Appendix C: Test results. Bluetooth EDR. ANT 3

INDEX

TEST CONDITIONS 278

TEST CASES DETAILS 281

Occupied Channel Bandwidth 99% *281*
RSS-247 6.2.3.1 (a) / FCC 15.247 (a) (1) 20 dB Bandwidth *281*
RSS-247 6.2.3.1 (a) / FCC 15.247 (a) (1) Carrier Frequency Separation *293*
RSS-247 6.2.3.1 (b) / FCC 15.247 (a) (1) (iii) Time of Occupancy (Dwell Time) *314*
RSS-247 6.2.3.1 (b) / FCC 15.247 (a) (1) (iii) Number of hopping channels *326*
RSS-247 6.2.3.2 / FCC 15.247 (b) Maximum Peak Conducted Output Power *326*
RSS-247 6.6 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter) *344*
RSS-247 6.6 / FCC 15.247 (d) Emission limitations radiated (Transmitter) *375*

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

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

ANTENNA (*):

Type of Antenna:	Integral antenna
Maximum Declared Antenna Gain:	+1.37 dBi

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).

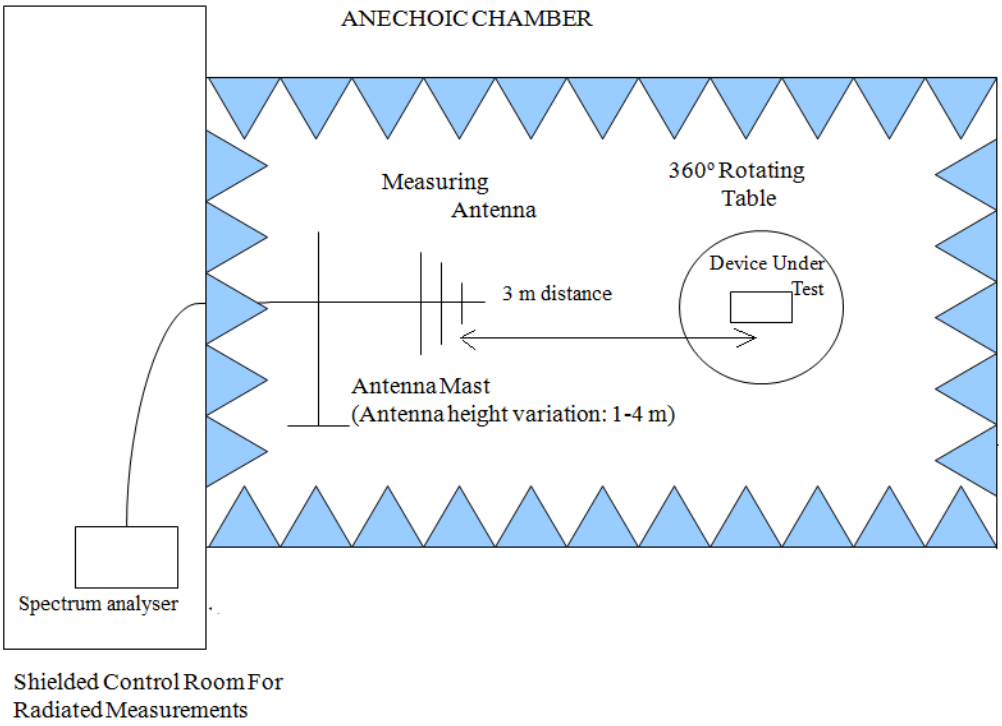
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

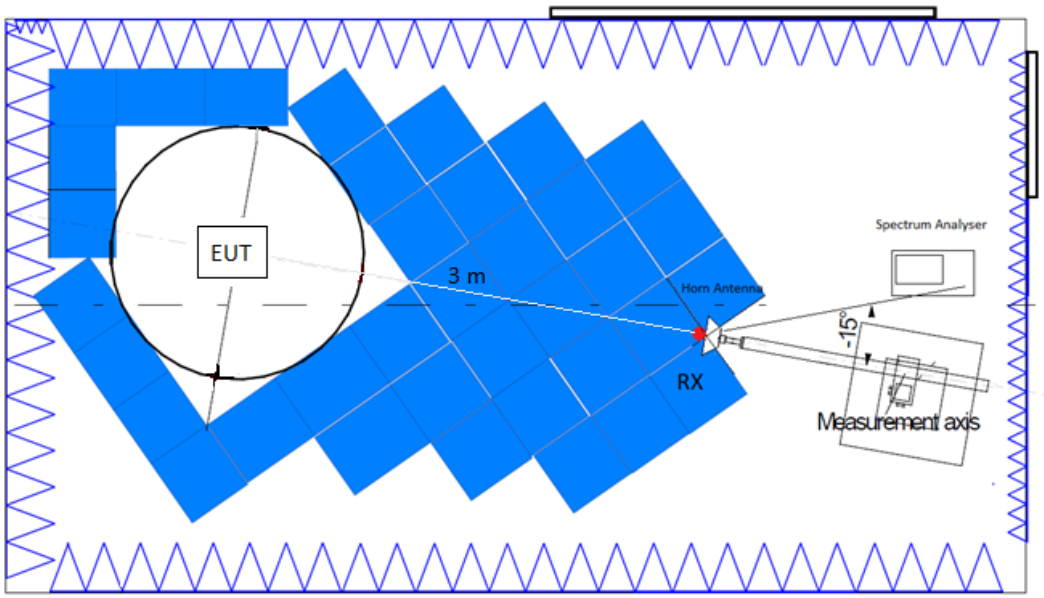
Measurements were made in both horizontal and vertical planes of polarization.

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.

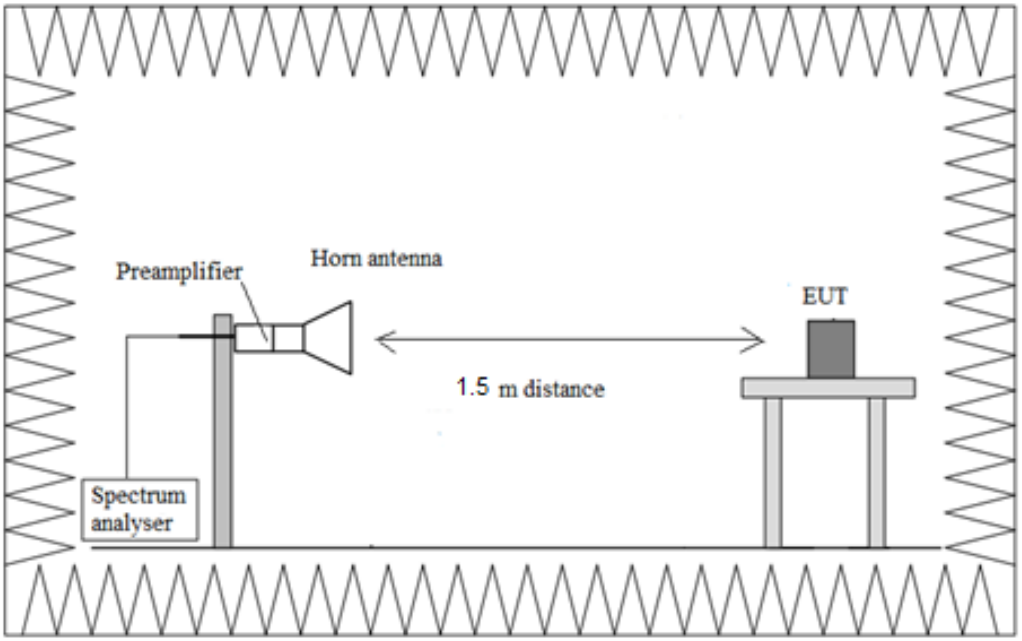
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Specification

RSS-Gen 6.7 / FCC 2.1049 - Occupied Channel Bandwidth 99%

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)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Port	Occ Ch BW (MHz)
[2400, 2483.5]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	0.880
		2441.00000		0.870
		2480.00000		0.880

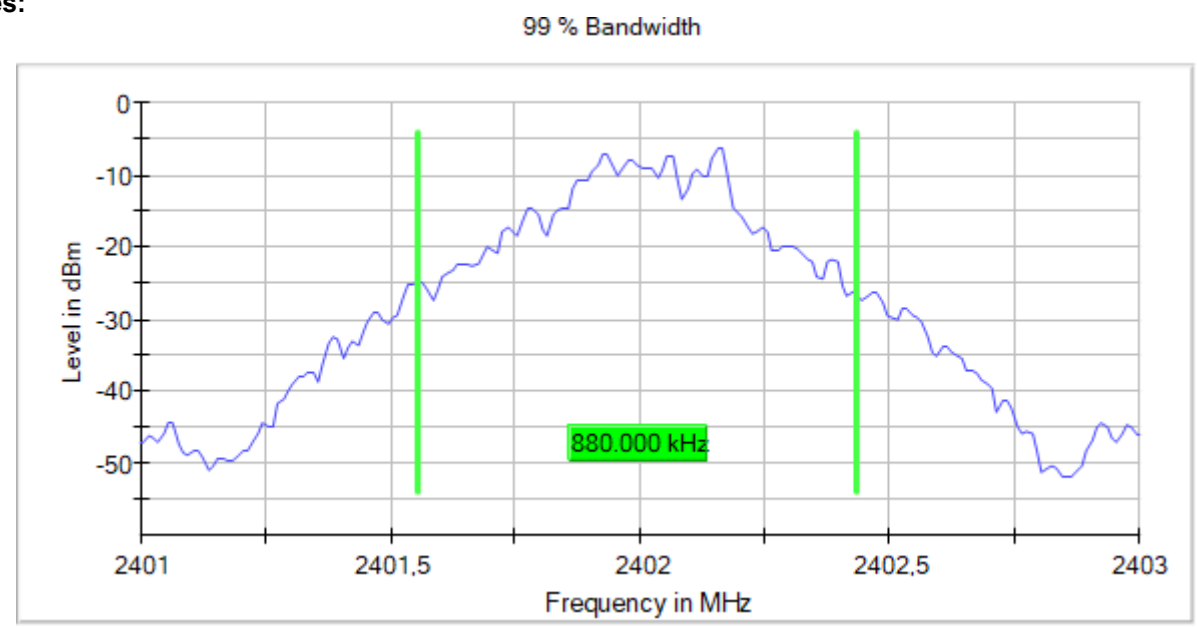
Verdict

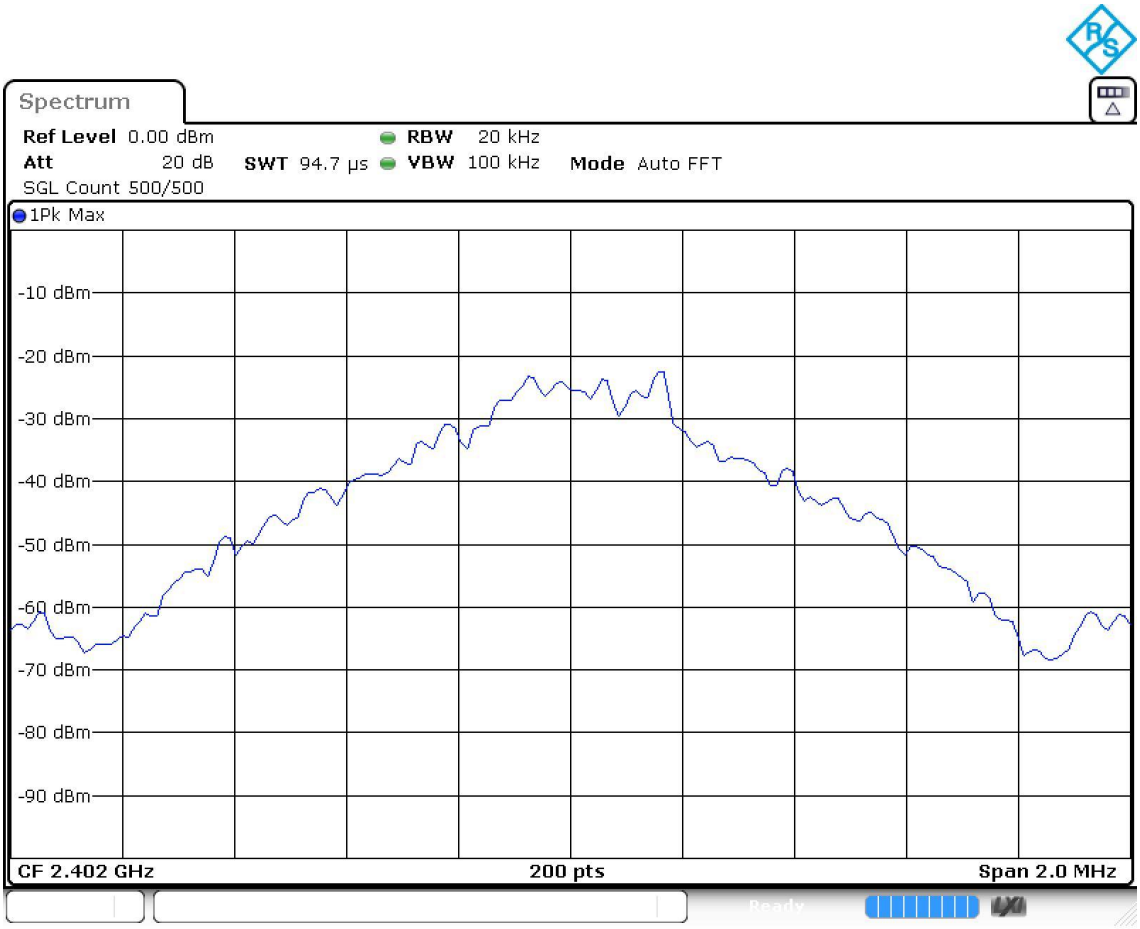
Pass

Attachments

Operation Band MHz = [2400, 2483.5]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Frequency MHz = 2402.00000	Active Port = 3
Modulation = BT (GFSK 1-DH5)	

Images:





Operation Band MHz = [2400, 2483.5]

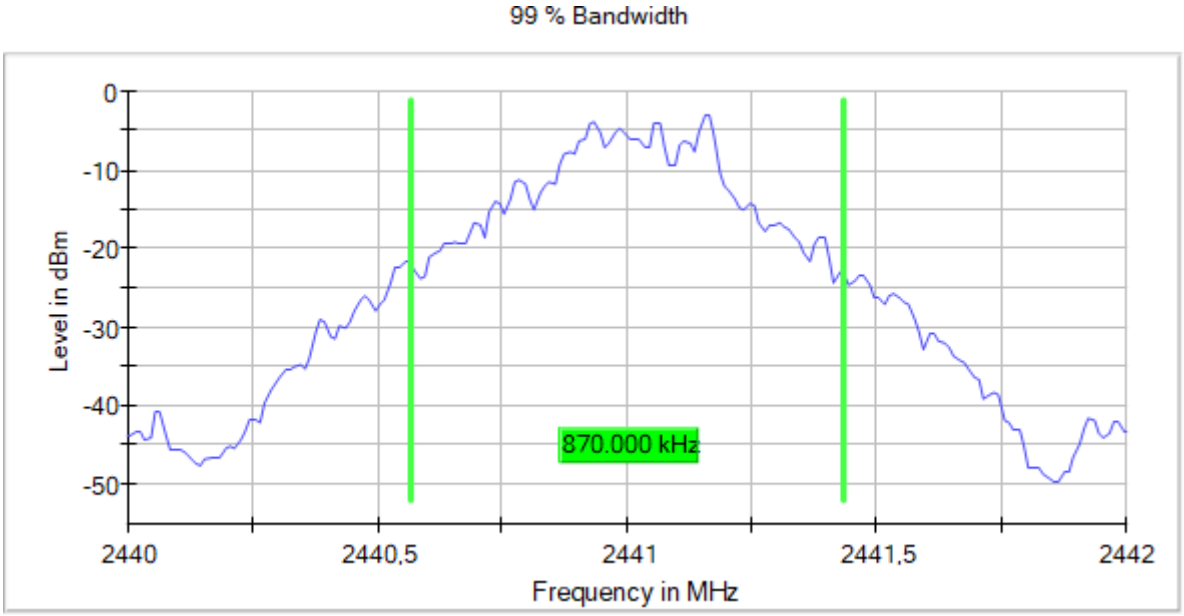
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

