

ISED CABid: ES1909

Test Report No:
NIE: 69536RRF.009A1

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive infotainment System
(*) Trademark	BMW
(*) Model and /or type reference	MGU FQ
Other identification of the product	HW version: 3.2 SW version: K18_21w43.1-1 FCC iD: T8GMGUFQ IC:6434A-MGUFQ
(*) Features	USB 2.0 (including support for Apple Devices), Bluetooth, WLAN Modul 2.4 / 5 GHz, GNSS, Video-out APIX2, CAN and 100Base-T1.
Manufacturer	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH Becker-Goering-Str. 16 76307, Karlsbad, GERMANY
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
Date of issue	2022-01-25
Report template No	FDT08_23 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
# of Ch	Available Number of Channels
# of Tx Chains	Number of Transmission Chains
20dBw	Emission Bandwidth
Avg Power	Maximum Average Conducted Output Power
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
PSD	Power Spectrum Density
Pol	Polarization
Unwanted Freq	Unwanted Emissions Frequency

Competences and guarantees

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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.

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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.

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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.

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 MGU Head-Unit. The main functionalities are: Navigation, USB, voice recognition and several interfaces to the vehicle and Bluetooth / WLAN. The Head-unit provides different interfaces like: Video-out APIX2 (for the connection of an external Display), 3 USB interfaces (including support for Apple devices), CAN and 100Base-T1.

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.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
69536B/036	Automotive infotainment System	MGU FQ	B49299M278000021	2021/11/11

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
69536B/040	OABR Converter Board	--	--	2021/11/11
69536B/037	OABR Converter Cable	--	--	2021/11/11
69536B/039	Power Cable DC	--	--	2021/11/11
69536B/042	Power Harness	--	--	2021/11/11
69536B/041	Ethernet to USB Adapter	EU-4306	--	2021/11/11

Sample S/01 has undergone the following test(s): Conducted test indicated in the Appendix A

- Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
69536B/025	Automotive infotainment System	MGU FQ	B49219M277000002	2021/11/11

Auxiliary elements used with the Sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
69536B/026	OABR Converter Board	--	--	2021/11/11
69536B/027	OABR Converter Cable	--	--	2021/11/11
69536B/028	Power Cable DC	--	--	2021/11/11
69536B/029	Ethernet Cable	--	--	2021/11/11
69536B/030	Ethernet to USB Adapter	EU-4306	--	2021/11/11
69536B/031	Power Harness	--	--	2021/11/11

Sample S/02 has undergone the following test(s): Radiated test indicated in the Appendix A.

Test sample description

Test Sample description (compulsory information for EMC and RF testing services)

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	2xFakra		[X]	[X]	[]		
	USB1 connector – CONM-SM 4POL ROS D4S20Y-40MA5-B		[]	[X]	[]		
	USB2 connector – CONM-SM 4POL ROS D4S20Y-40MA5-C		[]	[X]	[]		
	USB3 connector – CONM-SM 4POL ROS D4S20Y-40MA5-E		[]	[X]	[]		
	APIX2 connector – CONM-SM 4+2POL ROS 99S22A-40MA5-D		[X]	[]	[]		
	Car Main-connector – CONM 16POL TYC 2300483-s		[X]	[]	[]		
	Ethernet BroadR-Reach, 100 BASE-T1		[X]	[]	[]		
	GNSS connector		[X]	[X]	[]		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
		AC:					
		AC:					
	X	DC: 12Vdc					
		DC:					
Rated Power							
Clock frequencies.....							
Other parameters							
Software version	K18_21w43.1-1						

Hardware version	3.2		
Dimensions in cm (W x H x D)			
Mounting position		Table top equipment	
		Wall/Ceiling mounted equipment	
		Floor standing equipment	
		Hand-held equipment	
	X	Other: automotive dashboard	
Modules/parts.....	Module/parts of test item	Type	Manufacturer
Accessories (not part of the test item)	Description	Type	Manufacturer
Documents as provided by the applicant.....	Description	File name	Issue date

⁽³⁾ Only for Medical Equipment

Identification of the client

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

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-11-19
Date (finish)	2021-12-02

Document history

Report number	Date	Description
69536RRF.009	2022-01-12	First release.
69536RRF.009A1	2022-01-25	First modification due to typos. This modification test report cancels and replaces the test report 69536RRF.009

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Antonio Ruiz Sánchez, Francisco Javier Fernández Aragón, José Gabriel Pendón.

Used instrumentation:

Equipment	Model	Vendor	Latest Calibration	Next Calibration
DIGITAL MULTIMETER	179	FLUKE	2021-10-19	2022-10-19
EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2021-09-21	2023-09-21
HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2021-07-13	2024-07-13
PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2021-06-07	2022-06-07
HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	EST LINDGREN	2021-09-15	2024-09-15
PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	2021-10-27	2022-10-27
HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2021-09-29	2024-09-29
PRE-AMPLIFIER G>30dB 17-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2021-09-08	2022-09-08
OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2021-08-20	2023-08-20
POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	--	--
SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV 40	ROHDE AND SCHWARZ	2021-02-26	2023-02-26
SIGNAL GENERATOR 8kHz-6GHz	SMB100B	ROHDE AND SCHWARZ	2021-11-03	2023-11-03
VECTOR SIGNAL GENERATOR 100kHz-7.5GHz	SMW200A	ROHDE AND SCHWARZ	2021-08-20	2023-08-20
WIRELESS CONNECTIVITY TESTER BW 160 MHz	CMW270	ROHDE AND SCHWARZ	2021-11-30	2022-11-30

Testing verdicts

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

Summary

802.11 B/G/N 20 MHz 1x1

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

Appendix A: Test results. 802.11 B/G/N 20 MHz 1x1

TEST CONDITIONS	13
TEST CASES DETAILS	16
FCC 47 CFR PART 15.247 / RSS-247	16
RSS-247 5.2 (a) / FCC 15.247 (a) (2) [6dBw] 6 dB Bandwidth	16
99dBw Occupied Channel Bandwidth 99%	23
RSS-247 5.2 (b) / FCC 15.247 (e) [Psd] Power spectral density	29
FCC 15.247 (b) / RSS-247 5.4 (d) Maximum output power and antenna gain	35
RSS-247 5.5 / FCC 15.247 (d) [Bndedge] Band-edge emissions compliance (Transmitter)	36
RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)	40

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	12 VDC
Type of Power Supply:	DC External (Car Battery).

ANTENNA (*):

Type of Antenna:	External Antenna
Maximum Declared Antenna Gain:	-2.5 dBi

TEST FREQUENCIES (*):

Low Channel:	2412 MHz
Middle Channel:	2442 MHz
High Channel:	2462 MHz

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 m for the frequency range 17 GHz-26 GHz (antenna and 18 GHz-40 GHz horn antenna).

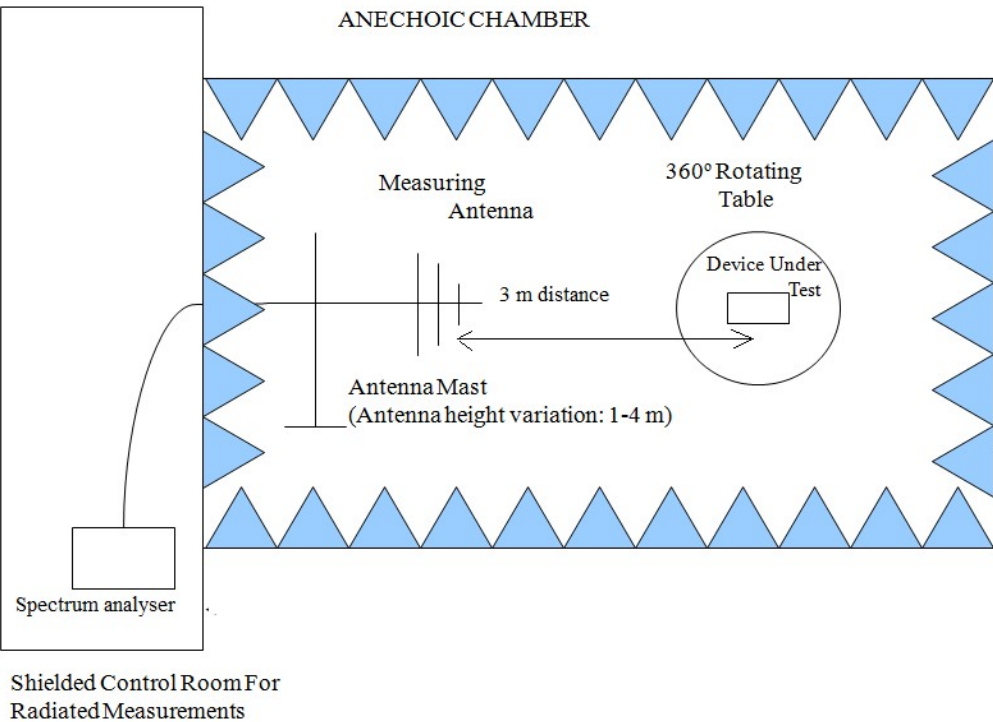
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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

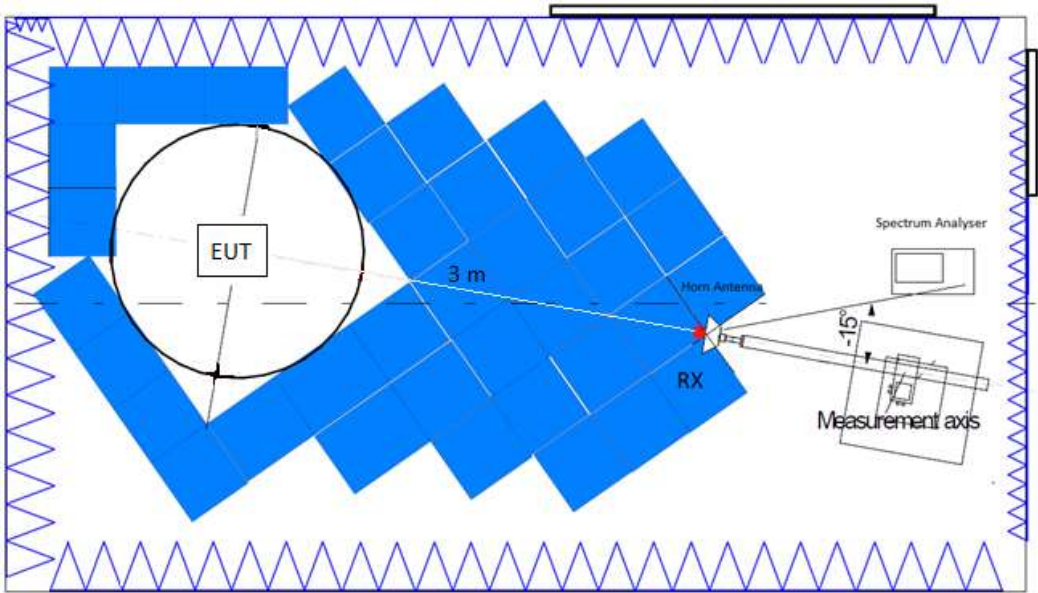
Measurements were made in both horizontal and vertical planes of polarization.

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

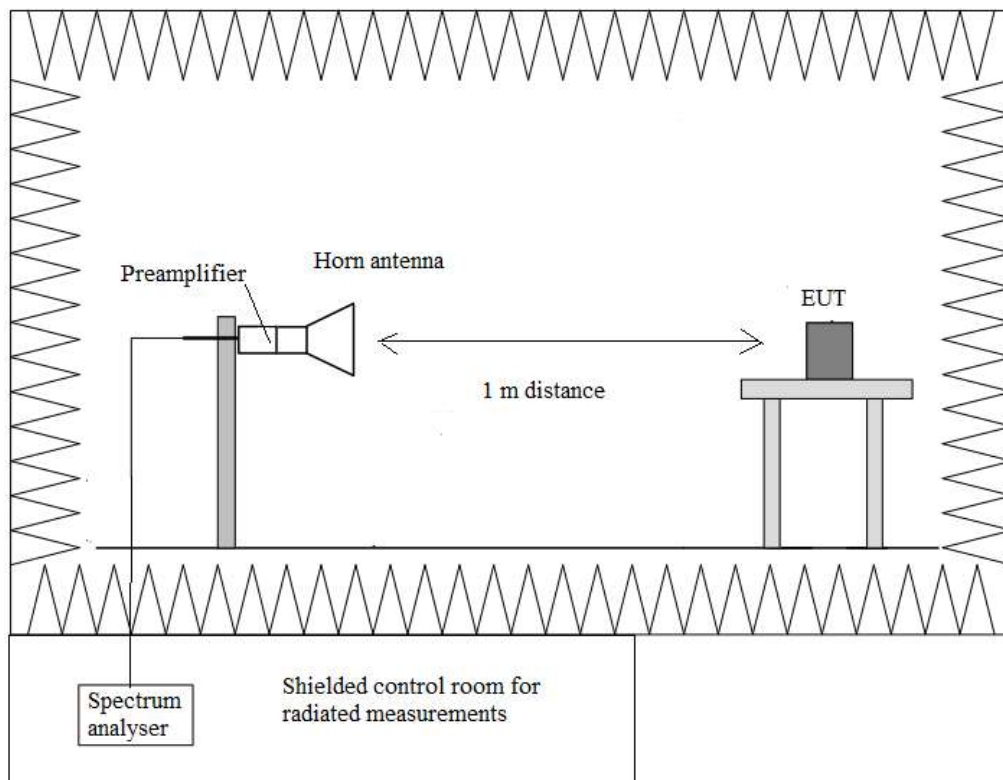
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247

RSS-247 5.2 (a) / FCC 15.247 (a) (2) [6dBw] 6 dB Bandwidth

Limits

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

Results

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	6dBw (MHz)
2412.00	Digital Transmission System (DTS)	16.4500
2442.00	Digital Transmission System (DTS)	16.4500
2462.00	Digital Transmission System (DTS)	16.4000

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	6dBw (MHz)
2412.00	Digital Transmission System (DTS)	10.1500
2442.00	Digital Transmission System (DTS)	10.1500
2462.00	Digital Transmission System (DTS)	10.1500

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

Freq (MHz)	Equipment	6dBw (MHz)
2412.00	Digital Transmission System (DTS)	16.4500
2442.00	Digital Transmission System (DTS)	16.4500
2462.00	Digital Transmission System (DTS)	16.4000

Verdict

Pass

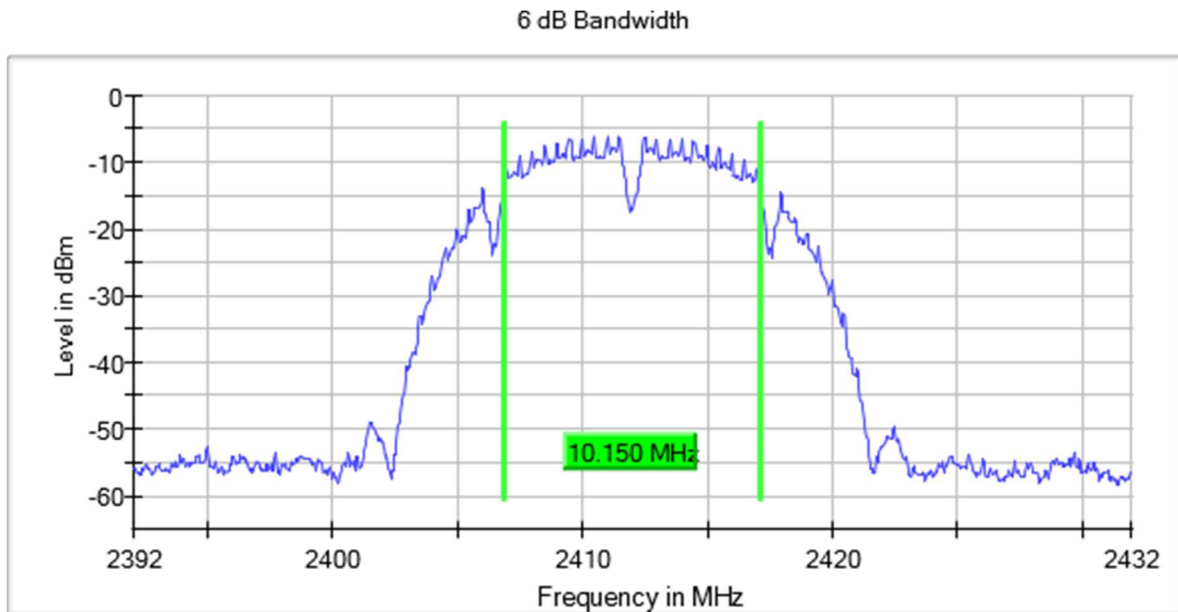
Uncertainty

Measurement uncertainty (%) <±1.14

Attachments

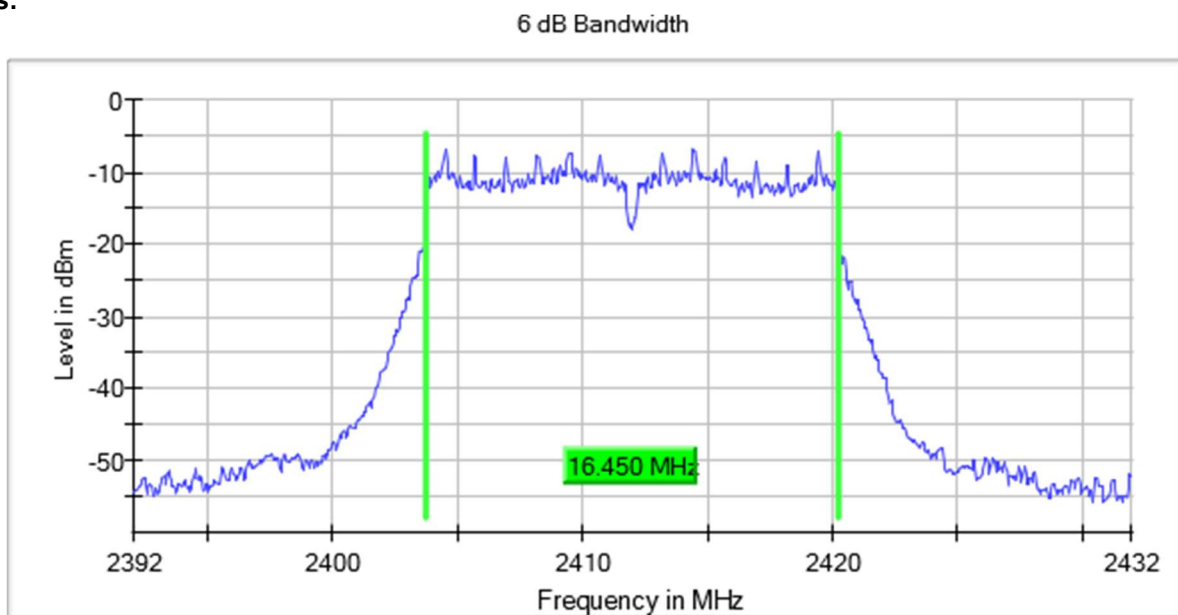
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



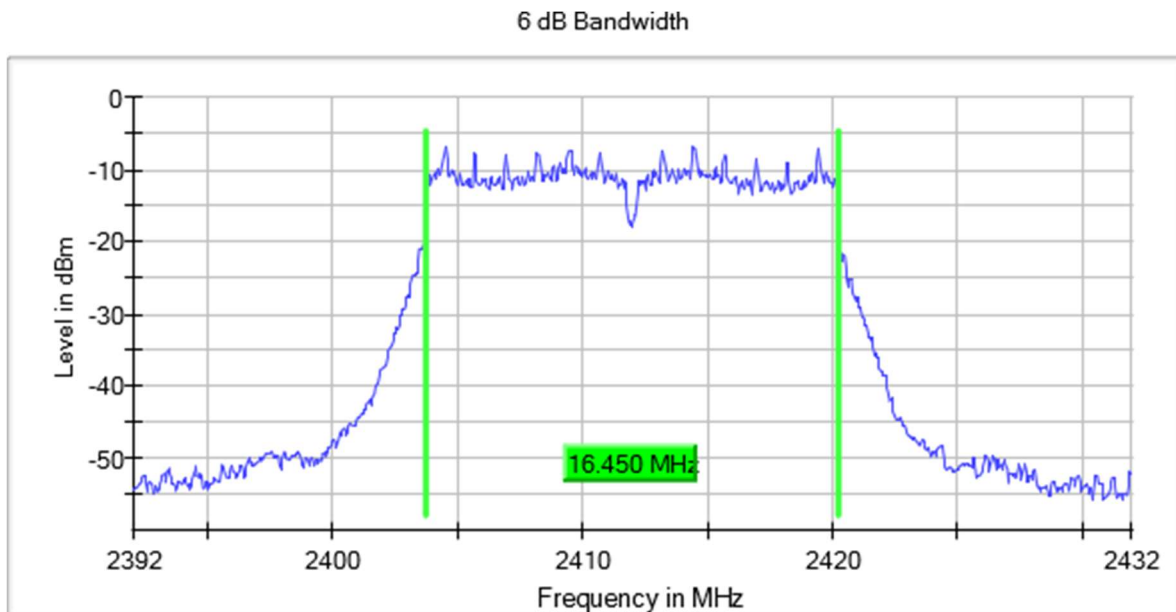
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



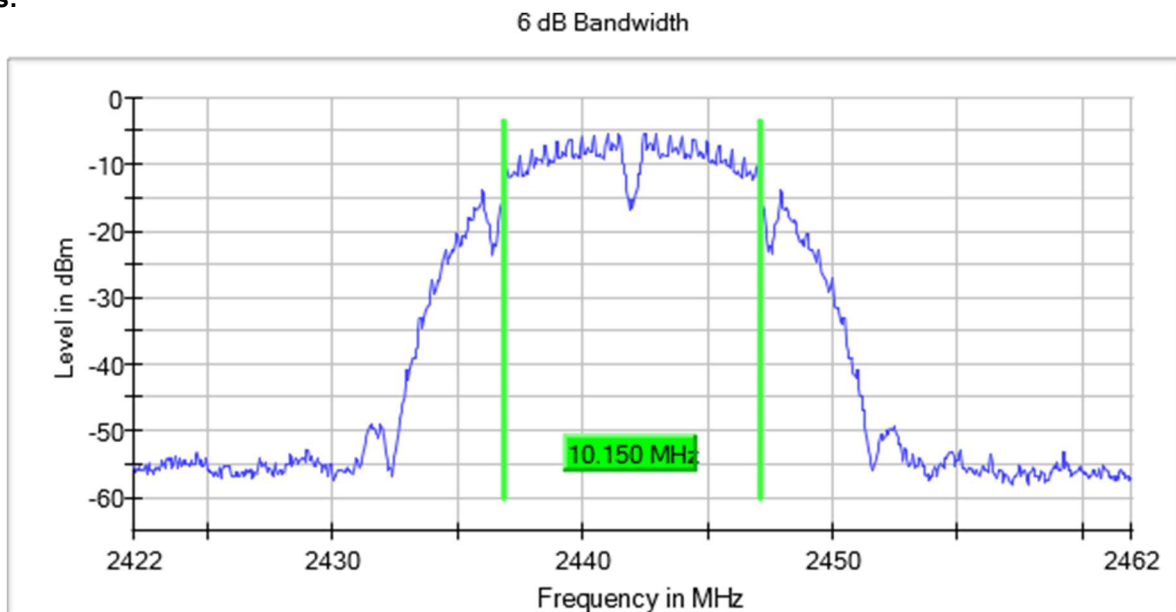
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



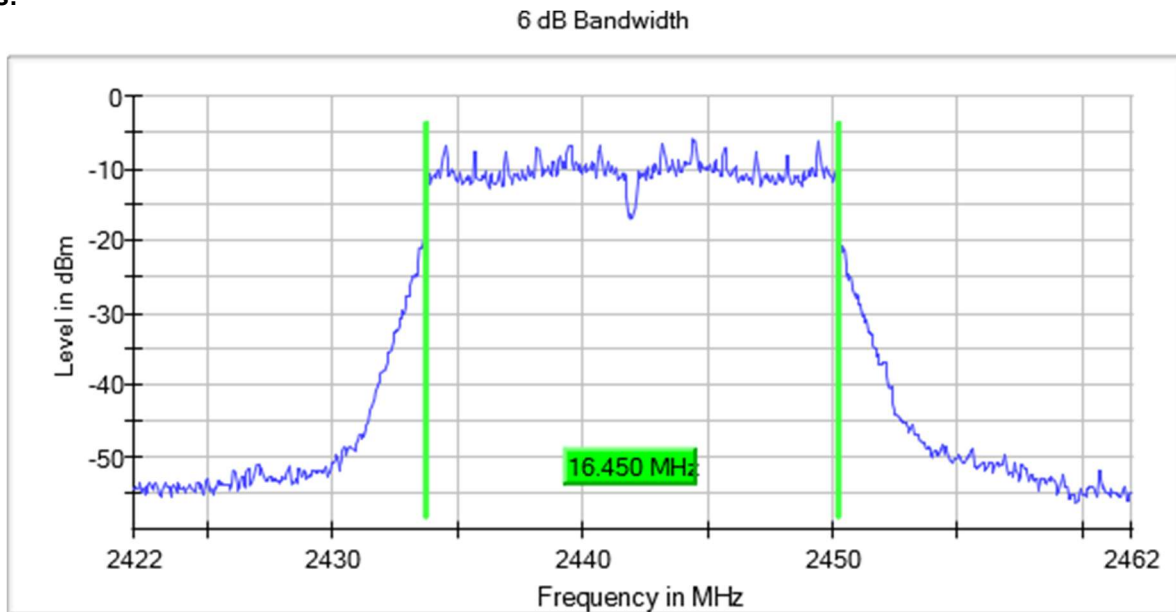
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



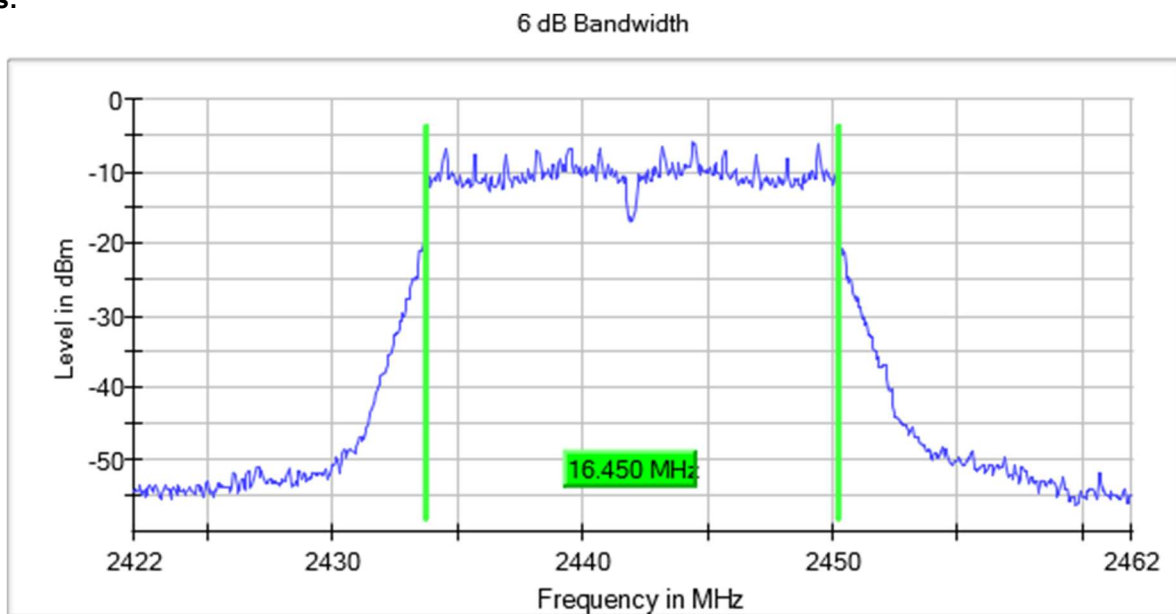
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



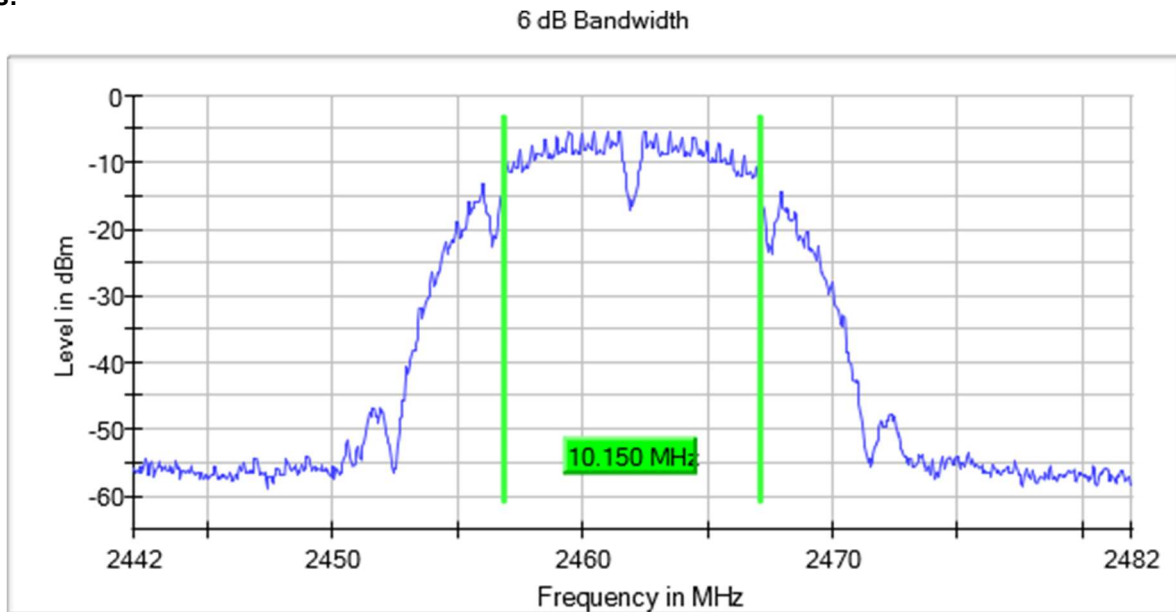
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



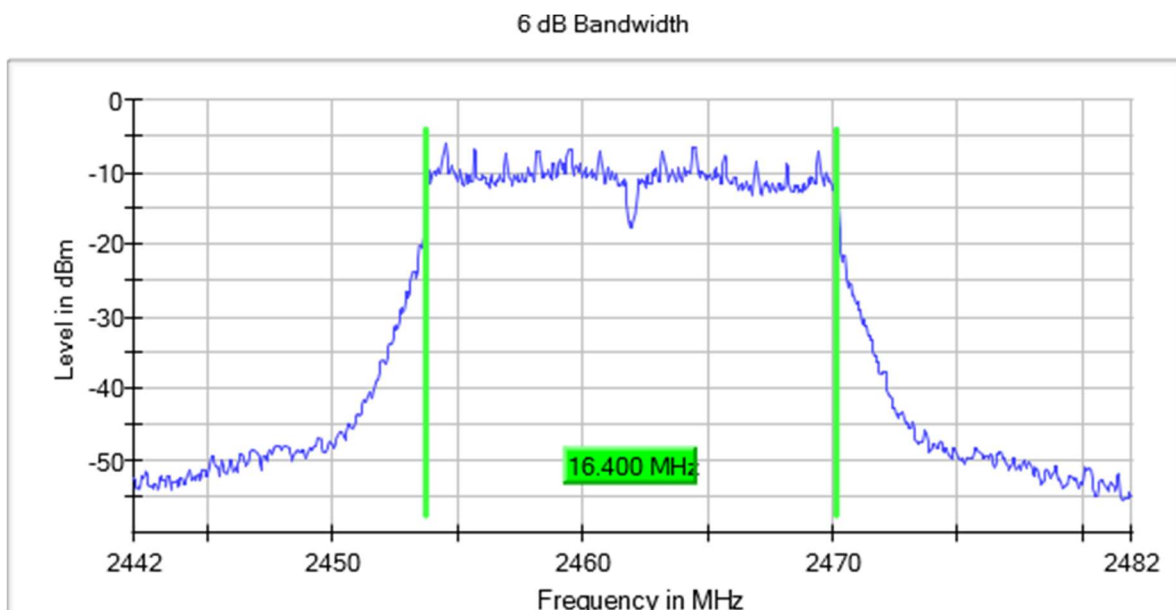
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



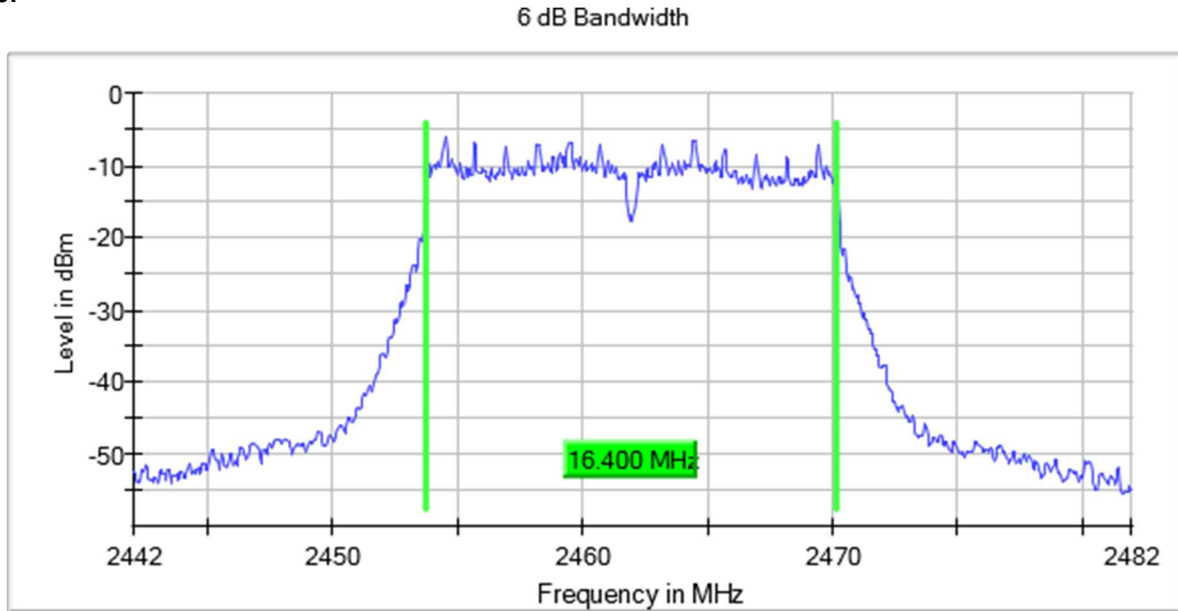
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



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), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



99dBw Occupied Channel Bandwidth 99%

Results

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	16.700000
2442.00	Digital Transmission System (DTS)	16.700000
2462.00	Digital Transmission System (DTS)	16.600000

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	13.400000
2442.00	Digital Transmission System (DTS)	13.400000
2462.00	Digital Transmission System (DTS)	13.300000

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

Freq (MHz)	Equipment	Occ Ch BW (MHz)
2412.00	Digital Transmission System (DTS)	16.700000
2442.00	Digital Transmission System (DTS)	16.700000
2462.00	Digital Transmission System (DTS)	16.600000

Verdict

Pass

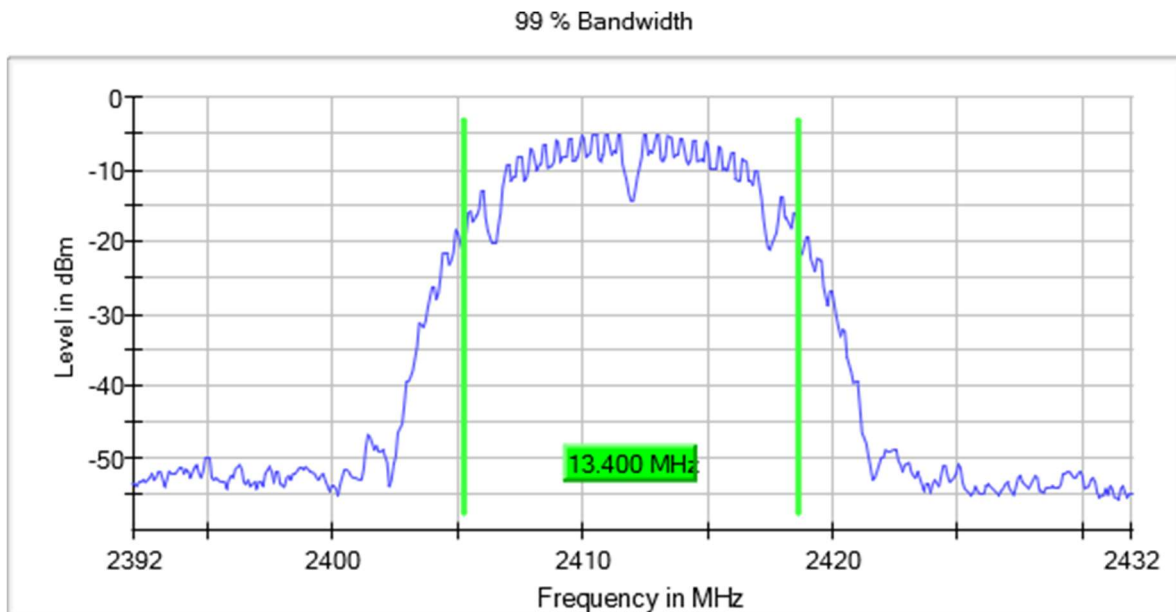
Uncertainty

Measurement uncertainty (%) $\leq \pm 1.40$

Attachments

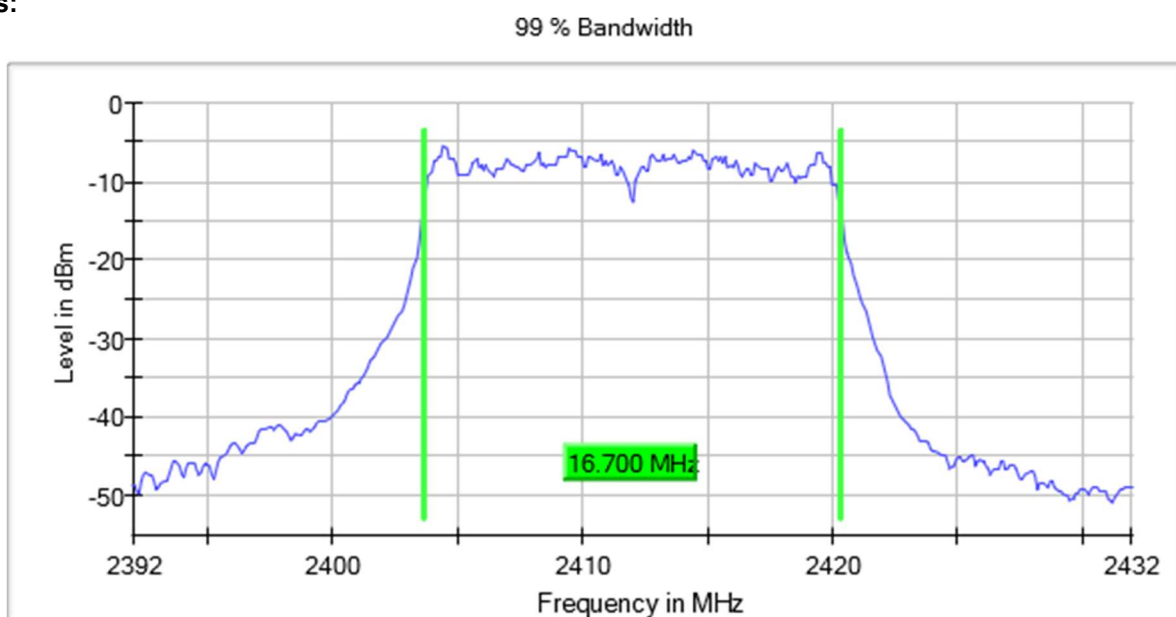
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



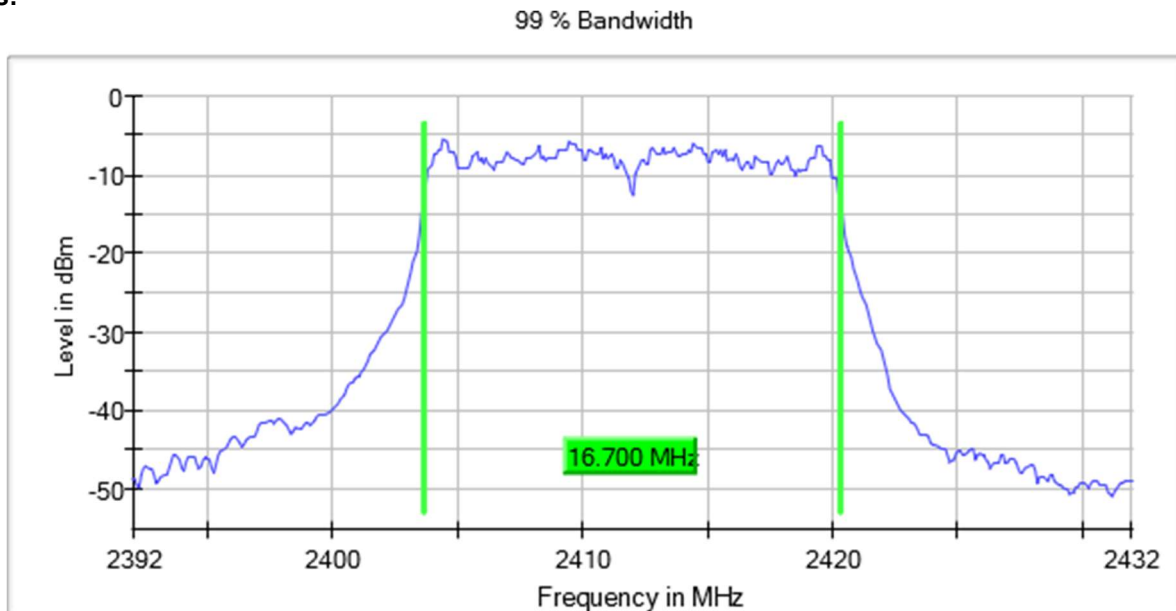
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Images:



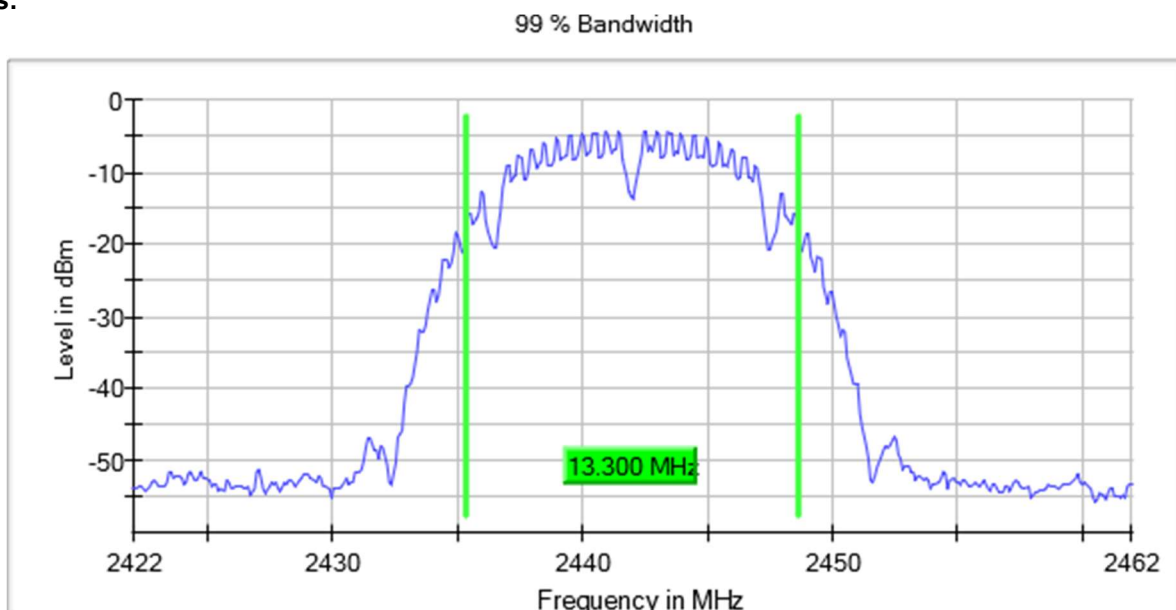
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Images:



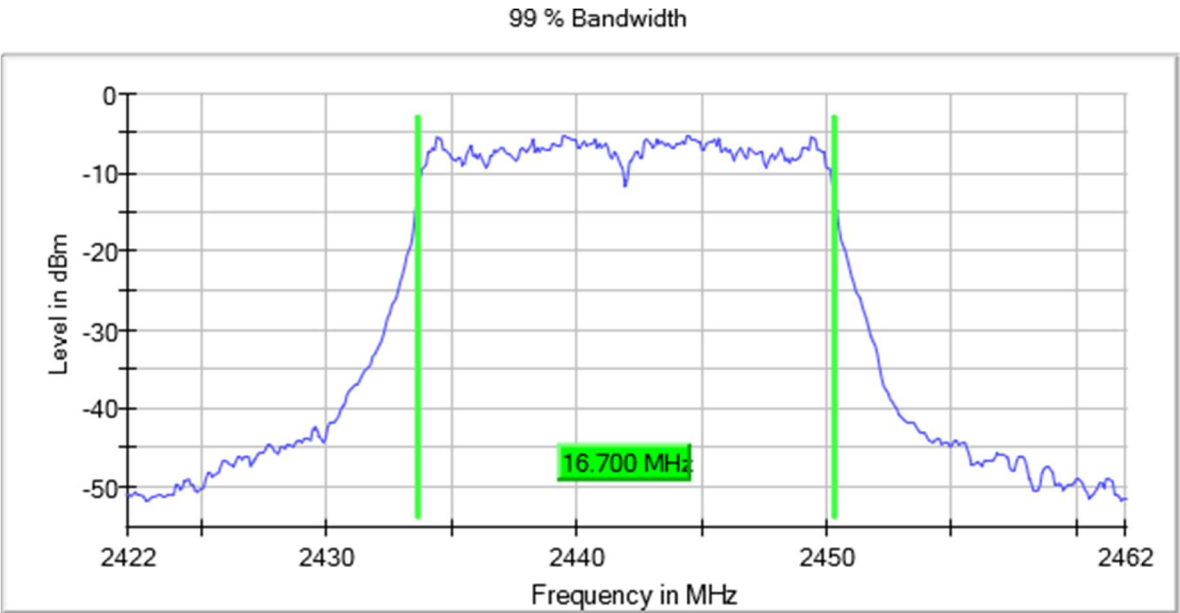
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



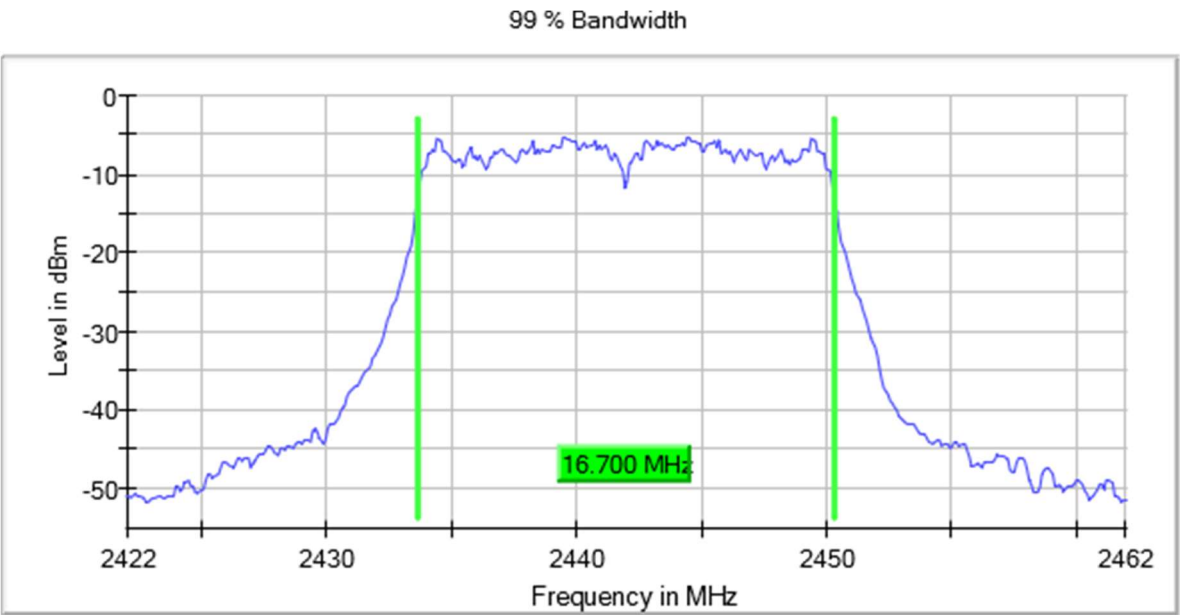
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



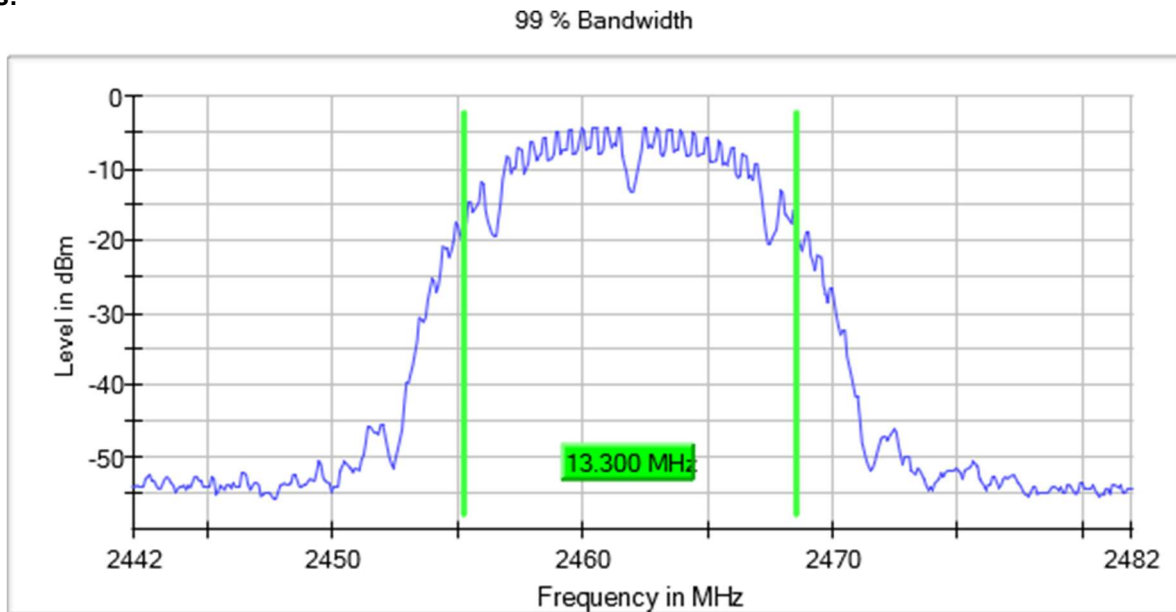
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



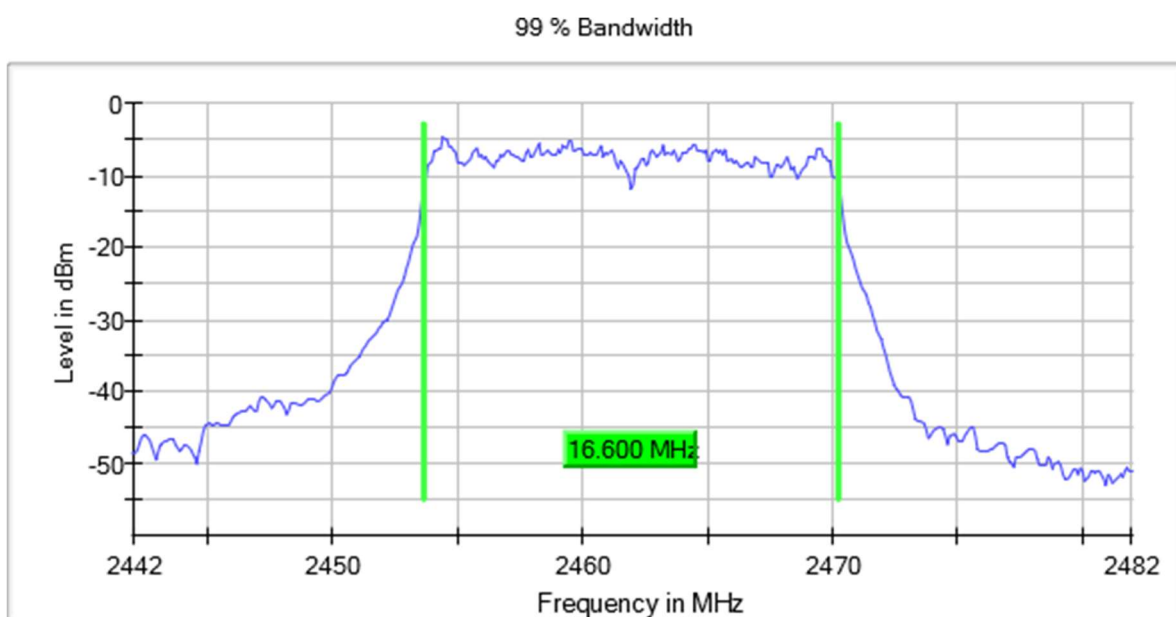
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



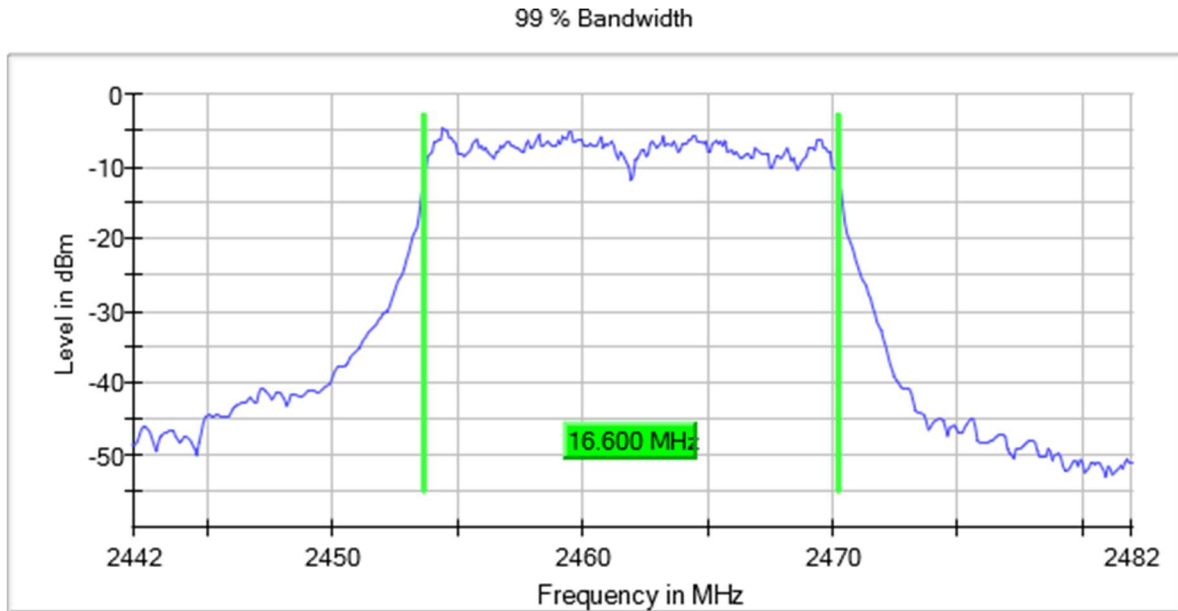
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



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), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



RSS-247 5.2 (b) / FCC 15.247 (e) [Psd] 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

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-15.492000
2442.00	Digital Transmission System (DTS)	-15.152000
2462.00	Digital Transmission System (DTS)	-14.897000

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-13.831000
2442.00	Digital Transmission System (DTS)	-13.197000
2462.00	Digital Transmission System (DTS)	-13.125000

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

Freq (MHz)	Equipment	PSD (dBm)
2412.00	Digital Transmission System (DTS)	-15.492000
2442.00	Digital Transmission System (DTS)	-15.152000
2462.00	Digital Transmission System (DTS)	-14.897000

Verdict

Pass

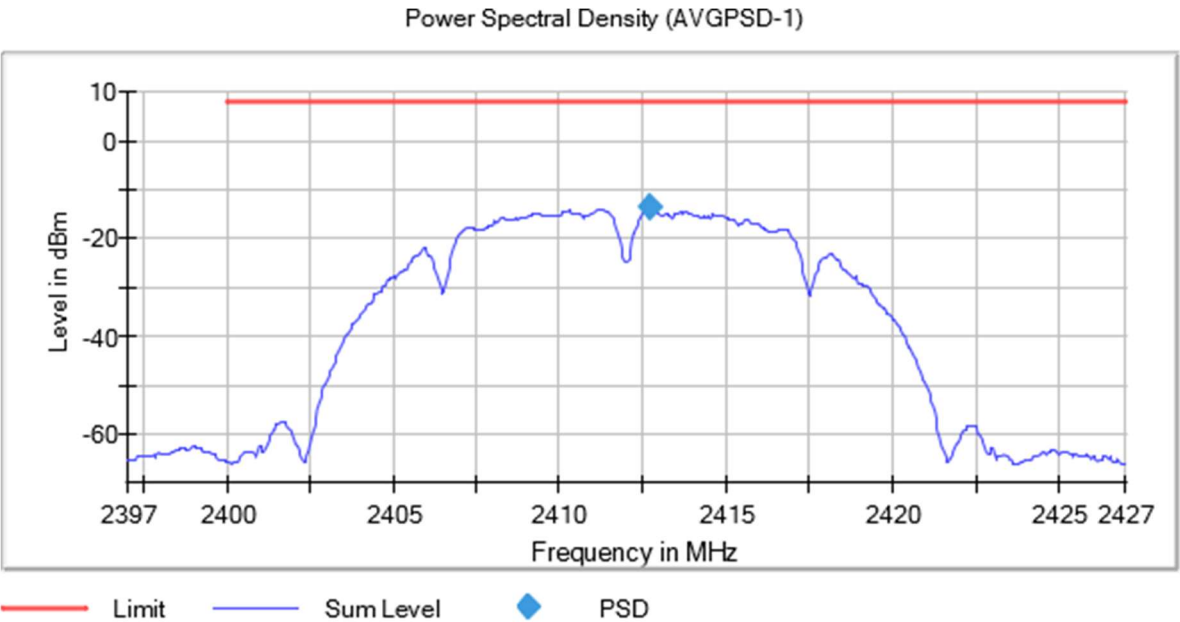
Uncertainty

Measurement uncertainty (dB) $\leq \pm 0.99$

Attachments

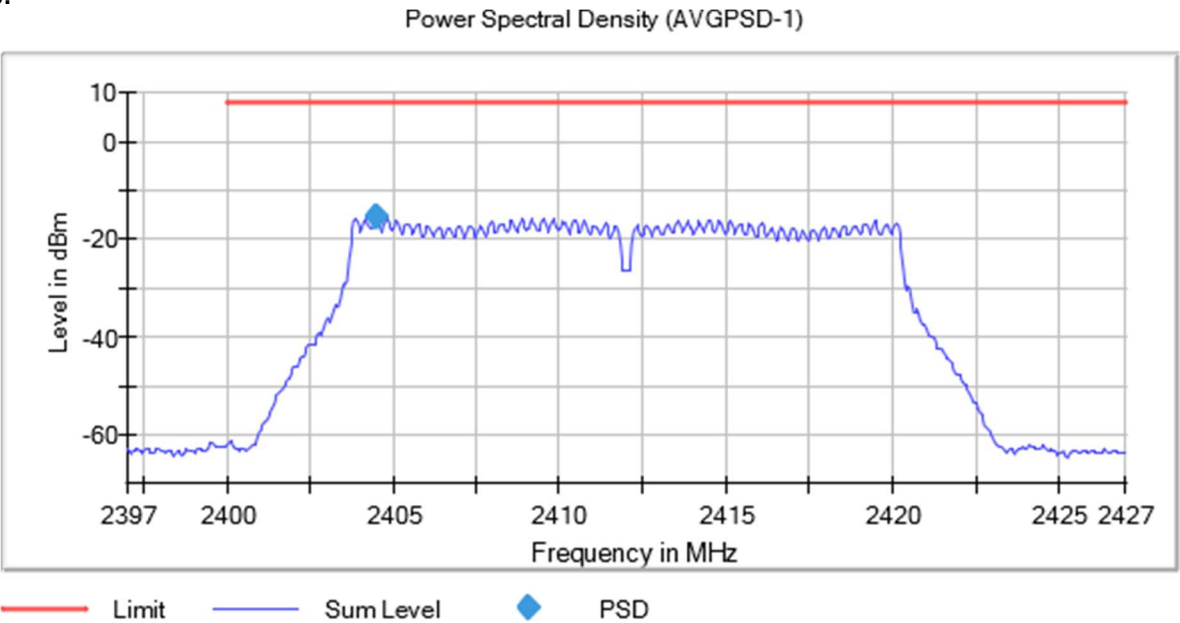
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



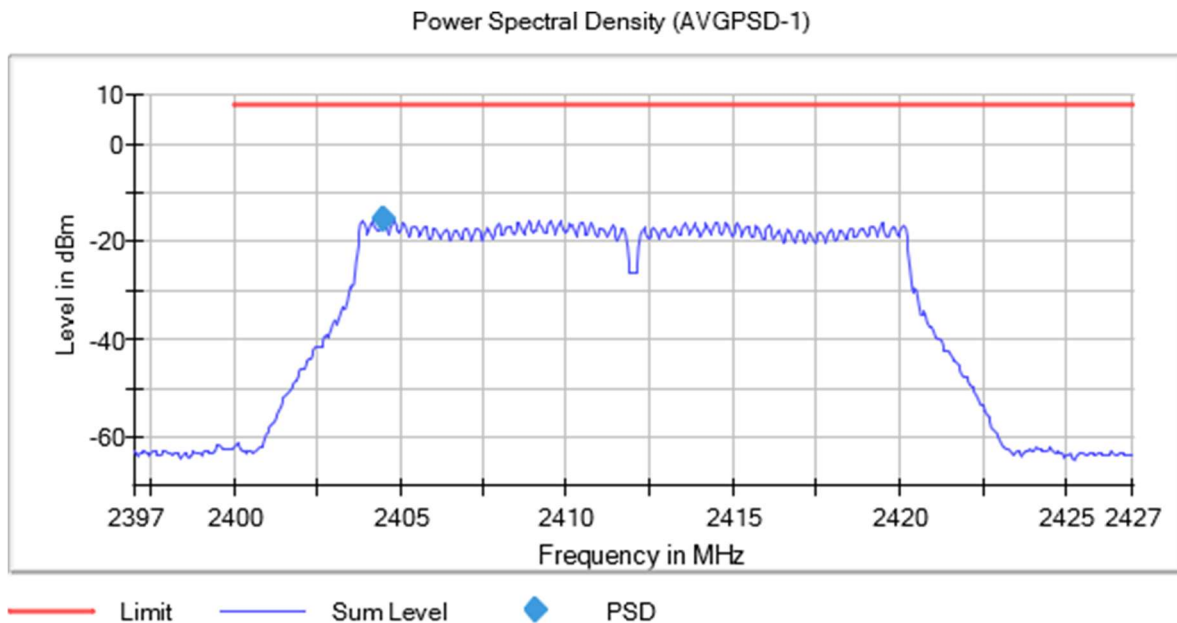
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



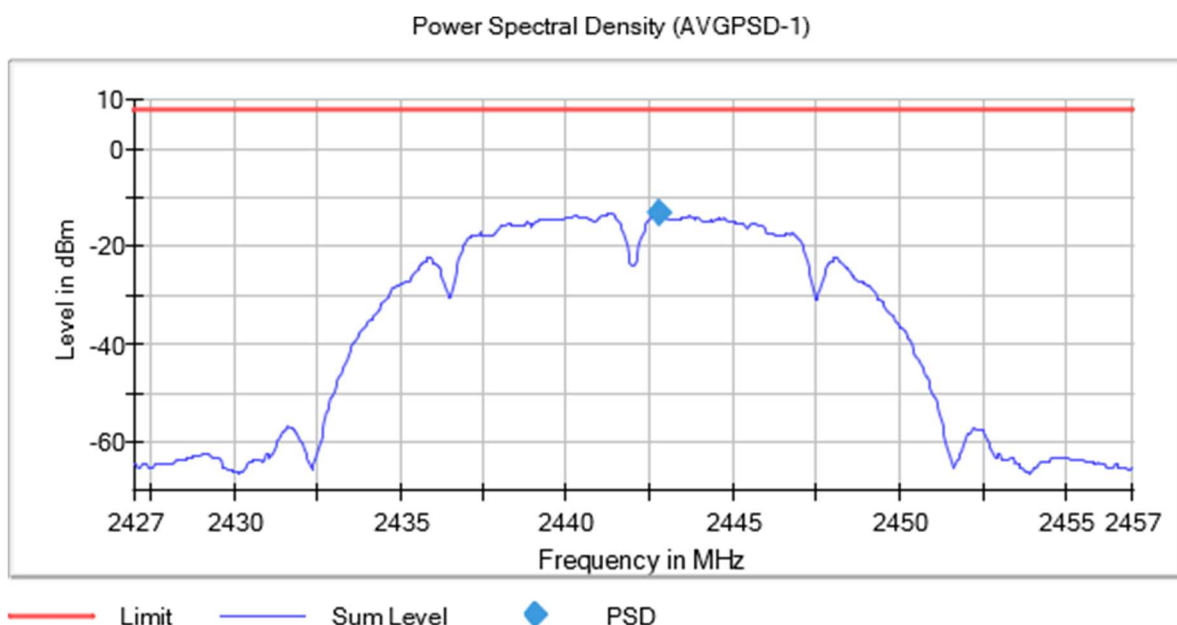
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



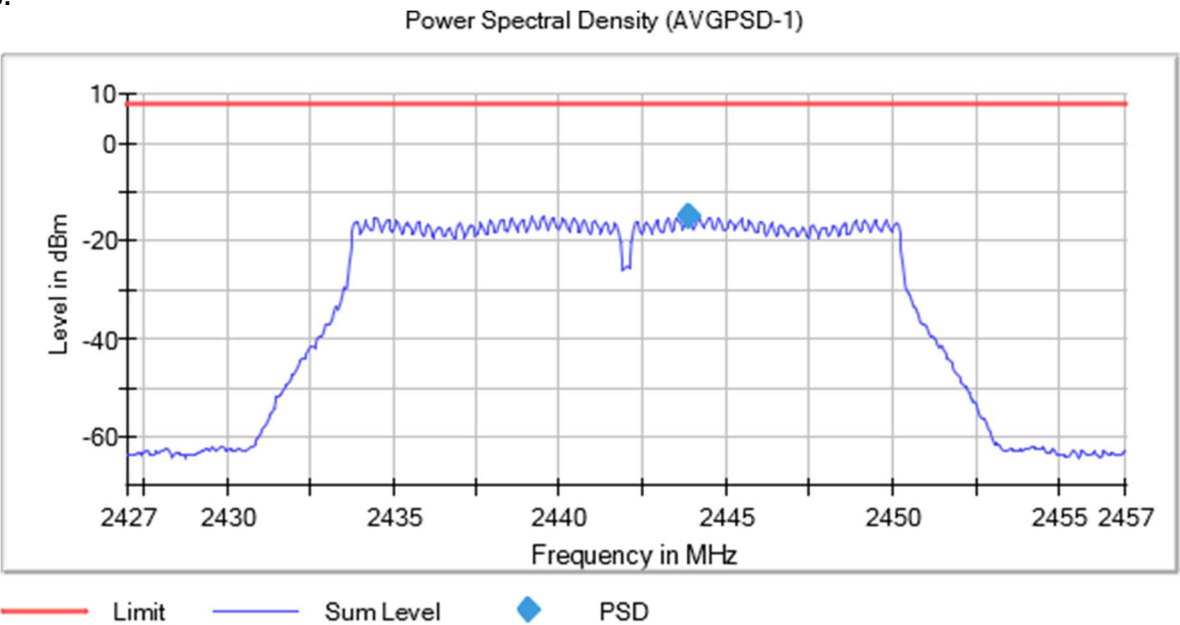
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



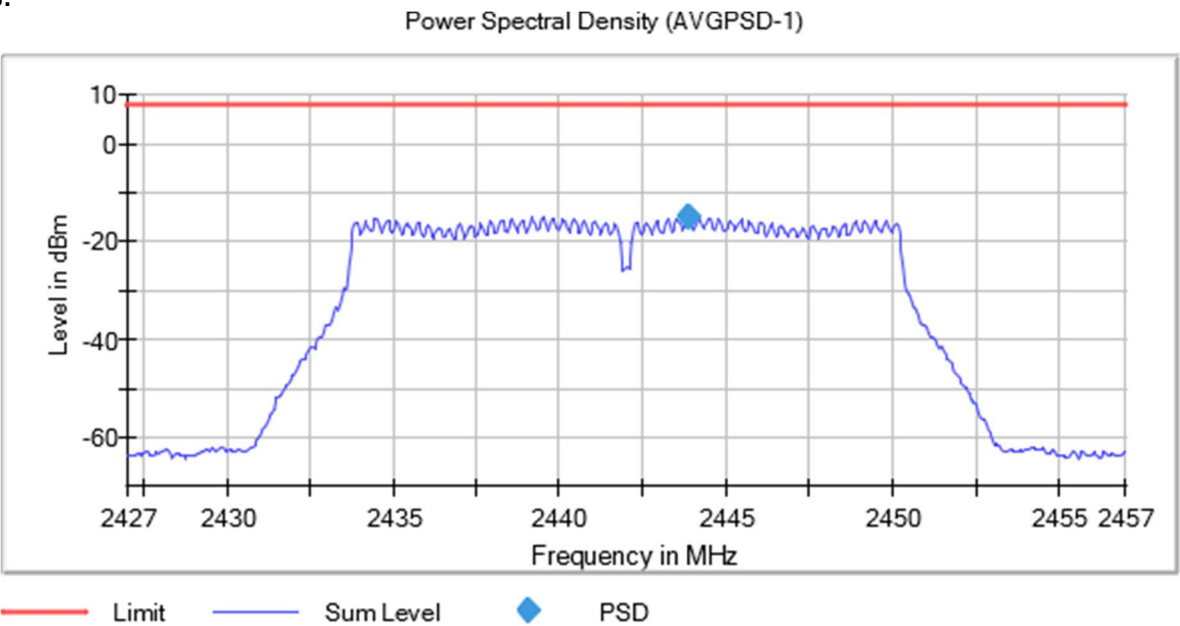
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



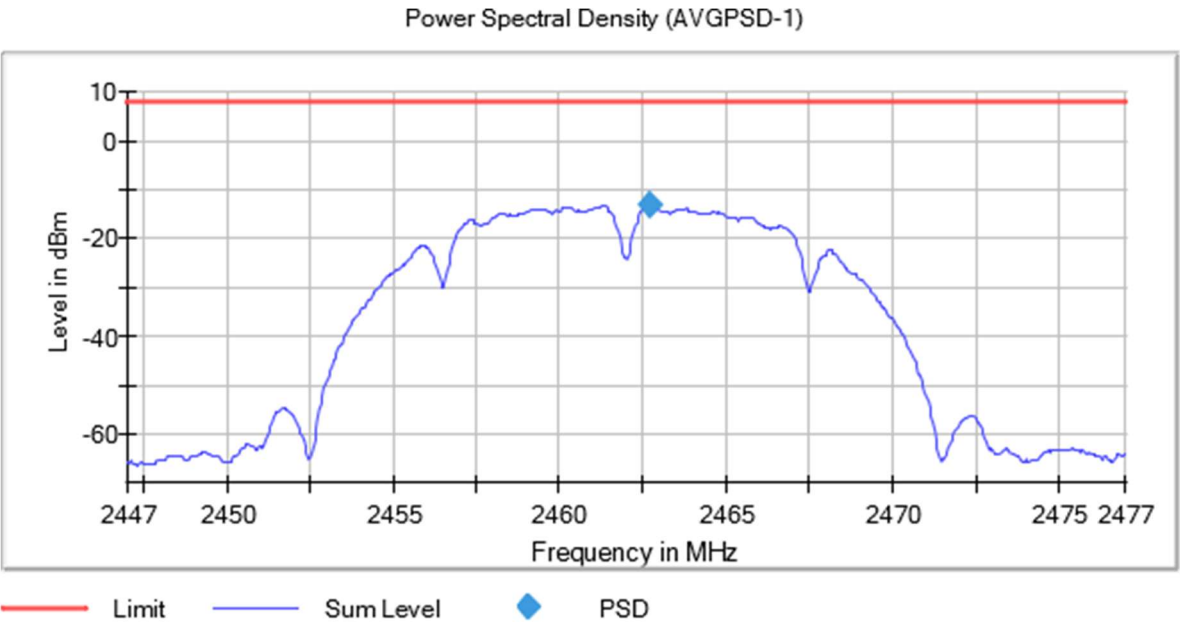
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



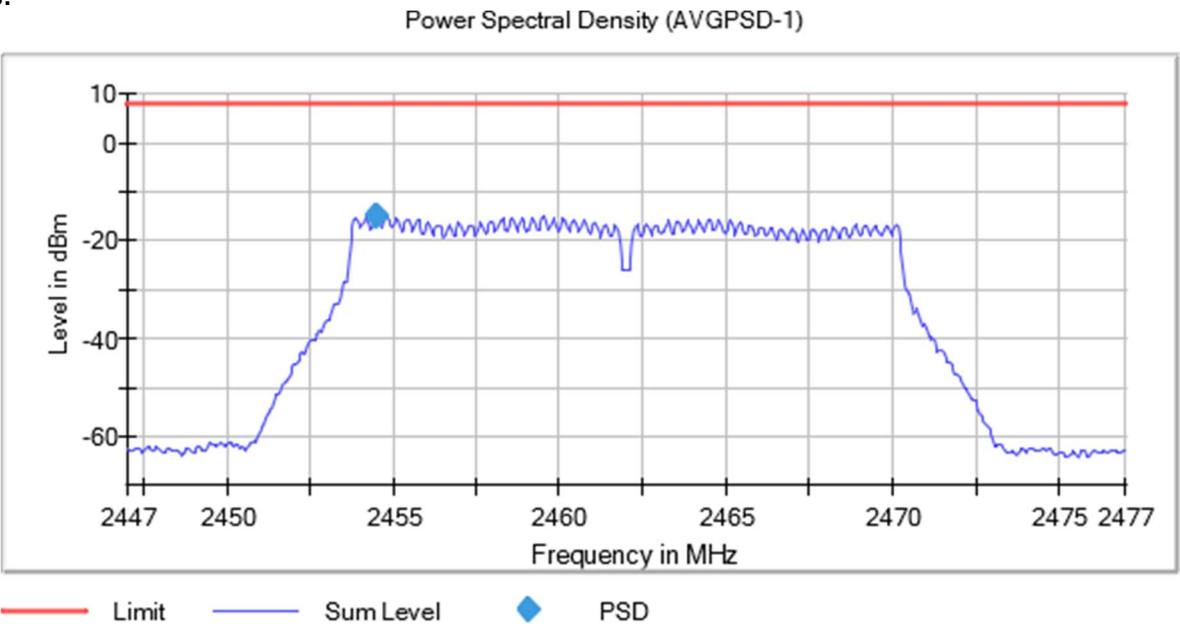
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



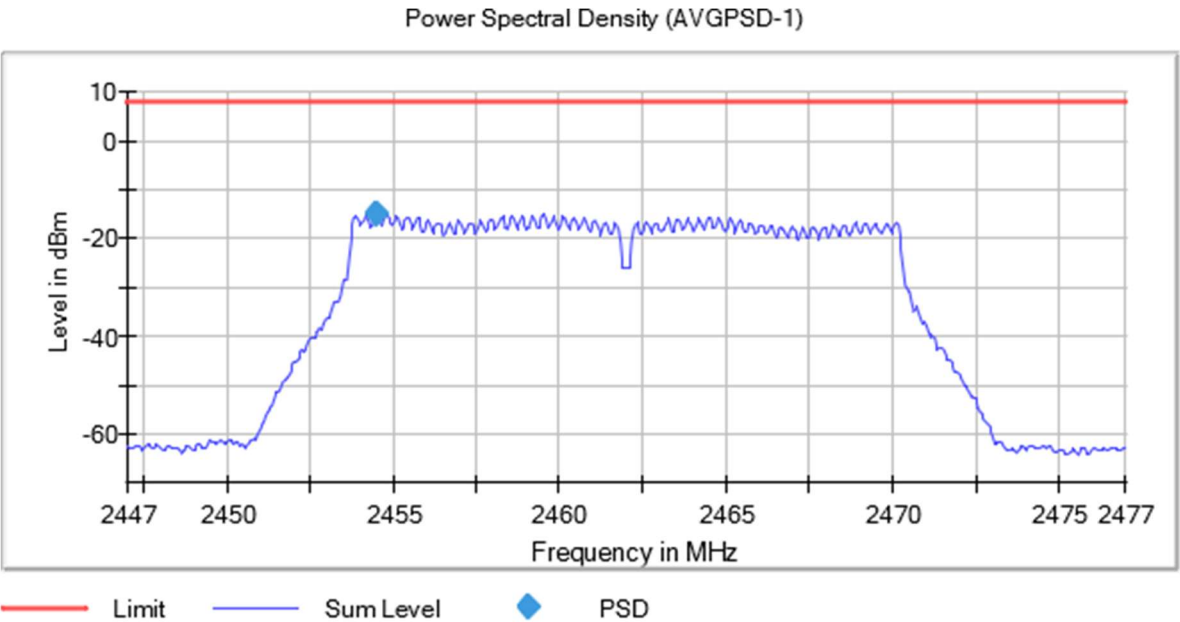
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



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), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



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

SPECIFICATION:

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) (Canada).

Results

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)	6.7	4,2
2442.00	Digital Transmission System (DTS)	6.4	3,9
2462.00	Digital Transmission System (DTS)	6.6	4,1

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)	4.7	2,2
2442.00	Digital Transmission System (DTS)	6.1	3,6
2462.00	Digital Transmission System (DTS)	5.7	3,2

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)	5.2	2,7
2442.00	Digital Transmission System (DTS)	6.6	4,1
2462.00	Digital Transmission System (DTS)	5.9	3,4

Verdict

Pass

Uncertainty

Measurement uncertainty (dB) $\leq \pm 0.99$

RSS-247 5.5 / FCC 15.247 (d) [Bndedge] 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.

Verdict

Pass

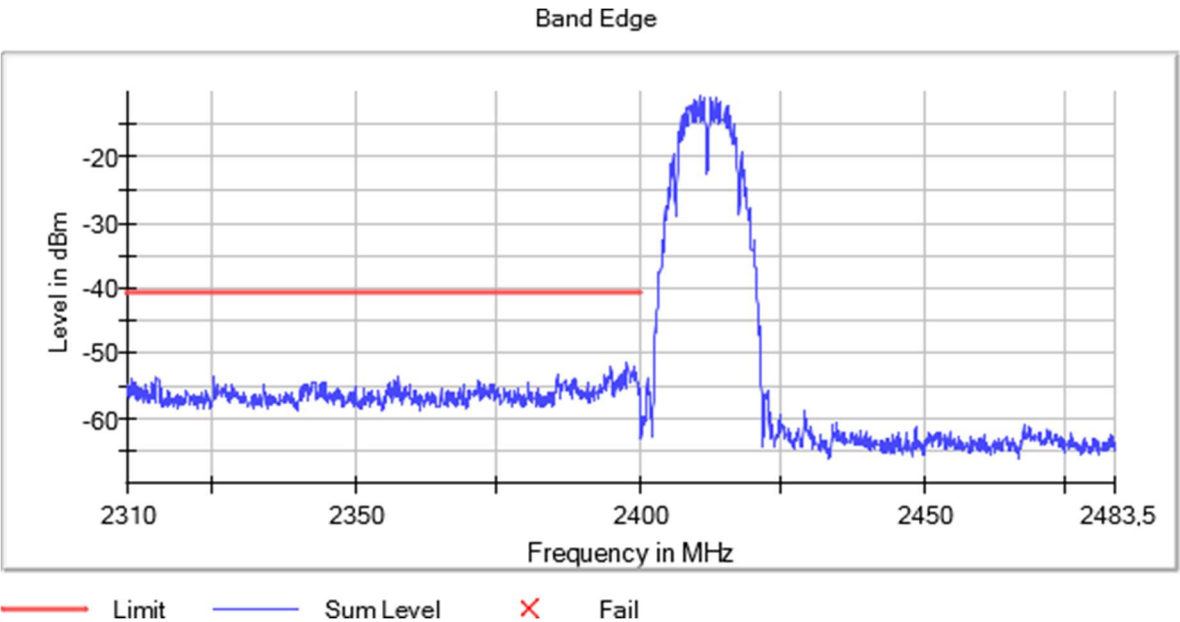
Uncertainty

Measurement uncertainty (dB) $<\pm 1.53$

Attachments

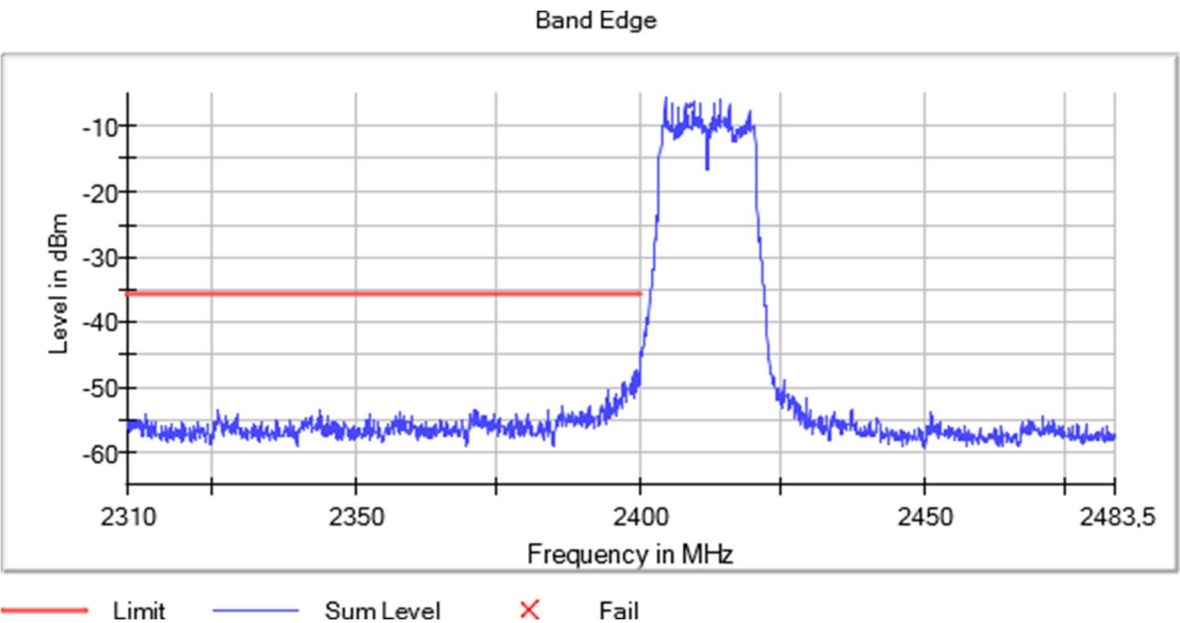
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



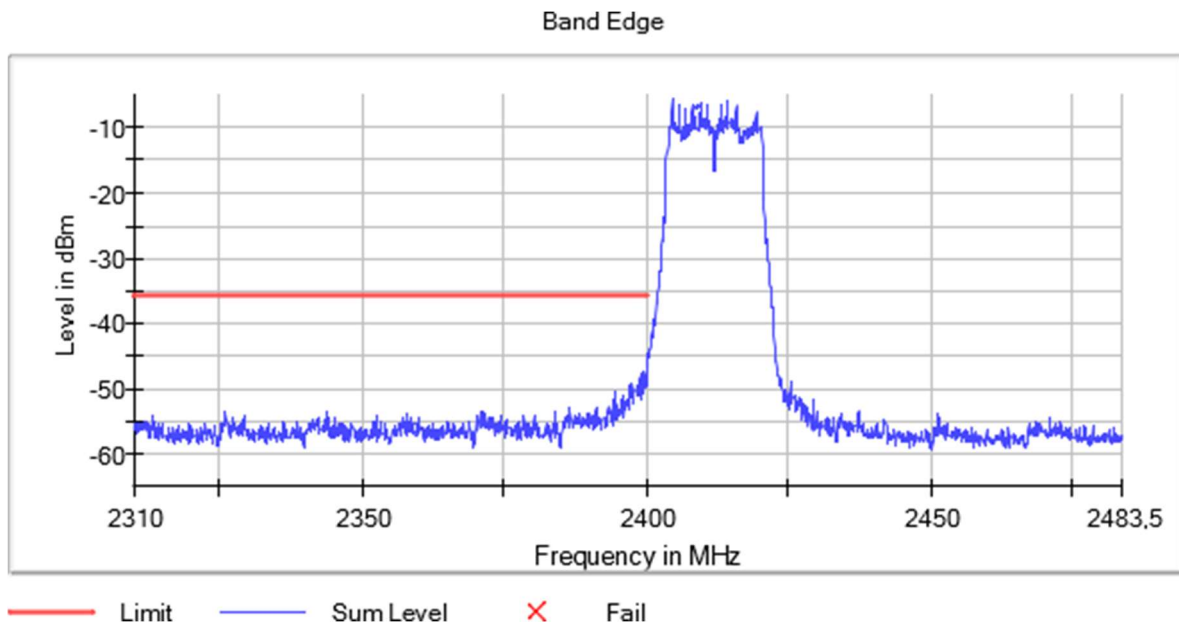
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



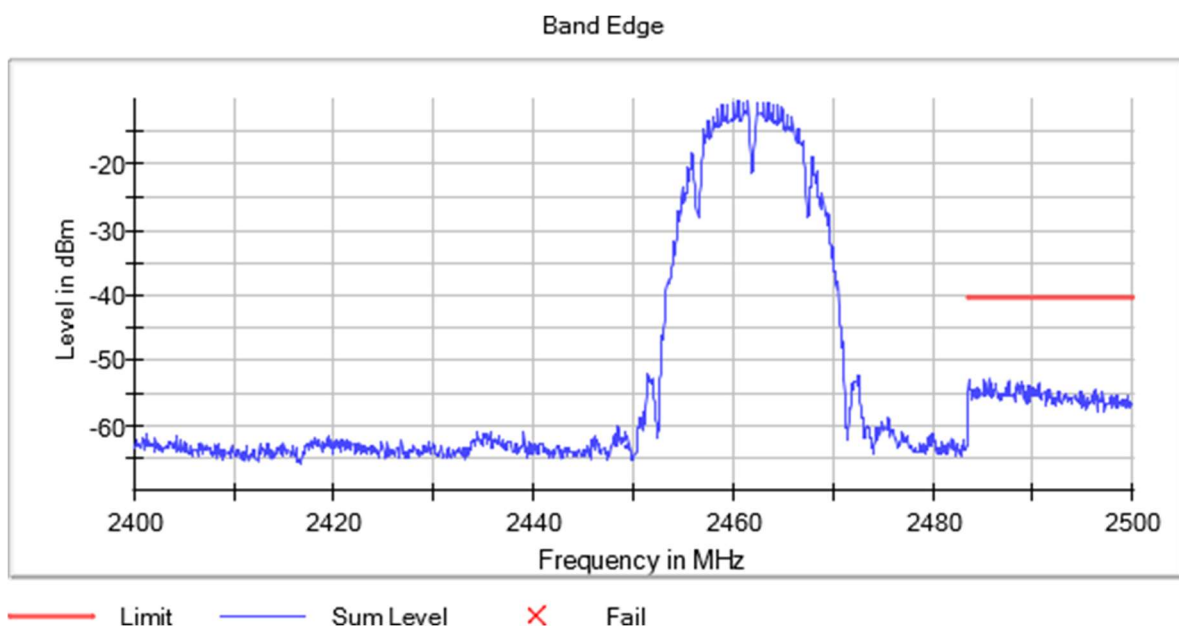
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



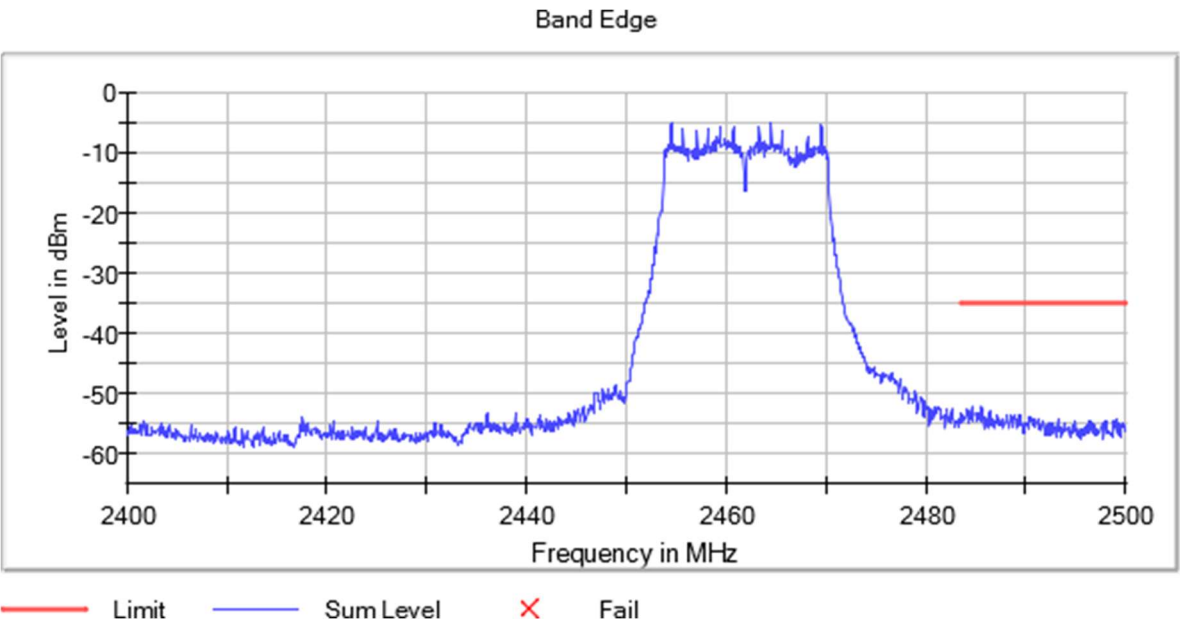
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



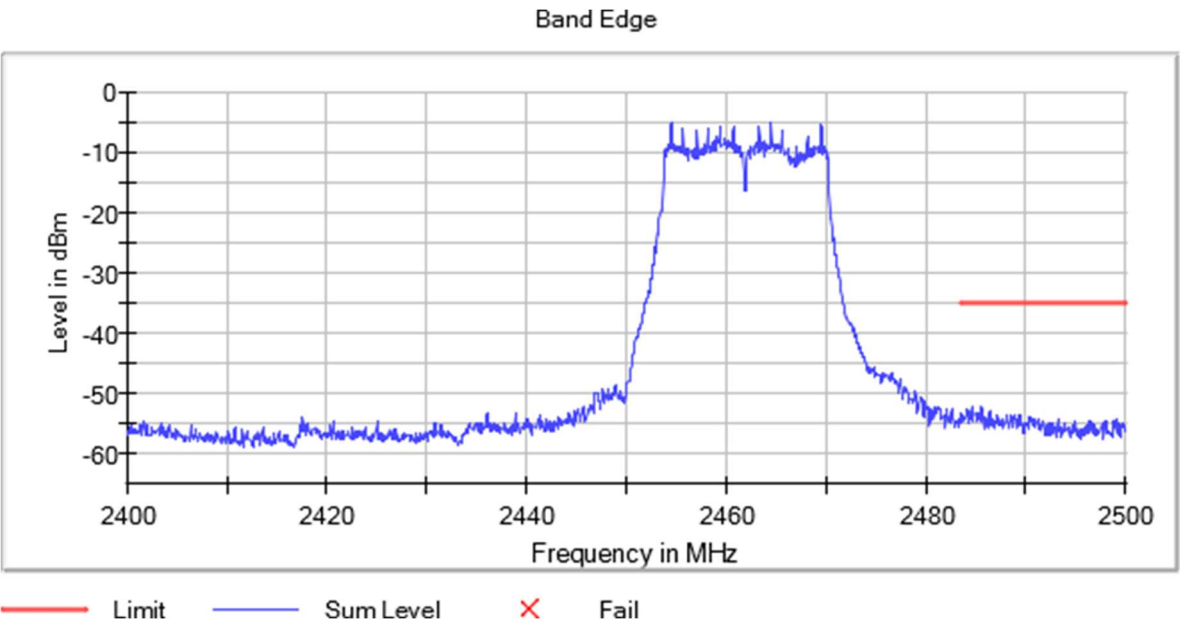
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



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), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



RSS-247 5.5 / FCC 15.247 (d) [RSE] 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.

Results

Modulation: 802.11g (OFDM 6 Mbit/s)

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2412.00	[0.03, 1]	32.153400	13.46	V	QP
2412.00	[0.03, 1]	32.153400	21.40	V	PK
2412.00	[1, 3]	2384.530000	54.11	H	PK
2412.00	[1, 3]	2384.530000	41.11	H	AVG
2462.00	[1, 3]	2484.680000	55.32	H	PK
2462.00	[1, 3]	2484.680000	40.10	H	AVG

Modulation: 802.11b (DSSS 1 Mbit/s)

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2412.00	[0.03, 1]	33.385300	12.57	V	QP
2412.00	[0.03, 1]	33.385300	20.22	V	PK
2442.00	[0.03, 1]	36.872450	20.61	V	QP
2442.00	[0.03, 1]	36.872450	26.37	V	PK
2462.00	[0.03, 1]	31.542300	15.20	V	QP
2462.00	[0.03, 1]	31.542300	22.69	V	PK

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

Freq (MHz)	Freq Rng (GHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
2462.00	[0.03, 1]	31.862400	15.91	V	QP
2462.00	[0.03, 1]	31.862400	24.15	V	PK

Verdict

Pass

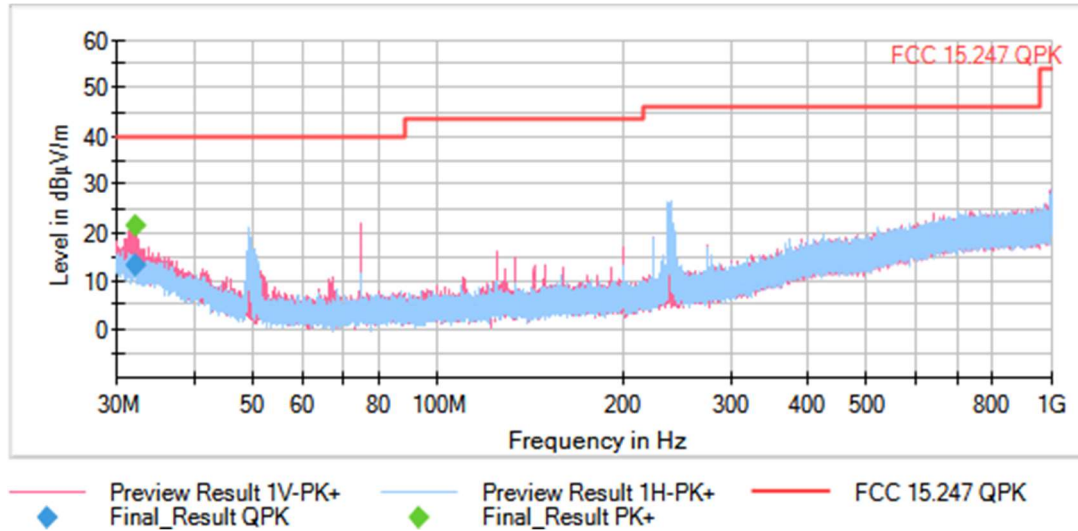
Uncertainty

Measurement Uncertainty (dB): $0.03 \text{ GHz} \leq f \leq 1 \text{ GHz}$: $< \pm 5.17$
 $1 \text{ GHz} \leq f \leq 3 \text{ GHz}$: $< \pm 4.11$
 $3 \text{ GHz} < f \leq 17 \text{ GHz}$: $< \pm 5.13$
 $17 \text{ GHz} < f \leq 26 \text{ GHz}$: $< \pm 4.81$

Attachments

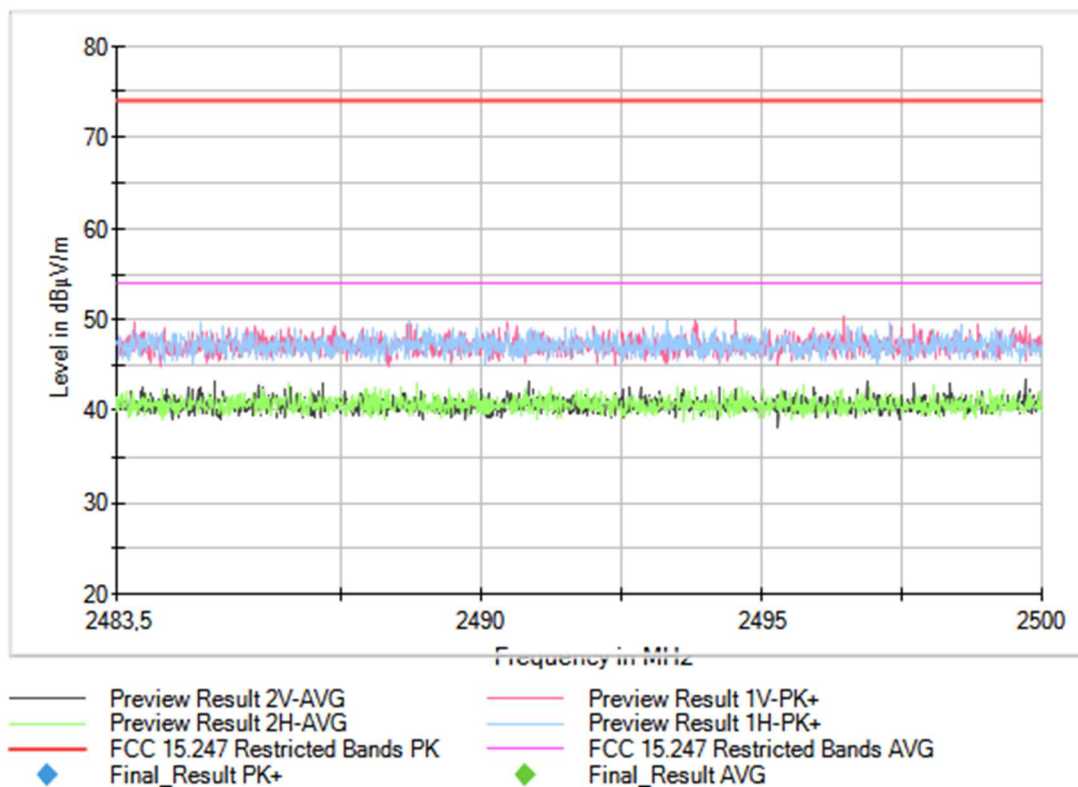
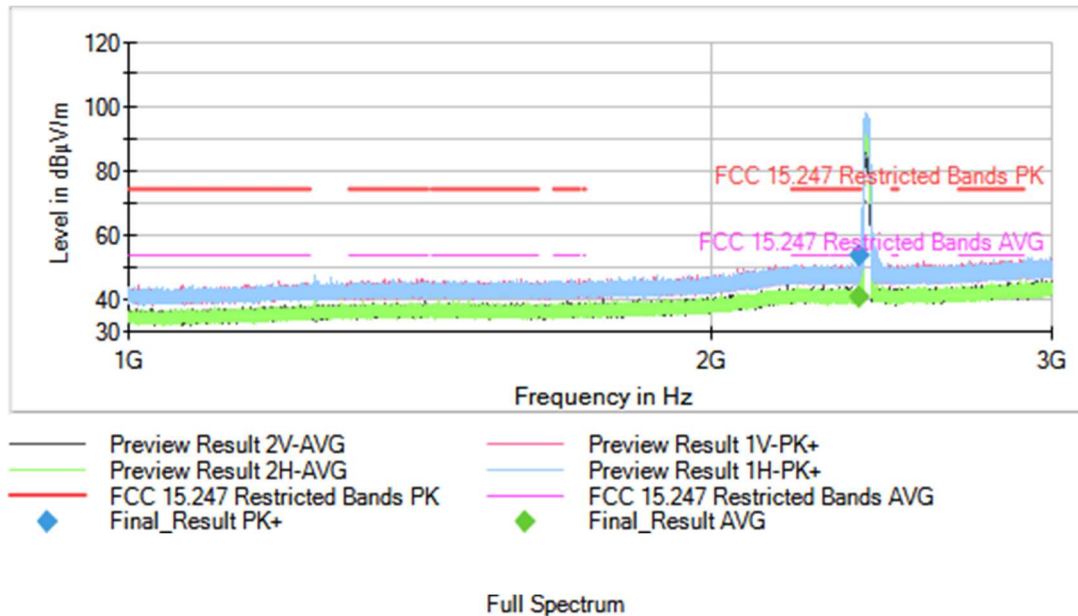
Operation Band MHz = [2400, 2483.5], Frequency MHz = The spurious frequencies detected do not depend neither on the operating channel, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [0.03, 1], Measurement Point = 1

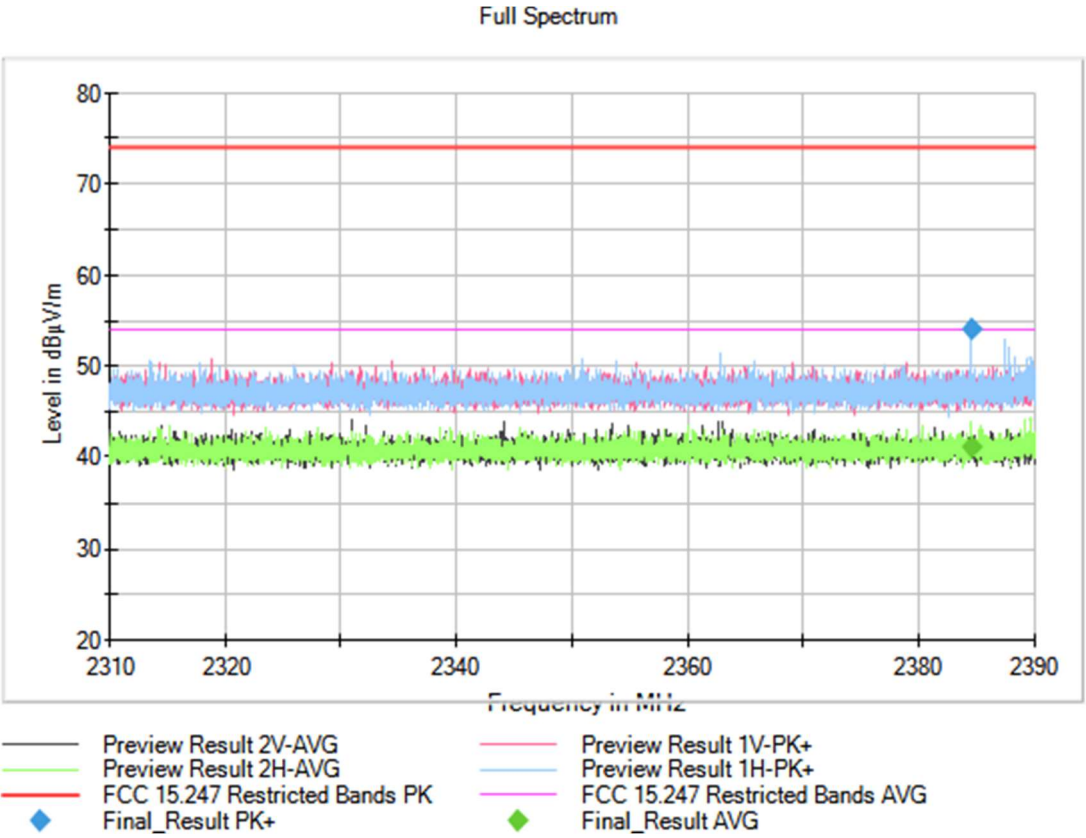
Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [1, 3], Measurement Point = 1

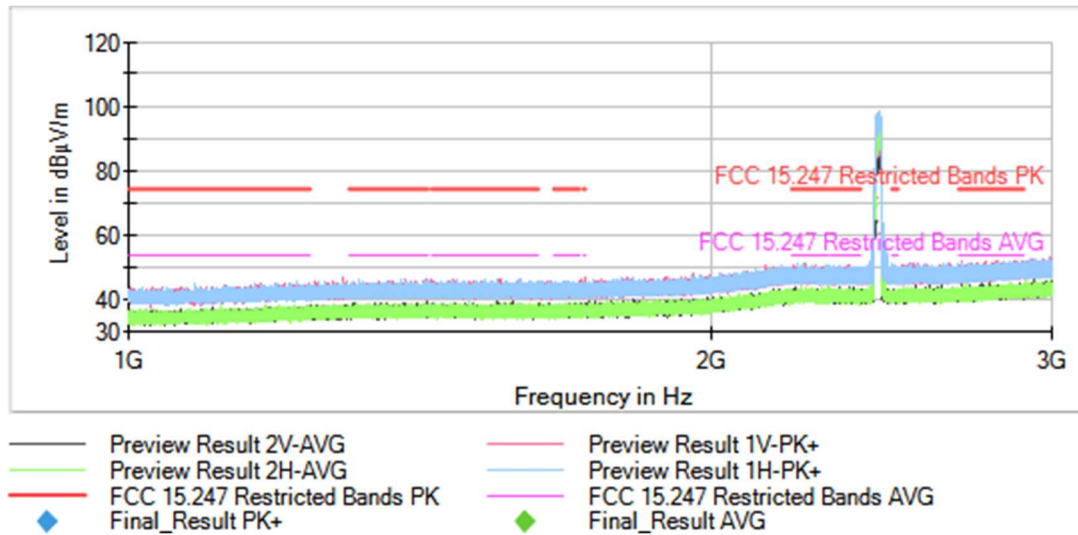
Images:



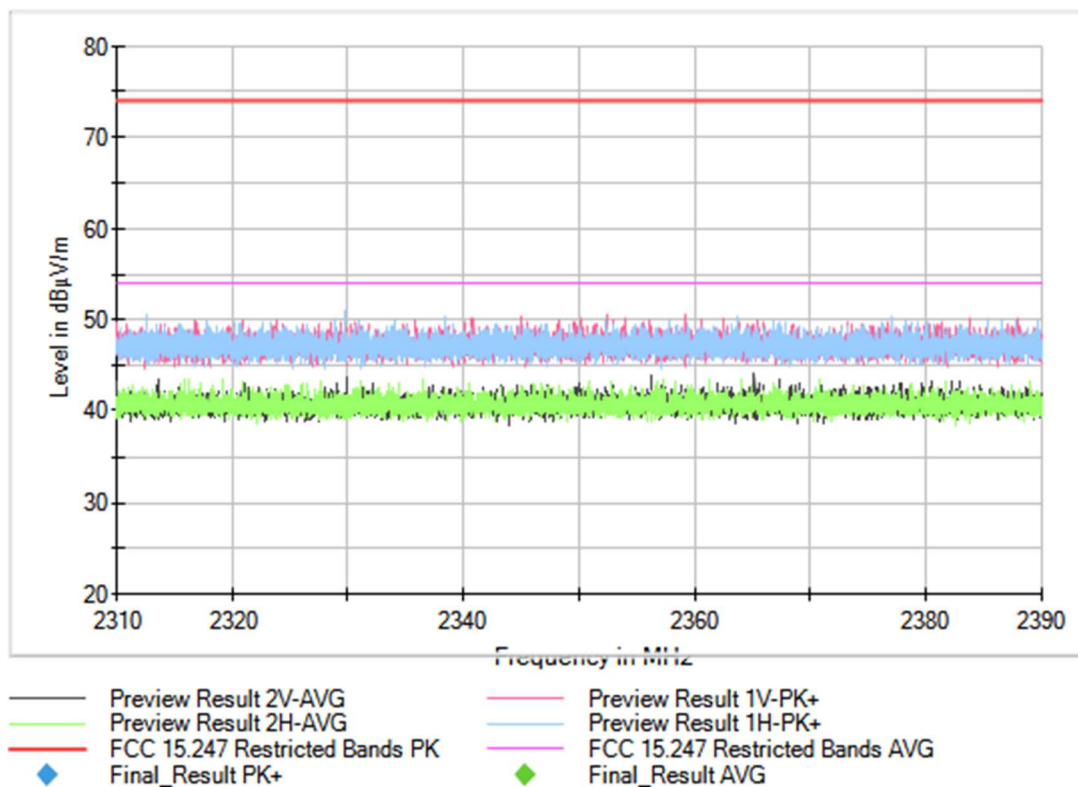


Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [1, 3], Measurement Point = 1

Images:



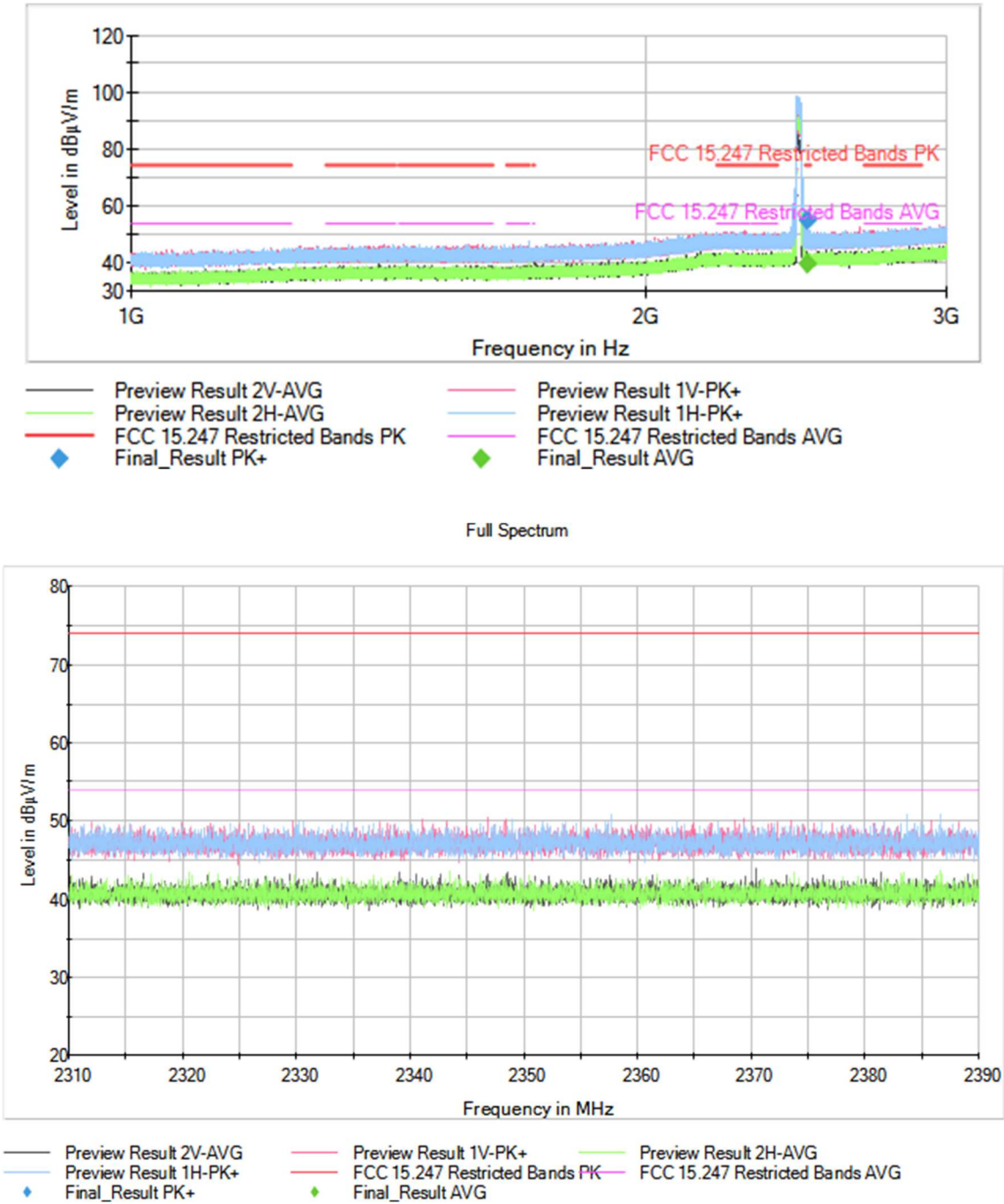
Full Spectrum





Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00000, Equipment Type = Digital
Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [1, 3],
Measurement Point = 1

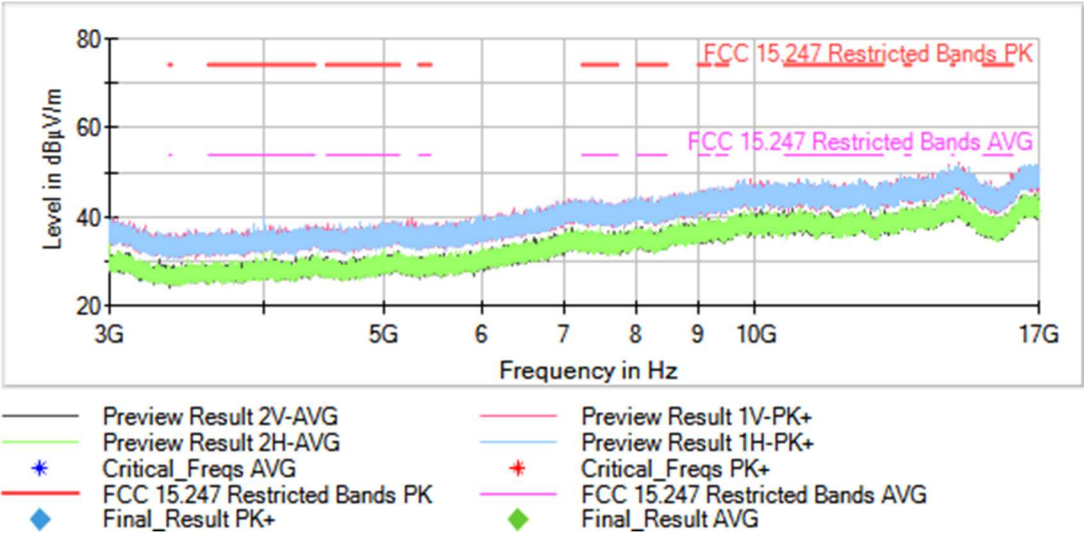
Images:





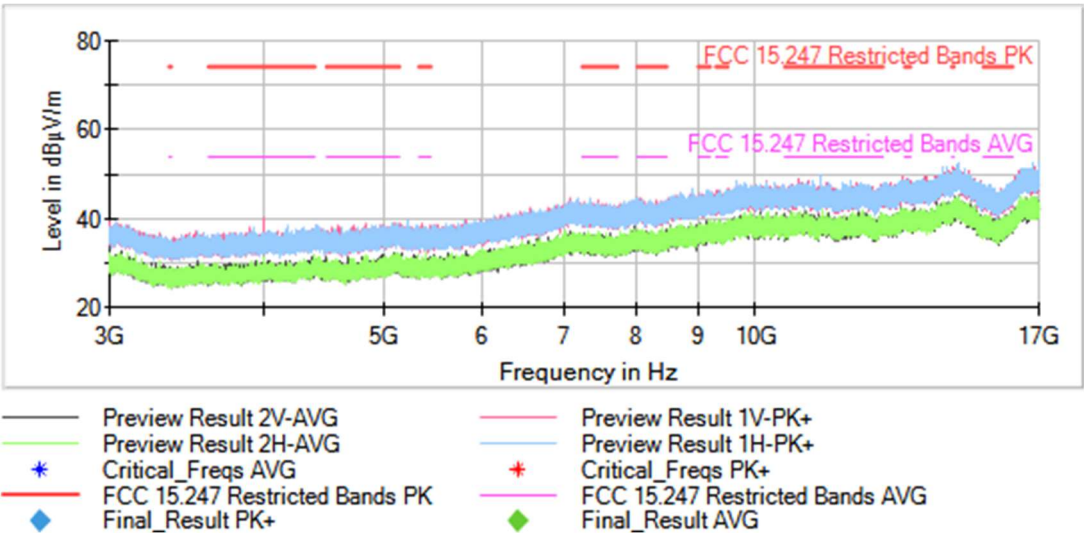
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [3, 17], Measurement Point = 1

Images:



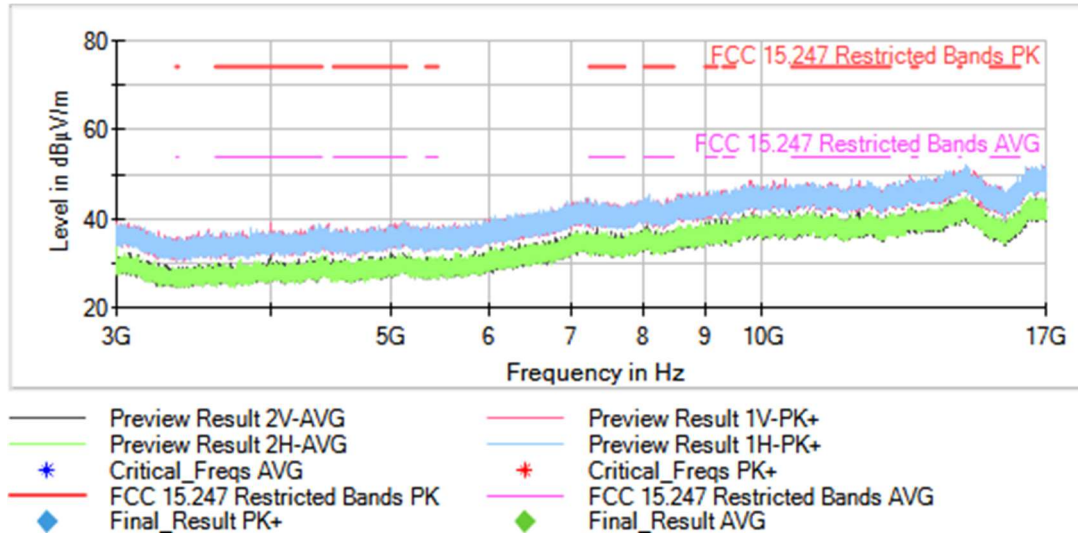
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [3, 17], Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [3, 17], Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s), Frequency Range GHz = [17, 26], Measurement Point = 1

Images:

