Attachments

Frequency Range GHz = [0.03, 1]

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

Modulation = The spurious frequencies detected do not depend on the modulation.

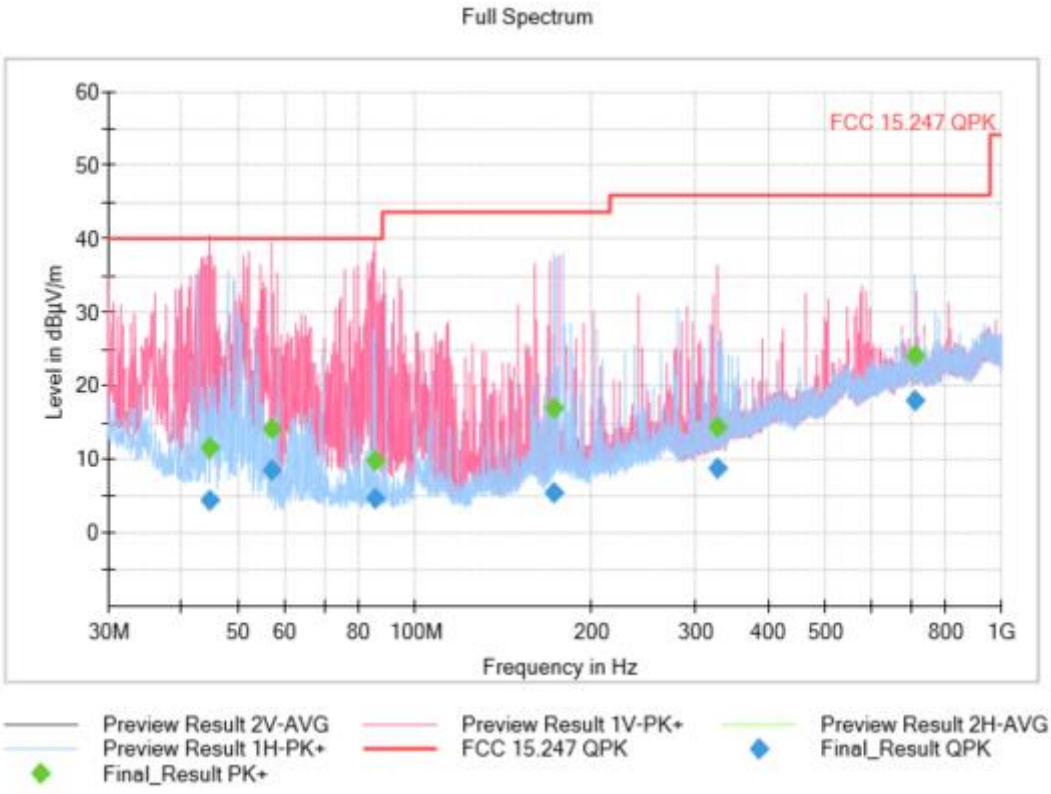
Frequency MHz = The spurious frequencies detected do not depend on the operating channel.

MIMO Mode = SISO

Active Port = 1

Images:

Test range performed in worst-case.



Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Results

** Duty Cycle correction factor: 1.14 dB*

Freq Rng (GHz)	Equipment	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
[1, 17]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	4979.600	56.26	--	V	PK
				35.43	36.57	V	AVG

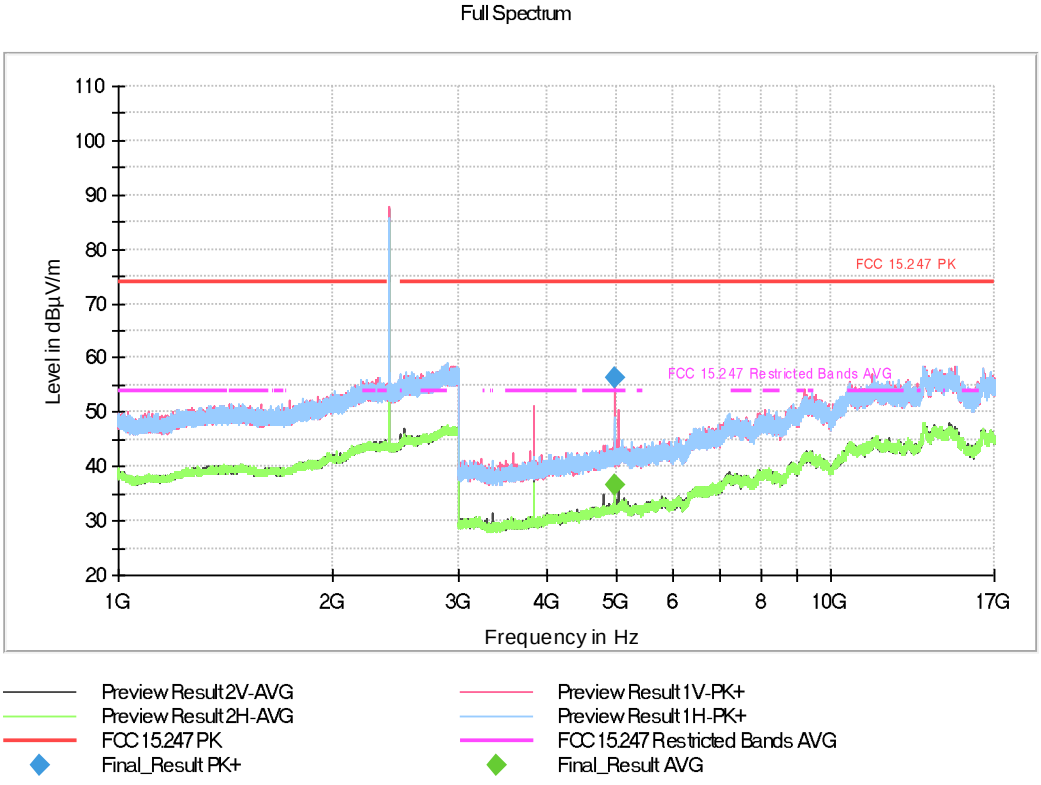
Verdict

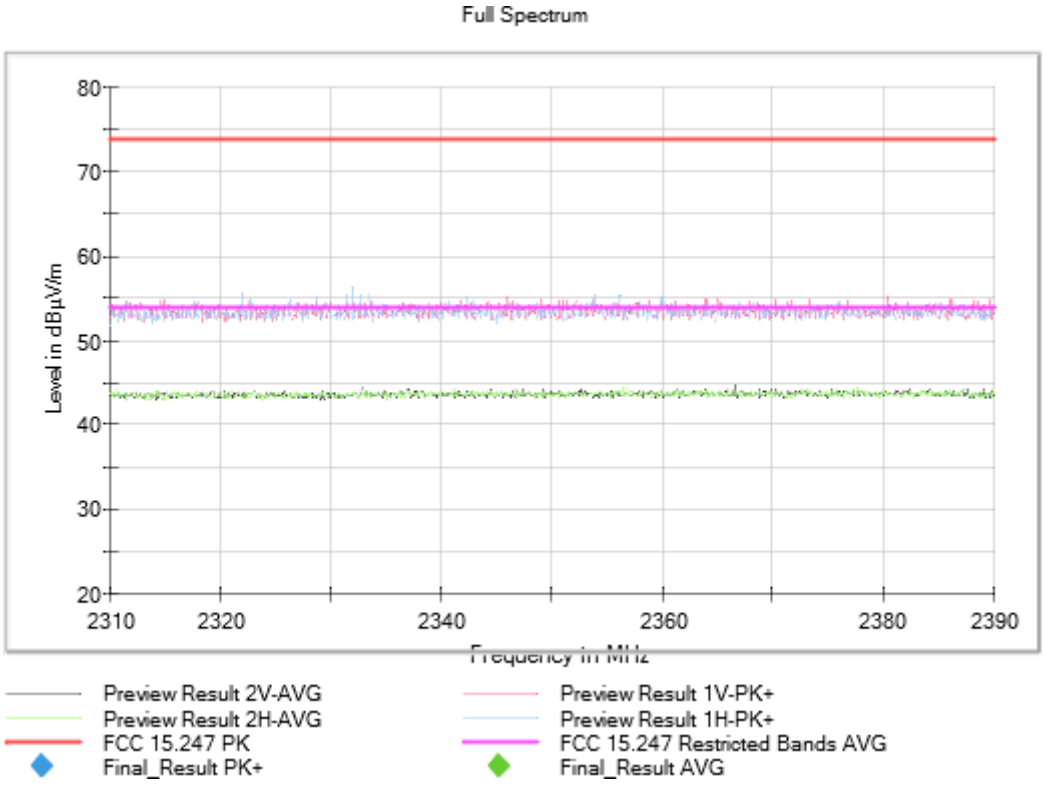
Pass

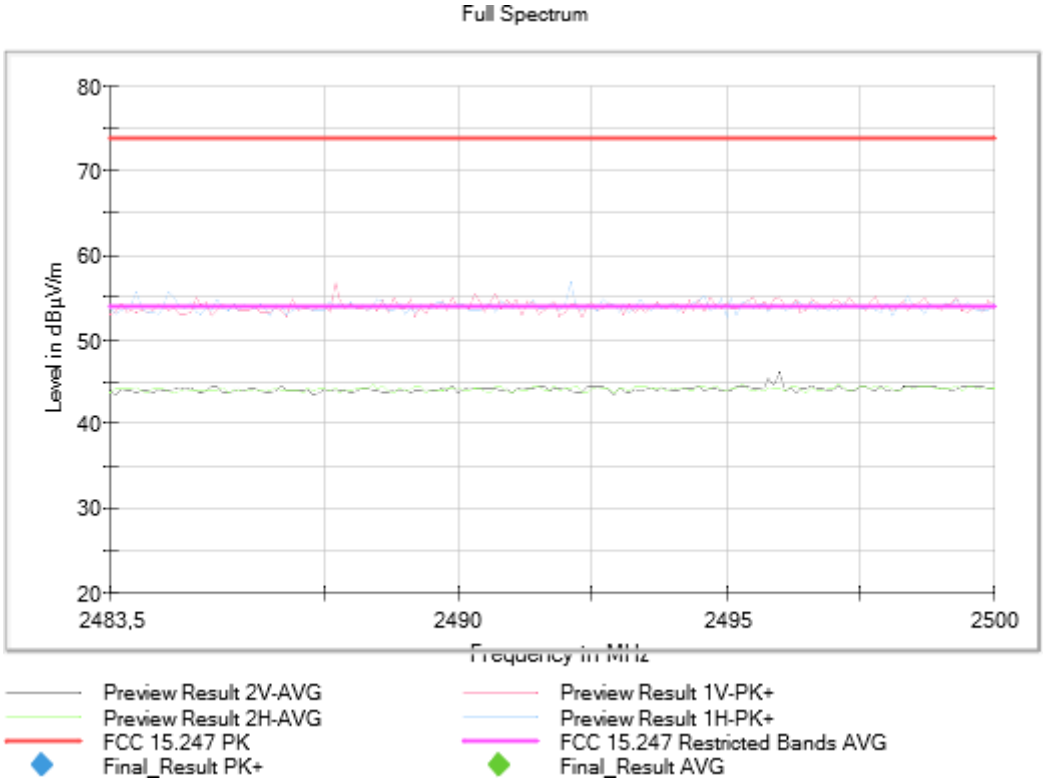
Attachments

Frequency Range GHz = [1, 17]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:





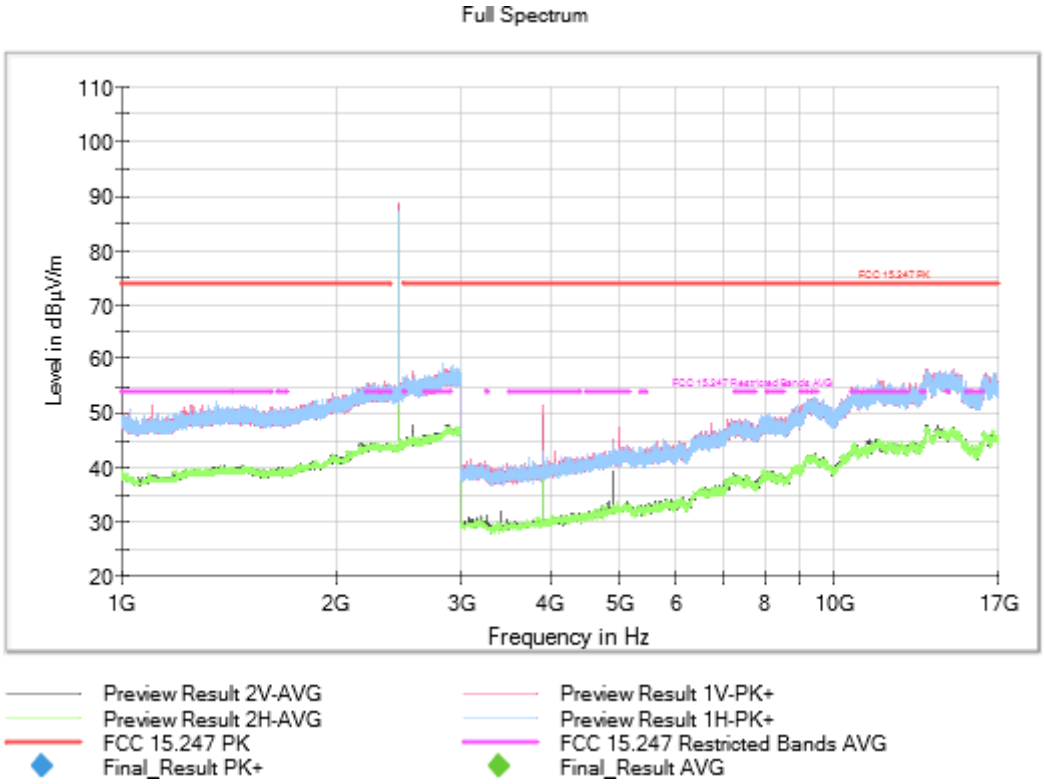

Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

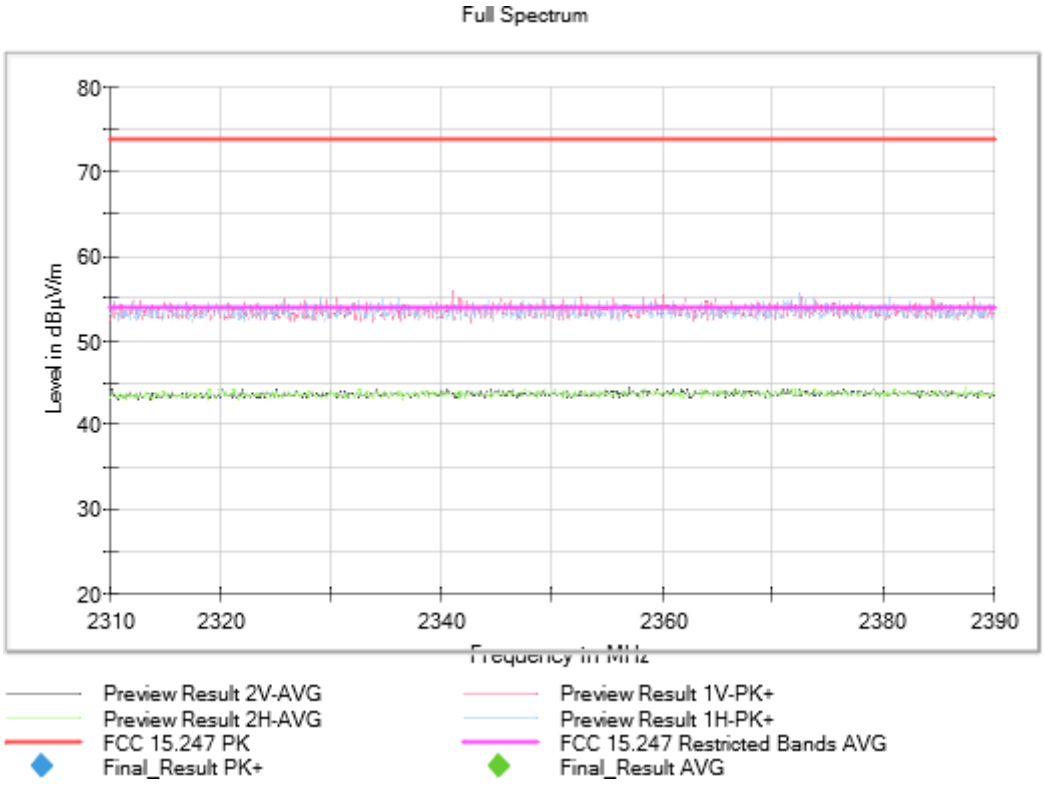
Frequency Range GHz = [1, 17] Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

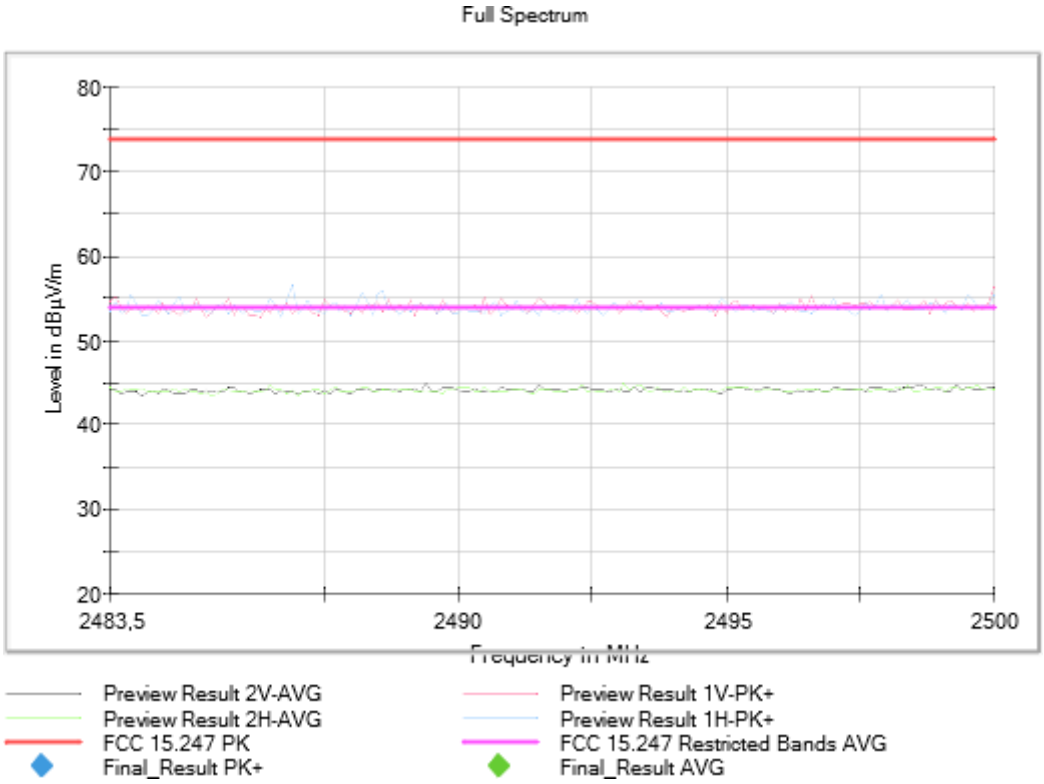
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2441.00000

MIMO Mode = SISO Active Port = 1

Images:






Full Spectrum
80
70
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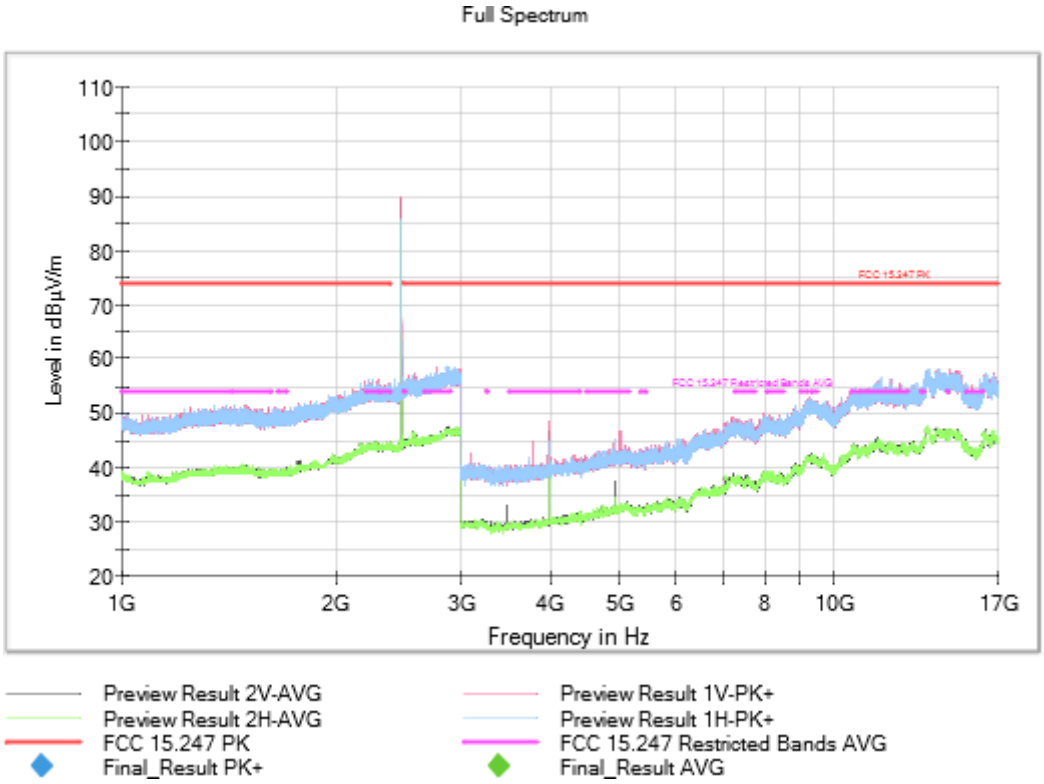
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

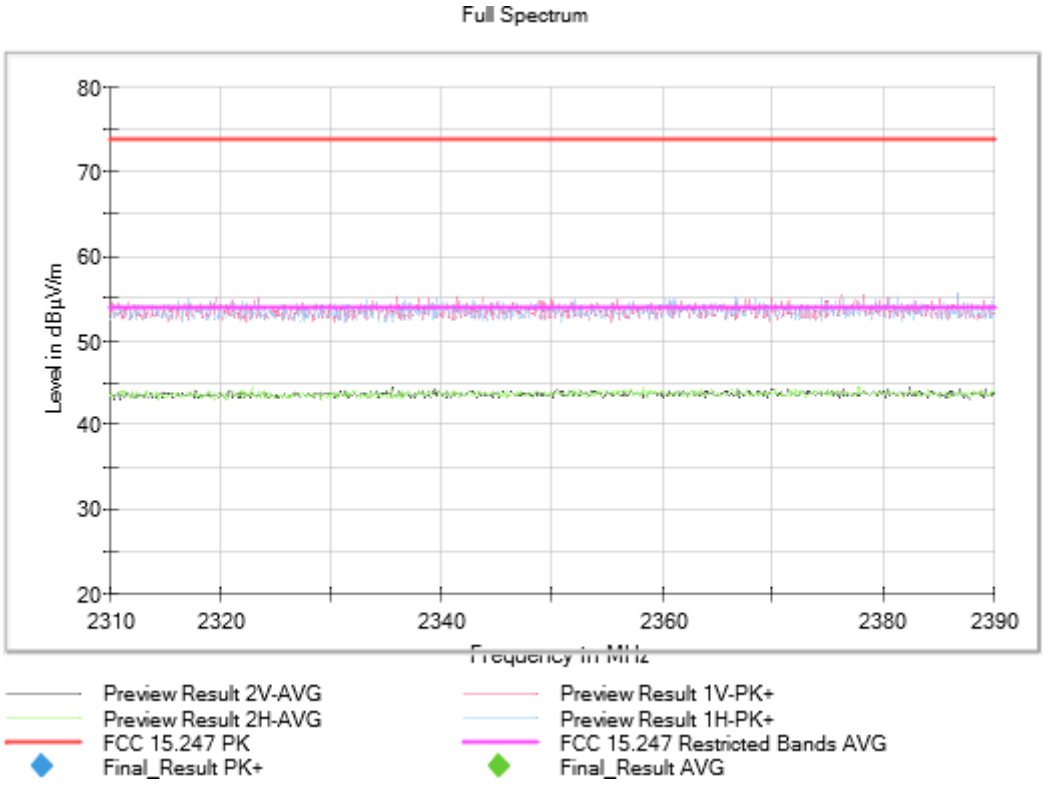
Frequency Range GHz = [1, 17] Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

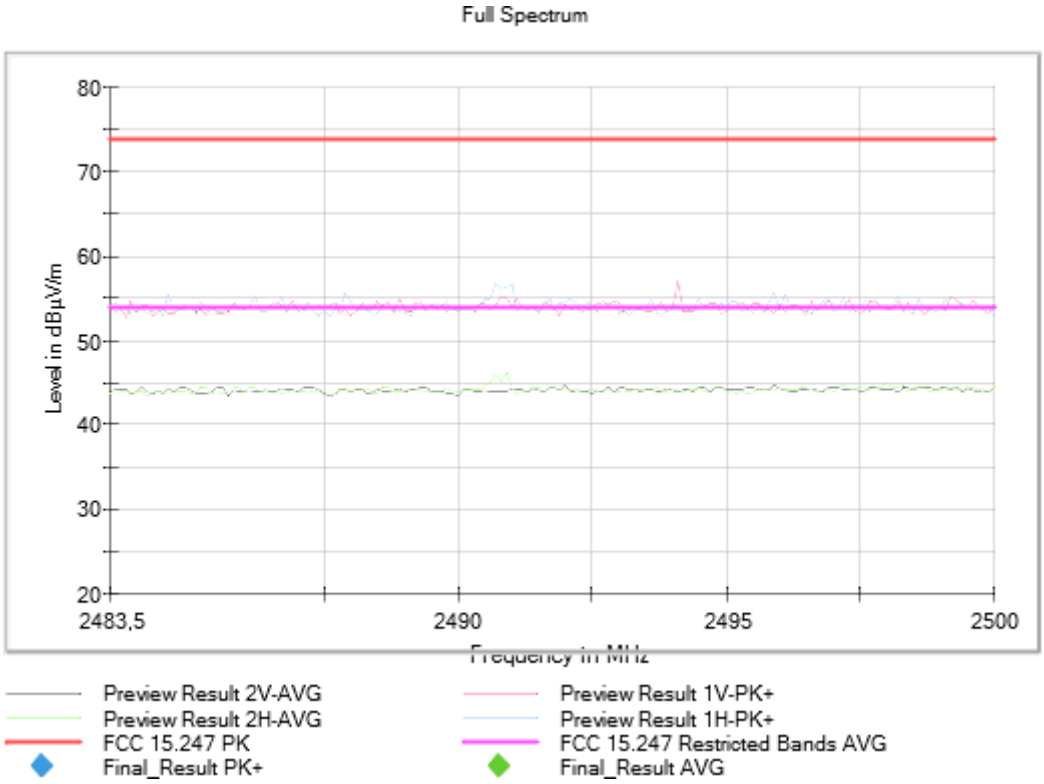
Modulation = BT (GFSK 1-DH5) Frequency MHz = 2480.00000

MIMO Mode = SISO Active Port = 1

Images:






Full Spectrum
80
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30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

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

MIMO Mode: SISO

Results

** Duty Cycle correction factor: 1.14 dB*

Freq Rng (GHz)	Equipment	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
[1, 17]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	4980.067	59.66	--	H	PK
				37.27	38.41	H	AVG
		2441.00000	2492.600	58.85	--	H	PK
				44.83	45.97	H	AVG

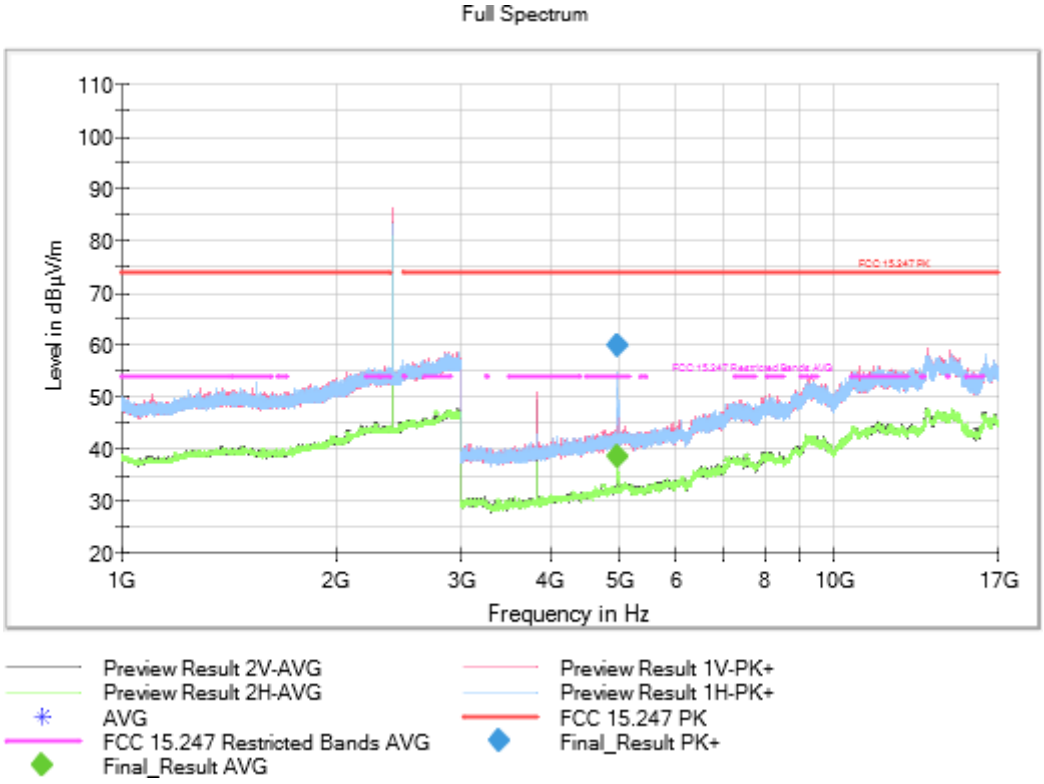
Verdict

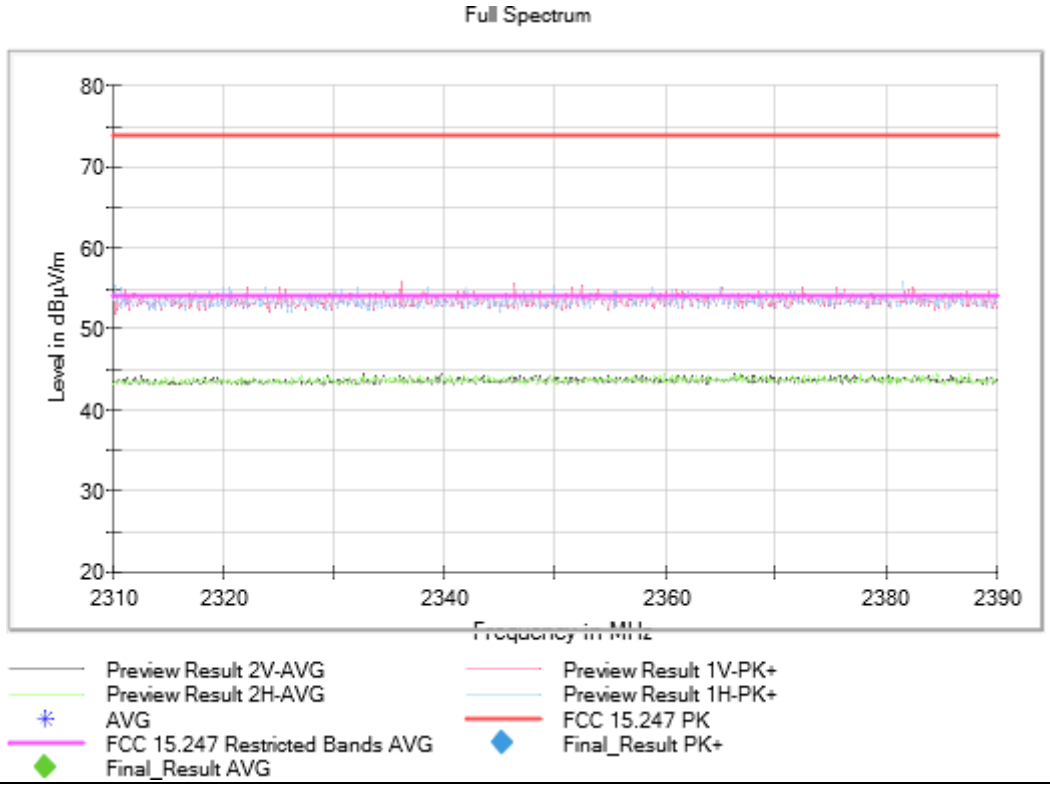
Pass

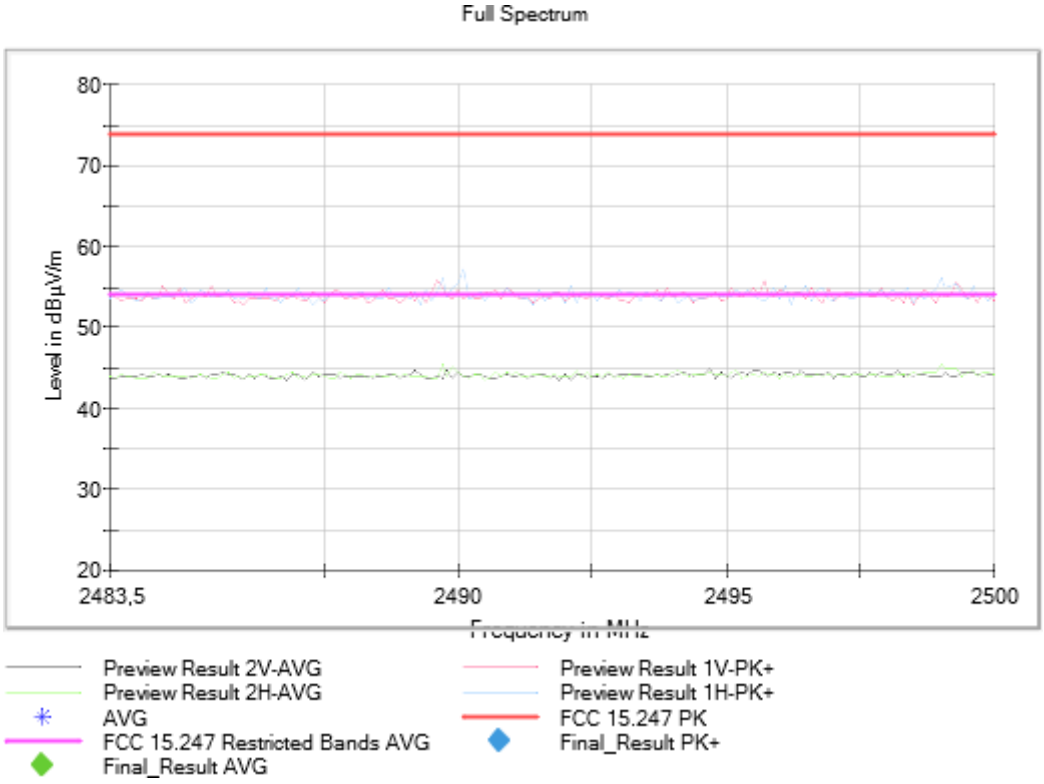
Attachments

Frequency Range GHz = [1, 17]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:

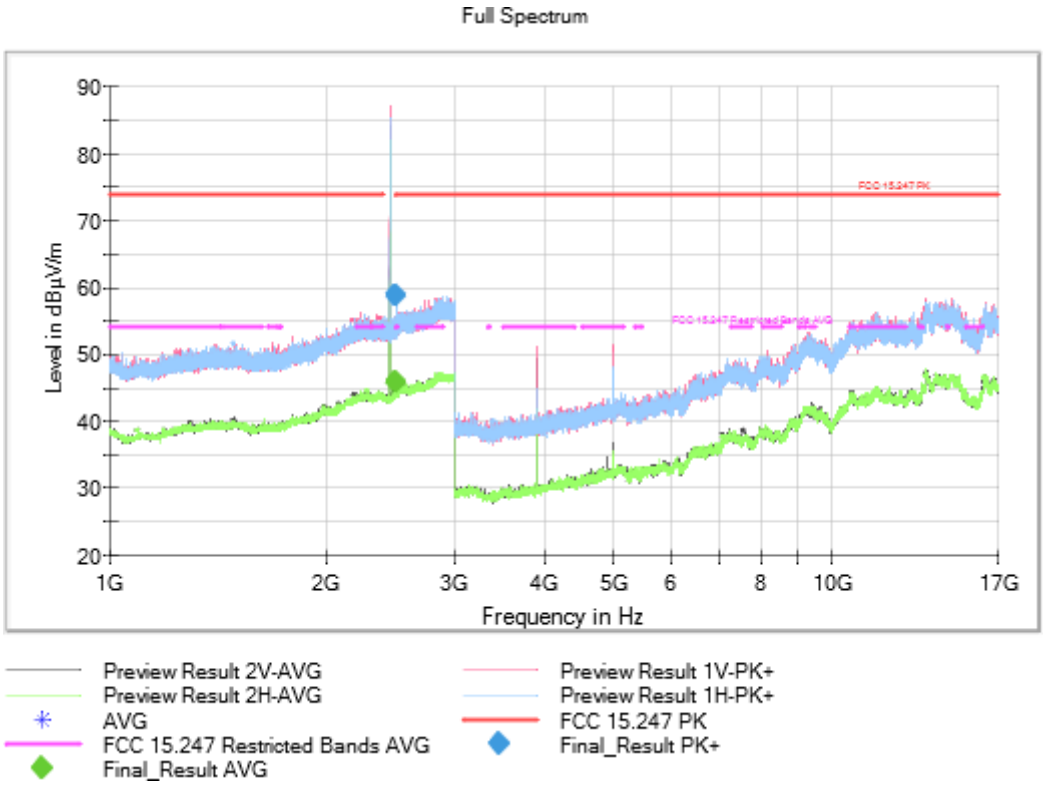


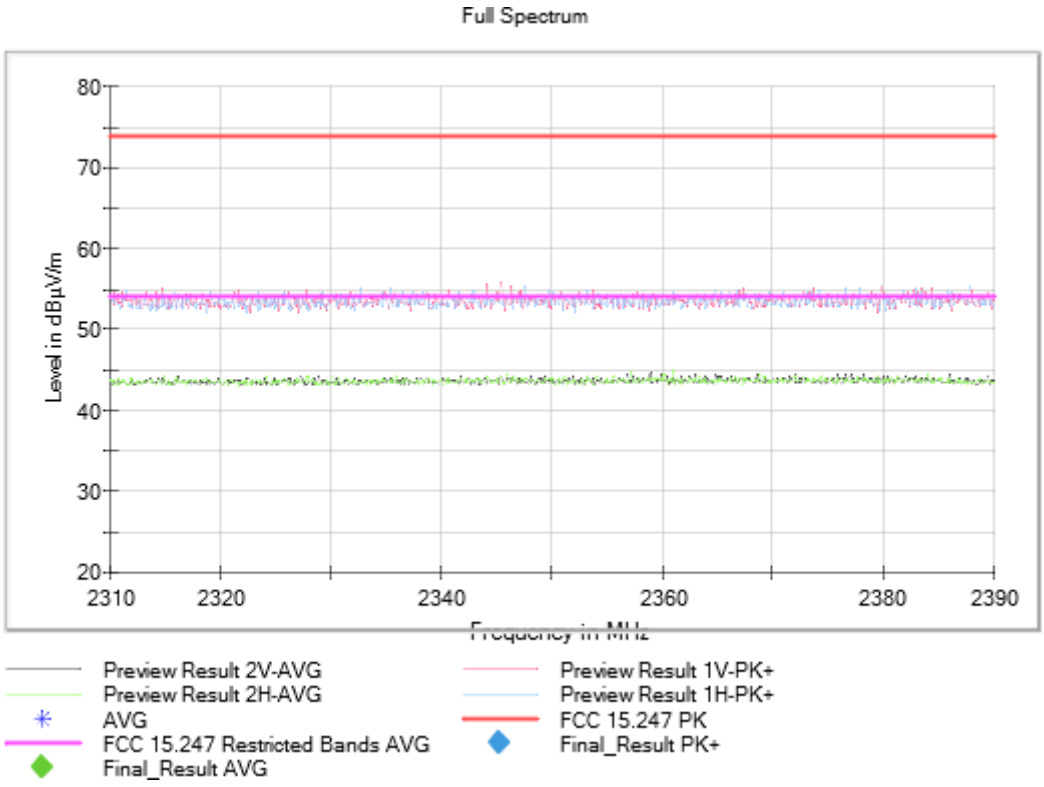


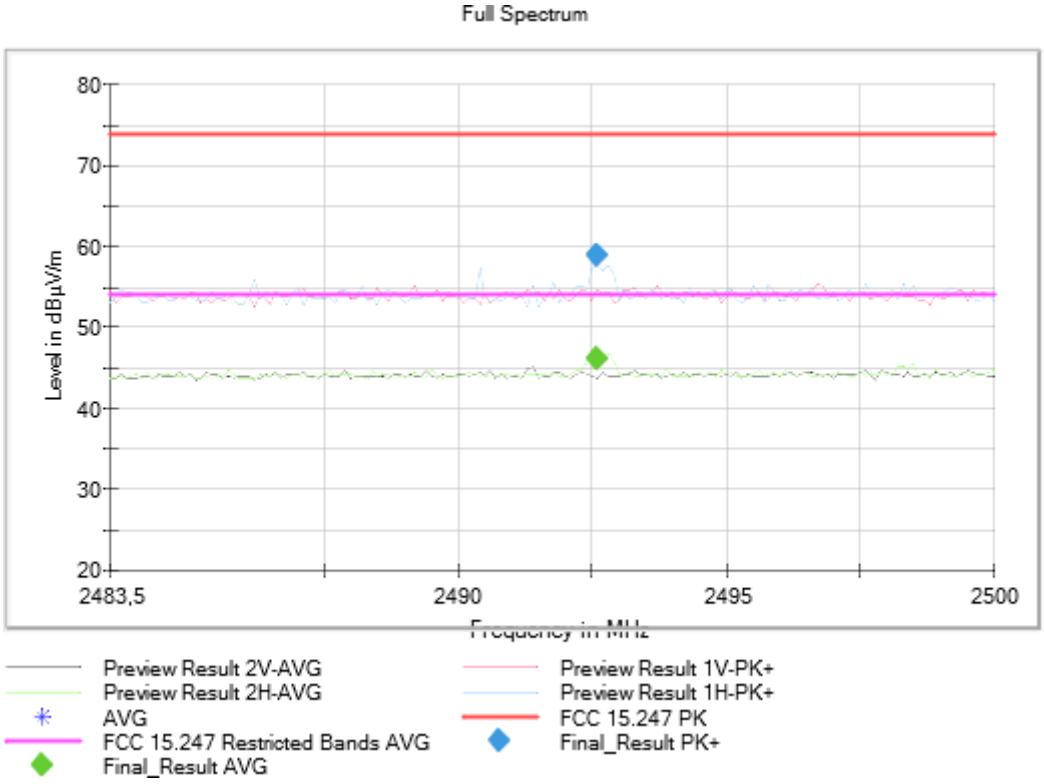

Full Spectrum
Level in dBµV/m
80
70
60
50
40
30
20
2483,5
2490
2495
2500
Preview Result 2V-AVG
Preview Result 2H-AVG
AVG
FCC 15.247 Restricted Bands AVG
Final_Result AVG
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 PK
Final_Result PK+

Frequency Range GHz = [1, 17]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)	Frequency MHz = 2441.00000
MIMO Mode = SISO	Active Port = 1

Images:






Full Spectrum
80
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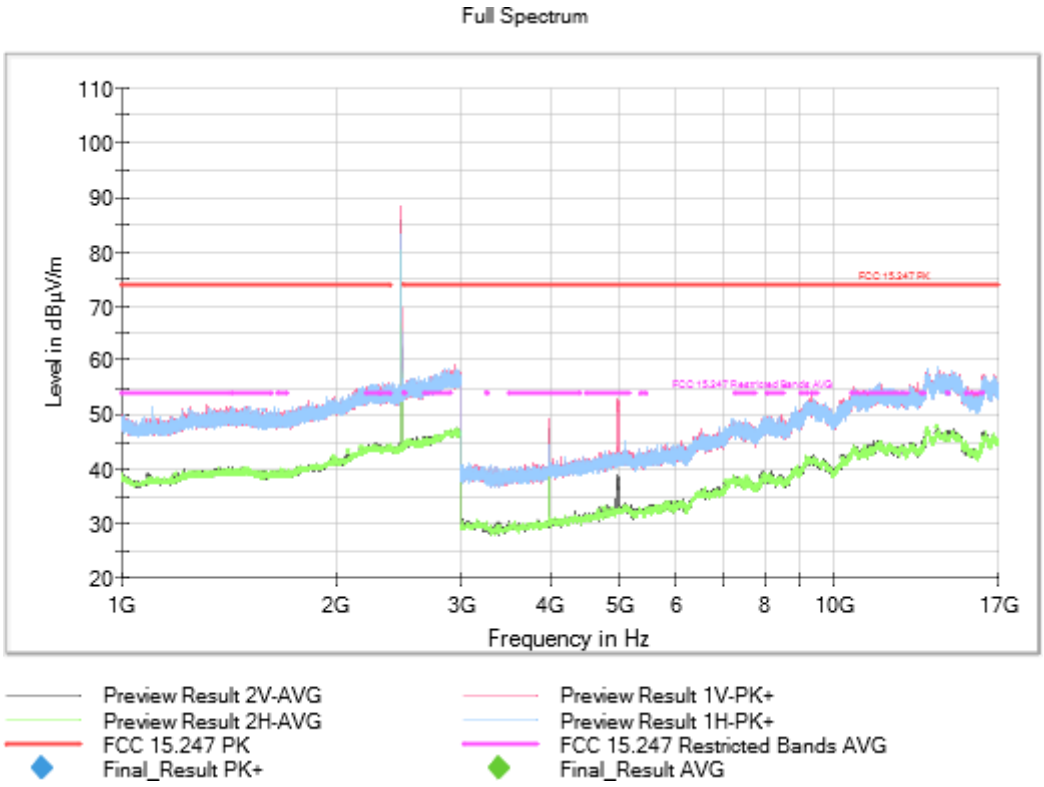
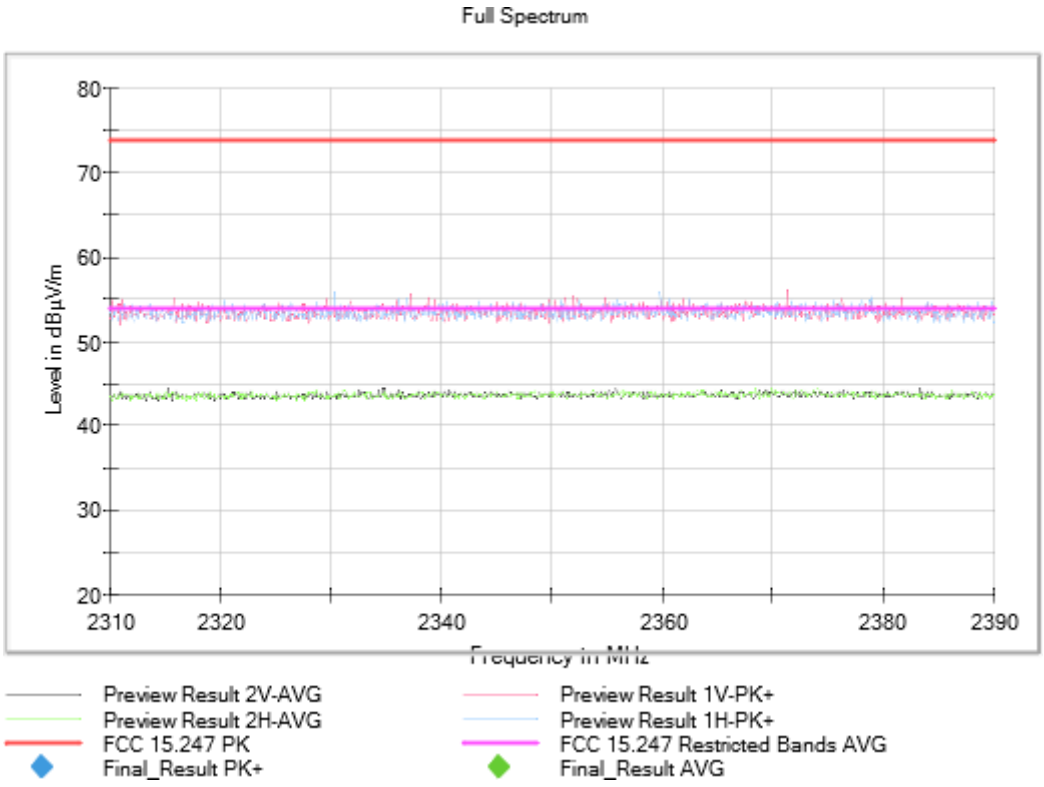
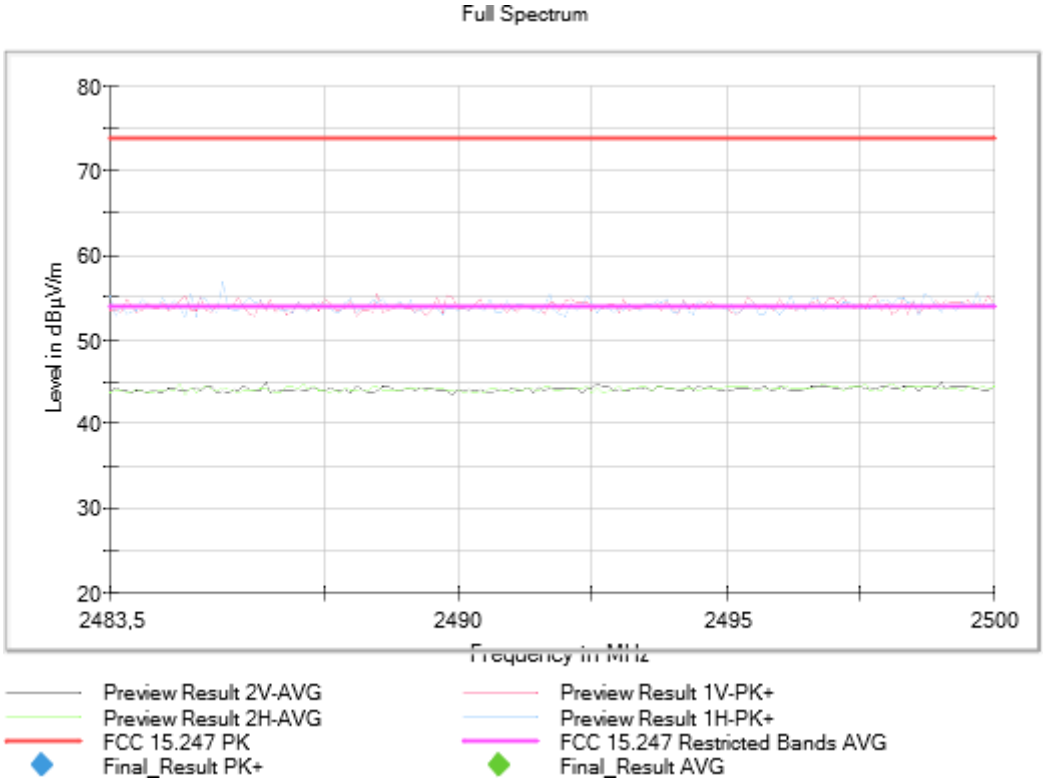
20
Level in dBµV/m
2483,5
2490
2495
2500
Preview Result 2V-AVG
Preview Result 2H-AVG
AVG
FCC 15.247 Restricted Bands AVG
Final_Result AVG
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 PK
Final_Result PK+

Frequency Range GHz = [1, 17]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)	Frequency MHz = 2480.00000
MIMO Mode = SISO	Active Port = 1

Images:






Full Spectrum
80
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Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

** Duty Cycle correction factor: 1.14 dB*

Freq Rng (GHz)	Equipment	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected RMS Unwanted Lvl (dBµV/m)	Pol	Detector
[1, 17]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	4985.200	57.56	--	V	PK
				36.26	37.40	V	AVG
		2441.00000	4991.267	46.89	--	V	PK
				33.17	34.31	V	AVG

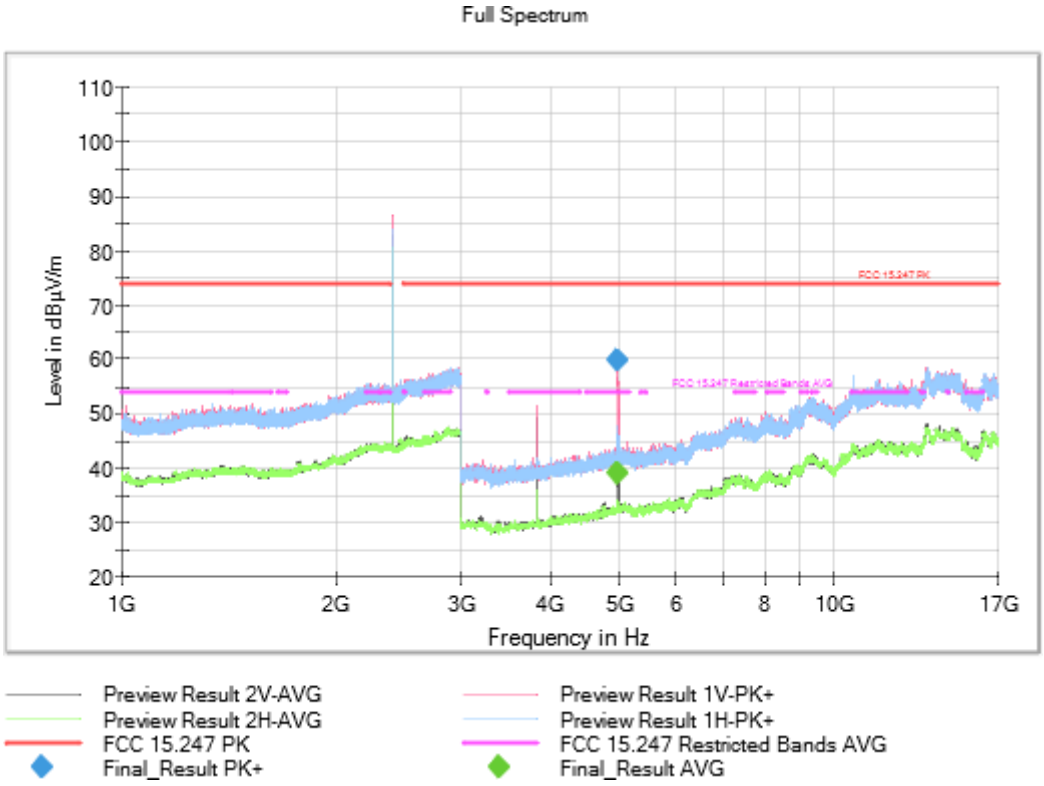
Verdict

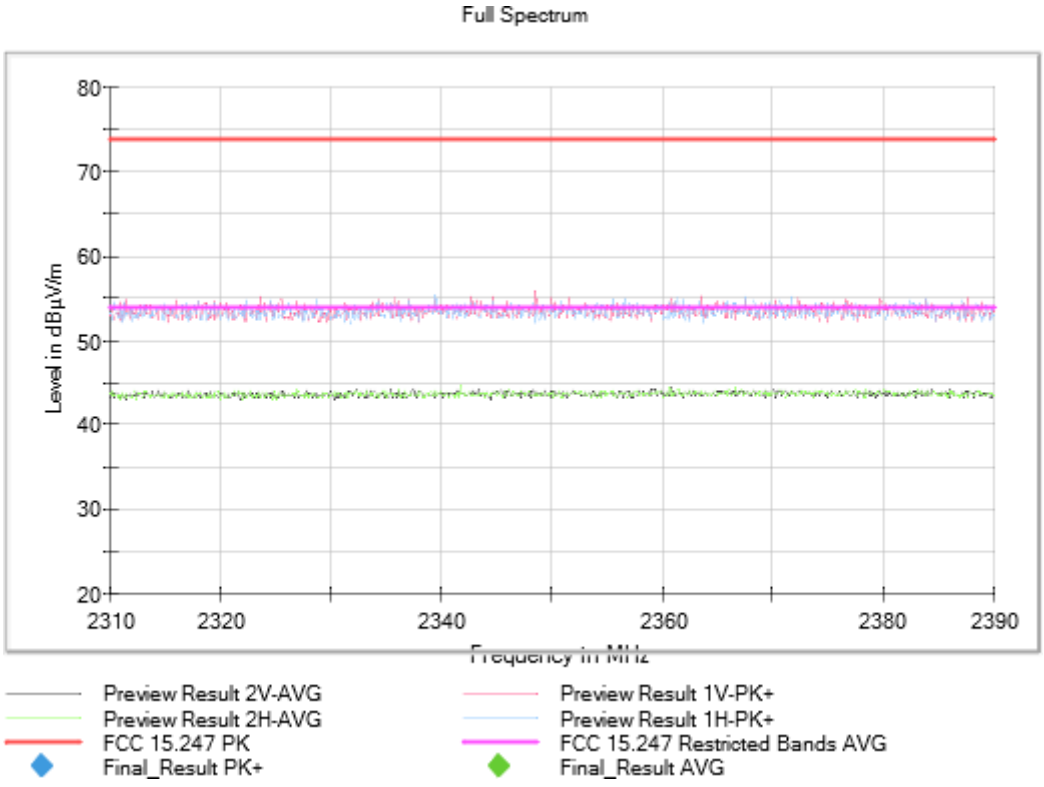
Pass

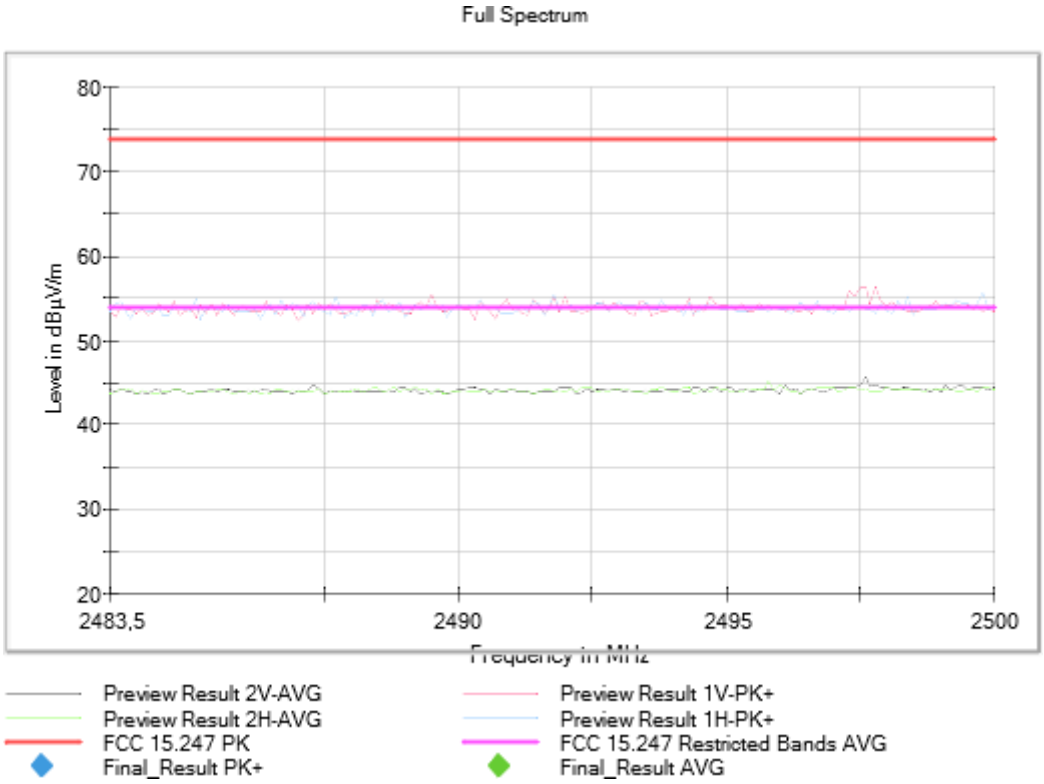
Attachments

Frequency Range GHz = [1, 17]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (8DPSK 3-DH5)	Frequency MHz = 2402.00000
MIMO Mode = SISO	Active Port = 1

Images:





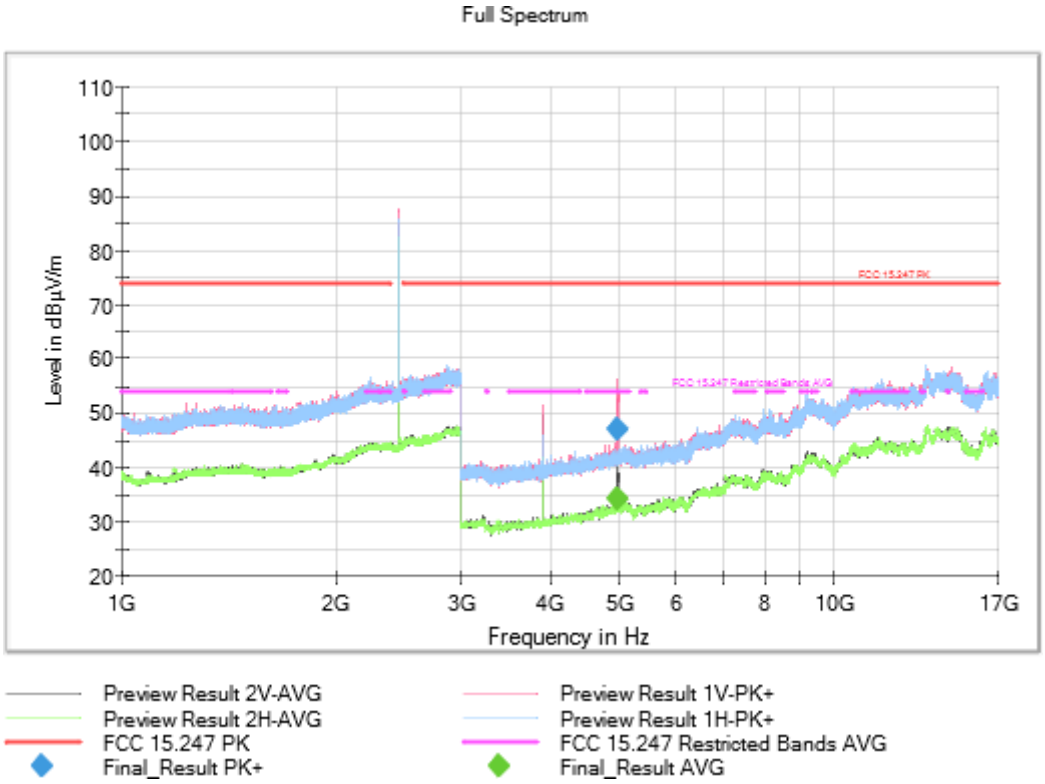

Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

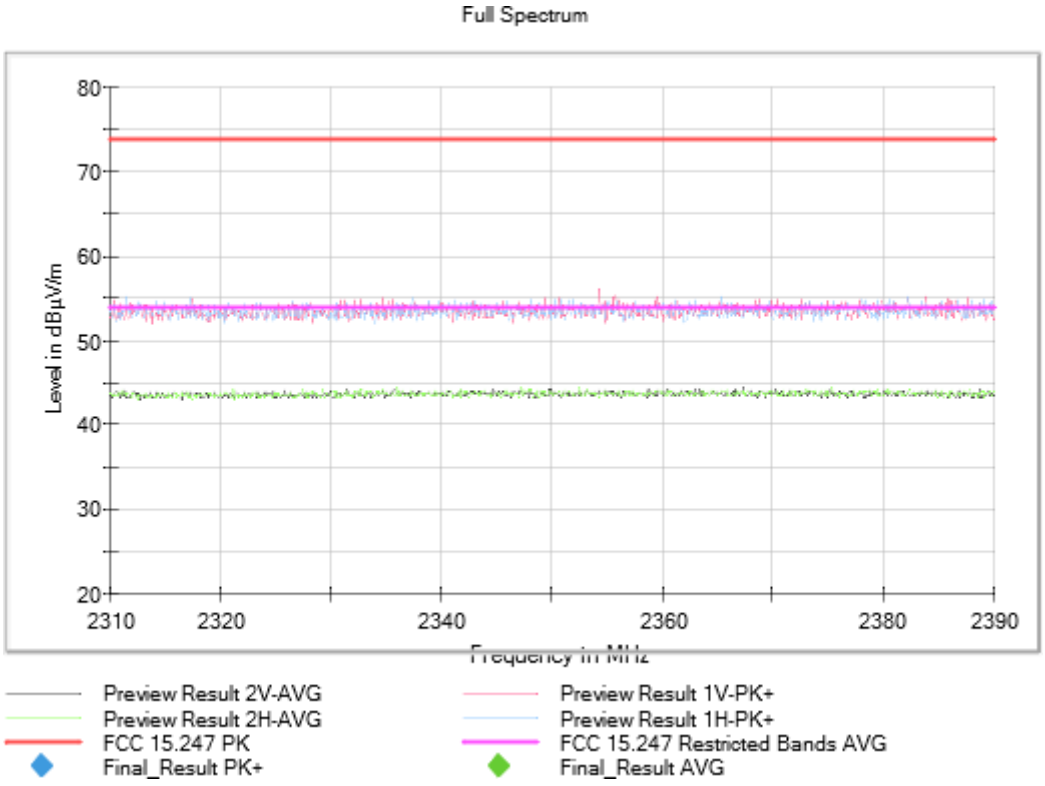
Frequency Range GHz = [1, 17] Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

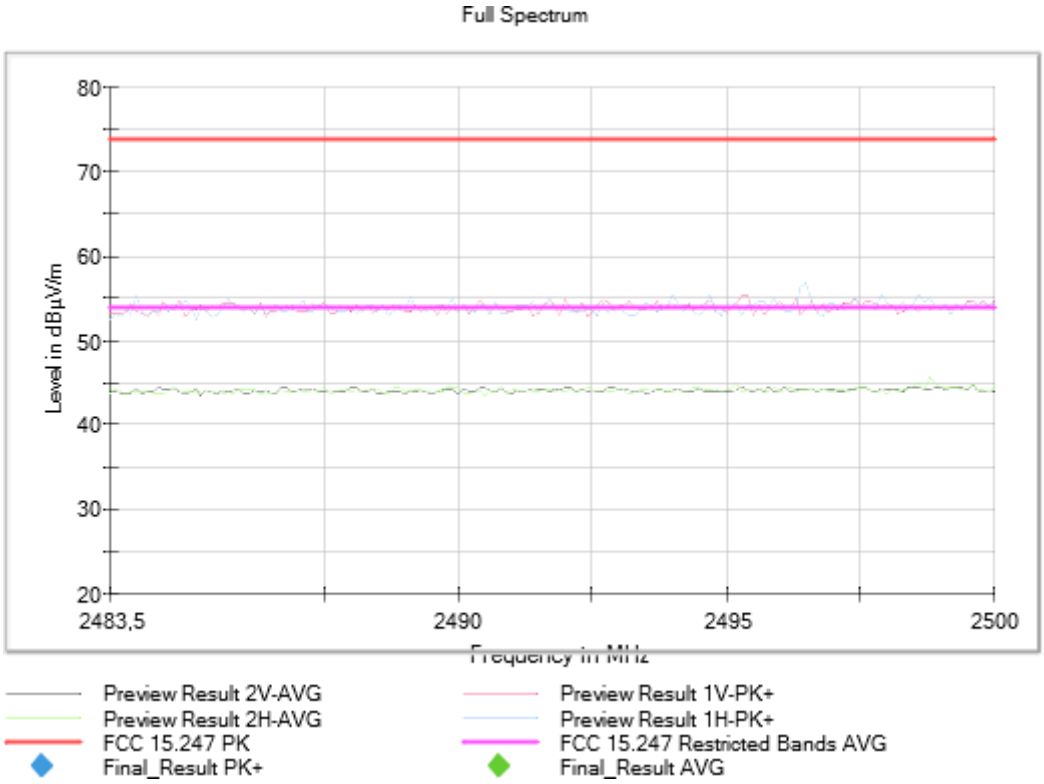
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2441.00000

MIMO Mode = SISO Active Port = 1

Images:






Full Spectrum
80
70
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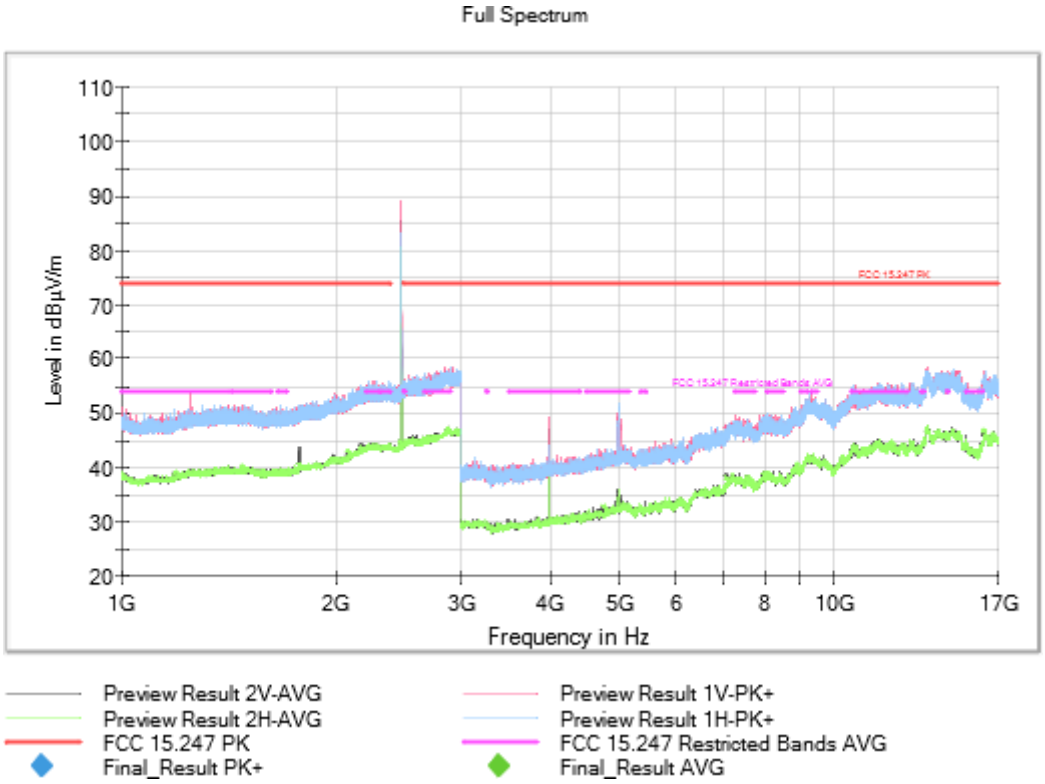
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

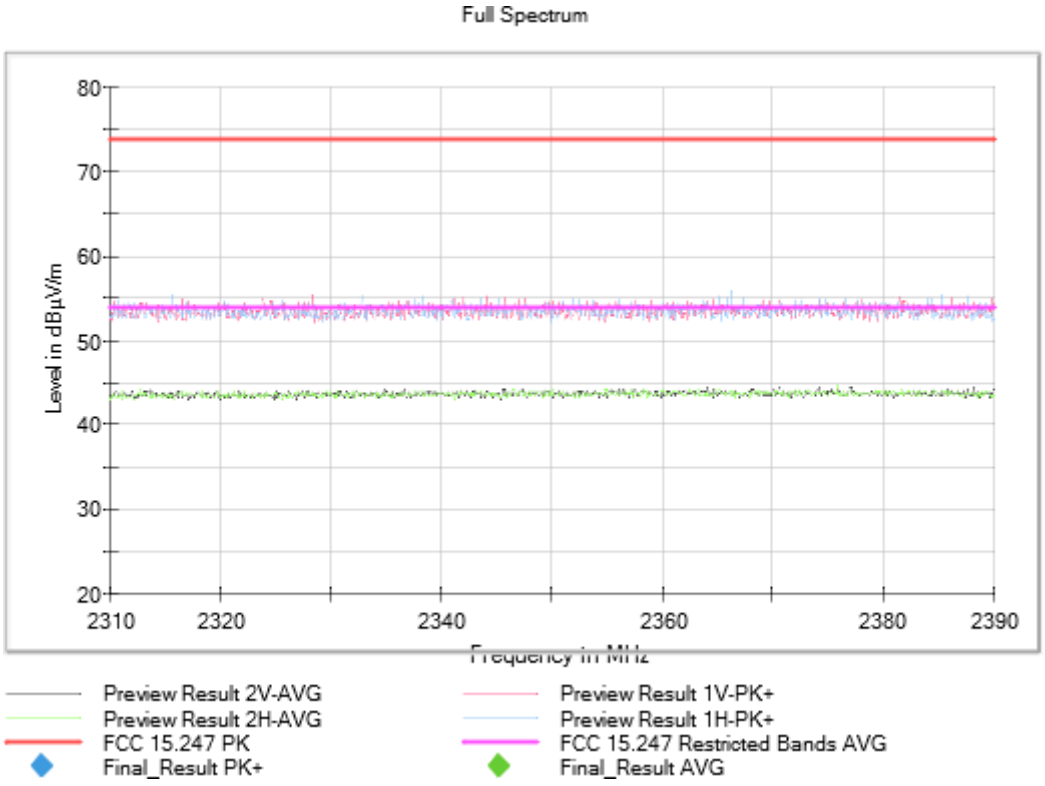
Frequency Range GHz = [1, 17] Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

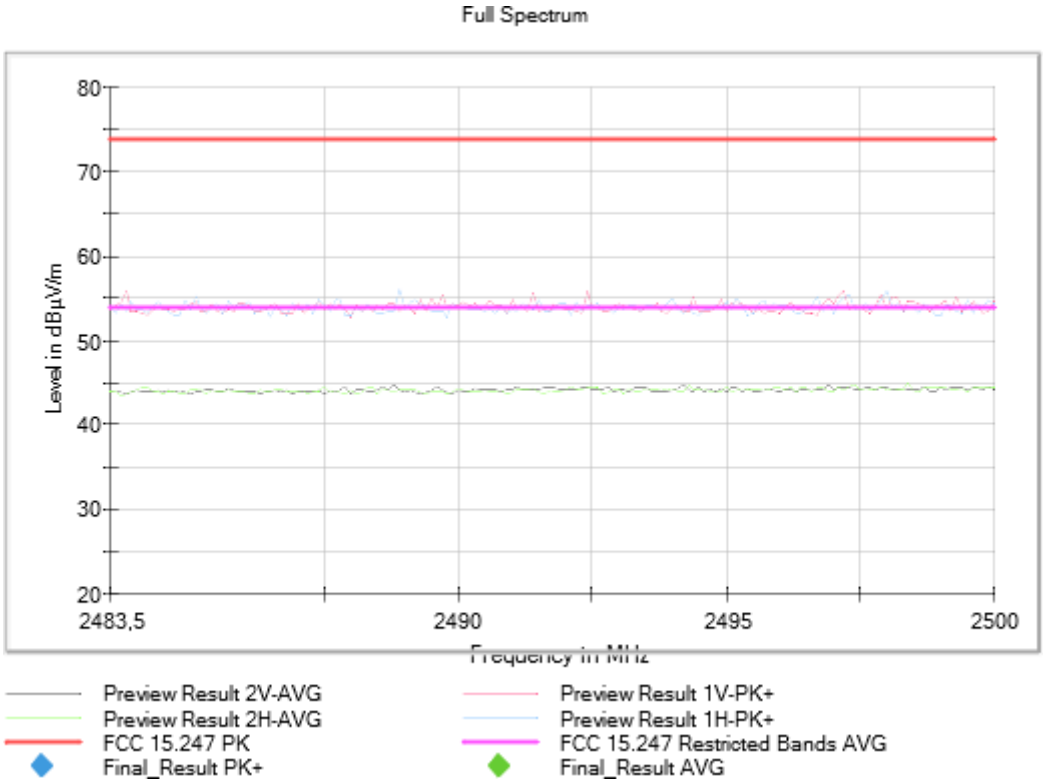
Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2480.00000

MIMO Mode = SISO Active Port = 1

Images:






Full Spectrum
80
70
60
50
40
30
20
Level in dBµV/m
2483,5
2490
2495
2500
Frequency in MHz
Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

Frequency Range GHz = [17, 26]

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

MIMO Mode: SISO

Results

No spurious frequencies detected at less than 20 dB below the limit.

Verdict

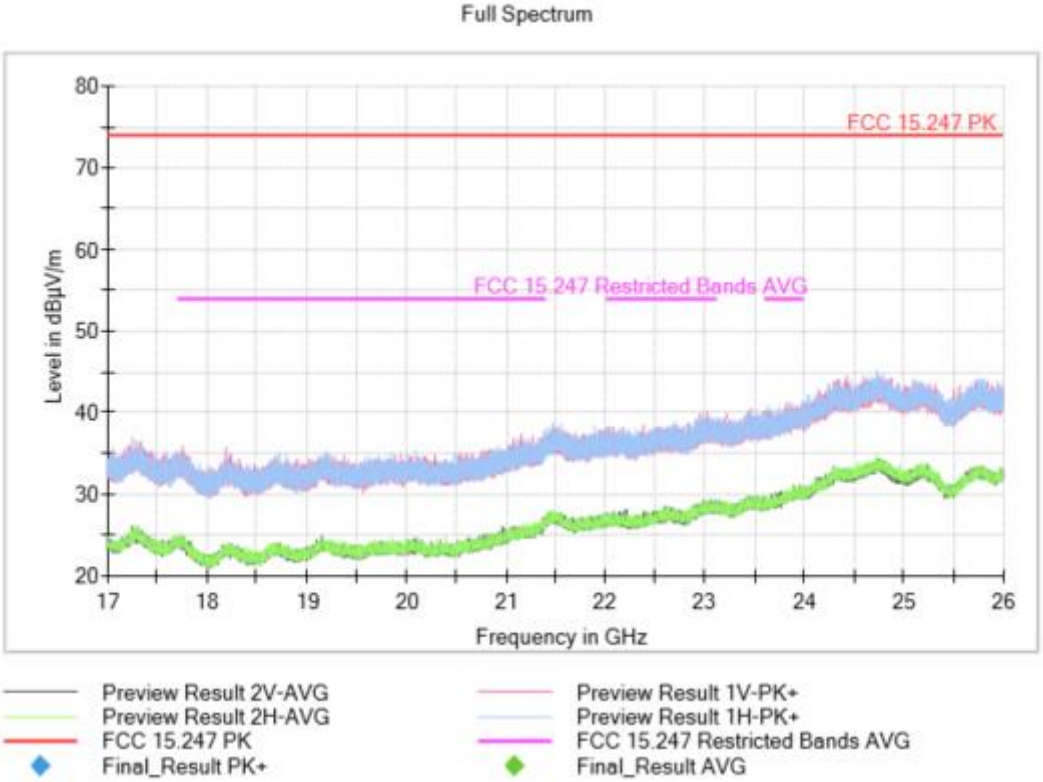
Pass

Attachments

Frequency Range GHz = [17, 26]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = The spurious frequencies detected do not depend on the modulation.	Frequency MHz = The spurious frequencies detected do not depend on the operating channel.
MIMO Mode = SISO	Active Port = 1

Images:

Test range performed in worst-case.



Appendix B: Test results. Bluetooth EDR. ANT 2

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Occupied Channel Bandwidth 99% *138*
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RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter) *228*

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:	-0.4dBi

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).

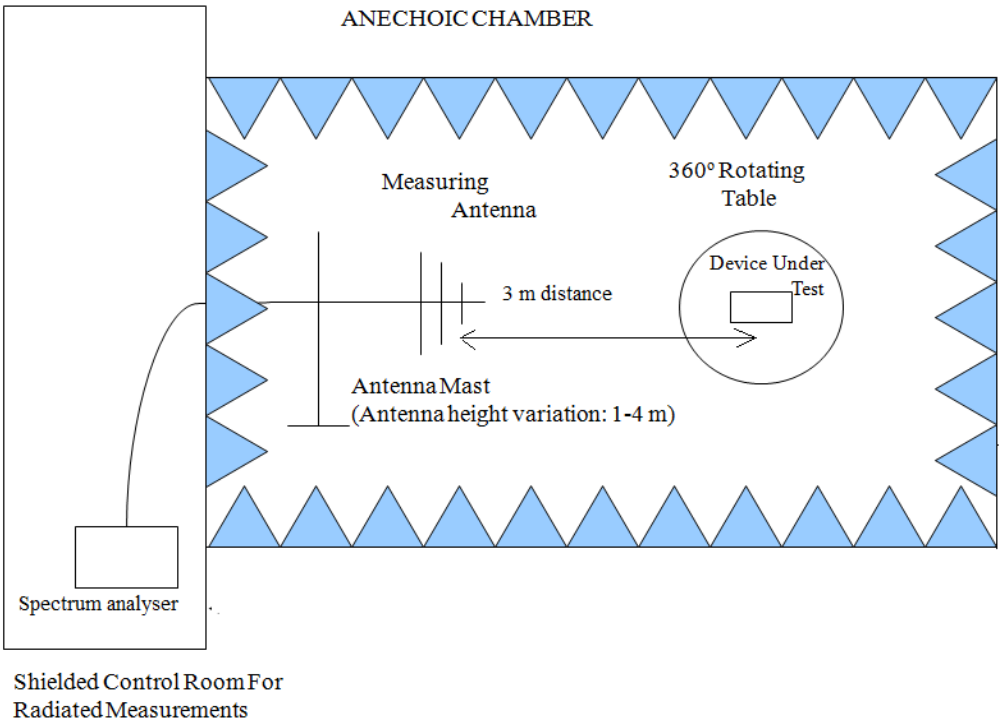
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

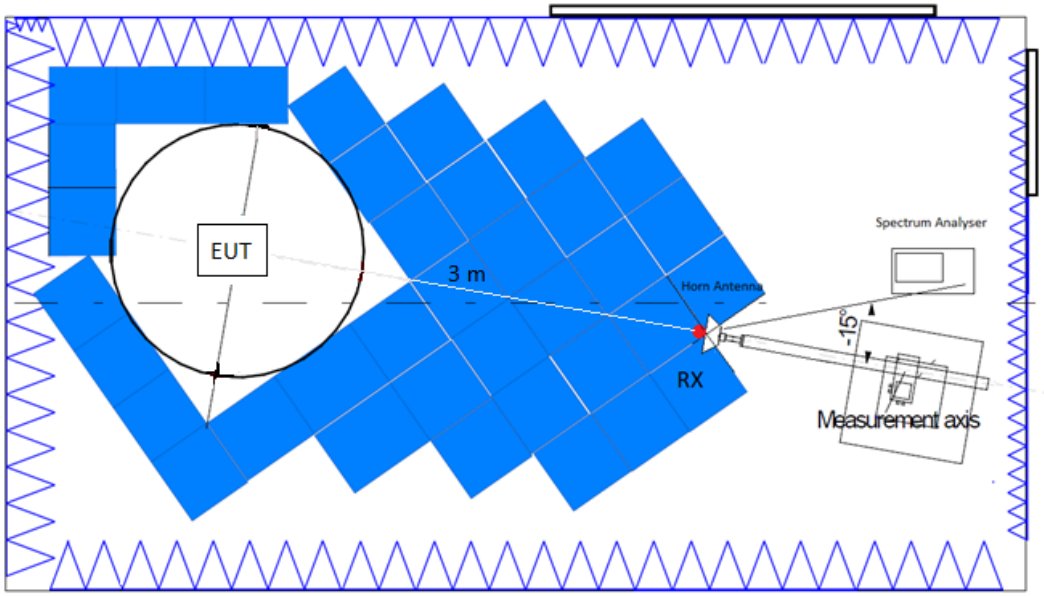
Measurements were made in both horizontal and vertical planes of polarization.

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

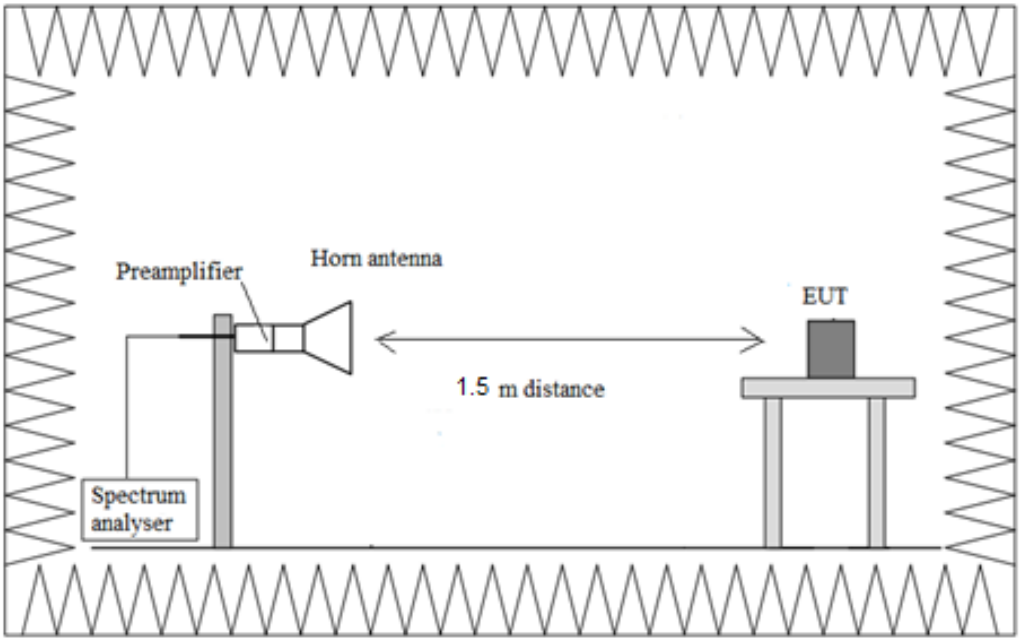
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Specifications

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

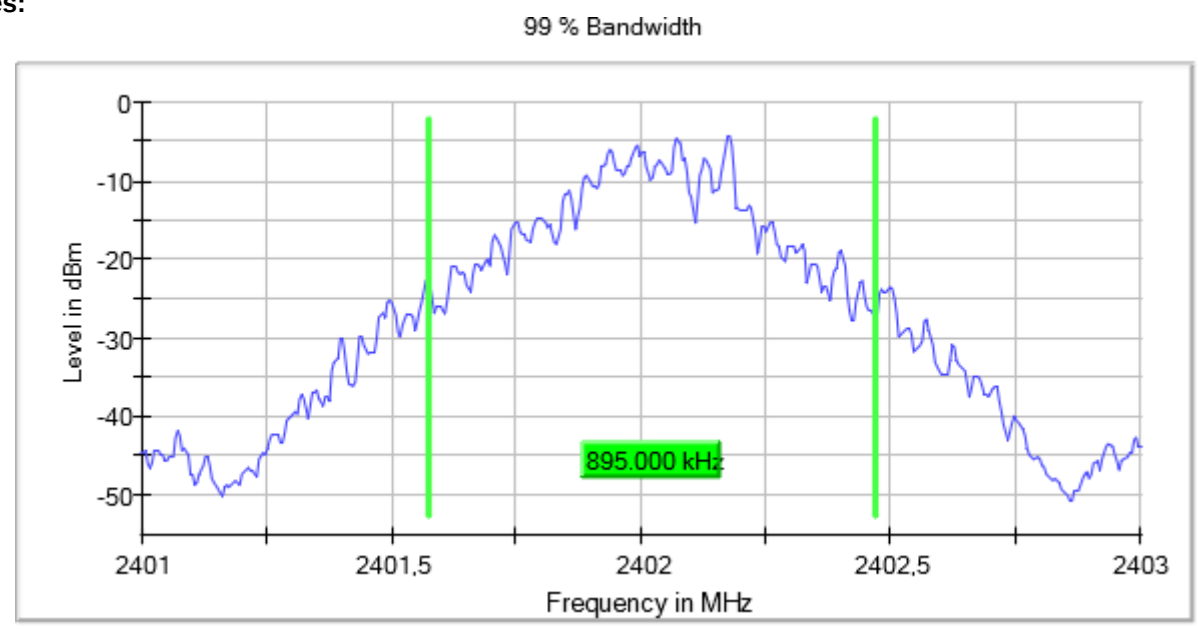
Results

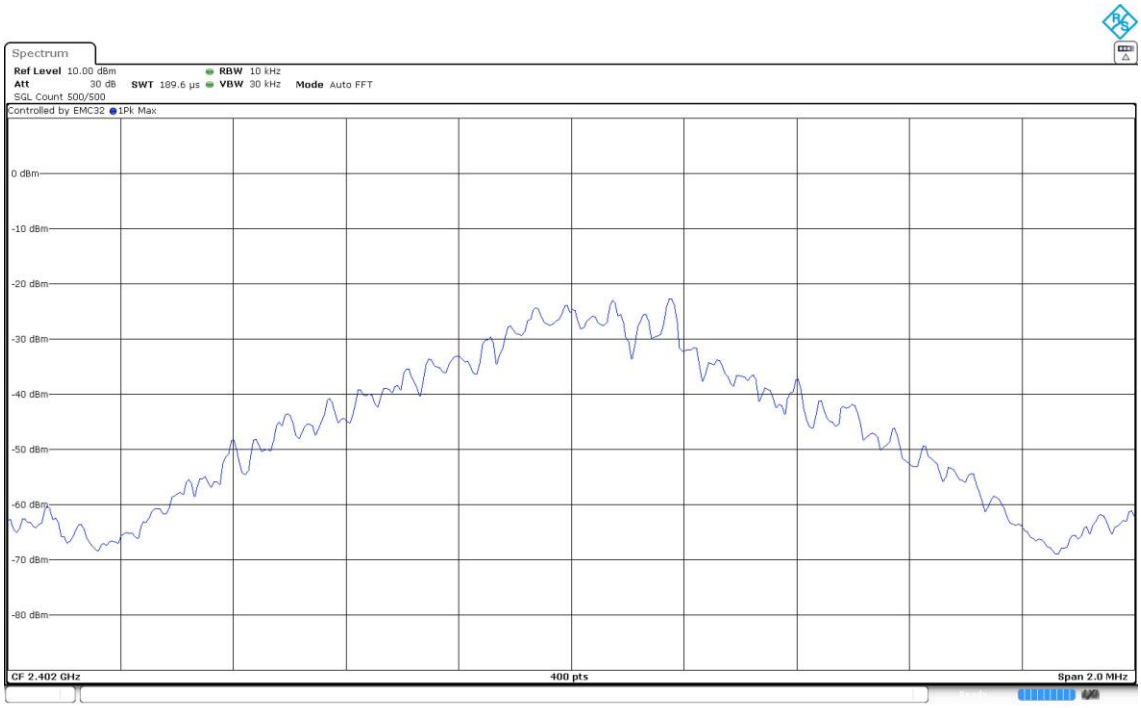
Equipment	BW (MHz)	Freq (MHz)	Port	Occ Ch BW (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	0.895
		2441.00000		0.890
		2480.00000		0.890

Attachments

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

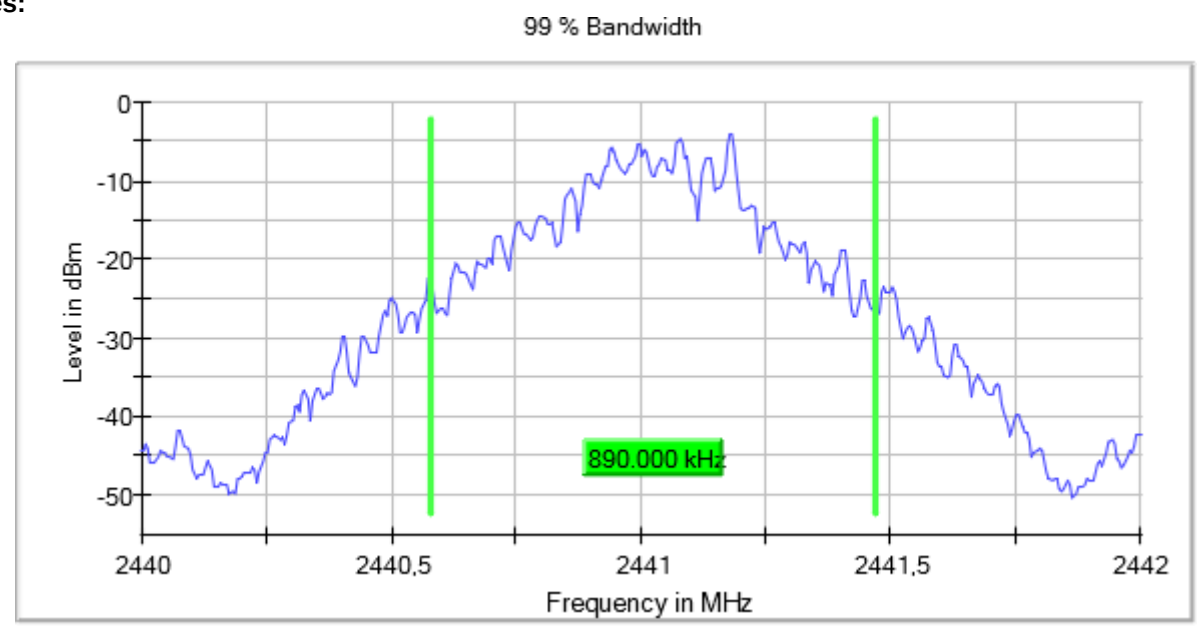
Images:

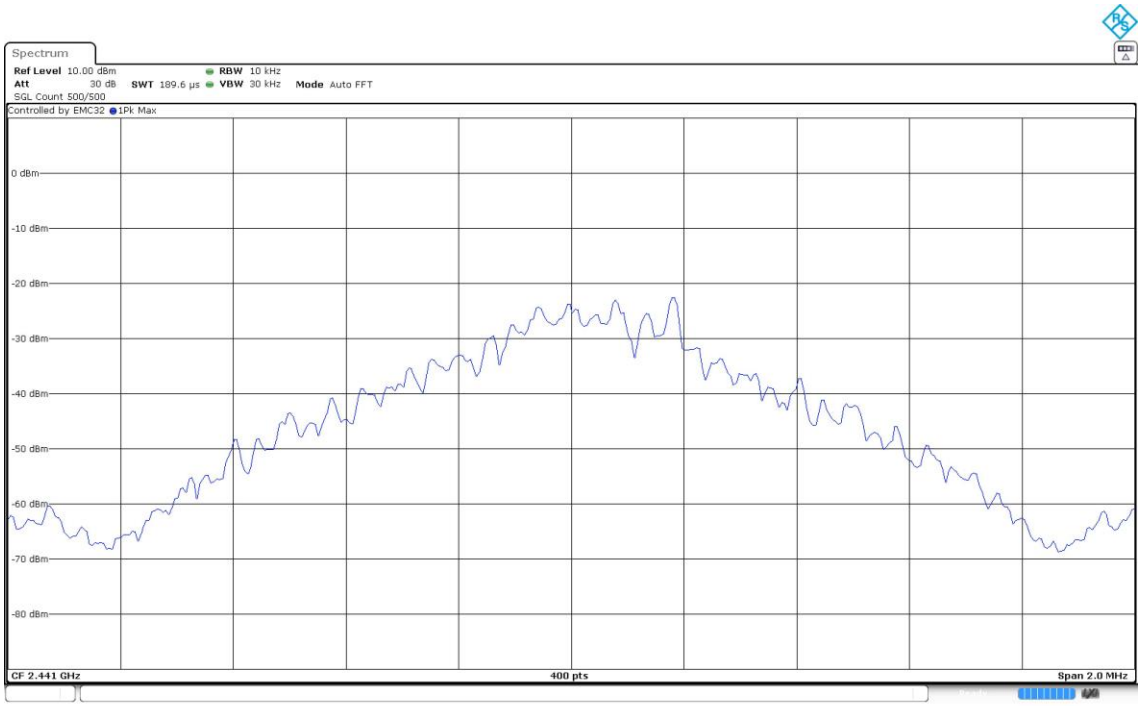




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2441.00000
Active Port = 1

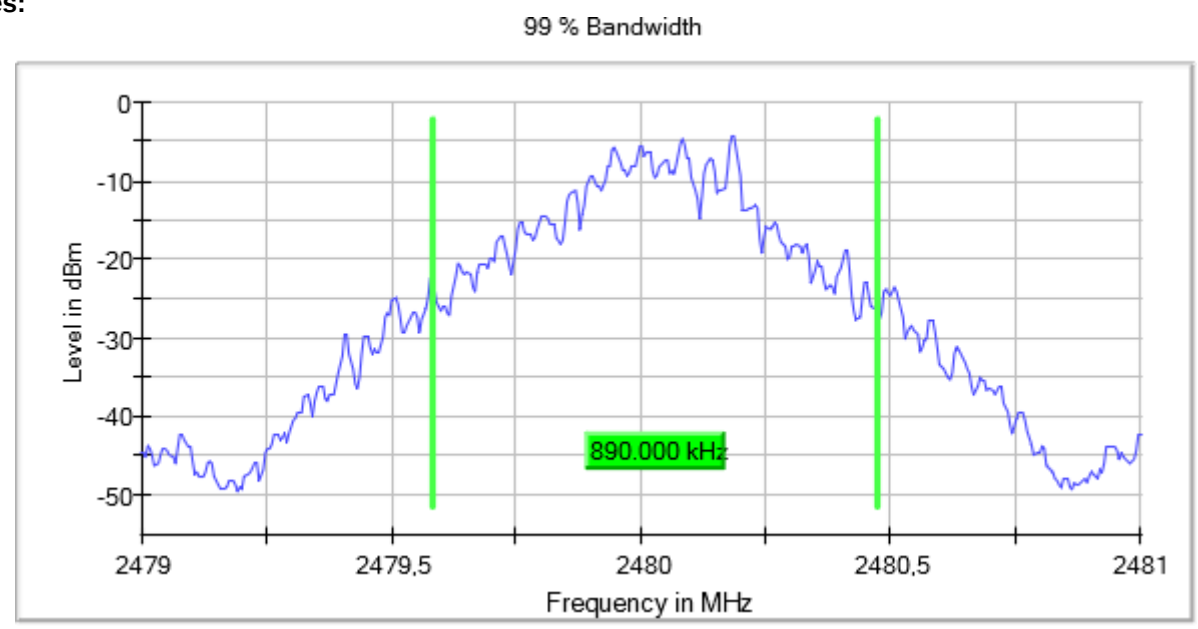
Images:

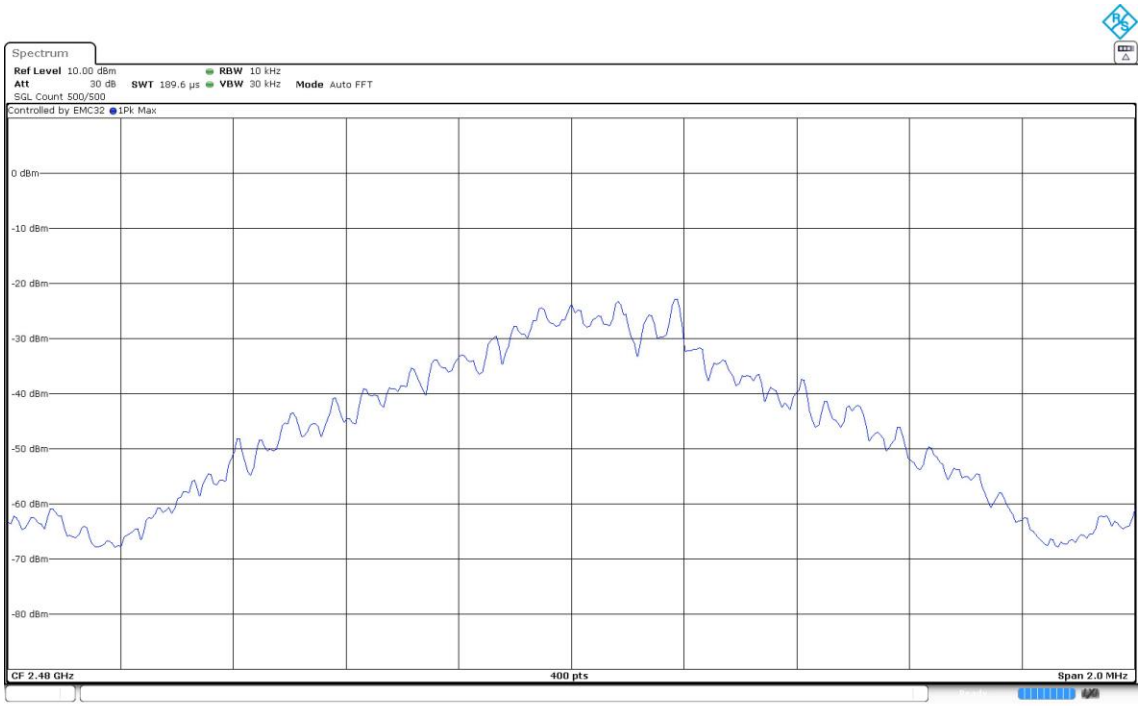




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:





Modulation: BT (Pi/4 DQPSK 2-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	1.200
		2441.00000		1.190
		2480.00000		1.190

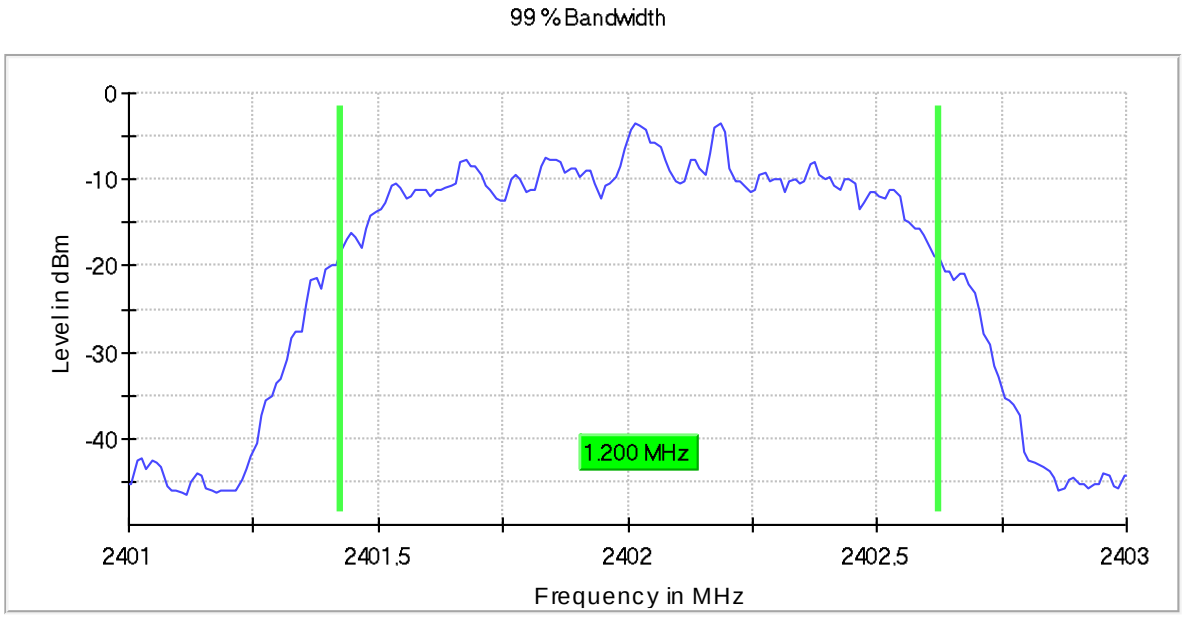
Verdict

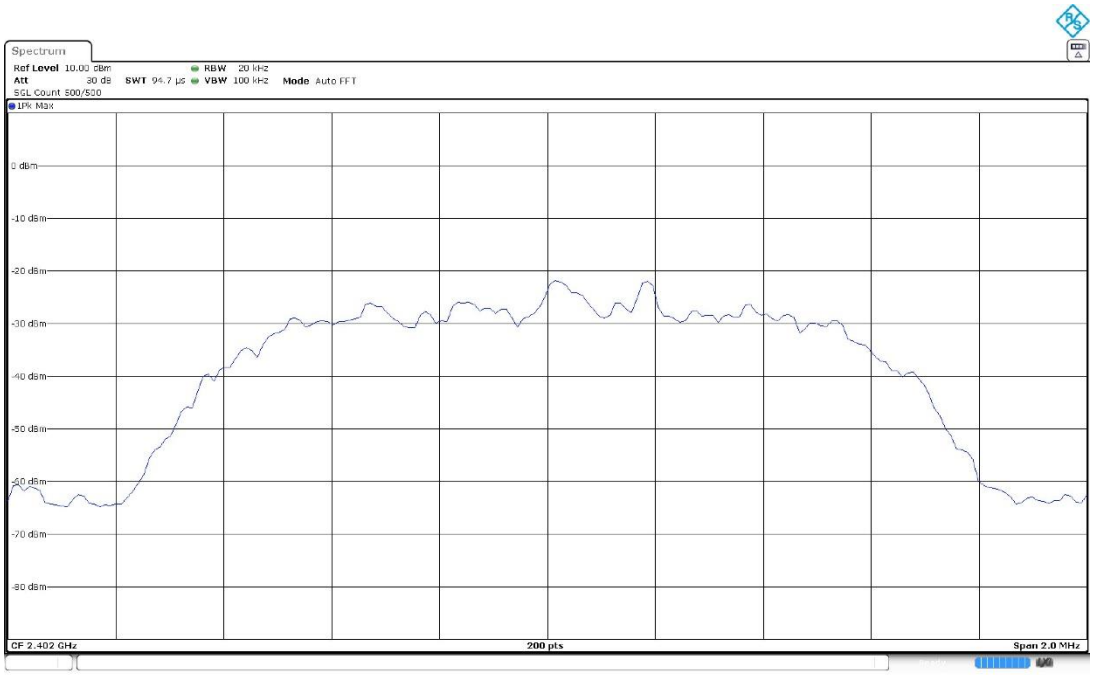
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2402.00000
Active Port = 1

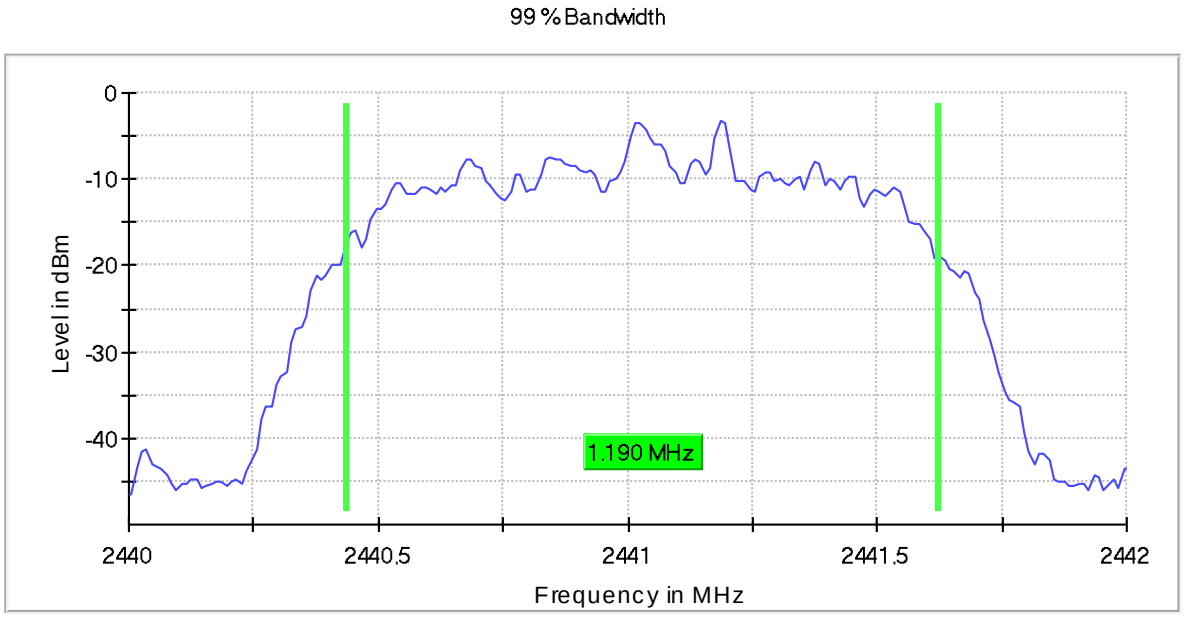
Images:

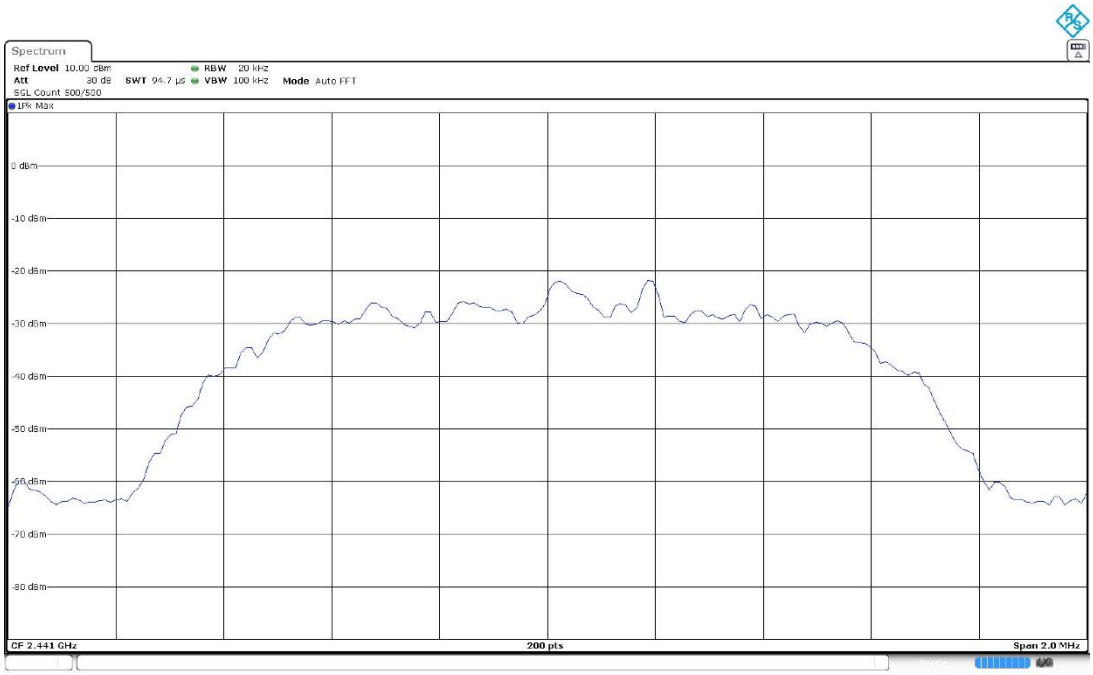




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK 2-DH5)
Frequency MHz = 2441.00000
MIMO Mode = SISO
Active Port = 1

Images:



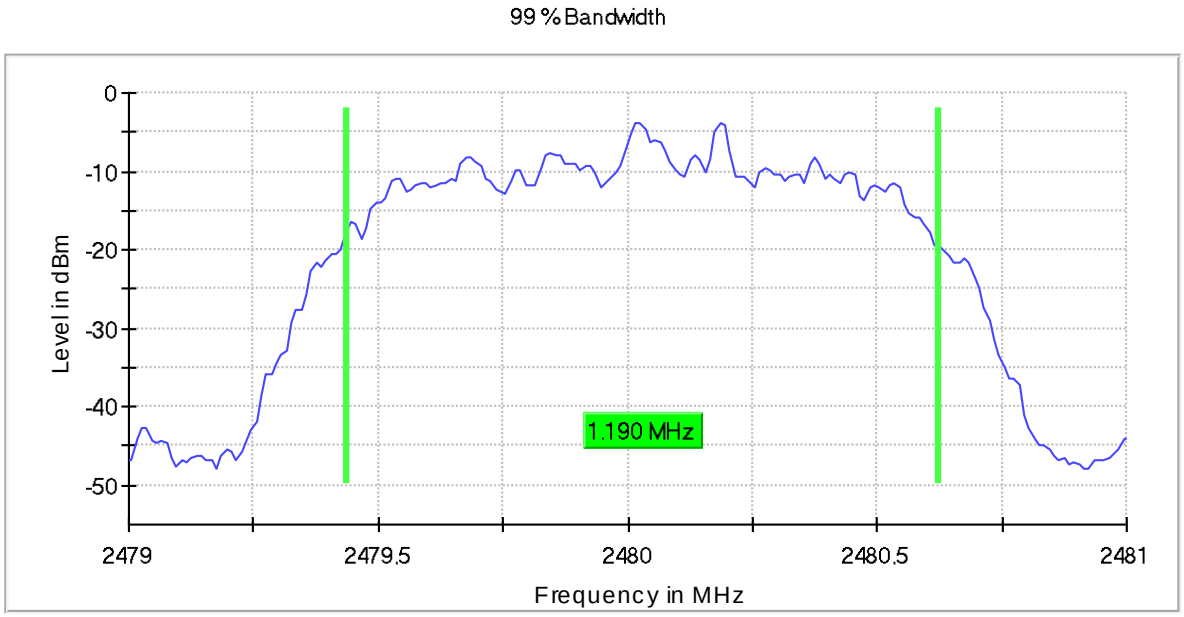


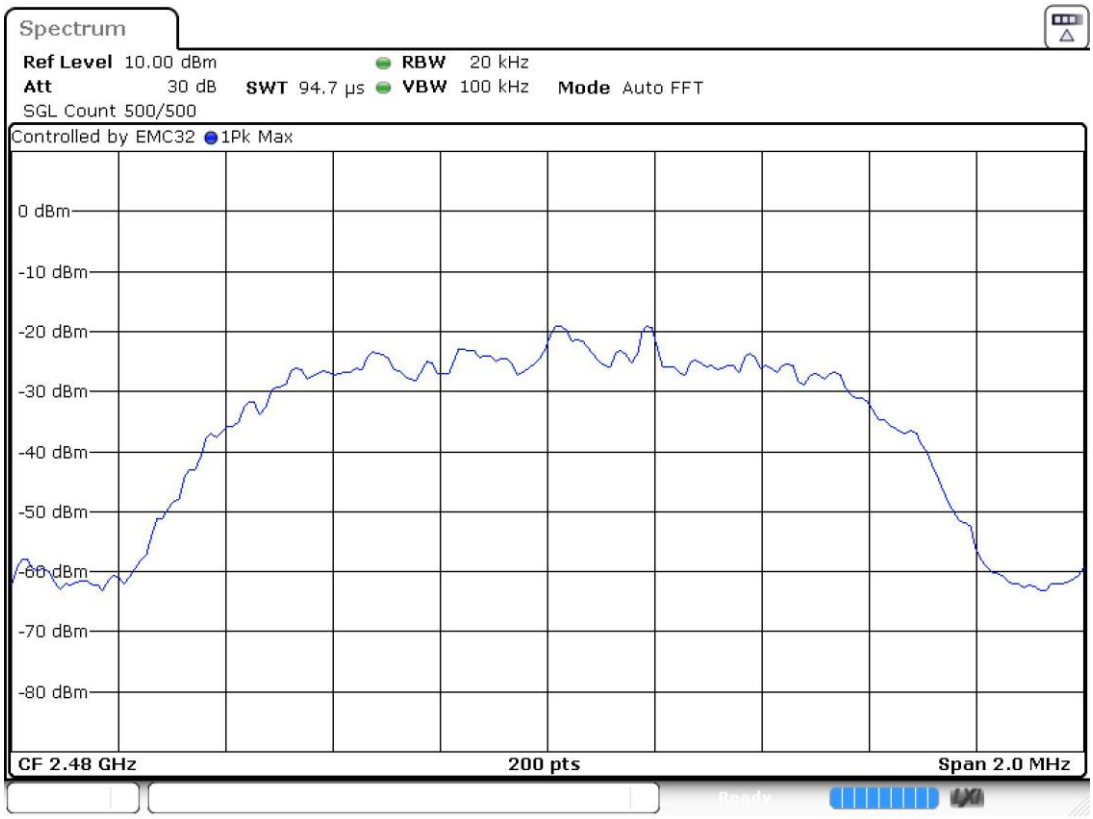
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) 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	1.200
		2441.00000		1.200
		2480.00000		1.200

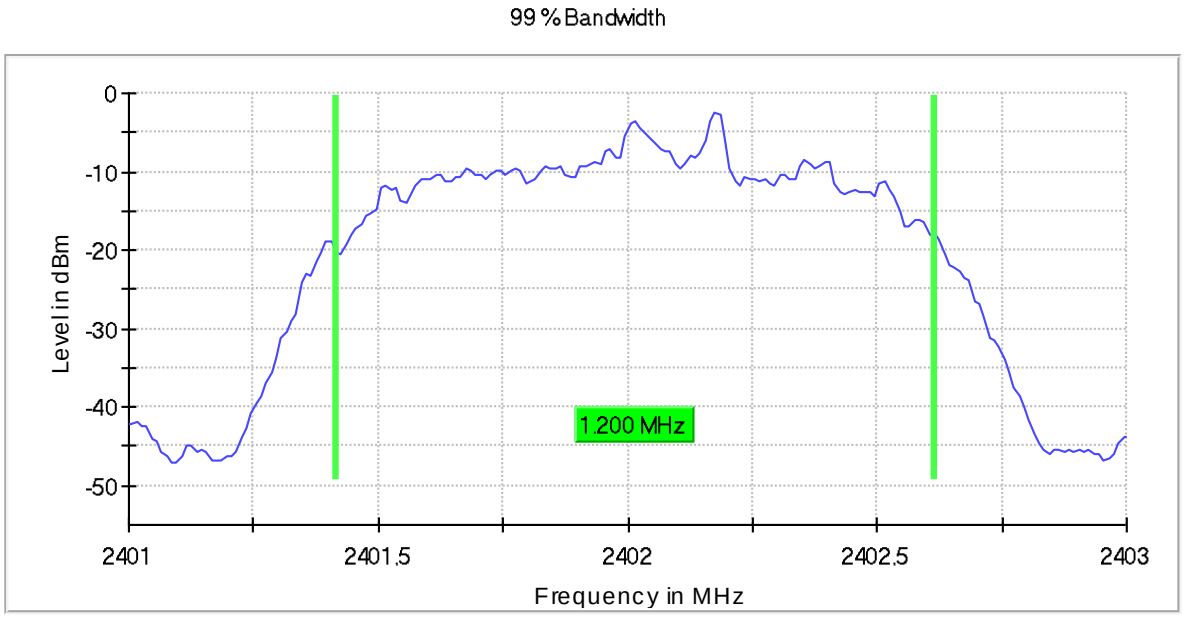
Verdict

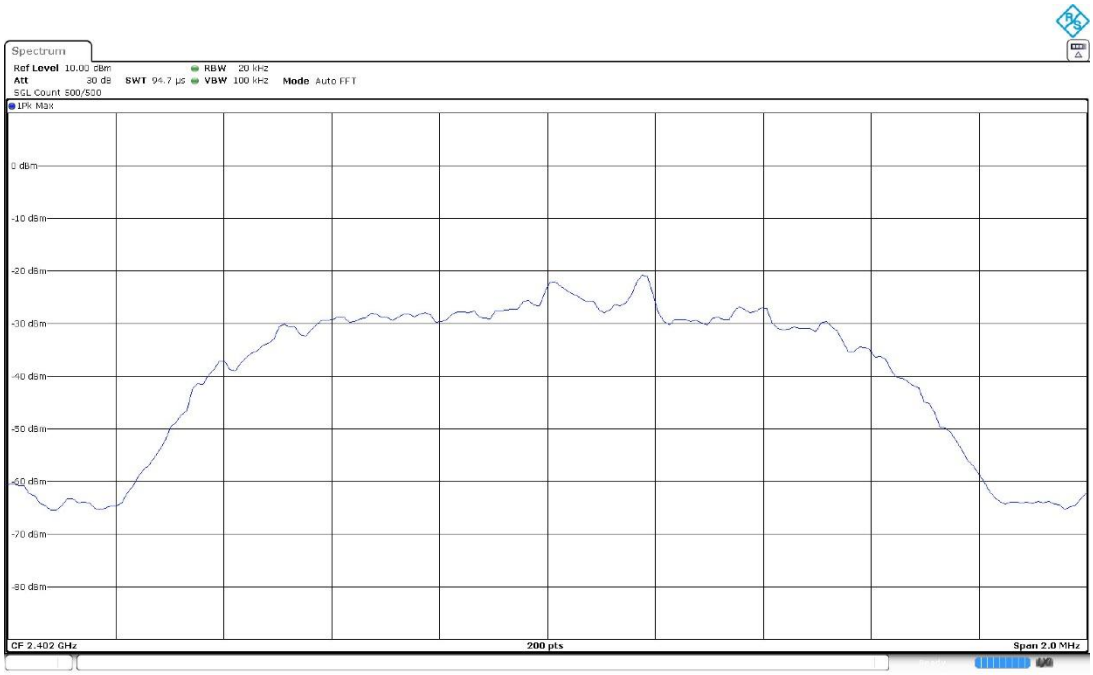
Pass

Attachments

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:



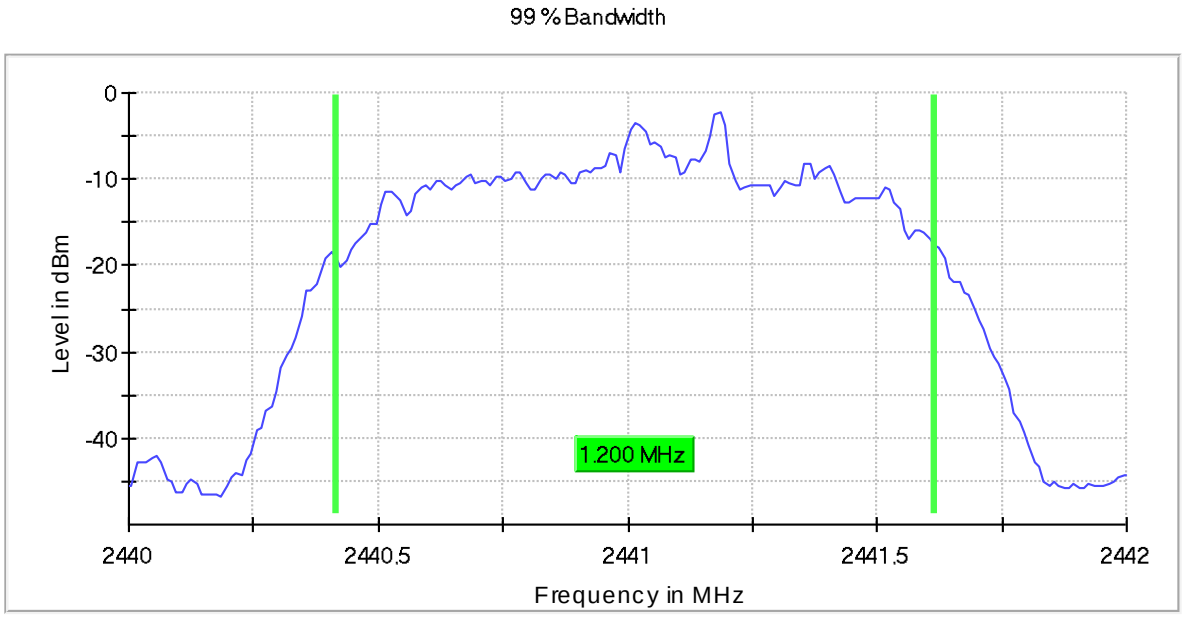


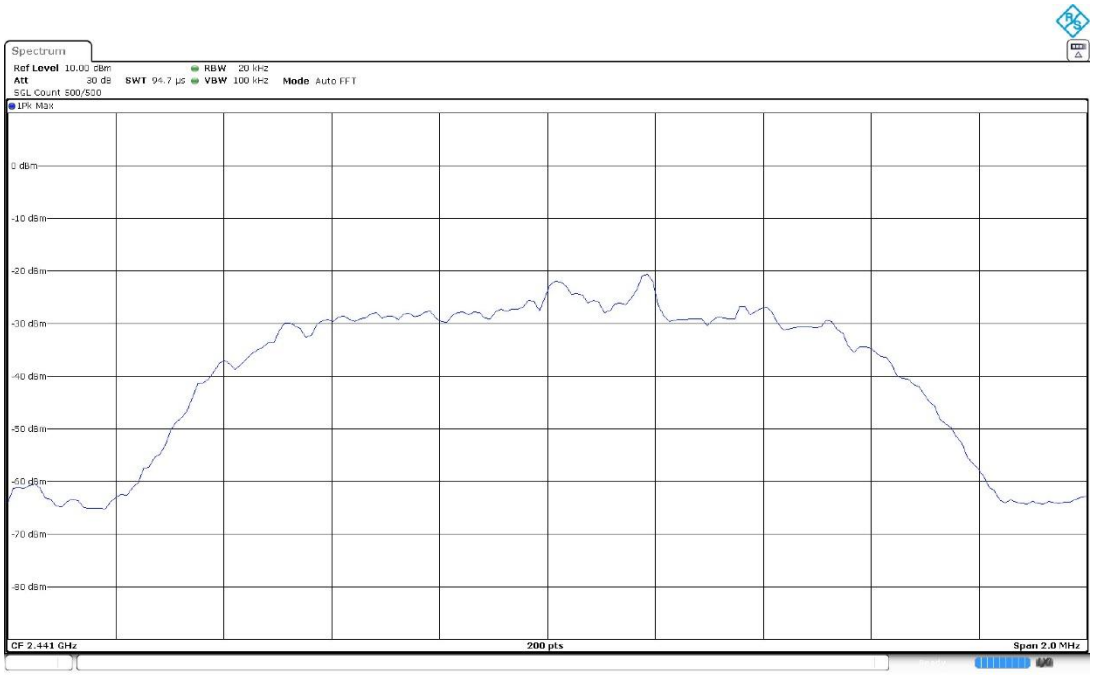
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (8DPSK 3-DH5) Frequency MHz = 2441.00000

MIMO Mode = SISO Active Port = 1

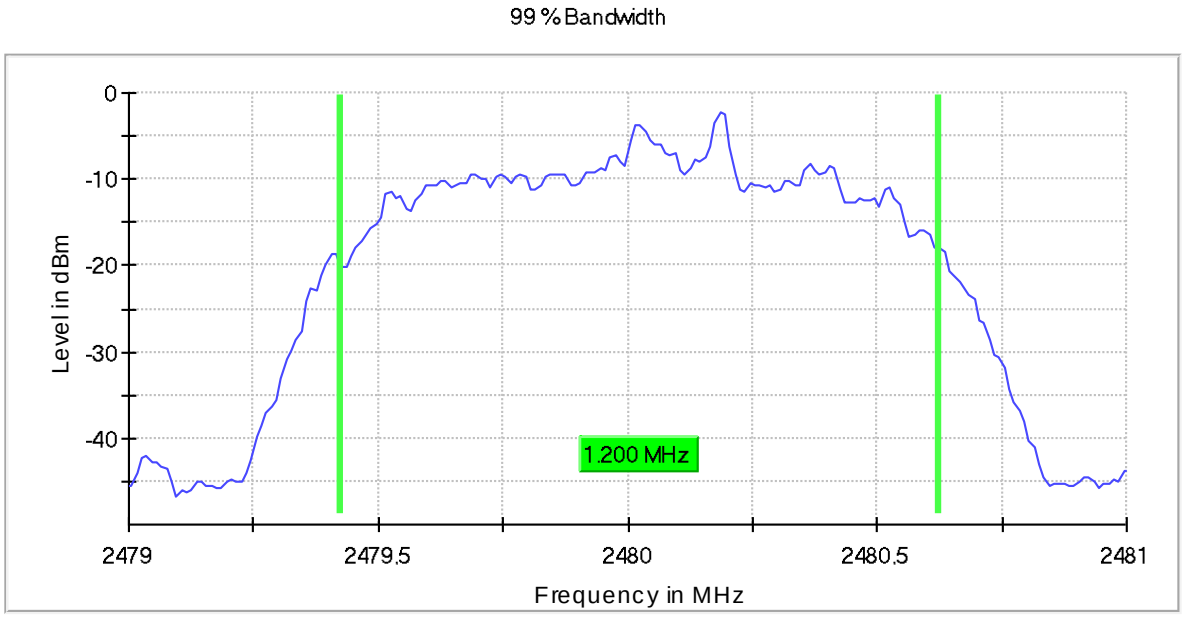
Images:

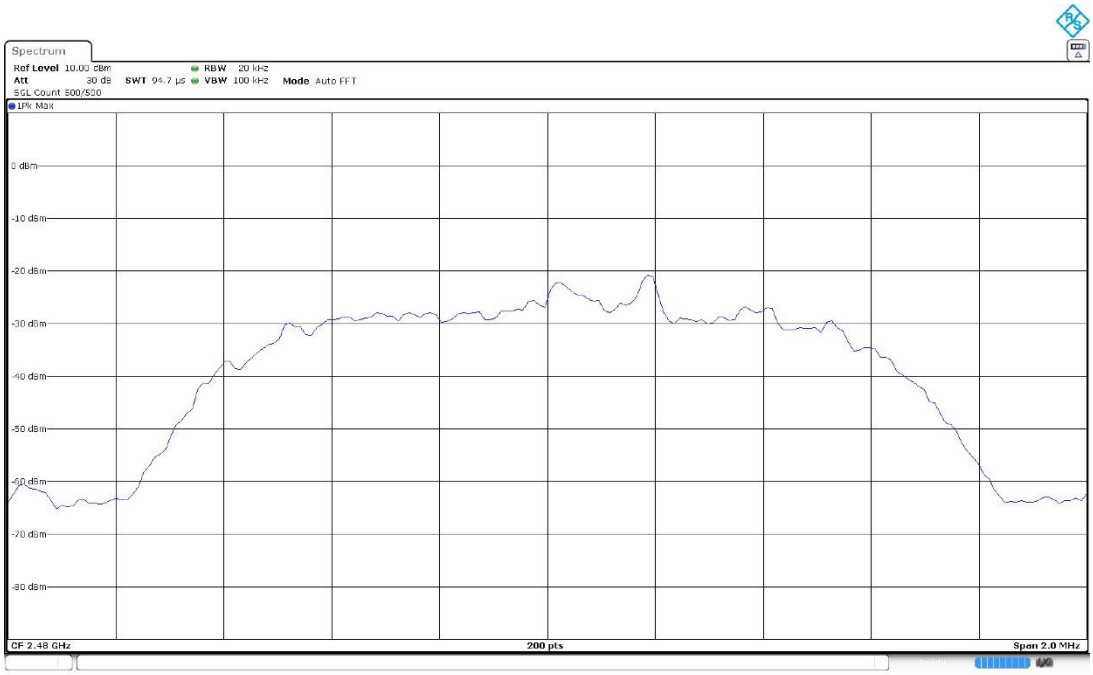




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5)
Frequency MHz = 2480.00000
MIMO Mode = SISO
Active Port = 1

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.

Results

Modulation: BT (GFSK 1-DH5)

MIMO Mode: SISO

Equipment	BW (MHz)	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	0.945
		2441.00000		0.945
		2480.00000		0.945

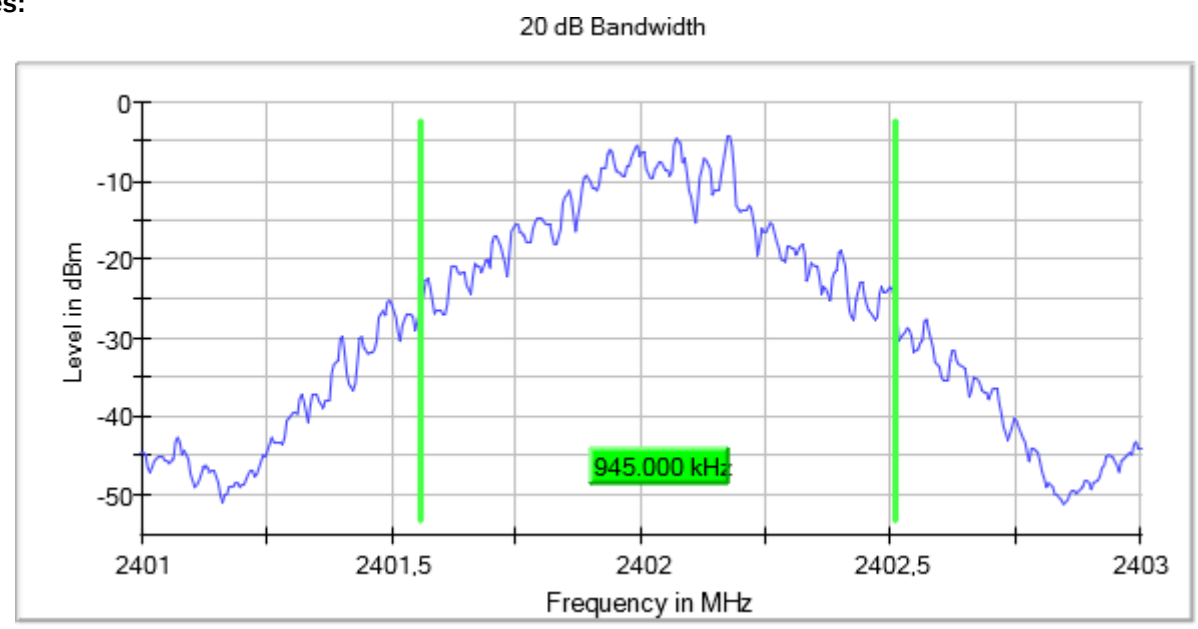
Verdict

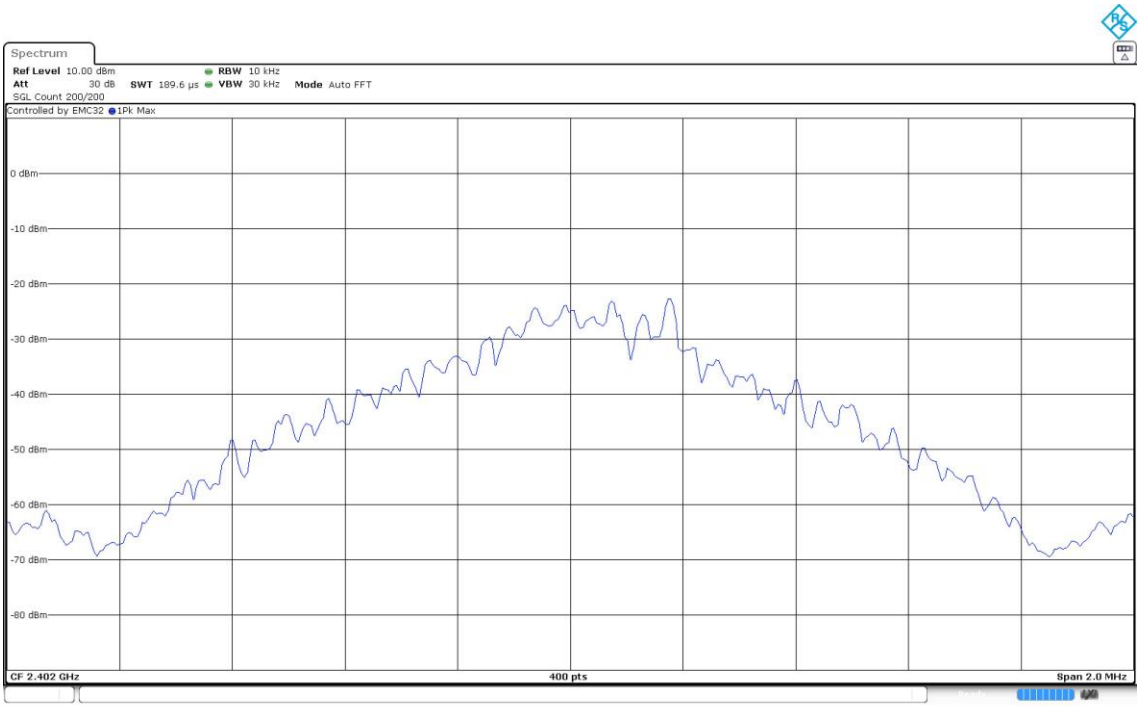
Pass

Attachments

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

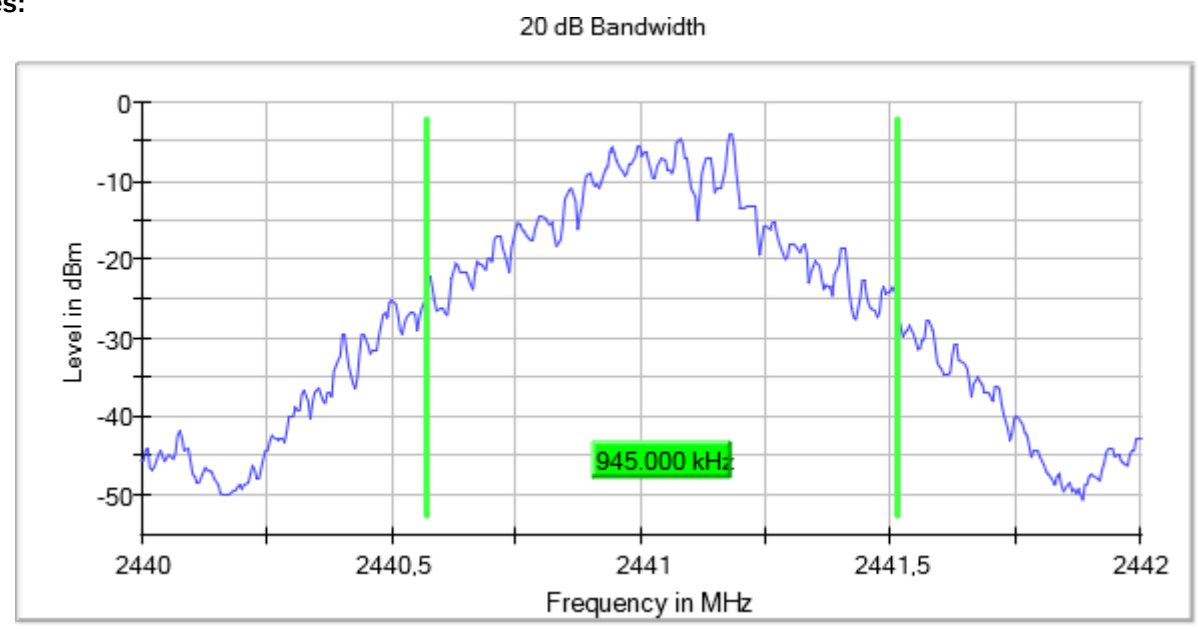
Images:

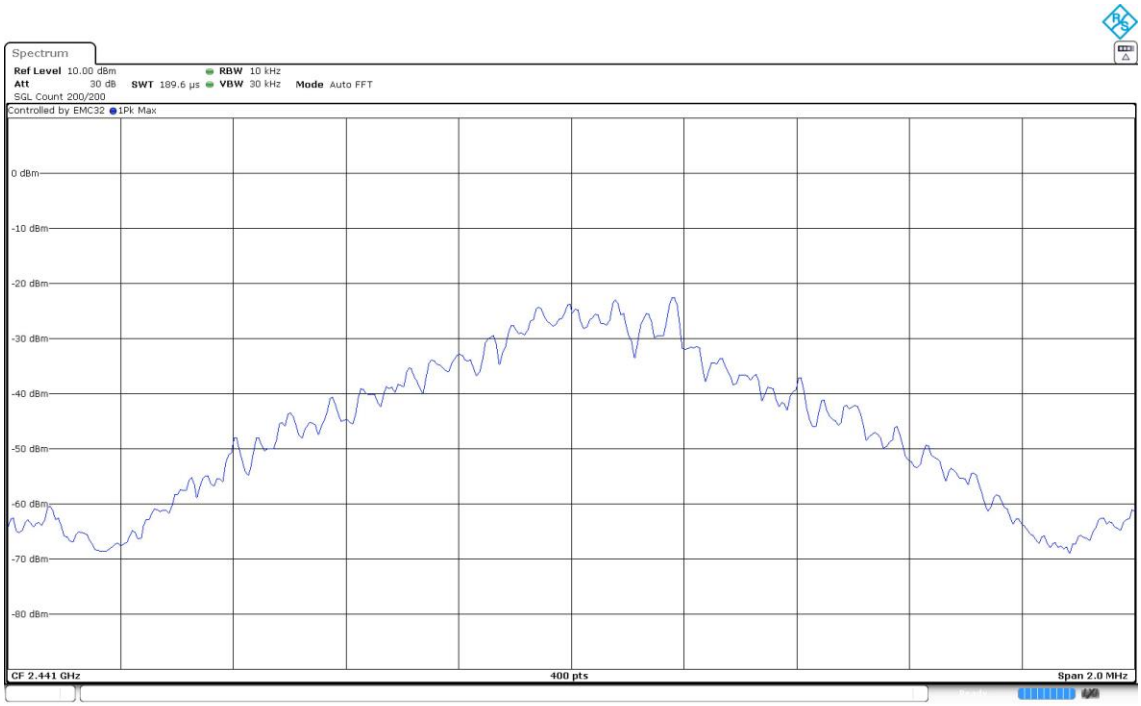




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2441.00000
Active Port = 1

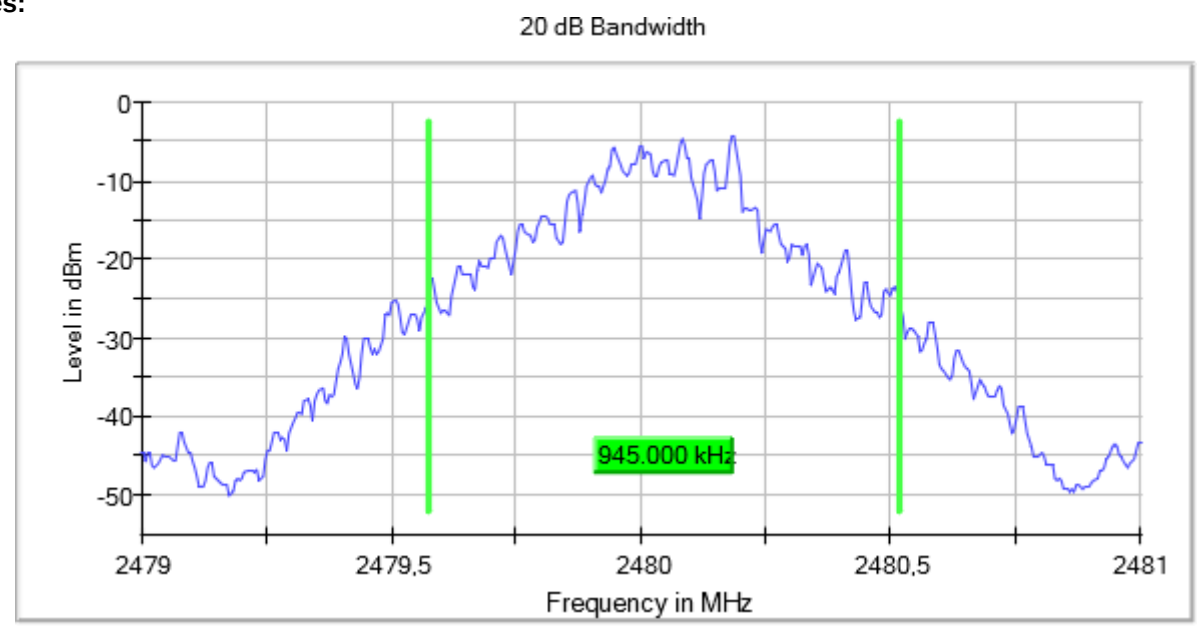
Images:

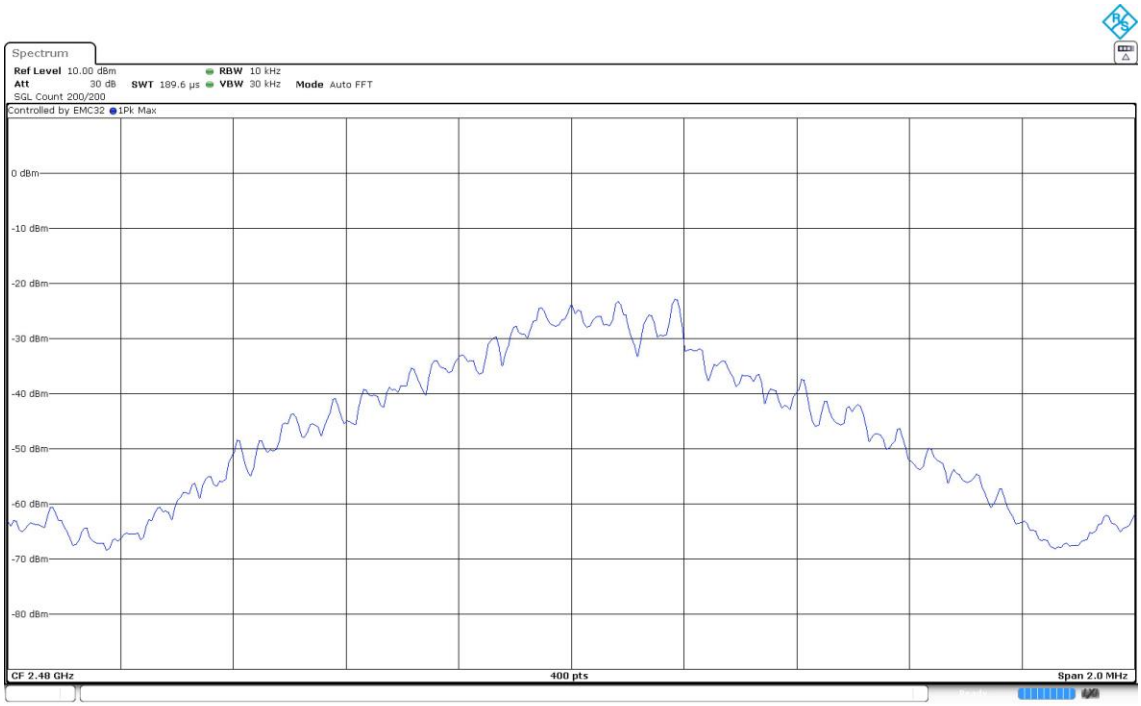




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:





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

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		1.330

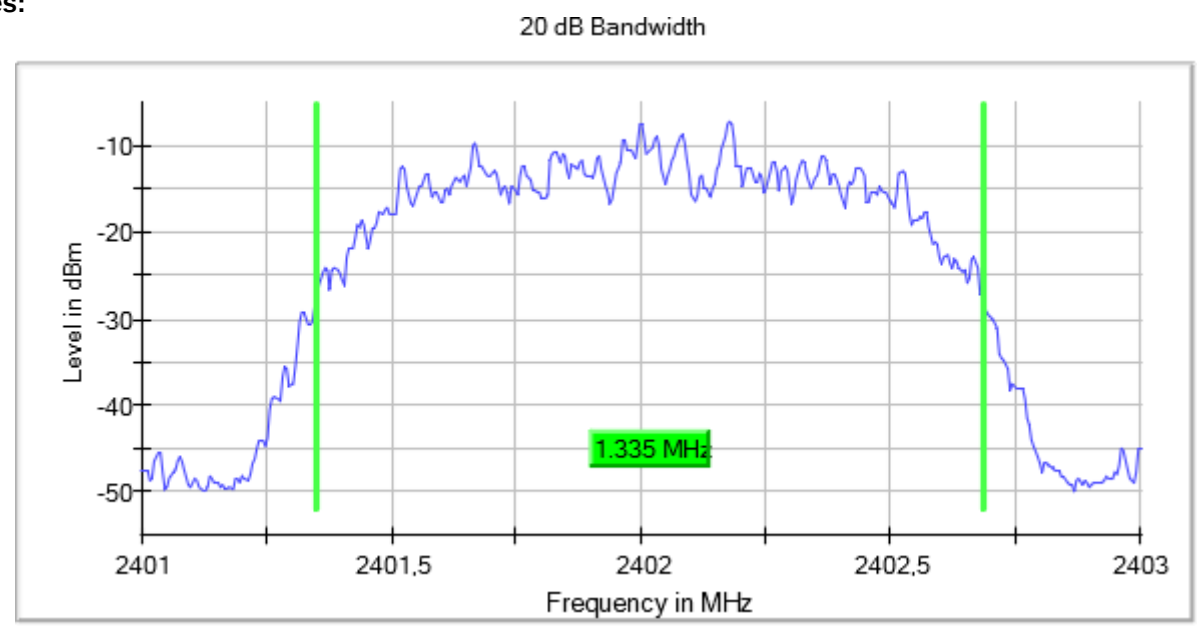
Verdict

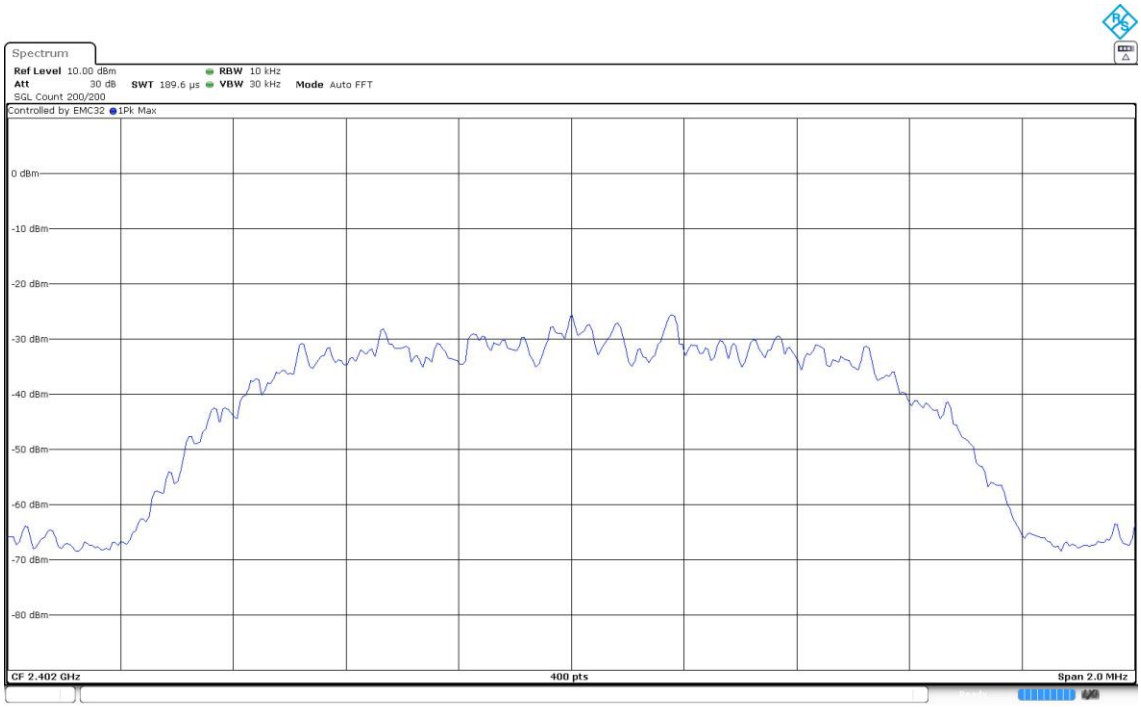
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK 2-DH5)
Frequency MHz = 2402.00000
MIMO Mode = SISO
Active Port = 1

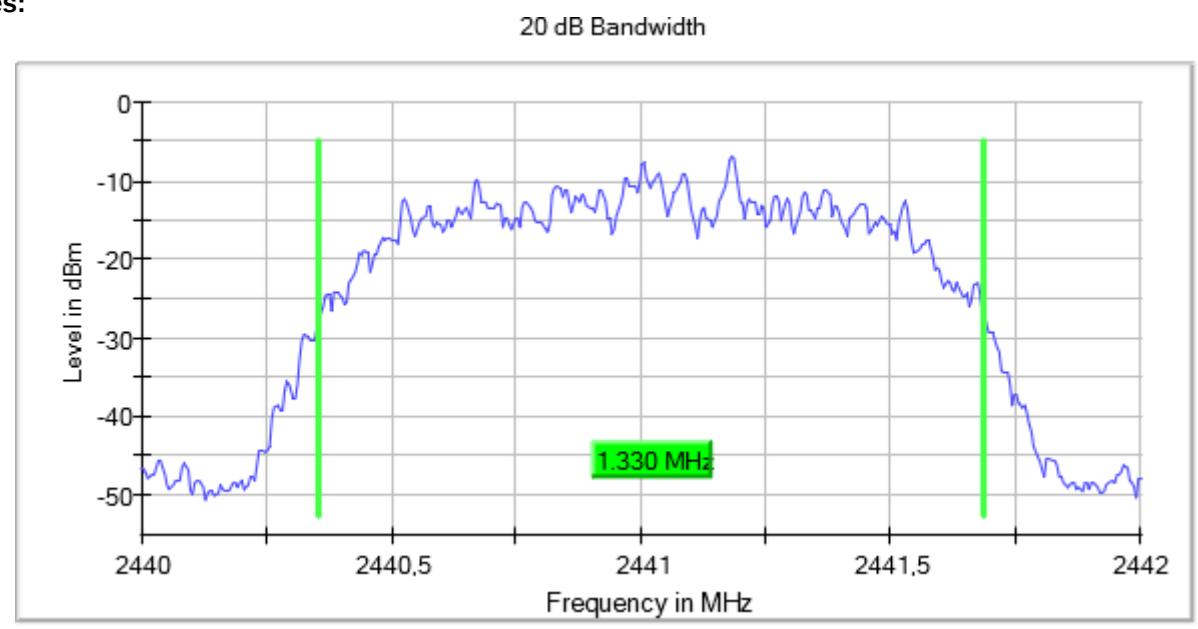
Images:

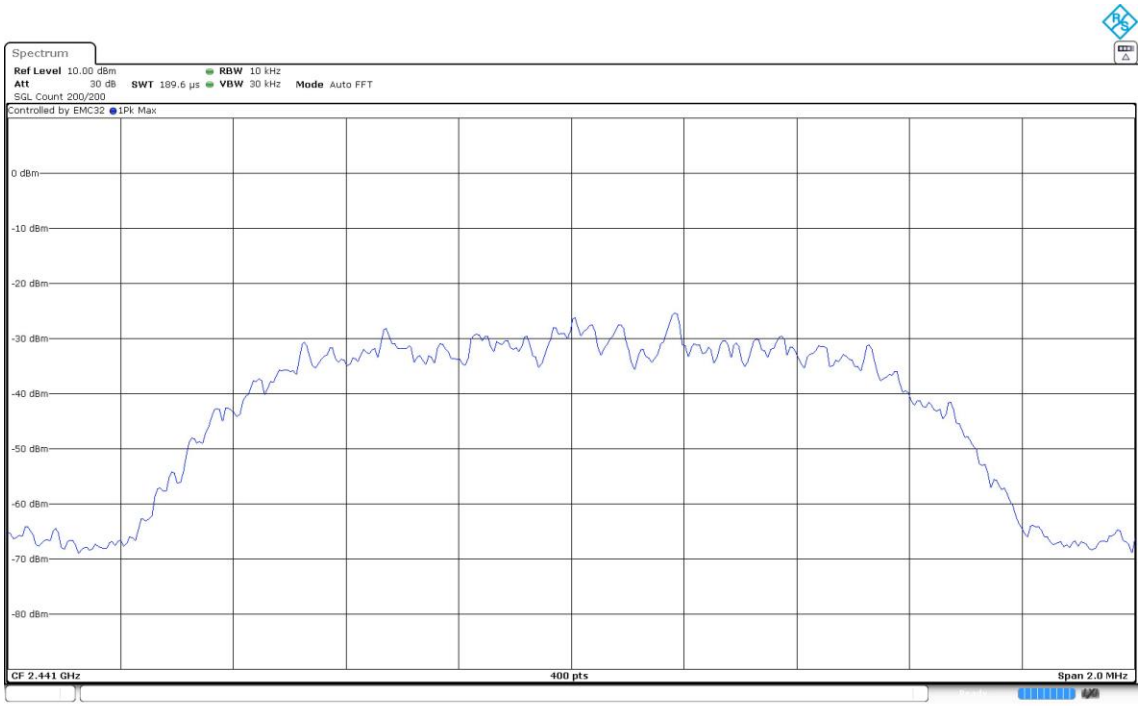




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK 2-DH5)
Frequency MHz = 2441.00000
MIMO Mode = SISO
Active Port = 1

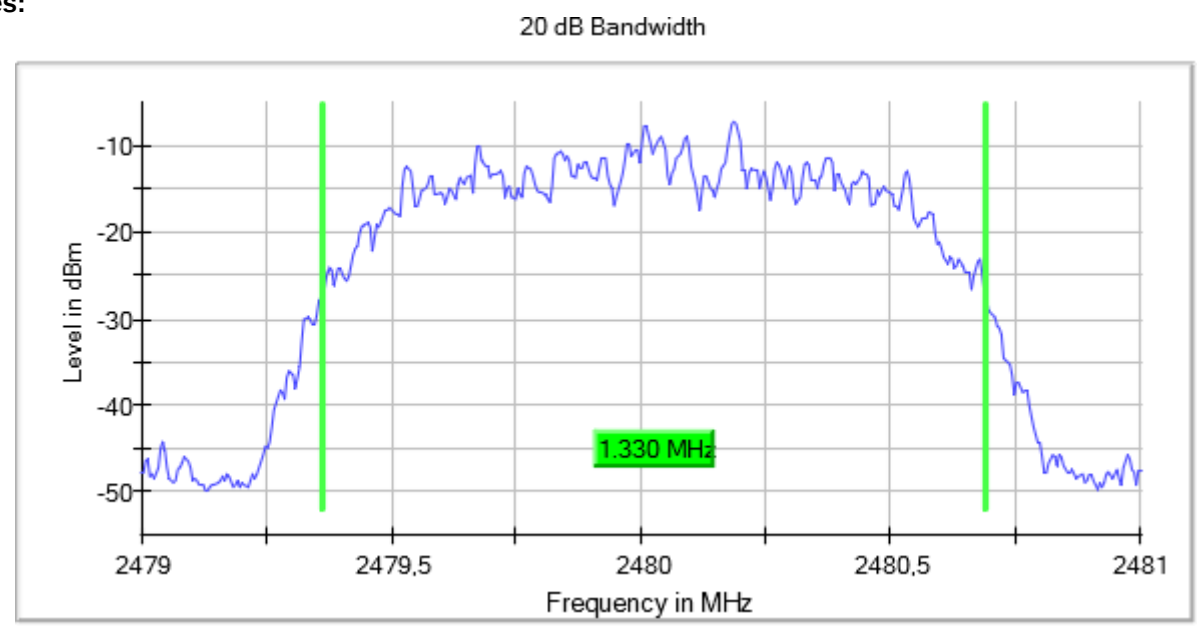
Images:

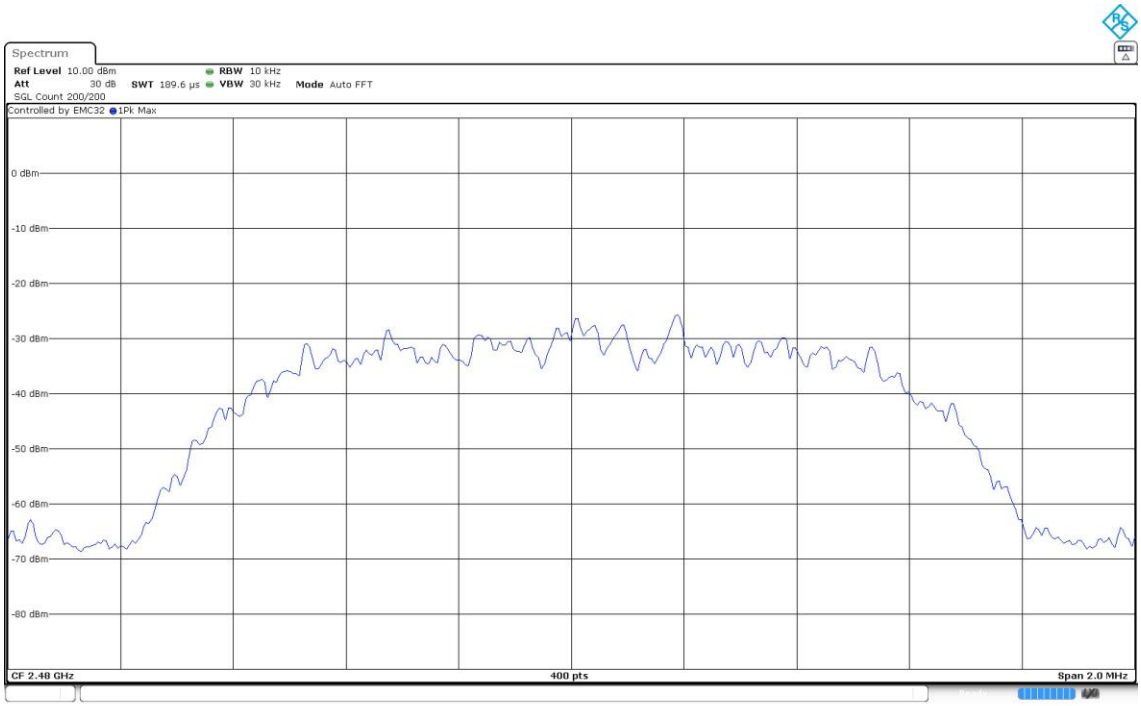




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK 2-DH5)
Frequency MHz = 2480.00000
MIMO Mode = SISO
Active Port = 1

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		1.275

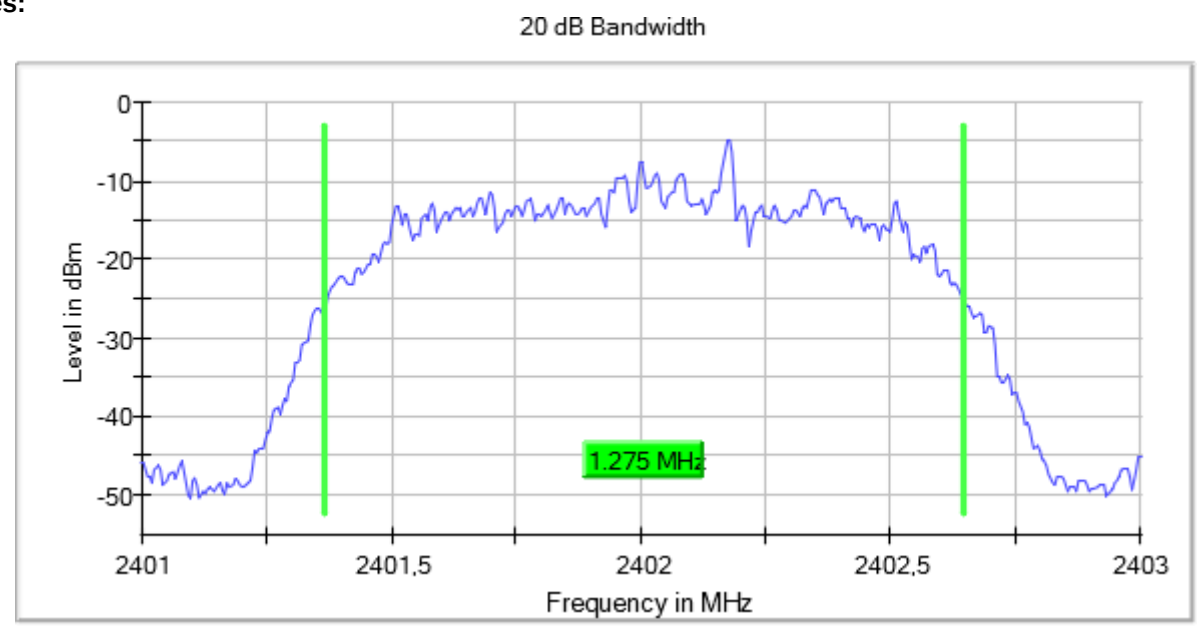
Verdict

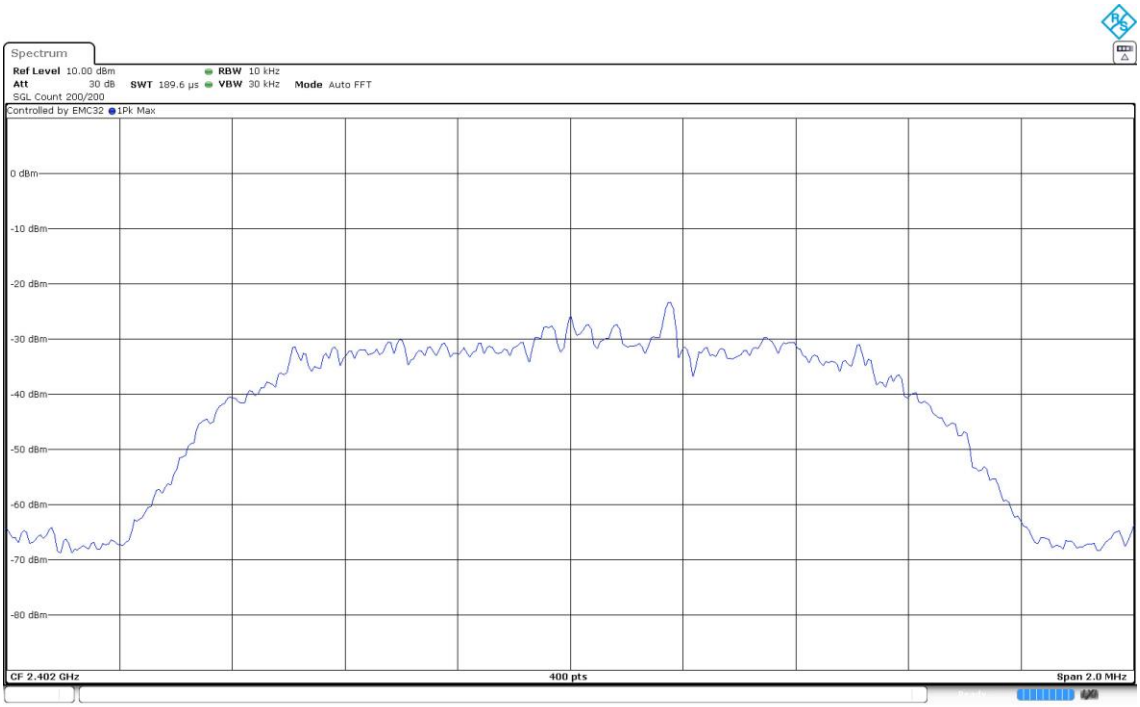
Pass

Attachments

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

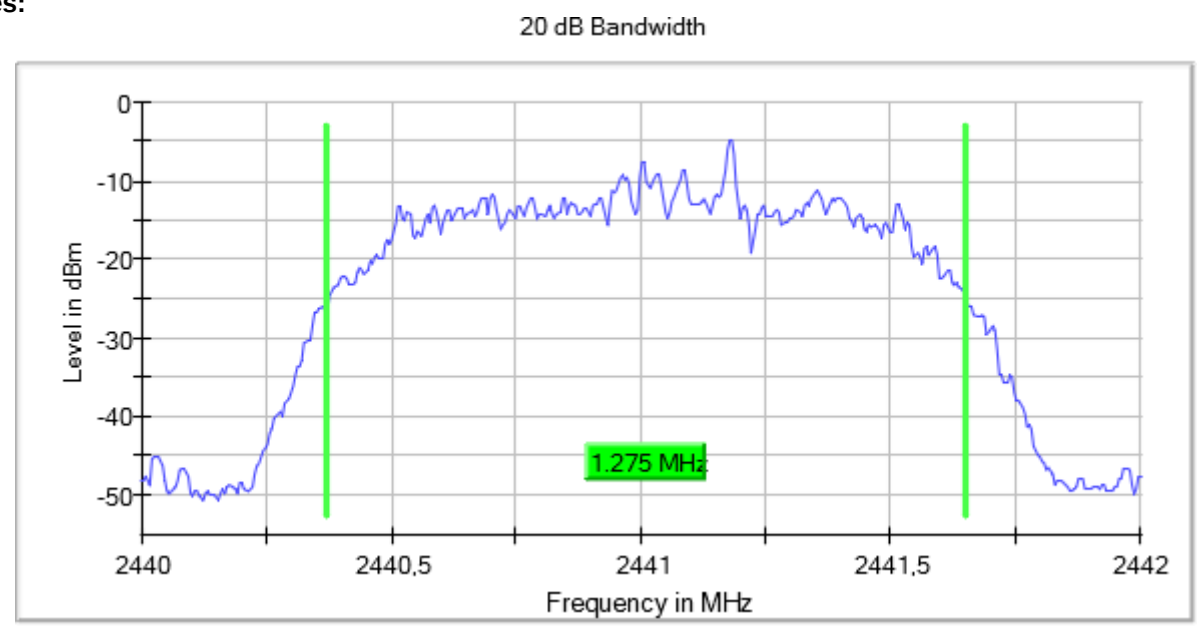
Images:

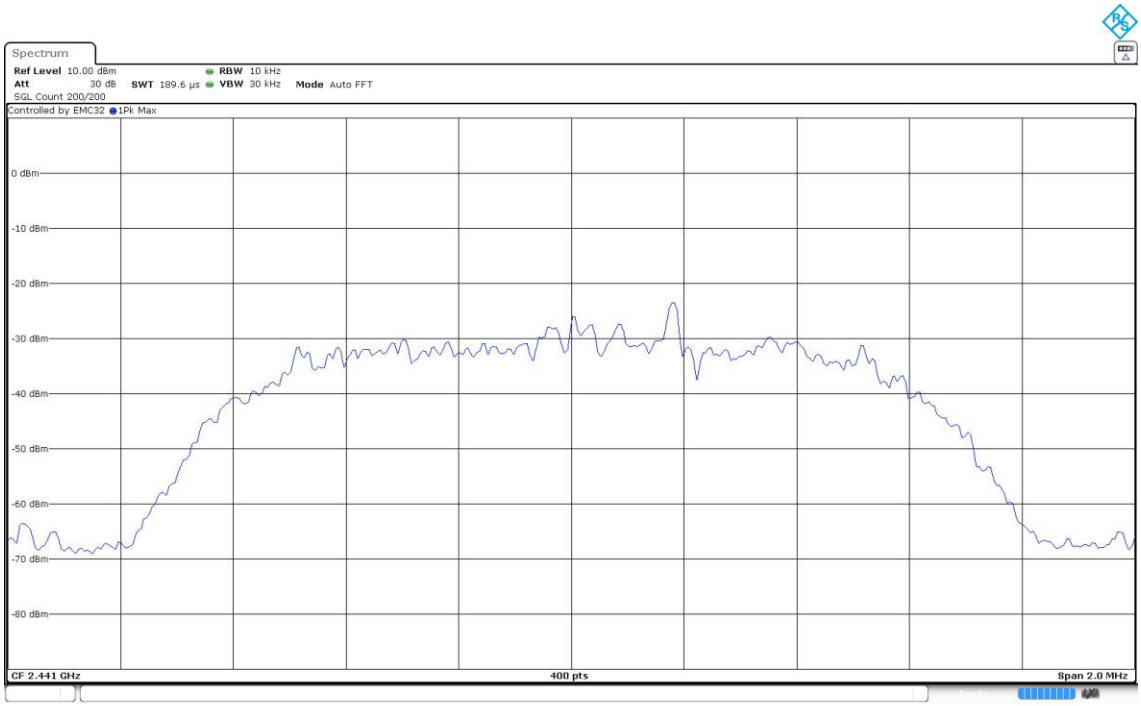




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (8DPSK 3-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2441.00000
Active Port = 1

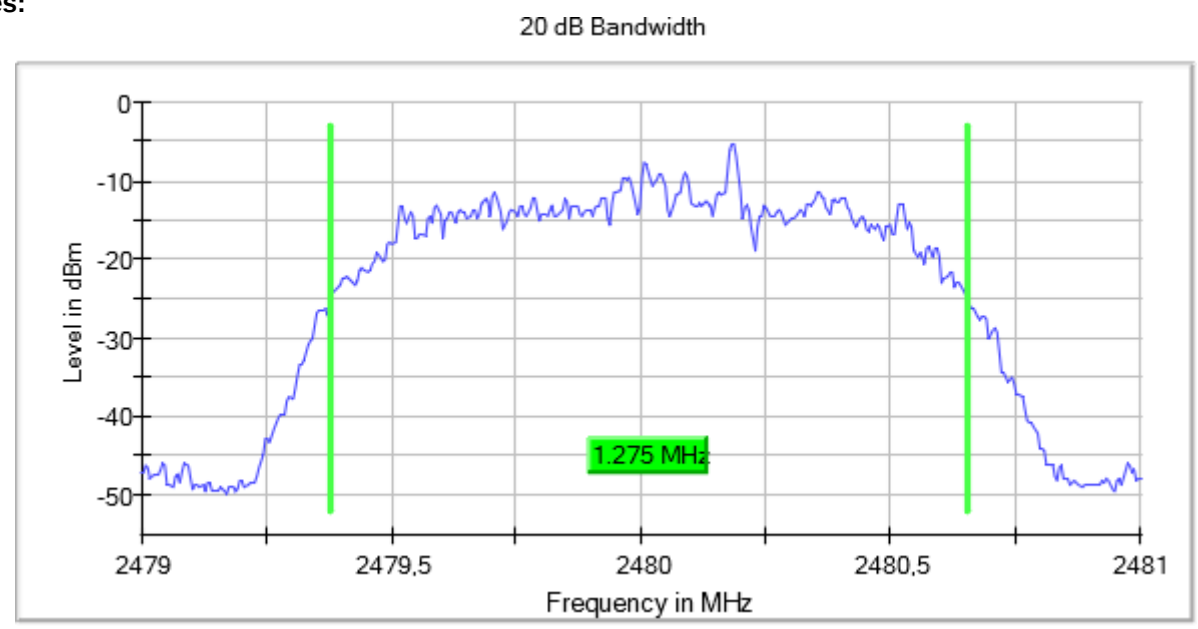
Images:

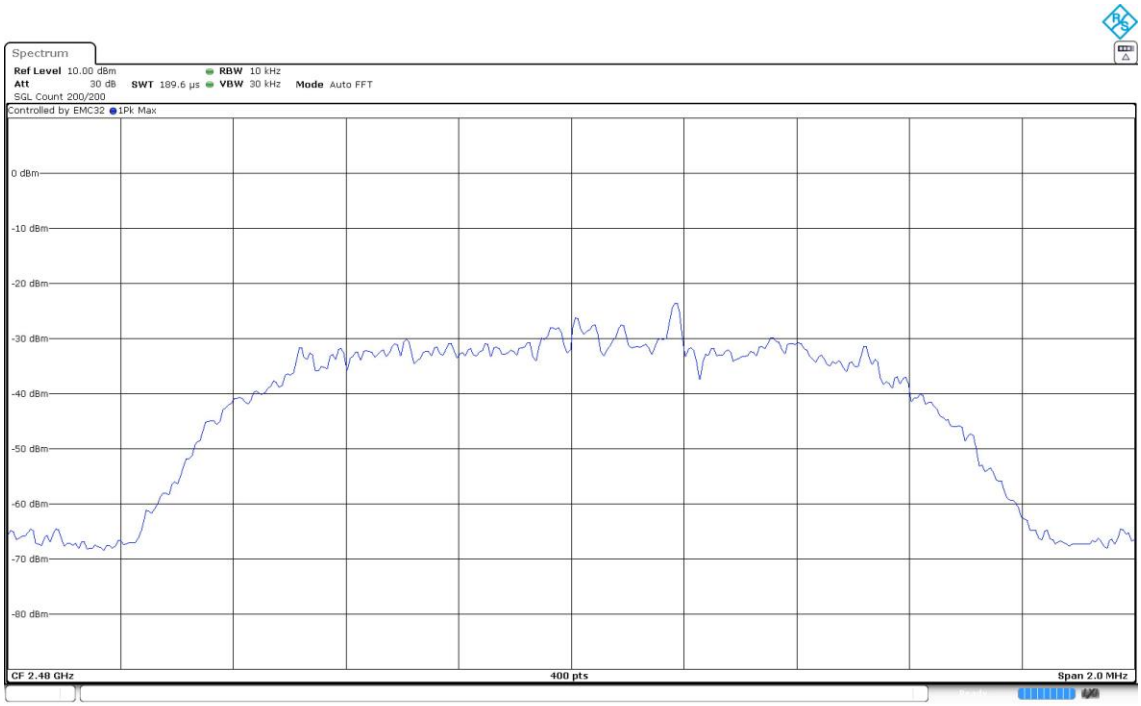




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (8DPSK 3-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:





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

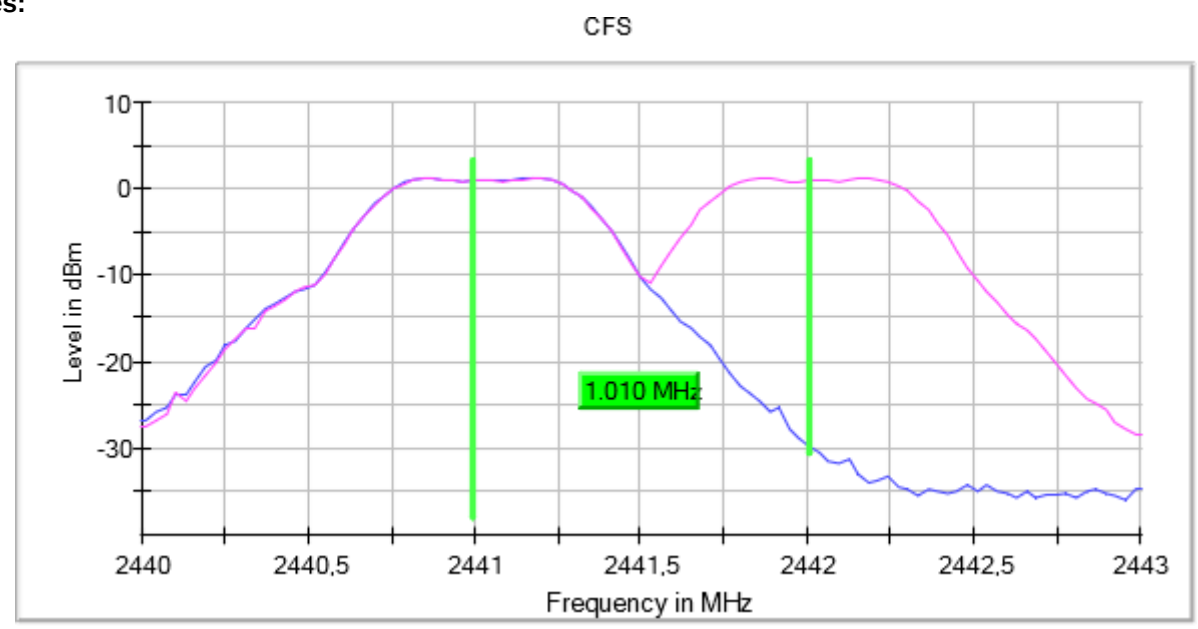
Attachments

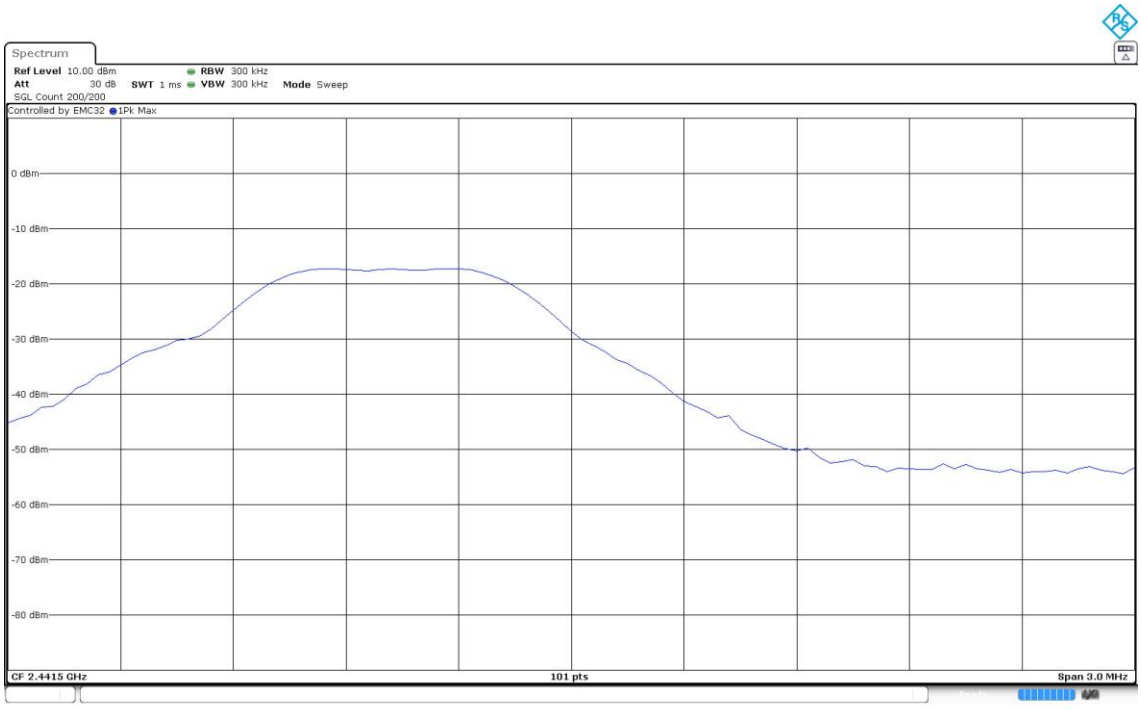
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

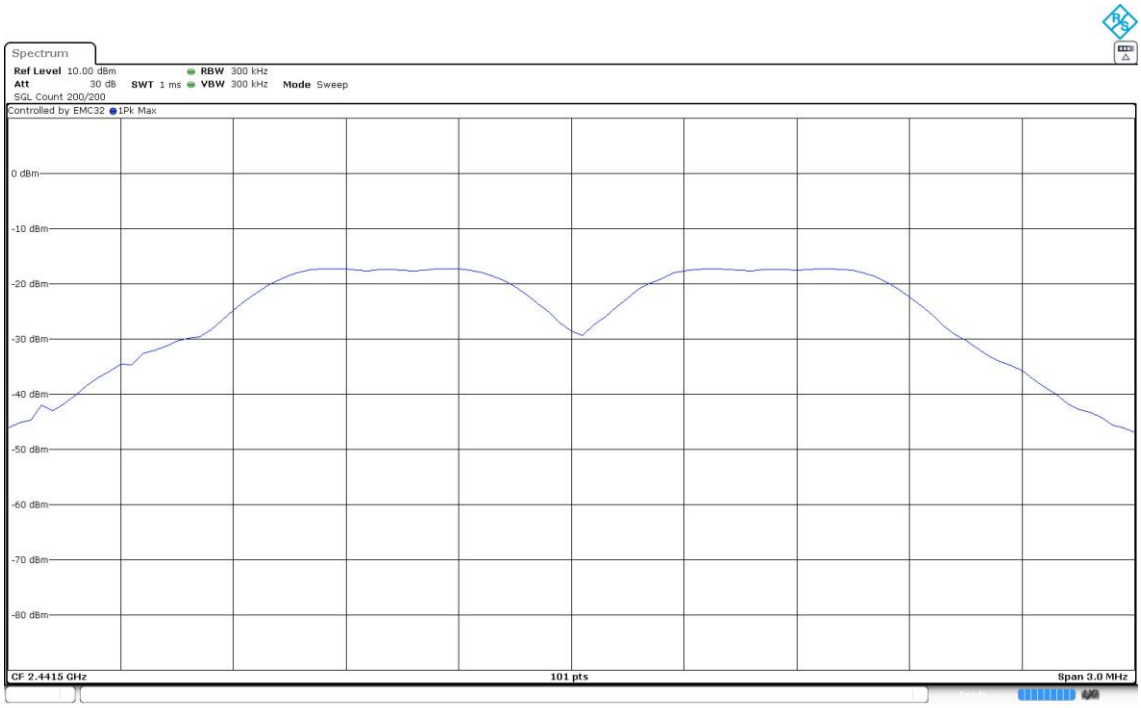
Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO

Active Port = 1

Images:






Spectrum
Ref Level 10.00 dBm
RBW 300 kHz
Att 30 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
Controlled by EMC32
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz

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

MIMO Mode: SISO

Results

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

Verdict

Pass

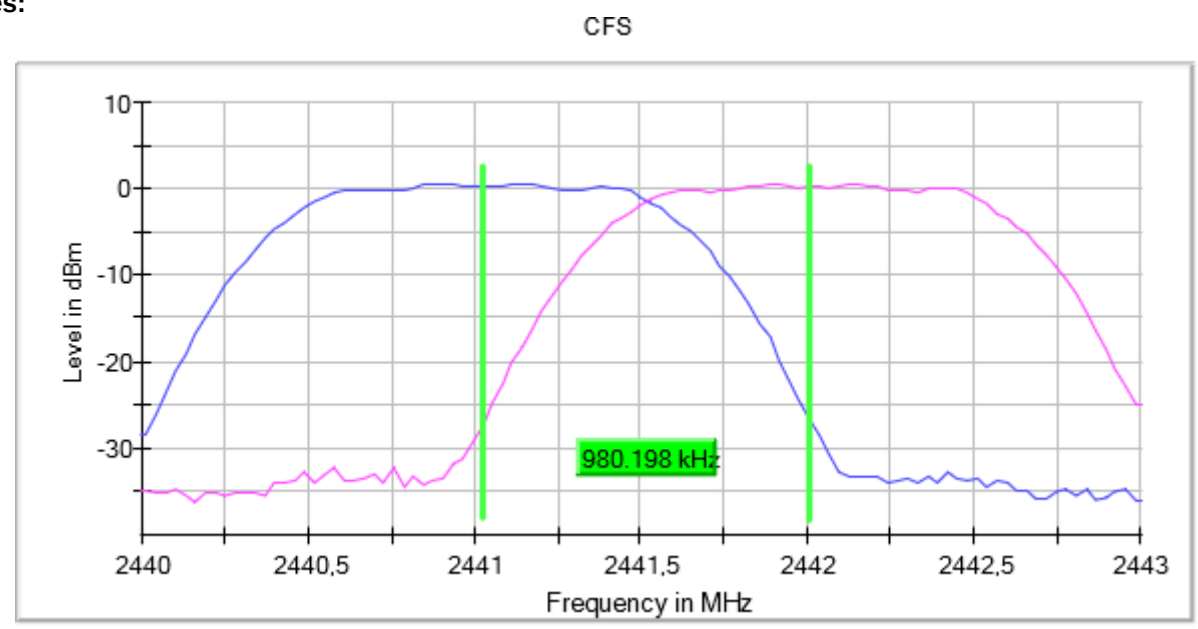
Attachments

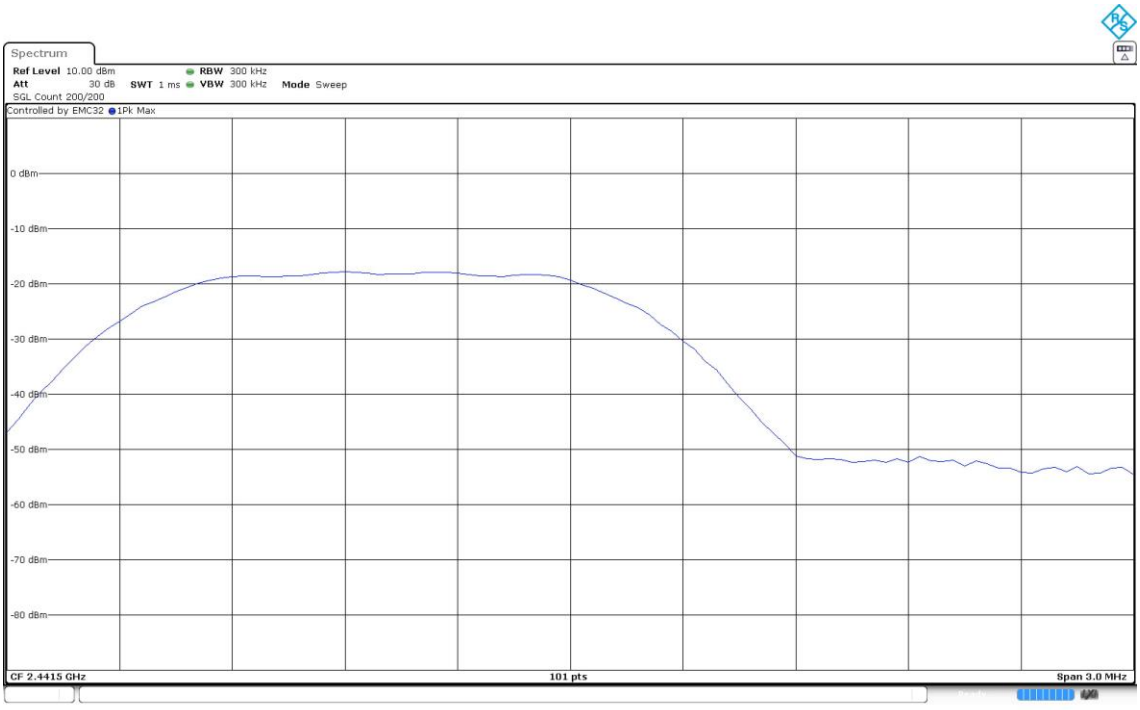
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

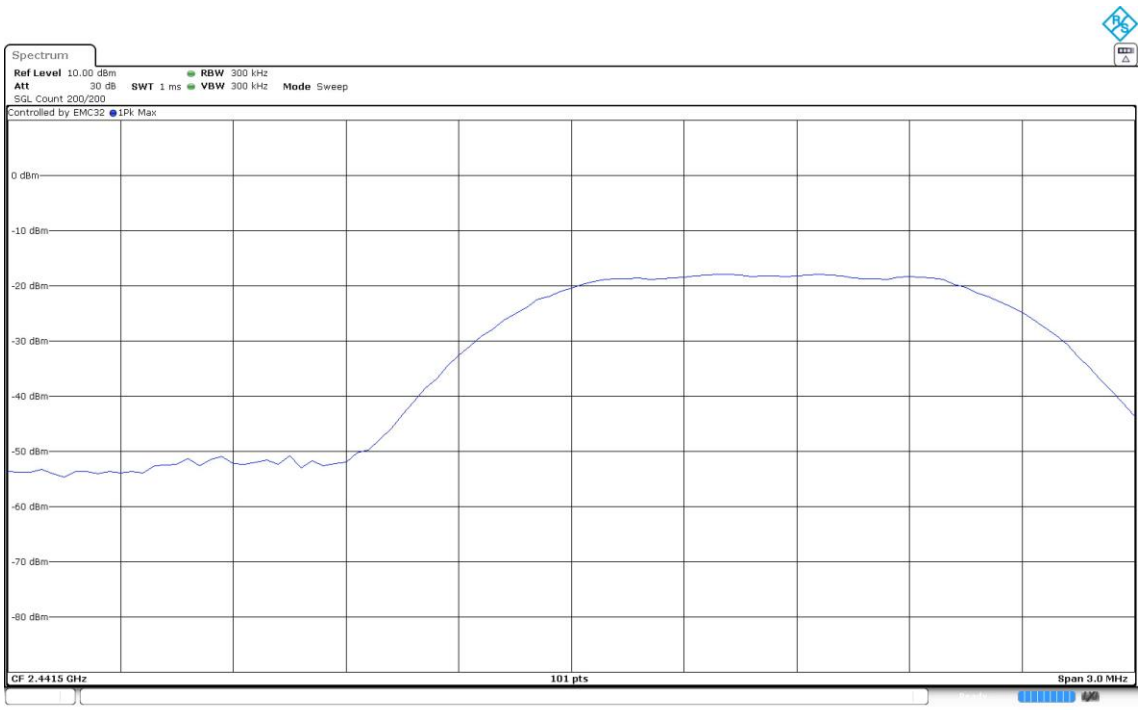
Modulation = BT (Pi/4 DQPSK 2-DH5) MIMO Mode = SISO

Active Port = 1

Images:






Spectrum
Ref Level 10.00 dBm
RBW 300 kHz
Att 30 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
Controlled by EMC32
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz

Modulation: BT (8DPSK 3-DH5)

MIMO Mode: SISO

Results

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

Verdict

Pass

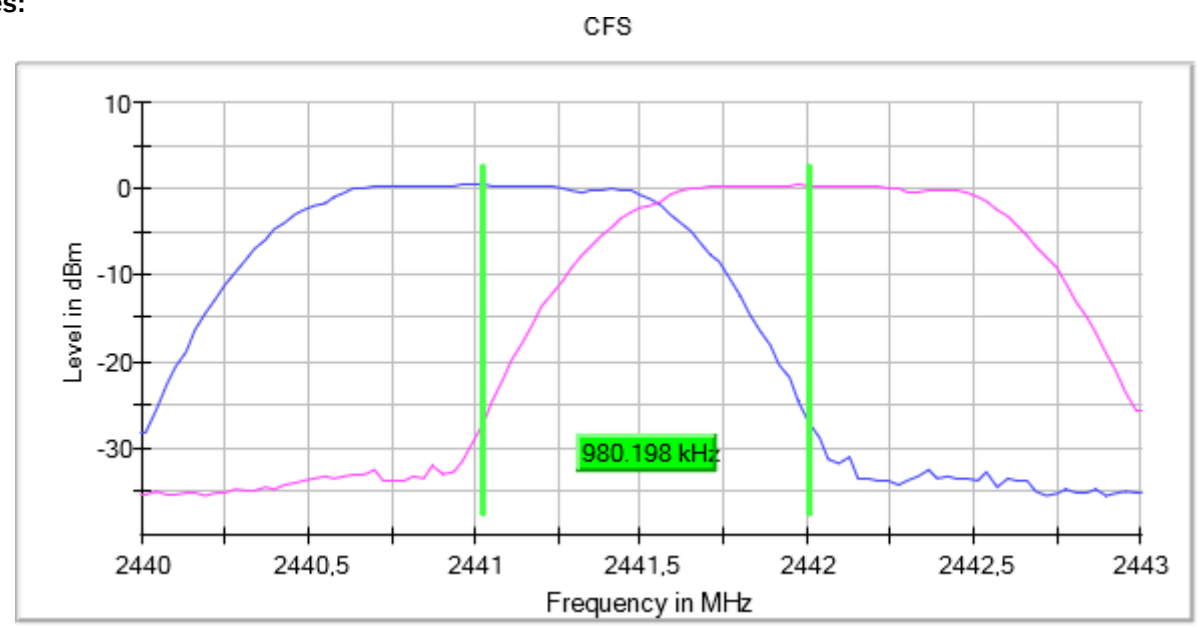
Attachments

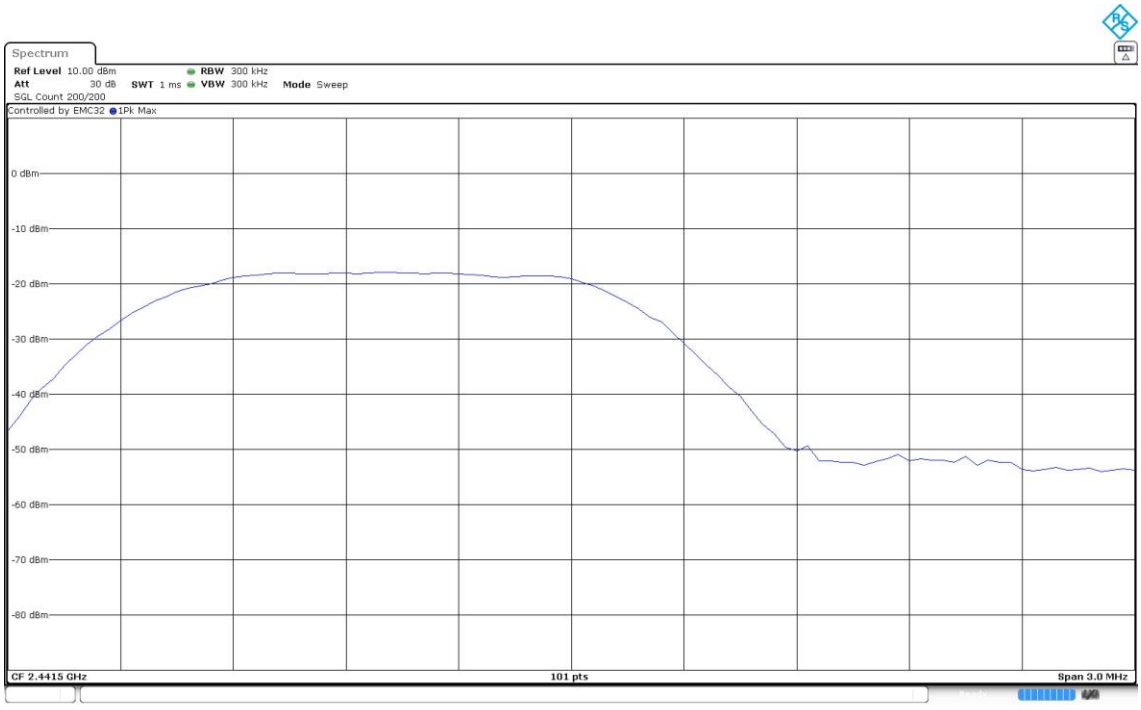
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

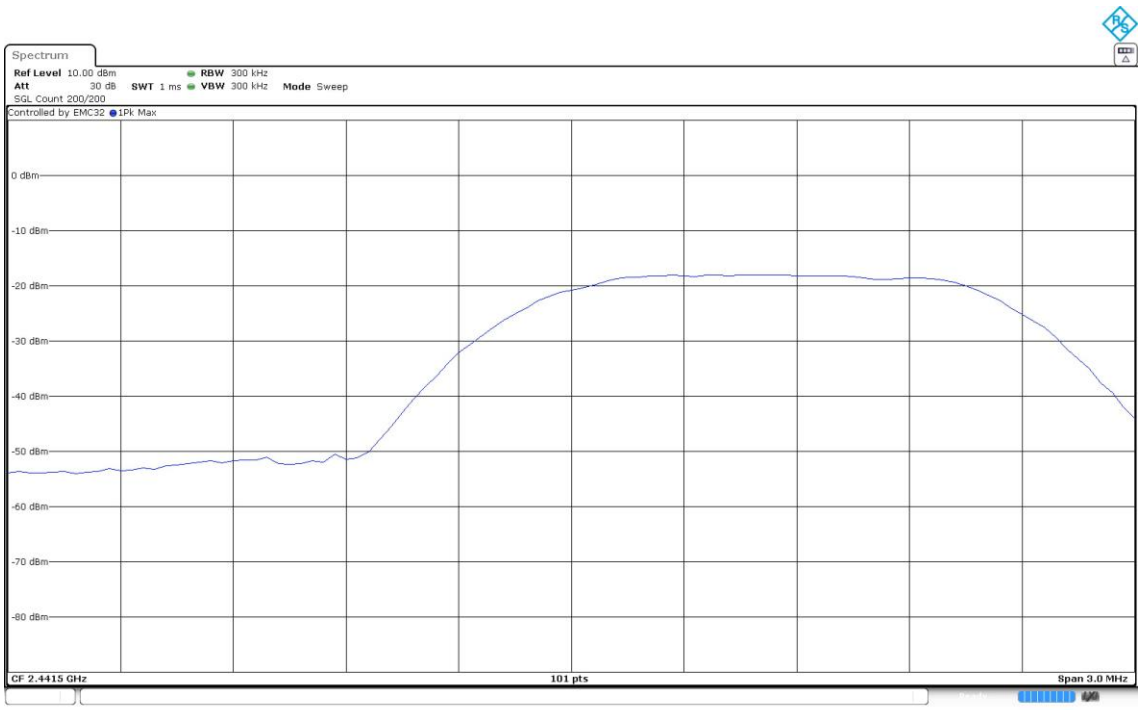
Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO

Active Port = 1

Images:






Spectrum
Ref Level 10.00 dBm
RBW 300 kHz
Att 30 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
Controlled by EMC32
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz

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	91	245.20
			117	313.84
			101	281.62

Verdict

Pass

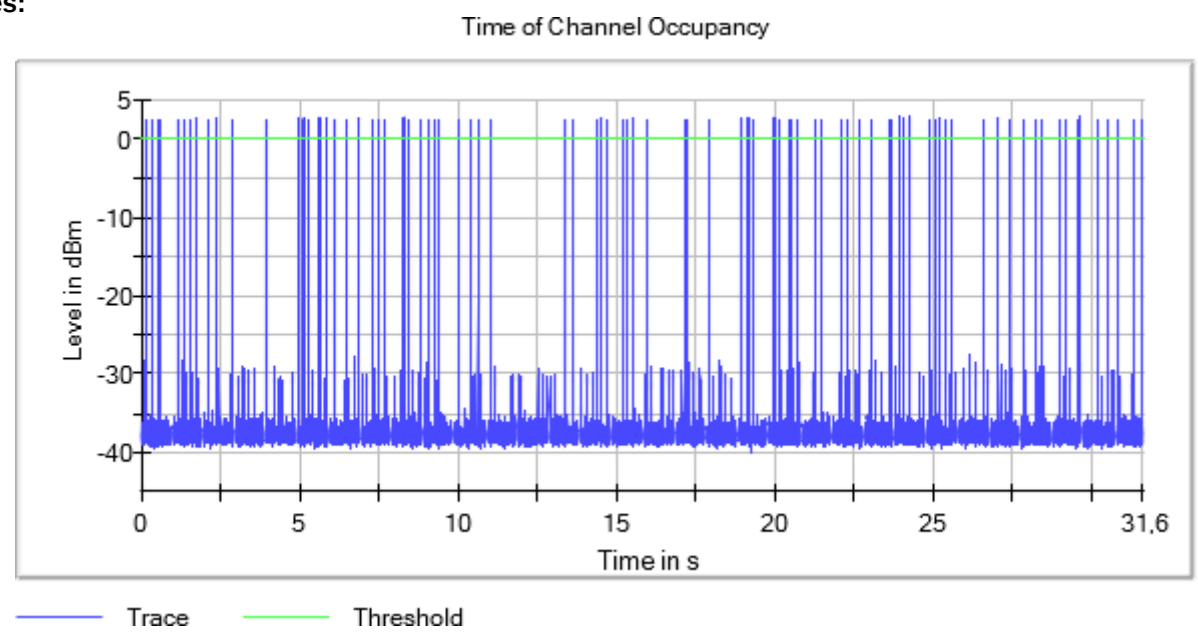
Attachments

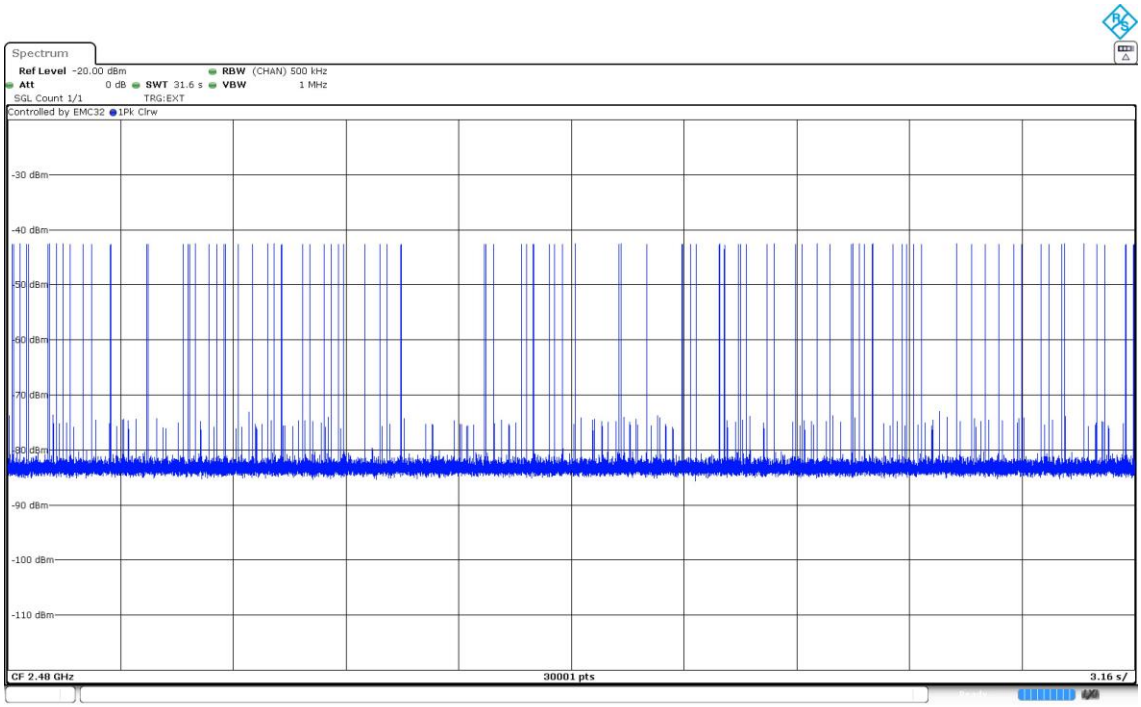
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO

Active Port = 1

Images:



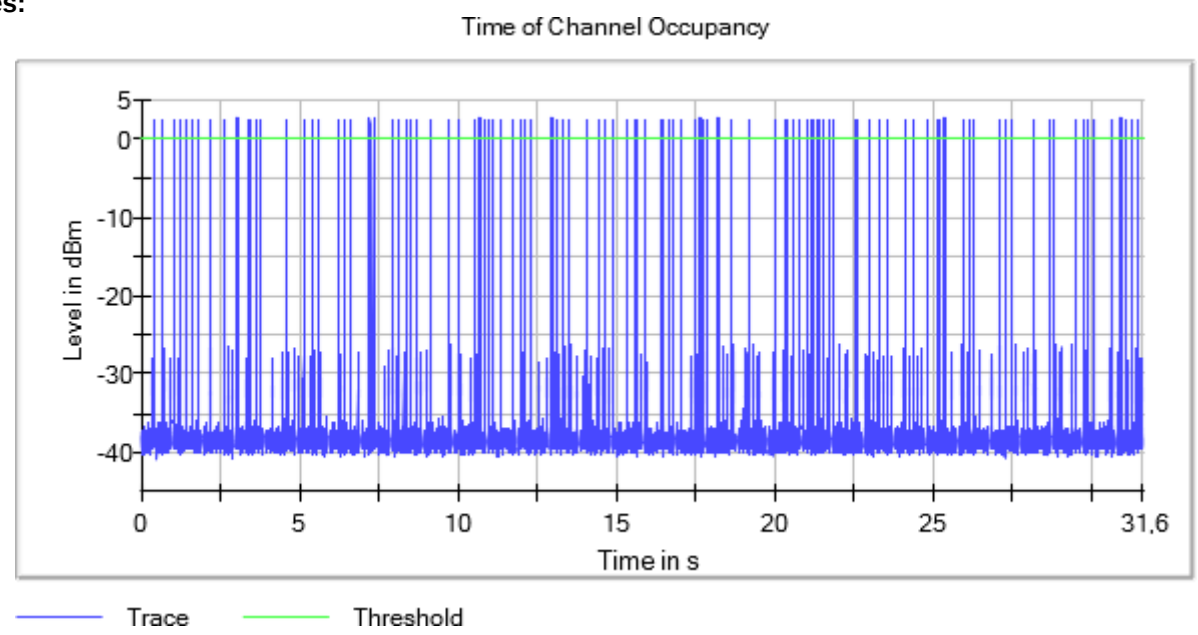


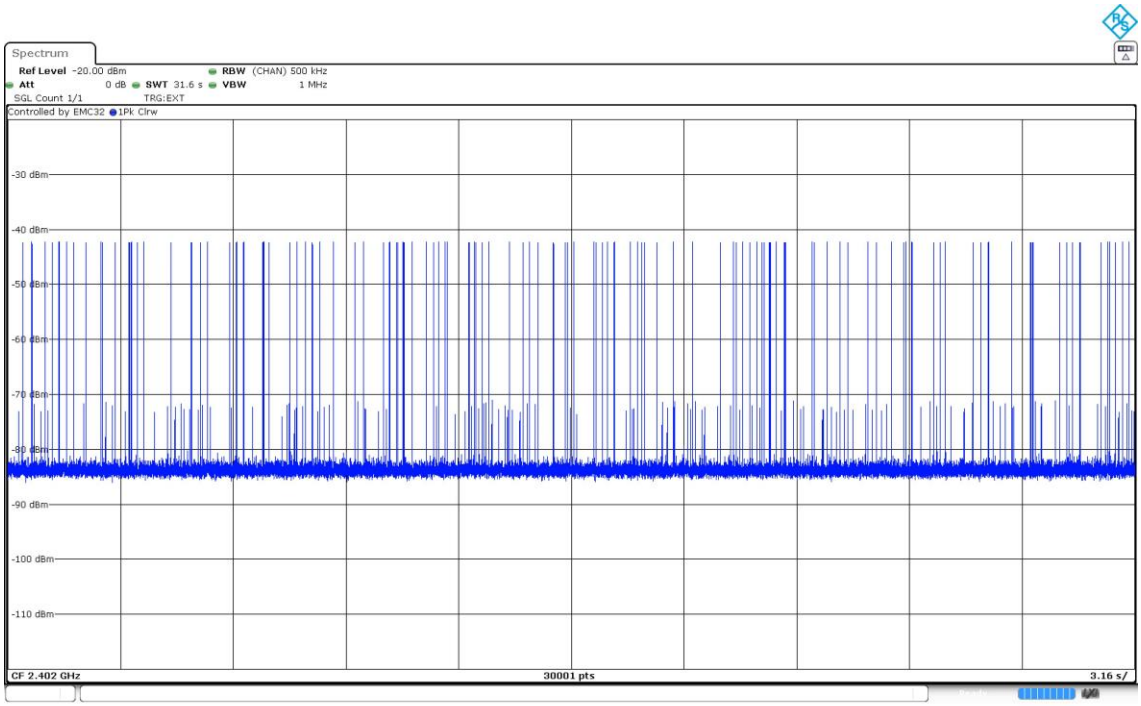
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO

Active Port = 1

Images:



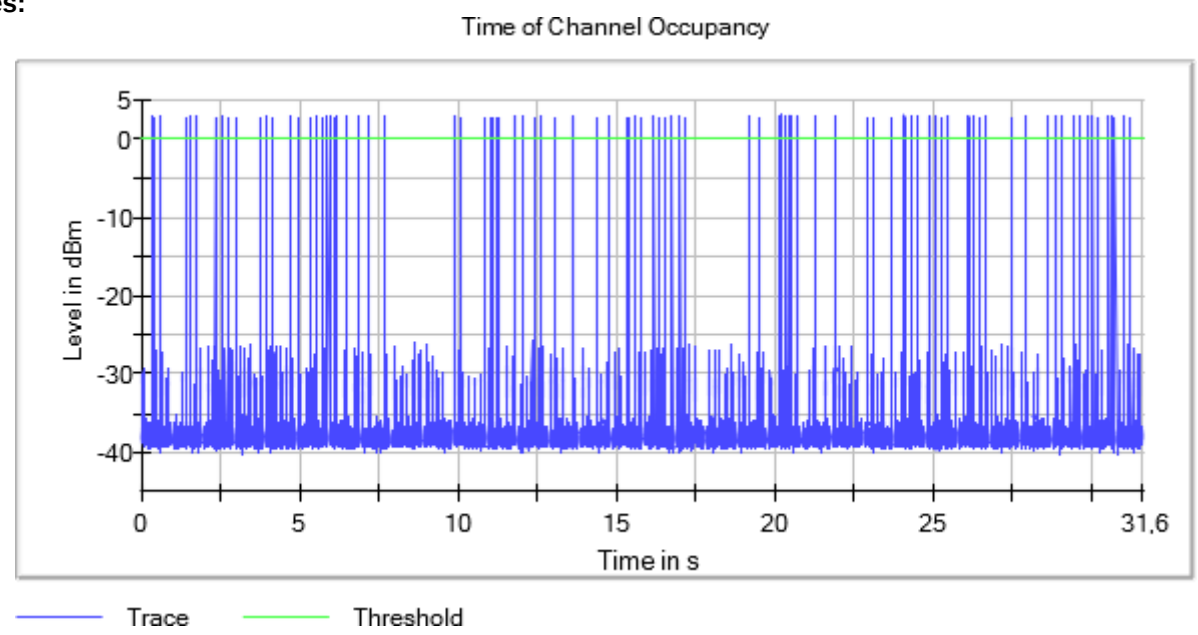


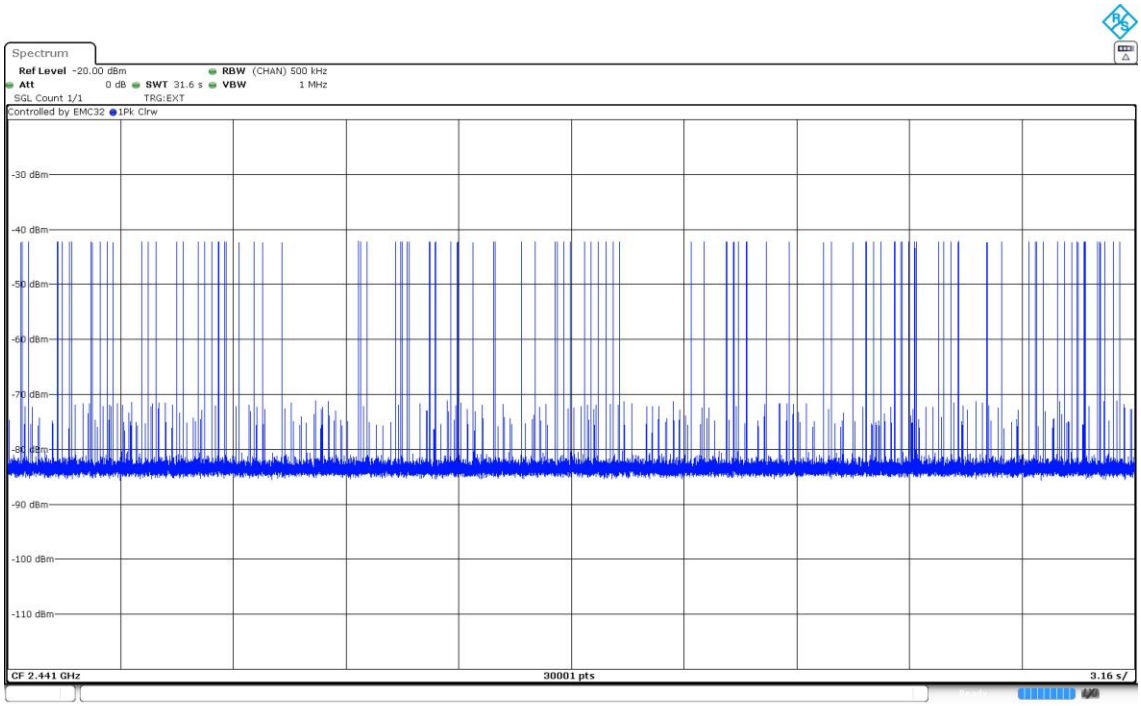
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO

Active Port = 1

Images:





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

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHp	Avg COT (ms)
Frequency Hopping Spread Spectrum systems (DSS)	1	1	108	85.17
			119	80.87
			109	85.66

Verdict

Pass

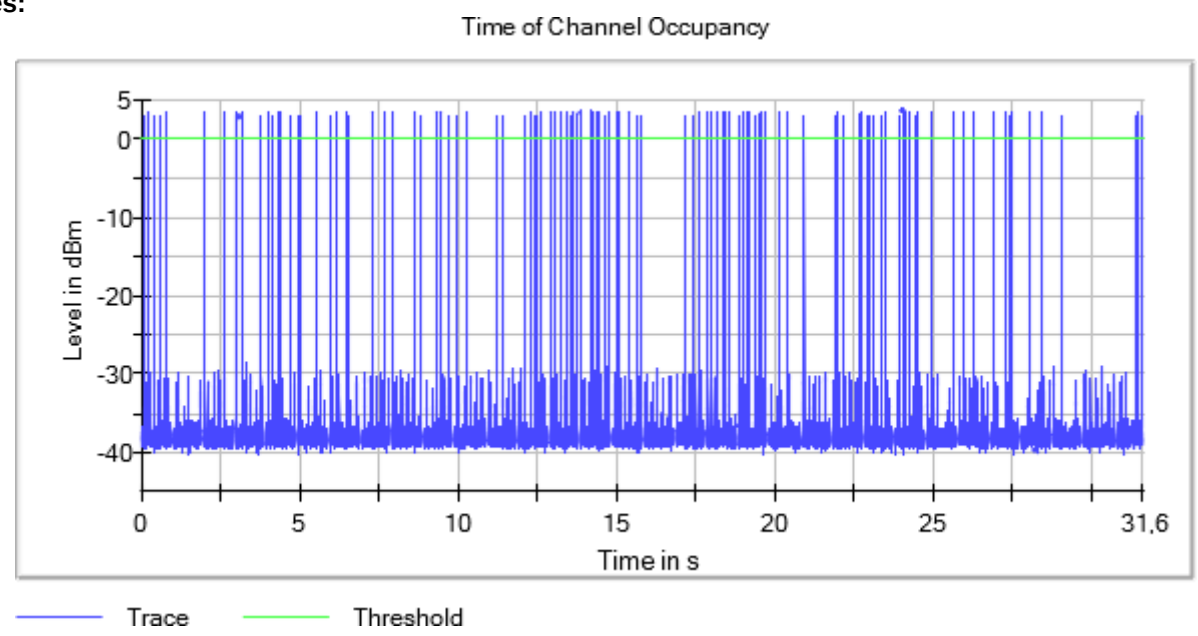
Attachments

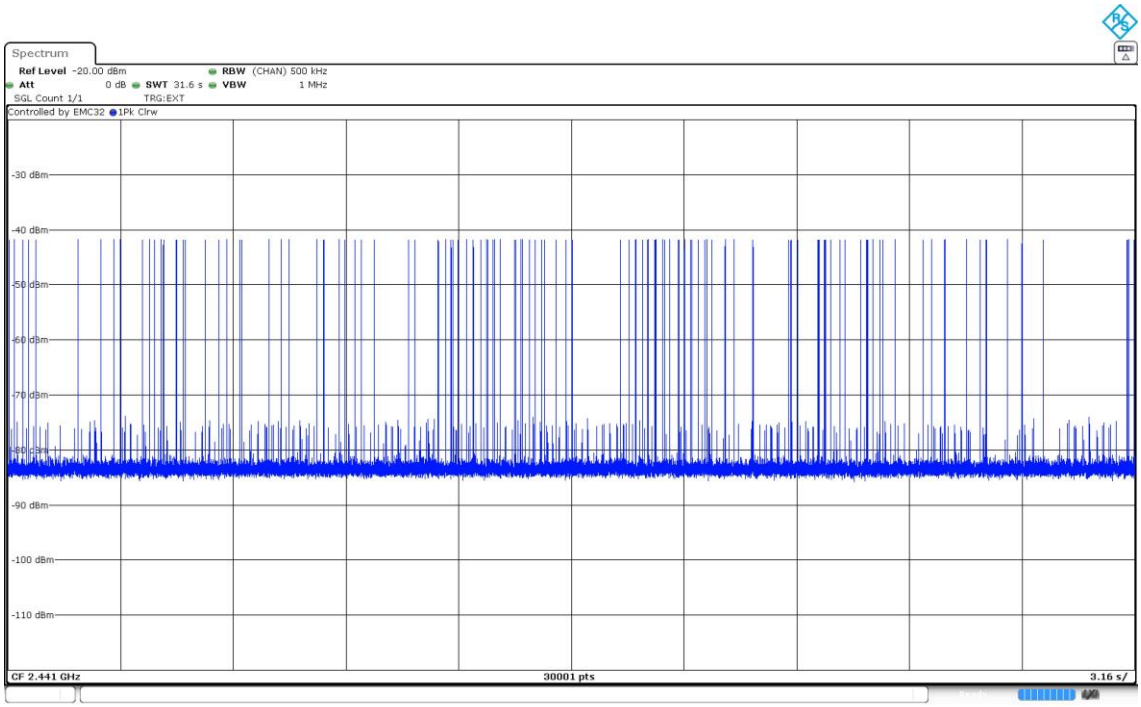
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) MIMO Mode = SISO

Active Port = 1

Images:



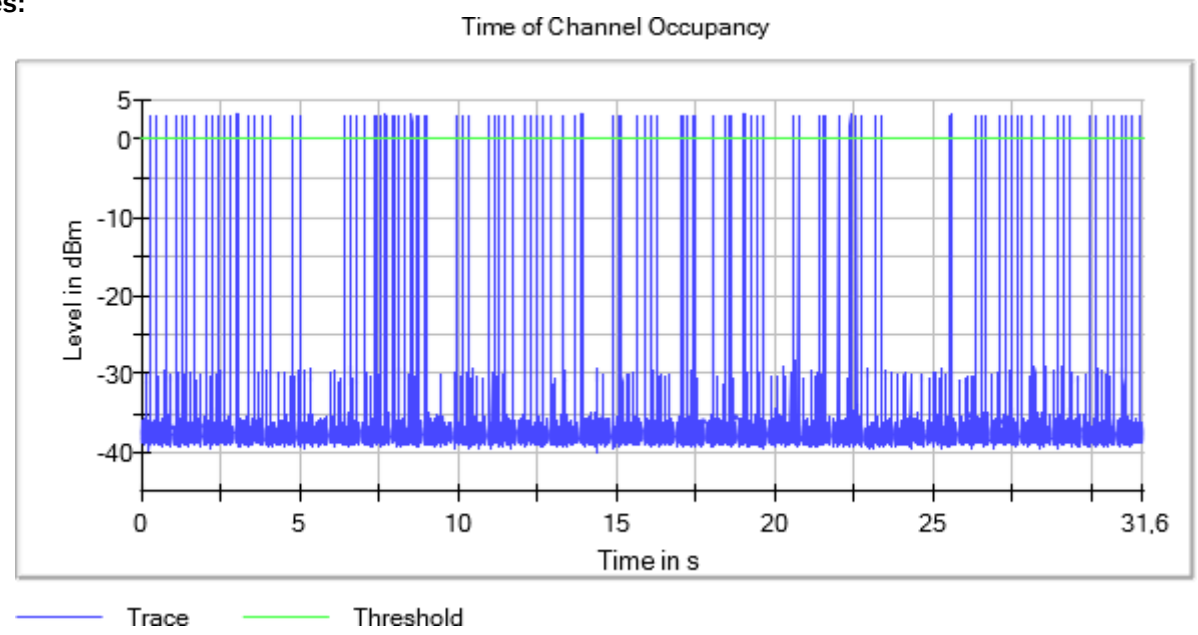


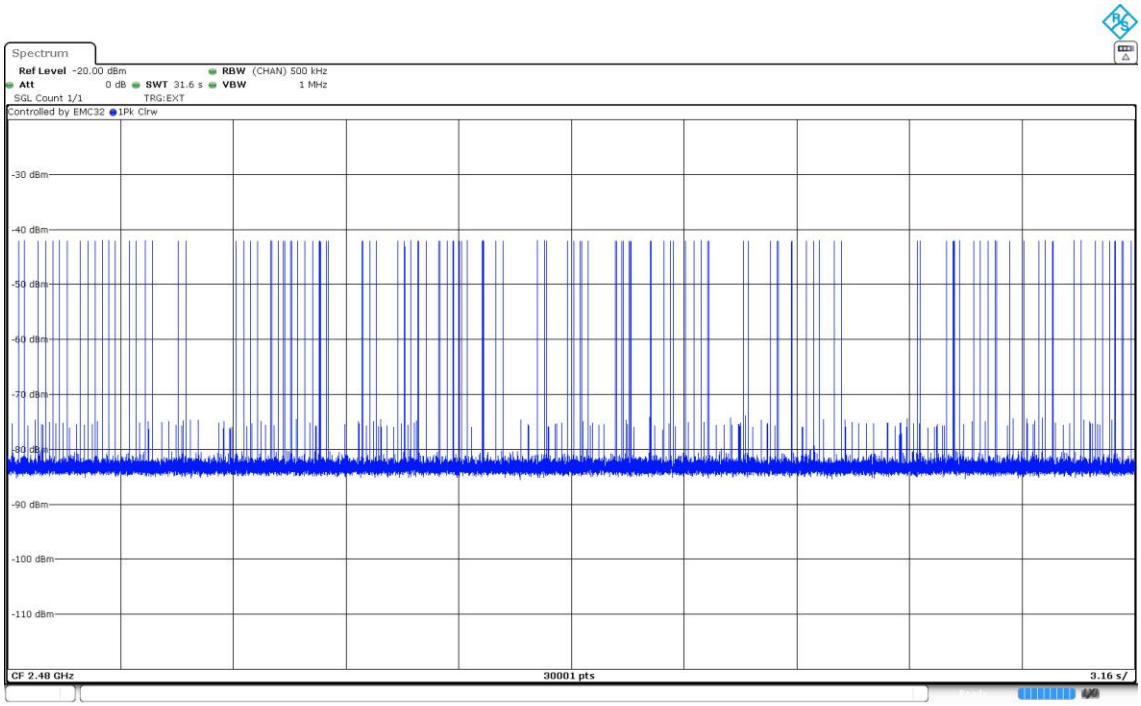
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) MIMO Mode = SISO

Active Port = 1

Images:



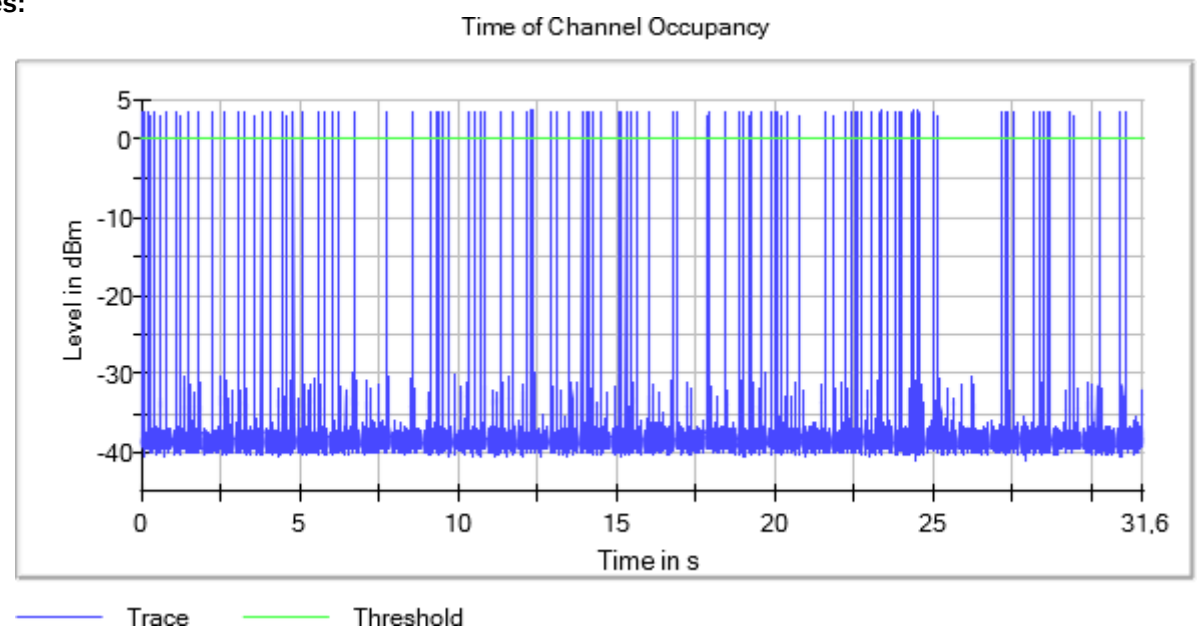


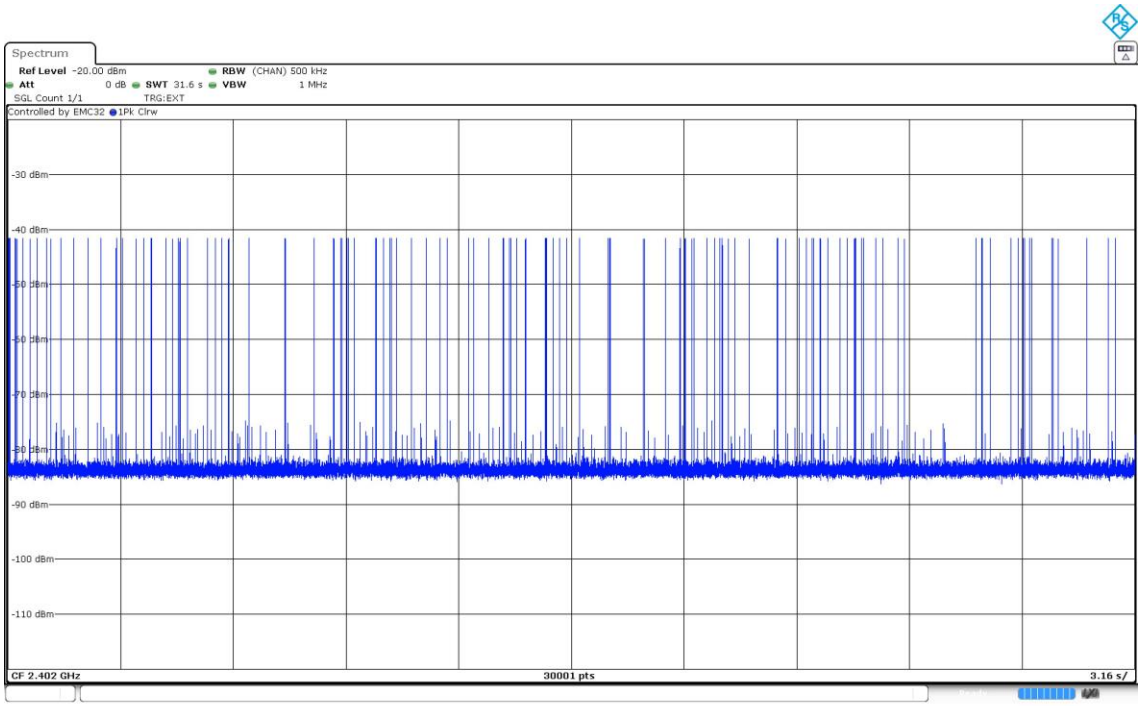
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) 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	115	80.58
			114	81.58
			101	65.16

Verdict

Pass

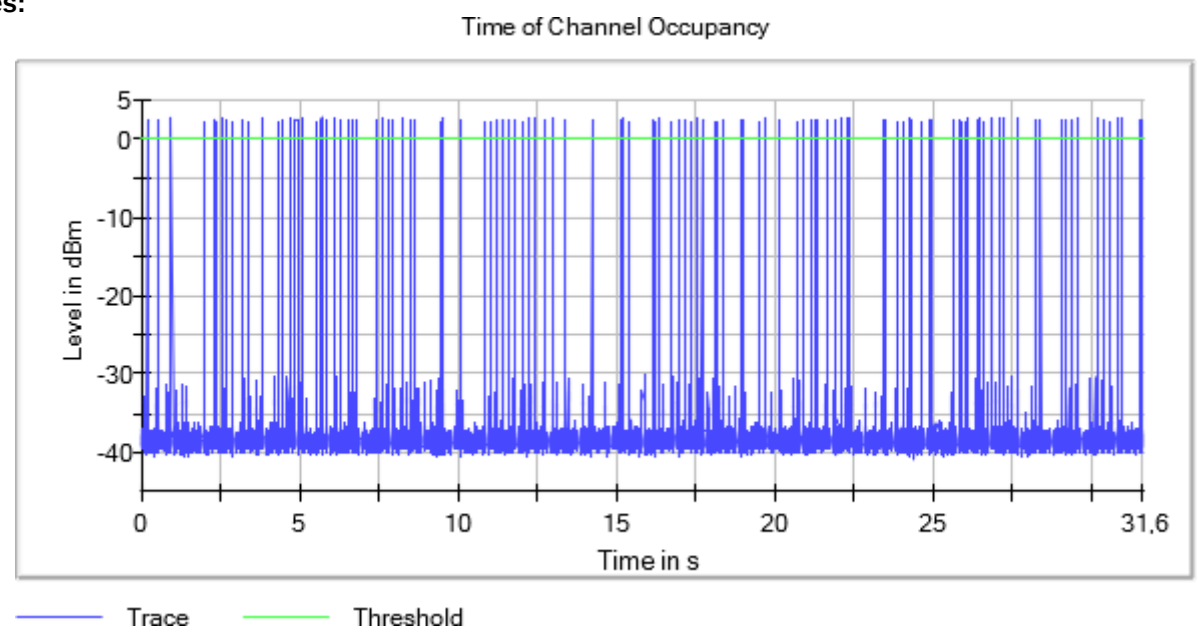
Attachments

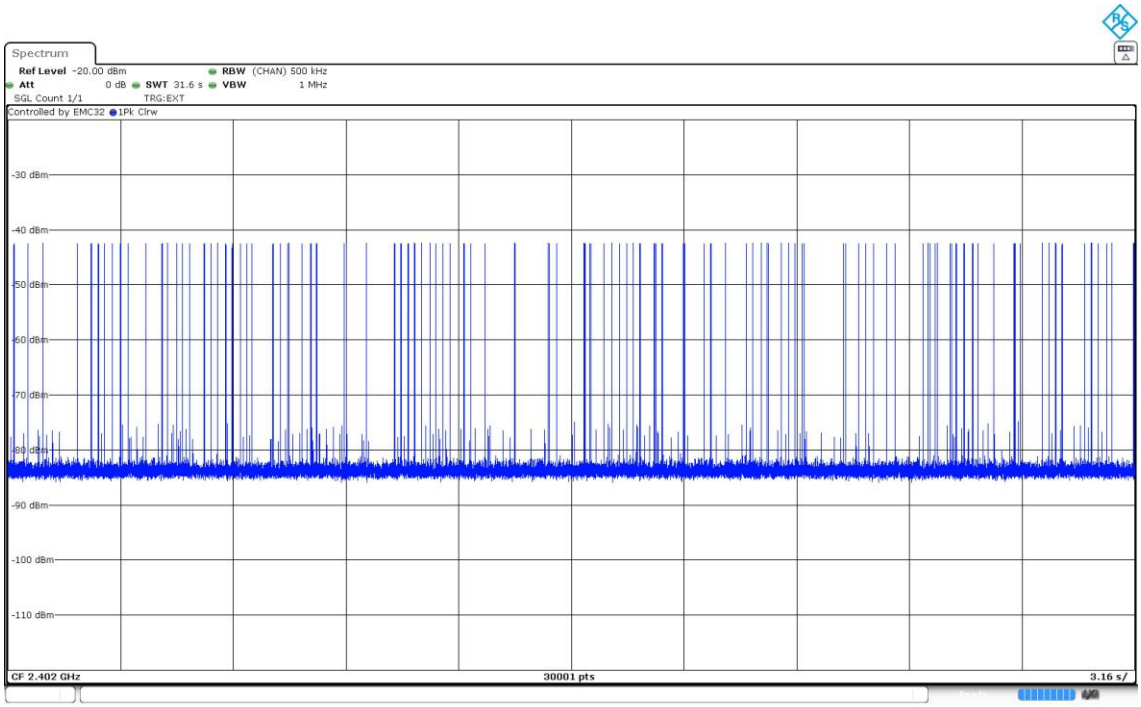
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO

Active Port = 1

Images:



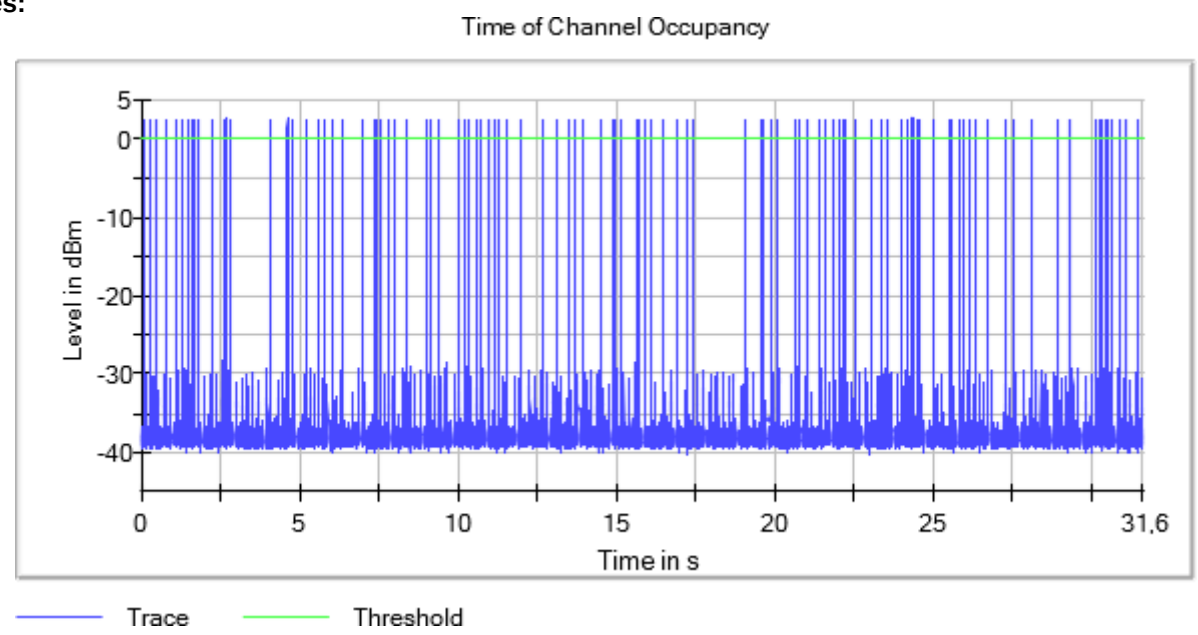


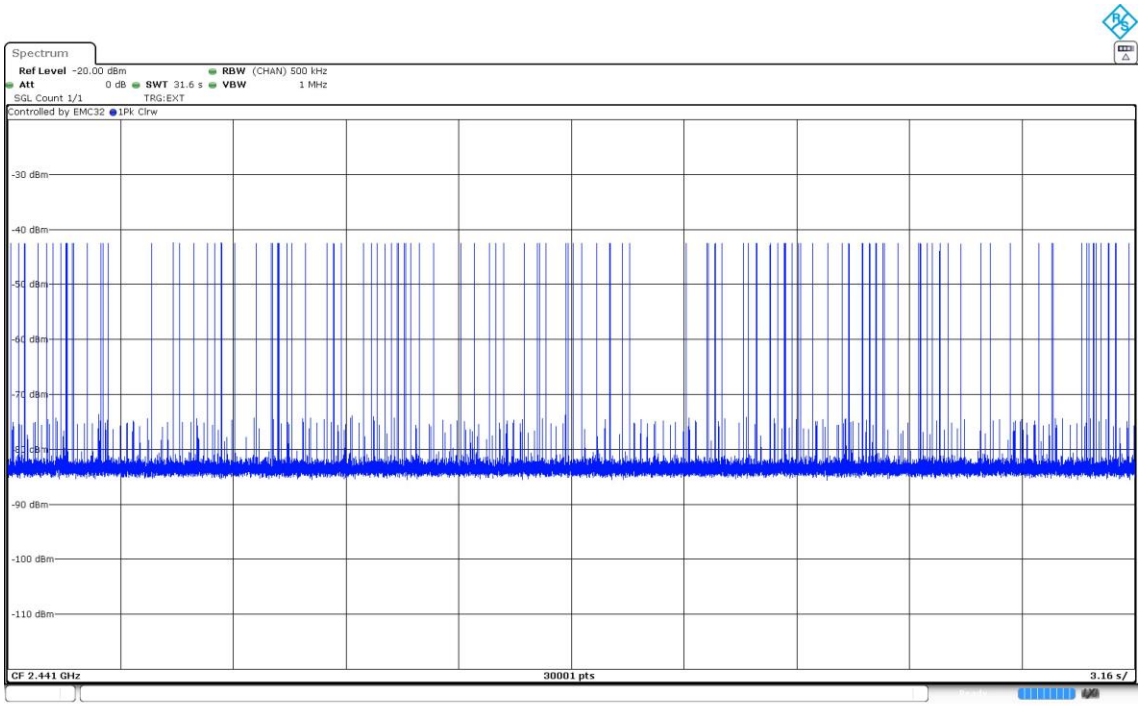
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (8DPSK 3-DH5) MIMO Mode = SISO

Active Port = 1

Images:



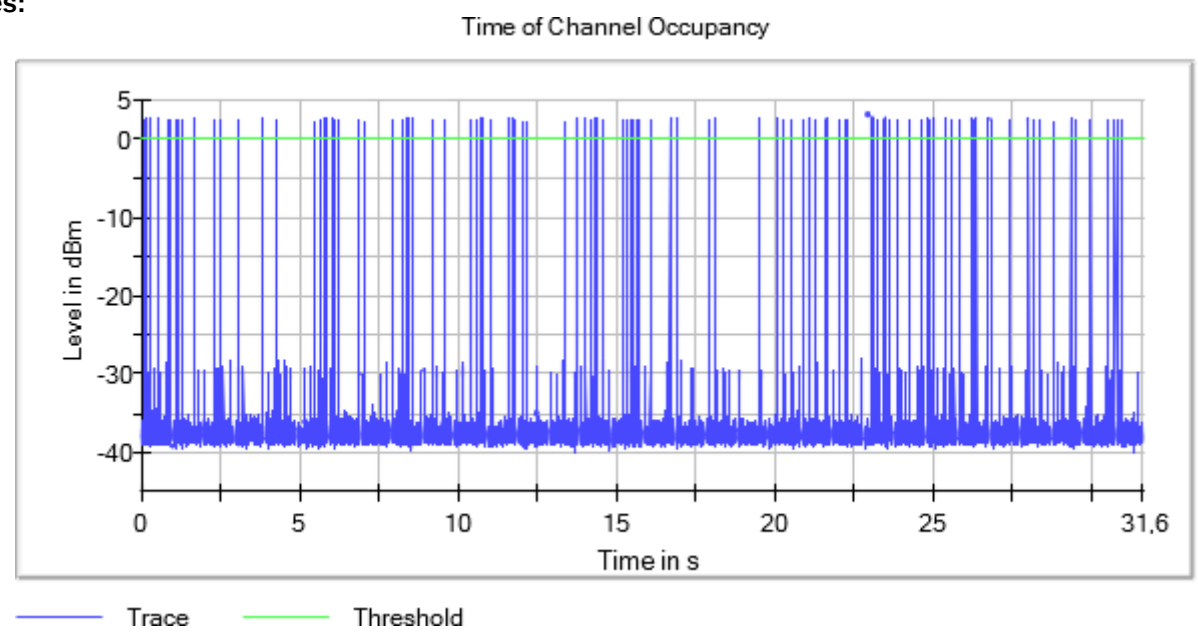


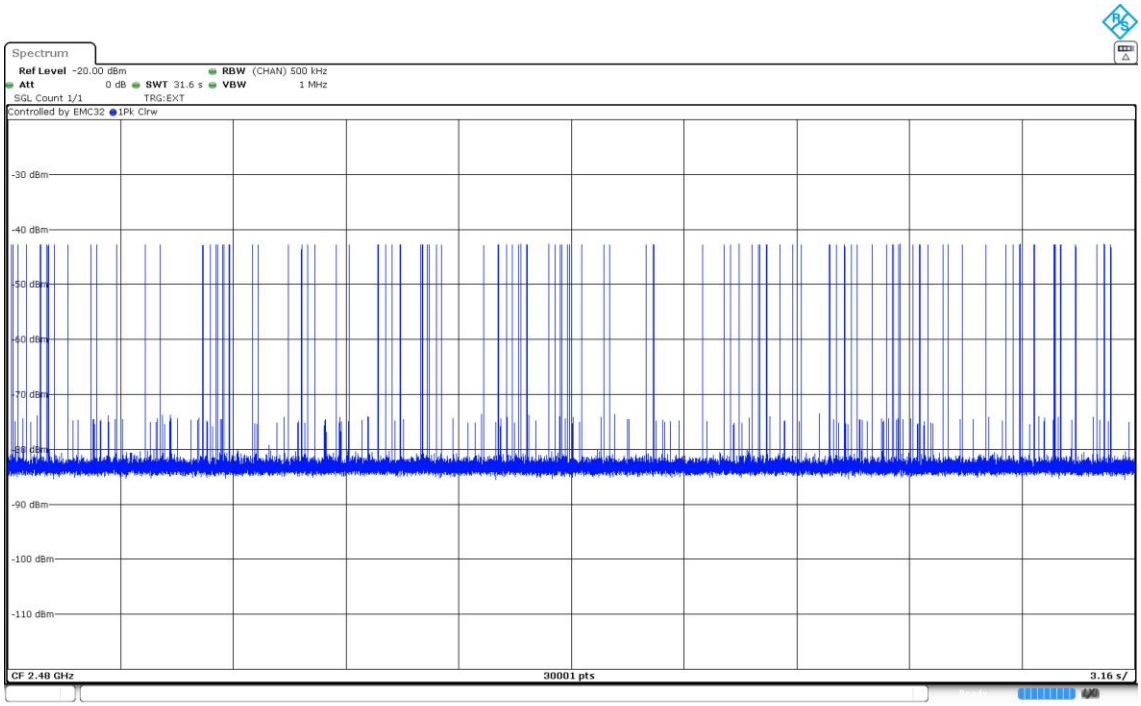
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

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

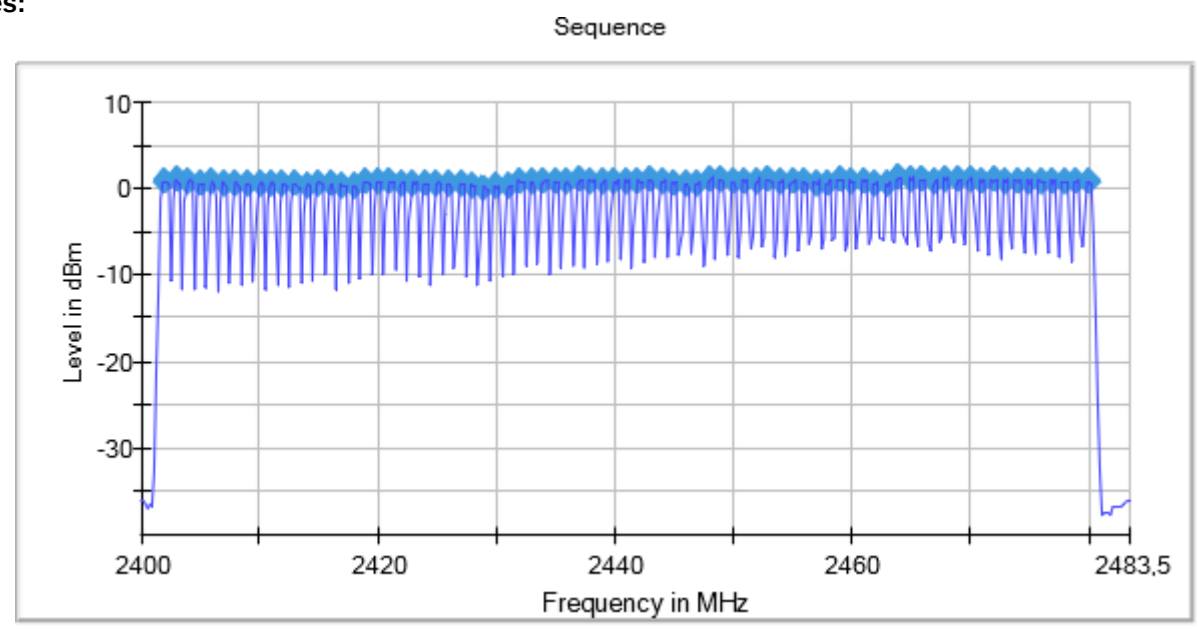
Attachments

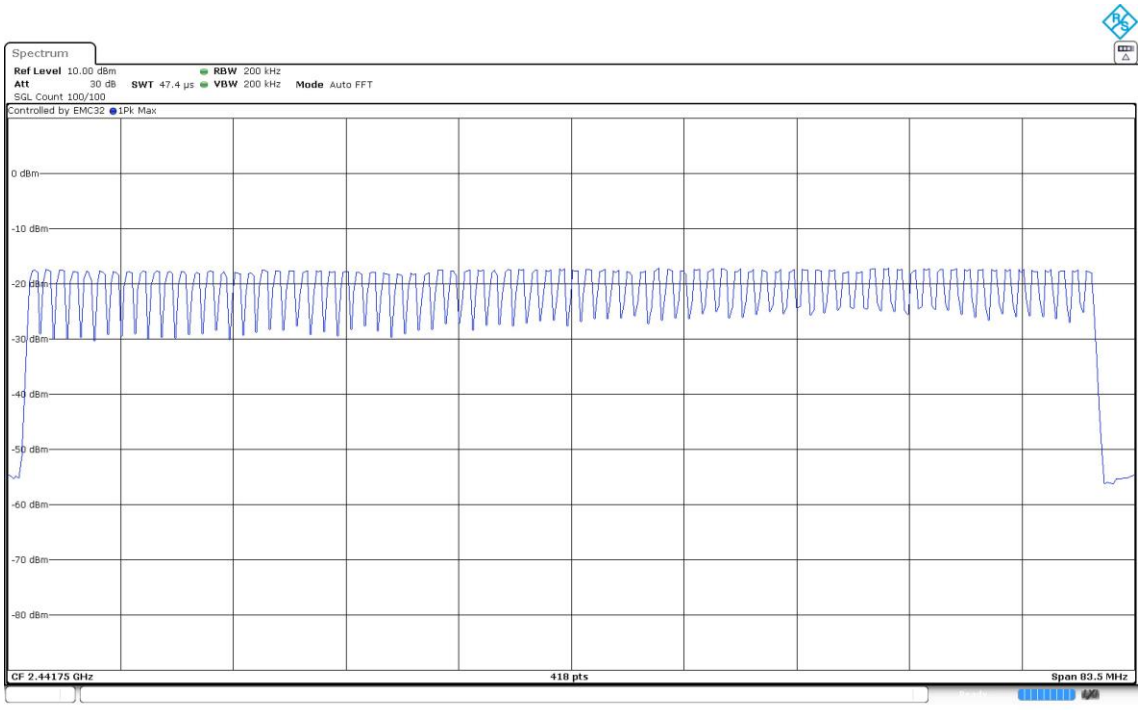
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (GFSK 1-DH5) MIMO Mode = SISO

Active Port = 1

Images:





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

MIMO Mode: SISO

Results

Equipment	BW (MHz)	Port	NHC
Frequency Hopping Spread Spectrum systems (DSS)	1	1	80

Verdict

Pass

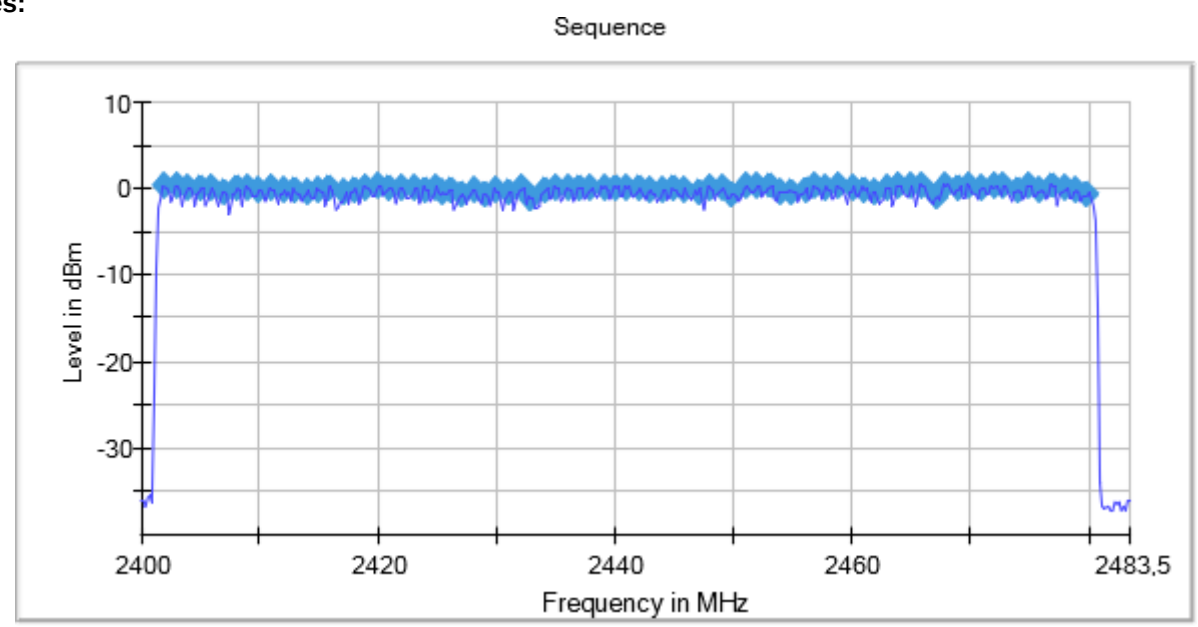
Attachments

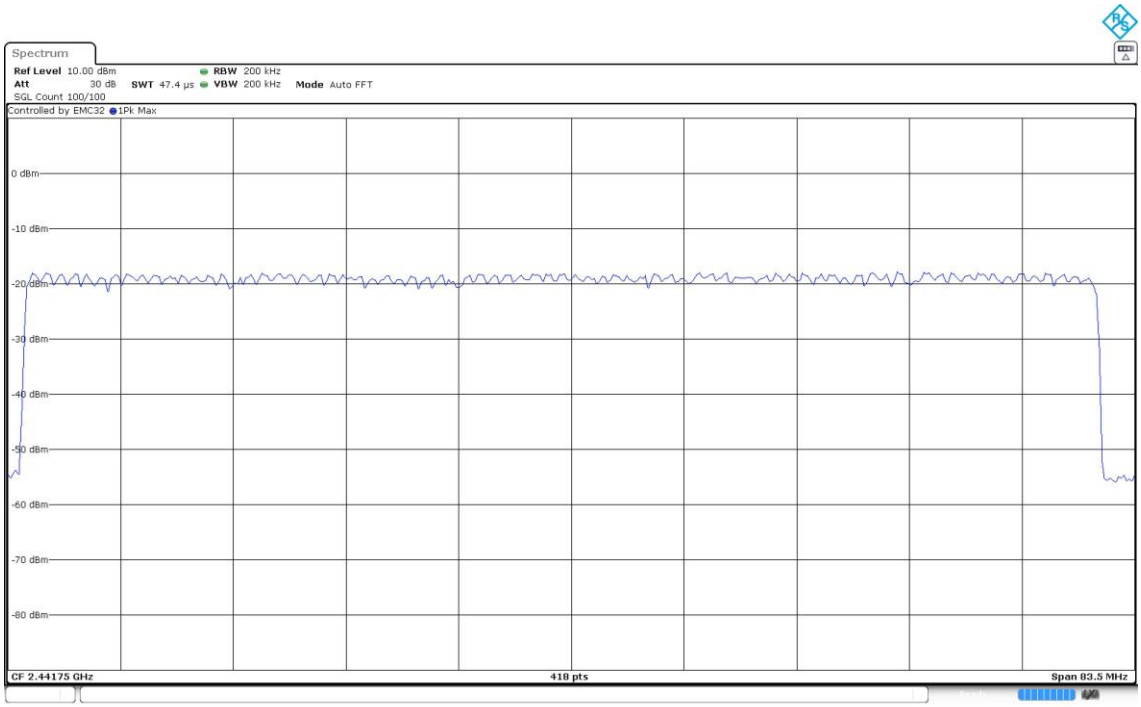
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) 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	81

Verdict

Pass

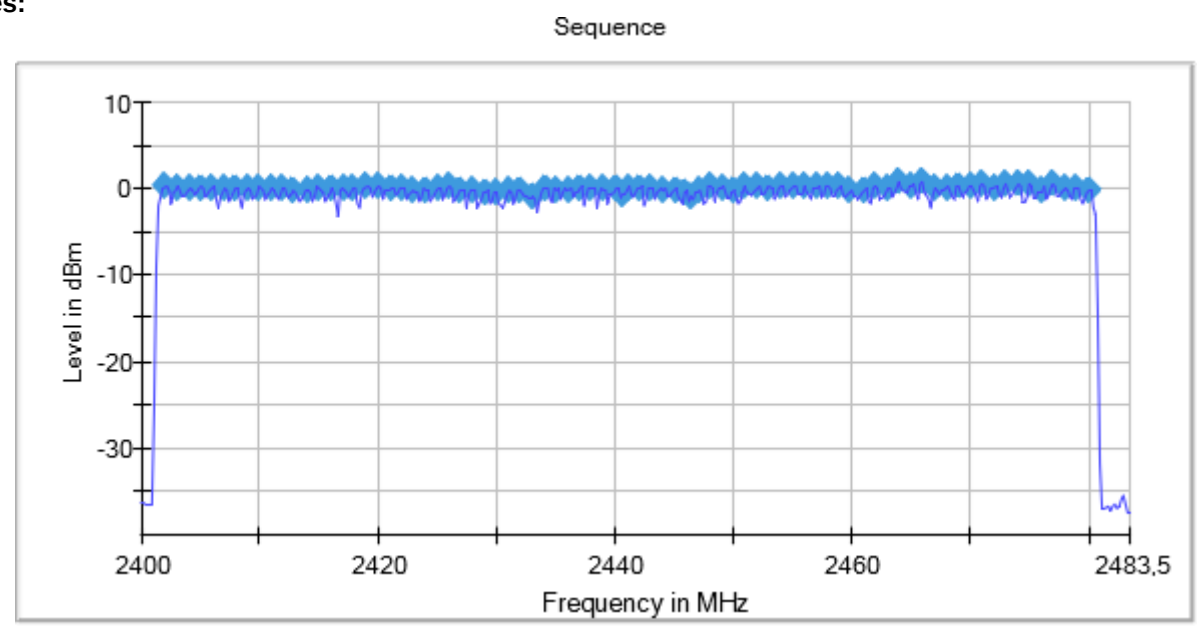
Attachments

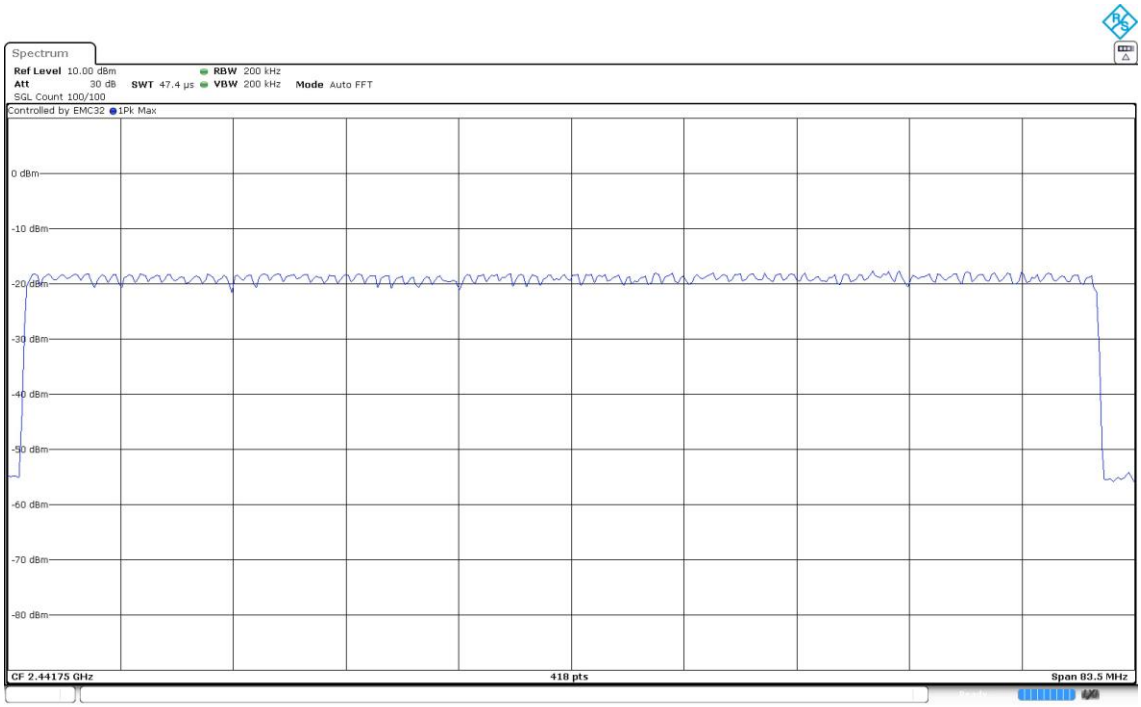
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

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: -0.4dBi

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

Results

Equipment	BW (MHz)	Freq (MHz)	Port	Peak Power (dBm)	EIRP (dBm)
Frequency Hopping Spread Spectrum systems (DSS)	1	2402.00000	1	1.3260	0.9260
		2441.00000		1.5560	1.1560
		2480.00000		1.3980	0.9980

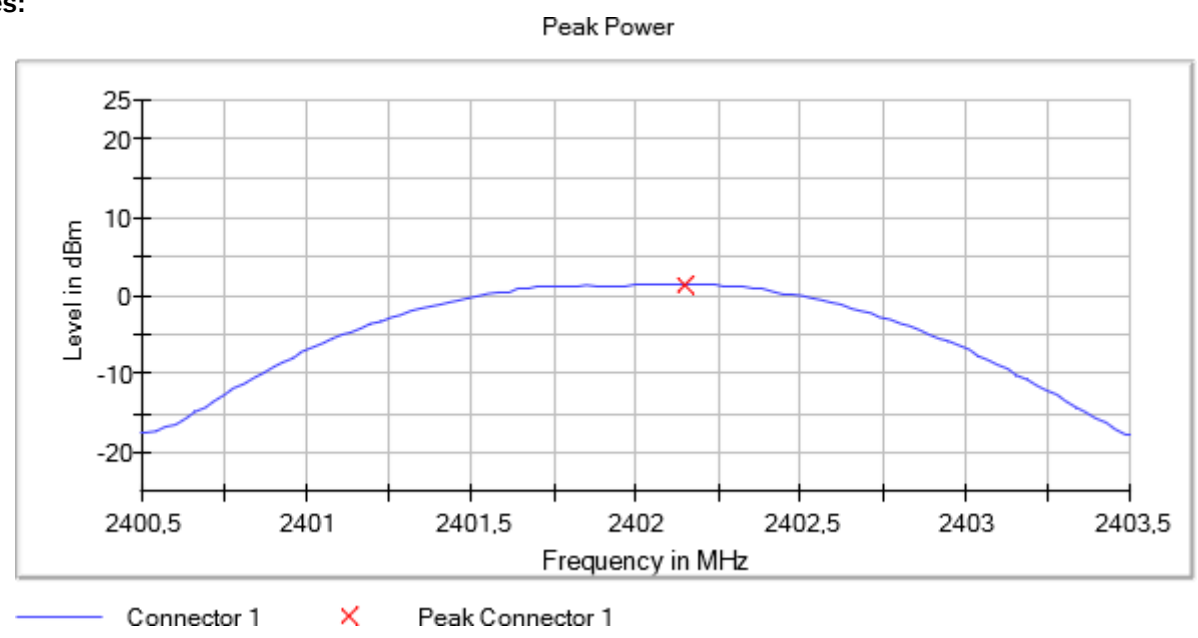
Verdict

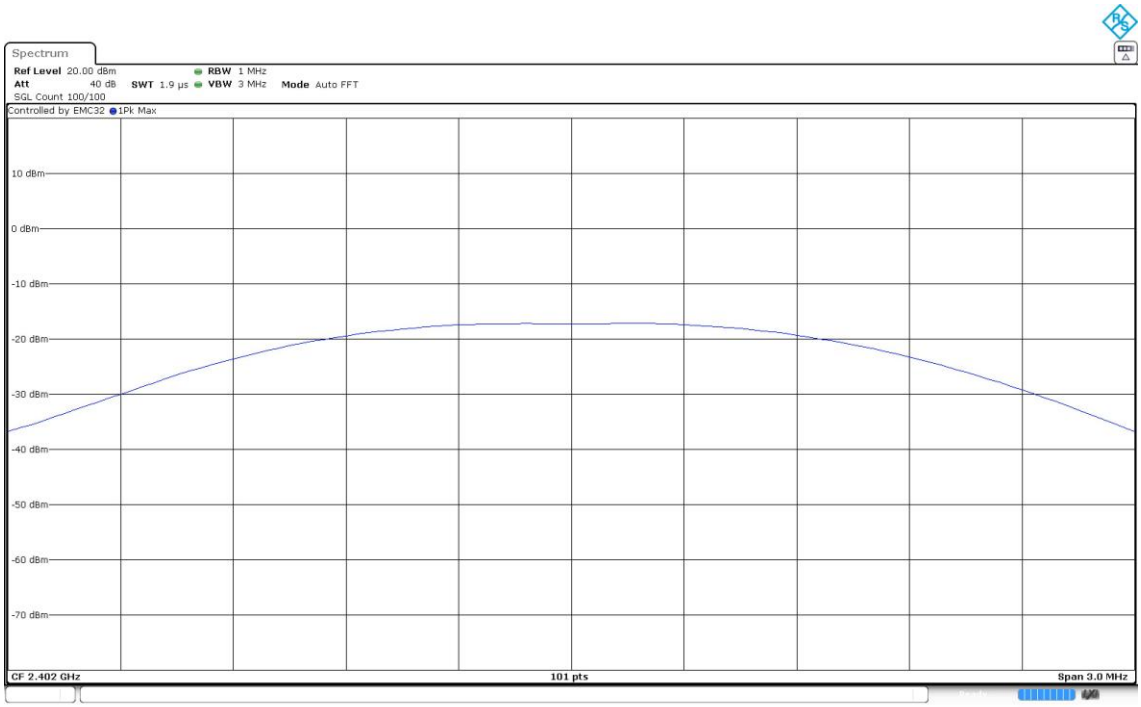
Pass

Attachments

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

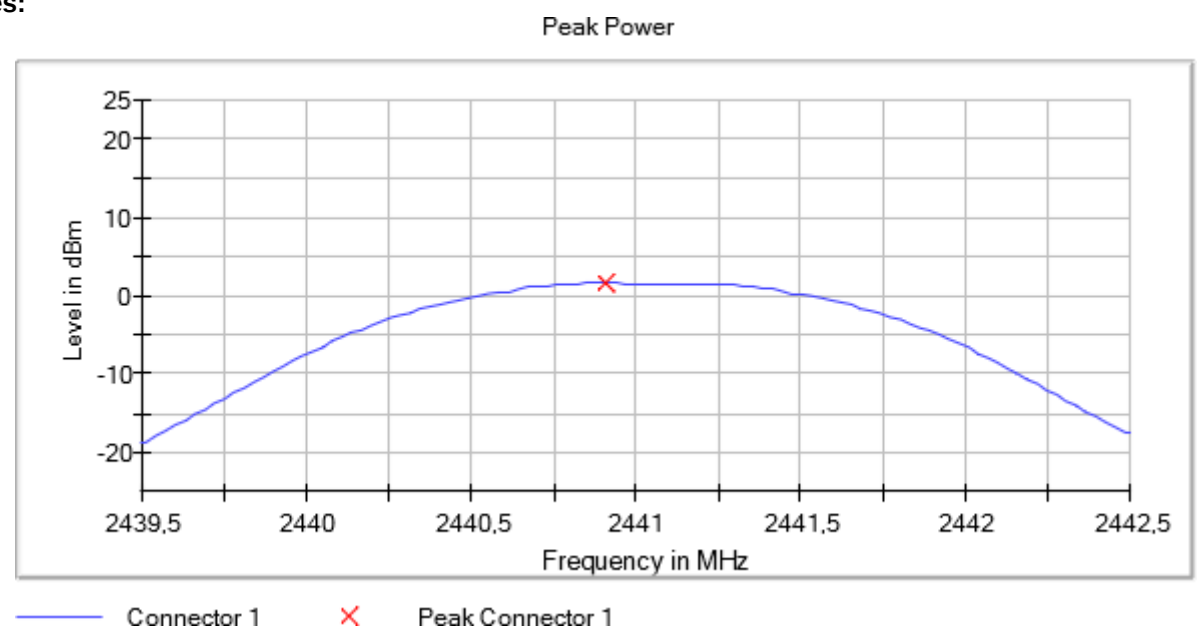
Images:

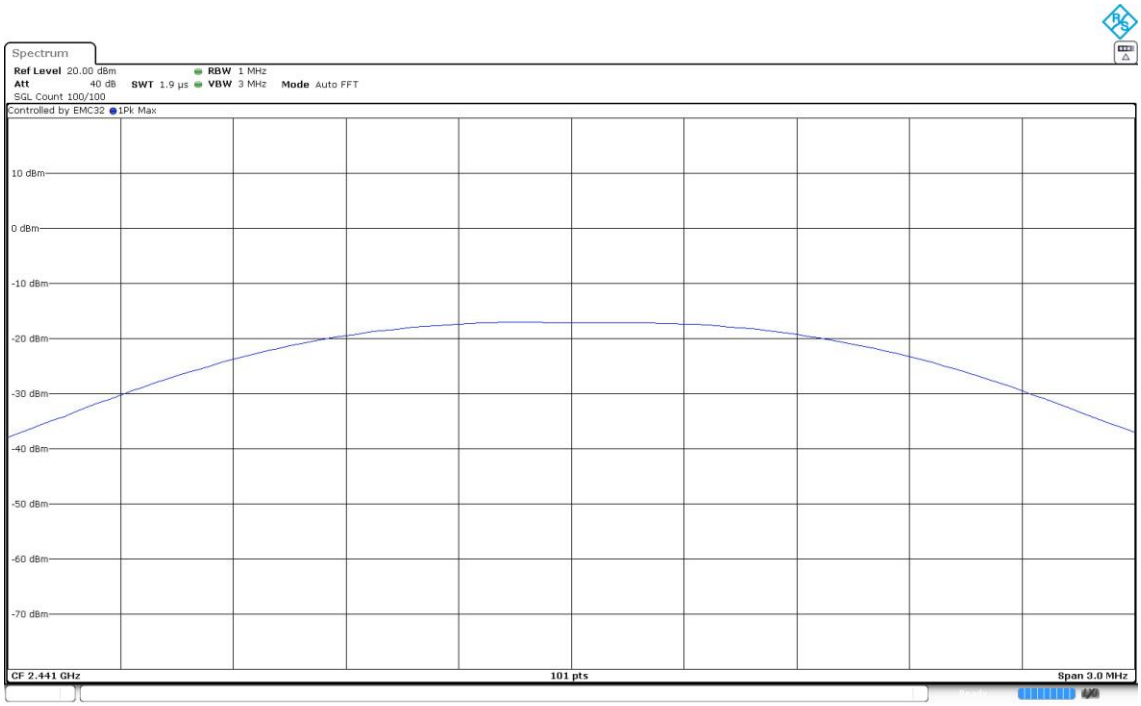




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2441.00000
Active Port = 1

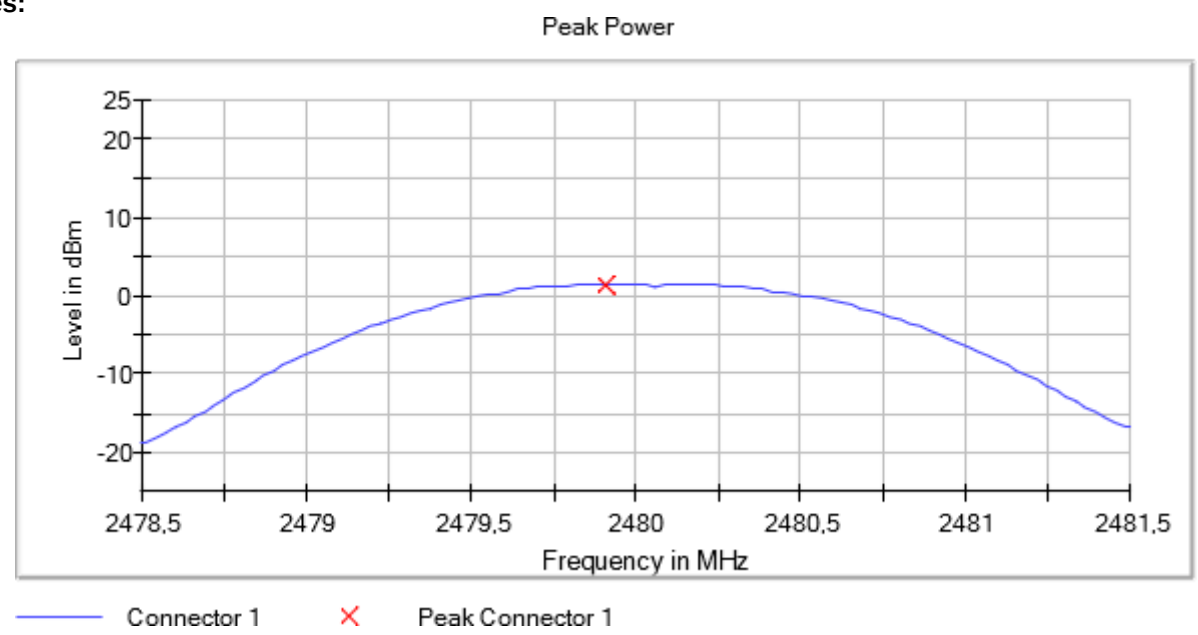
Images:

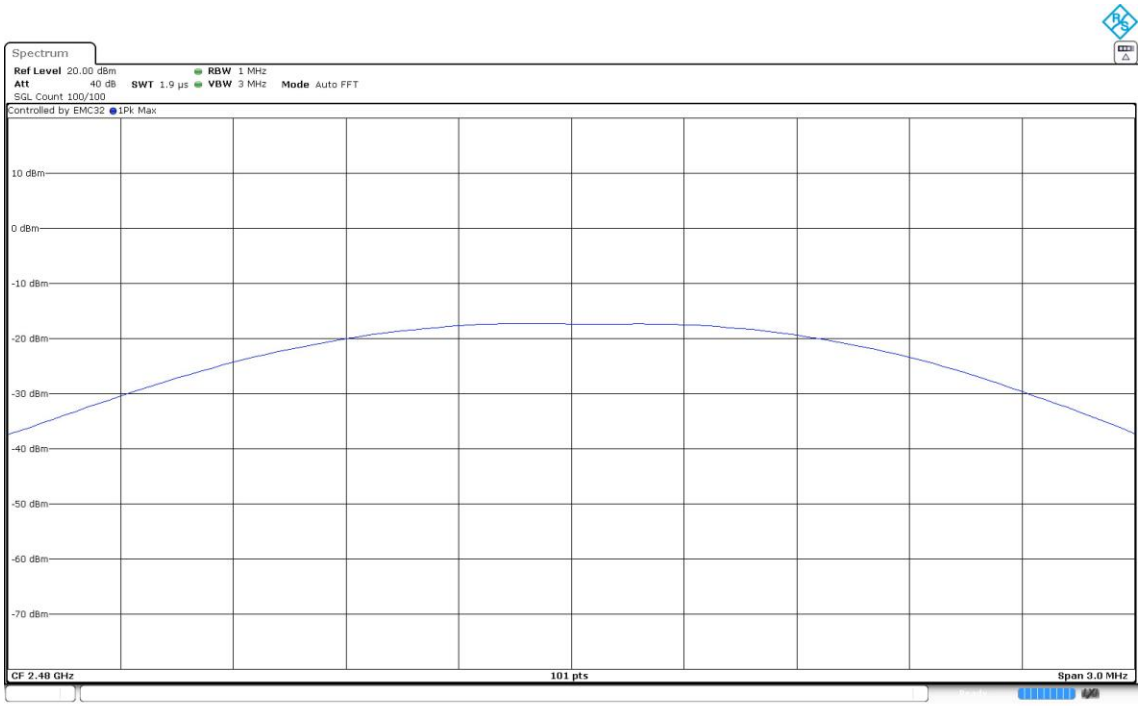




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (GFSK 1-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

Images:





Modulation: BT (Pi/4 DQPSK 2-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	2.9240	2.5240
		2441.00000		2.8970	2.4970
		2480.00000		2.6520	2.2520

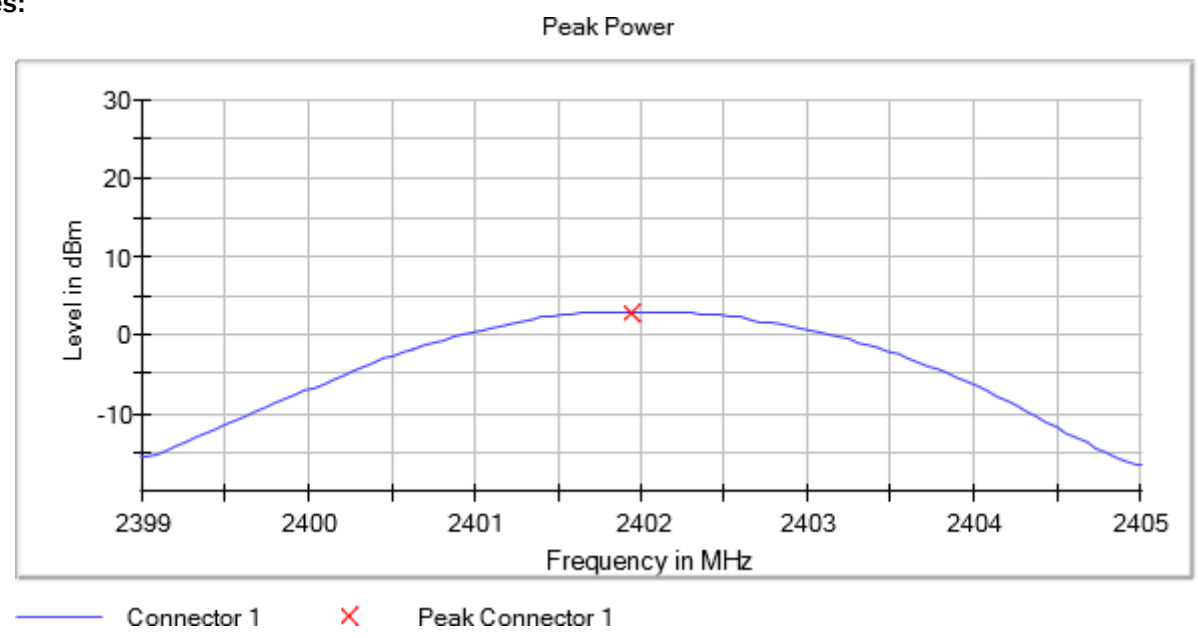
Verdict

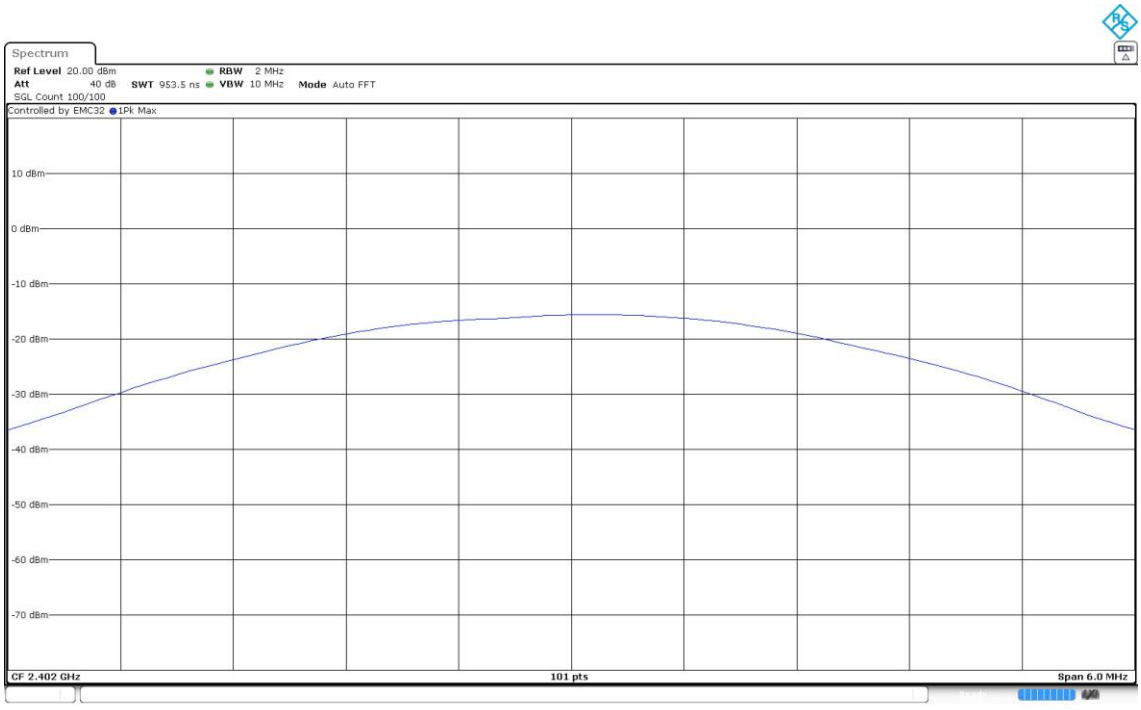
Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2402.00000
Active Port = 1

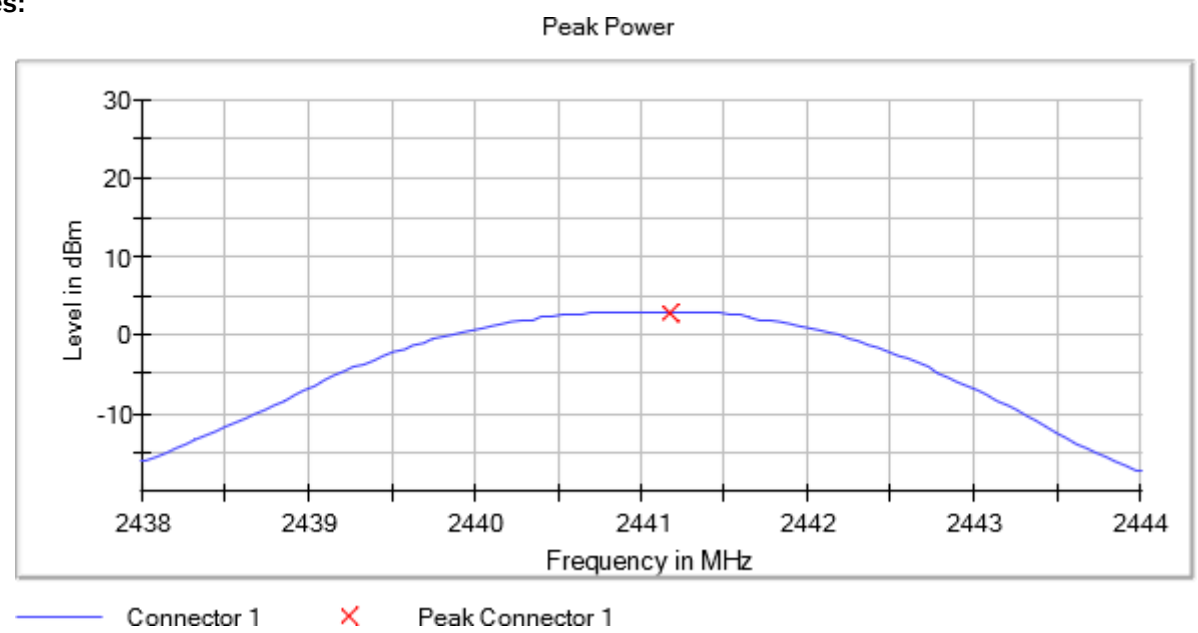
Images:

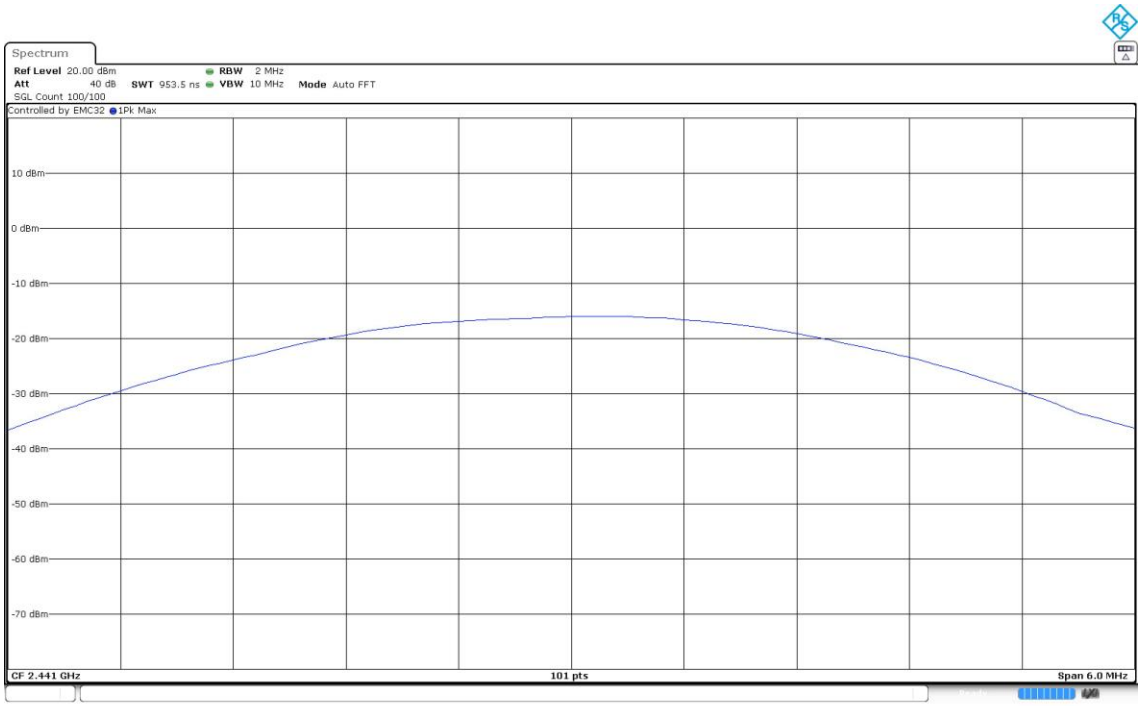




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (Pi/4 DQPSK 2-DH5)
Frequency MHz = 2441.00000
MIMO Mode = SISO
Active Port = 1

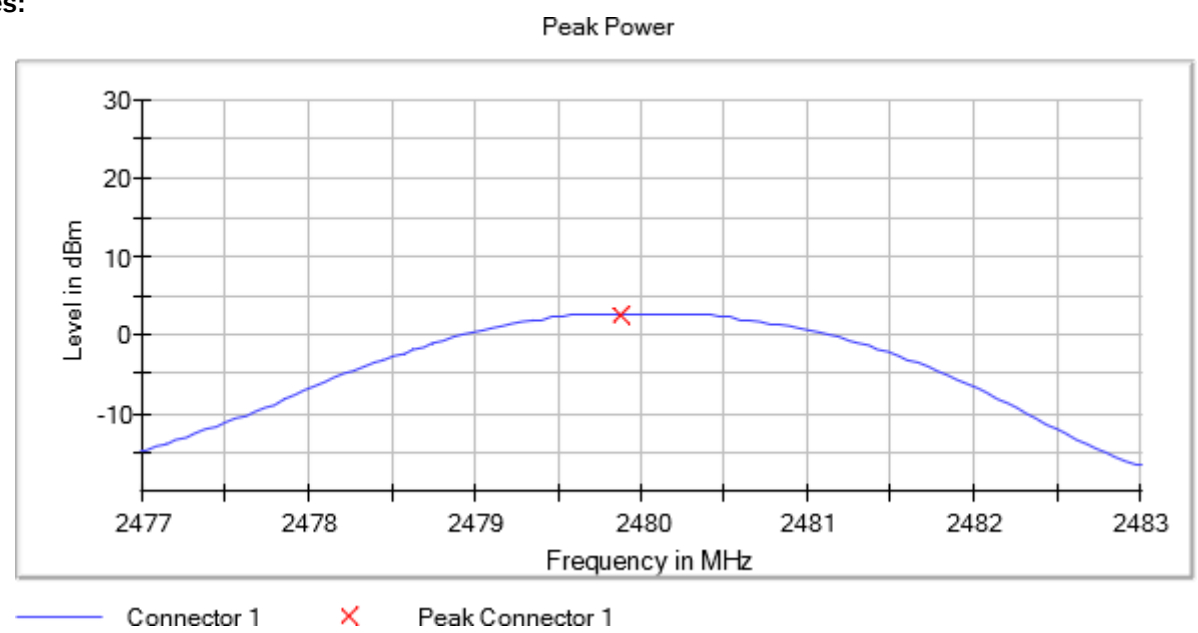
Images:

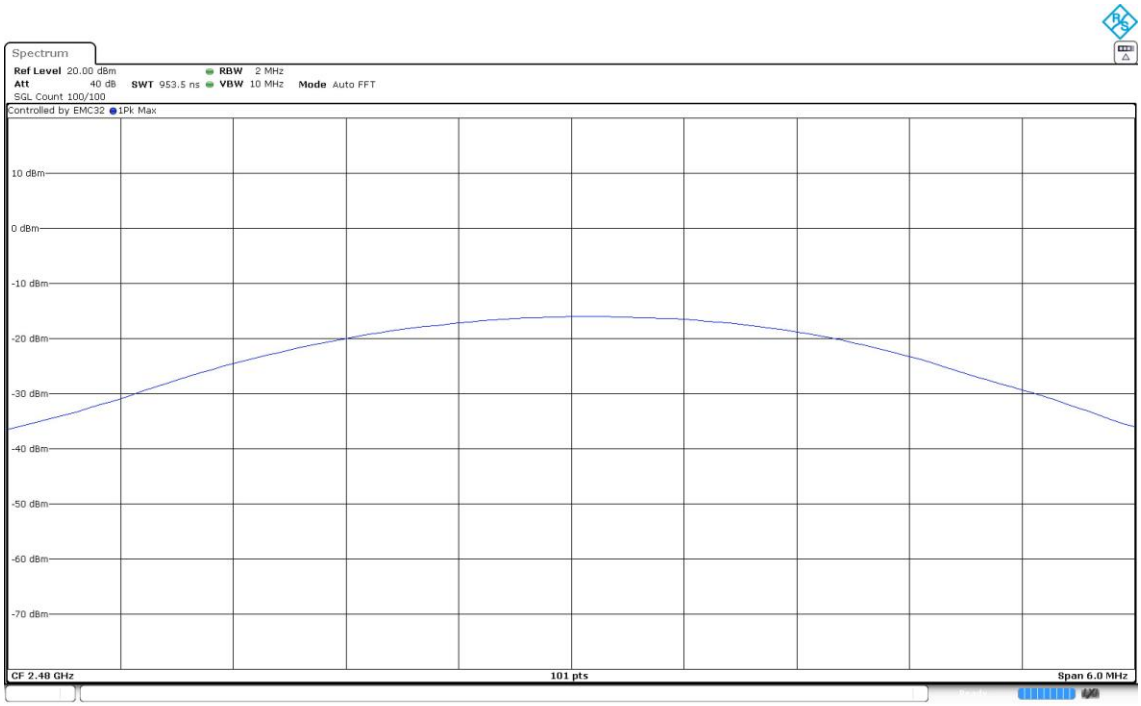




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

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	2.9080	2.5080
		2441.00000		2.9820	2.5820
		2480.00000		2.5970	2.1970

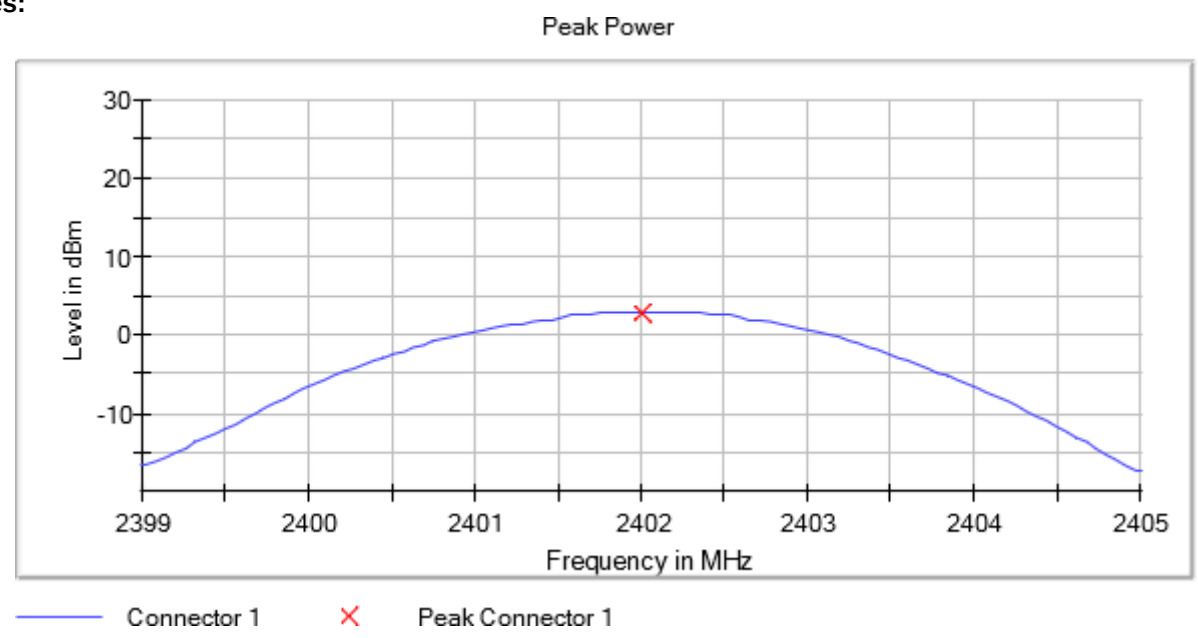
Verdict

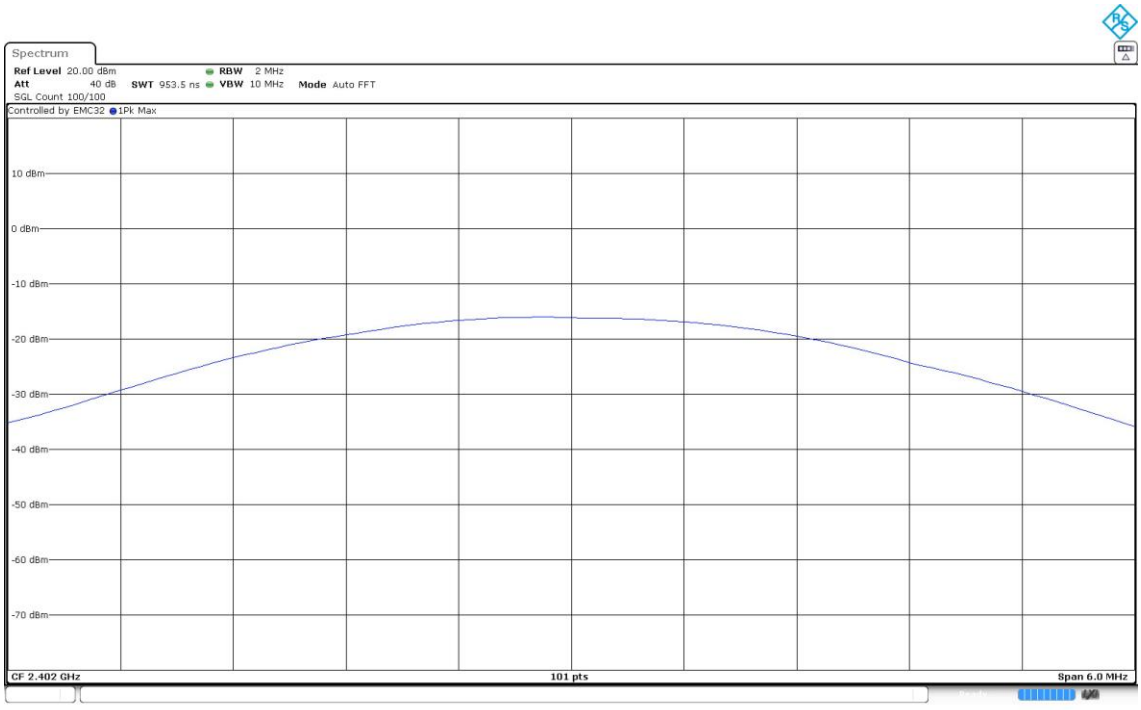
Pass

Attachments

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

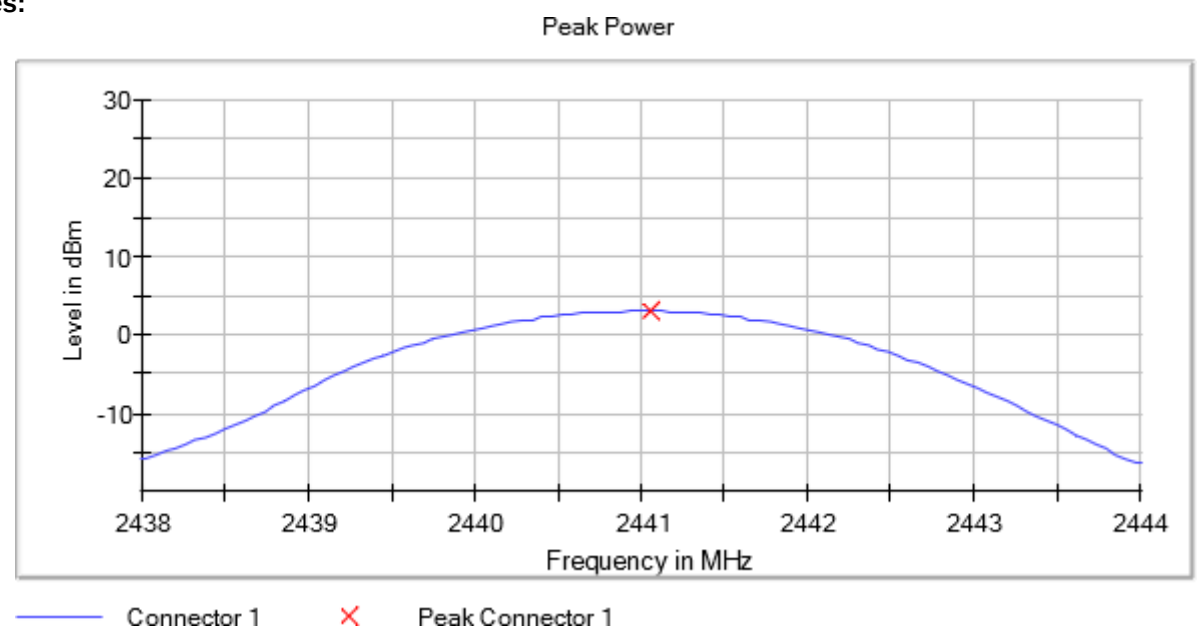
Images:

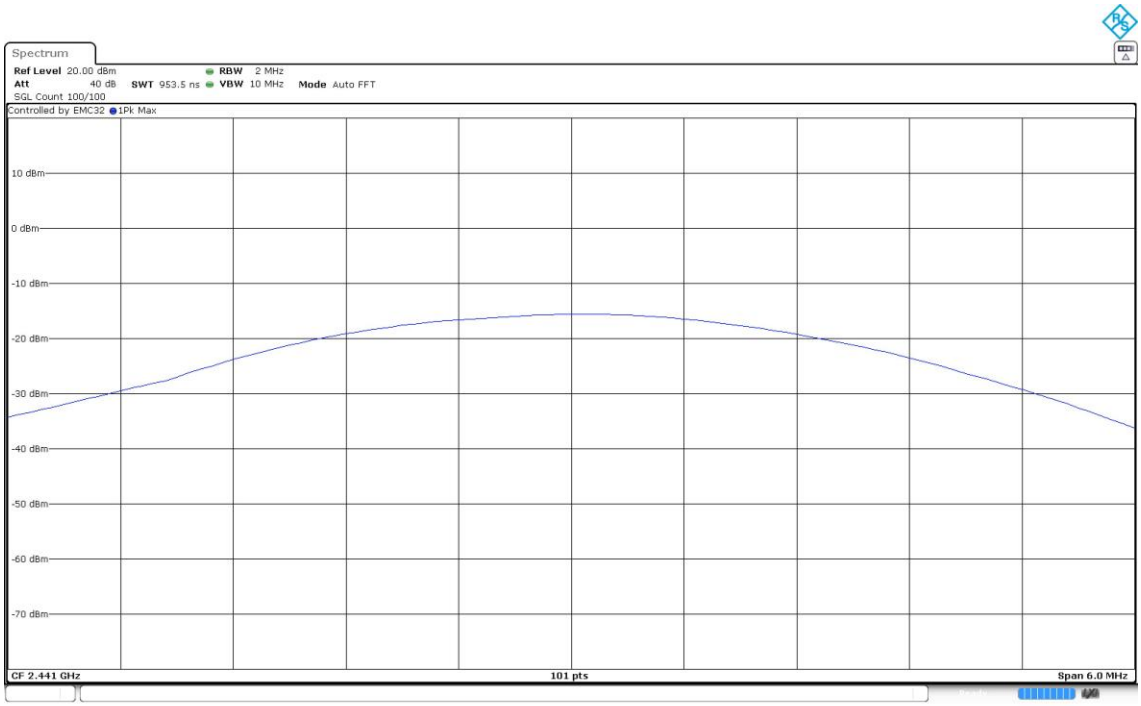




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Bandwidth MHz = 1
Modulation = BT (8DPSK 3-DH5)
Frequency MHz = 2441.00000
MIMO Mode = SISO
Active Port = 1

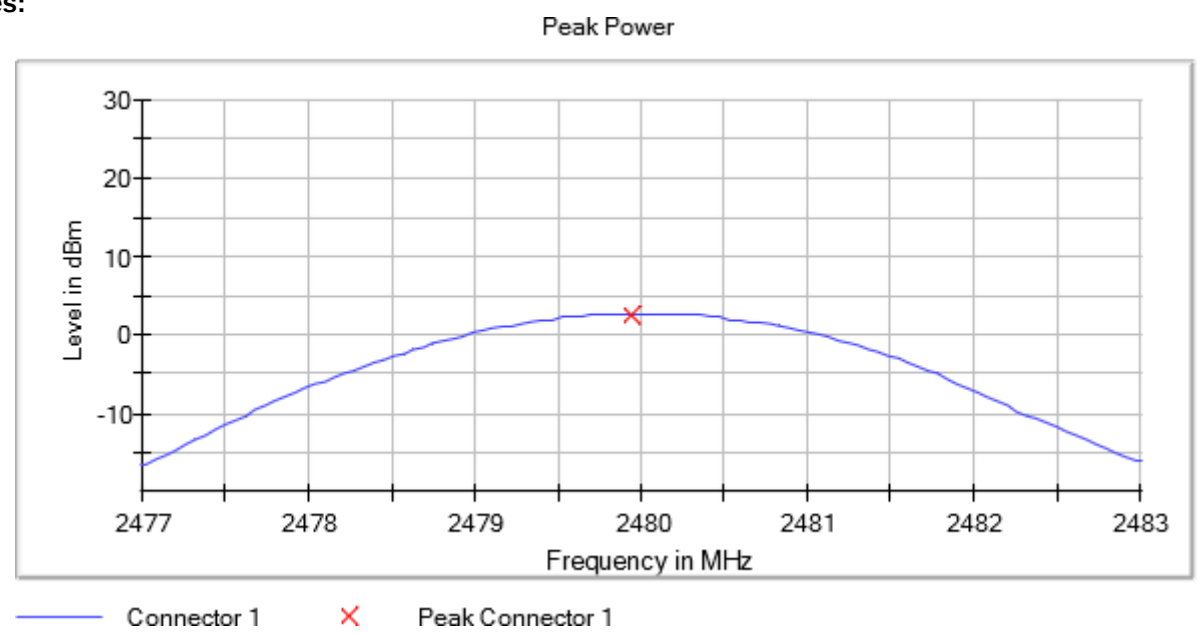
Images:

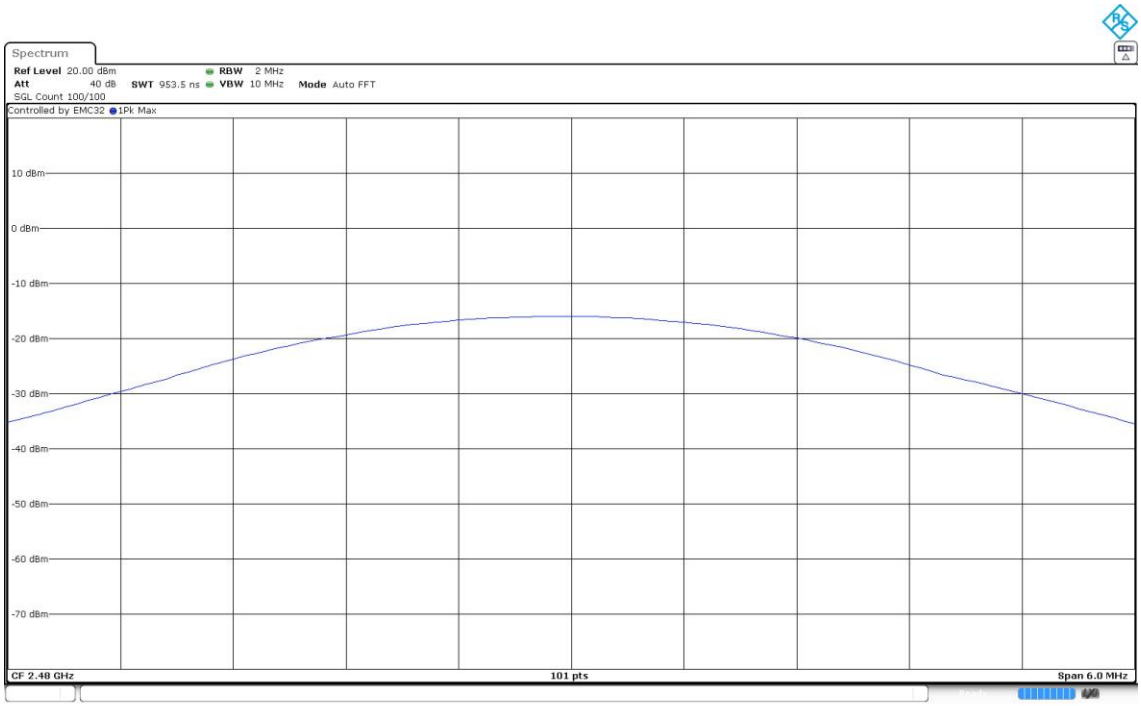




Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (8DPSK 3-DH5)
MIMO Mode = SISO
Bandwidth MHz = 1
Frequency MHz = 2480.00000
Active Port = 1

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.

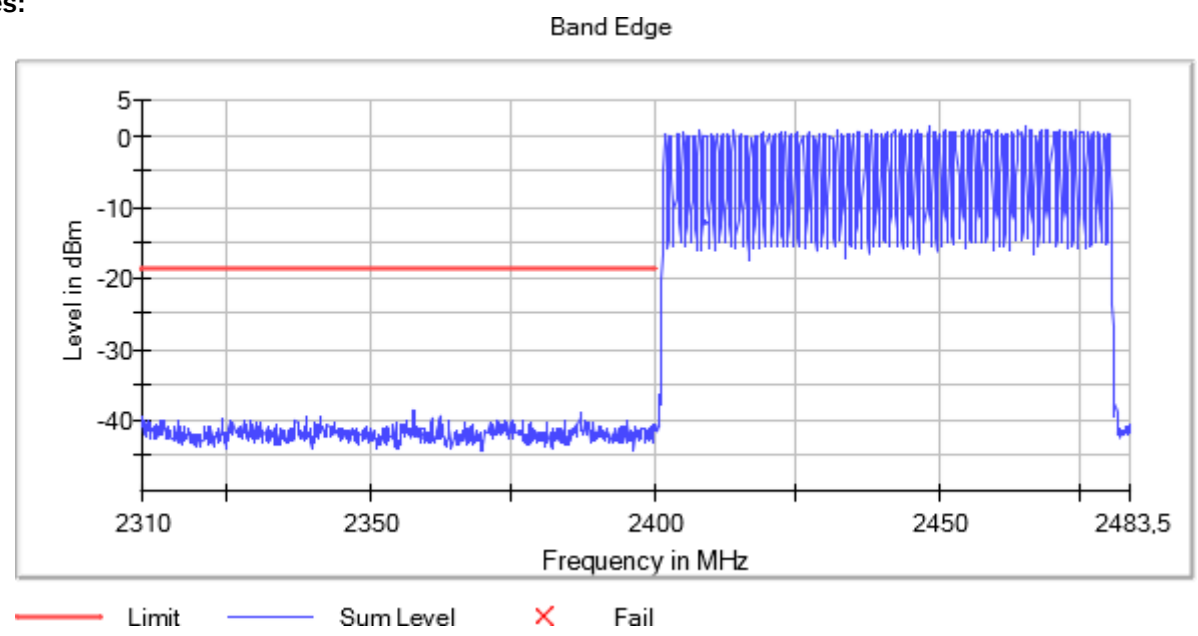
Verdict

Pass

Attachments

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

Images:



Tables:

Spectrum Analyzer Parameters 1

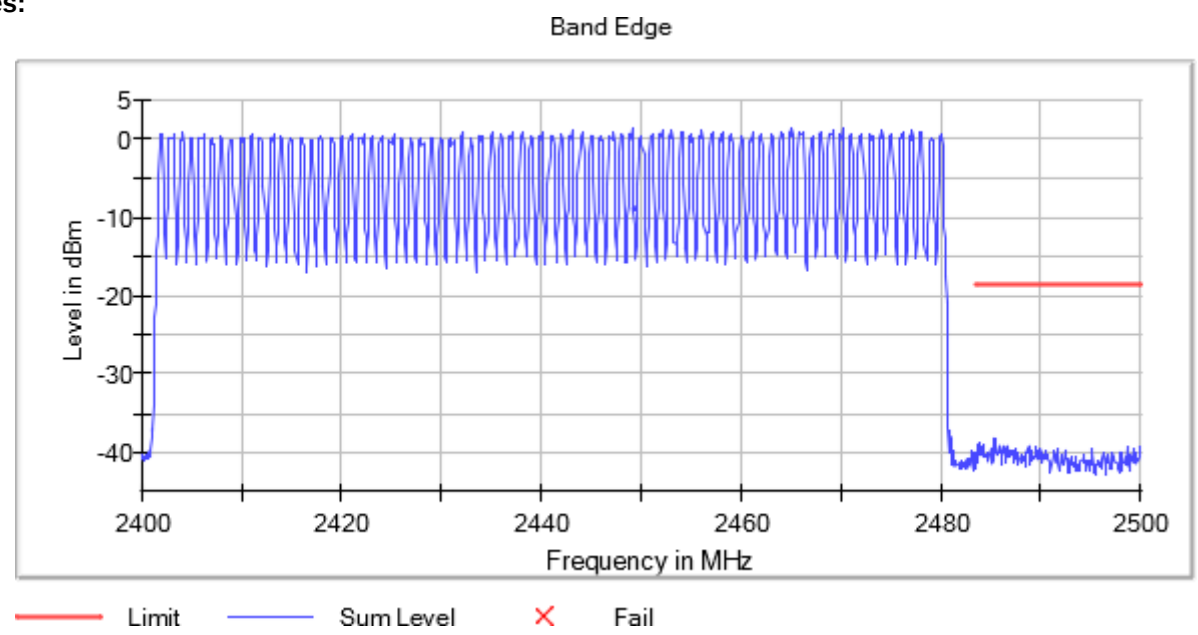
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
Sweeptime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
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
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	104 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.35 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

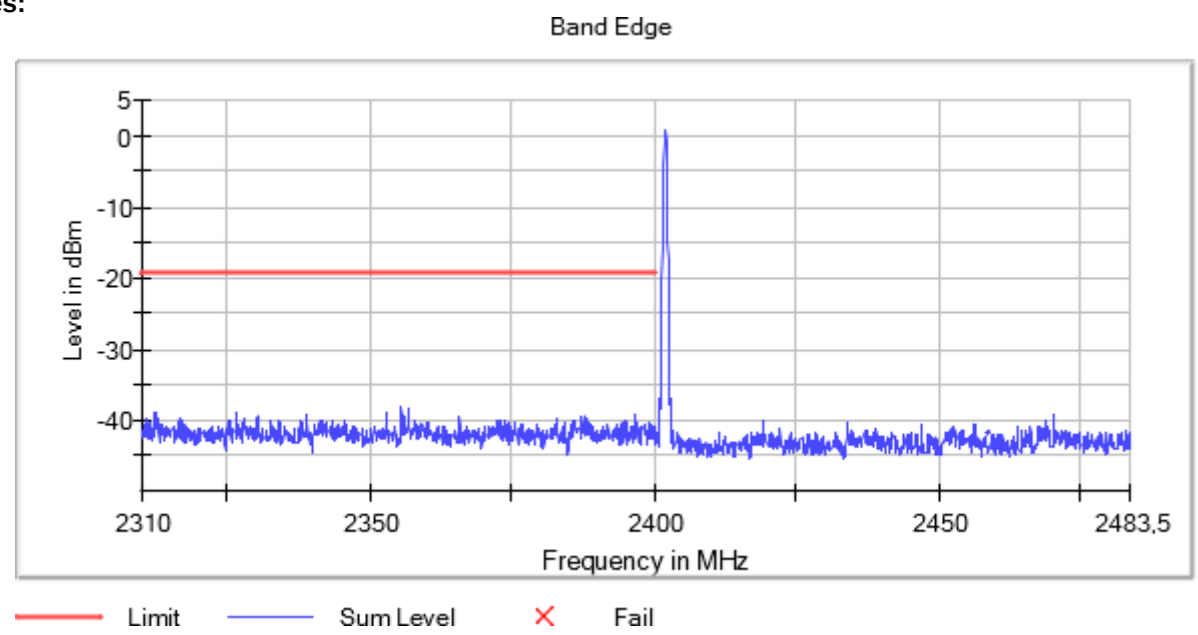
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
Sweeptime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
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
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	104 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.35 dB	0.50 dB

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:



Tables:
Spectrum Analyzer Parameters 1

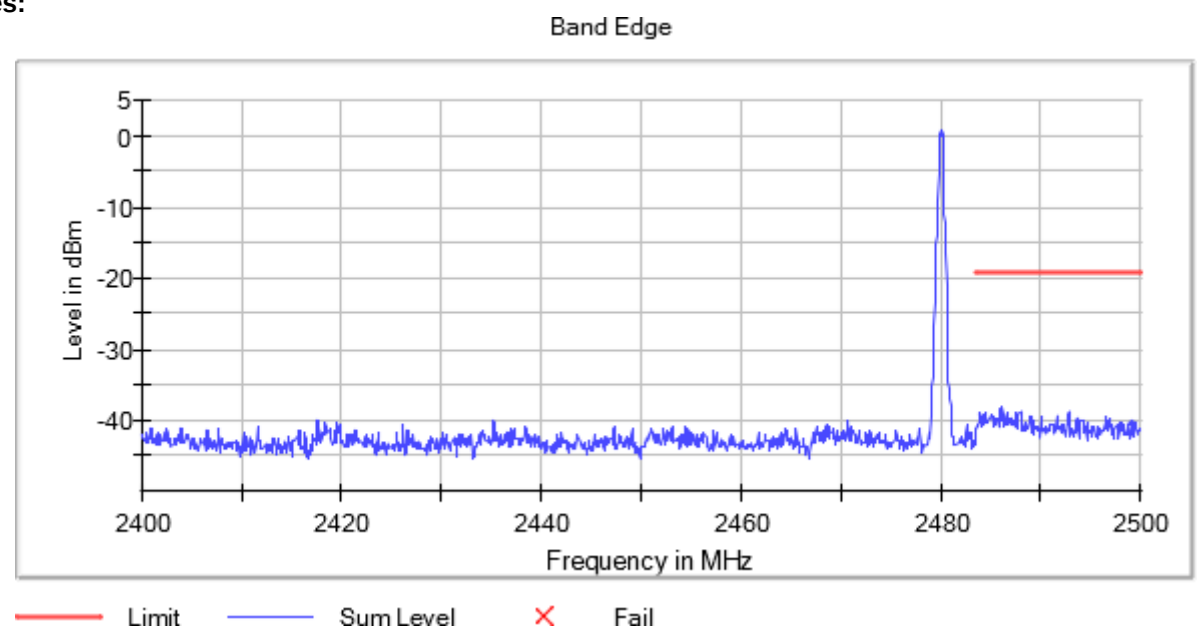
Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
Sweeptime	113.672 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	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
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	104 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.35 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
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
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	104 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.35 dB	0.50 dB

Modulation: BT (Pi/4 DQPSK 2-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.

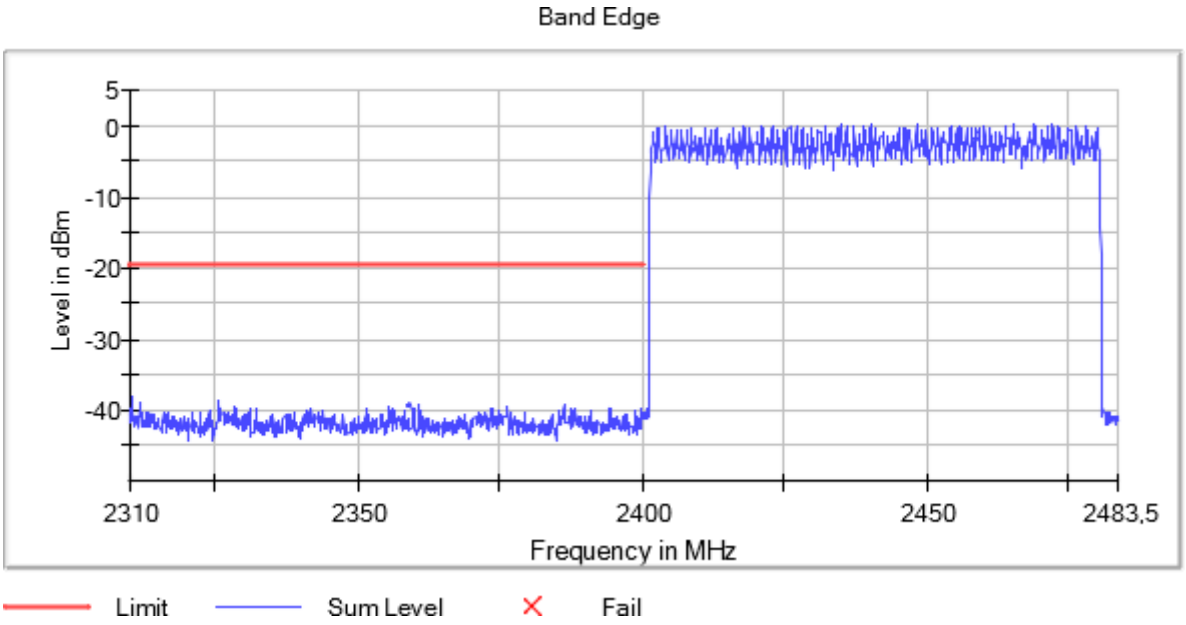
Verdict

Pass

Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Modulation = BT (Pi/4 DQPSK 2-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
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Preamp	off	off
Stablemode	Trace	Trace
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Run	4 / max. 150	max. 150
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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
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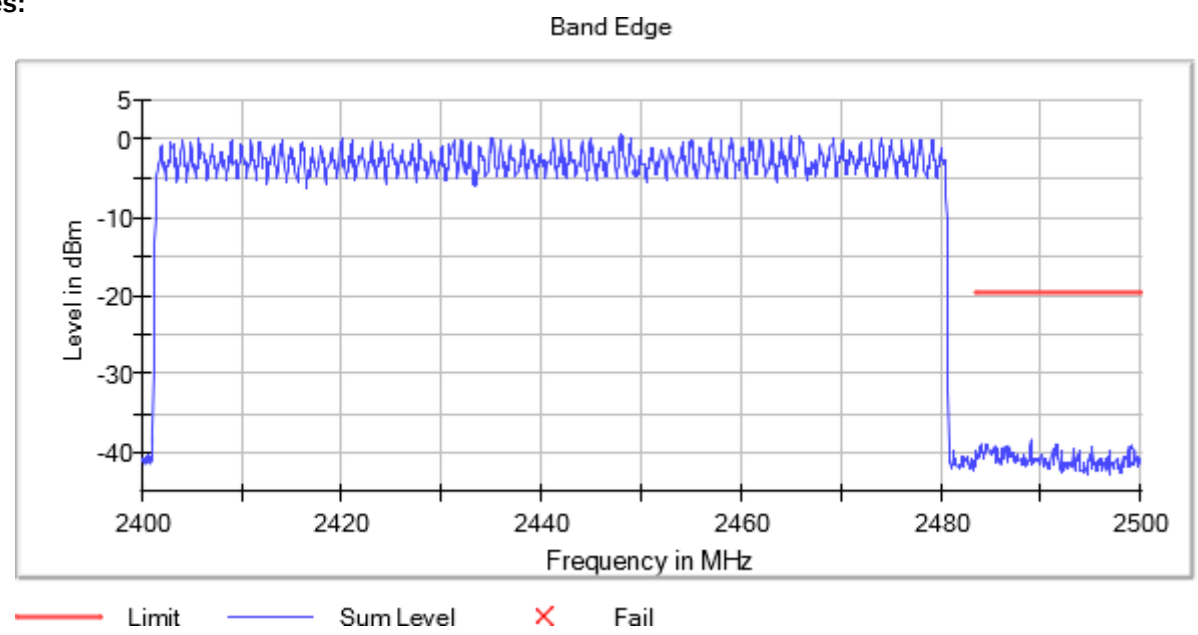
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	140 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) Frequency MHz = 0.00000

MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters 1

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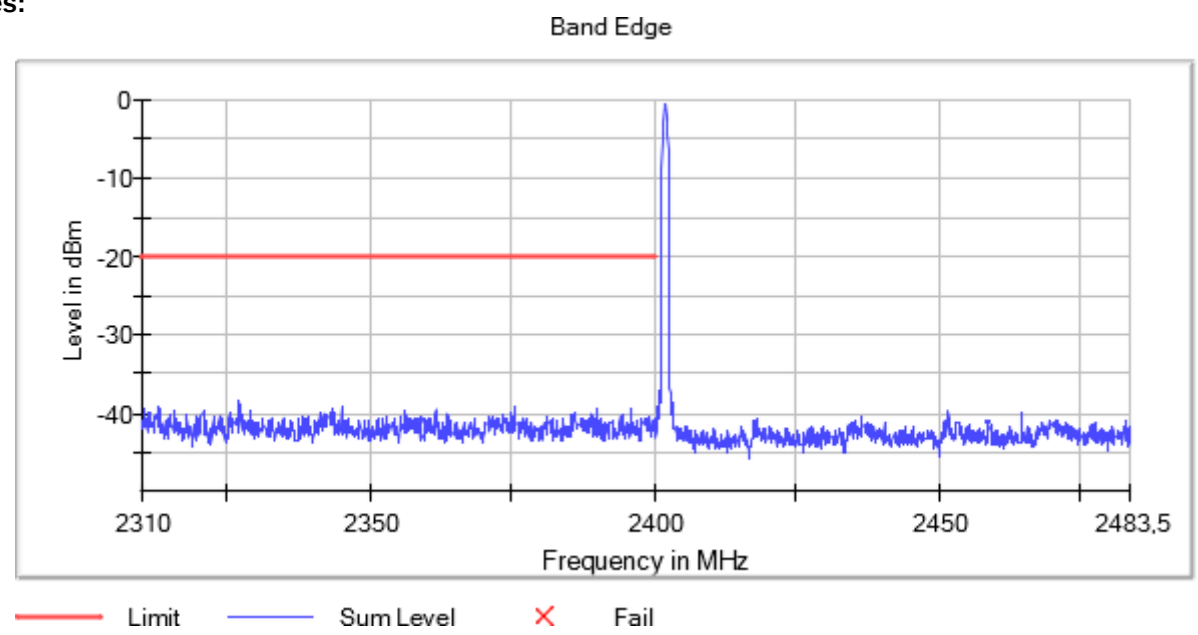
Stablevalue	0.50 dB	0.50 dB
Run	140 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Bandwidth MHz = 1

Modulation = BT (Pi/4 DQPSK 2-DH5) Frequency MHz = 2402.00000

MIMO Mode = SISO Active Port = 1

Images:



Tables:

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Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
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Spectrum Analyzer Parameters 2

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