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:
3428ERM.009A4

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	Infotainment Head Unit
(*) Trademark	Garmin
(*) Model and /or type reference	IDC23 High 8155
Other identification of the product	FCC ID: IPH-03911 IC: 1792A-03911
(*) Features	Bluetooth classic; BLE; Wi-Fi 2.4GHz; Wi-Fi 5GHz; GNSS
Manufacturer	Garmin International, Inc. 1200 E. 151st Street, Olathe, Kansas 66062, USA
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	12-09-2022
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Acronyms

Acronym ID	Acronym Description
	Emission Bandwidth
# of Tx Chains	Number of Transmission Chains
Equipment	Equipment Type
Freq	Frequency
In band Peak Lvl	In band Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
Occ Ch BW	Occupied Channel Bandwidth
PSD	Power Spectrum Density
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.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA 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 OF A THE MAIN FUNCTIONALITIES ARE NAVIGATION, USB, VOICE RECOGNITION AND SEVERAL INTERFACES TO THE VEHICLE AND BLUETOOTH / WLAN. THE HEAD-UNIT PROVIDES DIFFERENT INTERFACES LIKE: AR-CAM INPUT, VIDEO-OUT APIX3 (FOR THE CONNECTION OF AN EXTERNAL DISPLAY), 3 USB INTERFACES.

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:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	3428/04	Infotainment Head Unit - non beam forming sample	IDC23 High 8155	GAB443N0001134	03/16/2022	Element Under Test

Sample S/01 is composed of the following accessories:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	2874/05	Harness	-	-	03/26/2021	Accessory
S/01	2874/73	Antenna port cable with SMA connectors	-	-	10/22/2021	Accessory
S/01	3171/18	GPS Antenna	Taoglas-Magma AA.171	171TT20120060	03/12/2021	Accessory
S/01	2874/70	Automotive Ethernet Adapter	Rad Moon	13401	10/18/2021	Accessory

1. SAMPLE S/01 WAS USED FOR THE TEST(S): ALL CONDUCTED AND RADIATED INDICATED IN APPENDIX A, B AND C.

Sample S/02 is composed of the following elements:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	3428/05	Infotainment Head Unit - beam forming sample	IDC23 High 8155	GAB443N0001212	03/16/2022	Element Under Test

Sample S/02 is composed of the following accessories:

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	2874/05	Harness	-	-	03/26/2021	Accessory
S/01	2874/73	Antenna port cable with SMA connectors	-	-	10/22/2021	Accessory
S/01	3171/18	GPS Antenna	Taoglas-Magma AA.171	171TT20120060	03/12/2021	Accessory
S/01	2874/70	Automotive Ethernet Adapter	Rad Moon	13401	10/18/2021	Accessory

2. SAMPLE S/02 WAS USED FOR THE TEST(S): ALL CONDUCTED AND RADIATED TESTS INDICATED IN APPENDIX A, B AND C.

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Test sample description

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

<table>
<tr><td rowspan="7">Ports…… :</td><td rowspan="2">Port name and description</td><td colspan="4">Cable</td></tr>
<tr><td>Specified max length [m]</td><td>Attached during test</td><td>Shielded</td><td>Coupled to patient(3)</td></tr>
<tr><td>BT/Wi-Fi Antenna</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>USB1/2</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>Power</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>CID</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>AR-Cam</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>100 Base T1/1G Base T1/GPS/DCS/HUD/DFE</td><td>2m</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="5">N/A</td></tr>
<tr><td rowspan="5">Rated power supply ……:</td><td colspan="2" rowspan="2">Voltage and Frequency</td><td colspan="4">Reference poles</td></tr>
<tr><td>L1</td><td>L2</td><td>L3</td><td>N</td><td>PE</td></tr>
<tr><td>[ ]</td><td>AC: …….</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>[ ]</td><td>AC: …….</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>[X]</td><td colspan="5">DC: 8V to 16V</td></tr>
<tr><td>Rated Power ……:</td><td colspan="5">No Data Provided</td></tr>
<tr><td>Clock frequencies ……:</td><td colspan="5">No Data Provided</td></tr>
<tr><td>Other parameters……:</td><td colspan="5">No Data Provided</td></tr>
<tr><td>Software version ……:</td><td colspan="5">STS 21w24.4-1-41-072221-1409</td></tr>
<tr><td>Hardware version……:</td><td colspan="5">1.5.2</td></tr>
<tr><td>Dimensions in cm (W x H x D)….:</td><td colspan="5">No Data Provided</td></tr>
</table>

Mounting position.....:	[ ]	Table top equipment		
	[ ]	Wall/Ceiling mounted equipment		
	[ ]	Floor standing equipment		
	[ ]	Hand-held equipment		
	[X]	Other: automotive		
Modules/parts .....:	Module/parts of test item		Type	Manufacturer
	N/A		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
Accessories (not part of the test item) .....:	Description		Type	Manufacturer
	N/A		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
Documents as provided by the applicant.....:	Description		File name	Issue date
	Declaration Equipment Data		.....	05/24/2022
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....

(3) Only for Medical Equipment

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

Identification of the client

Garmin International, Inc.
1200 E. 151st Street,
Olathe, Kansas 66062, USA

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	2022-03-23
Date (finish)	2022-11-30

Document history

Report number	Date	Description
3428ERM.009	07-28-2022	First release.
3428ERM.009A1	08-09-2022	Second release. This modification of the test report cancels and replaces the test report 3428ERM.009.
3428ERM.009A2	09-23-2022	Third release. Spectrum analyzer settings were added and test results were corrected. This modification of the test report cancels and replaces the test report 3428ERM.009A1.
3428ERM.009A3	11-30-2022	Fourth release. Spectrum analyzer settings, methodologies used for MIMO and Beamforming modes, and AX mode test results were added. This modification of the test report cancels and replaces the test report 3428ERM.009A2.
3428ERM.009A4	12-05-2022	Fifth release. Test results for 802.11ax mode partial RU were added and Test Condition for Wi-Fi was updated to include directional gain calculation. This modification of the test report cancels and replaces the test report 3428ERM.009A3.

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. = 30 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % 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. = 30 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Lakshmi Gollamudi, Juliana Cherry, Yuri Barone, Nasir Khan and Koji Nishimoto.

List of equipment used during the test

FCC 47 CFR Part 15.247 / RSS-247

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
101	ESPEC CHMBER UNIT	19248	2022-02-28	2023-02-28
1039	FSV40 SIGNAL ANALYSER 40GHZ	101627	2020-09-24	2022-09-24
1107	ETHERNET SNMP THERMOMETER	60038026952	2020-08-16	2022-08-16
1313	WIRELESS MEASUREMENT SOFTWARE R&S WMS32	-	N/A	N/A

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
981	LOW NOISE PREAMPLIFIER	1711156B	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 ANTENNAS	213179	2020-01-10	2023-01-10
1057	3115 DOUBLE-RIDGED WAVEGUIDE HORN ANTENNAS	211373	2020-06-03	2023-06-03
1065	3142E BICONILOG ANTENNA	208587	2020-08-13	2023-08-13
1111	ETHERNET SNMP THERMOMETER	60038026577	2020-08-16	2022-08-16
1179	SEMI-ANECHOIC CHAMBER	F169021	N/A	N/A
1314	WIRELESS MEASUREMENT SOFTWARE R&S EMC32	1040-OT102236	N/A	N/A

Testing verdicts

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

Summary

Bluetooth Low Energy

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth		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) (3) Maximum Peak Conducted output power		Pass	N/A
RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter) - Conducted		Pass	N/A
FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%		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			

Bluetooth EDR

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.1 (b) / FCC 15.247 (a) (1) 20 dB Bandwidth		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
FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%		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

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth		Pass	N/A
RSS-247 5.2 (b) / FCC 15.247 (e) Power spectral density		Pass	N/A
RSS-247 5.4 (d) e.i.r.p		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
FCC 2.1049 / Occupied Channel Bandwidth 99%		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	Refer 1
Supplementary information and remarks: Appendix C1: SISO A Appendix C2: SISO B Appendix C3: MIMO Appendix C4: Beamforming 1: The results shows the worst cases 802.11b and 802.11g non-Beamforming MIMO modes			

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

INDEX

PRODUCT INFORMATION

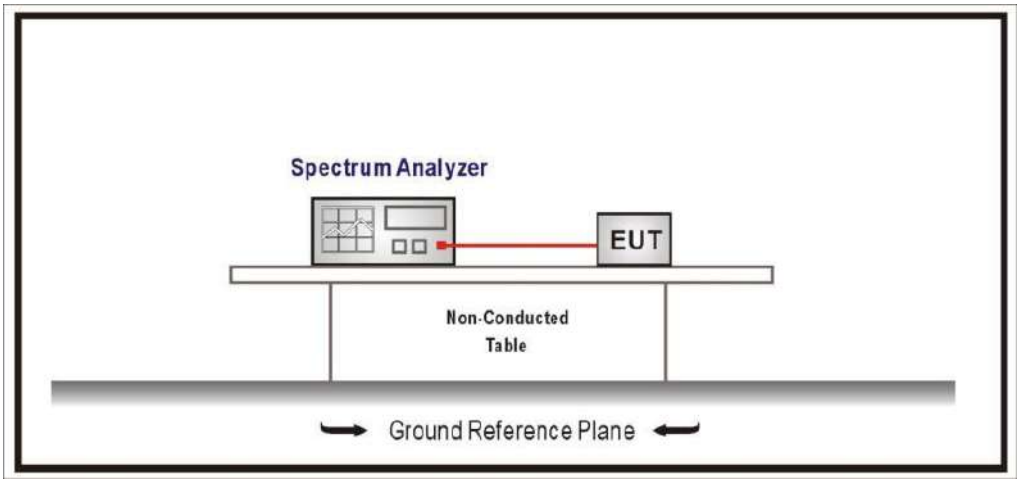
Information	Description
Modulation	BR/EDR: GFSK, π/4-DQPSK, 8-DPSK
Operation mode 1: Single Antenna Equipment	
- Operating Frequency Range	BR/EDR: 2400 - 2483.5 MHz
- Nominal Channel Bandwidth	BR/EDR: 1/ 1.5 MHz
- RF Output Power	BR/EDR: 4 dBm
Antenna type	1/4 wave coax
Antenna gain	-2.5 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth
Geo-location capability	No

TEST CONDITIONS

(*): Data provided by the client.

TEST CONDITIONS	DESCRIPTION
TC#01 (1 Mbps)	Power supply (V): $V_{nominal}$ = 12 V dc Data Rate: 1 Mbps Bandwidth: 1 MHz Test Frequencies for Conducted/ Radiated tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz
TC#02 (2 Mbps)	Power supply (V): $V_{nominal}$ = 12 V dc Data Rate: 2 Mbps Bandwidth: 2 MHz Test Frequencies for Conducted/ Radiated tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 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 antenna), 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.

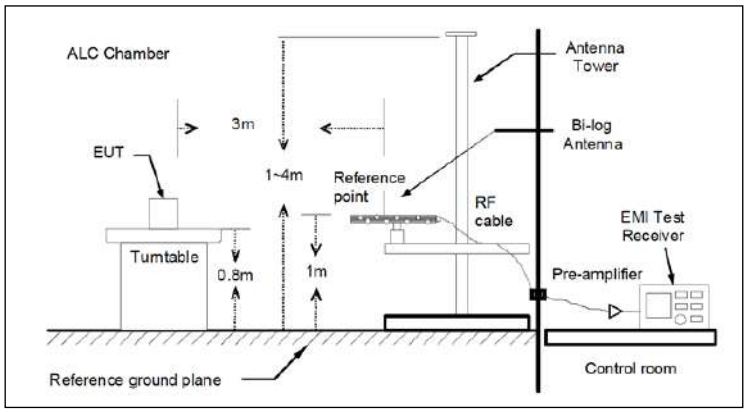


Fig A1: Radiated measurements Setup f < 1 GHz

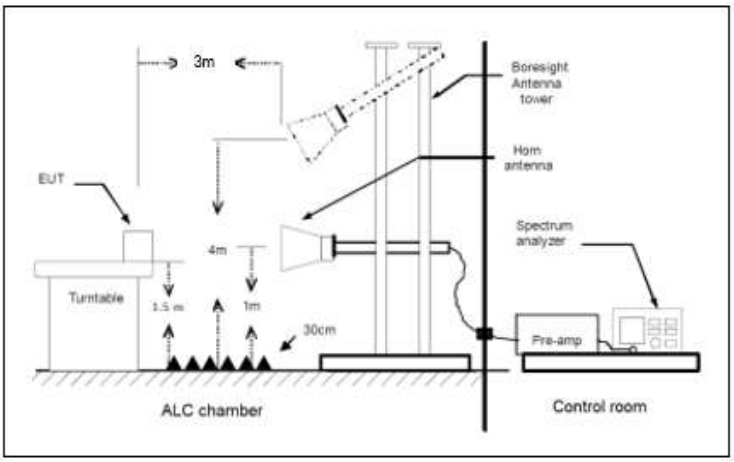


Fig A2: Radiated measurements setup f > 1-18 GHz

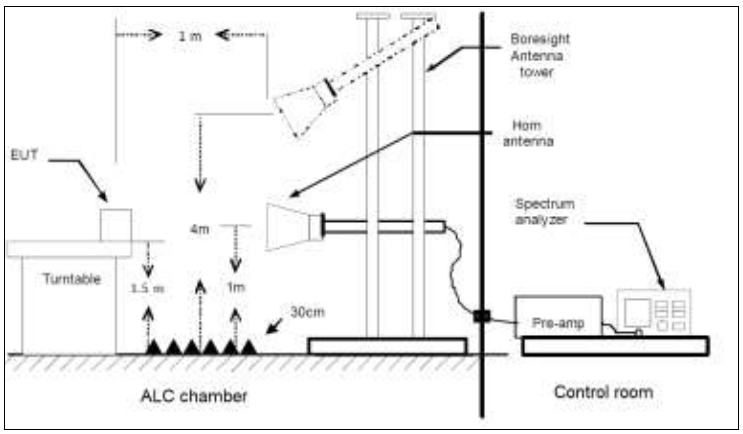


Fig A3: Radiated measurements setup f > 18 GHz

TEST CASES DETAILS

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

Limits

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

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)
Results

Freq (MHz)	# of Tx Chains	Port	Emission Bandwidth (KHz)
2402.00000	1	1	732.67
2440.00000			712.87
2480.00000			732.67

Verdict

Pass

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)
Results

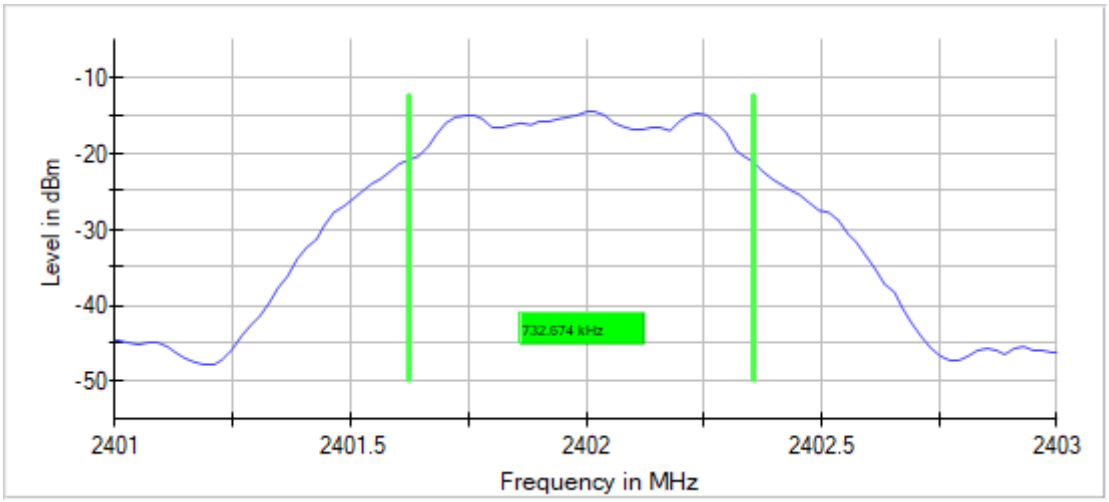
Freq (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2402.00000	1	1	1.228
2440.00000			1.228
2480.00000			1.228

Verdict

Pass

Frequency MHz = 2402.00000, Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

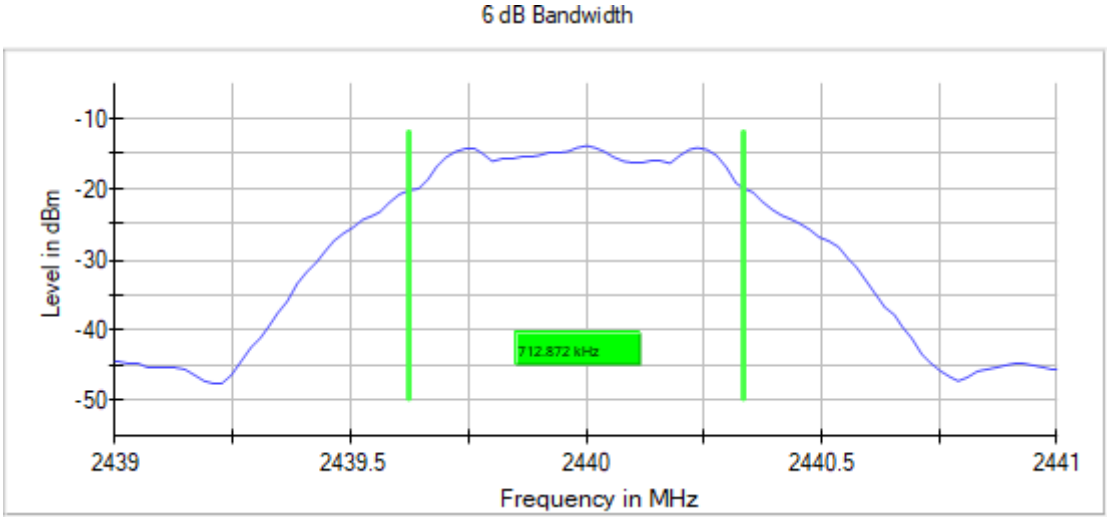
Images:



Attachments

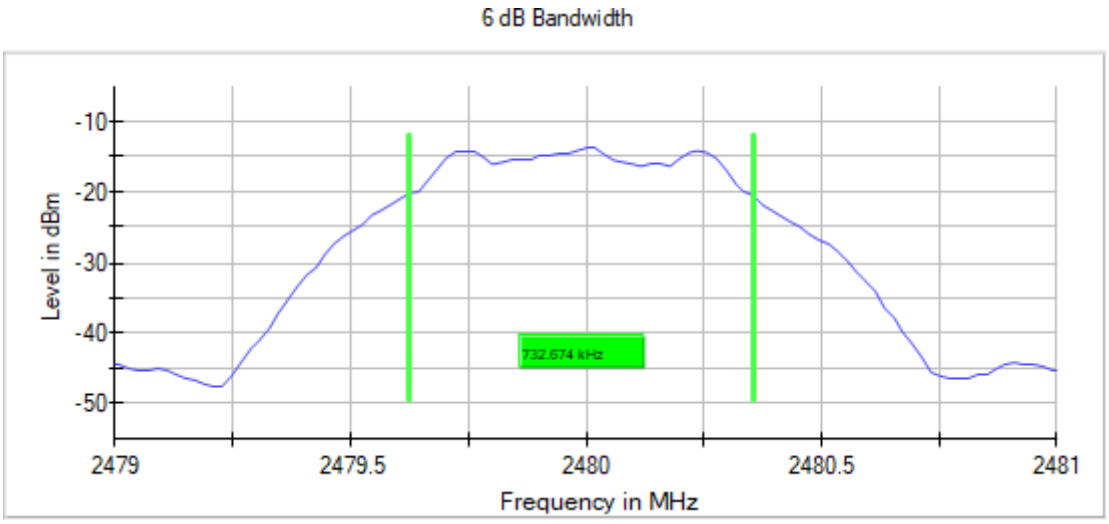
Frequency MHz = 2440.00000, Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Frequency MHz = 2440.00000, Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



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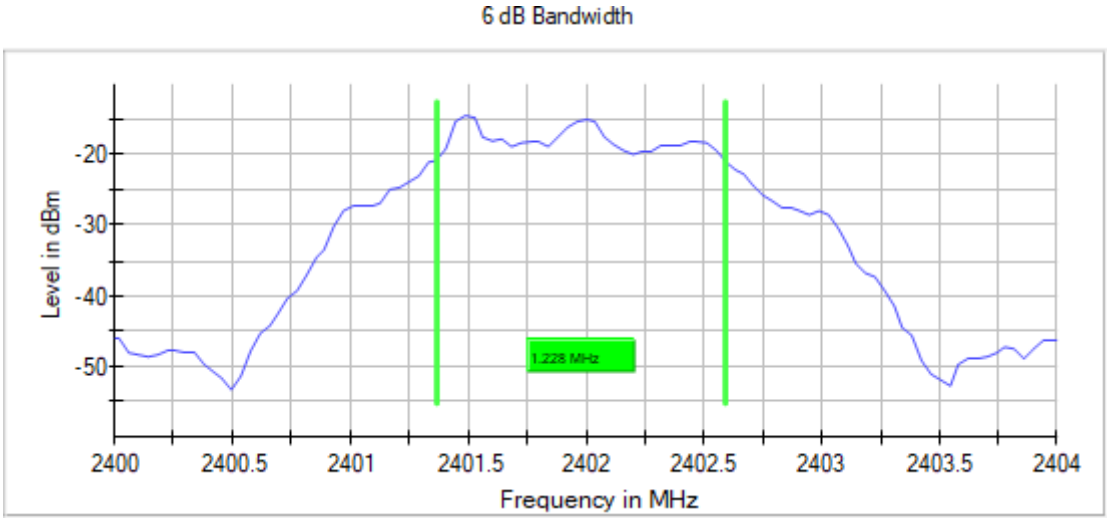
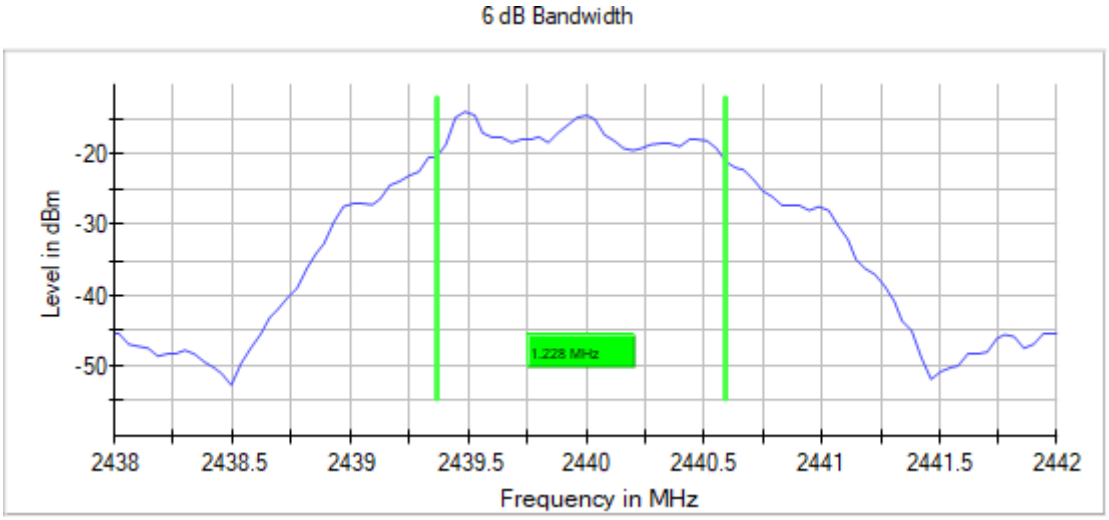
Images:



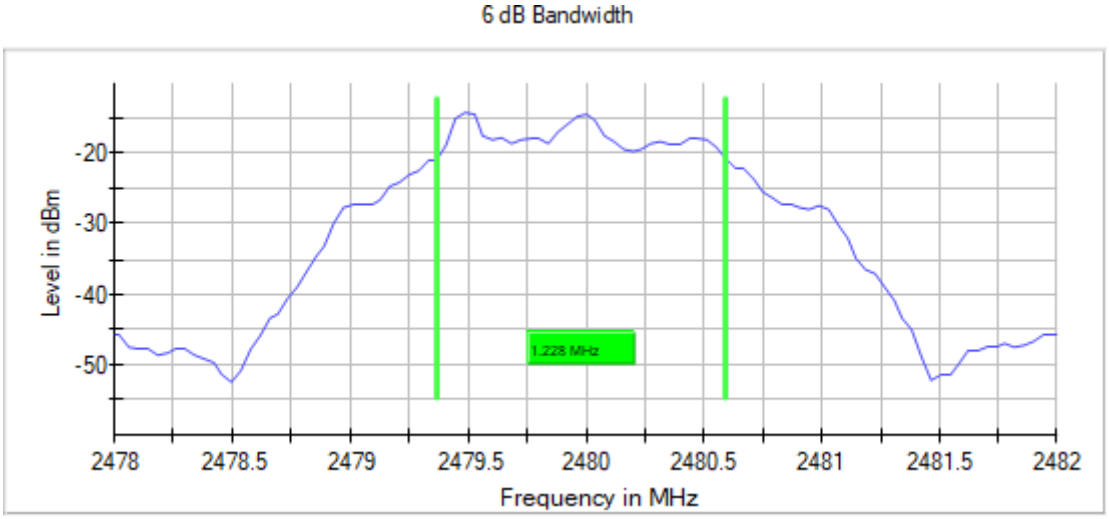
Frequency MHz = 2440.00000, Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Frequency MHz = 2480.00000, Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument	Instrument	Instrument
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	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	10 / max. 150	8 / max. 150	9 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable	0.07 dB	0.31 dB	0.05 dB

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

Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	PSD (dBm)
2402.00000	Digital Transmission System (DTS)	1	1	-23.90
2440.00000				-23.44
2480.00000				-23.15

Verdict

Pass

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	PSD (dBm)
2402.00000	Digital Transmission System (DTS)	1	1	-27.18
2440.00000				-26.76
2480.00000				-26.91

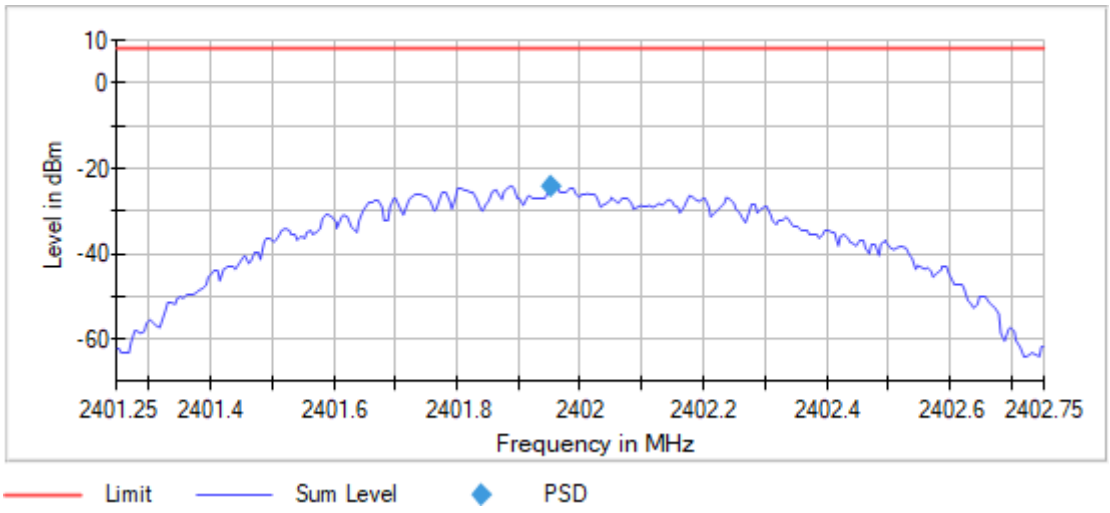
Verdict

Pass

Attachments

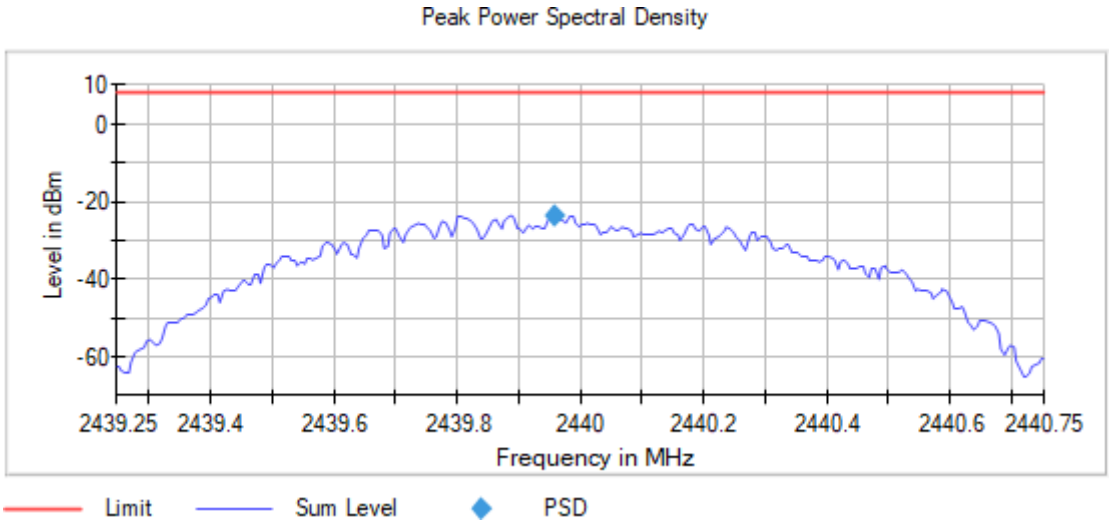
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



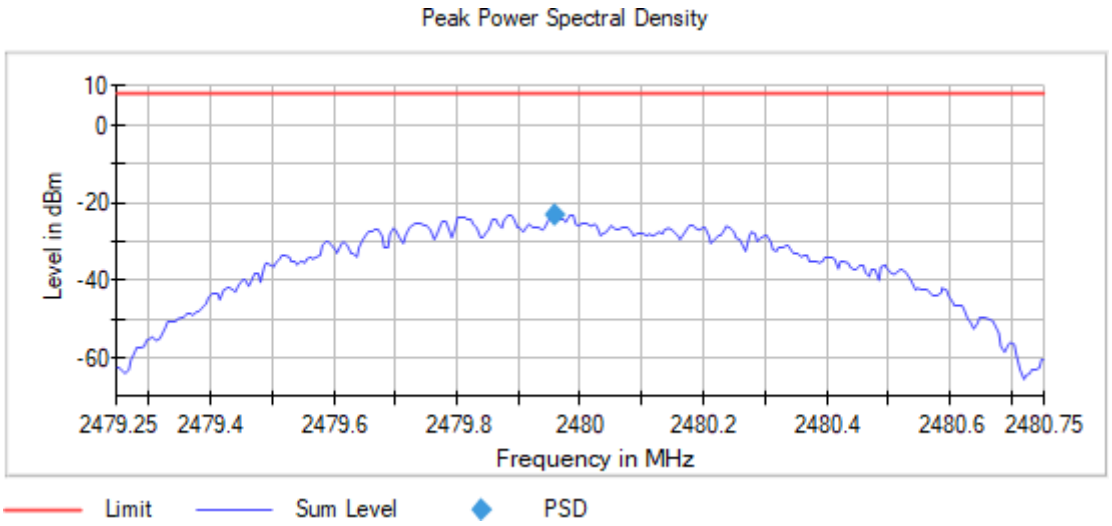
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



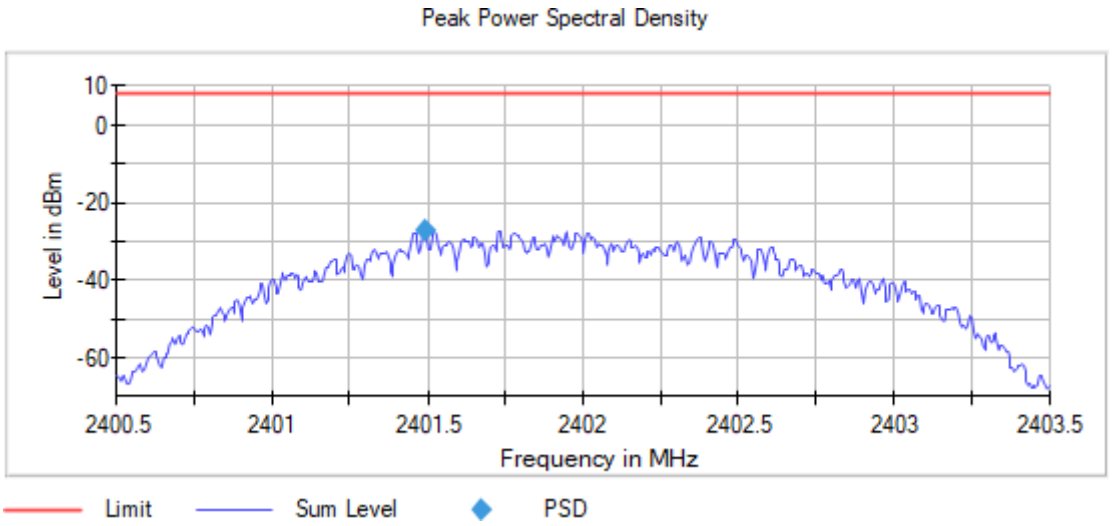
Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



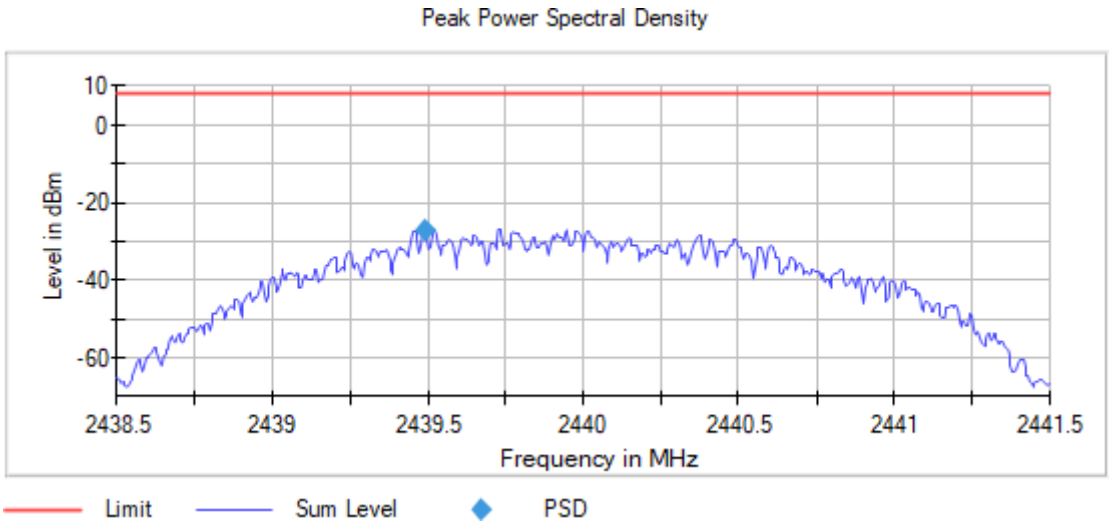
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



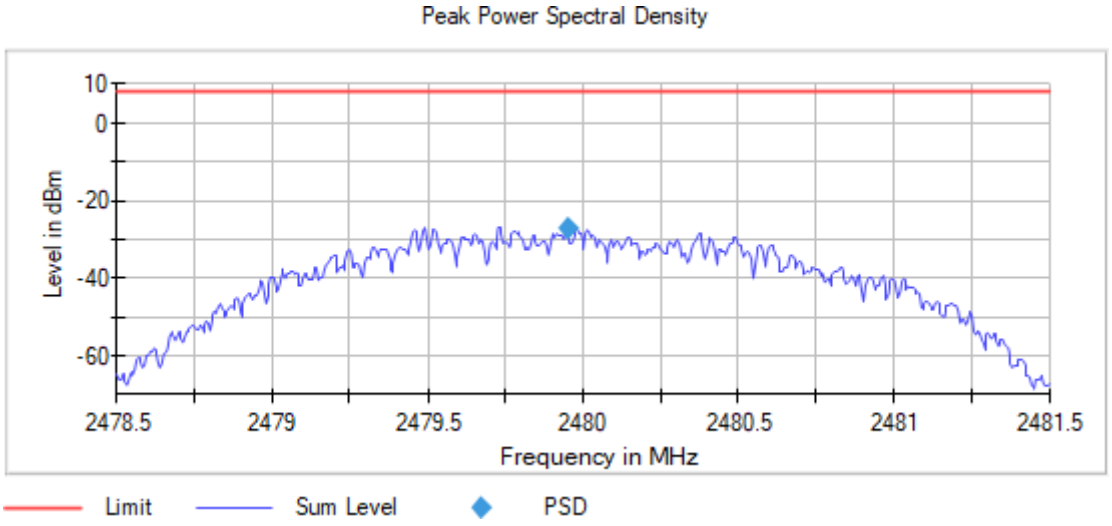
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument	Instrument	Instrument
Start Frequency	2.40125 GHz	2.43925 GHz	2.47925 GHz
Stop Frequency	2.40275 GHz	2.44075 GHz	2.48075 GHz
Span	1.500 MHz	1.500 MHz	1.500 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	300	300	300
Sweeptime	1.500 ms	1.500 ms	1.500 ms
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	3 / max. 150	4 / max. 150
Stable	2 / 2	2 / 2	2 / 2
Max Stable	0.12 dB	0.19 dB	0.15 dB

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

Limits

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

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 ”RBW ≥ DTS bandwidth” of ANSI C.63.10-2013.

Maximum declared antenna gain: -2.5 dBi

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Digital Transmission System (DTS)	1	1	-1.9
2440.00000				-7.1
2480.00000				-4.6

Verdict

Pass

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Digital Transmission System (DTS)	1	1	-1.8
2440.00000				-7.0
2480.00000				-4.4

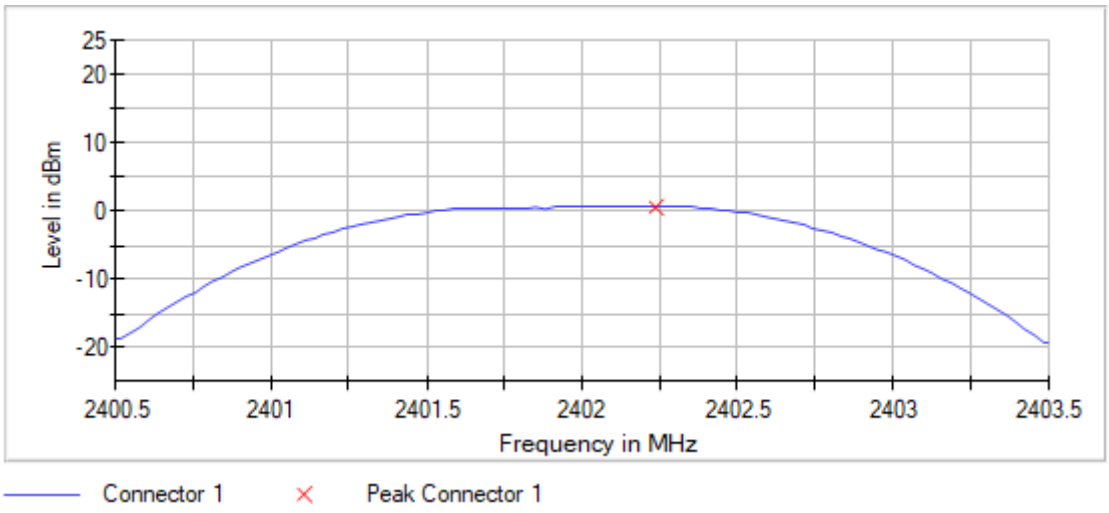
Verdict

Pass

Attachments

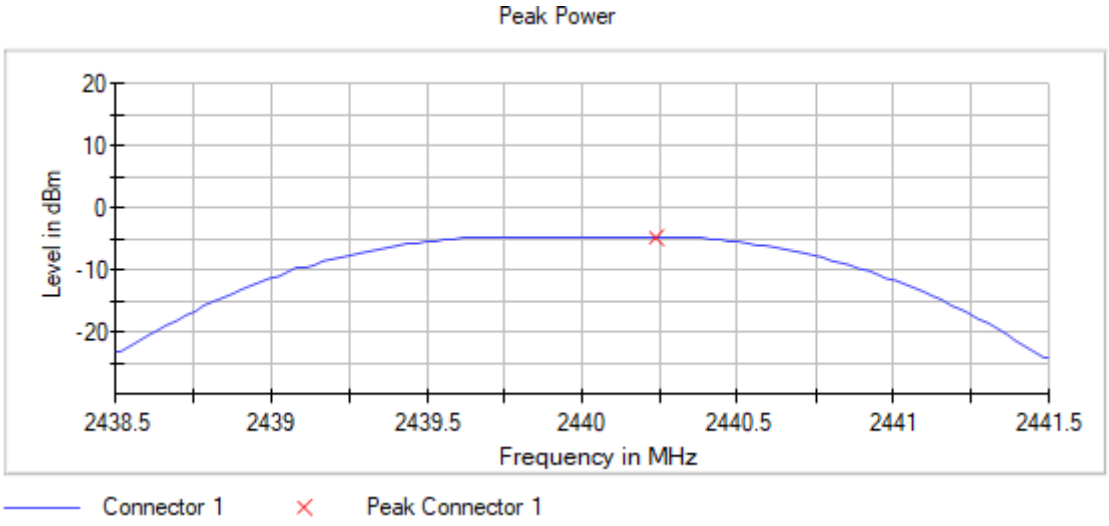
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



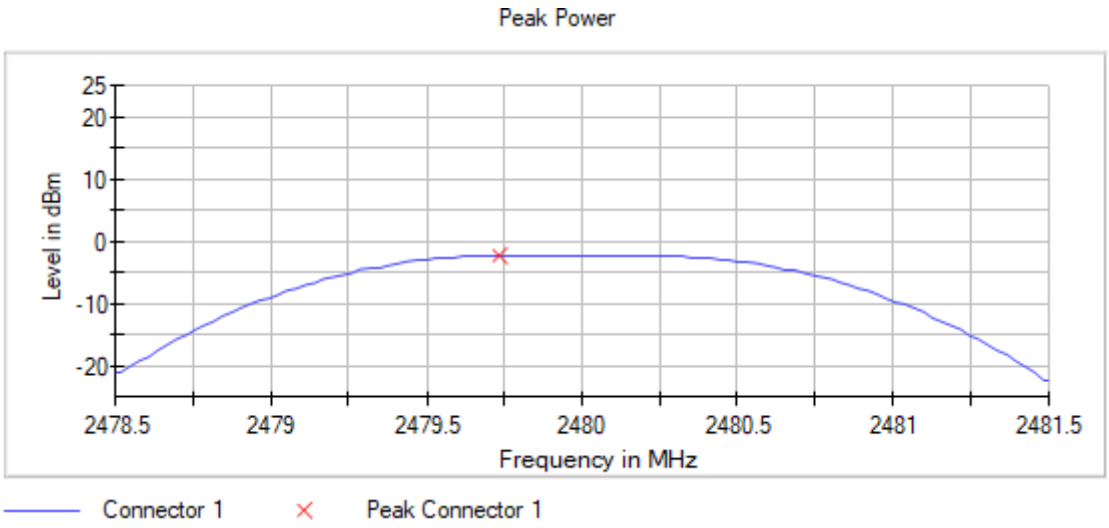
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



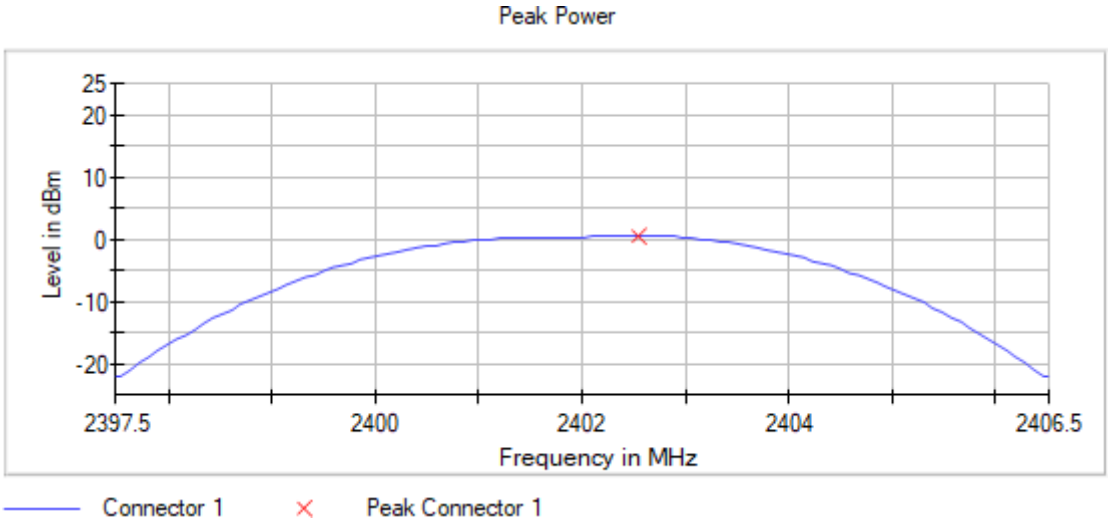
Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



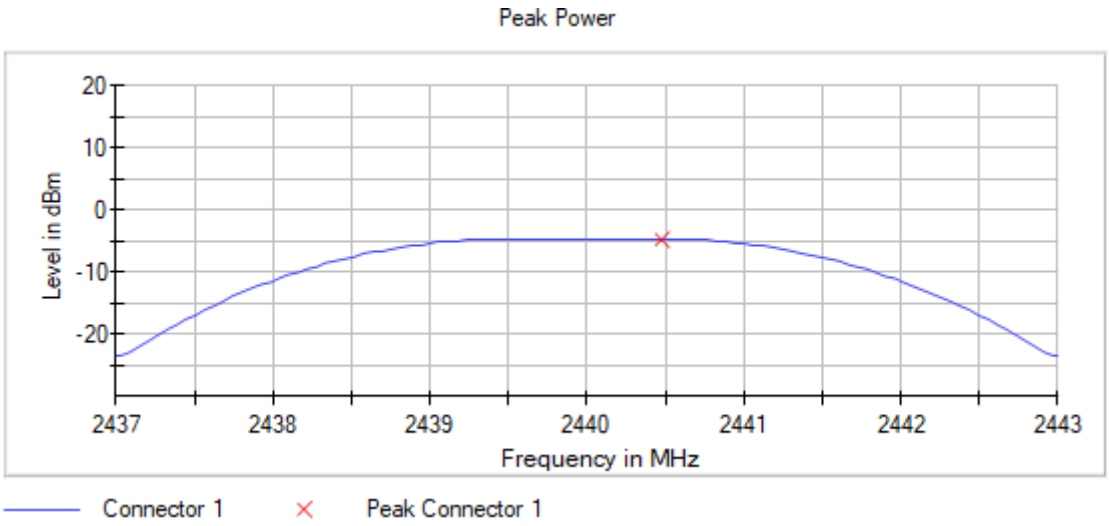
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



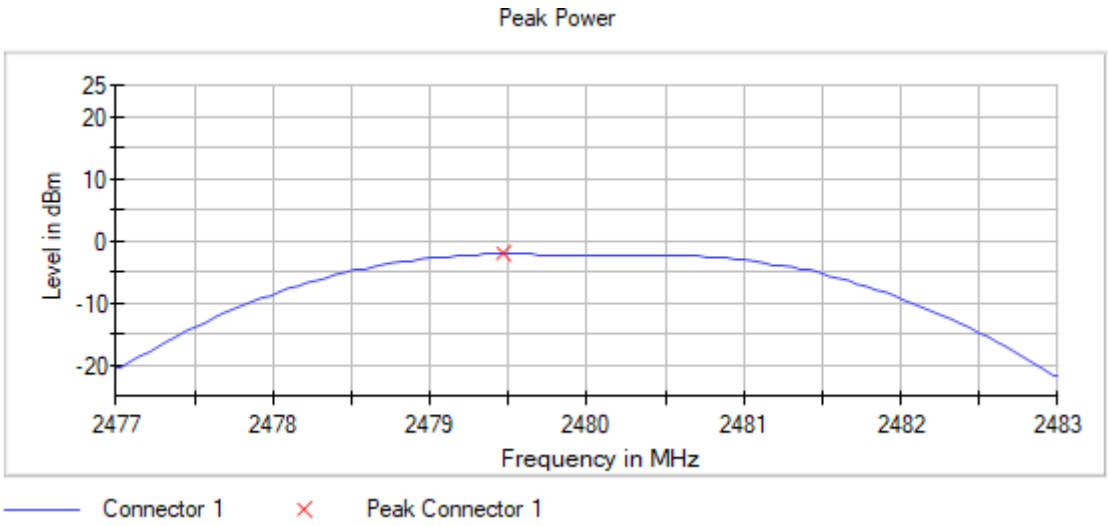
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	**2.39750 GHz**	**2.43700 GHz**	**2.47700 GHz**
Stop Frequency	**2.40650 GHz**	**2.44300 GHz**	**2.48300 GHz**
Span	**9.000 MHz**	**6.000 MHz**	**6.000 MHz**
RBW	**3.000 MHz**	**2.000 MHz**	**2.000 MHz**
VBW	**10.000 MHz**	**10.000 MHz**	**10.000 MHz**
SweepPoints	**101**	**101**	**101**
Sweeptime	**1.271 µs**	**953.450 ns**	**953.450 ns**
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**
SweepCount	**100**	**100**	**100**
Filter	**3 dB**	**3 dB**	**3 dB**
Trace Mode	**Max Hold**	**Max Hold**	**Max Hold**
Sweeptype	**FFT**	**FFT**	**FFT**
Preamp	**off**	**off**	**off**
Stablemode	**Trace**	**Trace**	**Trace**
Stablevalue	**0.50 dB**	**0.50 dB**	**0.50 dB**
Run	**4 / max. 150**	**4 / max. 150**	**4 / max. 150**
Stable	**3 / 3**	**3 / 3**	**3 / 3**
Max Stable Difference	**0.07 dB**	**0.01 dB**	**0.01 dB**

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

Limits

In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2337.875000	-53.9
2319.225000	-54.1
2311.875000	-54.1
2337.825000	-54.1
2311.925000	-54.2
2329.875000	-54.2
2359.225000	-54.2
2329.825000	-54.2
2358.275000	-54.3
2353.425000	-54.3
2365.575000	-54.4
2326.175000	-54.4
2349.525000	-54.4
2330.375000	-54.5
2349.575000	-54.5

Highest Channel

Results

Freq (MHz)	Lvl (dBm)
2483.775000	-53.9
2484.025000	-54.4
2484.075000	-54.5
2483.725000	-54.6
2483.825000	-54.7
2495.525000	-54.8
2486.525000	-54.8
2485.725000	-54.9
2486.575000	-55.0
2490.775000	-55.0
2499.975000	-55.0
2500.000000	-55.0
2486.225000	-55.1
2485.325000	-55.1
2492.625000	-55.1

Verdict

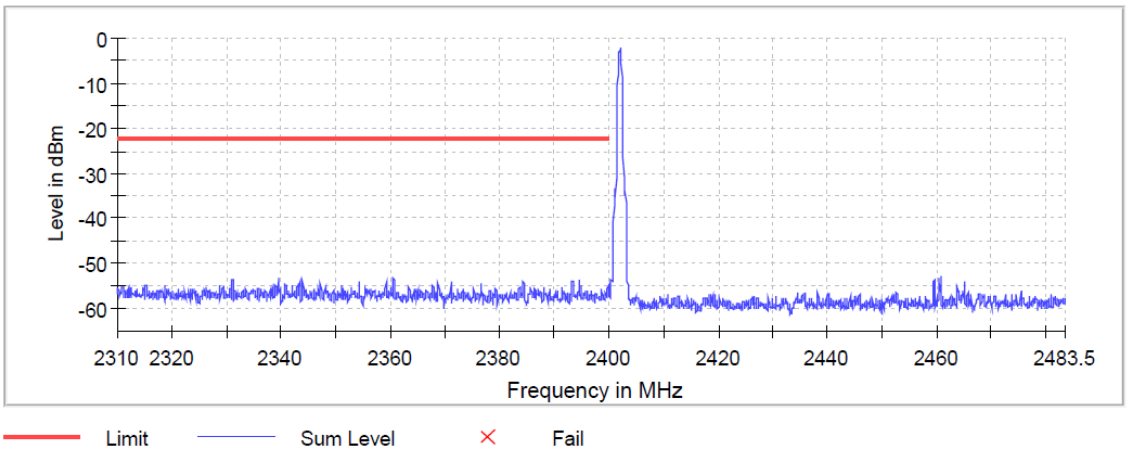
Pass

Attachments

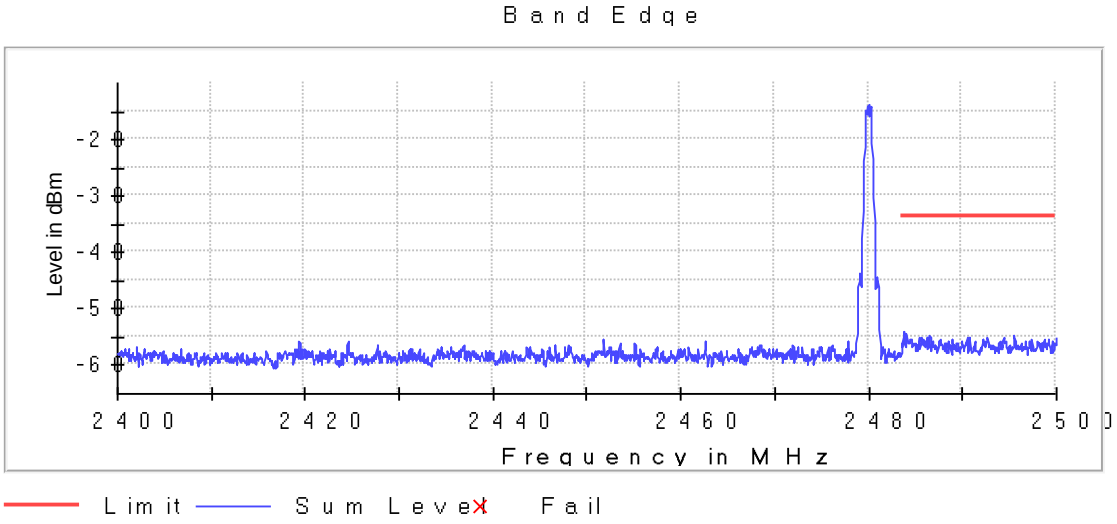
Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Lowest Channel

Results

Equipment	# of Tx Chains	Port	In band Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
Digital Transmission System (DTS)	1	1		2399.975000	-44.5
				2399.925000	-45.9
				2399.875000	-47.8
				2399.825000	-50.4
				2399.775000	-51.2
				2399.725000	-52.0
				2355.825000	-52.6
				2355.775000	-52.7
				2353.825000	-53.8
				2355.875000	-53.9
				2399.675000	-53.9
				2399.625000	-53.9
				2353.775000	-54.0
				2349.775000	-54.0
				2349.725000	-54.0

Highest Channel

Results

Equipment	# of Tx Chains	Port	In band Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
Digital Transmission System (DTS)	1	1		2499.075000	-54.1
				2499.025000	-54.2
				2494.875000	-54.3
				2484.775000	-54.4
				2494.825000	-54.5
				2487.125000	-54.6
				2484.725000	-54.6
				2487.075000	-54.6
				2492.875000	-54.9
				2483.675000	-55.0
				2488.625000	-55.0
				2492.825000	-55.1
				2488.775000	-55.1
				2488.675000	-55.1
				2488.825000	-55.1

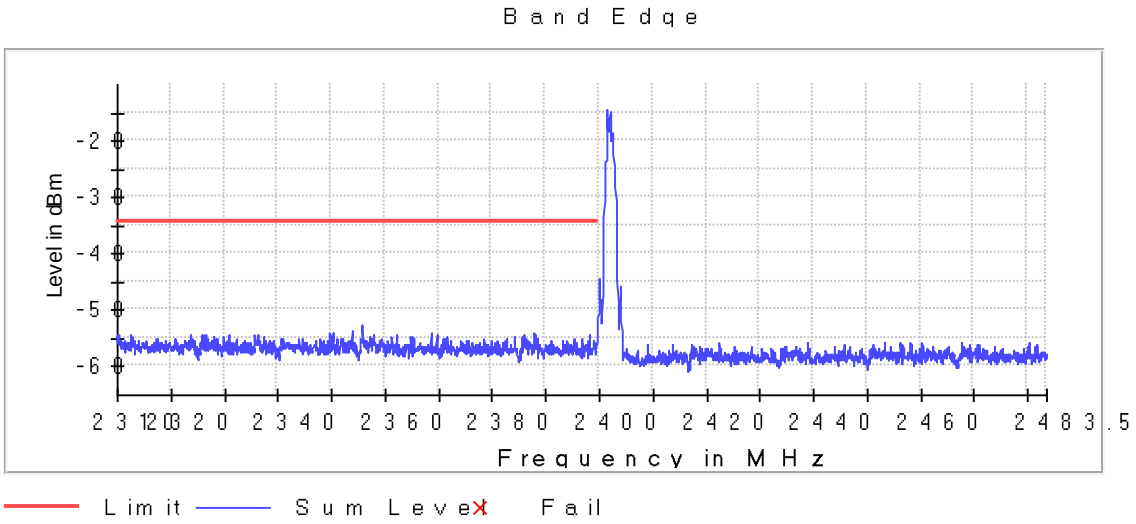
Verdict

Pass

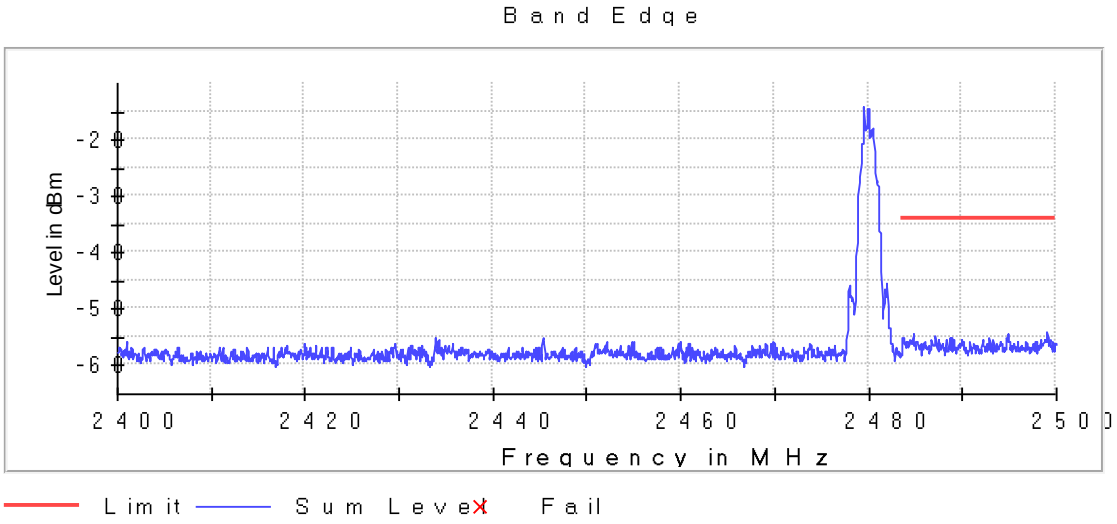
Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	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	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 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	6 / max. 150	11 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.02 dB

RSS-247 5.2 (a) / FCC 15.247 (a) (2) 99dBw Occupied Channel Bandwidth 99%

Limits

The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Digital Transmission System (DTS)	1	1	1.030
2440.00000				1.030
2480.00000				1.030

Verdict

Pass

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Digital Transmission System (DTS)	1	1	2.060
2440.00000				2.060
2480.00000				2.060

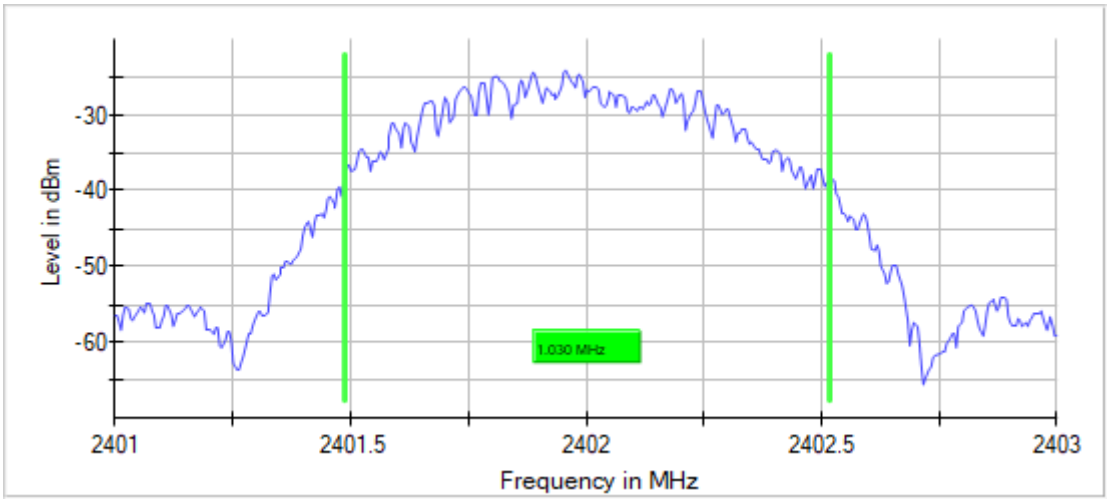
Verdict

Pass

Attachments

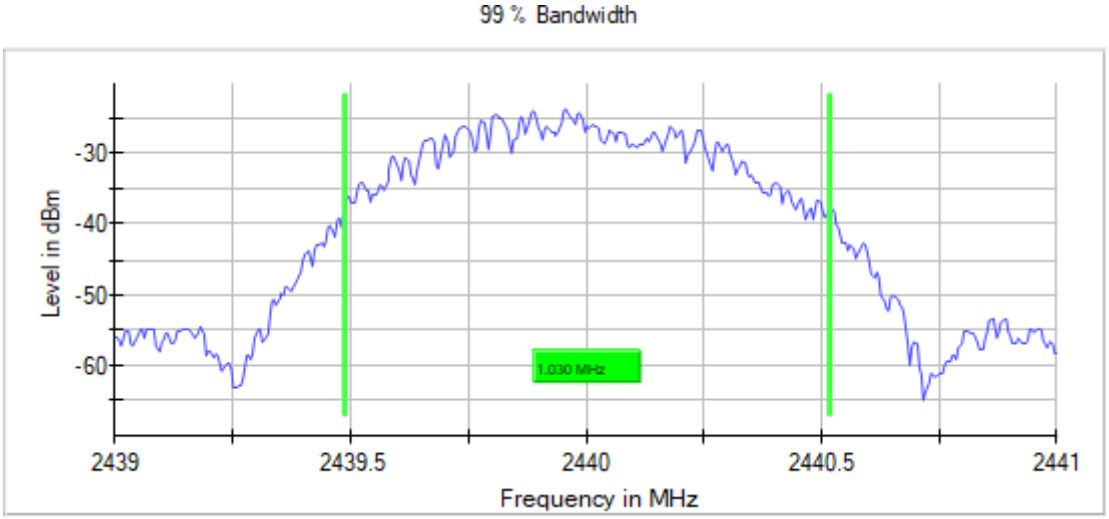
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



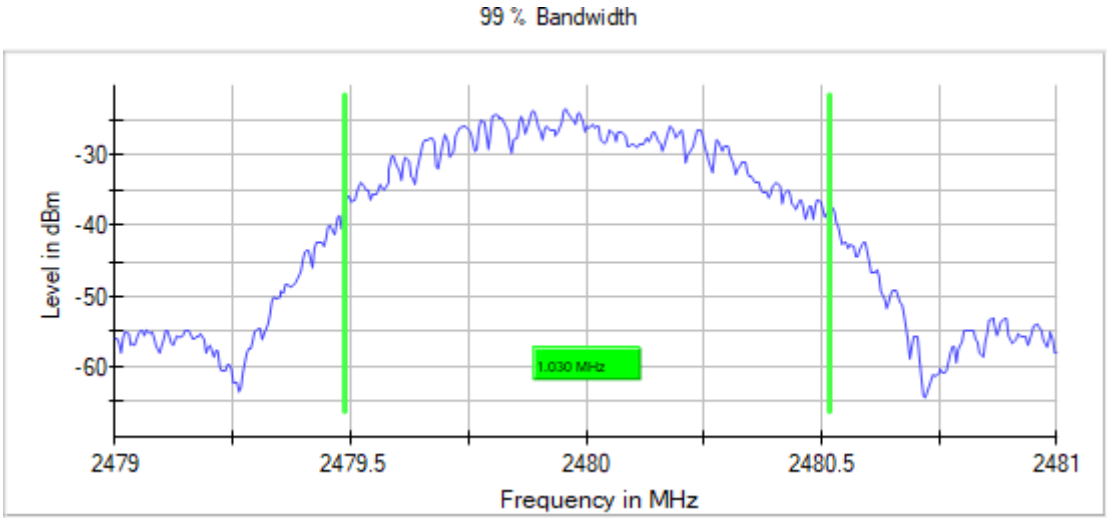
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



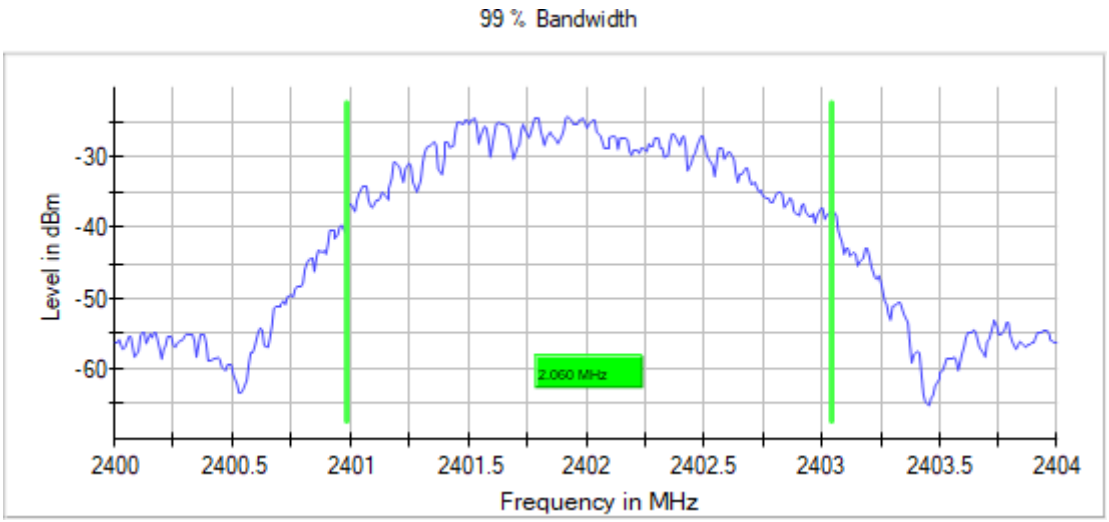
Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 1 Mbit/s), Number of Transmission Chains = 1,

Images:



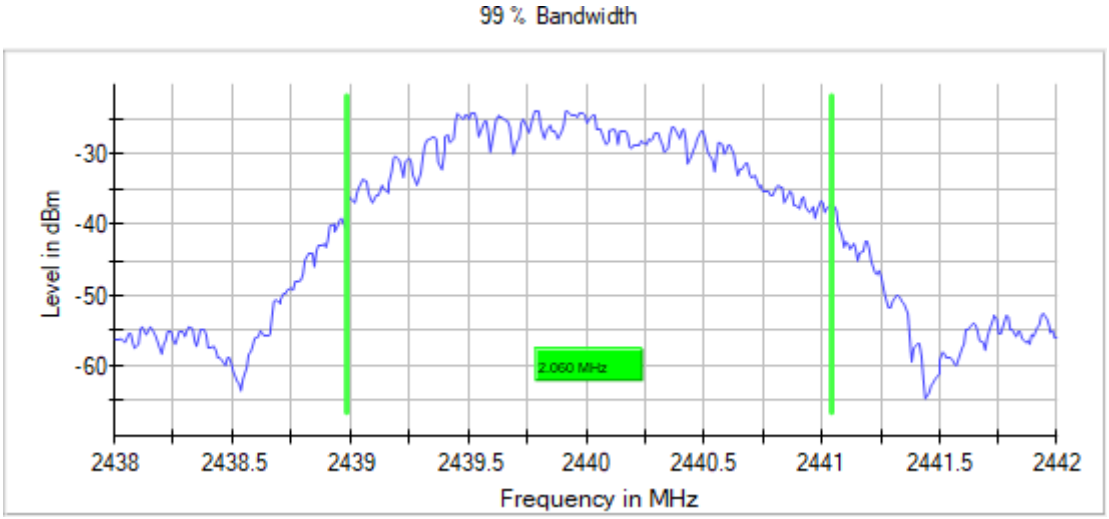
Frequency MHz = 2402.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



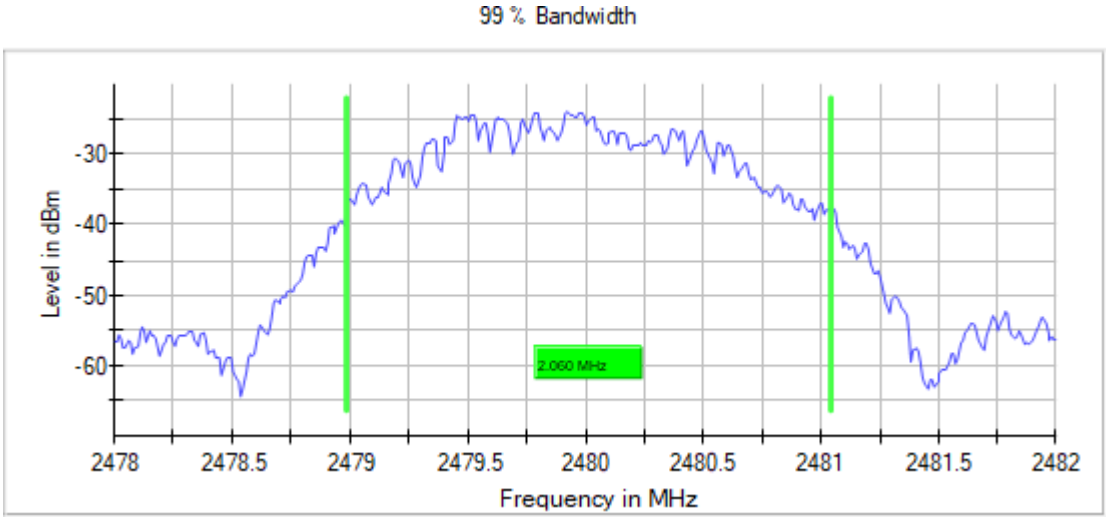
Frequency MHz = 2440.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Frequency MHz = 2480.00000, Equipment Type = Digital Transmission System (DTS), Modulation = BTLE 5.0 (GFSK 2 Mbit/s), Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.43800 GHz	2.47800 GHz
Stop Frequency	2.40400 GHz	2.44200 GHz	2.48200 GHz
Span	4.000 MHz	4.000 MHz	4.000 MHz
RBW	20.000 kHz	20.000 kHz	20.000 kHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
SweepPoints	400	400	400
Sweeptime	94.824 µs	94.824 µs	94.824 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	6 / max. 150	6 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.08 dB	0.17 dB	0.15 dB

RSS-247 5.5 / FCC 15.247 (d) 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: BTLE 5.0 (GFSK 1 Mbit/s)

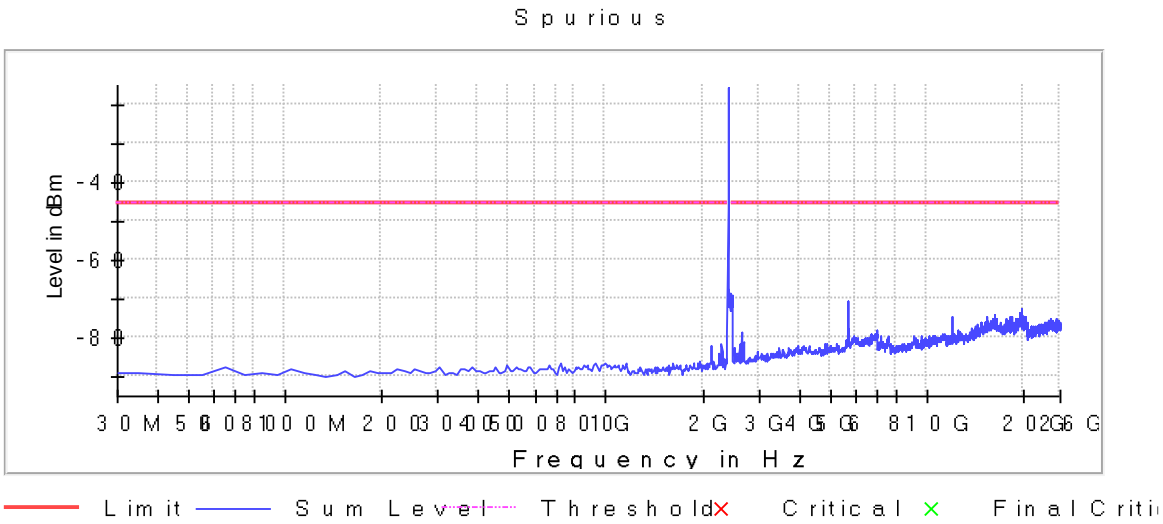
The results for the worst operation mode selected for this range (1 Mbps) are shown below.

