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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 an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test 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.
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 and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification 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 $\leq \pm 5.35$ 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 $\leq \pm 4.32$ 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 $\leq \pm 5.72$ dB (with factor $k = 2$).

The total uncertainty of the measurement system for the conducted testing of EUT is:

RF Output Power: Measurement uncertainty $\leq \pm 0.99$ dB

Power Spectral Density: Measurement uncertainty $\leq \pm 0.99$ dB

6dB Bandwidth: Measurement uncertainty $\leq \pm 1.13$ %

26dB Emission Bandwidth: Measurement uncertainty $\leq \pm 1.12$ %

Occupied Channel Bandwidth: Measurement uncertainty $\leq \pm 1.13$ %

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 telematics control unit with wireless technologies, used in automotive, equipped with one modem, OEM. This unit was designed for automotive usage and contains the following features: GSM, UMTS, LTE, 5G, GNSS, WiFi (a, b, g, n, ac), Bluetooth Low Energy (BTLE) and Bluetooth EDR.

HARMAN AUTOMOTIVE DIVISION
HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GÖRING-STRASSE 16
76307 KARLSBAD, GERMANY



Declaration of similarity

To whom it may concern,

We, **Harman Becker Automotive Systems GmbH**, located in
Becker-Goering-Str. 16; 76307 Karlsbad, Germany

Hereby declare that the following units: TKCMOD12E00, TKCMOD12N00,
TKCMOD11000, TKCMOD12C00, TKCMOD12J00, TKCMOD12R00,
TKCMOD12T00 and TKCMOD13C00

have integrated the same BT/Wifi chipset.

The different naming comes from country specific, features enabled or network
access device type.

Targeted countries	Product Name	Type	NAD-HW	GNSS	Bluetooth in WLAN	NAD Services	CV2X
Rest of the world (offline variant)	TKCMOD11000	V046	EU	x	x		
EU + some other countries	TKCMOD12E00	V037, V042, V043, V044, V049	EU	x	x	x	
Canada/Mexico/USA	TKCMOD12N00	V038, V039, V047	NA	x	x	x	
China (without CV2X)	TKCMOD12C00	V105	CN	x	x	x	
Japan	TKCMOD12J00	V045	RW	x	x	x	
Armenia/Belarus/Kazakhstan/R ussia/Uzbekistan	TKCMOD12R00	V048	EU	x	x	x	
Turkey	TKCMOD12T00	V040	EU	x	x	x	
China (with CV2X)	TKCMOD13C00	V106	CN	x	x	x	x

This declaration is intended to be included in the test reports where applies

Regards

HARMAN AUTOMOTIVE DIVISION
Harman Becker Automotive Systems GmbH
Becker-Göring-Straße 16
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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 result.

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	67003B_70.1	Telematic control unit	VW	358845890061449	2021-11-30	Element Under Test
S/01	67003B_32.1	BT_WLAN_2-3 - Audi	--	--	2021-09-23	Element Under Test
S/01	67003B_34.1	FAKRA cable 4 on 1 for antenna	--	--	2021-09-23	Element Under Test
S/01	67003B_35.1	Bumper antenna - Audi	--	--	2021-09-23	Element Under Test
S/01	67003B_37.1	BT_WLAN_2-3 - Audi	--	--	2021-09-23	Element Under Test
S/01	67003B_39.1	BT_WLAN_1 - Audi/Porsche	--	--	2021-09-23	Element Under Test
S/01	67003B_41.1	Roof antenna - Audi	--	--	2021-09-23	Element Under Test
S/01	67003B_43.1	FAKRA cable 4 on 1 for antenna	--	--	2021-09-23	Element Under Test
S/01	67003B_44.1	FAKRA cable for antenna	--	--	2021-09-23	Element Under Test
S/01	67003B_66.1	Battery	--	--	2021-11-30	Element Under Test
S/01	67003B_33.1	Metal panel	--	--	2021-09-23	Auxiliary Element
S/01	67003B_36.1	Metal panel	--	--	2021-09-23	Auxiliary Element
S/01	67003B_38.1	Metal panel	--	--	2021-09-23	Auxiliary Element
S/01	67003B_42.1	Metal panel	--	--	2021-09-23	Auxiliary Element
S/01	67003B_46.1	Harness	--	--	2021-09-23	Auxiliary Element
S/02	67003B_70.1	Telematic control unit	VW	358845890061449	2021-11-30	Element Under Test
S/02	67003B_14.1	GNSS antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_15.1	BT_WLAN_3 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_16.1	LTE_4 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_17.1	BT_WLAN_2 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_18.1	BT_WLAN_1 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_19.1	LTE_3 antenna	--	--	2021-09-07	Element Under Test

Id	Control Number	Description	Model	Serial No.	Date of Reception	Application
S/02	67003B_20.1	BTLE Ant. Combiner (BT_LE_1)	--	--	2021-09-07	Element Under Test
S/02	67003B_21.1	BT_LE_1 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_22.1	BT_LE_1 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_23.1	LTE_1 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_24.1	LTE_2 antenna	--	--	2021-09-07	Element Under Test
S/02	67003B_27.1	ETH (H-MTD) cable	--	--	2021-09-07	Element Under Test
S/02	67003B_46.1	Harness	--	--	2021-09-23	Auxiliary Element
S/02	67003B_66.1	Battery	--	--	2021-11-30	Element Under Test
S/03	67003B_70.1	Telematic control unit	VW	358845890061449	2021-11-30	Element Under Test
S/03	67003B_46.1	Harness	--	--	2021-09-23	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Radiated. Configuration #1 (BT_WLAN_2 antenna).
S/02	Radiated. Configuration #2 (BT_WLAN_2 antenna).
S/03	Conducted. Configuration #1 and Configuration #2.

Test sample description

Ports..... :	Port name and description		Cable			
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾
	RF connector – code			[]	[X]	[]
	RF connector – code			[X]	[X]	[]
RF connector – code			[X]	[]	[]	
Supplementary information to the ports..... :						
Rated power supply	Voltage and Frequency		Reference poles			
			L1	L2	L3	N
	[X]	DC: 12V car battery (4.8 VDC inside of TCU)				
Rated Power	12V DC					
Clock frequencies..... :	See Block diagram					
Other parameters	See Technical description					
Software version	X152					
Hardware version	C2.3					
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 telematics control unit				
Modules/parts..... :	Module/parts of test item		Type		Manufacturer	
						
Accessories (not part of the test item)	Description		Type		Manufacturer	
	Cable Harness					
	2G/3G/4G/5G Antenna				Hirschmann / Molex	
	eCall button/LED					
	SOS Loudspeaker					
	Wake-up unit Box					
Documents as provided by the applicant	Description		File name		Issue date	
	Technical Description					

⁽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)	2021-12-20
Date (finish)	2022-02-25

Document history

Report number	Date	Description
67003RRF.011	2022-06-17	First release.
67003RRF.011A1	2022-10-21	First modification: update of typos. This modification test report cancels and replaces the test report 67003RRF.011.

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 semi-anechoic 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 model TKCMOD12N00 comes with two different configurations. Each configuration has different antennas. A summary stating the gains used for the tests is included below:

	Model	Antenna Gain (dBi)	Antenna type	Technology used
Configuration 1	TKCMOD12N00	3.2 dBi	BT_WLAN_2 antenna	WiFi 5GHz
Configuration 2	TKCMOD12N00	5 dBi	BT_WLAN_2 antenna	WiFi 5GHz

More detailed information about the different configurations has been provided in the supporting documentation from the manufacturer.

The tests have been performed by the technical personnel: Alfonso Gutiérrez Martínez, José Manuel Jiménez González, Miguel Manuel López Guzmán, Nicolás Salguero Camarena and Pablo Redondo Reyes.

Used instrumentation:

Equipment	Model	Manufacturer	Next Calibration
SHIELDED ROOM	S101	ETS LINDGREN	N.A.
SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2023-02-26
OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE & SCHWARZ	2024-03-16
POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	N.A.
DIGITAL MULTIMETER	179	FLUKE	2022-10-19
TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-13
EMC/RF MEASUREMENT SOFTWARE	EMC32	ROHDE AND SCHWARZ	N.A.
SEMIANECHOIC ABSORBER LINED CHAMBER II	FACT 3 200 STP	ETS LINDGREN	N.A.
SHIELDED ROOM	S101	ETS LINDGREN	N.A.
SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2022-07-06
EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2022-12-12
HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2023-04-30
HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2022-11-18
HORN ANTENNA 17-40GHz	BBHA 9170	SCHWARZBECK	2023-05-05
PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	2022-03-09

Equipment	Model	Manufacturer	Next Calibration
PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2022-06-07
PRE-AMPLIFIER G>30dB 17-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2022-09-08
DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	N.A.

Testing verdicts

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

Summary

5.725 GHz – 5.85 GHz Band

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
Duty Cycle		N/A	
Transmitter 99% Occupied Bandwidth		N/A	
Transmitter 26 dB Emission Bandwidth (EBW)		N/A	
FCC 15.407 (e) / RSS-247 Clause 6.2.4.1	6 dB Bandwidth.	P	
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum conducted Output Power	P	
FCC 15.407 (a)(3) / RSS-247 Clause 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	
<u>Supplementary information and remarks:</u>			
None.			

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

TEST CONDITIONS	14
Transmitter Duty Cycle	18
Transmitter 99% Occupied Bandwidth	21
Transmitter 26 dB Emission Bandwidth (EBW)	36
FCC 15.407 (e) / RSS-247 6.2.4.1. 6 dB Bandwidth	51
FCC 15.407 (a)(3) / RSS-247 6.2.4.1. Maximum Conducted Output Power	67
FCC 15.407 (a)(3) / RSS-247 6.2.4.1. Maximum Power Spectral Density	71
FCC 15.407(b)(4) /RSS-247 6.2.4.2. Transmitter Out of Band Radiated Emissions and Transmitter Band Edge Radiated Emissions.	73

TEST CONDITIONS

(*) Declared by the Applicant.

POWER SUPPLY (*)

Vnominal: 12 Vdc
Type of Power Supply: External DC (vehicle battery).

ANTENNAS (*)

Type of Antenna: Dedicated external antenna.
Maximum Declared Antenna Gain:

- Configuration #1: +3.2 dBi
- Configuration #2: +5 dBi

TEST FREQUENCIES (*)

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:	BT_WLAN_2	
Beamforming:	No	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 149	5745
	Middle: 157	5785
	High: 165	5825
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 151	5755
	High: 159	5795
Channel Spacing:	80 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Middle: 155	5775

The test set-up was made in accordance to the general provisions of ANSI C63.10: 2013 and FCC KDB 789033 D02 General UNII 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 individually 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 scripts to configure the EUT and a document containing the setup instructions.

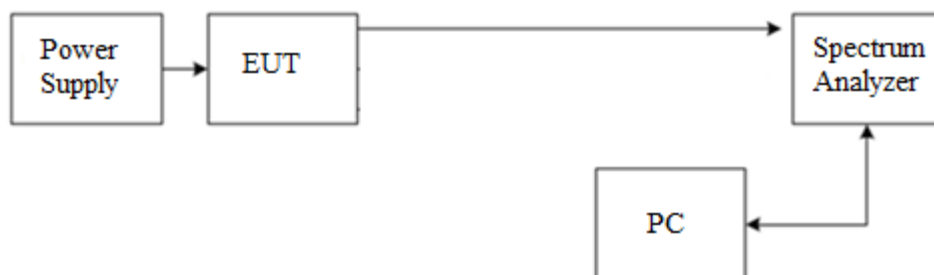
The worst-case modes for testing were identified in terms of output power based on preliminary measurements. Worst-case data rates:

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

TEST SETUP

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and connected to the spectrum analyzer using a low-loss RF cable. The reading in the spectrum analyzer is corrected considering the internal and external RF cable loss.



The DC supply voltage is applied using an external power supply.

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.

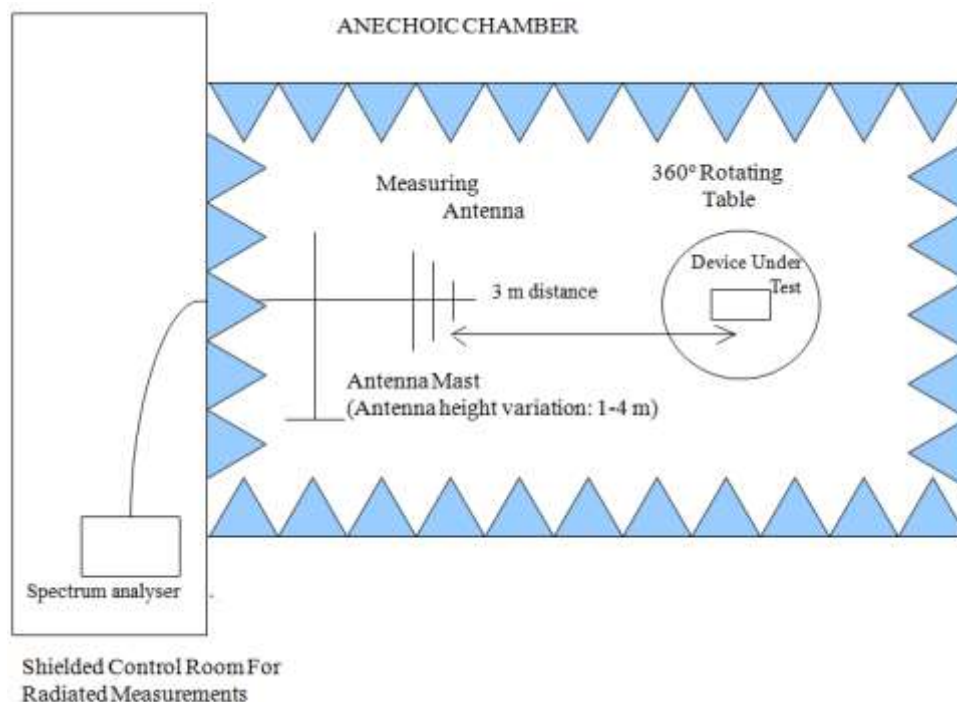
The equipment under test was set up on a non-conductive platform above the ground plane and its situation and orientation were varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters (up to 18GHz) to find the maximum radiated emission.

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

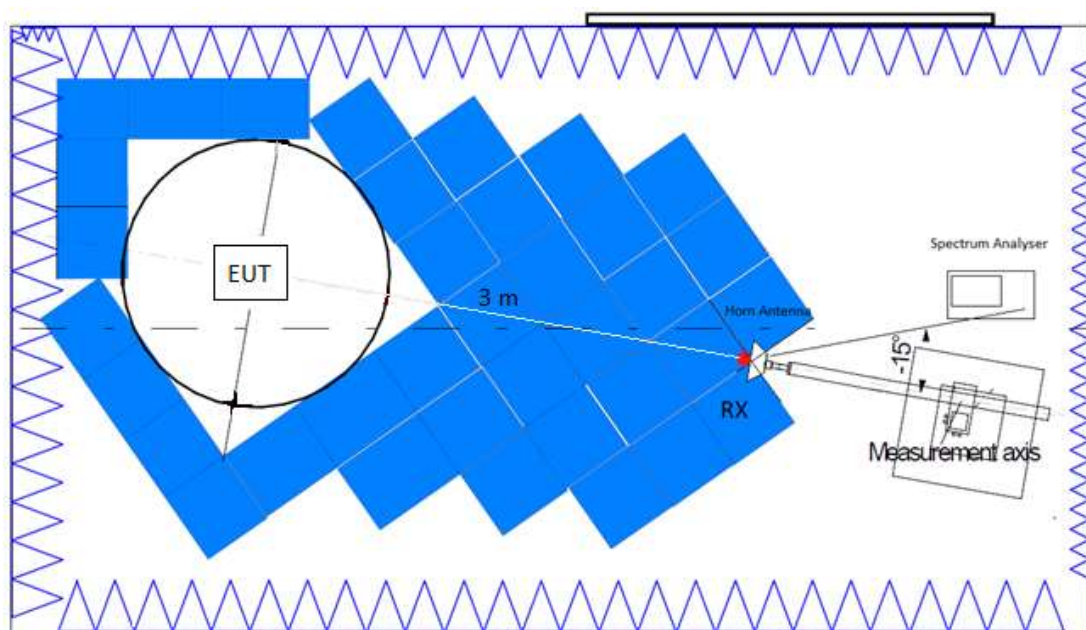
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

The final measured value, for any given emission in the tables below, incorporates the calibrated antenna factor, cable loss, pre-amplifiers gain and distance correction factor for measurements performed at 1-meter distance.

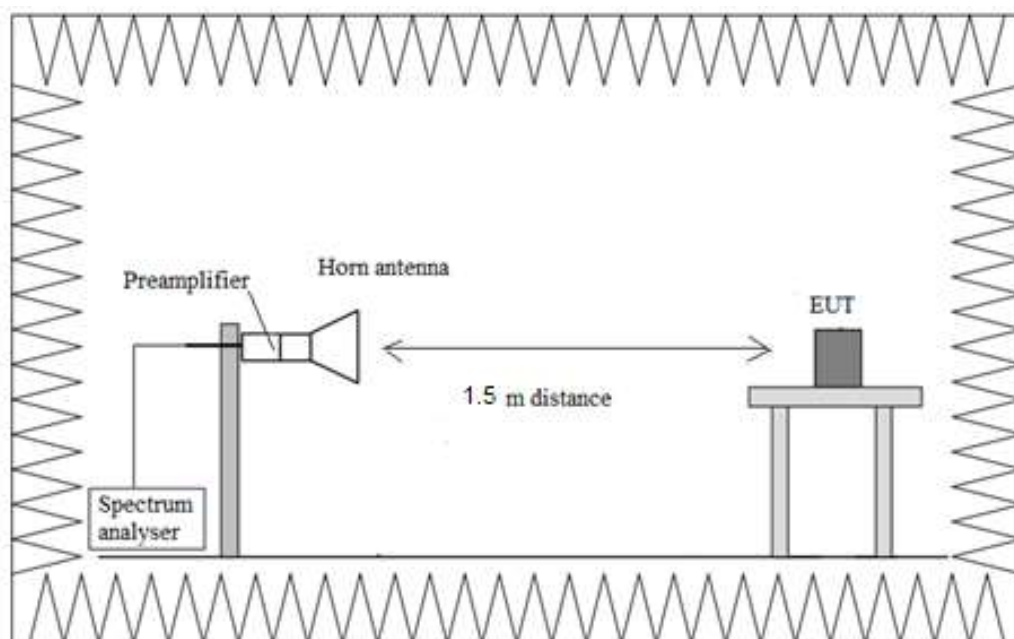
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz up to 40 GHz:



Transmitter Duty Cycle

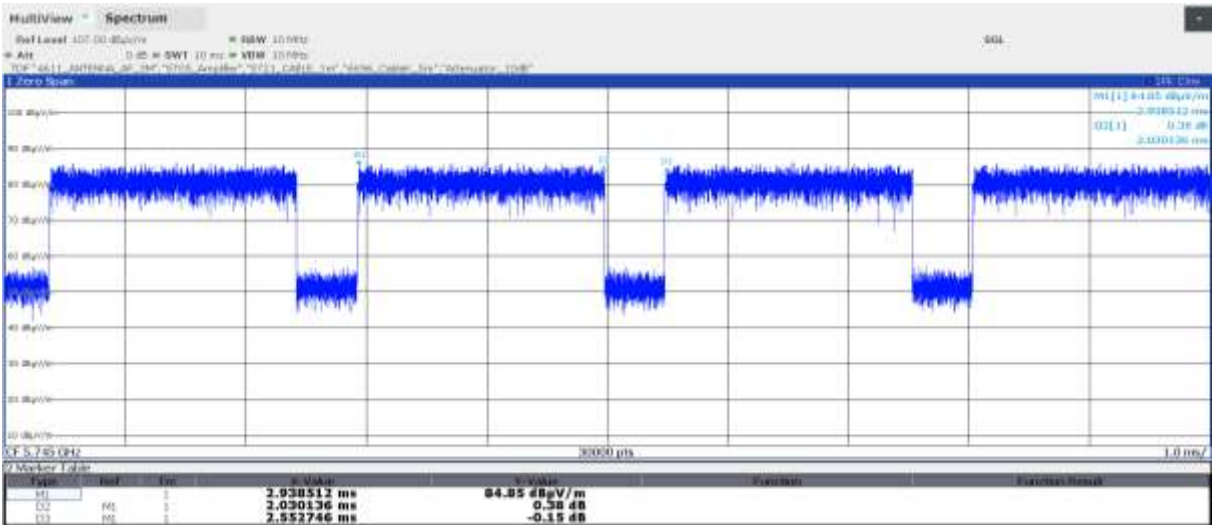
Results

- U-NII-3 sub-band:

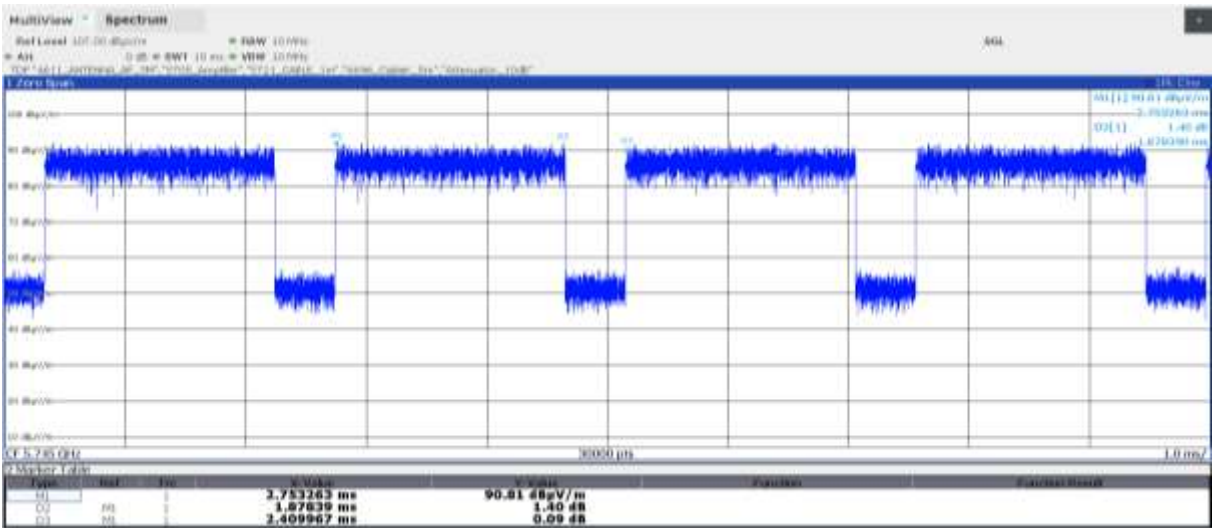
Mode	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction Factor(dB)
802.11a20 (6 Mbps)	2.030136	2.552746	0.99
802.11n20 (HT20 MCS0)	1.878390	2.409967	1.08
802.11ac20 (VHT20 MCS0)	1.899925	2.421835	1.05
802.11n40 (HT40 MCS0)	0.903859	1.413568	1.94
802.11ac40 (VHT40 MCS0)	0.911925	1.424918	1.94
802.11ac80 (VHT80)	0.421045	0.915756	3.37

Attachments

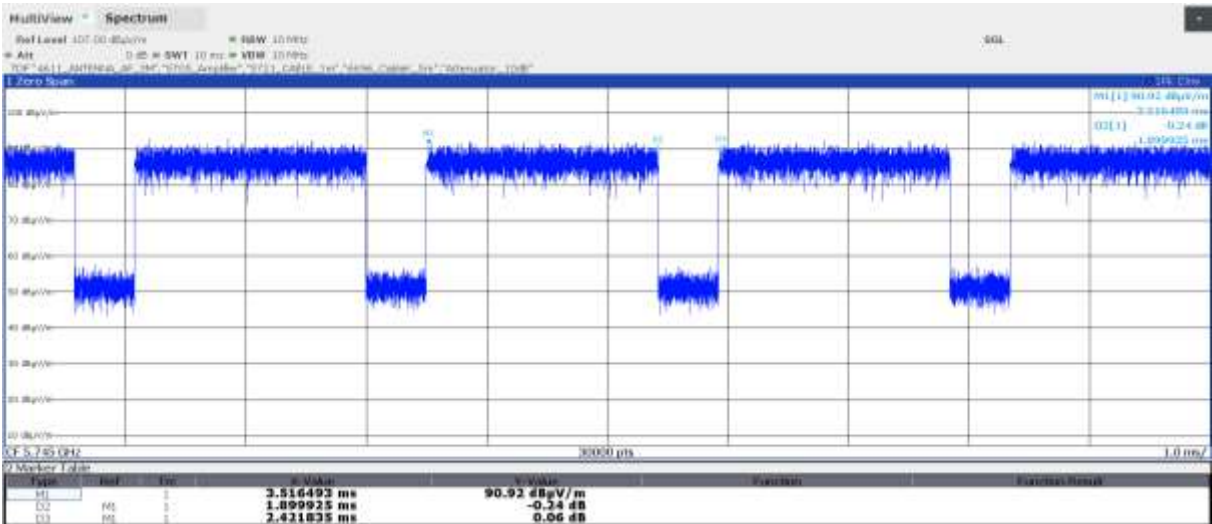
Mode 802.11 a20 (6 Mbps):



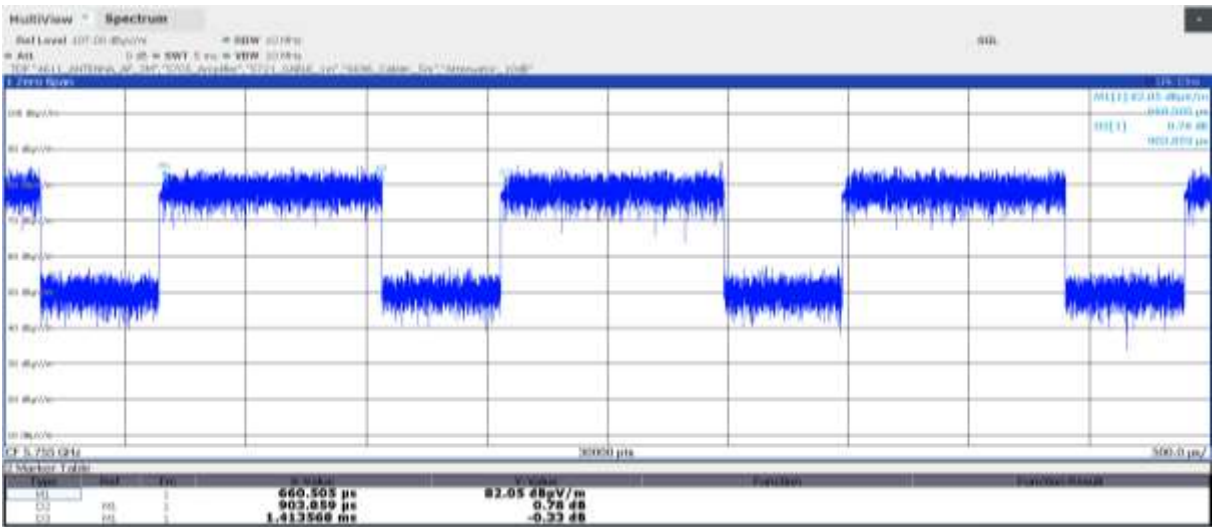
Mode 802.11 n20 (HT20 MCS0):



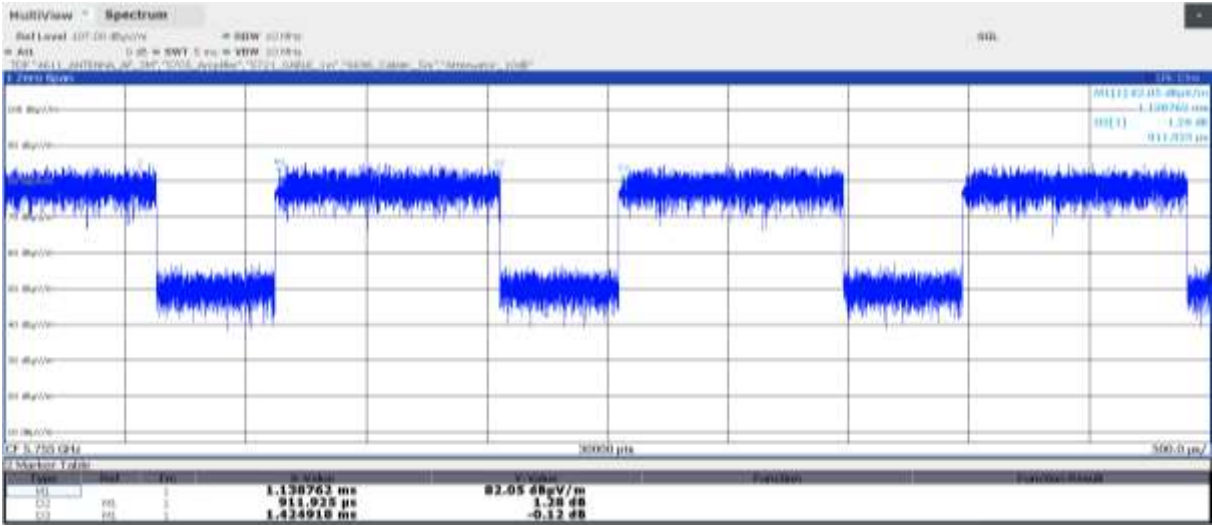
Mode 802.11 ac20 (VHT20 MCS0):



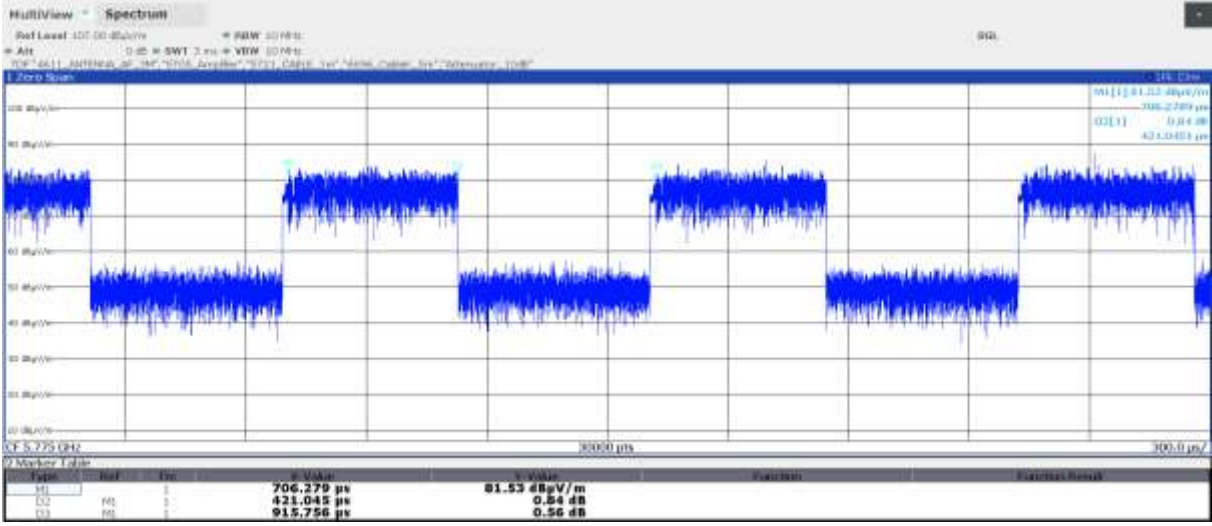
Mode 802.11 n40 (HT40 MCS0):



Mode 802.11 ac40 (VHT40 MCS0):



Mode 802.11 ac80 (VHT80):



Transmitter 99% Occupied Bandwidth

Results

- U-NII-3 sub-band:

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	16.800000	16.600000	16.700000

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	18.100000	17.900000	18.000000

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	18.100000	17.800000	18.000000

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.750000	36.500000

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.500000	36.250000

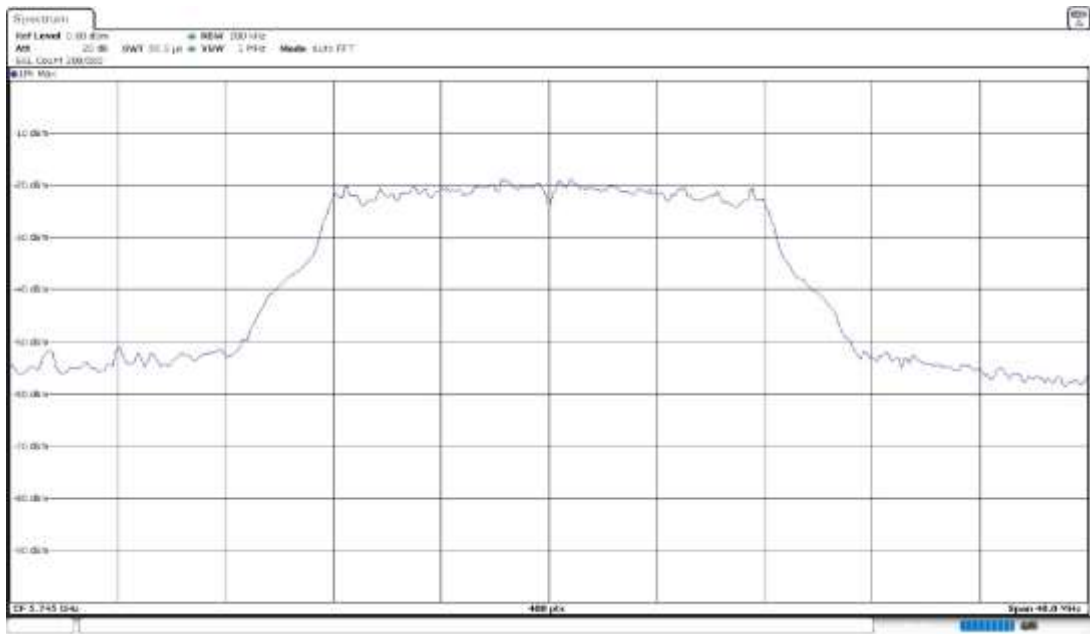
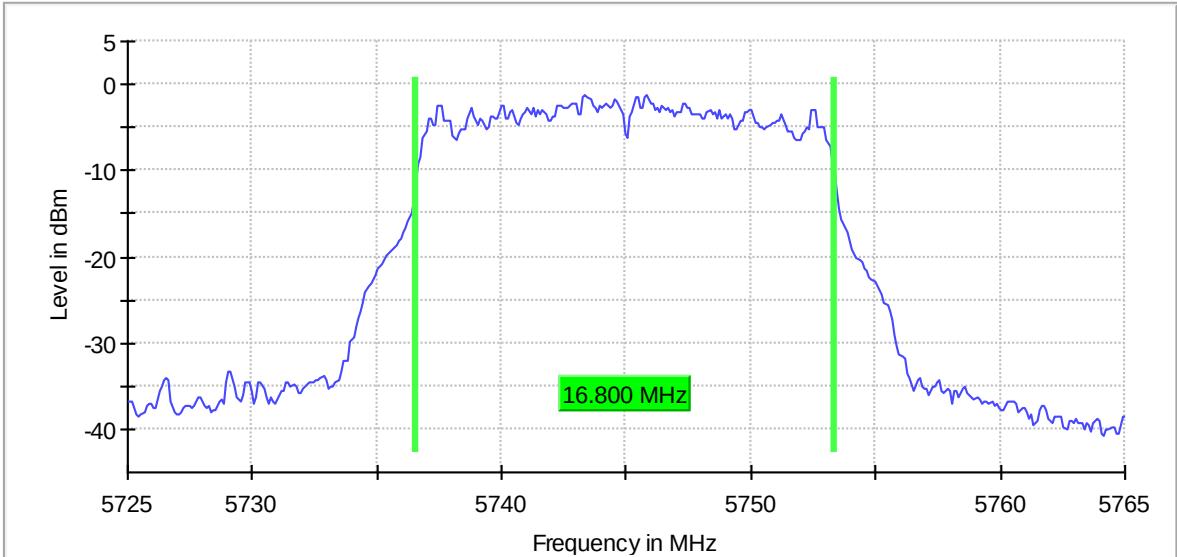
Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
99% Occupied Bandwidth (MHz)	75.500000

Attachments

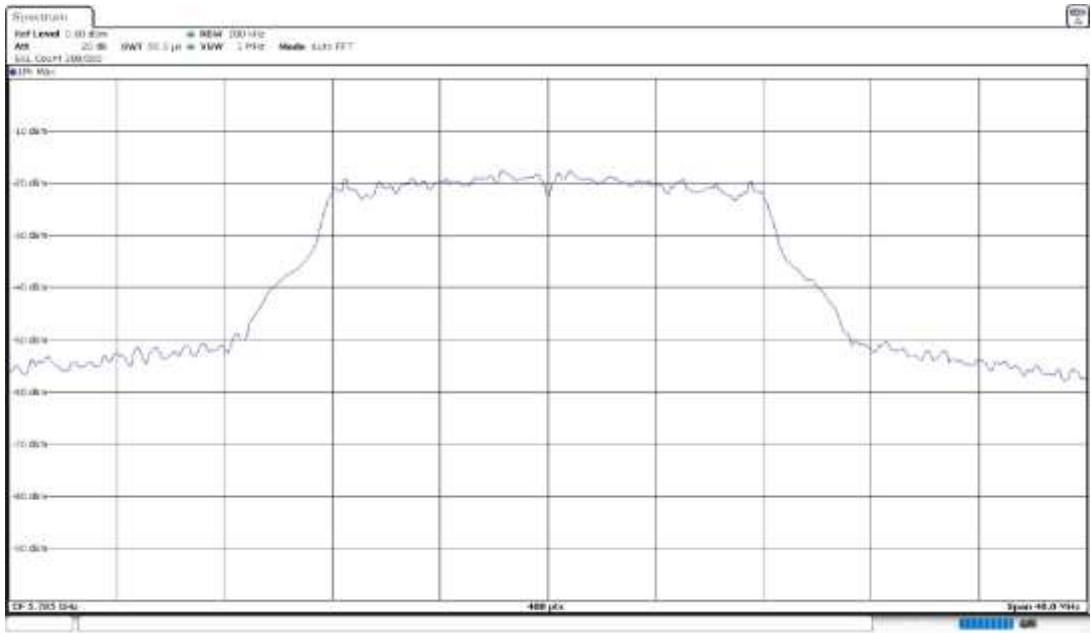
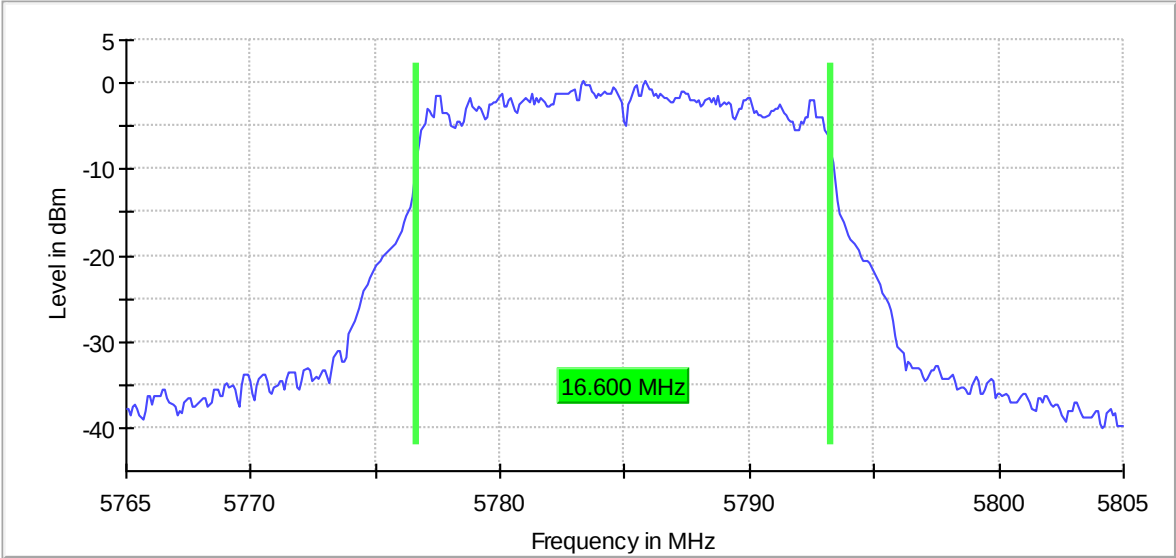
Mode 802.11 a20, Low Channel 149 (5745 MHz)

99 % Bandwidth



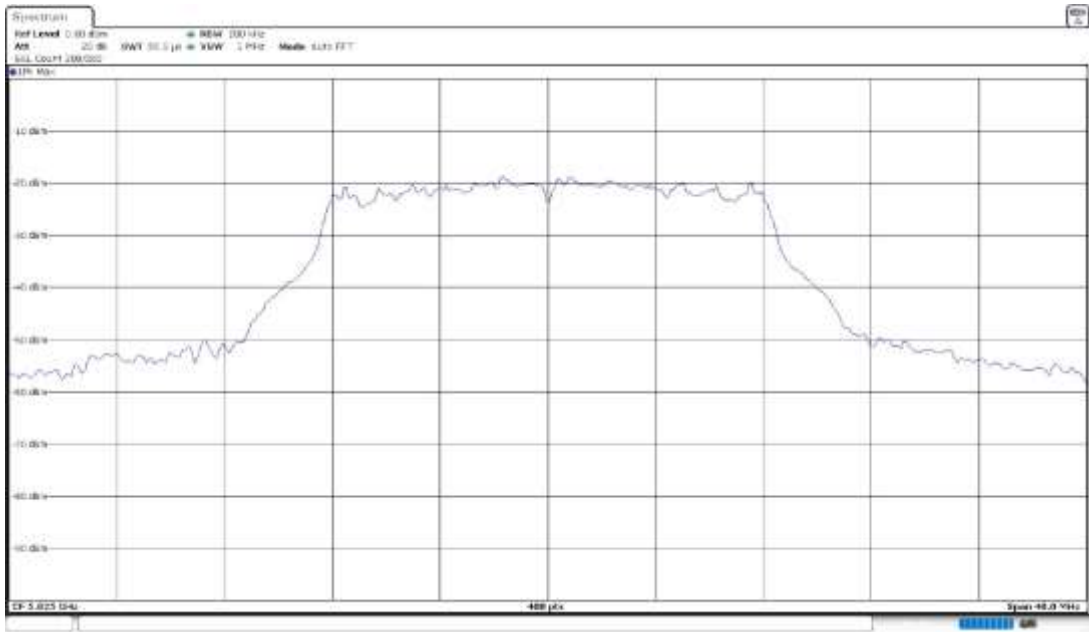
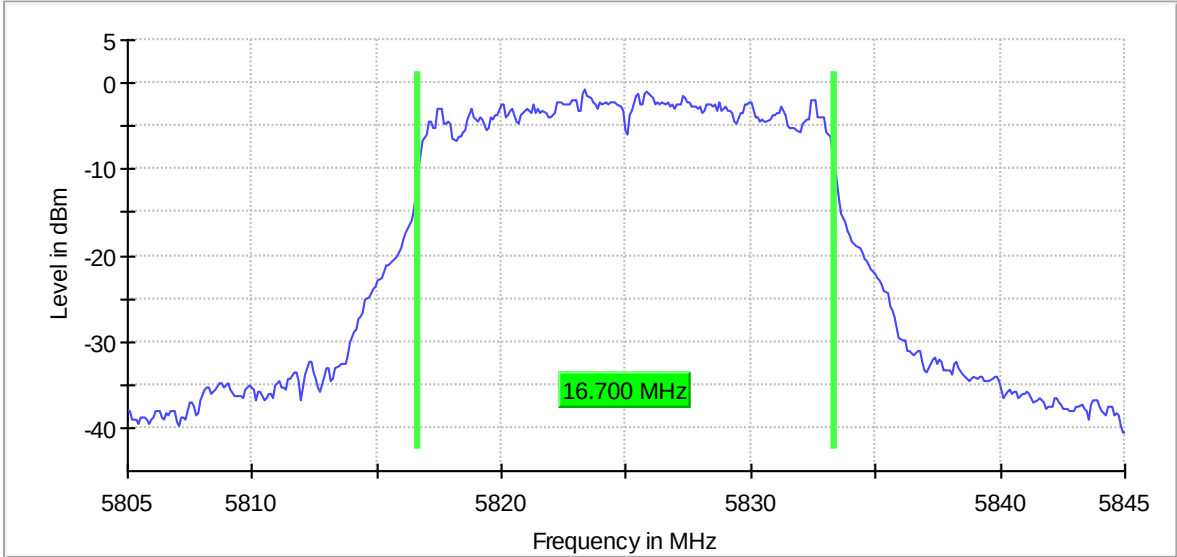
Mode 802.11 a20, Middle Channel 157 (5785 MHz)

99 % Bandwidth



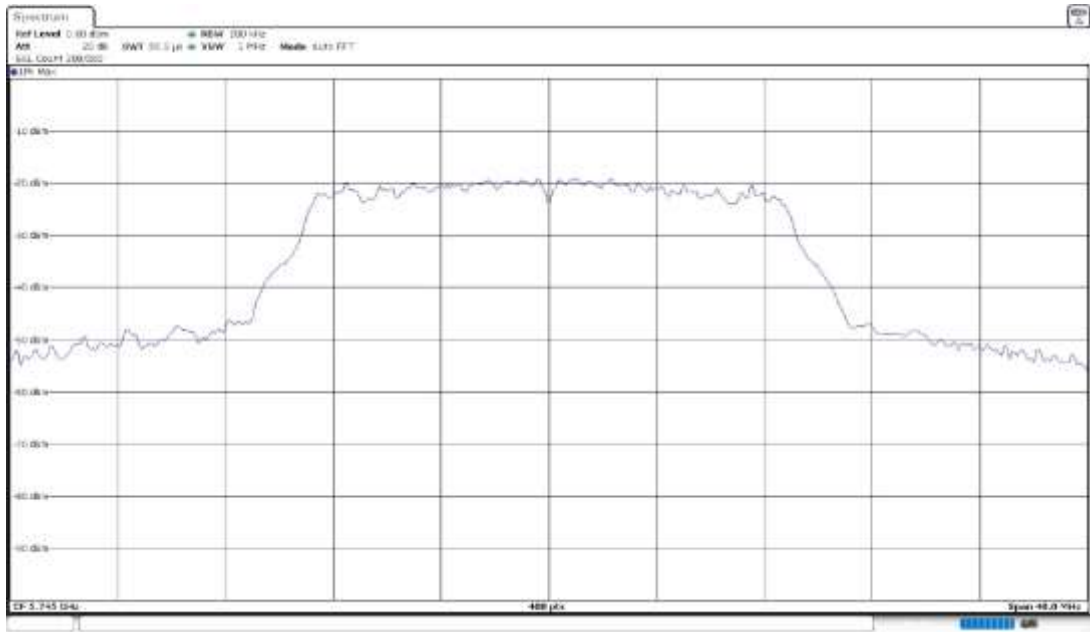
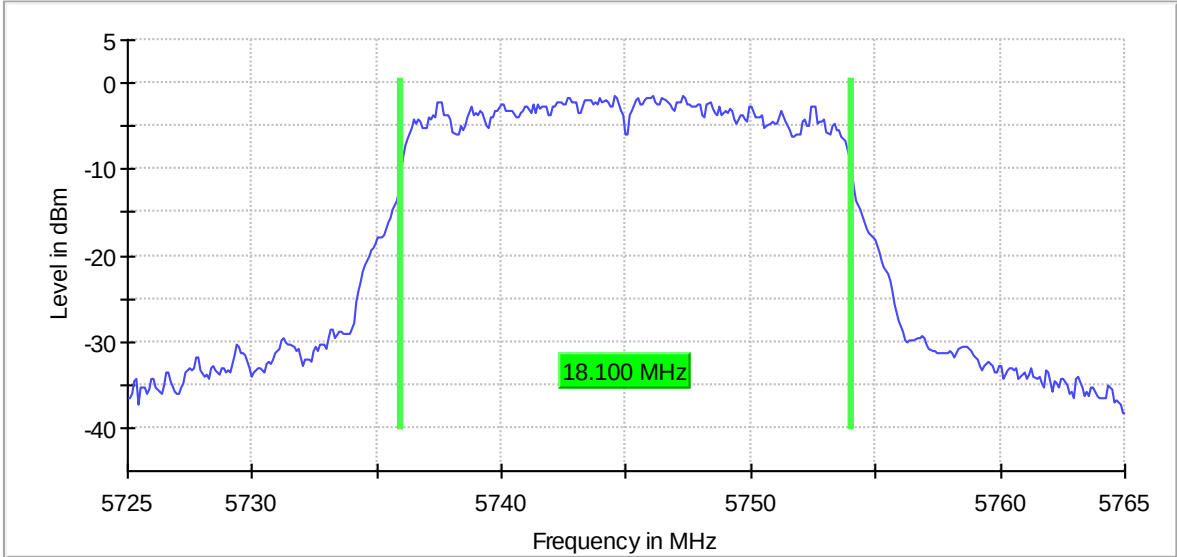
Mode 802.11 a20, High Channel 165 (5825 MHz)

99 % Bandwidth



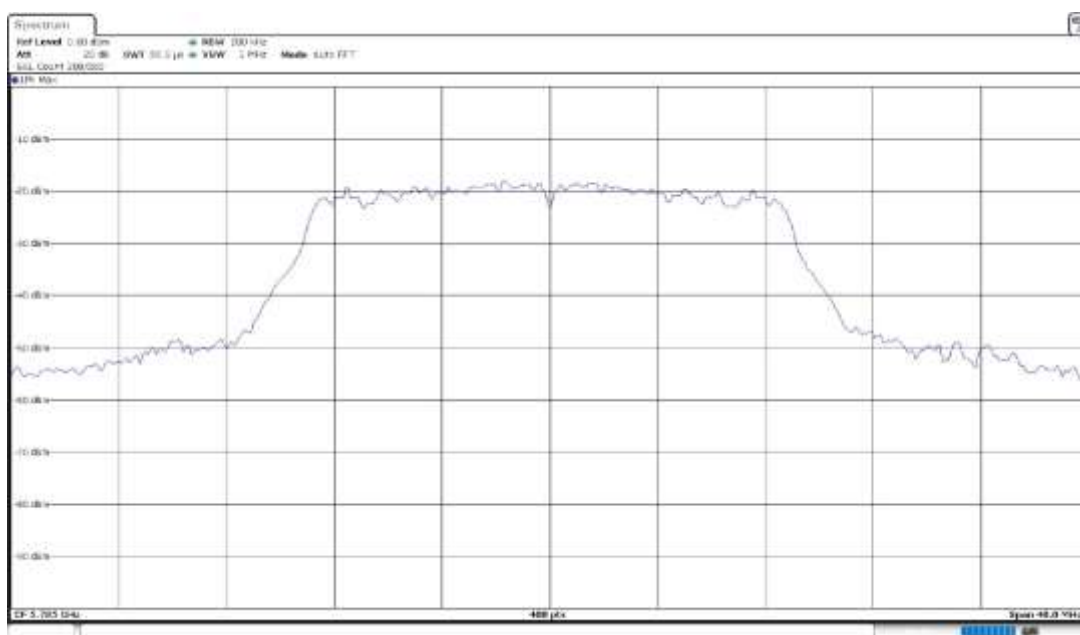
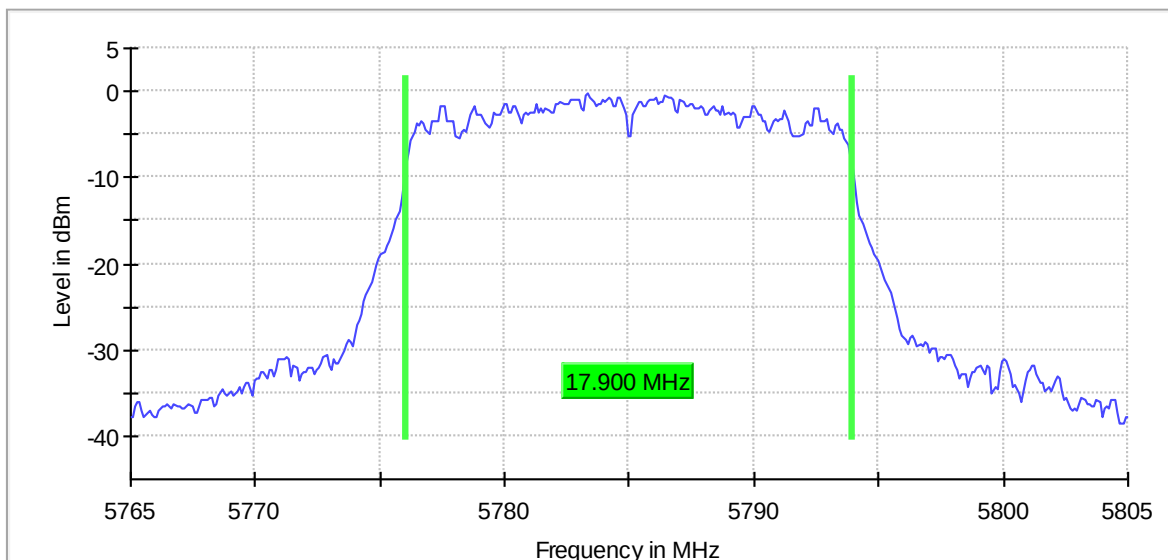
Mode 802.11 n20 (HT20), Low Channel 149 (5745 MHz)

99 % Bandwidth



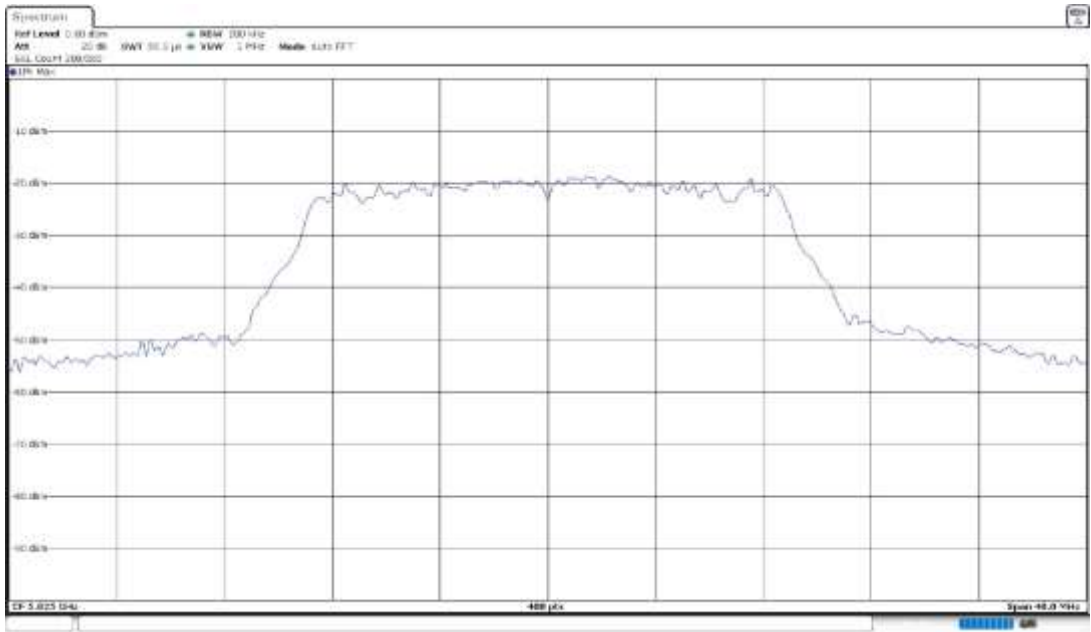
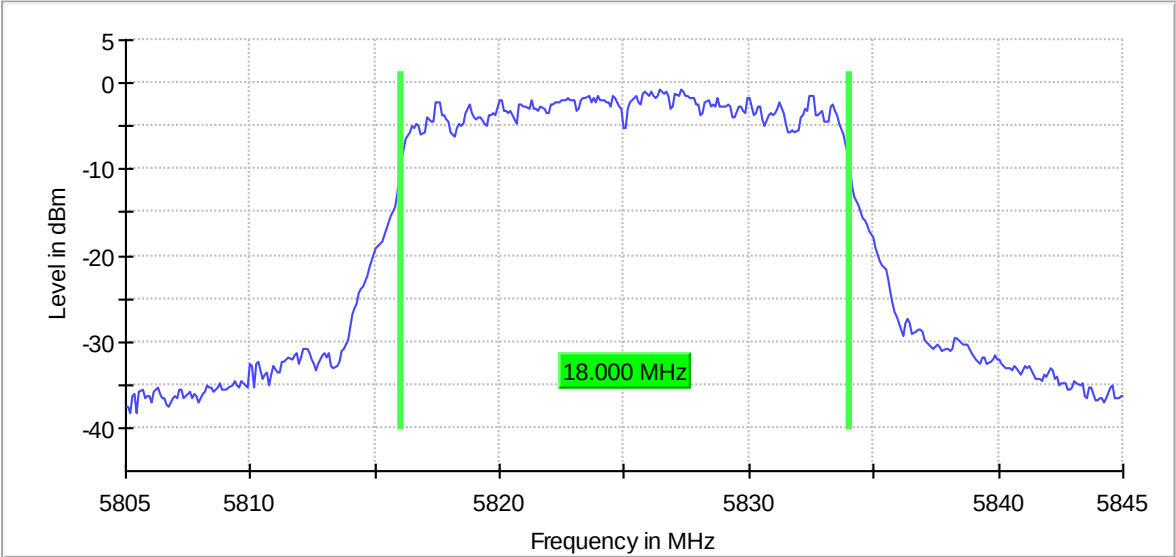
Mode 802.11 n20 (HT20), Middle Channel 157 (5785 MHz)

99 % Bandwidth



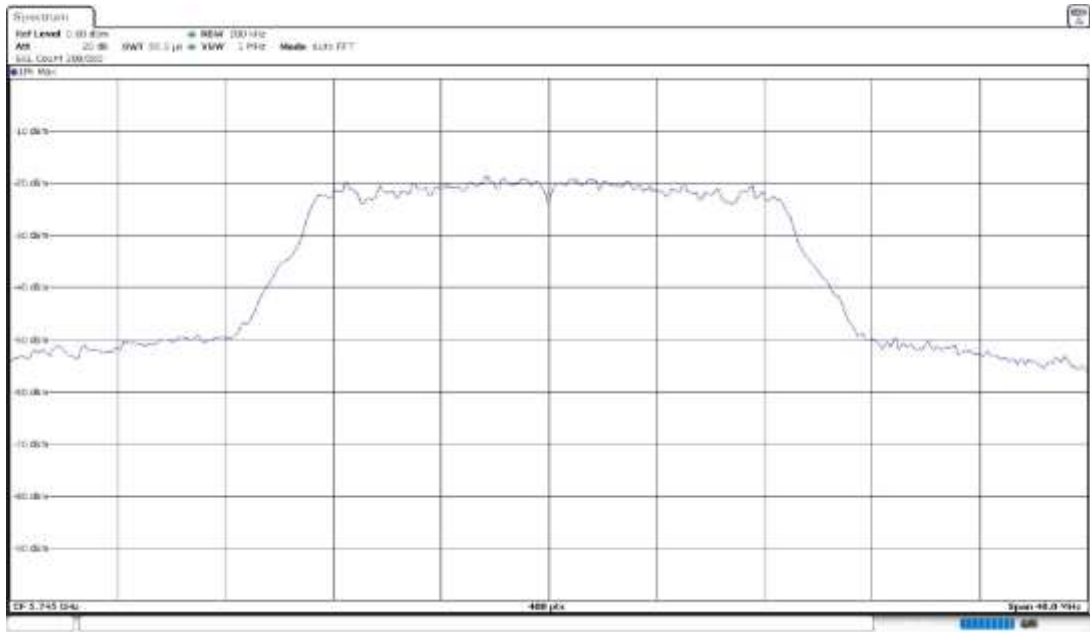
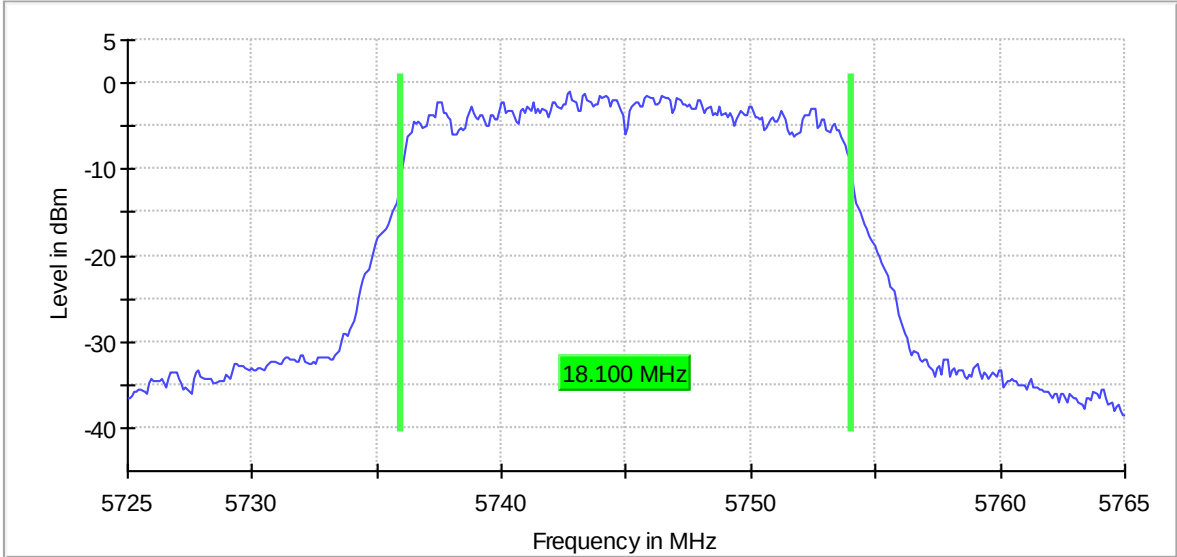
Mode 802.11 n20 (HT20), High Channel 165 (5825 MHz)

99 % Bandwidth



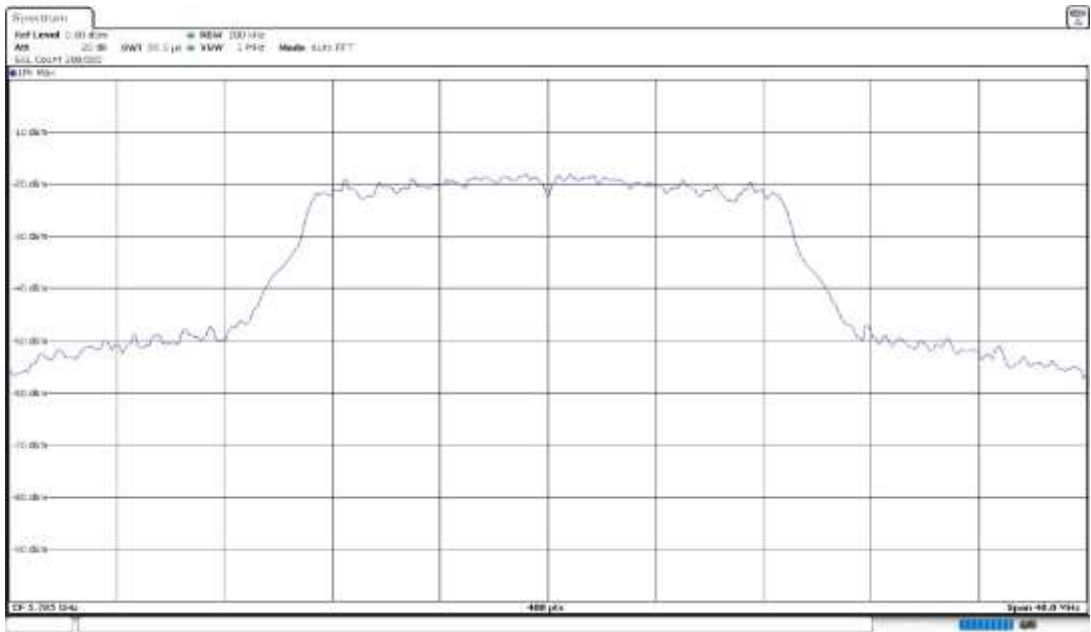
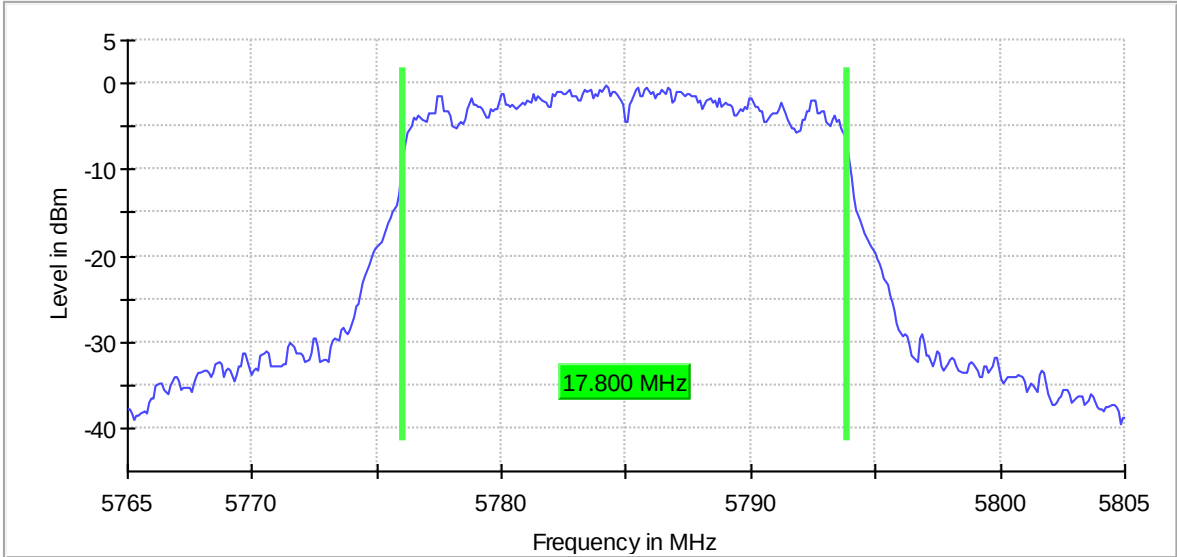
Mode 802.11 ac20 (VHT20), Low Channel 149 (5745 MHz)

99 % Bandwidth



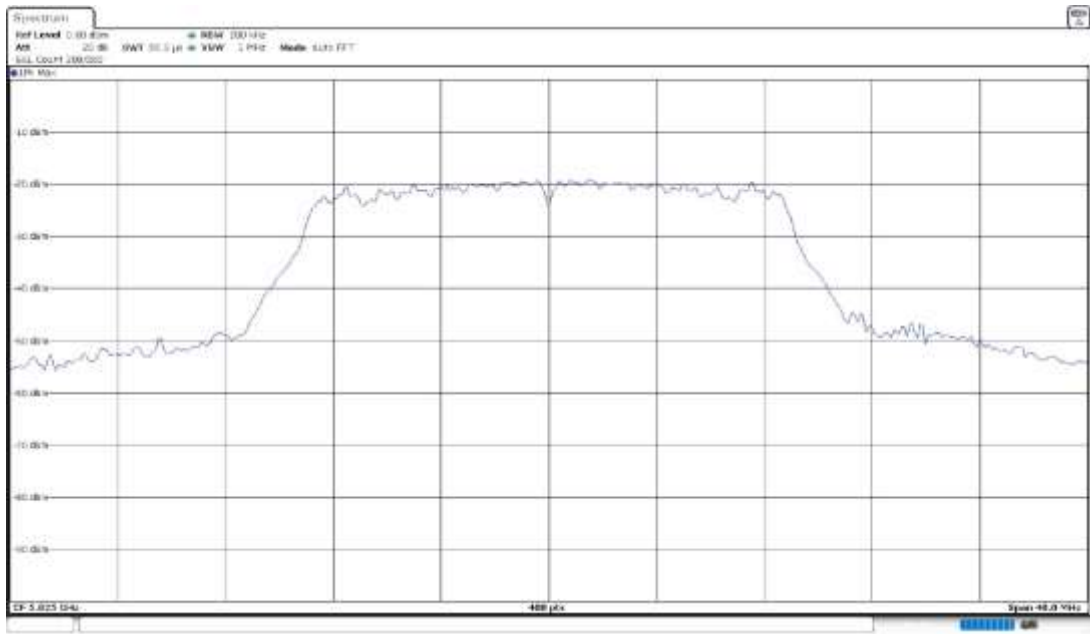
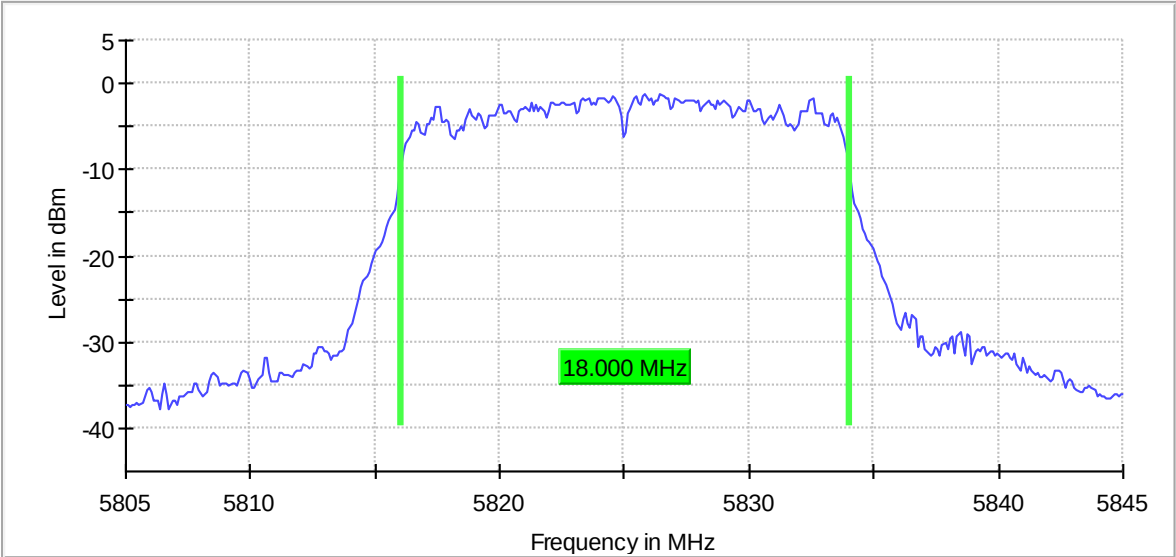
Mode 802.11 ac20 (VHT20), Middle Channel 157 (5785 MHz)

99 % Bandwidth



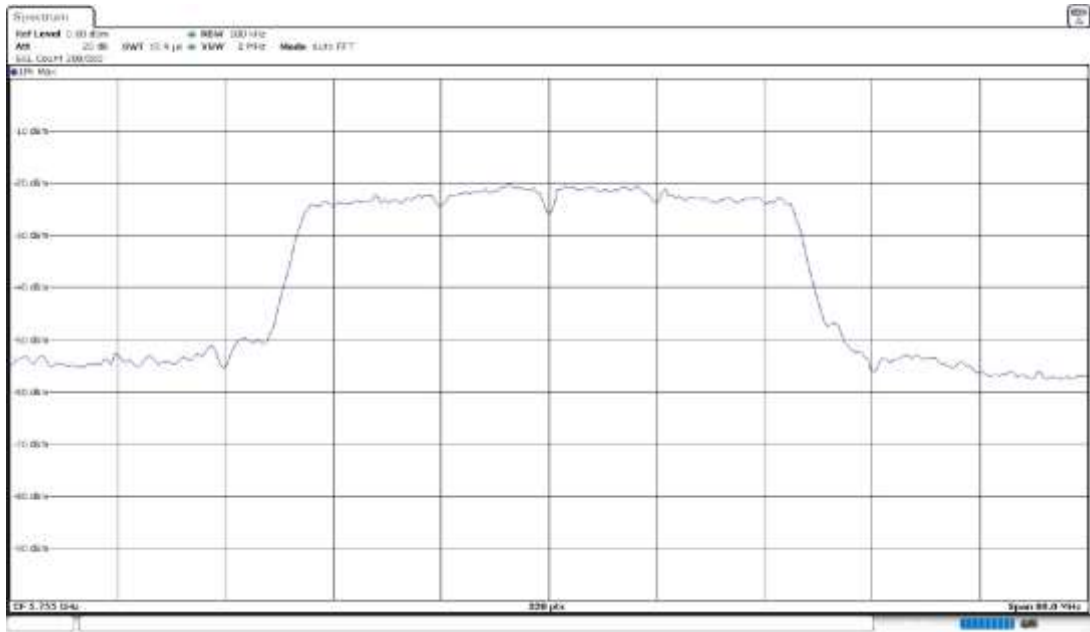
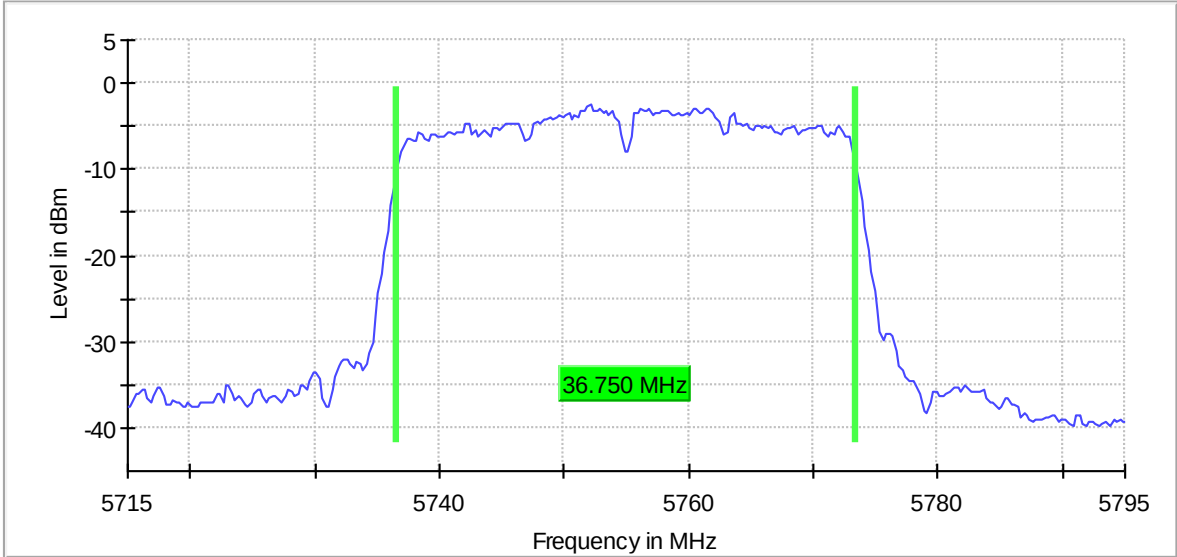
Mode 802.11 ac20 (VHT20), High Channel 165 (5825 MHz)

99 % Bandwidth

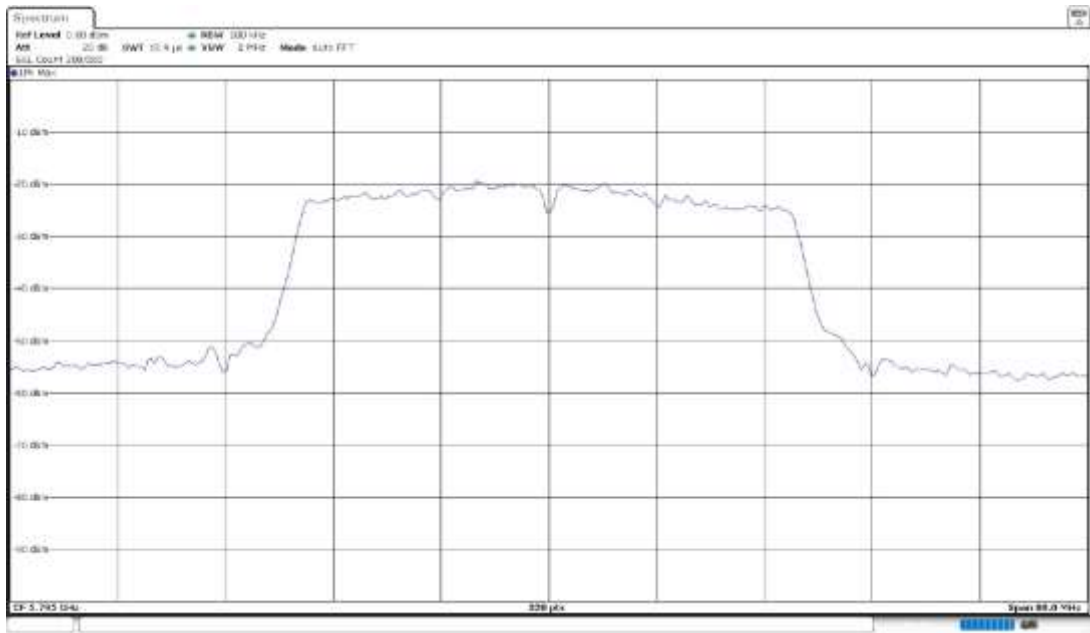
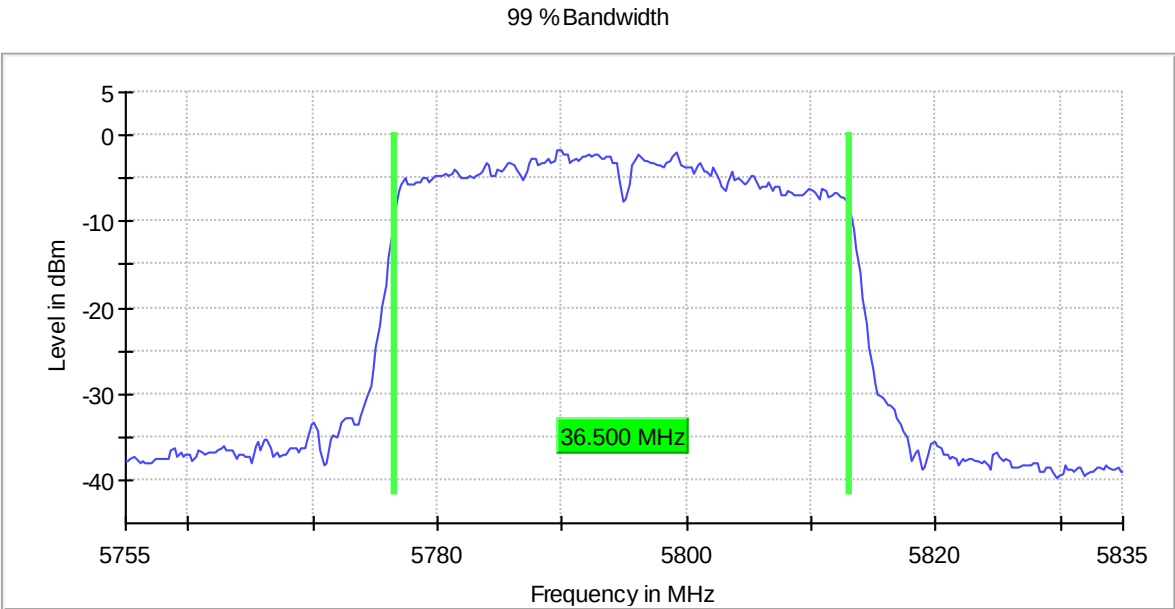


Mode 802.11 n40 (HT40), Low Channel 151 (5755 MHz)

99 % Bandwidth

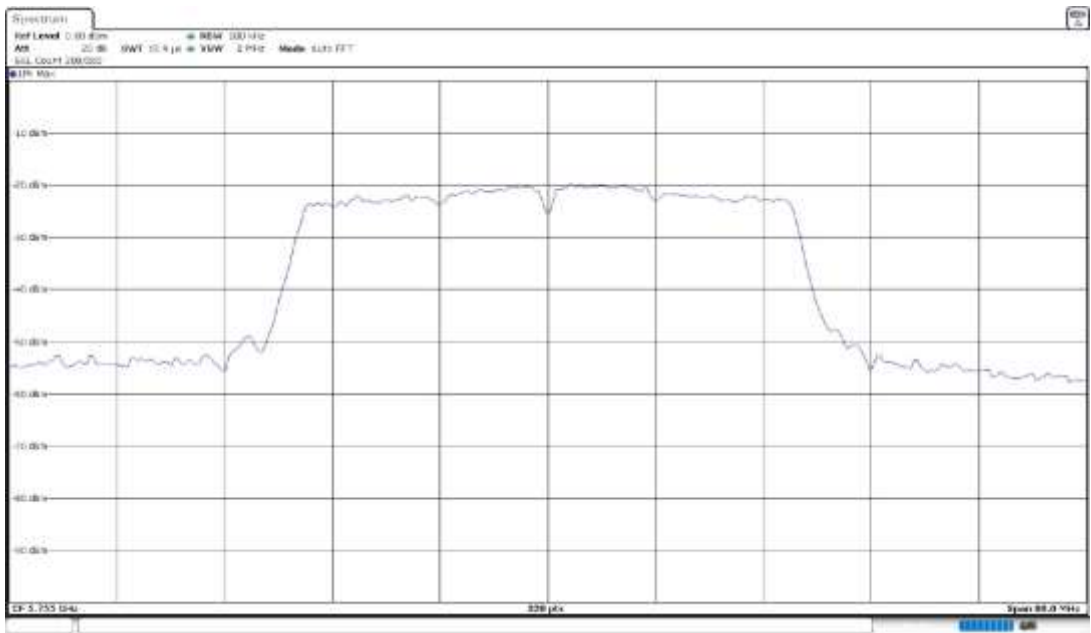
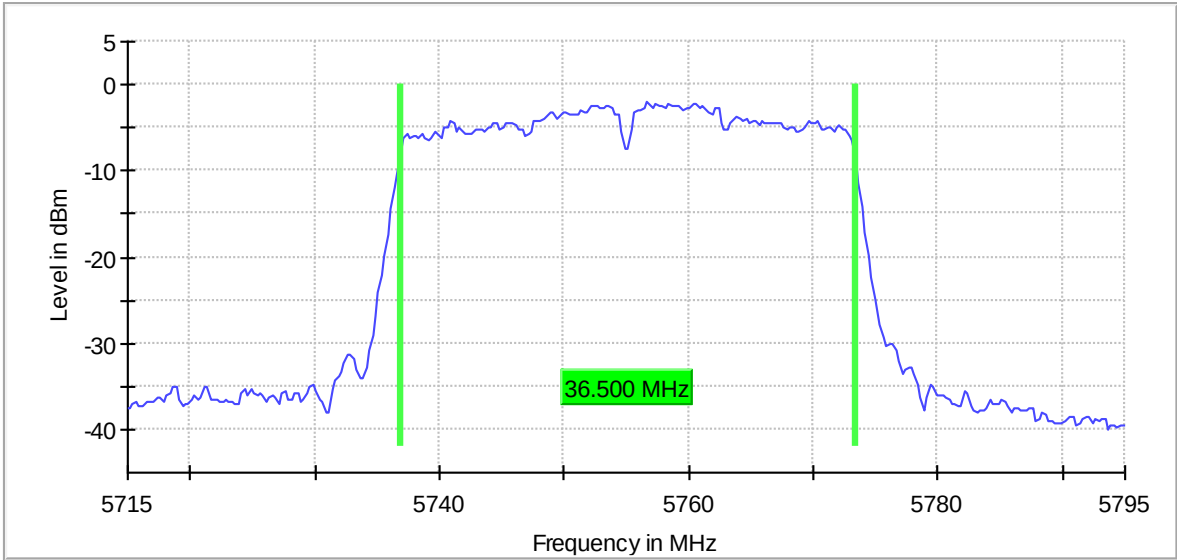


Mode 802.11 n40 (HT40), High Channel 159 (5795 MHz)



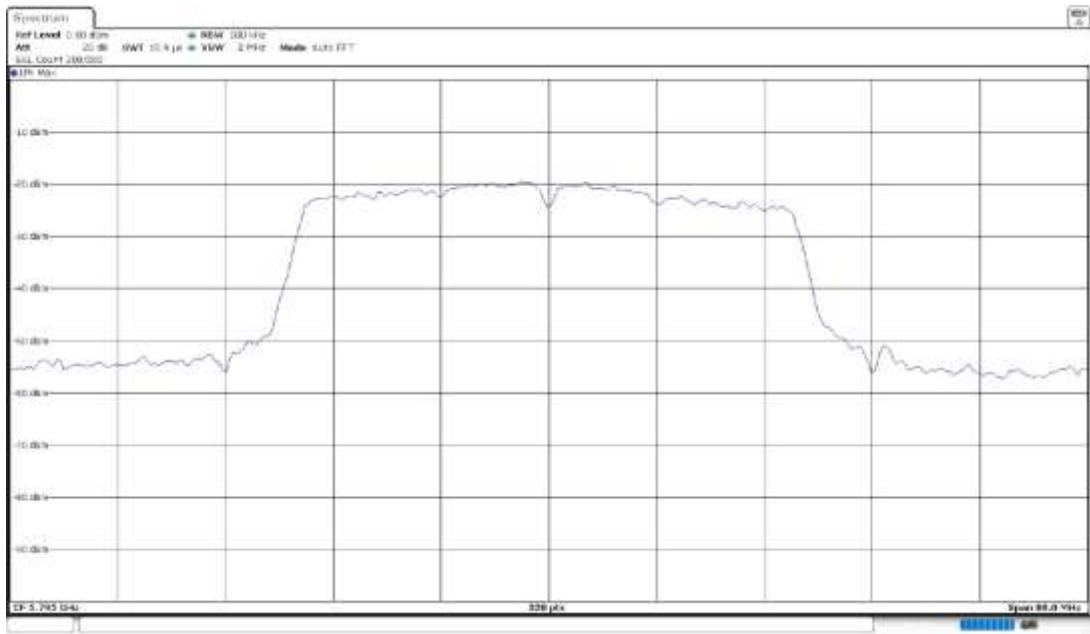
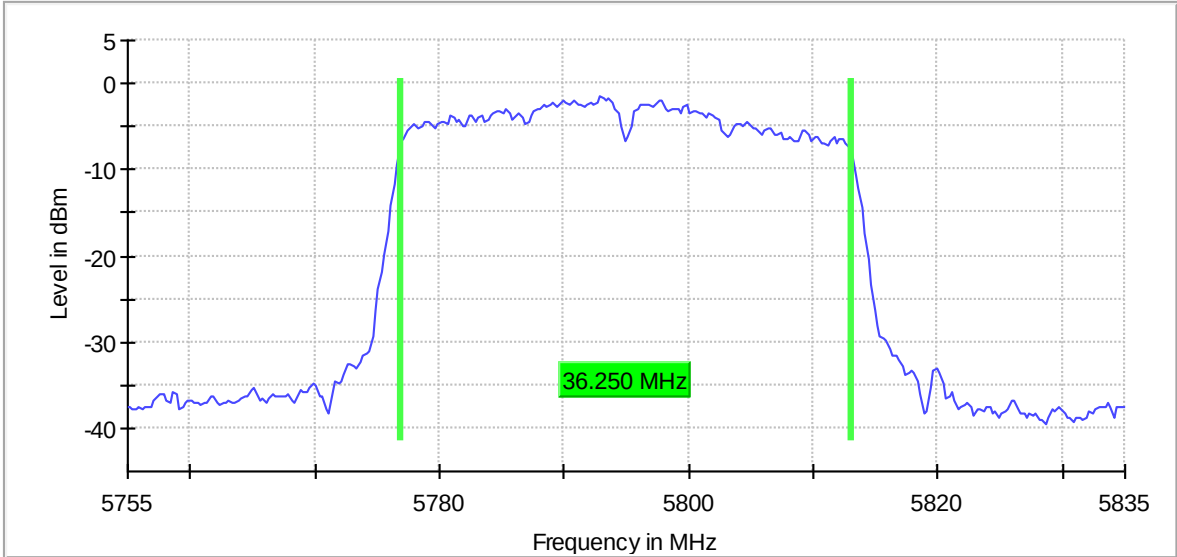
Mode 802.11 ac40 (VHT40), Low Channel 151 (5755 MHz)

99 % Bandwidth

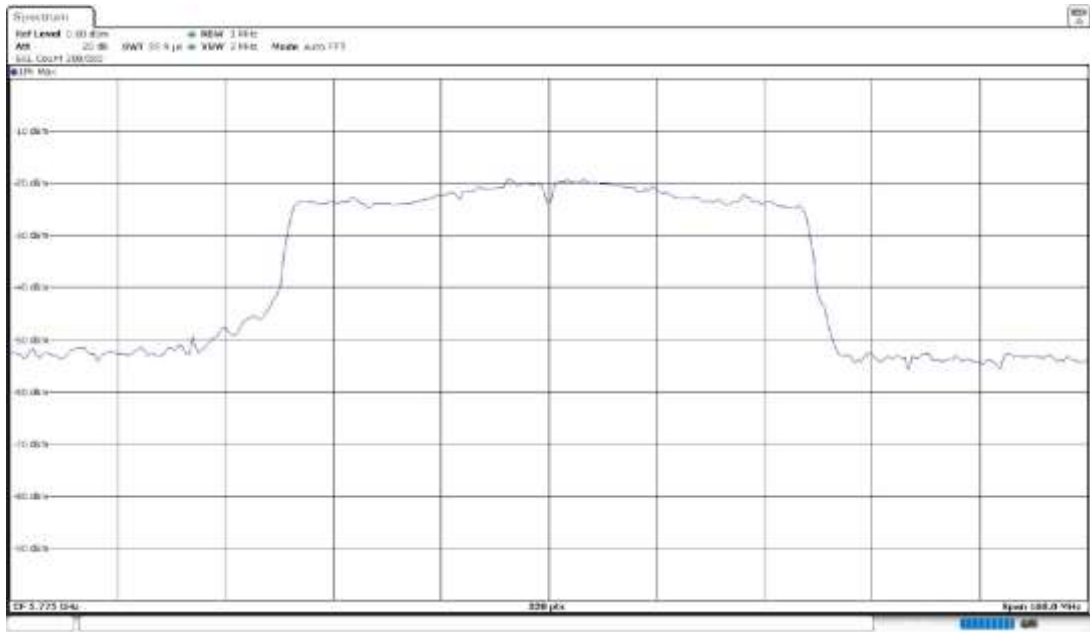
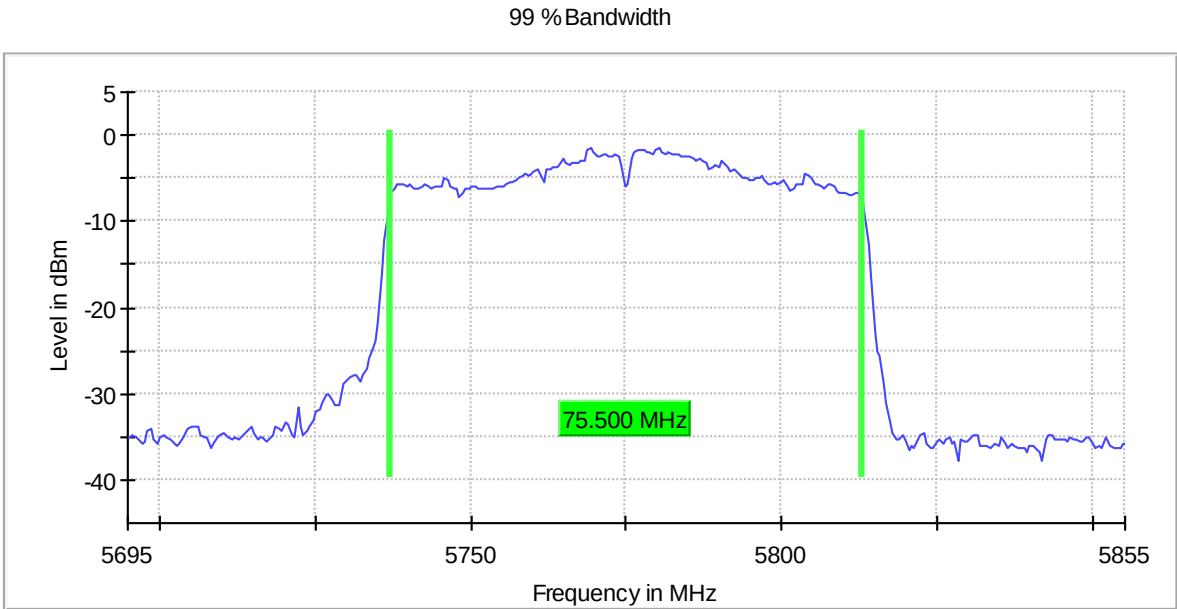


Mode 802.11 ac40 (VHT40), High Channel 159 (5795 MHz)

99 % Bandwidth



Mode 802.11 ac80 (VHT80), Single Channel 155 (5775 MHz)



Transmitter 26 dB Emission Bandwidth (EBW)

Results

The 26 dB Emission Bandwidth was measured according to 789033 D02 General UNII Test Procedures New Rules v02r01 clause C.1.

- **U-NII-3 sub-band:**

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
26 dB Emission Bandwidth (MHz)	21.400000	21.200000	21.400000

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
26 dB Emission Bandwidth (MHz)	21.900000	21.800000	21.900000

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
26 dB Emission Bandwidth (MHz)	22.700000	21.700000	21.700000

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
26 dB Emission Bandwidth (MHz)	40.075047	39.924953

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
26 dB Emission Bandwidth (MHz)	40.075047	40.075047

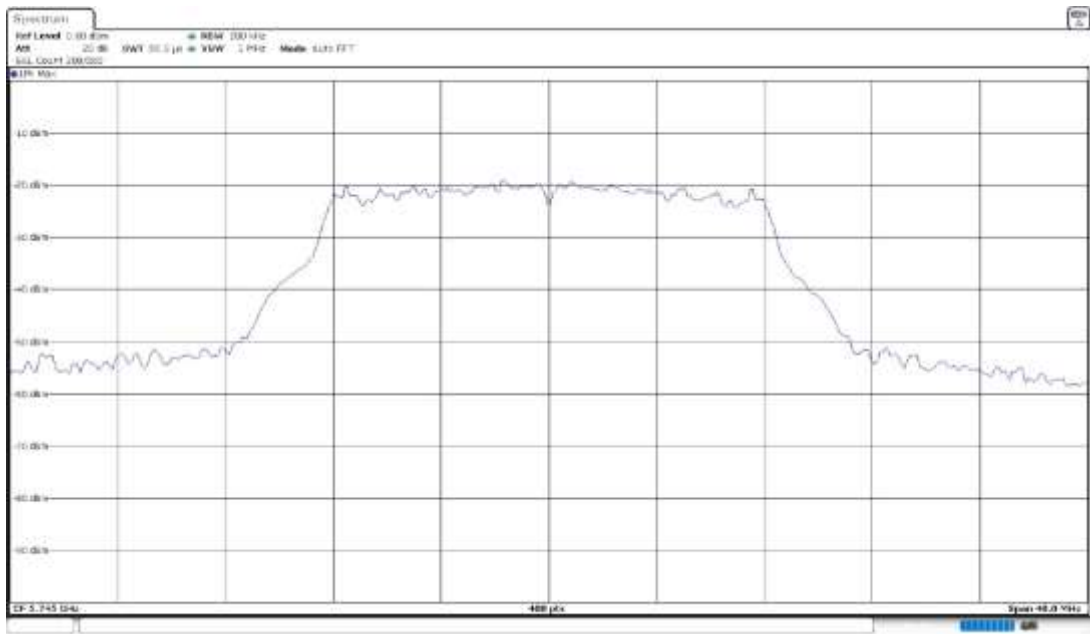
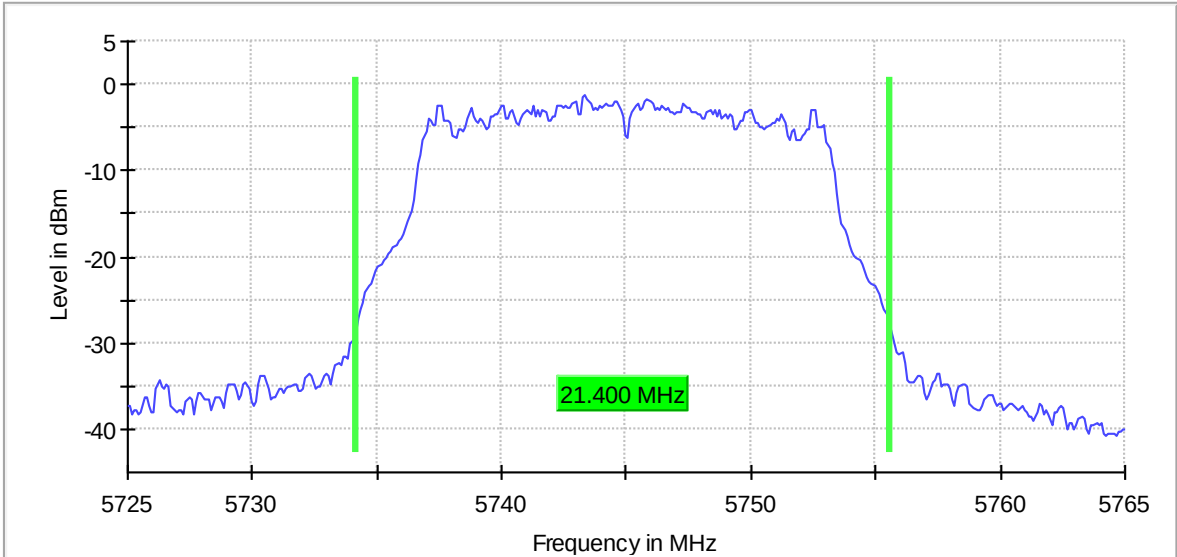
Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
26 dB Emission Bandwidth (MHz)	83.500000

Attachments

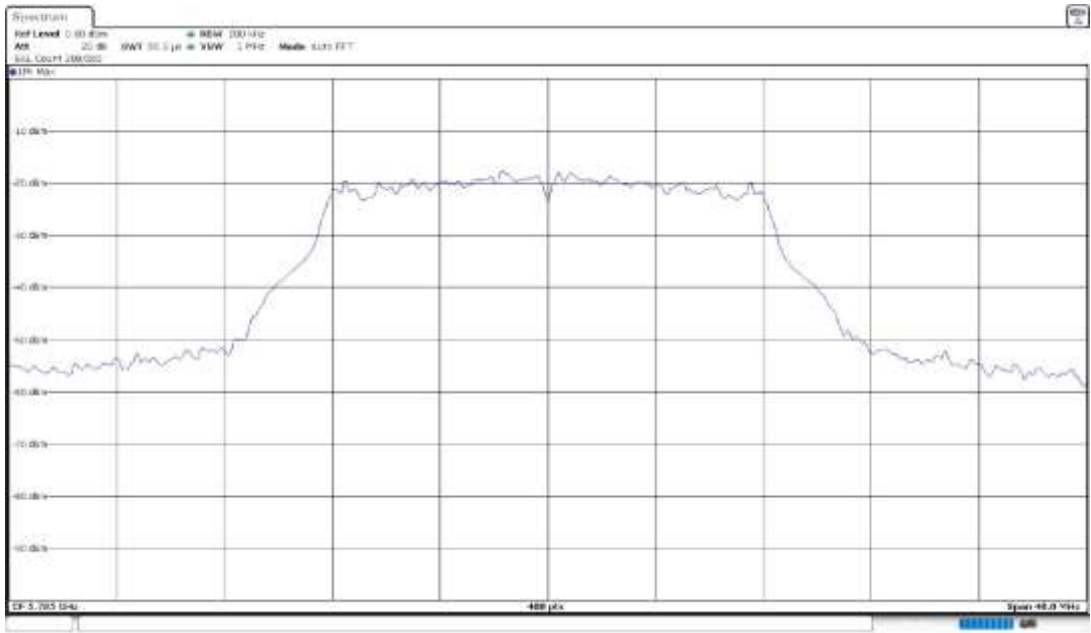
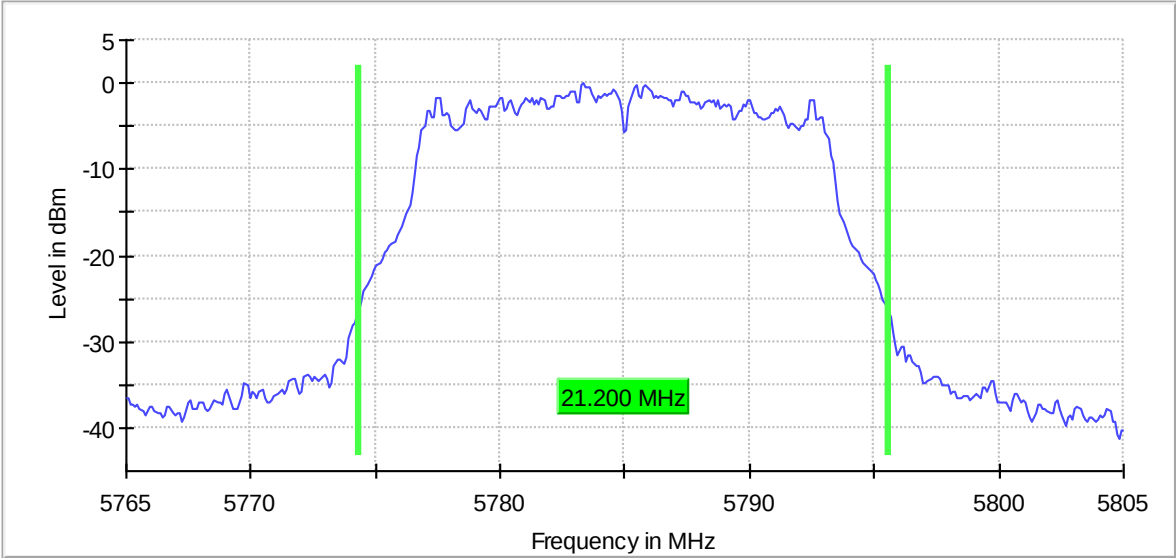
Mode 802.11 a20, Low Channel 149 (5745 MHz)

26 dB Bandwidth



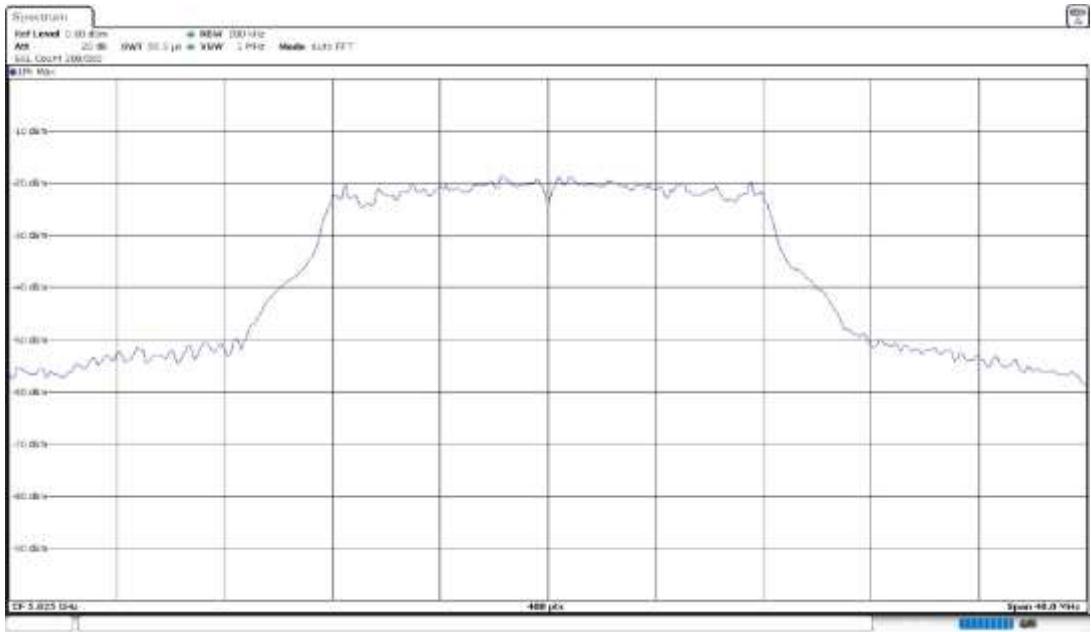
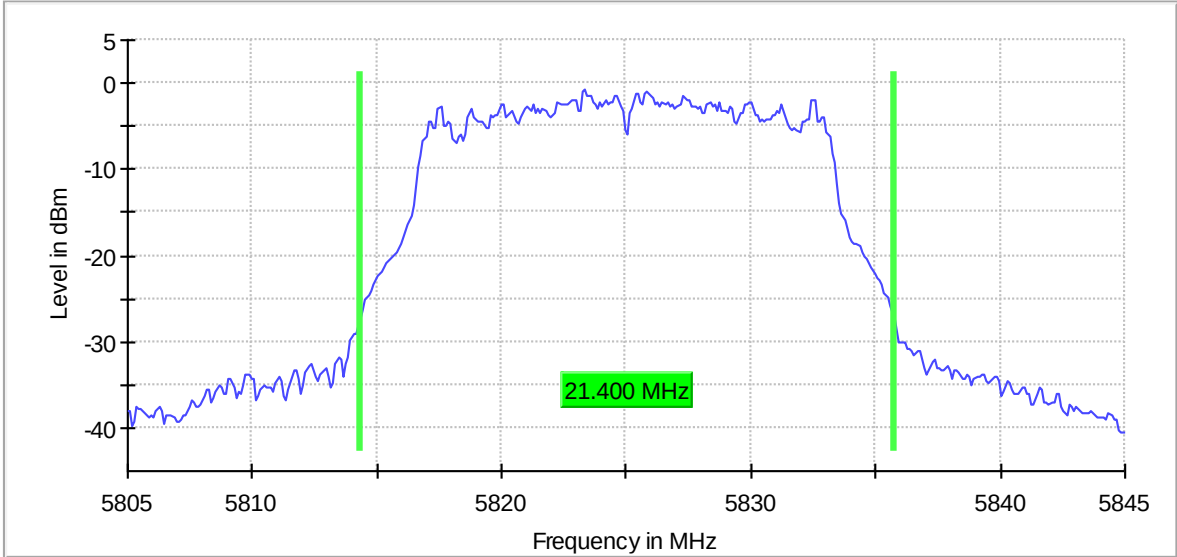
Mode 802.11 a20, Middle Channel 157 (5785 MHz)

26 dB Bandwidth



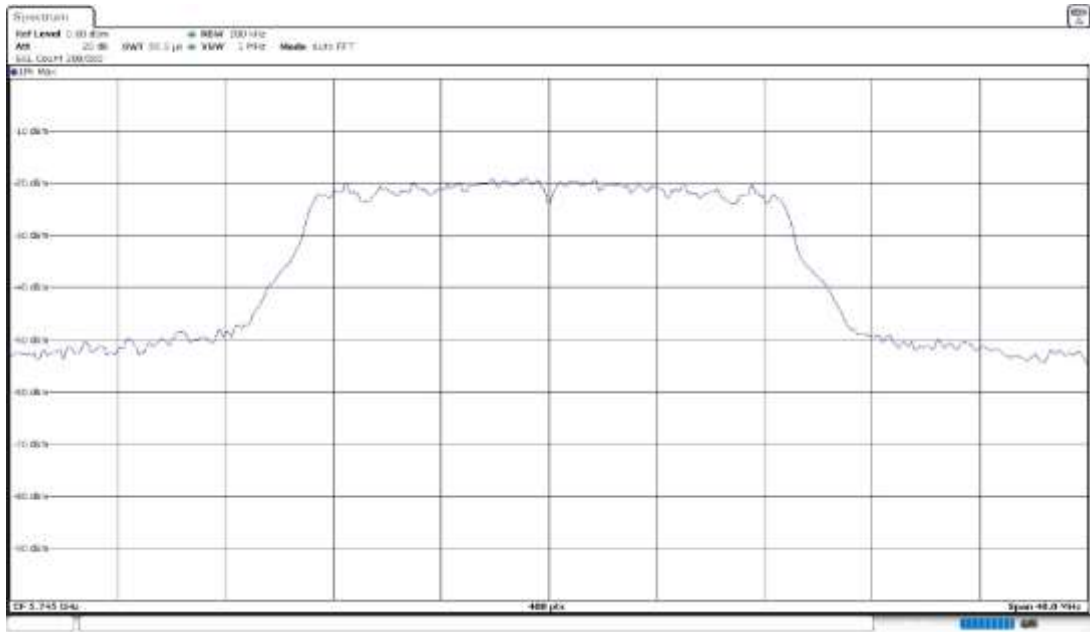
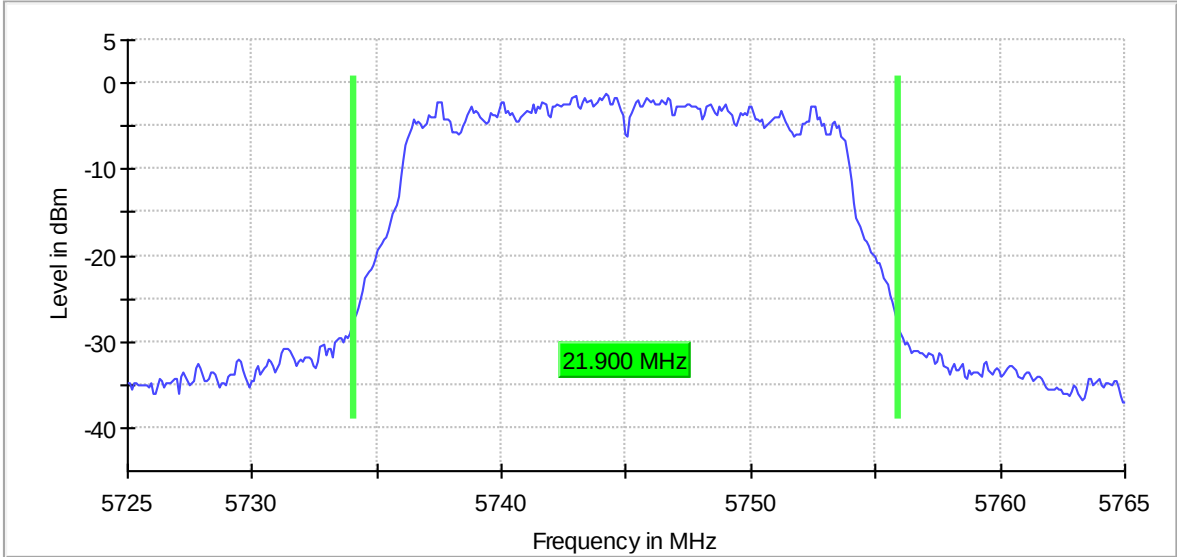
Mode 802.11 a20, High Channel 165 (5825 MHz)

26 dB Bandwidth



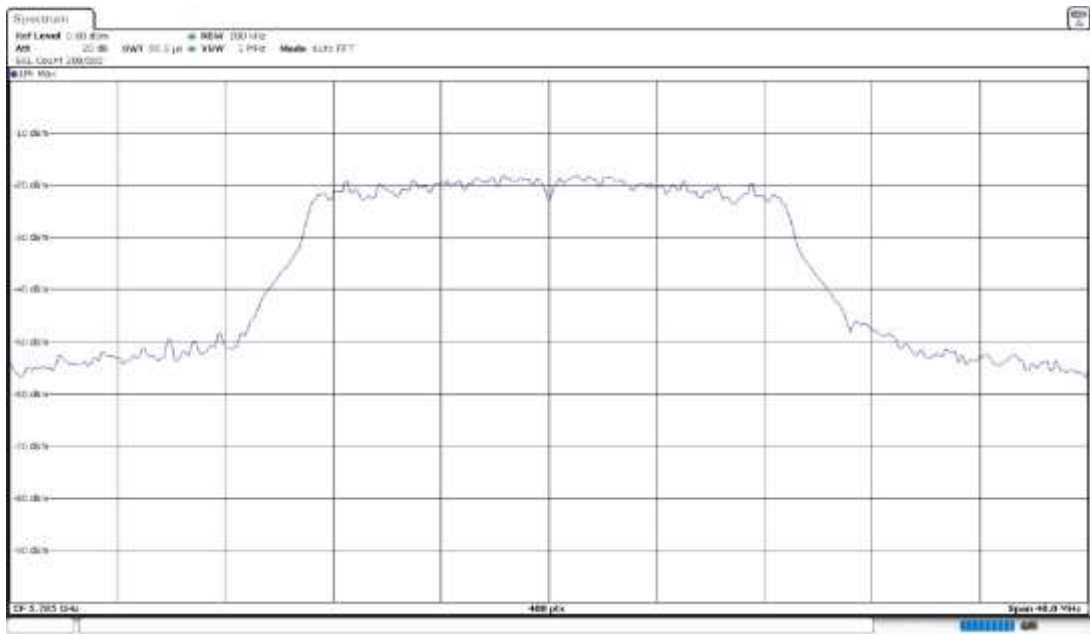
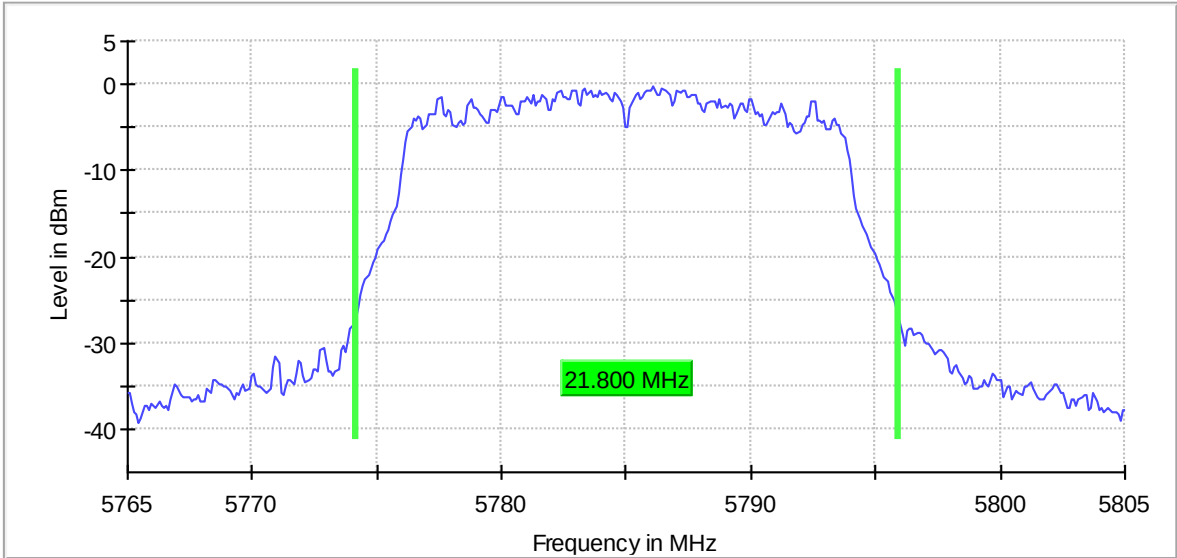
Mode 802.11 n20 (HT20), Low Channel 149 (5745 MHz)

26 dB Bandwidth



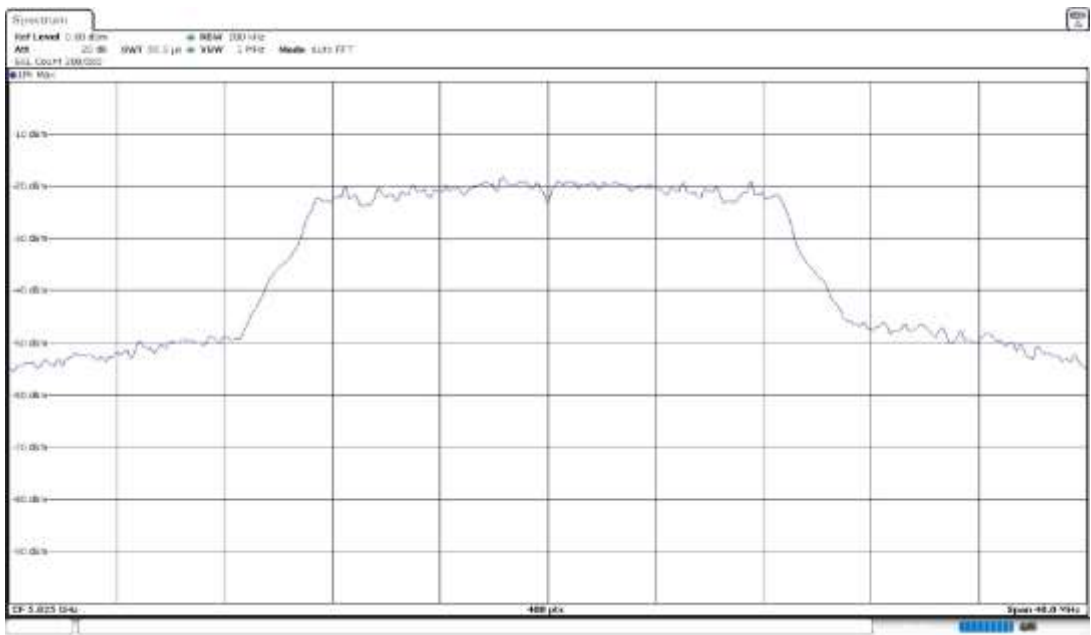
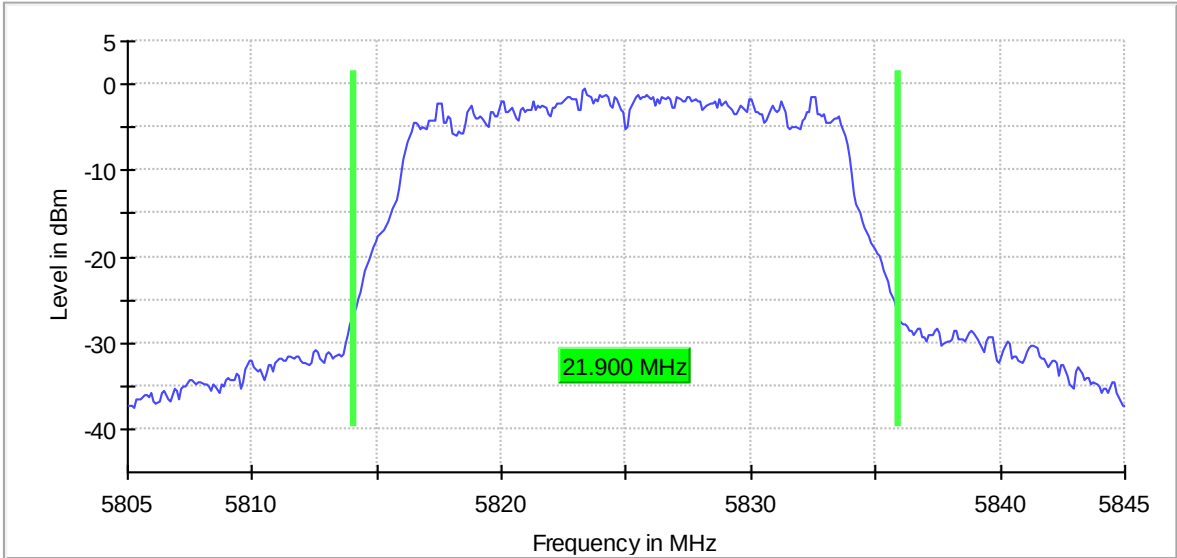
Mode 802.11 n20 (HT20), Middle Channel 157 (5785 MHz)

26 dB Bandwidth



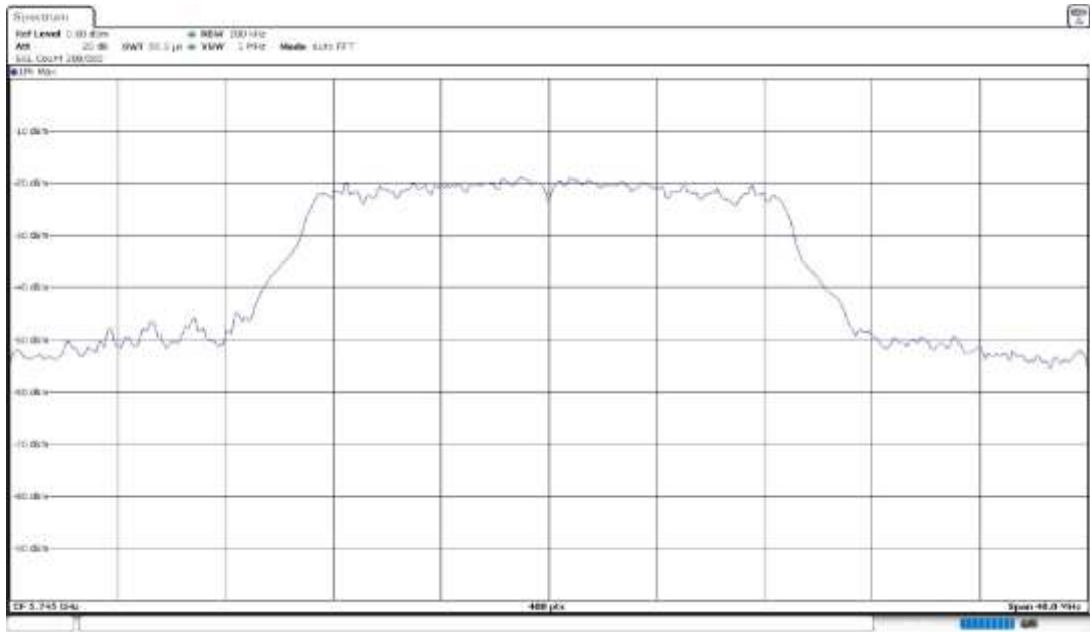
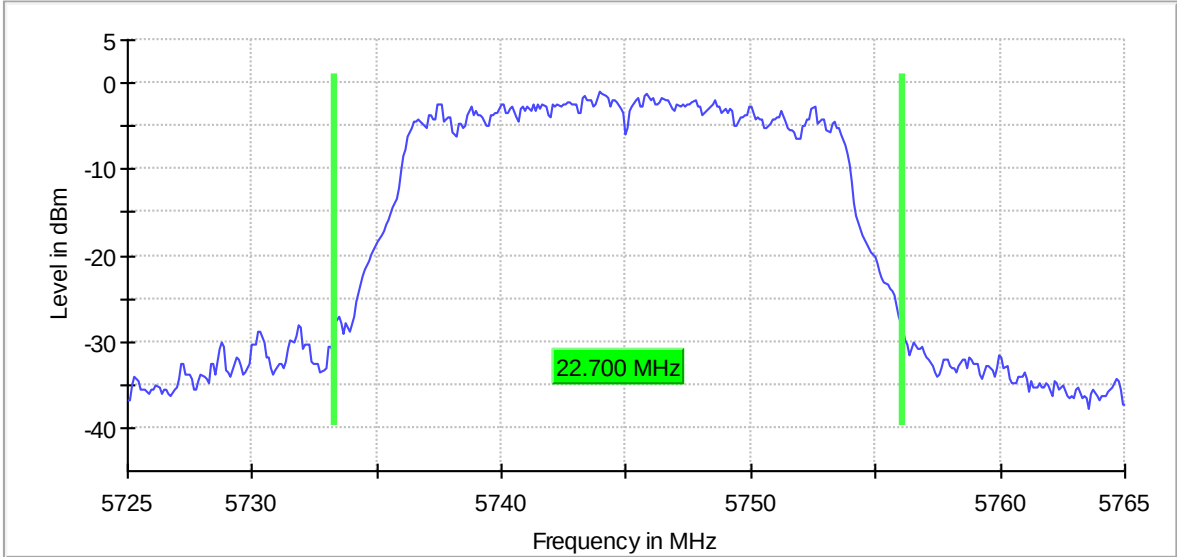
Mode 802.11 n20 (HT20), High Channel 165 (5825 MHz)

26 dB Bandwidth



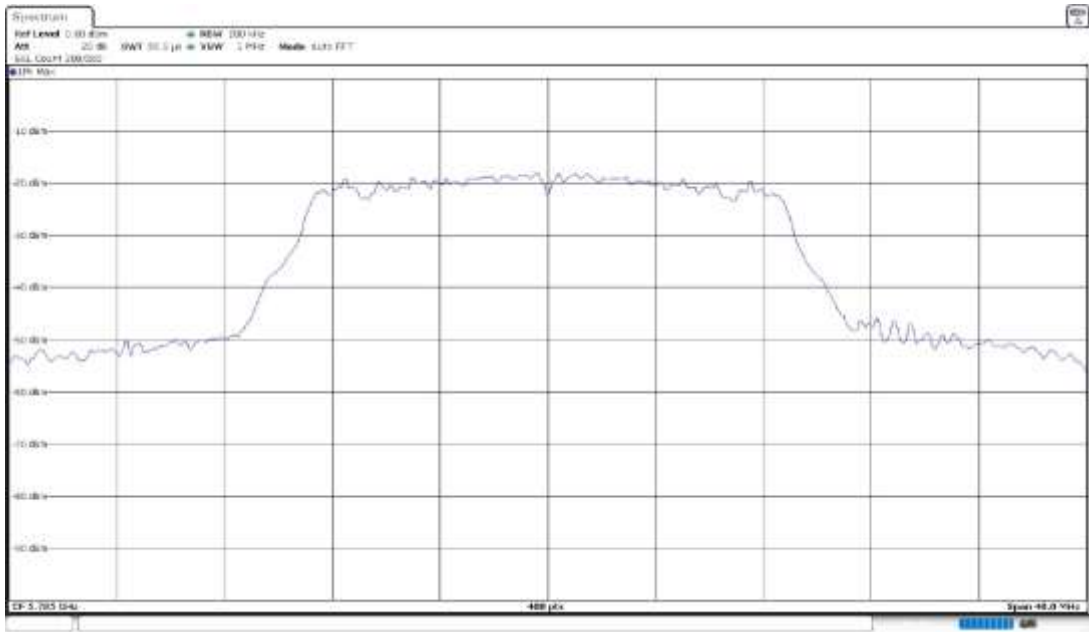
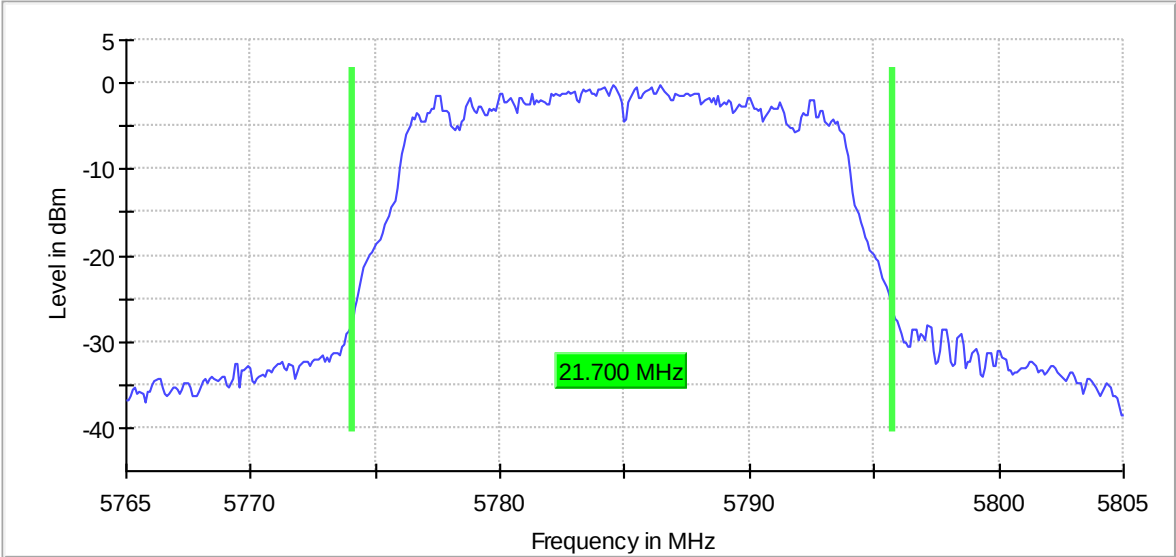
Mode 802.11 ac20 (VHT20), Low Channel 149 (5745 MHz)

26 dB Bandwidth



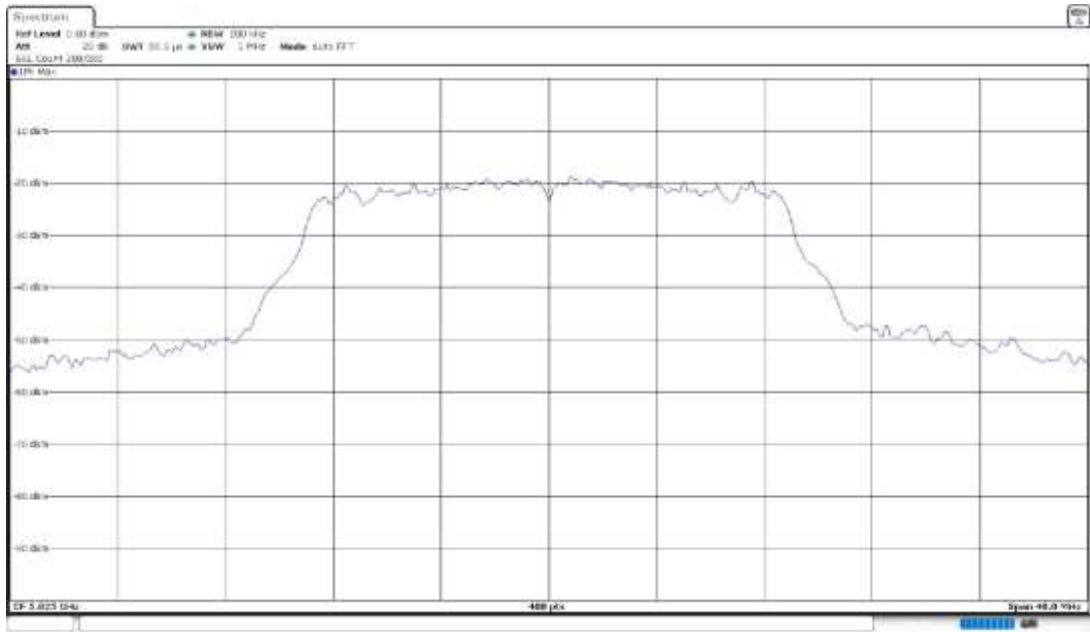
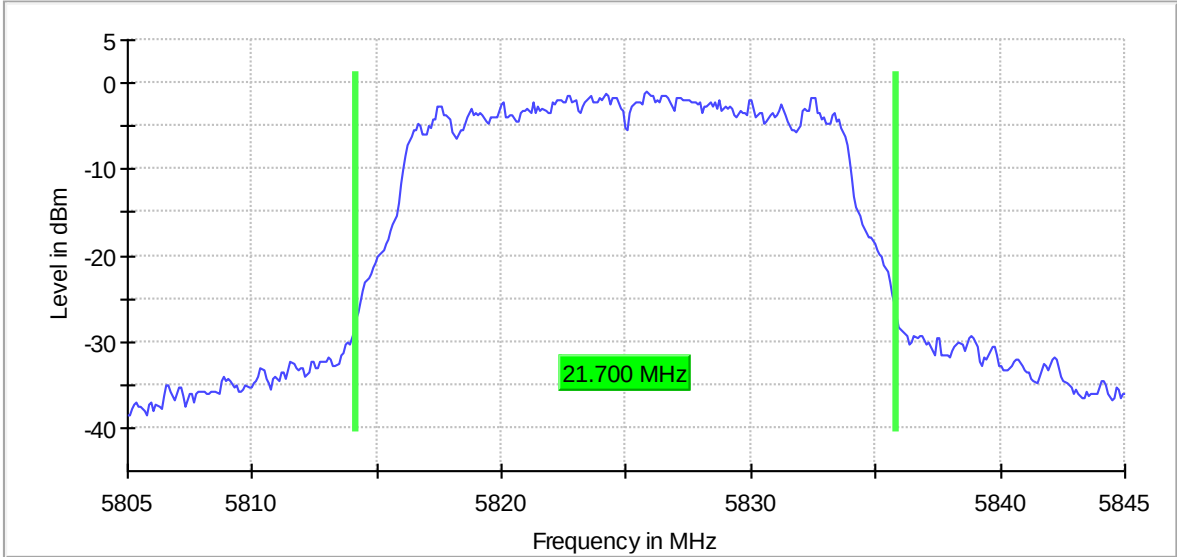
Mode 802.11 ac20 (VHT20), Middle Channel 157 (5785 MHz)

26 dB Bandwidth



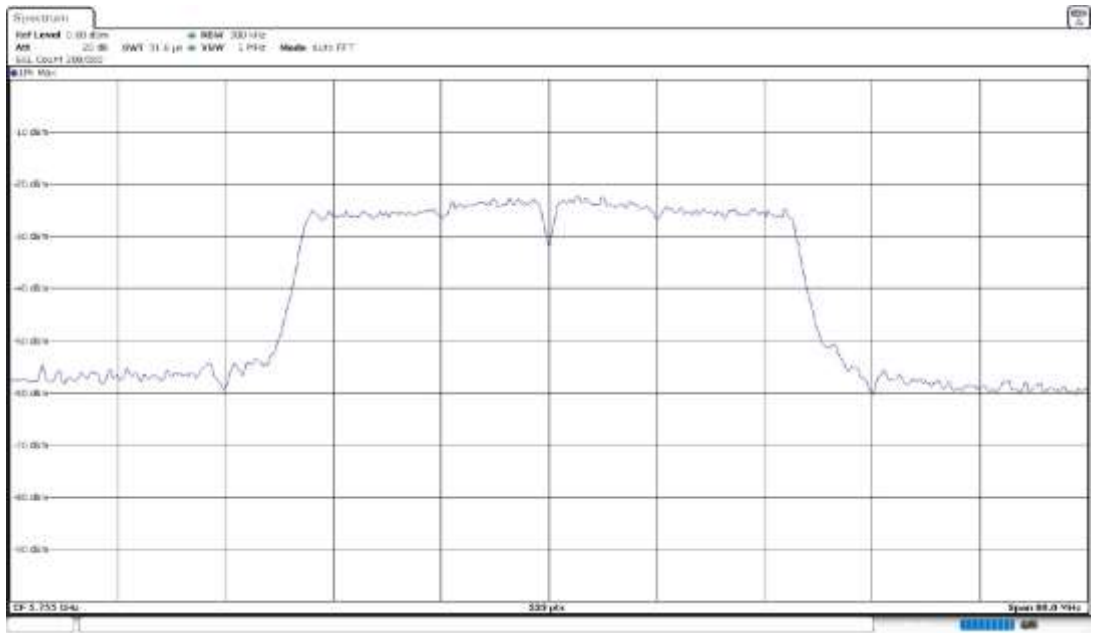
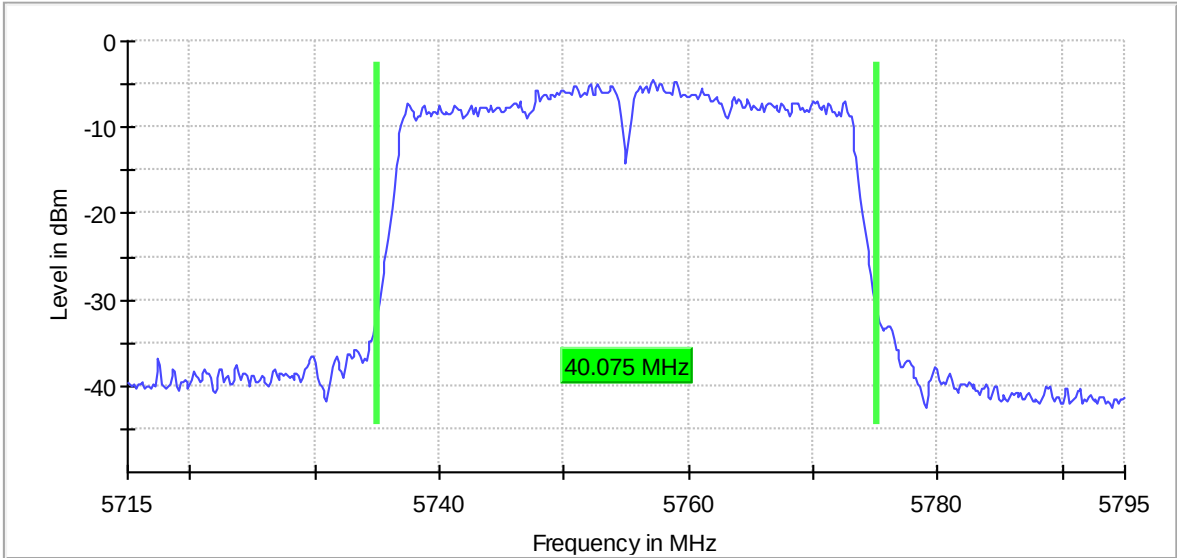
Mode 802.11 ac20 (VHT20), High Channel 165 (5825 MHz)

26 dB Bandwidth



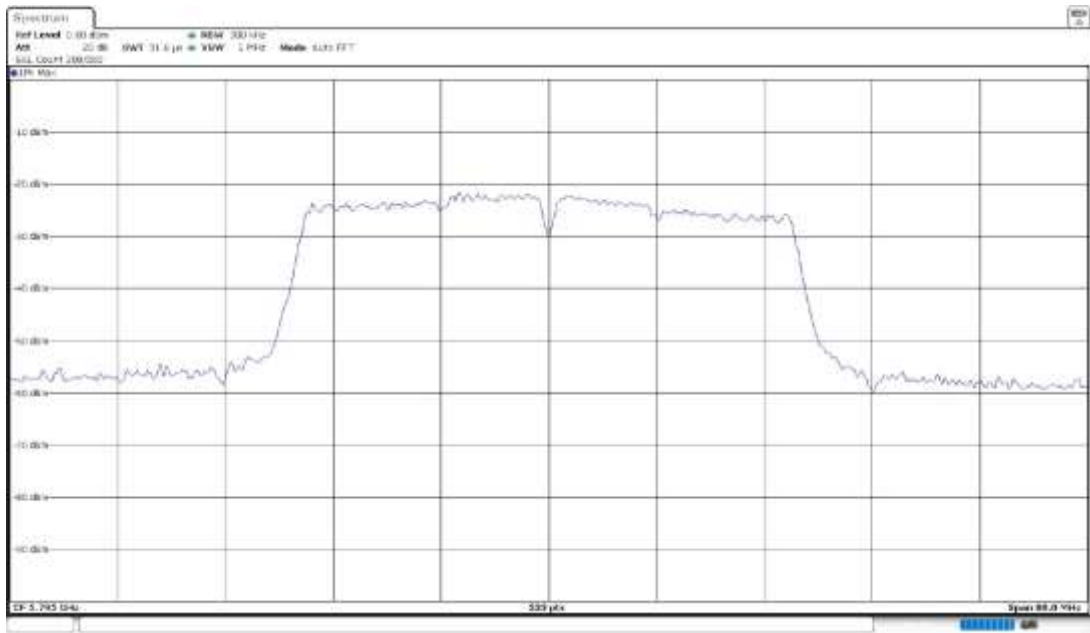
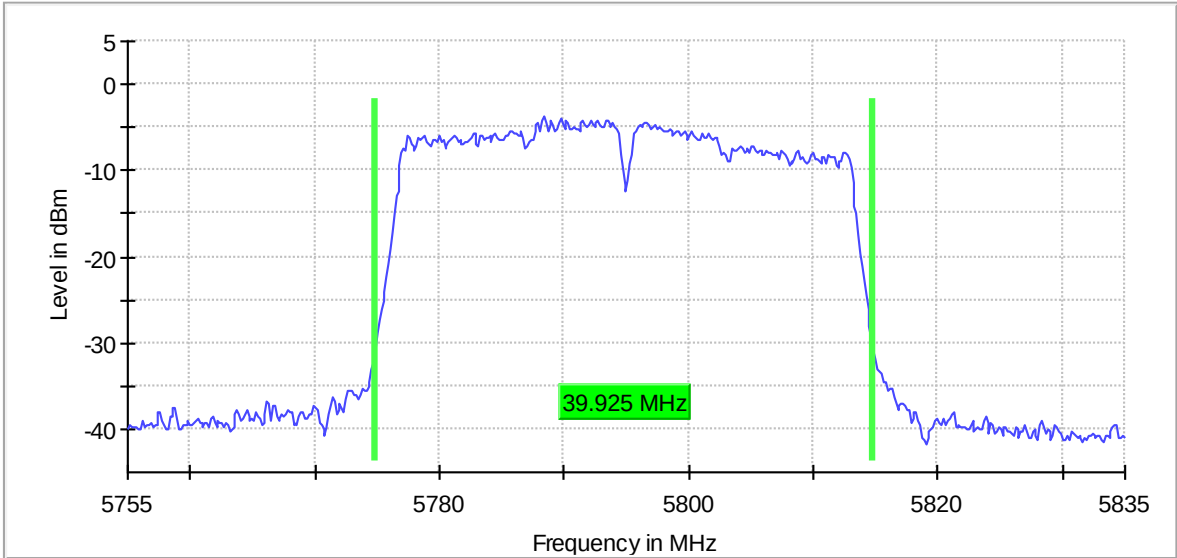
Mode 802.11 n40 (HT40), Low Channel 151 (5755 MHz)

26 dB Bandwidth



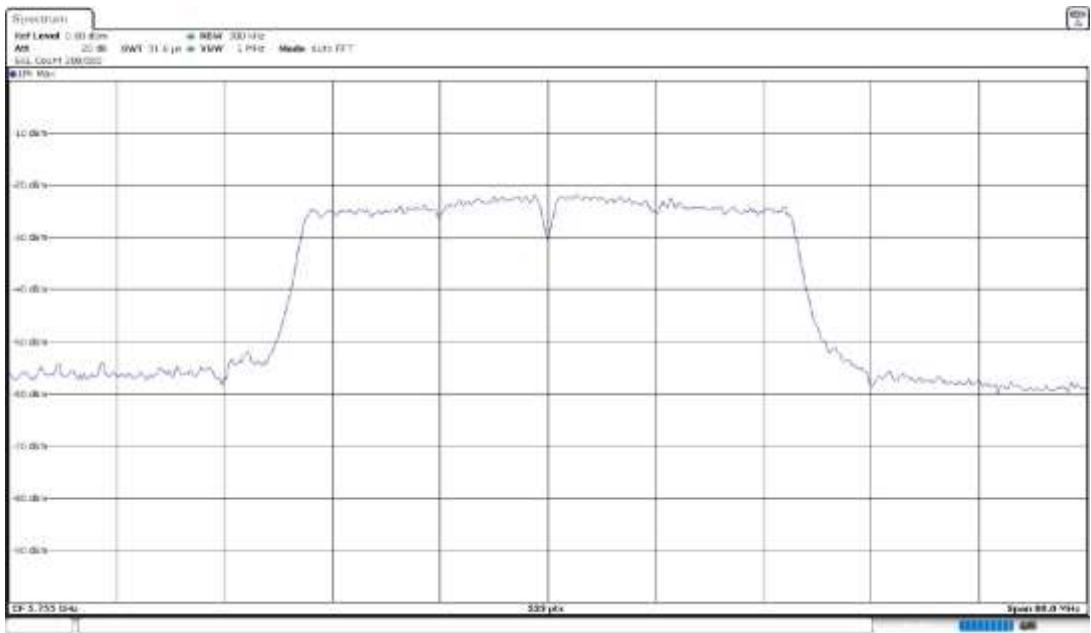
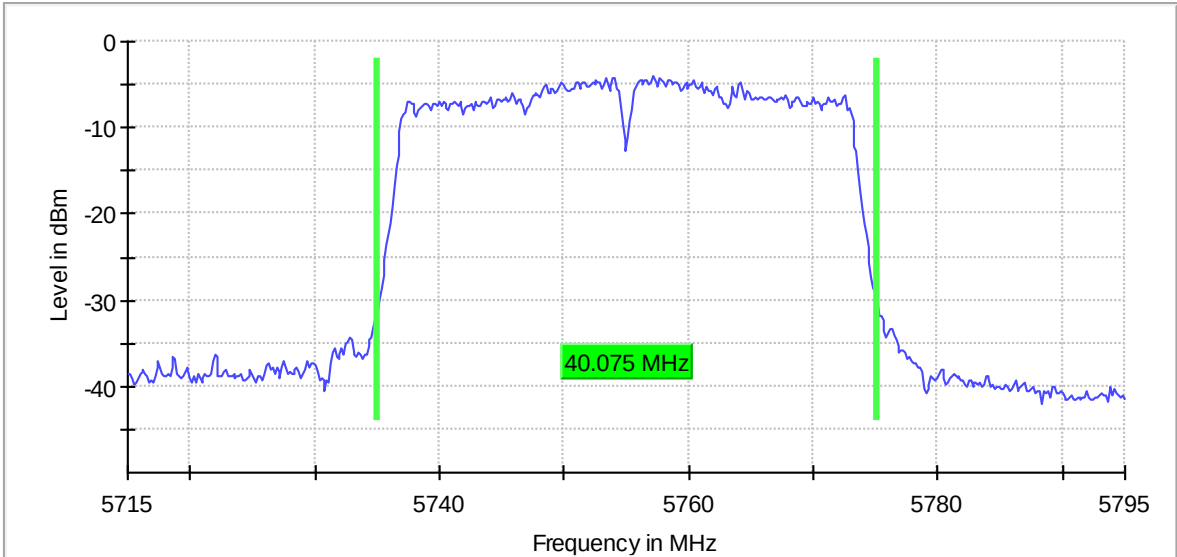
Mode 802.11 n40 (HT40), High Channel 159 (5795 MHz)

26 dB Bandwidth



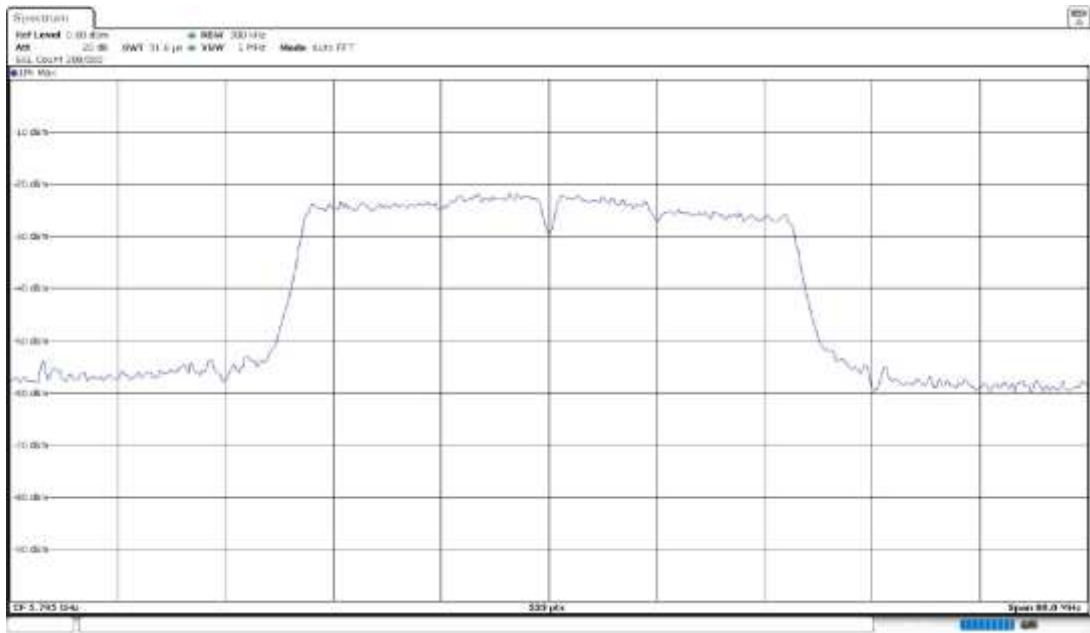
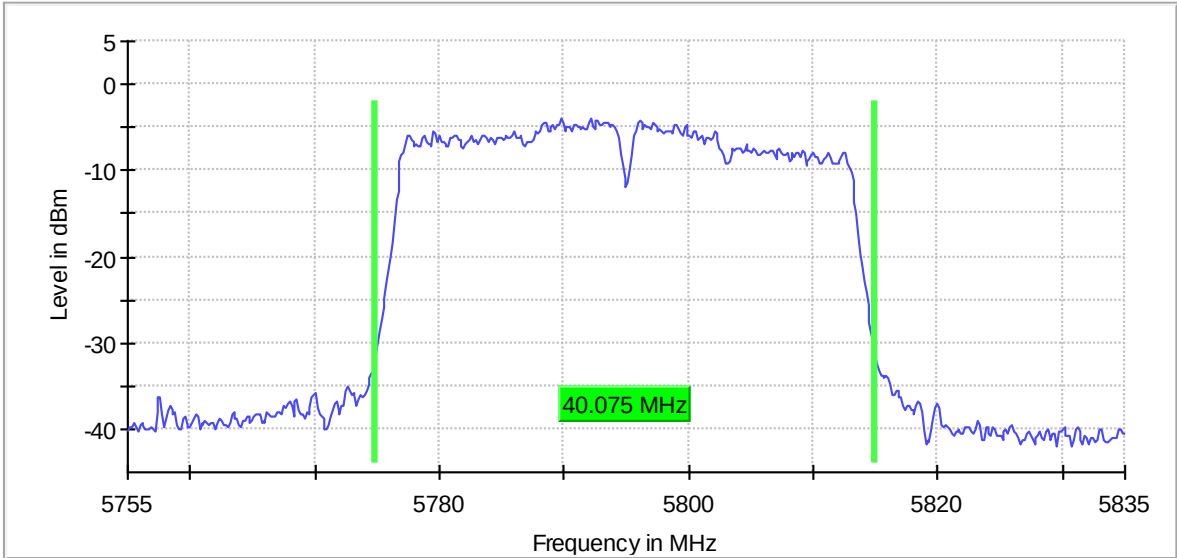
Mode 802.11 ac40 (VHT40), Low Channel 151 (5755 MHz)

26 dB Bandwidth



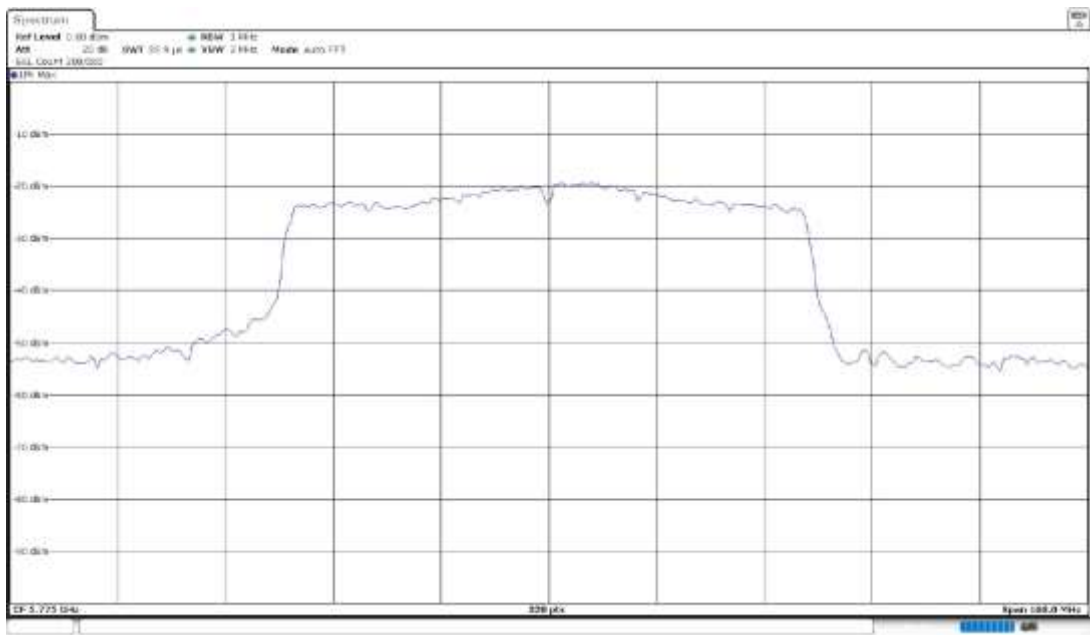
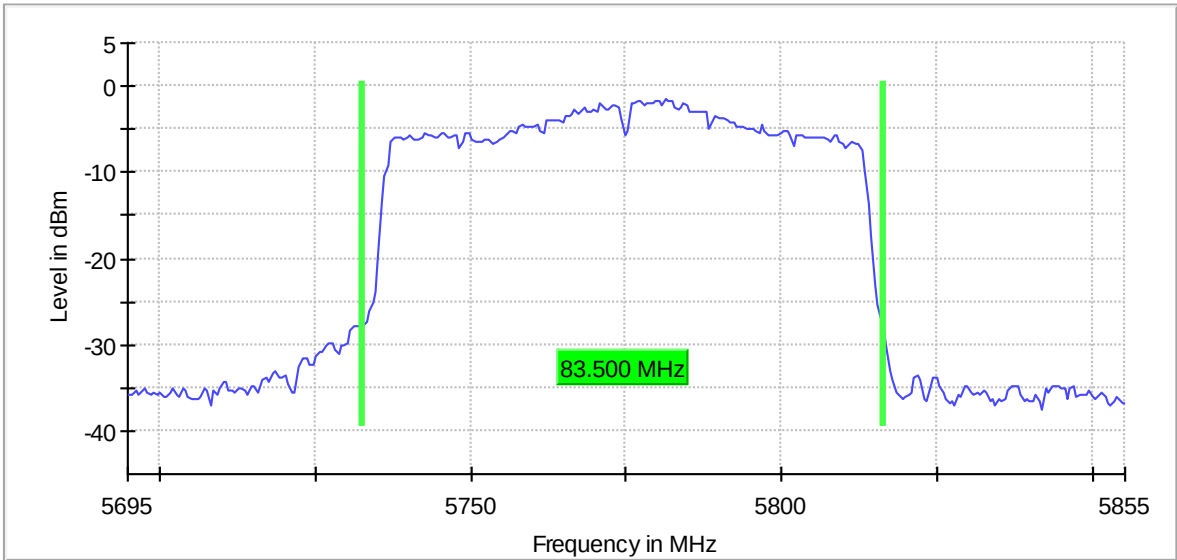
Mode 802.11 ac40 (VHT40), High Channel 159 (5795 MHz)

26 dB Bandwidth



Mode 802.11 ac80 (VHT80), Single Channel 155 (5775 MHz)

26 dB Bandwidth



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

Limits

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

Results

- U-NII-3 sub-band:

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
6 dB Bandwidth (MHz)	16.450000	16.400000	16.400000

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
6 dB Bandwidth (MHz)	17.650000	17.650000	17.650000

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
6 dB Bandwidth (MHz)	17.650000	17.650000	17.650000

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
6 dB Bandwidth (MHz)	36.100000	35.550000

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
6 dB Bandwidth (MHz)	36.100000	35.550000

Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
6 dB Bandwidth (MHz)	75.250000

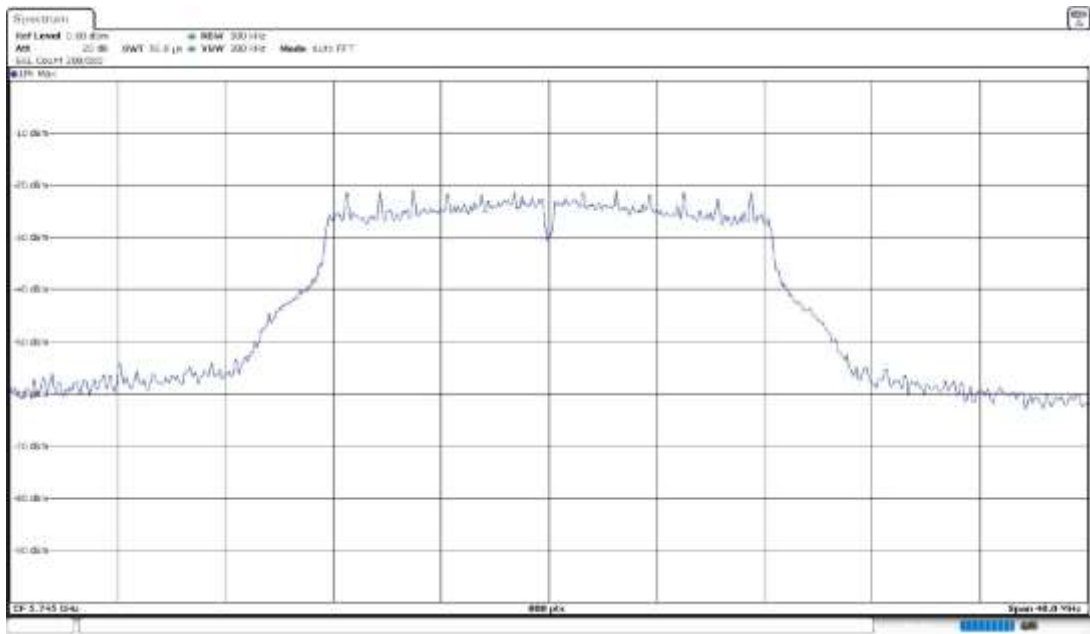
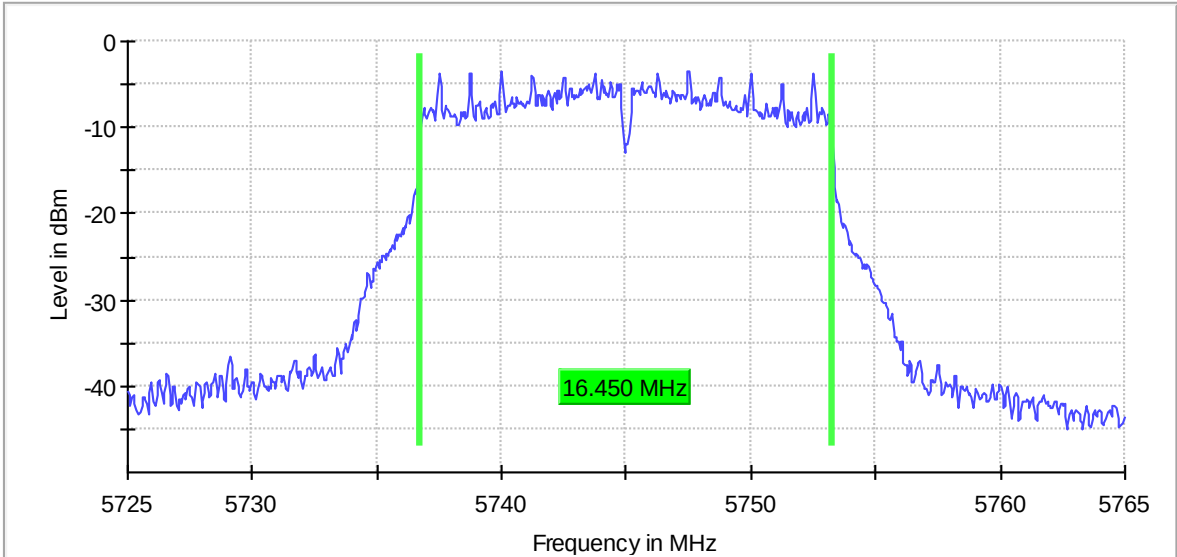
Verdict

Pass

Attachments

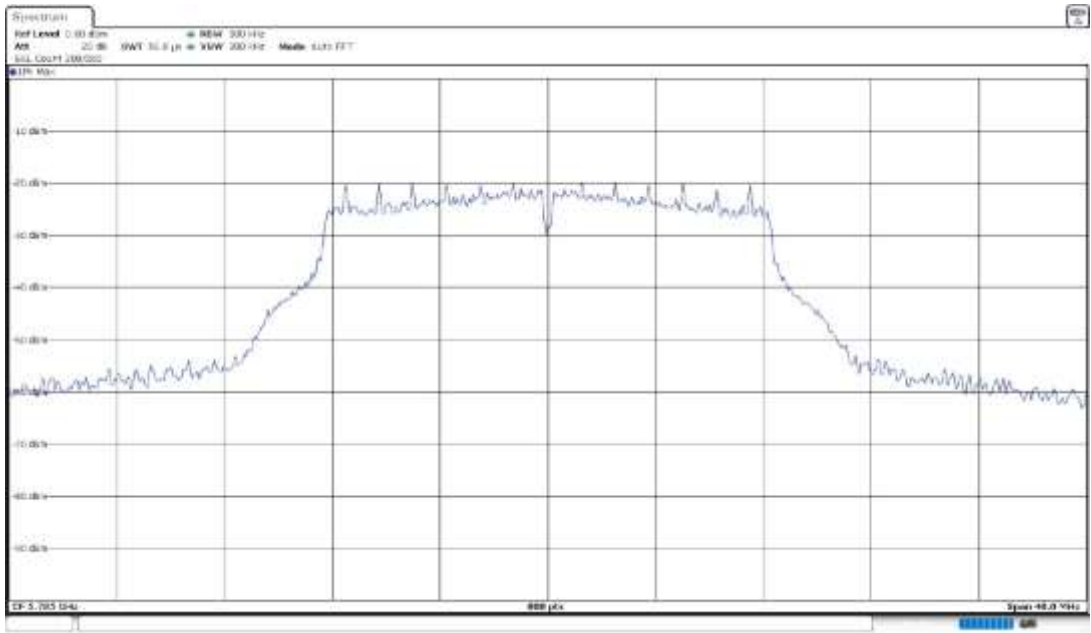
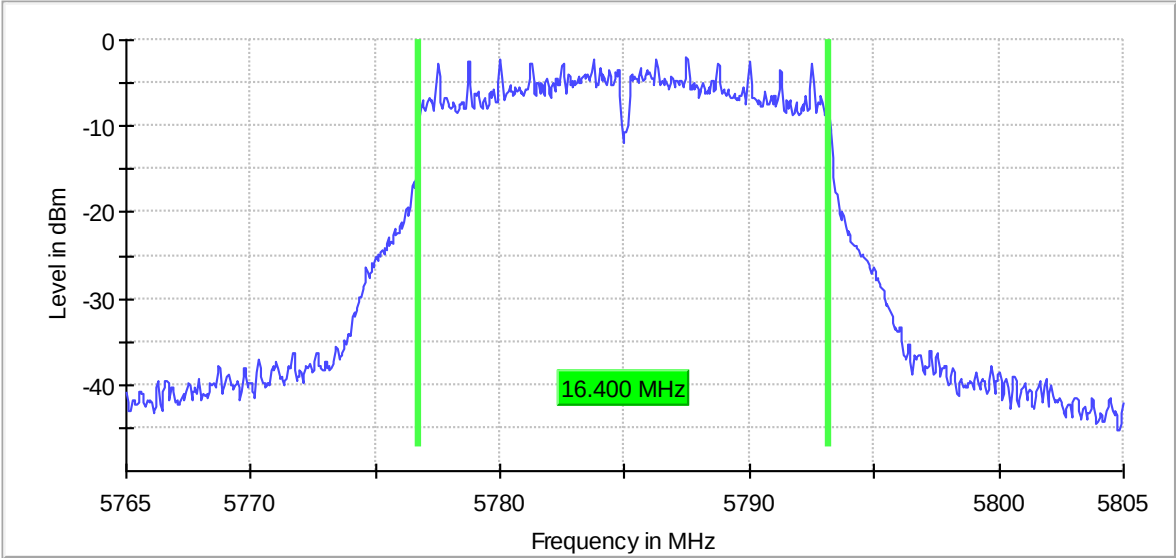
Mode 802.11 a20, Low Channel 149 (5745 MHz)

6 dB Bandwidth



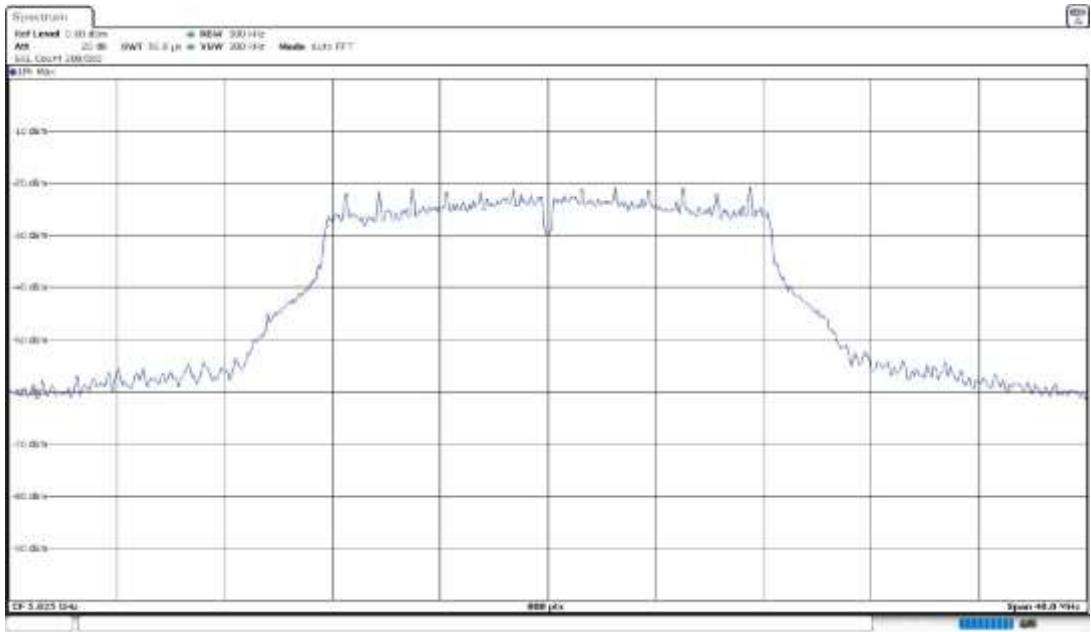
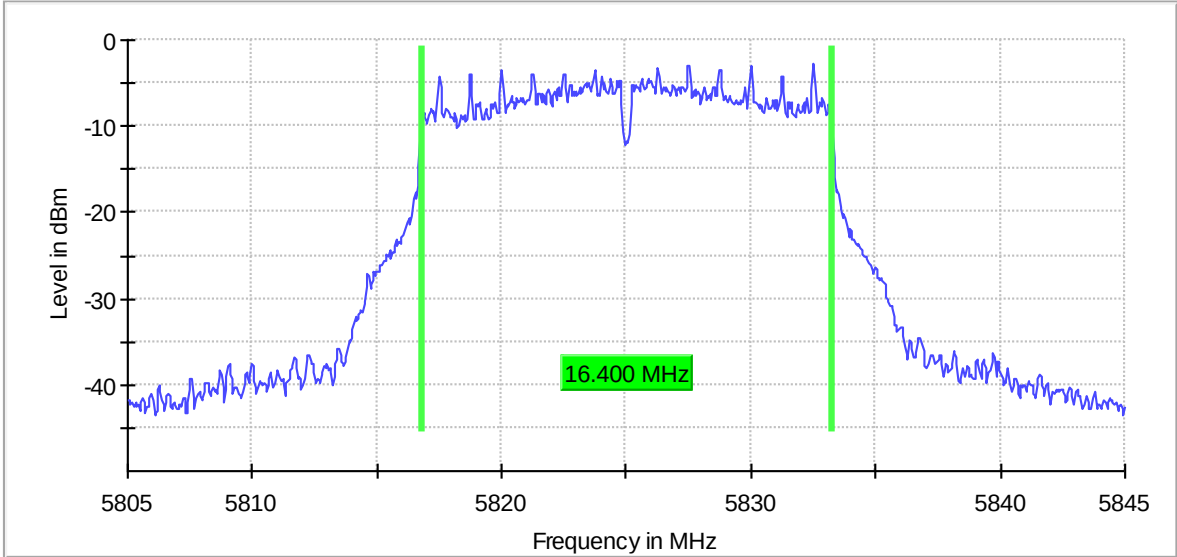
Mode 802.11 a20, Middle Channel 157 (5785 MHz)

6 dB Bandwidth



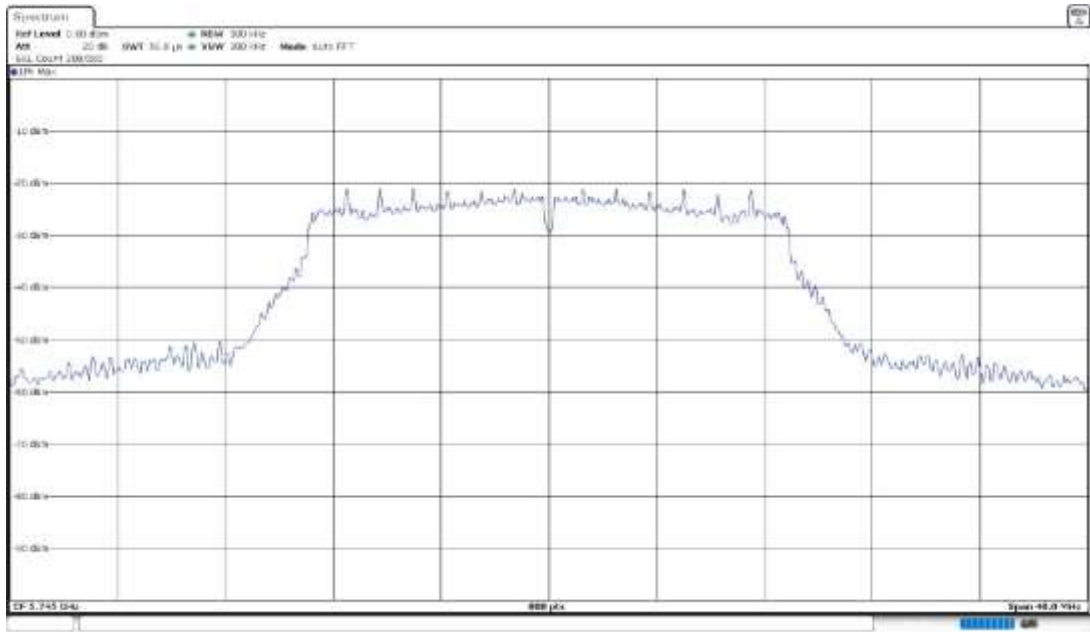
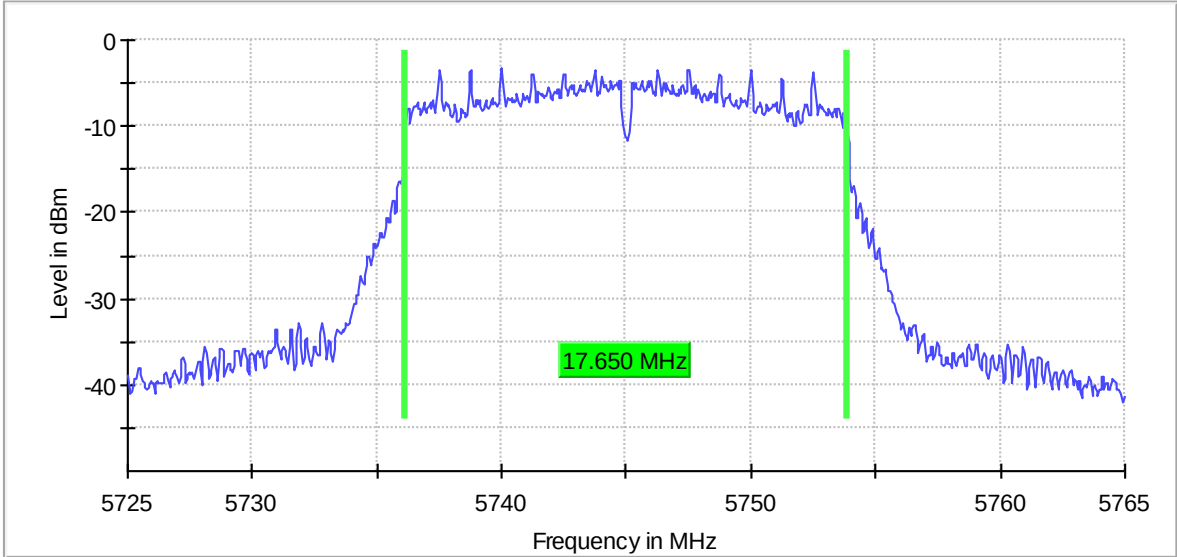
Mode 802.11 a20, High Channel 165 (5825 MHz)

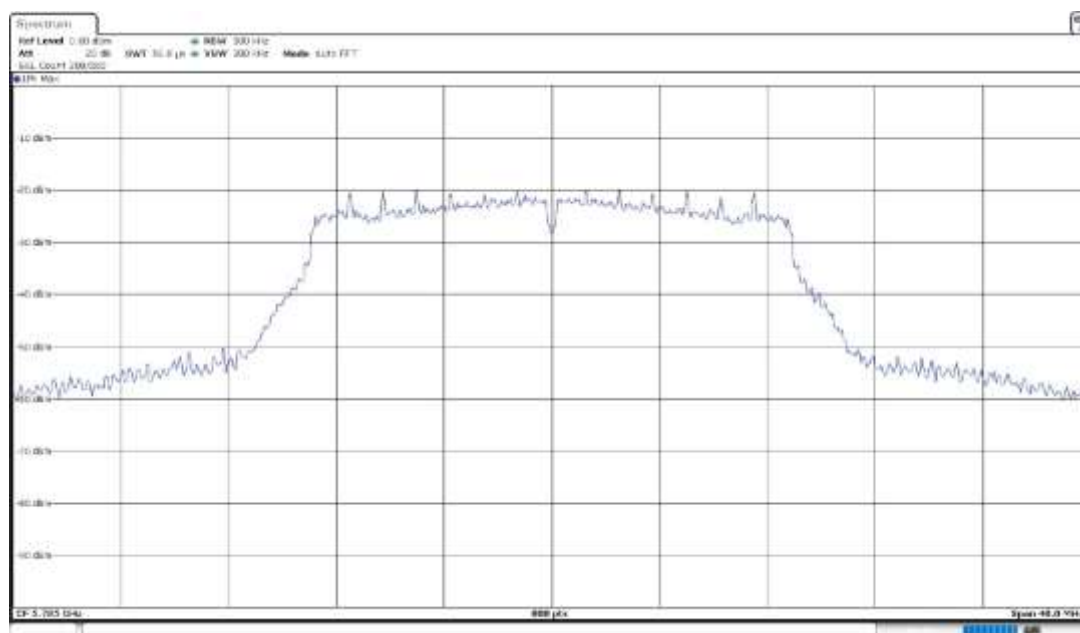
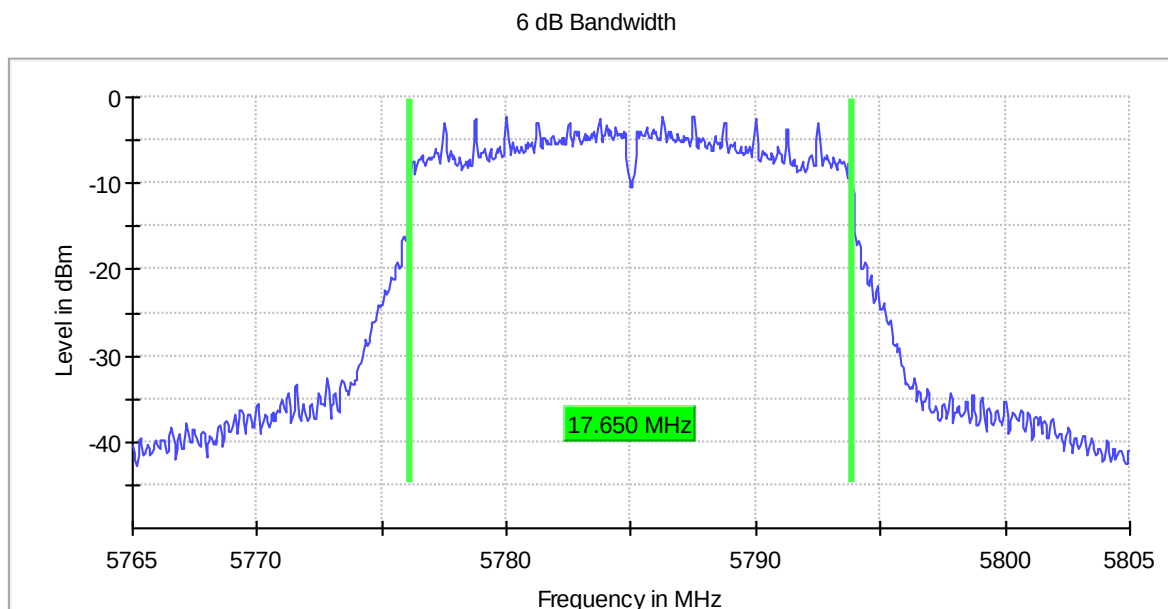
6 dB Bandwidth



Mode 802.11 n20 (HT20), Low Channel 149 (5745 MHz)

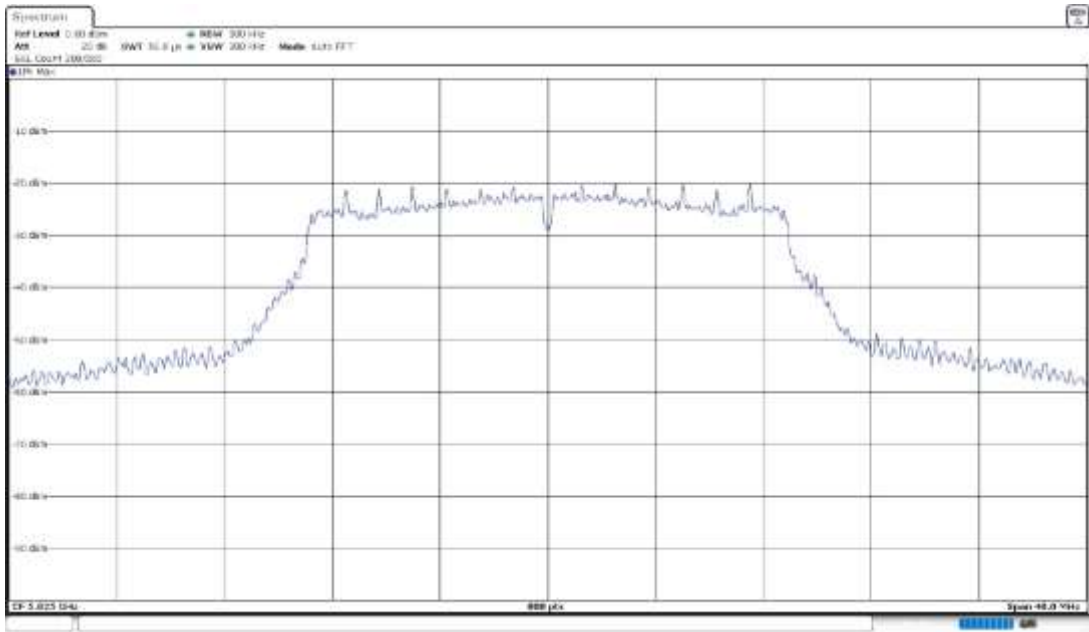
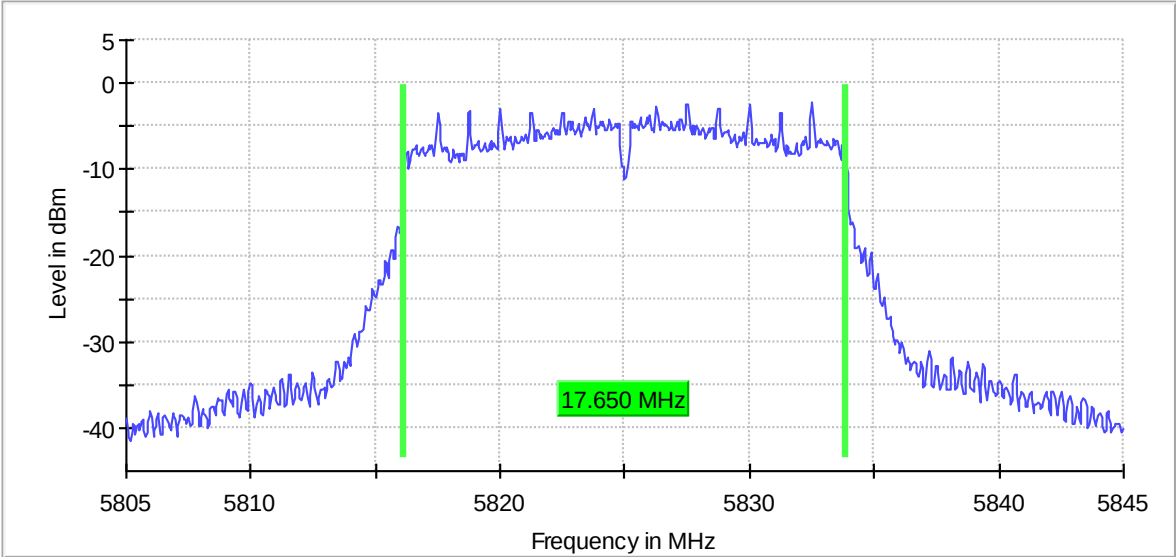
6 dB Bandwidth



Mode 802.11 n20 (HT20), Middle Channel 157 (5785 MHz)

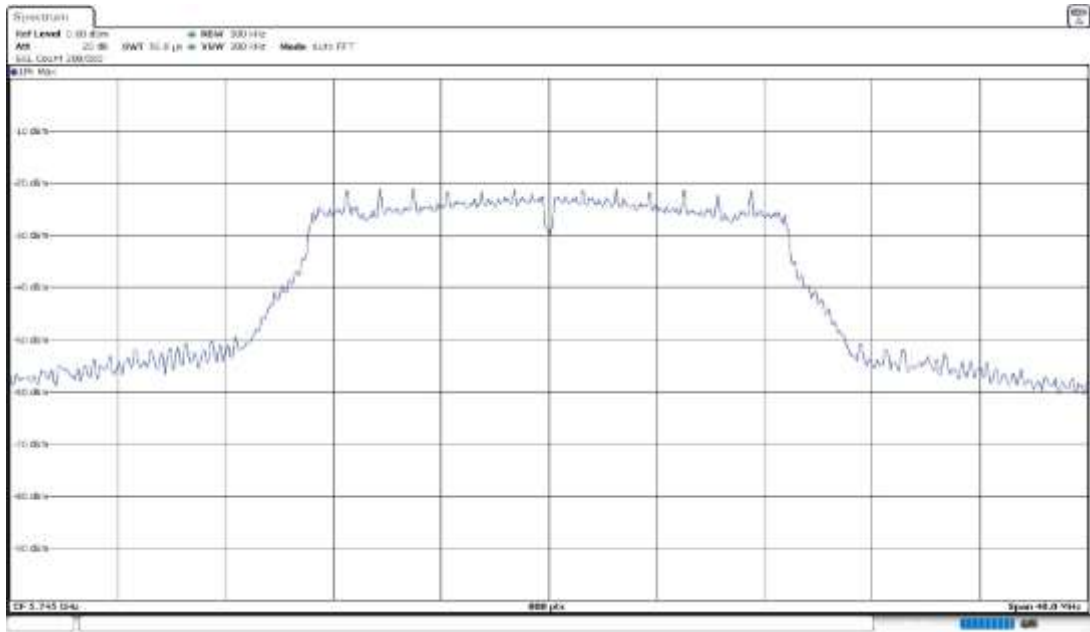
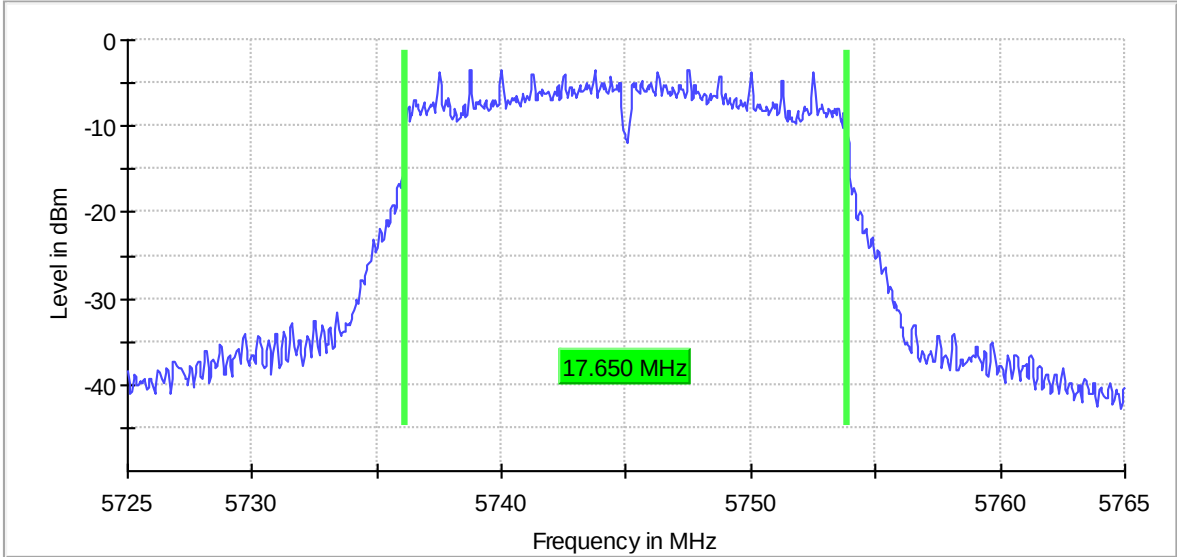
Mode 802.11 n20 (HT20), High Channel 165 (5825 MHz)

6 dB Bandwidth



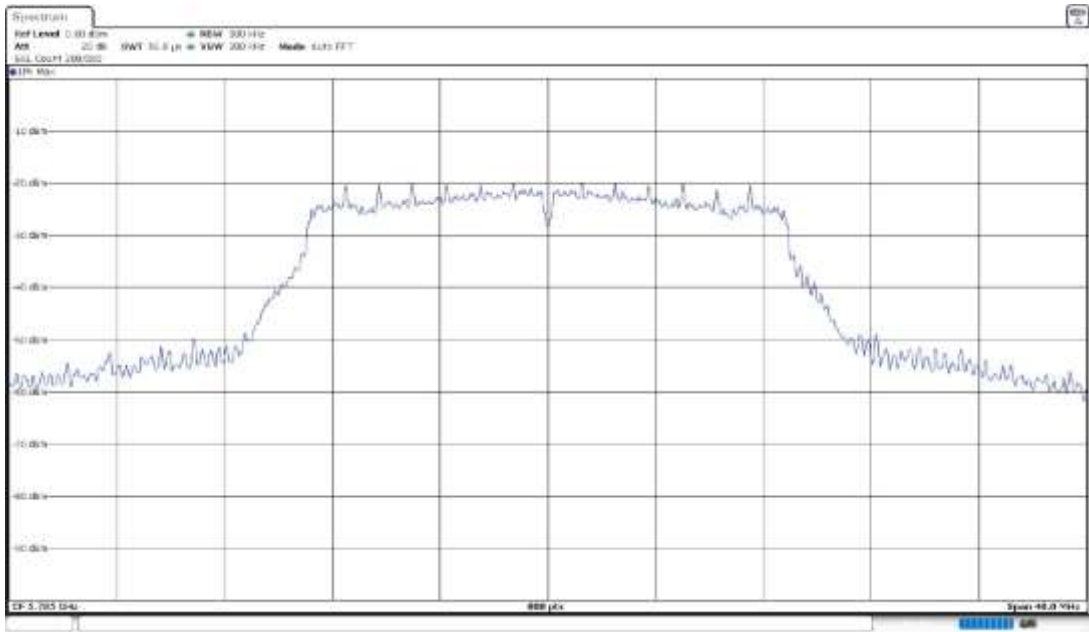
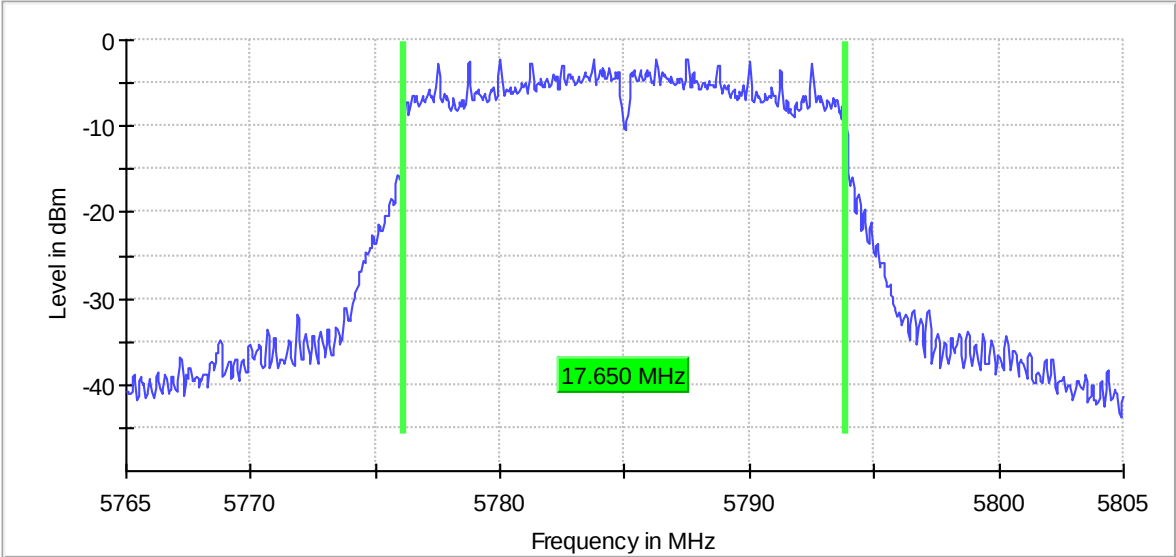
Mode 802.11 ac20 (VHT20), Low Channel 149 (5745 MHz)

6 dB Bandwidth



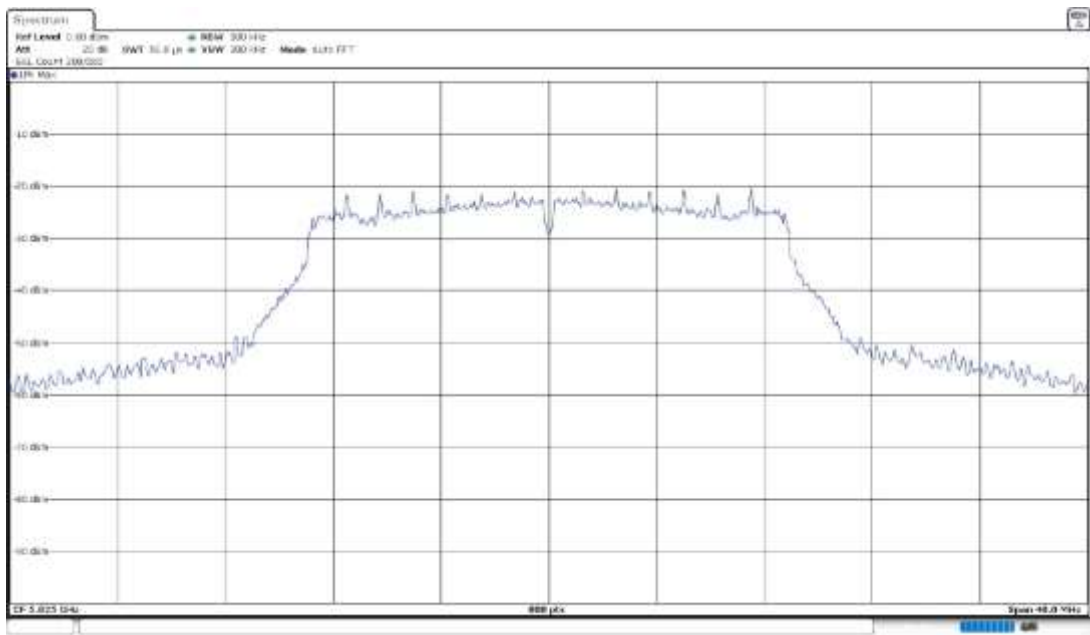
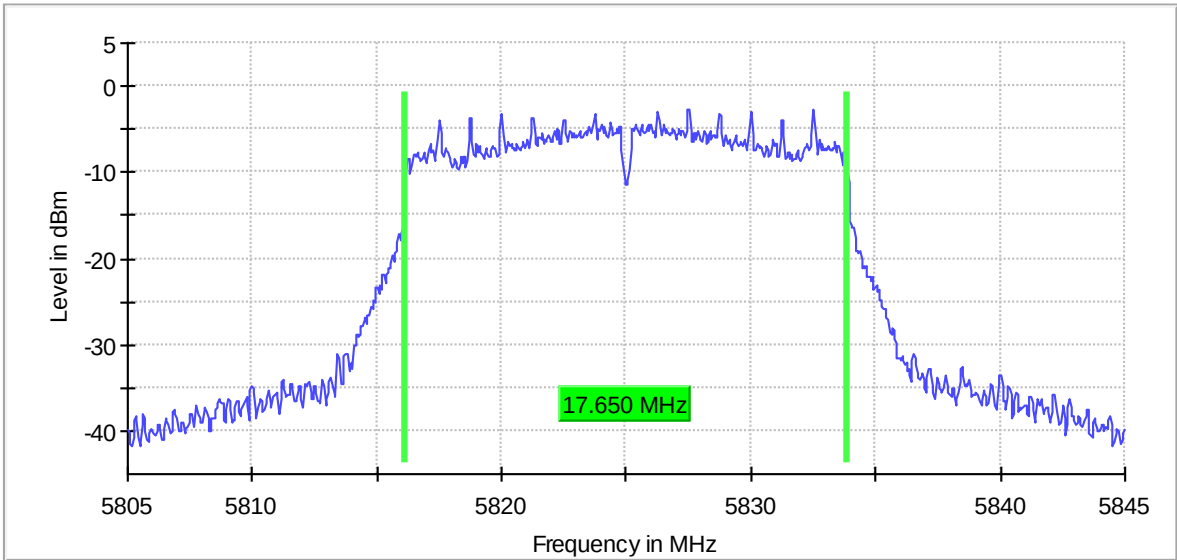
Mode 802.11 ac20 (VHT20), Middle Channel 157 (5785 MHz)

6 dB Bandwidth

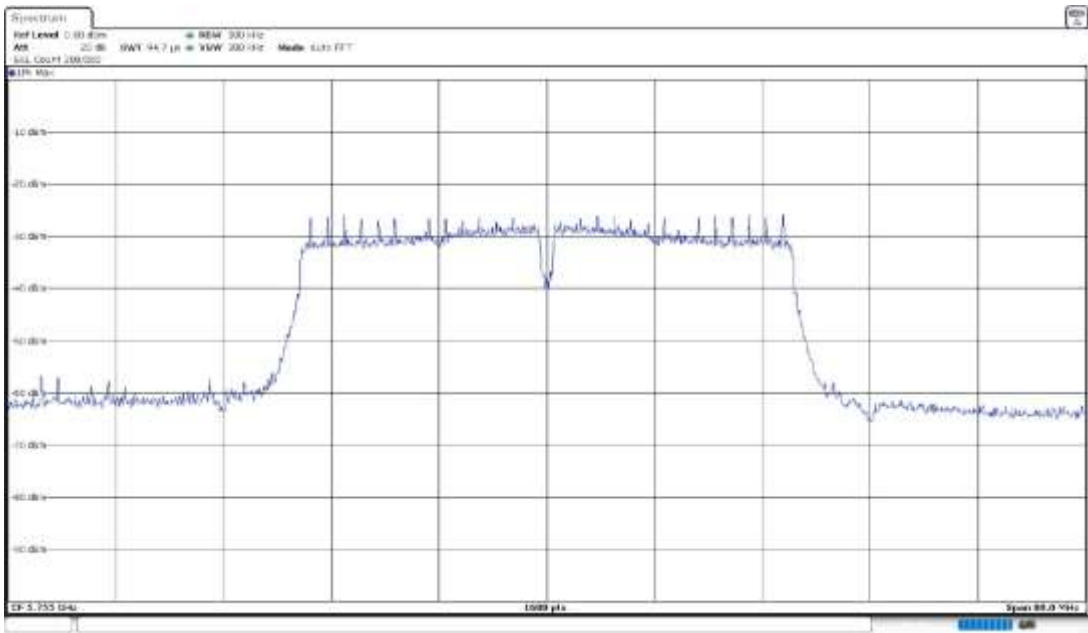
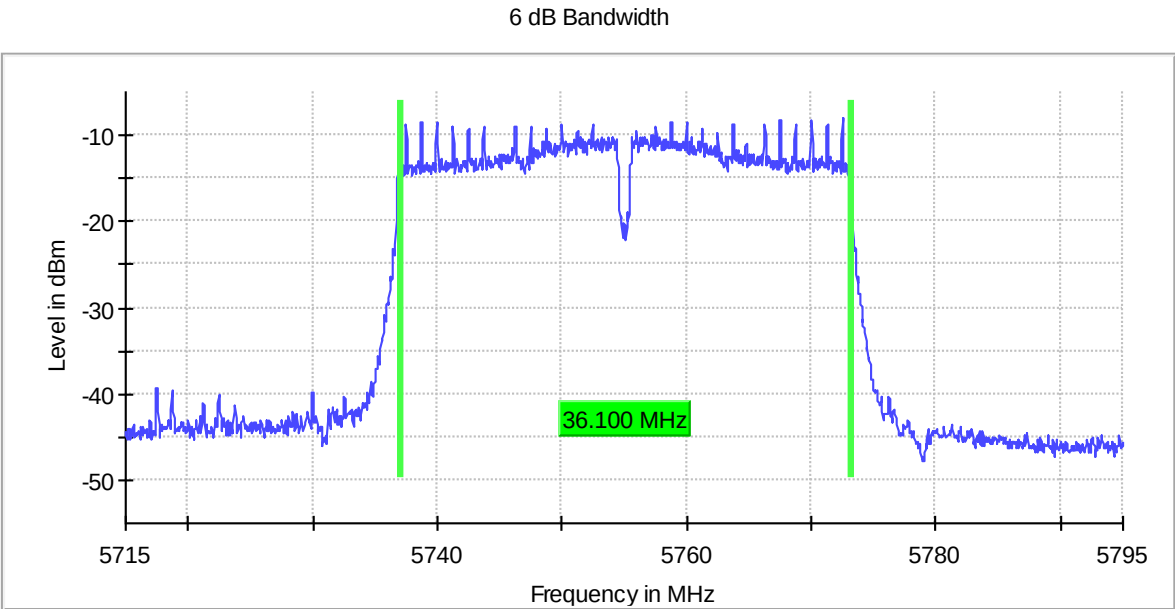


Mode 802.11 ac20 (VHT20), High Channel 165 (5825 MHz)

6 dB Bandwidth

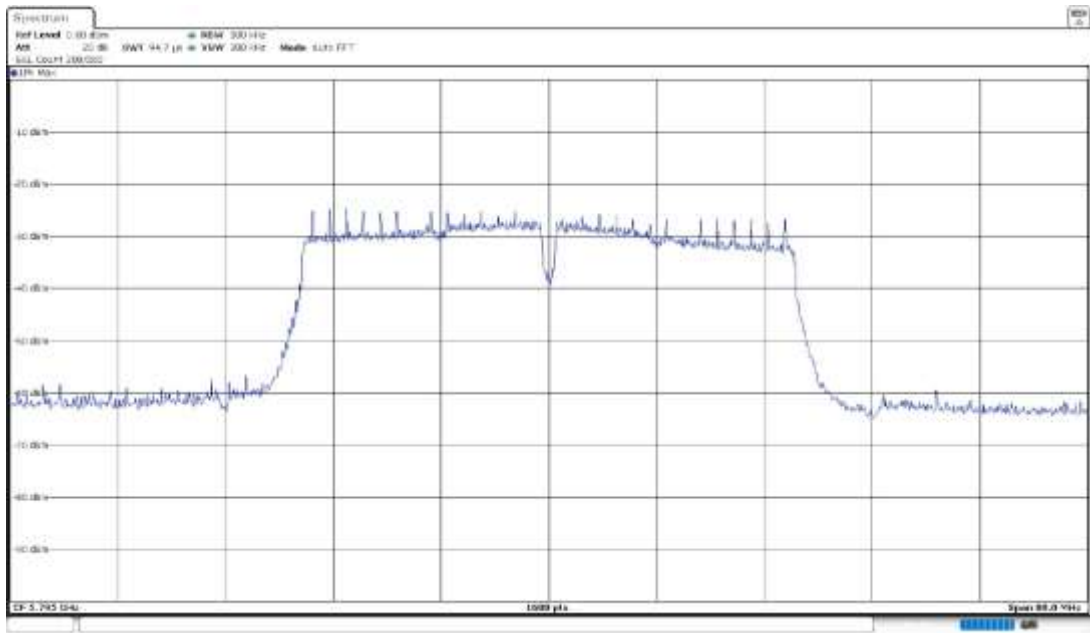
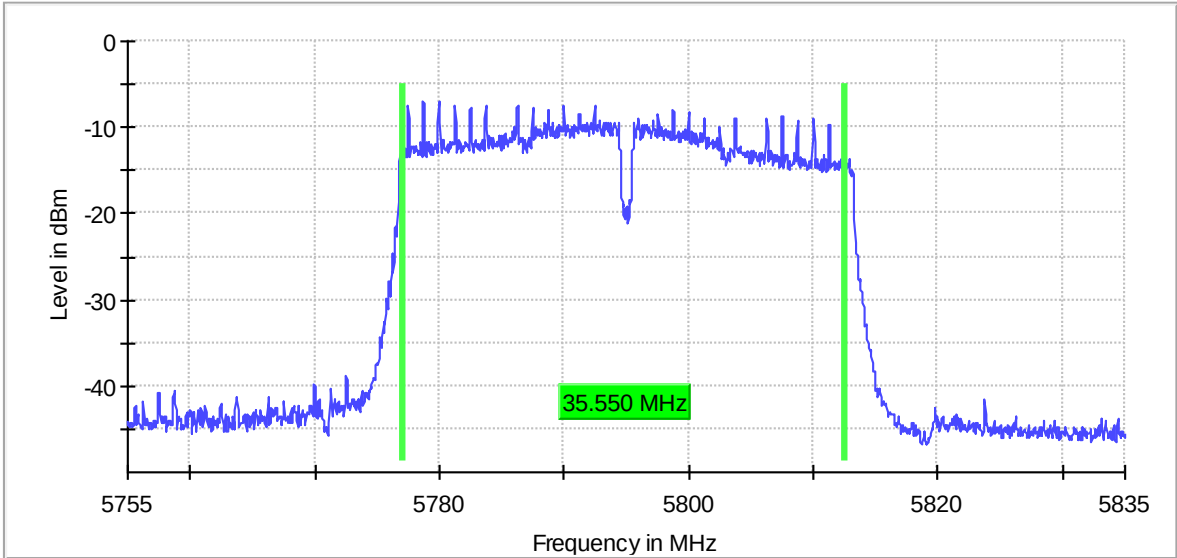


Mode 802.11 n40 (HT40), Low Channel 151 (5755 MHz)



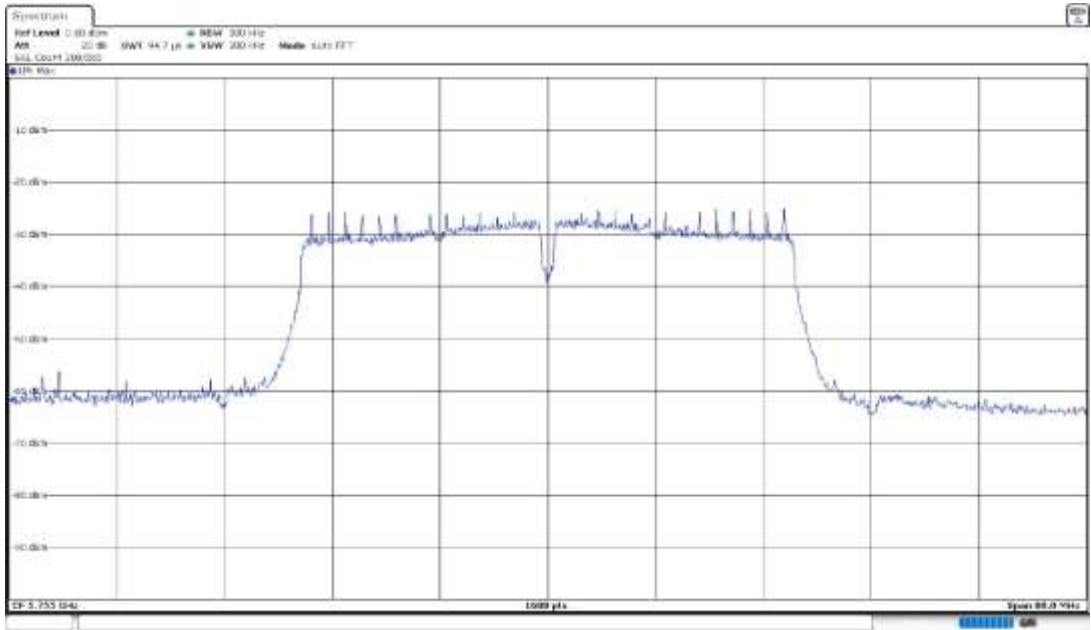
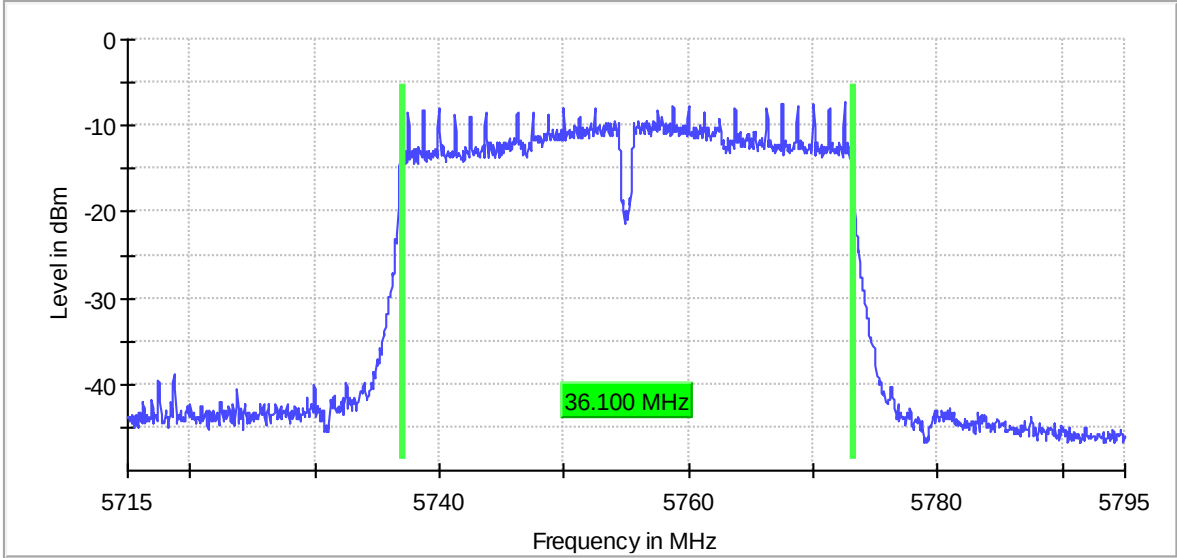
Mode 802.11 n40 (HT40), High Channel 159 (5795 MHz)

6 dB Bandwidth



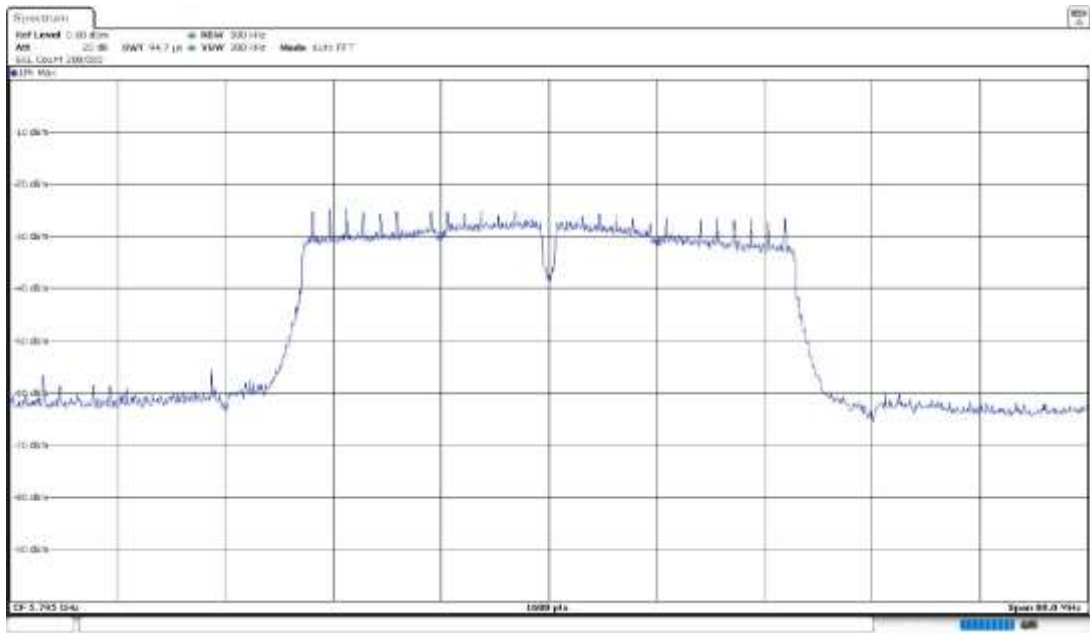
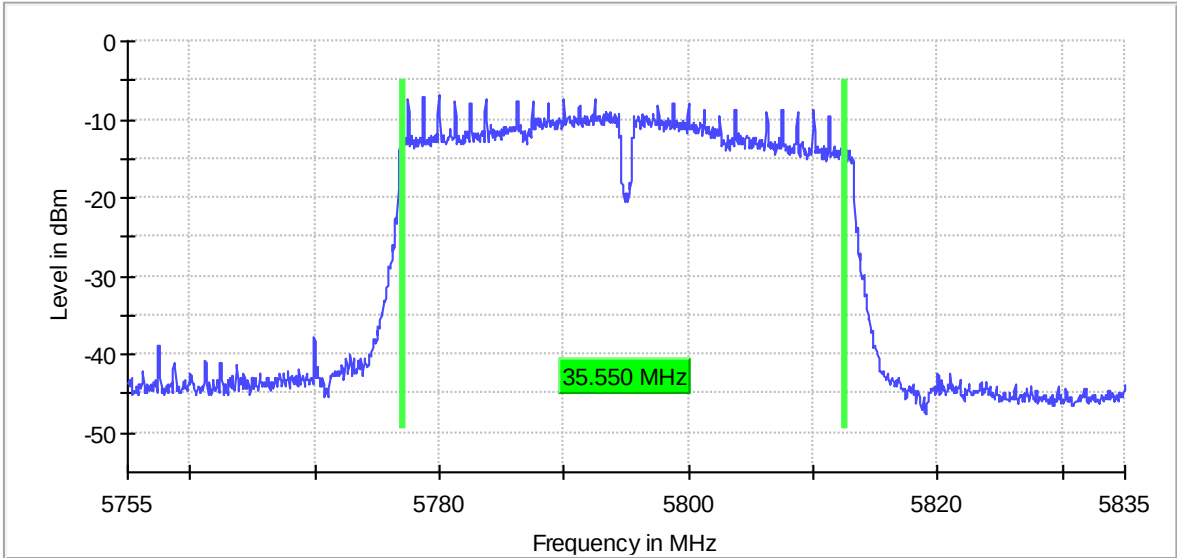
Mode 802.11 ac40 (VHT40), Low Channel 151 (5755 MHz)

6 dB Bandwidth

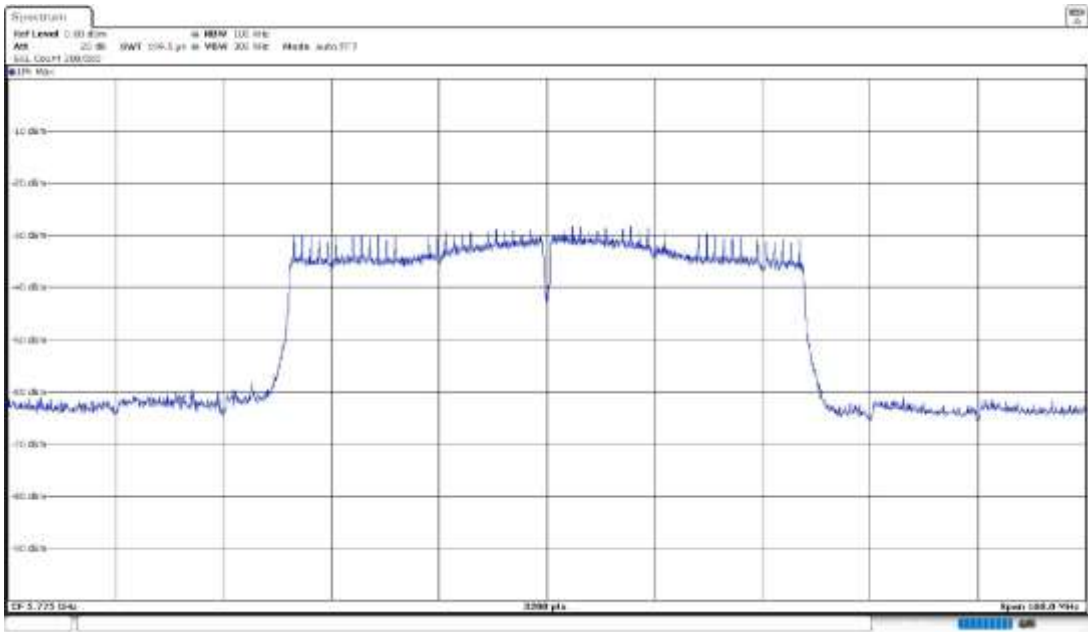
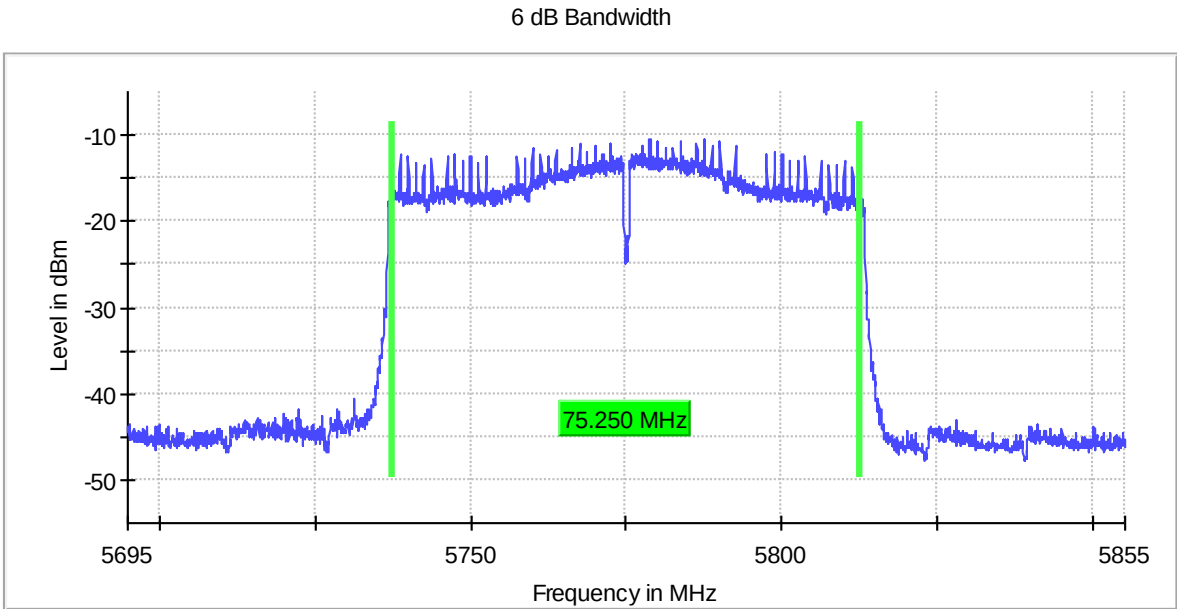


Mode 802.11 ac40 (VHT40), High Channel 159 (5795 MHz)

6 dB Bandwidth



Mode 802.11 ac80 (VHT80), Single Channel 155 (5775 MHz)



FCC 15.407 (a)(3) / RSS-247 6.2.4.1. Maximum Conducted Output Power

Limits

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30 dBm). 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.

Results

The maximum conducted output power was measured according to 789033 D02 General UNII Test Procedures New Rules v02r01 clause E.3.b) (Method PM-G) (duty cycle is < 98%).

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

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

- Configuration 1**

- U-NII-3 sub-band:**

Maximum Declared Antenna Gain: +3.2 dBi

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.63	11.62	10.58
Max. EIRP (dBm)	13.83	14.82	13.78

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.69	11.29	10.62
Max. EIRP (dBm)	13.89	14.49	13.82

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.59	11.48	10.50
Max. EIRP (dBm)	13.79	14.68	13.70

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. RMS Conducted Power (dBm)	7.83	8.17
Max. EIRP (dBm)	11.03	11.37

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. RMS Conducted Power (dBm)	8.41	8.25
Max. EIRP (dBm)	11.61	11.45

Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
Max. RMS Conducted Power (dBm)	8.02
Max. EIRP (dBm)	11.22

Verdict

Pass

- **Configuration 2**

- **U-NII-3 sub-band:**

Maximum Declared Antenna Gain: +5 dBi

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.63	11.62	10.58
Max. EIRP (dBm)	15.63	16.62	15.58

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.69	11.29	10.62
Max. EIRP (dBm)	15.69	16.29	15.62

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. RMS Conducted Power (dBm)	10.59	11.48	10.50
Max. EIRP (dBm)	15.59	16.48	15.50

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. RMS Conducted Power (dBm)	7.83	8.17
Max. EIRP (dBm)	12.83	13.17

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. RMS Conducted Power (dBm)	8.41	8.25
Max. EIRP (dBm)	13.41	13.25

Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
Max. RMS Conducted Power (dBm)	8.02
Max. EIRP (dBm)	13.02

Verdict

Pass

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

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 clause F) referencing E.2.b) (Method SA-1) and E.2.d) (Method SA-2) of 789033 D02 General UNII Test Procedures New Rules v02r01.

A resolution bandwidth of 500 kHz was used.

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

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

- Configuration 1**

- U-NII-3 sub-band:**

Maximum Declared Antenna Gain: +3.2 dBi

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.61	-4.19	-5.20
Duty Cycle Correction Factor (dB)	0.99		
Max. Corrected Average PSD (dBm/500kHz)	-4.62	-3.20	-4.21
Maximum EIRP PSD (dBm/500kHz)	-1.42	0.00	-1.01

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.84	-4.98	-5.44
Duty Cycle Correction Factor (dB)	1.08		
Max. Corrected Average PSD (dBm/500kHz)	-4.76	-3.90	-4.36
Maximum EIRP PSD (dBm/500kHz)	-1.56	-0.70	-1.16

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.90	-4.80	-5.75
Duty Cycle Correction Factor (dB)	1.05		
Max. Corrected Average PSD (dBm/500kHz)	-4.85	-3.75	-4.70
Maximum EIRP PSD (dBm/500kHz)	-1.65	-0.55	-1.50

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. Average PSD (dBm/500kHz)	-12.12	-11.55
Duty Cycle Correction Factor (dB)	1.94	
Max. Corrected Average PSD (dBm/500kHz)	-10.18	-9.61
Maximum EIRP PSD (dBm/500kHz)	-6.98	-6.41

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. Average PSD (dBm/500kHz)	-11.48	-11.62
Duty Cycle Correction Factor (dB)	1.94	
Max. Corrected Average PSD (dBm/500kHz)	-9.54	-9.68
Maximum EIRP PSD (dBm/500kHz)	-6.34	-6.48

Mode 802.11 ac80 (VHT80):

Channel:	Single Channel 155 (5775 MHz)
Max. Average PSD (dBm/500kHz)	-15.50
Duty Cycle Correction Factor (dB)	3.37
Max. Corrected Average PSD (dBm/500kHz)	-12.13
Maximum EIRP PSD (dBm/500kHz)	-8.93

Verdict

Pass

- **Configuration 2**

- **U-NII-3 sub-band:**

Maximum Declared Antenna Gain: +5 dBi

Mode 802.11 a20:

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.61	-4.19	-5.20
Duty Cycle Correction Factor (dB)	0.99		
Max. Corrected Average PSD (dBm/500kHz)	-4.62	-3.20	-4.21
Maximum EIRP PSD (dBm/500kHz)	0.38	1.80	0.79

Mode 802.11 n20 (HT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.84	-4.98	-5.44
Duty Cycle Correction Factor (dB)	1.08		
Max. Corrected Average PSD (dBm/500kHz)	-4.76	-3.90	-4.36
Maximum EIRP PSD (dBm/500kHz)	0.24	1.10	0.64

Mode 802.11 ac20 (VHT20):

Channel:	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Average PSD (dBm/500kHz)	-5.90	-4.80	-5.75
Duty Cycle Correction Factor (dB)	1.05		
Max. Corrected Average PSD (dBm/500kHz)	-4.85	-3.75	-4.70
Maximum EIRP PSD (dBm/500kHz)	0.15	1.25	0.30

Mode 802.11 n40 (HT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. Average PSD (dBm/500kHz)	-12.12	-11.55
Duty Cycle Correction Factor (dB)	1.94	
Max. Corrected Average PSD (dBm/500kHz)	-10.18	-9.61
Maximum EIRP PSD (dBm/500kHz)	-5.18	-4.61

Mode 802.11 ac40 (VHT40):

Channel:	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. Average PSD (dBm/500kHz)	-11.48	-11.62
Duty Cycle Correction Factor (dB)	1.94	
Max. Corrected Average PSD (dBm/500kHz)	-9.54	-9.68
Maximum EIRP PSD (dBm/500kHz)	-4.54	-4.68

Mode 802.11 ac80 (VHT80):

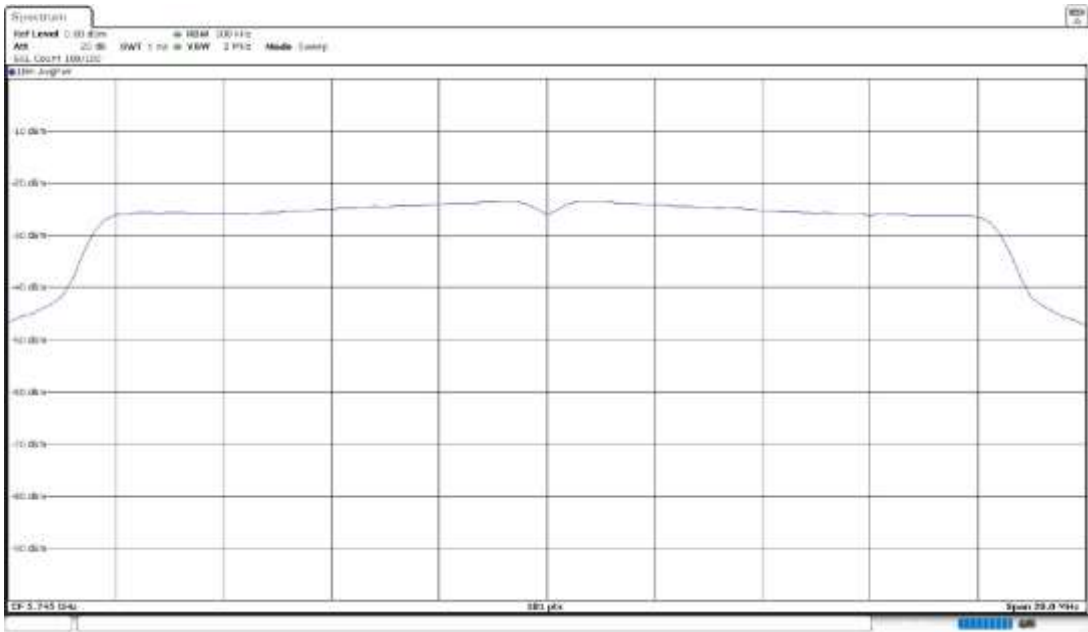
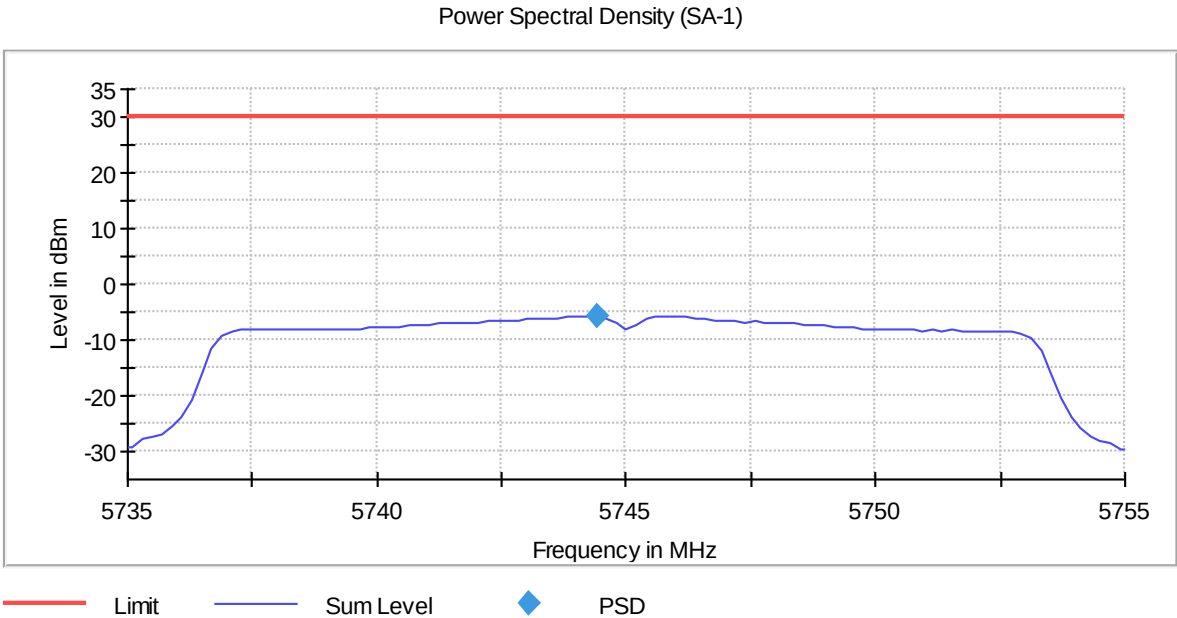
Channel:	Single Channel 155 (5775 MHz)
Max. Average PSD (dBm/500kHz)	-15.50
Duty Cycle Correction Factor (dB)	3.37
Max. Corrected Average PSD (dBm/500kHz)	-12.13
Maximum EIRP PSD (dBm/500kHz)	-7.13

Verdict

Pass

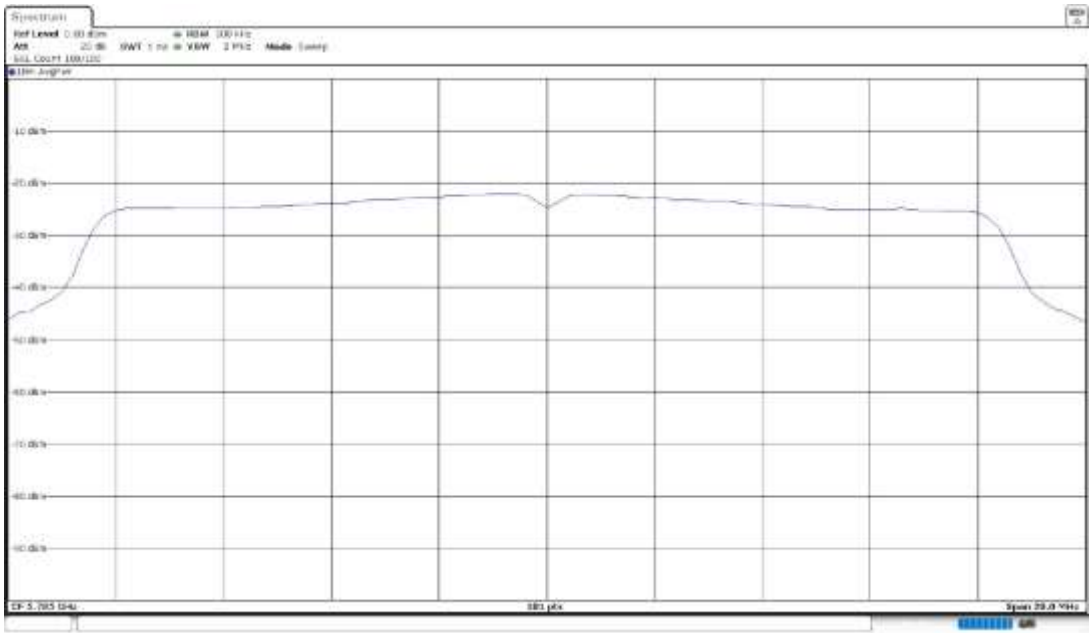
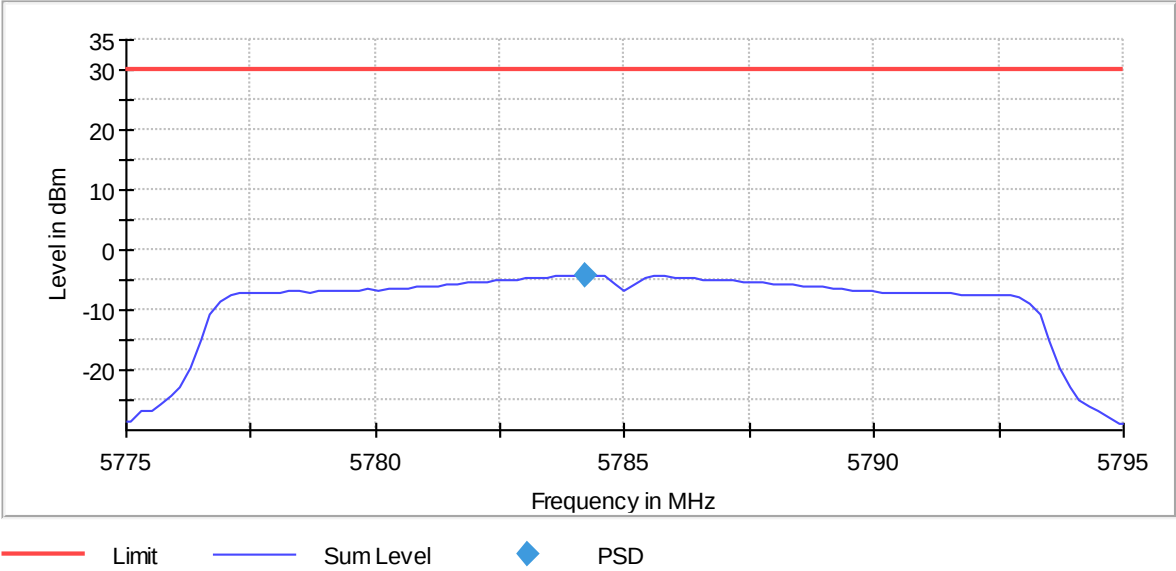
Attachments

Mode 802.11 a20, Low Channel 149 (5745 MHz)

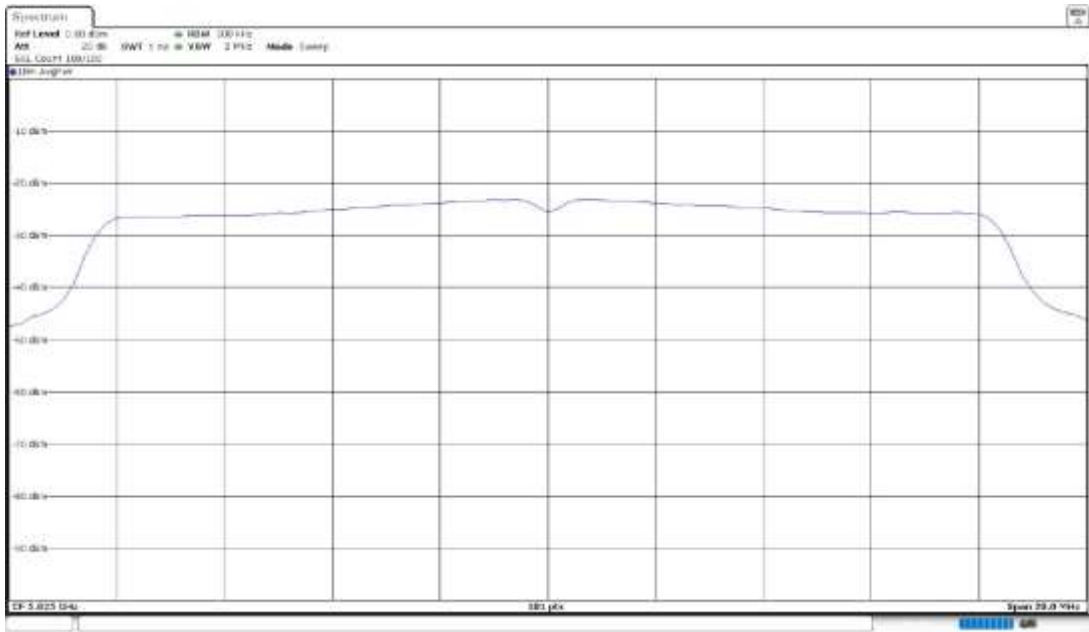
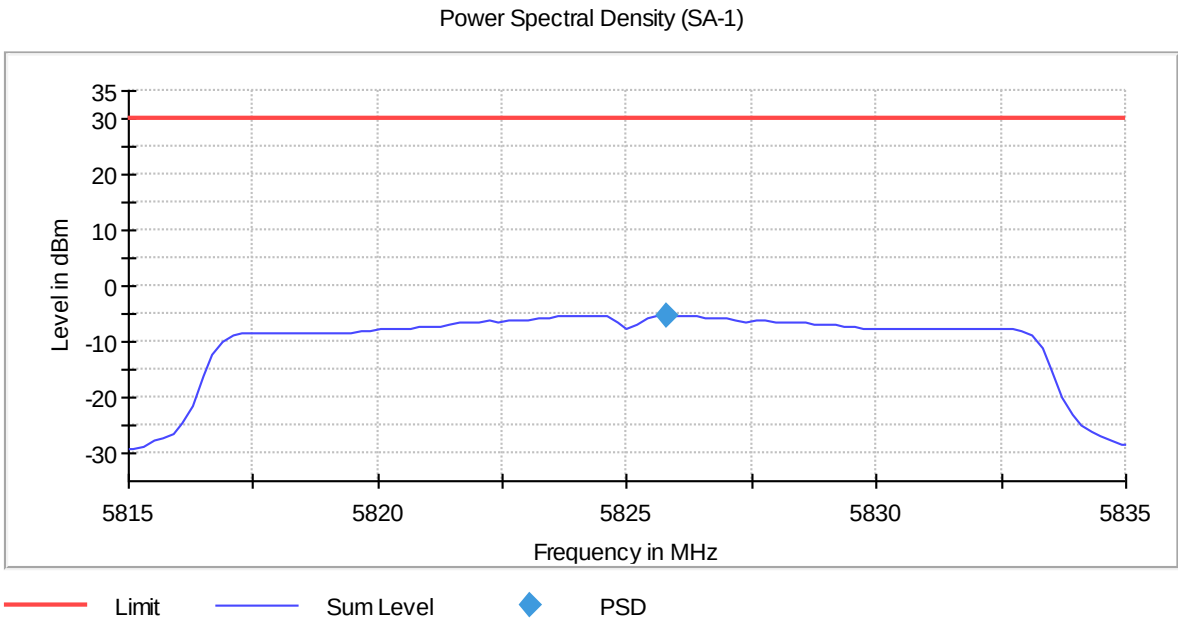


Mode 802.11 a20, Middle Channel 157 (5785 MHz)

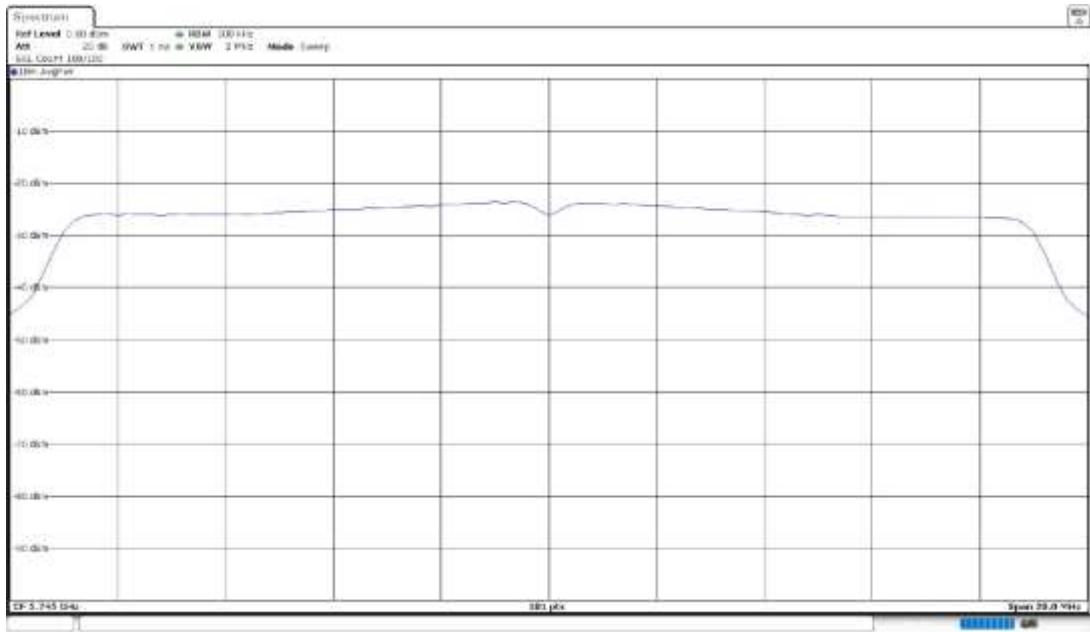
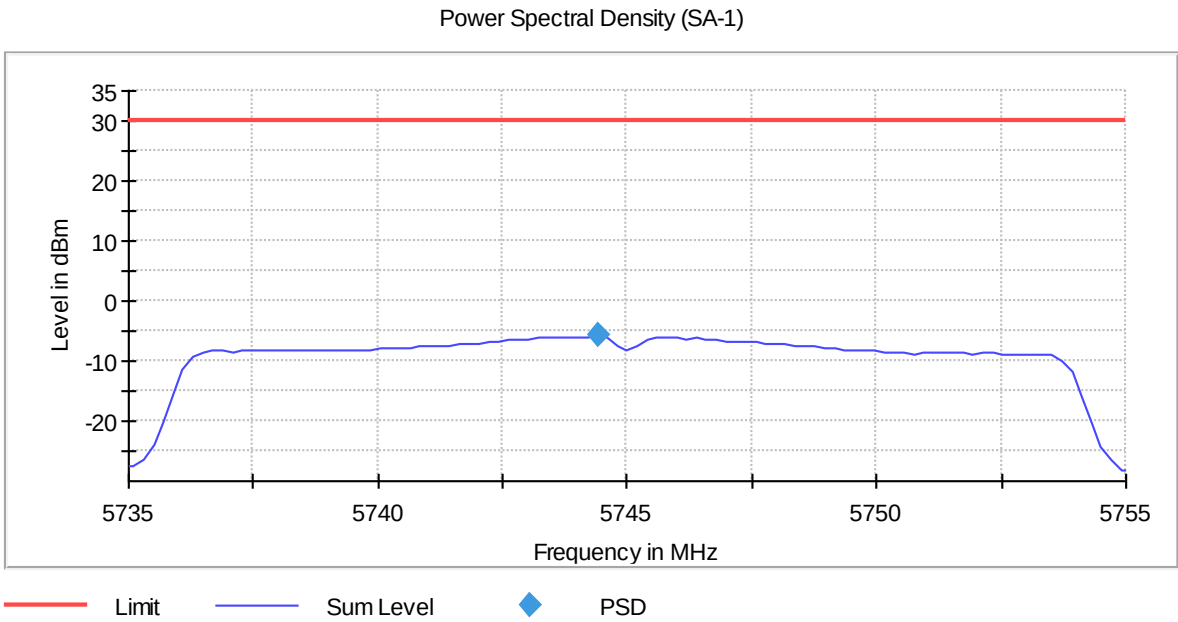
Power Spectral Density (SA-1)



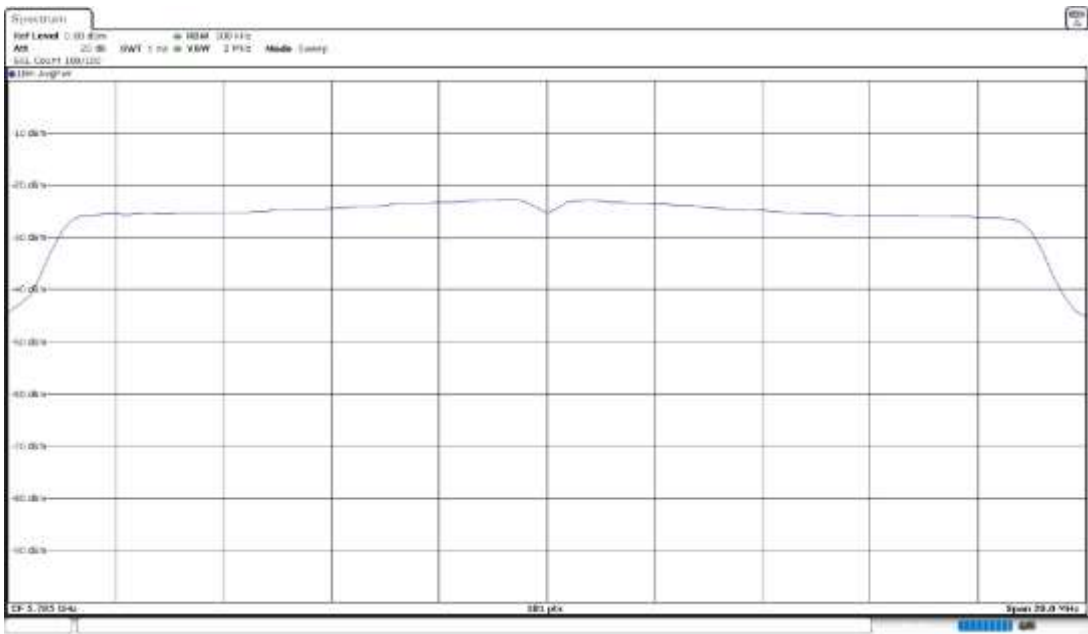
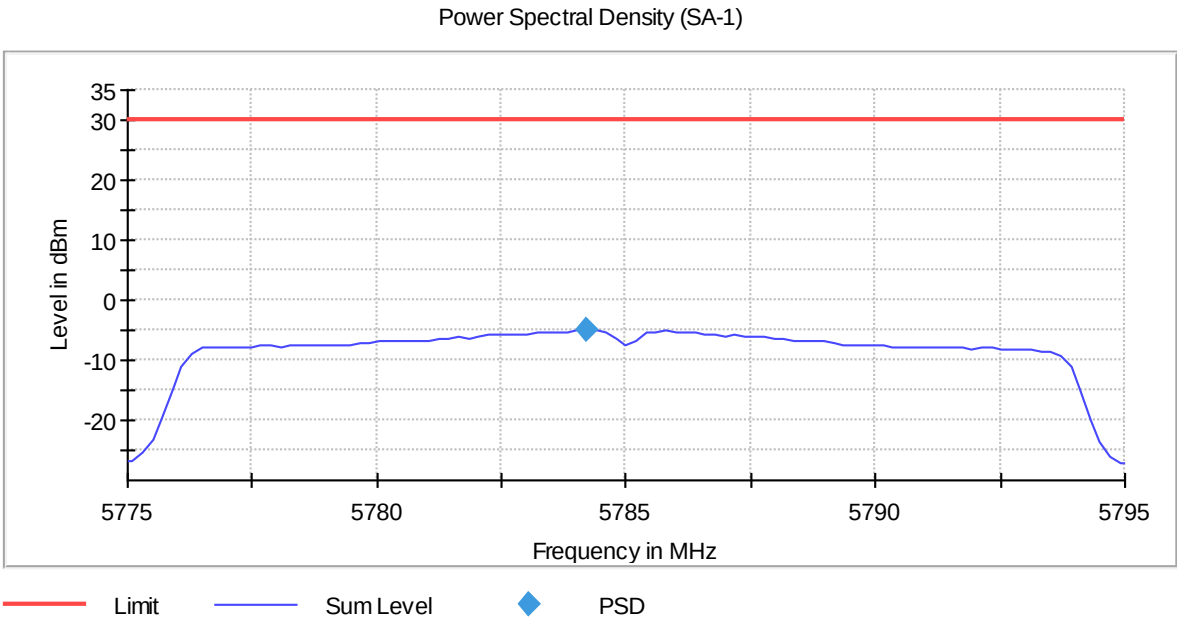
Mode 802.11 a20, High Channel 165 (5825 MHz)



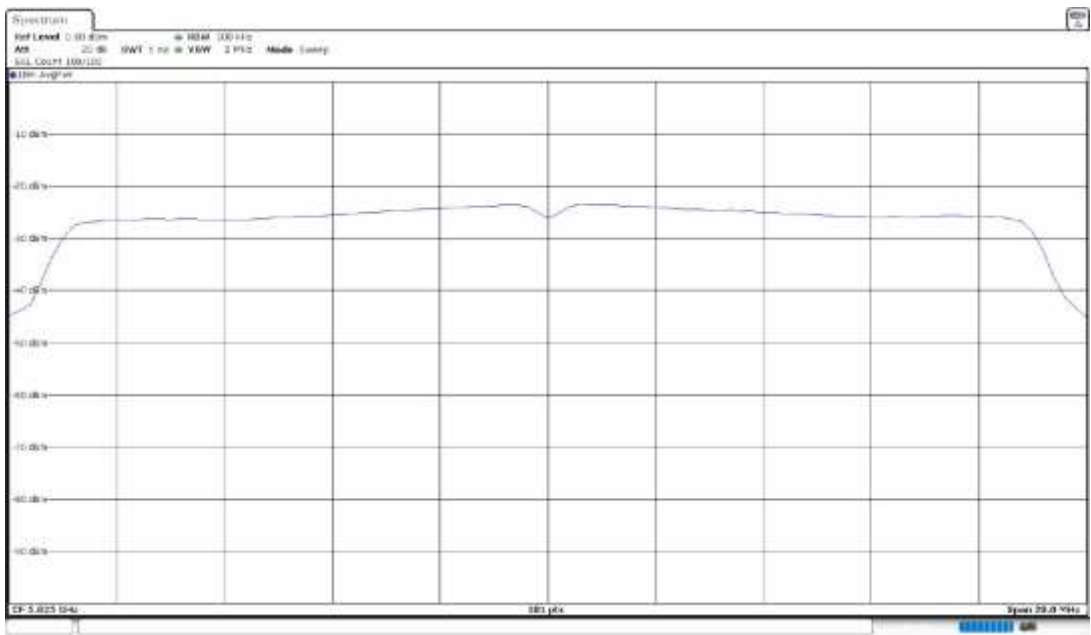
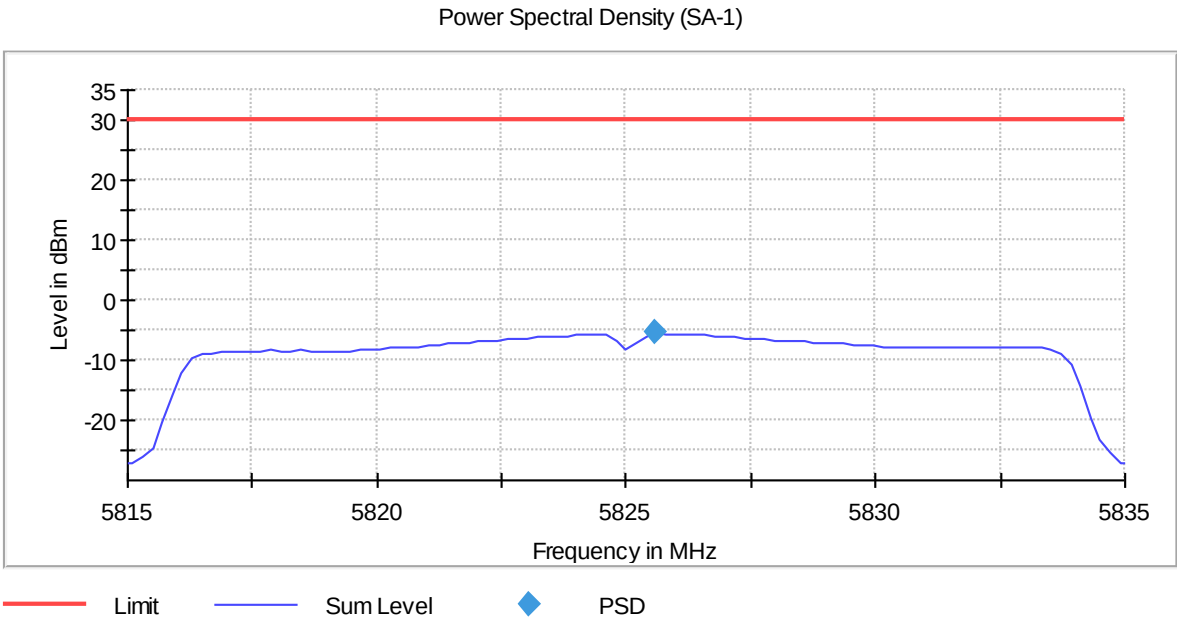
Mode 802.11 n20 (HT20), Low Channel 149 (5745 MHz)



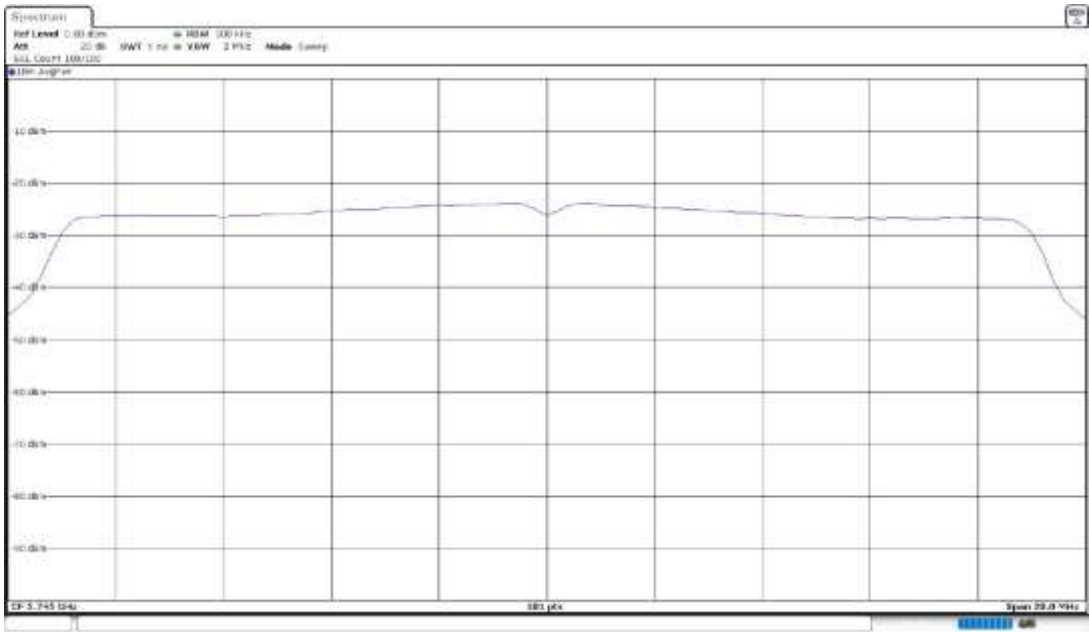
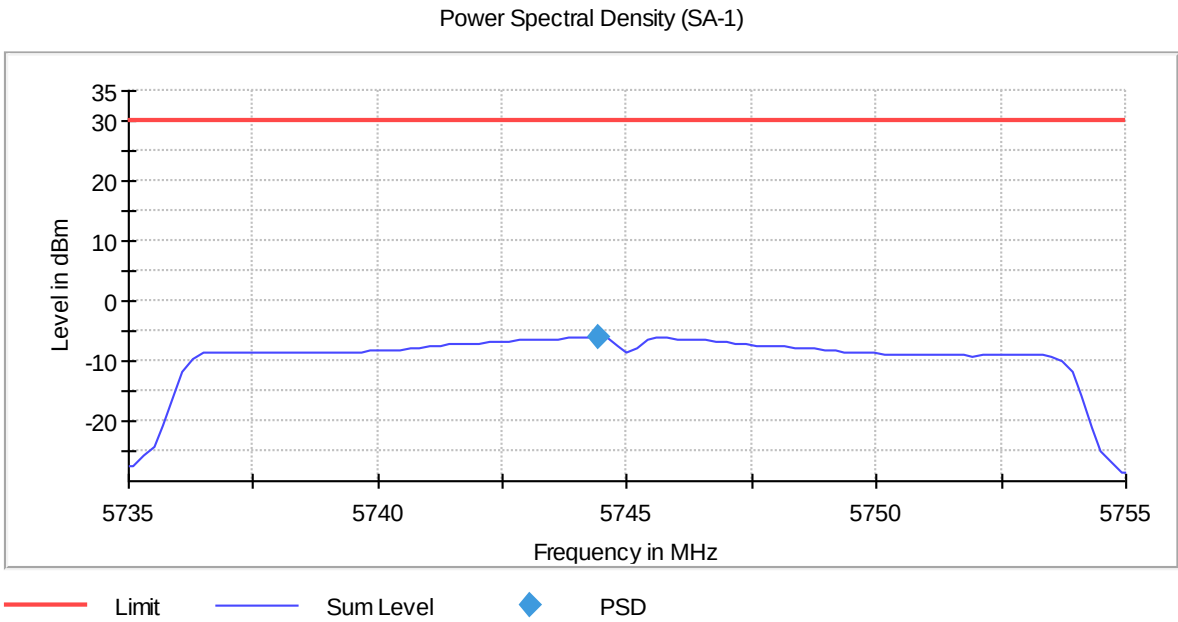
Mode 802.11 n20 (HT20), Middle Channel 157 (5785 MHz)



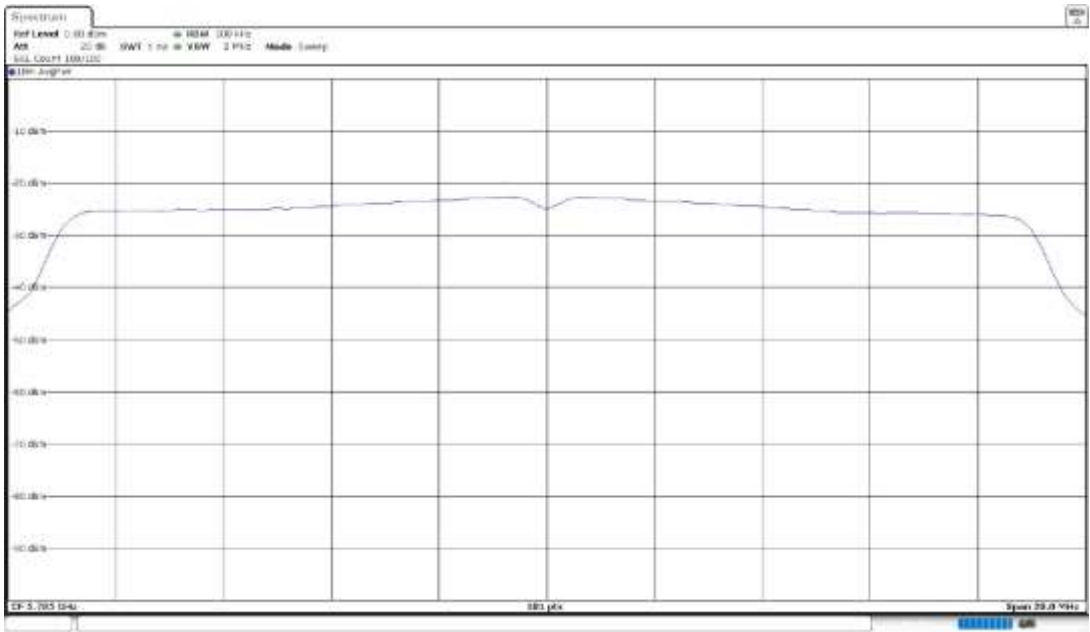
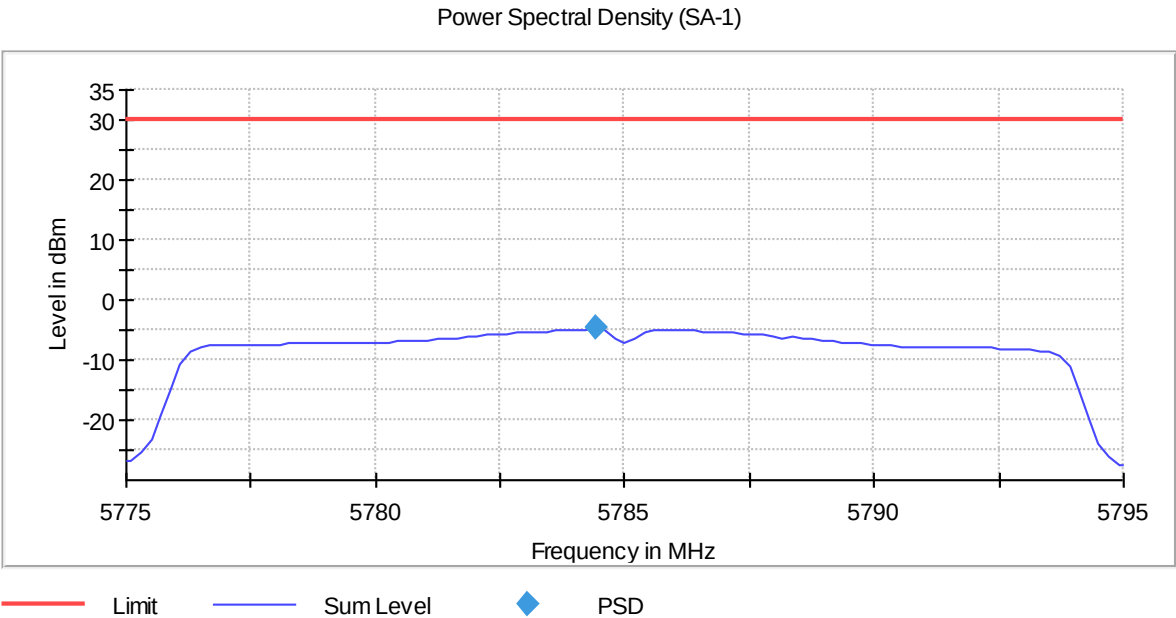
Mode 802.11 n20 (HT20), High Channel 165 (5825 MHz)



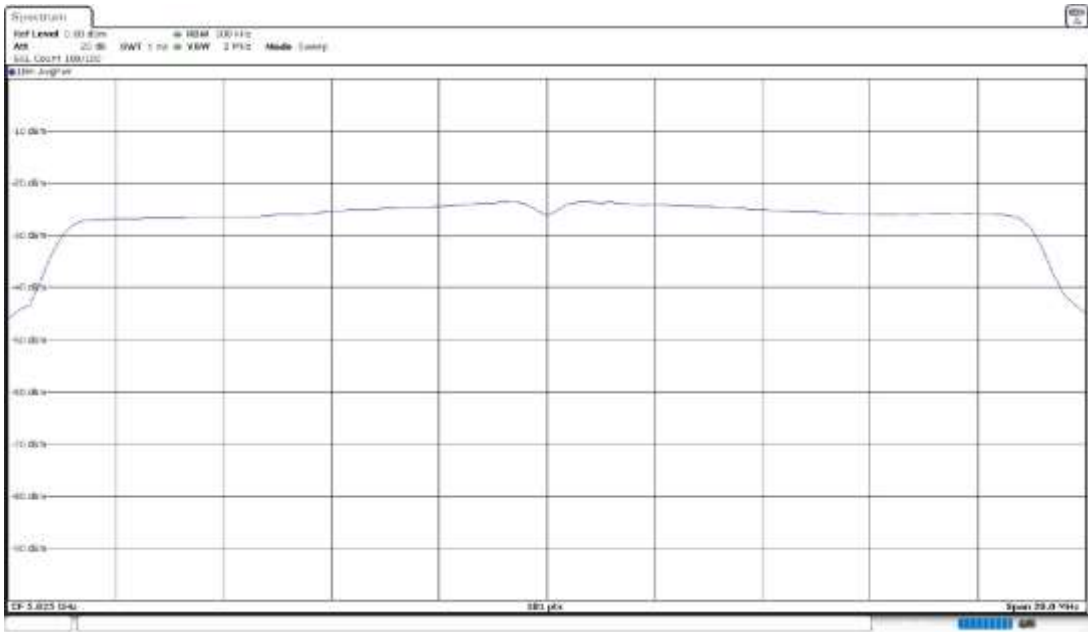
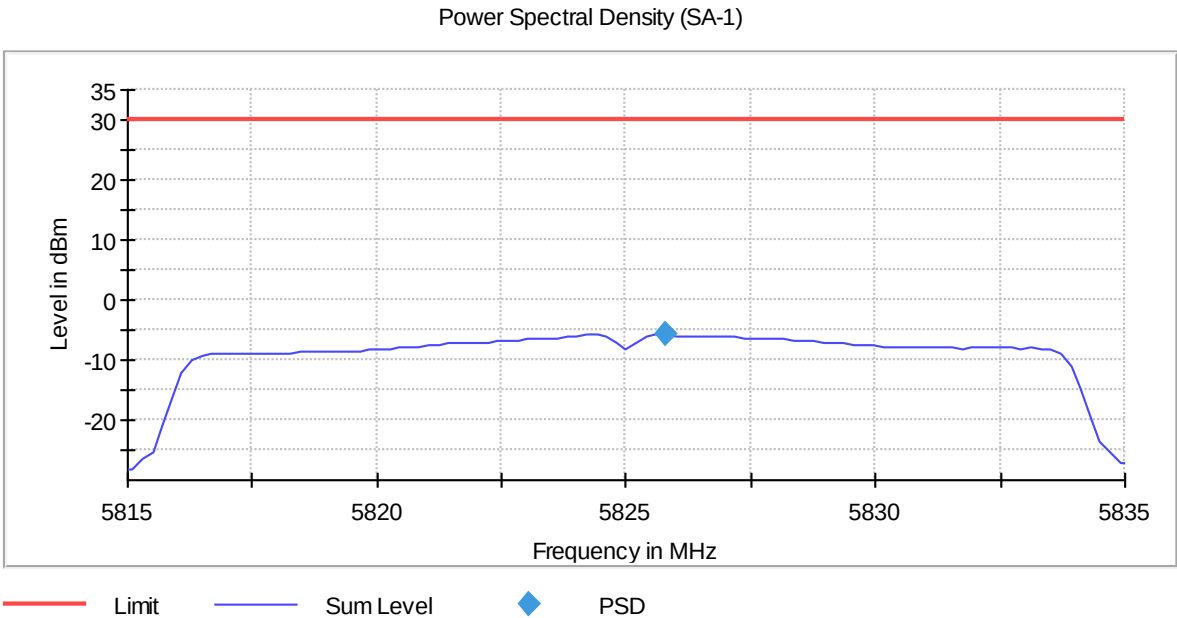
Mode 802.11 ac20 (VHT20), Low Channel 149 (5745 MHz)



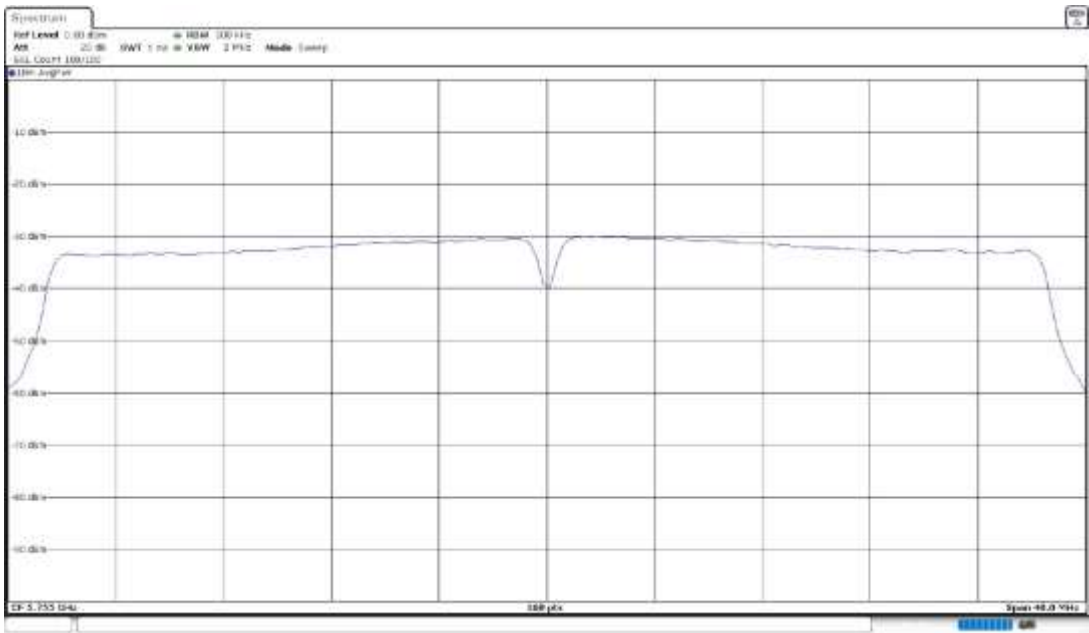
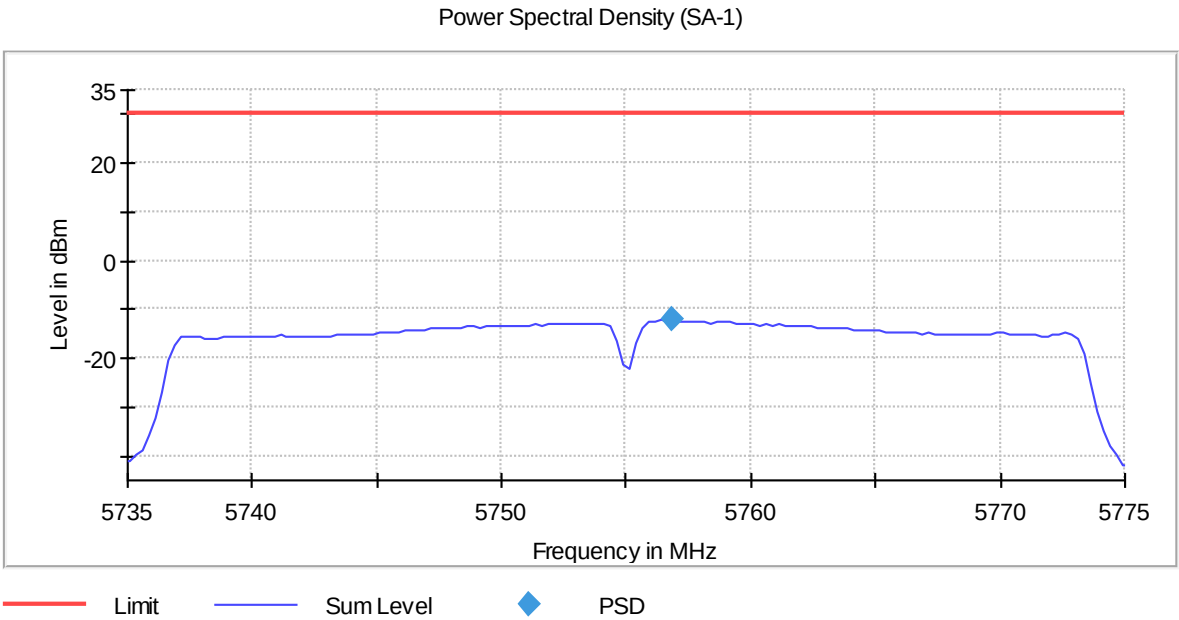
Mode 802.11 ac20 (VHT20), Middle Channel 157 (5785 MHz)



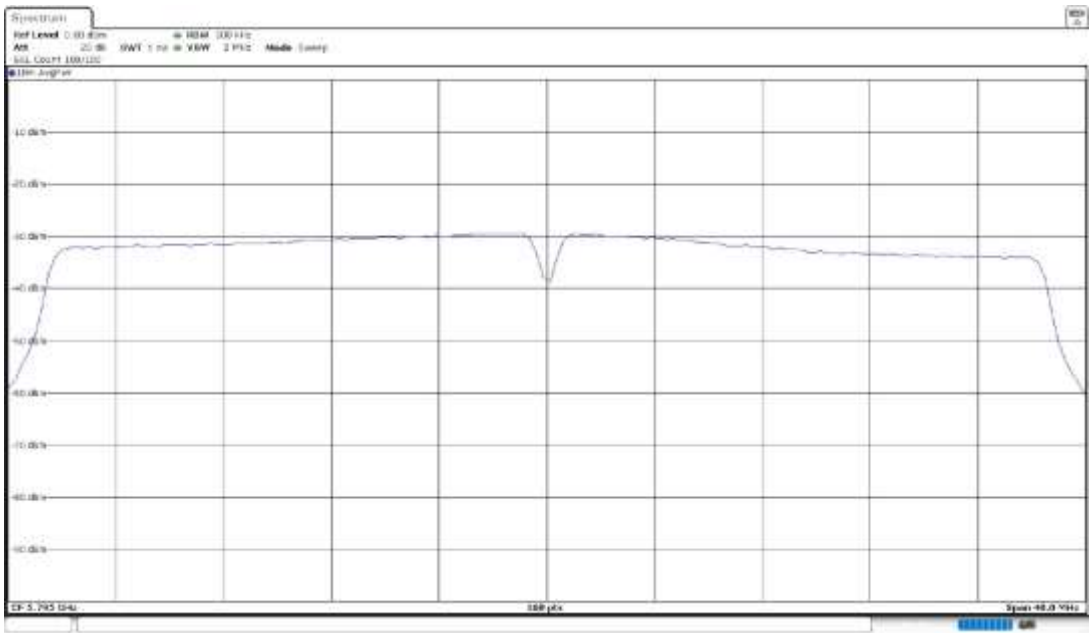
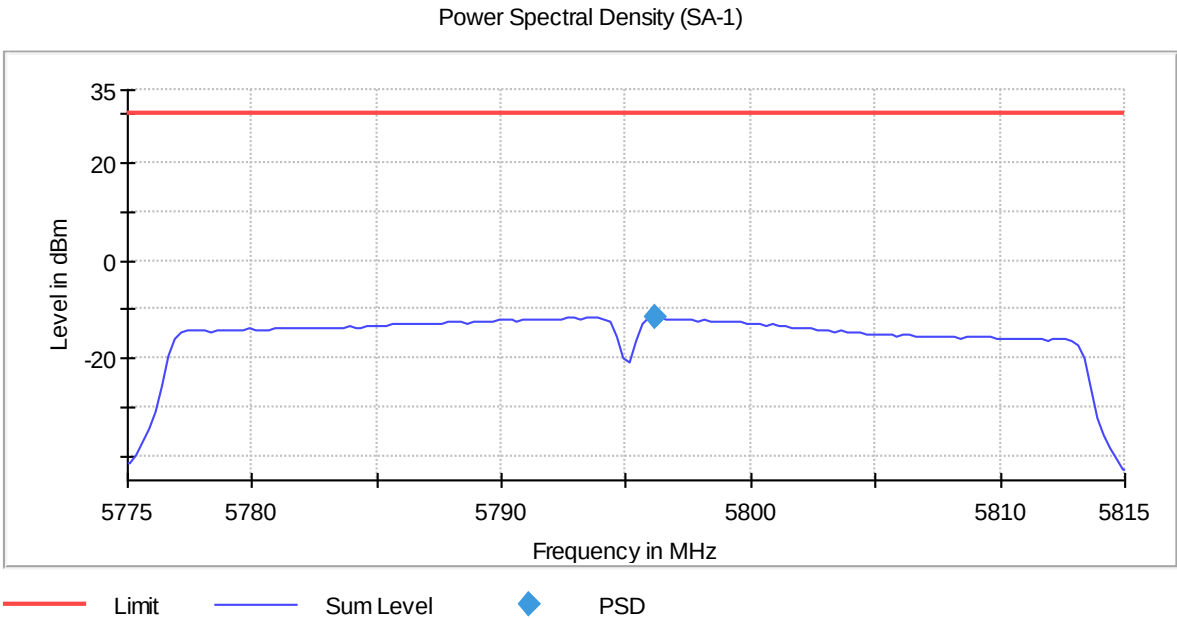
Mode 802.11 ac20 (VHT20), High Channel 165 (5825 MHz)



Mode 802.11 n40 (HT40), Low Channel 151 (5755 MHz)

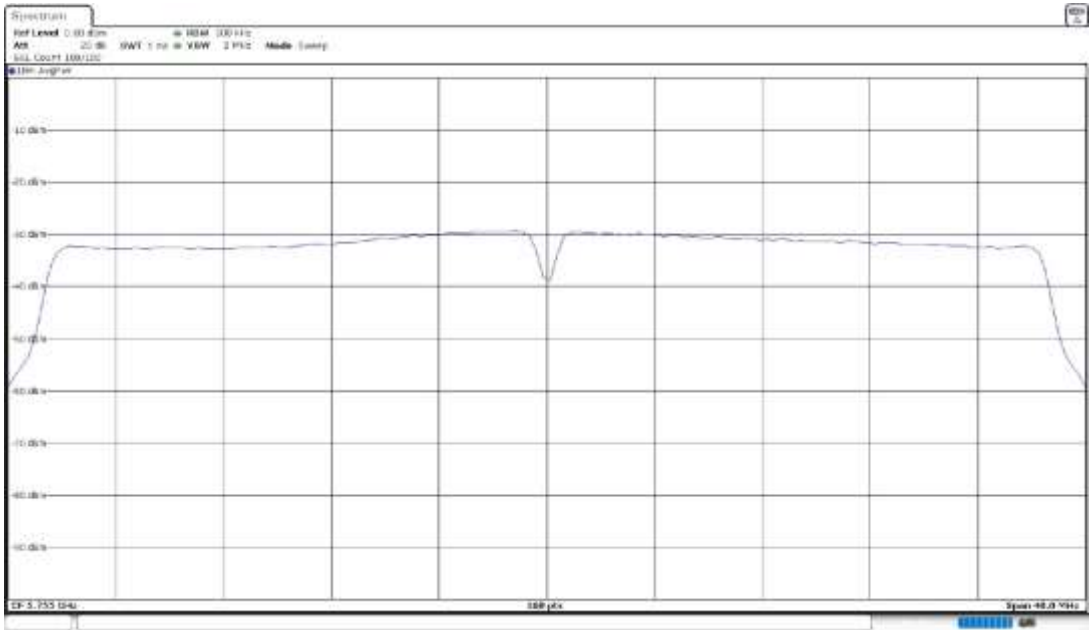
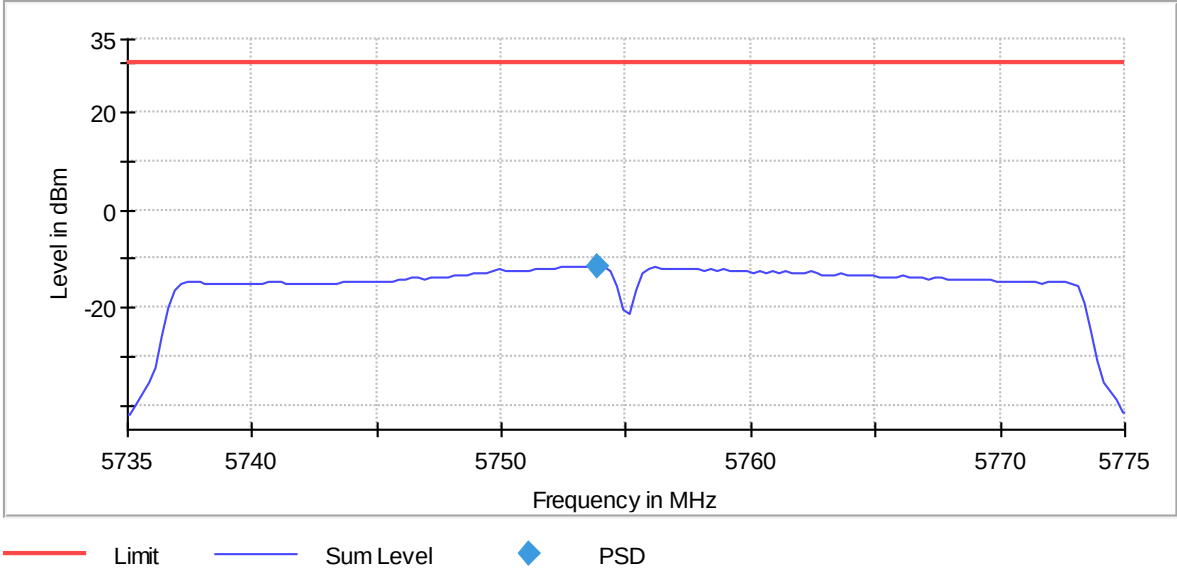


Mode 802.11 n40 (HT40), High Channel 159 (5795 MHz)

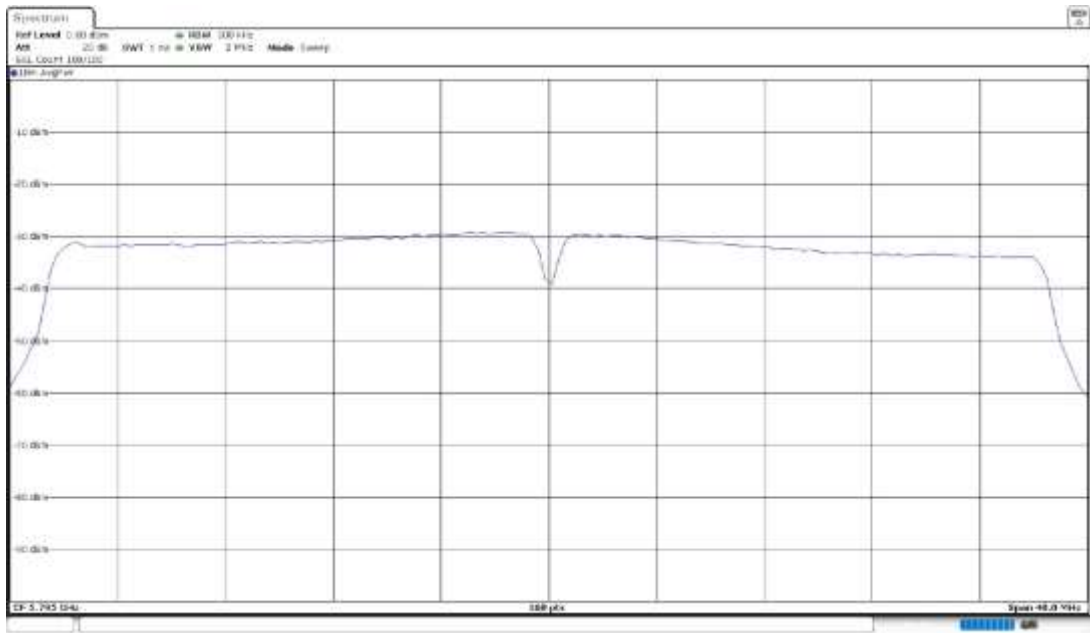
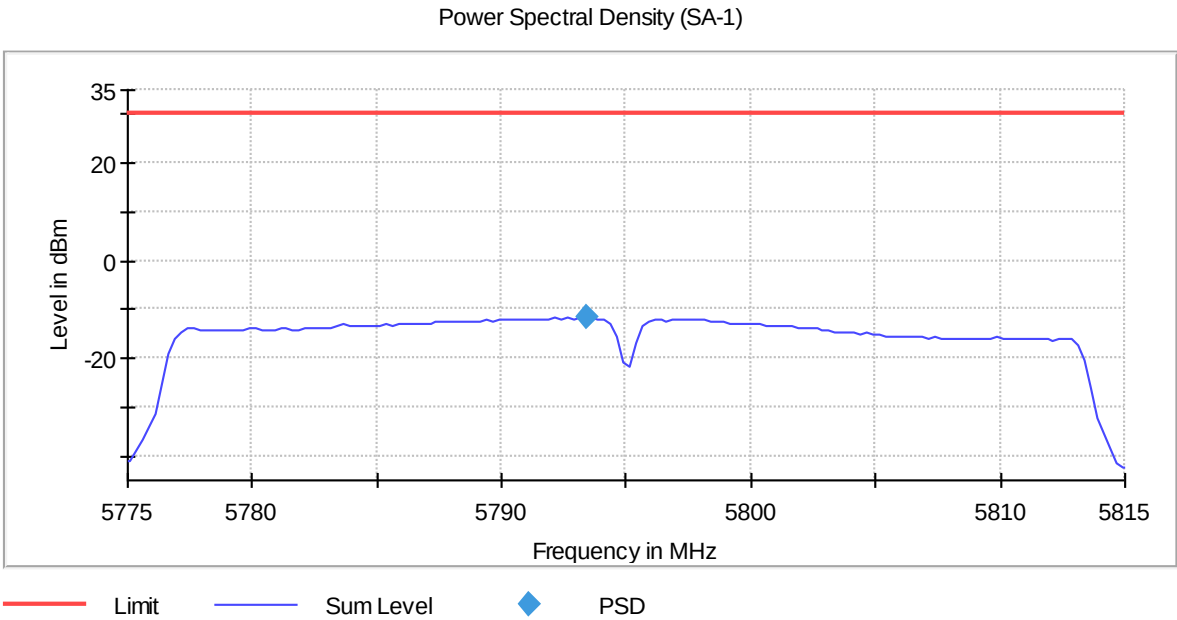


Mode 802.11 ac40 (VHT40), Low Channel 151 (5755 MHz)

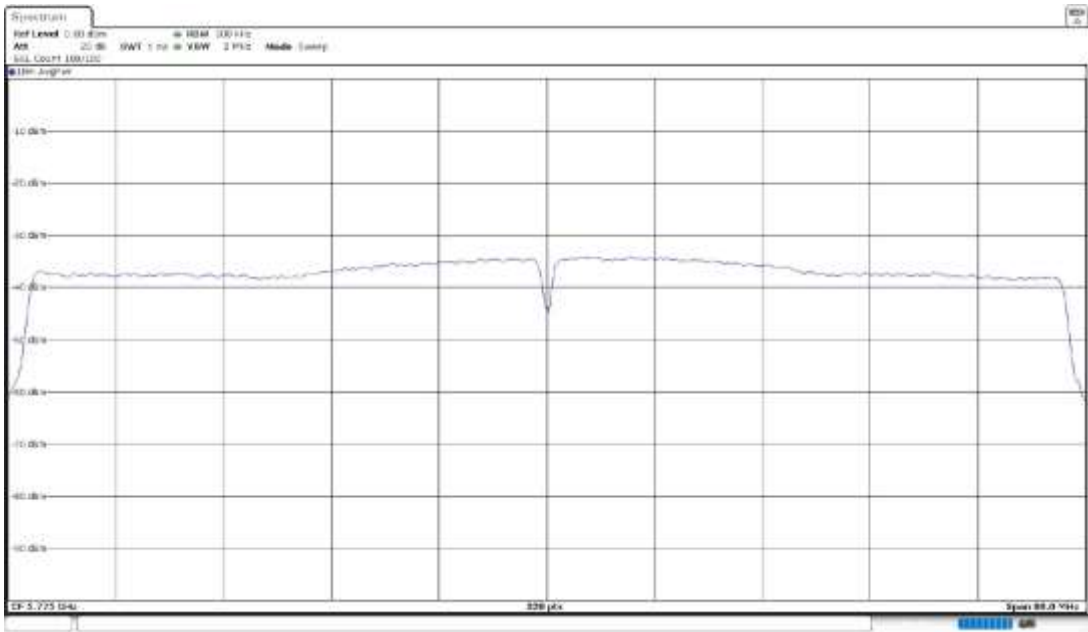
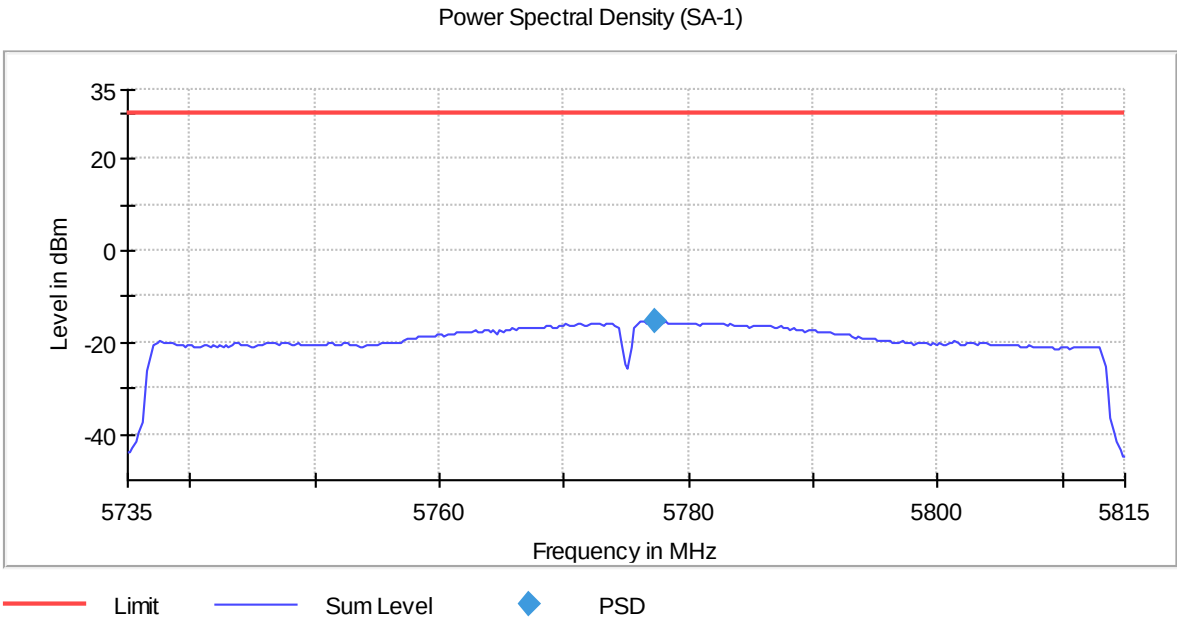
Power Spectral Density (SA-1)



Mode 802.11 ac40 (VHT40), High Channel 159 (5795 MHz)



Mode 802.11 ac80 (VHT80), Single Channel 155 (5775 MHz)



FCC 15.407(b)(4) /RSS-247 6.2.4.2. Transmitter Out of Band Radiated Emissions and Transmitter Band Edge Radiated Emissions.

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)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	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.

Results

- **U-NII-3 sub-band:**

For spurious emissions outside of the U-NII-3 band edge mask defined for the frequency range 5.65–5.925 GHz, the OFDM worst-case mode was determined after preliminary measurements of the radiated power spectral density.E.I.R.P. The Low, Middle and High Channels of the worst-case mode were tested.

- Configuration 1**

Worst case: 802.11n20 (HT20 MCS0)

Frequency range 30 MHz – 1 GHz:

ID	Comments
--	The spurious frequencies detected below 1 GHz do not depend either on the modulation or the operating channel.

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

Frequency Range (GHz)	Unwanted Frequency (MHz)	Unwanted Level (dBμV/m)	Polarization	Detector
[0.03, 1]	124.99533	37.16	H	Quasi-Peak
	249.99600	38.51	H	Quasi-Peak
	374.99667	39.32	H	Quasi-Peak
	450.01000	43.34	H	Quasi-Peak
	624.99800	37.91	V	Quasi-Peak
	874.96700	28.01	V	Quasi-Peak

Frequency range 1 GHz – 40 GHz (worst-case):

ID	Comments
--	The results in the next tables show the maximum measured levels in the range 1–40 GHz except the 5.65–5.725 GHz and 5.85–5.925 GHz adjacent bands. The results in the adjacent bands is evaluated in the next section.
--	Spurious frequencies with peak levels above the average limit (54 dBμV/m at 3 m) are measured with average detector for average compliance checking.

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

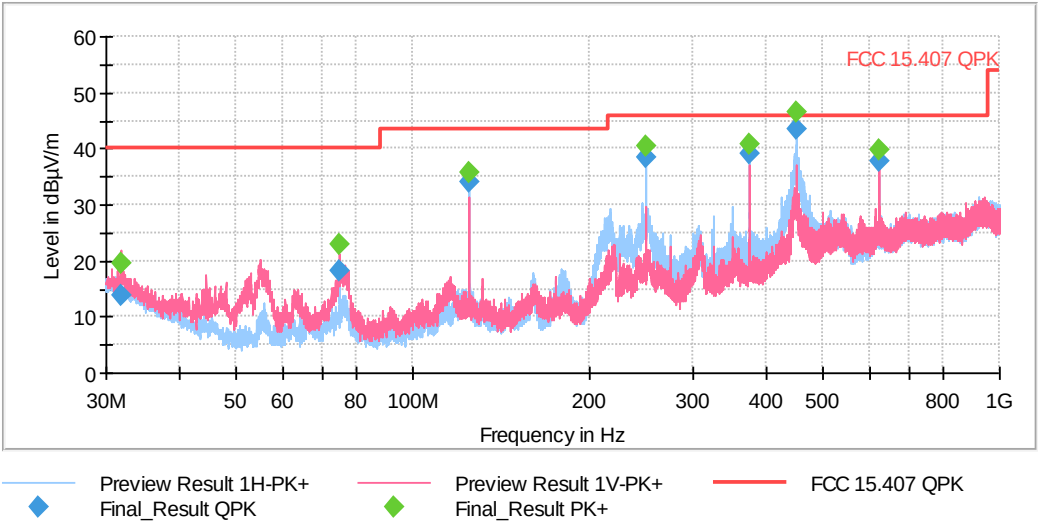
Frequency (MHz)	Frequency Range (GHz)	Unwanted Frequency (MHz)	Unwanted Level (dBμV/m)	Polarization	Detector
5745.0000	[7, 17]	11490.23750	63.71	V	Peak
			53.25		Aaverage
5785.0000	[7, 17]	11573.03750	62.38	V	Peak
			51.95		Average
5825.0000	[7, 17]	11646.54250	60.88	V	Peak
			50.00		Average

Verdict

Pass

Attachments

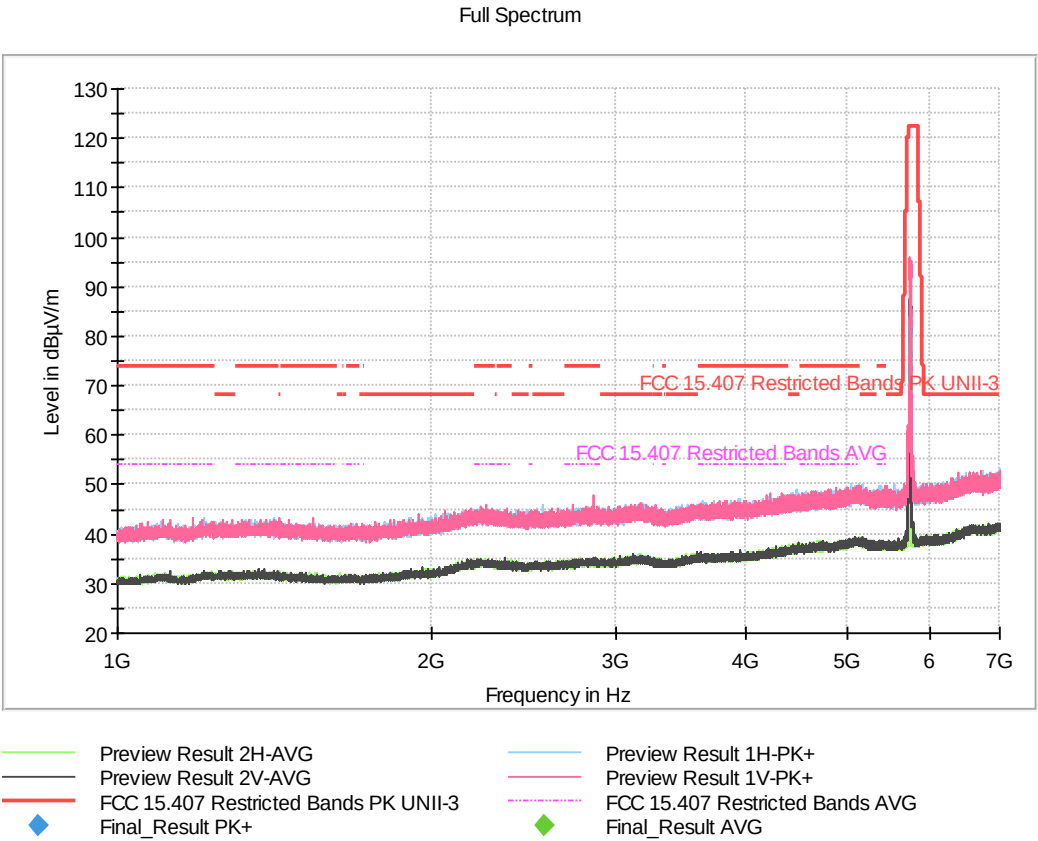
FREQUENCY RANGE 30 MHz – 1 GHz (worst-case)



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

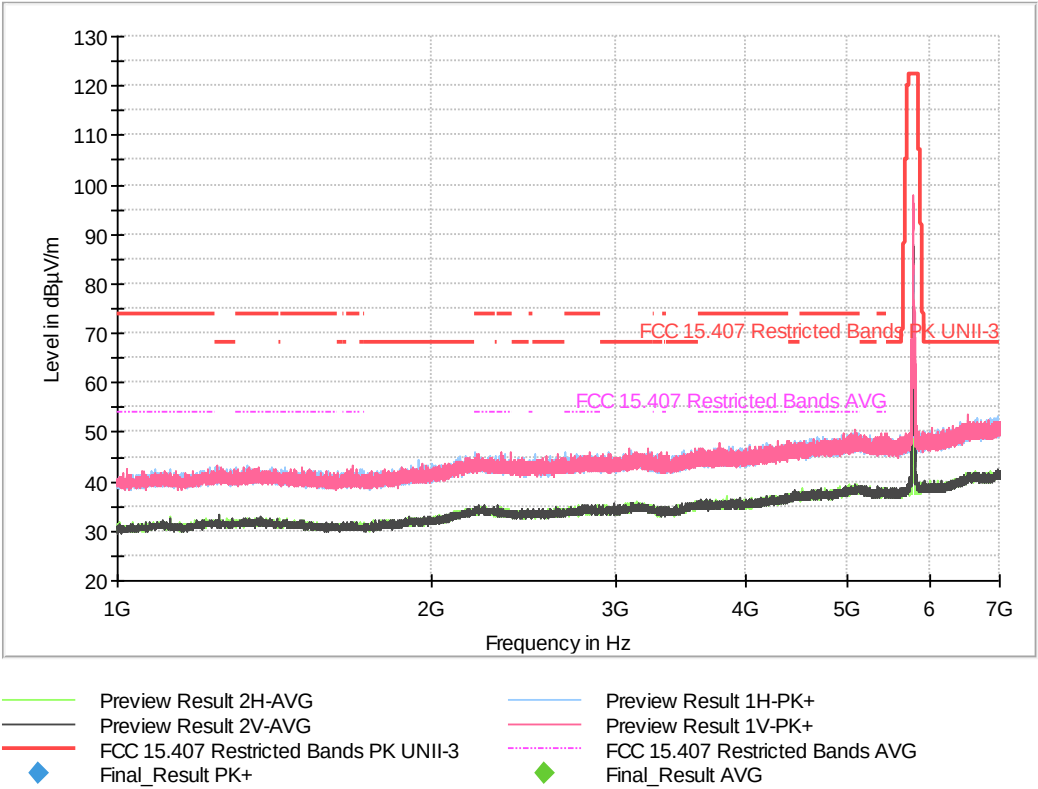
FREQUENCY RANGE 1 GHz – 7 GHz (worst-case)

- Low Channel 149 (5745 MHz)



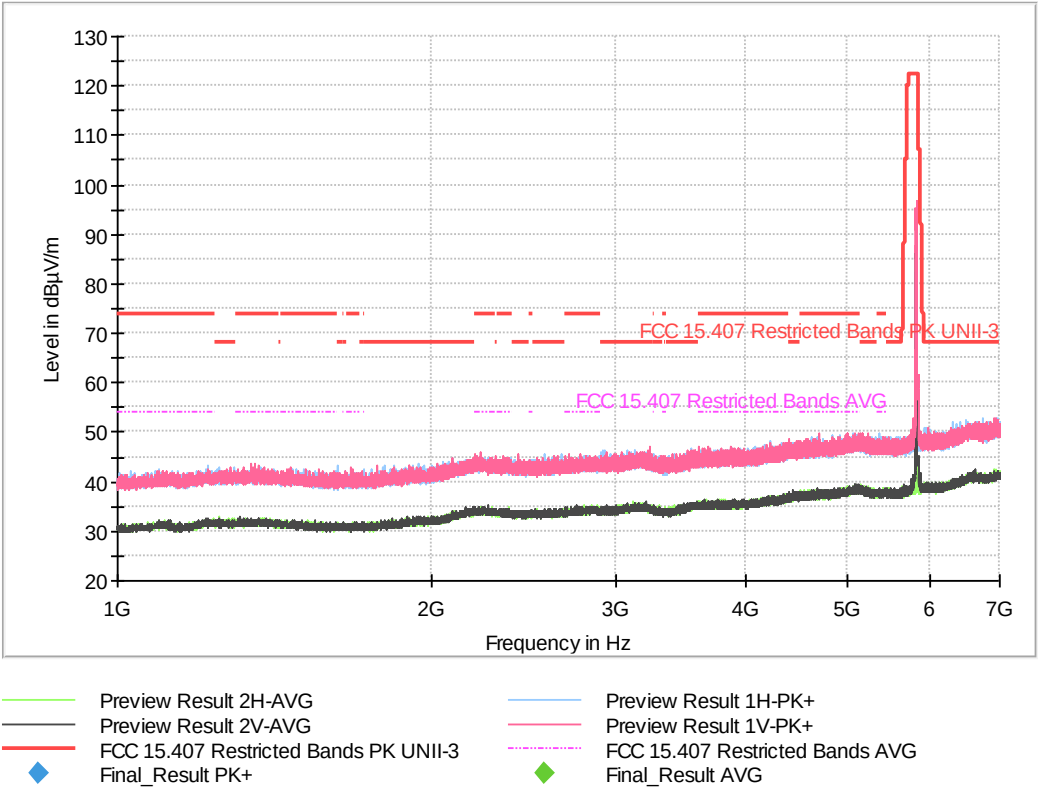
- Middle Channel 157 (5785 MHz)

Full Spectrum



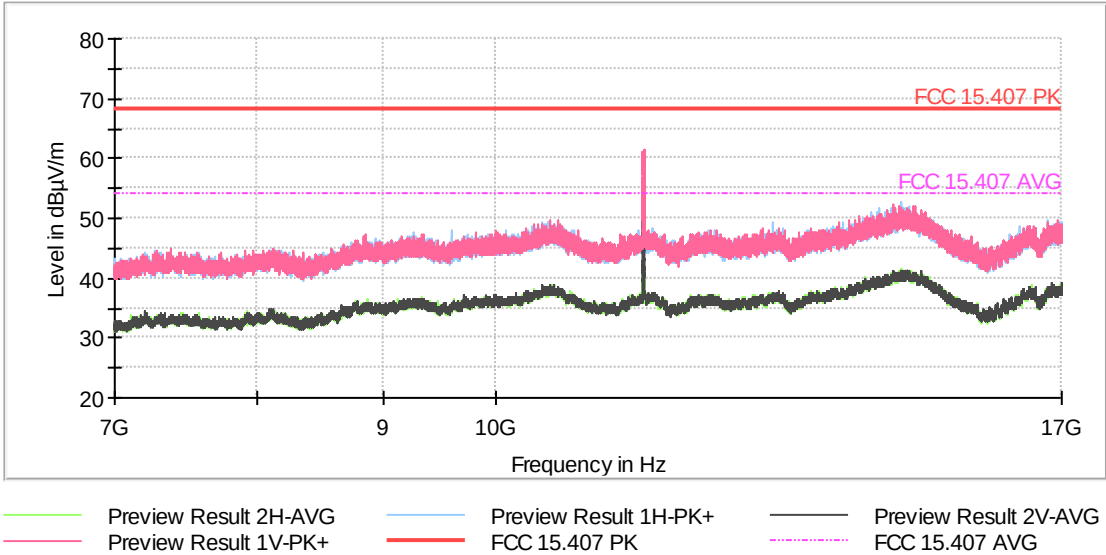
- High Channel 165 (5825 MHz)

Full Spectrum

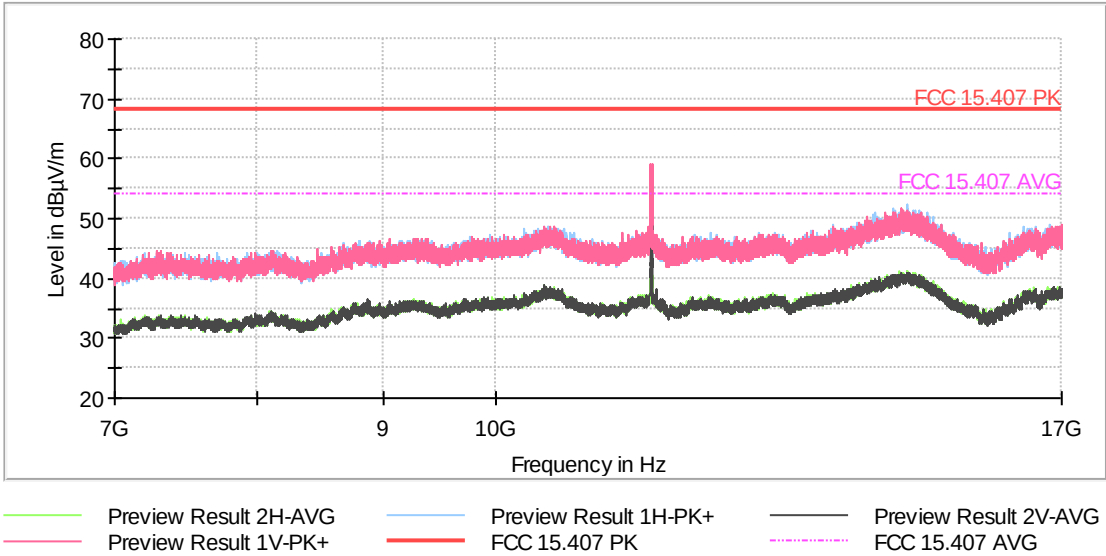


FREQUENCY RANGE 7 GHz – 17 GHz (worst-case)

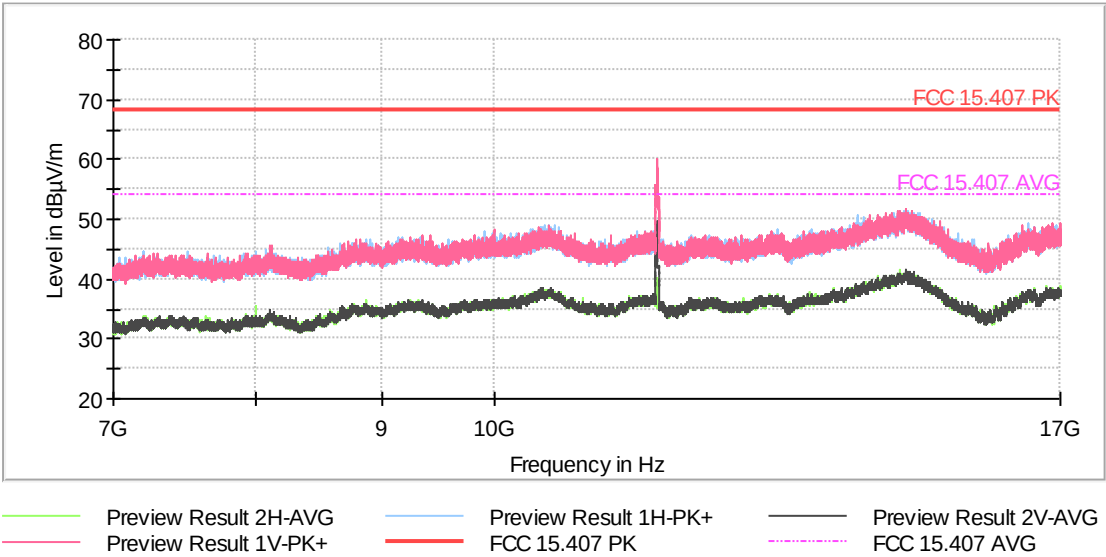
- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)

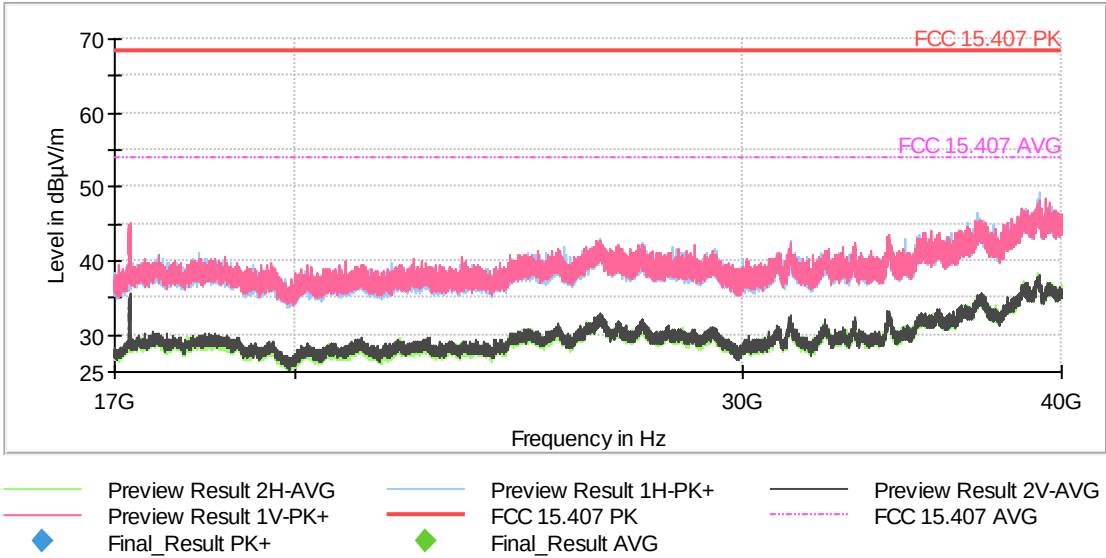


- High Channel 165 (5825 MHz)

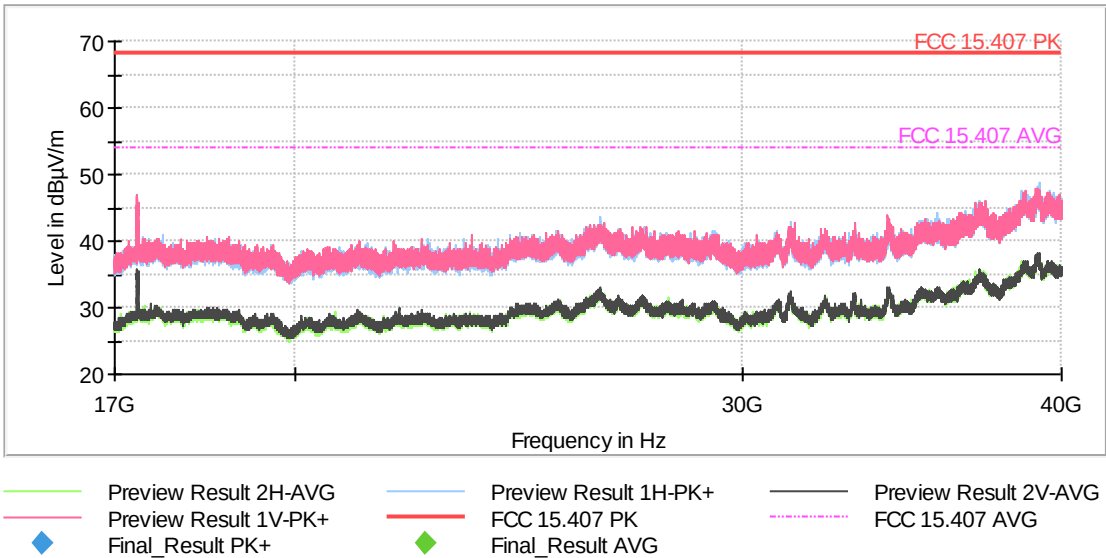


FREQUENCY RANGE 17 GHz – 40 GHz (worst-case)

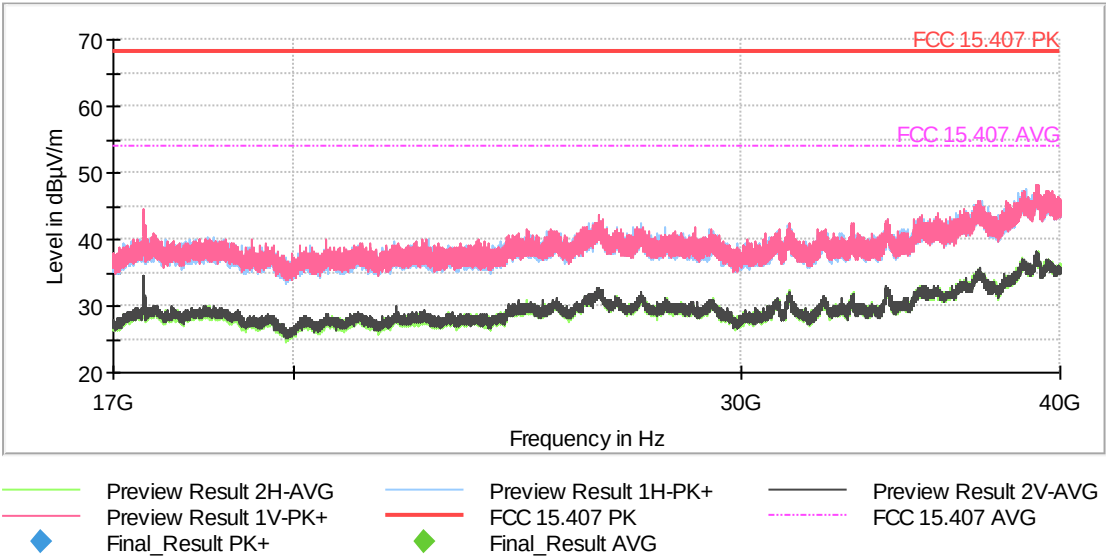
- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)



- High Channel 165 (5825 MHz)



Band Edge Emissions:

802.11 a20. Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

802.11 n20 (HT20). Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

802.11 ac20 (VHT20). Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

802.11 n40 (HT40). Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

802.11 ac40 (VHT40). Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

802.11 ac80 (VHT80). Spurious emissions inside of the mask 5.65-5.925 GHz:

ID	Comments
--	No spurious frequencies found at less than 20 dB below the limit.

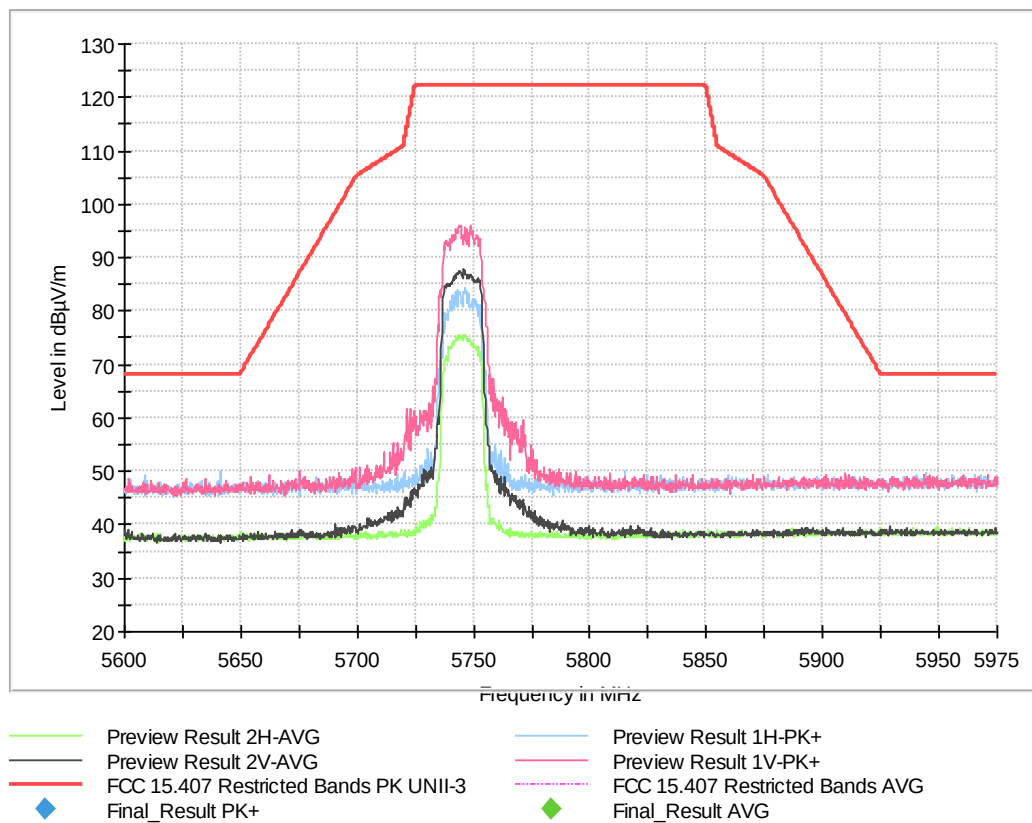
Verdict

Pass

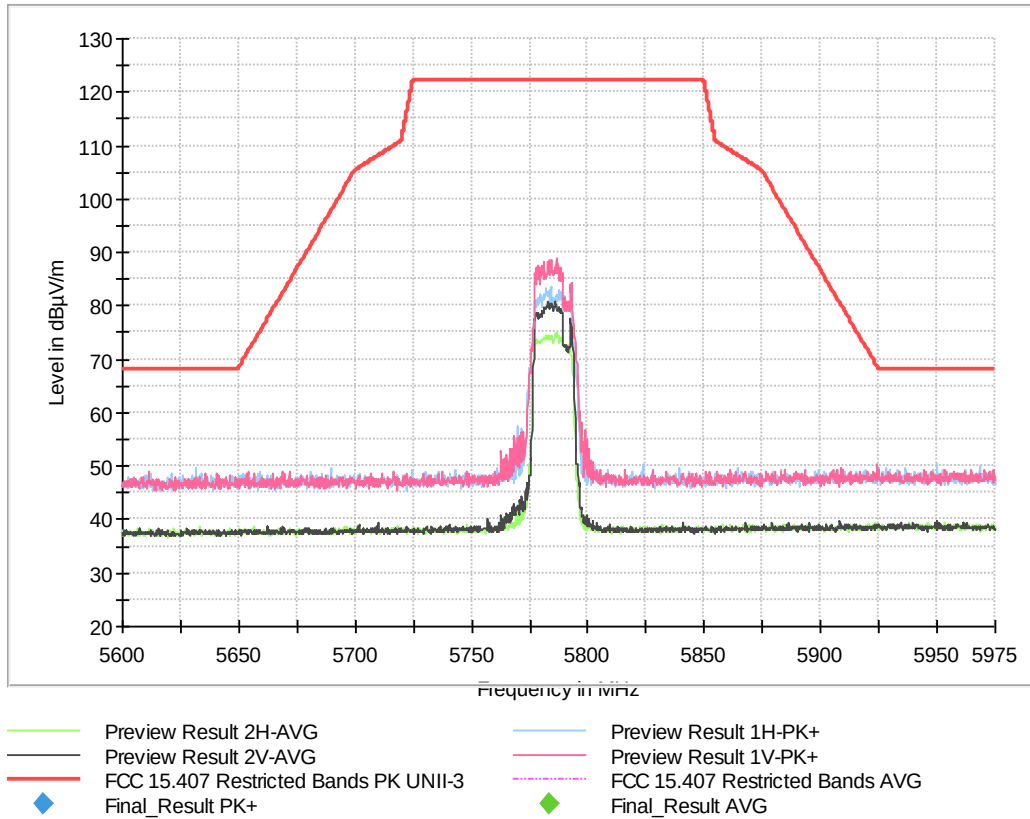
Attachments

802.11 a20. Spurious emissions inside of the mask 5.65-5.925 GHz:

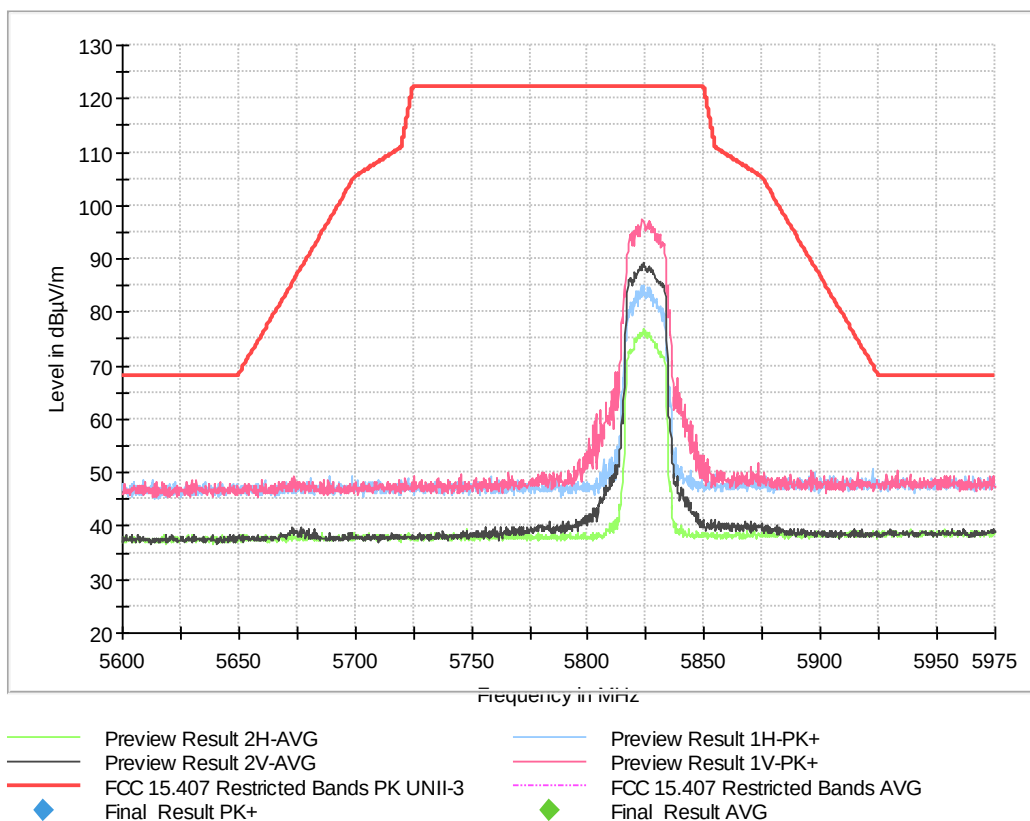
- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)

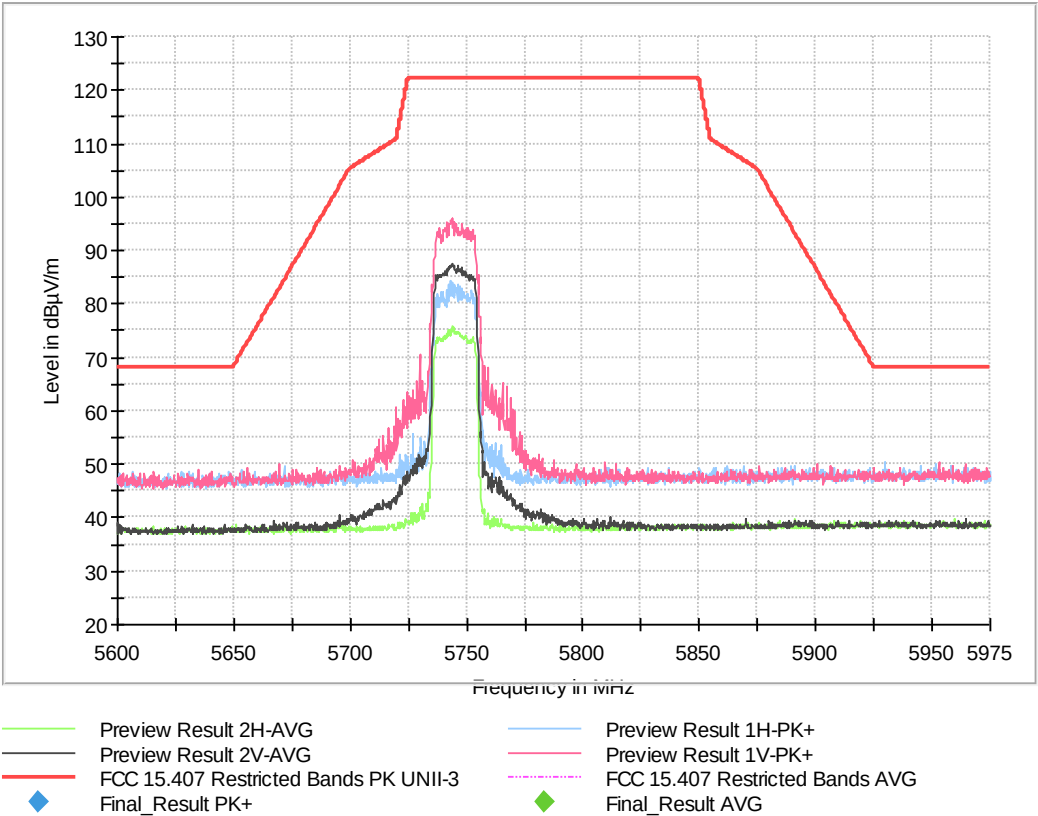


- High Channel 165 (5825 MHz)

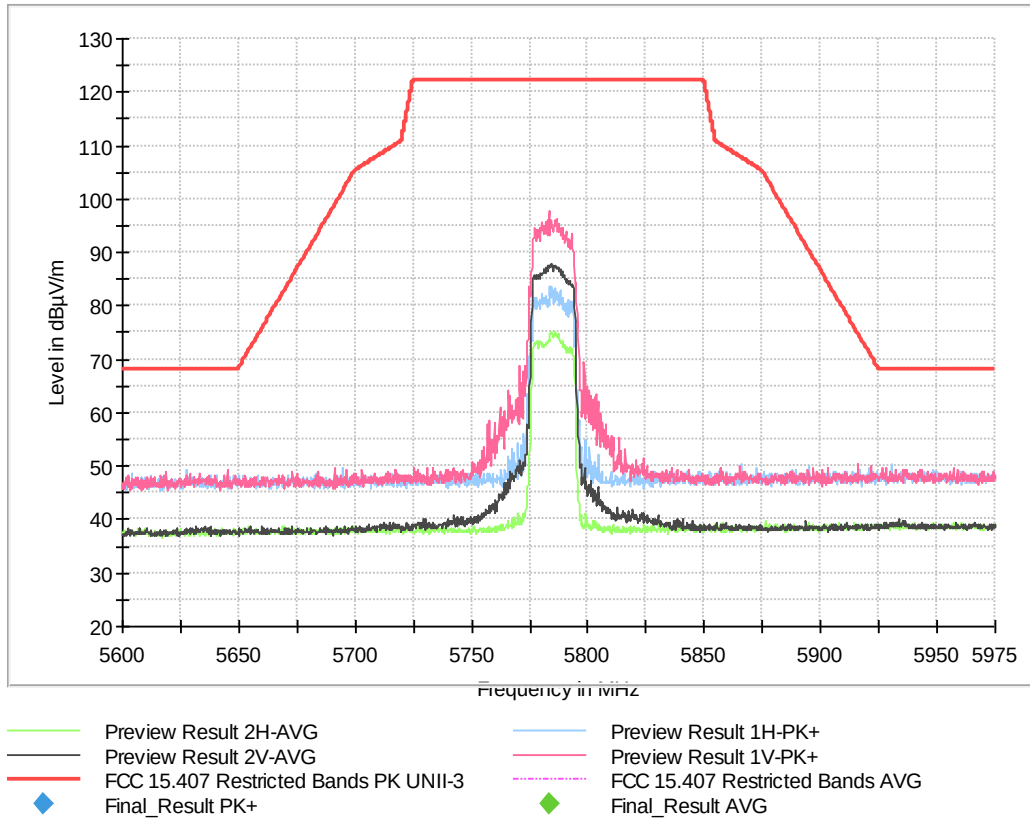


802.11 n20 (HT20). Spurious emissions inside of the mask 5.65-5.925 GHz:

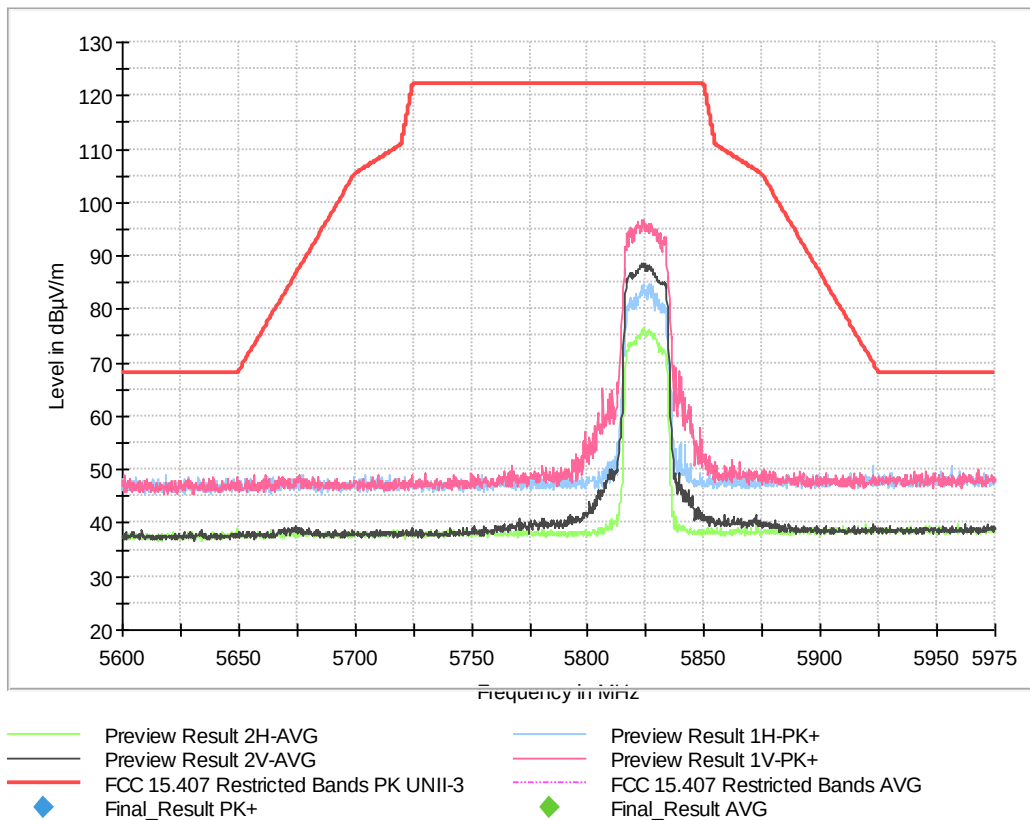
- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)

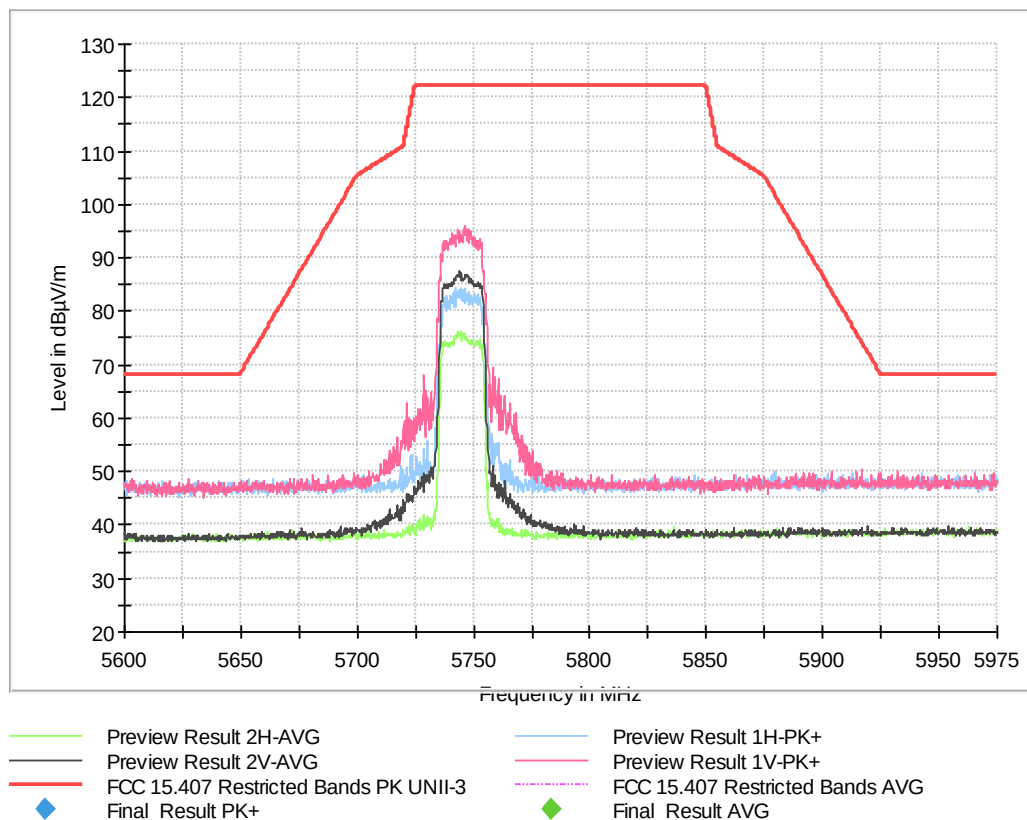


- High Channel 165 (5825 MHz)

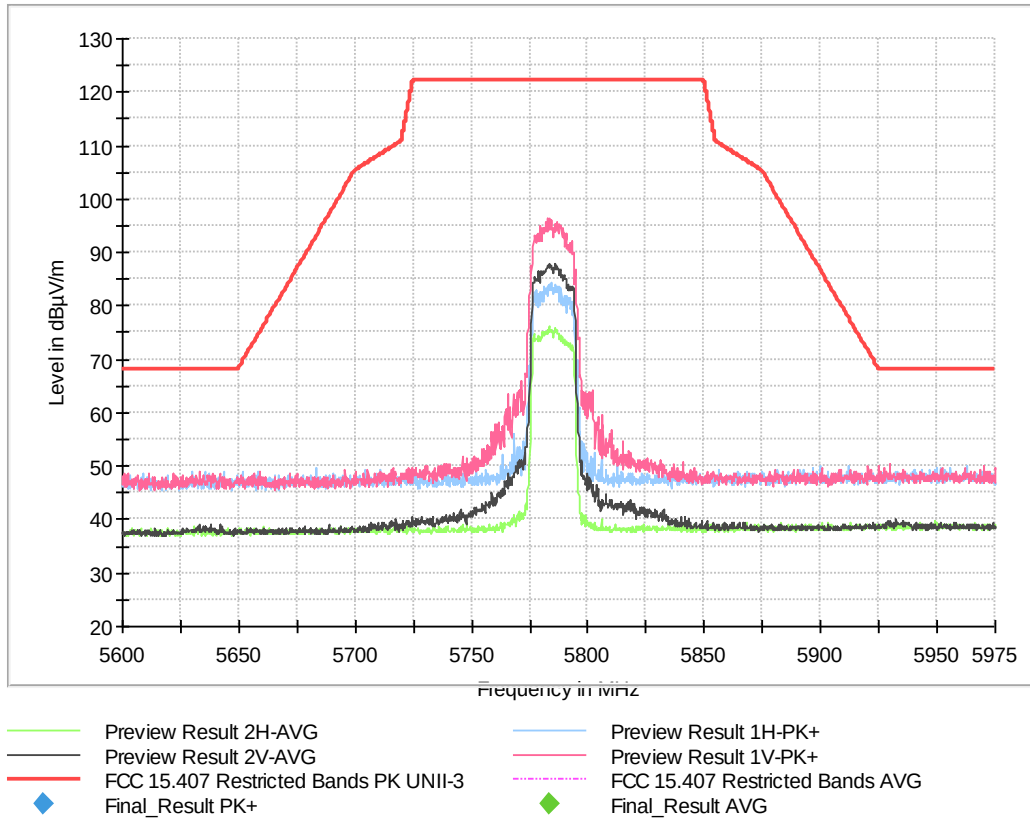


802.11 ac20 (VHT20). Spurious emissions inside the mask 5.65-5.925 GHz:

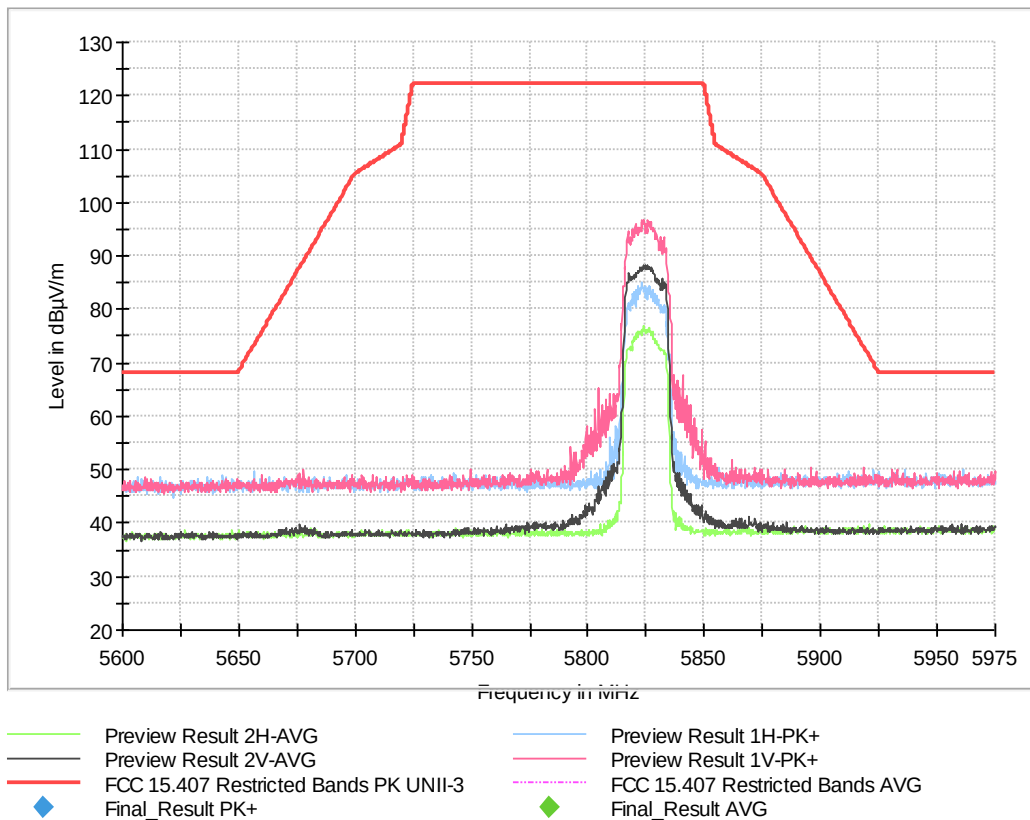
- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)

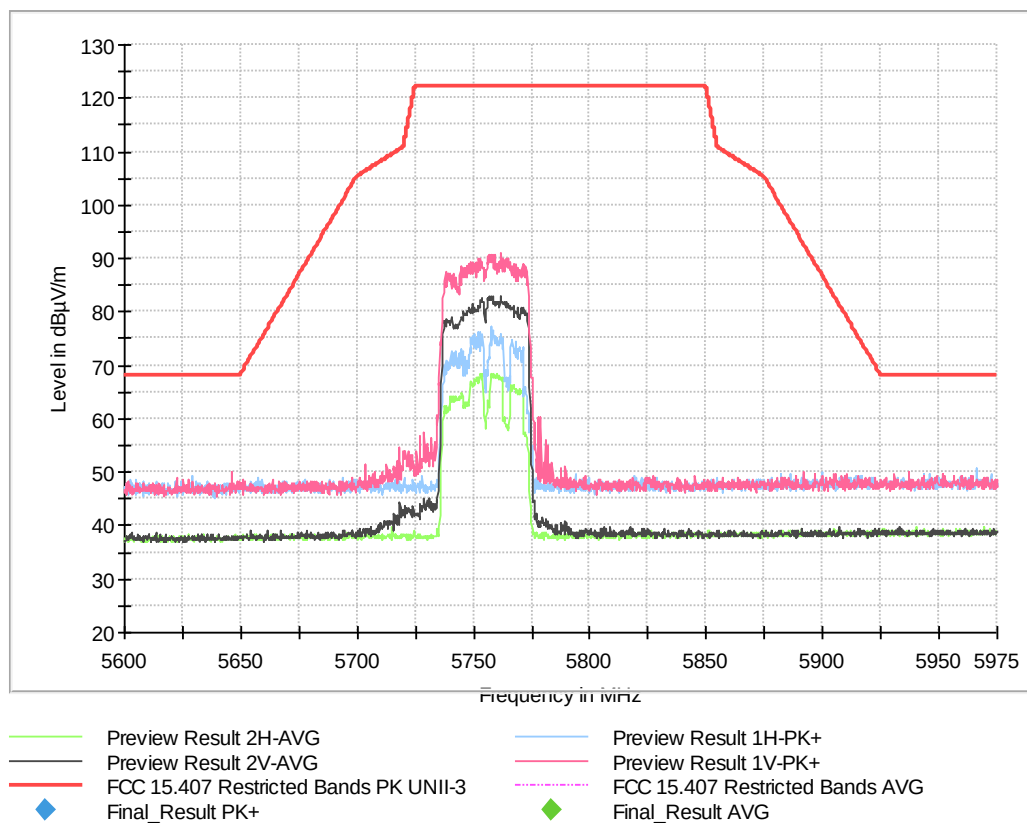


- High Channel 165 (5825 MHz)

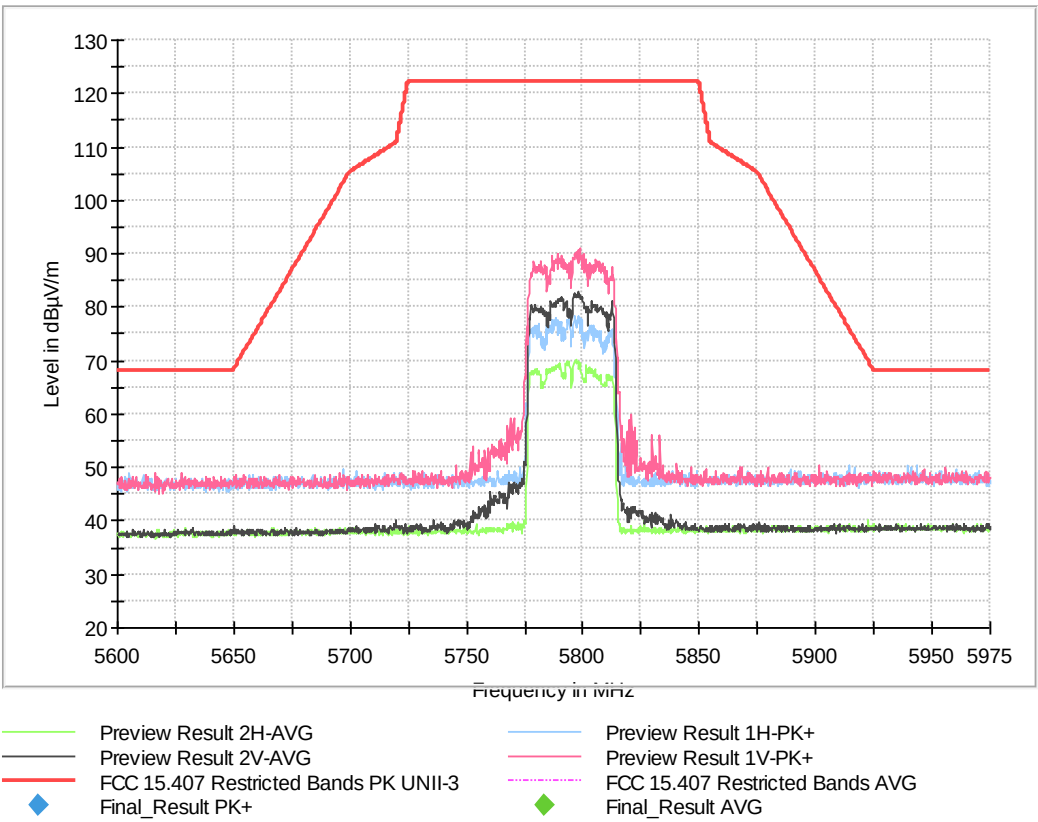


802.11 n40 (HT40). Spurious emissions inside of the mask 5.65-5.925 GHz:

- Low Channel 151 (5755 MHz)

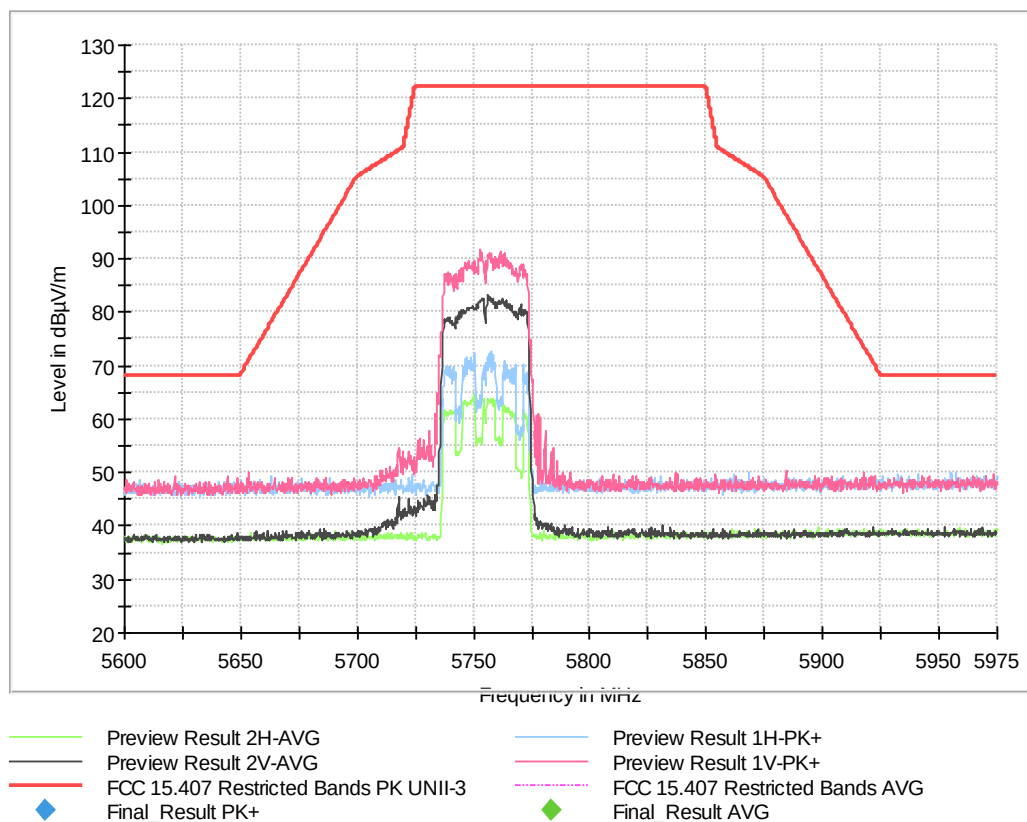


- High Channel 159 (5795 MHz)

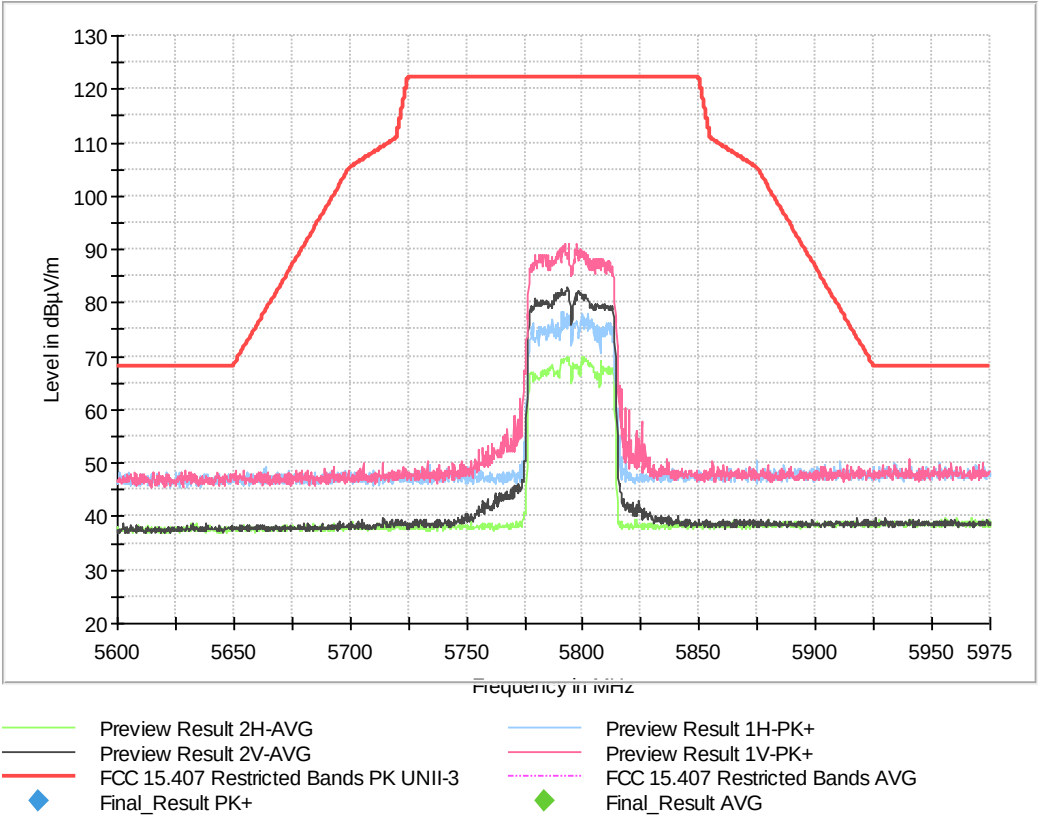


802.11 ac40 (VHT40). Spurious emissions inside the mask 5.65-5.925 GHz:

- Low Channel 151 (5755 MHz)

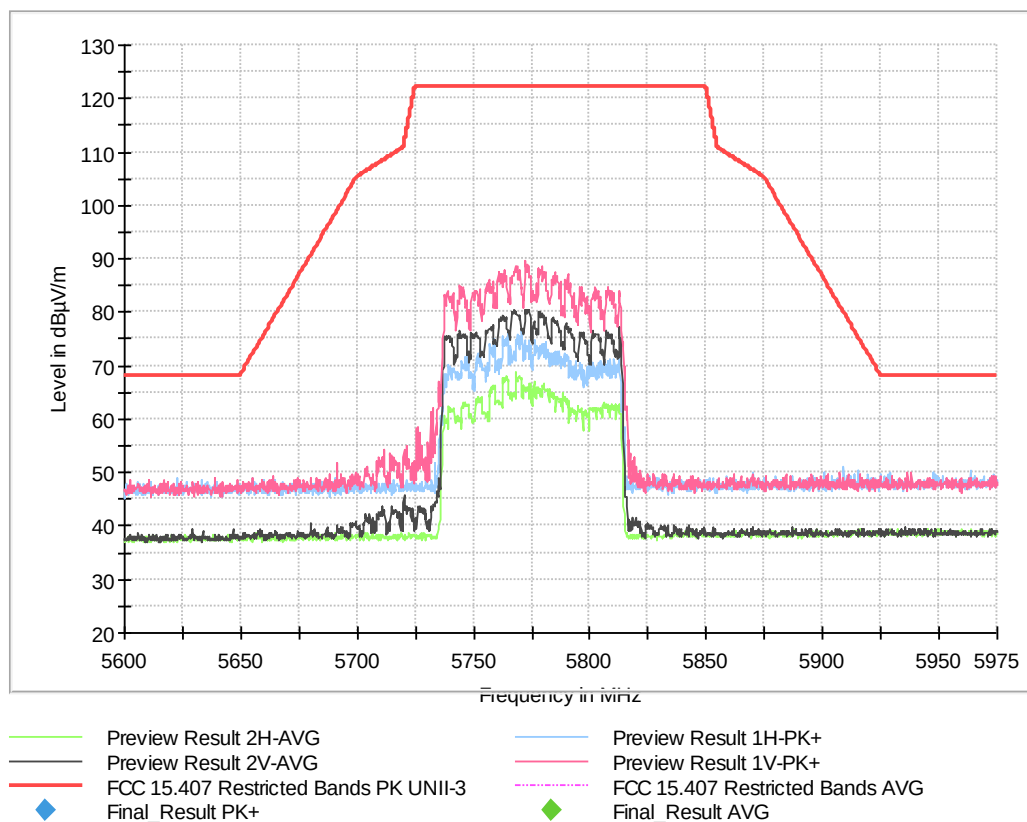


- High Channel 159 (5795 MHz)



802.11 ac80 (VHT80). Spurious emissions inside the mask 5.65-5.925 GHz:

- Single Channel 155 (5775 MHz)



• Configuration 2

Worst case: 802.11 a20

Frequency range 30 MHz – 1 GHz:

ID	Comments
--	The spurious frequencies detected below 1 GHz do not depend either on the modulation or the operating channel.

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

Frequency Range (GHz)	Unwanted Frequency (MHz)	Unwanted Level (dBμV/m)	Polarization	Detector
[0.03, 1]	124.99533	24.32	V	Quasi-Peak
	217.50100	26.68	H	Quasi-Peak
	374.99667	39.40	H	Quasi-Peak
	624.99800	39.12	H	Quasi-Peak

Frequency range 1 GHz – 40 GHz (worst-case):

ID	Comments
--	The results in the next tables show the maximum measured levels in the range 1–40 GHz except the 5.65–5.725 GHz and 5.85–5.925 GHz adjacent bands. The results in the adjacent bands is evaluated in the next section.
--	Spurious frequencies with peak levels above the average limit (54 dBμV/m at 3 m) are measured with average detector for average compliance checking.

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

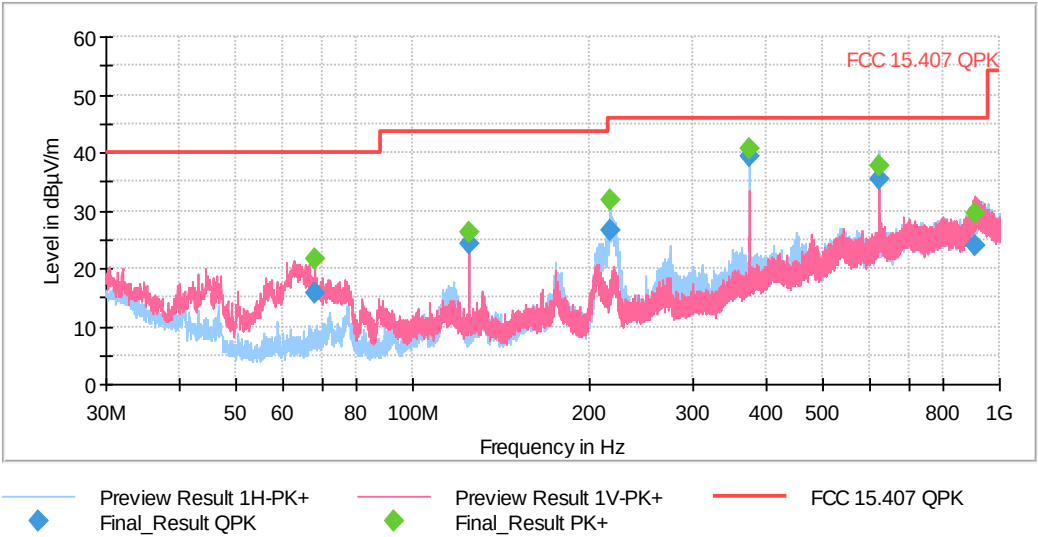
Frequency (MHz)	Frequency Range (GHz)	Unwanted Frequency (MHz)	Unwanted Level (dBμV/m)	Polarization	Detector
5745.0000	[7, 17]	11489.12470	60.31	V	Peak
			49.29		Aaverage
5785.0000	[7, 17]	11568.92000	62.63	V	Peak
			50.91		Average
5825.0000	[7, 17]	11648.85570	63.39	H	Peak
			52.08		Average

Verdict

Pass

Attachments

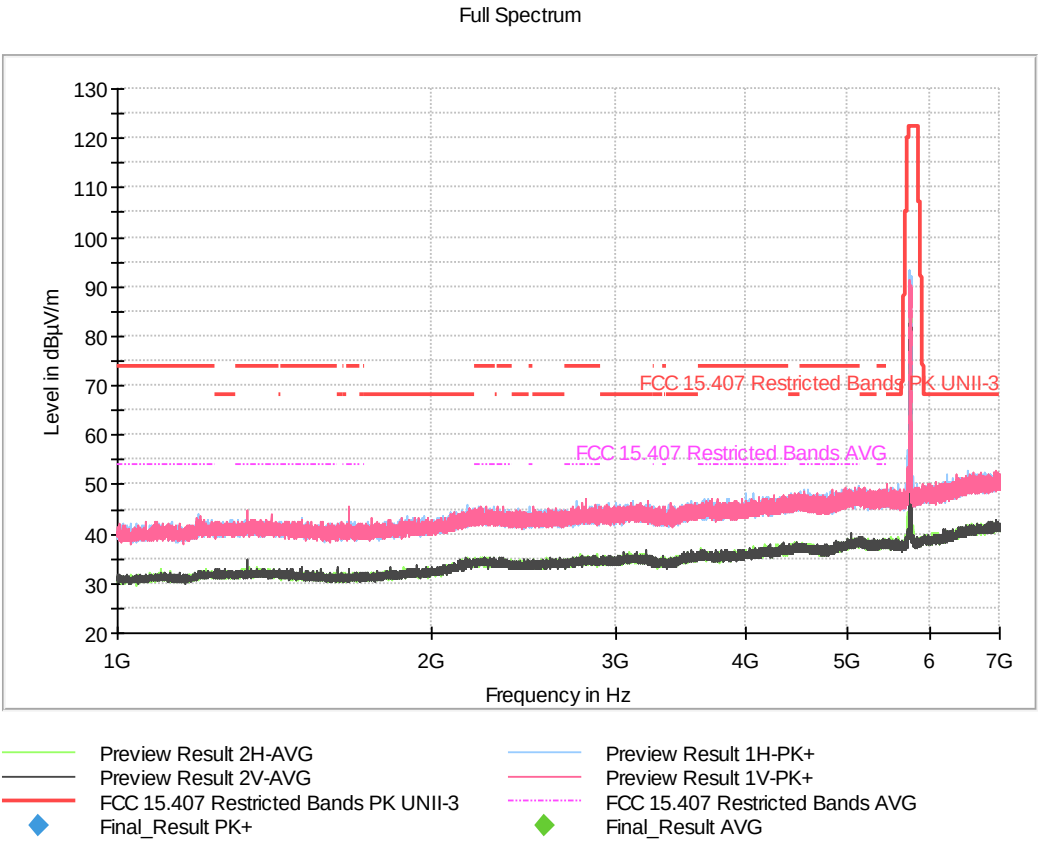
FREQUENCY RANGE 30 MHz – 1 GHz (worst-case)



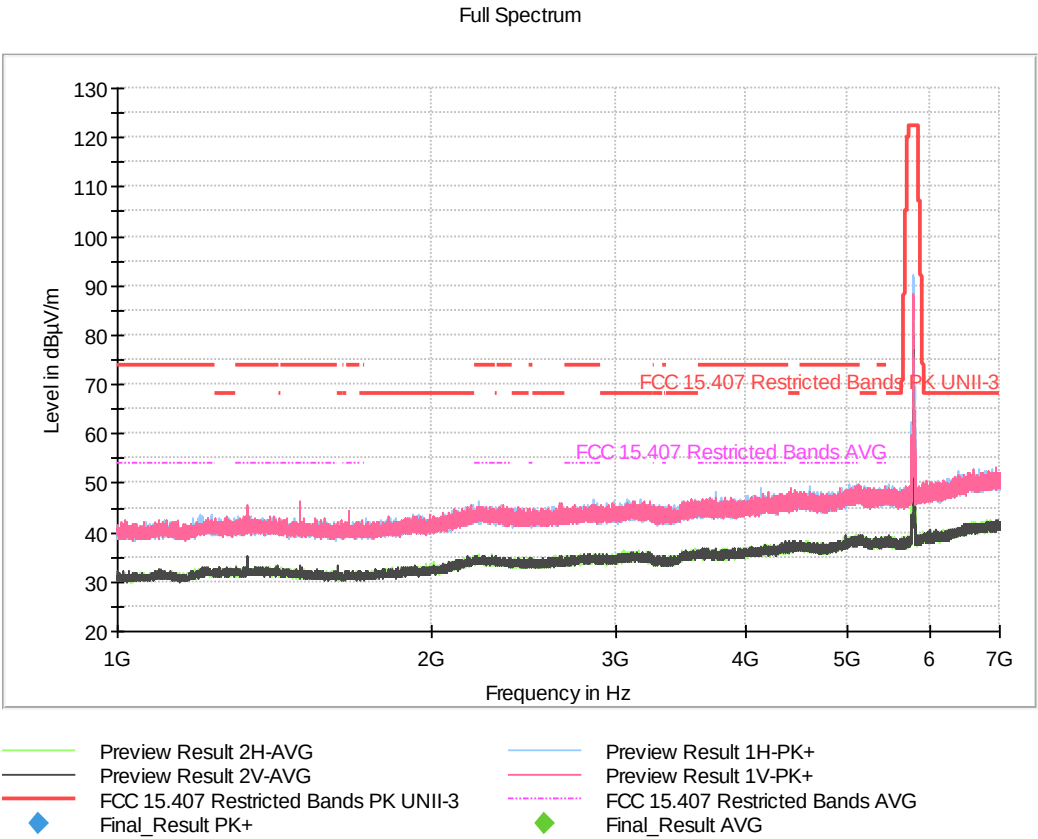
This plot is valid for Low, Middle and High Channels.

FREQUENCY RANGE 1 GHz – 7 GHz (worst-case)

- Low Channel 149 (5745 MHz)



- Middle Channel 157 (5785 MHz)



- High Channel 165 (5825 MHz)

Full Spectrum

