DEKRA Certification, Inc.
405 Glenn Dr. Suite 12,
Sterling, VA 20164
United States of America

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test Report No:
3844ERM.009

Test Report

USA FCC Part 15.247, 15.209, 15.207; & CANADA RSS-247, RSS-Gen

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

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

(*) Identification of item tested	Automotive infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG7Q MID LF2
Other identification of the product	FCC ID: 2AOUZNTG7QMIDLF2 IC: 23650-NTG7QMIDLF2
(*) Features	FM/AM/DAB, USB, Bluetooth, WLAN, GNSS. HW Version: D11 SW Version: E329.1
Manufacturer	Continental Automotive Technologies Gmbh VDO-Strasse 1, 64832 Babenhausen, Germany
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US
Date of issue	11-29-2022
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Acronyms

Acronym ID	Acronym Description
# of Tx Chains	Number of Transmission Chains
26Ebw	Emission Bandwidth
Avg COT	Average Channel Occupancy Time
BW	Bandwidth
Equipment	Equipment Type
Freq	Frequency
Freq Sep	Frequency Separation
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
NHC	Number of Hopping Channels
NHp	Number of hops over the period
Occ Ch BW	Occupied Channel Bandwidth
Peak Power	Maximum Peak Conducted Output Power
Port	Active Port

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

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

DEKRA Certification Inc. 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 Certification at the time of performance of the test.

DEKRA Certification Inc. 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 Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Test case	Frequency (MHz)	U (k=2)	Units
RF Power and PSD	5150-5850	0.88	dB
Occupied Bandwidth		1.87	%
Dwell Time		0.01	%
Band Edge		0.64	dB
Radiated Spurious Emission	30-180	4.27	dB
	180-1000	3.14	dB
	1000-18000	3.30	dB
	18000-40000	3.49	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 an Automotive head unit to be installed in cars with the following features: FM/AM/DAB, USB, Bluetooth, WLAN and GNSS.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements, accessories and auxiliary equipment:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	3844/22	Infotainment Head Unit	NTG7Q MID LF2	COM652NB000375	9/13/2022	Element Under Test
S/01	3844/25	Harness	-	-	9/13/2022	Accessory
S/01	3844/27	Cable 4 in 1 – BT/Wi-Fi (SMA connector)	-	-	9/13/2022	Accessory

1. Sample S/01 Was Used for The Test(S): All Conducted Tests Indicated in Appendix A, and B.

Sample S/02 is composed of the following elements, accessories and auxiliary equipment:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/02	3844/01	Infotainment Head Unit	NTG7Q MID LF2	COM652NB000376	9/13/2022	Element Under Test
S/02	3844/05	BT/WLAN Antenna 1	-	-	9/13/2022	Accessory
S/02	3844/06	BT/WLAN Antenna 2	-	-	9/13/2022	Accessory
S/02	3844/07	BT/WLAN Antenna 3	-	-	9/13/2022	Accessory
S/02	3844/08	BT/WLAN Antenna 4	-	-	9/13/2022	Accessory
S/02	3844/26	Harness	-	-	9/13/2022	Accessory
S/02	3844/27	RF antenna cable	-	-	9/13/2022	Accessory

2. Sample S/02 Was Used for The Test(S): All Radiated Tests Indicated in Appendix A, and B.

Test sample description

Test Sample description (compulsory information for EMC and RF testing services).

Ports……:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)		
	Car Connector A	>3m	[X]	[ ]	[ ]		
	Car Connector B	>3m	[X]	[ ]	[ ]		
	Display Connector CID/PIP / RVC	>3m	[X]	[X]	[ ]		
	USB Connector	<3m	[X]	[X]	[ ]		
	Eth Connector	>3m	[X]	[ ]	[ ]		
	BT/WLAN-Antenna	>3m	[X]	[X]	[ ]		
	FM/AM/DAB Ant	>3m	[X]	[X]	[ ]		
	GNSS Antenna	>3m	[X]	[X]	[ ]		
Supplementary information to the ports…… :							
Rated power supply ..... :	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[ ]	AC:	[ ]	[ ]	[ ]	[ ]	[ ]
	[ ]	AC:	[ ]	[ ]	[ ]	[ ]	[ ]
	[X]	DC: 12V car battery /attenuator (9,5-15,5v normal operation)					
Rated Power ..... :	12V						
Clock frequencies..... :	See schematics						
Other parameters ..... :	See technical description						
Software version ..... :	E329.1						
Hardware version ..... :	D11						
Dimensions in cm (W x H x D) :	182 x 78 x 160 mm						
Mounting position ..... :	[ ]	Table top equipment					
	[ ]	Wall/Ceiling mounted equipment					
	[ ]	Floor standing equipment					
	[ ]	Hand-held equipment					
	[X]	Other: Automotive Infotainment Head Unit					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	N/A		.....		.....		
	.....		.....		.....		

Accessories (not part of the test item)..... :	Description	Type	Manufacturer
	HARMANeco (with Display or headless)		HBAS
	Cable harness		HBAS
	Display		L.G.
	BT/WLAN-Antenna		HIRSCHMANN
Documents as provided by the applicant..... :	Description	File name	Issue date
	Technical description	Technical Description NTG7Q_A20 200717 SOP2 AllVariant_NXP DRAFT.pdf	
	Testing Guide	NTG7QTestsetupScript_220704_v3 2.pdf	
	Declaration Equipment Data	FDT30_16 Declaration Equipment Data_NTG7Q MID LF2_D11_update1_signed	

Copy of marking plate:

Identification of the client

CONTINENTAL AUTOMOTIVE TECHNOLOGIES GMBH
VDO-Strasse 1,
64832 Babenhausen,
Germany

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	10-04-2022
Date (finish)	11-09-2022

Document history

Report number	Date	Description
3844ERM.009	11-29-2022	First release.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Juliana Cherry, Koji Nishimoto, and Victor Albrecht.

Testing verdicts

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

Summary

Bluetooth EDR

FCC PART 15 PARAGRAPH / RSS-247			
Requirement	**Test case**	**Verdict**	**Remark**
RSS-247 5.1 (b) / FCC 15.247 (a) (1)	20 dB Bandwidth	Pass	N/A
FCC 2.1049 / 99dBw	Occupied Channel Bandwidth 99%	Pass	N/A
RSS-247 5.1 (b) / FCC 15.247 (a) (1)	Carrier Frequency Separation	Pass	N/A
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii)	Time of Occupancy (Dwell Time)	Pass	N/A
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii)	Number of hopping channels	Pass	N/A
RSS-247 5.4 (b) / FCC 15.247 (b) (1)	Maximum Peak Conducted output power & Antenna gain	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Band-edge emissions compliance (Transmitter) – Conducted	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Emissions compliance (Transmitter) - Conducted	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Emissions compliance (Transmitter) - Radiated	Pass	N/A
Supplementary information and remarks: None			

Wi-Fi 2.4GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement	**Test case**	**Verdict**	**Remark**
RSS-247 5.2 (a) / FCC 15.247 (a) (2)	6 dB Bandwidth	Pass	N/A
FCC 2.1049 / 99dBw	Occupied Channel Bandwidth 99%	Pass	N/A
RSS-247 5.2 (b) / FCC 15.247 (e)	Power spectral density	Pass	N/A
RSS-247 5.4 (d) / FCC 15.247 (b) (1)	Maximum Average Conducted Output Power	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Band-edge emissions compliance (Transmitter) - Conducted	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Emissions compliance (Transmitter) - Conducted	Pass	N/A
RSS-247 5.5 / FCC 15.247 (d)	Emissions compliance (Transmitter) - Radiated	Pass	N/A
Supplementary information and remarks: None			

List of equipment used during the test

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
897	AMETEK PROG DC Power supply	1707A01906	N/A	N/A
1014	FSV40 Signal Analyzer 40GHz	101626	2021-05-19	2023-05-19
1107	Ethernet SNMP Thermometer-RF1 Room	60038026952	2022-10-18	2024-10-18
1313	Wireless Measurement Software R&S EMC32	-	N/A	N/A

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
878	AMETEK PROG DC Power supply	1707A01783	N/A	N/A
982	Low Noise Preamplifier	1711156C	2020-11-10	2022-11-10
1012	ESR26 EMI Test Receiver	101478	2022-04-12	2024-04-12
1014	FSV40 Signal Analyzer 40GHz	101626	2021-05-19	2023-05-19
1056	3116C Double-Ridged Waveguide Horn Antenna 19-40 GHz	213179	2020-01-10	2023-01-10
1057	3115 Double-Ridged Waveguide Horn Antenna 1-18 GHz	211373	2020-06-03	2023-06-03
1065	3142E Biconilog Antenna	208587	2020-08-13	2023-08-13
1108	Ethernet SNMP Thermometer-CR Room	60038026954	2022-10-18	2024-10-18
1111	Ethernet SNMP Thermometer-SAC	60038026577	2022-10-18	2024-10-18
1179	Semi anechoic Absorber Lined Chamber	F169021	N/A	N/A
1314	Wireless Measurement Software R&S EMC32	1040-OT102236	N/A	N/A
1460	Low Noise Preamplifier	2213857A	2022-06-01	2024-06-01

Appendix A: Test results. Bluetooth EDR

Appendix A

PRODUCT INFORMATION

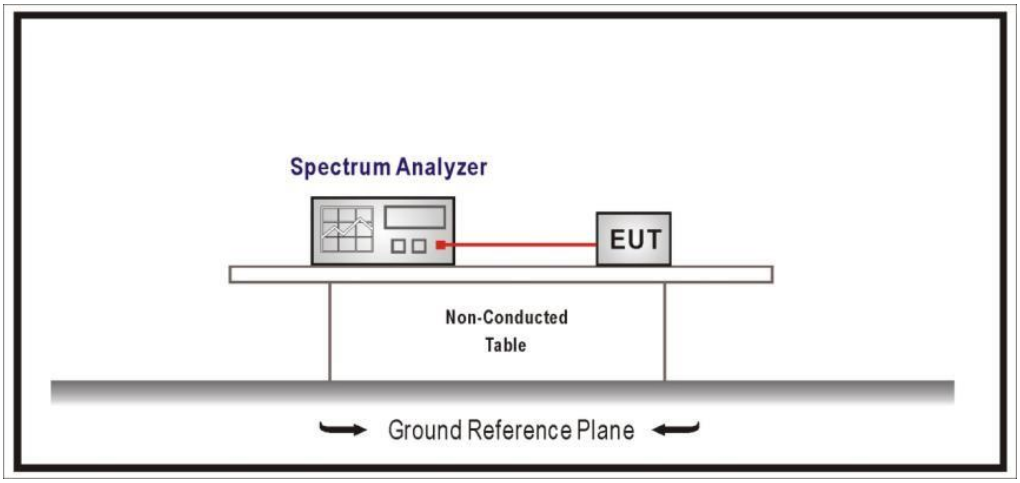
Information	Description
Modulation	GFSK, π/4-DQPSK, 8-DPSK
Operation mode 1:	
Operating Frequency Range	2402 – 2480 MHz
Nominal Channel Bandwidth	1 MHz
RF Output Power	7 dBm
Antenna type	External Antenna
Antenna gain	1.8 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth Classic

TEST CONDITIONS

(*): Data provided by the client.

TEST CONDITIONS	DESCRIPTION
TC/01	Power supply (V): $V_{nominal}$: 12 Vdc Temperature: $T_{nominal}$: +15 to +35 ºC Modulation: GFSK Test Frequencies for conducted/Radiated tests: Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC/02	Power supply (V): $V_{nominal}$: 12 Vdc Temperature: $T_{nominal}$: +15 to +35 ºC Modulation: π/4-DQPSK Test Frequencies for Conducted/Radiated tests: Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC/03	Power supply (V): $V_{nominal}$: 12 Vdc Temperature: $T_{nominal}$: +15 to +35 ºC Modulation: 8-DPSK Test Frequencies for Conducted/Radiated tests: Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz

CONDUCTED MEASUREMENTS:



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and 1-18 GHz Double ridge horn antennas, and 1m for the frequency range 18 GHz- 26 GHz Double ridge horn antenna.

For radiated emissions in the range 18 - 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 was varied from 1 to 4 meters to find the maximum radiated emission.

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

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

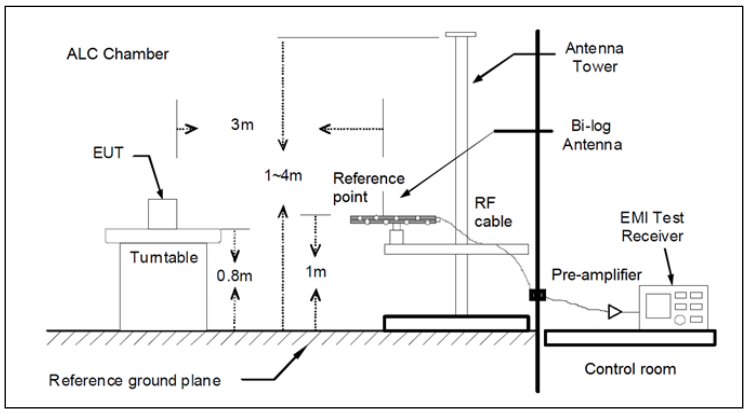


Fig A1: Radiated measurements Setup f < 1 GHz

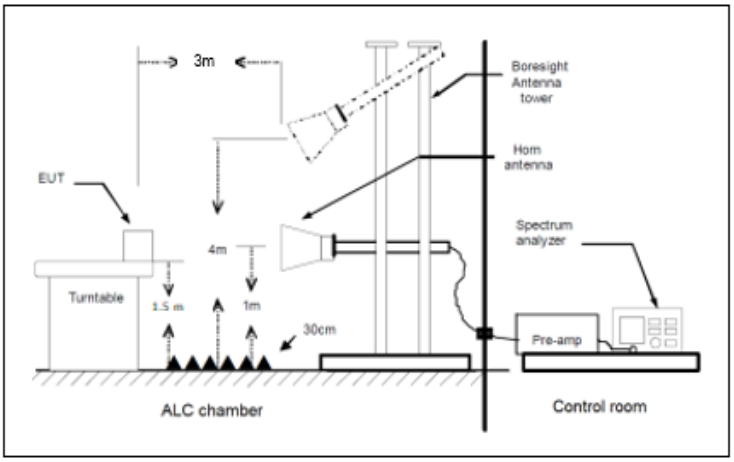


Fig A2: Radiated measurements setup f > 1-18 GHz

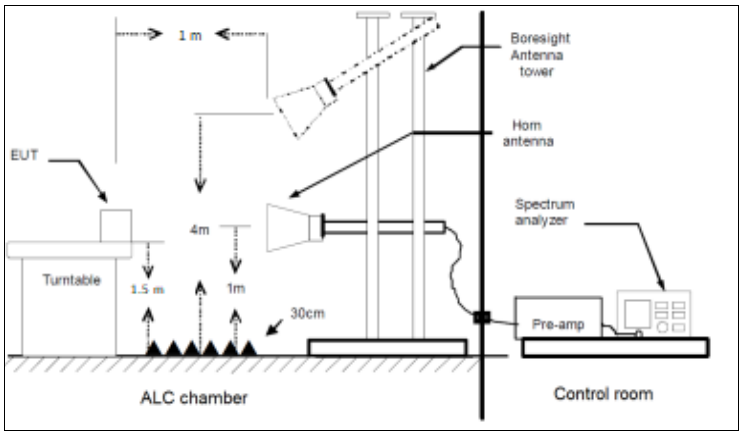


Fig A3: Radiated measurements setup f > 18 GHz

TEST CASES DETAILS

RSS-247 5.1 (b) / FCC 15.247 (a) (1) [20dBW] 20 dB Bandwidth

Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	20Ebw (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.900
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.895
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.895

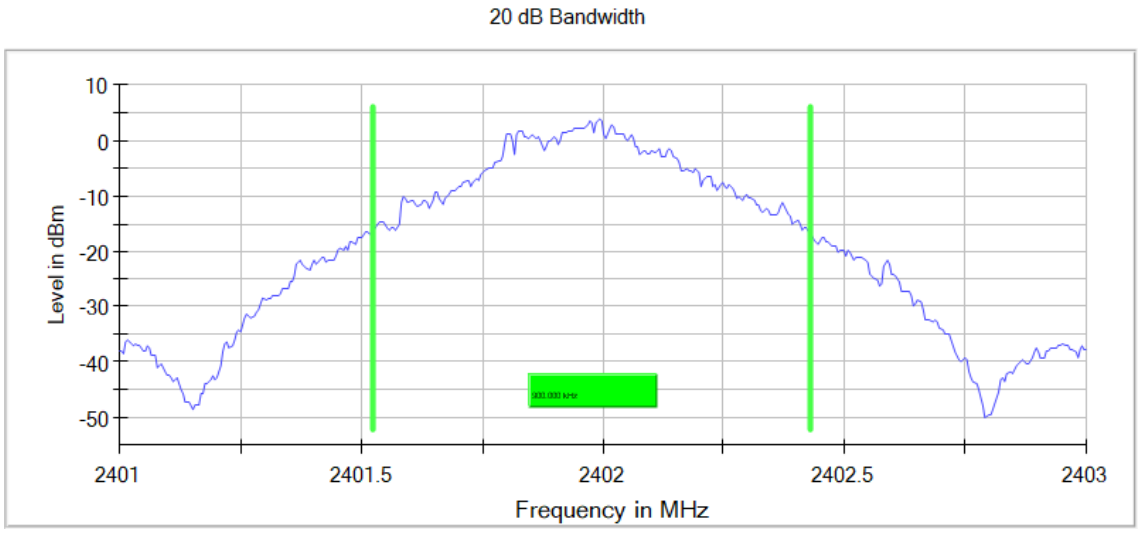
Verdict

Pass

Attachments

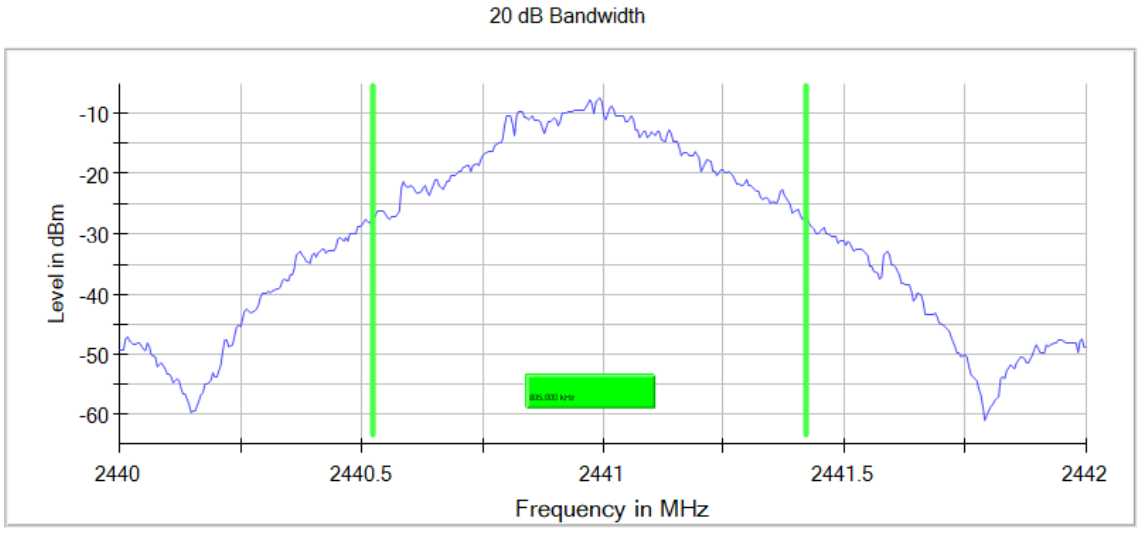
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



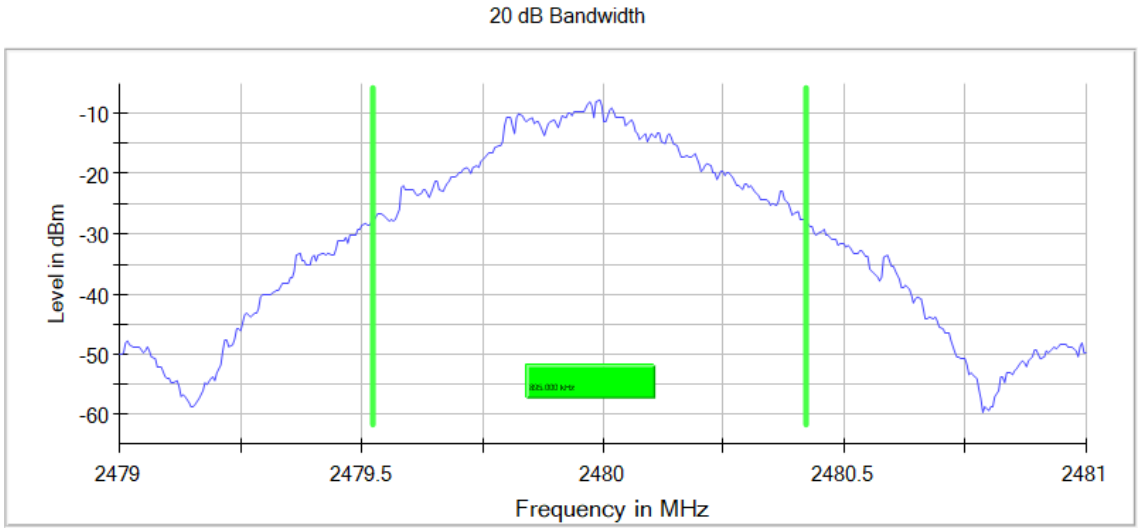
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK 2-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	26Ebw (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.265
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.265
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.260

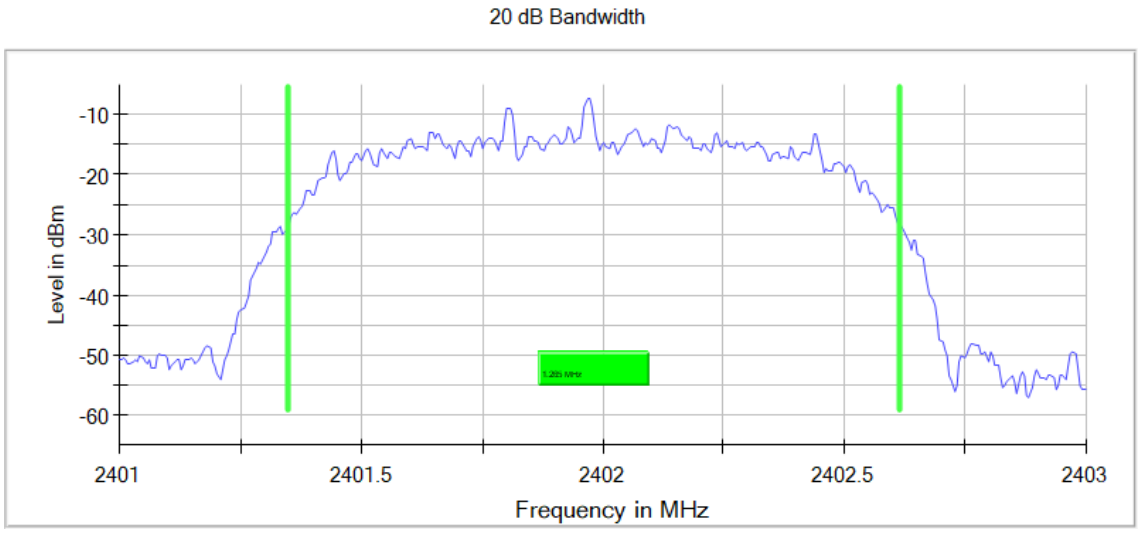
Verdict

Pass

Attachments

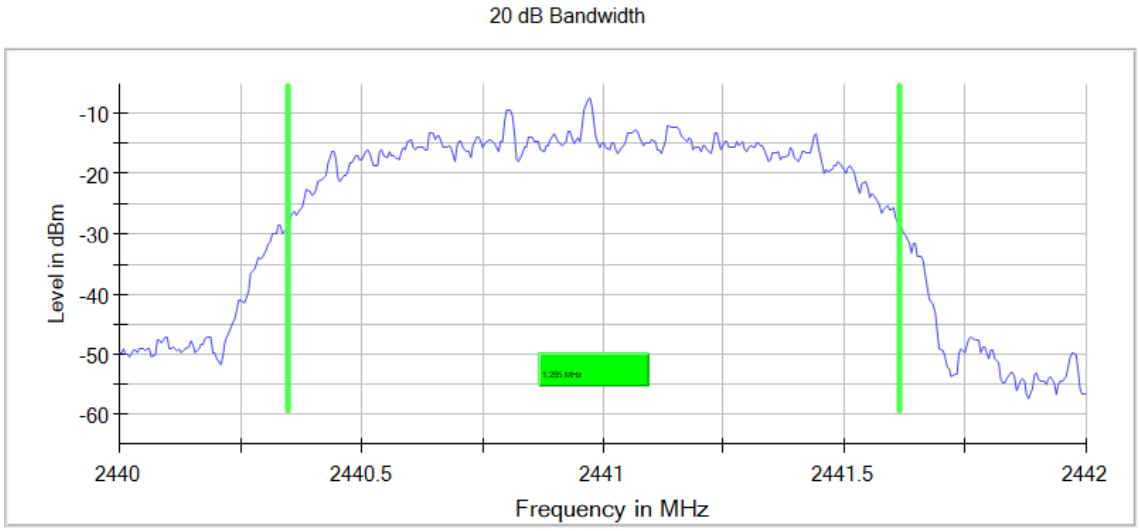
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



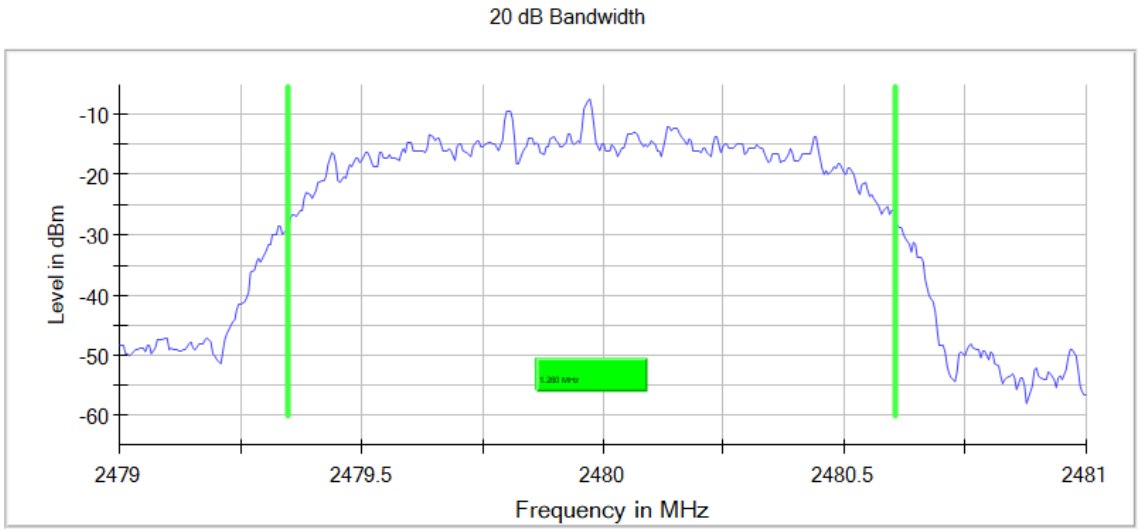
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	26Ebw (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.255
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.255
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.235

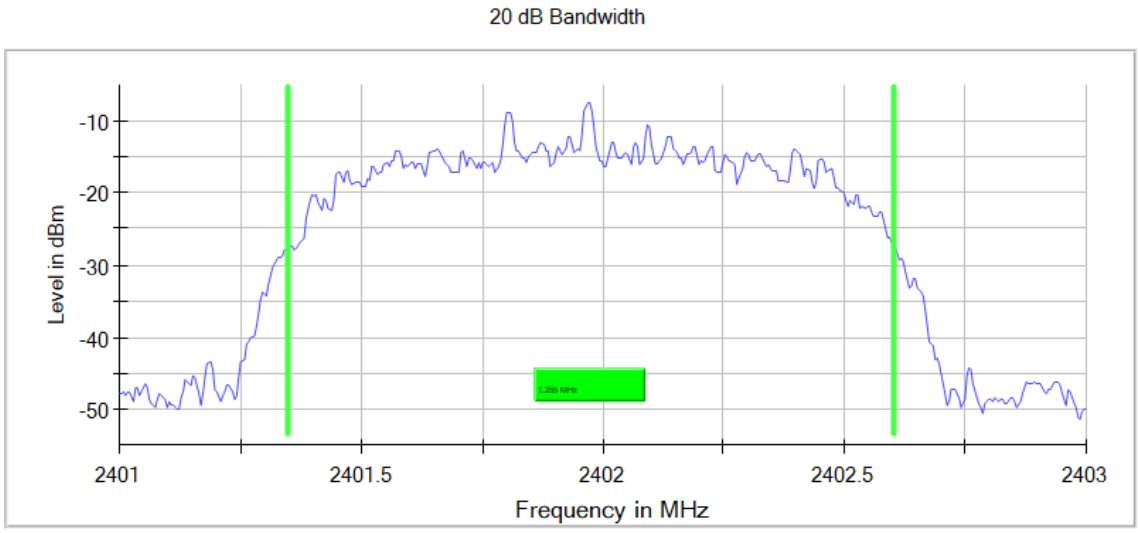
Verdict

Pass

Attachments

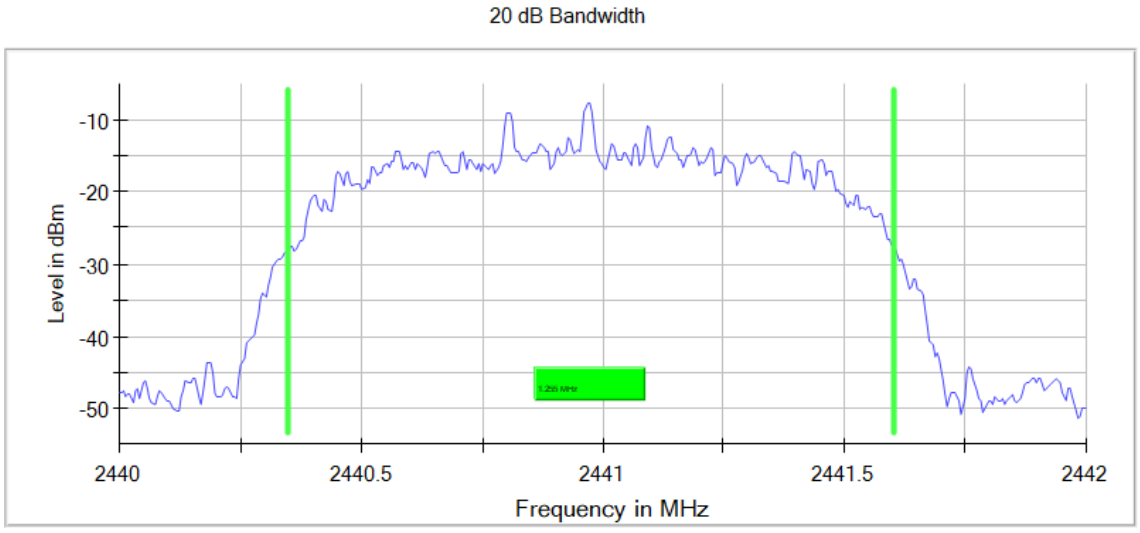
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



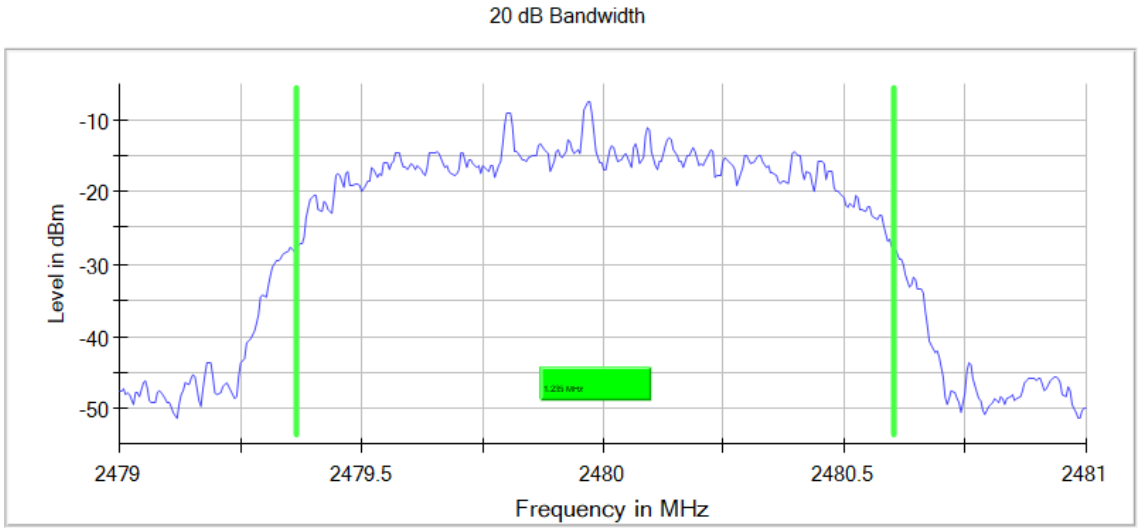
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	12 / max. 150	8 / max. 1150150	9 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.09 dB	0.10 dB	0.04 dB

FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%

Limits

No Limit has been set to this test case

Modulation: BT (GFSK 1-DH5)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.860
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.860
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.860

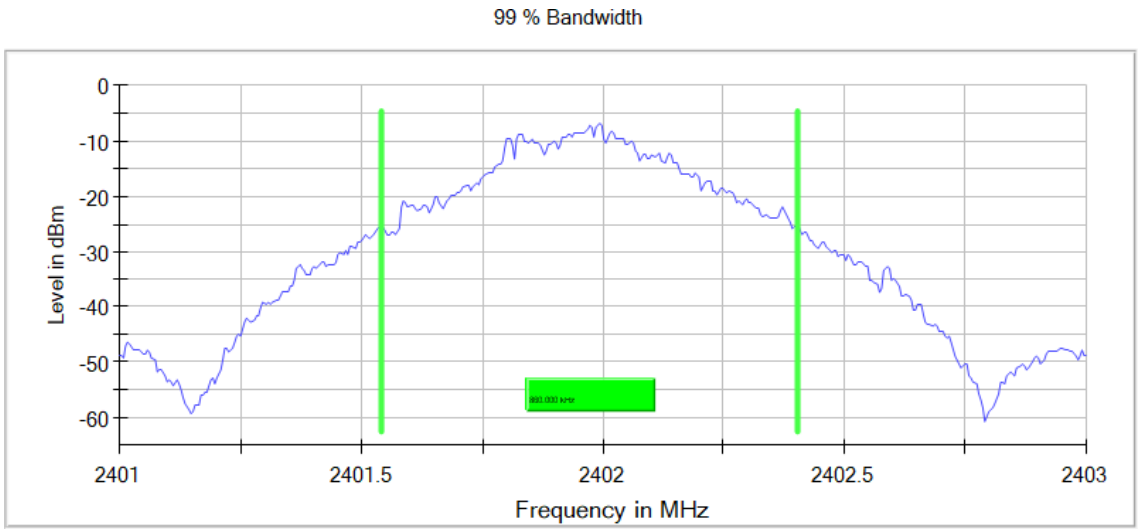
Verdict

Pass

Attachments

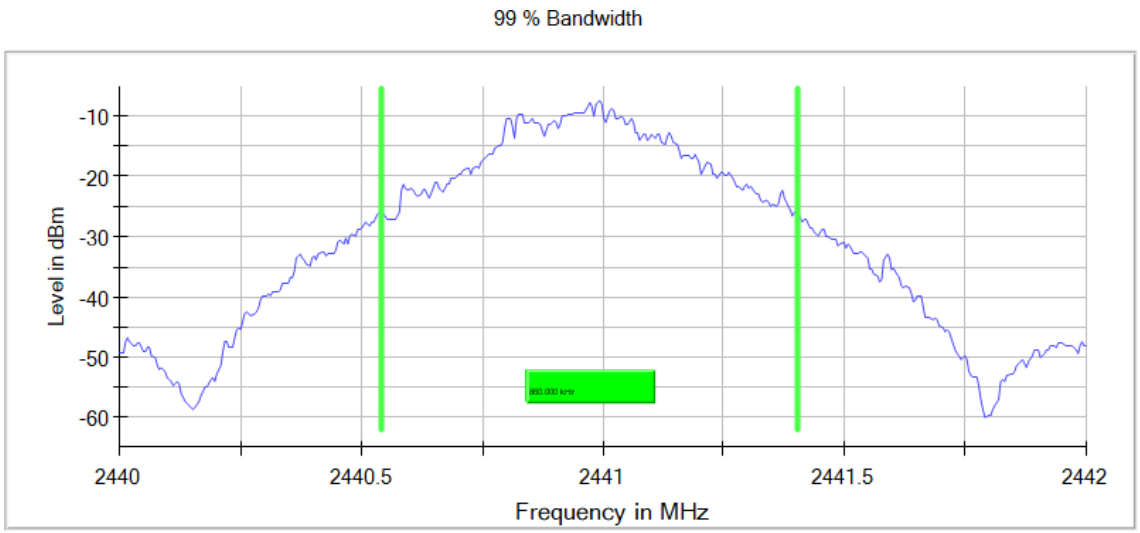
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



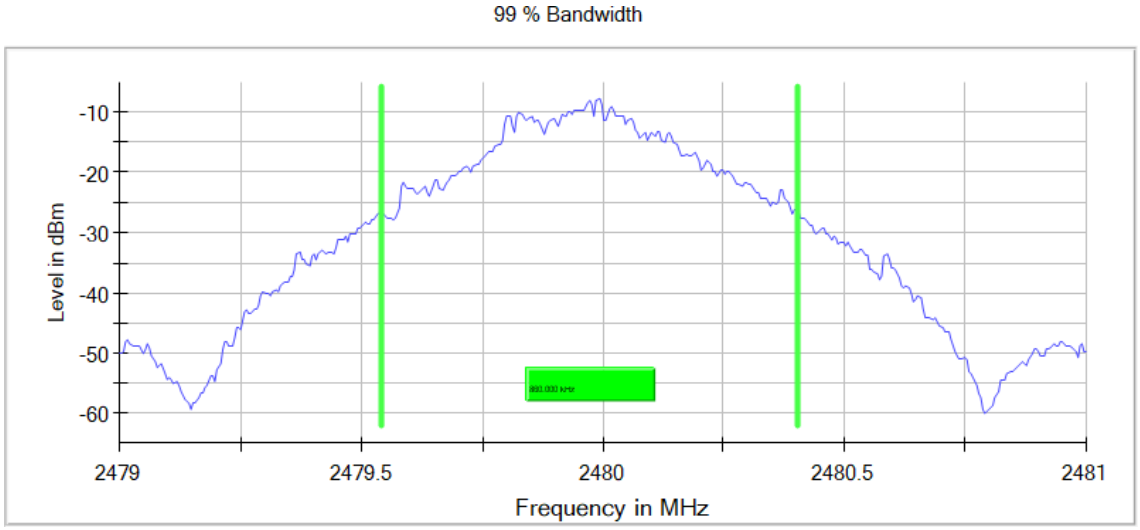
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK 2-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.170
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.175
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.175

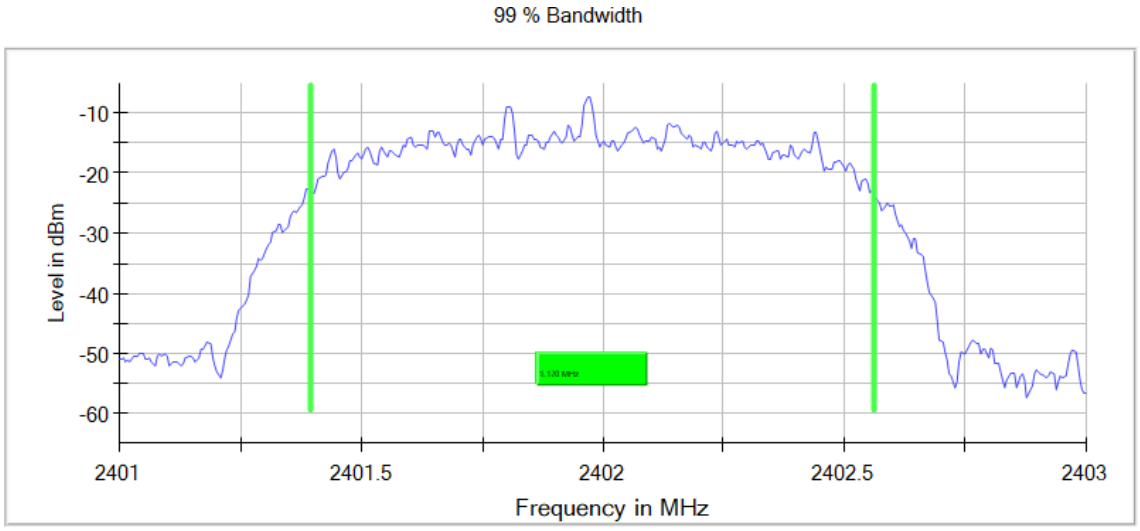
Verdict

Pass

Attachments

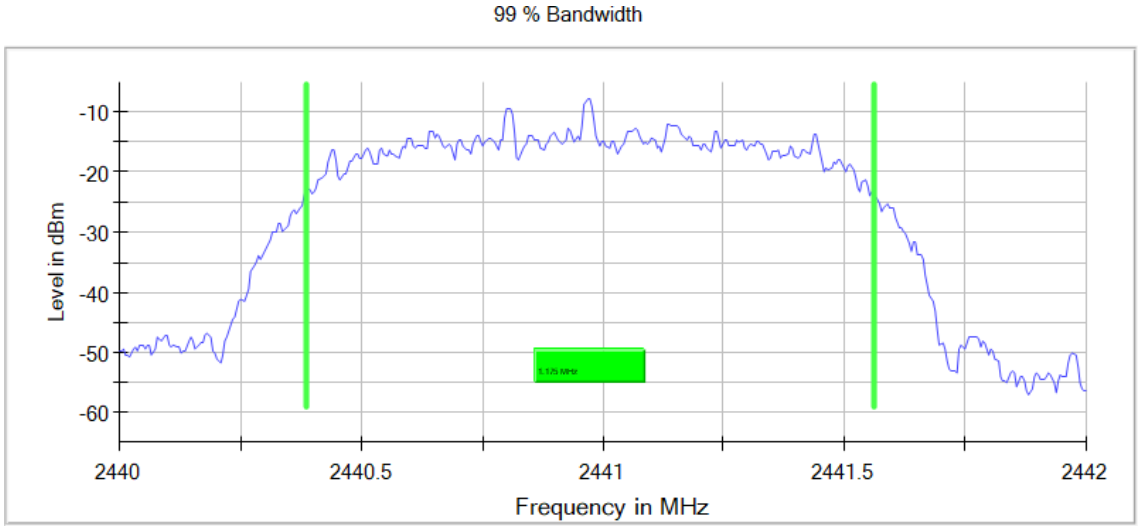
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



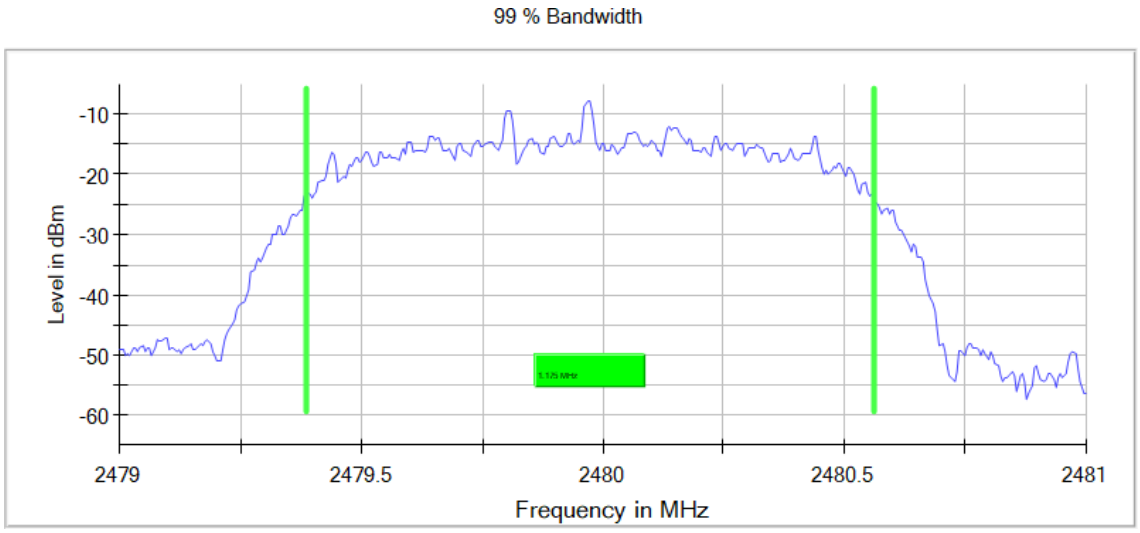
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.175
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.175
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.175

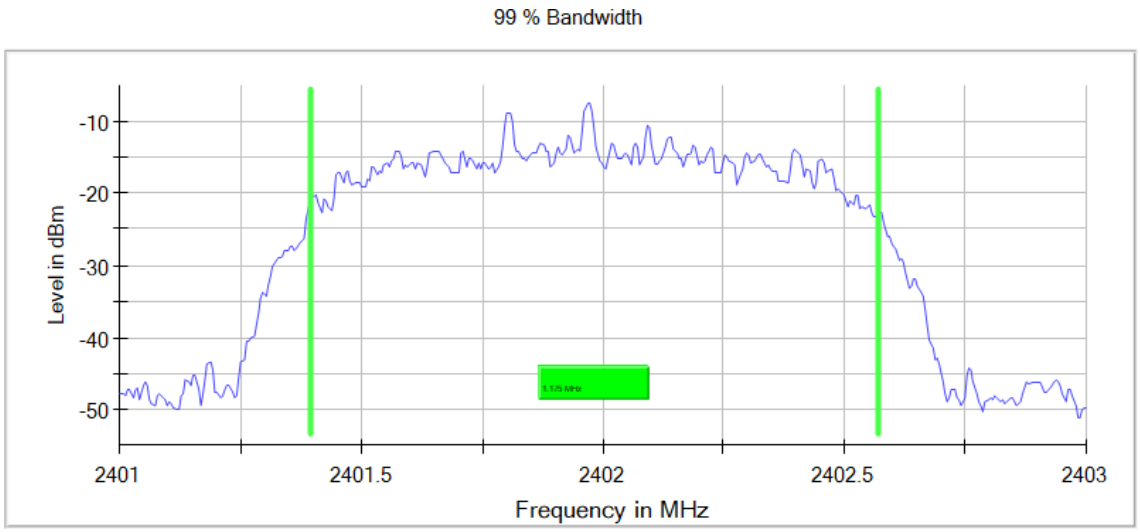
Verdict

Pass

Attachments

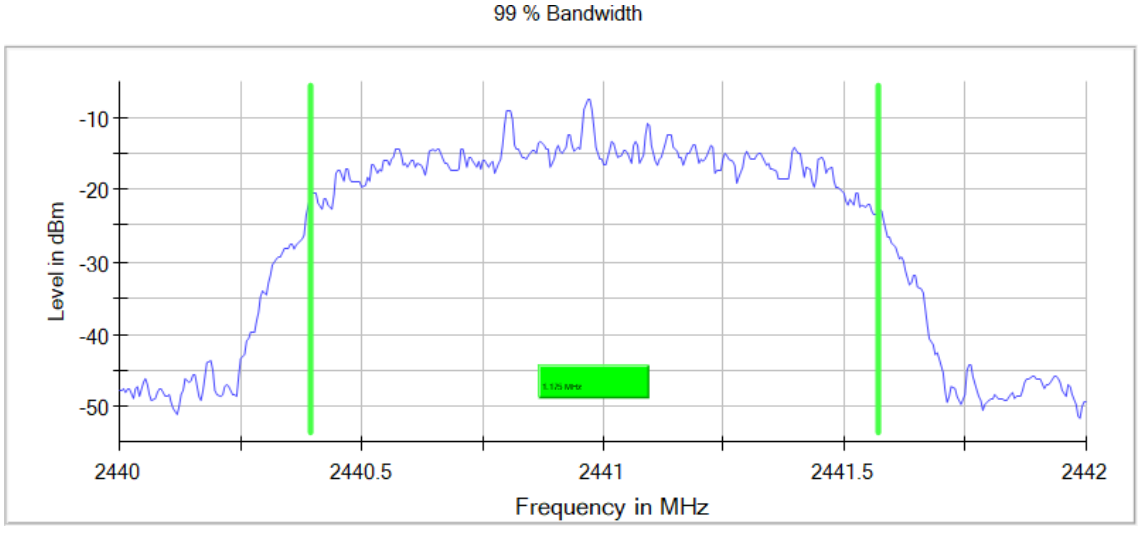
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



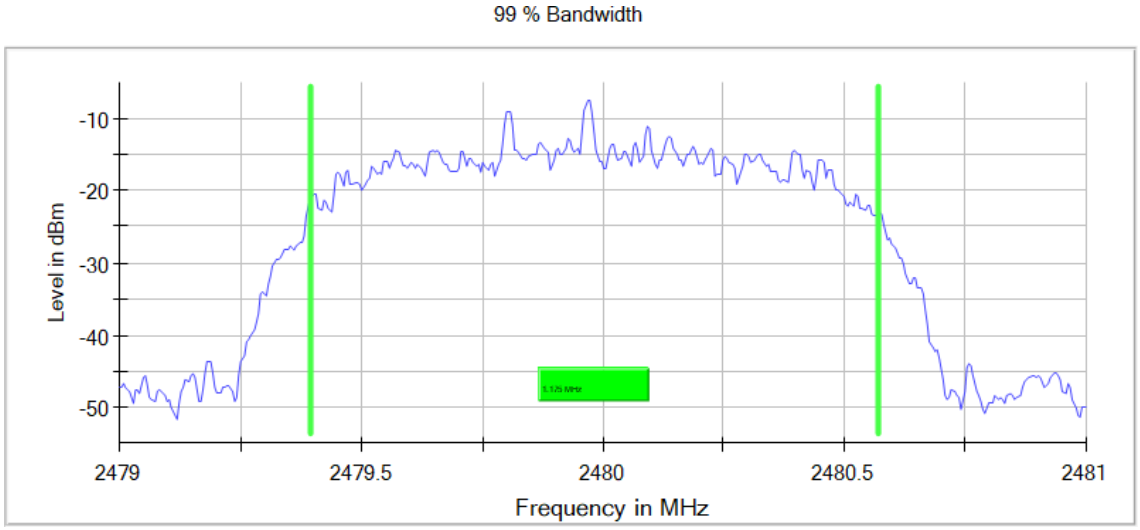
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	500	500	500
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.30 dB	0.30 dB	0.30 dB
Run	5 / max.150	5 / max.150	6 / max.150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.17 dB	0.08 dB	0.12 dB

RSS-247 5.1 (b) / FCC 15.247 (a) (1) [CFS] Carrier Frequency Separation

Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

Modulation: BT (GFSK 1-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.01

Modulation: BT (Pi/4 DQPSK 2-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.01

Modulation: BT (8DPSK 3-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.98

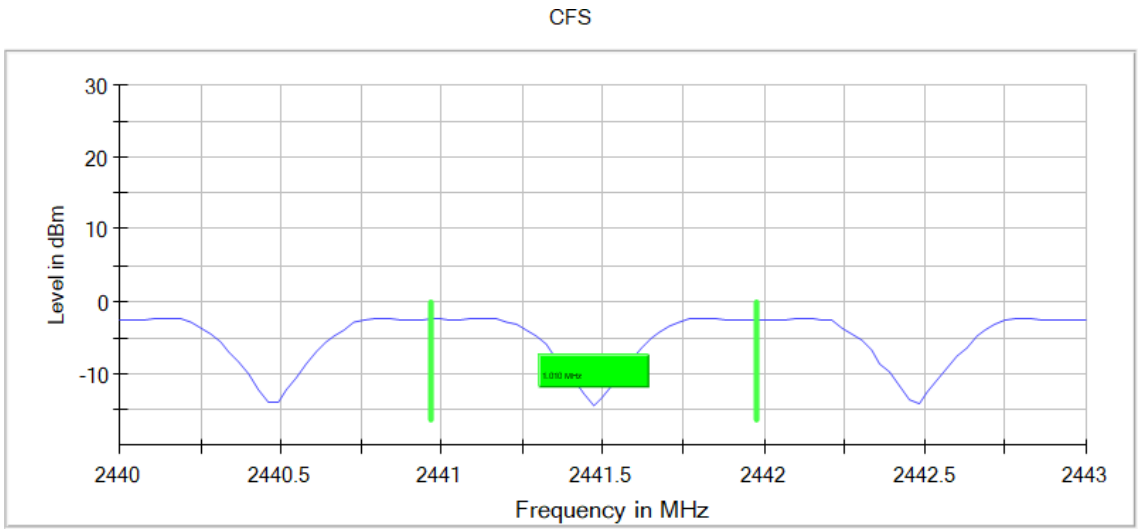
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

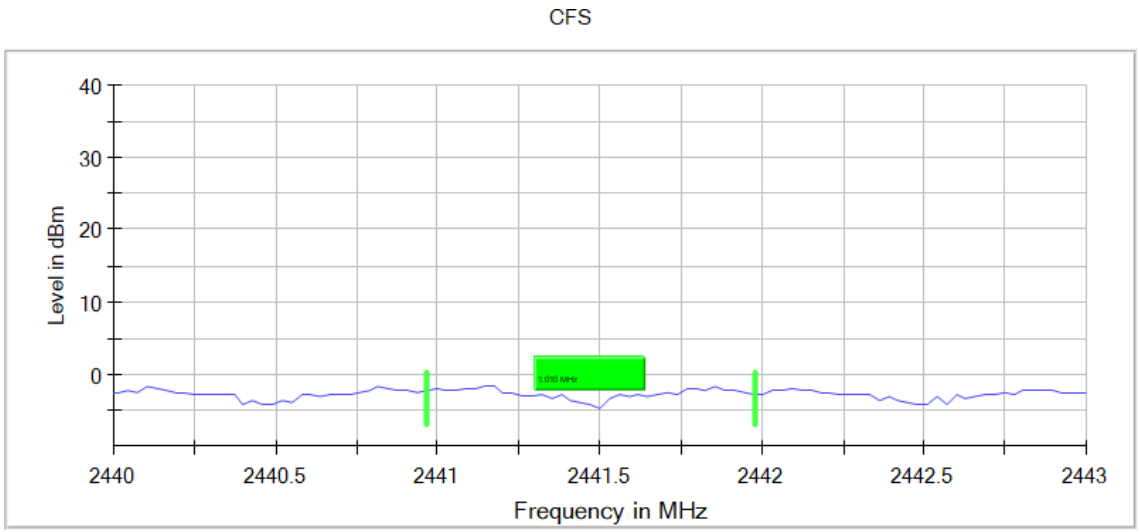
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

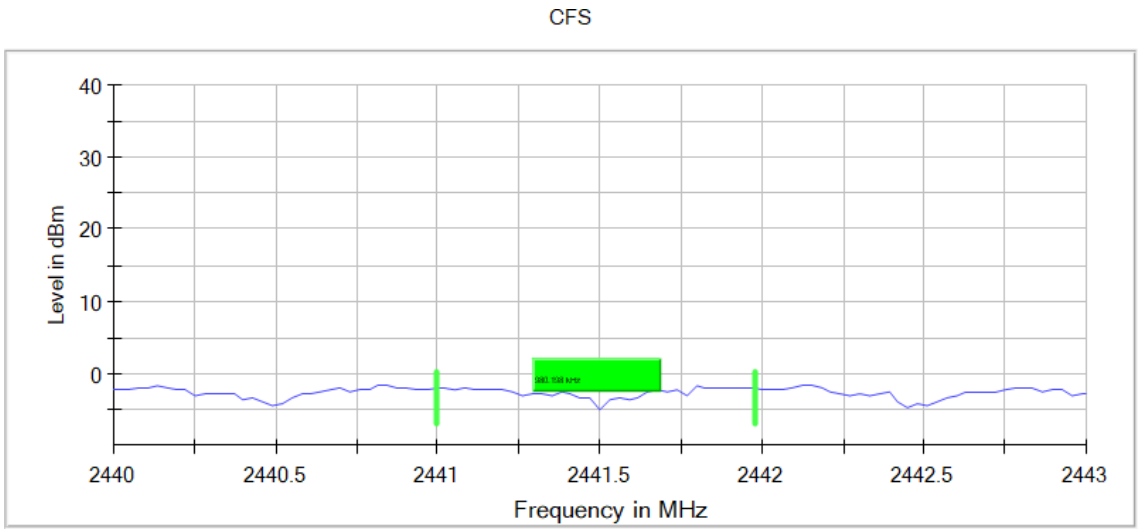
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.00 MHz	2.00 MHz	2.00 MHz
RBW	10.000 KHz	10.000 KHz	10.000 KHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	10 / max. 150	7 / max. 150	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.10 dB	0.10 dB	0.07 dB

RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) Time of Occupancy (Dwell Time)

Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

Modulation: BT (GFSK 1-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1		8.68

Modulation: BT (Pi/4 DQPSK 2-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1		5.69

Modulation: BT (8DPSK 3-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1		17.30

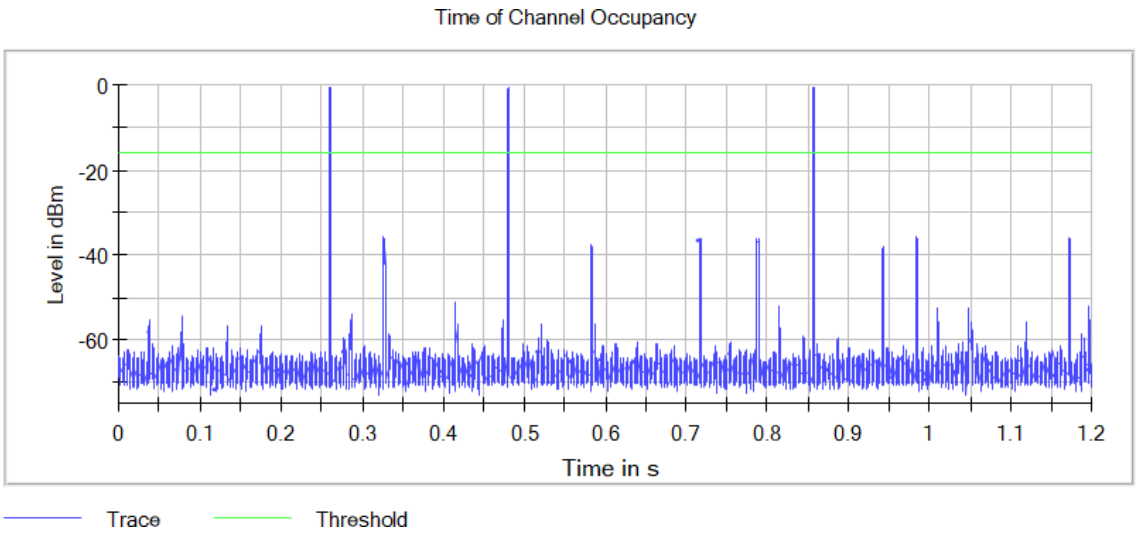
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

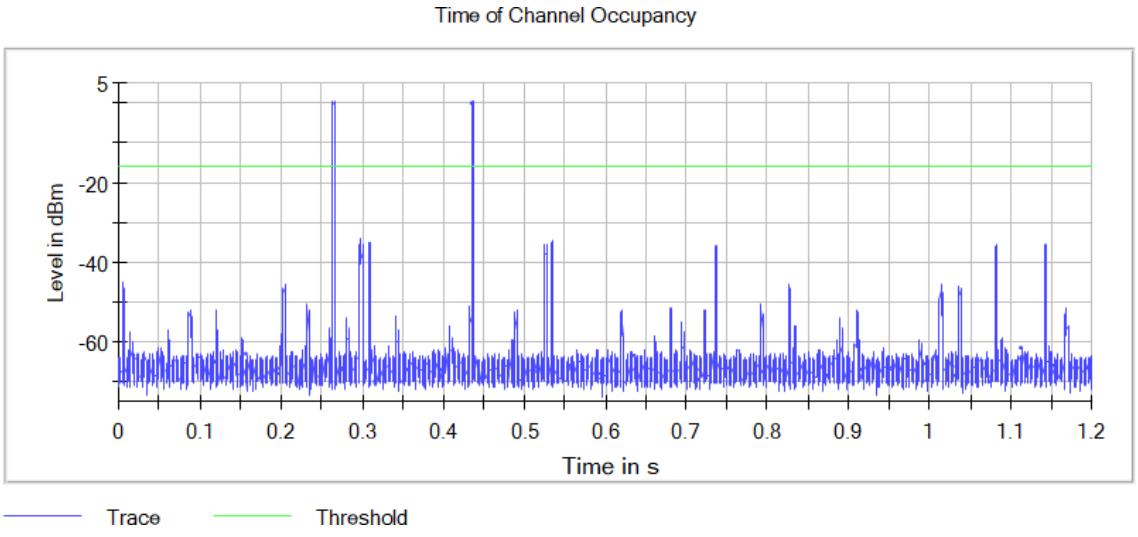
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

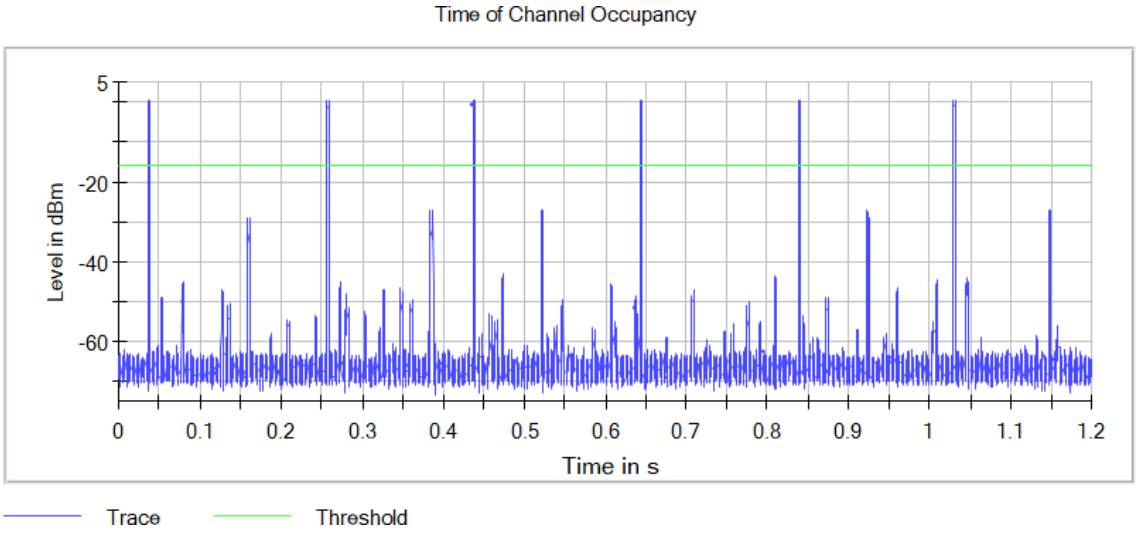
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	ZeroSpan
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
Sweeptime	1.200 s
Reference Level	-10.000 dBm
Attenuation	0.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear Write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.000 s

OSP

Setting	Instrument Value
Measurement Time	1.200 s
Tracepoints	1199999
Time resolution	1.000 µs
Detector	RMS

RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [NHC] Number of hopping channels

Limits

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 channels

Modulation: BT (GFSK 1-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	79

Modulation: BT (Pi/4 DQPSK 2-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	79

Modulation: BT (8DPSK 3-DH5)
Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	81

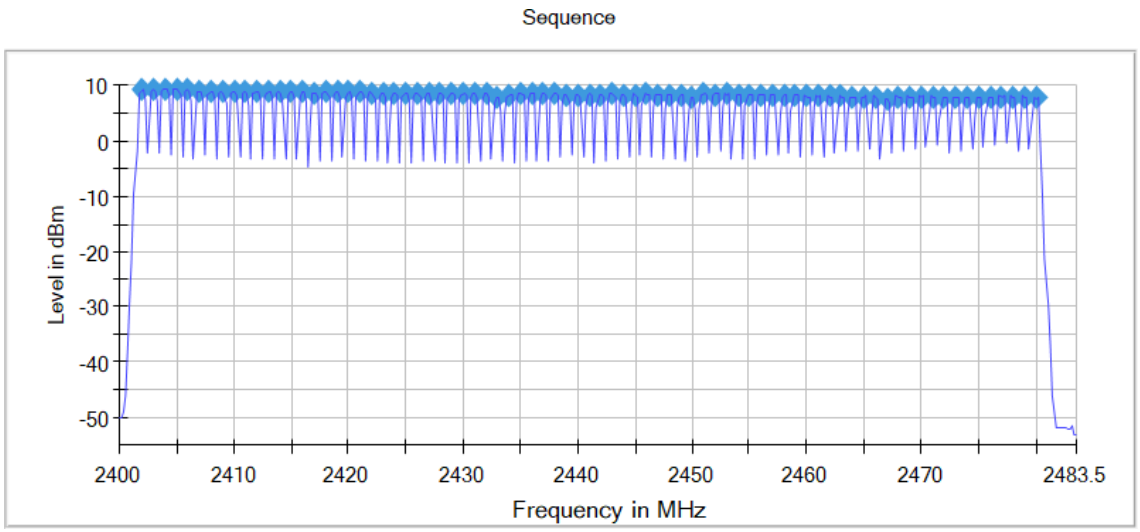
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

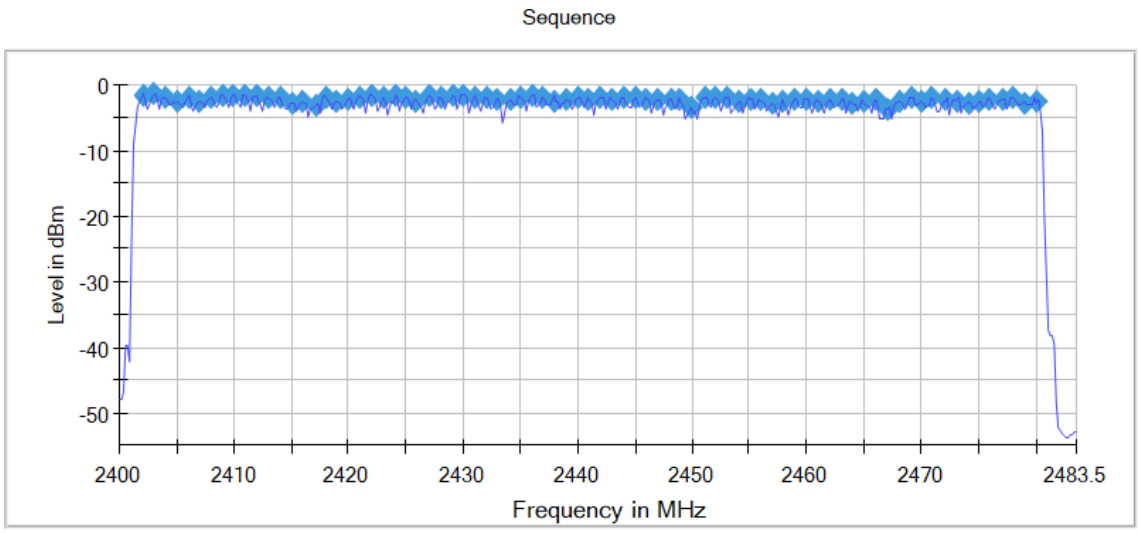
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

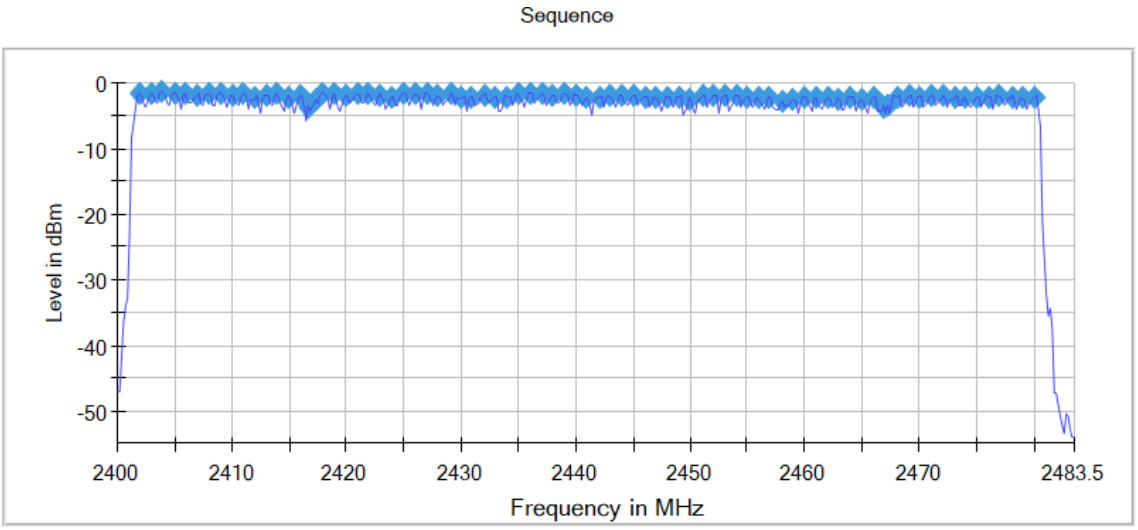
Images:



Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value
Start Frequency	2.40000 GHz
Stop Frequency	2.48350 GHz
Span	83.500 MHz
RBW	200.000 kHz
VBW	200.000 kHz
SweepPoints	418
Sweeptime	47.405 µs
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	100
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	52 / max. 150
Stable	3 / 3
Max Stable Difference	0.28 dB

RSS-247 5.4 (b) / FCC 15.247 (b) (1) [Pkcp] Maximum Peak Conducted output power

Limits

For Frequency Hopping systems operating in the 2400 – 2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm). (Part 15 Subpart C §15.247). The e.i.r.p. shall not exceed 4 W (RSS-247).

Maximum declared antenna gain: 1.8 dBi

Modulation: BT (GFSK 1-DH5)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Maximum EIRP power (dBm)	Peak Power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	11	9.2
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	10.3	8.5
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	9.8	8.0

Modulation: BT (Pi/4 DQPSK 2-DH5)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	13.2	11.4
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	12.8	11.0
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	12.6	10.8

Modulation: BT (8DPSK 3-DH5)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	13.5	11.7
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	13.1	11.3
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	12.8	11.0

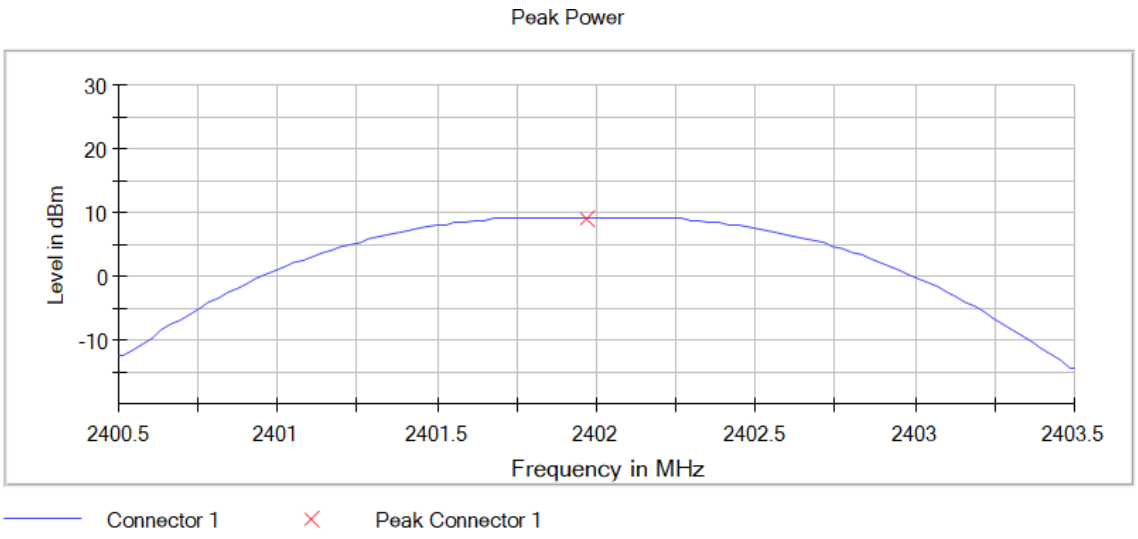
Verdict

Pass

Attachments

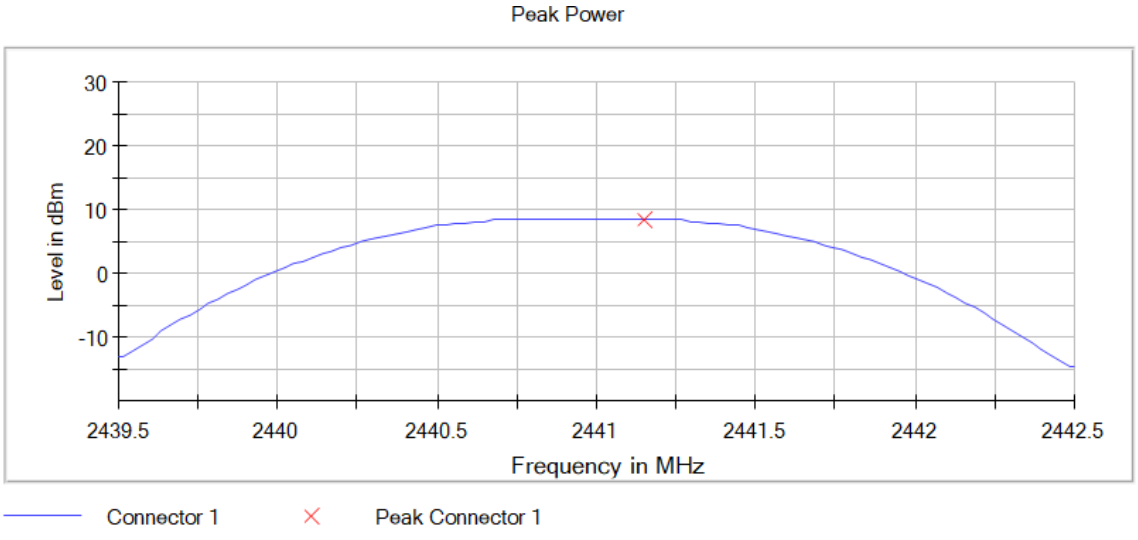
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



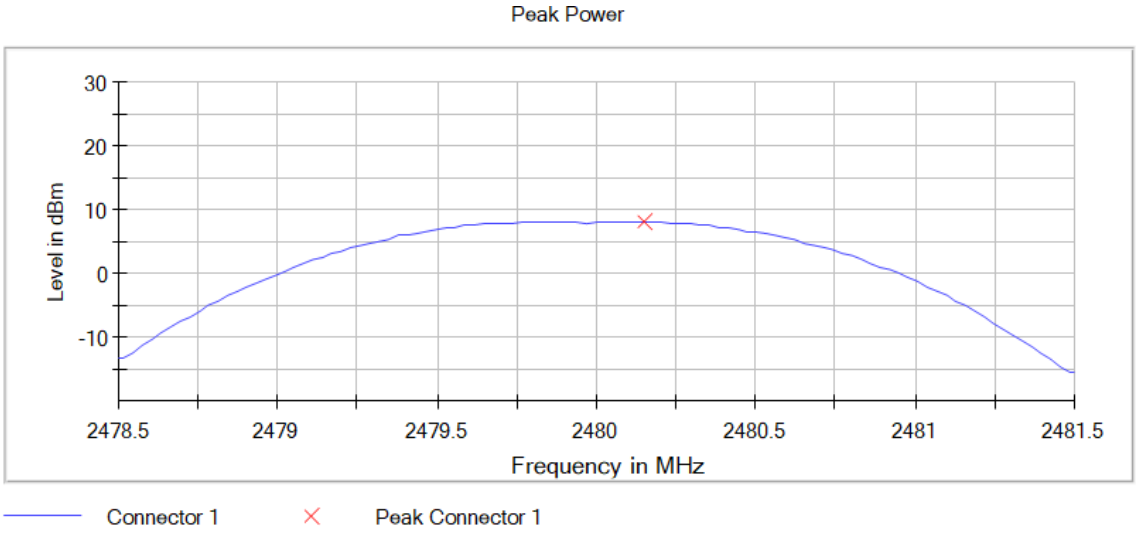
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

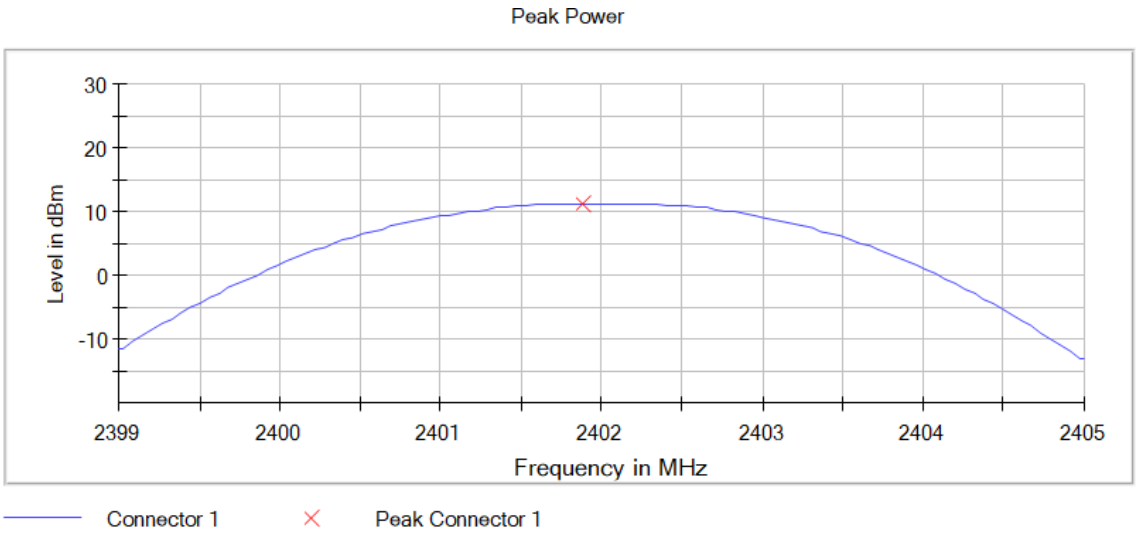
Images:



Attachments

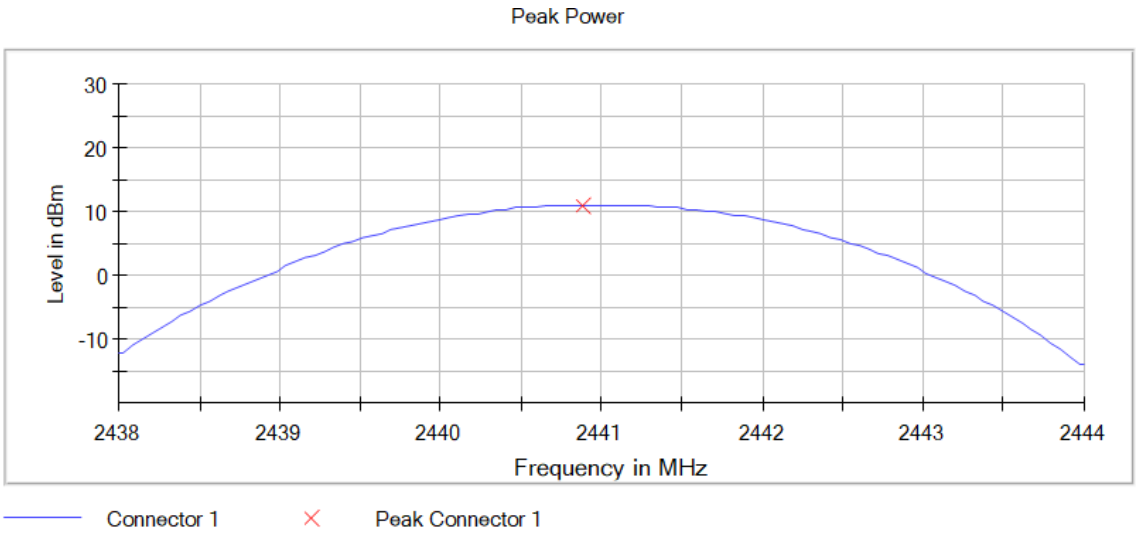
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



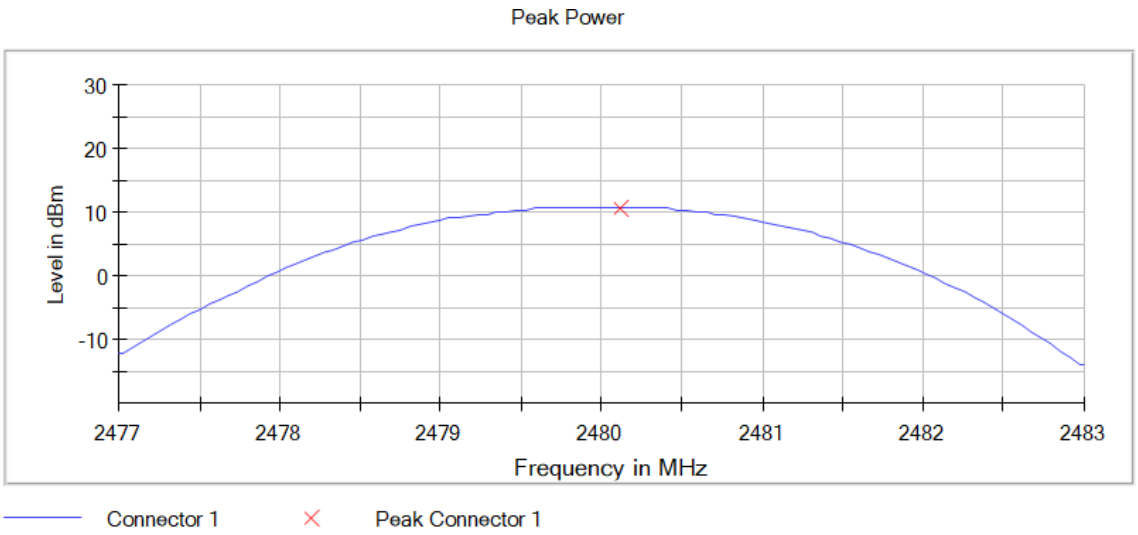
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

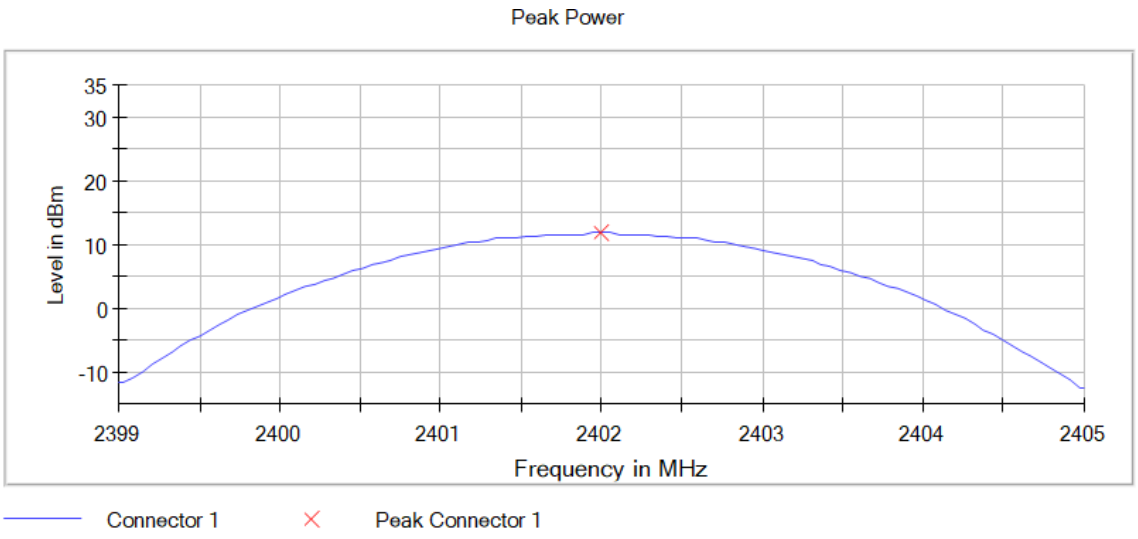
Images:



Attachments

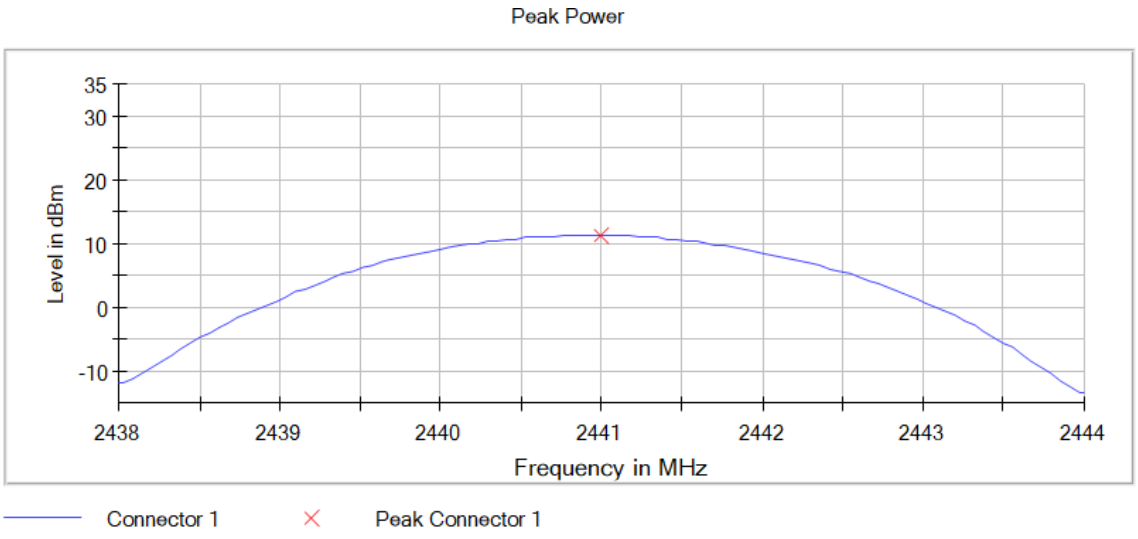
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



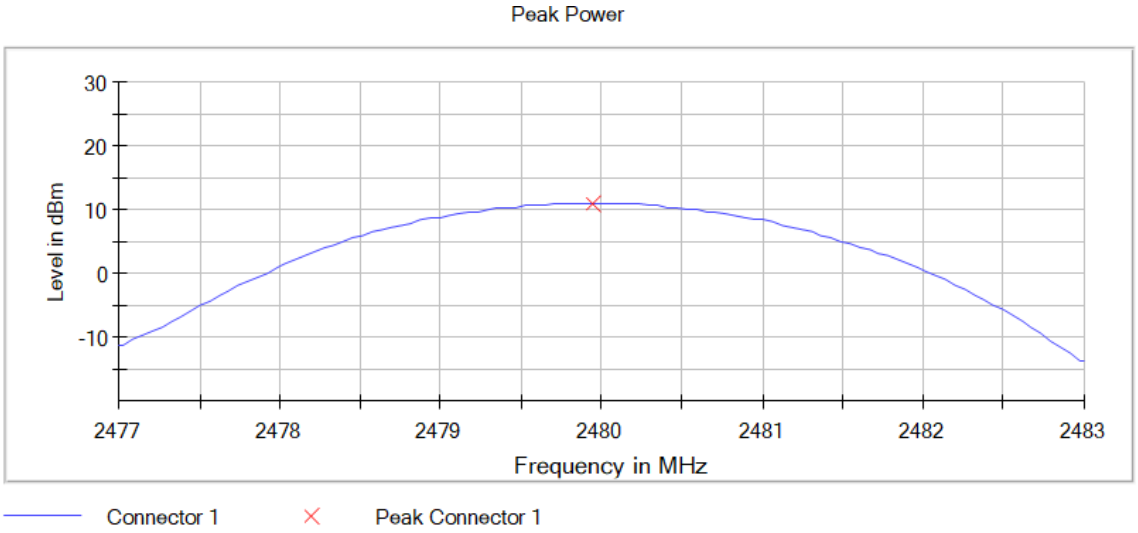
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	Instrument Value
Start Frequency	2.40050 GHz
Stop Frequency	2.40350 GHz
Span	3.000 MHz
RBW	1.000 MHz
VBW	3.000 MHz
SweepPoints	101
Sweeptime	1.907 µs
Reference Level	10.000 dBm
Attenuation	30.000 dB
Detector	MaxPeak
SweepCount	100
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	4 / max. 150
Stable	3 / 3
Max Stable Difference	0.01 dB

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: BT (GFSK 1-DH5) - HOPPING OFF
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2310.525000	-52.8	31.0	-21.8	PASS
2310.575000	-52.8	31.0	-21.8	PASS
2312.275000	-53.2	31.4	-21.8	PASS
2310.625000	-53.3	31.5	-21.8	PASS
2312.325000	-53.3	31.5	-21.8	PASS
2399.775000	-53.5	31.7	-21.8	PASS
2327.525000	-53.6	31.8	-21.8	PASS
2310.425000	-53.7	31.9	-21.8	PASS
2368.025000	-53.7	32.0	-21.8	PASS
2399.725000	-53.8	32.0	-21.8	PASS
2310.775000	-53.8	32.0	-21.8	PASS
2327.475000	-53.9	32.1	-21.8	PASS
2327.575000	-54.0	32.2	-21.8	PASS
2310.475000	-54.0	32.2	-21.8	PASS
2351.775000	-54.0	32.2	-21.8	PASS

DUT Frequency	Result
2480.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2484.625000	-53.7	31.0	-22.7	PASS
2493.925000	-54.0	31.4	-22.7	PASS
2484.575000	-54.0	31.4	-22.7	PASS
2493.975000	-54.3	31.6	-22.7	PASS
2484.675000	-54.4	31.8	-22.7	PASS
2493.025000	-54.6	31.9	-22.7	PASS
2483.725000	-54.6	32.0	-22.7	PASS
2492.975000	-54.7	32.0	-22.7	PASS
2484.025000	-54.9	32.3	-22.7	PASS
2493.875000	-55.0	32.3	-22.7	PASS
2497.175000	-55.1	32.4	-22.7	PASS
2484.075000	-55.2	32.5	-22.7	PASS
2485.875000	-55.2	32.5	-22.7	PASS
2483.775000	-55.3	32.6	-22.7	PASS
2485.025000	-55.3	32.6	-22.7	PASS

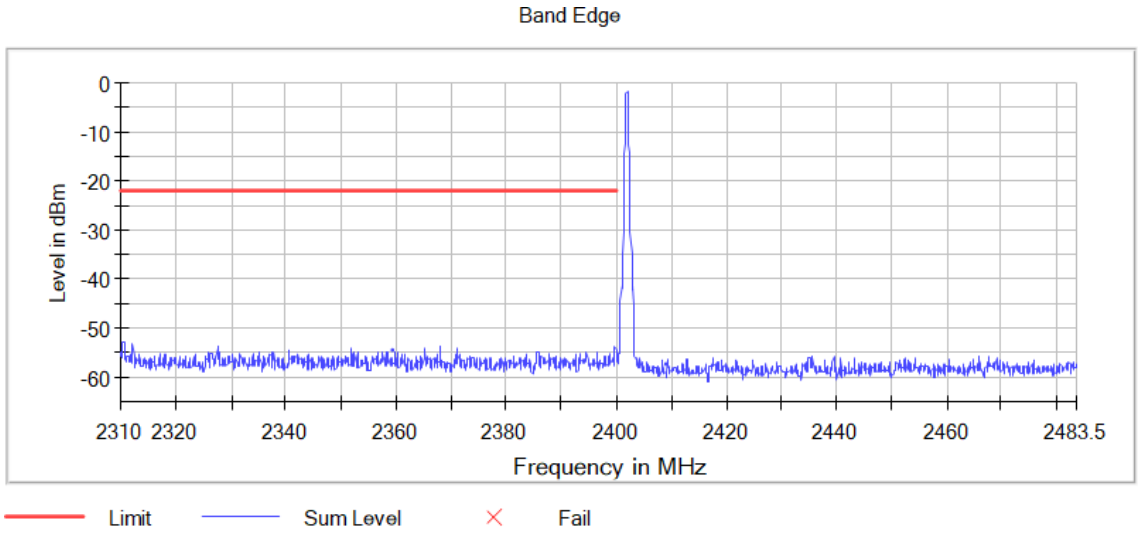
Verdict

Pass

Attachments

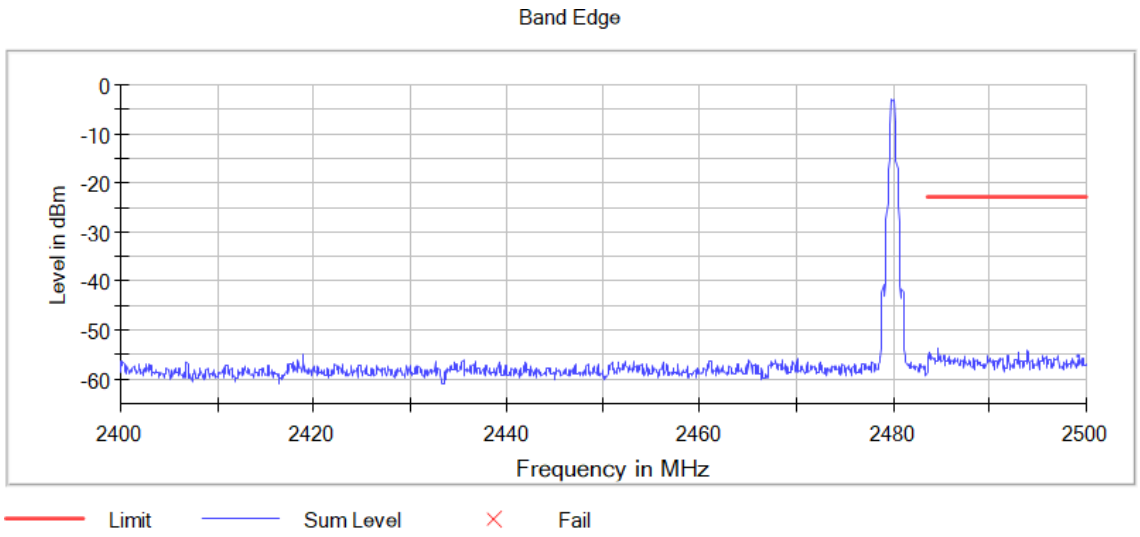
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Modulation: BT (GFSK 1-DH5) - HOPPING ON
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2377.575000	-43.2	32.2	-11.0	PASS
2377.525000	-43.5	32.5	-11.0	PASS
2357.125000	-43.8	32.8	-11.0	PASS
2313.875000	-43.9	32.9	-11.0	PASS
2334.075000	-43.9	32.9	-11.0	PASS
2357.175000	-44.0	33.0	-11.0	PASS
2331.025000	-44.0	33.0	-11.0	PASS
2331.075000	-44.0	33.0	-11.0	PASS
2326.625000	-44.1	33.1	-11.0	PASS
2327.625000	-44.2	33.2	-11.0	PASS
2334.625000	-44.2	33.2	-11.0	PASS
2320.875000	-44.2	33.2	-11.0	PASS
2331.625000	-44.3	33.3	-11.0	PASS
2313.925000	-44.3	33.3	-11.0	PASS
2334.125000	-44.4	33.4	-11.0	PASS

DUT Frequency	Result
2480.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2495.375000	-49.9	38.7	-11.2	PASS
2495.425000	-50.1	38.9	-11.2	PASS
2499.075000	-51.0	39.8	-11.2	PASS
2499.025000	-51.4	40.2	-11.2	PASS
2495.325000	-51.6	40.4	-11.2	PASS
2494.025000	-51.7	40.5	-11.2	PASS
2483.825000	-51.8	40.6	-11.2	PASS
2483.875000	-51.9	40.7	-11.2	PASS
2499.125000	-52.0	40.8	-11.2	PASS
2487.325000	-52.3	41.1	-11.2	PASS
2487.375000	-52.6	41.4	-11.2	PASS
2487.525000	-52.6	41.4	-11.2	PASS
2491.075000	-52.7	41.5	-11.2	PASS
2493.975000	-52.8	41.6	-11.2	PASS
2494.075000	-52.8	41.6	-11.2	PASS

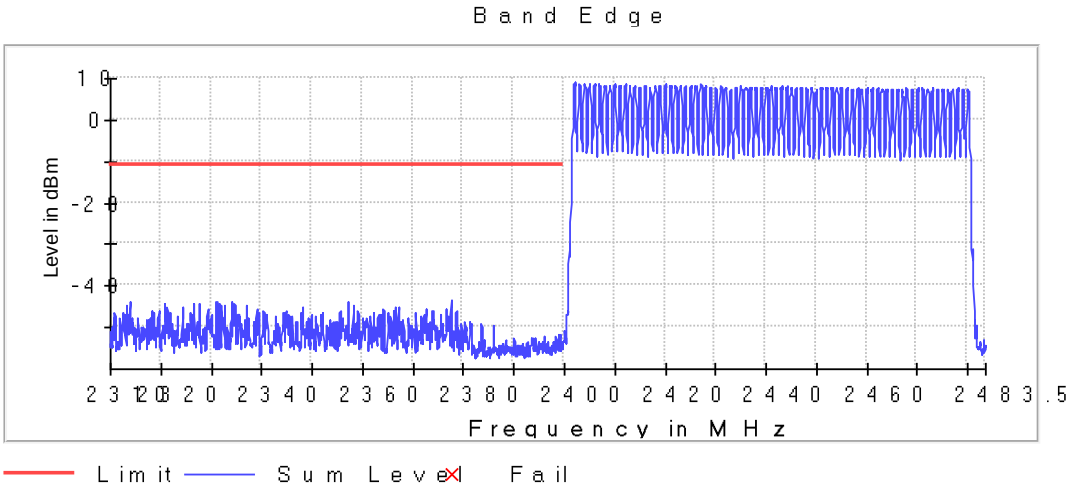
Verdict

Pass

Attachments

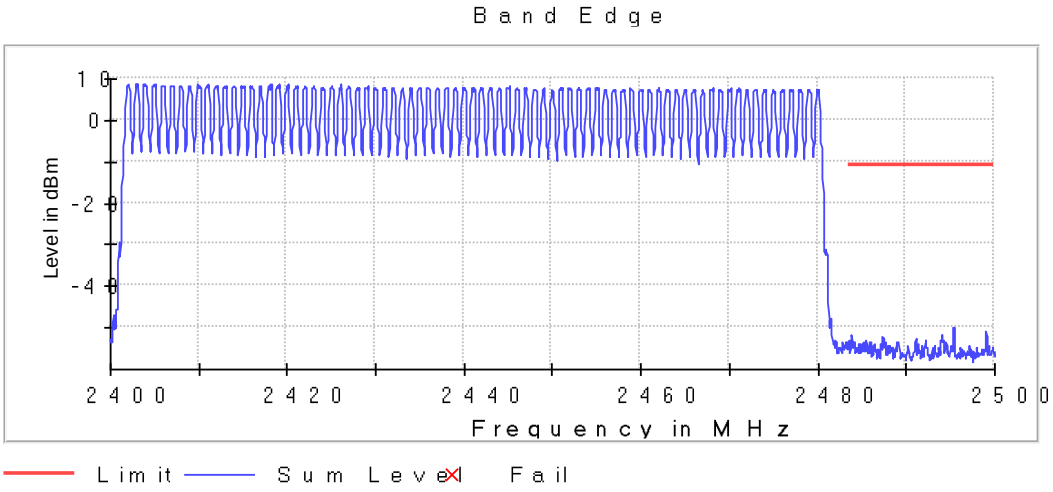
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK 2-DH5) - HOPPING OFF
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.875000	-47.5	26.0	-21.4	PASS
2399.825000	-47.5	26.1	-21.4	PASS
2399.775000	-49.0	27.6	-21.4	PASS
2399.925000	-49.1	27.6	-21.4	PASS
2399.975000	-49.3	27.9	-21.4	PASS
2399.375000	-50.6	29.2	-21.4	PASS
2399.325000	-50.8	29.4	-21.4	PASS
2399.675000	-51.1	29.7	-21.4	PASS
2399.625000	-51.1	29.7	-21.4	PASS
2399.725000	-51.6	30.1	-21.4	PASS
2399.425000	-51.7	30.3	-21.4	PASS
2399.275000	-52.5	31.0	-21.4	PASS
2399.225000	-52.5	31.1	-21.4	PASS
2399.125000	-52.6	31.2	-21.4	PASS
2399.475000	-52.7	31.3	-21.4	PASS

DUT Frequency	Result
2480.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.525000	-53.5	31.6	-21.9	PASS
2498.575000	-54.3	32.4	-21.9	PASS
2484.625000	-54.3	32.4	-21.9	PASS
2484.025000	-54.4	32.5	-21.9	PASS
2498.625000	-54.4	32.5	-21.9	PASS
2500.000000	-54.4	32.5	-21.9	PASS
2499.975000	-54.4	32.5	-21.9	PASS
2484.425000	-54.5	32.6	-21.9	PASS
2486.075000	-54.6	32.7	-21.9	PASS
2484.375000	-54.7	32.8	-21.9	PASS
2486.025000	-54.7	32.8	-21.9	PASS
2497.525000	-54.7	32.8	-21.9	PASS
2484.575000	-54.7	32.8	-21.9	PASS
2496.625000	-54.8	32.8	-21.9	PASS
2483.625000	-54.8	32.8	-21.9	PASS

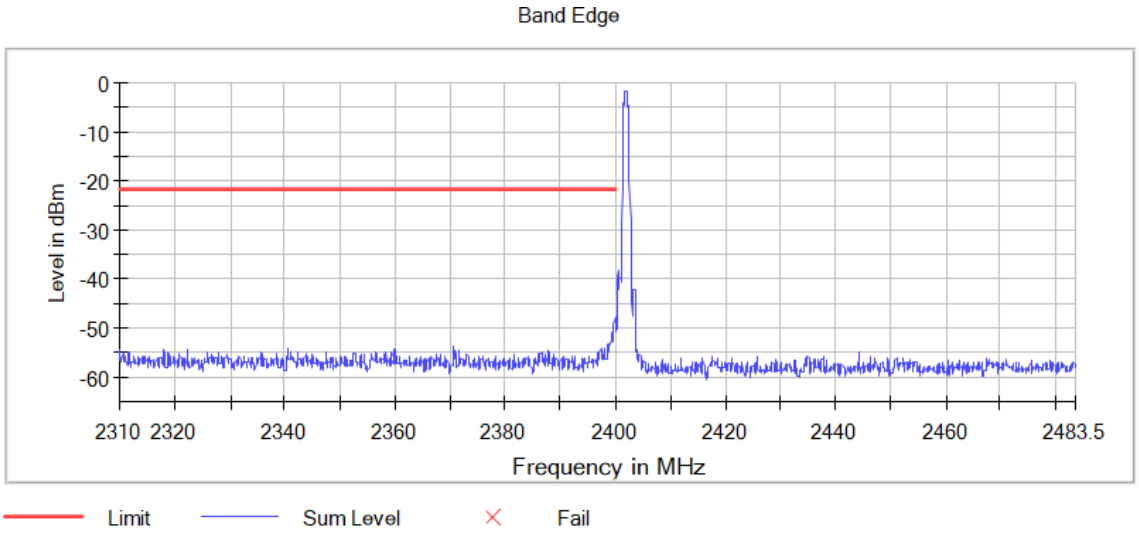
Verdict

Pass

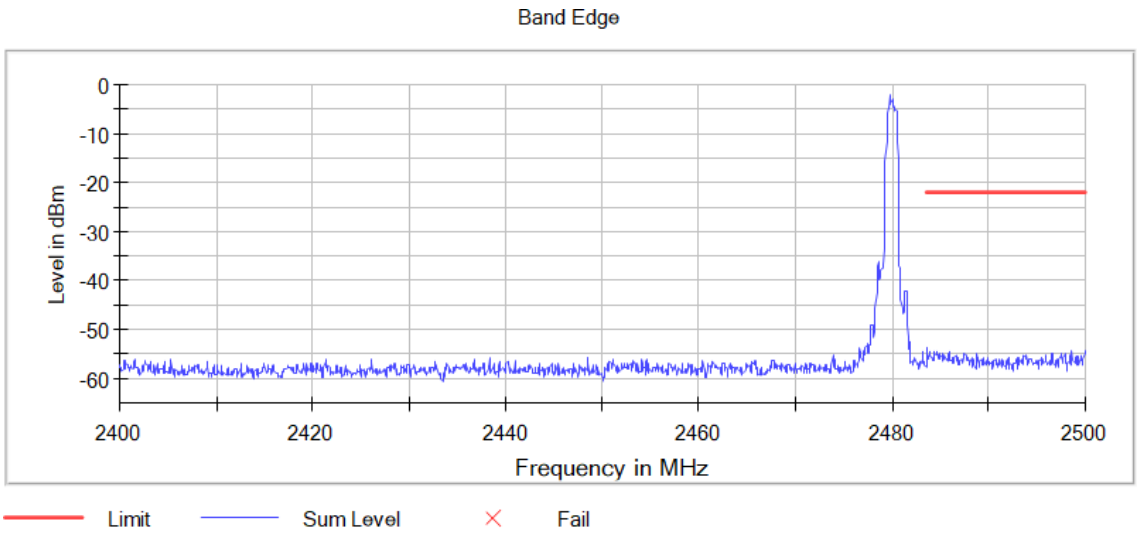
Attachments

Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1



Modulation: BT (Pi/4 DQPSK 2-DH5) - HOPPING ON
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-50.1	28.6	-21.5	PASS
2399.925000	-51.3	29.8	-21.5	PASS
2381.025000	-53.7	32.2	-21.5	PASS
2341.275000	-54.0	32.5	-21.5	PASS
2381.075000	-54.0	32.5	-21.5	PASS
2325.725000	-54.2	32.7	-21.5	PASS
2341.225000	-54.3	32.8	-21.5	PASS
2325.675000	-54.4	32.8	-21.5	PASS
2366.775000	-54.5	33.0	-21.5	PASS
2384.225000	-54.6	33.1	-21.5	PASS
2356.975000	-54.6	33.1	-21.5	PASS
2310.675000	-54.7	33.2	-21.5	PASS
2341.475000	-54.8	33.3	-21.5	PASS
2382.675000	-54.8	33.3	-21.5	PASS
2357.025000	-54.8	33.3	-21.5	PASS

DUT Frequency	Result
2480.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2498.175000	-54.0	32.5	-21.5	PASS
2491.325000	-54.6	33.1	-21.5	PASS
2498.225000	-54.7	33.2	-21.5	PASS
2494.975000	-54.7	33.2	-21.5	PASS
2494.925000	-54.8	33.3	-21.5	PASS
2491.275000	-54.9	33.4	-21.5	PASS
2499.625000	-54.9	33.4	-21.5	PASS
2499.575000	-54.9	33.4	-21.5	PASS
2486.925000	-54.9	33.4	-21.5	PASS
2484.175000	-55.0	33.5	-21.5	PASS
2484.025000	-55.0	33.5	-21.5	PASS
2498.125000	-55.0	33.5	-21.5	PASS
2484.125000	-55.2	33.7	-21.5	PASS
2486.875000	-55.2	33.7	-21.5	PASS
2490.175000	-55.3	33.8	-21.5	PASS

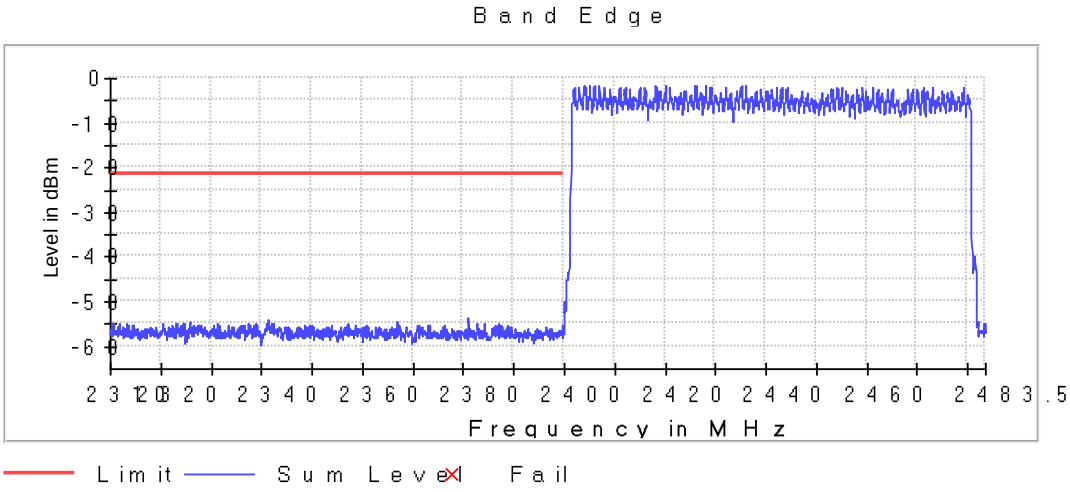
Verdict

Pass

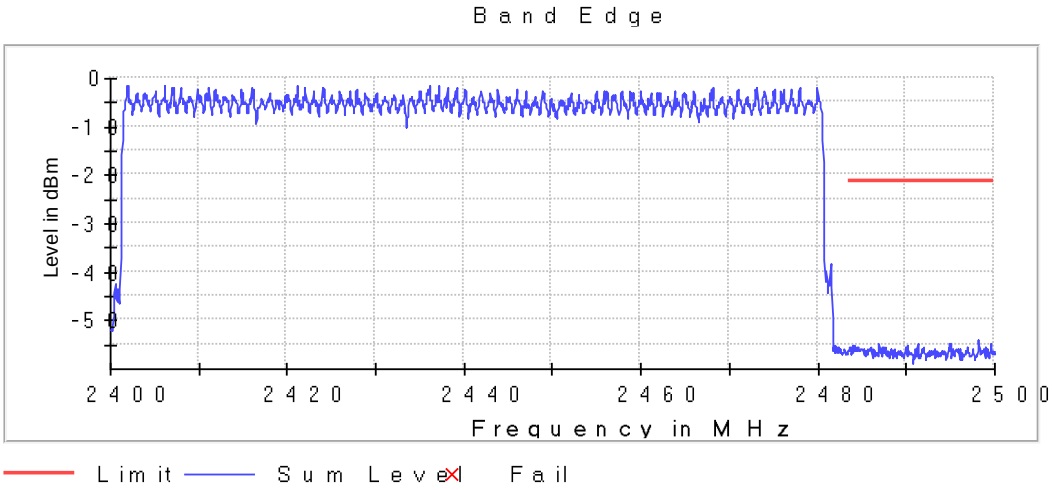
Attachments

Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1



Modulation: BT (8DPSK 3-DH5) - HOPPING OFF
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.675000	-46.9	25.5	-21.4	PASS
2399.625000	-47.3	25.9	-21.4	PASS
2399.725000	-47.6	26.2	-21.4	PASS
2399.775000	-47.7	26.3	-21.4	PASS
2399.925000	-48.3	26.9	-21.4	PASS
2399.575000	-48.3	26.9	-21.4	PASS
2399.525000	-48.3	27.0	-21.4	PASS
2399.975000	-48.4	27.0	-21.4	PASS
2399.875000	-48.5	27.1	-21.4	PASS
2399.475000	-48.7	27.3	-21.4	PASS
2399.825000	-48.8	27.5	-21.4	PASS
2399.025000	-49.8	28.4	-21.4	PASS
2398.975000	-50.0	28.6	-21.4	PASS
2399.225000	-50.6	29.2	-21.4	PASS
2399.075000	-50.7	29.4	-21.4	PASS

DUT Frequency	Result
2480.000000	PASS

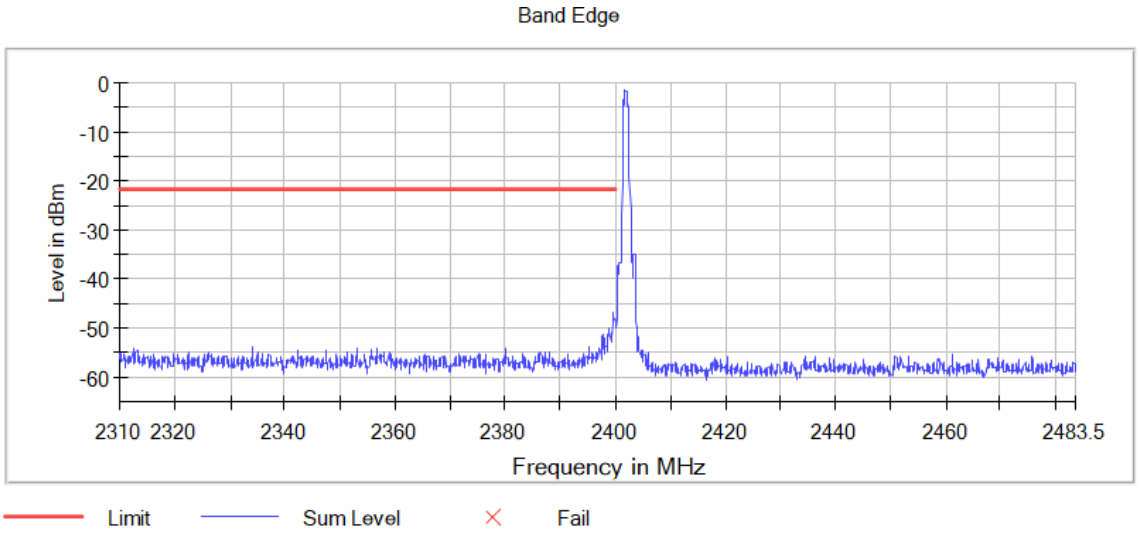
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.675000	-52.9	31.0	-21.9	PASS
2483.725000	-53.2	31.3	-21.9	PASS
2494.875000	-54.3	32.4	-21.9	PASS
2484.225000	-54.3	32.5	-21.9	PASS
2494.925000	-54.4	32.5	-21.9	PASS
2483.625000	-54.4	32.6	-21.9	PASS
2483.575000	-54.4	32.6	-21.9	PASS
2491.425000	-54.5	32.6	-21.9	PASS
2486.875000	-54.6	32.7	-21.9	PASS
2494.825000	-54.6	32.8	-21.9	PASS
2493.325000	-54.6	32.8	-21.9	PASS
2493.275000	-54.6	32.8	-21.9	PASS
2489.925000	-54.7	32.8	-21.9	PASS
2484.025000	-54.8	32.9	-21.9	PASS
2484.275000	-54.8	32.9	-21.9	PASS

Verdict

Pass

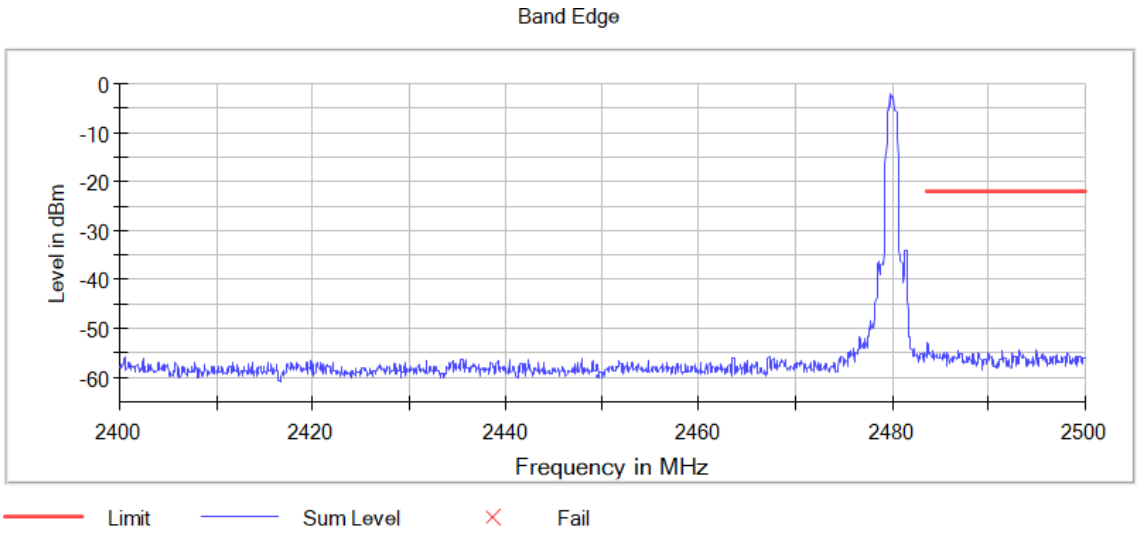
Attachments

Frequency MHz = 0.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5) - HOPPING ON
Results

DUT Frequency	Result
2402.000000	PASS

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.925000	-52.5	31.1	-21.5	PASS
2399.975000	-52.7	31.2	-21.5	PASS
2367.325000	-53.0	31.6	-21.5	PASS
2311.275000	-53.3	31.8	-21.5	PASS
2399.875000	-53.3	31.9	-21.5	PASS
2311.225000	-53.5	32.0	-21.5	PASS
2367.375000	-53.6	32.1	-21.5	PASS
2385.825000	-53.8	32.3	-21.5	PASS
2385.875000	-53.8	32.3	-21.5	PASS
2394.725000	-53.9	32.5	-21.5	PASS
2367.275000	-54.0	32.5	-21.5	PASS
2399.525000	-54.0	32.5	-21.5	PASS
2340.775000	-54.1	32.6	-21.5	PASS
2355.775000	-54.1	32.7	-21.5	PASS
2355.725000	-54.1	32.7	-21.5	PASS

DUT Frequency	Result
2480.000000	PASS

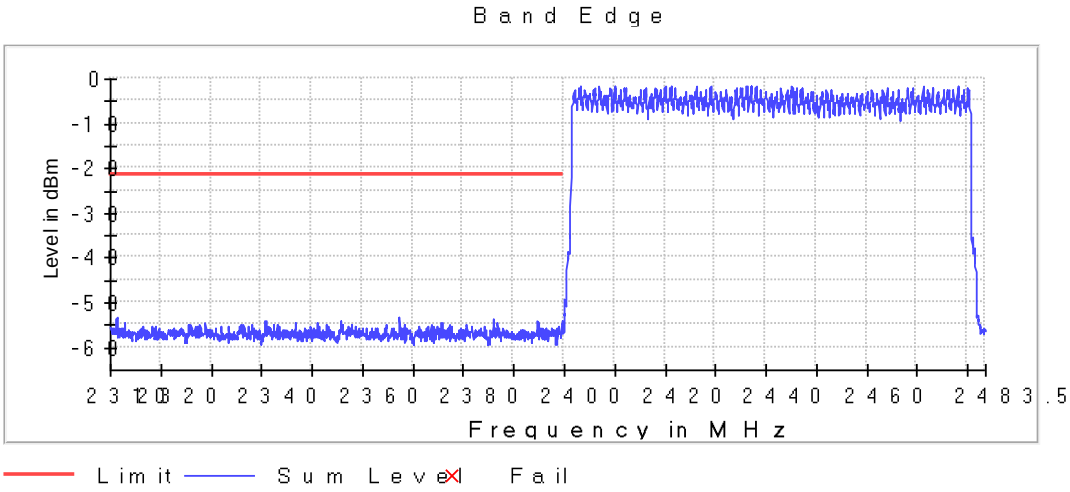
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2486.325000	-54.3	32.8	-21.4	PASS
2494.775000	-54.4	32.9	-21.4	PASS
2494.725000	-54.4	33.0	-21.4	PASS
2492.175000	-54.5	33.1	-21.4	PASS
2486.275000	-54.5	33.1	-21.4	PASS
2483.525000	-54.6	33.1	-21.4	PASS
2485.225000	-54.6	33.2	-21.4	PASS
2494.875000	-54.7	33.3	-21.4	PASS
2485.825000	-54.7	33.3	-21.4	PASS
2498.975000	-54.8	33.3	-21.4	PASS
2485.875000	-54.8	33.4	-21.4	PASS
2485.775000	-54.8	33.4	-21.4	PASS
2485.125000	-54.8	33.4	-21.4	PASS
2485.725000	-54.8	33.4	-21.4	PASS
2485.075000	-54.9	33.4	-21.4	PASS

Verdict

Pass

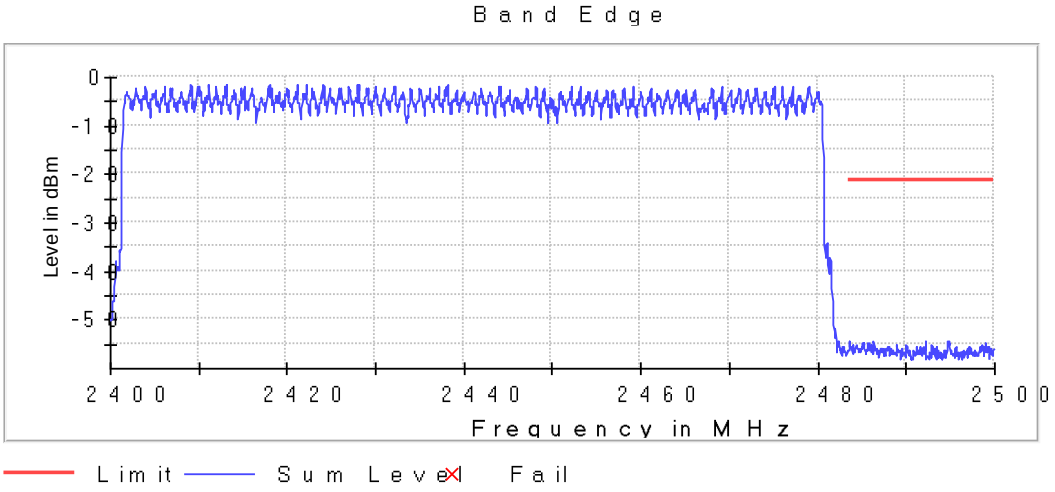
Attachments

Frequency MHz = 0.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1



Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Spectrum Analyzer Parameters

Setting	HOPPING OFF		HOPPING ON	
	Instrument Value - low	Instrument Value- high	Instrument Value- low	Instrument Value- high
Start Frequency	2.31000 GHz	2.40000 GHz	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1800	1670
Sweeptime	113.672 µs	94.727 µs	113.672 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100	100
Filter	3 dB	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT	FFT
Preamp	off	off	off	off
Stablemode	Trace	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	5 / max. 150	4 / max. 150	139 / max. 150
Stable	3 / 3	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.12 dB	0.00 dB	0.00 dB

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

Limits

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Verdict

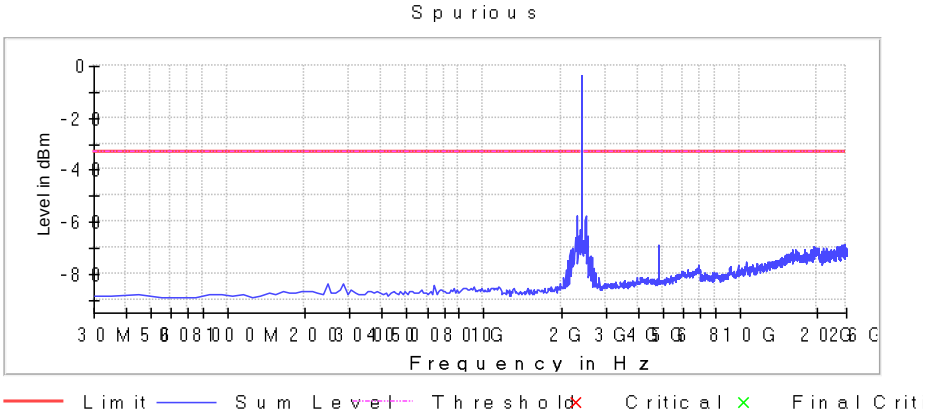
Pass

Results

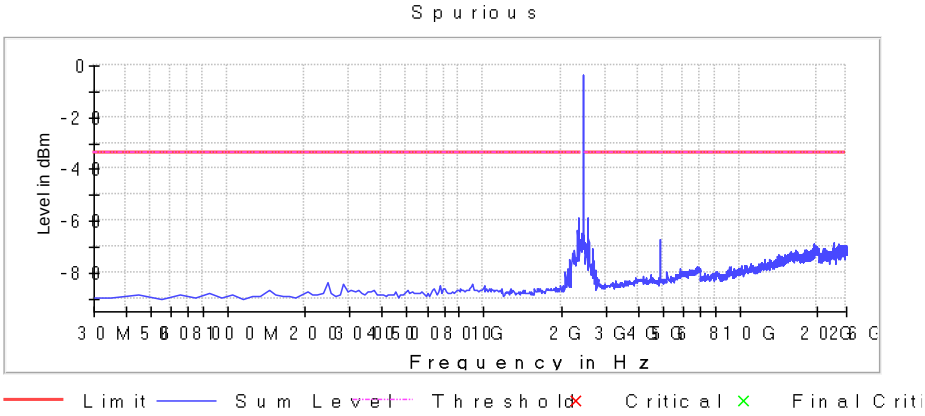
Modulation: BTBR (GFSK 1-DH5)

