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Acronyms

Acronym ID	Acronym Description
Avg COT	Average Channel Occupancy Time
BW	Bandwidth
Detector	Detector used
Ebw	Emission Bandwidth
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Freq Sep	Frequency Separation
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
Mode	MIMO Mode
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
Pol	Polarization
Port	Active Port
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

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

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

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

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

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

Uncertainty

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

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 1 GHz is:
Measurement uncertainty $\leq \pm 5,35$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 1 GHz to 17 GHz is:
Measurement uncertainty $\leq \pm 4,32$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 26 GHz is:
Measurement uncertainty $\leq \pm 5,51$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the conducted testing of EUT is:

RF Peak Output Power: Measurement uncertainty $\leq \pm 0,80$ dB

RF Average Output Power: Measurement uncertainty $\leq \pm 0,99$ dB

Power Spectral Density: Measurement uncertainty $\leq \pm 0,99$ dB

6dB Bandwidth: Measurement uncertainty $\leq \pm 1,14$ %

Occupied Channel Bandwidth: Measurement uncertainty $\leq \pm 1,40$ %

Conducted Band-edge spurious emissions: Measurement uncertainty $\leq \pm 1,76$ dB

Accumulated Dwell Time: Measurement uncertainty $\leq \pm 0,16$ %

Minimum Frequency Occupation Time: Measurement uncertainty $\leq \pm 0,53$ %

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 an Headunit with Display and TP, USB, BT and WLAN.

3. Declaration of similarity for SW version:

HARMAN AUTOMOTIVE DIVISION
HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GÖRING-STRASSE 16
76307 KARLSBAD, GERMANY
E-MAIL: STEFAN.BLASCHKE@HARMAN.COM



Harman Becker Automotive Systems GmbH | Postfach 2260 | 76303 Karlsbad
To whom it may concern

Karlsbad, 27.11.2024

SW-Declaration for model: SPACE 4 BASE 1.1A

Dear Ladies and Gentlemen,

we, Harman Becker Automotive Systems GmbH herewith confirm, that the product use for RED/FCC testing had the following HW/SW configuration:

Model: SPACE 4 BASE 1.1A
HW: DV2
SW: R11

Hint: On the product label you can find the SW version "SW: RB09.1.1" – this was printed in the production, but before doing the measurements the units have been updated.

In case of any question please do not hesitate and contact us. Thank you

Regards



Stefan Blaschek
Regulatory Compliance Management

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

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	76426_14.1	Headunit	SPACE 4 BASE 1.1A	Z0681A000041379321A0694E0012	2024-09-30	Element Under Test
S/01	76426_15.1	PCB board	--	--	2024-09-30	Auxiliary Element
S/01	76426_16.1	USB cable	--	--	2024-09-30	Auxiliary Element
S/01	76426_17.1	Harness	--	--	2024-09-30	Auxiliary Element
S/02	76426_10.1	Headunit	SPACE 4 BASE 1.1A	Z0681A000041379321A0694E0010	2024-08-21	Element Under Test
S/02	76426_11.1	Harness	--	--	2024-08-21	Auxiliary Element
S/02	76426_12.1	USB cable	--	--	2024-08-21	Auxiliary Element
S/02	76426_13.1	PCB board	--	--	2024-08-21	Auxiliary Element

Notes referenced to samples during the project:

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

Test sample description

Ports..... :	Port name and description	Cable				
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
		Main Connector	2m	[X]	[]	[]
		USB Connector		[X]	[X]	[]
		GPS/FVC/RVC		[X]	[X]	[]
--						
Supplementary information to the ports..... :						
Rated power supply	Voltage and Frequency		Reference poles			
			L1	L2	L3	N
	[]	AC:	[]	[]	[]	[]
[X]	DC: 12V car battery /attenuator (9,5-15,5v normal operation)					
Rated Power	--					
Clock frequencies.....	--					
Other parameters	--					
Software version	R11					
Hardware version	DV2					
Dimensions in cm (W x H x D)	--					
Mounting position	[]	Table top equipment				
	[]	Wall/Ceiling mounted equipment				
	[]	Floor standing equipment				
	[]	Hand-held equipment				
	[X]	Other: automotive (car vehicles, agricultural vehicles, motor bikes)				
Modules/parts..... :	Module/parts of test item		Type		Manufacturer	
	--					
Accessories (not part of the test item)	Description		Type		Manufacturer	
	--					
Documents as provided by the applicant	Description		File name		Issue date	
	--					

⁽³⁾ Only for Medical Equipment

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
Becker-Goering-Str. 16
76307, Karlsbad, GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-10-29
Date (finish)	2024-11-15

Document history

Report number	Date	Description
80708RRF.006	2024-12-11	First release.
80708RRF.006A1	2024-12-19	Second release. Modification to add missing info. This test report replaces and cancels the test report 80708RRF.006

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Antonio Maireles, Sergio Carrasco and Valentin Andarias Diaz.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
06791	SEMIANECHOIC ABSORBER LINED CHAMBER IV	FACT 3 200 STP	ETS LINDGREN	N/A
06792	SHIELDED ROOM	S101	ETS LINDGREN	N/A
06609	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2025-04-22
06615	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2025-04-04
07817	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2026-07-01
06143	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2027-01-22
06142	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2025-07-25
06496	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK	2026-12-01
03783	PRE-AMPLIFIER G>30dB 1GHz-18GHz	BLMA 0118-3A	BONN ELEKTRONIK	2025-03-15
04657	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2026-06-12
08856	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2025-02-27
07445	DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	N/A
07760	DIGITAL MULTIMETER	175	FLUKE	2025-11-07
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
06793	SHIELDED ROOM	S101	ETS LINDGREN	N/A
06611	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2025-04-04
06668	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2024-12-14
08848	OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2024-12-21
07040	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2025-04-19
00922	POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	2027-10-02
05850	DIGITAL MULTIMETER	179	FLUKE	2025-11-04
07798	WMS32	WMS32	ROHDE AND SCHWARZ	N/A

Testing verdicts

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

Summary

Bluetooth EDR. ANT 1. Appendix A

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
FCC 15.247 (a) (1) / RSS-247 5.1 (b)	20 dB Bandwidth	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	P	--
FCC 15.247 (b) / RSS-247 5.4. (b)	Maximum peak output power and	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)]	Number of hopping channels	P	--
FCC 15.247 (d) / RSS-247 5.5	Band-edge emissions compliance	P	--
FCC 15.247 (d) / RSS-247 5.5	Emission limitations radiated (Transmitter)	P	--
<u>Supplementary information and remarks:</u> None			

Bluetooth EDR. ANT 2. Appendix B

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
FCC 15.247 (a) (1) / RSS-247 5.1 (b)	20 dB Bandwidth	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	P	--
FCC 15.247 (b) / RSS-247 5.4. (b)	Maximum peak output power and	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)]	Number of hopping channels	P	--
FCC 15.247 (d) / RSS-247 5.5	Band-edge emissions compliance	P	--
FCC 15.247 (d) / RSS-247 5.5	Emission limitations radiated (Transmitter)	P	--
<u>Supplementary information and remarks:</u> None			

Bluetooth EDR. ANT 3. Appendix C

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
FCC 15.247 (a) (1) / RSS-247 5.1 (b)	20 dB Bandwidth	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	P	--
FCC 15.247 (b) / RSS-247 5.4. (b)	Maximum peak output power and	P	--
FCC 15.247 (a) (1) (iii) / RSS-247 5.1 (d)]	Number of hopping channels	P	--
FCC 15.247 (d) / RSS-247 5.5	Band-edge emissions compliance	P	--
FCC 15.247 (d) / RSS-247 5.5	Emission limitations radiated (Transmitter)	P	--
<u>Supplementary information and remarks:</u> None			

WLAN 2.4 GHz. Appendix D:

FCC PART 15 PARAGRAPH/ RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.247 (a)(2) / RSS-247 5.2. (a)	6 dB Bandwidth	P	--
FCC 15.247 (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	--
FCC 15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	--
FCC 15.247 (e) / RSS-247 5.2. (b)	Power spectral density	P	--
FCC 15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	--
<u>Supplementary information and remarks:</u> None.			

Appendix A: Test results. Bluetooth EDR. ANT 1

TEST CONDITIONS	15
TEST CASES DETAILS	18
<i>Occupied Channel Bandwidth 99%</i>	<i>18</i>
<i>RSS-247 5.1 (b) / FCC 15.247 (a) (1) 20 dB Bandwidth</i>	<i>30</i>
<i>RSS-247 5.1 (b) / FCC 15.247 (a) (1) Carrier Frequency Separation</i>	<i>42</i>
<i>RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) Time of Occupancy (Dwell Time)</i>	<i>51</i>
<i>RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) Number of hopping channels</i>	<i>63</i>
<i>RSS-247 5.4 (b) / FCC 15.247 (b) (1) Maximum Peak Conducted output power</i>	<i>69</i>
<i>RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)</i>	<i>81</i>
<i>RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)</i>	<i>108</i>

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 12Vdc
Type of Power Supply: Car battery / alternator

ANTENNA (*):

Type of Antenna: Integral antenna
Maximum Declared Antenna Gain: +0.34dBi

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Middle Channel	High Channel
BTEDR GFSK	1-DH5	2402 MHz	2441 MHz	2480 MHz
BTEDR PI/4 DQPSK	2-DH5	2402 MHz	2441 MHz	2480 MHz
BTEDR 8DPSK	3-DH5	2402 MHz	2441 MHz	2480 MHz

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

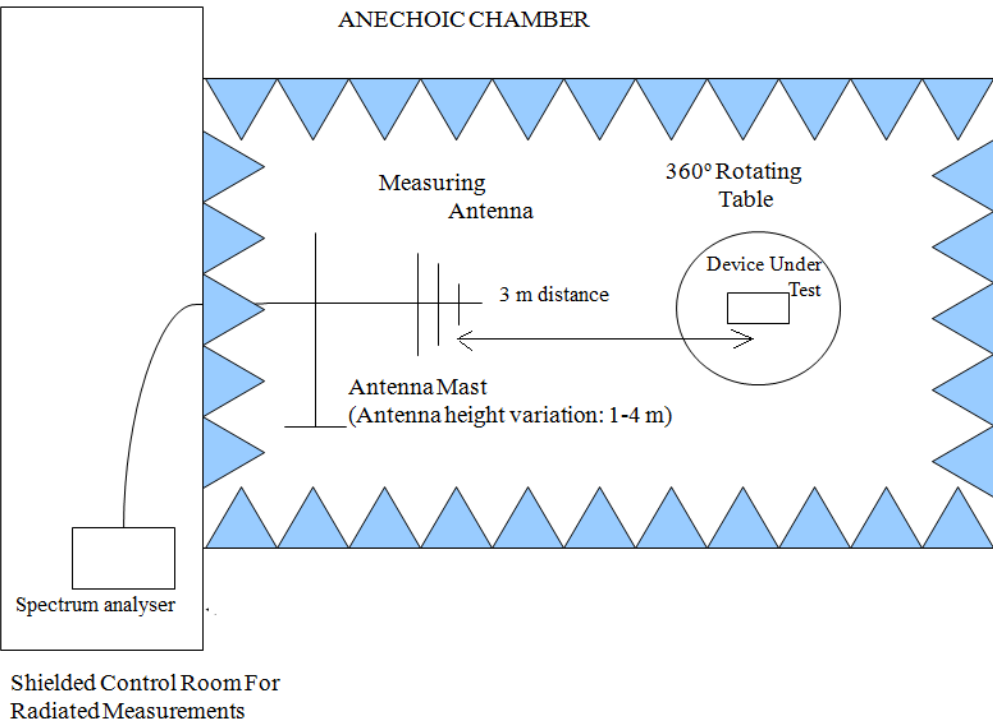
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

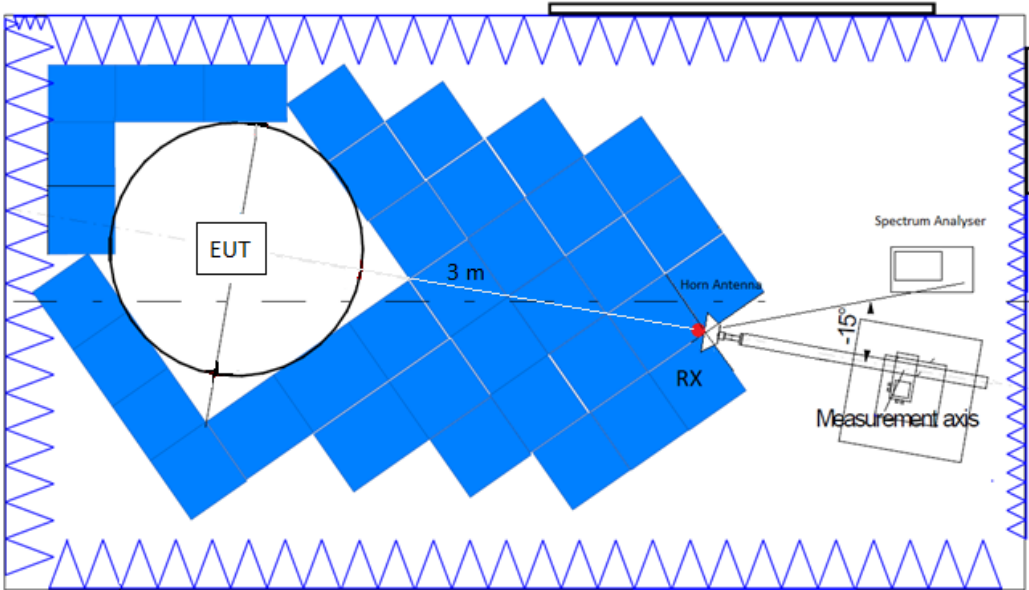
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

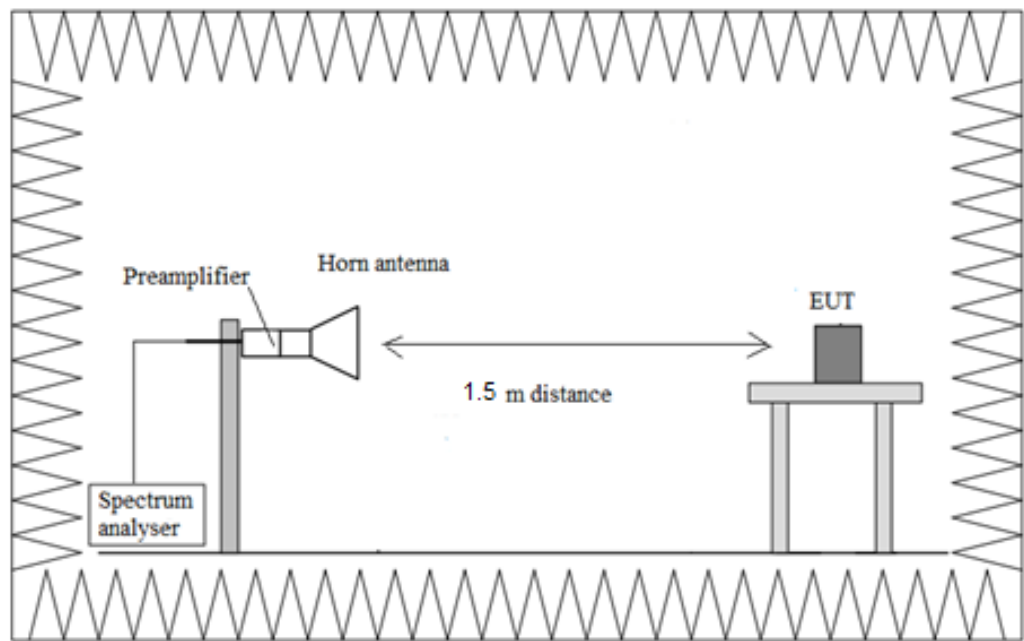
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17\text{ GHz}$:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Specification

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

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

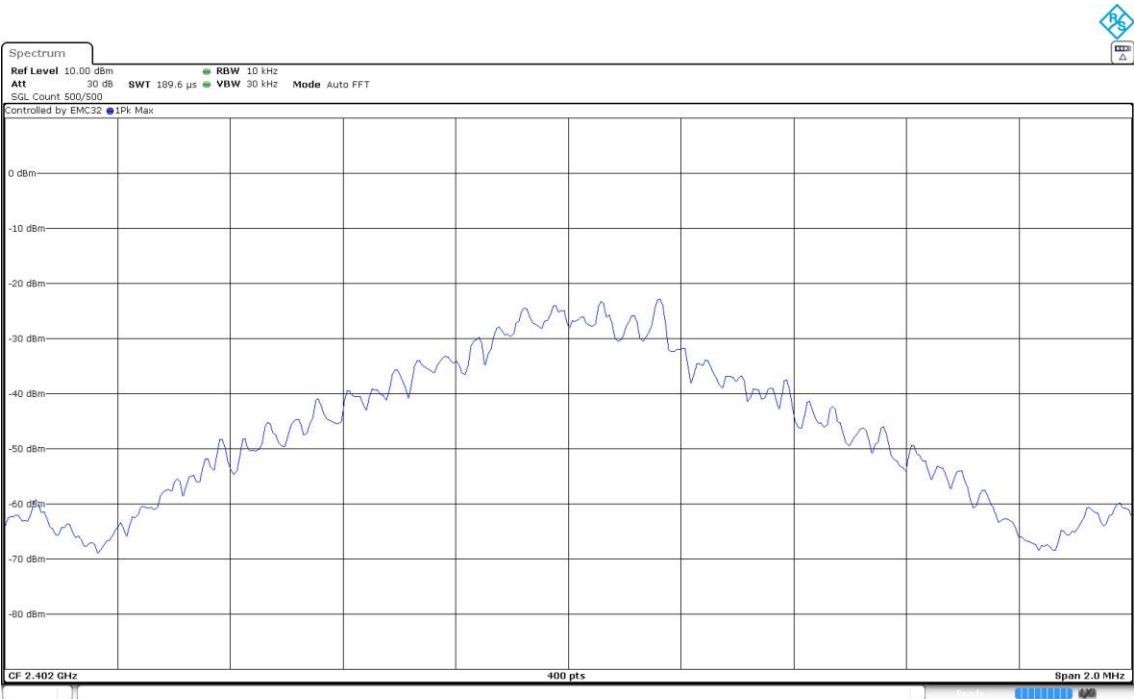
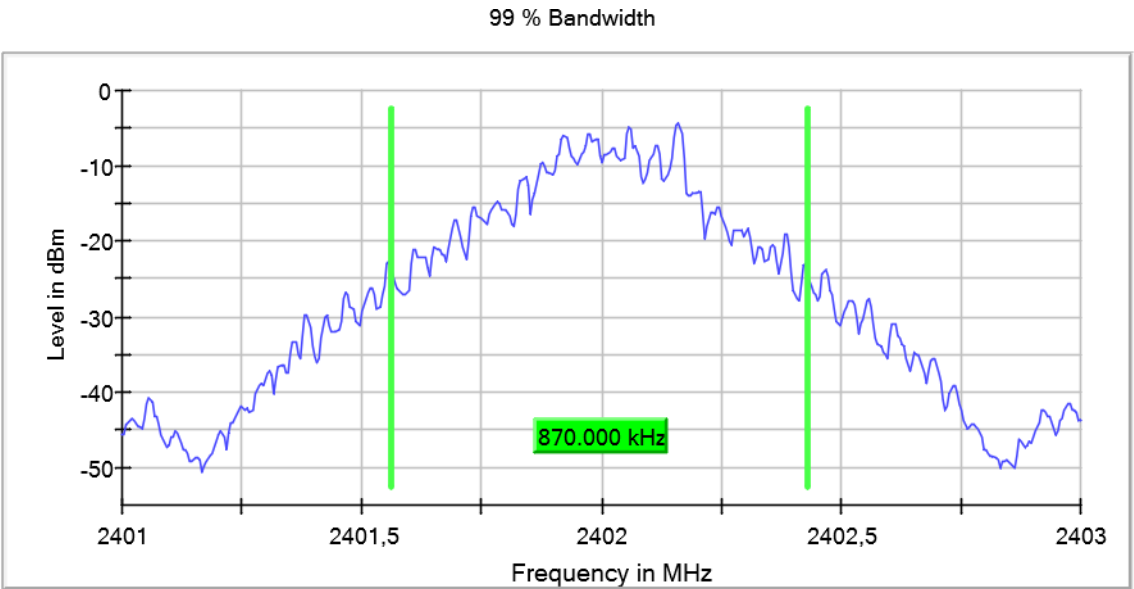
Results

Equipment	BW (MHz)	Freq (MHz)	Port	Occ Ch BW (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	0.870
		2441.00000		0.875
		2480.00000		0.885

Attachments

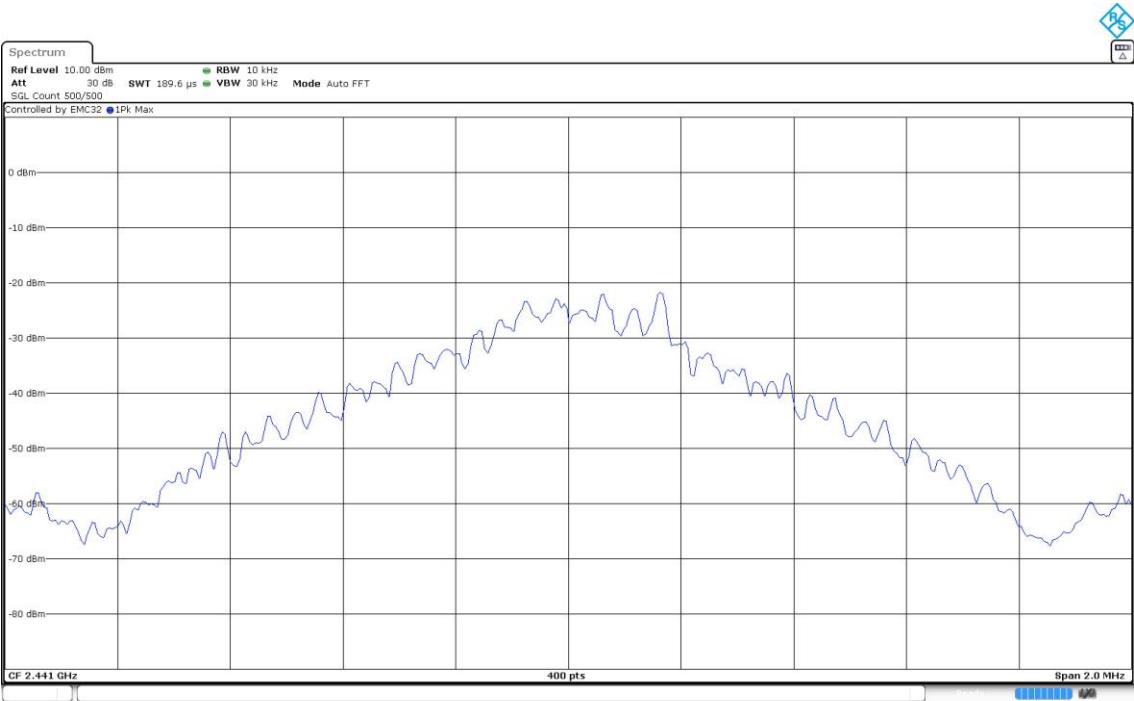
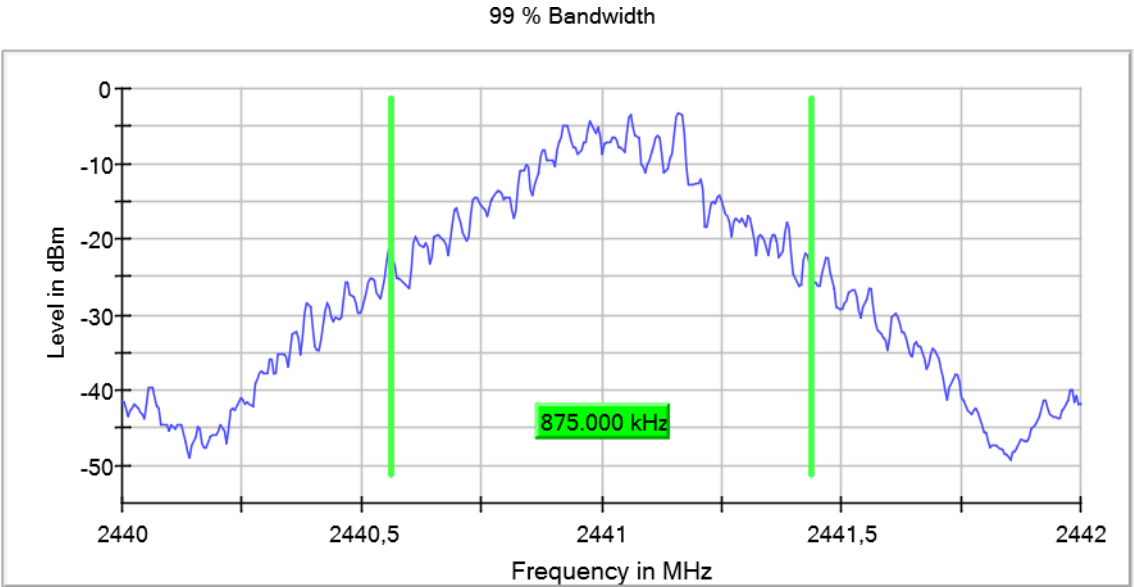
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



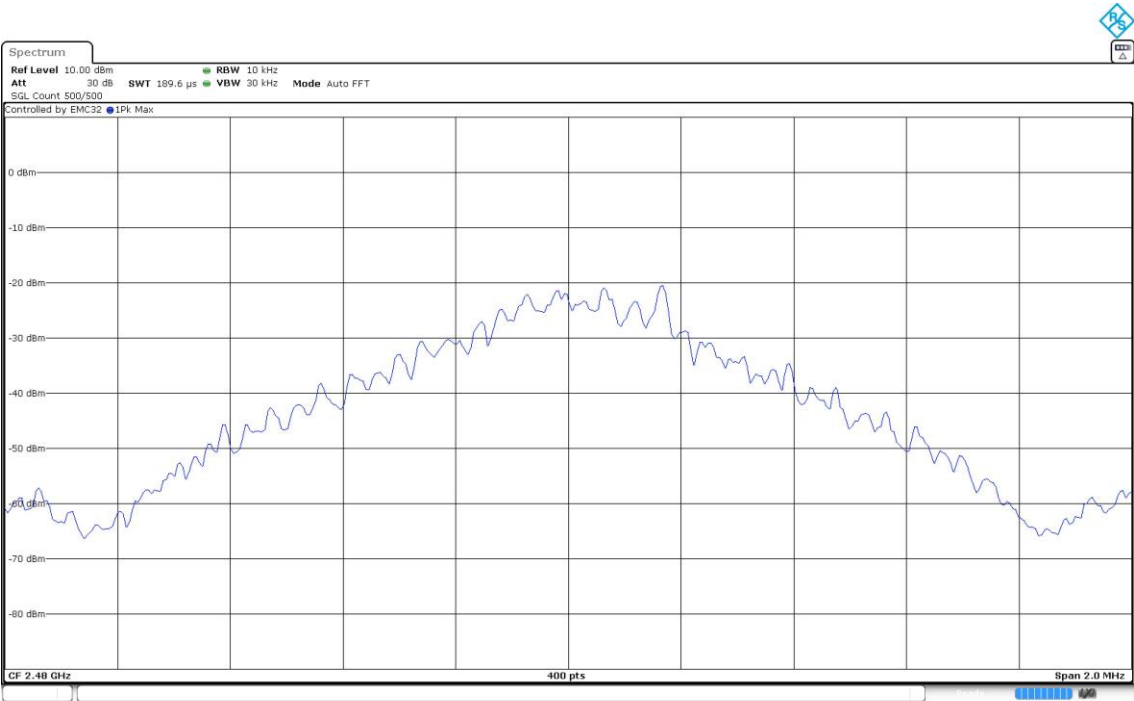
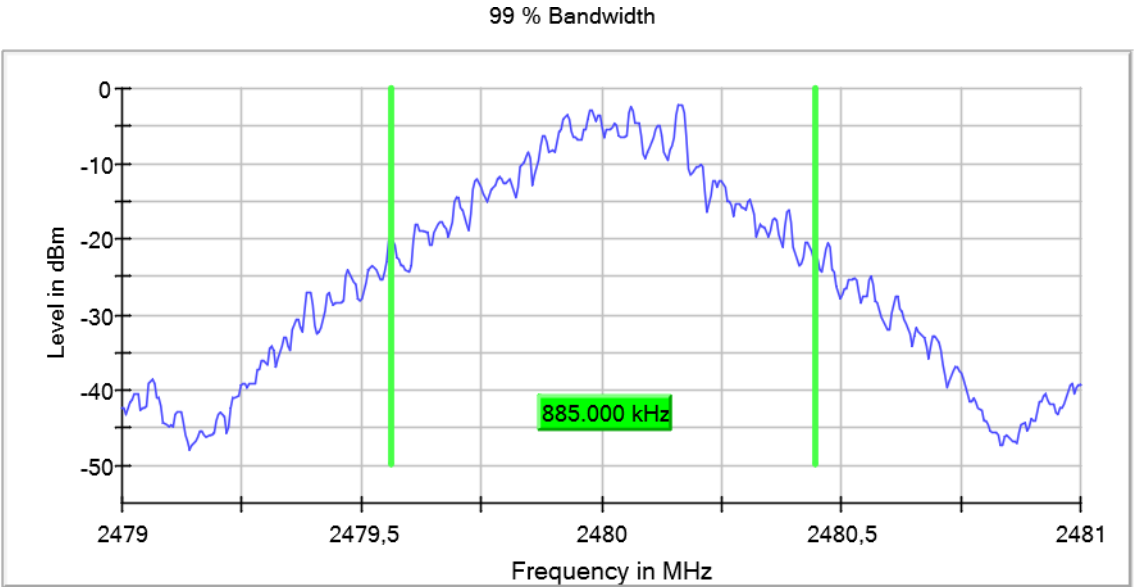
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

