



FCC LISTED, REGISTRATION
 NUMBER: 2764.01

ISED LISTED REGISTRATION
 NUMBER: 23595-1

Test Report No:
3810ERM.007A1

Test Report

USA FCC Part 15.247, 15.209, 15.207; & CANADA RSS-247, RSS-Gen
 Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -
 2483.5 MHz, and 5725 - 5850 MHz

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

(*) Identification of item tested	Automotive infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG7Q MID
Other identification of the product	FCC ID: T8GNTG7QMID IC: 6434A-NTG7QMID
(*) Features	FM/AM/DAB, USB, Bluetooth, WLAN, GNSS. HW version: D11 SW version: E329
Manufacturer	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD GERMANY
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	11-02-2022
Report template No	FDT08_24 (* "Data provided by the client")

Index

INDEX	2
ACRONYMS	3
COMPETENCES AND GUARANTEES	3
GENERAL CONDITIONS	3
UNCERTAINTY	4
DATA PROVIDED BY THE CLIENT	4
USAGE OF SAMPLES	5
TEST SAMPLE DESCRIPTION	7
IDENTIFICATION OF THE CLIENT	9
TESTING PERIOD AND PLACE	9
DOCUMENT HISTORY	9
MODIFICATIONS TO THE REFERENCE TEST REPORT	9
ENVIRONMENTAL CONDITIONS	9
REMARKS AND COMMENTS	10
LIST OF EQUIPMENT USED DURING THE TEST	11
TESTING VERDICTS	12
SUMMARY	12
APPENDIX A: TEST RESULTS. BLUETOOTH EDR.....	13
APPENDIX B: TEST RESULTS. WI-FI 2.4GHZ.....	103

Acronyms

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

Competences and guarantees

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

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

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

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document. **IMPORTANT:** No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Certification Inc.

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	%
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 Automotive head unit to be installed in cars with the following features: FM/AM/DAB, USB, Bluetooth, WLAN and GNSS .

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

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	3810/08	Infotainment Head Unit	NTG7Q	HBM652N4884007	08/10/2022	Element Under Test

Sample S/01 is composed of the following accessories:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	3810/02	Harness	-	-	08/10/2022	Accessory
S/01	3810/21	SMA cable	-	-	08/10/2022	Accessory
S/01	3810/17	RJ45 to USB Ethernet Adapter	UE300	220B4P9004769	08/15/2022	Accessory
S/01	3810/19	Ethernet Cable RJ45 to RJ45	UE300	-	08/15/2022	Accessory

1. Sample S/01 was used for the test(s): All Conducted tests indicated in appendix A and B.

Sample S/02 is composed of the following elements:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/02	3810/15	Infotainment Head Unit	NTG7Q	HBM652N4884012	08/15/2022	Element Under Test
S/02	3810/09	RF antenna cable	BT/WLAN	-	08/15/2022	Element Under Test
S/02	3810/10	BT/WLAN Antenna 1	LV19	-	08/15/2022	Element Under Test
S/02	3810/11	BT/WLAN Antenna 2	LV19	-	08/15/2022	Element Under Test
S/02	3810/12	BT/WLAN Antenna 3	LV19	-	08/15/2022	Element Under Test
S/02	3810/13	BT/WLAN Antenna 4	LV19	-	08/15/2022	Element Under Test

Sample S/02 is composed of the following accessories:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/02	3810/16	Harness	-	-	08/10/2022	Accessory
S/02	3810/04	SMA cable	-	-	08/10/2022	Accessory
S/02	3810/18	RJ45 to USB Ethernet Adapter	UE300	220B4P9004769	08/15/2022	Accessory
S/02	3810/19	Ethernet Cable RJ45 to RJ45	UE300	-	08/15/2022	Accessory

2. Sample S/02 was used for the test(s): All Radiated tests indicated in appendix A and B.

Test sample description

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

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Car Connector A	>3m	[X]	[]	[]		
	Car Connector B	>3m	[X]	[]	[]		
	Display Connector CID/PIP / RVC	>3m	[X]	[X]	[]		
	USB Connector	<3m	[X]	[X]	[]		
	Eth Connector	>3m	[X]	[]	[]		
BT/WLAN-Antenna	>3m	[X]	[X]	[]			
Supplementary information to the ports..... :	GNSS Antenna >3m						
Rated power supply	Voltage and Frequency	Reference poles					
		L1	L2	L3	N	PE	
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC:					
[]	DC: 12V car battery /attenuator (9,5-15,5v normal operation)						
Rated Power	12V						
Clock frequencies.....	No data provided						
Other parameters	No data provided						
Software version	No data provided						
Hardware version	No data provided						
Dimensions in cm (W x H x D)	No data provided						
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
	No data provided		
Accessories (not part of the test item)	Description	Type	Manufacturer
	HARMANeco (with Display or headless)	HARMANeco	HARMAN
	Cable harness	harness	HARMAN
	Display	different suppliers	different versions
	BT/WLAN-Antenna	OEM-Antenna	HIRSCHMANN
Documents as provided by the applicant.....:	Description	File name	Issue date
	Technical description	Technical Description NTG7_A20 200717 SOP2 AllVariant.pdf	A20
	Testing Guide	NTG7- TestsetupScript_191209 HU+RSU_v2.0.pdf	v2.0

Copy of marking plate:

(3) Only for Medical Equipment

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GOERING-STR. 16; 76307 KARLSBAD
GERMANY

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	2022-08-23
Date (finish)	2022-08-29

Document history

Report number	Date	Description
3810ERM.007	09-16-2022	First release
3810ERM.007A1	11-01-2022	Second release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 3810ERM.007 related with the same samples:

Clauses/ Sub-Clauses	Modification	Justification
Page 26: RSS-247 5.1 (b) / FCC 15.247 (a) (1) Carrier Frequency Separation	Limits section updated	To show limits
Pages 30: RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) Time of Occupancy (Dwell Time)	Limits section updated	To show limits
Page 34: RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [NHC] Number of hopping channels	Limits section updated	To show limits
Pages 53-63: RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)	Band edge Hopping on test results added	To show Band edge hopping on test results

This modification test report cancels and replaces the test report 3810ERM.007

Environmental conditions

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

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

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

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

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

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

Remarks and comments

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

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	2023/02
1039	FSV40 SIGNAL ANALYSER 40GHZ	101627	2020/09	2022/09
1107	ETHERNET SNMP THERMOMETER	60038026952	2020/09	2022/09
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	2022/11
1012	ESR26 EMI TEST RECEIVER	101478	2022/04	2024/04
1014	FSV40 SIGNAL ANALYZER 40GHZ	101626	2021/05	2023/05
1056	3116C DOUBLE-RIDGED WAVEGUIDE HORN ANTENNAS	213179	2020/01	2023/01
1057	3115 DOUBLE-RIDGED WAVEGUIDE HORN ANTENNAS	211373	2020/06	2023/06
1065	3142E BICONILOG ANTENNA	208587	2020/08	2023/08
1111	ETHERNET SNMP THERMOMETER	60038026577	2020/09	2022/09
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 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: N/A			

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) / 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 / 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: N/A			

Appendix A: Test results. Bluetooth EDR

PRODUCT INFORMATION

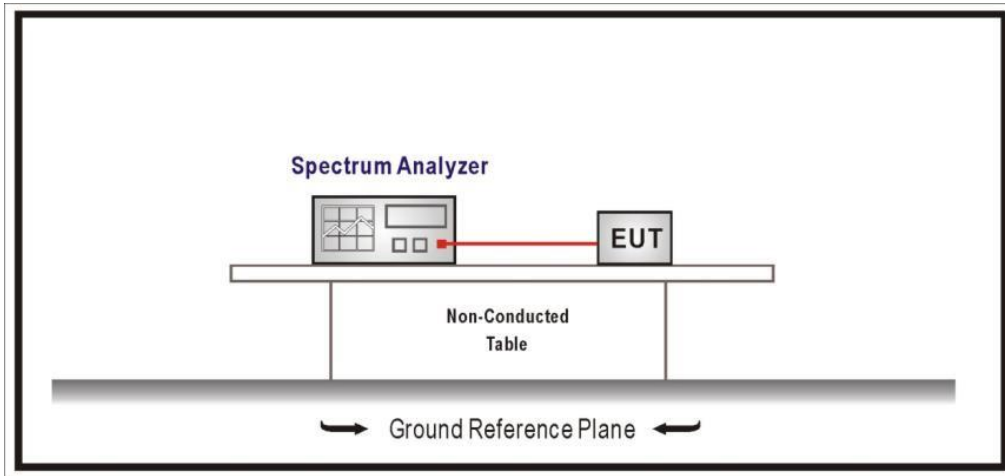
Information	Description
Modulation	FHSS
Adaptive	Non-Adaptive Equipment
Operation mode 1:	Equipment with only one antenna
Operating Frequency Range	2400 – 2483.5 MHz
Nominal Channel Bandwidth	1 MHz
RF Output Power	7 dBm
Extreme operating conditions	
- Temperature range	-20 °C to +55 °C
Antenna type	
Antenna gain	1,8 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	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$</p> <p><u>Modulation:</u> GFSK</p> <p><u>Test Frequencies for conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>
TC#02	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$</p> <p><u>Modulation:</u> $\pi/4$-DQPSK</p> <p><u>Test Frequencies for Conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>
TC#03	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$</p> <p><u>Modulation:</u> 8-DPSK</p> <p><u>Test Frequencies for Conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>

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 (Bi-log 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 360° 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.

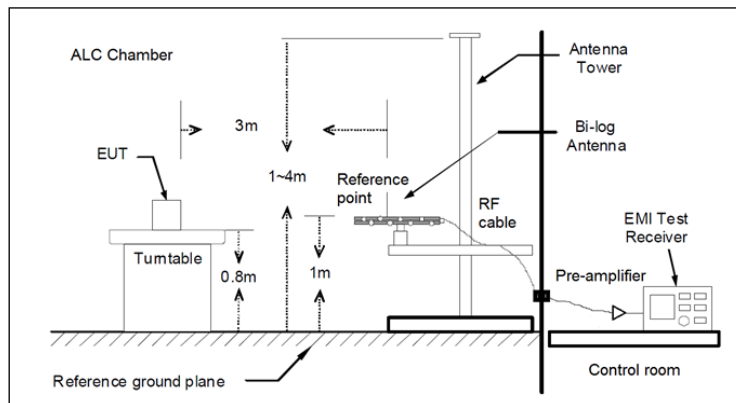


Fig A1: Radiated measurements Setup $f < 1$ GHz

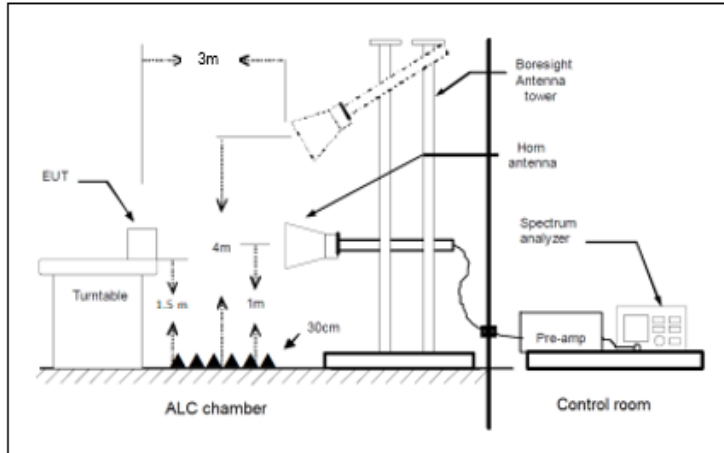


Fig A2: Radiated measurements setup $f > 1-18$ GHz

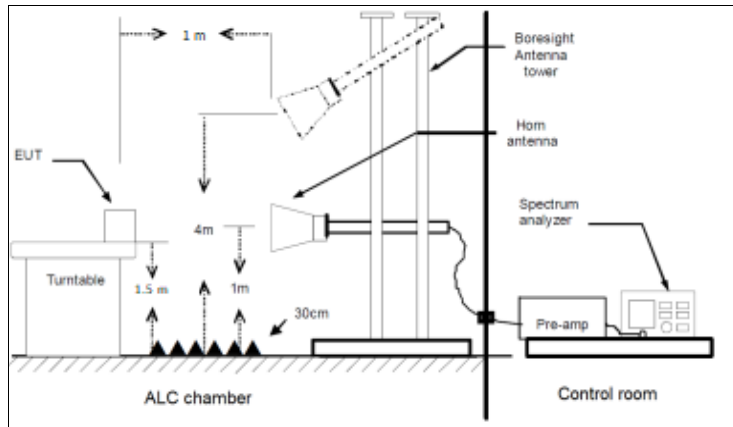


Fig A3: Radiated measurements setup $f > 18$ GHz

TEST CASES DETAILS

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

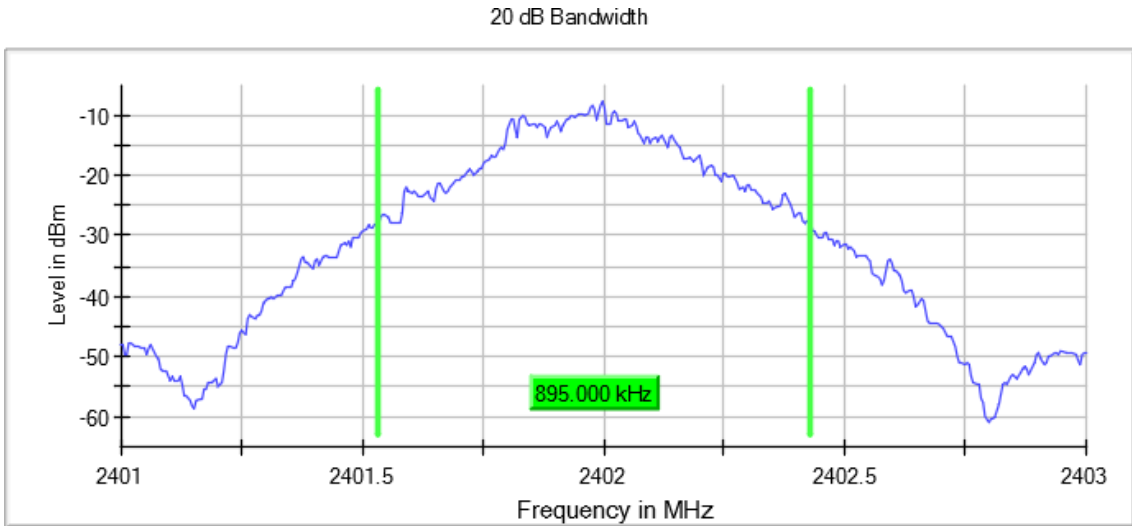
Verdict

Pass

Attachments

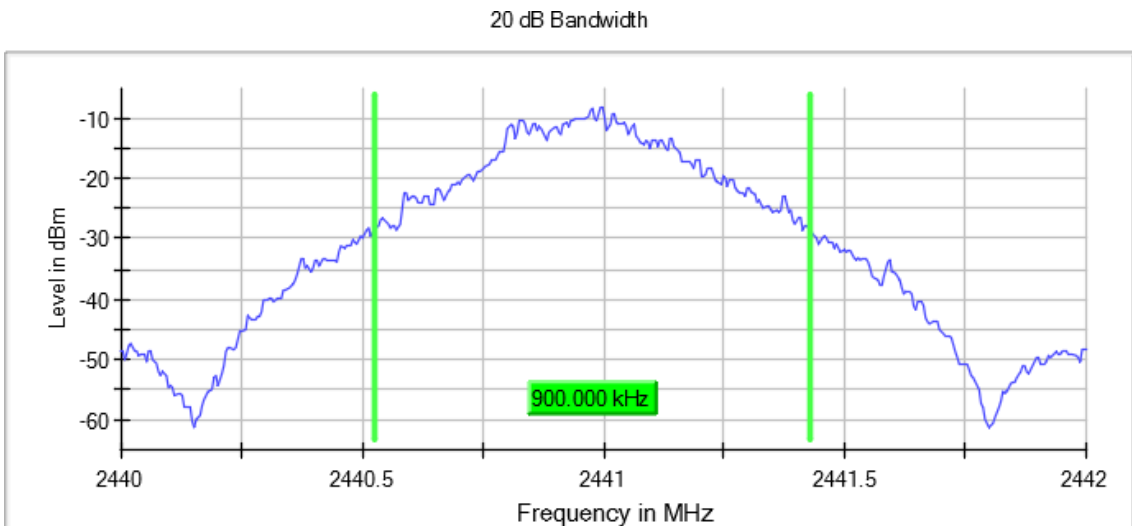
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



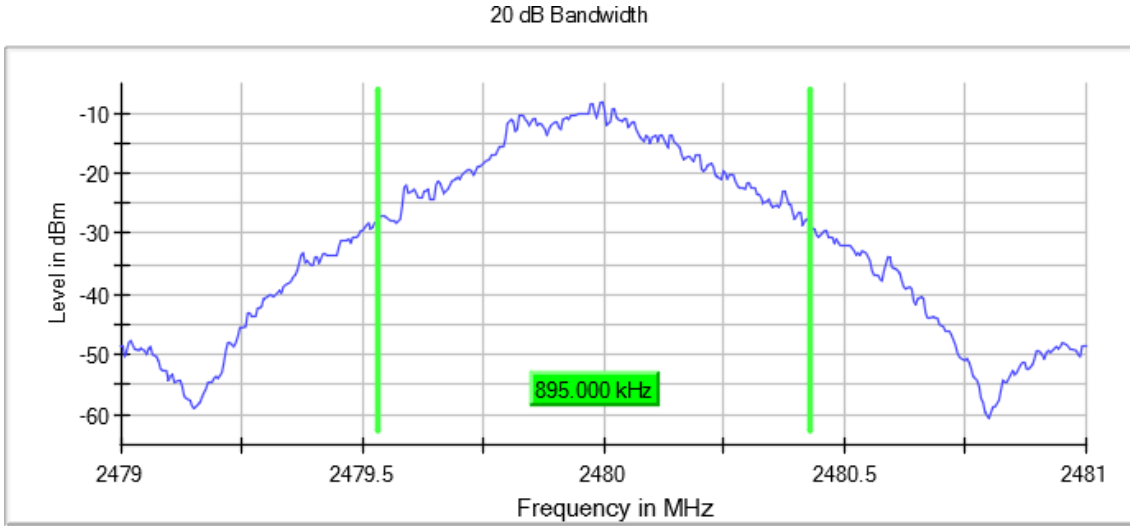
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

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

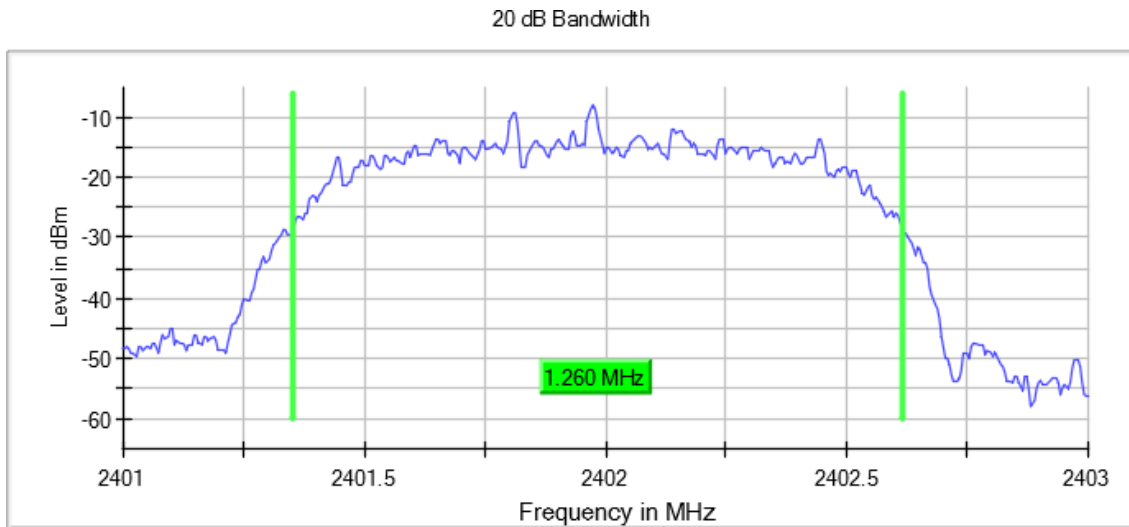
Verdict

Pass

Attachments

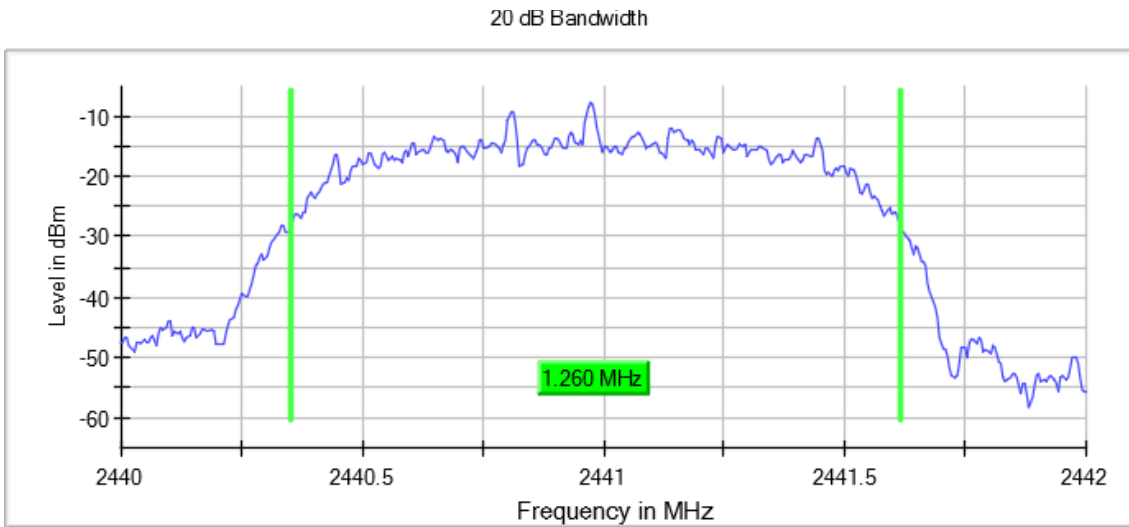
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



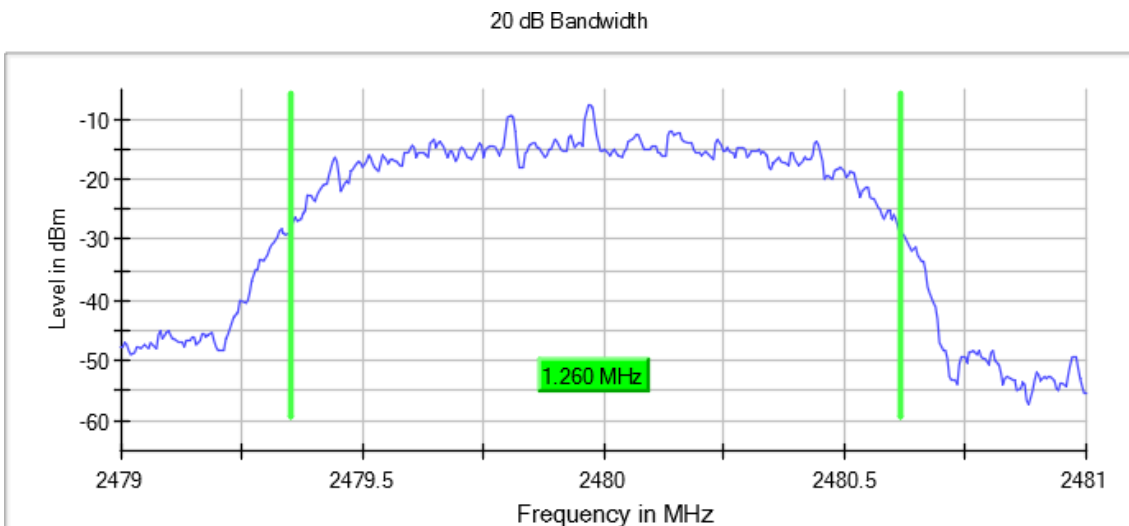
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	26Ebw (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.265
2441.00000					1.260
2480.00000					1.245

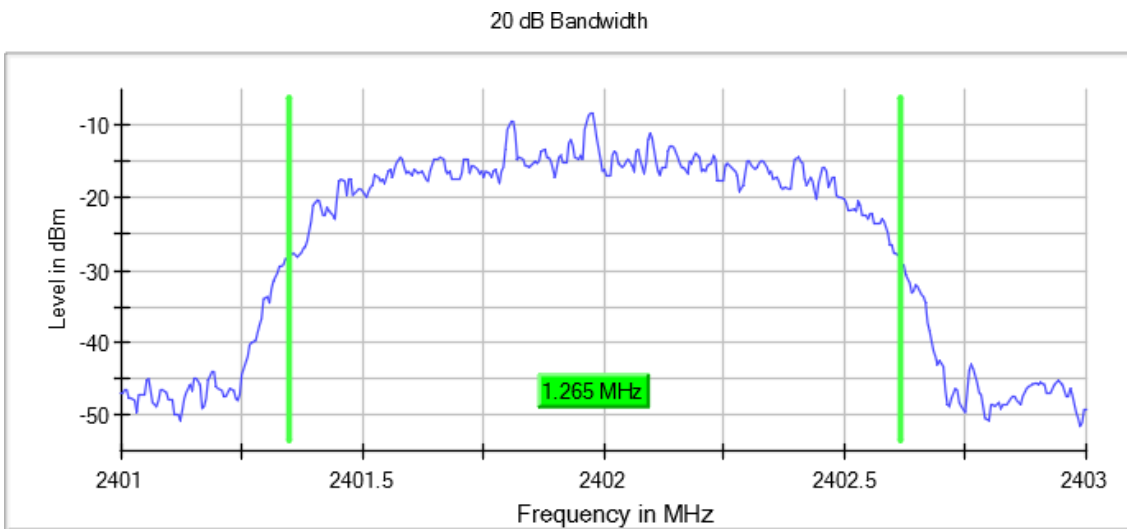
Verdict

Pass

Attachments

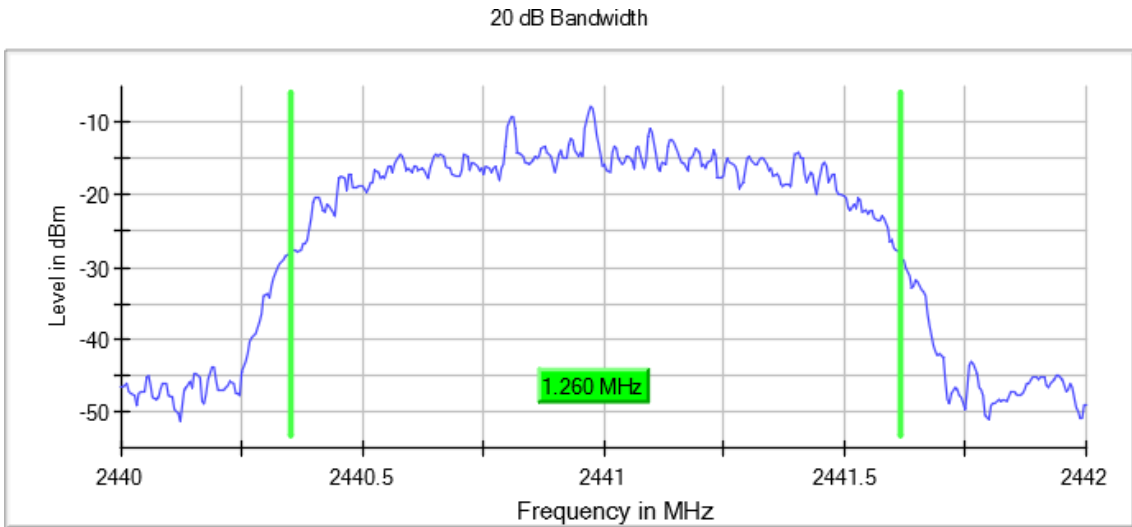
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



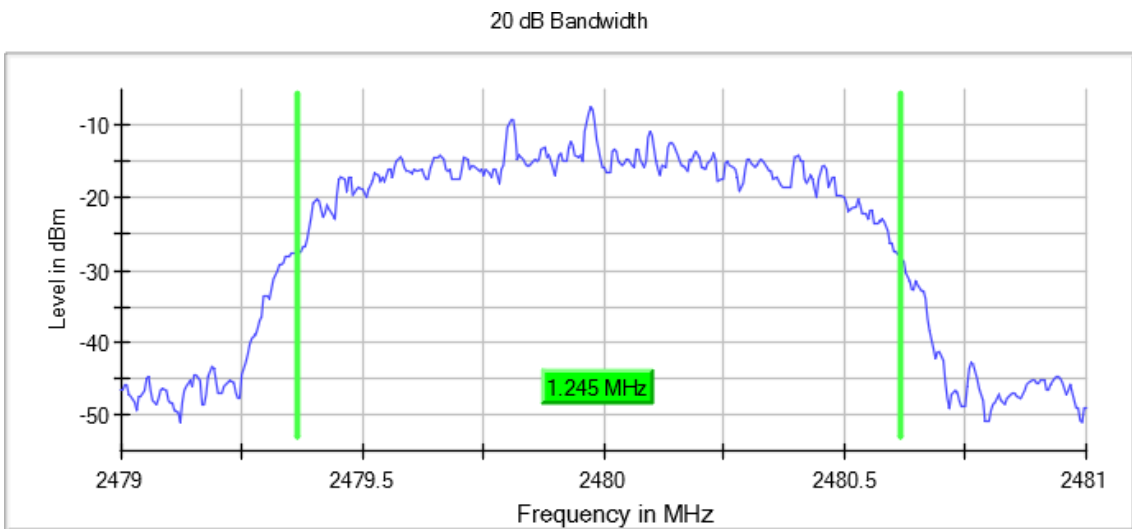
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900	2.47900
Stop Frequency	2.40300 GHz	2.44100	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
Sweep Points	400	400	400
Sweep time	189.648 us	189.648 us	189.648 us
Reference Level	10.000 dBm	10.000 dBm	10.000
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamplifier	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	12 / max. 150	8 / max.	9 / max.
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.09 dB	0.10 dB	0.04 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	BW (MHz)	# of Tx Chains	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	1.01

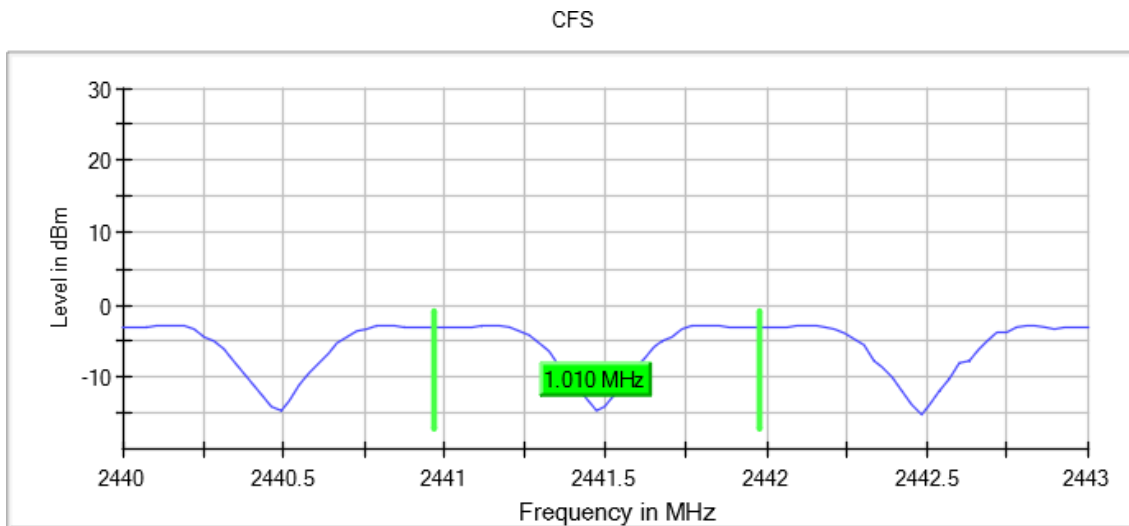
Verdict

Pass

Attachments

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

Images:



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

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

Verdict

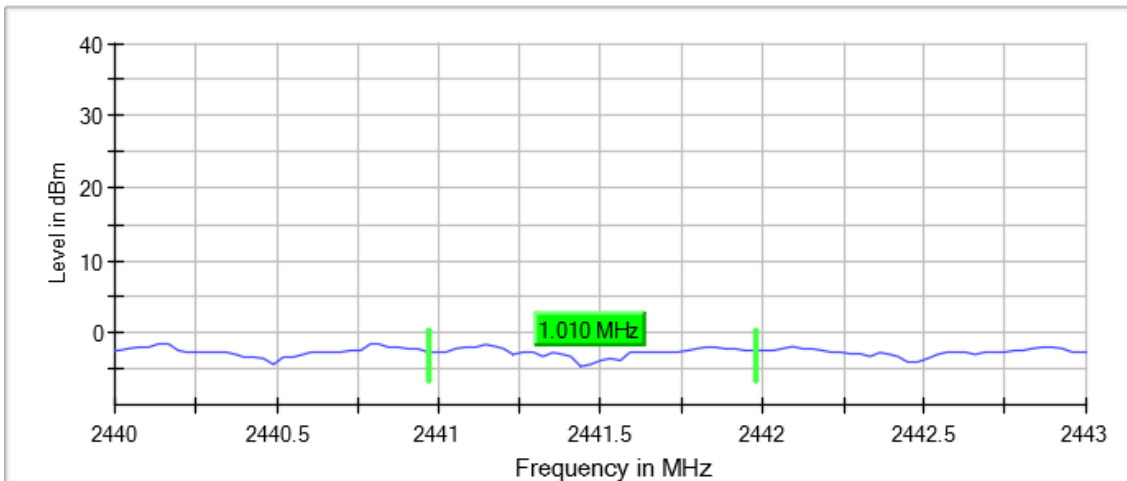
Pass

Attachments

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

Images:

CFS



Modulation: BT (8DPSK 3-DH5)

Results

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

Verdict

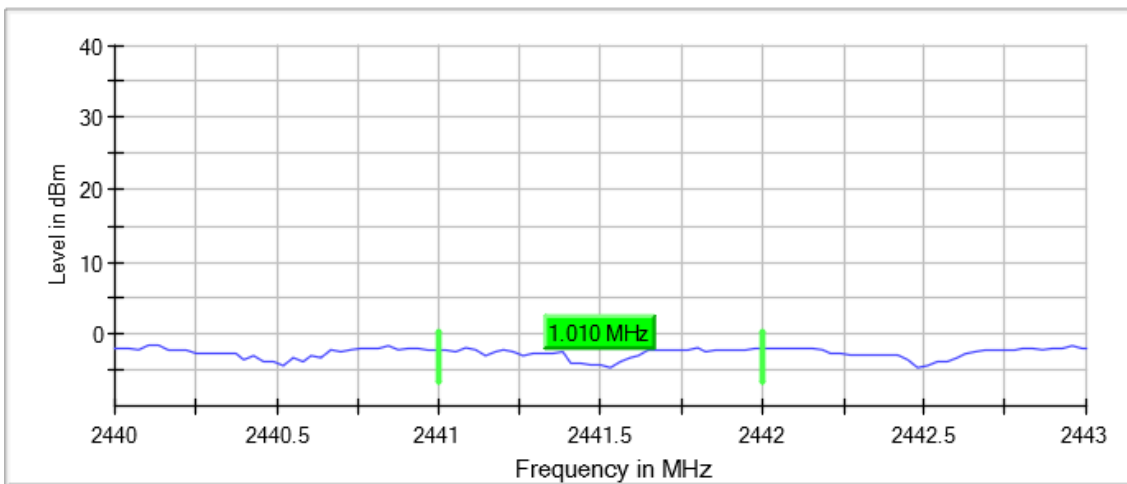
Pass

Attachments

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

Images:

CFS



Measurement Setup

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

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

Limits:

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Modulation: BT (GFSK 1-DH5)

Results

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

Verdict

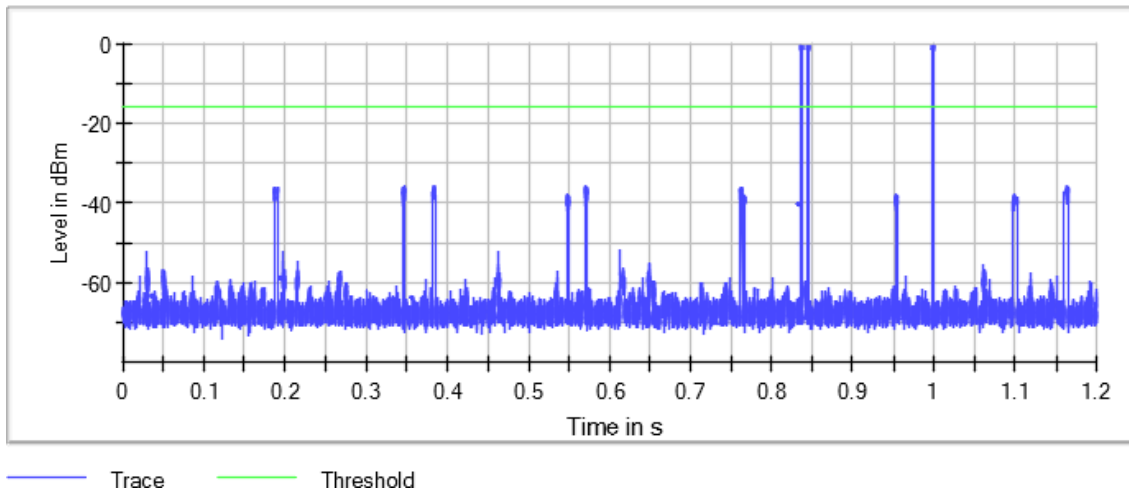
Pass

Attachments

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

Images:

Time of Channel Occupancy



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1		14.28

Verdict

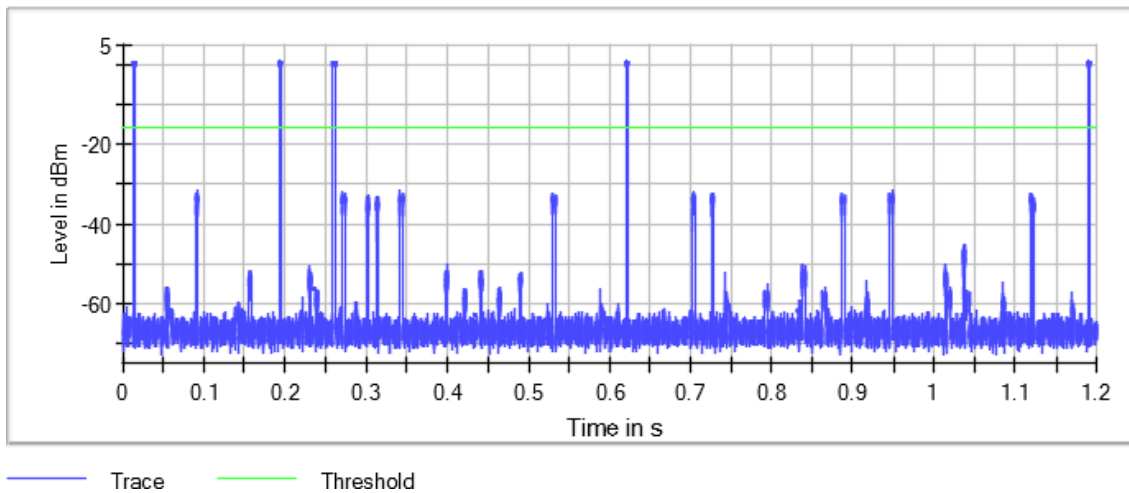
Pass

Attachments

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

Images:

Time of Channel Occupancy



Modulation: BT (8DPSK 3-DH5)

Results

Equipment	BW (MHz)	# of Tx Chains	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	1		8.66

Verdict

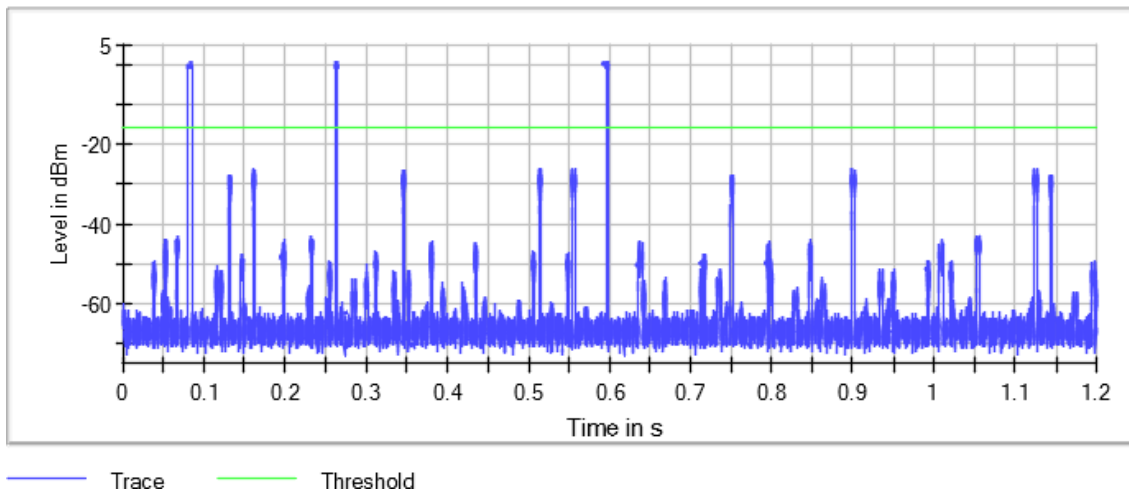
Pass

Attachments

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

Images:

Time of Channel Occupancy



Measurement Setup

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

OSP

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

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

Limits:

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

Modulation: BT (GFSK 1-DH5)

Results

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

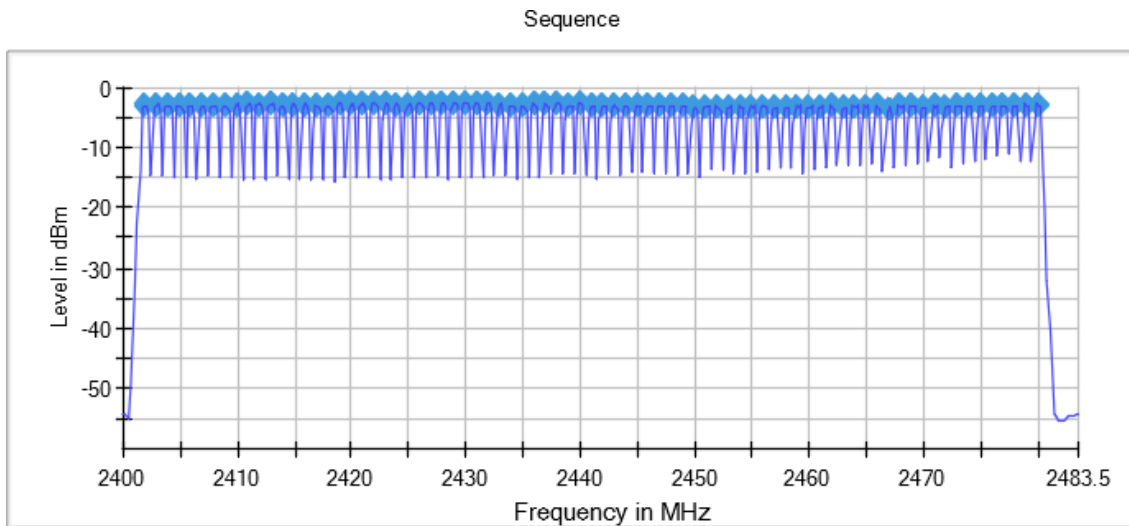
Verdict

Pass

Attachments

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

Images:



Number of Hopping Frequencies: 79

Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

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

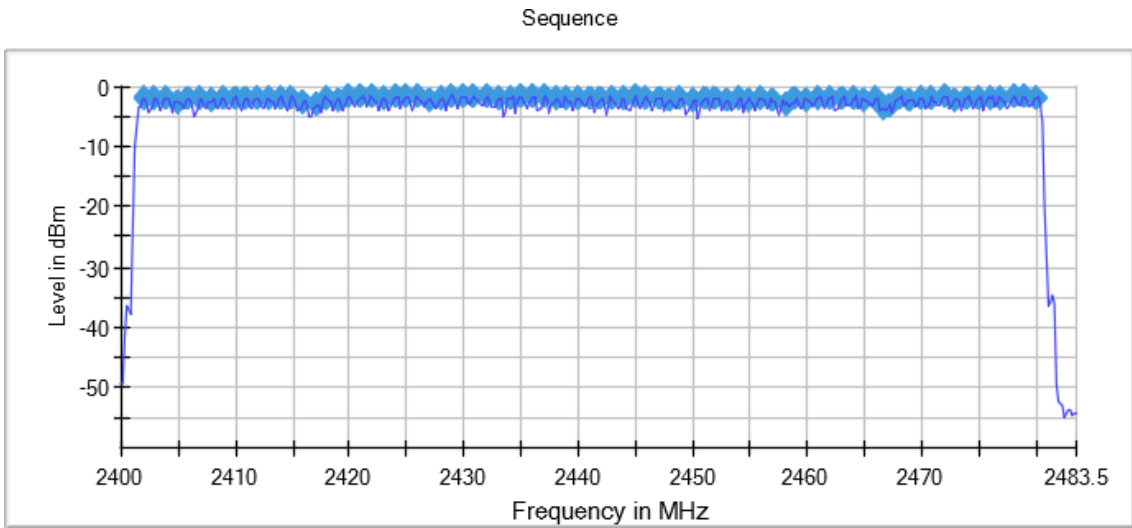
Verdict

Pass

Attachments

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

Images:



Number of Hopping Frequencies: 80

Modulation: BT (8DPSK 3-DH5)

Results

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

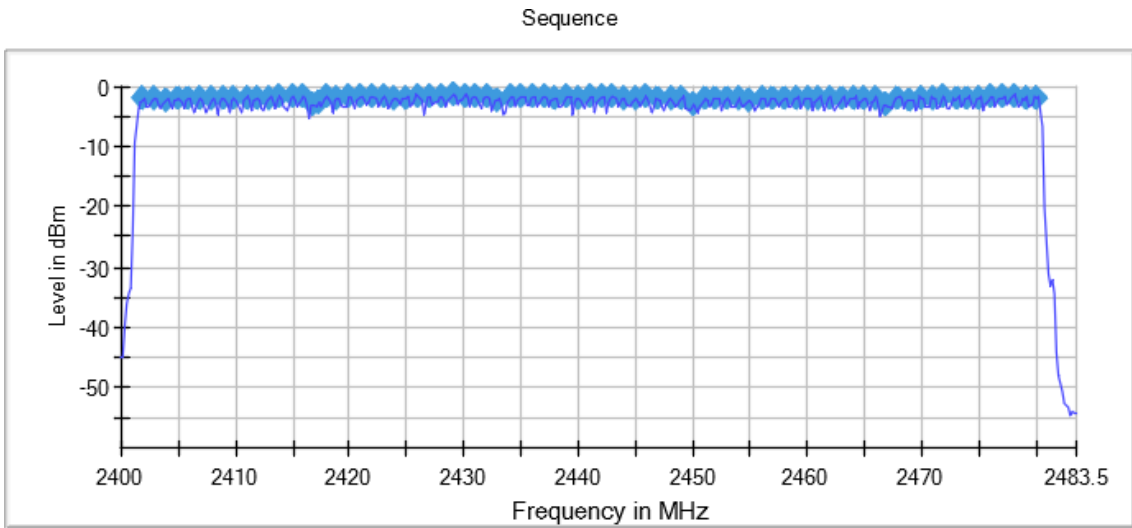
Verdict

Pass

Attachments

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

Images:



Number of Hopping Frequencies: 80

Measurement Setup

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

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

Limits

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

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	8.3
2441.00000					7.9
2480.00000					7.8

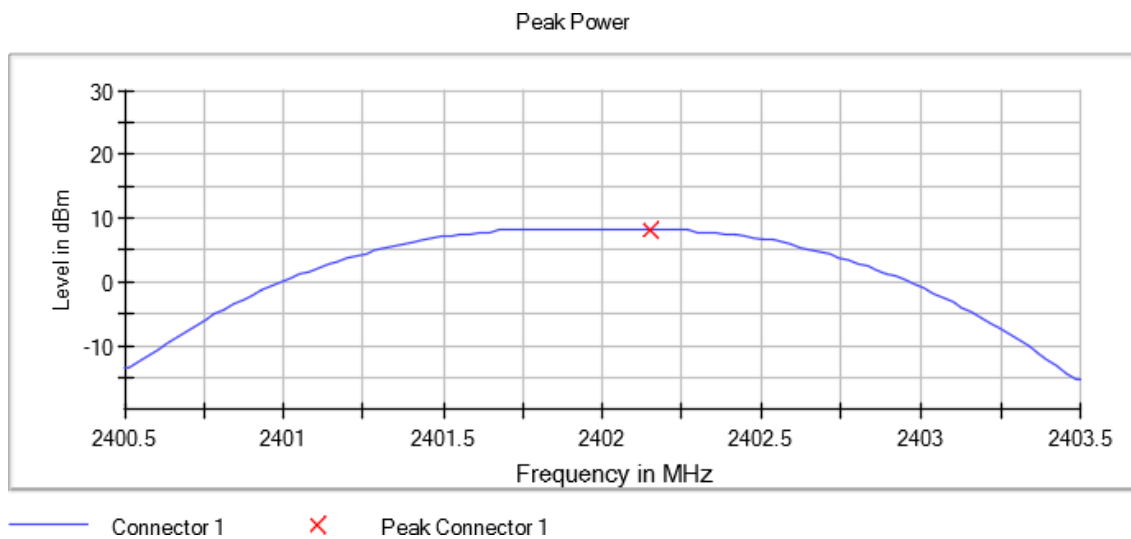
Verdict

Pass

Attachments

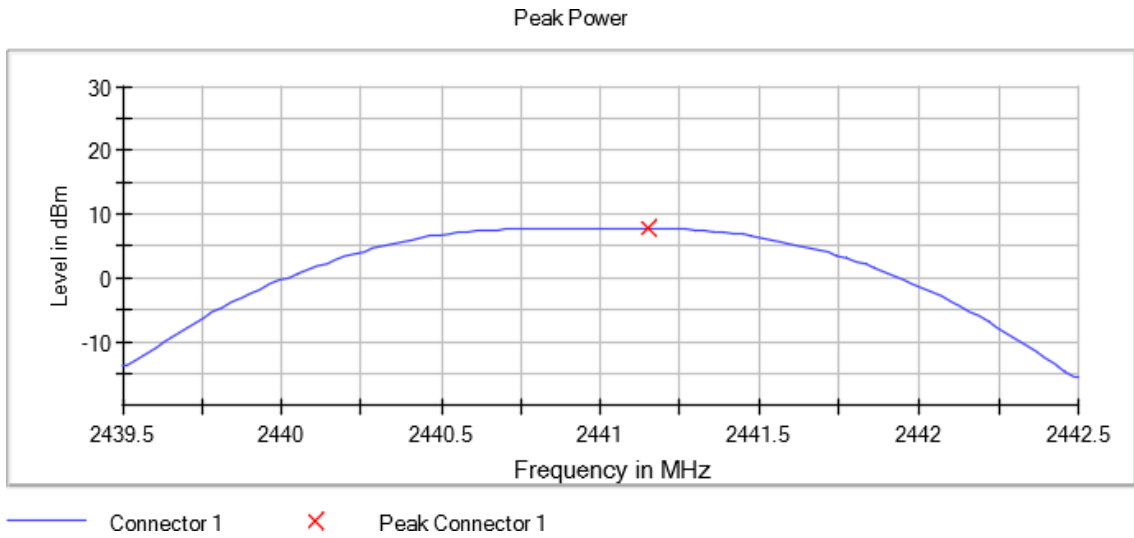
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



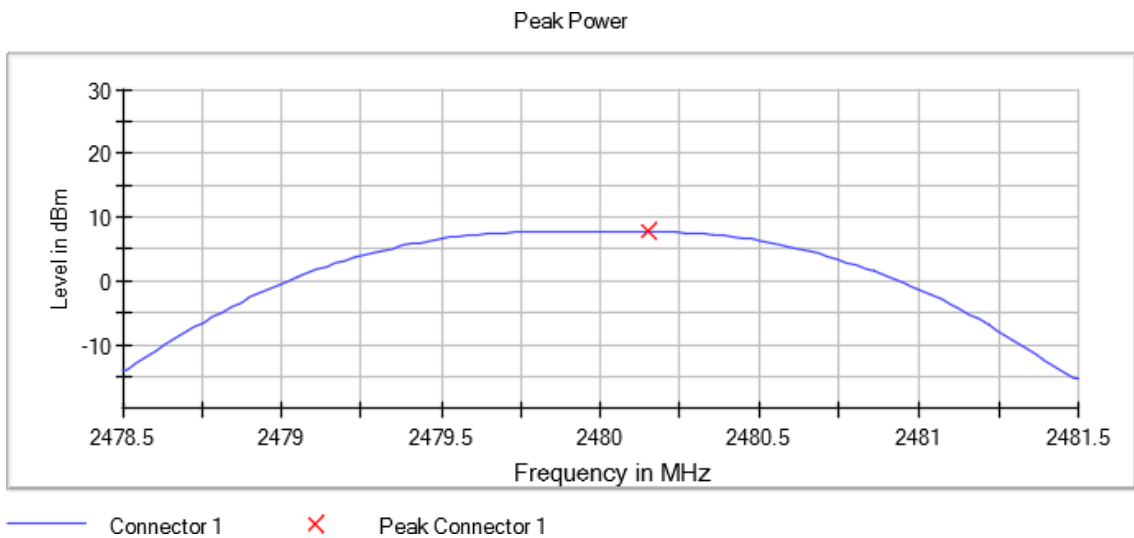
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	11.0
2441.00000					10.9
2480.00000					10.9

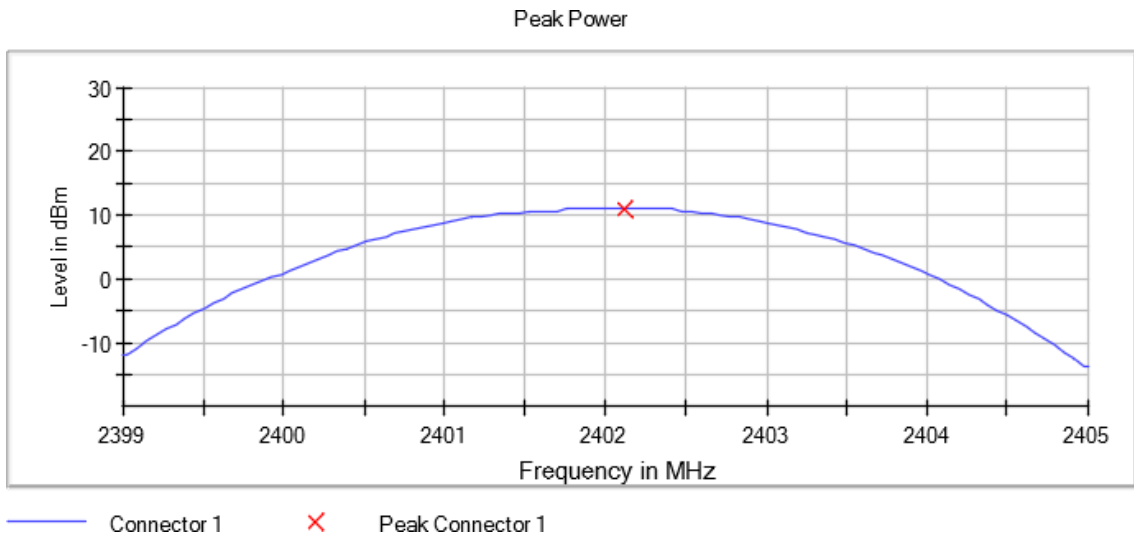
Verdict

Pass

Attachments

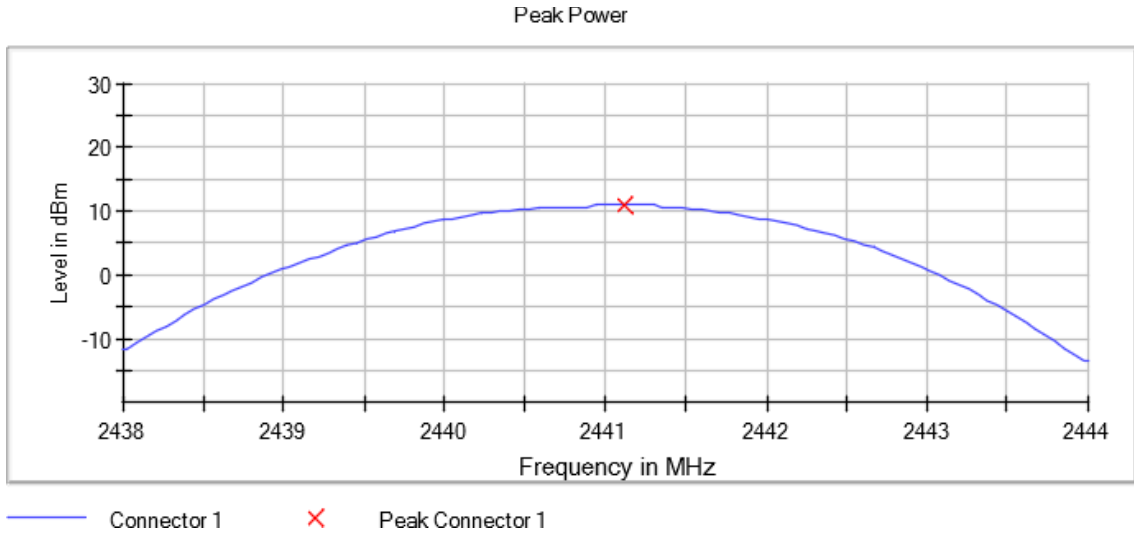
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



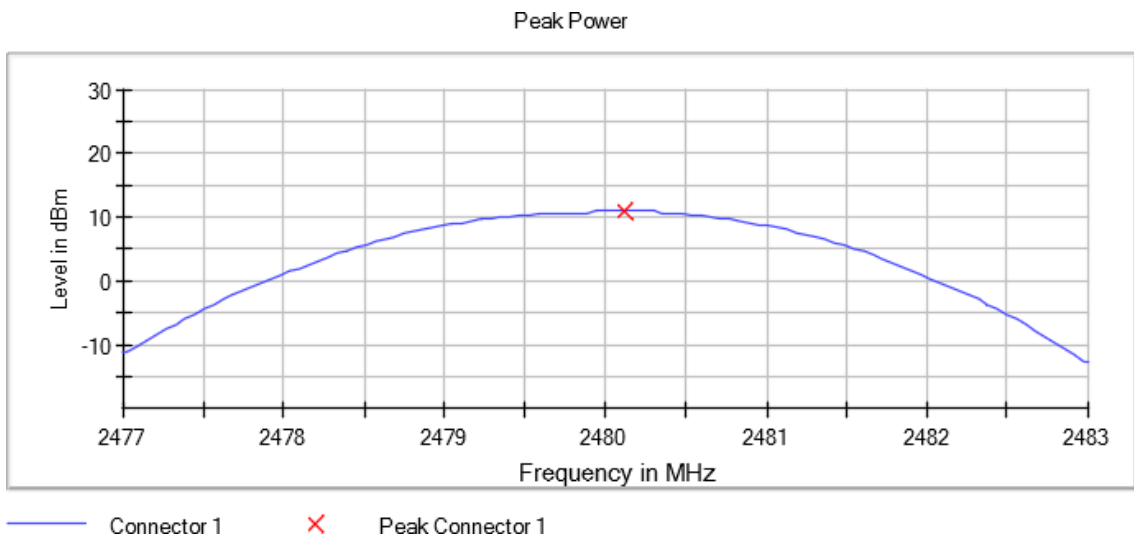
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Peak Power (dBm)
2402.00000	Frequency				11.2
2441.00000	Hopping Spread	1	1	1	11.1
2480.00000	Spectrum systems (DSS)				11.1

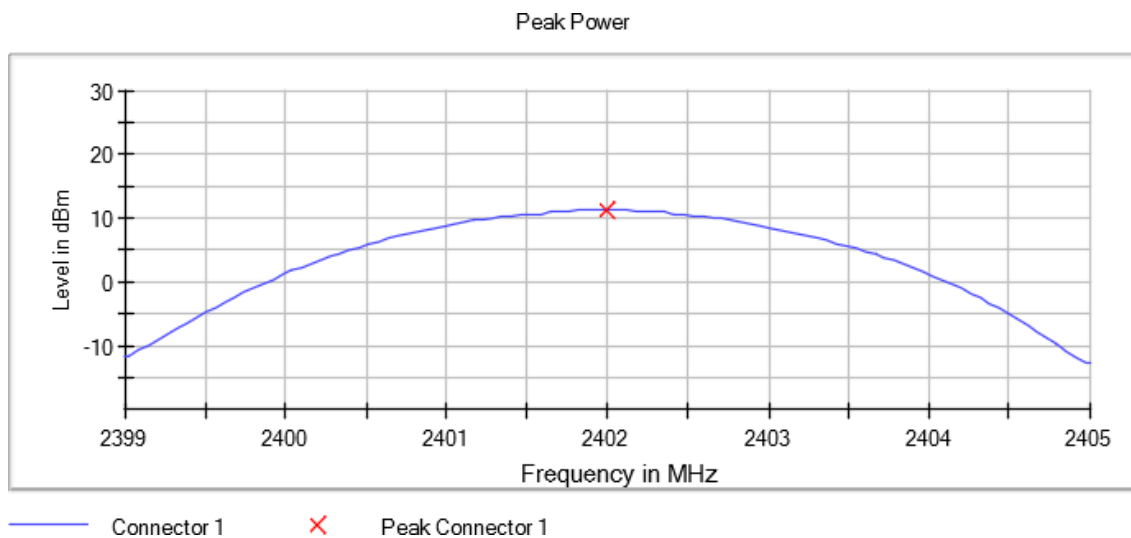
Verdict

Pass

Attachments

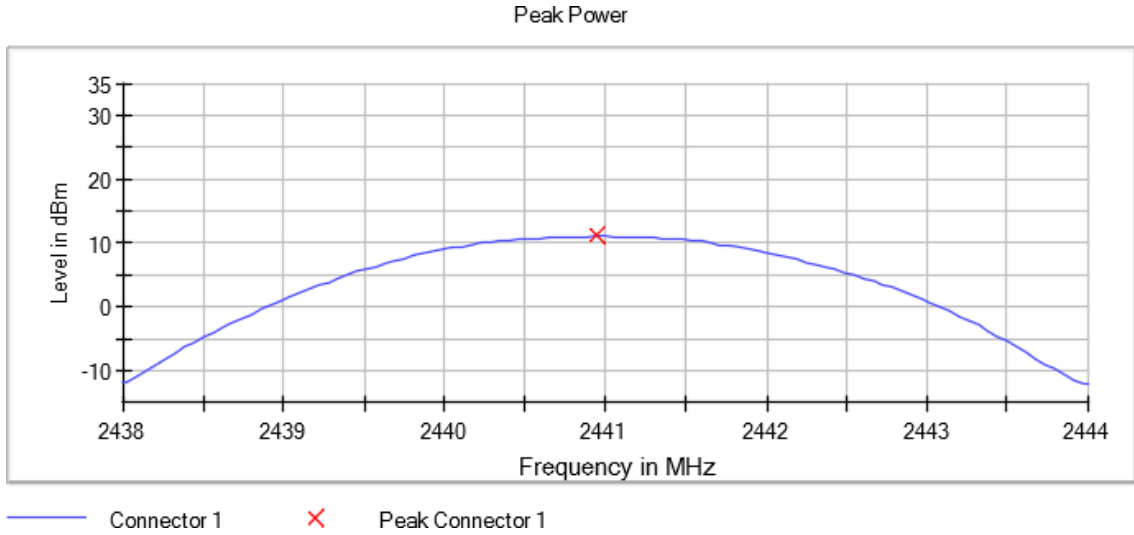
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



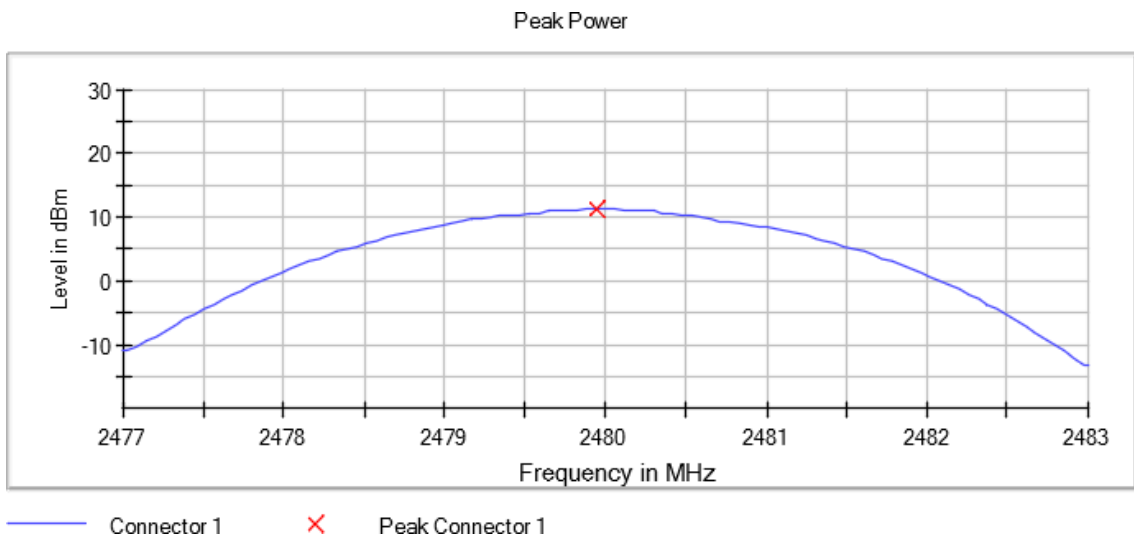
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

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

Limits

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

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Lvl (dBm)
2368.275000	-52.8
2368.325000	-52.8
2356.575000	-53.2
2356.525000	-53.4
2328.375000	-53.5
2328.425000	-53.5
2334.175000	-53.7
2379.025000	-54.0
2356.625000	-54.2
2338.825000	-54.2
2334.225000	-54.3
2378.975000	-54.3
2318.025000	-54.4
2379.975000	-54.4
2342.625000	-54.4
2497.375000	-54.8
2497.825000	-54.9
2497.425000	-54.9
2497.775000	-55.1
2483.675000	-55.2
2484.975000	-55.3
2484.775000	-55.4
2483.625000	-55.4
2496.275000	-55.5
2483.525000	-55.6
2499.675000	-55.6
2494.725000	-55.6
2496.225000	-55.7
2485.025000	-55.7

Freq (MHz)	Lvl (dBm)
2484.825000	-55.7
2359.275000	-54.6
2329.175000	-54.8
2329.125000	-55.0
2359.325000	-55.0
2340.775000	-55.1
2387.625000	-55.1
2327.425000	-55.2
2340.825000	-55.2
2319.175000	-55.3
2487.675000	-54.1
2487.625000	-54.4
2485.225000	-54.5
2485.175000	-54.6
2492.725000	-54.8
2492.675000	-55.1
2485.325000	-55.1
2487.725000	-55.4
2492.775000	-55.4
2387.575000	-55.3
2355.875000	-55.4
2329.225000	-55.4
2355.925000	-55.4
2358.925000	-55.4
2327.375000	-55.4
2485.275000	-55.4
2492.625000	-55.5
2492.575000	-55.5
2484.775000	-55.6
2492.525000	-55.6
2487.425000	-55.7

Verdict

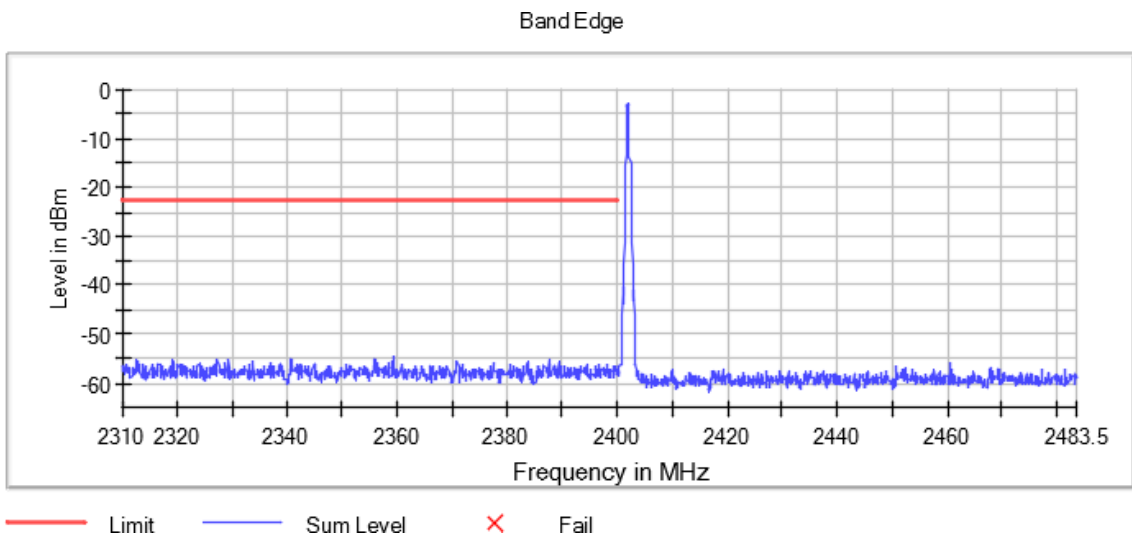
Pass

Attachments

HOPPING OFF (Lowest channel)

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

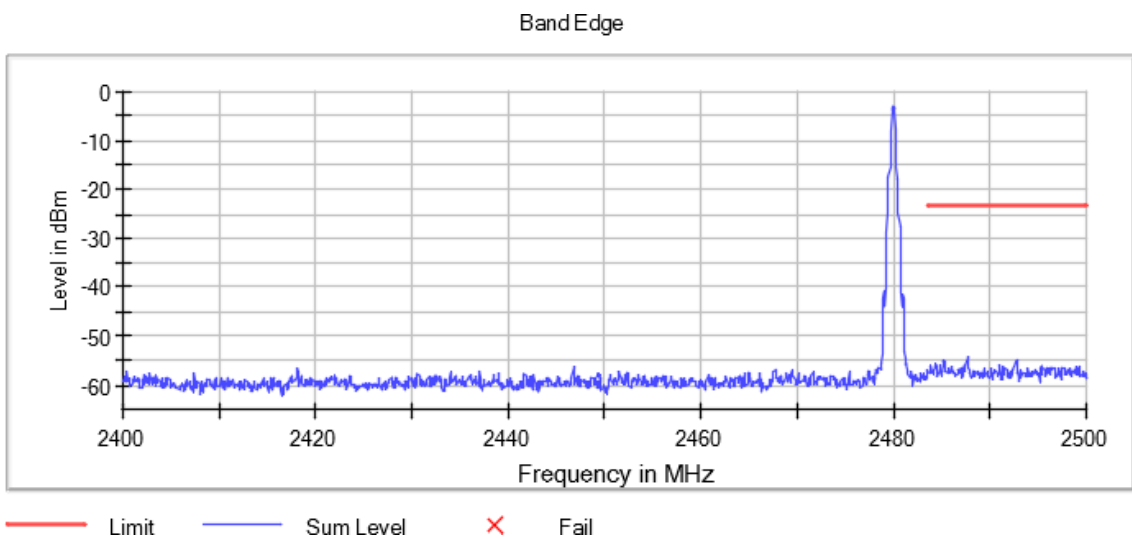
Images:



HOPPING OFF (Highest channel)

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

Images:



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

Freq (MHz)	Lvl (dBm)
2399.875000	-54.3
2399.825000	-54.4
2399.975000	-54.4
2338.875000	-54.6
2325.875000	-54.8
2338.925000	-54.9
2360.325000	-55.0
2338.825000	-55.0
2399.725000	-55.1
2310.525000	-55.2
2399.775000	-55.2
2360.375000	-55.2
2399.925000	-55.3
2340.875000	-55.4
2355.675000	-55.4
2484.725000	-54.5
2484.675000	-54.6
2485.875000	-55.7
2499.325000	-55.8
2487.975000	-55.9
2487.475000	-55.9
2487.525000	-55.9
2498.725000	-55.9
2499.375000	-56.0
2489.225000	-56.0
2485.925000	-56.0
2494.575000	-56.0
2483.575000	-56.0
2494.625000	-56.0
2485.975000	-56.0
2399.975000	-49.2
2399.925000	-50.4
2399.825000	-51.6
2399.725000	-51.9
2399.875000	-51.9
2399.675000	-52.1
2399.775000	-52.5
2399.625000	-52.9

Freq (MHz)	Lvl (dBm)
2399.275000	-53.6
2489.075000	-55.2
2489.125000	-55.3
2496.075000	-55.4
2495.725000	-55.5
2484.425000	-55.5
2495.775000	-55.6
2496.125000	-55.6
2495.225000	-55.7
2484.375000	-55.8
2398.875000	-53.8
2399.325000	-53.8
2399.525000	-53.9
2398.675000	-54.1
2399.575000	-54.2
2398.925000	-54.2
2483.575000	-55.8
2494.475000	-55.9
2496.175000	-55.9
2486.025000	-55.9
2483.525000	-55.9
2484.475000	-55.9

Verdict

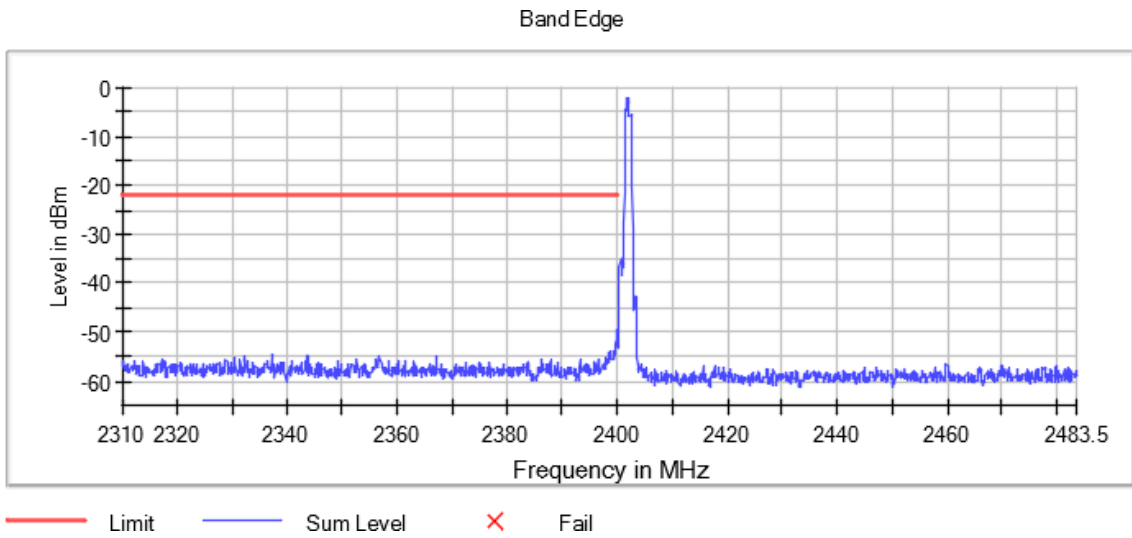
Pass

Attachments

HOPPING OFF (Lowest channel)

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

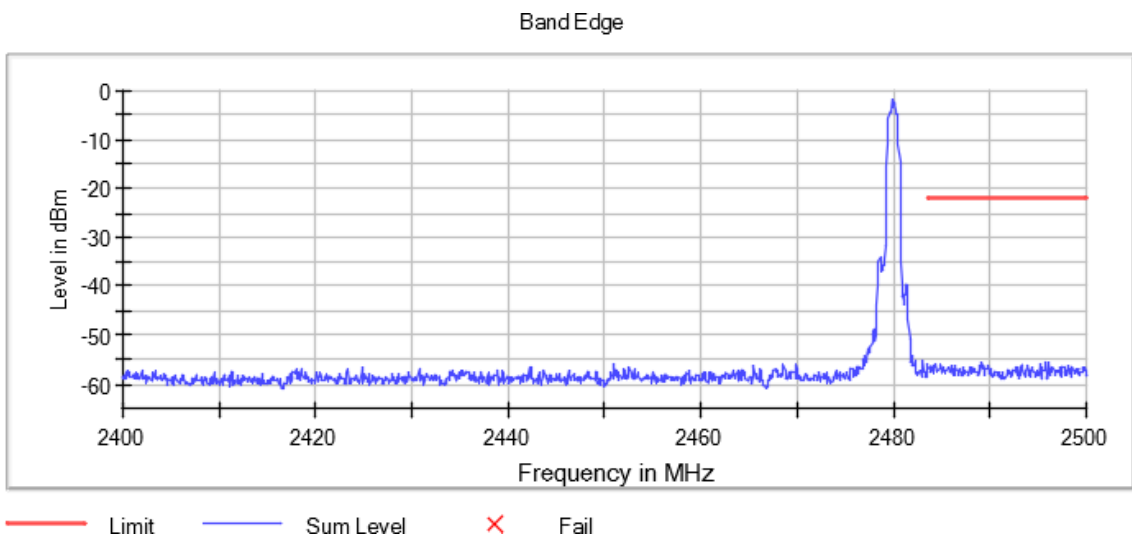
Images:



HOPPING OFF (Highest channel)

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

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Lvl (dBm)
2399.825000	-50.6
2399.775000	-50.9
2399.875000	-52.1
2329.225000	-54.2
2329.175000	-54.5
2399.725000	-54.9
2399.425000	-55.0
2341.775000	-55.0
2371.125000	-55.2
2329.275000	-55.2
2399.375000	-55.2
2399.975000	-55.3
2328.925000	-55.3
2341.725000	-55.3
2328.975000	-55.4
2483.575000	-55.5
2483.975000	-55.6
2483.925000	-55.6
2485.425000	-55.7
2489.175000	-55.7
2483.525000	-55.7
2498.125000	-56.0
2489.225000	-56.0
2484.125000	-56.0
2496.675000	-56.1
2498.075000	-56.1
2486.575000	-56.1
2497.225000	-56.2
2485.375000	-56.3
2485.525000	-56.3
2399.975000	-49.1
2399.925000	-49.3
2399.625000	-49.4
2399.675000	-49.4
2399.725000	-49.4
2399.775000	-49.8
2399.825000	-49.8
2399.875000	-49.9

Freq (MHz)	Lvl (dBm)
2399.575000	-50.3
2483.575000	-54.0
2483.525000	-54.0
2493.425000	-54.2
2484.425000	-54.3
2493.375000	-54.4
2484.375000	-54.8
2487.825000	-55.1
2483.725000	-55.1
2483.875000	-55.1
2399.525000	-51.1
2399.475000	-51.4
2398.975000	-51.7
2398.925000	-51.8
2398.775000	-52.0
2398.725000	-52.0
2483.675000	-55.2
2484.175000	-55.2
2488.825000	-55.2
2487.775000	-55.2
2488.875000	-55.3
2483.925000	-55.5

Verdict

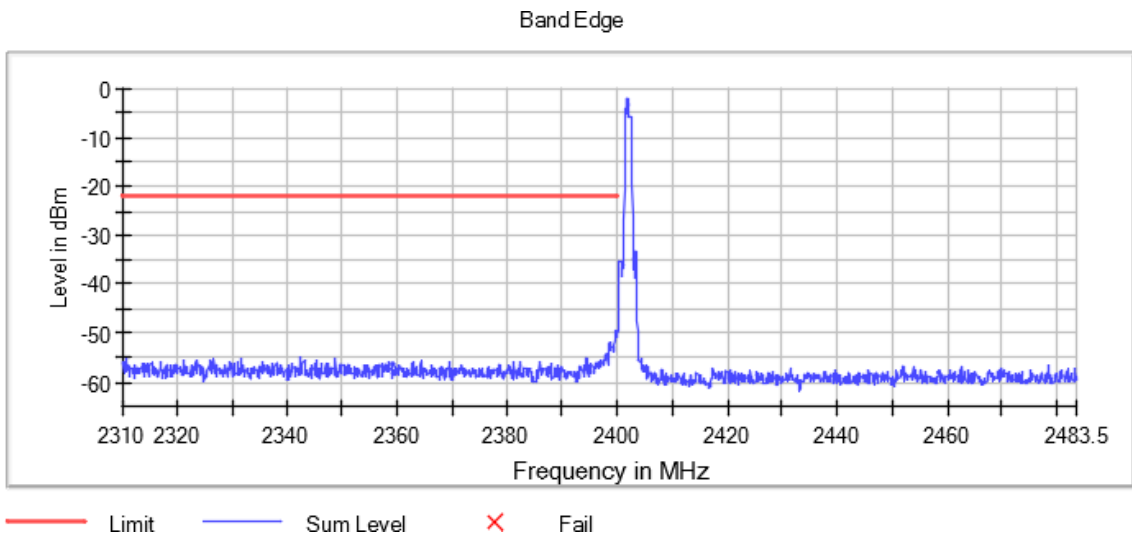
Pass

Attachments

HOPPING OFF (Lowest channel)

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

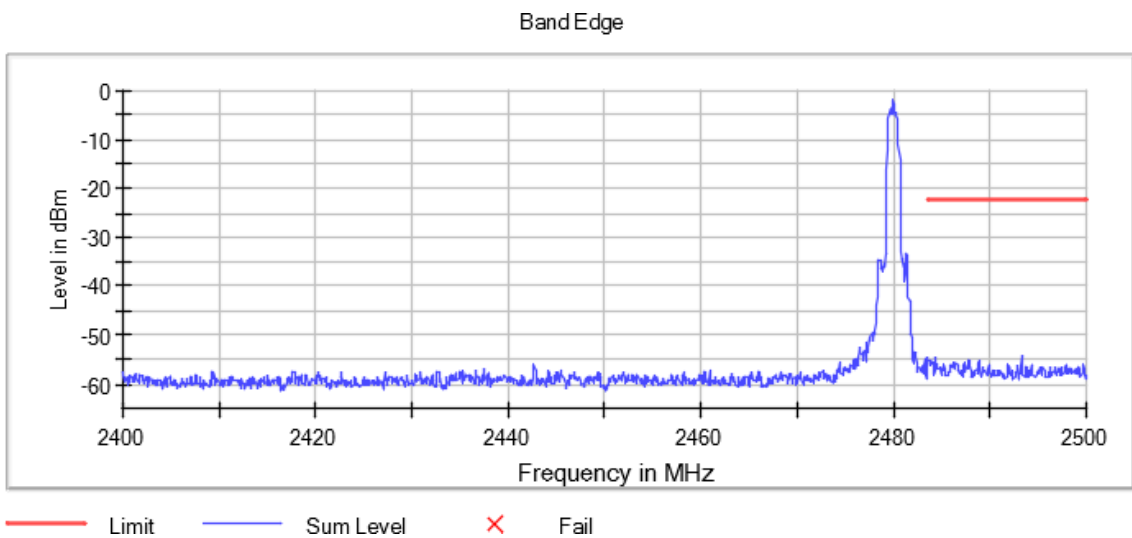
Images:



HOPPING OFF (Highest channel)

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

Images:



Measurement Setup

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	4 / max. 150	132 / max.
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.49 dB

Modulation: BT (GFSK 1-DH5)

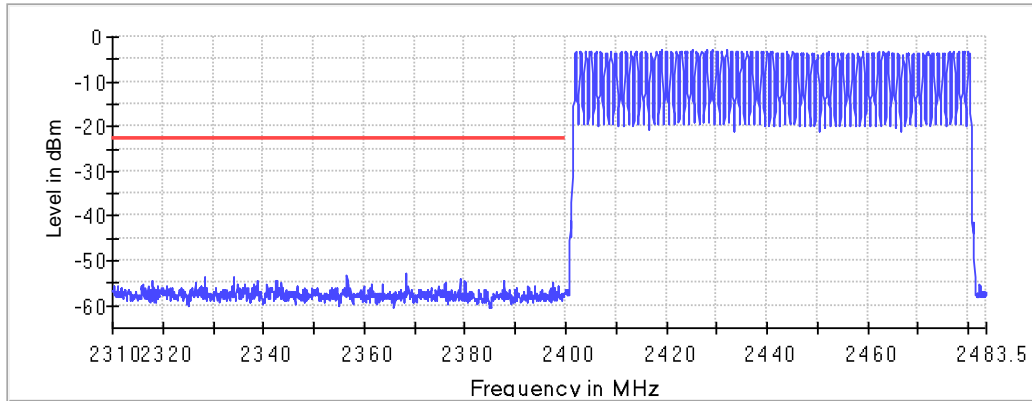
HOPPING ON (Lowest channel) Results

Frequency (MHz)	Level (dBm)
2368.275000	-52.8
2368.325000	-52.8
2356.575000	-53.2
2356.525000	-53.4
2328.375000	-53.5
2328.425000	-53.5
2334.175000	-53.7
2379.025000	-54.0
2356.625000	-54.2
2338.825000	-54.2
2334.225000	-54.3
2378.975000	-54.3
2318.025000	-54.4
2379.975000	-54.4
2342.625000	-54.4

Verdict

Pass

Band Edge



— Limit — Sum Level × Fail

Measurement Setup

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 μ s	94.727 μ s
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. 150	132 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.49 dB

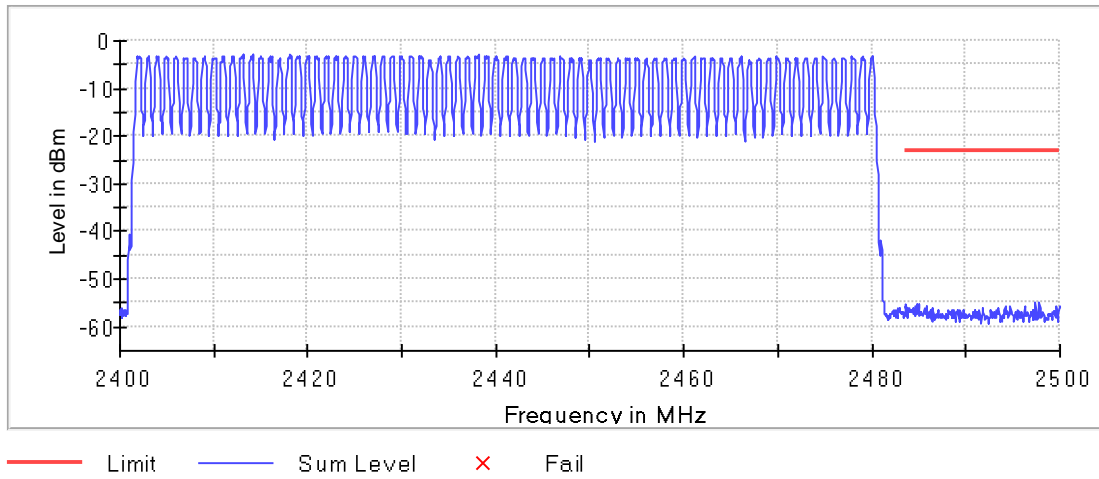
HOPPING ON (Highest channel)

Frequency (MHz)	Level (dBm)
2497.375000	-54.8
2497.825000	-54.9
2497.425000	-54.9
2497.775000	-55.1
2483.675000	-55.2
2484.975000	-55.3
2484.775000	-55.4
2483.625000	-55.4
2496.275000	-55.5
2483.525000	-55.6
2499.675000	-55.6
2494.725000	-55.6
2496.225000	-55.7
2485.025000	-55.7
2484.825000	-55.7

Verdict

Pass

Band Edge



Measurement Setup

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 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	101 / max.	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable	0.11 dB	0.00 dB

Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

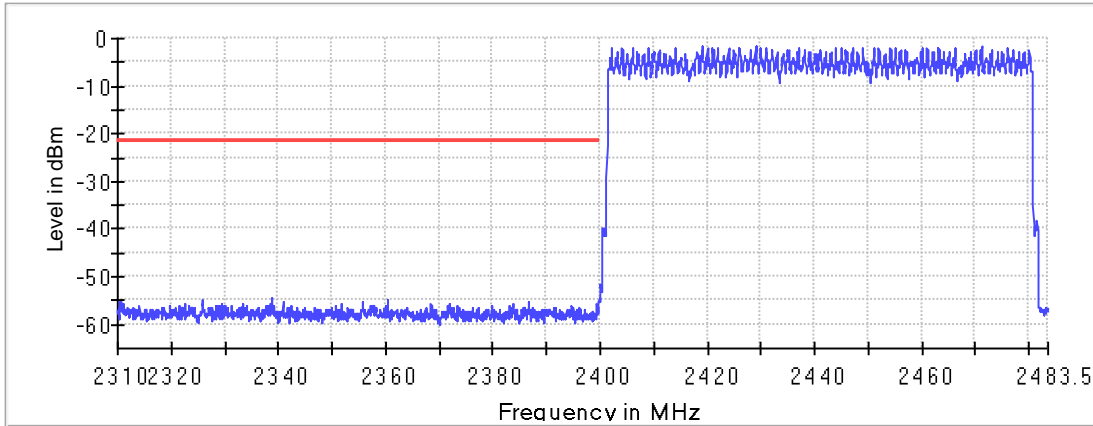
HOPPING ON (Lowest channel)

Frequency (MHz)	Level (dBm)
2399.875000	-54.3
2399.825000	-54.4
2399.975000	-54.4
2338.875000	-54.6
2325.875000	-54.8
2338.925000	-54.9
2360.325000	-55.0
2338.825000	-55.0
2399.725000	-55.1
2310.525000	-55.2
2399.775000	-55.2
2360.375000	-55.2
2399.925000	-55.3
2340.875000	-55.4
2355.675000	-55.4

Verdict

Pass

Band Edge



— Limit — Sum Level × Fail

Measurement Setup

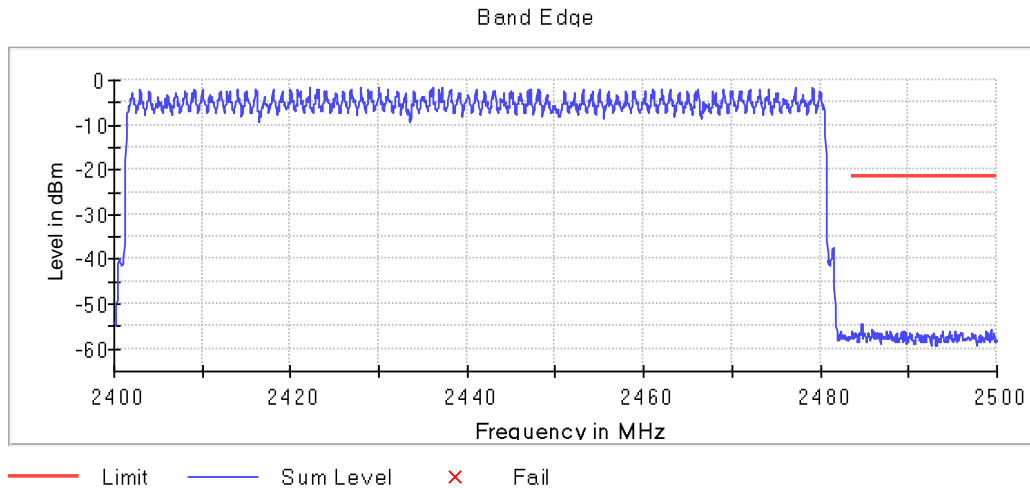
Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	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. 150	121 / max.
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

HOPPING ON (Highest channel)

Frequency (MHz)	Level (dBm)
2484.725000	-54.5
2484.675000	-54.6
2485.875000	-55.7
2499.325000	-55.8
2487.975000	-55.9
2487.475000	-55.9
2487.525000	-55.9
2498.725000	-55.9
2499.375000	-56.0
2489.225000	-56.0
2485.925000	-56.0
2494.575000	-56.0
2483.575000	-56.0
2494.625000	-56.0
2485.975000	-56.0

Verdict

Pass



Measurement Setup

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 μ s	18.945 μ s
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	136 / max.	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

Modulation: BT (8DPSK 3-DH5)

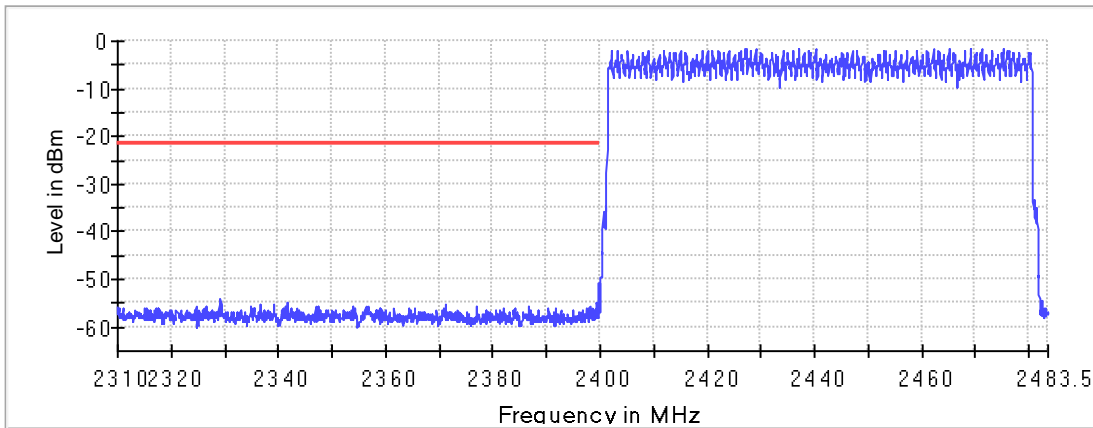
HOPPING ON (Lowest channel)

Frequency (MHz)	Level (dBm)
2399.825000	-50.6
2399.775000	-50.9
2399.875000	-52.1
2329.225000	-54.2
2329.175000	-54.5
2399.725000	-54.9
2399.425000	-55.0
2341.775000	-55.0
2371.125000	-55.2
2329.275000	-55.2
2399.375000	-55.2
2399.975000	-55.3
2328.925000	-55.3
2341.725000	-55.3
2328.975000	-55.4

Verdict

Pass

Band Edge



Measurement Setup

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	4 / max. 150	133 / max.
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

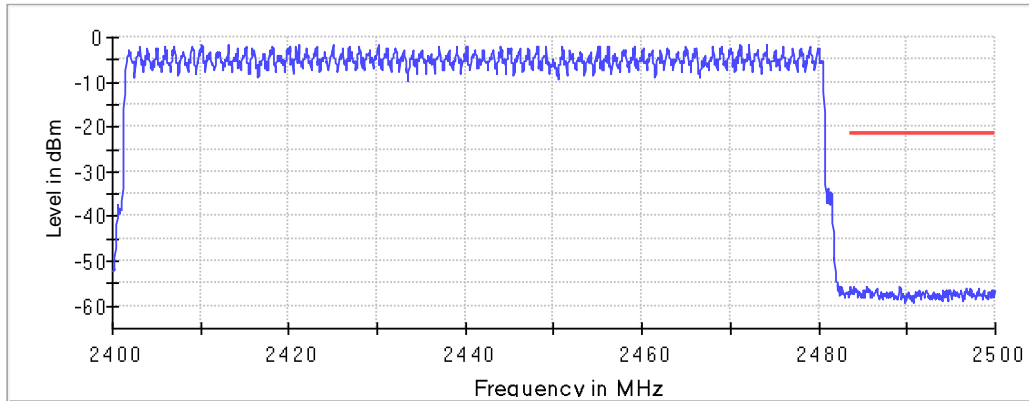
HOPPING ON (Highest channel)

Frequency (MHz)	Level (dBm)
2483.575000	-55.5
2483.975000	-55.6
2483.925000	-55.6
2485.425000	-55.7
2489.175000	-55.7
2483.525000	-55.7
2498.125000	-56.0
2489.225000	-56.0
2484.125000	-56.0
2496.675000	-56.1
2498.075000	-56.1
2486.575000	-56.1
2497.225000	-56.2
2485.375000	-56.3
2485.525000	-56.3

Verdict

Pass

Band Edge



— Limit — Sum Level × Fail

Measurement Setup

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 μ s	18.945 μ s
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	126 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.40 dB	0.00 dB

9dBw Occupied Channel Bandwidth 99%

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2402.00000	Frequency Hopping Spread Spectrum systems (DSS)	1	1	1	0.860
2441.00000					0.865
2480.00000					0.860

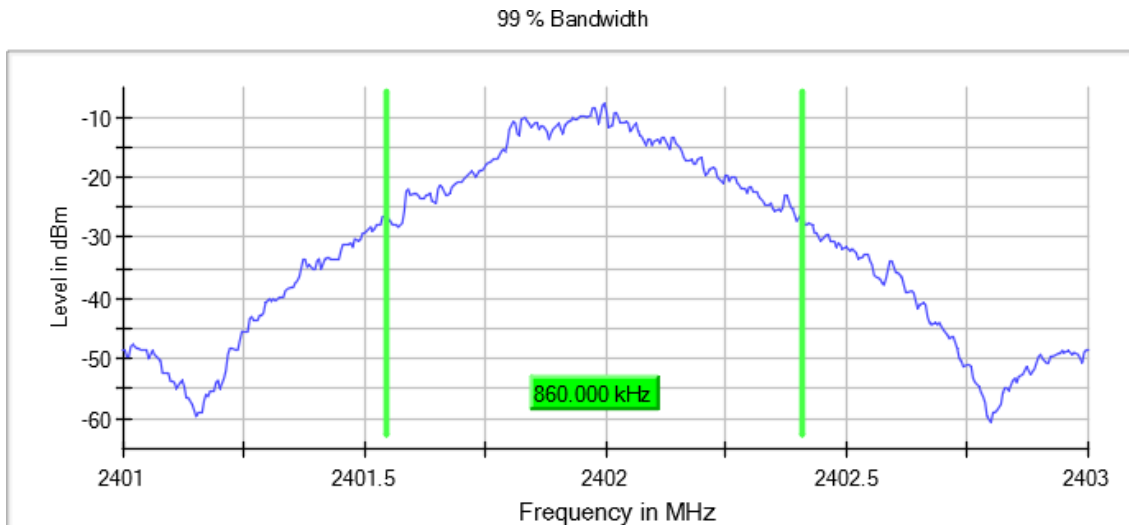
Verdict

Pass

Attachments

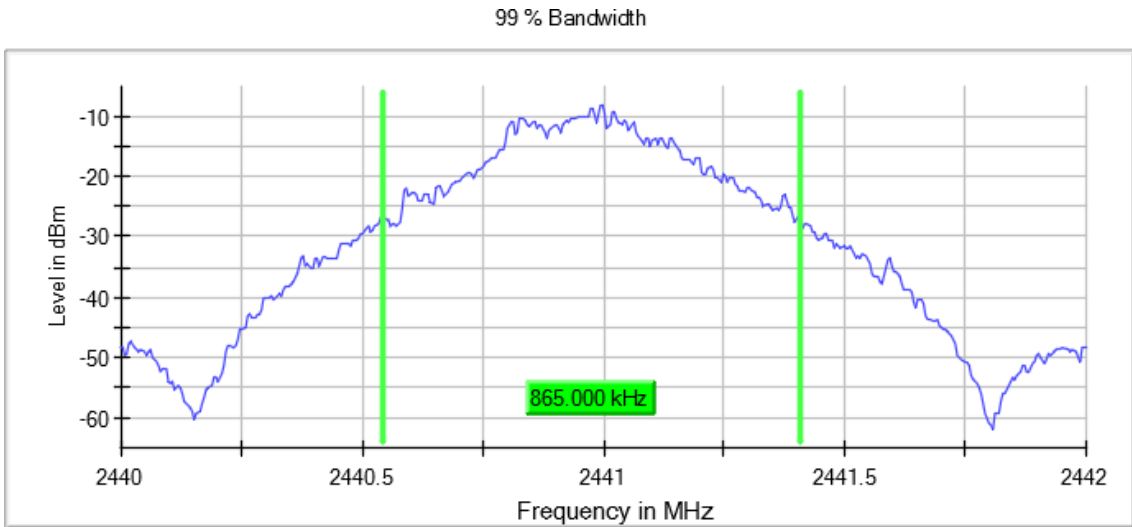
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



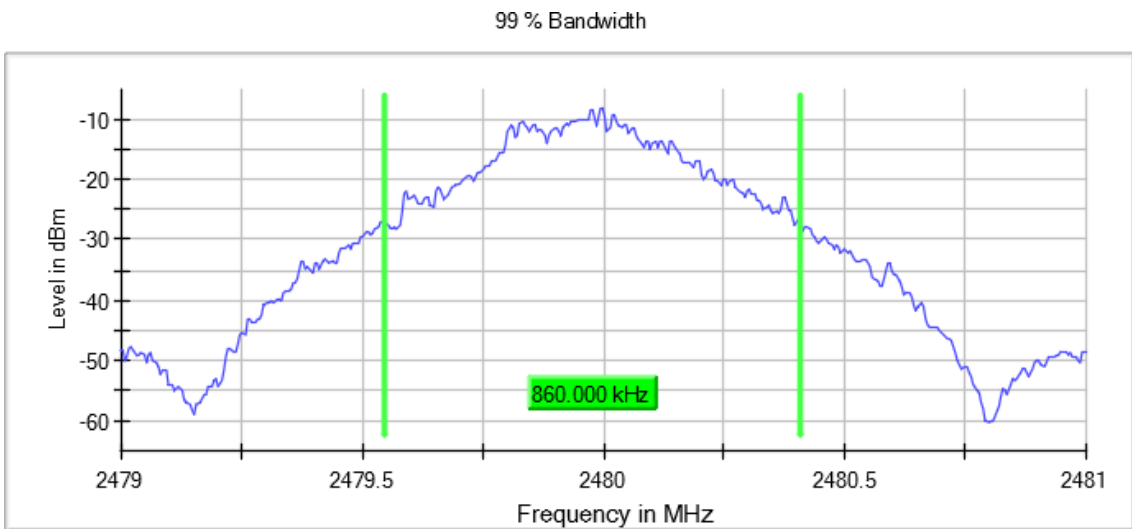
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT (GFSK 1-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

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

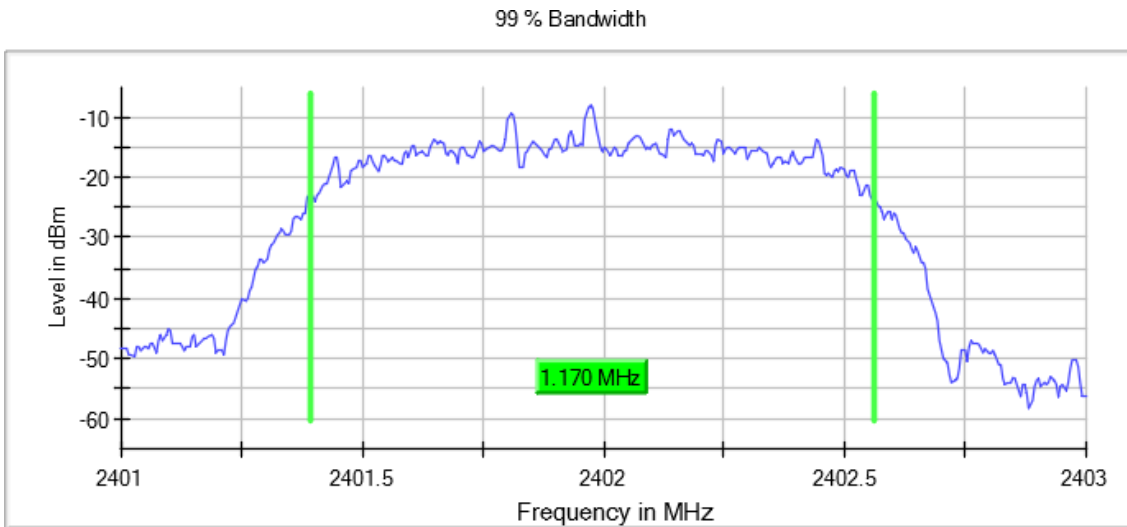
Verdict

Pass

Attachments

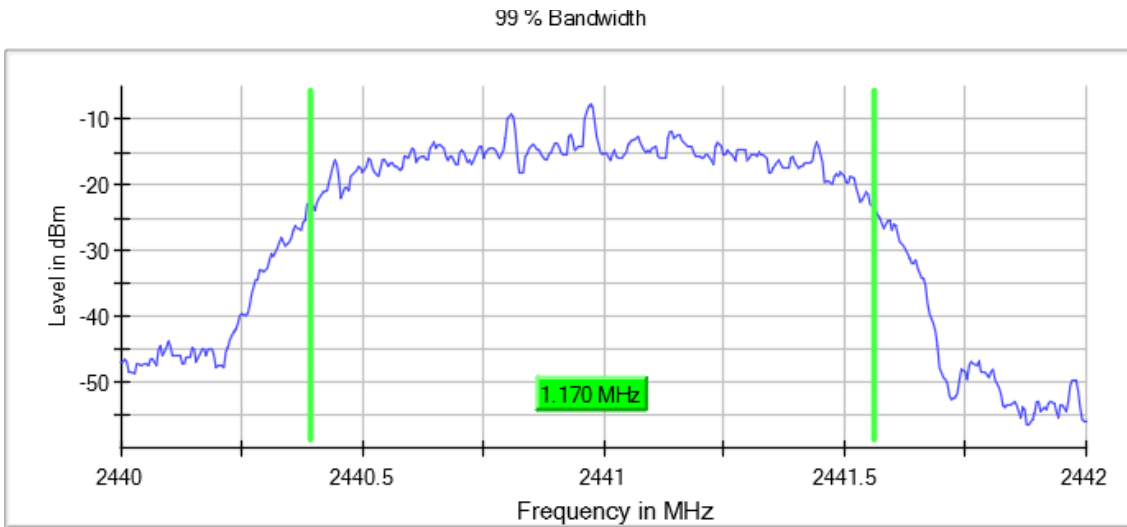
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



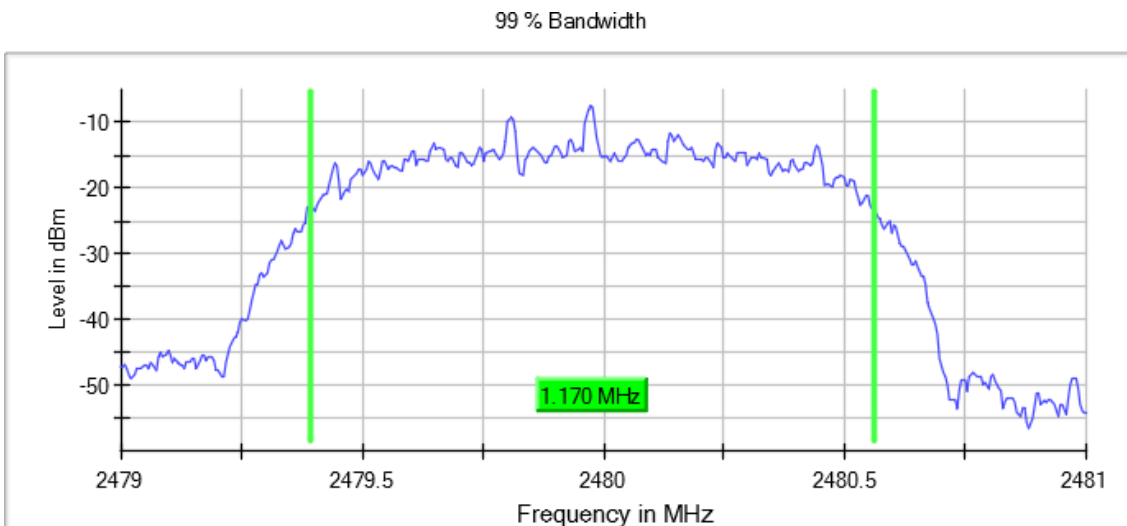
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT ($\pi/4$ -DQPSK 2-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: BT (8DPSK 3-DH5)

Results

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

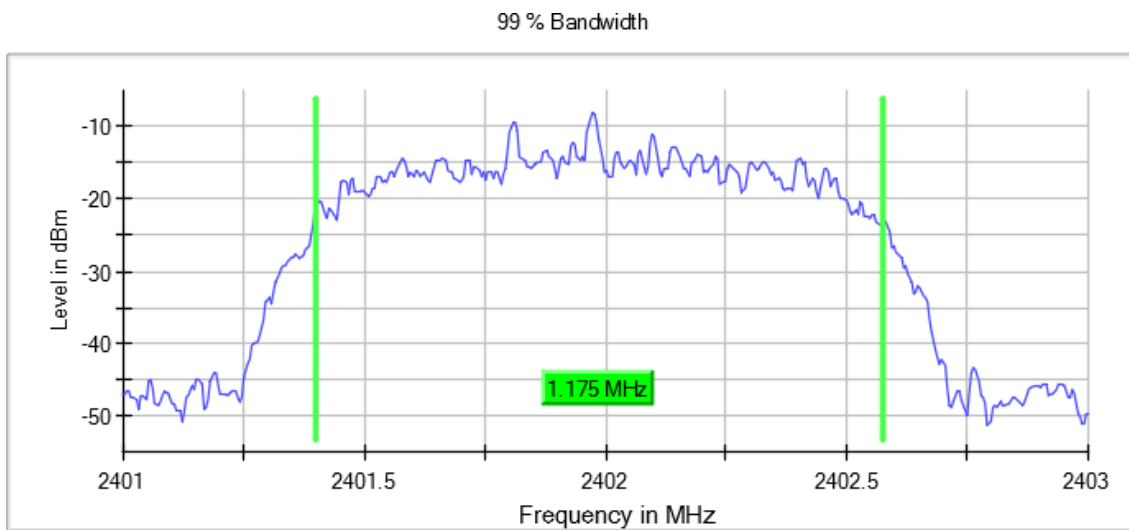
Verdict

Pass

Attachments

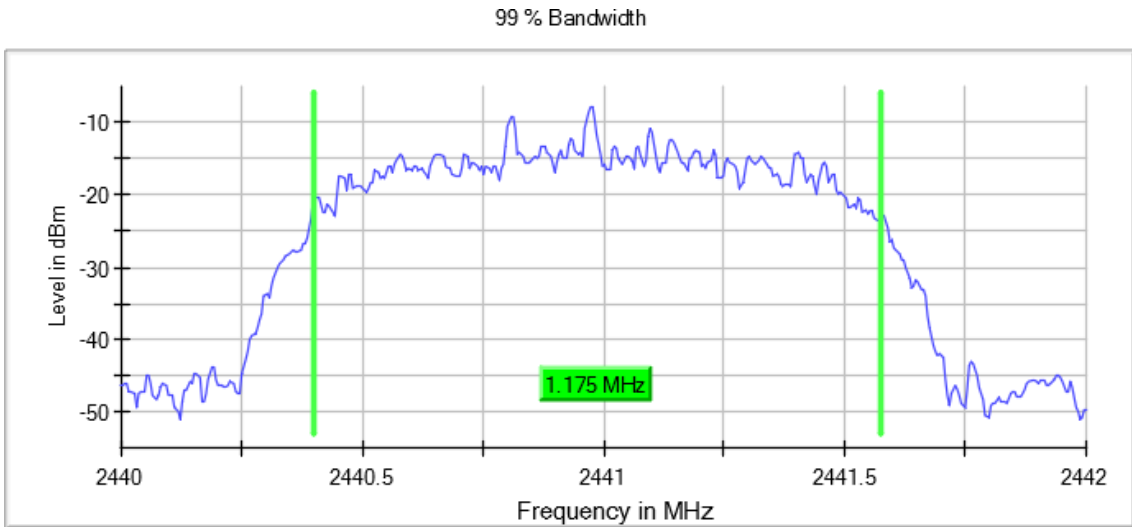
Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



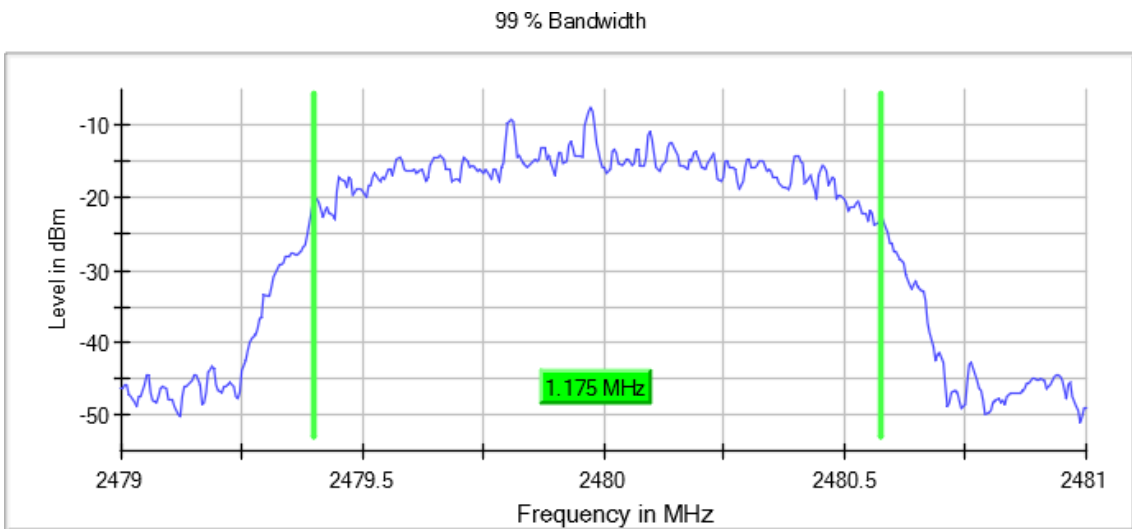
Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS),
Bandwidth MHz = 1, Modulation = BT (8DPSK 3-DH5), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

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

Limits

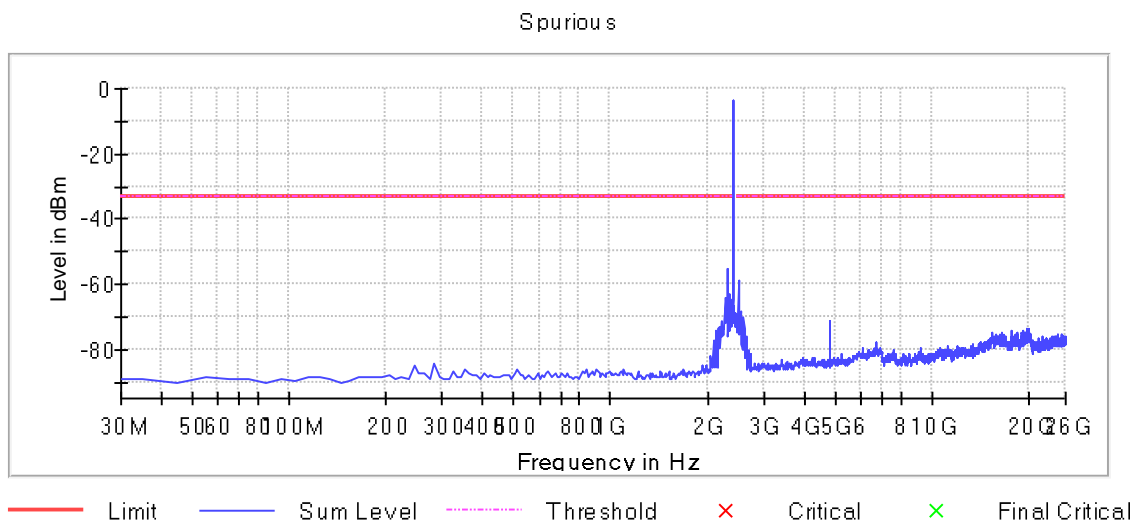
In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of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

Modulation: BTBR (GFSK 1-DH5)

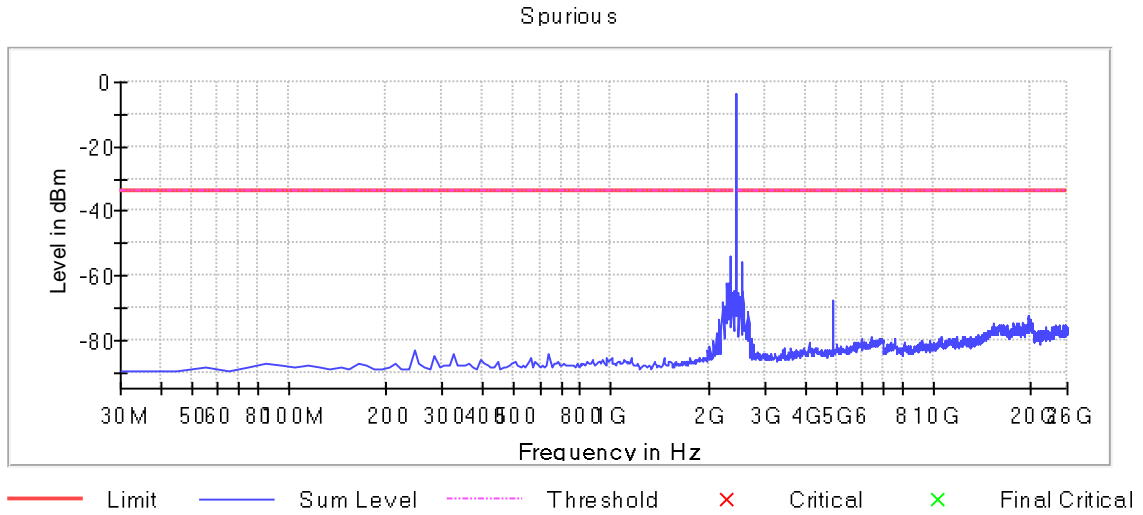
Results

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

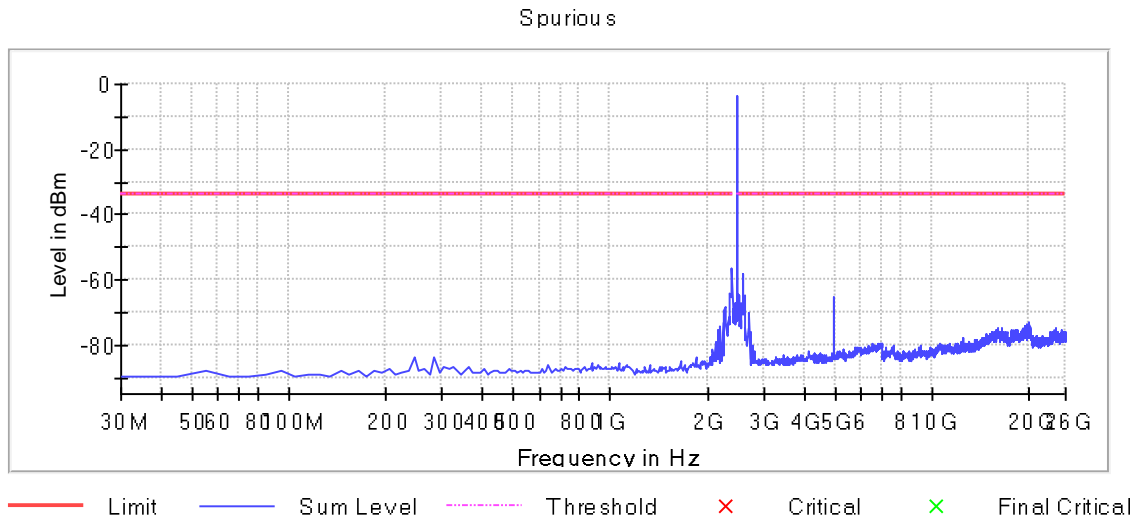
Lowest Channel



Middle Channel



Highest Channel



Verdict

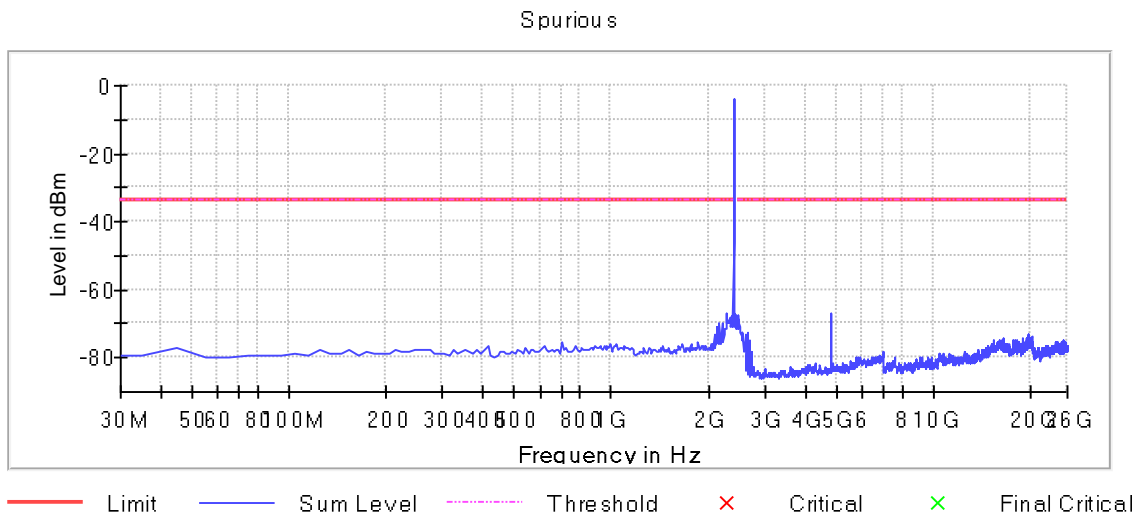
Pass

Modulation: BTEDR ($\pi/4$ -DQPSK 2-DH5)

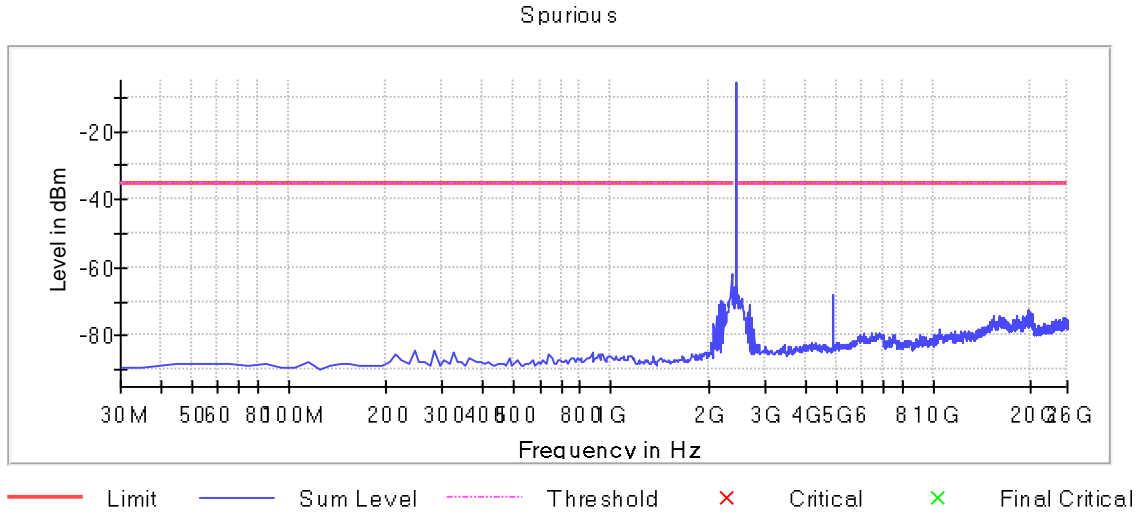
Results

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

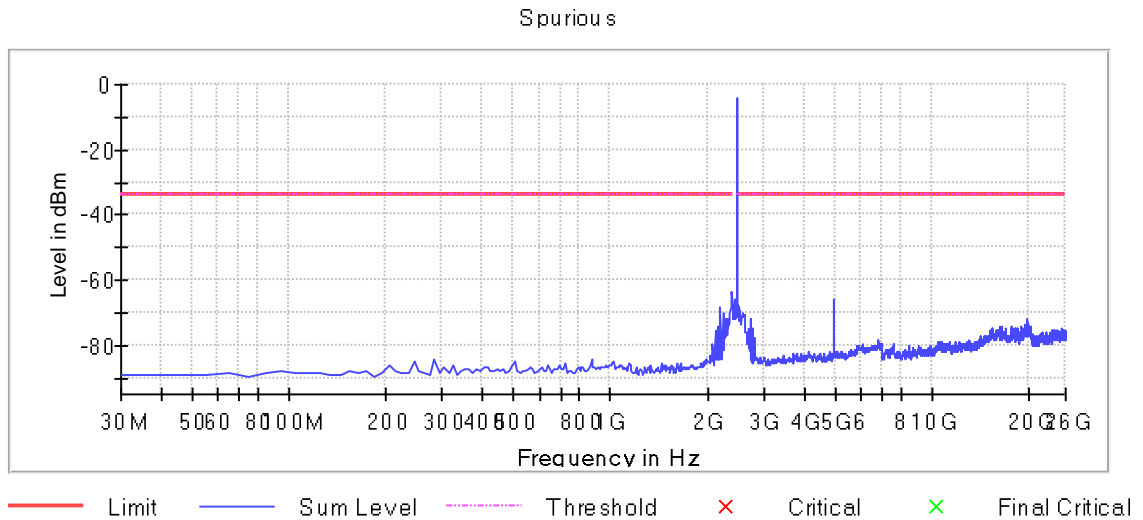
Lowest Channel



Middle Channel



Highest Channel



Verdict

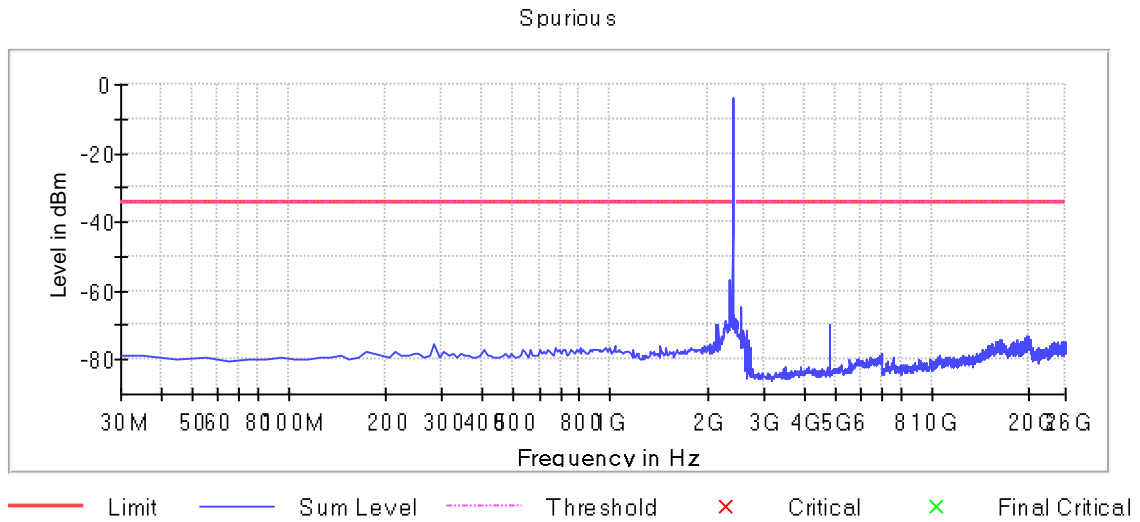
Pass

Modulation: BTEDR (8DPSK 3-DH5)

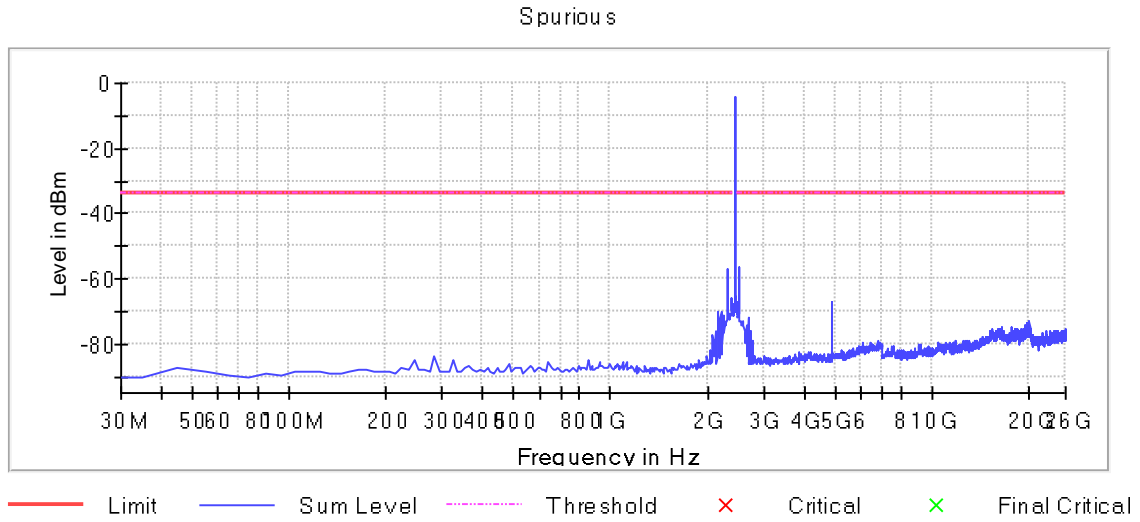
Conducted spurious signals detected were minimum 20 dB respect to the limit for the lowest, middle and highest operating channels.

Results

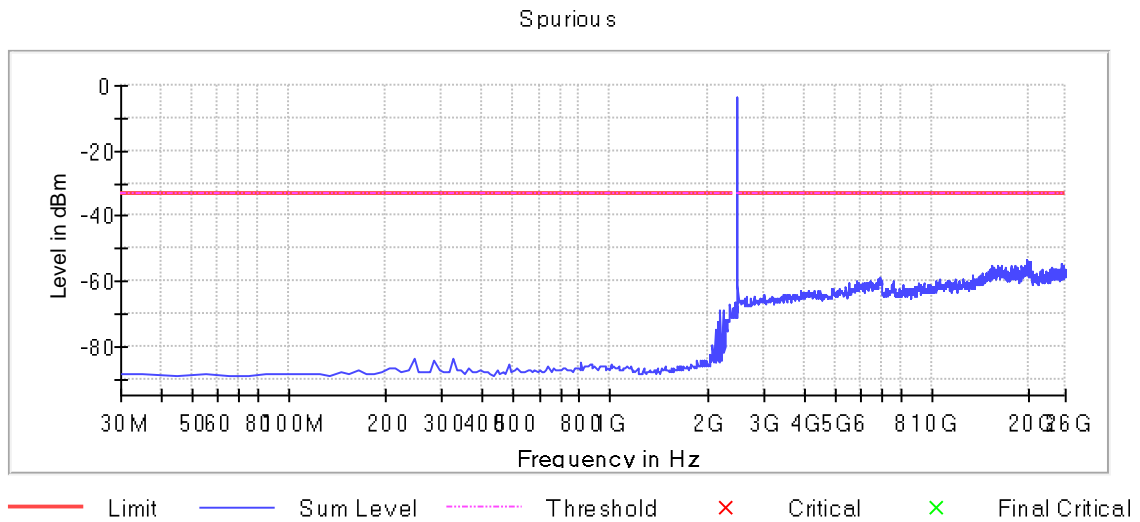
Lowest Channel



Middle Channel



Highest Channel



Verdict

Pass

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

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

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required

Verdict

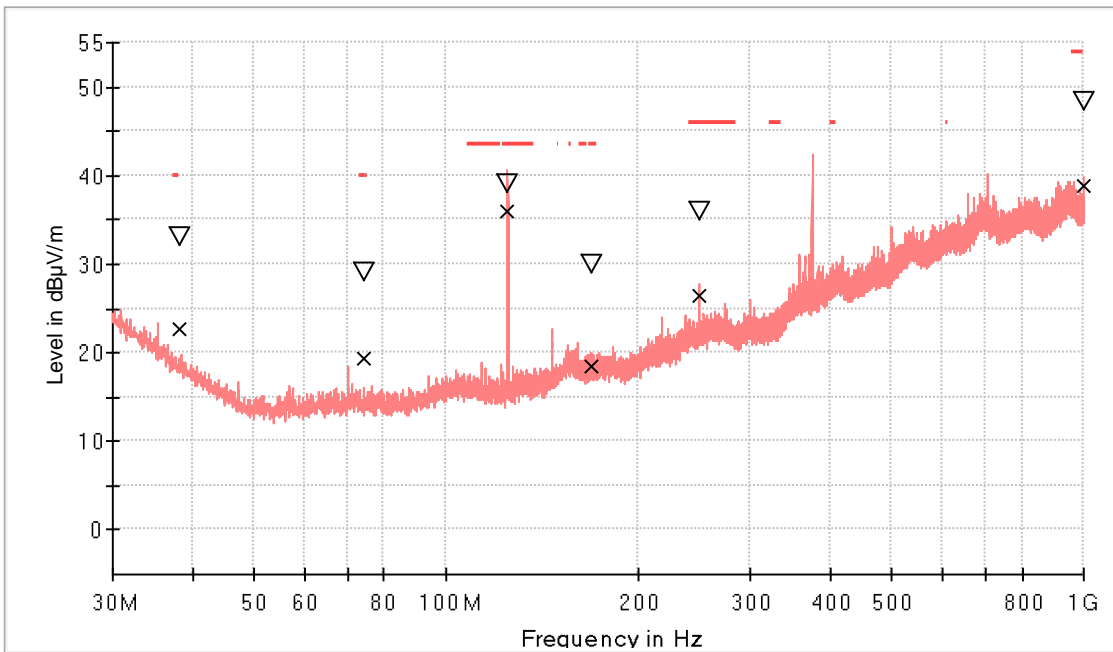
Pass

Modulation: BT (GFSK 1-DH5)

Results

Frequency range 30 - 1000 MHz

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

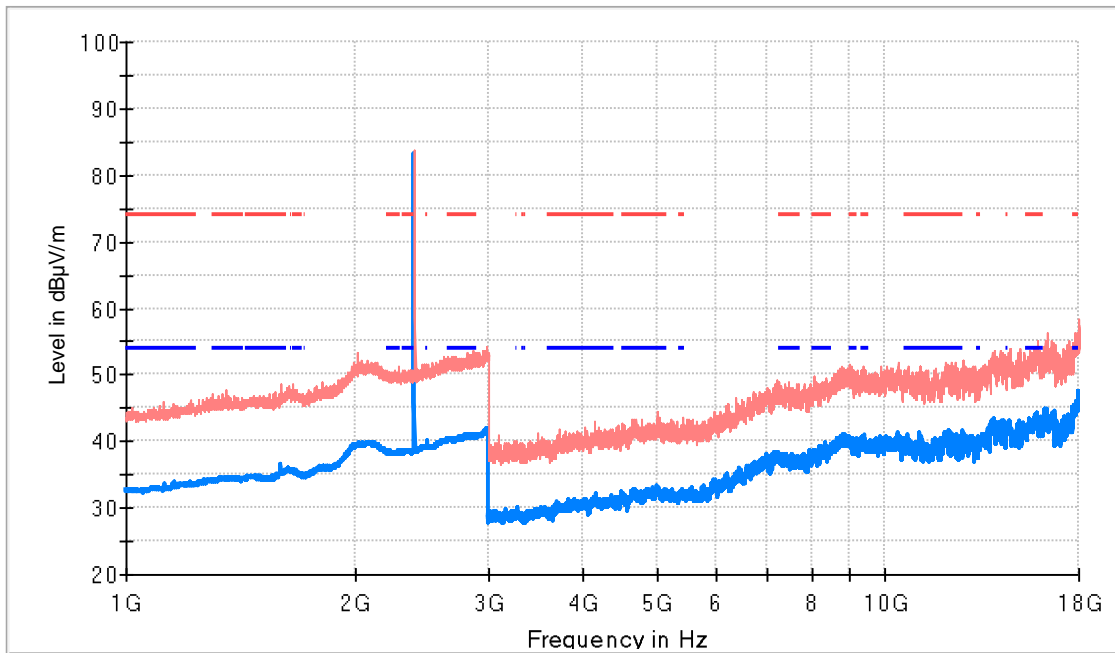


- PK+_MAXH
- ▽ MaxPeak-PK+ (Single)
- TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz) Restricted Bands QPK Limit
- x QuasiPeak-QPK (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
38.099500	33.0	22.7	H	7.0	40.0
74.329000	29.0	19.3	V	11.0	40.0
124.963000	39.0	36.0	V	4.6	43.5
169.098000	30.0	18.4	H	13.6	43.5
249.996000	36.0	26.5	H	10.0	46.0
1000.000000	48.4	38.8	V	5.6	54.0

Frequency range 1 - 18 GHz

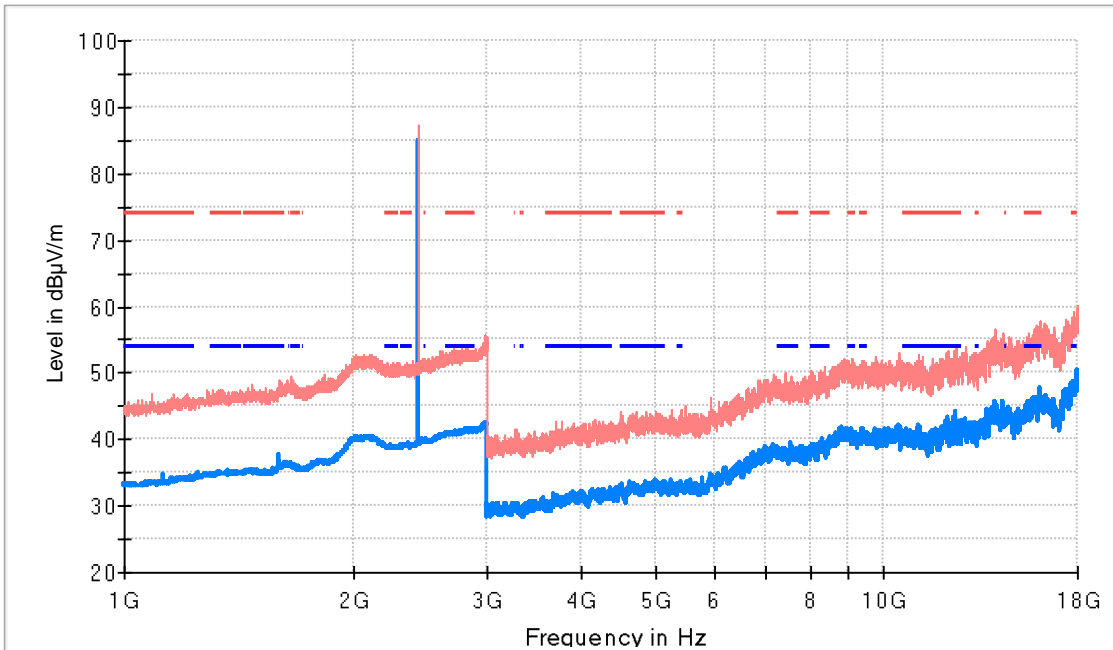
Lowest Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	83.8	83.2	H	---	---	Fundamental
17984.500000	57.3	47.3	V	6.7	54.0	

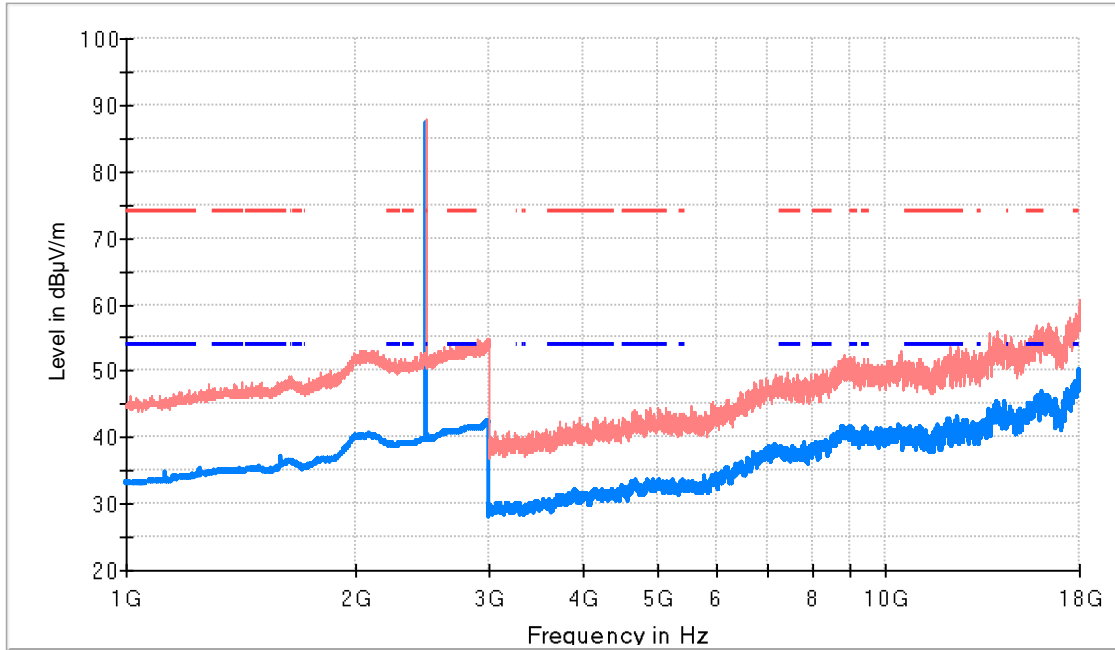
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	87.2	85.0	H	---	---	Fundamental
16078.500000	57.7	46.9	H	7.1	54.0	

Highest Channel

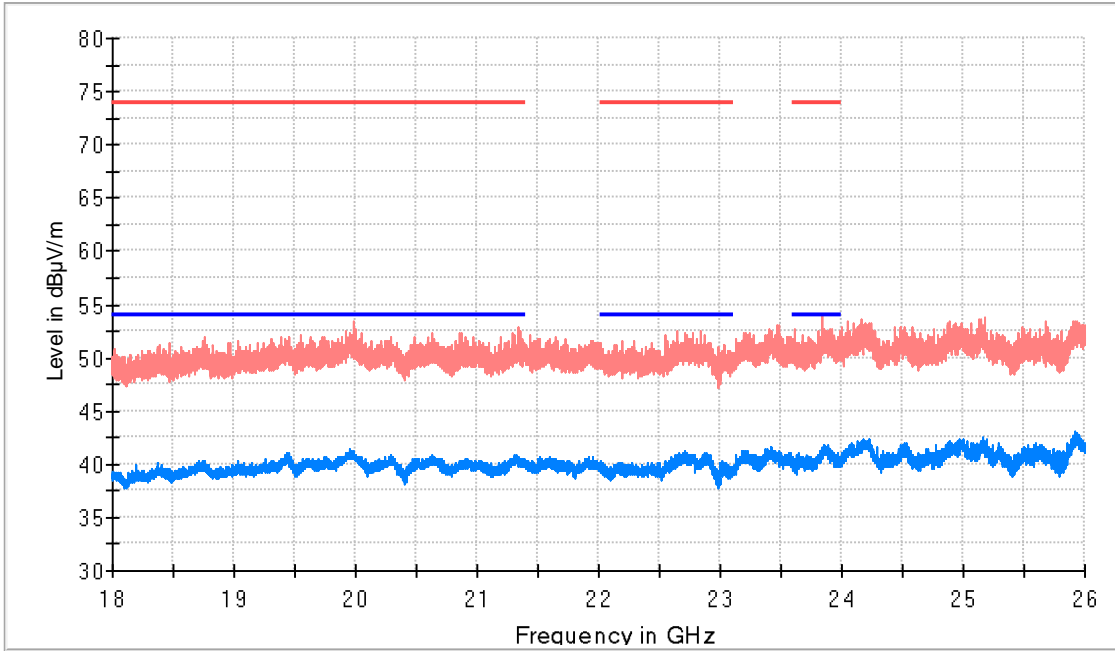


- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.00000	87.8	87.2	H	---	---	Fundamental
15821.50000	56.9	45.2	V	8.8	54.0	

Frequency range 18 - 26 GHz

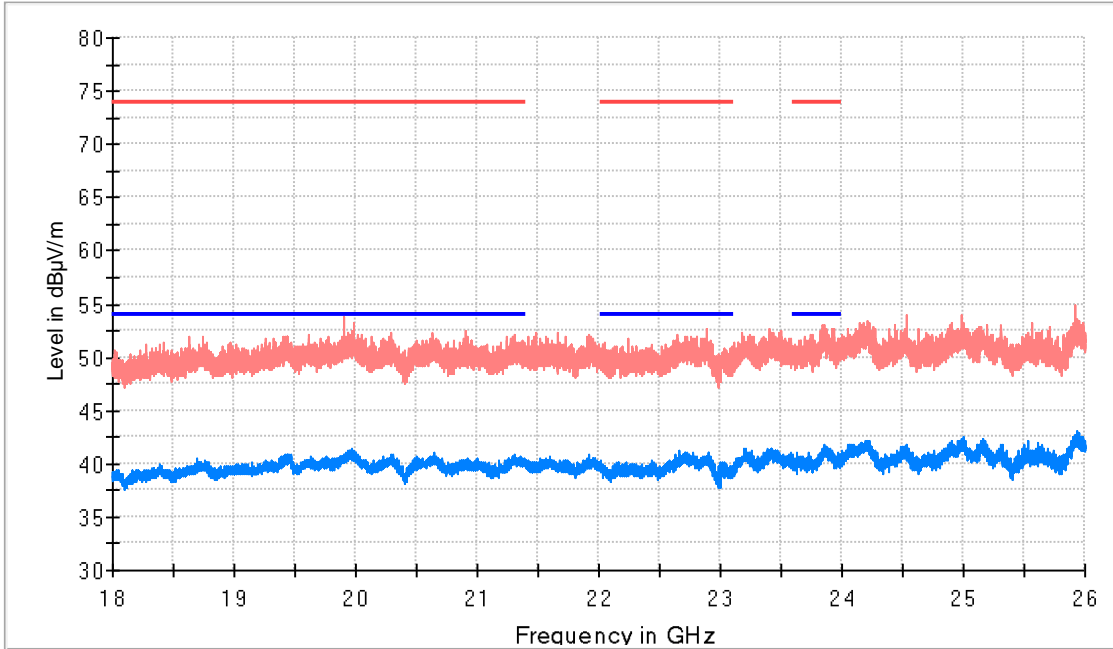
Lowest Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23889.000000	51.5	41.9	H	12.1	54.0

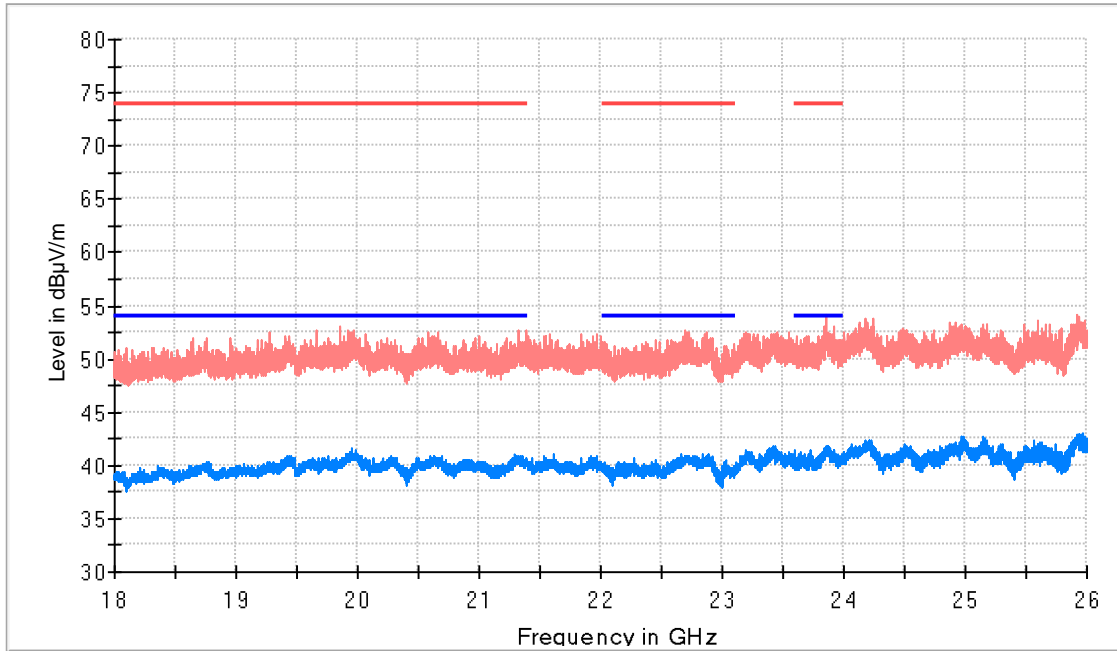
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23861.000000	51.7	41.7	V	12.3	54.0

Highest Channel

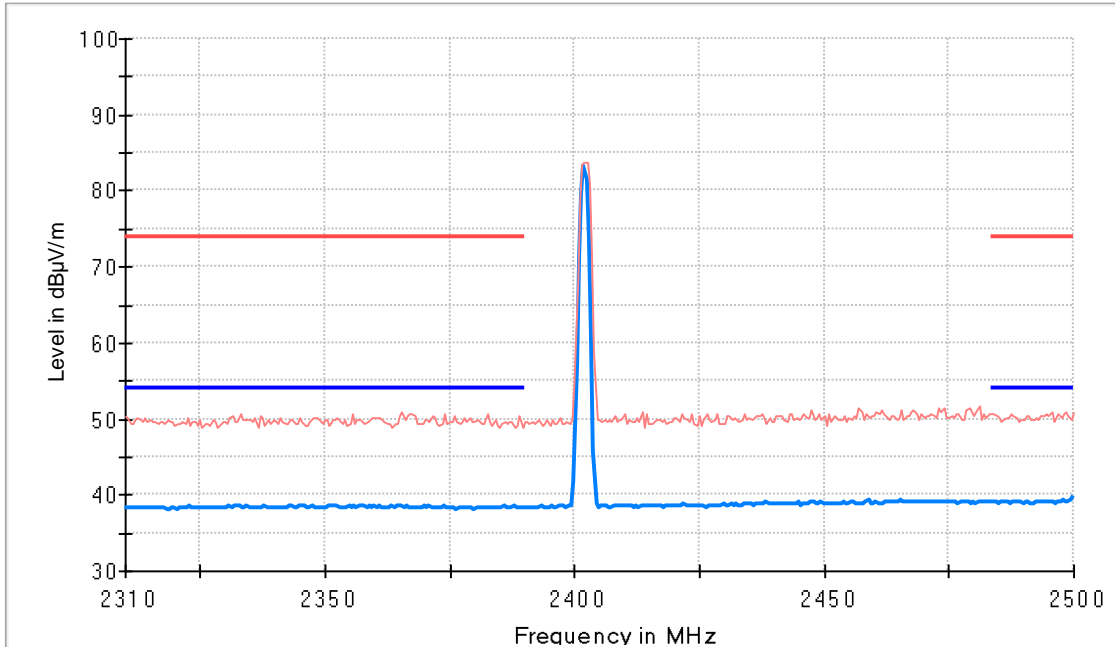


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23869.000000	50.7	41.8	V	12.2	54.0

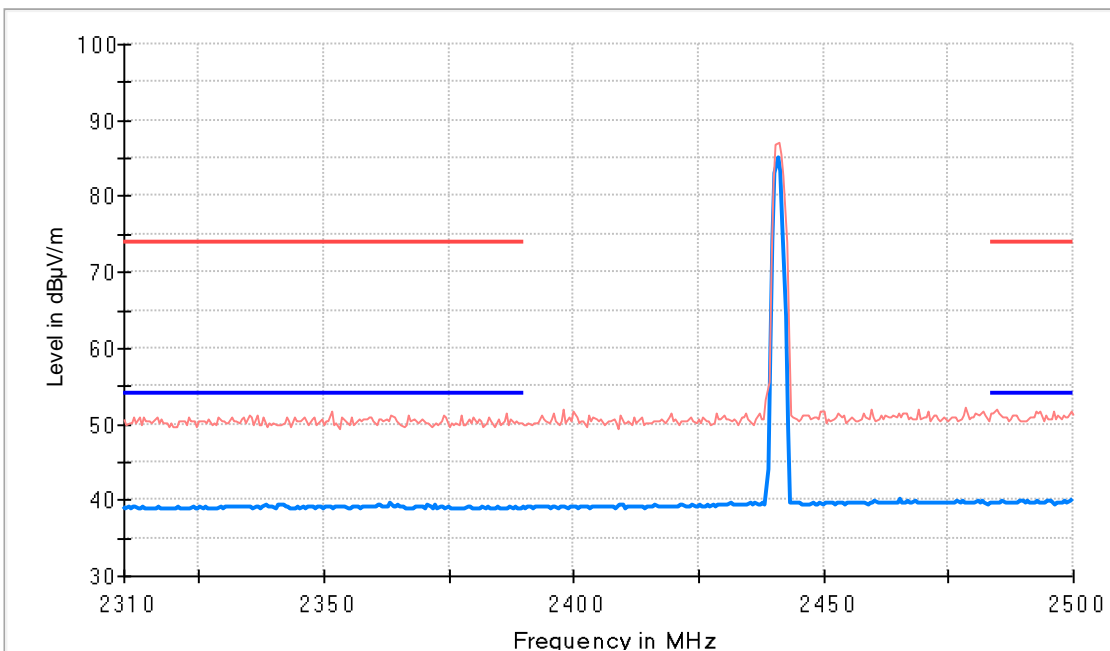
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



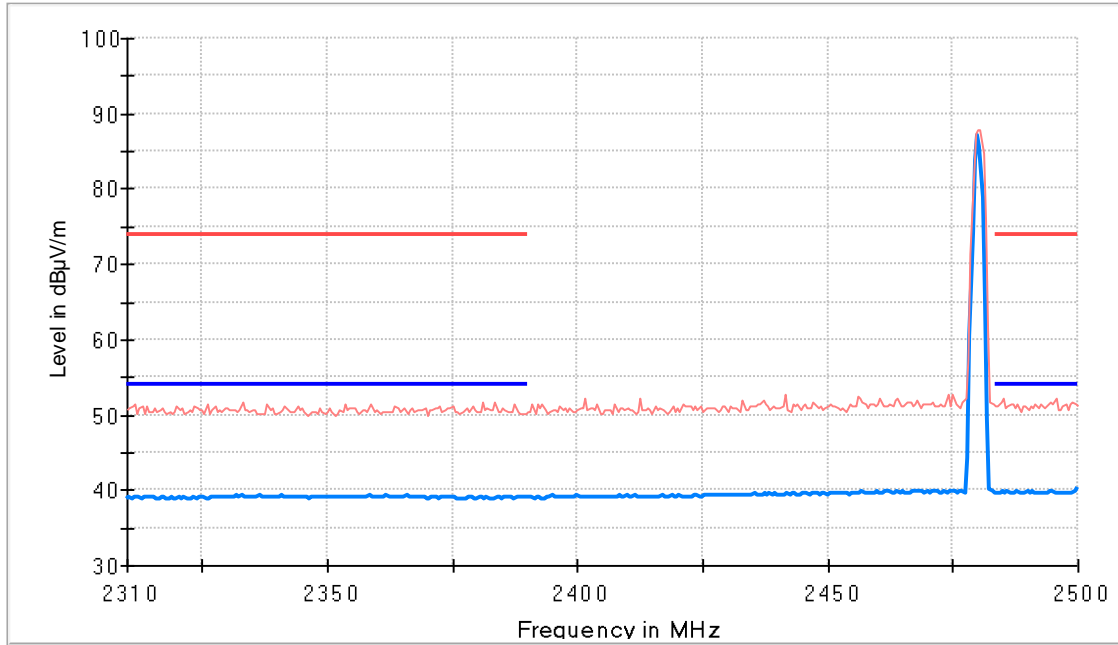
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Middle Channel



- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Highest Channel



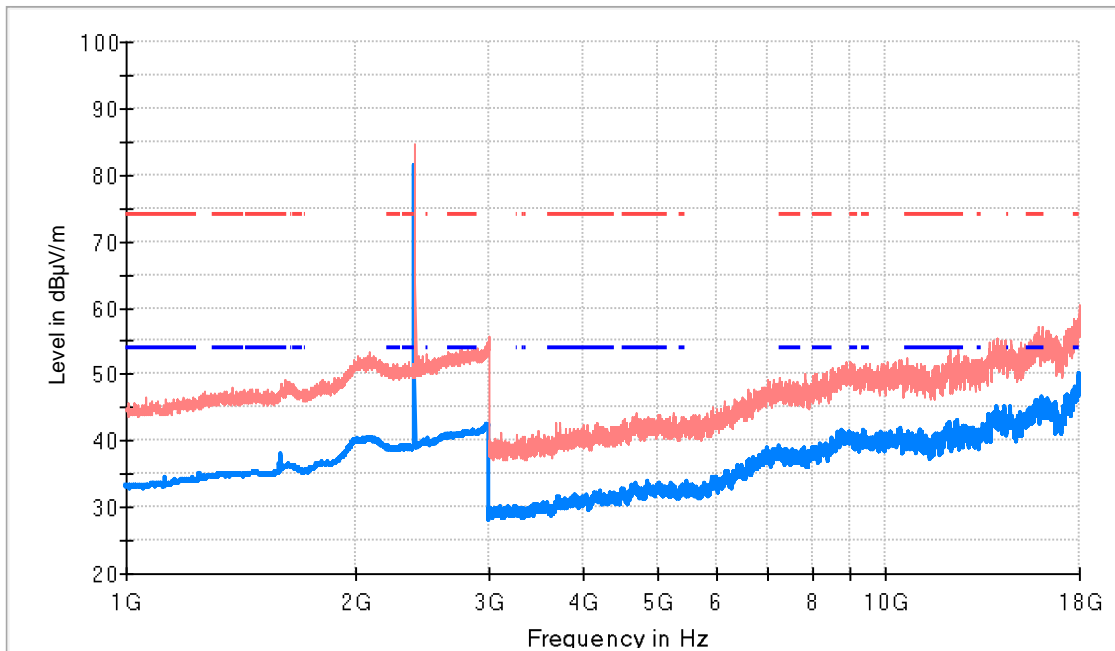
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Modulation: BT ($\pi/4$ -DQPSK 2-DH5)

Results

Frequency range 1 - 18 GHz

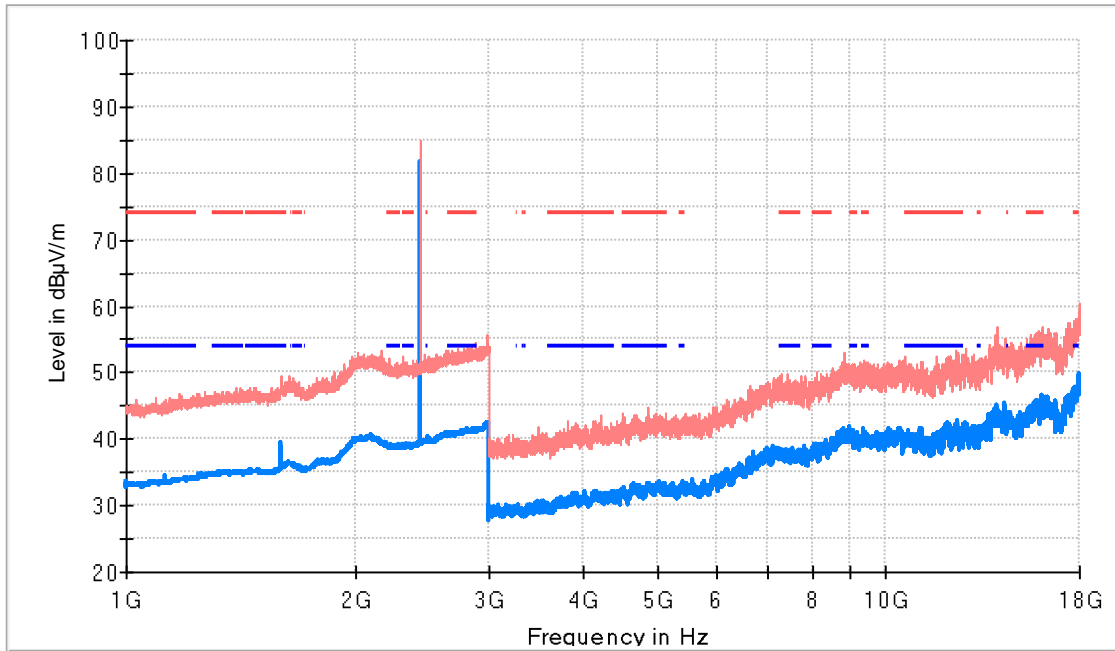
Lowest Channel



- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	84.7	81.4	V	---	---	Fundamental
15841.500000	57.1	45.1	V	8.9	54.0	

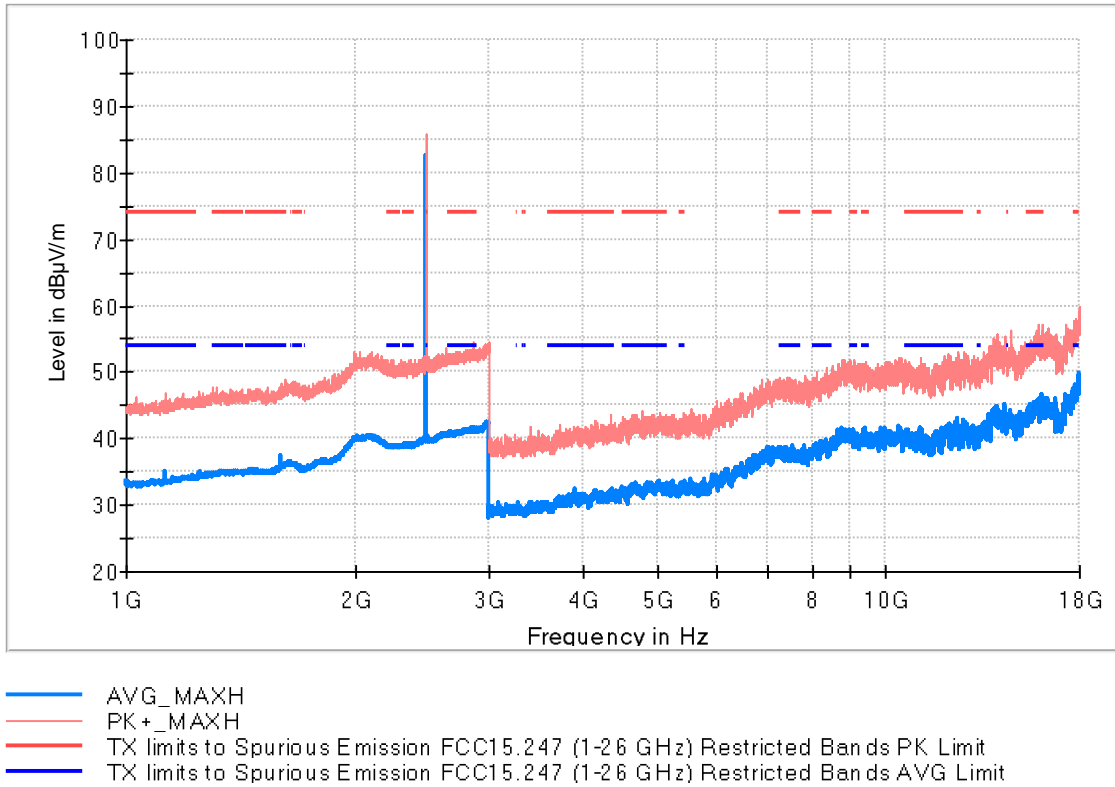
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	84.8	81.7	V	---	---	Fundamental
17994.000000	60.6	49.0	H	5.0	54.0	

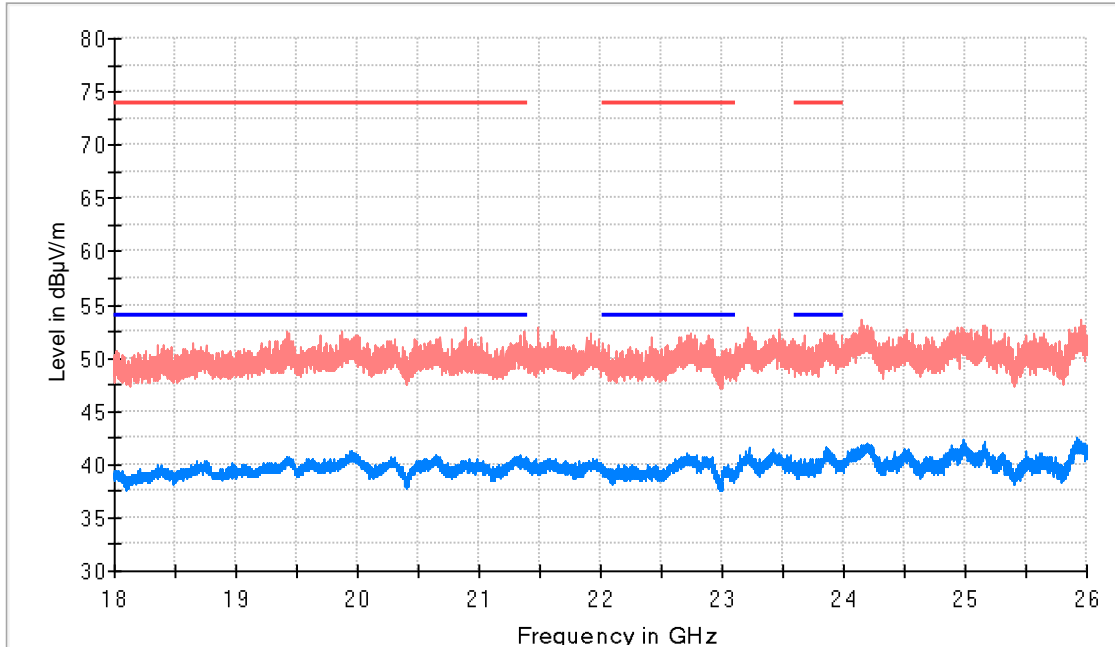
Highest Channel



Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.00000	85.8	82.6	H	---	---	Fundamental
8303.50000	49.7	38.3	V	15.7	54.0	

Frequency range 18 - 26 GHz

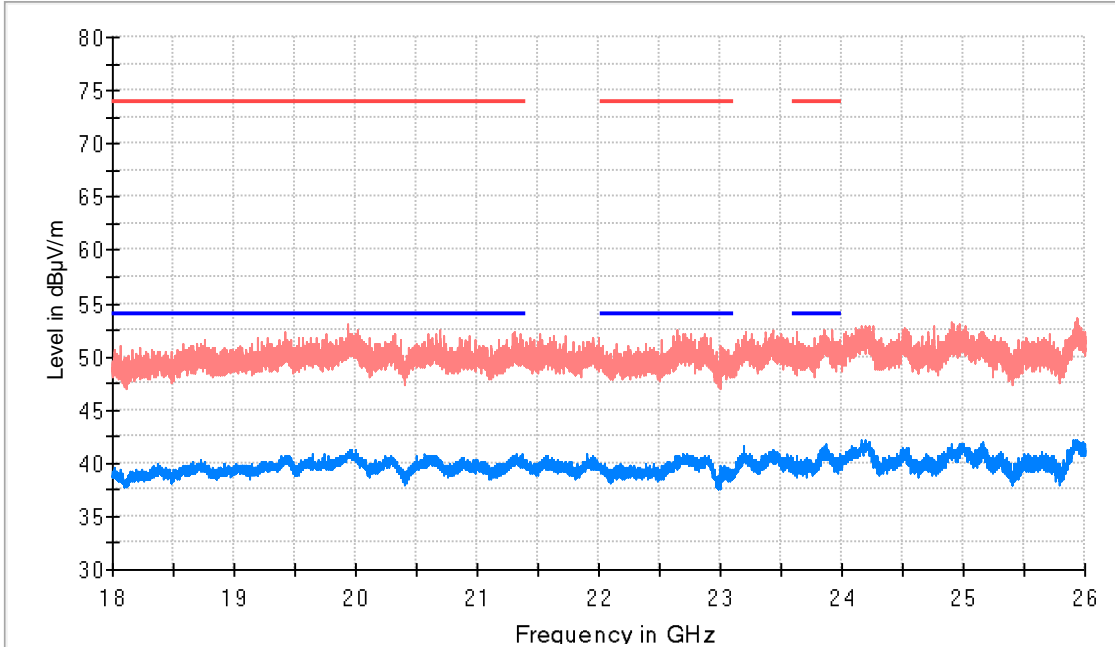
Lowest Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	PoI	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23859.000000	51.5	41.6	V	12.4	54.0

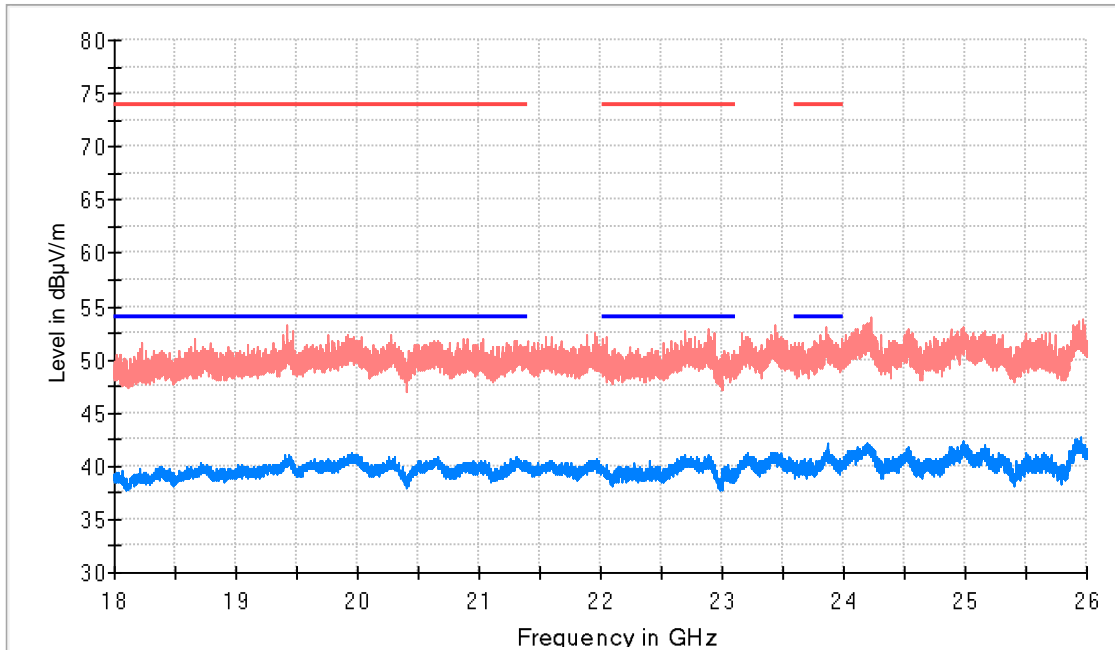
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
19961.000000	50.5	41.3	H	12.7	54.0

Highest Channel

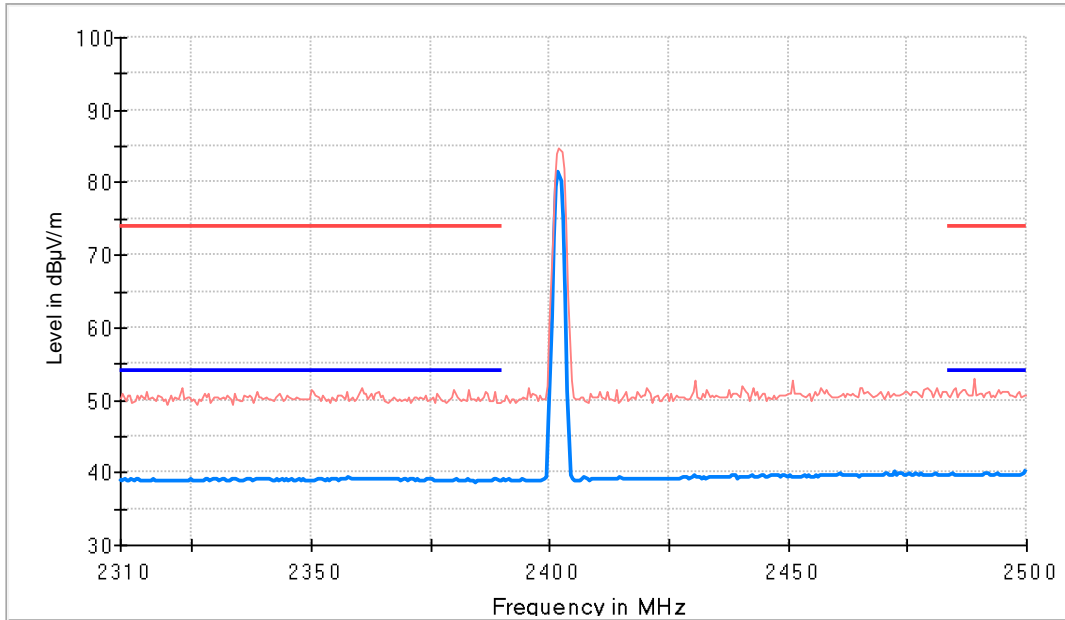


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Poi	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23863.000000	50.8	42.2	H	11.8	54.0

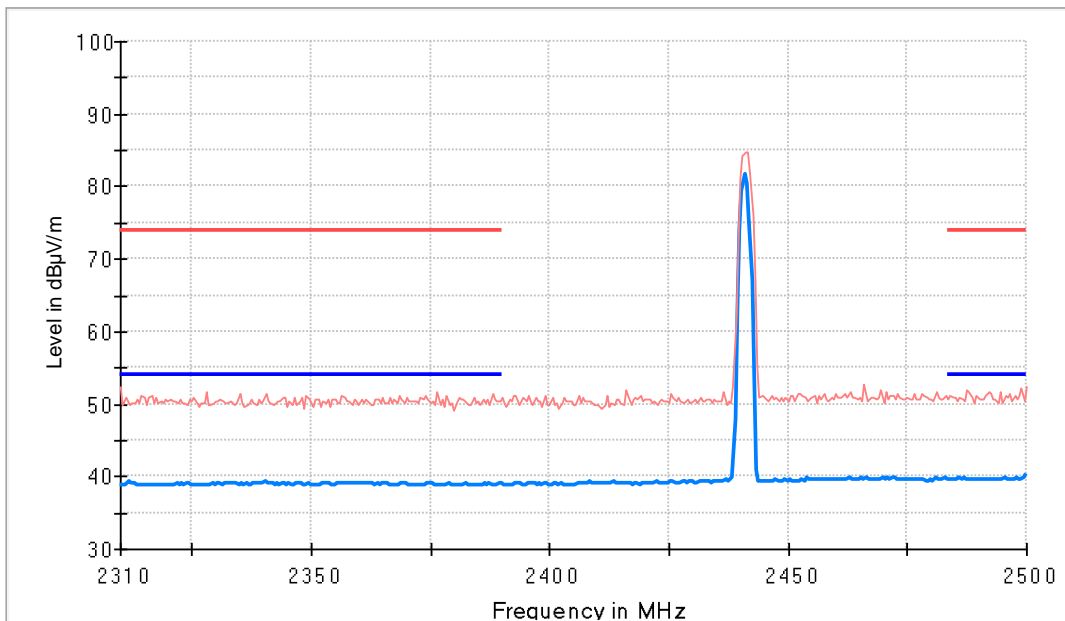
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



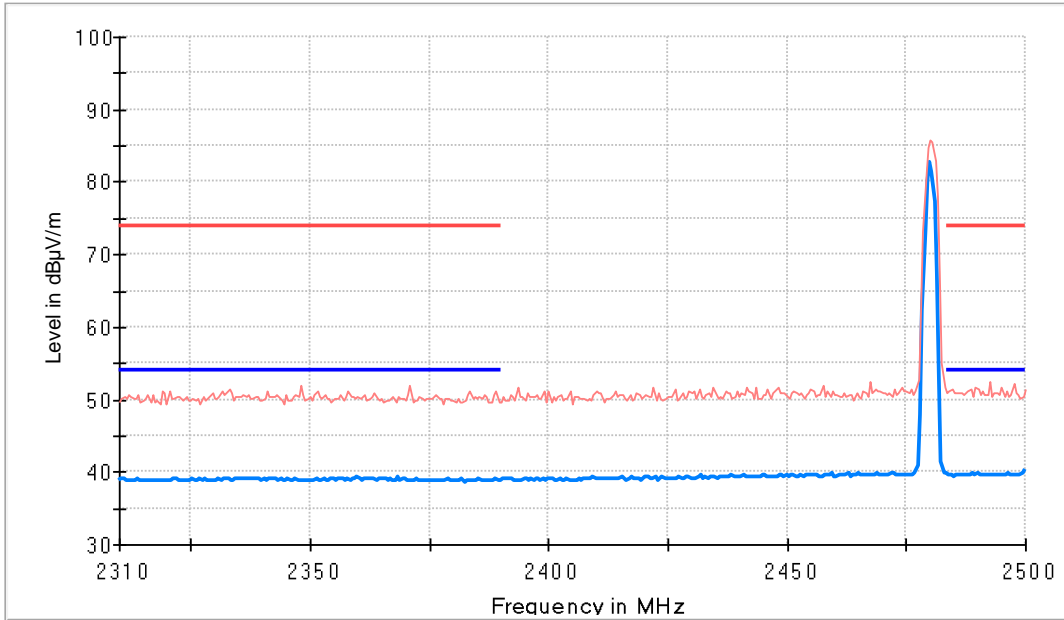
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Middle Channel



- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Highest Channel



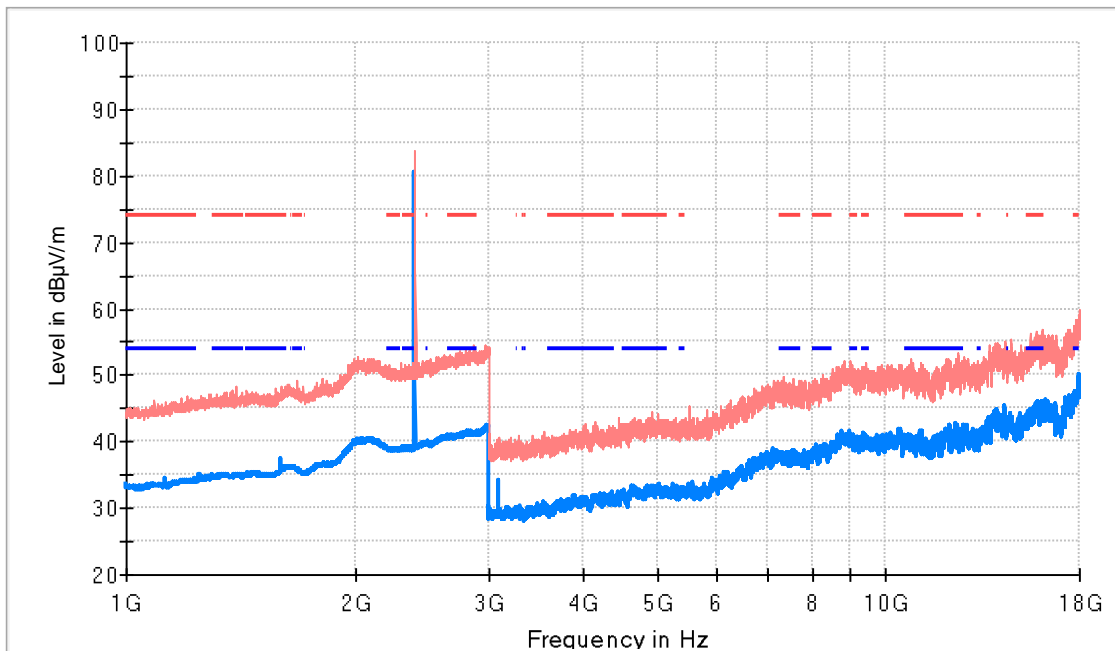
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Modulation: BT (8DPSK 3-DH5)

Results

Frequency range 1 - 18 GHz

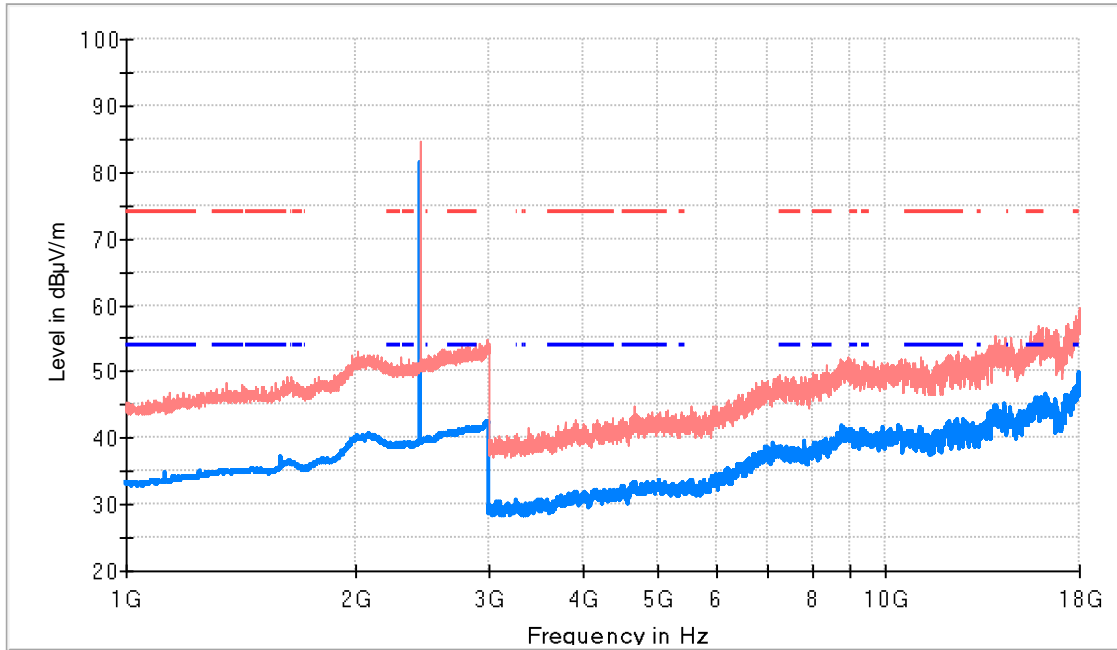
Lowest Channel



- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2402.000000	83.7	80.4	H	---	---	Fundamental
15496.000000	56.3	43.9	V	10.1	54.0	

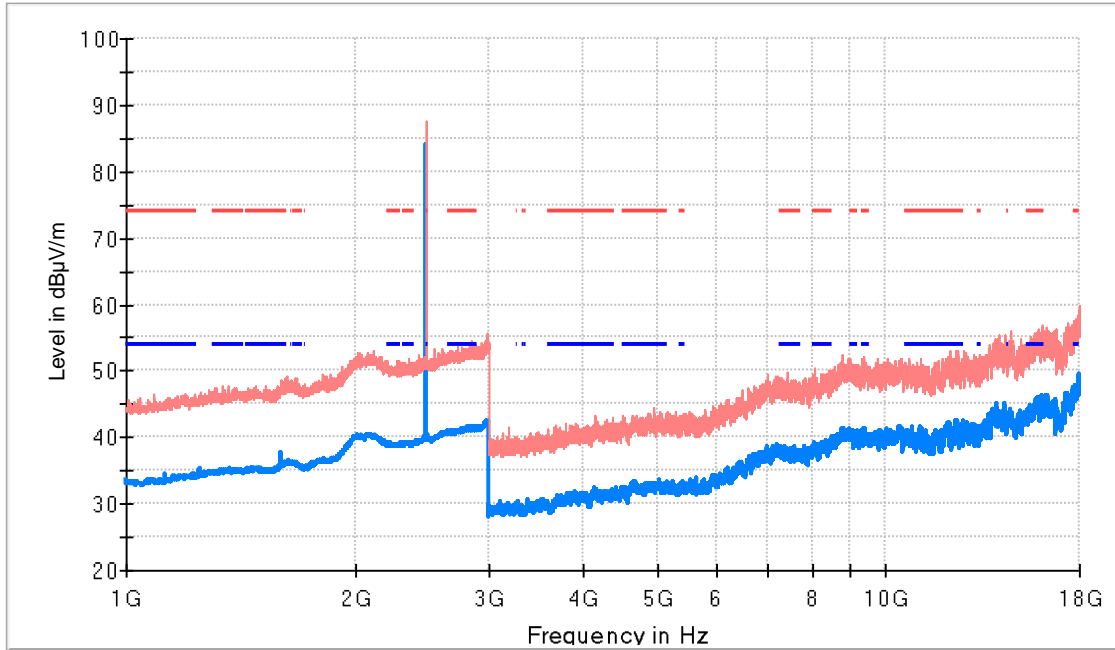
Middle Channel



- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	84.7	81.3	H	---	---	Fundamental
11139.000000	52.1	40.9	H	13.1	54.0	

Highest Channel

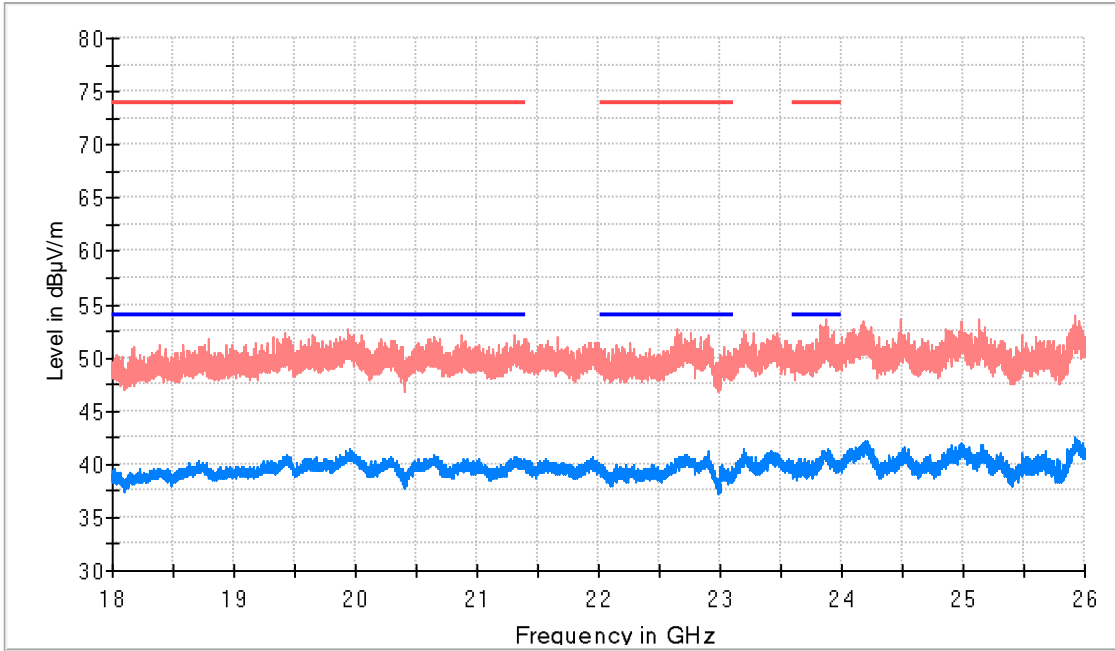


- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2480.00000	87.5	84.1	H	---	---	
12389.00000	53.2	41.5	H	12.5	54.0	

Frequency range 18 - 26 GHz

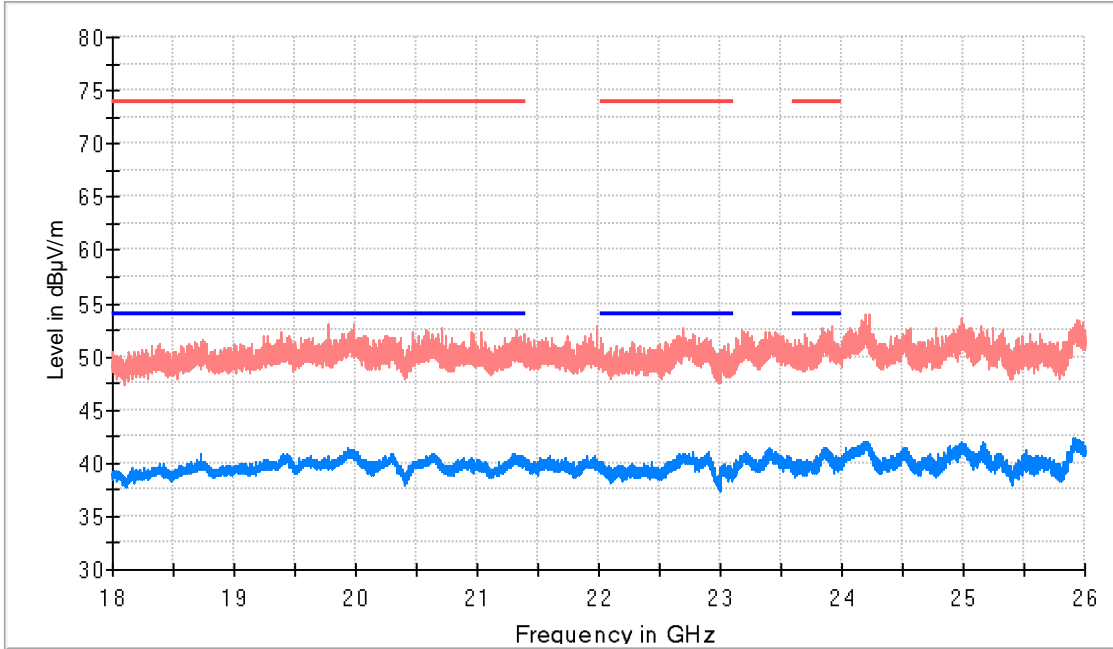
Lowest Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
22902.000000	50.5	41.3	H	12.7	54.0

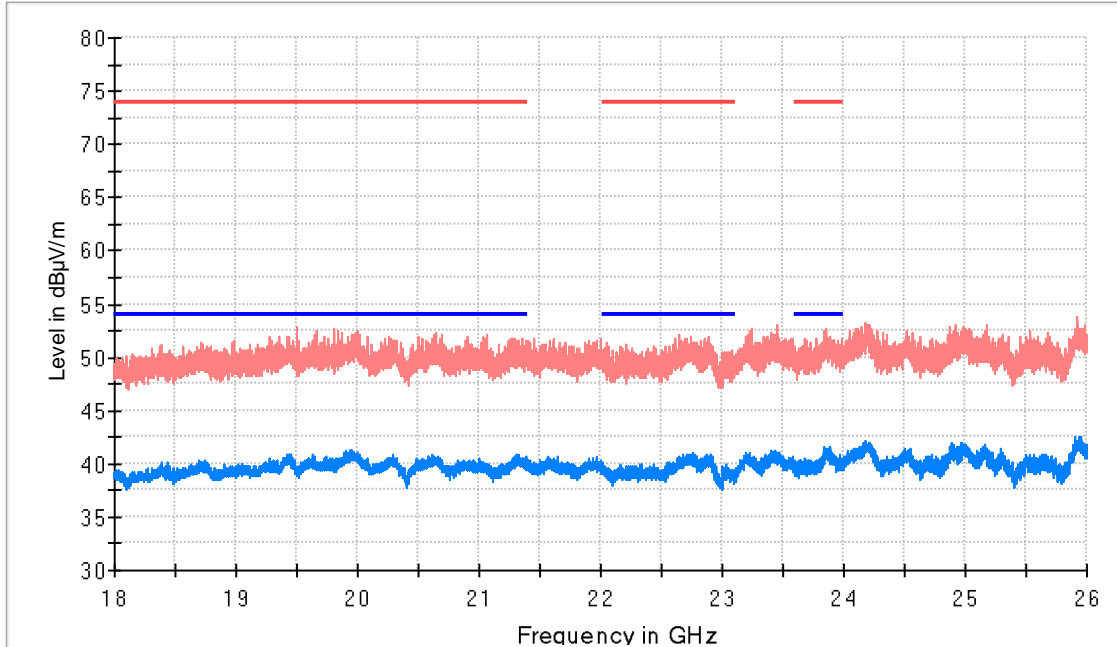
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
19937.000000	51.4	41.3	V	12.7	54.0

Highest Channel

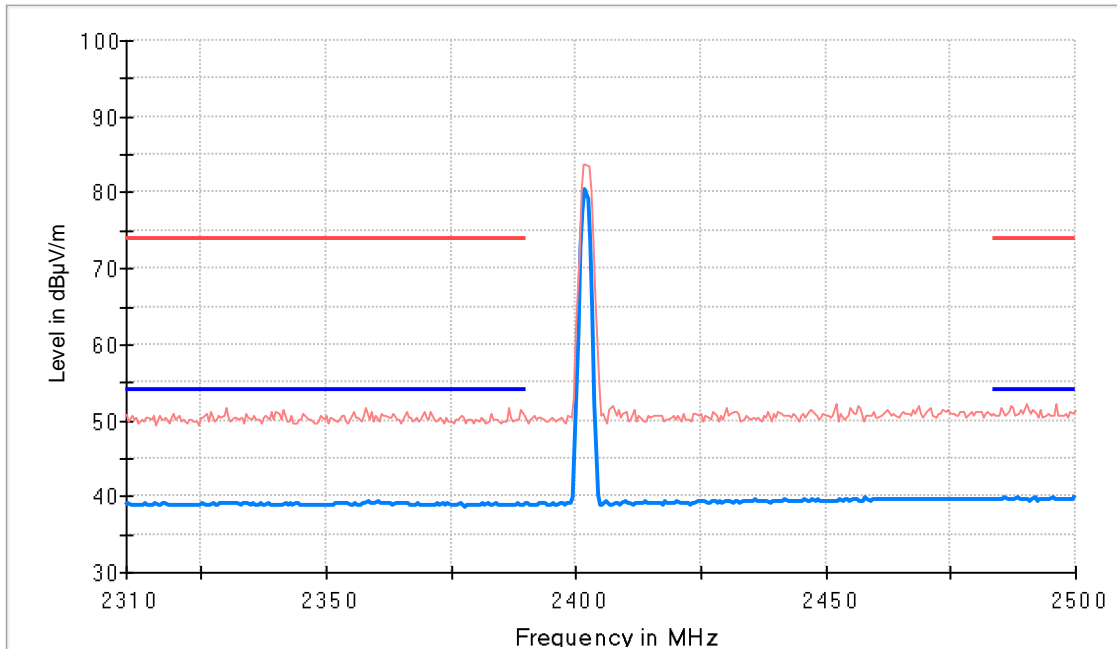


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23831.000000	50.4	41.7	V	12.3	54.0

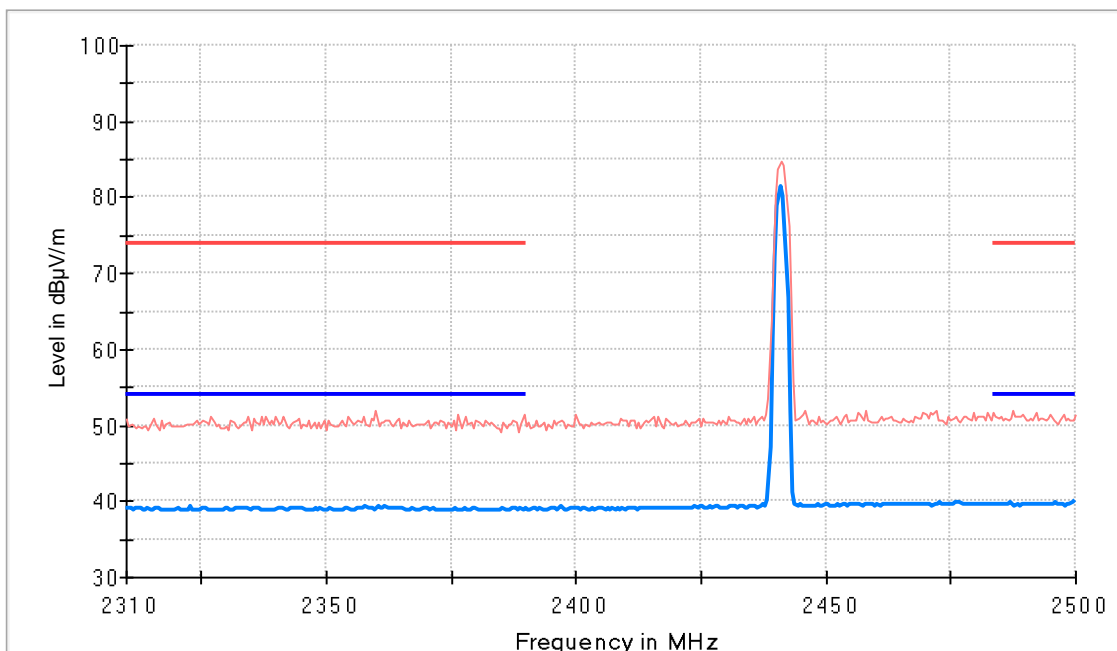
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



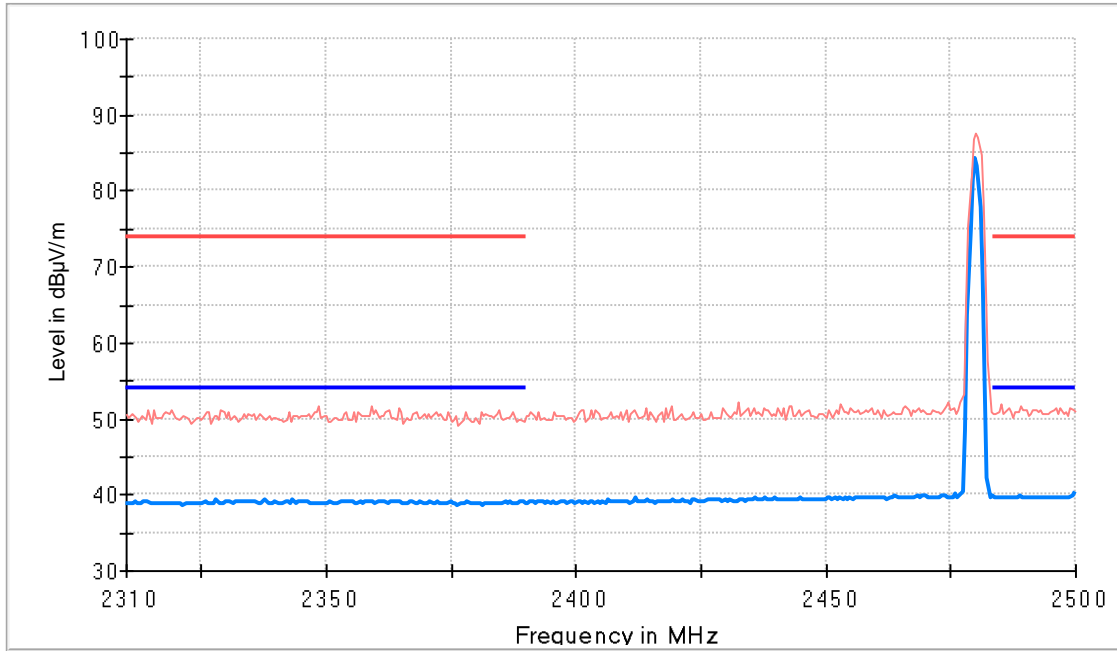
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Middle Channel



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

Highest Channel



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

Appendix B: Test results. Wi-Fi 2.4GHz

PRODUCT INFORMATION

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

TEST CONDITIONS

(*): Data provided by the client.

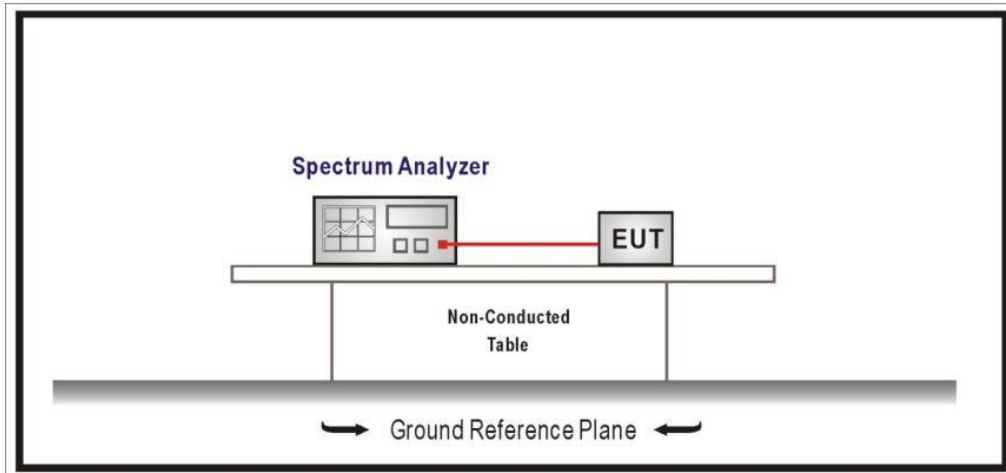
TEST CONDITIONS	DESCRIPTION
<p>TC#01⁽¹⁾ (b mode)</p>	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$</p> <p><u>Channel Bandwidth:</u> 20 MHz</p> <p><u>Test Frequencies for Conducted/Radiated tests:</u></p> <p>Lowest channel: 2412 MHz Middle channel: 2442 MHz Highest channel: 2462 MHz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

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

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

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

CONDUCTED MEASUREMENTS:



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and 1-18 GHz (Double ridge horn 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 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

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

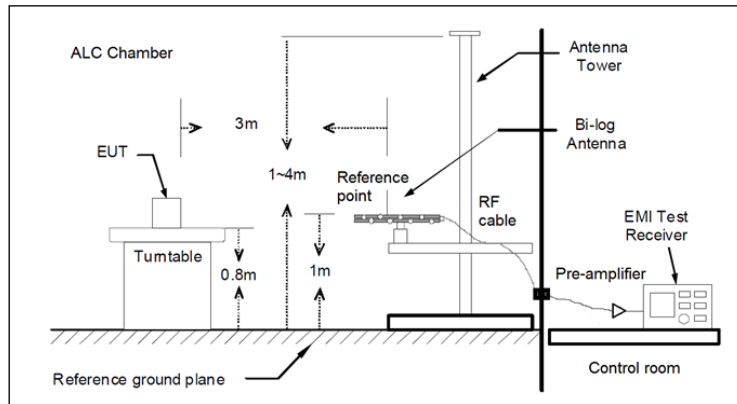


Fig A1: Radiated measurements Setup $f < 1$ GHz

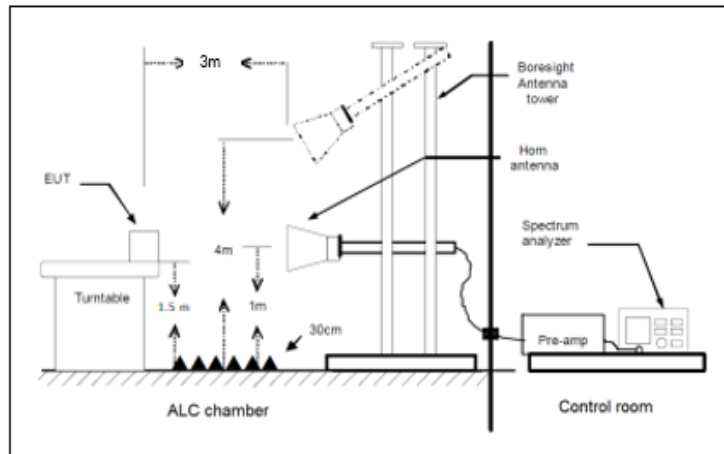


Fig A2: Radiated measurements setup $f > 1-18$ GHz

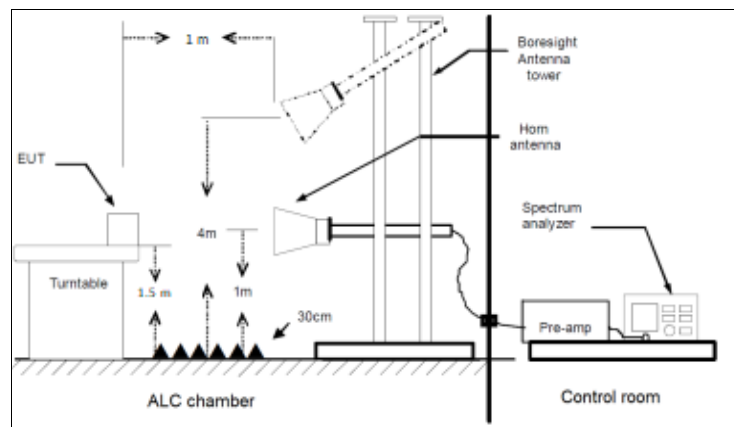


Fig A3: Radiated measurements setup $f > 18$ GHz

TEST CASES DETAILS

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

Limits

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

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Emission Bandwidth (MHz)
2412.00000				10.100
2442.00000	20	1	1	10.200
2462.00000				10.100

Verdict

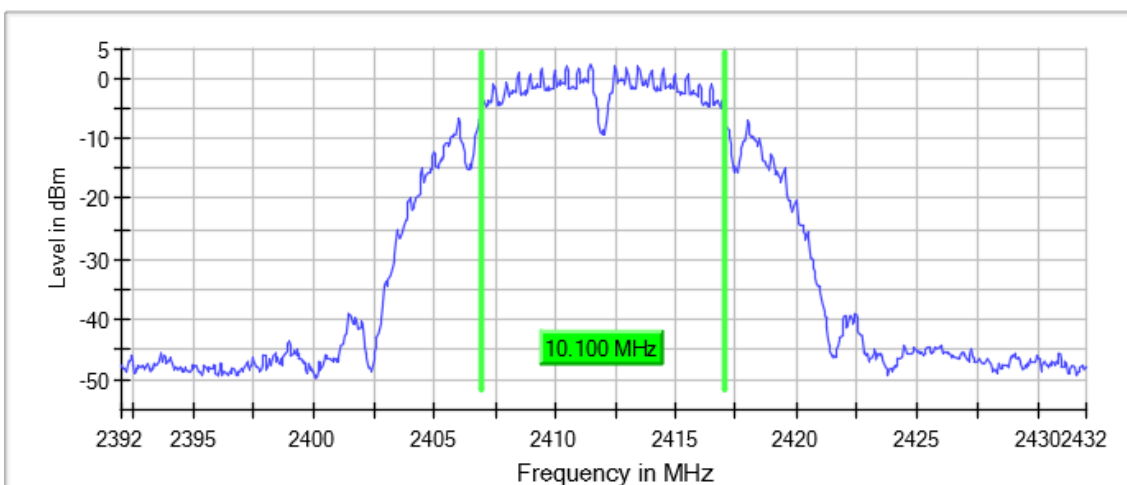
Pass

Attachments

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

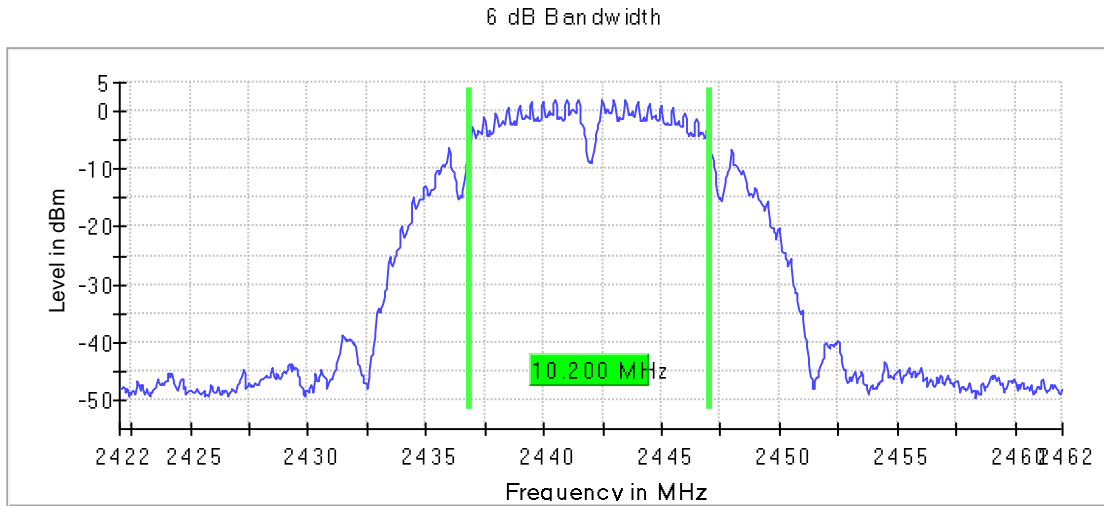
Images:

6 dB Bandwidth



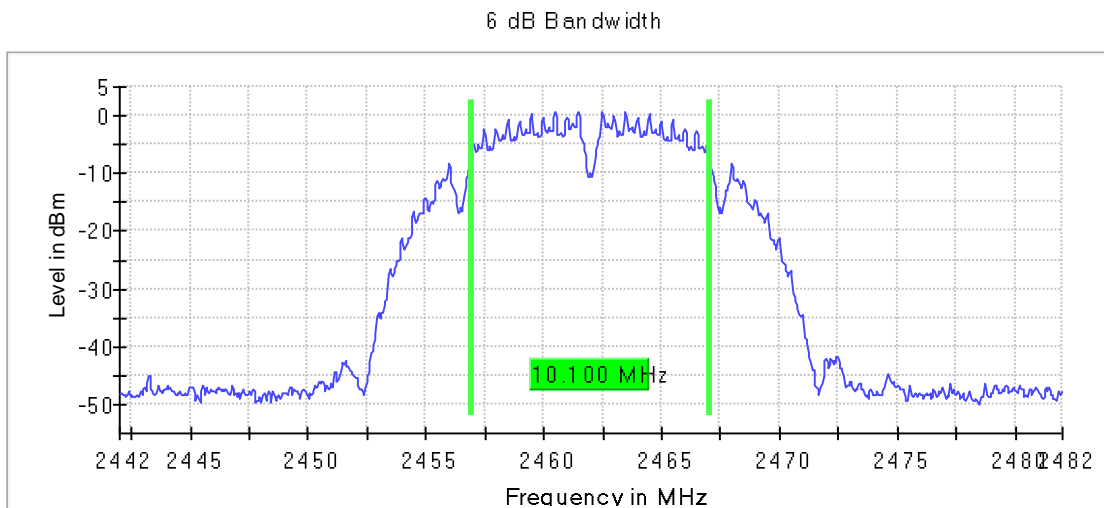
Frequency MHz = 2442.00000, Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

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

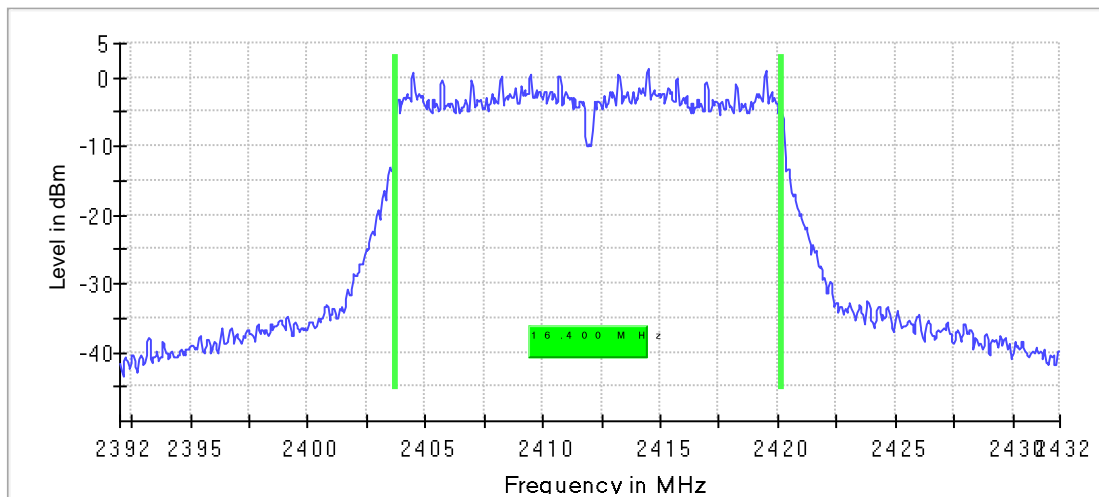
Verdict

Pass

Attachments

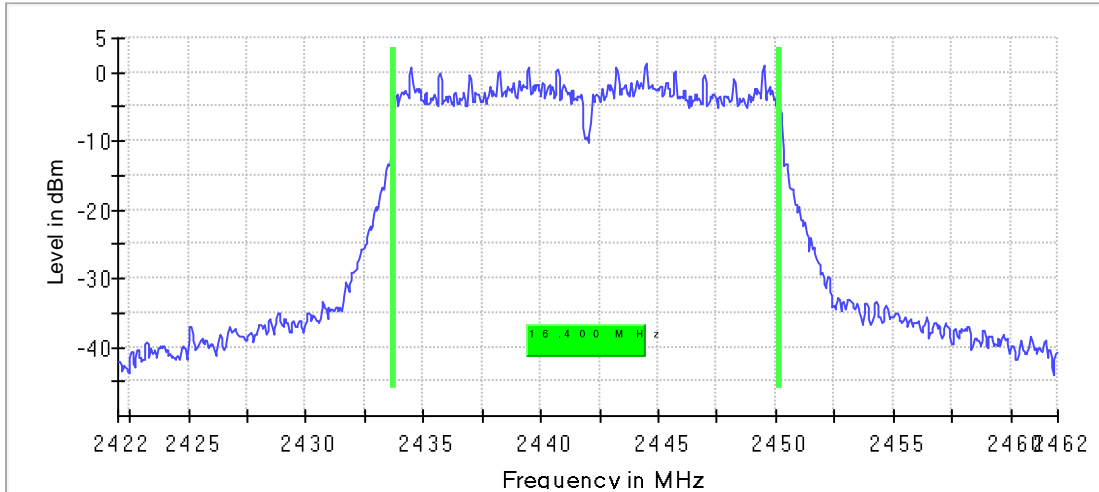
Frequency MHz = 2412.00000, Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



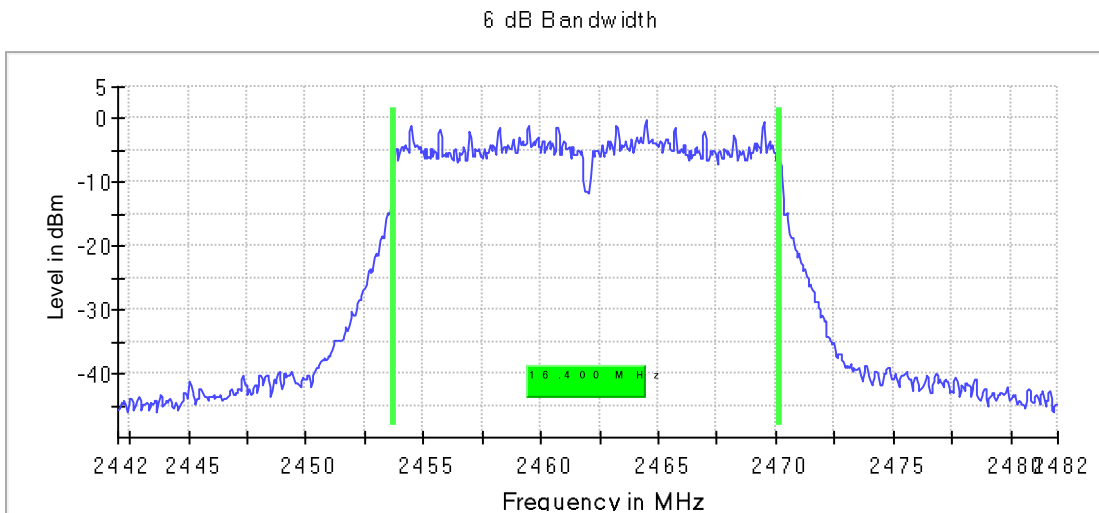
Frequency MHz = 2442.00000, Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



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

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	26Ebw (MHz)
2412.00000				17.600
2442.00000	20	1	1	17.400
2462.00000				17.600

Verdict

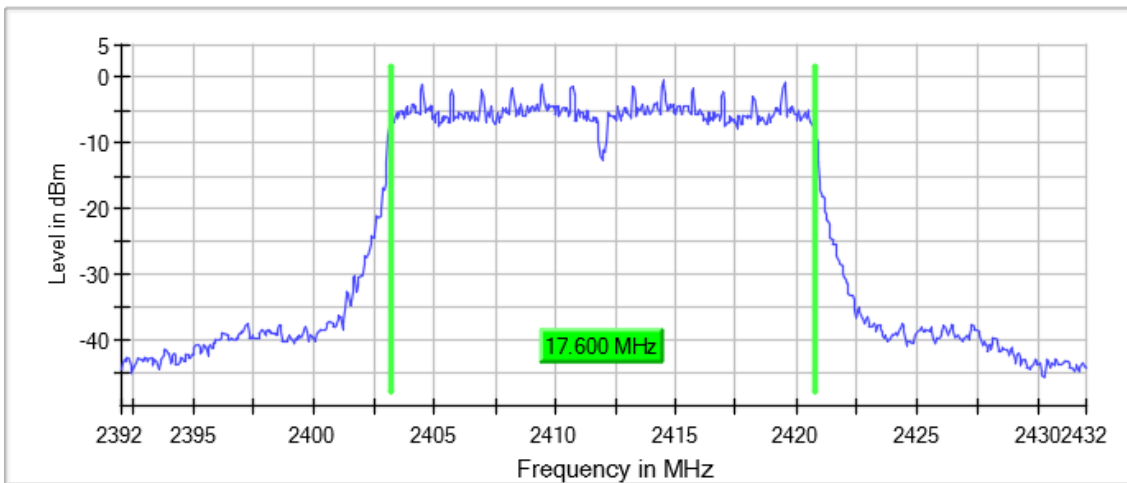
Pass

Attachments

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

Images:

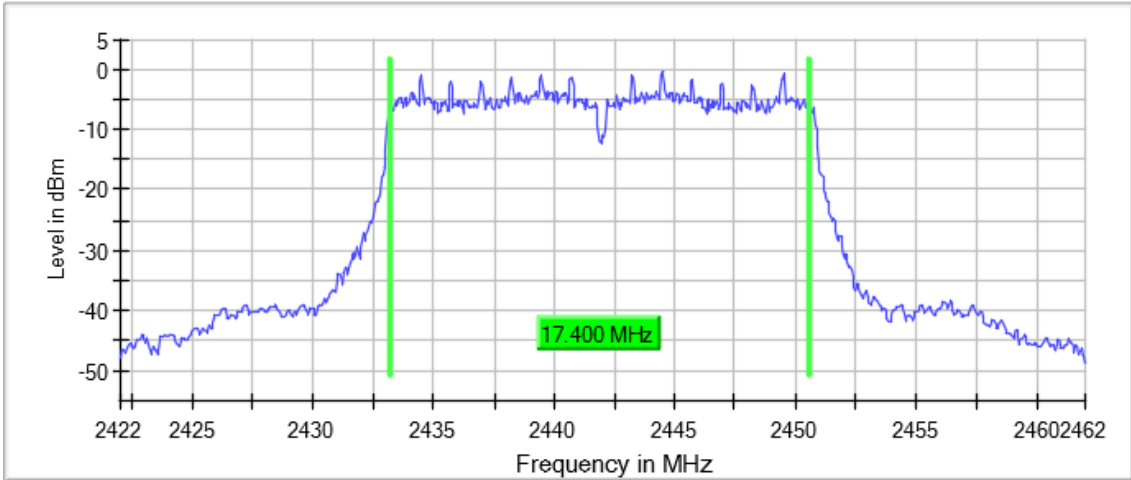
6 dB Bandwidth



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

Images:

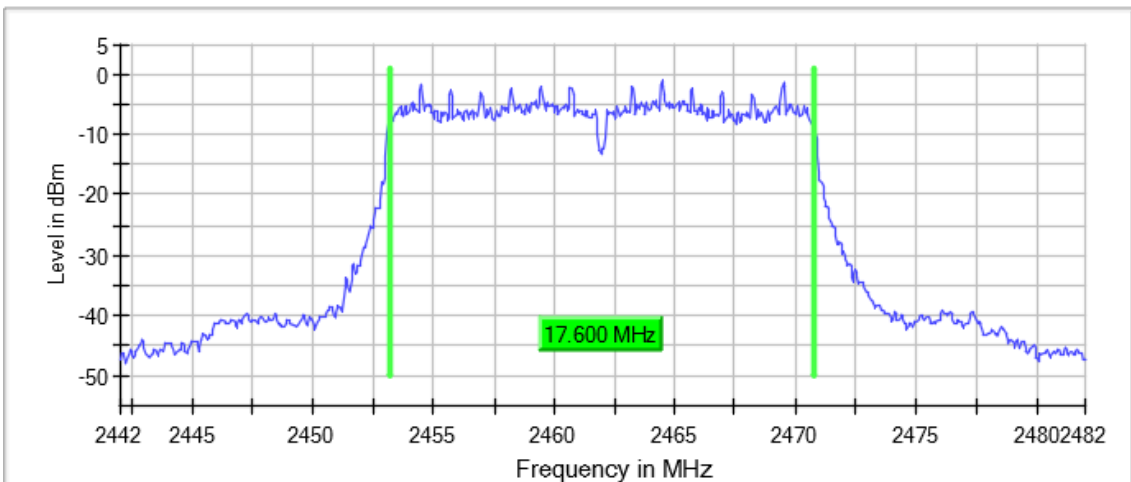
6 dB Bandwidth



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

Images:

6 dB Bandwidth



Measurement Setup

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

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

Limits

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

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital				1.19
2440.00000	Transmission	20	1	1	2.55
2462.00000	System (DTS)				0.30

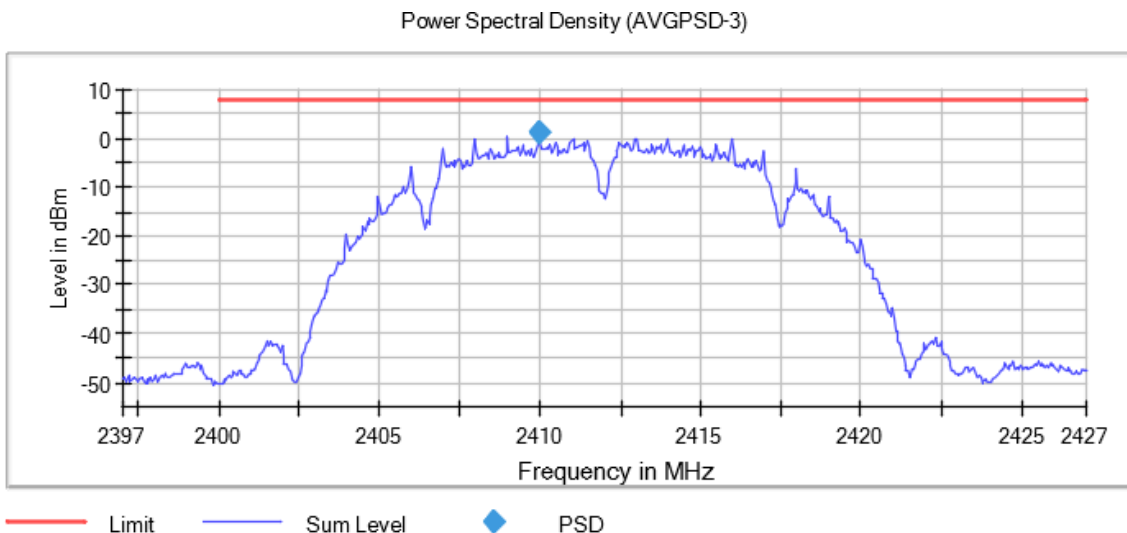
Verdict

Pass

Attachments

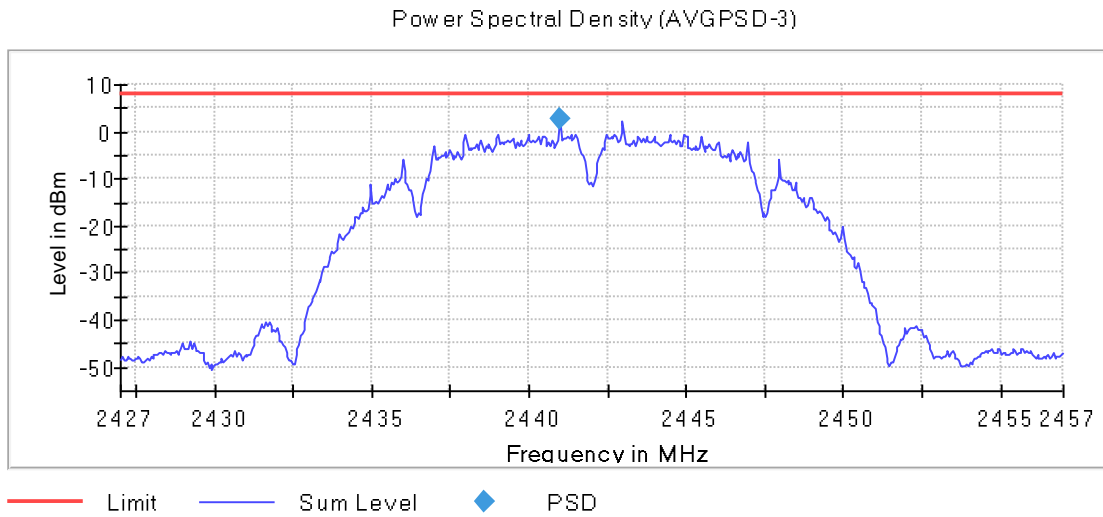
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



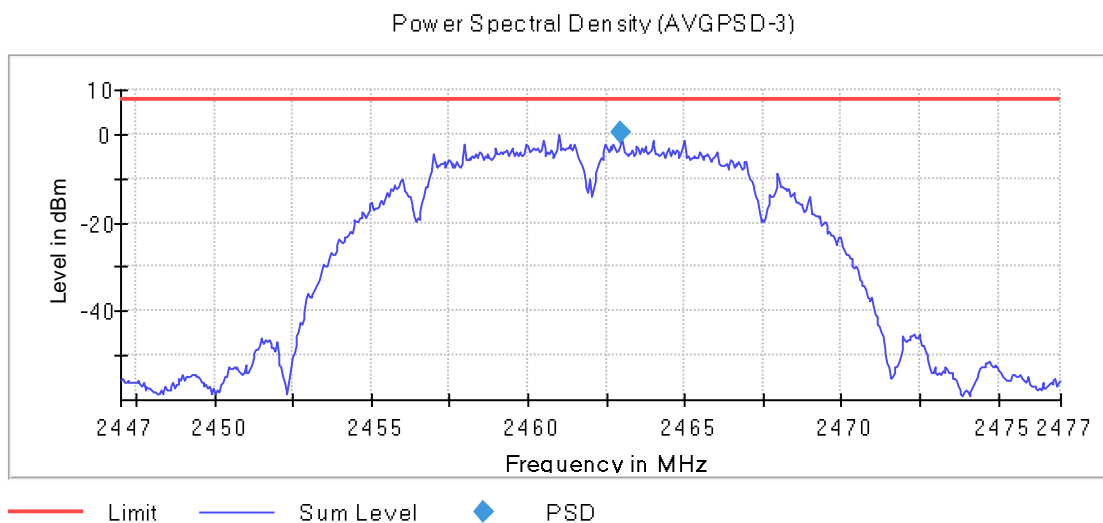
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital Transmission System (DTS)	20	1	1	-1.84
2442.00000					-1.66
2462.00000					-3.40

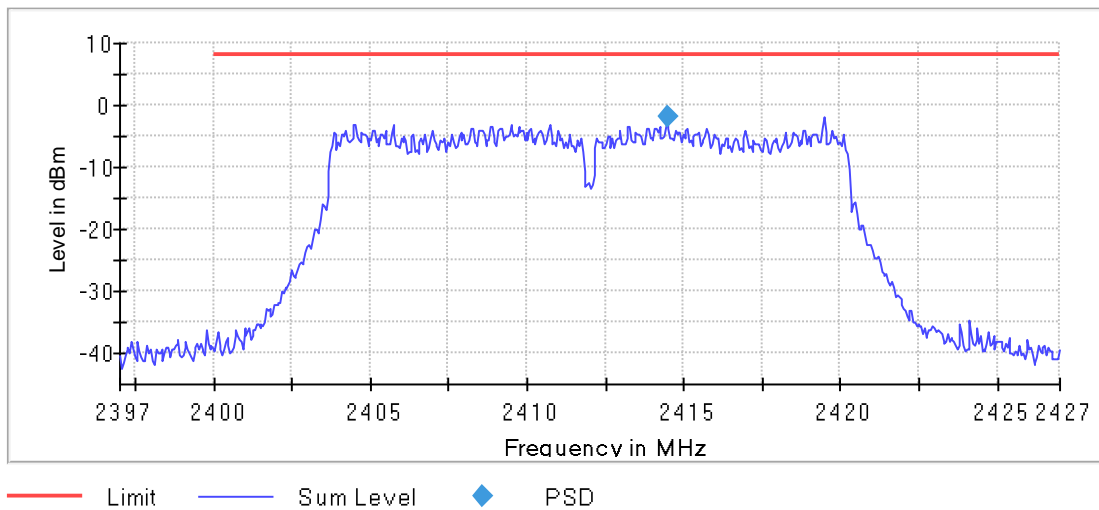
Verdict

Pass

Attachments

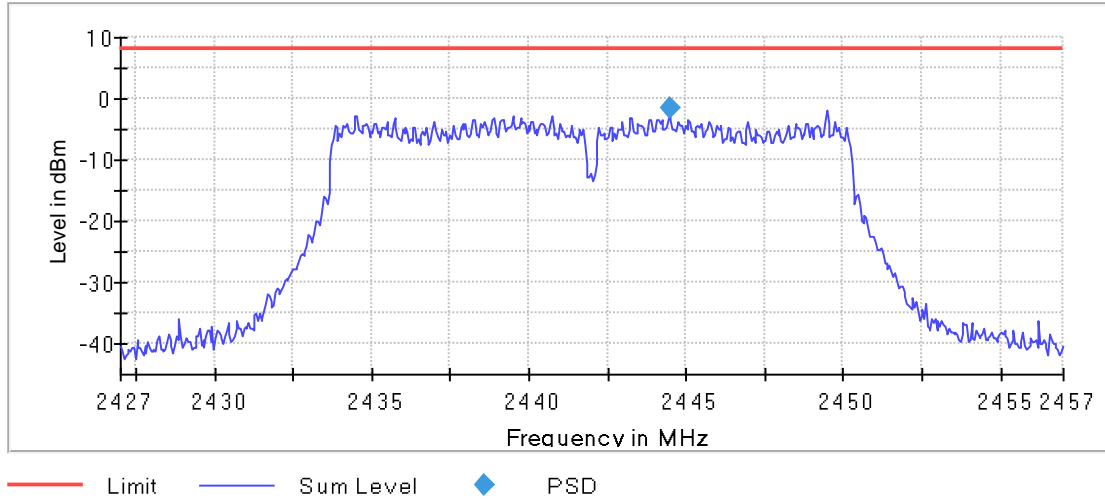
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

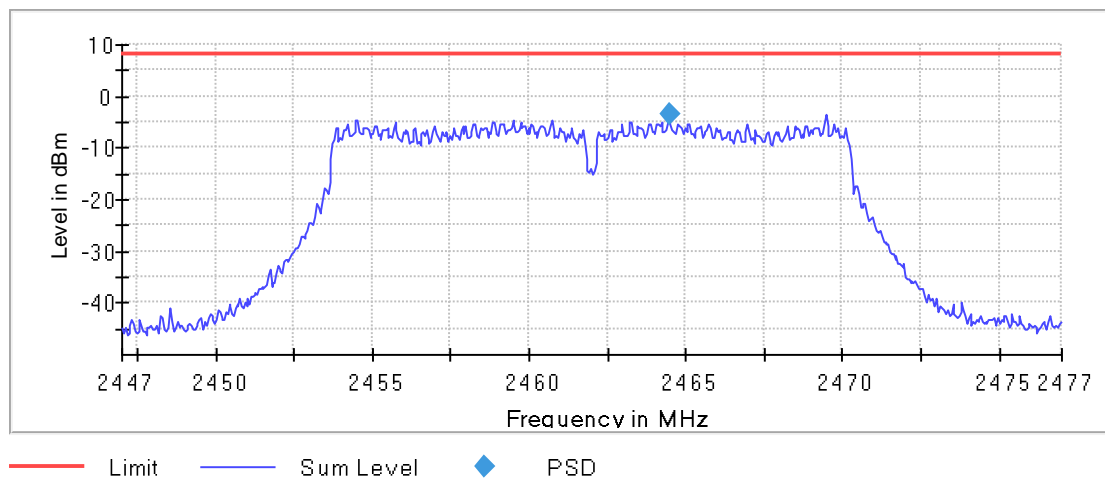
Images:



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

Images:

Power Spectral Density (AVGPSD-3)



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

Results

Freq (MHz)	Equipment	BW (MHz)	# of Tx Chains	Port	PSD (dBm)
2412.00000	Digital				-4.14
2442.00000	Transmission System (DTS)	20	1	1	-4.09
2462.00000					-4.76

Verdict

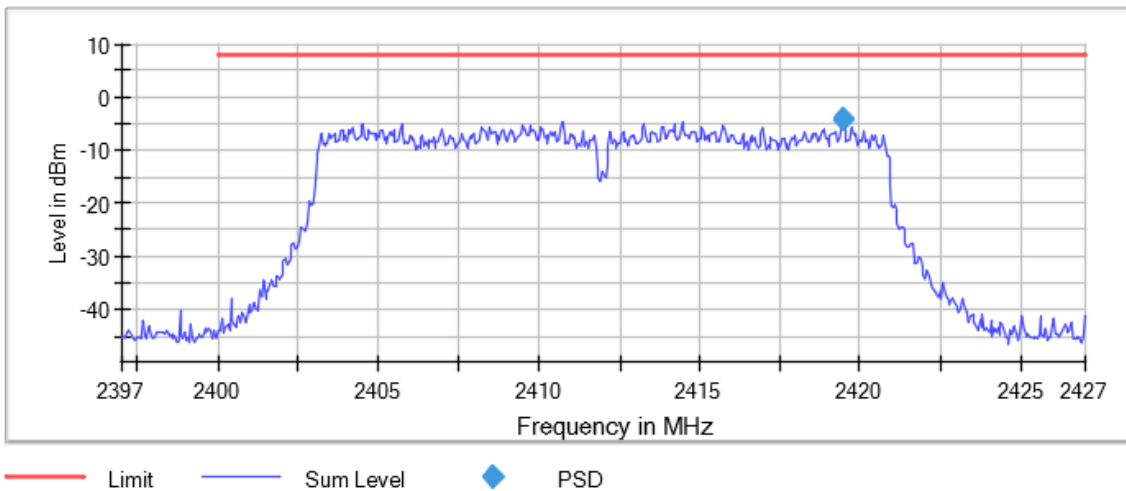
Pass

Attachments

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

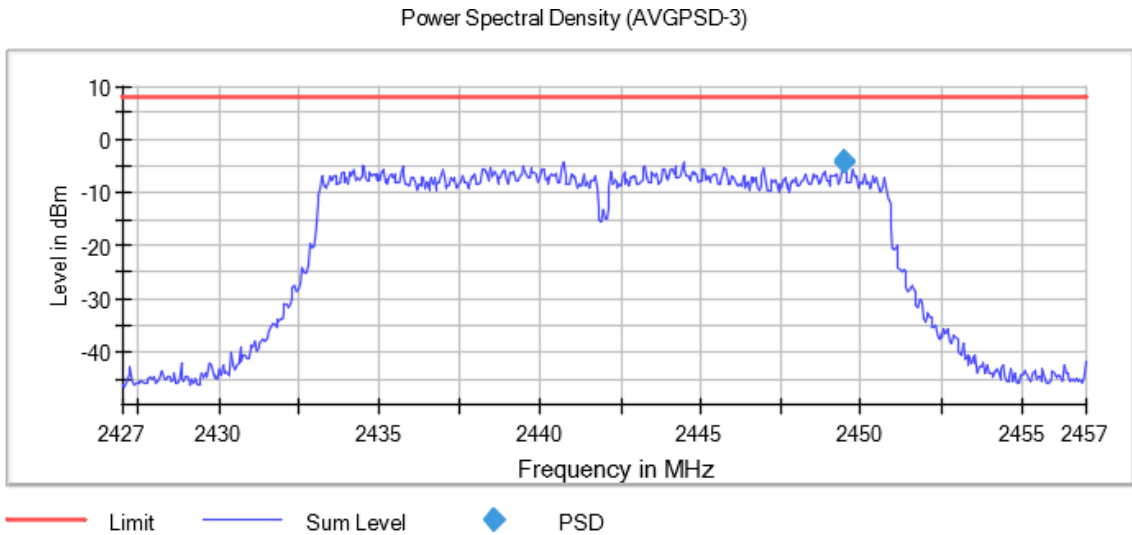
Images:

Power Spectral Density (AVGPSD-3)



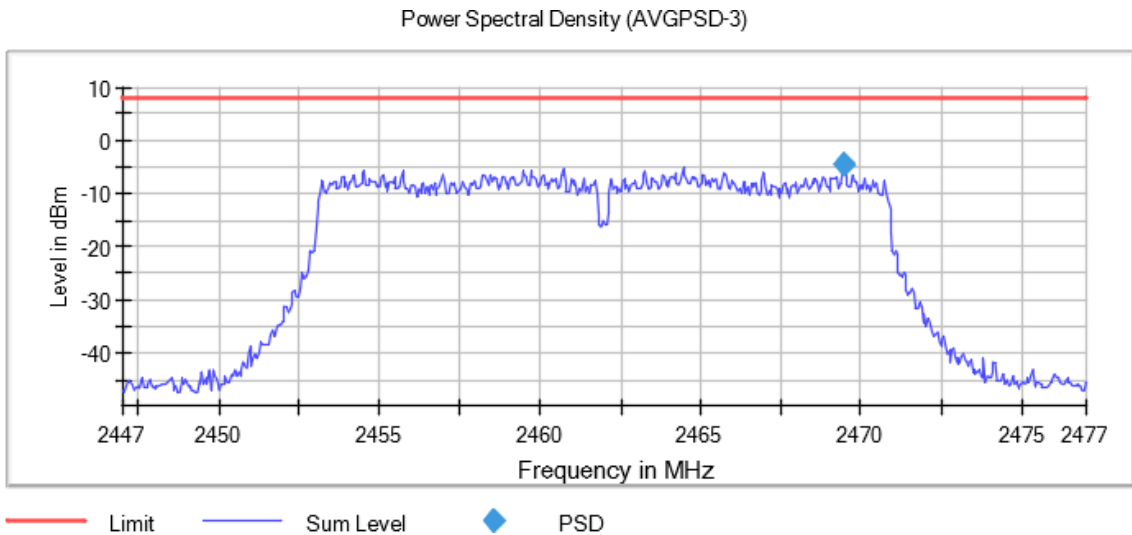
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

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

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

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

Maximum declared antenna gain: 2.4 dBi

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000				12.05	14.45
2442.00000	20	1	1	12.30	14.70
2462.00000				10.47	12.87

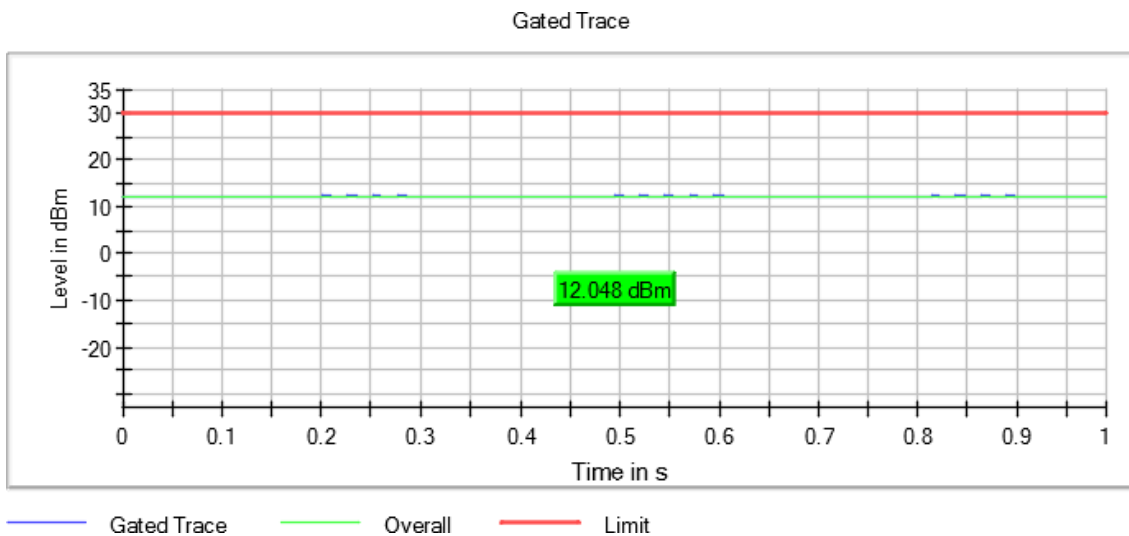
Verdict

Pass

Attachments

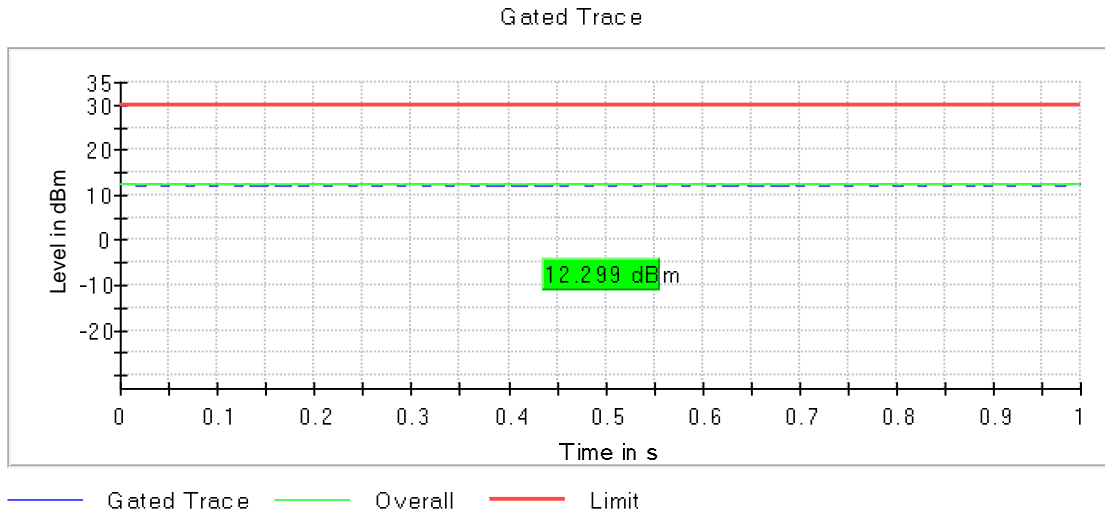
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



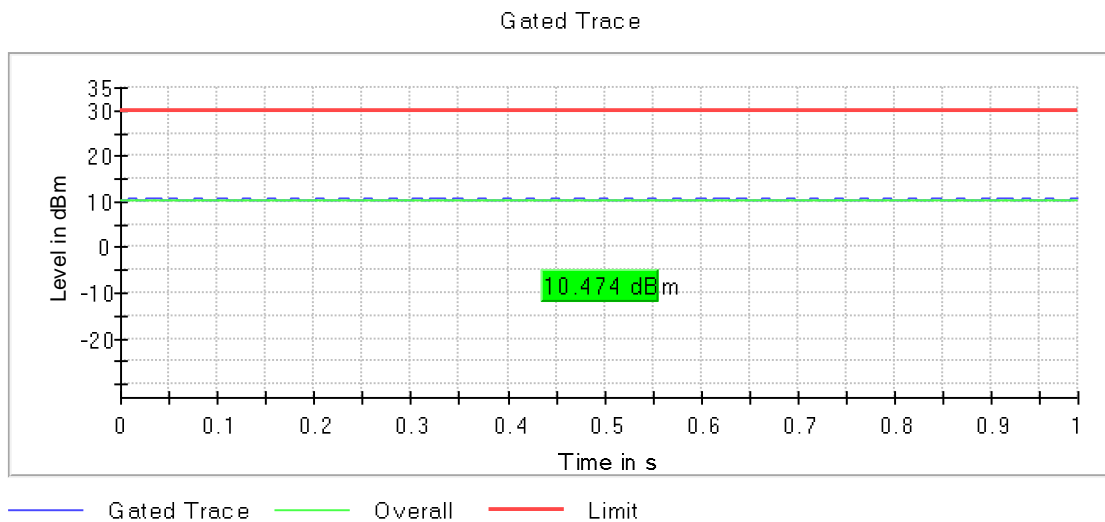
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000				12.51	14.91
2437.00000	20	1	1	12.68	15.08
2462.00000				11.03	13.43

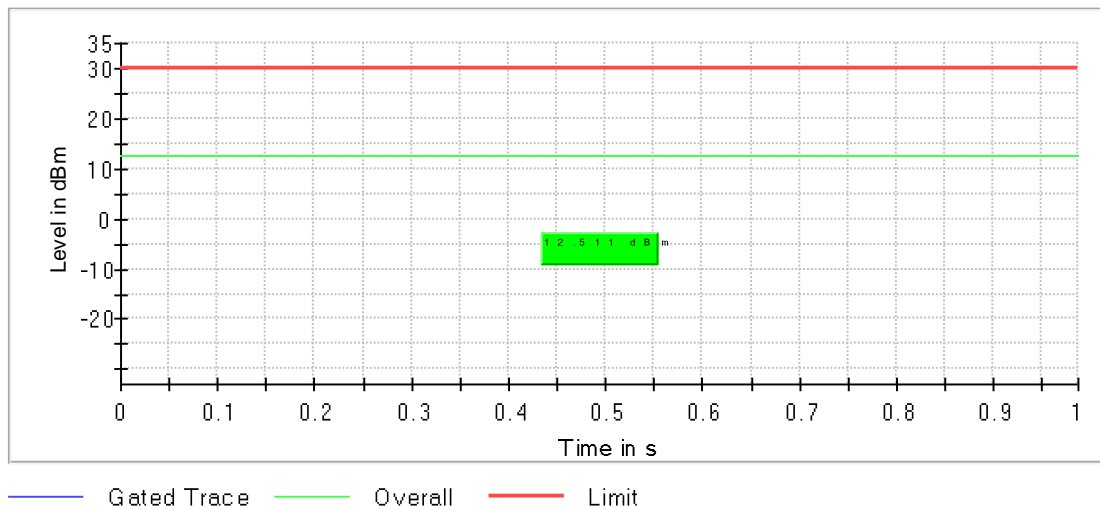
Verdict

Pass

Attachments

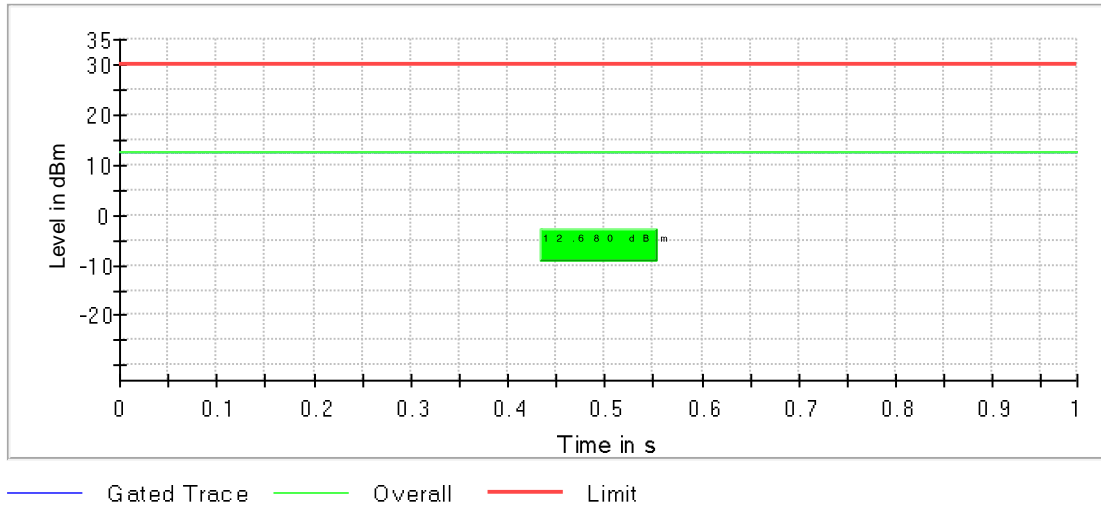
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



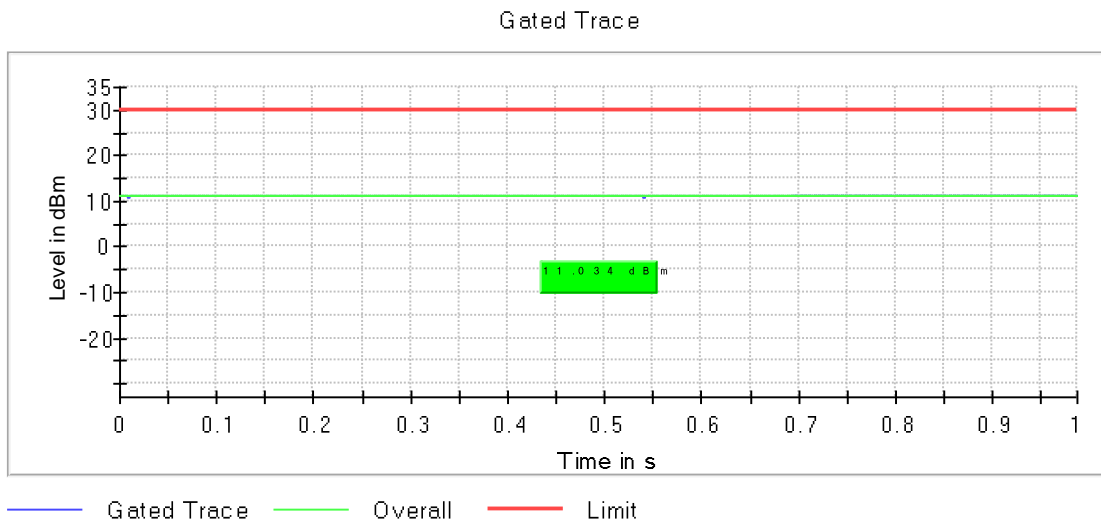
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



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

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Avg Power (dBm)	E.I.R.P. (dBm)
2412.00000	20	1	1	10.55	12.95
2442.00000	20	1	1	10.70	13.10
2462.00000	20	1	1	10.03	12.43

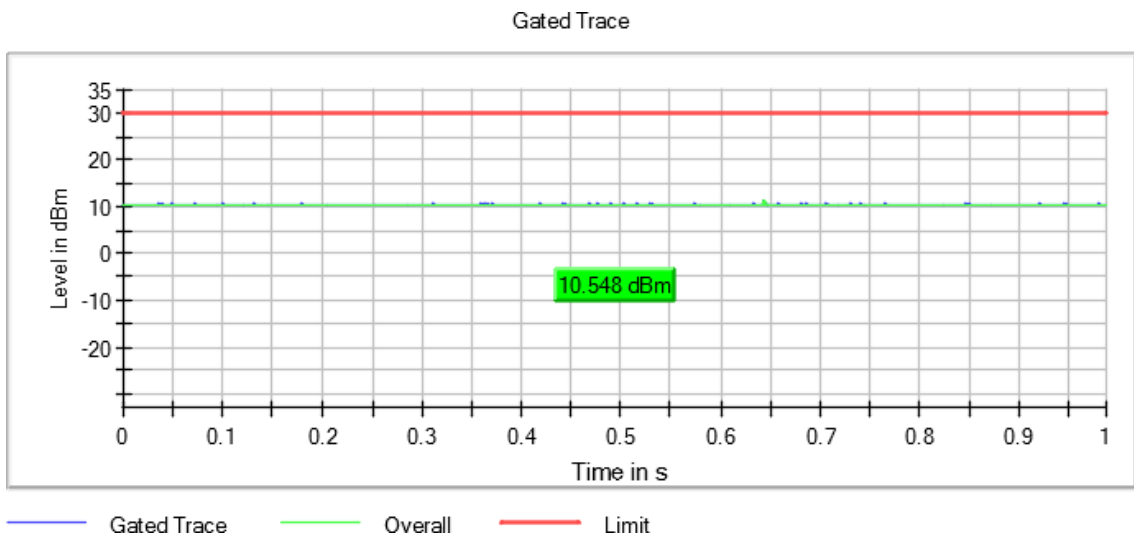
Verdict

Pass

Attachments

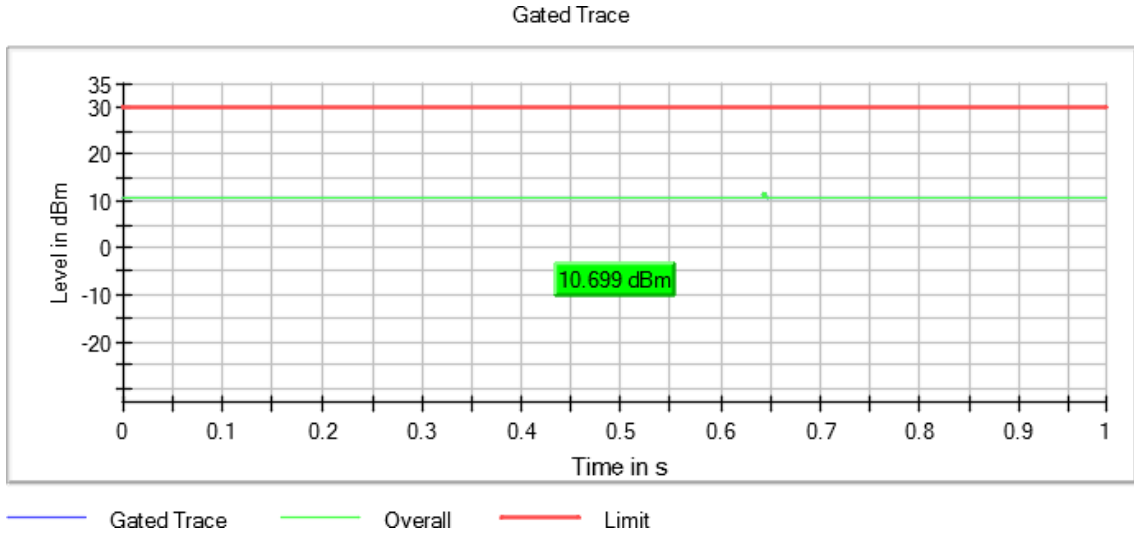
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



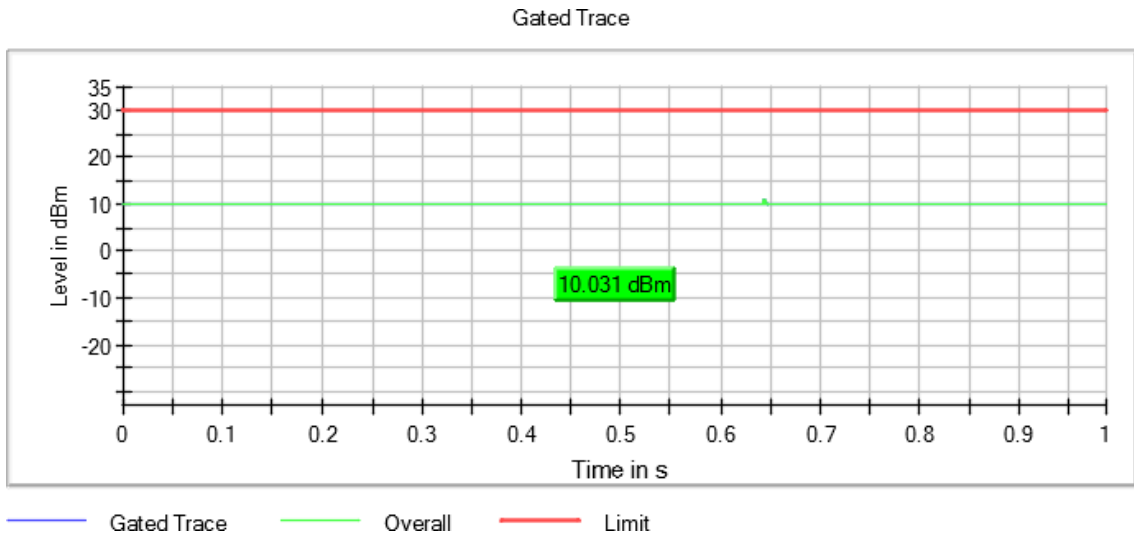
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
 Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

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

Limits

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

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	Lvl (dBm)
2399.325000	-42.1
2399.325000	-42.1
2399.325000	-42.1
2399.375000	-42.2
2399.375000	-42.2
2399.375000	-42.2
2398.825000	-42.7
2398.825000	-42.7
2398.825000	-42.7
2399.025000	-42.8
2399.025000	-42.8
2399.025000	-42.8
2386.575000	-43.1
2386.575000	-43.1
2386.575000	-43.1
2398.875000	-43.1
2398.875000	-43.1
2398.875000	-43.1
2398.925000	-43.1
2398.925000	-43.1
2398.925000	-43.1
2398.975000	-43.2
2398.975000	-43.2
2398.975000	-43.2
2399.275000	-43.2
2399.275000	-43.2
2399.275000	-43.2
2399.225000	-43.4

Freq (MHz)	Lvl (dBm)
2399.225000	-43.4
2399.225000	-43.4
2386.525000	-43.6
2386.525000	-43.6
2386.525000	-43.6
2399.075000	-43.6
2399.075000	-43.6
2399.075000	-43.6
2399.525000	-44.0
2399.525000	-44.0
2399.525000	-44.0
2398.775000	-44.0
2398.775000	-44.0
2398.775000	-44.0
2399.475000	-44.2
2399.475000	-44.2
2399.475000	-44.2

Verdict

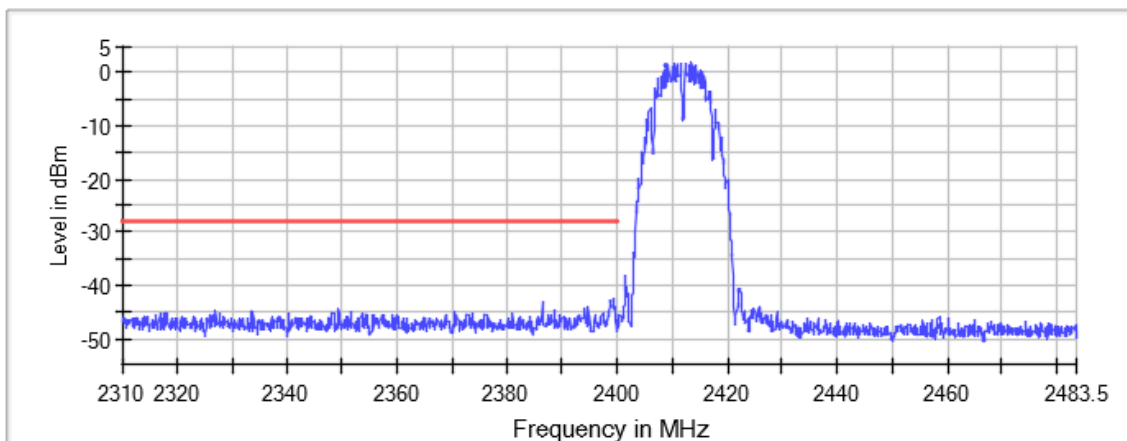
Pass

Attachments

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

Images:

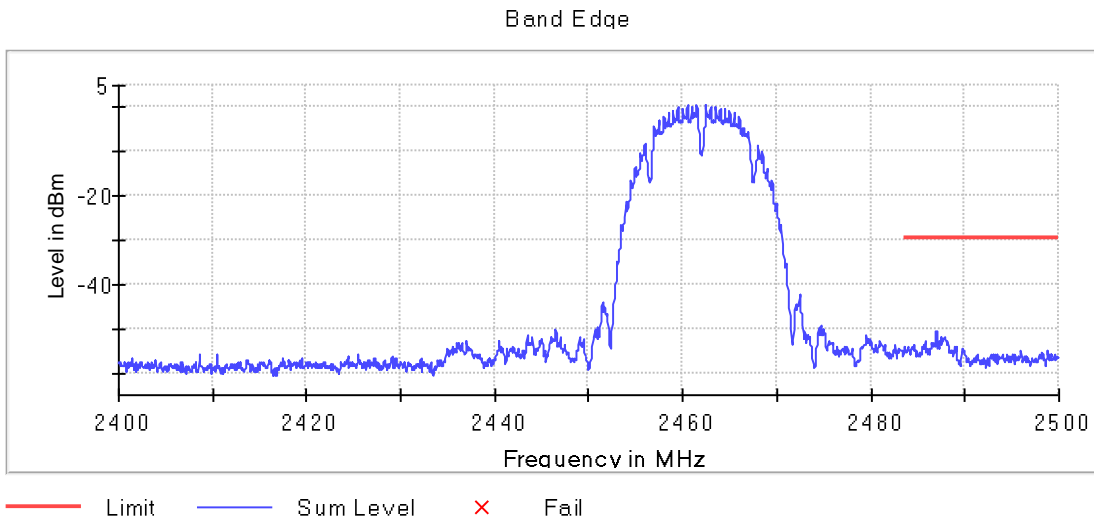
Band Edge



— Limit — Sum Level × Fail

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

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Lvl (dBm)
2399.825000	-31.3
2399.775000	-31.7
2399.875000	-32.3
2398.825000	-32.8
2398.875000	-32.9
2399.075000	-33.2
2398.225000	-33.3
2399.125000	-33.4
2399.525000	-33.5
2484.525000	-43.5
2484.475000	-43.6
2484.425000	-43.8
2484.125000	-43.9
2484.075000	-43.9
2484.175000	-44.0
2484.725000	-44.1
2488.425000	-44.2
2486.025000	-44.2
2399.175000	-33.5
2398.775000	-33.5
2398.175000	-33.5
2399.725000	-33.6
2399.475000	-33.7
2396.725000	-33.8
2484.375000	-44.5
2486.075000	-44.6
2484.025000	-44.6
2488.475000	-44.7
2483.925000	-44.7
2485.975000	-44.7

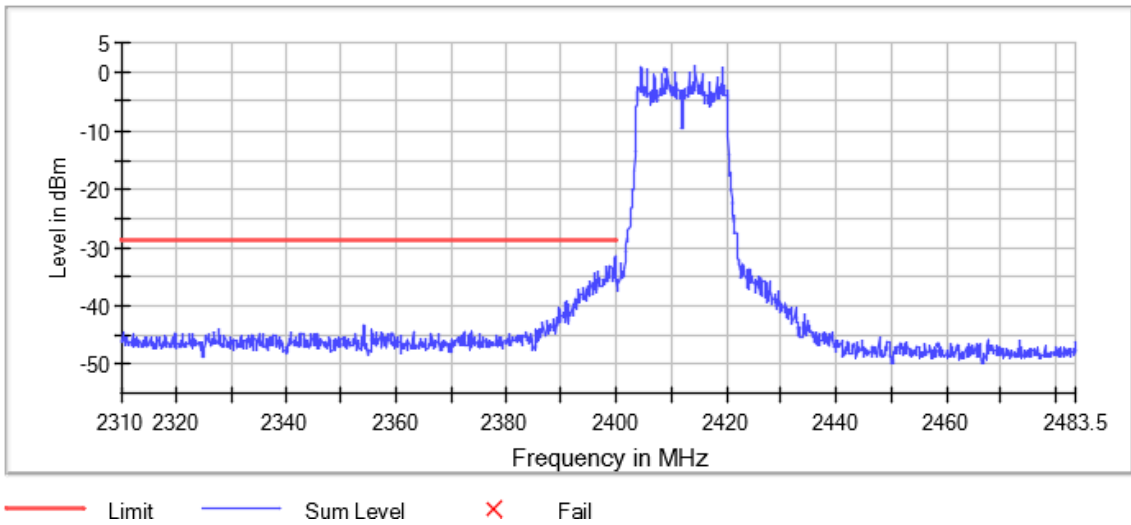
Verdict

Pass

Attachments

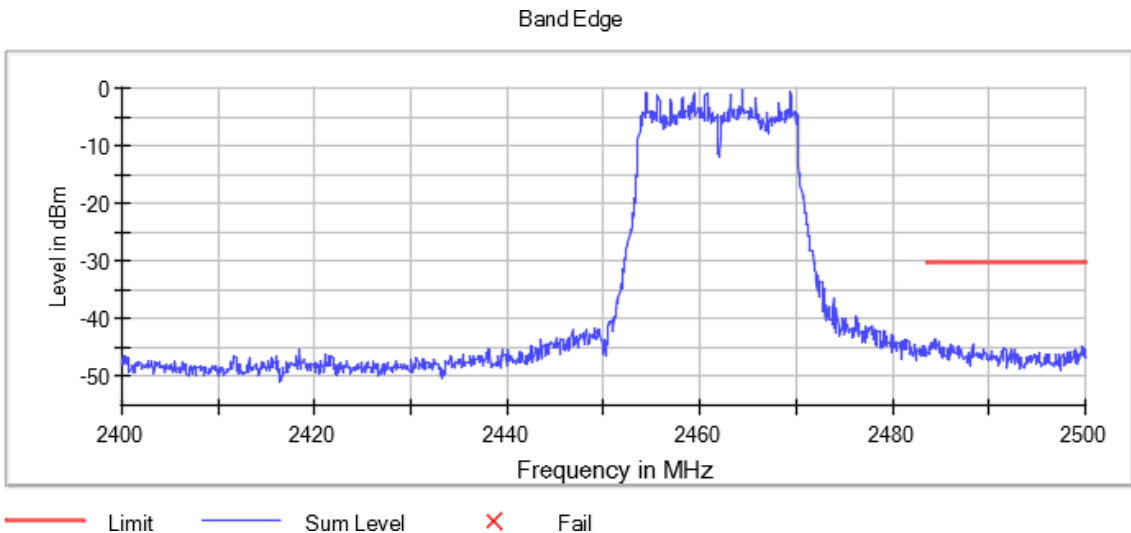
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



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

Images:



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

Results

Freq (MHz)	Lvl (dBm)
2398.425000	-36.7
2397.225000	-36.8
2398.475000	-36.8
2397.275000	-36.8
2398.375000	-36.8
2399.625000	-36.8
2397.175000	-37.0
2399.575000	-37.0
2398.225000	-37.0
2484.775000	-49.0
2484.725000	-49.1
2484.825000	-49.2
2484.525000	-49.2
2484.475000	-49.2
2484.675000	-49.4
2486.925000	-49.5
2484.125000	-49.6
2483.525000	-49.6
2398.275000	-37.0
2398.325000	-37.1
2399.675000	-37.1
2398.525000	-37.2
2398.175000	-37.2
2397.825000	-37.3
2486.975000	-49.6
2485.525000	-49.8
2484.075000	-49.8
2485.475000	-49.8
2486.325000	-50.0
2484.225000	-50.1

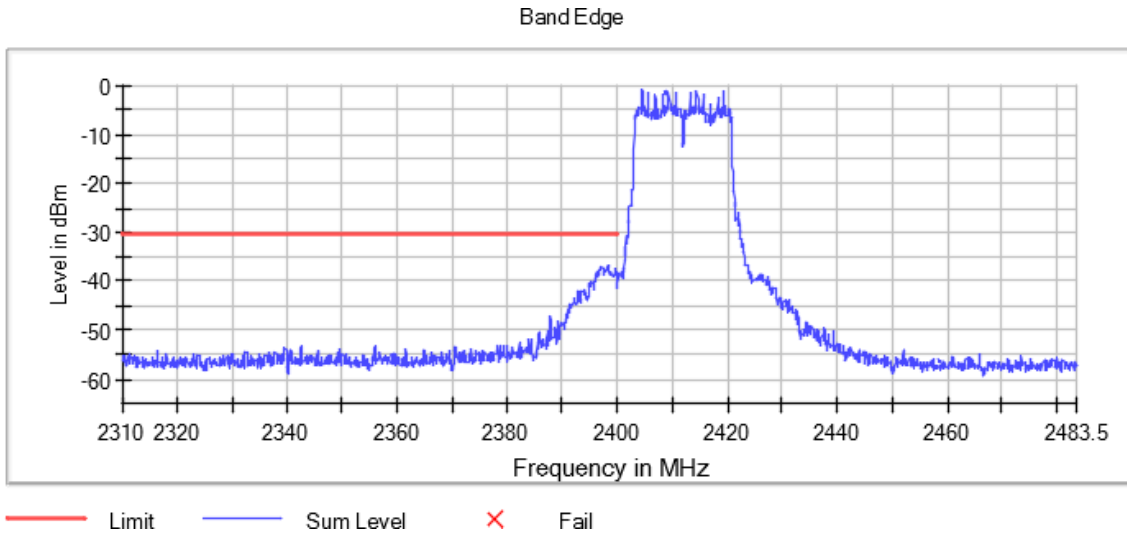
Verdict

Pass

Attachments

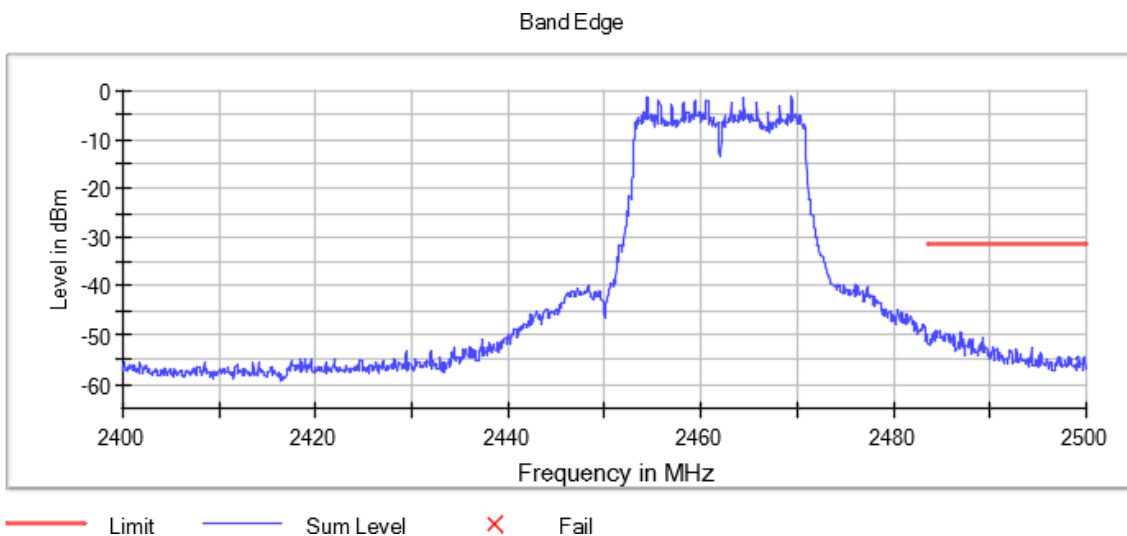
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Measurement Point = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

FCC 2.1049 / 99dBw Occupied Channel Bandwidth 99%

Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000				13.200
2442.00000	20	1	1	13.200
2462.00000				13.200

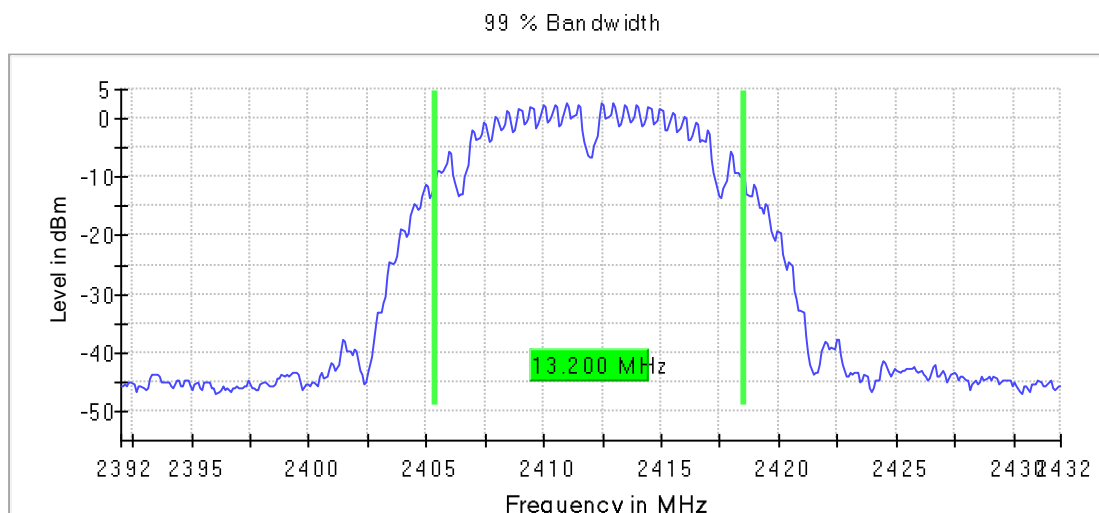
Verdict

Pass

Attachments

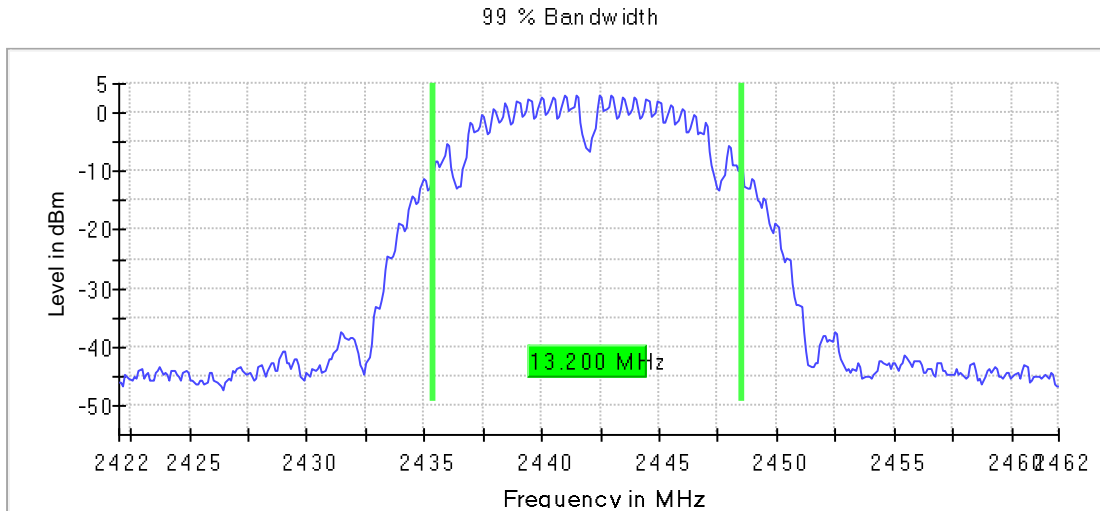
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



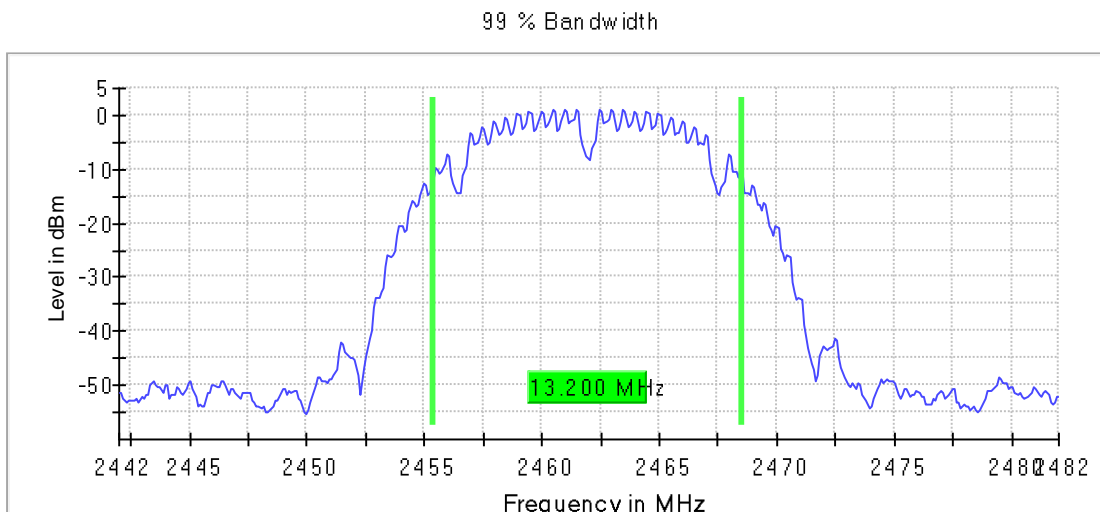
**Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Active Port = 1**

Images:



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

Images:



Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000				16.700
2442.00000	20	1	1	16.700
2462.00000				16.600

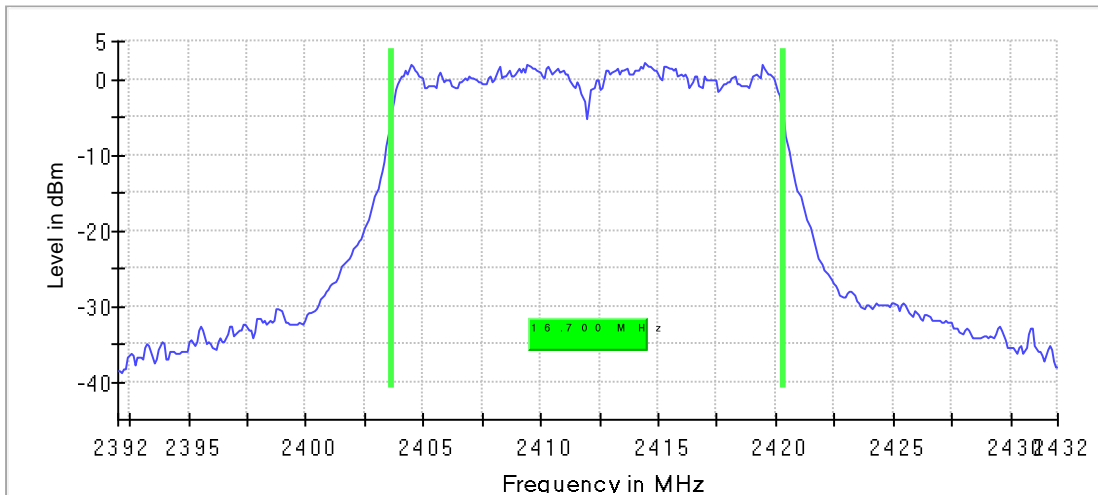
Verdict

Pass

Attachments

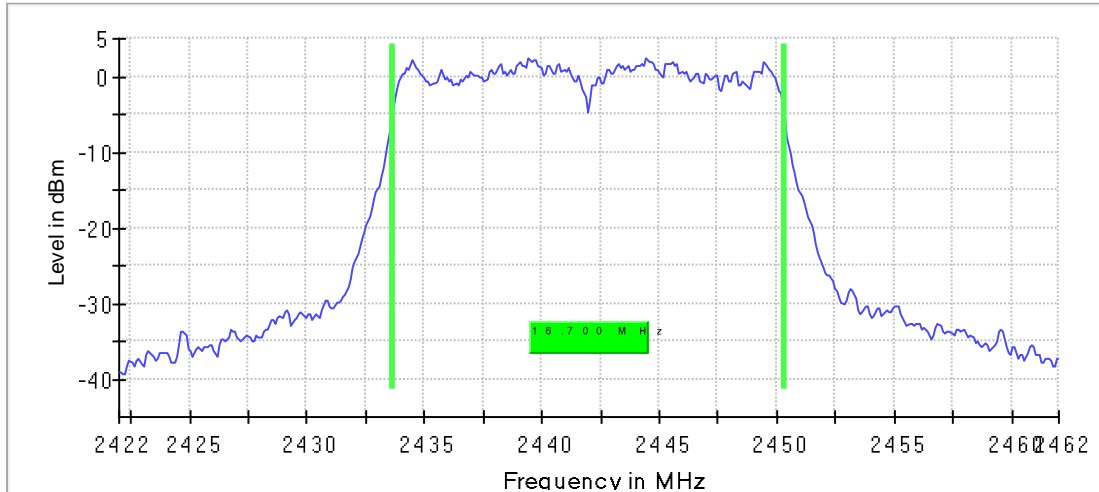
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



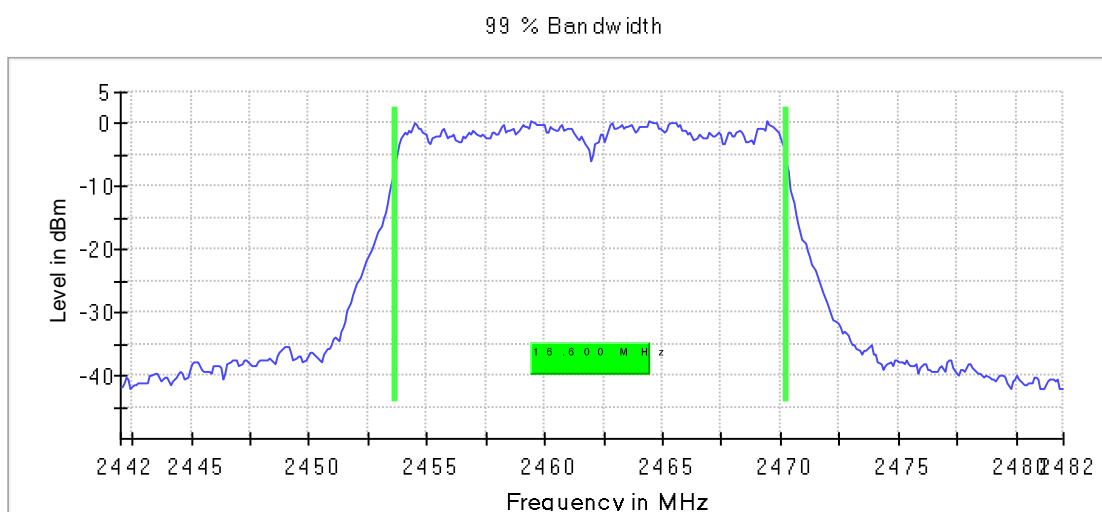
Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



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

Results

Freq (MHz)	BW (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00000				17.700
2442.00000	20	1	1	17.700
2462.00000				17.700

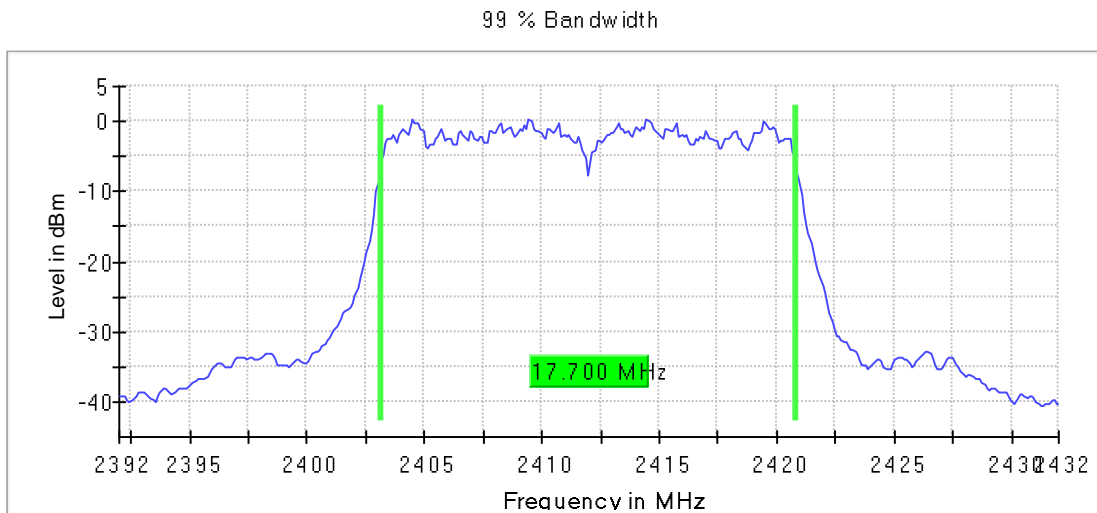
Verdict

Pass

Attachments

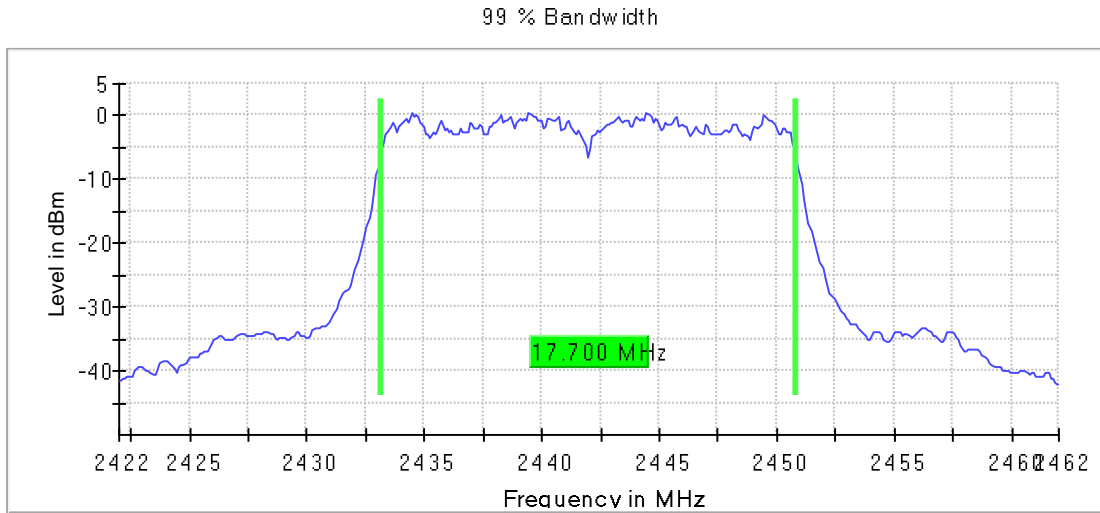
Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20, Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



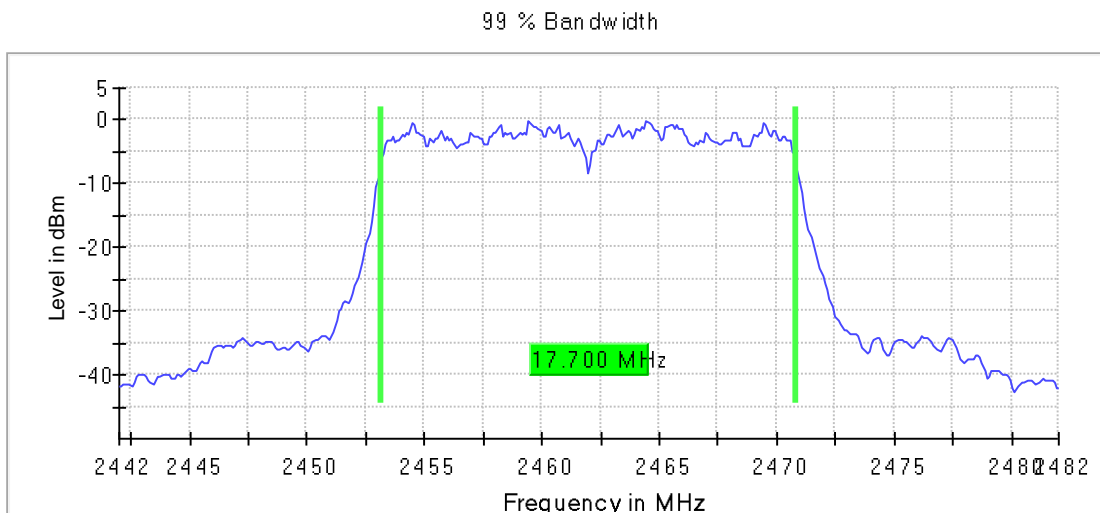
Frequency MHz = 2437.00000, Equipment Type = Digital Transmission System (DTS), Bandwidth MHz = 20,
Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Active Port = 1

Images:



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

Images:



Measurement Setup

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

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

Limits

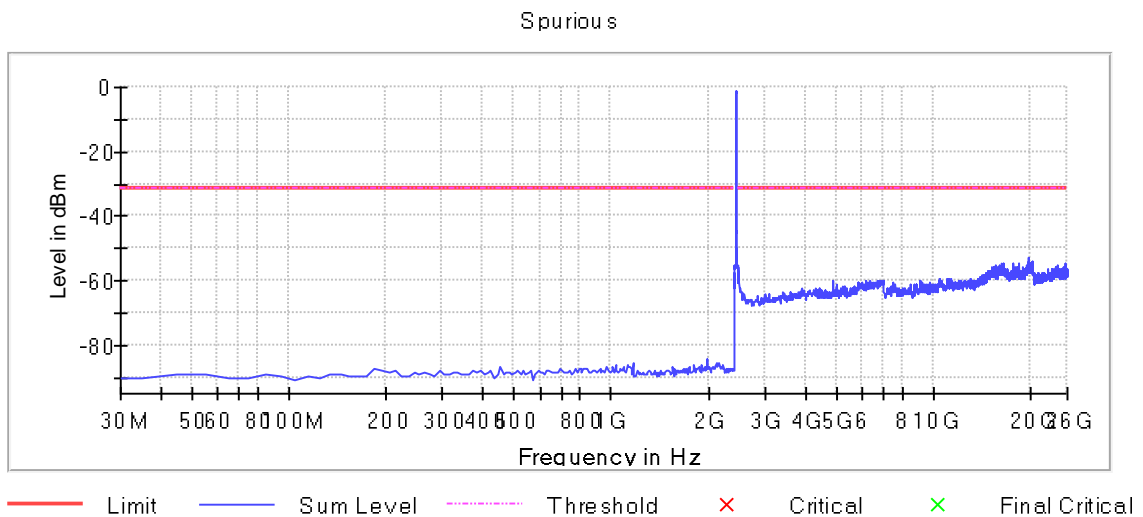
In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of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

Modulation: 802.11b

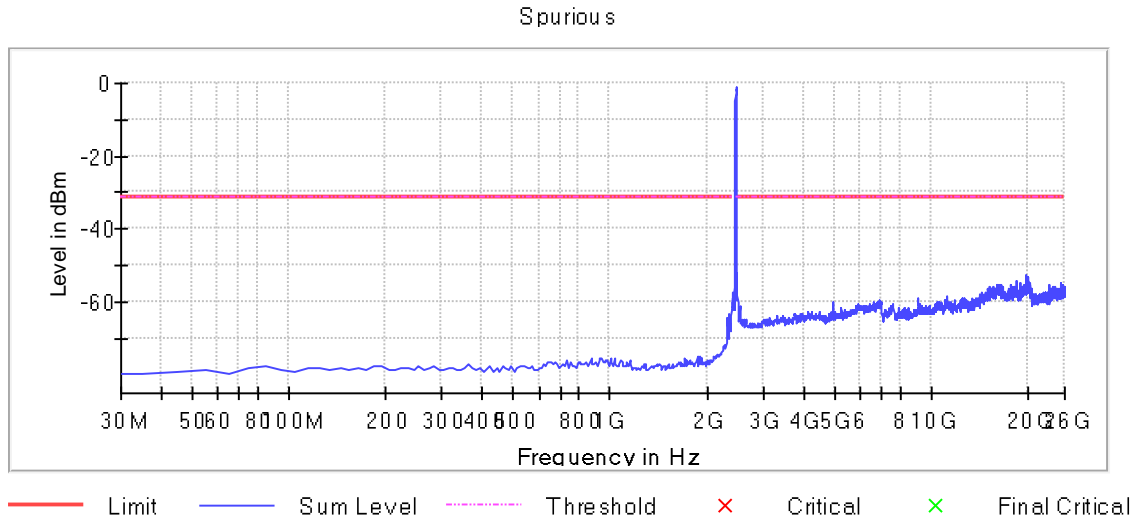
Results

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

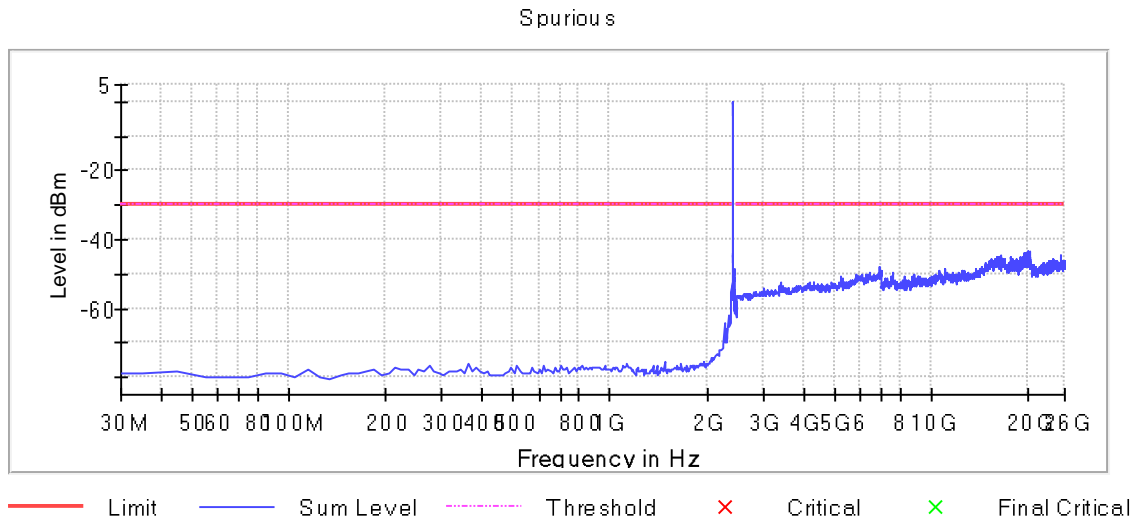
Lowest Channel



Middle Channel



Highest Channel



Verdict

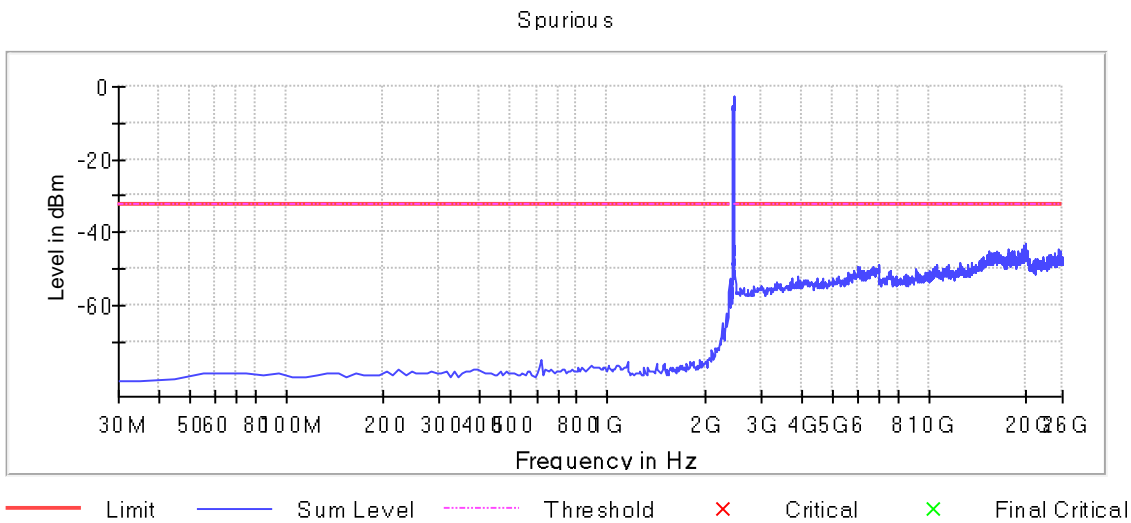
Pass

Modulation: 802.11g (DSS 6 Mbit/s)

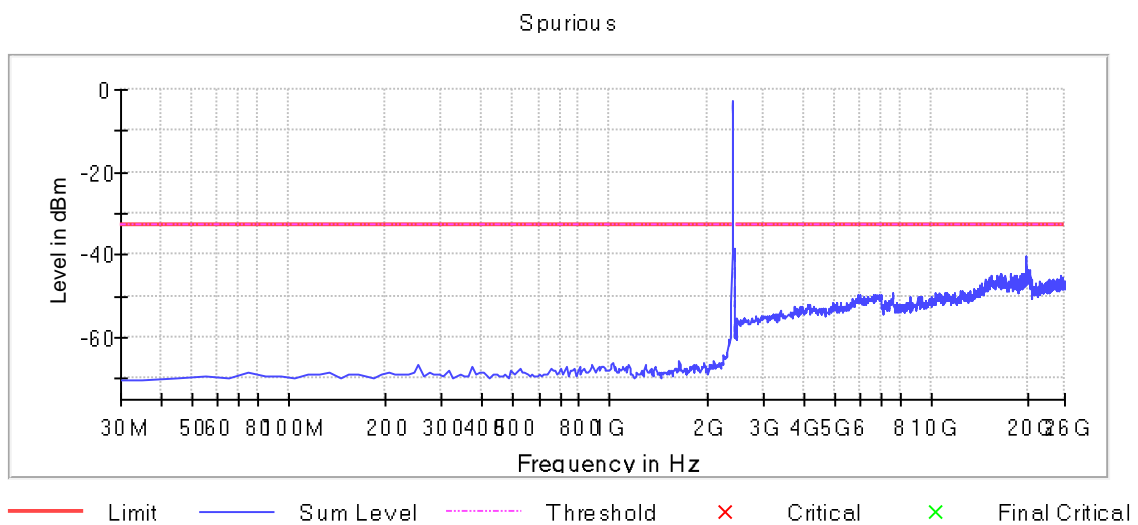
Results

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

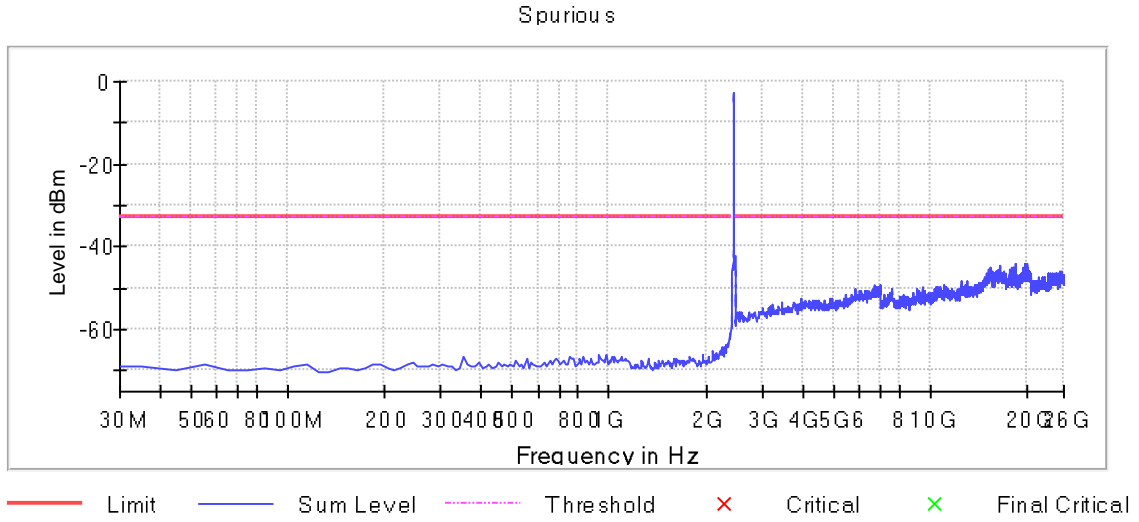
Lowest Channel



Middle Channel



Highest Channel



Verdict

Pass

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

Limits

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

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required

Verdict

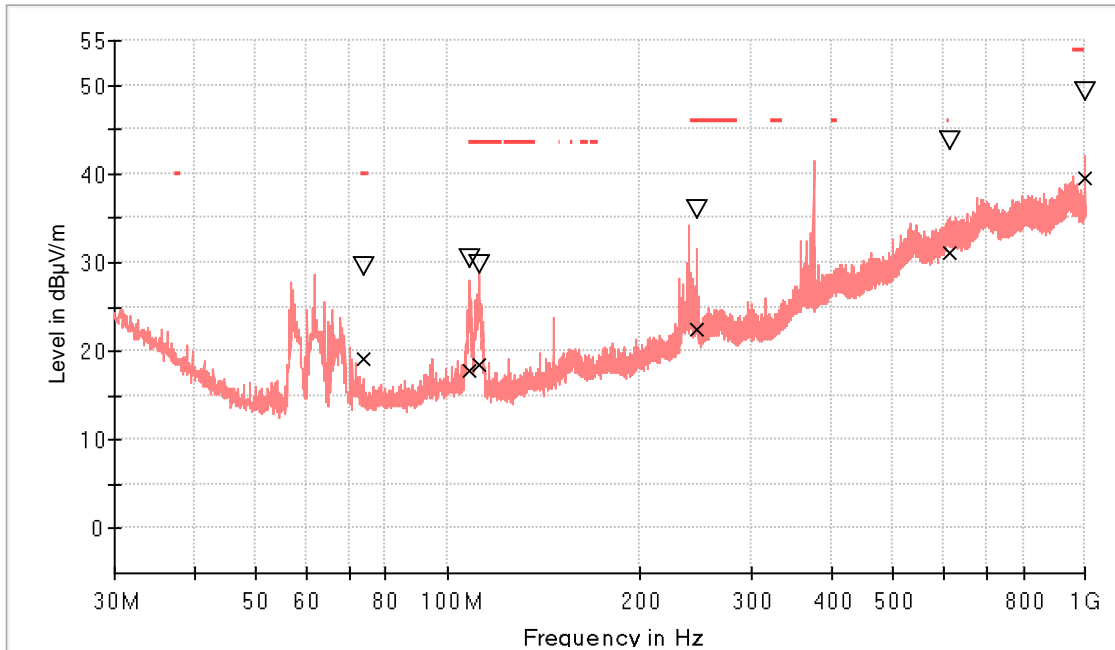
Pass

Modulation: 802.11b

Results

Frequency range 30 - 1000 MHz

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

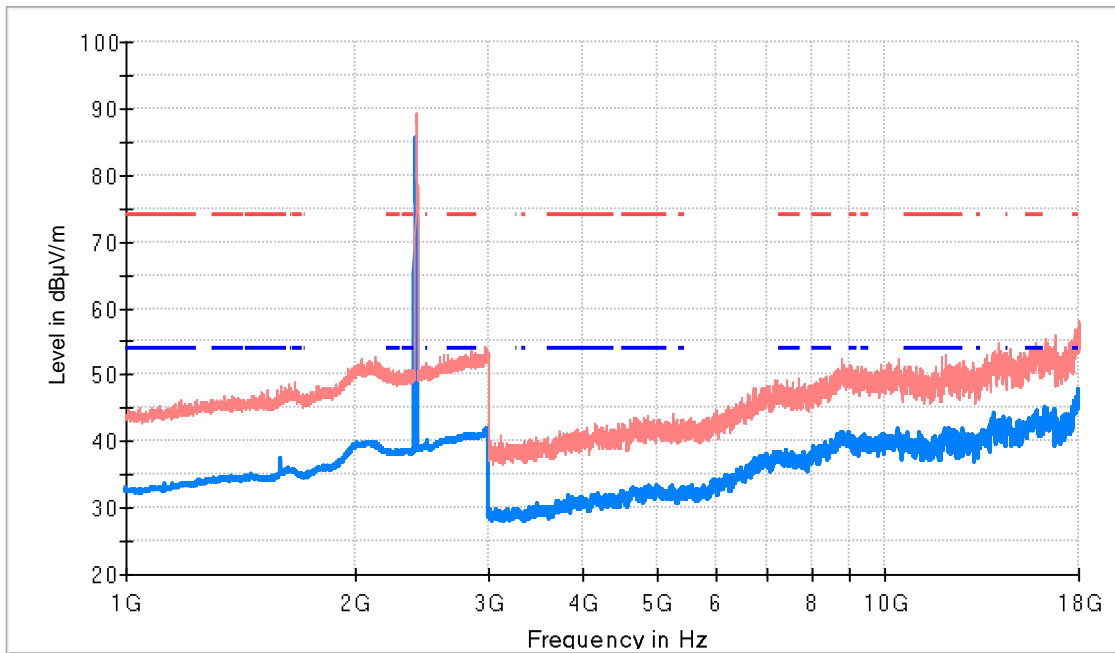


- PK+_MAXH
- ▽ MaxPeak-PK+ (Single)
- TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz) Restricted Bands QPK Limit
- x QuasiPeak-QPK (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
73.747000	29.6	19.2	V	20.8	40.0
108.133500	30.3	17.9	V	25.7	43.5
112.256000	29.8	18.5	V	25.0	43.5
245.825000	36.0	22.5	H	23.6	46.0
613.843000	43.7	31.2	V	14.9	46.0
1000.000000	49.3	39.4	V	14.6	54.0

Frequency range: 1 – 18 GHz

Lowest Channel

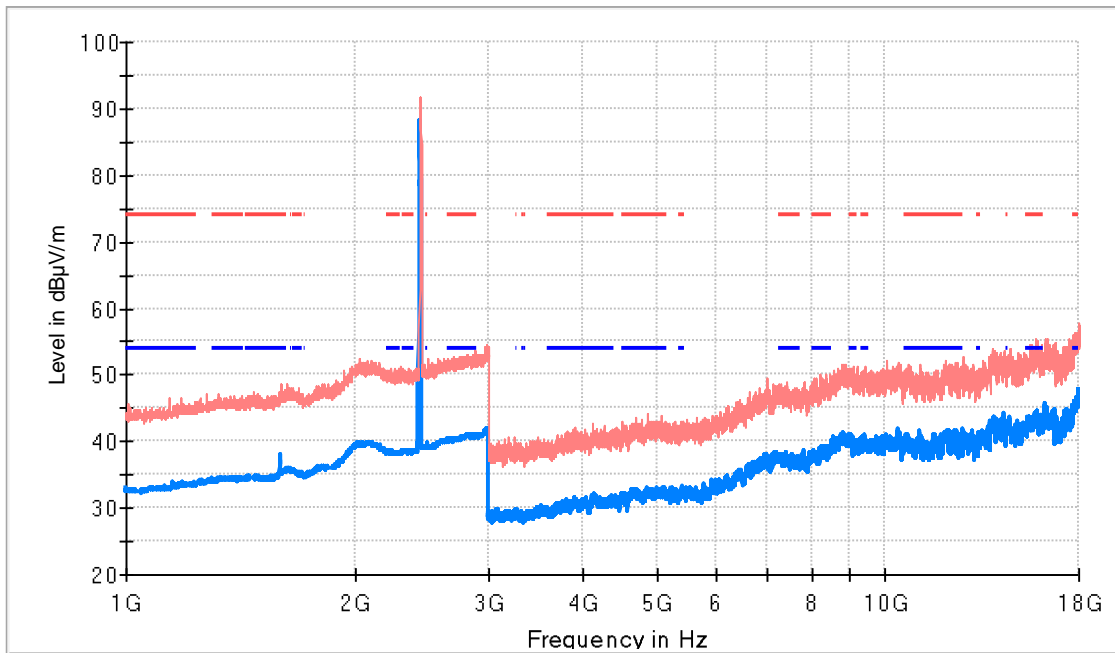


- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	PoI	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2413.500000	89.3	85.5	H	---	---	Fundamental
12069.500000	49.3	41.4	H	12.6	54.0	

Frequency range: 1 – 18 GHz

Middle Channel

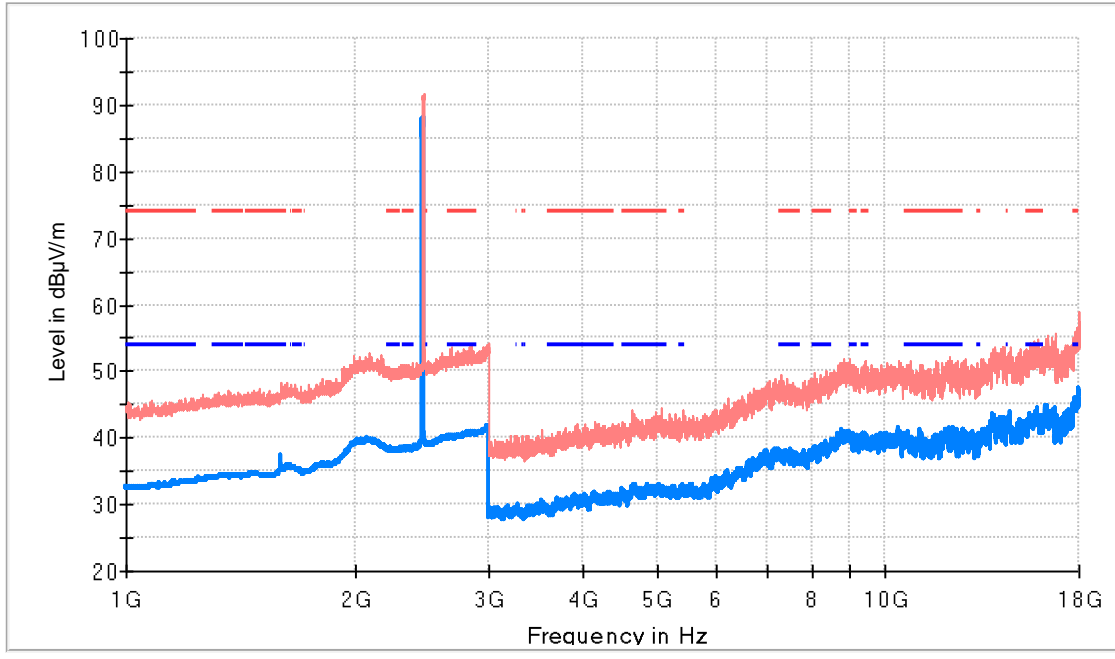


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2441.000000	91.8	88.2	H	---	---	Fundamental
12182.500000	48.9	40.8	V	13.2	54.0	

Frequency range: 1 – 18 GHz

Highest Channel

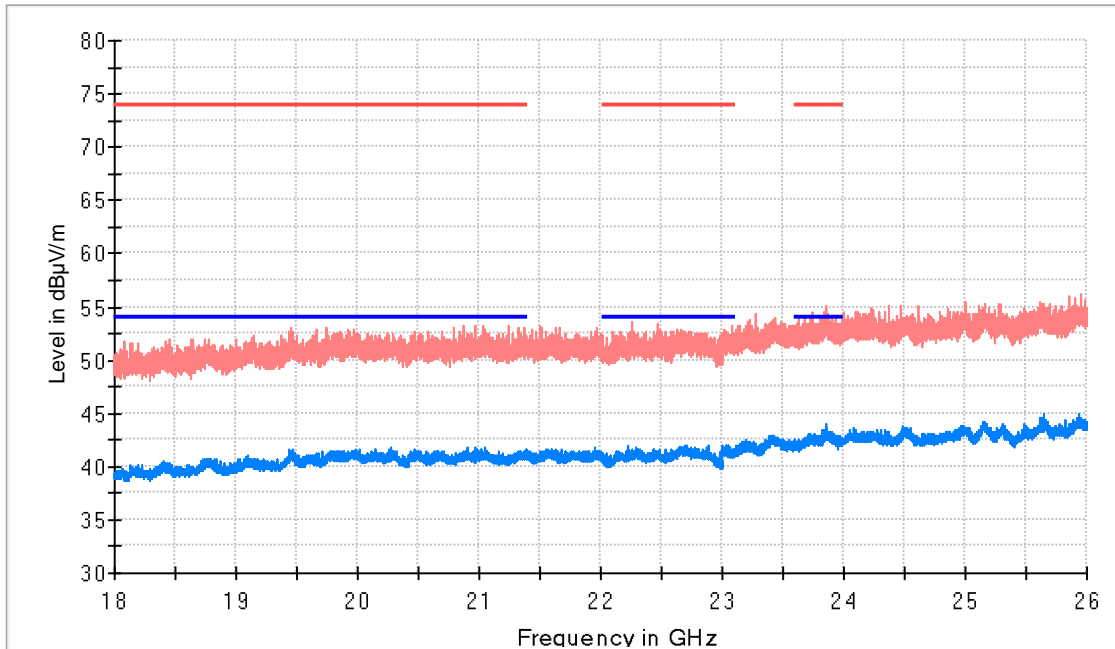


- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	PoI	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2463.500000	91.8	88.0	H	---	---	Fundamental
12309.500000	49.9	40.5	H	13.5	54.0	

Frequency range 18 - 26 GHz

Lowest Channel

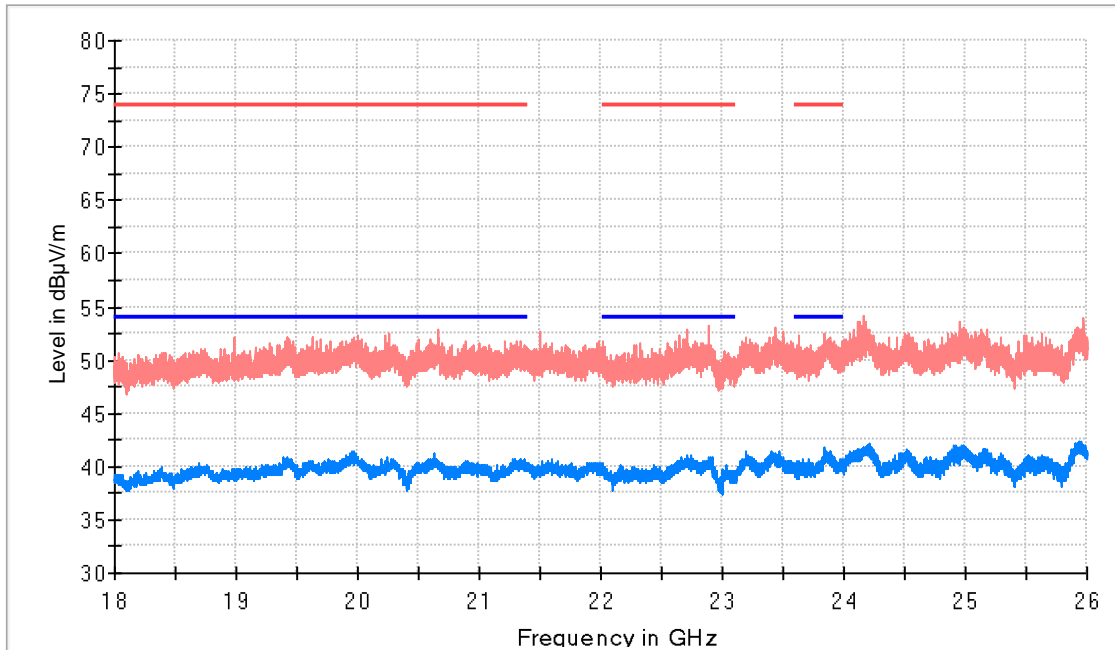


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23855.500000	52.7	44.1	H	9.9	54.0

Frequency range 18 - 26 GHz

Middle Channel

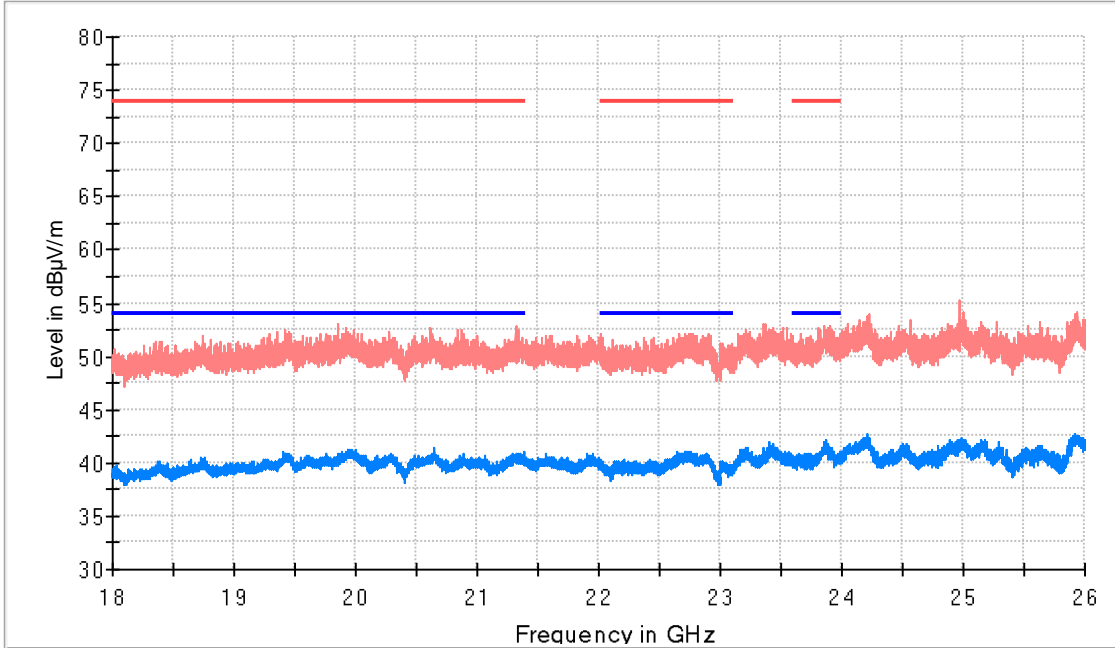


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23842.50000	51.2	41.8	H	12.2	54.0

Frequency range 18 - 26 GHz

Highest Channel

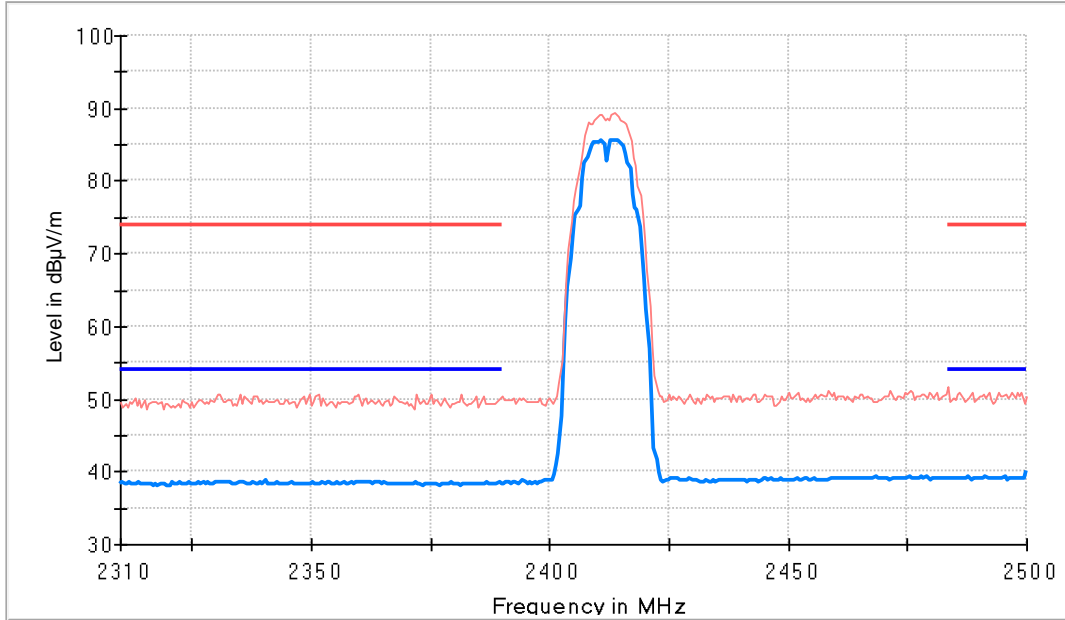


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23865.500000	52.2	42.1	V	11.9	54.0

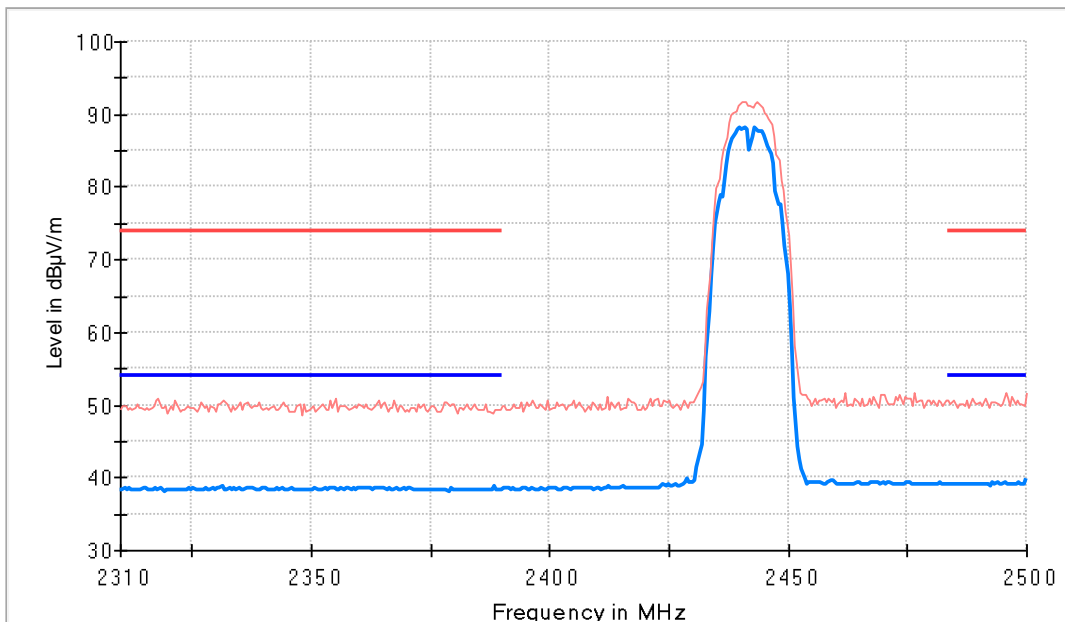
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



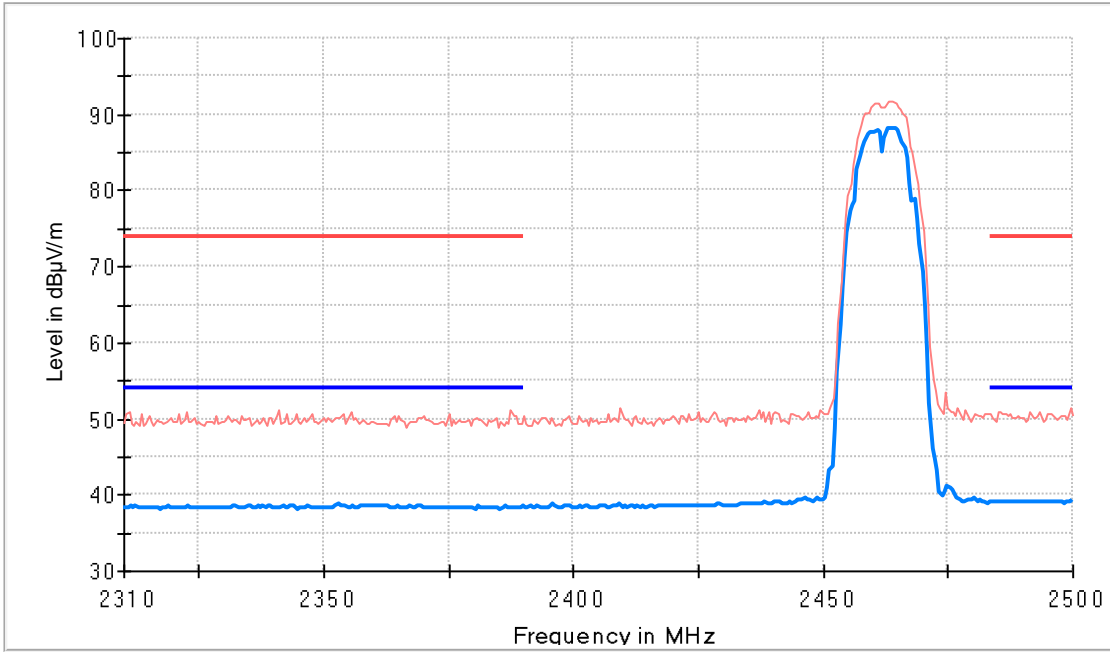
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Middle Channel



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

Highest Channel



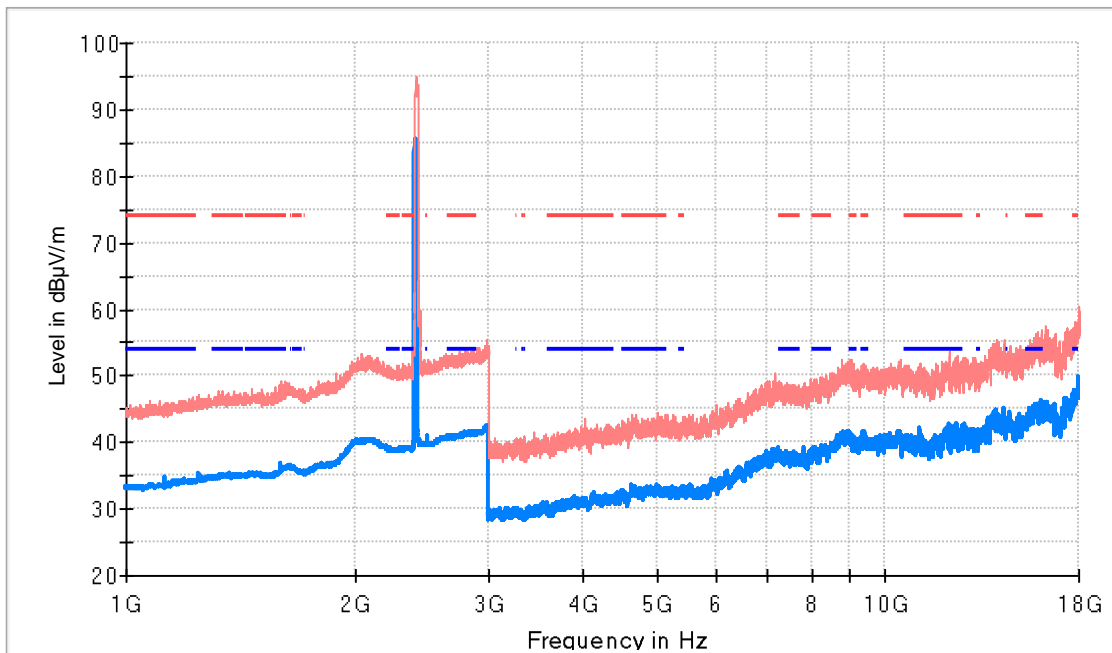
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Modulation: 802.11g

Results

Frequency range 1 - 18 GHz

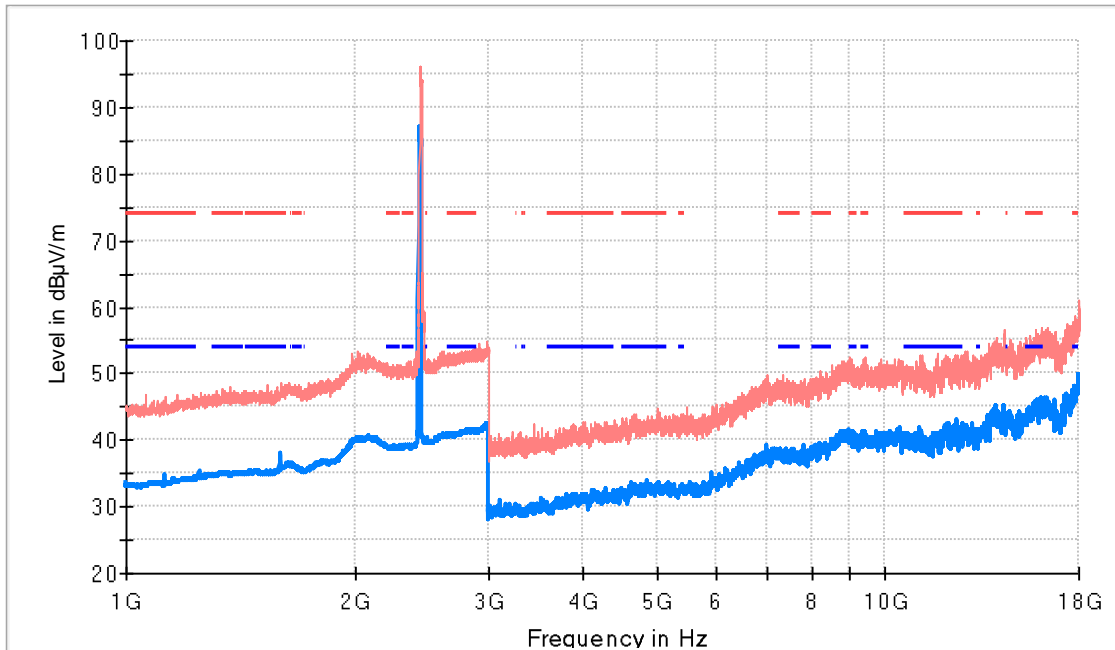
Lowest Channel



- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-2.6 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2412.000000	92.1	82.9	V	---	---	Fundamental
16051.500000	56.9	45.5	H	8.5	54.0	

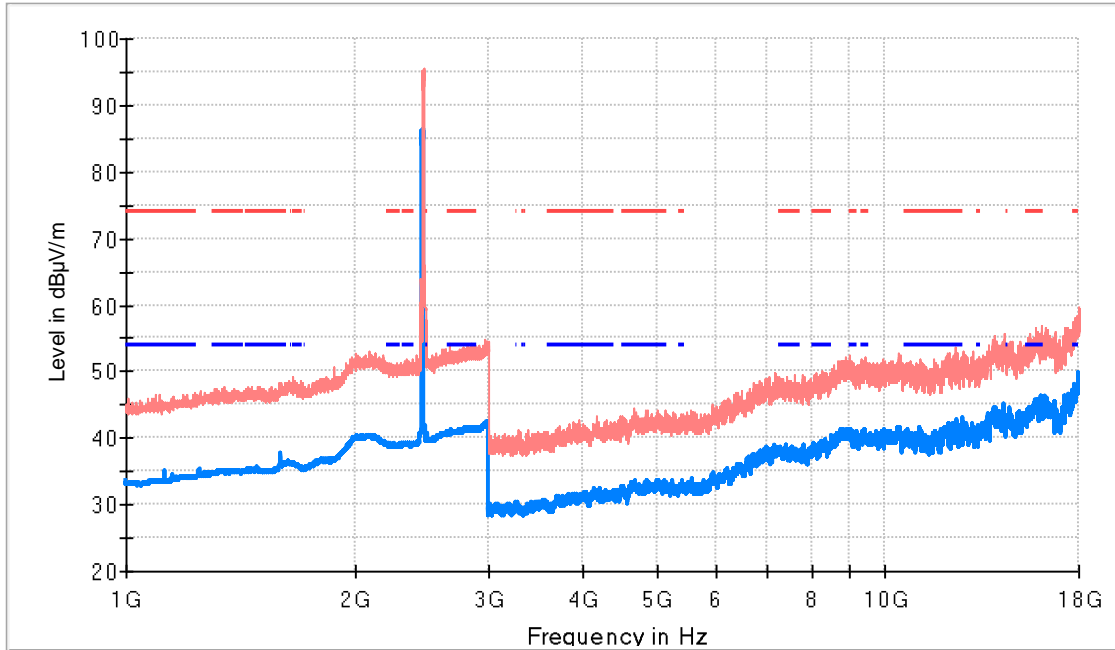
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2440.000000	95.6	87.1	H	---	---	Fundamental
17986.500000	59.9	49.7	V	4.3	54.0	

Highest Channel

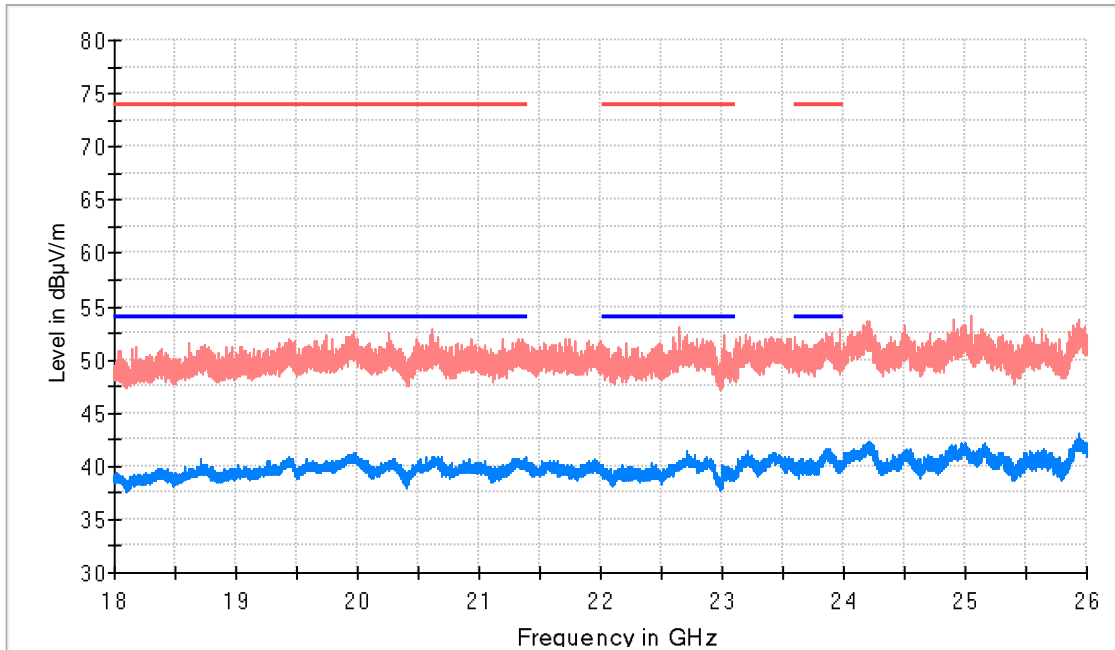


- AVG_MAXH
- PK+_MAXH
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- - - TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	PoI	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
2462.000000	92.4	84.2	V	---	---	Fundamental
12385.500000	53.5	41.5	V	12.5	54.0	

Frequency range 18 - 26 GHz

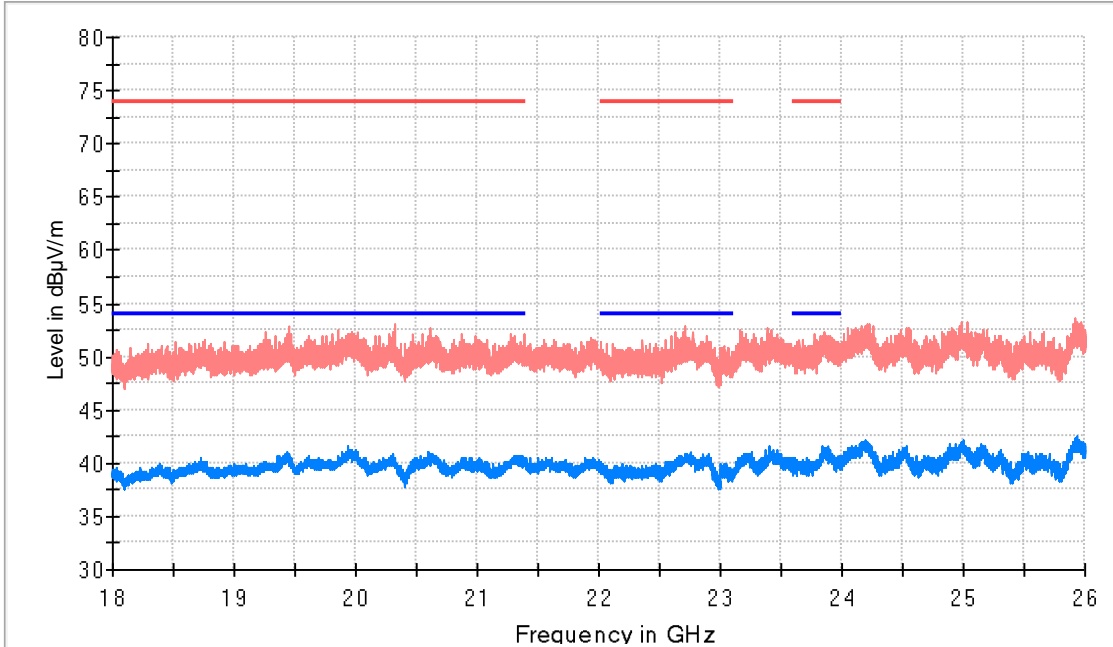
Lowest Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
22717.000000	50.2	41.4	V	12.6	54.0

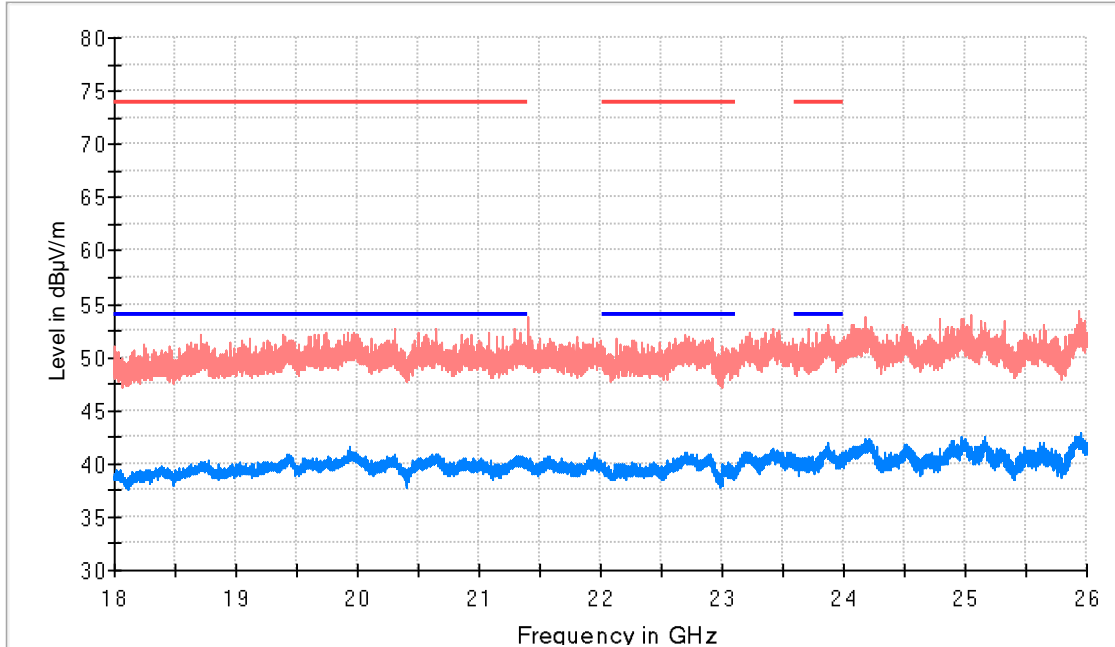
Middle Channel



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

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
19939.50000	51.7	41.6	H	12.4	54.0

Highest Channel

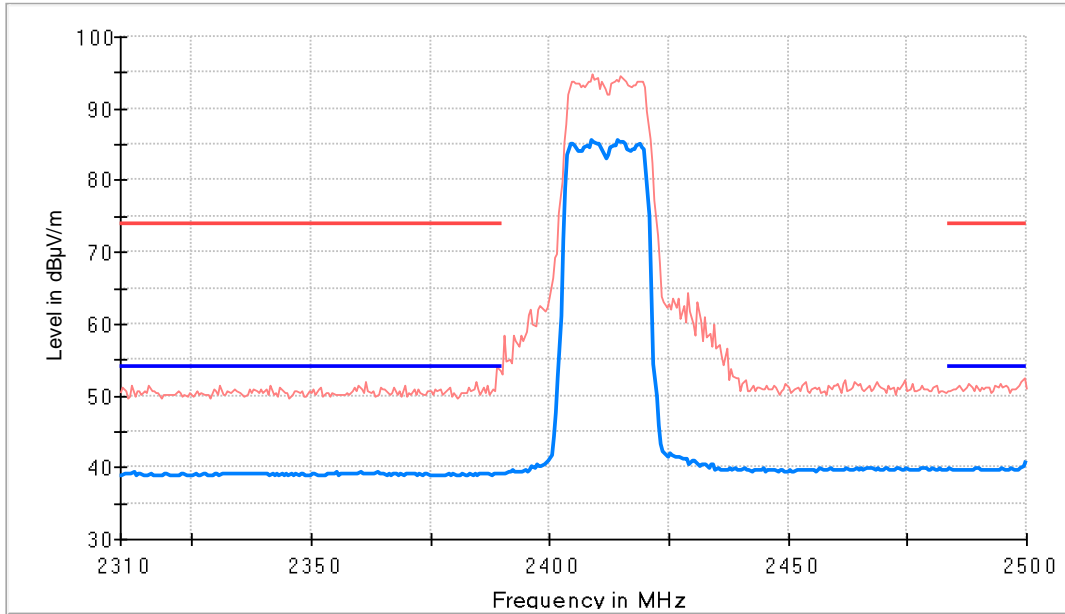


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
23878.500000	51.2	41.9	H	12.1	54.0

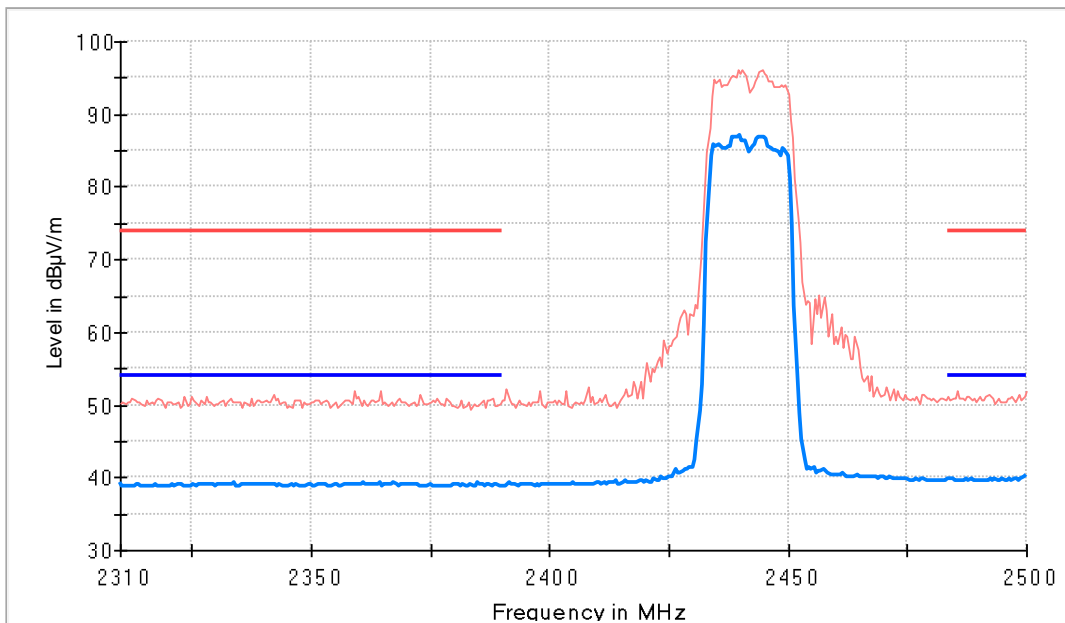
Restricted Bands (2.31 GHz - 2.5 GHz)

Lowest Channel



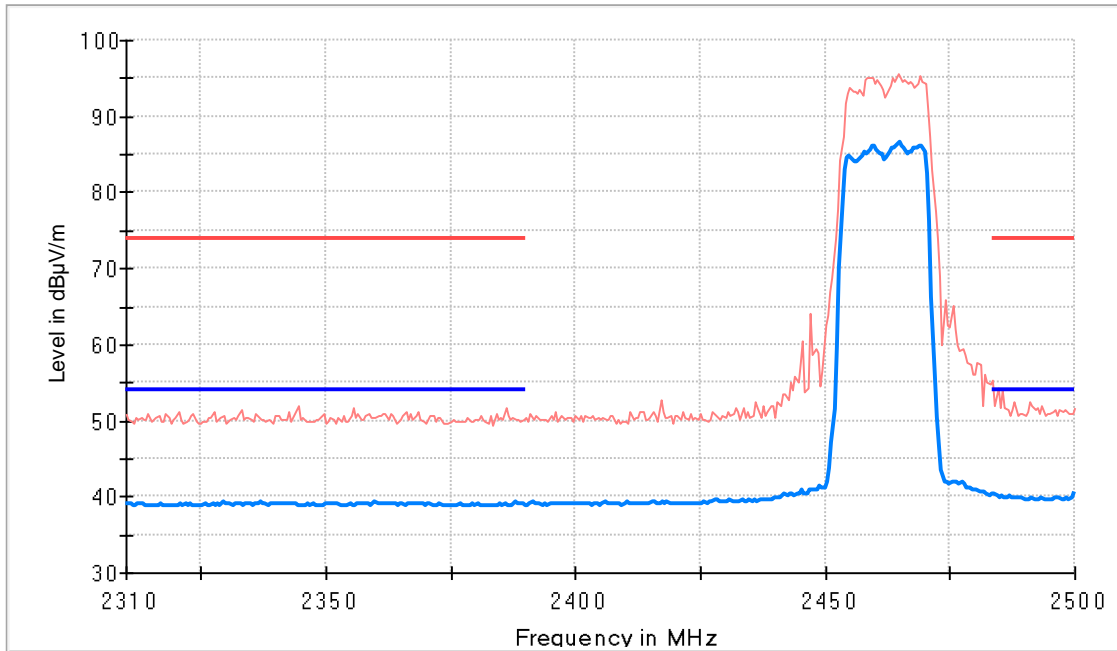
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1-26 GHz) Restricted Bands AVG Limit

Middle Channel



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

Highest Channel



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