element Under Test
S/02	78327_3.1	Heart rate sensor	5T	D642EC27	2024-02-15	Element Under Test

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for radiated tests
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		0.6	[X]	[ ]	[ ]	
	.....		.....	[ ]	[ ]	[ ]	
Supplementary information to the ports…… :	.....						
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[ ]	AC:	[ ]	[ ]	[ ]	[ ]	[ ]
	[ ]	AC:	[ ]	[ ]	[ ]	[ ]	[ ]
	[X]	DC: 3,87 Vdc					
	[ ]	DC:					
Rated Power .....:	0.6 W						
Clock frequencies.....:	32 MHz, 32.768 kHz						
Other parameters .....:	.....						
Software version .....:	0.2.59						
Hardware version .....:	007108819						
Dimensions in cm (W x H x D) ....:	2.7 x 4.2 x 1.0						
Mounting position .....:	[ ]	Table top equipment					
	[ ]	Wall/Ceiling mounted equipment					
	[ ]	Floor standing equipment					
	[X]	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 for Medical Equipment

Identification of the client

Polar Electro Oy
Professorintie 5
90440, Kempele, FINLAND

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-02-21
Date (finish)	2024-02-22

Document history

Report number	Date	Description
78327RRF.002	2024-03-18	First release.
78327RRF.002A1	2024-08-01	Second release. It is modified due to some minor typos. This modification test report cancels and replaces the test report 78327RRF.002

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: Victoria Olmedo Villalba.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
08130	SEMIANECHOIC ABSORBER LINED CHAMBER	P29419	ALBATROSS PROJECTS GMBH	N/A
08134	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	N/A
07550	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
07549	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
09968	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2026-09-22
05862	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2025-02-15
06158	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2026-02-05
07763	HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
08788	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2025-01-26
06495	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2024-03-19
07862	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-3G	BONN ELEKTRONIK	2024-03-14
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
08661	SHIELDED ROOM	-	SIEPEL	N/A
07552	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
08835	SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2025-02-08
07039	OPEN SWITCH UNIT UP TO 6 GHz	OSP-B157W8	ROHDE AND SCHWARZ	2025-05-25
07040	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2025-04-19
09335	DC POWER SUPPLY 200V/25A	EA-PSI-9200-25-DT	ELEKTRO-AUTOMATIC	N/A
07756	DIGITAL MULTIMETER	175	FLUKE	2024-12-18
07798	SOFTWARE FOR EMC/RF TESTING	WMS32	ROHDE AND SCHWARZ	N/A

Testing verdicts

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

Summary

Bluetooth Low Energy 5.3 (2M, 1M).

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. Bluetooth Low Energy 5.3 (2M, 1M)

INDEX

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	3.87Vdc
Type of Power Supply:	Internal battery

ANTENNA (*):

Type of Antenna:	Monopole FPC antenna
Maximum Declared Antenna Gain:	+2.6 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).

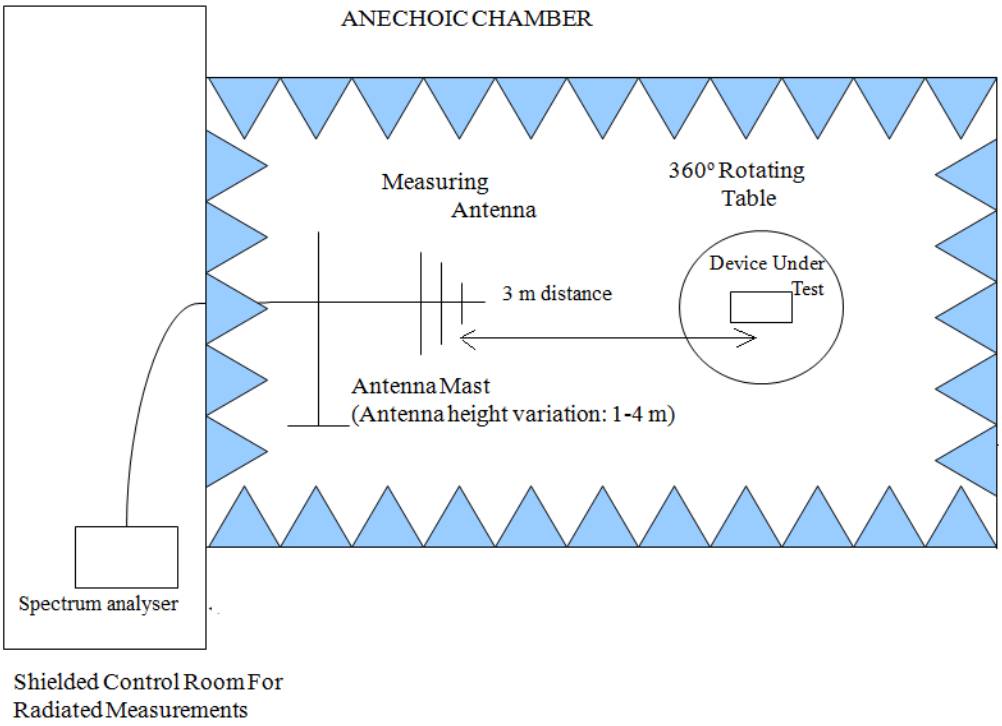
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 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.

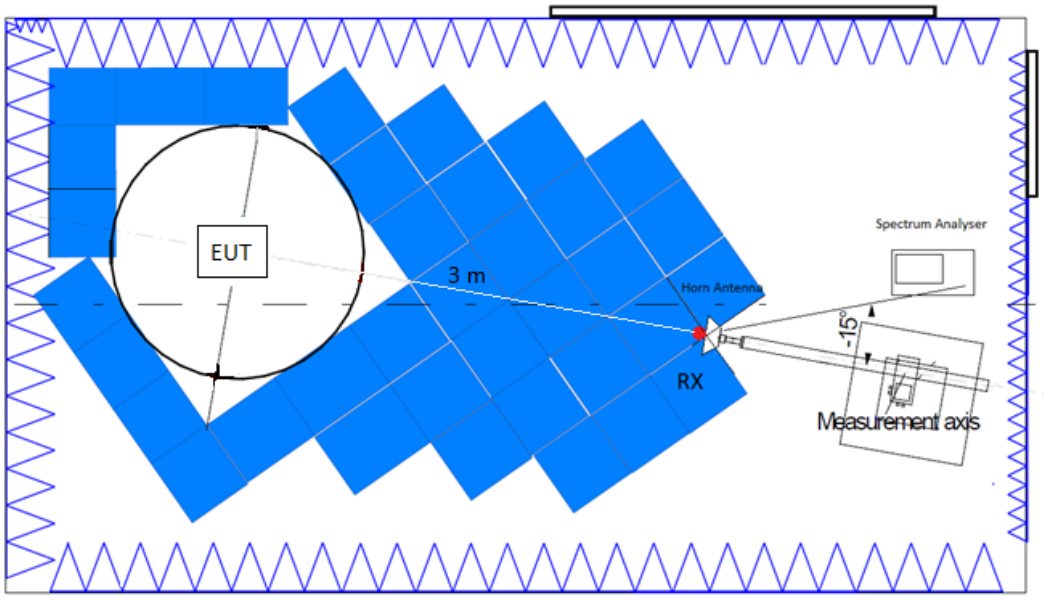
Measurements were made in both horizontal and vertical planes of polarization.

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.

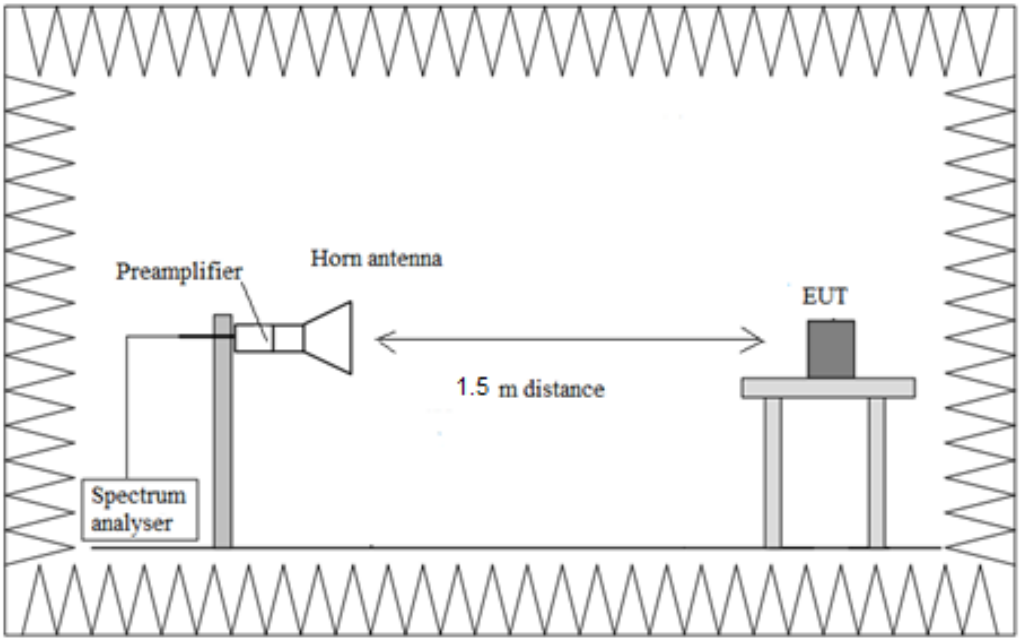
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

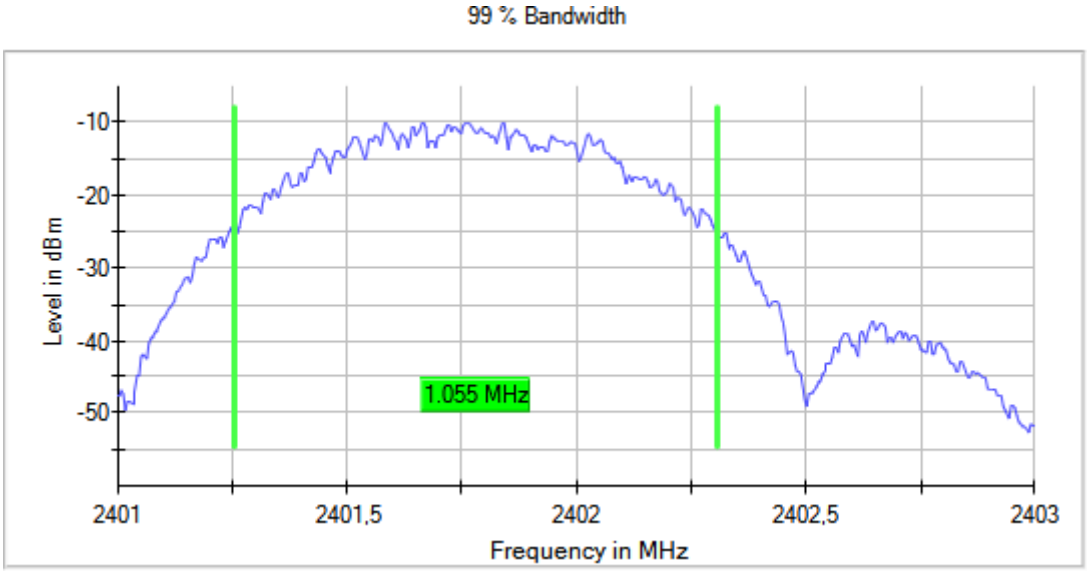
Results

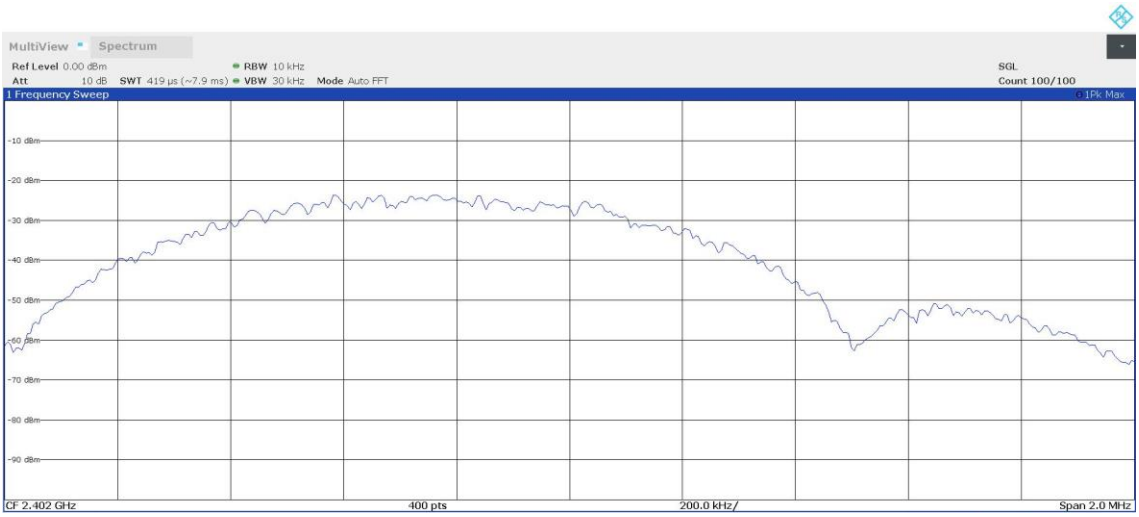
Freq (MHz)	Occ Ch BW (MHz)
2402.00000	1.055
2440.00000	1.060
2480.00000	1.055

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

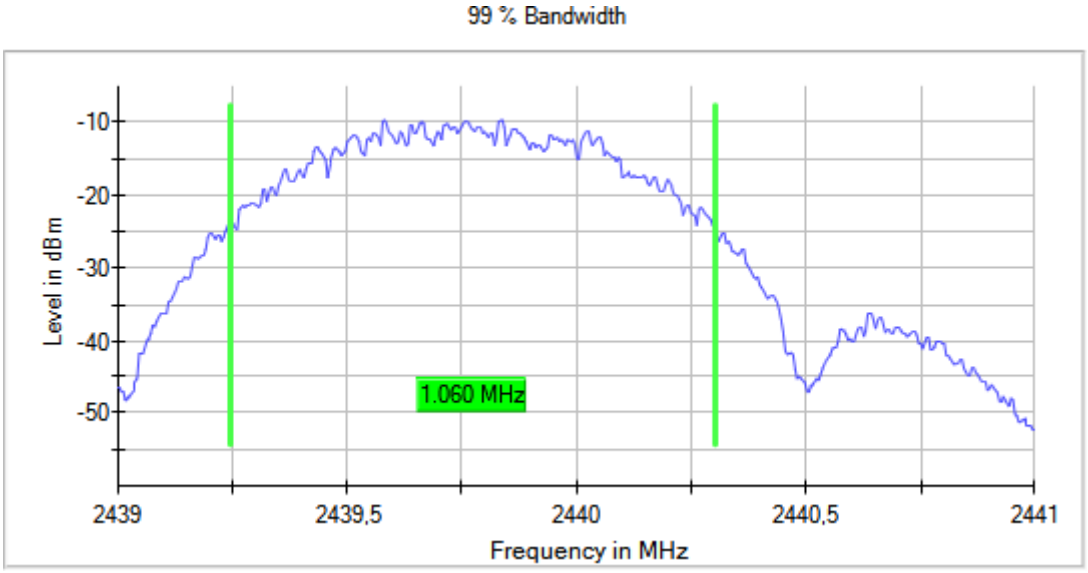
Images:

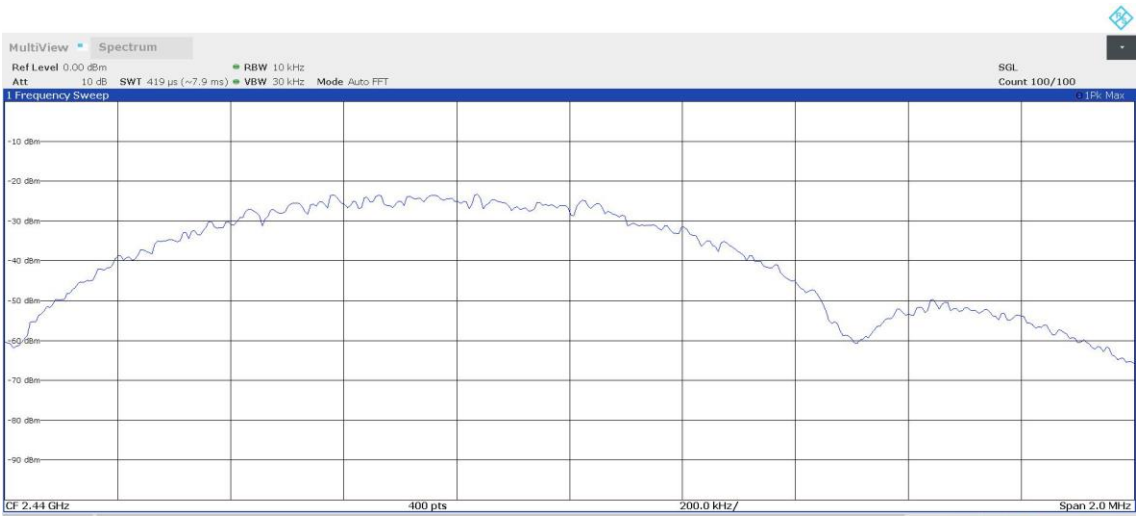




Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)
Frequency MHz = 2440.00000
MIMO Mode = SISO
Active Port = 1

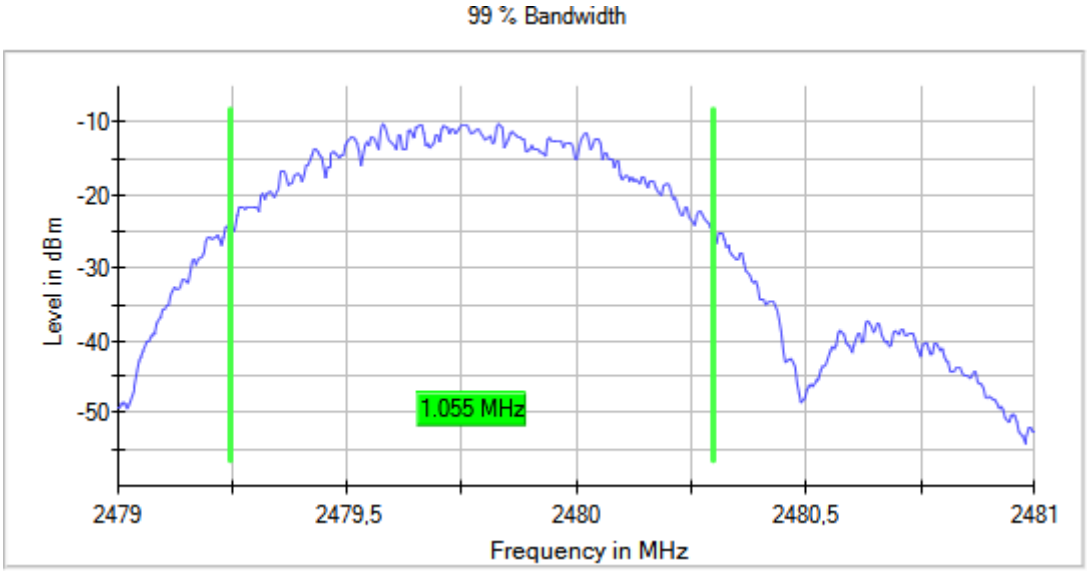
Images:

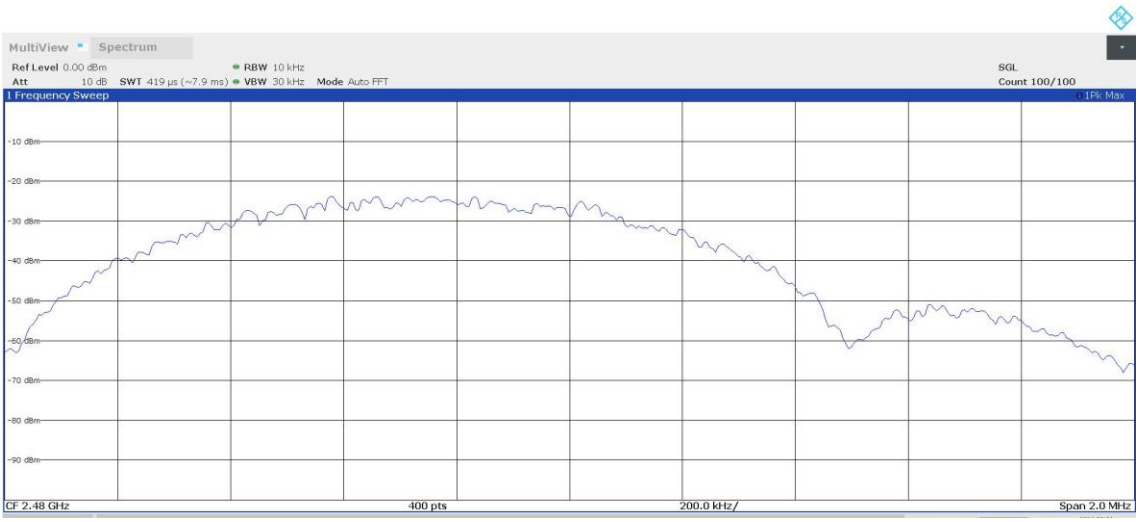




Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)
Frequency MHz = 2480.00000
MIMO Mode = SISO
Active Port = 1

Images:





Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

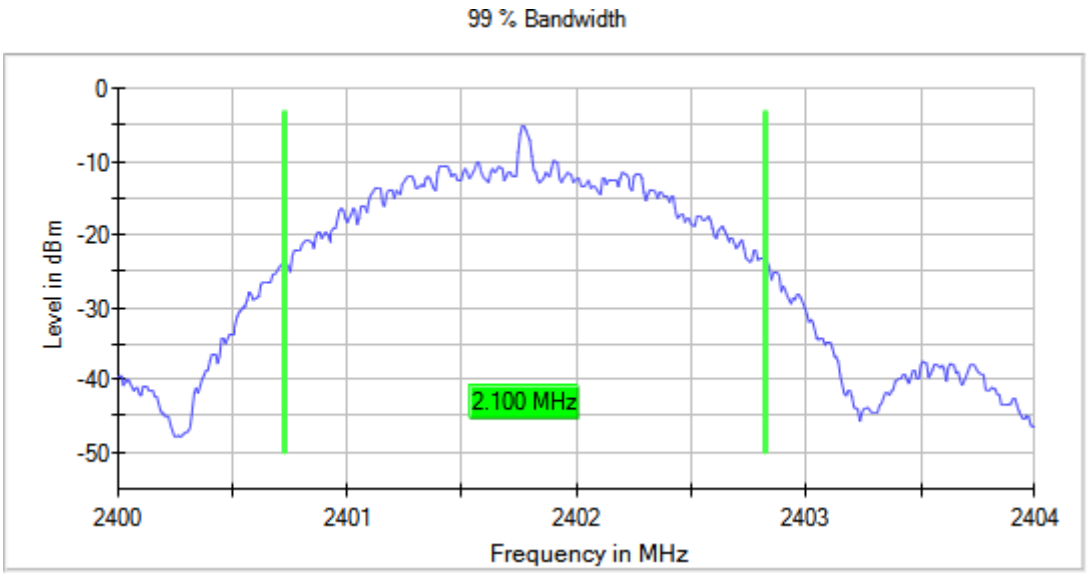
Results

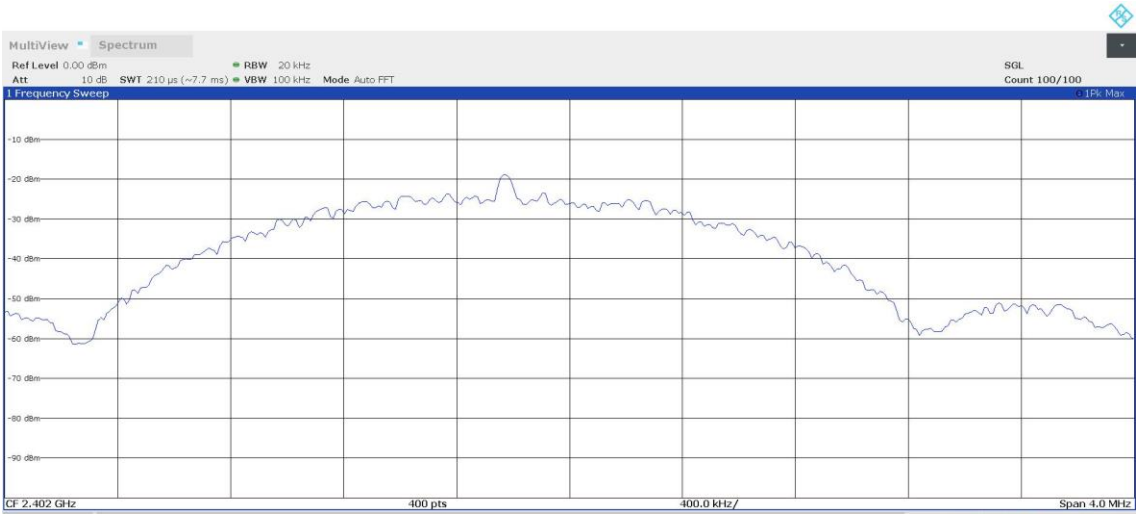
Freq (MHz)	Occ Ch BW (MHz)
2402.00000	2.100
2440.00000	2.120
2480.00000	2.110

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 2
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:



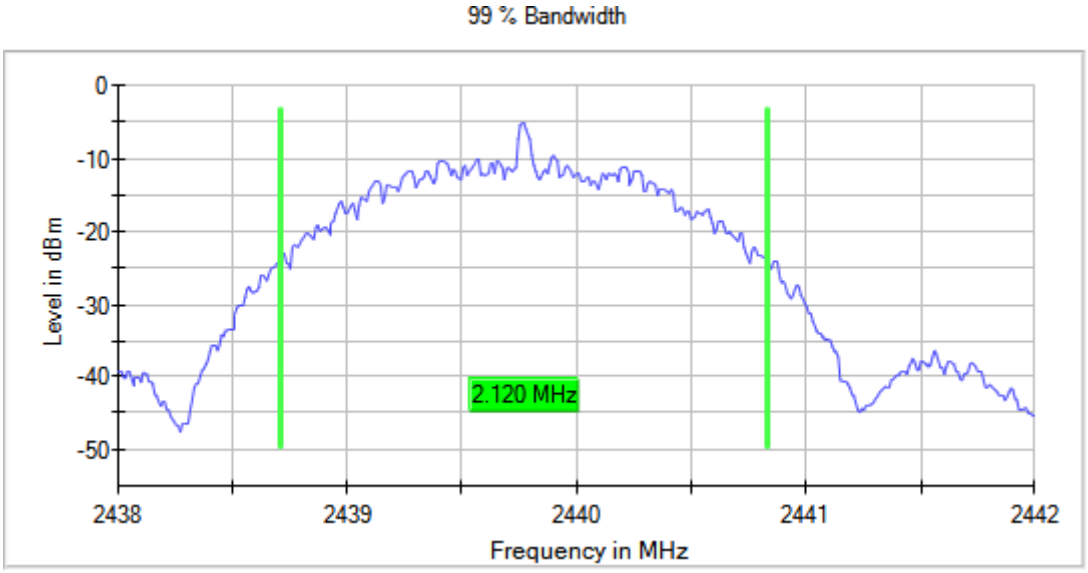


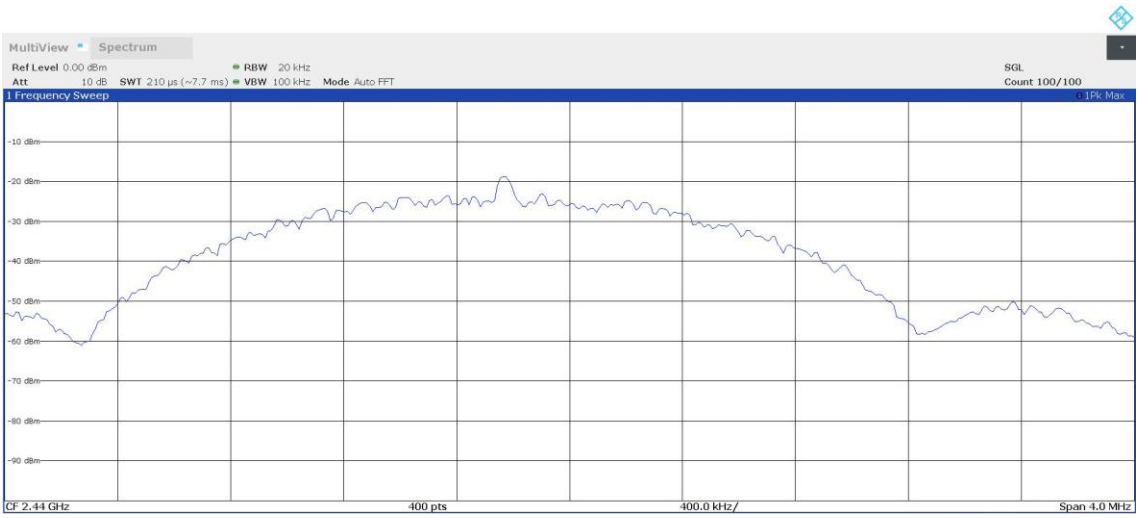
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.3 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

MIMO Mode = SISO Active Port = 1

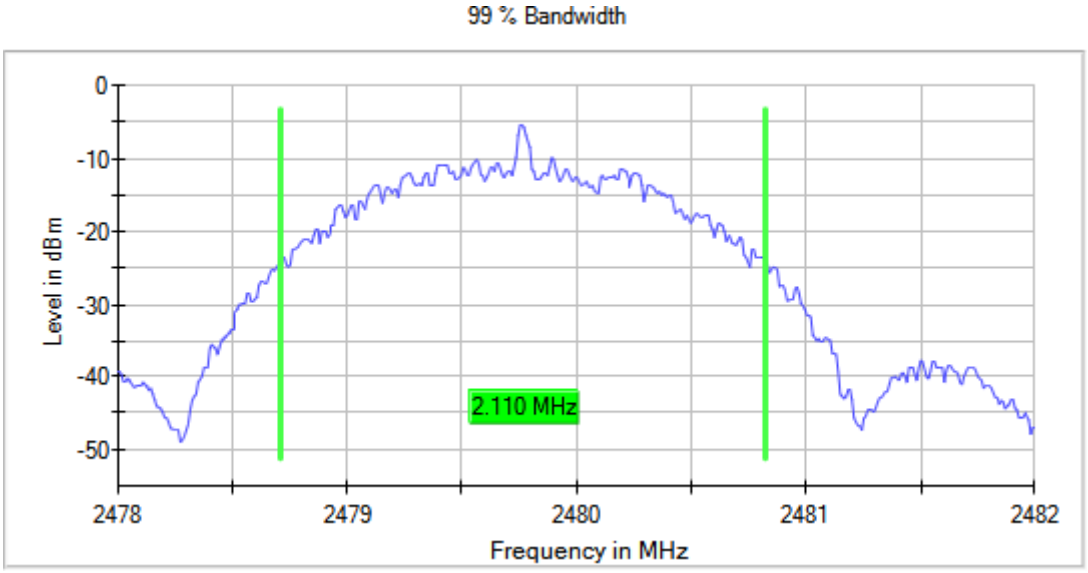
Images:

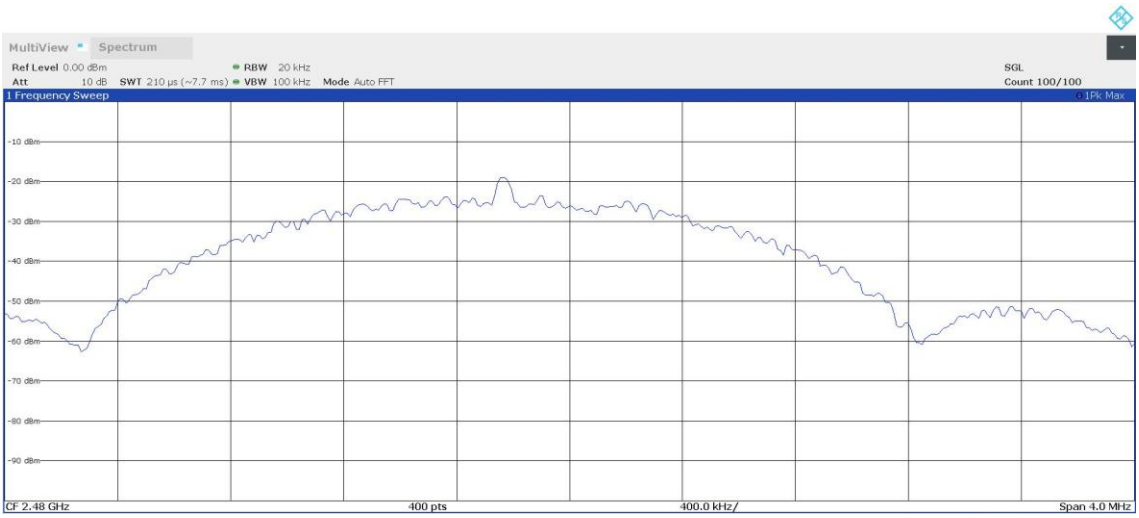




Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)
MIMO Mode = SISO
Bandwidth MHz = 2
Frequency MHz = 2480.00000
Active Port = 1

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.

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

Results

Freq (MHz)	6 dB Bandwidth (MHz)
2402.00000	0.772
2440.00000	0.792
2480.00000	0.812

Verdict

Pass

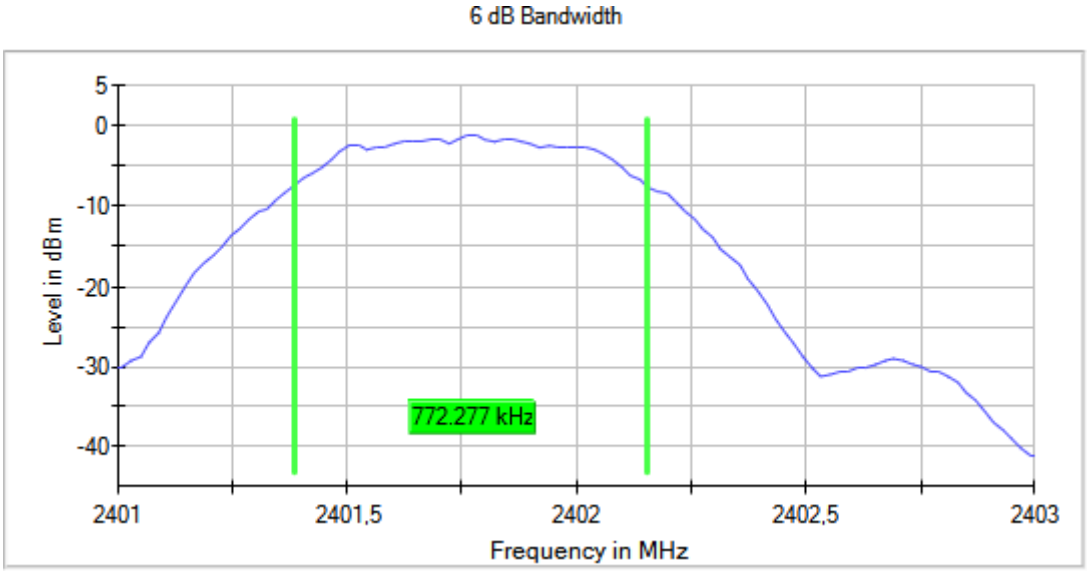
Attachments

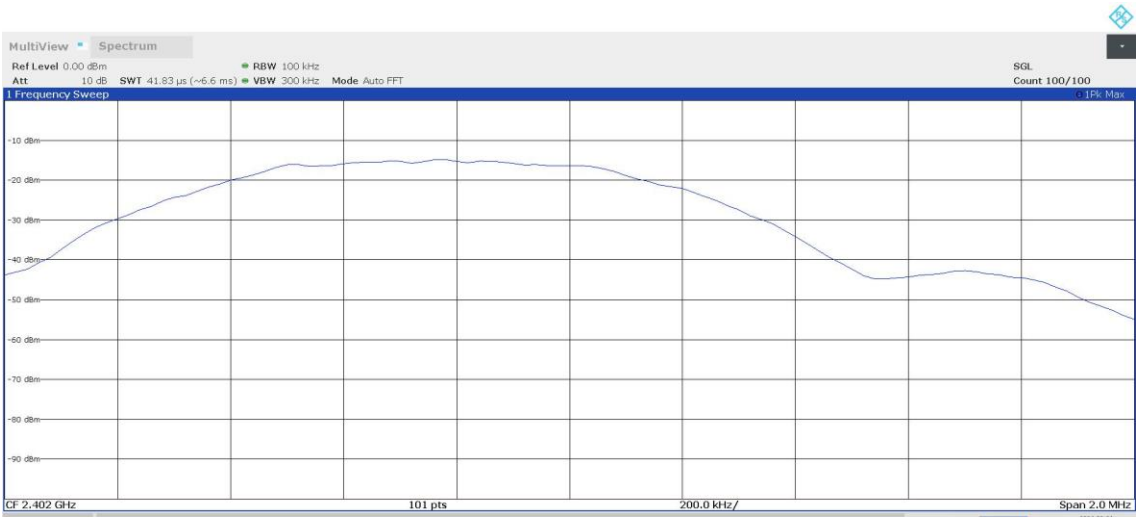
Bandwidth MHz = 1 Modulation = BTLE 5.3 (GFSK 1 Mbit/s)

Frequency MHz = 2402.00000 MIMO Mode = SISO

Active Port = 1

Images:



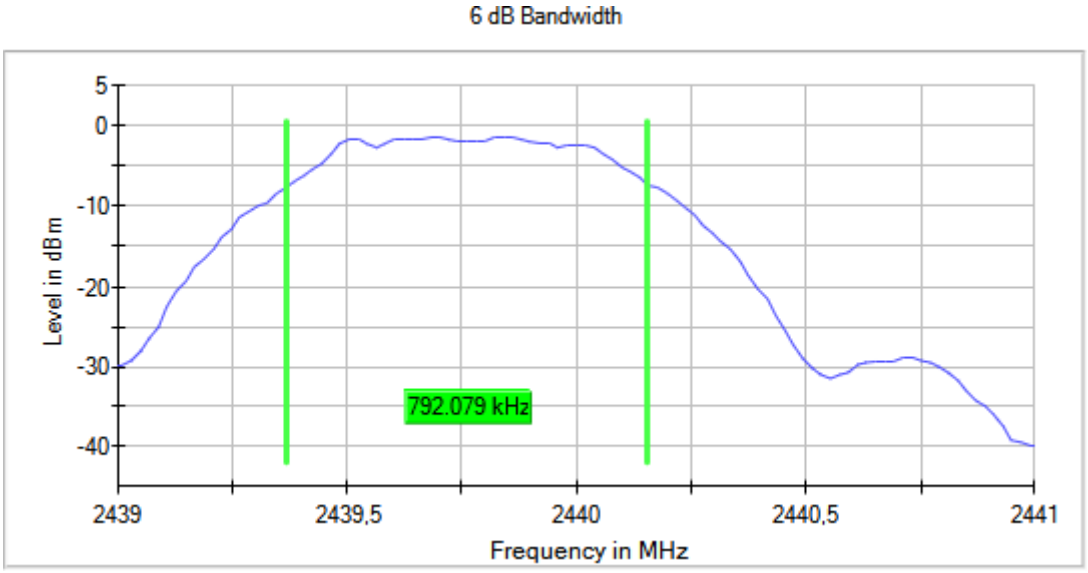


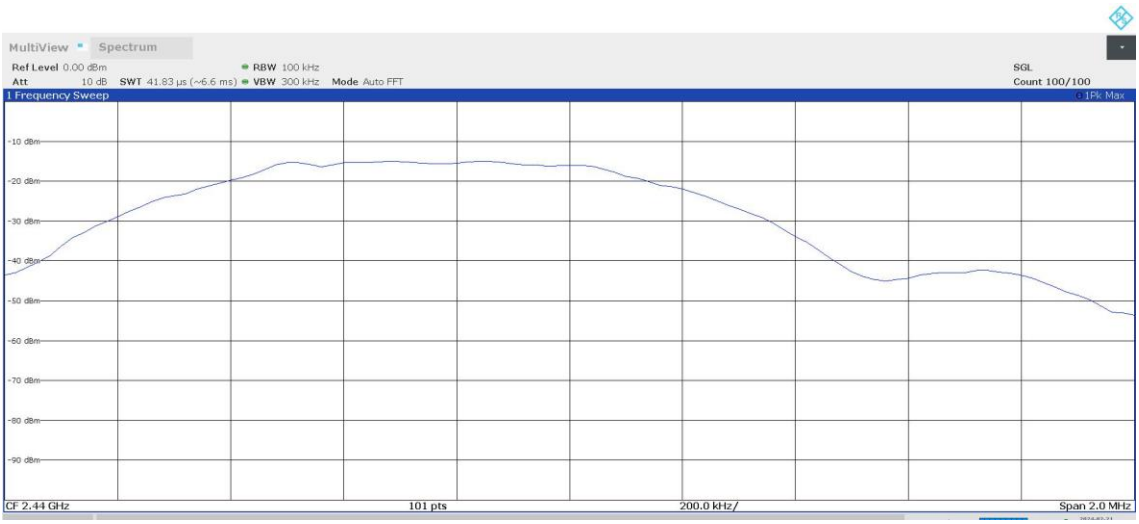
Bandwidth MHz = 1 Modulation = BTLE 5.3 (GFSK 1 Mbit/s)

Frequency MHz = 2440.00000 MIMO Mode = SISO

Active Port = 1

Images:



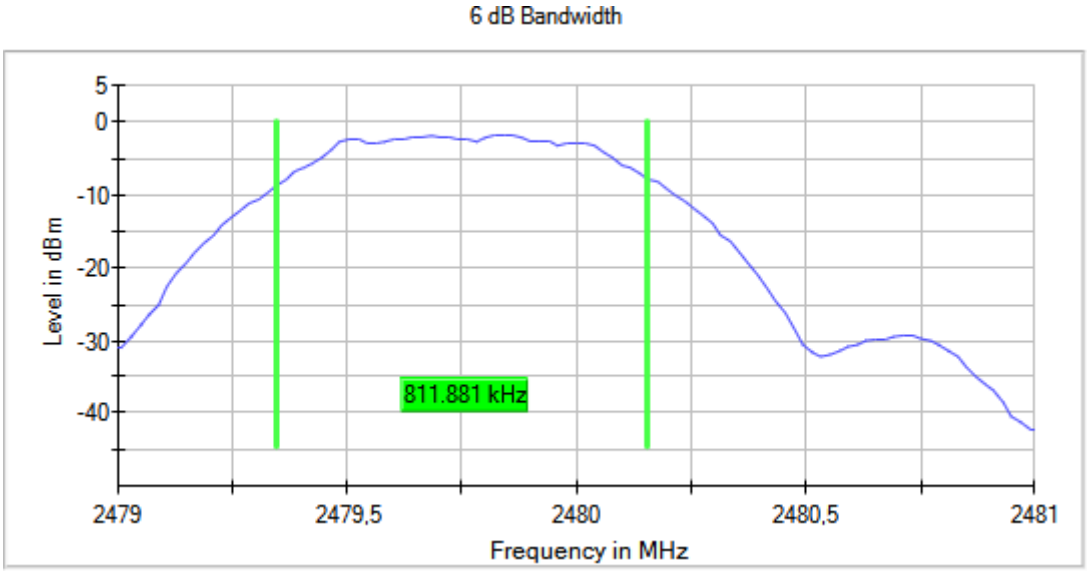


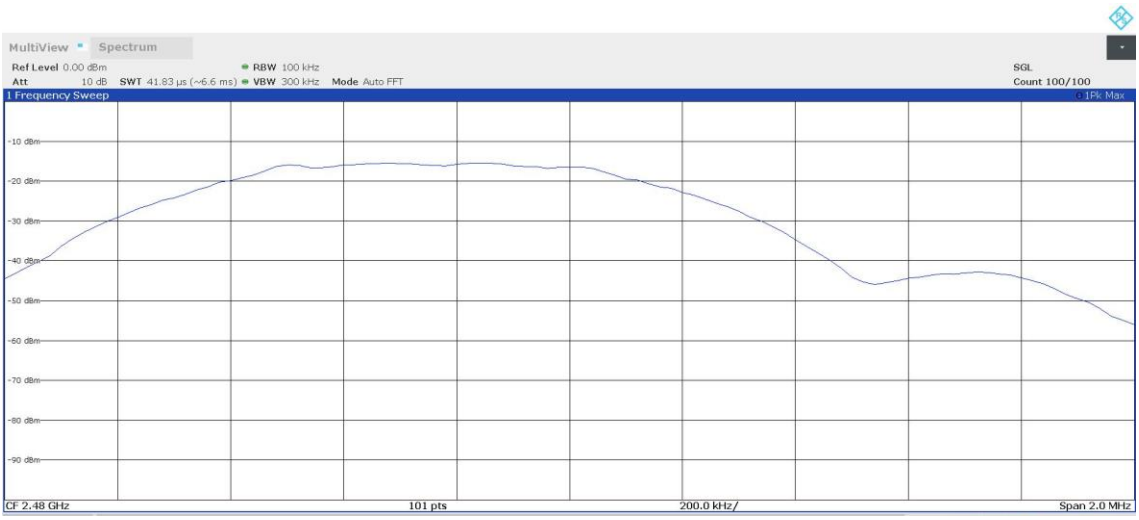
Bandwidth MHz = 1 Modulation = BTLE 5.3 (GFSK 1 Mbit/s)

Frequency MHz = 2480.00000 MIMO Mode = SISO

Active Port = 1

Images:





Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

Results

Freq (MHz)	6 dB Bandwidth (MHz)
2402.00000	1.465
2440.00000	1.465
2480.00000	1.505

Verdict

Pass

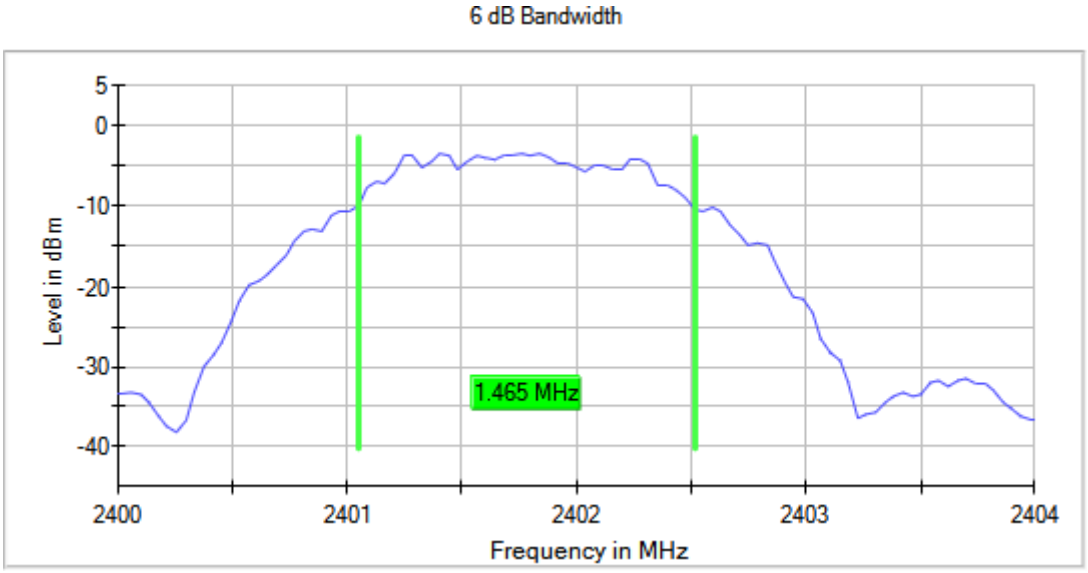
Attachments

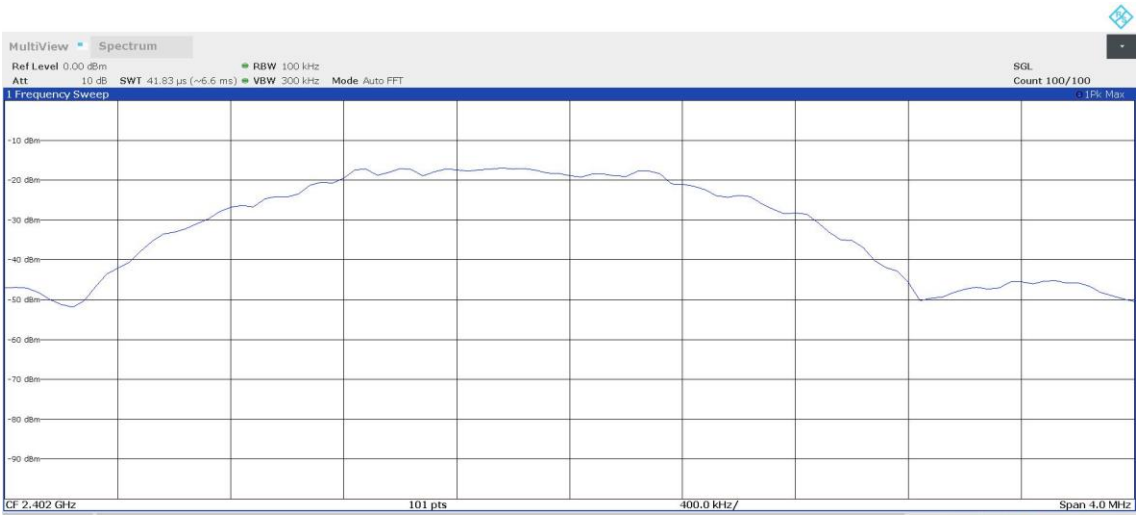
Bandwidth MHz = 2 Modulation = BTLE 5.3 (GFSK 2 Mbit/s)

Frequency MHz = 2402.00000 MIMO Mode = SISO

Active Port = 1

Images:



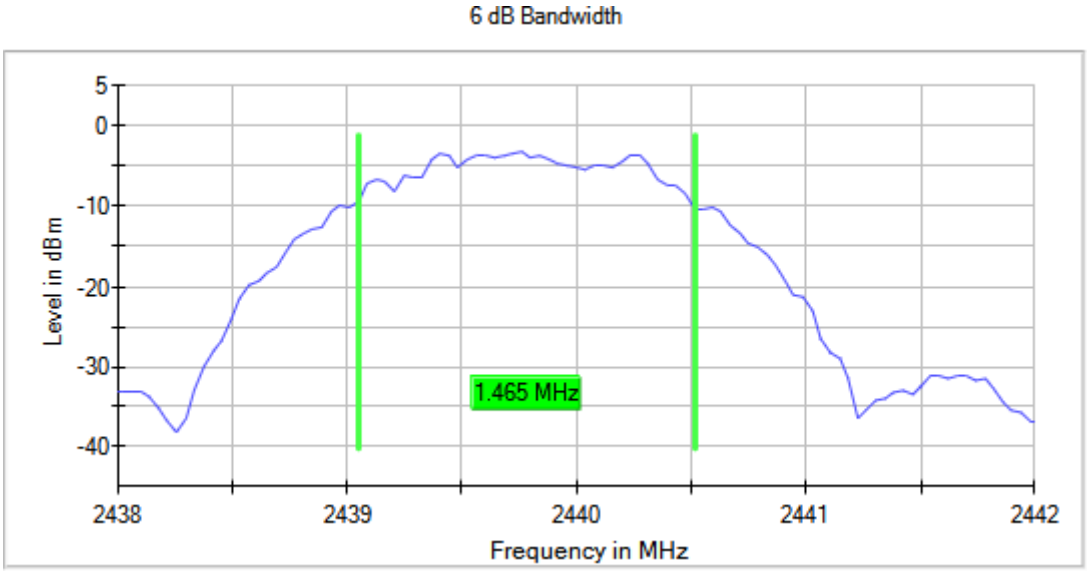


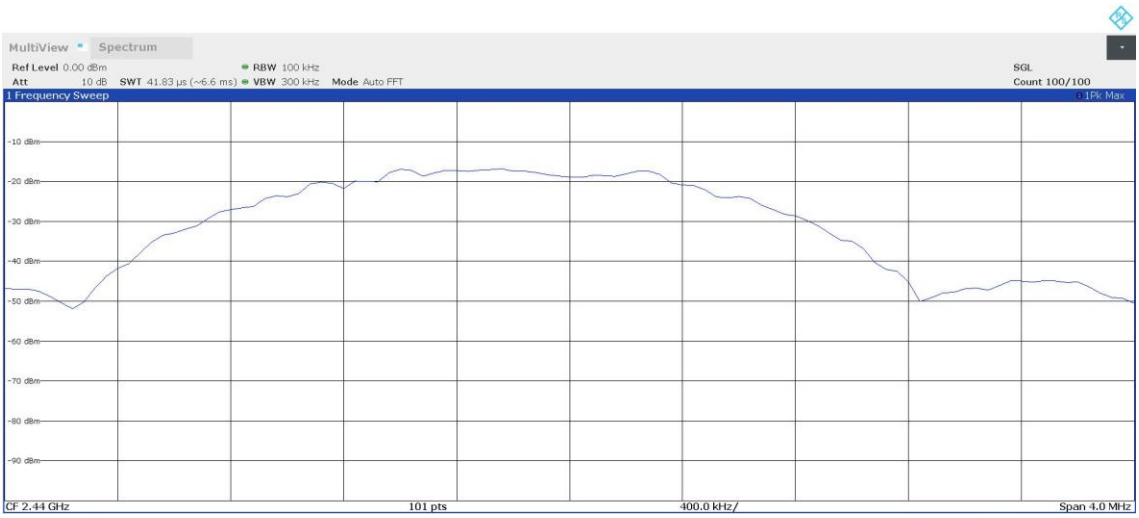
Bandwidth MHz = 2 Modulation = BTLE 5.3 (GFSK 2 Mbit/s)

Frequency MHz = 2440.00000 MIMO Mode = SISO

Active Port = 1

Images:



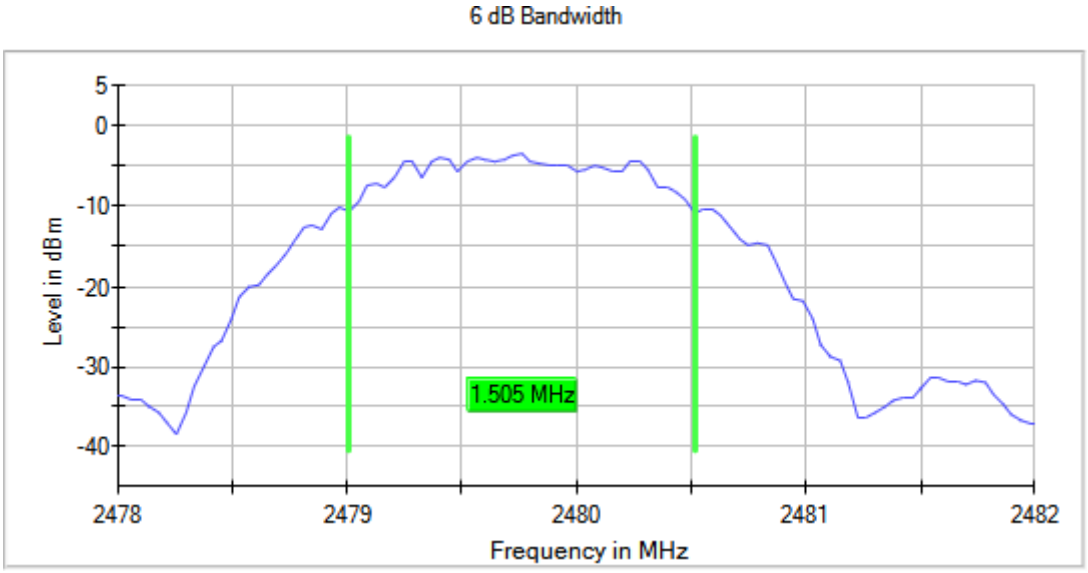


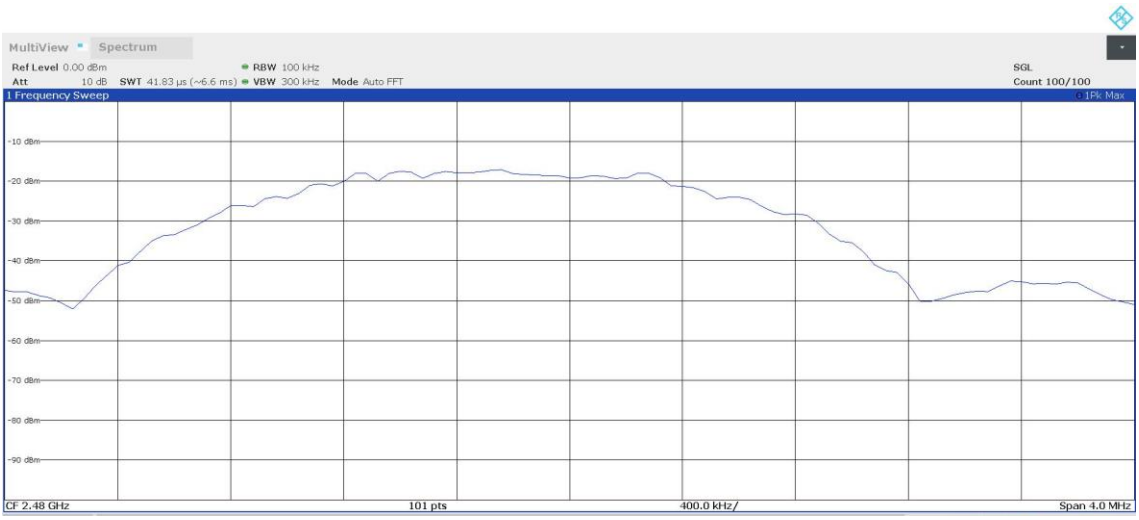
Bandwidth MHz = 2 Modulation = BTLE 5.3 (GFSK 2 Mbit/s)

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.

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

Results

Freq (MHz)	Measured Freq (MHz)	PSD (dBm)
2402.00000	2401.83750	-9.91
2440.00000	2439.58250	-9.68
2480.00000	2479.83250	-10.16

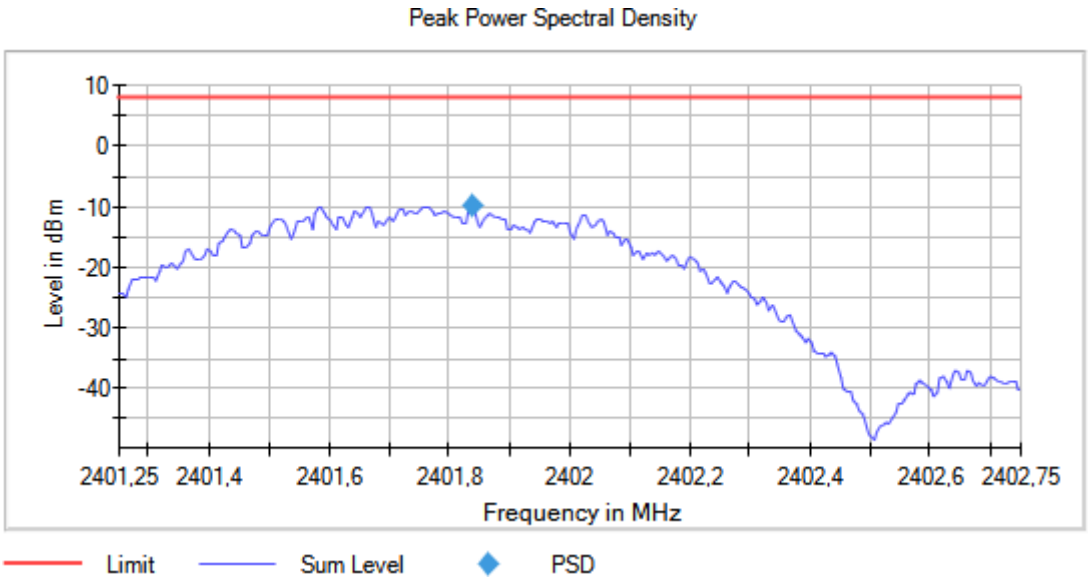
Verdict

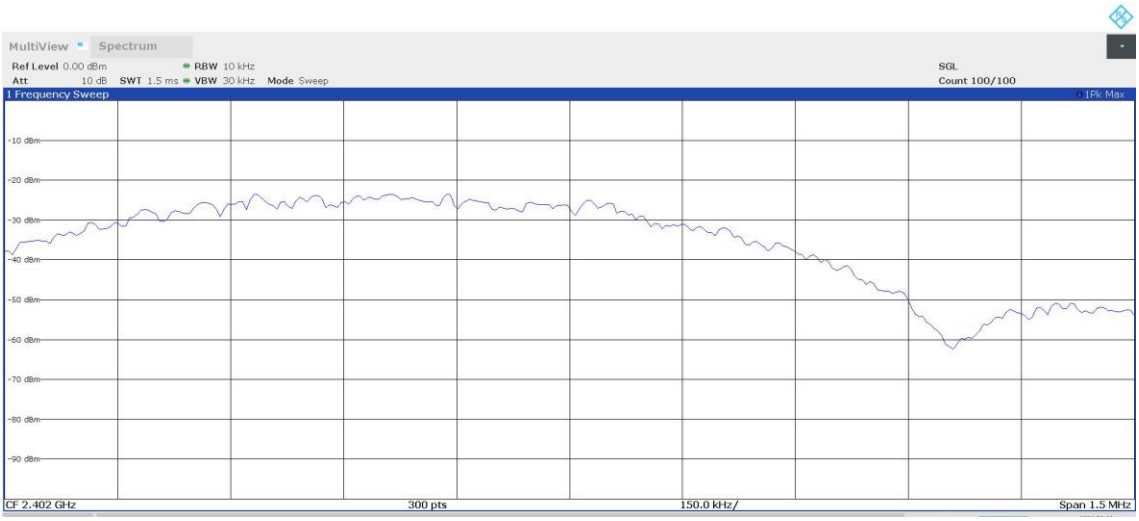
Pass

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:



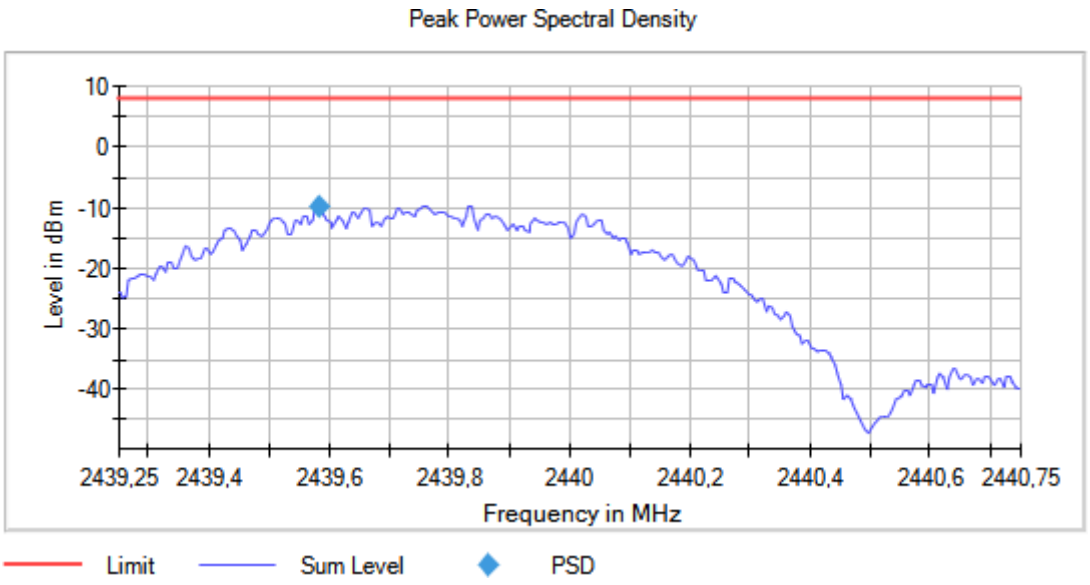


Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1

Modulation = BTLE 5.3 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000

MIMO Mode = SISO Active Port = 1

Images:

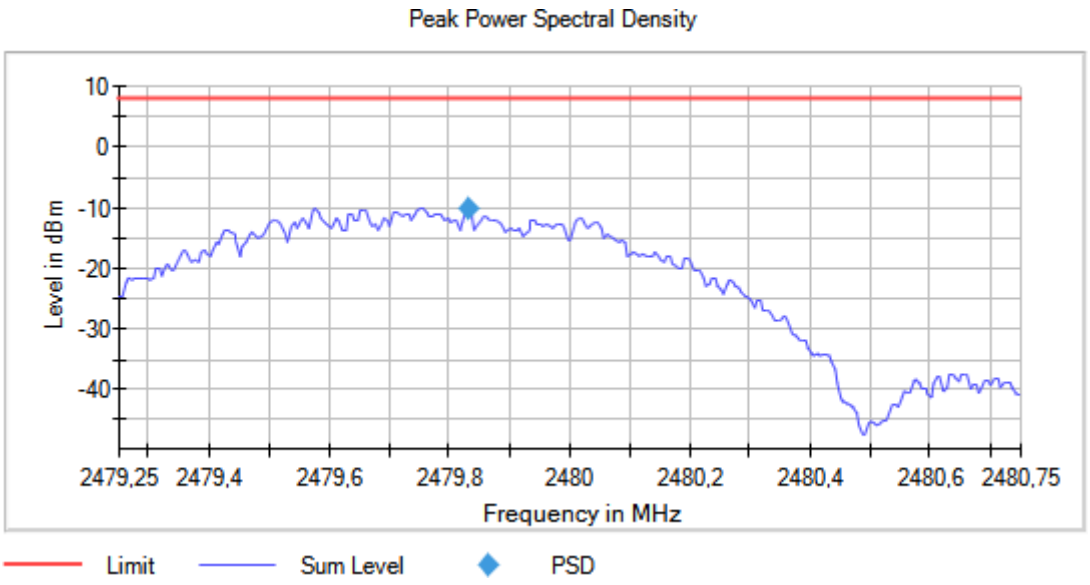


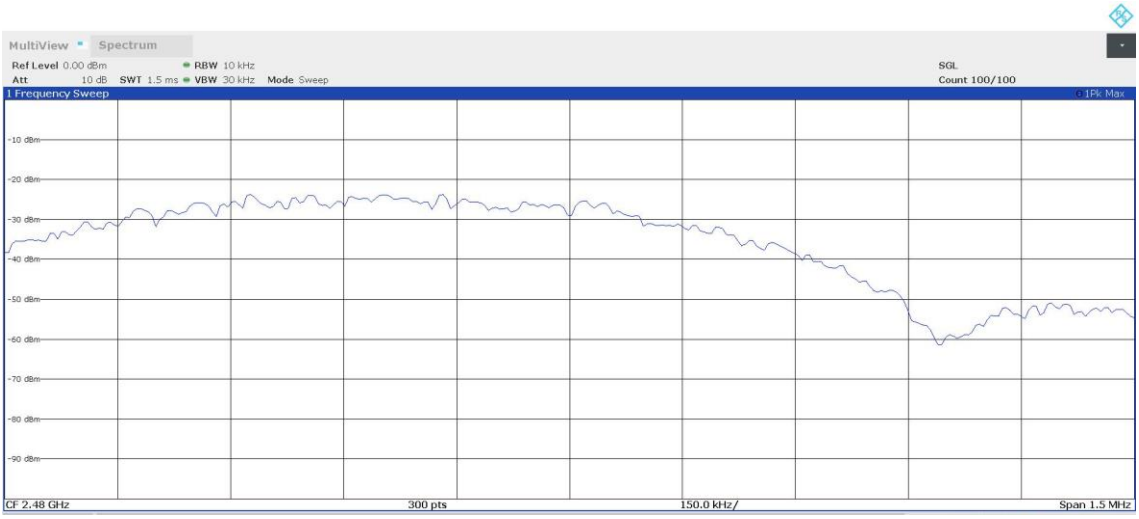
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1

Modulation = BTLE 5.3 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000

MIMO Mode = SISO Active Port = 1

Images:





Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

MIMO Mode: SISO

Results

Freq (MHz)	Measured Freq (MHz)	PSD (dBm)
2402.00000	2401.76250	-10.30
2440.00000	2439.76250	-10.22
2480.00000	2479.75750	-10.49

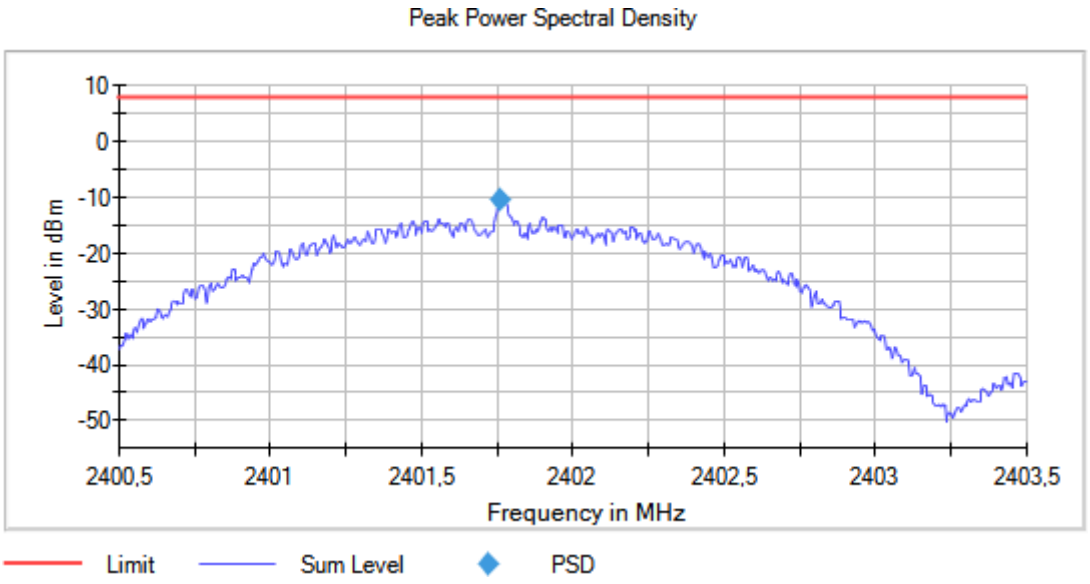
Verdict

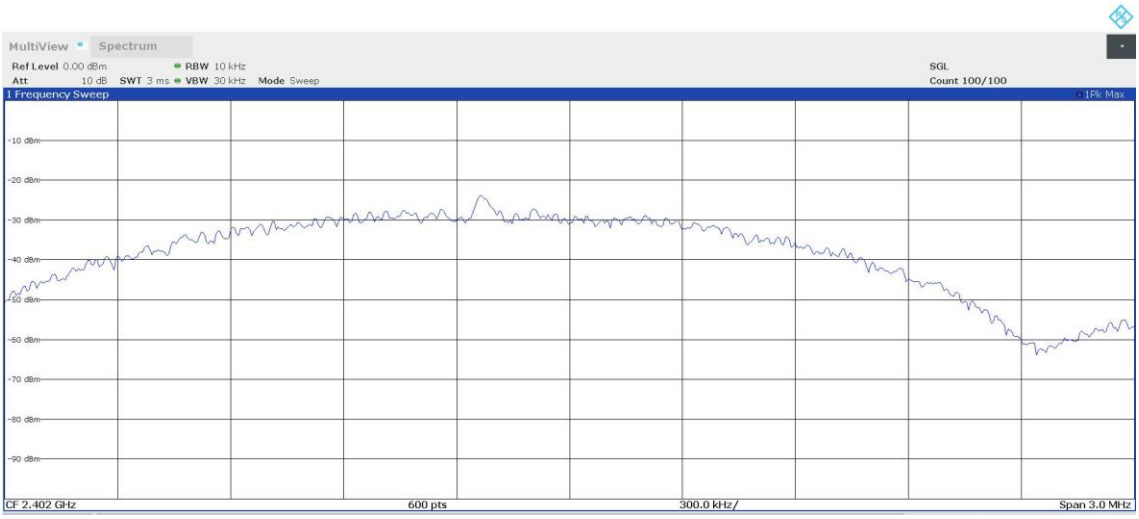
Pass

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 2
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

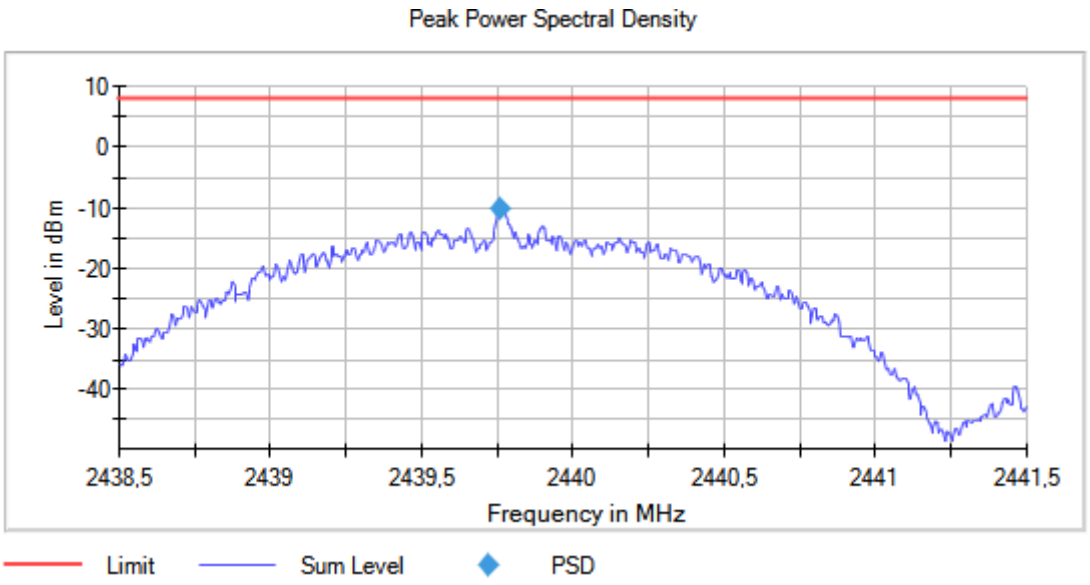
Images:

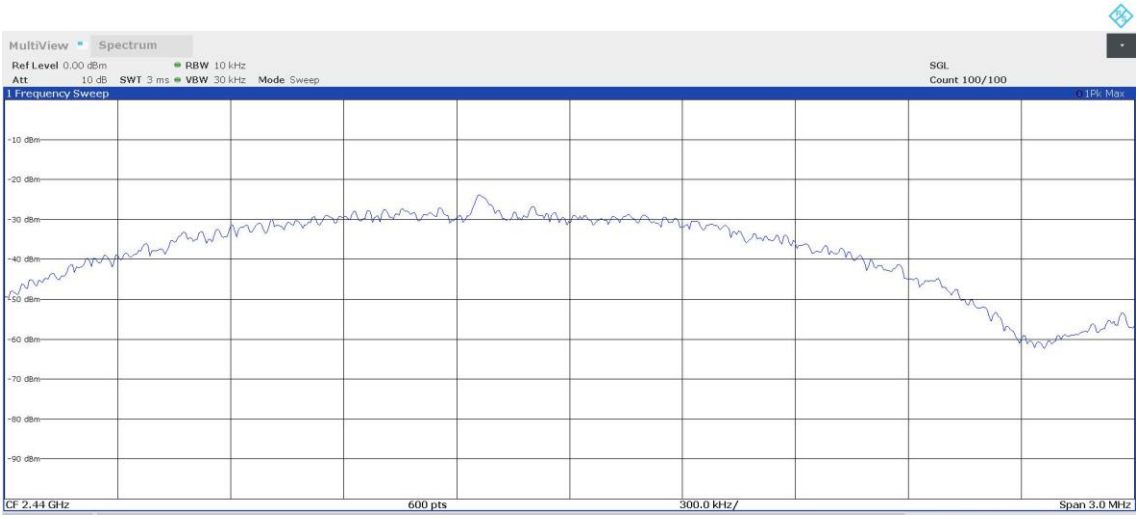




Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)
MIMO Mode = SISO
Bandwidth MHz = 2
Frequency MHz = 2440.00000
Active Port = 1

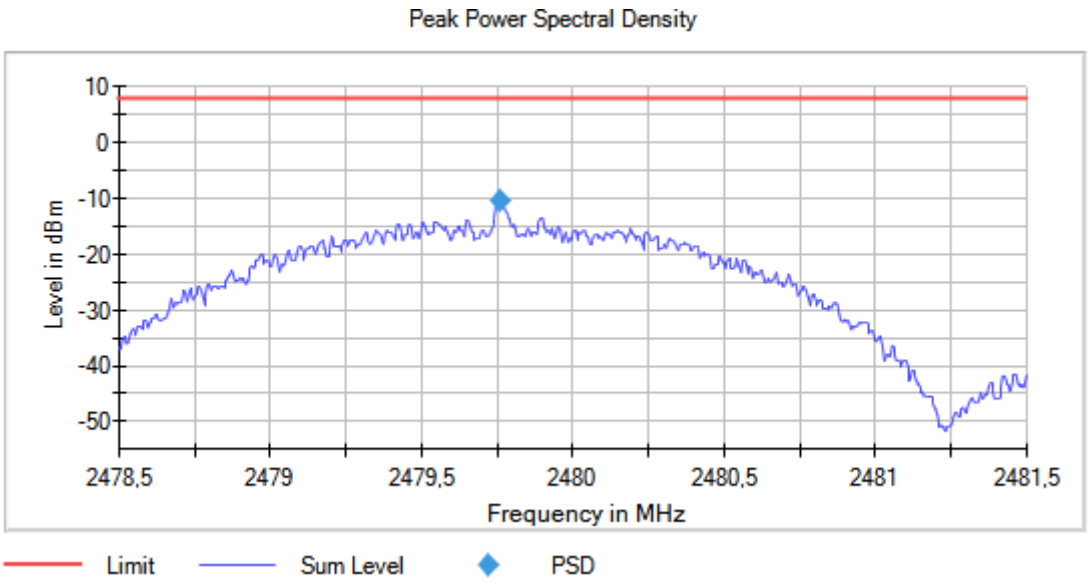
Images:

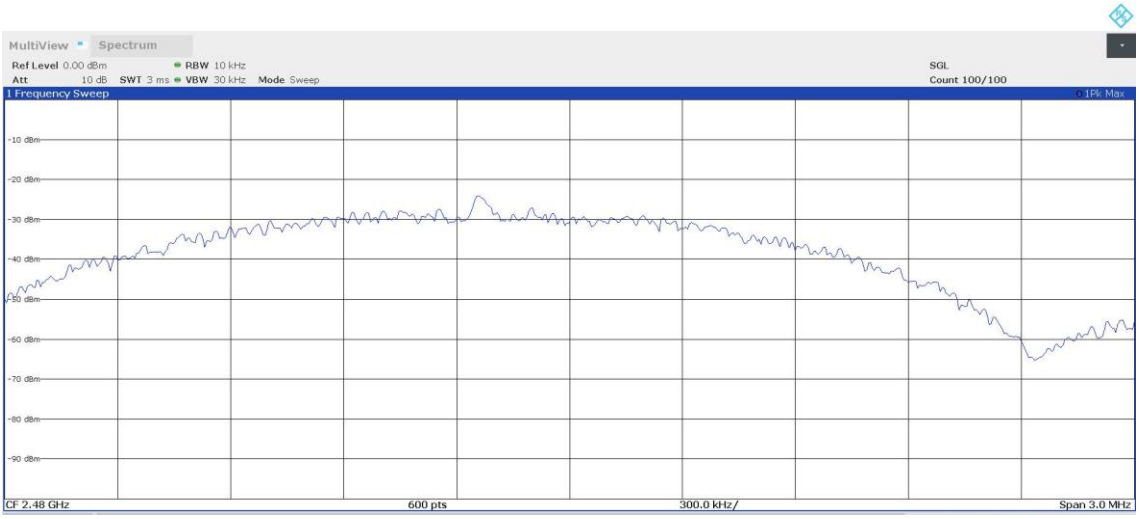




Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)
MIMO Mode = SISO
Bandwidth MHz = 2
Frequency MHz = 2480.00000
Active Port = 1

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) (Canada).

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.

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

Results

Freq (MHz)	Peak Power (dBm)	Maximum EIRP Power (dBm)
2402.00000	-0.0770	2.523
2440.00000	0.2030	2.803
2480.00000	-0.1850	2.415

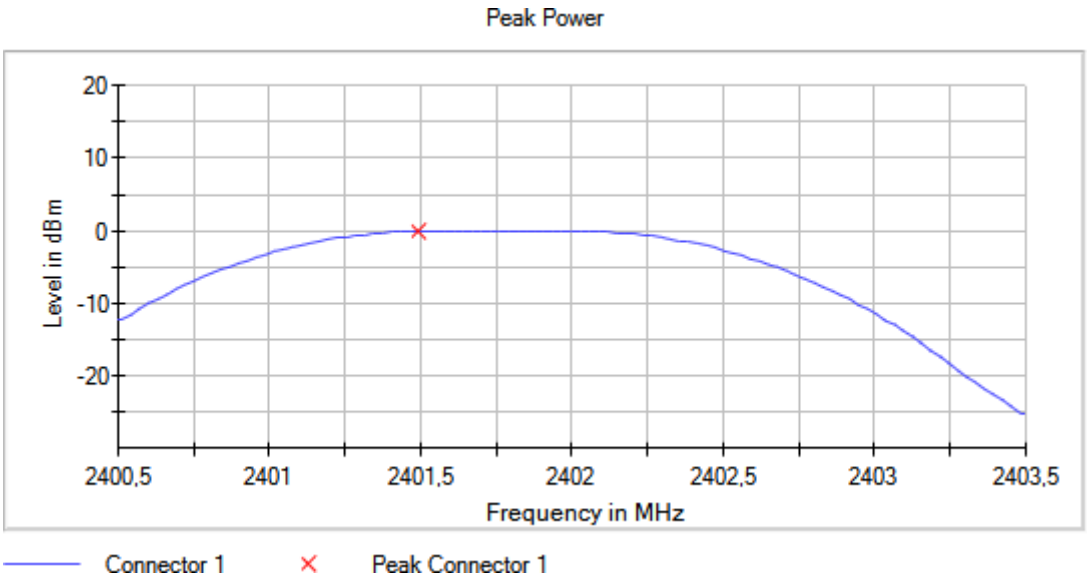
Verdict

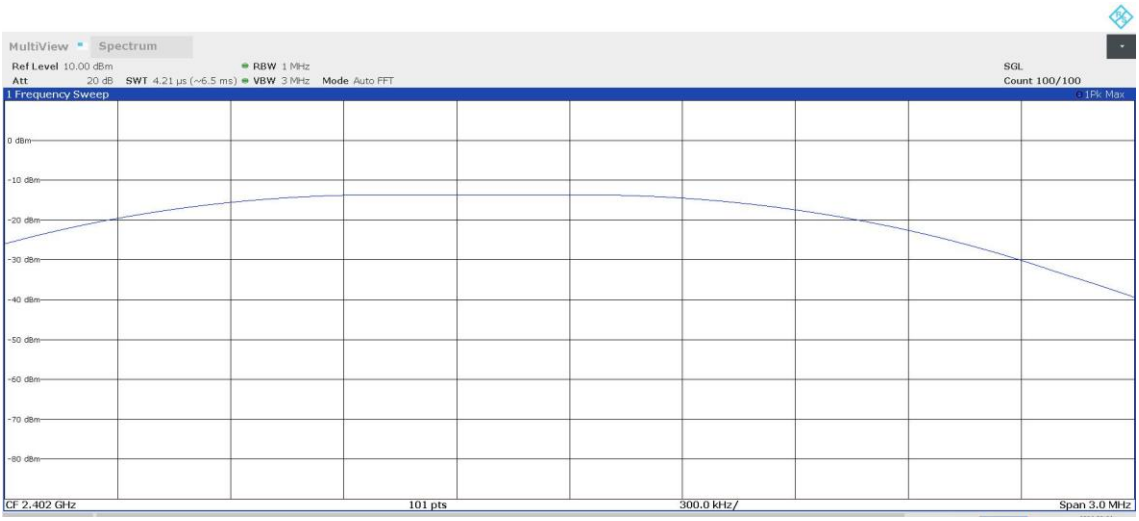
Pass

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:



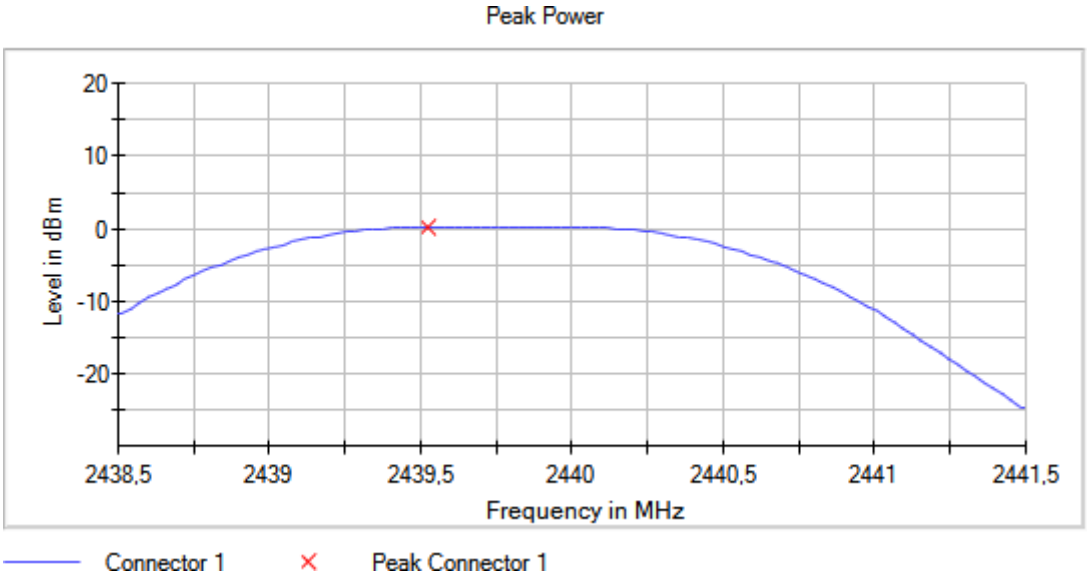


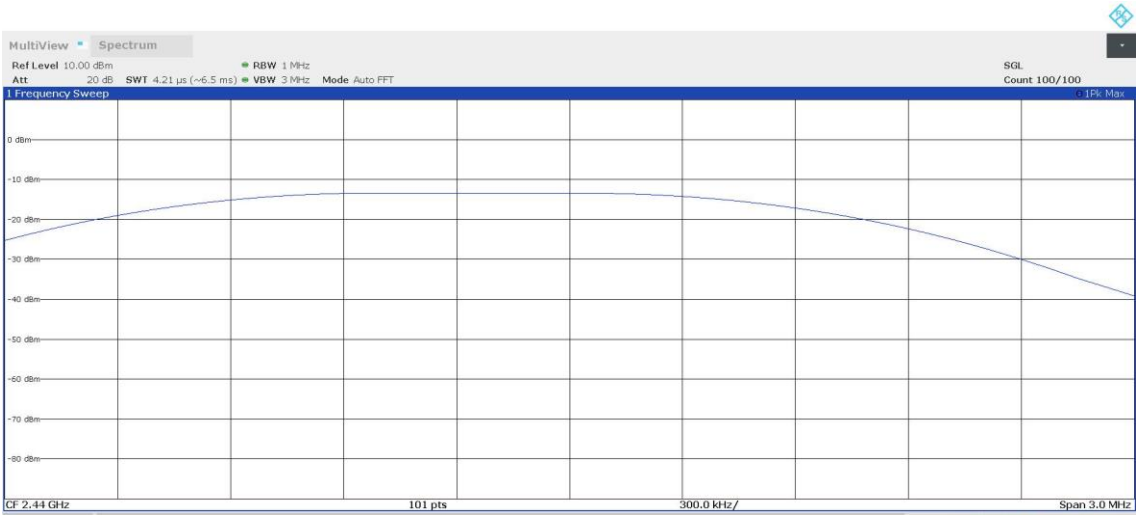
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1

Modulation = BTLE 5.3 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000

MIMO Mode = SISO Active Port = 1

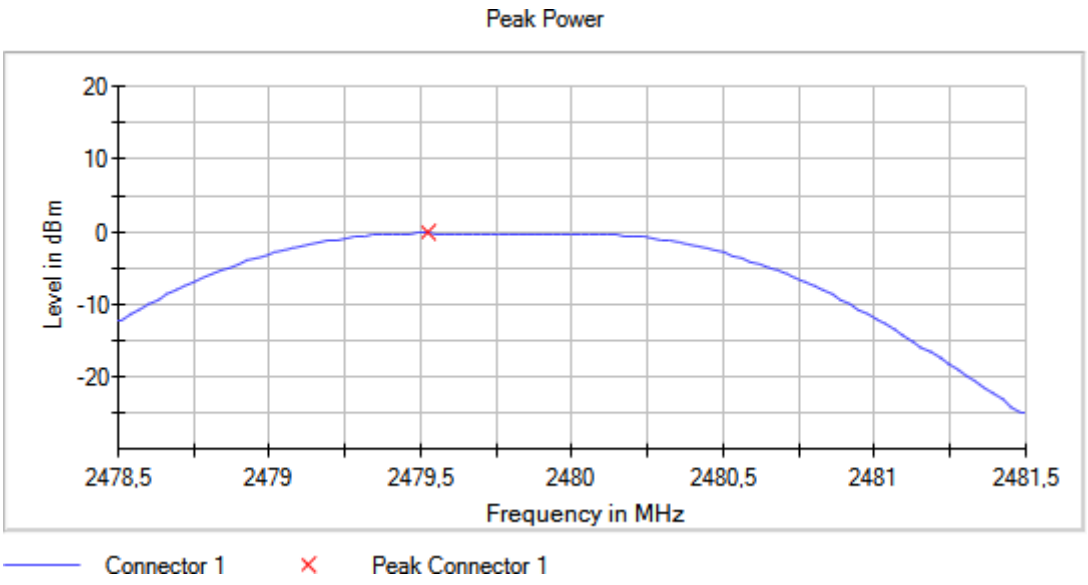
Images:

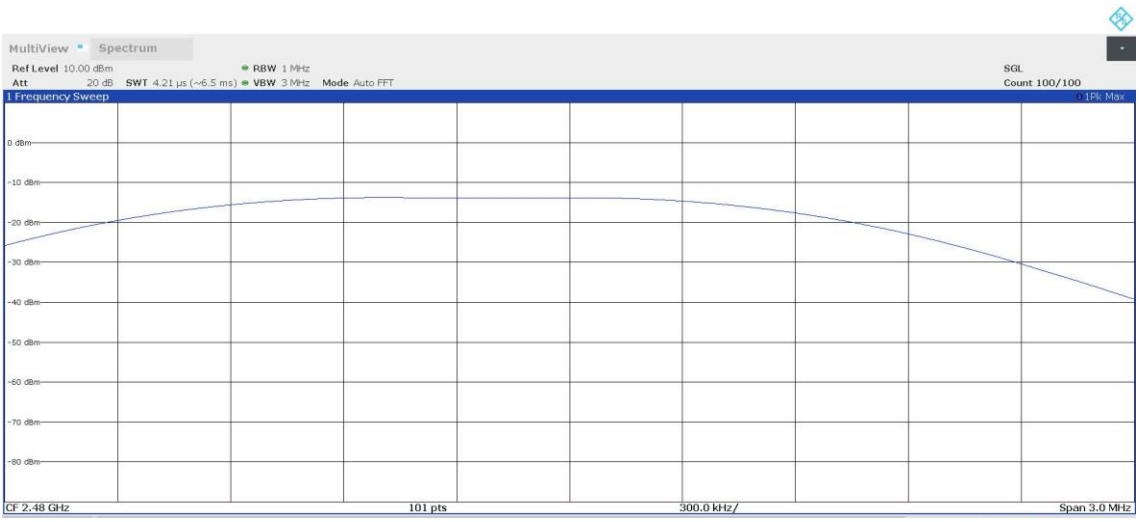




Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:





Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

Results

Freq (MHz)	Peak Power (dBm)	Maximum EIRP Power (dBm)
2402.00000	0.0550	2.655
2440.00000	0.3880	2.988
2480.00000	-0.0250	2.575

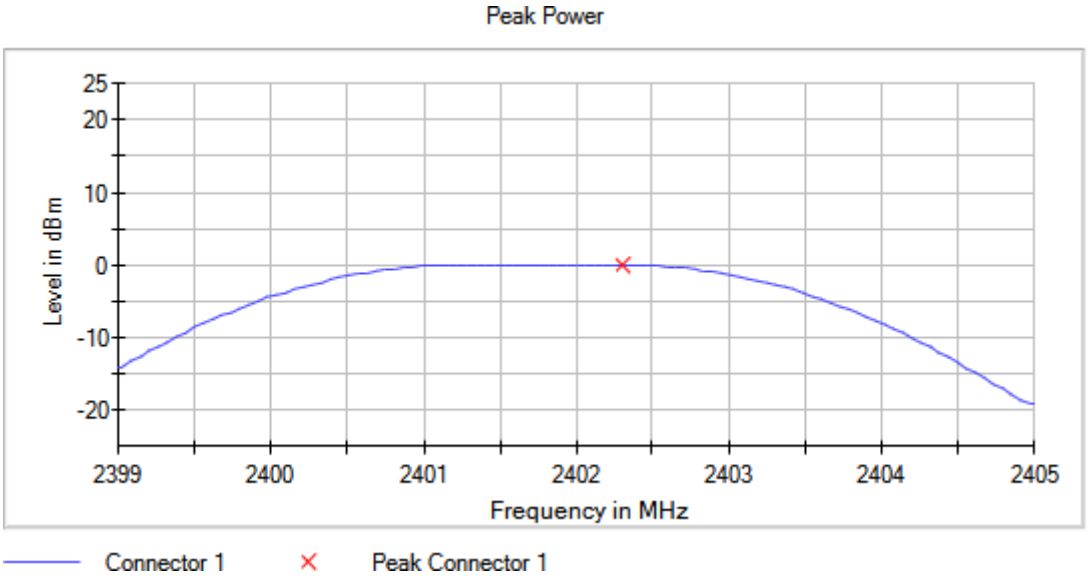
Verdict

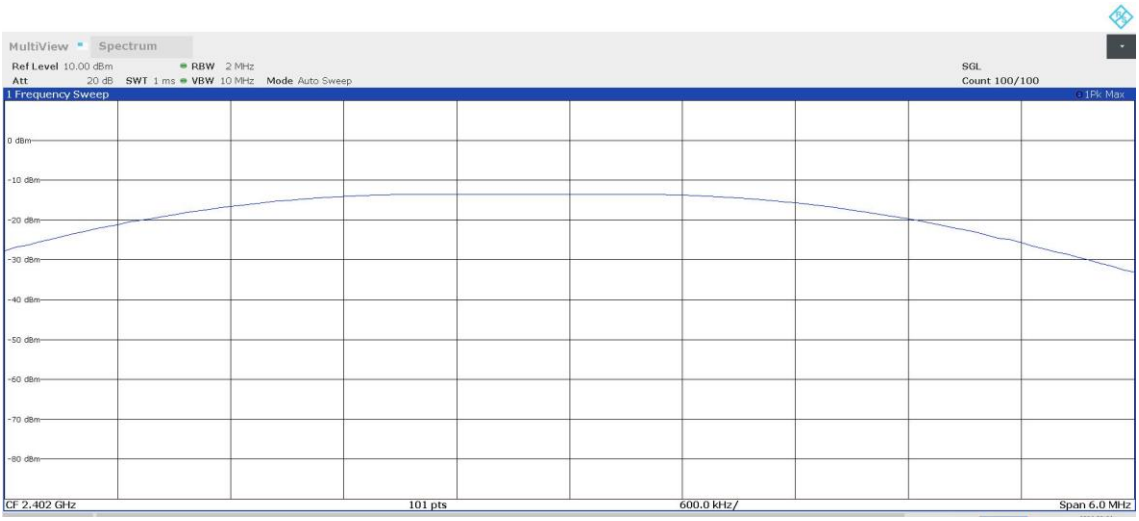
Pass

Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 2
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

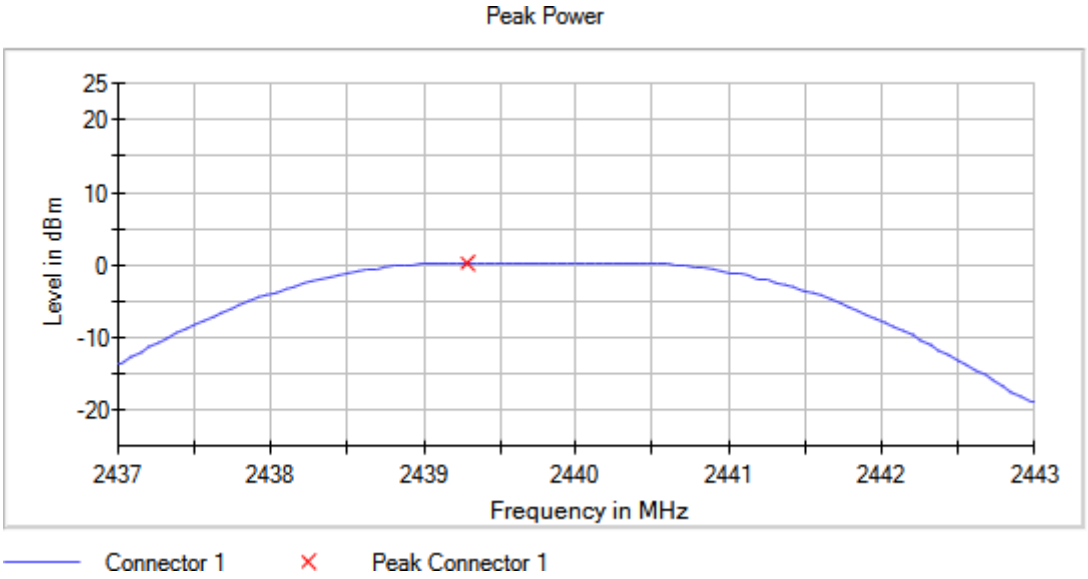
Images:

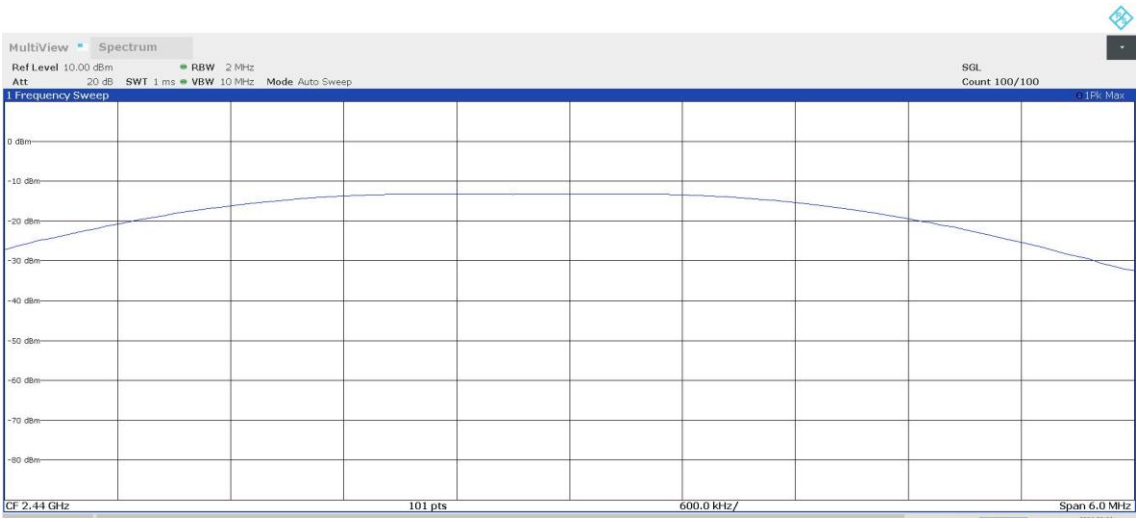




Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 2
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2440.00000
MIMO Mode = SISO	Active Port = 1

Images:



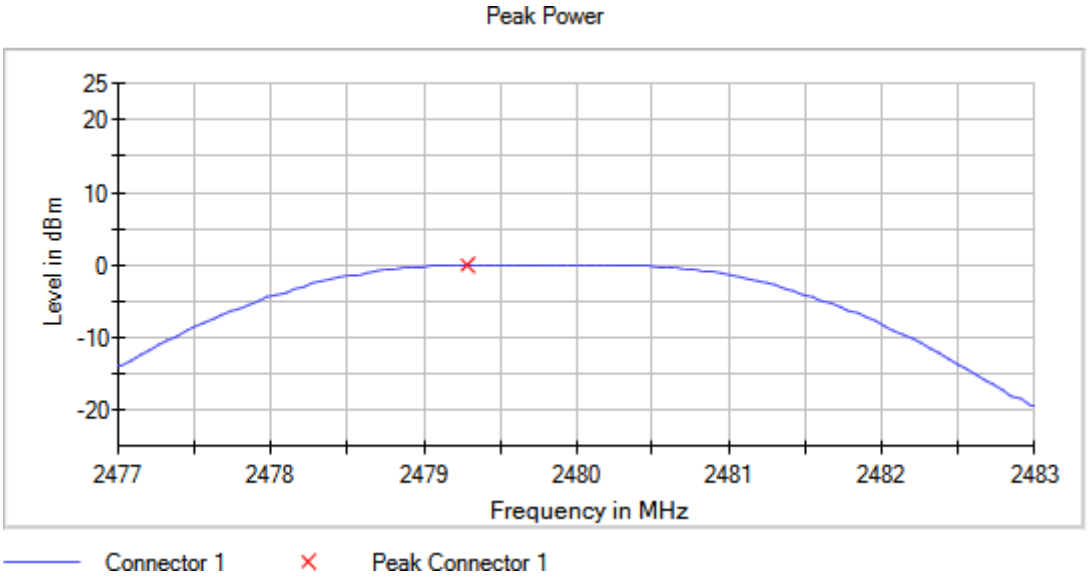


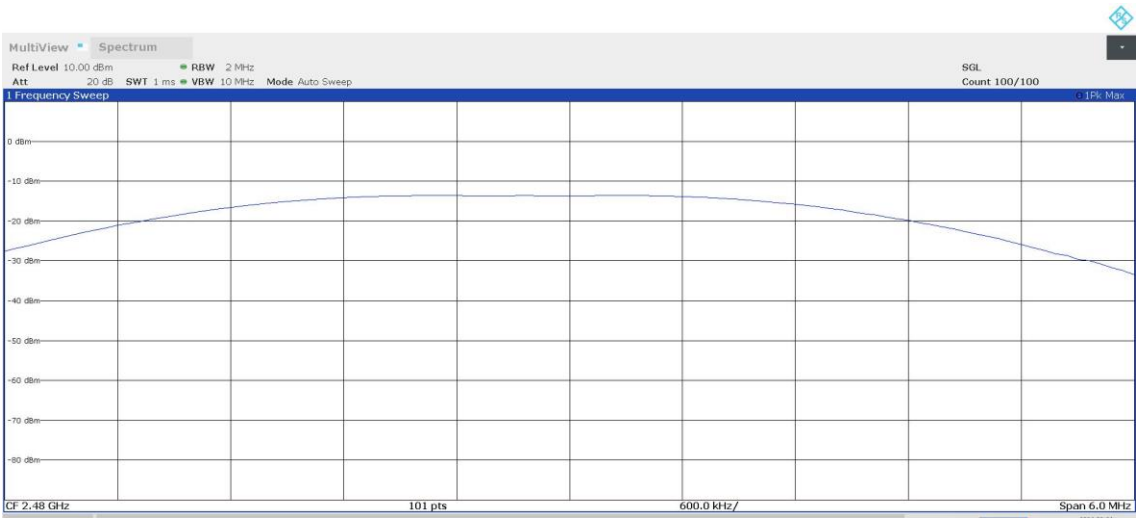
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

Modulation = BTLE 5.3 (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.

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

Results

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2402.00000	2399.875000	-48.676	-16.287
	2399.925000	-48.747	
	2399.825000	-48.961	
	2399.975000	-49.003	
	2399.775000	-49.106	
	2399.725000	-50.384	
	2399.675000	-51.225	
	2399.625000	-51.933	
	2399.575000	-52.171	
	2399.475000	-52.311	
	2399.425000	-52.393	
	2399.525000	-52.849	
	2399.375000	-53.574	
	2399.225000	-53.776	
	2399.175000	-53.998	

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2480.00000	2483.525000	-58.598	-16.281
	2483.575000	-59.345	
	2483.775000	-59.459	
	2484.375000	-59.524	
	2483.625000	-59.564	
	2484.425000	-59.574	
	2483.675000	-59.702	
	2483.825000	-59.853	
	2483.975000	-59.862	
	2483.725000	-60.090	
	2485.425000	-60.288	
	2484.675000	-60.345	
	2484.225000	-60.409	
	2484.625000	-60.505	
	2484.475000	-60.550	

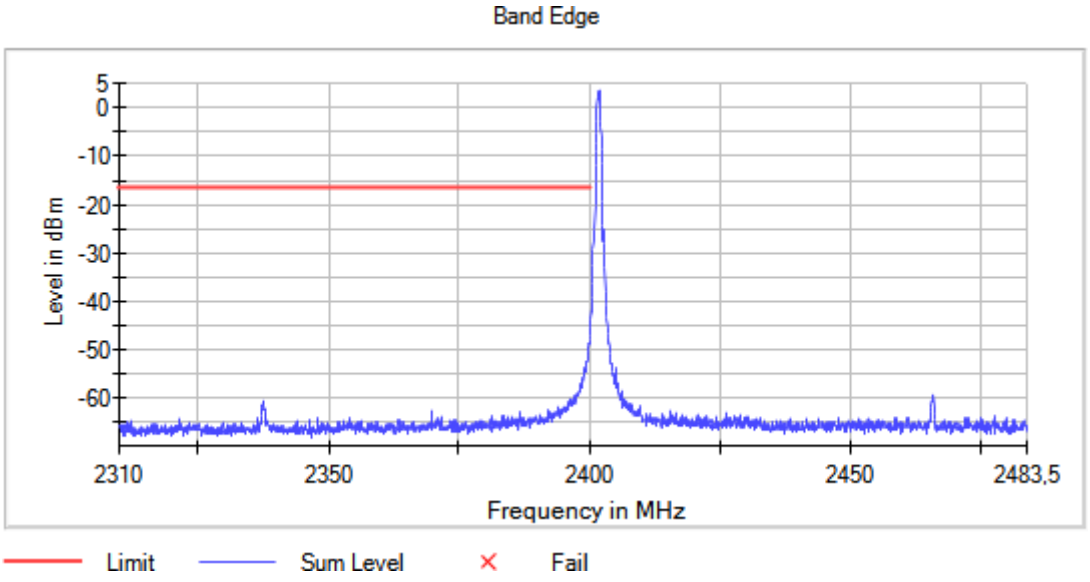
Verdict

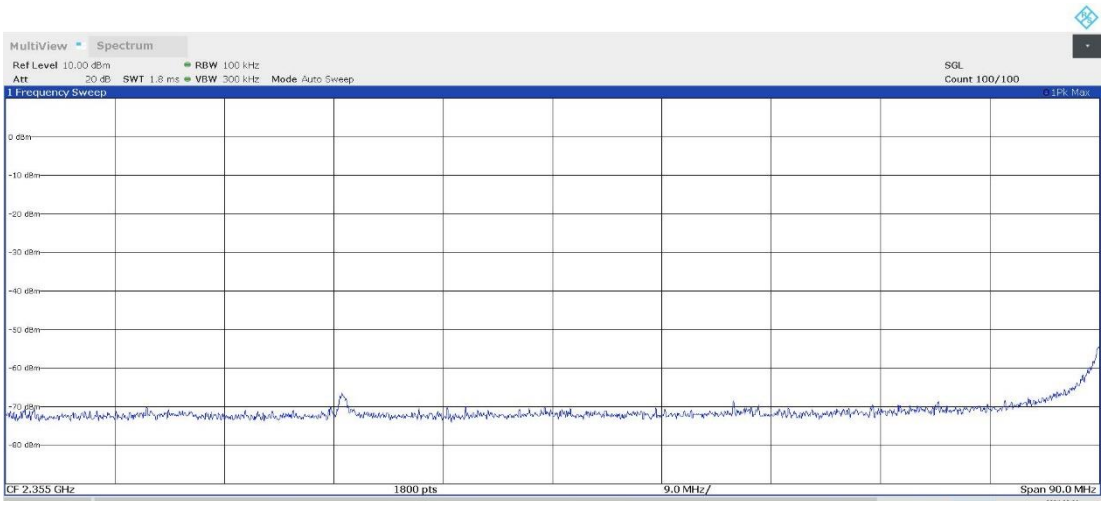
Pass

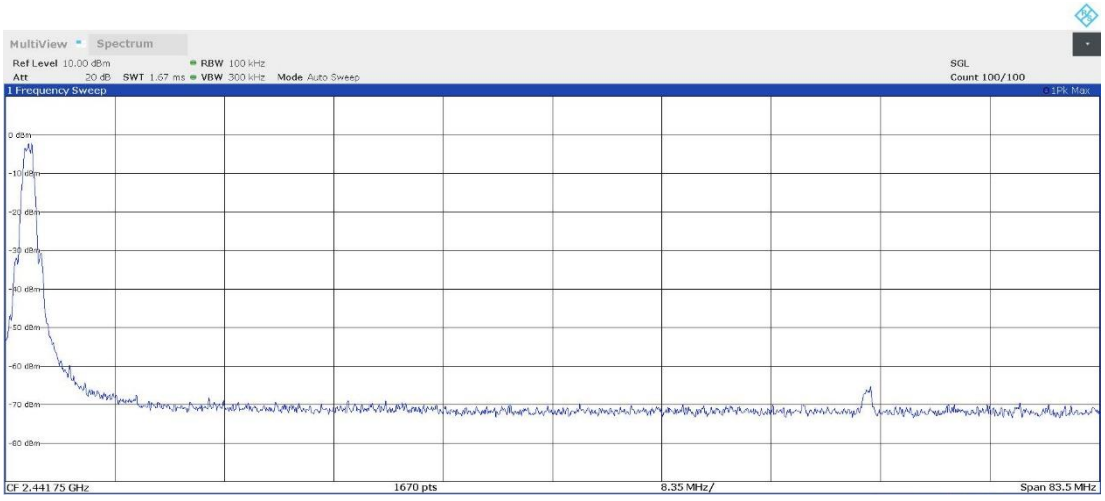
Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 1
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:

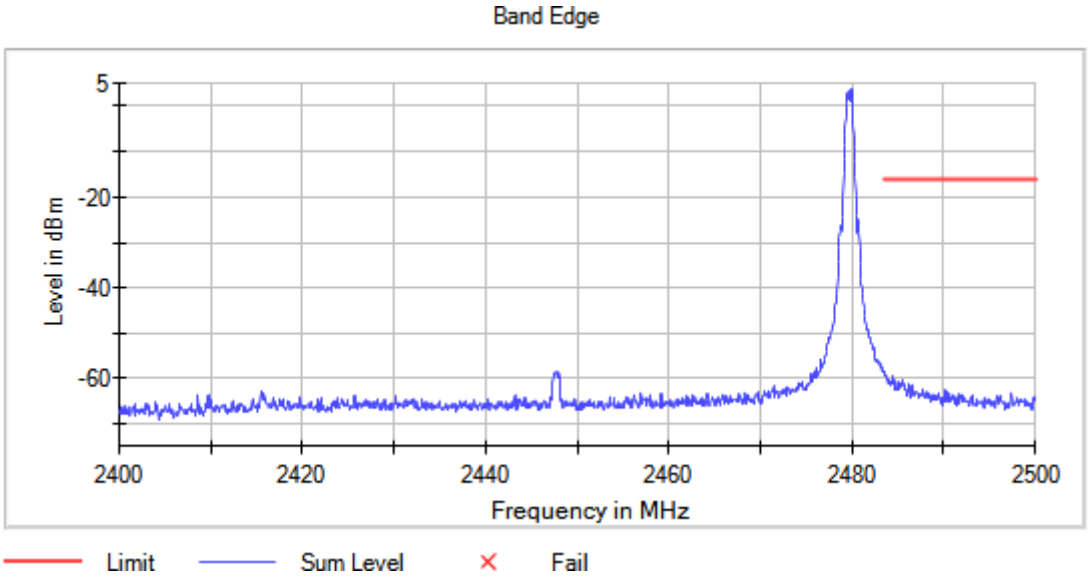


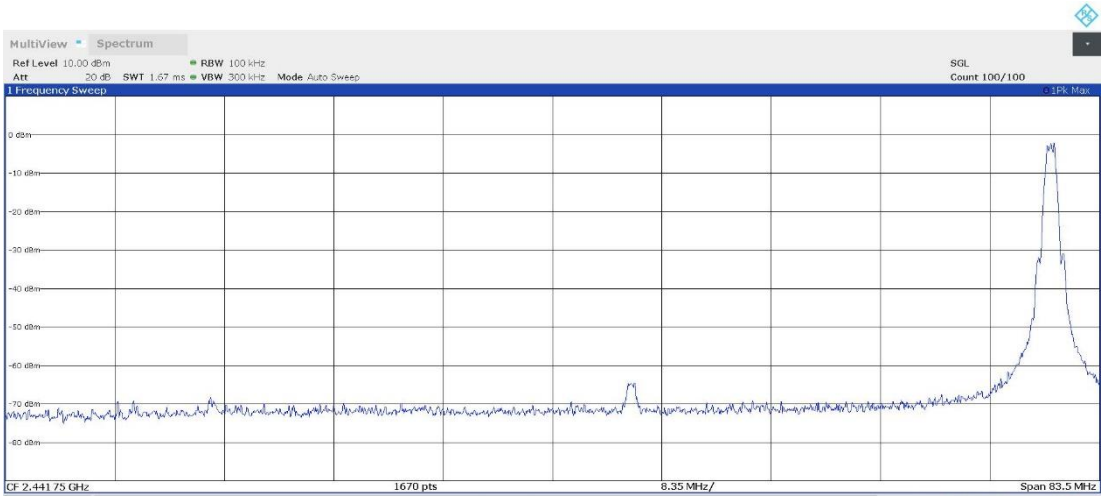


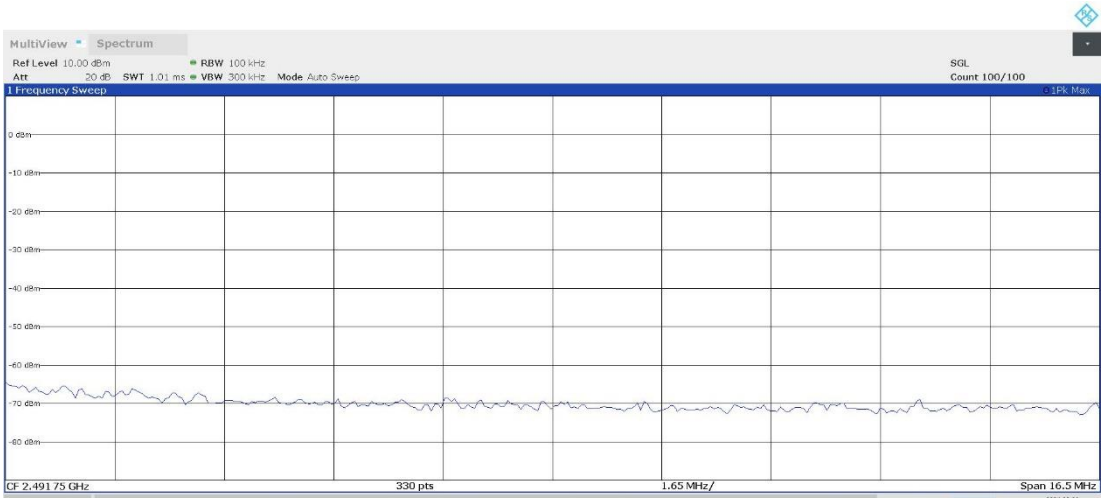


Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:







Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

MIMO Mode: SISO

Results

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2402.00000	2399.925000	-27.553	-16.333
	2399.725000	-27.852	
	2399.975000	-28.001	
	2399.875000	-28.241	
	2399.775000	-28.933	
	2399.675000	-29.410	
	2399.825000	-29.515	
	2399.625000	-31.950	
	2399.575000	-34.354	
	2399.525000	-34.699	
	2399.475000	-38.047	
	2399.425000	-40.336	
	2399.375000	-41.904	
	2399.325000	-42.945	
	2399.075000	-44.778	
2480.00000	2483.625000	-47.620	-16.312
	2483.675000	-47.650	
	2483.575000	-48.010	
	2483.525000	-48.291	
	2483.725000	-48.812	
	2483.825000	-49.435	
	2484.325000	-49.437	
	2484.375000	-49.621	
	2483.875000	-49.746	
	2483.775000	-50.214	
	2484.275000	-50.283	
	2484.225000	-50.993	
	2484.025000	-51.031	
	2483.975000	-51.062	
	2484.075000	-51.064	

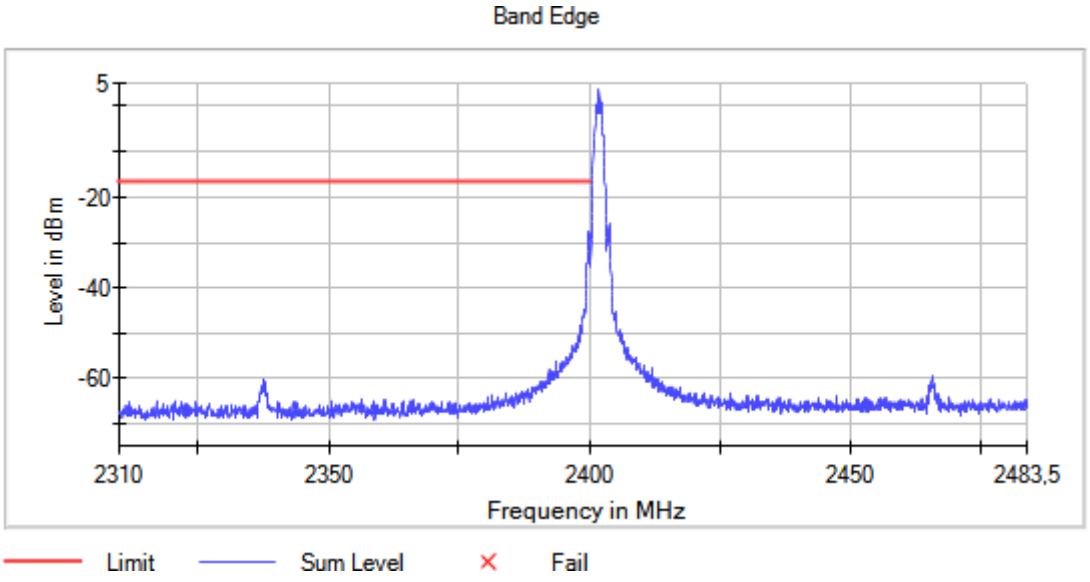
Verdict

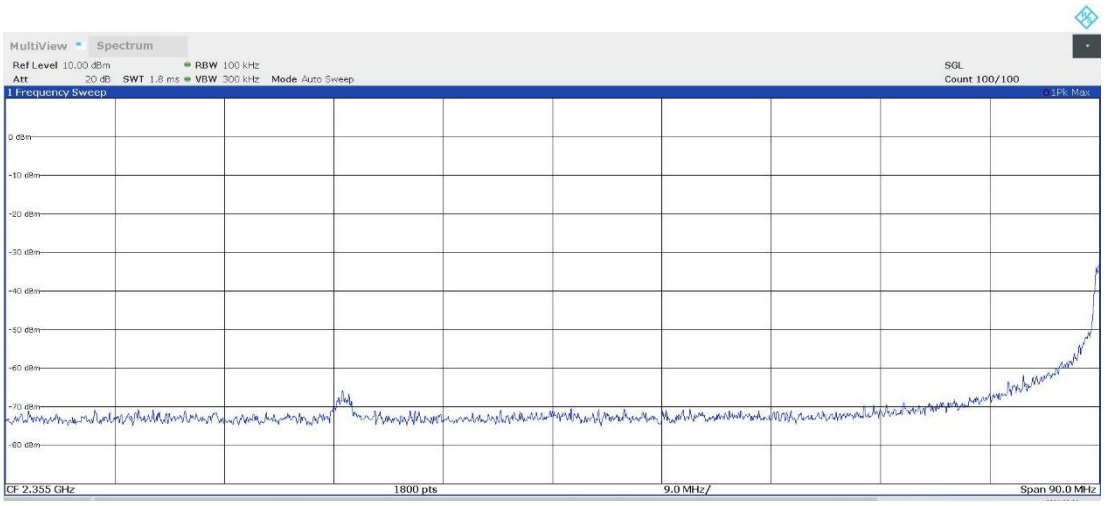
Pass

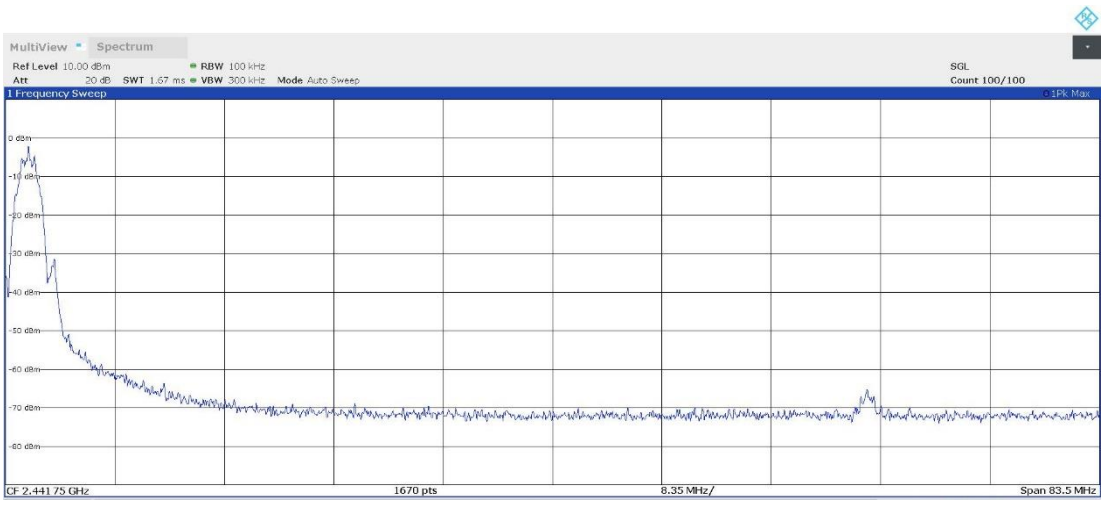
Attachments

Equipment Type = Digital Transmission System (DTS)	Bandwidth MHz = 2
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:





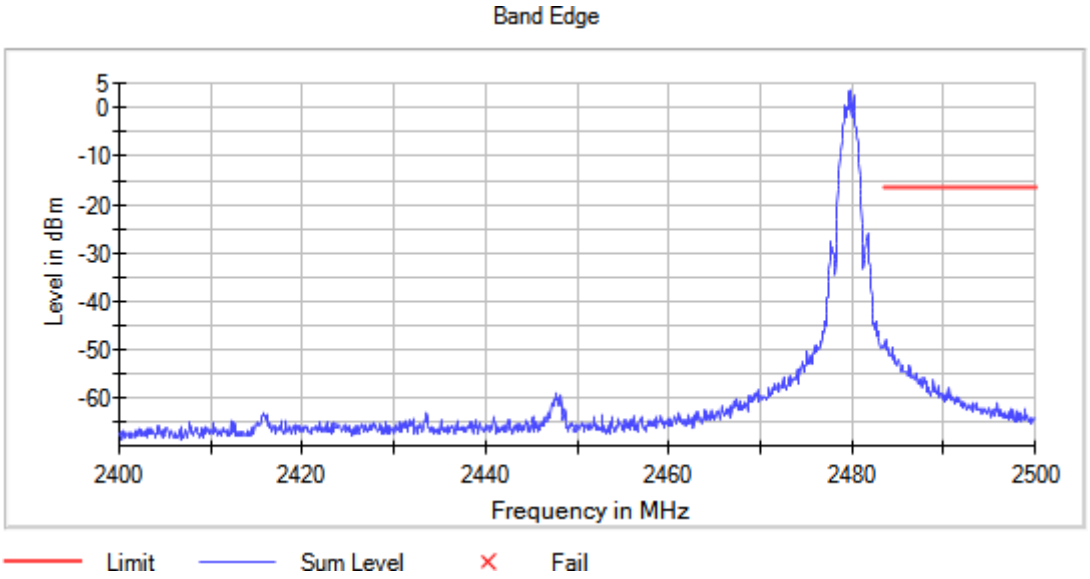


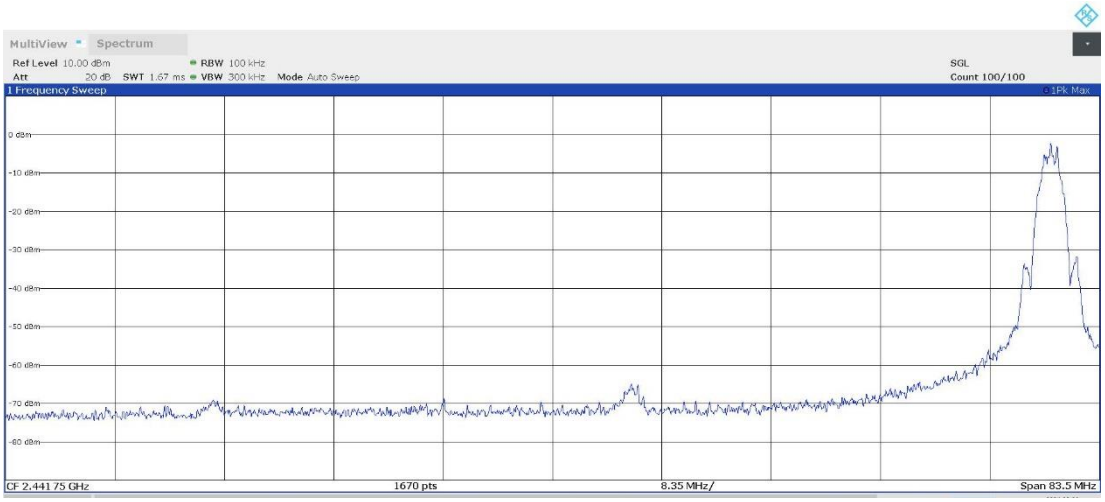
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2

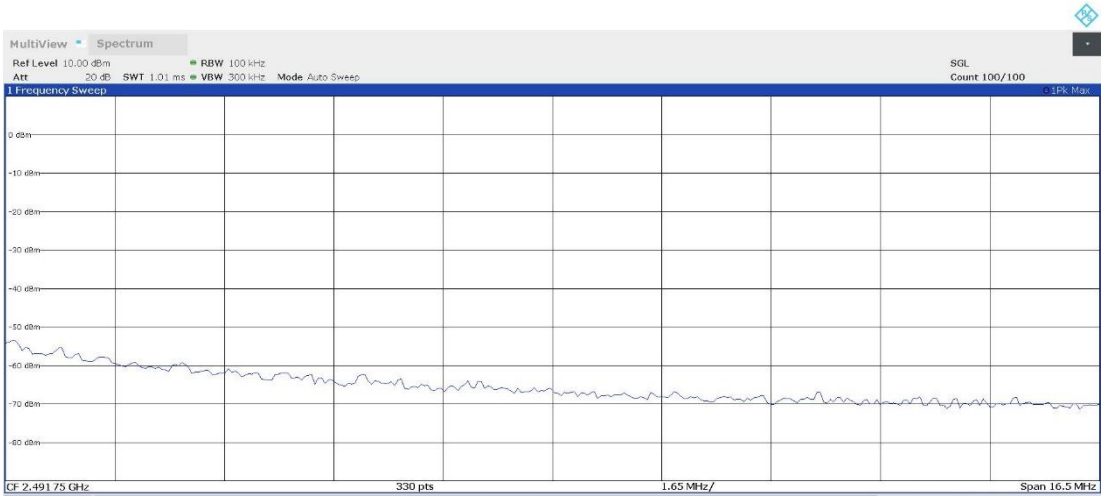
Modulation = BTLE 5.3 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000

MIMO Mode = SISO 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.

Frequency range tested for Radiated emissions:

Start frequency: no radiofrequency signal generated in the device found below 10th sub-harmonic, no further investigation required.

Stop frequency: it has been performed the radiated spurious emissions until 10th harmonic.

Modulation: BTLE 5.3 (GFSK 1 Mbit/s)

Results

** Duty Cycle correction factor: 0.67 dB*

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected Unwanted Lvl (dBµV/m)	Pol	Detector
[3, 17]	2402.00000	4803.500	54.94	--	V	PK
			51.59	52.26	V	AVG
		7204.500 (*)	57.49	--	V	PK
	2440.00000	4879.000	53.11	--	V	PK
		7320.500	54.57	--	V	PK
			48.35	49.02	V	AVG
	2480.00000	4959.500	53.45	--	H	PK
		7440.000	57.17	--	V	PK
			49.68	50.35	V	AVG

(*): This frequency is not within any restricted band. The emission levels were measured with a RBW = 100 kHz and the measured radiated carrier level was 96 dBµV/m with RBW = 100 kHz. The emission level is therefore more than 20 dB below the carrier level as indicated in FCC 15.247 (d).

Verdict

Pass

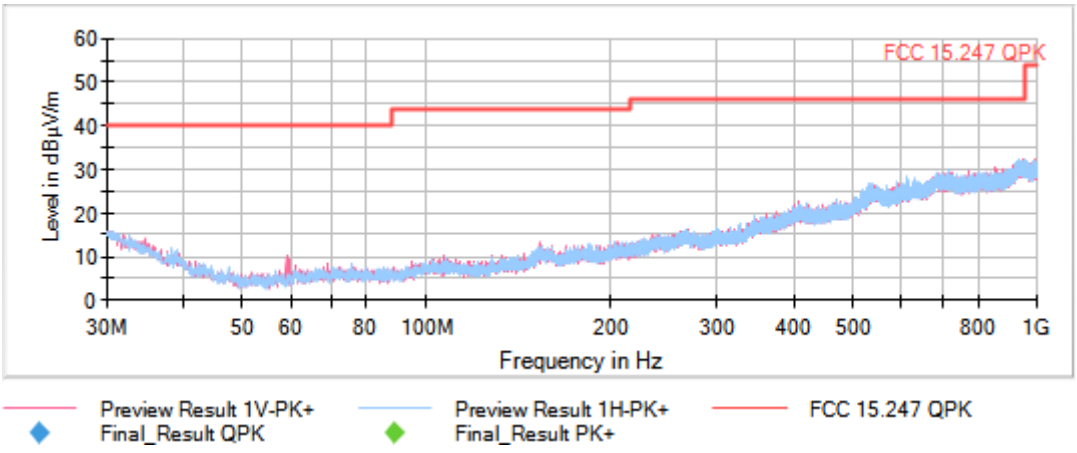
Attachments

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
3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
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 5.3 (GFSK 1 Mbit/s)	Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO	Active Port = 1

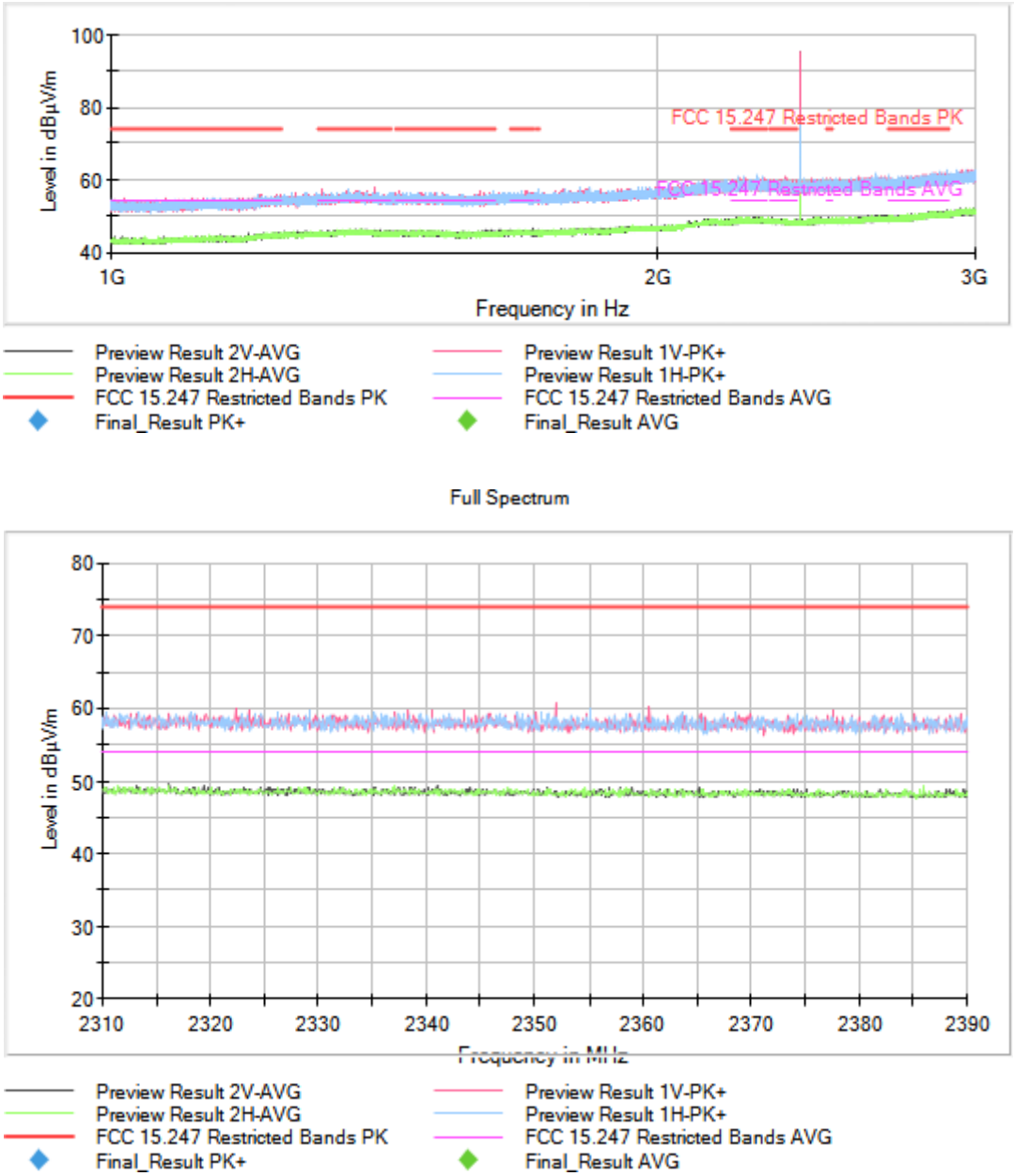
Images:



This plot is valid for all channels

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:

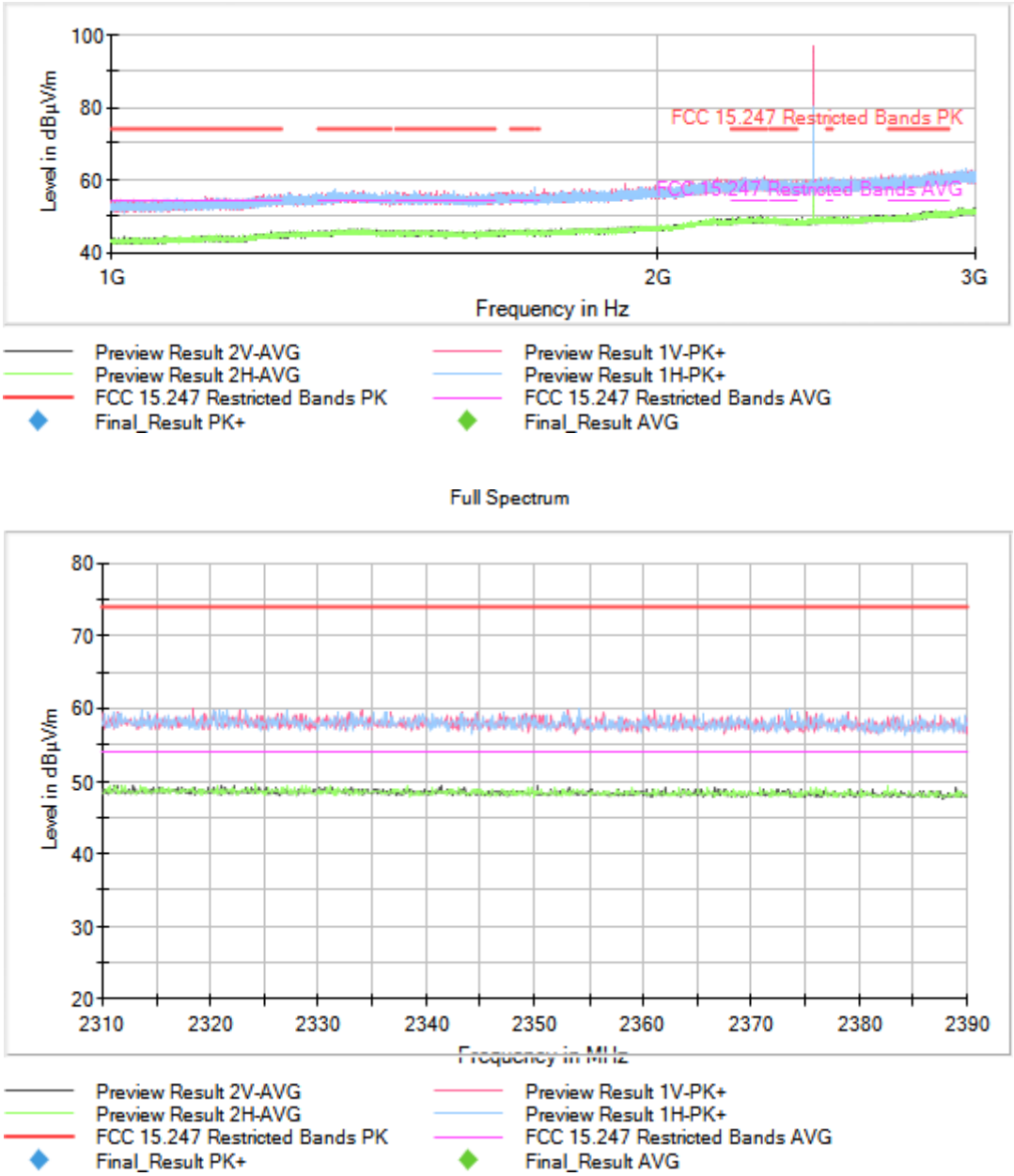


Full Spectrum


Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
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

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2440.00000
MIMO Mode = SISO	Active Port = 1

Images:

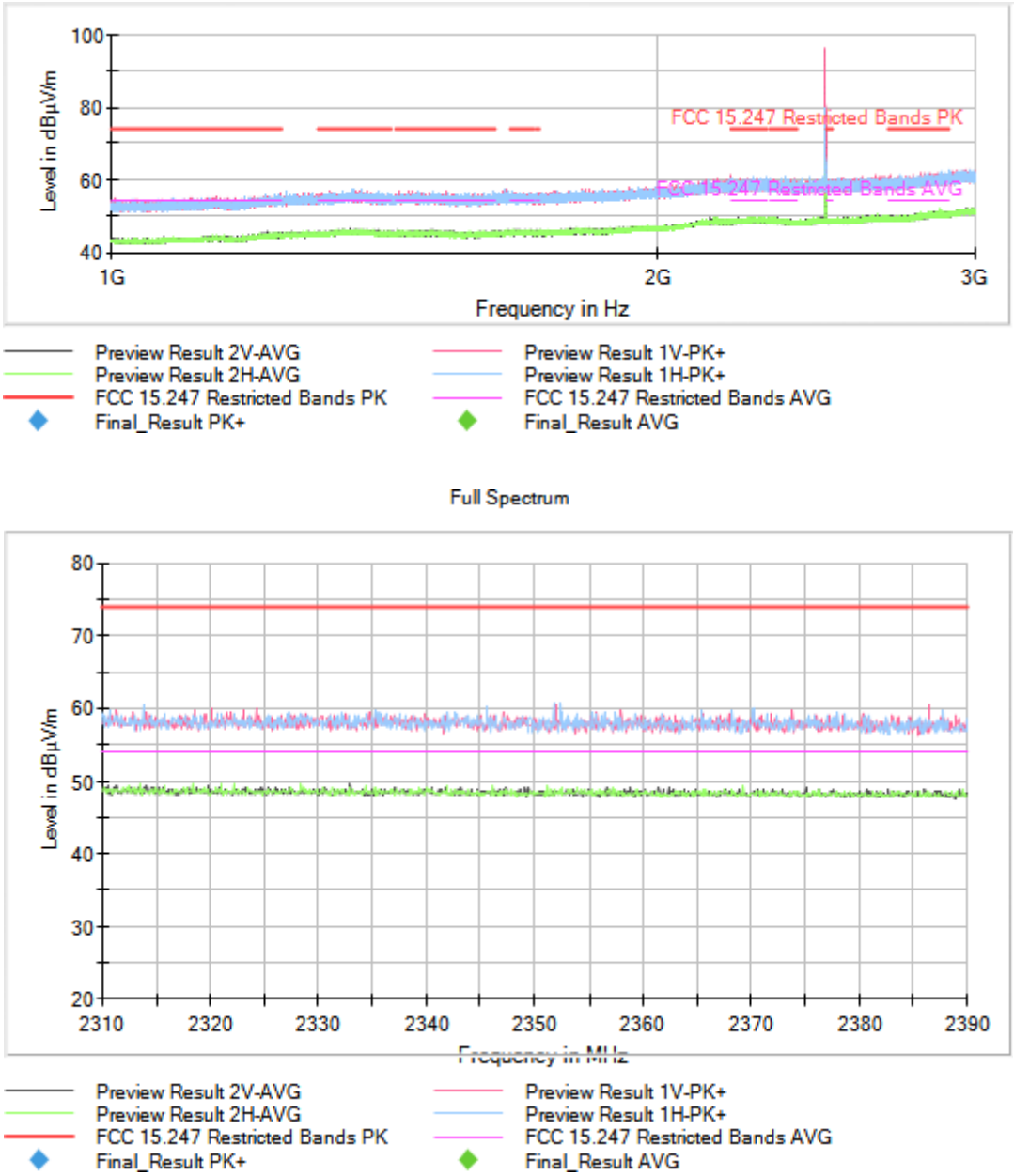


Full Spectrum


Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
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

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2480.00000
MIMO Mode = SISO	Active Port = 1

Images:



Full Spectrum

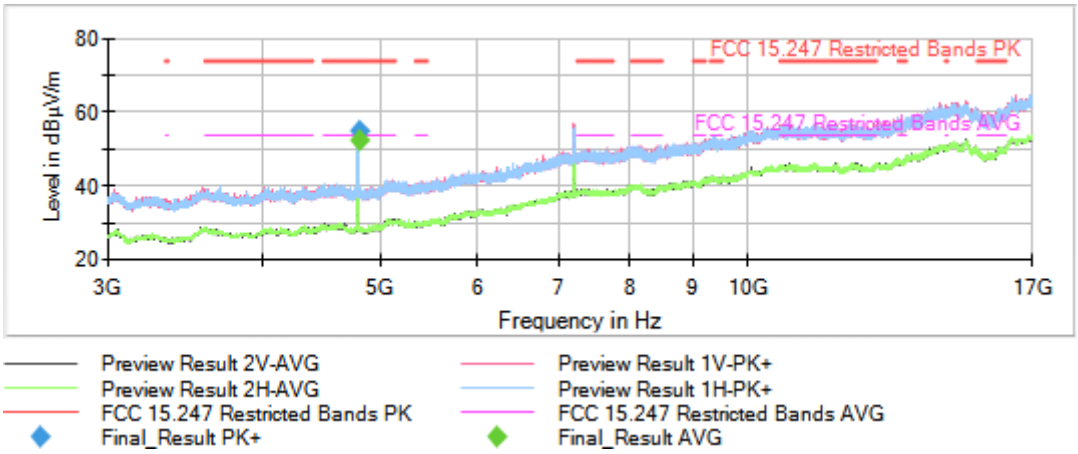

Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.3 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000

MIMO Mode = SISO Active Port = 1

Images:

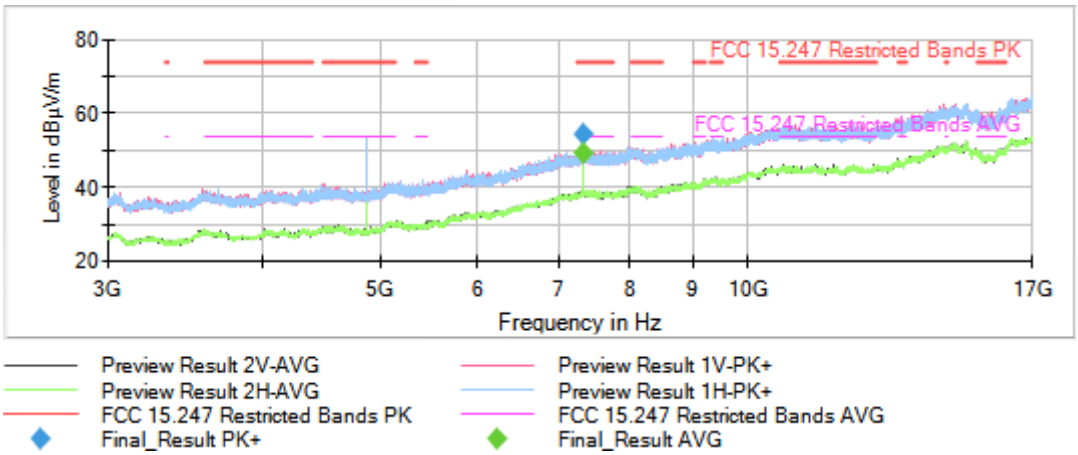


Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.3 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000

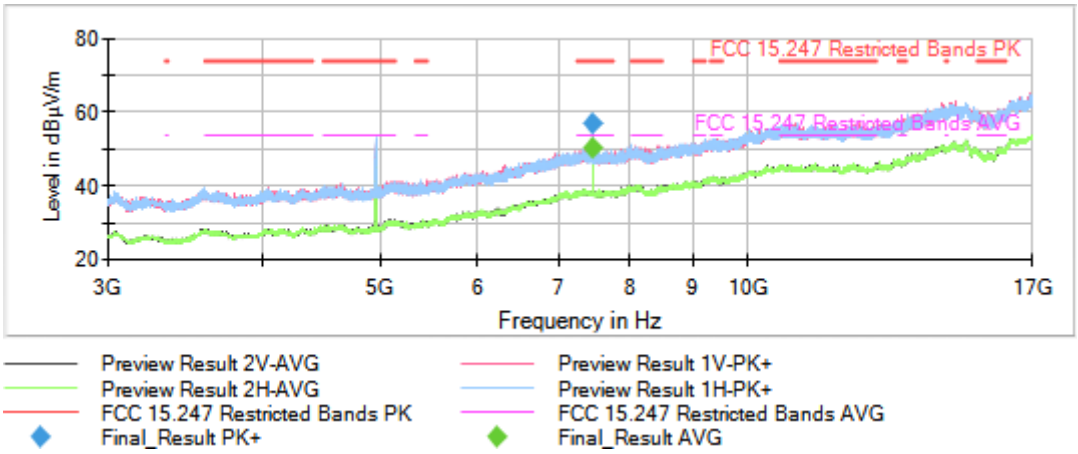
MIMO Mode = SISO Active Port = 1

Images:



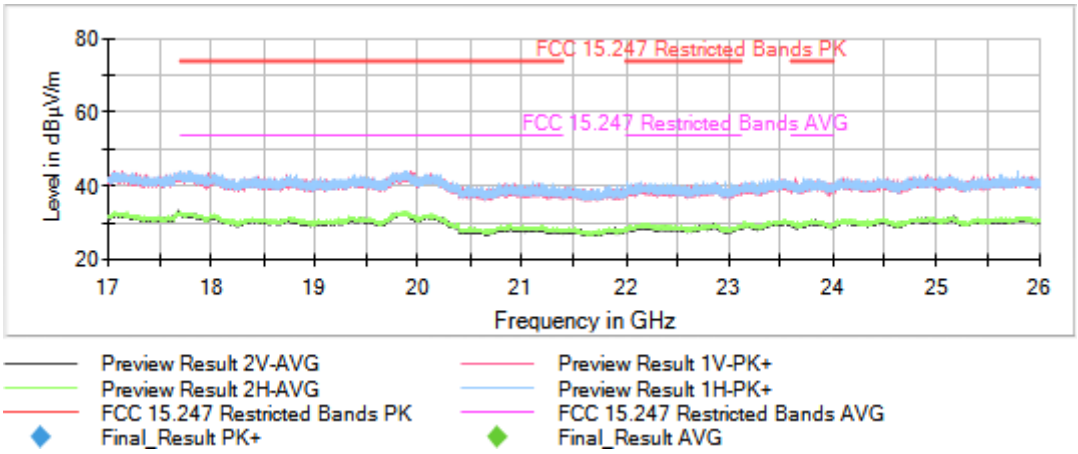
Frequency Range GHz = [3, 17]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = 2480.00000
MIMO Mode = SISO	Active Port = 1

Images:



Frequency Range GHz = [17, 26]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 1 Mbit/s)	Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO	Active Port = 1

Images:



This plot is valid for all channels

Modulation: BTLE 5.3 (GFSK 2 Mbit/s)

Results

** Duty Cycle correction factor: 2.40 dB*

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected Unwanted Lvl (dBµV/m)	Pol	Detector
[3, 17]	2402.00000	4802.500	55.31	--	H	PK
			48.58	50.98	H	AVG
		7203.500 (*)	57.38	--	V	PK
	2440.00000	4878.500	52.06	--	V	PK
		7318.000	55.51	--	V	PK
			46.91	49.31	V	AVG
	2480.00000	4958.500	53.22	--	H	PK
		7437.500	56.32	--	V	PK
			47.80	50.20	V	AVG

(*): This frequency is not within any restricted band. The emission levels were measured with a RBW = 100 kHz and the measured radiated carrier level was 95.12 dBµV/m with RBW = 100 kHz. The emission level is therefore more than 20 dB below the carrier level as indicated in FCC 15.247 (d).

Verdict

Pass

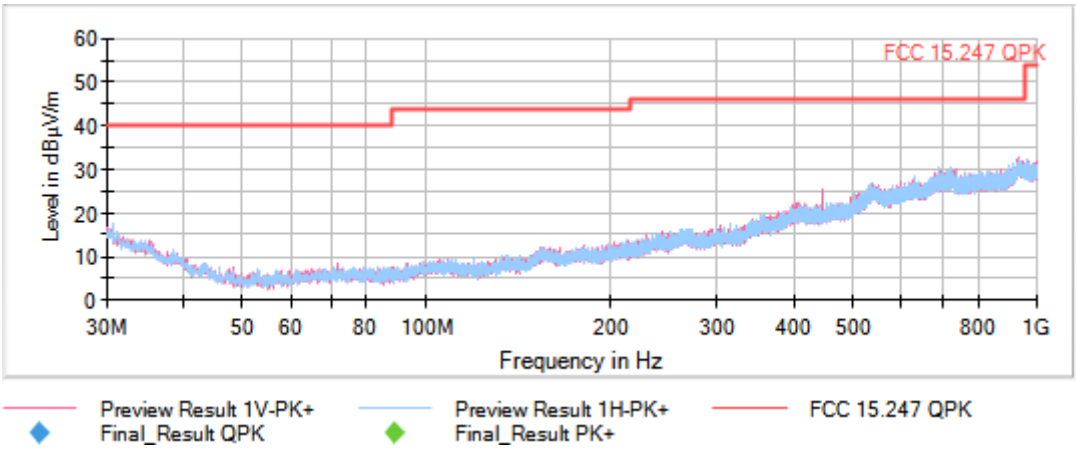
Attachments

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
3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
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 5.3 (GFSK 2 Mbit/s)	Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO	Active Port = 1

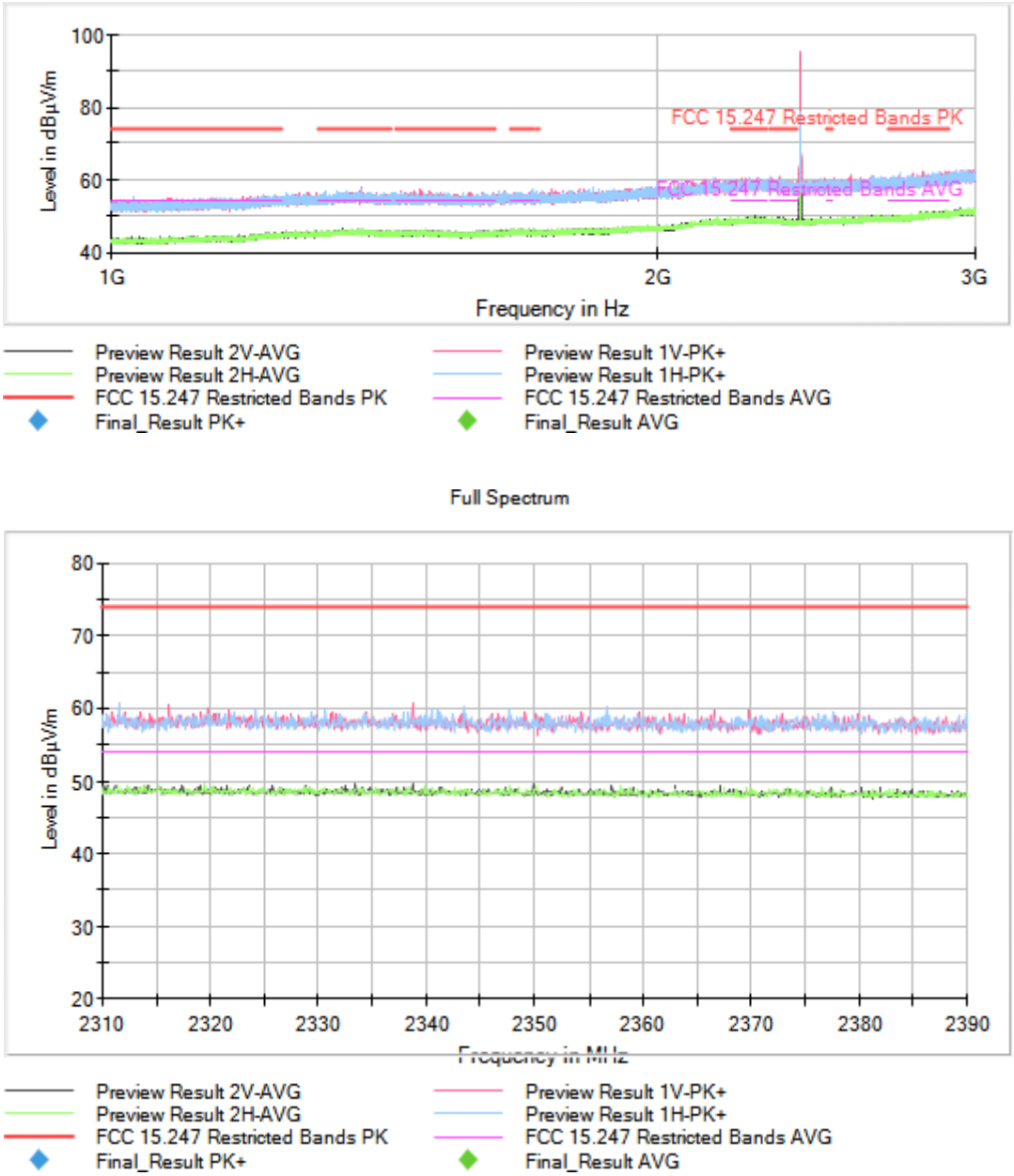
Images:



This plot is valid for all channels

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:

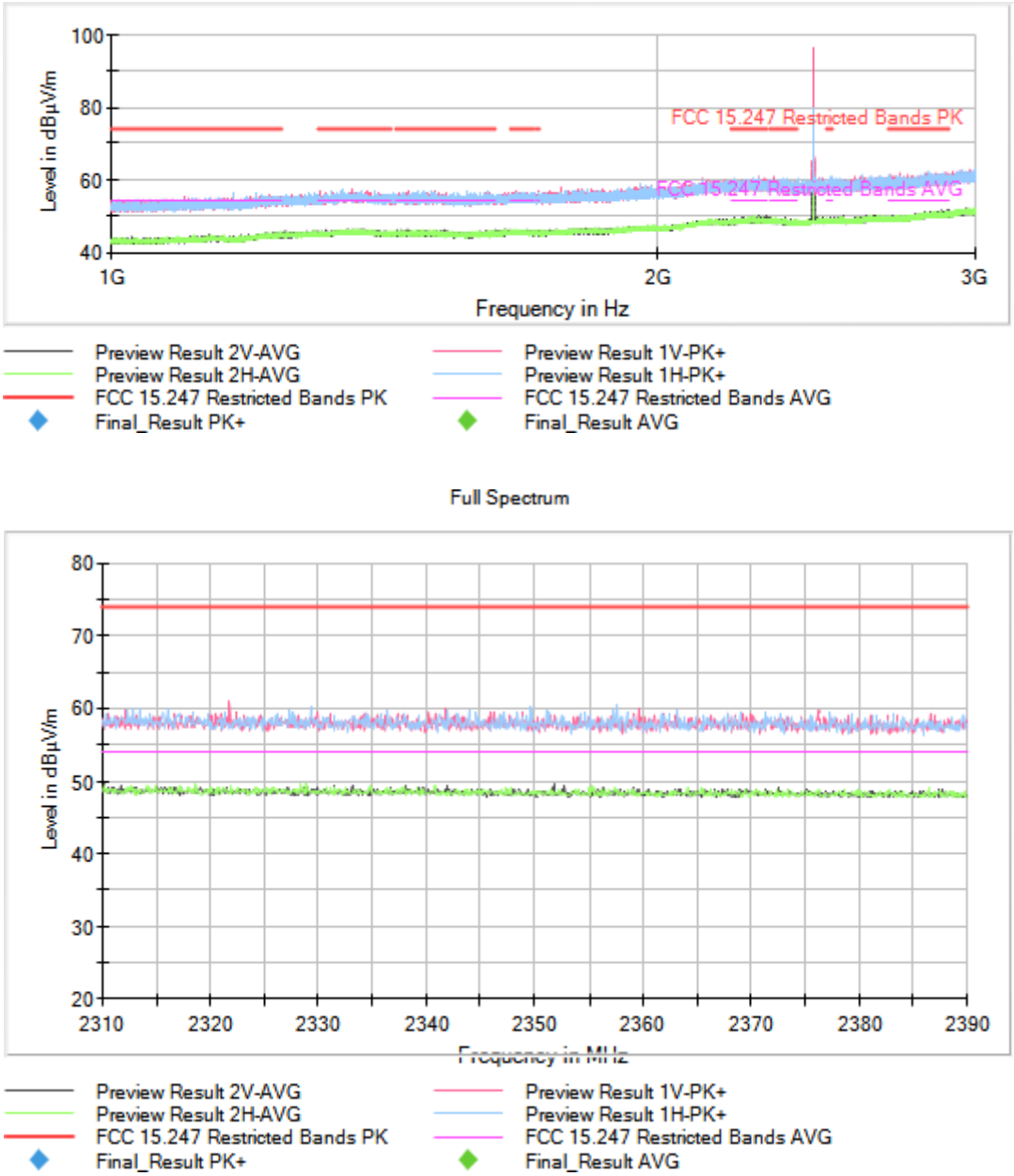


Full Spectrum


Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
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

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2440.00000
MIMO Mode = SISO	Active Port = 1

Images:



Full Spectrum


Full Spectrum
80
70
60
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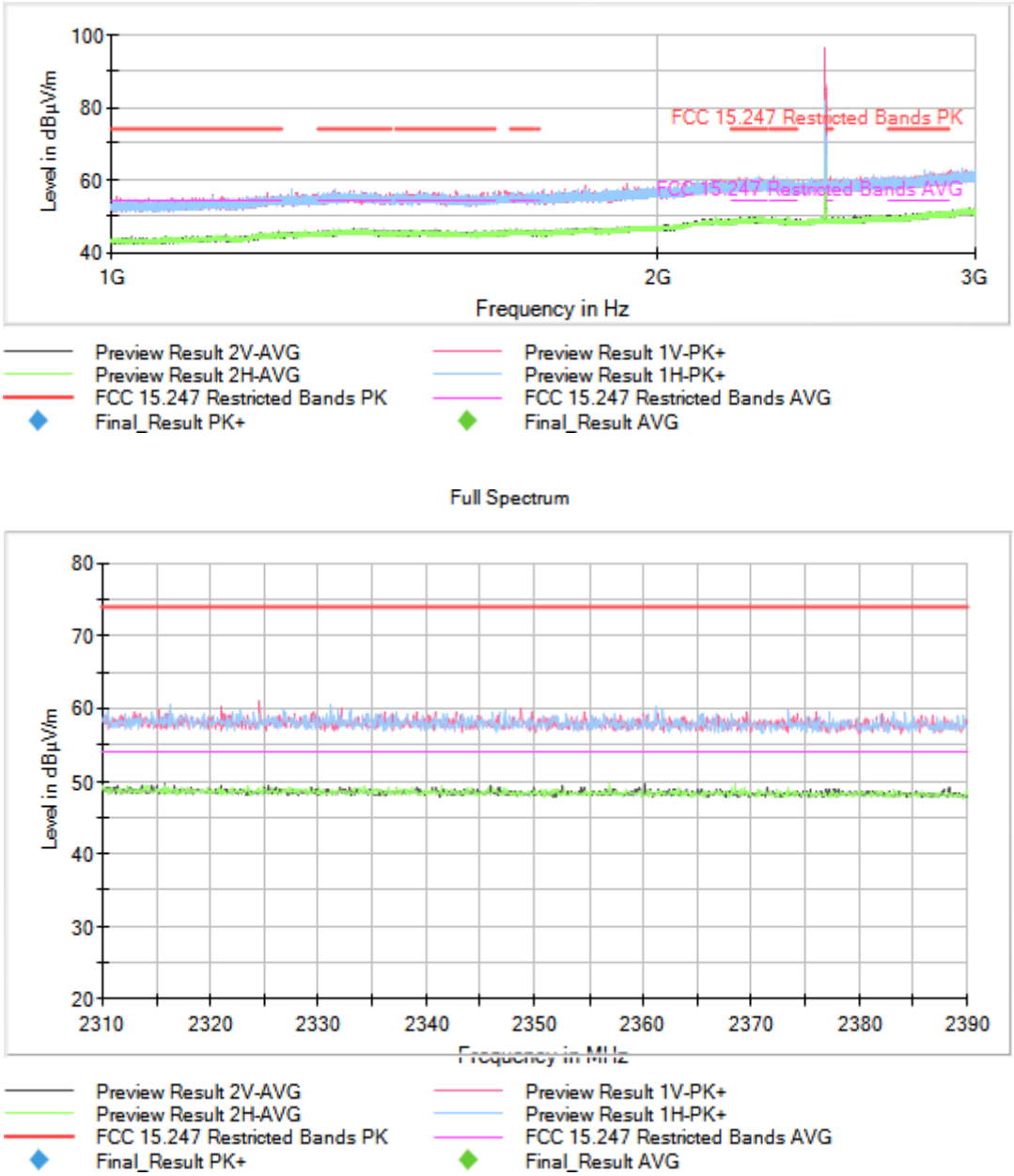
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

Frequency Range GHz = [1, 3]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2480.00000
MIMO Mode = SISO	Active Port = 1

Images:



Full Spectrum

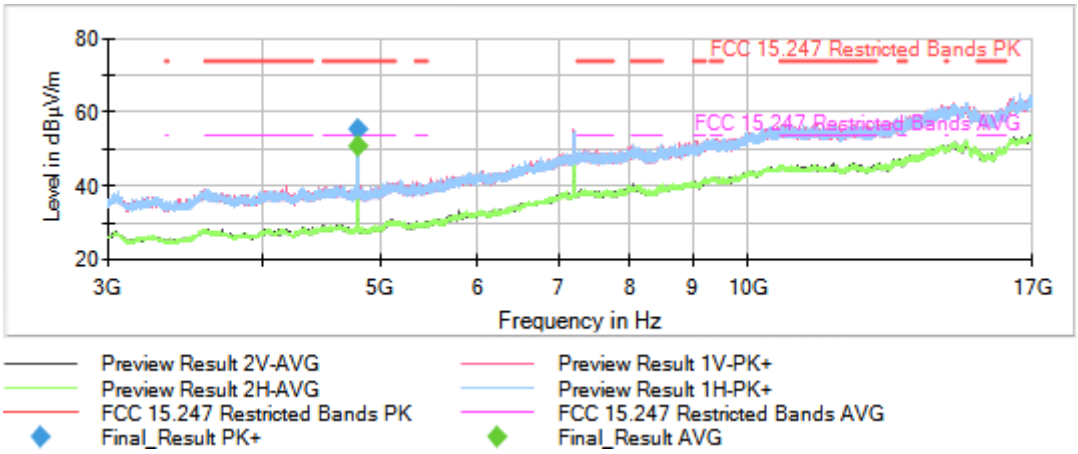

Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.3 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000

MIMO Mode = SISO Active Port = 1

Images:

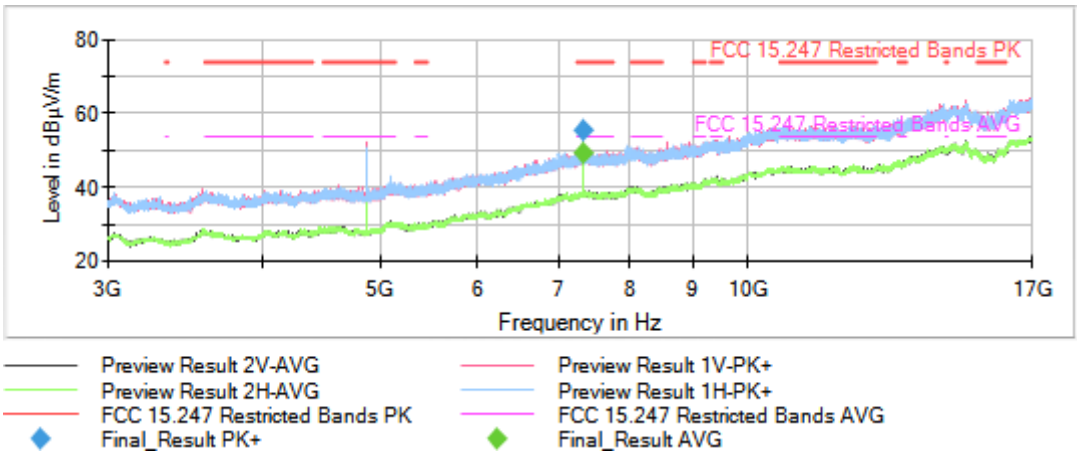


Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.3 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000

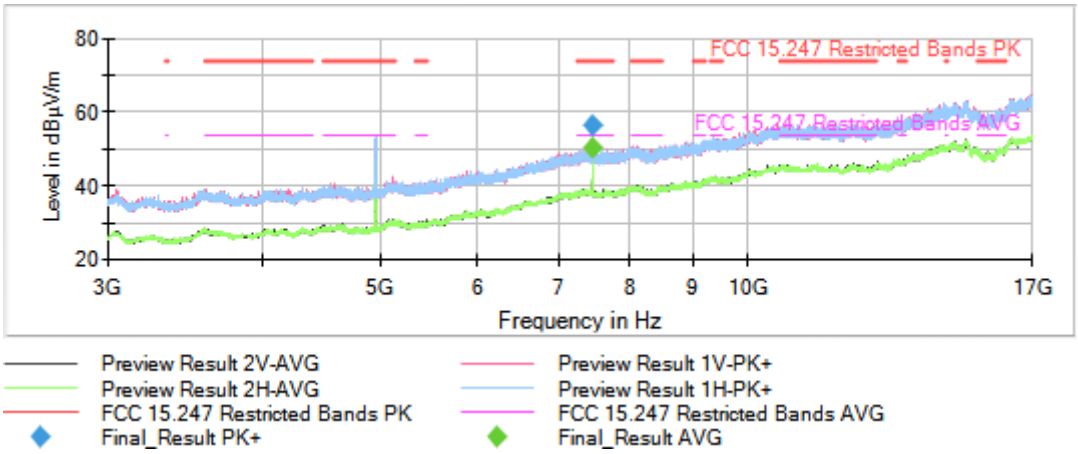
MIMO Mode = SISO Active Port = 1

Images:



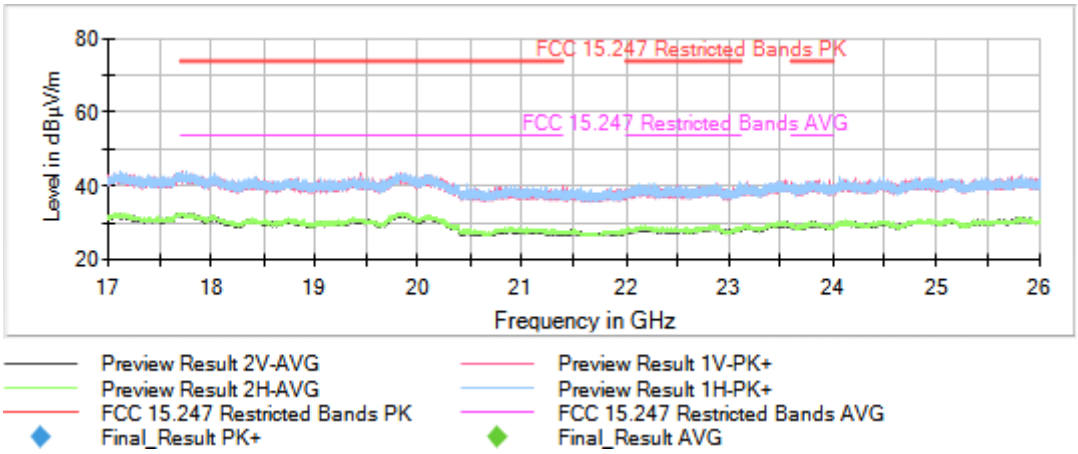
Frequency Range GHz = [3, 17]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = 2480.00000
MIMO Mode = SISO	Active Port = 1

Images:



Frequency Range GHz = [17, 26]	Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.3 (GFSK 2 Mbit/s)	Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO	Active Port = 1

Images:



This plot is valid for all channels