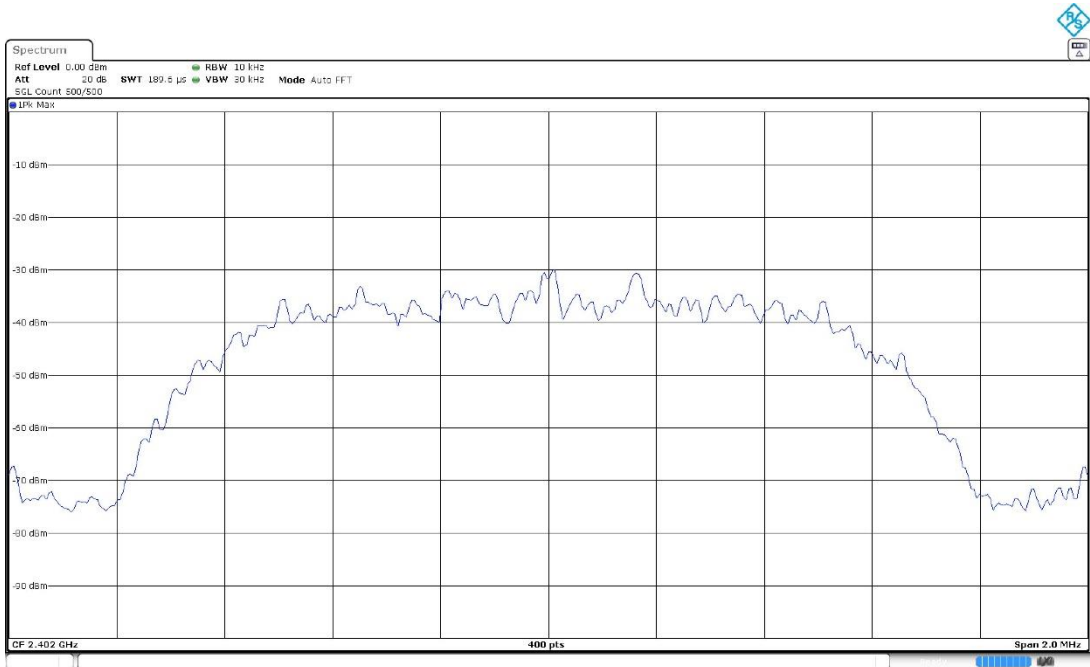
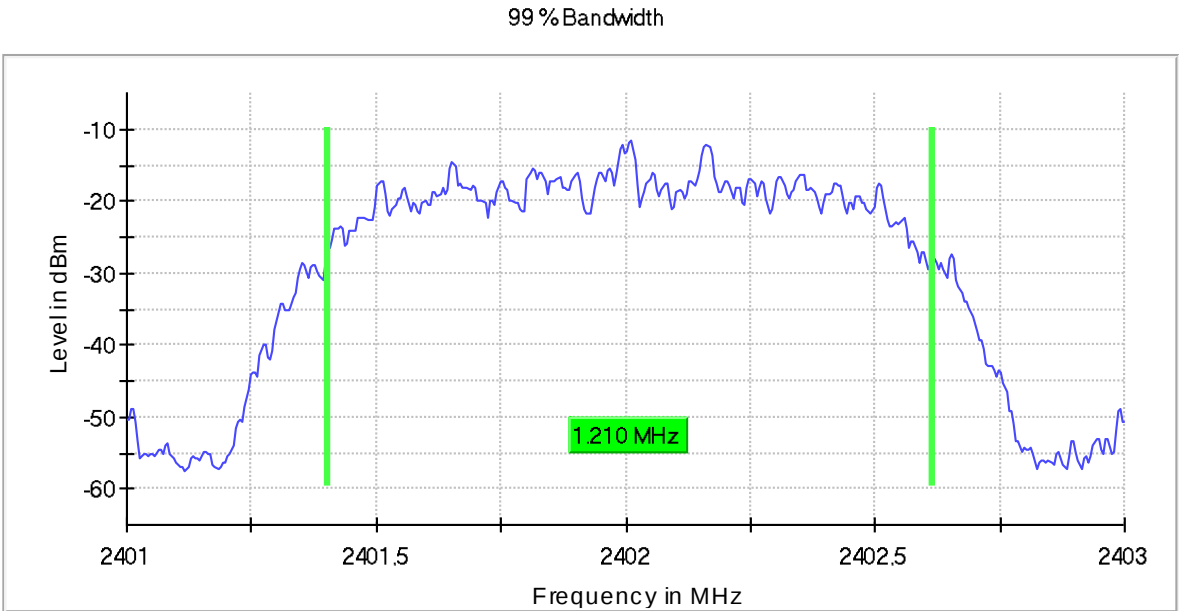
Results

Equipment	BW (MHz)	Freq (MHz)	Port	Occ Ch BW (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.210
		2441.00000		1.210
		2480.00000		1.210

Attachments

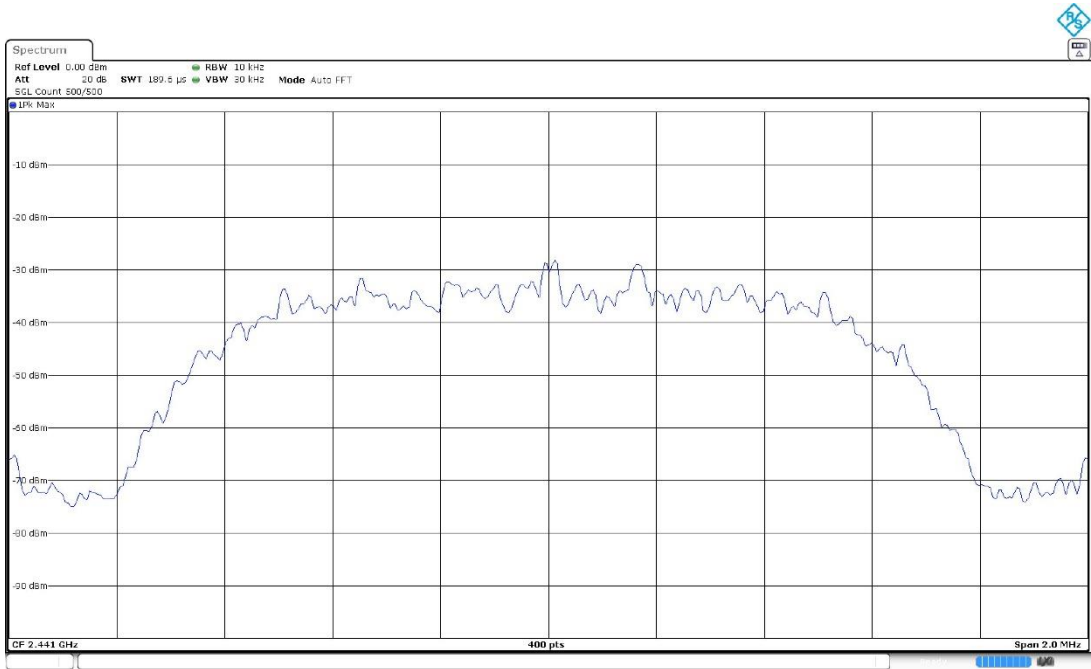
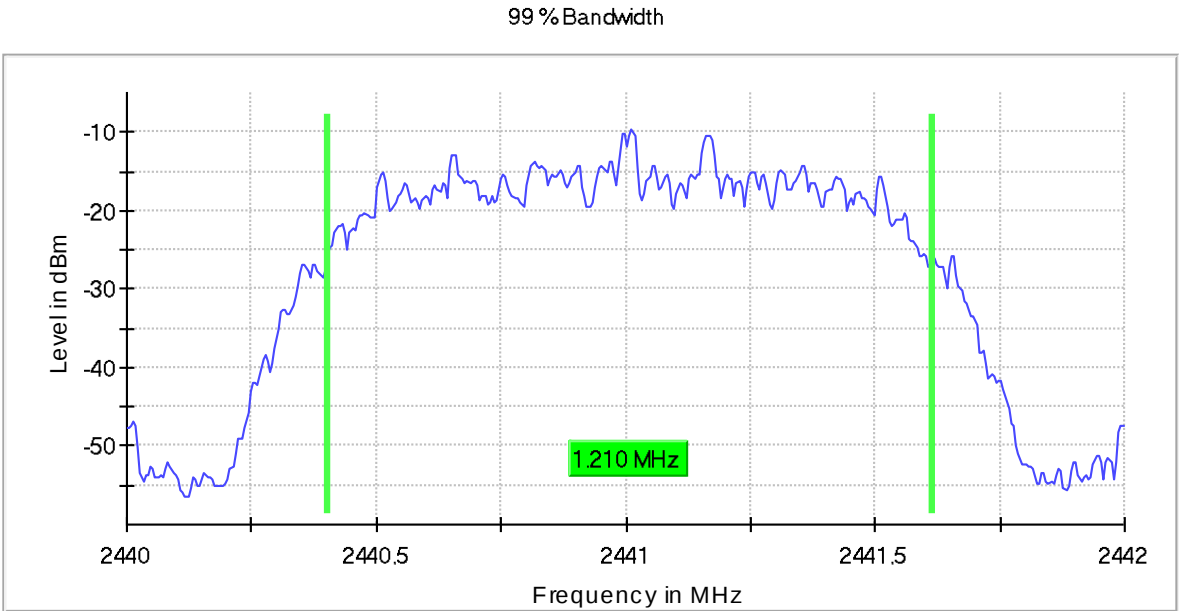
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



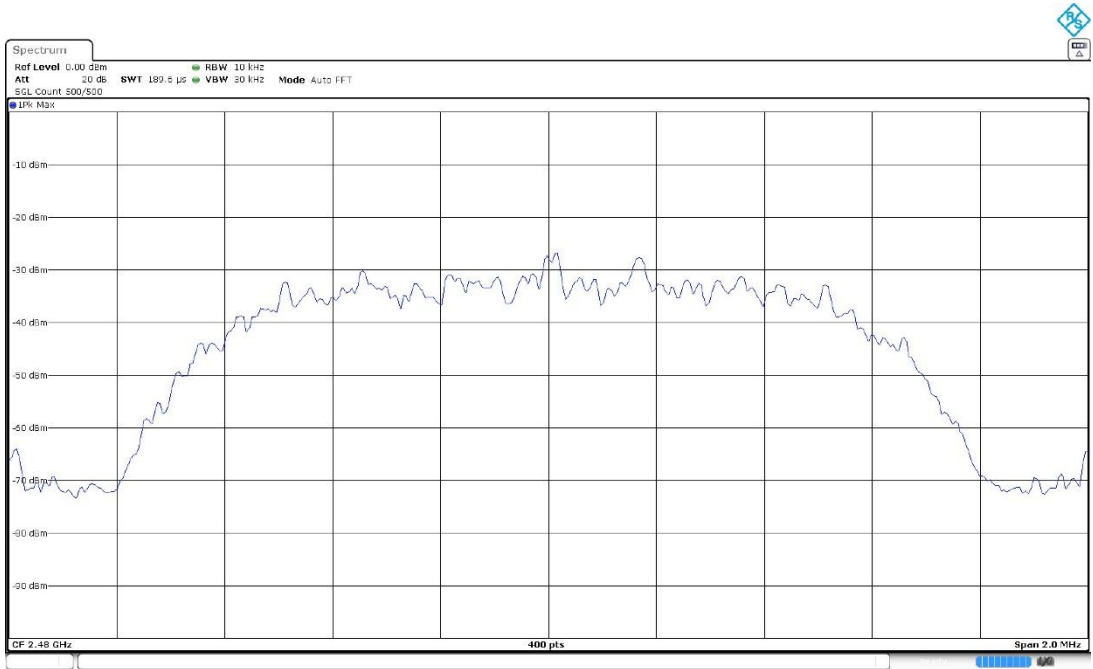
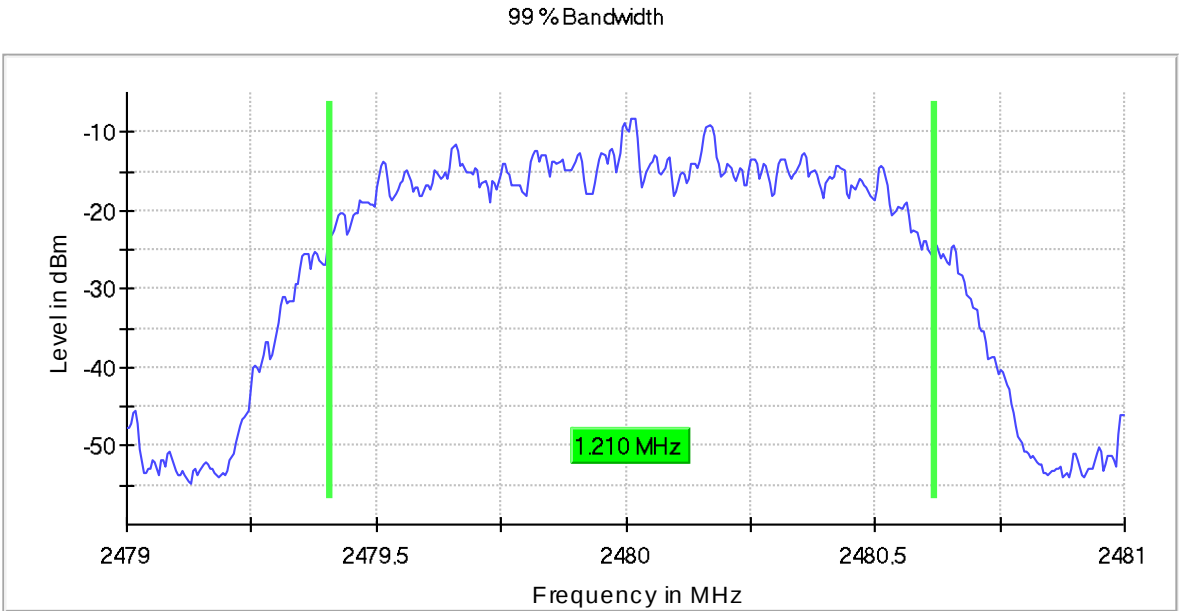
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

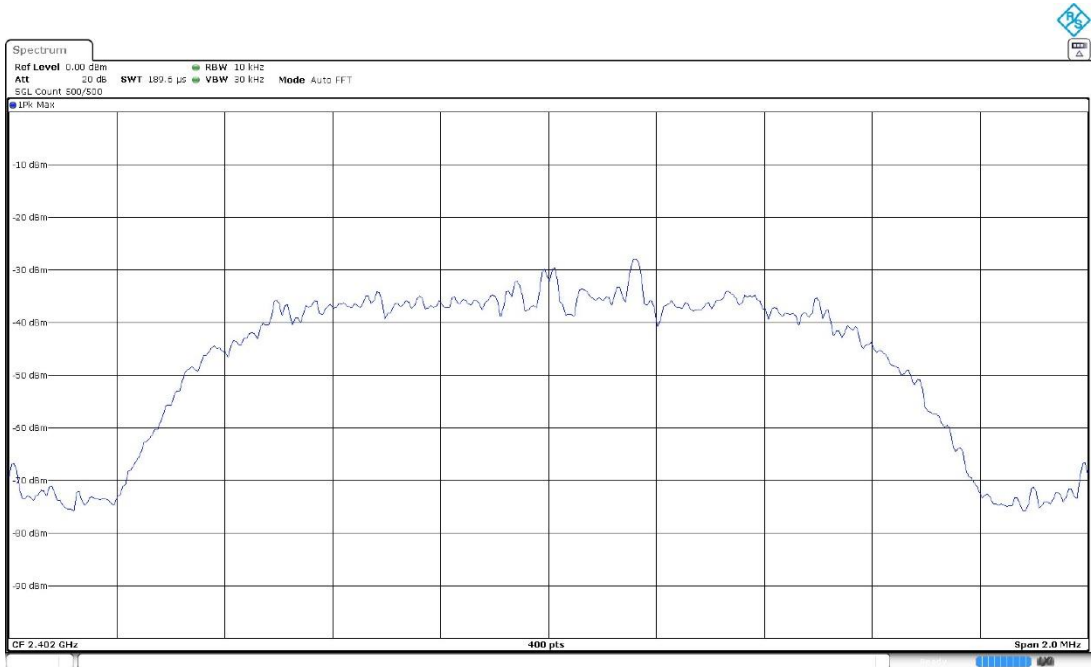
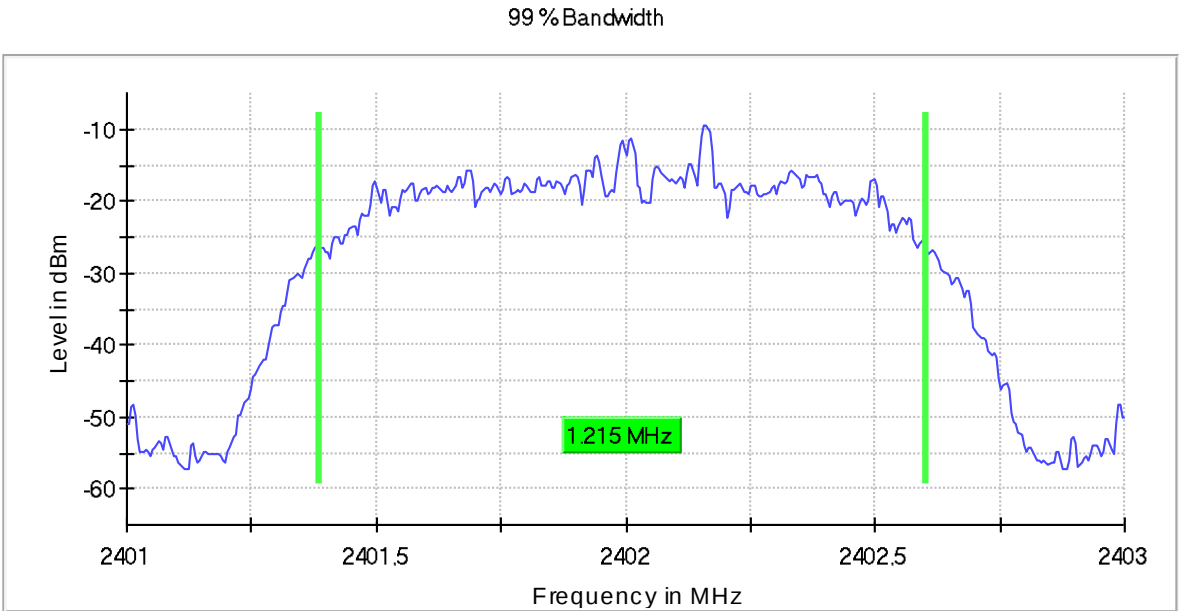
Results

Equipment	BW (MHz)	Freq (MHz)	Port	Occ Ch BW (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.215
		2441.00000		1.210
		2480.00000		1.215

Attachments

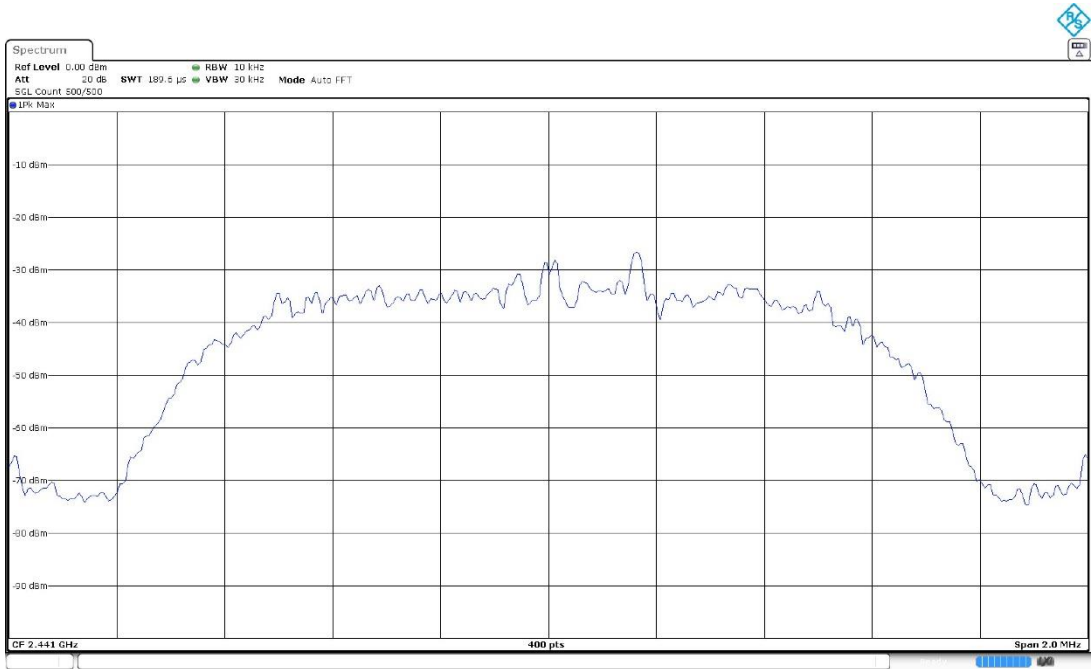
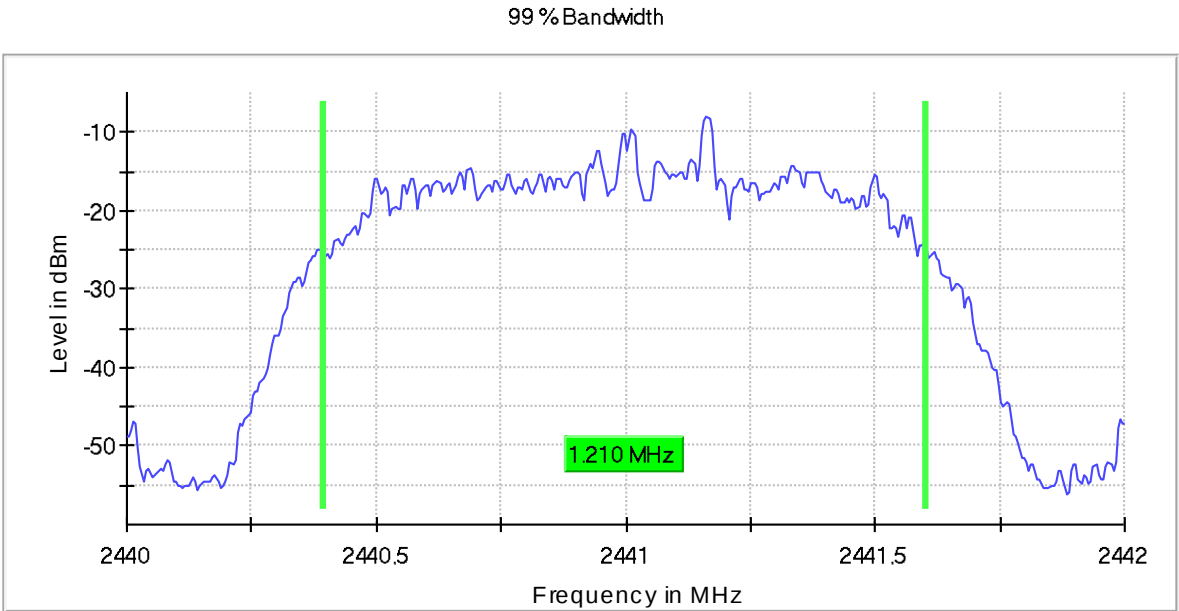
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



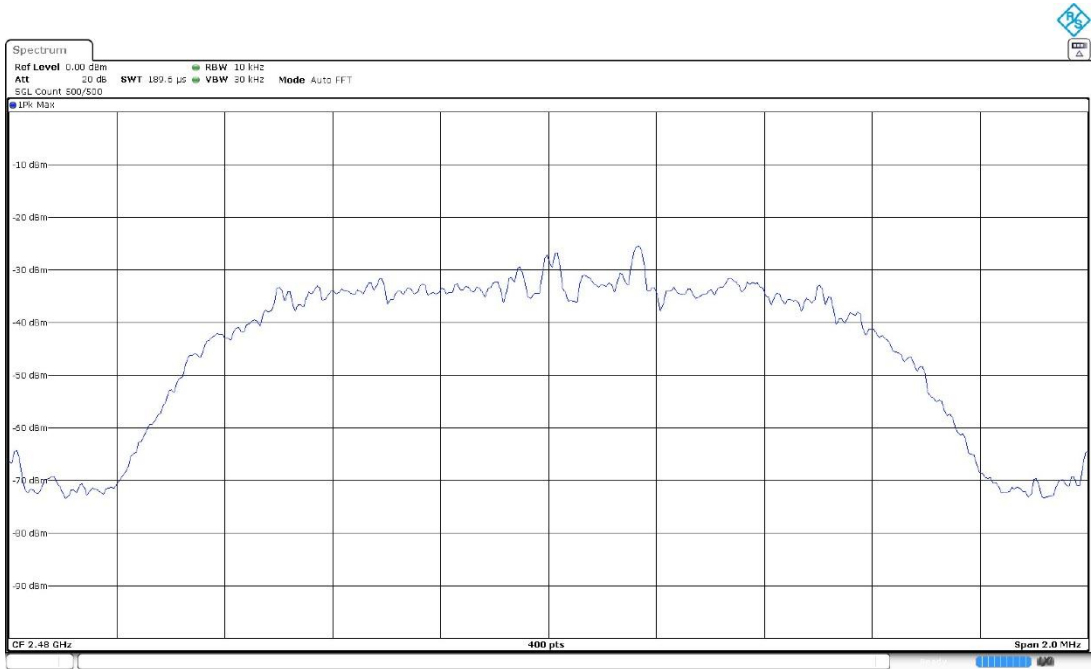
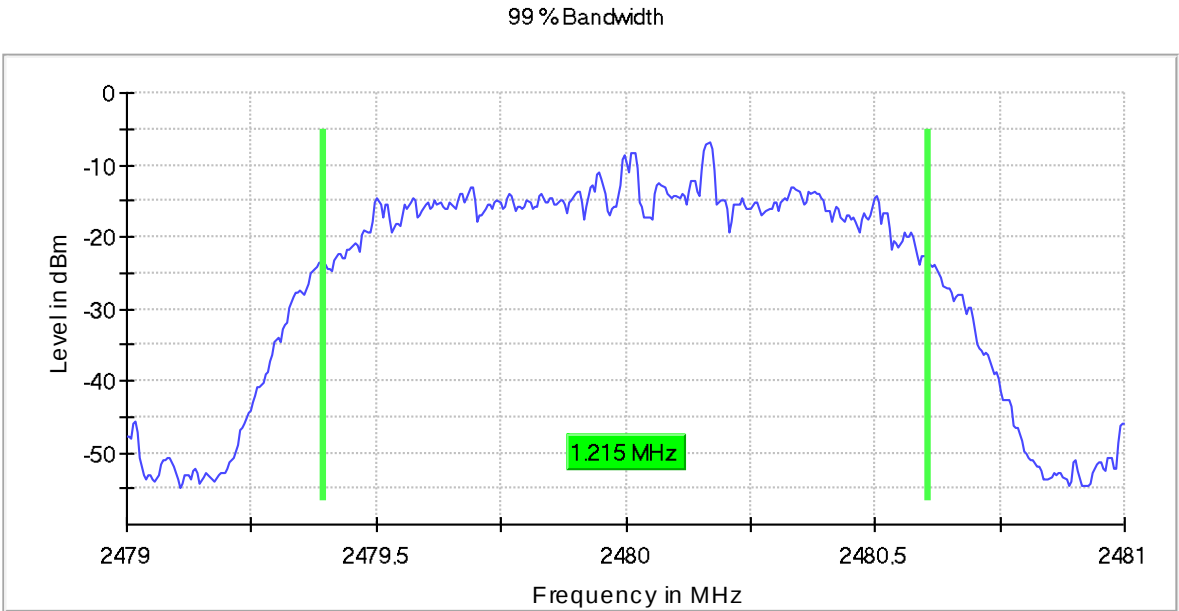
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



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)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	0.925
		2441.00000		0.930
		2480.00000		0.930

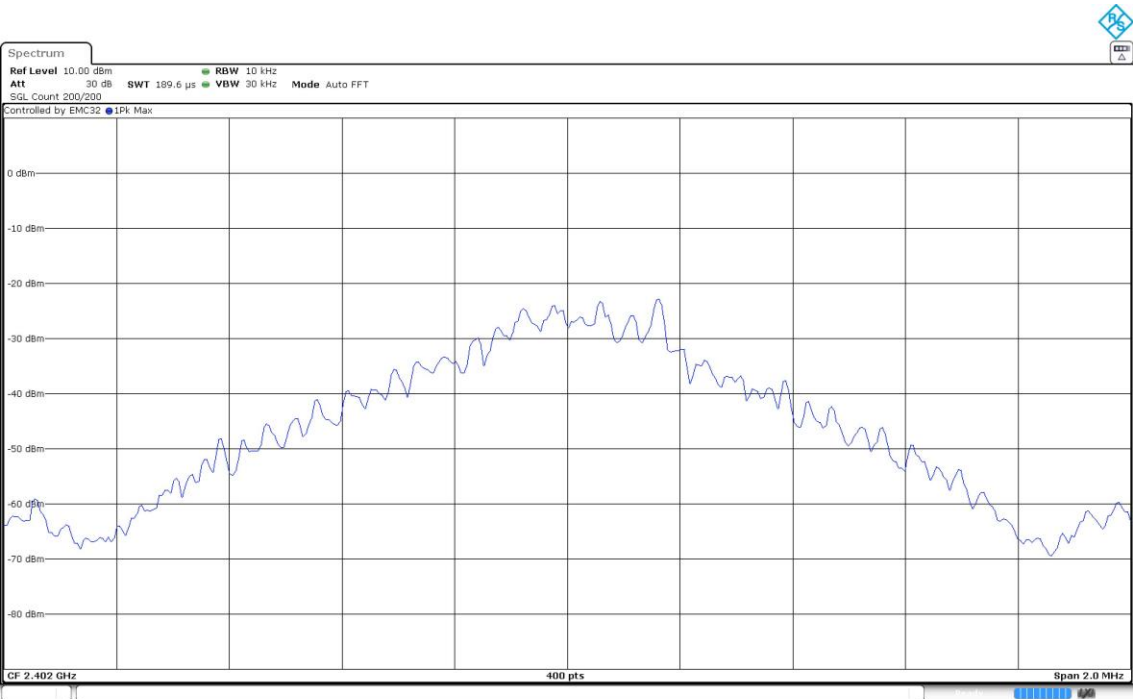
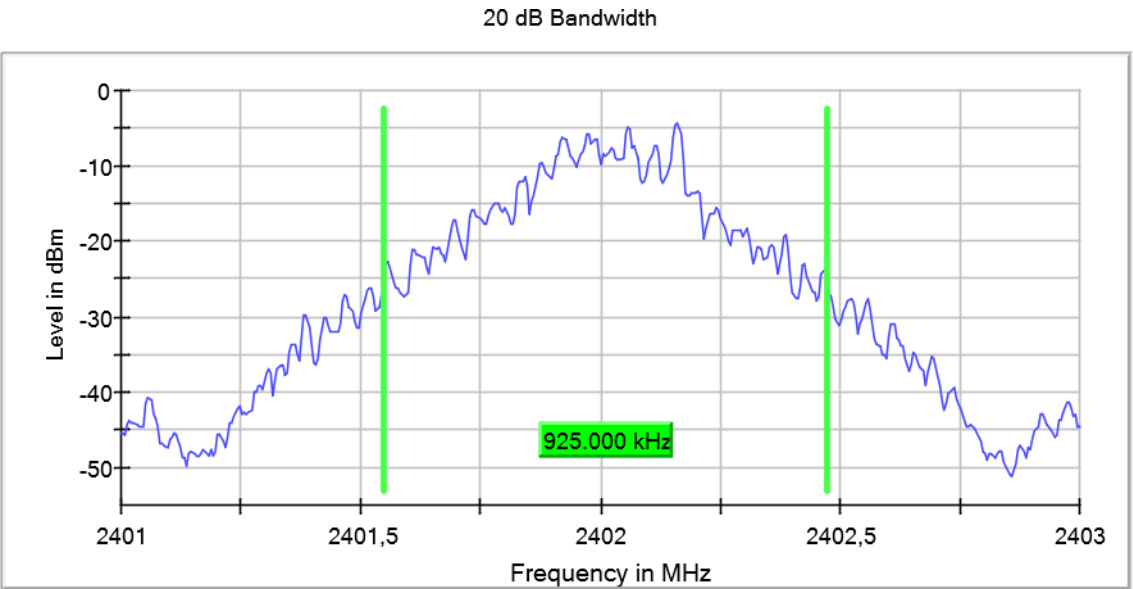
Verdict

Pass

Attachments

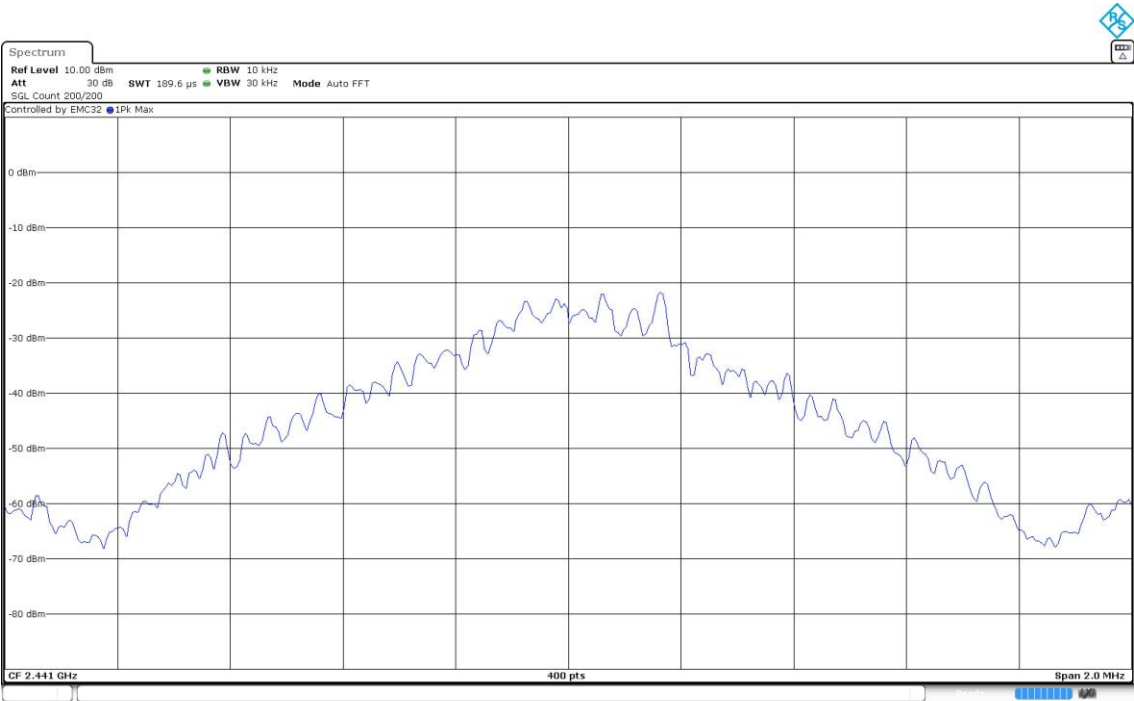
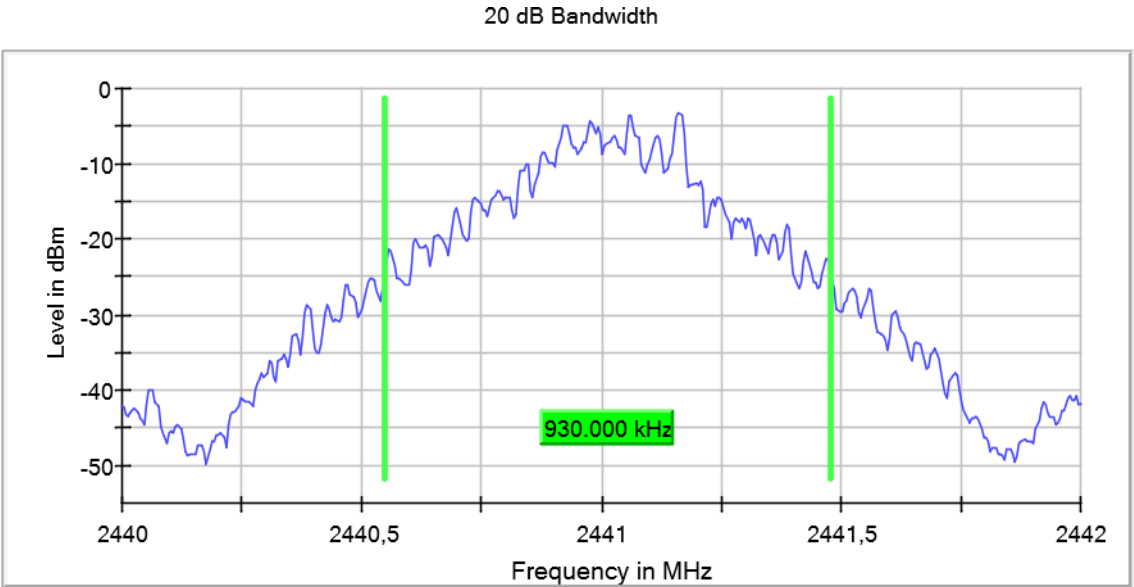
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



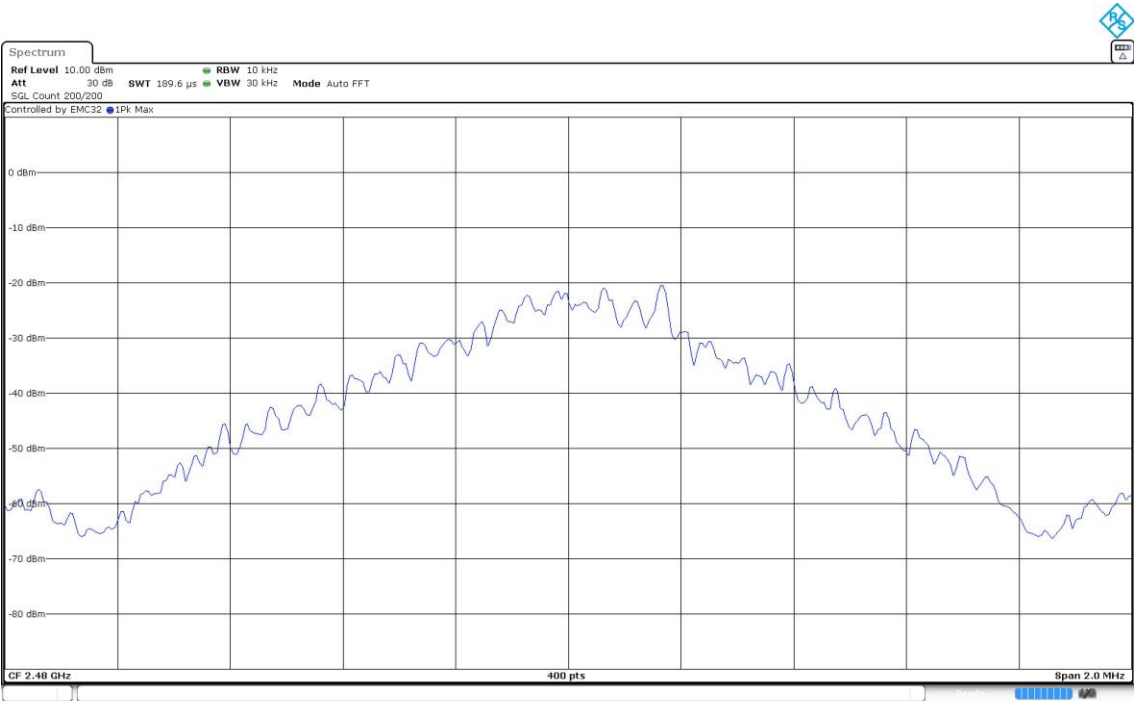
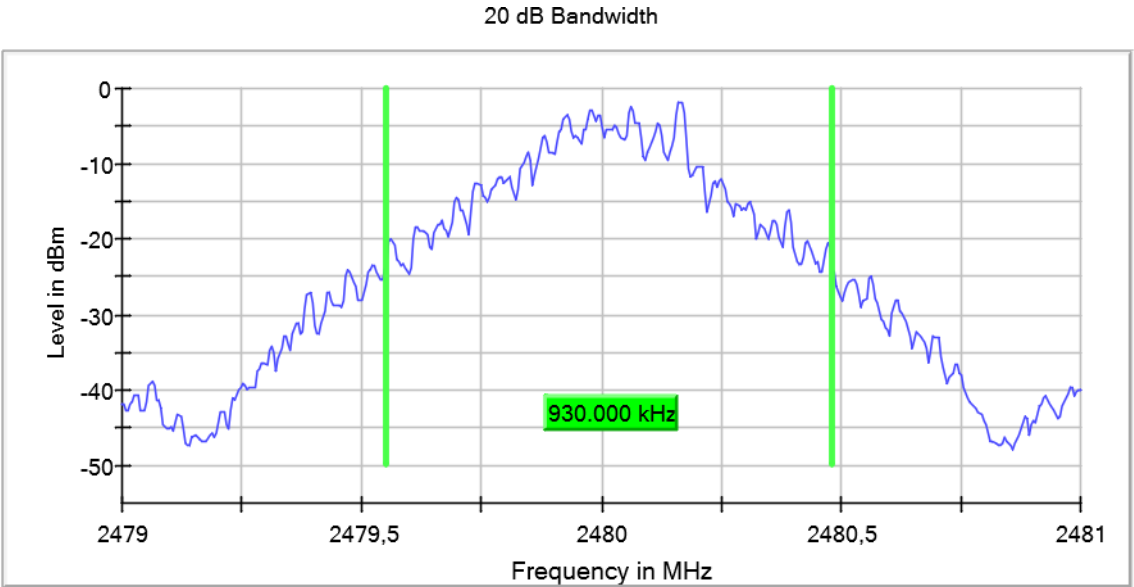
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.335
		2441.00000		1.330
		2480.00000		1.335

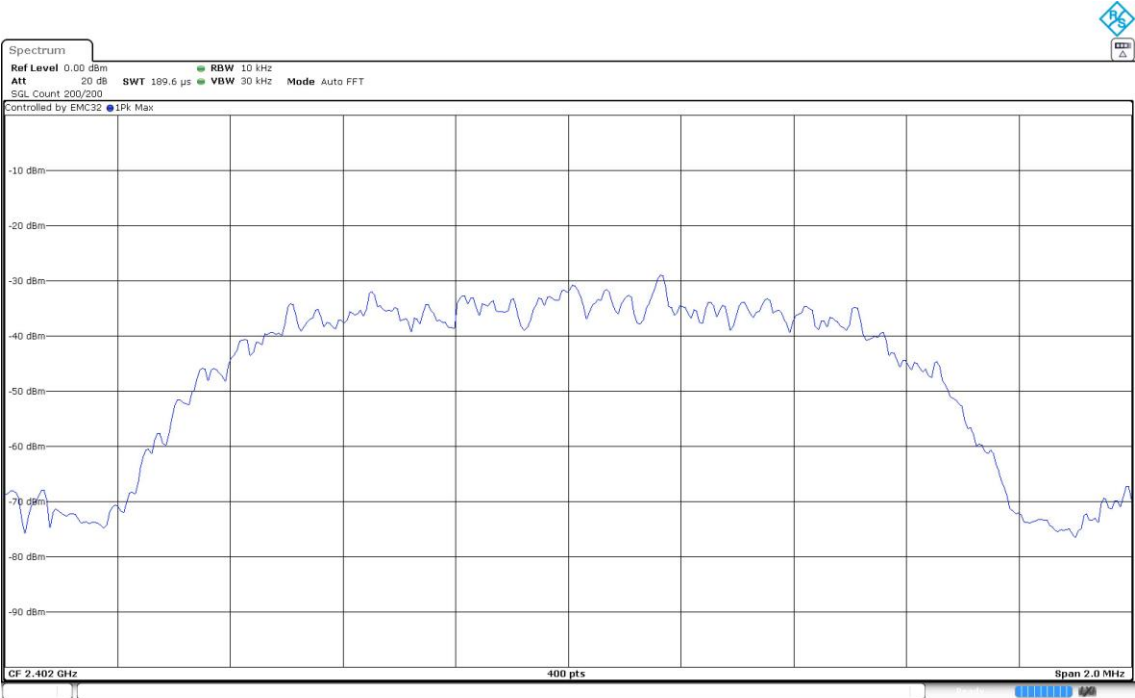
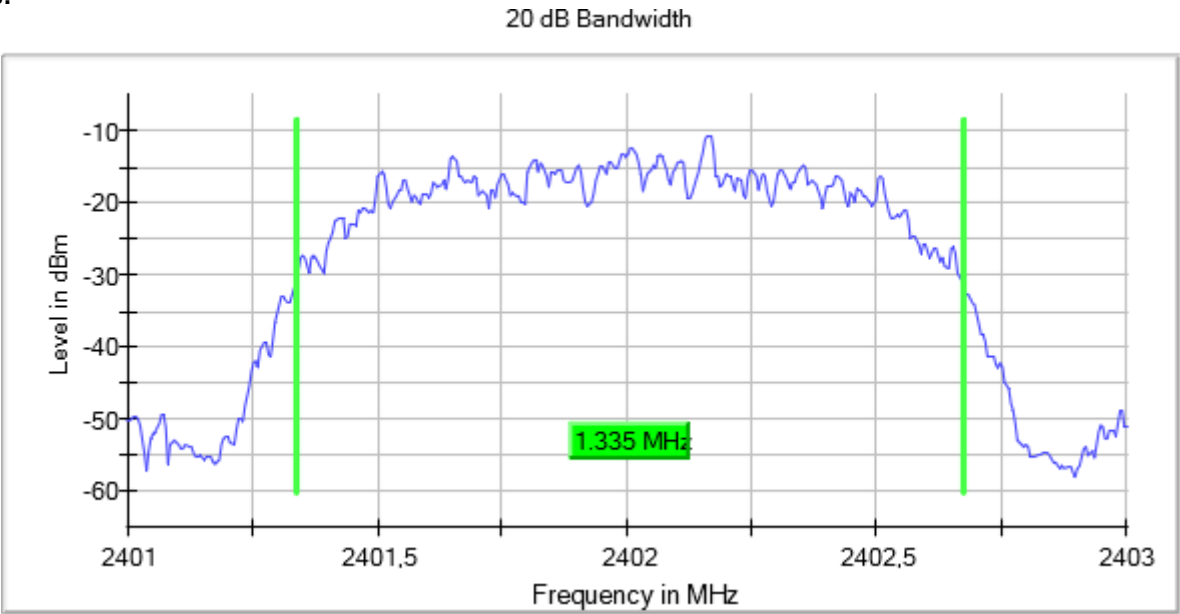
Verdict

Pass

Attachments

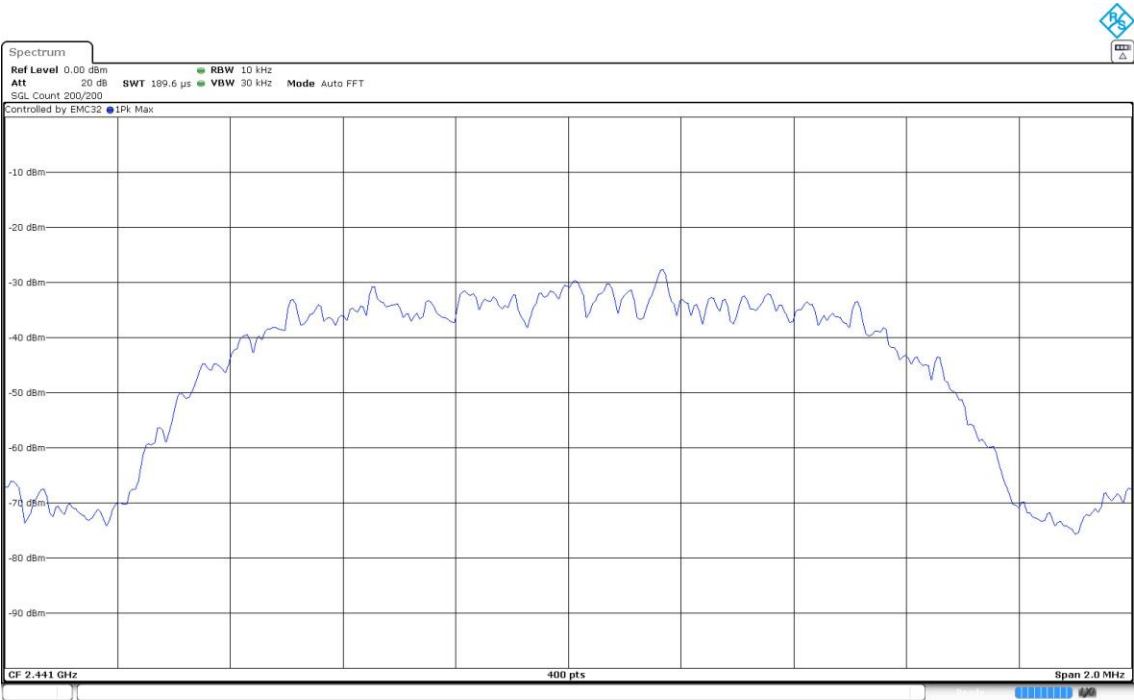
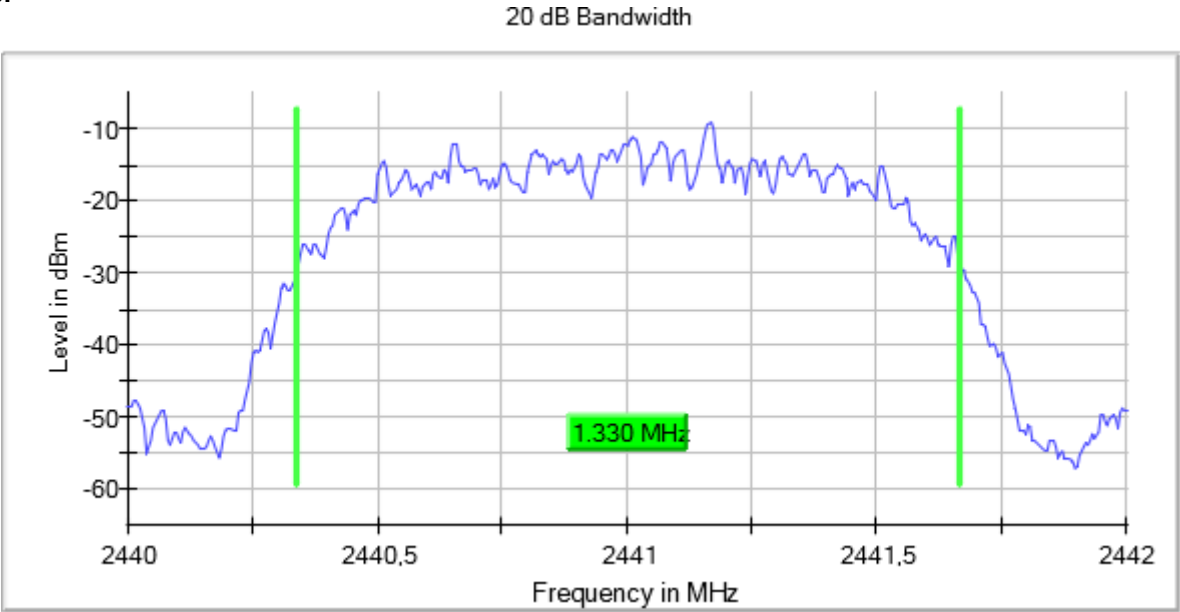
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



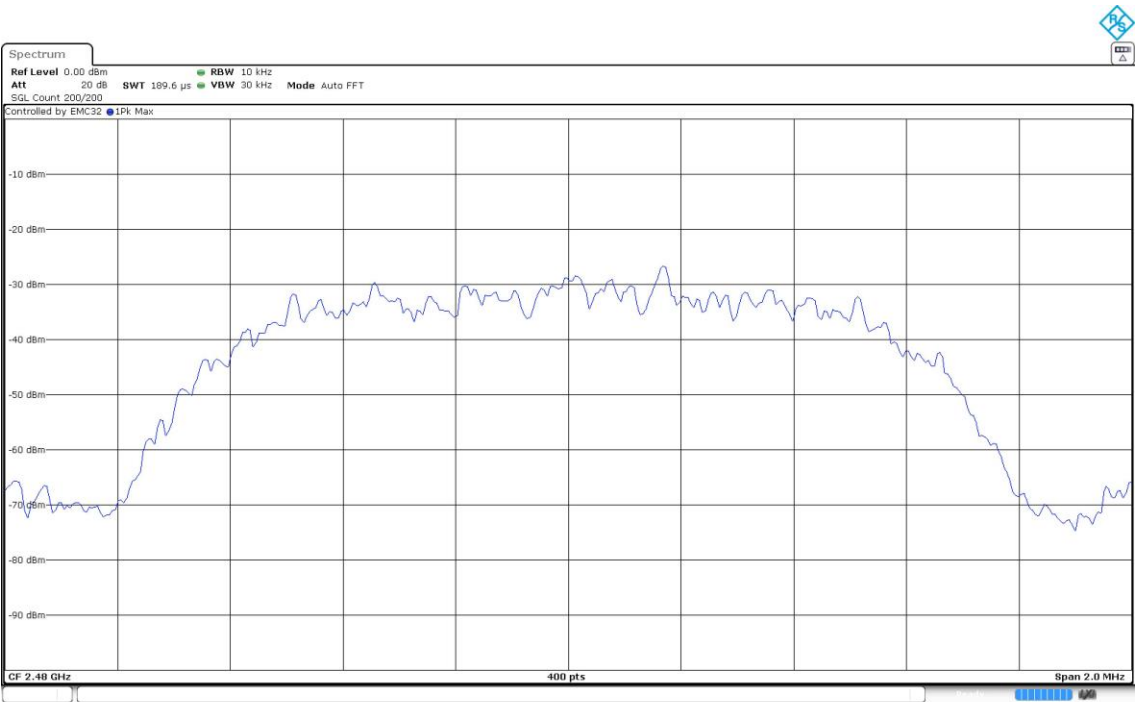
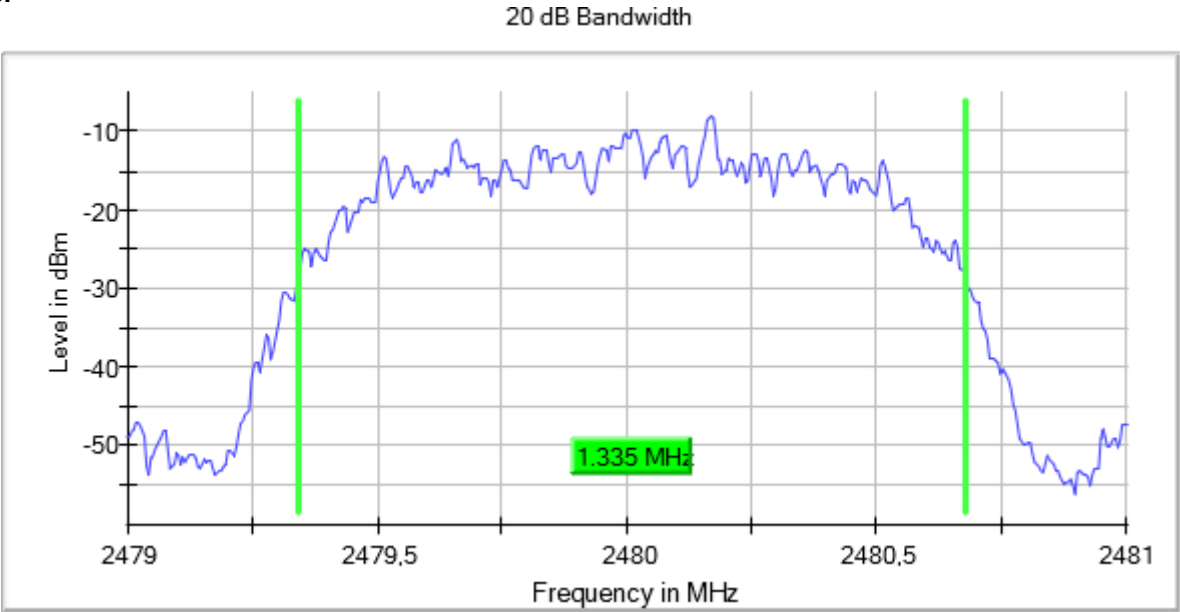
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.275
		2441.00000		1.275
		2480.00000		1.280

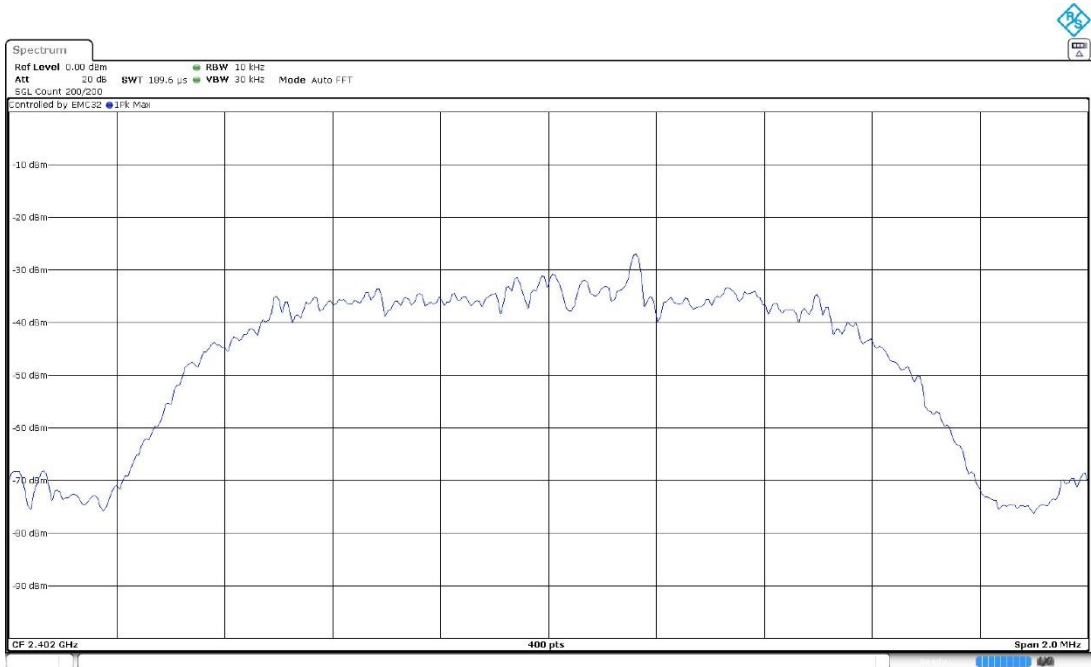
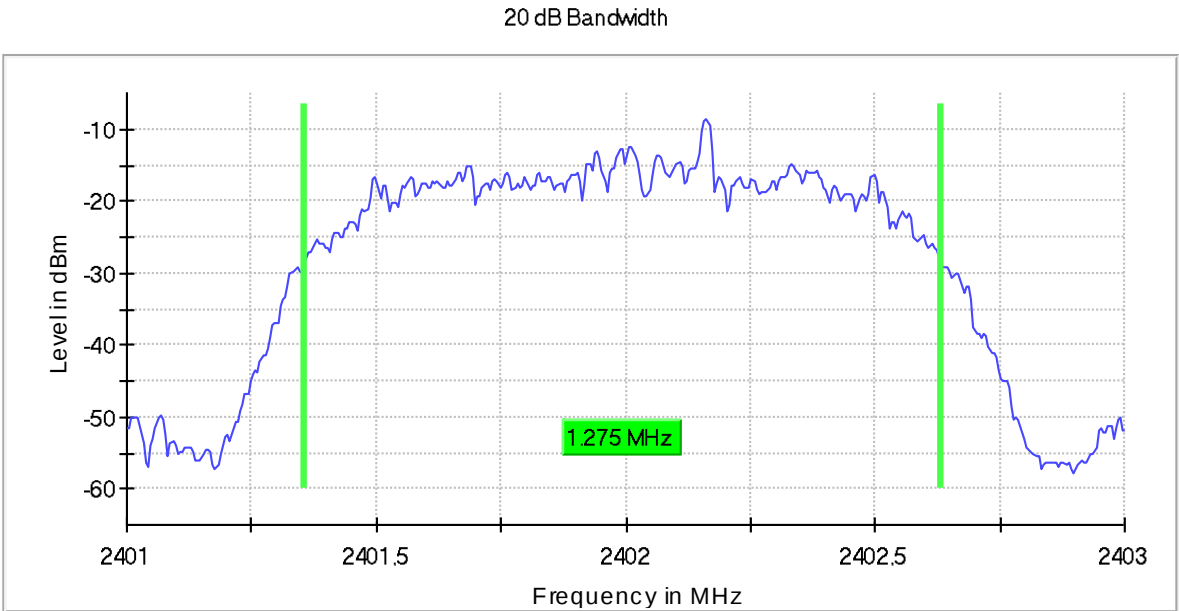
Verdict

Pass

Attachments

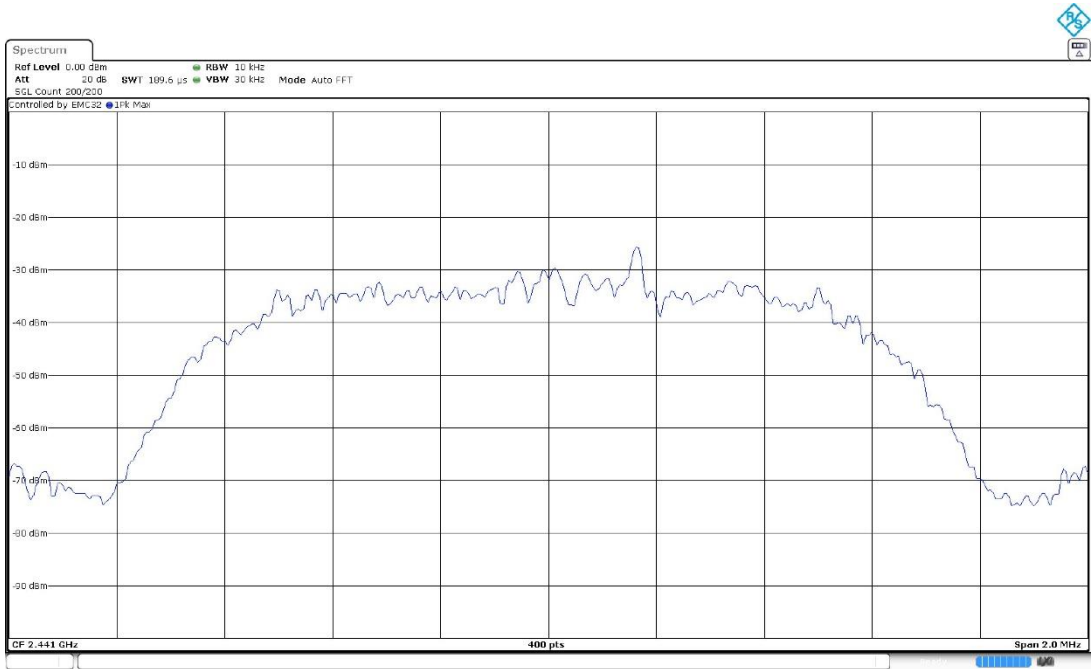
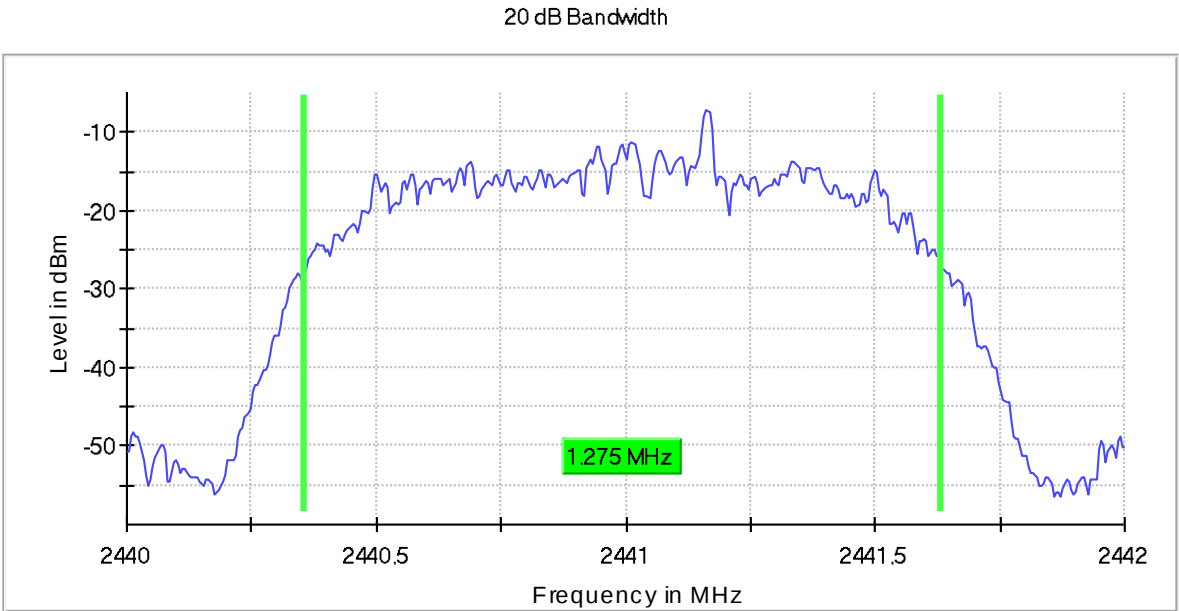
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



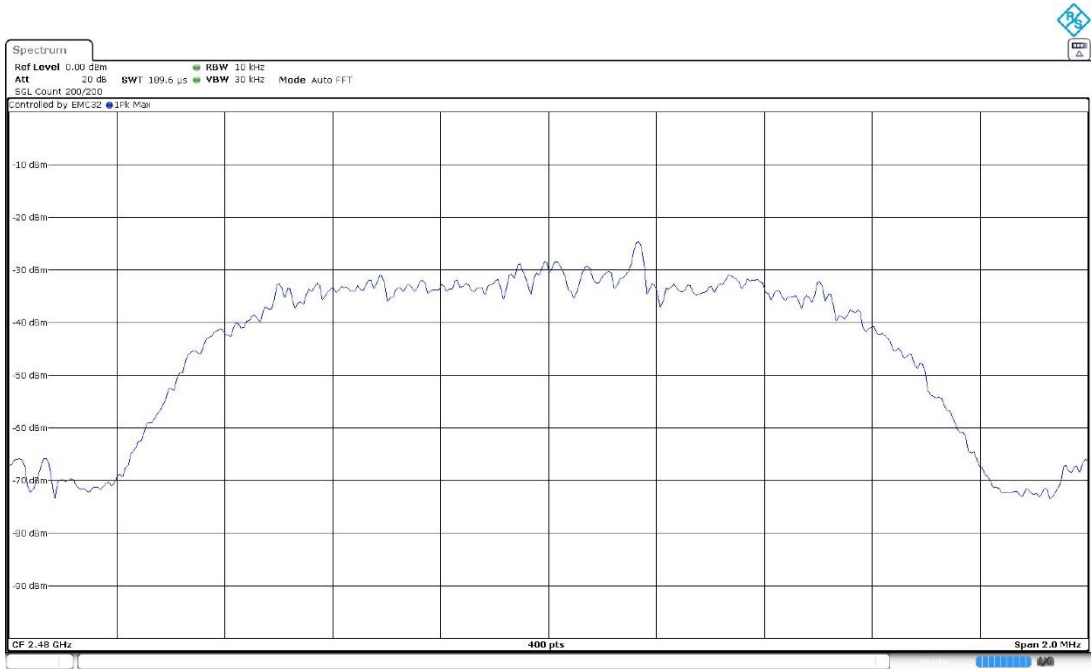
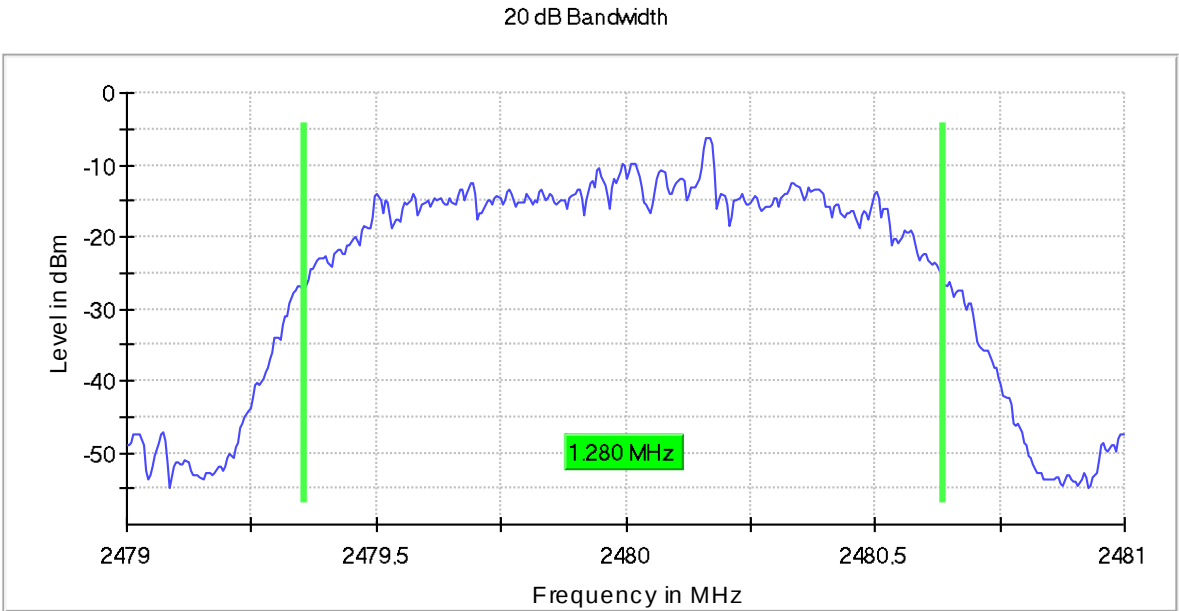
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



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)

MIMO Mode: SISO

Results

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

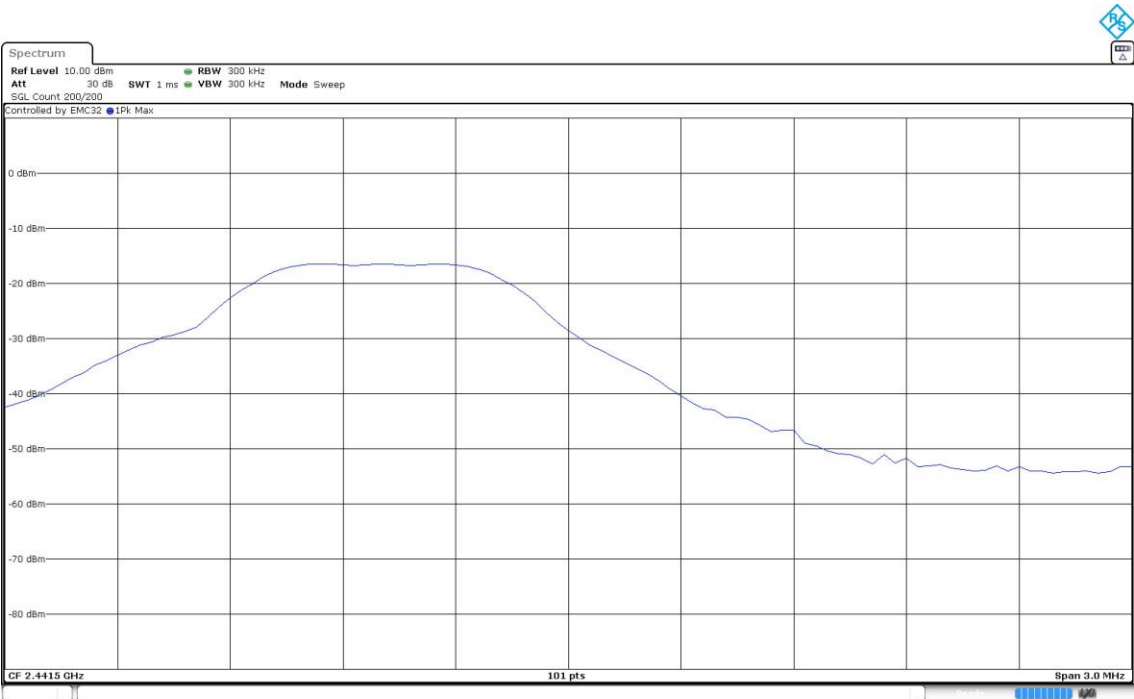
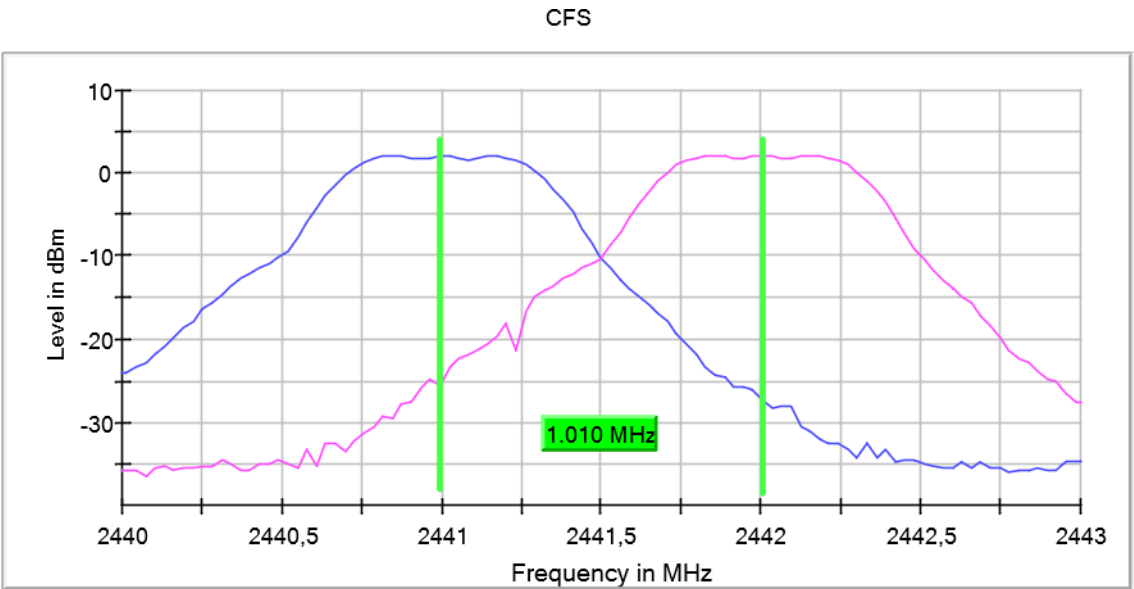
Verdict

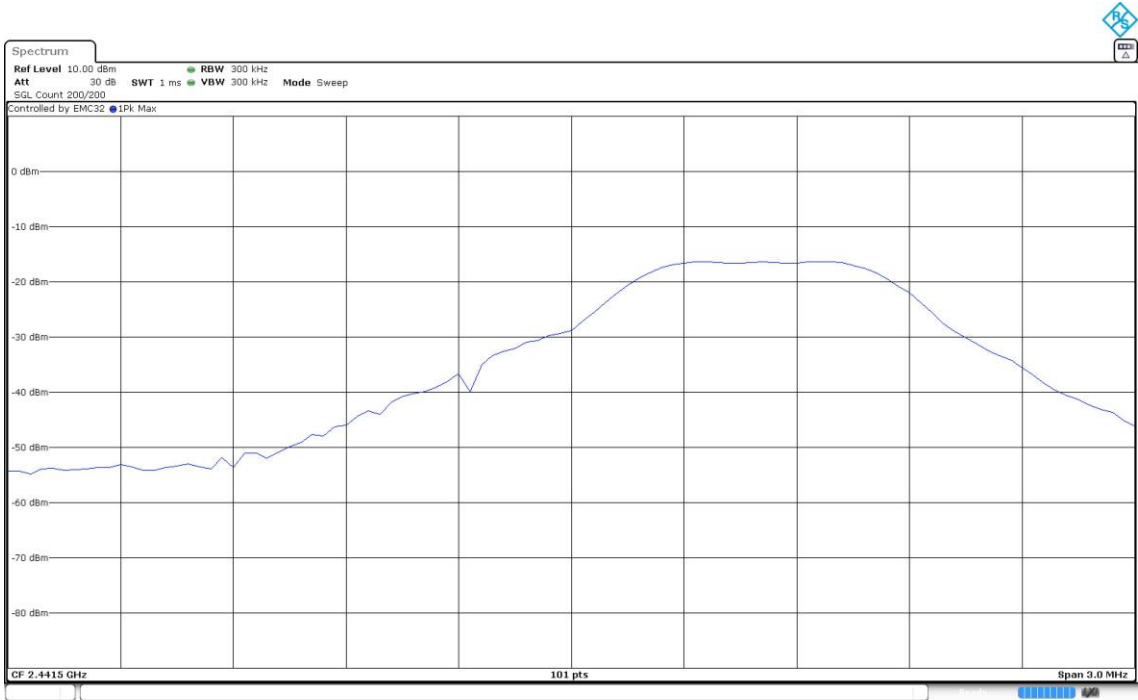
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO
Active Port = 1

Images:





Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

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

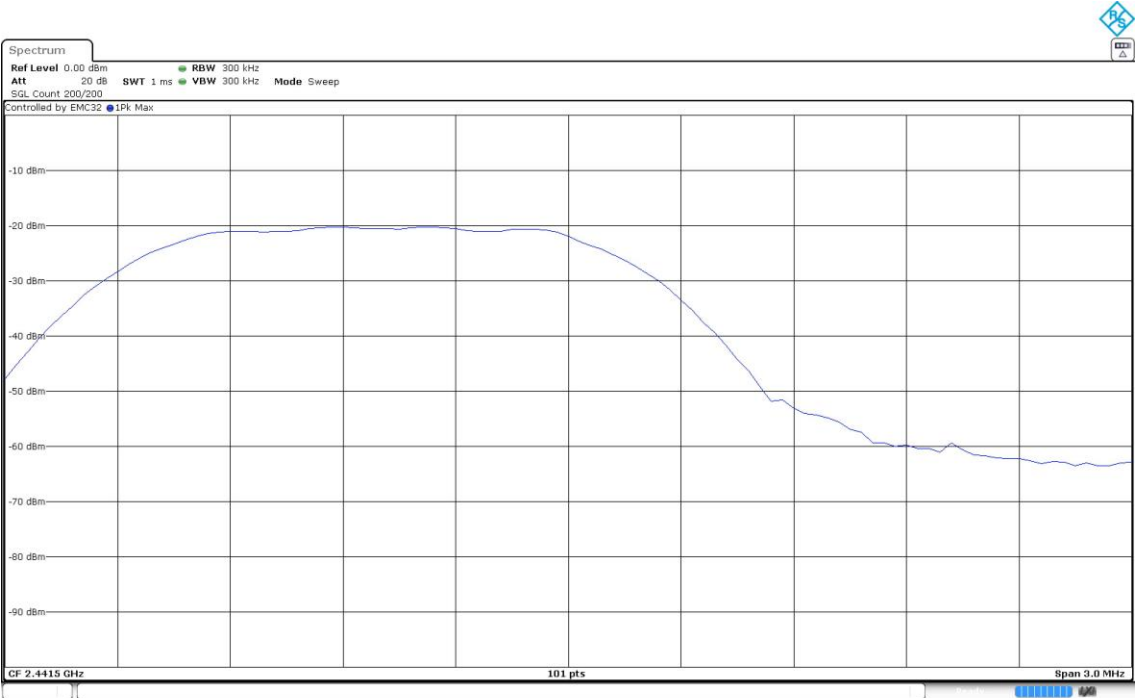
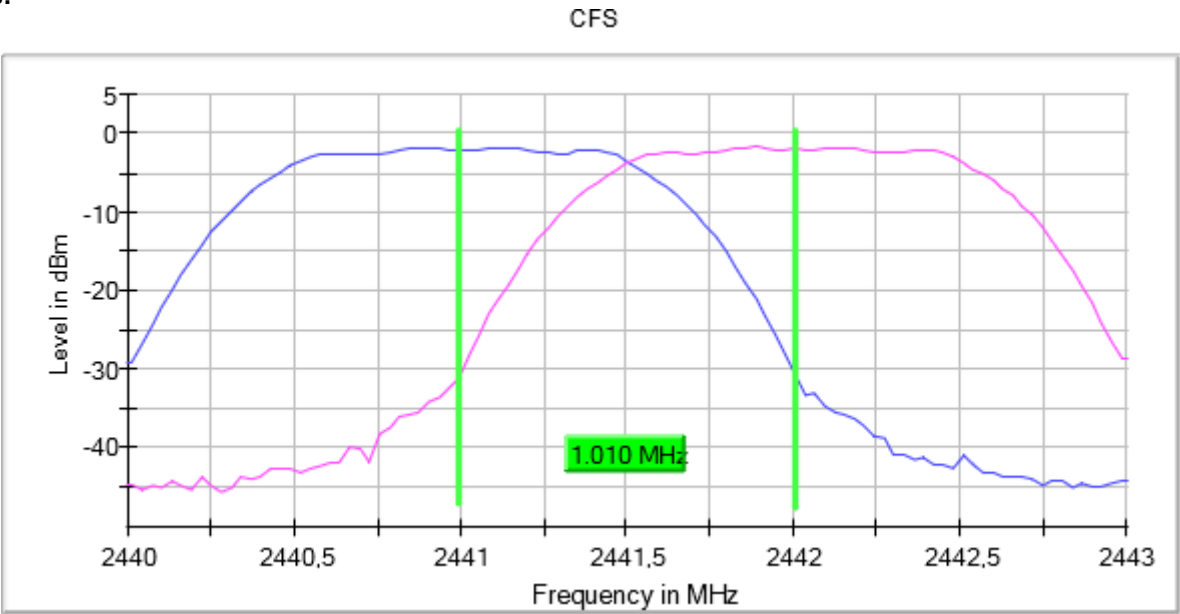
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) MIMO Mode = SISO
Active Port = 1

Images:





Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

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

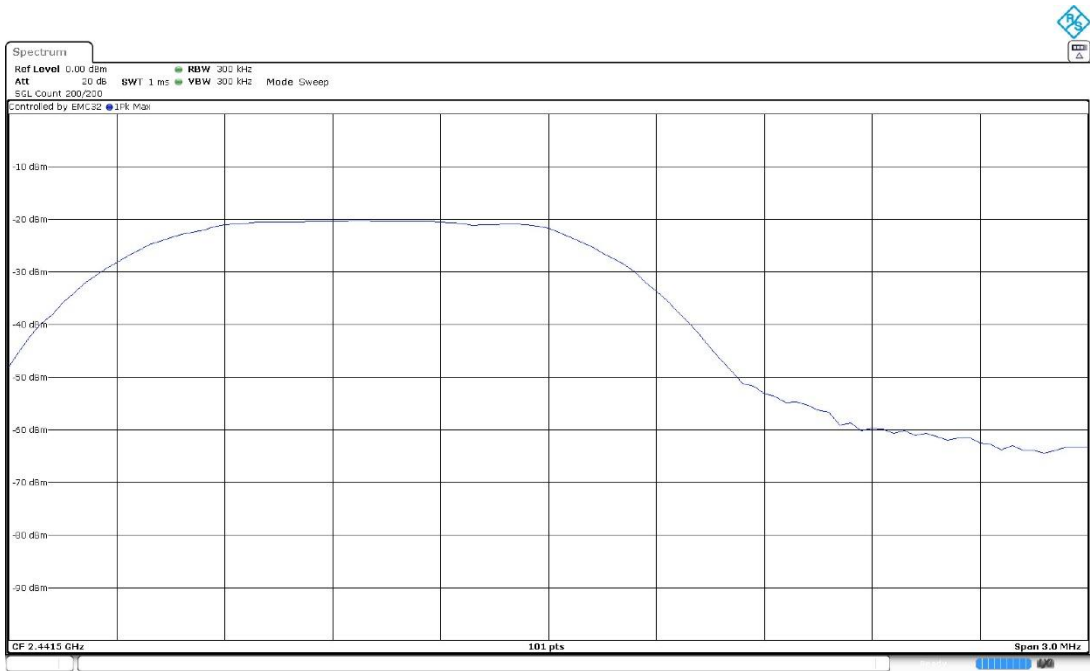
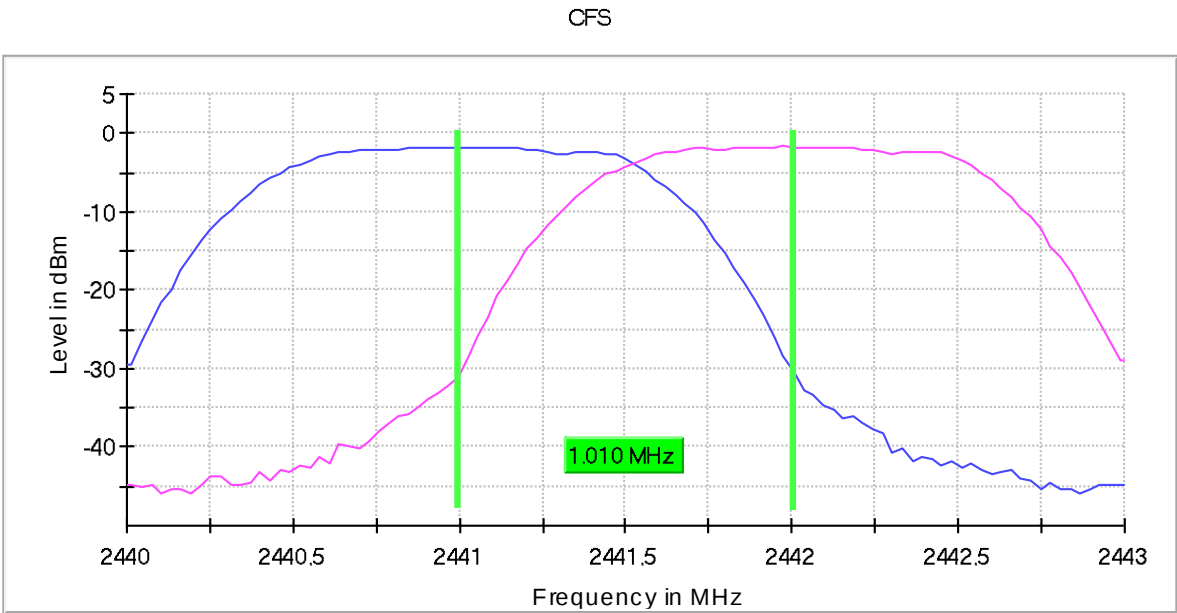
Verdict

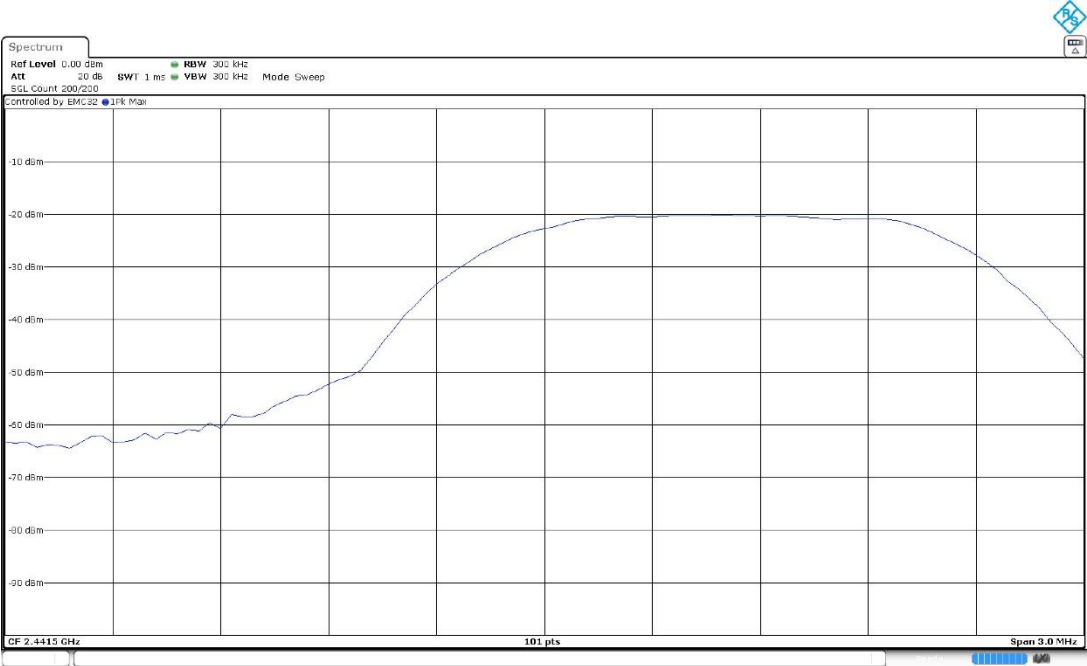
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO
Active Port = 1

Images:





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

Limits

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

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	108	315.67
			101	220.81
			107	312.24

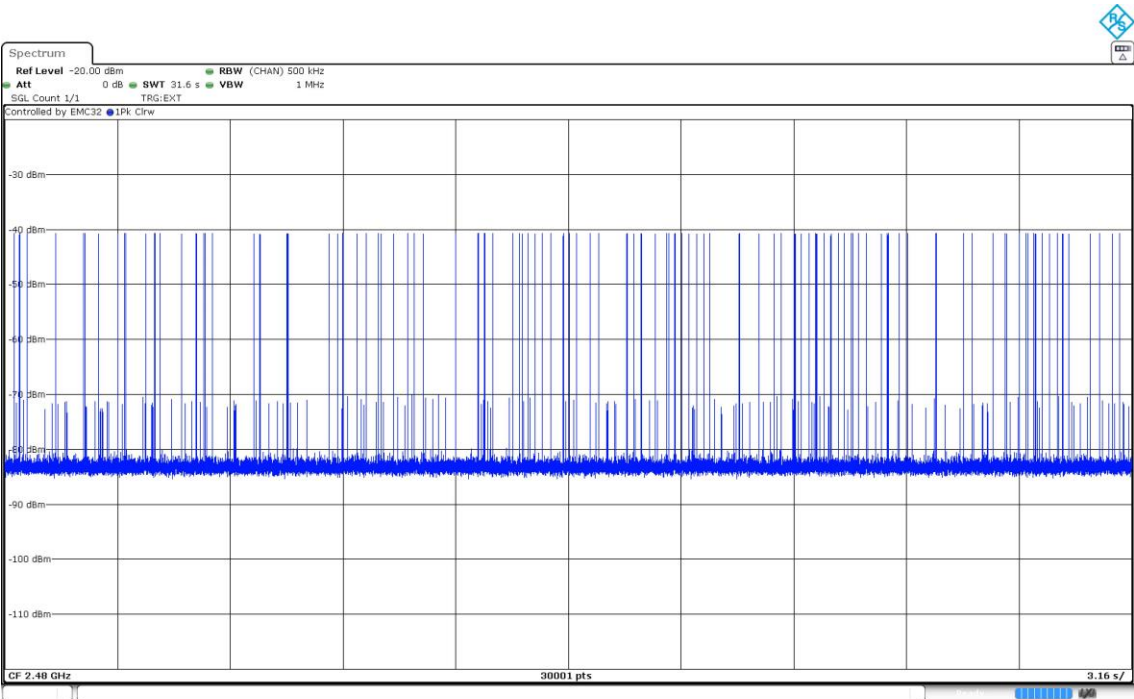
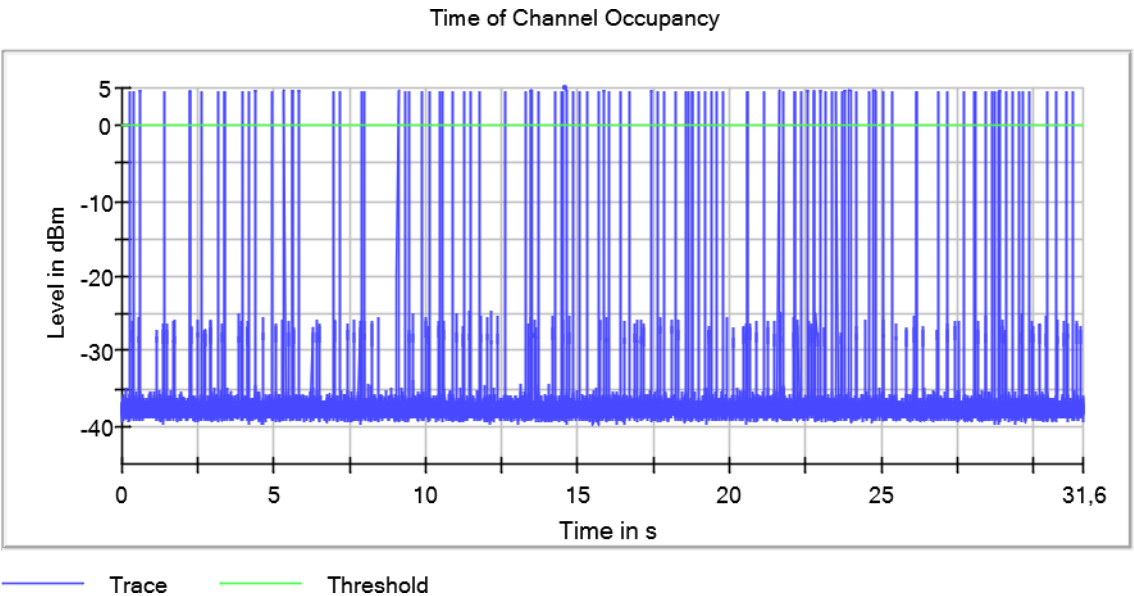
Verdict

Pass

Attachments

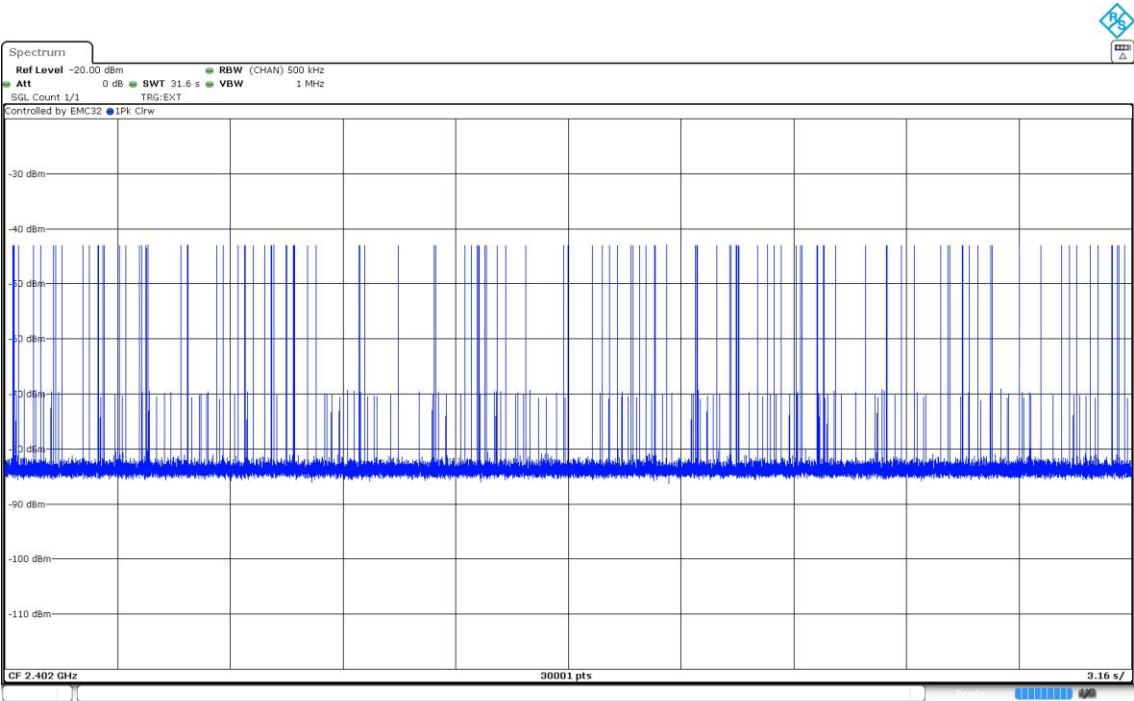
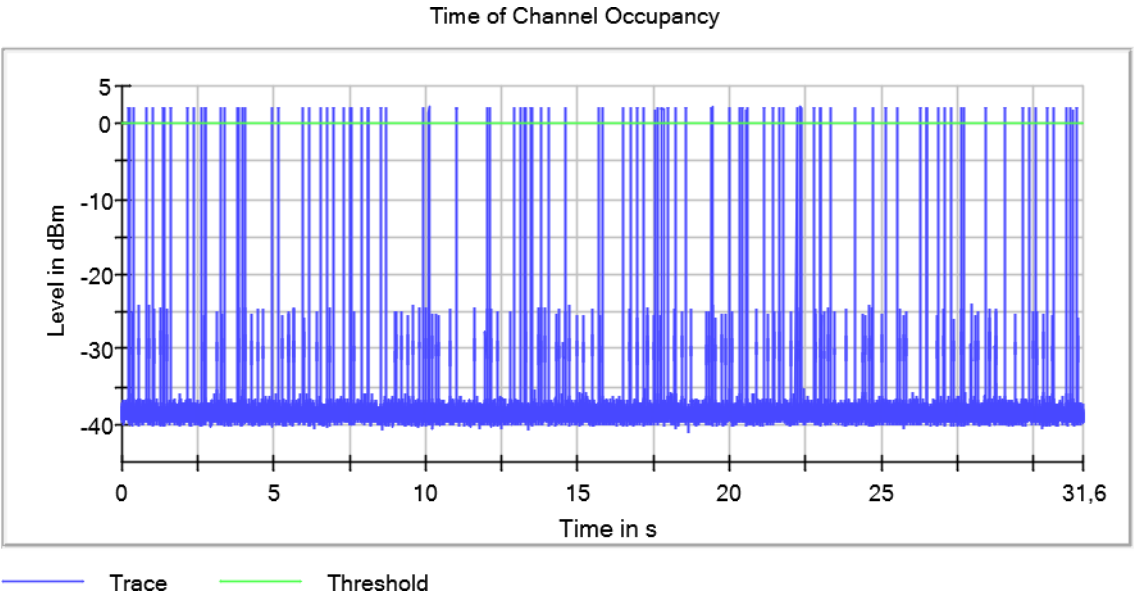
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO
Active Port = 1

Images:



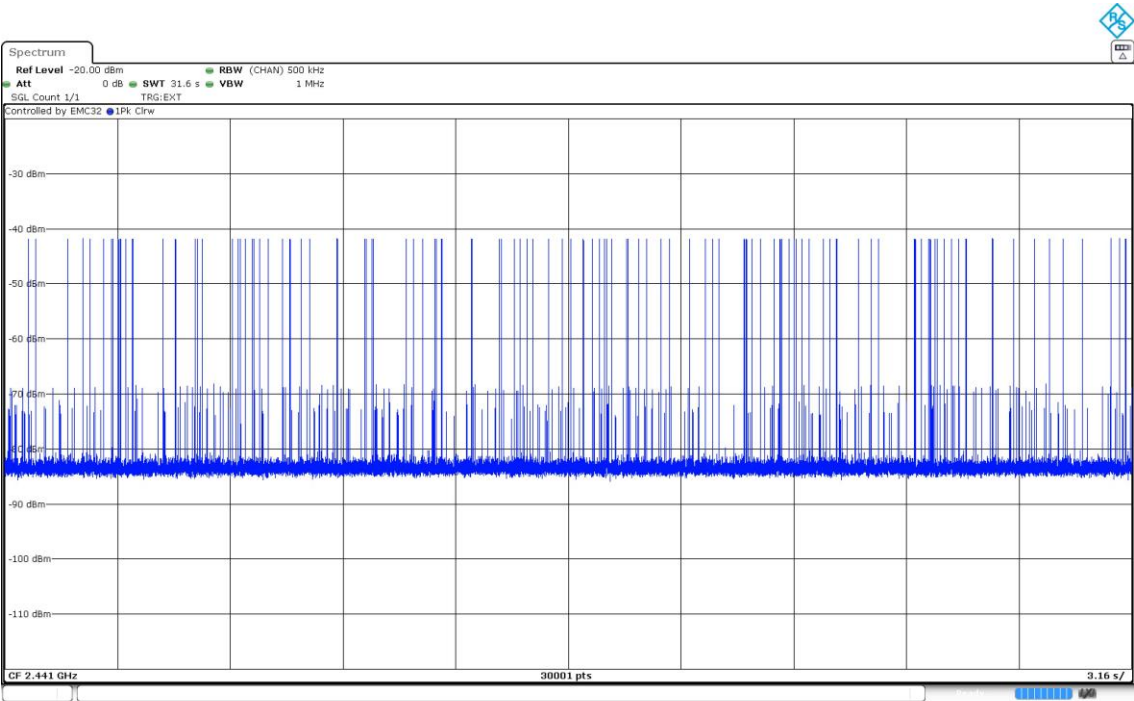
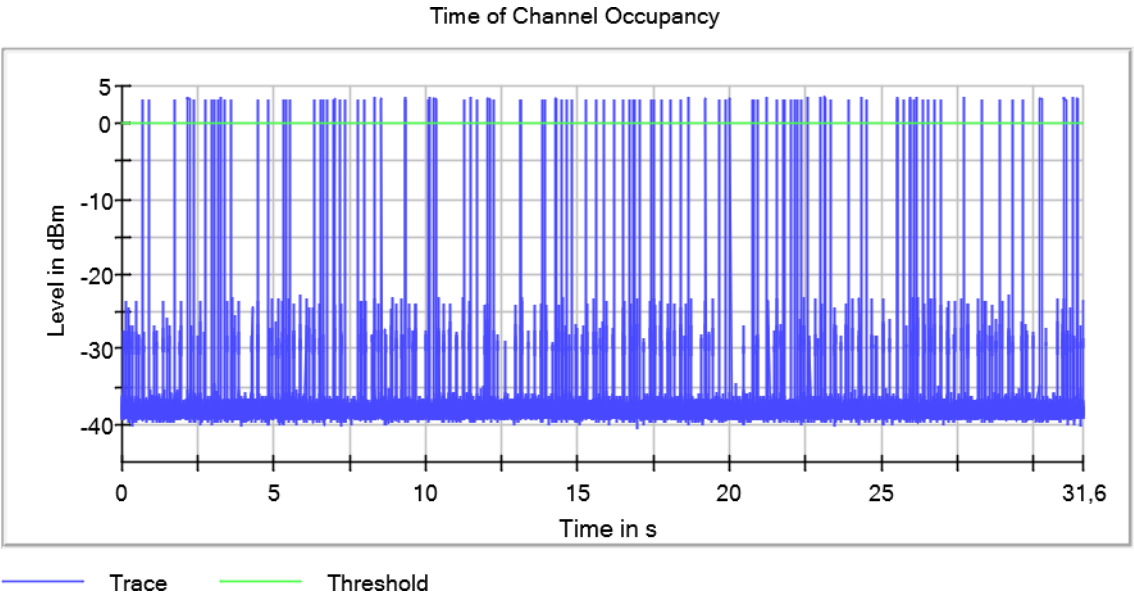
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO
Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO
Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	112	320.40
			97	273.82
			106	292.34

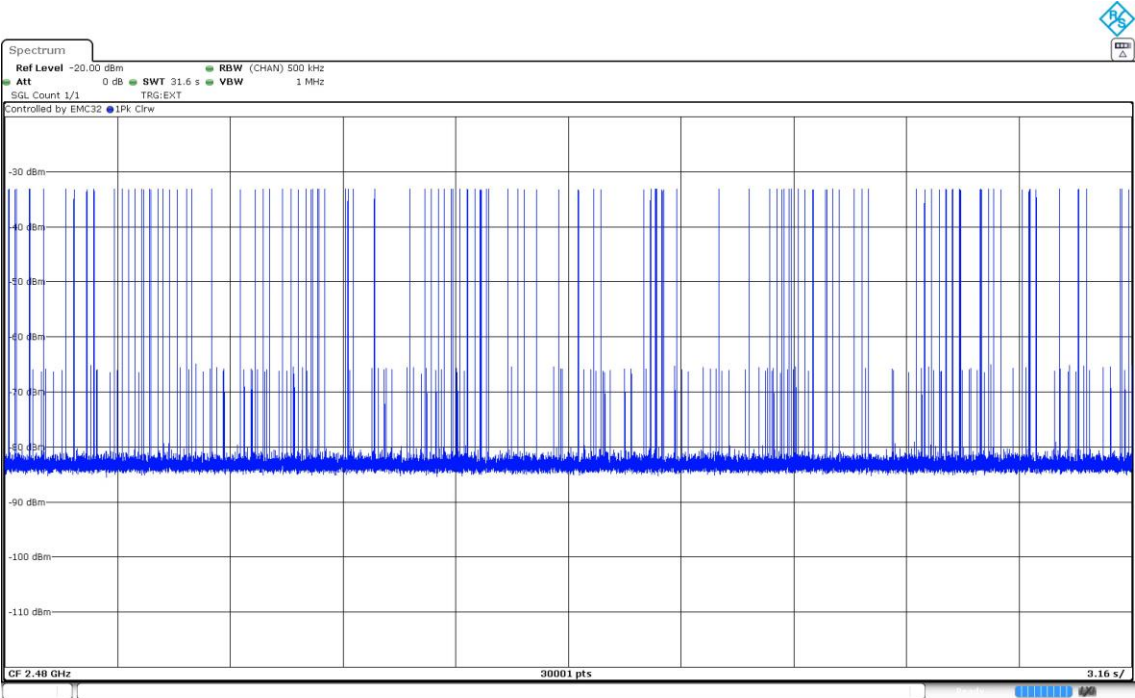
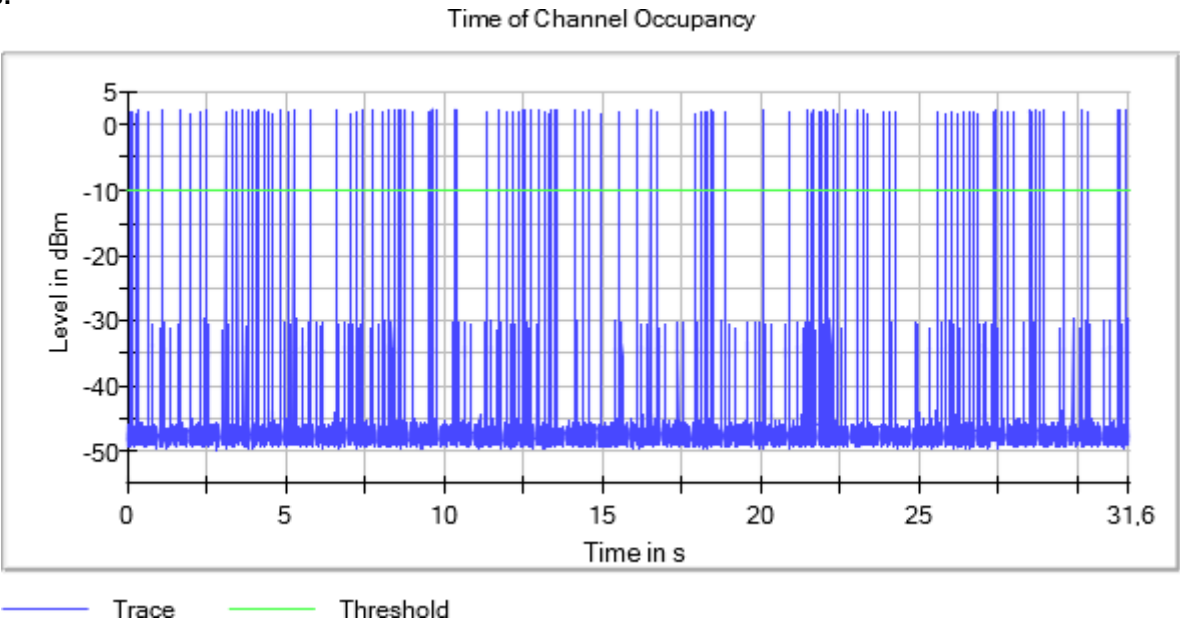
Verdict

Pass

Attachments

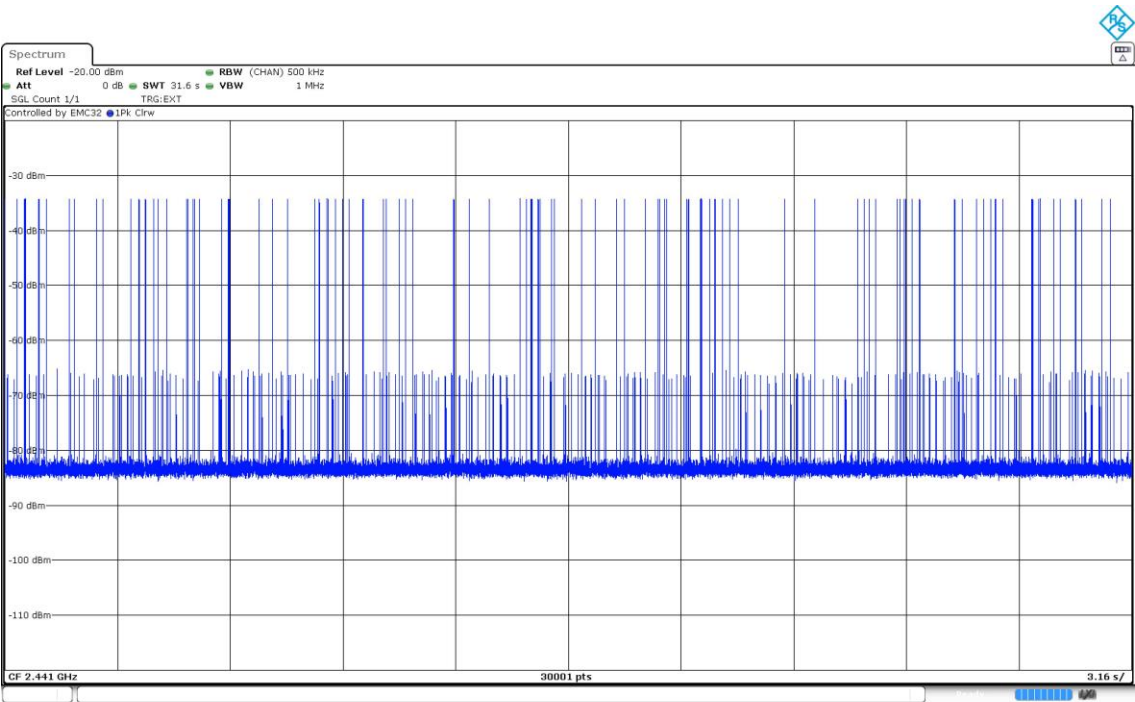
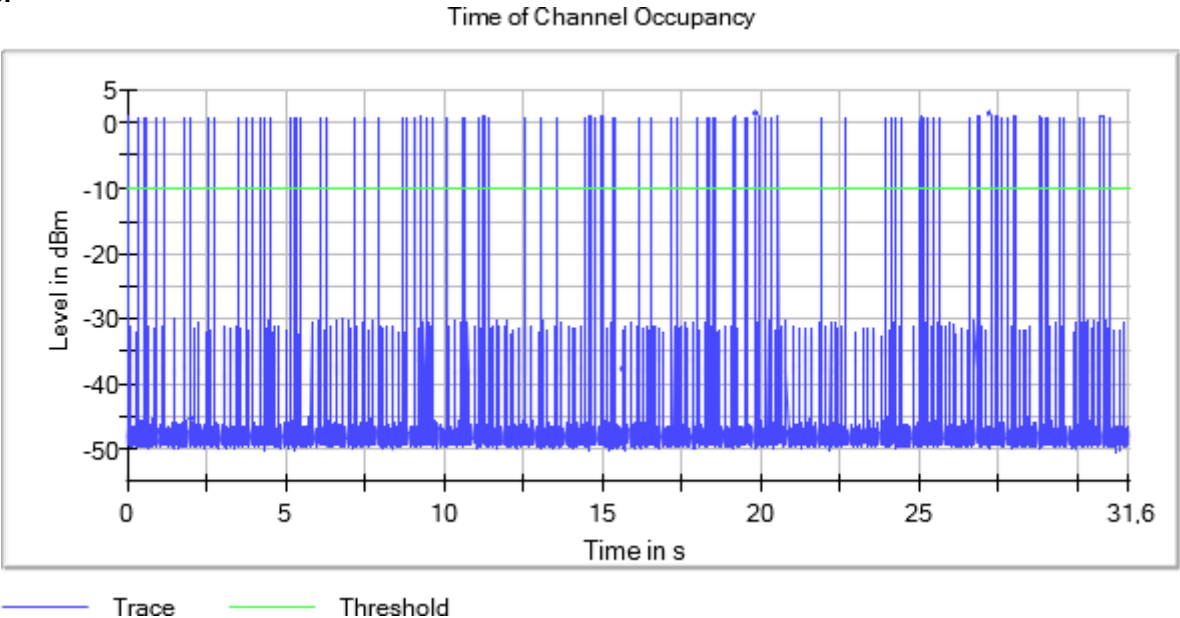
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) MIMO Mode = SISO
Active Port = 1

Images:



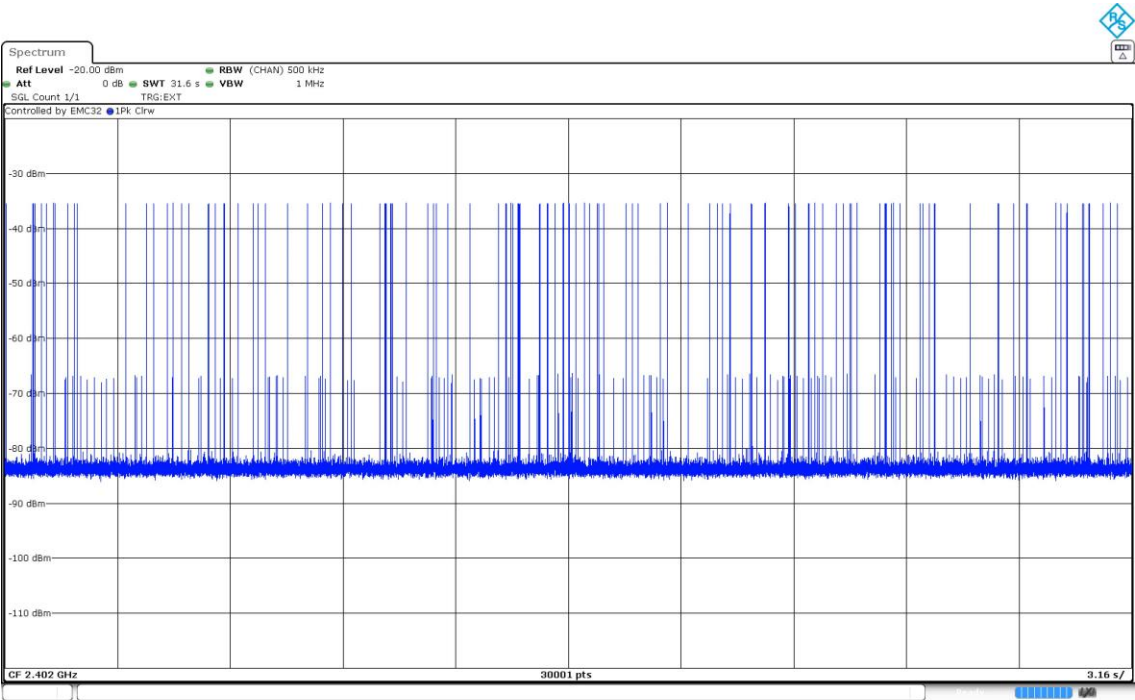
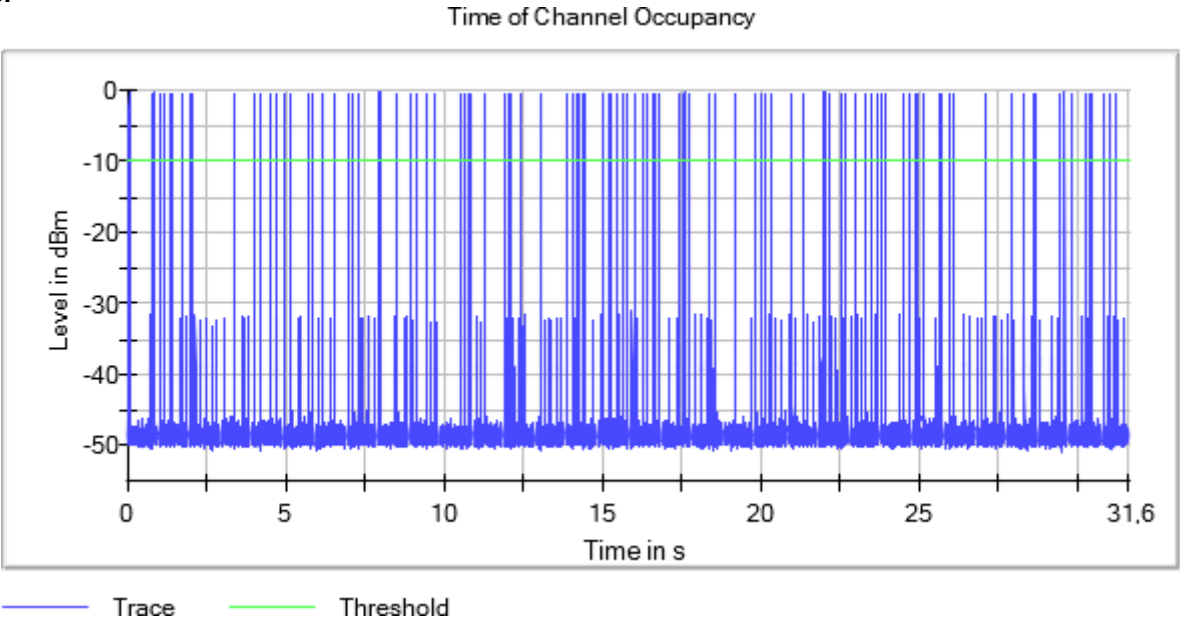
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) MIMO Mode = SISO
Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) MIMO Mode = SISO
Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	107	286.70
			104	290.80
			111	316.04

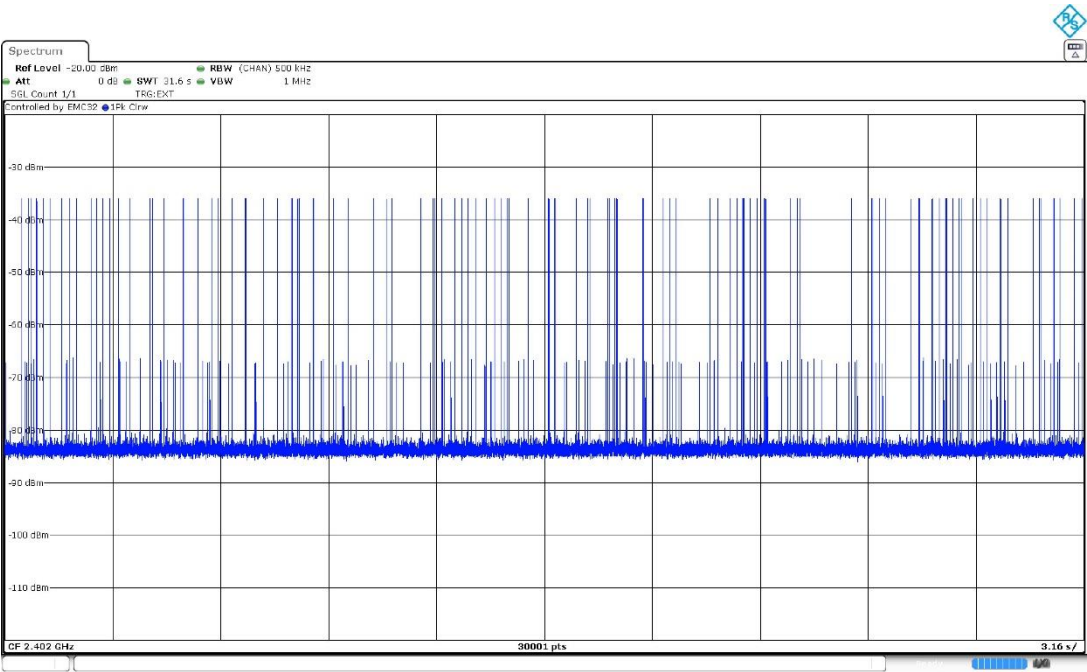
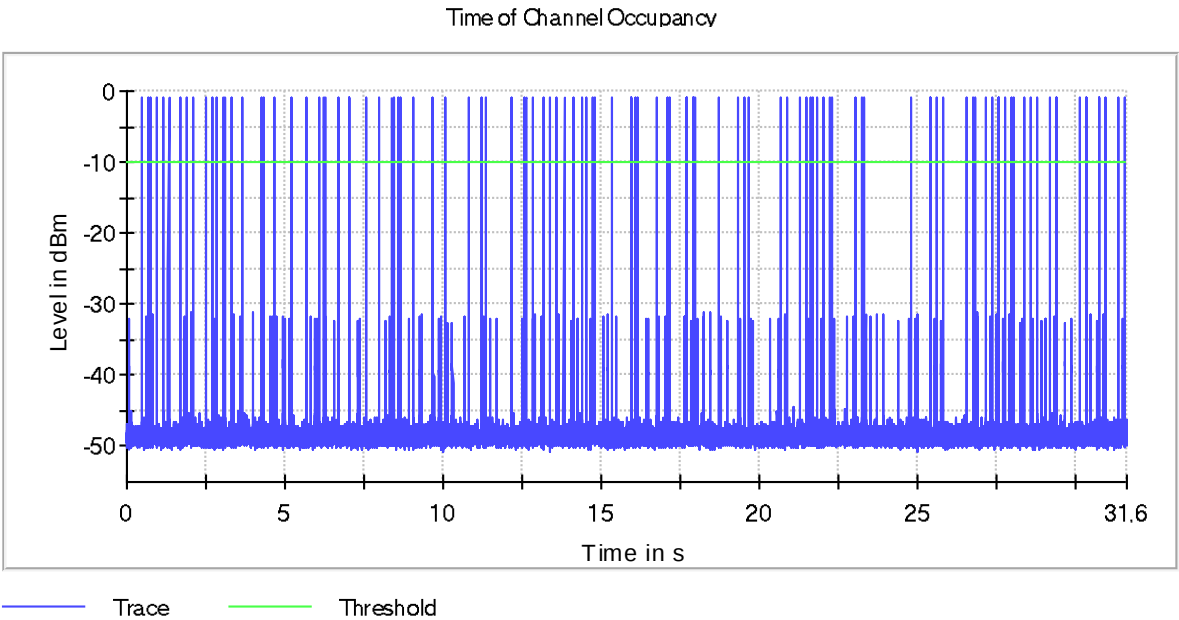
Verdict

Pass

Attachments

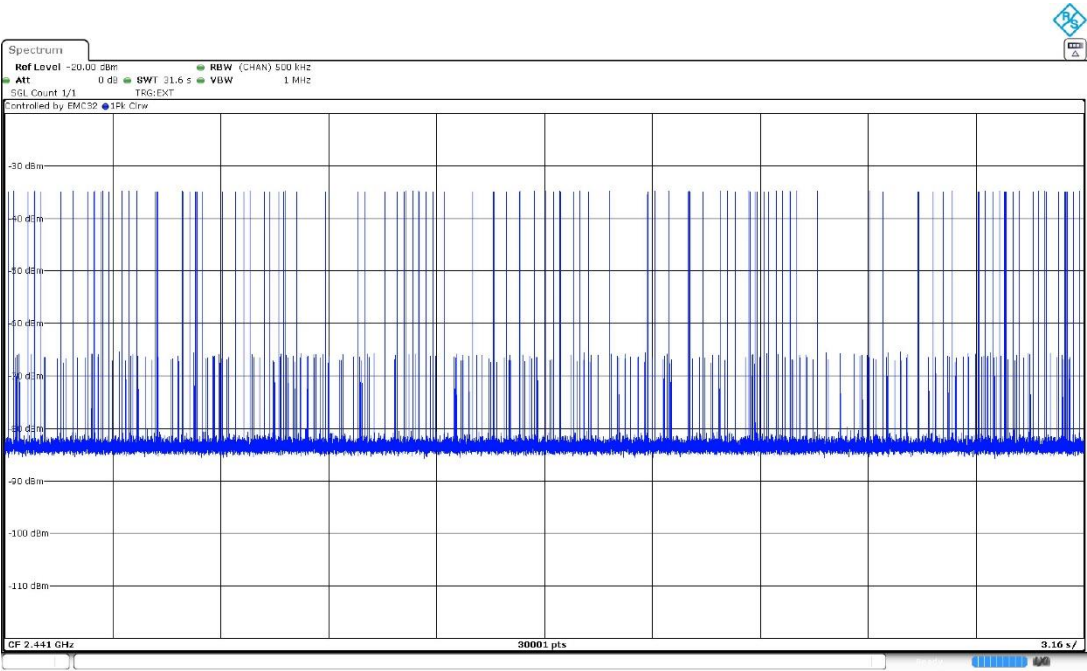
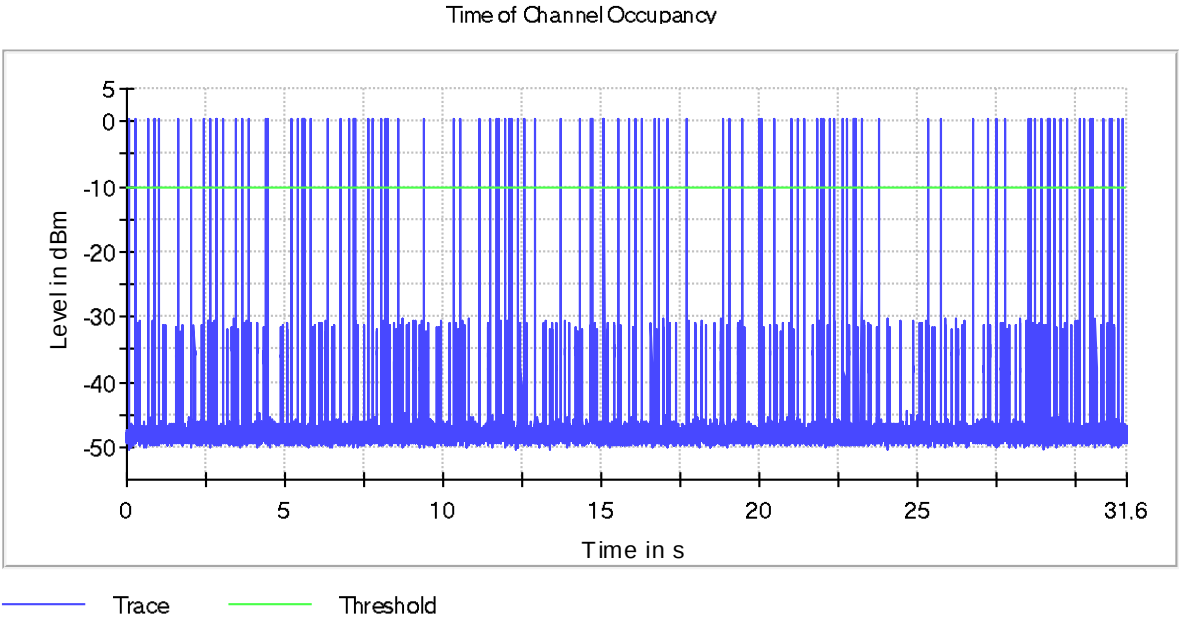
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO
Active Port = 1