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

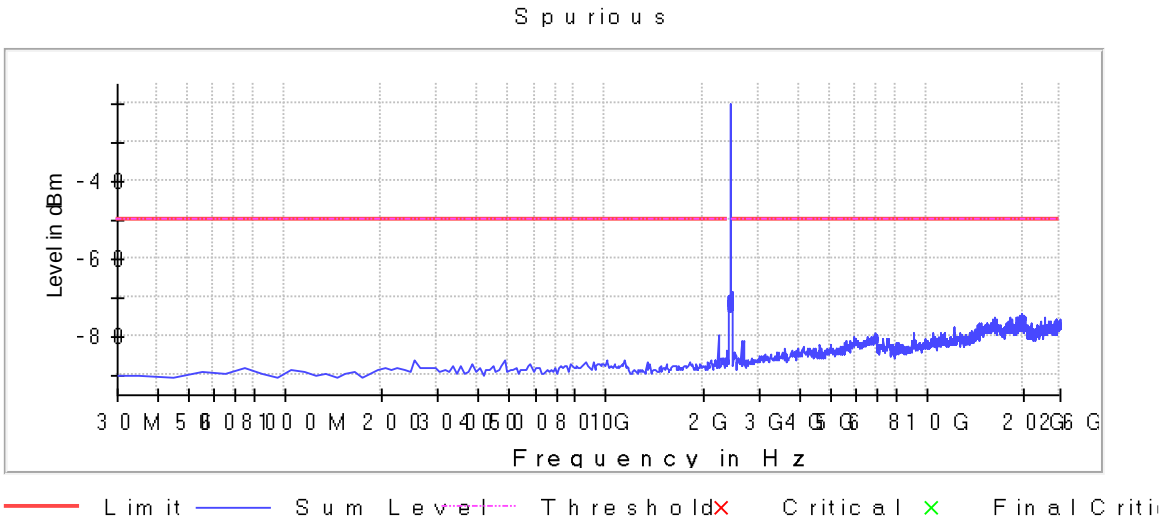
Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Results

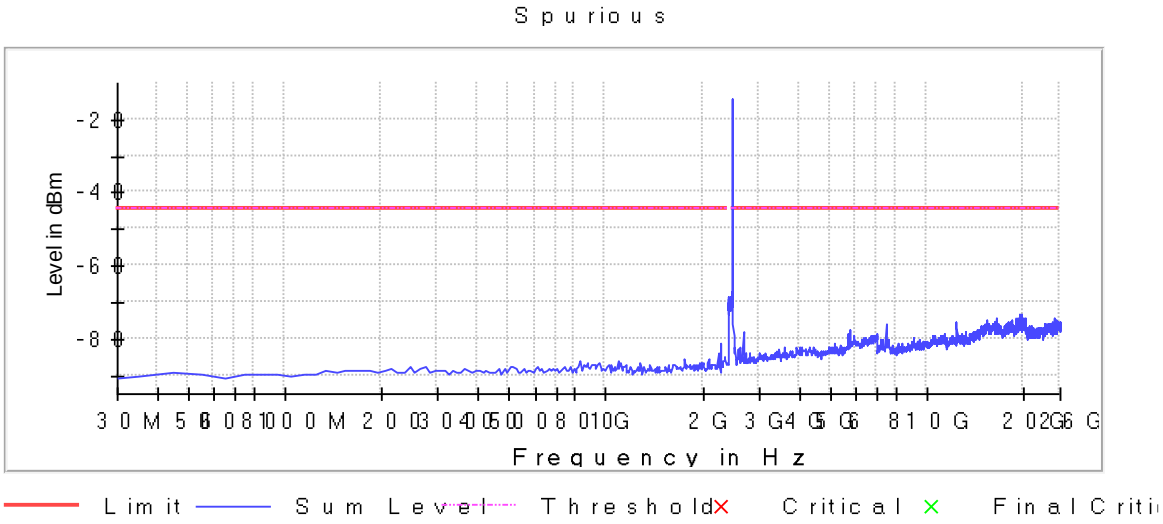
Lowest Channel



Middle Channel



Highest Channel



Verdict

Pass

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1670
Sweeptime	113.672 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	40 / max.	43 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.00 dB	0.00 dB	0.01 dB

RSS-247 5.5 / FCC 15.247 (d) EMISSION LIMITATIONS RADIATED (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

Test Setup:

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.

Verdict

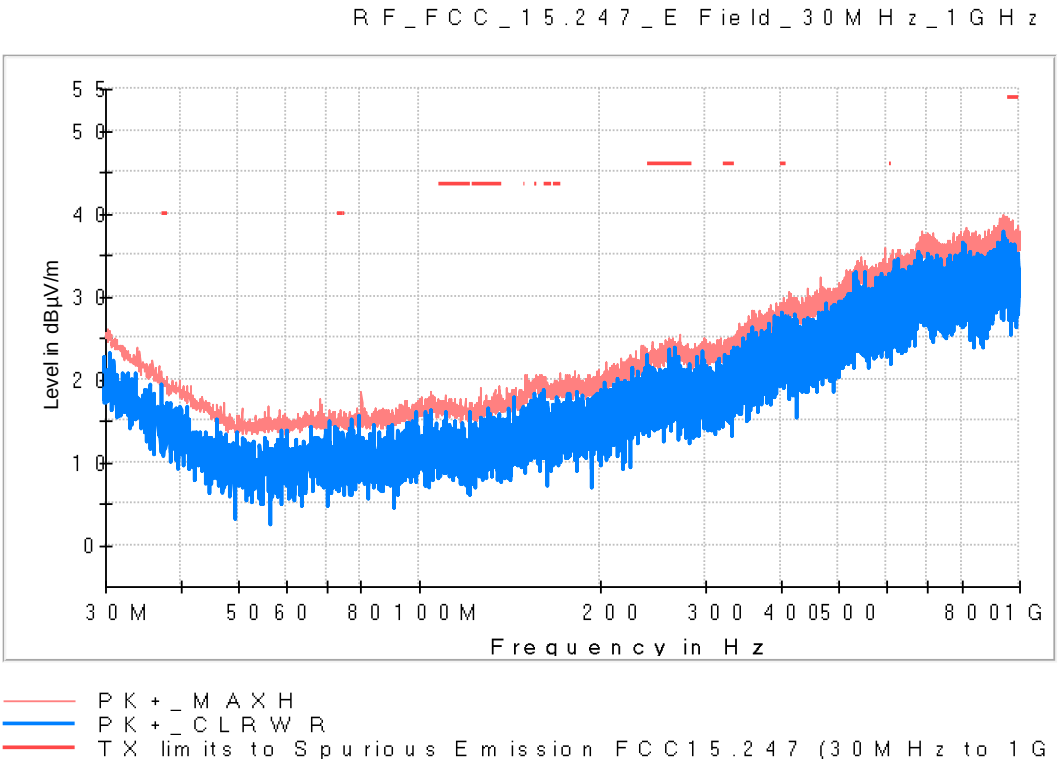
Pass

Results

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Middle Channel



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
126.563500	28.6	16.3	V	27.3	43.5
259.987000	35.3	22.8	V	23.2	46.0
328.081000	33.3	20.9	V	25.1	46.0
405.002000	38.4	25.4	V	20.6	46.0
613.164000	44.0	31.1	H	14.9	46.0
938.744500	47.5	35.1	V	---	---

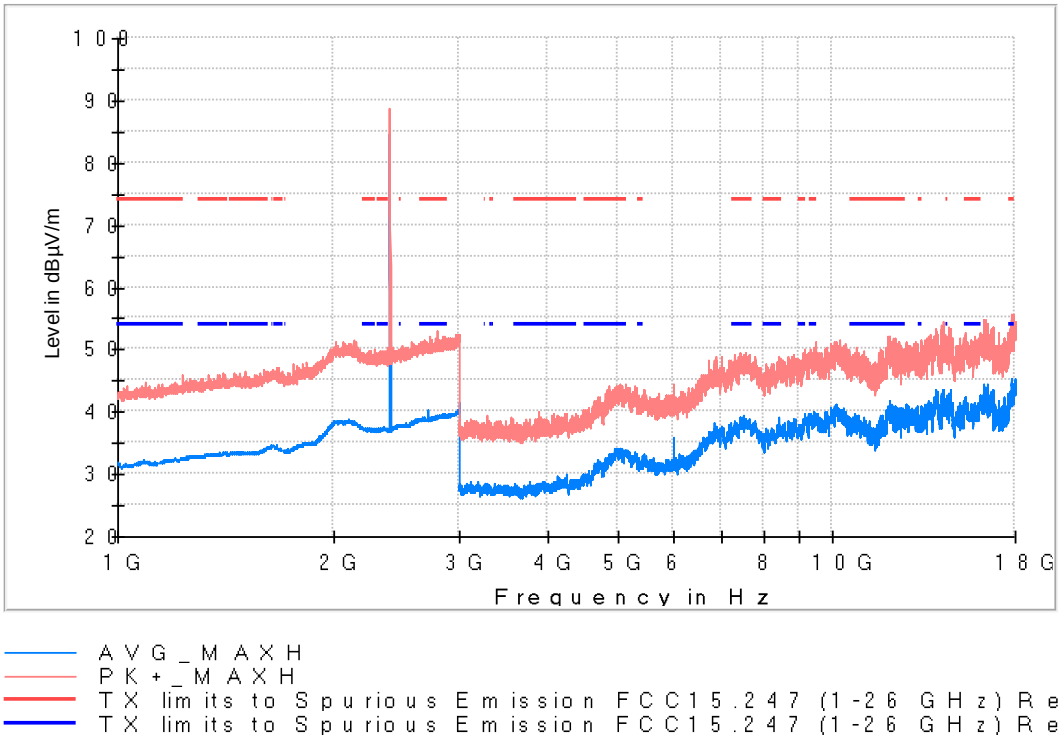
Frequency range 1 GHz – 26 GHz

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

Please see the following results for worst operation mode selected for this range (2 Mbps).

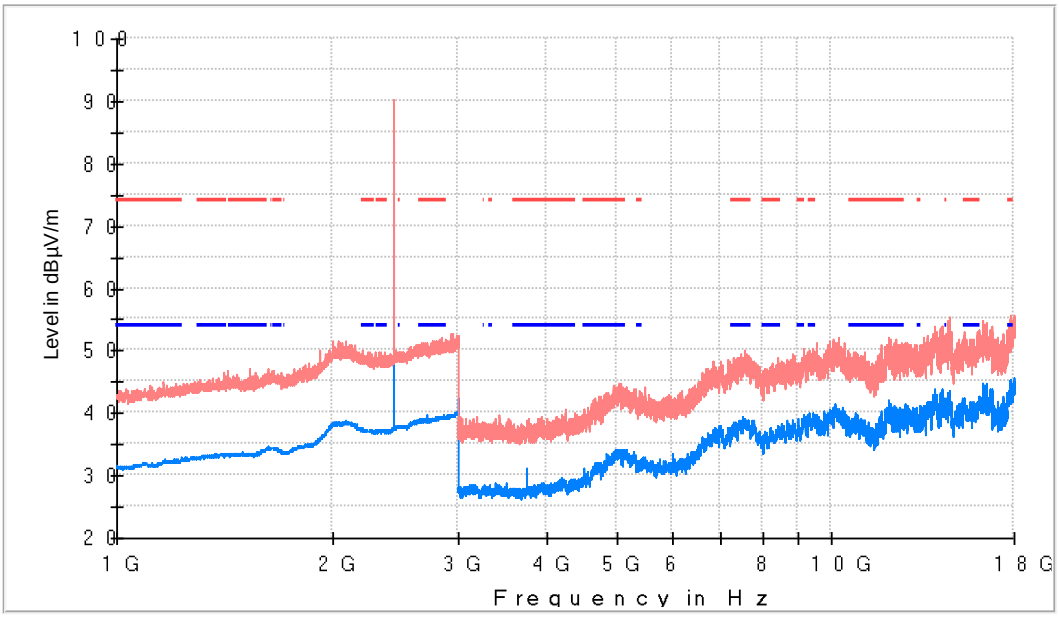
Frequency range 1 - 18 GHz

Lowest Channel



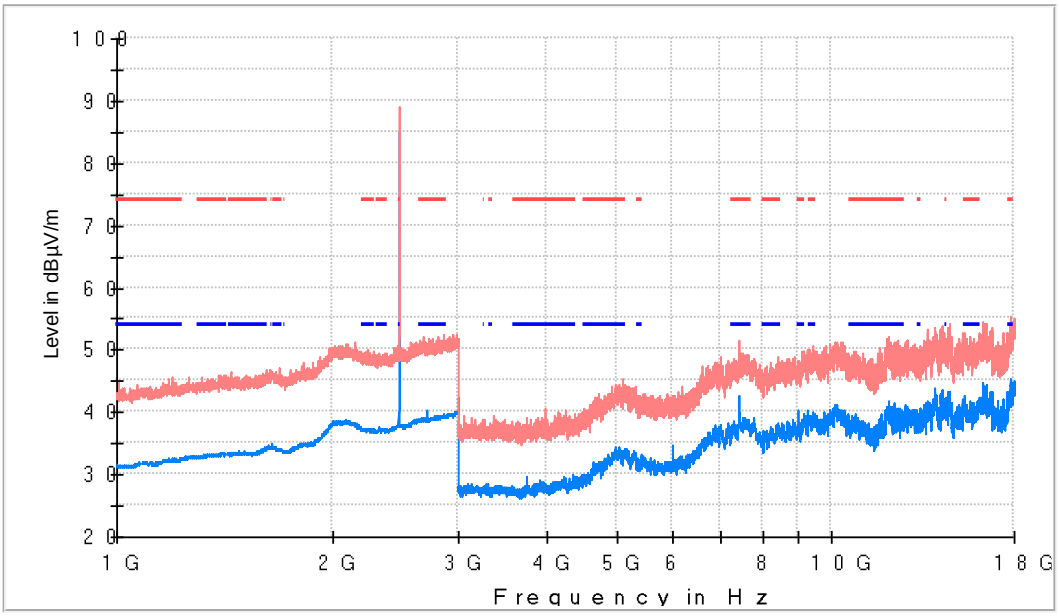
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	88.9	84.5	H	---	---	Fundamental
18000.000000	53.7	44.8	H	9.2	54.0	

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2439.500000	90.1	80.4	H	---	---	Fundamental
18000.000000	54.1	44.8	V	9.2	54.0	

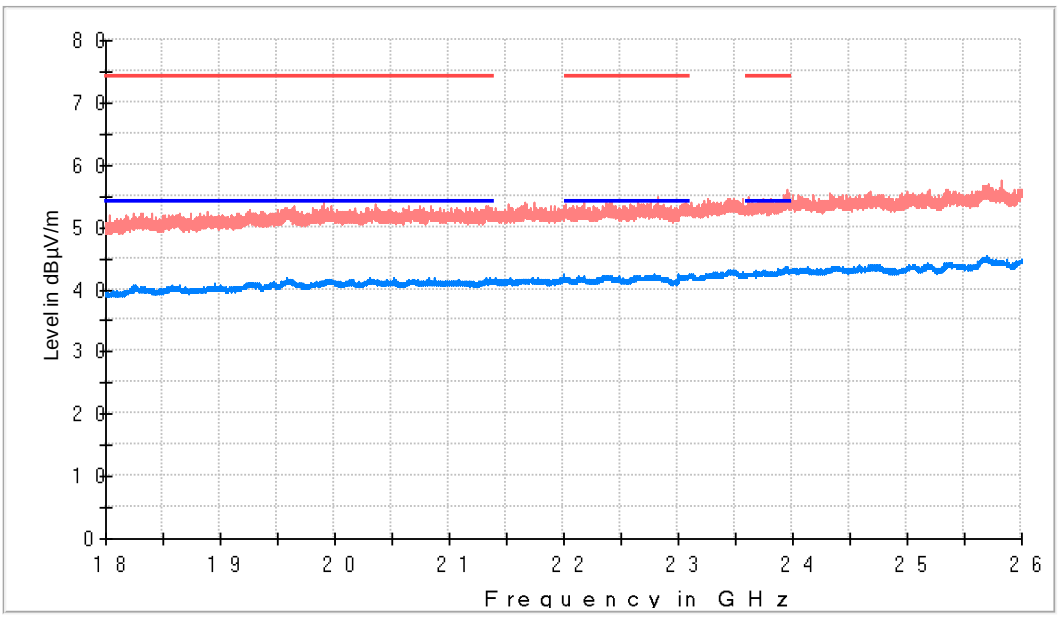
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.000000	89.1	85.3	H	---	---	Fundamental
18000.000000	54.3	44.8	V	9.2	54.0	

Frequency range 18 - 26 GHz

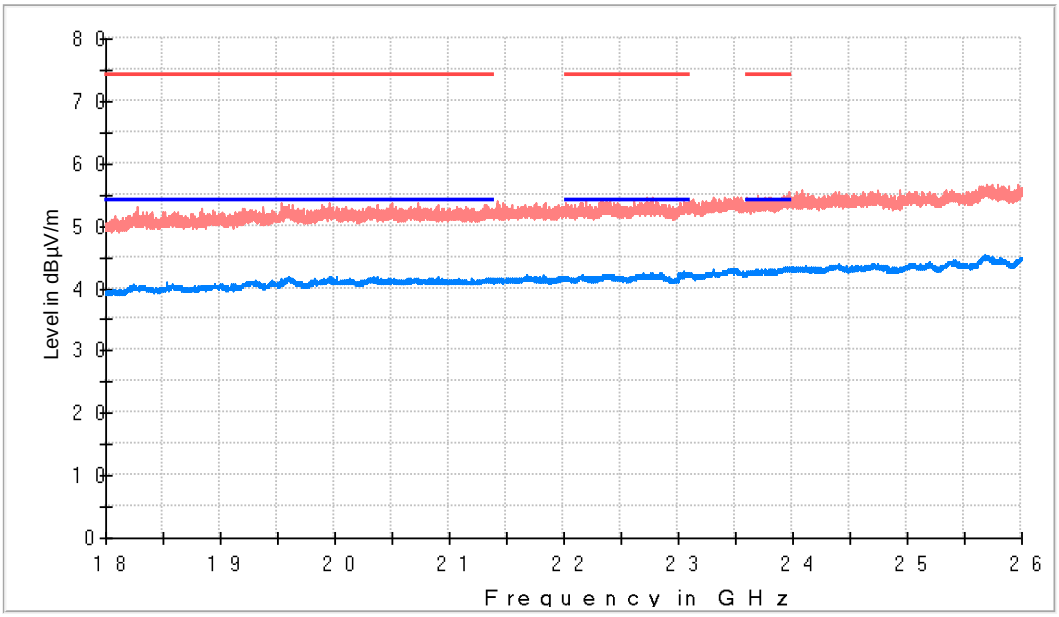
Lowest Channel



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

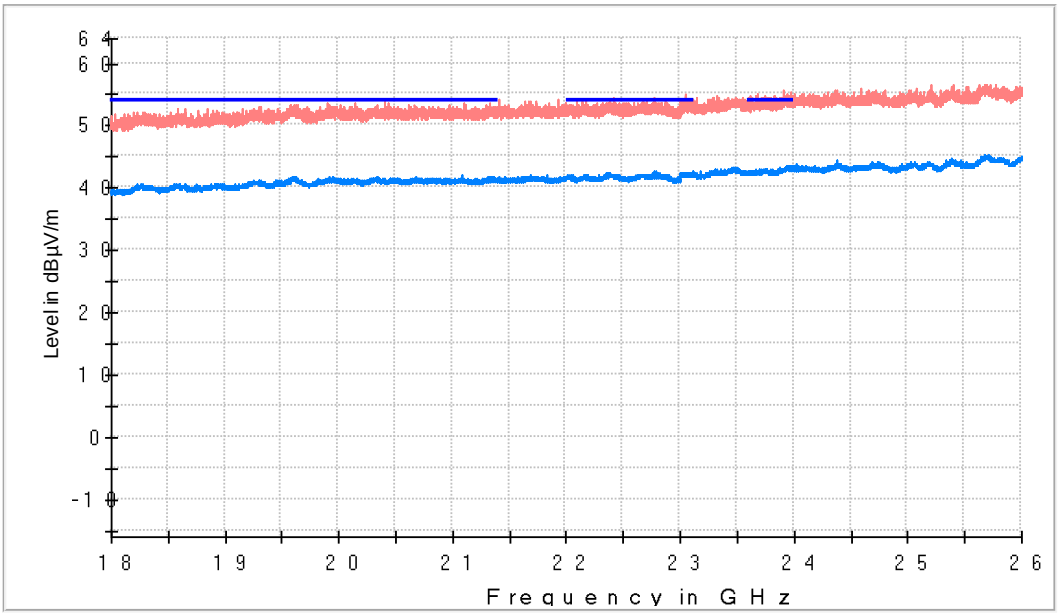
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23945.000000	54.4	43.6	H	10.5	54.0

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23989.000000	53.0	43.5	H	10.5	54.0

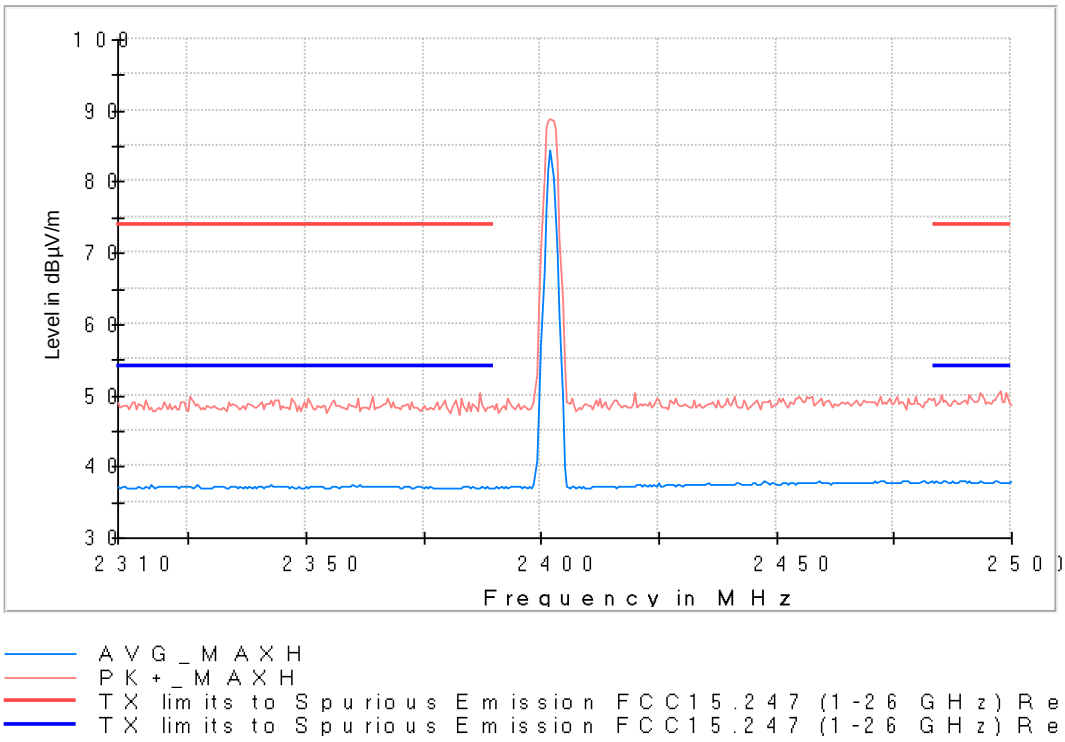
Highest Channel



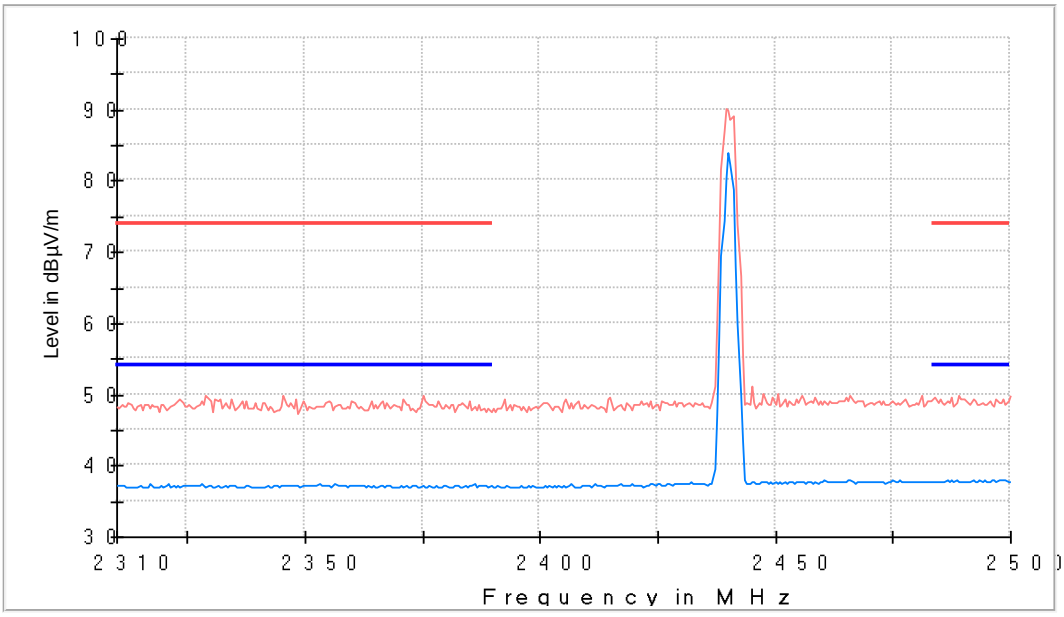
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23931.500000	53.9	43.5	H	10.5	54.0

Restricted Bands (2.31 GHz - 2.5 GHz)

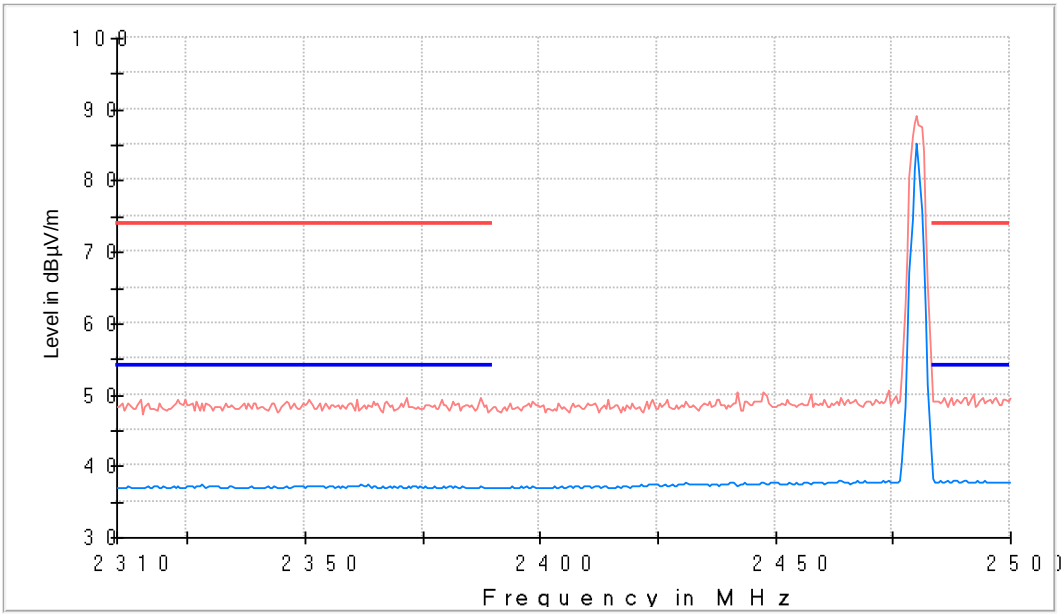
Lowest Channel



Middle Channel



Highest Channel



Appendix B: Test results. Bluetooth EDR

PRODUCT INFORMATION

Information	Description
Modulation	FHSS
Adaptive	Non-Adaptive Equipment
Operation mode 1:	
Operating Frequency Range	2400 – 2483.5 MHz
Nominal Channel Bandwidth	2 MHz
RF Output Power	4 dBm
Extreme operating conditions	-40 ºC to +65 ºC
- Temperature range	
Antenna type	
Antenna gain	-2.5 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth Classic
Geo-location capability	No

TEST CONDITIONS

(*): Data provided by the client.

TEST CONDITIONS	DESCRIPTION
TC#01	Power supply (V): $V_{nominal}$ = 12 Vdc 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 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 Modulation: 8-DPSK Test Frequencies for Conducted/Radiated tests: Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz

TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247

RSS-247 5.1 (b) / FCC 15.247 (a) (1) 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	# of Tx Chains	Port	Emission Bandwidth (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.93
2441.00000				0.93
2480.00000				0.93

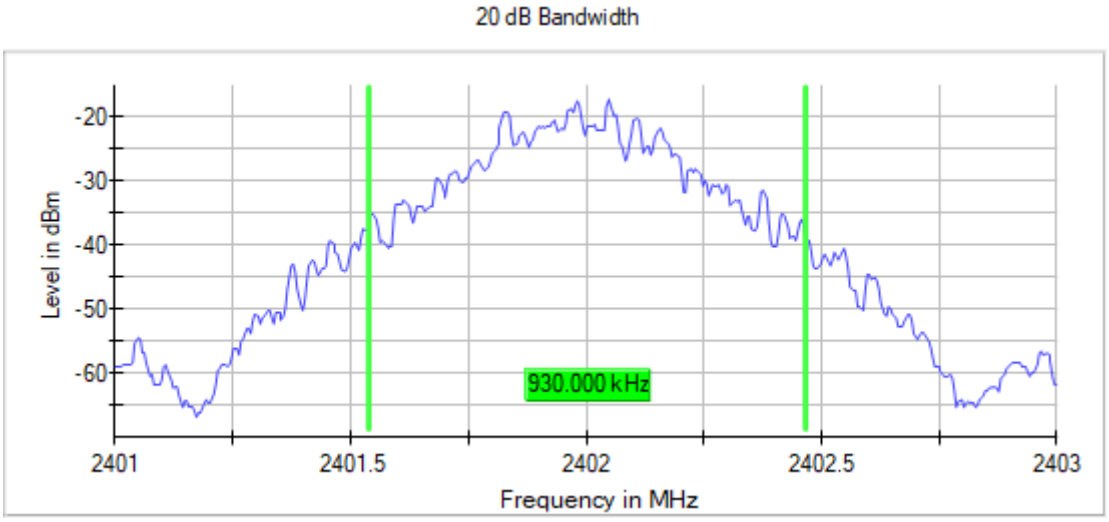
Verdict

Pass

Attachments

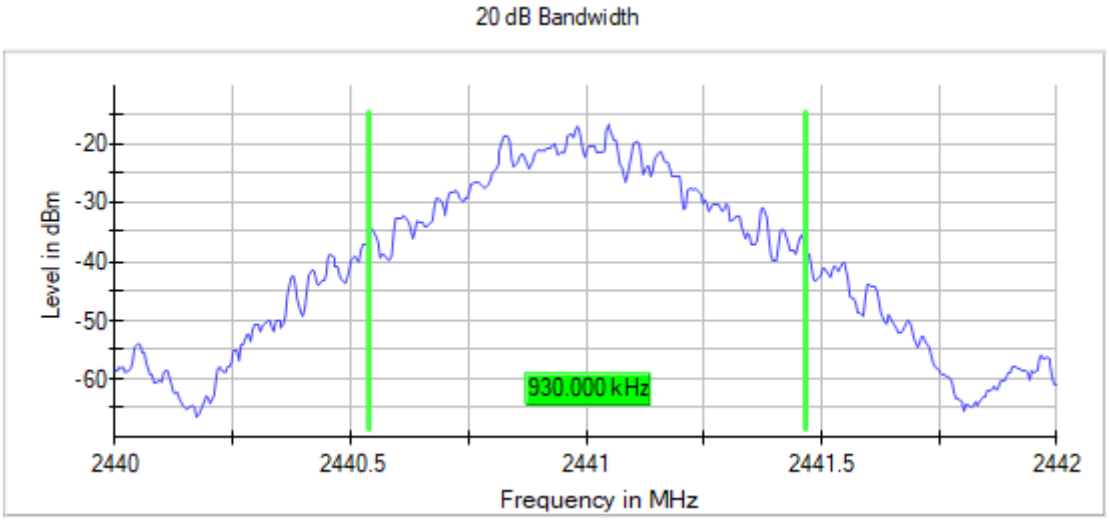
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



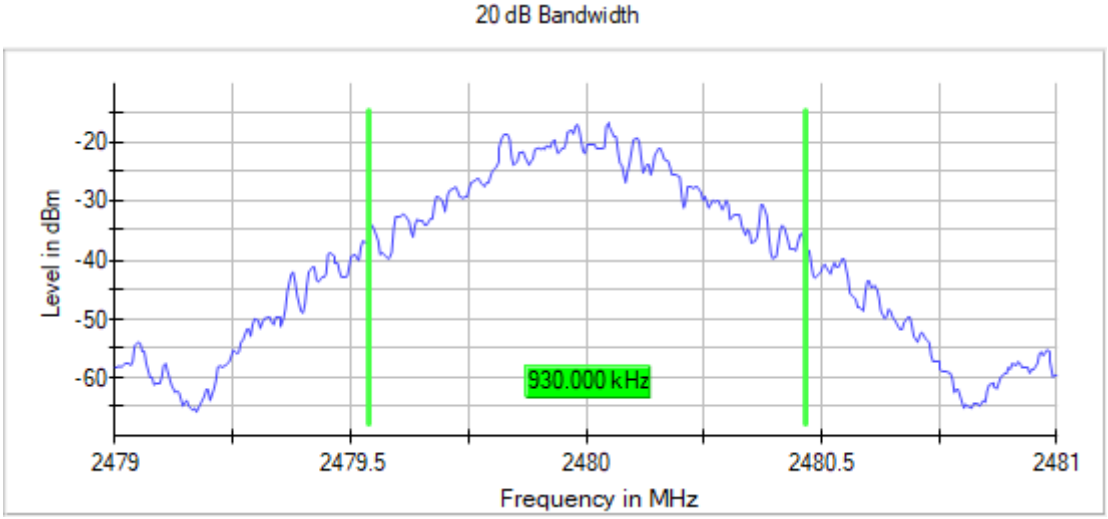
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



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

Images:



Measurement

Setting	Instrument Value
Start Frequency	2.40100 GHz
Stop Frequency	2.40300 GHz
Span	2.000 MHz
RBW	10.000 kHz
VBW	30.000 kHz
SweepPoints	400
Sweeptime	189.648 µs
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	200
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	7 / max. 150
Stable	5 / 5
Max Stable Difference	0.19 dB

Modulation: BT (π/4 DQPSK 2-DH5)

Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Emission Bandwidth (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1.29
2441.00000				1.29
2480.00000				1.29

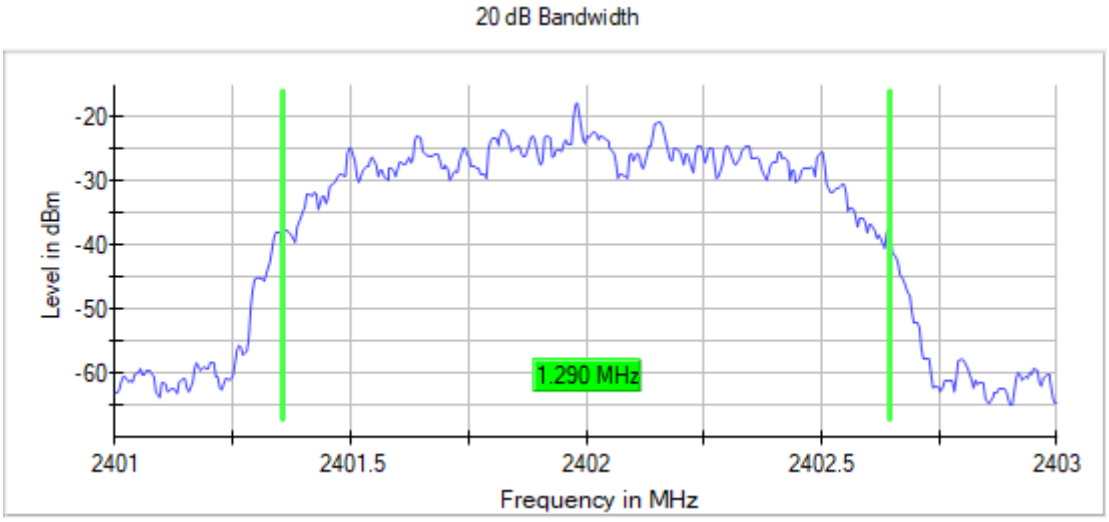
Verdict

Pass

Attachments

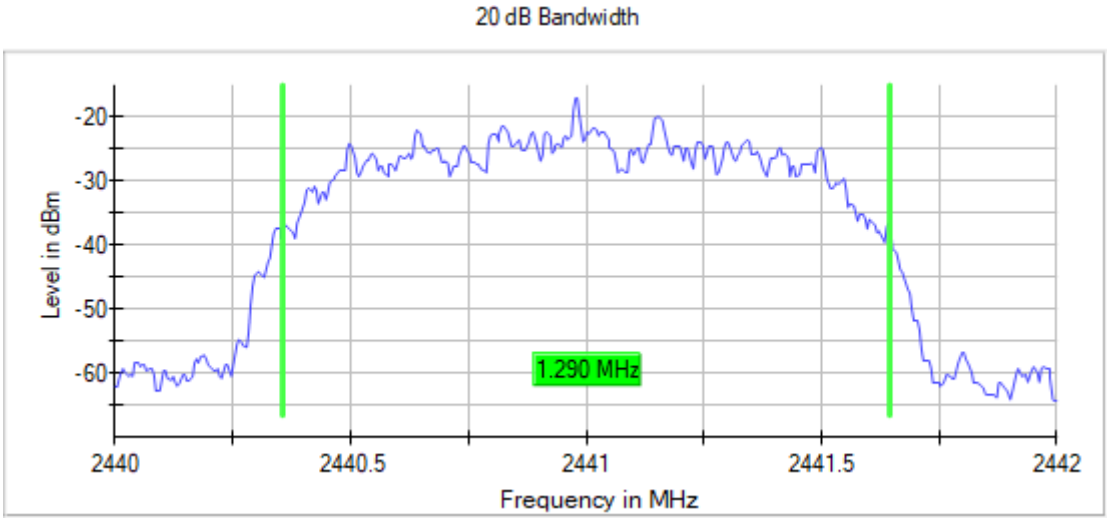
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



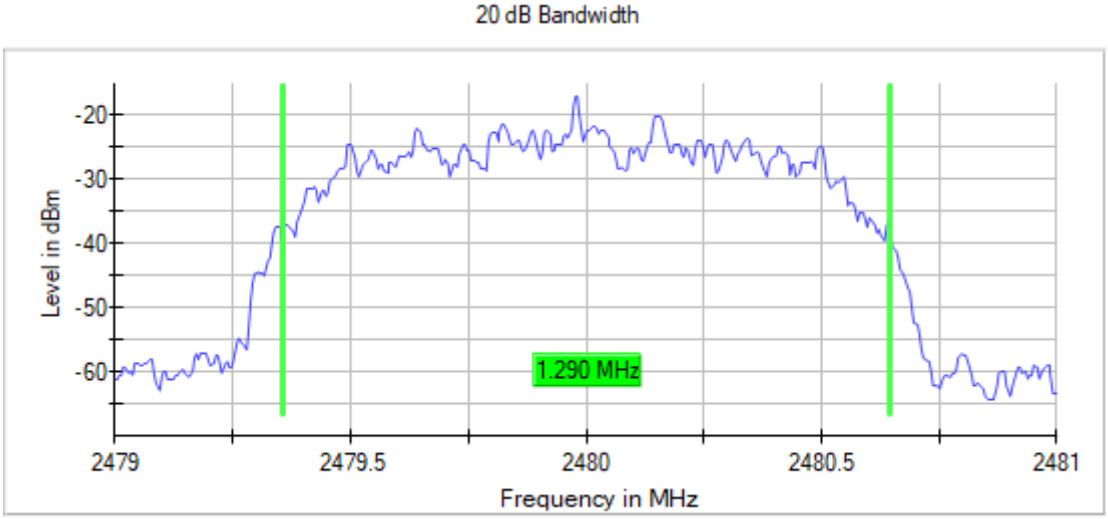
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



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

Images:



Measurement

Setting	Instrument Value
Start Frequency	2.40100 GHz
Stop Frequency	2.40300 GHz
Span	2.000 MHz
RBW	10.000 kHz
VBW	30.000 kHz
SweepPoints	400
Sweeptime	189.648 µs
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	200
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	7 / max. 150
Stable	5 / 5
Max Stable Difference	0.13 dB

Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Emission Bandwidth (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1.26
2441.00000				1.26
2480.00000				1.26

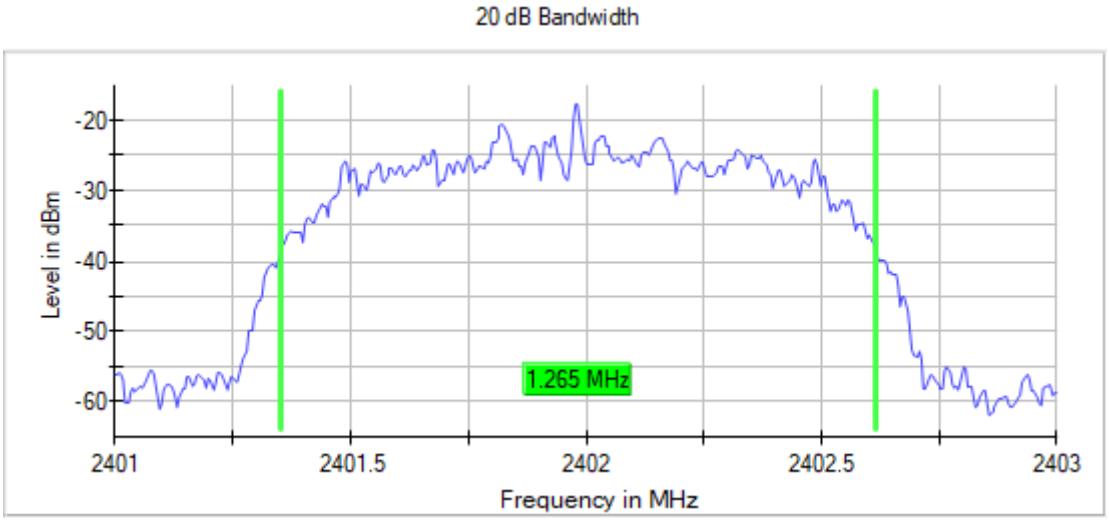
Verdict

Pass

Attachments

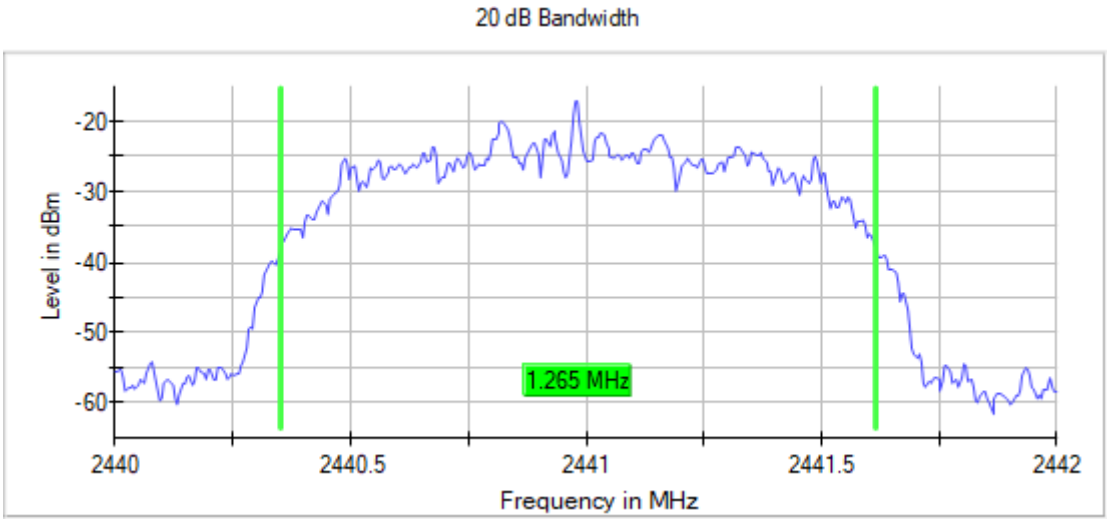
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



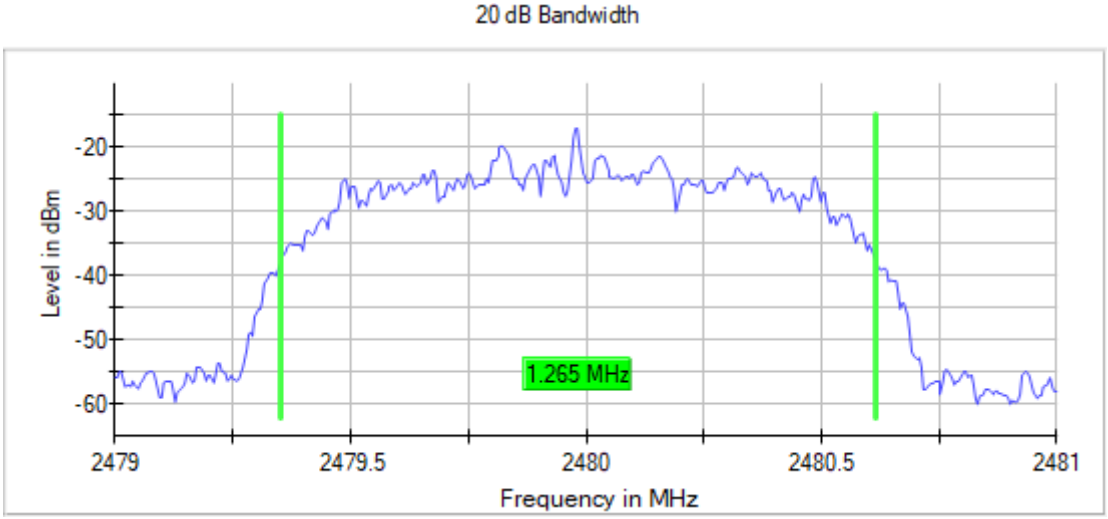
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



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

Images:



Measurement

Setting	Instrument Value
Start Frequency	2.40100 GHz
Stop Frequency	2.40300 GHz
Span	2.000 MHz
RBW	10.000 kHz
VBW	30.000 kHz
SweepPoints	400
Sweeptime	189.648 µs
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	200
Filter	3 dB
Trace Mode	Max Hold
Sweeptype	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.50 dB
Run	7 / max. 150
Stable	5 / 5
Max Stable Difference	0.21 dB

RSS-247 5.1 (b) / FCC 15.247 (a) (1) 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	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.98

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

Equipment	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1.04

Modulation: BT (8DPSK 3-DH5)
Results

Equipment	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1.04

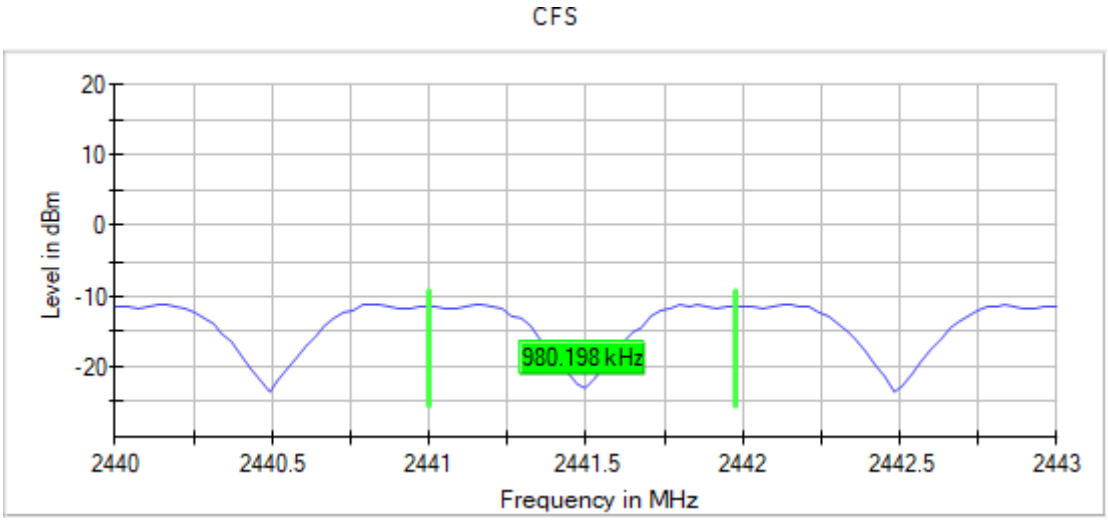
Verdict

Pass

Attachments

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

Images:

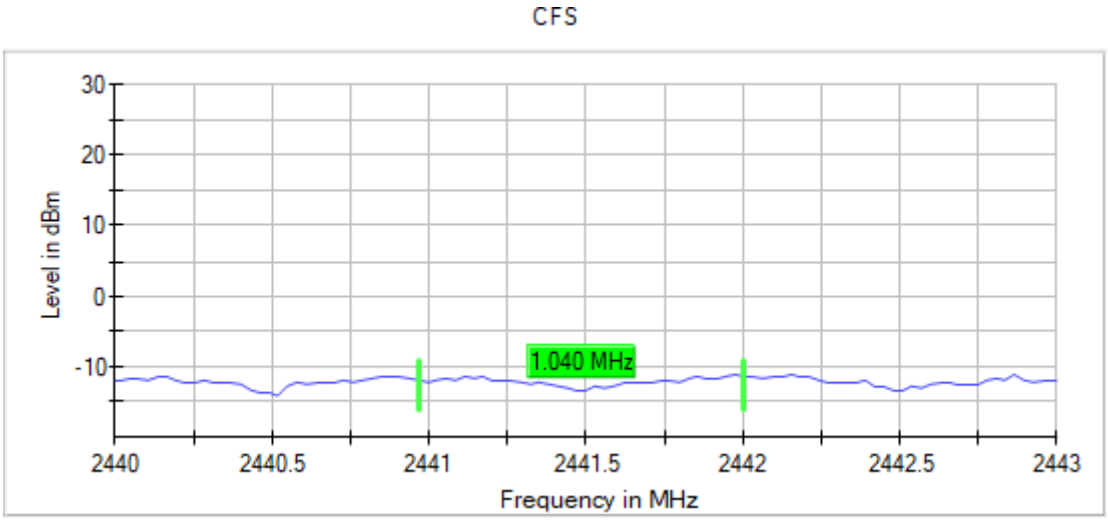


The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20dB bandwidth of the hopping channel.

Attachments

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

Images:

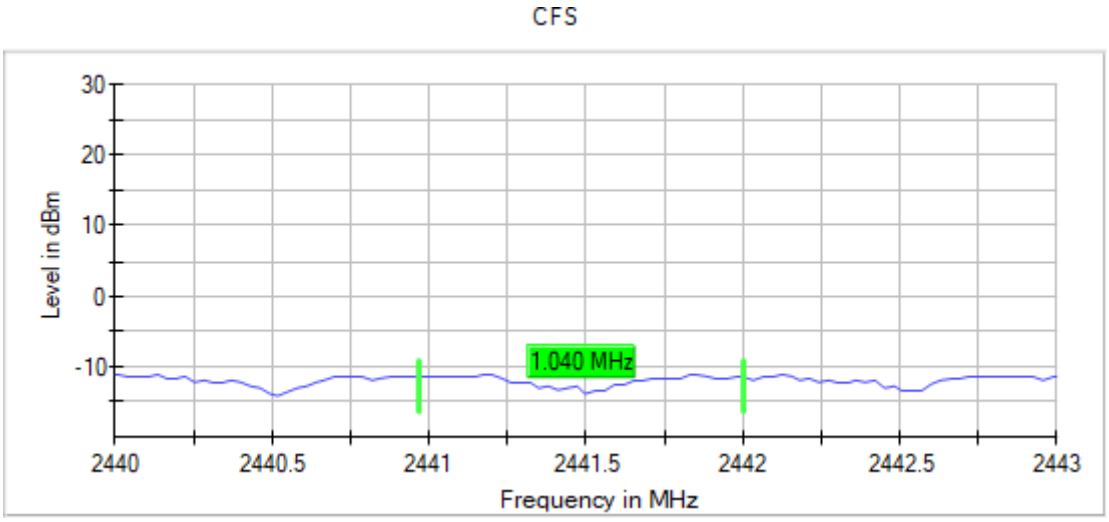


The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20dB bandwidth of the hopping channel.

Attachments

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

Images:



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20dB bandwidth of the hopping channel.

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 -DH1)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	12	5.00

Modulation: BT (GFSK -DH3)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	4	8.20

Modulation: BT (GFSK -DH5)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	6	20.22

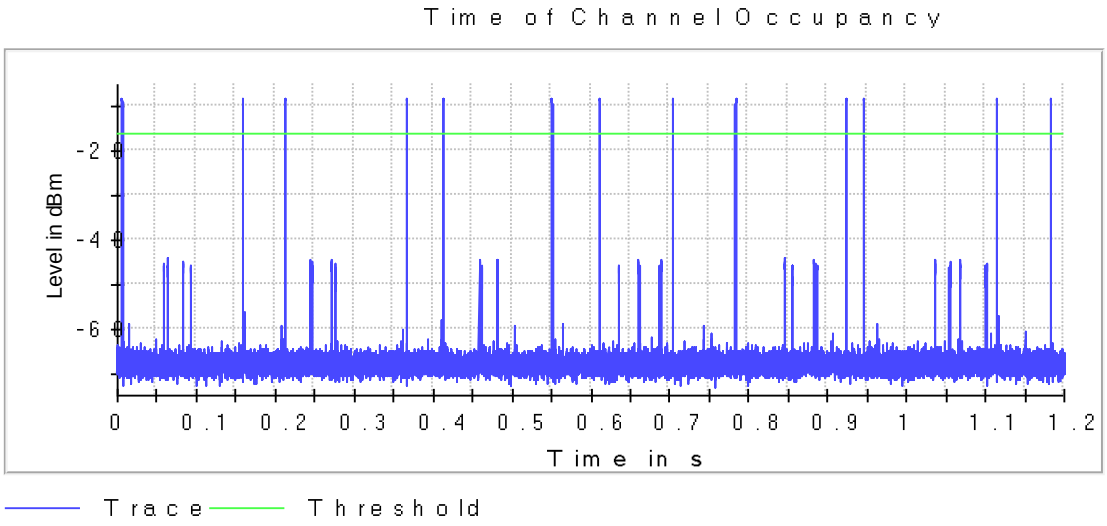
Verdict

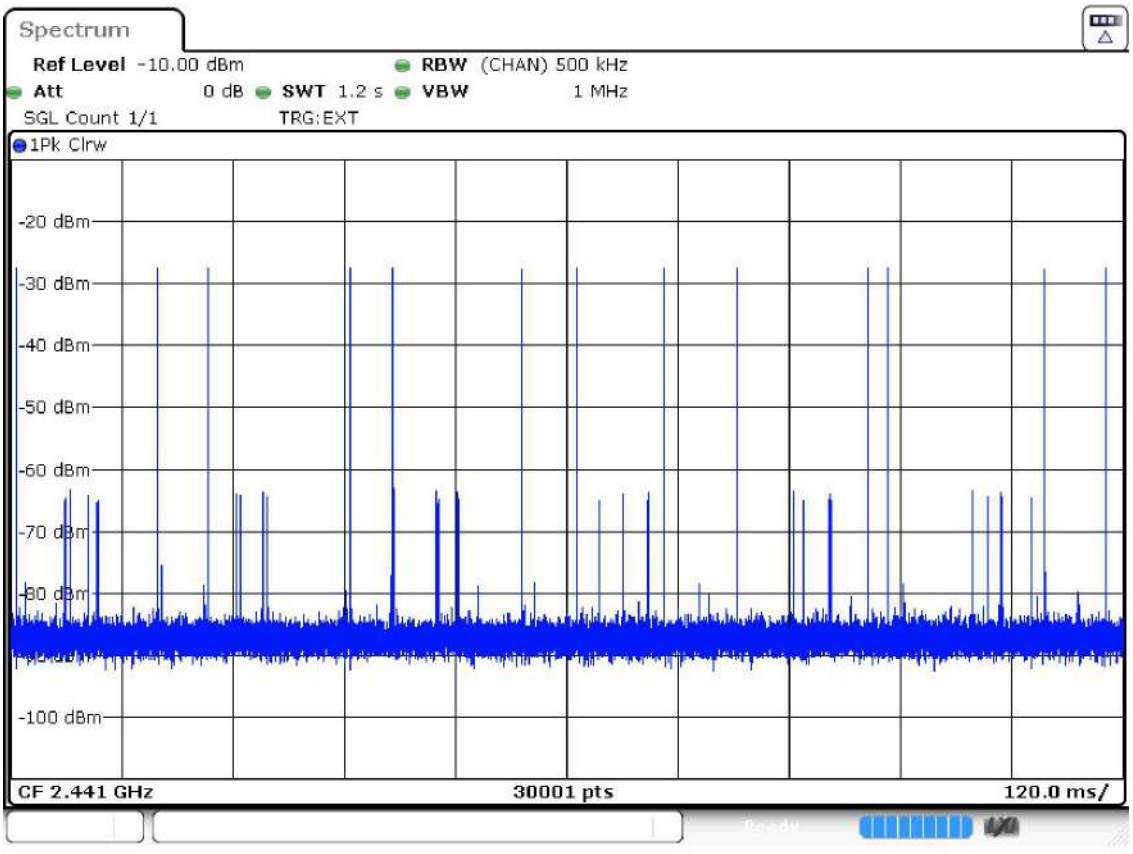
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK -DH1), Number of Transmission Chains = 1,

Images:



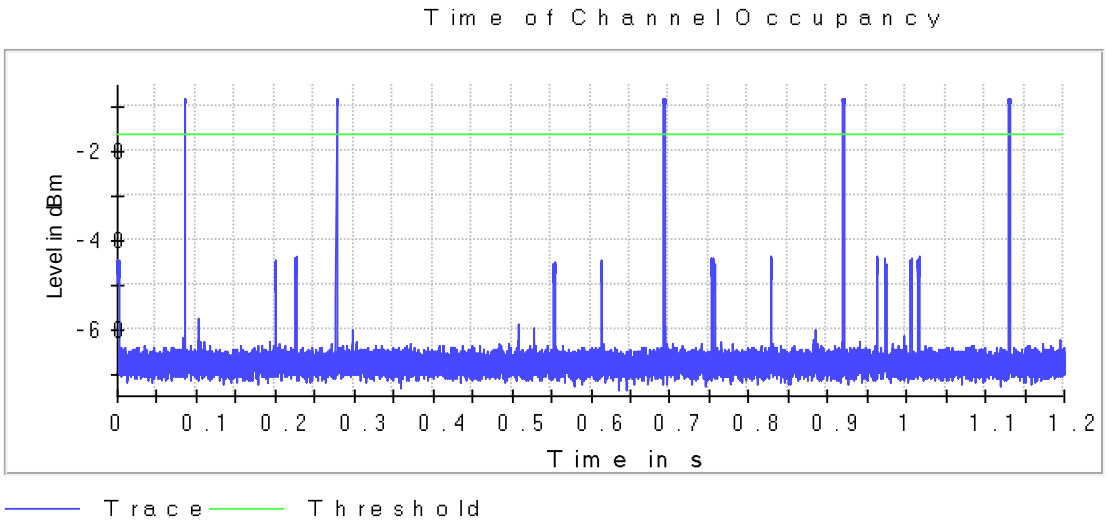


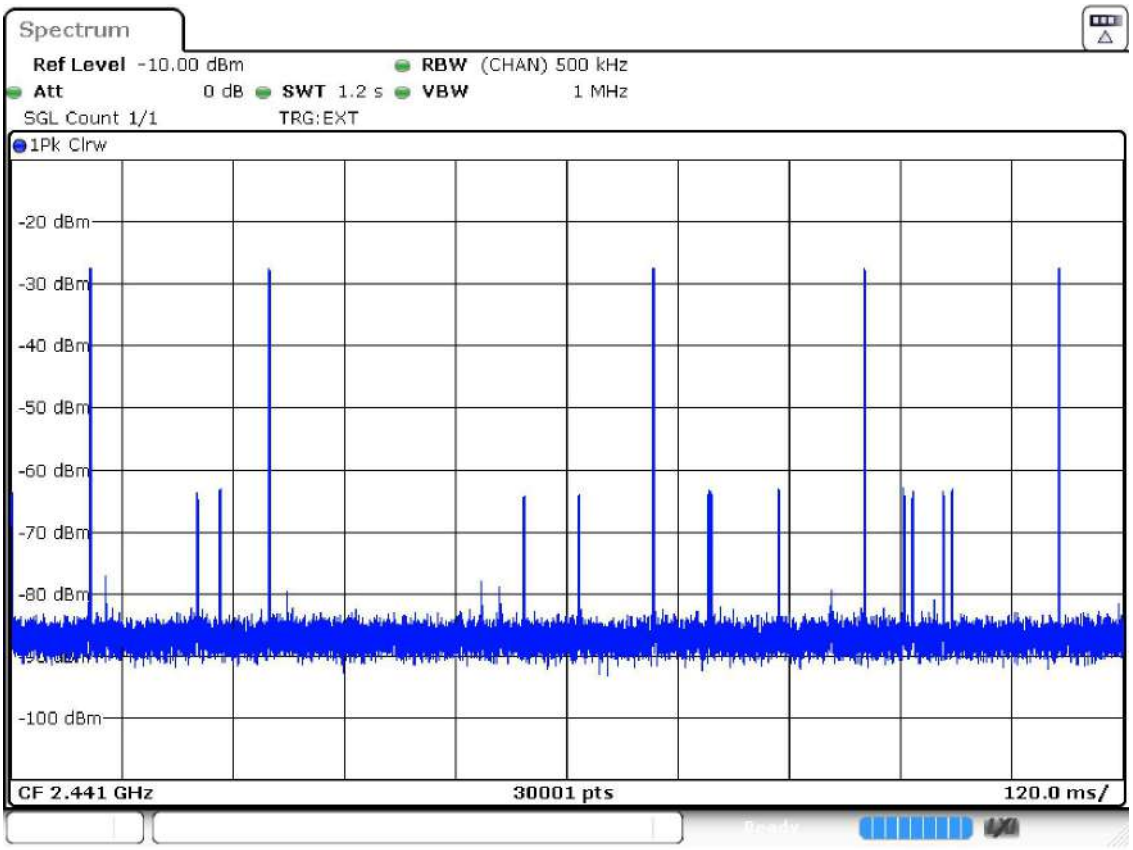
Date: 28.MAR.2022 18:36:28

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK -DH3), Number of Transmission Chains = 1,

Images:



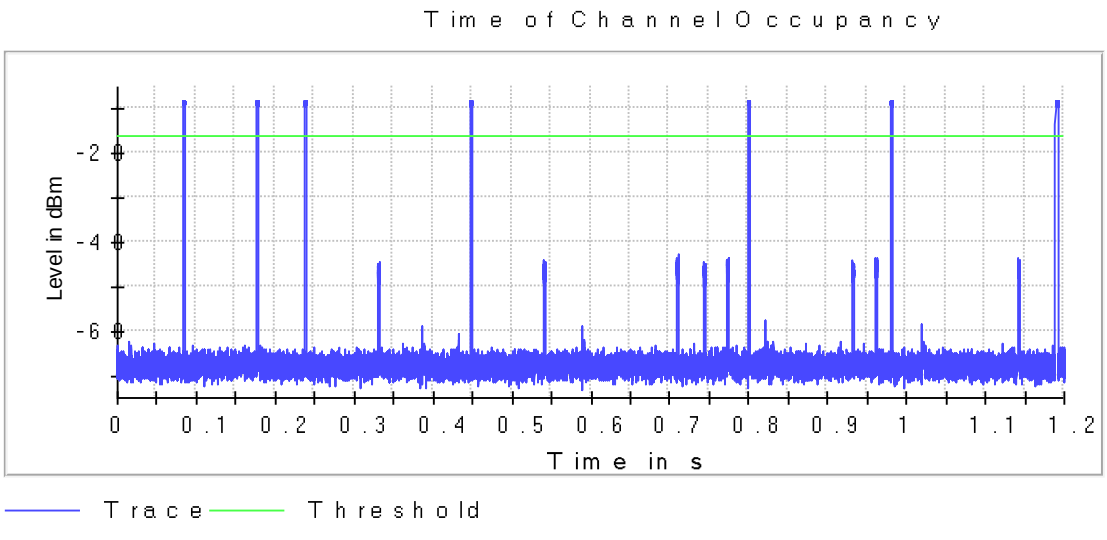


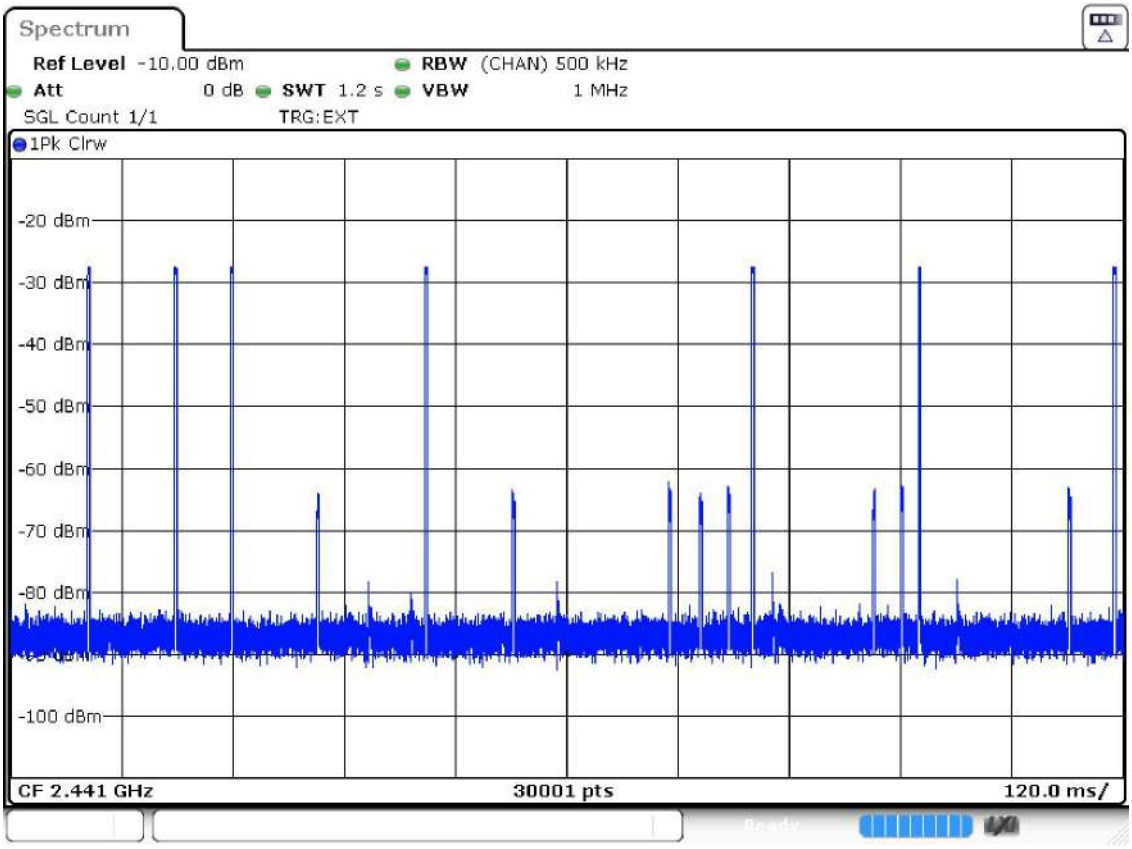
Date: 28.MAR.2022 18:38:43

Attachments

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

Images:





Date: 28.MAR.2022 18:40:14

Modulation: BT (π/4 DQPSK 2-DH1)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	11	3.88

Modulation: BT (π/4 DQPSK 2-DH3)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	6	9.54

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

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	2	7.13

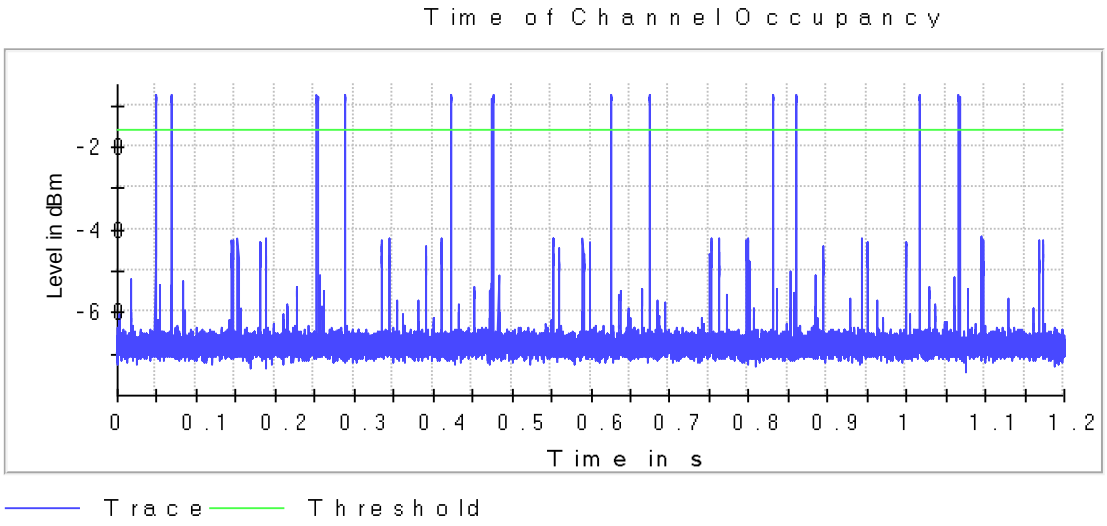
Verdict

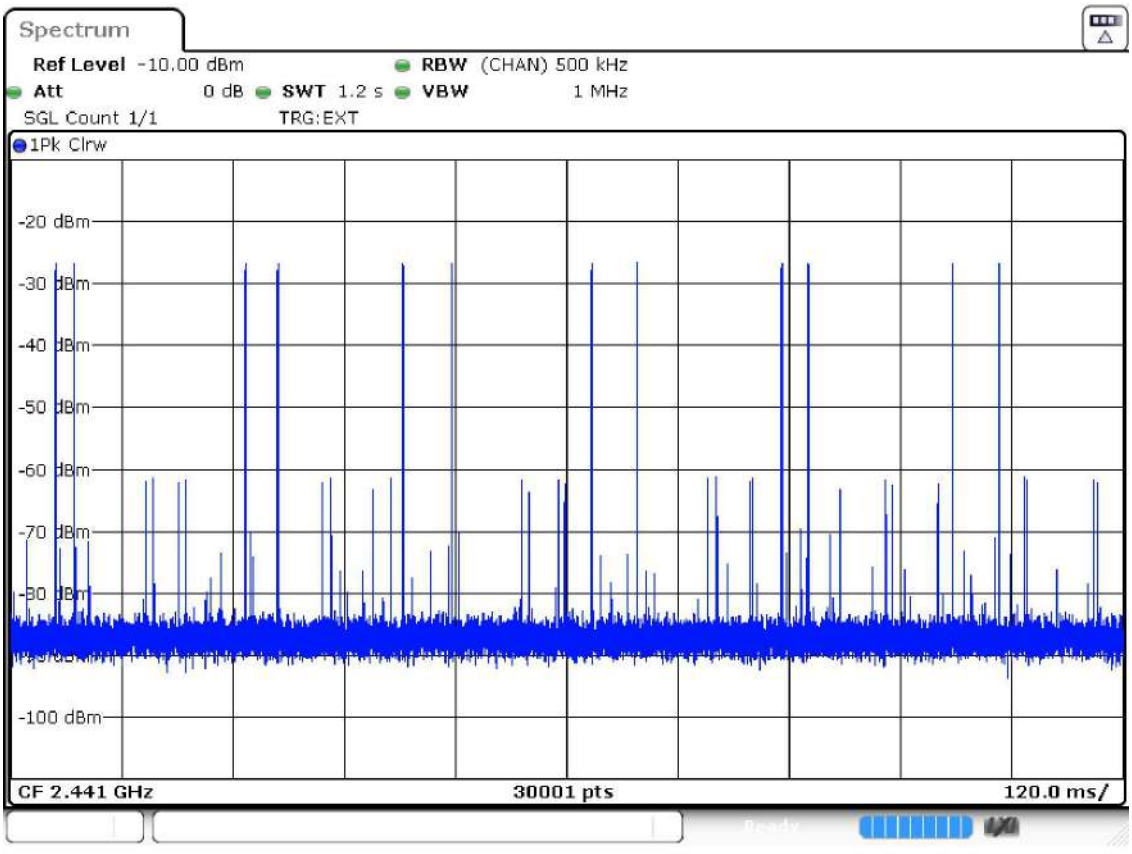
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH1), Number of Transmission Chains = 1,

Images:



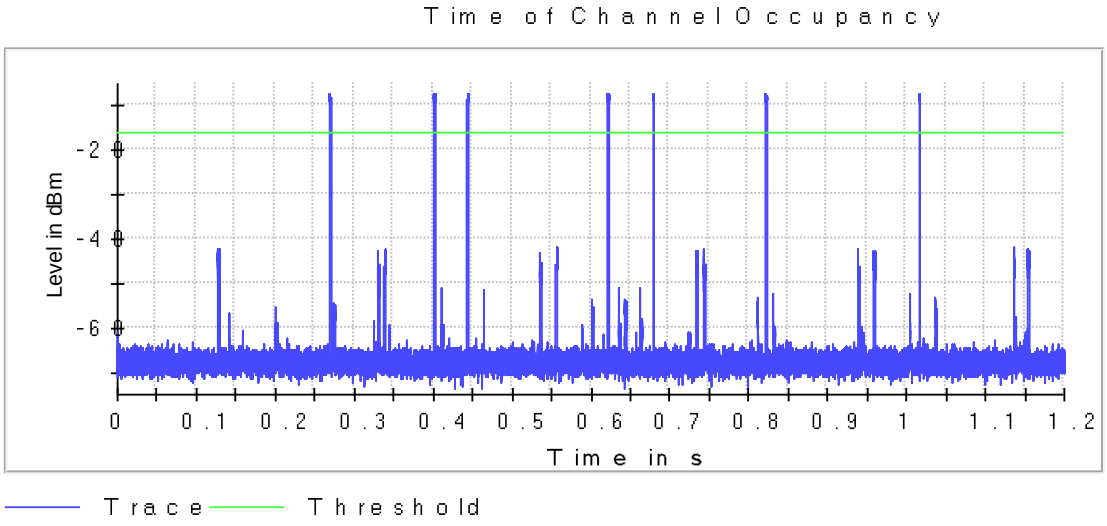


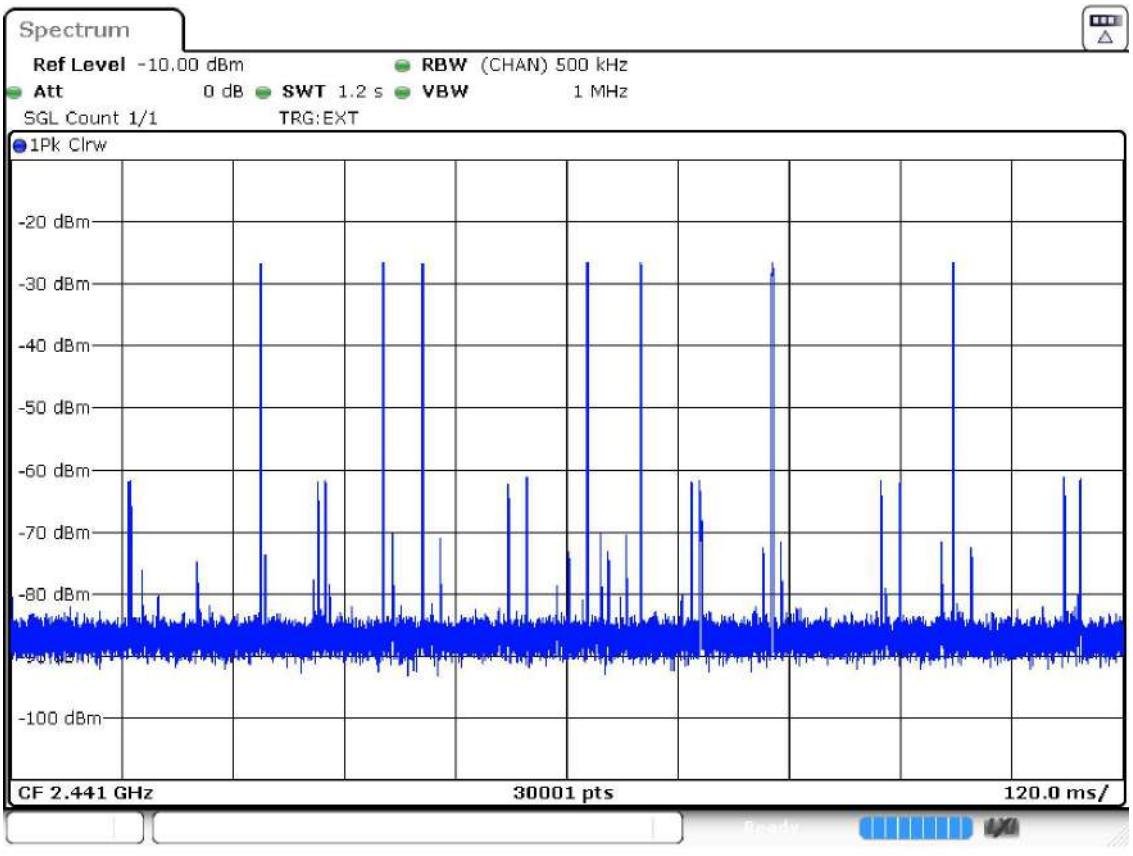
Date: 28.MAR.2022 18:42:01

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH3), Number of Transmission Chains = 1,

Images:



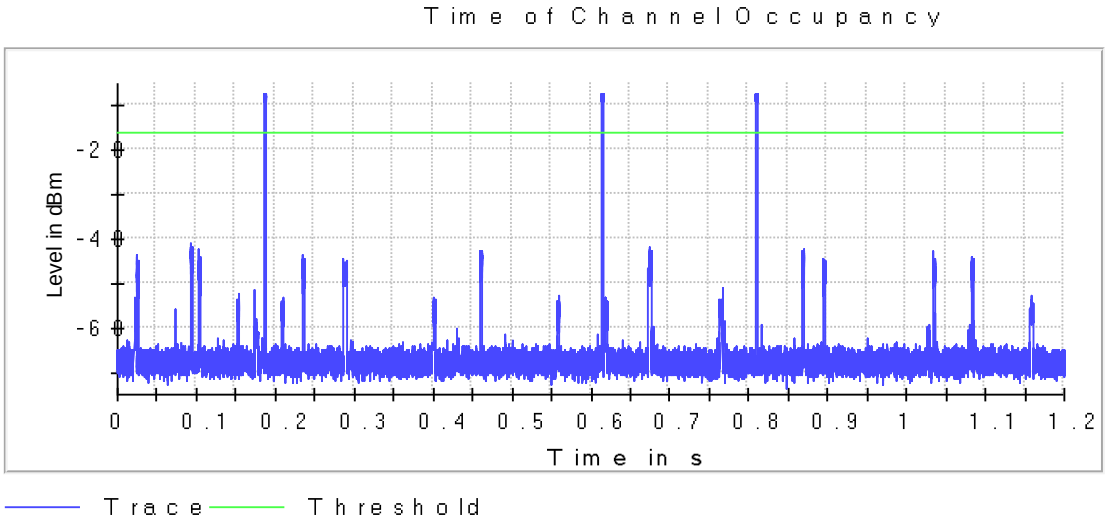


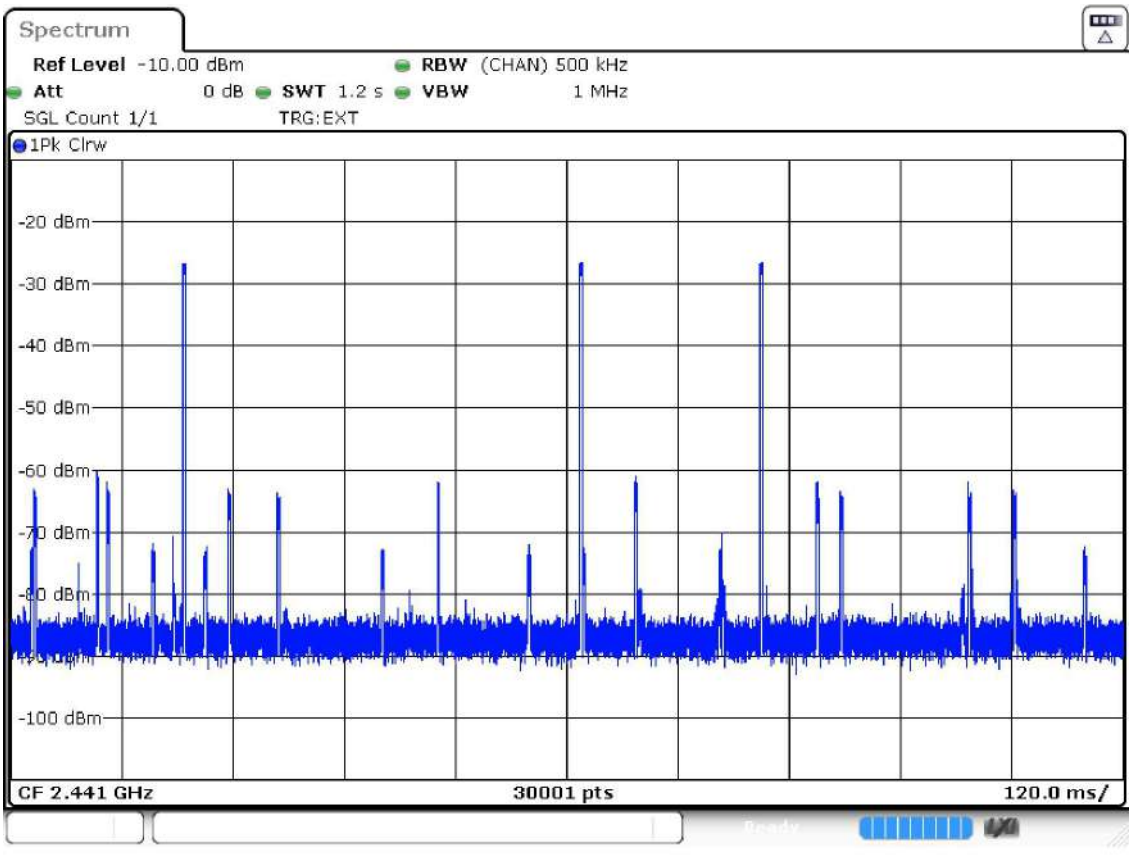
Date: 28.MAR.2022 18:43:57

Attachments

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

Images:





Date: 28.MAR.2022 18:46:14

Modulation: BT (8DQPSK 3-DH1)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	11	3.93

Modulation: BT (8DQPSK 3-DH3)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	6	9.39

Modulation: BT (8DQPSK 3-DH5)
Results

Equipment	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	3	9.41

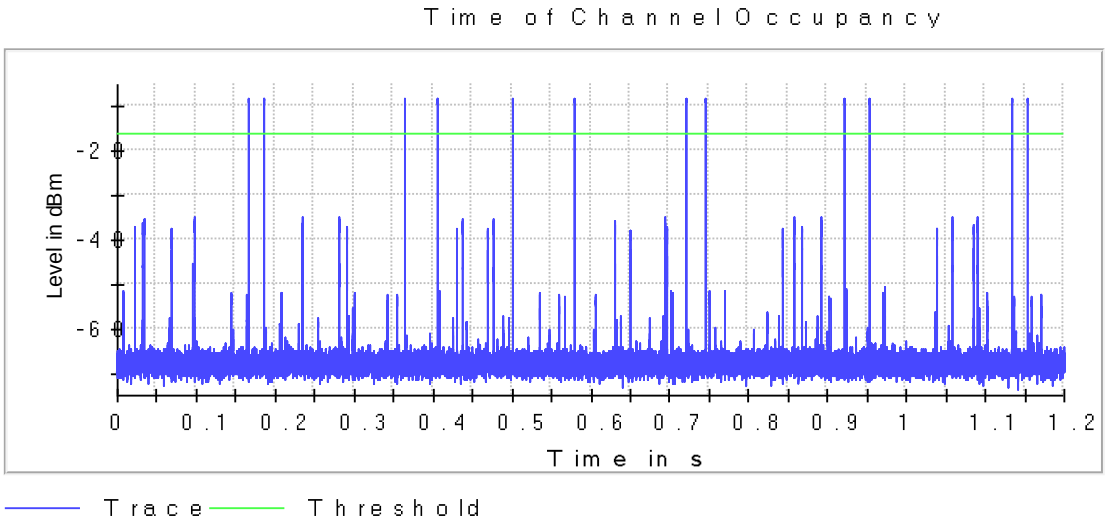
Verdict

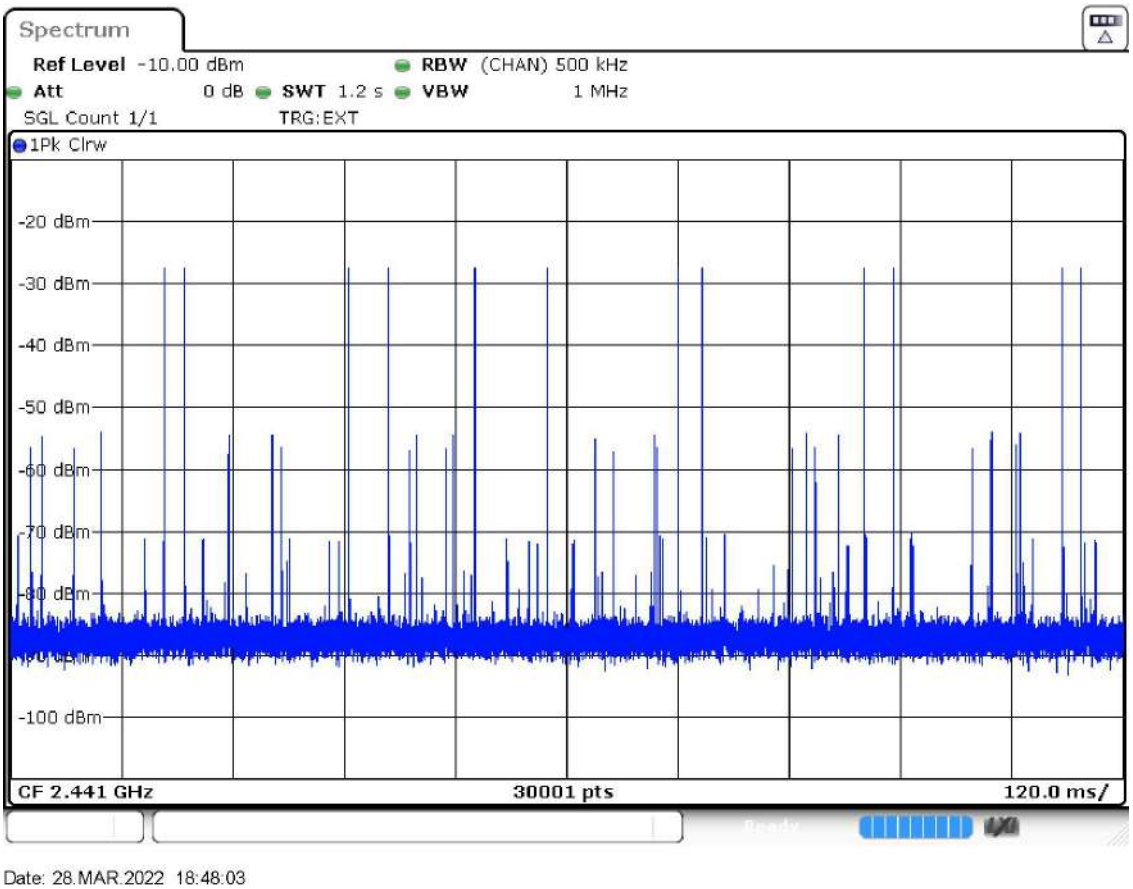
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DQPSK 3-DH1), Number of Transmission Chains = 1,

Images:

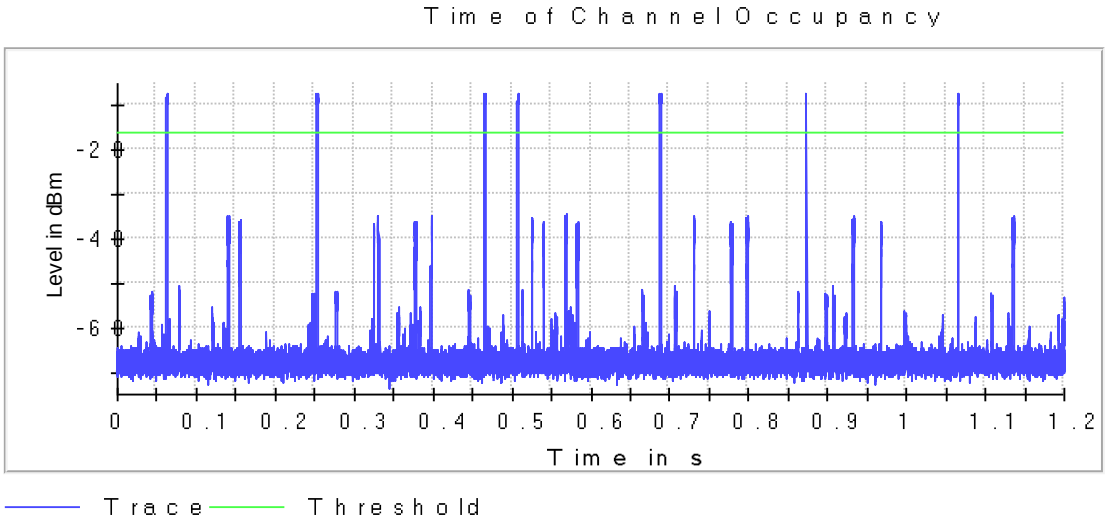


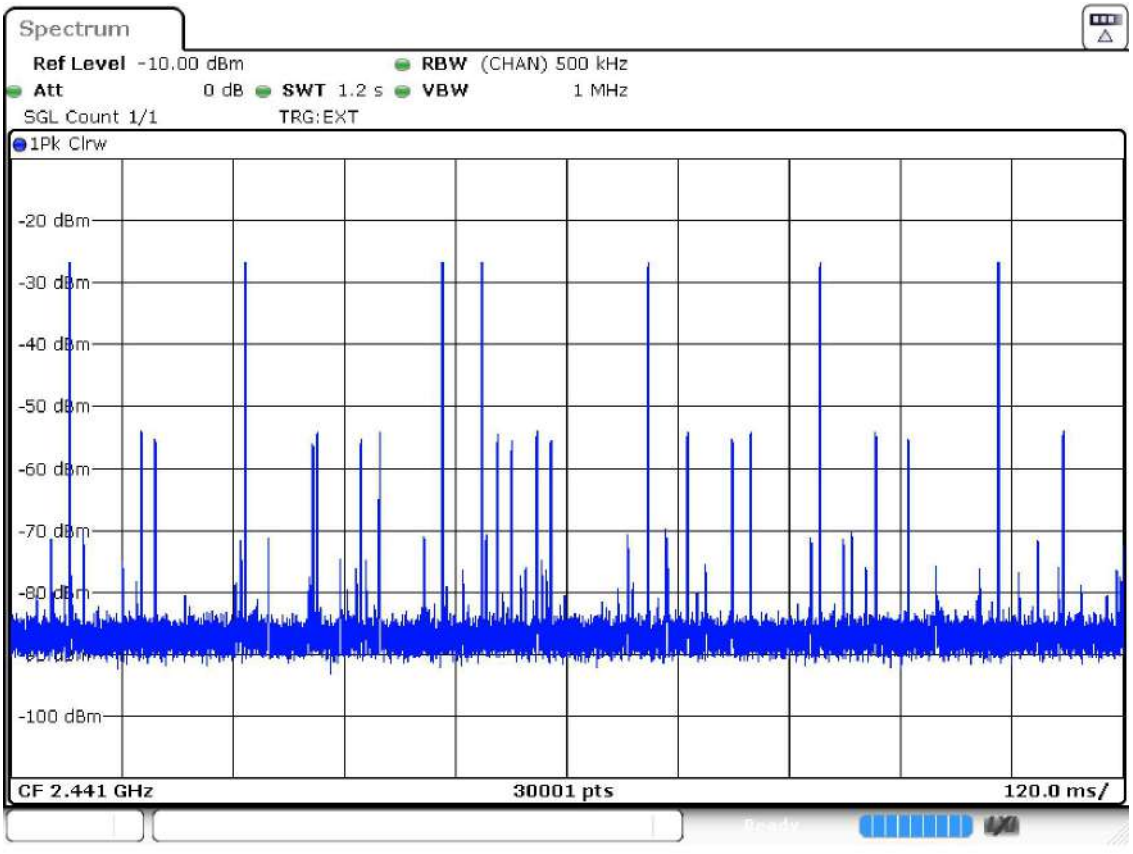


Date: 28.MAR.2022 18:48:03

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DQPSK 3-DH3), Number of Transmission Chains = 1,

Images:

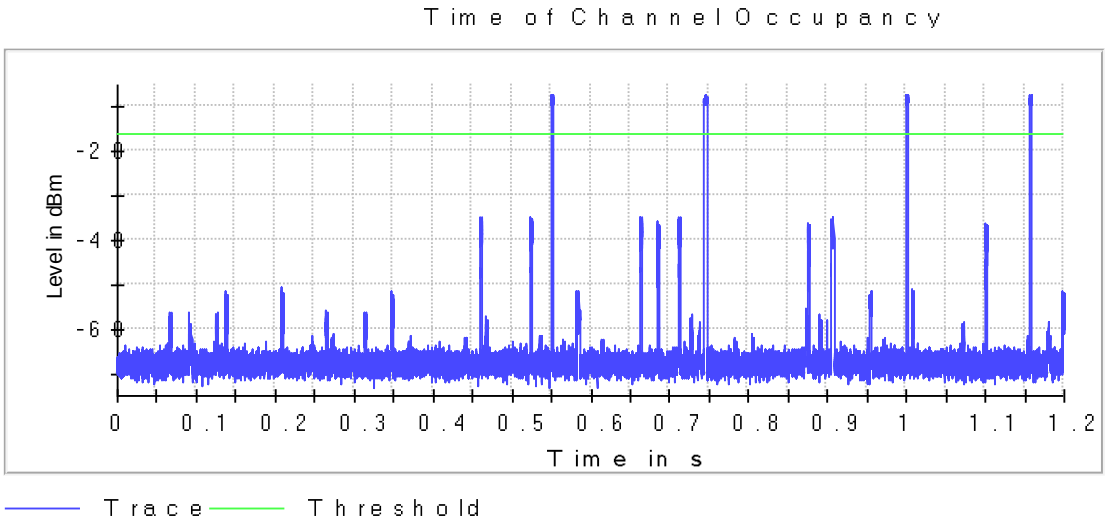


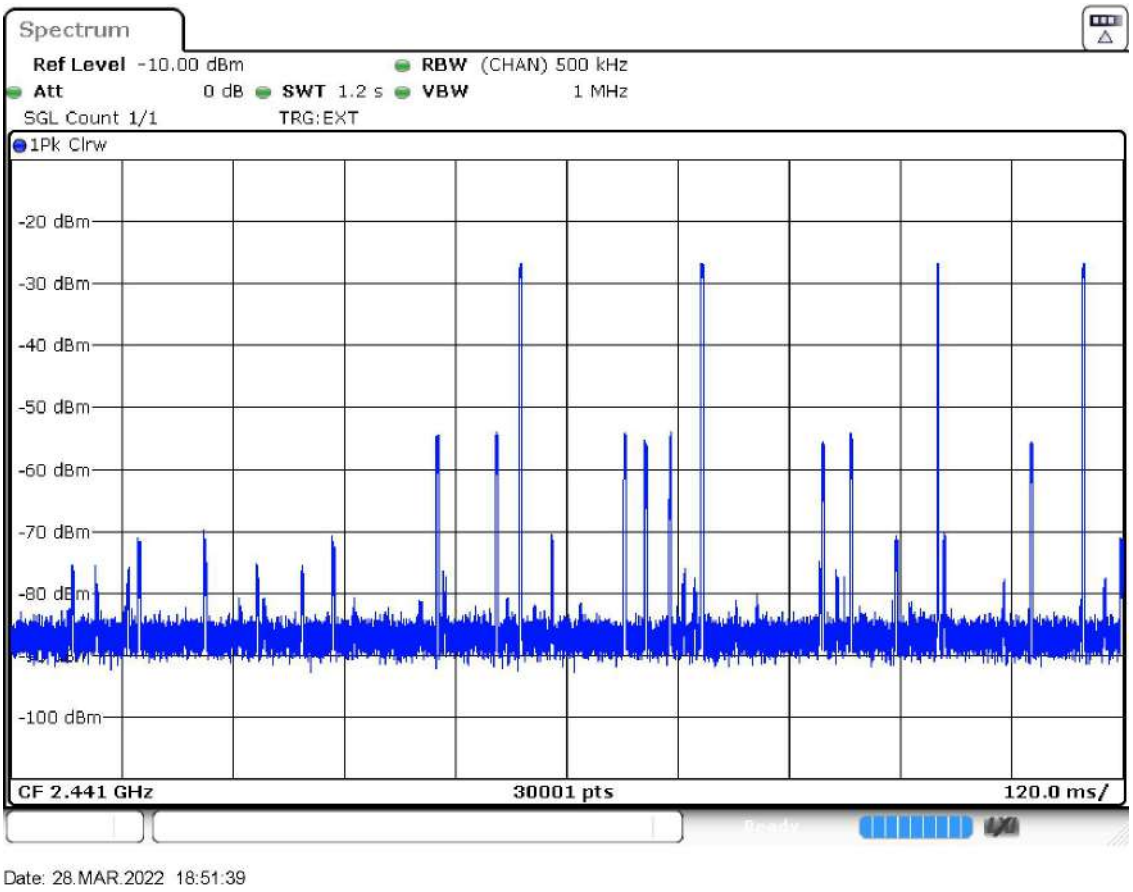


Date: 28.MAR.2022 18:49:51

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DQPSK 3-DH5), Number of Transmission Chains = 1,

Images:





RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) 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	# of Tx Chains	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	79

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

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

Modulation: BT (8DPSK 3-DH5)
Results

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

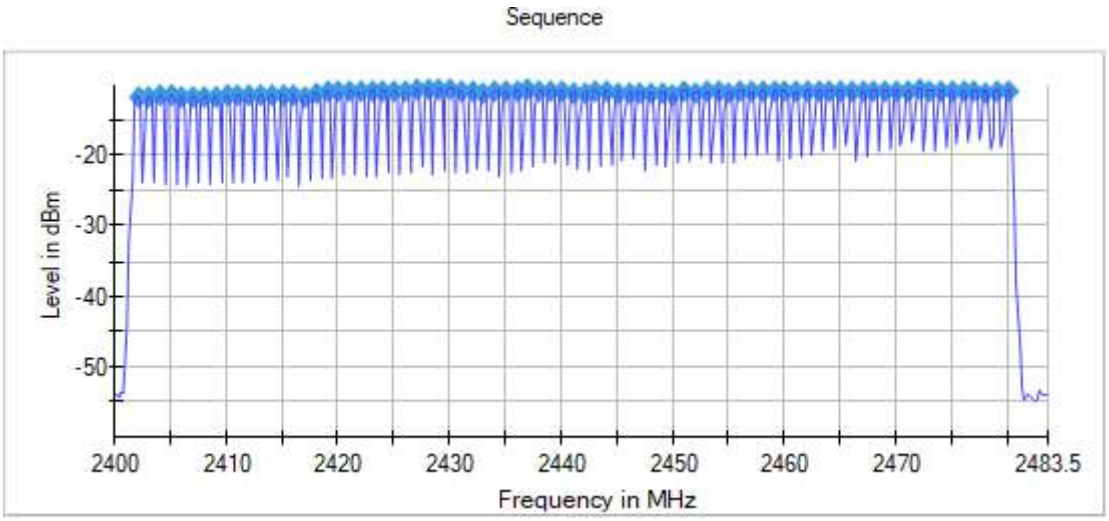
Verdict

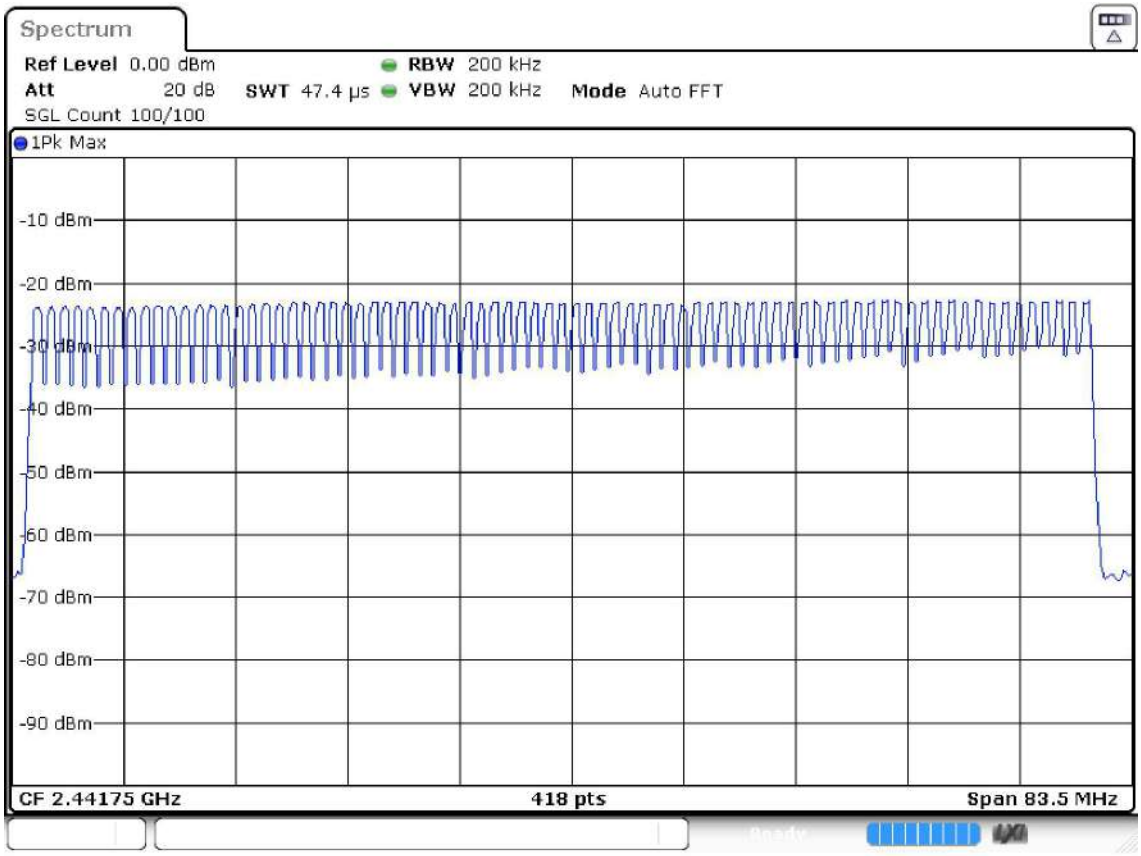
Pass

Attachments

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

Images:



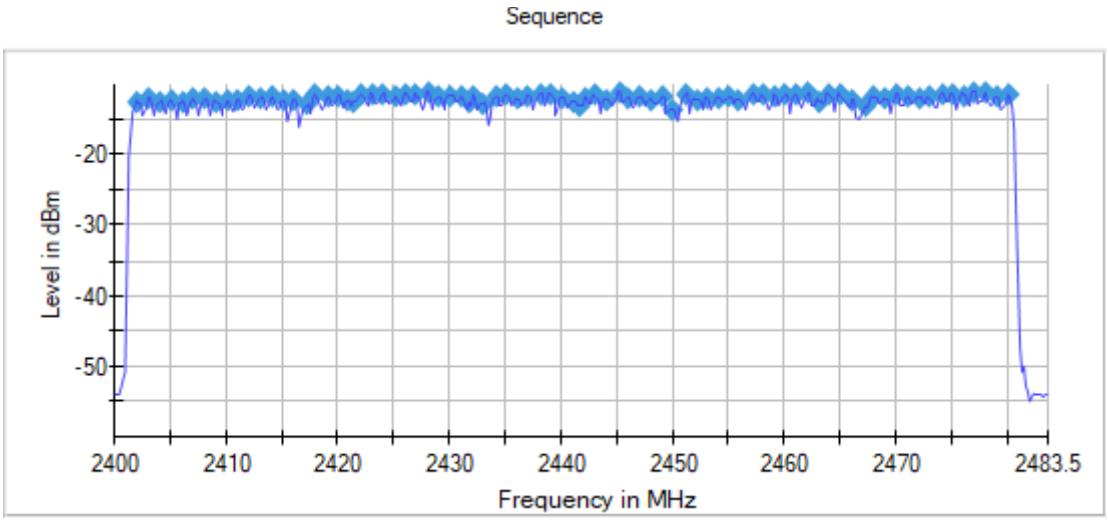


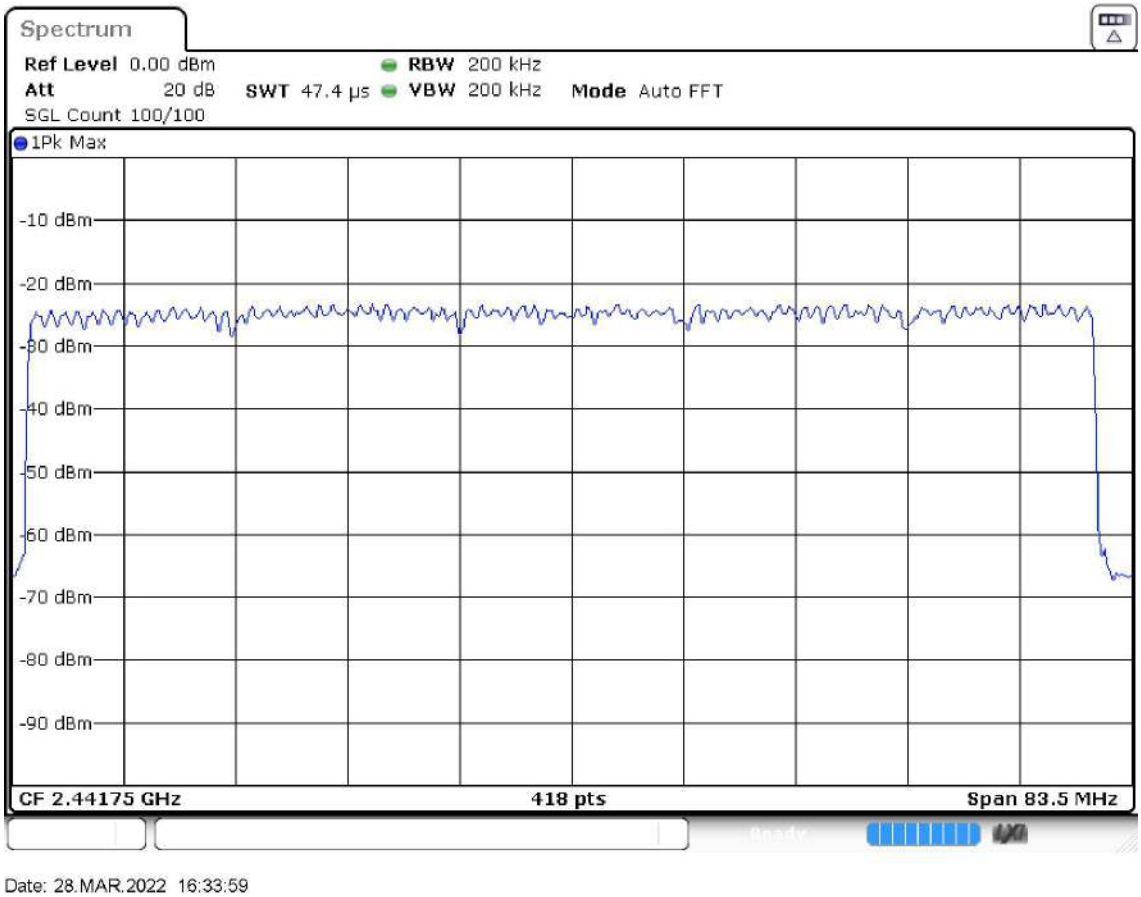
Date: 28.MAR.2022 15:42:09

Attachments

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

Images:

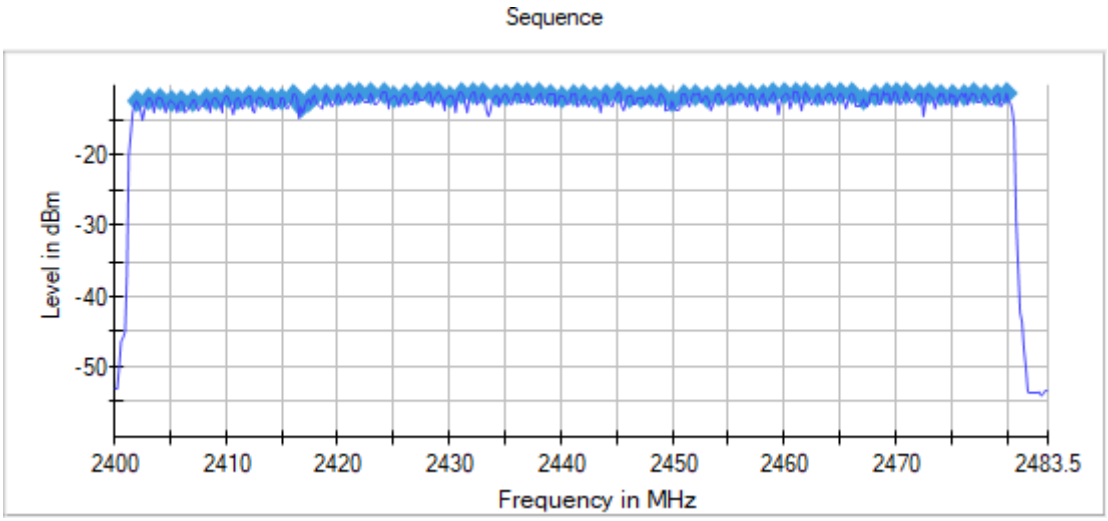


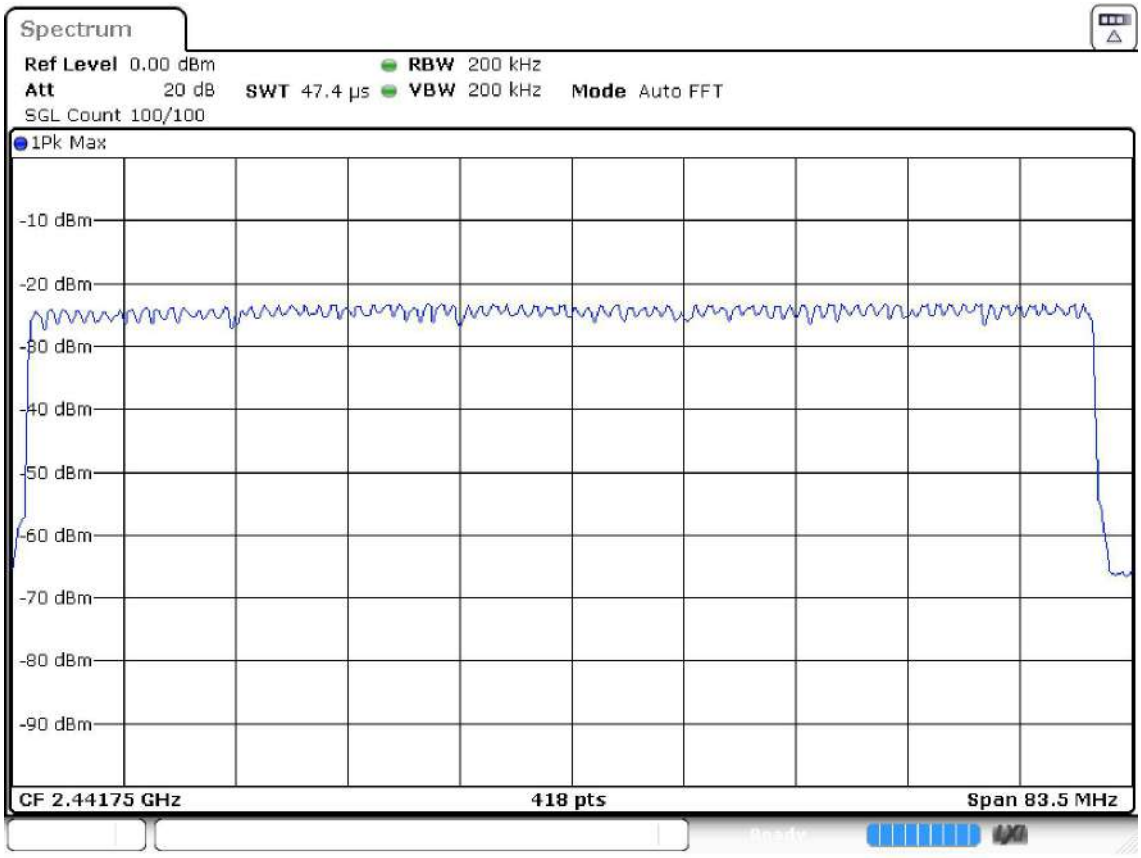


Attachments

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

Images:





Date: 28.MAR.2022 17:06:59

RSS-247 5.4 (b) / FCC 15.247 (b) (1) Maximum Peak Conducted & Antenna gain

Limits

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm). The e.i.r.p. shall not exceed 4 W (RSS-247).

Maximum declared antenna gain: -2.5 dBi

Modulation: BT (GFSK 1-DH5)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Peak Power (dBm)	Maximum EIRP power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	3.2	0.7
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	-1.9	-4.4
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.7	-1.8

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

Freq (MHz)	Equipment	# of Tx Chains	Port	Peak Power (dBm)	Maximum EIRP power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	5.3	2.8
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.3	-2.2
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	2.7	0.2

Modulation: BT (8DPSK 3-DH5)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Peak Power (dBm)	Maximum EIRP power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	5.4	2.9
2441.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.6	-1.9
2480.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	3.1	0.6

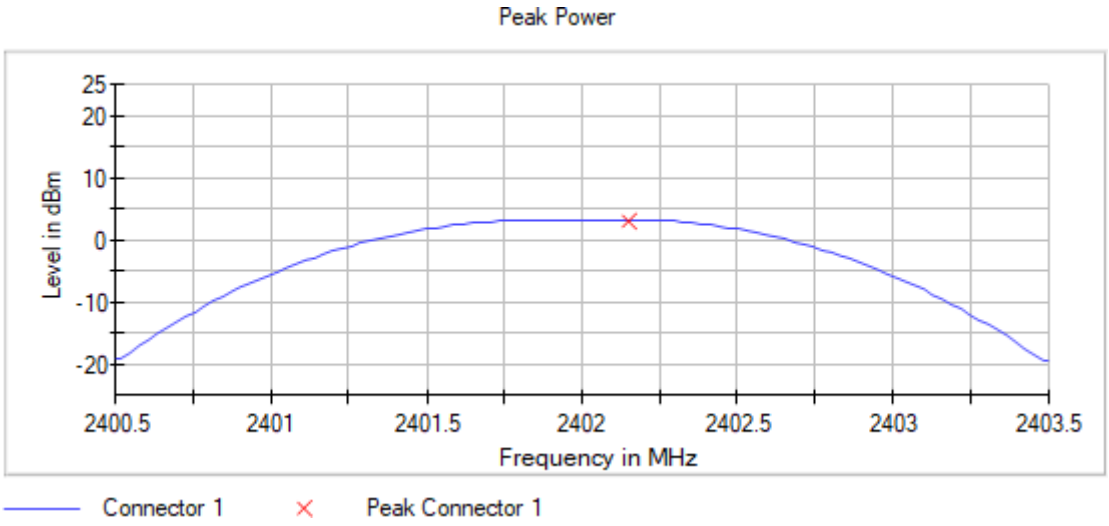
Verdict

Pass

Attachments

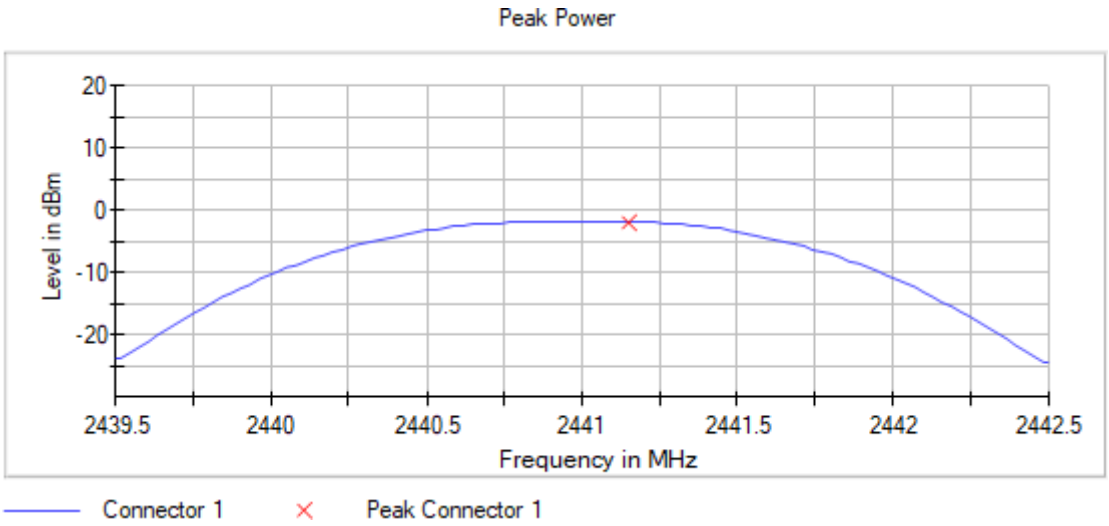
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



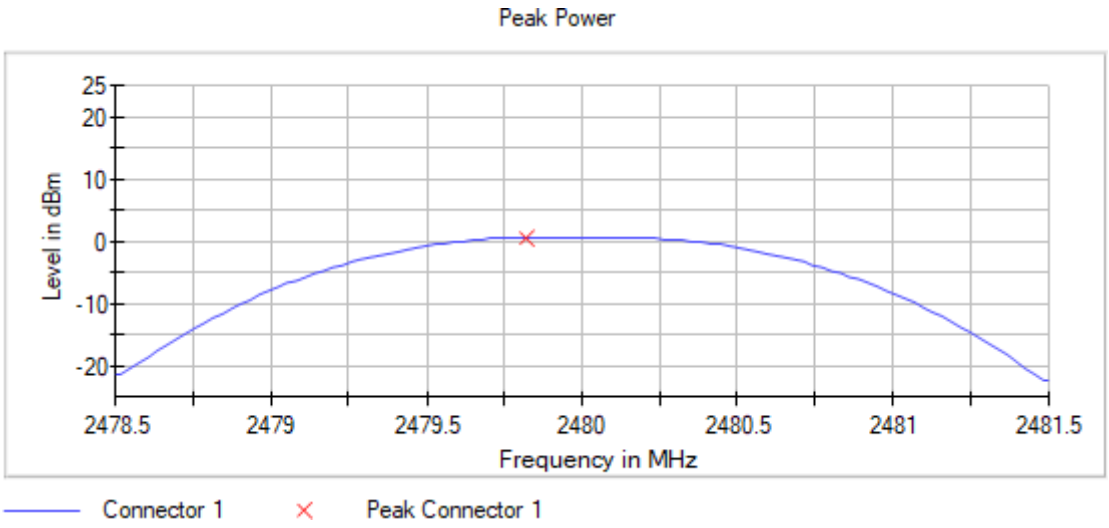
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



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

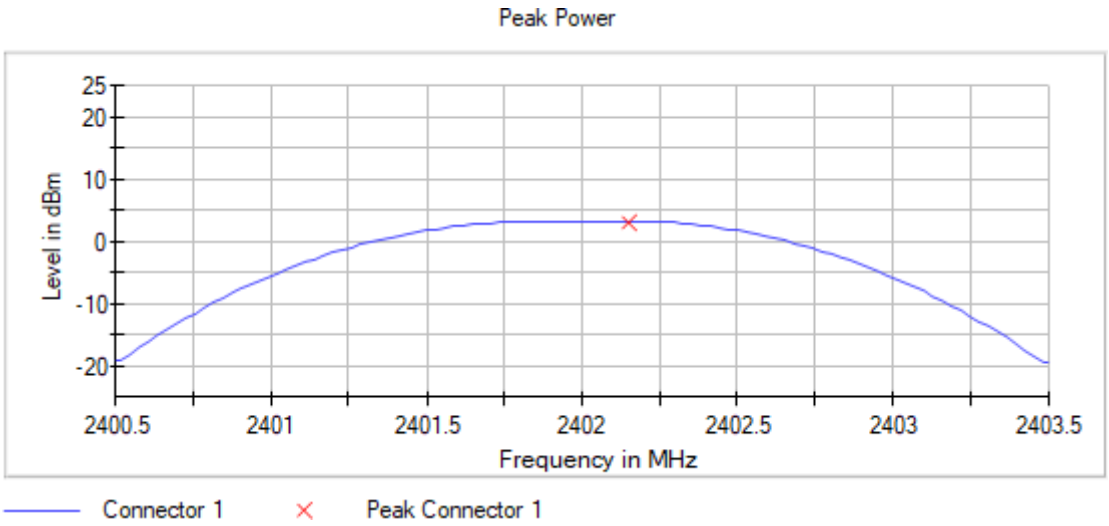
Images:



Attachments

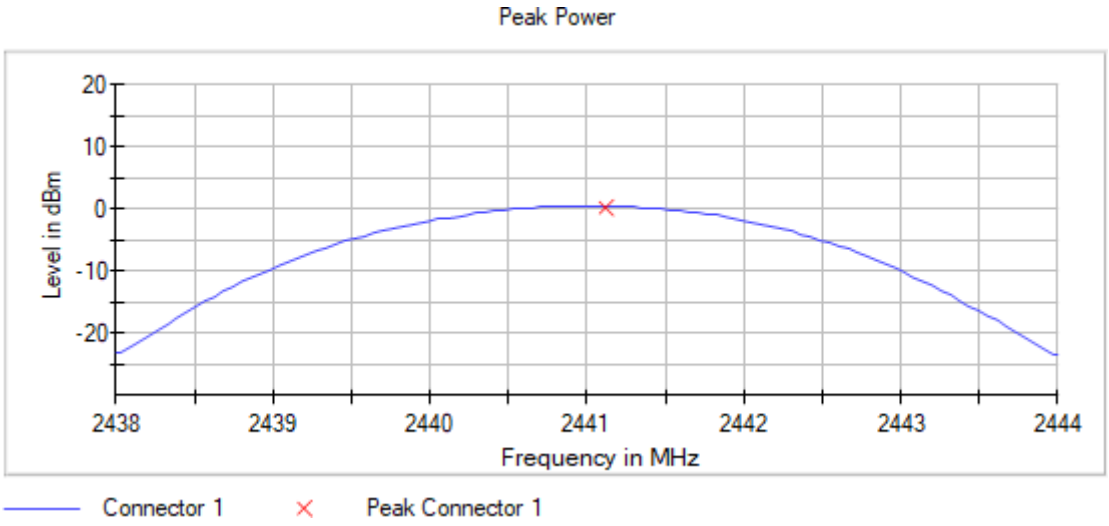
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



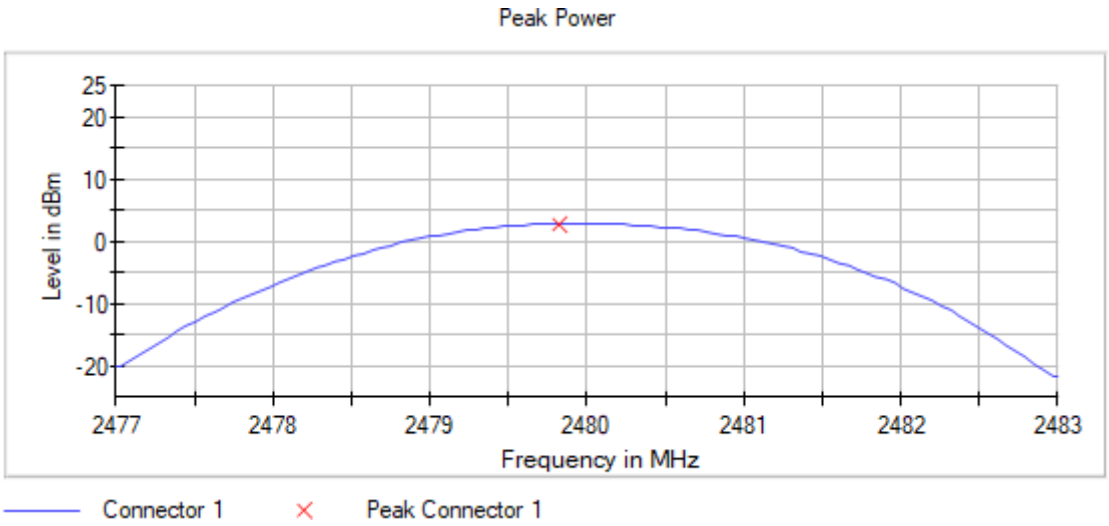
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



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

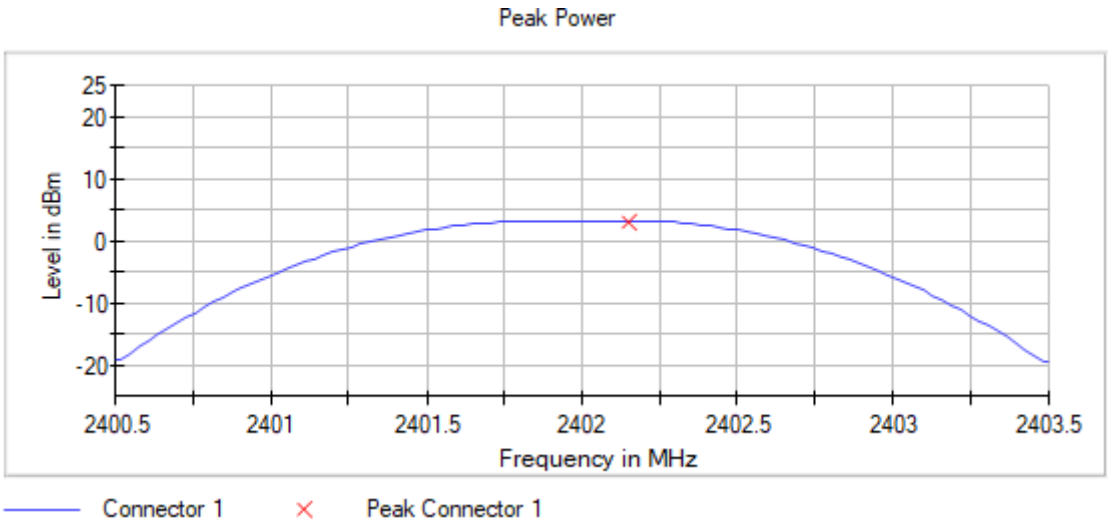
Images:



Attachments

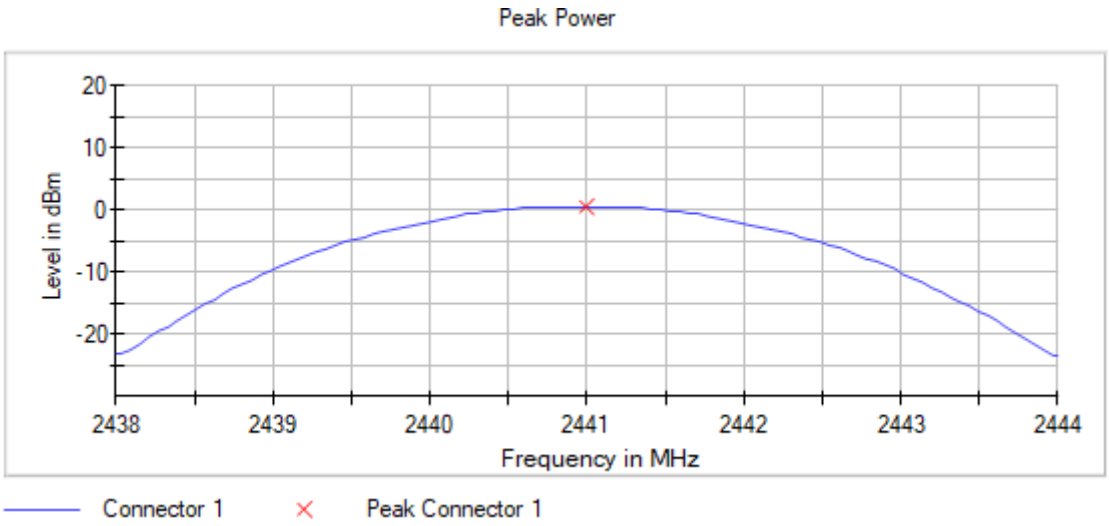
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



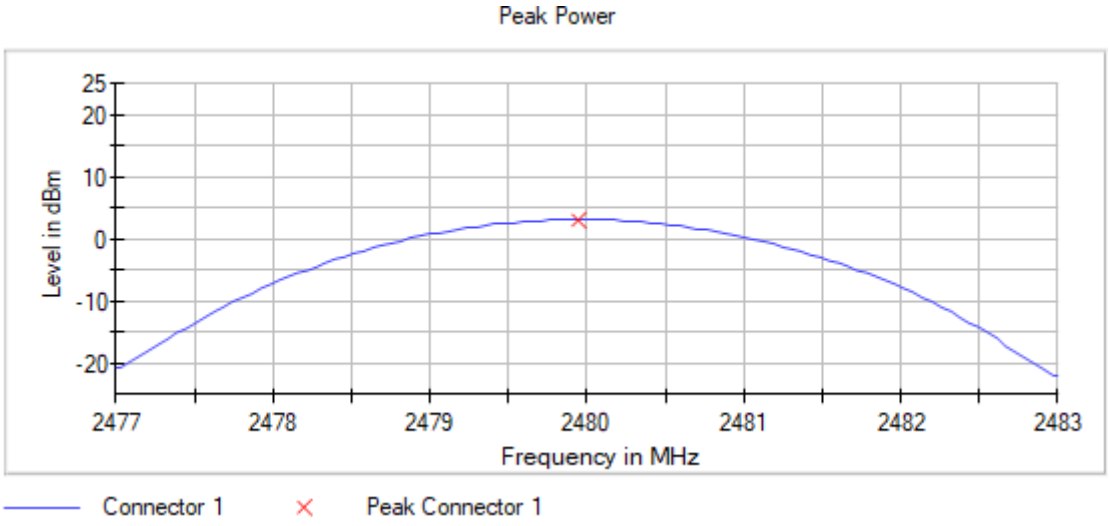
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



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

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.43950 GHz	2.39900 GHz	2.39900 GHz
Stop Frequency	2.44250 GHz	2.40500 GHz	2.40500 GHz
Span	3.000 MHz	6.000 MHz	6.000 MHz
RBW	1.000 MHz	2.000 MHz	2.000 MHz
VBW	3.000 MHz	10.000 MHz	10.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	953.450 ns	953.450 ns
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
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	5 / max. 150	6 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.04 dB	0.07 dB

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

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

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2328.125000	-54.0
2328.075000	-54.0
2313.125000	-54.2
2313.175000	-54.3
2313.075000	-54.4
2377.875000	-54.6
2377.925000	-54.8
2310.225000	-54.8
2322.075000	-54.9
2322.125000	-54.9
2321.325000	-54.9
2390.975000	-55.0
2313.225000	-55.0
2310.575000	-55.1
2373.275000	-55.1

Highest Channel

Results

Equipment	# of Tx Chains	Port	In band Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	1		2485.425000	-54.5
				2485.475000	-54.6
				2493.625000	-54.7
				2493.575000	-54.8
				2498.525000	-54.9
				2498.575000	-54.9
				2498.725000	-55.0
				2498.775000	-55.0
				2490.075000	-55.2
				2491.275000	-55.4
				2484.325000	-55.4
				2484.575000	-55.5
				2483.775000	-55.5
				2483.725000	-55.5
				2491.225000	-55.5