Note: Fundamental signals are above the limit and shown in the frequency range of 2402 - 2480 MHz in the plots

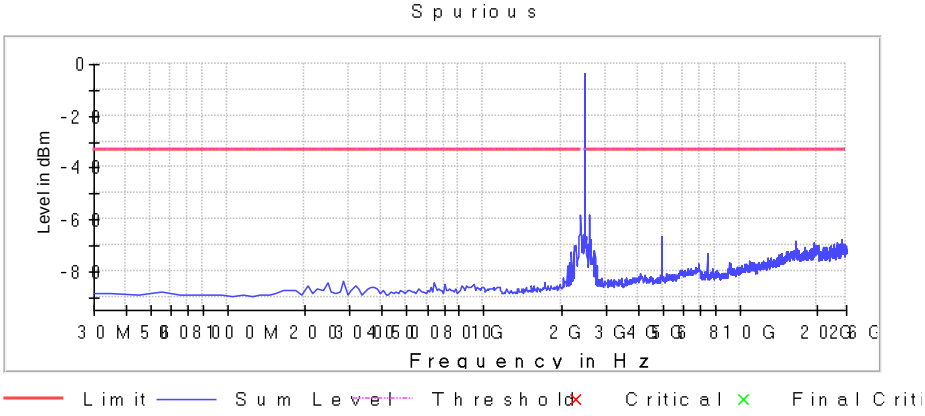
Lowest Channel



Middle Channel



Highest Channel

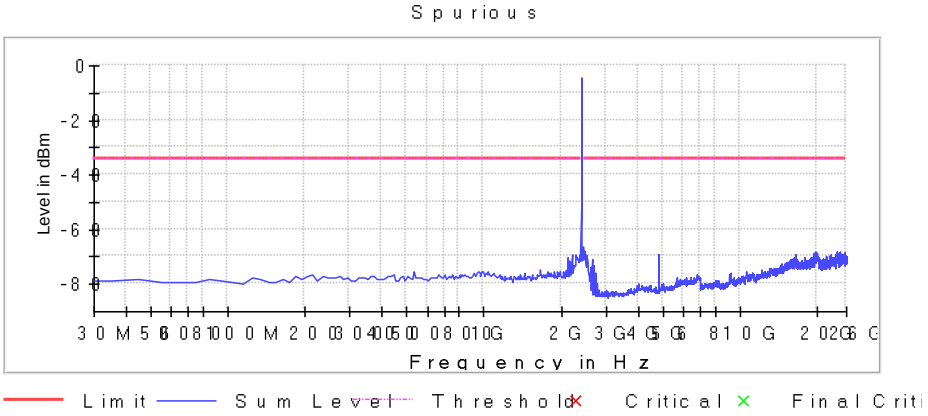


Results

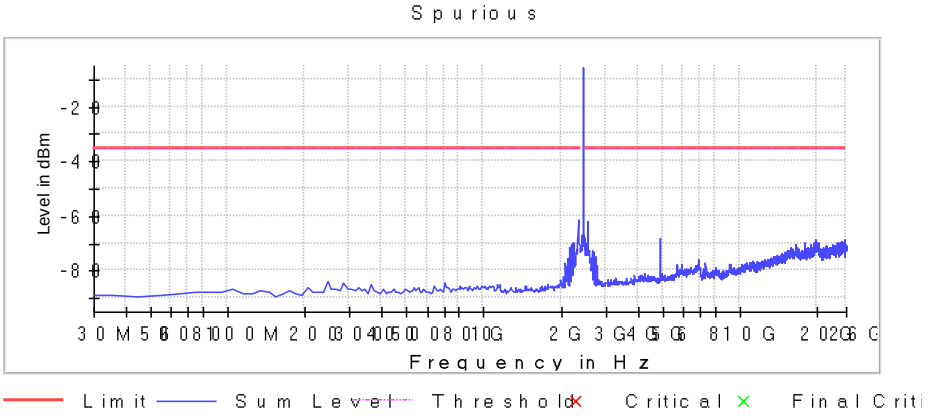
Modulation: BTEDR (π/4-DQPSK 2-DH5)

Note: Fundamental signals are above the limit and shown in the frequency range of 2402 - 2480 MHz in the plots

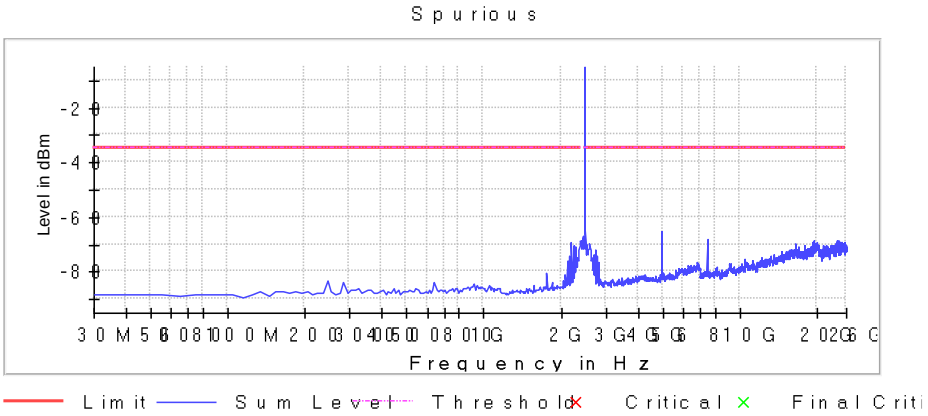
Lowest Channel



Middle Channel



Highest Channel

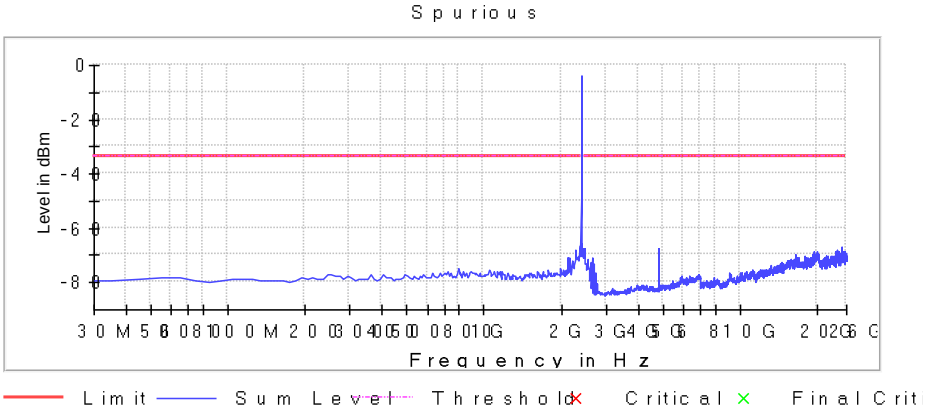


Results

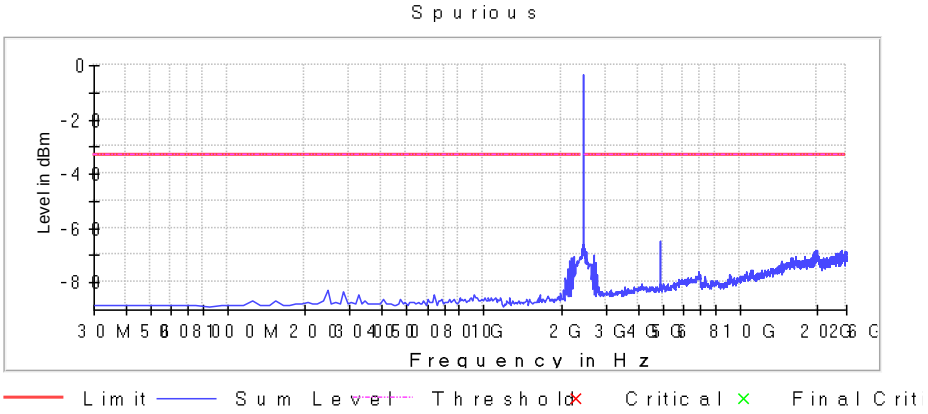
Modulation: BTEDR (8DPSK 3-DH5)

Note: Fundamental signals are above the limit and shown in the frequency range of 2402 - 2480 MHz in the plots

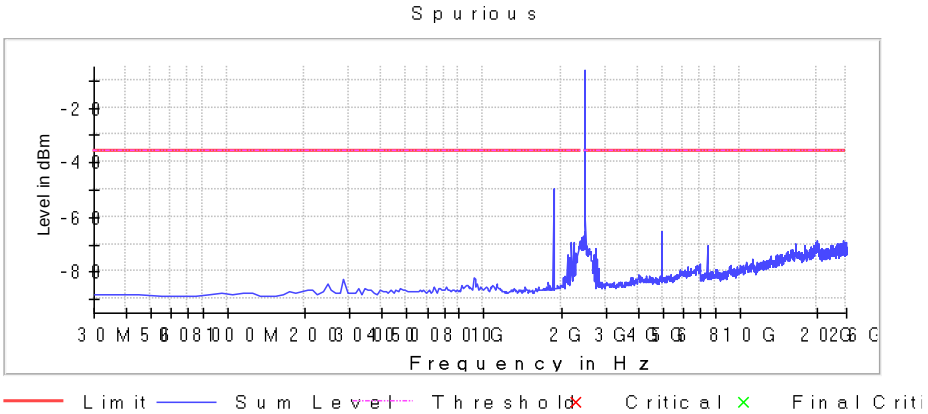
Lowest Channel



Middle Channel



Highest Channel



Spectrum Analyzer Parameters

Setting	Instrument Value
RBW	100.000 kHz
VBW	300.000 kHz
SweepPoints	238
Sweeptime	23.700 ms
Reference Level	-30.000 dBm
Attenuation	0.000 dB
Detector	MaxPeak
SweepCount	3
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	Sweep
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	4 / max. 40
Stable	3 / 3
Max Stable Difference	0.00 dB

RSS-247 5.5 / FCC 15.247 (d) Emissions compliance (Transmitter) – Radiated

Limits

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	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

Verdict

Pass

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Equipment	Freq Rng (GHz)	# of Tx Chains	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	108.667	16.70	V	QP
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	124.963	24.80	H	QP
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	240.441	23.30	H	QP
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	408.106	25.50	H	QP
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	611.563	31.00	V	QP
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[0.03, 1]	1	1	965.565	34.60	V	QP
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2402.000	84.20	V	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17865.000	47.30	H	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17983.000	49.30	V	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1597.000	39.30	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17992.000	49.50	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2441.500	84.70	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	15881.000	45.40	V	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17982.000	49.00	V	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2480.000	87.20	H	AVG

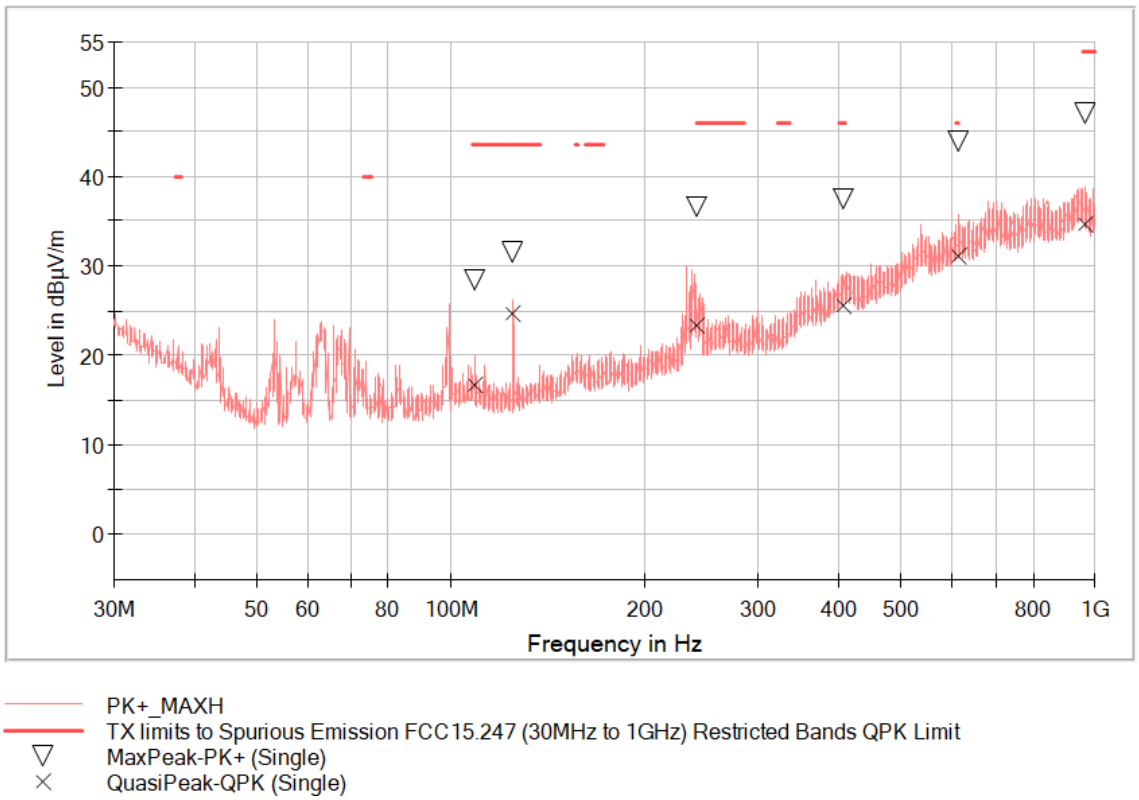
Verdict

Pass

Attachments

Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Frequency Range GHz = [0.03, 1], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



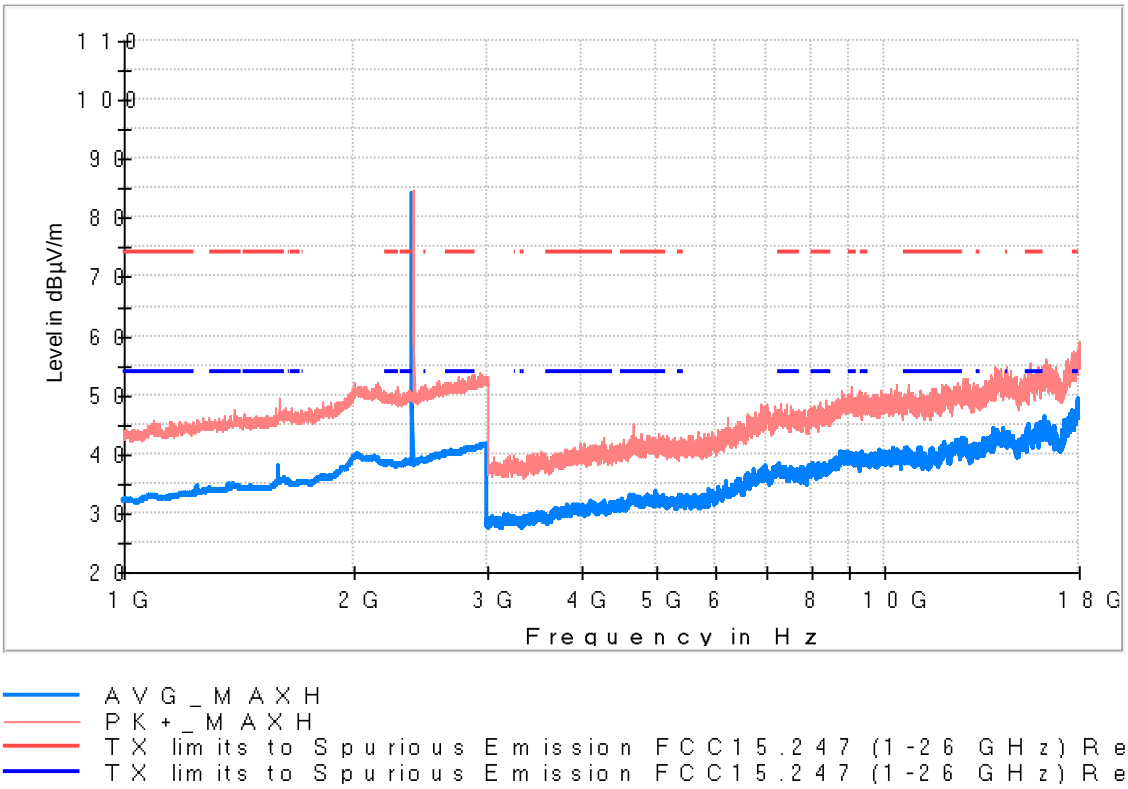
Tables:

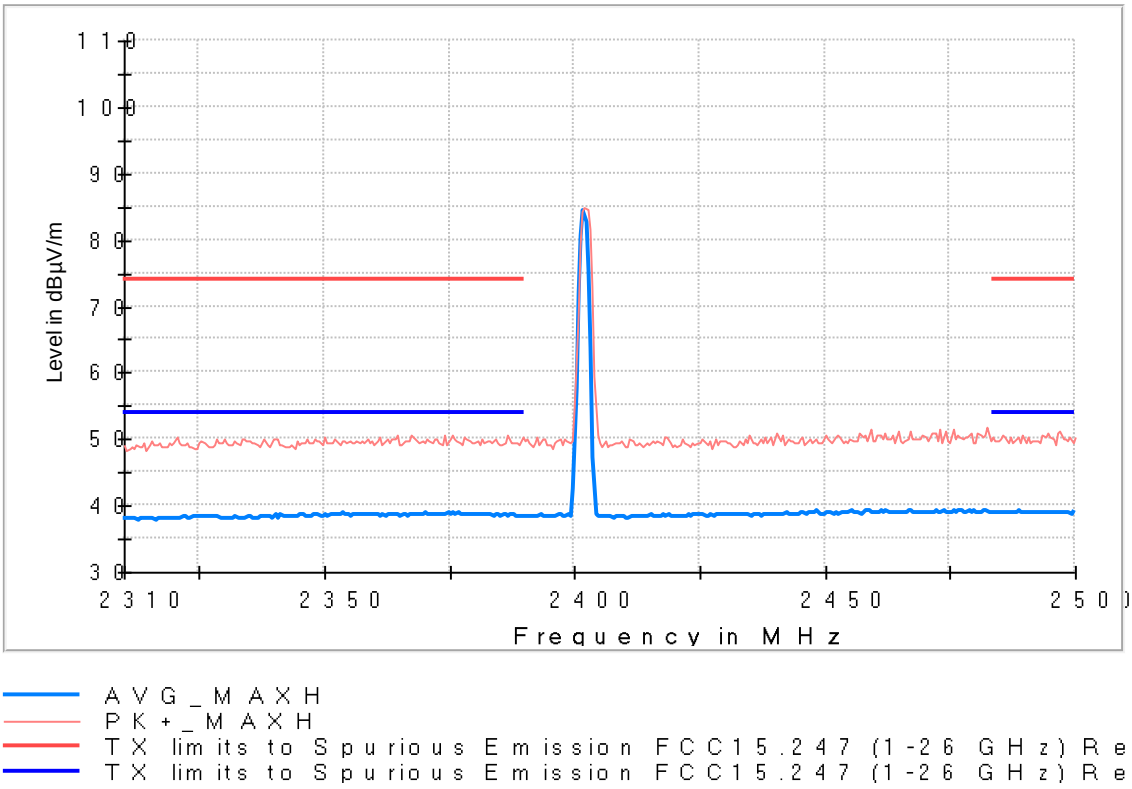
Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s	20 dB

Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:




110
100
90
80
70
60
50
40
30
Level in dBµV/m
2310
2350
2400
2450
2500
Frequency in MHz
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restr
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restr

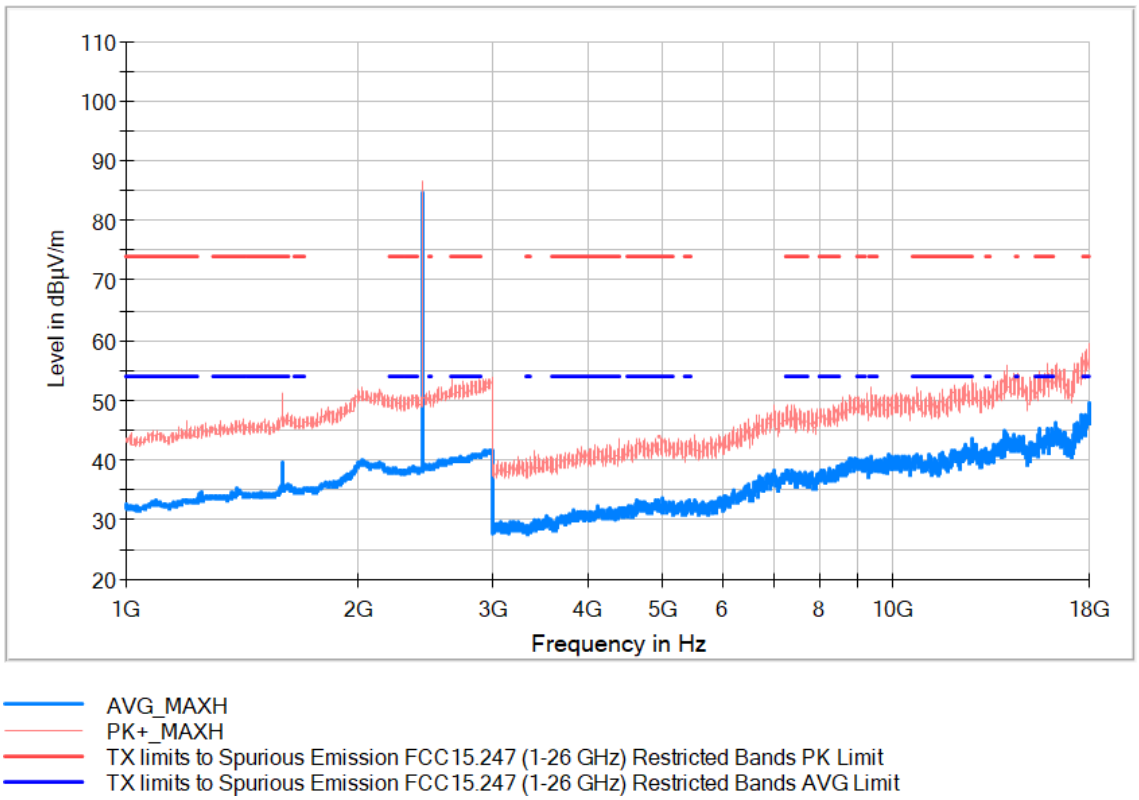
Tables:

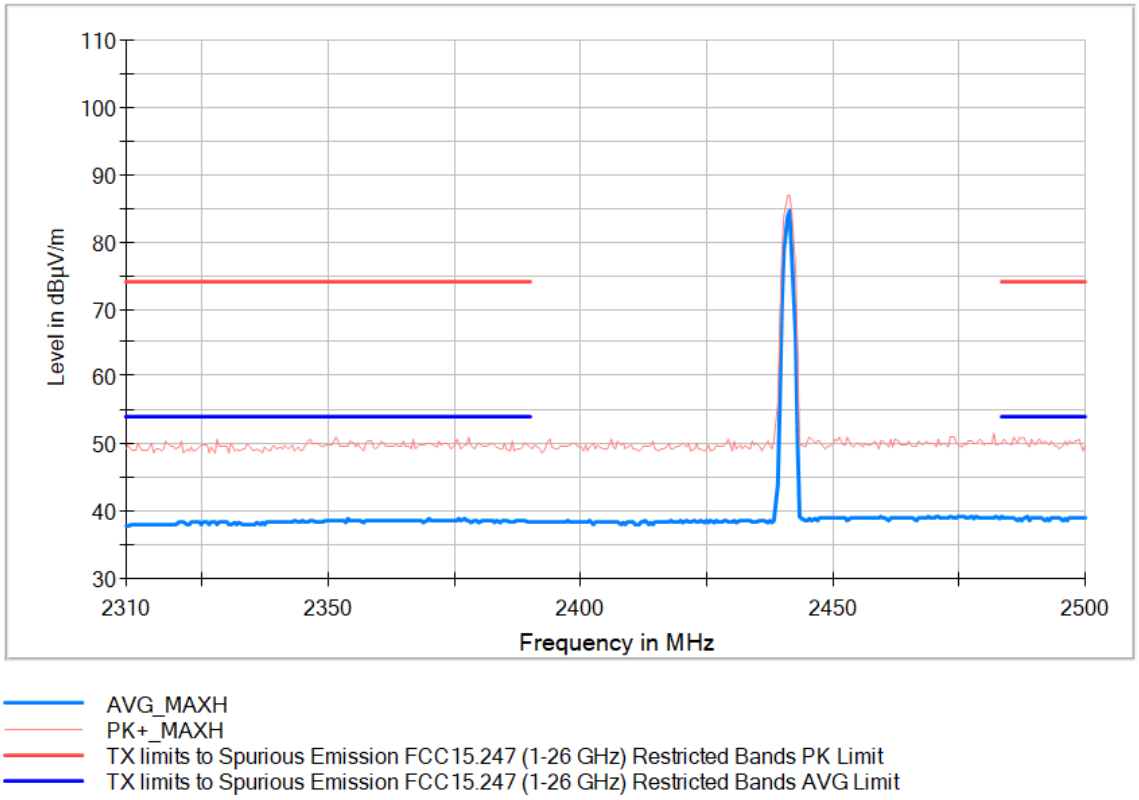
Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:





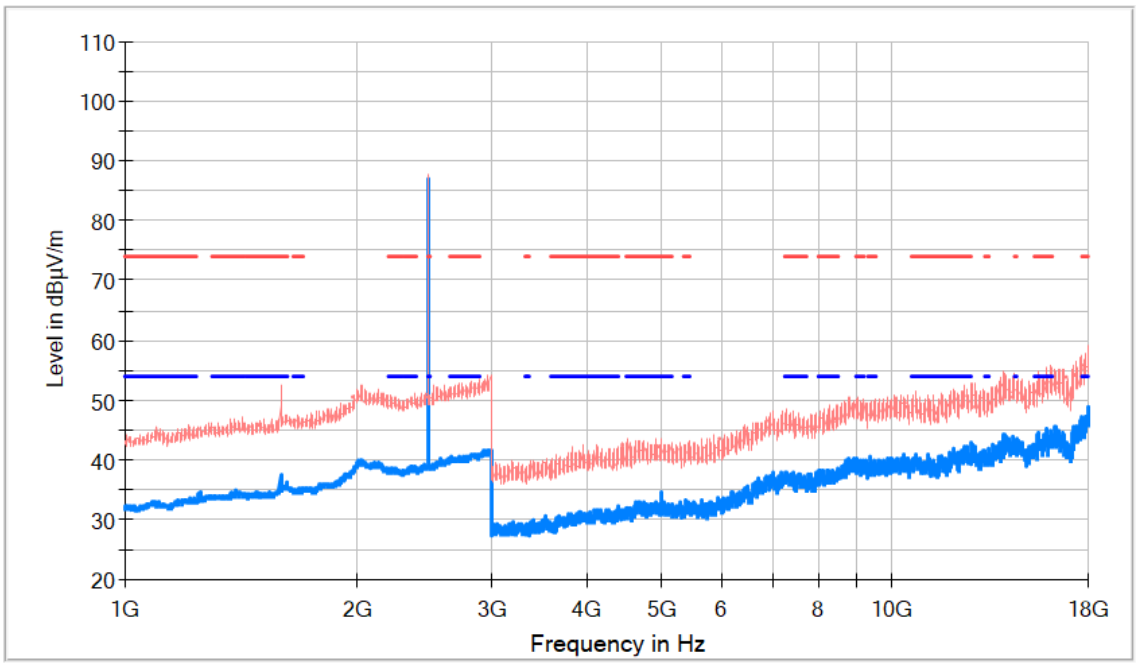
Tables:

Spectrum Analyzer Parameters

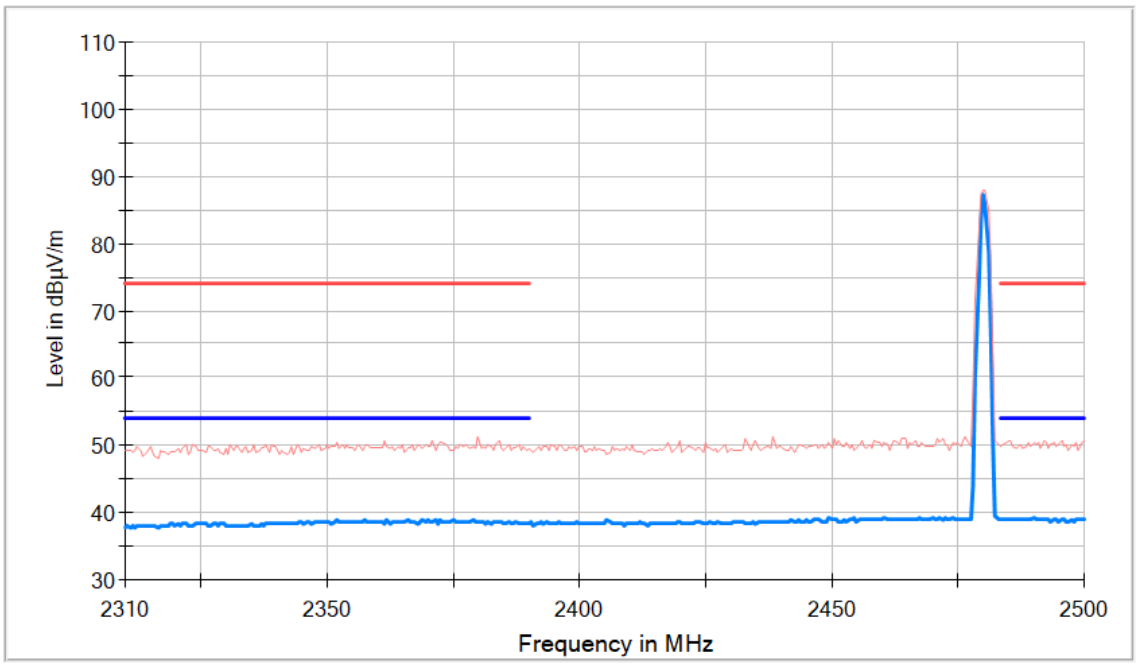
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Tables:

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Modulation: BT (Pi/4 DQPSK 2-DH5)

Results

Freq (MHz)	Equipment	Freq Rng (GHz)	# of Tx Chains	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17993.500	49.00	H	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2402.000	81.50	H	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	5000.000	35.00	V	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1597.500	41.40	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2441.000	82.80	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17839.000	55.20	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1598.500	38.30	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17981.500	48.60	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2480.000	84.00	H	AVG

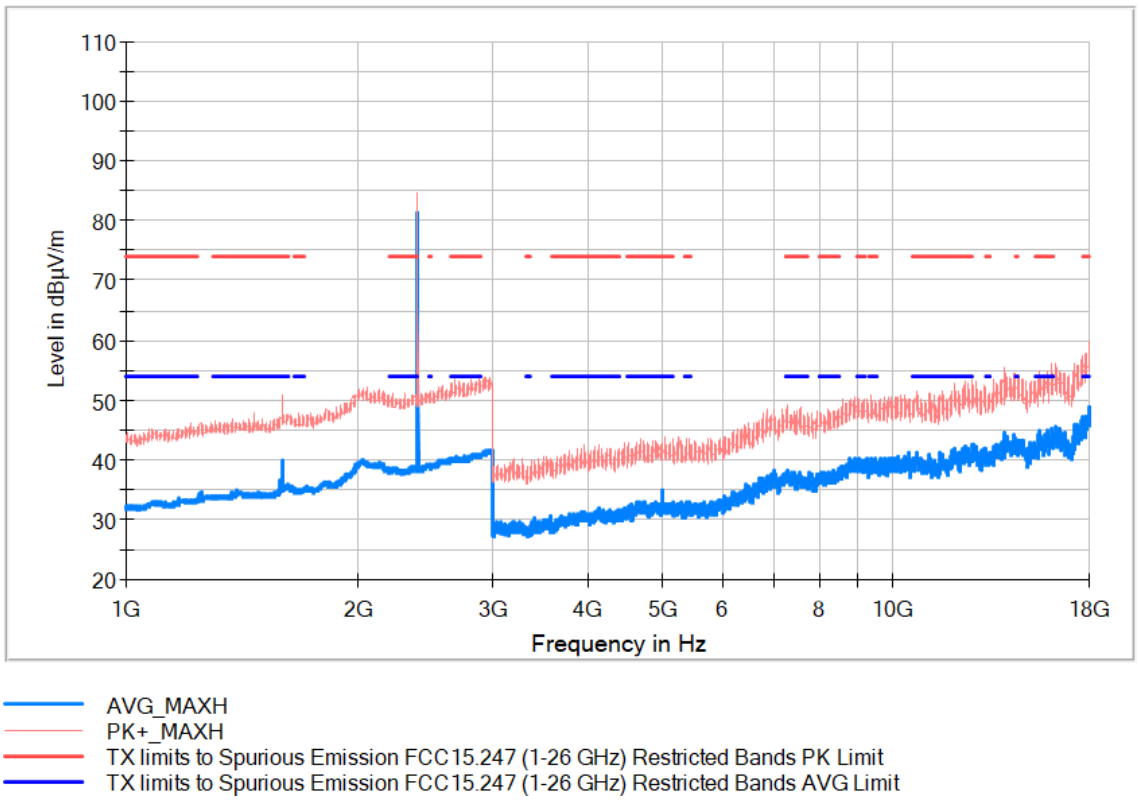
Verdict

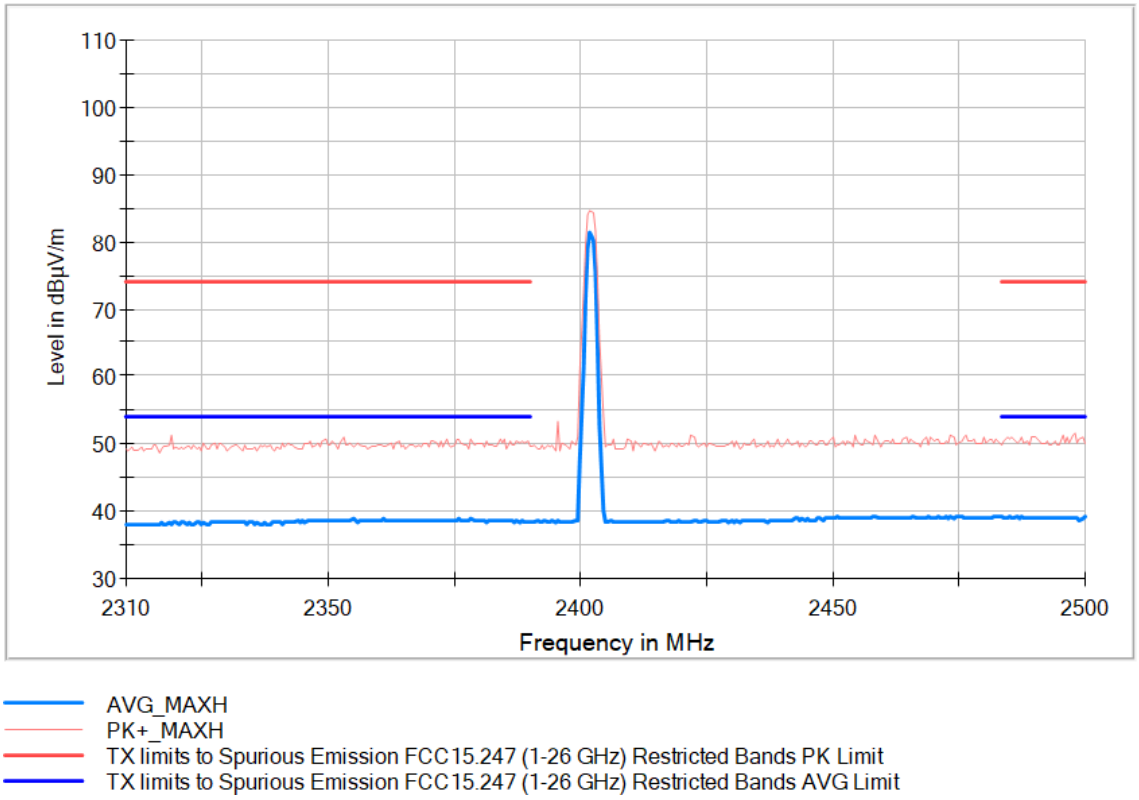
Pass

Attachments

Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:





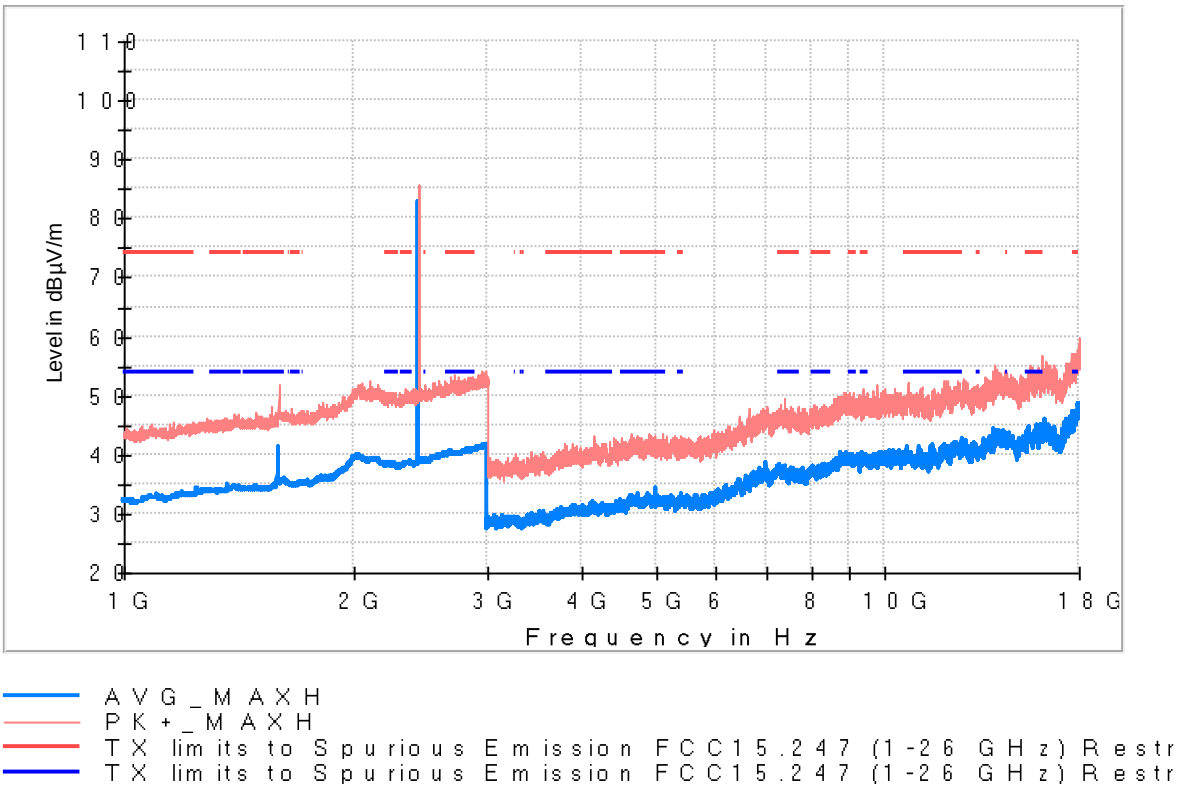
Tables:
Spectrum Analyzer Parameters

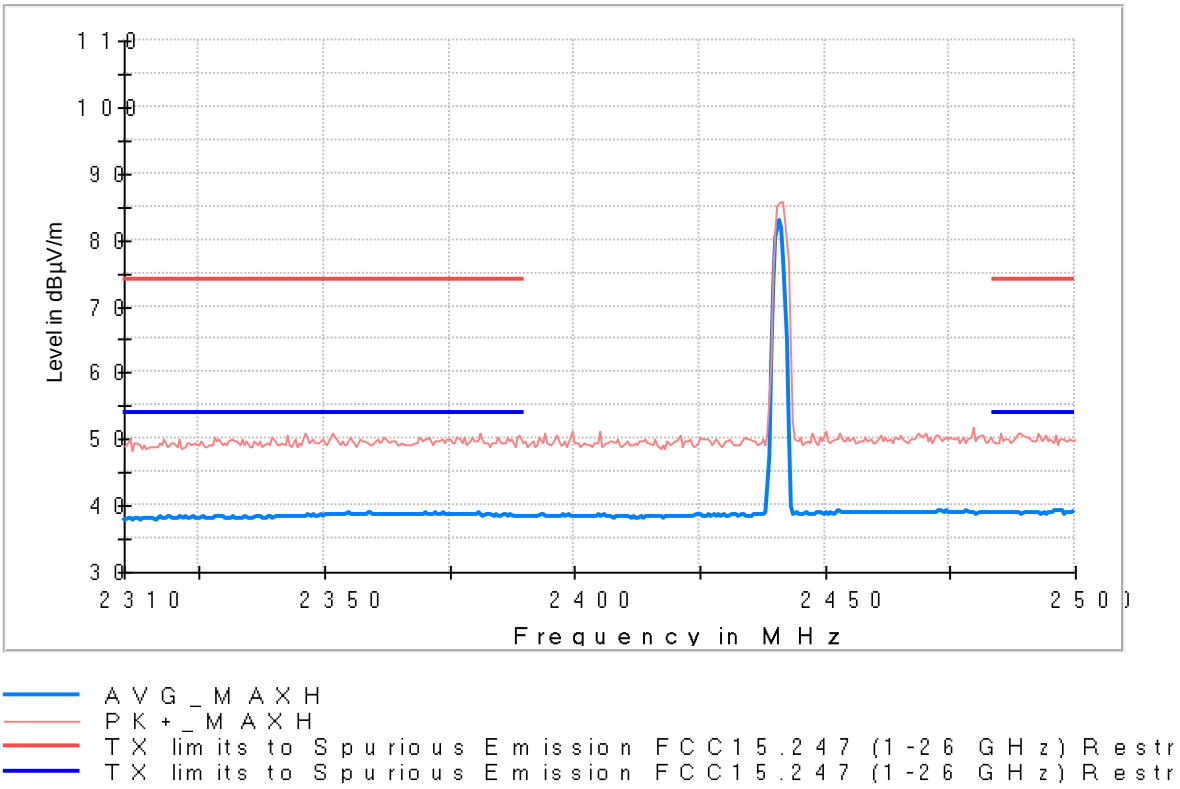
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Attachments

Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



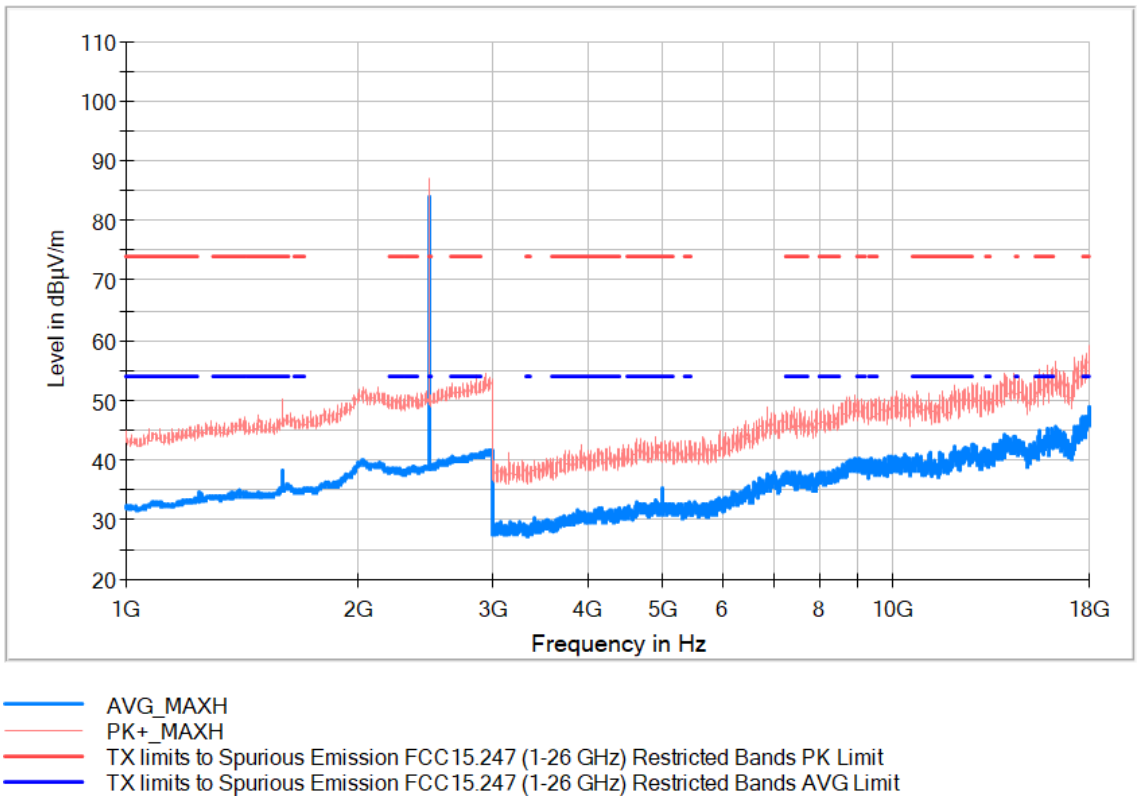


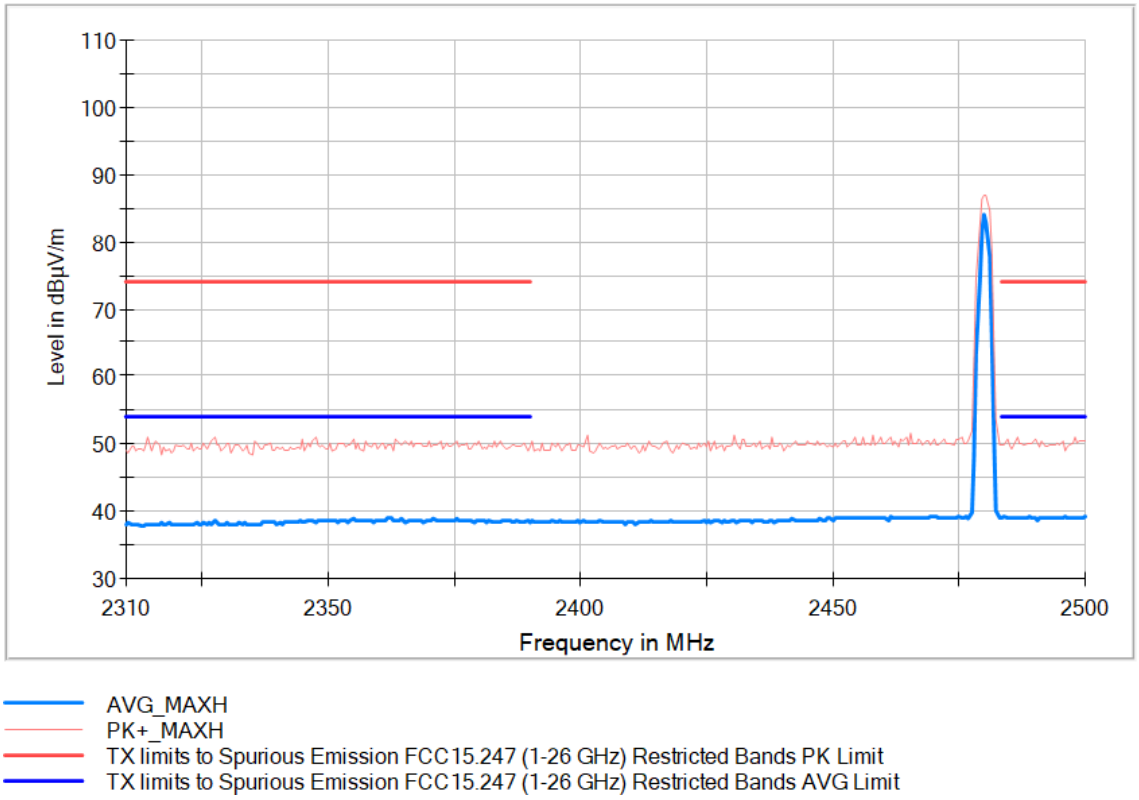
Tables:
Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:





Tables:

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	Freq Rng (GHz)	# of Tx Chains	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1596.500	39.10	H	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17990.500	49.10	H	AVG
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2402.000	81.90	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1596.500	38.80	H	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17993.500	49.20	V	AVG
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2441.000	82.50	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	1596.500	40.20	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	17985.500	49.00	H	AVG
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	[1, 18]	1	1	2480.000	81.80	H	AVG

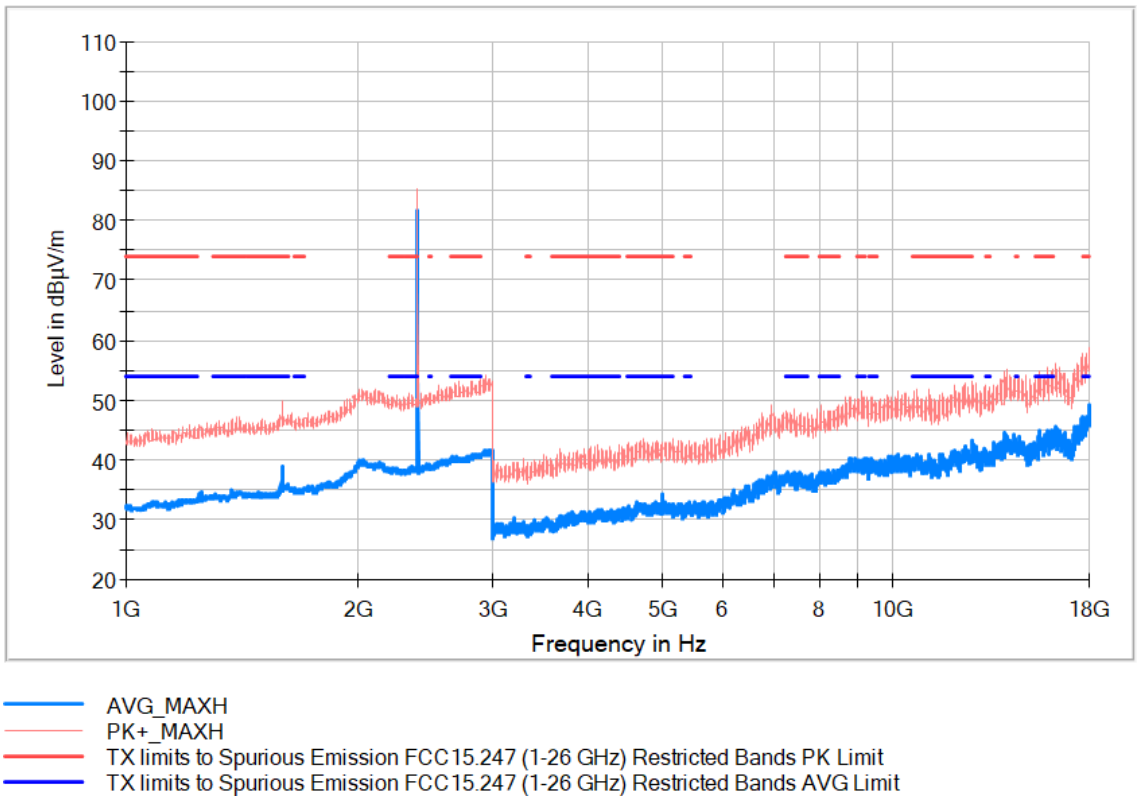
Verdict

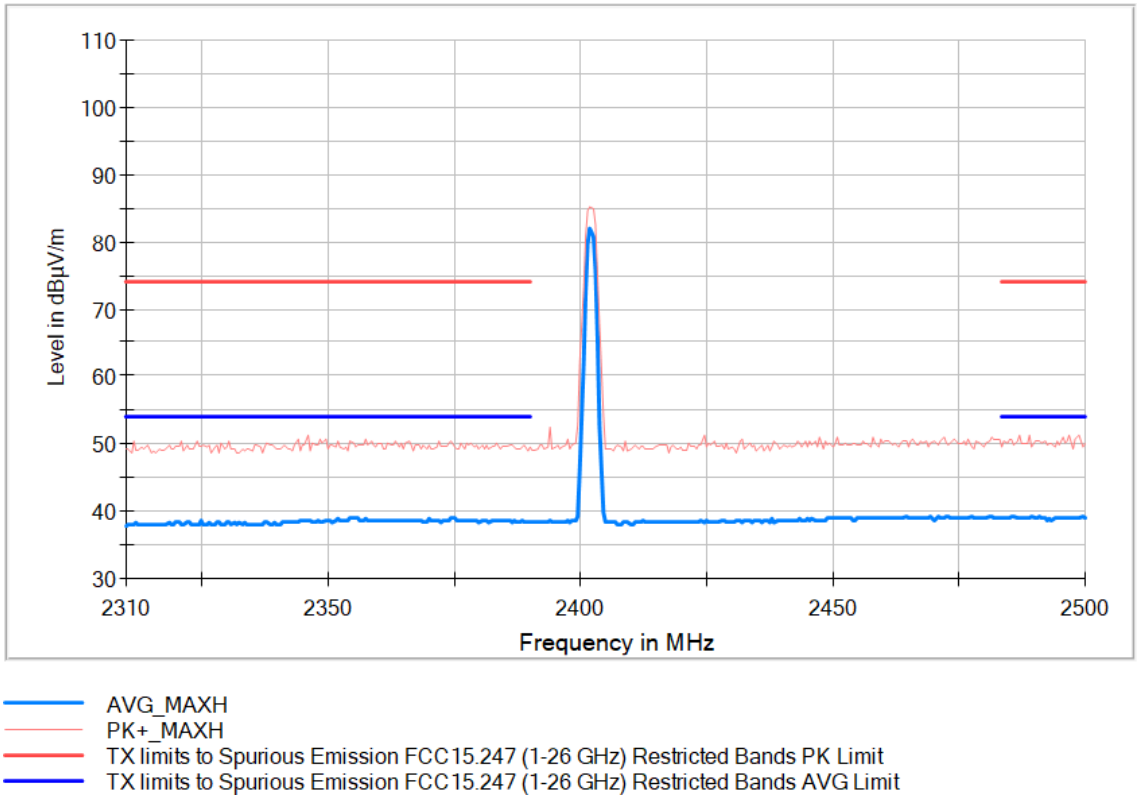
Pass

Attachments

Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:





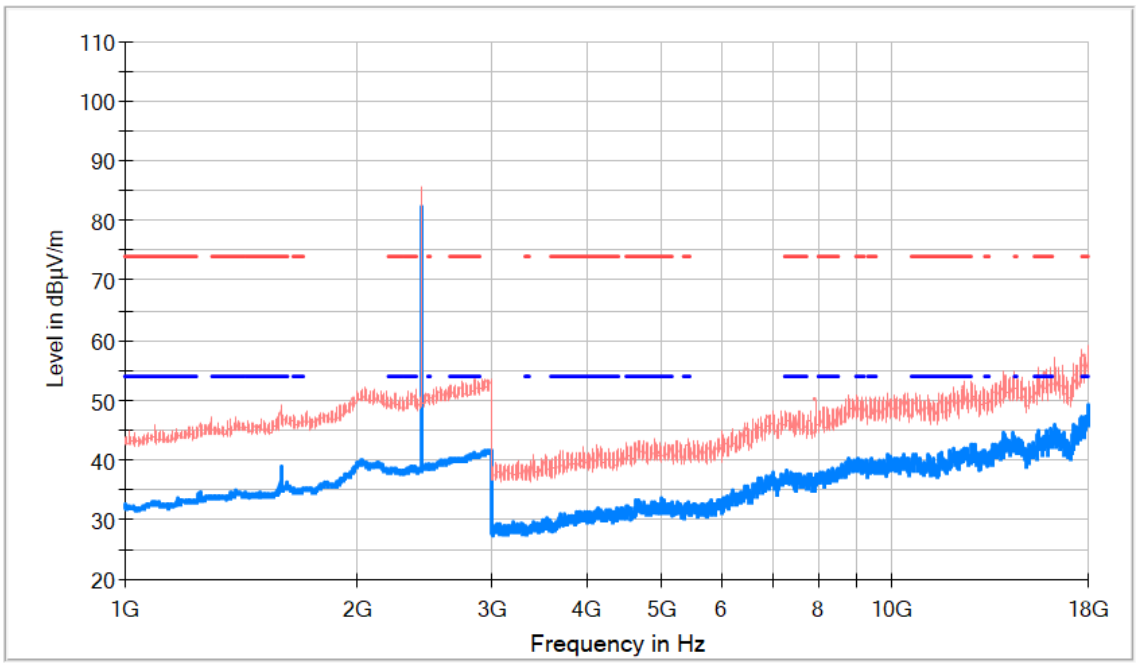
Tables:

Spectrum Analyzer Parameters

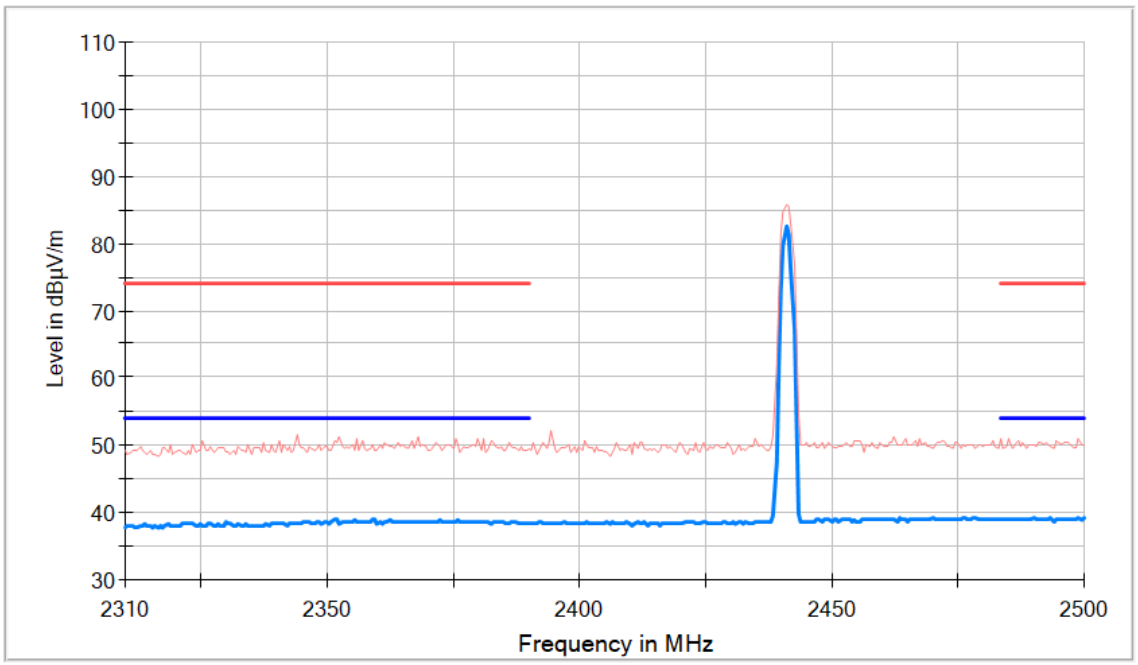
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

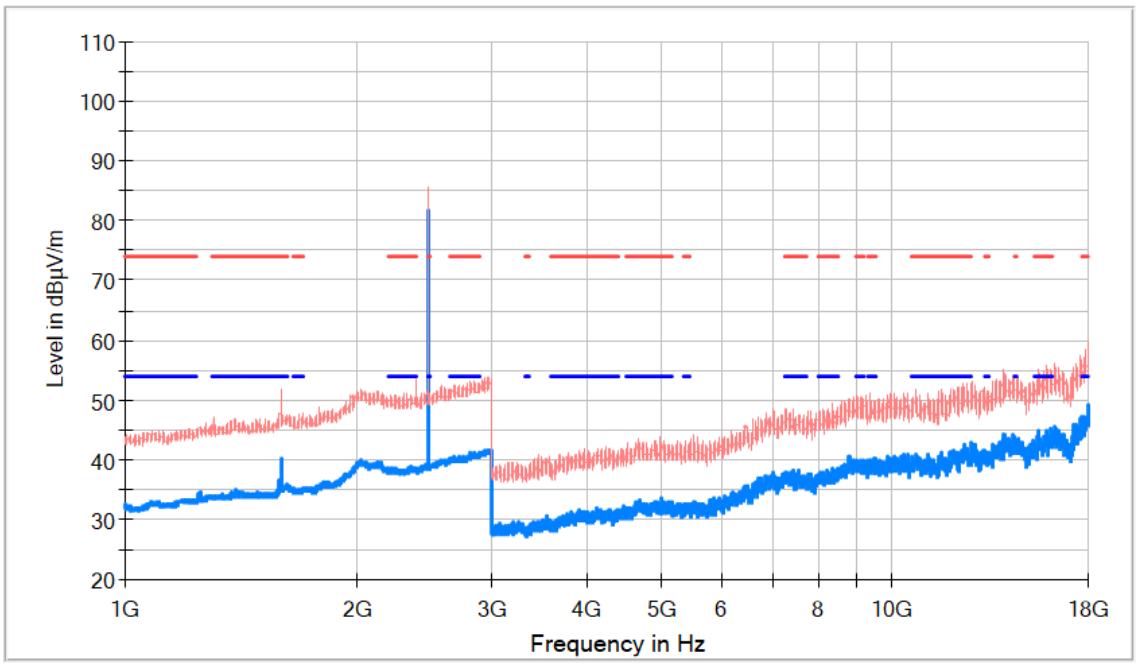
Tables:

Spectrum Analyzer Parameters

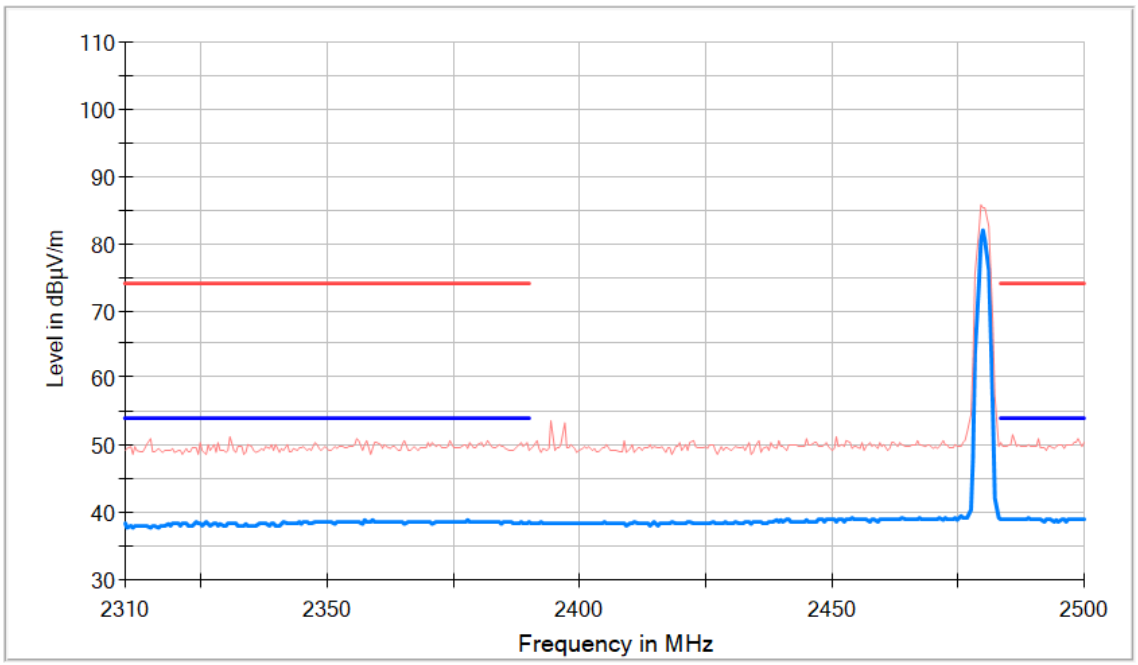
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Tables:

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
3 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB

Appendix B: Test results. Wi-Fi 2.4GHz

INDEX

PRODUCT INFORMATION

Information	Description
Modulation	DSSS/OFDM
Maximum RF Output Power	< 20 dBm
Operation mode	
- Operating Frequency Range	2400 – 2483.5 MHz
- Nominal Channel Bandwidth	20 MHz
Extreme operating conditions	
- Temperature range	-20 ºC to +55 ºC
Antenna type	Dedicated External Antenna
Antenna gain	2,4 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Wi-Fi 2.4 GHz b/g/n20
Geo-location capability	No

TEST CONDITIONS

(*): Data provided by the client.

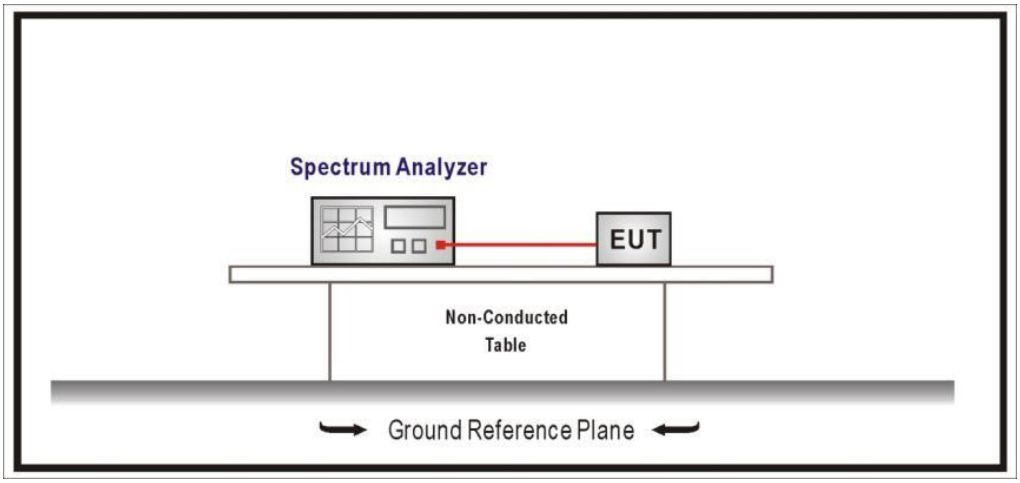
TEST CONDITIONS	DESCRIPTION
TC#01(1) **(b mode)**	Power supply (V): $V_{nominal}$ = 12 Vdc Channel Bandwidth: 20 MHz Test Frequencies for Conducted/Radiated tests: Lowest channel: 2412 MHz Middle channel: 2442 MHz Highest channel: 2462 MHz
TC#02(1) **(g mode)**	Power supply (V): $V_{nominal}$ = 12 Vdc Channel Bandwidth: 20 MHz Test Frequencies for Conducted/Radiated tests: Lowest channel: 2412 MHz Middle channel: 2442 MHz Highest channel: 2462 MHz

TEST CONDITIONS	DESCRIPTION
TC#03(1) **(n mode)**	Power supply (V): $V_{nominal}$ = 12 Vdc Channel Bandwidth: 20 MHz Test Frequencies for Conducted/Radiated tests: Lowest channel: 2412 MHz Middle channel: 2442 MHz Highest channel: 2462 MHz

Note (1): For spurious emissions for OFDM modes 802.11g and 802.11n20 a preliminary scan was performed to determine the worst case. The following tables and plots show the results for the worst case in DSSS modulation (802.11b) and OFDM modulation (802.11g).

The data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g, MCS0 for 802.11n20 were selected based on preliminary testing that identified those rates corresponding to the worst cases.

CONDUCTED MEASUREMENTS:



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and 1-18 GHz Double ridge horn antennas, and 1m for the frequency range 18 GHz- 26 GHz Double ridge horn antenna.

For radiated emissions in the range 18 - 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 was varied from 1 to 4 meters to find the maximum radiated emission.

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

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

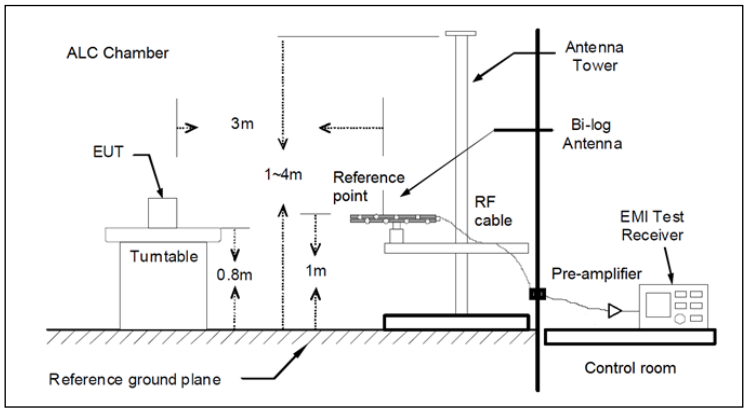


Fig A1: Radiated measurements Setup f < 1 GHz

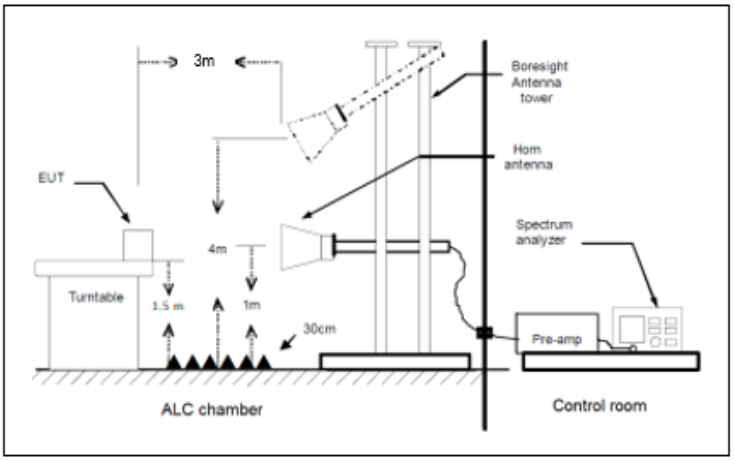


Fig A2: Radiated measurements setup f > 1-18 GHz

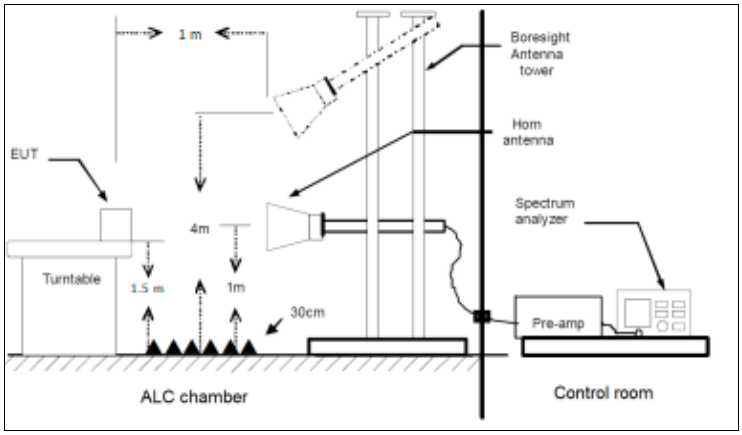


Fig A3: Radiated measurements setup f > 18 GHz

TEST CASES DETAILS

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: 802.11b (DSSS 1 Mbit/s)
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000	20	1	1	10.150
2442.00000	20	1	1	10.150
2462.00000	20	1	1	10.150

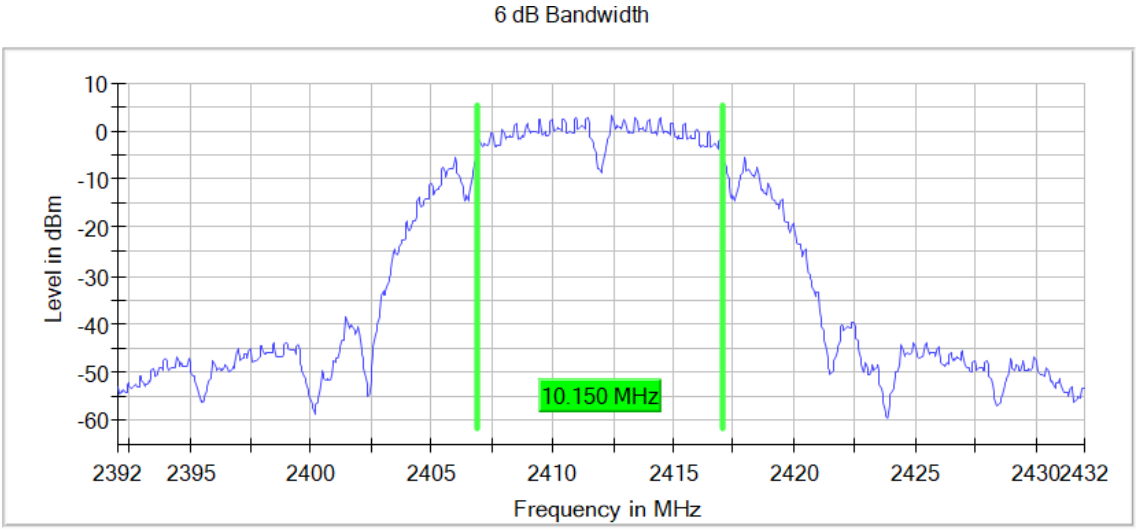
Verdict

Pass

Attachments

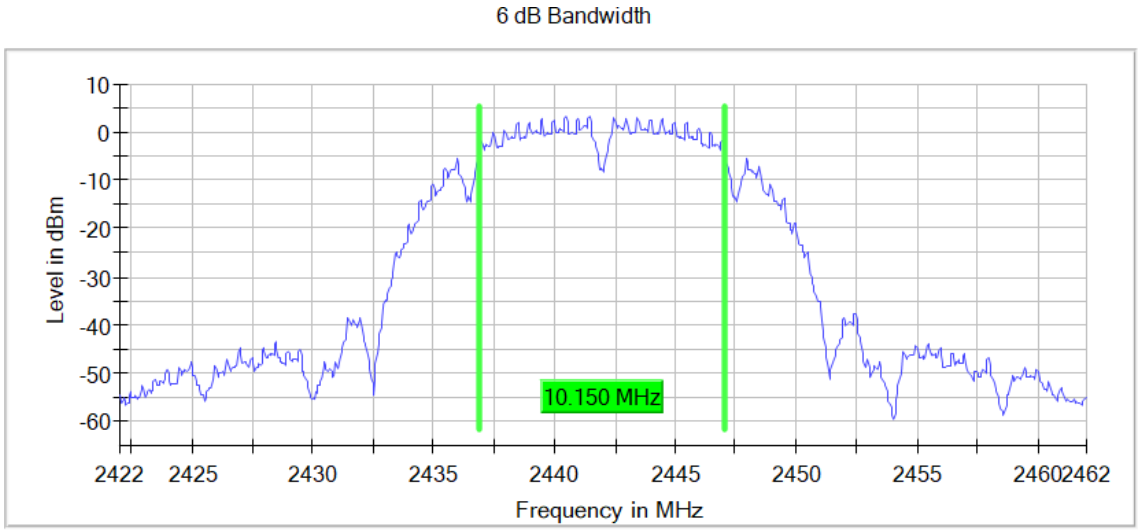
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



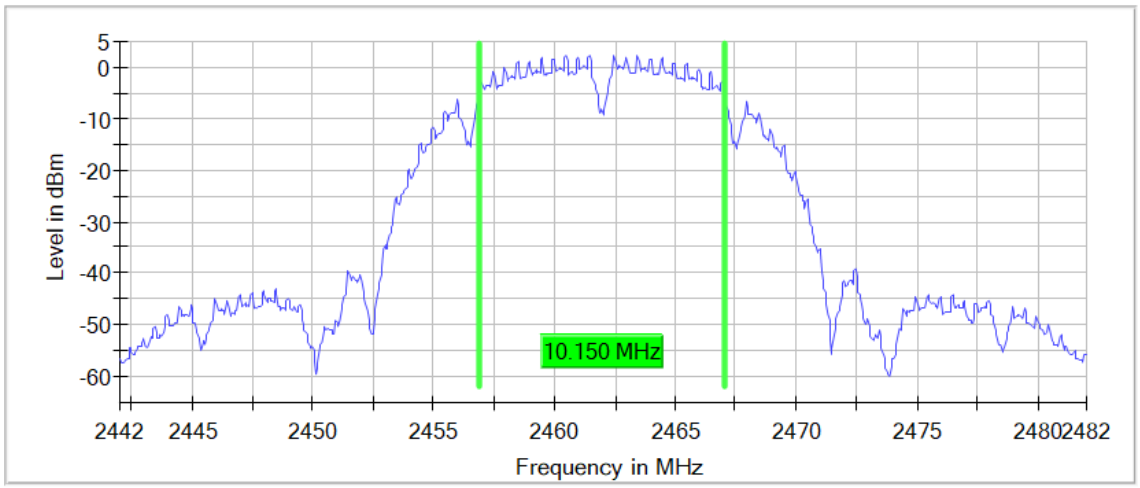
Frequency MHz = 2442.00000, Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000	20	1	1	16.400
2442.00000	20	1	1	16.400
2462.00000	20	1	1	16.400

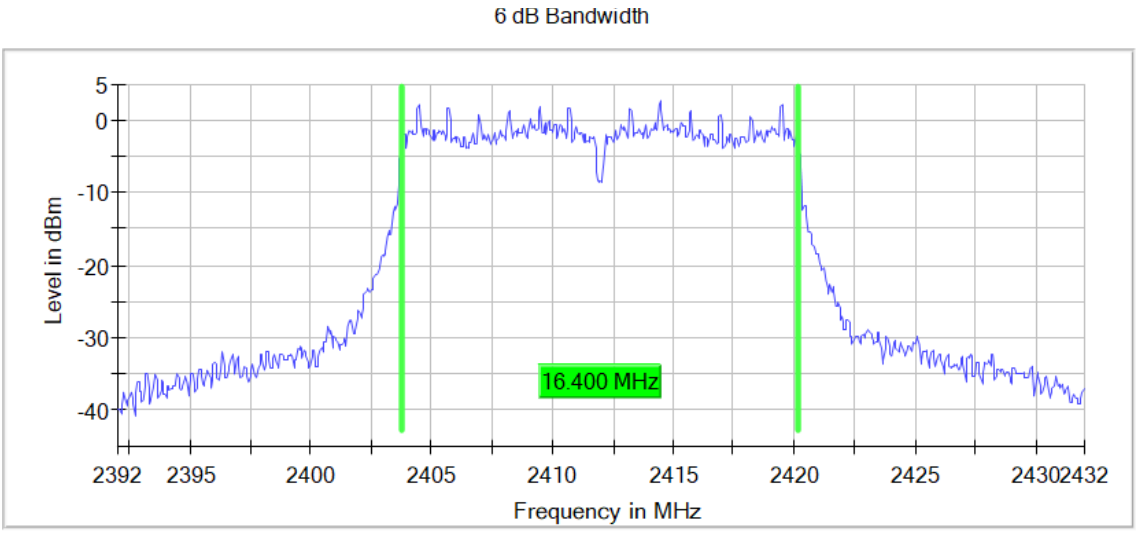
Verdict

Pass

Attachments

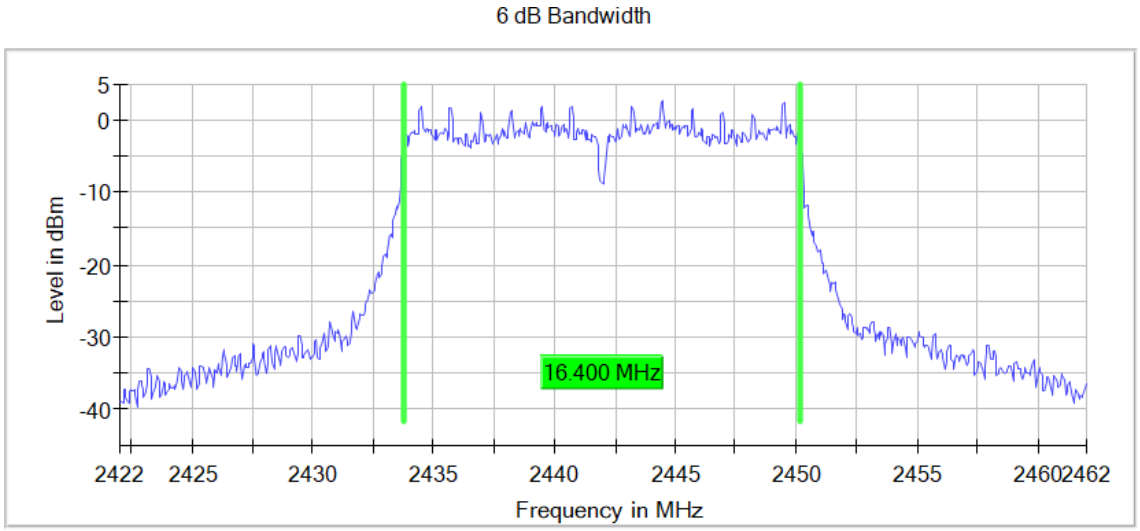
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



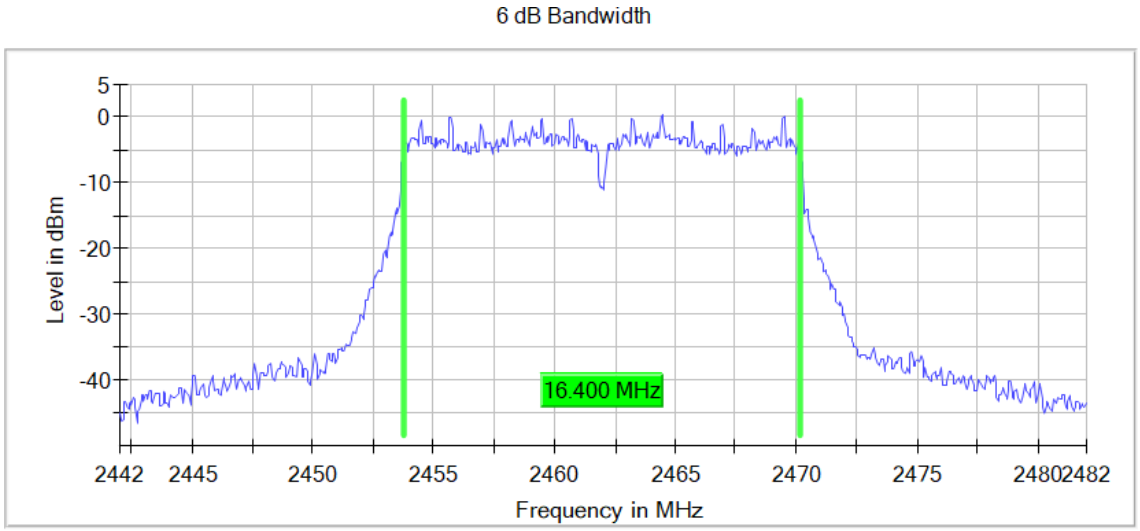
Frequency MHz = 2442.00000, Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000	20	1	1	17.650
2442.00000	20	1	1	17.400
2462.00000	20	1	1	17.400

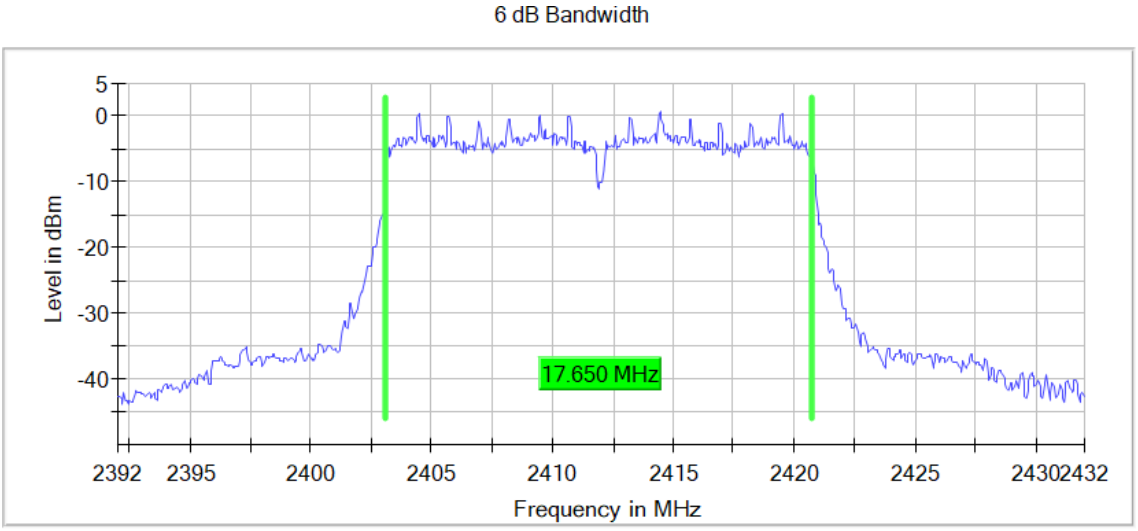
Verdict

Pass

Attachments

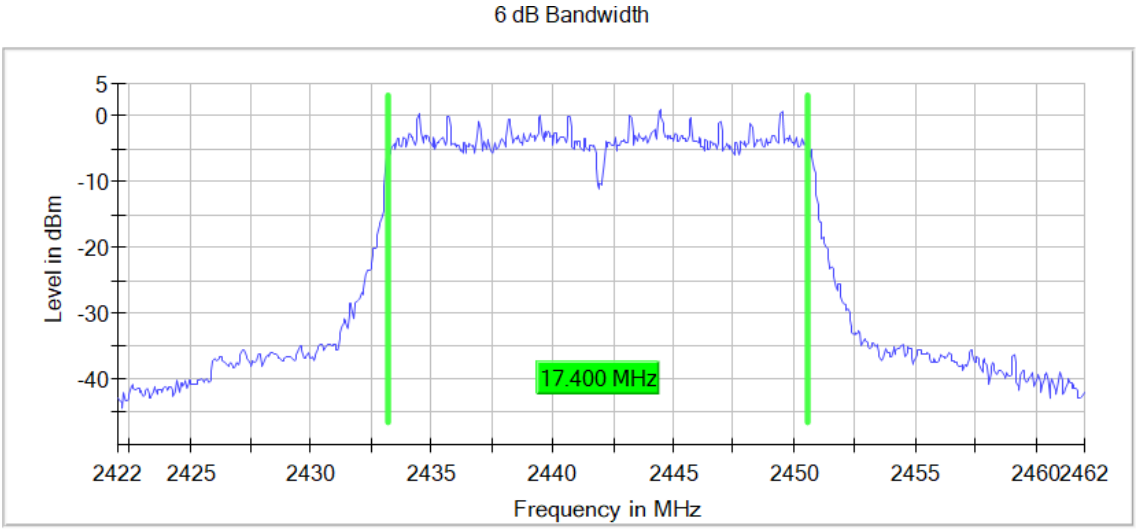
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



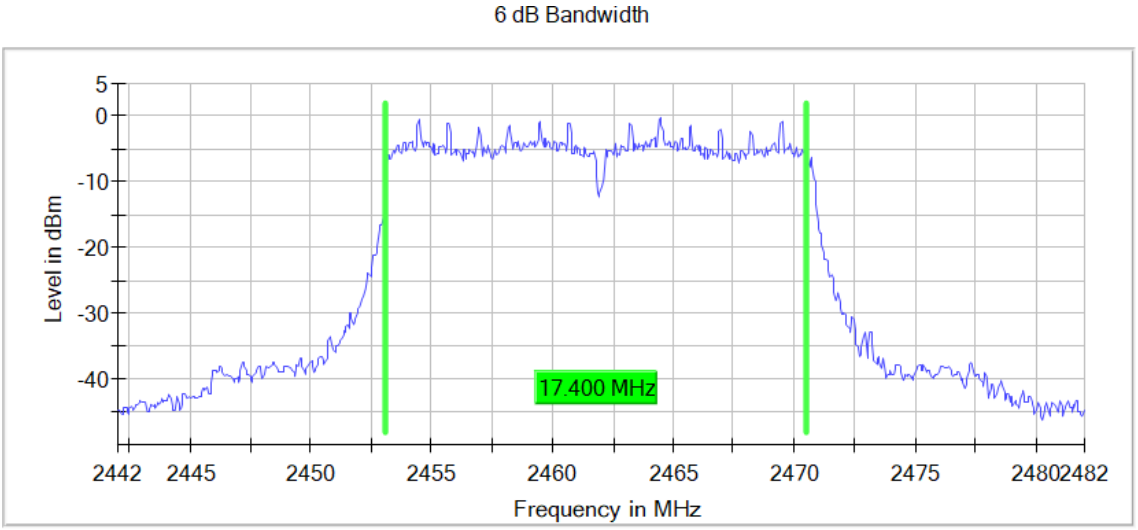
Frequency MHz = 2442.00000, Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39200 GHz	2.41700 GHz	2.44200 GHz
Stop Frequency	2.43200 GHz	2.45700 GHz	2.48200 GHz
Span	40.00 MHz	40.000 MHz	40.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
Sweep Points	800	800	800
Sweep time	56.836 µs	56.836 µs	56.836 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	15 / max. 150	20 / max. 150	29 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable	0.33 dB	0.27 dB	0.04 dB

RSS-247 5.2 (b) / FCC 15.247 (e) [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: 802.11b (DSSS 1 Mbit/s)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	2.57
2442.00000	Digital Transmission System (DTS)	20	1	1	1.33
2462.00000	Digital Transmission System (DTS)	20	1	1	1.23

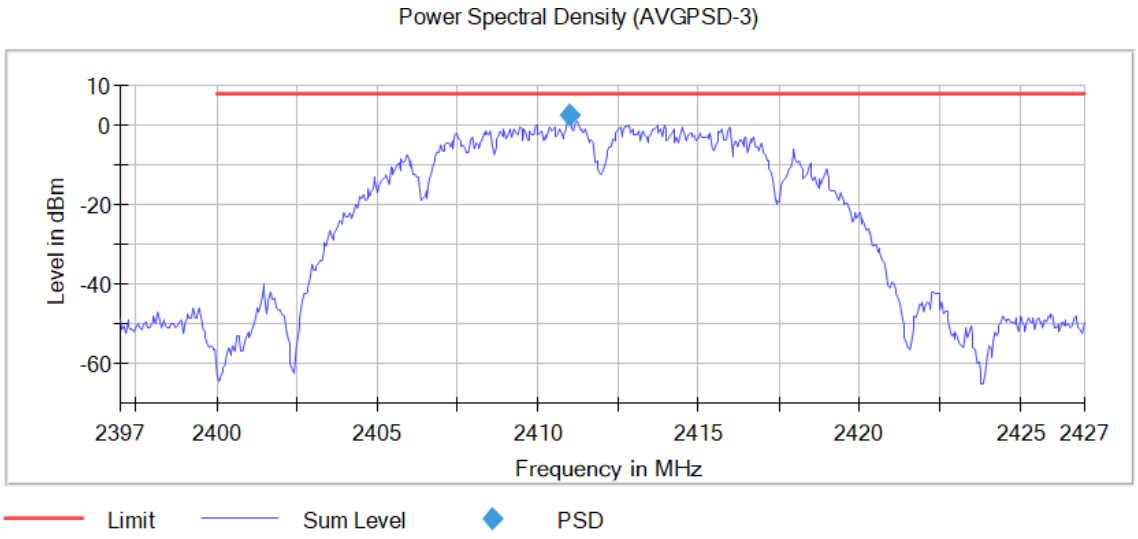
Verdict

Pass

Attachments

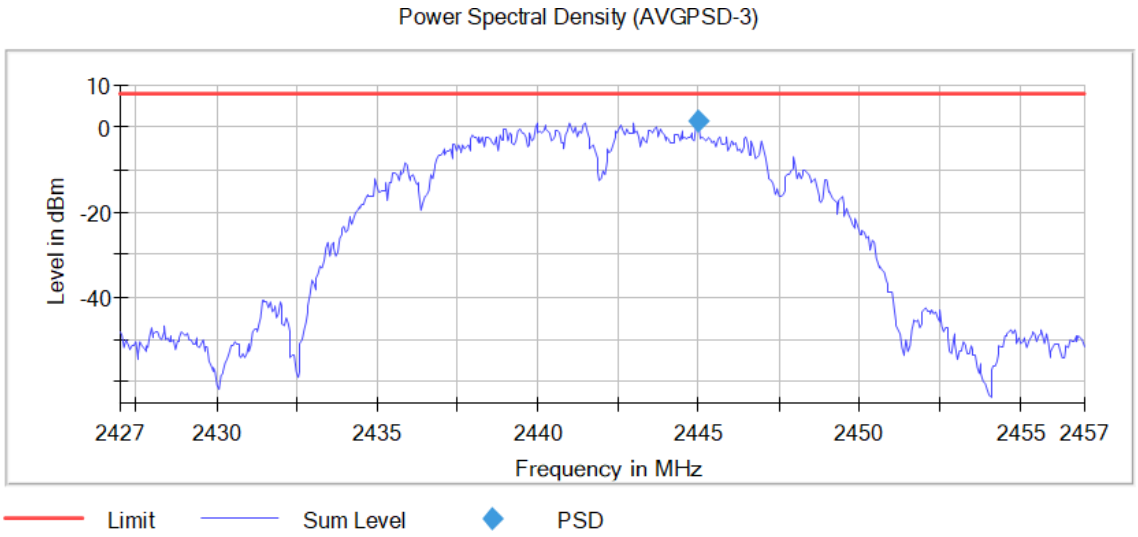
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



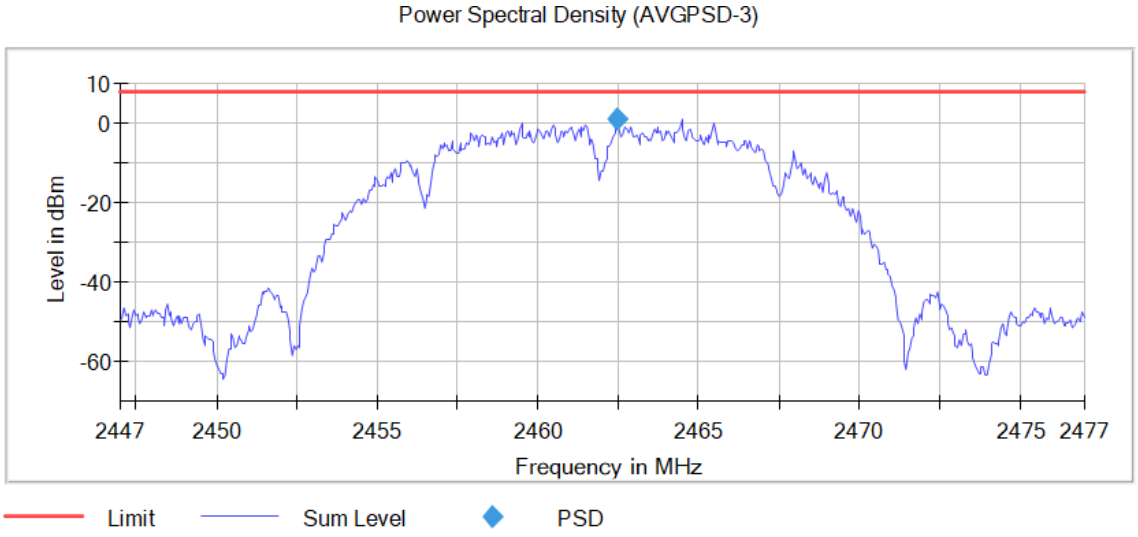
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-1.30
2442.00000	Digital Transmission System (DTS)	20	1	1	-0.28
2462.00000	Digital Transmission System (DTS)	20	1	1	-3.04

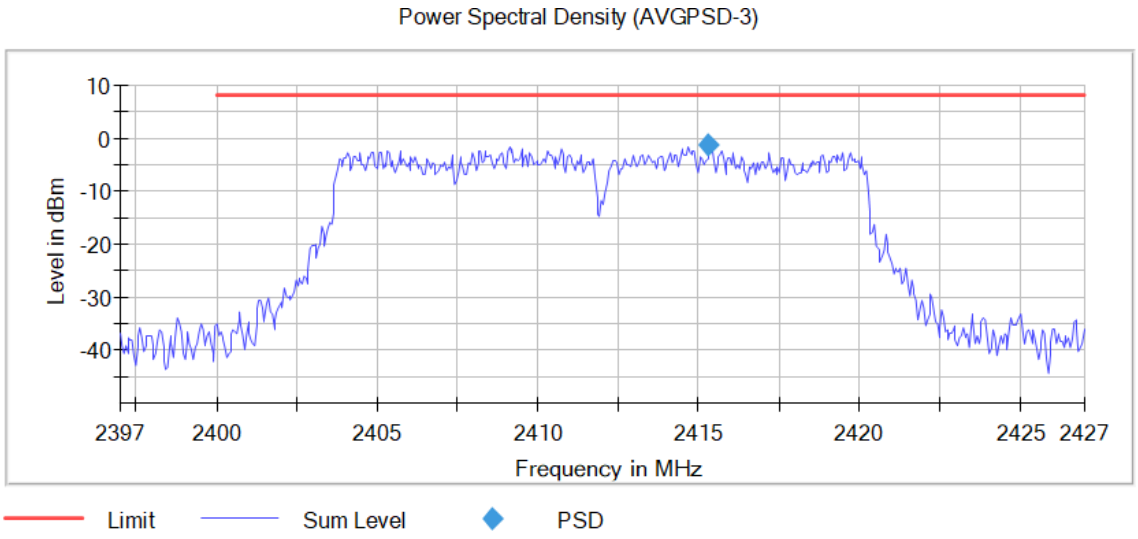
Verdict

Pass

Attachments

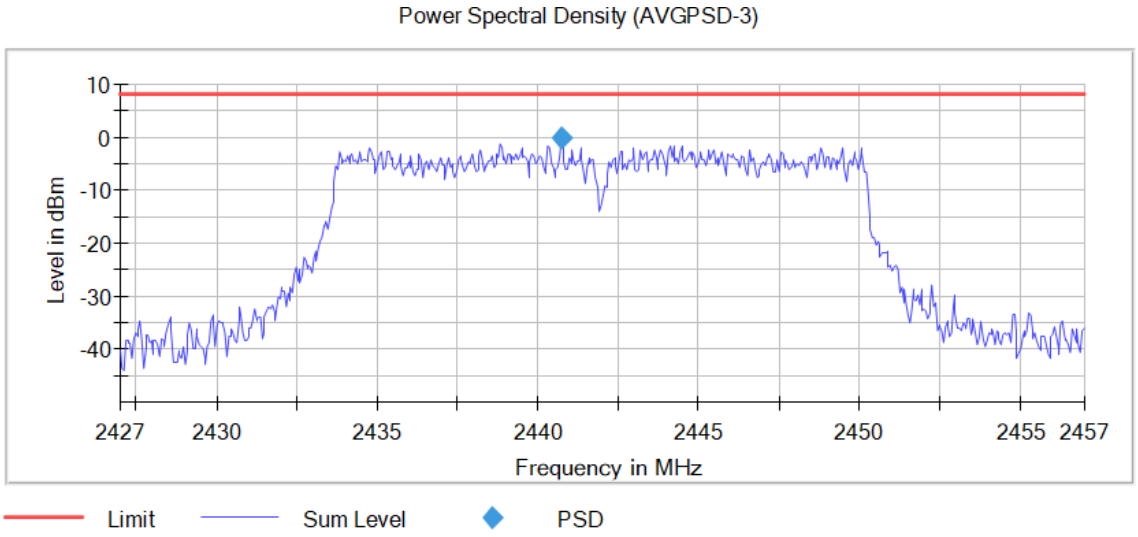
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



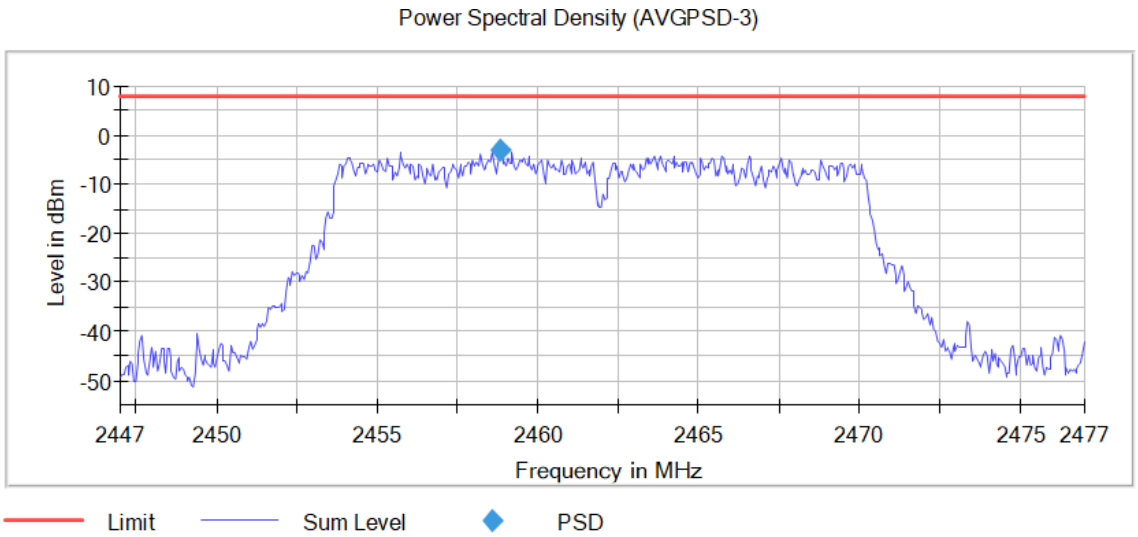
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-3.63
2442.00000	Digital Transmission System (DTS)	20	1	1	-0.25
2462.00000	Digital Transmission System (DTS)	20	1	1	-4.85

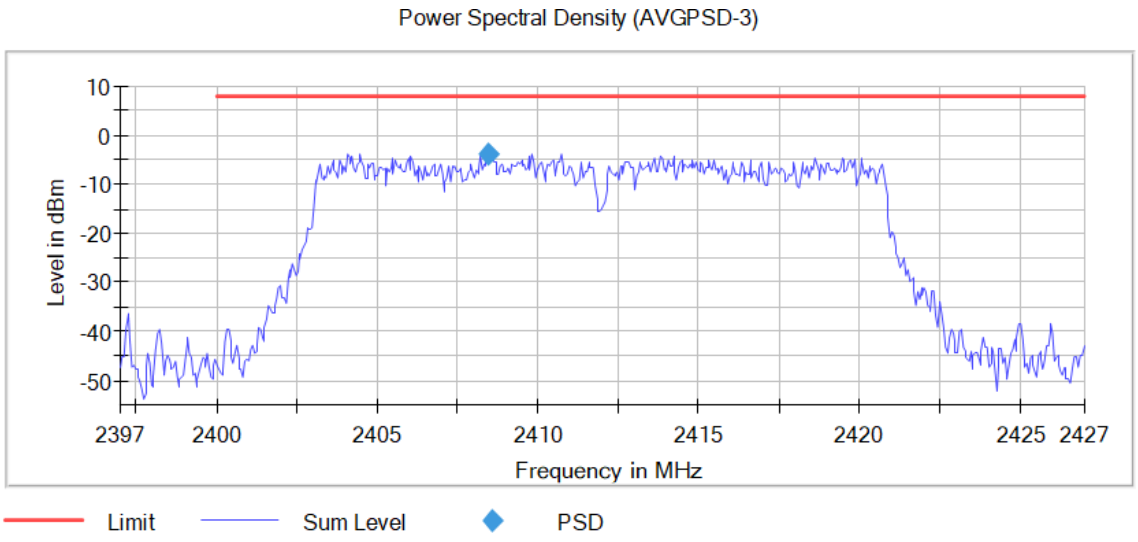
Verdict

Pass

Attachments

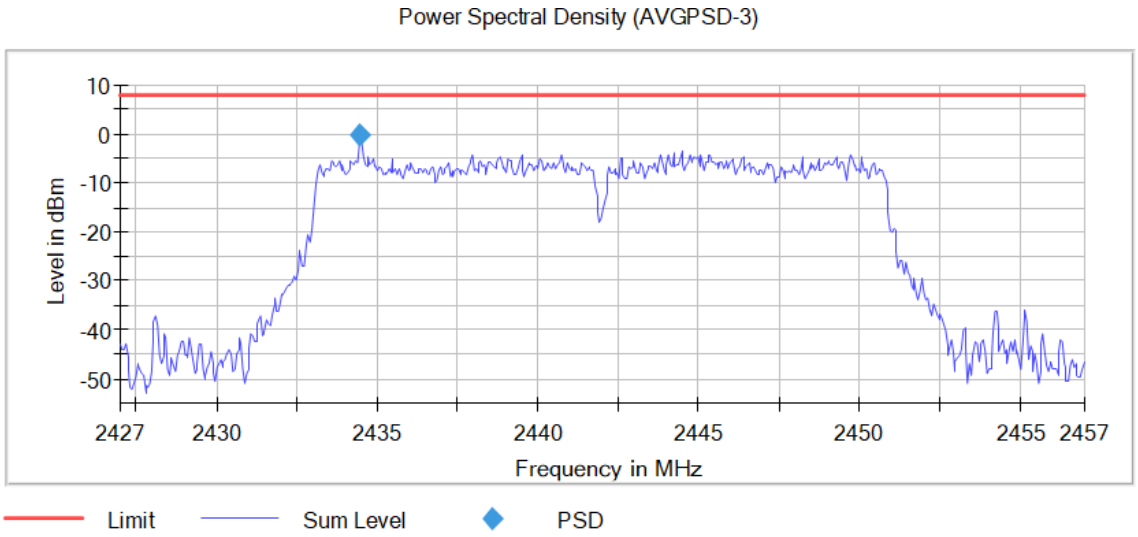
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



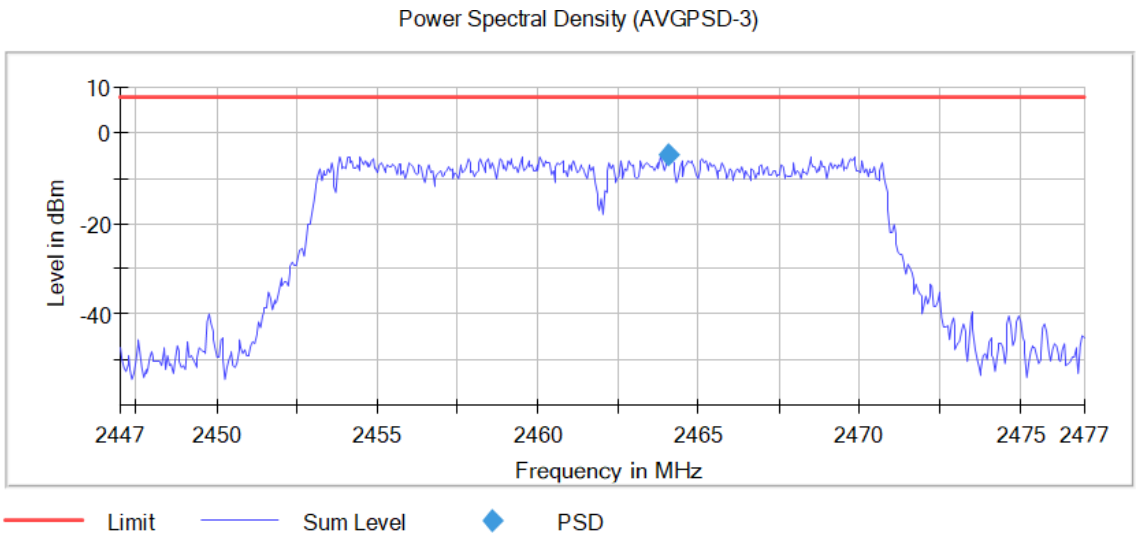
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39700 GHz	2.42200 GHz	2.44700 GHz
Stop Frequency	2.42700 GHz	2.45200 GHz	2.47700 GHz
Span	30.000 MHz	30.000 MHz	30.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
Sweep Points	600	600	600
Sweep time	12.000 ms	12.000 ms	12.000 ms
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	RMS	RMS	RMS
Sweep Count	1	1	1
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	Sweep	Sweep	Sweep
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	79 / max.150	83 / max. 150	94 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.05 dB	0.46 dB	0.25 dB

RSS-247 5.4 (d) / FCC 15.247 (b) (1) [Avcp] Maximum Average Conducted output Power

Limits

systems using digital modulation in the 2400 -2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (RSS-247).

Maximum declared antenna gain: 2.4 dBi

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	13.2	15.6
2442.00000	Digital Transmission System (DTS)	20	1	1	13.3	15.7
2462.00000	Digital Transmission System (DTS)	20	1	1	12.1	14.5

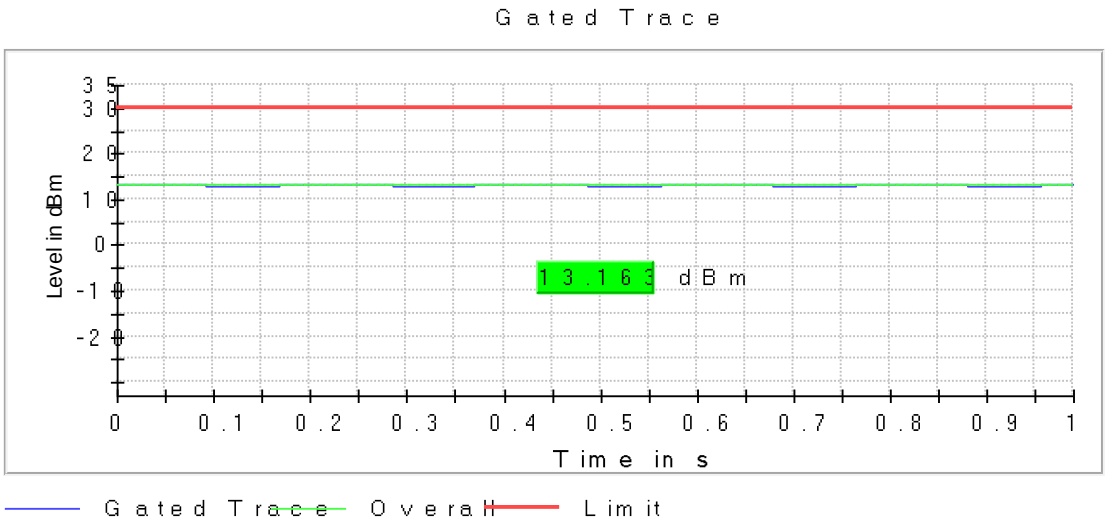
Verdict

Pass

Attachments

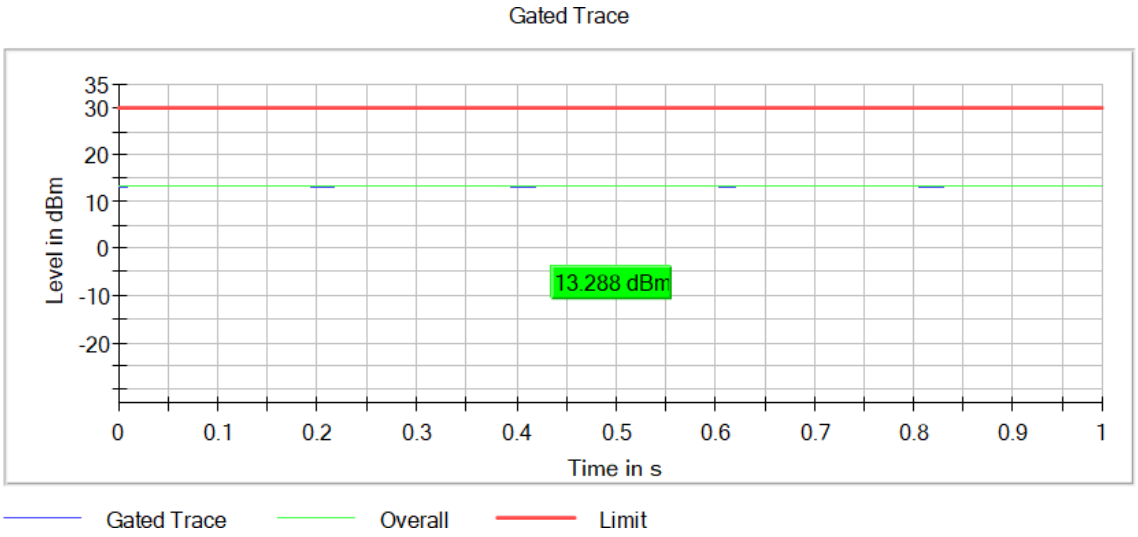
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



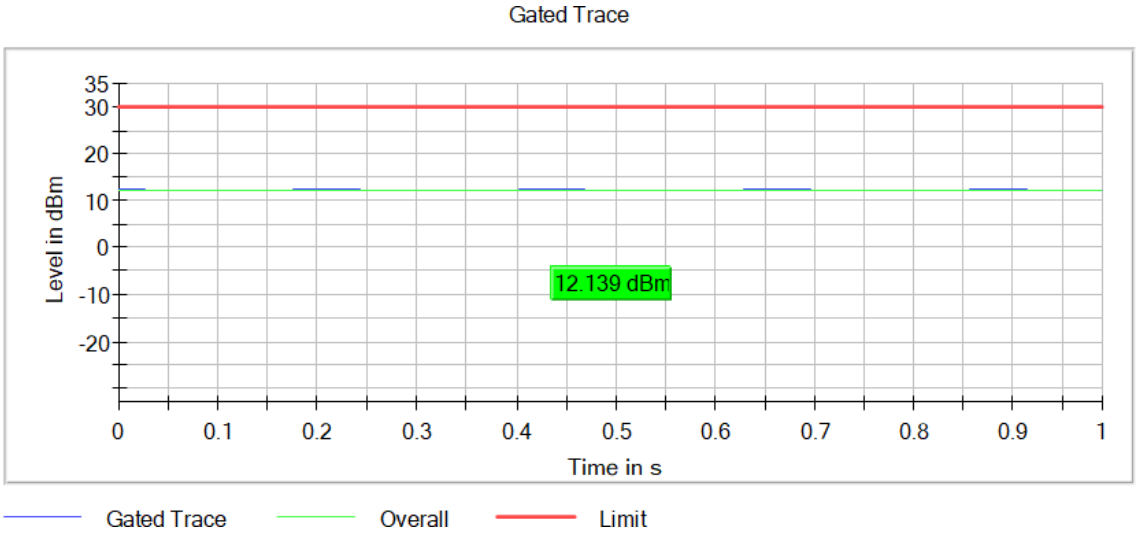
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	13.8	16.2
2442.00000	Digital Transmission System (DTS)	20	1	1	13.9	17.3
2462.00000	Digital Transmission System (DTS)	20	1	1	11.8	14.2

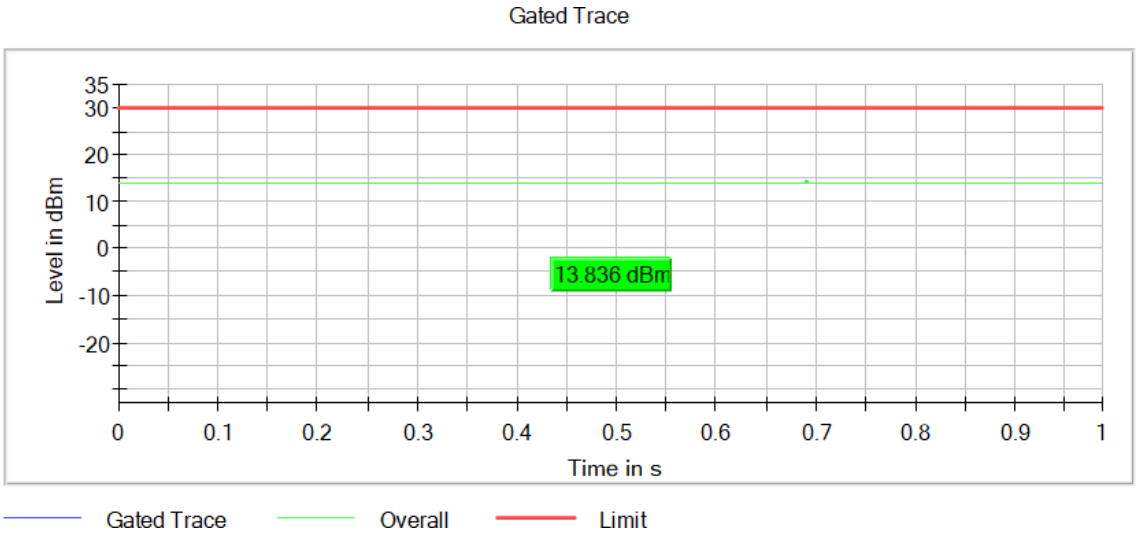
Verdict

Pass

Attachments

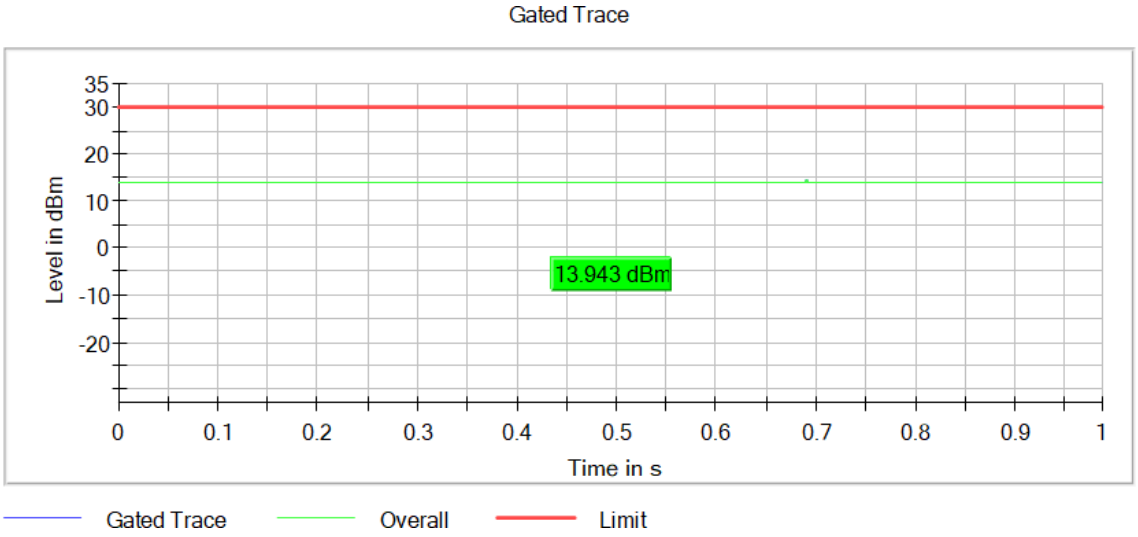
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



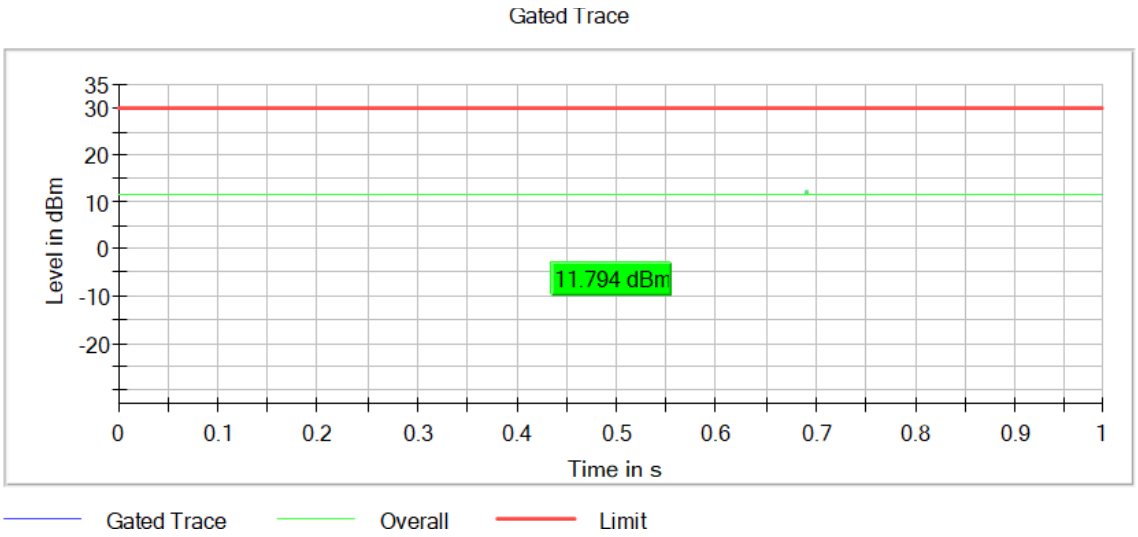
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	11.9	14.3
2442.00000	Digital Transmission System (DTS)	20	1	1	12.0	14.4
2462.00000	Digital Transmission System (DTS)	20	1	1	10.8	13.2

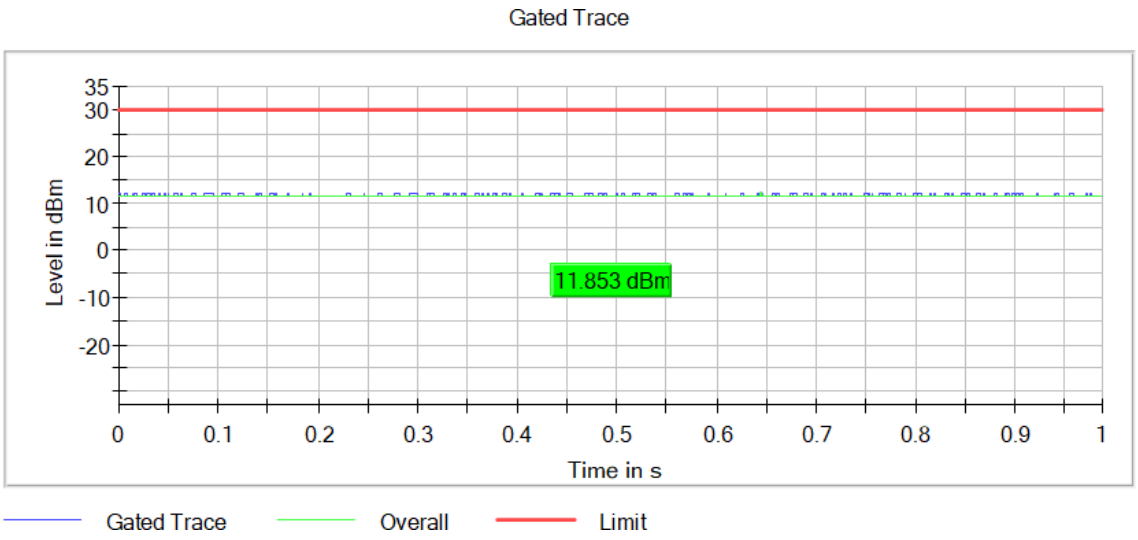
Verdict

Pass

Attachments

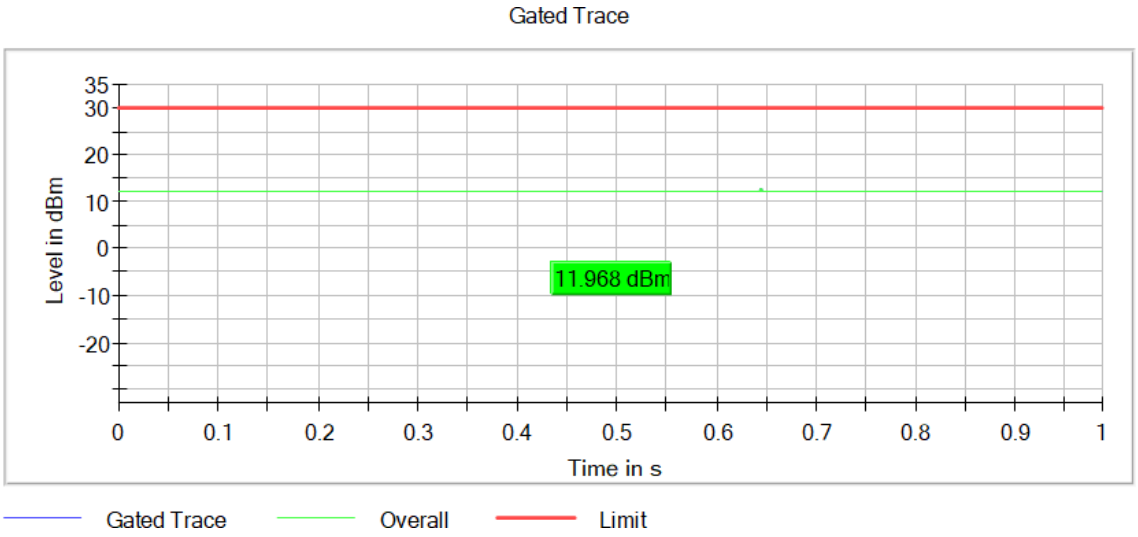
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



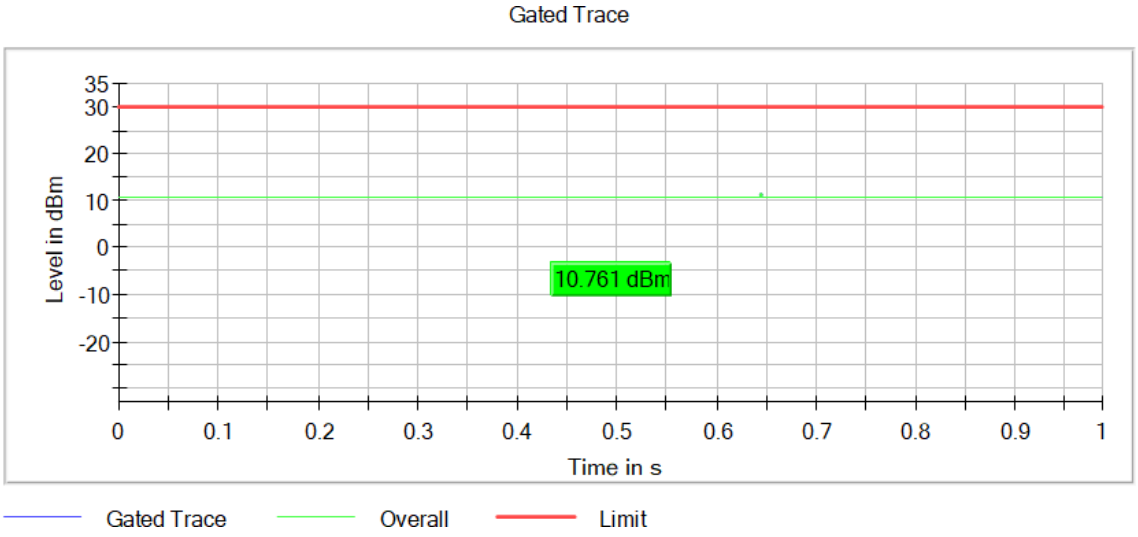
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Measurement Setup

Setting	Instrument Value
Measurement Time	1.000 s
Points	1000000
Time resolution	1.000 µs

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: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	Lvl (dBm)
2398.475000	-41.7
2398.425000	-41.8
2398.975000	-42.0
2398.925000	-42.3
2397.975000	-42.4
2397.925000	-42.7
2396.975000	-42.9
2398.525000	-42.9
2399.025000	-42.9
2483.525000	-53.7
2484.475000	-53.8
2484.425000	-53.9
2484.525000	-54.1
2483.675000	-54.9
2483.625000	-55.0
2484.575000	-55.0
2484.625000	-55.0
2484.775000	-55.0
2397.475000	-43.0
2397.425000	-43.1
2396.925000	-43.2
2399.225000	-43.2
2399.475000	-43.2
2399.175000	-43.3
2484.875000	-55.0
2484.275000	-55.3
2484.725000	-55.4
2484.375000	-55.4
2484.325000	-55.4
2484.675000	-55.5

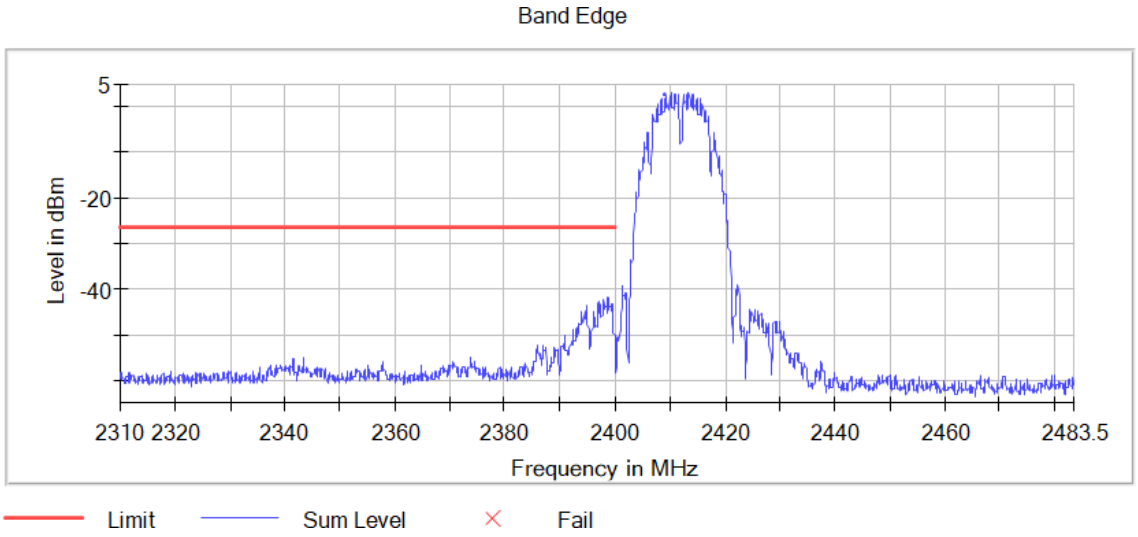
Verdict

Pass

Attachments

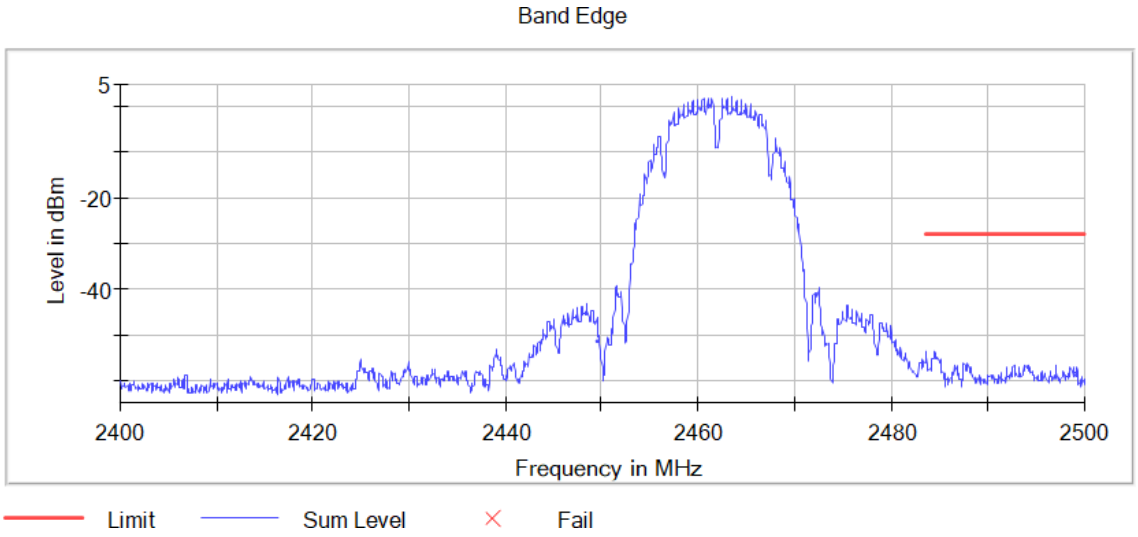
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Lvl (dBm)
2398.875000	-28.4
2398.825000	-28.4
2399.425000	-29.5
2399.475000	-29.6
2398.475000	-29.6
2398.925000	-29.7
2397.975000	-29.9
2399.725000	-29.9
2399.175000	-29.9
2484.825000	-43.8
2483.775000	-43.9
2483.725000	-43.9
2484.775000	-44.0
2483.625000	-44.2
2483.575000	-44.2
2484.175000	-44.2
2485.075000	-44.4
2483.975000	-44.5
2399.075000	-30.0
2399.775000	-30.0
2399.225000	-30.0
2398.525000	-30.0
2398.775000	-30.0
2399.125000	-30.1
2484.225000	-44.6
2485.425000	-44.6
2483.875000	-44.6
2485.375000	-44.7
2483.825000	-44.7
2485.025000	-44.7

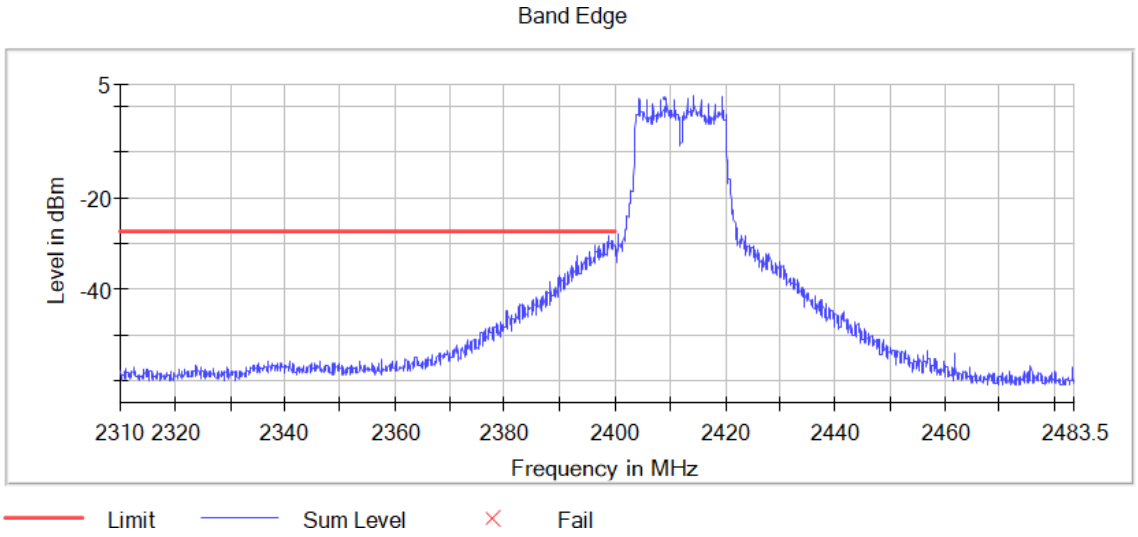
Verdict

Pass

Attachments

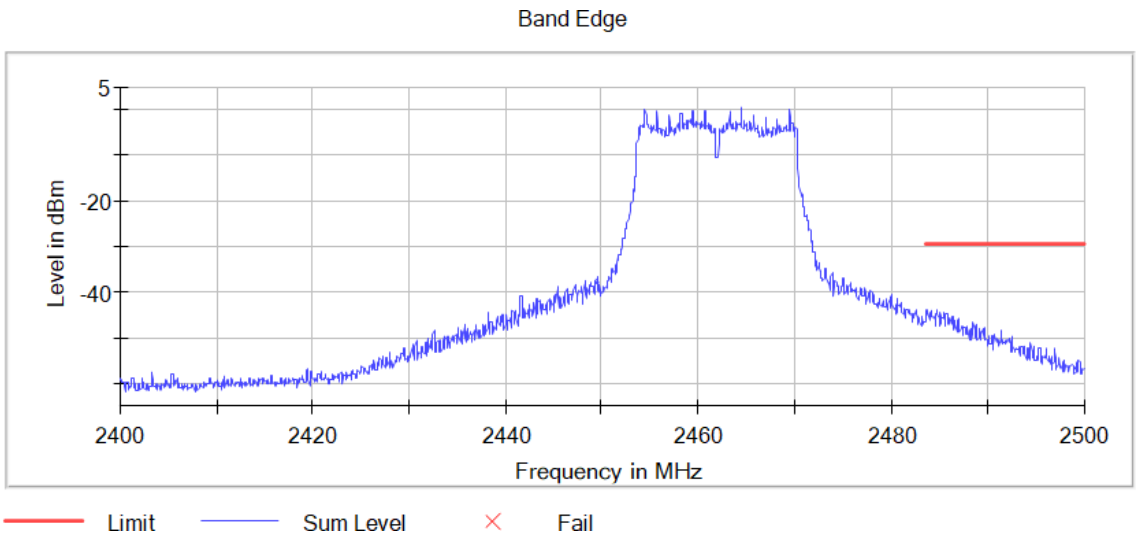
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Modulation: 802.11n HT20 (OFDM MCS1)
Results

Freq (MHz)	Lvl (dBm)
2399.625000	-33.2
2399.575000	-33.3
2399.525000	-33.7
2397.225000	-33.9
2399.675000	-34.0
2397.175000	-34.0
2397.275000	-34.2
2398.175000	-34.4
2399.925000	-34.4
2485.725000	-44.1
2484.475000	-44.3
2486.325000	-44.3
2484.125000	-44.4
2484.175000	-44.5
2483.875000	-44.6
2484.425000	-44.6
2483.825000	-44.7
2484.525000	-44.7
2398.475000	-34.5
2398.225000	-34.5
2399.875000	-34.5
2399.475000	-34.5
2397.825000	-34.5
2398.525000	-34.5
2486.375000	-44.8
2486.425000	-44.9
2483.525000	-45.0
2485.775000	-45.1
2483.575000	-45.2
2485.675000	-45.5

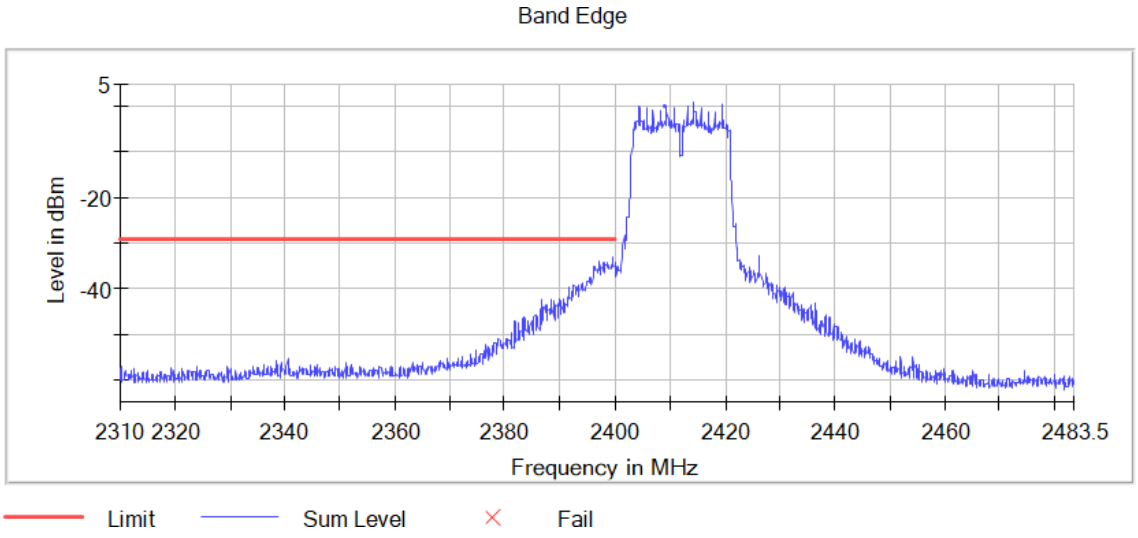
Verdict

Pass

Attachments

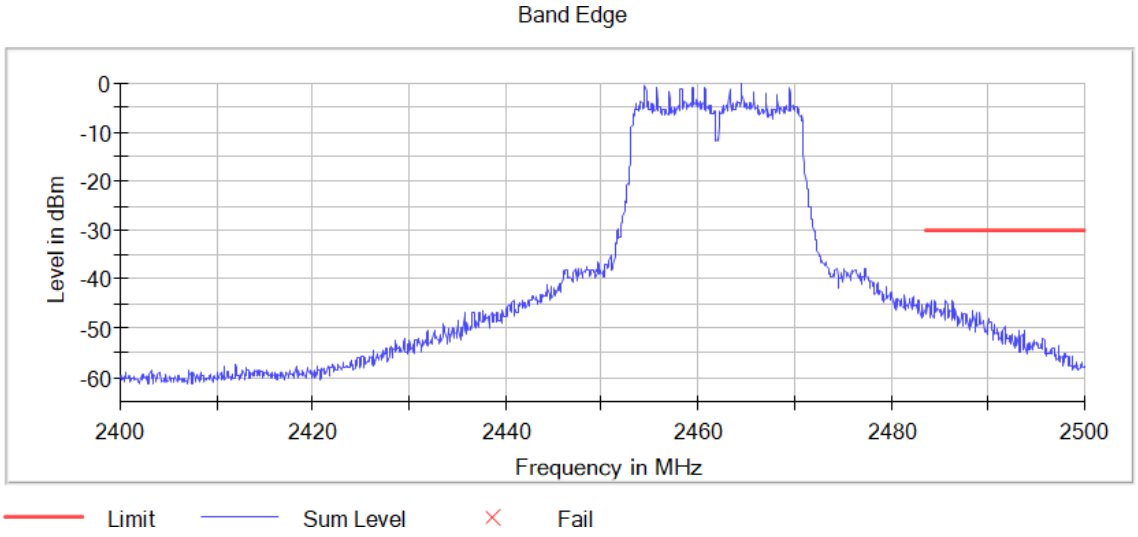
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



Measurement Setup

Setting	Instrument Value	Instrument Value
Start Frequency	2.31000	2.40000 GHz
Stop Frequency	2.40000	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	9 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.07 dB

FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%

Modulation: 802.11b (DSSS 1 Mbit/s)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000	Digital Transmission System (DTS)	20	1	1	13.400
2442.00000	Digital Transmission System (DTS)	20	1	1	13.300
2462.00000	Digital Transmission System (DTS)	20	1	1	13.300

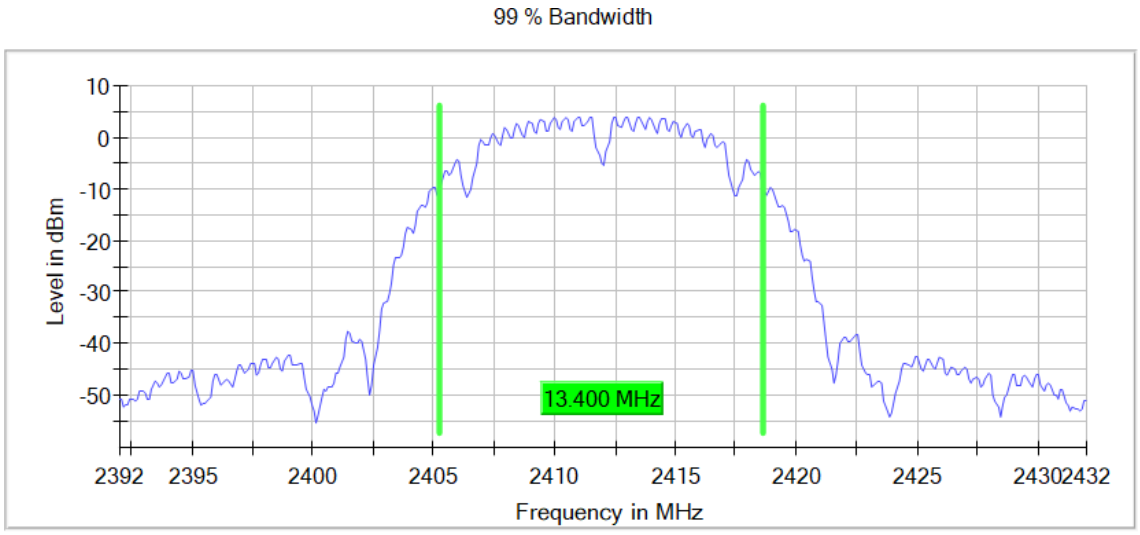
Verdict

Pass

Attachments

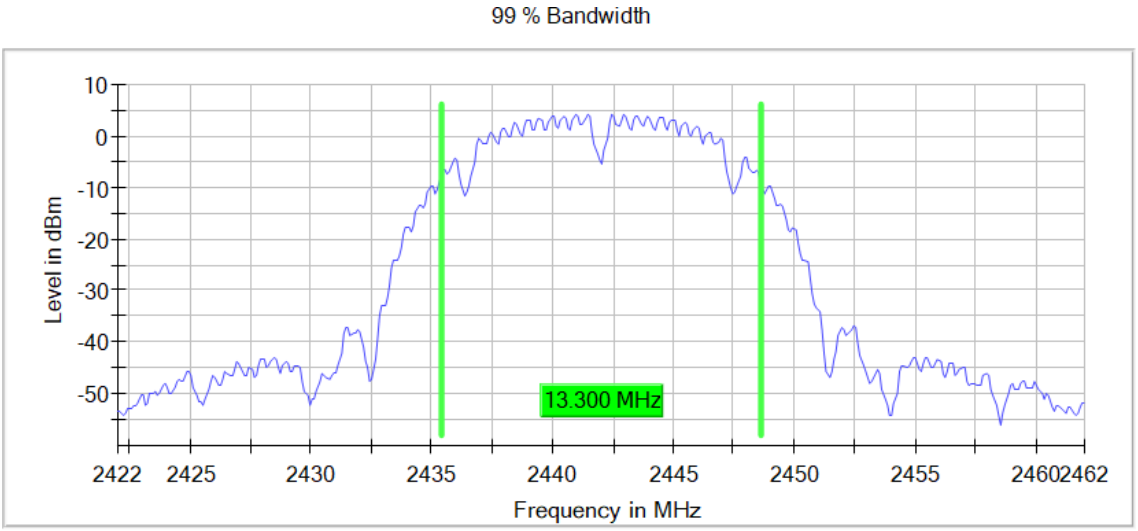
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



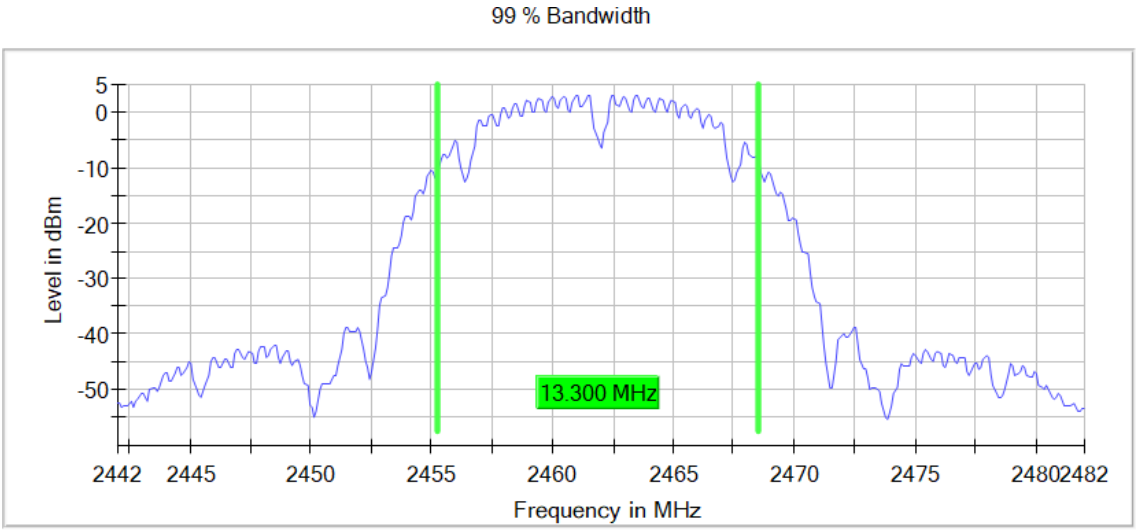
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000	Digital Transmission System (DTS)	20	1	1	16.700
2442.00000	Digital Transmission System (DTS)	20	1	1	16.700
2462.00000	Digital Transmission System (DTS)	20	1	1	16.600

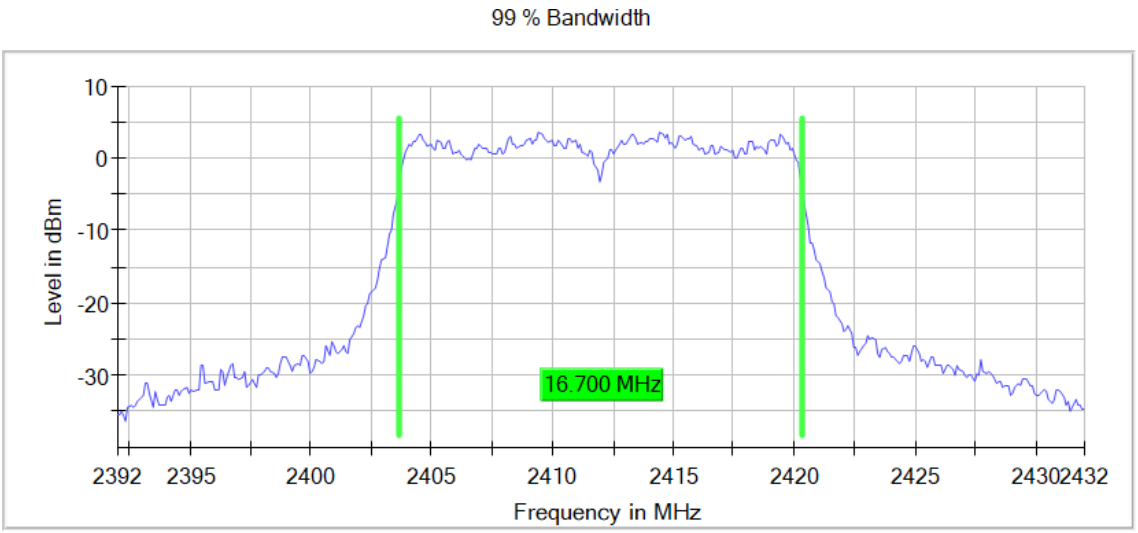
Verdict

Pass

Attachments

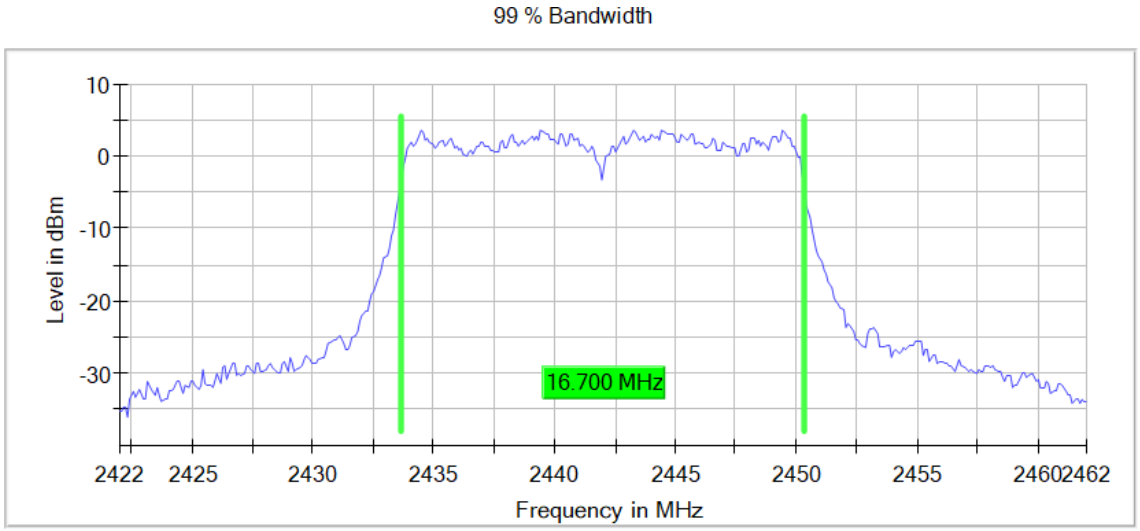
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



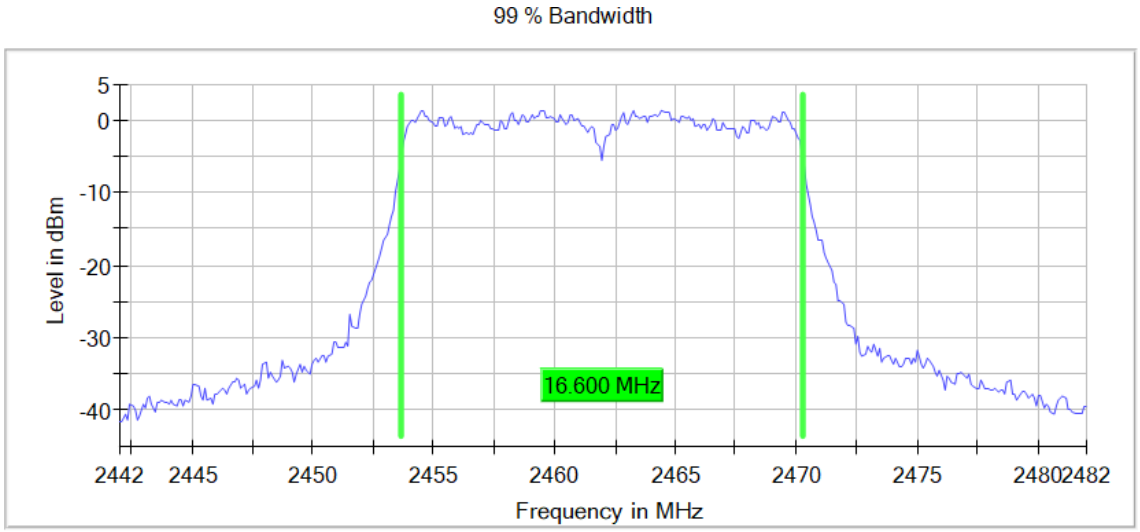
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000	Digital Transmission System (DTS)	20	1	1	17.700
2442.00000	Digital Transmission System (DTS)	20	1	1	17.700
2462.00000	Digital Transmission System (DTS)	20	1	1	17.600

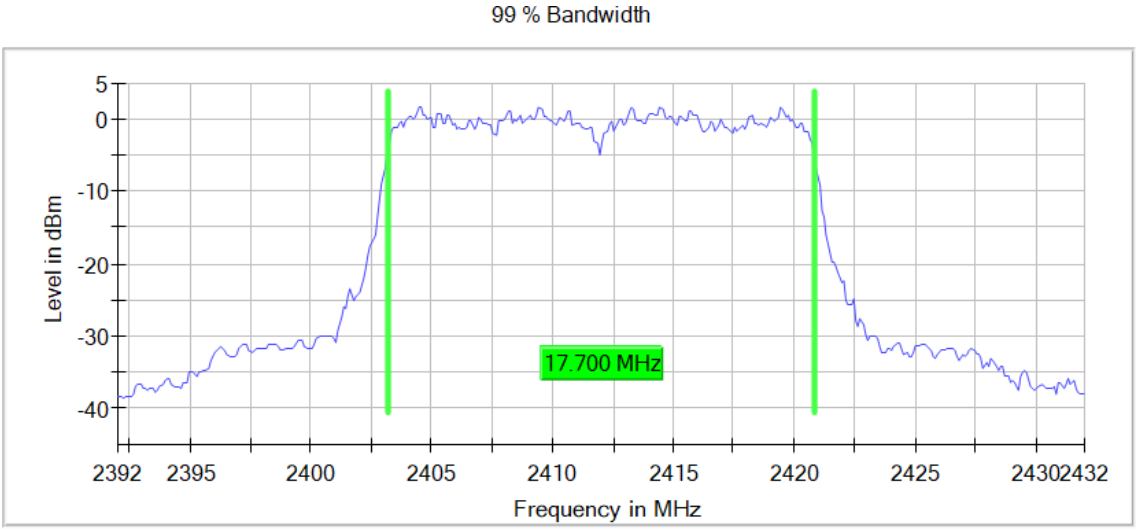
Verdict

Pass

Attachments

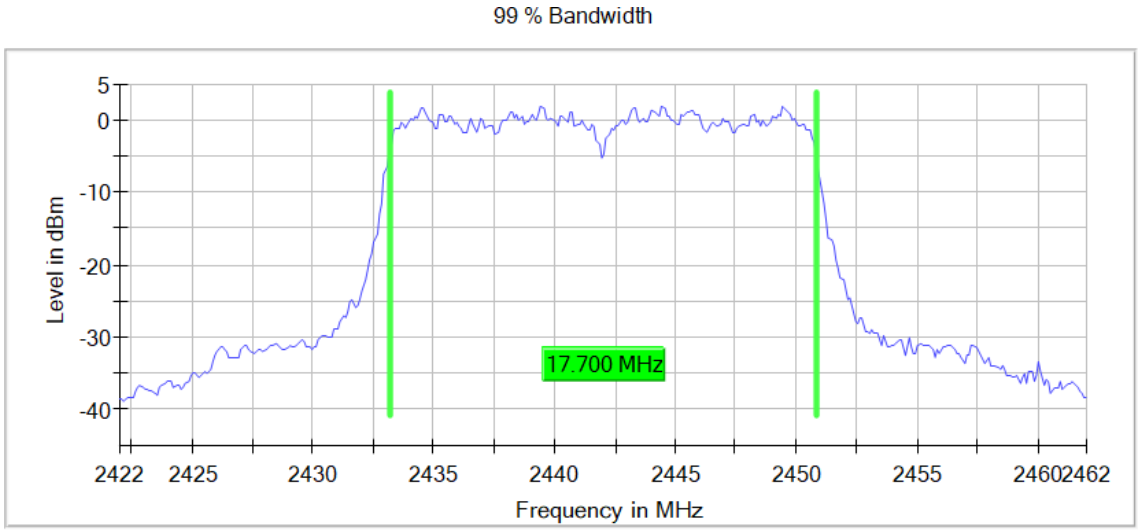
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



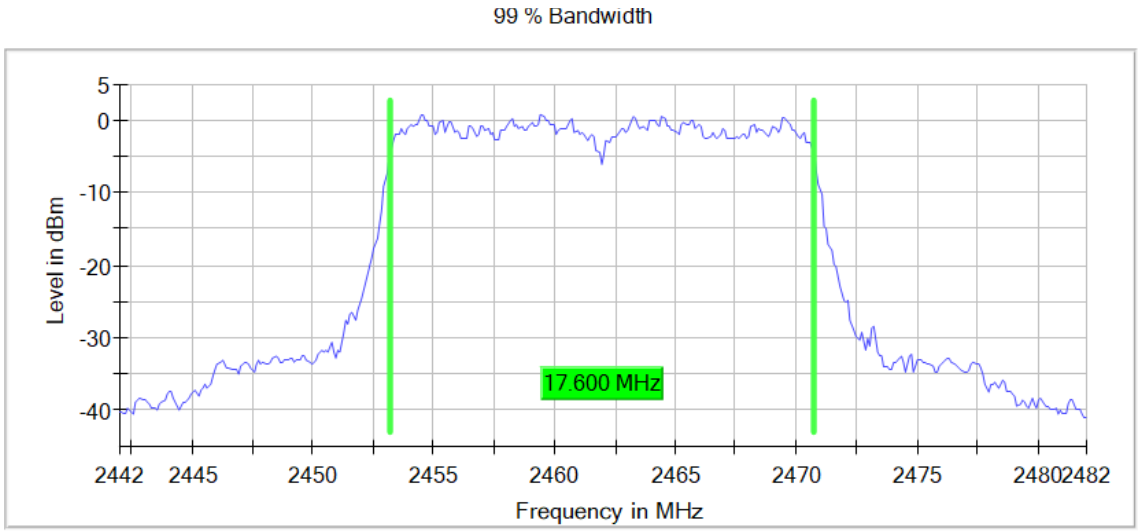
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS1), Number of Transmission Chains = 1, Active Port = 1

Images:



Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39200 GHz	2.41700 GHz	2.44200 GHz
Stop Frequency	2.43200 GHz	2.45700 GHz	2.48200 GHz
Span	40.00 MHz	40.000 MHz	40.000 MHz
RBW	200.000 kHz	200.000 kHz	200.000 kHz
VBW	1.000 MHz	1.000 MHz	1.000 MHz
Sweep Points	400	400	400
Sweep time	28.447 µs	28.447 µs	28.447 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	15 / max. 150	16 / max. 150	16 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.04 dB	0.02 dB	0.32 dB

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

Limits

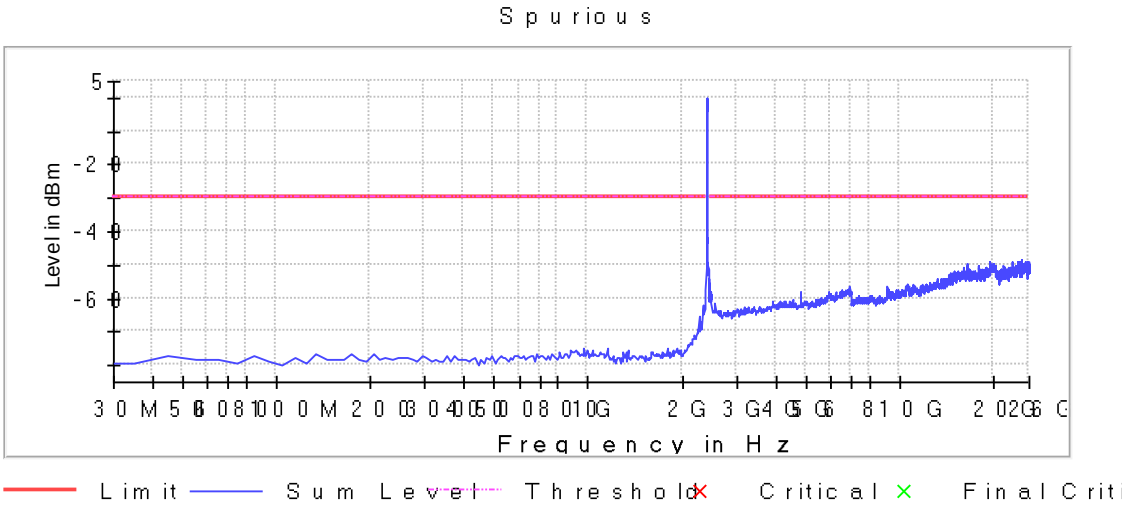
In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

Modulation: 802.11b

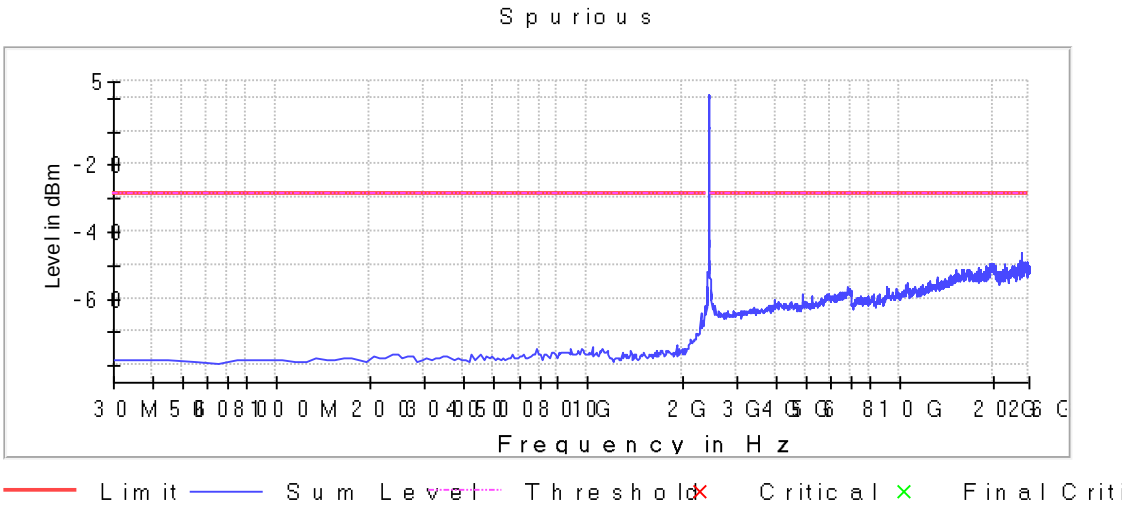
Results

Conducted spurious signals detected were minimum 16 dB respect to the limit for the lowest, middle and highest operating channels.

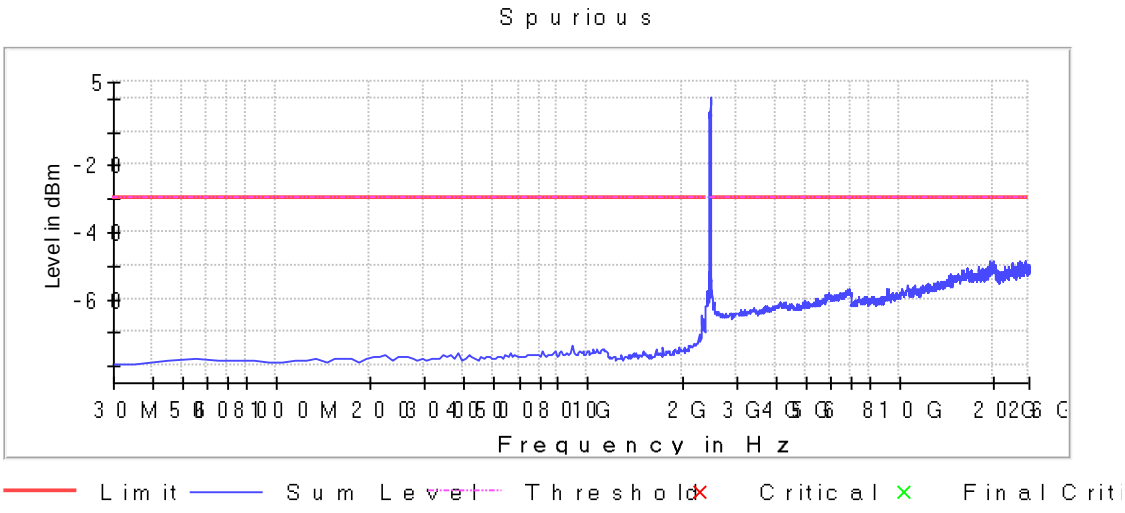
Lowest Channel



Middle Channel



Highest Channel



Verdict

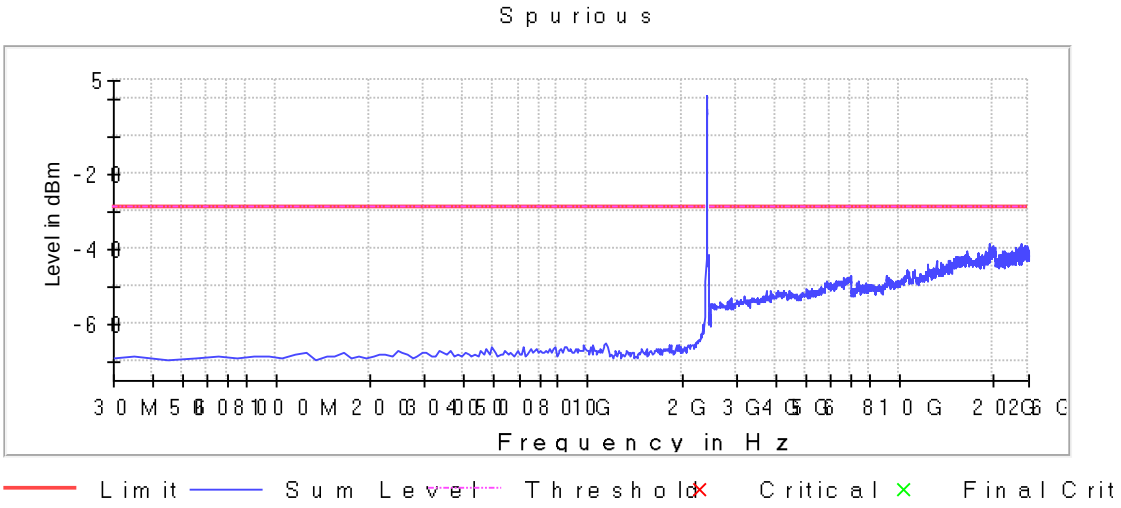
Pass

Modulation: 802.11g (DSS 6 Mbit/s)

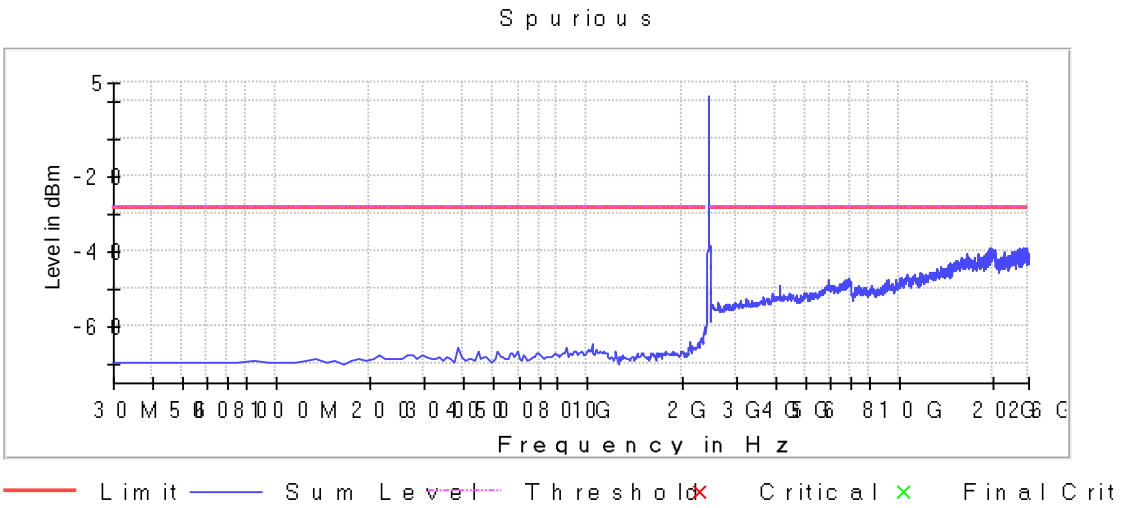
Results

Conducted spurious signals detected were minimum 10 dB respect to the limit for the lowest, middle and highest operating channels.

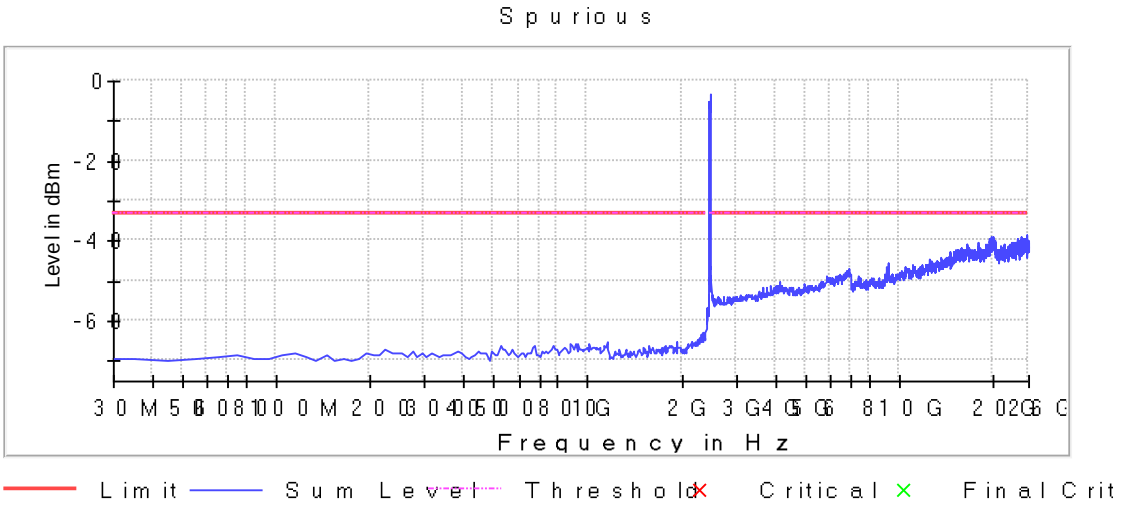
Lowest Channel



Middle Channel



Highest Channel



Verdict

Pass

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 §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	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

Verdict

Pass

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

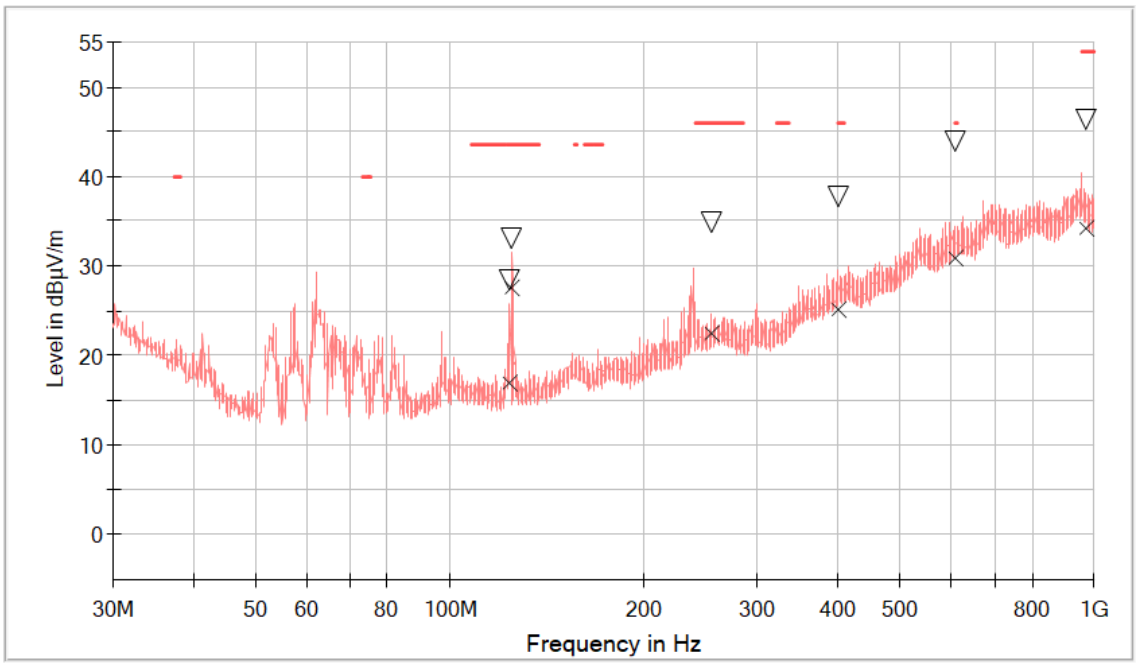
Freq (MHz)	Equipment	Freq Rng (GHz)	# of Tx Chains	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	124.138	17.00	V	QP
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	124.963	27.50	V	QP
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	255.671	22.40	H	QP
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	401.995	25.10	V	QP
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	609.866	31.00	H	QP
2442.00000	Digital Transmission System (DTS)	[0.03, 1]	1	1	971.094	34.30	V	QP
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2413.000	91.20	V	AVG
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	4935.000	40.20	H	AVG
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	5127.000	43.80	V	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	1598.000	40.70	H	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	17995.500	49.20	V	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2443.000	90.50	H	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	1597.500	39.10	H	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	17979.000	49.00	V	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2463.000	90.10	H	AVG

Verdict

Pass

Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Frequency Range GHz = [0.03, 1], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



PK+_MAXH
TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz) Restricted Bands QPK Limit
MaxPeak-PK+ (Single)
QuasiPeak-QPK (Single)

Tables:

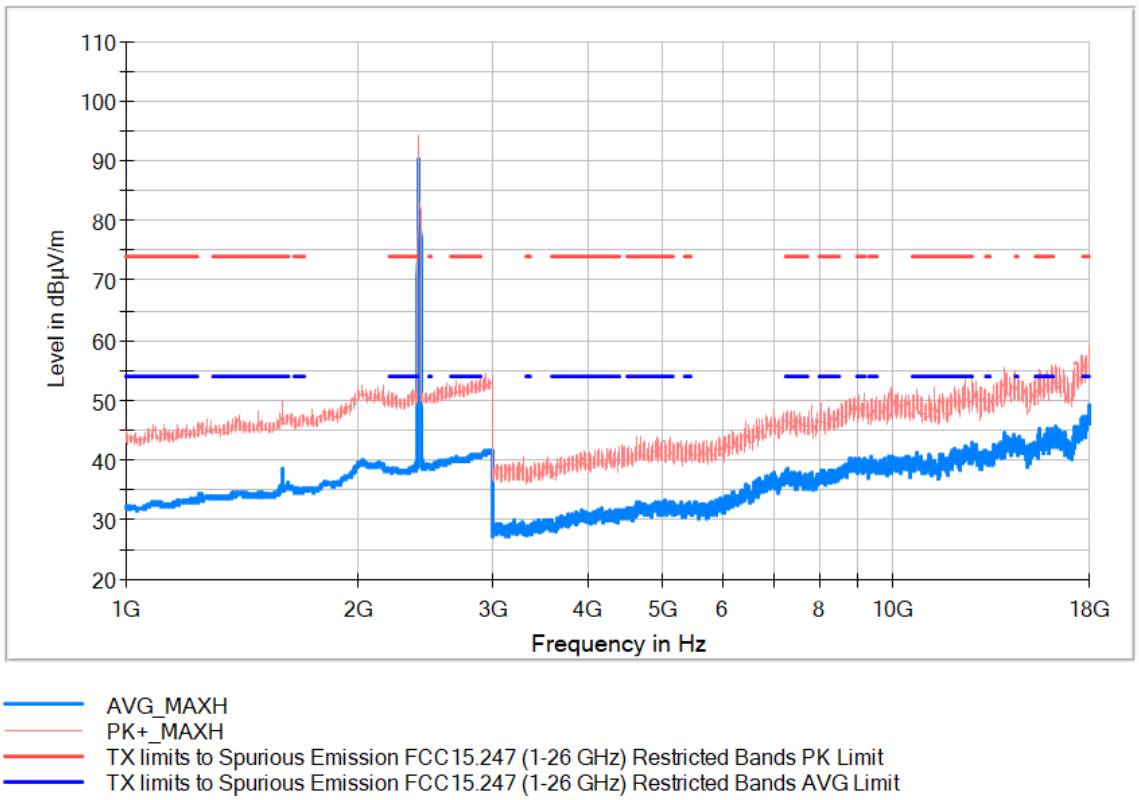
Spectrum Analyzer Parameters

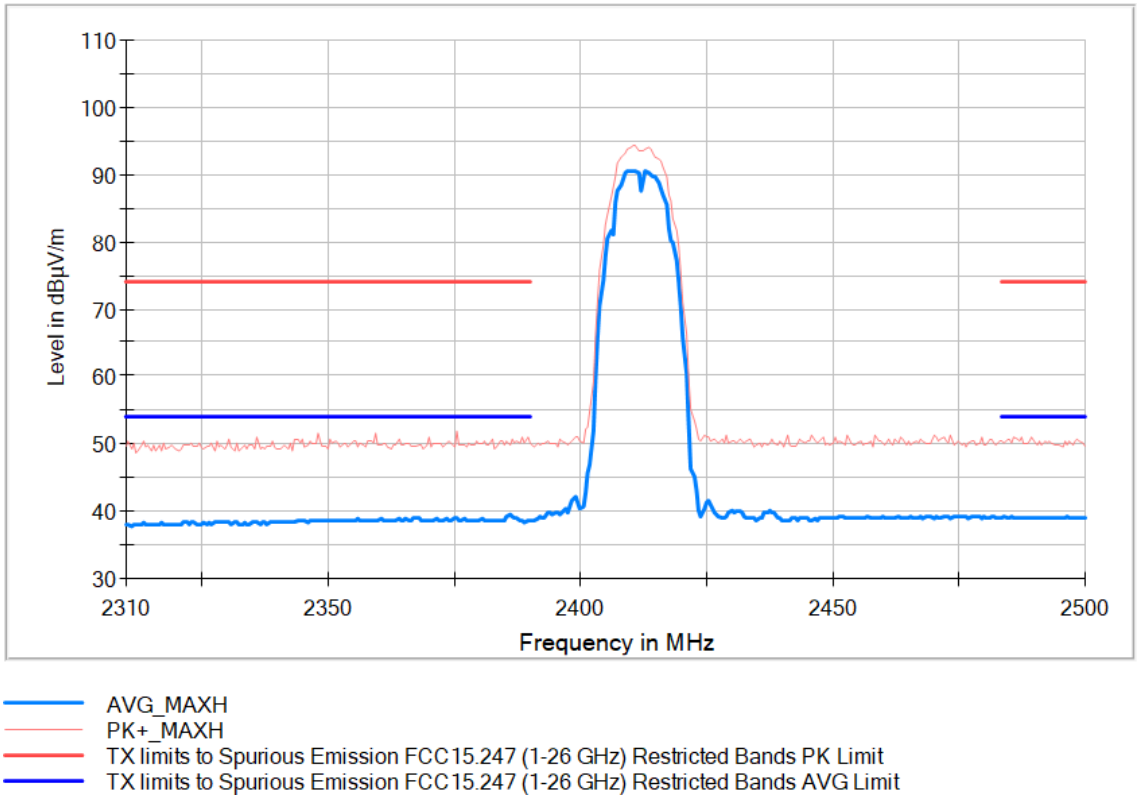
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s	20 dB

Attachments

Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:





Tables:

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 3 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
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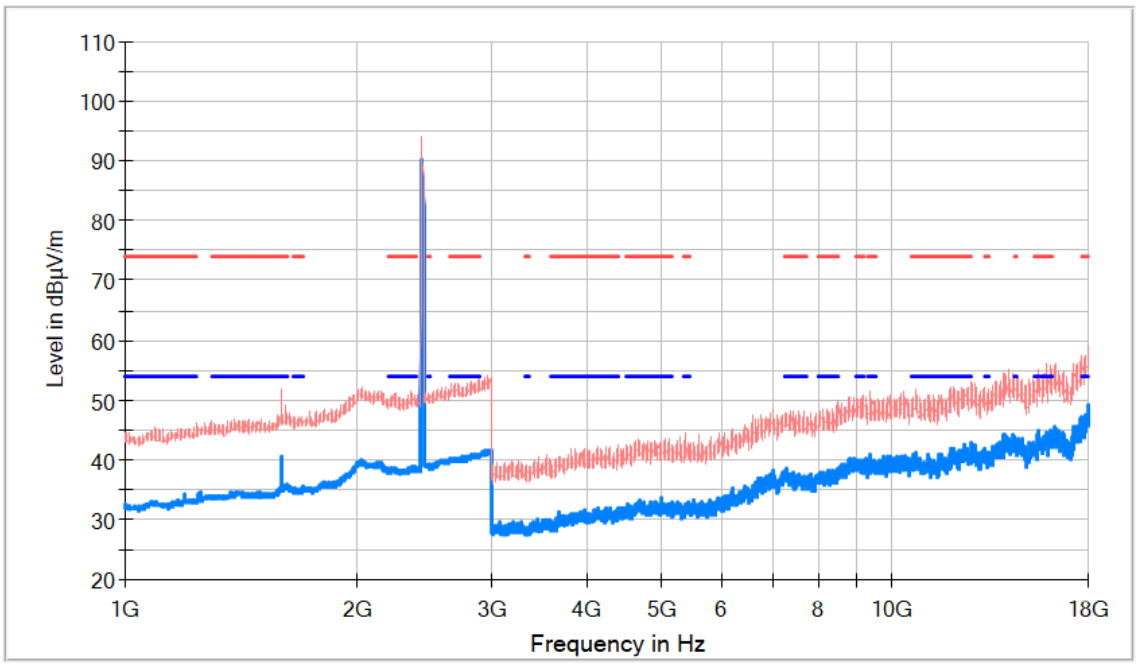
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



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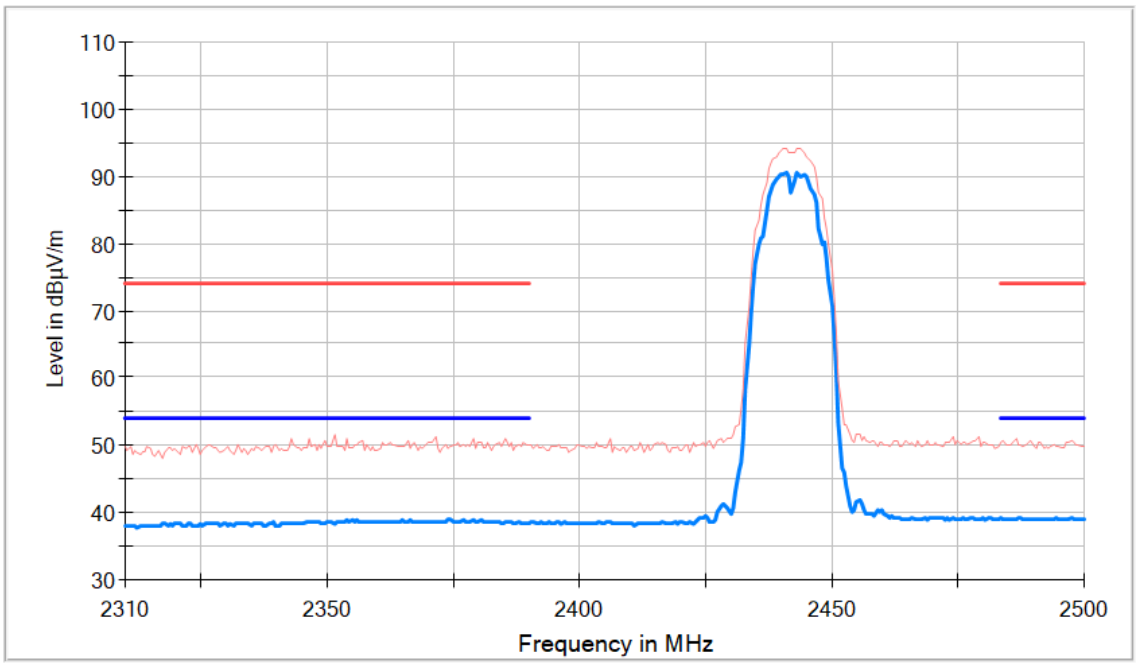
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit



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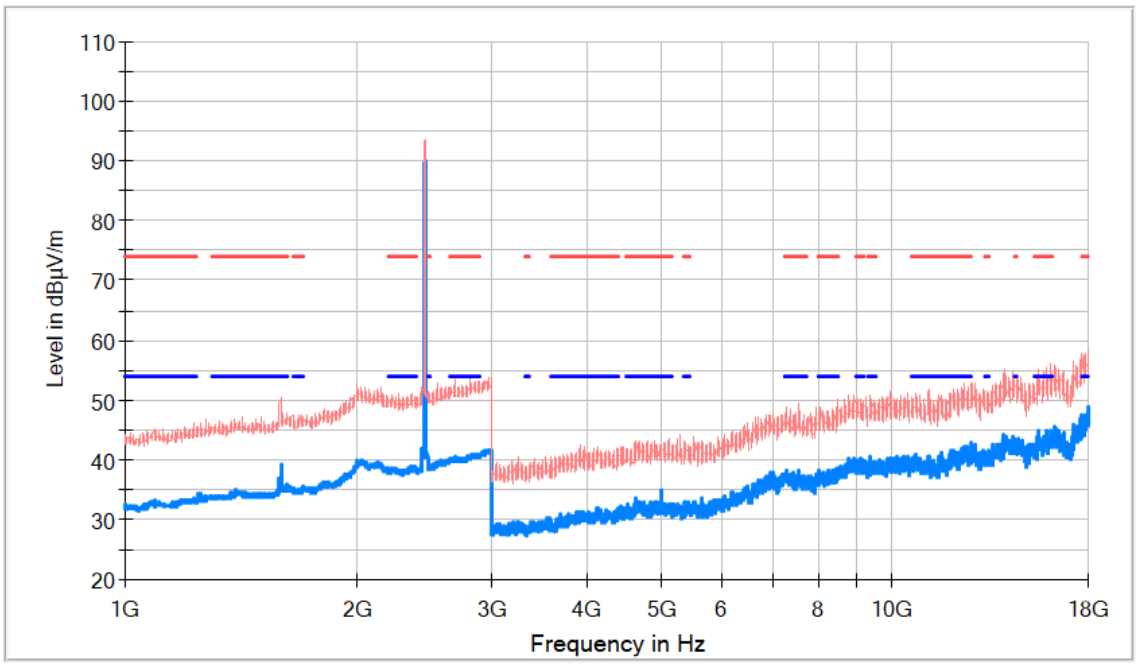

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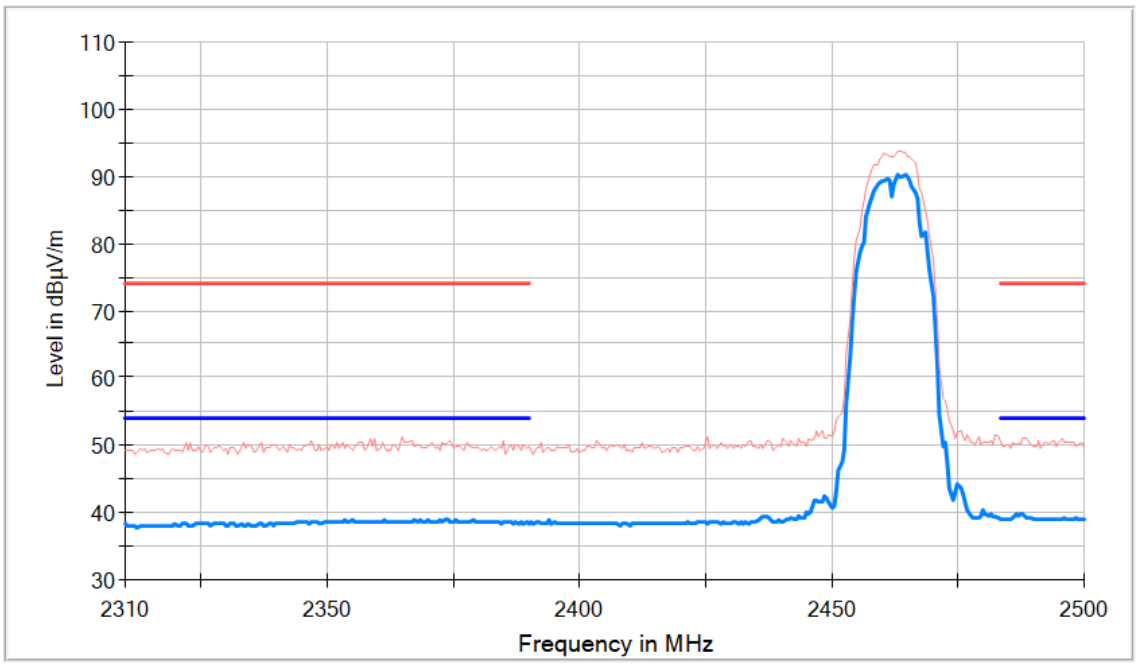

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Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Equipment	Freq Rng (GHz)	# of Tx Chains	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	17994.500	49.10	V	AVG
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2408.500	87.50	V	AVG
2412.00000	Digital Transmission System (DTS)	[1, 18]	1	1	4999.500	35.00	V	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	15868.000	44.90	H	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	17982.000	48.70	V	AVG
2442.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2444.000	87.90	H	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	17992.000	49.10	V	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	2464.500	87.10	H	AVG
2462.00000	Digital Transmission System (DTS)	[1, 18]	1	1	5000.000	35.10	V	AVG

Verdict

Pass

Attachments

Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [1, 18], Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

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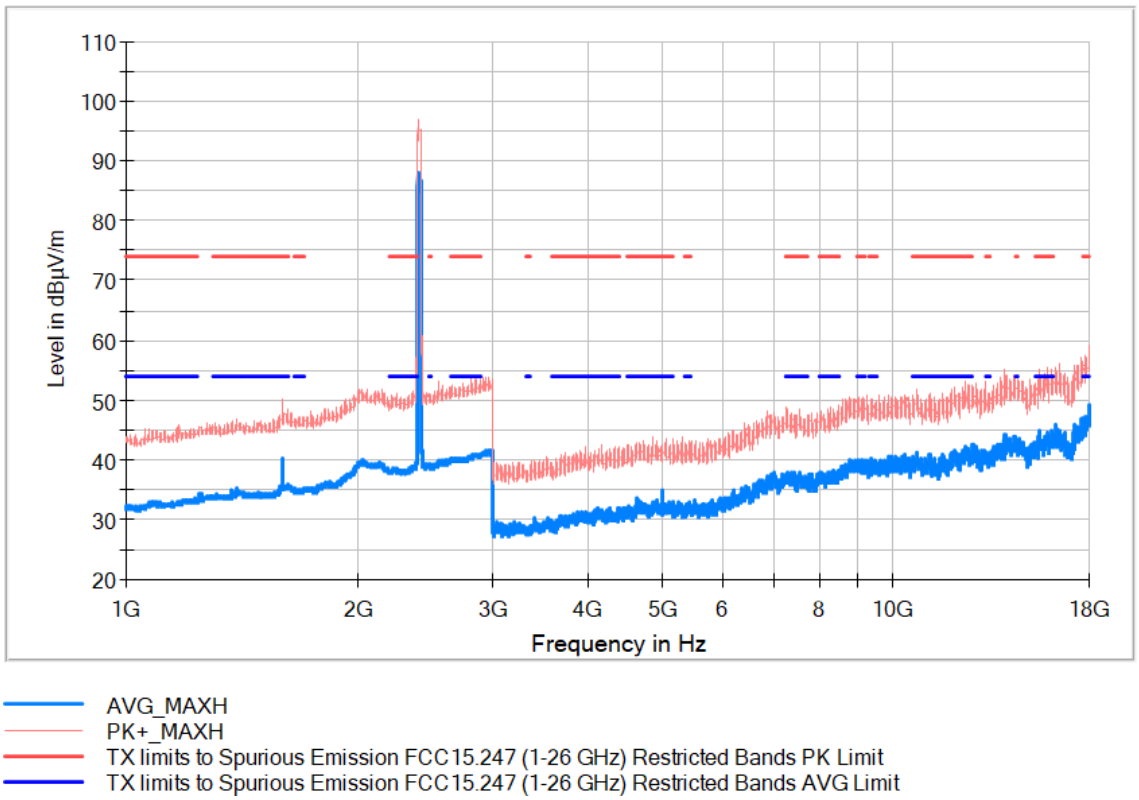

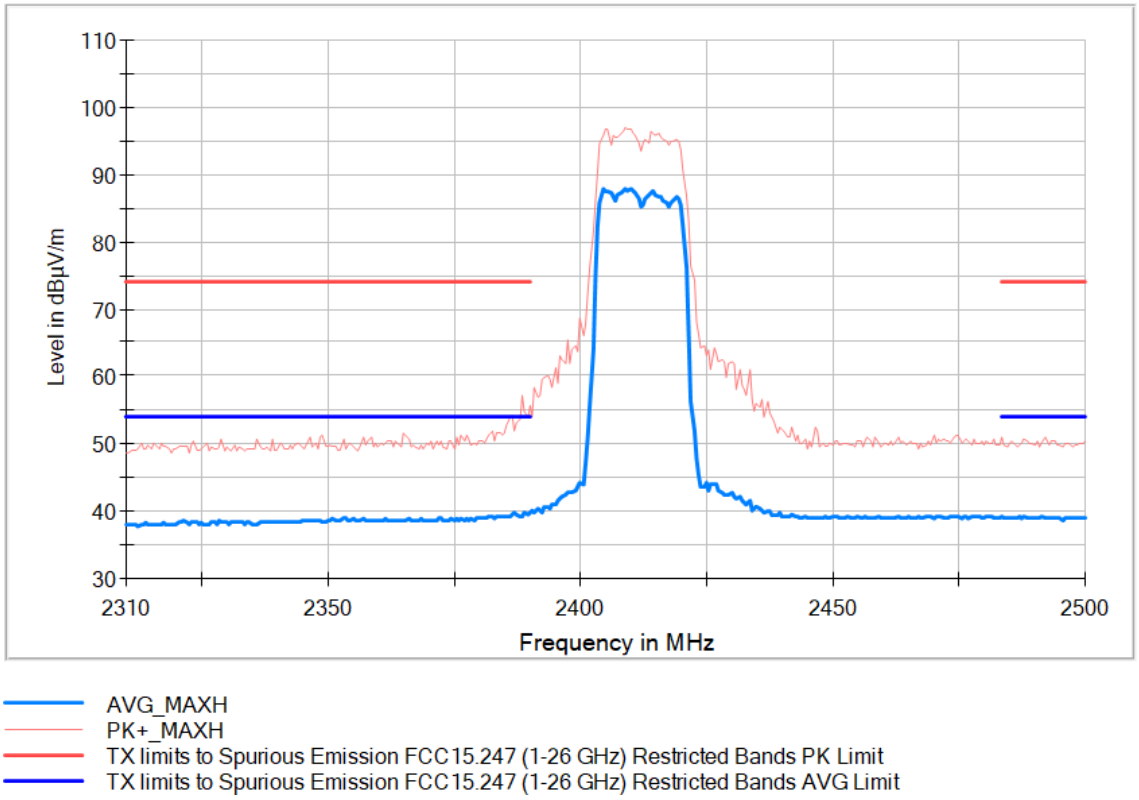

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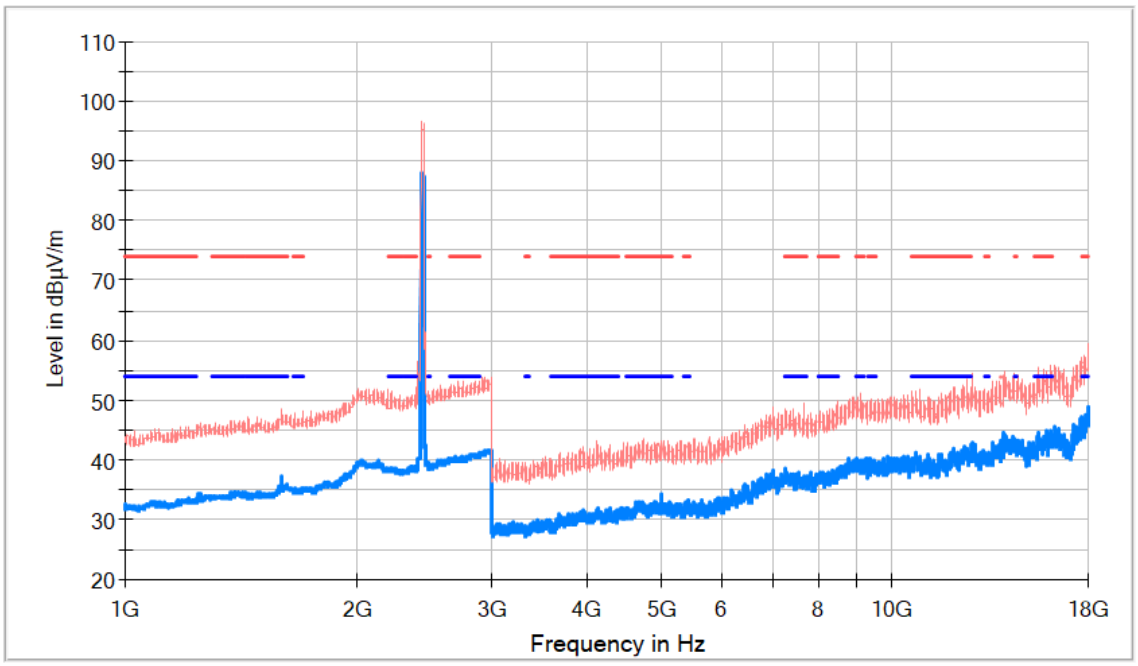

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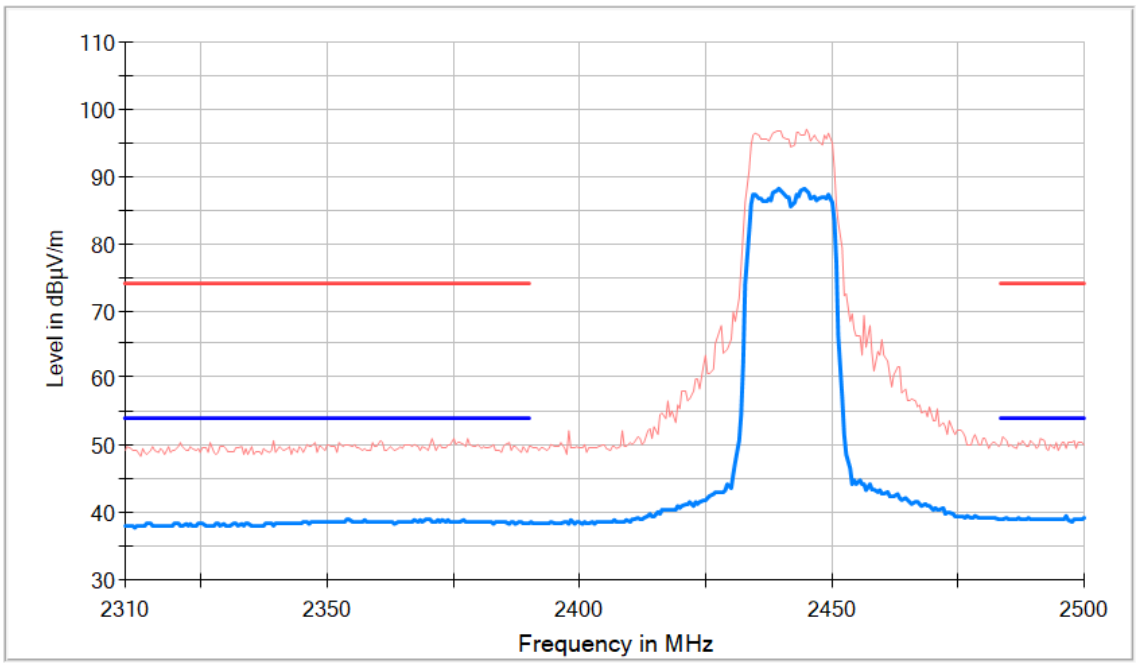

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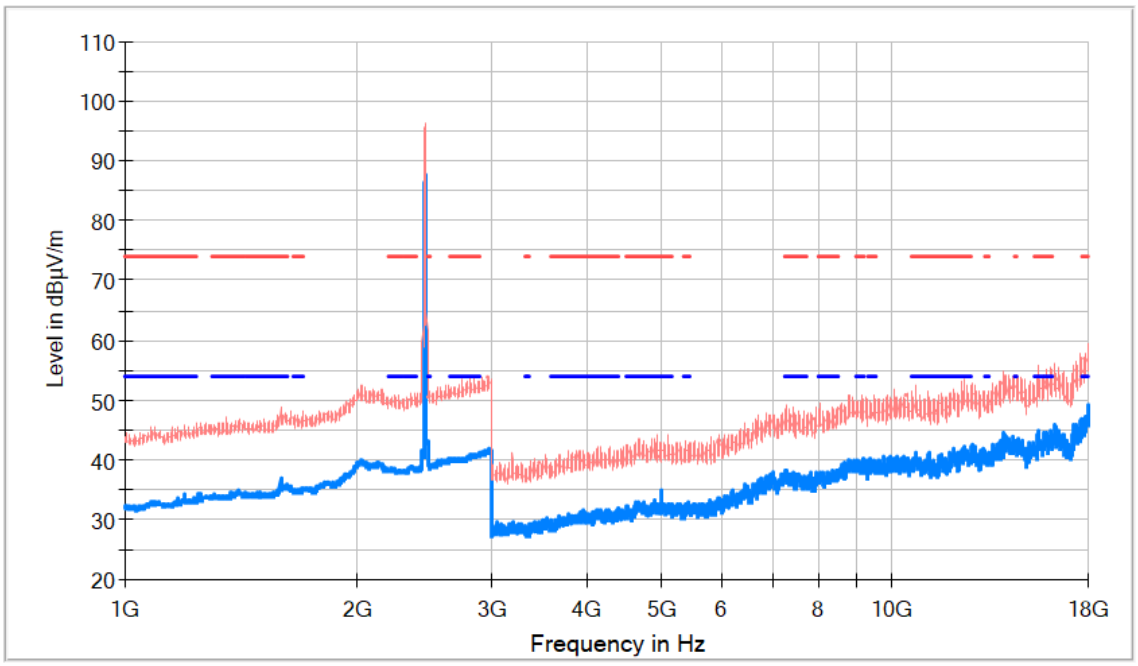

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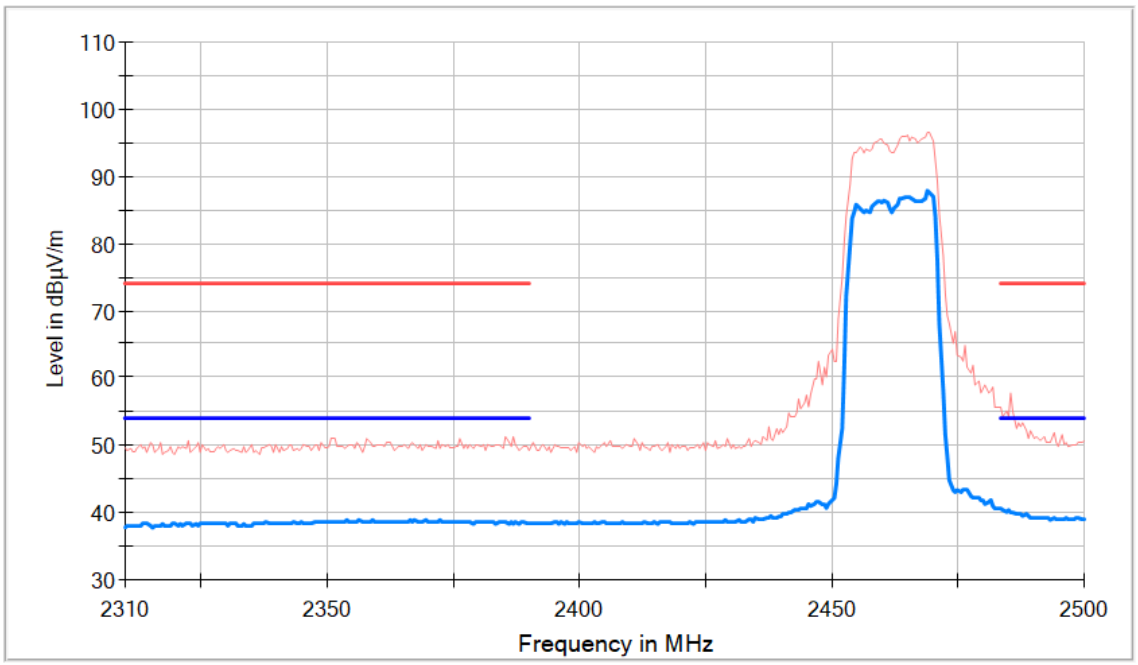

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