Images:



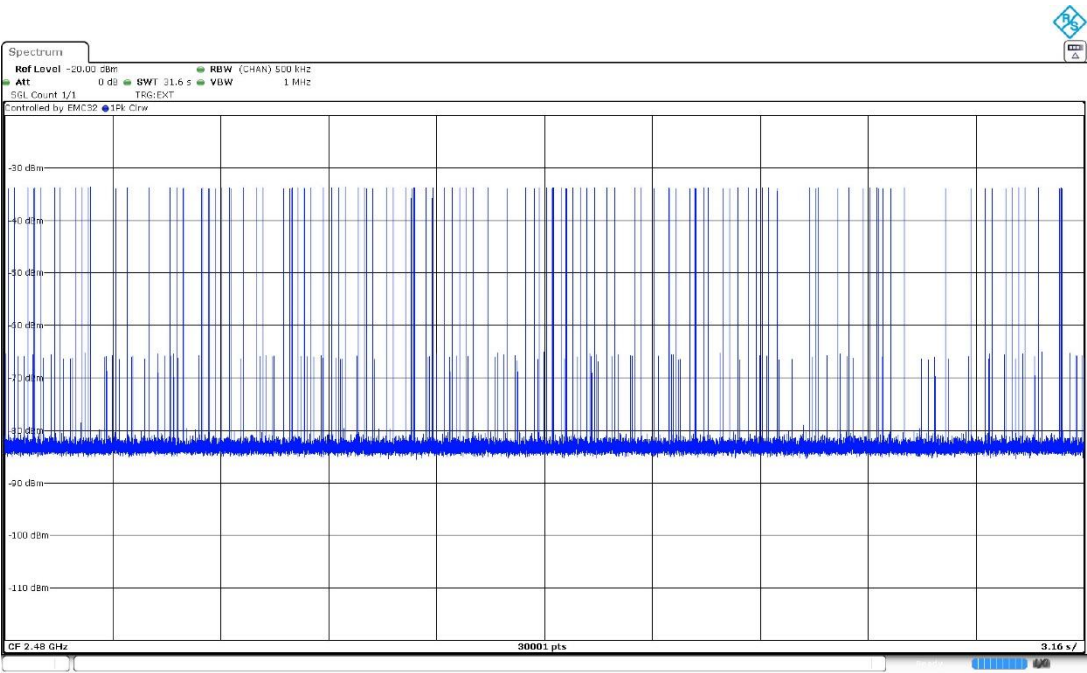
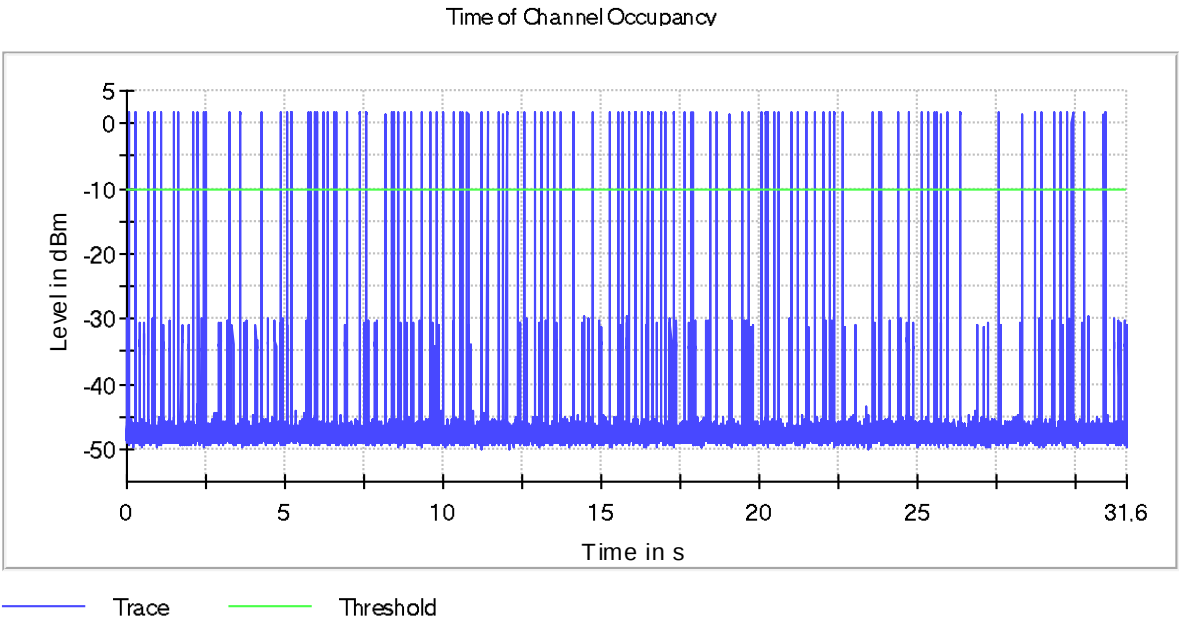
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO
Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO
Active Port = 1

Images:



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

Limits

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

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	79

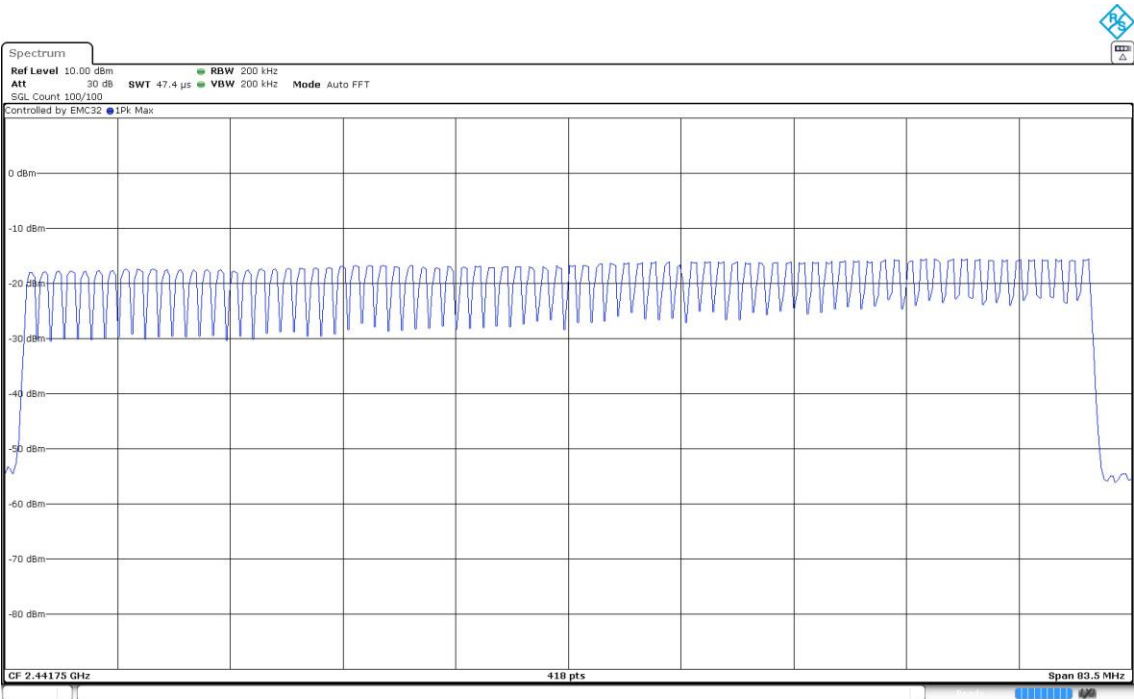
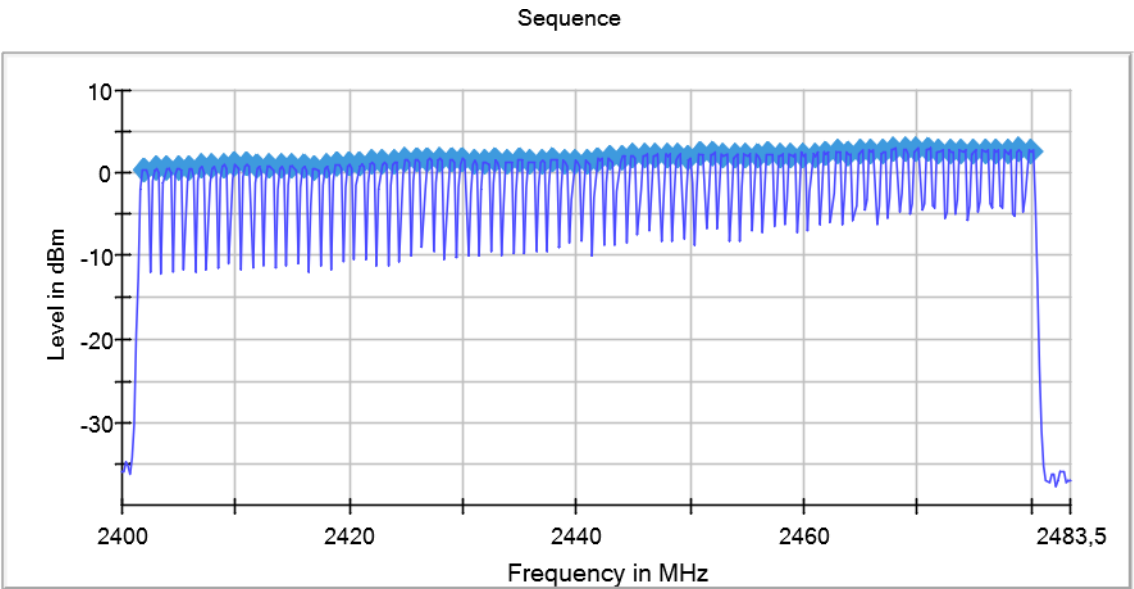
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO
Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	81

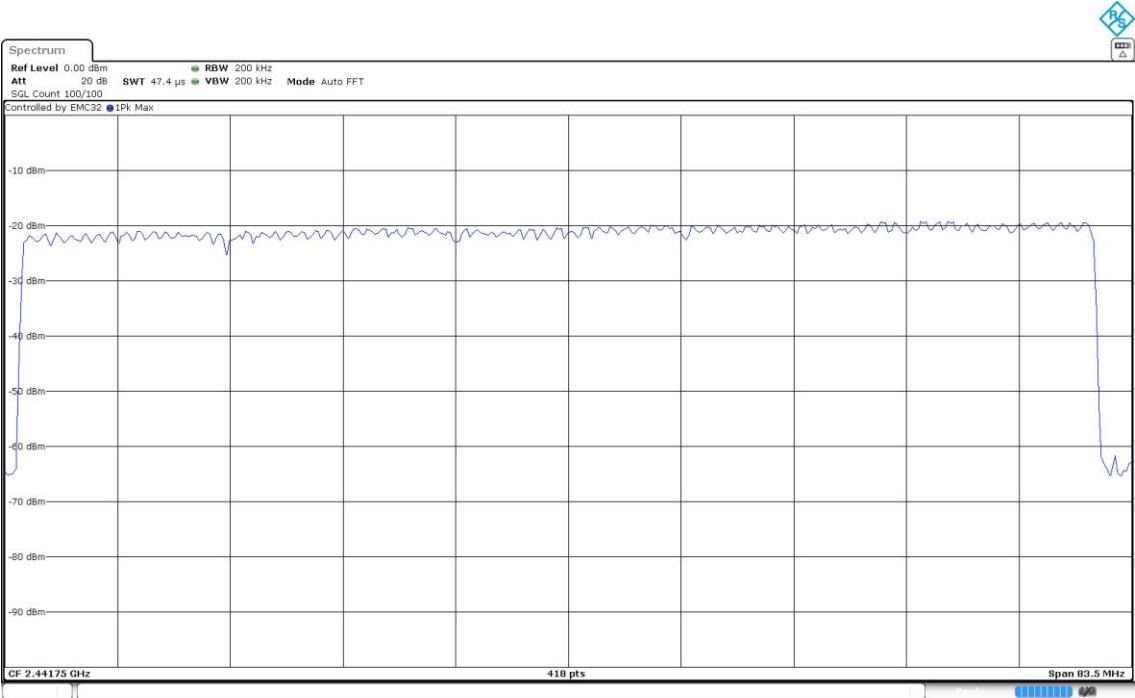
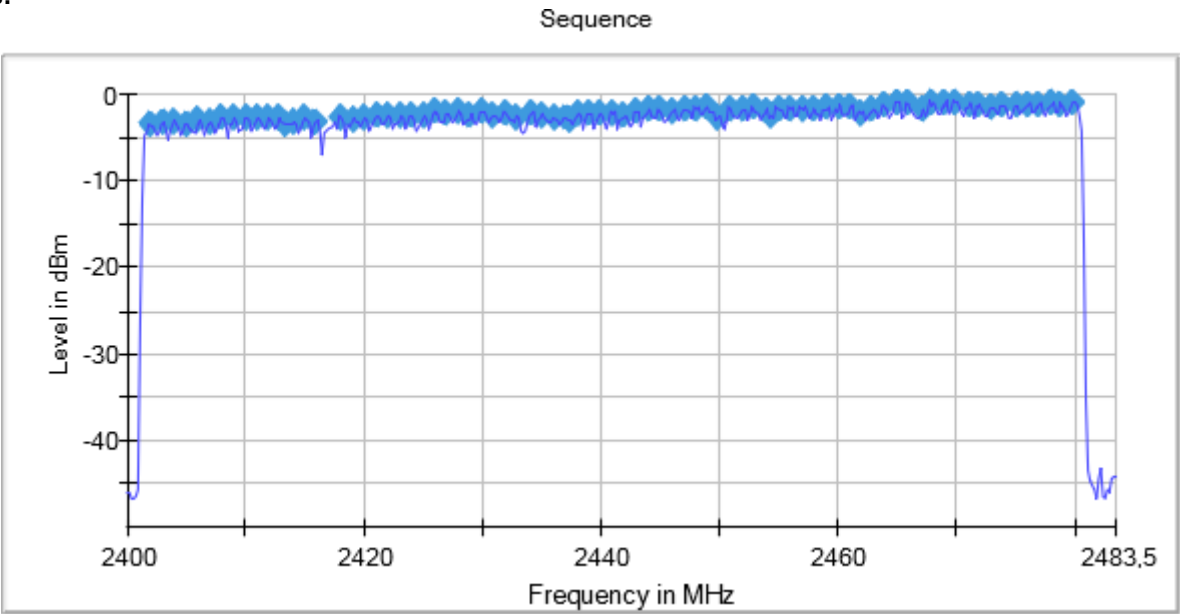
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) MIMO Mode = SISO
Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	79

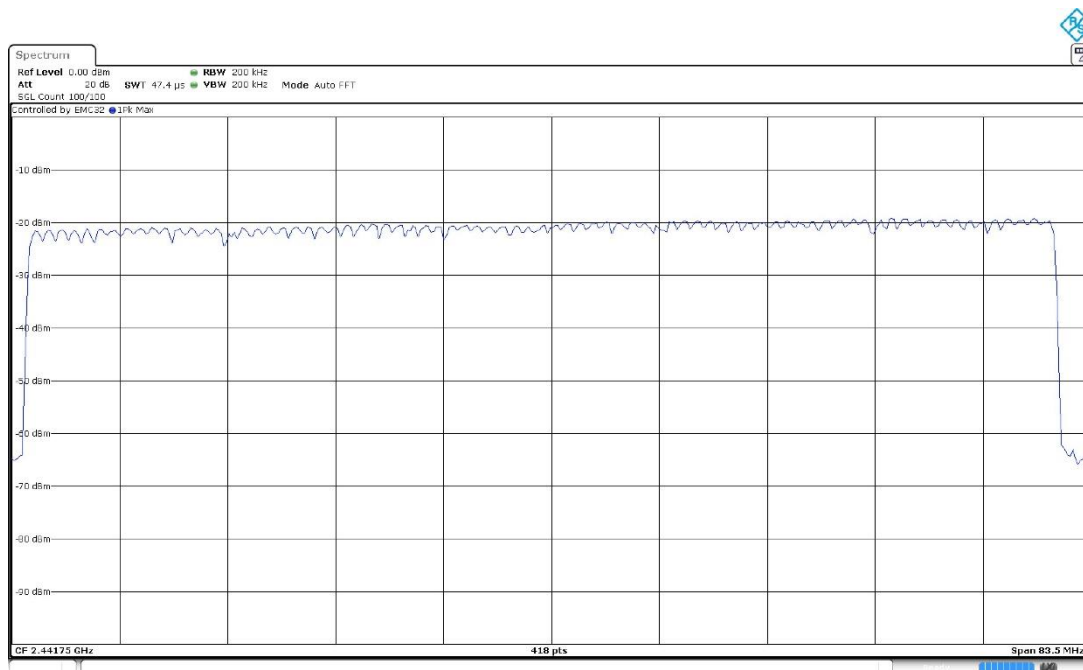
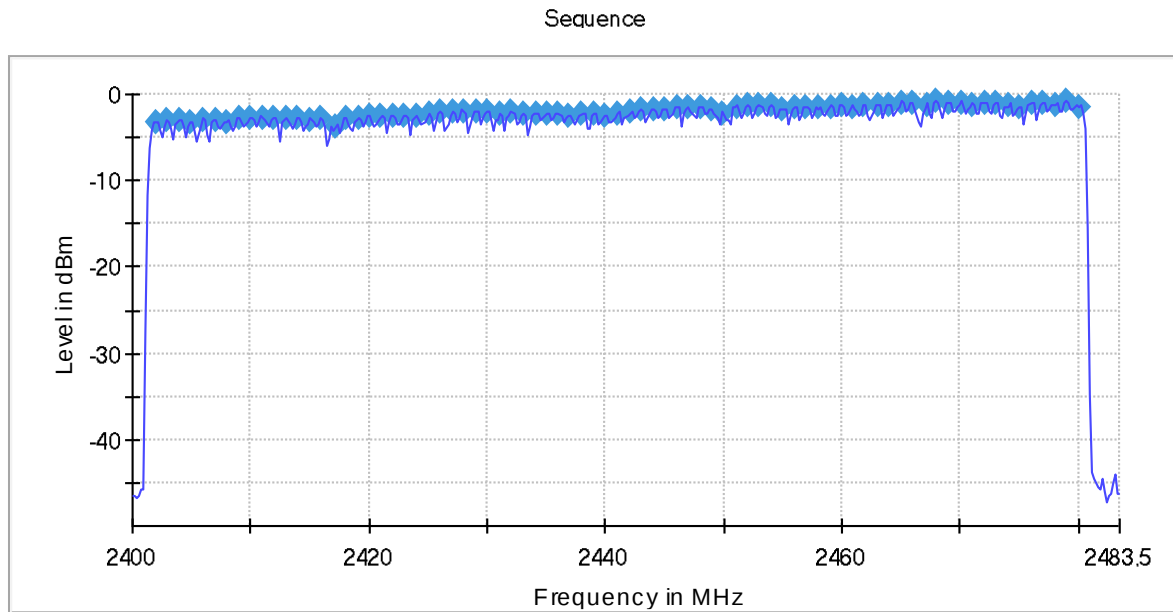
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
 Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO
 Active Port = 1

Images:



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).

RSS-247:

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

Results

The maximum peak conducted output power level of the fundamental emission was measured according to clause 7.8.5 “Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices” of ANSI C63.10-2013.

The EIRP power (dBm) is calculated by adding the maximum declared antenna gain to the measured conducted power.

Maximum Declared Antenna Gain: +0.34 dBi

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Equipment	BW (MHz)	Freq (MHz)	Port	Peak Power (dBm)	EIRP (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.1030	1.3700
		2441.00000		2.2610	2.6010
		2480.00000		3.4930	3.8330

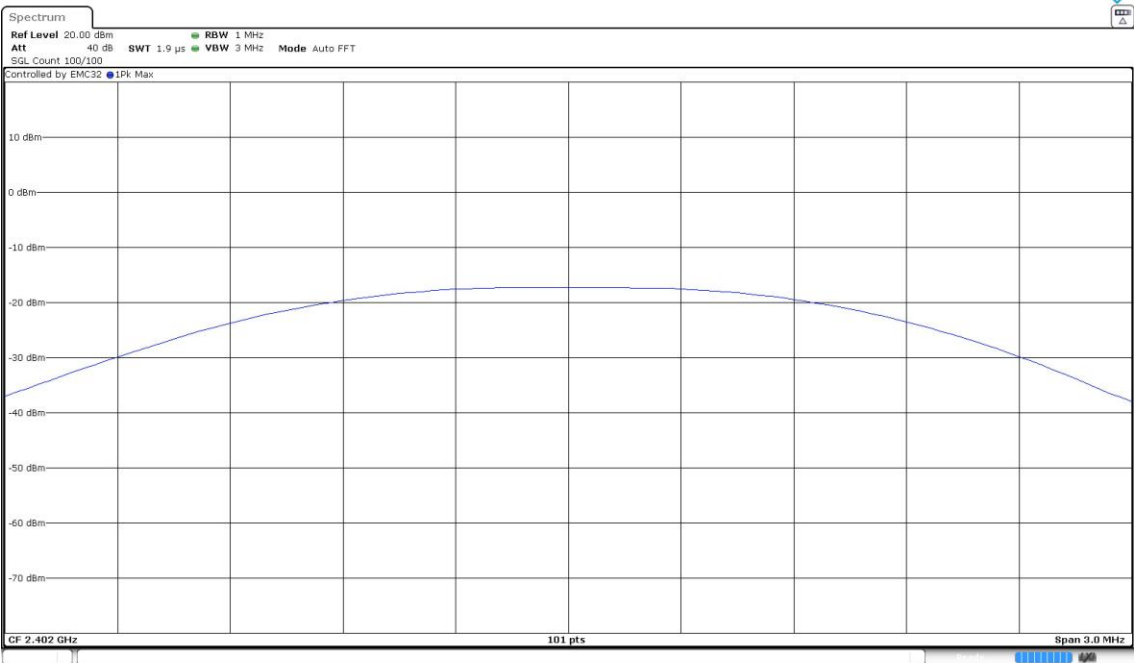
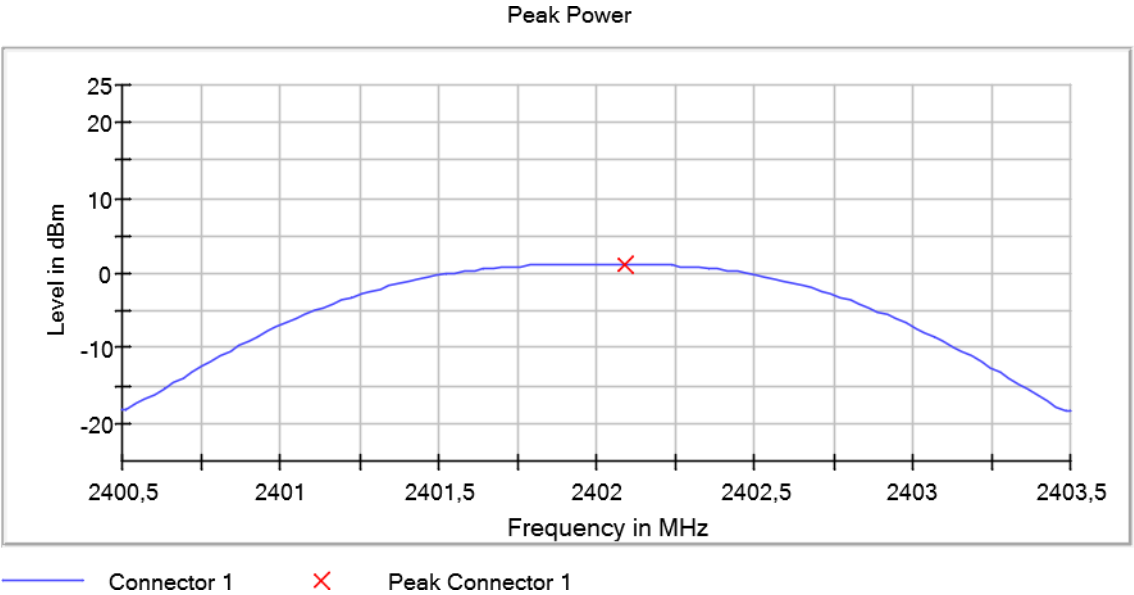
Verdict

Pass

Attachments

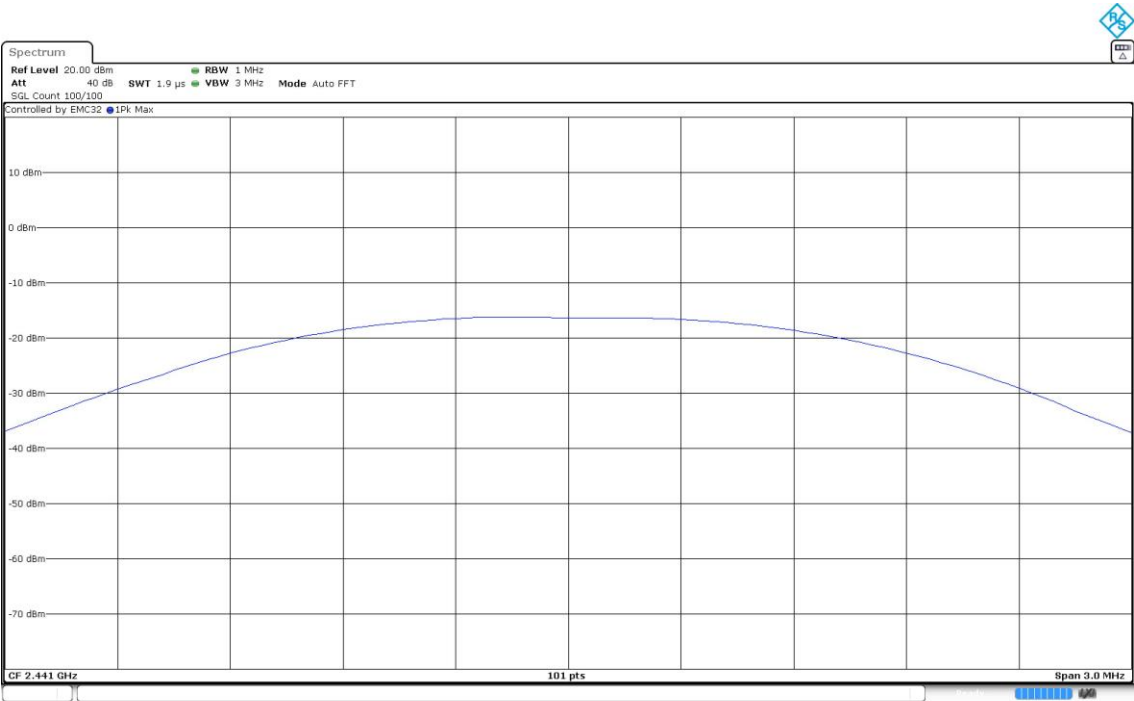
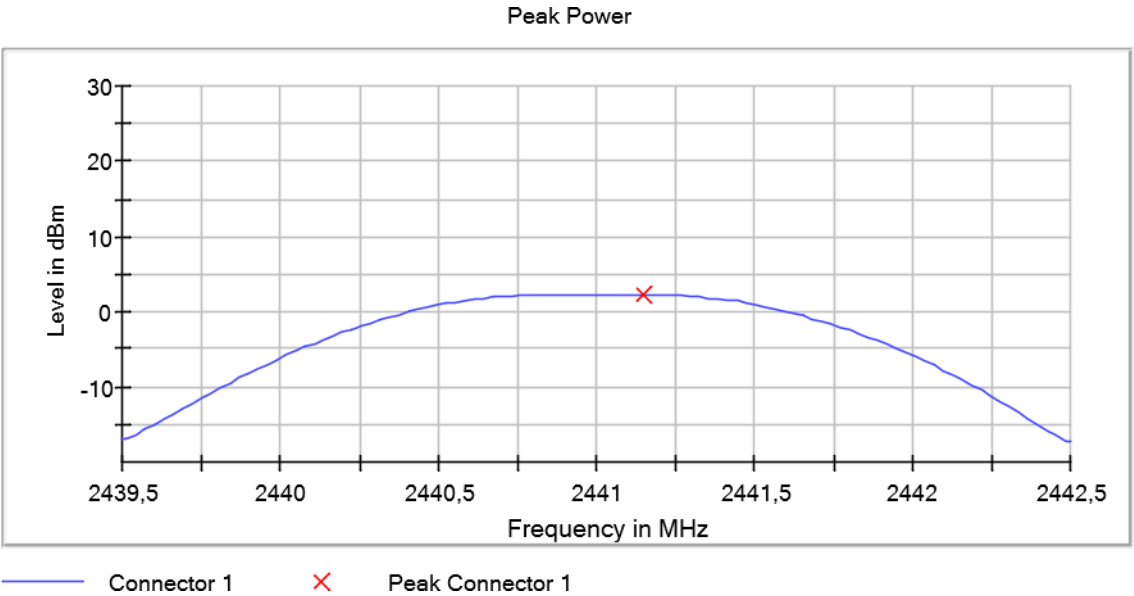
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