Verdict

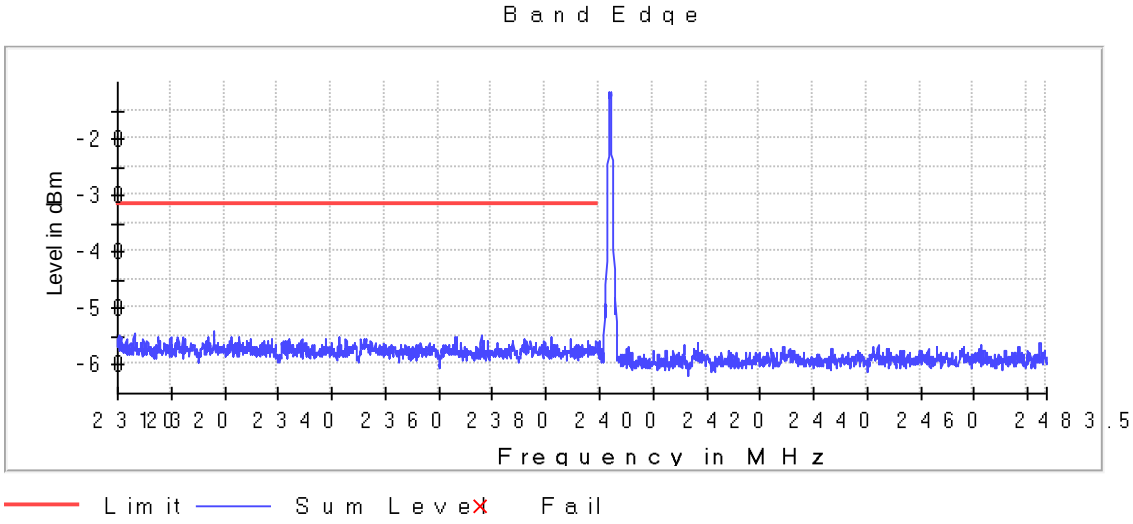
Pass

Attachments

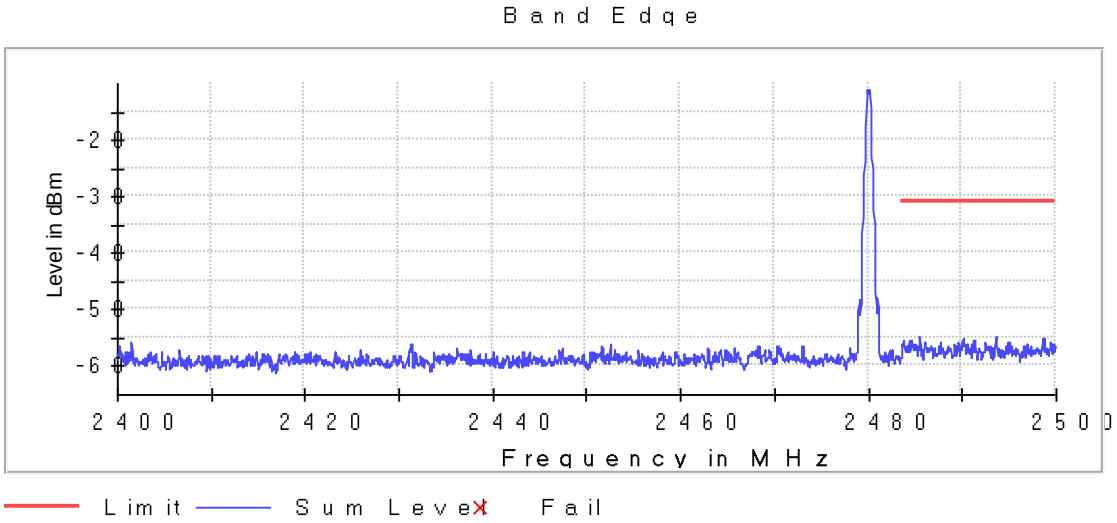
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



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

Lowest Channel

Results

Equipment	# of Tx Chains	Port	In band Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	1		2341.525000	-54.2
				2322.025000	-54.3
				2321.975000	-54.3
				2338.225000	-54.6
				2341.475000	-54.6
				2313.525000	-54.6
				2372.475000	-54.6
				2372.425000	-54.6
				2311.725000	-54.7
				2338.175000	-54.7
				2311.675000	-54.8
				2341.575000	-54.8
				2327.275000	-54.9
				2327.325000	-54.9
				2313.575000	-55.0

Highest Channel

Results

Equipment	# of Tx Chains	Port	In band Peak Lvl (dBm)	Freq (MHz)	Lvl (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	1		2494.925000	-53.7
				2494.975000	-54.1
				2494.875000	-54.3
				2499.125000	-54.3
				2484.075000	-54.6
				2499.175000	-54.8
				2489.475000	-54.9
				2484.025000	-54.9
				2483.775000	-55.0
				2499.075000	-55.1
				2489.425000	-55.2
				2486.925000	-55.2
				2486.875000	-55.3
				2489.525000	-55.3
				2483.825000	-55.4

Verdict

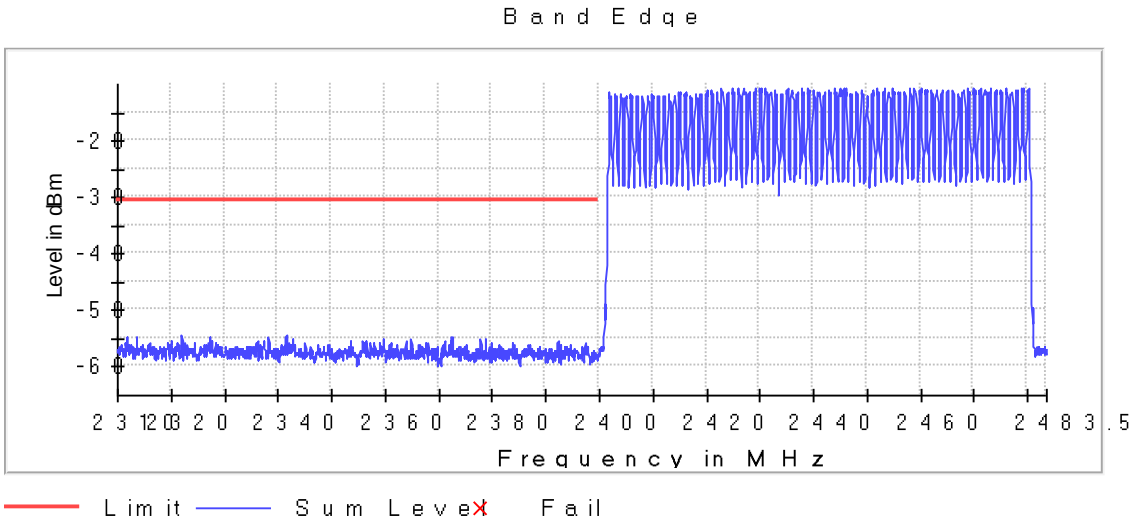
Pass

Attachments

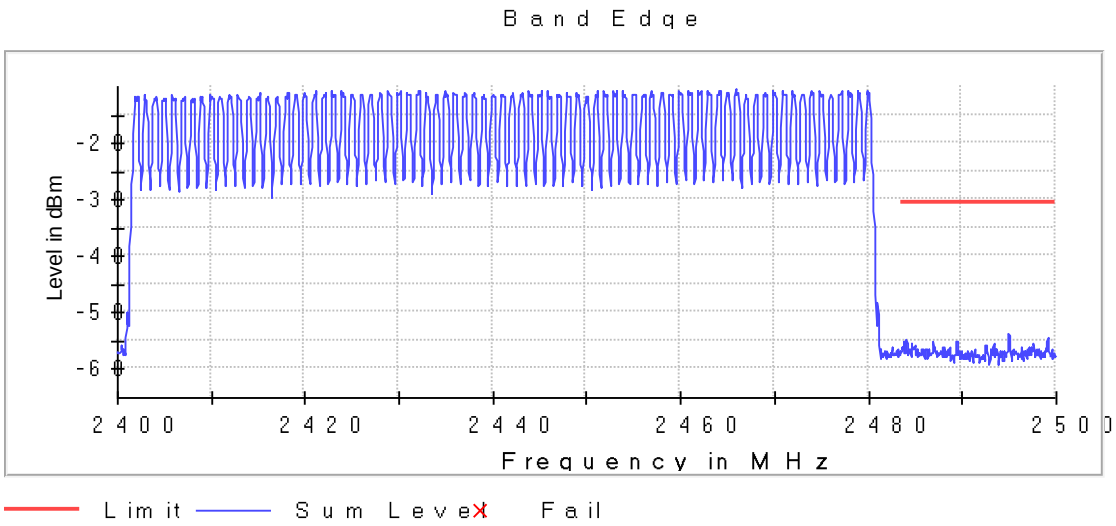
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



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

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2310.725000	-54.3
2399.975000	-54.4
2310.675000	-54.4
2388.825000	-54.5
2319.575000	-54.6
2357.825000	-54.6
2319.625000	-54.6
2311.775000	-54.7
2388.875000	-54.7
2339.325000	-54.7
2392.825000	-54.7
2310.775000	-54.8
2392.775000	-54.8
2357.775000	-54.8
2398.025000	-54.9

Highest Channel

Results

Freq (MHz)	Lvl (dBm)
2498.425000	-54.7
2498.475000	-54.7
2498.225000	-55.1
2498.175000	-55.1
2496.175000	-55.3
2496.225000	-55.4
2499.325000	-55.5
2493.125000	-55.6
2491.225000	-55.6
2493.175000	-55.6
2484.475000	-55.6
2487.075000	-55.6
2498.275000	-55.7
2486.725000	-55.7
2491.275000	-55.7

Verdict

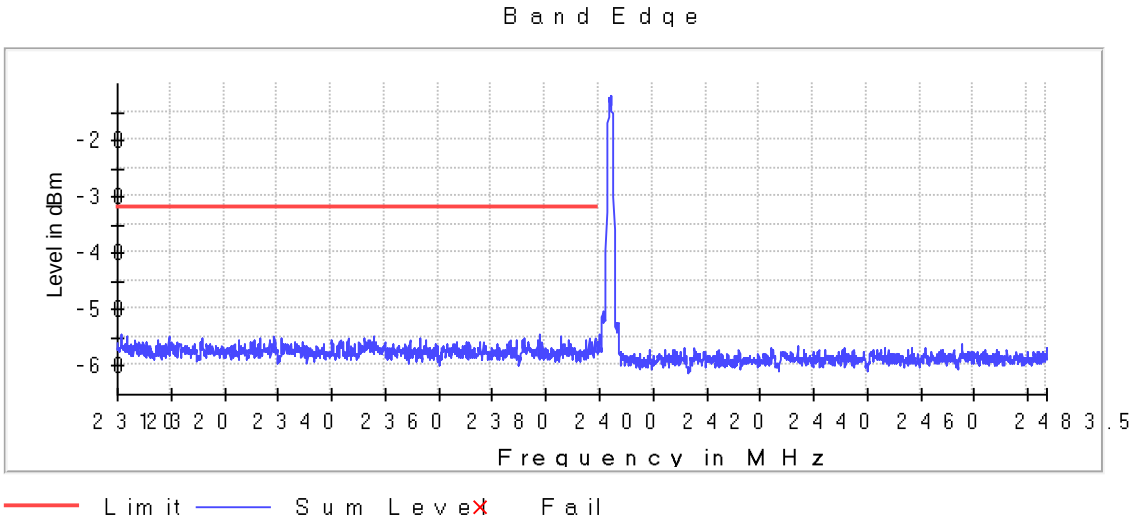
Pass

Attachments

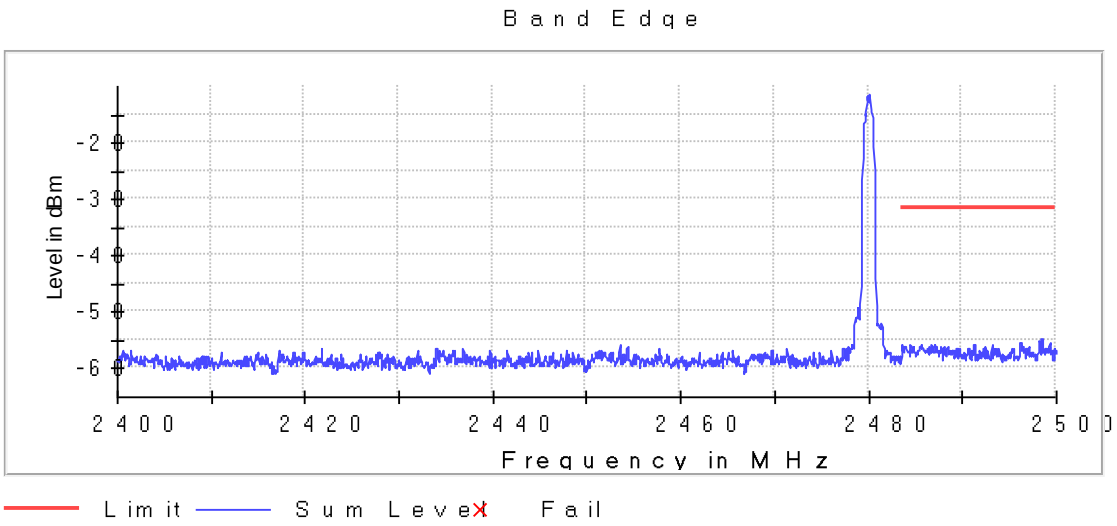
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



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

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2335.275000	-53.7
2320.625000	-53.9
2320.575000	-53.9
2313.225000	-54.1
2335.325000	-54.4
2313.175000	-54.4
2313.925000	-54.5
2335.225000	-54.6
2372.025000	-54.7
2326.675000	-54.7
2364.025000	-54.7
2352.675000	-54.7
2363.975000	-54.8
2311.425000	-54.8
2311.375000	-54.8

Highest Channel

Results

Freq (MHz)	Lvl (dBm)
2486.425000	-54.6
2483.875000	-54.7
2483.925000	-54.7
2484.275000	-54.7
2484.325000	-54.8
2498.275000	-55.0
2498.575000	-55.1
2486.475000	-55.1
2486.375000	-55.1
2492.725000	-55.5
2485.925000	-55.5
2491.025000	-55.6
2498.225000	-55.6
2490.975000	-55.6
2484.925000	-55.6

Verdict

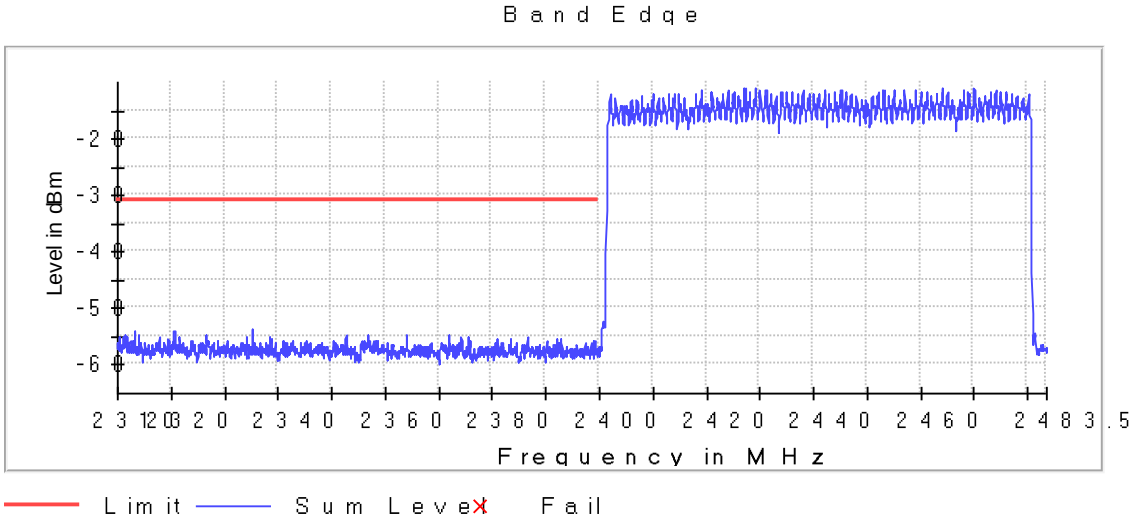
Pass

Attachments

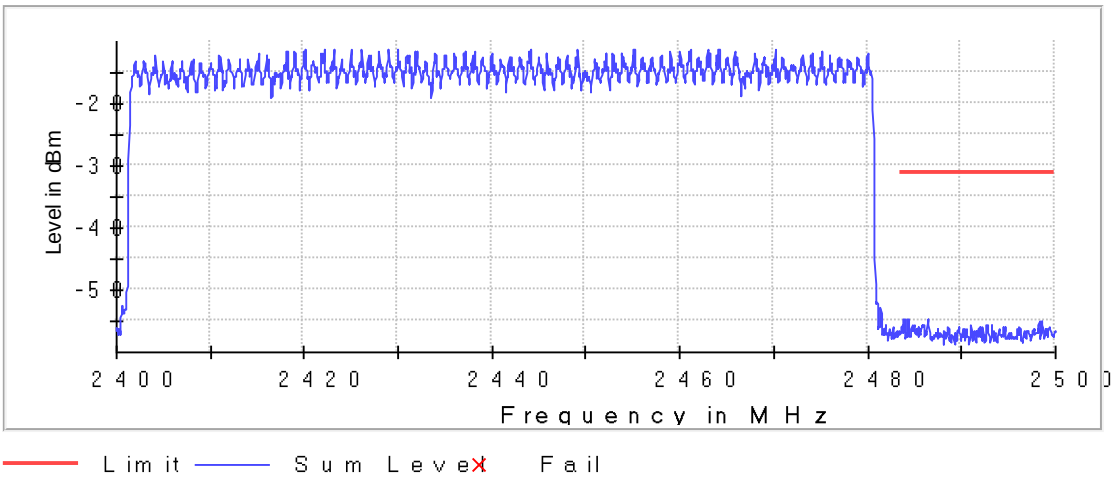
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (π/4 DQPSK 2-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



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

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2310.225000	-54.2
2310.275000	-54.3
2371.075000	-54.6
2371.775000	-54.7
2399.675000	-54.7
2371.825000	-54.7
2322.325000	-54.7
2371.025000	-54.9
2329.025000	-54.9
2322.375000	-54.9
2399.625000	-55.0
2325.925000	-55.1
2351.675000	-55.1
2345.675000	-55.1
2385.575000	-55.1

Highest Channel

Results

Freq (MHz)	Lvl (dBm)
2483.525000	-54.2
2483.575000	-54.3
2493.625000	-54.7
2493.575000	-54.8
2499.075000	-54.9
2492.725000	-55.0
2492.675000	-55.0
2484.625000	-55.1
2484.675000	-55.1
2499.475000	-55.2
2499.025000	-55.3
2484.125000	-55.3
2484.175000	-55.4
2493.675000	-55.4
2483.625000	-55.5

Verdict

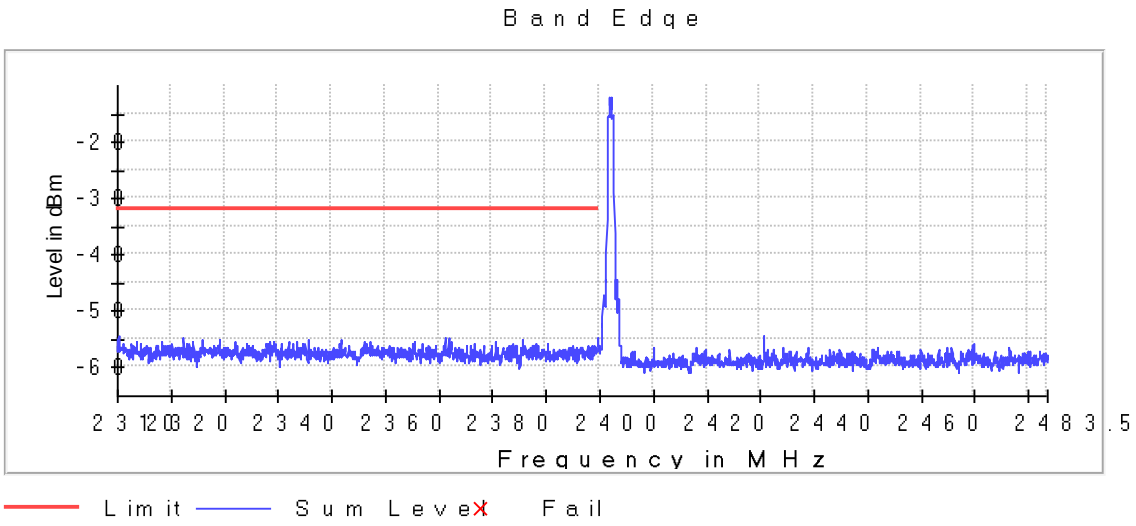
Pass

Attachments

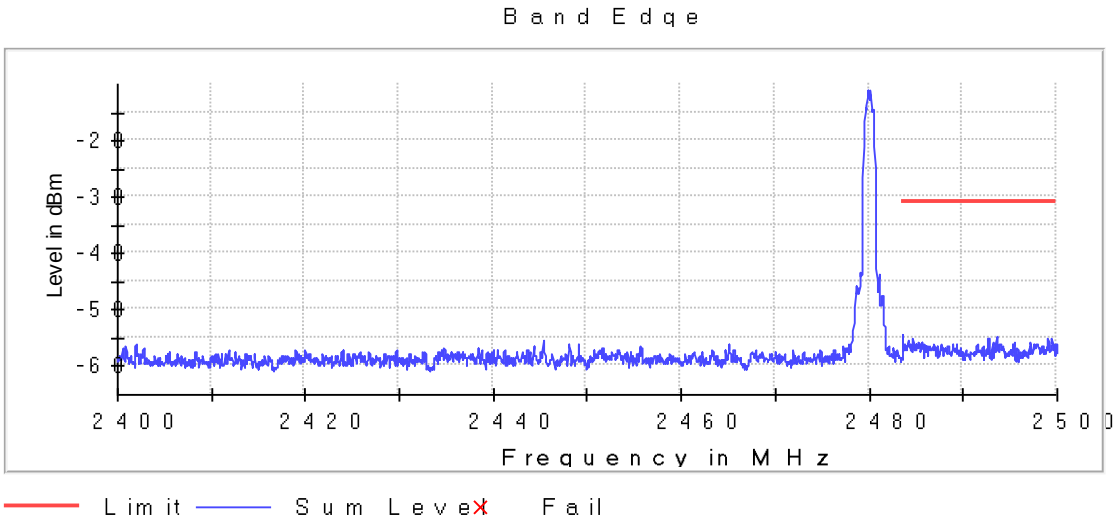
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



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

Lowest Channel

Results

Freq (MHz)	Lvl (dBm)
2315.475000	-53.9
2315.525000	-54.0
2337.875000	-54.0
2337.825000	-54.3
2341.875000	-54.4
2341.825000	-54.4
2372.225000	-54.6
2372.275000	-54.7
2335.625000	-54.8
2338.175000	-54.9
2337.925000	-54.9
2335.675000	-54.9
2325.925000	-55.0
2322.625000	-55.0
2325.975000	-55.1

Highest Channel

Results

Freq (MHz)	Lvl (dBm)
2486.775000	-54.1
2486.825000	-54.2
2485.675000	-54.9
2498.675000	-55.0
2488.875000	-55.2
2485.325000	-55.2
2484.275000	-55.2
2484.325000	-55.3
2485.725000	-55.3
2493.525000	-55.3
2485.275000	-55.4
2498.625000	-55.4
2486.925000	-55.4
2485.625000	-55.5
2483.675000	-55.5

Verdict

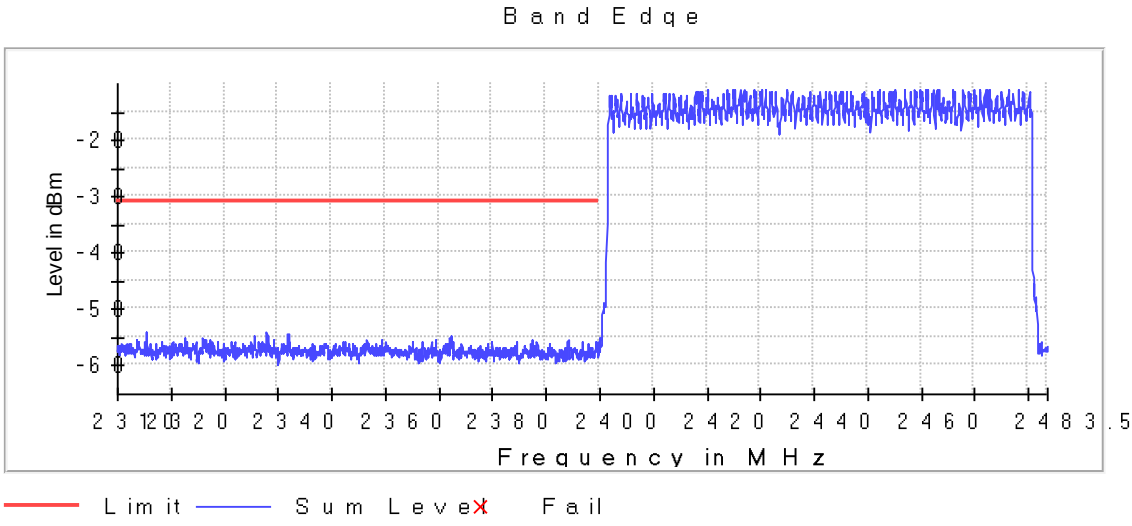
Pass

Attachments

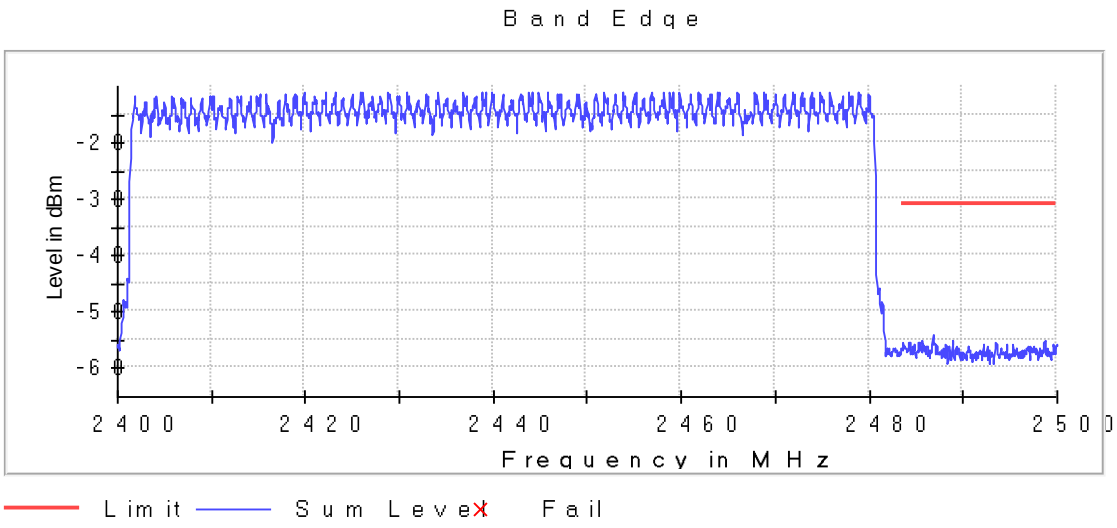
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Lowest Channel



Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.31000	2.40000
Stop Frequency	2.40000	2.48350
Span	90.000 MHz	83.500 MHz
RBW	100.000	100.000
VBW	300.000	300.000
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 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.	129 / max.
Stable	3 / 3	3 / 3
Max Stable	0.00 dB	0.31 dB

RSS-247 5.2 (a) / FCC 15.247 (a) (2) 99dBw Occupied Channel Bandwidth 99%

Limits

No Limit has been set to this test case

Modulation: BT (GFSK 1-DH5)
Results

Freq (MHz)	Equipment	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	0.875
2441.00000				0.870
2480.00000				0.880

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

Freq (MHz)	Equipment	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1.165
2441.00000				1.165
2480.00000				1.165

Modulation: BT (8DPSK 3-DH5)
Results

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

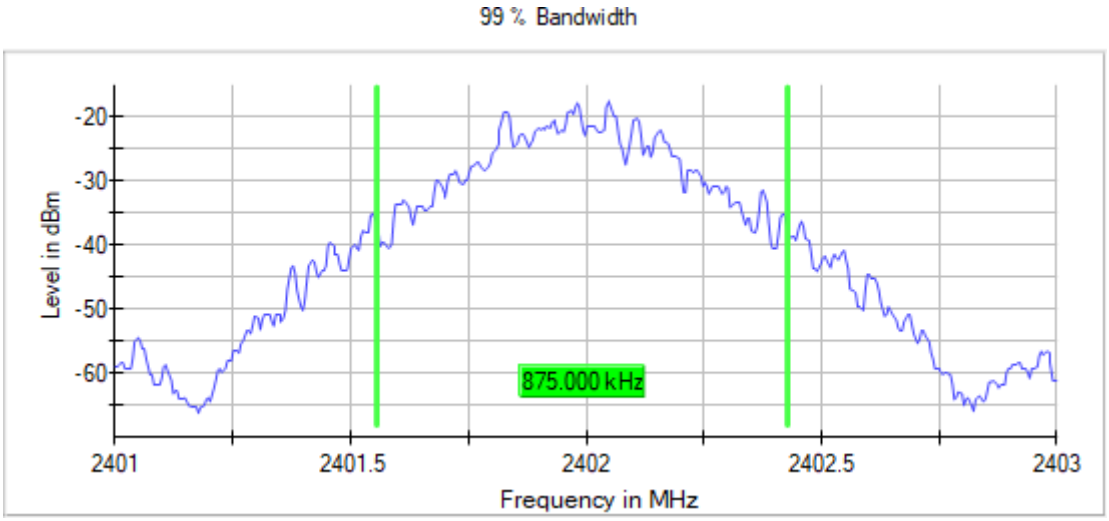
Verdict

Pass

Attachments

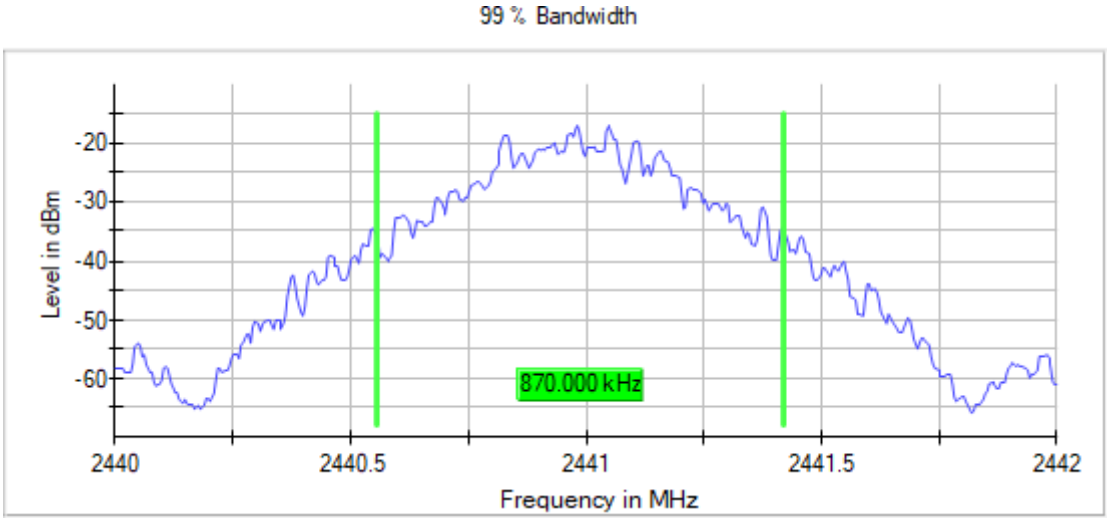
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



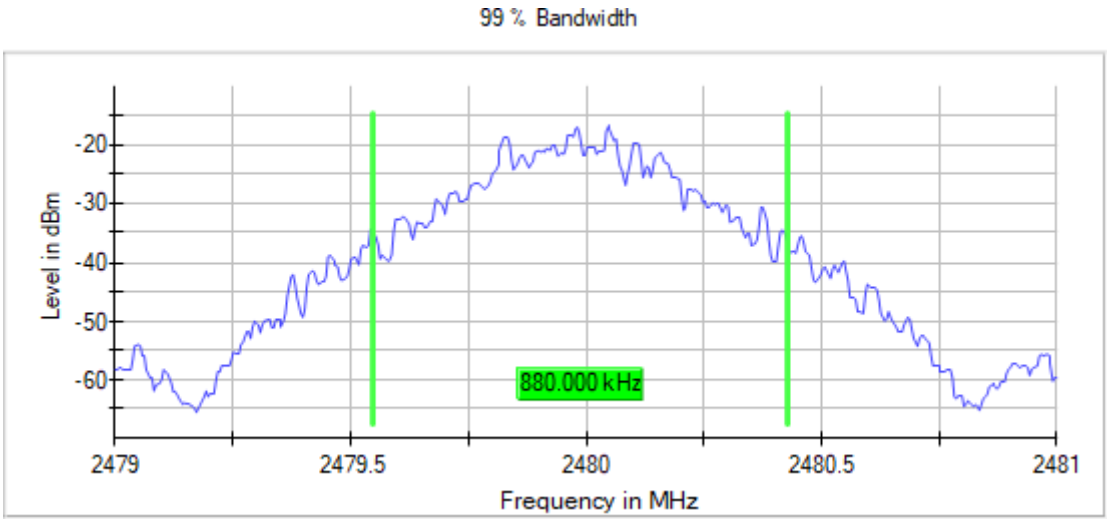
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1,

Images:



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

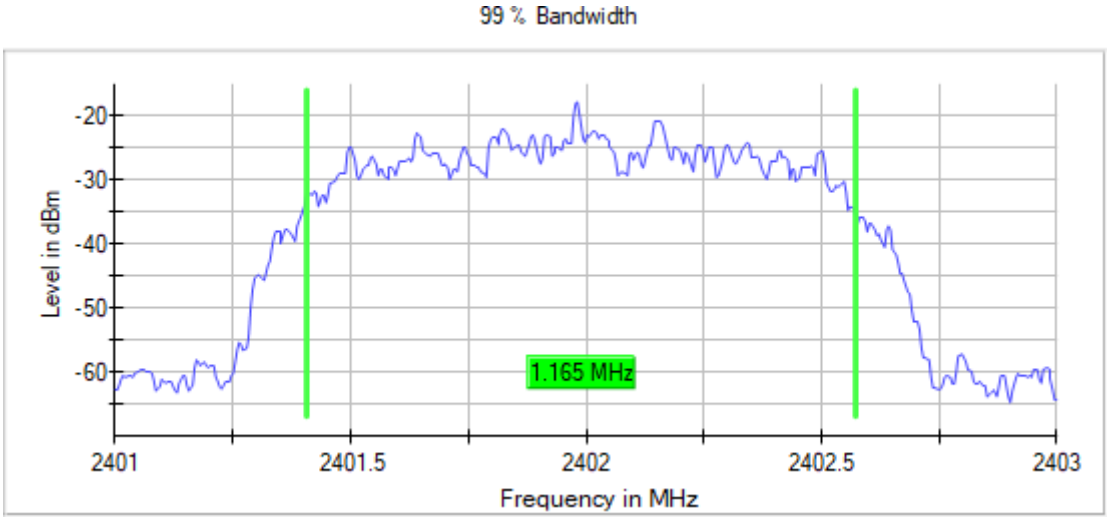
Images:



Attachments

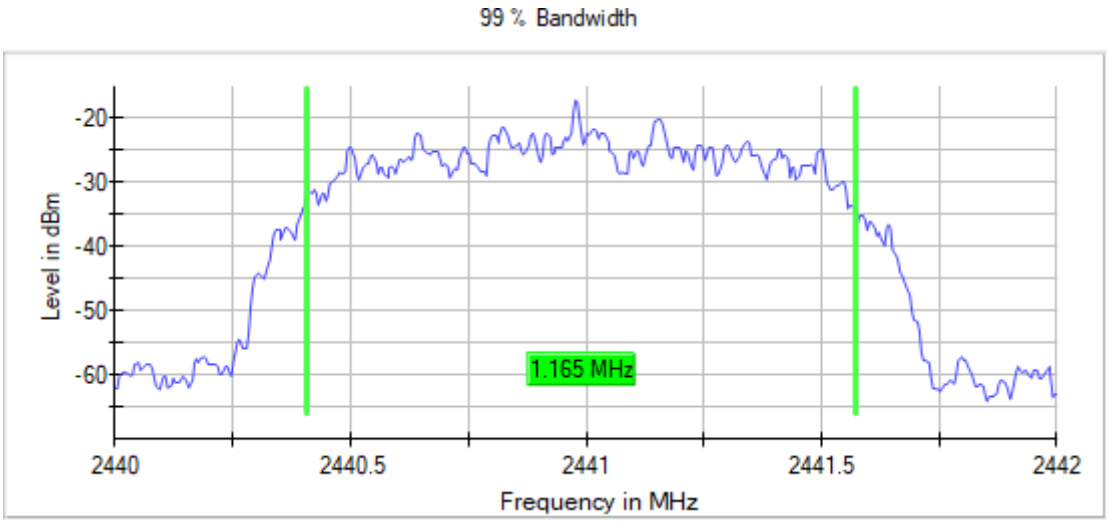
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



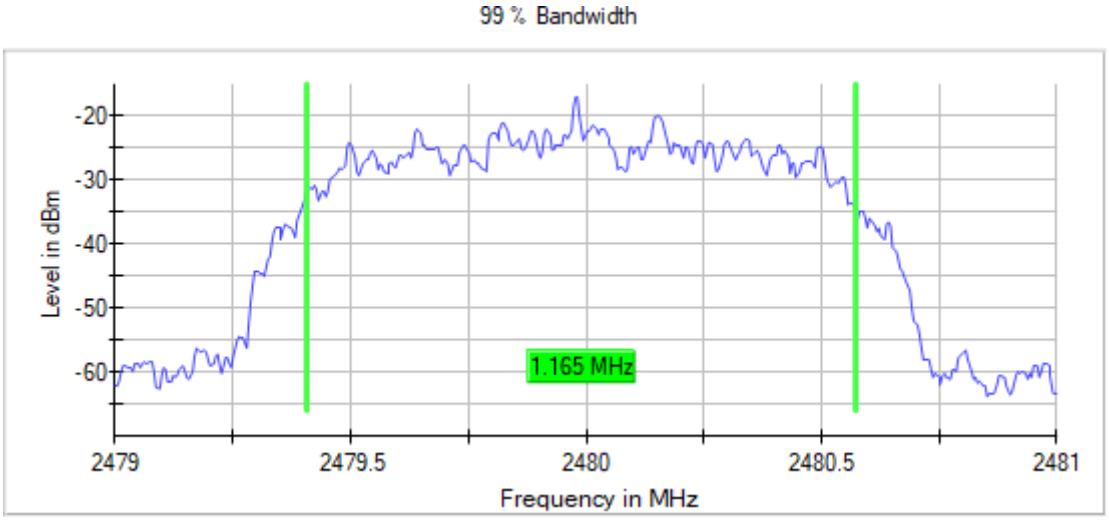
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5), Number of Transmission Chains = 1,

Images:



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

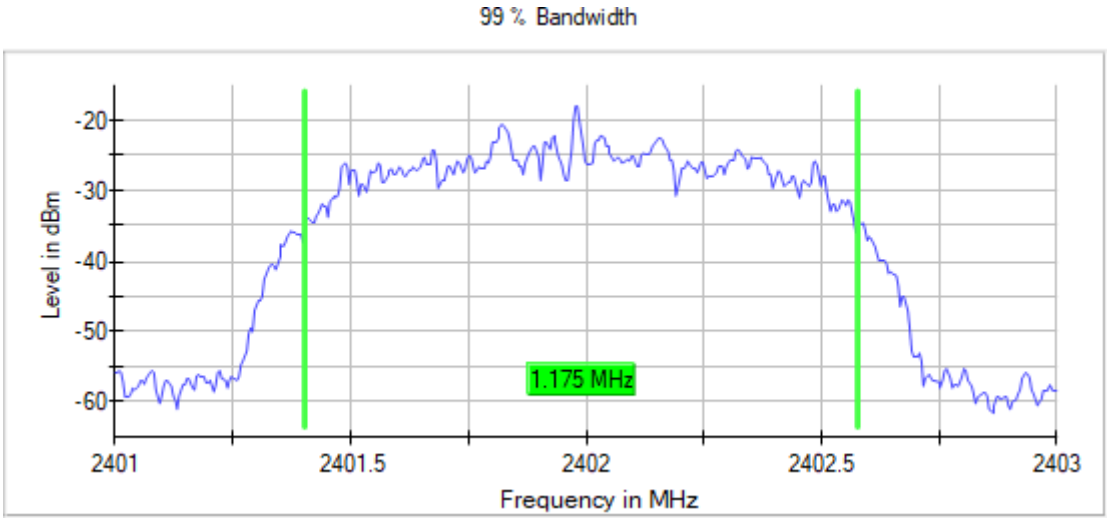
Images:



Attachments

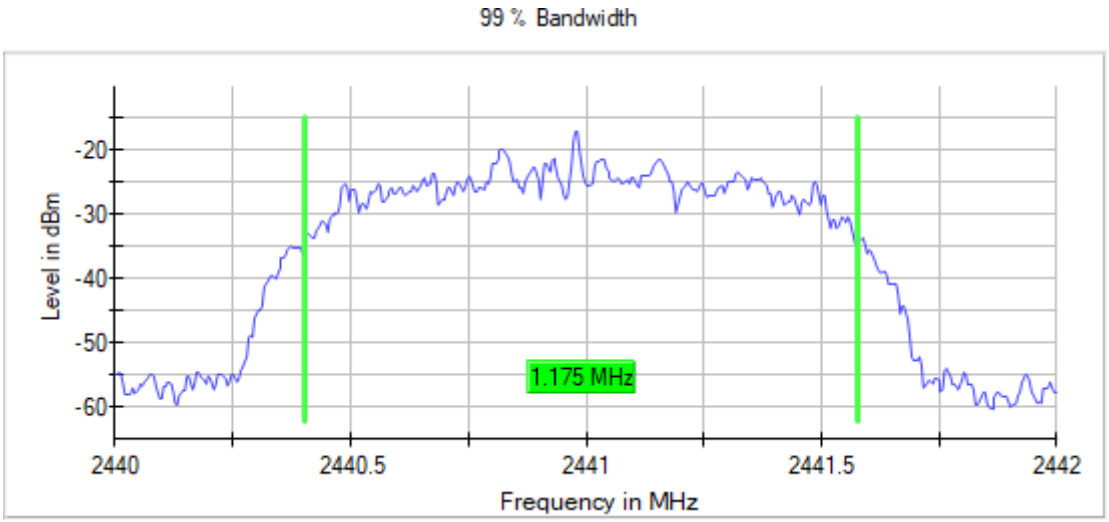
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



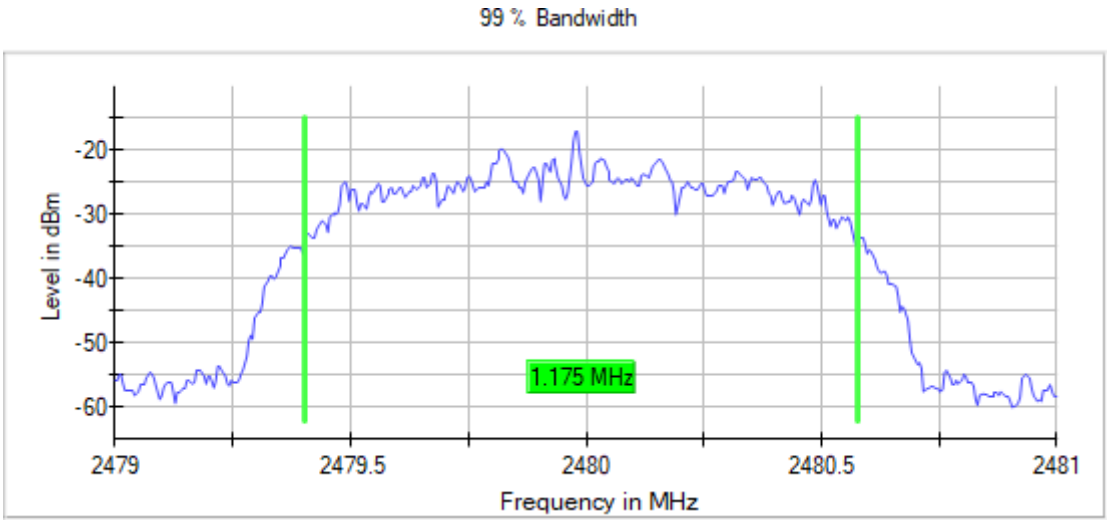
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1,

Images:



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

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100	2.44000	2.47900
Stop Frequency	2.40300	2.44200	2.48100
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
SweepPoints	400	400	400
Sweeptime	189.648 µs	189.648 µs	189.648 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	500	500	500
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	5 / max. 150	4 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.04 dB	0.09 dB	0.06 dB

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

Limits

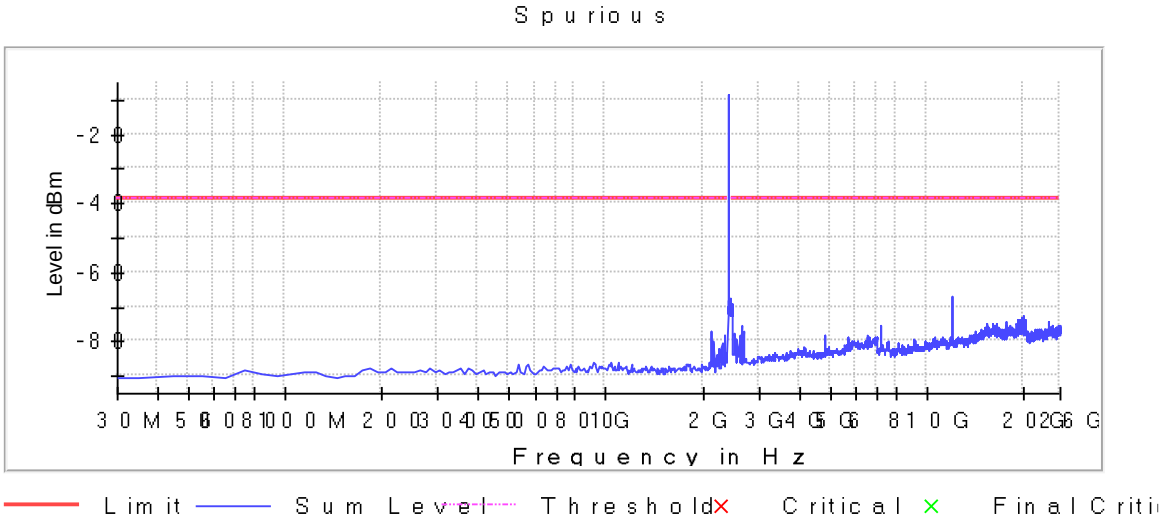
In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of 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: BTLE 5.0 (GFSK 1-DH5)

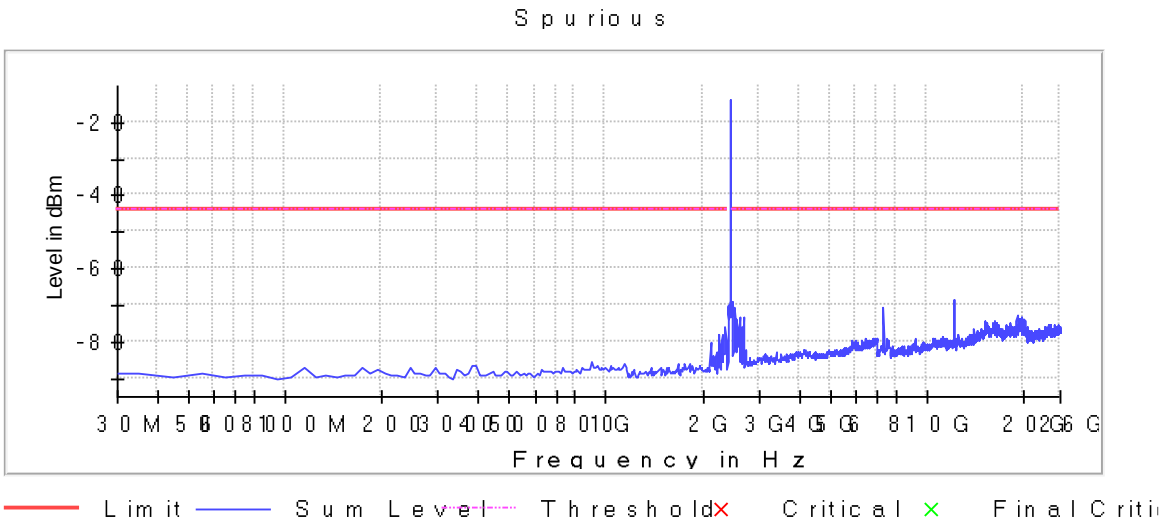
Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Results

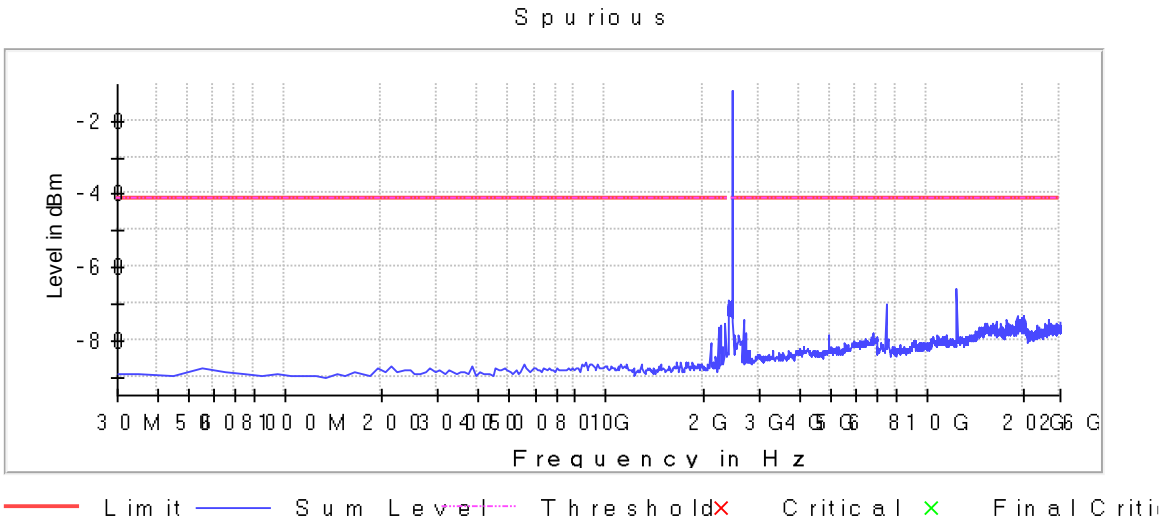
Lowest Channel



Middle Channel



Highest Channel



Verdict

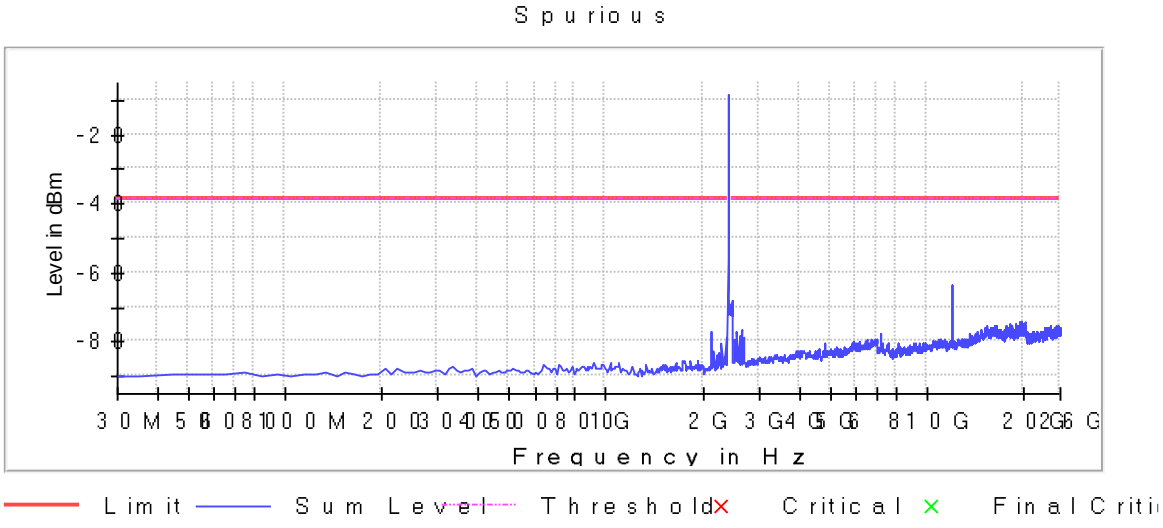
Pass

Modulation: BTLE 5.0 (π/4 DQPSK 2-DH5)

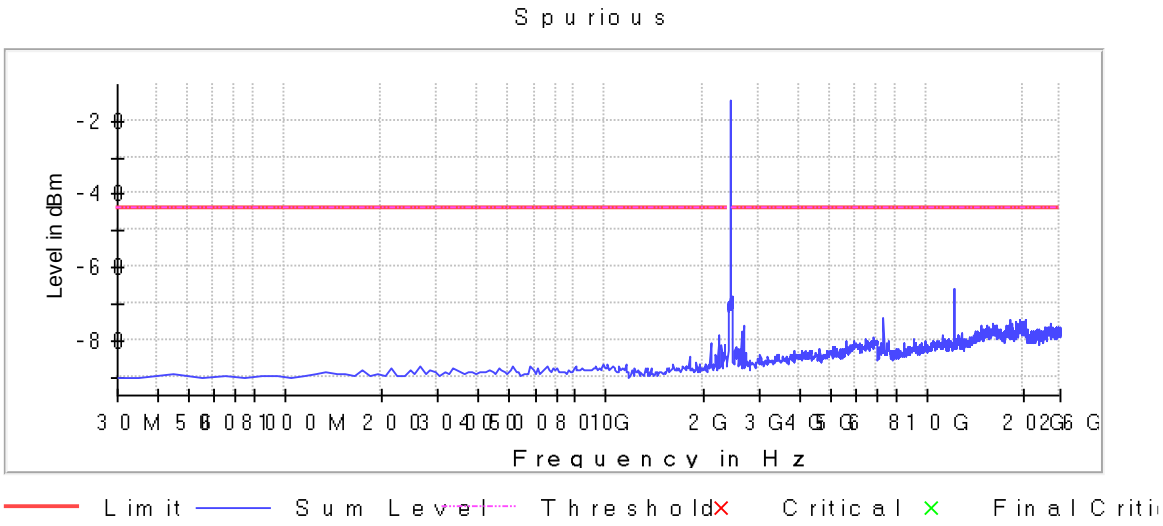
Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Results

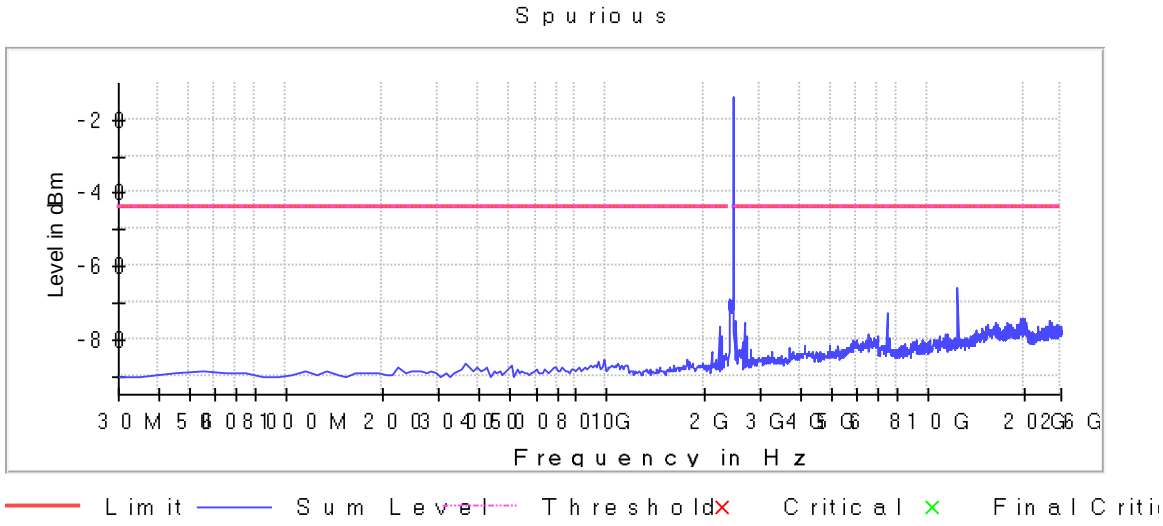
Lowest Channel



Middle Channel



Highest Channel



Verdict

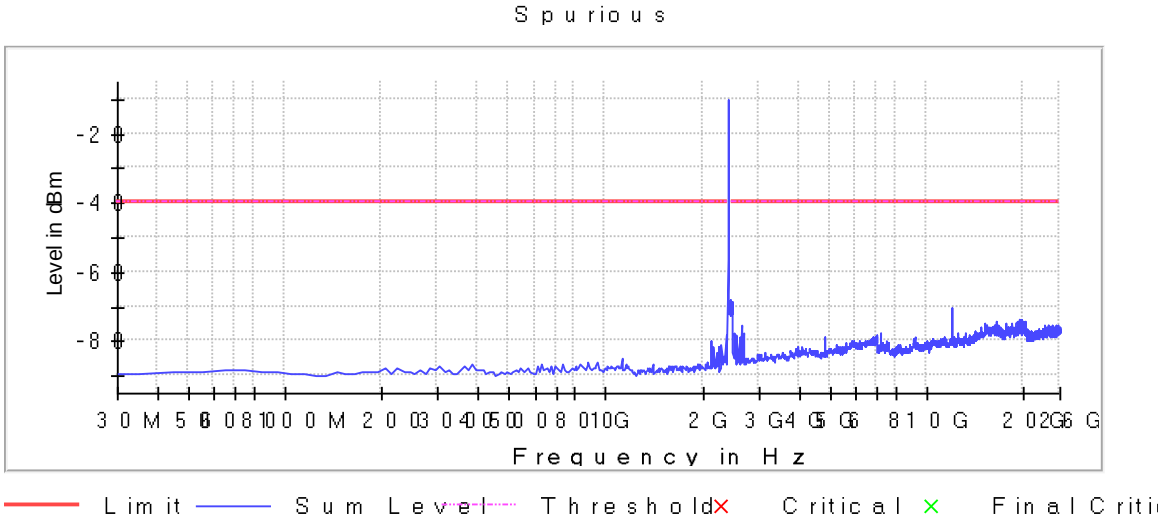
Pass

Modulation: BTLE 5.0 (8DPSK 3-DH5)

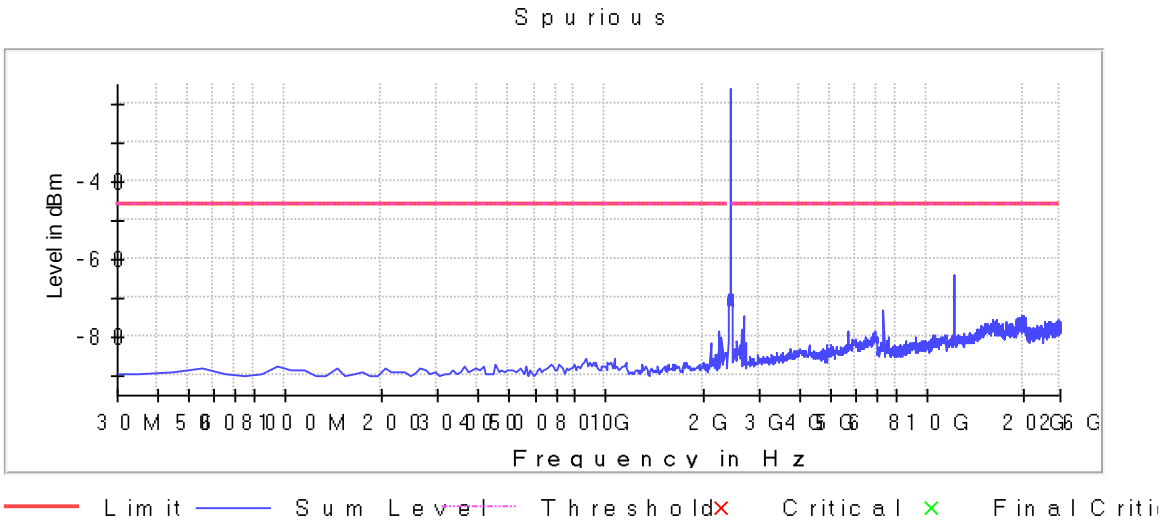
Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Results

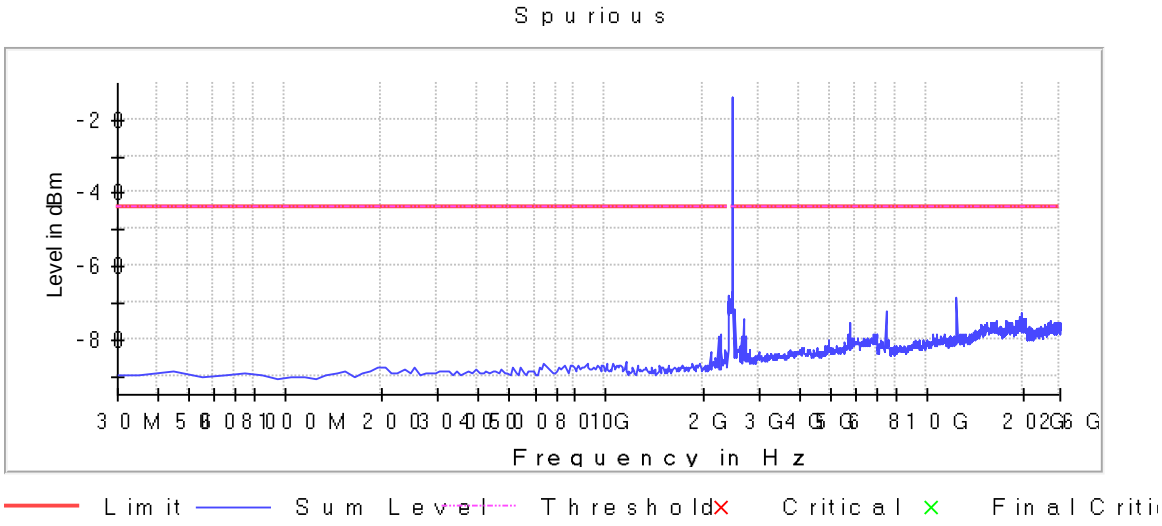
Lowest Channel



Middle Channel



Highest Channel



Verdict

Pass

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	238	238	238
Sweeptime	23.700 ms	23.700 ms	23.700 ms
Reference Level	-30.000	-30.000	-30.000
Attenuation	0.000 dB	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	3	3	3
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 40	4 / max. 40	4 / max. 40
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.00 dB	0.00 dB	0.00 dB

RSS-247 5.5 / FCC 15.247 (d) EMISSION LIMITATIONS RADIATED (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

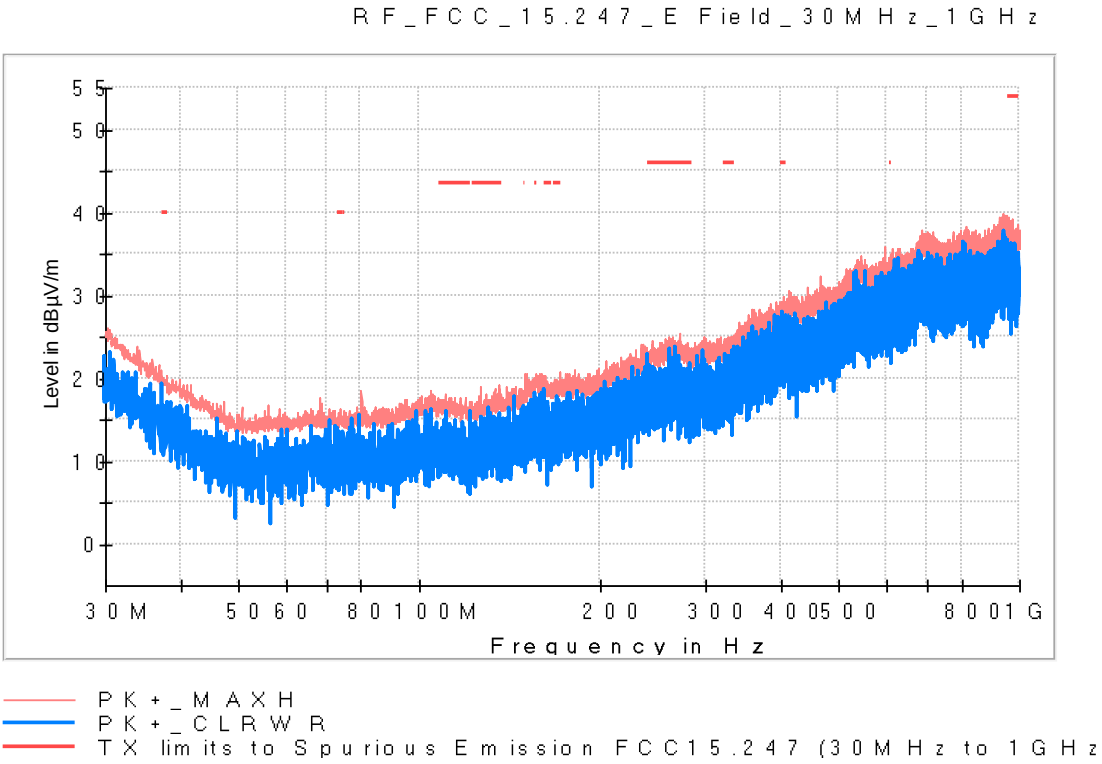
Verdict

Pass

Results

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
126.563500	28.6	16.3	V	27.3	43.5
259.987000	35.3	22.8	V	23.2	46.0
328.081000	33.3	20.9	V	25.1	46.0
405.002000	38.4	25.4	V	20.6	46.0
613.164000	44.0	31.1	H	14.9	46.0
938.744500	47.5	35.1	V	---	---

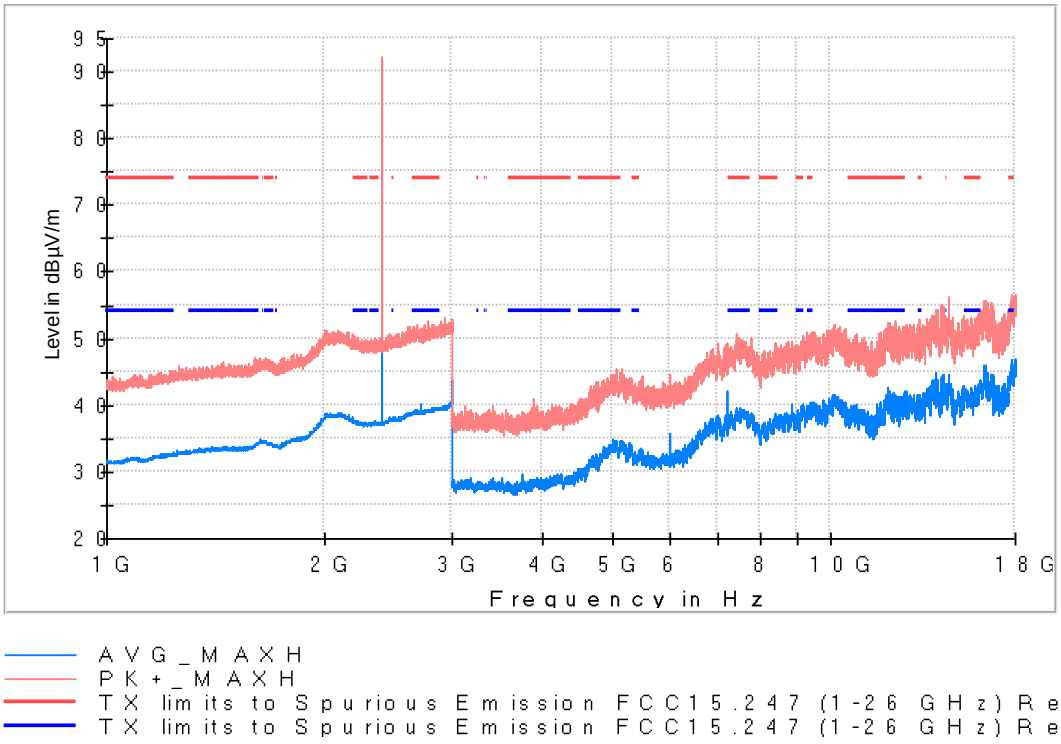
Frequency range 1 GHz – 26 GHz

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

Modulation: BT (GFSK 1-DH5)

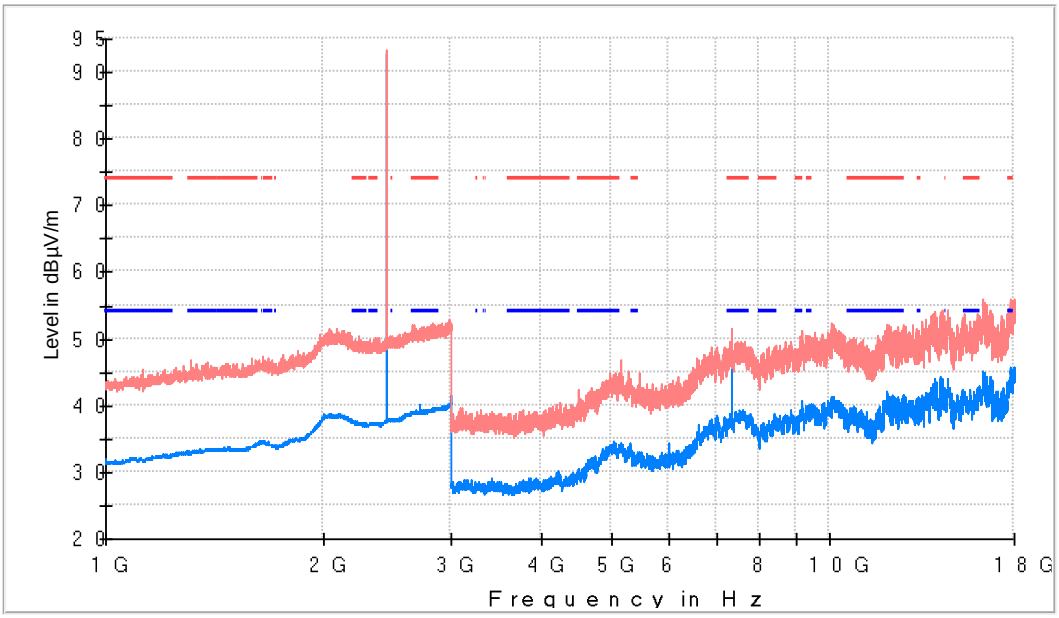
Frequency range 1 - 18 GHz

Lowest Channel



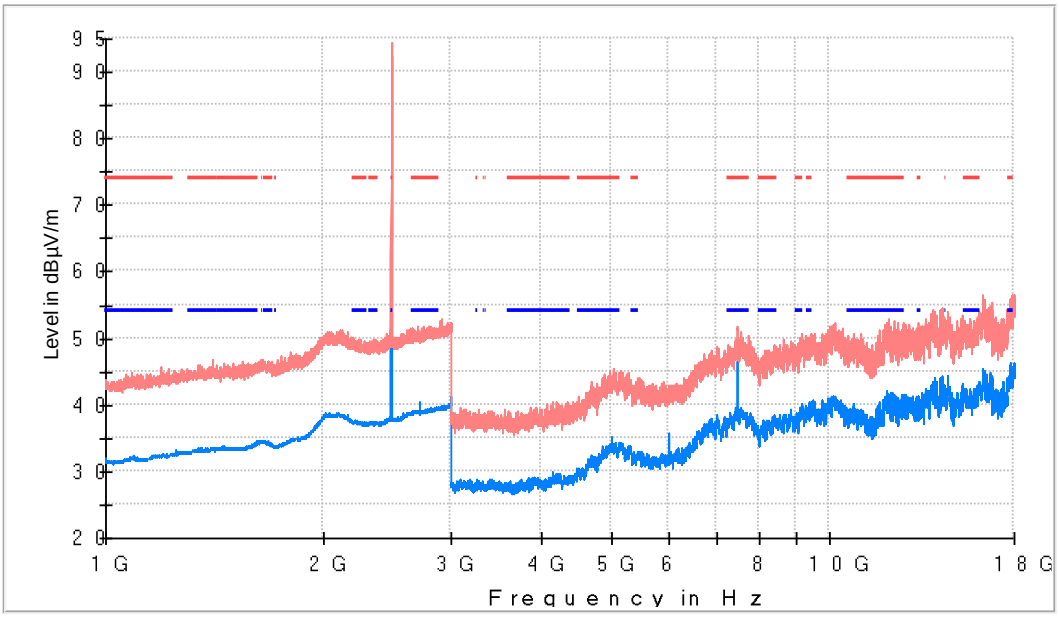
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	92.3	91.7	H	---	---	Fundamental
18000.000000	55.9	47.2	H	6.8	54.0	

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	93.3	92.7	H	---	---	Fundamental
18000.000000	54.4	45.7	H	8.3	54.0	

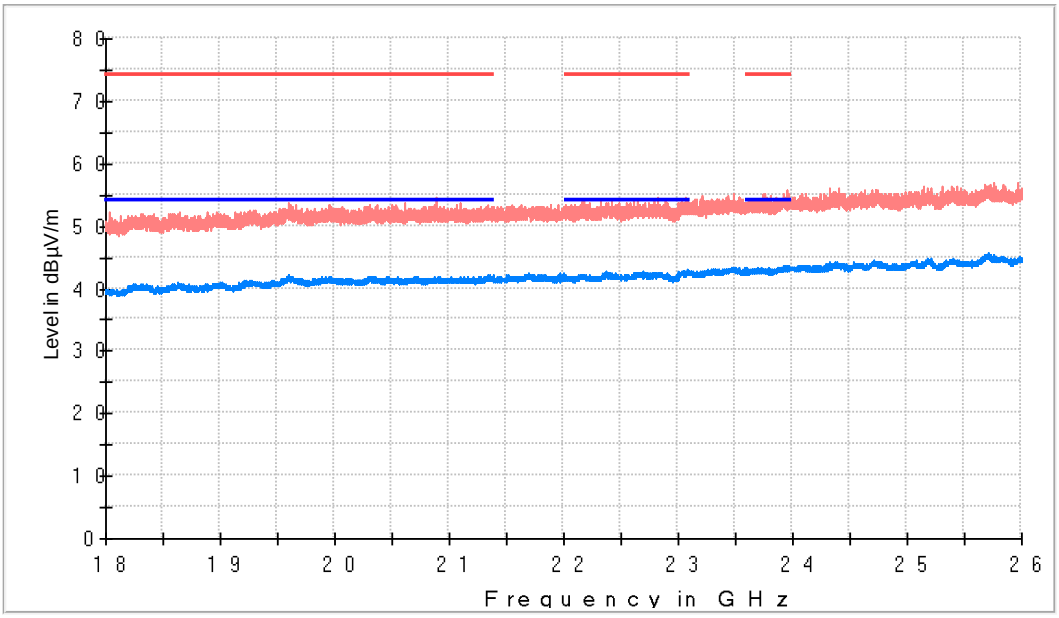
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.500000	94.3	92.3	H	---	---	Fundamental
18000.000000	55.6	46.2	H	7.8	54.0	

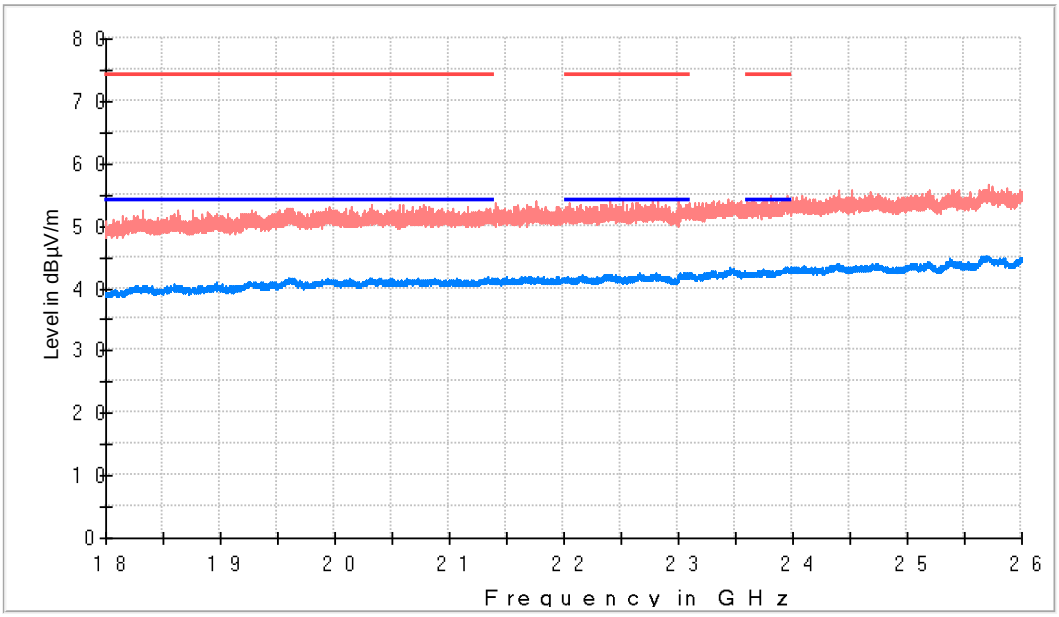
Frequency range 18 - 26 GHz

Lowest Channel



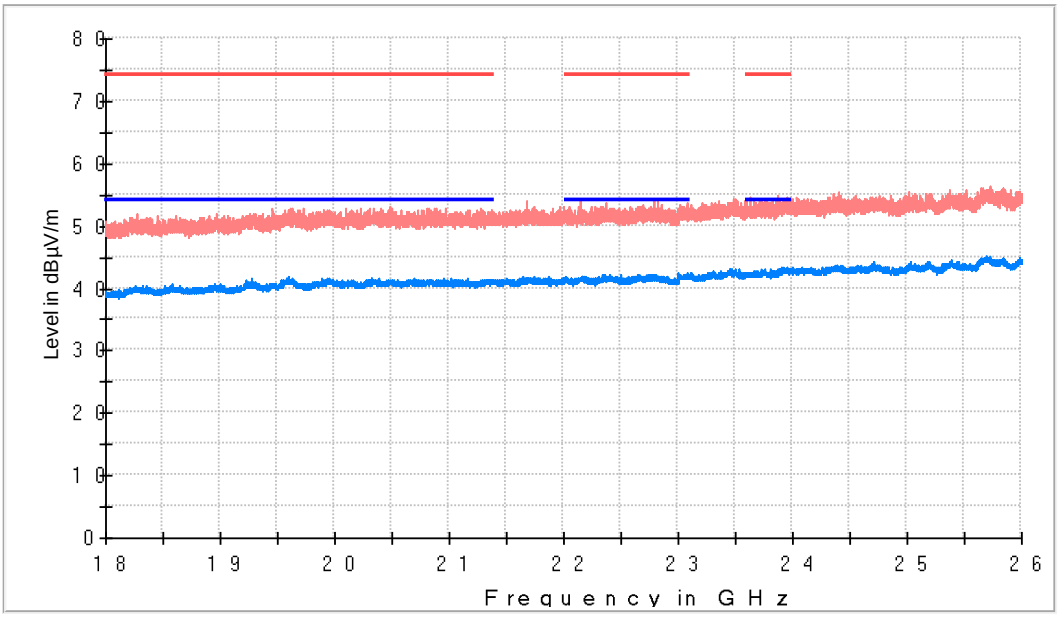
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23925.500000	53.1	43.7	V	10.3	54.0

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23981.500000	53.6	43.3	H	10.7	54.0

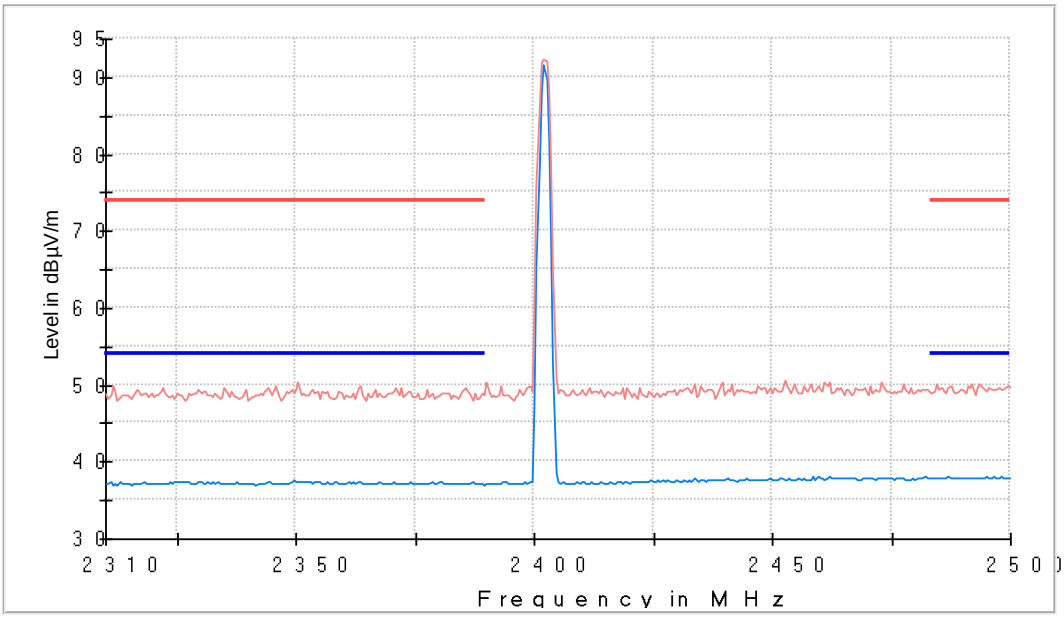
Highest Channel



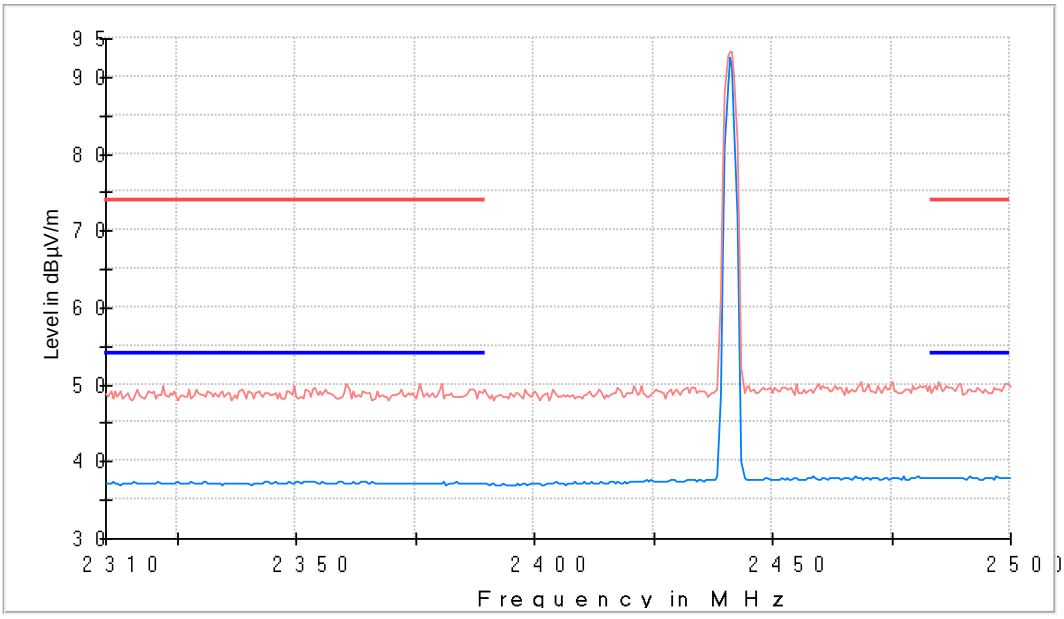
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23927.000000	53.7	43.5	H	10.5	54.0

Restricted Bands (2.31 GHz - 2.5 GHz)

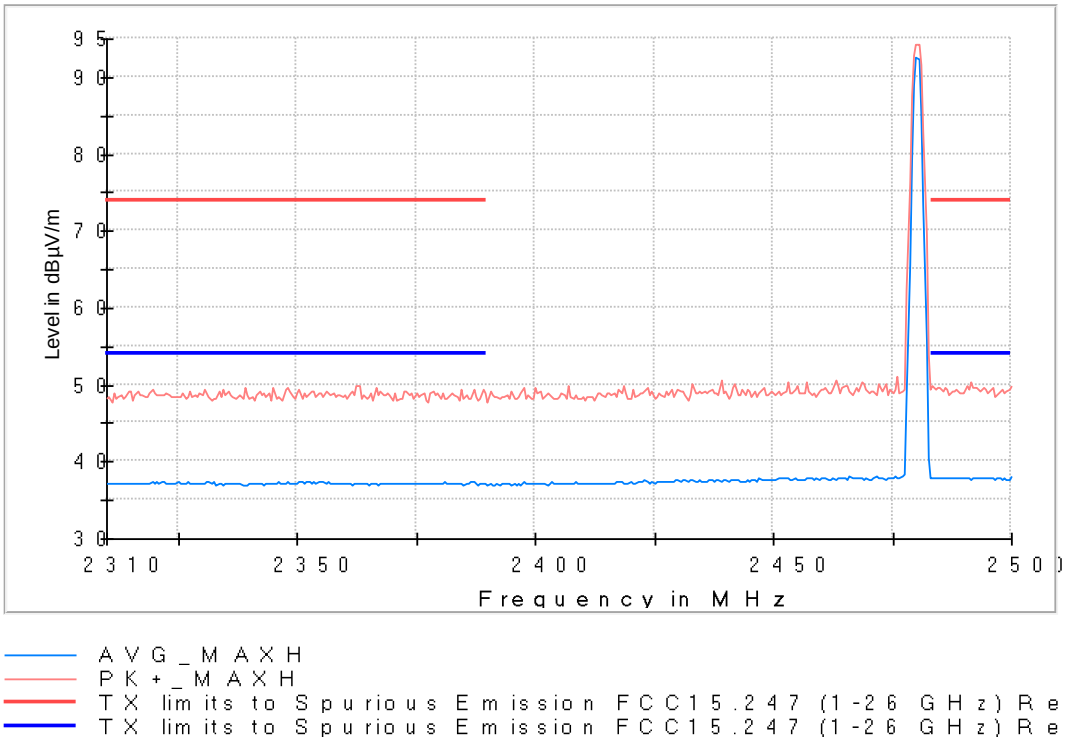
Lowest Channel



Middle Channel



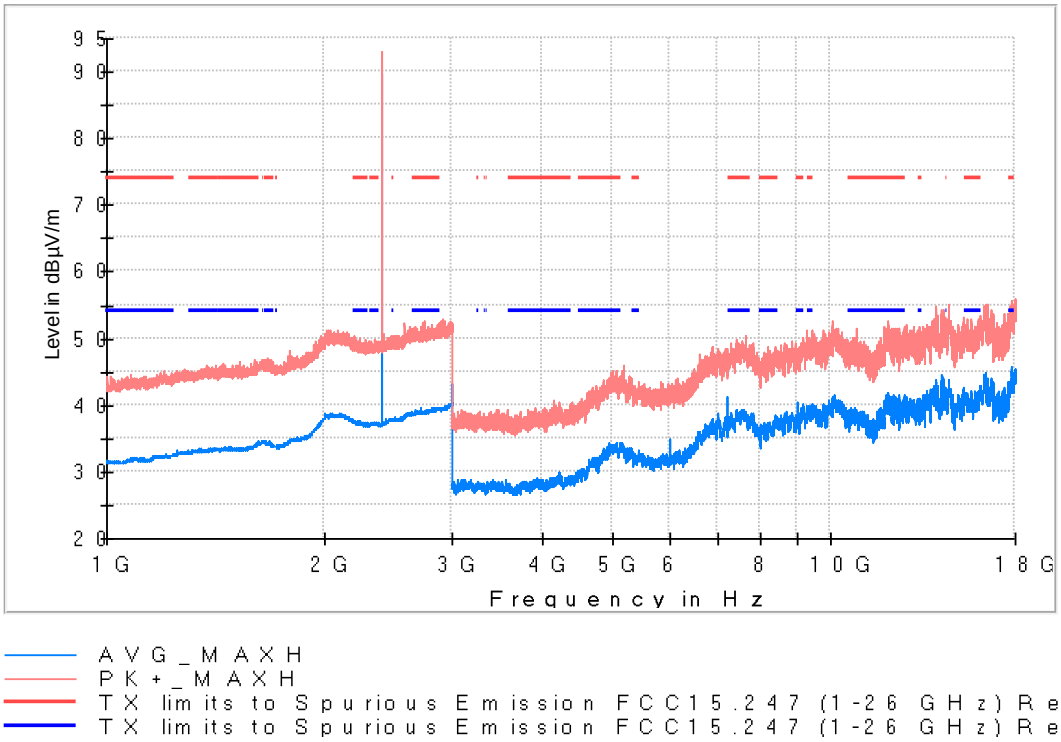
Highest Channel



Modulation: BT (π/4 DQPSK 2-DH5)

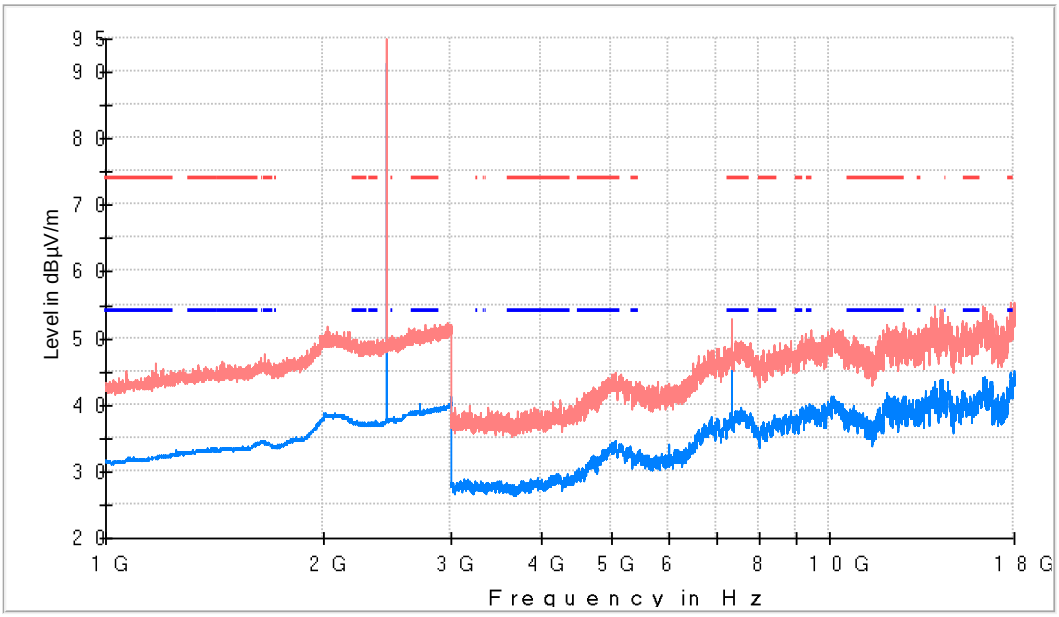
Frequency range 1 - 18 GHz

Lowest Channel



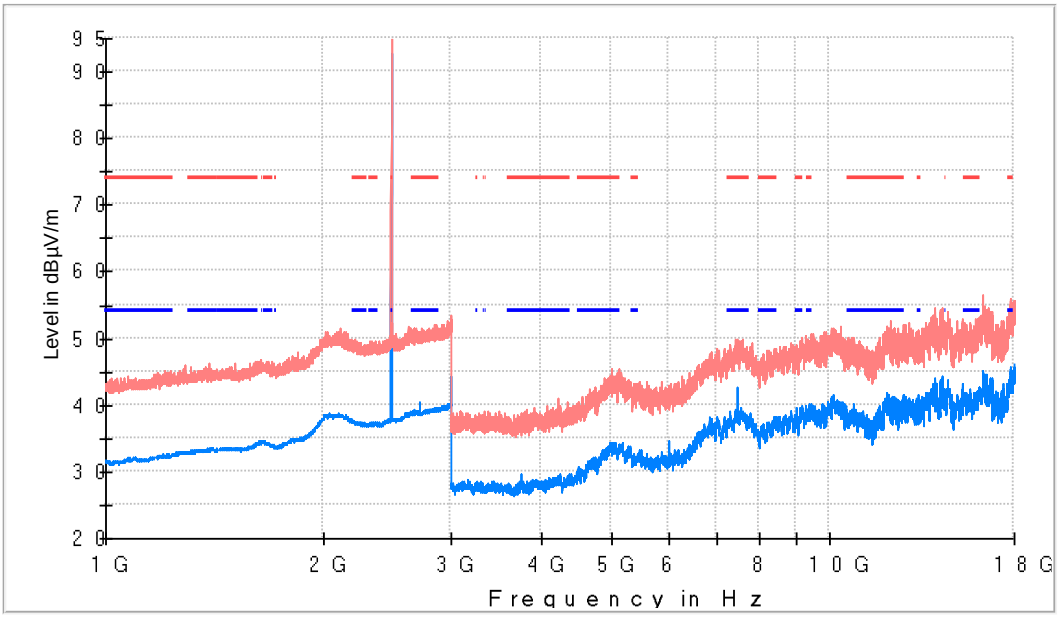
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	93.1	89.6	H	---	---	Fundamental
18000.000000	54.7	45.3	H	8.7	54.0	

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	94.9	91.4	H	---	---	Fundamental
18000.000000	54.6	44.7	H	9.3	54.0	

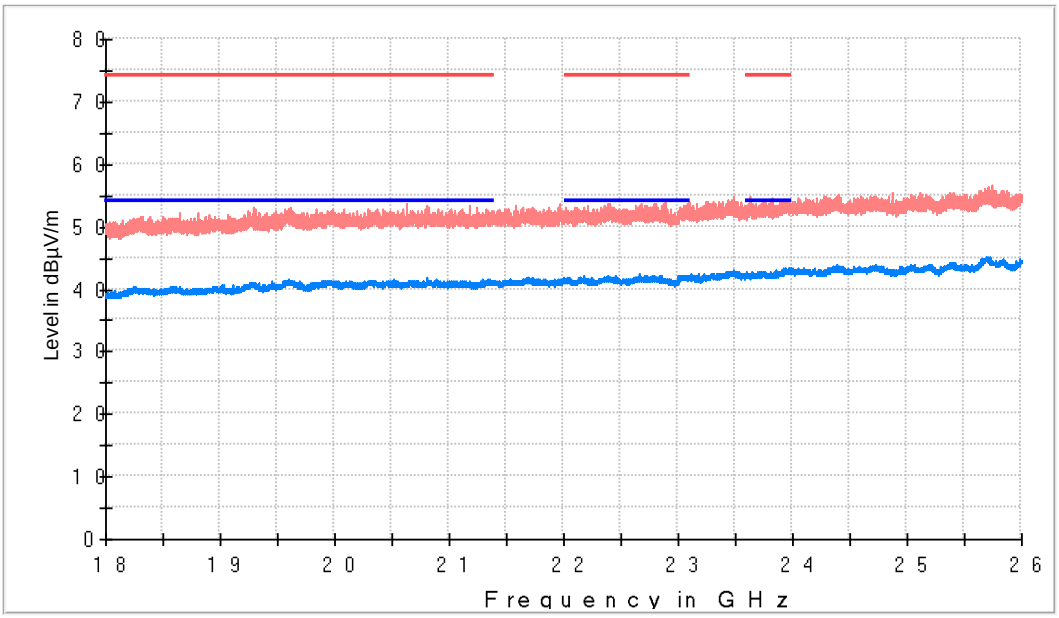
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2481.000000	93.5	86.6	H	---	---	Fundamental
18000.000000	54.7	46.3	H	7.7	54.0	

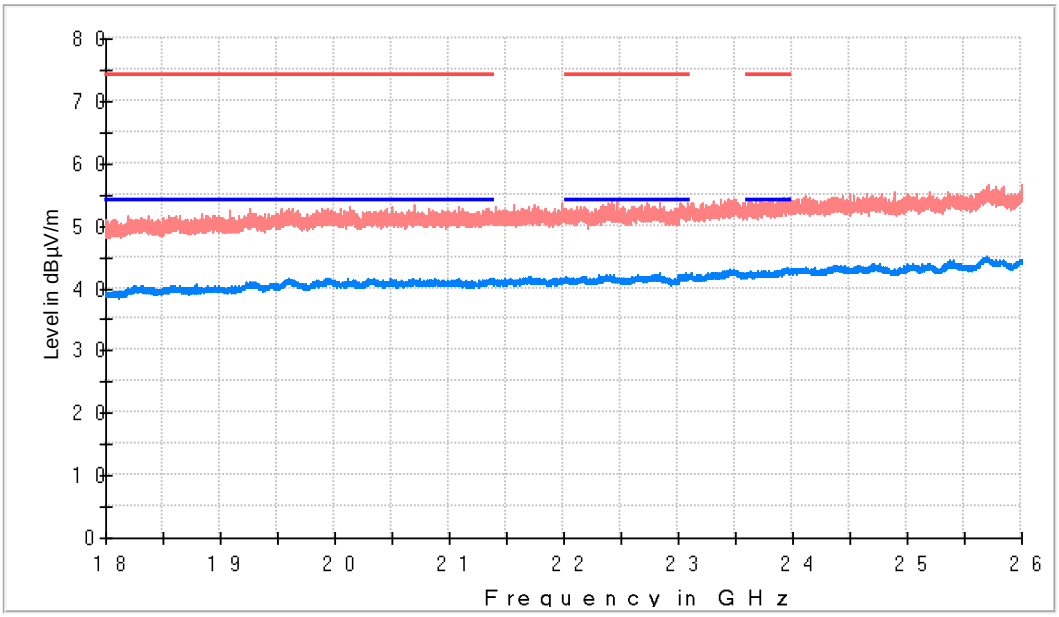
Frequency range 18 - 26 GHz

Lowest Channel



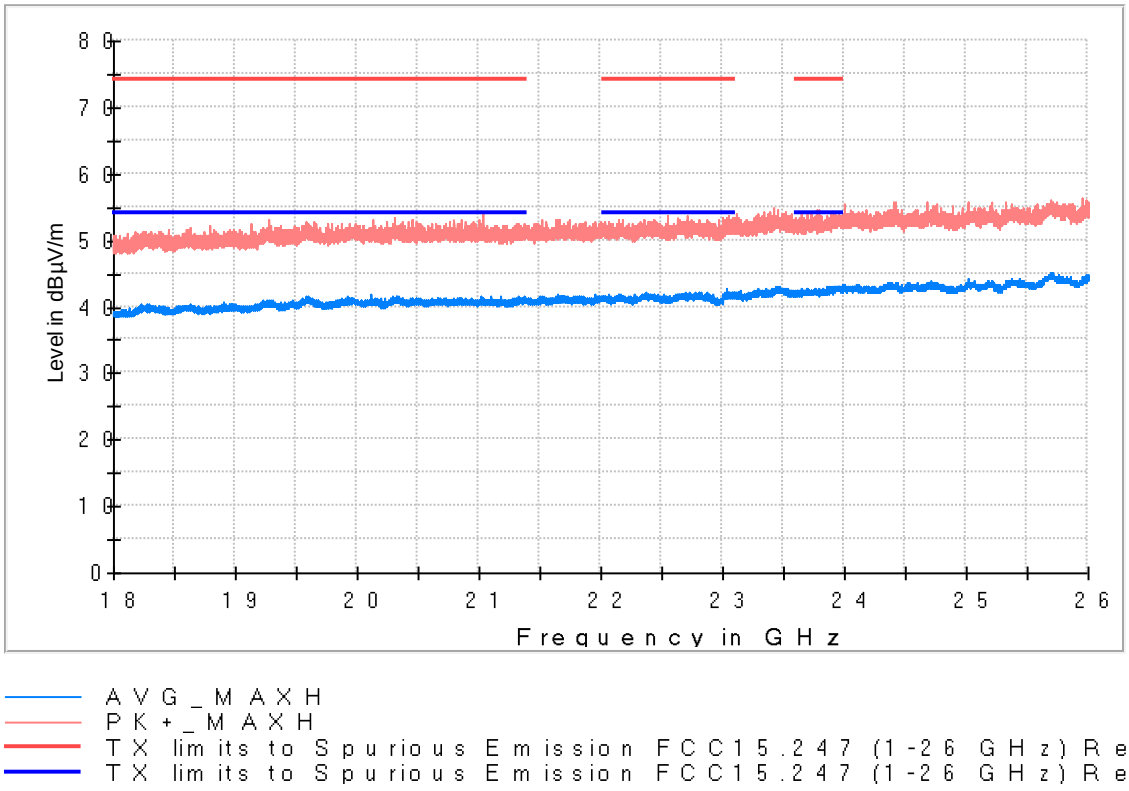
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23937.500000	52.7	43.5	V	10.5	54.0

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23958.000000	52.8	43.2	H	10.8	54.0

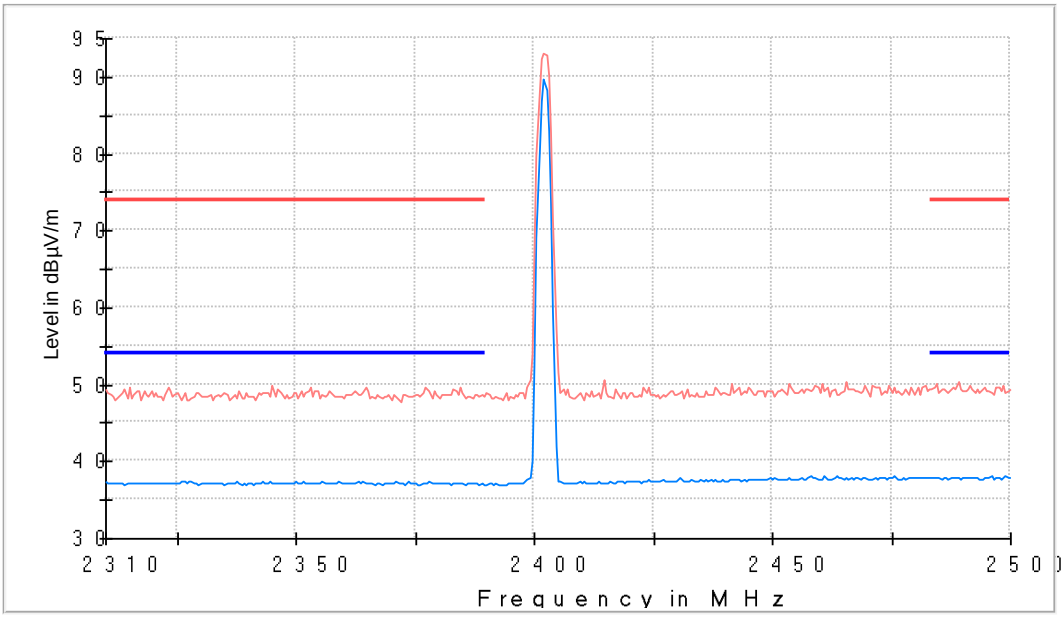
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23980.000000	52.3	43.5	H	10.5	54.0

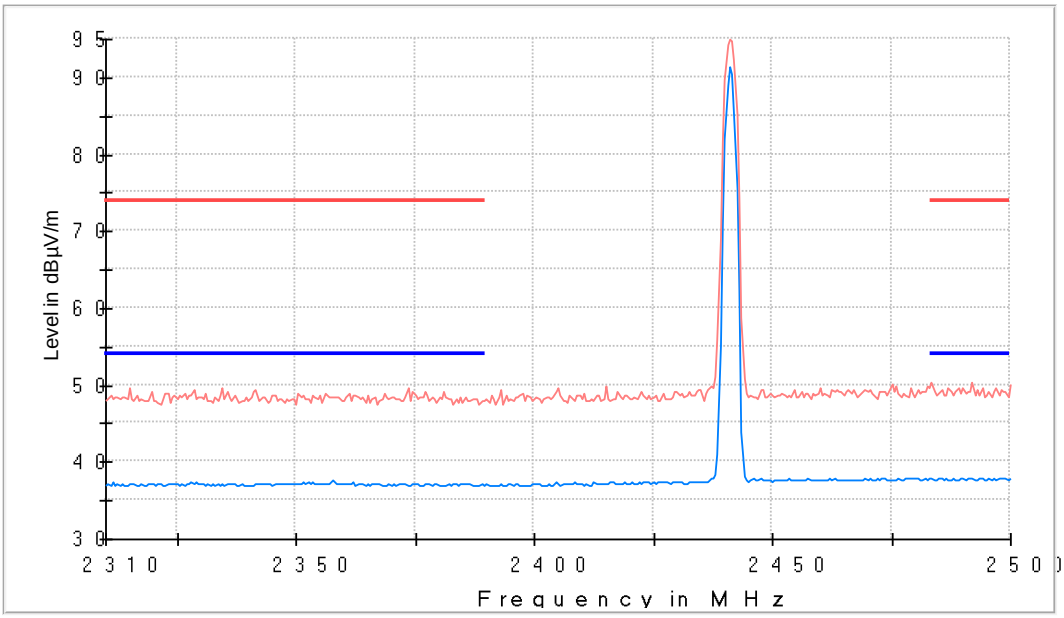
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



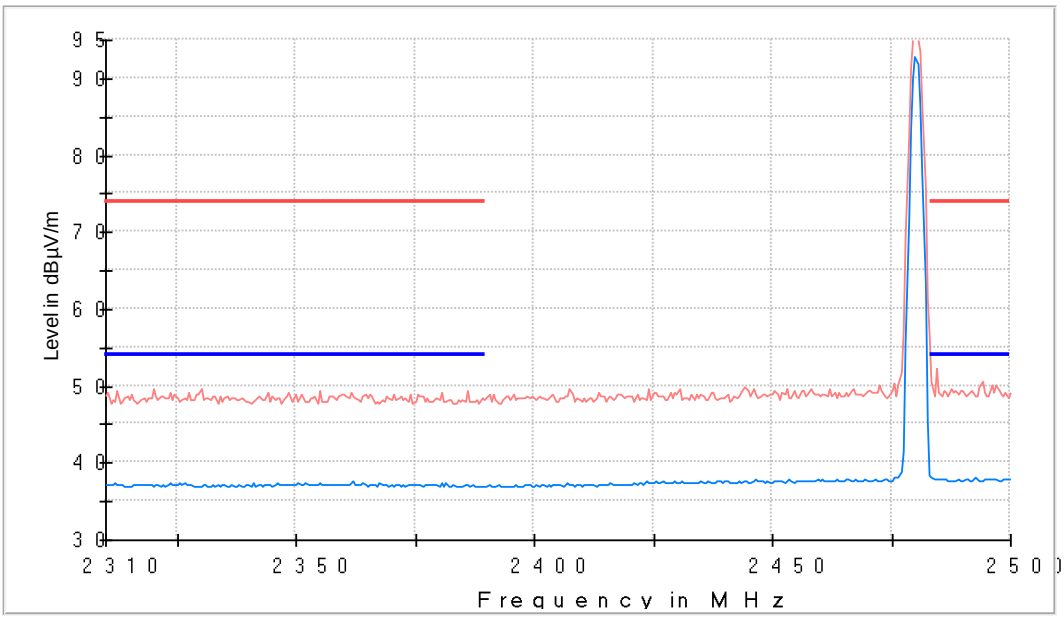
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restr
TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restr

Middle Channel



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

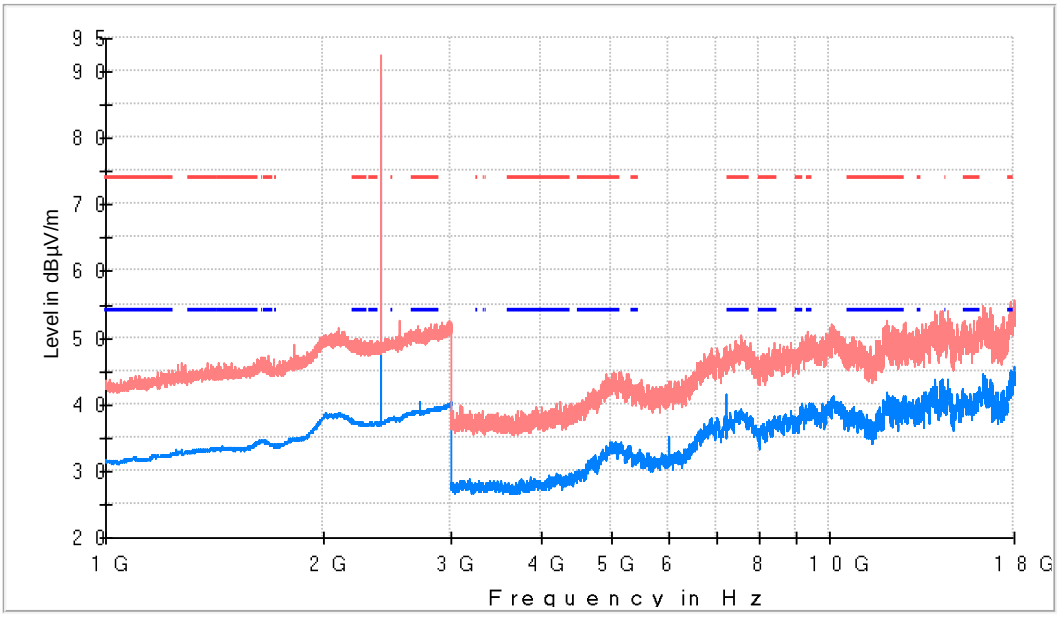
Highest Channel



Modulation: BT (8DPSK 3-DH5)

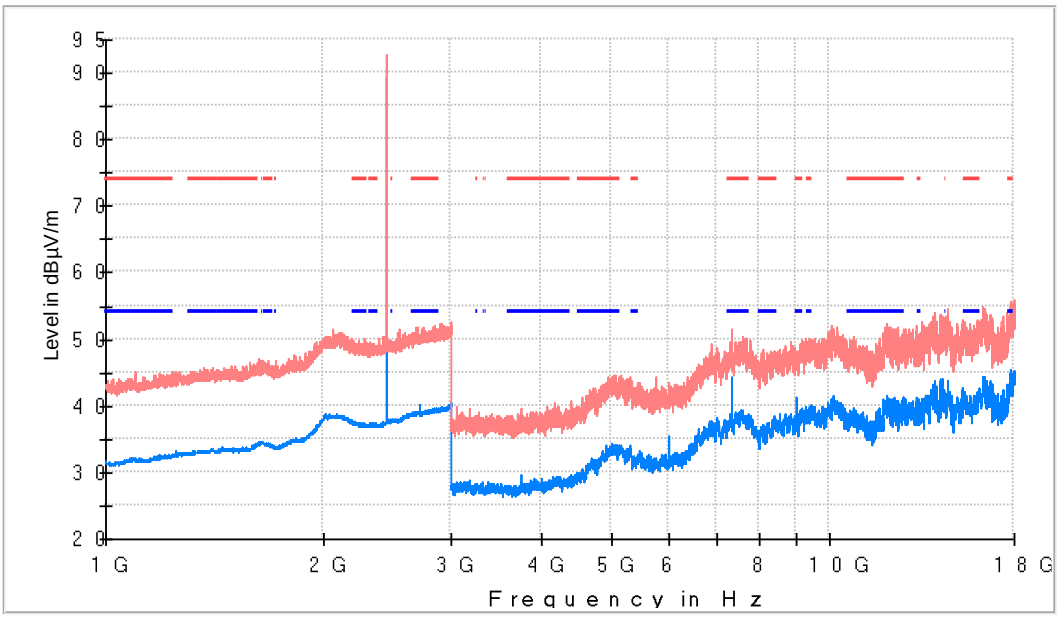
Frequency range 1 - 18 GHz

Lowest Channel



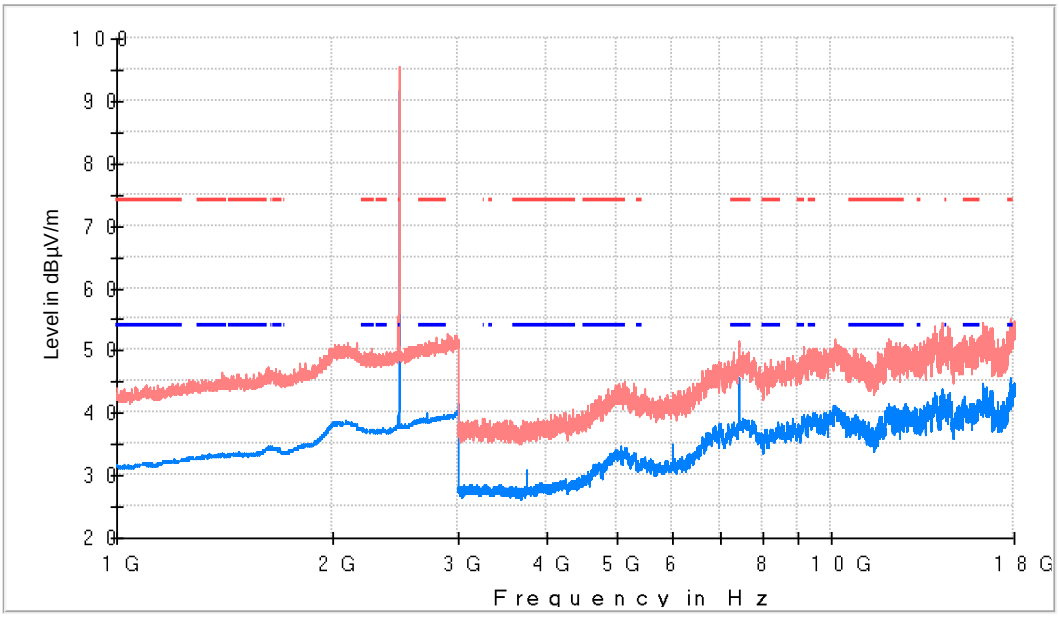
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.500000	92.4	87.9	H	---	---	Fundamental
18000.000000	54.2	45.3	H	8.7	54.0	

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.500000	92.7	88.2	H	---	---	Fundamental
18000.000000	54.4	45.4	H	8.6	54.0	

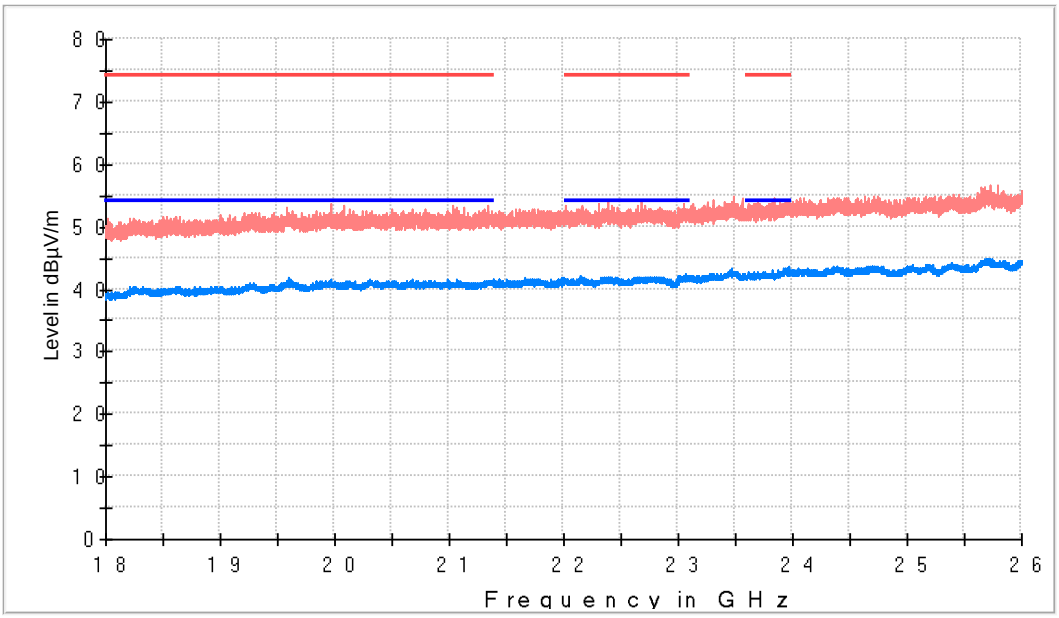
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.000000	95.4	91.6	H	---	---	Fundamental
18000.000000	54.4	44.4	H	9.6	54.0	

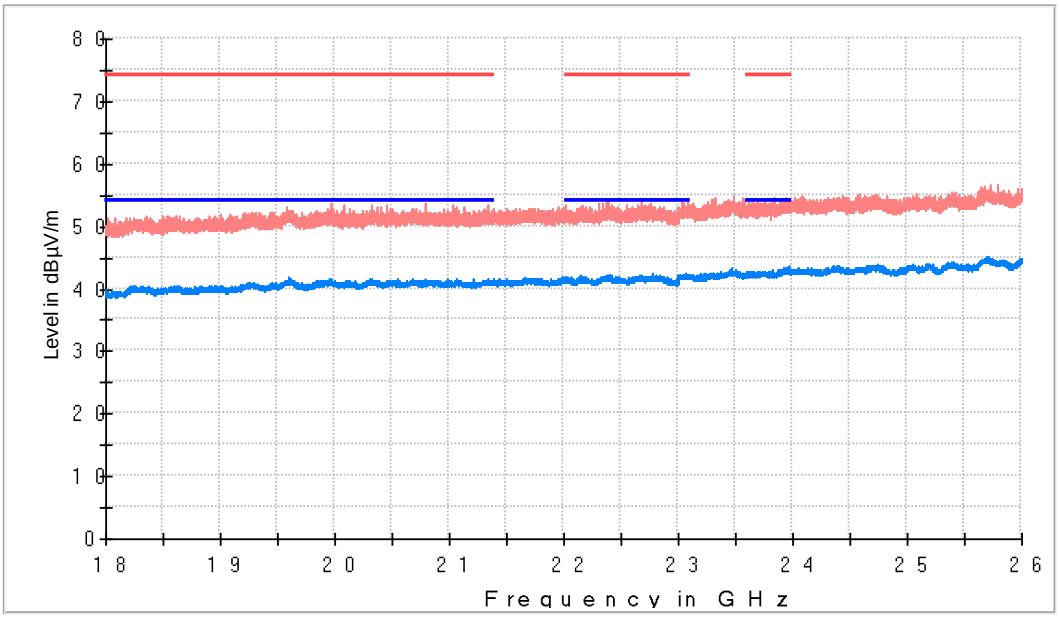
Frequency range 18 - 26 GHz

Lowest Channel



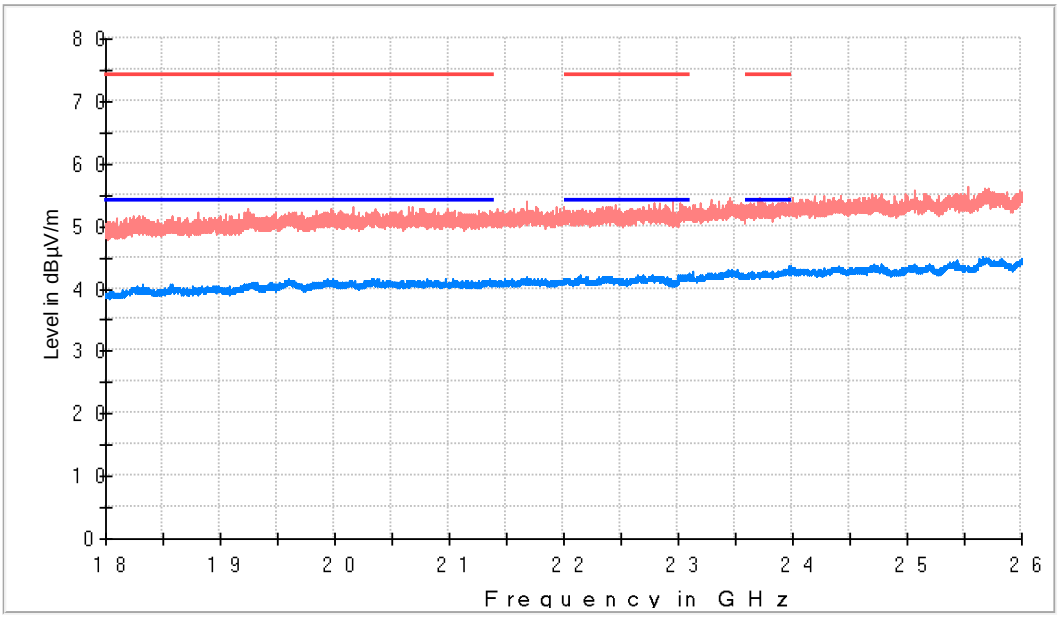
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23974.000000	52.7	43.5	V	10.4	54.0

Middle Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23974.000000	53.7	43.2	H	10.4	54.0

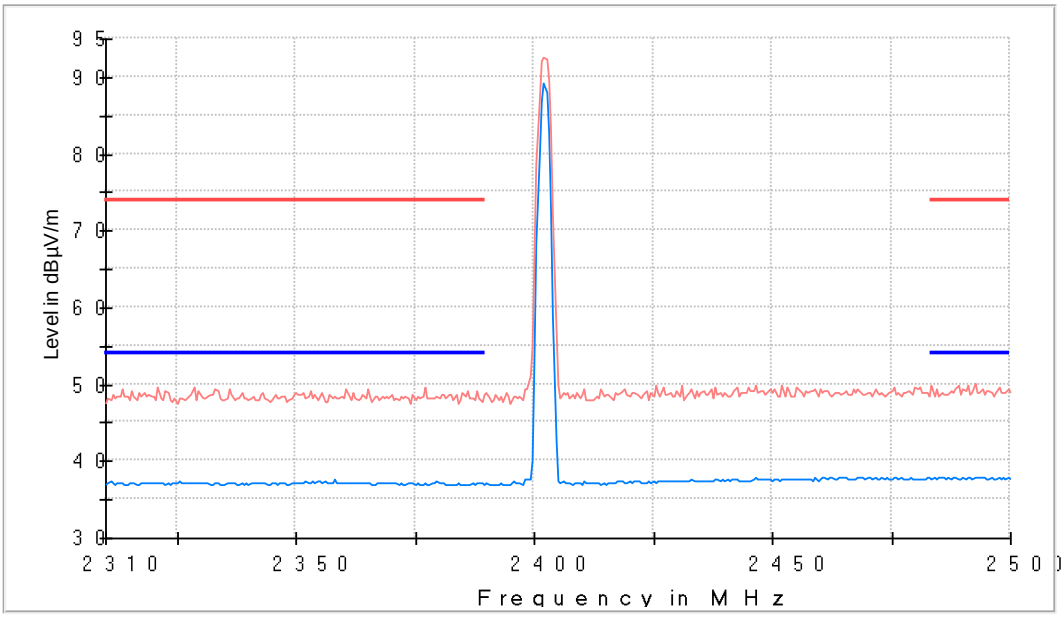
Highest Channel



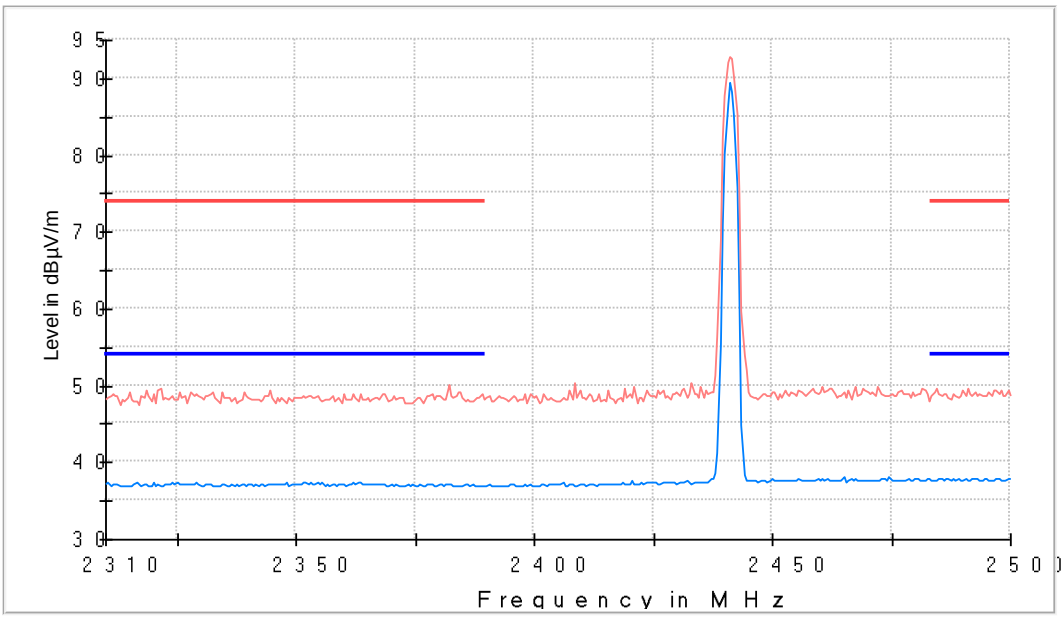
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23970.500000	52.7	43.5	H	10.3	54.0

Restricted Bands (2.31 GHz - 2.5 GHz)

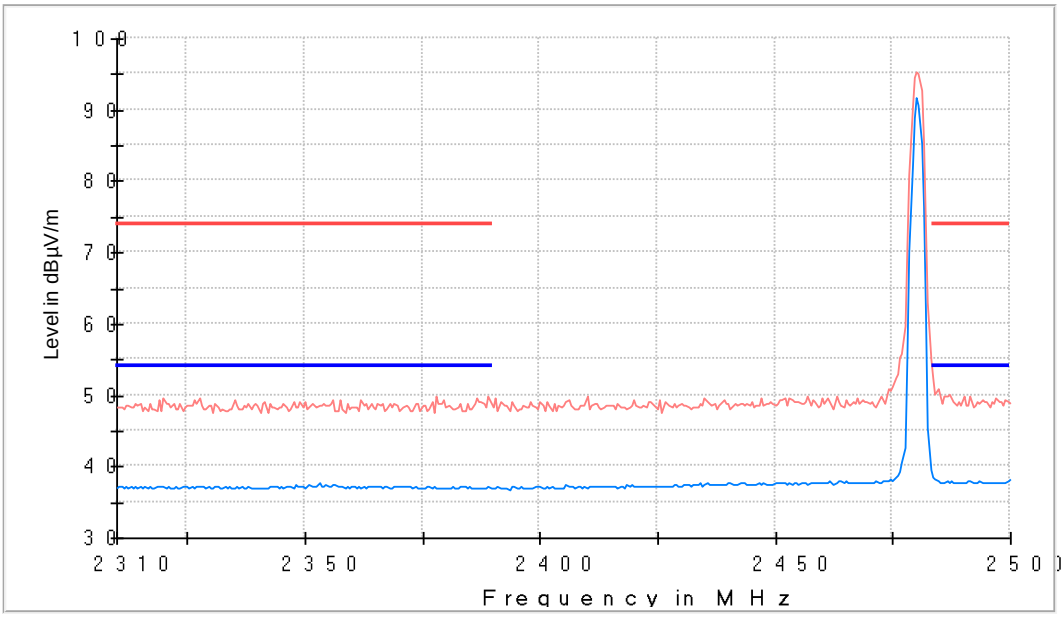
Lowest Channel



Middle Channel



Highest Channel



Subrange	Step Size	Detectors	Bandwidth	Sweep Time
30 MHz - 1 GHz	48.5 kHz	PK+; QPK	100 kHz	1 s
1 GHz - 7 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s
7 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s
18 GHz - 40 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s

DEKRA Certification, Inc.
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Sterling, VA 20164
United States of America

Appendix C: Test results. Wi-Fi 2.4GHz

PRODUCT INFORMATION

Information	Description
Modulation	Other forms of modulation
Maximum RF Output Power	Adaptive Equipment without the possibility to switch to a non- adaptive mode.
Operation mode	
- Operating Frequency Range	2400 – 2483.5 MHz
- Nominal Channel Bandwidth	20 MHz 40 MHz
Extreme operating conditions	
- Temperature range	-40 ºC to +65 ºC
Antenna type	
Antenna gain	-2.5 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Wi-Fi 2.4 GHz b/g/n20/n40/ax20/ax40
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 (**Radio B SISO, Radio A SISO, Radio B & Radio A MIMO**): Lowest channel: 2412 MHz Middle channel: 2437 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 (**Radio B SISO, Radio A SISO, Radio B & Radio A MIMO**): Lowest channel: 2412 MHz Middle channel: 2437 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 (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2412 MHz Middle channel: 2437 MHz Highest channel: 2462 MHz Channel Bandwidth: 40 MHz Test Frequencies for Conducted/Radiated tests (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2422 MHz Middle channel: 2437 MHz Highest channel: 2452 MHz

TEST CONDITIONS	DESCRIPTION
TC#04(1)(3) **(ax mode non-beam forming)**	Power supply (V): $V_{nominal}$ = 12 Vdc Channel Bandwidth: 20 MHz Test Frequencies for Conducted/Radiated tests (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2412 MHz Middle channel: 2437 MHz Highest channel: 2462 MHz Worst case (RU Index 8): 3.6 Channel Bandwidth: 40 MHz Test Frequencies for Conducted/Radiated tests (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2422 MHz Middle channel: 2437 MHz Highest channel: 2452 MHz Worst case (RU Index 0): 0.1

TEST CONDITIONS	DESCRIPTION
TC#05(1) **(ax mode Beam forming)**	Power supply (V): $V_{nominal}$ = 12 Vdc Channel Bandwidth: 20 MHz Test Frequencies for Conducted/Radiated tests (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2412 MHz Middle channel: 2437 MHz Highest channel: 2462 MHz Channel Bandwidth: 40 MHz Test Frequencies for Conducted/Radiated tests (**Radio A SISO, Radio B SISO , Radio A + B MIMO**): Lowest channel: 2422 MHz Middle channel: 2437 MHz Highest channel: 2452 MHz

Note (1): For spurious emissions for OFDM modes 802.11g, 802.11n20 and 802.11ax20 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 11Mb/s for 802.11b, 54Mb/s for 802.11g, MCS7 for 802.11n20, 802.11 ax were selected based on preliminary testing that identified those rates corresponding to the worst cases.

(2): Preliminary measurements determined the PSD levels of partial RU is higher than the full RU in ax mode. RU 26 tone was identified as the worst-case RU (Resource Unit) carrier allocation for all ax mode testing.

The worst case RU combinations used in the SISO/MIMO modes measurement are indicated as follows:

- 20 MHz BW: RU26 offset 0
- 40 MHz BW: RU26 offset 8

(3): Preliminary measurements determined the SISO A mode is identified as a worst case for 802.11ax HE20 Partial RU in6 dB Bandwidth, Occupied Channel Bandwidth 99%, and Band-edge emissions compliance (Transmitter) – Conducted test.

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements:

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)i), directional gain was calculated as follows:

- For power spectral density (PSD) measurements:

  Directional gain $_{PSD}$ = G_{ANT} + 10 log(N_{ANT}/N_{SS}) dBi

  N_{SS} = 1 (worst case), N_{ANT} = 2, G_{ANT} = -2.5 dBi

  Directional gain $_{PSD}$ = -2.5 + 10 log(2/1) = -2.5 + 10log(2) = -2.5 + 3.01 = +0.51 dBi

  PSD Antenna Gain MIMO Chain 0 & 1: +0.51 dBi

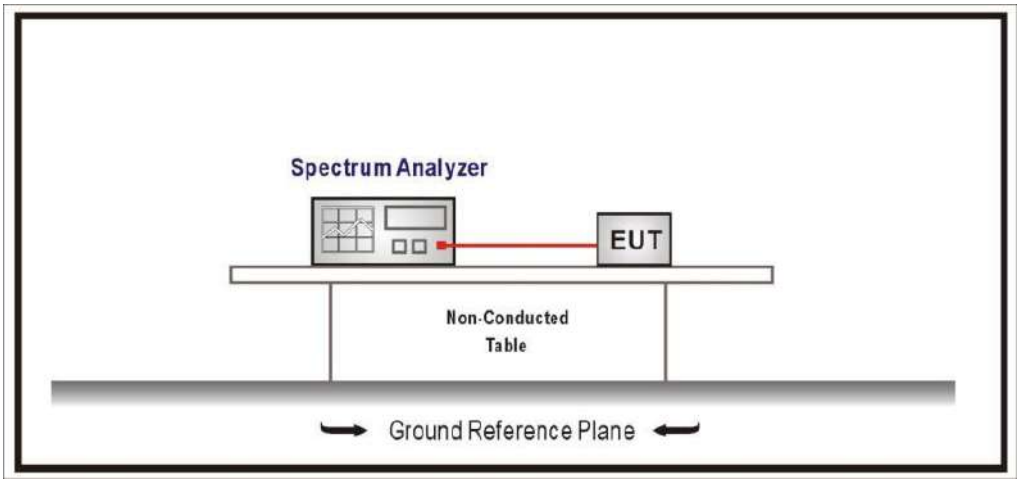
- For power measurements:

  Directional gain $_{POWER}$ = G_{ANT} dBi (N_{ANT} < 4)

  Directional gain $_{POWER}$ = G_{ANT} = -2.5 dBi

  Power Antenna Gain MIMO Chain 0 & 1: -2.5 dBi

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 antenna), 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.

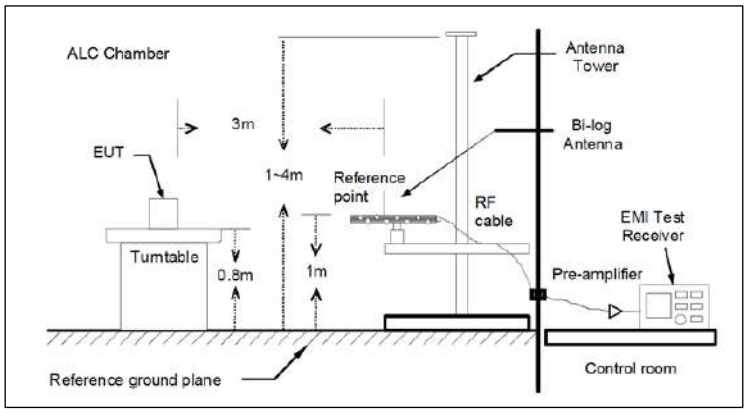


Fig A1: Radiated measurements Setup f < 1 GHz

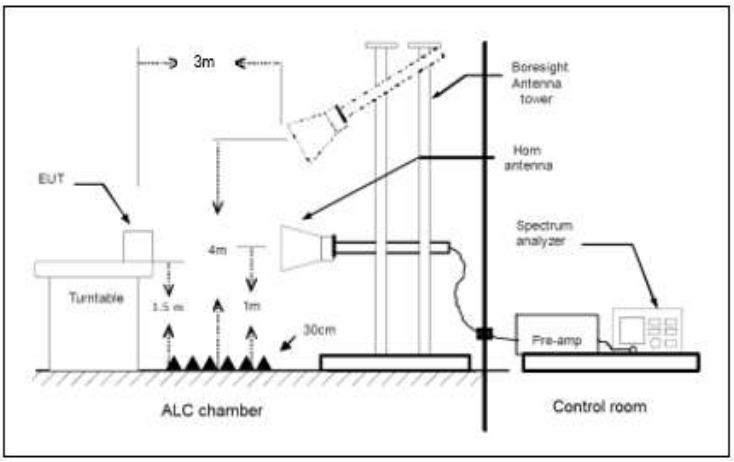


Fig A2: Radiated measurements setup f > 1-18 GHz

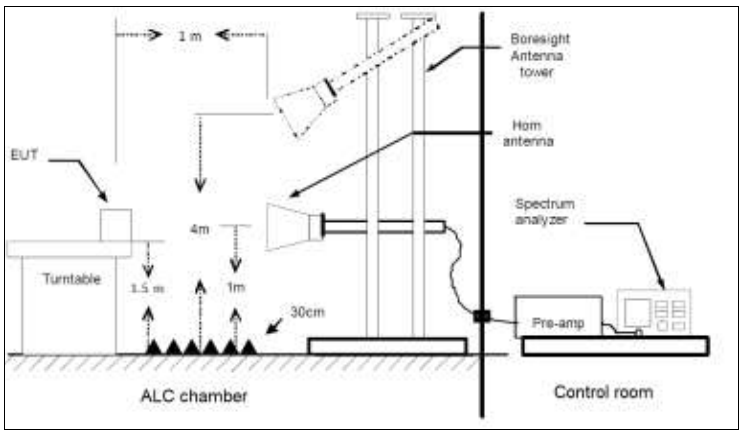


Fig A3: Radiated measurements setup f > 18 GHz

Appendix C.1: SISO A

TEST CASES DETAILS

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

Limits

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

Modulation: 802.11b
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000				10.00
2437.00000	20	1	1	10.10
2462.00000				9.75

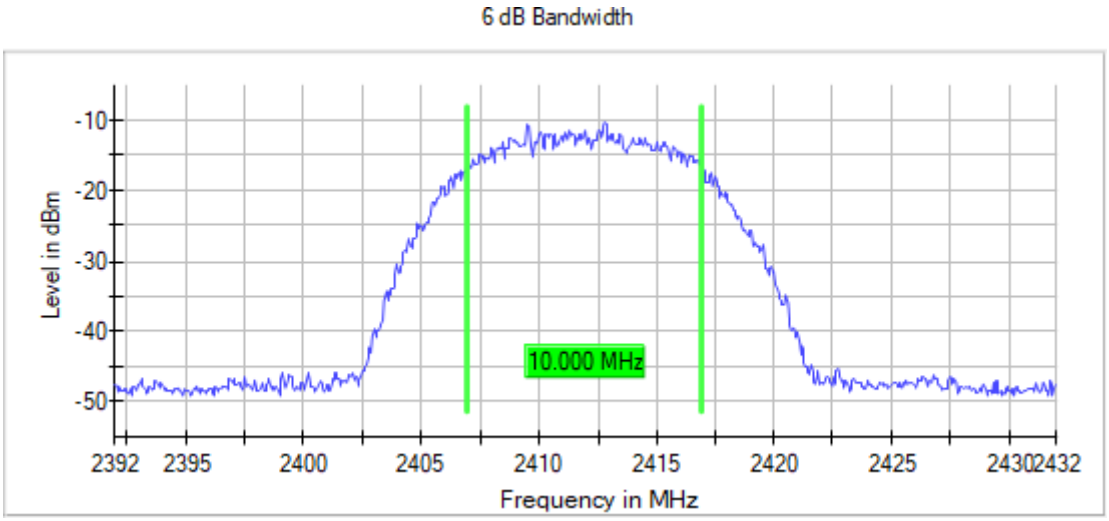
Verdict

Pass

Attachments

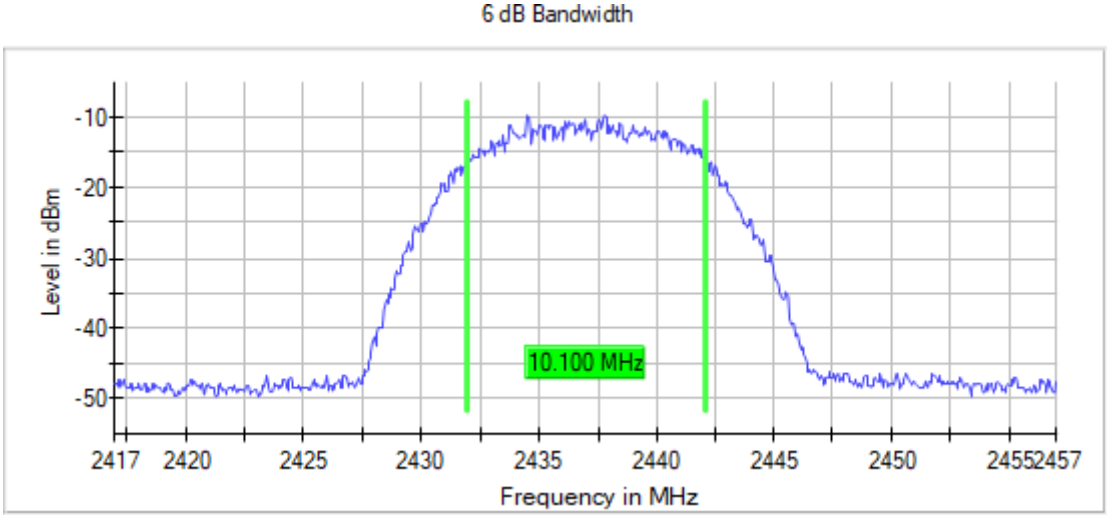
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



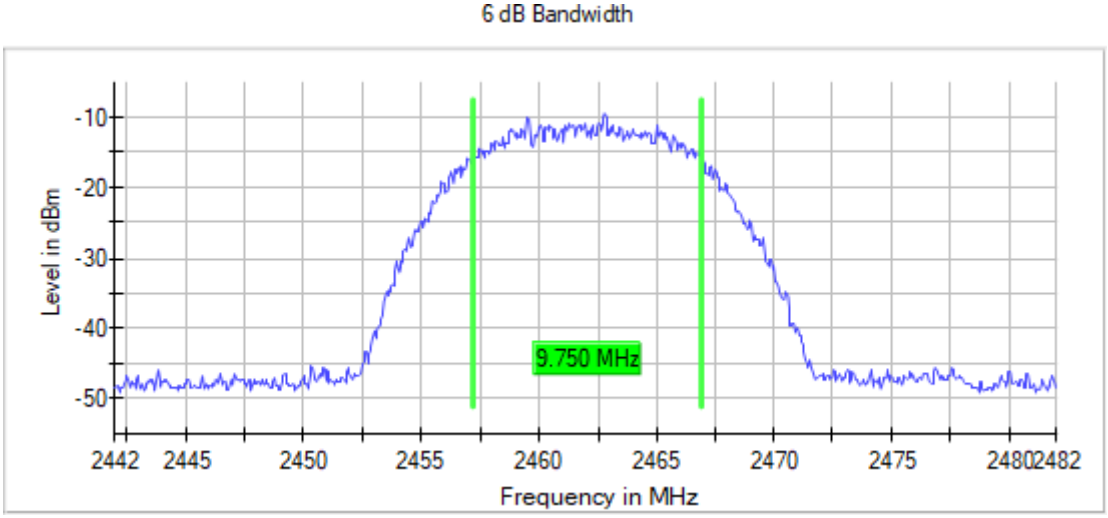
Frequency MHz = 2437.00000, Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Modulation: 802.11g

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000				16.55
2437.00000	20	1	1	16.55
2462.00000				16.55

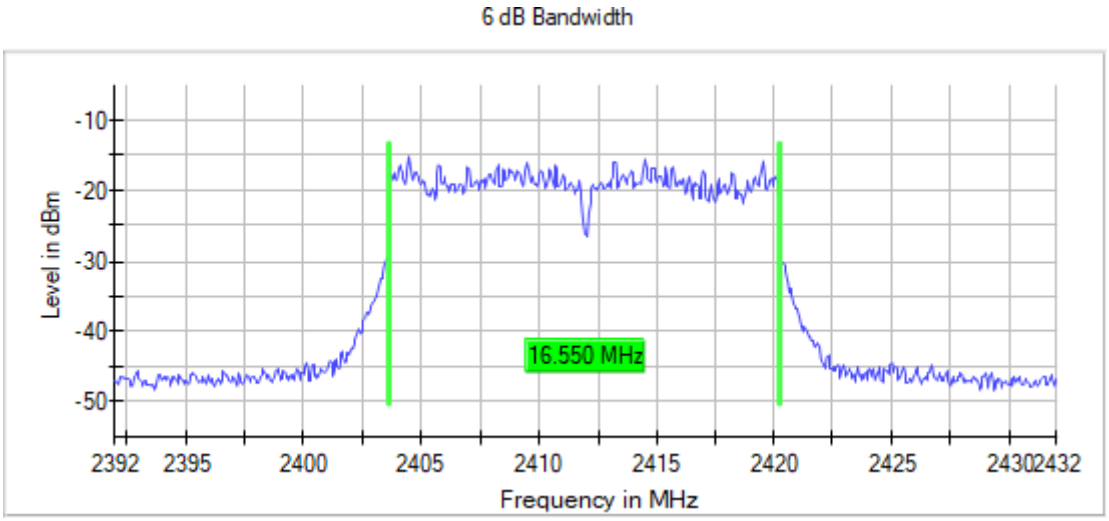
Verdict

Pass

Attachments

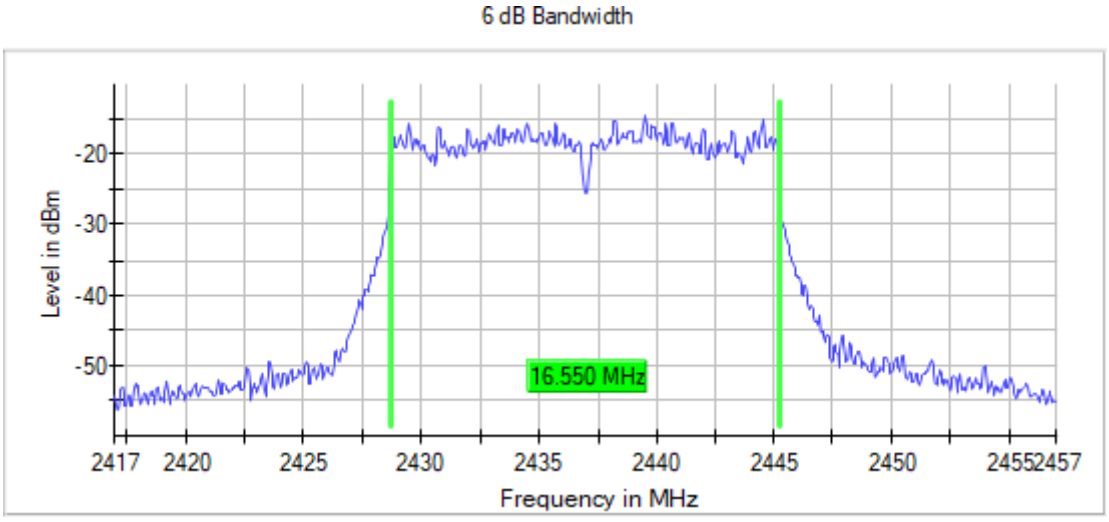
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



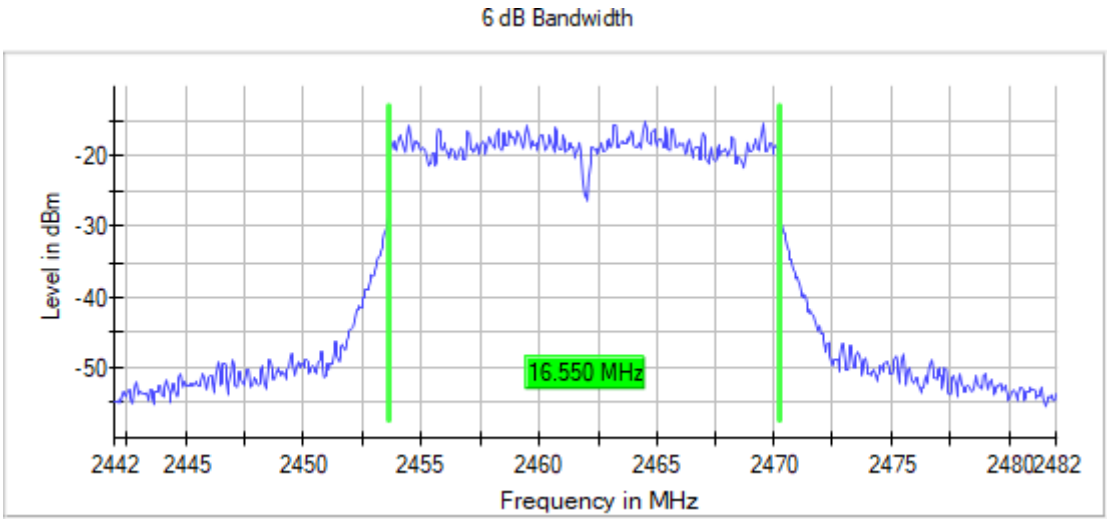
Frequency MHz = 2437.00000, Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Modulation: 802.11n
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000				17.80
2437.00000	20	1	1	17.75
2462.00000				17.80

Modulation: 802.11n HT40
Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2422.00000				36.45
2437.00000	40	1	1	36.40
2452.00000				36.40

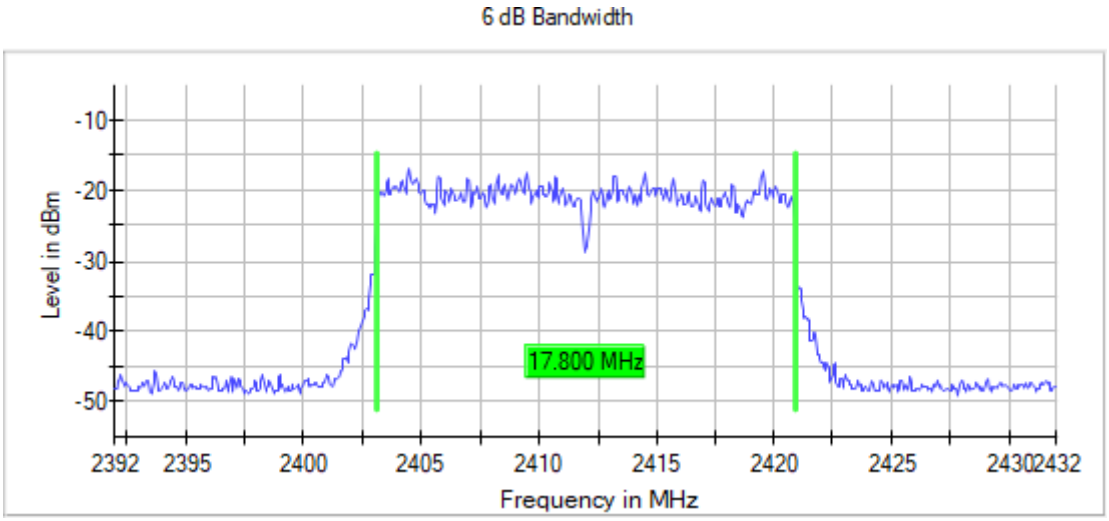
Verdict

Pass

Attachments

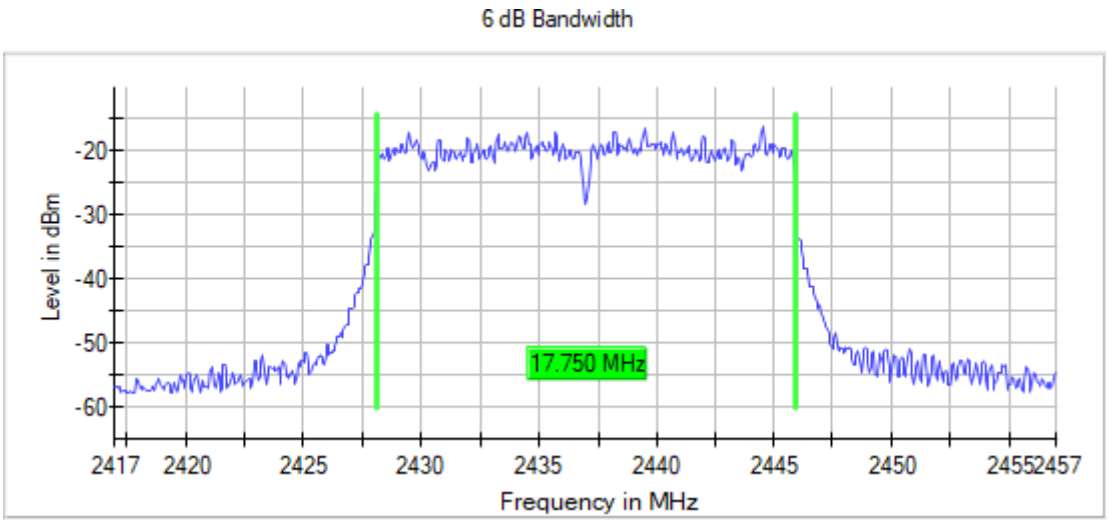
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



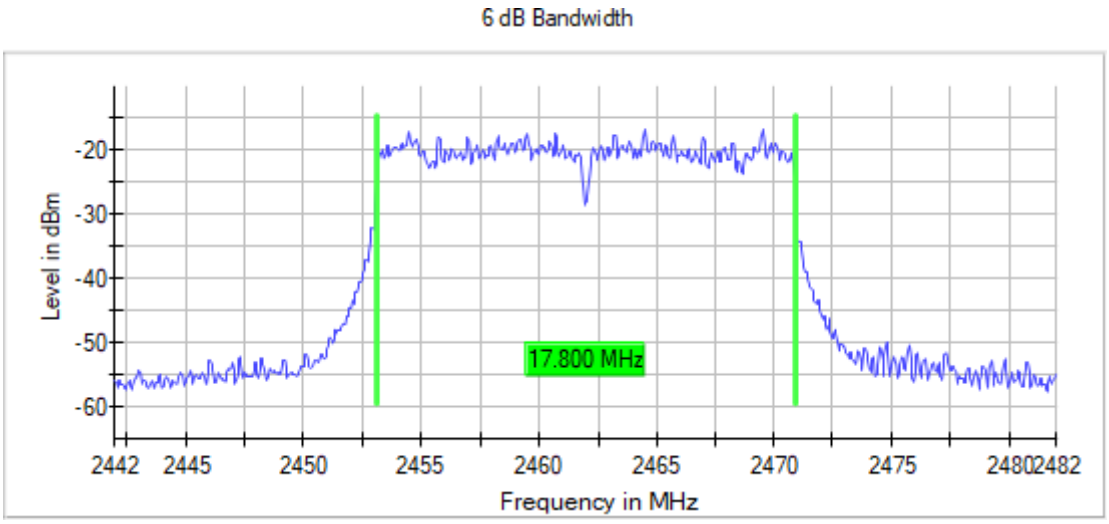
Frequency MHz = 2437.00000, Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



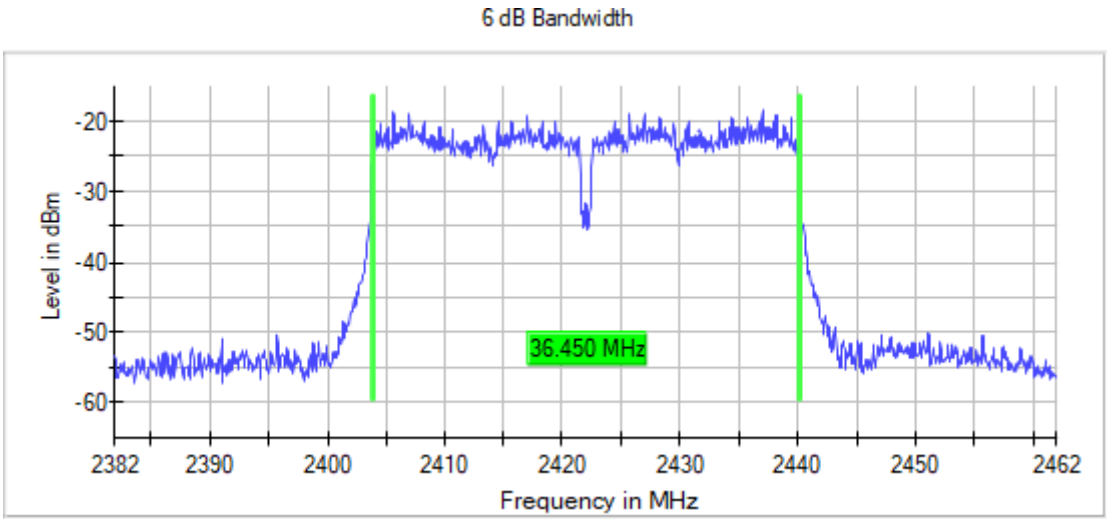
Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



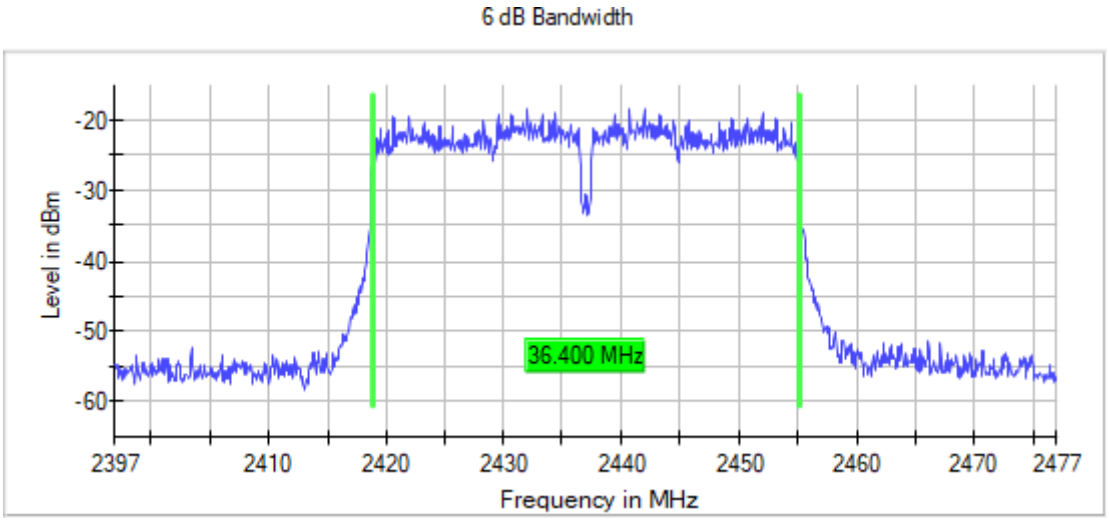
Frequency MHz = 2422.00000, Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



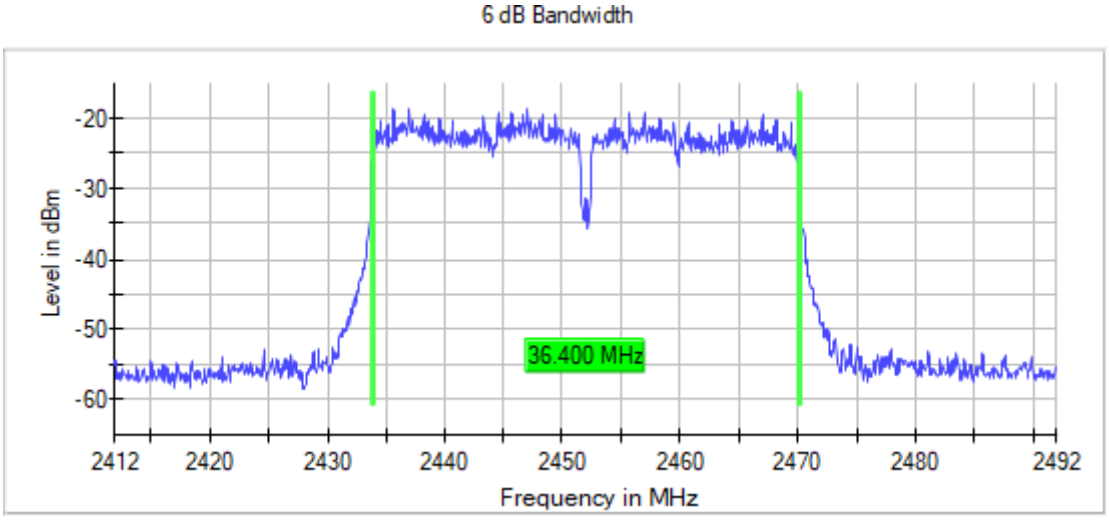
Frequency MHz = 2437.00000, Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



Modulation: 802.11ax HE20 Full RU
Results

Freq (MHz)	BW (MHz)	Emission Bandwidth (MHz)
2412.00000		18.70
2437.00000	20	18.80
2462.00000		18.65

Modulation: 802.11ax HE40 Full RU
Results

Freq (MHz)	BW (MHz)	Emission Bandwidth (MHz)
2422.00000		35.25
2437.00000	40	35.25
2452.00000		35.25

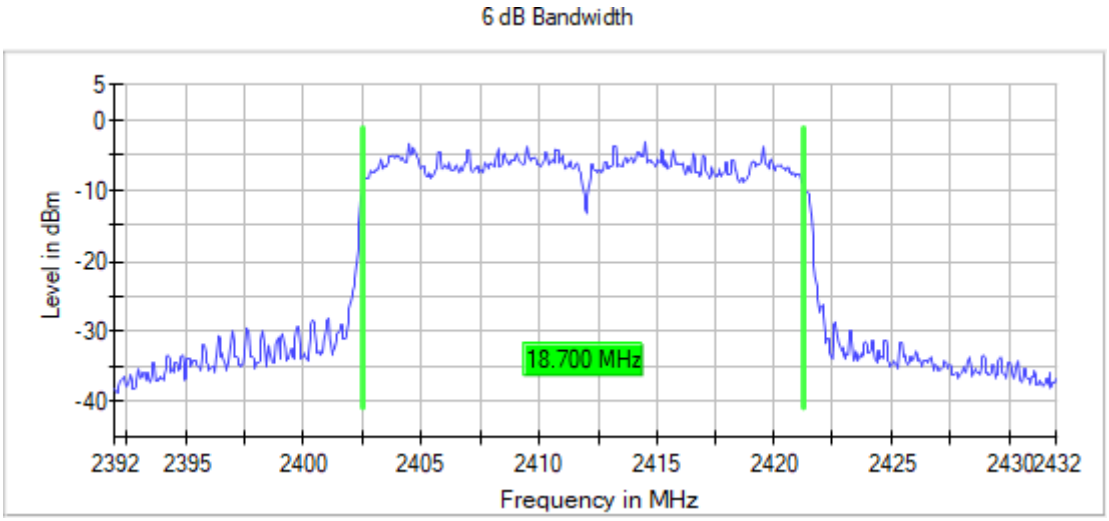
Verdict

Pass

Attachments

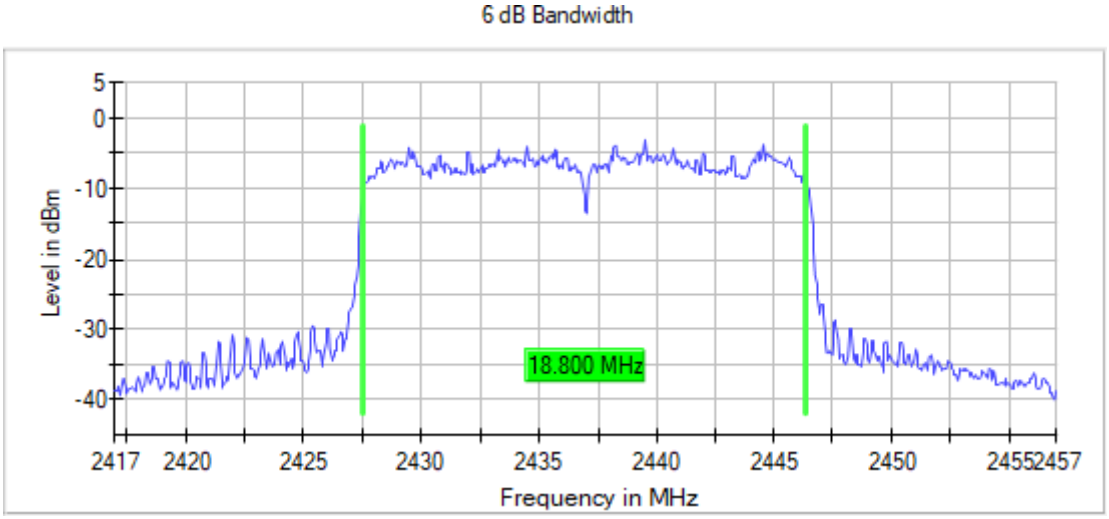
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



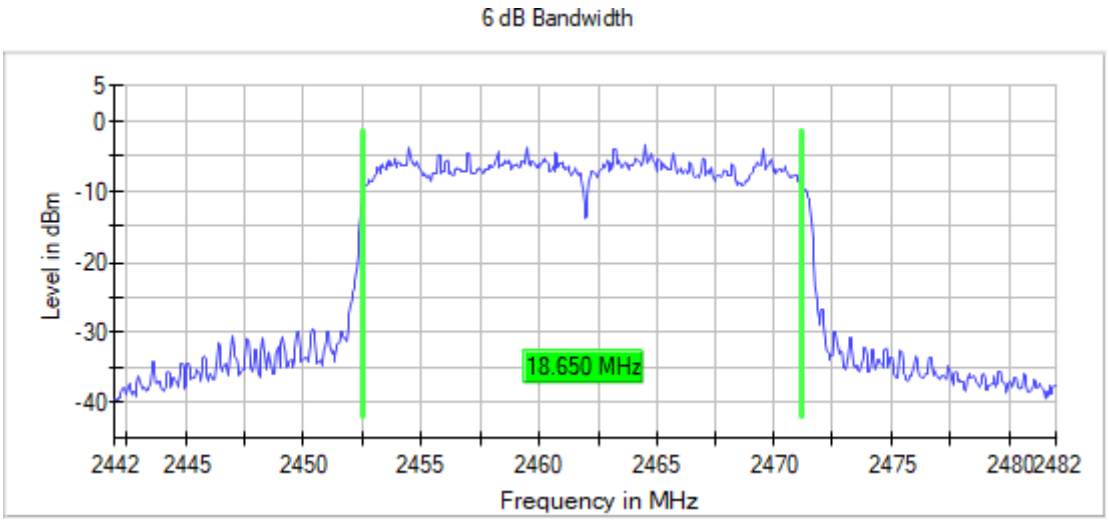
Frequency MHz = 2437.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



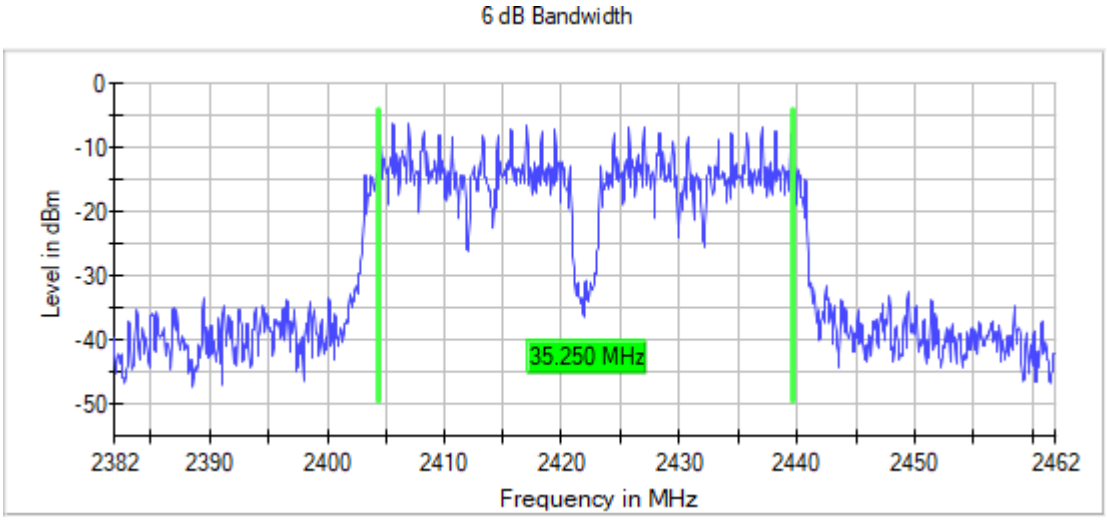
Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



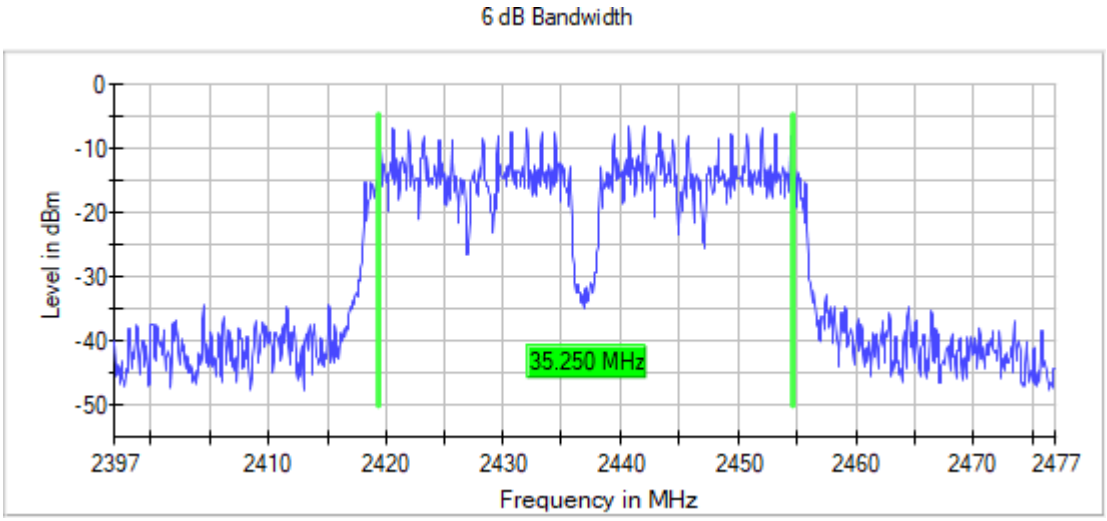
Frequency MHz = 2422.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



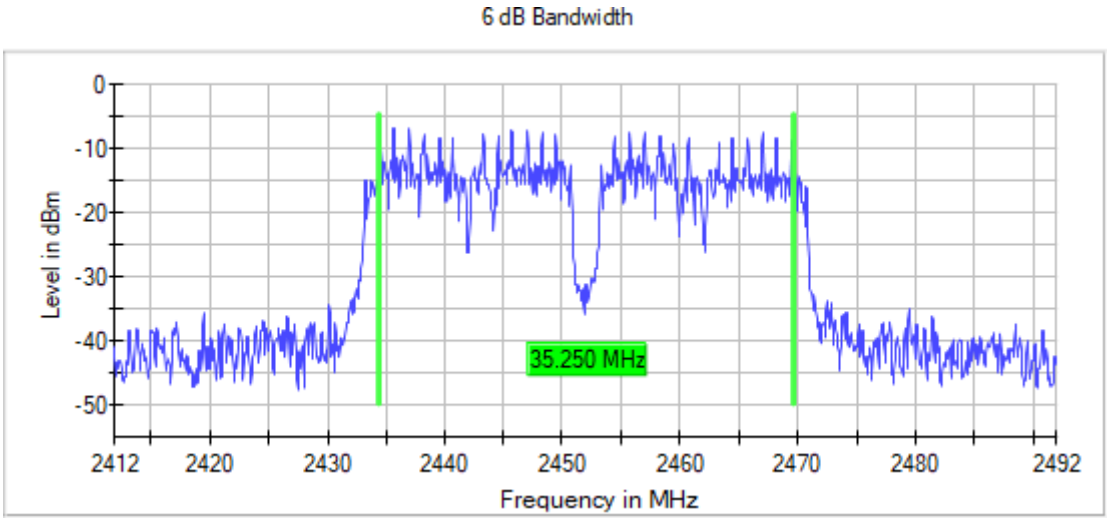
Frequency MHz = 2437.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39200	2.41700	2.44200
Stop Frequency	2.43200	2.45700	2.48200
Span	40.000 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
SweepPoints	800	800	800
Sweeptime	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
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	72 / max.	66 / max.	71 / max.
Stable	5 / 5	5 / 5	5 / 5
Max Stable	0.16 dB	0.23 dB	0.12 dB

Modulation: 802.11ax HE20 Partial RU
Results

Freq (MHz)	BW (MHz)	Emission Bandwidth (MHz)
2412.00000		17.10
2437.00000	20	02.20
2462.00000		17.10

Modulation: 802.11ax HE40
Results

Freq (MHz)	BW (MHz)	Emission Bandwidth (MHz)
2422.00000		02.15
2437.00000	40	02.20
2452.00000		02.20

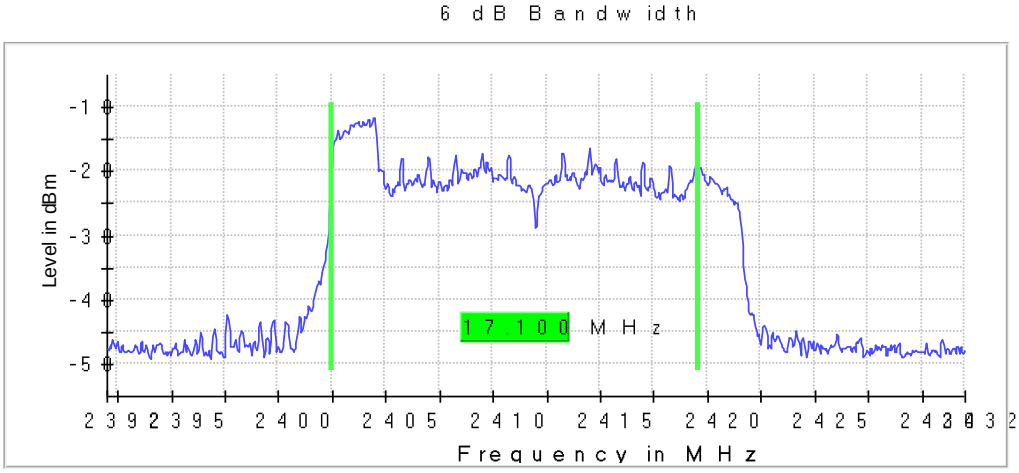
Verdict

Pass

Attachments

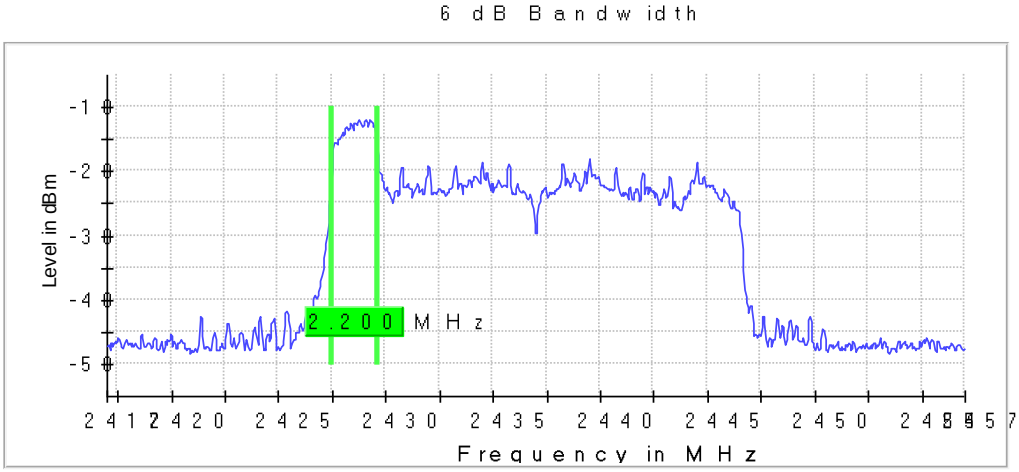
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



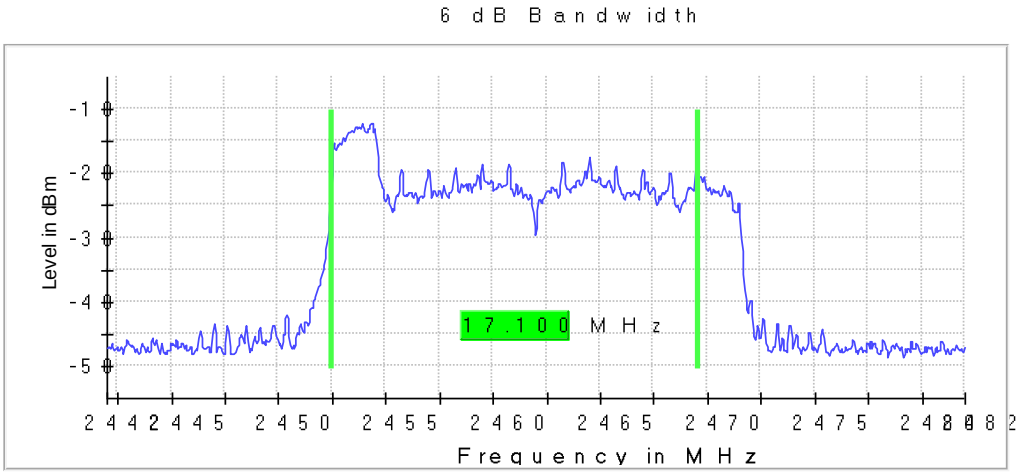
Frequency MHz = 2437.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



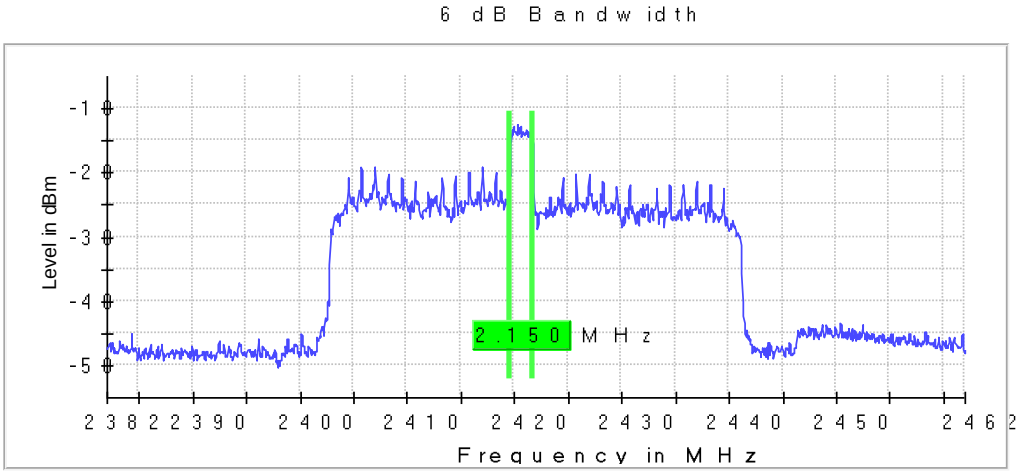
Frequency MHz = 2462.00000, Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



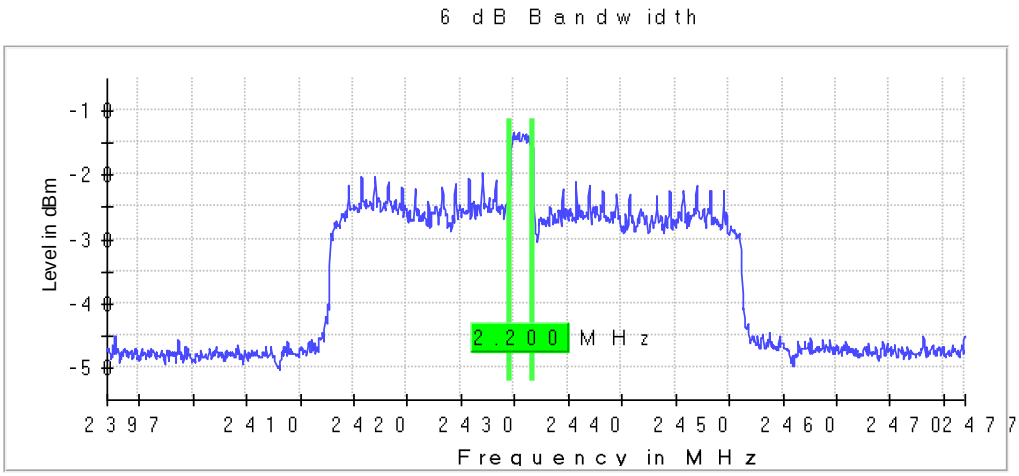
Frequency MHz = 2422.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



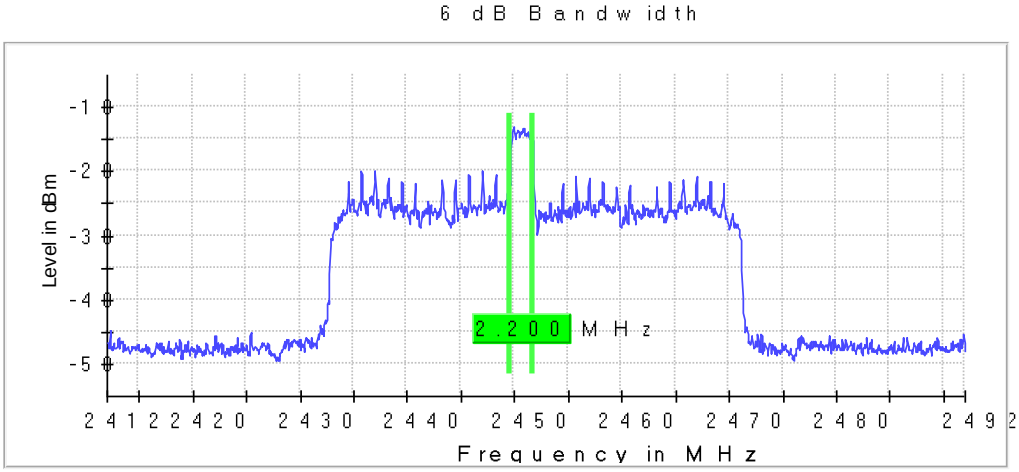
Frequency MHz = 2437.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	**2.39200**	**2.41700**	**2.44200**
Stop Frequency	**2.43200**	**2.45700**	**2.48200**
Span	**40.000 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**
SweepPoints	**800**	**800**	**800**
Sweeptime	**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**
SweepCount	**100**	**100**	**100**
Filter	**3 dB**	**3 dB**	**3 dB**
Trace Mode	**Max Hold**	**Max Hold**	**Max Hold**
Sweeptype	**FFT**	**FFT**	**FFT**
Preamp	**off**	**off**	**off**
Stablemode	**Trace**	**Trace**	**Trace**
Stablevalue	**0.50 dB**	**0.50 dB**	**0.50 dB**
Run	**72 / max.**	**66 / max.**	**71 / max.**
Stable	**5 / 5**	**5 / 5**	**5 / 5**
Max Stable	**0.16 dB**	**0.23 dB**	**0.12 dB**

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

Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Modulation: 802.11b
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	0.24
2437.00000					-12.67
2462.00000					-4.33

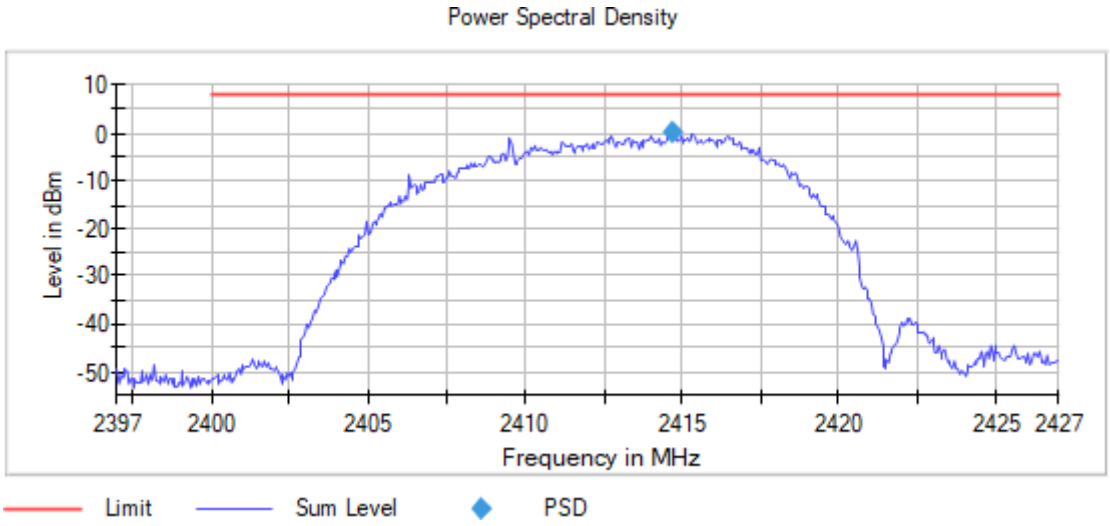
Verdict

Pass

Attachments

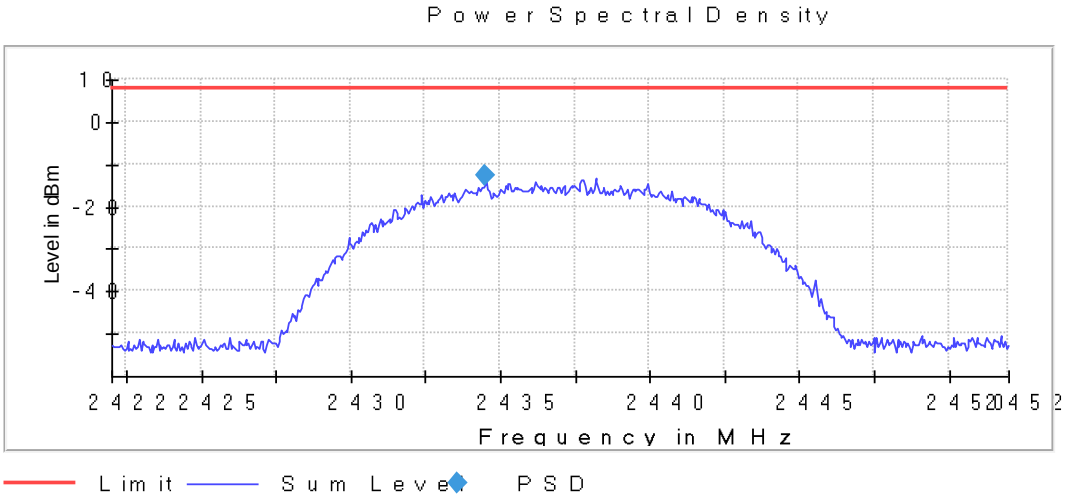
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



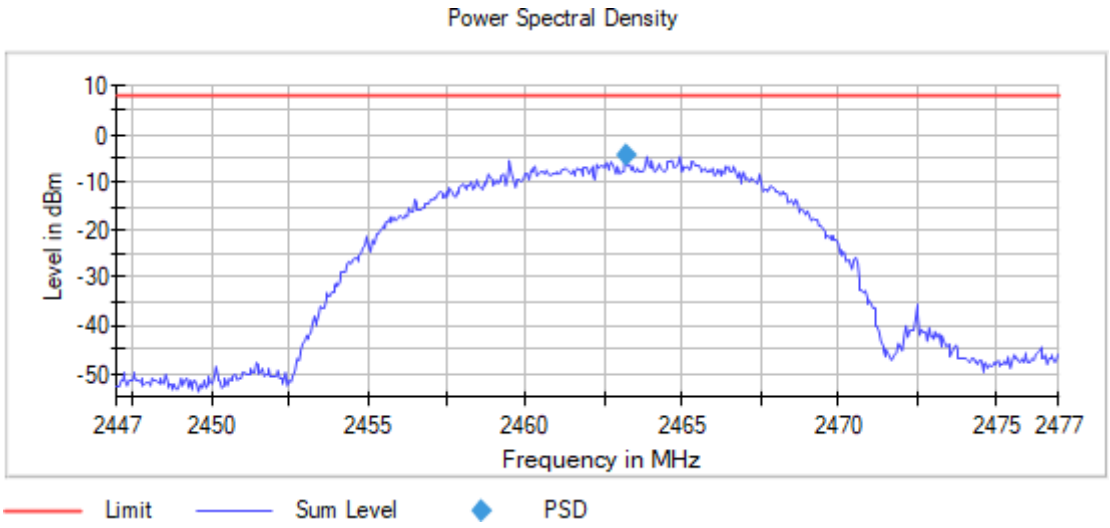
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Modulation: 802.11g

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-18.96
2437.00000					-18.14
2462.00000					-18.68

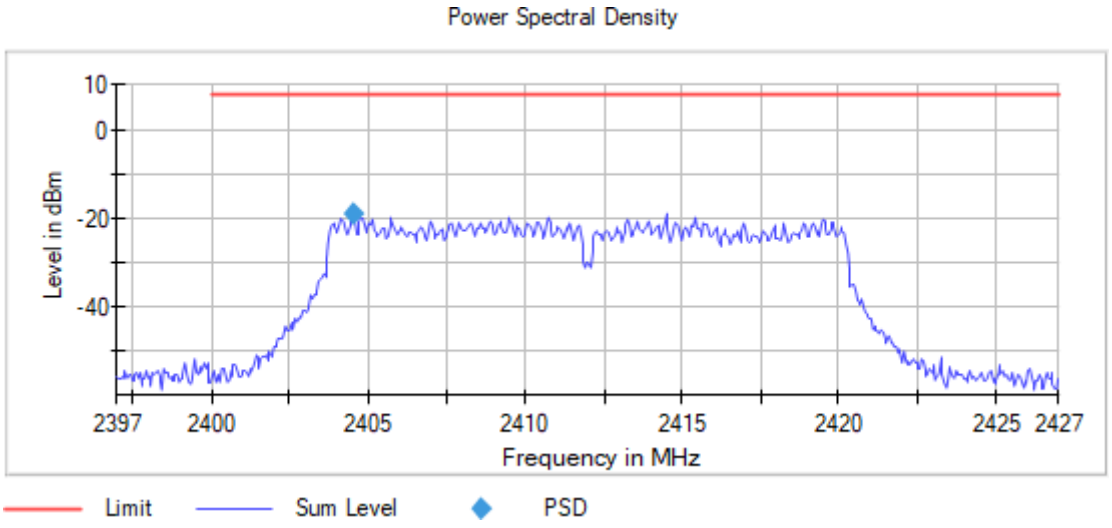
Verdict

Pass

Attachments

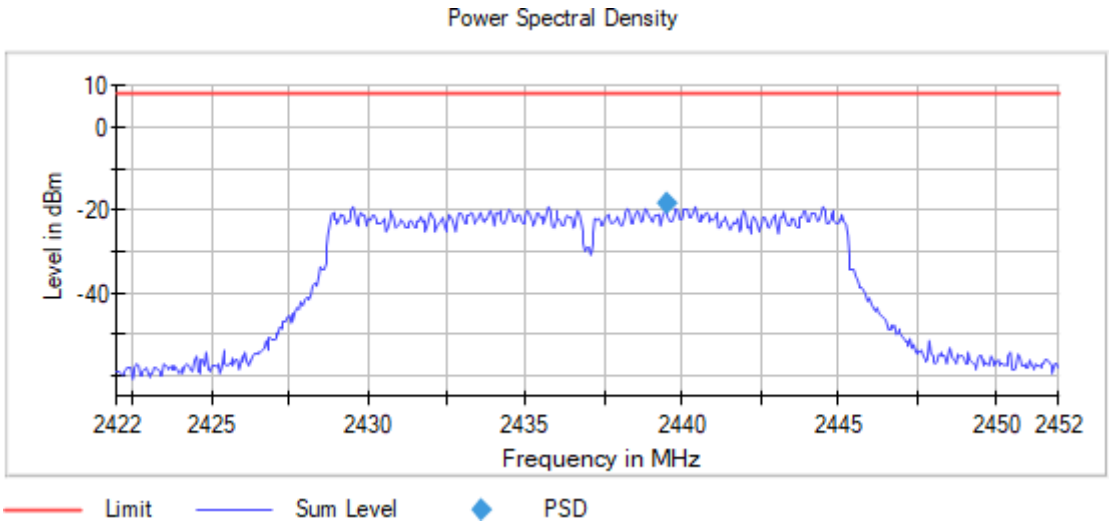
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



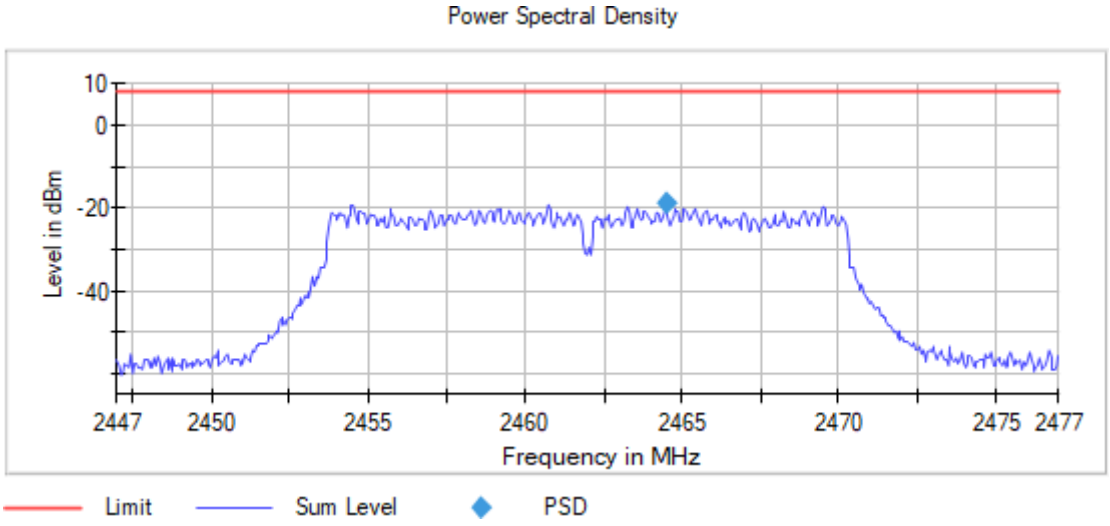
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Modulation: 802.11n

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-20.58
2437.00000					-19.93
2462.00000					-20.37

Modulation: 802.11n HT40

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2422.00000	Digital Transmission System (DTS)	40	1	1	-21.74
2437.00000					-21.81
2452.00000					-22.01

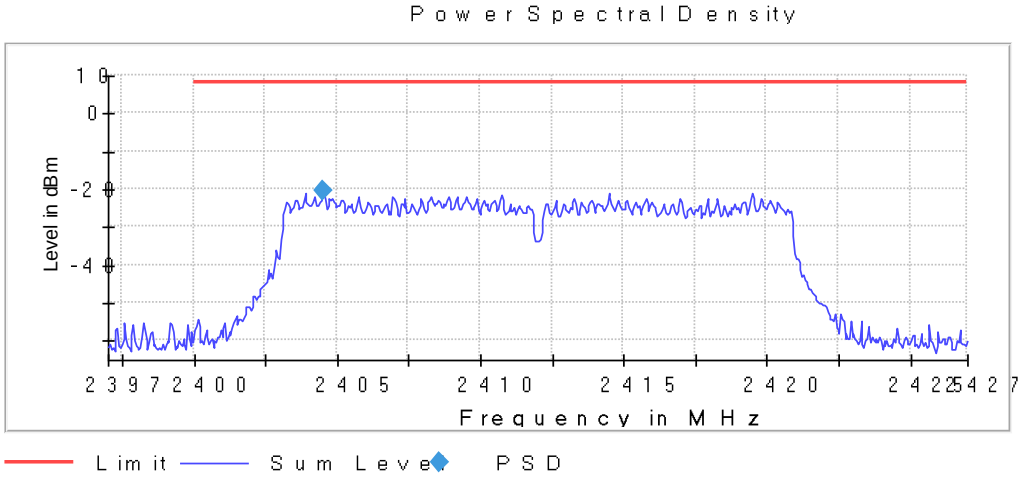
Verdict

Pass

Attachments

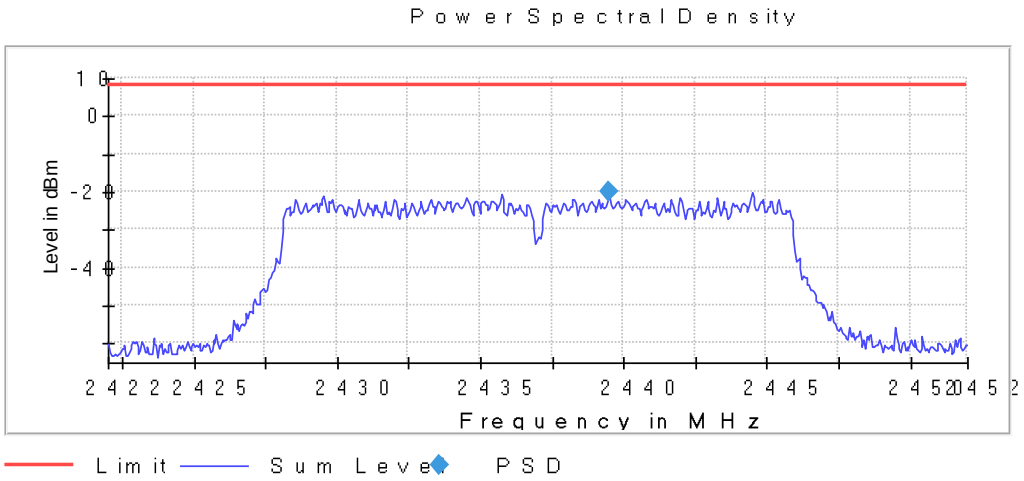
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



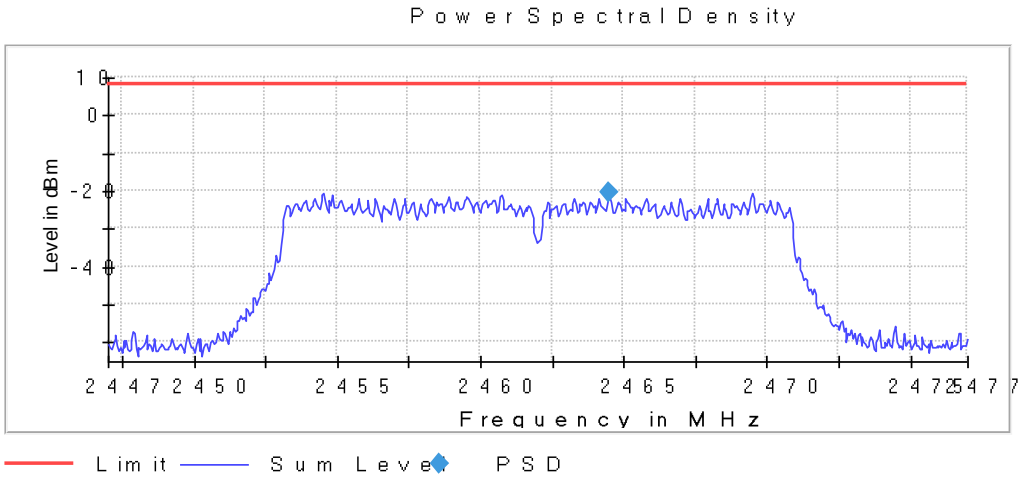
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



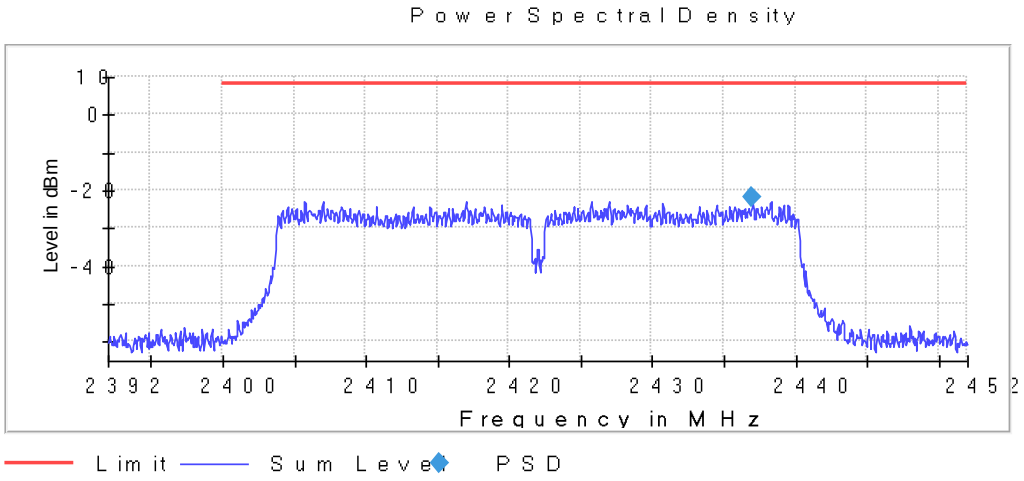
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



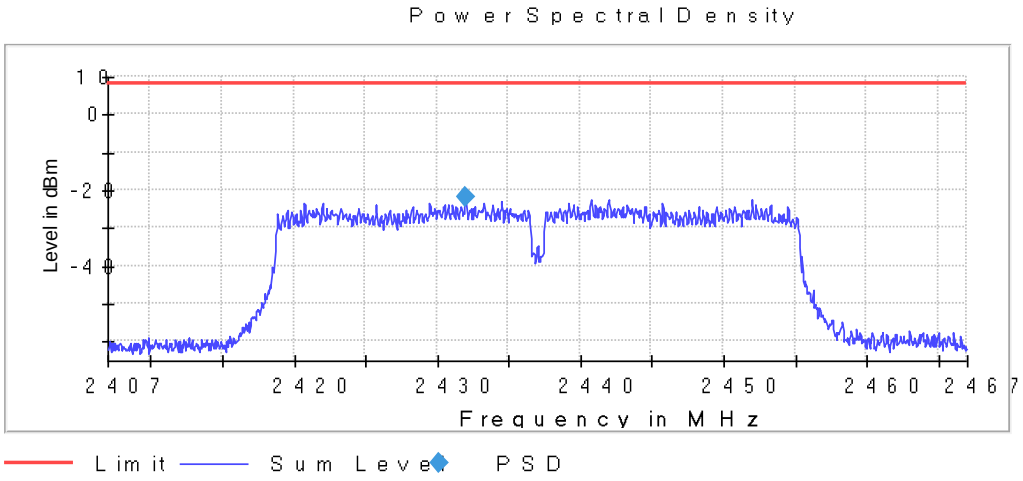
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



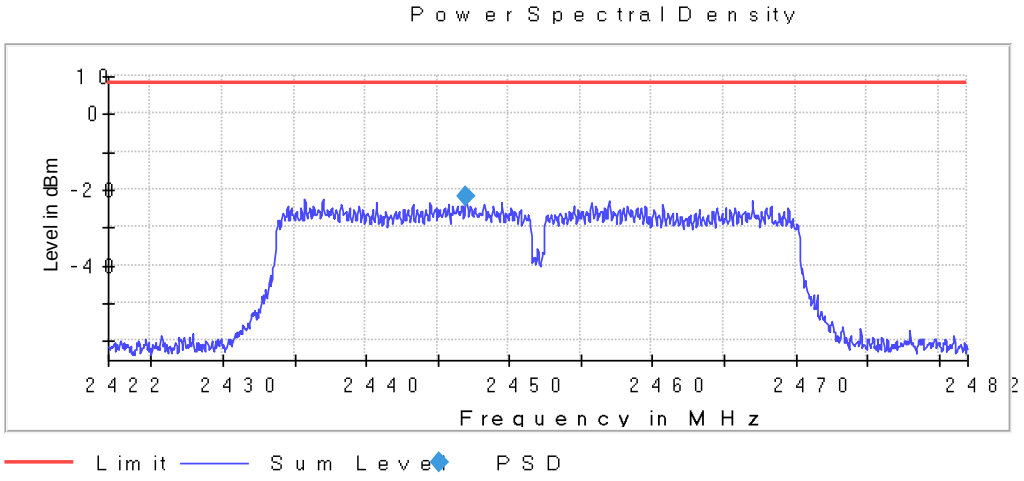
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n HT40 , Number of Transmission Chains = 1,

Images:



Modulation: 802.11ax HE20 FULL RU
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-5.85
2437.00000					-7.99
2462.00000					-7.50

Modulation: 802.11ax HE40
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2422.00000	Digital Transmission System (DTS)	40	1	1	-9.03
2437.00000					-9.43
2452.00000					

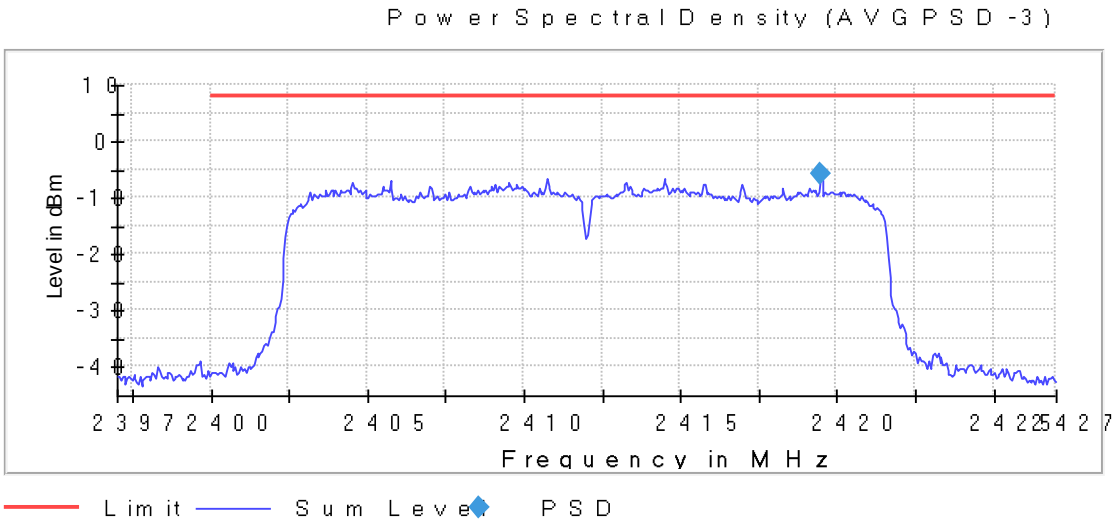
Verdict

Pass

Attachments

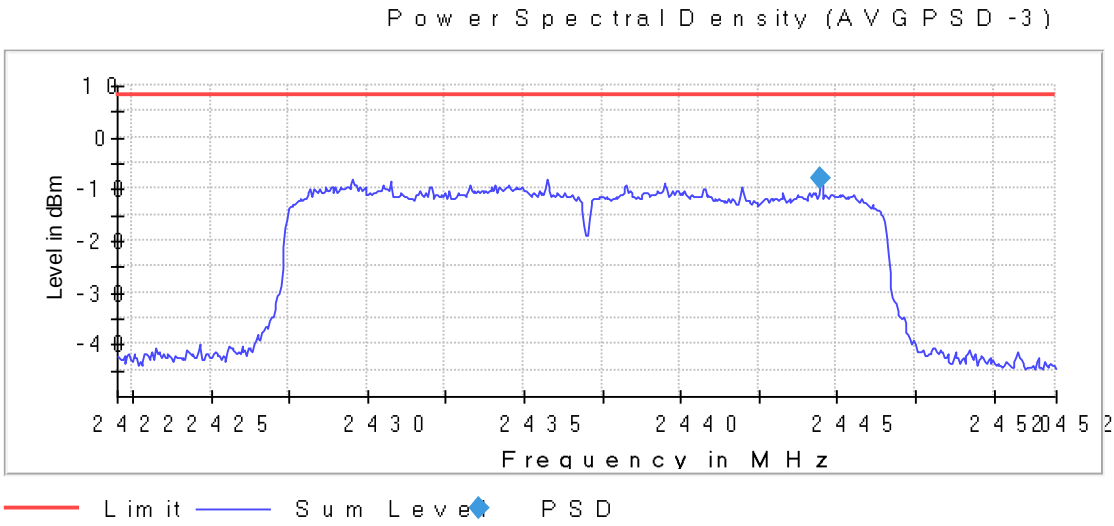
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



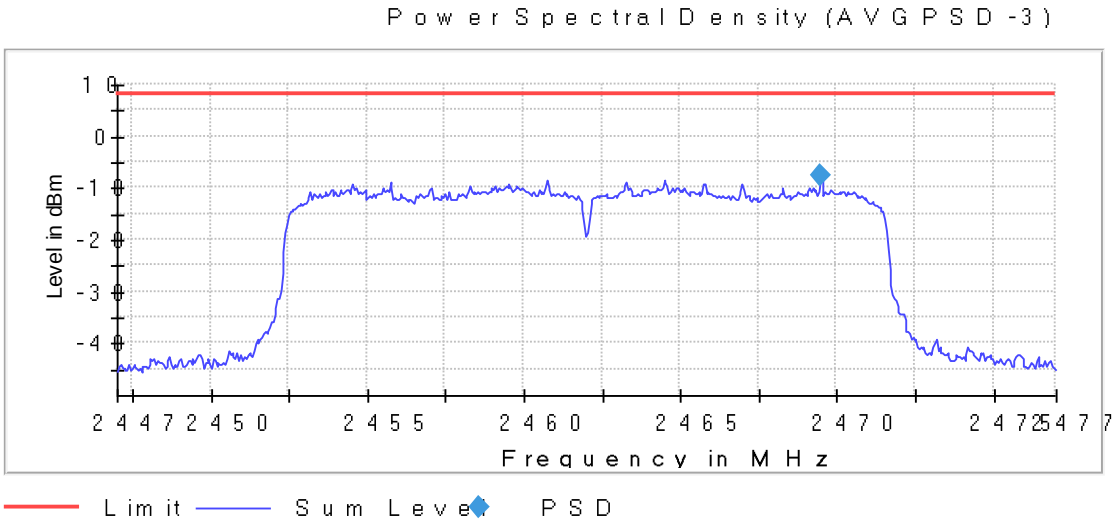
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



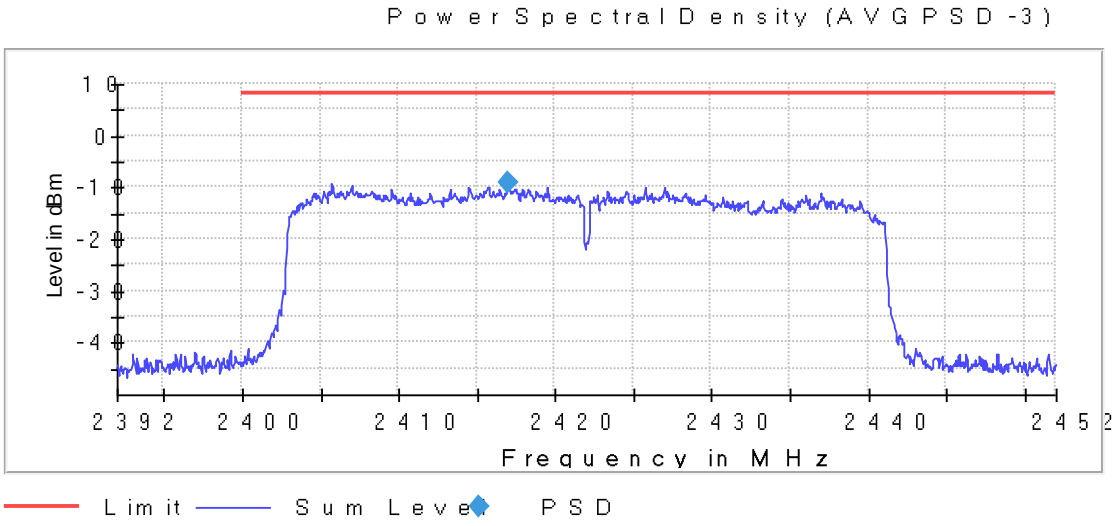
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



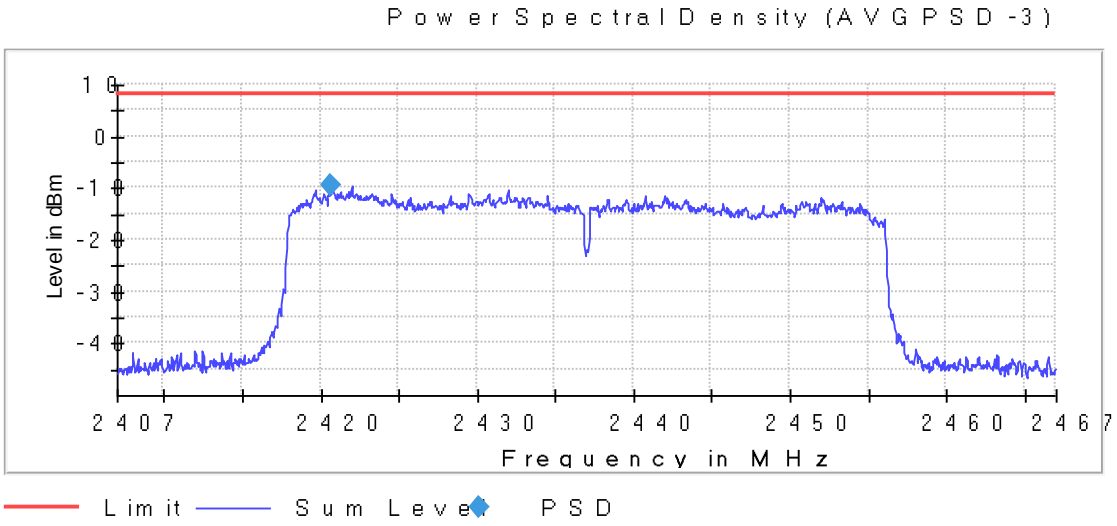
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



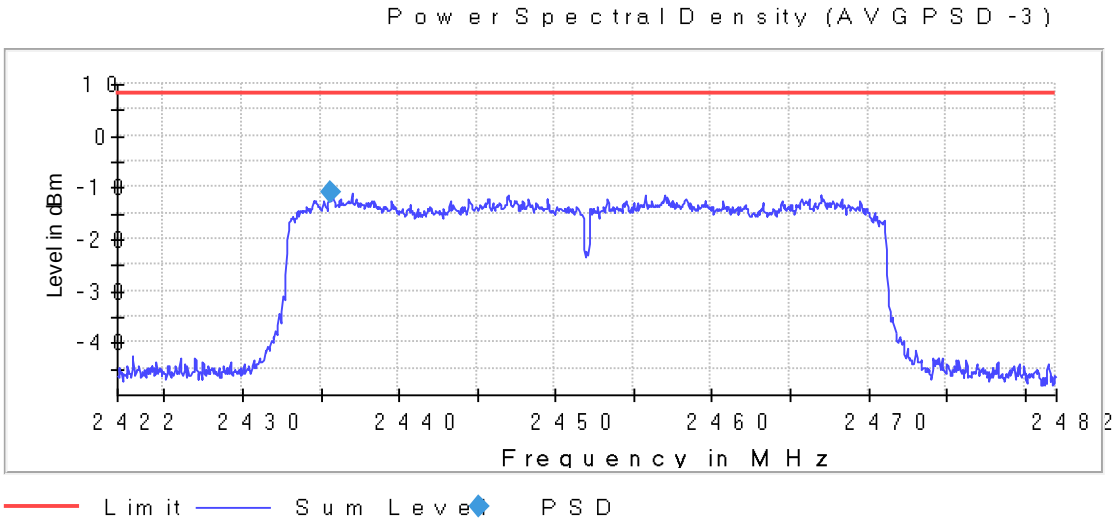
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39700 GHz	2.42200	2.44700	2.39200	2.40700	2.42200
Stop Frequency	2.42700 GHz	2.45200	2.47700	2.45200	2.46700	2.48200
Span	30.000 MHz	30.000 MHz	30.000 MHz	60.000 MHz	60.000 MHz	60.000 MHz
RBW	100.000 kHz	100.000 kHz	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	300.000 kHz	300.000 kHz
SweepPoints	600	600	600	1200	1200	1200
Sweeptime	12.000 ms	12.000 ms	12.000 ms	24.000 ms	24.000 ms	24.000 ms
Reference Level	0.000 dBm	0.000 dBm	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	20.000 dB	20.000 dB
Detector	RMS	RMS	RMS	RMS	RMS	RMS
SweepCount	5000	5000	5000	2500	2500	2500
Filter	3 dB	3 dB	3 dB	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep	Sweep	Sweep	Sweep
Preamp	off	off	off	off	off	off
Stablemode	Trace	Trace	Trace	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB	0.50 dB	0.50 dB	0.50 dB
Run	6 / max. 15	4 / max. 15	6 / max. 15	10 / max. 15	7 / max. 15	8 / max. 15
Stable	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1
Max Stable	0.28 dB	0.49 dB	0.49 dB	0.43 dB	0.47 dB	0.45 dB

Modulation: 802.11ax HE20 Partial RU
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-0.56
2437.00000					-9.10
2462.00000					-4.52

Modulation: 802.11ax HE40
Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2422.00000	Digital Transmission System (DTS)	40	1	1	-4.61
2437.00000					-4.62
2452.00000					-9.71

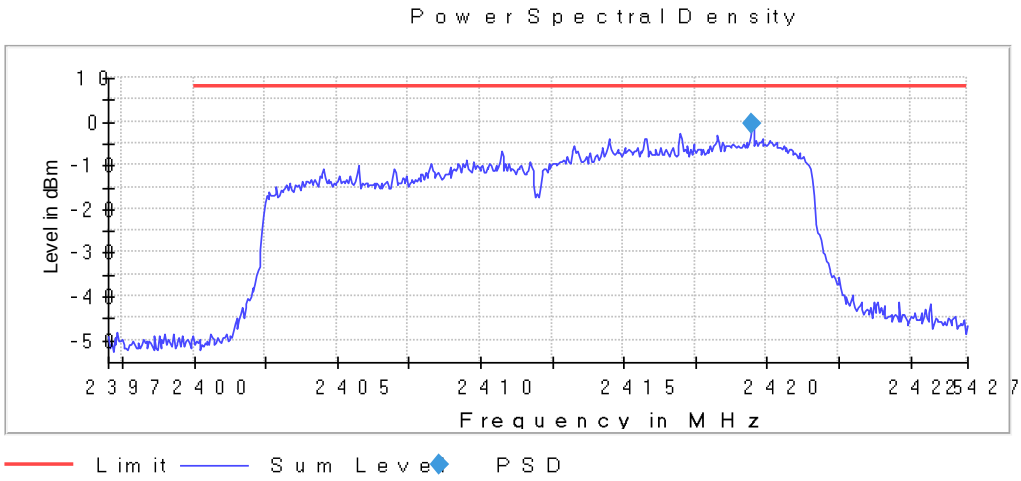
Verdict

Pass

Attachments

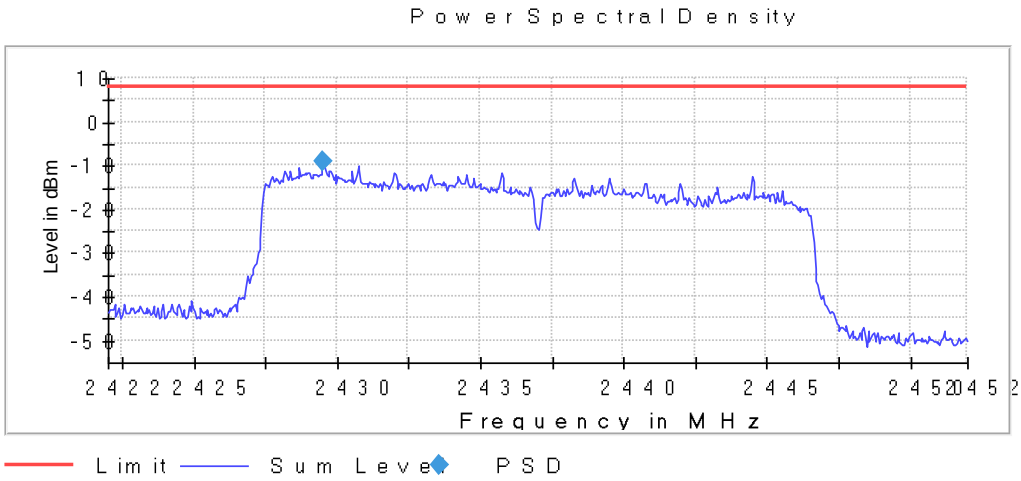
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



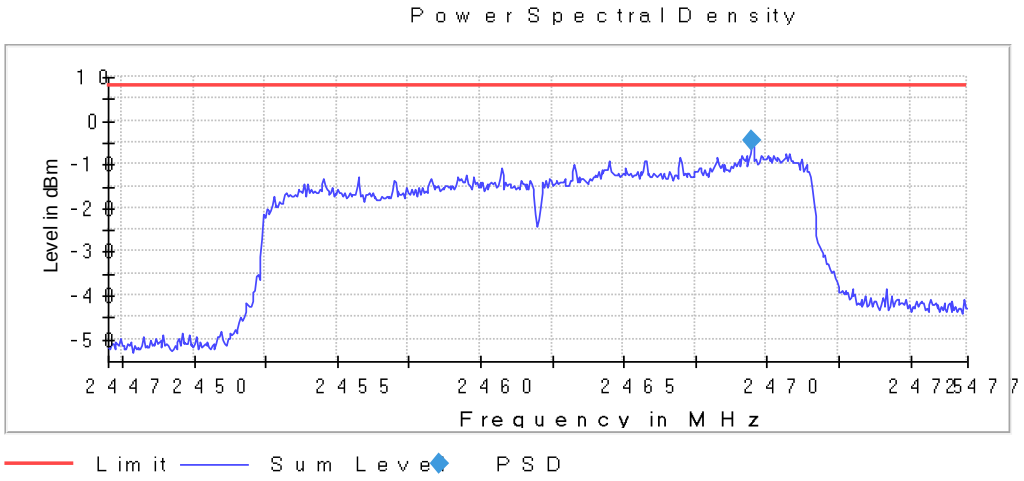
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



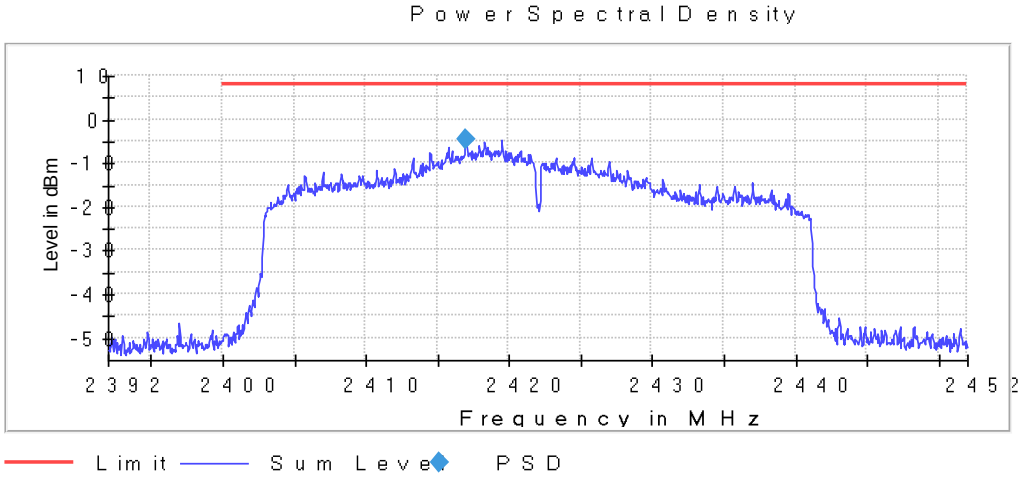
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



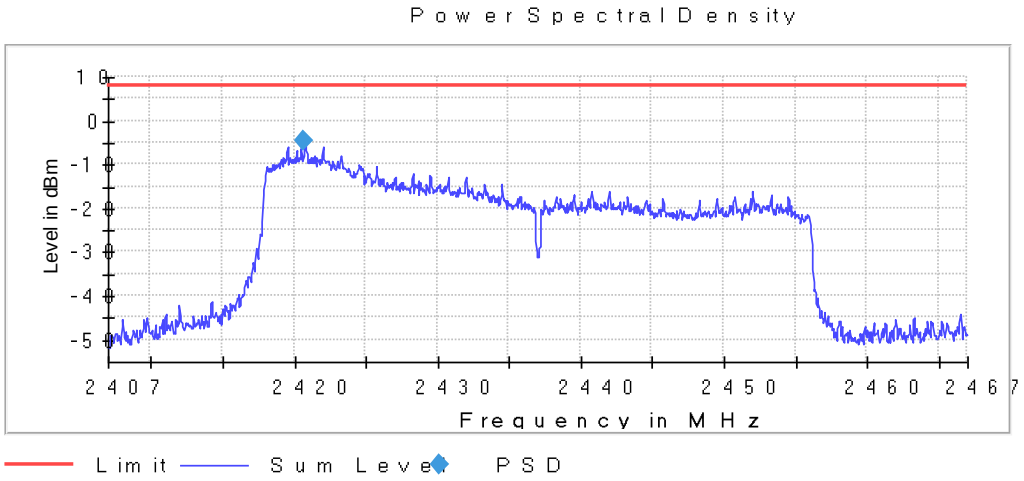
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



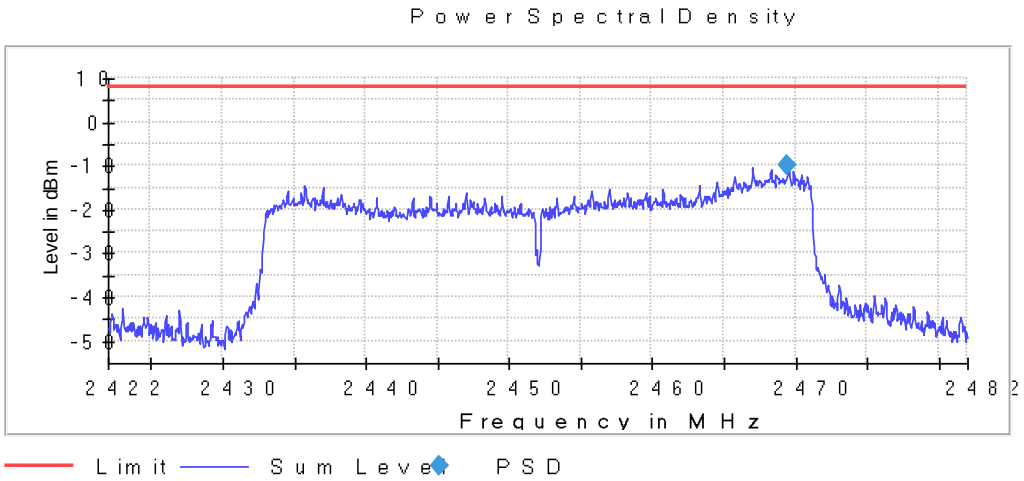
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39700 GHz	2.42200	2.44700	2.39200	2.40700	2.42200
Stop Frequency	2.42700 GHz	2.45200	2.47700	2.45200	2.46700	2.48200
Span	30.000 MHz	30.000 MHz	30.000 MHz	60.000 MHz	60.000 MHz	60.000 MHz
RBW	100.000 kHz	100.000 kHz	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	300.000 kHz	300.000 kHz
SweepPoints	600	600	600	1200	1200	1200
Sweeptime	12.000 ms	12.000 ms	12.000 ms	24.000 ms	24.000 ms	24.000 ms
Reference Level	0.000 dBm	0.000 dBm	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	20.000 dB	20.000 dB
Detector	RMS	RMS	RMS	RMS	RMS	RMS
SweepCount	5000	5000	5000	2500	2500	2500
Filter	3 dB	3 dB	3 dB	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep	Sweep	Sweep	Sweep
Preamp	off	off	off	off	off	off
Stablemode	Trace	Trace	Trace	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB	0.50 dB	0.50 dB	0.50 dB
Run	6 / max. 15	4 / max. 15	6 / max. 15	10 / max. 15	7 / max. 15	8 / max. 15
Stable	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1
Max Stable	0.28 dB	0.49 dB	0.49 dB	0.43 dB	0.47 dB	0.45 dB

RSS-247 5.4 (d) / FCC 15.247 (b) (1) Maximum Average Conducted Output Power

Limits

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

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

Maximum declared antenna gain: -2.5 dBi

Modulation: 802.11b

Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2412.00000		9.26
2437.00000	20	8.49
2462.00000		8.59

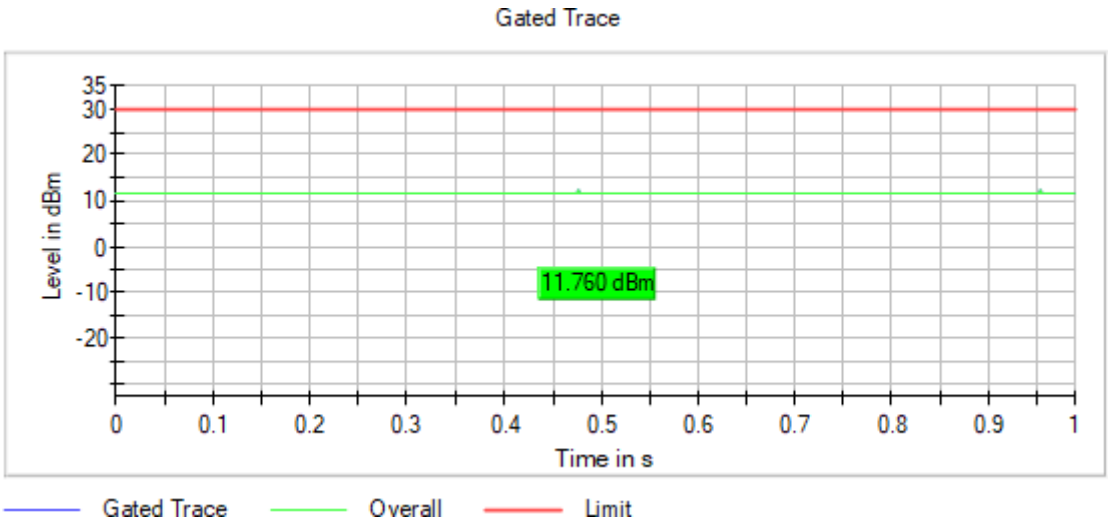
Verdict

Pass

Attachments

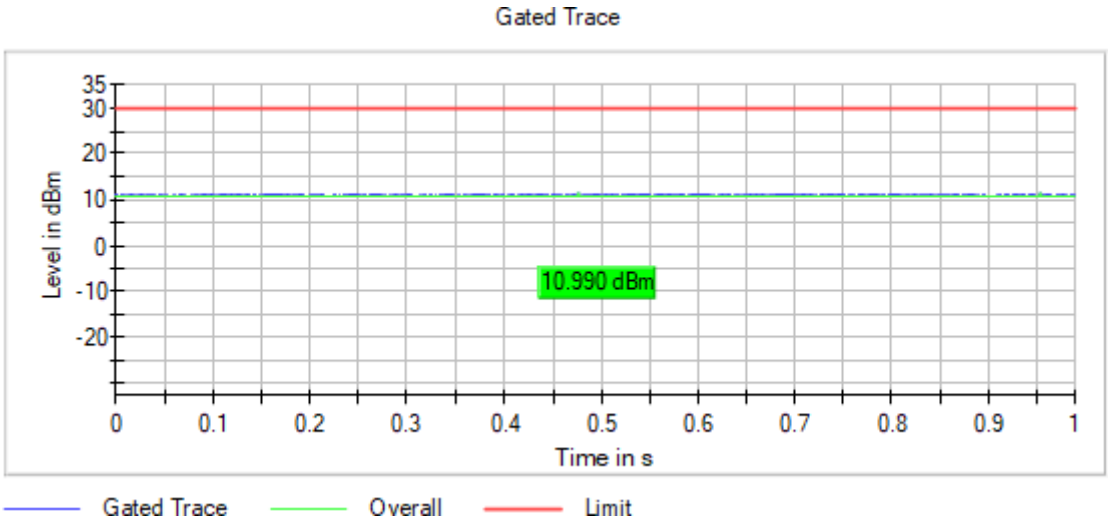
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



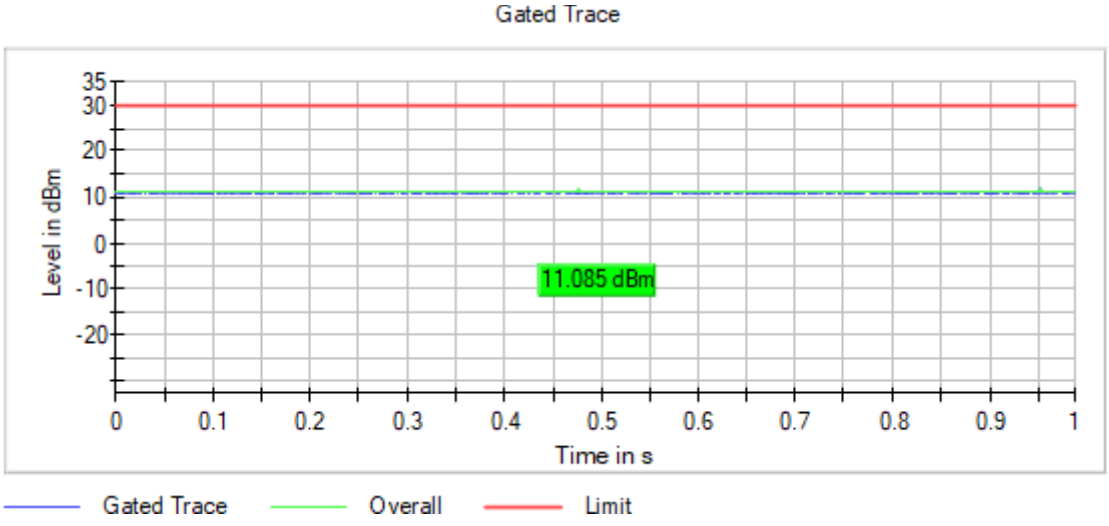
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Antenna gain: -2.5 dBi

Modulation: 802.11g
Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2412.00000		5.88
2437.00000	20	5.75
2462.00000		5.12

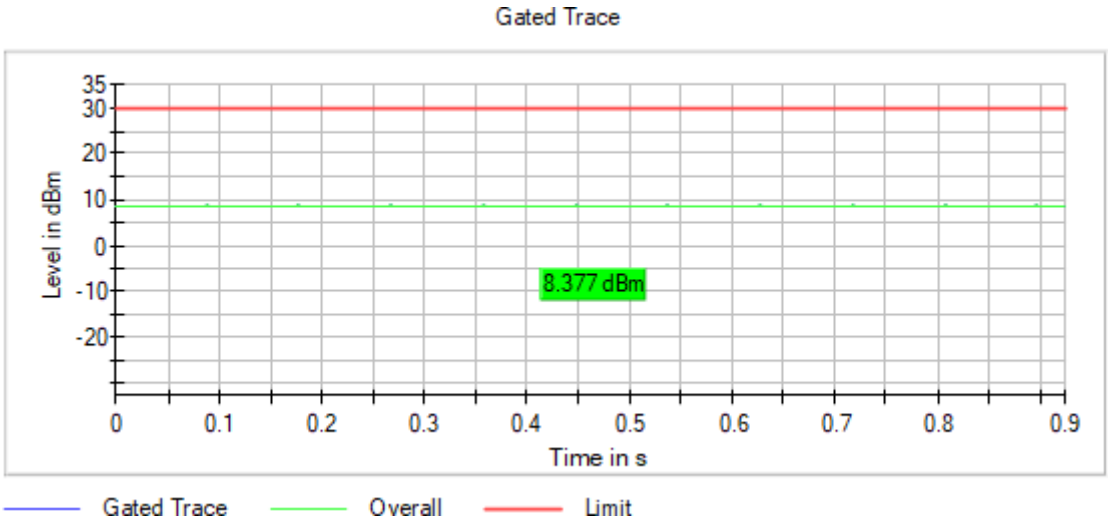
Verdict

Pass

Attachments

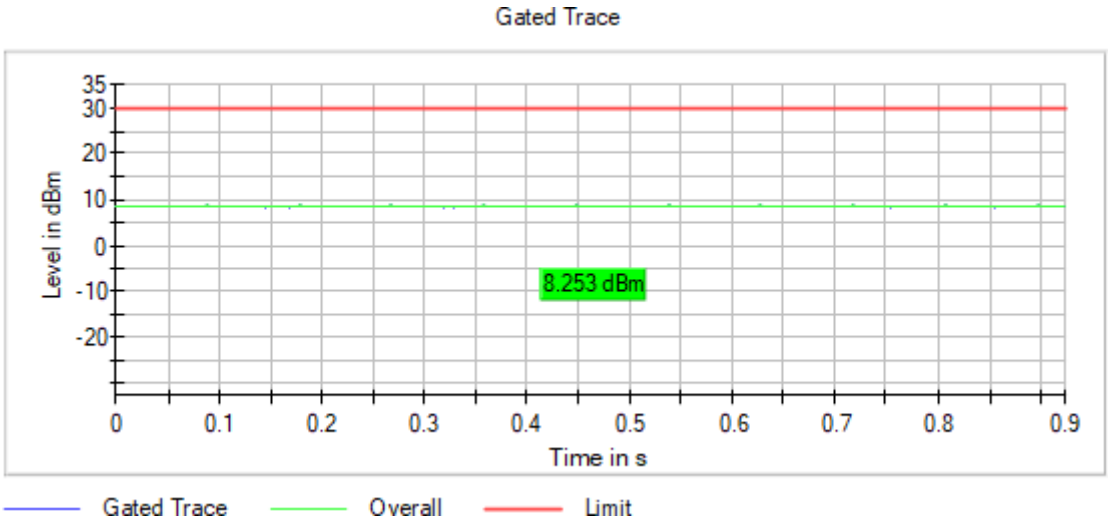
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



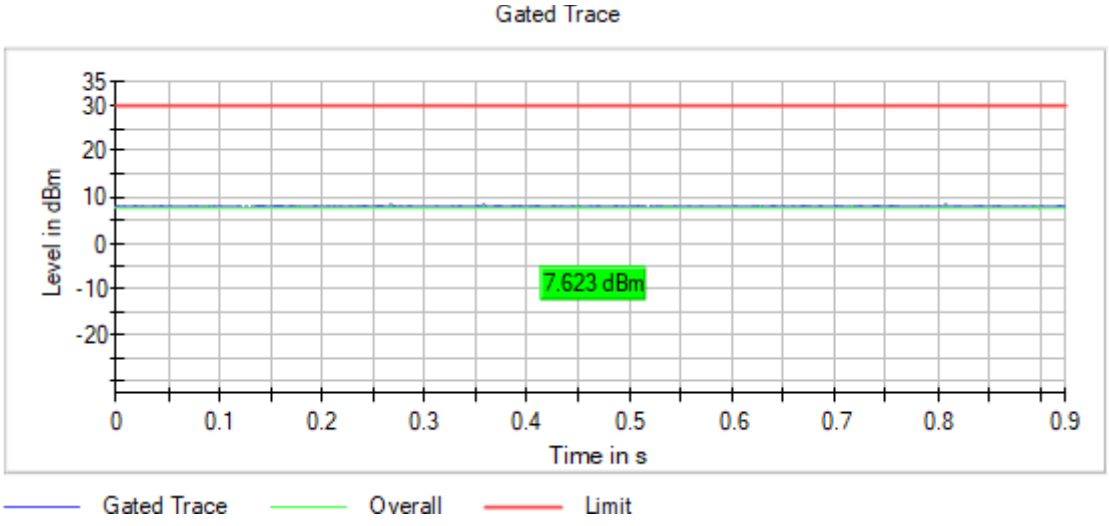
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Antenna gain: -2.5 dBi

Modulation: 802.11n
Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2412.00000	20	4.26
2437.00000		3.56
2462.00000		3.60

Modulation: 802.11n
Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2422.00000	40	4.83
2437.00000		4.80
2452.00000		4.60

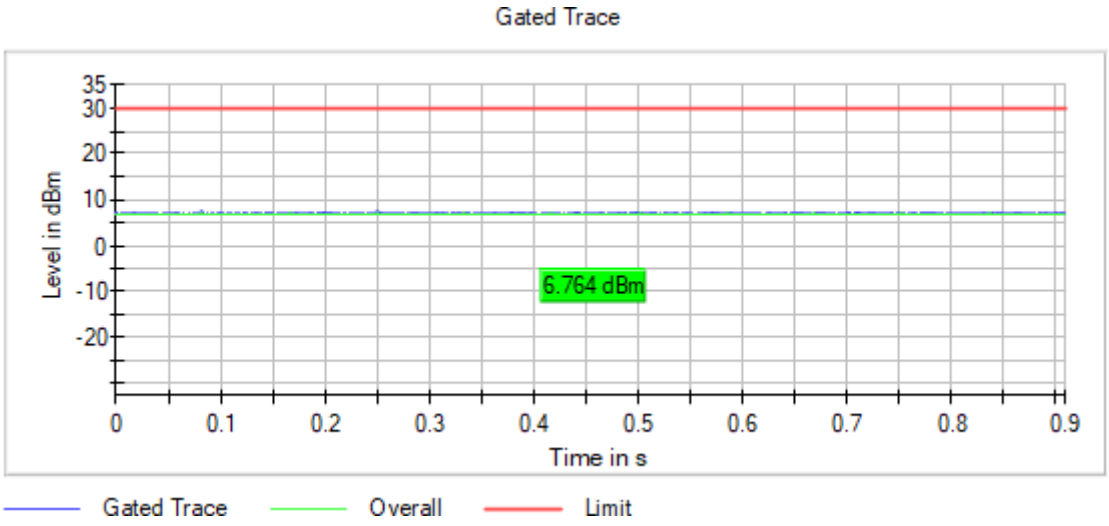
Verdict

Pass

Attachments

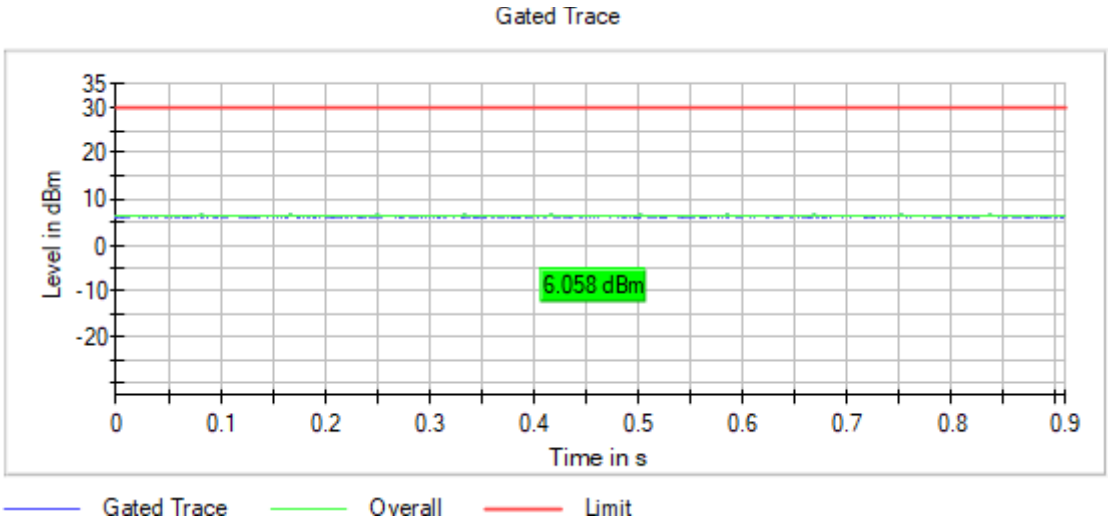
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



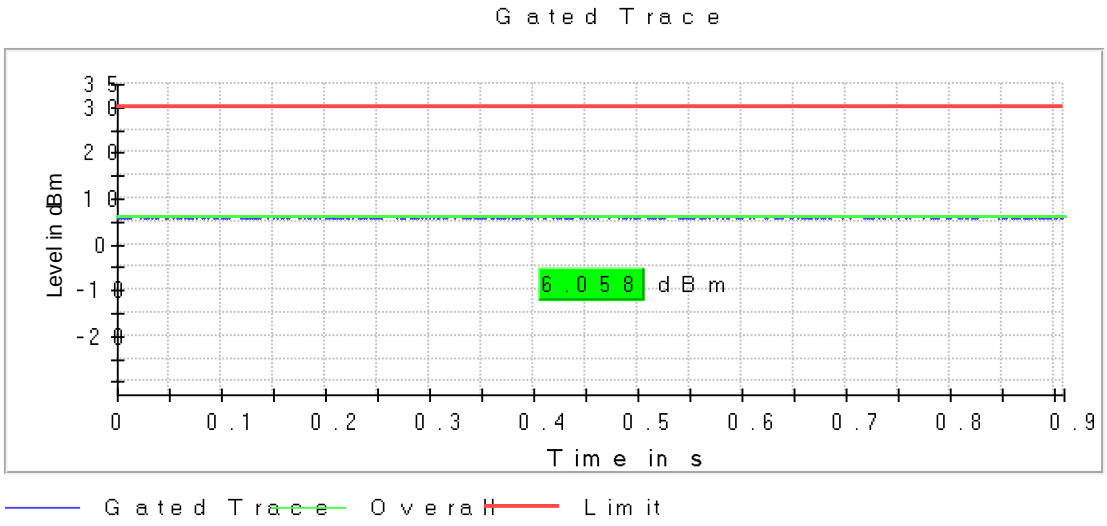
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



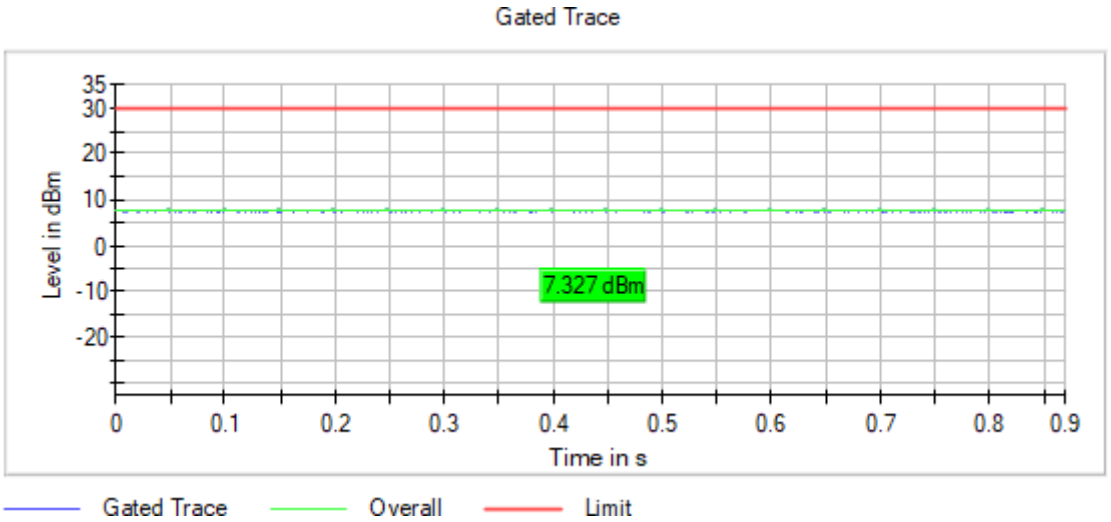
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



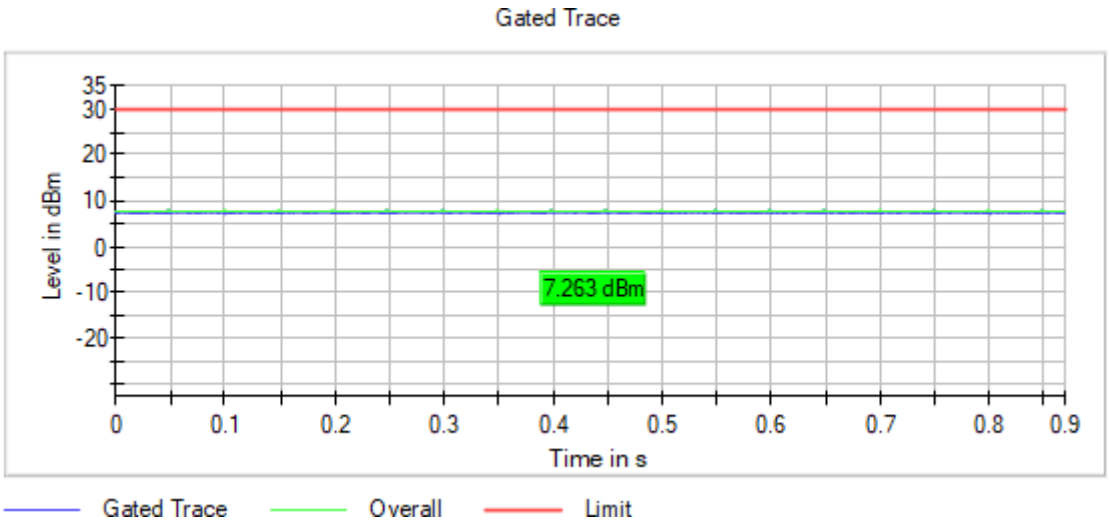
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



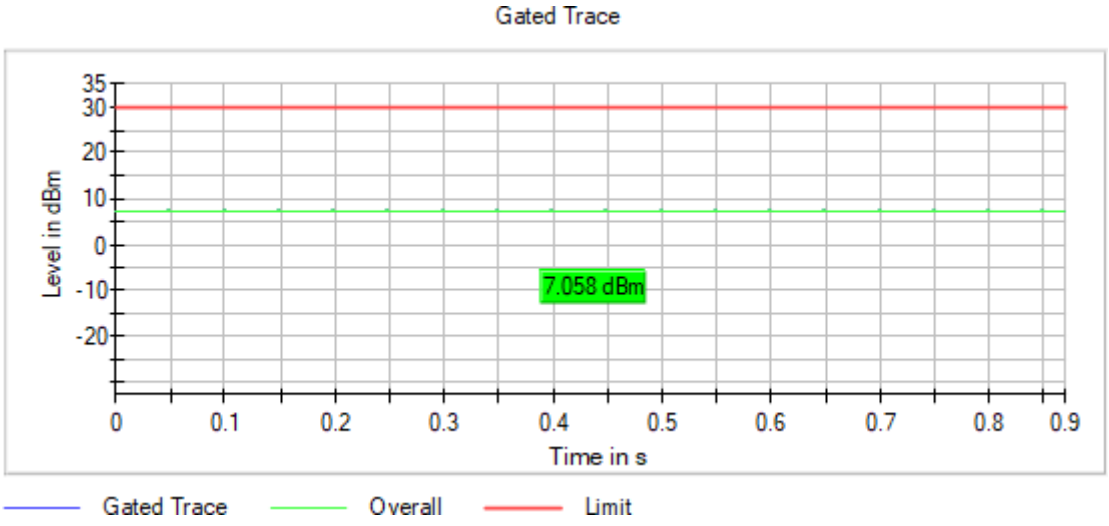
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



Antenna gain: -2.5 dBi

Modulation: 802.11ax HE20 Full RU

Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2412.00000	20	7.4
2437.00000		5.9
2462.00000		5.8

Modulation: 802.11ax HE40
Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2422.00000	40	7.1
2437.00000		6.2
2452.00000		5.7

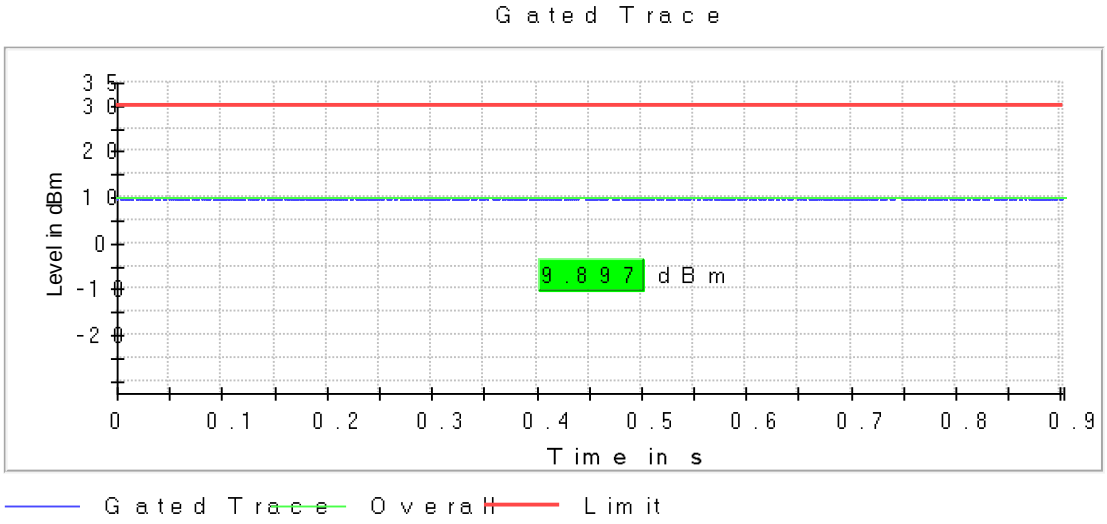
Verdict

Pass

Attachments

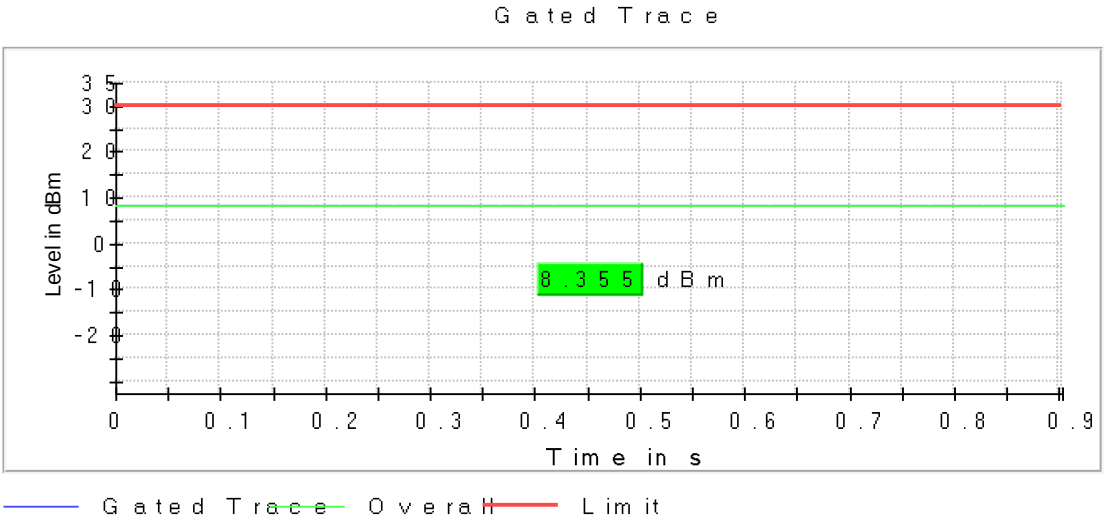
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



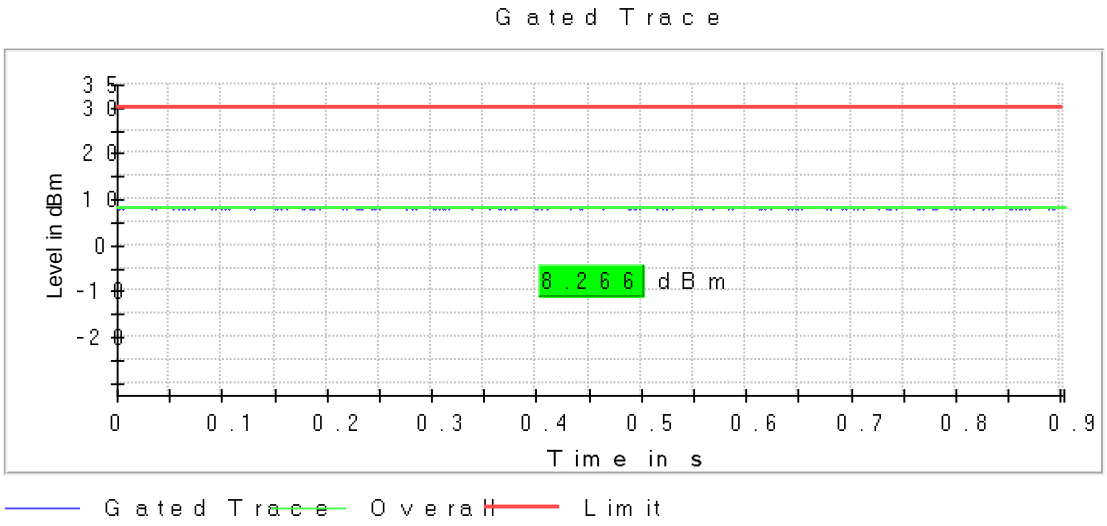
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



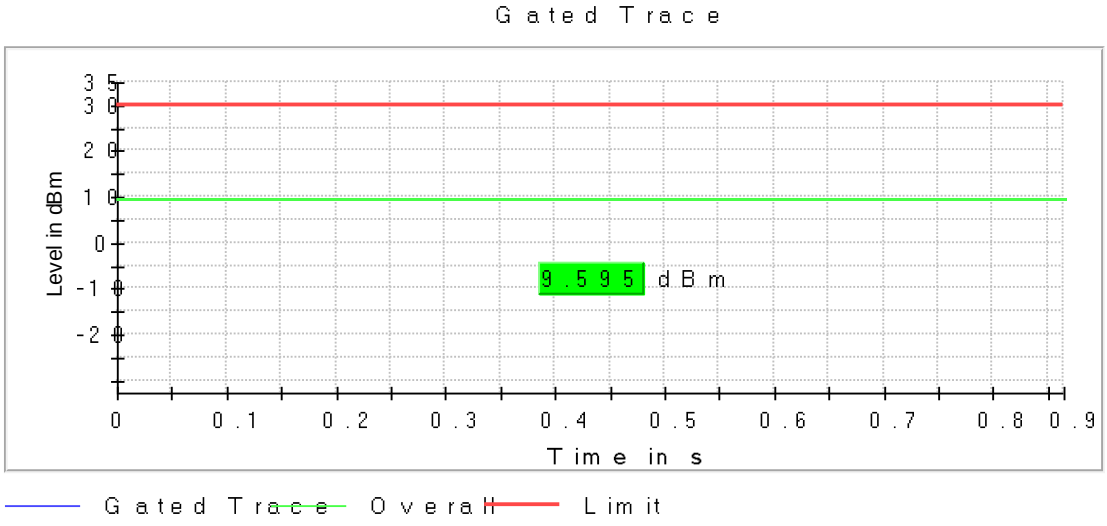
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



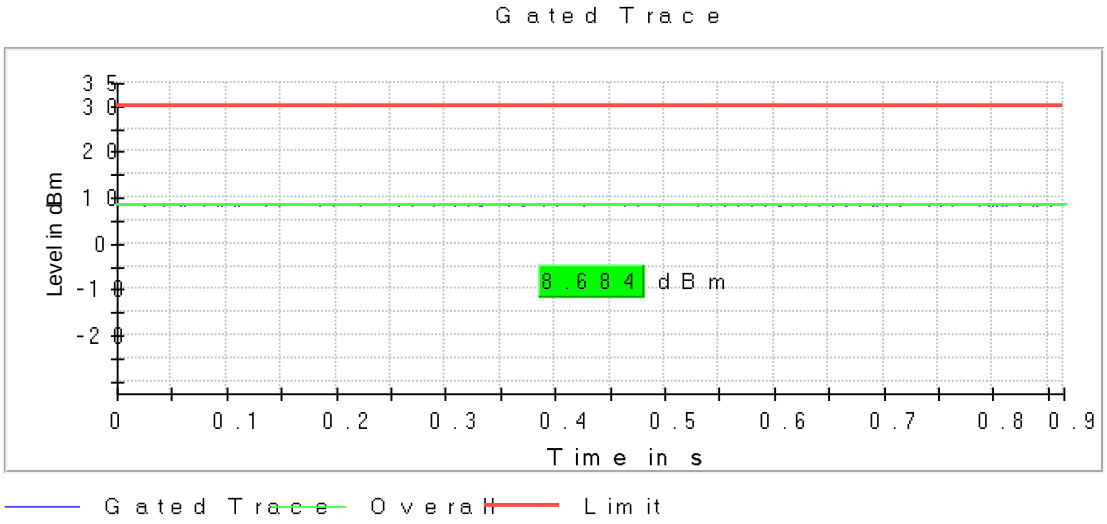
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



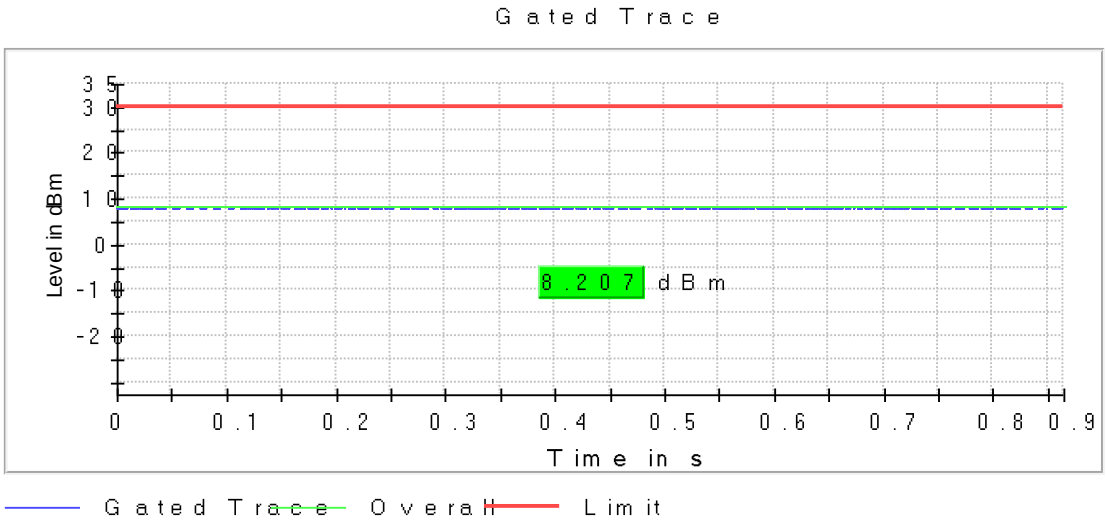
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



OSP PowerMeter settings

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

Antenna gain: -2.5 dBi

Modulation: 802.11ax HE20 Partial RU

Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2412.00000	20	4.96
2437.00000		4.99
2462.00000		3.91

Modulation: 802.11ax HE40
Results

Freq (MHz)	BW (MHz)	E.I.R.P. (dBm)
2422.00000	40	3.83
2437.00000		5.16
2452.00000		5.29

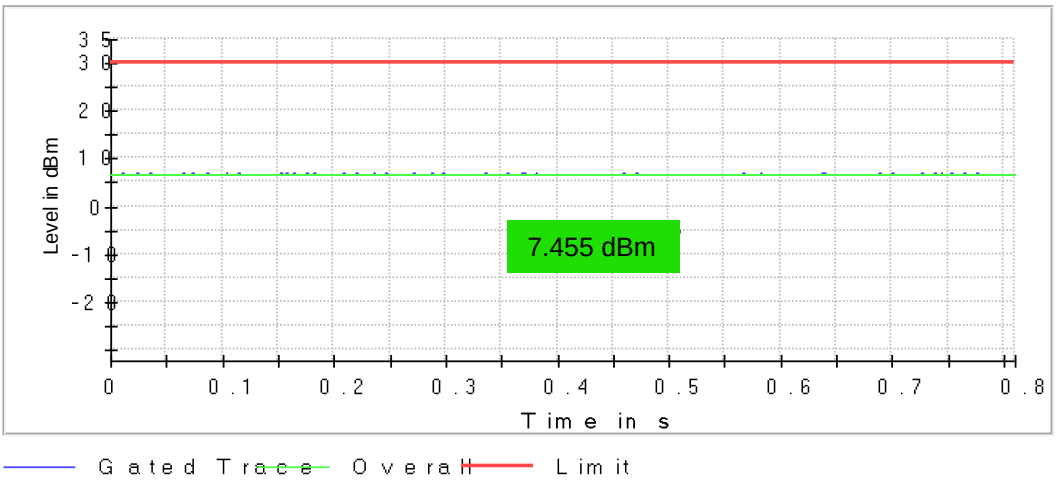
Verdict

Pass

Attachments

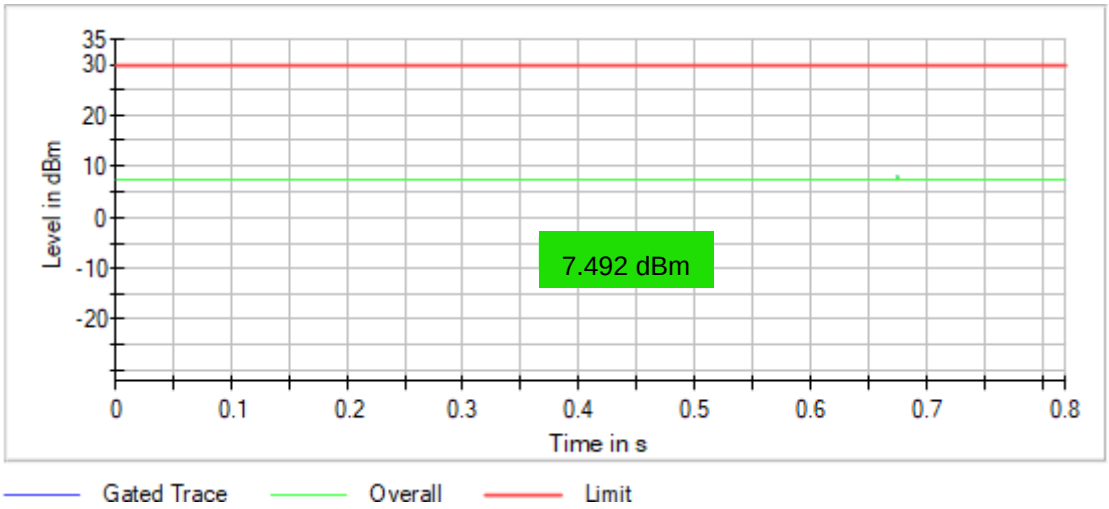
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



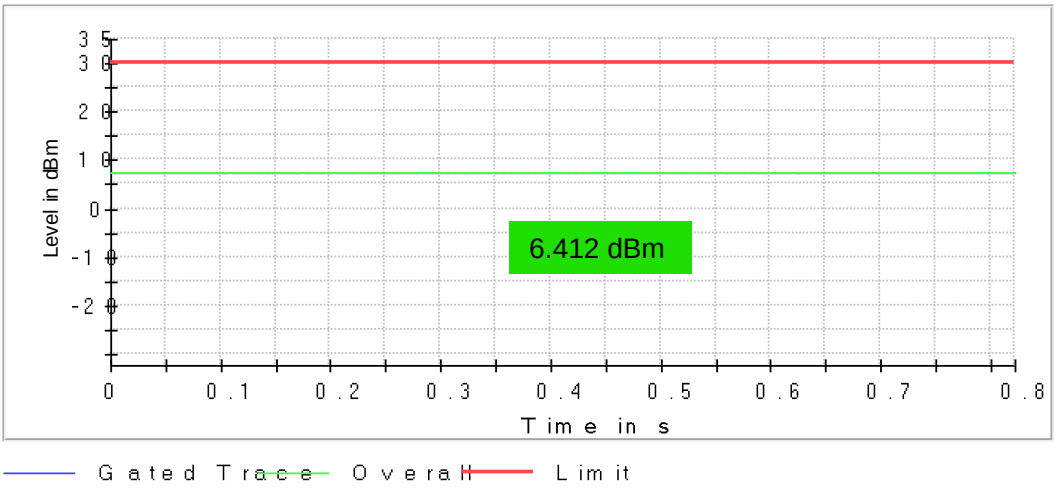
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



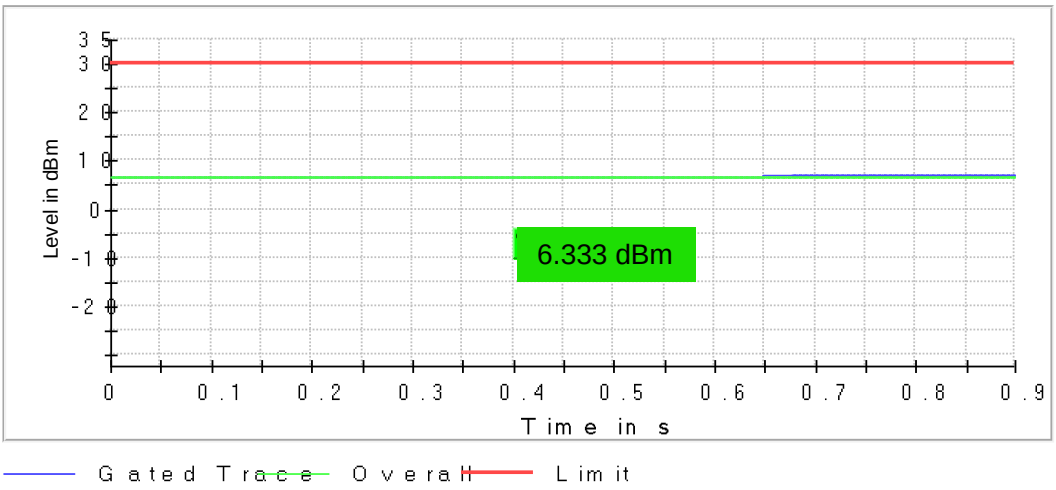
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 1, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1,

Images:



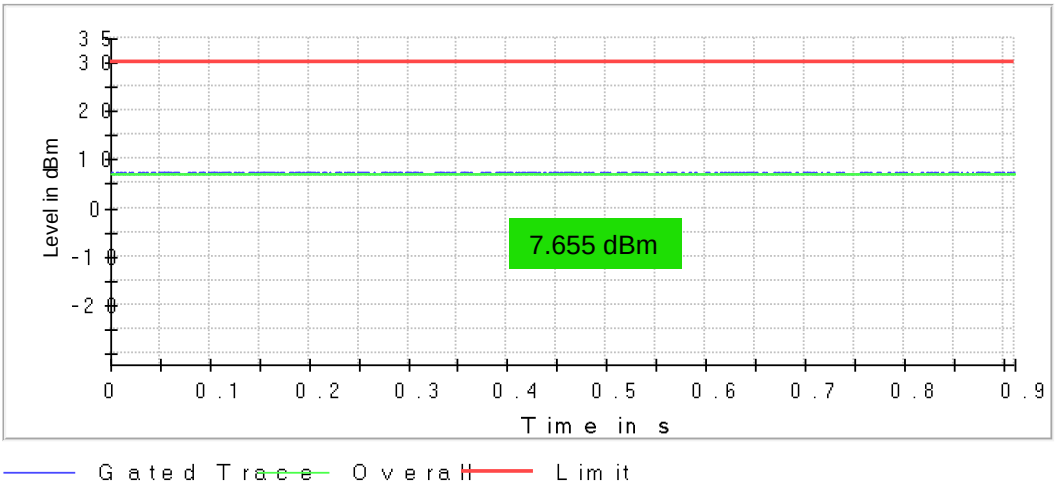
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



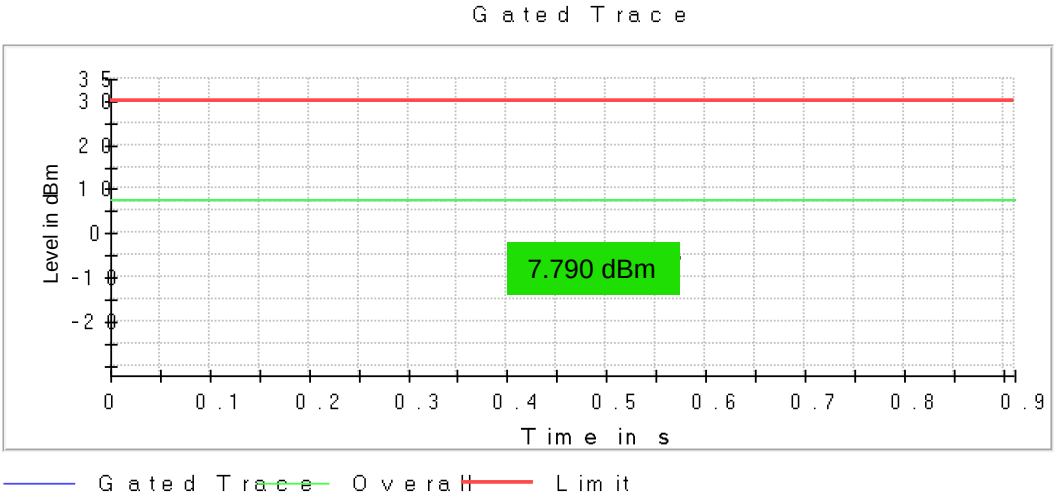
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE40 , Number of Transmission Chains = 1,

Images:



OSP PowerMeter settings

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

RSS-247 5.5 / FCC 15.247 (d) 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
Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2396.775000	-44.4
20	2487.425000	-53.8
20	2312.125000	-44.5
20	2487.375000	-54.0
20	2484.475000	-54.2
20	2396.725000	-44.5
20	2484.425000	-54.3
20	2322.475000	-44.8
20	2322.525000	-45.0
20	2483.625000	-54.5
20	2492.325000	-54.5
20	2397.825000	-45.0
20	2483.975000	-54.5
20	2312.075000	-45.0
20	2312.175000	-45.1
20	2492.275000	-54.6
20	2484.725000	-54.6
20	2386.025000	-45.1
20	2483.675000	-54.7
20	2385.975000	-45.1
20	2397.775000	-45.1
20	2484.025000	-54.7
20	2489.875000	-54.8
20	2364.575000	-45.2
20	2328.075000	-45.2
20	2484.675000	-54.9
20	2335.225000	-45.2
20	2485.075000	-55.0
20	2496.975000	-55.0
20	2397.975000	-45.2

Verdict

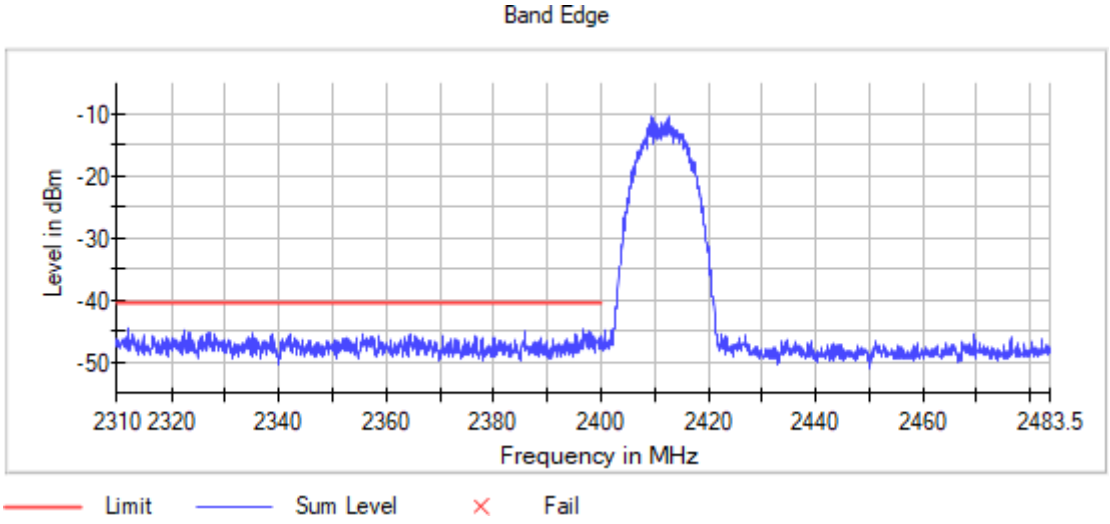
Pass

Attachments

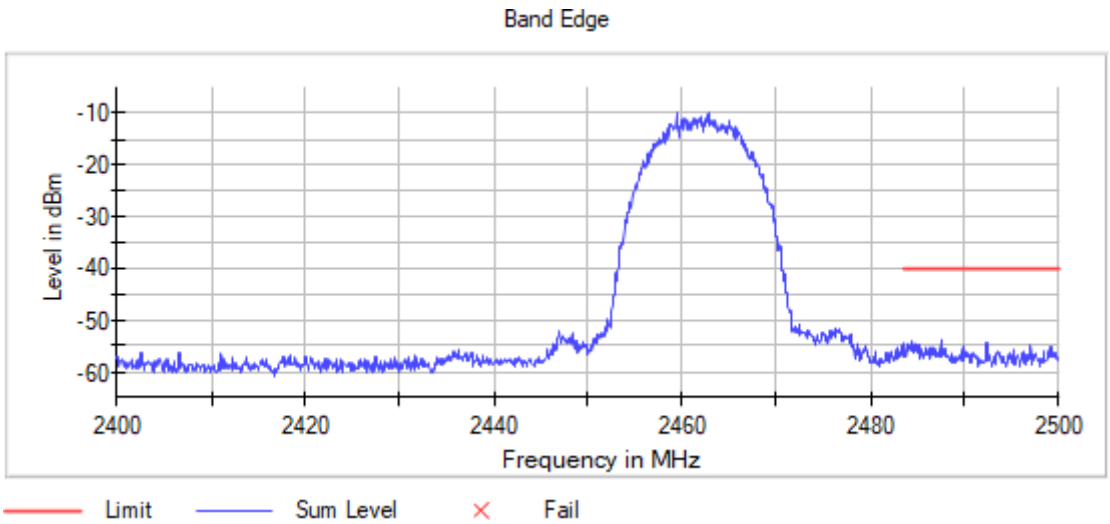
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Modulation: 802.11g

Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2484.025000	-53.2
20	2399.175000	-46.6
20	2484.075000	-53.2
20	2399.125000	-47.3
20	2483.625000	-54.0
20	2399.225000	-47.5
20	2396.625000	-47.6
20	2484.225000	-54.1
20	2396.675000	-47.8
20	2483.675000	-54.1
20	2483.775000	-54.1
20	2398.275000	-48.0
20	2483.725000	-54.1
20	2396.925000	-48.0
20	2483.825000	-54.2
20	2397.625000	-48.1
20	2397.675000	-48.2
20	2484.275000	-54.2
20	2483.975000	-54.3
20	2398.525000	-48.2
20	2398.575000	-48.2
20	2484.575000	-54.3
20	2484.125000	-54.4
20	2398.225000	-48.2
20	2487.475000	-54.4
20	2396.725000	-48.5
20	2395.675000	-48.6
20	2487.425000	-54.4
20	2396.975000	-48.7
20	2484.625000	-54.4

Verdict

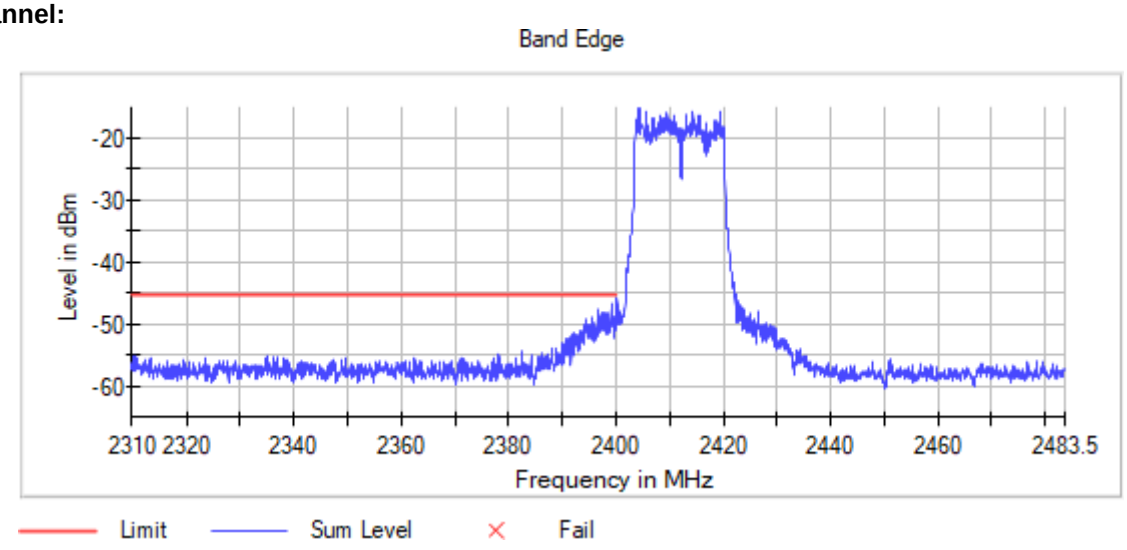
Pass

Attachments

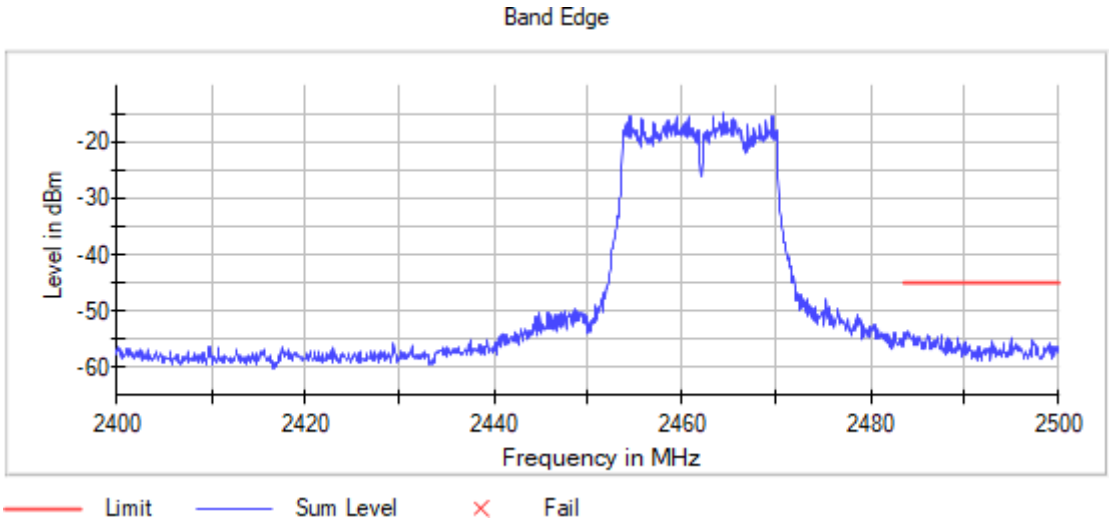
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Modulation: 802.11n
Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2484.175000	-53.8
20	2399.175000	-52.3
20	2399.575000	-52.6
20	2483.925000	-53.9
20	2483.875000	-54.0
20	2399.525000	-52.7
20	2499.775000	-54.3
20	2399.125000	-53.1
20	2484.025000	-54.3
20	2396.375000	-53.2
20	2484.075000	-54.4
20	2399.625000	-53.5
20	2499.825000	-54.4
20	2399.475000	-53.6
20	2396.325000	-53.6
20	2484.225000	-54.6
20	2491.975000	-54.7
20	2397.225000	-53.6
20	2397.175000	-53.6
20	2492.025000	-54.7
20	2483.575000	-54.7
20	2397.125000	-53.7
20	2399.425000	-53.8
20	2484.125000	-54.8
20	2399.075000	-53.8
20	2490.125000	-54.8
20	2490.175000	-54.9
20	2399.225000	-53.8
20	2398.675000	-53.9
20	2483.625000	-54.9

BW (MHz)	Freq (MHz)	Lvl (dBm)
40	2493.075000	-53.8
40	2399.225000	-50.8
40	2484.225000	-53.8
40	2394.525000	-50.8
40	2399.625000	-50.9
40	2493.275000	-53.8
40	2486.725000	-53.9
40	2395.725000	-50.9
40	2399.925000	-51.0
40	2496.025000	-54.0
40	2388.625000	-51.0
40	2489.125000	-54.0
40	2485.675000	-53.0
40	2395.675000	-50.0
40	2392.125000	-50.2
40	2485.725000	-53.1
40	2388.575000	-50.3
40	2485.625000	-53.1
40	2395.625000	-50.4
40	2484.175000	-53.4
40	2487.725000	-53.4
40	2388.525000	-50.4
40	2484.675000	-53.5
40	2392.075000	-50.4
40	2399.275000	-50.7
40	2484.625000	-53.6
40	2391.025000	-50.7
40	2487.675000	-53.7
40	2483.525000	-53.8
40	2391.075000	-50.7

Verdict

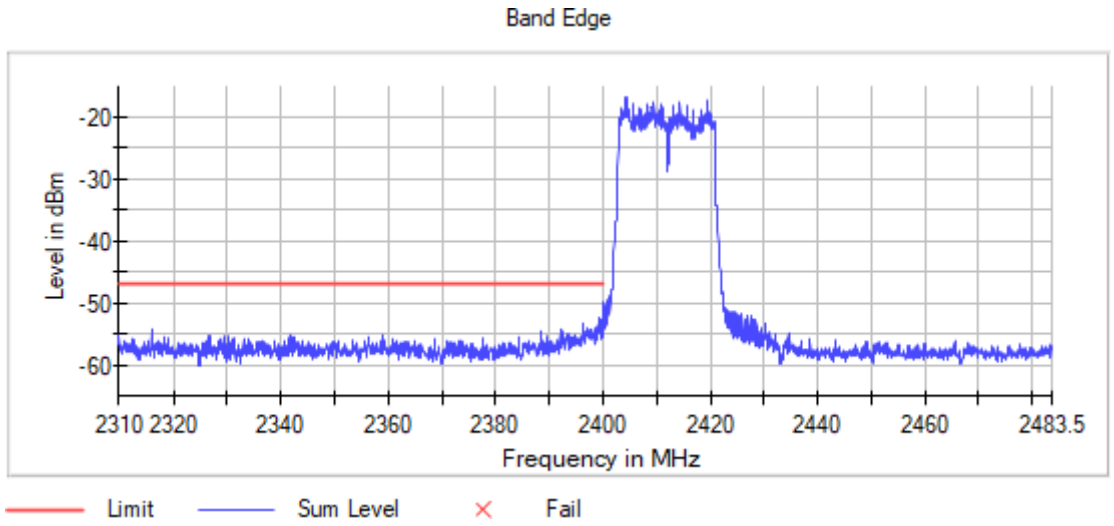
Pass

Attachments

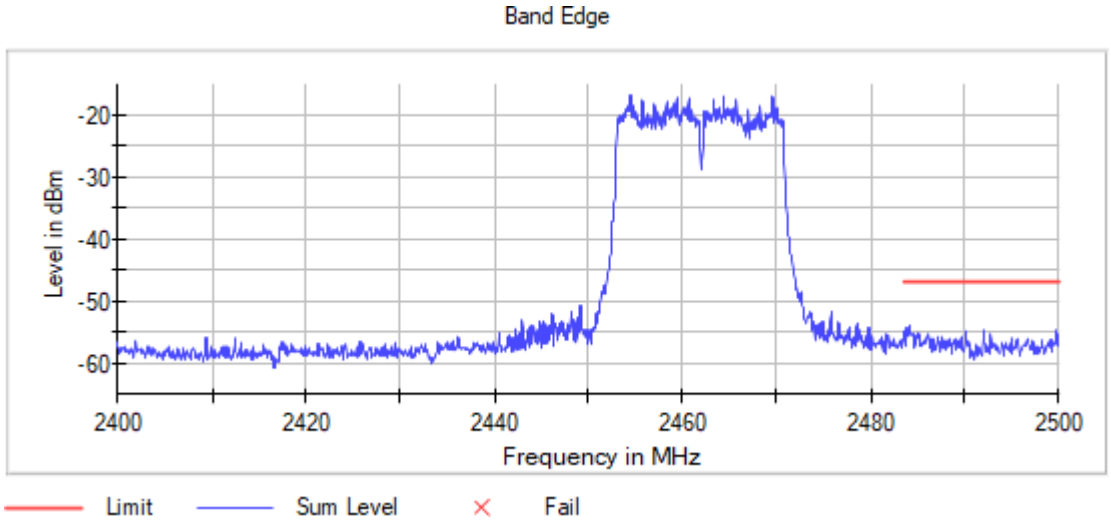
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



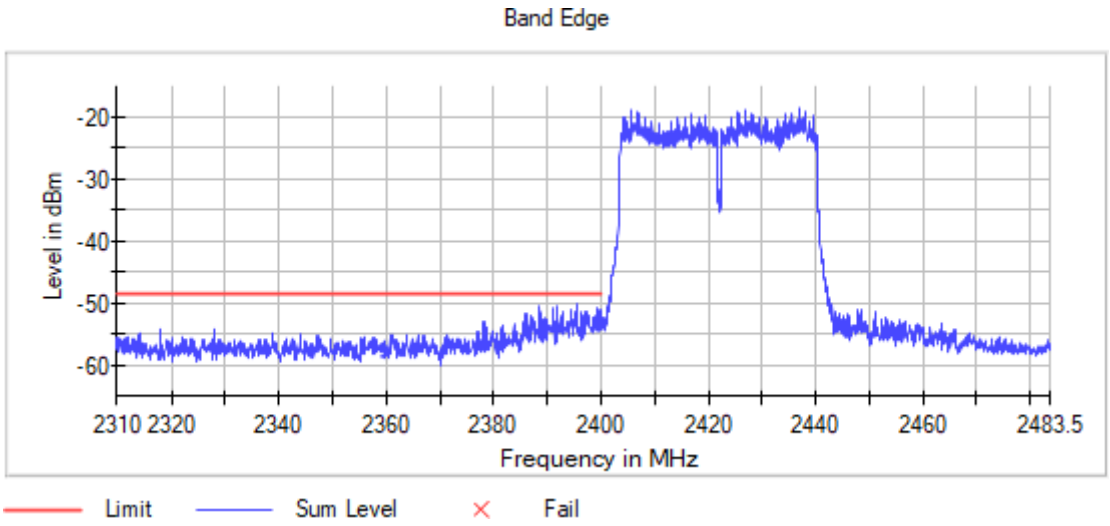
High Channel:



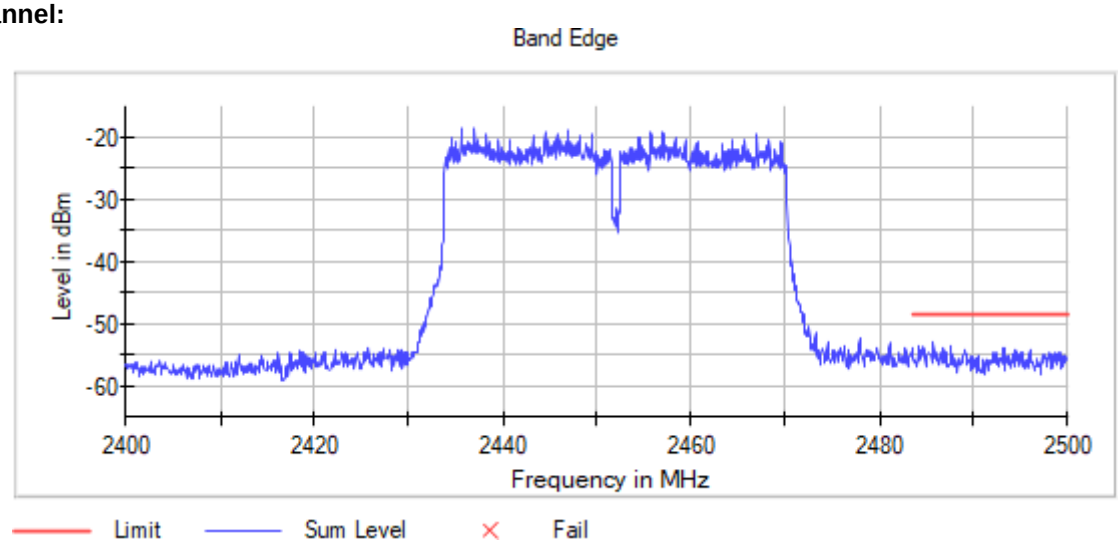
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Modulation: 802.11ax HE20 FULL RU
Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2399.625000	-33.4
20	2399.675000	-33.5
20	2399.575000	-34.3
20	2399.975000	-34.5
20	2399.525000	-34.8
20	2399.475000	-34.8
20	2398.575000	-34.9
20	2398.975000	-34.9
20	2398.625000	-34.9
20	2398.325000	-34.9
20	2398.925000	-35.0
20	2399.875000	-35.0
20	2399.375000	-35.1
20	2398.275000	-35.1
20	2399.325000	-35.1
20	2483.875000	-47.0
20	2483.825000	-43.6
20	2484.125000	-43.7
20	2485.275000	-43.7
20	2485.325000	-43.8
20	2484.925000	-43.8
20	2484.075000	-43.8
20	2483.775000	-43.8
20	2484.975000	-43.9
20	2485.225000	-44.2
20	2483.875000	-44.2
20	2484.225000	-44.3
20	2484.175000	-44.3
20	2484.525000	-44.8
20	2484.875000	-44.9
20	2484.575000	-45.0
40	2396.225000	-46.8
40	2399.525000	-47.0
40	2399.475000	-47.1
40	2396.875000	-47.2
40	2396.275000	-47.2
40	2398.475000	-47.2
40	2396.825000	-47.3

BW (MHz)	Freq (MHz)	Lvl (dBm)
40	2398.525000	-47.6
40	2396.175000	-47.8
40	2396.925000	-48.1
40	2398.425000	-48.1
40	2396.025000	-48.2
40	2398.225000	-48.2
40	2398.275000	-48.3
40	2399.575000	-48.3
40	2486.975000	-39.0
40	2487.025000	-39.4
40	2484.725000	-40.0
40	2486.925000	-40.0
40	2484.775000	-40.2
40	2484.575000	-40.4
40	2484.525000	-40.6
40	2489.225000	-40.6
40	2486.025000	-40.7
40	2485.975000	-40.7
40	2484.825000	-41.0
40	2484.475000	-41.1
40	2484.625000	-41.1
40	2484.675000	-41.2
40	2489.175000	-41.3

Verdict

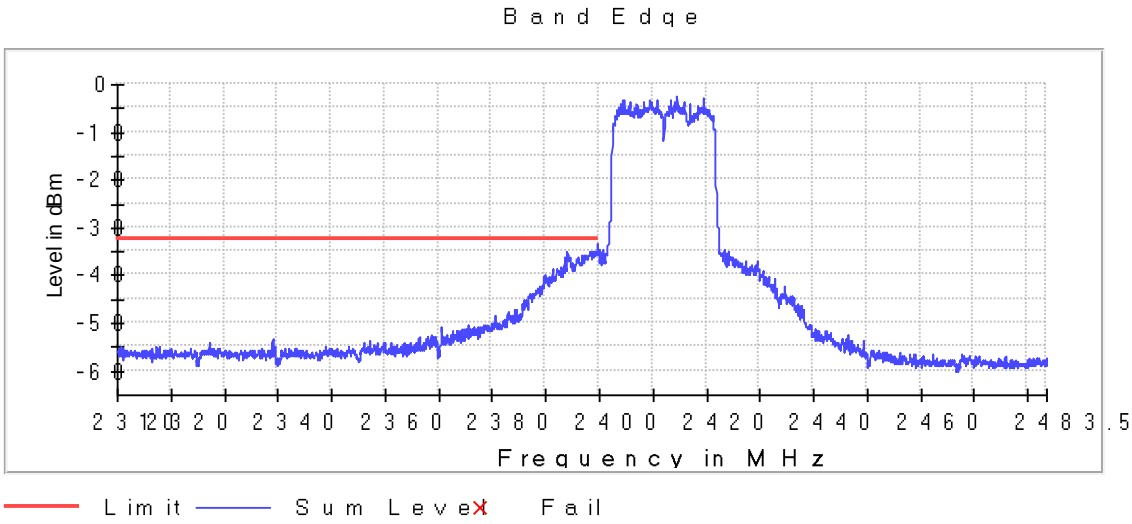
Pass

Attachments

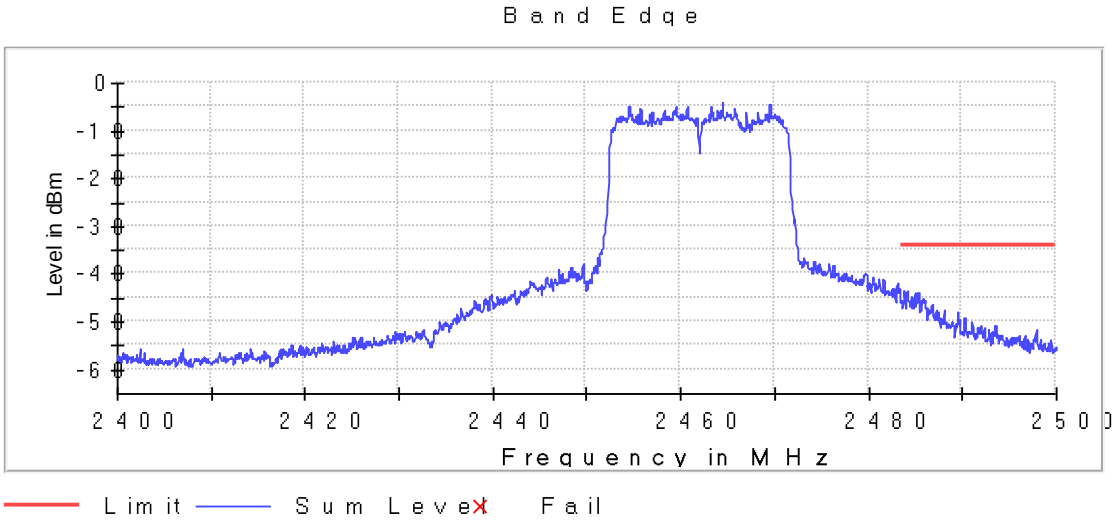
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



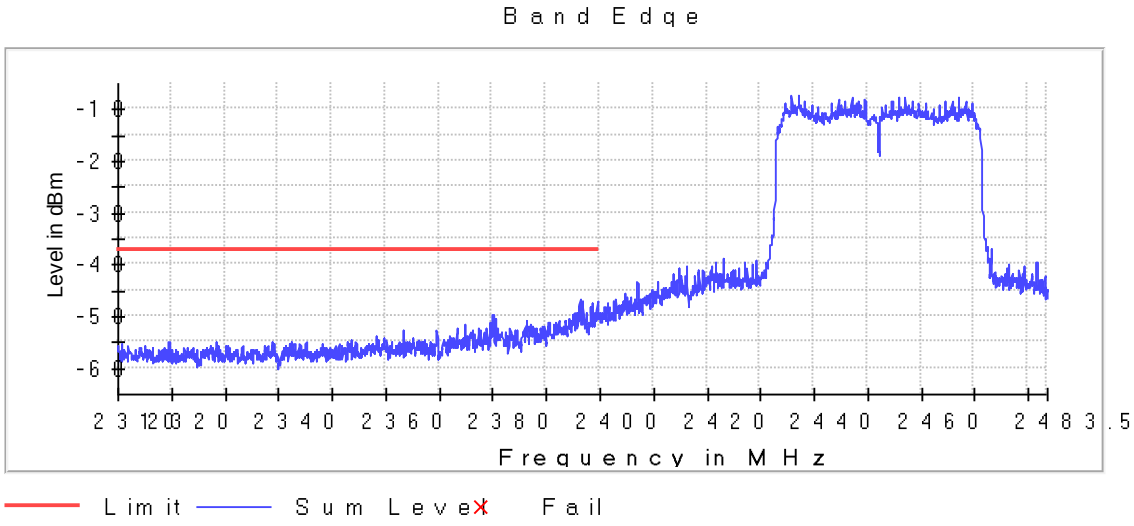
High Channel:



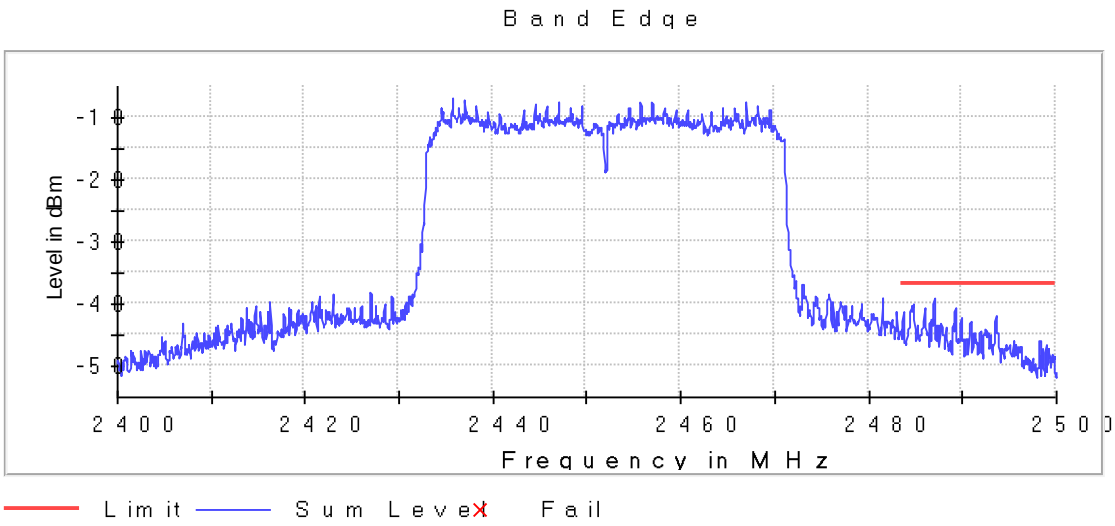
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1670
Sweeptime	113.672 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	40 / max.	43 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.00 dB	0.00 dB	0.01 dB

Modulation: 802.11ax HE20 Partial RU Extremities
Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2399.775000	-32.2
20	2399.725000	-32.4
20	2399.825000	-33.1
20	2399.125000	-33.2
20	2399.175000	-33.4
20	2397.025000	-34.1
20	2396.975000	-34.1
20	2397.625000	-34.2
20	2399.075000	-34.2
20	2399.675000	-34.3
20	2397.675000	-34.5
20	2396.375000	-34.6
20	2398.525000	-34.8
20	2397.575000	-34.9
20	2398.275000	-35.0
20	2483.875000	-48.7
20	2483.925000	-49.2
20	2483.825000	-49.3
20	2484.525000	-50.4
20	2484.475000	-50.4
20	2484.575000	-50.9
20	2484.425000	-51.4
20	2483.975000	-51.7
20	2483.775000	-51.7
20	2483.575000	-51.7
20	2483.525000	-51.9
20	2483.625000	-52.5
20	2485.075000	-52.7
20	2485.025000	-52.8
20	2485.825000	-53.1
40	2399.975000	-42.3
40	2399.925000	-42.6
40	2399.875000	-42.9
40	2399.825000	-43.0
40	2399.775000	-43.4
40	2399.625000	-43.6
40	2399.575000	-43.7
40	2399.675000	-43.7

BW (MHz)	Freq (MHz)	Lvl (dBm)
40	2399.075000	-43.9
40	2399.025000	-43.9
40	2399.725000	-44.0
40	2399.525000	-44.1
40	2399.125000	-44.1
40	2399.175000	-44.2
40	2398.975000	-44.3
40	2487.825000	-48.5
40	2487.775000	-48.6
40	2487.875000	-48.9
40	2487.025000	-49.0
40	2486.125000	-49.1
40	2486.975000	-49.1
40	2487.075000	-49.2
40	2487.175000	-49.2
40	2487.125000	-49.3
40	2487.475000	-49.3
40	2487.425000	-49.3
40	2487.925000	-49.4
40	2486.175000	-49.4
40	2487.525000	-49.5
40	2486.075000	-49.5

Verdict

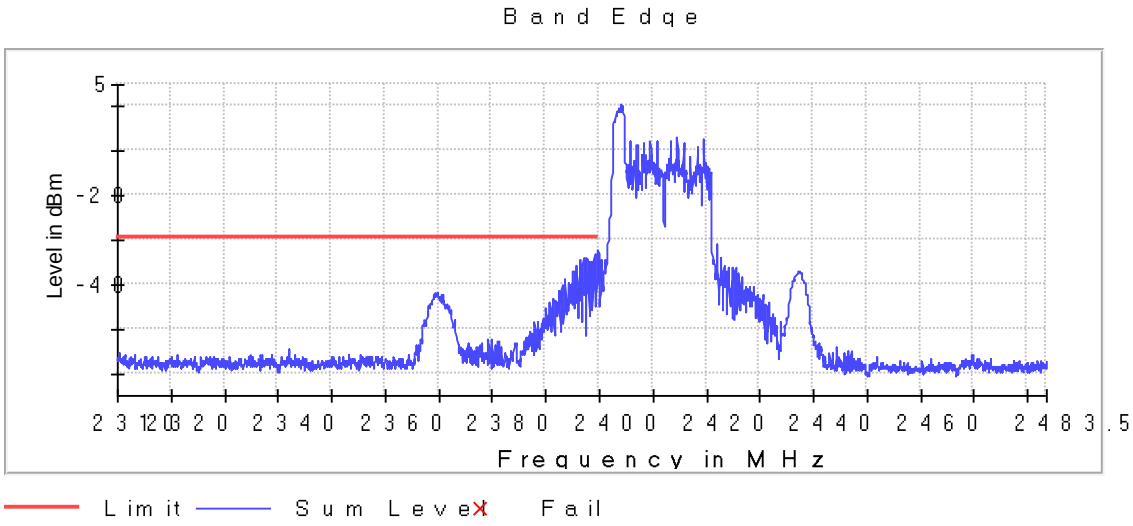
Pass

Attachments

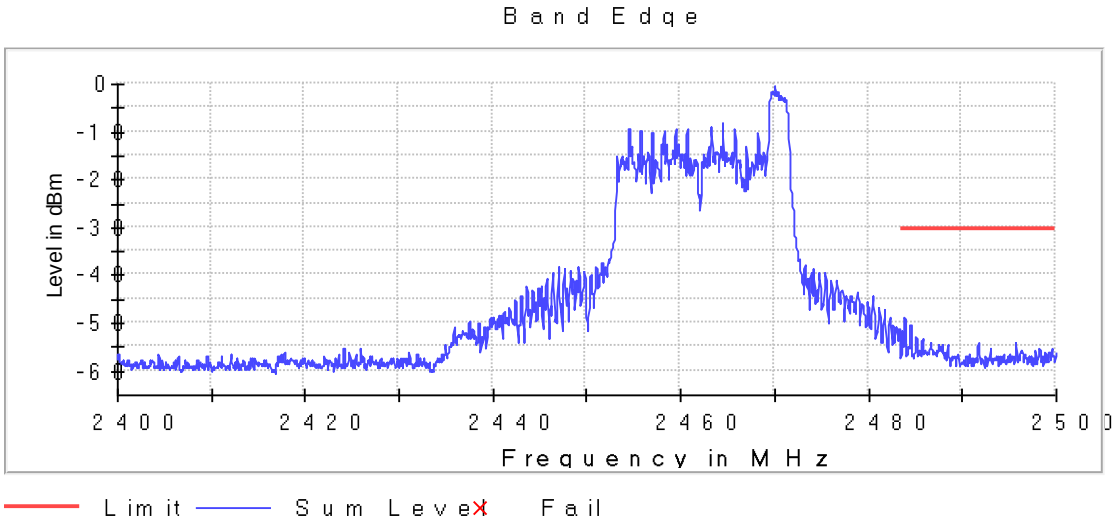
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



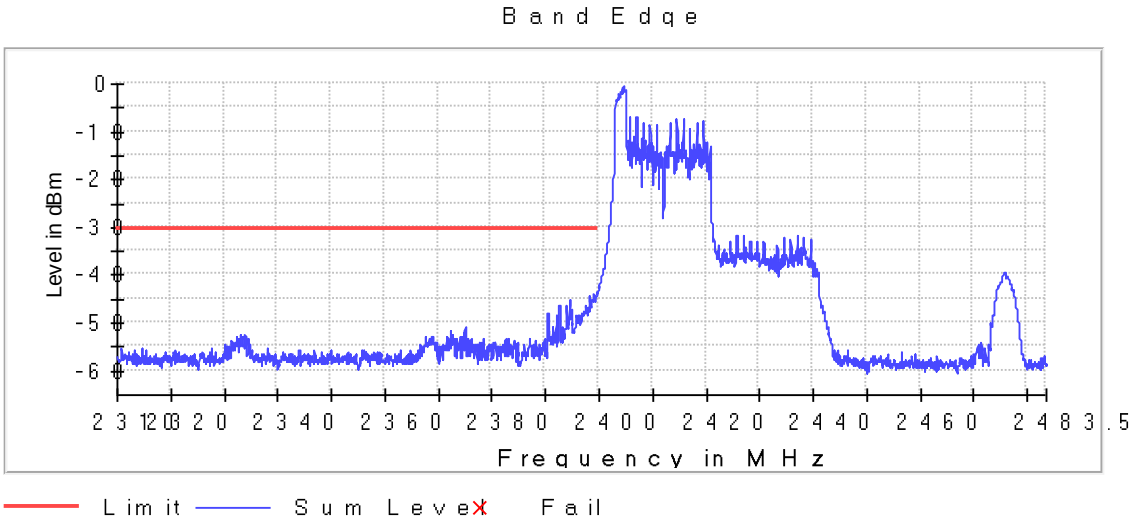
High Channel:



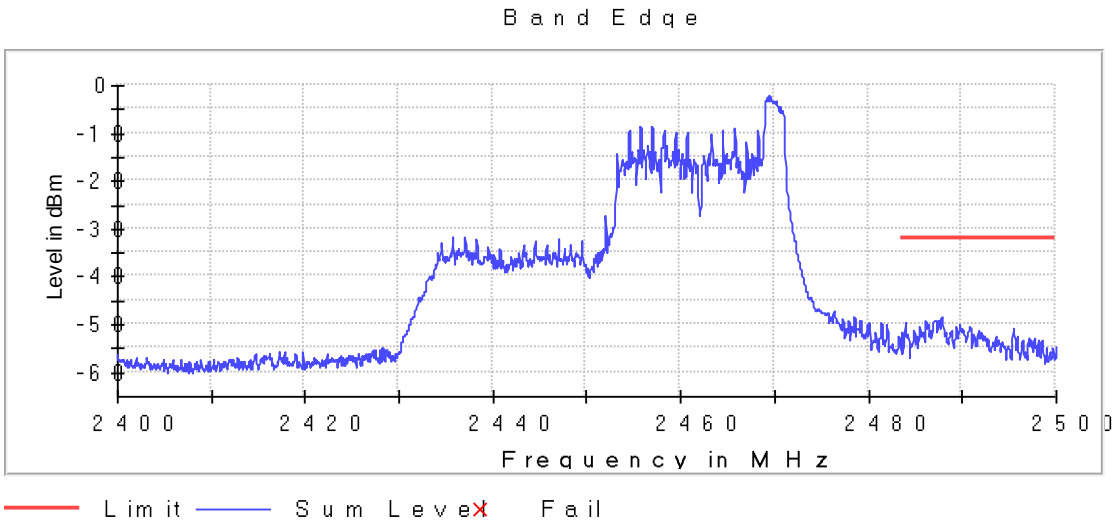
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1670
Sweeptime	113.672 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	40 / max.	43 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.00 dB	0.00 dB	0.01 dB

Modulation: 802.11ax HE20 Partial RU Worst case
Results

BW (MHz)	Freq (MHz)	Lvl (dBm)
20	2399.725000	-26.2
20	2399.775000	-26.2
20	2396.975000	-26.8
20	2397.625000	-26.8
20	2398.225000	-26.9
20	2397.025000	-27.0
20	2399.675000	-27.1
20	2398.275000	-27.1
20	2399.125000	-27.1
20	2397.575000	-27.1
20	2399.075000	-27.3
20	2399.825000	-27.3
20	2396.925000	-27.6
20	2398.175000	-27.8
20	2397.675000	-27.9
20	2483.875000	-47.0
20	2397.575000	-29.7
20	2484.375000	-47.2
20	2485.225000	-47.3
20	2398.875000	-29.8
20	2397.675000	-29.8
20	2483.825000	-47.3
20	2398.175000	-30.1
20	2484.325000	-47.4
20	2484.225000	-47.5
20	2398.925000	-30.1
20	2484.425000	-47.7
20	2398.825000	-30.2
20	2486.325000	-47.7
20	2396.375000	-30.3

BW (MHz)	Freq (MHz)	Lvl (dBm)
40	2399.475000	-33.1
40	2496.725000	-52.2
40	2399.325000	-33.2
40	2496.325000	-52.3
40	2493.225000	-52.3
40	2399.425000	-33.3
40	2499.175000	-52.3
40	2399.375000	-33.4
40	2498.375000	-52.3
40	2399.675000	-33.5
40	2399.225000	-33.7
40	2492.025000	-52.4
40	2491.075000	-51.9
40	2399.975000	-31.5
40	2399.825000	-31.7
40	2486.075000	-52.1
40	2486.125000	-52.2
40	2498.275000	-52.3
40	2493.375000	-52.5
40	2493.425000	-52.9
40	2495.575000	-53.1
40	2494.725000	-53.1
40	2498.225000	-53.2
40	2493.175000	-53.2
40	2499.675000	-53.2
40	2494.675000	-53.2
40	2497.525000	-53.3
40	2496.025000	-53.4
40	2486.875000	-53.4
40	2498.725000	-53.4

Verdict

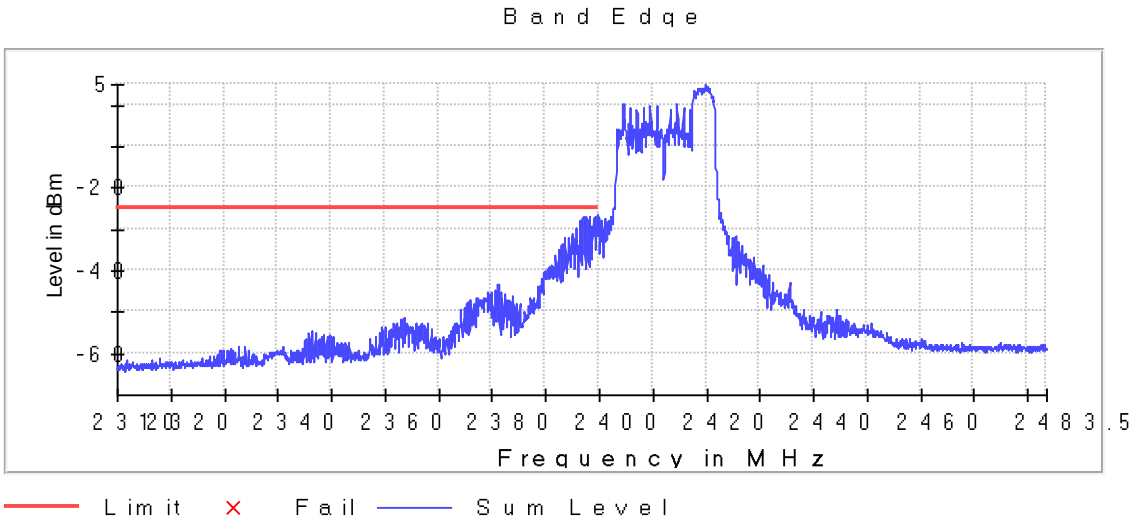
Pass

Attachments

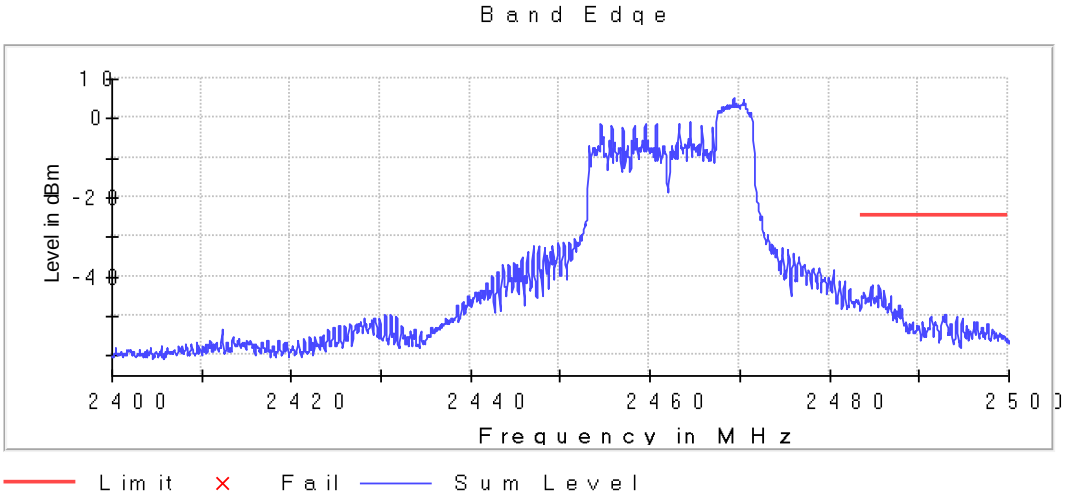
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



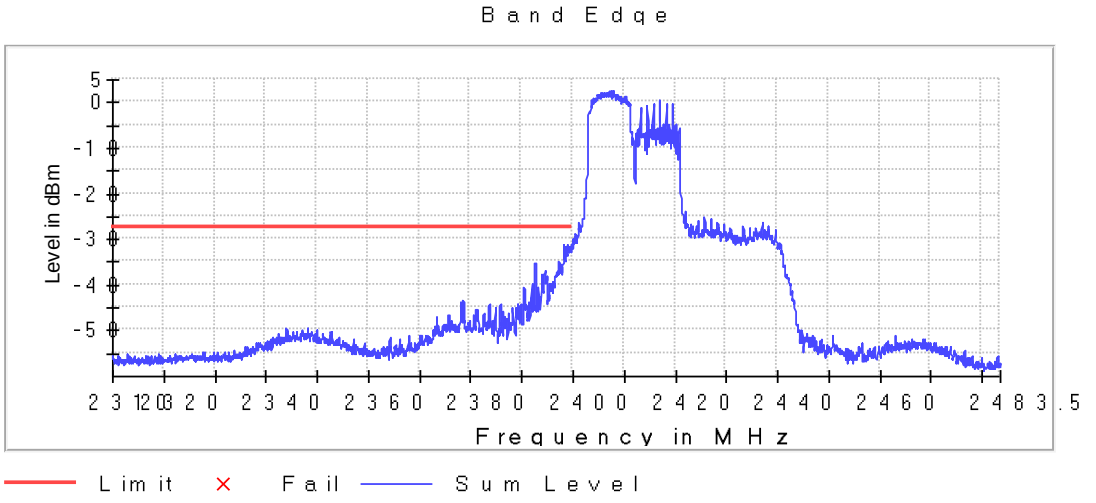
High Channel:



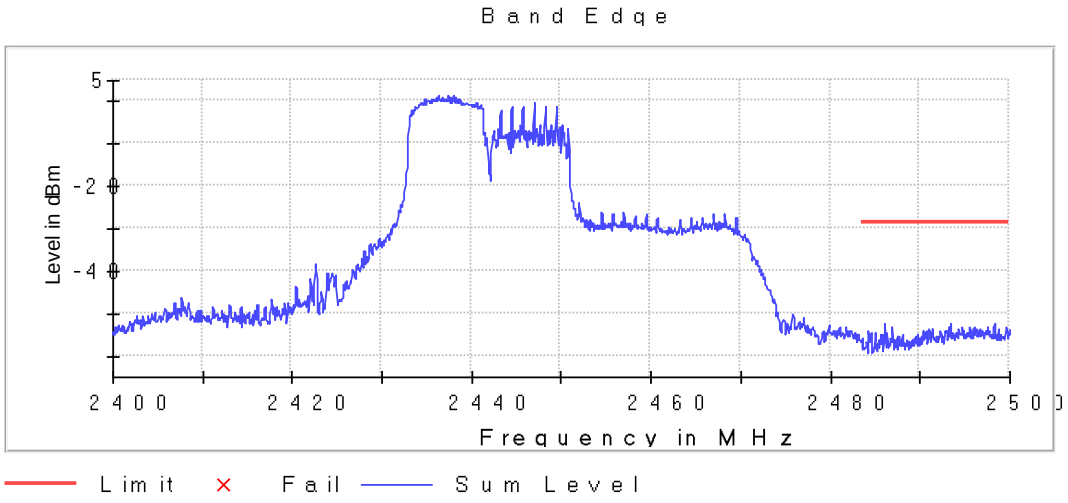
Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11ax HE20 , Number of Transmission Chains = 1, Measurement Point = 1,

Images:

Low Channel:



High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1670
Sweeptime	113.672 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	40 / max.	43 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.00 dB	0.00 dB	0.01 dB

FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%

Limits

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands.

Modulation: 802.11b

Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2412.00000	20	13.500
2437.00000	20	13.300
2462.00000	20	13.400

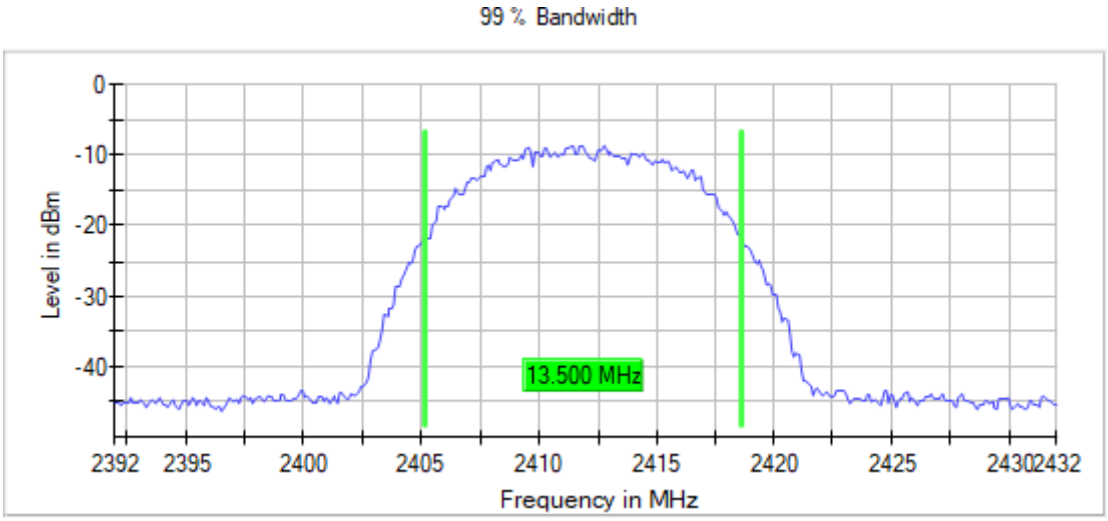
Verdict

Pass

Attachments

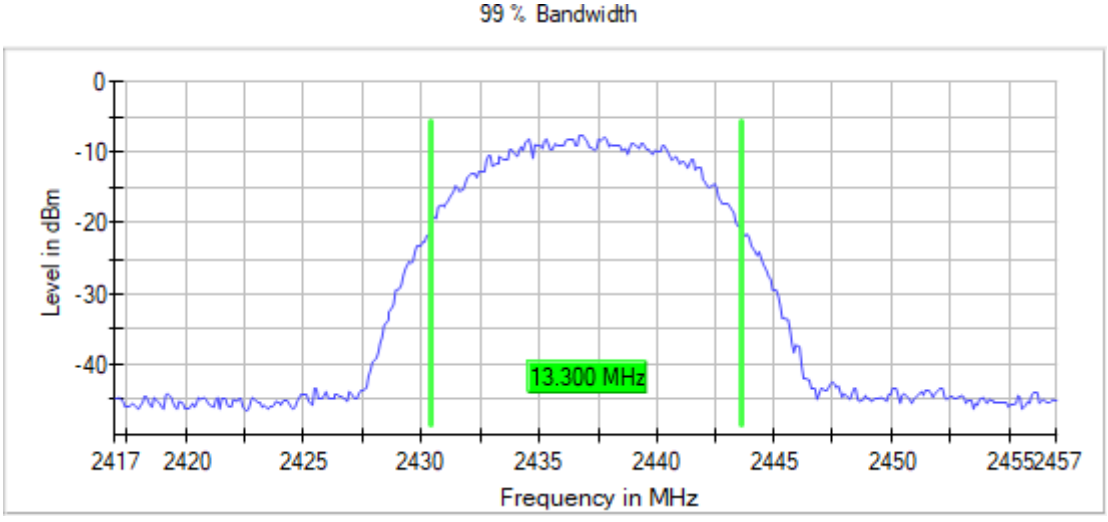
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



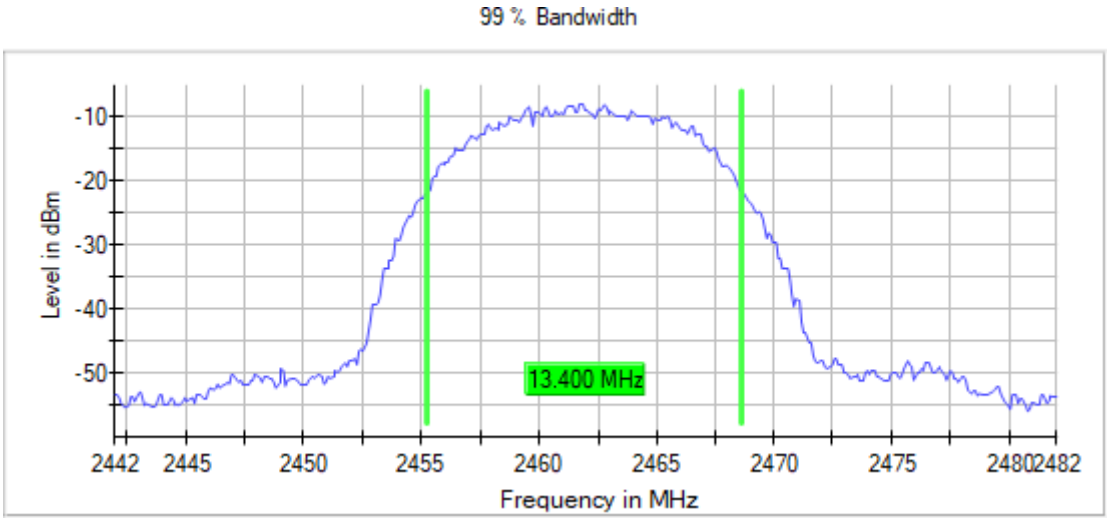
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b , Number of Transmission Chains = 1,

Images:



Modulation: 802.11g
Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2412.00000	20	16.600
2437.00000	20	16.500
2462.00000	20	16.600

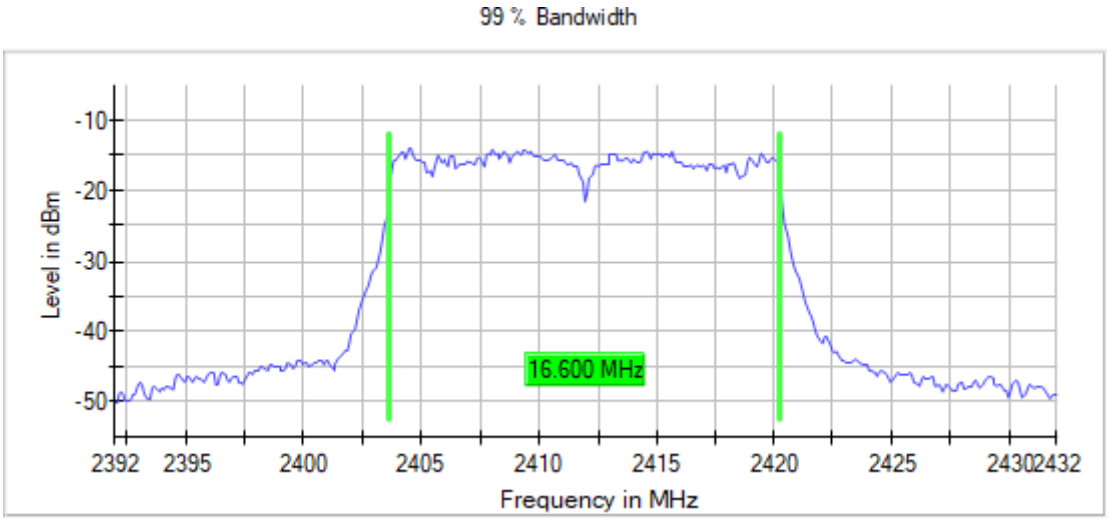
Verdict

Pass

Attachments

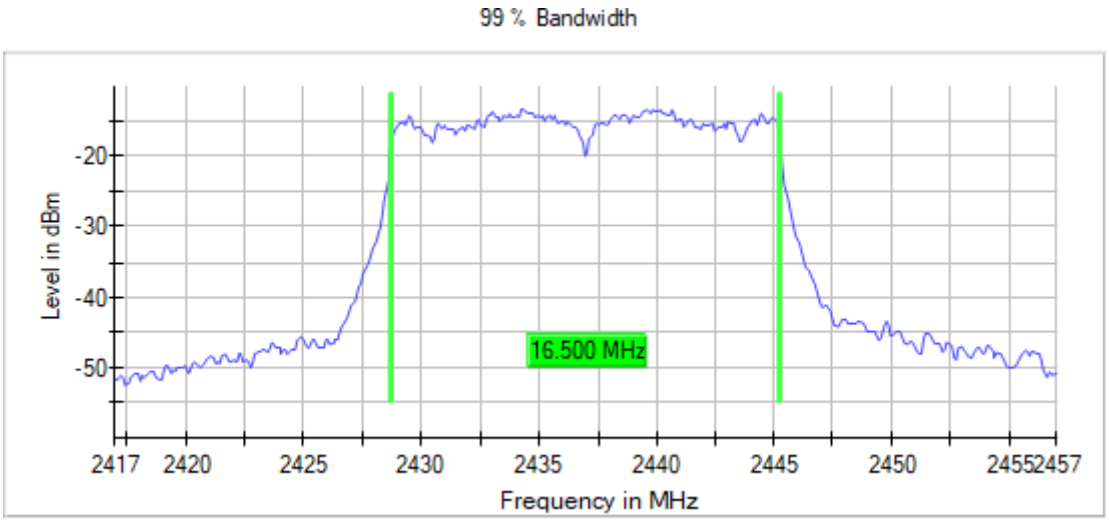
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



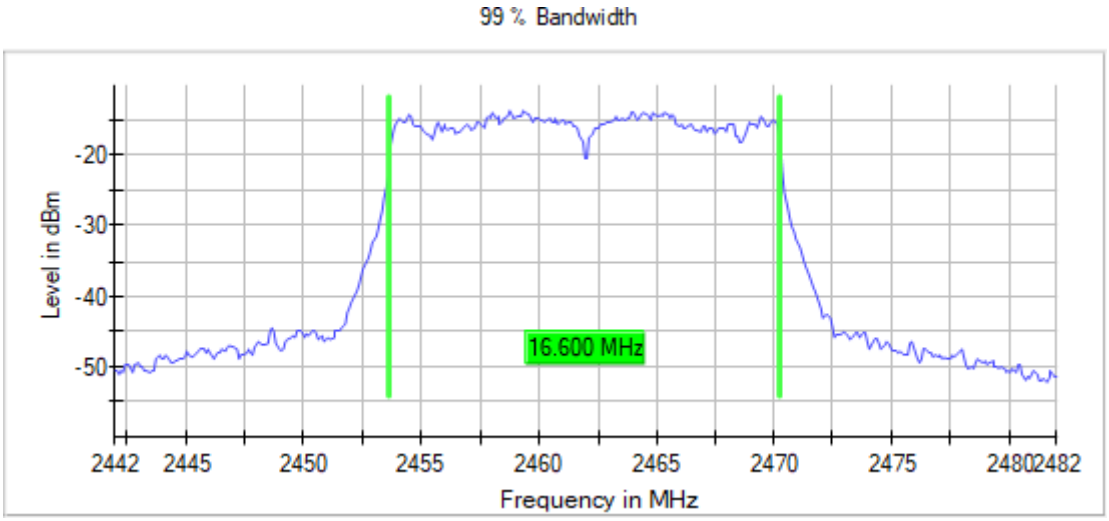
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g , Number of Transmission Chains = 1,

Images:



Modulation: 802.11n20
Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2412.00000		17.800
2437.00000	20	17.700
2462.00000		17.700

Modulation: 802.11n40
Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2422.00000		36.250
2437.00000	40	36.250
2452.00000		36.250

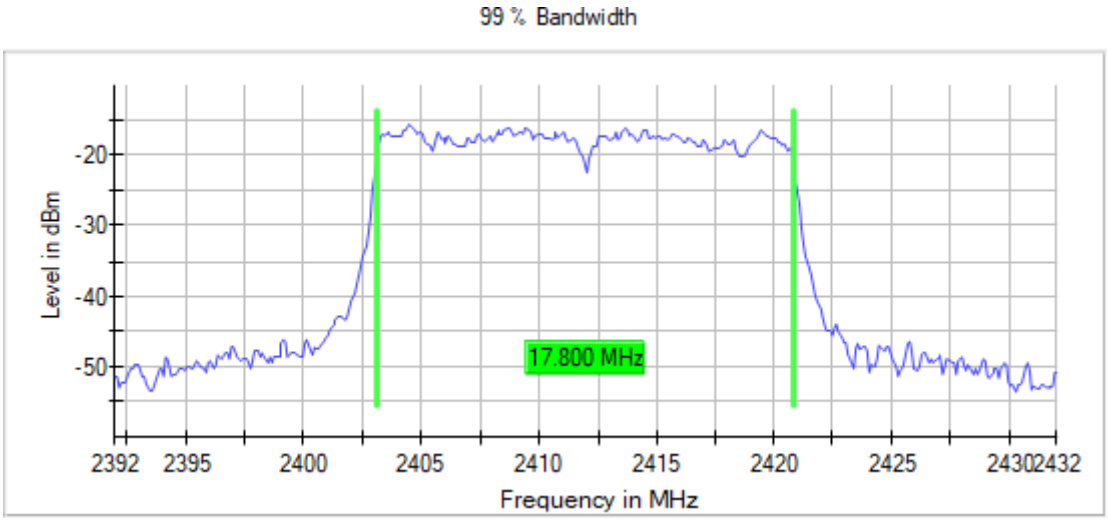
Verdict

Pass

Attachments

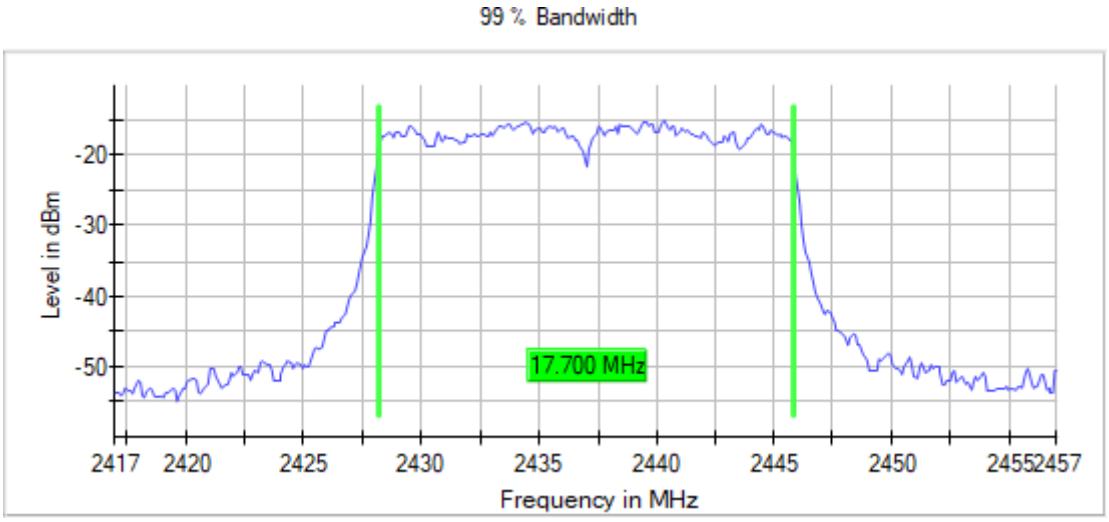
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



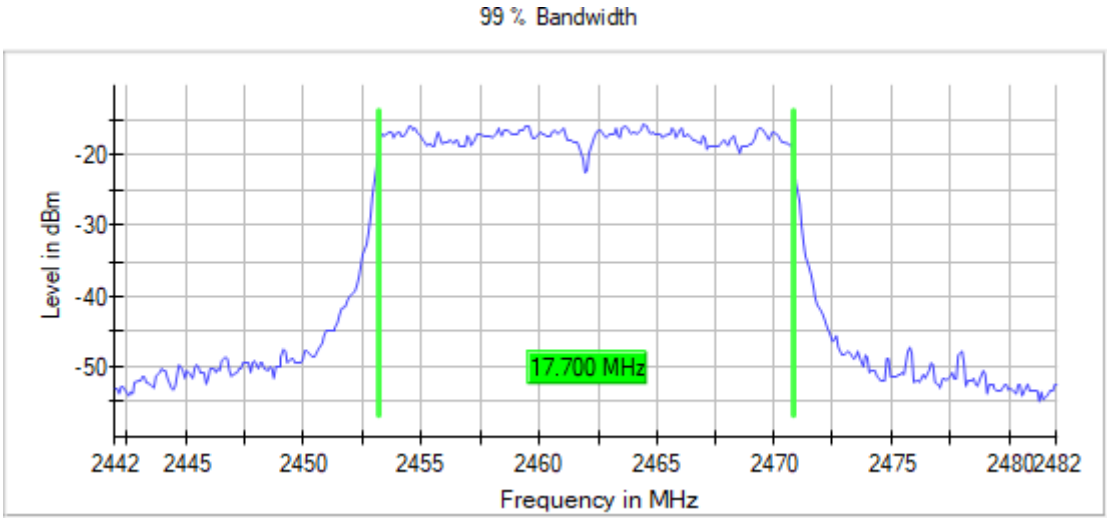
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



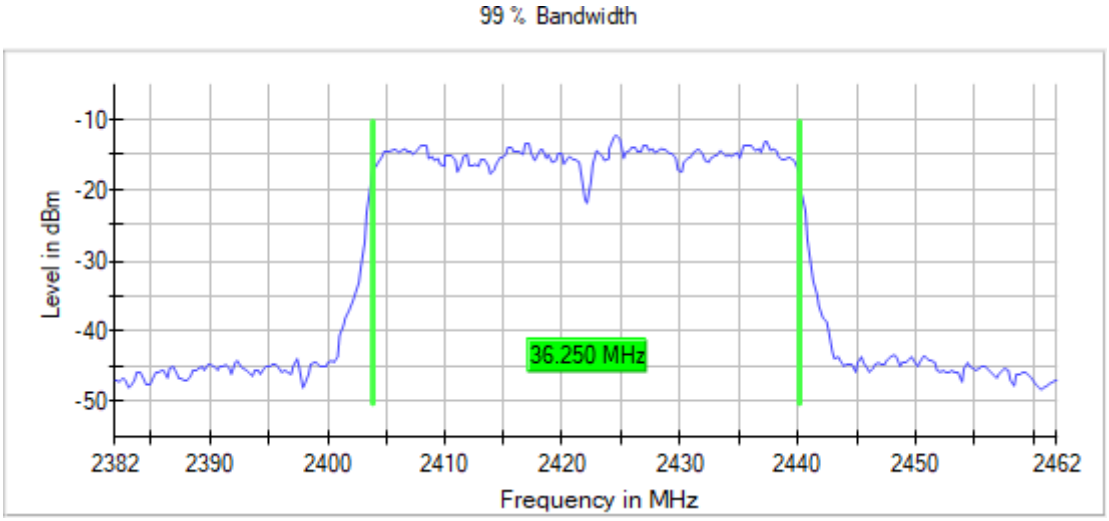
Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



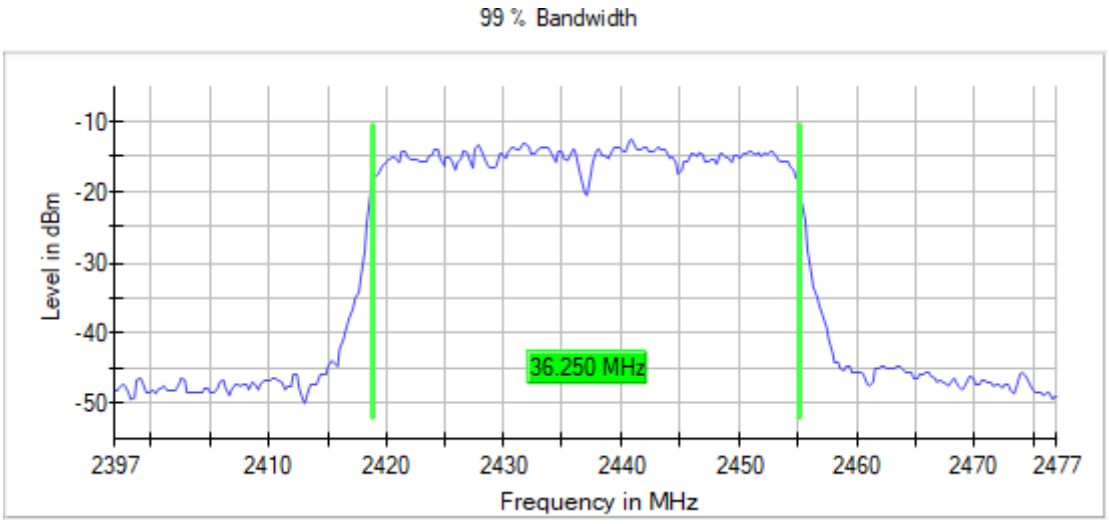
Frequency MHz = 2422.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



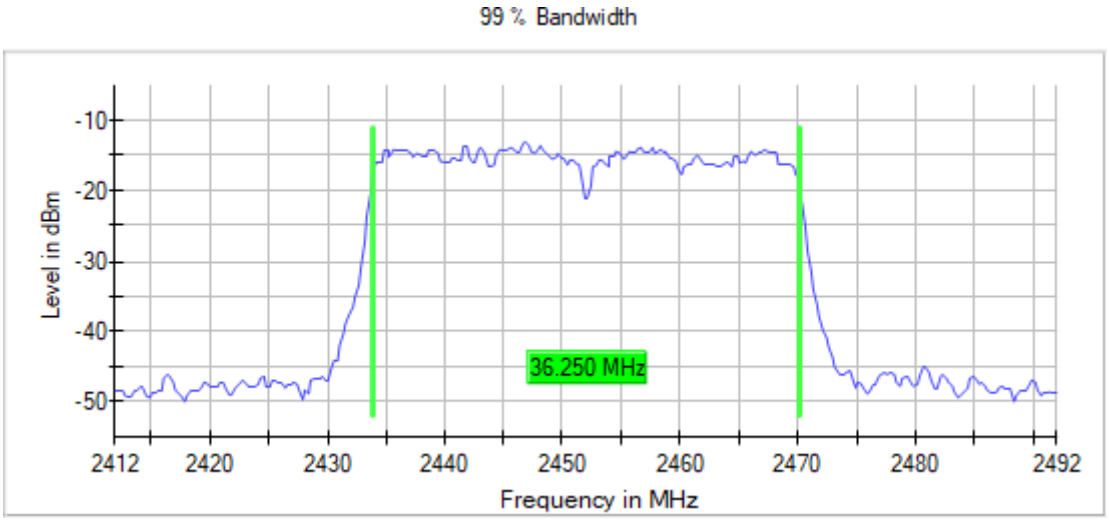
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



Frequency MHz = 2452.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 40, Modulation = 802.11n , Number of Transmission Chains = 1,

Images:



Modulation: 802.11ax HE20 Full RU
Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2412.00000		18.900
2437.00000	20	18.900
2462.00000		18.900

Modulation: 802. 11ax HE40 Full RU
Results

Freq (MHz)	BW (MHz)	Occ Ch BW (MHz)
2422.00000		37.750
2437.00000	40	37.500
2452.00000		37.500

Verdict

Pass