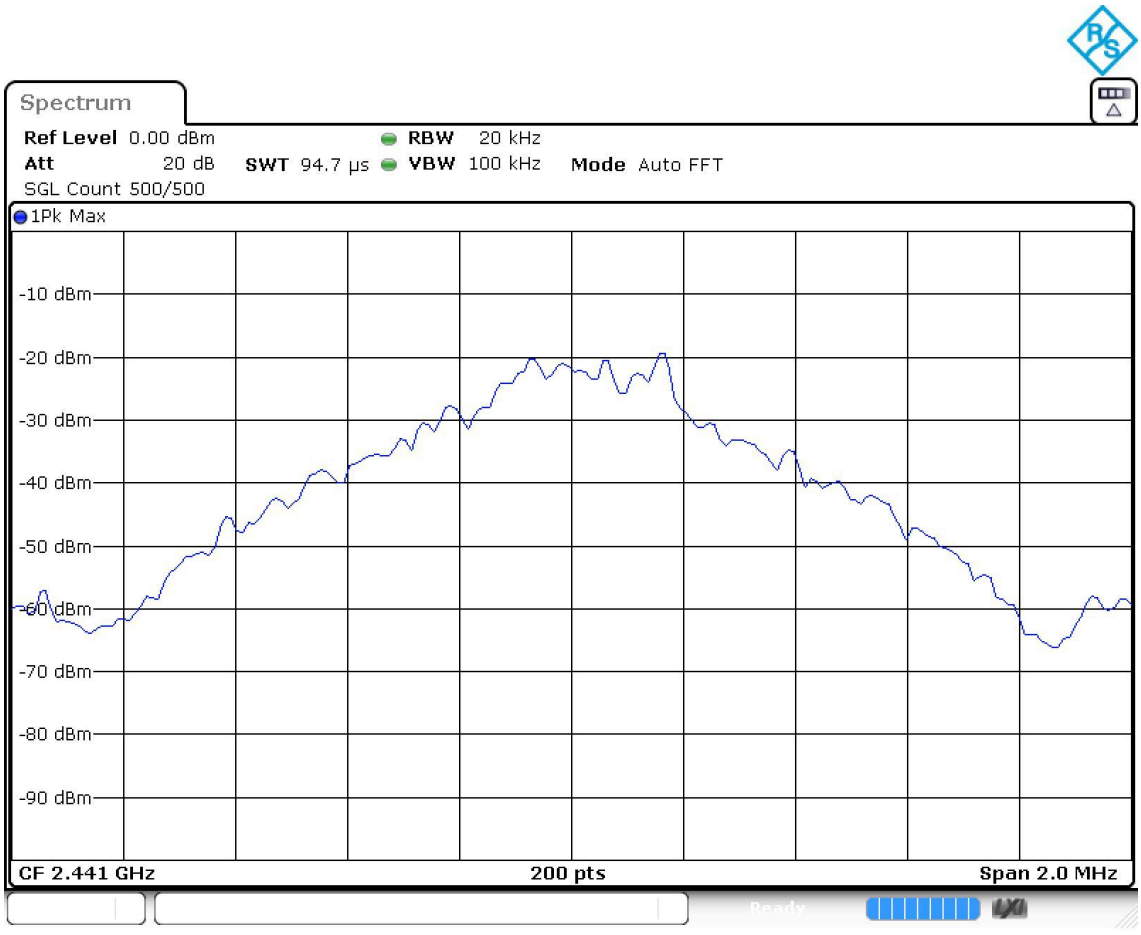
Frequency MHz = 2441.00000

Active Port = 3

Modulation = BT (GFSK 1-DH5)

Images:





Operation Band MHz = [2400, 2483.5]

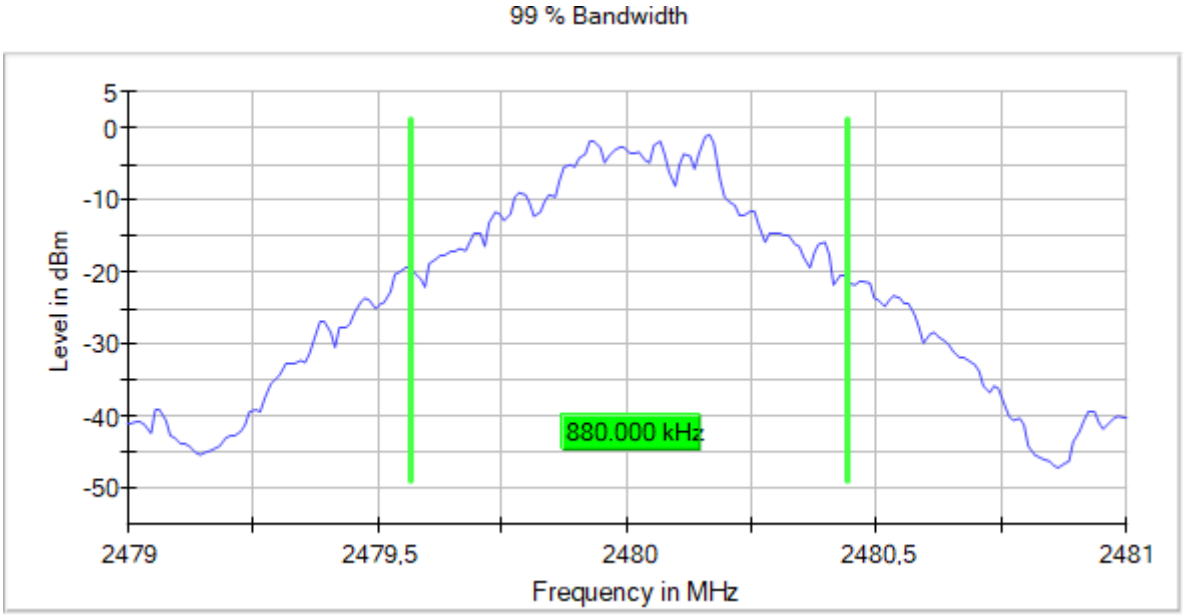
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

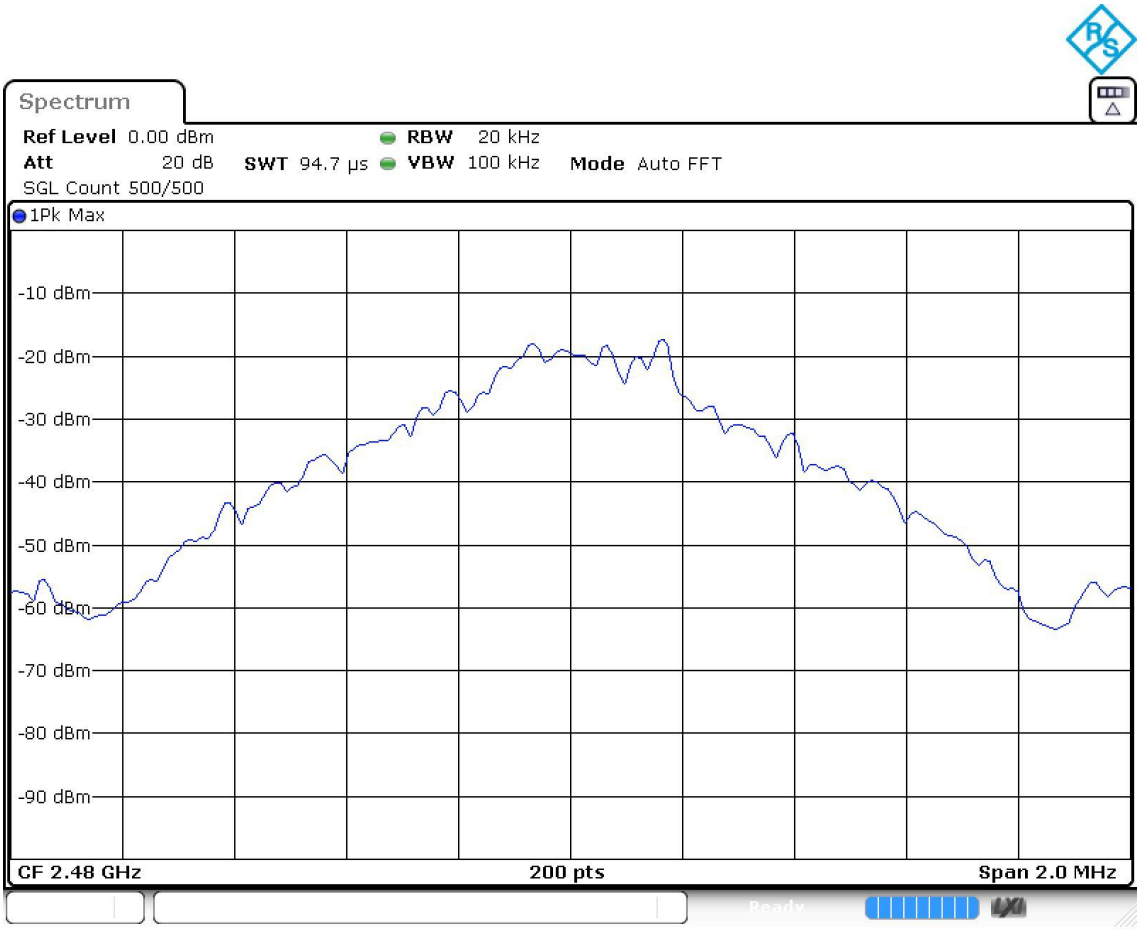
Frequency MHz = 2480.00000

Active Port = 3

Modulation = BT (GFSK 1-DH5)

Images:





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

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Port	Occ Ch BW (MHz)
[2400, 2483.5]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	1.200
		2441.00000		1.200
		2480.00000		1.200

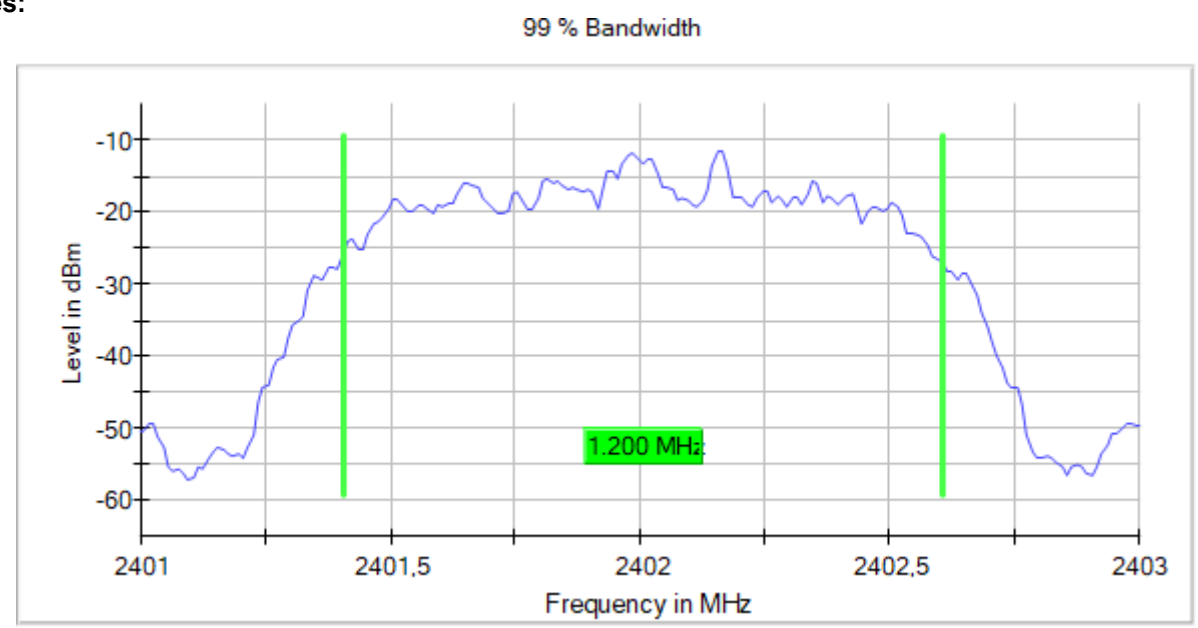
Verdict

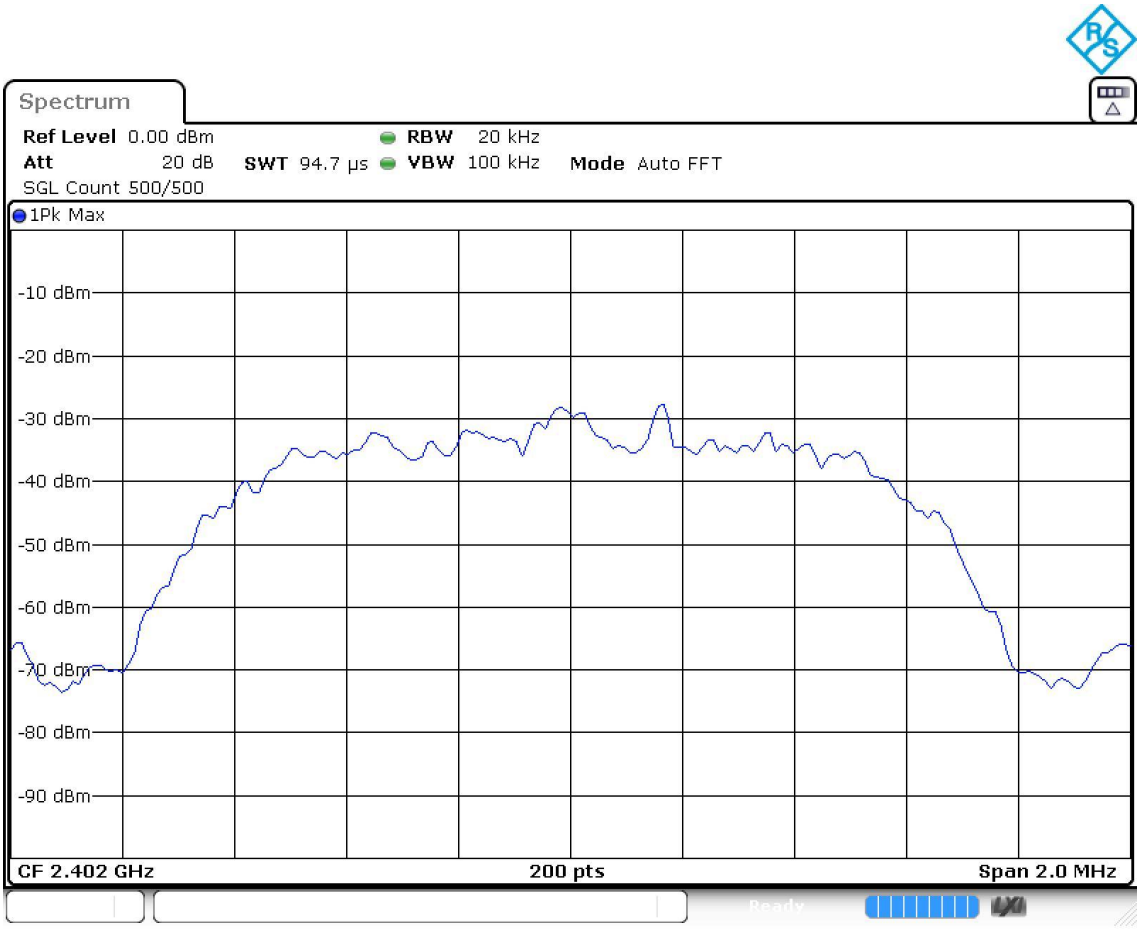
Pass

Attachments

Operation Band MHz = [2400, 2483.5]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Frequency MHz = 2402.00000	Active Port = 3
Modulation = BT (Pi/4 DQPSK 2-DH5)	

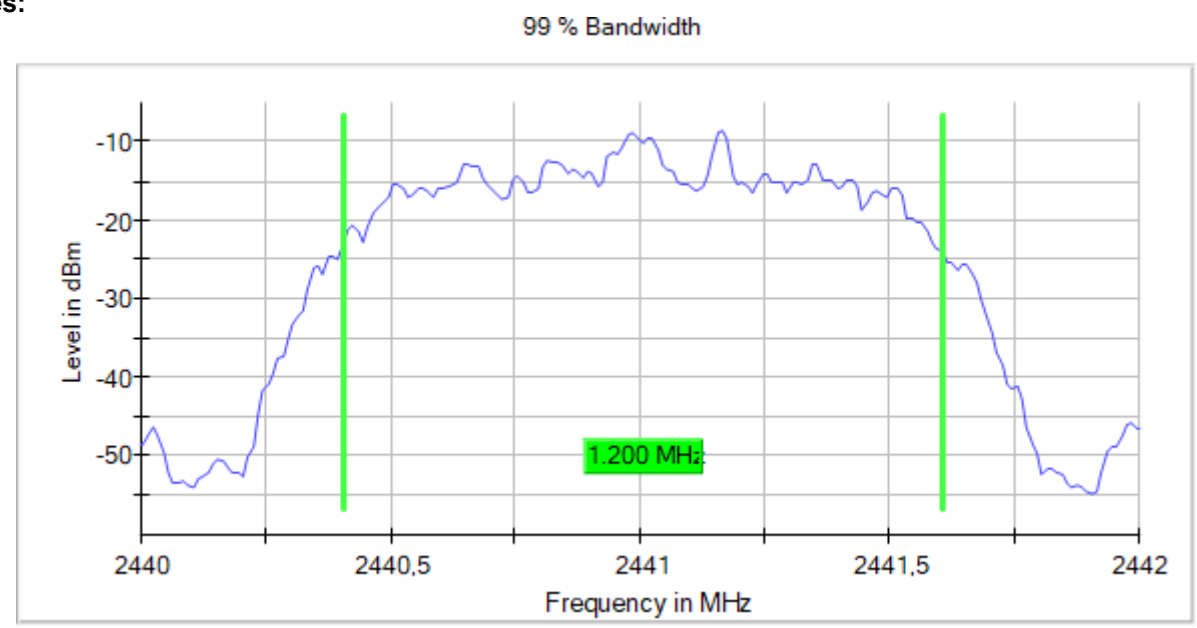
Images:

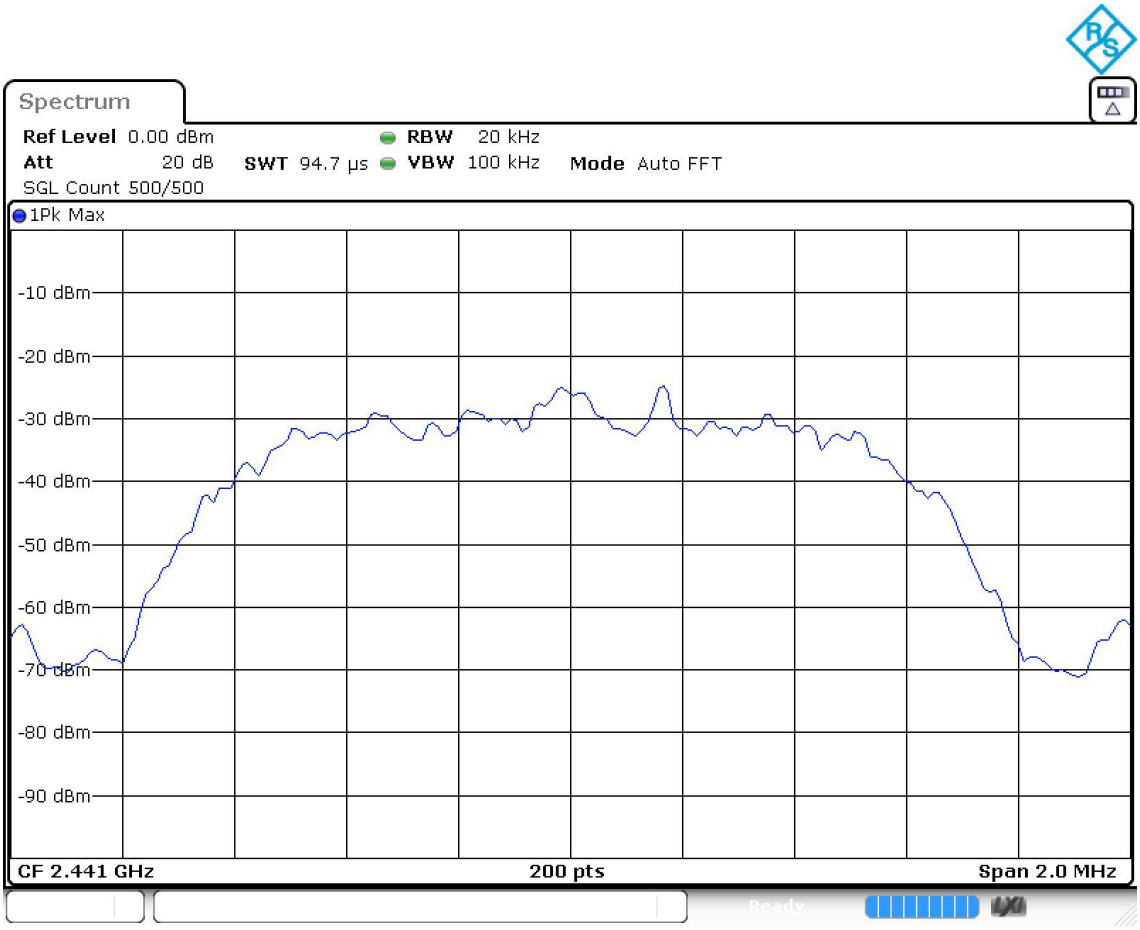




Operation Band MHz = [2400, 2483.5]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Frequency MHz = 2441.00000	Active Port = 3
Modulation = BT (Pi/4 DQPSK 2-DH5)	

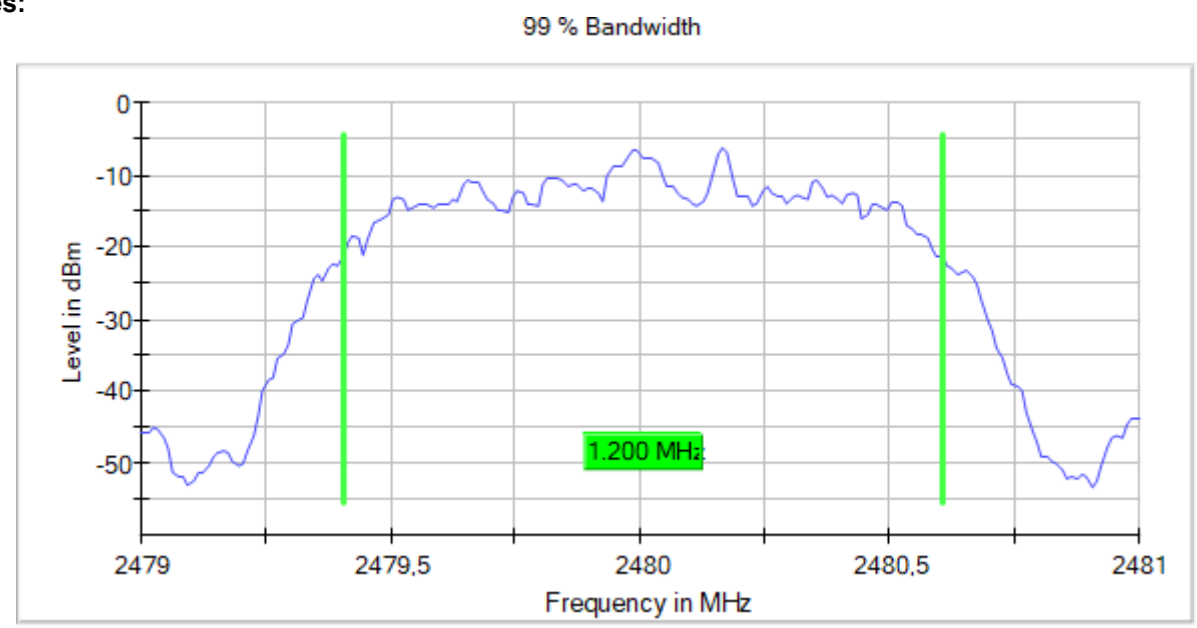
Images:

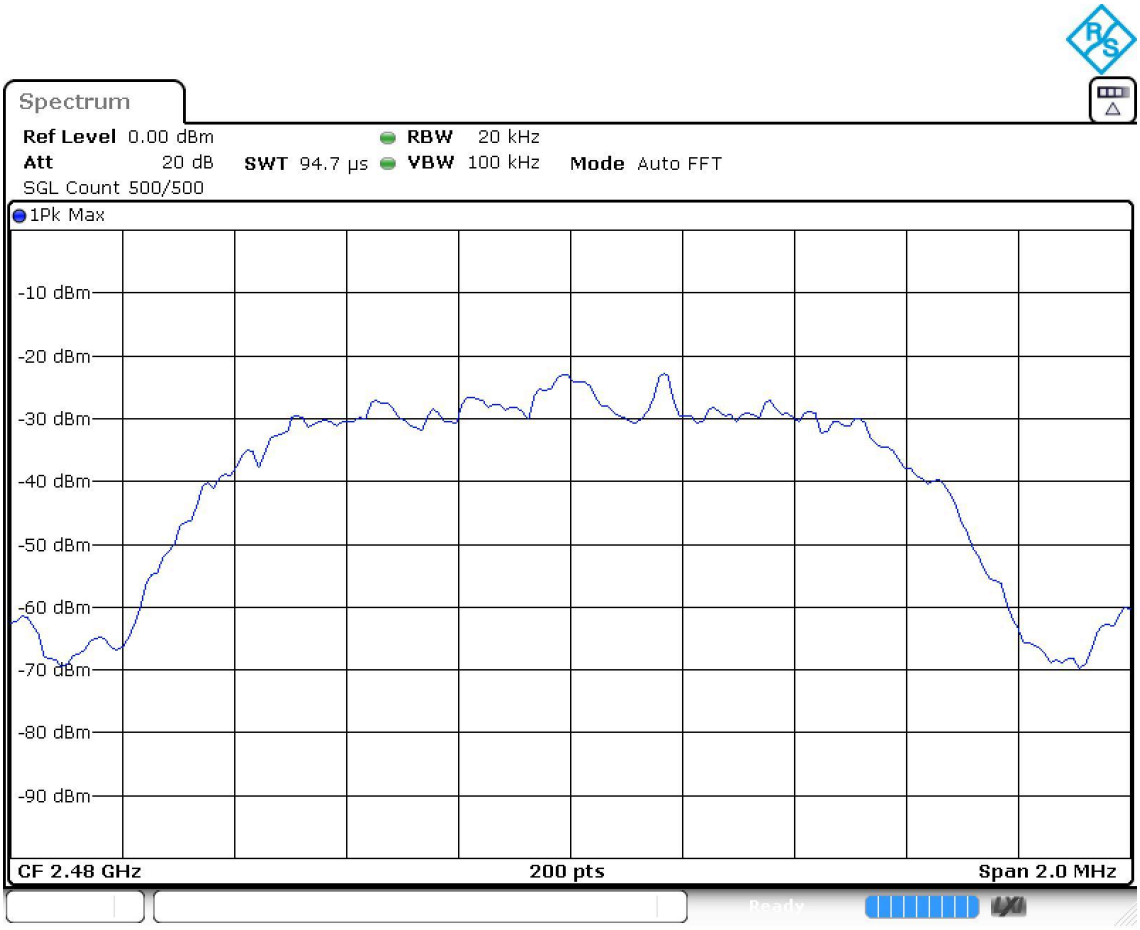




Operation Band MHz = [2400, 2483.5]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Frequency MHz = 2480.00000	Active Port = 3
Modulation = BT (Pi/4 DQPSK 2-DH5)	

Images:





Modulation: BT (8DPSK 3-DH5)

Results

Operation Band (MHz)	Equipment	Freq (MHz)	Port	Occ Ch BW (MHz)
[2400, 2483.5]	Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	1.200
		2441.00000		1.200
		2480.00000		1.210

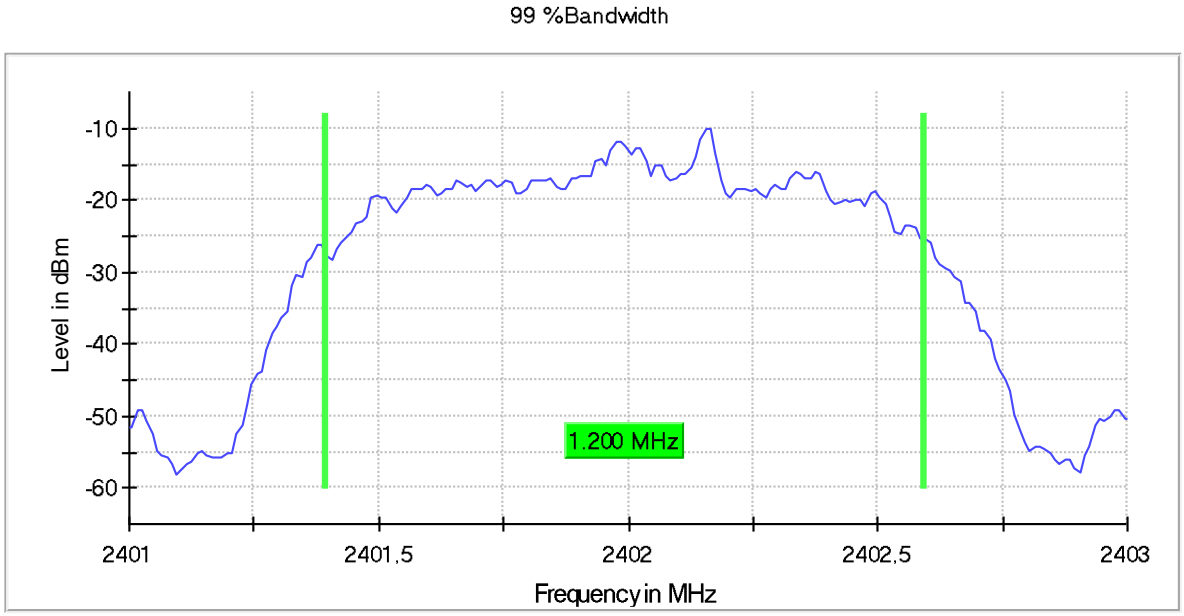
Verdict

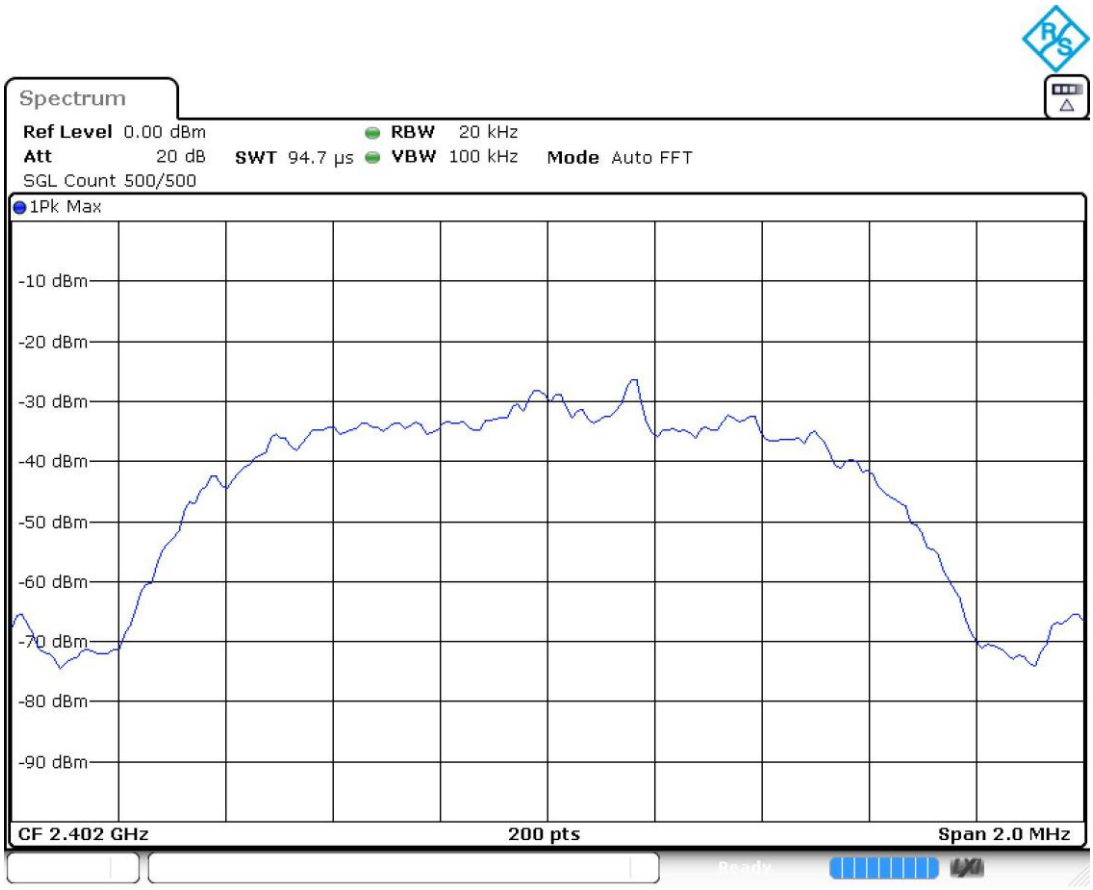
Pass

Attachments

Operation Band MHz = [2400, 2483.5]	Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)
Frequency MHz = 2402.00000	Active Port = 3
Modulation = BT (8DPSK 3-DH5)	

Images:





Operation Band MHz = [2400, 2483.5]

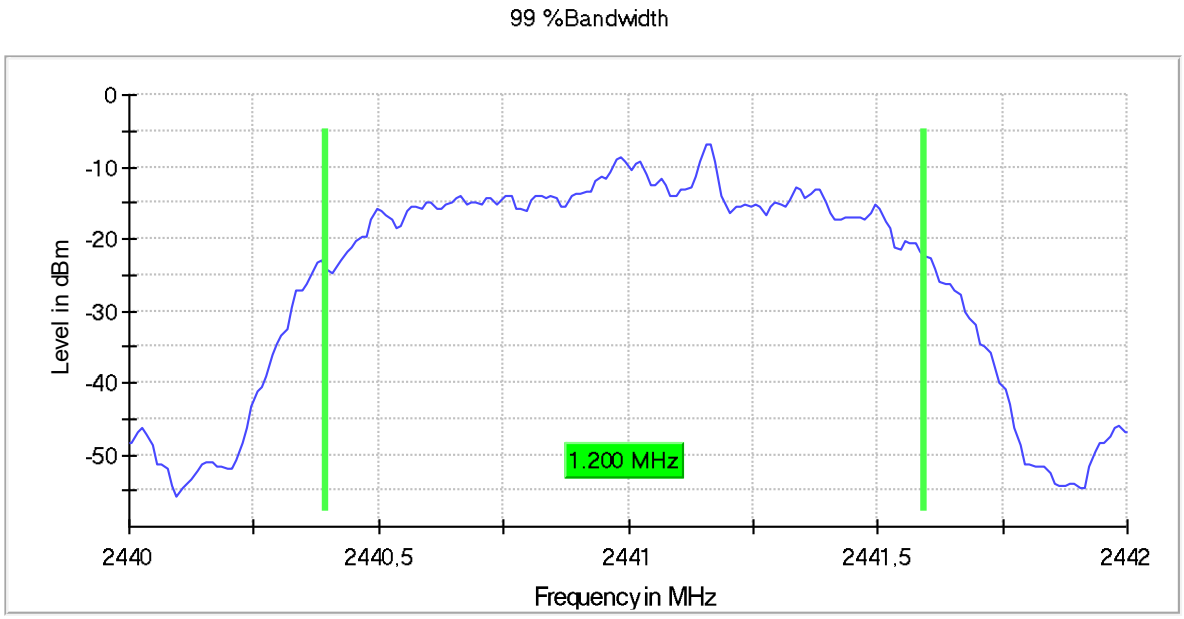
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

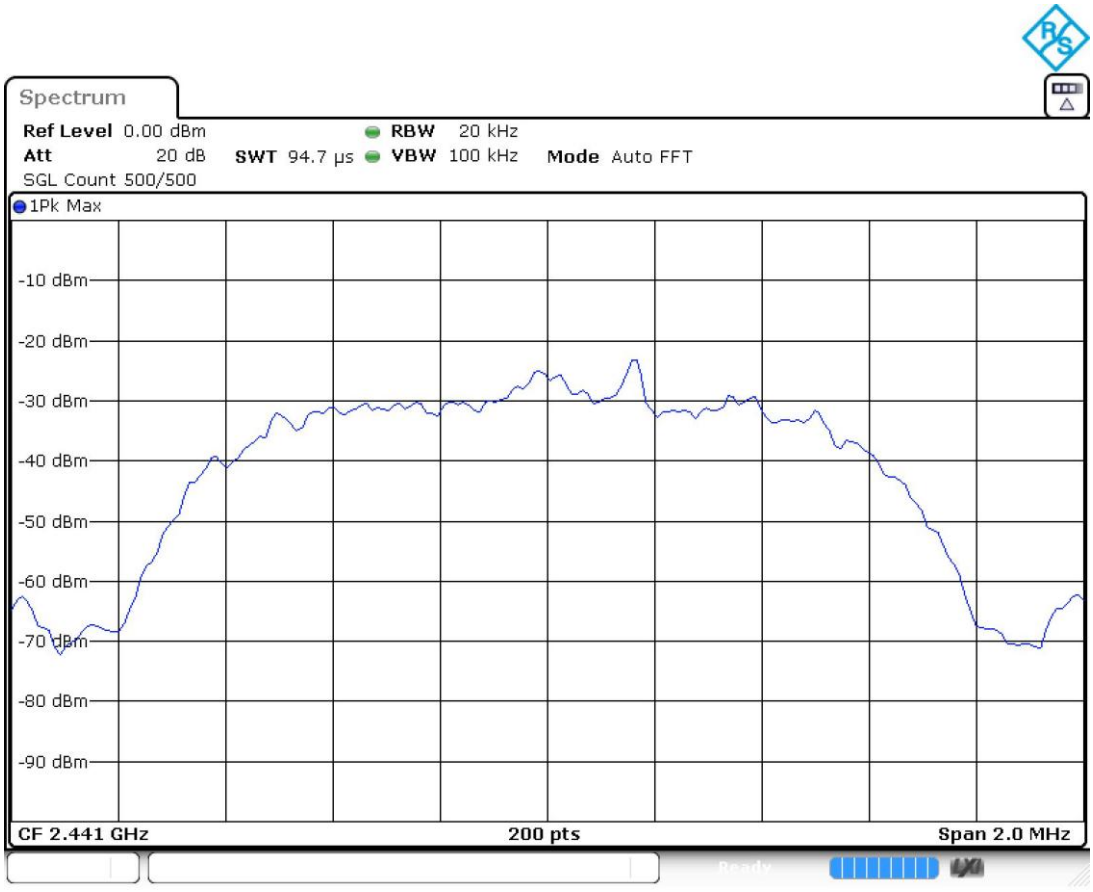
Frequency MHz = 2441.00000

Active Port = 3

Modulation = BT (8DPSK 3-DH5)

Images:





Operation Band MHz = [2400, 2483.5]

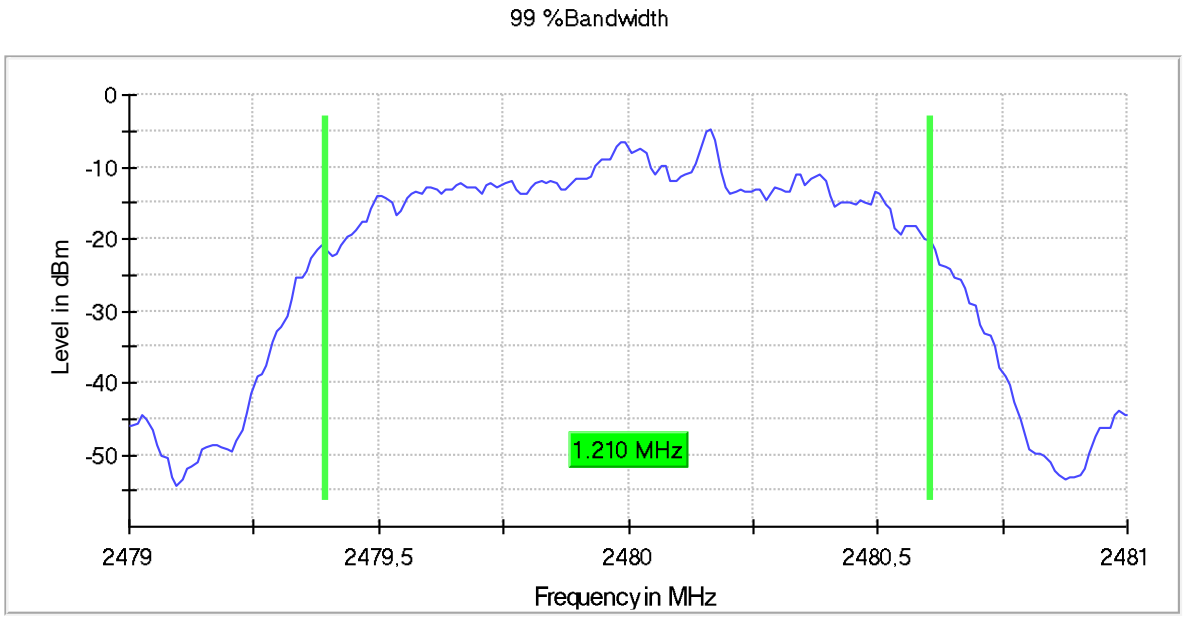
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

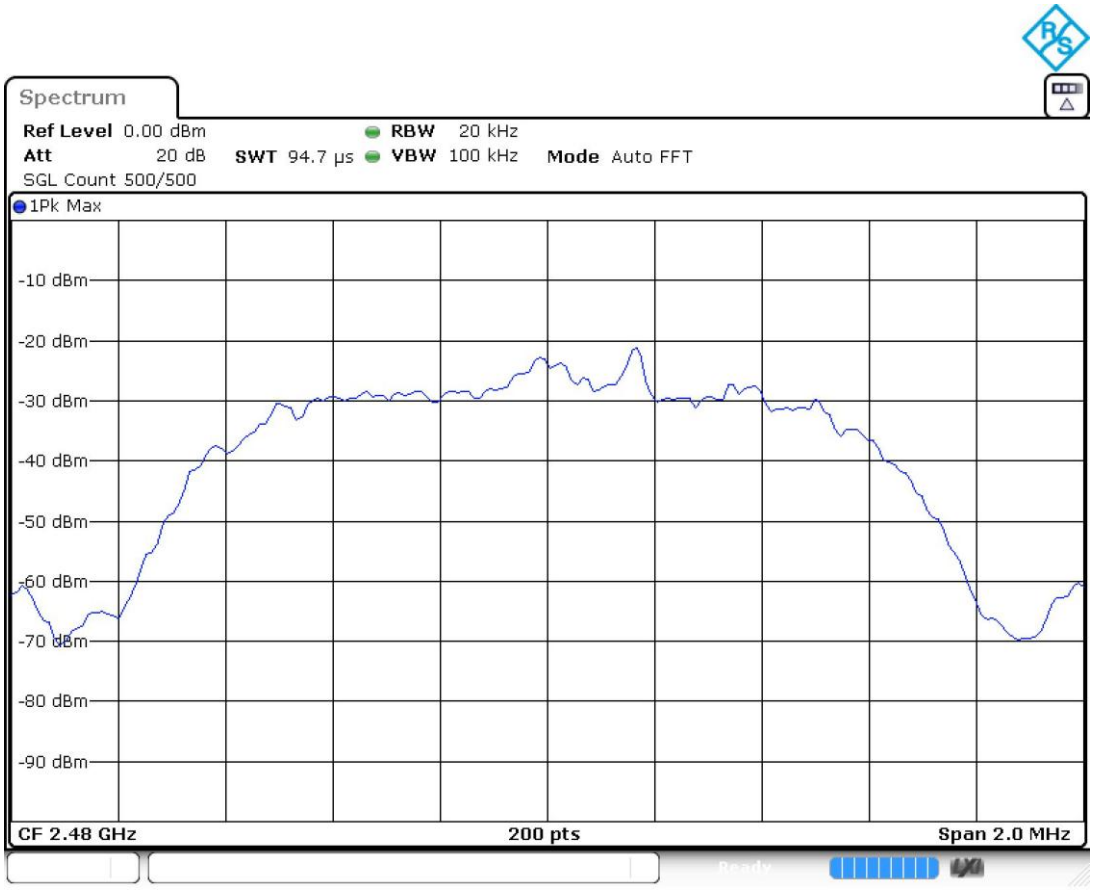
Frequency MHz = 2480.00000

Active Port = 3

Modulation = BT (8DPSK 3-DH5)

Images:





RSS-247 6.2.3.1 (a) / FCC 15.247 (a) (1) 20 dB Bandwidth

Limits

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

Modulation: BT (GFSK 1-DH5)

Results

Equipment	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	0.930
	2441.00000		0.935
	2480.00000		0.930

Verdict

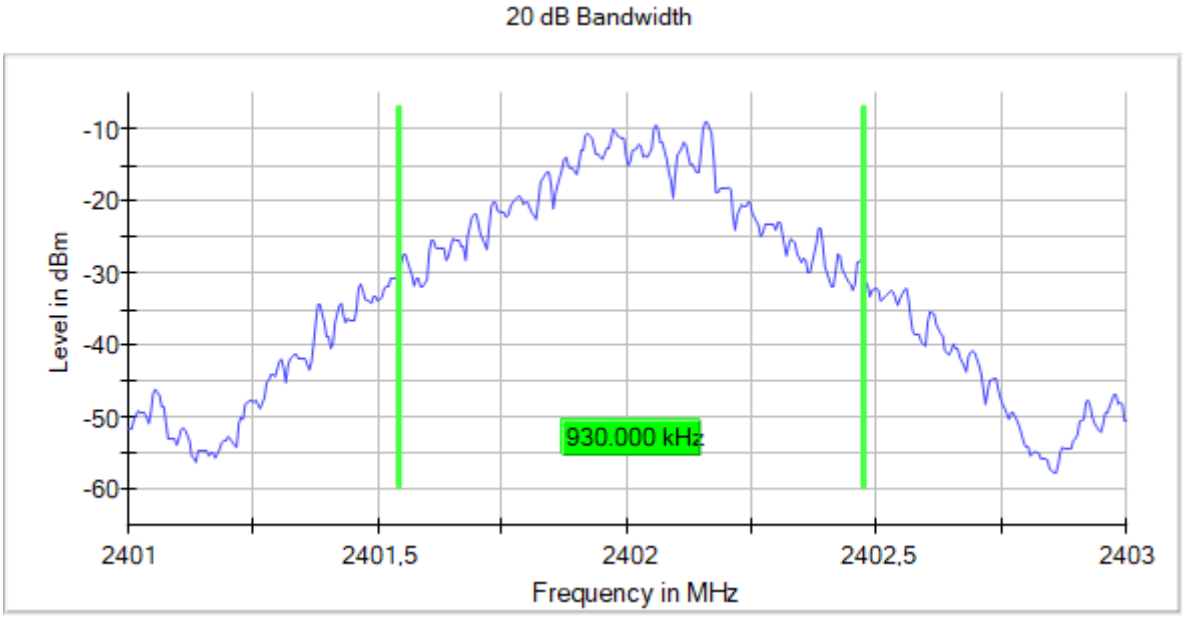
Pass

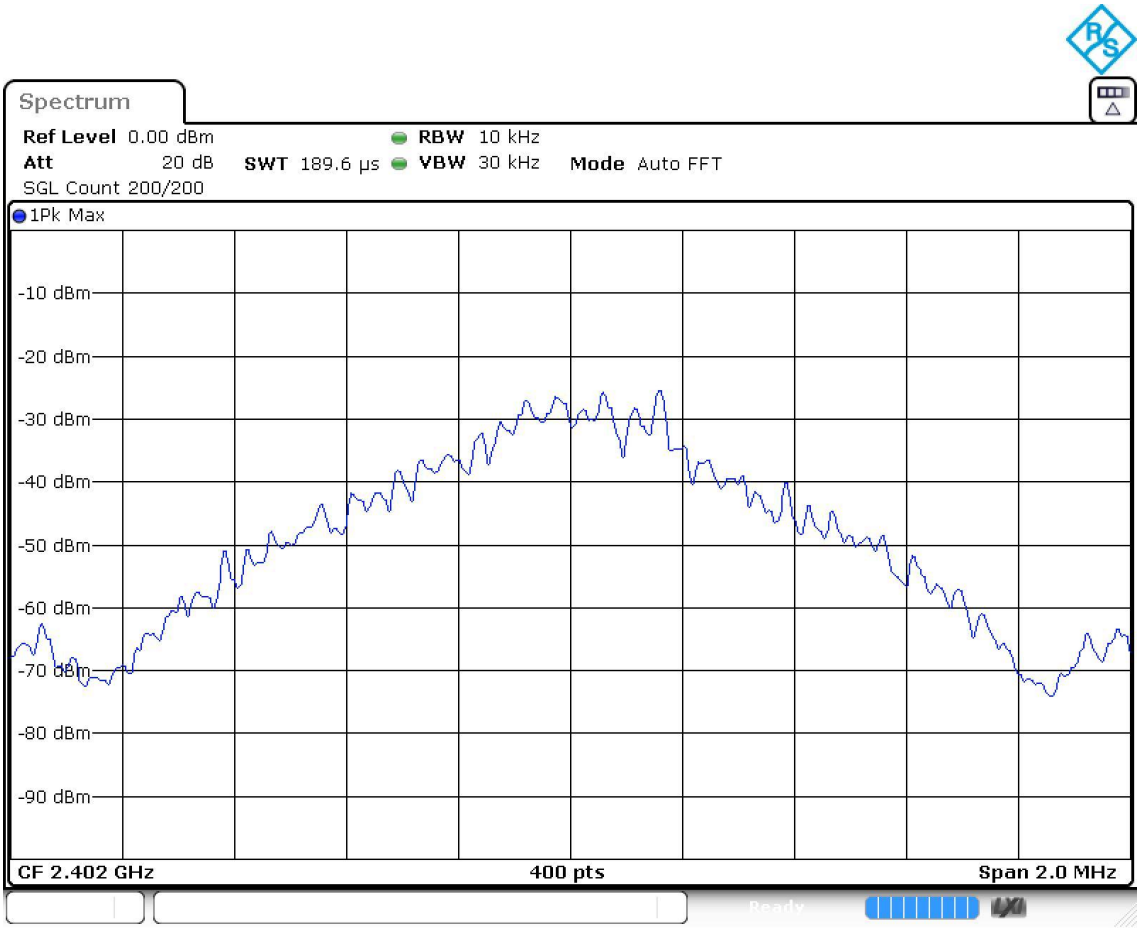
Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2402.00000

Active Port = 3 Modulation = BT (GFSK 1-DH5)

Images:

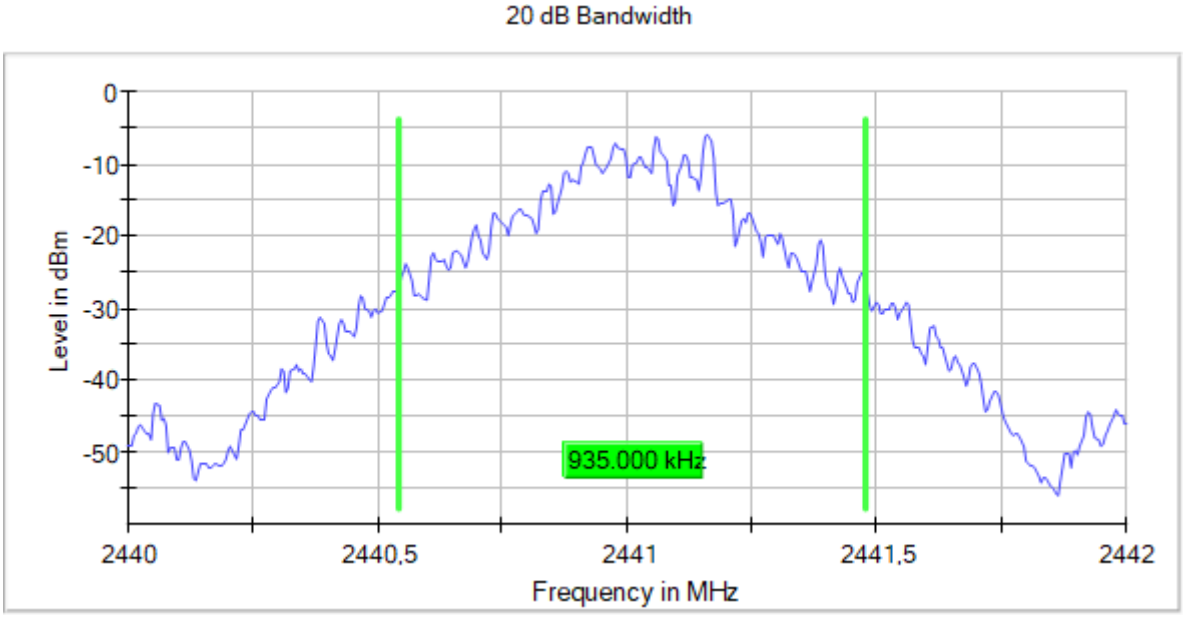


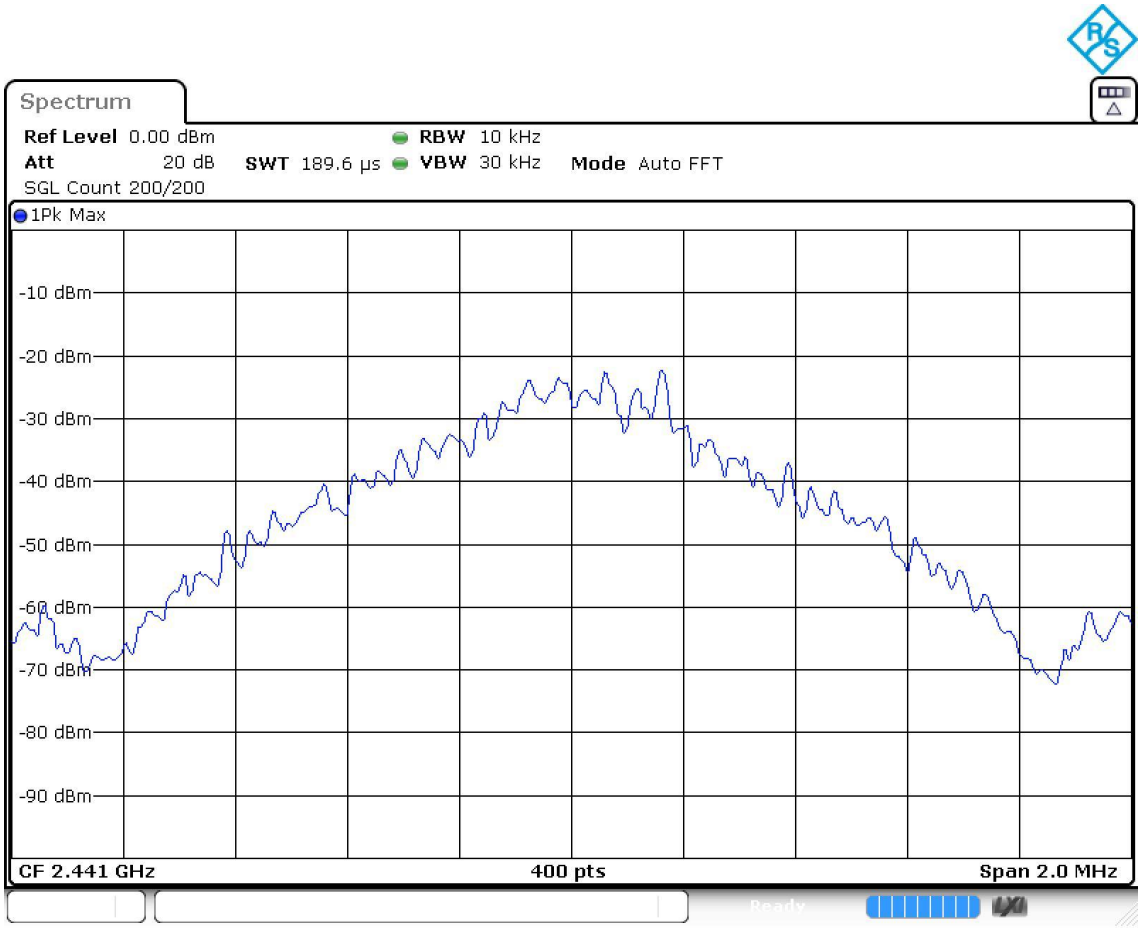


Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2441.00000

Active Port = 3 Modulation = BT (GFSK 1-DH5)

Images:

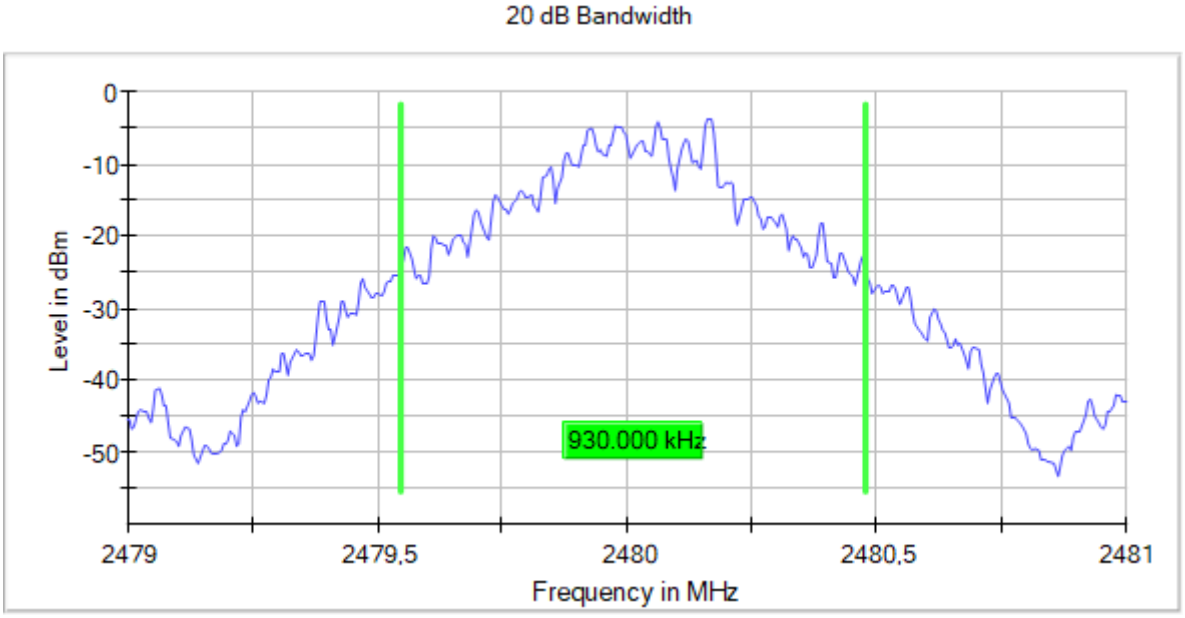


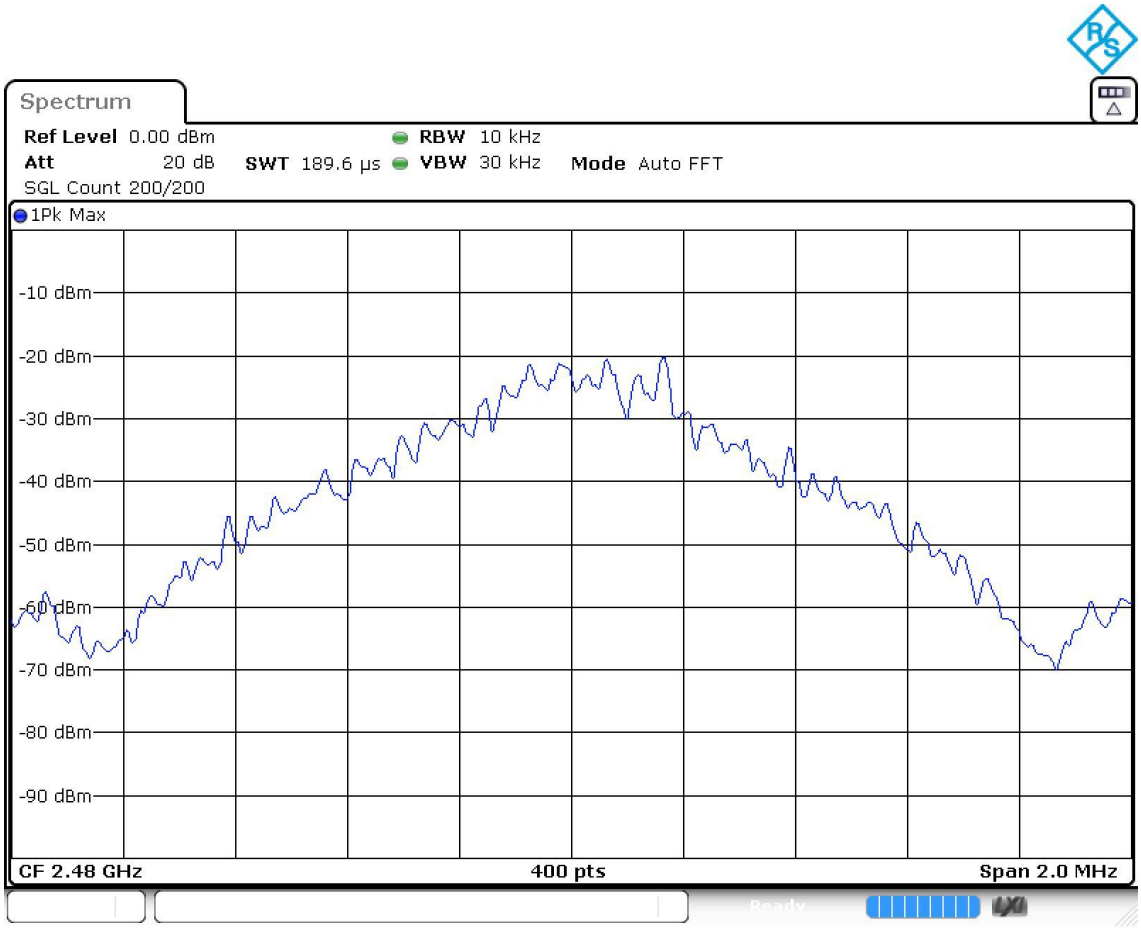


Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2480.00000

Active Port = 3 Modulation = BT (GFSK 1-DH5)

Images:





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

Results

Equipment	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	1.330
	2441.00000		1.335
	2480.00000		1.335

Verdict

Pass

Attachments

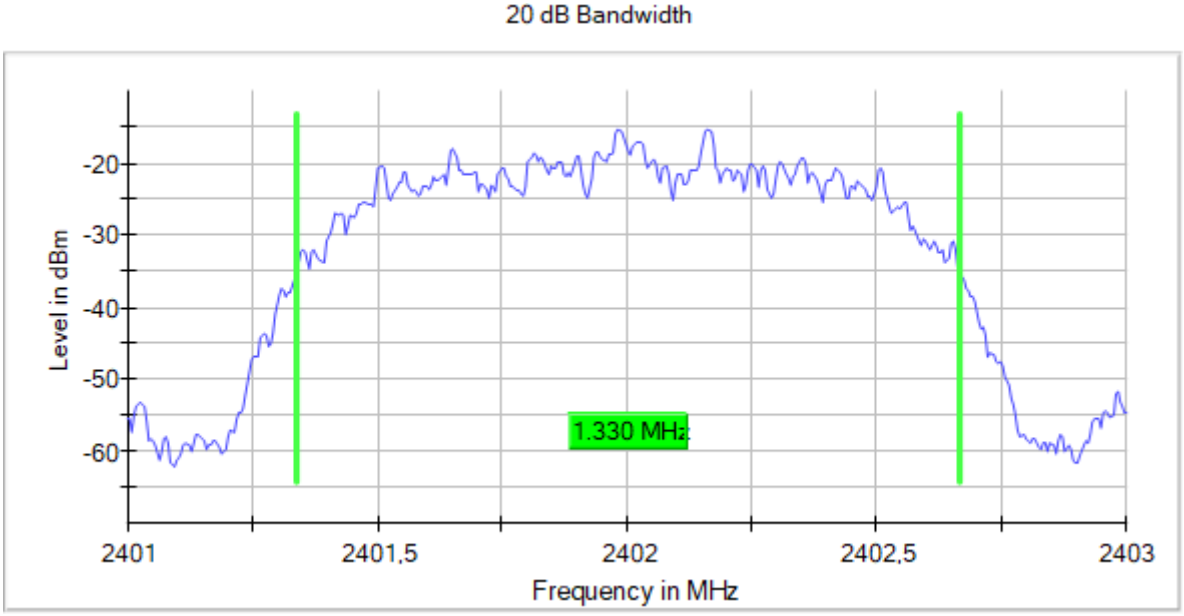
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

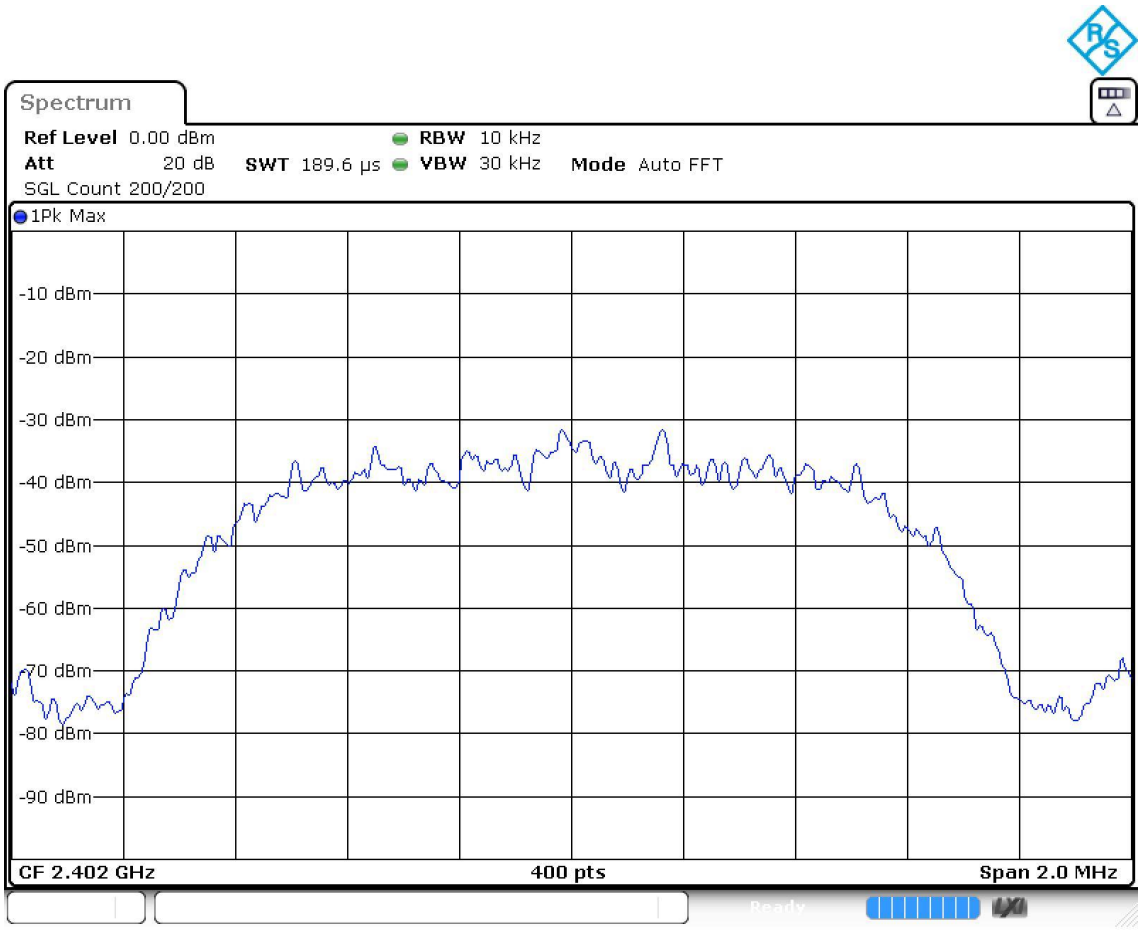
Active Port = 3

Frequency MHz = 2402.00000

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

Images:





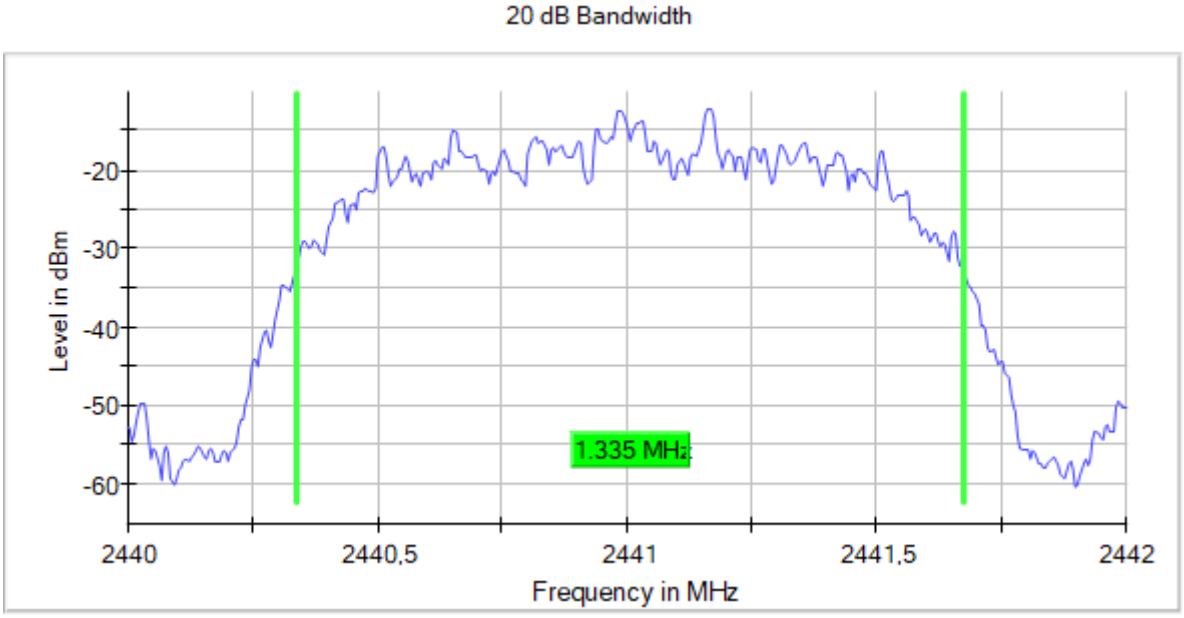
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

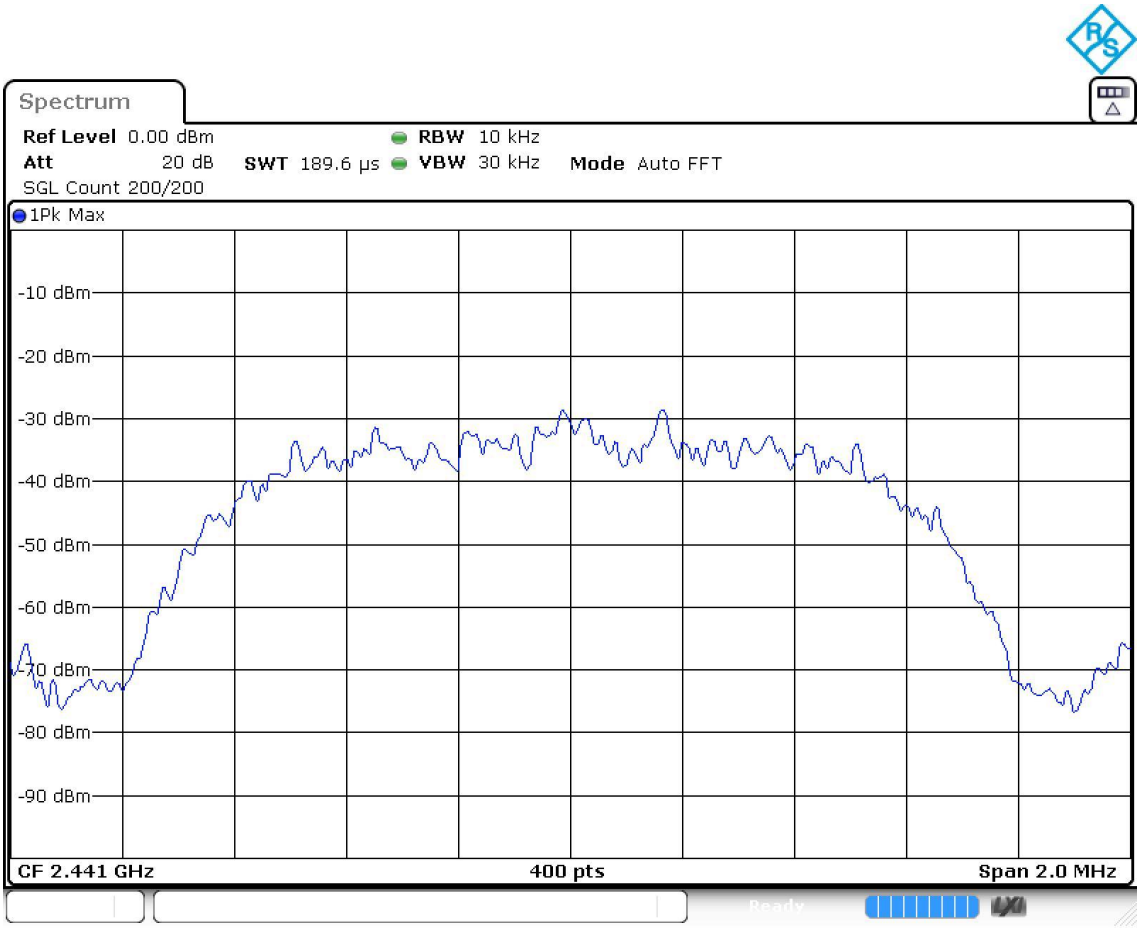
Active Port = 3

Frequency MHz = 2441.00000

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

Images:





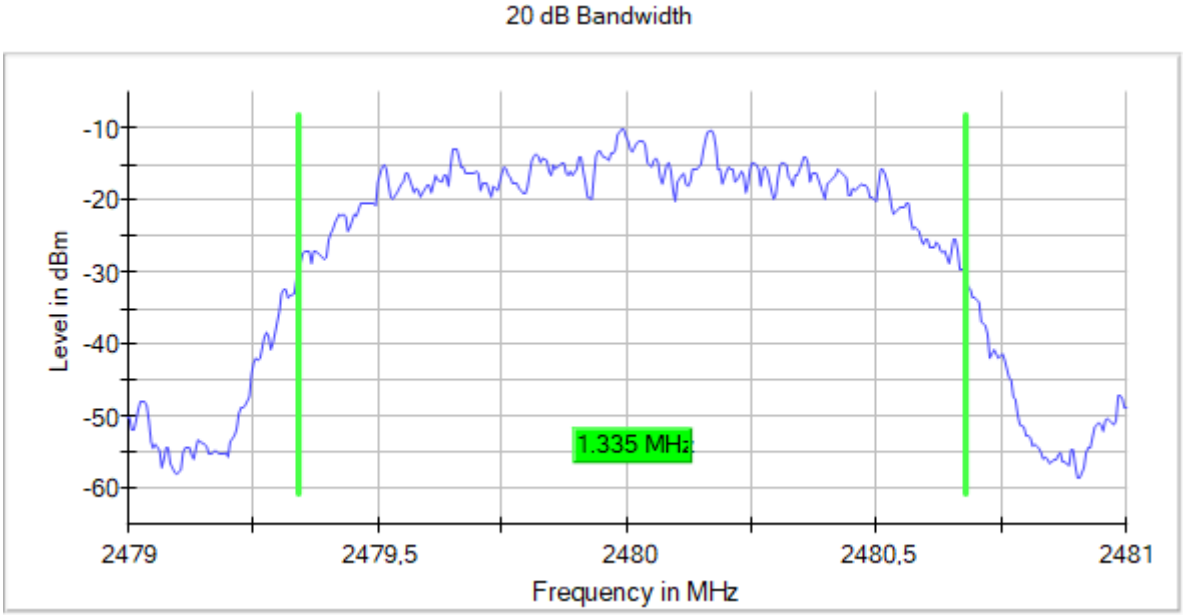
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS)

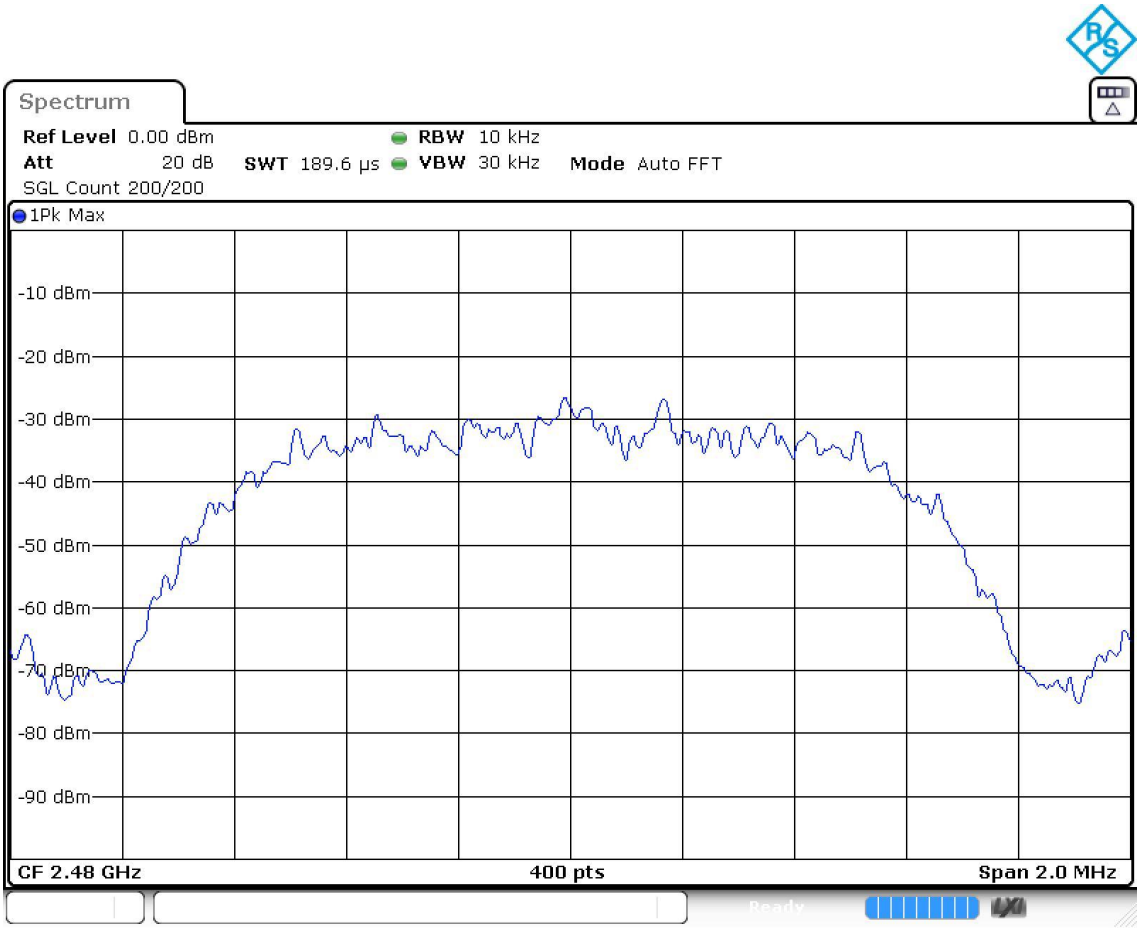
Frequency MHz = 2480.00000

Active Port = 3

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

Images:





Modulation: BT (8DPSK 3-DH5)

Results

Equipment	Freq (MHz)	Port	Ebw (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	2402.00000	3	1.280
	2441.00000		1.275
	2480.00000		1.285

Verdict

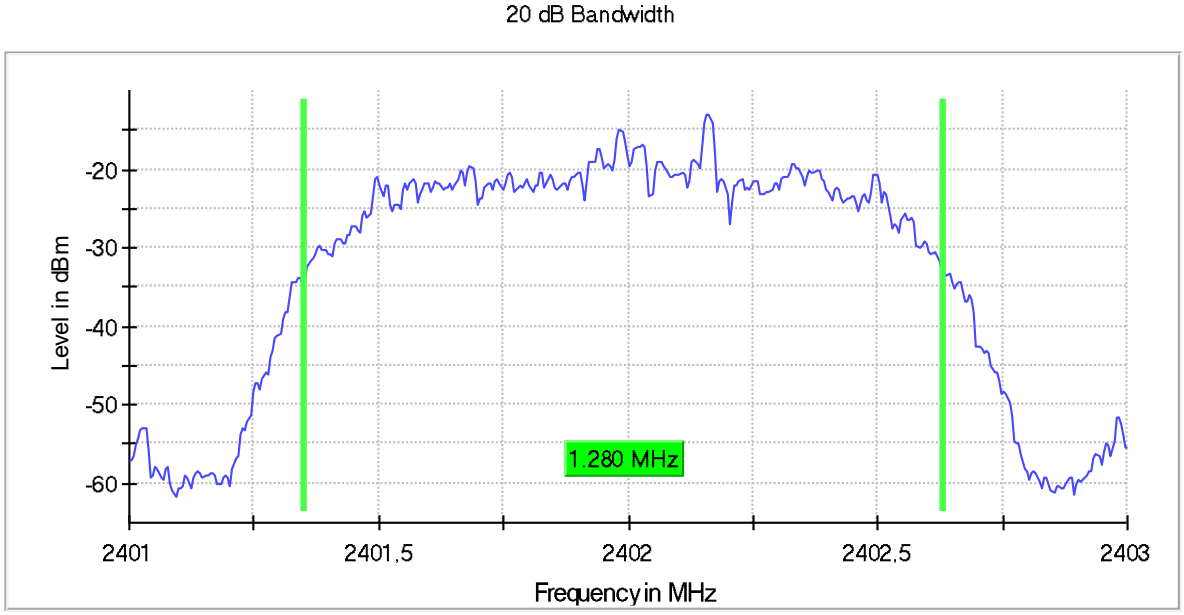
Pass

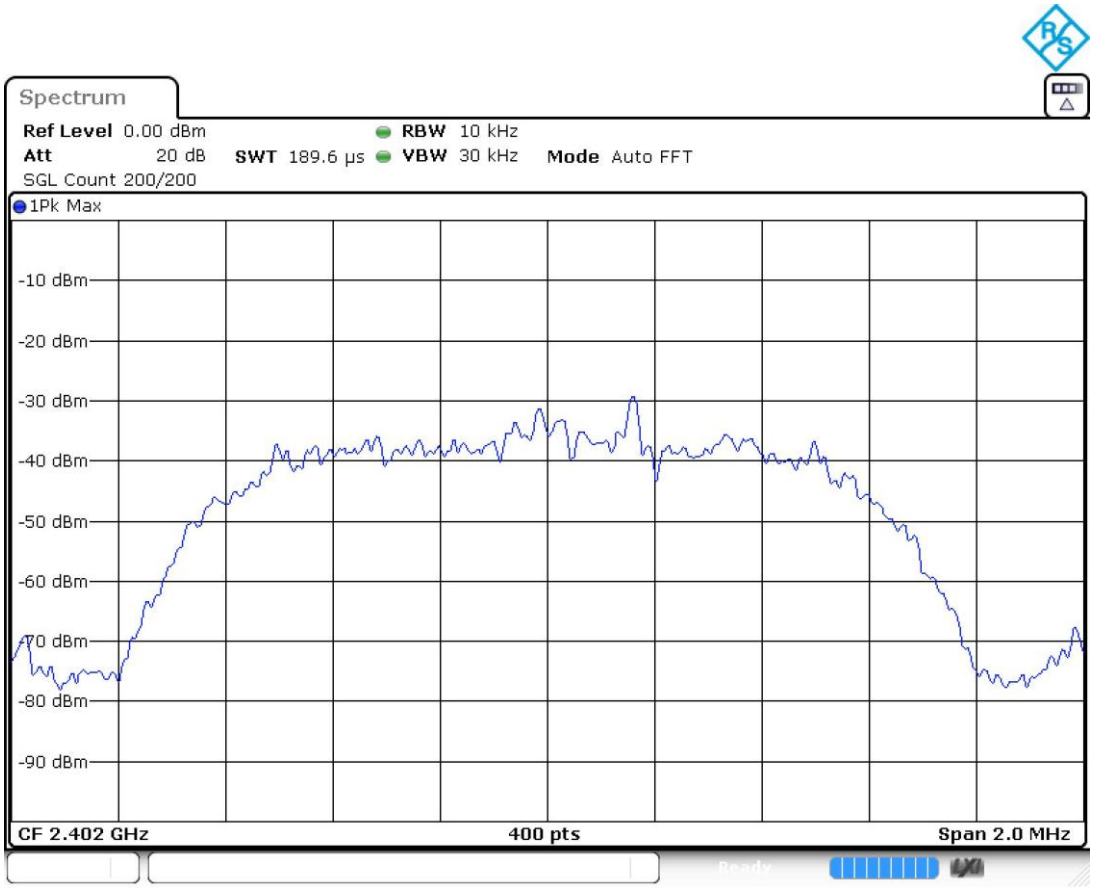
Attachments

Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2402.00000

Active Port = 3 Modulation = BT (8DPSK 3-DH5)

Images:

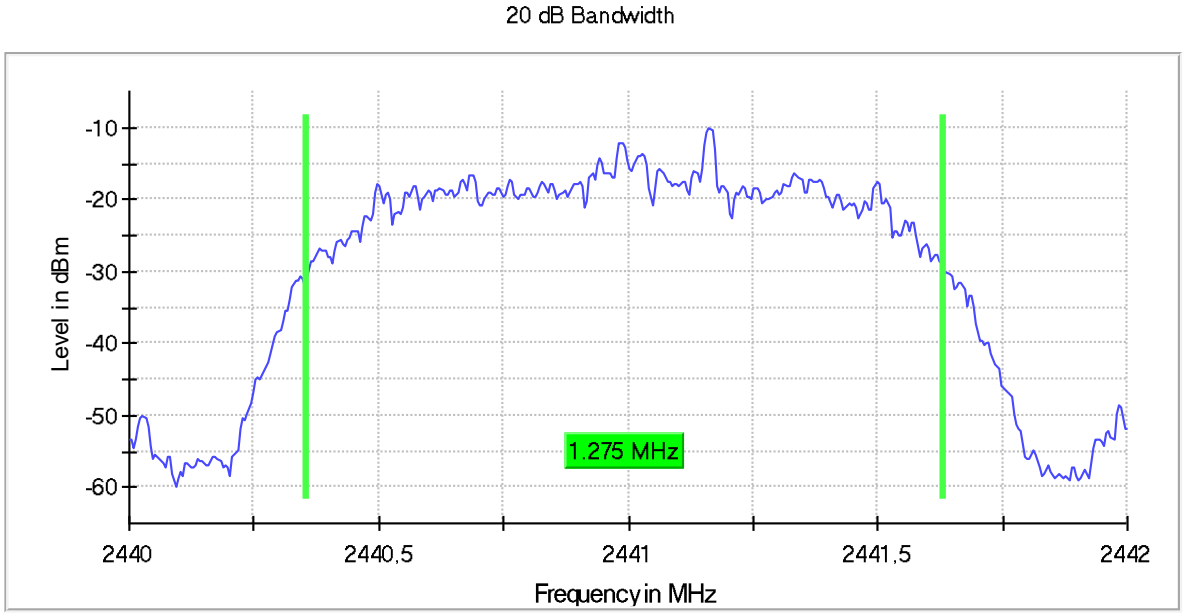


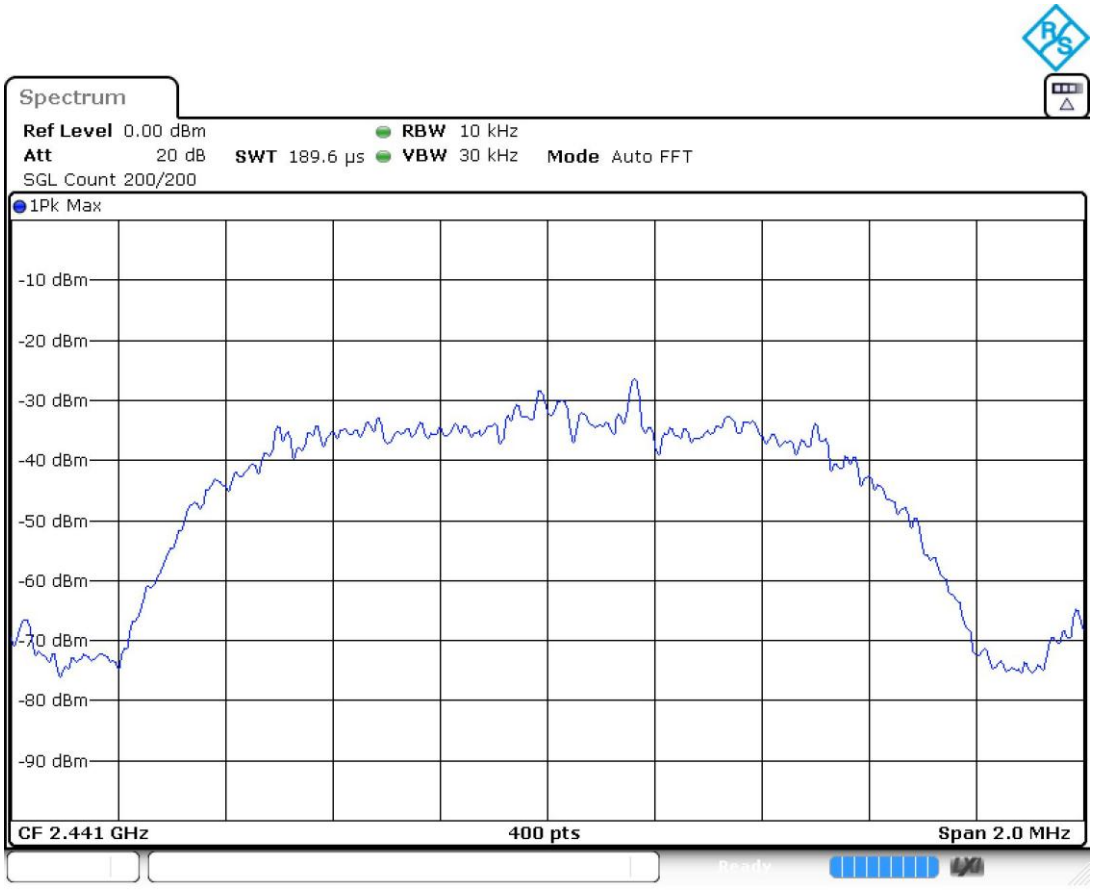


Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2441.00000

Active Port = 3 Modulation = BT (8DPSK 3-DH5)

Images:

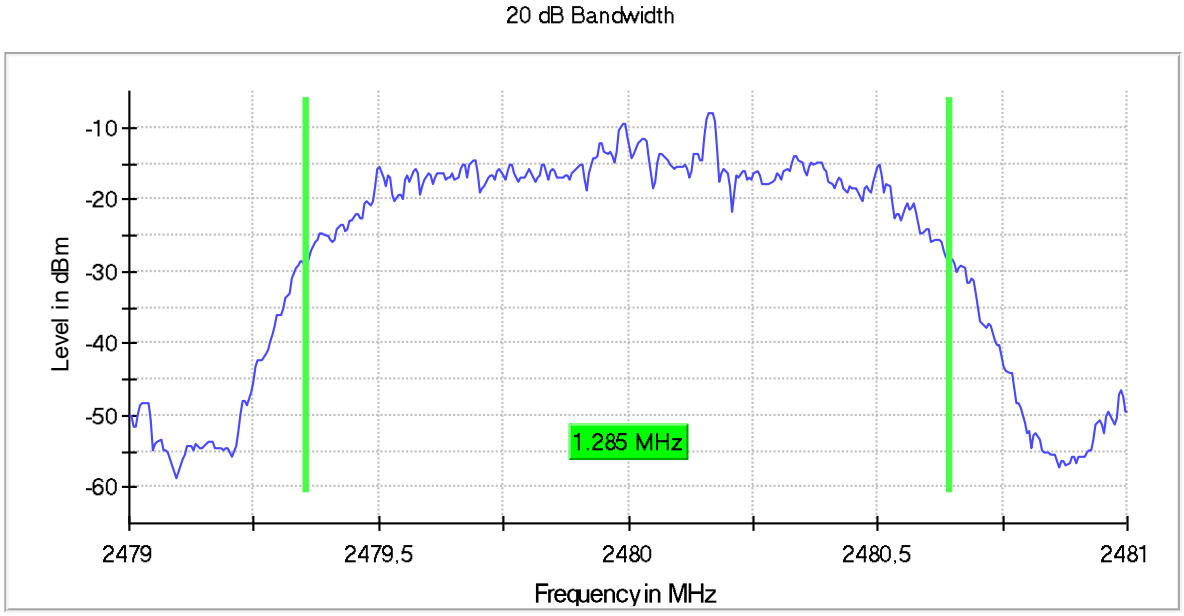


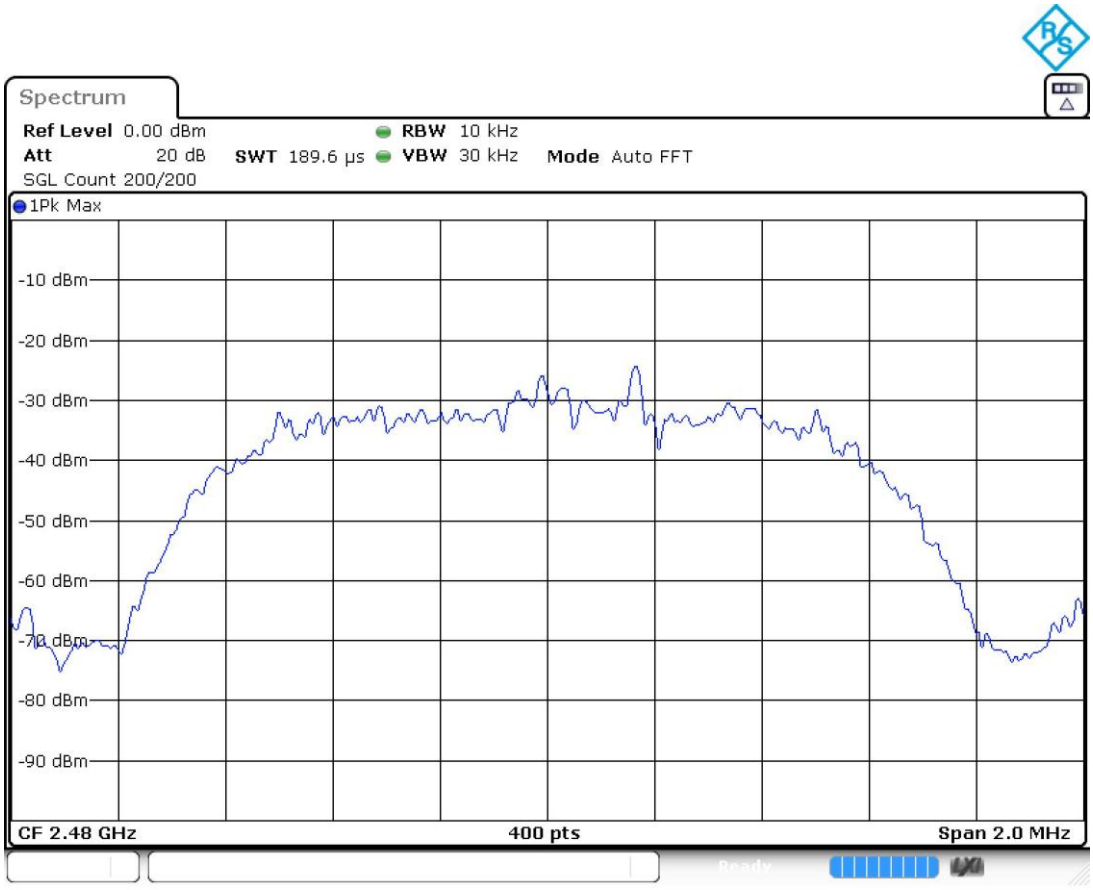


Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Frequency MHz = 2480.00000

Active Port = 3 Modulation = BT (8DPSK 3-DH5)

Images:





RSS-247 6.2.3.1 (a) / FCC 15.247 (a) (1) Carrier Frequency Separation

Limits

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

Modulation: BT (GFSK 1-DH5)

Results

Equipment	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	3	0.98

Verdict

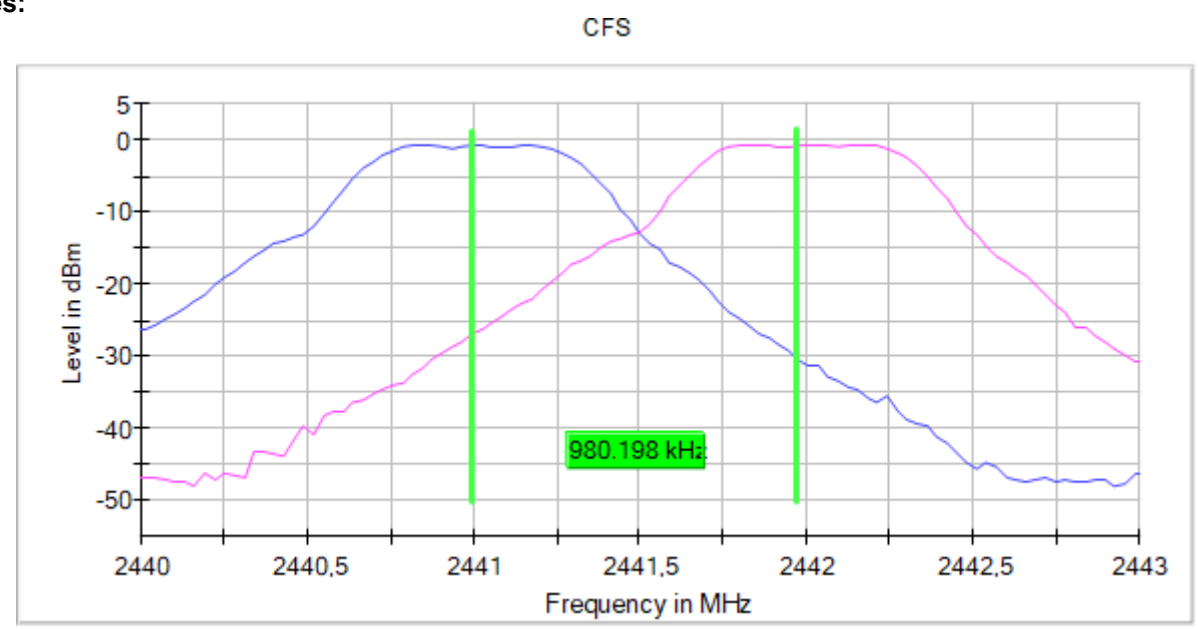
Pass

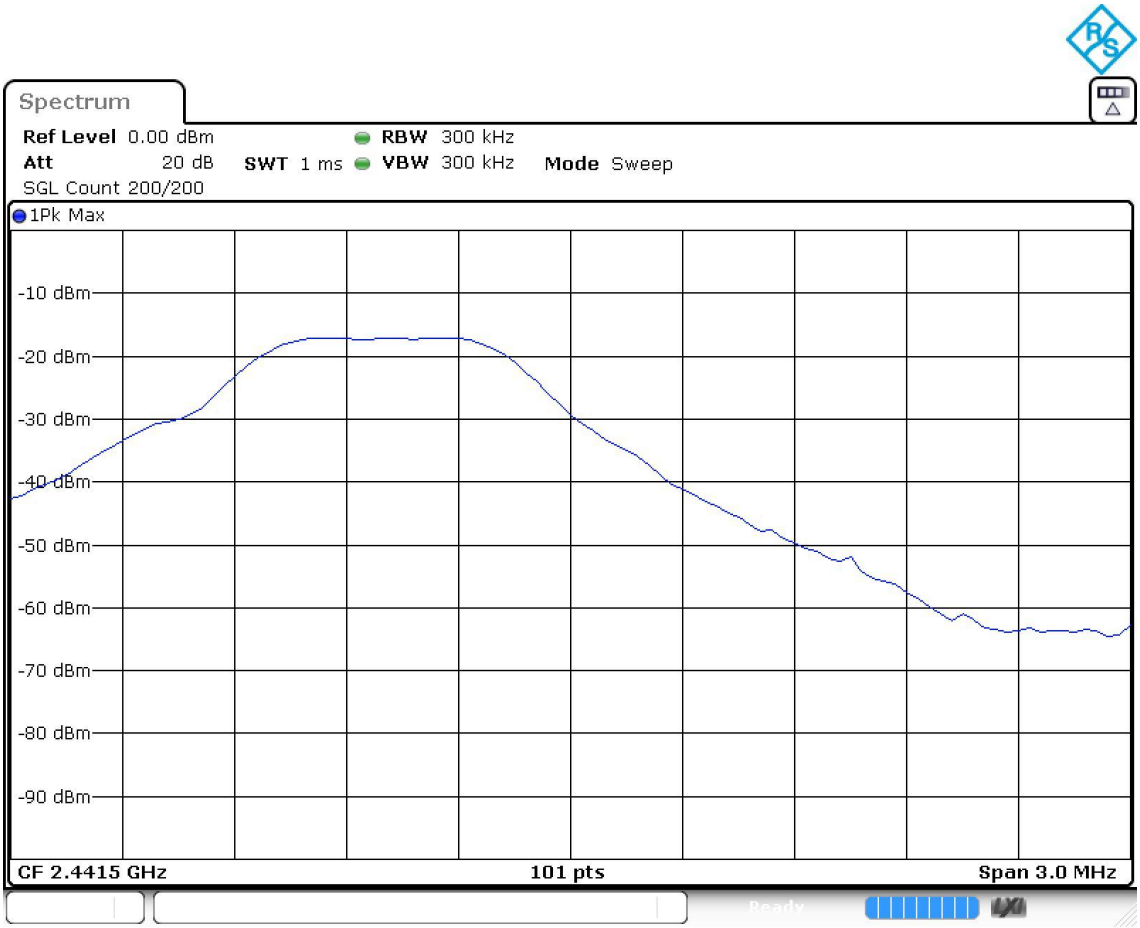
Attachments

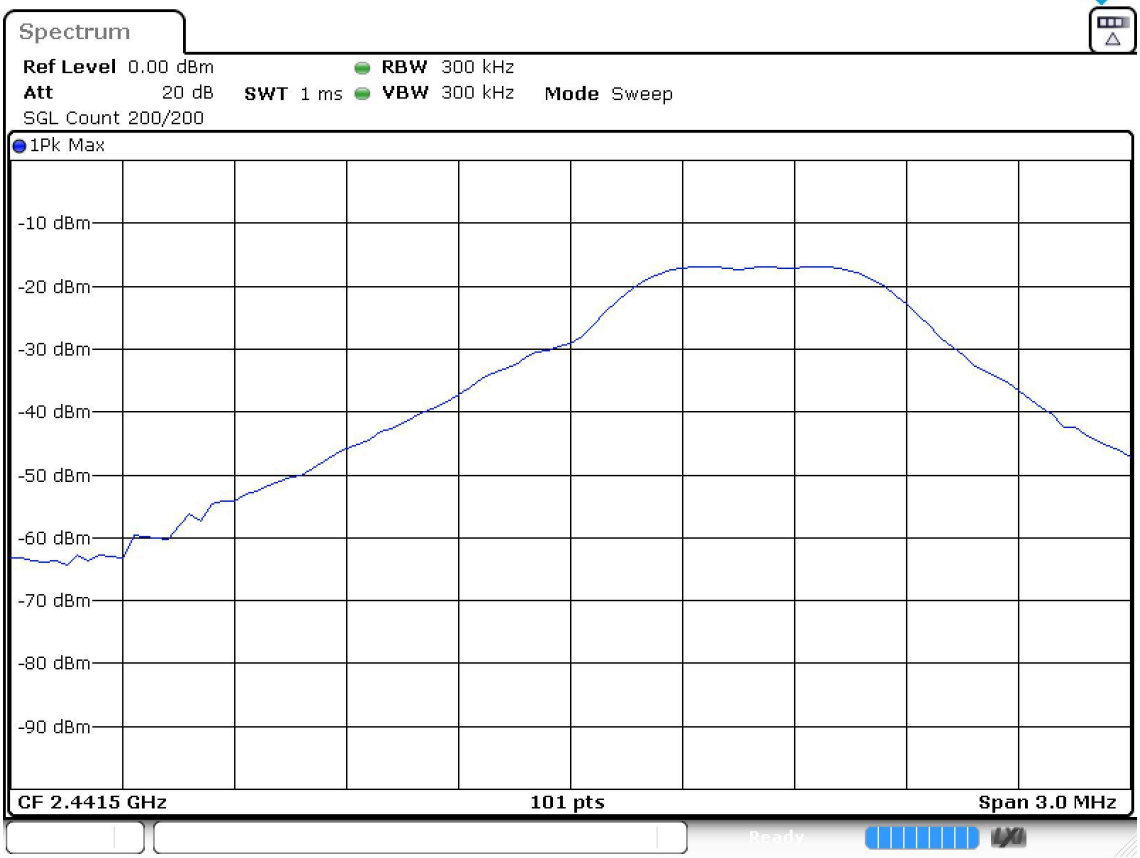
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Active Port = 3

Modulation = BT (GFSK 1-DH5)

Images:






Spectrum
Ref Level 0.00 dBm
RBW 300 kHz
Att 20 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz
Ready

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

Results

Equipment	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	3	1.01

Verdict

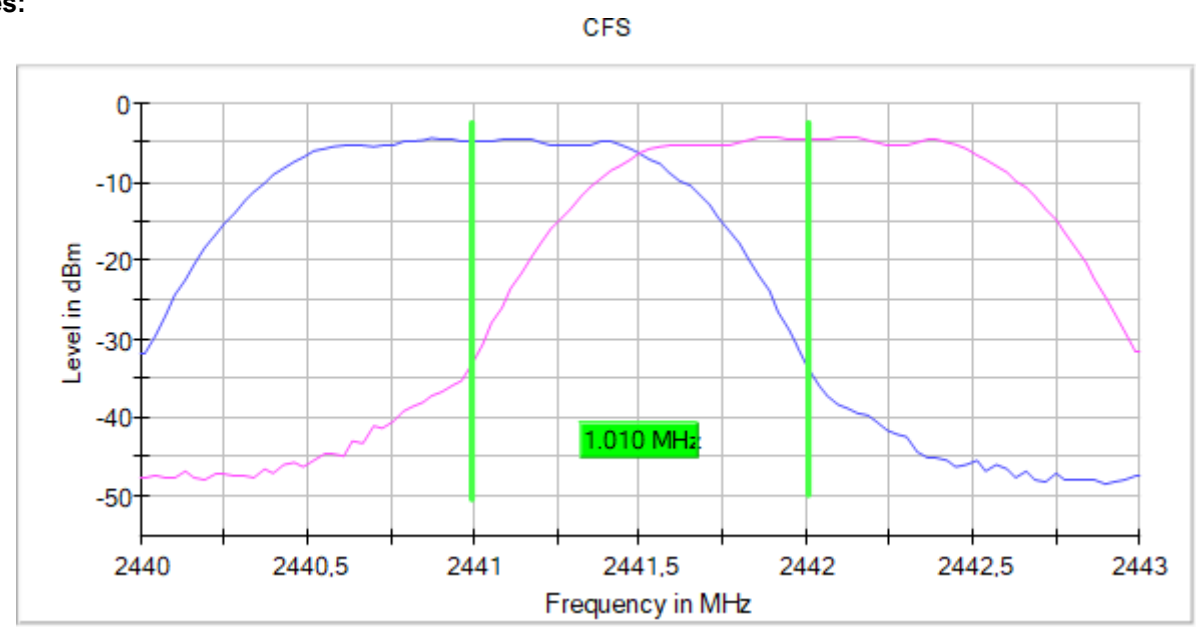
Pass

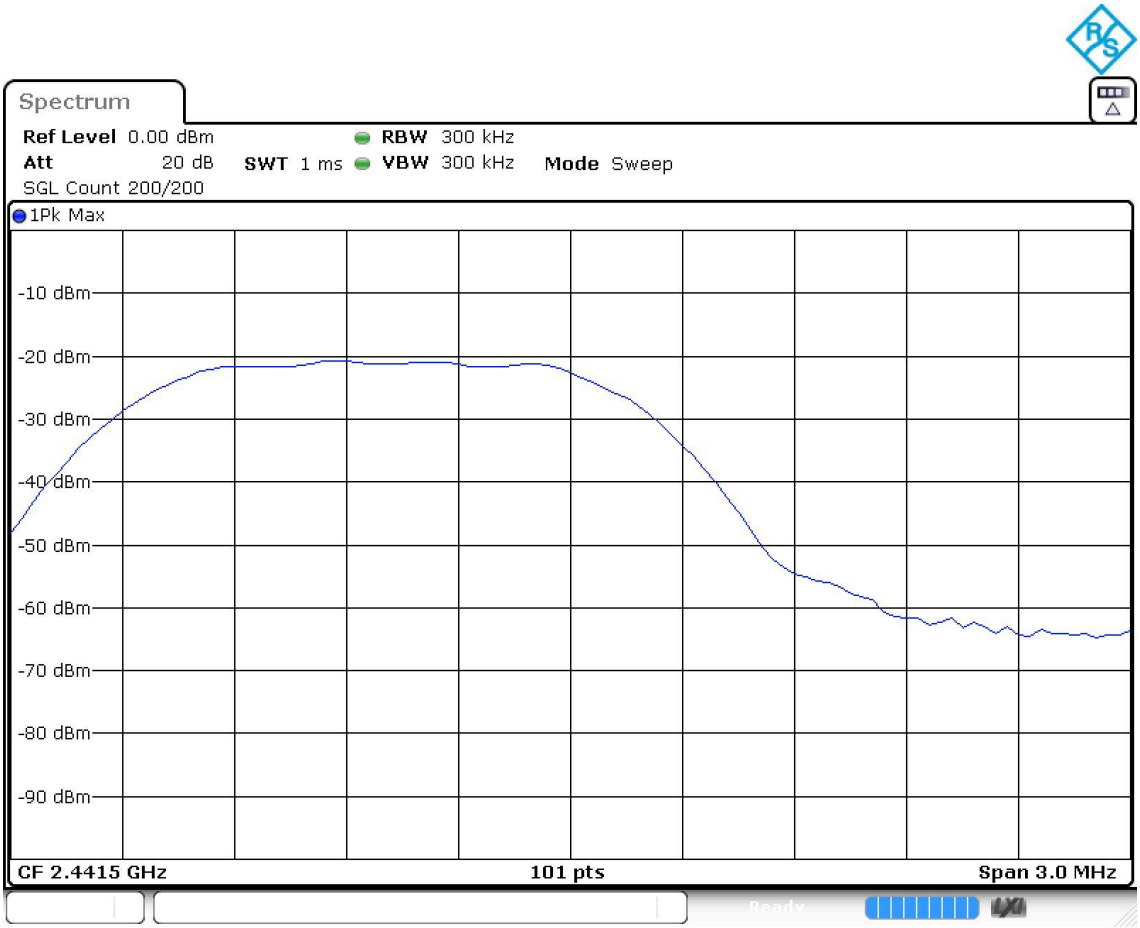
Attachments

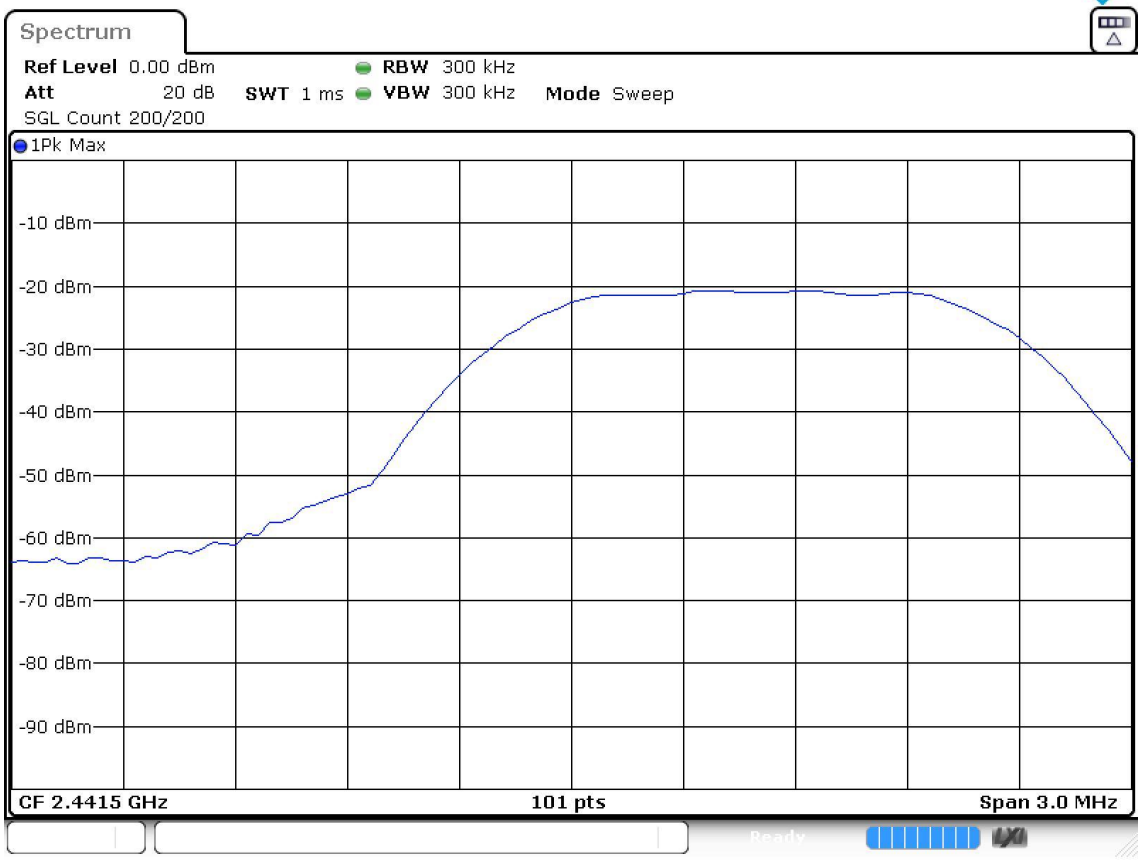
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Active Port = 3

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

Images:






Spectrum
Ref Level 0.00 dBm
RBW 300 kHz
Att 20 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz
Ready

Modulation: BT (8DPSK 3-DH5)

Results

Equipment	Port	Freq Sep (MHz)
Frequency Hopping Spread Spectrum systems (DSS)	3	1.01

Verdict

Pass

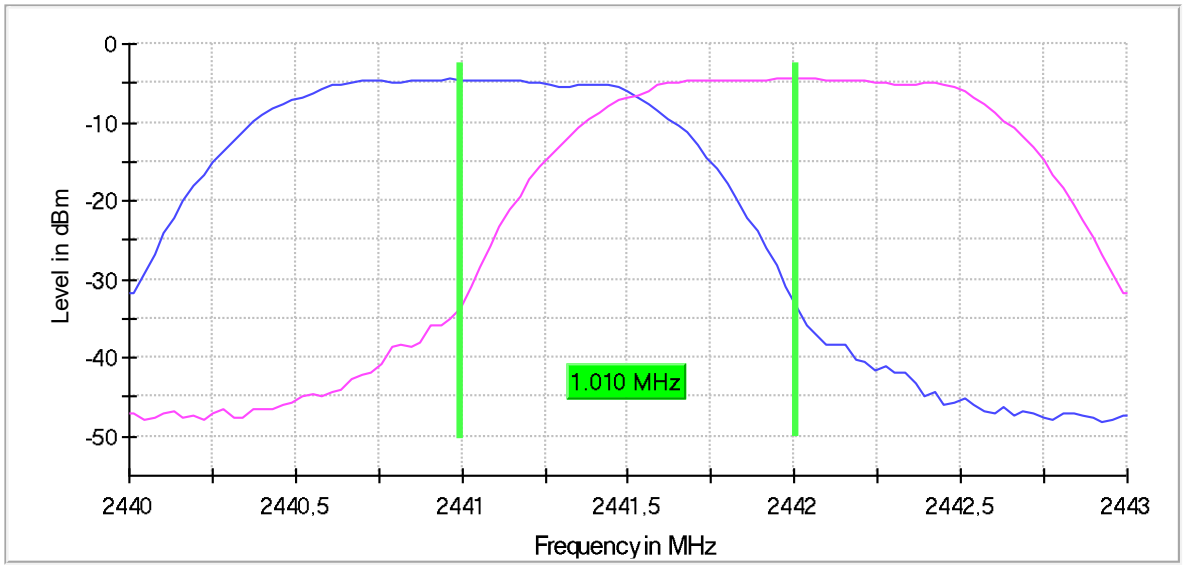
Attachments

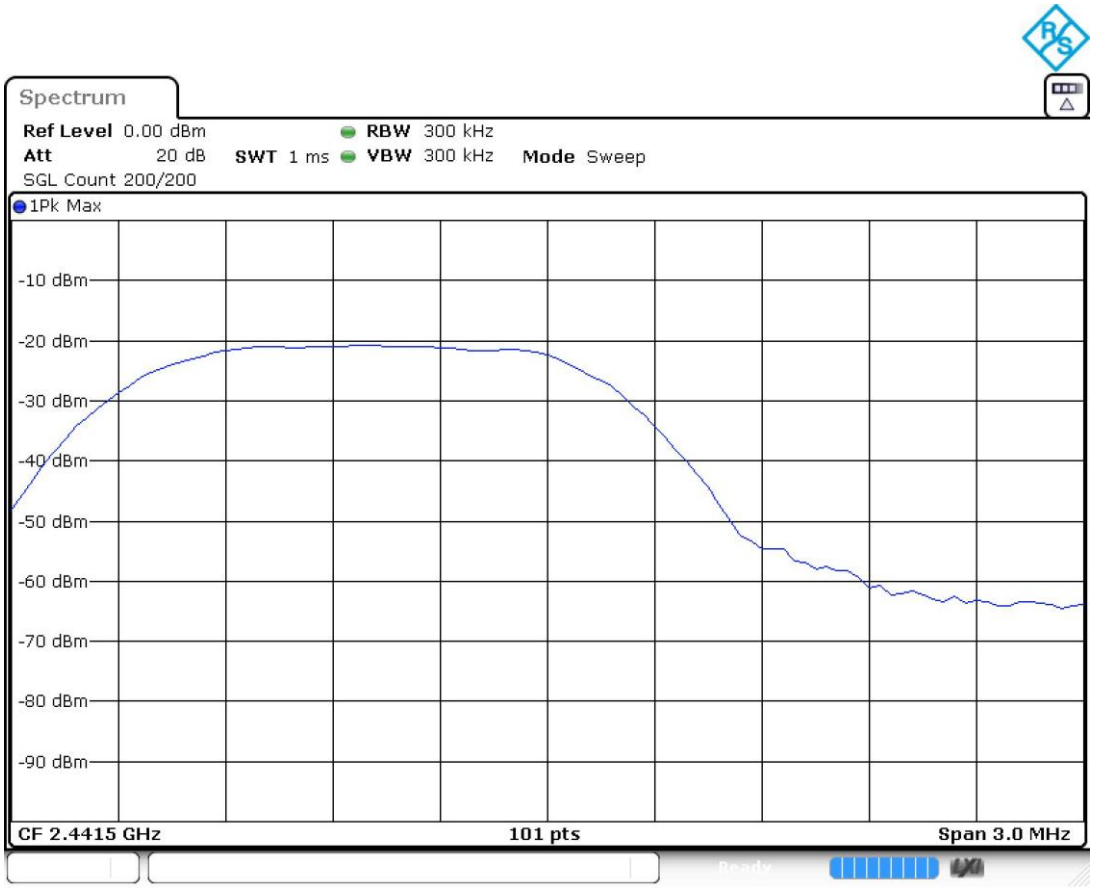
Equipment Type = Frequency Hopping Spread Spectrum systems (DSS) Active Port = 3

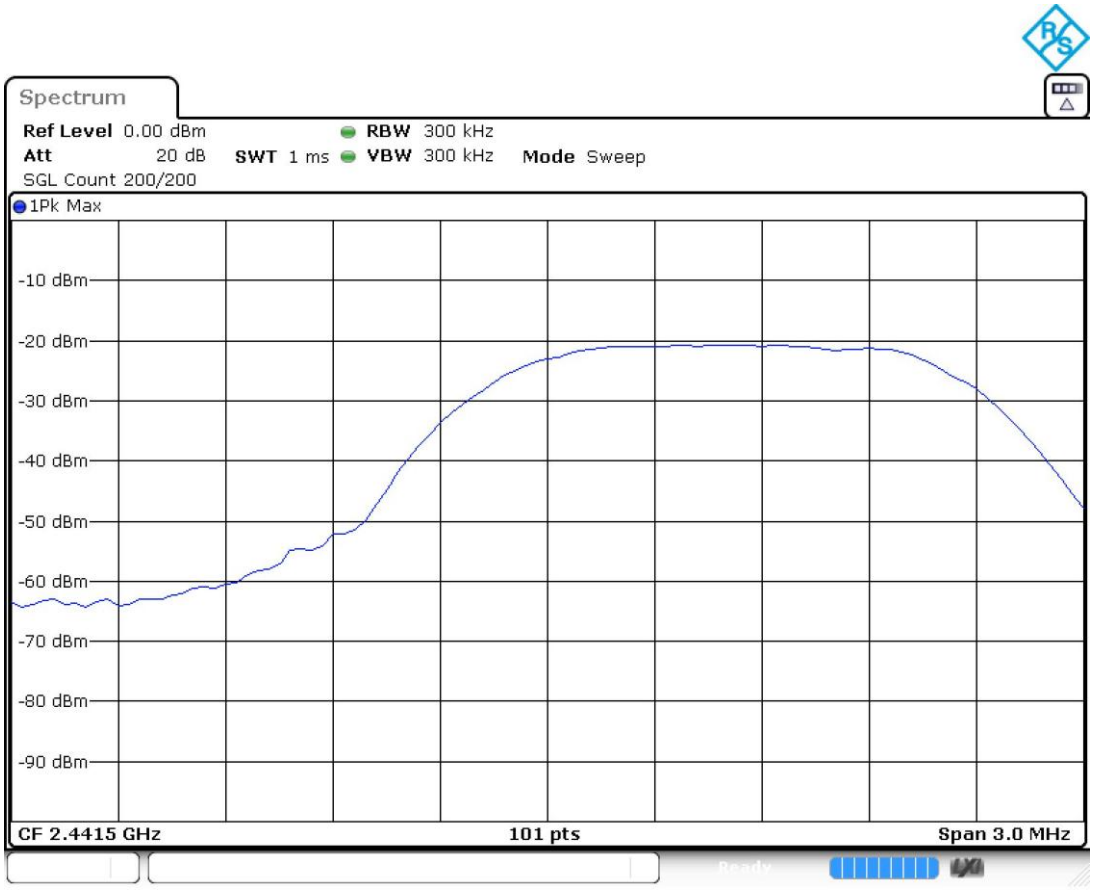
Modulation = BT (8DPSK 3-DH5)

Images:

CFS






Spectrum
Ref Level 0.00 dBm
RBW 300 kHz
Att 20 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.4415 GHz
101 pts
Span 3.0 MHz