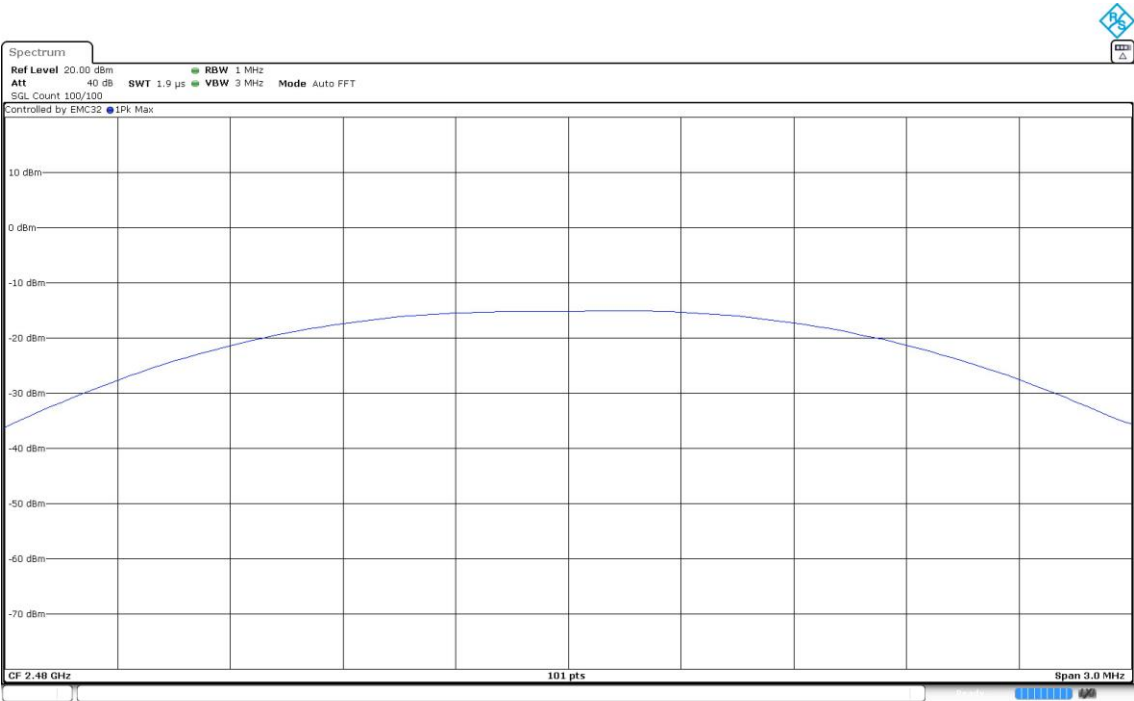
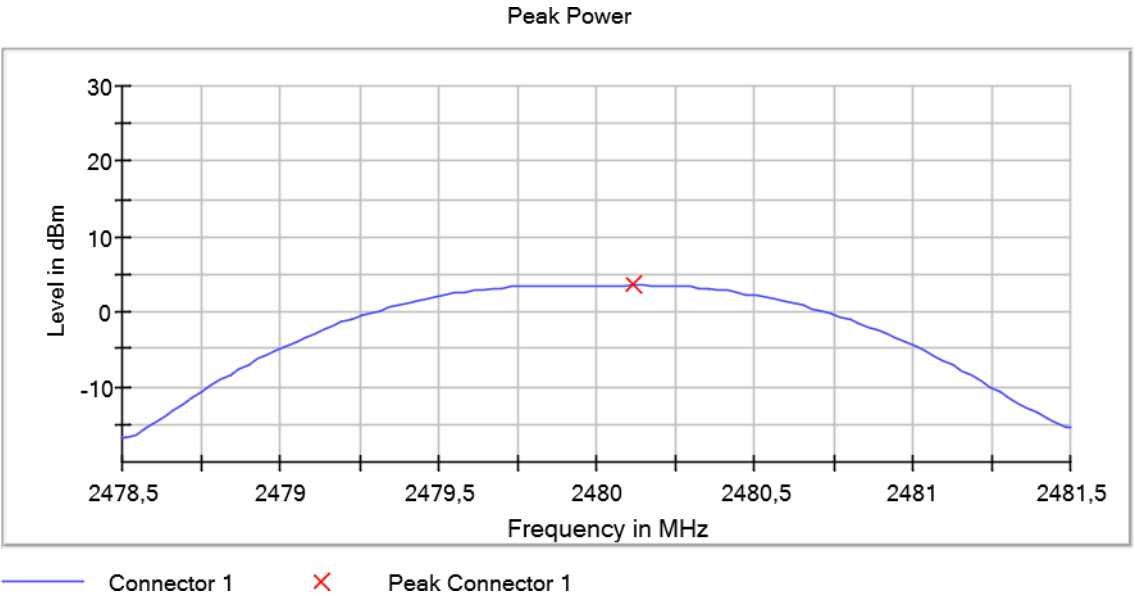
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Peak Power (dBm)	EIRP (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	-0.8570	-0.5170
		2441.00000		0.3100	0.6500
		2480.00000		1.5180	1.8580

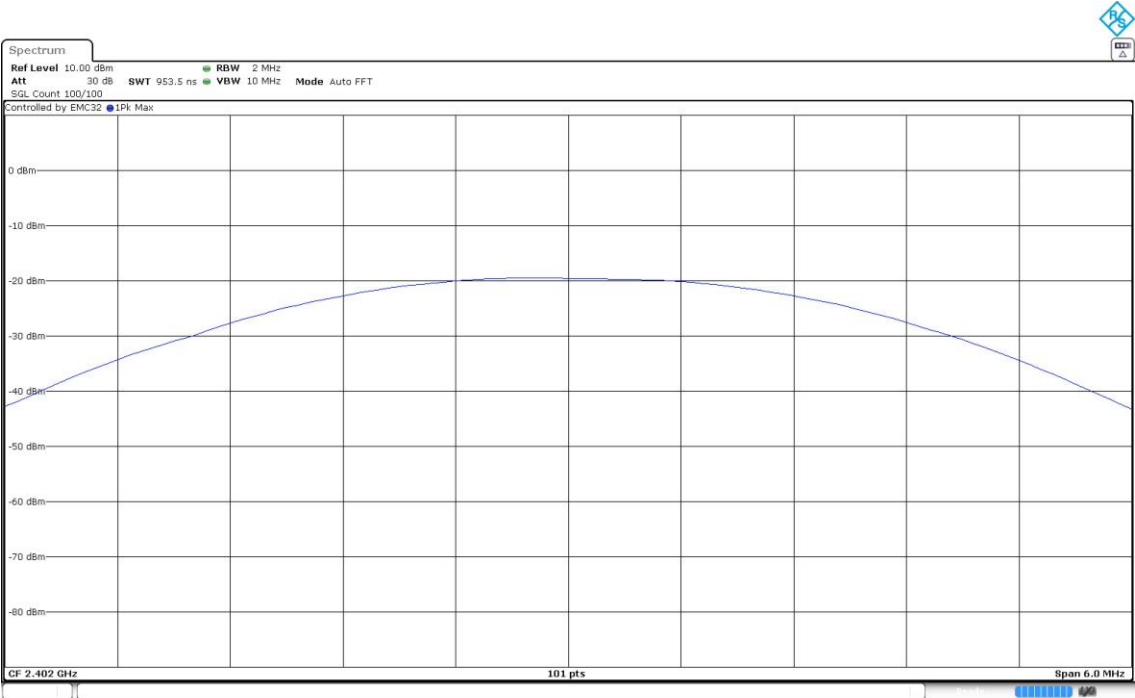
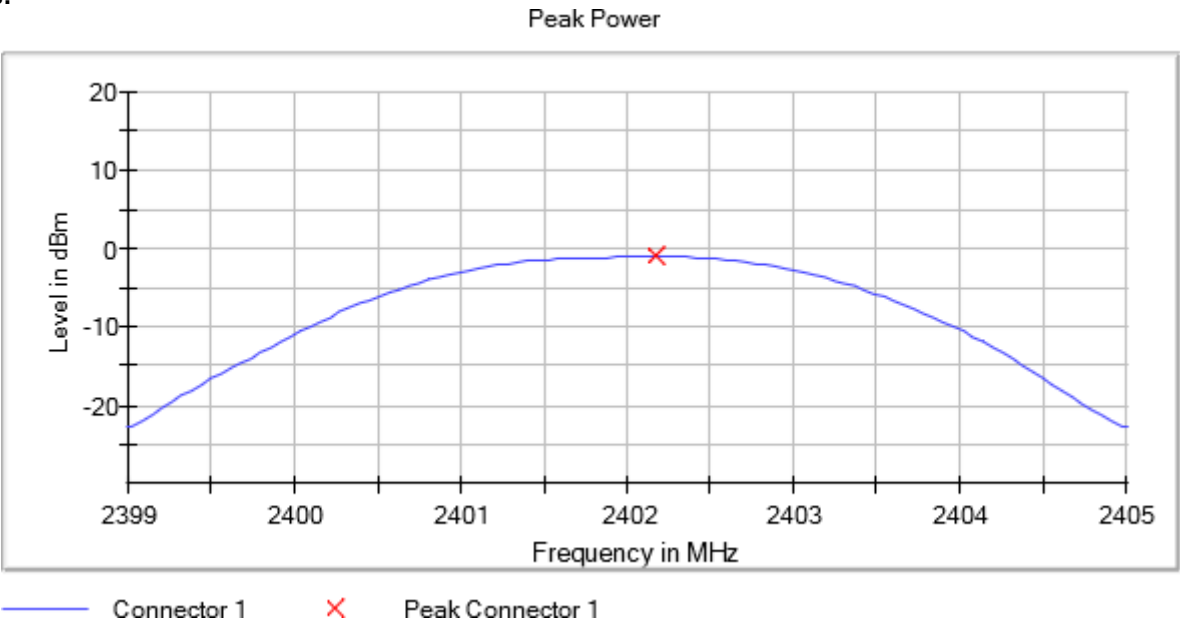
Verdict

Pass

Attachments

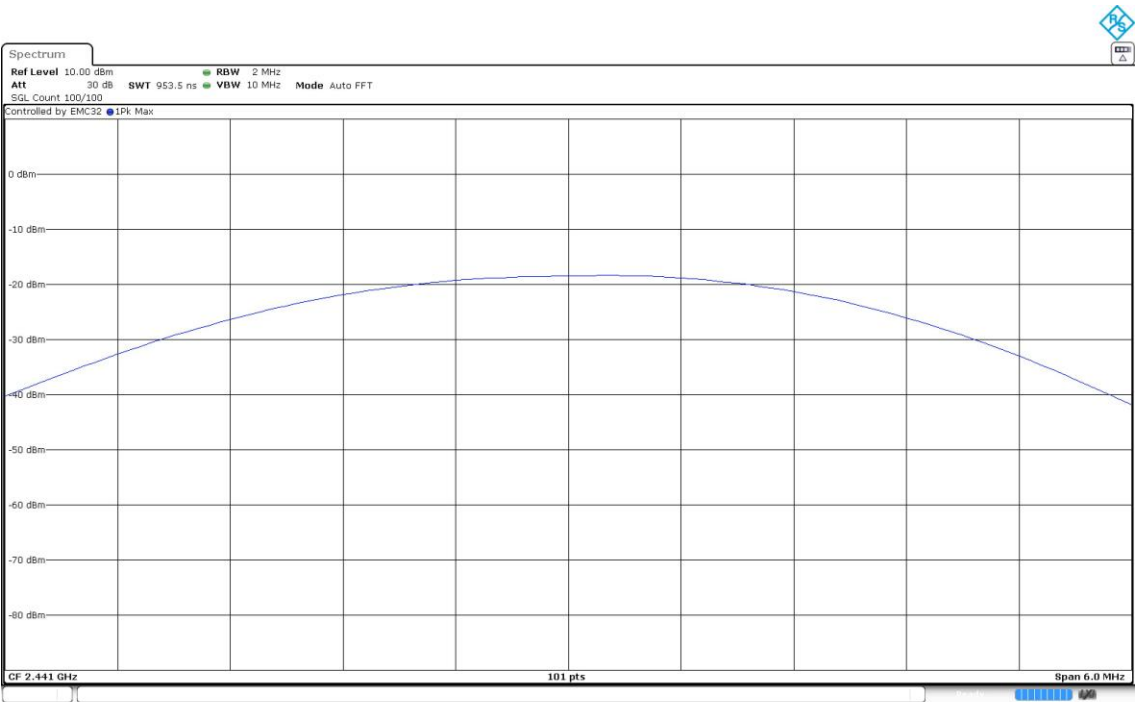
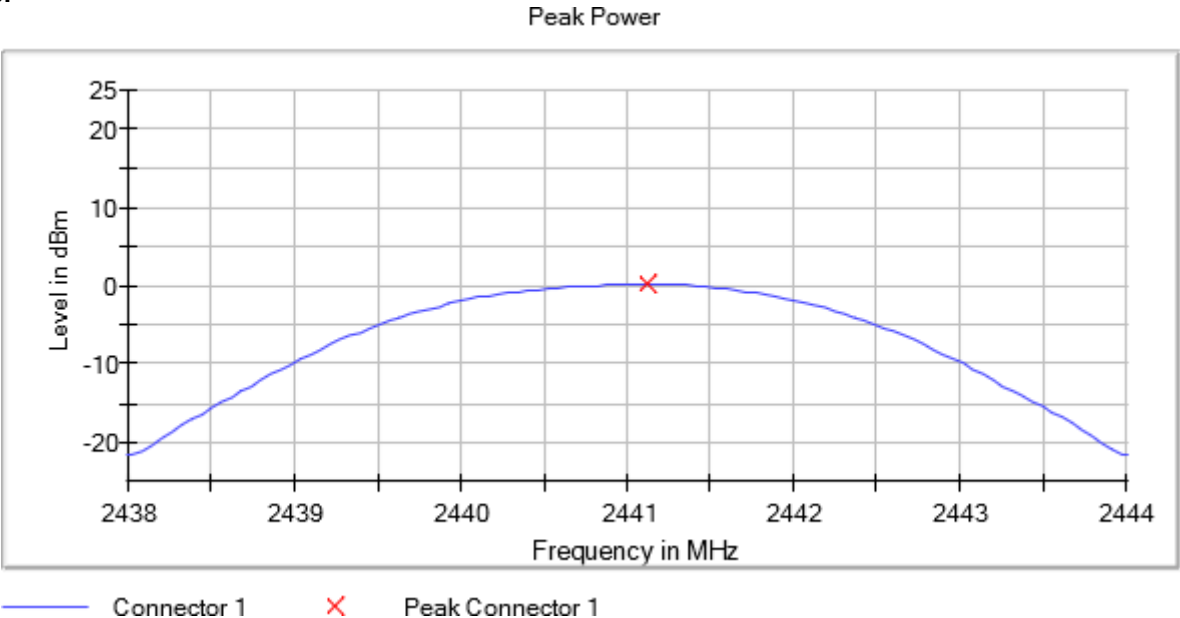
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



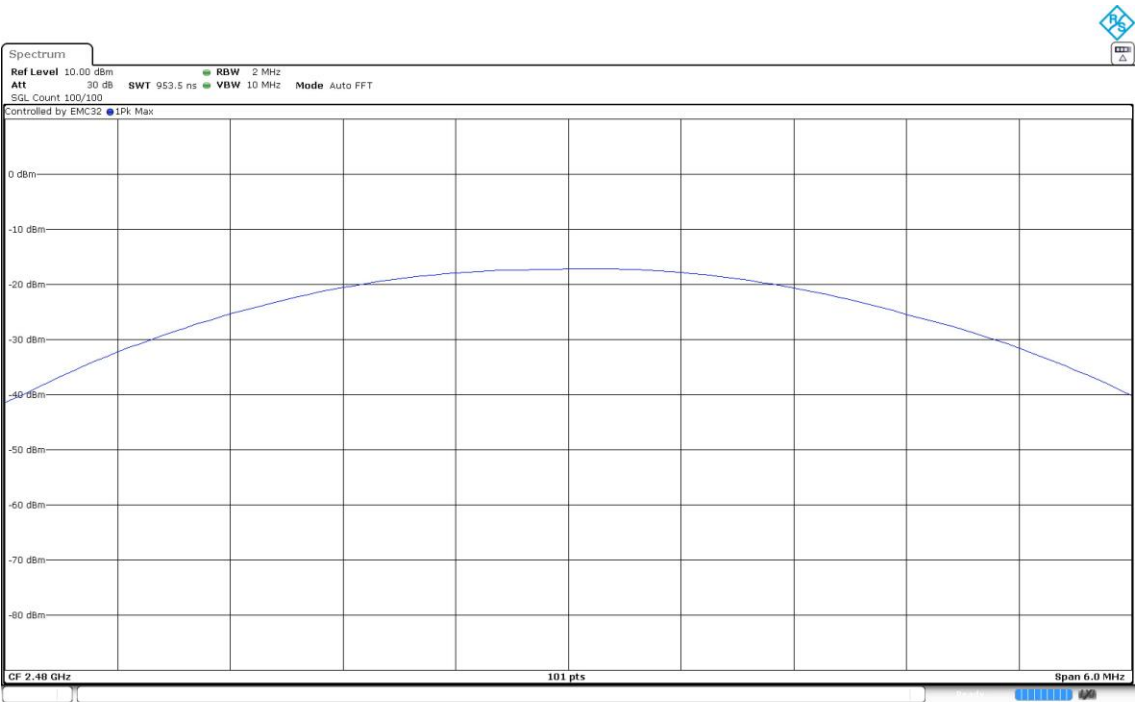
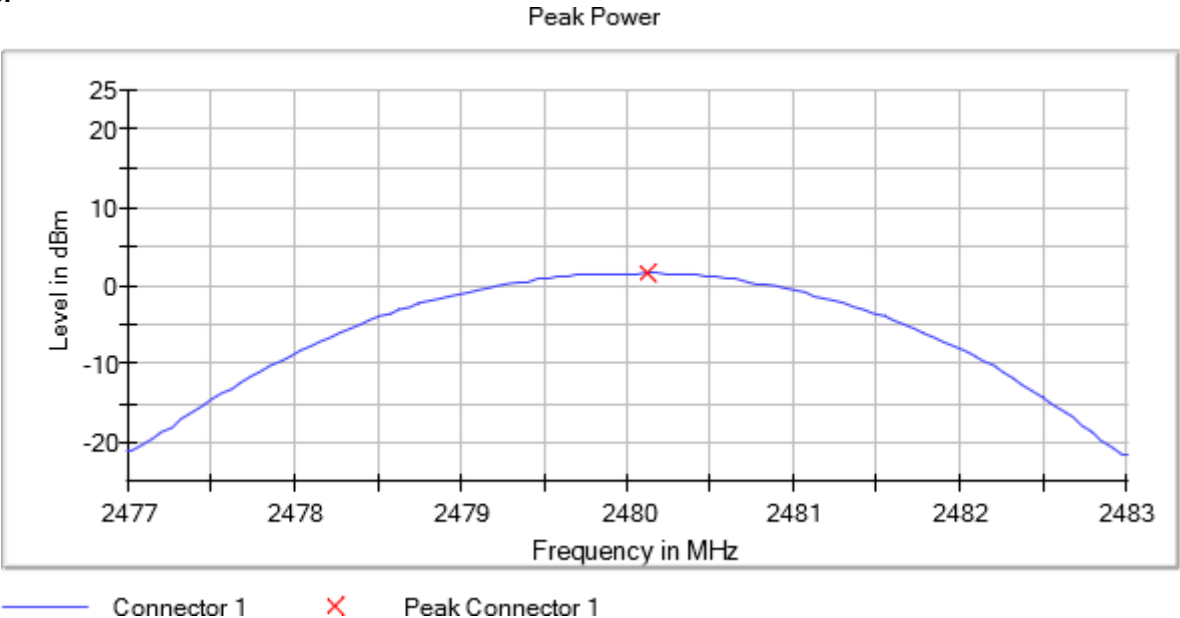
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Peak Power (dBm)	EIRP (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	-0.3000	0.0400
		2441.00000		0.5840	0.9240
		2480.00000		1.9170	2.2570

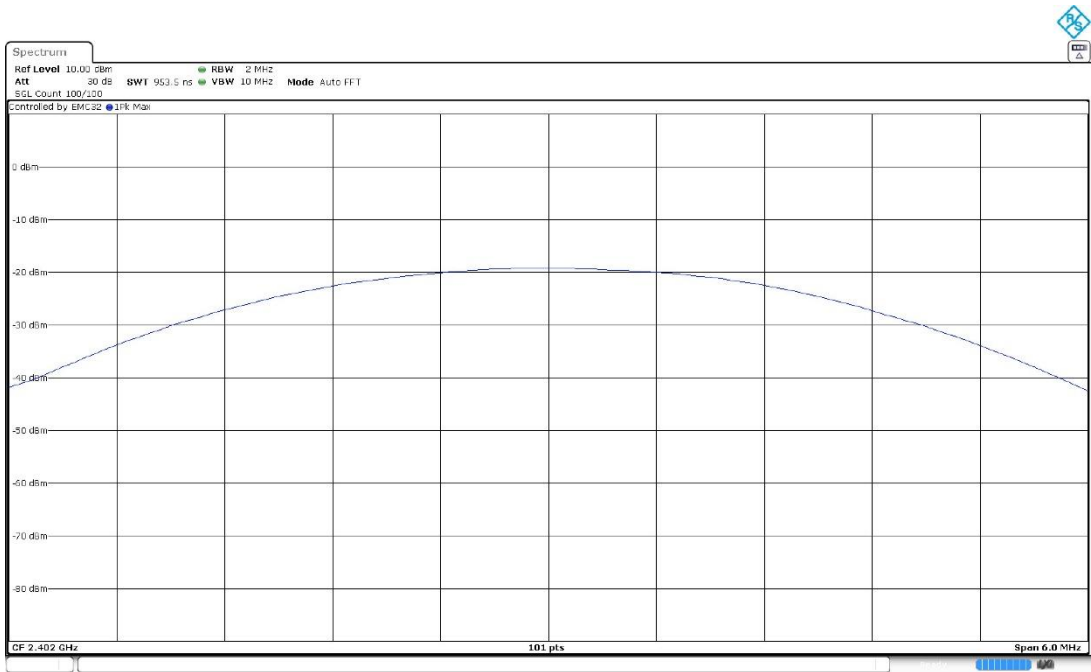
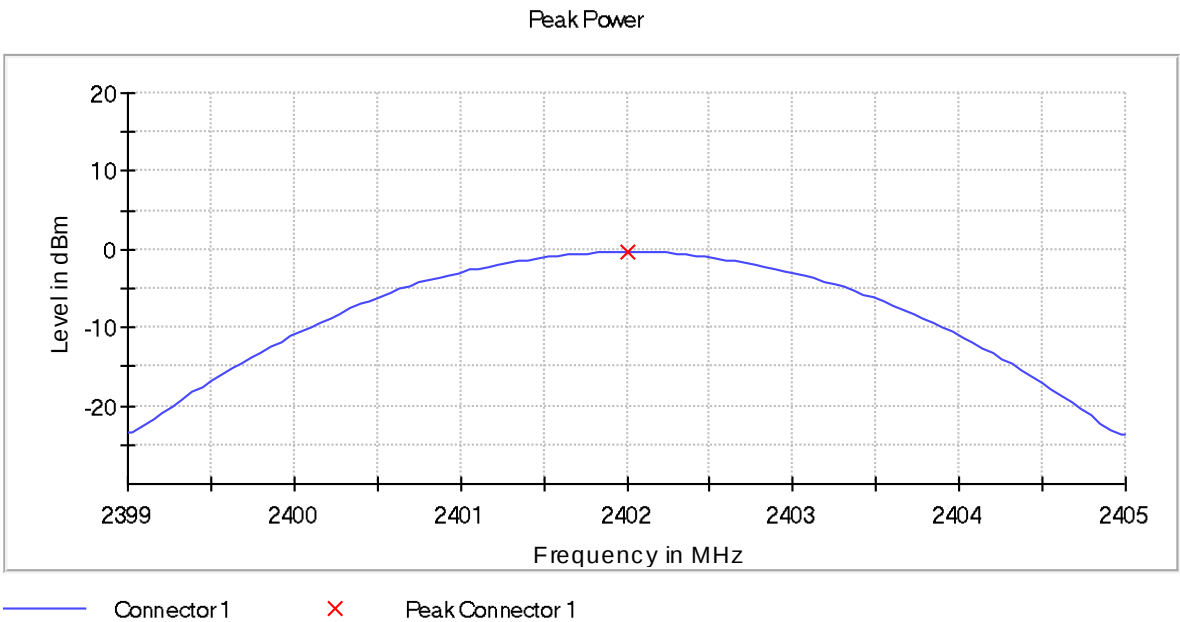
Verdict

Pass

Attachments

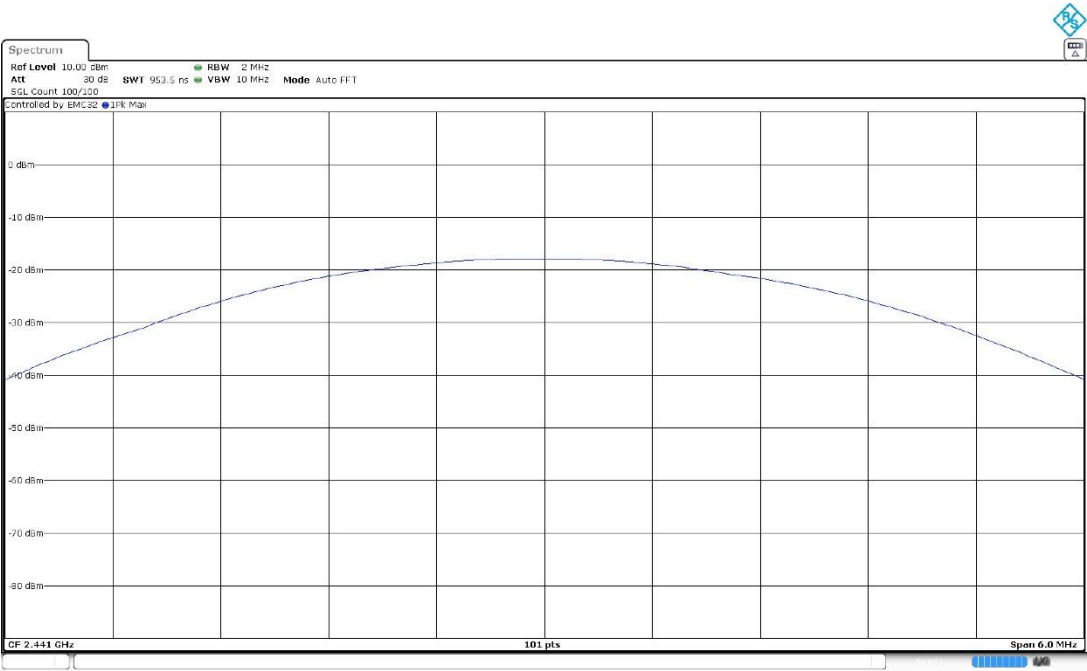
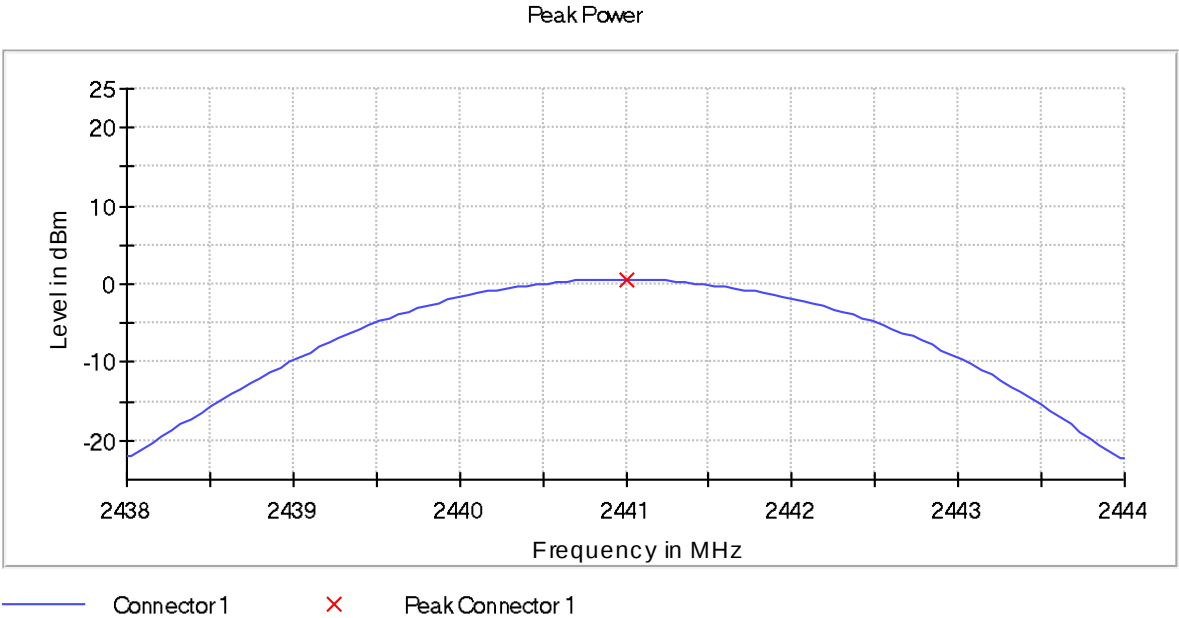
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



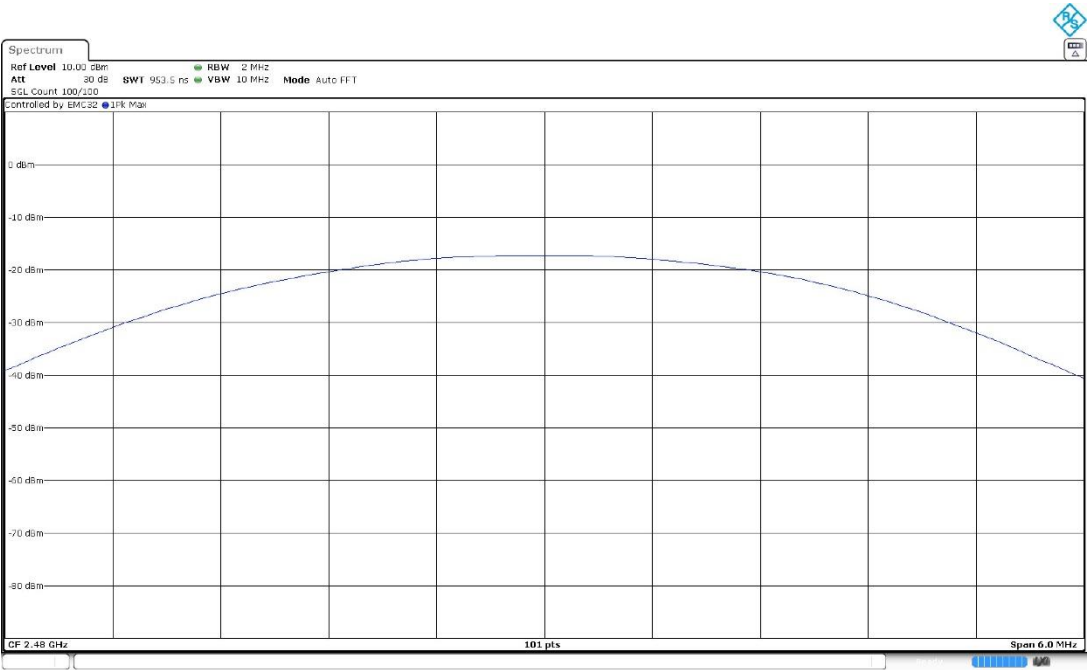
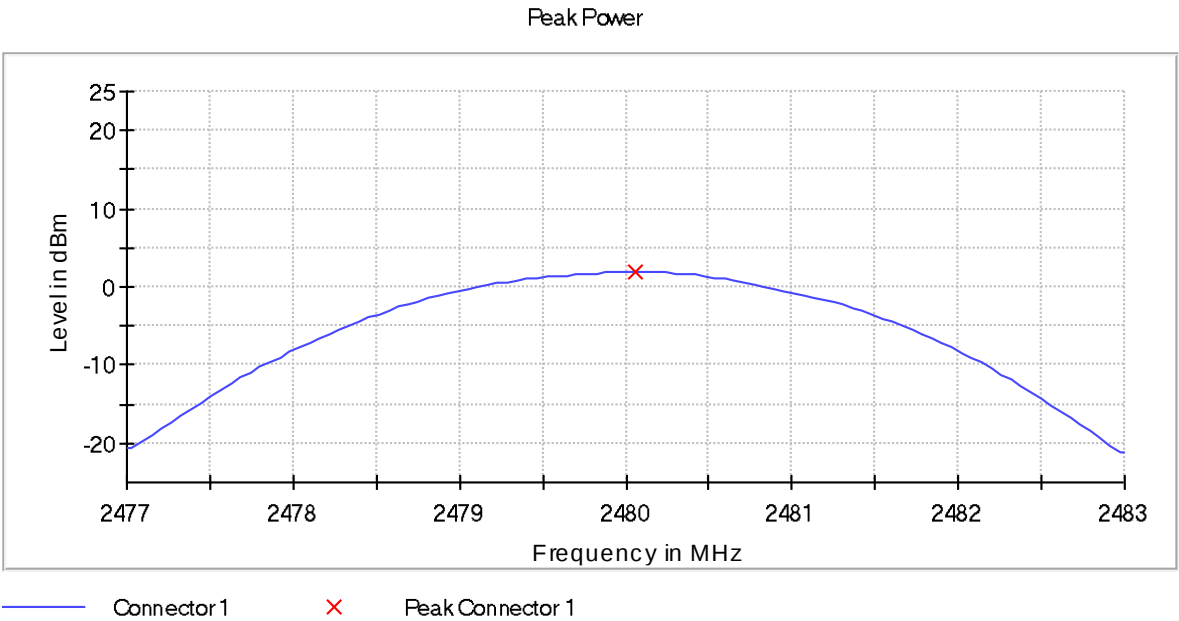
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2441.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



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

Limits

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

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Results

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

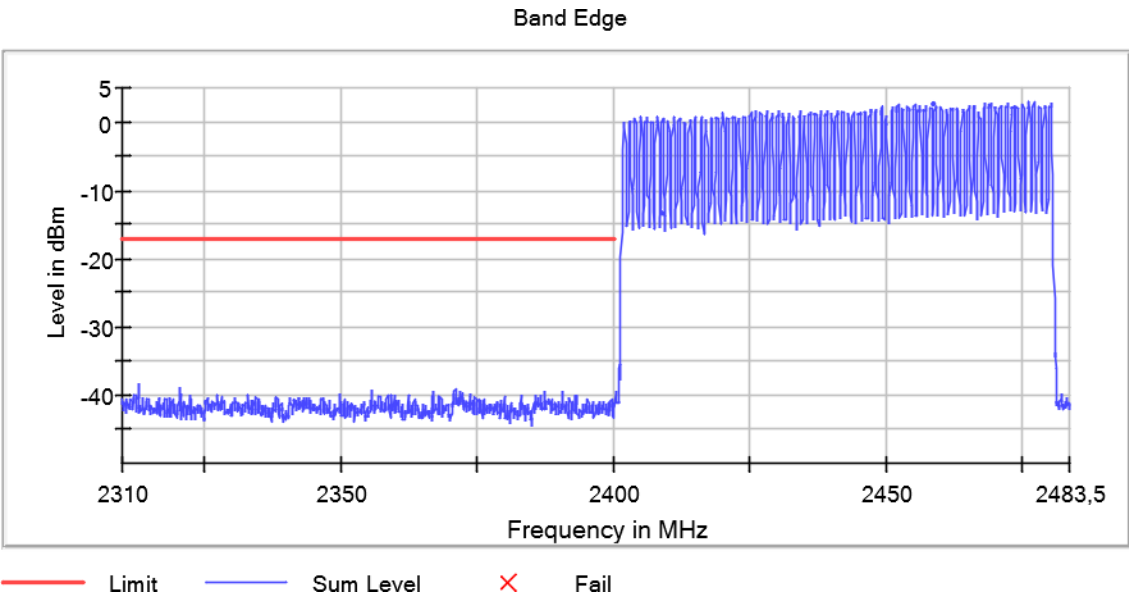
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 0.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	108 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.30 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (GFSK 1-DH5)

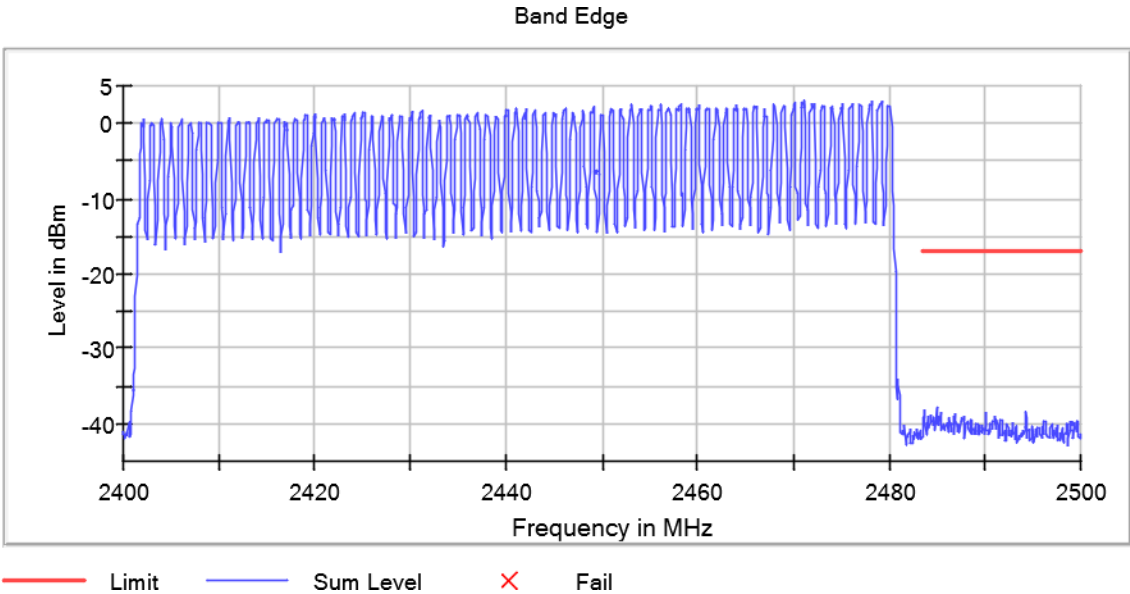
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 0.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	108 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.30 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (GFSK 1-DH5)

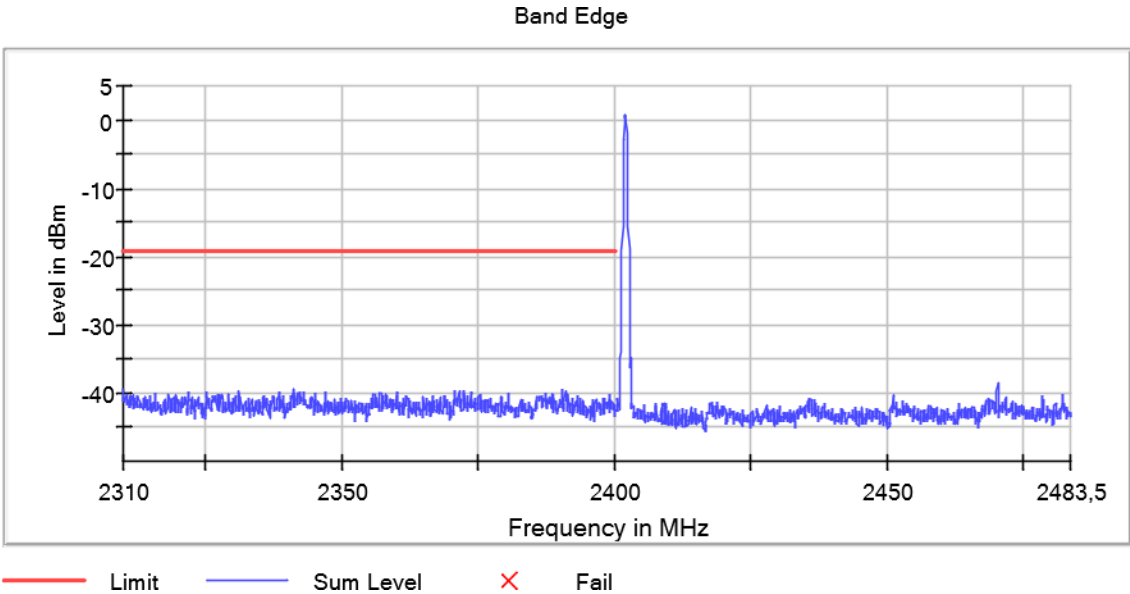
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 2402.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

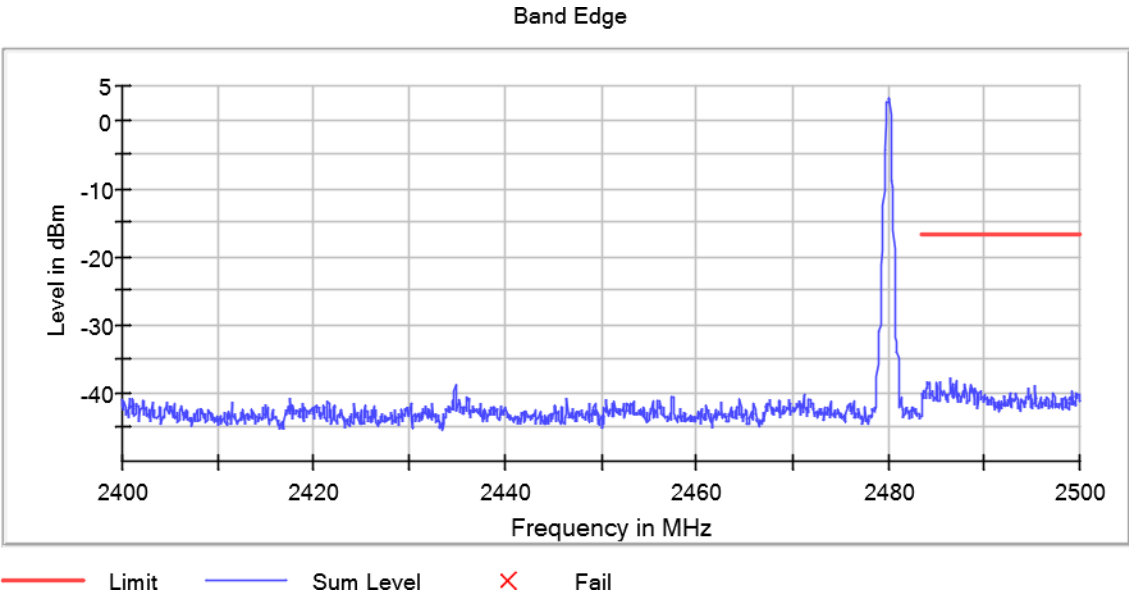
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	108 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.30 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	108 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.30 dB	0.50 dB

Modulation: BT (Pi/4 DQPSK)

MIMO Mode: SISO

Results

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

Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (Pi/4 DQPSK)

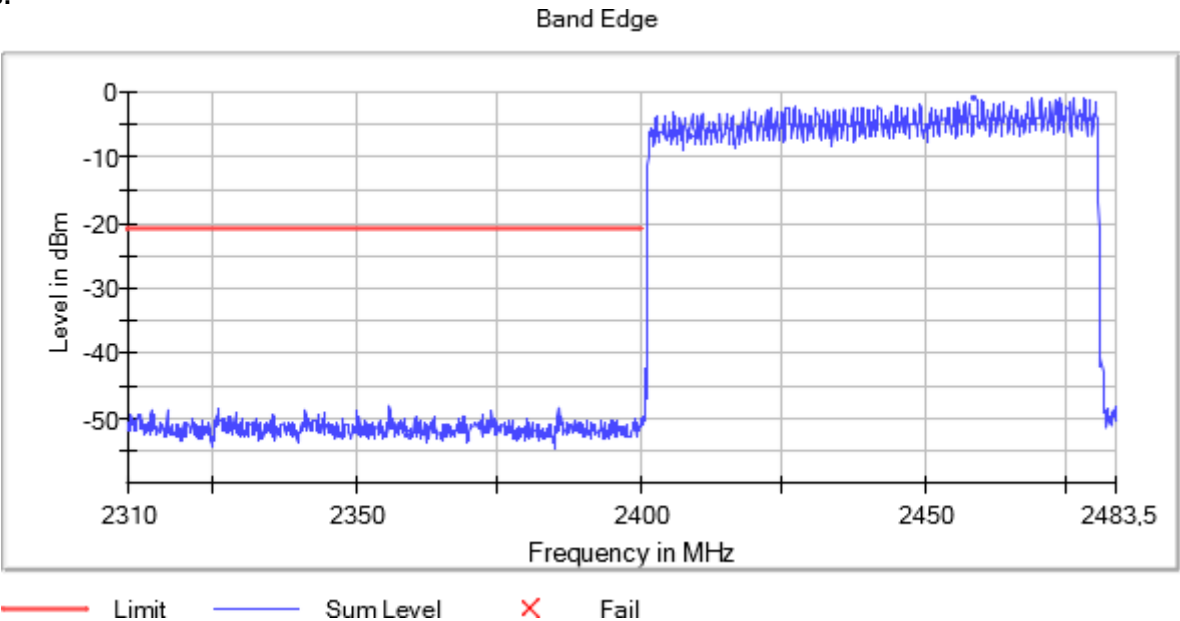
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 0.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	126 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (Pi/4 DQPSK)

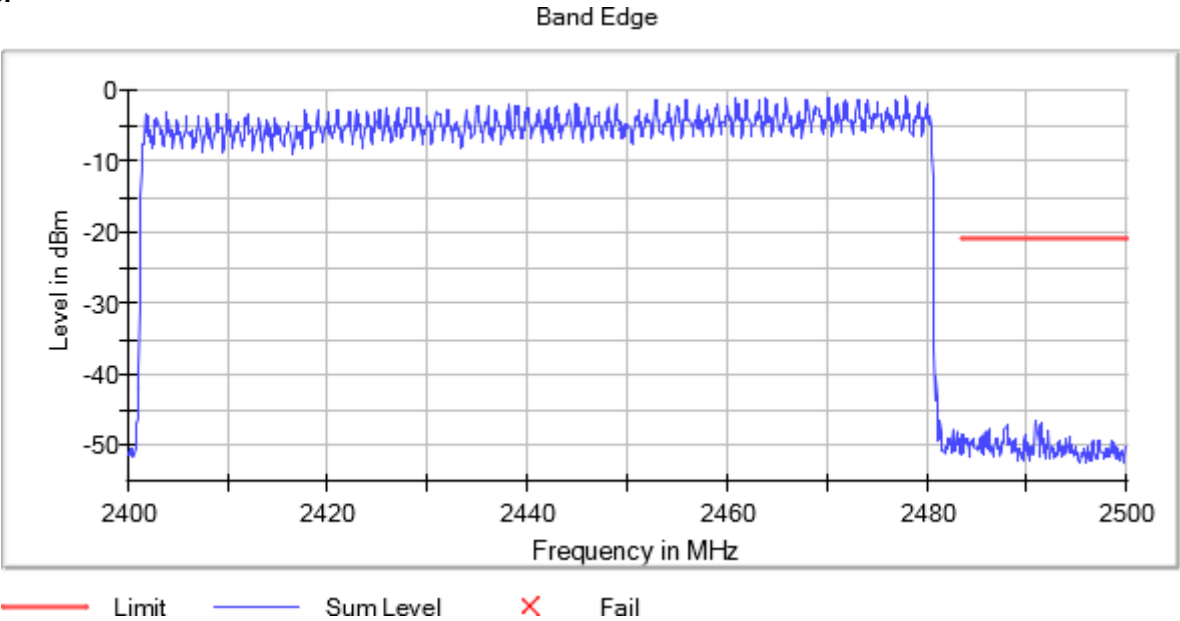
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 0.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	126 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (Pi/4 DQPSK)

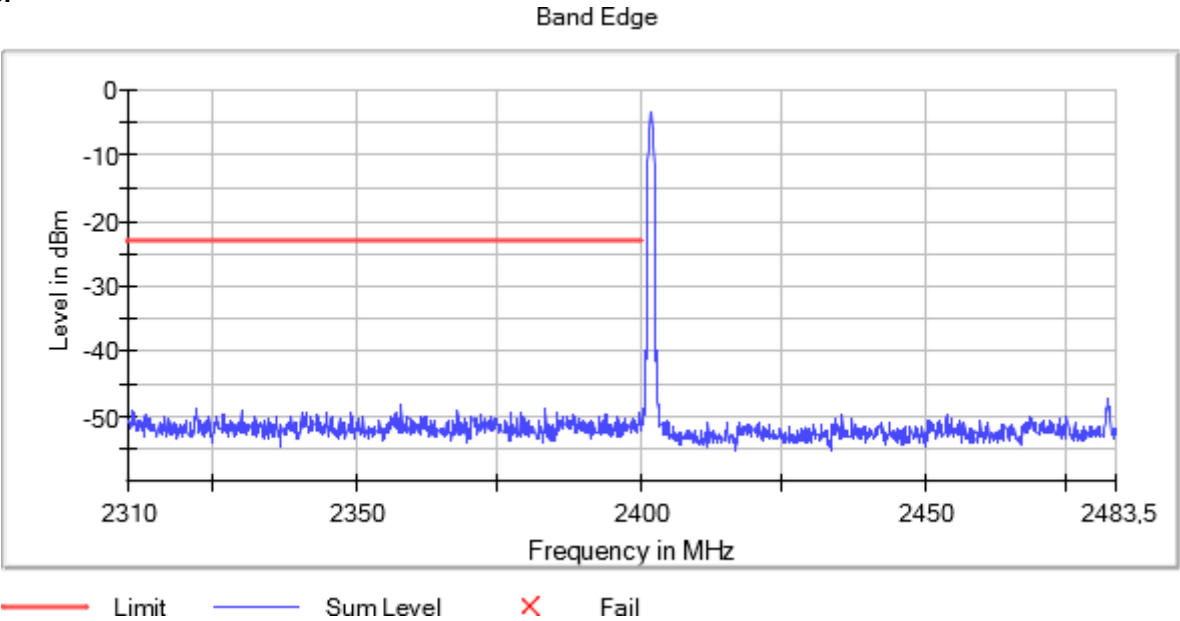
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 2402.00000

Active Port = 1

Images:



Tables:
Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	126 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (Pi/4 DQPSK)

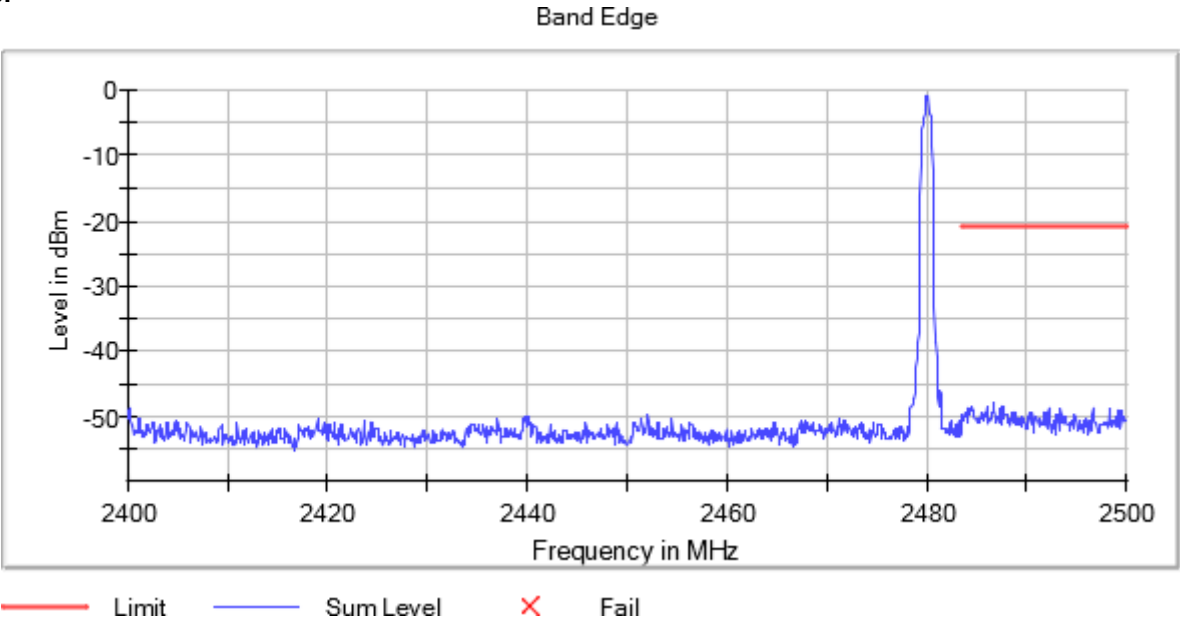
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 2480.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	126 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

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

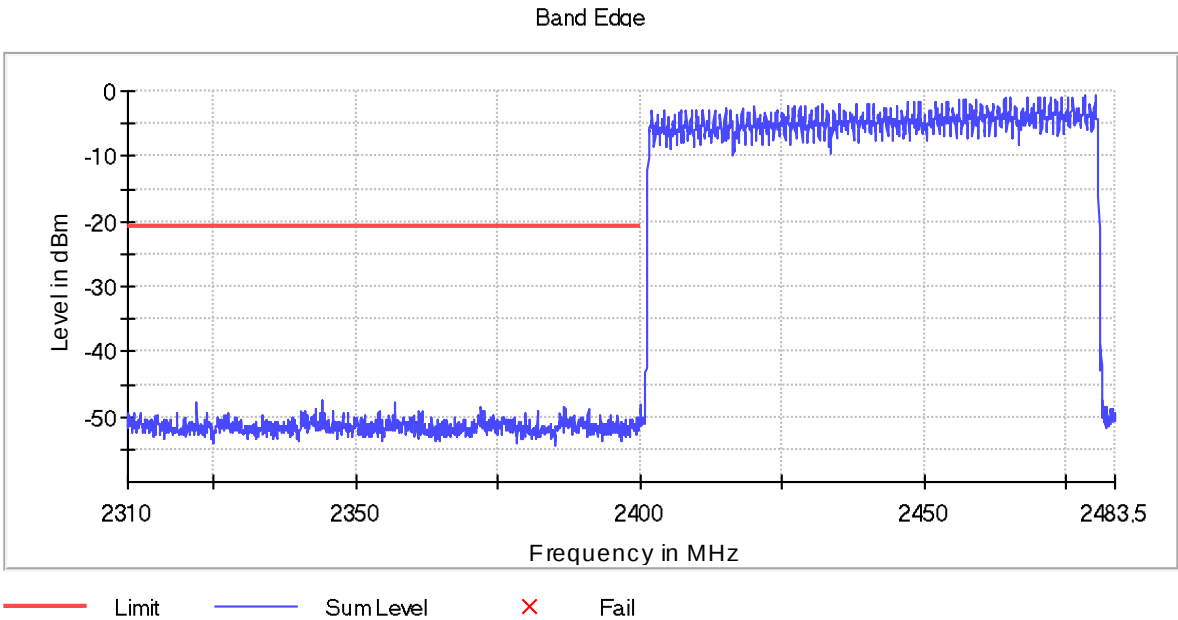
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 0.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	127 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (8DPSK 3-DH5)

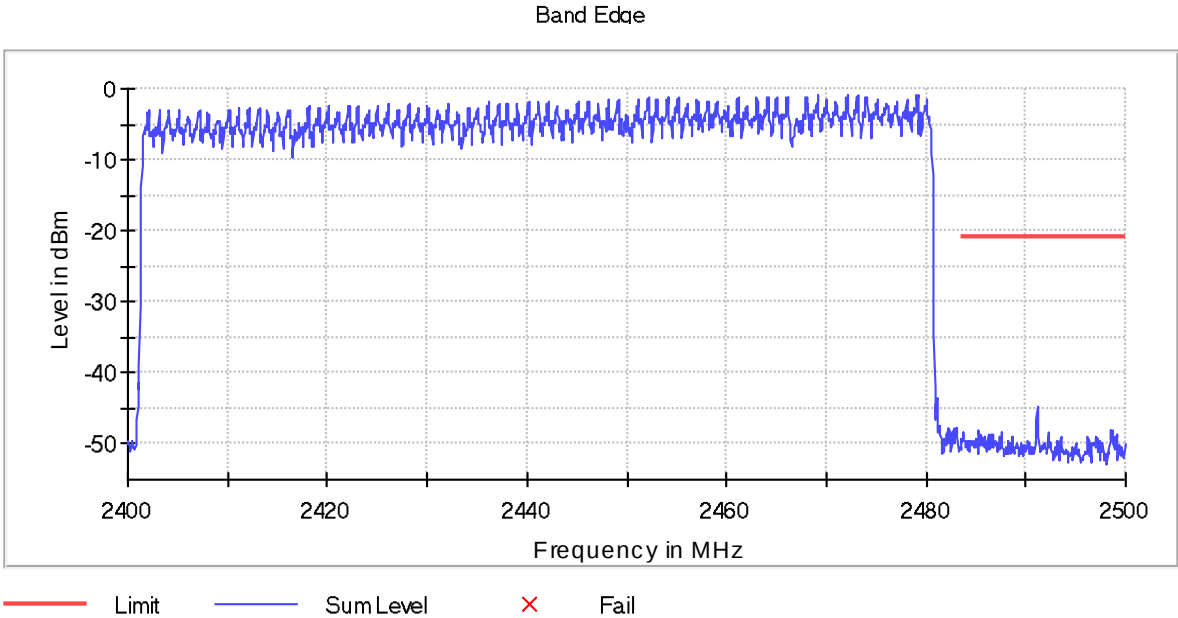
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 0.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	139 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.01 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.48350 GHz	2.48350 GHz
Stop Frequency	2.50000 GHz	2.50000 GHz
Span	16.500 MHz	16.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	330	~ 330
SweepTime	18.945 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (8DPSK 3-DH5)

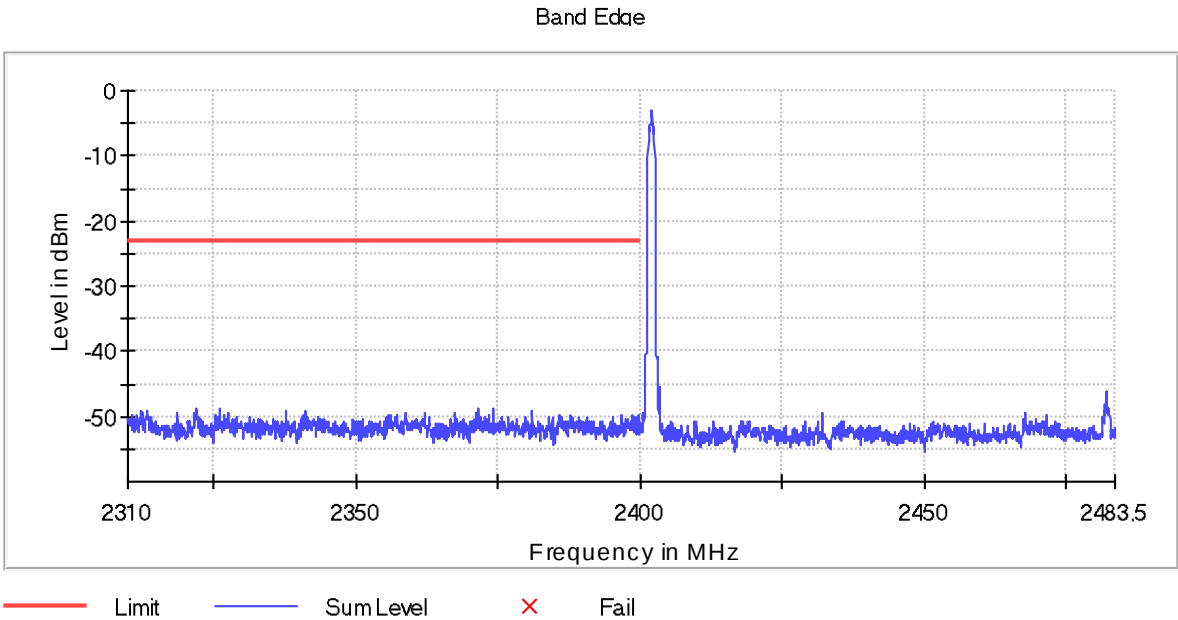
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 2402.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.46 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = BT (8DPSK 3-DH5)

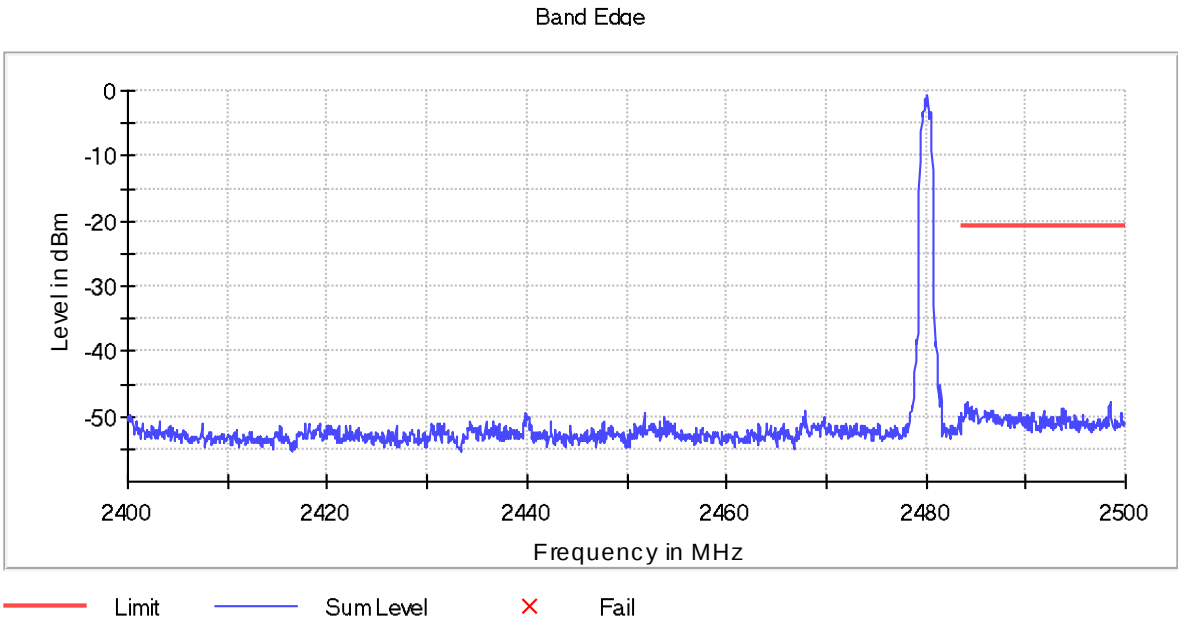
MIMO Mode = SISO

Bandwidth MHz = 1

Frequency MHz = 2480.00000

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	7 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Spectrum Analyzer Parameters 2

Setting	Instrument Value	Target Value
Start Frequency	2.48350 GHz	2.48350 GHz
Stop Frequency	2.50000 GHz	2.50000 GHz
Span	16.500 MHz	16.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	330	~ 330
SweepTime	18.945 µs	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)

Limits

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

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

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

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

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

Frequency range tested for Radiated emissions:

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

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

The setting for each range of frequency is indicated in the following tables:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44] 30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44] 1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44] 3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44] 17 GHz - 26 GHz	300 kHz	PK+ ; AVG	1 MHz	0,3 s	0 dB

Frequency Range GHz = [0.03, 1]

Modulation: The spurious frequencies detected do not depend on either the modulation or the operating channel.

MIMO Mode: SISO

Freq Rng (GHz)	Equipment	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	44.598	11.48	--	V	PK
				--	4.28	V	QP
			57.063	14.04	--	V	PK
				--	8.54	V	QP
			85.678	9.81	--	V	PK
				--	4.49	V	QP
			172.735	16.99	--	H	PK
				--	5.46	H	QP
			327.353	14.39	--	V	PK
				--	8.62	V	QP
			710.746	23.98	--	H	PK
				--	18.06	H	QP

Verdict

Pass