DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
72872RRF.001

Test Report
USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Central Unit 2 - LatAm variant
(*) Trademark	Verisure
(*) Model and /or type reference	GW-CU2L
Other identification of the product	FCC ID: 2A93W-GW-CU2L IC: Not provided
(*) Features	Central processing, Ethernet, Wi-Fi, Cellular, DECT, ISM HW version: A5 SW version: 1.8.26
Applicant	Verisure Sàrl Chemin Jean-Baptiste Vandelle 3 1290 Versoix (Switzerland)
Test method requested, standard	USA FCC Part 15.247 (10-1-21 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-21 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2023-05-04
Report template No	FDT08_24 (*) “Data provided by the client”

Index

Acronyms

Acronym ID	Acronym Description
# of Tx Chains	Number of Transmission Chains
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
MP	Measurement Point
Mod	Modulation
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.

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 ≤ ± 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 ≤ ± 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 ≤ ± 5,51 dB with factor (k = 2).

The total uncertainty of the measurement system for the conducted testing of EUT is:
RF Average Output Power: Measurement uncertainty ≤ ± 0,99 dB
Power Spectral Density: Measurement uncertainty ≤ ± 0,99 dB
6dB Bandwidth: Measurement uncertainty ≤ ± 2,84 %
Occupied Channel Bandwidth: Measurement uncertainty ≤ ± 1,17 %
Conducted Band-edge spurious emissions: Measurement uncertainty ≤ ± 1,76 dB

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample consists of a Central Unit 2 - LatAm variant. Central Unit of the alarm suite. It acts as the main hub and gateway.

3. Equipment supports frequency sharing techniques.

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.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	72872C_30.1	Central Unit 2 - LatAm variant (radiated)	GW-CU2L	26MN K2ZF	2022-12-22	Element Under Test
S/02	72872C_57.1	Central Unit 2 - LatAm variant (conducted)	GW-CU2L	26MN JYAR	2022-12-28	Element Under Test
S/03	72872C_56.1	Central Unit 2 - LatAm variant (conducted)	GW-CU2L	26MN K3HD	2022-12-28	Element Under Test
S/01, S/02 & S/03	72872C_39.1	AC/DC adapter	AA18A-120GVS1	--	2022-12-22	Element Under Test
S/01, S/02 & S/03	72872C_19.1	Raspberry Pi	--	--	2022-12-12	Auxiliary Element
S/01, S/02 & S/03	72872C_35.1	Ethernet cable	--	--	2022-12-22	Auxiliary Element
S/01, S/02 & S/03	72872C_65.1	AC/DC adapter	KSA-15E-051300HE	--	2022-12-28	Auxiliary Element
S/01, S/02 & S/03	72872C_70.1	HDMI cable	--	--	2022-12-28	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Test samples used for Radiated testing.
S/02	Test samples used for Conducted testing included in Appendix A.
S/03	Test samples used for Conducted testing included in Appendix B.

Test sample description

<table>
<tr><td rowspan="3">Ports…… :</td><td colspan="2" rowspan="2">Port name and description</td><td colspan="4">Cable</td></tr>
<tr><td>Specified max length [m]</td><td>Attached during test</td><td>Shielded</td><td>Coupled to patient(3)</td></tr>
<tr><td colspan="2">RJ45 Ethernet socket</td><td>.....</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td colspan="2">DC power barrel jack</td><td>.....</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="6">Insertion loss for semi-rigids for conducted testing: 0.5-1.5GHz: 0.1 dB; 1.5-3.5GHz: 0.2dB; 3.5-5.5GHz: 0.3dB; 5.5-6.5GHz: 0.5dB.</td></tr>
<tr><td rowspan="4">Rated power supply .....:</td><td colspan="2" rowspan="2">Voltage and Frequency</td><td colspan="5">Reference poles</td></tr>
<tr><td>L1</td><td>L2</td><td>L3</td><td>N</td><td>PE</td></tr>
<tr><td>[X]</td><td>AC:100-240Vac @50-60Hz</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>[ ]</td><td colspan="5">DC: 12-14.5V 1.5A</td></tr>
<tr><td>Rated Power .....:</td><td colspan="6">18 W</td></tr>
<tr><td>Clock frequencies.....:</td><td colspan="6">32.786 kHz, 13.824 MHz, 24 MHz, 25 MHz, 26 MHz, 37.4 MHz (+ frequencies derived)</td></tr>
<tr><td>Other parameters.....:</td><td colspan="6">.....</td></tr>
<tr><td>Software version .....:</td><td colspan="6">1.8.26</td></tr>
<tr><td>Hardware version.....:</td><td colspan="6">A5</td></tr>
<tr><td>Dimensions in cm (W x H x D) ....:</td><td colspan="6">17.4 x 10.5 x 3</td></tr>
<tr><td rowspan="5">Mounting position.....:</td><td>[ ]</td><td colspan="5">Table top equipment</td></tr>
<tr><td>[X]</td><td colspan="5">Wall/Ceiling mounted equipment</td></tr>
<tr><td>[ ]</td><td colspan="5">Floor standing equipment</td></tr>
<tr><td>[ ]</td><td colspan="5">Hand-held equipment</td></tr>
<tr><td>[ ]</td><td colspan="5">Other: .....</td></tr>
<tr><td rowspan="3">Modules/parts.....:</td><td colspan="3">Module/parts of test item</td><td>Type</td><td colspan="2">Manufacturer</td></tr>
<tr><td colspan="3">Wall bracket</td><td>.....</td><td colspan="2">Verisure</td></tr>
<tr><td colspan="3">Power supply</td><td>.....</td><td colspan="2">Phihong</td></tr>
<tr><td rowspan="2">Accessories (not part of the test item) .....:</td><td colspan="3">Description</td><td>Type</td><td colspan="2">Manufacturer</td></tr>
<tr><td colspan="3">Aux. test computer</td><td>.....</td><td colspan="2">Raspberry Pi</td></tr>
</table>

Documents as provided by the applicant.....:	Description	File name	Issue date
	.....	.....	.....

(3) Only for Medical Equipment

Identification of the client

ESML SD IBERIA HOLDING SA
Calle Priégola, 2, Pozuelo de Alarcon, 28224, Madrid, Spain

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-01-03
Date (finish)	2023-01-30

Document history

Report number	Date	Description
72872RRF.001	2023-01-24	First release.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Fernando Chito Solis, Rafael Fernandez Martín, Sergio Carrasco and Pablo Redondo Reyes.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
4578	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2023-04-30
6142	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2023-06-16
6165	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2023-11-08
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2024-09-15
6121	PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	2023-11-30
8866	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2023-09-21
4611	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2022-11-18
5705	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2023-07-21
4716	SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2024-08-12
7794	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2023-02-26
4825	SEMIANECHOIC ABSORBER LINED CHAMBER	FACT 3 200 STP	ETS LINDGREN	--
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	Frankonia	--
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
0922	DC POWER SUPPLY 40V/40A	NGPE 40/40	ROHDE AND SCHWARZ	--
5880	DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	--
7760	DIGITAL MULTIMETER	175	FLUKE	2023-11-14

Testing verdicts

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

Summary

SRD 915 MHz

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	
Supplementary information and remarks: None			

802.11 B/G/N 20 MHz 2x2

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	
Supplementary information and remarks: None			

Appendix A: Test results. SRD 915 MHz

INDEX

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	115 Vac
Type of Power Supply:	AC power

ANTENNA (*):

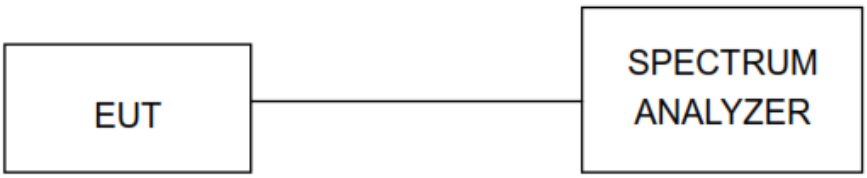
Type of Antenna:	IFA/PIFA (printed on PCB). 3 antennas (independent).
Maximum Declared Antenna Gain:	-1.6 dBi

TEST FREQUENCIES (*):

Low Channel:	917.5 MHz
High Channel:	925.5 MHz

CONDUCTED MEASUREMENTS:

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



RADIATED MEASUREMENTS:

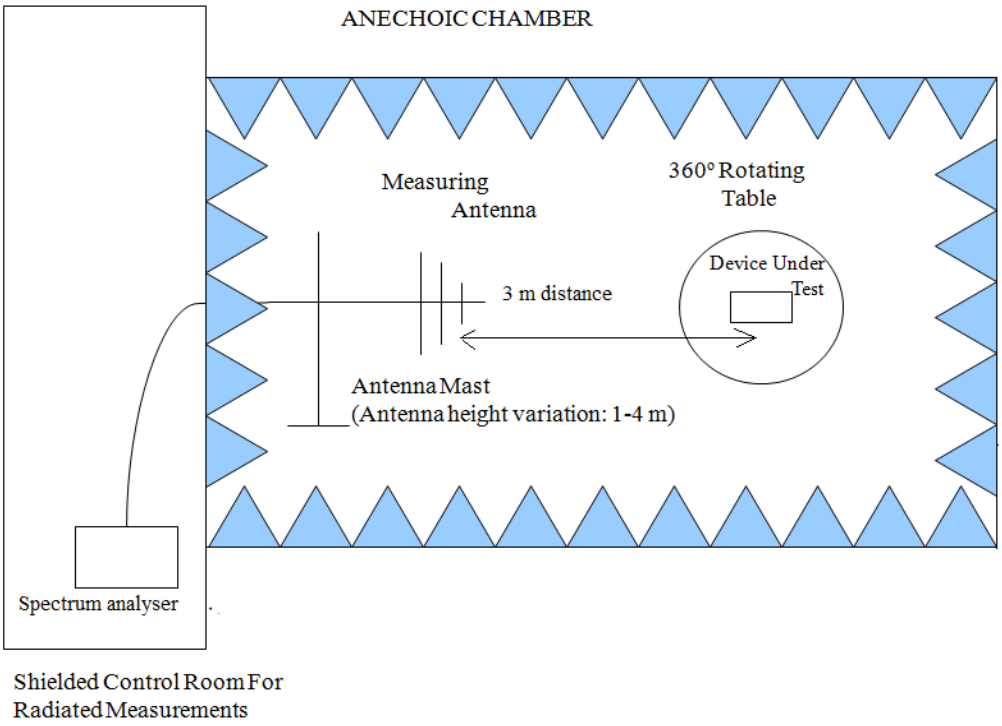
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-10 GHz Double ridge horn antenna) is situated at a distance of 3 m.

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.

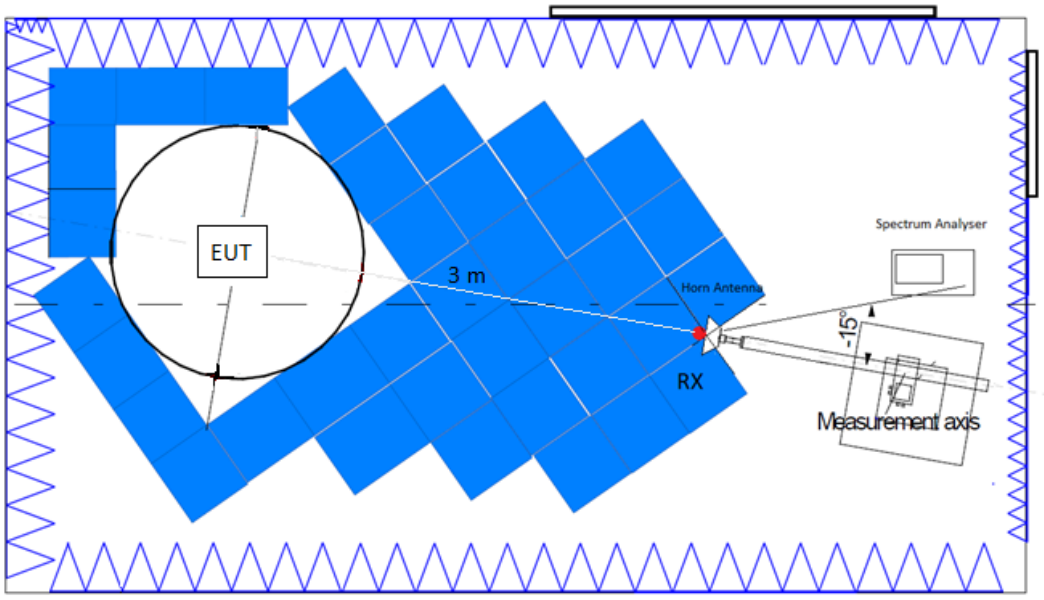
Measurements were made in both horizontal and vertical planes of polarization.

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 10 GHz:



TEST CASES DETAILS

Occupied Bandwidth

Modulation: 2GFSK

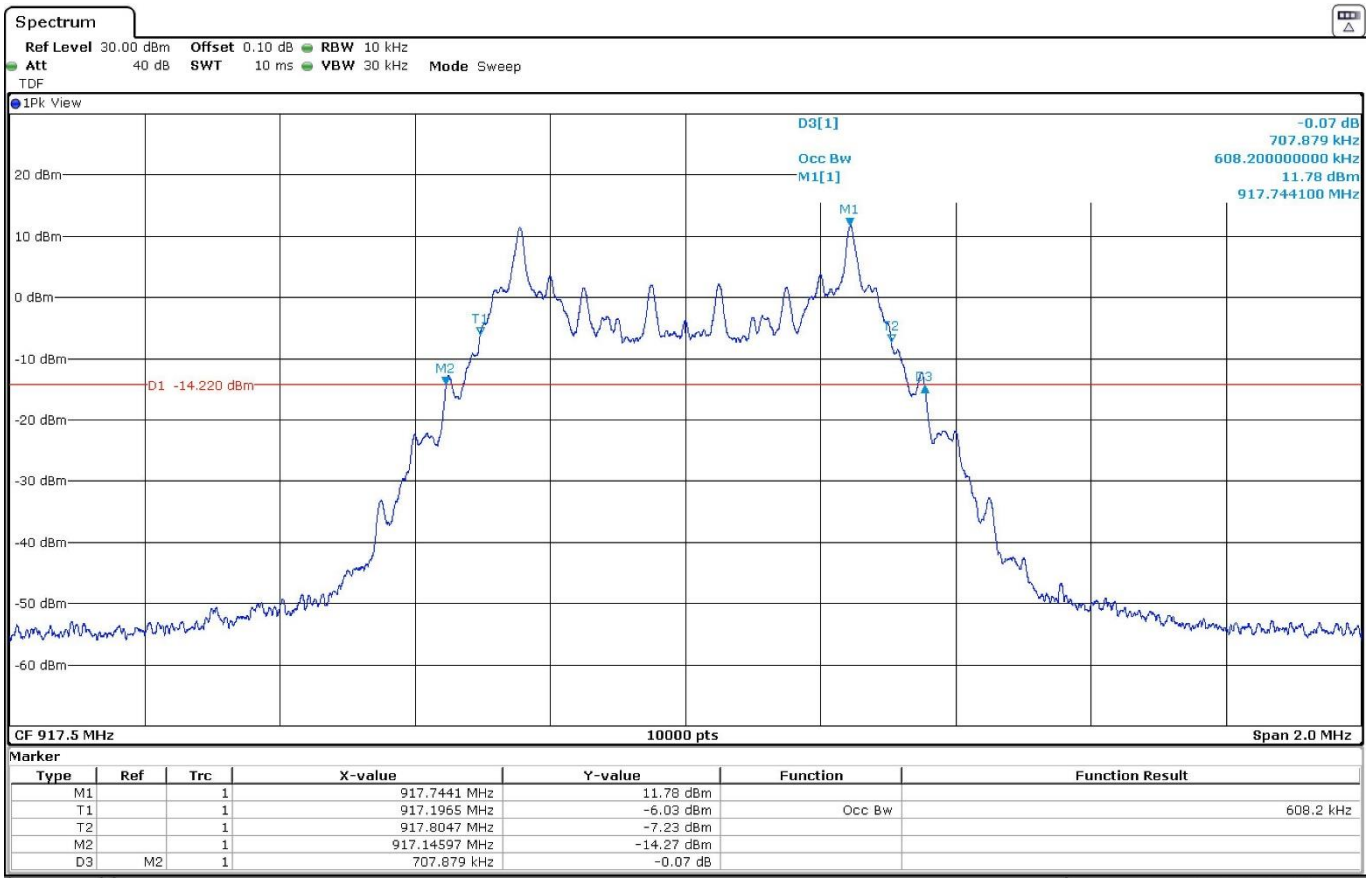
Results

Freq (MHz)	Occ Ch BW (kHz)
917.50	608.20
925.50	609.40

Attachments

Frequency MHz = 917.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

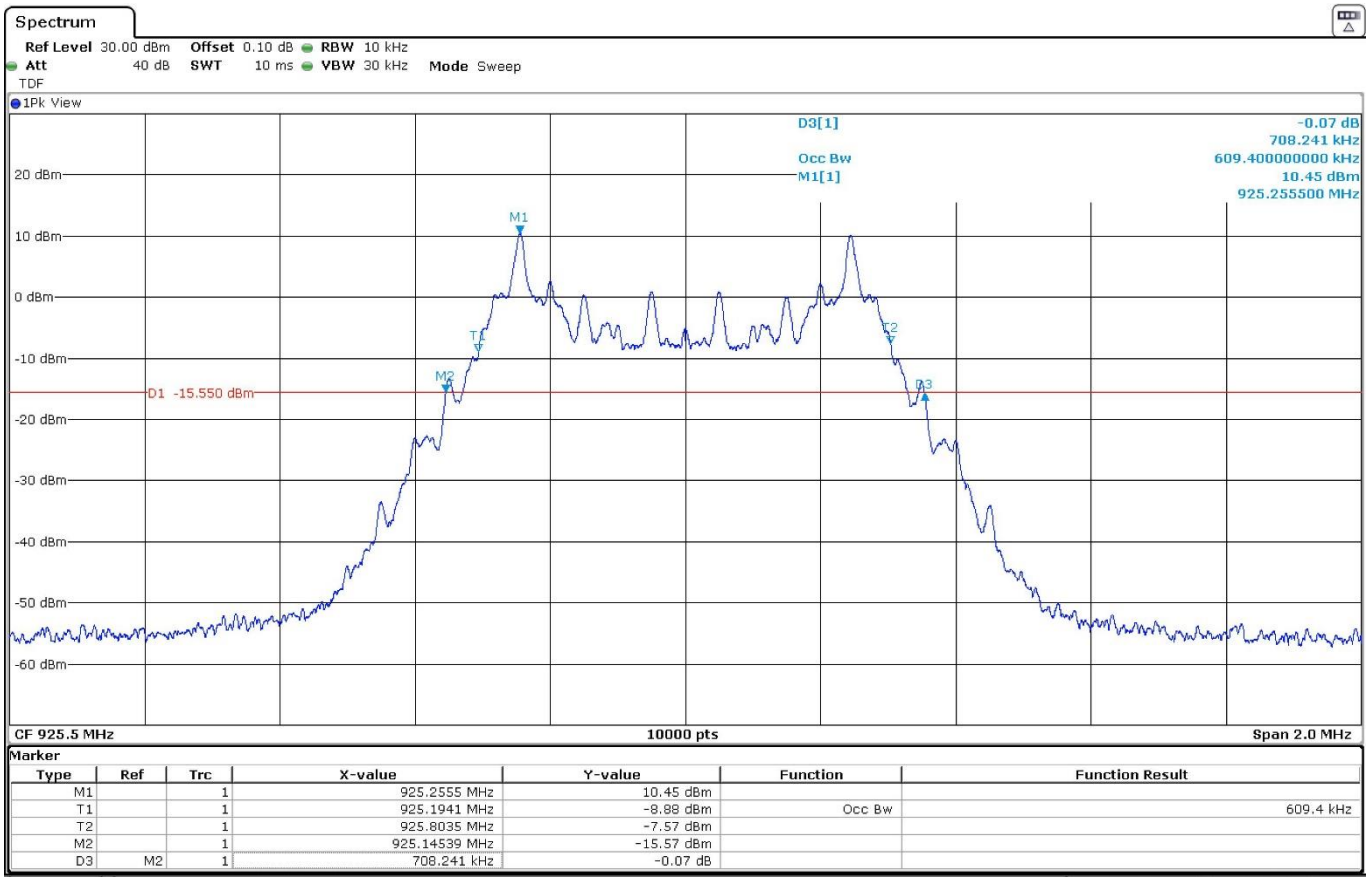
Images:



Attachments

Frequency MHz = 925.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

Images:



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

Limits

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

Modulation: 2GFSK

Results

Freq (MHz)	Ebw (kHz)
917.50	679.20
925.50	582.96

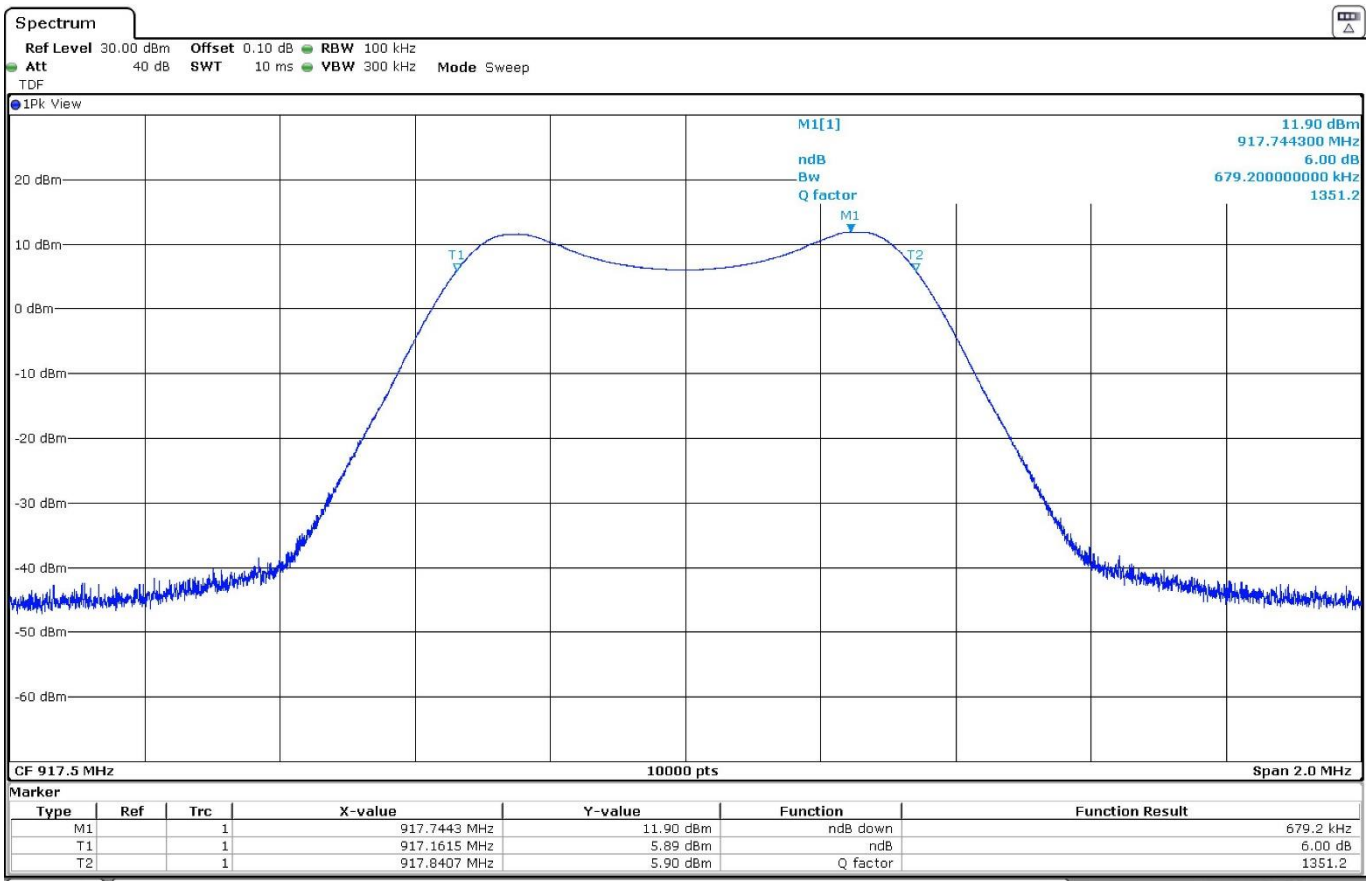
Verdict

Pass

Attachments

Frequency MHz = 917.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

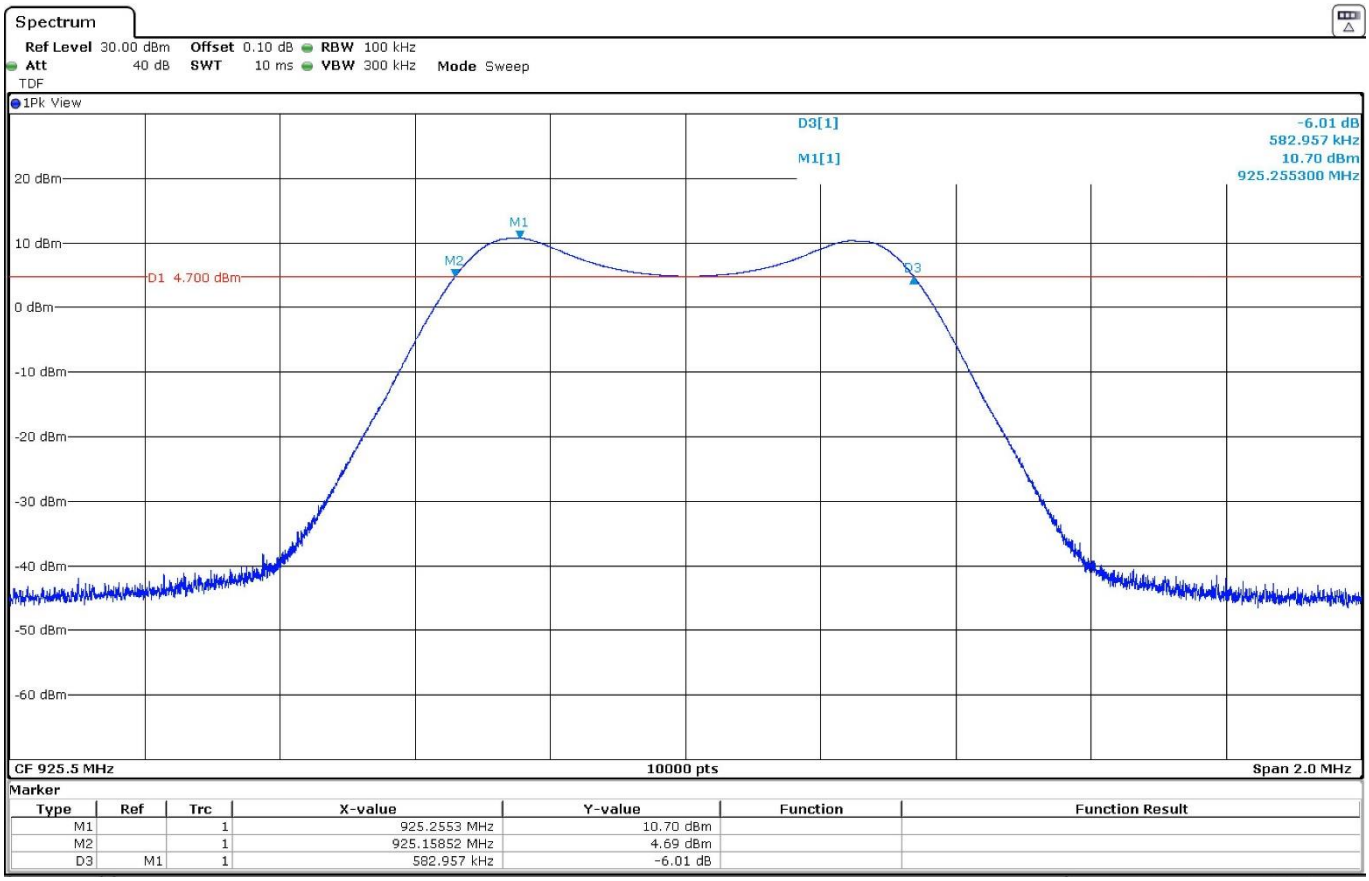
Images:



Attachments

Frequency MHz = 925.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

Images:



FCC 15.247 (b) / RSS-247 5.4. (d) Maximum output power and antenna gain

Limits

For systems using digital modulation in the 902-928 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

Modulation: 2GFSK

Results

The maximum conducted output power was measured using the method according to point “11.9.2.2.2 Method AVGSA-1” of ANSI C.63.10-2013.

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

Maximum Declared Antenna Gain: -1.6 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.

Freq (MHz)	Avg Power (dBm)	E.I.R.P. (dBm)
917.50	11.96	10.36
925.50	10.44	8.84

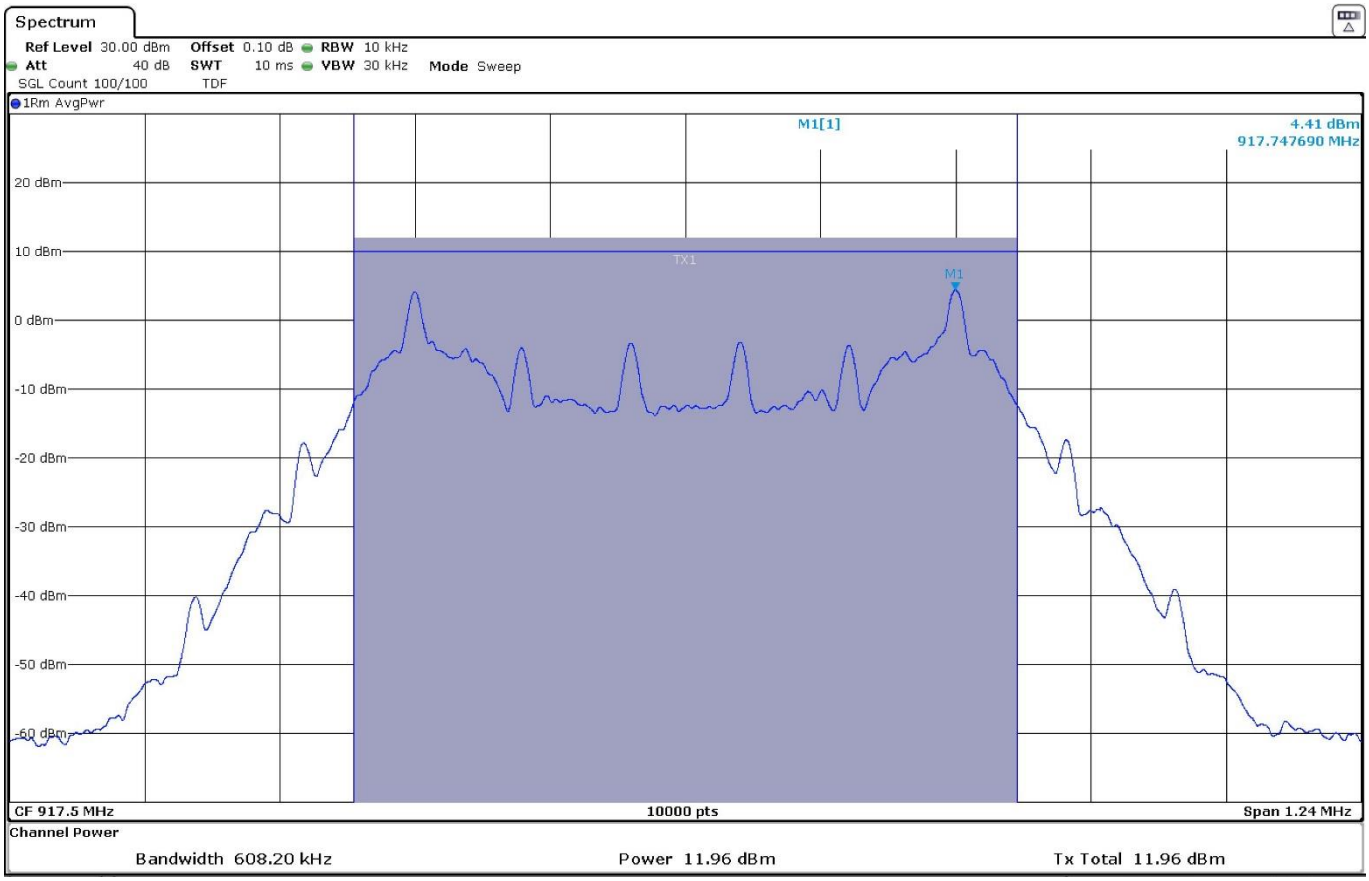
Verdict

Pass

Attachments

Frequency MHz = 917.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

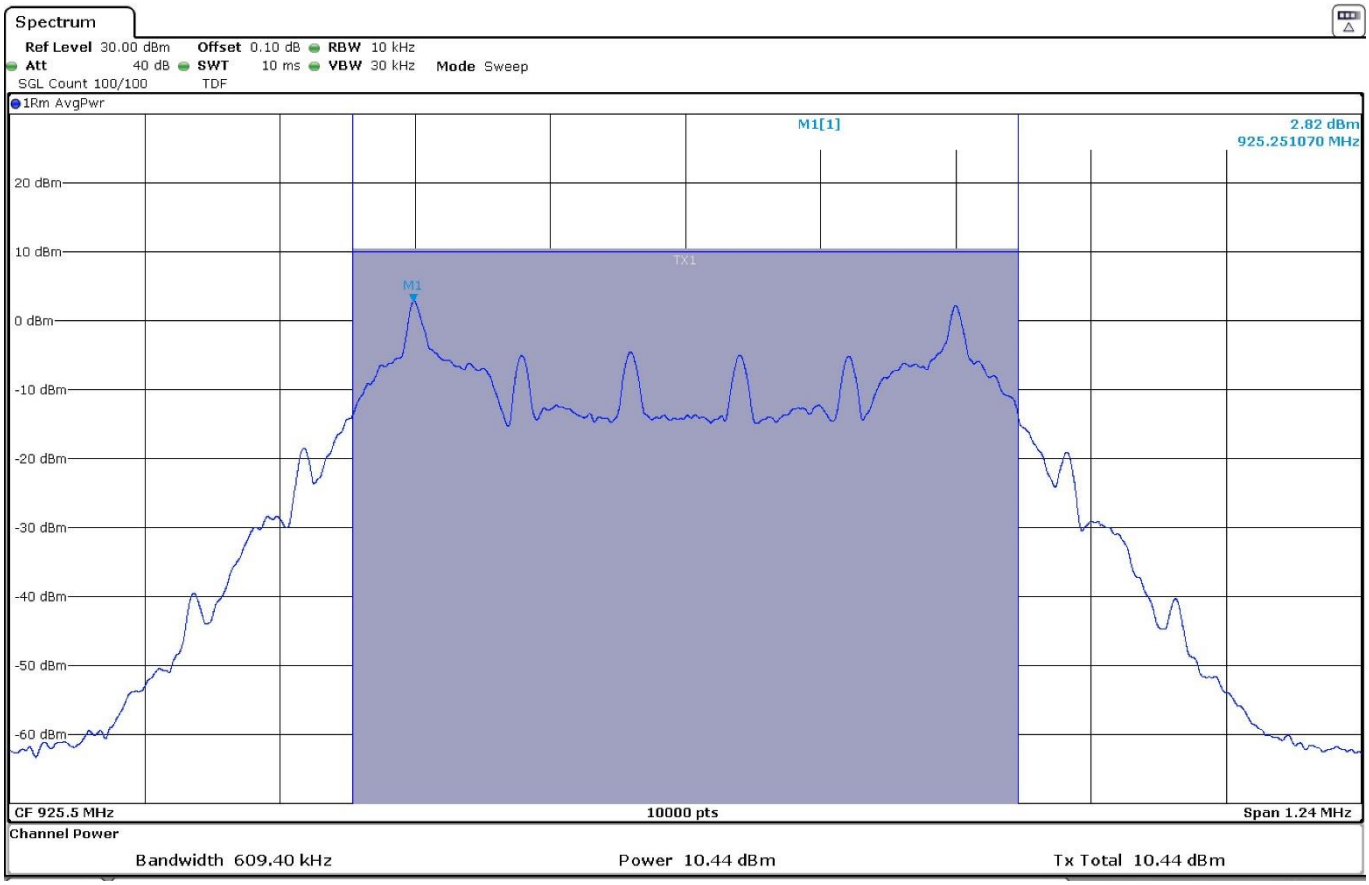
Images:



Attachments

Frequency MHz = 925.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

Images:



FCC 15.247 (d) / RSS-247 5.5. 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.

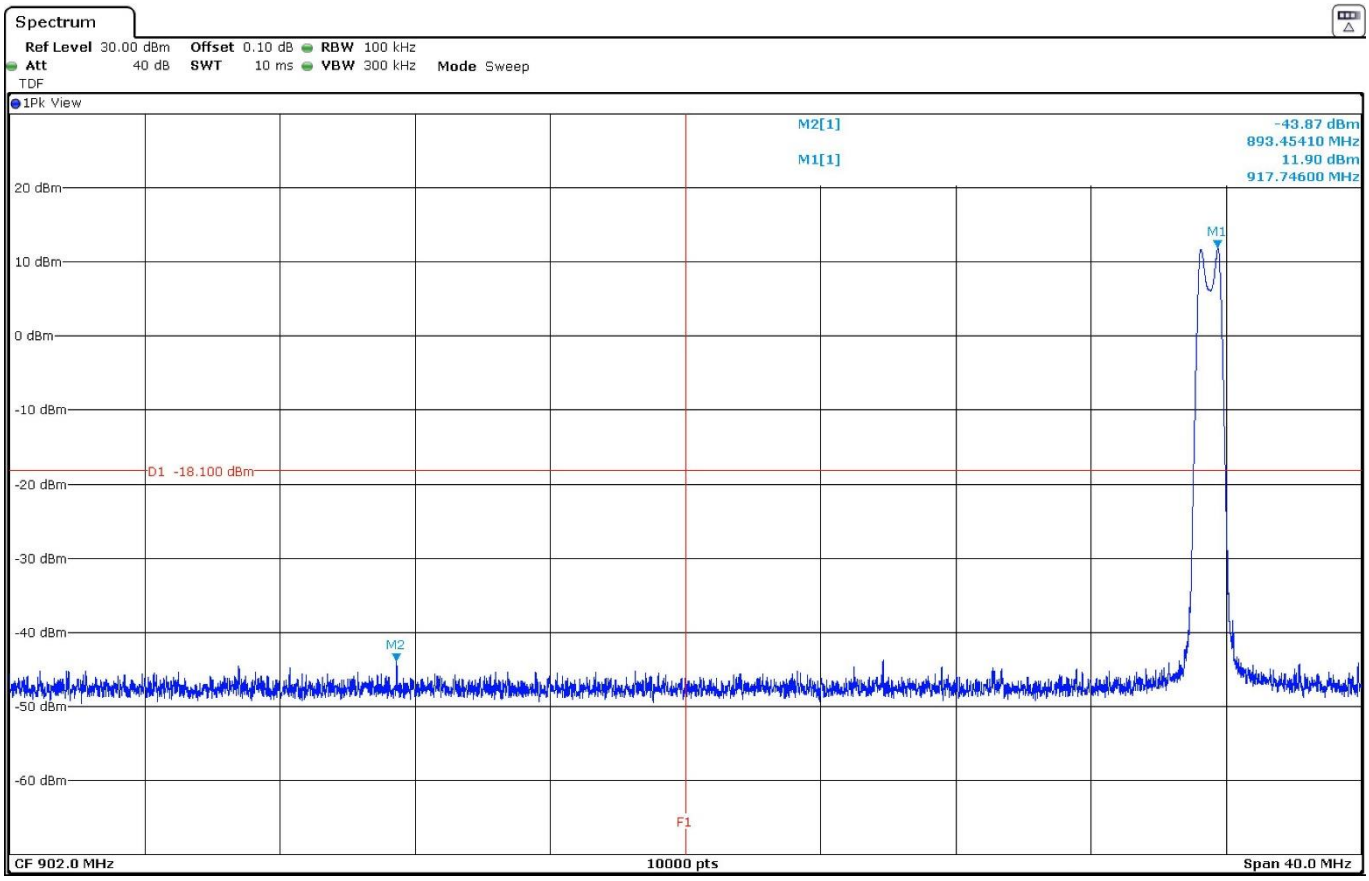
Modulation: 2GFSK

Results

Attachments

Frequency MHz = 917.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

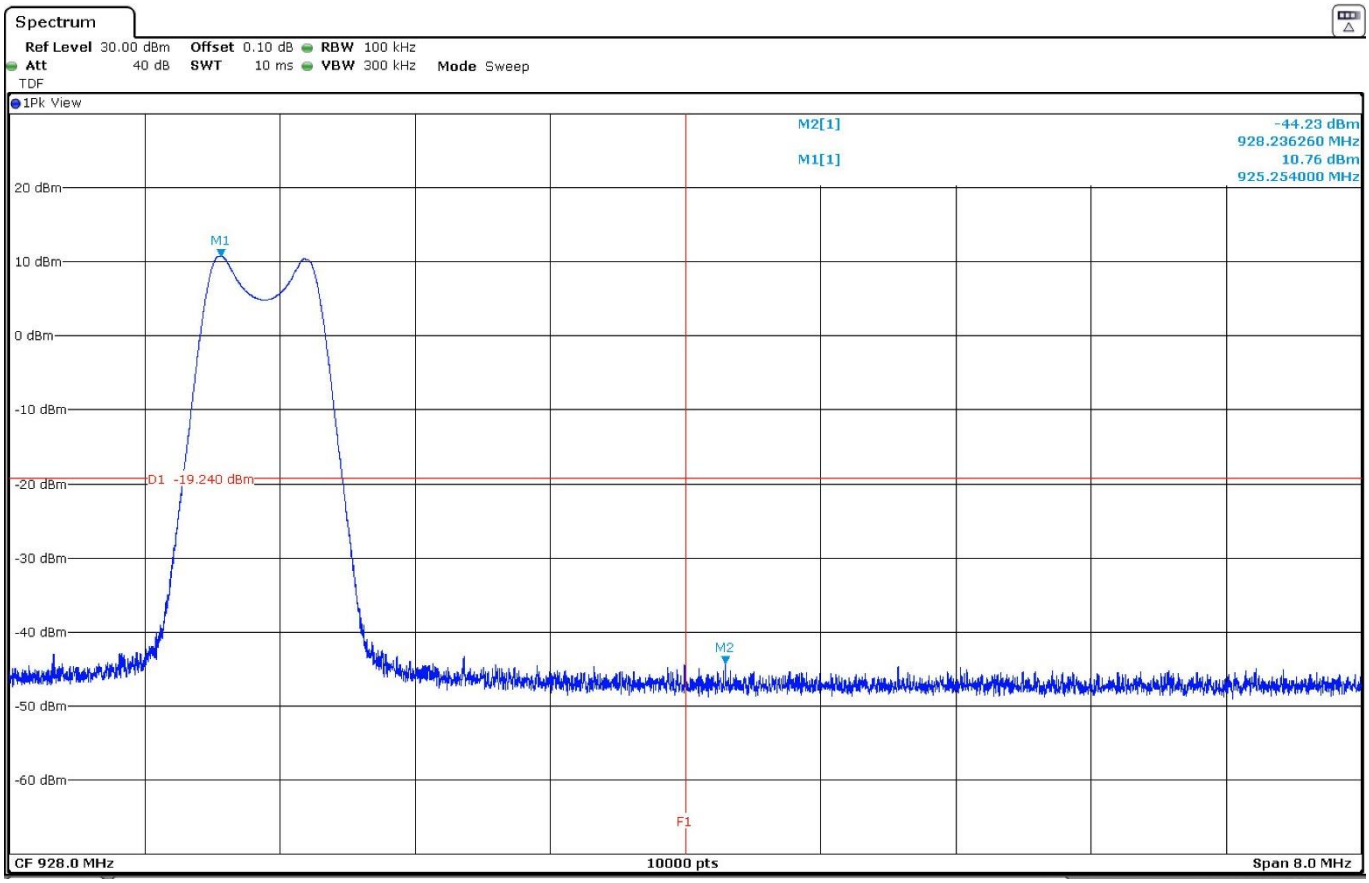
Images:



Attachments

Frequency MHz = 925.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

Images:



Verdict

Pass

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

Limits

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

Modulation: 2GFSK

Results

The power spectral density was measured using the method according to point 11.10.3 “Method AVGPSD-1” of ANSI C.63.10-2013.

Freq (MHz)	Avg PSD (dBm)
917.50	2.17
925.50	0.84

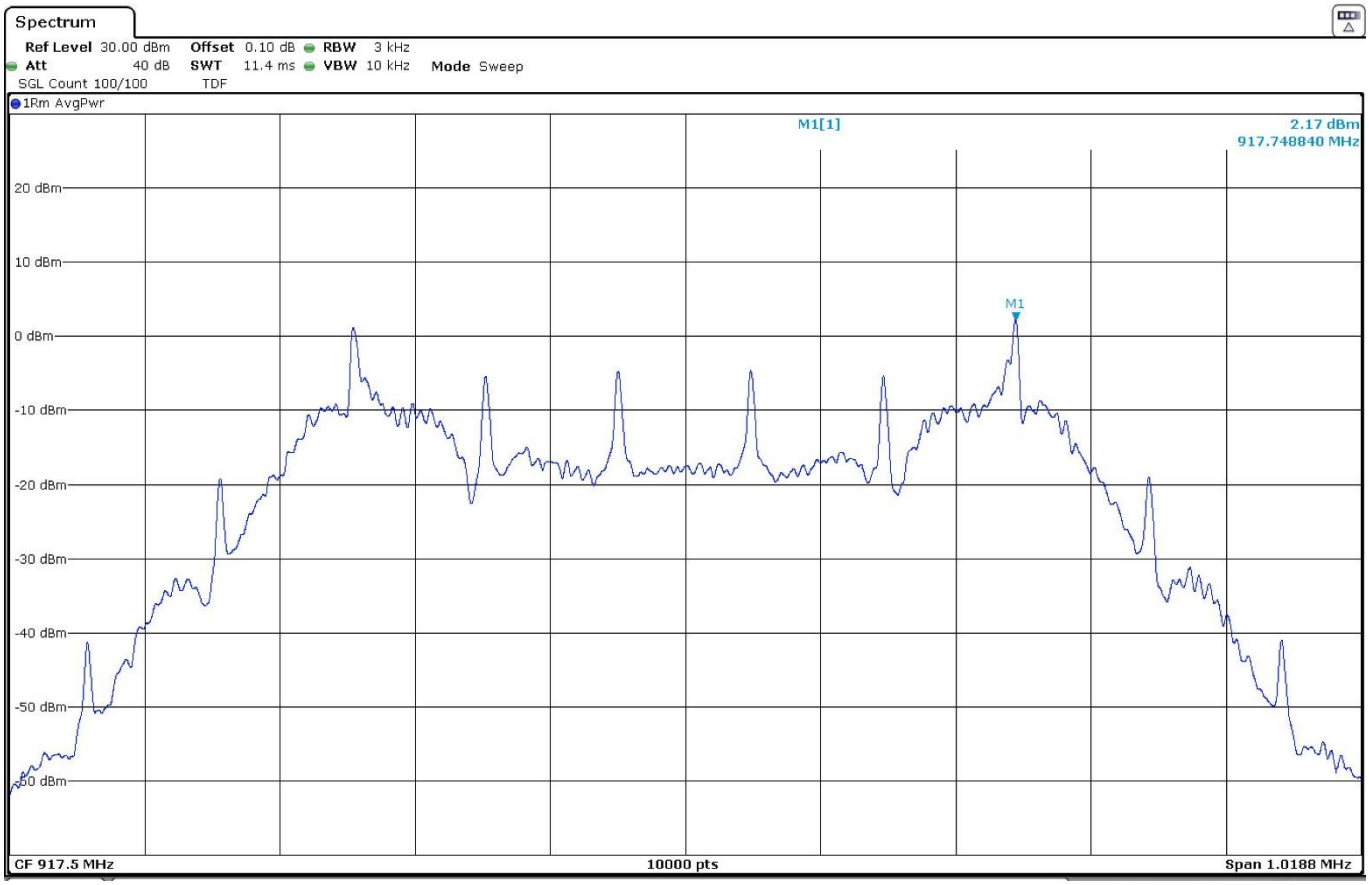
Verdict

Pass

Attachments

Frequency MHz = 917.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

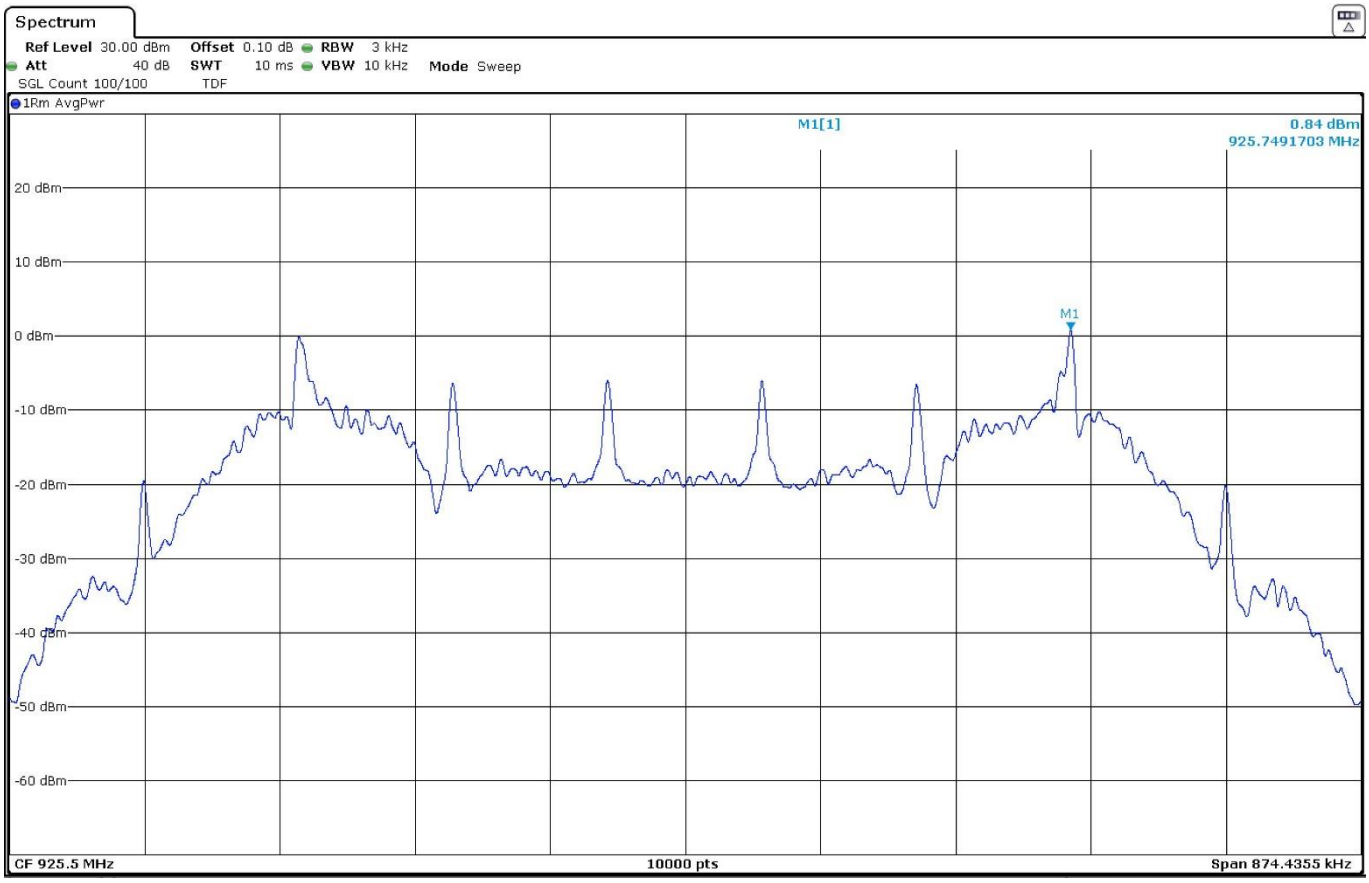
Images:



Attachments

Frequency MHz = 925.5; Equipment Type = Digital Transmission System (DTS); Modulation = 2GFSK.

Images:



FCC 15.247 (d) / RSS-247 5.5 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.

Modulation: 2GFSK

Results

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
917.50	[0.03, 1]	66.254	22.92	V	PK
			20.47		QP
		69.073	26.47	V	PK
			23.52		QP
		79.318	22.66	V	PK
			19.52		QP
		94.353	29.58	V	PK
			28.58		QP
		104.751	27.37	V	PK
			25.05		QP
		151.583	22.95	V	PK
			19.98		QP
	[1, 3]	1834.492	54.73	V	PK
	[3, 10]	4586.620	55.61	V	PK
			52.57		AVG
925.50	[0.03, 1]	69.043	24.96	V	PK
			21.60		QP
		94.353	26.70	V	PK
			24.41		QP
		151.553	25.54	V	PK
			23.00		QP
		151.583	23.77	H	PK
			21.66		QP
		280.593	22.32	V	PK
			19.59		QP
	[1, 3]	1851.538	54.63	V	PK
	[3, 10]	4627.920	56.99	V	PK
			49.04		AVG

Verdict

Pass

Attachments

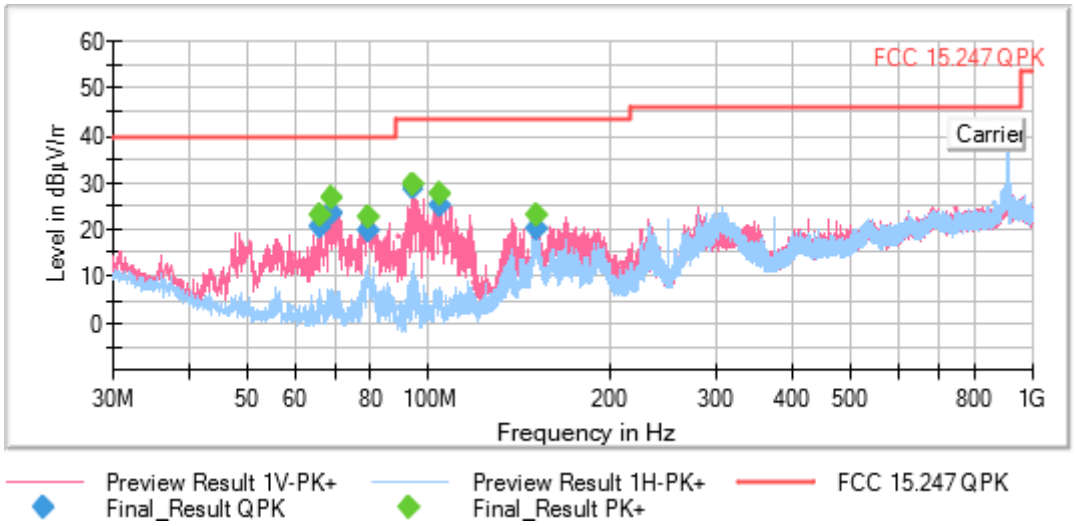
Frequency MHz = 917.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [0.03, 1]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESR 7]					
	30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB

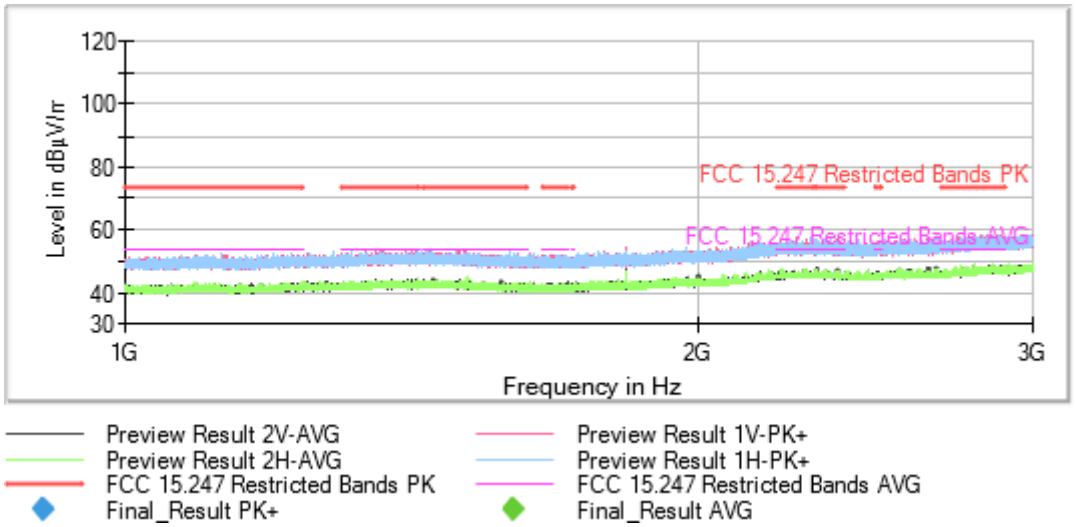
Frequency MHz = 917.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [1, 3]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [FSW 50]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

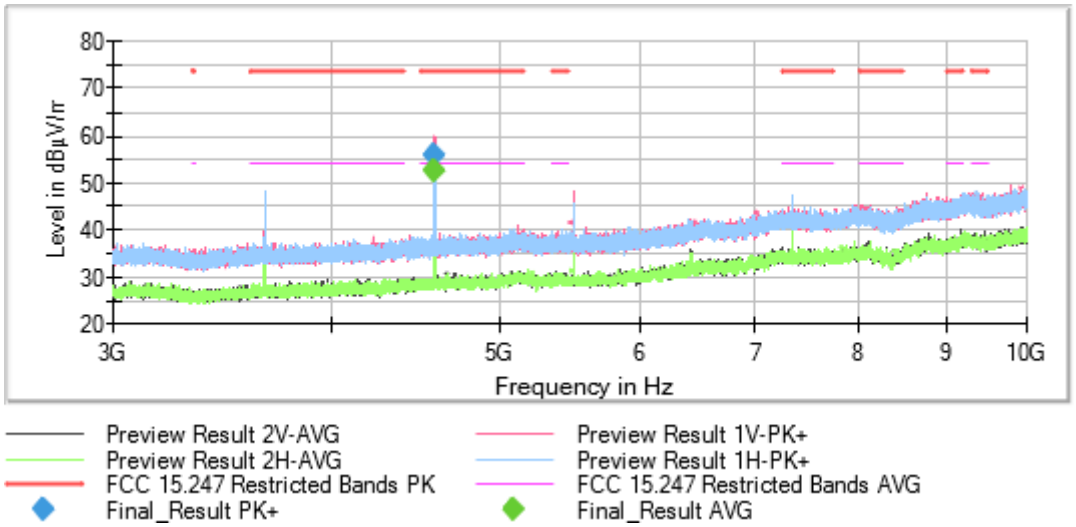
Frequency MHz = 917.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [3, 10]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [FSW 50]					
	3 GHz - 10 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

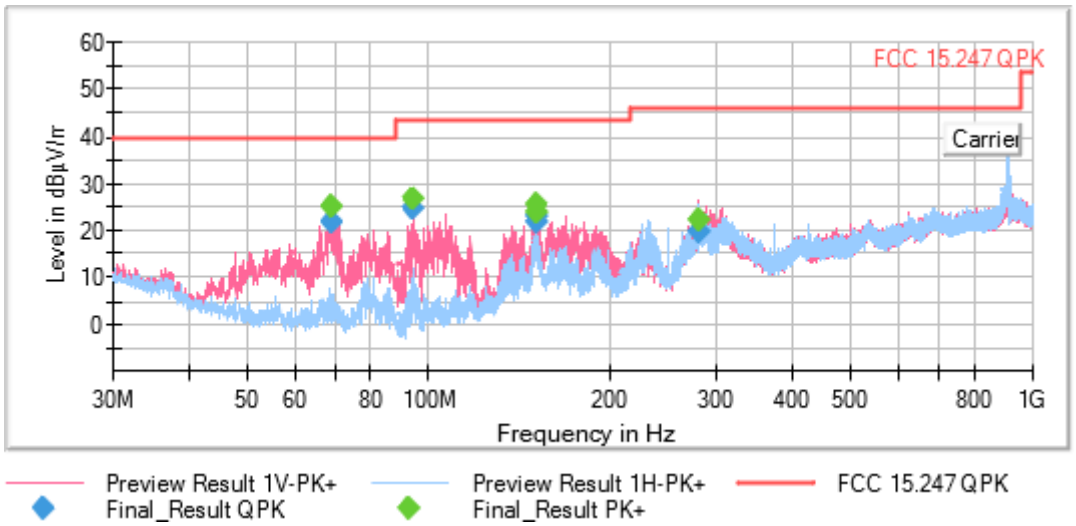
Frequency MHz = 925.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [0.03, 1]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESR 7]					
	30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB

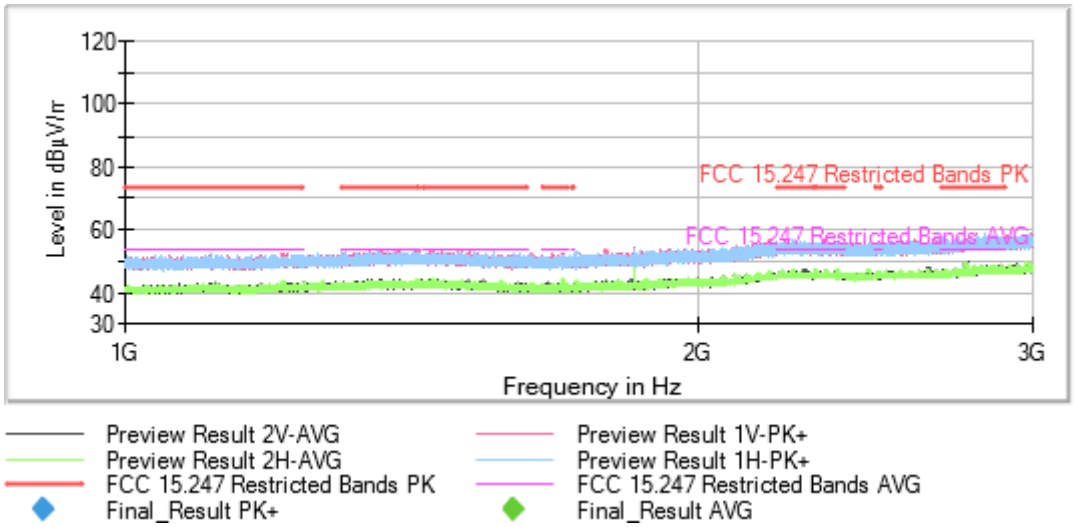
Frequency MHz = 925.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [1, 3]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [FSW 50]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

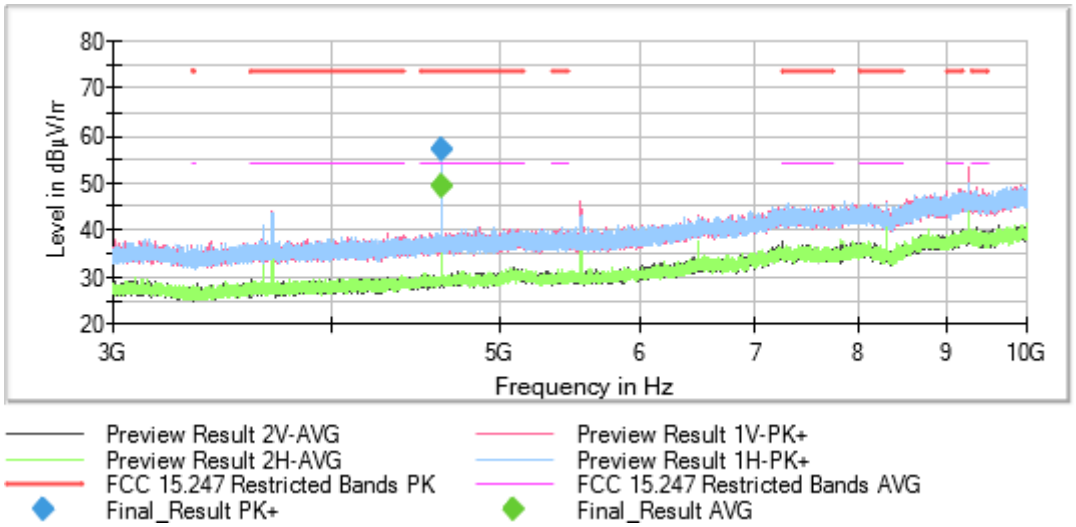
Frequency MHz = 925.50000 Equipment Type = Digital Transmission System (DTS)

Modulation = 2GFSK Frequency Range GHz = [3, 10]

Number of Transmission Chains = 1 Measurement Point = 1

Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [FSW 50]					
	3 GHz - 10 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Appendix B: Test results. 802.11 B/G/N 20 MHz 2x2

INDEX

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	115 Vac
Type of Power Supply:	AC power

ANTENNA (*):

Type of Antenna:	Monopoles (printed on PCB). 2 antennas.	
Maximum Declared Antenna Gain:		
	SISO Antenna 0:	+1.30 dBi
	SISO Antenna 1:	+2.20 dBi
	MIMO Antenna 0 + Antenna 1:	+4.77 dBi

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)(ii) y F)2)e)ii), directional gain was calculated as (worst case):

N_{SS} = 1, N_{ANT} = 2, G_{ANT0} = 1.3dBi, G_{ANT1} = 2.2dBi

$$\text{Directional Gain} = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left(\sum_{k=1}^{N_{ANT}} g_{j,k}\right)^2}{N_{ANT}}\right] = 10\log\left[\frac{\sum_{j=1}^{1}\left(\sum_{k=1}^{2} g_{j,k}\right)^2}{2}\right]$$

$$= 10\log\left[\frac{(g_{1,1}+g_{1,2})^2}{2}\right] = 10\log\left[\frac{\left(10^{\frac{G_1}{20}}+10^{\frac{G_2}{20}}\right)^2}{2}\right] = 10\log\left[\frac{\left(10^{\frac{1.3}{20}}+10^{\frac{2.2}{20}}\right)^2}{2}\right] = 4.77\ \text{dBi}$$

TEST FREQUENCIES (*):

Low Channel (1):	2412 MHz
Middle Channel (6):	2437 MHz
High Channel (11):	2462 MHz

The sample was used to configure the EUT to continuously transmit at a specified output power in all channels with different modes and modulation schemes.

The field strength at the band edges was evaluated for each mode for the channel under test.

The data rates of 1Mb/s for 802.11b, 6.5Mb/s for 802.11g, MSC0 for 802.11n20 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and band edge levels at restricted bands.

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).

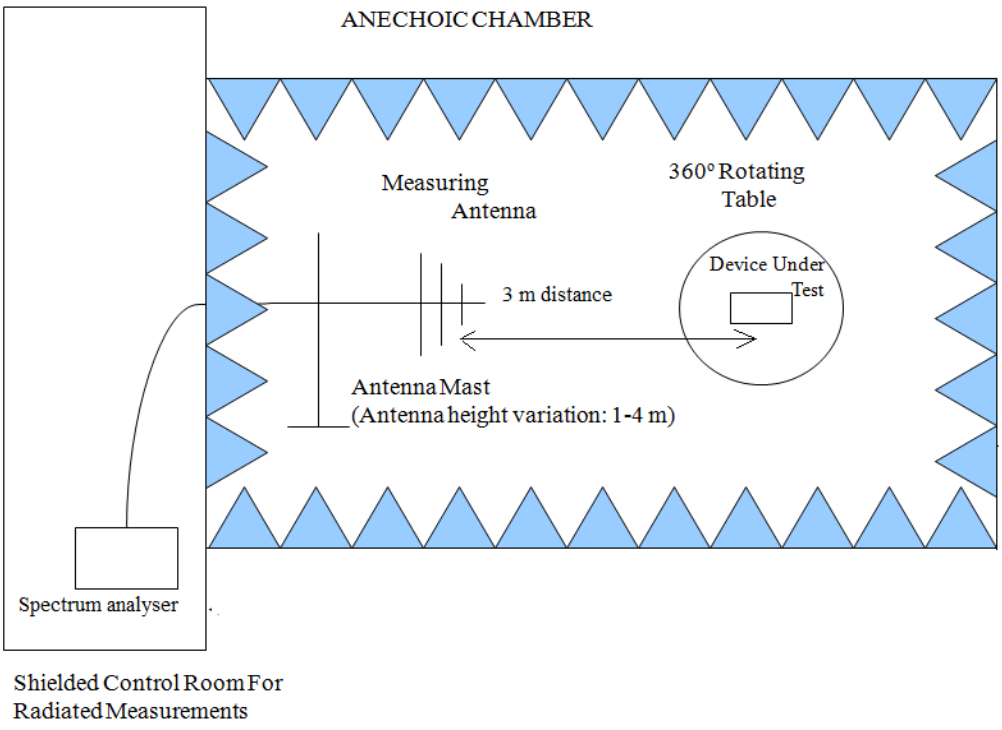
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

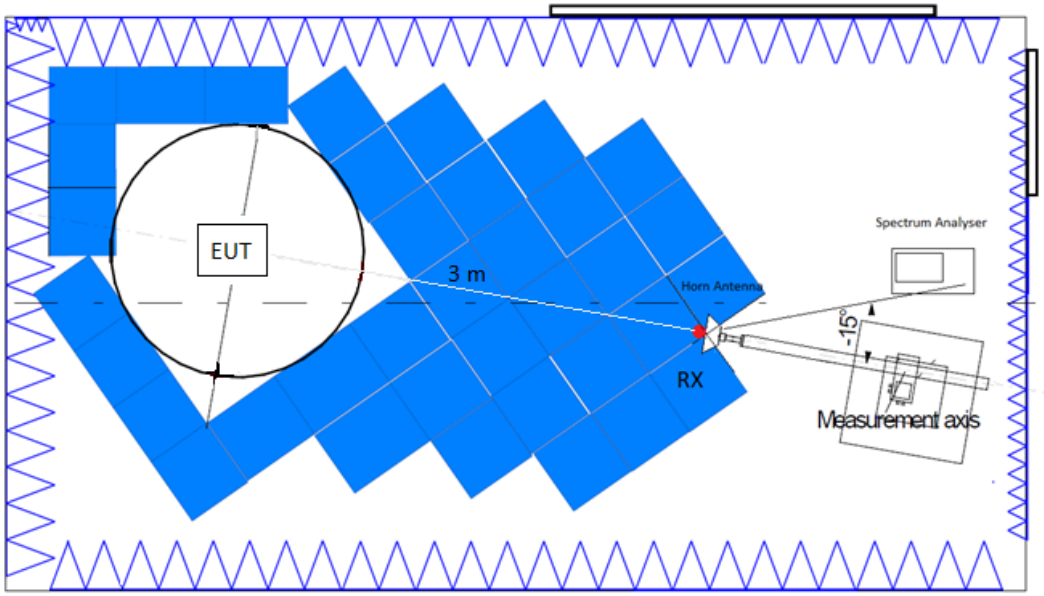
Measurements were made in both horizontal and vertical planes of polarization.

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.

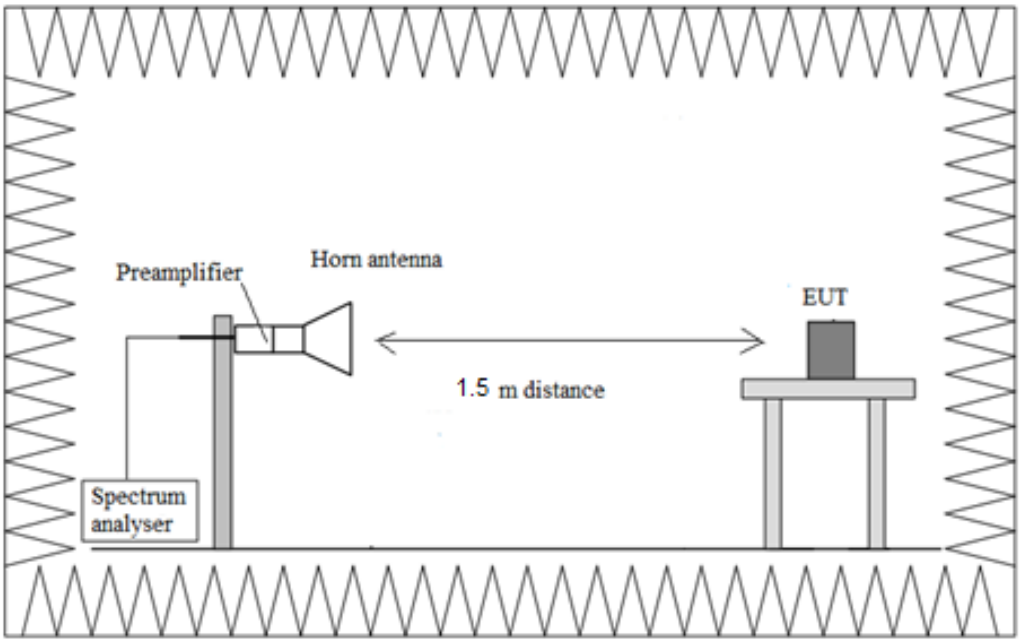
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

Occupied Bandwidth

Results

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00	1	1	11.10
2437.00			11.40
2462.00			11.00

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00	1	1	16.60
2437.00			16.90
2462.00			16.50

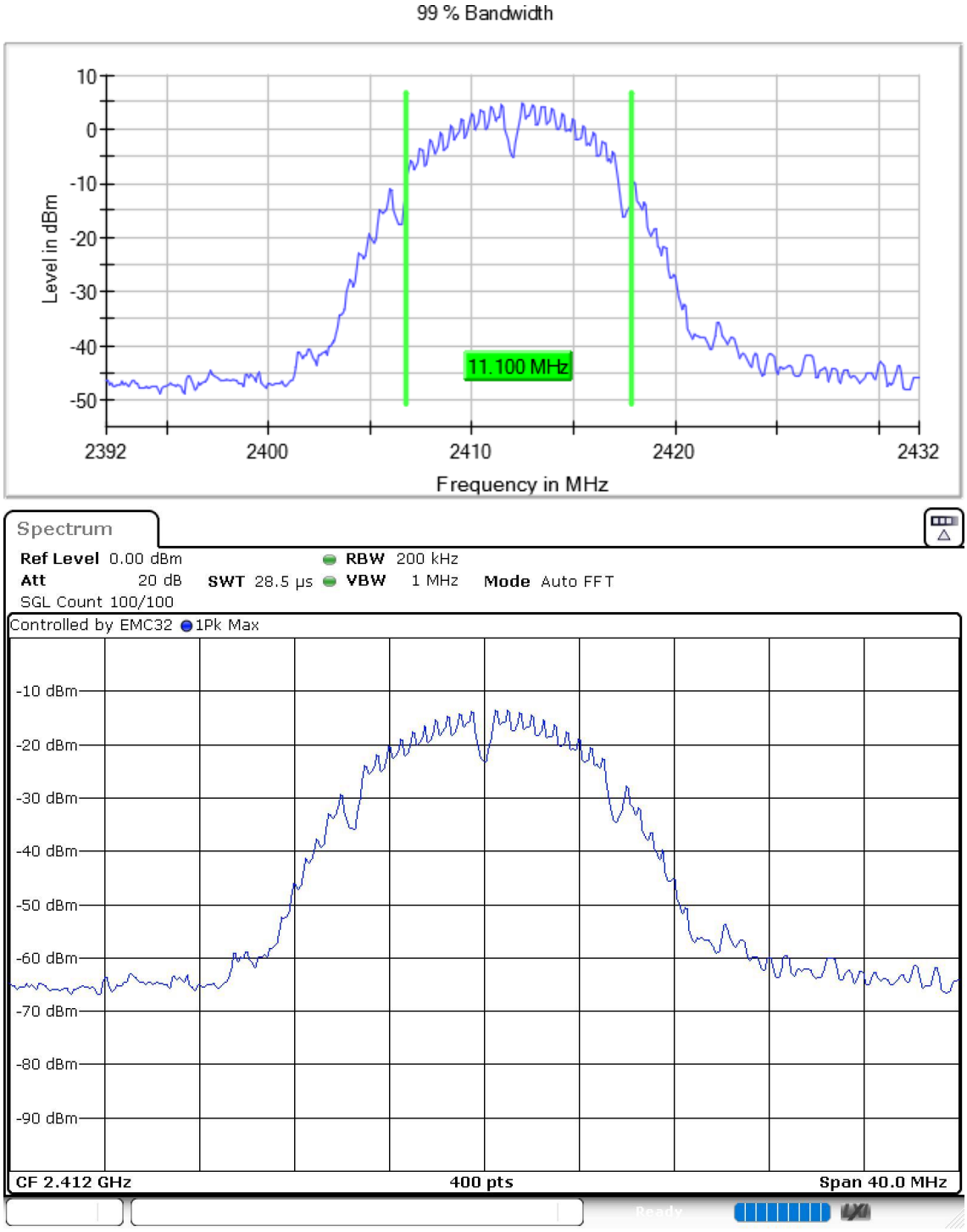
Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Freq (MHz)	# of Tx Chains	Port	Occ Ch BW (MHz)
2412.00	1	1	17.70
2437.00			18.00
2462.00			17.60
2412.00	2	1+2	17.80
2437.00			18.00
2462.00			17.70

Attachments

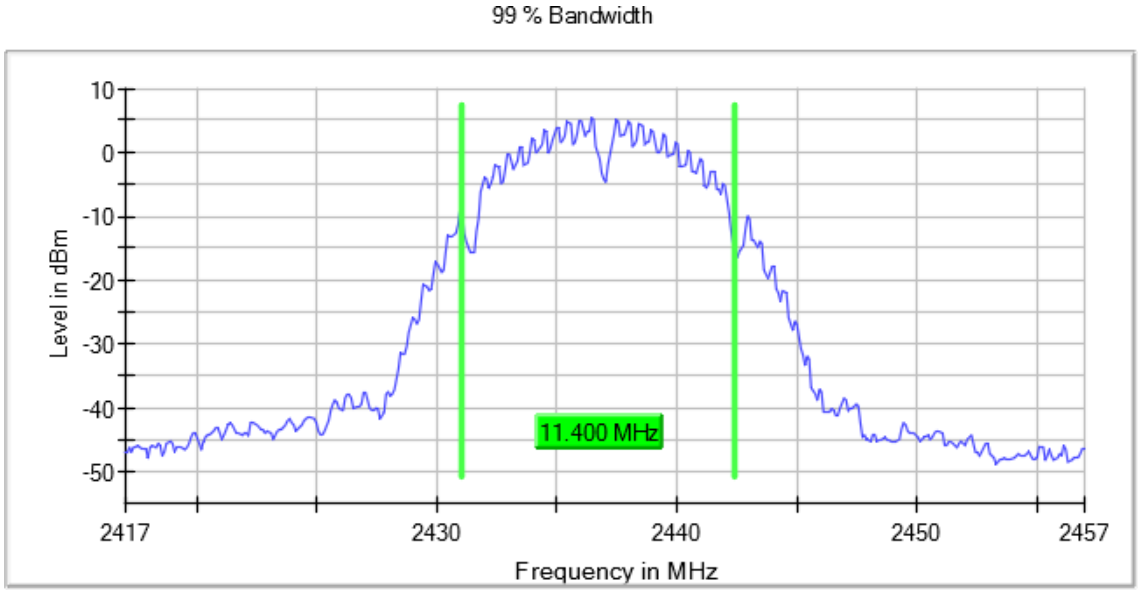
Frequency MHz = 2412.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11b (DSSS 1 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

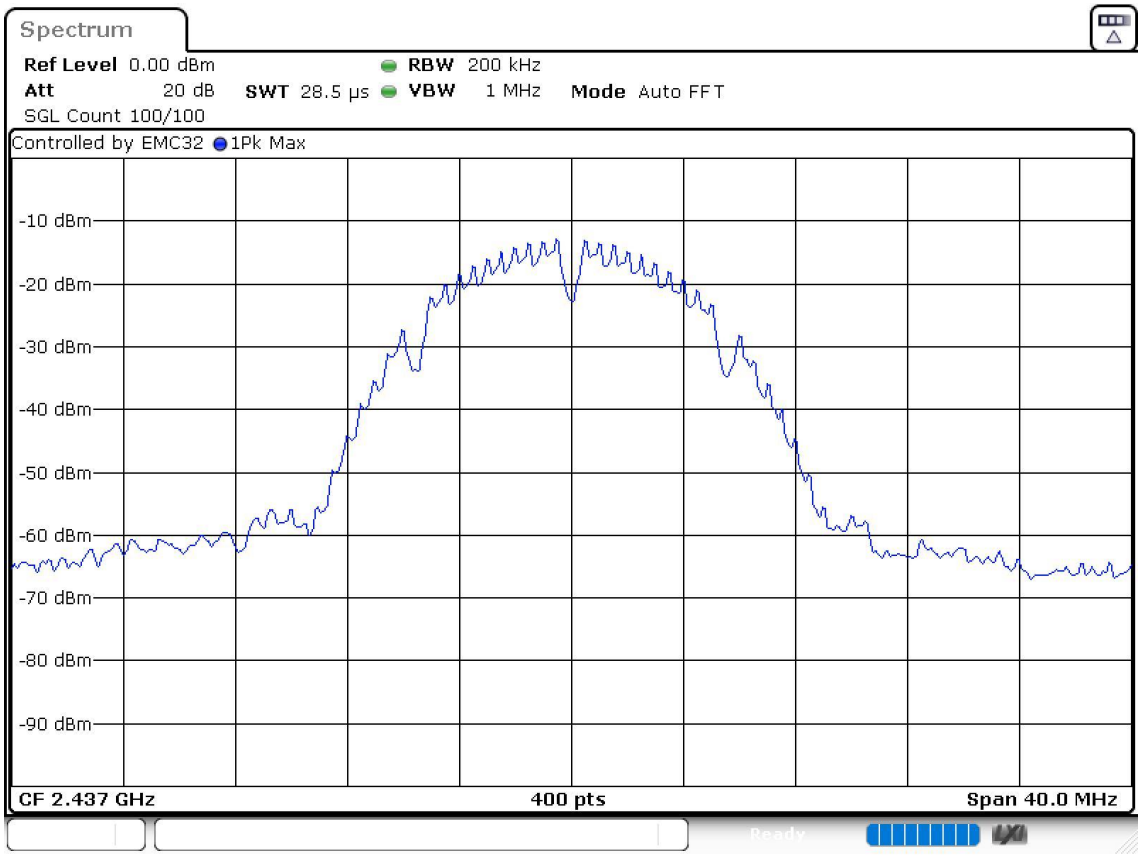
Images:



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

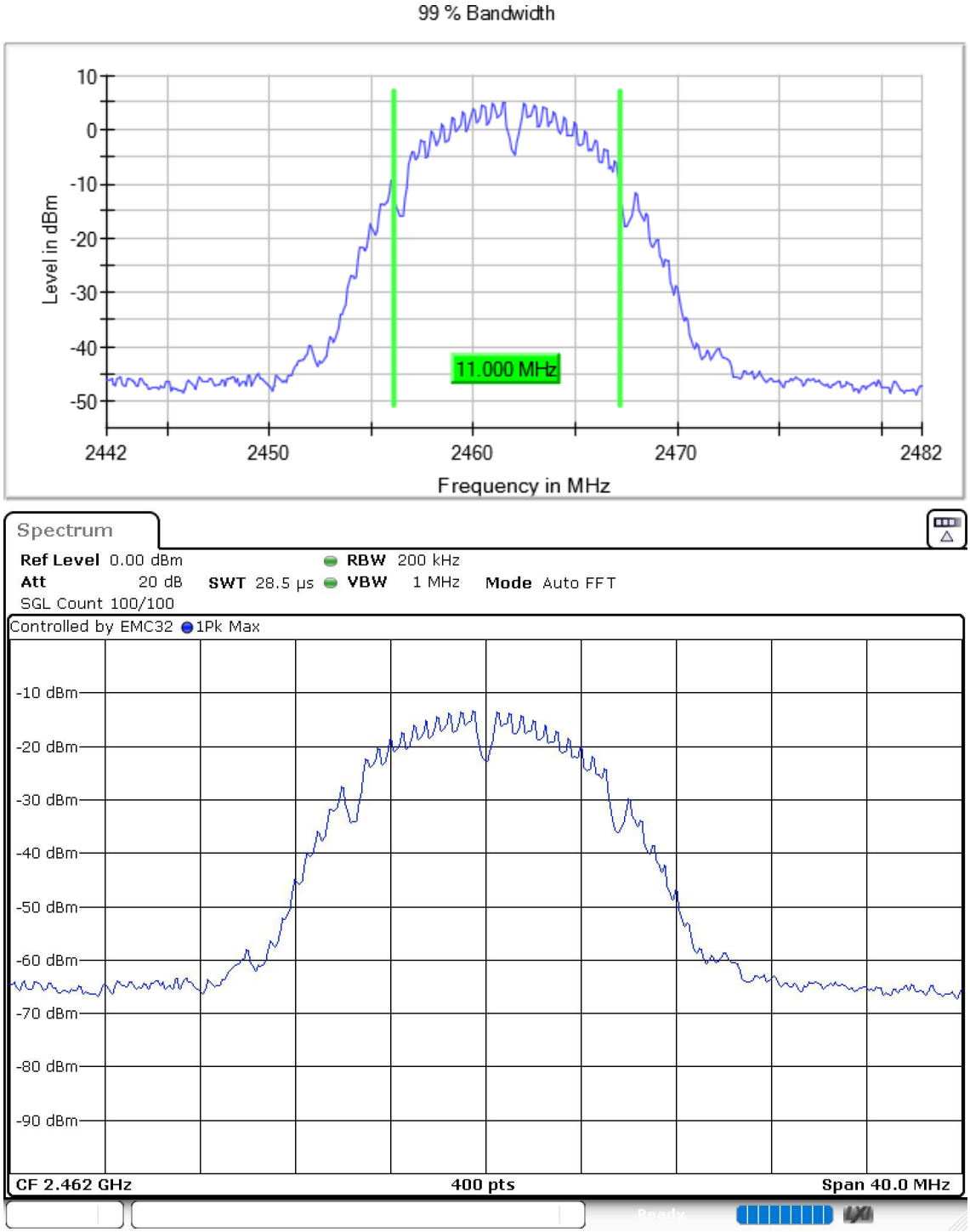
Images:





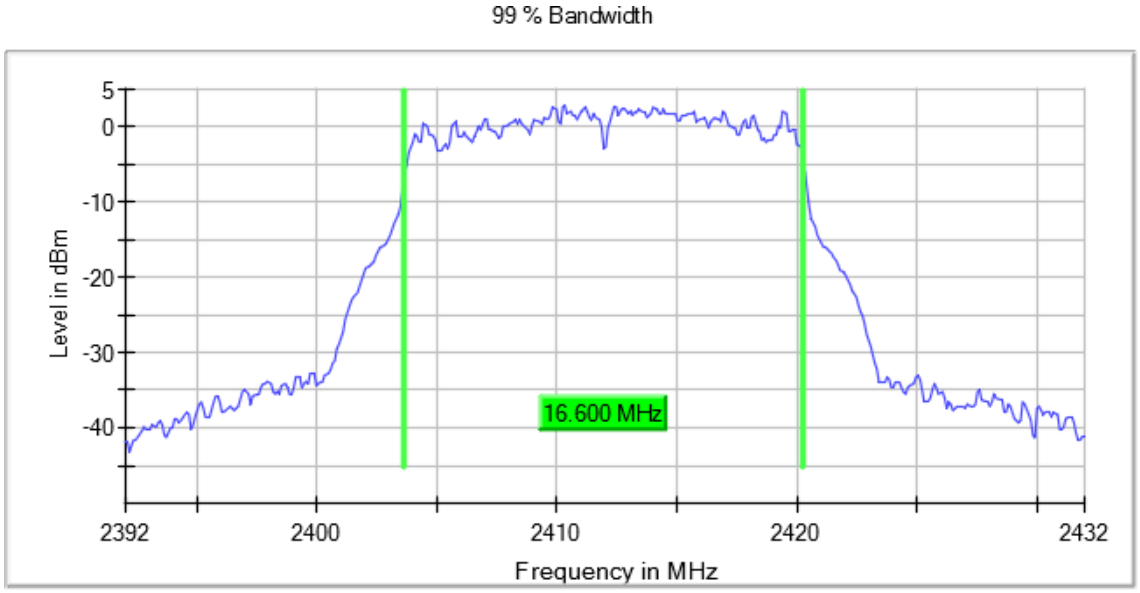
Frequency MHz = 2462.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11b (DSSS 1 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

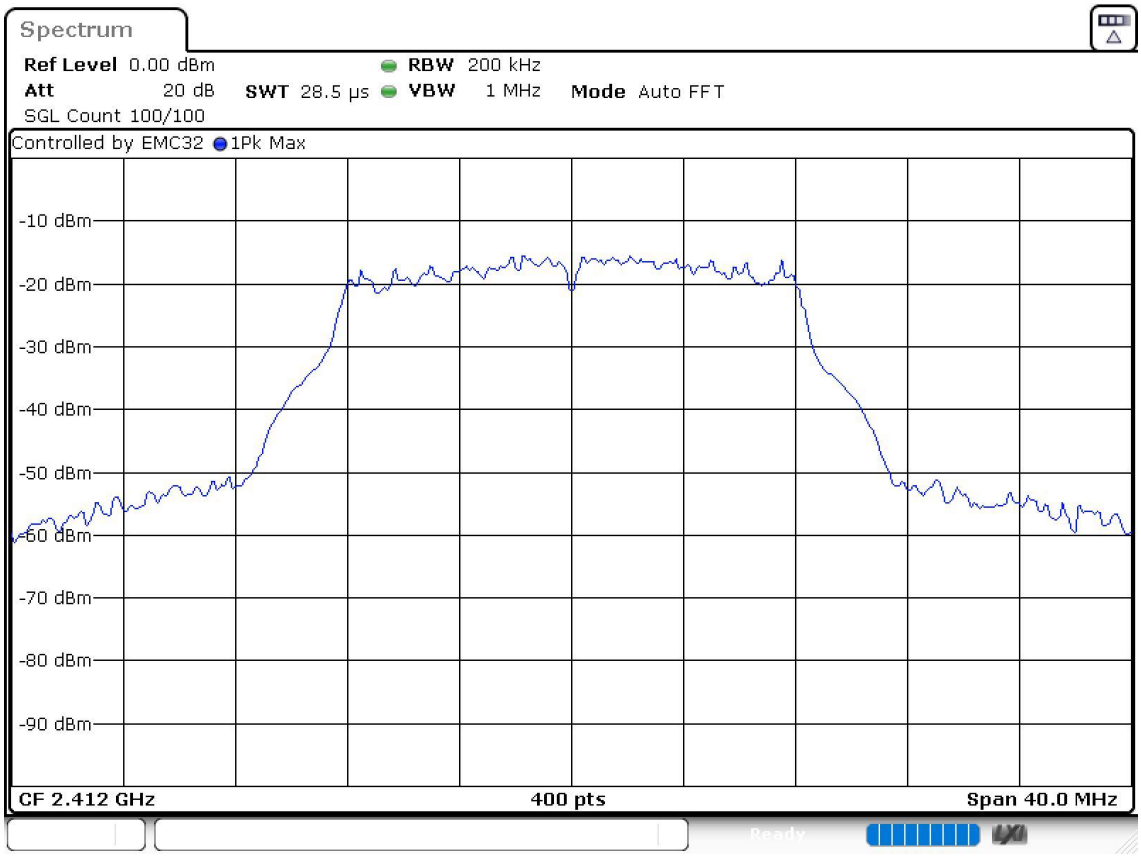
Images:



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

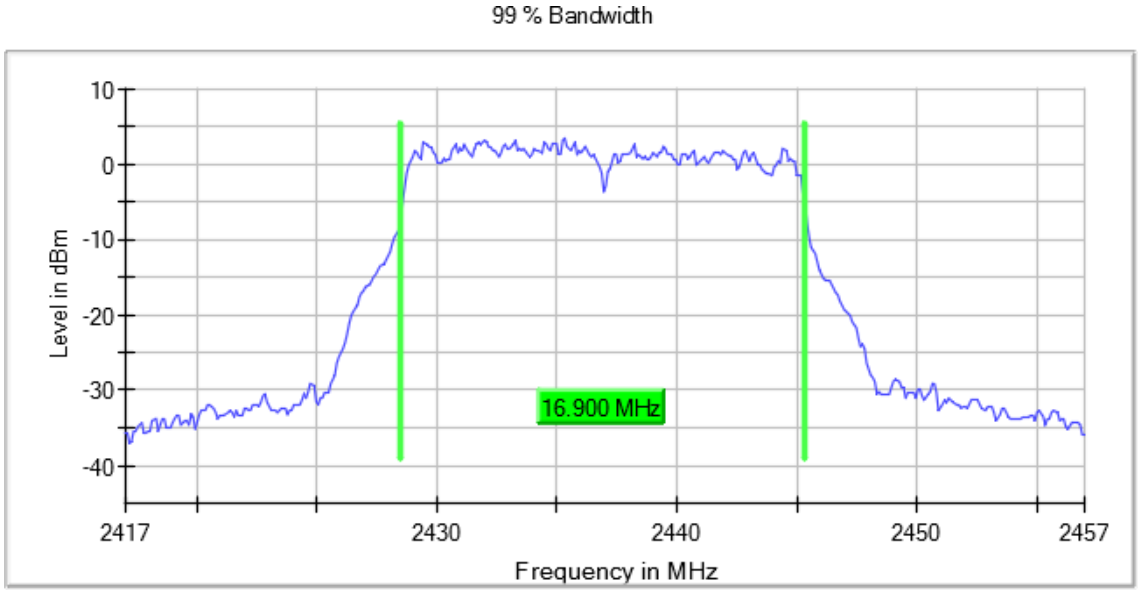
Images:

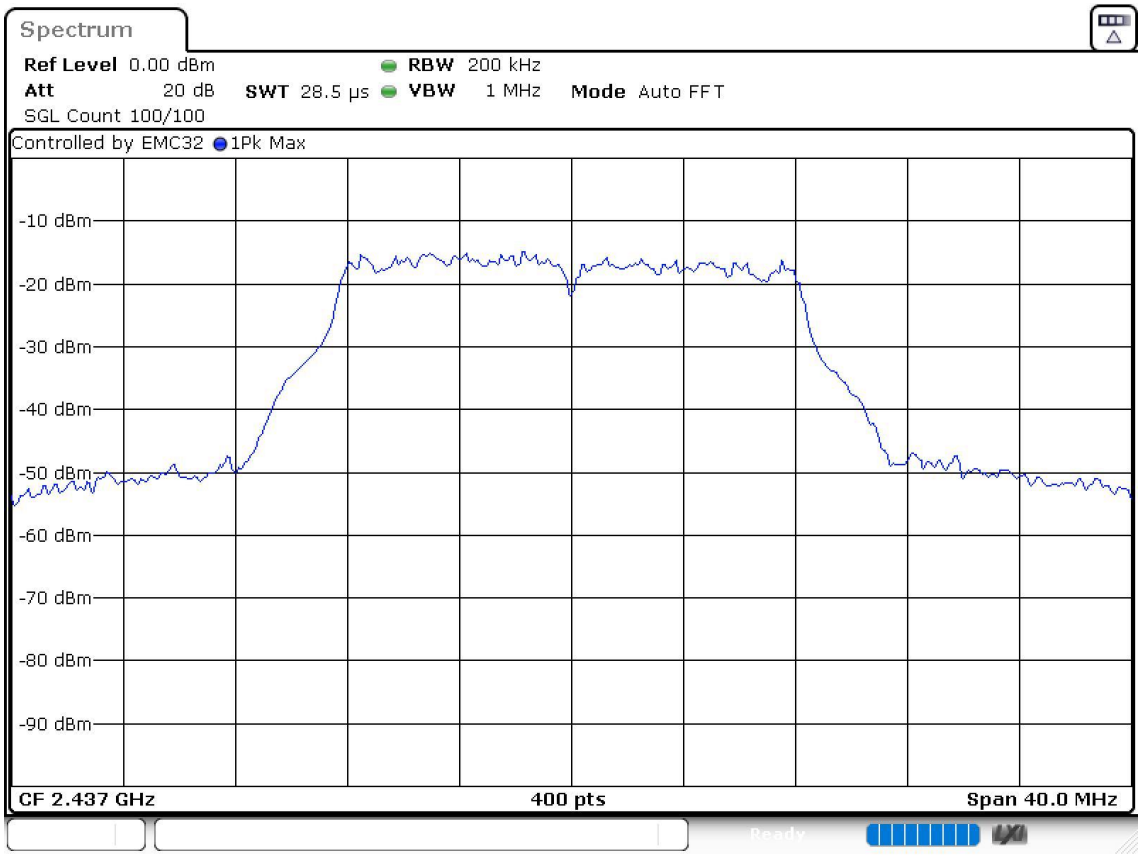




Frequency MHz = 2437.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11g (OFDM 6 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

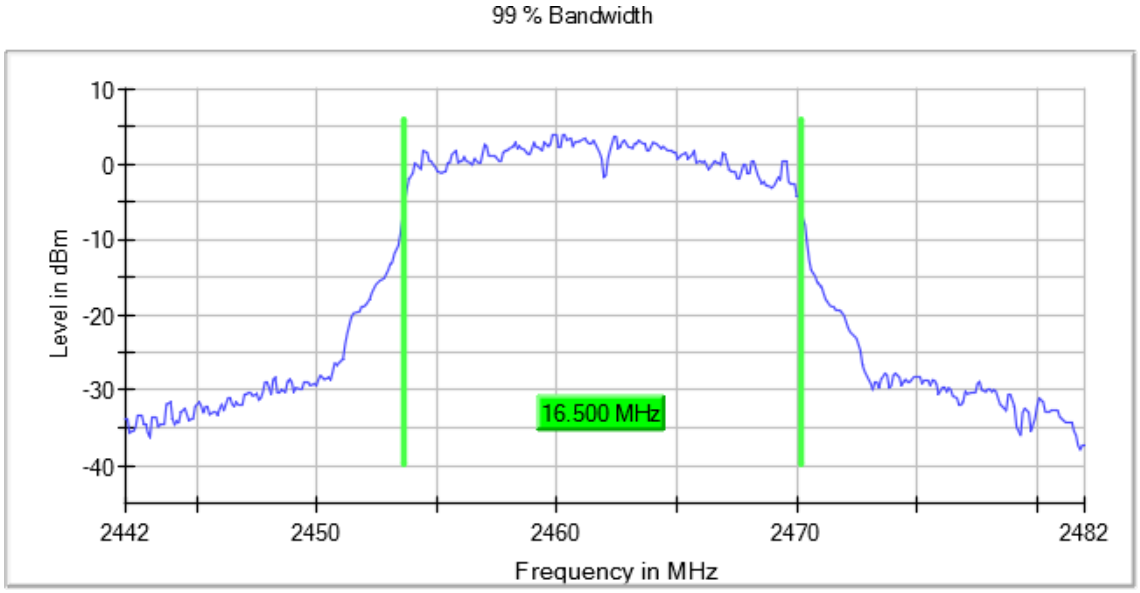
Images:

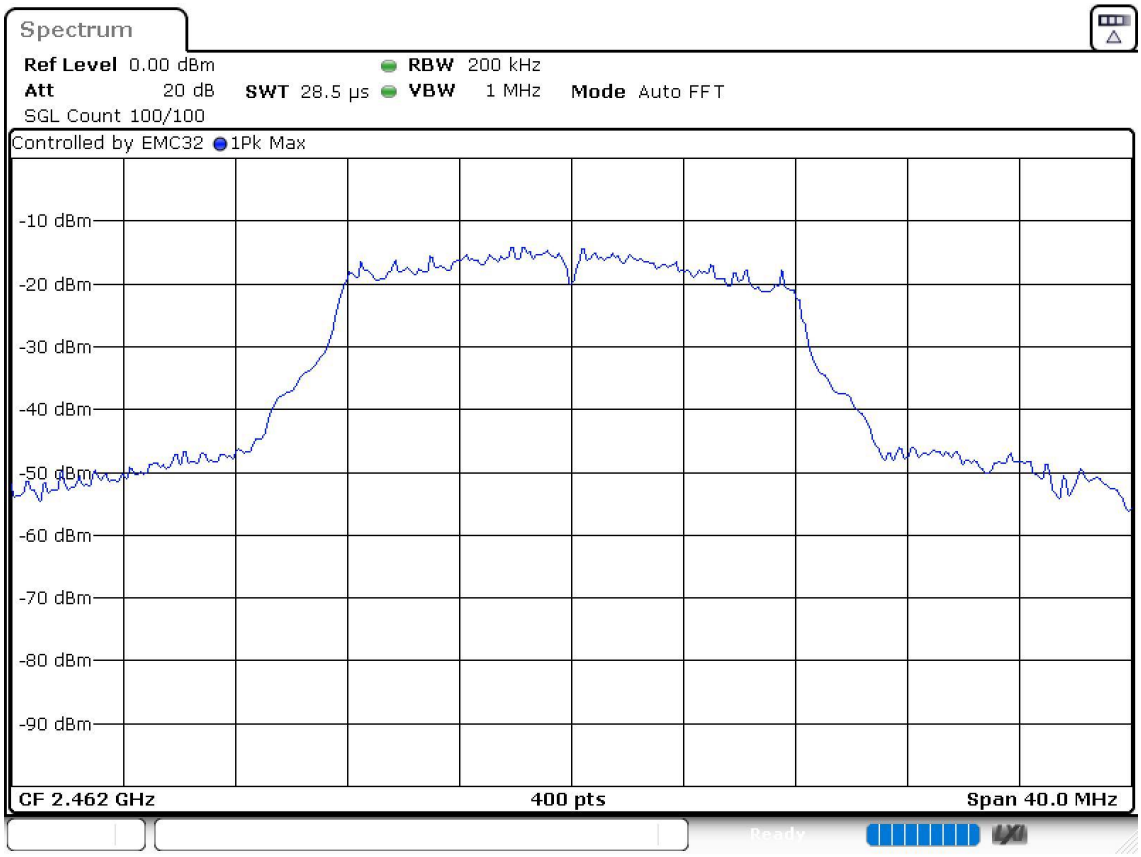




Frequency MHz = 2462.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11g (OFDM 6 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

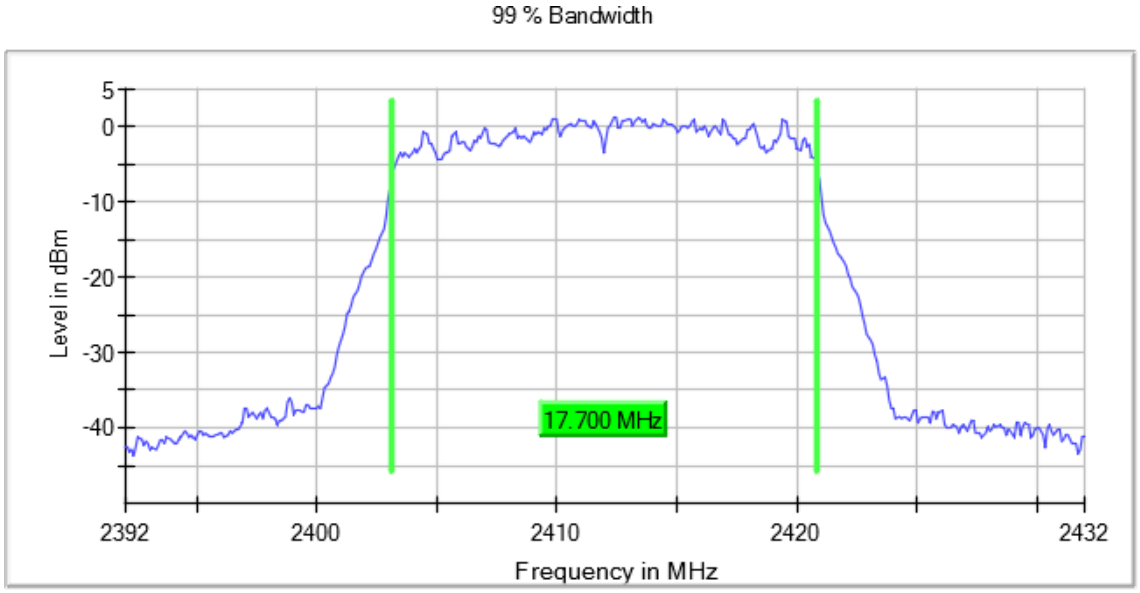
Images:

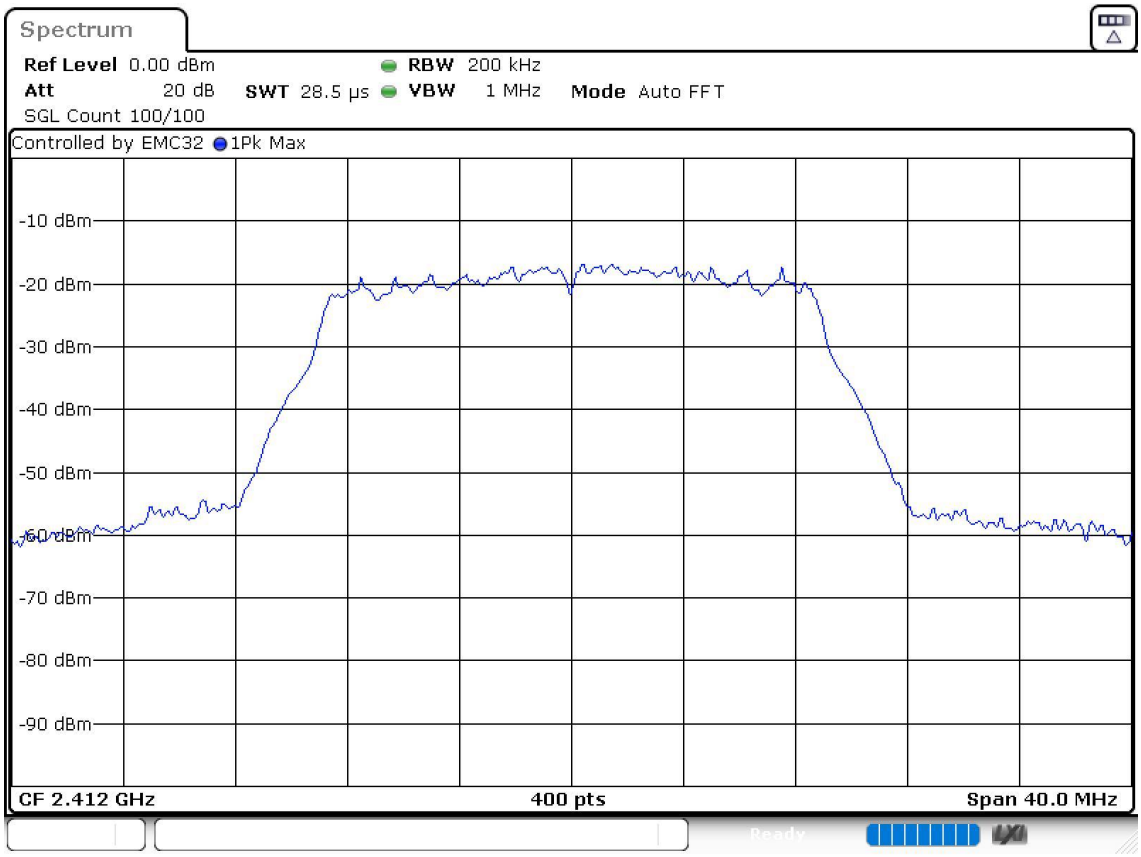




Frequency MHz = 2412.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

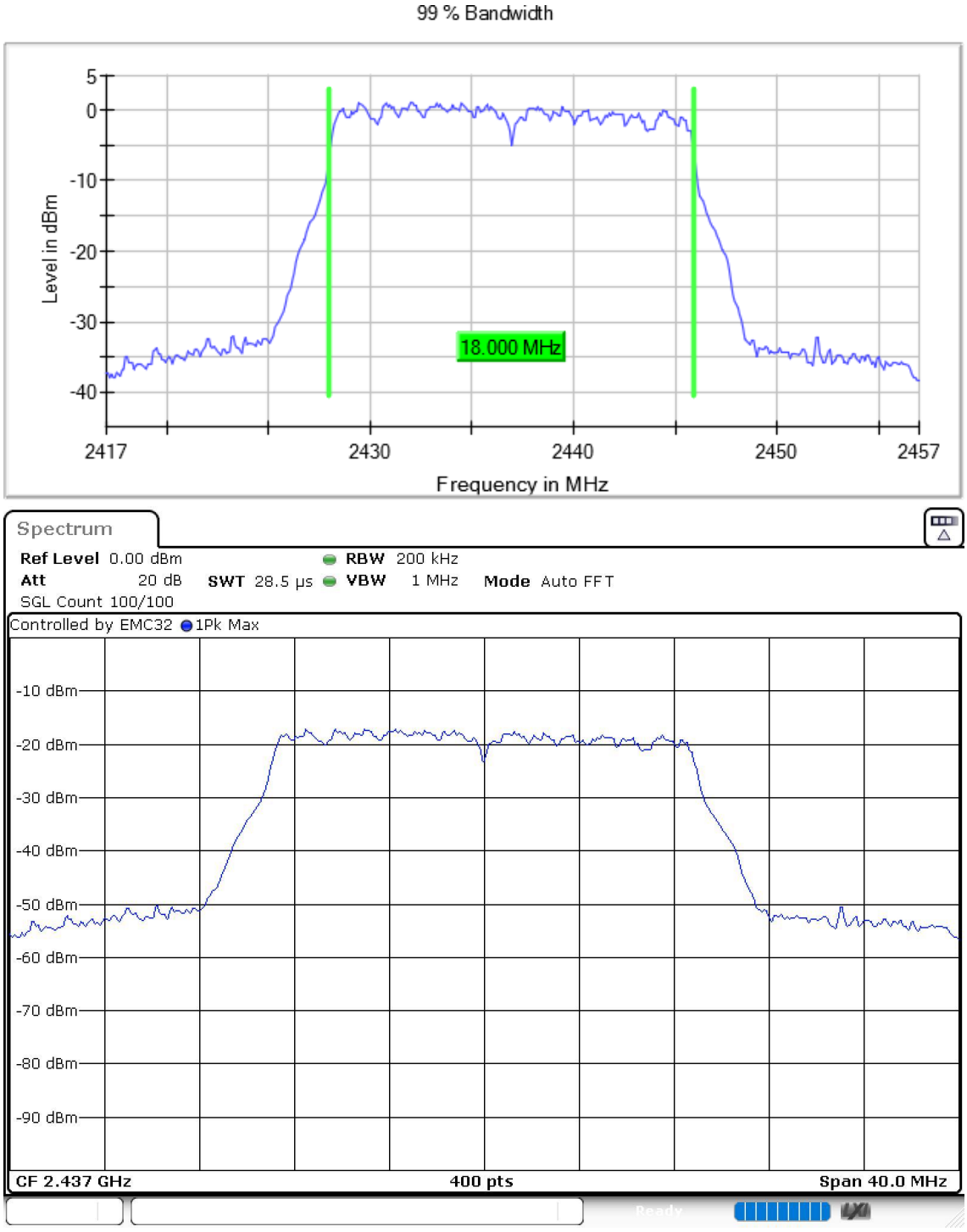
Images:





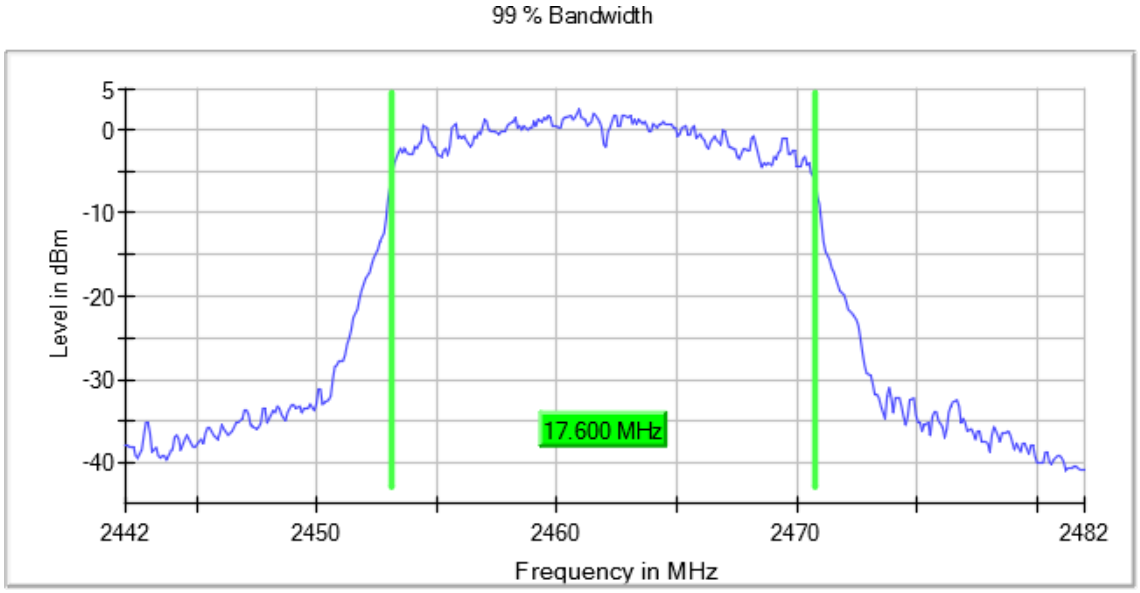
Frequency MHz = 2437.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Number of Transmission Chains = 1	Active Port = 1

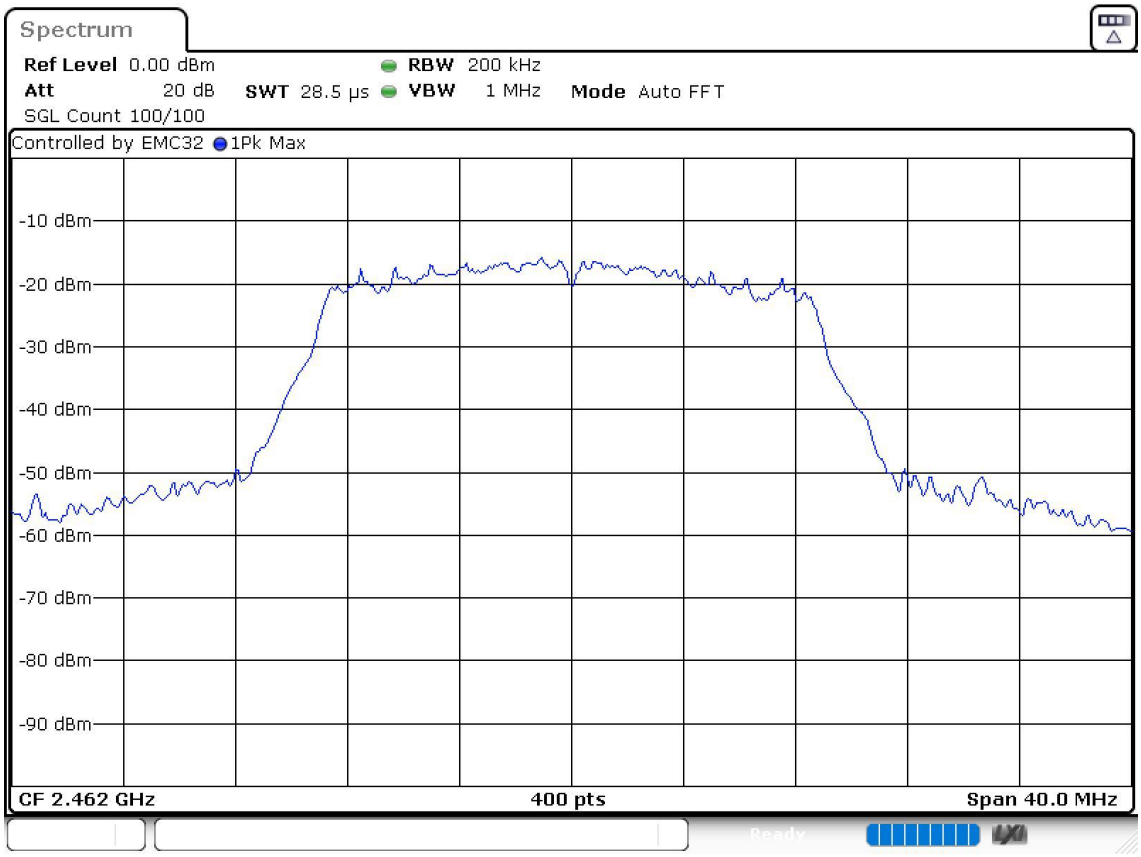
Images:



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

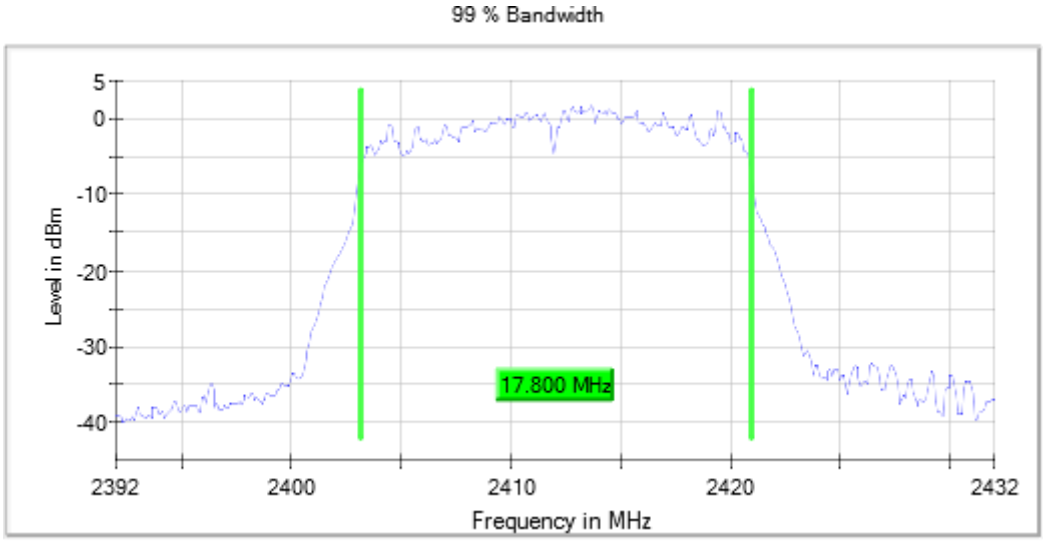
Images:

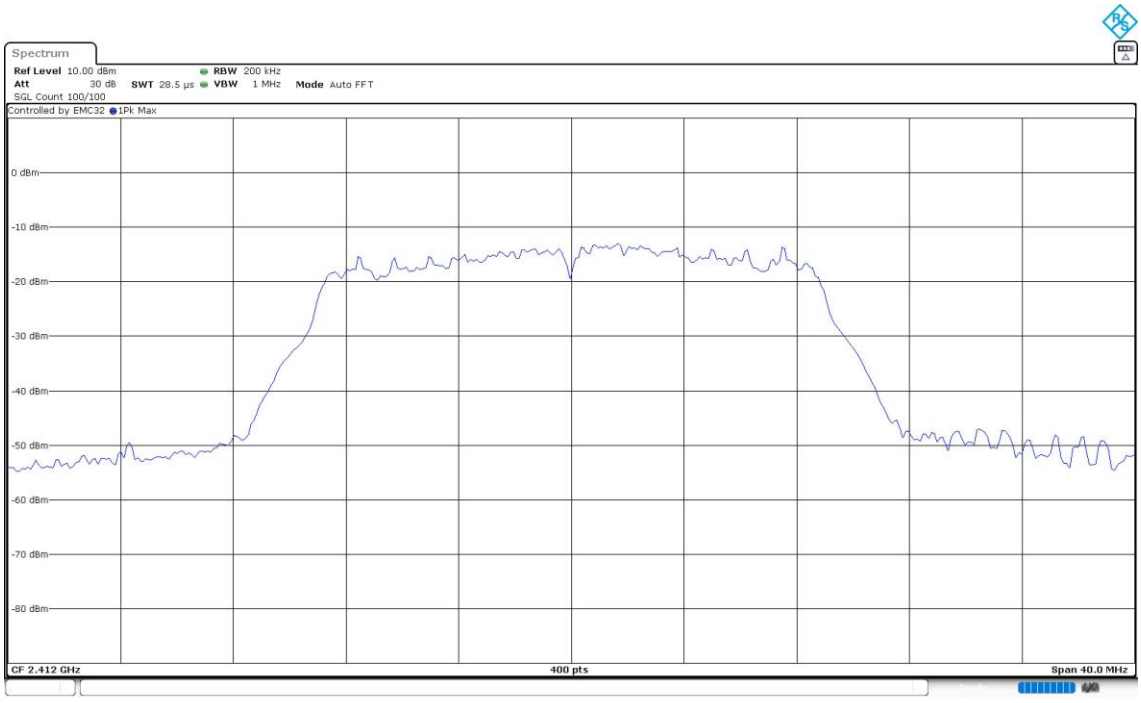




Frequency MHz = 2412.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Number of Transmission Chains = 2	Active Port = 1+2

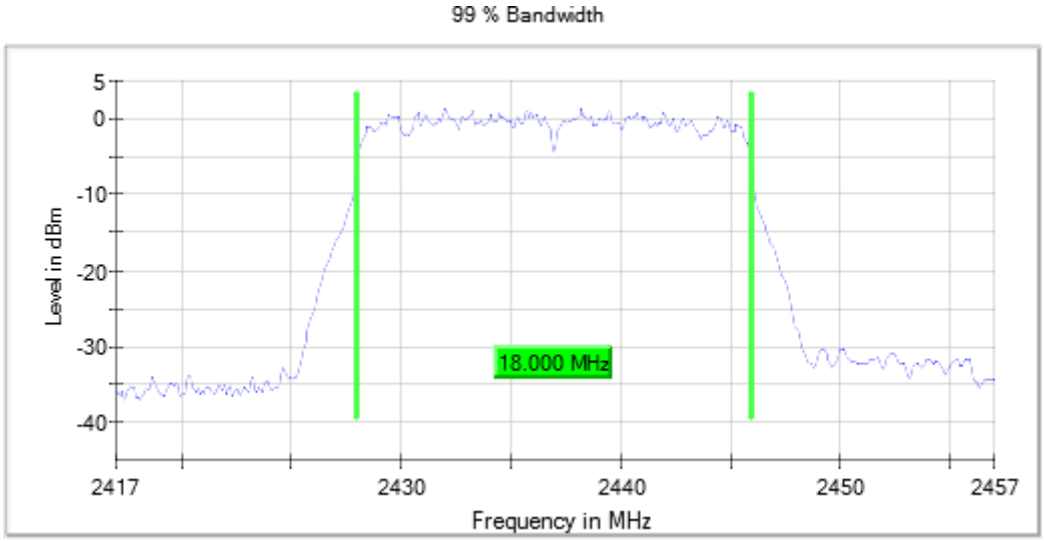
Images:

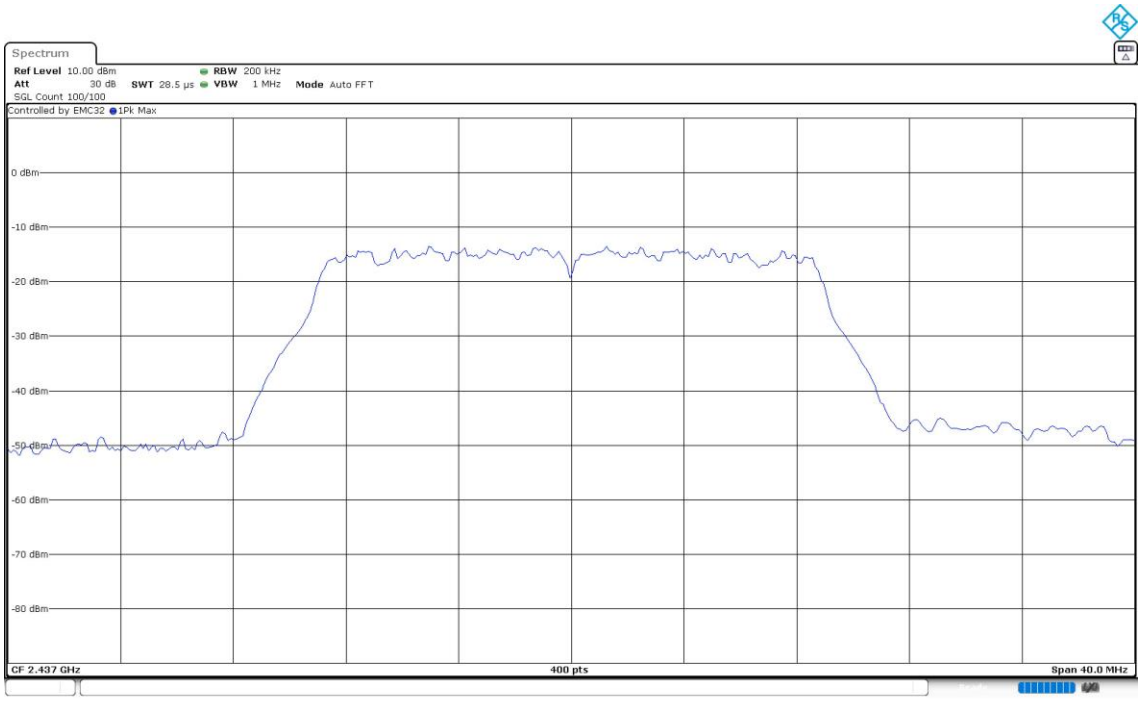




Frequency MHz = 2437.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Number of Transmission Chains = 2	Active Port = 1+2

Images:





Frequency MHz = 2462.00000	Equipment Type = Digital Transmission System (DTS)
Bandwidth MHz = 20	Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)
Number of Transmission Chains = 2	Active Port = 1+2

Images: