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

Test Report No:
NIE: 71079RRF.003A2

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

(*) Identification of item tested	SPICA Analyzer
(*) Trademark	BioSystems
(*) Model and /or type reference	Spica Hightrouput
Other identification of the product	HW version: Hightrought Spica HW SW version: BTS Platform FCC ID: 2A5PS000083100 IC: --
(*) Features	Bluetooth LE, Bluetooth EDR, 802.11a/b/g/n20
Manufacturer	BioSystems S.A. C/ Costa Brava, 30 08030 Barcelona SPAIN
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager 2022.09.12 11:58:58 +02'00'
Date of issue	2022-09-12
Report template No	FDT08_24 (*) "Data provided by the client"

ilac-MRA ENAC ENSAYO ISO 17025 Nº51 / LE147

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Acronyms

Acronym ID	Acronym Description
Avg Power	Maximum Average Conducted Output Power
Detector	Detector used
Equipment	Equipment Type
EUT	Equipment Under Test
Freq	Frequency
Freq Rng	Frequency Range
Inband Peak Lvl	Inband Peak Level
Lvl	Level
Mod	Modulation
Occ Ch BW	Occupied Channel Bandwidth
PSD	Power Spectrum Density
Pol	Polarization
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 is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

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

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

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

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

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

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General conditions

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

Uncertainty

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

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 1 GHz is: Measurement uncertainty ≤ ±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 Peak Output Power: Measurement uncertainty ≤ ±0.80 dB
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 SPICA Analyzer is used to determine analytes concentrations by colorimetric and turbidimetric measurements of several kinds of samples from a wide range of industries. There are two clear business divisions: IVD & non-IVD.

   The SPICA IVD analyzer is used to determine analyte concentrations by in vitro colorimetric, turbidimetric, and electrolyte measurements of different human body fluids or samples (for example serum, urine, plasma, cerebrospinal fluid, total blood, seminal plasma, and fecal samples). For in vitro professional use only in the clinical laboratory.

   The SPICA non-IVD analyzer determines analytes concentrations by colorimetric, turbidimetric, and electrolyte measurements of different kinds of food (for example, meat or fish) and beverage samples (for example, wines, juices, milk), veterinary samples, and/or samples of biological cultures. For professional use in analytical laboratories only.

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	70829_1.1	SPICA Analyzer	Spica Hightrouput	831000005	2022-01-05	Element Under Test
S/02	70829_5.1	SPICA Analyzer (Orange Pi motherboard)	PI-3/2G8G	2020110400100351	2022-01-12	Element Under Test
S/02	70829_6.1	USB - nano USB cable	--	--	2022-01-12	Auxiliary Element

Samples have been used for the following test(s):

Id	Type
S/01	Radiated
S/02	Conducted

Test sample description

<table>
<tr><td rowspan="4">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">.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td colspan="2">.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td colspan="2">.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="6">.....</td></tr>
<tr><td rowspan="5">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: 115V -50Hz</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>[ ]</td><td>AC:</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>[ ]</td><td colspan="5">DC: .....</td></tr>
<tr><td></td><td>[ ]</td><td colspan="5">DC: .....</td></tr>
<tr><td>Rated Power .....:</td><td colspan="6">450 VA</td></tr>
<tr><td>Clock frequencies.....:</td><td colspan="6">Not provided data</td></tr>
<tr><td>Other parameters .....:</td><td colspan="6">Not provided data</td></tr>
<tr><td>Software version .....:</td><td colspan="6">BTS Platform</td></tr>
<tr><td>Hardware version .....:</td><td colspan="6">Hightrought Spica HW</td></tr>
<tr><td>Dimensions in cm (W x H x D) ....:</td><td colspan="6">Not provided data</td></tr>
<tr><td rowspan="5">Mounting position .....:</td><td>[X]</td><td colspan="5">Table top equipment</td></tr>
<tr><td>[ ]</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="4">Module/parts of test item</td><td>Type</td><td>Manufacturer</td></tr>
<tr><td colspan="4">.....</td><td>.....</td><td>.....</td></tr>
<tr><td colspan="4">.....</td><td>.....</td><td>.....</td></tr>
</table>

Accessories (not part of the test item) .....:	Description	Type	Manufacturer
	.....	.....	.....
	.....	.....	.....
	.....	.....	.....
Documents as provided by the applicant.....:	Description	File name	Issue date
	.....	.....	.....
	.....	.....	.....
	.....	.....	.....

(3) Only for Medical Equipment

Identification of the client

BioSystems S.A.
C/ Costa Brava, 30 08030 Barcelona
SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-01-26
Date (finish)	2022-02-02

Document history

Report number	Date	Description
71079RRF.003	2022-05-17	First release.
71079RRF.003A1	2022-06-03	Second release: It was corrected minor typos. This test report cancels and replaces the report: 71079RRF.003
71079RRF.003A2	2022-09-12	Third release: It was attached spectrum analyzer parameter This test report cancels and replaces the report: 71079RRF.003A1

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 semi-anechoic 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: Antonio Manuel Sánchez Carrizo, Daniel Mejías Herrera, Jaime Barranquero Gómez and Victoria Olmedo Villalba.

Used instrumentation:

Equipment	Model	Manufacturer	Next Calibration
SEMIANECHOIC ABSORBER LINED CHAMBER VI	P29419	ALBATROSS	N.A.
SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	N.A.
EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2023-12-30
ULTRALOG ANTENNA 30MHz-6GHz	HL562E_UPG	ROHDE AND SCHWARZ	2022-10-15
HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS- ELEKTRONIK	2022-11-15
HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2024-03-19
PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2022-02-10
PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-3G	BONN ELEKTRONIK	2023-02-15
SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2023-07-29
OPEN SWITCH UNIT UP TO 6 GHz	OSP-B157W8	ROHDE & SCHWARZ	2023-03-18
EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2023-03-23
WMS32	--	ROHDE AND SCHWARZ	Software

Testing verdicts

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

Summary

802.11 b/g/n20 MHz 1x1

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. 802.11 b/g/n20 MHz 1x1

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FCC 15.247 (b) / RSS-247 5.4 (d) Maximum Output Power and Antenna Gain 36
FCC 15.247 (e) / RSS-247 5.2 (b) Power Spectral Density 37
FCC 15.247 (d) / RSS-247 5.5 Band-Edge Emissions Compliance (Transmitter) 47
RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter) 60

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	115 Vac
Type of Power Supply:	External (mains)

ANTENNA (*):

Type of Antenna:	Dedicated antenna (UFL connector)
Maximum Declared Antenna Gain:	+3 dBi

TEST FREQUENCIES (*):

Low Channel:	2412 MHz
Middle Channel:	2437 MHz
High Channel:	2462 MHz

The tests were performed in the worst case of modulation, bandwidth, data rate and power as stated below:

Mode b:	DSSS, 1 Mbps.
Mode g:	OFDM, 6 Mbps.
Mode n20:	OFDM, MCS0.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it connected to the TS8997 RF test bench 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 from 30 MHz to 1000 MHz and 1 – 17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz – 26 GHz (17 GHz – 40 GHz horn antenna).

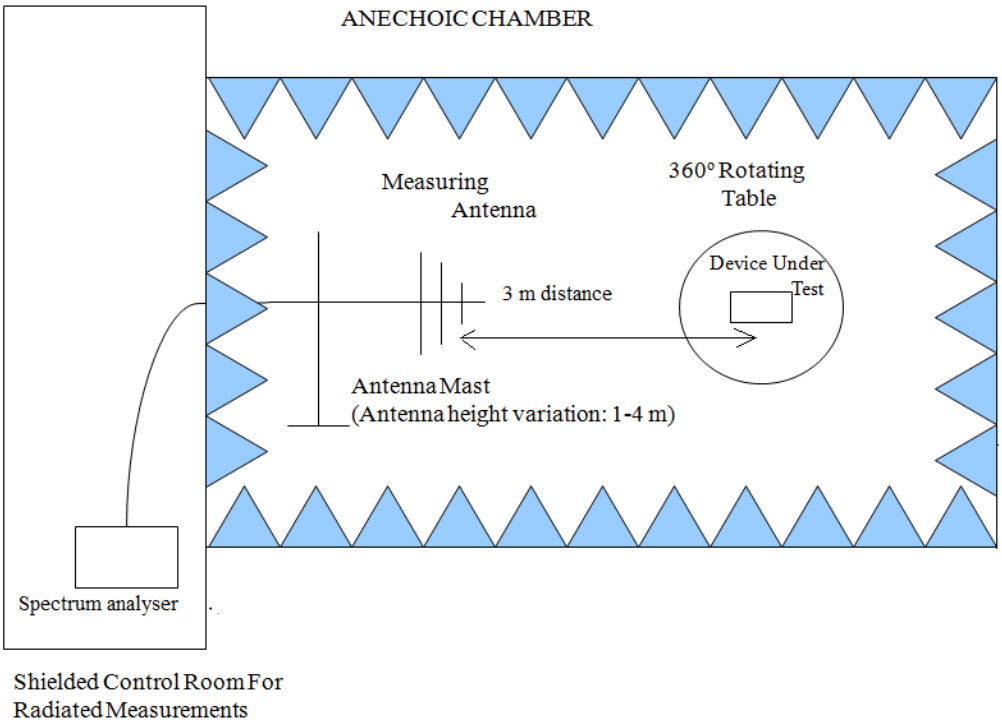
For radiated emissions in the range 17 GHz – 26 GHz performed at a distance closer than the distance specified in standard, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and its situation and orientation were varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters (up to 17GHz) to find the maximum radiated emission.

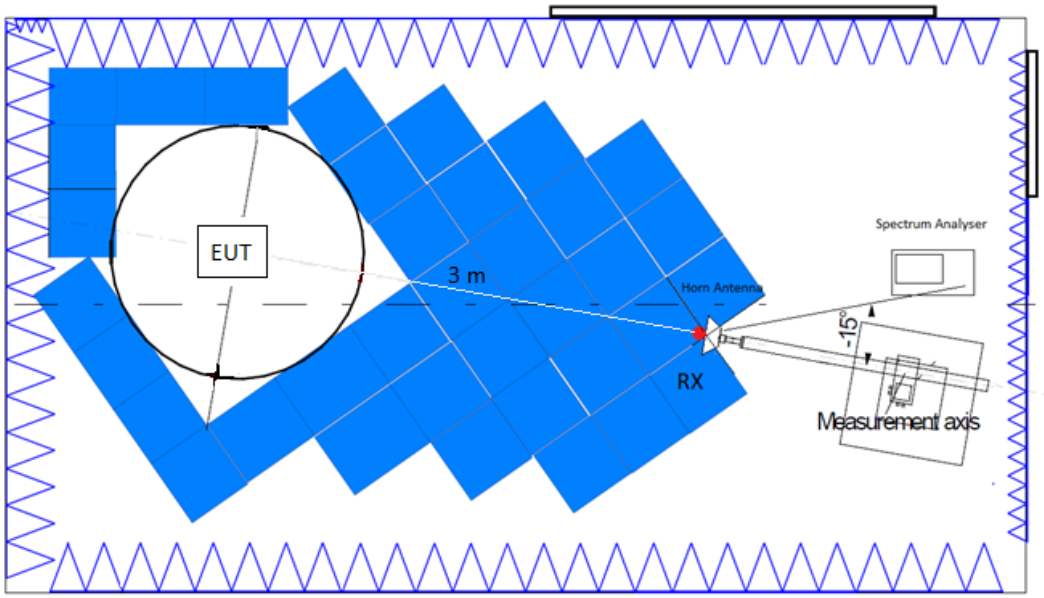
Measurements were made in both horizontal and vertical planes of polarization.

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.

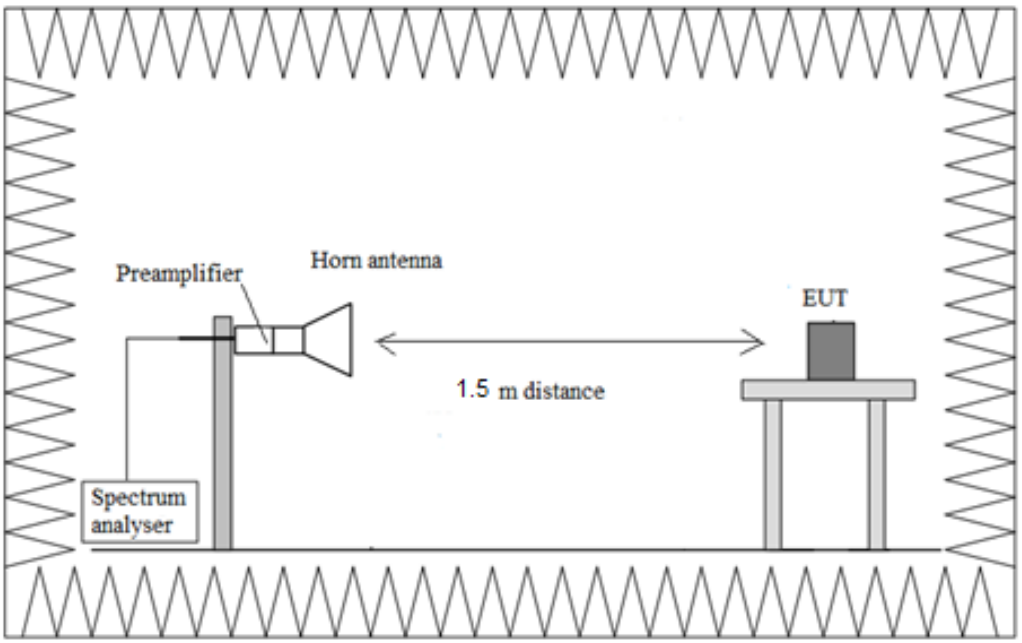
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247

Occupied Bandwidth

Results

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	11.100
2437.00		11.200
2462.00		11.200

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	16.500
2437.00		16.500
2462.00		16.400

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

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	25.800
2437.00		17.700
2462.00		17.600

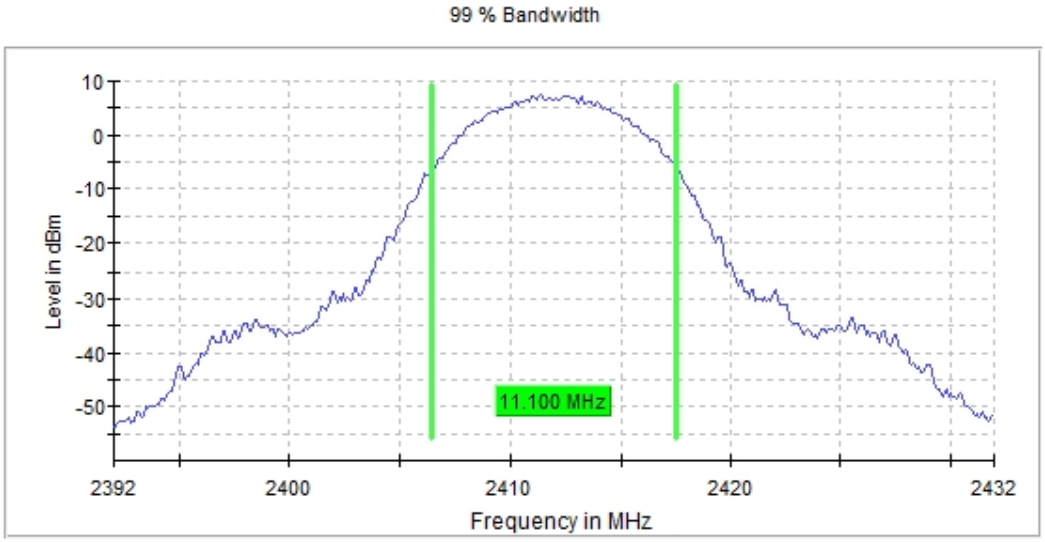
Verdict

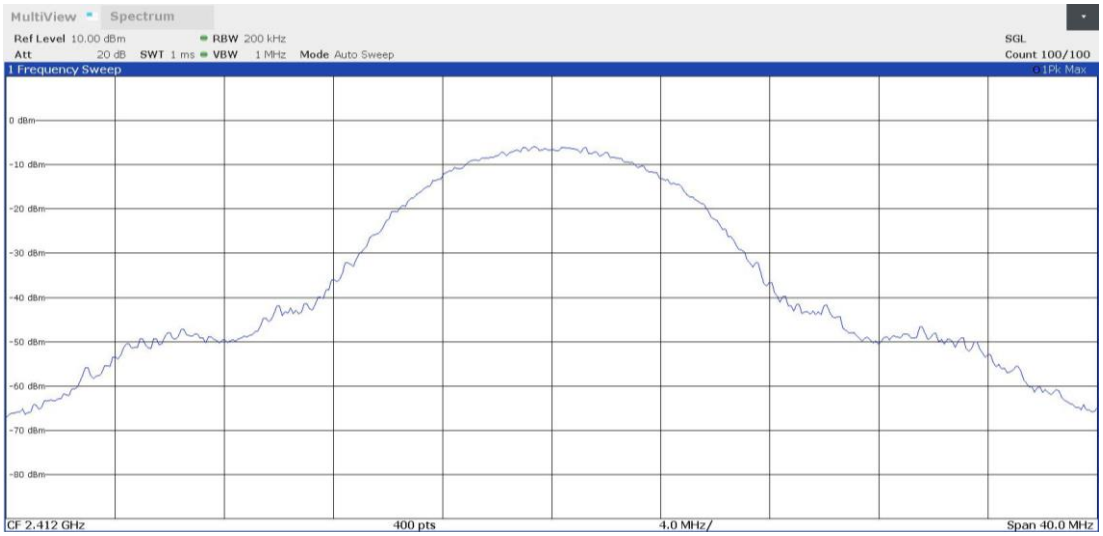
Pass

Attachments

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

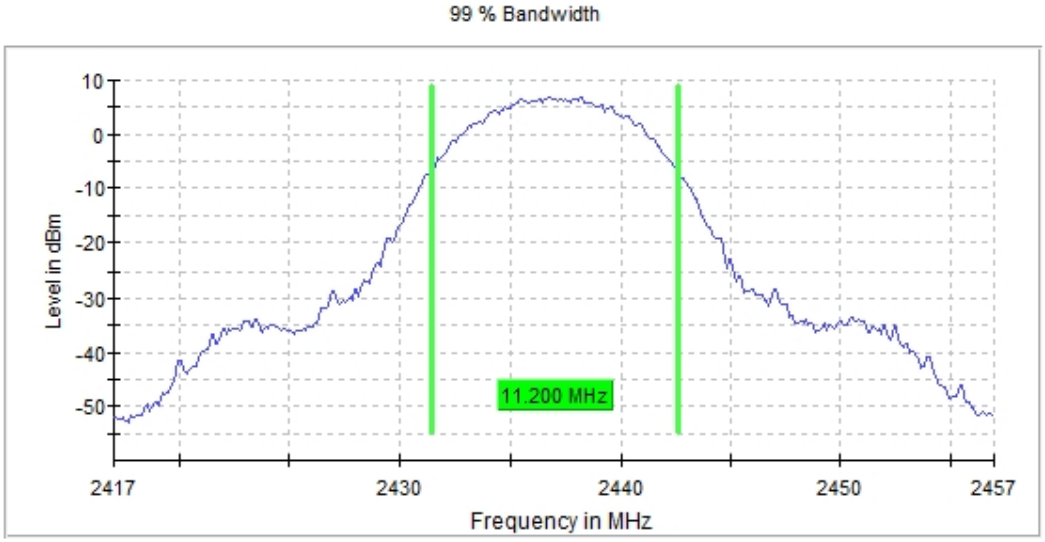
Plots:

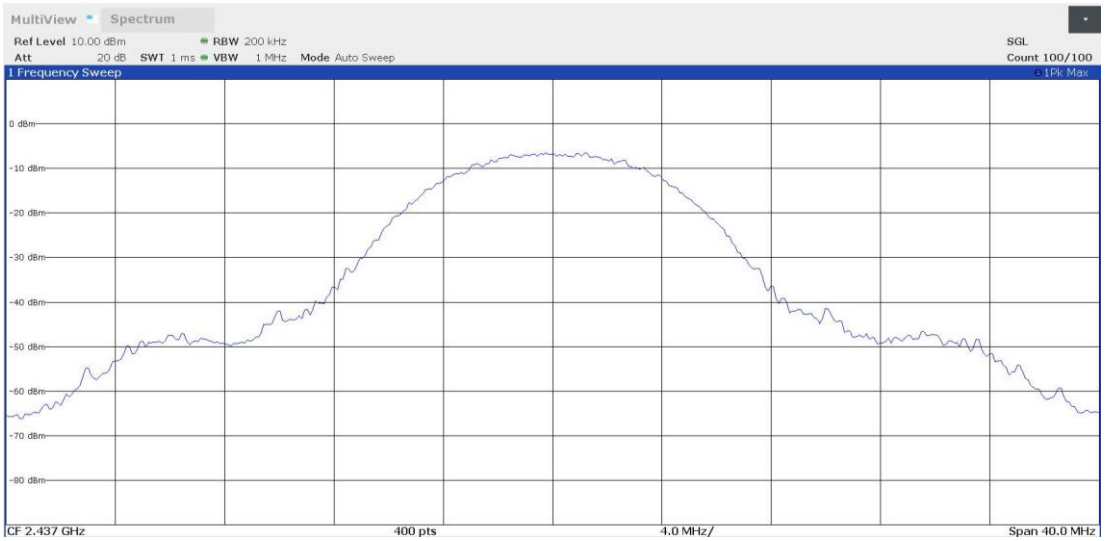




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

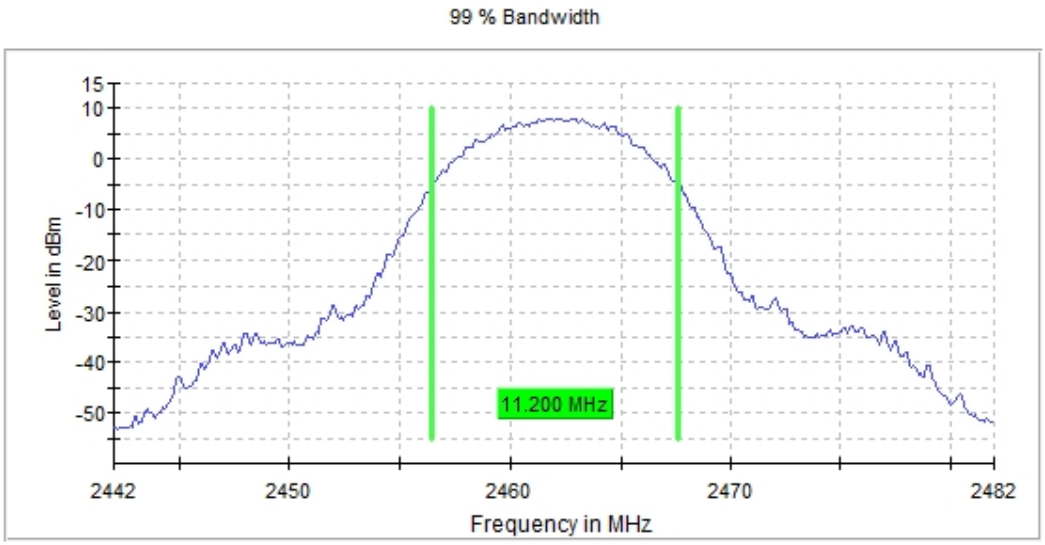
Plots:

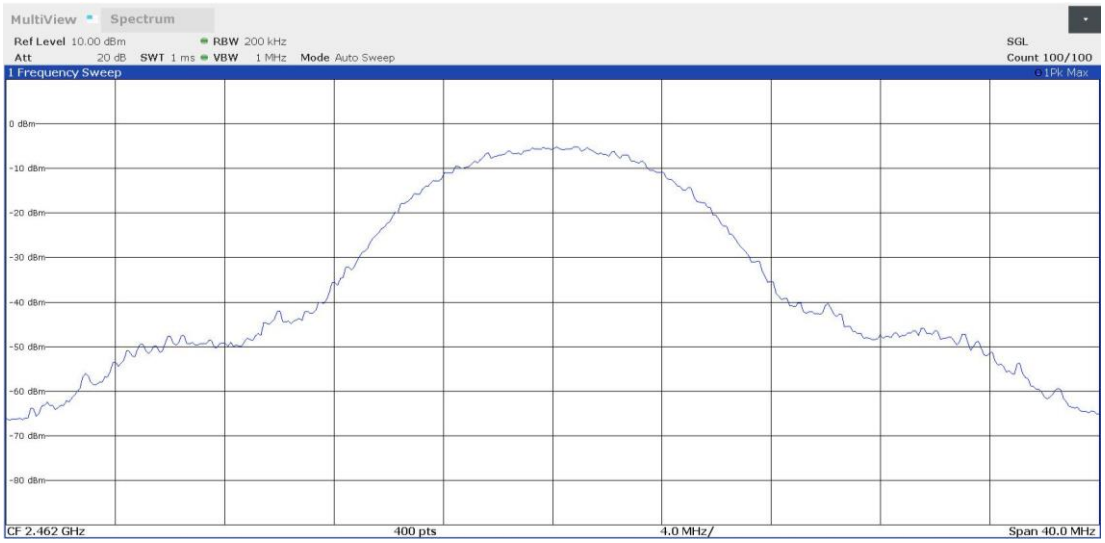




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

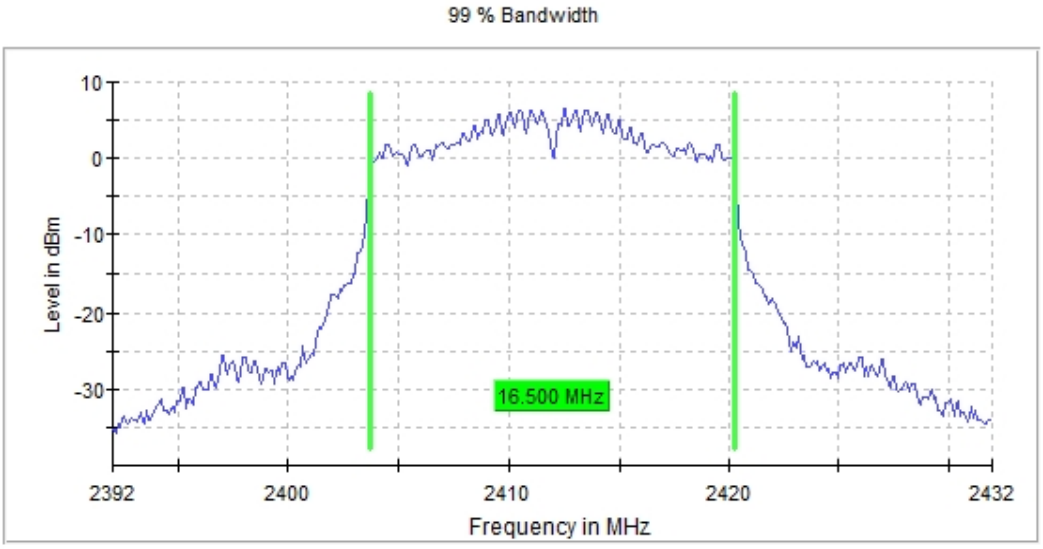
Plots:

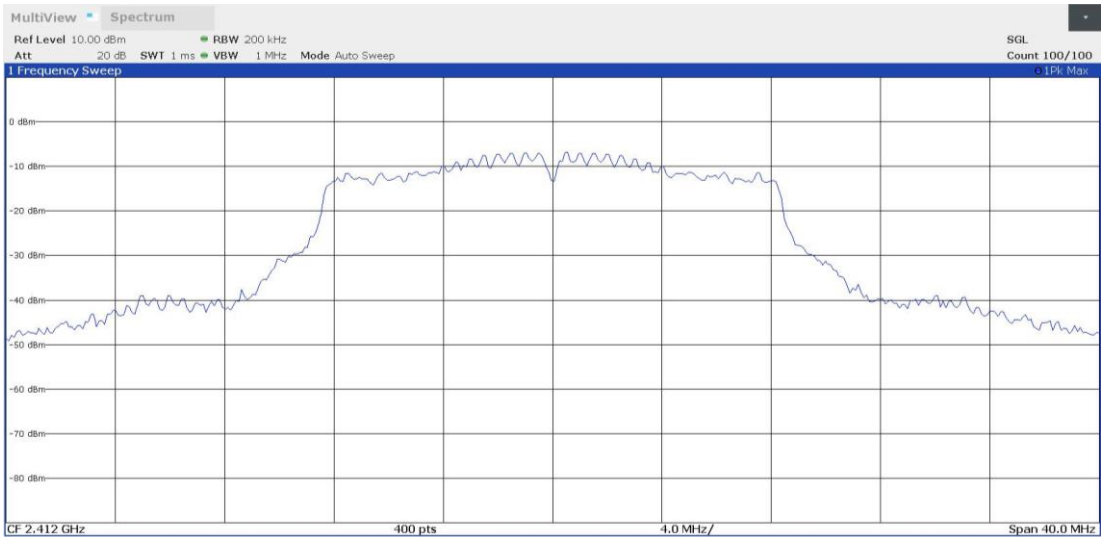




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

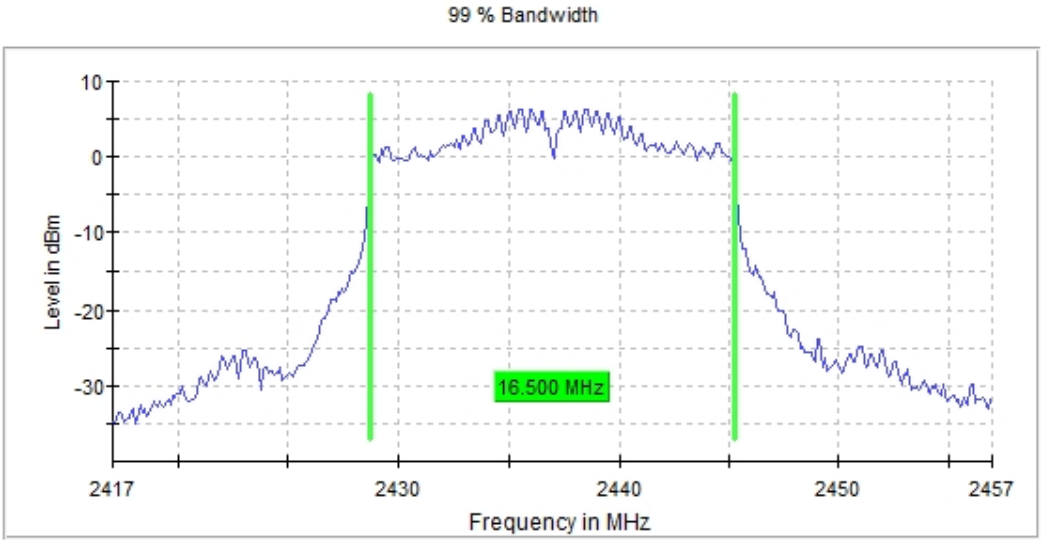
Plots:

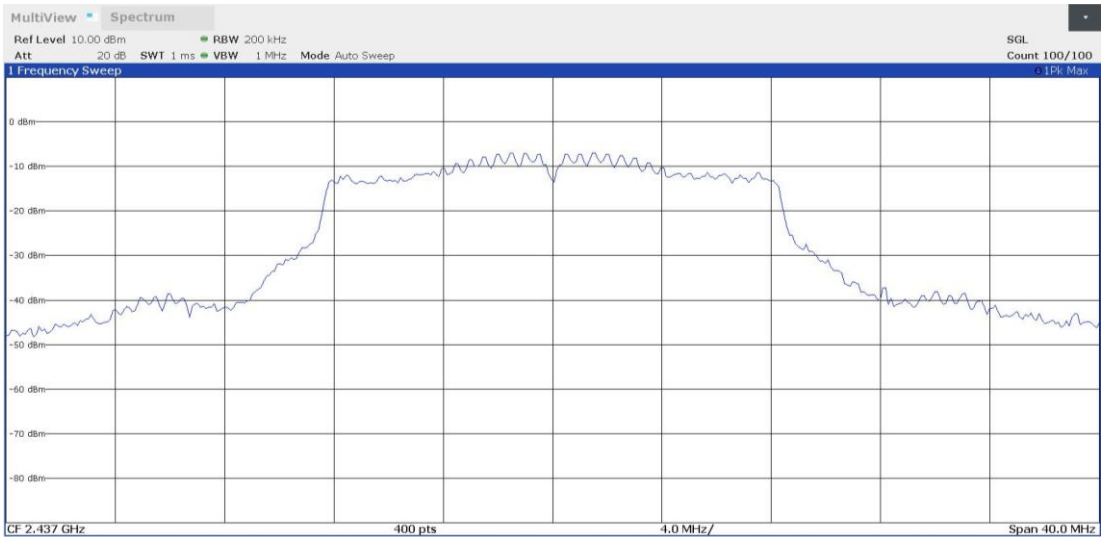




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

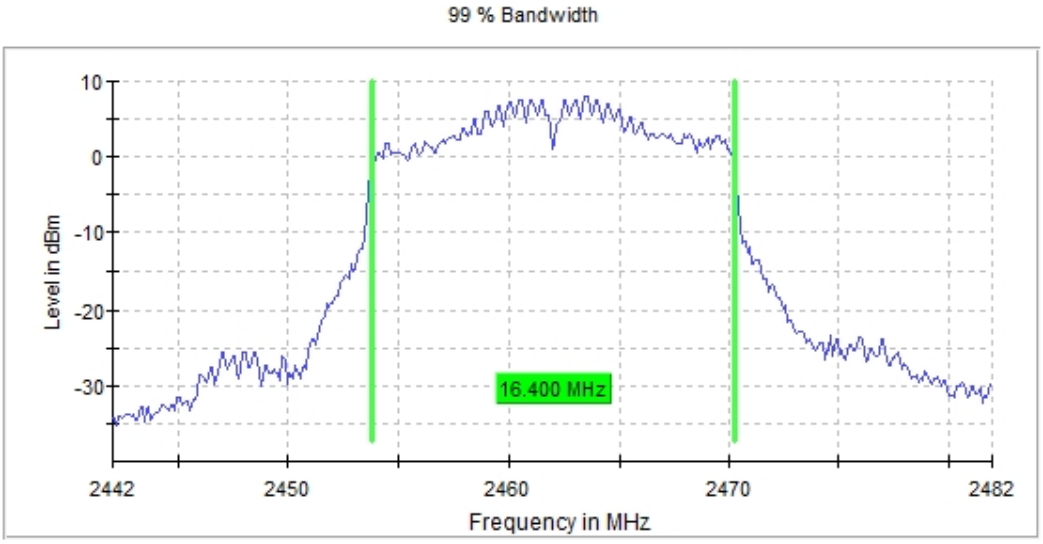
Plots:

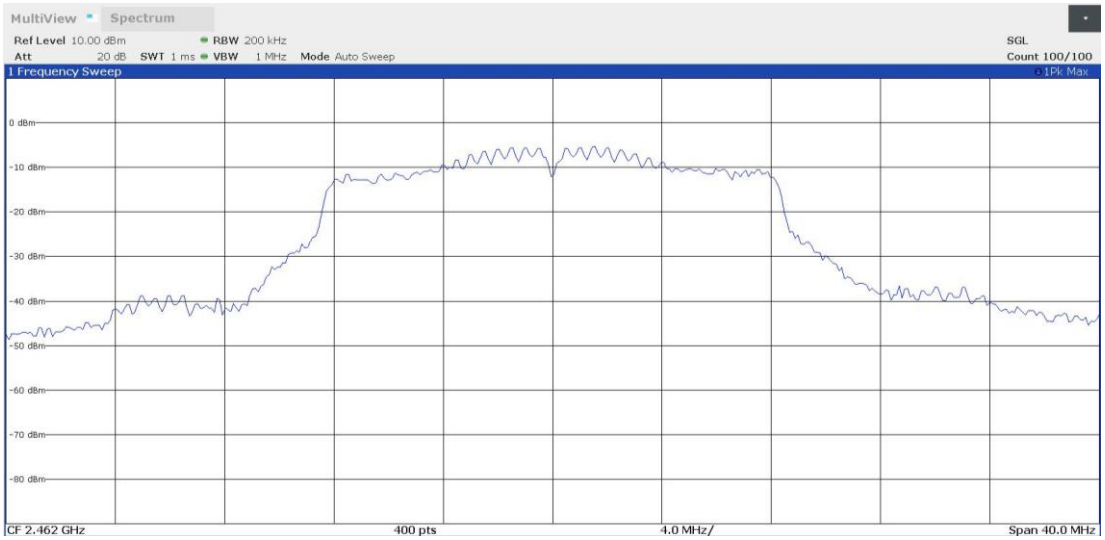




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

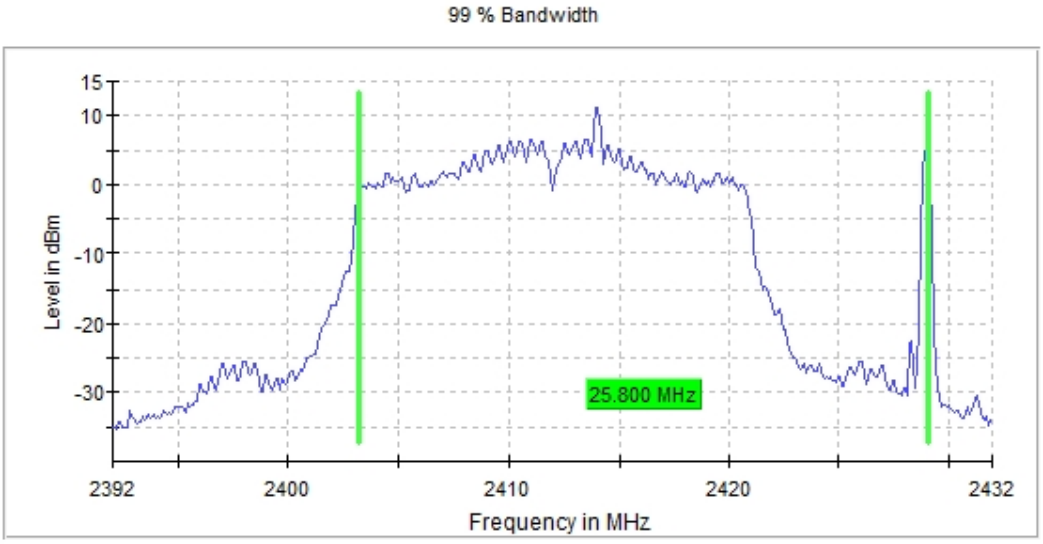
Plots:

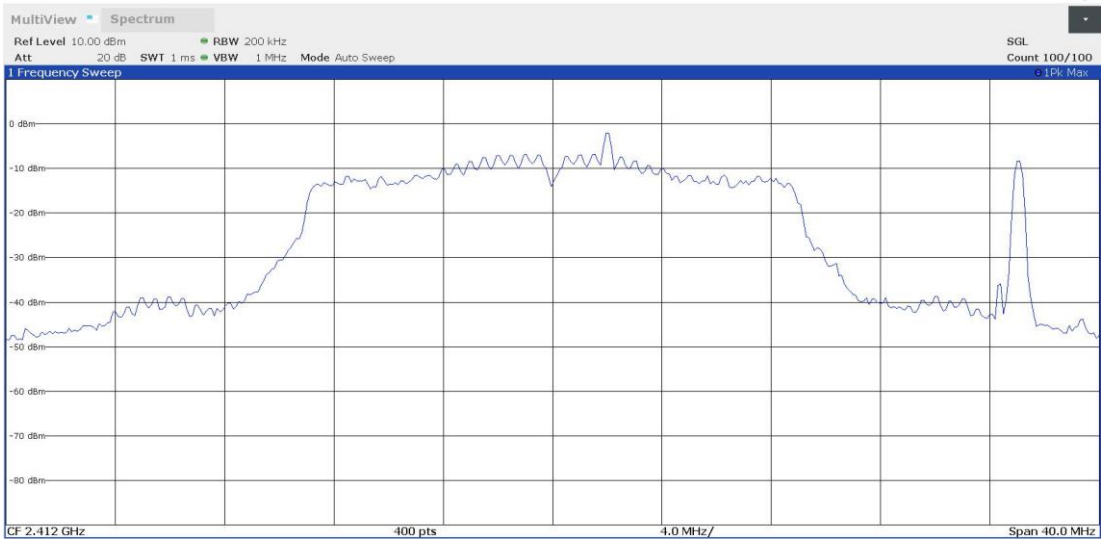




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

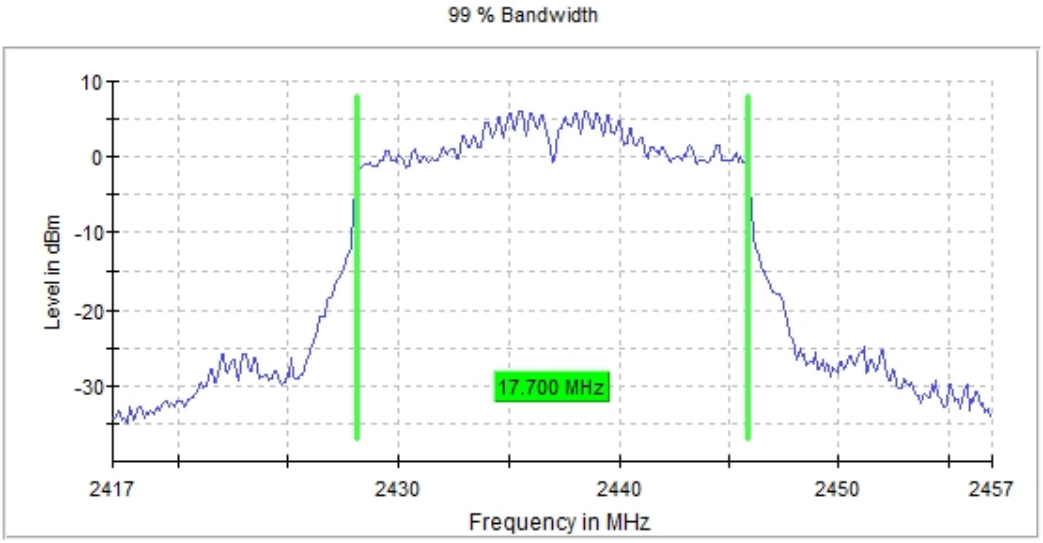
Plots:

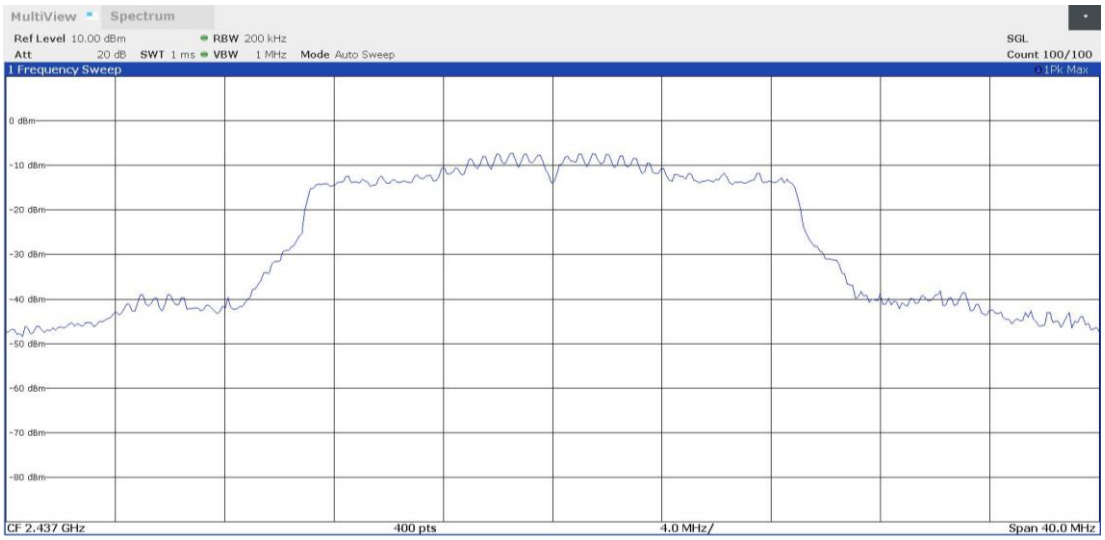




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

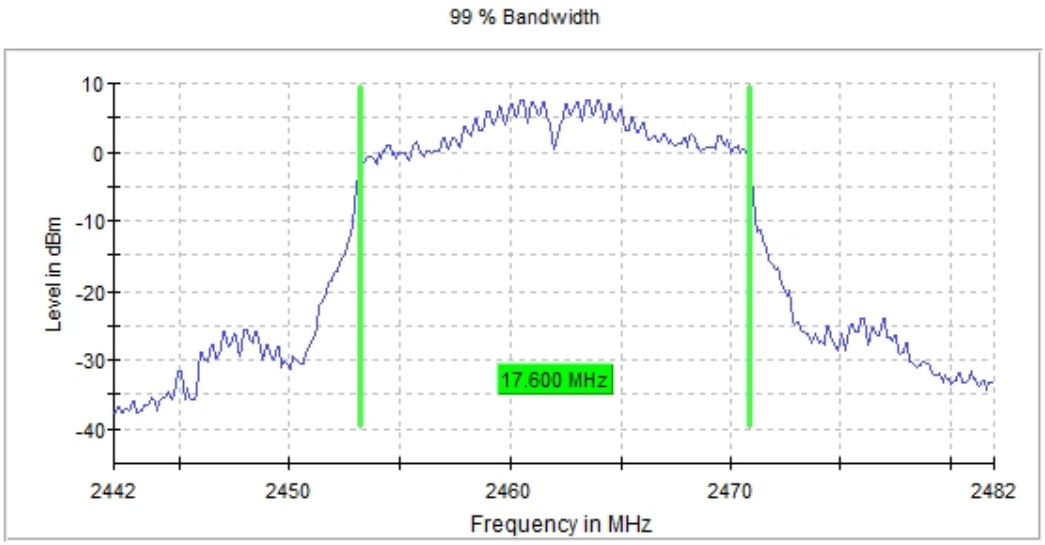
Plots:

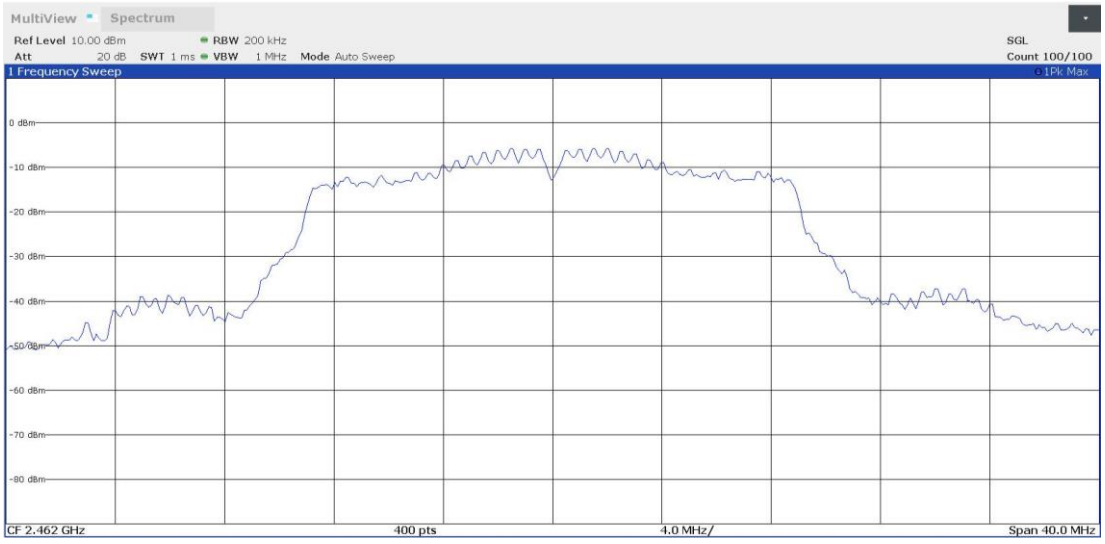




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Plots:





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.

Results

The 6 dB bandwidth of the fundamental emission was measured according to clause 11.8.1 “DTS bandwidth, Option 1” of ANSI C63.10-2013.

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	6dB BW (MHz)
2412.00	Digital Transmission System (DTS)	7.85
2437.00		8.15
2462.00		7.70

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	6dB BW (MHz)
2412.00	Digital Transmission System (DTS)	13.90
2437.00		13.90
2462.00		11.65

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

Freq (MHz)	Equipment	6dB BW (MHz)
2412.00	Digital Transmission System (DTS)	13.90
2437.00		13.90
2462.00		11.65

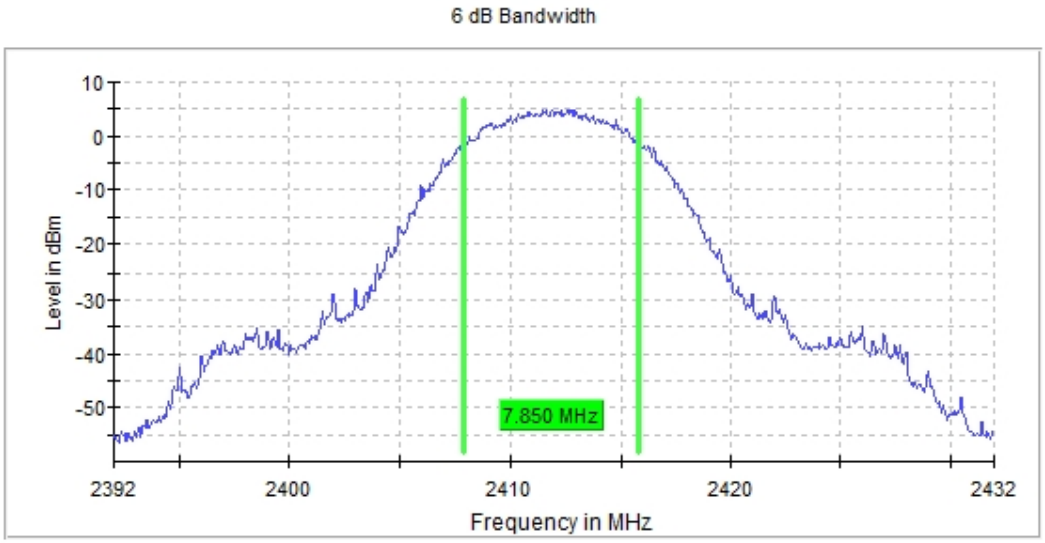
Verdict

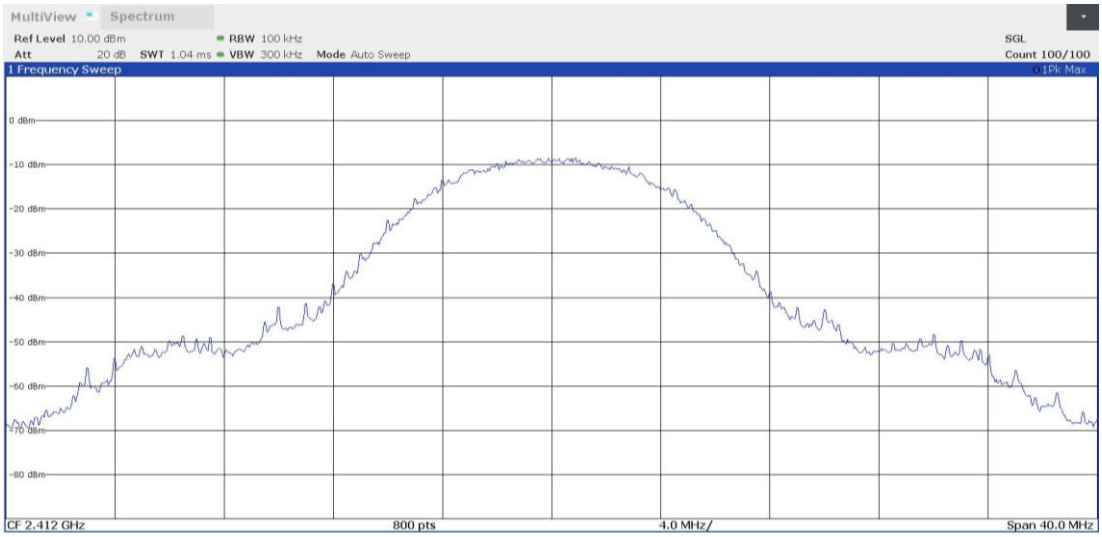
Pass

Attachments

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

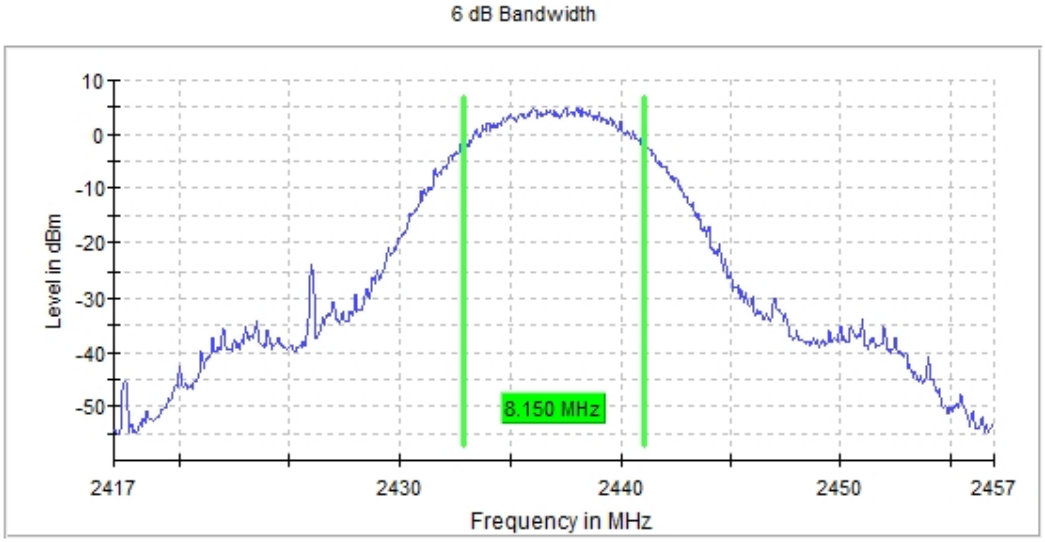
Plots:

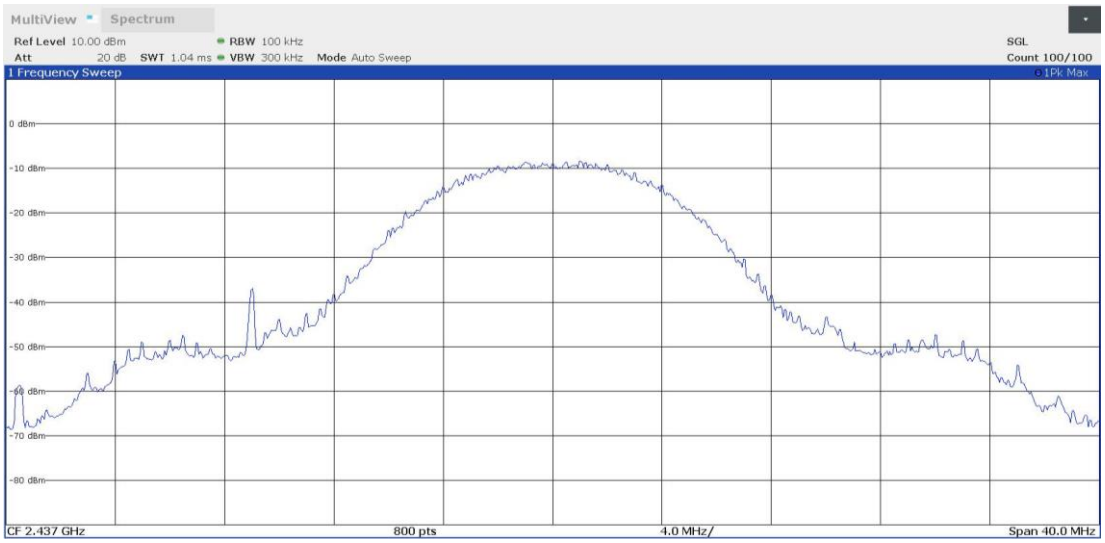




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

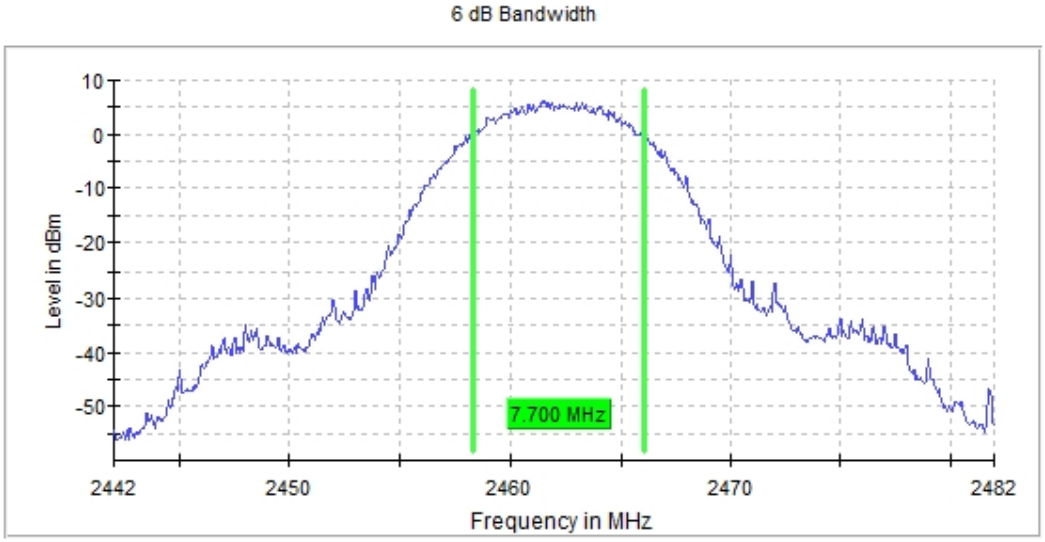
Plots:

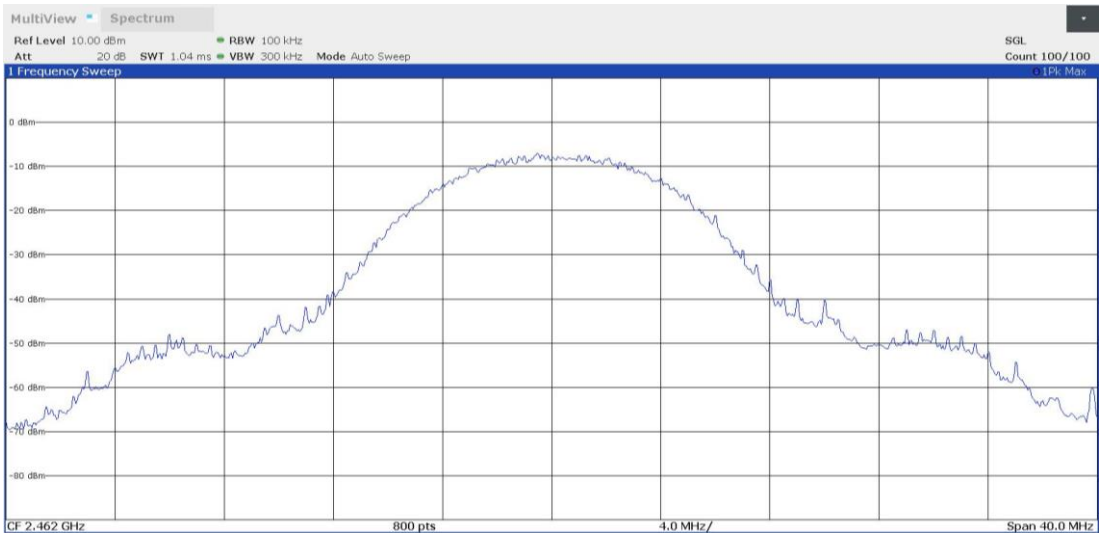




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

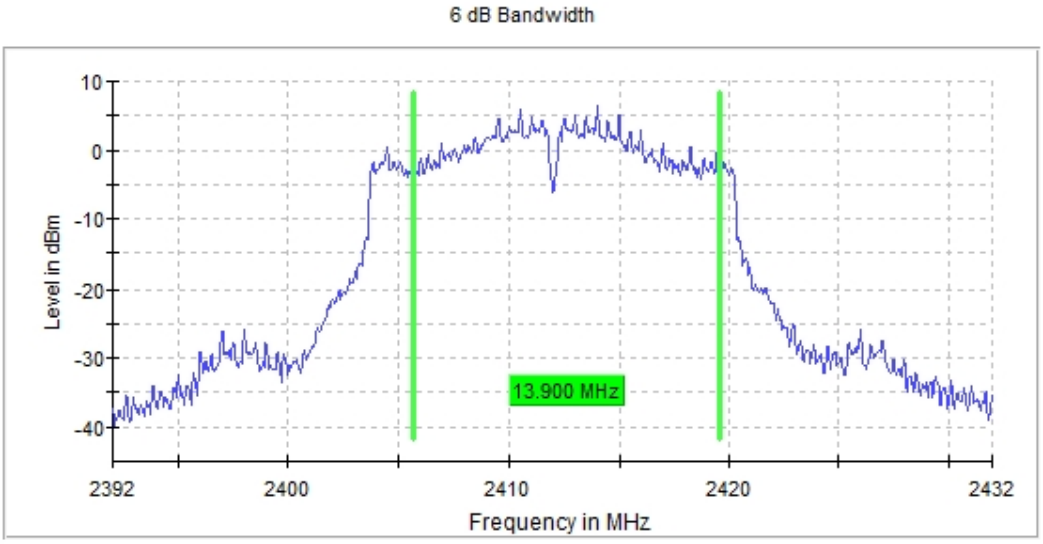
Plots:

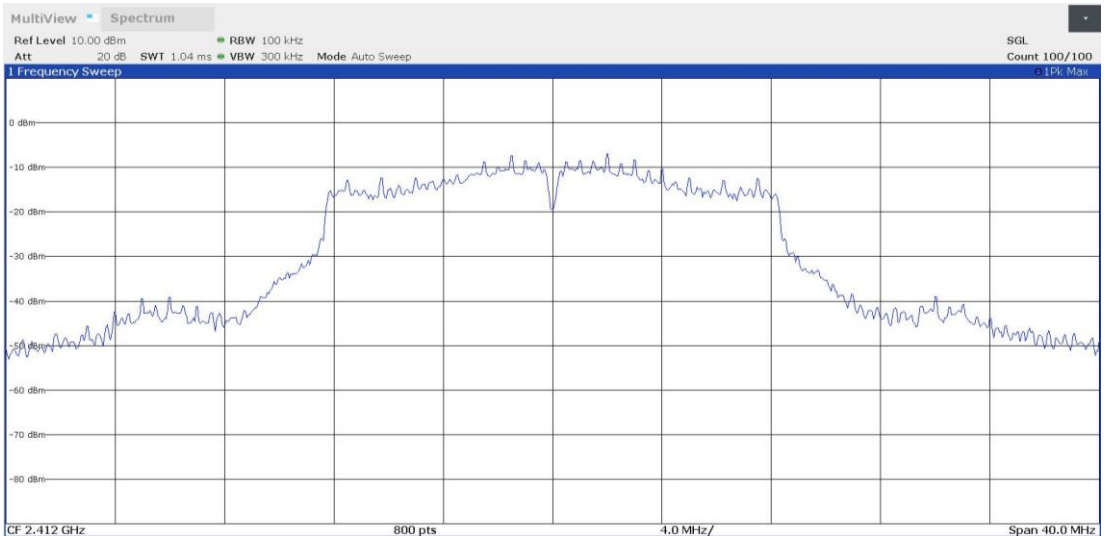




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

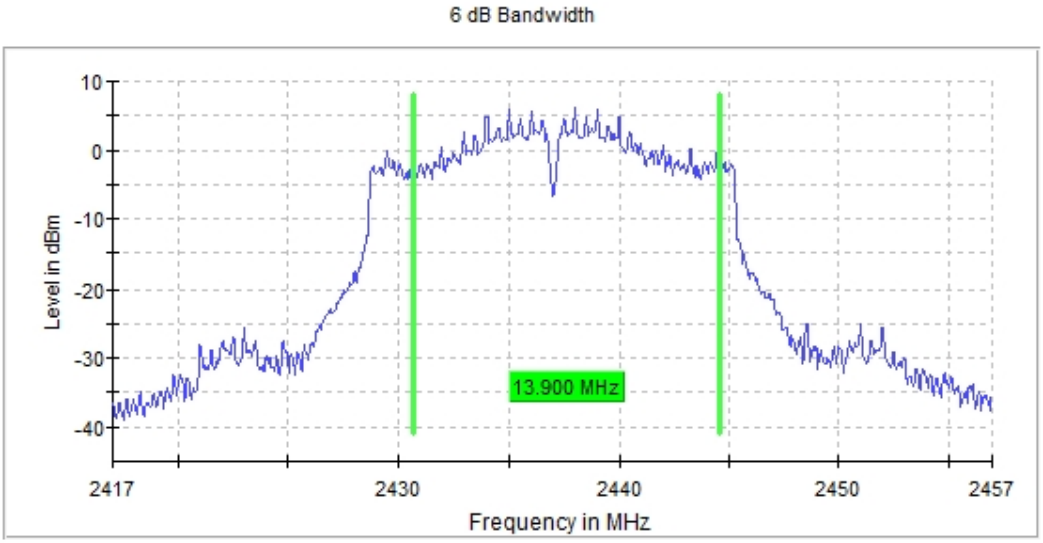
Plots:

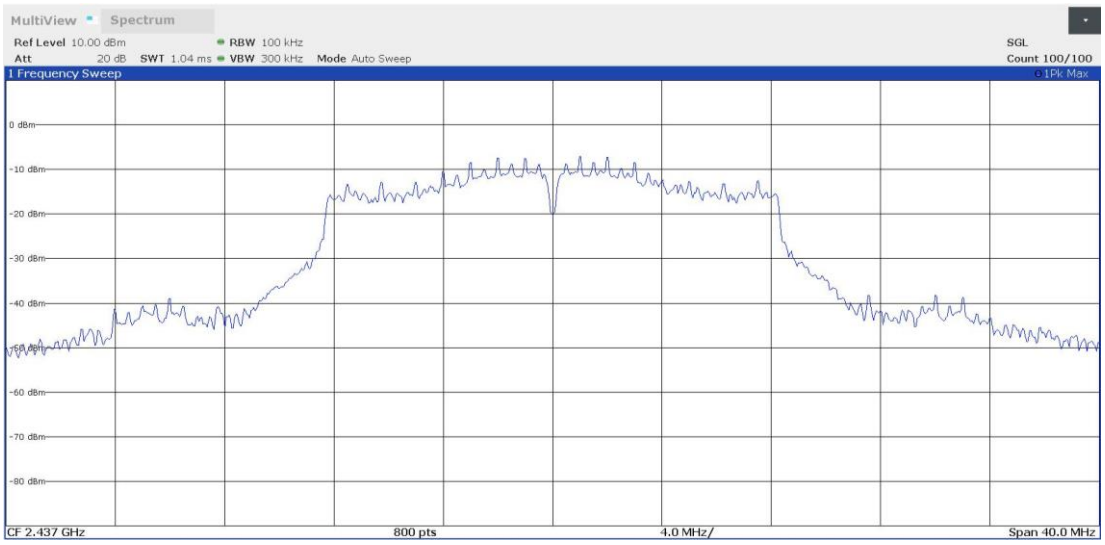




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

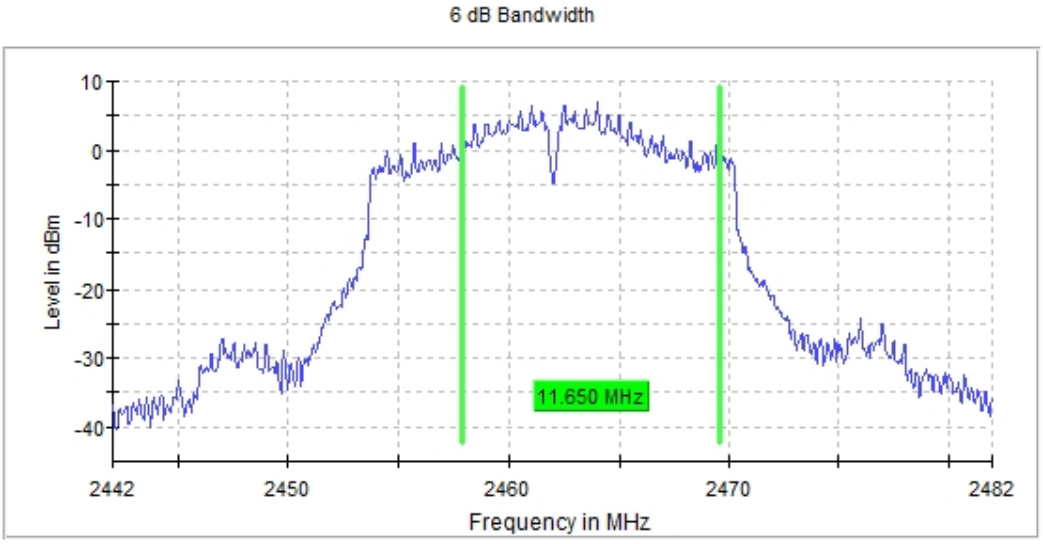
Plots:

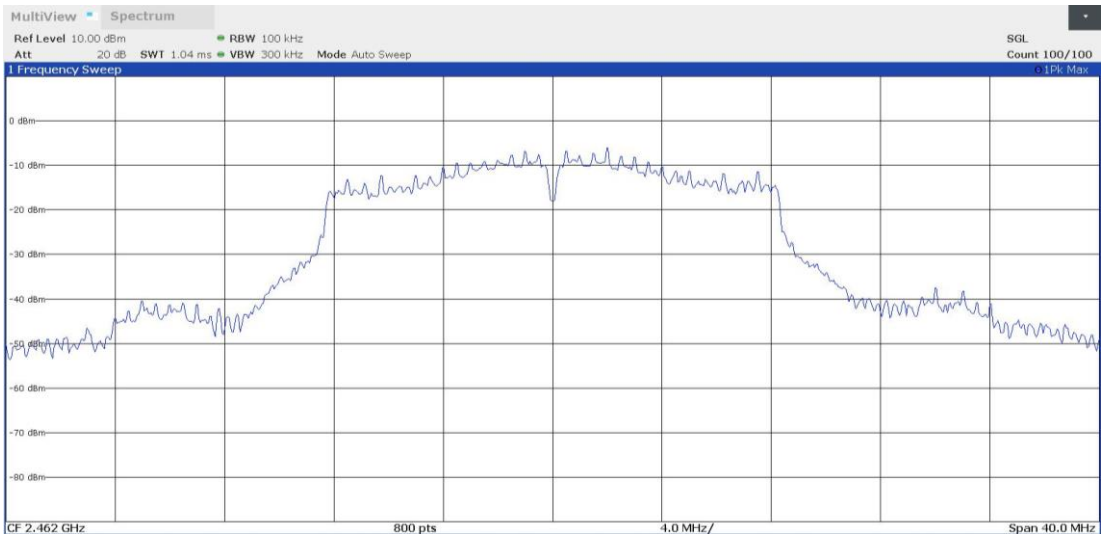




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

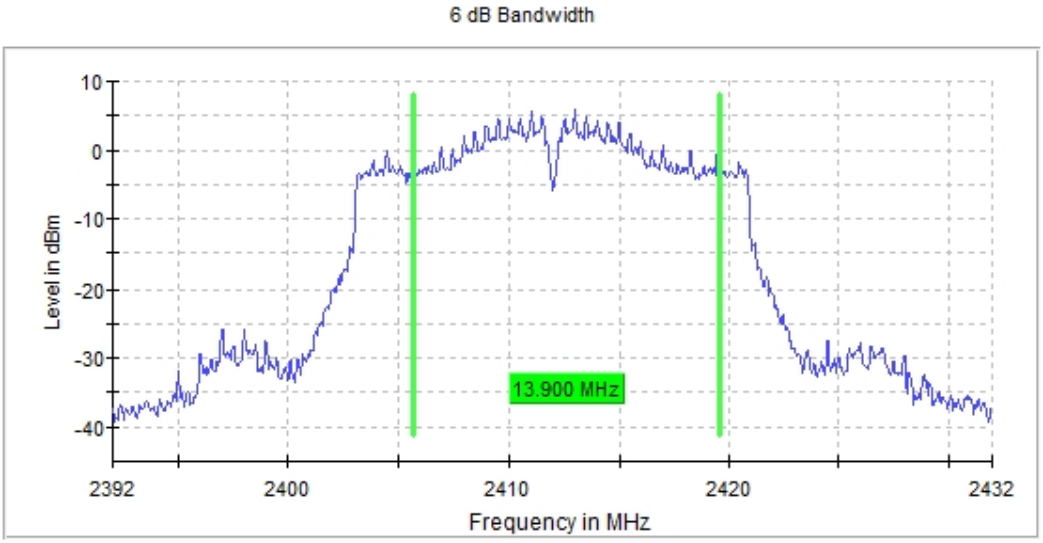
Plots:

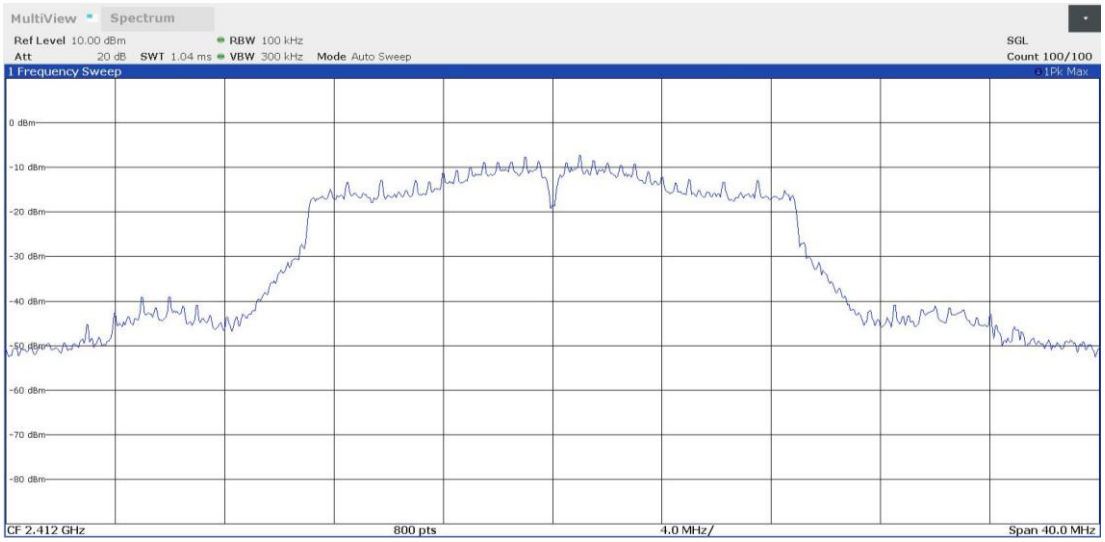




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

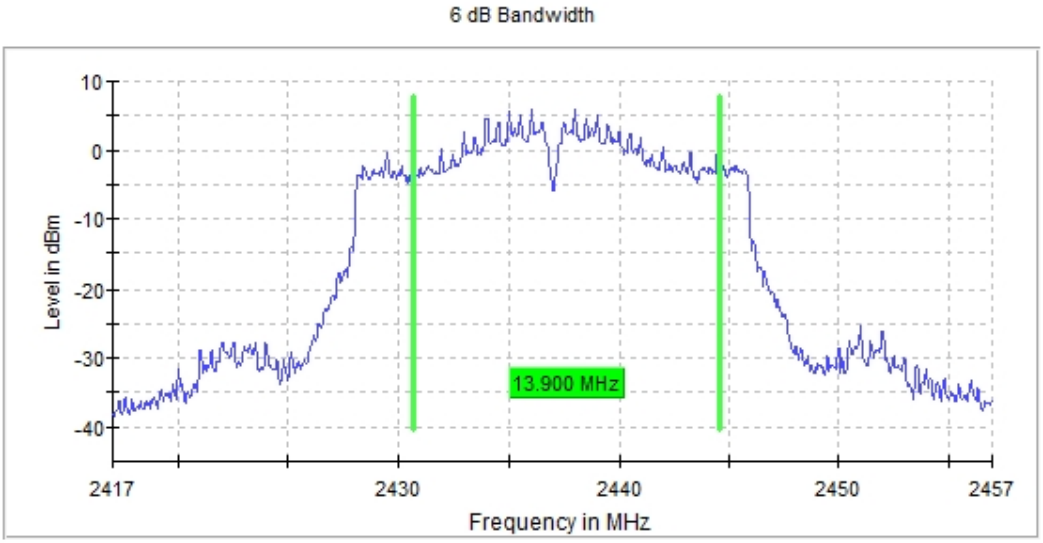
Plots:

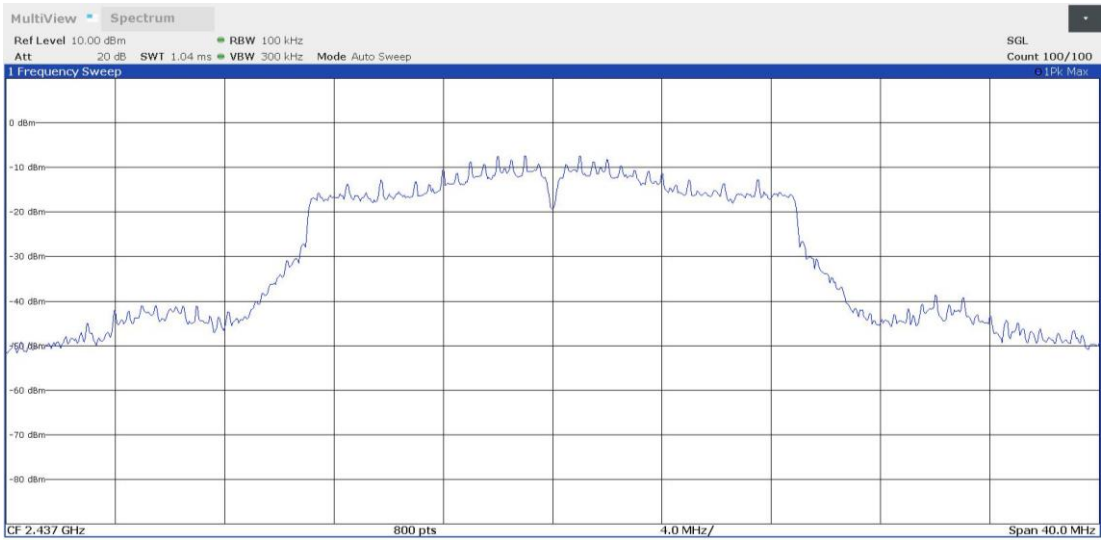




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

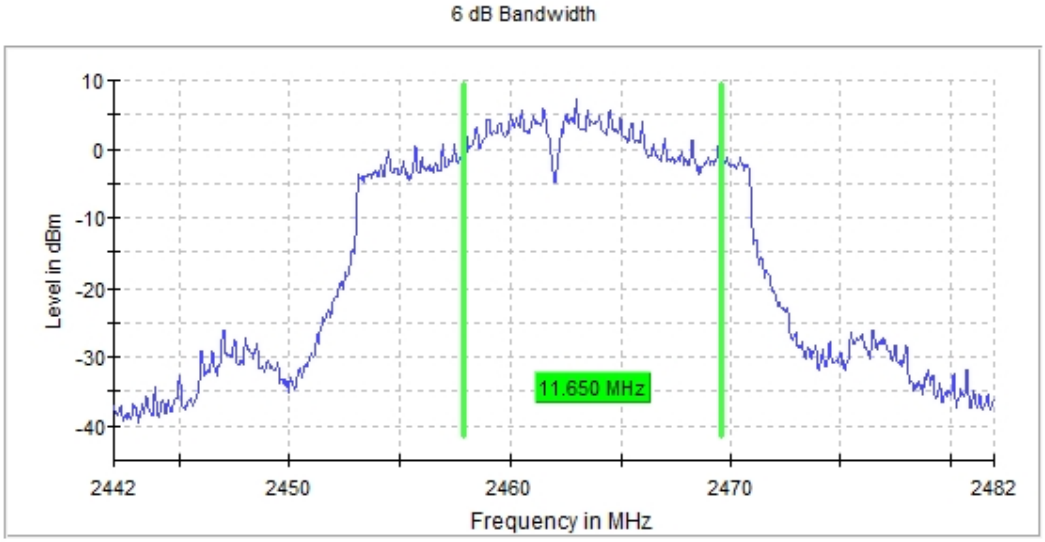
Plots:

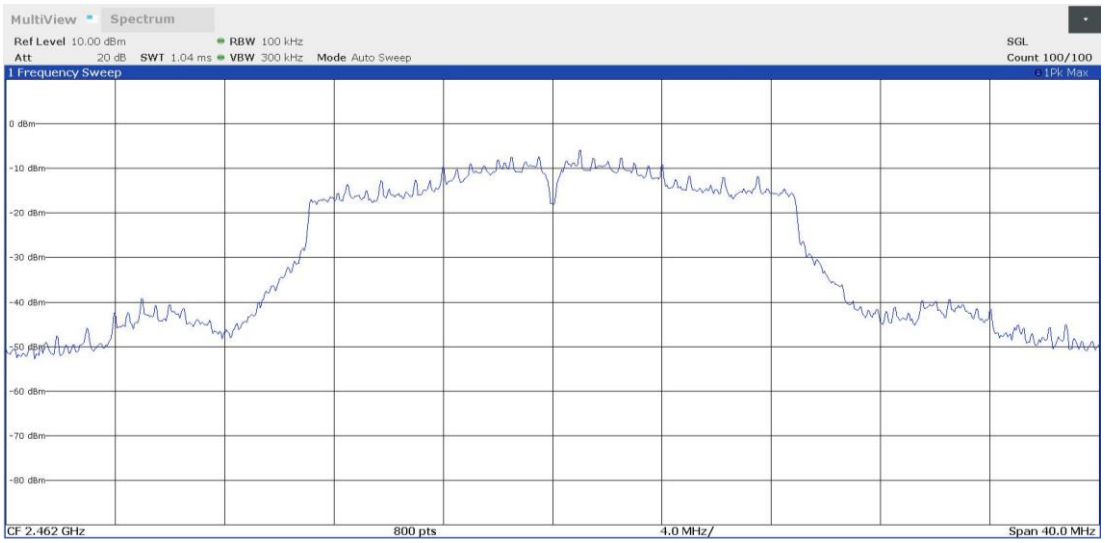




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Plots:





FCC 15.247 (b) / RSS-247 5.4 (d) Maximum Output Power and Antenna Gain

Limits

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (RSS-247).

Results

The maximum peak conducted output power level of the fundamental emission was measured according to clause 11.9.2.3.2 “Method AVGPM-G” of ANSI C63.10-2013.

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

Maximum Declared Antenna Gain: +3 dBi

Modulation: 802.11b (DSSS 1 Mbit/s)

Operation Band (MHz)	Equipment	Avg Power Conducted (dBm)	Maximum EIRP Power (dBm)
2412.00	Digital Transmission System (DTS)	13.60	16.60
2437.00		13.40	16.60
2462.00		14.30	17.30

Modulation: 802.11g (OFDM 6 Mbit/s)

Operation Band (MHz)	Equipment	Avg Power Conducted (dBm)	Maximum EIRP Power (dBm)
2412.00	Digital Transmission System (DTS)	13.80	16.80
2437.00		13.70	16.70
2462.00		14.80	17.80

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

Operation Band (MHz)	Equipment	Avg Power Conducted (dBm)	Maximum EIRP Power (dBm)
2412.00	Digital Transmission System (DTS)	13.30	16.30
2437.00		13.10	16.10
2462.00		14.10	17.10

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.

Results

The maximum power spectral density level of the fundamental emission was measured according to clause 11.10.3 “Method AVGPSD-1” of ANSI C63.10-2013.

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-5.509
2437.00		-5.531
2462.00		-4.519

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-6.485
2437.00		-6.522
2462.00		-5.617

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

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-6.644
2437.00		-7.069
2462.00		-5.823

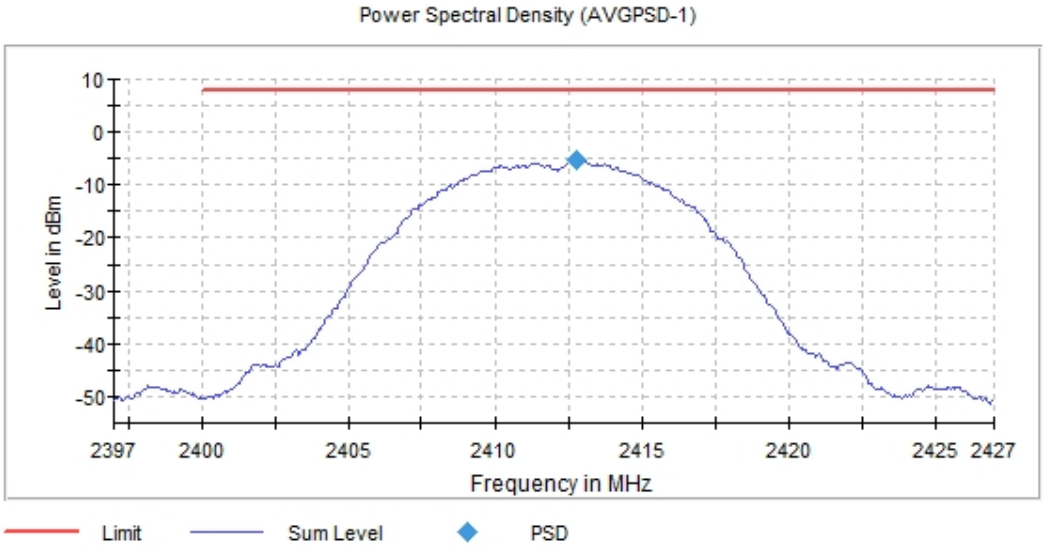
Verdict

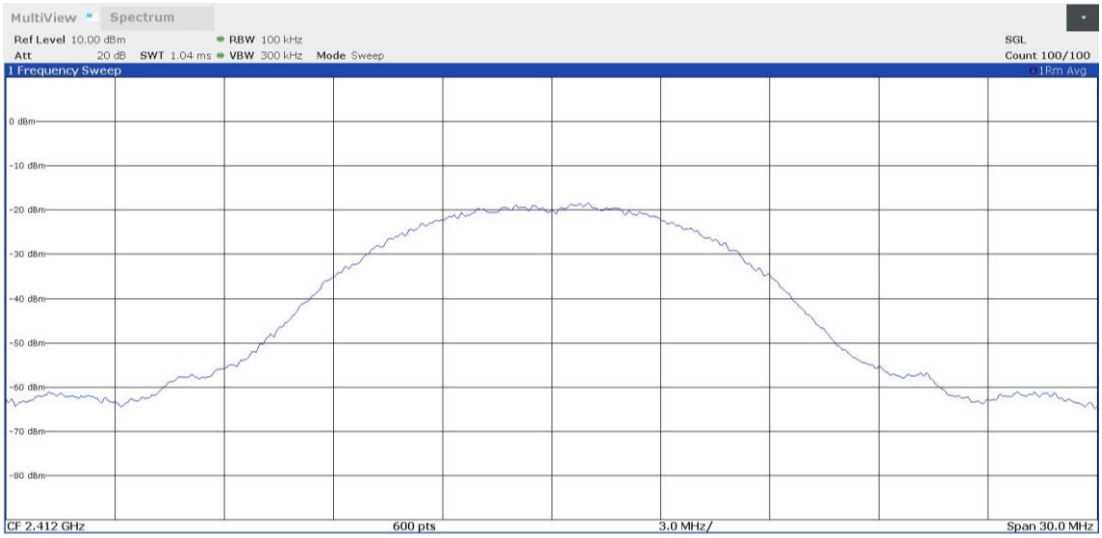
Pass

Attachments

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

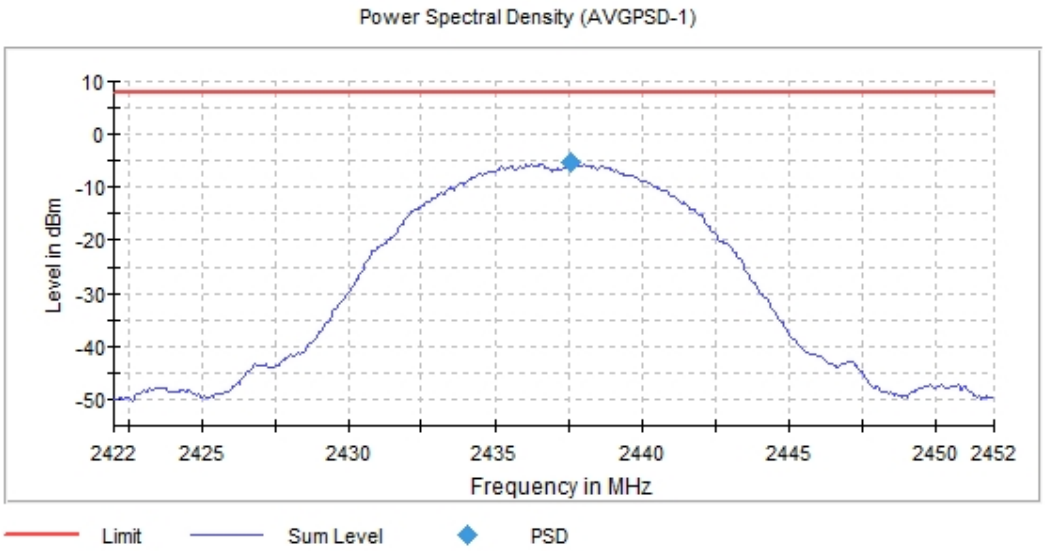
Plots:

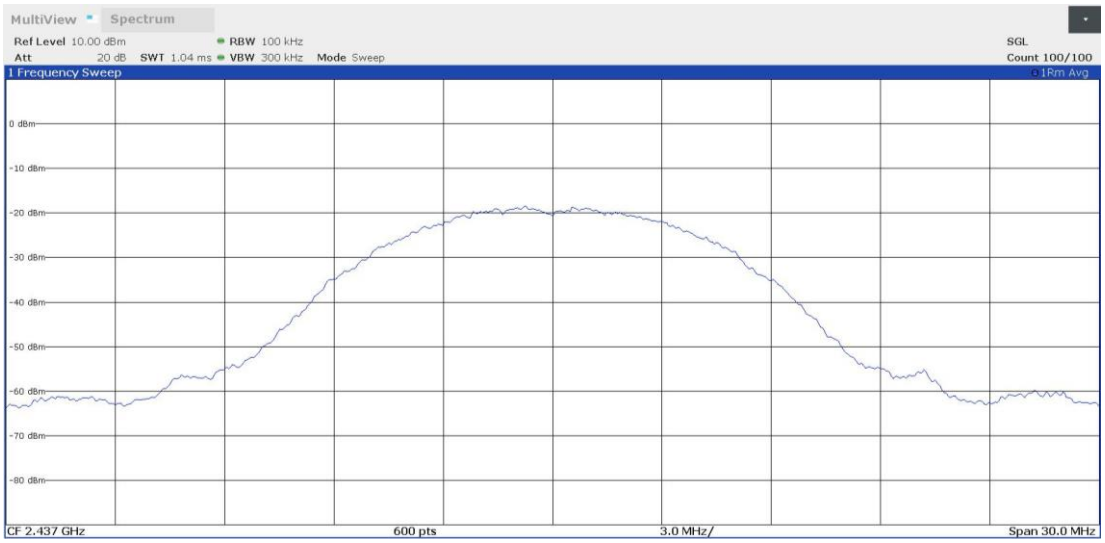




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

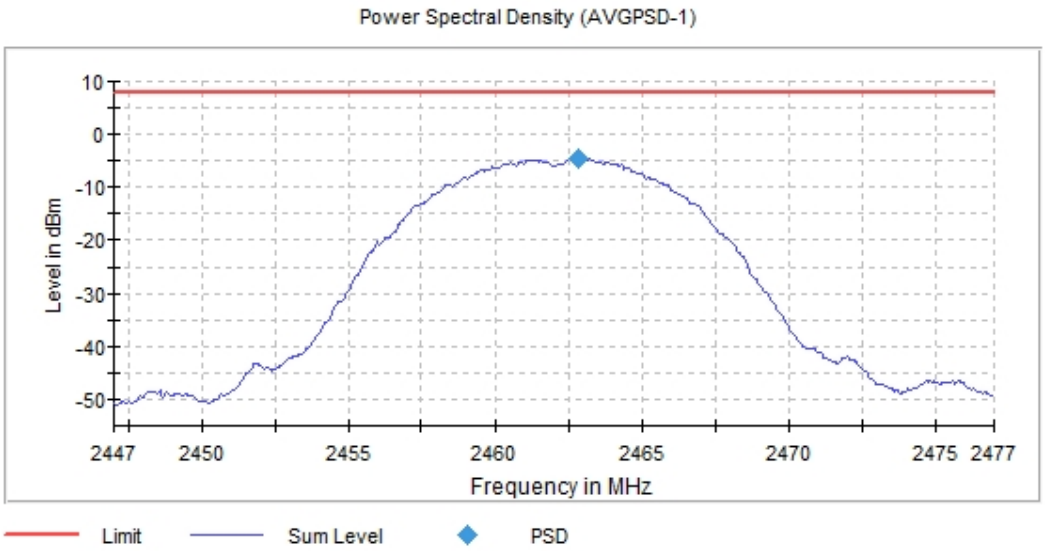
Plots:

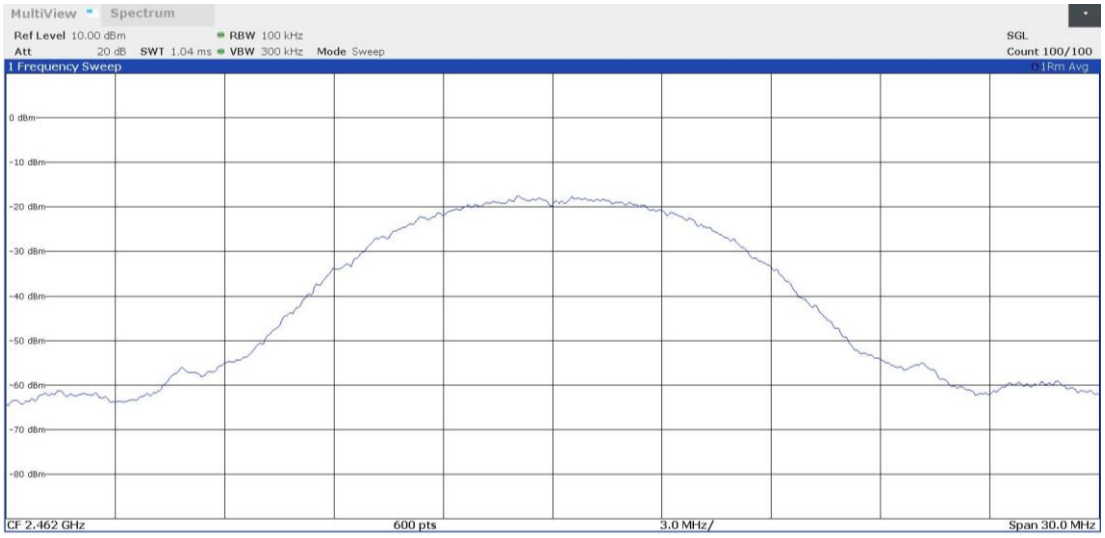




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

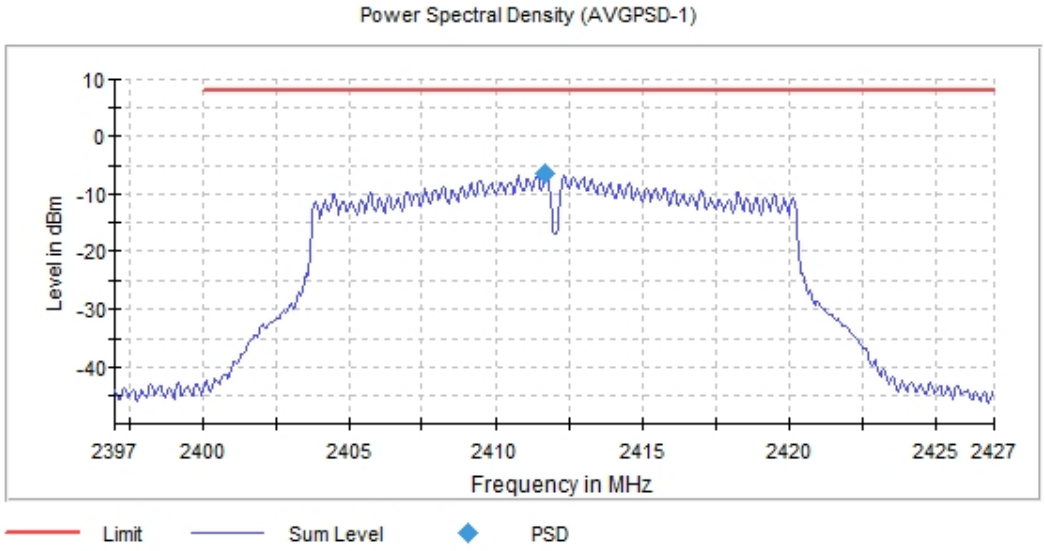
Plots:

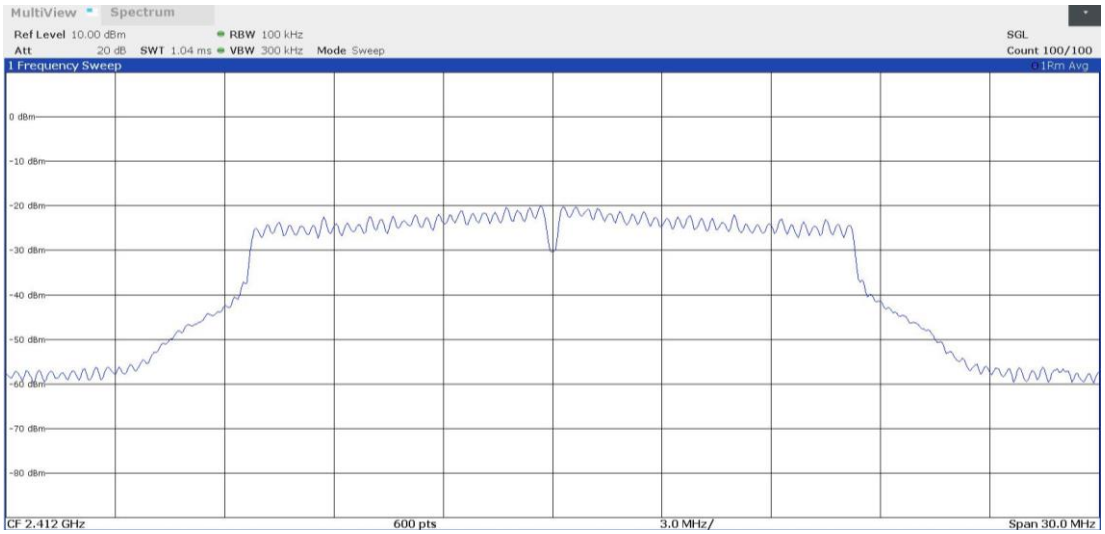




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

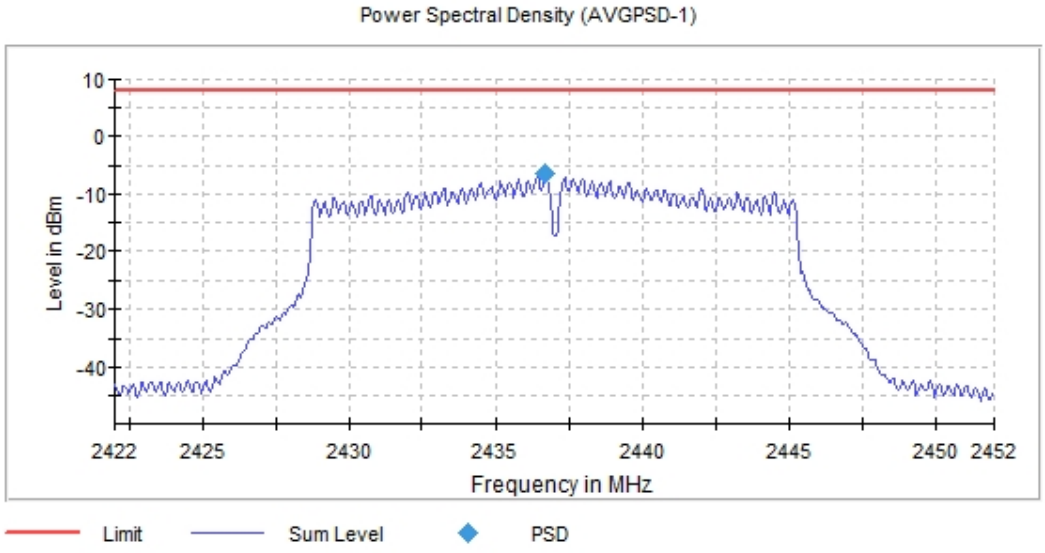
Plots:

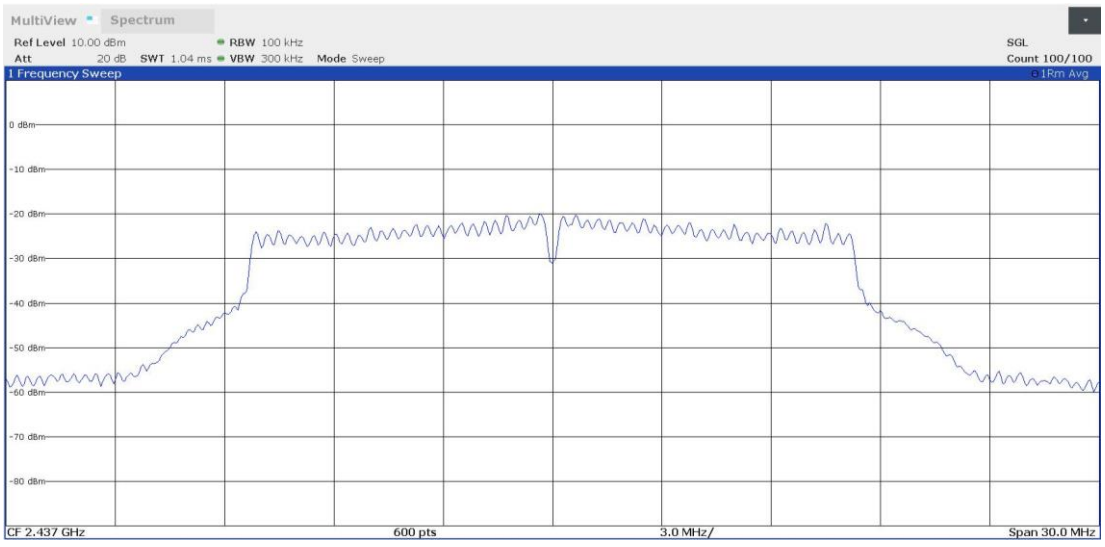




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

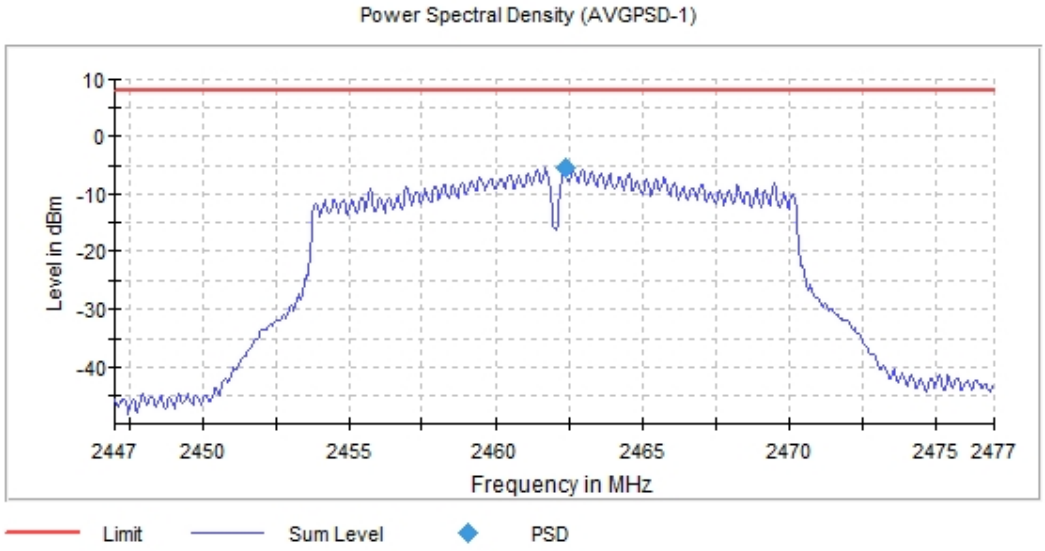
Plots:

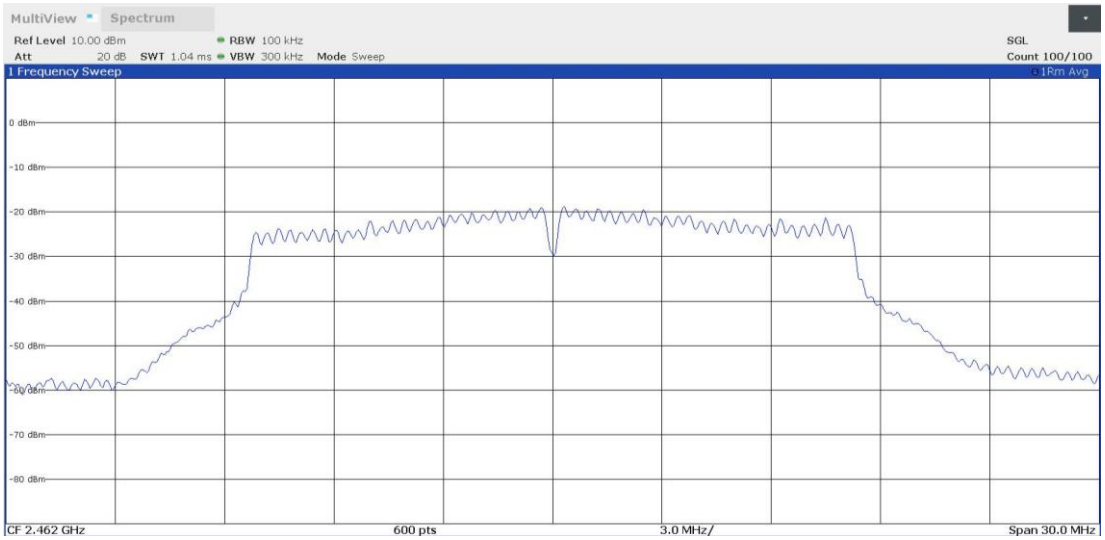




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

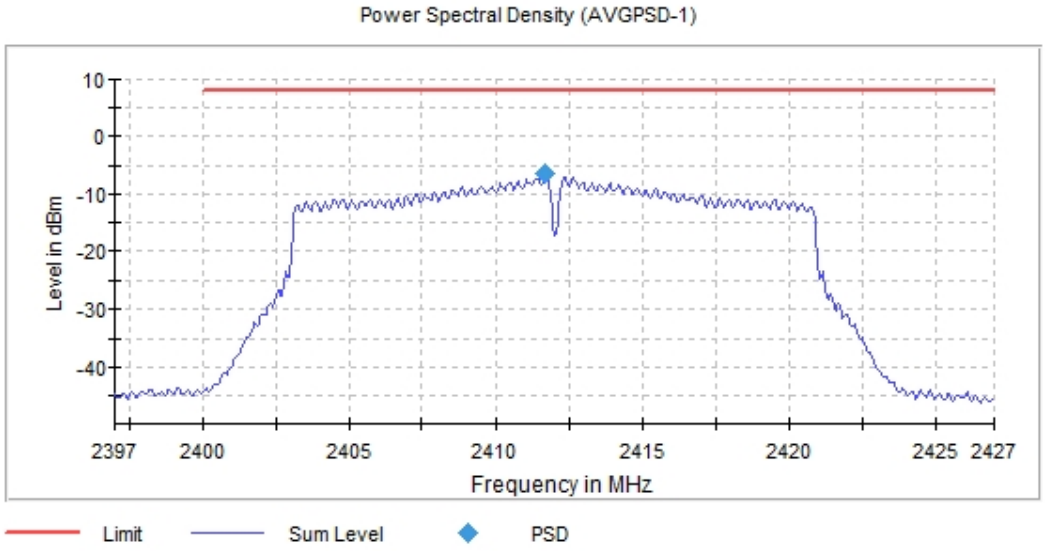
Plots:

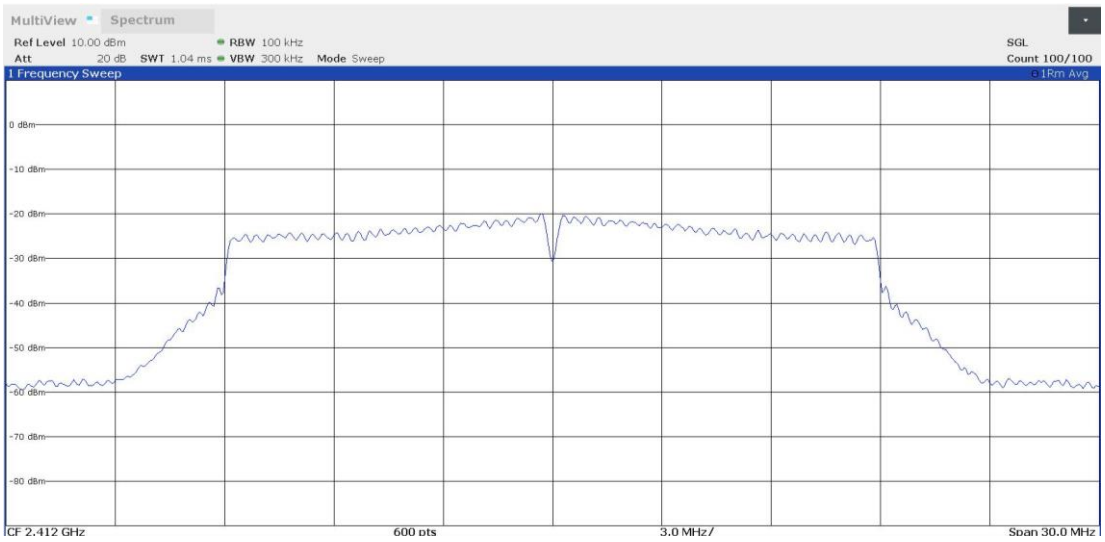




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

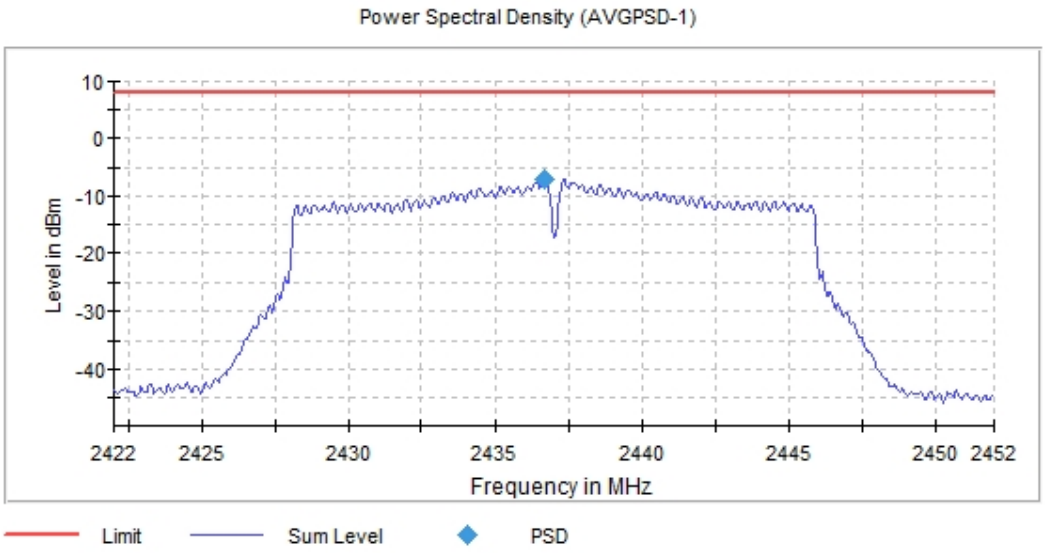
Plots:

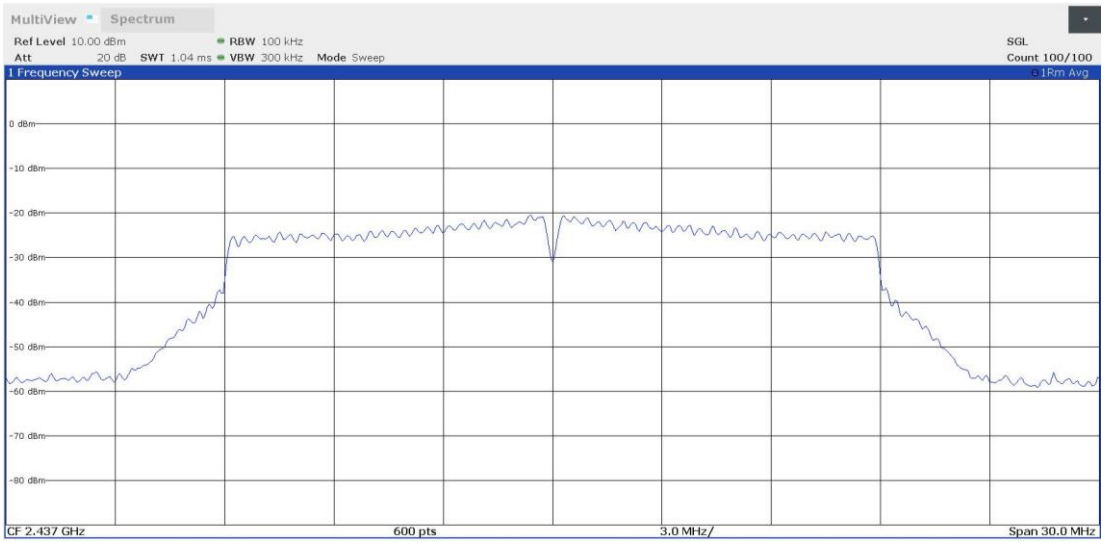




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

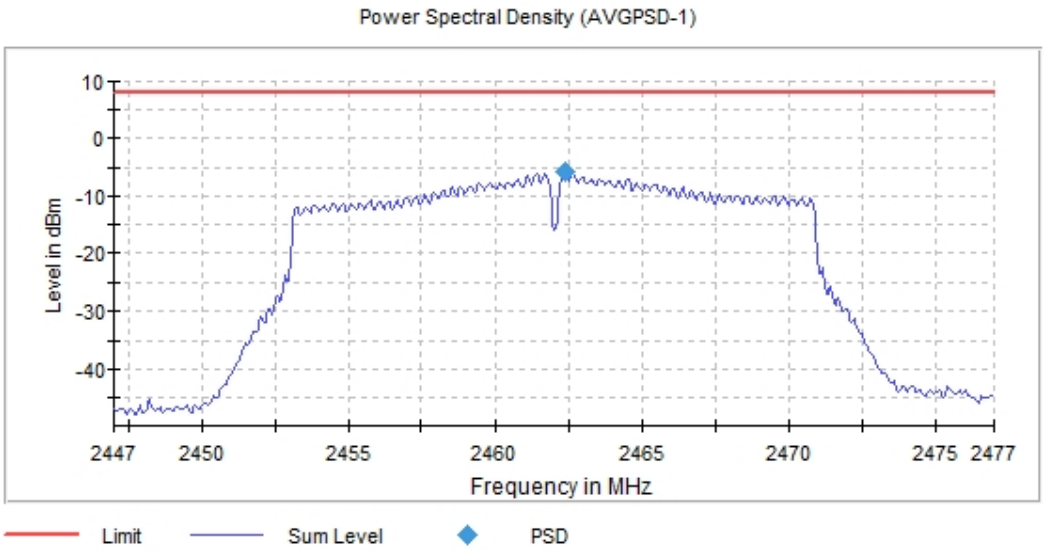
Plots:

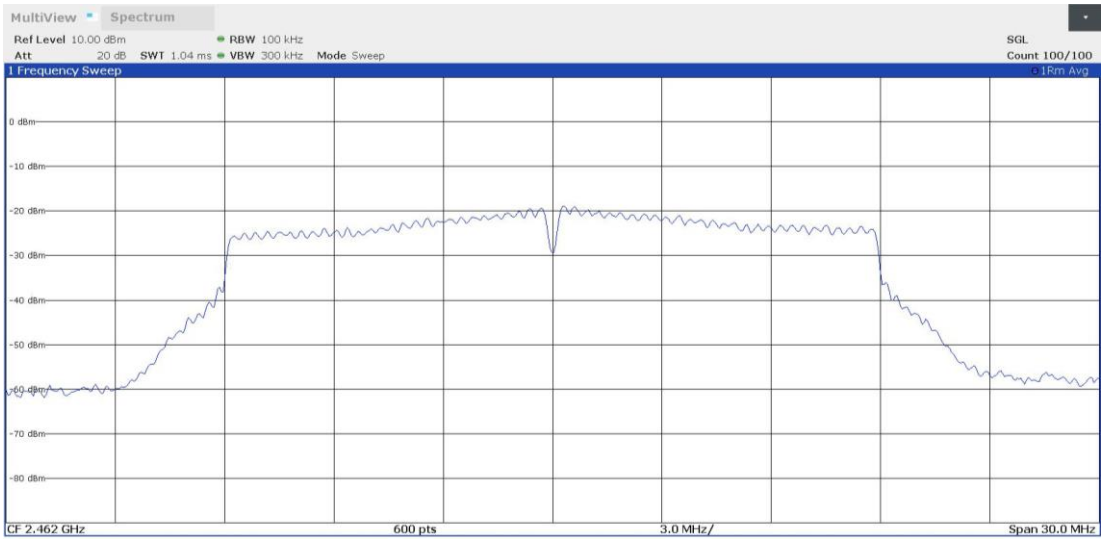




Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Plots:





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.

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.

Modulation: 802.11b (DSSS 1 Mbit/s)

Verdict

Pass

Modulation: 802.11g (OFDM 6 Mbit/s)

Verdict

Pass

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

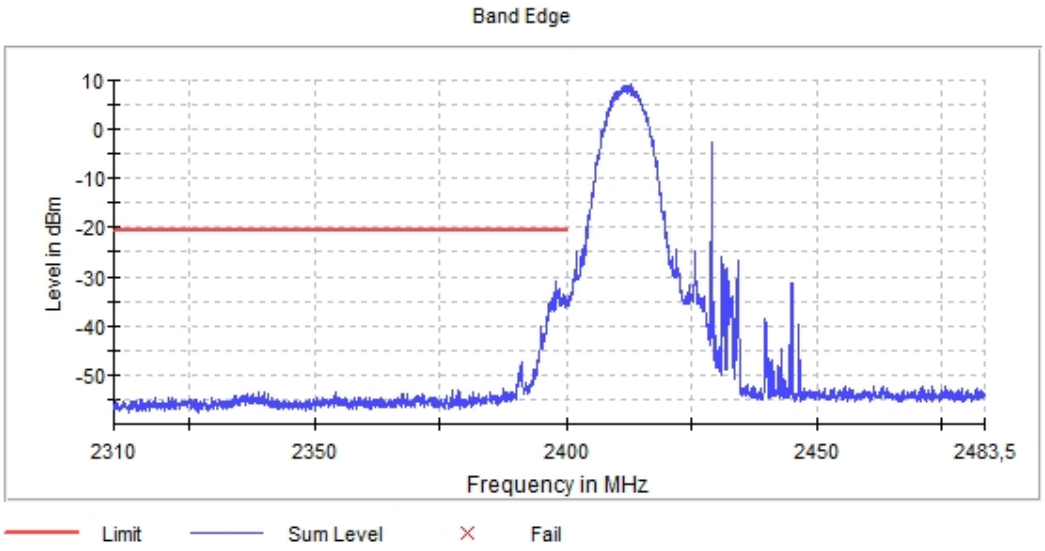
Verdict

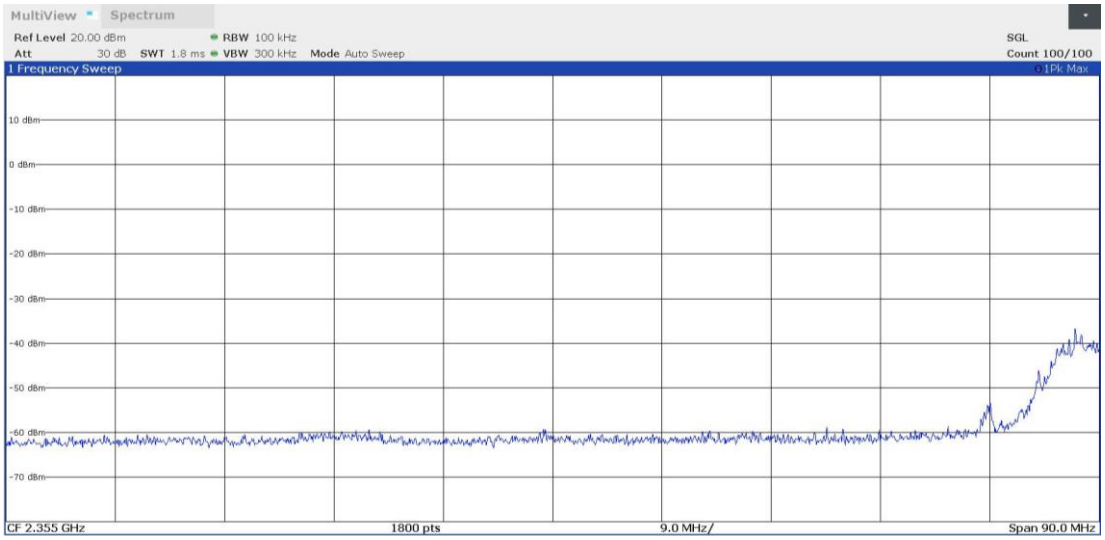
Pass

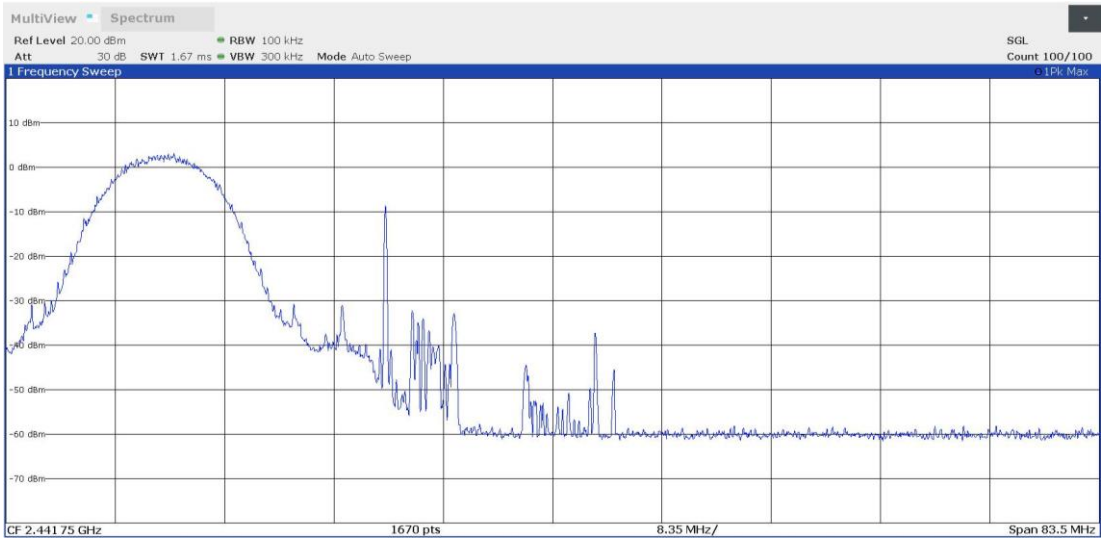
Attachments

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

Plots:

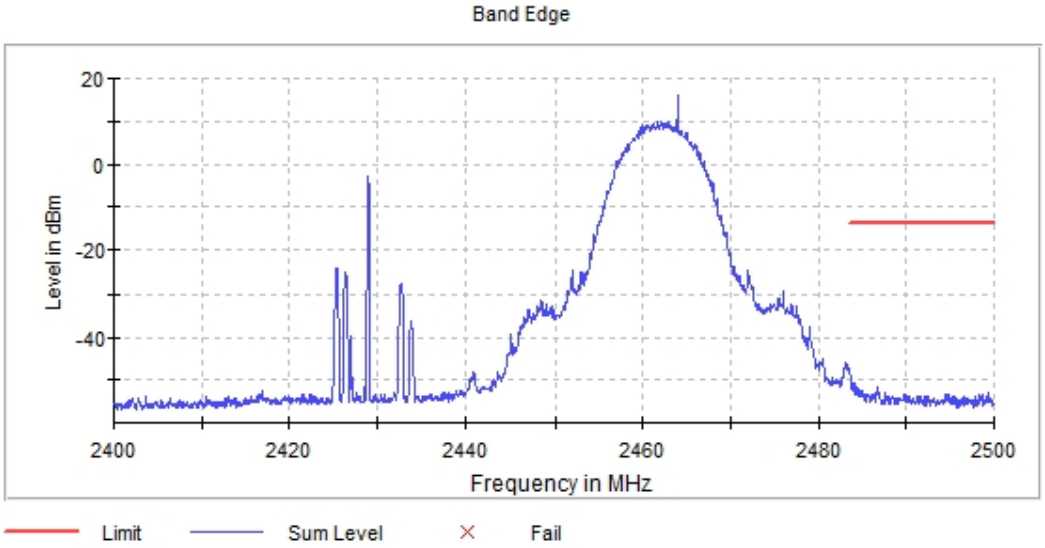


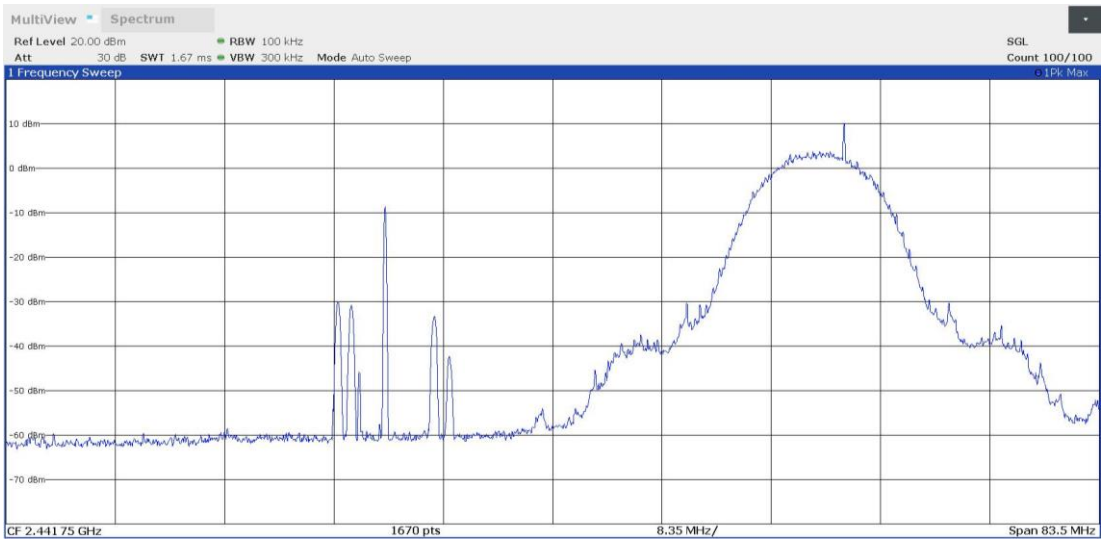


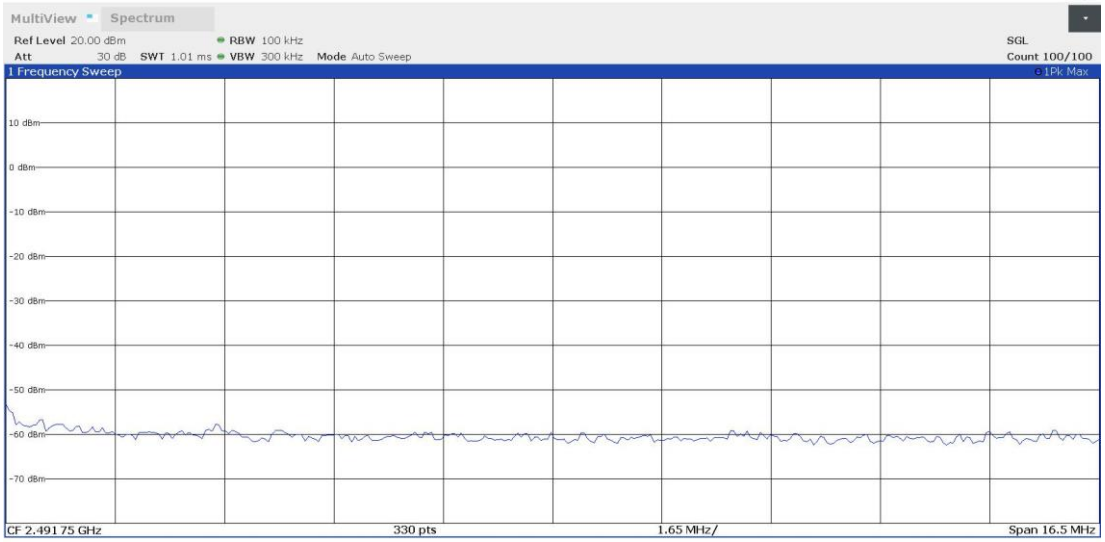

MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.67 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 75 GHz
1670 pts
8.35 MHz/
Span 83.5 MHz

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s)

Plots:

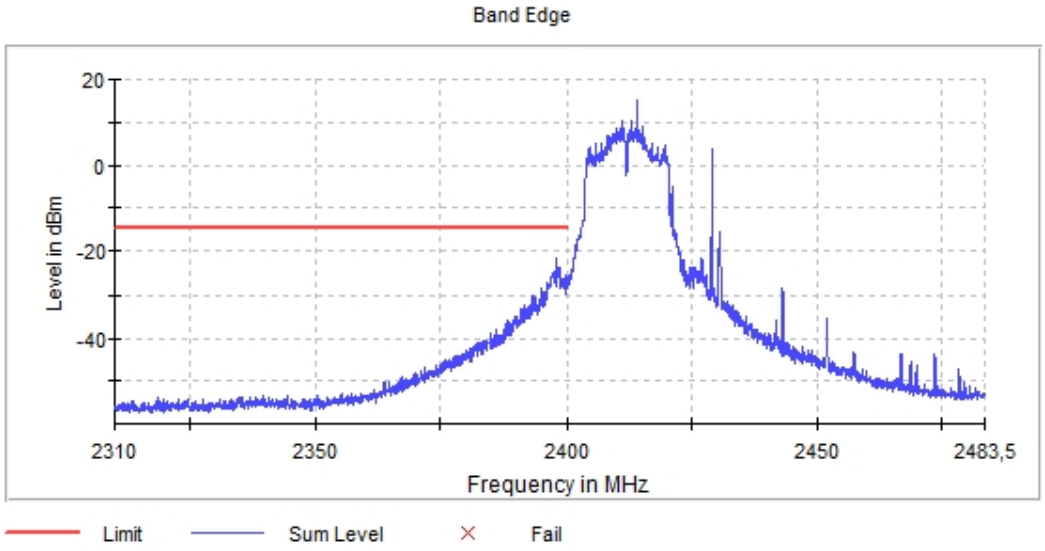


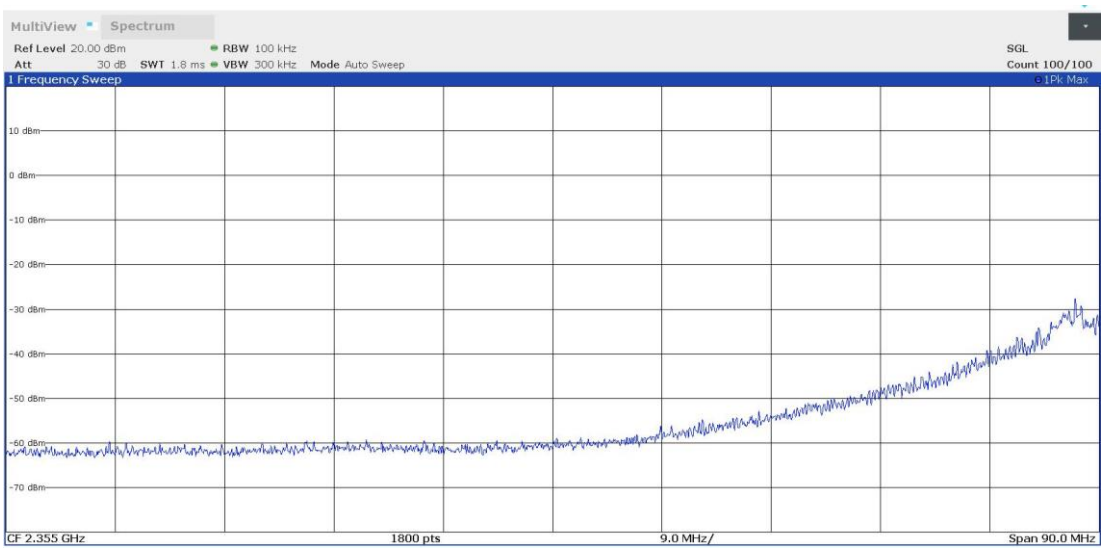


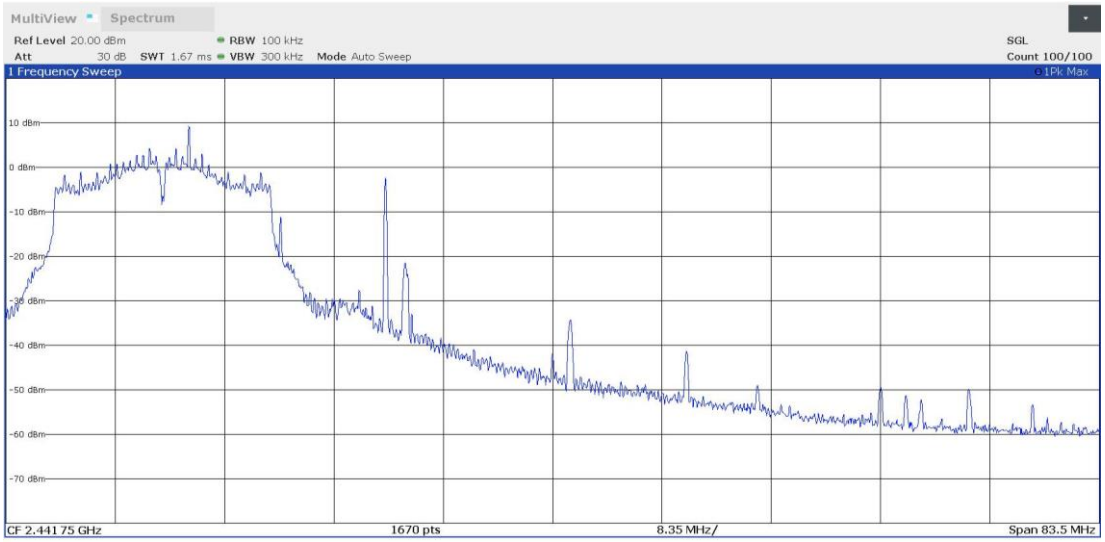

MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.01 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.491 75 GHz
330 pts
1.65 MHz/
Span 16.5 MHz

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

Plots:

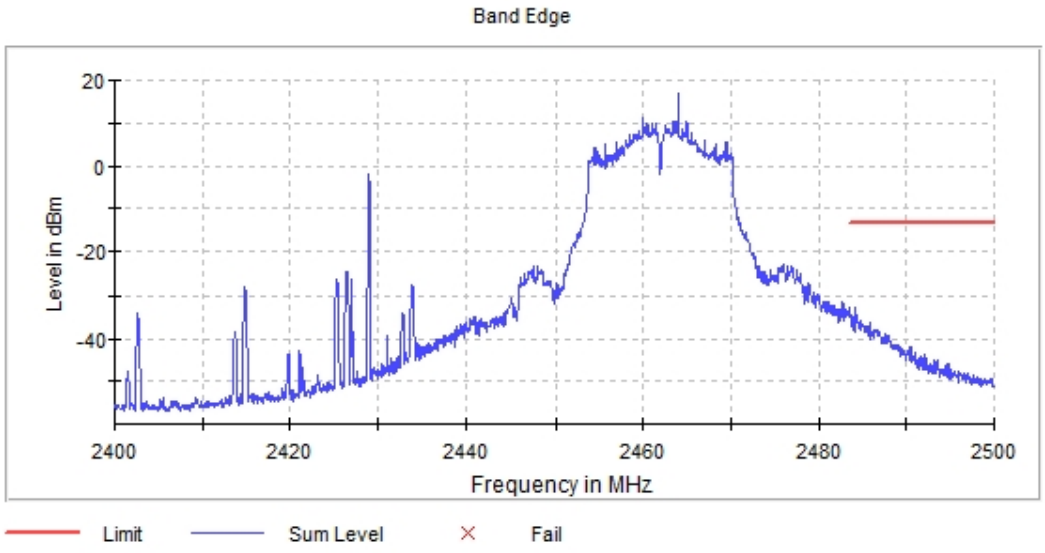


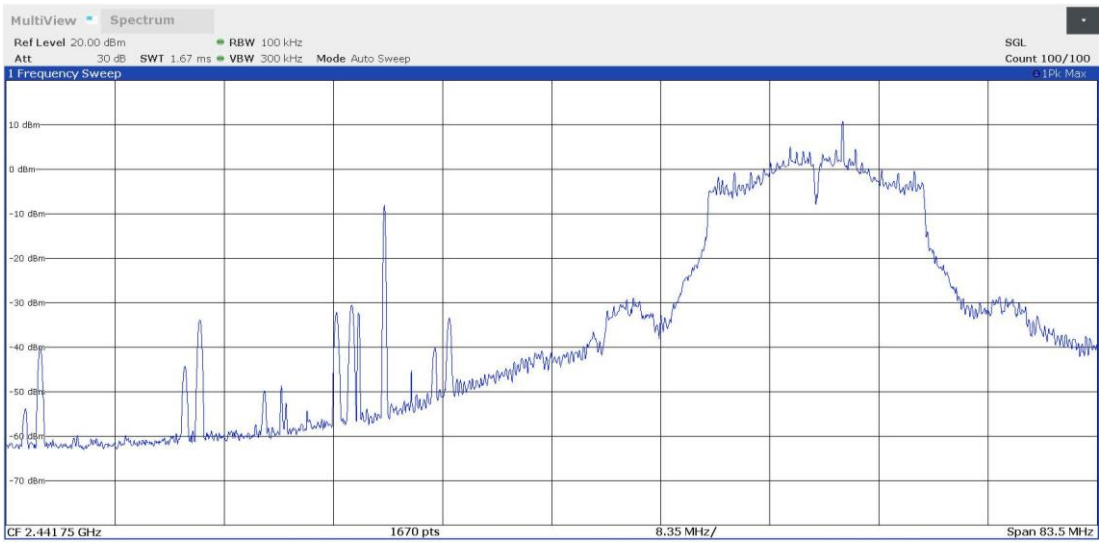


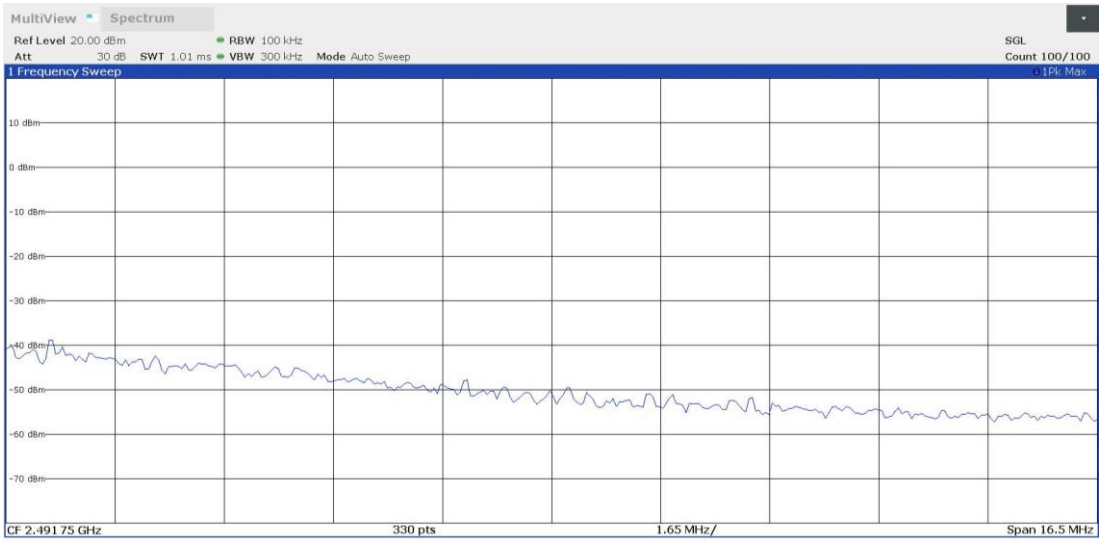

MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.67 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 75 GHz
1670 pts
8.35 MHz/
Span 83.5 MHz

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s)

Plots:

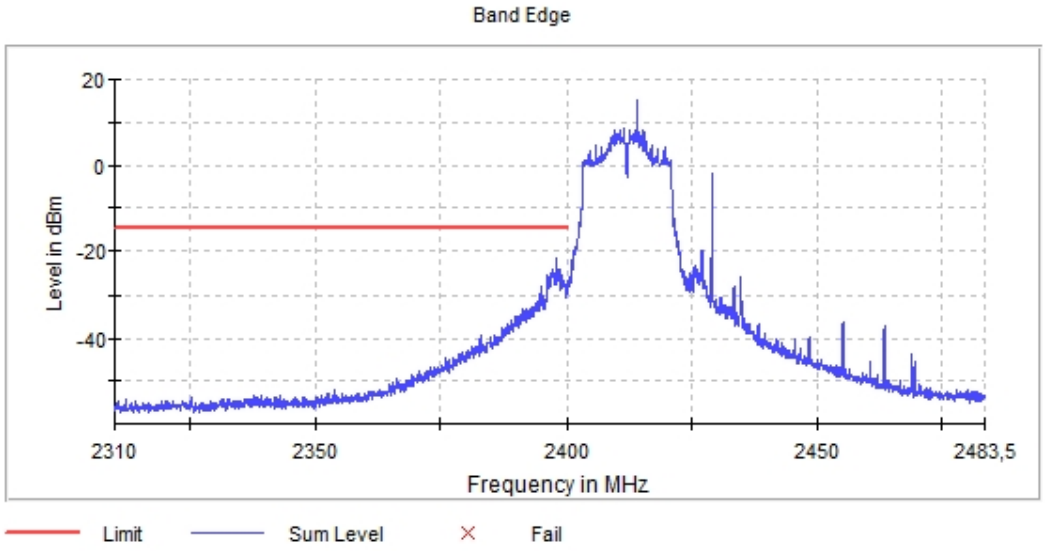


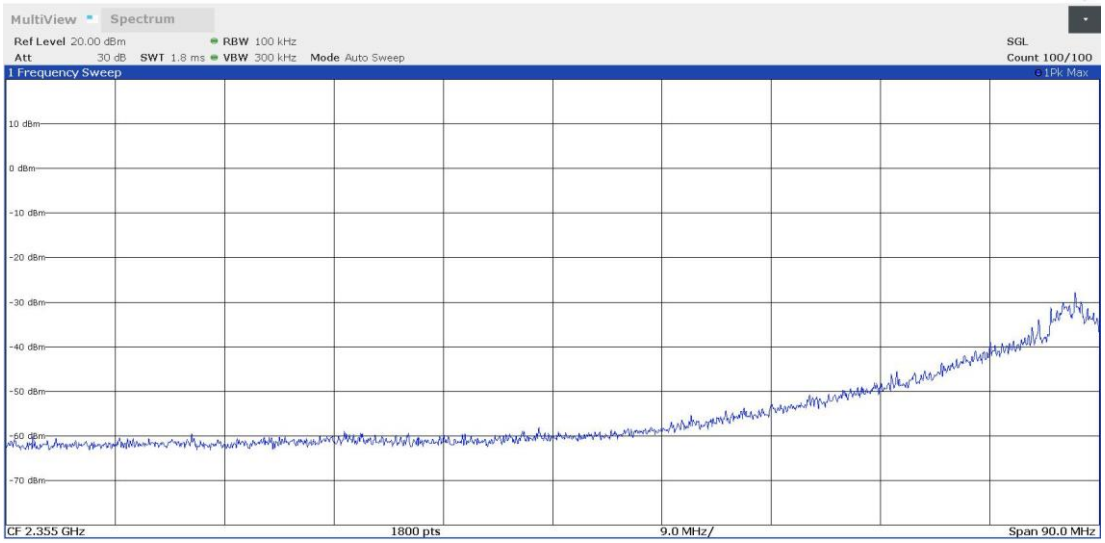


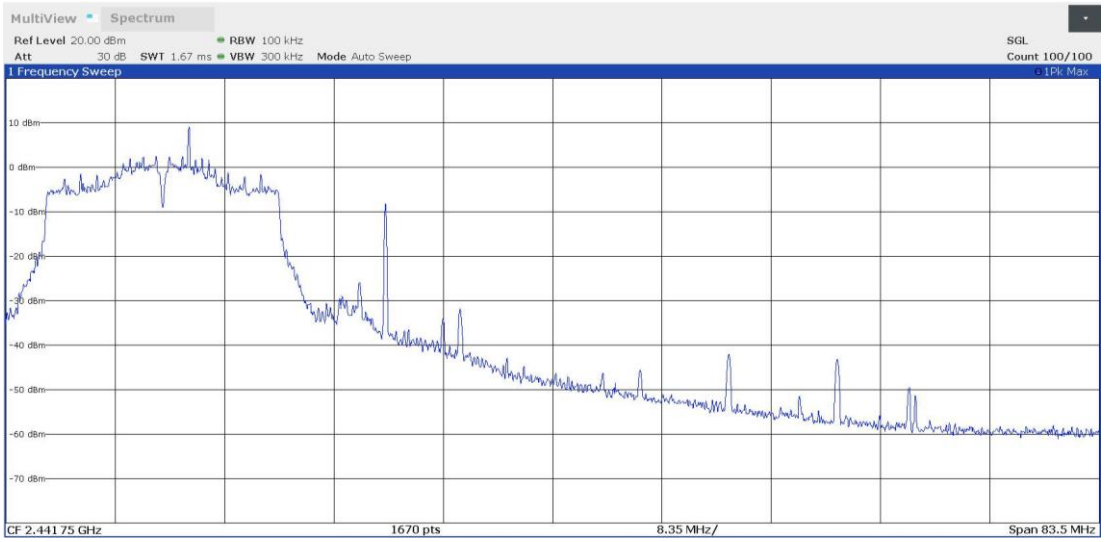

MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.01 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.491 75 GHz
330 pts
1.65 MHz/
Span 16.5 MHz

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Plots:

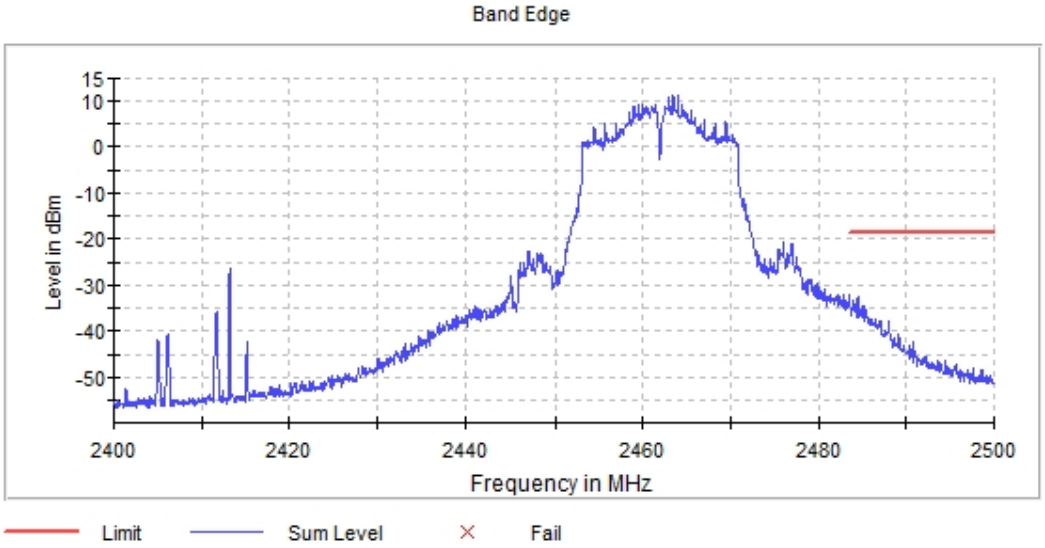


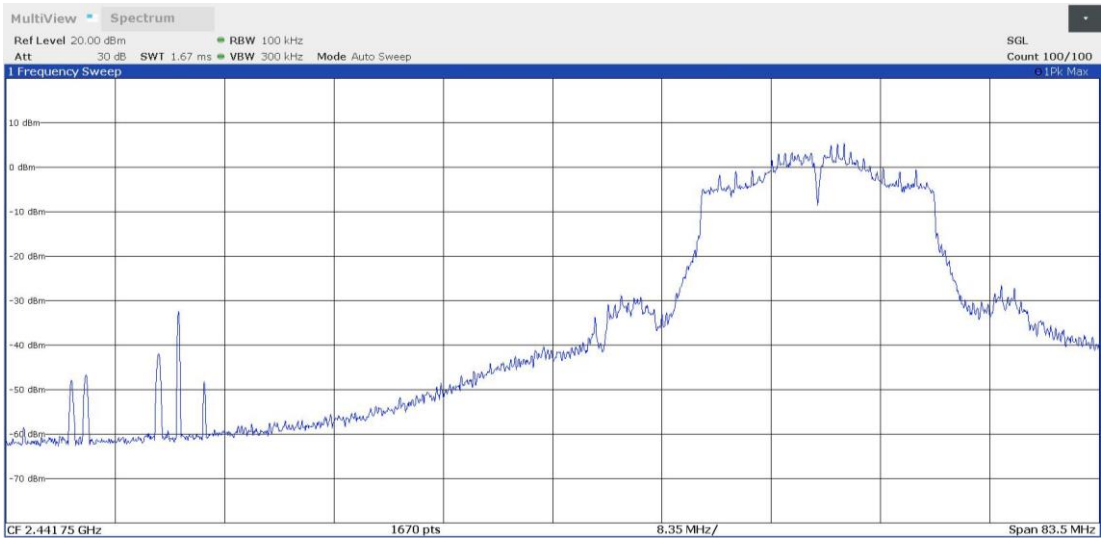


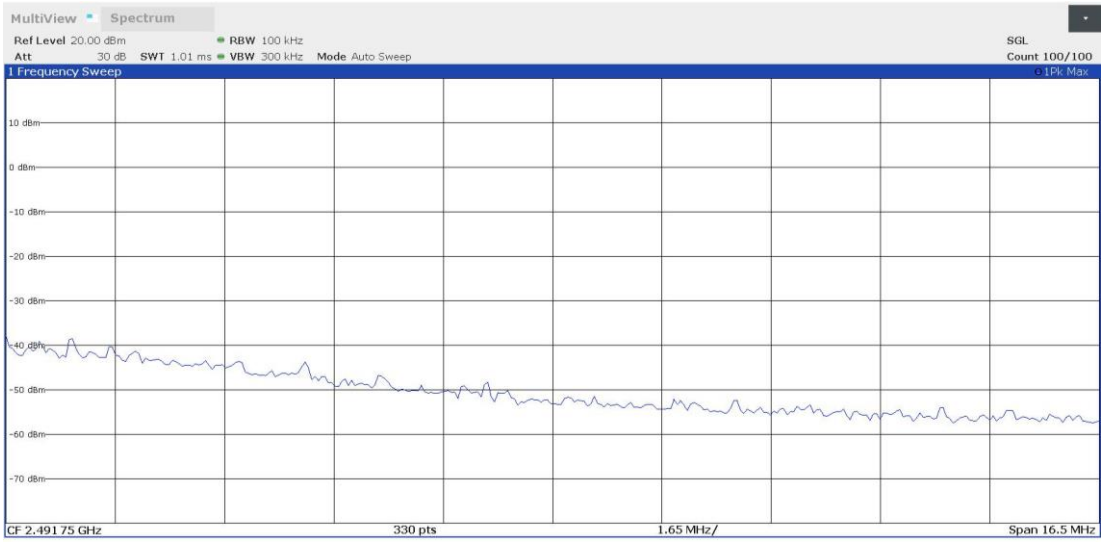

MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.67 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 75 GHz
1670 pts
8.35 MHz/
Span 83.5 MHz

Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Plots:






MultiView
Spectrum
Ref Level 20.00 dBm
RBW 100 kHz
SGL
Att 30 dB
SWT 1.01 ms
VBW 300 kHz
Mode Auto Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.491 75 GHz
330 pts
1.65 MHz/
Span 16.5 MHz

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

Limits

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

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	-	300
0.490 – 1.705	24000/F(kHz)	-	30
1.705 – 30	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 specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.

RSS-247:

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

Results

Modulation: 802.11b (DSSS 1 Mbit/s)

Frequency range 30 MHz – 1 GHz:

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

Spurious frequencies detected at less than 20 dB below the limit:

Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	52.5525	25.29	V	QP
	84.8535	24.08	V	QP
	112.4500	30.13	V	QP
	127.4850	33.88	H	QP
	166.1395	36.46	H	QP
	249.9960	36.38	V	QP

Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	277.4955	40.39	V	QP
	302.5215	39.96	V	QP
	307.4685	37.75	V	QP
	424.9840	39.31	V	QP
	500.0135	39.81	V	QP
	720.0580	35.00	V	QP

Frequency range 1 GHz – 26 GHz:

The results in the next tables show the maximum measured levels in the 1 – 26 GHz range including the restricted bands 2.31 – 2.39 GHz and 2.4835 – 2.5 GHz.

Spurious frequencies with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for compliance checking with the average limit.

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[3, 17]	2412.00	7237.5000 (*)	53.50	H	PK
	2437.00	7312.5000	53.35	H	PK
	2462.00	7387.0000	51.94	H	PK

(*) This Spurious Frequency is outside the restricted bands as defined in §15.205(a). The peak spurious level is more than 20 dB below the peak carrier level.

Modulation: 802.11g (OFDM 6 Mbit/s)

Frequency range 30 MHz – 1 GHz:

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

Spurious frequencies detected at less than 20 dB below the limit:

Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	166.1395	36.14	H	QP
	272.5000	40.67	V	QP
	277.4470	39.78	V	QP
	307.5170	40.19	V	QP
	312.5125	40.03	V	QP
	500.0135	39.49	V	QP

Frequency range 1 GHz – 26 GHz:

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[1, 3]	2412.00	2389.0000	62.10	V	PK
			49.97		AVG
[3, 17]	2412.00	7251.5000	52.63	V	PK
	2437.00	7312.0000	53.93	V	PK
	2462.00	7385.5000	51.06	V	PK

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

Frequency range 30 MHz – 1 GHz:

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

Spurious frequencies detected at less than 20 dB below the limit:

Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	55.9960	30.49	V	QP
	82.4770	28.27	V	QP
	112.4500	29.15	V	QP
	166.0910	36.06	H	QP
	207.5100	39.66	H	QP
	217.5010	42.10	H	QP
	232.4875	38.52	H	QP
	272.5000	43.66	V	QP
	277.4470	38.80	V	QP
	302.5215	41.77	V	QP
	307.4685	39.34	V	QP
	425.0325	39.46	V	QP
	500.0620	39.38	V	QP
	624.9980	36.26	H	QP
	875.0155	40.47	H	QP

Frequency range 1 GHz – 26 GHz:

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[3, 17]	2412.00	7237.0000 (*)	52.30	V	PK
	2437.00	7312.0000	46.79	H	PK
	2462.00	7385.0000	49.30	H	PK

(*) This Spurious Frequency is outside the restricted bands as defined in §15.205(a). The peak spurious level is more than 20 dB below the peak carrier level.

Attachments

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

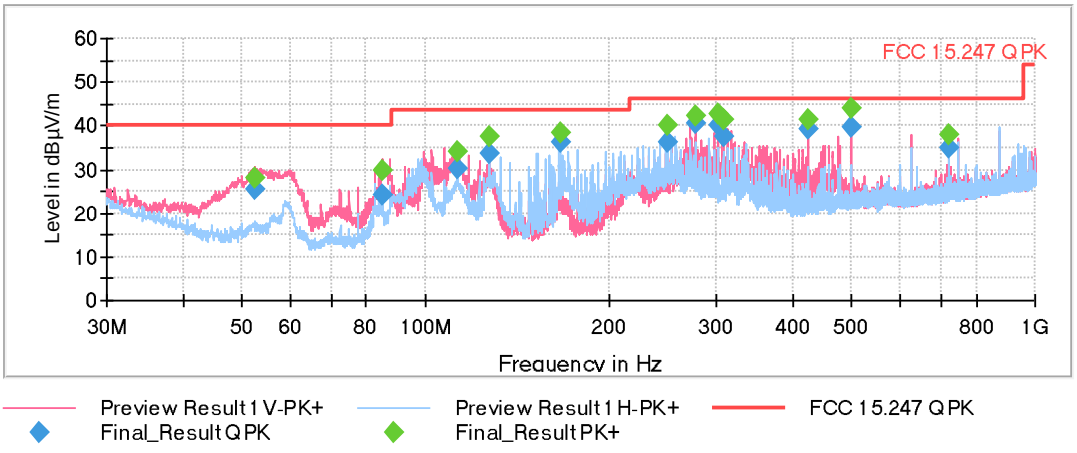
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	30 dB

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
1 GHz - 3 GHz	66,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

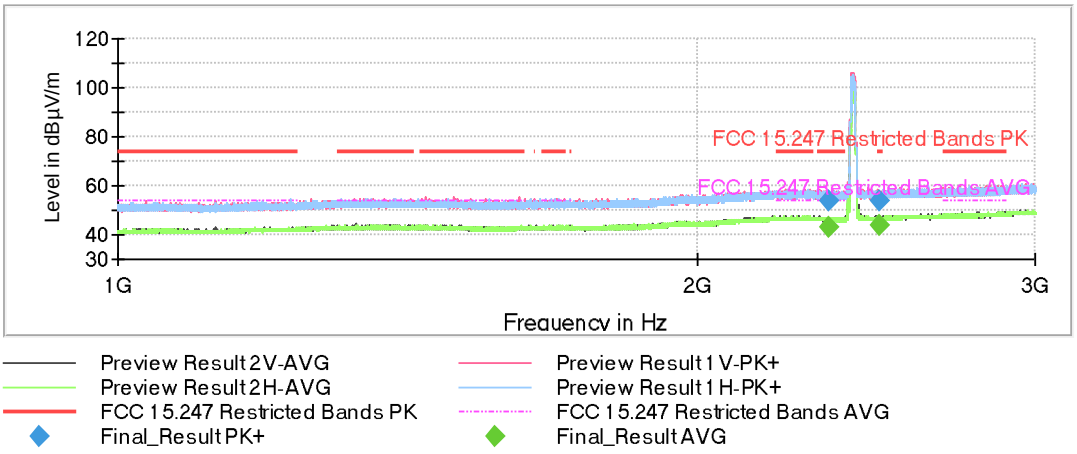
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
17 GHz - 26 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band (MHz) = [2400, 2483.5], Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [0.03, 1]

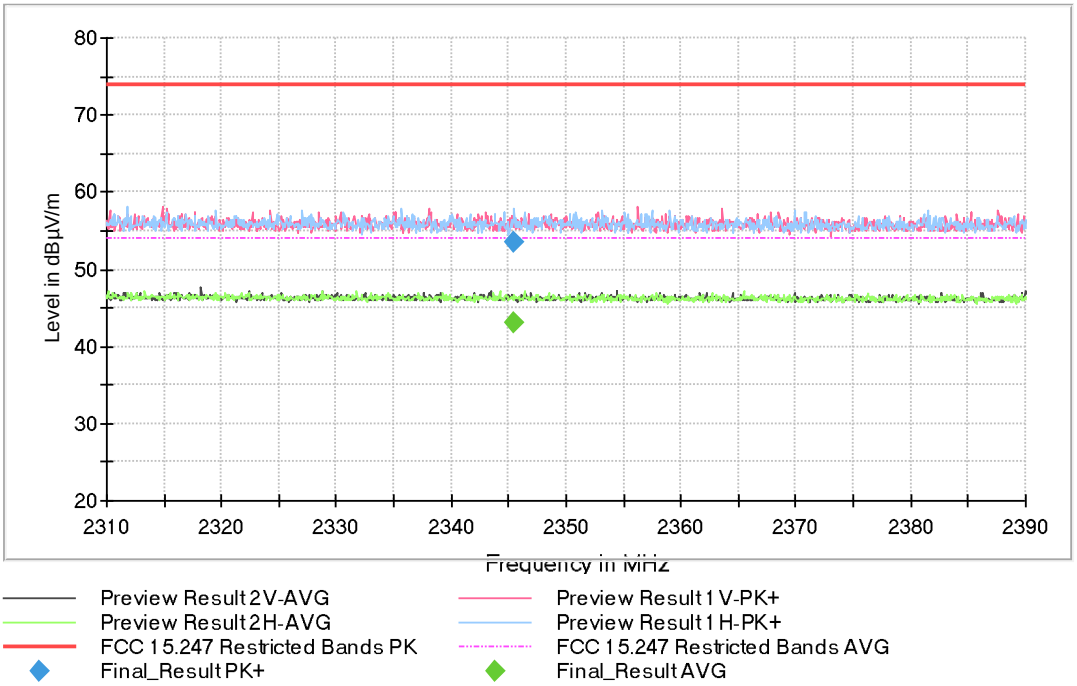


This plot is valid for Low, Middle and High Channels.

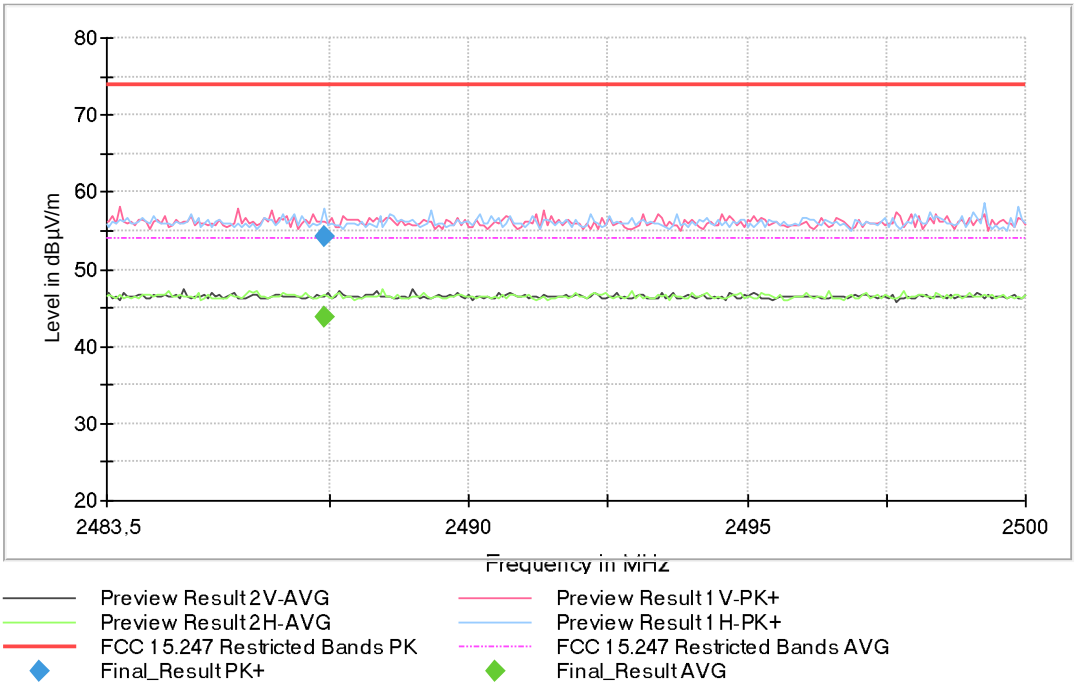
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [1, 3]



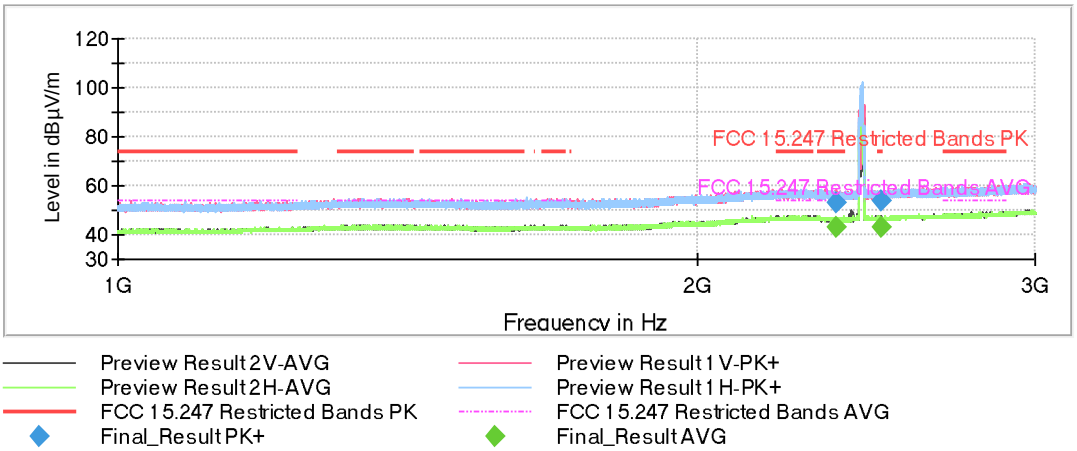
Full Spectrum



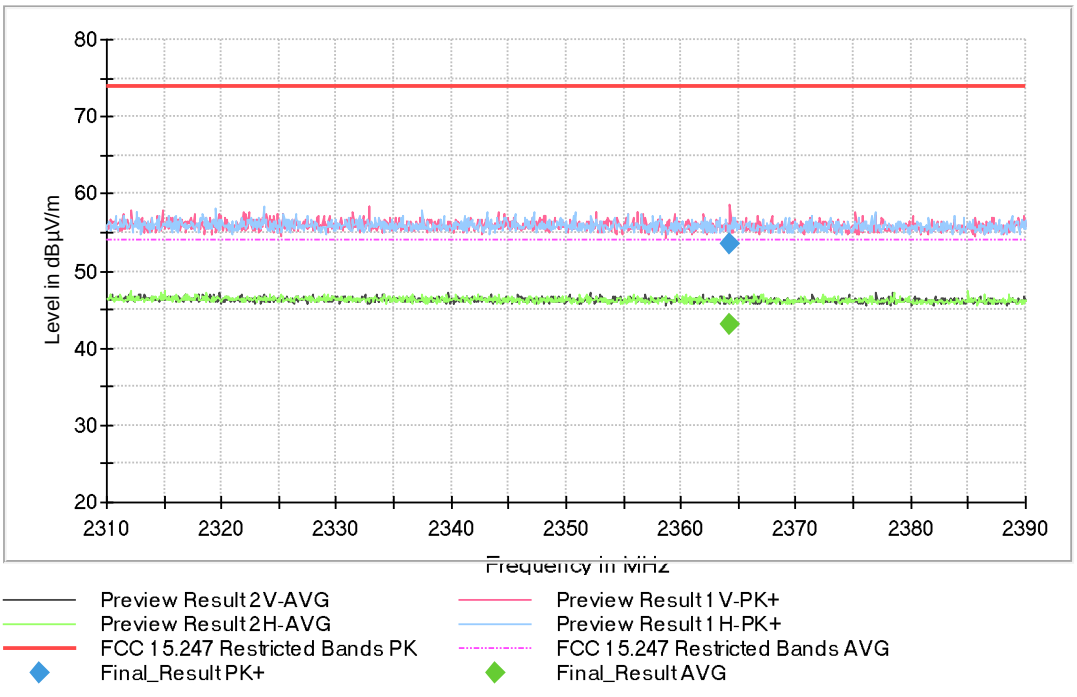
Full Spectrum



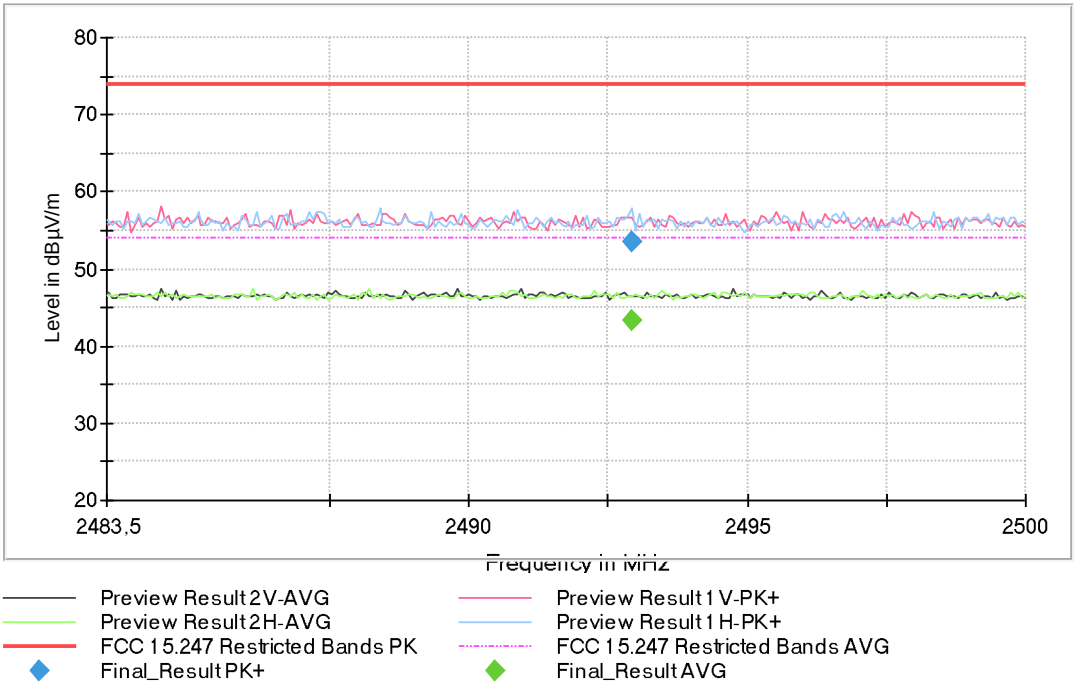
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [1, 3]



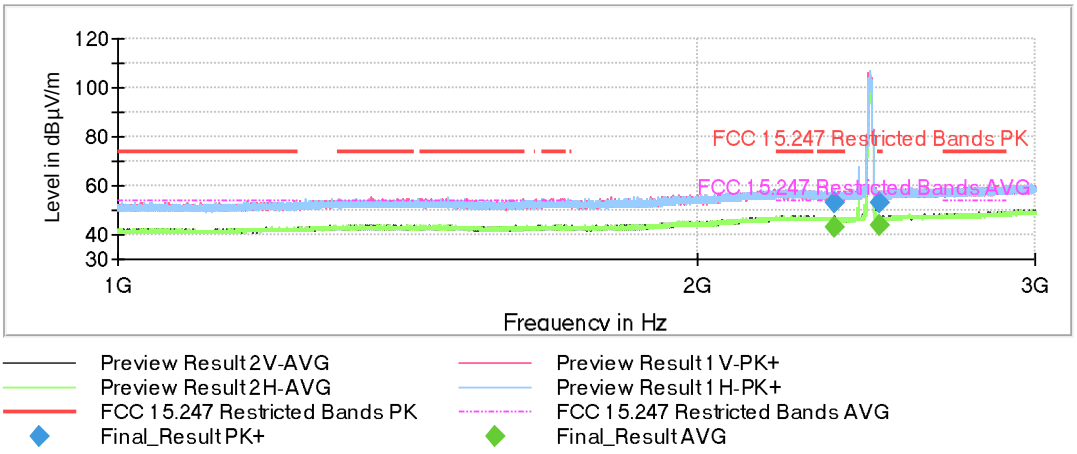
Full Spectrum



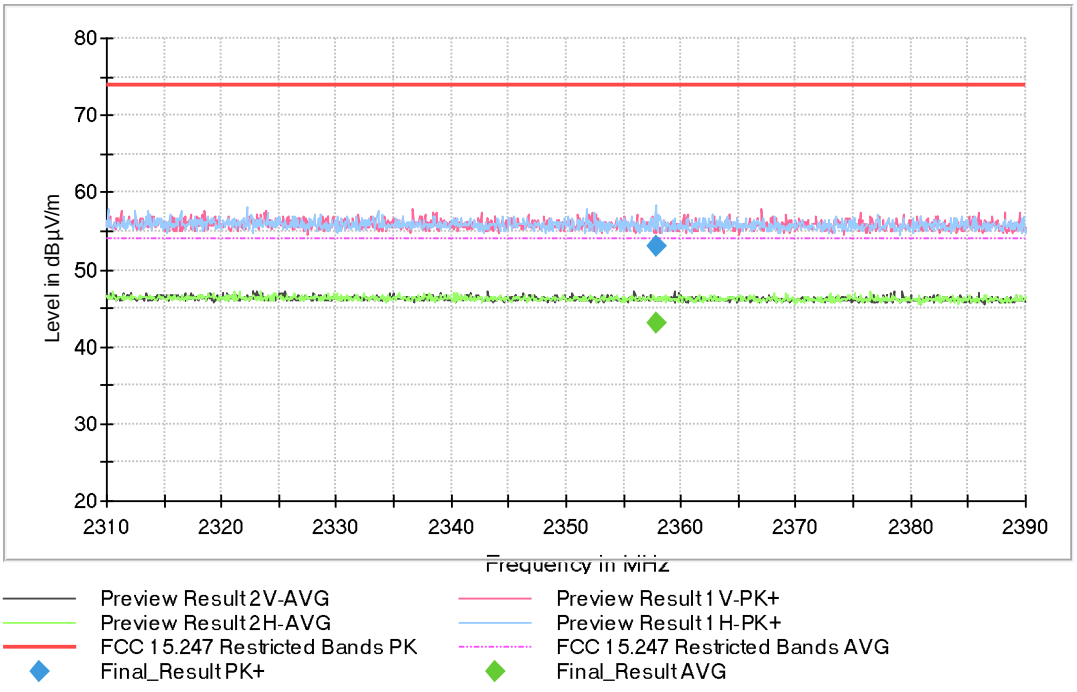
Full Spectrum



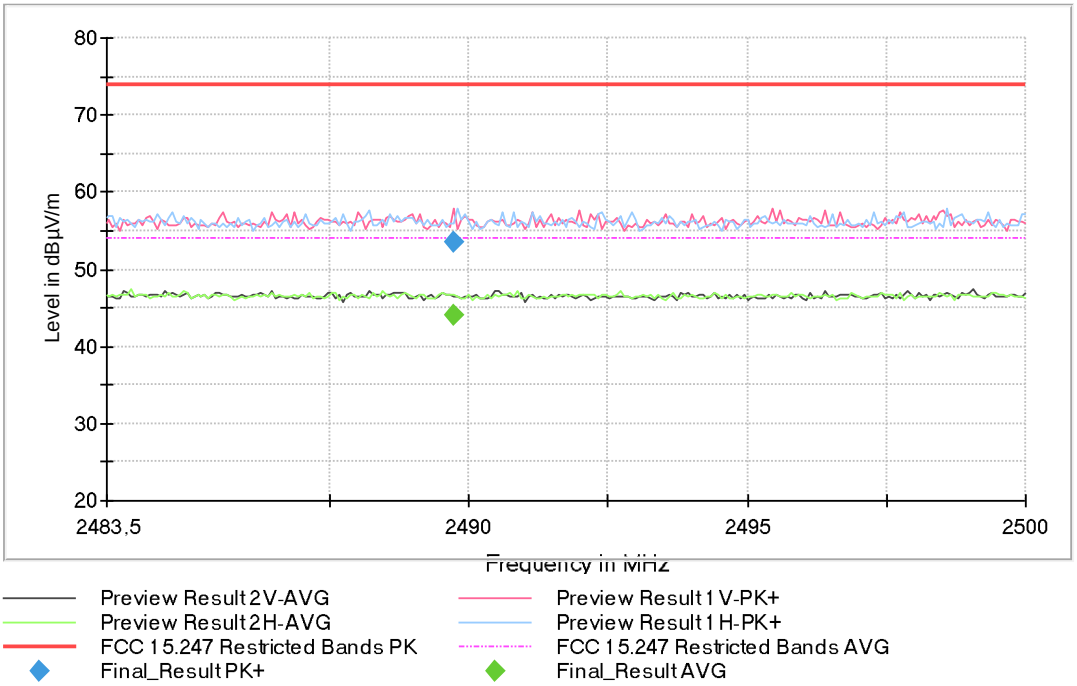
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [1, 3]



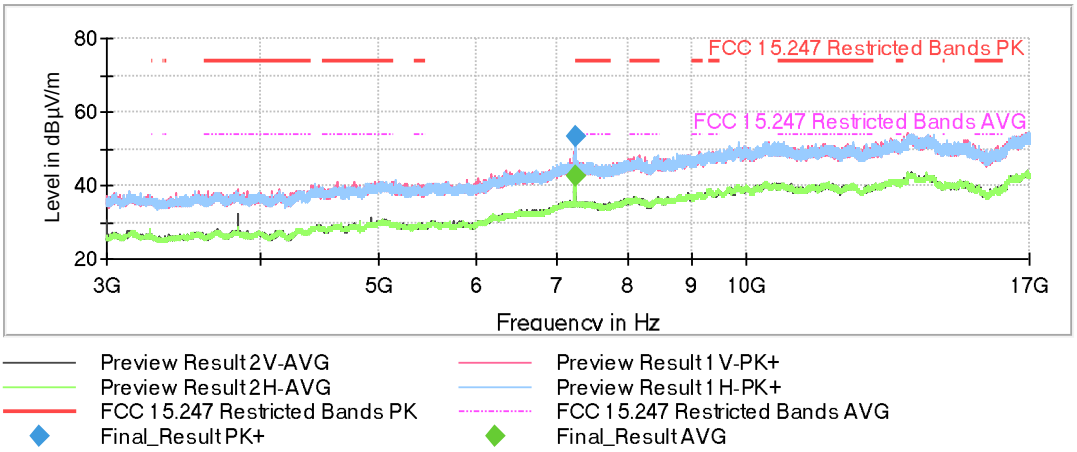
Full Spectrum



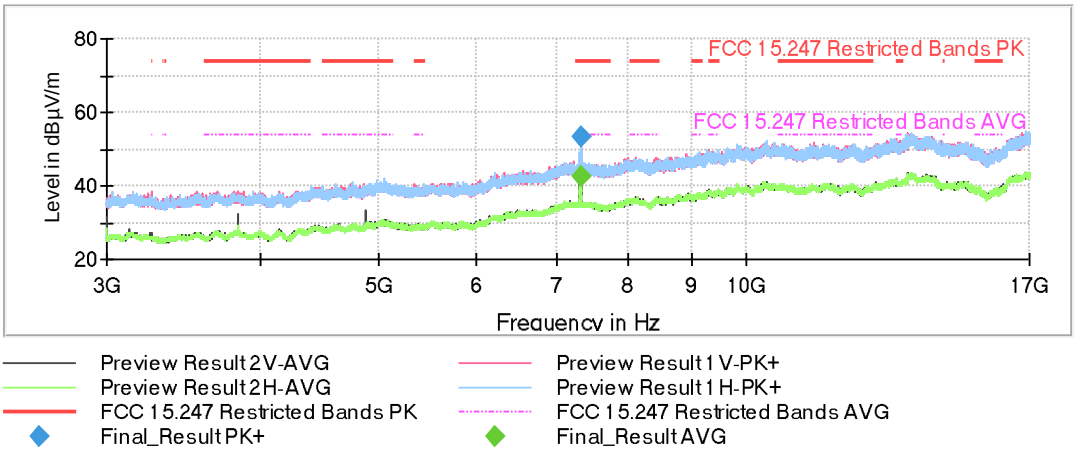
Full Spectrum



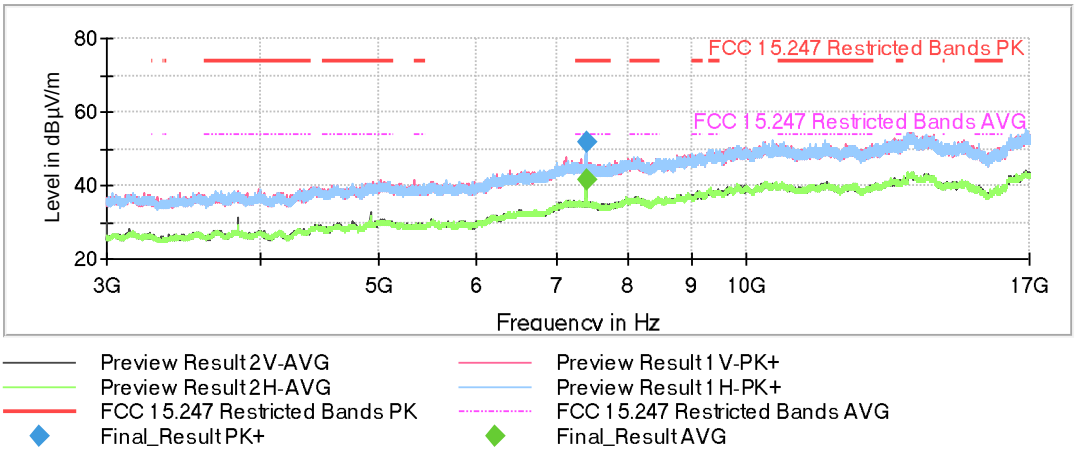
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [3, 17]



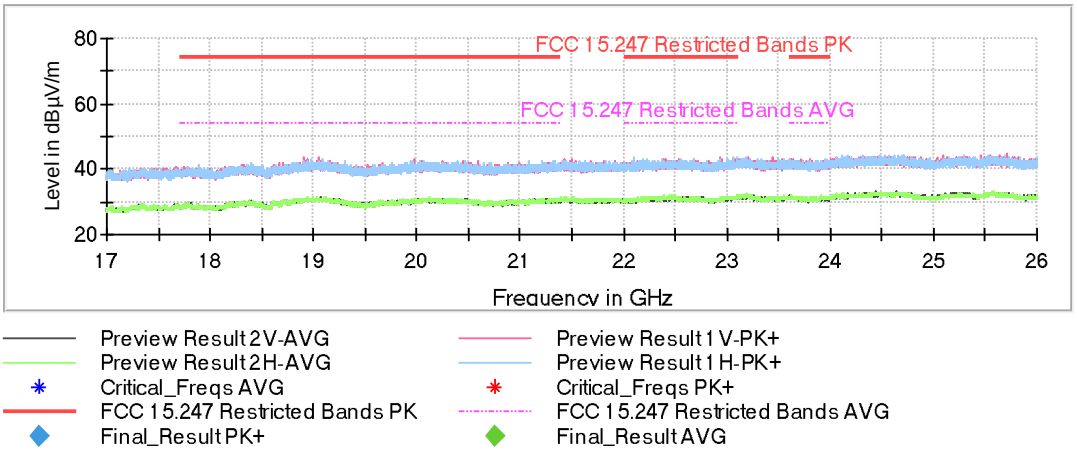
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [3, 17]



Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2462.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [3, 17]

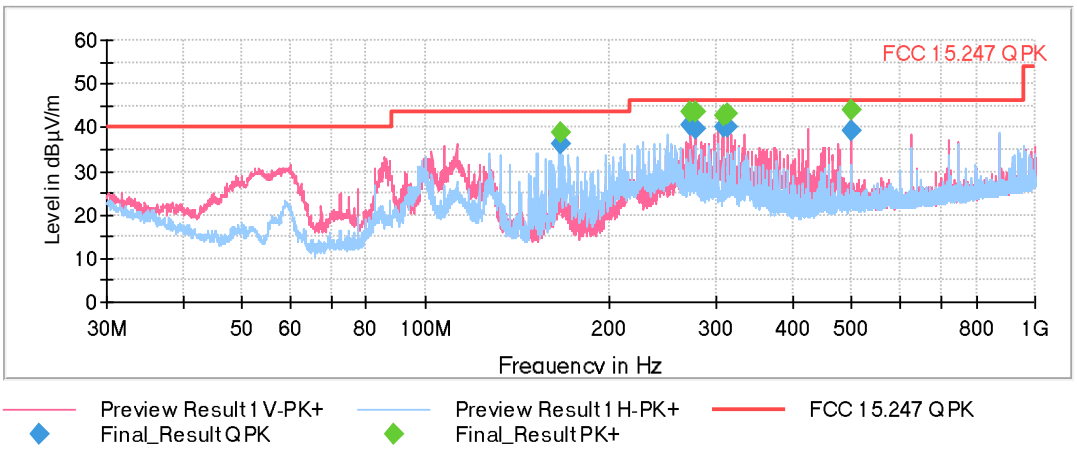


Operation Band (MHz) = [2400, 2483.5], Equipment Type: Digital Transmission System (DTS), Modulation: 802.11b (DSSS 1 Mbit/s), Frequency Range (GHz) = [17, 26]



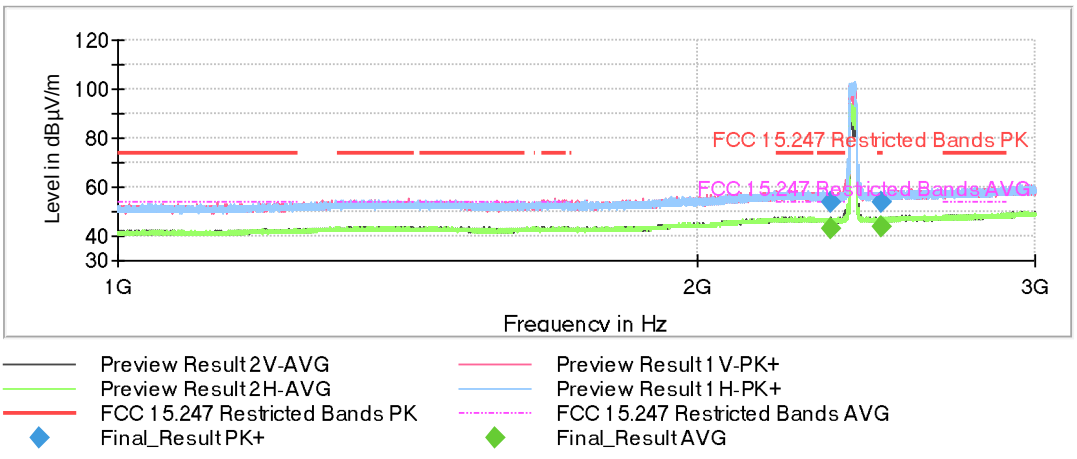
This plot is valid for Low, Middle and High Channels.

Operation Band (MHz) = [2400, 2483.5], Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s), Frequency Range (GHz) = [0.03, 1]

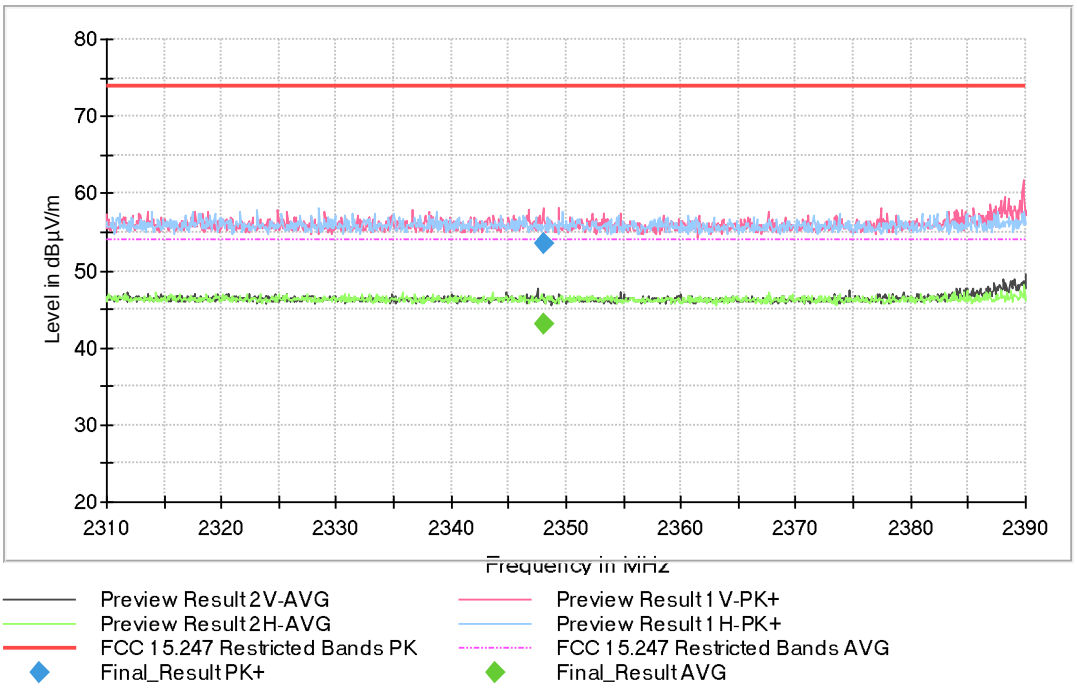


This plot is valid for Low, Middle and High Channels.

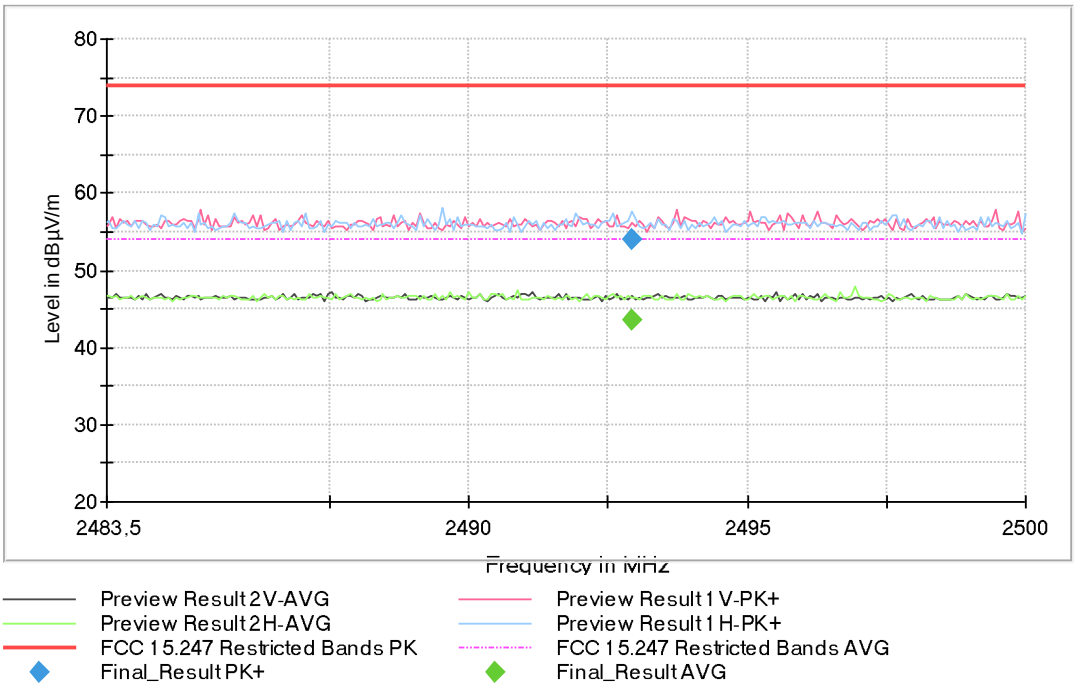
Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2412.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s), Frequency Range (GHz) = [1, 3]



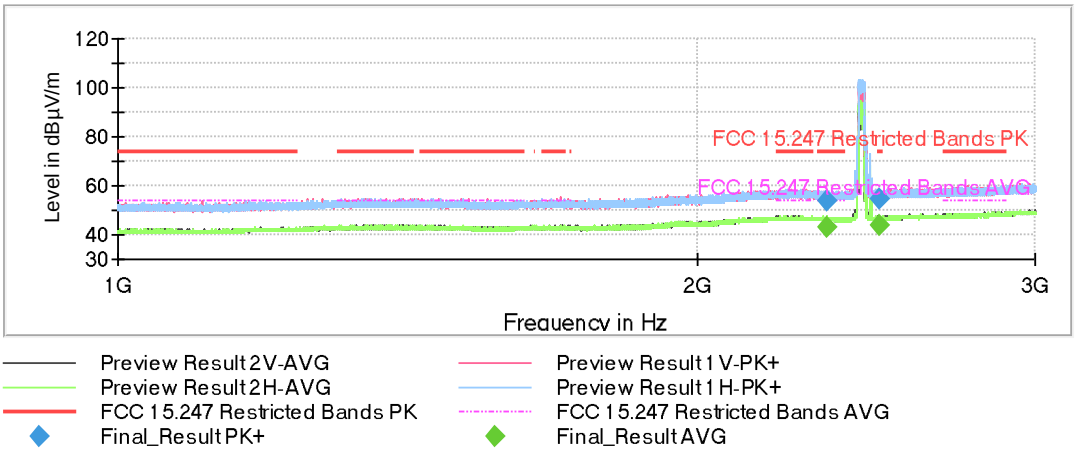
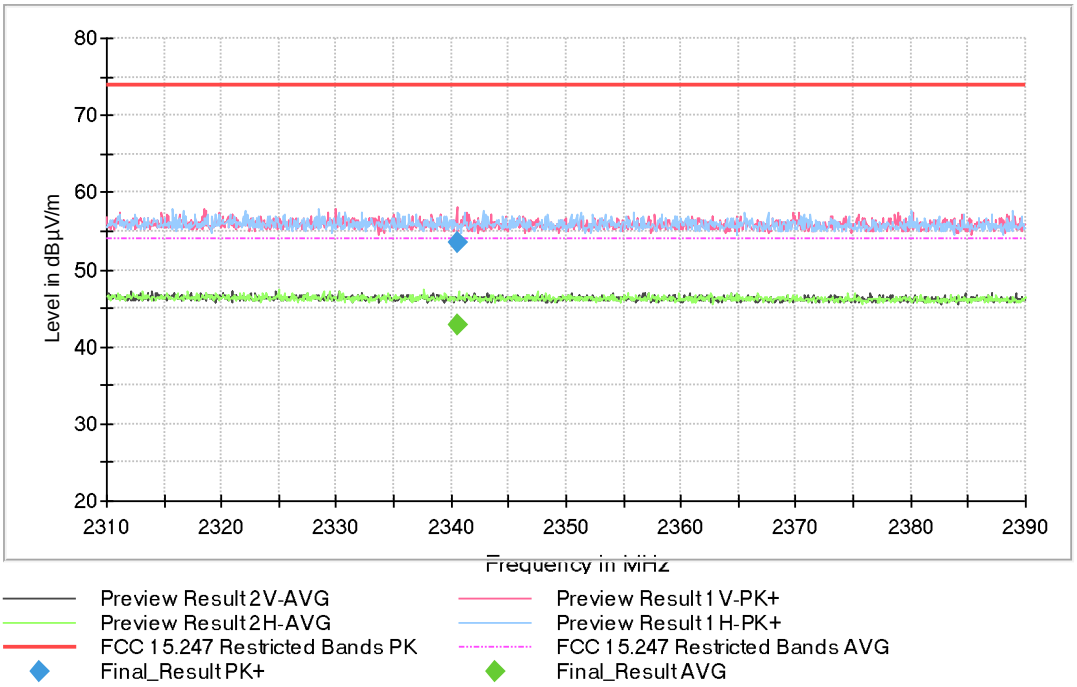
Full Spectrum



Full Spectrum



Operation Band (MHz) = [2400, 2483.5], Frequency (MHz) = 2437.00, Equipment Type: Digital Transmission System (DTS), Modulation: 802.11g (OFDM 6 Mbit/s), Frequency Range (GHz) = [1, 3]



Full Spectrum