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

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
75163RRF.005A1

Test Report

USA FCC Part 15.407, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Infotainment Head Unit
(*) Trademark	Marelli
(*) Model and /or type reference	HUAIDP20BY
Other identification of the product	FCC ID: RX2HUAIDP20BY IC: 4983A-HUAIDP20BY HUAIDP20BY HW version: PRS2.1 SW version: PI26.50
(*) Features	Bluetooth, WLAN 5GHz Channel #149
Applicant	Marelli Europe S.p.A. Viale A. Borletti 61/63 – 20011 Corbetta (MI) - ITALY
Test method requested, standard	USA FCC Part 15.407 (10-1-21) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-21) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 3 (February 2023). CANADA RSS-Gen Issue 5 Amendment 2 (February 2021). Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456)
Date of issue	2024-04-08
Report template No	FDT08_24 (*) "Data provided by the client"

Index

Acronyms

Acronym ID	Acronym Description
Avg Power	Maximum Average Conducted Output Power
DC	Duty Cycle
Detector	Detector used
Ebw	Emission Bandwidth
Freq	Frequency
Freq Rng	Frequency Range
MP	Measurement Point
Max EIRP	Maximum Burst EIRP
Mod	Modulation
Mode	MIMO Mode
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
Pol	Polarization
Port	Active Port
TPC	Transmit Power Control
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

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

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

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

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

General conditions

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

Uncertainty

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

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 1 GHz is: Measurement uncertainty ≤ ± 5,35 dB with factor (k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 1 GHz to 17 GHz is: Measurement uncertainty ≤ ± 4,32 dB with factor (k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 40 GHz is: Measurement uncertainty ≤ ± 5,55 dB with factor (k = 2).

The total uncertainty of the measurement system for the conducted testing of EUT is:
RF Average Output Power: Measurement uncertainty ≤ ± 2,01 dB
Duty Cycle: Measurement uncertainty ≤ ± 0,84 ms
Power Spectral Density: Measurement uncertainty ≤ ± 2,01 dB
Occupied/26 dBc Bandwidth: Measurement uncertainty
≤ ± 57,76 kHz for BW 20MHz;
≤ ± 115,53 kHz for BW 40MHz; and
≤ ± 231,06 kHz for BW 80MHz.

6 dB Banwidth: Measurement uncertainty
≤ ± 34,67 kHz for BW 20MHz;
≤ ± 46,22 kHz for BW 40MHz; and
≤ ± 80,90 kHz for BW 80MHz.

Conducted Band-edge spurious emissions: Measurement uncertainty ≤ ± 2,57 dB
DFS Channel closing & Move time: Measurement uncertainty ≤ ± 0,84 ms
DFS Detection Threshold Level: Measurement uncertainty ≤ ± 1,81 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 Infotainment Head Unit, with Bluetooth and Wi-Fi.

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	75163_10.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_11.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_12.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_13.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_14.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_16.1	Infotainment Unit	HUAIDP20BY	190S3B0PM47D	2023-09-25	Element Under Test
	75163_3.1	Harness	--	--	2023-09-25	Element Under Test
	75163_5.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_6.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_8.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_9.1	Cable FAKRA	--	--	2023-09-25	Element Under Test
	75163_1.1	Module	--	--	2023-09-25	Auxiliary Element
	75163_4.1	AIDA CANBOX	--	--	2023-09-25	Auxiliary Element
S/02	75163_19.1	Infoteinment module CONDUCTED	IVI-R2 HIGH ETH100M ROW	190S3B0T047D	2023-10-04	Element Under Test
	75163_17.1	Canbox	AIDA	--	2023-10-04	Auxiliary Element
	75163_23.1	Harness	--	--	2023-10-04	Auxiliary Element
	75163_24.1	USB- FAKRA cable	--	--	2023-10-04	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Radiated
S/02	Conducted

Test sample description

<table>
<tr><td rowspan="7">Ports…… :</td><td 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>MB connector (black)</td><td>>3</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>SB connector (blue)</td><td>>3</td><td>[X]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>shielded cables</td><td>>3</td><td>[X]</td><td>[X]</td><td>[ ]</td></tr>
<tr><td>.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>.....</td><td>.....</td><td>[ ]</td><td>[ ]</td><td>[ ]</td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="5">.....</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>[ ]</td><td>AC: .....</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>[X]</td><td colspan="5">DC: MB and SB: 9.5 – 16Vdc; Nominal voltage: 12 Vdc</td></tr>
<tr><td></td><td>[X]</td><td colspan="5">DC: shielded cables: 13.5Vdc nominal voltage</td></tr>
<tr><td>Rated Power .....:</td><td colspan="6">.....</td></tr>
<tr><td>Clock frequencies.....:</td><td colspan="6">.....</td></tr>
<tr><td>Other parameters .....:</td><td colspan="6">.....</td></tr>
<tr><td>Software version .....:</td><td colspan="6">PI26.50</td></tr>
<tr><td>Hardware version .....:</td><td colspan="6">PRS2.1</td></tr>
<tr><td>Dimensions in cm (W x H x D) ....:</td><td colspan="6">220 x 160 x 52 mm</td></tr>
<tr><td rowspan="5">Mounting position .....:</td><td>[ ]</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>[X]</td><td colspan="5">Other: HUAIDP20BY is installed in vehicle dashboard (automotive environment)</td></tr>
</table>

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

Marelli Europe S.p.A.
Viale A. Borletti 61/63 – 20011 Corbetta (MI) - ITALY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-10-09
Date (finish)	2023-12-04

Document history

Report number	Date	Description
75163RRF.005	2024-01-29	First release.
75163RRF.005A1	2024-04-08	First modification. In the main page, the standard “CANADA RSS-247 Issue 2 (February 2017)” is corrected to “CANADA RSS-247 Issue 3 (February 2023)”. This report cancels and replaces the previous 75163RRF.005.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Jia Hao Luo Chen and Victoria Olmedo Villalba.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
05850	DIGITAL MULTIMETER	179	FLUKE	2024-11-02
05862	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2025-02-15
07796	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2024-03-16
07763	HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
09968	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2026-09-22
08848	OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2024-12-21
00922	POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	--
08130	SEMIANECHOIC ABSORBER LINED CHAMBER	P29419	ALBATROSS	--
08134	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	--
06793	SHIELDED ROOM	S101	ETS LINDGREN	--
06668	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2024-12-14
07794	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2025-04-21
08040	SIGNAL GENERATOR 9kHz-6GHz	SMB100B	ROHDE AND SCHWARZ	2023-12-30
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
07550	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
07549	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
08002	TEMPERATURE CHAMBER MK56 BINDER	MK 56	BINDER	2024-03-21
08847	VECTOR SIGNAL GENERATOR 100kHz-7.5GHz	SMW200A	ROHDE AND SCHWARZ	2025-09-29
07795	WIRELESS CONNECTIVITY TESTER BW 160 MHz	CMW270	ROHDE AND SCHWARZ	2023-12-29
07798	WMS32	WMS32	ROHDE AND SCHWARZ	--

Testing verdicts

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

Summary

Common requirements for all bands

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		**Verdict**	**Remark**
Duty Cycle		P	
99% Occupied Bandwidth		P	
26 dB Emission Bandwidth (EBW)		P	
Supplementary information and remarks: None.			

U-NII-3 Band: 5.725 - 5.85 GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum conducted Output Power	P	
FCC 15.407 (e) / RSS-247 6.2.4.1	6 dB bandwidth.	P	
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b)(4) / RSS-247 6.2.4.2	Transmitter Band Edge Radiated Emissions	P	
FCC 15.407 (b)(4)(6) / RSS-247 6.2.4.2	Transmitter Out of Band Radiated Emissions	P	
Supplementary information and remarks: None.			

Appendix A: Test results for the U-NII-3 Band 5.725 - 5.85 GHz

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	12Vdc
Type of Power Supply:	External power supply (DC)

ANTENNA (*):

Type of Antenna:	Integral
Maximum Declared Antenna Gain:	0dBi

Technology Tested:	WLAN (IEEE 802.11 a/n/ac): U-NII-3 band	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps	
	802.11n HT20: MCS0 to MCS7	
	802.11n HT40: MCS0 to MCS7	
	802.11ac VHT20: MCS0 to MCS8	
	802.11ac VHT40: MCS0 to MCS9	
	802.11ac VHT80: MCS0 to MCS9	
Setting of cores / ports:	One port.	
Beamforming:	No	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 149	5745
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 151	5755
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 155	5775

The test set-up was made in accordance to the general provisions of FCC Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017.

The EUT was tested in the following operating mode:

- Continuously transmitting with a modulated carrier at maximum power in all required channels using the supported data rates/modulations types.

The field strength at the band edges was evaluated for each mode on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied instructions to configure the EUT. The customer supplied a document containing the setup instructions.

The worst cases for testing were identified for output power and spurious levels at the band edges which were selected based on preliminary testing that correspond to next data rates:

- 802.11 a20: 6 Mbps
- 802.11 n HT20: MCS0
- 802.11 n HT40: MCS0
- 802.11 ac VHT20: MCS0
- 802.11 ac VHT40: MCS0
- 802.11 ac VHT80: MCS0

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

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

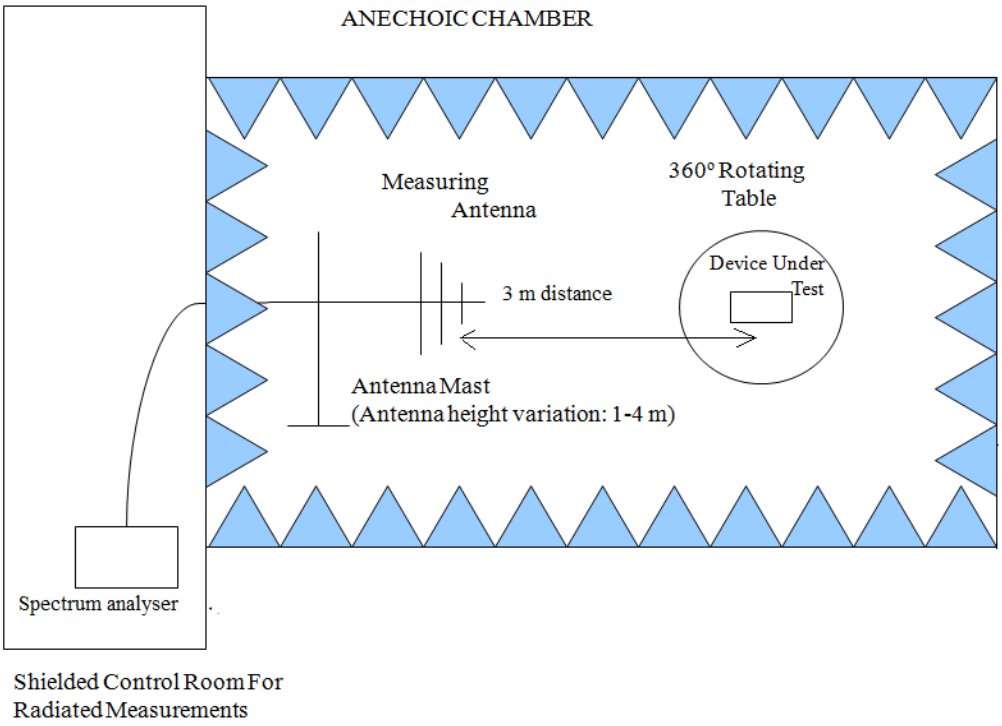
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

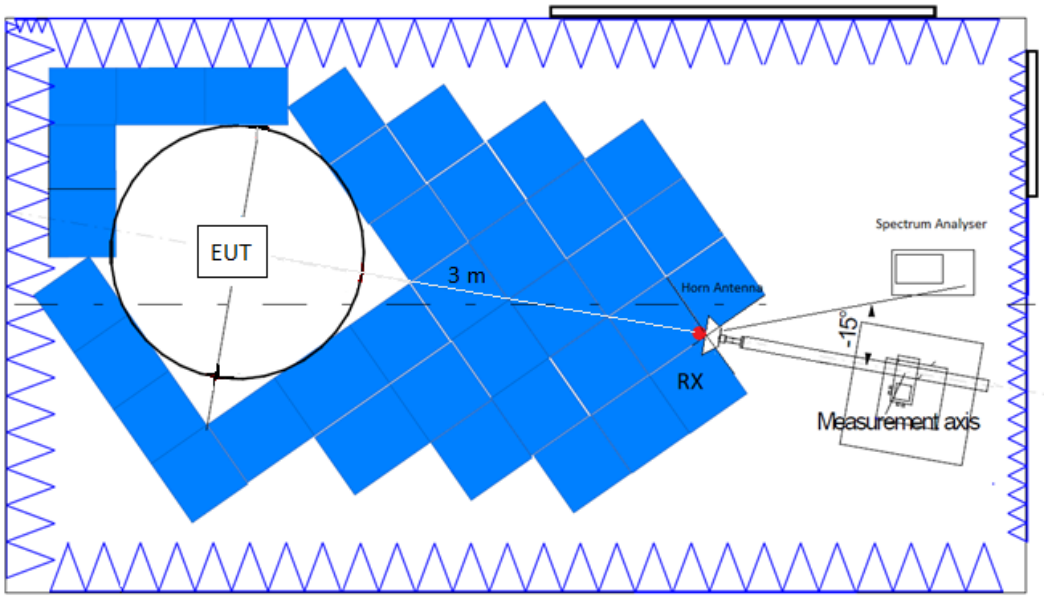
The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

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.

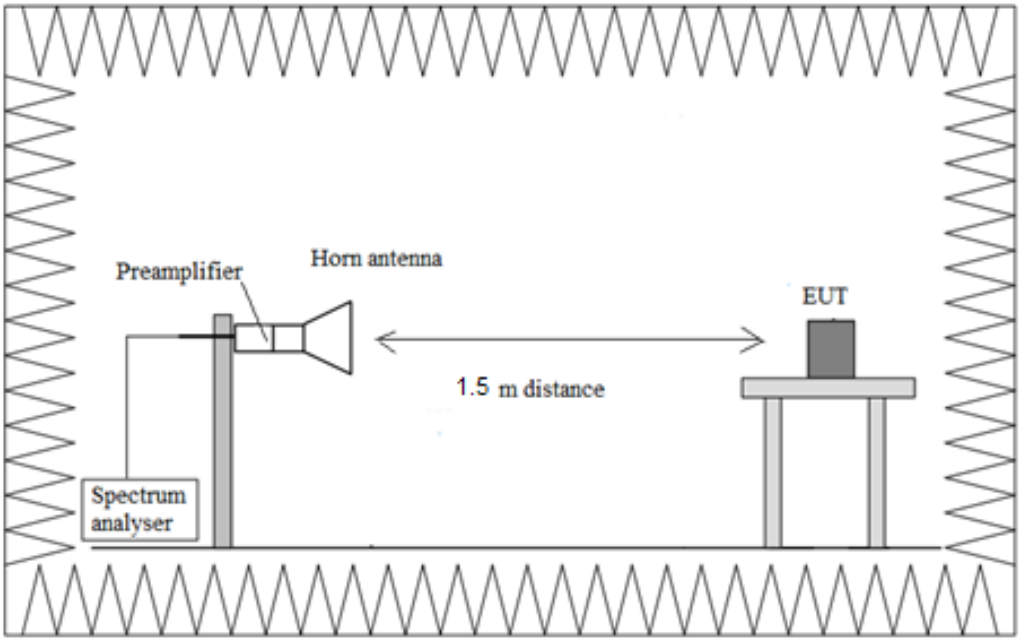
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

RSS-247 6.2.4.1 / FCC 15.407 (a) (3) Maximum Conducted output power UNII-3

Limits

FCC 15.407: For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247: The maximum conducted output power shall not exceed 1 W.

Results

The maximum conducted output power was measured according to ANSI C63.10-2013 clause 11.9.2.3.2 and clause E.3.b) of Guidance 789033 D02 General UNII Test Procedures New Rules v02r01 (Method AVGPM-G). A gated RF average power meter was used; therefore, no duty cycle correction factor is applicable to the measured results.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For all modes of operation, the antenna gain is less than 6 dBi.

Maximum Declared Antenna Gain: 0 dBi

Modulation: 802.11a (OFDM 6 Mbit/s):

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5745.00000	No	13.07	13.07

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

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5745.00000	No	12.71	12.71

Modulation: 802.11ac VHT20 (OFDM MCS0):

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5745.00000	No	12.67	12.67

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s):

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5755.00000	No	12.43	12.43

Modulation: 802.11ac VHT40 (OFDM MCS0):

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5755.00000	No	12.61	12.61

Modulation: 802.11ac VHT80 (OFDM MCS0x1):

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5725, 5850]	1	5775.00000	No	10.57	10.57

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

Verdict

Pass

RSS-247 6.2.4.1 / FCC 15.407 (e) 6 dB Emission Bandwidth

Limits

For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

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

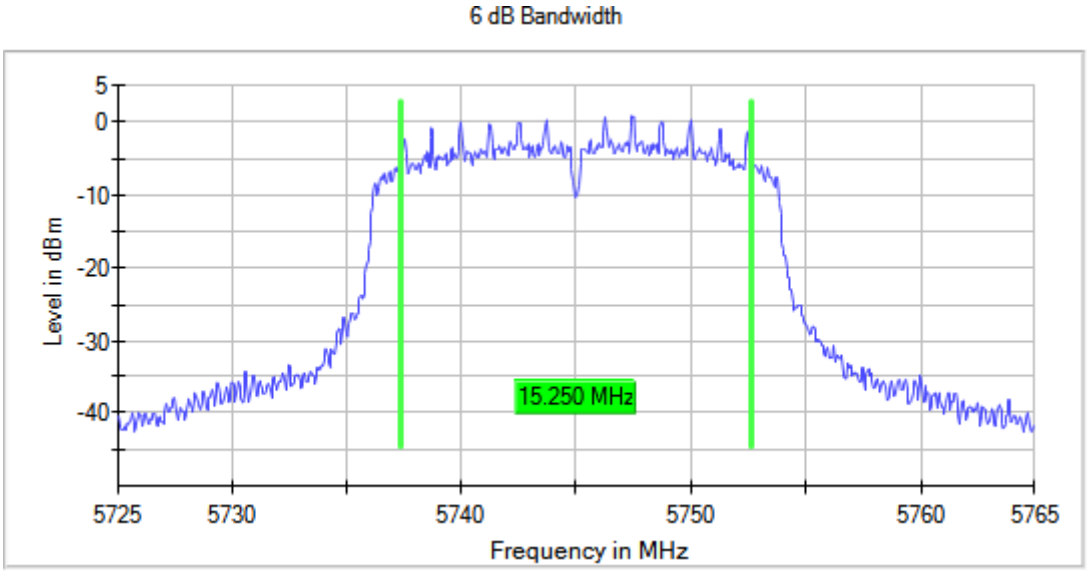
Results

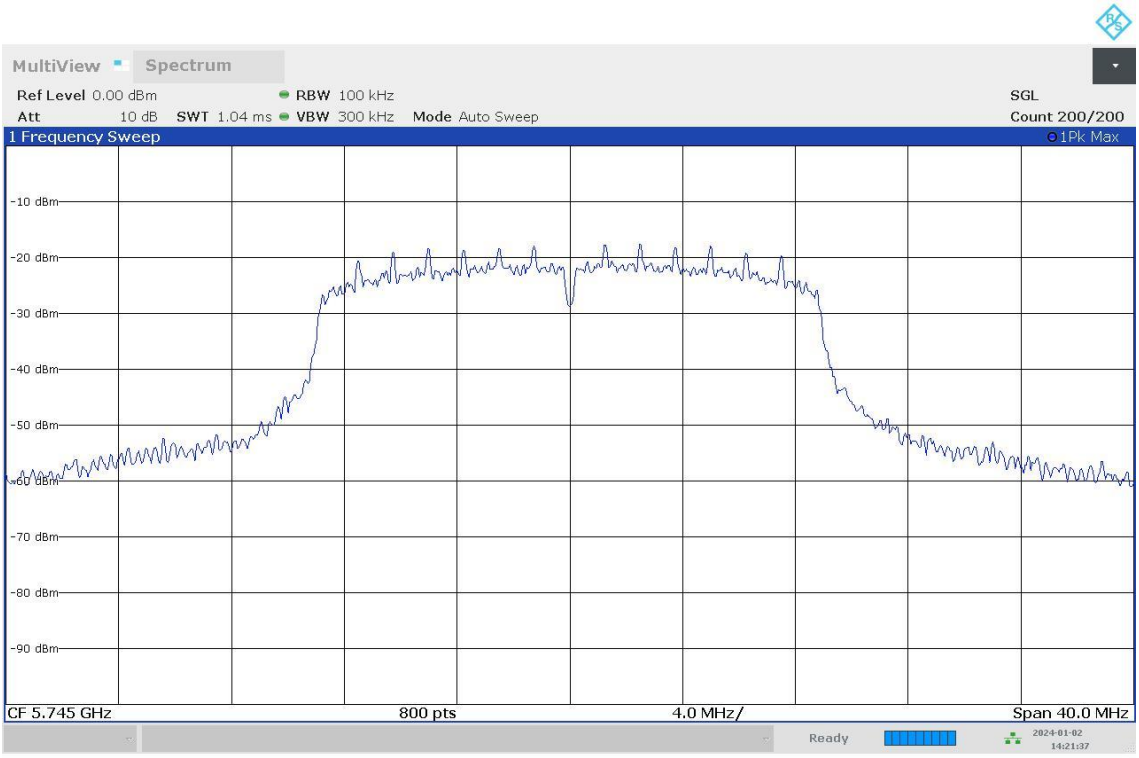
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	15.250

Verdict

Pass

Images:





02:21:38 PM 01/02/2024

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

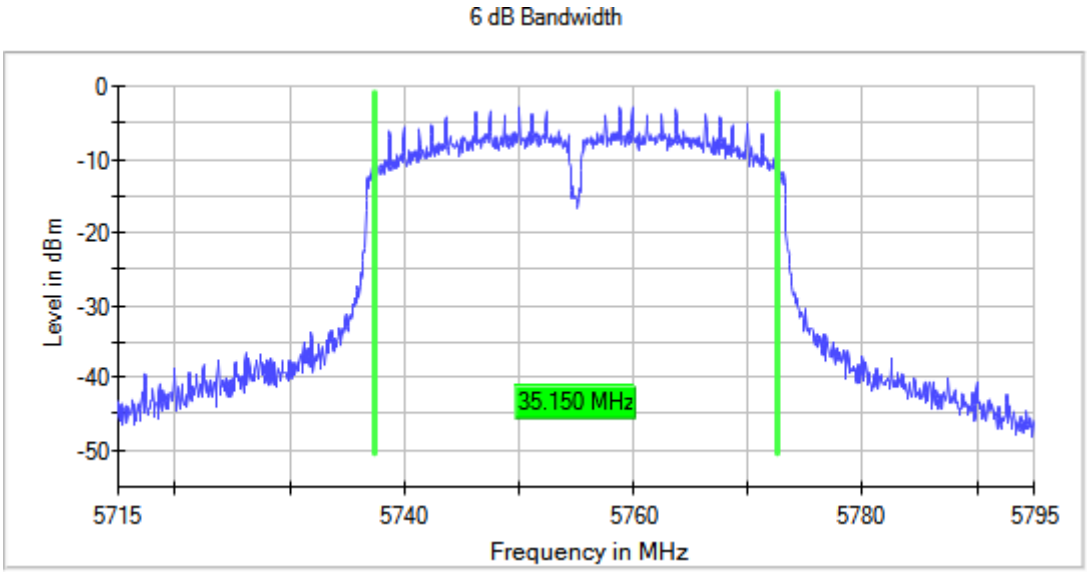
Results

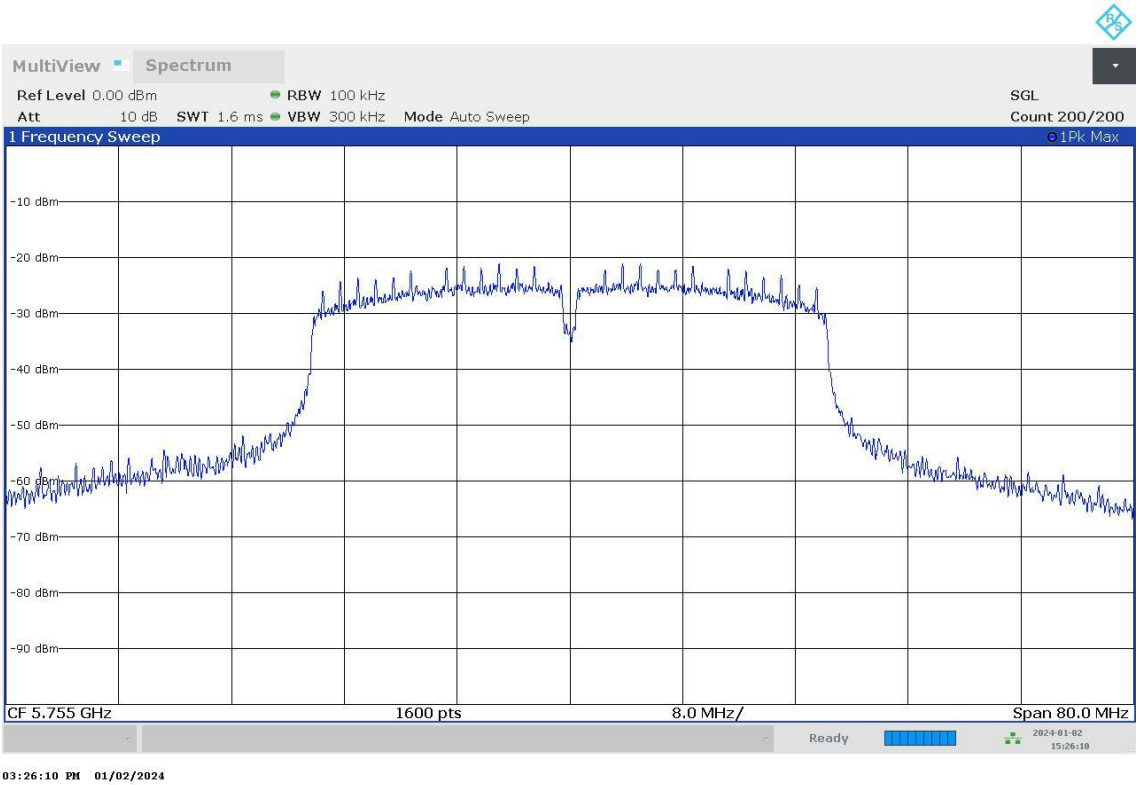
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5755.00000	35.150

Verdict

Pass

Images:





Modulation: 802.11a (OFDM 6 Mbit/s)

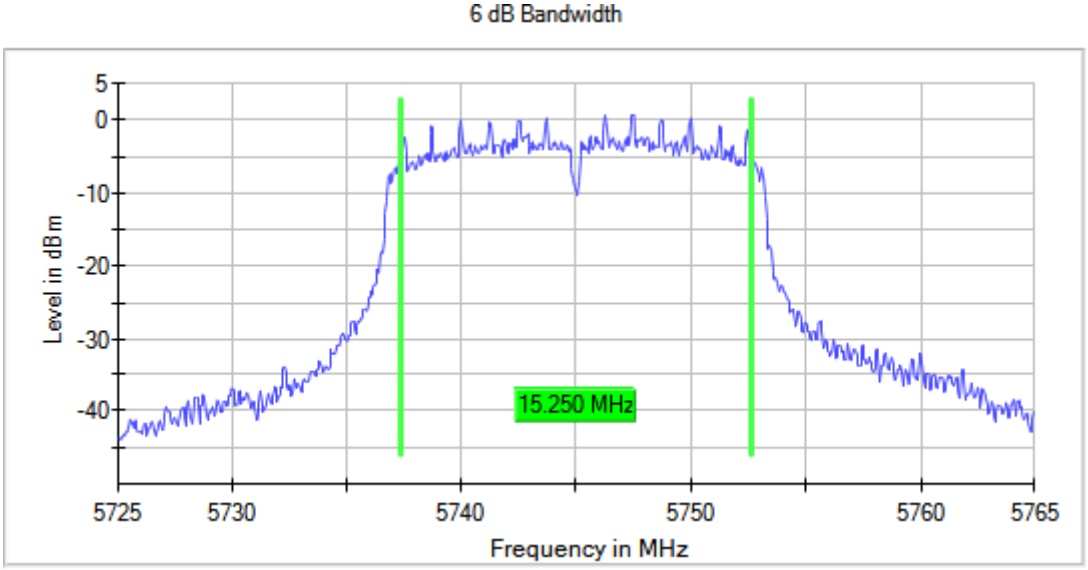
Results

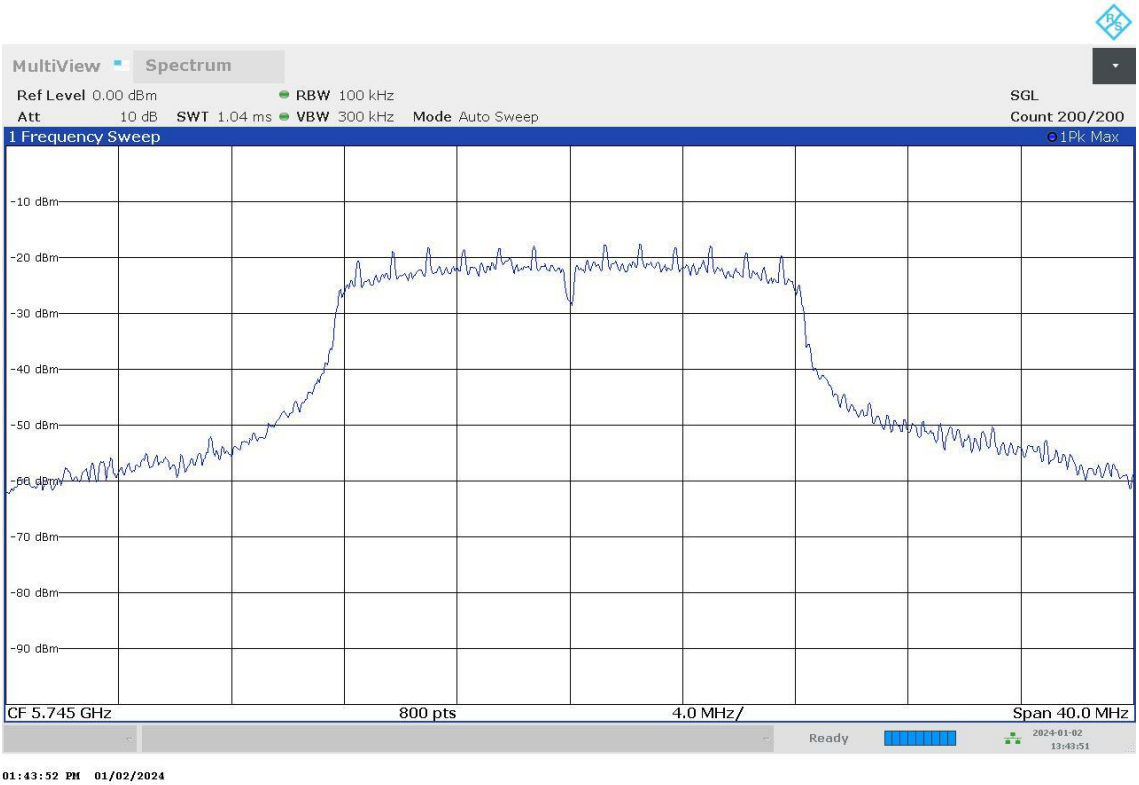
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	15.250

Verdict

Pass

Images:





Modulation: 802.11ac VHT20 (OFDM MCS0)

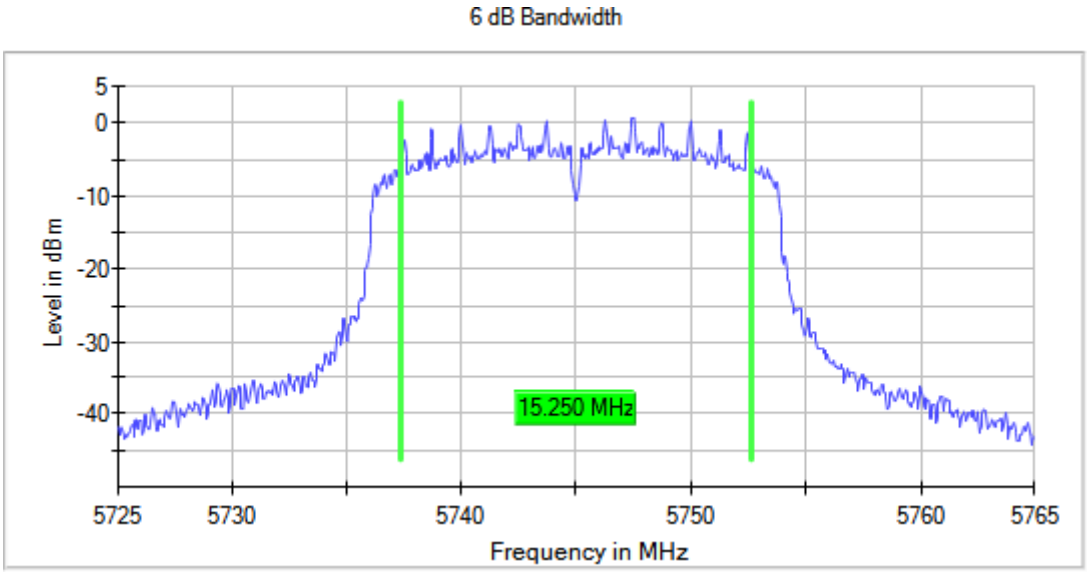
Results

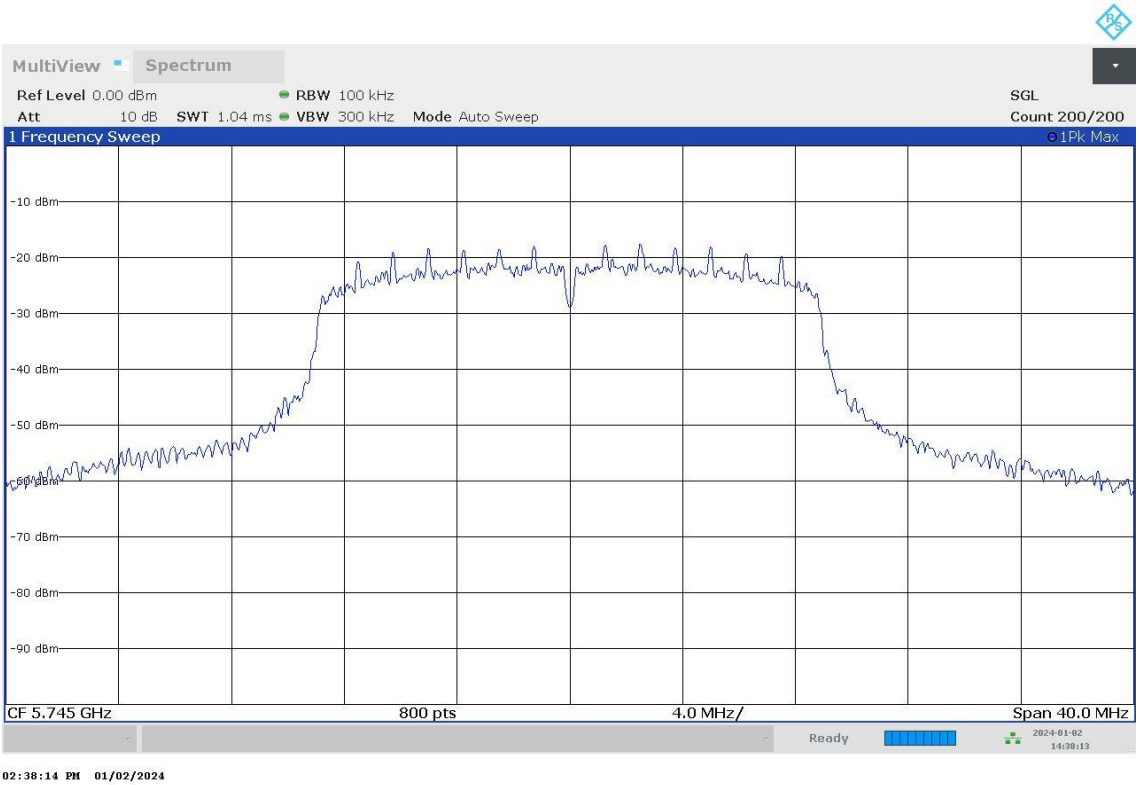
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	15.250

Verdict

Pass

Images:





Modulation: 802.11ac VHT40 (OFDM MCS0)

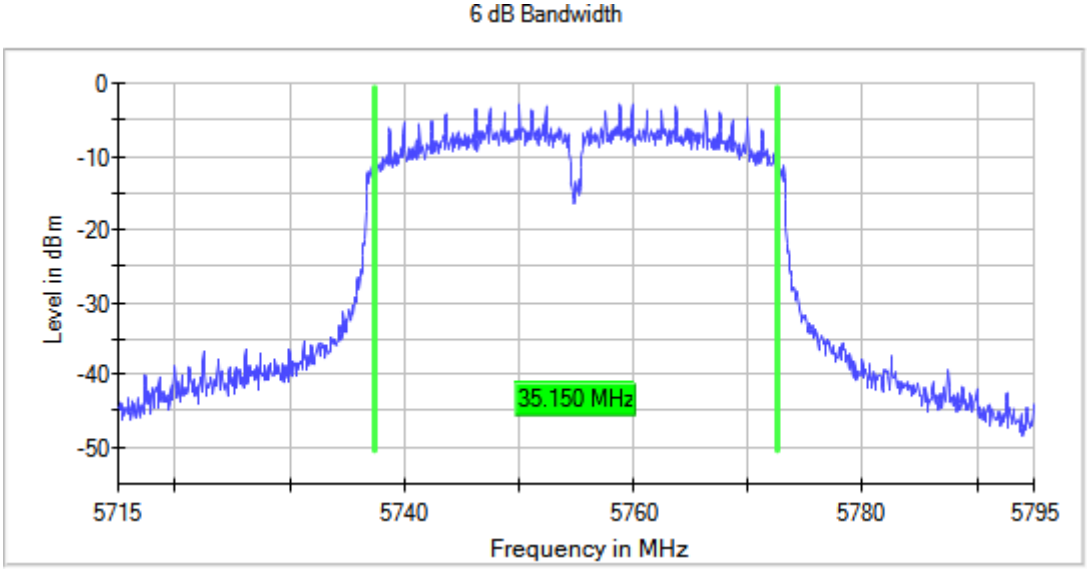
Results

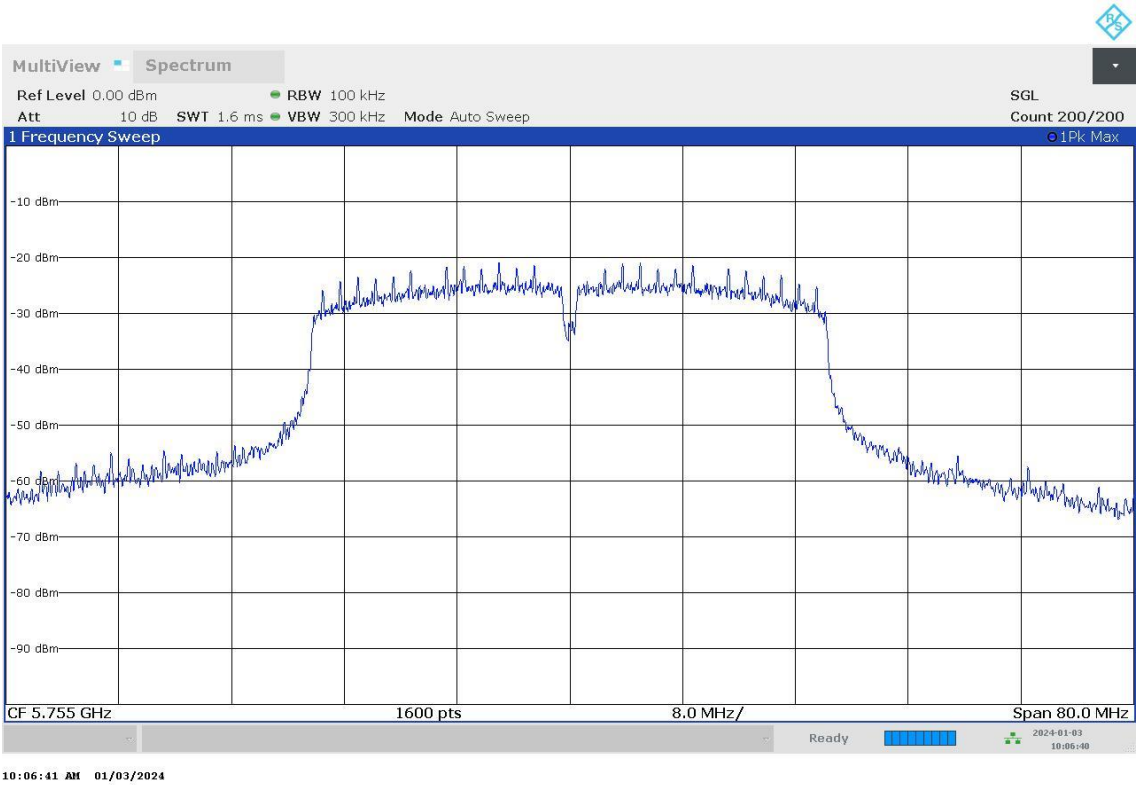
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5755.00000	35.150

Verdict

Pass

Images:





Modulation: 802.11ac VHT80 (OFDM MCS0x1)

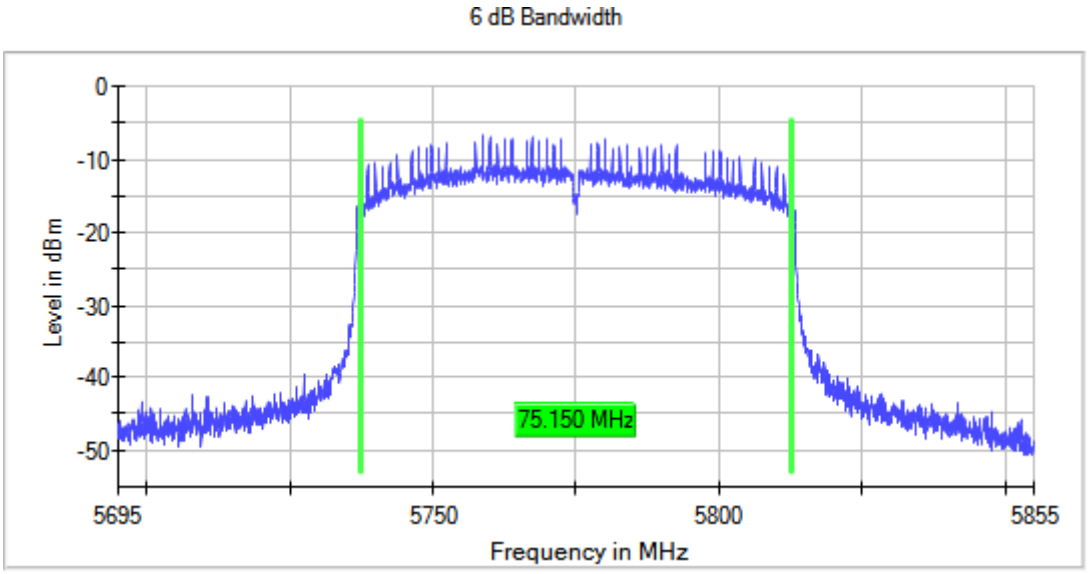
Results

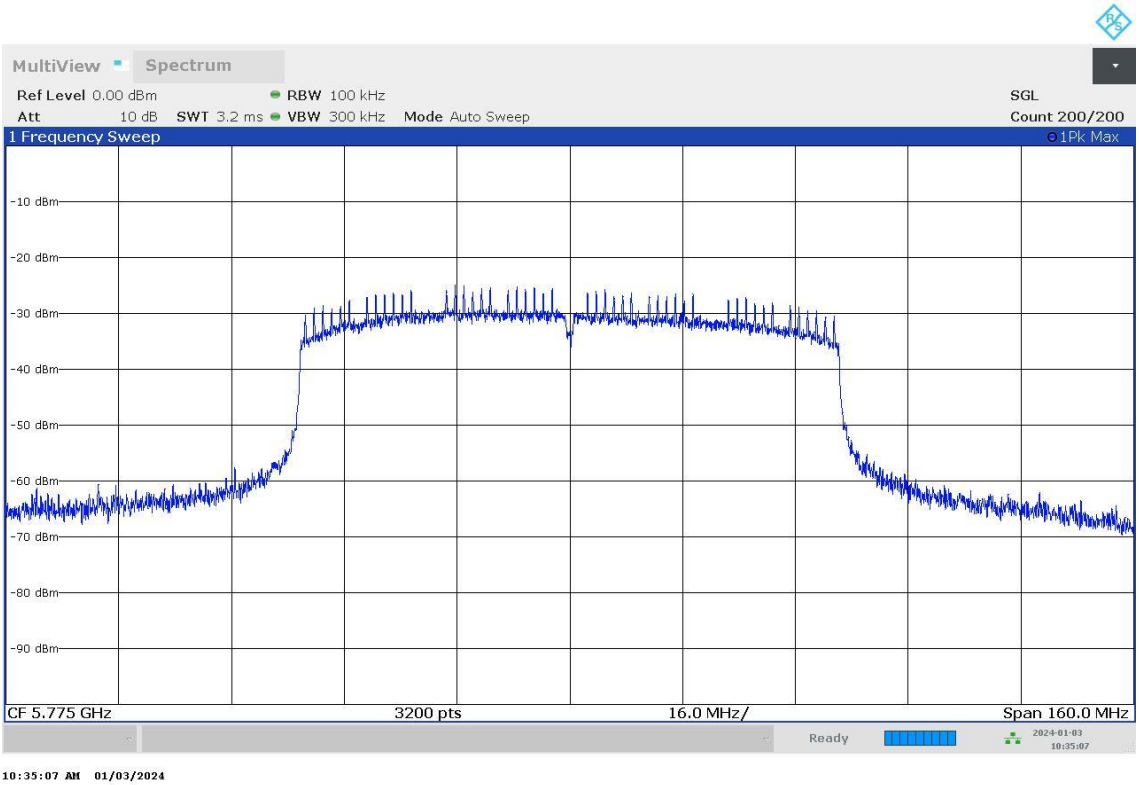
Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5775.00000	75.150

Verdict

Pass

Images:





RSS-247 6.2.4.2 / FCC 15.407 (b) (4) (6) Transmitter Out of Band Radiated Emissions For transmitters operating solely in the 5.725-5.850 GHz band

Limits

For transmitters operating in the 5.725–5.85 GHz band:

All emissions shall be limited to a level of −27 dBm/MHz (68.23 dBµV/m at 3 m distance) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

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.

Results

The field strength is calculated by adding a correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain. For measurements above 17 GHz performed at a reduced distance, this factor also includes an inverse proportionality factor of 20 dB per decade to normalize the measured data.

Test performed on the following modulations and data rates:

802.11 a20:	6 Mbps
802.11 n HT20:	MCS0
802.11 n HT40:	MCS0
802.11 ac VHT20:	MCS0
802.11 ac VHT40:	MCS0
802.11 ac VHT80:	MCS0

For spurious emissions outside of the U-NII-3 band-edge mask of 5.65-5.925 GHz, the worst-case mode was determined among all modulations after preliminary measurements of the radiated power spectral density.

The Low Channel was tested for the determined worst case.

Worst case: 802.11 n HT20: MCS0

Modulation: 802.11n HT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[5725, 5850]	1	[0.03, 1]	5745.00000	62.810	30.53	V	PK
				62.810	23.54	V	QP
				877.995	35.26	V	PK
				877.995	26.25	V	QP
		[1, 7]		No spurious emission detected at less than 20dB below the limit.			
		[7, 17]		11487.873	67.50	H	PK
				11487.873	51.93	H	AVG
		[17, 40]		No spurious emission detected at less than 20dB below the limit.			

Verdict

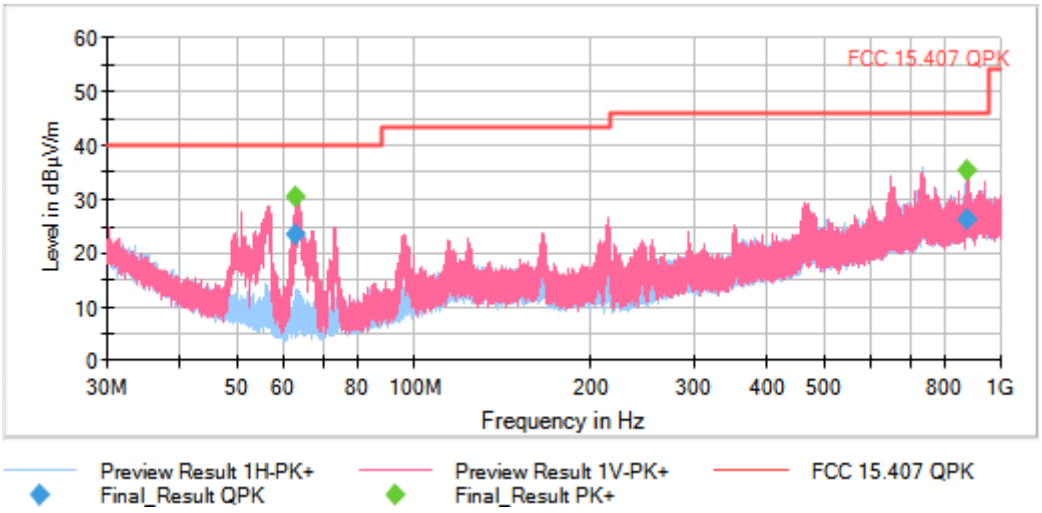
Pass

Attachments

Frequency Range GHz = [0.03, 1] Frequency MHz = 5745.00000

Modulation = 802.11n HT20 (OFDM MCS0)

Images:



Tables:

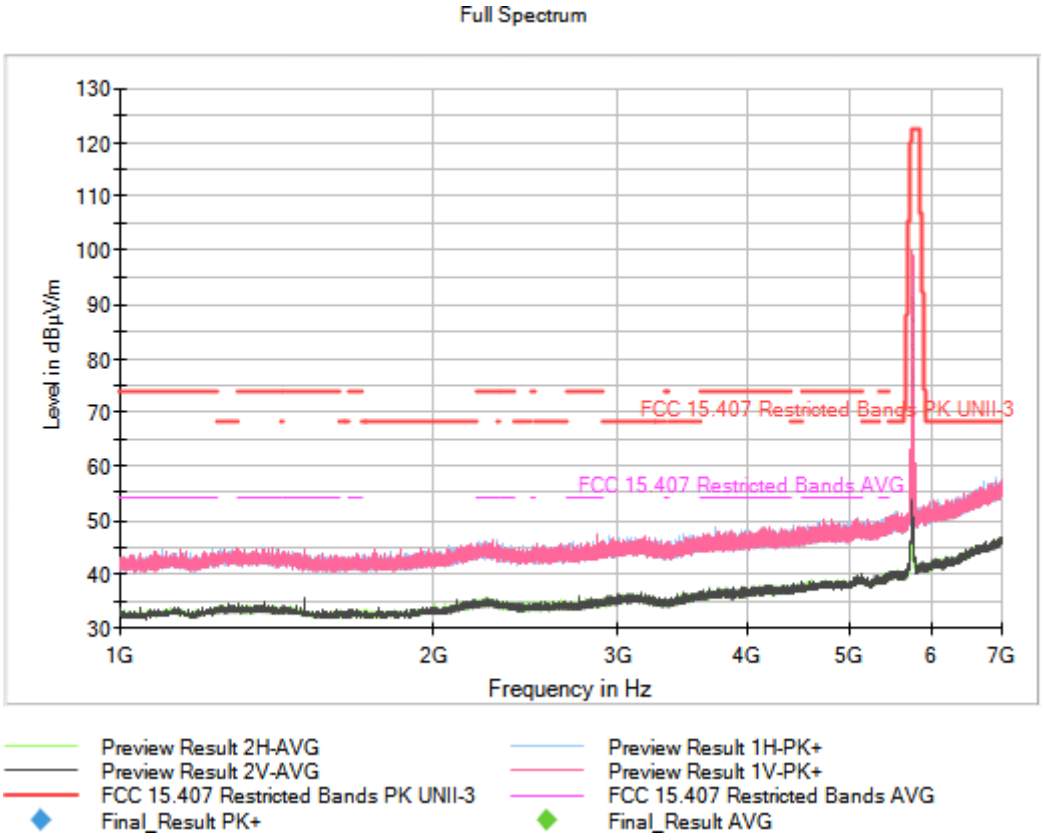
Spectrum Analyzer Parameters

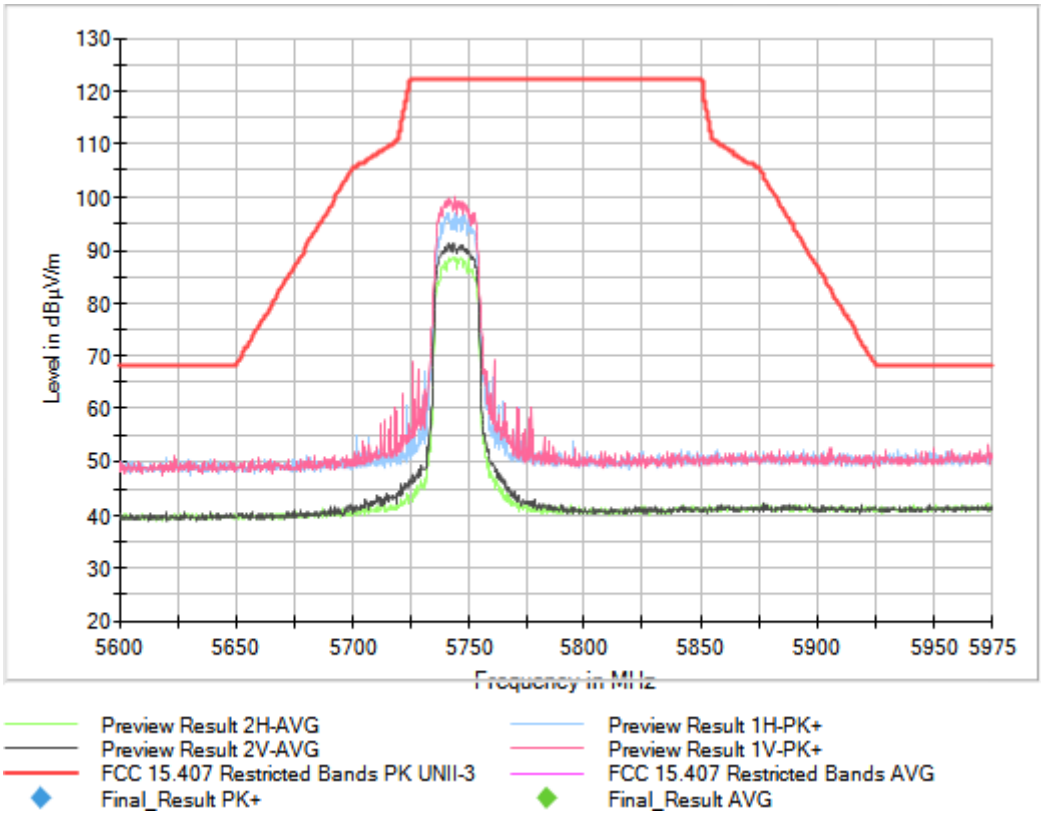
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	4,85 kHz	PK+	100 kHz	1 s	20 dB

Frequency Range GHz = [1, 7] Frequency MHz = 5745.00000

Modulation = 802.11n HT20 (OFDM MCS0)

Images:





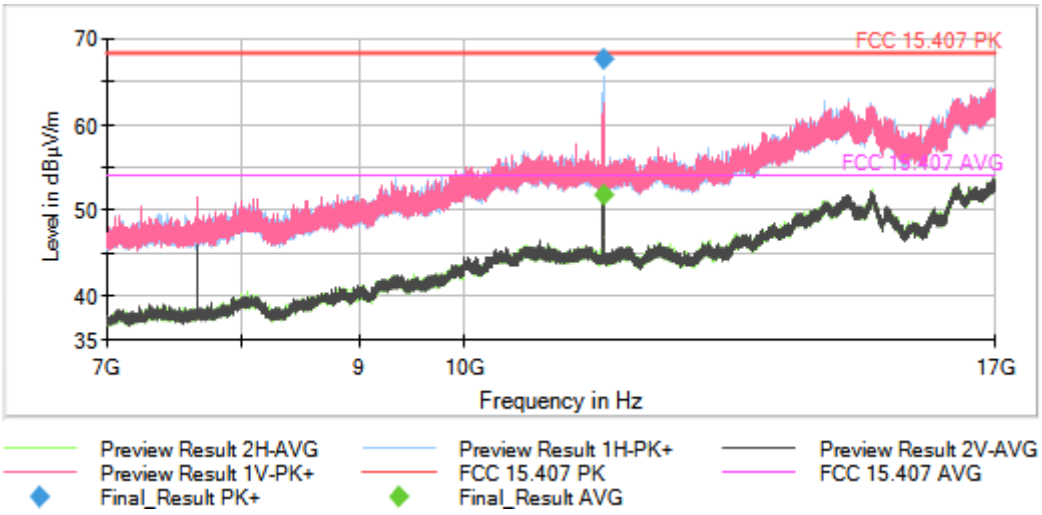
Tables:
Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 7 GHz	187,5 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [7, 17] Frequency MHz = 5745.00000

Modulation = 802.11n HT20 (OFDM MCS0)

Images:



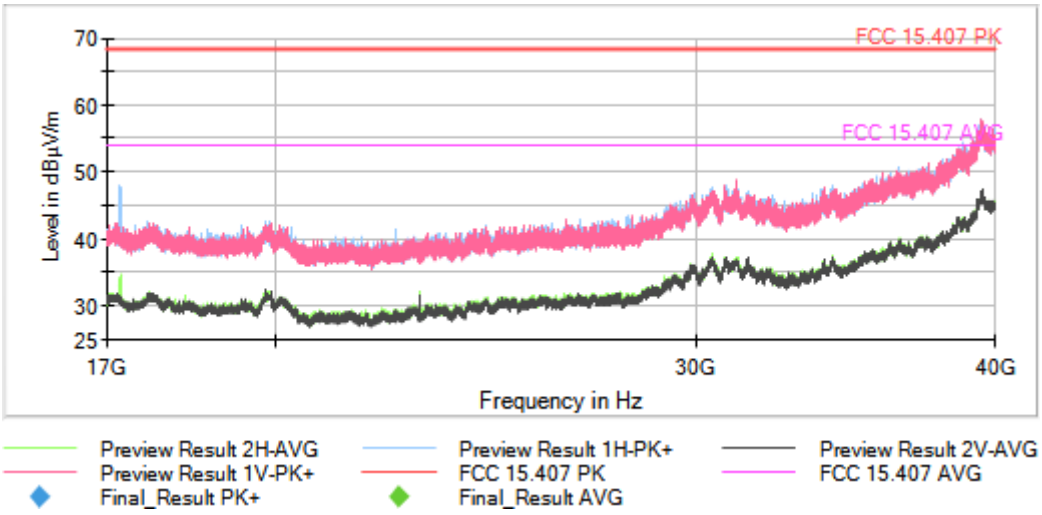
Tables:
Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
7 GHz - 17 GHz	312,5 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [17, 40] Frequency MHz = 5745.00000

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

Images:



Tables:

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
17 GHz - 40 GHz	718,75 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Modulation: 802.11n HT40 (OFDM MCS0)

Verdict

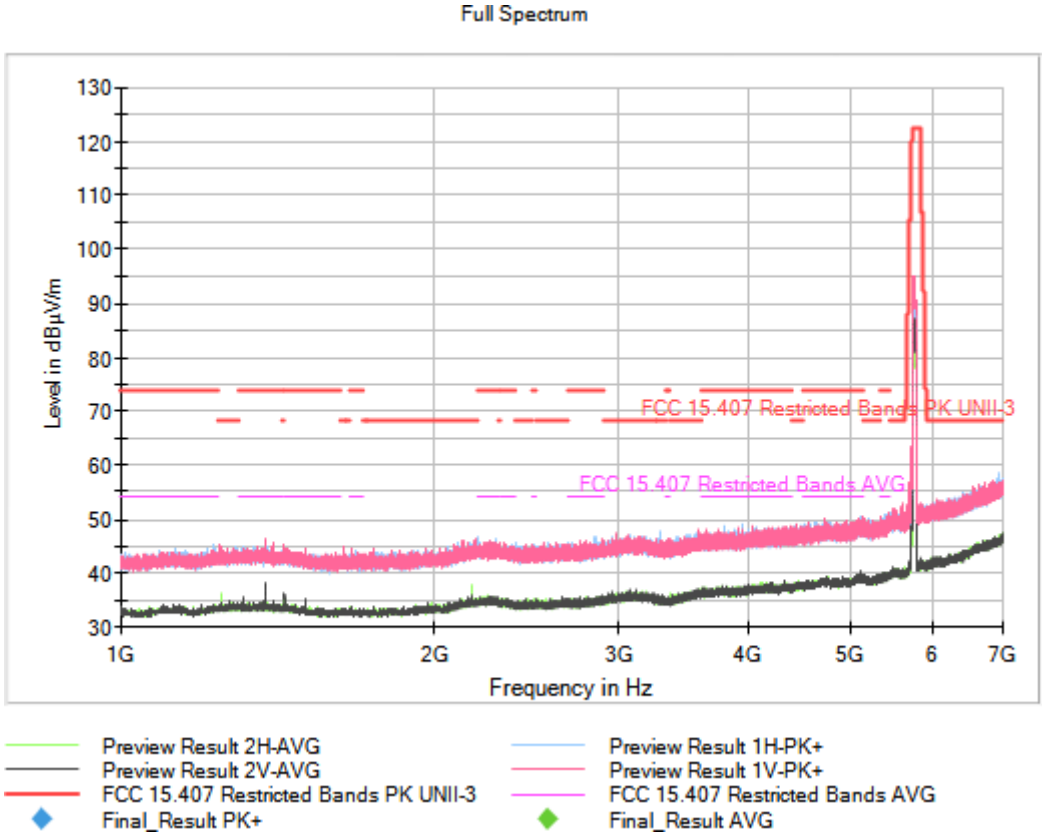
Pass

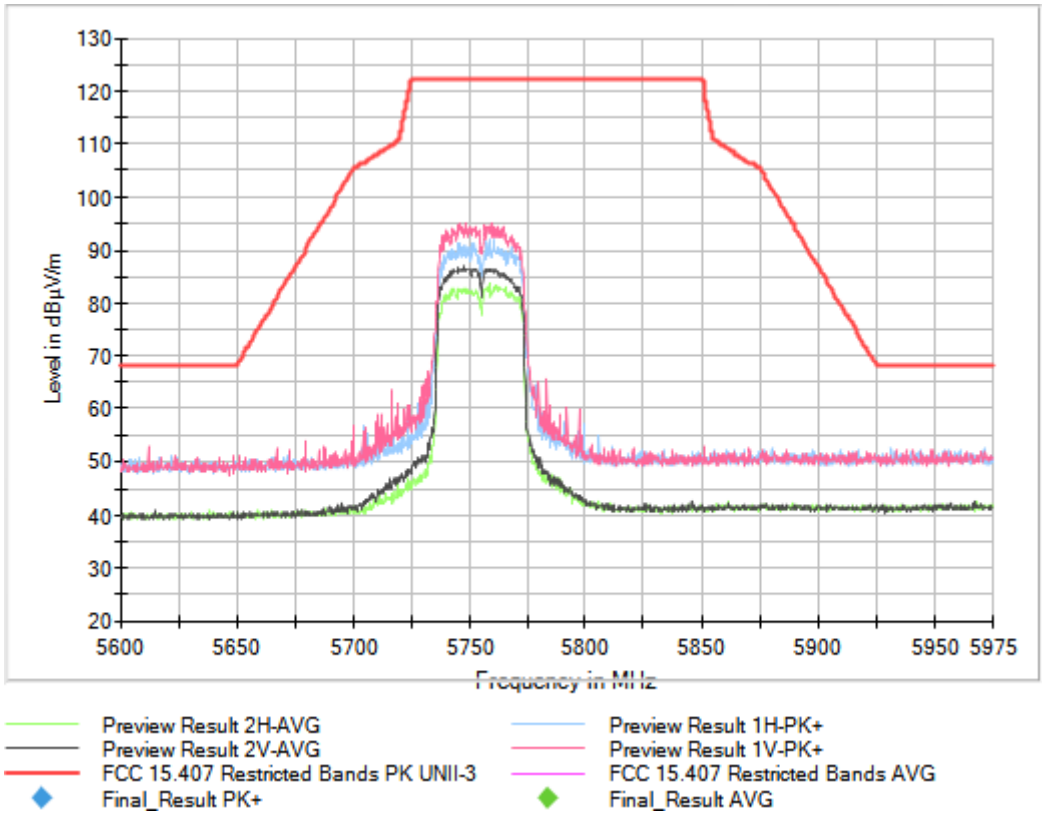
Attachments

Frequency Range GHz = [1, 7] Frequency MHz = 5755.00000

Modulation = 802.11n HT40 (OFDM MCS0)

Images:




130
120
110
100
90
80
70
60
50
40
30
20
Level in dBµV/m
5600
5650
5700
5750
5800
5850
5900
5950
5975
Frequency in MHz
Preview Result 2H-AVG
Preview Result 2V-AVG
FCC 15.407 Restricted Bands PK UNII-3
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

Modulation: 802.11a (OFDM 6 Mbit/s)

Verdict

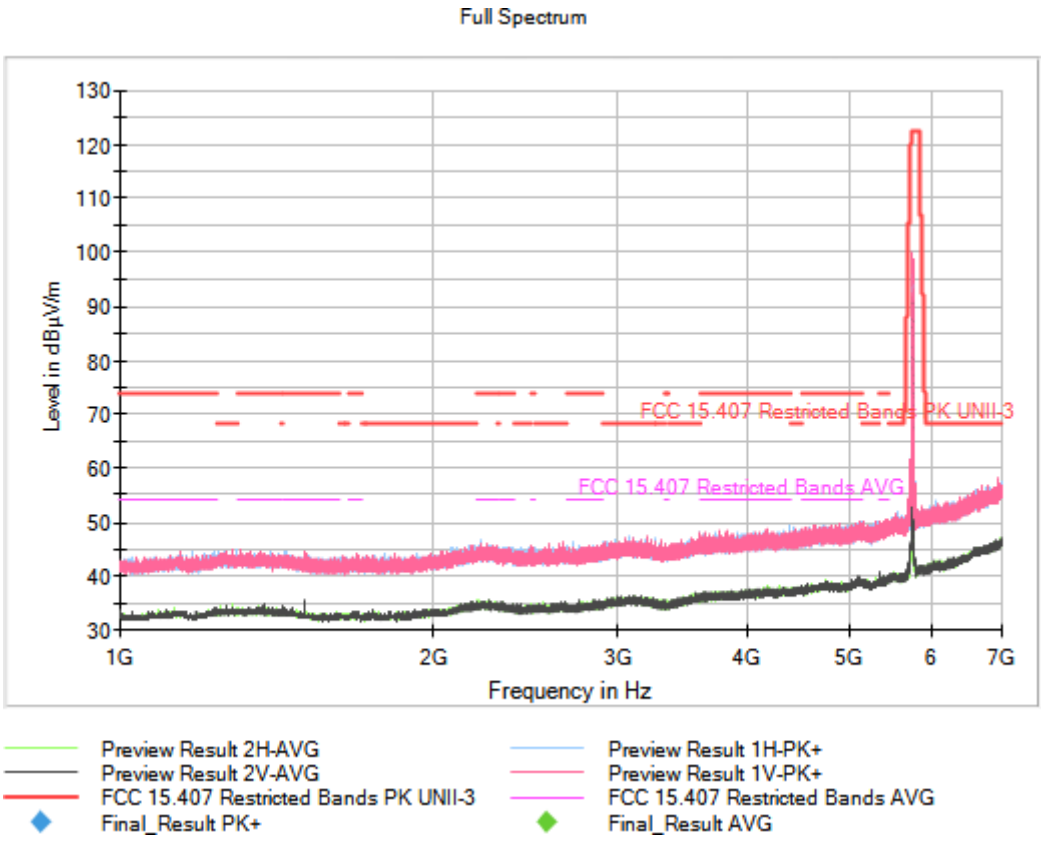
Pass

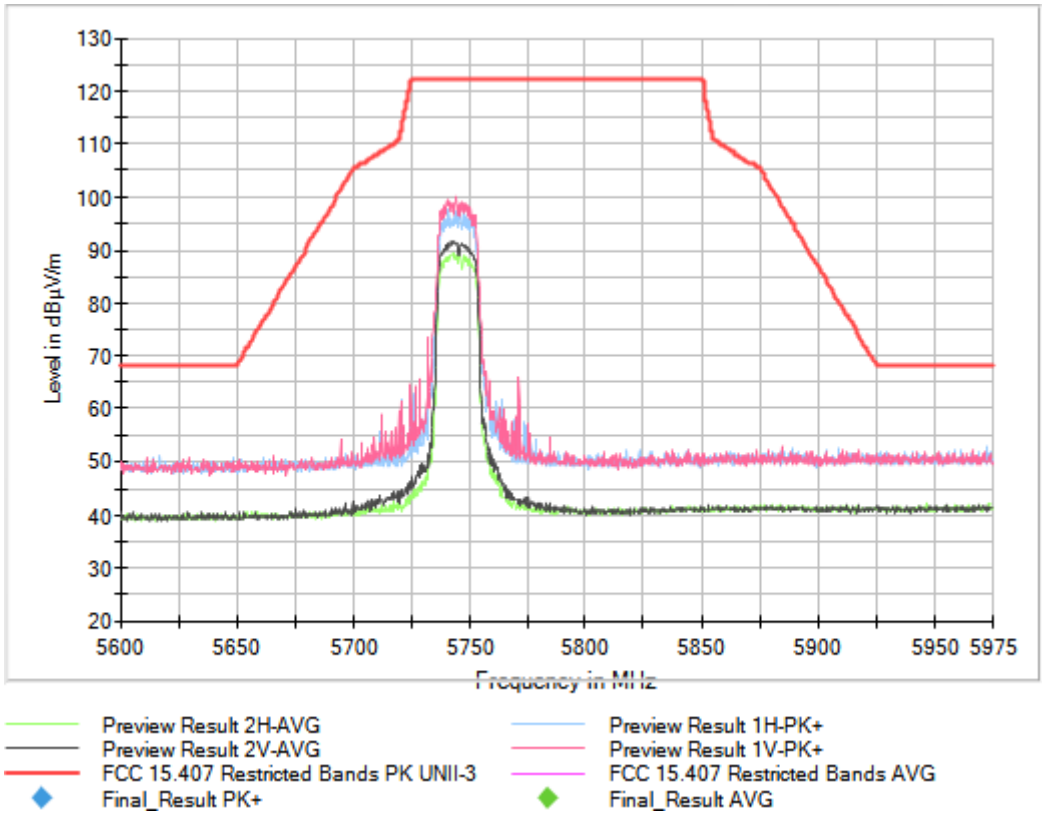
Attachments

Frequency Range GHz = [1, 7] Frequency MHz = 5745.00000

Modulation = 802.11a (OFDM 6 Mbit/s)

Images:




130
120
110
100
90
80
70
60
50
40
30
20
Level in dBµV/m
5600
5650
5700
5750
5800
5850
5900
5950
5975
Frequency in MHz
Preview Result 2H-AVG
Preview Result 2V-AVG
FCC 15.407 Restricted Bands PK UNII-3
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

Modulation: 802.11ac VHT20 (OFDM MCS0)

Verdict

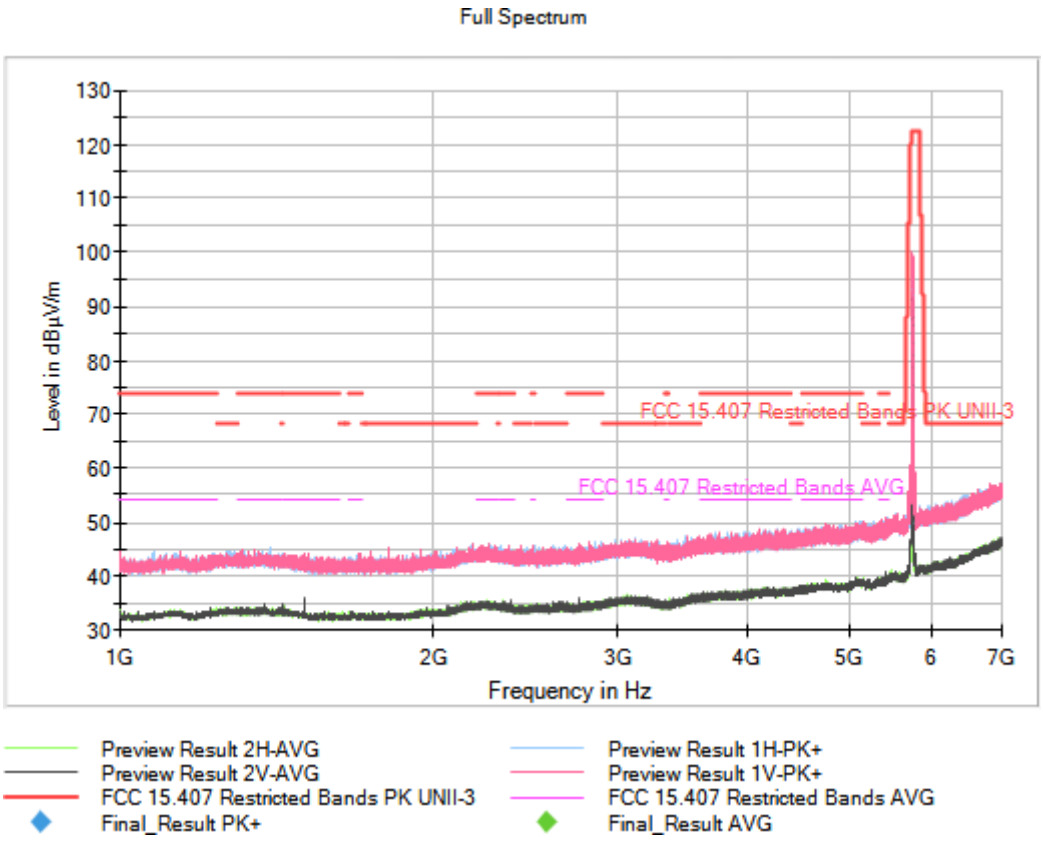
Pass

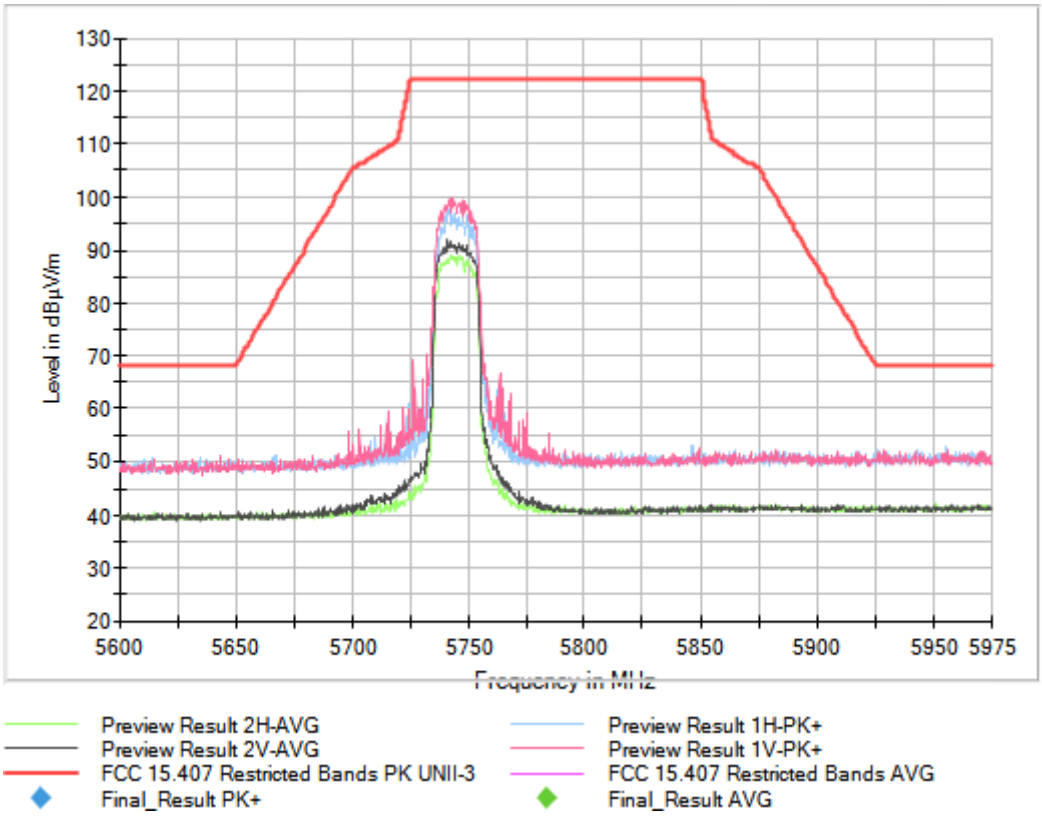
Attachments

Frequency Range GHz = [1, 7] Frequency MHz = 5745.00000

Modulation = 802.11ac VHT20 (OFDM MCS0)

Images:




130
120
110
100
90
80
70
60
50
40
30
20
Level in dBµV/m
5600
5650
5700
5750
5800
5850
5900
5950
5975
Frequency in MHz
Preview Result 2H-AVG
Preview Result 2V-AVG
FCC 15.407 Restricted Bands PK UNII-3
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

Modulation: 802.11ac VHT40 SS1 (OFDM MCS0)

Verdict

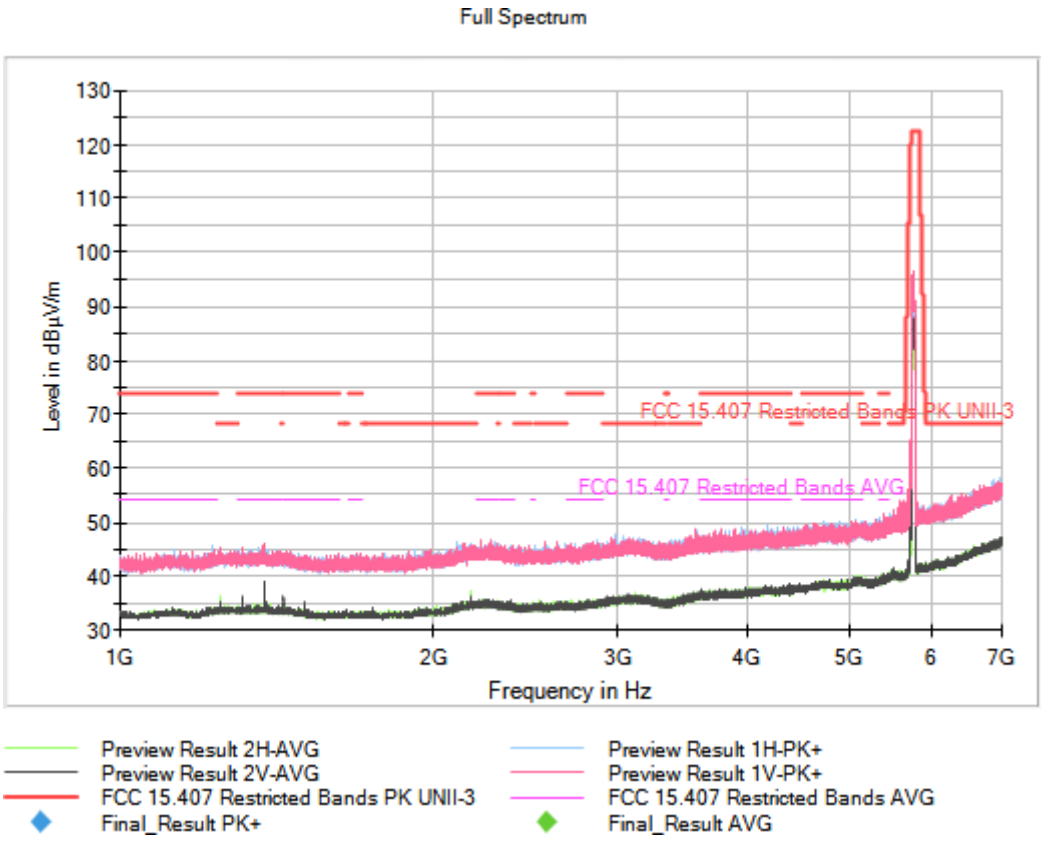
Pass

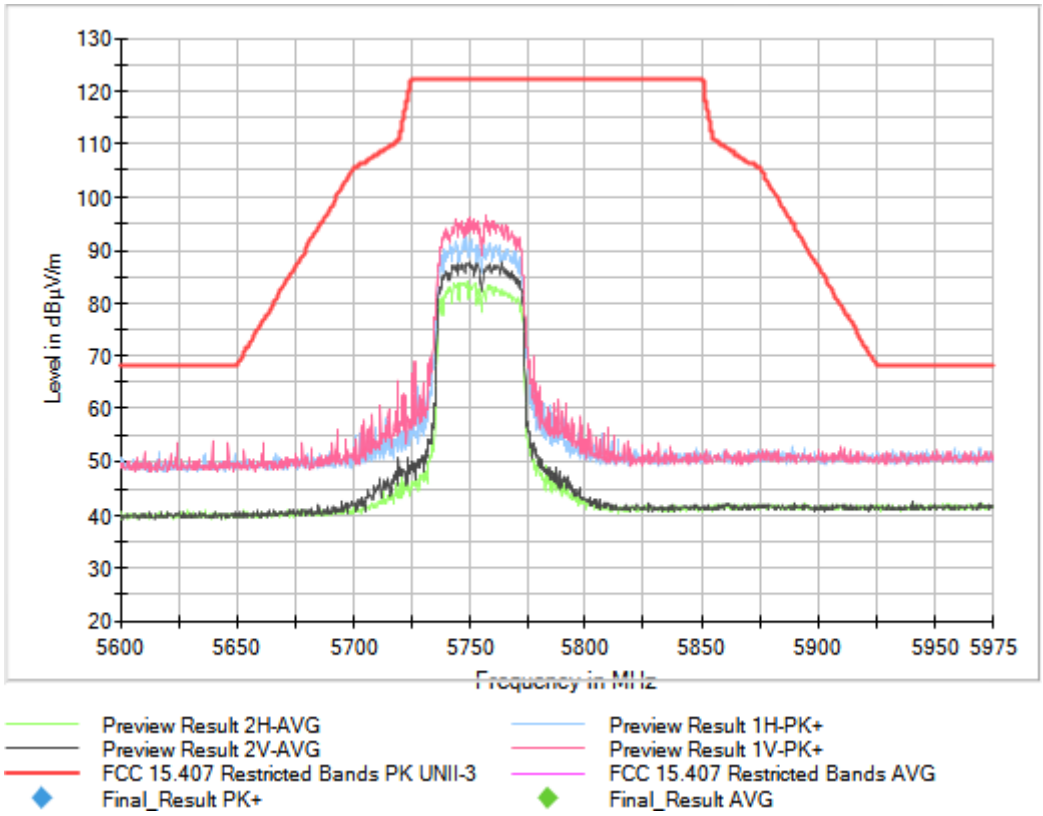
Attachments

Frequency Range GHz = [1, 7] Frequency MHz = 5755.00000

Modulation = 802.11ac VHT40 SS1 (OFDM MCS0)

Images:




130
120
110
100
90
80
70
60
50
40
30
20
Level in dBµV/m
5600
5650
5700
5750
5800
5850
5900
5950
5975
Frequency in MHz
Preview Result 2H-AVG
Preview Result 2V-AVG
FCC 15.407 Restricted Bands PK UNII-3
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

Modulation: 802.11ac VHT80 (OFDM MCS0x1)

Verdict

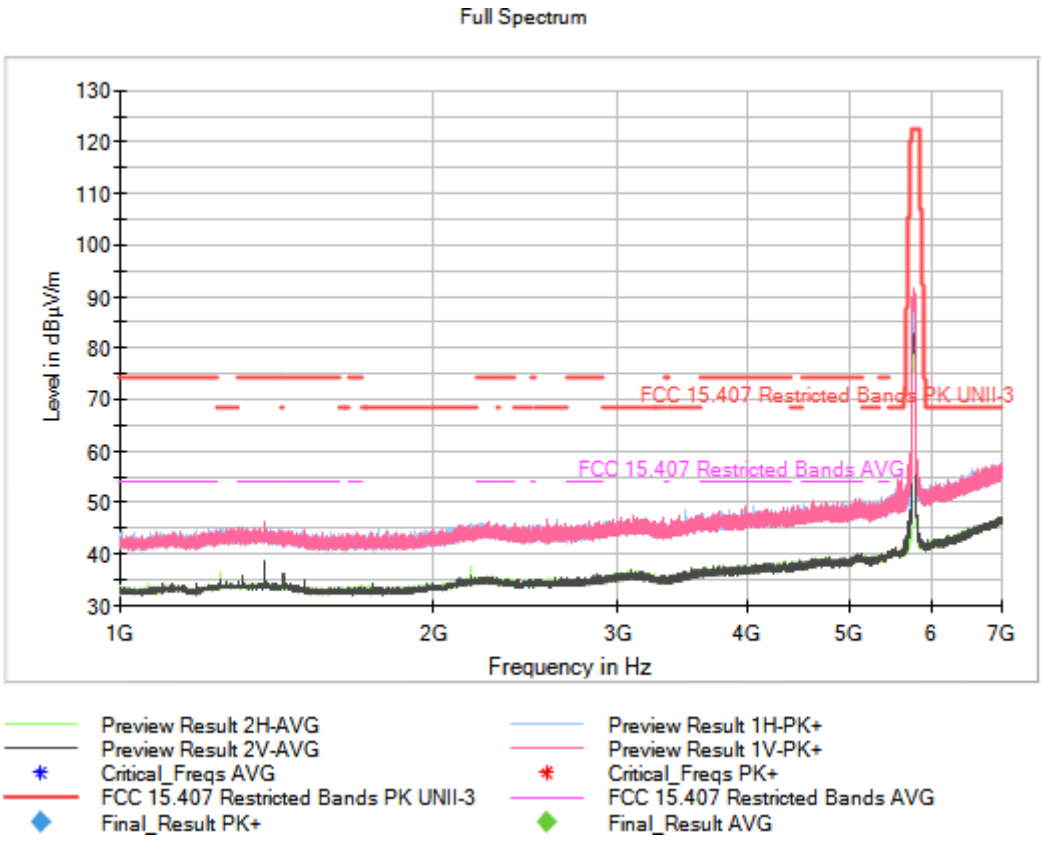
Pass

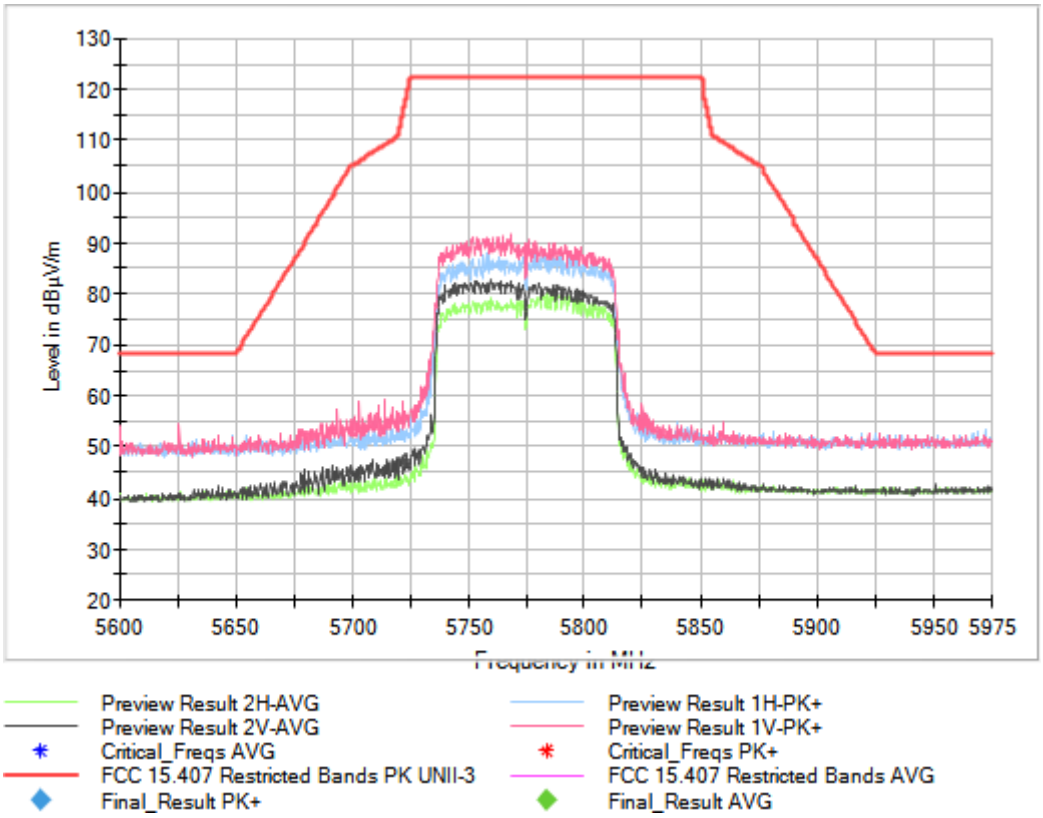
Attachments

Frequency Range GHz = [1, 7] Frequency MHz = 5775.00000

Modulation = 802.11ac VHT80 (OFDM MCS0x1)

Images:




130
120
110
100
90
80
70
60
50
40
30
20
Level in dBµV/m
5600
5650
5700
5750
5800
5850
5900
5950
5975
Preview Result 2H-AVG
Preview Result 2V-AVG
Critical_Freqs AVG
FCC 15.407 Restricted Bands PK UNII-3
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
Critical_Freqs PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

RSS-Gen 6.10. / Section 15.35 Subclause (c) Duty Cycle

Limits

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

Results

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

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5745.00000	93.88

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5755.00000	88.49

Modulation: 802.11a (OFDM 6 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5745.00000	94.29

Modulation: 802.11ac VHT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5745.00000	93.97

Modulation: 802.11ac VHT40 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5755.00000	80.25

Modulation: 802.11ac VHT80 (OFDM MCS0x1)

Operation Band (MHz)	Port	Freq (MHz)	DC (%)
[5725, 5850]	1	5775.00000	67.98

Verdict

Pass

RSS-Gen 6.6 / RSS-247 6.2. Transmitter 99% Occupied Bandwidth

Results

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

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5745.00000	17.400

Verdict

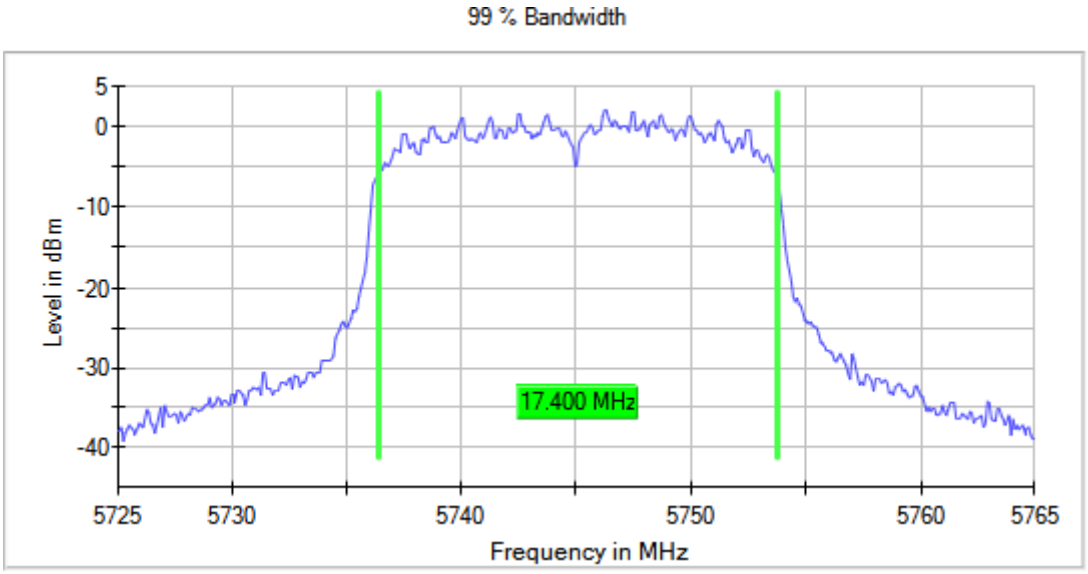
Pass

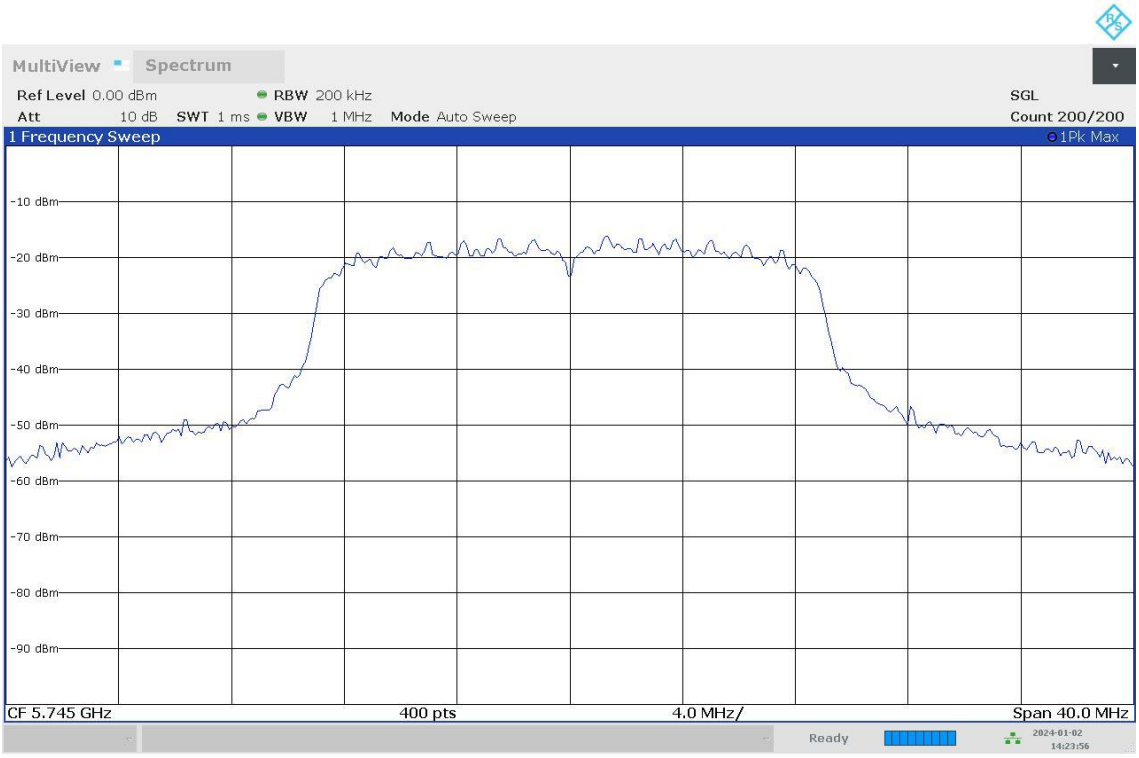
Attachments

Frequency MHz = 5745.00000 Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

MIMO Mode = SISO

Images:





02:23:57 PM 01/02/2024

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5755.00000	36.000

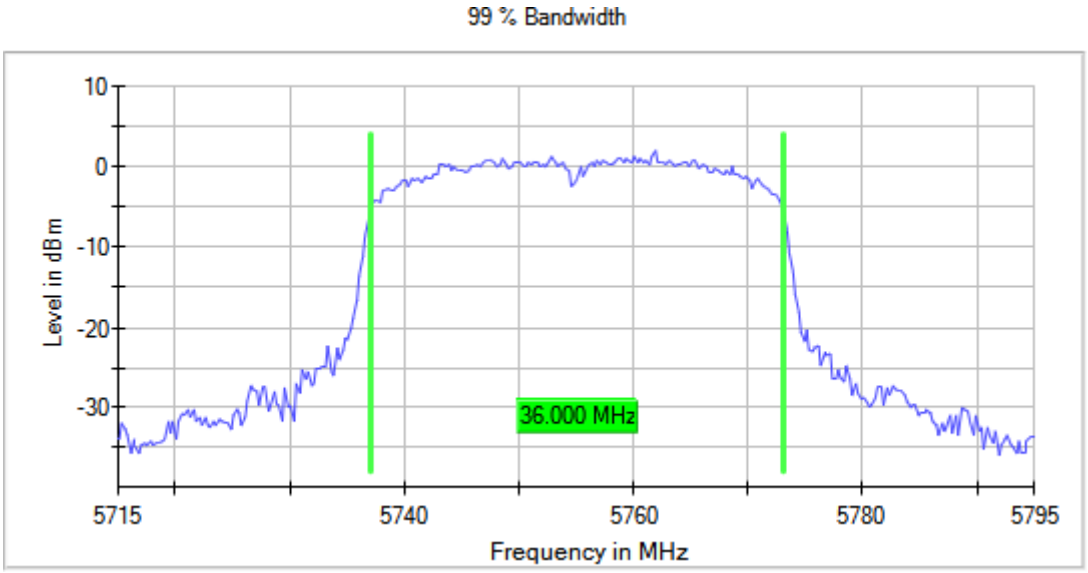
Verdict

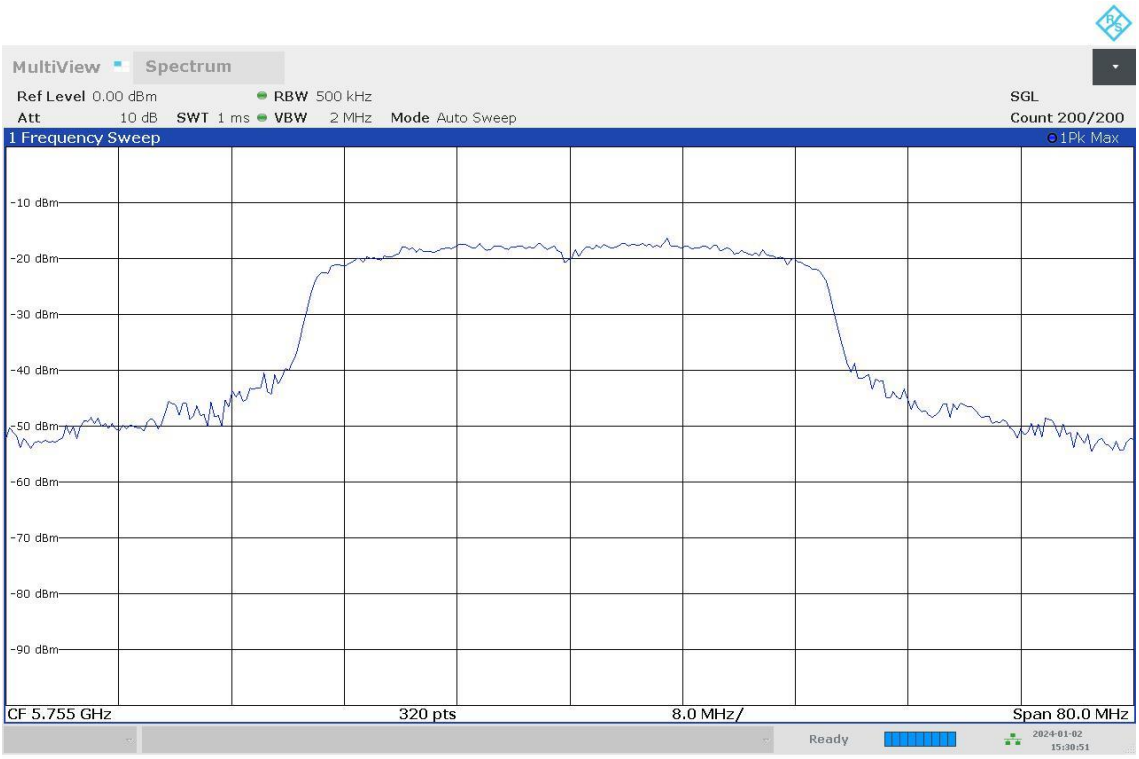
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Images:





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Modulation: 802.11a (OFDM 6 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5745.00000	16.300

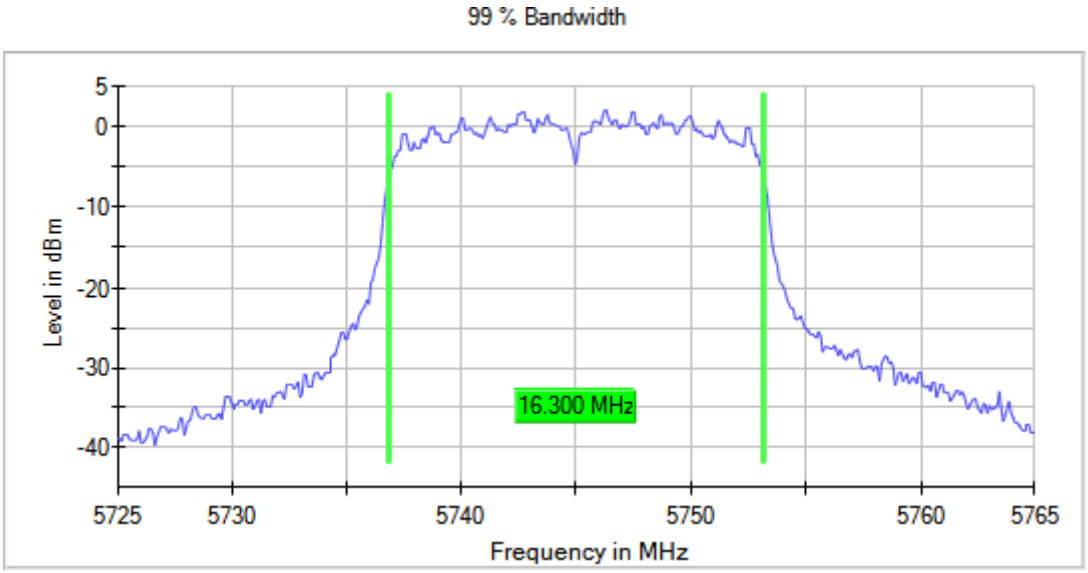
Verdict

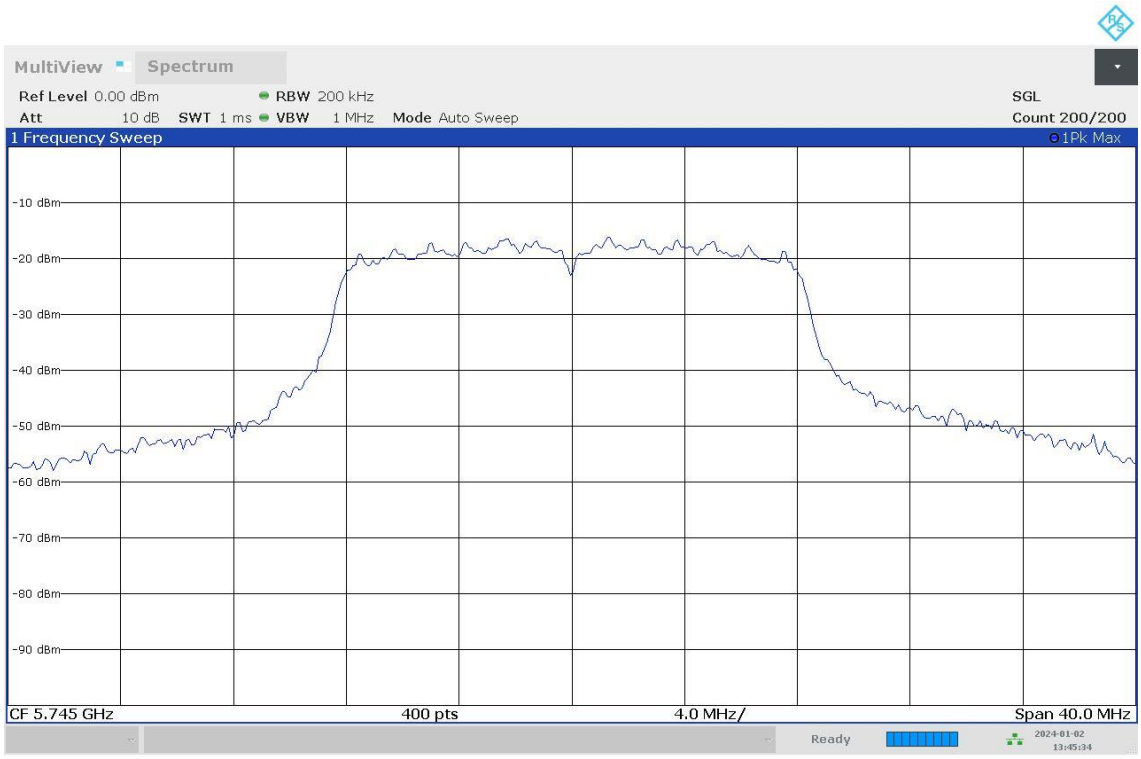
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11a (OFDM 6 Mbit/s)

Images:





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Modulation: 802.11ac VHT20 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5745.00000	17.300

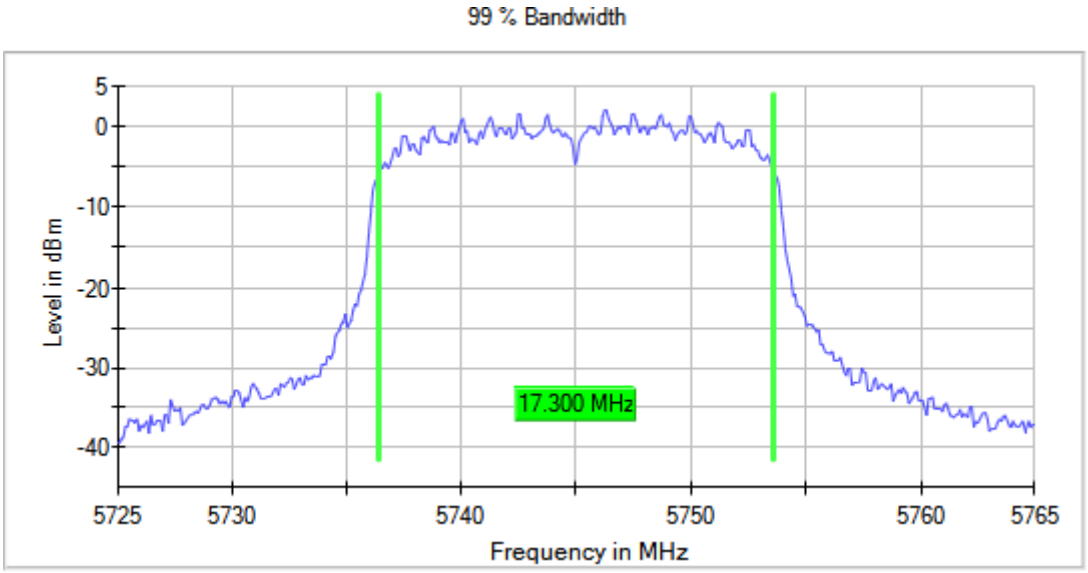
Verdict

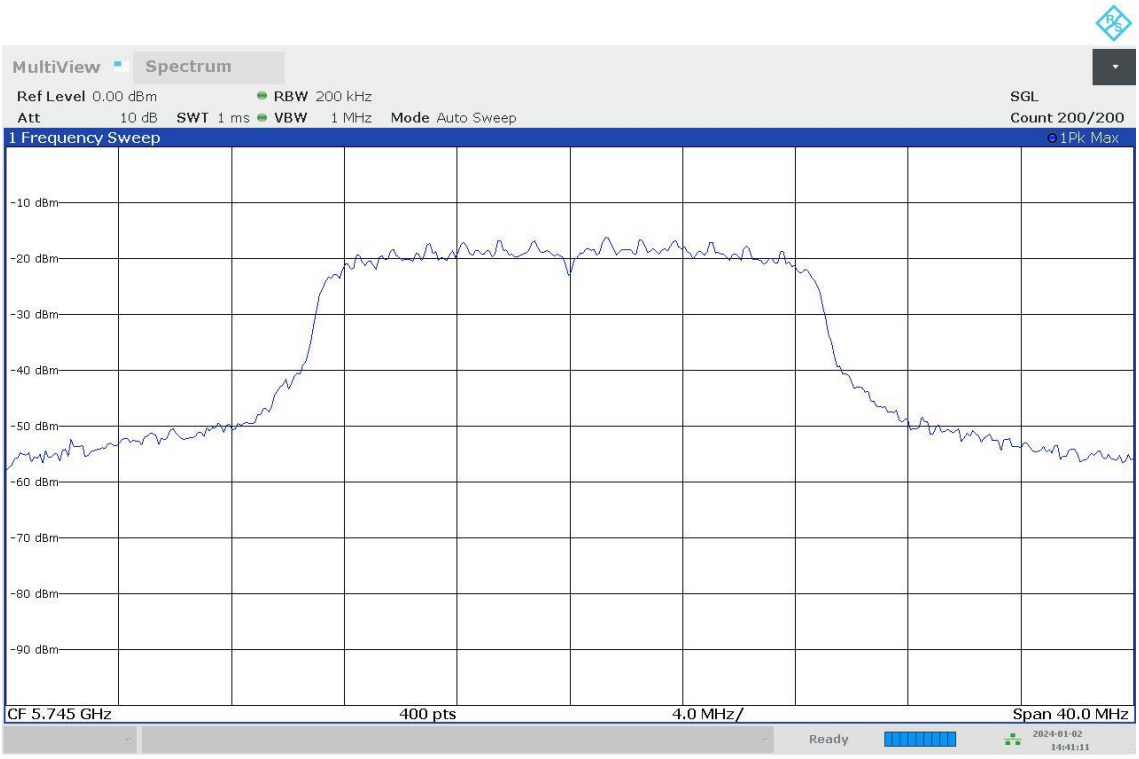
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

Images:





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Modulation: 802.11ac VHT40 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5755.00000	36.000

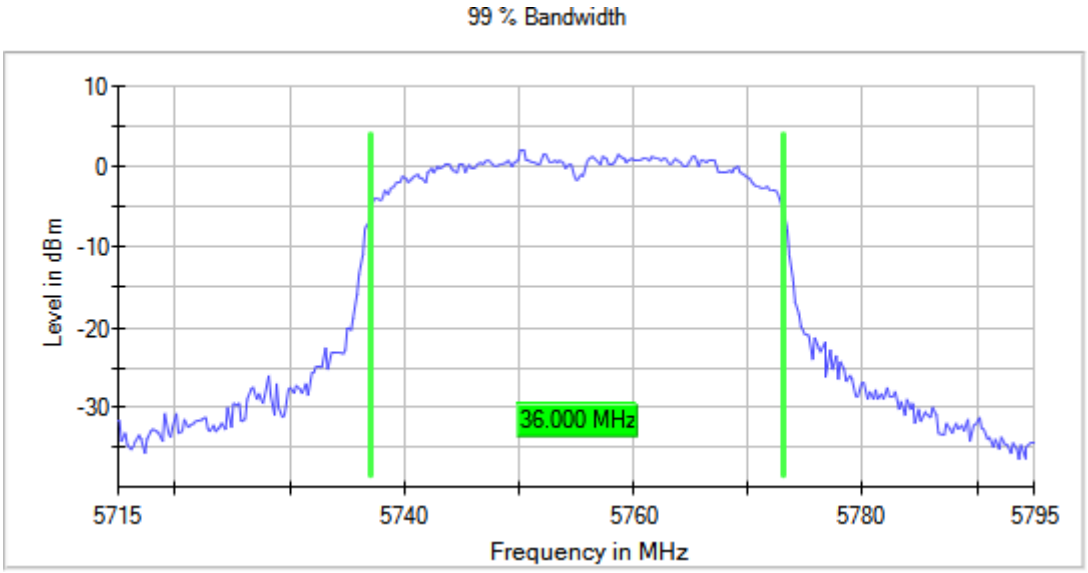
Verdict

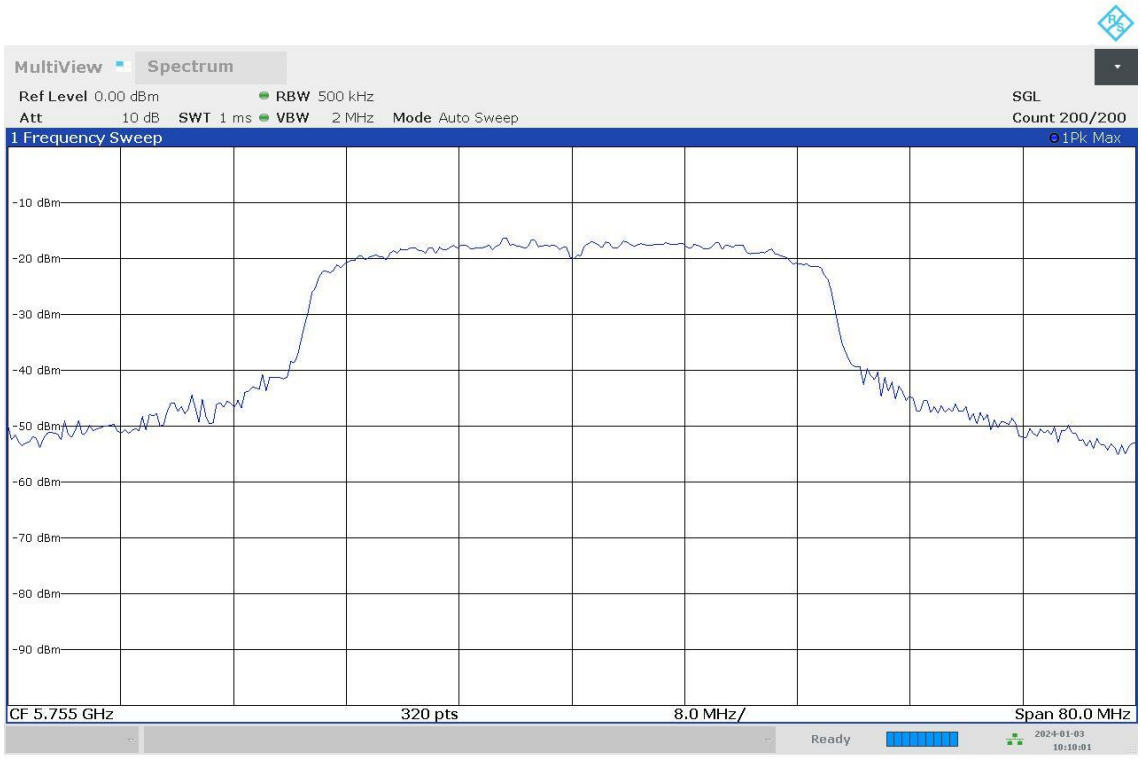
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)

Images:





10:10:02 AM 01/03/2024

Modulation: 802.11ac VHT80 (OFDM MCS0x1)

Results

Operation Band (MHz)	Port	Freq (MHz)	Occ Ch BW (MHz)
[5725, 5850]	1	5775.00000	75.000

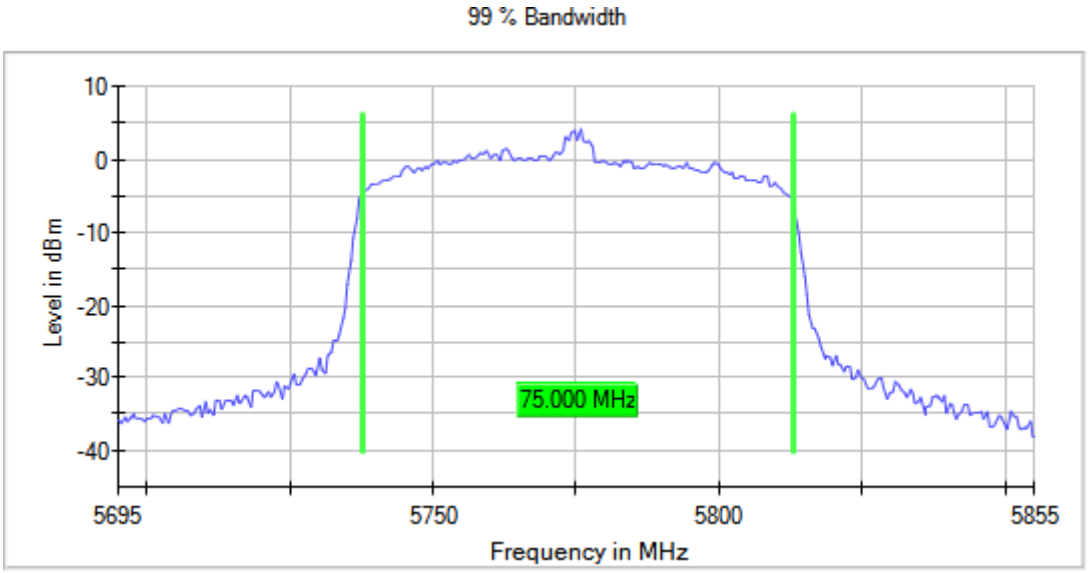
Verdict

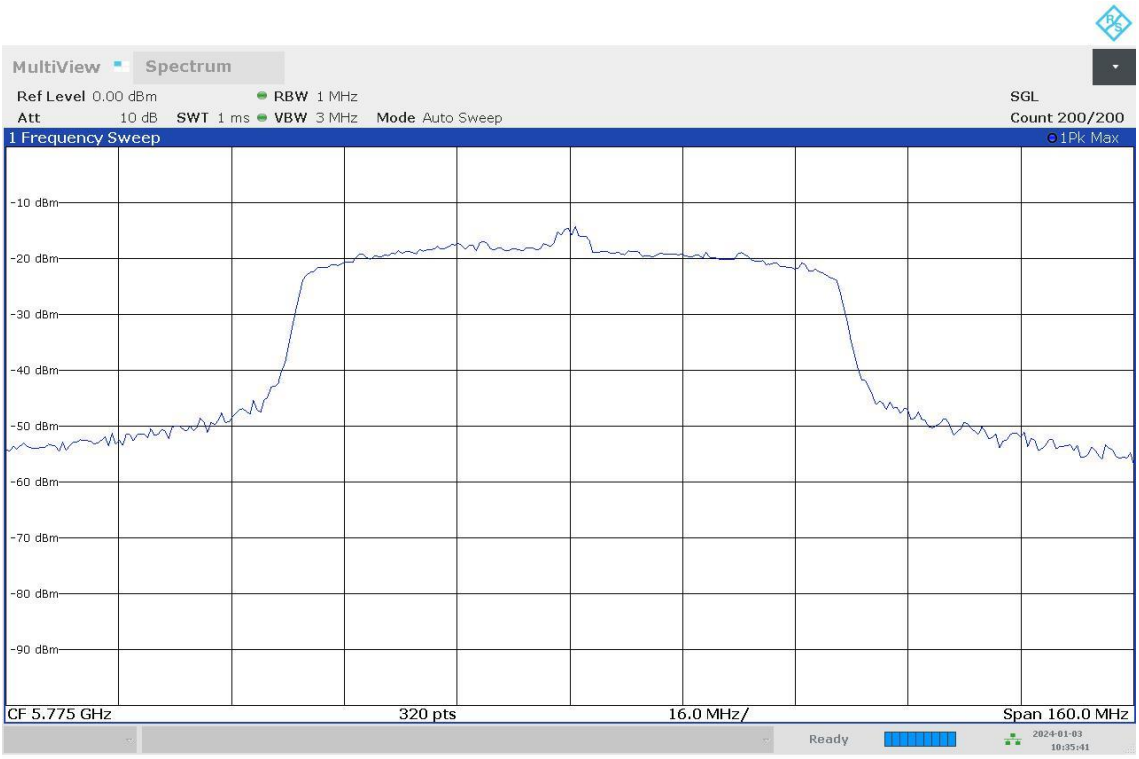
Pass

Attachments

Frequency MHz = 5775.00000 Modulation = 802.11ac VHT80 (OFDM MCS0x1)

Images:





10:35:42 AM 01/03/2024

Section 15.407 Subclause 15.403(i) Transmitter 26 dB Emission Bandwidth (EBW)

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

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	20.200

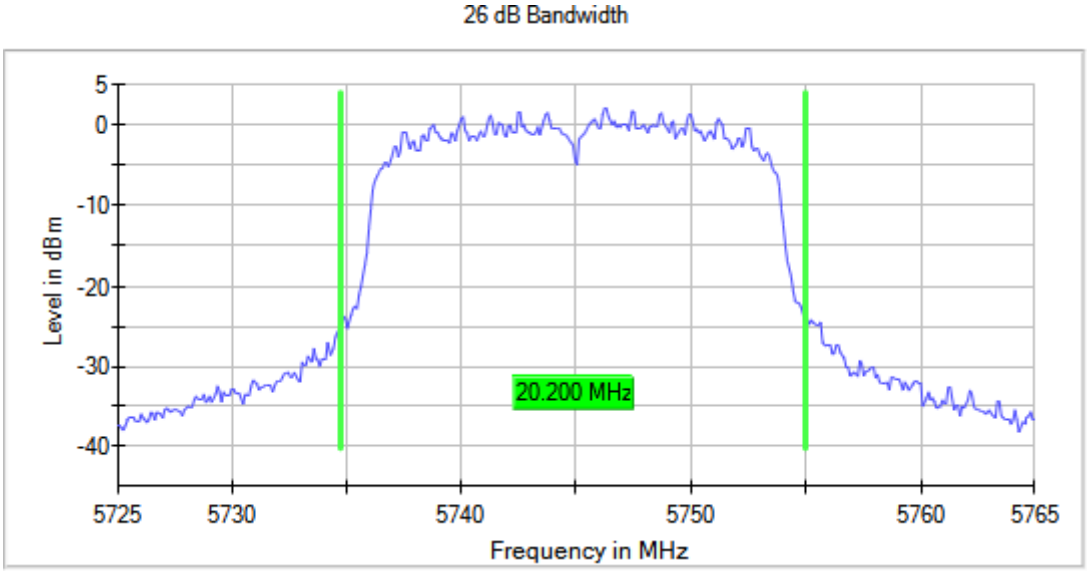
Verdict

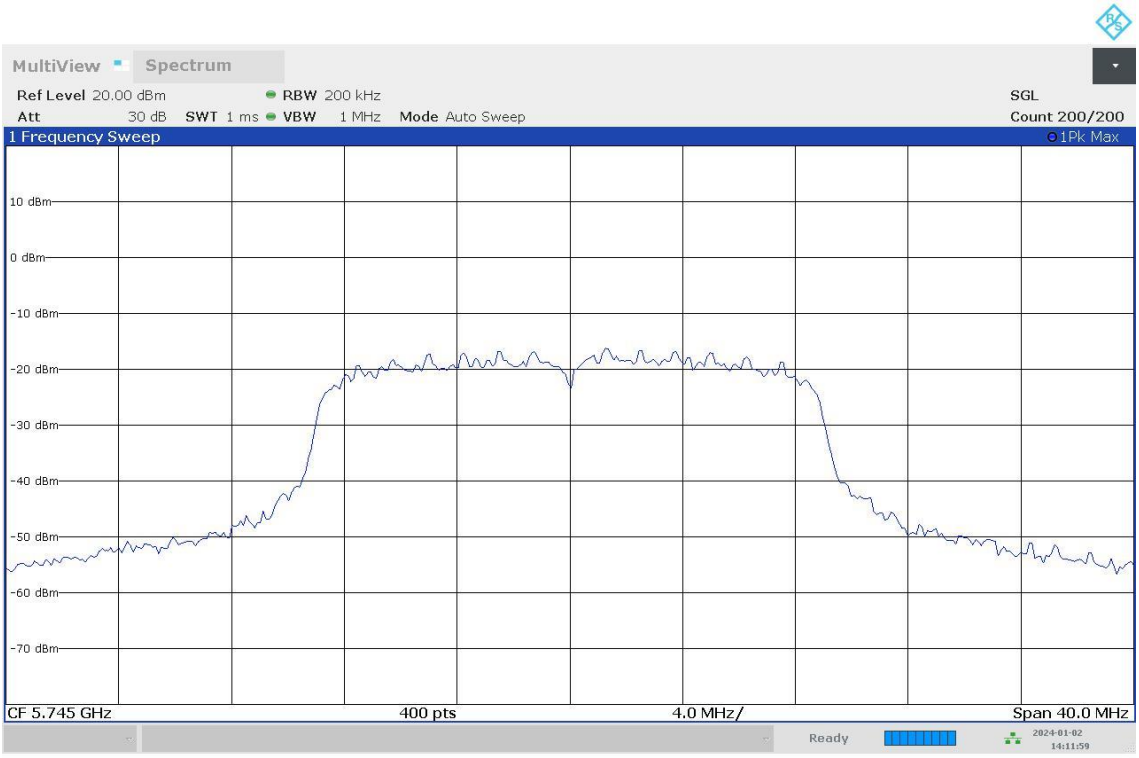
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Images:




MultiView
Spectrum
Ref Level 20.00 dBm
RBW 200 kHz
SGL
Att 30 dB
SWT 1 ms
VBW 1 MHz
Mode Auto Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 5.745 GHz
400 pts
4.0 MHz/
Span 40.0 MHz
Ready
2024-01-02
14:11:59
02:12:00 PM 01/02/2024

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5755.00000	42.176

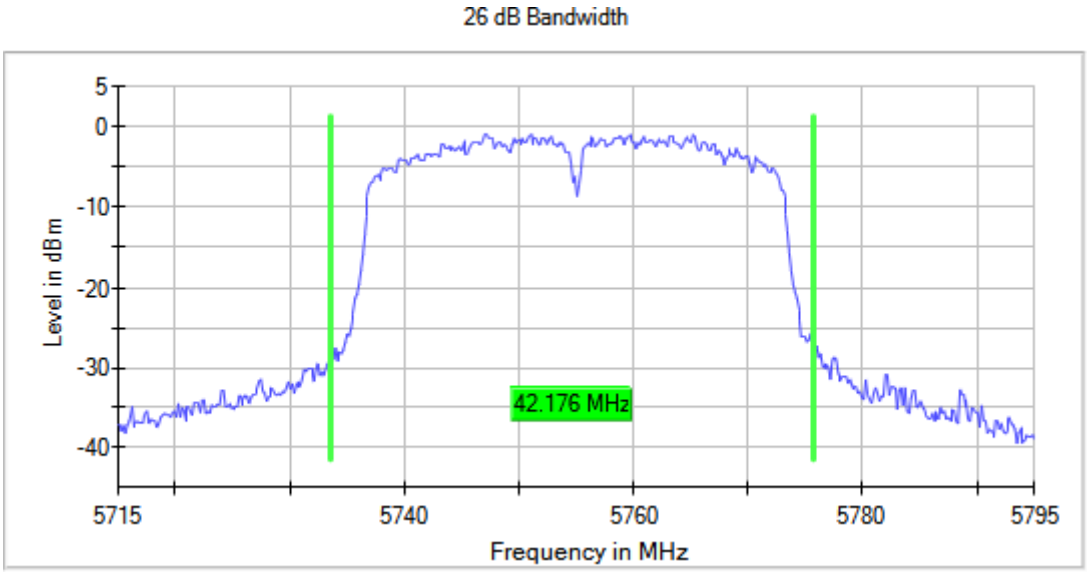
Verdict

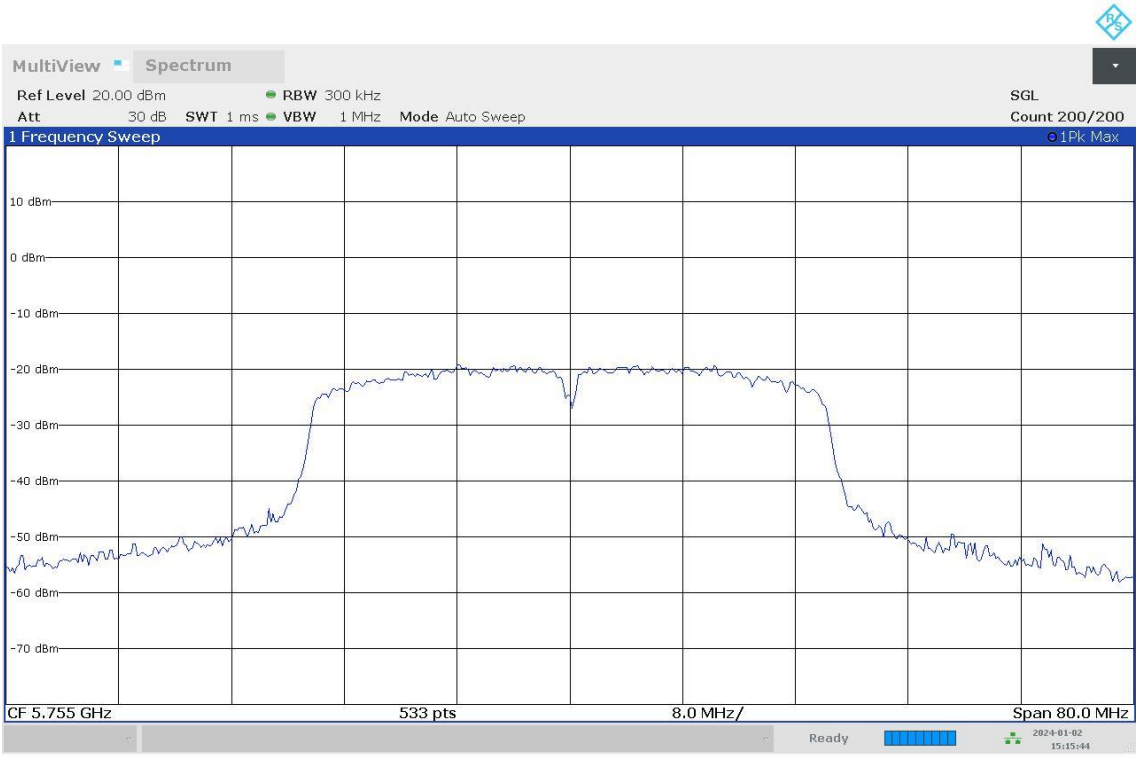
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Images:





03:15:45 PM 01/02/2024

Modulation: 802.11a (OFDM 6 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	19.000

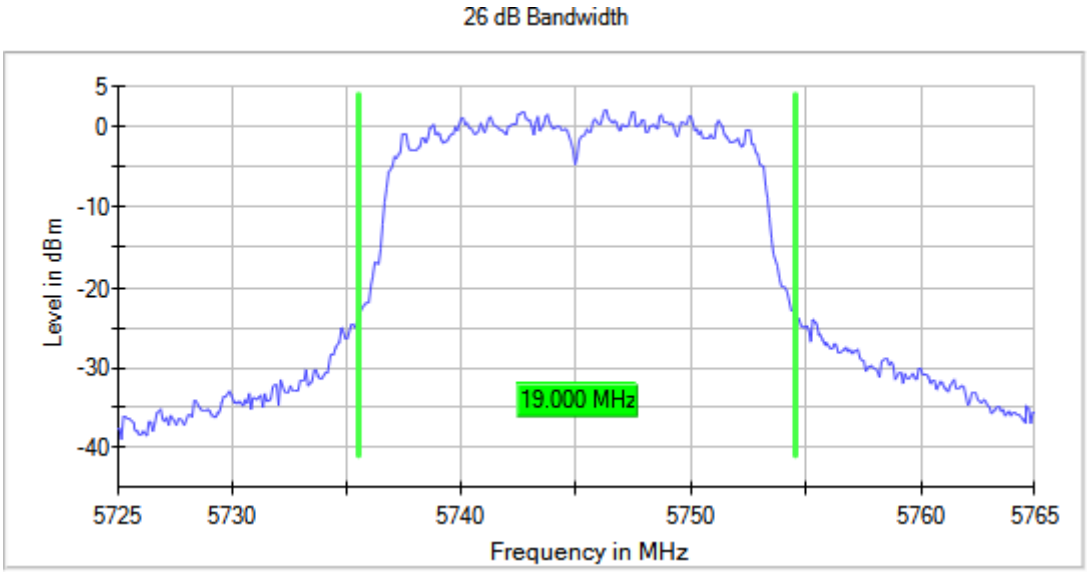
Verdict

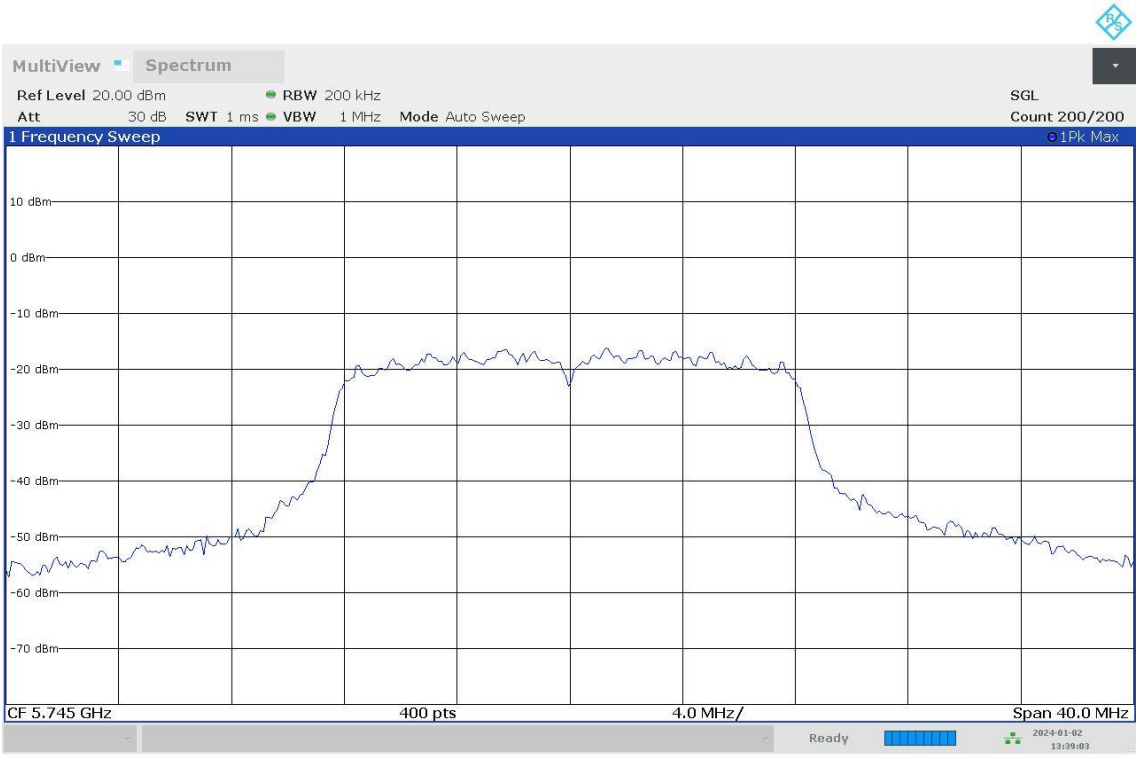
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11a (OFDM 6 Mbit/s)

Images:





01:39:04 PM 01/02/2024

Modulation: 802.11ac VHT20 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5745.00000	19.900

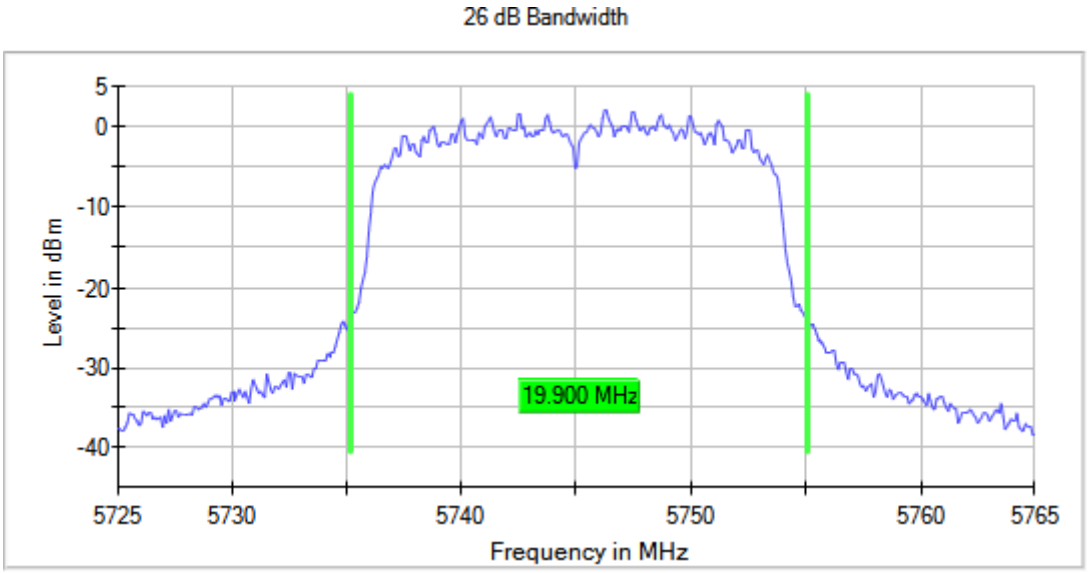
Verdict

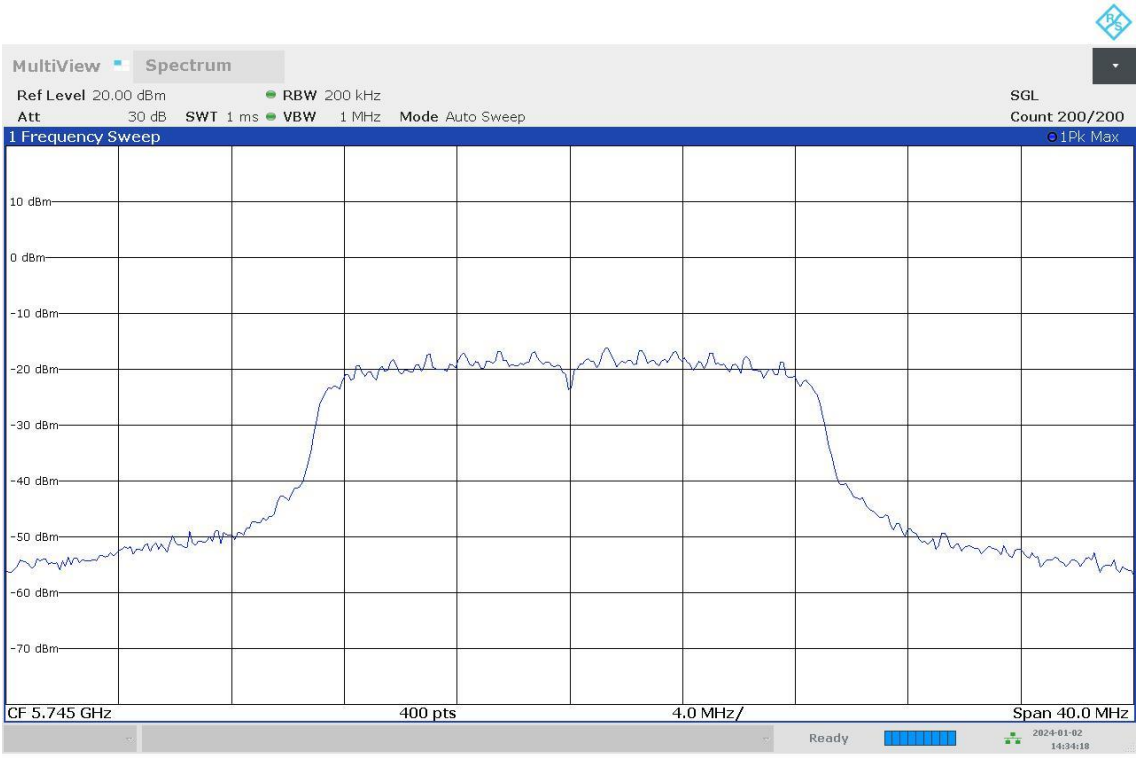
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

Images:





02:34:19 PM 01/02/2024

Modulation: 802.11ac VHT40 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5755.00000	40.075

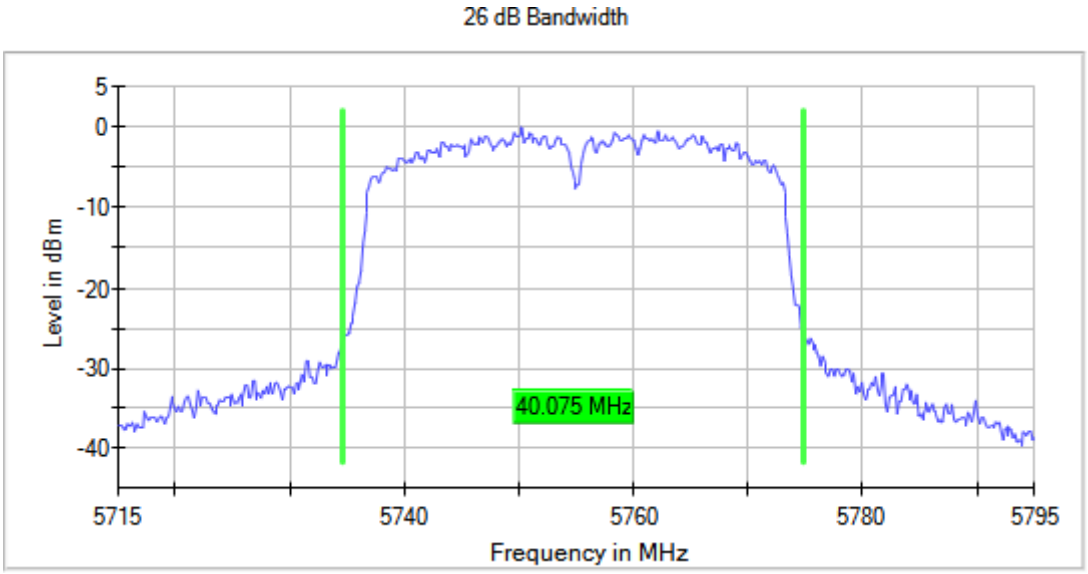
Verdict

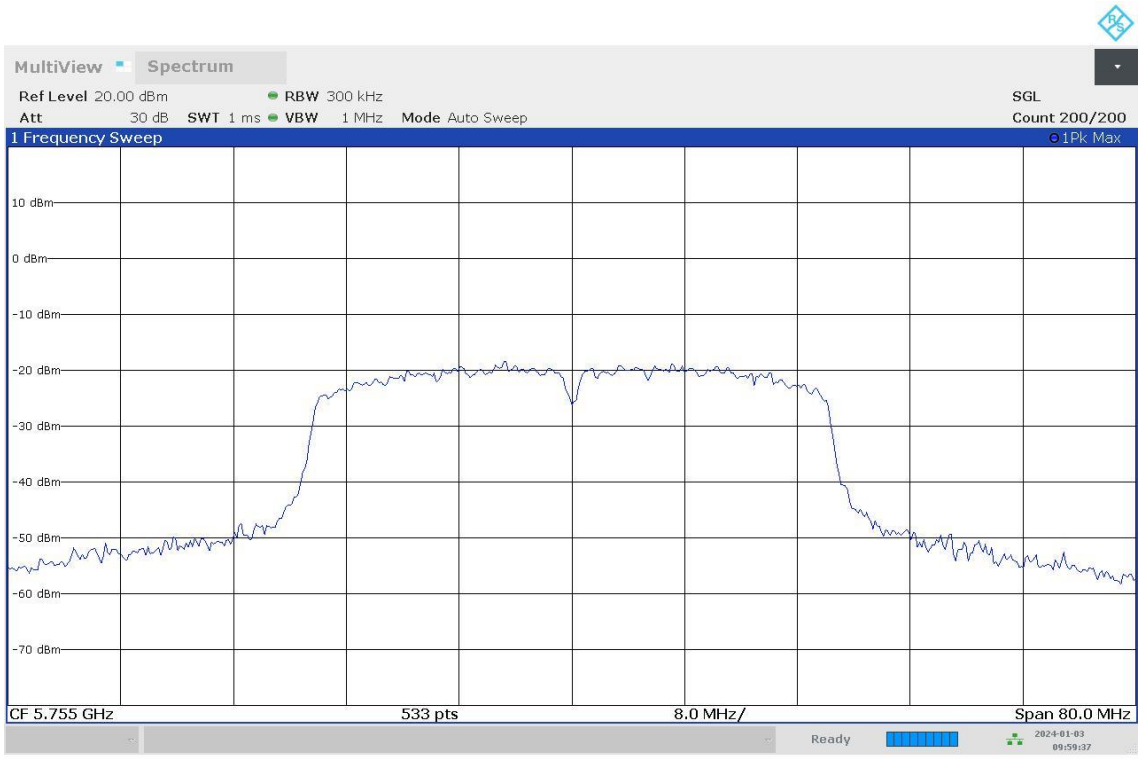
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)

Images:




MultiView
Spectrum
Ref Level 20.00 dBm
RBW 300 kHz
SGL
Att 30 dB
SWT 1 ms
VBW 1 MHz
Mode Auto Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 5.755 GHz
533 pts
8.0 MHz/
Span 80.0 MHz
Ready
09:59:38 AM 01/03/2024

Modulation: 802.11ac VHT80 (OFDM MCS0x1)

Results

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	1	5775.00000	82.000

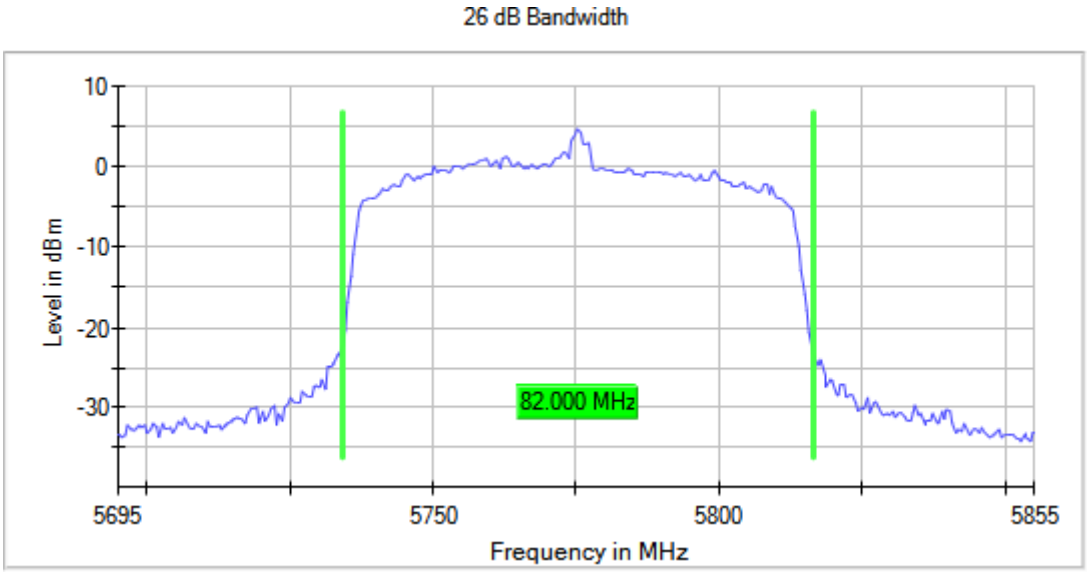
Verdict

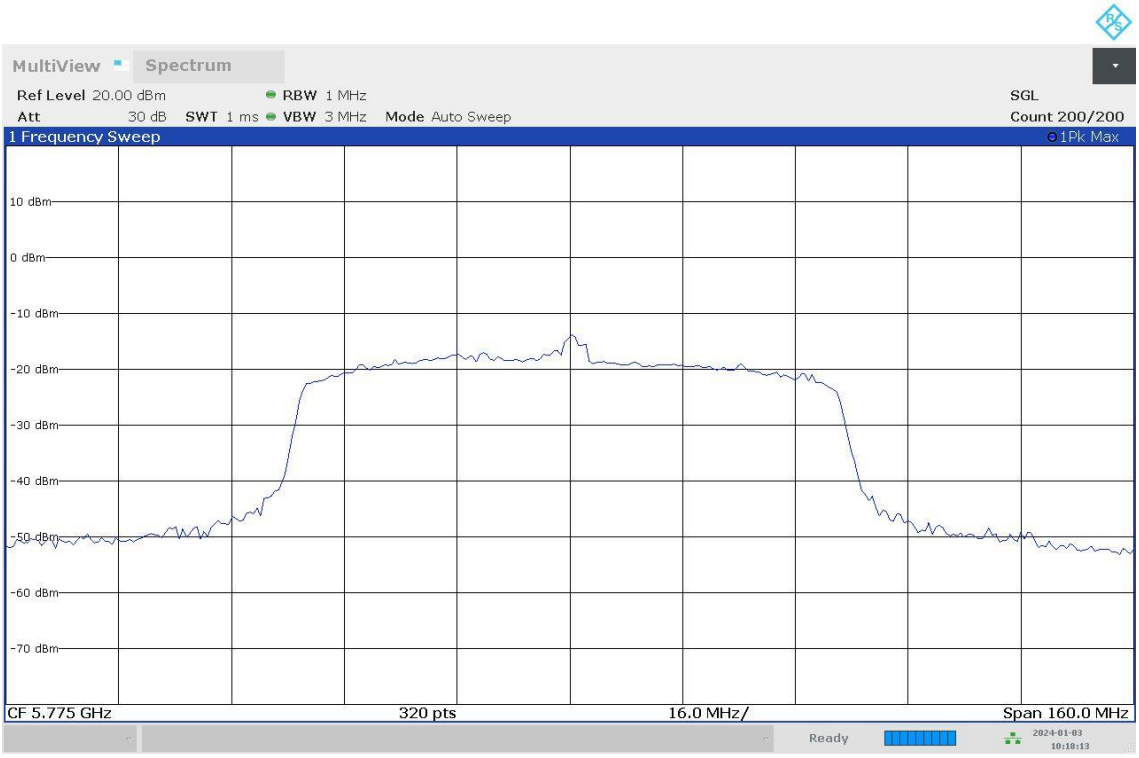
Pass

Attachments

Frequency MHz = 5775.00000 Modulation = 802.11ac VHT80 (OFDM MCS0x1)

Images:





10:18:14 AM 01/03/2024

RSS-247 6.2.4.1 / FCC 15.407 (a) (3) Transmitter Maximum Power Spectral Density UNII-3

Limits

The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Results

The maximum power spectral density (PSD) was measured using the method according to point F) referencing E.2.b) (Method SA-1) and E.2.b) (Method SA-2) of Guidance 789033 D02 General UNII Test Procedures New Rules v02r01.

An average of 100 traces was performed using rms detector. The maximum PSD is determined by using the peak marker function to find the maximum amplitude level. For the modes with an associated duty cycle < 98 % the applicable duty cycle correction factor is added to the measured PSD value in order to compute the PSD during the actual transmission times.

Both the measured and the corrected PSD values are reported in the tables below.

For all modes of operation, the antenna gain is lower than 6 dBi. Therefore no reduction is applicable to the measured results.

Maximum Declared Antenna Gain: 0 dBi

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

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5745.00000	No	5747.772277	-3.47

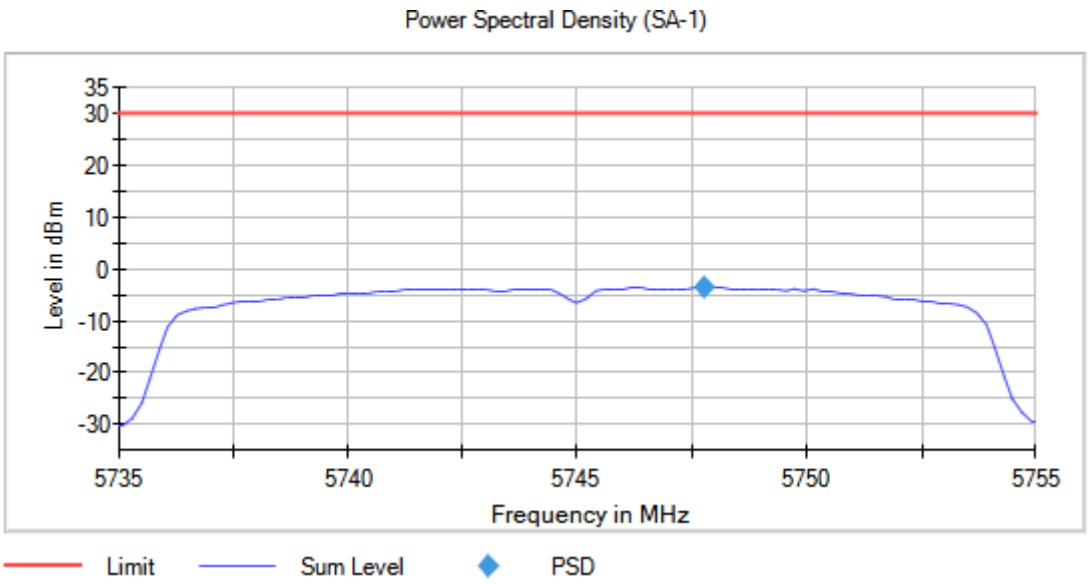
Verdict

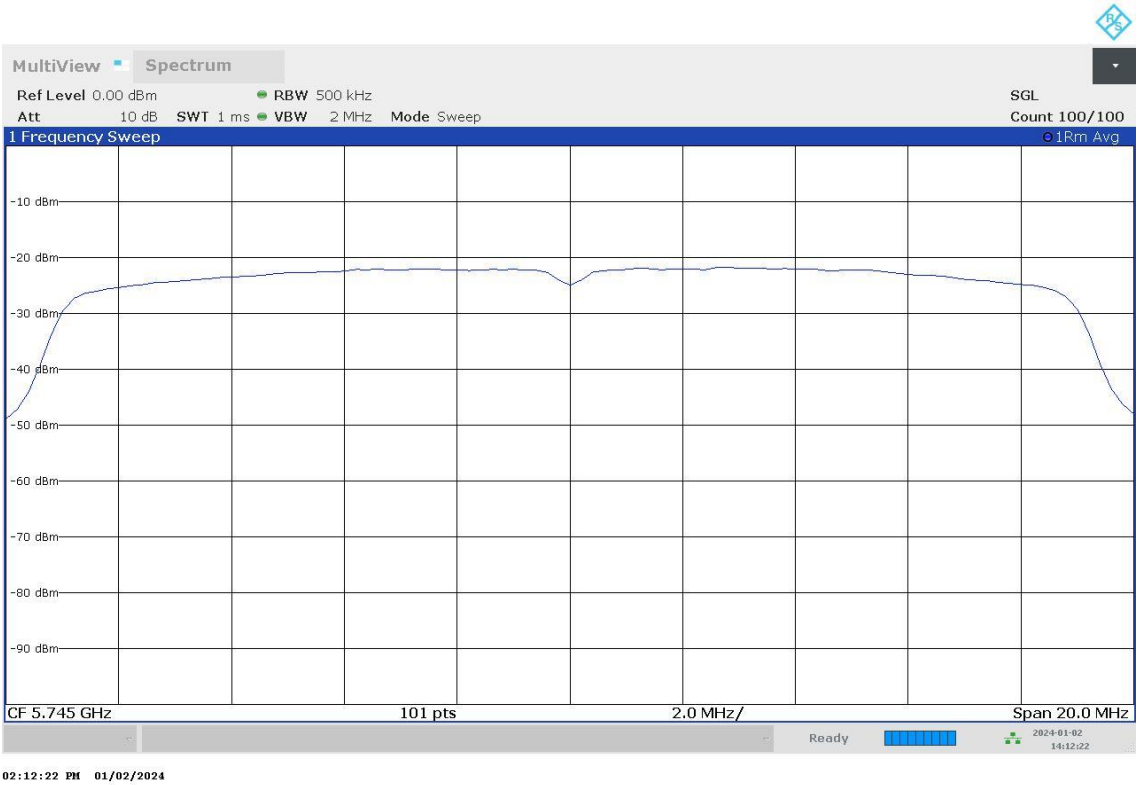
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Images:





Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5755.00000	No	5752.625000	-6.96

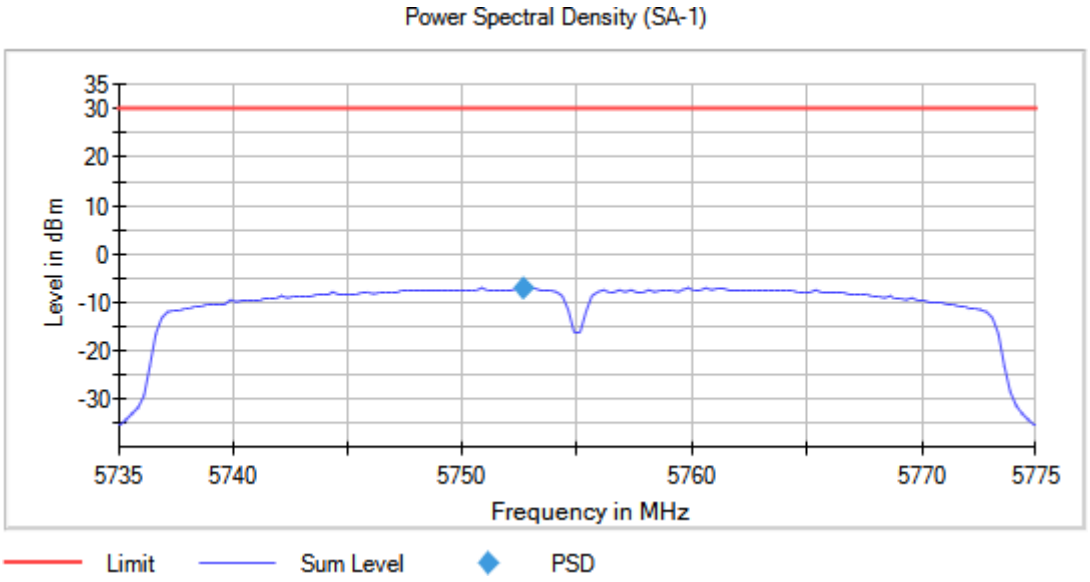
Verdict

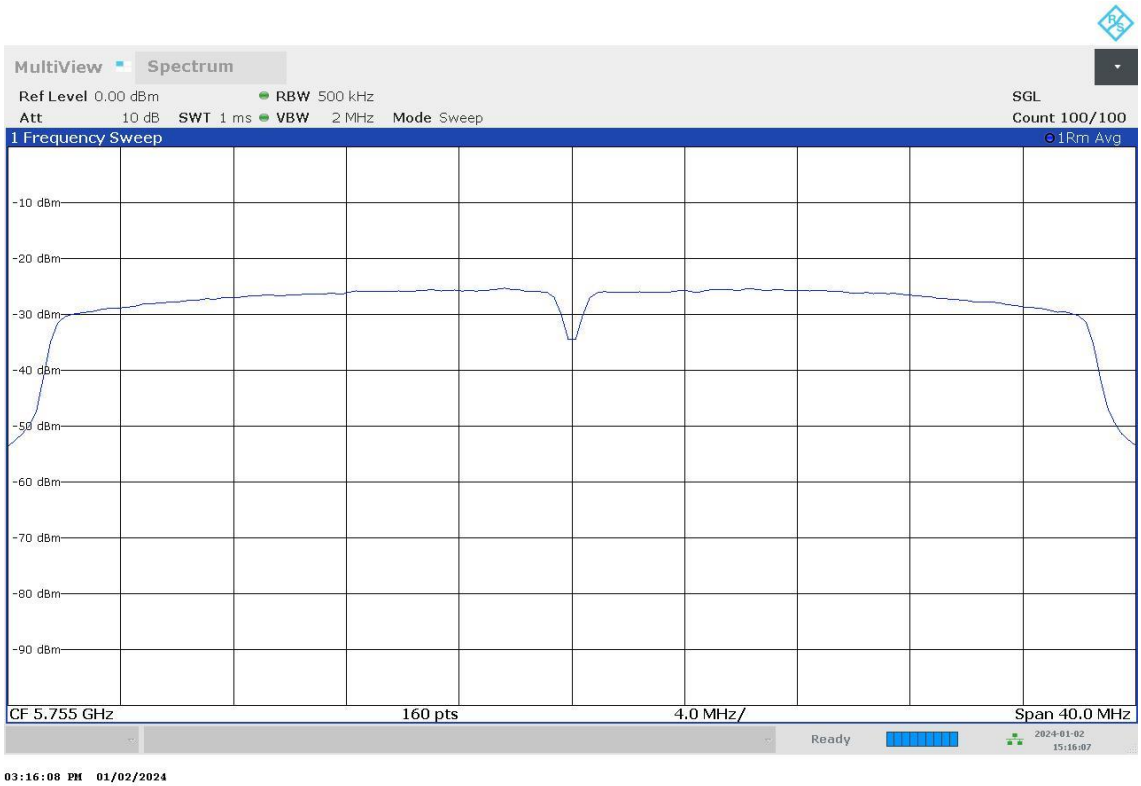
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Images:





03:16:08 PM 01/02/2024

Modulation: 802.11a (OFDM 6 Mbit/s)

Results

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5745.00000	No	5743.811881	-2.99

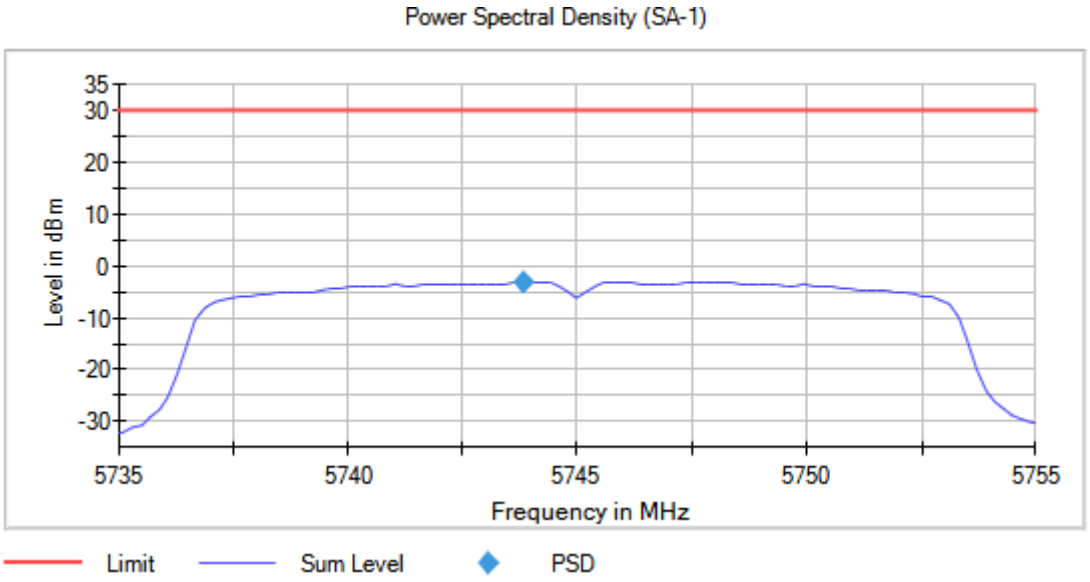
Verdict

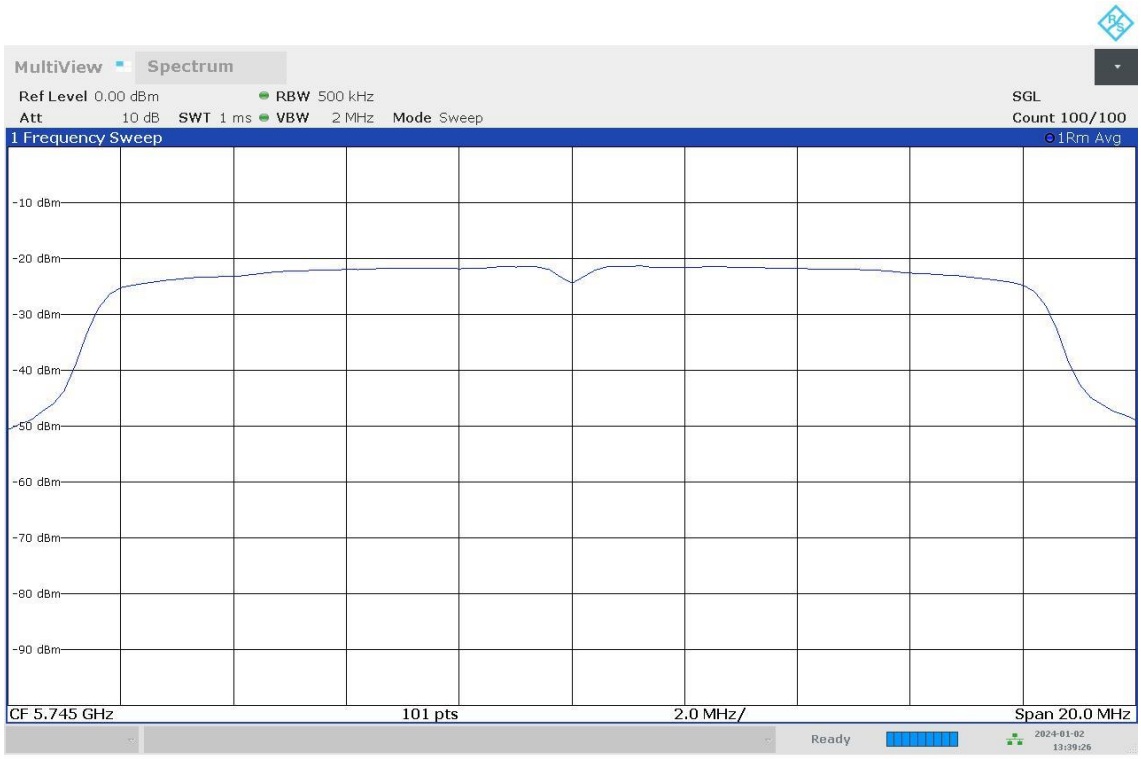
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11a (OFDM 6 Mbit/s)

Images:





01:39:26 PM 01/02/2024

Modulation: 802.11ac VHT20 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5745.00000	No	5746.188119	-3.44

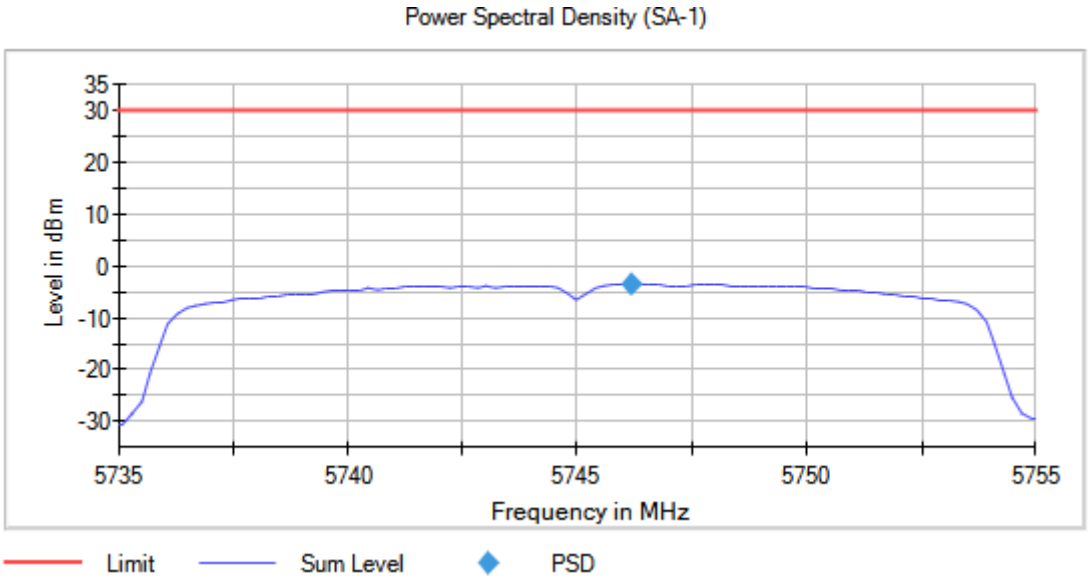
Verdict

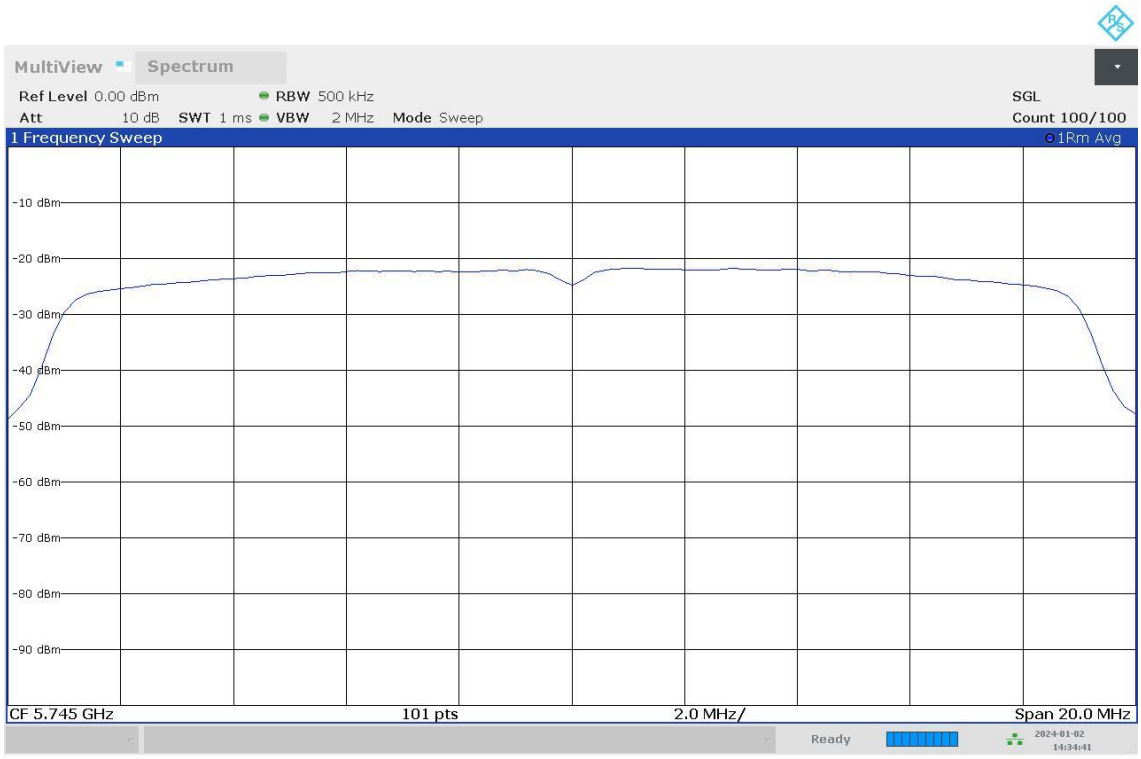
Pass

Attachments

Frequency MHz = 5745.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

Images:





02:34:42 PM 01/02/2024

Modulation: 802.11ac VHT40 (OFDM MCS0)

Results

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5755.00000	No	5752.625000	-7.30

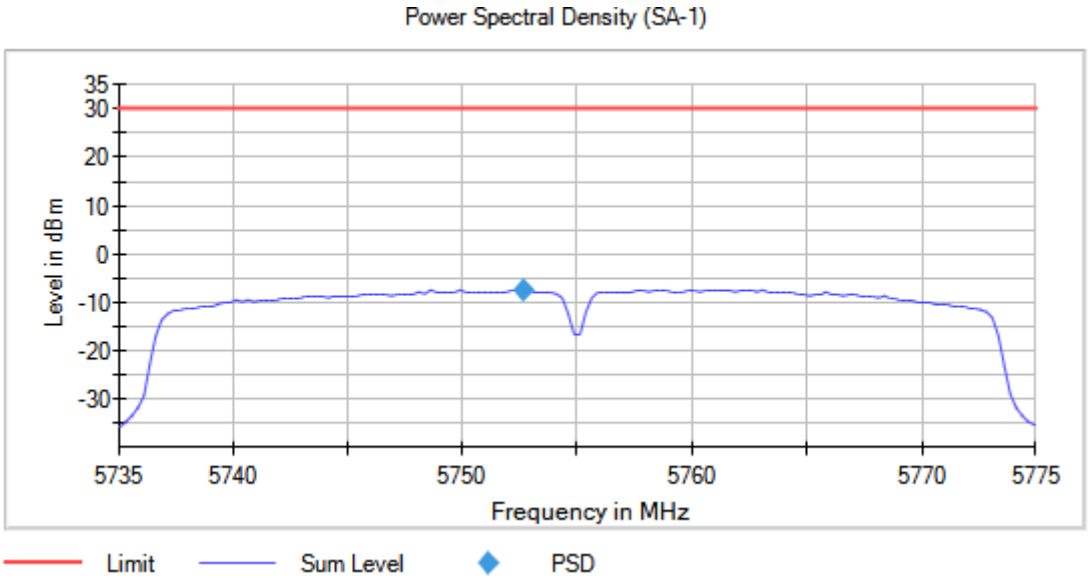
Verdict

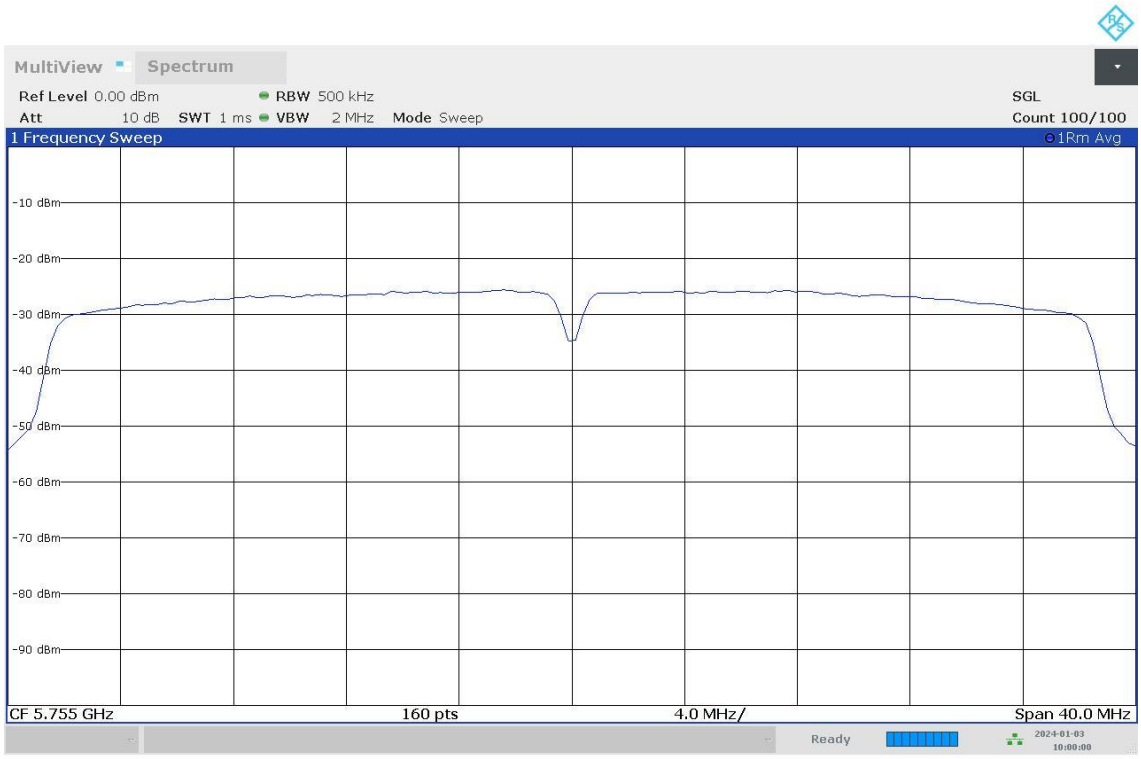
Pass

Attachments

Frequency MHz = 5755.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)

Images:





10:00:01 AM 01/03/2024

Modulation: 802.11ac VHT80 (OFDM MCS0x1)

Results

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5725, 5850]	1	5775.00000	No	5760.125000	-12.44

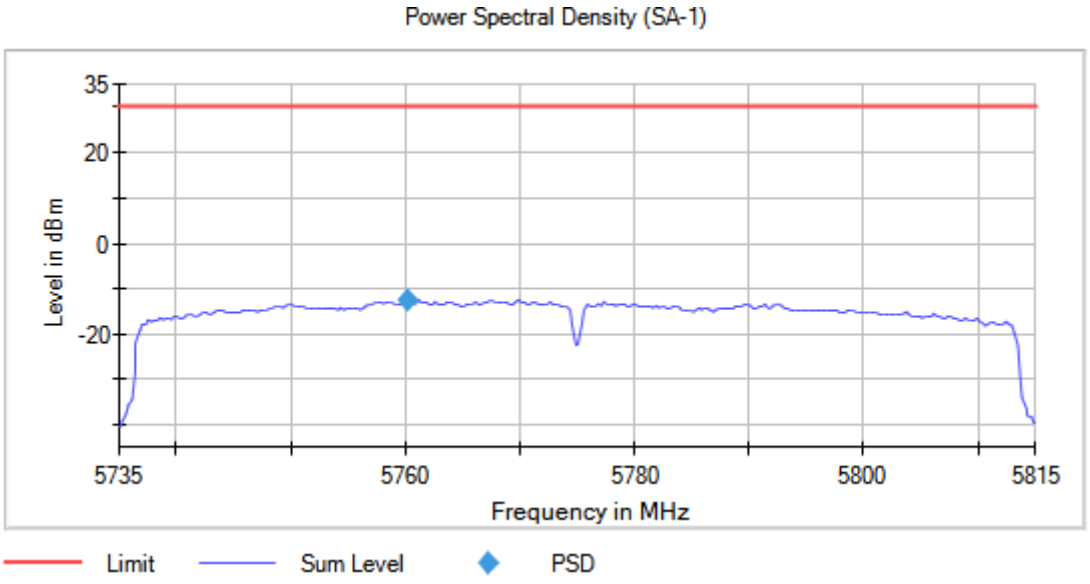
Verdict

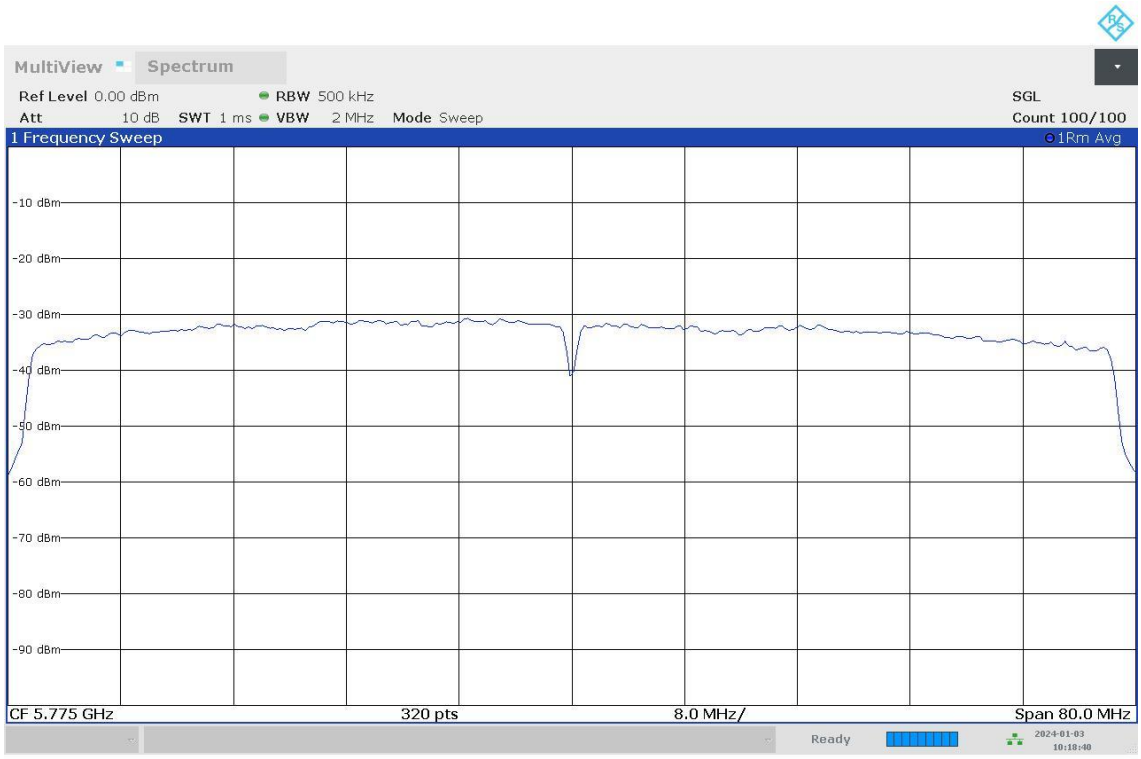
Pass

Attachments

Frequency MHz = 5775.00000 Modulation = 802.11ac VHT80 (OFDM MCS0x1)

Images:




MultiView
Spectrum
Ref Level 0.00 dBm
RBW 500 kHz
SGL
Att 10 dB
SWT 1 ms
VBW 2 MHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Rm Avg
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 5.775 GHz
320 pts
8.0 MHz/
Span 80.0 MHz
Ready
2024-01-03
10:18:40
10:18:40 AM 01/03/2024