

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
82408RRF.001

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	An instrument cluster with Bluetooth® for operation in a vehicle.
(*) Trademark	BOSCH
(*) Model and /or type reference	5inColorD
Other identification of the product	FCC ID: 2AUXS-5INCOLORD IC: 25847-5INCOLORD
(*) Features	Bluetooth LE HW version: C3.2 SW version: BRP5-0.0.SWP25.1.28
Applicant	Robert Bosch GmbH Robert-Bosch-Strasse 200, 31139 Hildesheim, Germany
Test method requested, standard	USA FCC Part 15.247 (10-1-23 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-23 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
Date of issue	2025-07-01
Report template No	FDT08_25 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
	E.I.R.P.
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
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
PSD	Power Spectral Density
Peak Power	Maximum Peak Conducted Output Power
Pol	Polarization
Port	Active Port
RU	Resource Unit
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.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

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
- RF Average Output Power: Measurement uncertainty $\leq \pm 0,99$ 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 An instrument cluster with Bluetooth® for operation in a vehicle.. see technical passport, additional document..

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	82408_106.1	Display (Conducted)	--	0000568	2025-06-03	Element Under Test
S/01 & S/02	82408_37.1	Module	--	--	2025-04-14	Auxiliary Element
S/01 & S/02	82408_39.1	Harness	--	--	2025-04-14	Auxiliary Element
S/01 & S/02	82408_40.1	Ethernet Cable	--	--	2025-04-14	Auxiliary Element
S/01 & S/02	82408_41.1	USB 2.0 to DB9 Adapter Cable	--	--	2025-04-14	Auxiliary Element
S/01 & S/02	82408_42.1	VGA to VGA Flat Cable	--	--	2025-04-14	Auxiliary Element
S/02	82408_88.1	Display (Radiated)	--	0000579	2025-05-12	Element Under Test

Notes referenced to samples during the project:

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

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
			[]	[]	[]		
			[]	[]	[]		
			[]	[]	[]		
			[]	[]	[]		
			[]	[]	[]		
			[]	[]	[]		
Supplementary information to the ports..... :							
Rated power supply.....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[]	DC:					
	[]	DC:					
Rated Power							
Clock frequencies.....:							
Other parameters.....:							
Software version	BRP5-0.0.SWP25.1.28						
Hardware version	C3.2						
Dimensions in cm (W x H x D).....:	15,054 x 10,047 x 4,697						
Mounting position.....:	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[]	Hand-held equipment					
	[]	Other:					

Modules/parts:	Module/parts of test item	Type	Manufacturer
			
			
			
			
Accessories (not part of the test item):	Description	Type	Manufacturer
			
			
			
			
			
Documents as provided by the applicant:	Description	File name	Issue date
			
			
			

⁽³⁾ Only for Medical Equipment

Identification of the client

Robert Bosch GmbH
Robert-Bosch-Platz 1, 70839 Gerlingen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2025-05-30
Date (finish)	2025-06-04

Document history

Report number	Date	Description
82408RRF.001	2025-07-01	First release.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Antonio Maireles and Carmen Vázquez Perez.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
07445	DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	--
05850	DIGITAL MULTIMETER	179	FLUKE	2025-11-04
07760	DIGITAL MULTIMETER	175	FLUKE	2025-11-07
07817	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2026-07-01
06609	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2026-04-21
06615	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2026-04-24
07796	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2027-01-09
04953	HIGH PASS FILTER 1.1-8GHz	WHK10-990-1100-8000-40SS	WAINWRIGHT INSTRUMENTS	2026-02-14
09029	HIGH PASS FILTER 17-40 GHZ	STHP-17-40G-92	TEMSTRON/TEM WELL	2026-04-02
08770	HIGH PASS FILTER 3-18 GHZ	ST-3GA2833-HS	TEMSTRON/TEM WELL	2025-08-02
06496	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK	2026-12-01
04657	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2026-06-12
06143	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2027-01-22
07656	LOW PASS FILTER TEMSTRON/TEMWELL DC - 1 GHZ	ST-1GA3250-LS	TEMSTRON/TEM WELL	2026-02-03
07193	MULTI-DEVICE CONTROLLER	CO3000	INNCO	--
08848	OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2027-01-02
00922	POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	2027-10-02
04729	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-1M	BONN ELEKTRONIK	2026-04-03
03783	PRE-AMPLIFIER G>30dB 1GHz-18GHz	BLMA 0118-3A	BONN ELEKTRONIK	2026-03-17
06144	PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	2025-07-22

Control No.	Equipment	Model	Manufacturer	Next Calibration
06791	SEMIANECHOIC ABSORBER LINED CHAMBER IV	FACT 3 200 STP	ETS LINDGREN	--
06793	SHIELDED ROOM	S101	ETS LINDGREN	--
06668	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2027-04-01
07791	SIGNAL GENERATOR 8kHz-6GHz	SMB100B	ROHDE AND SCHWARZ	2026-03-15
07793	SIGNAL GENERATOR 8kHz-6GHz	SMBV100B	ROHDE AND SCHWARZ	2026-03-11
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
06611	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2026-04-21
08847	VECTOR SIGNAL GENERATOR 100kHz-7.5GHz	SMW200A	ROHDE AND SCHWARZ	2025-09-29
10743	WIRELESS CONNECTIVITY TESTER BW 160 MHz	CMW270	ROHDE AND SCHWARZ	2025-07-11
07798	WMS32	WMS32	ROHDE AND SCHWARZ	--

Testing verdicts

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

Summary

Bluetooth Low Energy (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	
<u>Supplementary information and remarks:</u>			
None			

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

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 99dBw Occupied Channel Bandwidth 99% 17

 RSS-247 5.2 (a) / FCC 15.247 (a) (2) [6dBw] 6 dB Bandwidth 25

 RSS-247 5.4 / FCC 15.247 (b) [Pkcp] Maximum Peak Conducted Output Power 33

 RSS-247 5.5 / FCC 15.247 (d) [Bndedge] Band-edge emissions compliance (Transmitter) 41

 RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter) 52

 [Psd] Power Spectral Density 73

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 12 V
Type of Power Supply: External power supply

ANTENNA (*):

Type of Antenna: Internal
Maximum Declared Antenna Gain: 3.04 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).

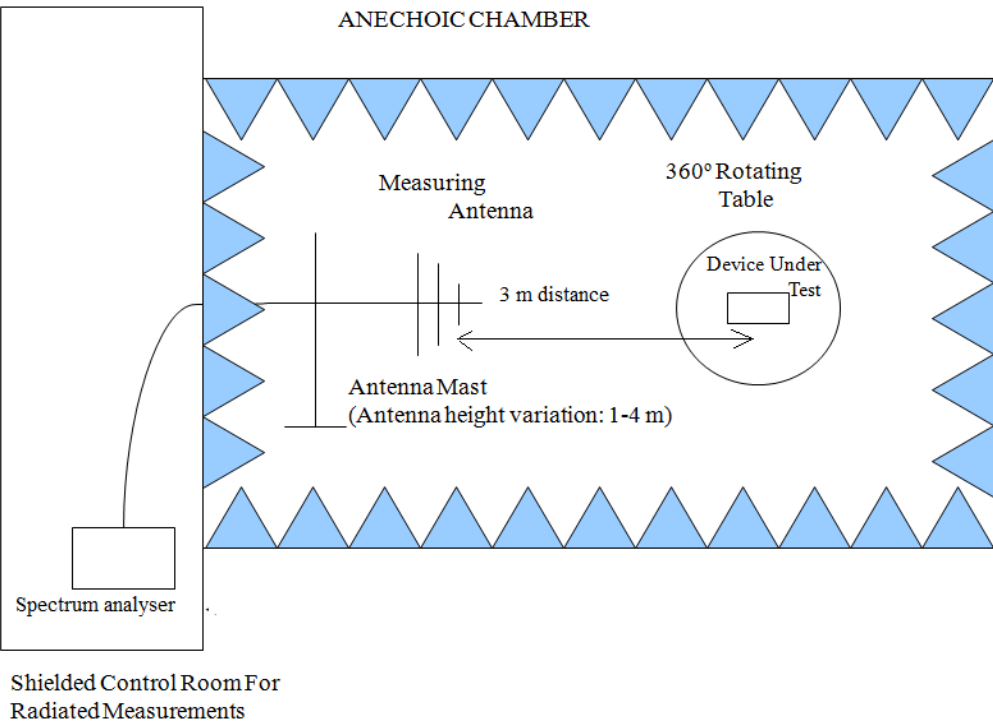
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

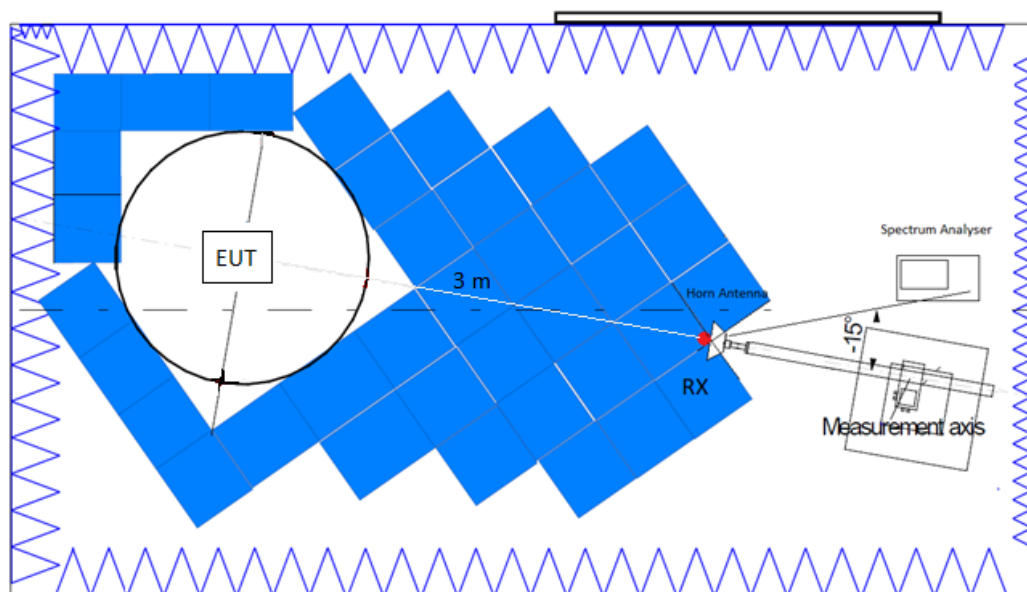
Measurements were made in both horizontal and vertical planes of polarization.

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.

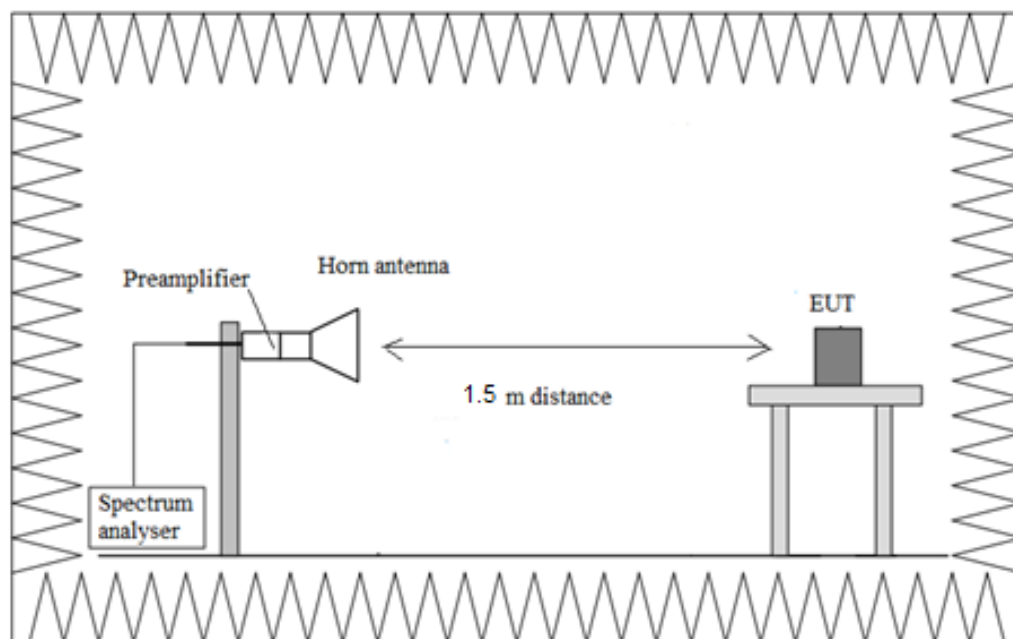
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247 99dBw Occupied Channel Bandwidth 99%

Limits

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Occ Ch BW (MHz)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1.068
		2440.00000	1.083
		2480.00000	1.068

Verdict

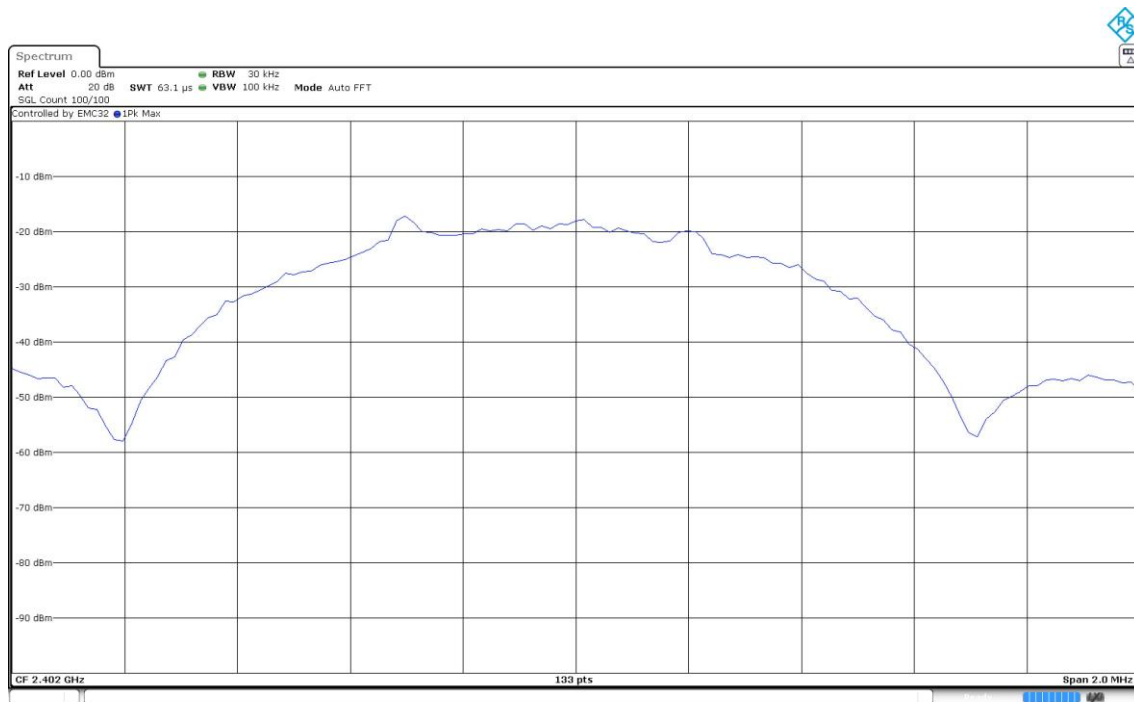
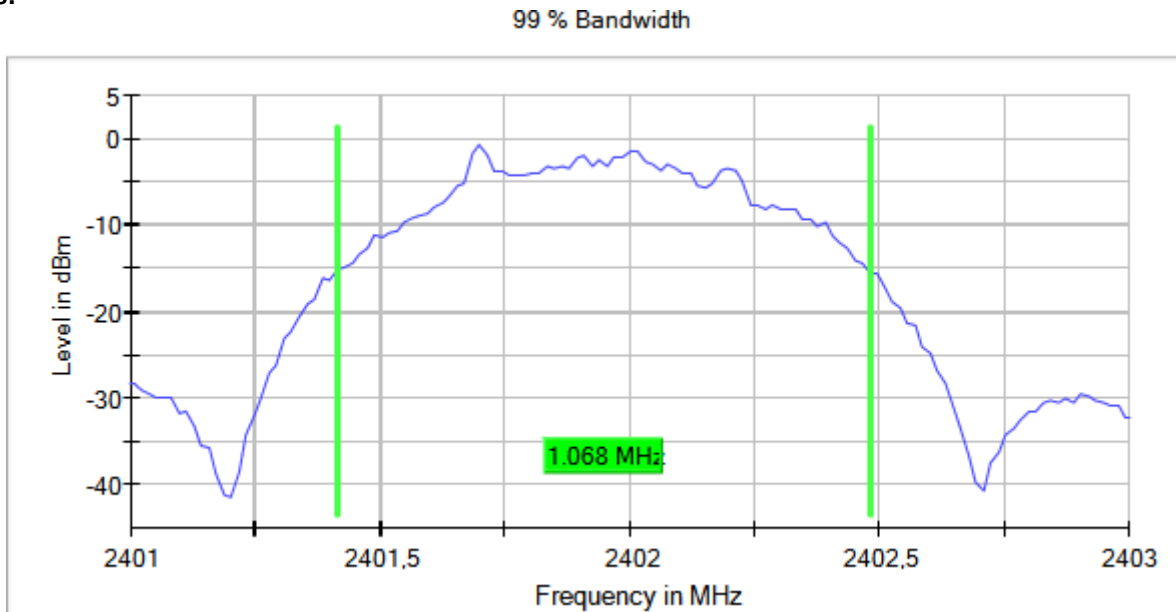
Pass

Attachments

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)

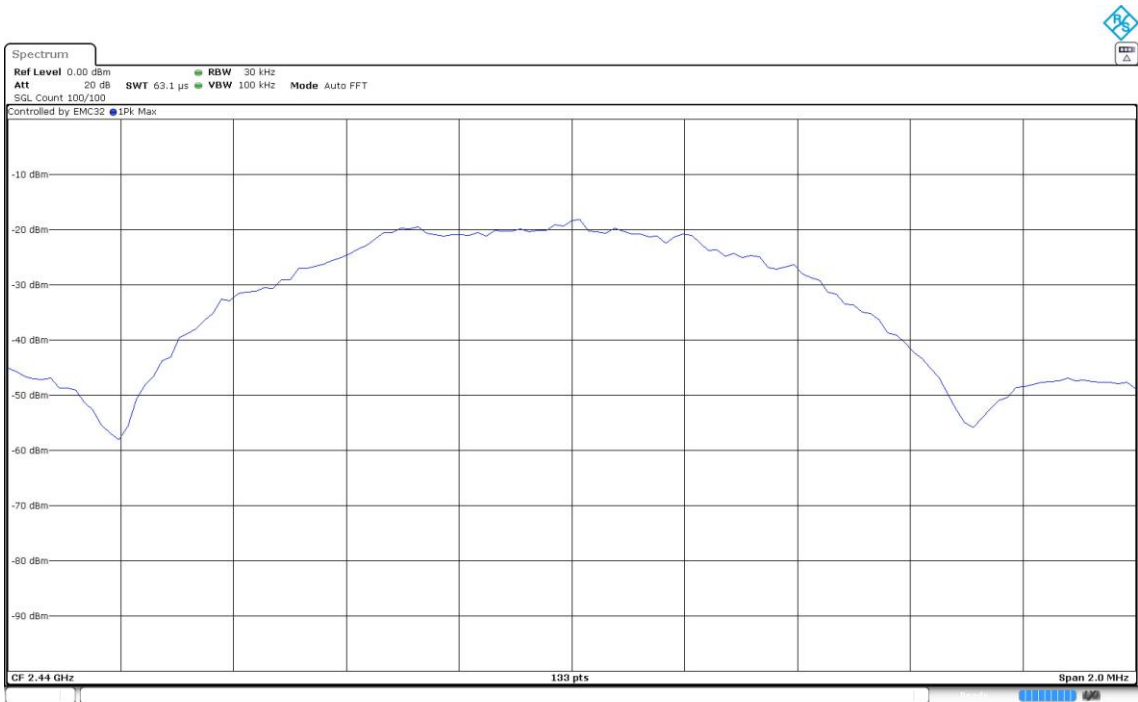
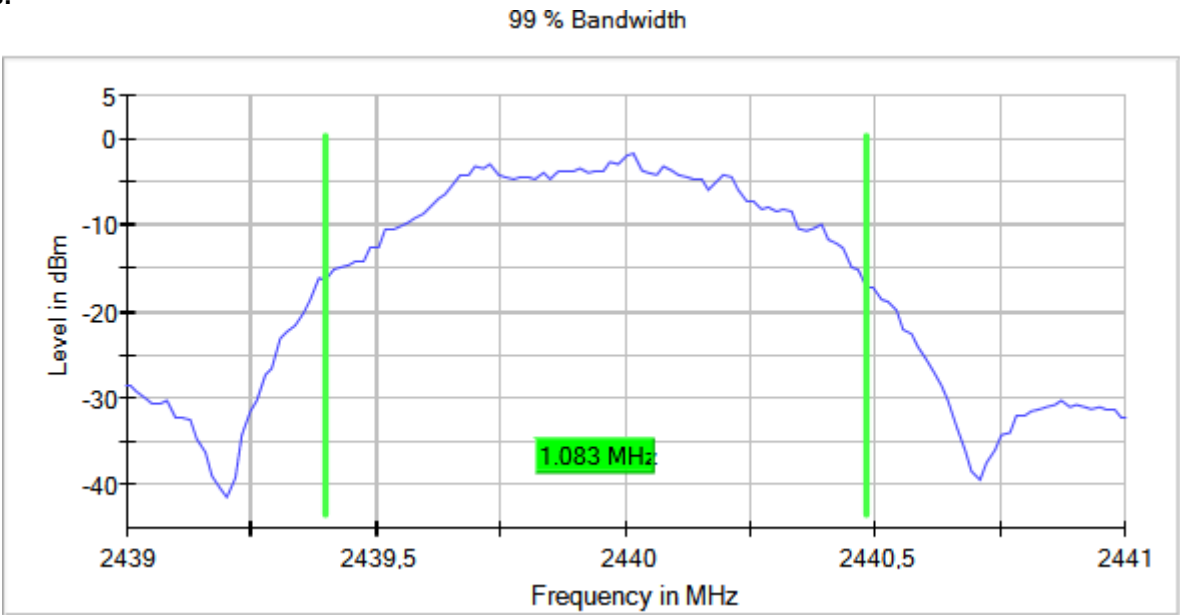
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



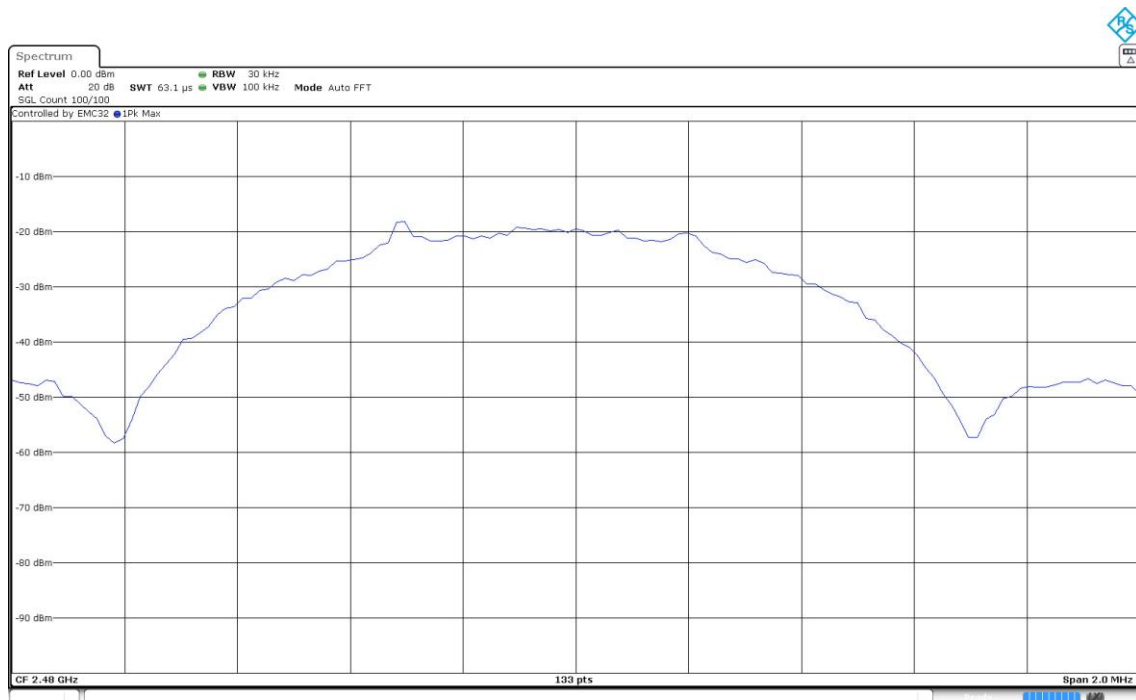
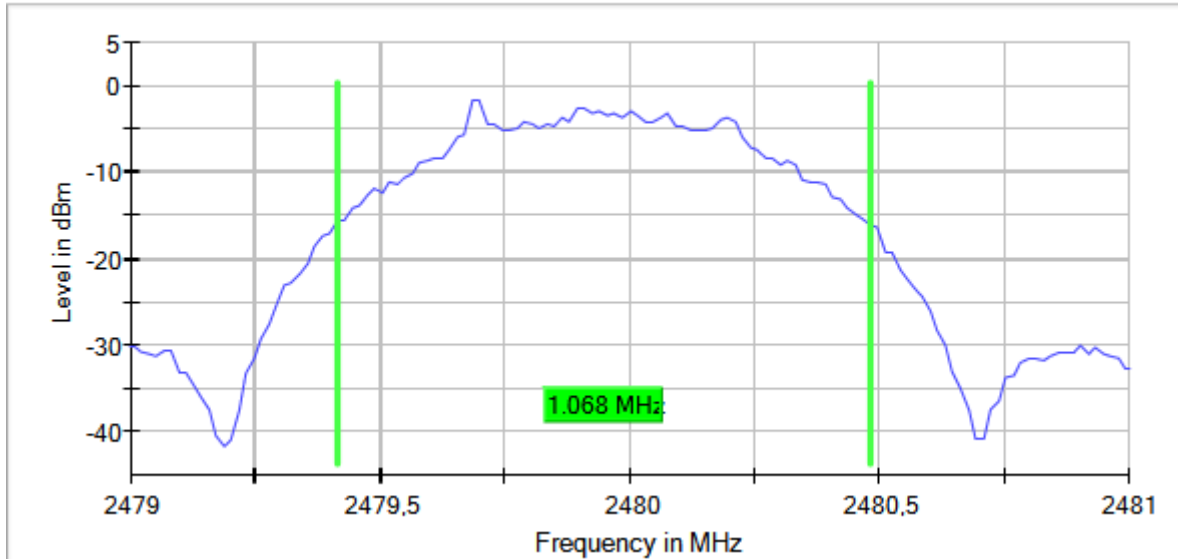
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2480.00000

Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:

99 % Bandwidth



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Occ Ch BW (MHz)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	2.059
		2440.00000	2.099
		2480.00000	2.099

Verdict

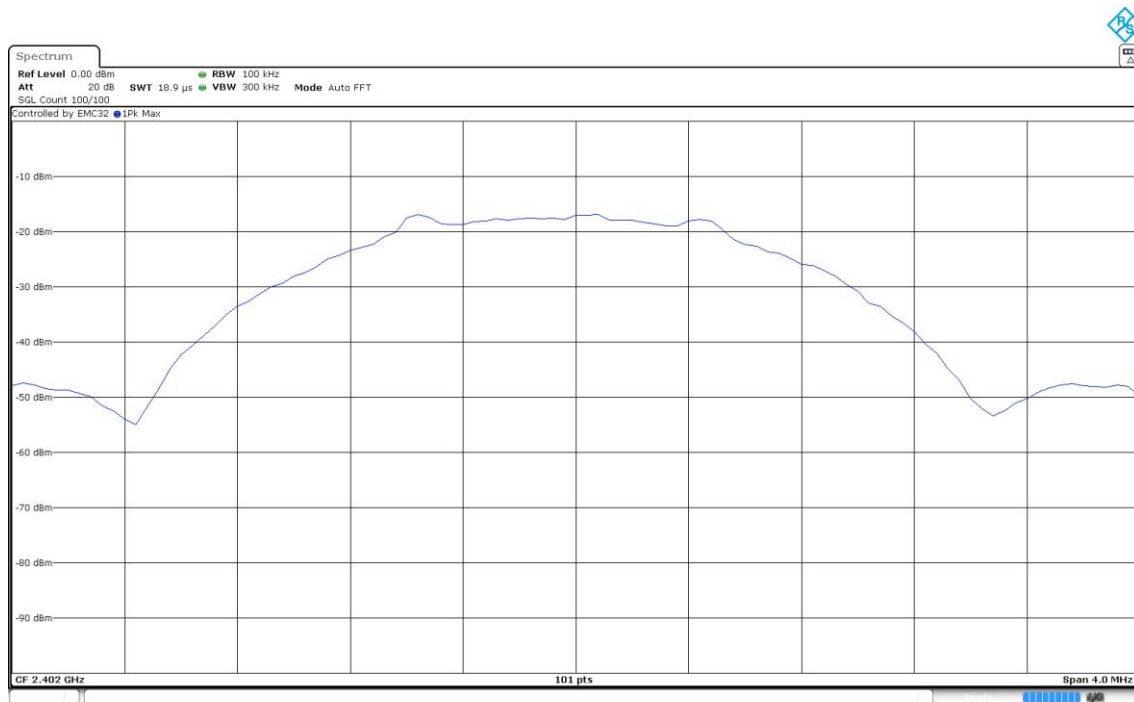
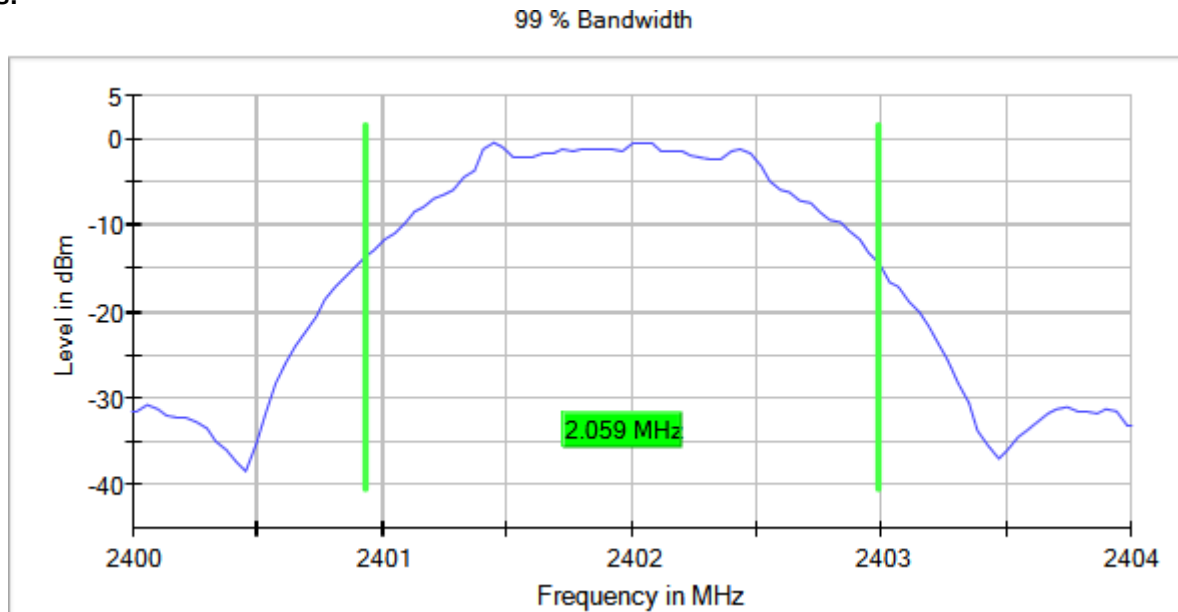
Pass

Attachments

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)

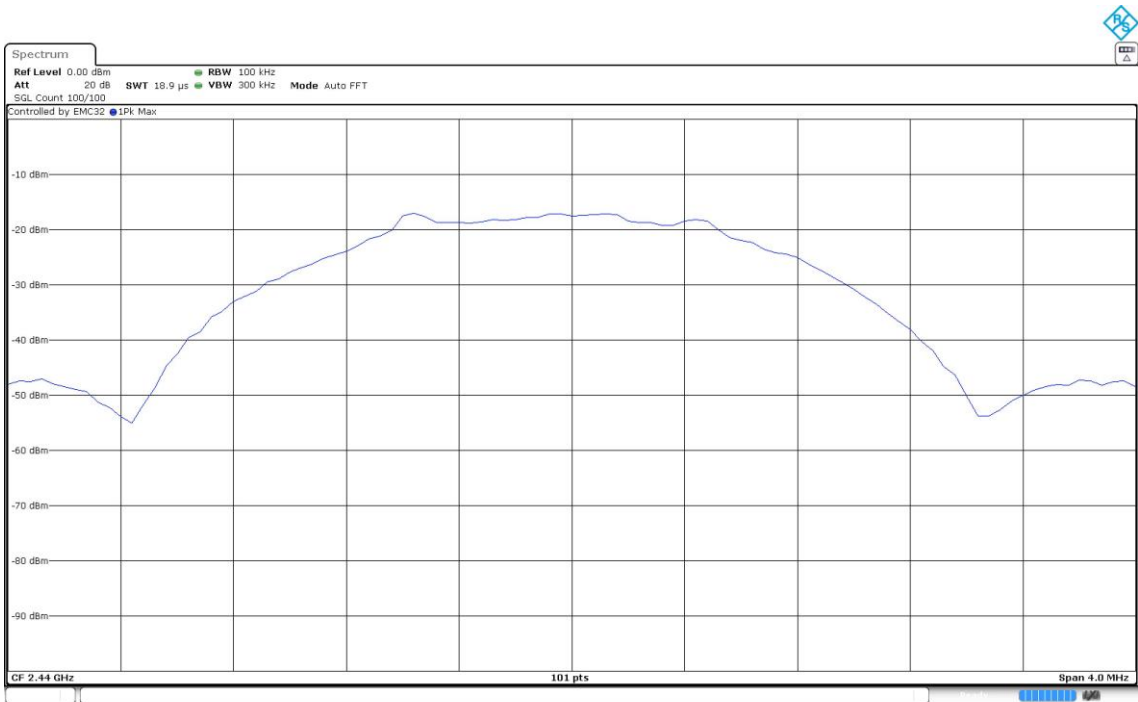
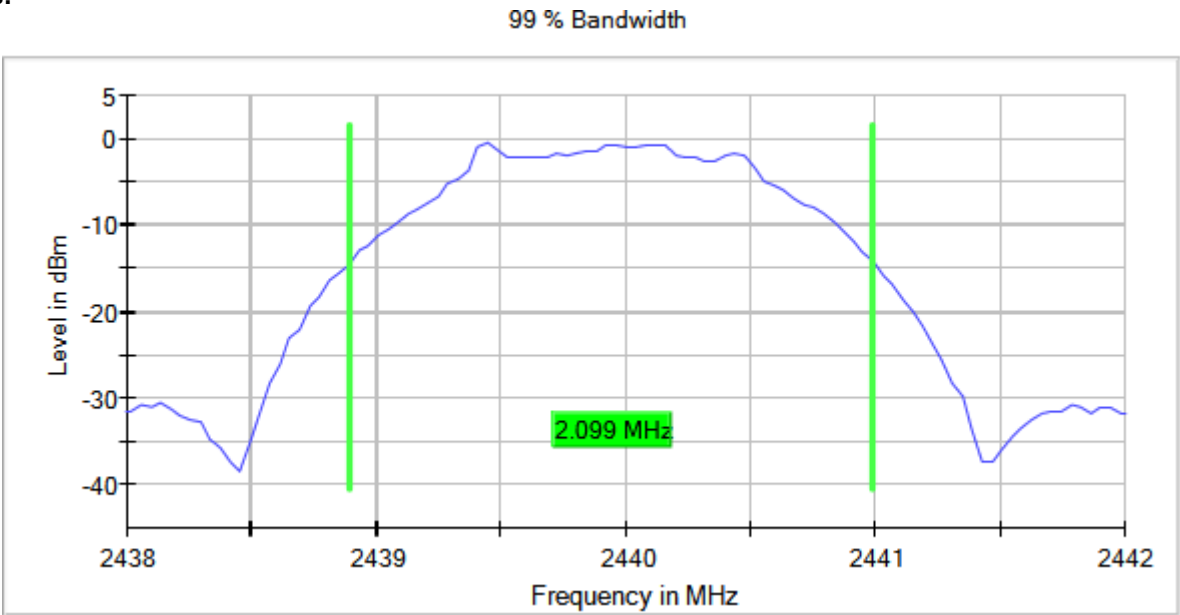
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



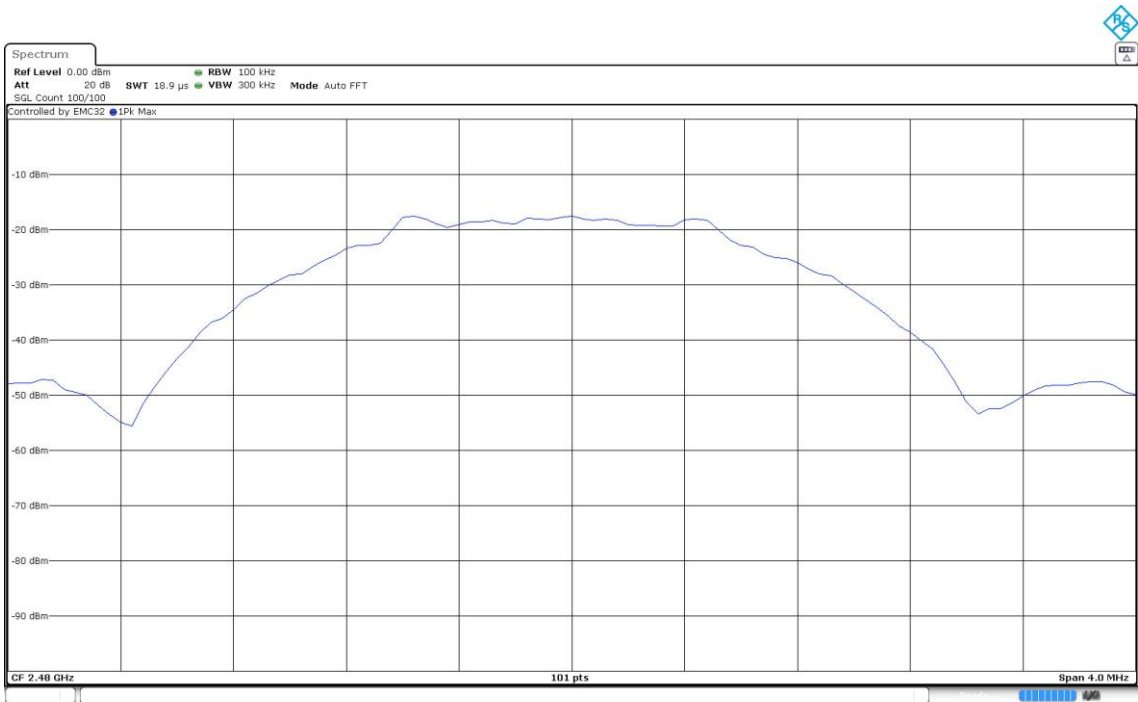
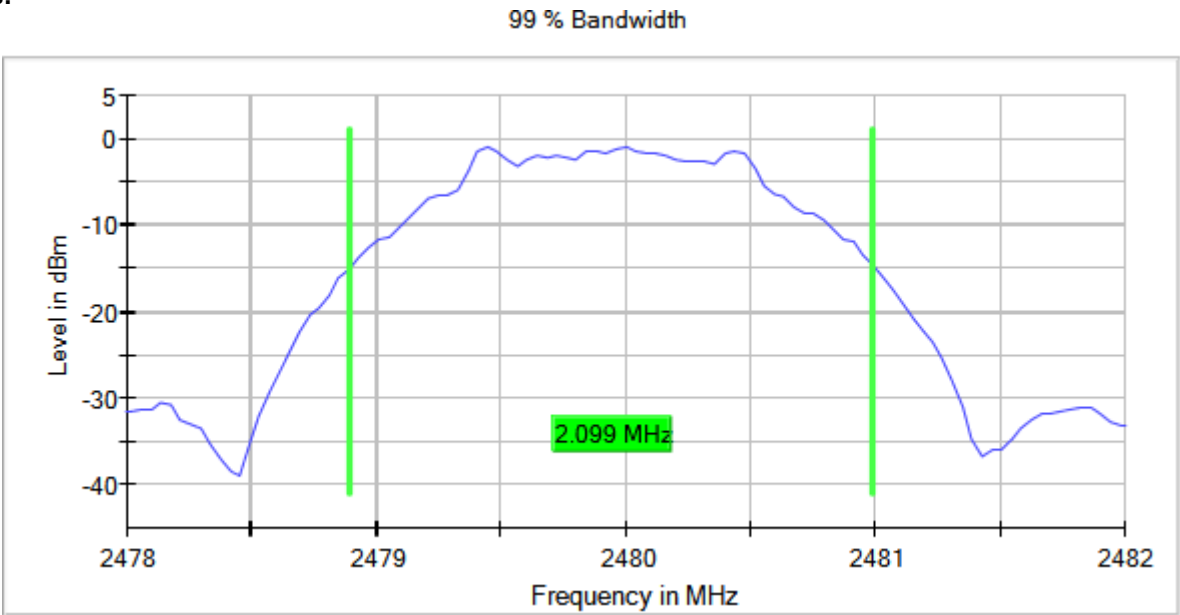
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



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

Limits

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

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Ebw (MHz)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	0.752
		2440.00000	0.733
		2480.00000	0.733

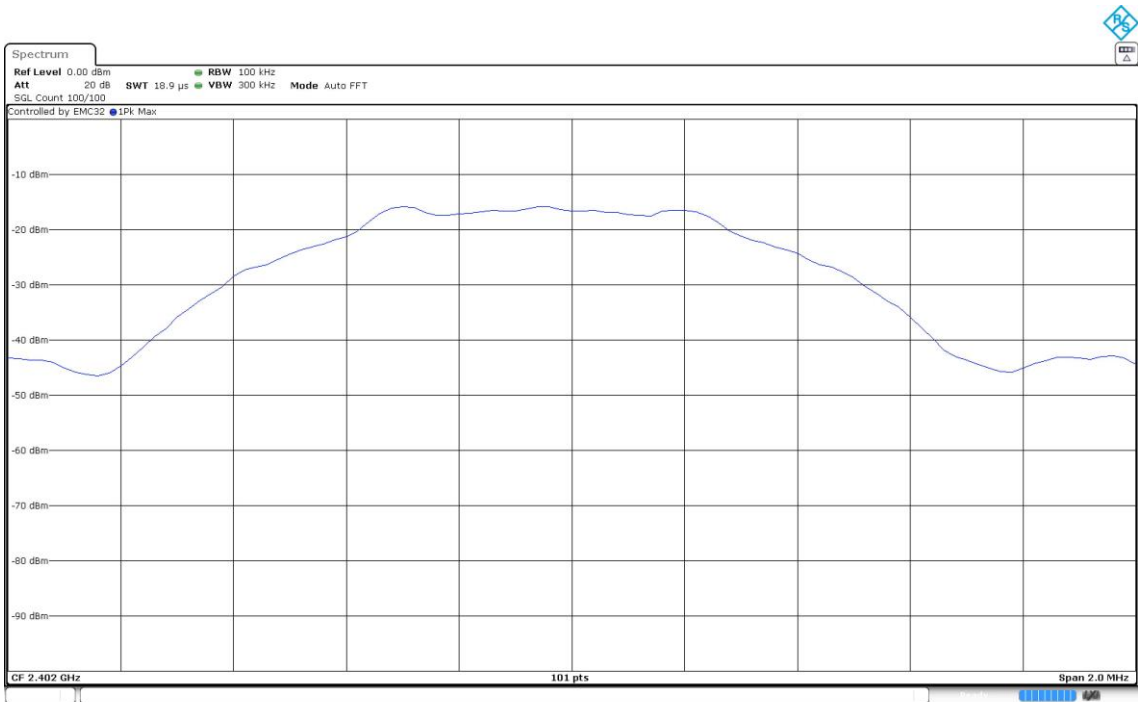
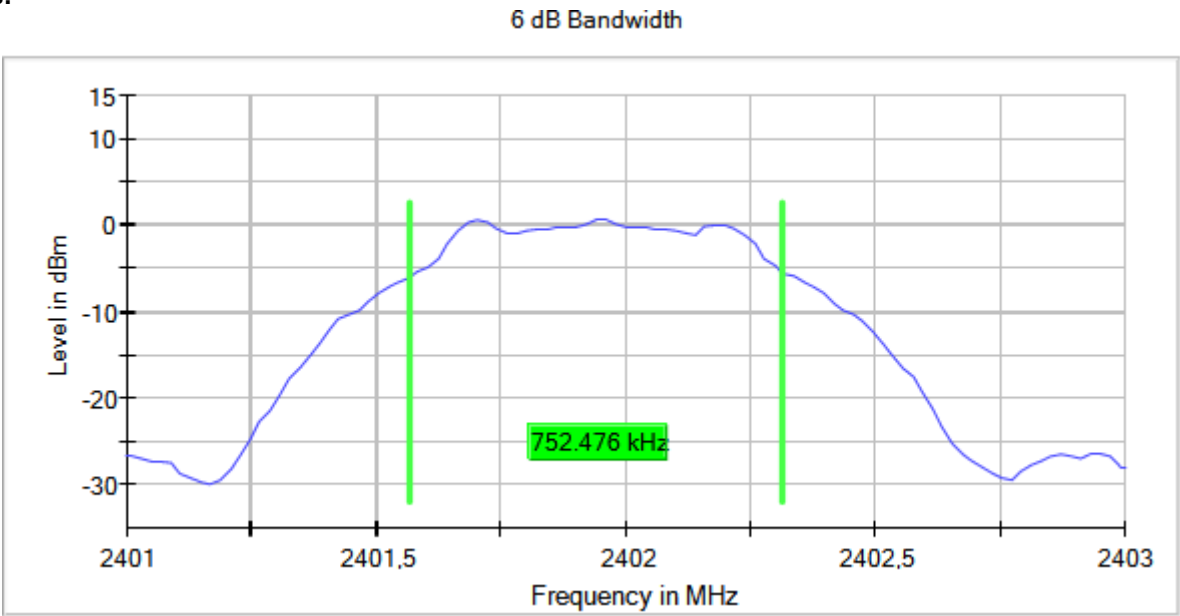
Verdict

Pass

Attachments

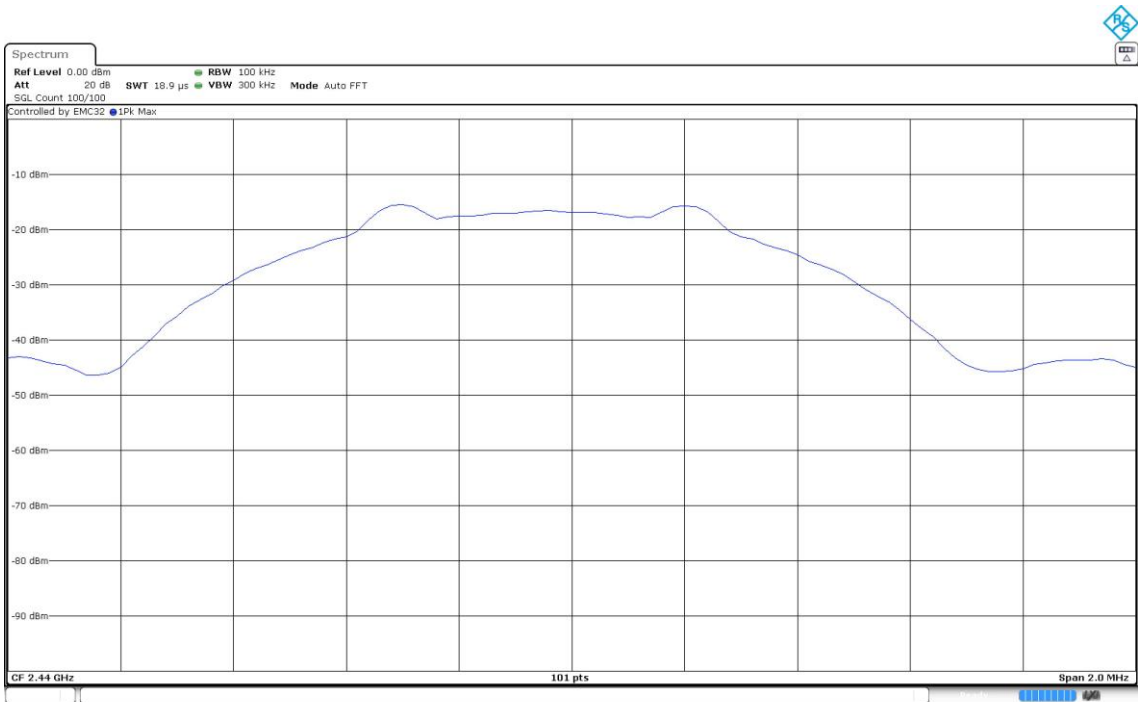
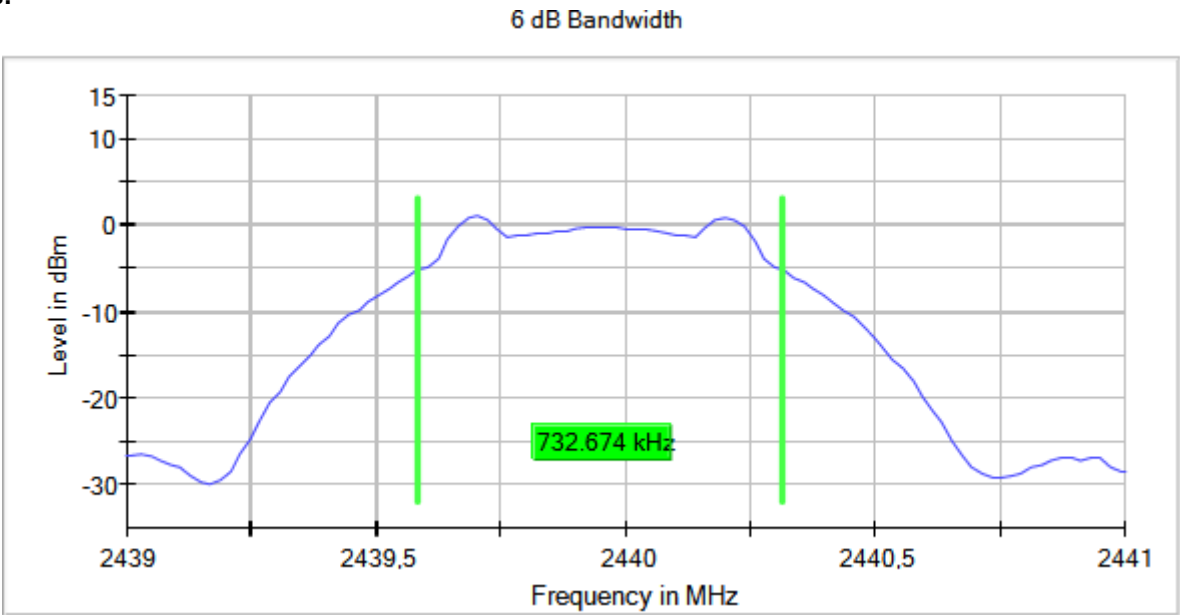
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



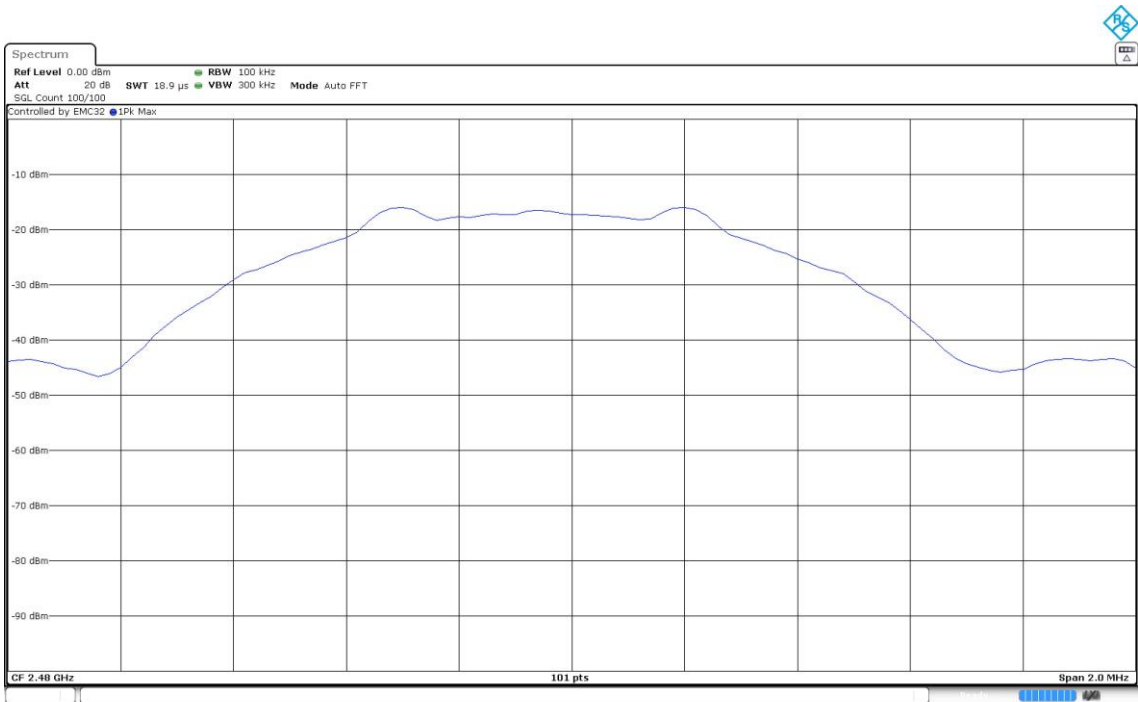
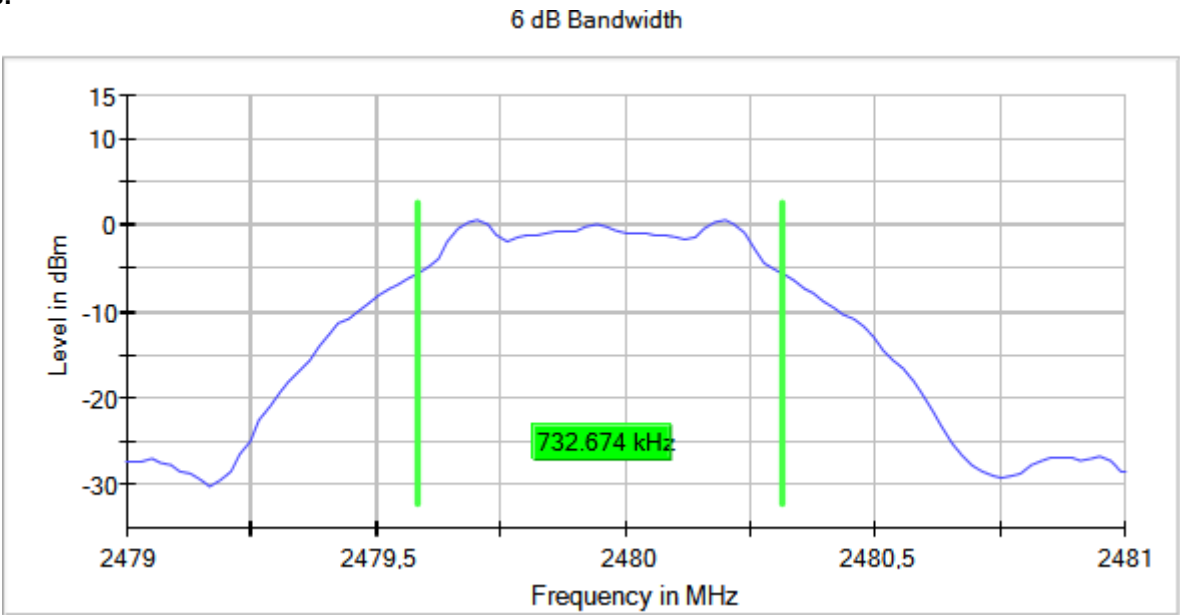
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Ebw (MHz)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1.465
		2440.00000	1.465
		2480.00000	1.426

Verdict

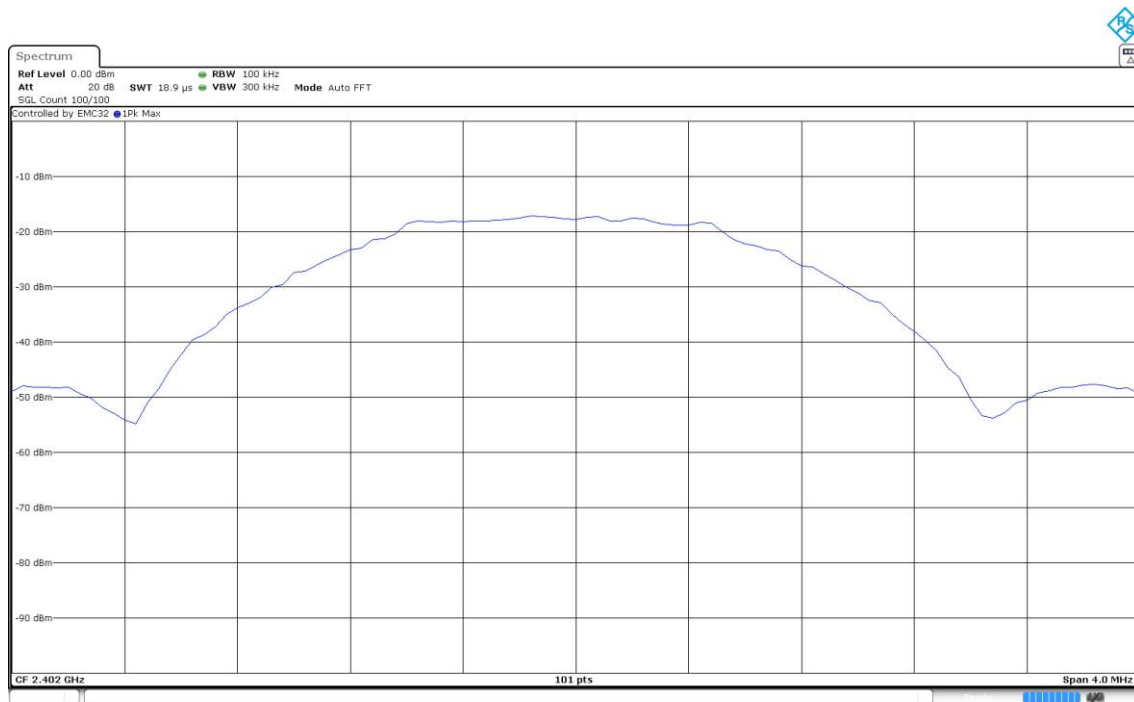
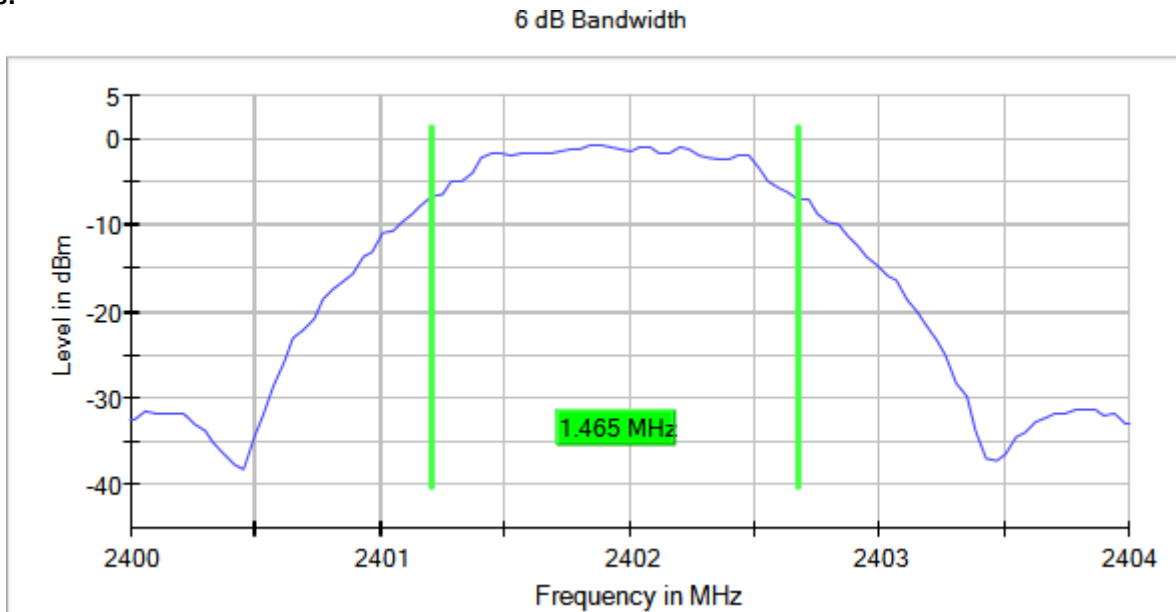
Pass

Attachments

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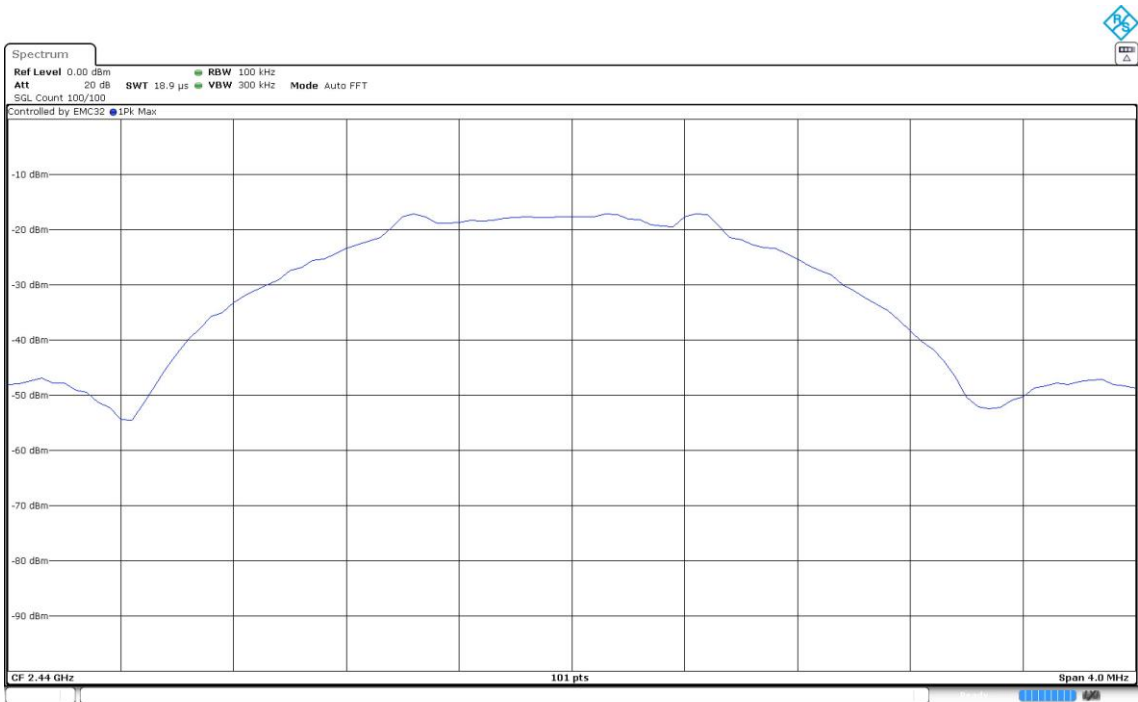
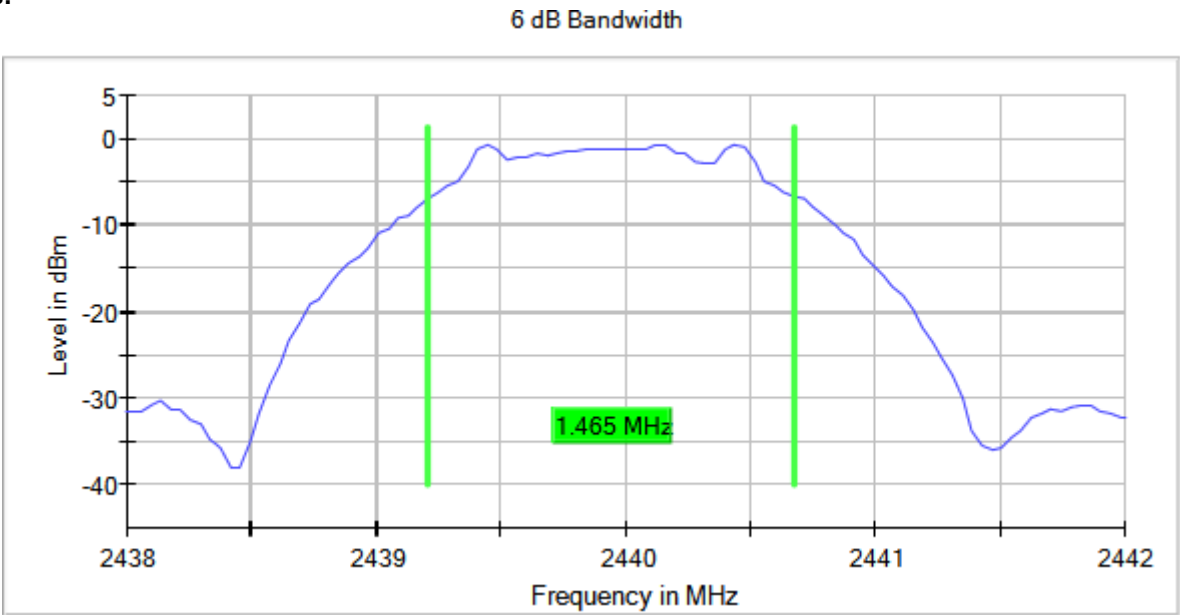
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



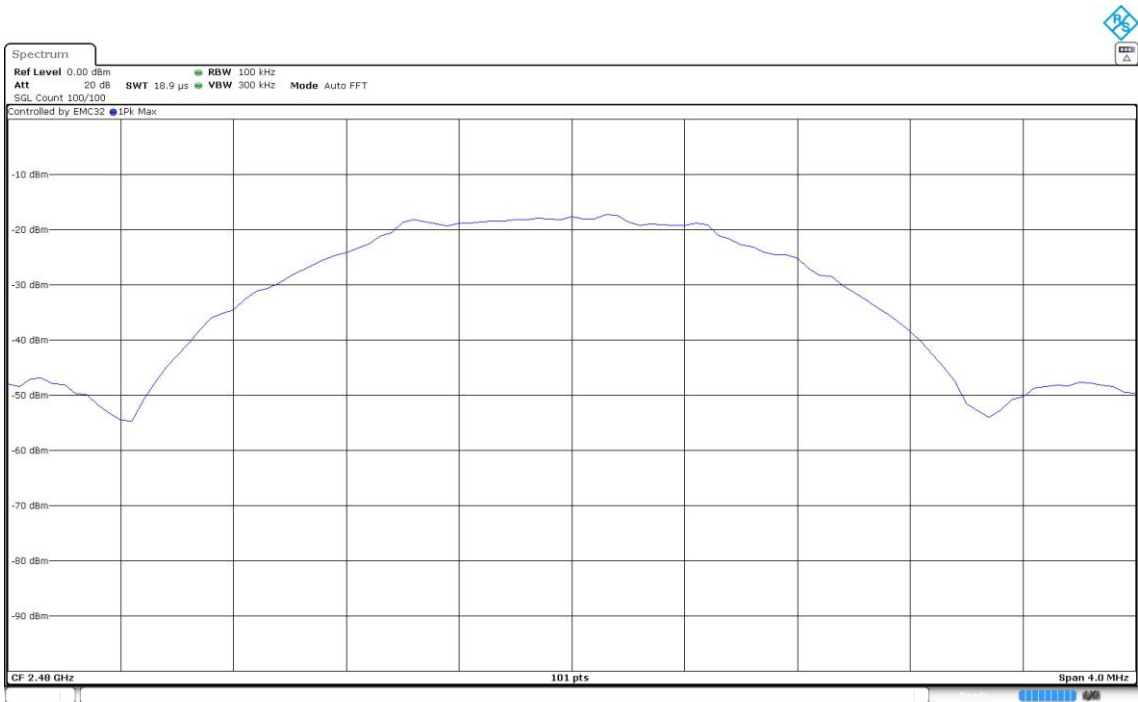
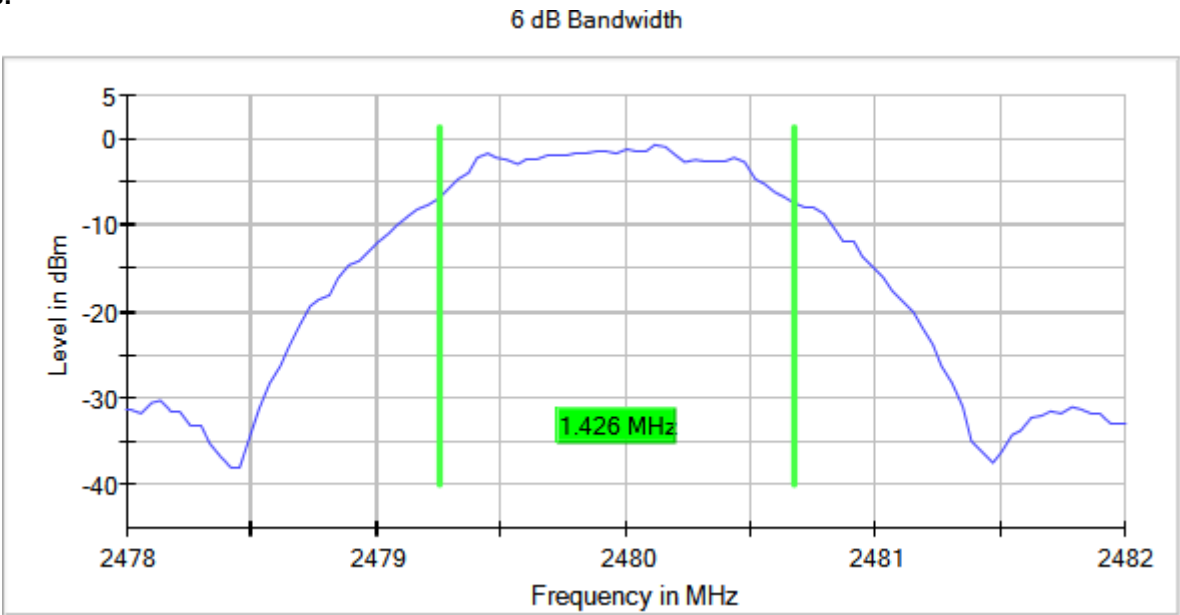
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



RSS-247 5.4 / FCC 15.247 (b) [Pkcp] 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).

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Peak Power (dBm)	E.I.R.P. (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1.4480	4,4880
		2440.00000	1.2310	4,2710
		2480.00000	1.0290	4,0690

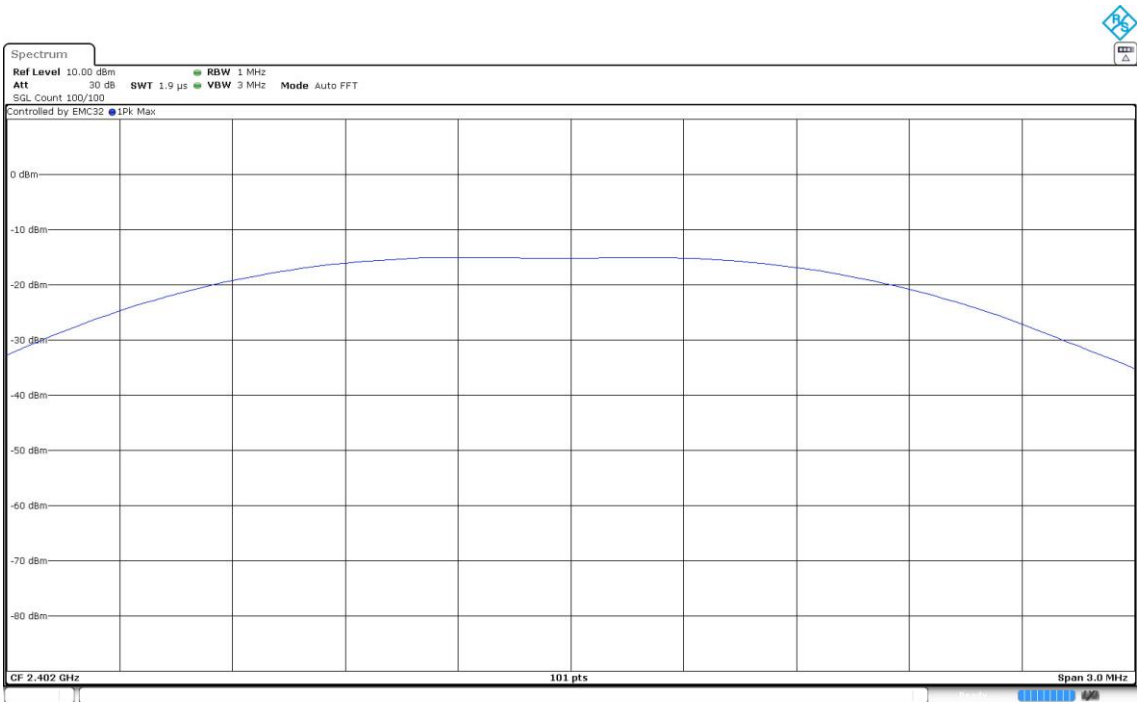
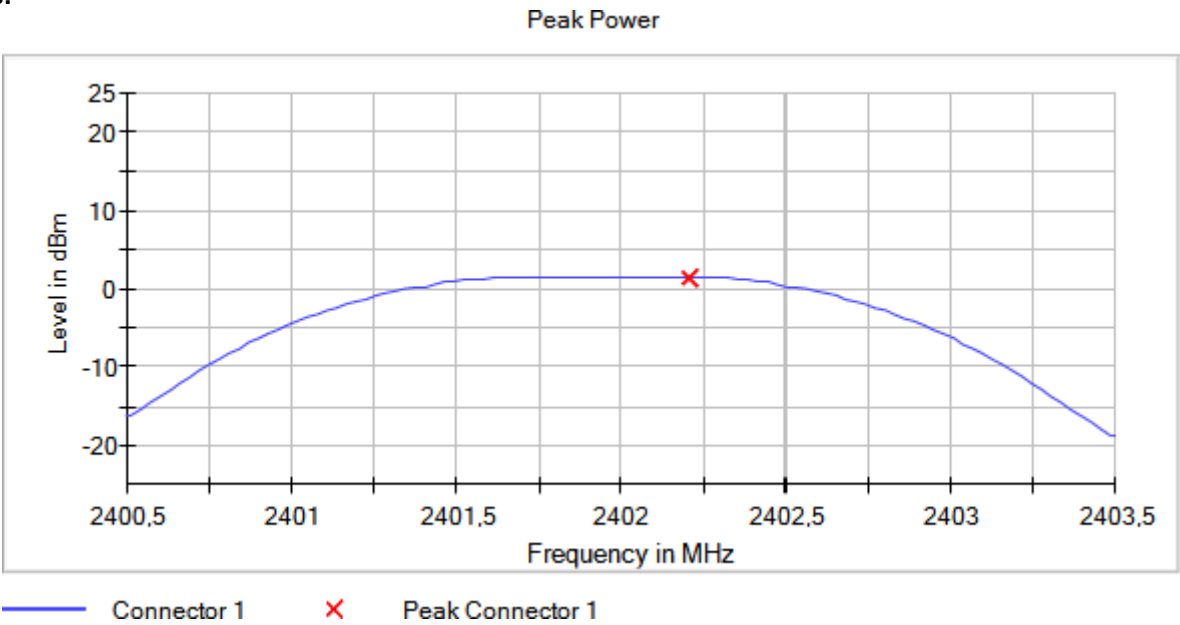
Verdict

Pass

Attachments

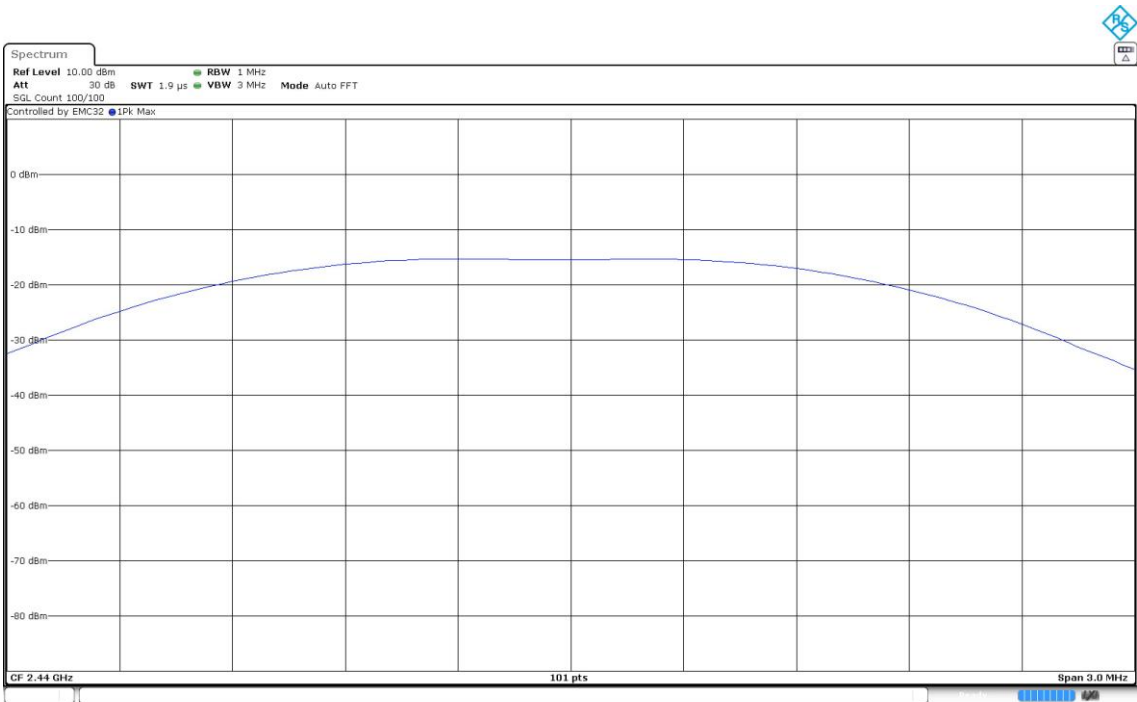
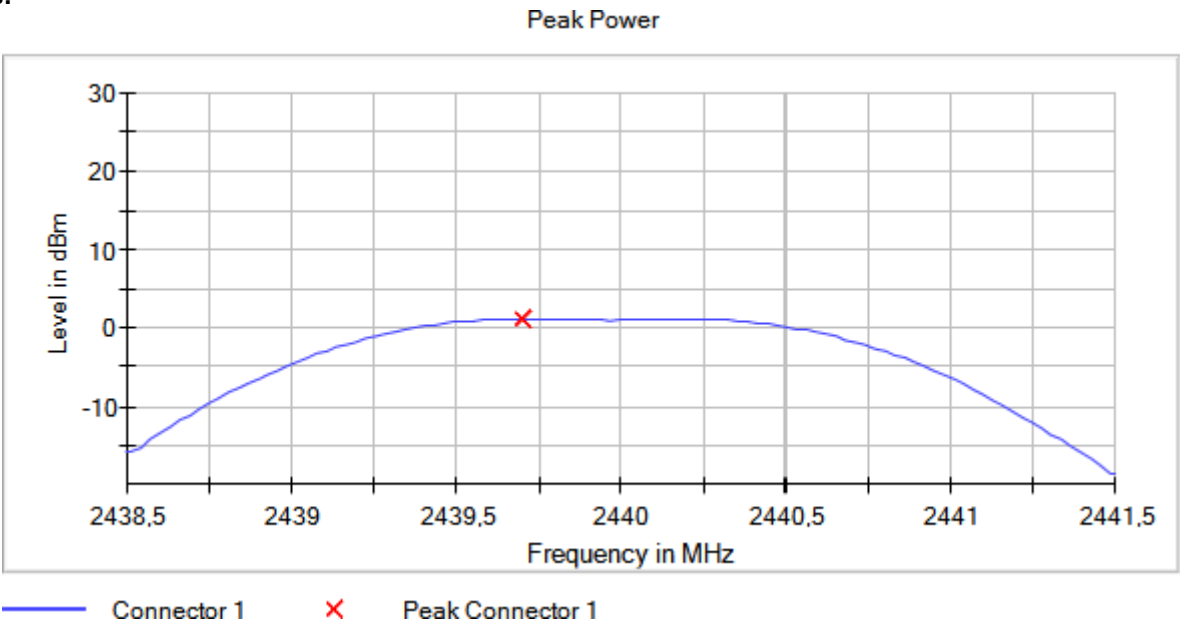
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



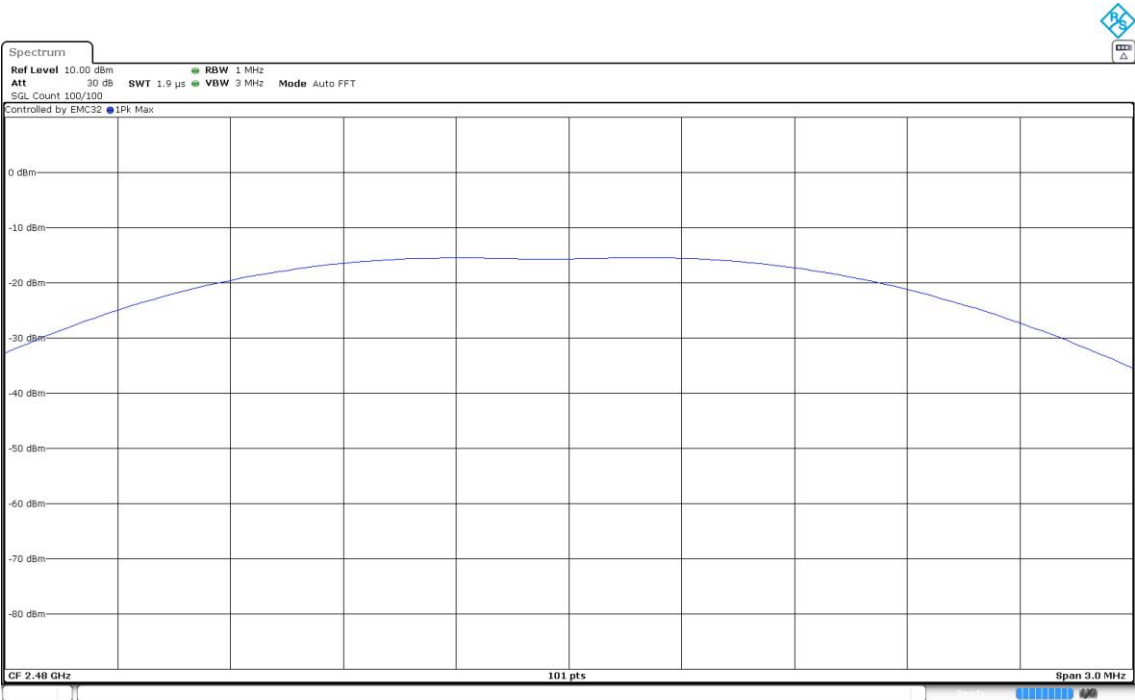
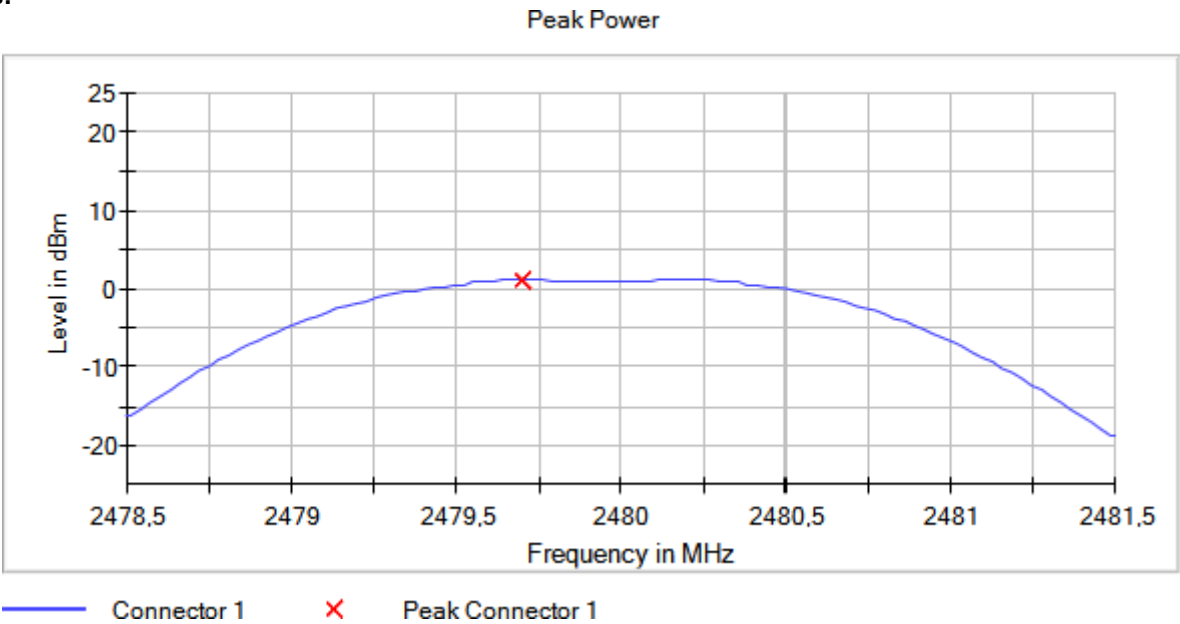
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Peak Power (dBm)	E.I.R.P. (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1.4230	4,4630
		2440.00000	1.2320	4,2720
		2480.00000	1.0570	4,0970

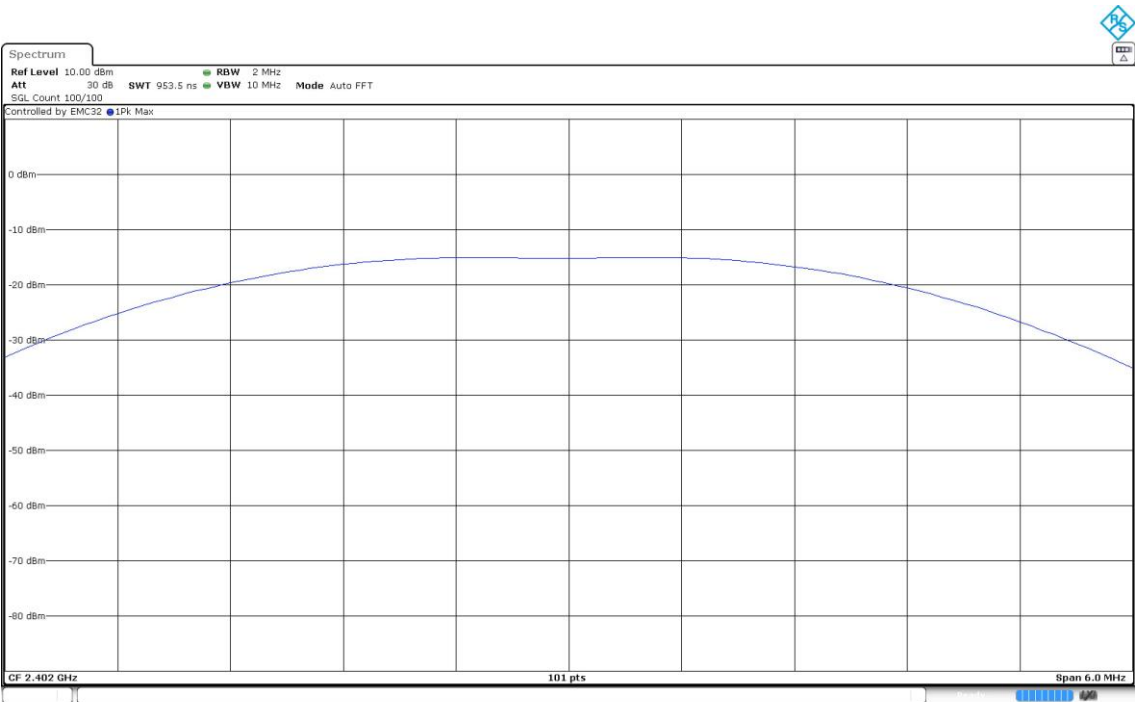
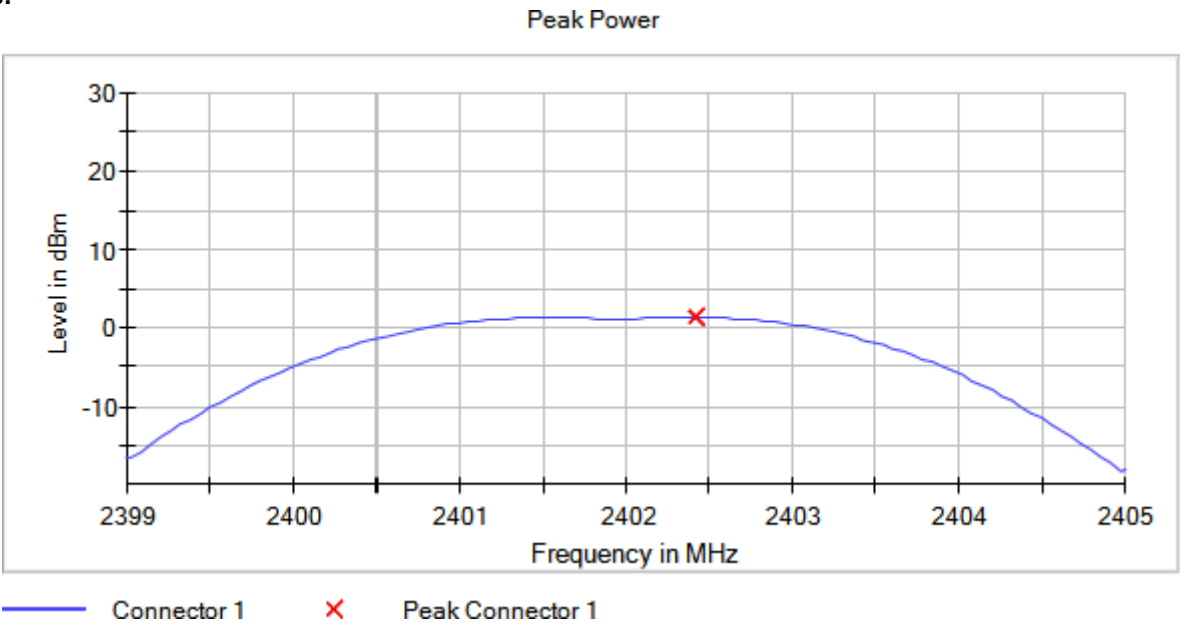
Verdict

Pass

Attachments

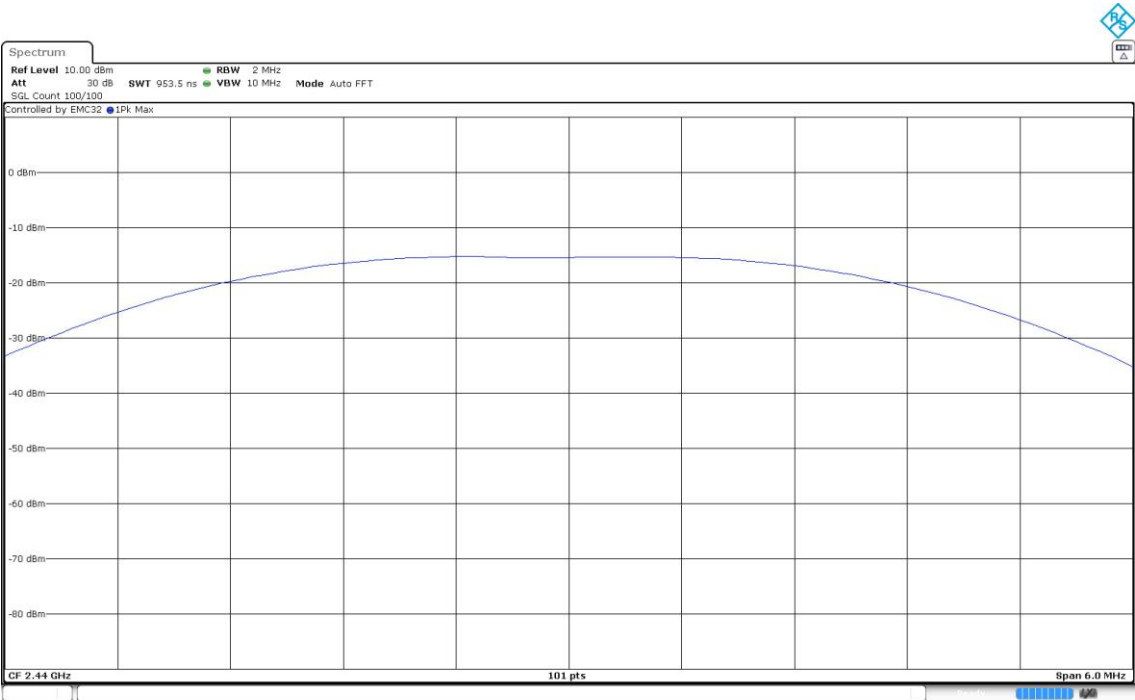
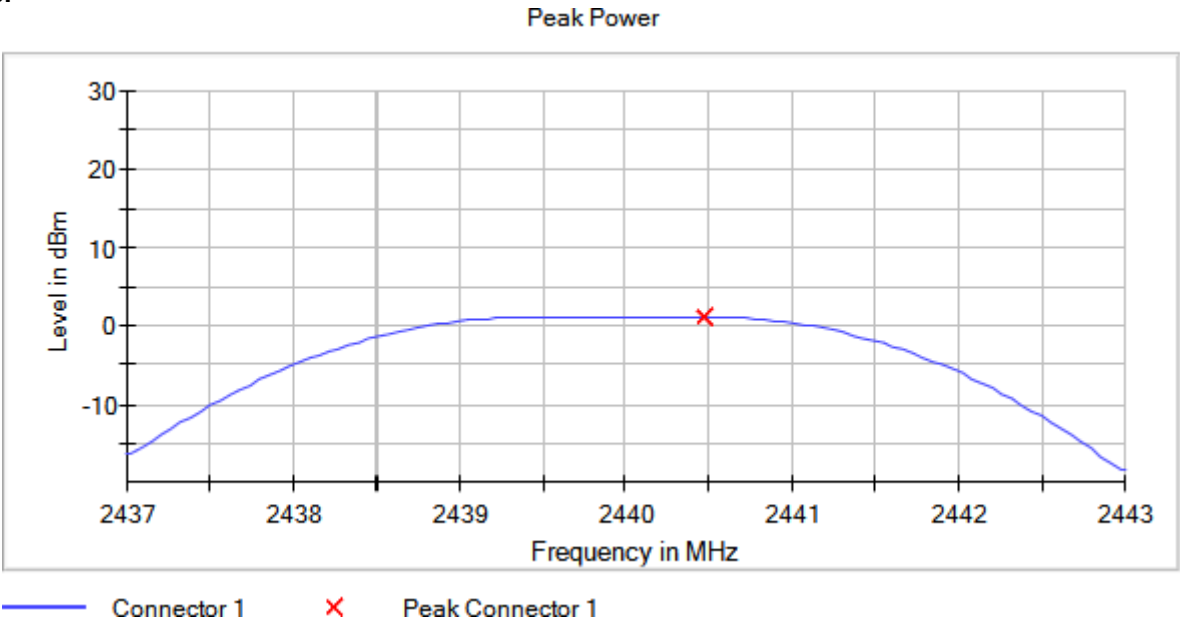
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



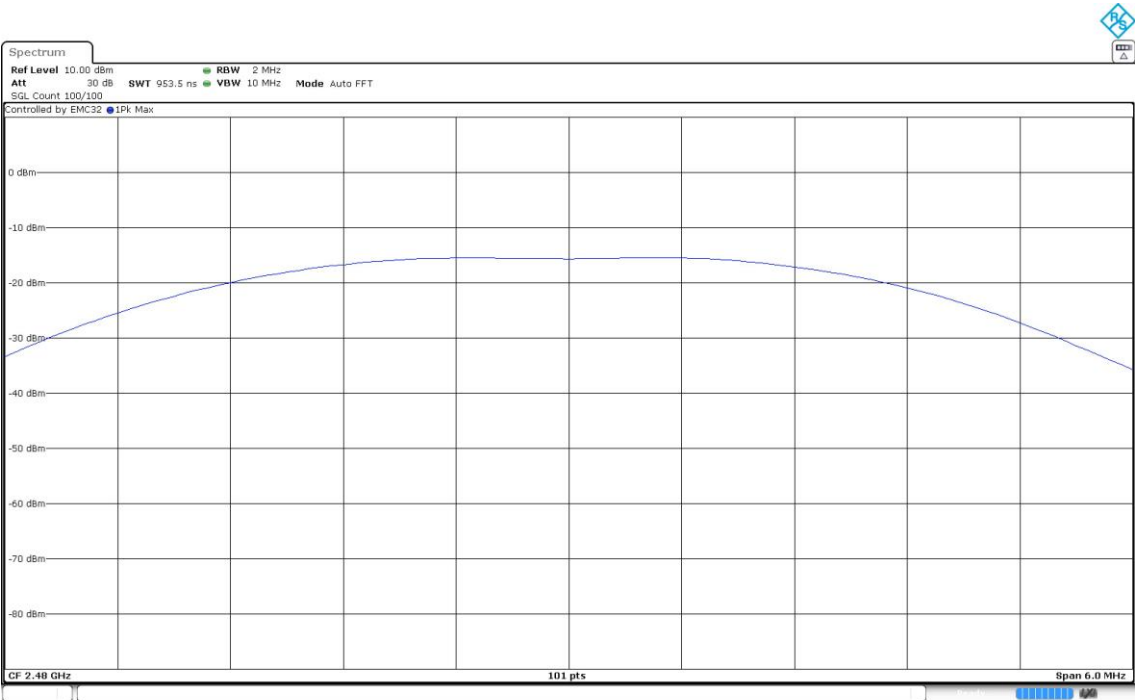
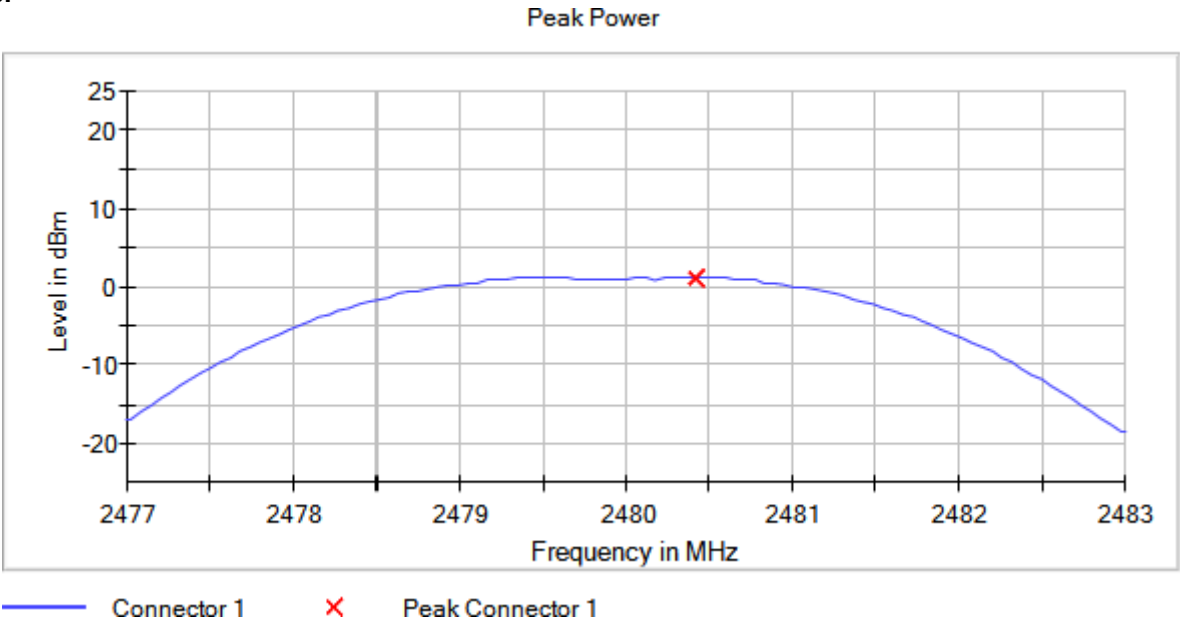
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



RSS-247 5.5 / FCC 15.247 (d) [Bndedge] 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 5.0 (GFSK 1 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Inband Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	-42.211	2399.975000	-42.2
			-42.398	2399.925000	-42.4
			-45.576	2399.875000	-45.6
			-46.366	2399.825000	-46.4
			-47.119	2399.775000	-47.1
			-48.886	2398.075000	-48.9
			-48.918	2398.125000	-48.9
			-49.371	2399.725000	-49.4
			-49.652	2398.025000	-49.7
			-49.712	2397.975000	-49.7
			-49.772	2397.925000	-49.8
			-50.006	2398.225000	-50.0
			-50.067	2398.175000	-50.1
			-50.230	2399.675000	-50.2
			-50.258	2397.825000	-50.3
		2480.00000	-49.660	2484.175000	-49.7
			-49.961	2497.525000	-50.0
			-50.006	2484.225000	-50.0
			-50.210	2497.475000	-50.2
			-50.270	2486.525000	-50.3
			-50.343	2497.575000	-50.3
			-50.730	2484.325000	-50.7
			-50.750	2486.475000	-50.8
			-50.789	2484.425000	-50.8
			-50.864	2486.625000	-50.9
			-50.875	2483.875000	-50.9
			-50.922	2485.775000	-50.9
			-50.933	2486.575000	-50.9

Operation Band (MHz)	Equipment	Freq (MHz)	Inband Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
			-50.959	2484.475000	-51.0
			-51.027	2485.725000	-51.0

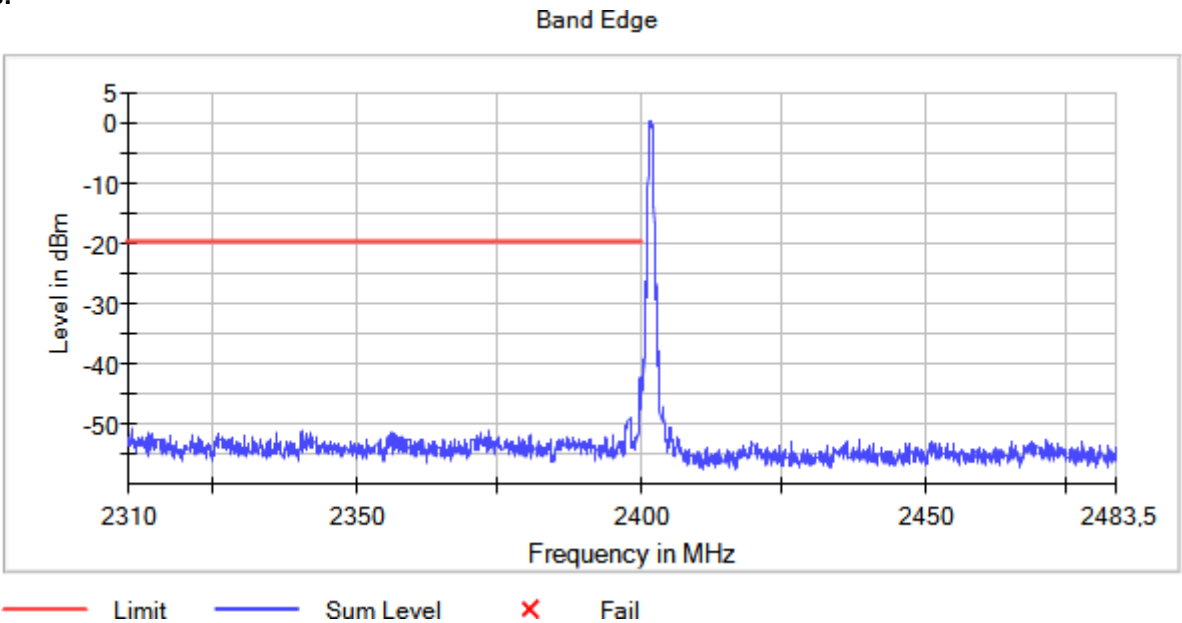
Verdict

Pass

Attachments

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters 1

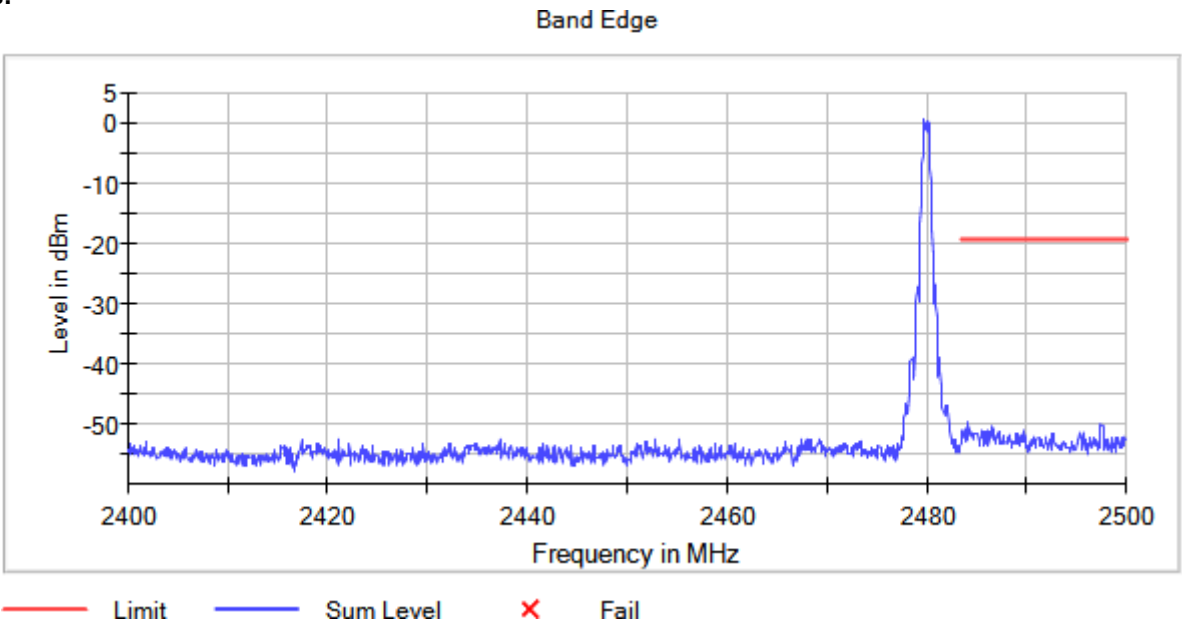
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	6 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.26 dB	0.50 dB

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	6 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.26 dB	0.50 dB

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Inband Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	-31.124	2399.975000	-31.1
			-31.745	2399.925000	-31.7
			-32.046	2399.875000	-32.0
			-33.035	2399.825000	-33.0
			-34.928	2399.775000	-34.9
			-36.975	2399.725000	-37.0
			-38.445	2399.675000	-38.4
			-40.062	2399.625000	-40.1
			-42.069	2399.575000	-42.1
			-44.167	2399.475000	-44.2
			-44.173	2399.525000	-44.2
			-45.771	2399.125000	-45.8
			-45.819	2399.075000	-45.8
			-45.822	2399.025000	-45.8
			-46.734	2398.975000	-46.7
		2480.00000	-49.738	2483.725000	-49.7
			-49.941	2483.775000	-49.9
			-50.672	2484.975000	-50.7
			-50.692	2484.175000	-50.7
			-50.846	2484.875000	-50.8
			-50.883	2484.925000	-50.9
			-50.974	2484.125000	-51.0
			-51.008	2487.175000	-51.0
			-51.010	2484.825000	-51.0
			-51.038	2485.175000	-51.0
			-51.091	2483.925000	-51.1
			-51.102	2484.075000	-51.1
			-51.114	2487.225000	-51.1
			-51.119	2485.275000	-51.1
			-51.124	2483.975000	-51.1

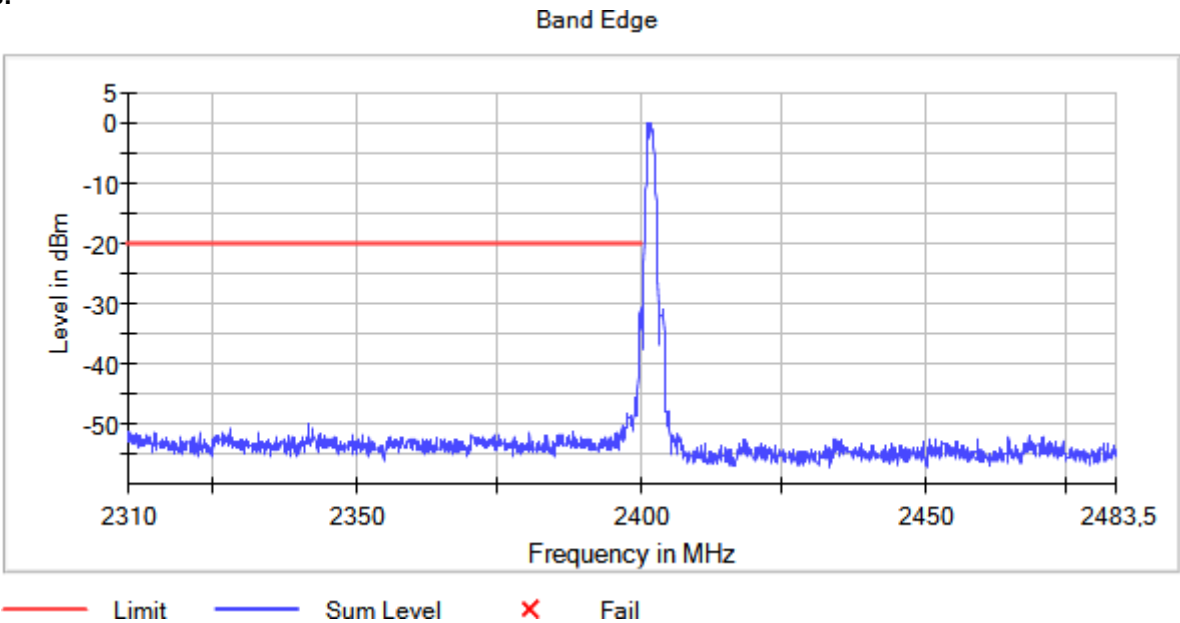
Verdict

Pass

Attachments

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters 1

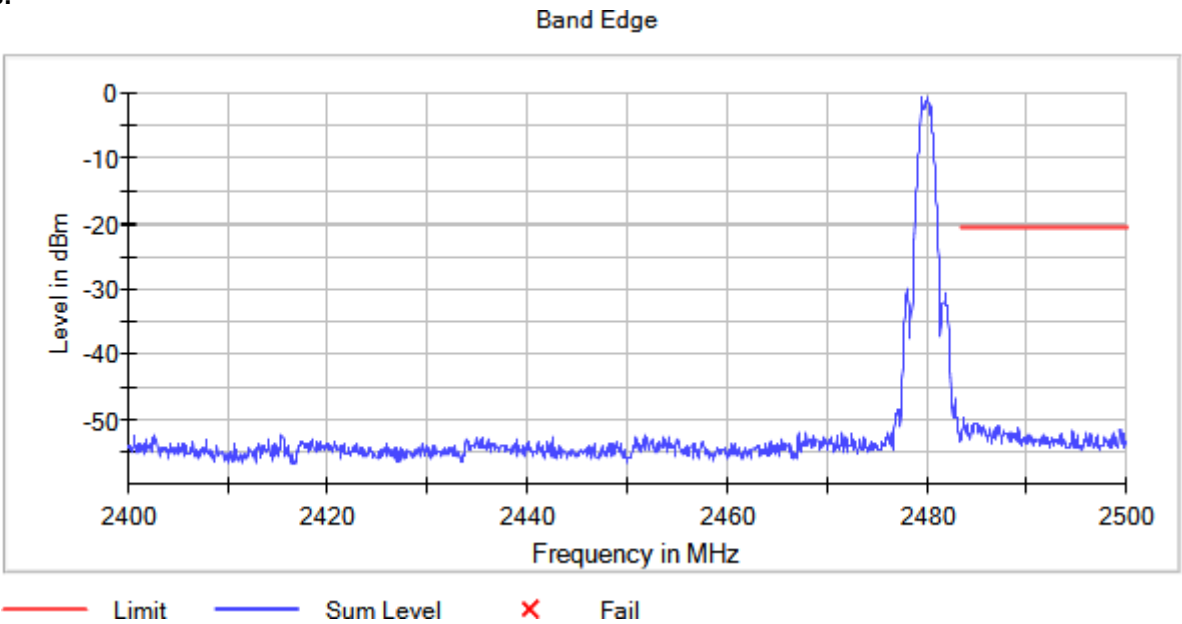
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.05 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.34 dB	0.50 dB

Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.05 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.34 dB	0.50 dB

RSS-247 5.5 / FCC 15.247 (d) [RSE] 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 (GFSK 1 Mbit/s)

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1	56.627	26.32	V	QP
					56.627	29.64	V	PK
					60.264	26.29	V	PK
					60.264	22.45	V	QP
					74.911	24.33	V	QP
					74.911	27.57	V	PK
					95.960	23.86	V	QP
					95.960	28.67	V	PK
					240.005	26.51	V	QP

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
					240.005	29.03	V	PK
					499.916	31.78	V	PK
					499.916	21.19	V	QP
			2480.00000		51.097	24.07	V	PK
					51.097	19.22	V	QP
					62.107	27.48	V	PK
					62.107	24.23	V	QP
					74.911	22.80	V	PK
					74.911	19.11	V	QP
					84.029	22.27	V	PK
					84.029	18.94	V	QP
					177.246	25.30	V	PK
					177.246	20.84	V	QP
					332.688	30.63	V	PK
					332.688	17.26	V	QP
					737.470	27.53	V	QP
					737.470	31.77	V	PK

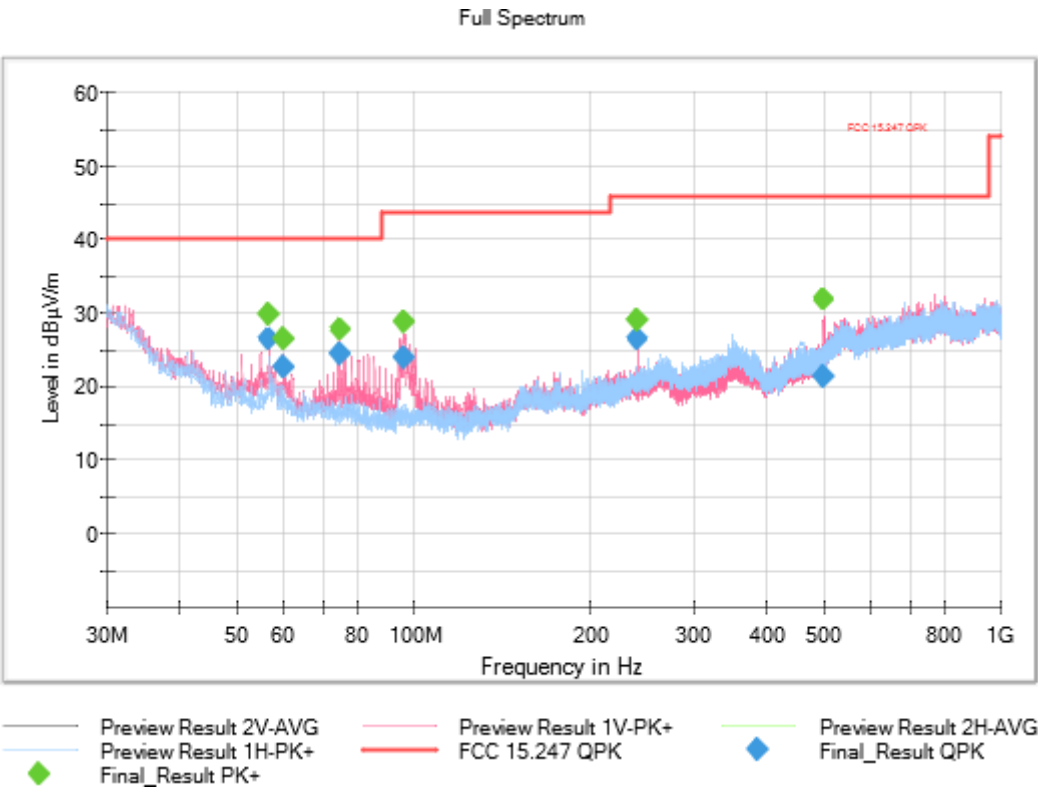
Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [2400, 2483.5]
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2402.00000
Active Port = 1 Modulation = BTLE (GFSK 1 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	0 dB

Frequency Range GHz = [0.03, 1]

Operation Band MHz = [2400, 2483.5]

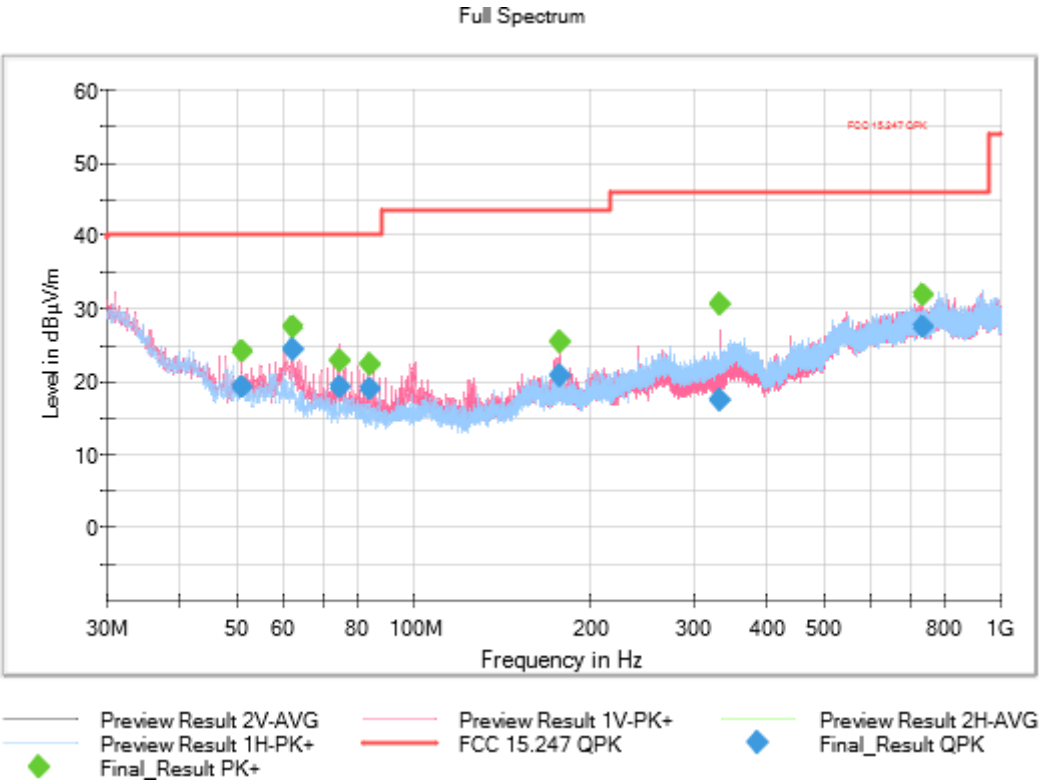
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2480.00000

Active Port = 1

Modulation = BTLE (GFSK 1 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	0 dB

Frequency Range GHz = [1, 17]

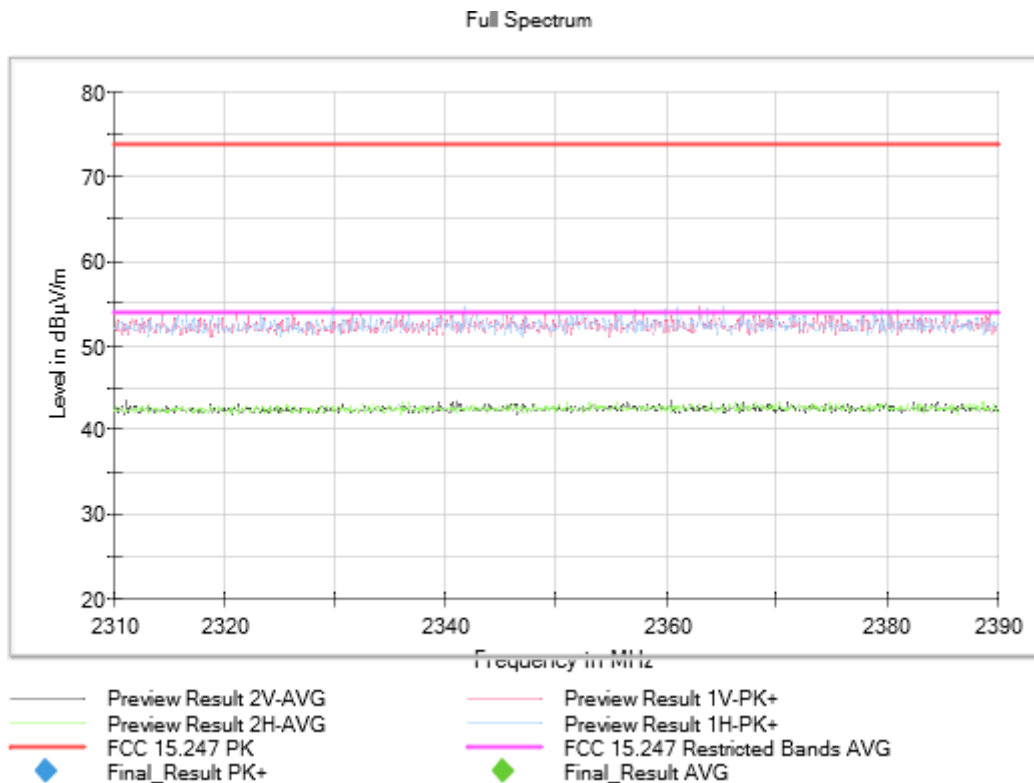
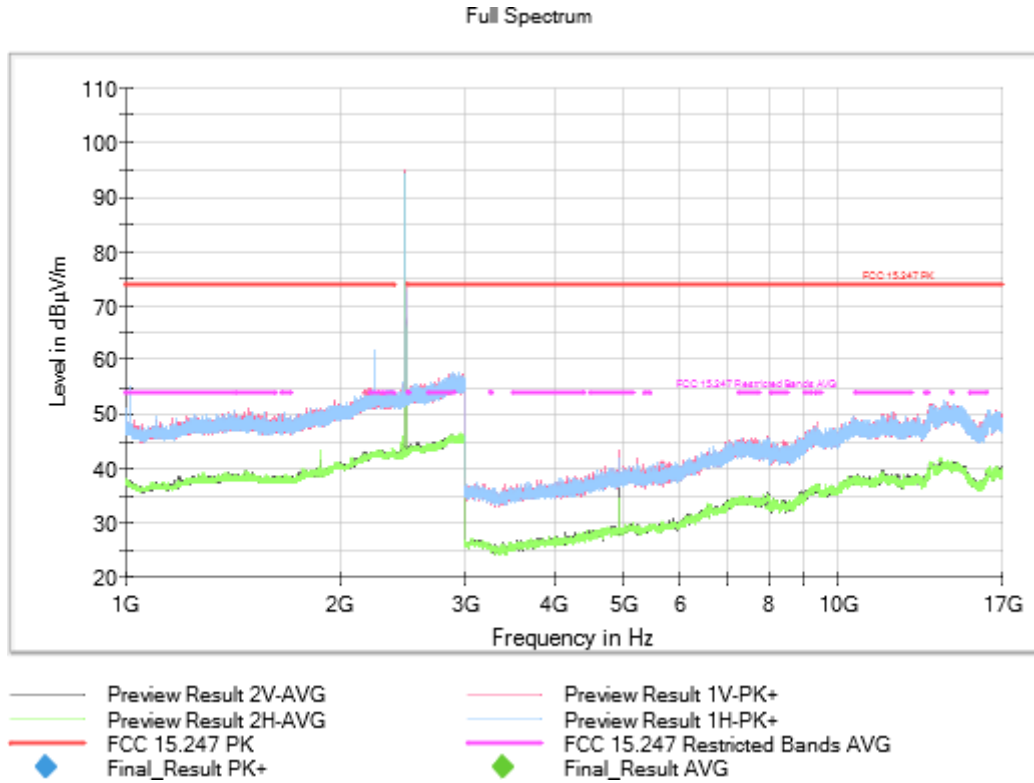
Operation Band MHz = [2400, 2483.5]

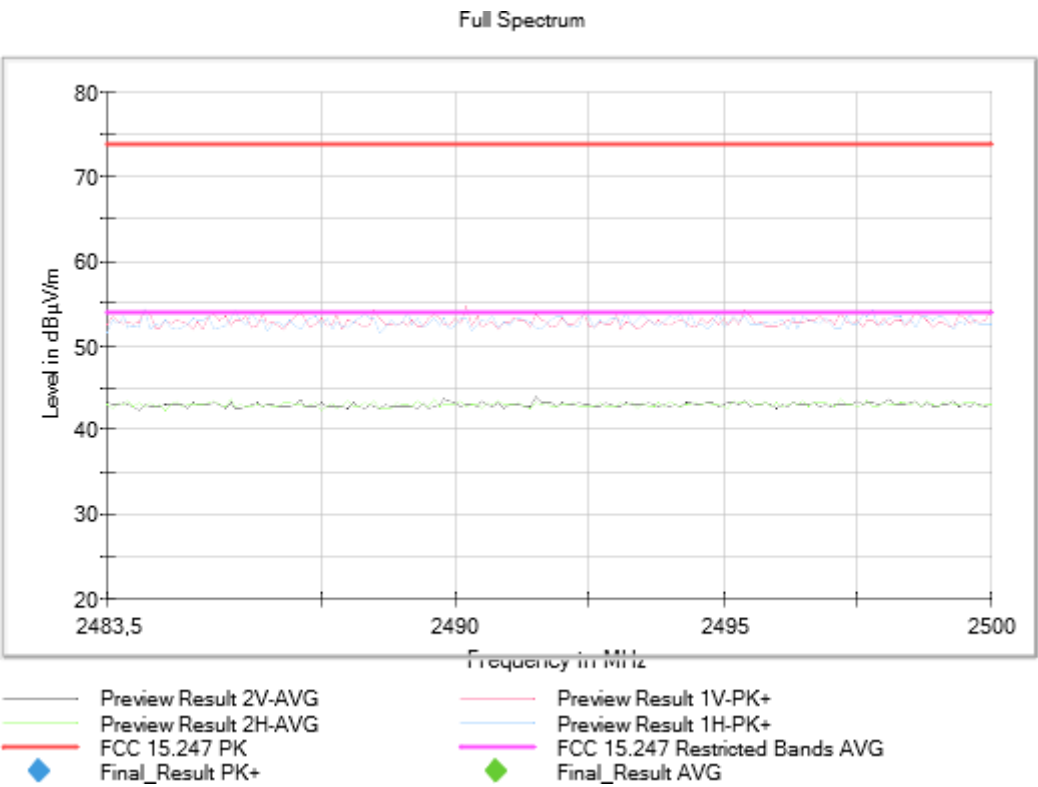
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2402.00000

Active Port = 1

Modulation = BTLE (GFSK 1 Mbit/s)

Images:





Frequency Range GHz = [1, 17]

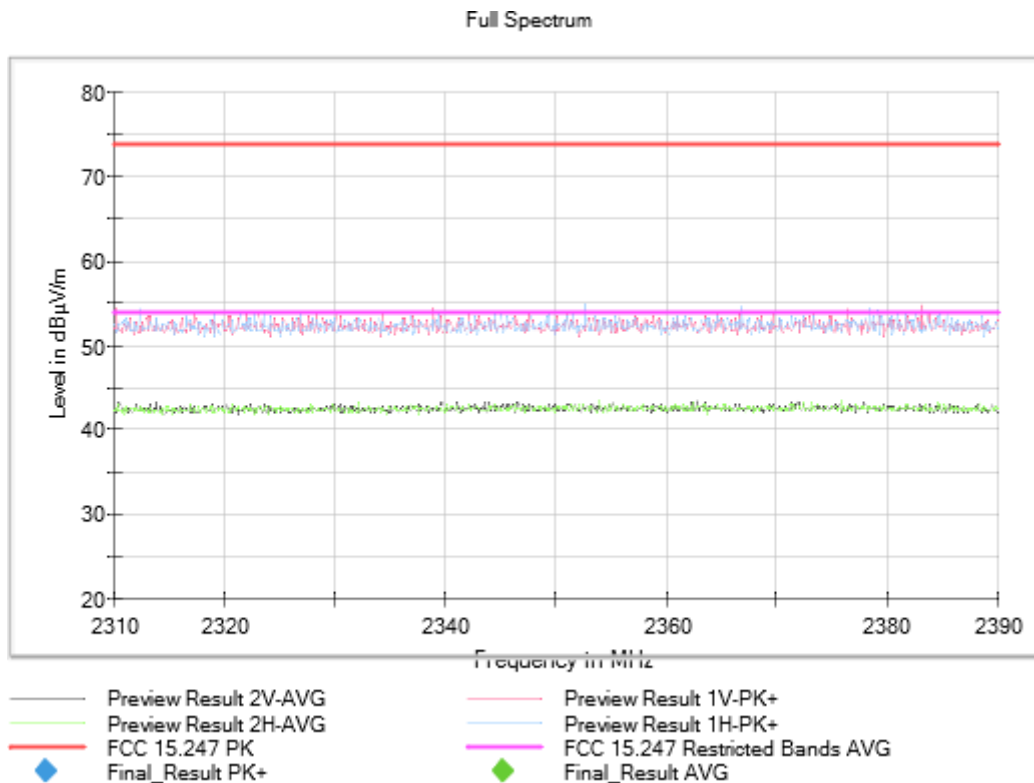
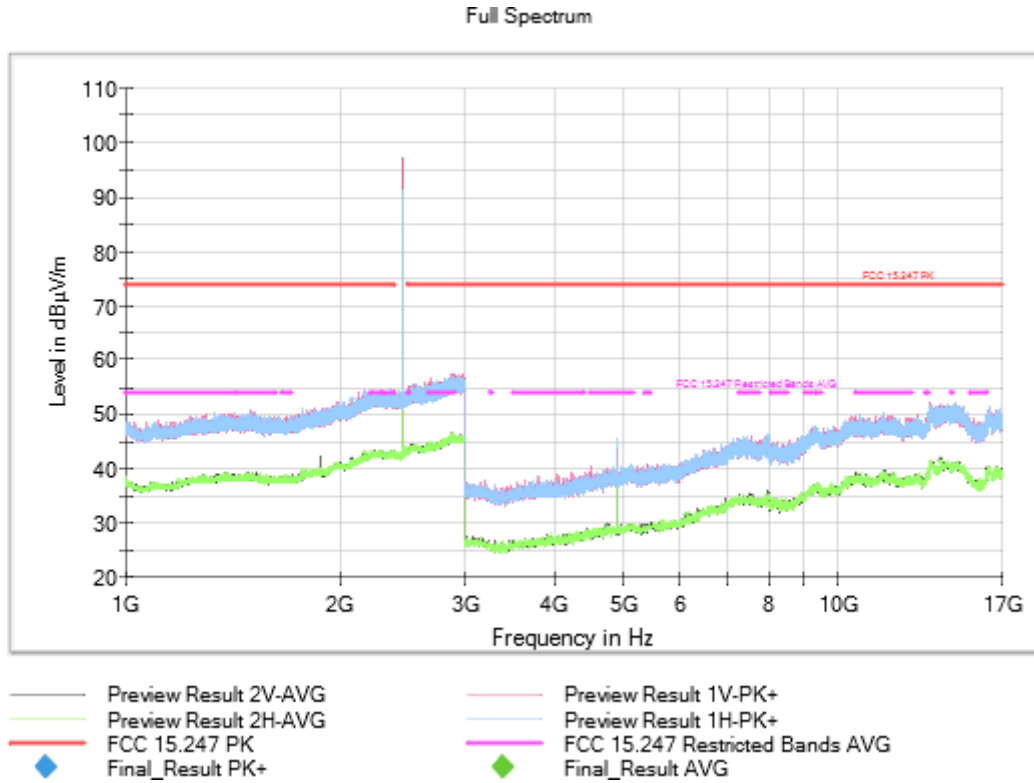
Operation Band MHz = [2400, 2483.5]

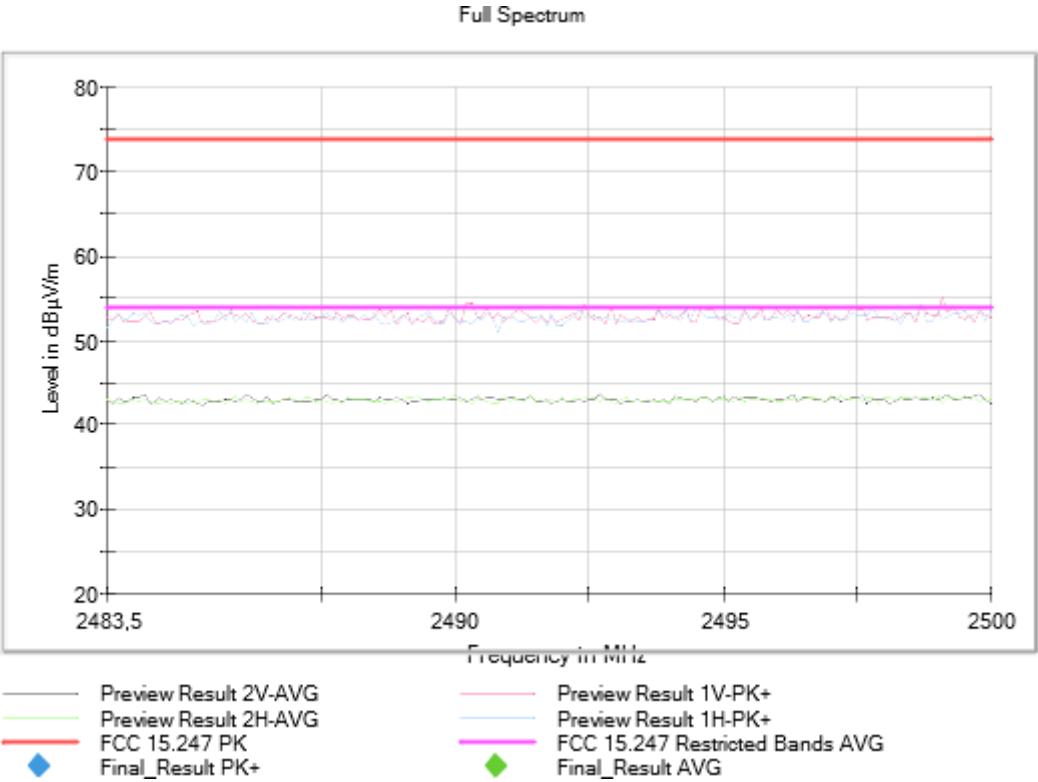
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2440.00000

Active Port = 1

Modulation = BTLE (GFSK 1 Mbit/s)

Images:





Frequency Range GHz = [1, 17]

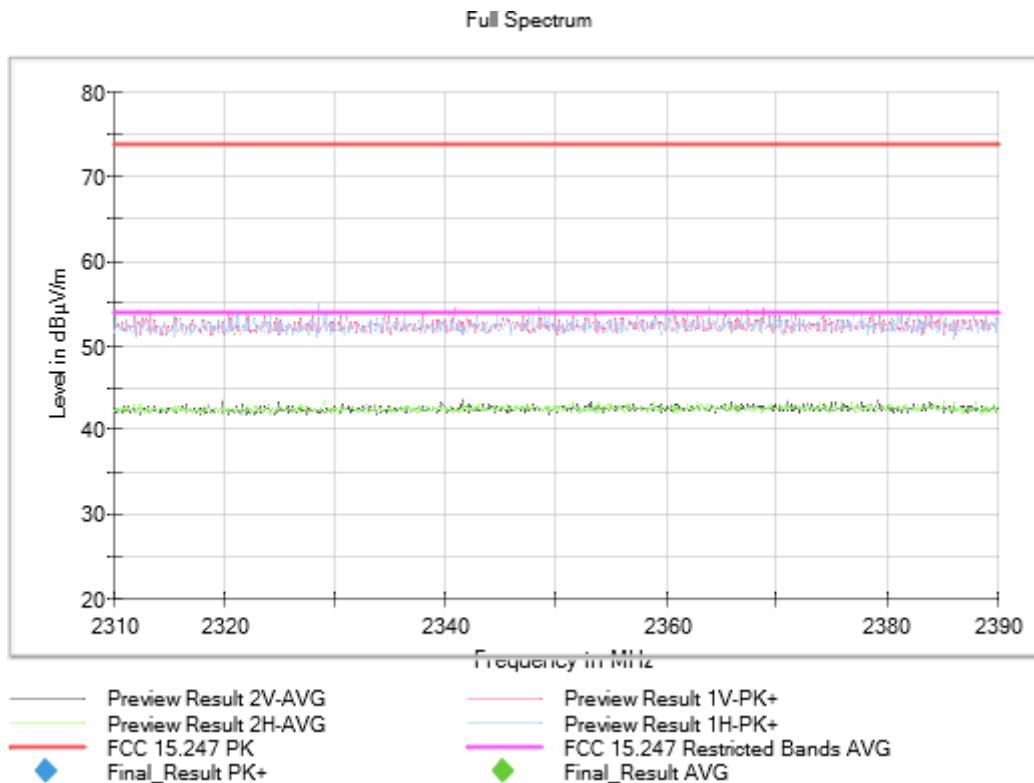
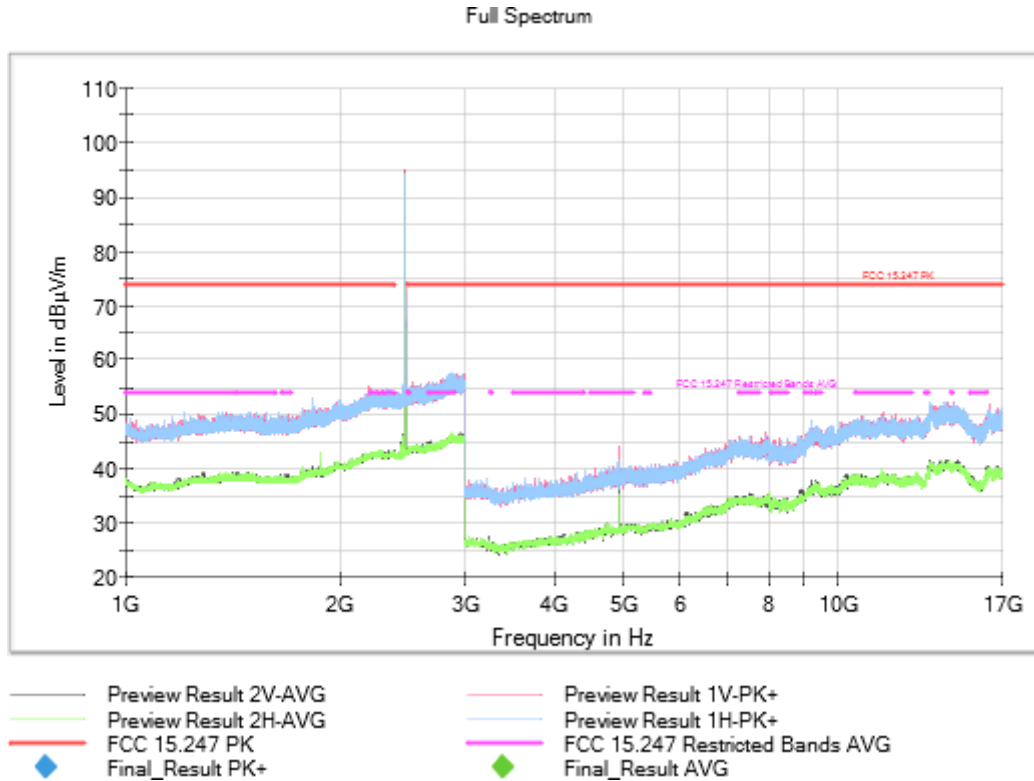
Operation Band MHz = [2400, 2483.5]

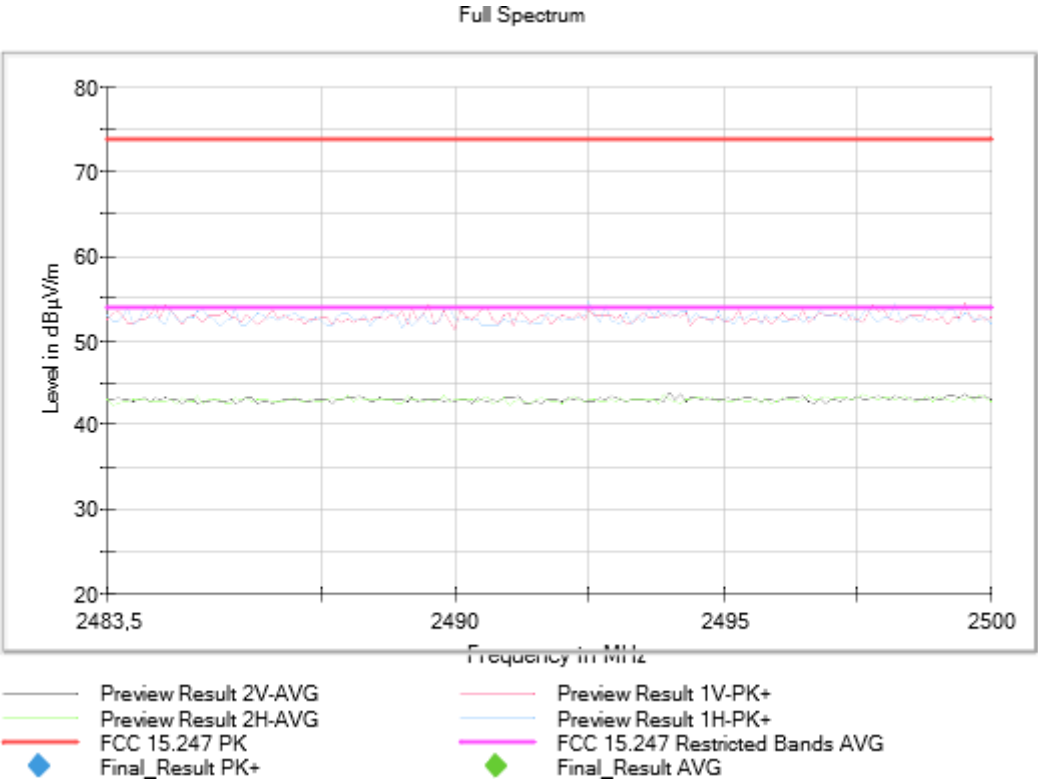
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2480.00000

Active Port = 1

Modulation = BTLE (GFSK 1 Mbit/s)

Images:





Modulation: BTLE (GFSK 2 Mbit/s)

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	1	46.684	27.25	V	PK
					46.684	23.97	V	QP
					60.215	27.69	V	PK
					60.215	22.82	V	QP
					74.911	20.51	V	QP
					74.911	24.27	V	PK
					177.974	22.02	V	QP
					177.974	26.07	V	PK

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1]

Operation Band MHz = [2400, 2483.5]

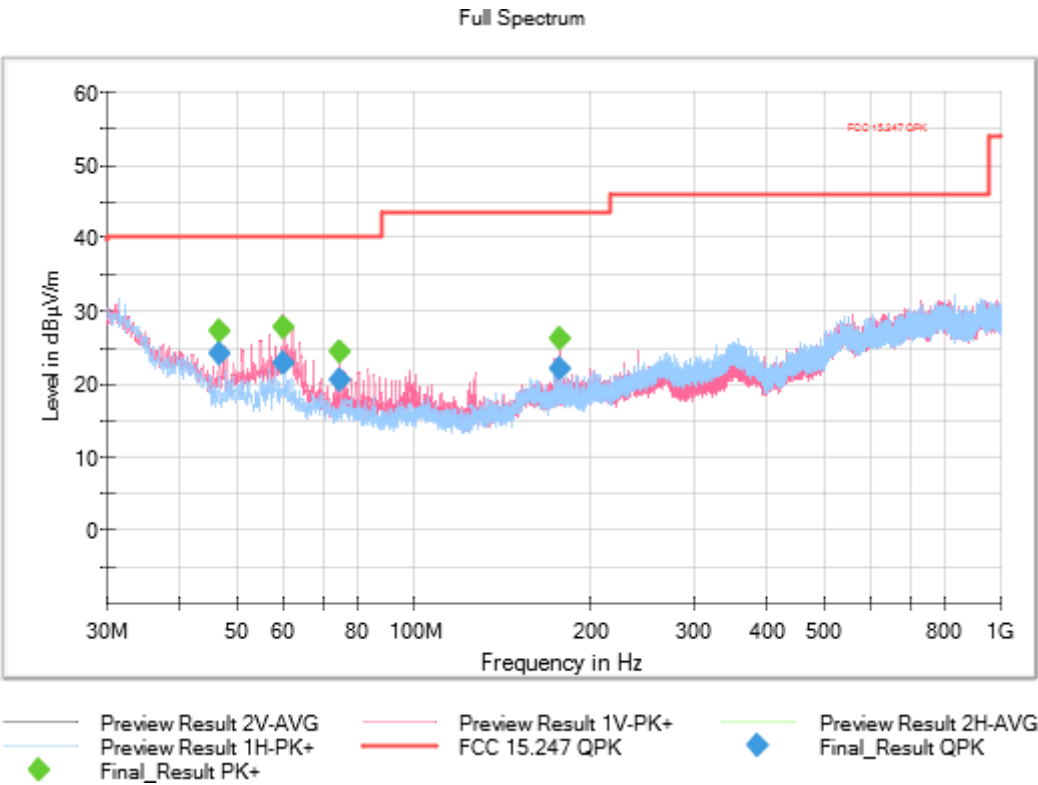
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2402.00000

Active Port = 1

Modulation = BTLE (GFSK 2 Mbit/s)

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	0 dB

Emissions in 30MHz - 1GHz frequency range do not depend on modulation or channel, so no further measurements are required in this range.

Frequency Range GHz = [1, 17]

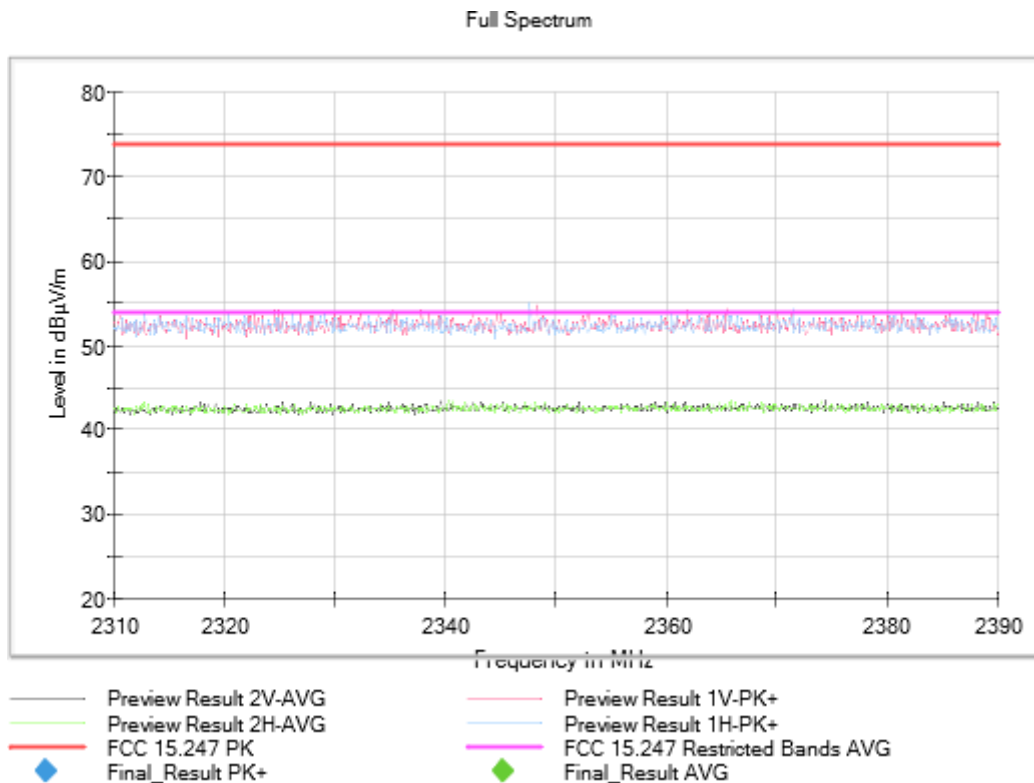
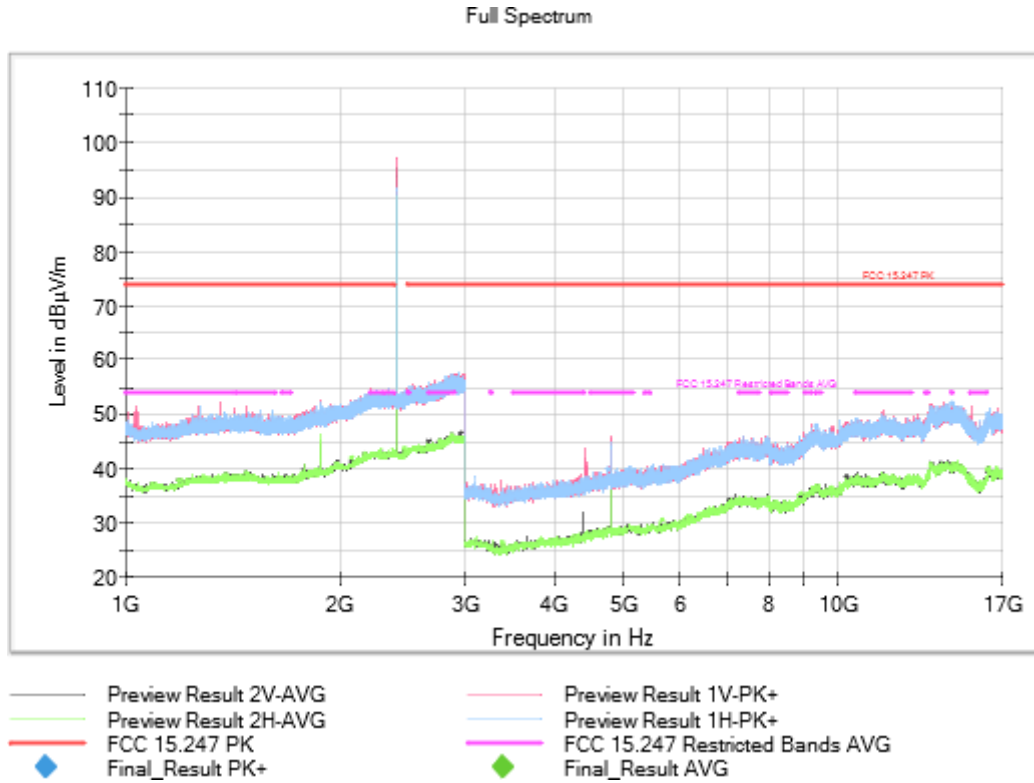
Operation Band MHz = [2400, 2483.5]

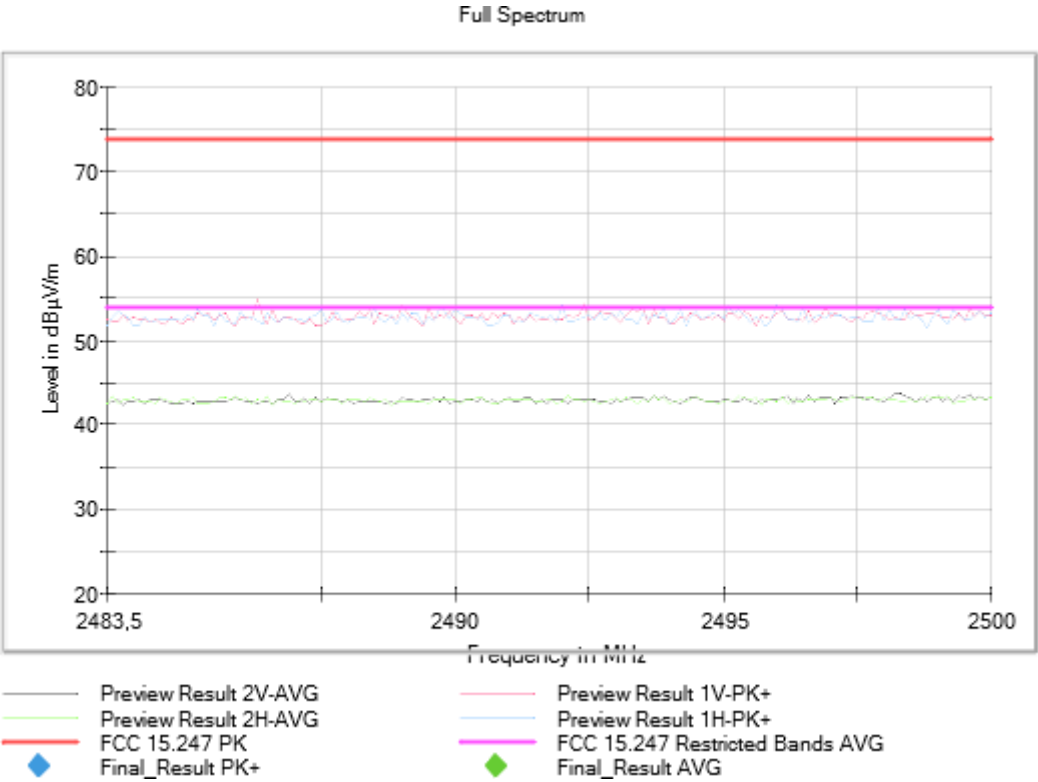
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2402.00000

Active Port = 1

Modulation = BTLE (GFSK 2 Mbit/s)

Images:





Frequency Range GHz = [1, 17]

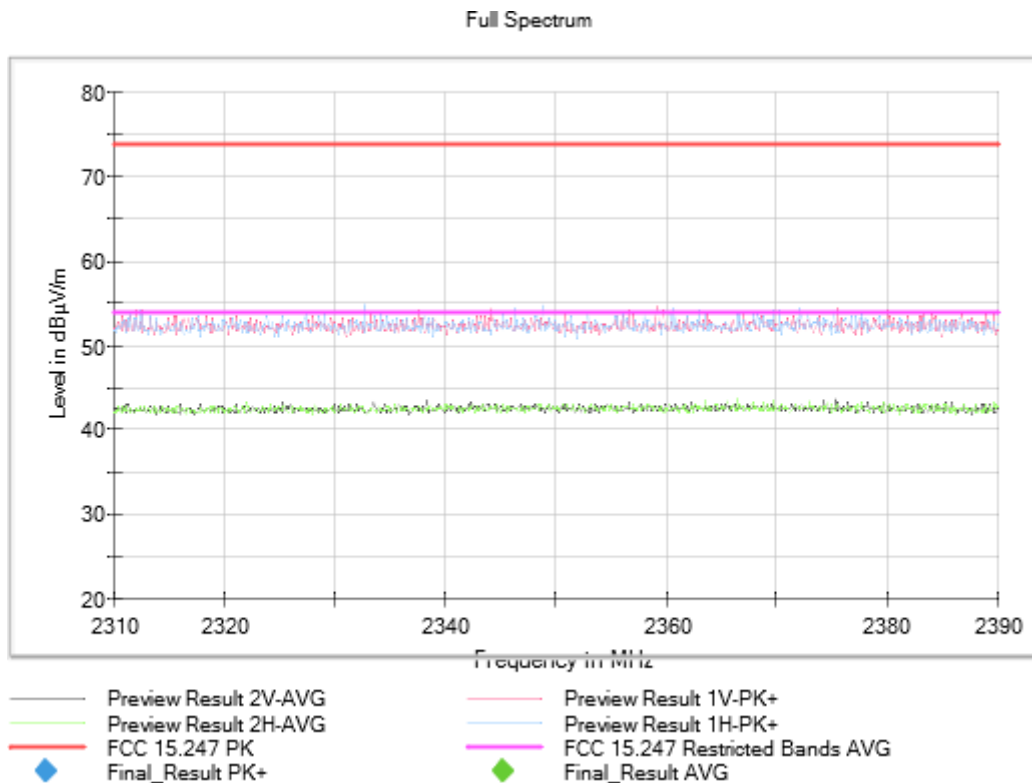
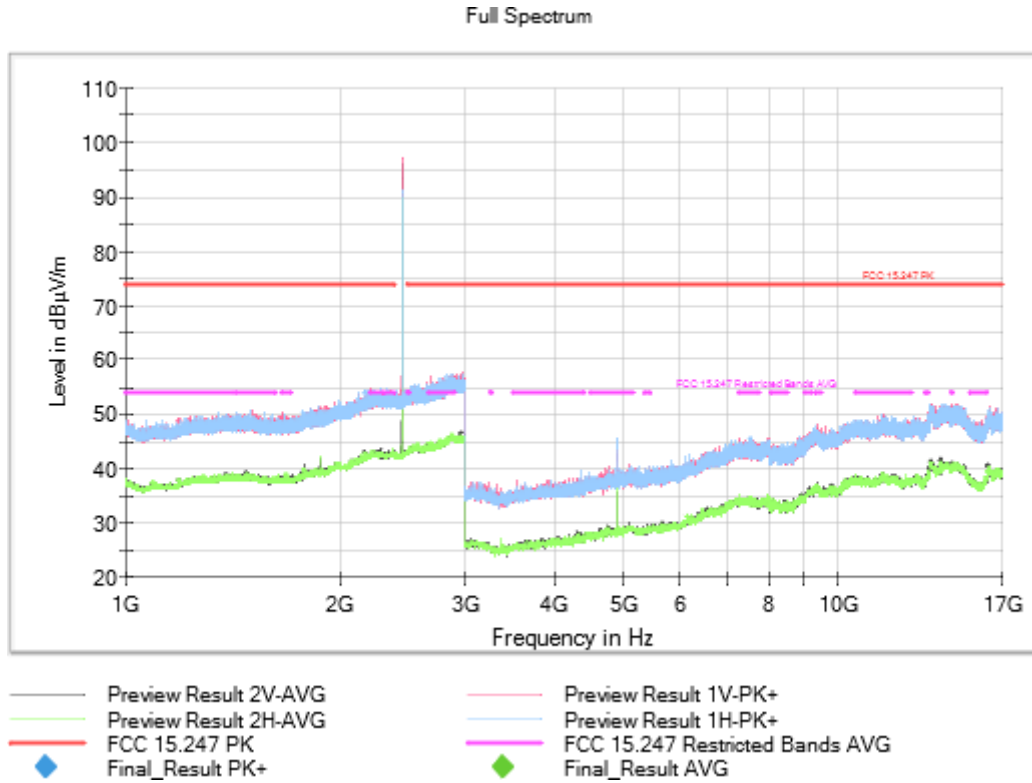
Operation Band MHz = [2400, 2483.5]

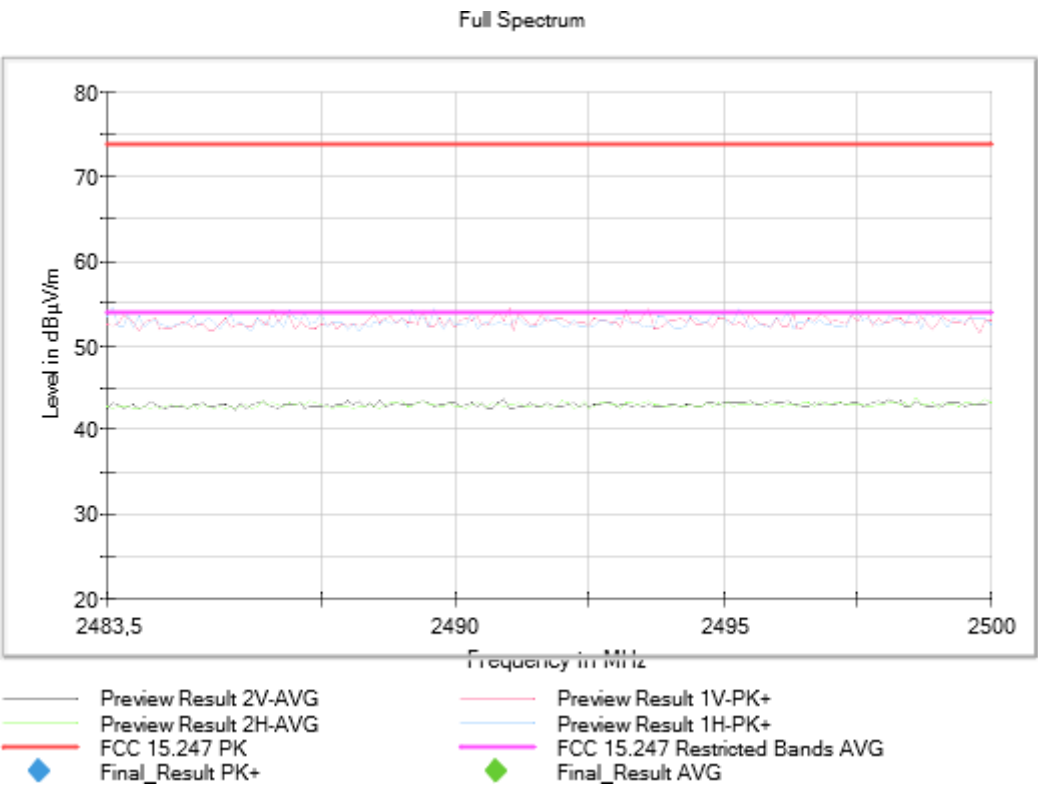
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2440.00000

Active Port = 1

Modulation = BTLE (GFSK 2 Mbit/s)

Images:





Frequency Range GHz = [1, 17]

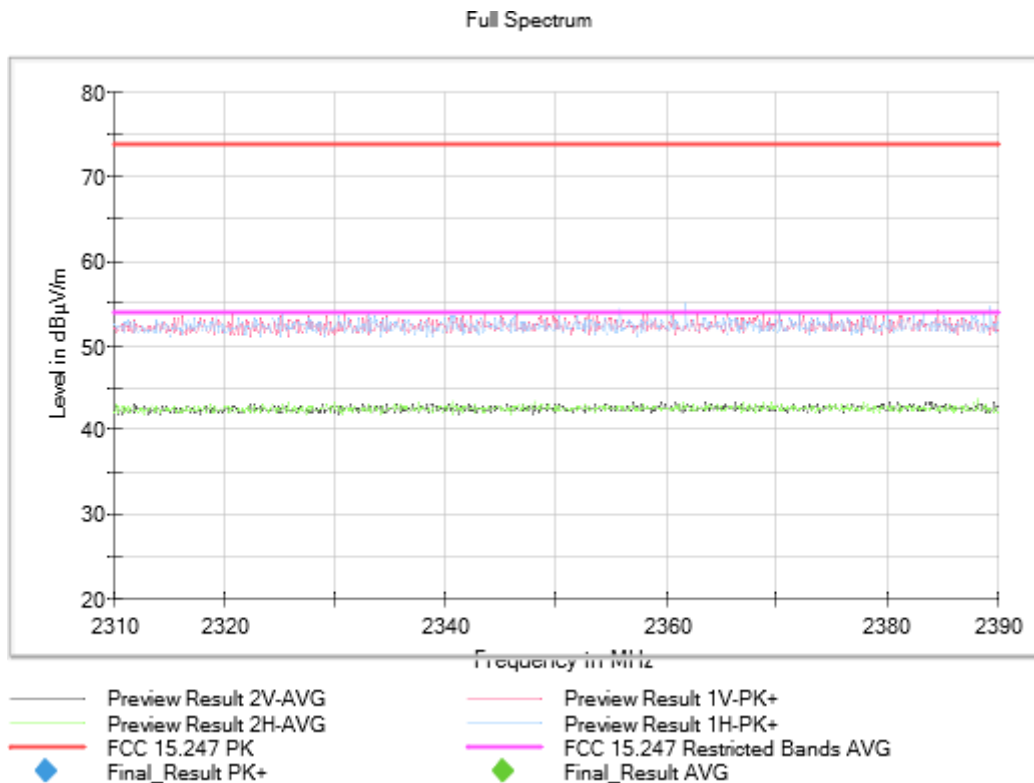
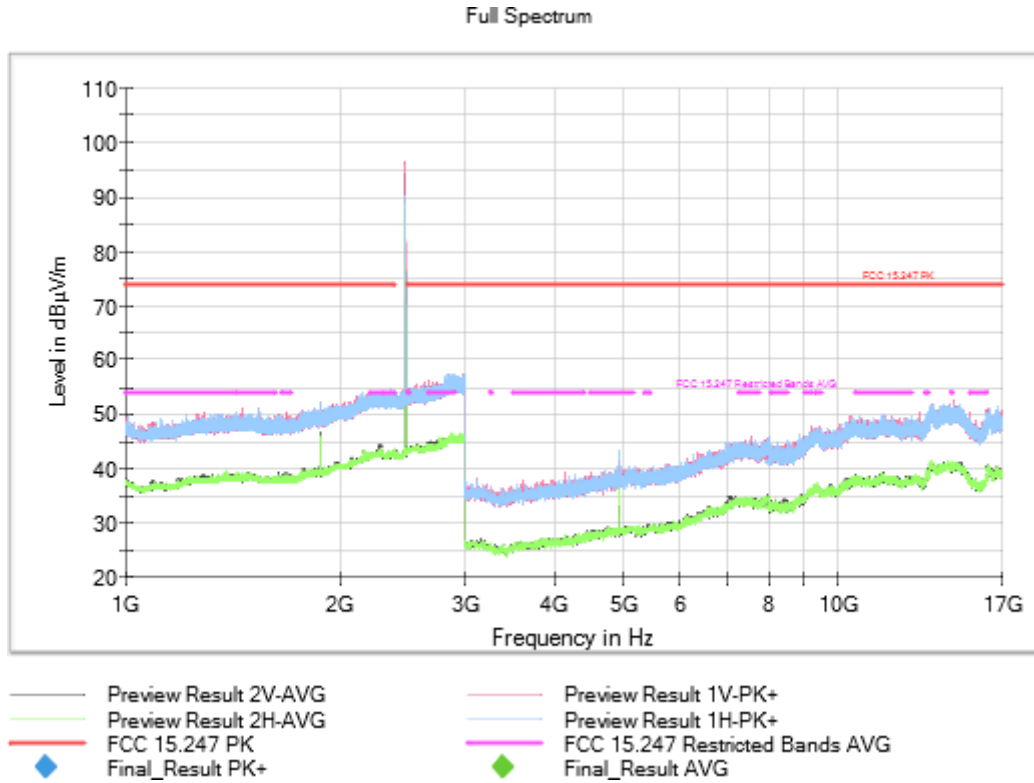
Operation Band MHz = [2400, 2483.5]

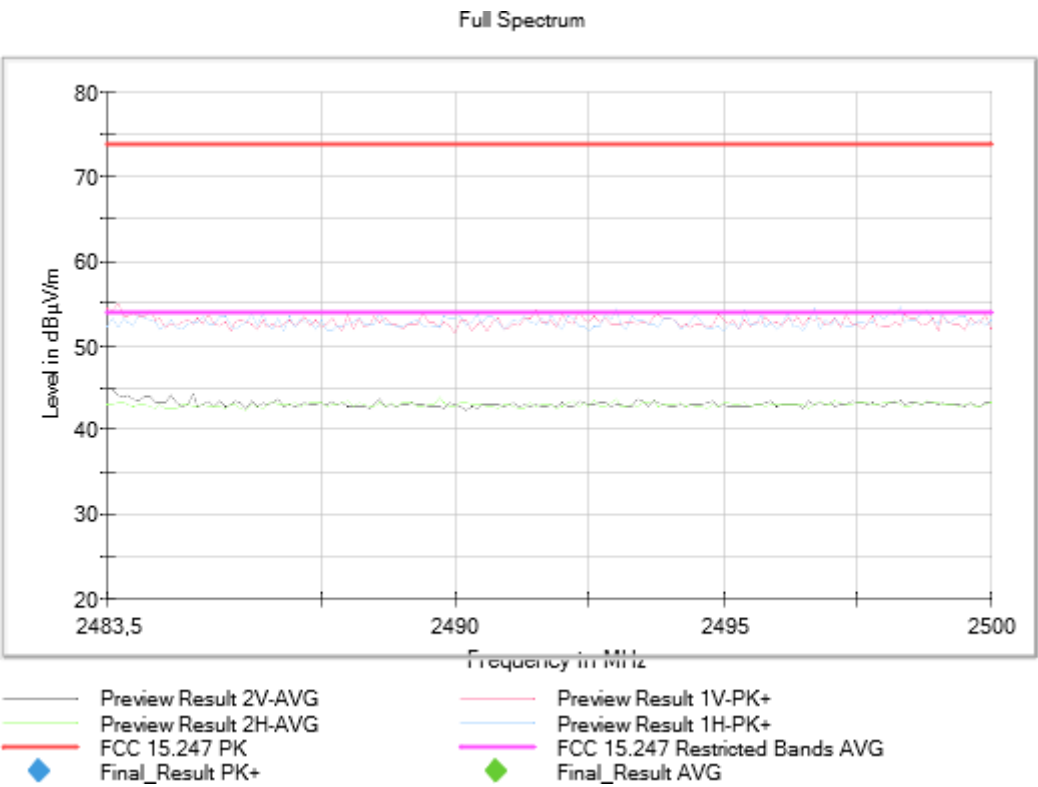
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2480.00000

Active Port = 1

Modulation = BTLE (GFSK 2 Mbit/s)

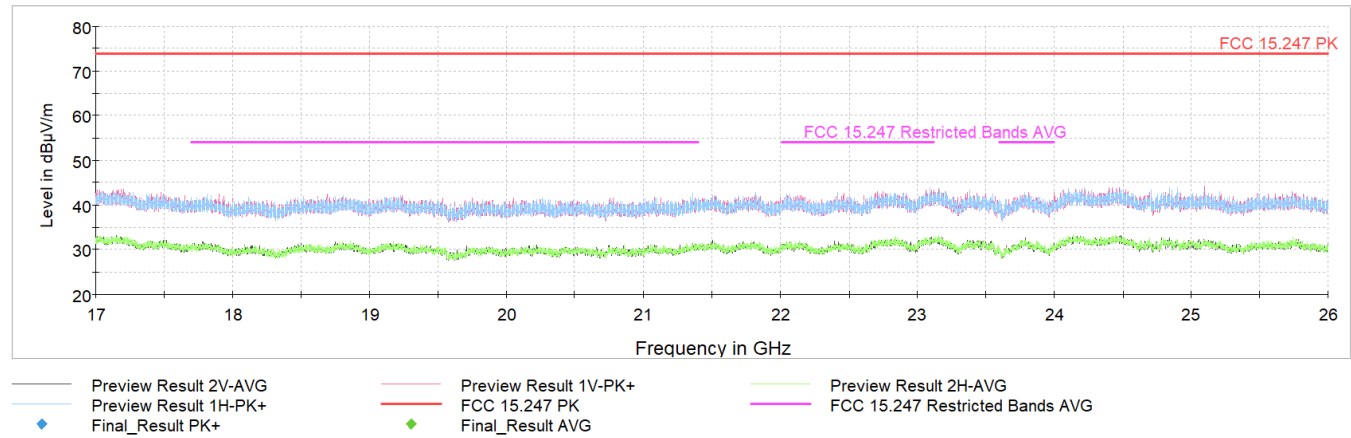
Images:





Frequency Range GHz = [17, 26] Operation Band MHz = [2400, 2483.5]
Equipment Type = Digital Transmission System (DTS) Frequency MHz = 2402.00000
Active Port = 1 Modulation = BTLE (GFSK 1 Mbit/s)

Images:



Frequency Range GHz = [17, 26]

Operation Band MHz = [2400, 2483.5]

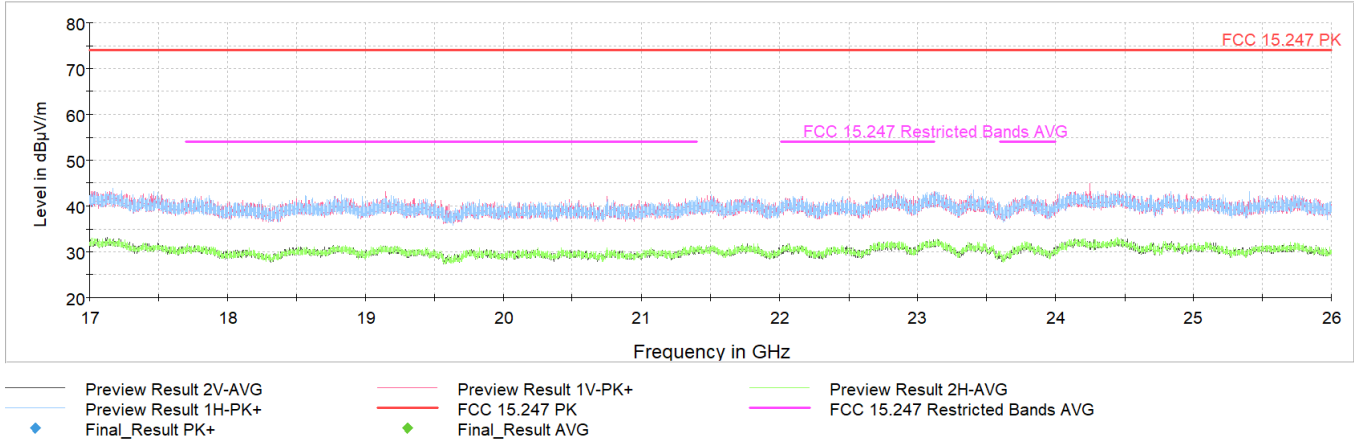
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2480.00000

Active Port = 1

Modulation = BTLE (GFSK 1 Mbit/s)

Images:



Frequency Range GHz = [17, 26]

Operation Band MHz = [2400, 2483.5]

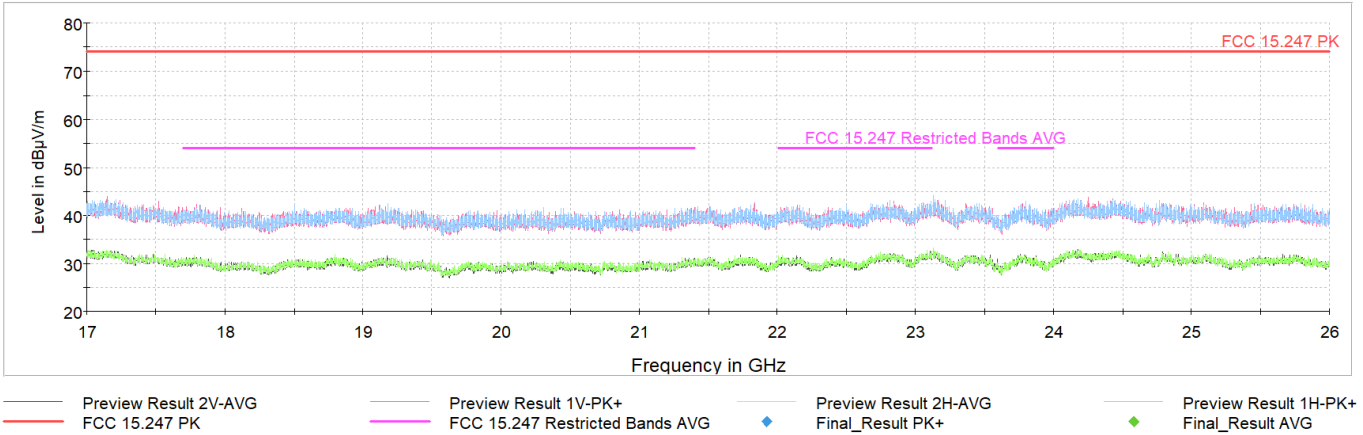
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2402.00000

Active Port = 1

Modulation = BTLE (GFSK 2 Mbit/s)

Images:



Emissions in 17-26 GHz frequency range do not depend on modulation or channel, so no further measurements are required in this range.

[Psd] 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 5.0 (GFSK 1 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	PSD (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	-3.52
		2440.00000	-3.21
		2480.00000	-4.11

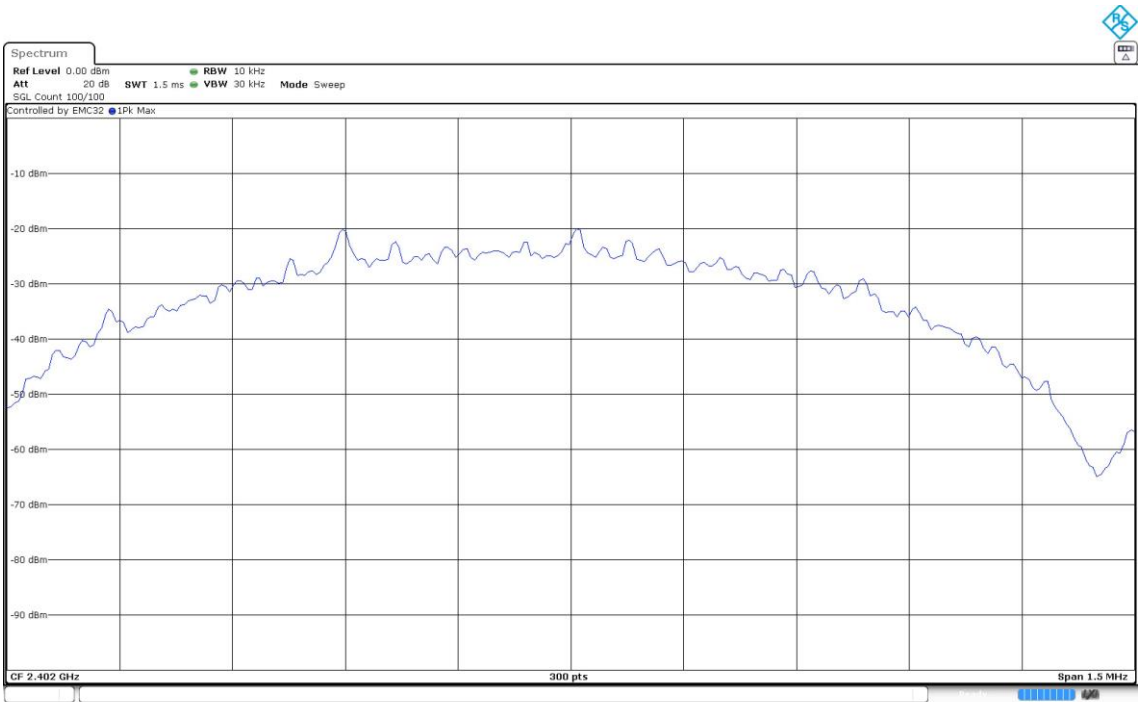
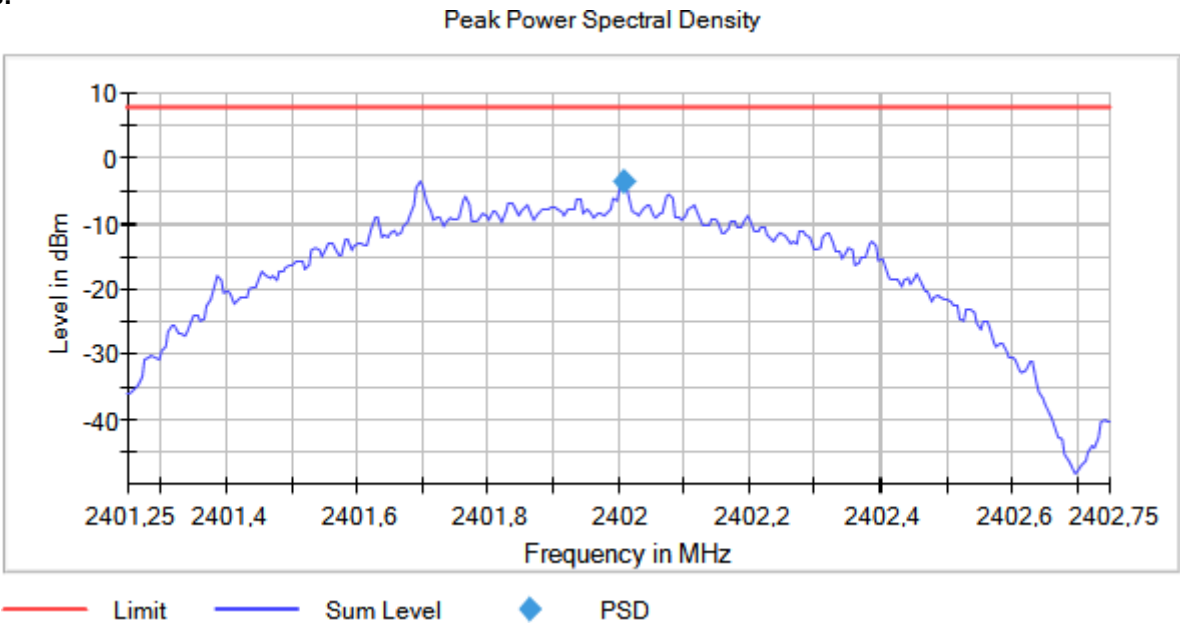
Verdict

Pass

Attachments

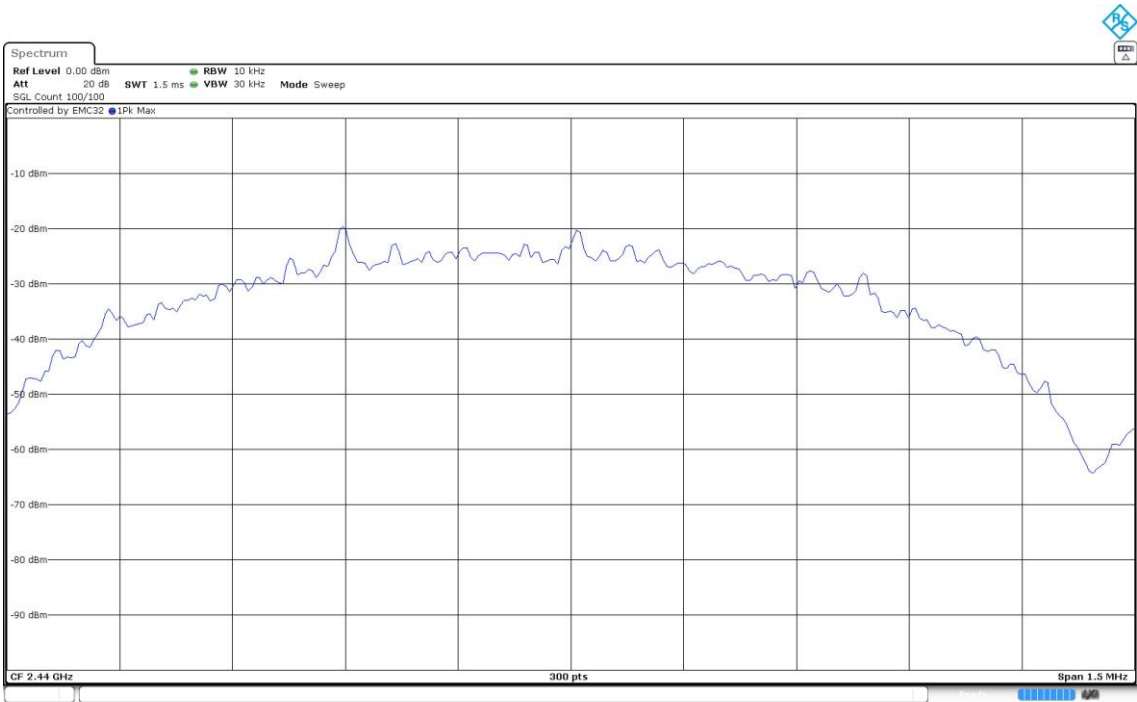
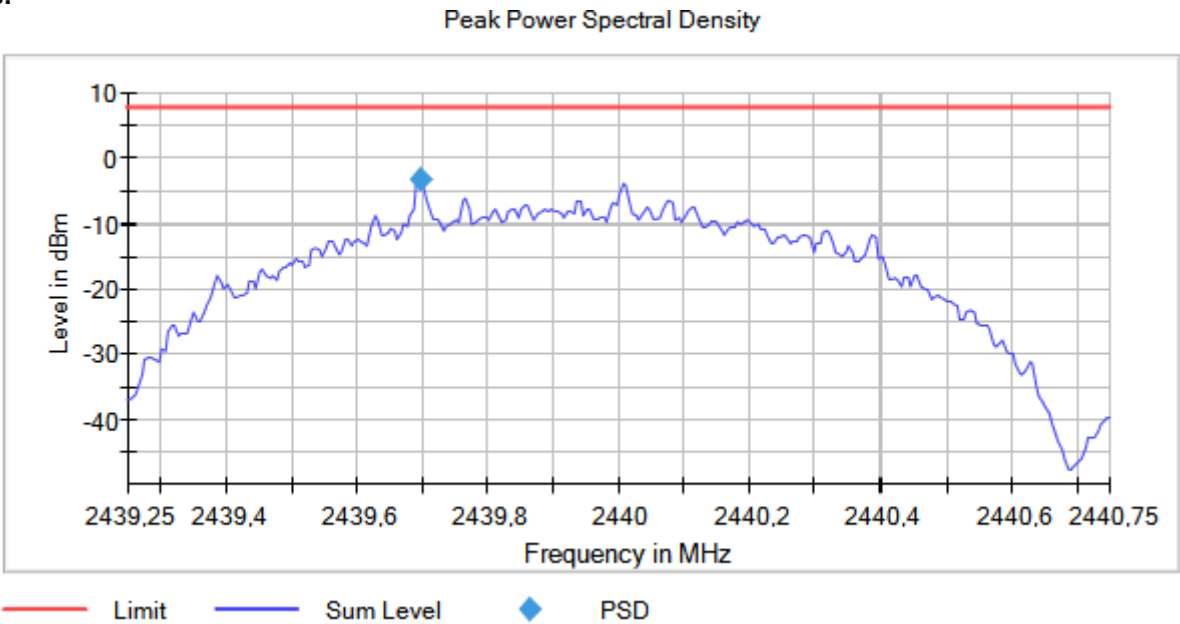
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



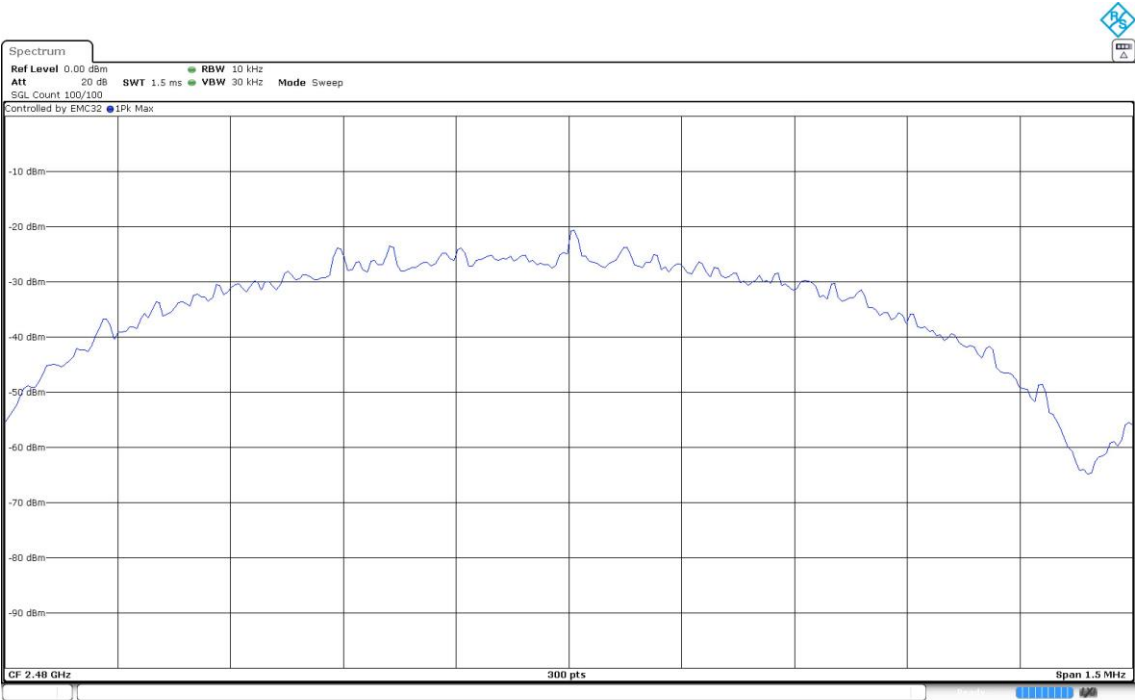
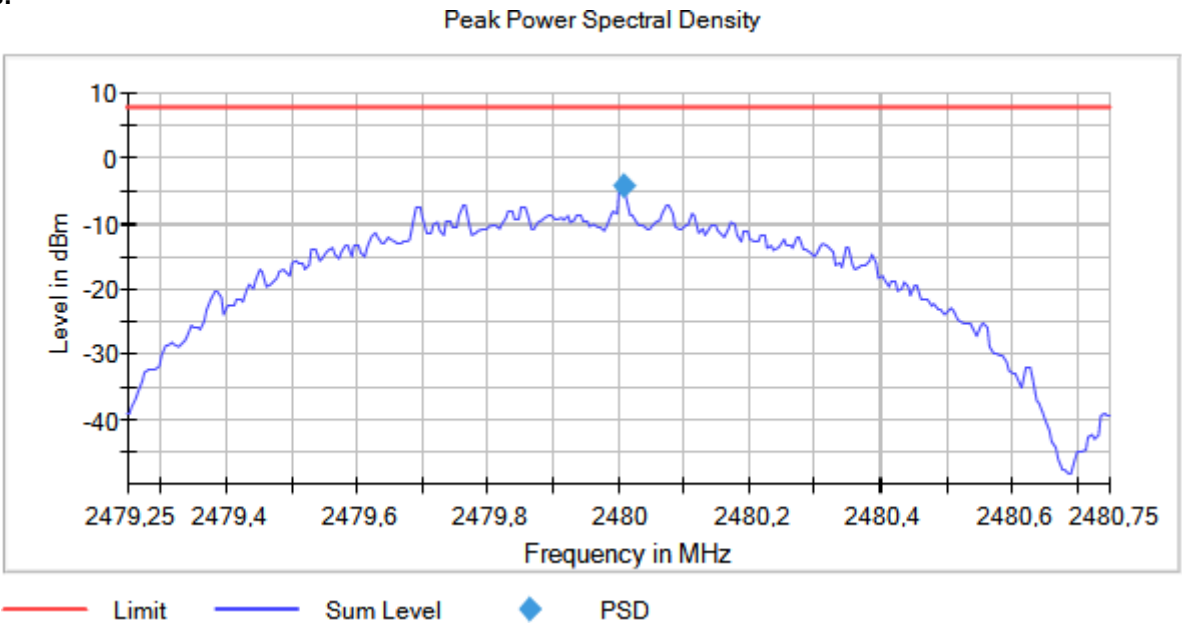
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

Images:



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	PSD (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2402.00000	-5.91
		2440.00000	-5.91
		2480.00000	-6.21

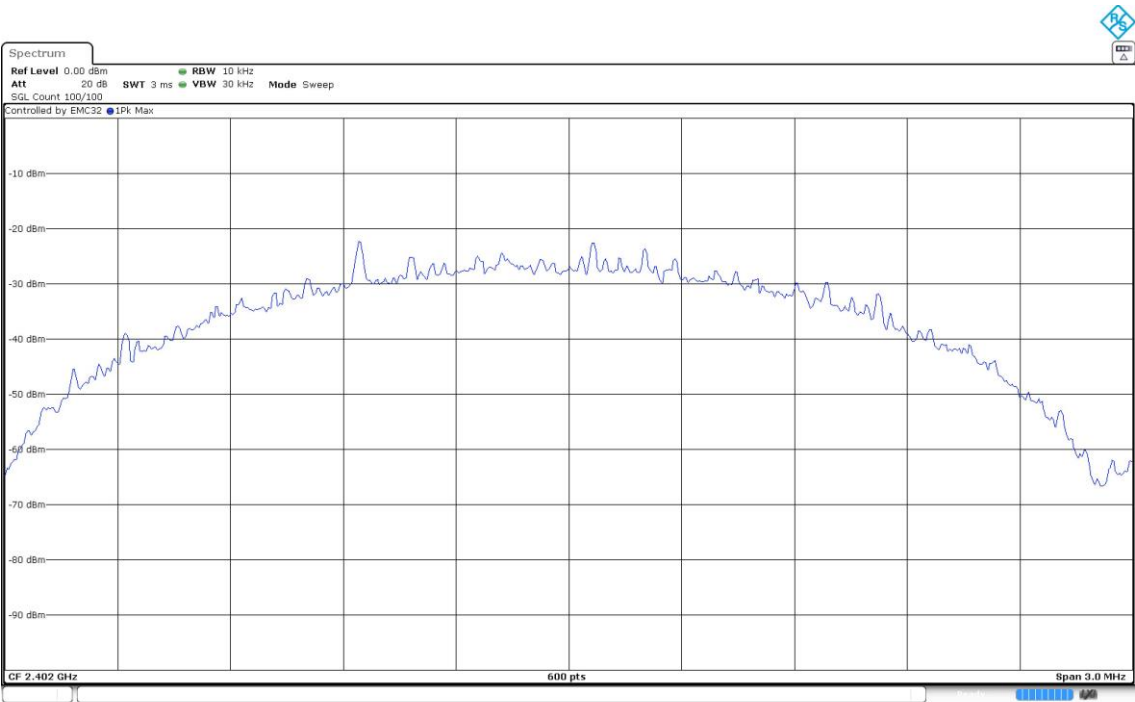
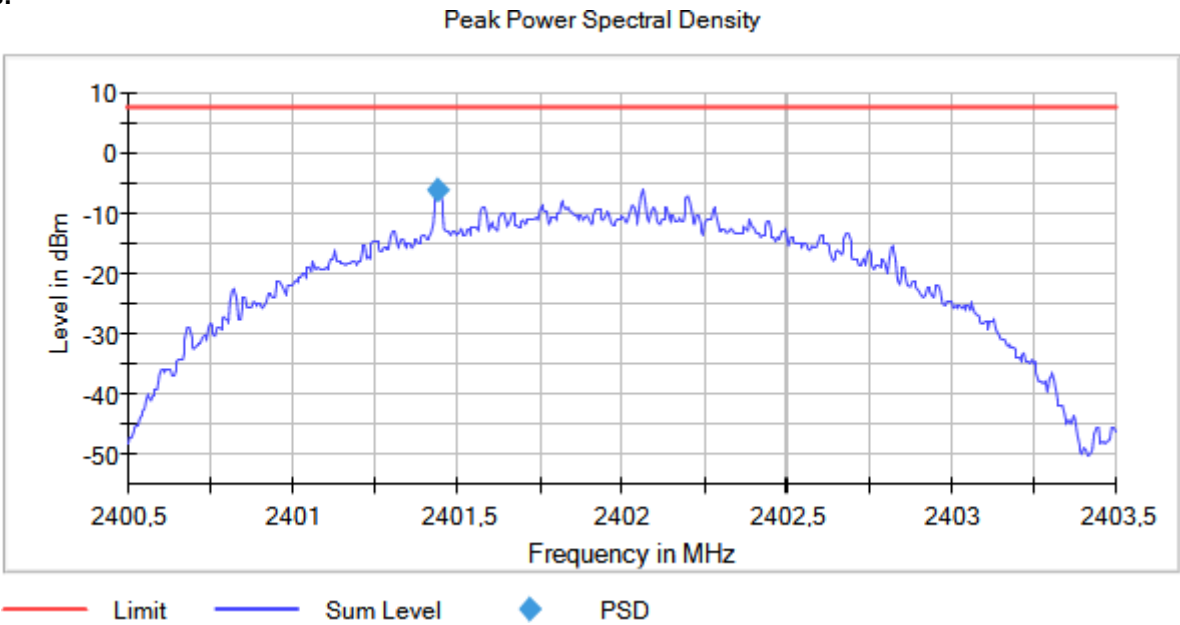
Verdict

Pass

Attachments

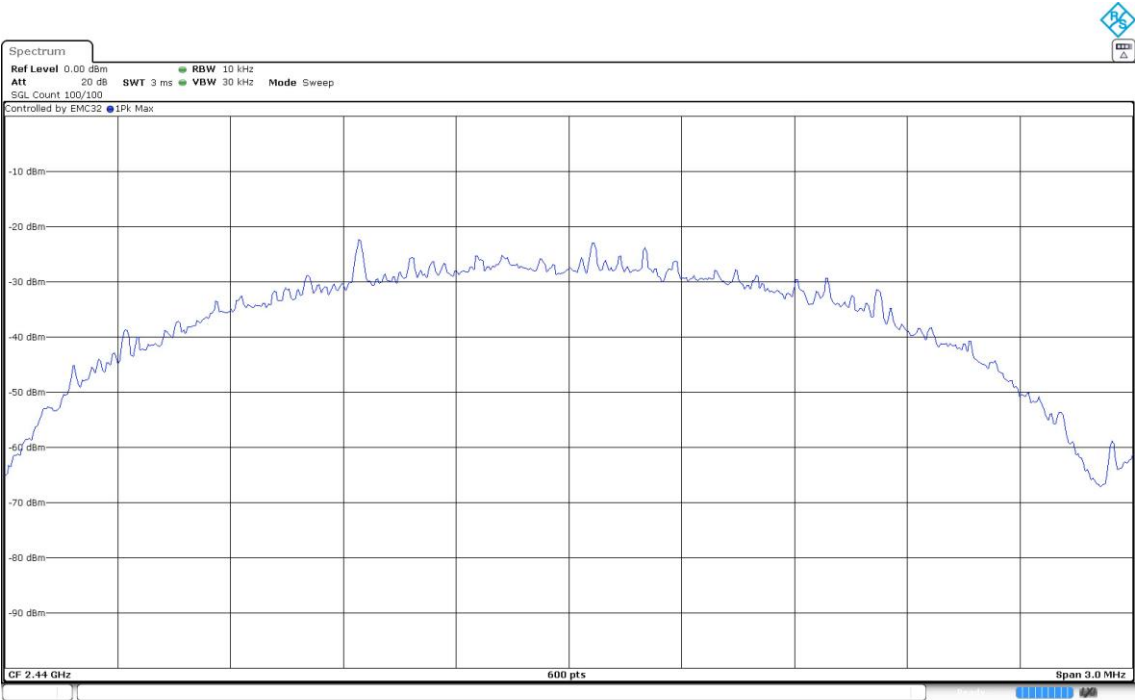
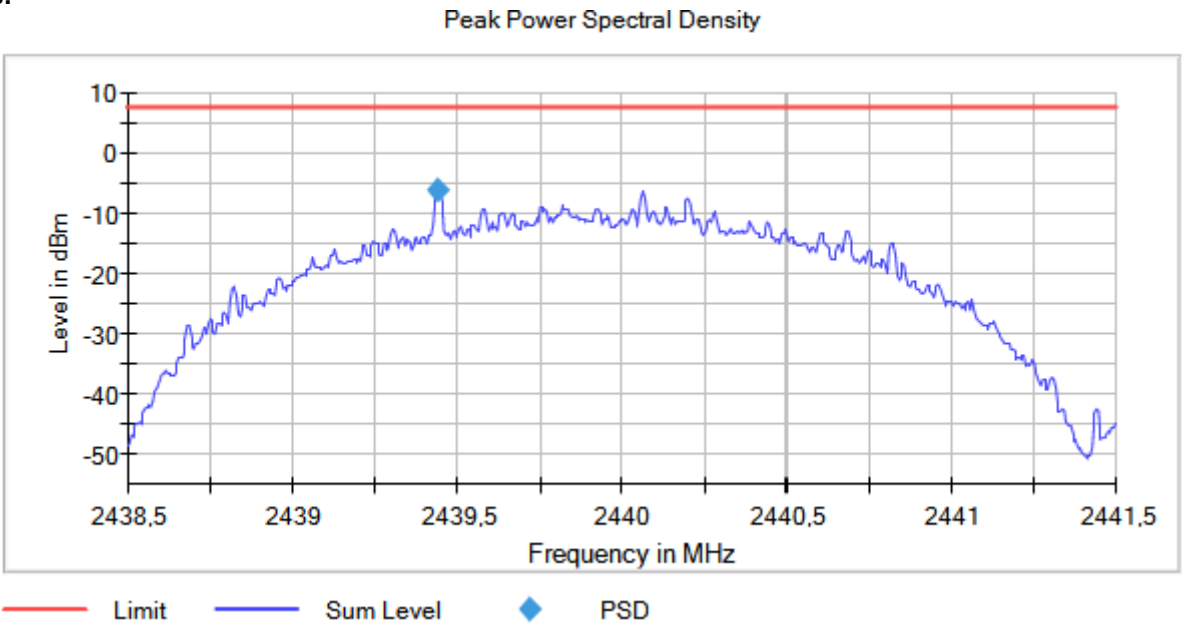
Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2402.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2440.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5] Equipment Type = Digital Transmission System (DTS)
Frequency MHz = 2480.00000 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

Images:

