

Test Report No:
NIE: 72370RRF.006A1

Test Report

USA FCC Part 15.209, 15.407

(*) Identification of item tested	CIVIC Central In-Vehicle Infotainment Computer
(*) Trademark	Bosch
(*) Model and /or type reference	MBCI2LS4PN1
Other identification of the product	FCC ID: 2AUXS-MBCI2LS4PN1 IC: 25847-MBCI2LS4PN1
(*) Features	AM/FM/DAB/SIRIUS, GNSS, 2.4/5GHz WLAN, Bluetooth 5.1, Video/Audio etc HW version: D1.1 SW version: E23.3
Applicant	Robert Bosch GmbH Robert-Bosch-Strasse 200 31139, Hildesheim Germany
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. 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. Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated October 31, 2013 ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2022-10-20
Report template No.	FDT08_24 (*) "Data provided by the client"

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Competences and guarantees

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Uncertainty

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

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the model MBCI2LS4PN1 is a CIVIC Central In-Vehicle Infotainment Computer, including WLAN/Bluetooth, GPS, AM/FM/DAB receiver.

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.

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

Control No.	Description	Model	Serial No.	Reception
72370C/026	Central In-Vehicle Infotainment Computer	MBCI2LS4PN1	0006002	17/05/2022
72370C/010	Harness	--	--	17/05/2022
72370C/027	BT/WLAN Antenna	--	--	17/05/2022
72370C/028	BT/WLAN Antenna	--	--	17/05/2022
72370C/029	BT/WLAN Antenna	--	--	17/05/2022
72370C/030	BT/WLAN Antenna	--	--	17/05/2022

Auxiliary elements used with the Sample S/01:

Control No.	Description	Model	Serial No.	Reception
72370C/007	USB Cable	--	--	17/05/2022
72370C/008	USB Adapter	--	--	17/05/2022
72370C/009	Connecting Cable	--	--	17/05/2022
72370C/031	FAKRA 4n1 Cable	--	--	17/05/2022
72370C/032	SMA 4n1 Cable	--	--	17/05/2022
72370C/034	FAKRA to SMA Adapter	--	--	17/05/2022
72370C/035	FAKRA to SMA Adapter	--	--	17/05/2022
72370C/036	FAKRA to SMA Adapter	--	--	17/05/2022
72370C/037	FAKRA to SMA Adapter	--	--	17/05/2022
72370C/038	DC Block	--	--	17/05/2022
72370C/039	DC Block	--	--	17/05/2022
72370C/042	DC Block	--	--	17/05/2022
72370C/043	FAKRA to SMA Cable	--	--	17/05/2022

Sample S/01 has undergone the test(s):

The SISO and MIMO U-NII-1 and U-NII-3 Radiated tests indicated in the Appendixes A & B.

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

Control No.	Description	Model	Serial No.	Reception
72370C/158	Central In-Vehicle Infotainment Computer	MBCI2LS4PN1	0006008	17/05/2022
72370C/162	Harness	--	--	17/05/2022

Auxiliary elements used with the Sample S/02:

Control No.	Description	Model	Serial No.	Reception
72370C/033	SMA 4n1 Cable	--	--	17/05/2022
72370C/067	SMA 4n1 Cable	--	--	17/05/2022
72370C/163	USB Cable	--	--	17/05/2022
72370C/164	Connecting Cable	--	--	17/05/2022
72370C/192	USB Adapter	--	--	30/05/2022

Sample S/02 has undergone the test(s):

The SISO and MIMO U-NII-1 and U-NII-3 Conducted tests indicated in the Appendixes A & B.

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Main Connector	2m	☒	☐	☐		
	Most Connector	2m	☒	☐	☐		
	Fakra Quad Connector AM/FM/DAB	-	☒	☒	☐		
	Fakra Single Connector GPS						
	Fakra Quad Connector WLAN/BT	-	☒	☒	☐		
	-	-	☐	☐	☐		
-	-	☐	☐	☐			
Supplementary information to the ports.....:	-						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐ AC:	☐	☐	☐	☐	☐	
☒ DC: 9-16V nominal 12 VDC by vehicle battery							
Rated Power.....:	-						
Clock frequencies.....:	-						
Other parameters	-						
Software version.....:	E23.3						
Hardware version	D1.1						
Dimensions in cm (W x H x D) ...:	-						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Cluster in the car					
Modules/parts.....:	Module/parts of test item		Type	Manufacturer			
	-						
	-						
	-						
Accessories (not part of the test item)	Description		Type	Manufacturer			
	Antennas						
	HUD						
	SA2 Panel						
	Cameras						
	-						
Documents as provided by the applicant	Description		File name	Issue date			
	-						
	-						
	-						

(3) Only for Medical Equipment

Identification of the client

Robert Bosch GmbH
Robert-Bosch-Strasse 200, 31139, Hildesheim, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-06-08
Date (finish)	2022-10-06

Document history

Report number	Date	Description
72370RRF.006	2022-10-18	First release.
72370RRF.006A1	2022-10-20	Second release. Modification of Hardware Version of sample tested and correction of minor typos. This modification of test report cancels and replaces the test report 72370RRF.006.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Miguel Manuel López, Nicolás Salguero.

Used instrumentation:

Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N/A	N/A
2. Shielded Room ETS LINDGREN S101	N/A	N/A
3. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2021/09	2024/09
4. PRE-AMPLIFIER G>40dB 10MHz-6GHz BONN ELEKTRONIK BLNA 0160-01N	2022/03	2023/03
5. EMI Test Receiver 2Hz-44GHz ROHDE AND SCHWARZ ESW44	2021/09	2023/09
6. DC Power Supply 30V/5A, KEYSIGHT TECHNOLOGIES U8002A	N/A	N/A
7. Digital Multimeter, FLUKE 175	2021/11	2022/11
8. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2020/08	2023/08
9. Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10. RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2021/12	2022/12
11. Pre-Amplifier G>30dB 17-40GHz BONN ELEKTRONIK BLMA 1840-4A	2021/09	2022/09
12. EMC/RF Test SW ROHDE AND SCHWARZ EMC32	N/A	N/A

Conducted Measurements

	Last Calibration	Due Calibration
1. SHIELDED ROOM ETS LINDGREN S101	N/A	N/A
2. Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2021/02	2023/02
3. DC Power Supply 40V/40A Rohde & Schwarz NGPE40	N/A	N/A
4. Digital Multimeter FLUKE 179	2021/10	2022/10
5. Open Switch Unit up to 7.5 GHz ROHDE & SCHWARZ OSP-B157W8 PLUS	2021/08	2023/08
6. EMC/RF Test SW ROHDE AND SCHWARZ WMS32	N/A	N/A

Testing verdicts

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

Summary

A. Common requirements for all Bands:

FCC PART 15 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Transmitter. Duty Cycle	N/A	(1)
Transmitter. 99% Occupied Bandwidth	P	
Transmitter. 26 dB Emission Bandwidth (EBW)	P	
<u>Supplementary information and remarks:</u>		
(1) The equipment transmits continuously 100% for all modulations, BW and SISO/MIMO modes.		

B. U-NII-1: 5.15 GHz – 5.25 GHz Band:

FCC PART 15		
Requirement – Test case	Verdict	Remark
FCC 15.407 (a)(1)(iv) Transmitter Maximum Conducted Output Power	P	
FCC 15.407 (a)(1)(iv) Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b)(1) Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(1) Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u>		
None.		

C. U-NII-3: 5.725 GHz – 5.85 GHz Band:

FCC PART 15			
Requirement – Test case		Verdict	Remark
FCC 15.407 (e)	6 dB Bandwidth	P	
FCC 15.407 (a)(3)(i)	Transmitter Maximum Conducted Output Power	P	
FCC 15.407 (a)(3)(i)	Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b)(4)	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(4)	Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u>			
None.			

Appendix A: Test results of Common requirements for all Bands

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TEST CONDITIONS

(*) Declared by the Client.

POWER SUPPLY (*):

Vnominal:	12 Vdc
Type of Power Supply:	External DC (Vehicle Battery).

ANTENNA (*):

Type of Antennas:	External.
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Maximum Declared Antenna Gain Chain 0 U-NII-1:	+5 dBi
Maximum Declared Antenna Gain Chain 0 U-NII-3:	+5 dBi
Antenna cable loss for 0.45m cable length:	-0.54 dB
Effective Antenna Gain Chain 0 U-NII-1:	+4.46 dBi
Effective Antenna Gain Chain 0 U-NII-3:	+4.46 dBi
Maximum Declared Antenna Gain Chain 1 U-NII-1:	+5 dBi
Maximum Declared Antenna Gain Chain 1 U-NII-3:	+5 dBi
Antenna cable loss for 0.45m cable length:	-0.54 dB
Effective Antenna Gain Chain 1 U-NII-1:	+4.46 dBi
Effective Antenna Gain Chain 1 U-NII-3:	+4.46 dBi

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements:

U-NII-1 & U-NII-3:

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)i), directional gain was calculated as follows:

- For power spectral density (PSD) measurements:

$$\text{Directional gain}_{\text{PSD}} = G_{\text{ANT}} + 10 \log(N_{\text{ANT}}/N_{\text{SS}}) \text{ dBi}$$

$$N_{\text{SS}} = 1 \text{ (worst case)}, \quad N_{\text{ANT}} = 2, \quad G_{\text{ANT}} = +4.46 \text{ dBi}$$

$$\text{Directional gain}_{\text{PSD}} = 4.46 + 10 \log(2/1) = 4.46 + 10 \log(2) = 4.46 + 3.01 = 7.47 \text{ dBi}$$

$$\text{PSD Antenna Gain MIMO Chain 0 \& 1:} \quad + 7.47 \text{ dBi}$$

- For power measurements:

$$\text{Directional gain}_{\text{POWER}} = G_{\text{ANT}} \text{ dBi} \quad (N_{\text{ANT}} < 4)$$

$$\text{Directional gain}_{\text{POWER}} = G_{\text{ANT}} = 4.46 \text{ dBi}$$

$$\text{Power Antenna Gain MIMO Chain 0 \& 1:} \quad + 4.46 \text{ dBi}$$

TEST FREQUENCIES (*):

Band U-NII-1:

Technology Tested:	WLAN (IEEE 802.11 a20 / n2040 / ac204080 / ax204080 1x1 & 2x2)	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO, or MIMO with CDD)	
	802.11n HT20: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD).	
	802.11n HT40: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD).	
	802.11ac VHT20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ac VHT40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ac VHT80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ax HE20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ax HE40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ax HE80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
Setting of cores / ports:	Chain 0, Chain 1, Chain 0 & 1	
Beamforming:	No.	
Frequency Range:	5150 - 5250 MHz	
Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (36)	5180
	Middle (40)	5200
	Middle (44)	5220
	High (48)	5240
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (38)	5190
	High (46)	5230
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Single (42)	5210

Band U-NII-3:

Technology Tested:	WLAN (IEEE 802.11 a20 / n2040 / ac204080 / ax204080 2x2)	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO, or MIMO with CDD)	
	802.11n HT20: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD)	
	802.11n HT40: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD)	
	802.11ac VHT20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ac VHT40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ac VHT80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ax HE20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ax HE40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
	802.11ax HE80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).	
Setting of cores / ports:	Chain 0, Chain 1, Chain 0 & 1	
Beamforming:	No.	
Frequency Range:	5725 MHz to 5850 MHz	
Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channel	Channel Frequency (MHz)
	Low (149)	5745
	Middle (157)	5785
	High (165)	5825
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channel	Channel Frequency (MHz)
	Low (151)	5755
	High (159)	5795
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Single (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 on 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. They correspond to the next data rates:

- 802.11a: 6 Mbps SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11n HT20: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11n HT40: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT20: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT40: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT80: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ax HE20: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ax HE40: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ax HE80: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.

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 taking into account the internal and external RF cable loss.

For all modes:



Transmitter. 99% Occupied Bandwidth

SPECIFICATION:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

The following conditions shall be observed for measuring the occupied bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

RESULTS:

This test was performed on all the supported modes of the EUT, in the worst data rates after preliminary testing.

Preliminary tests determined the SISO worst case: Chain 1.
Preliminary tests determined the MIMO worst case: Chain 1.

SISO worst-case

SISO 802.11 a20:

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 36 (5180 MHz)	Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	16.400000	16.400000	16.400000
Measurement uncertainty (kHz)	< ±36.95		

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	16.300000	16.400000	16.300000
Measurement uncertainty (kHz)	< ±36.95		

SISO 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 36 (5180 MHz)	Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.600000	17.600000	17.500000
Measurement uncertainty (kHz)	< ±36.95		

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	17.500000	17.500000	17.500000
Measurement uncertainty (kHz)	< ±36.95		

SISO 802.11 ac20 (VHT20):

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 36 (5180 MHz)	Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.700000	17.600000	17.600000
Measurement uncertainty (kHz)	< ±36.95		

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	17.600000	17.500000	17.500000
Measurement uncertainty (kHz)	< ±36.95		

SISO 802.11 ax20 (HE20) – SU Full-channel allocation:

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 36 (5180 MHz)	Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	19.000000	19.000000	19.000000
Measurement uncertainty (kHz)	< ±36.95		

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	19.000000	18.900000	18.900000
Measurement uncertainty (kHz)	< ±36.95		

SISO 802.11 ax20 (HE20) – RU Subcarrier allocation (RU26):

The next RU combinations were tested as worst cases:

Low Channel:	RU26 Offset 0
Middle Channel:	RU26 Offset 4
High Channel:	RU26 Offset 8

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 36 (5180 MHz)	Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	18.500000	17.300000	18.500000
Measurement uncertainty (kHz)	< ±36.95		

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	18.500000	17.400000	18.500000
Measurement uncertainty (kHz)	< ±36.95		

SISO 802.11 n40 (HT40):

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	36.250000	36.250000
Measurement uncertainty (kHz)	< ±36.95	

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.250000	36.250000
Measurement uncertainty (kHz)	< ±36.95	

SISO 802.11 ac40 (VHT40):

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	36.250000	36.250000
Measurement uncertainty (kHz)	< ±36.95	

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.250000	36.250000
Measurement uncertainty (kHz)	< ±36.95	

SISO 802.11 ax40 (HE40) – SU Full-channel allocation:

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	37.750000	37.750000
Measurement uncertainty (kHz)	< ±36.95	

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	37.750000	37.750000
Measurement uncertainty (kHz)	< ±36.95	

SISO 802.11 ax40 (HE40) – RU Subcarrier allocation (RU26):

The next RU combinations were tested as worst cases:

Low Channel: RU26 Offset 0
 High Channel: RU26 Offset 17

U-NII-1 (5150-5250 MHz):

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	37.750000	38.250000
Measurement uncertainty (kHz)	< ±36.95	

U-NII-3 (5725-5850 MHz):

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	37.750000	38.250000
Measurement uncertainty (kHz)	< ±36.95	

SISO 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz):

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	75.500000
Measurement uncertainty (kHz)	< ±36.95

U-NII-3 (5725-5850 MHz):

Channel	Single Channel 155 (5775 MHz)
99% Occupied Bandwidth (MHz)	75.500000
Measurement uncertainty (kHz)	< ±36.95

SISO 802.11 ax80 (HE80) – SU Full-channel allocation:

U-NII-1 (5150-5250 MHz):

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	77.500000
Measurement uncertainty (kHz)	< ±36.95

U-NII-3 (5725-5850 MHz):

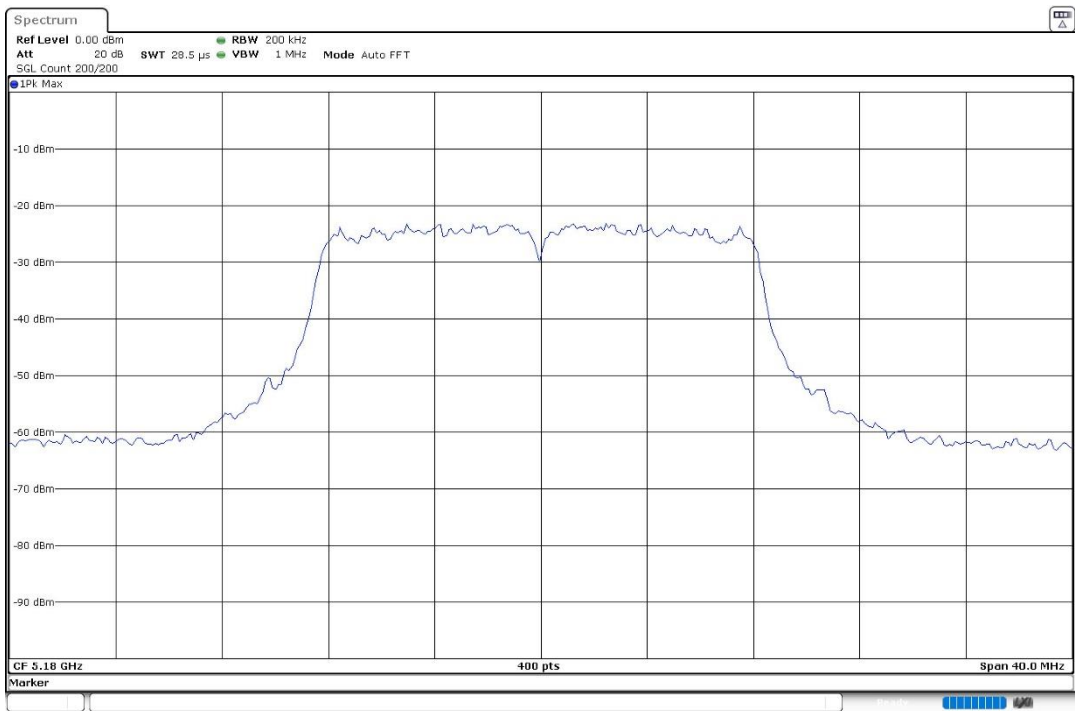
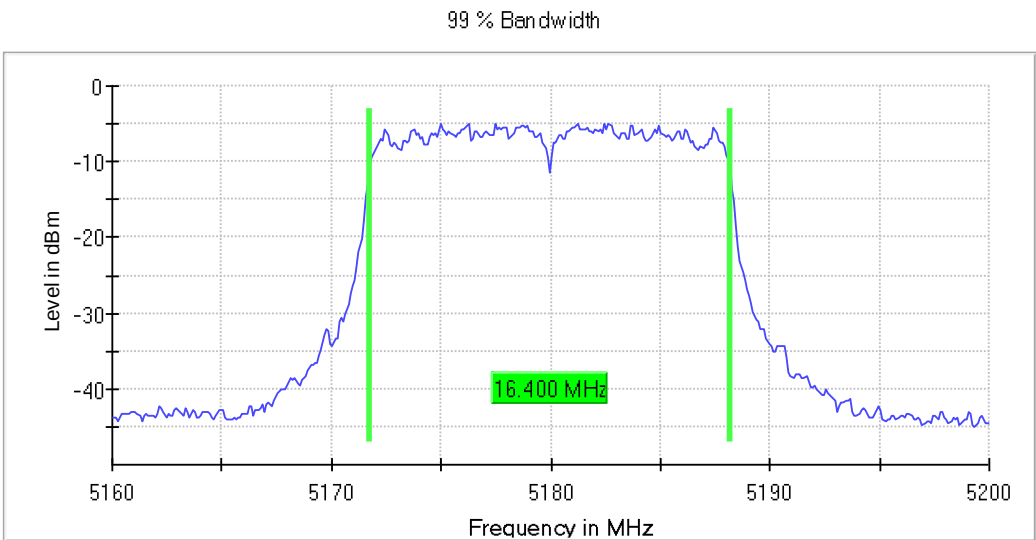
Channel	Single Channel 155 (5775 MHz)
99% Occupied Bandwidth (MHz)	77.500000
Measurement uncertainty (kHz)	< ±36.95

SISO worst case

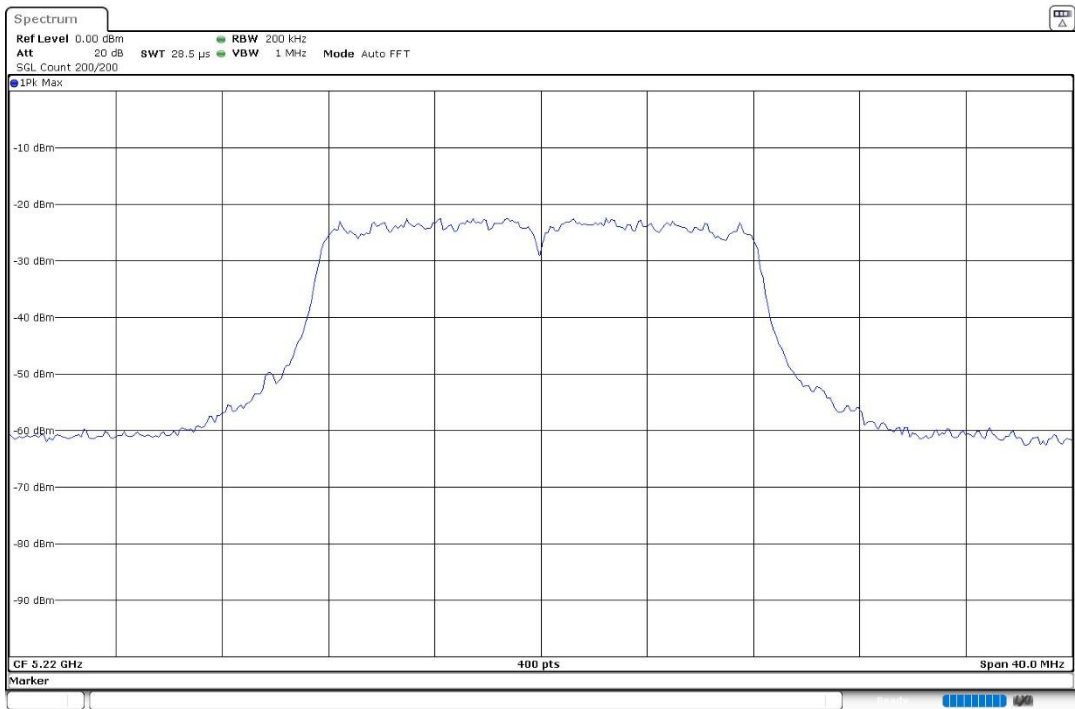
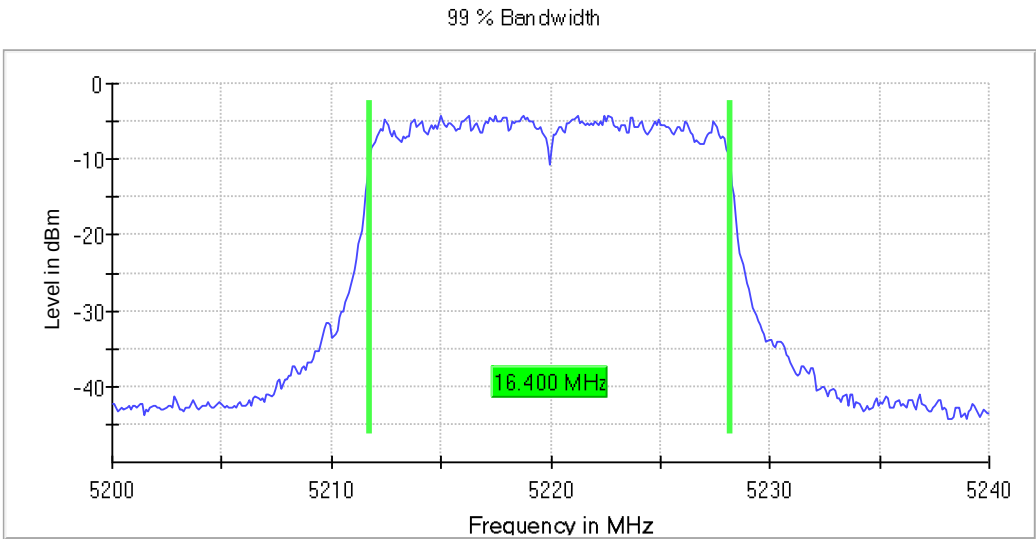
SISO 802.11 a20:

U-NII-1 (5150-5250 MHz)

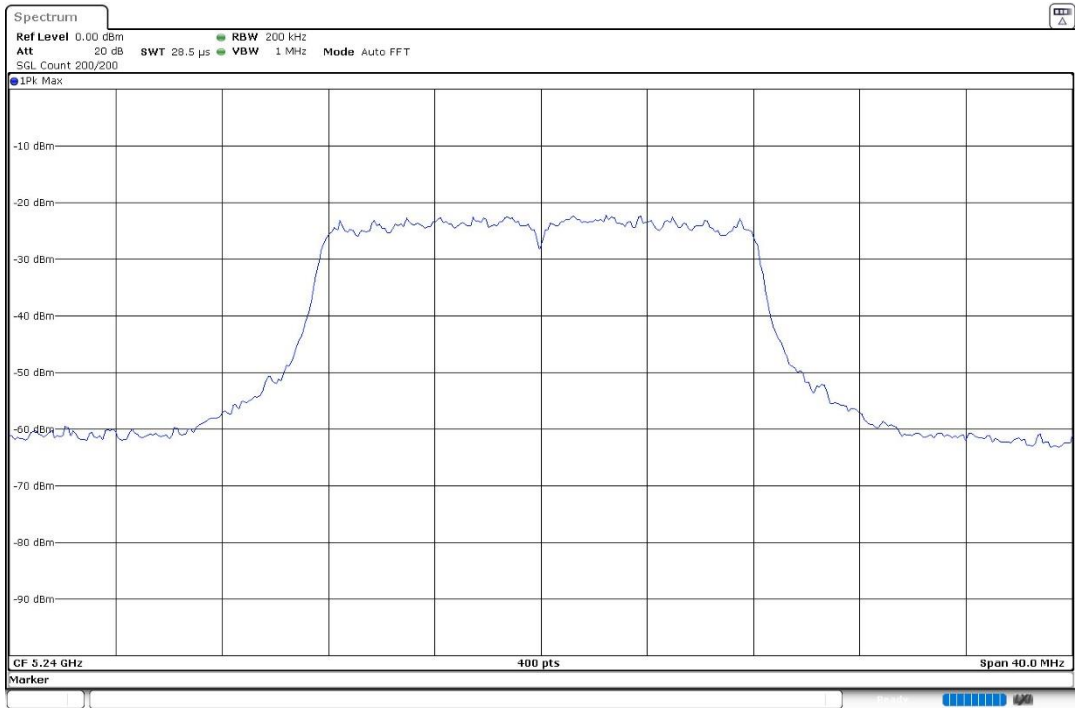
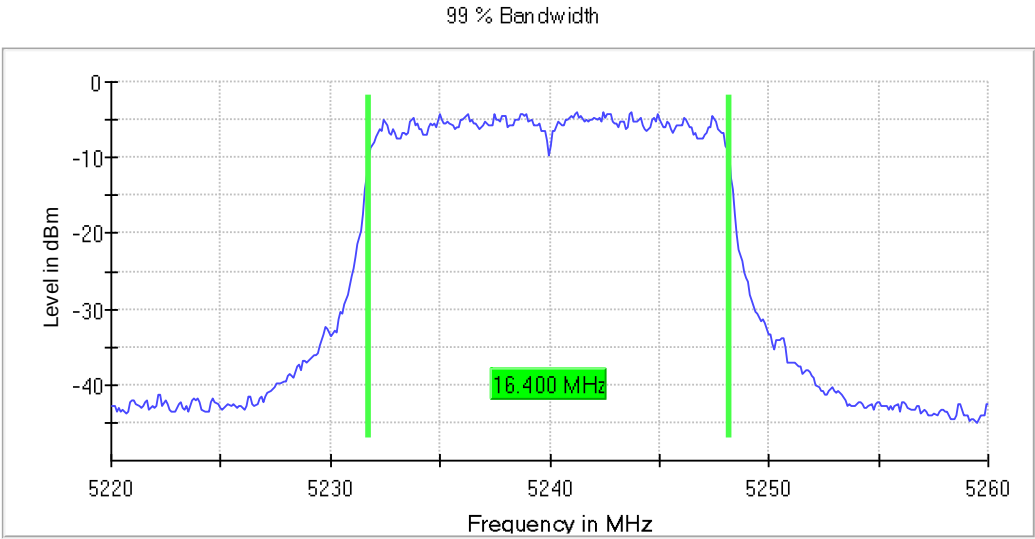
- Low Channel 36 (5180 MHz):



- Channel 44 (5220 MHz):

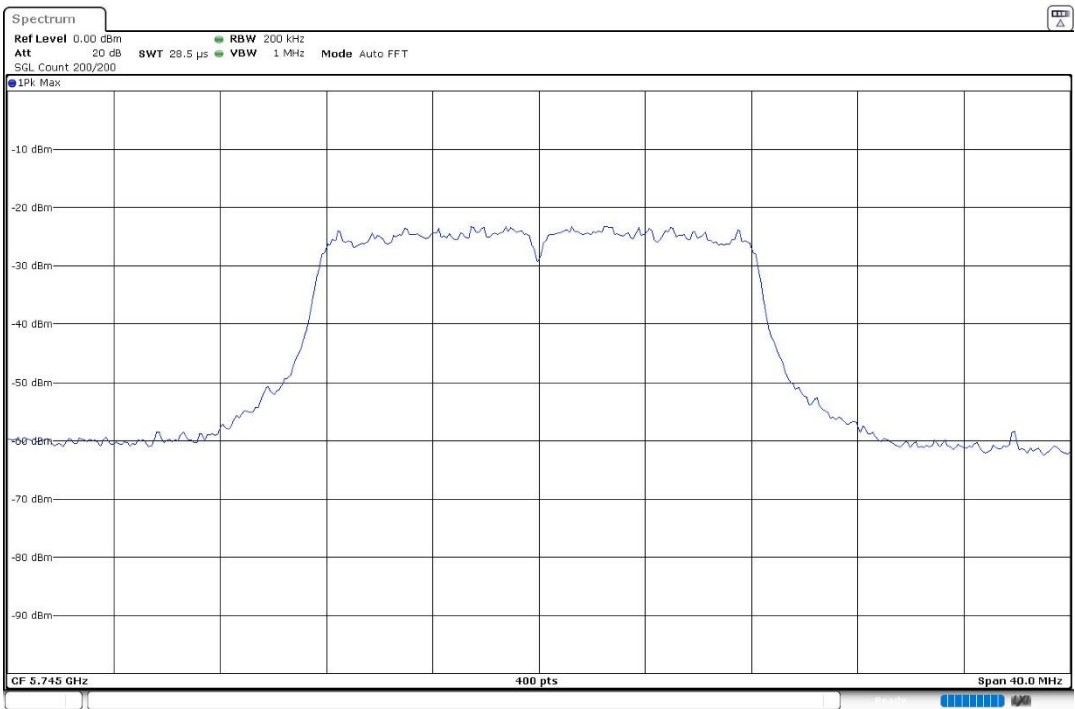
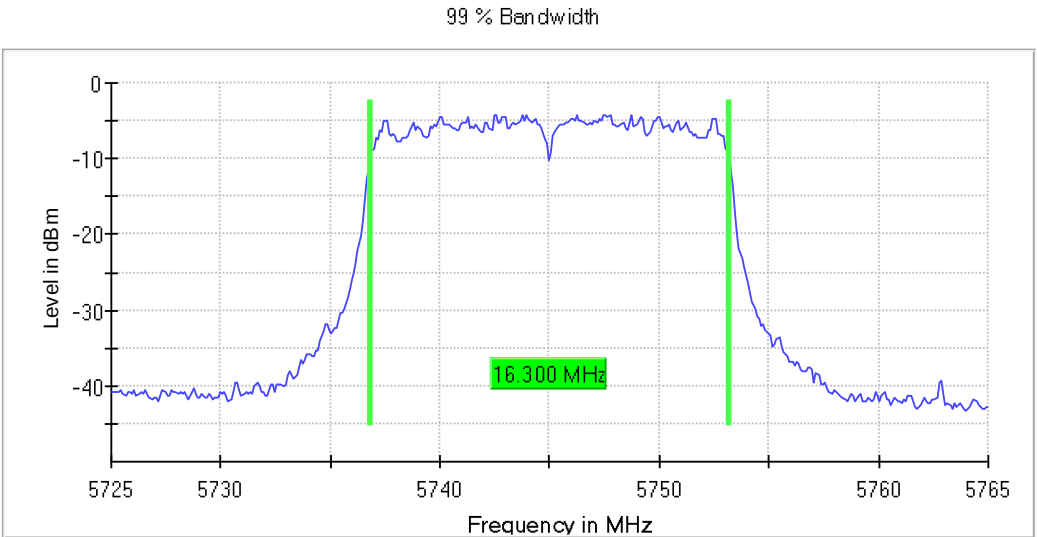


- High Channel 48 (5240 MHz):

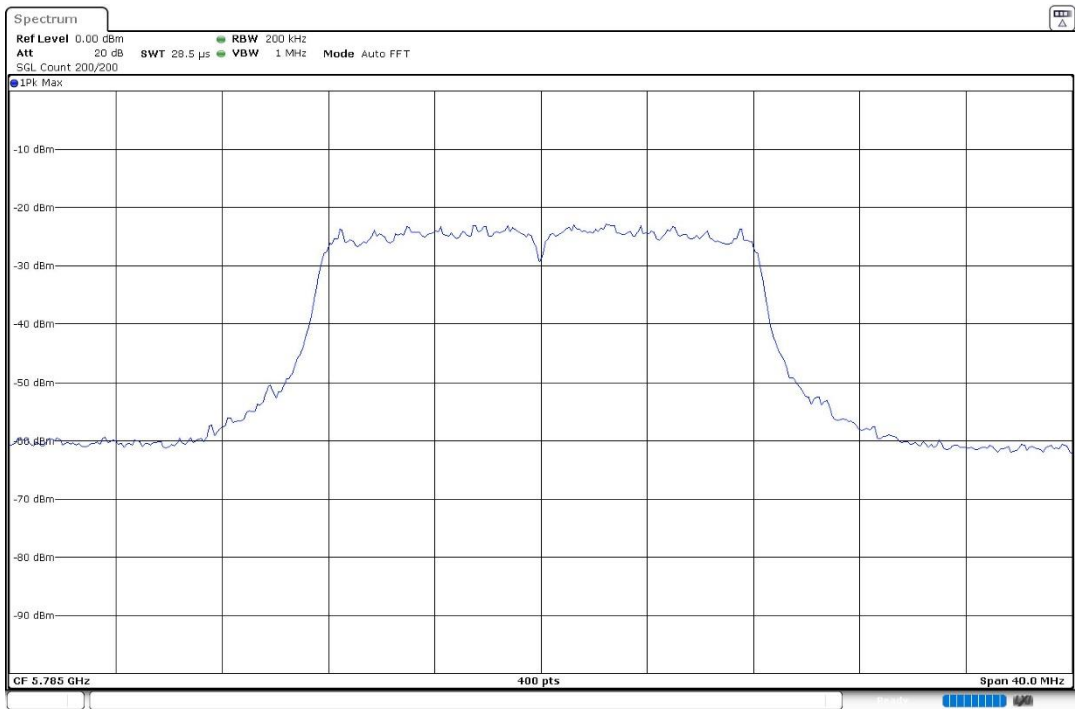
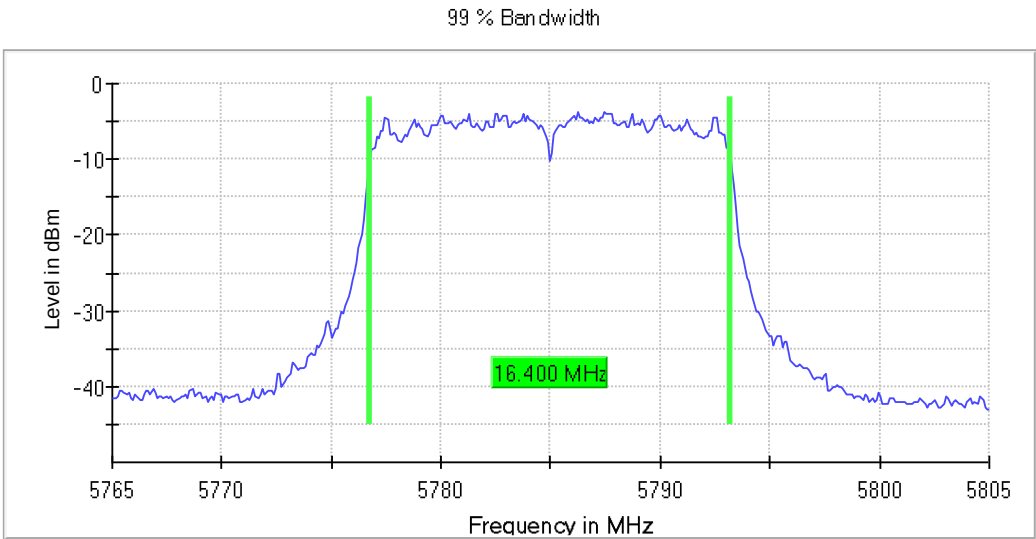


U-NII-3 (5725-5850 MHz)

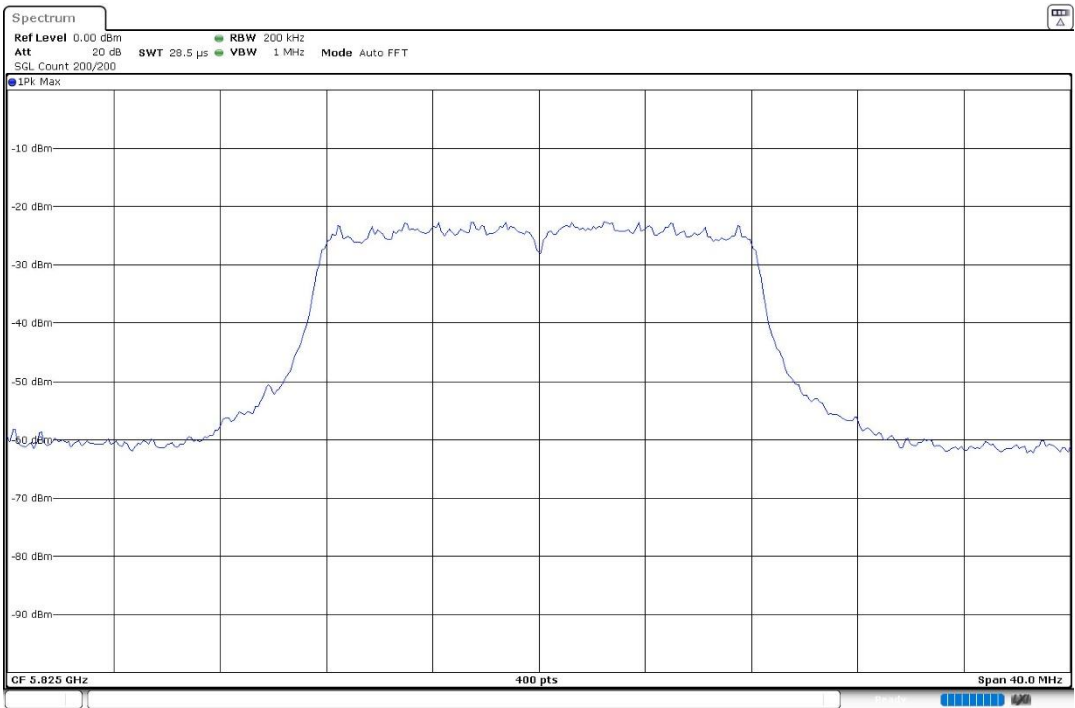
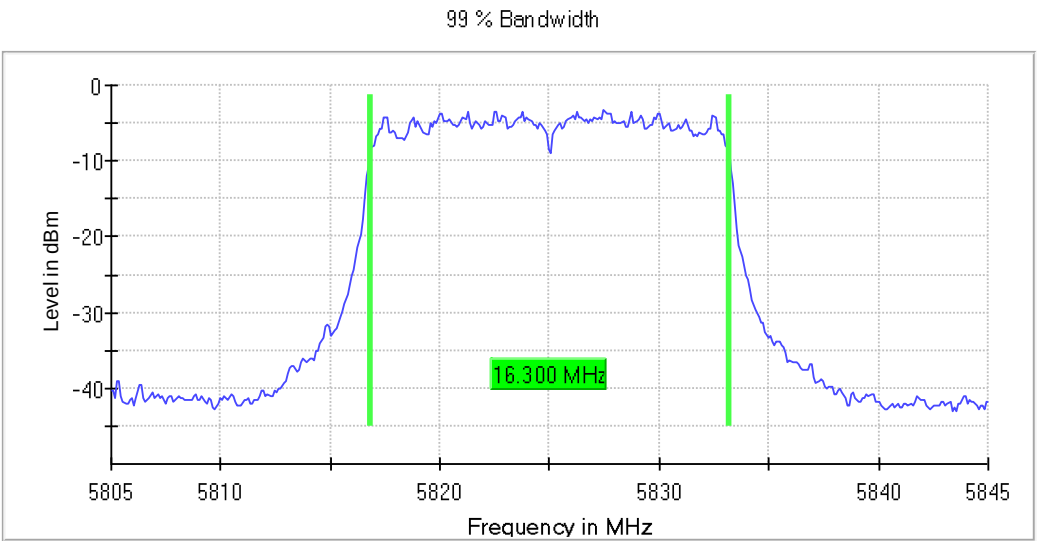
- Low Channel 149 (5745 MHz):



- Middle Channel 157 (5785 MHz):



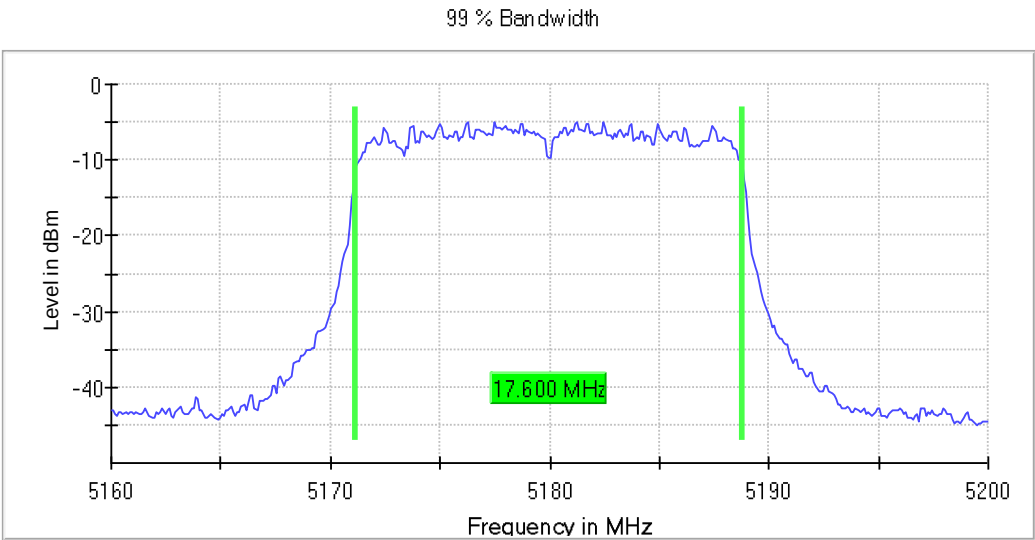
- High Channel 165 (5825 MHz):



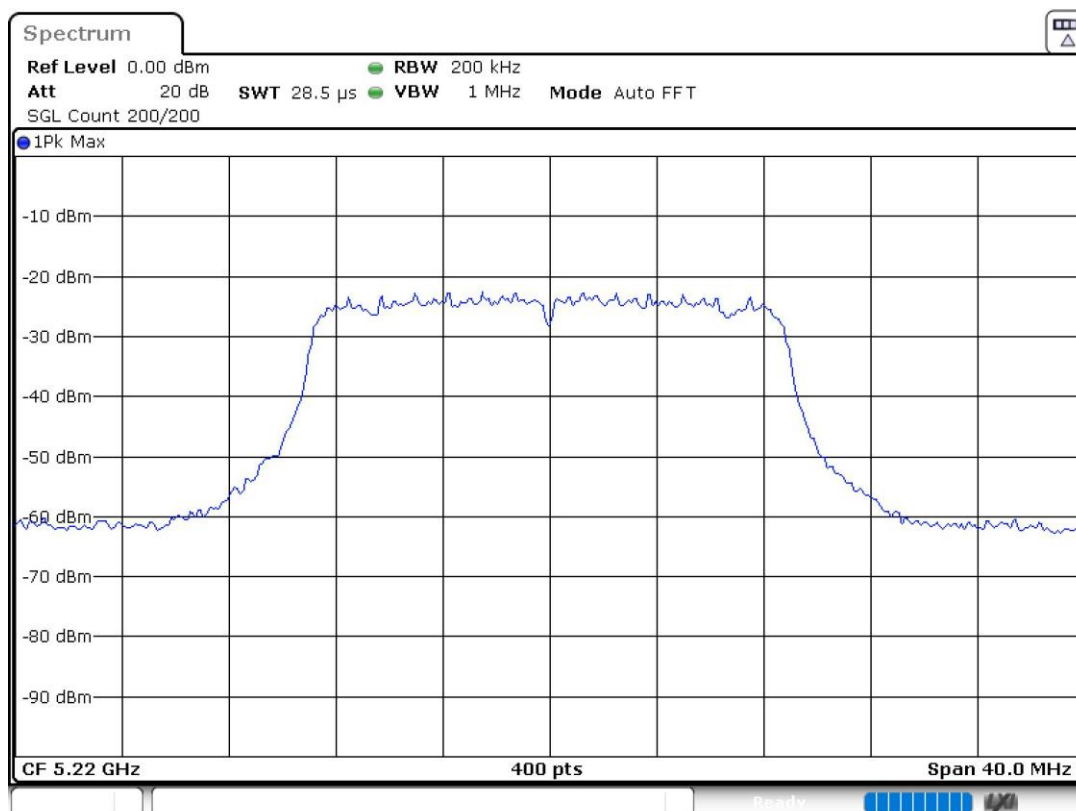
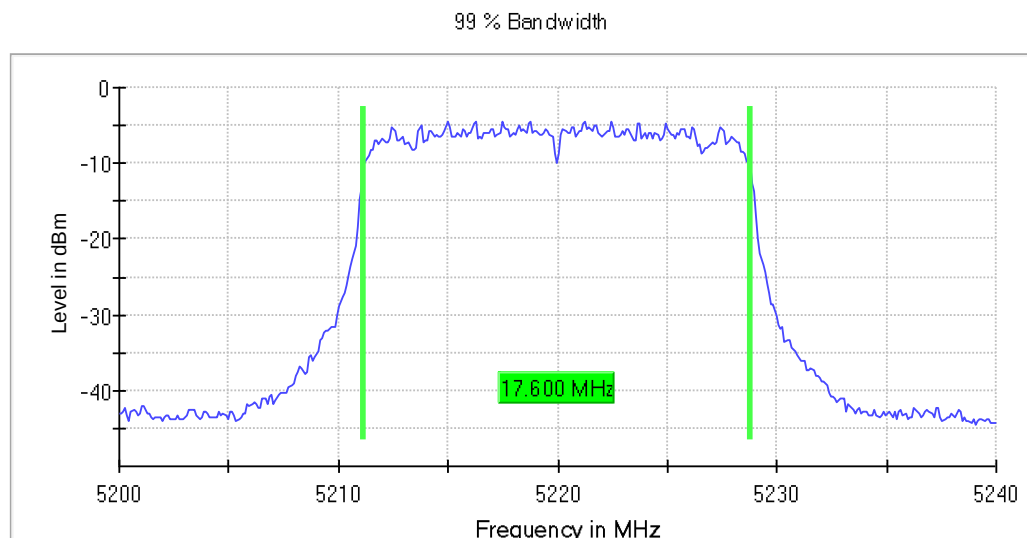
SISO 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

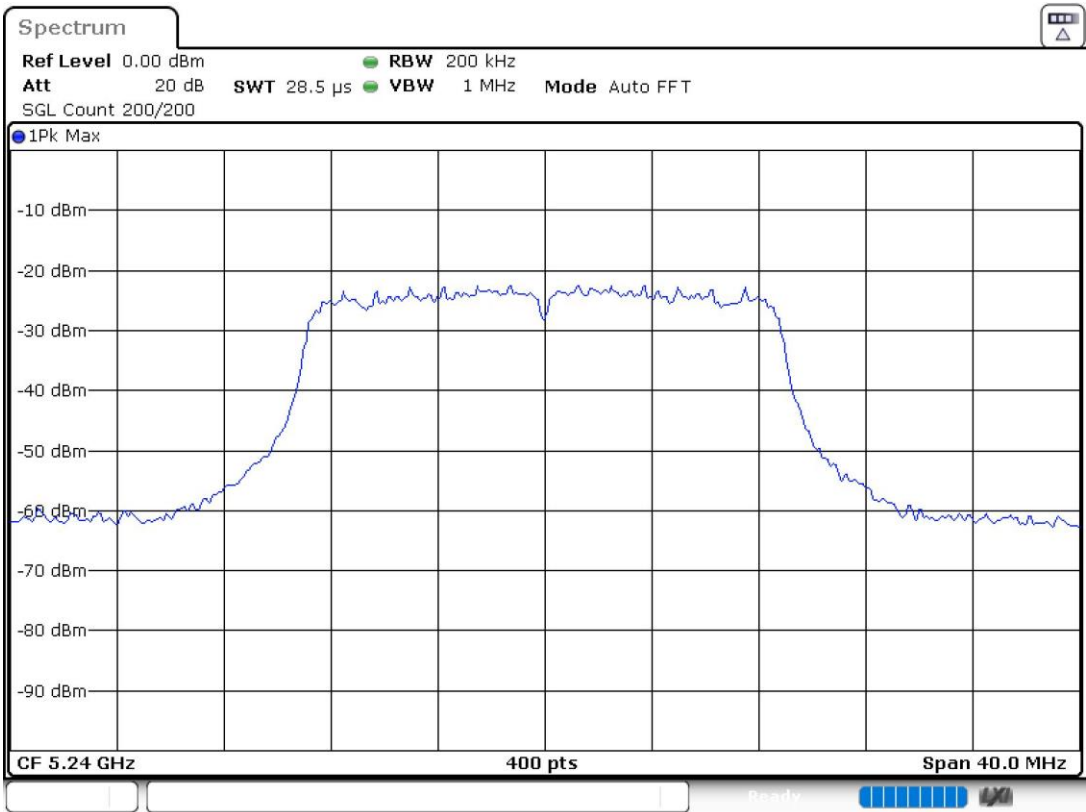
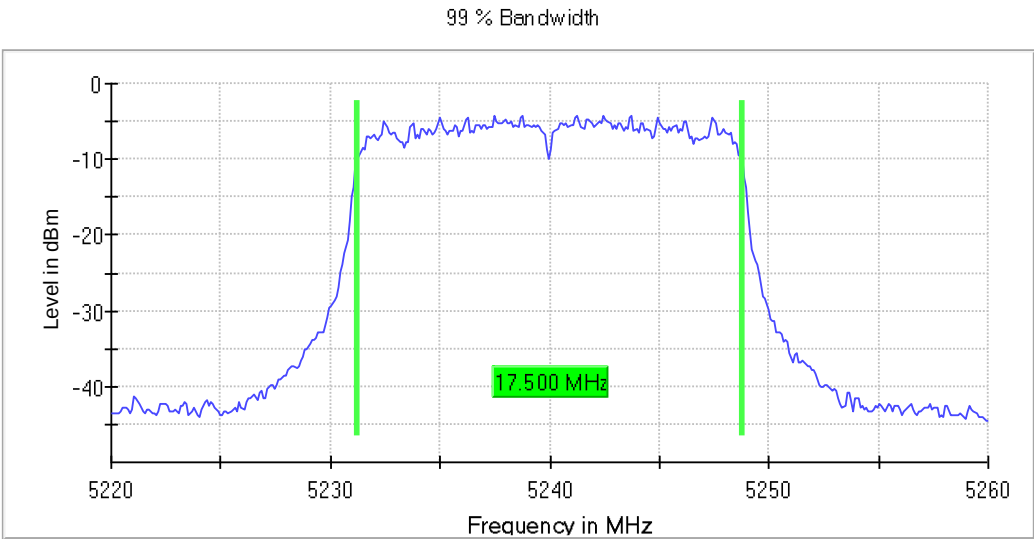
- Low Channel 36 (5180 MHz):



- Channel 44 (5220 MHz):

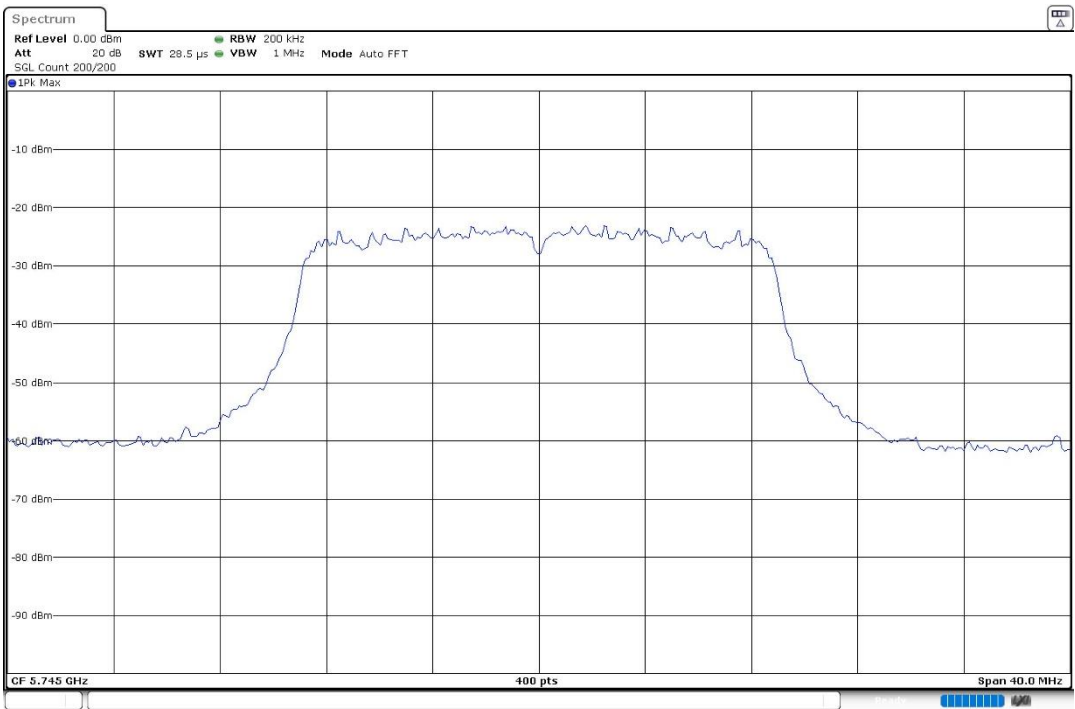
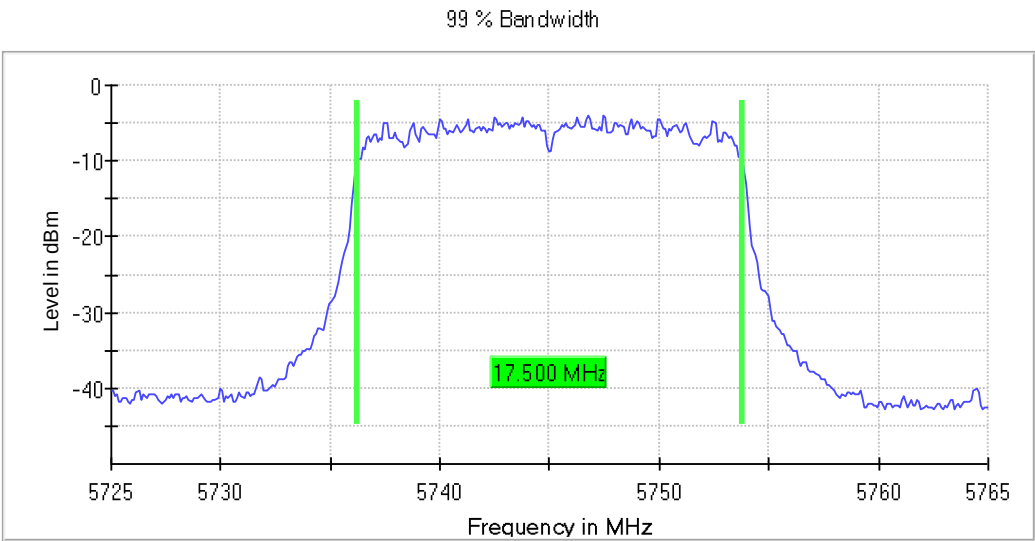


- High Channel 48 (5240 MHz):

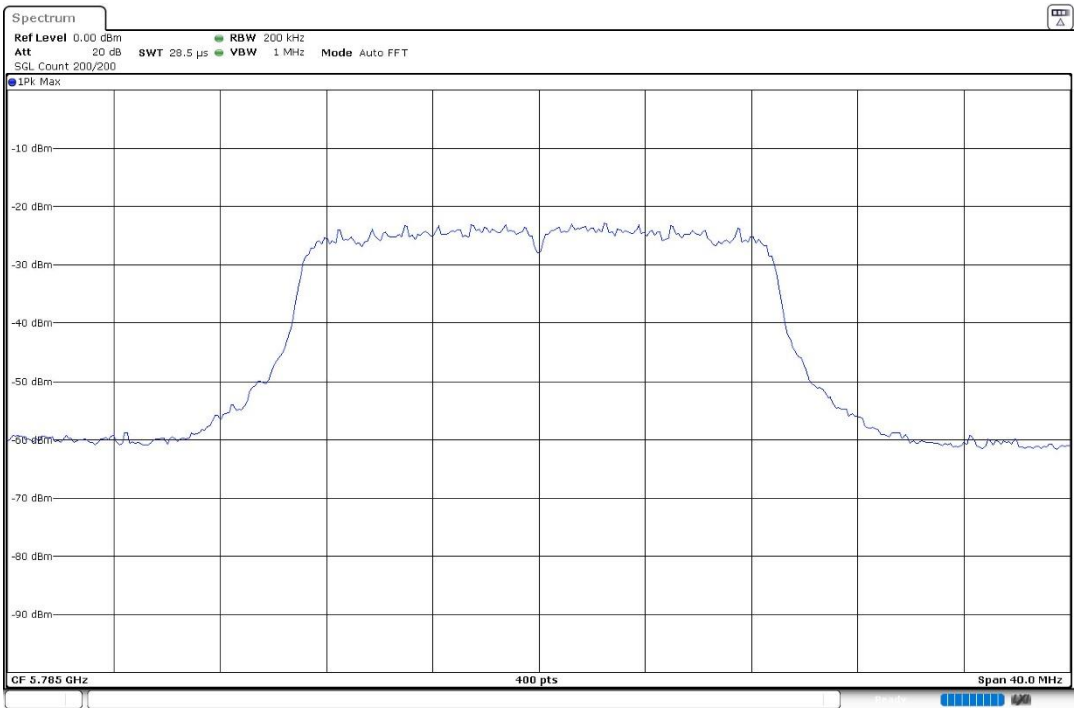
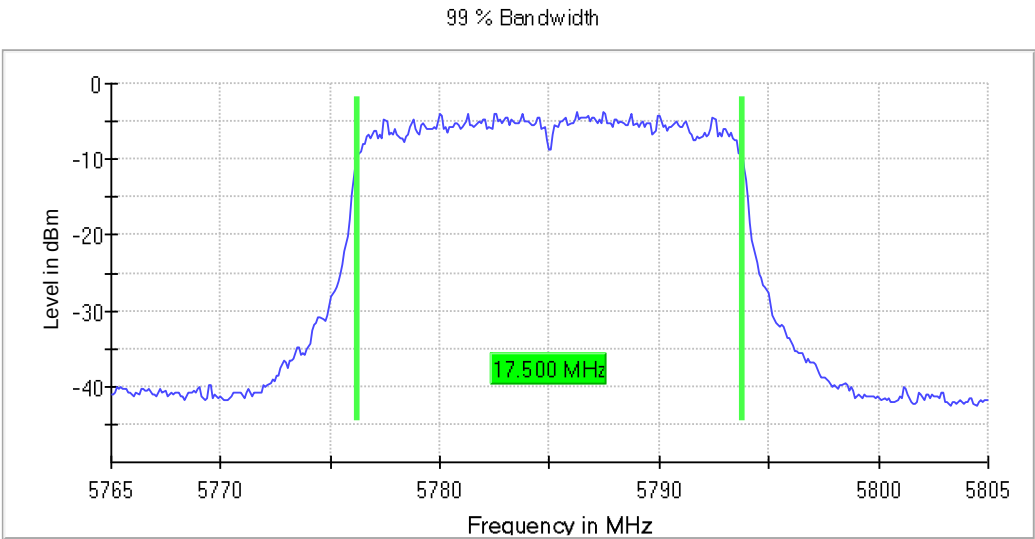


U-NII-3 (5725-5850 MHz)

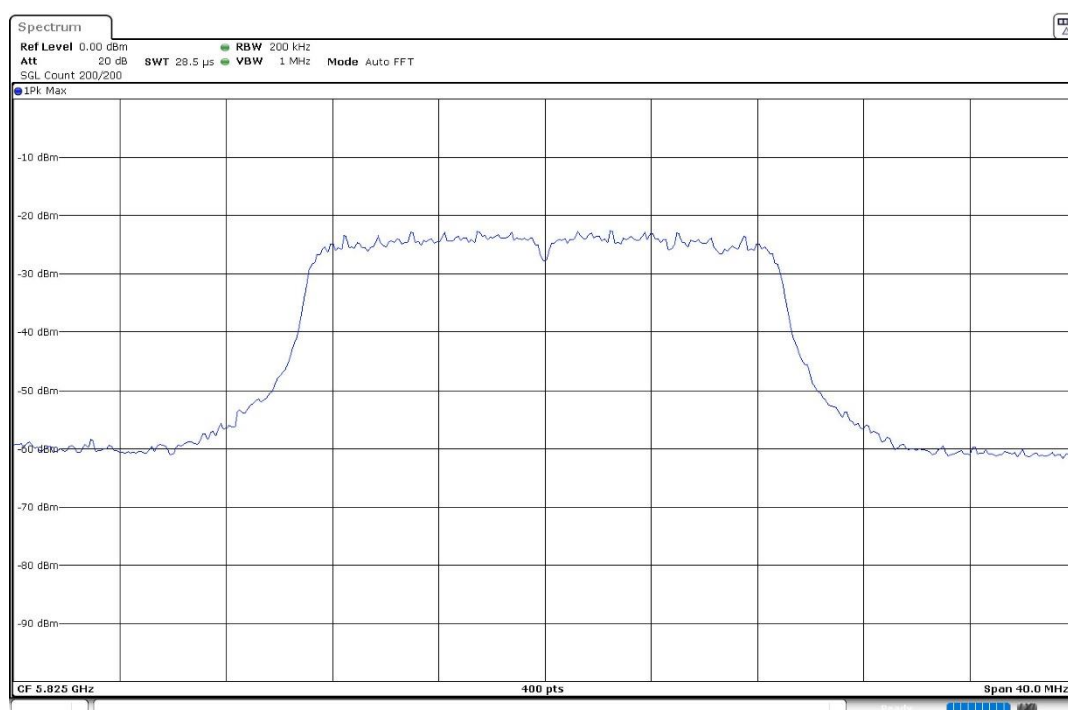
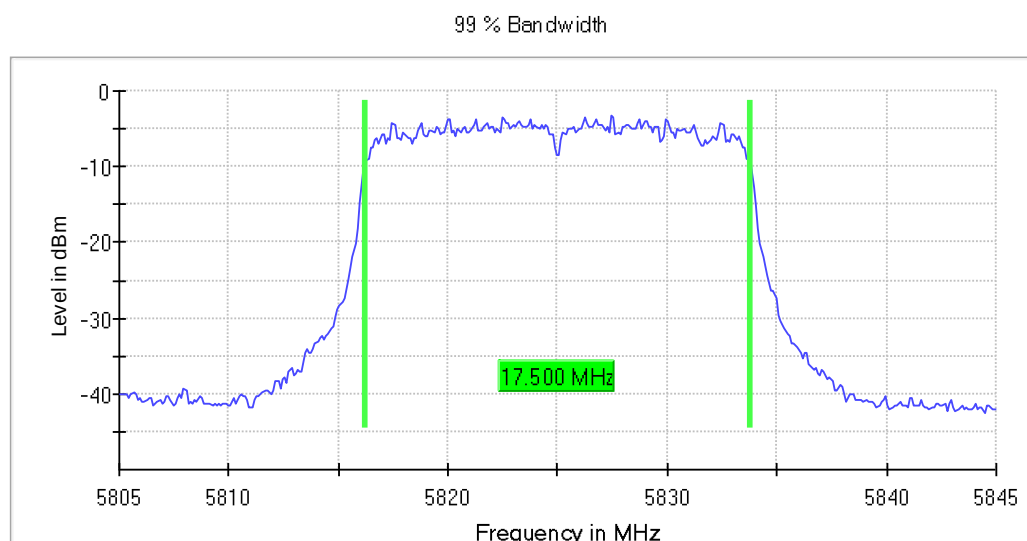
- Low Channel 149 (5745 MHz):



- Middle Channel 157 (5785 MHz):



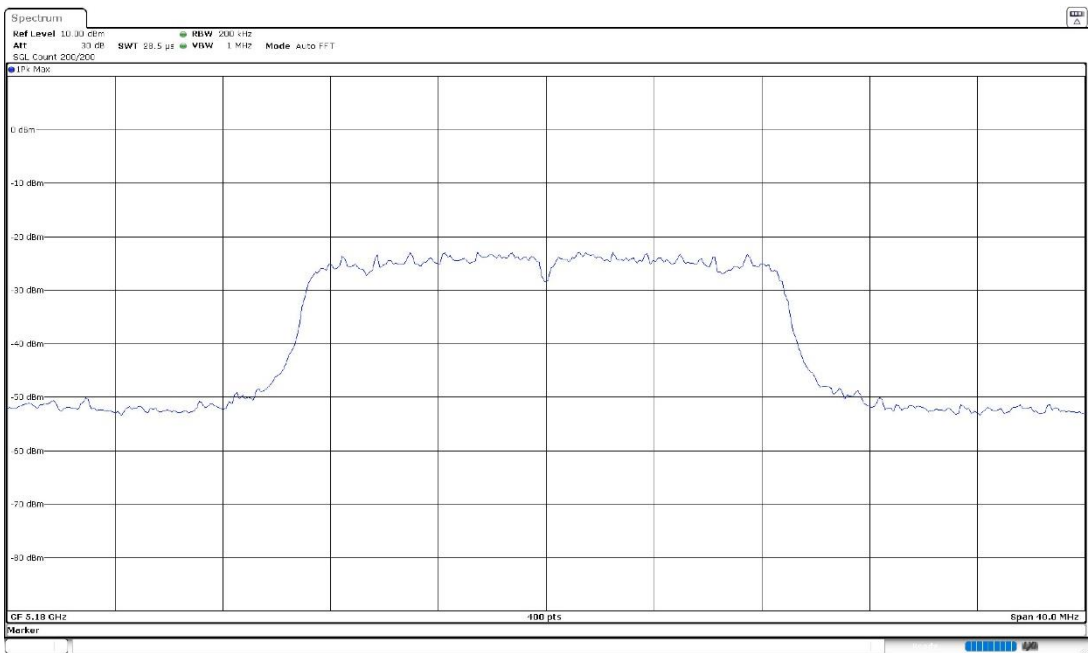
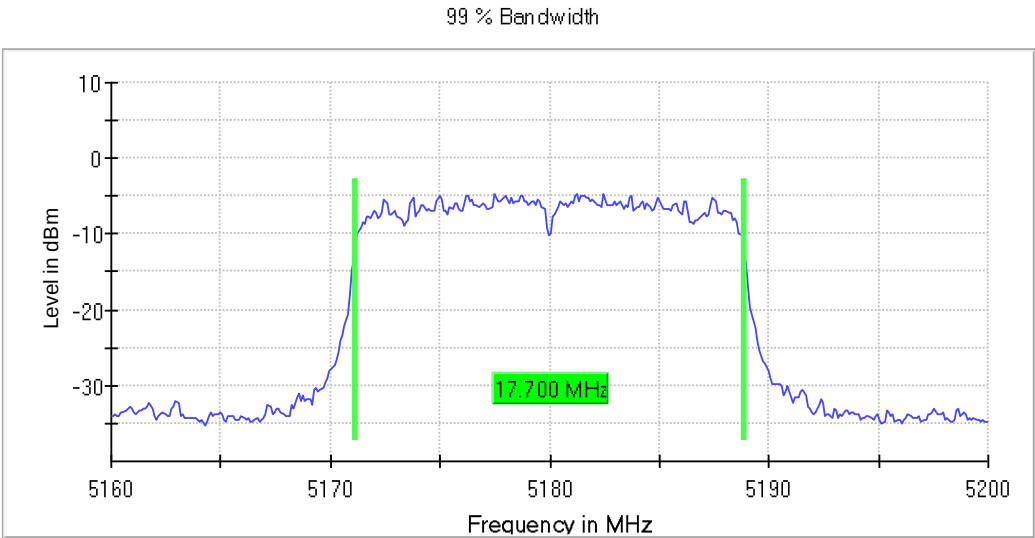
- High Channel 165 (5825 MHz):



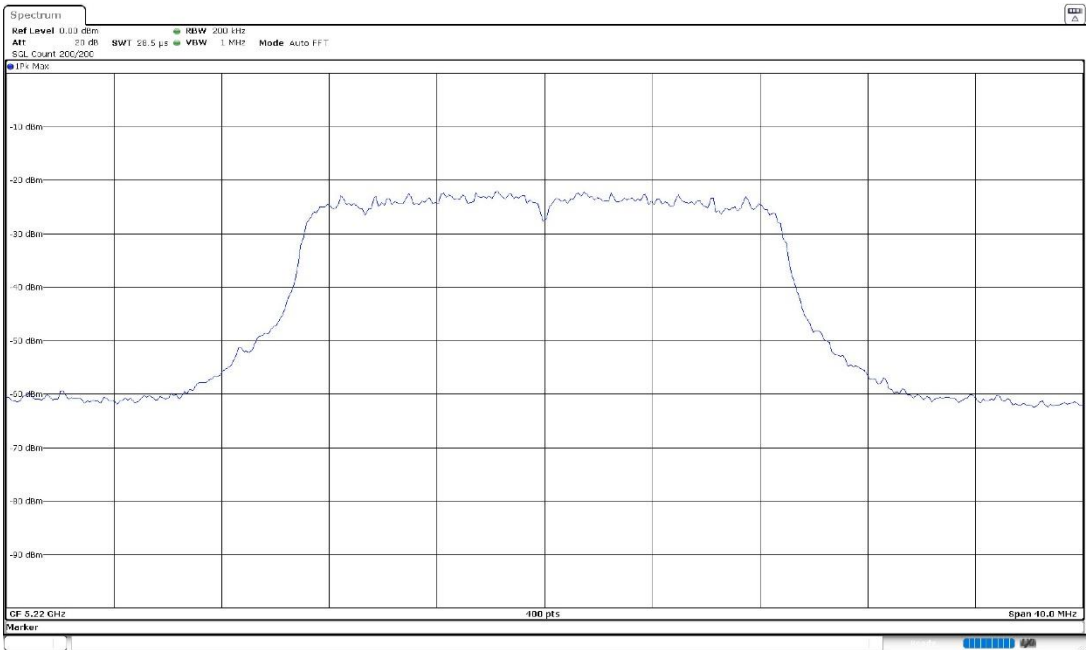
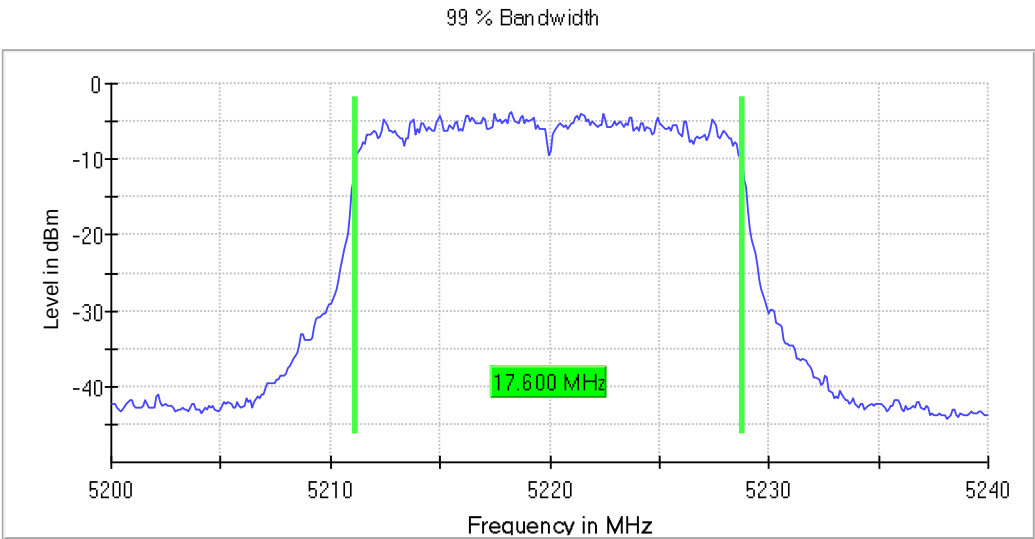
SISO 802.11 ac20 (VHT20):

U-NII-1 (5150-5250 MHz)

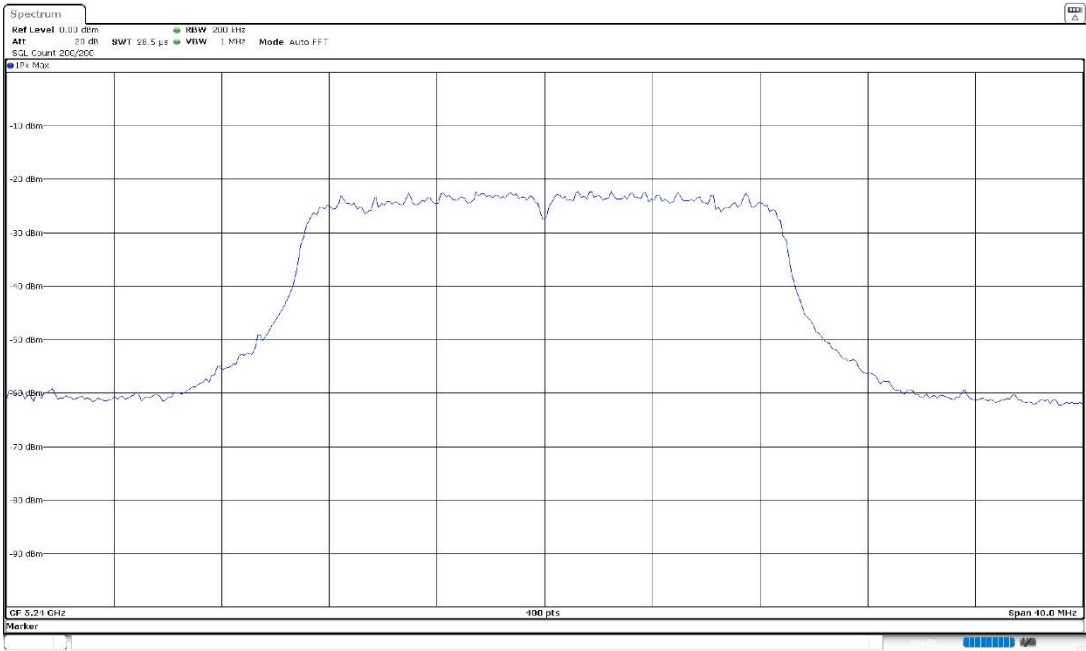
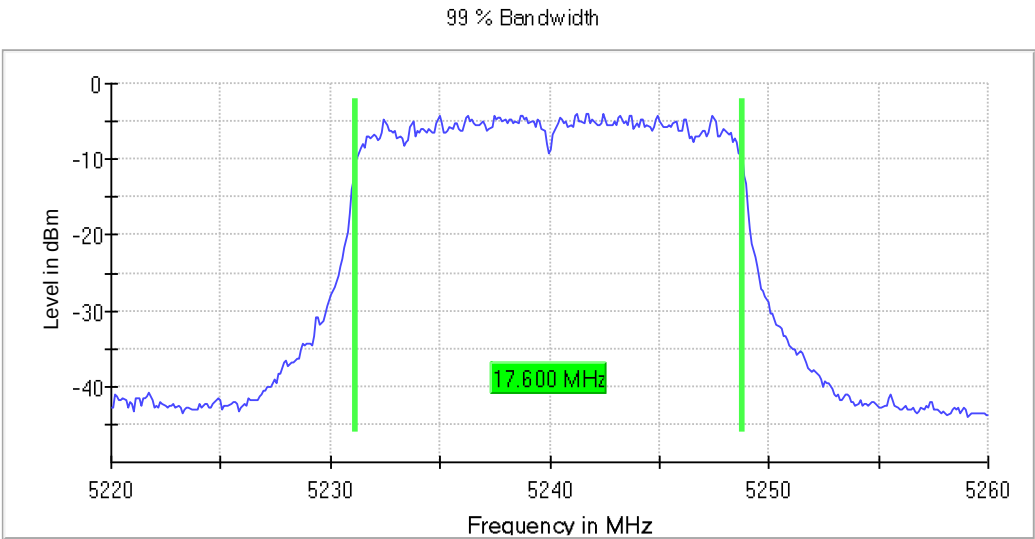
- Low Channel 36 (5180 MHz):



- Channel 44 (5220 MHz):

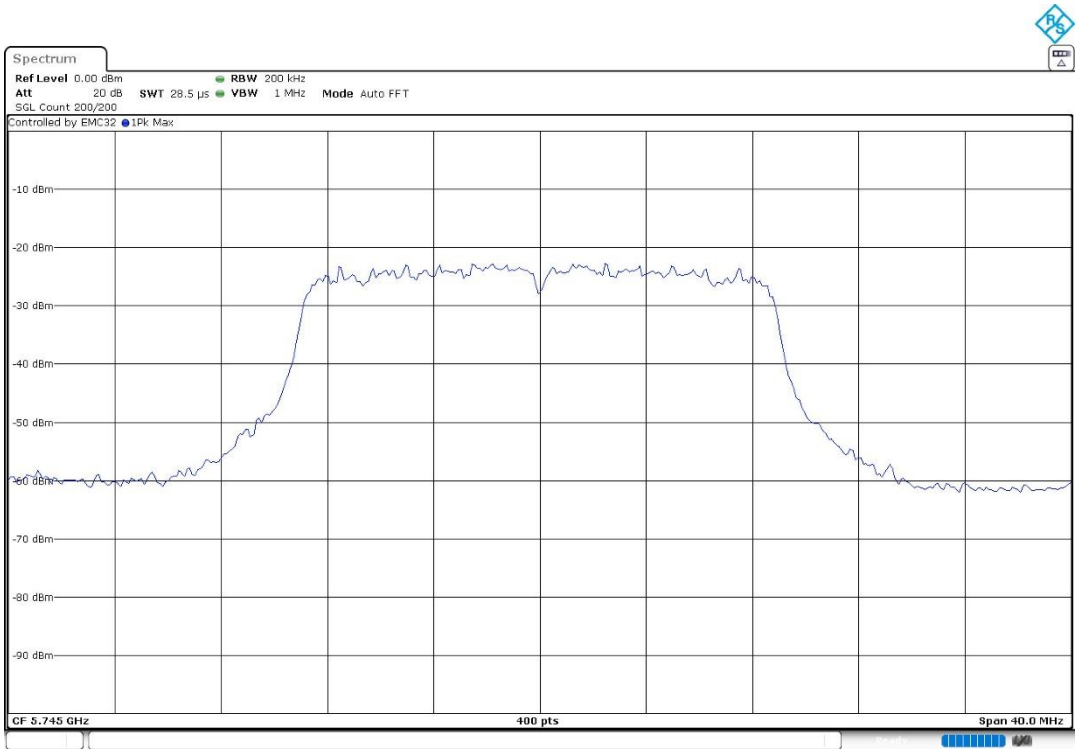
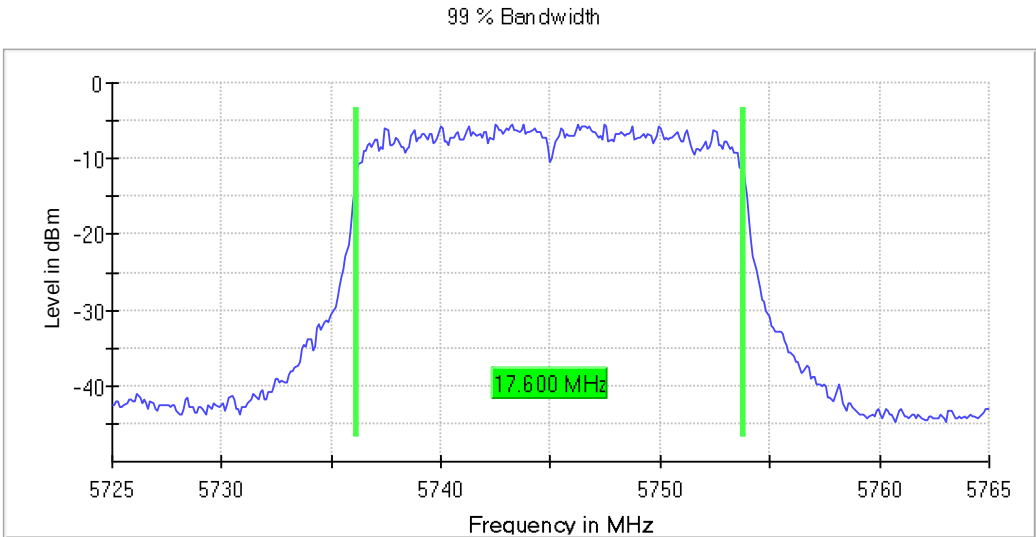


- High Channel 48 (5240 MHz):

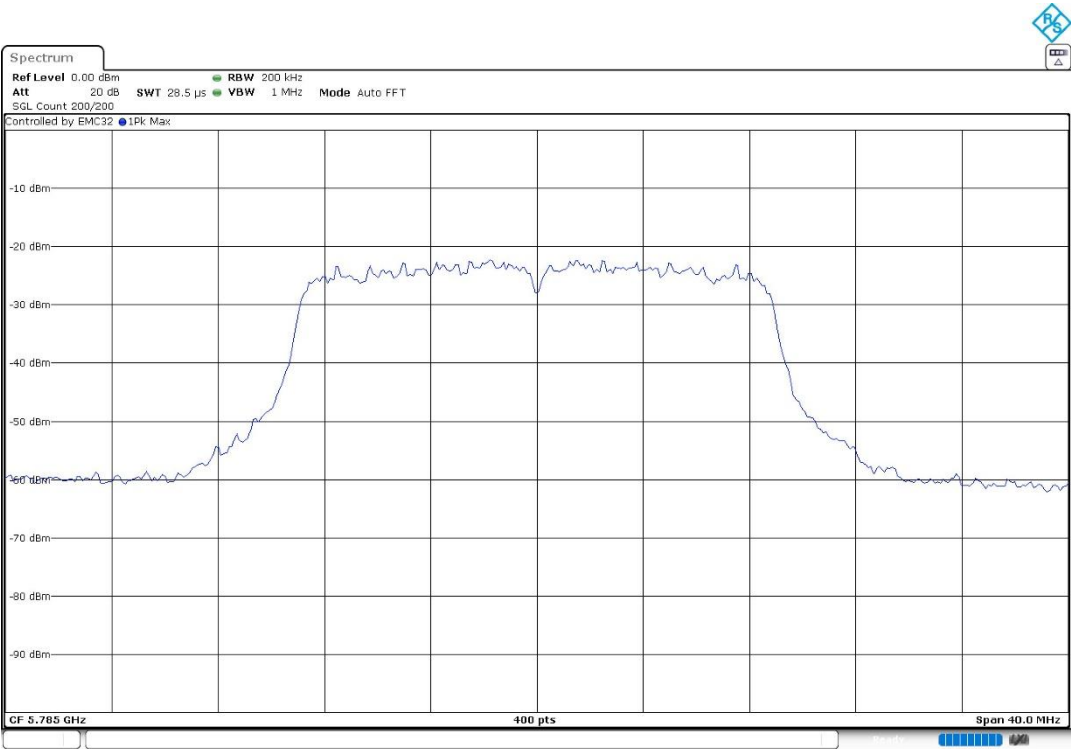
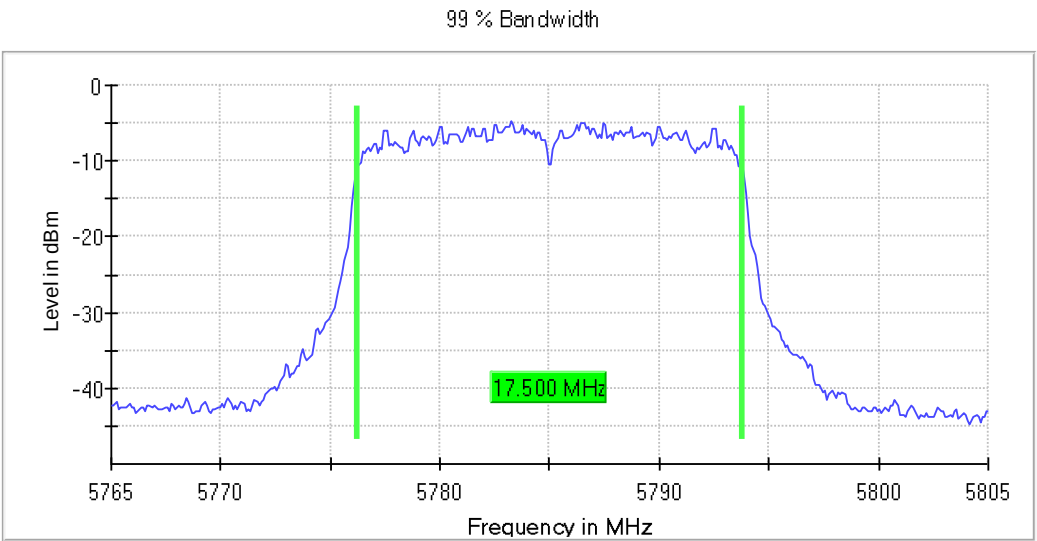


U-NII-3 (5725-5850 MHz)

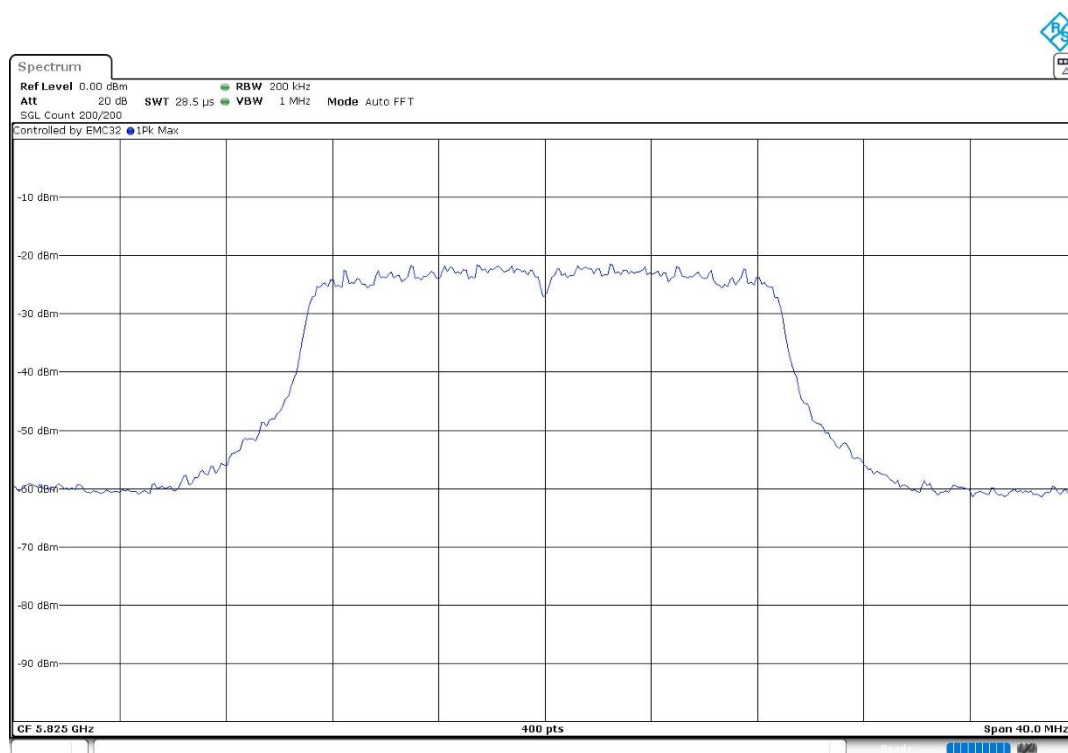
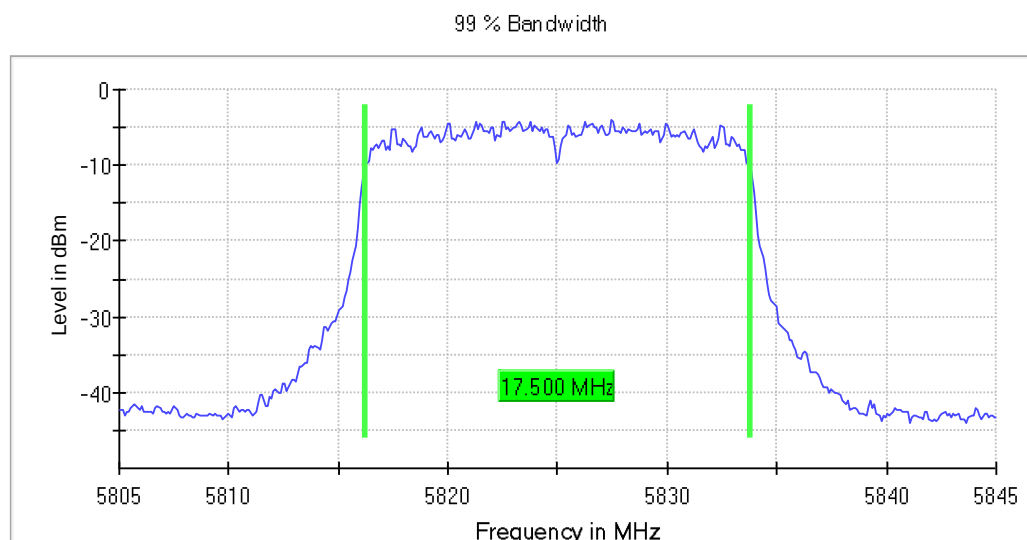
- Low Channel 149 (5745 MHz):



- Middle Channel 157 (5785 MHz):



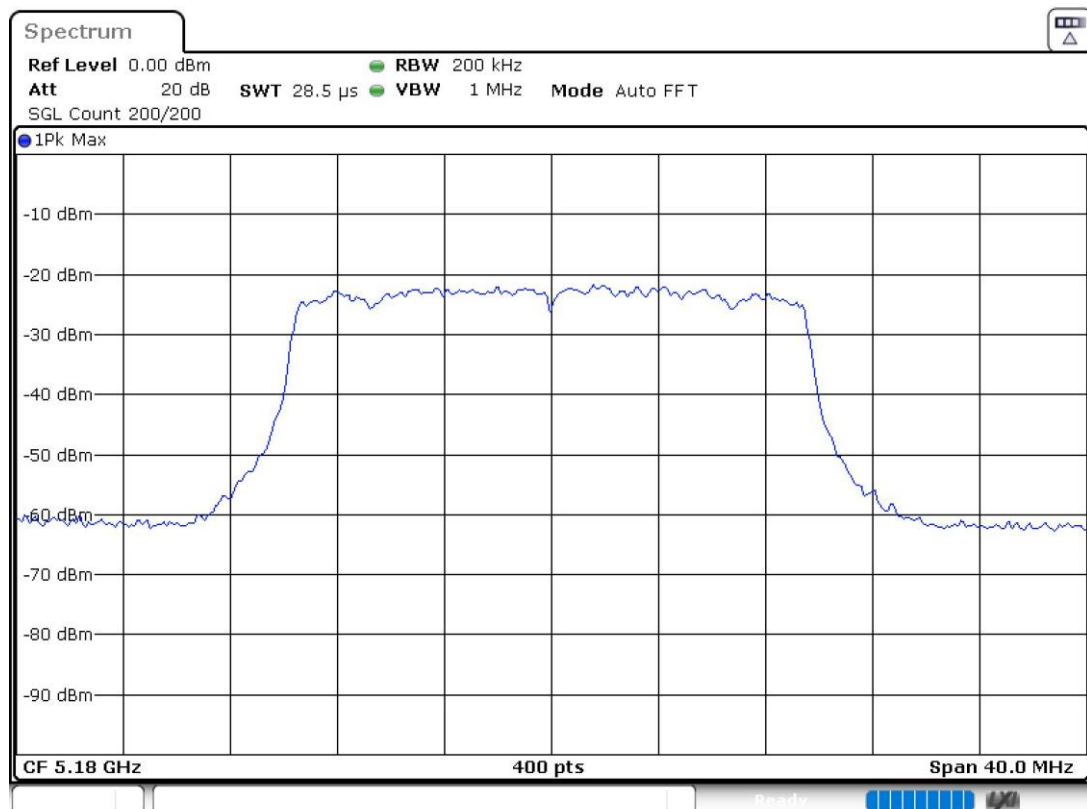
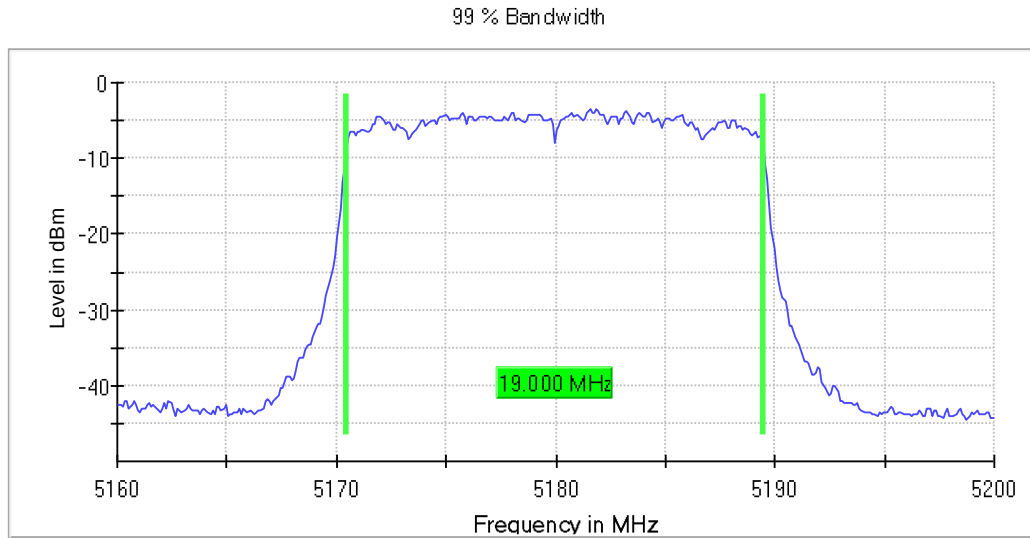
- High Channel 165 (5825 MHz):



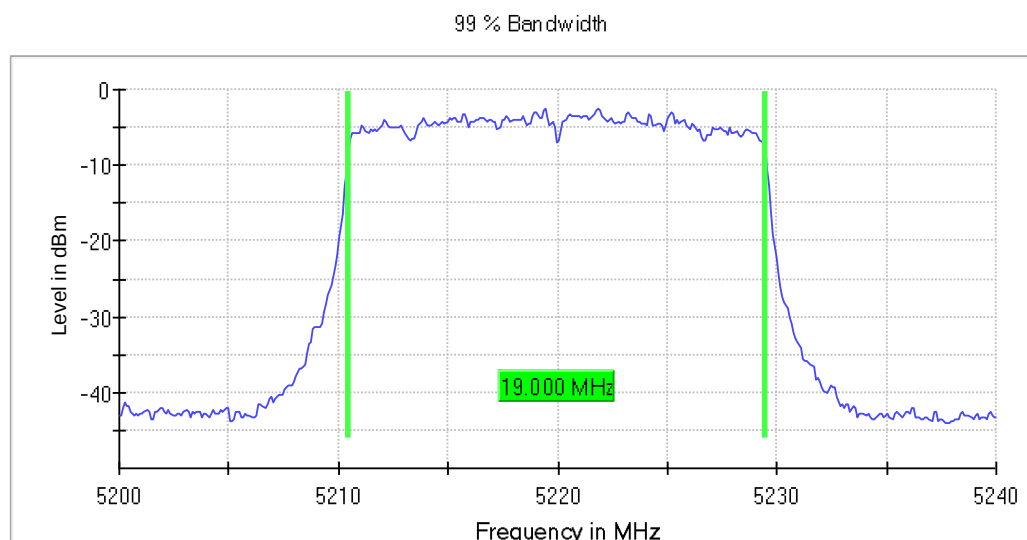
SISO 802.11 ax20 (HE20) – SU Full-channel allocation:

U-NII-1 (5150-5250 MHz)

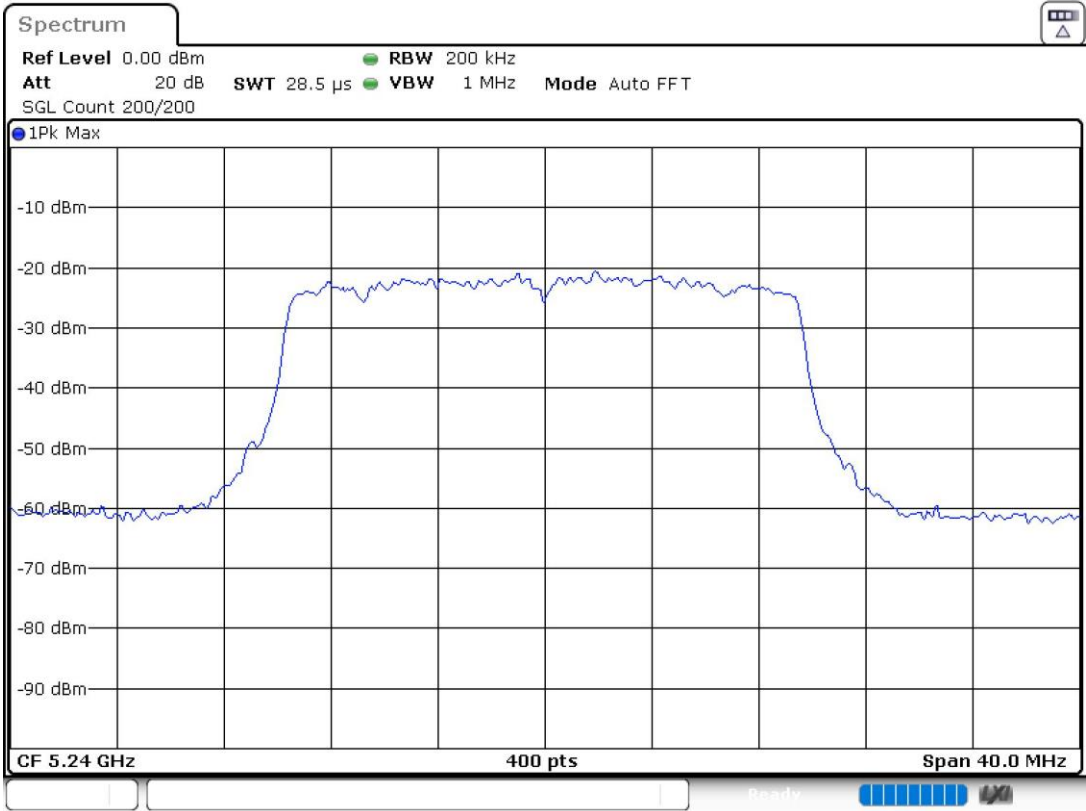
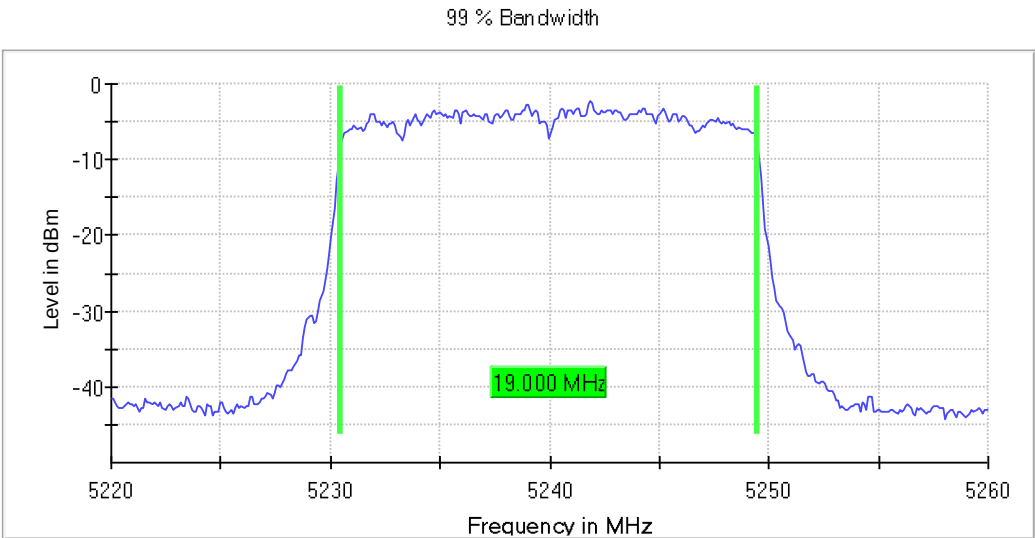
- Low Channel 36 (5180 MHz):



- Channel 44 (5220 MHz):

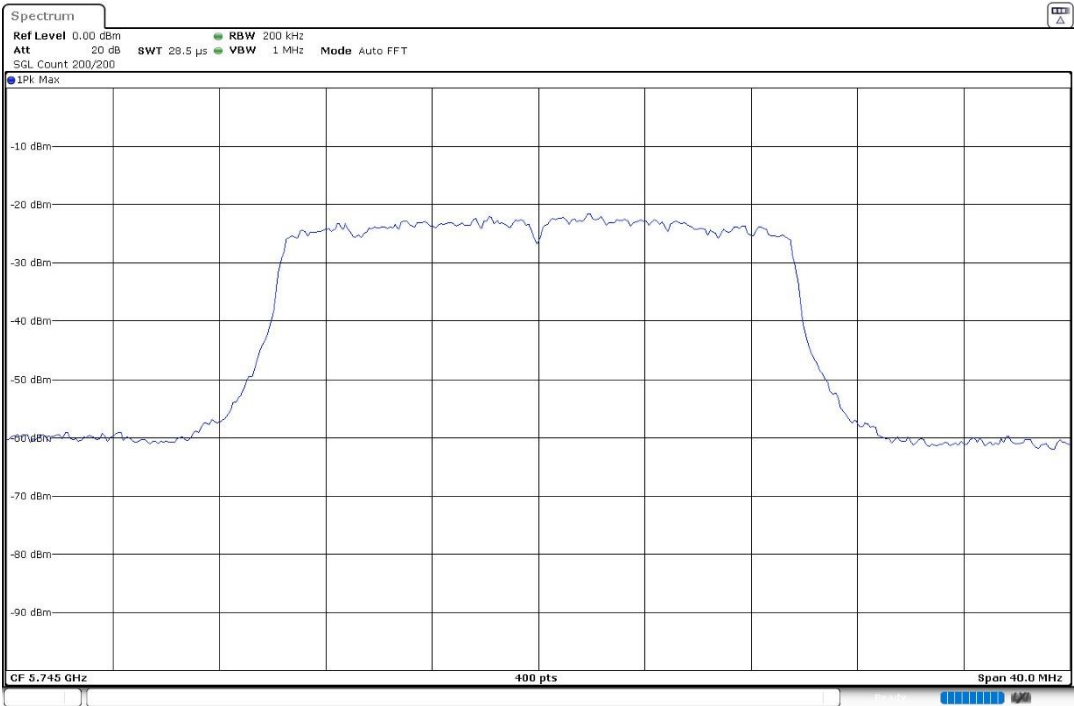
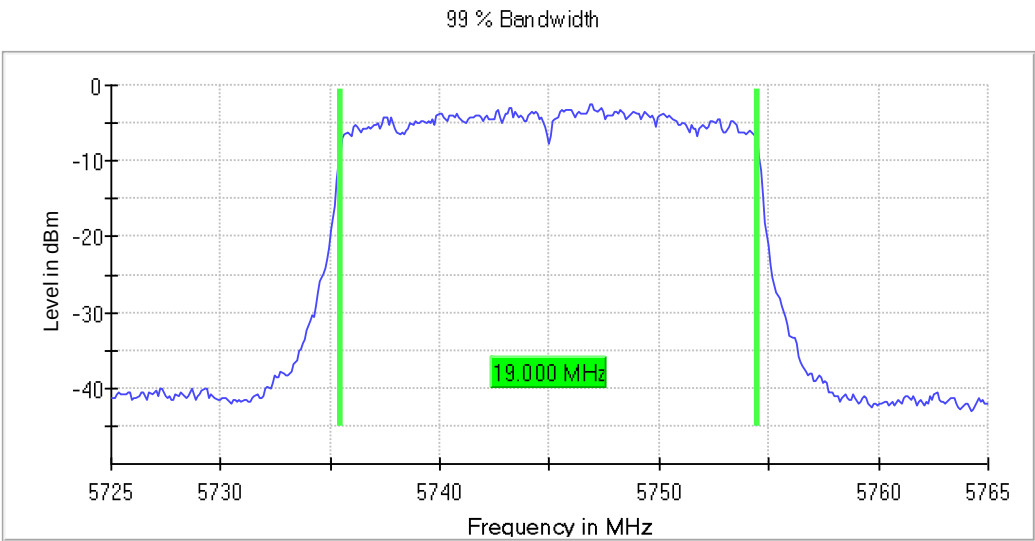


- High Channel 48 (5240 MHz):

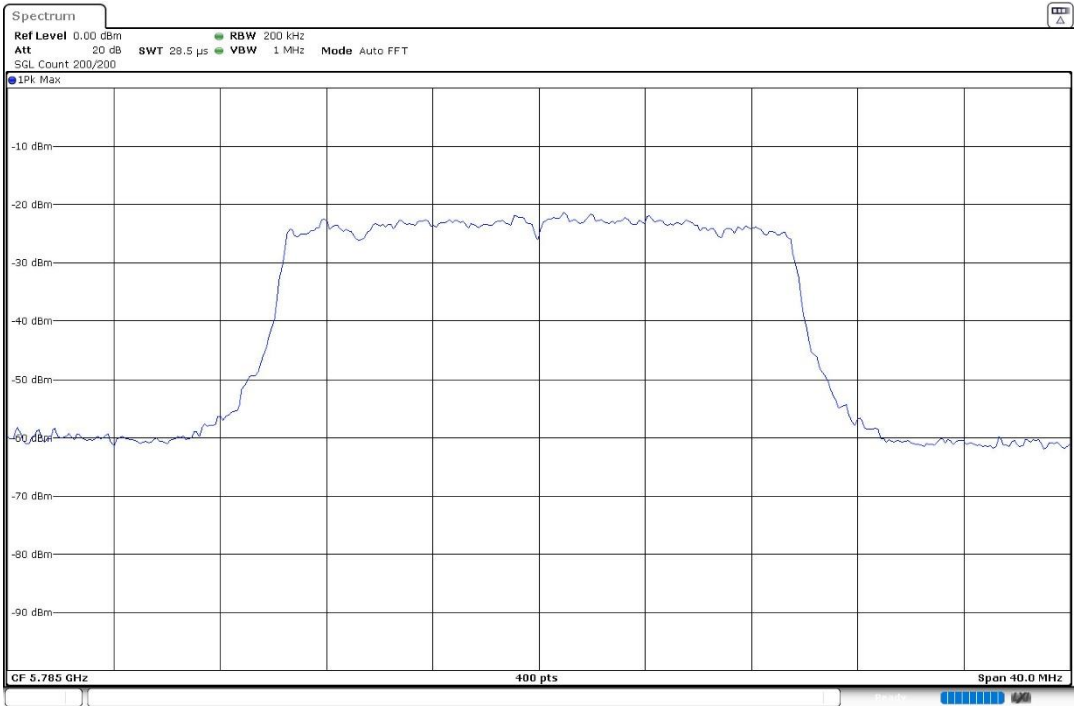
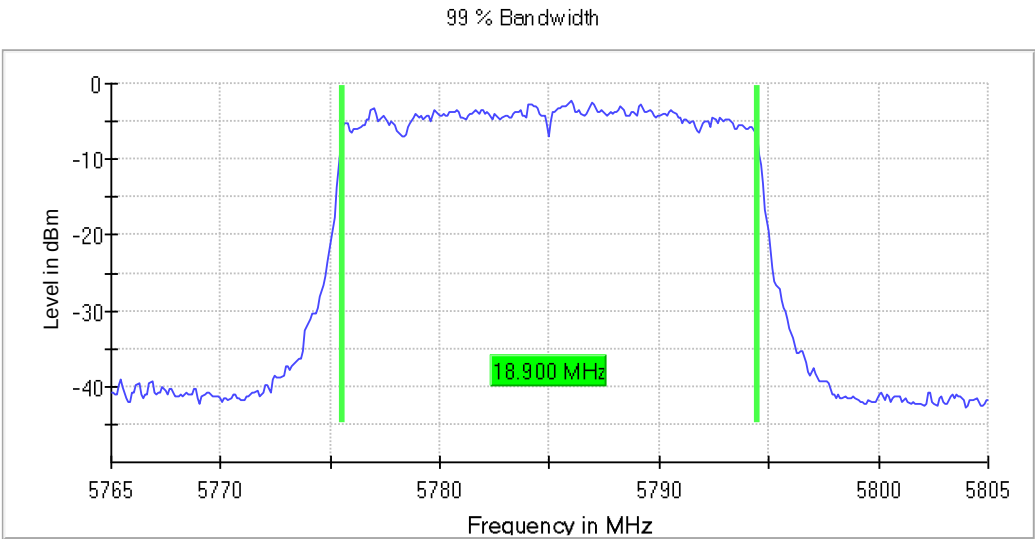


U-NII-3 (5725-5850 MHz)

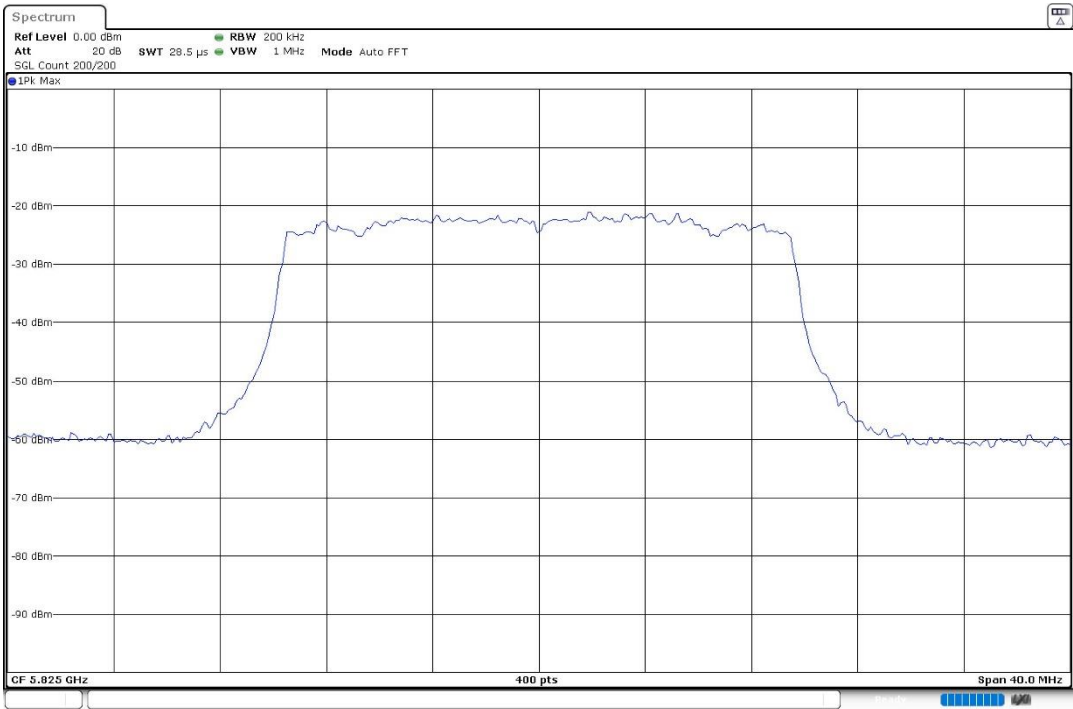
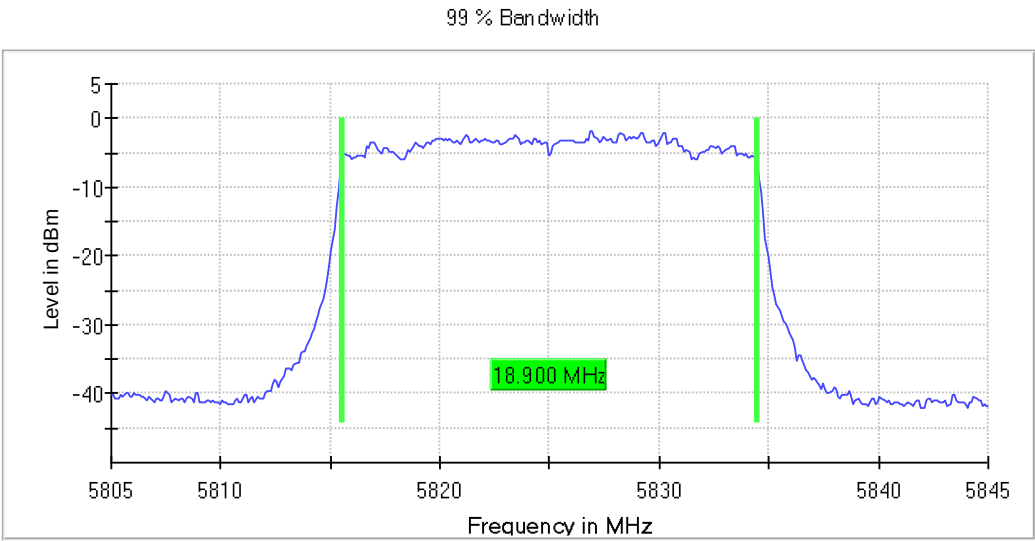
- Low Channel 149 (5745 MHz):



- Middle Channel 157 (5785 MHz):



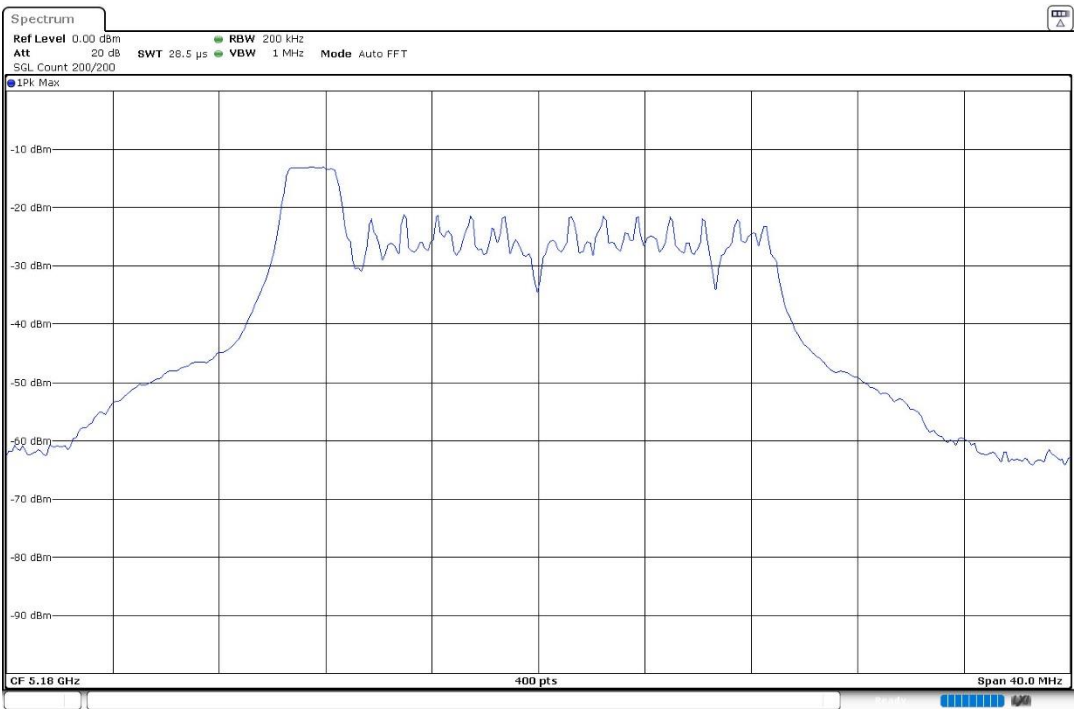
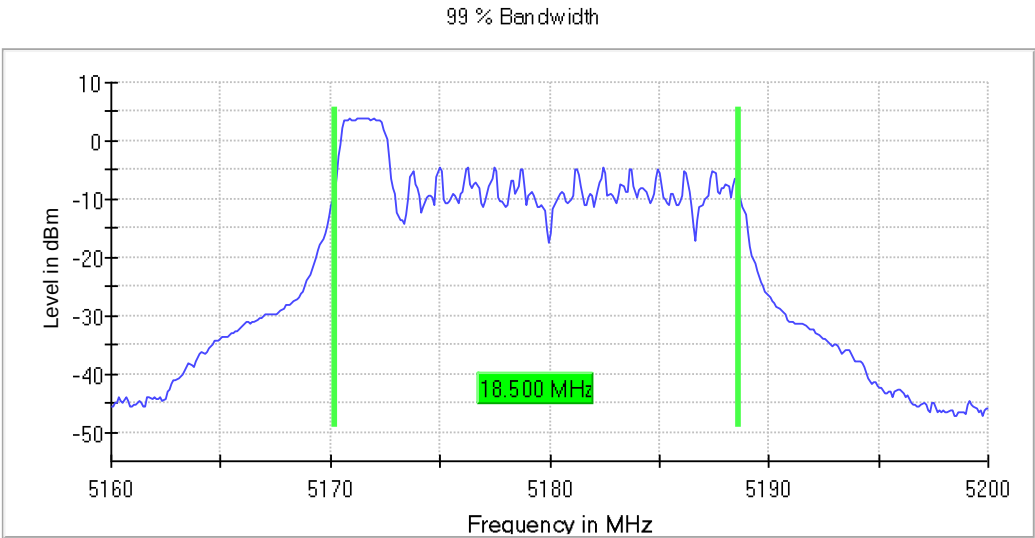
- High Channel 165 (5825 MHz):



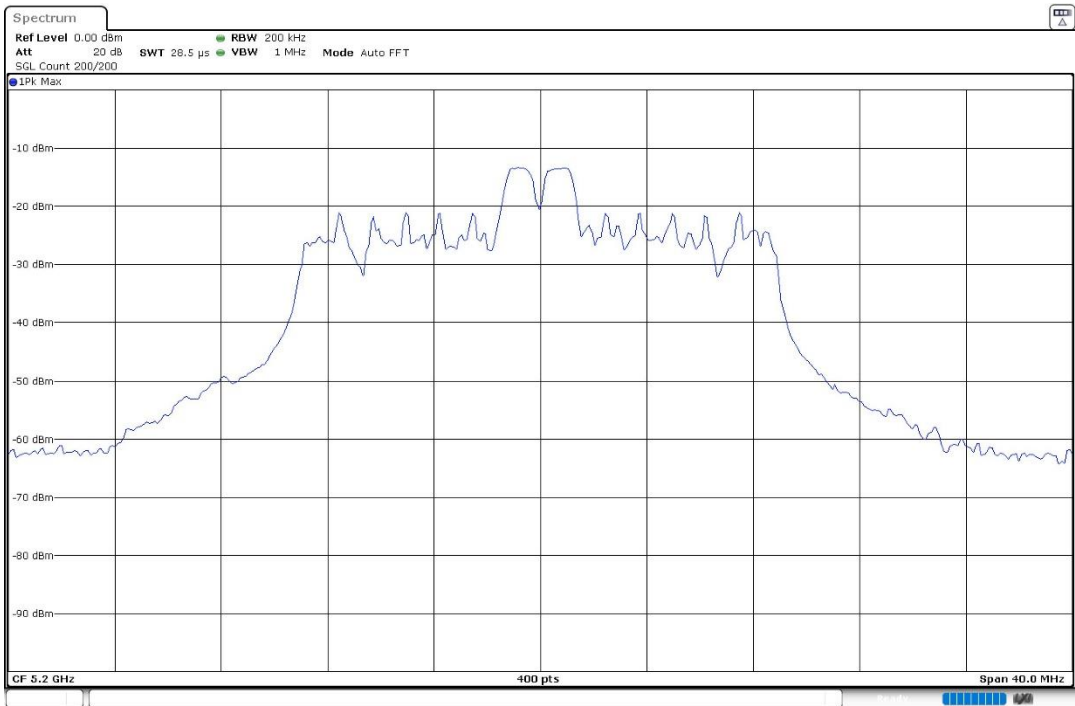
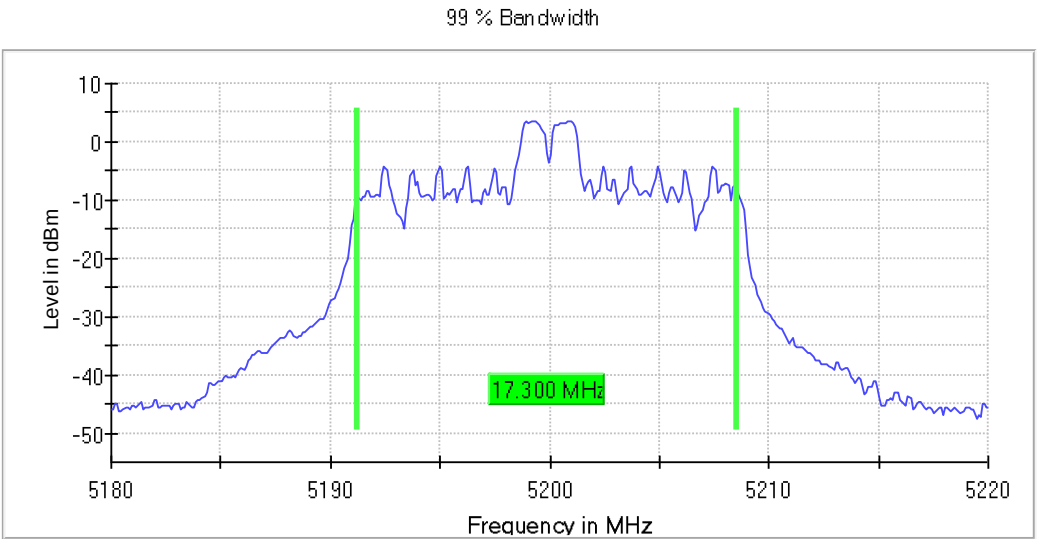
SISO 802.11 ax20 (HE20) – RU Subcarrier allocation (RU26):

U-NII-1 (5150-5250 MHz)

- Low Channel 36 (5180 MHz) / RU26 Offset 0:

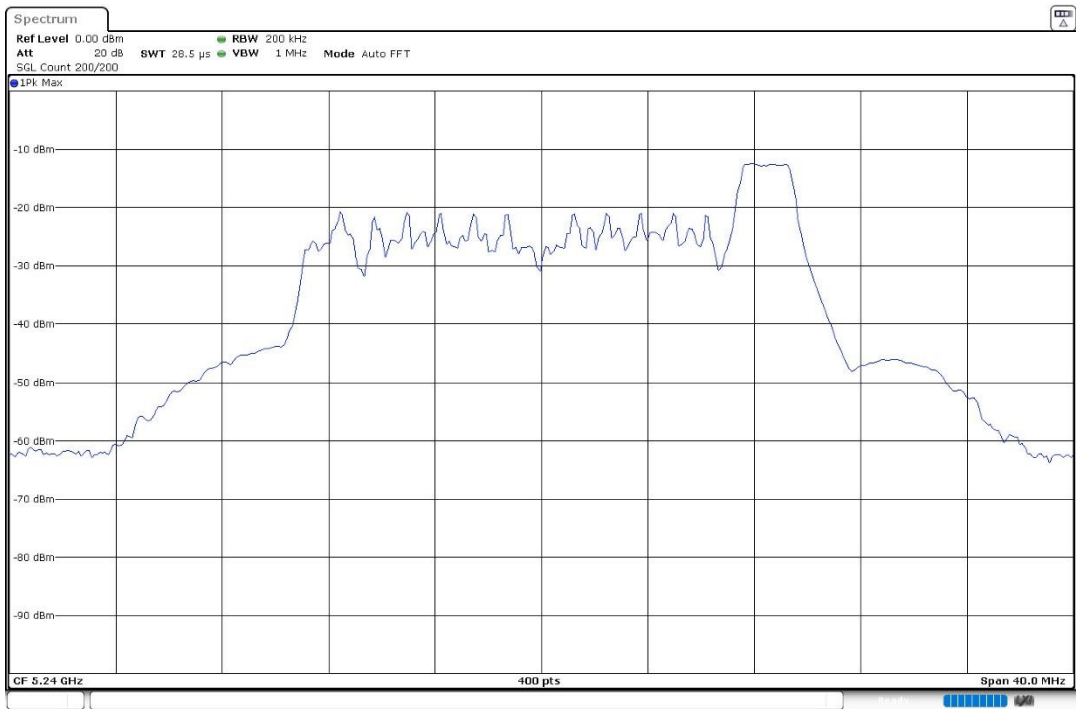
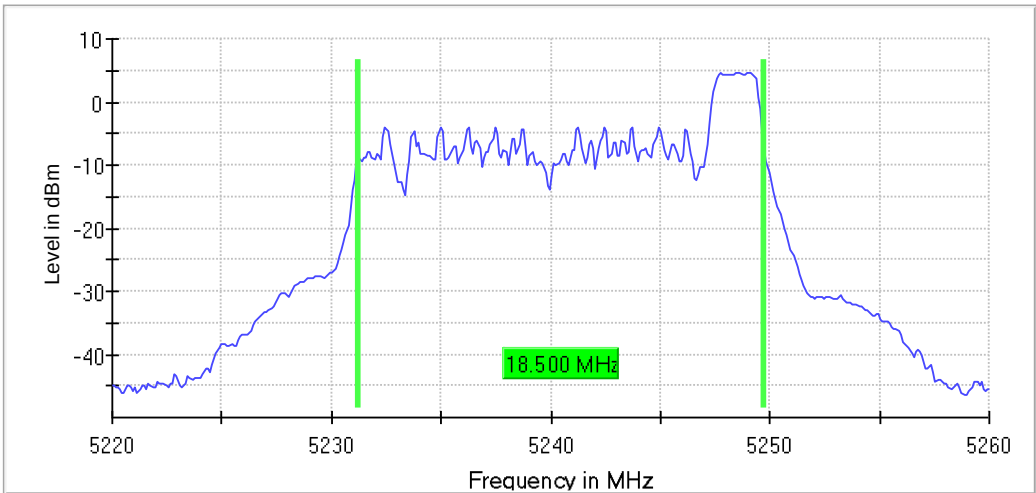


- Channel 40 (5200 MHz) / RU26 Offset 4:



- High Channel 48 (5240 MHz) / RU26 Offset 8:

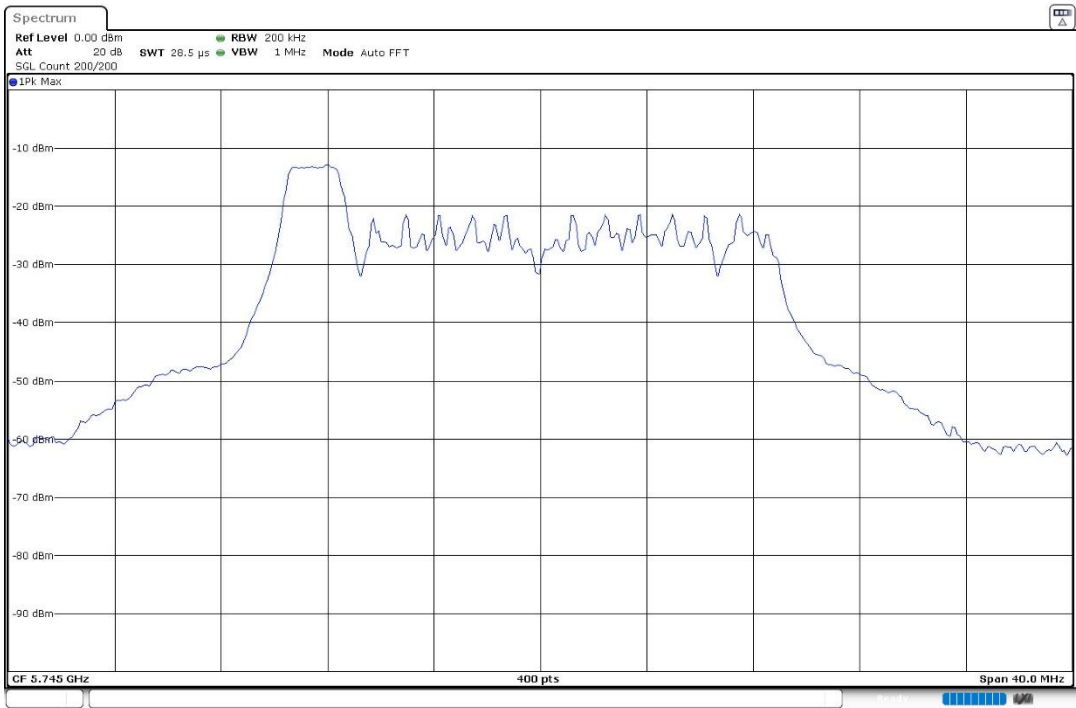
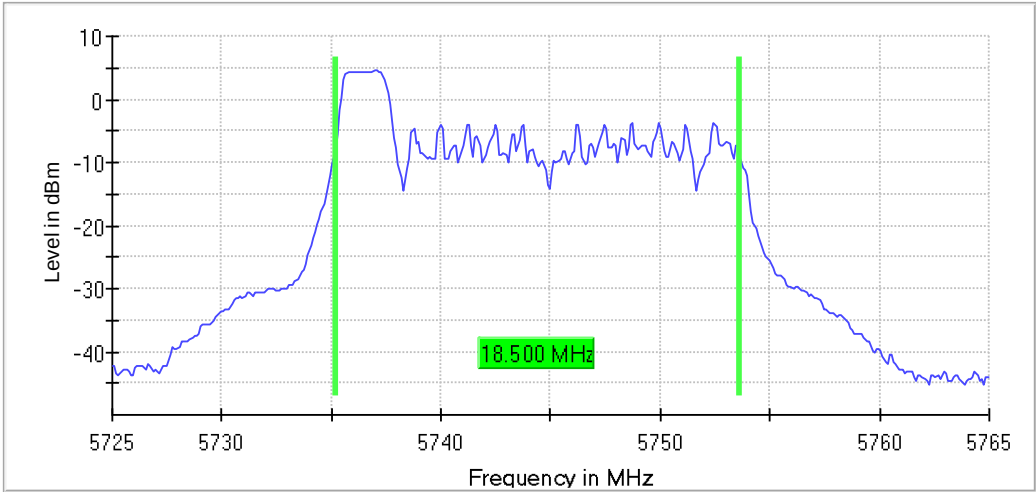
99 % Bandwidth



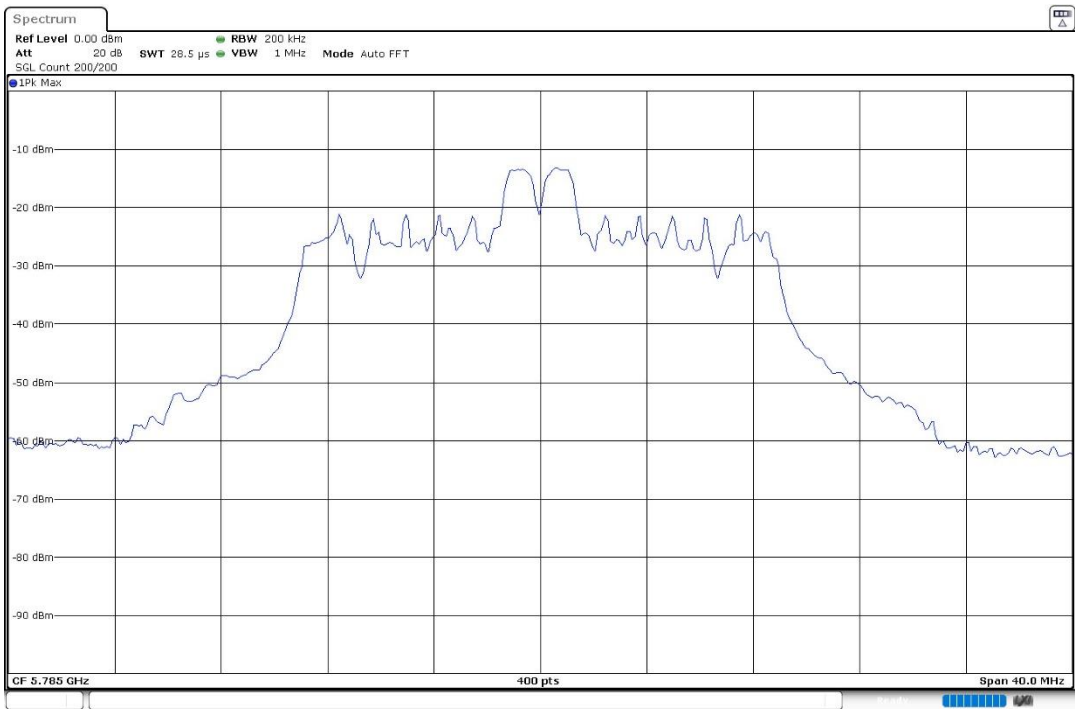
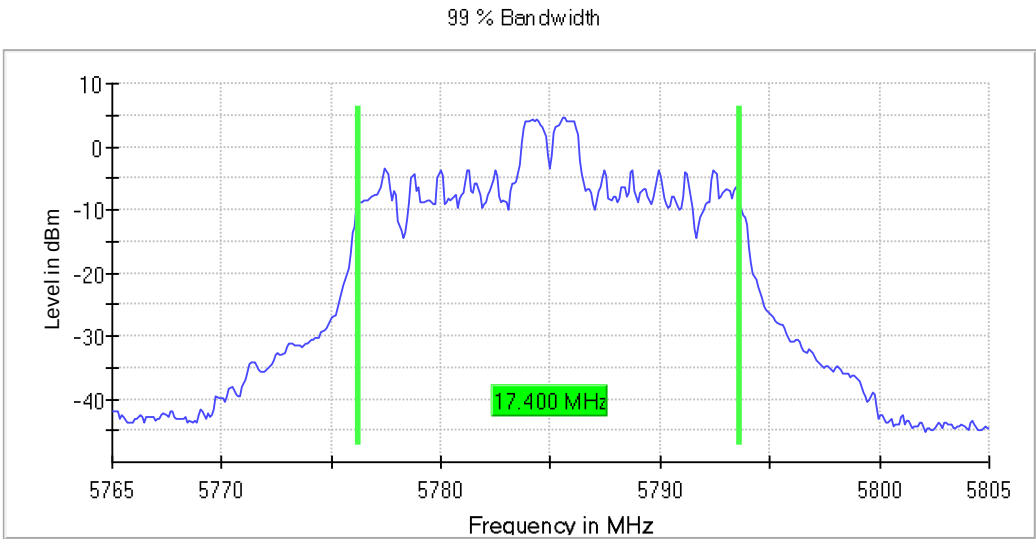
U-NII-3 (5725-5850 MHz)

- Low Channel 149 (5745 MHz) / RU26 Offset 0:

99 % Bandwidth

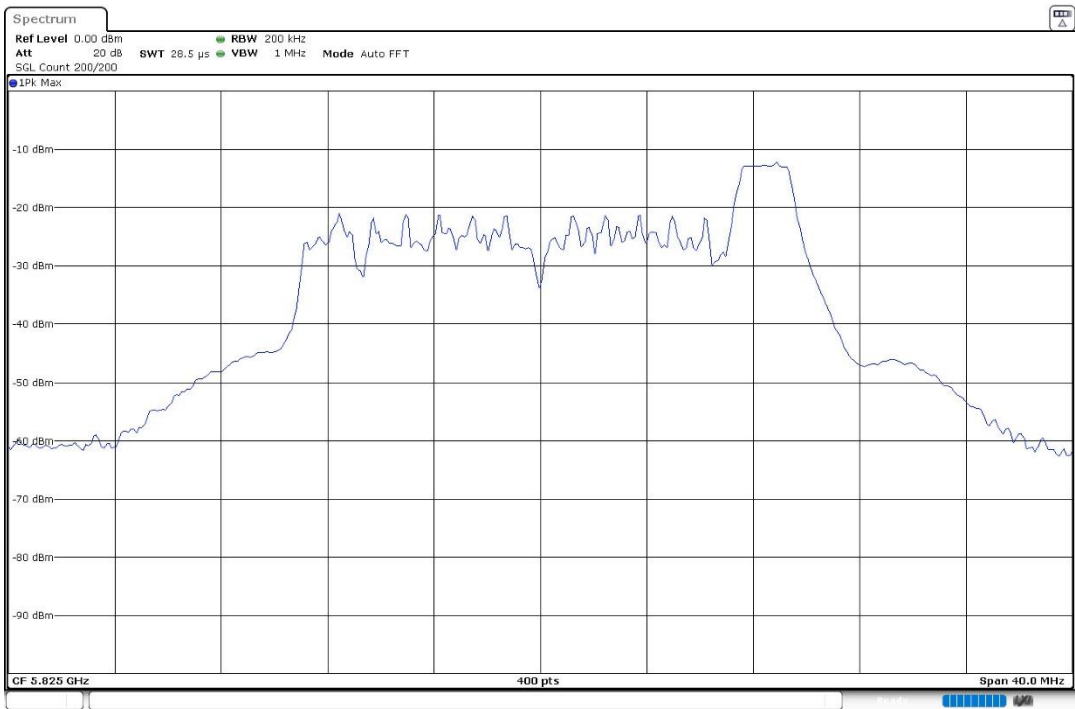
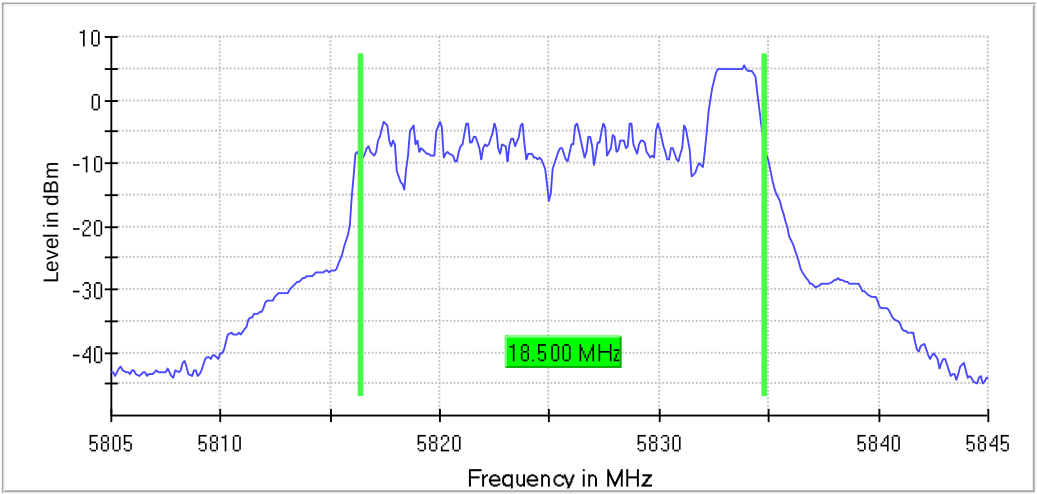


- Middle Channel 157 (5785 MHz) / RU26 Offset 4:



- High Channel 165 (5825 MHz) / RU26 Offset 8:

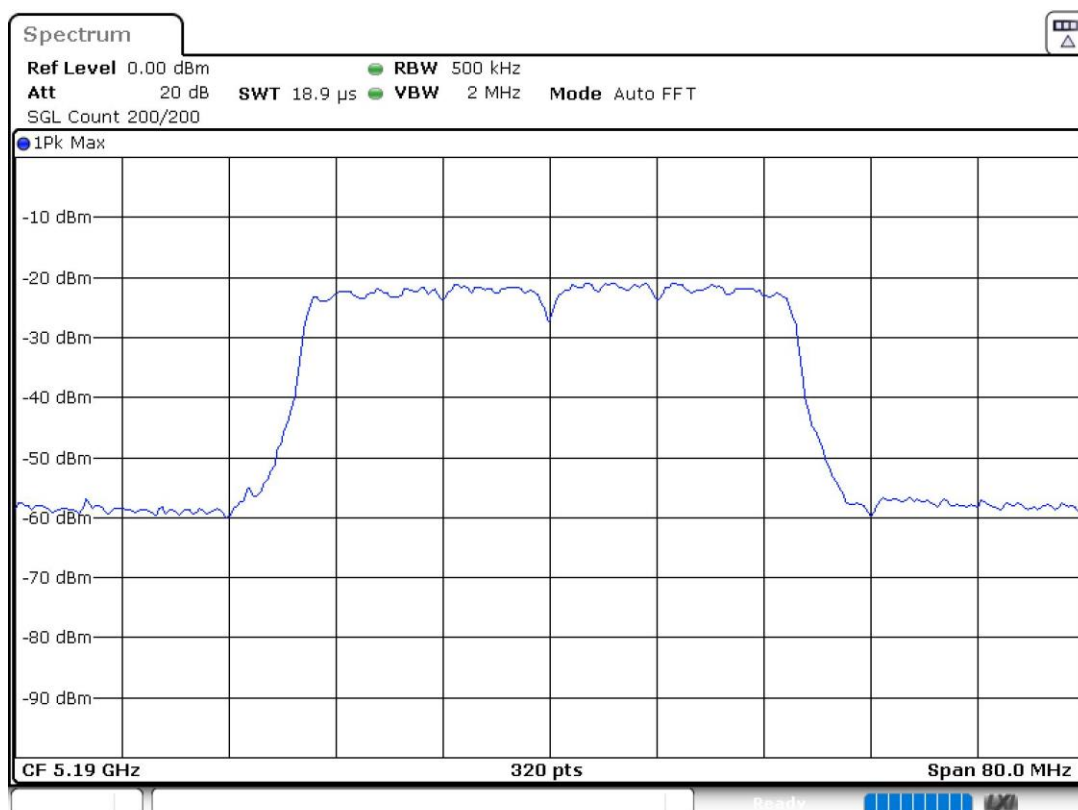
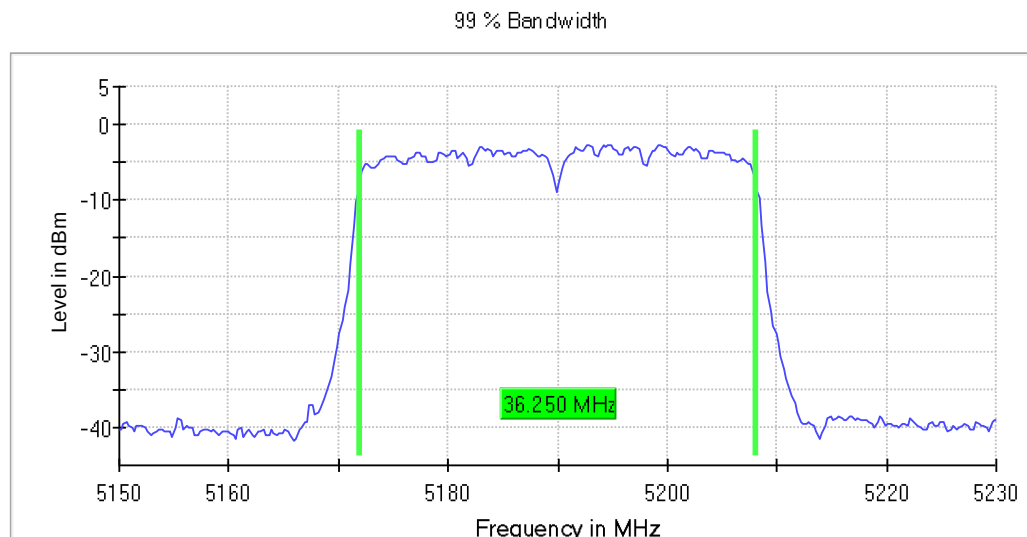
99 % Bandwidth



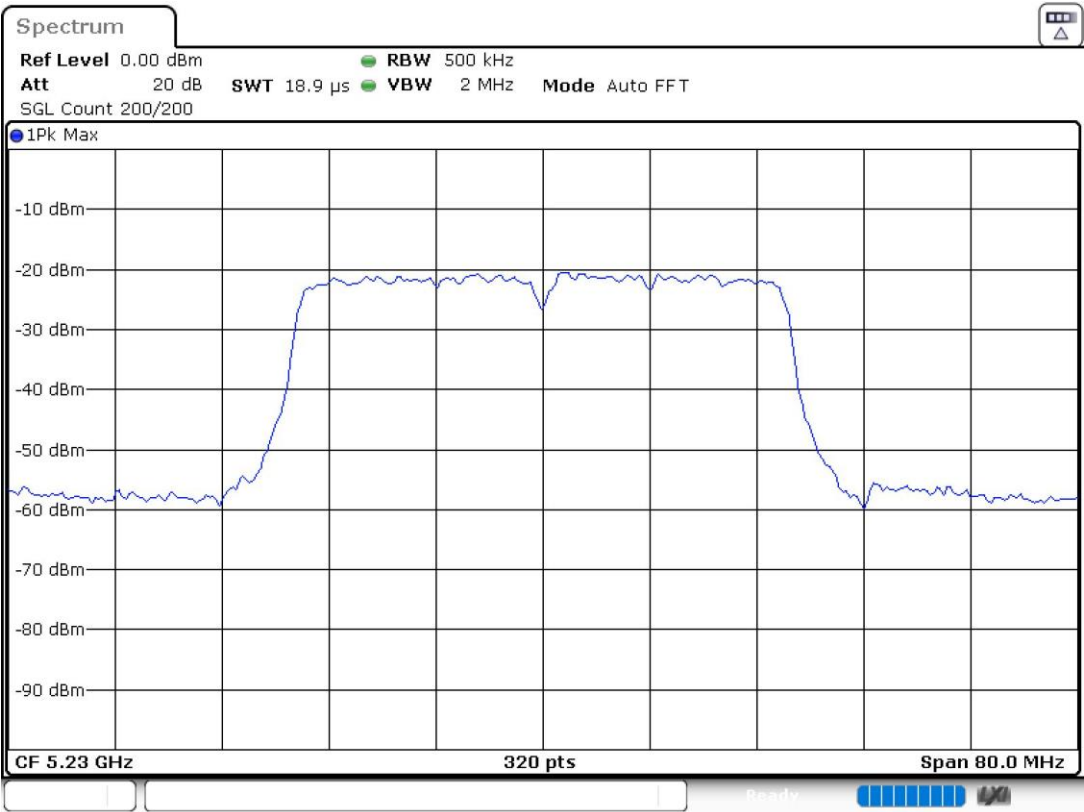
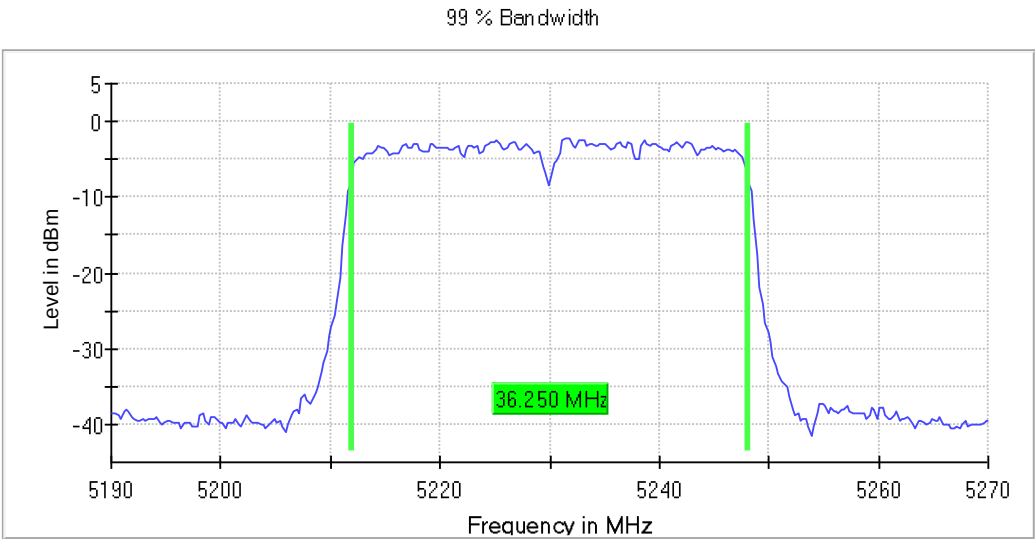
SISO 802.11 n40 (HT40):

U-NII-1 (5150-5250 MHz)

- Low Channel 38 (5190 MHz):

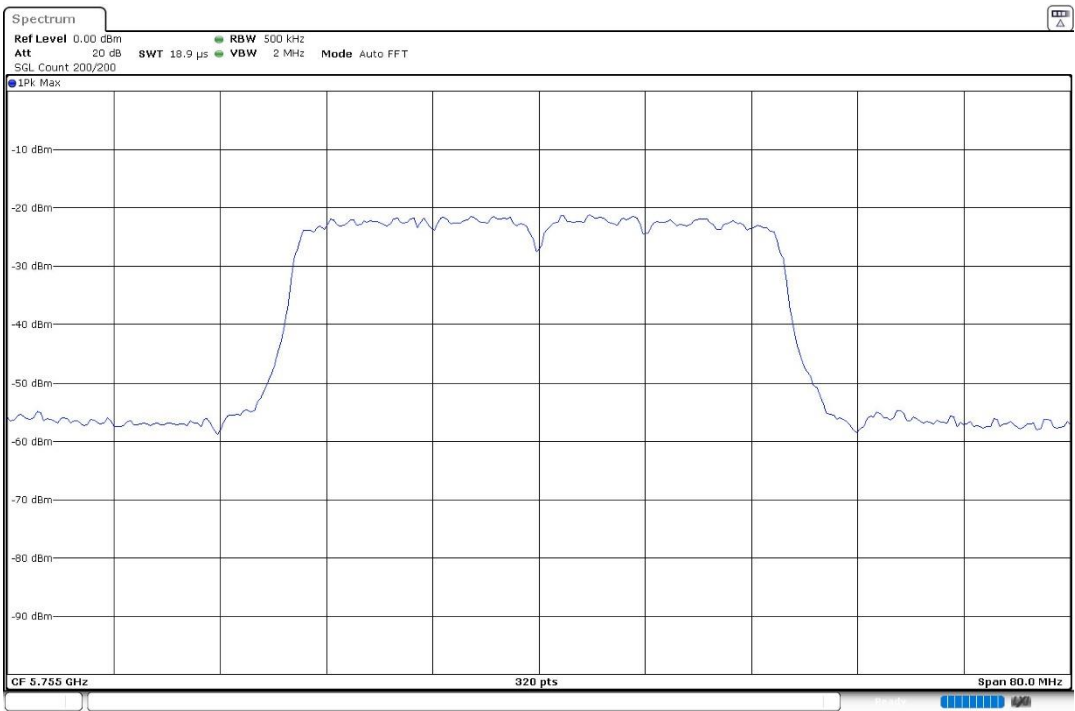
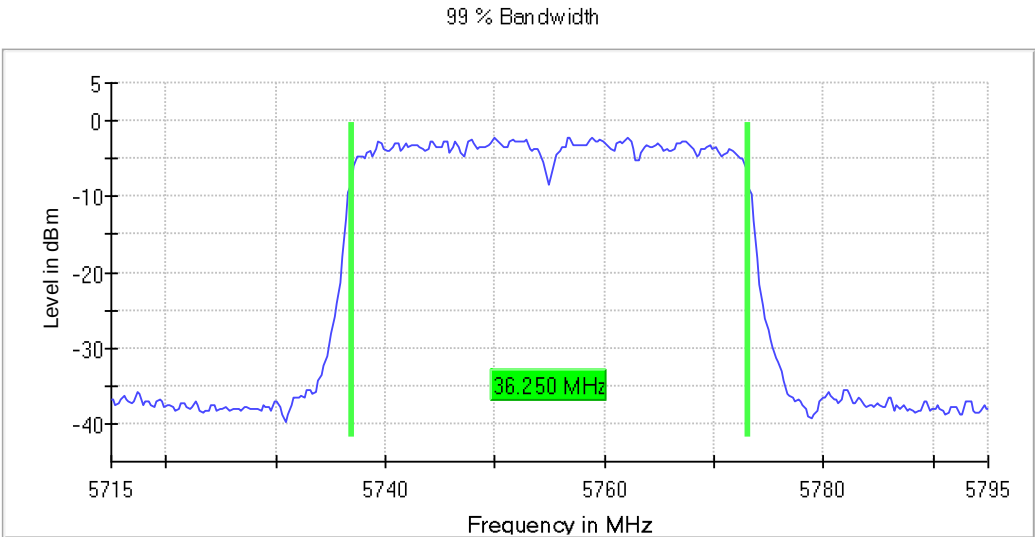


- High Channel 46 (5230 MHz):

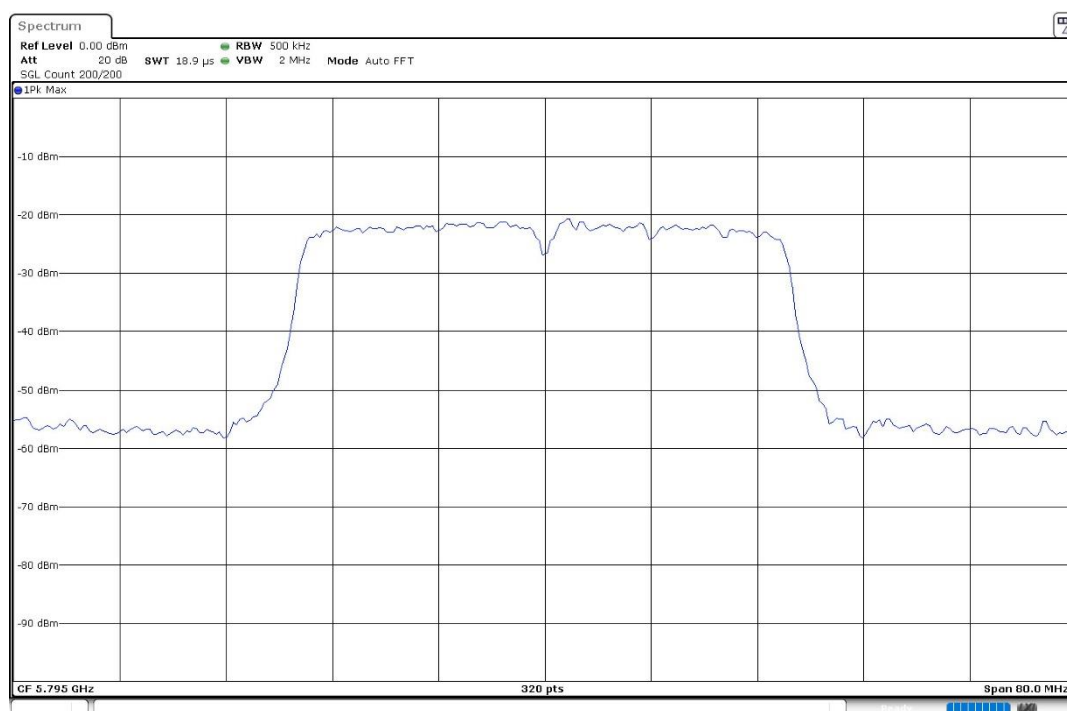
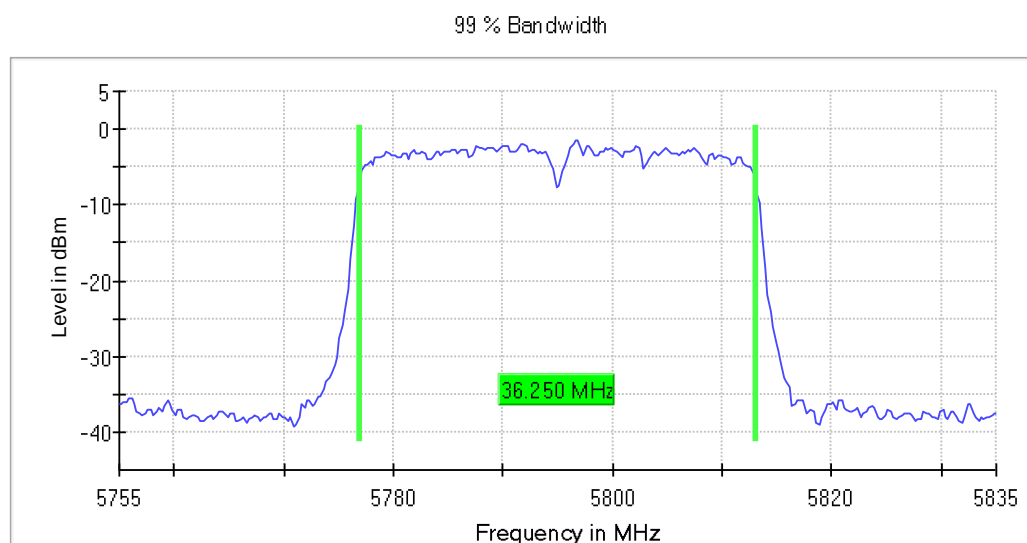


U-NII-3 (5725-5850 MHz)

- Low Channel 151 (5755 MHz):



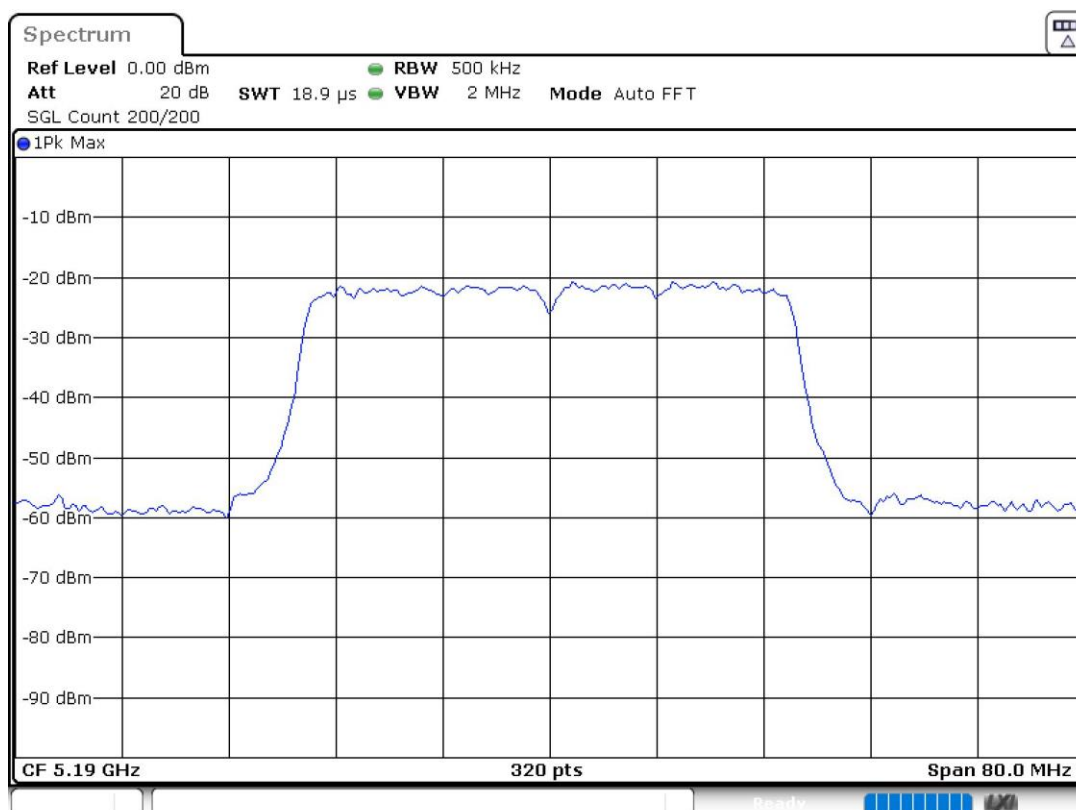
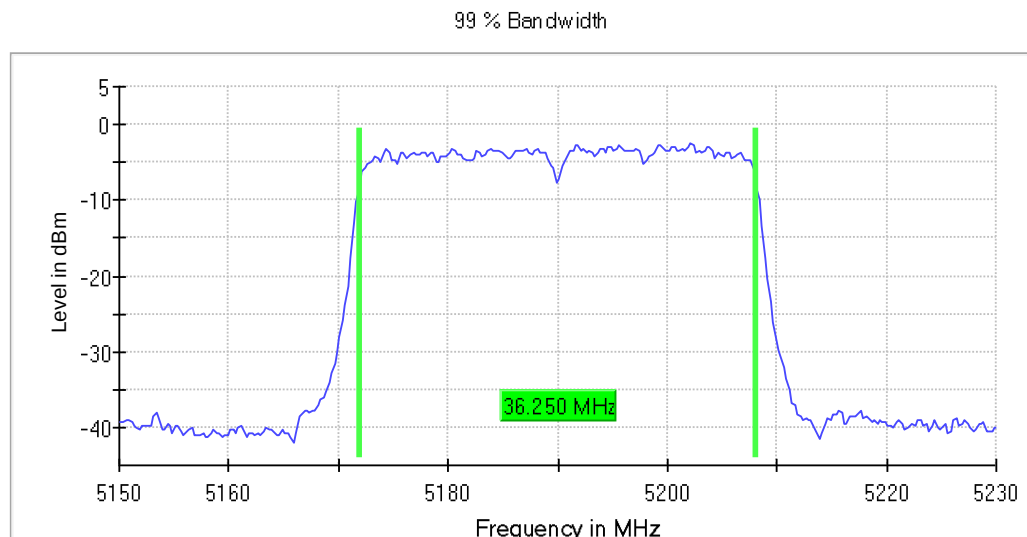
- High Channel 159 (5795 MHz):



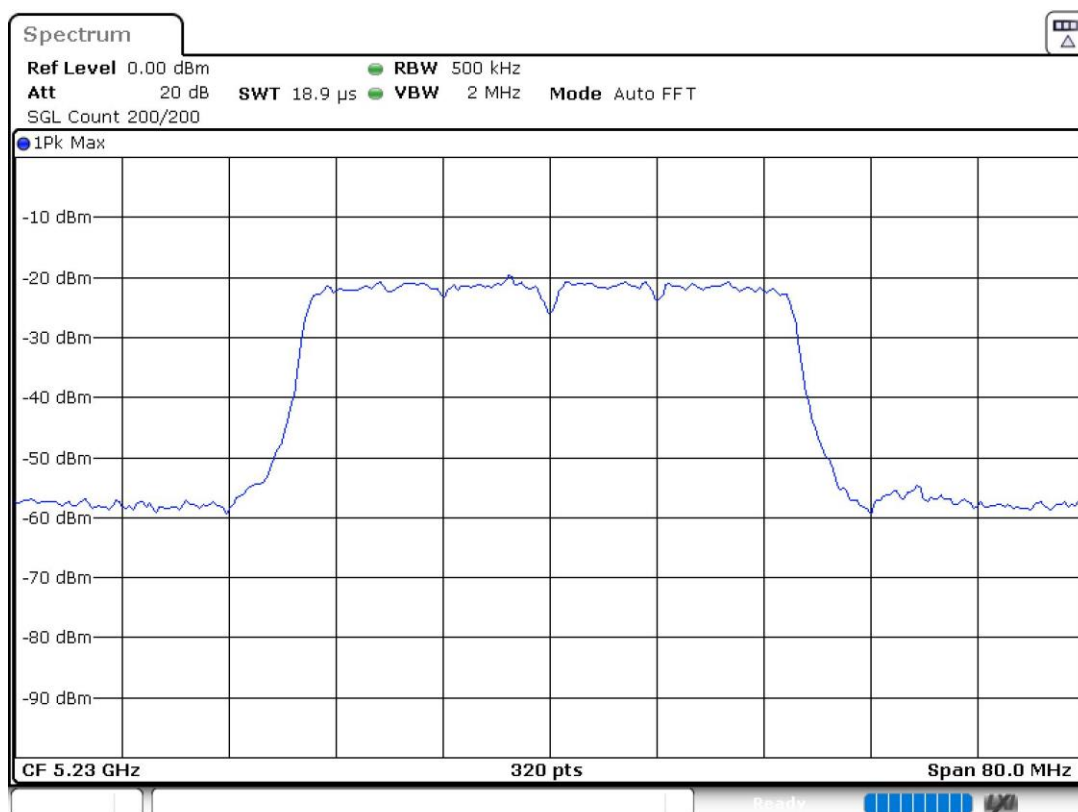
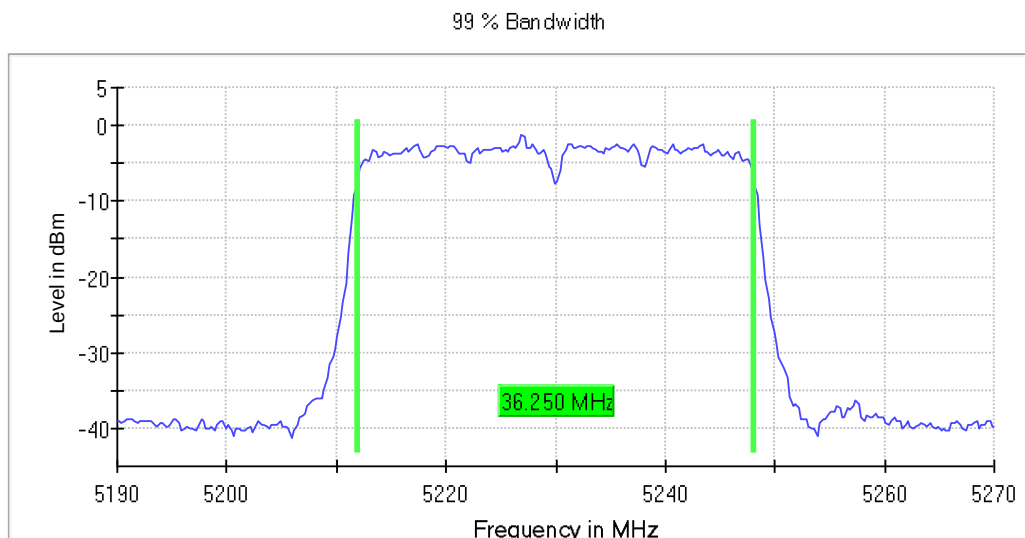
SISO 802.11 ac40 (VHT40):

U-NII-1 (5150-5250 MHz)

- Low Channel 38 (5190 MHz):

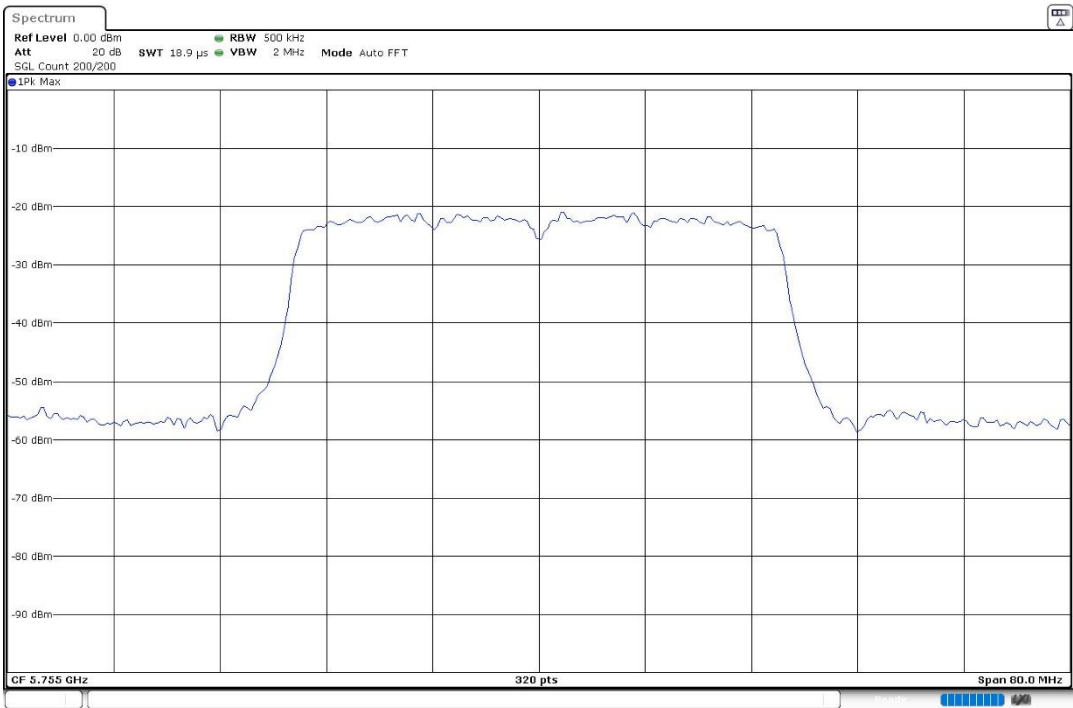
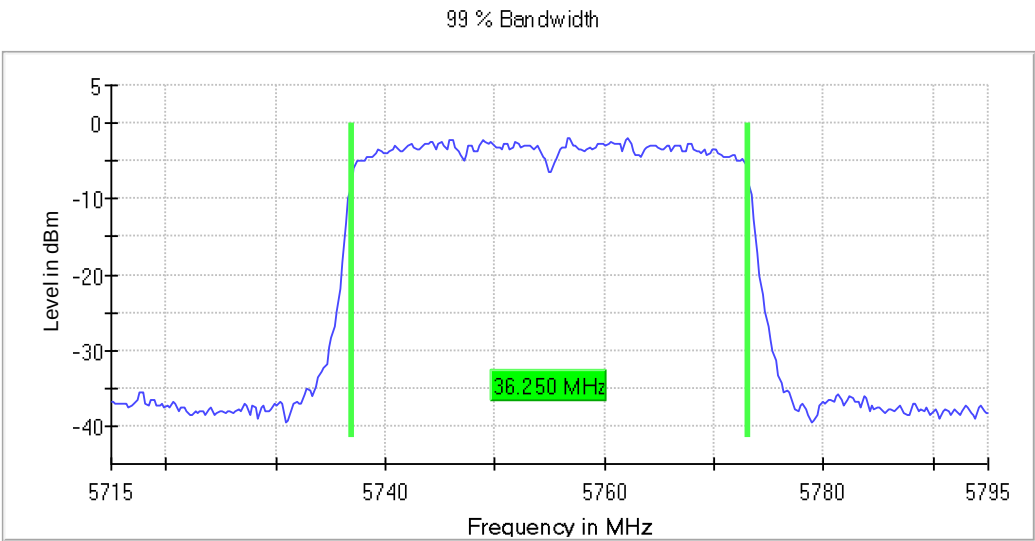


- High Channel 46 (5230 MHz):

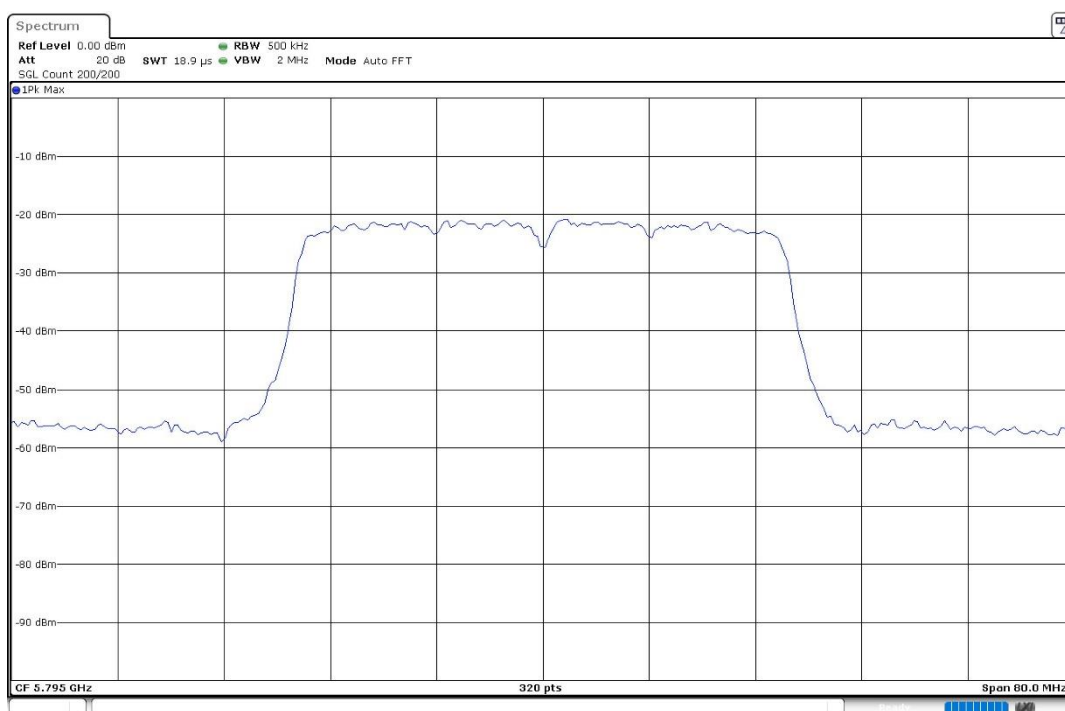
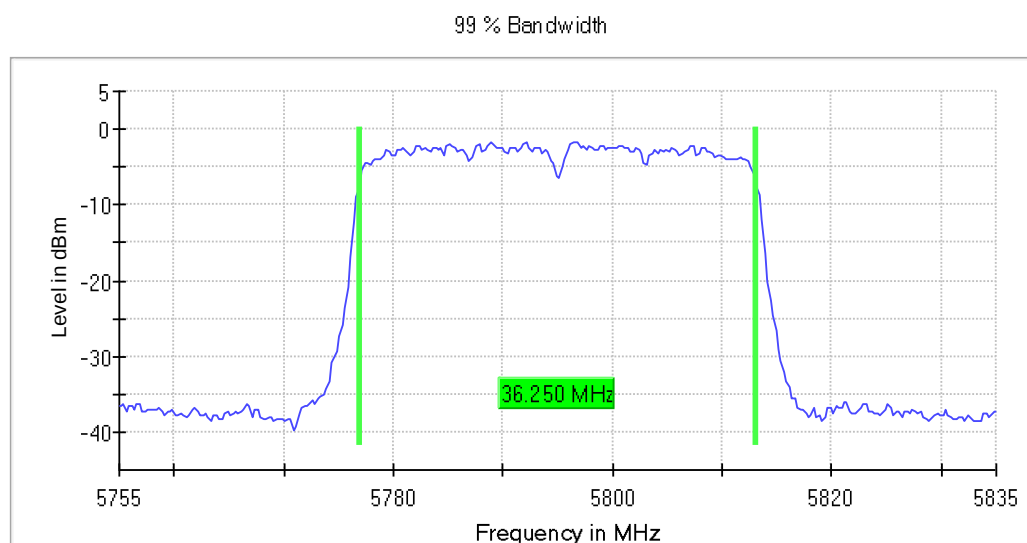


U-NII-3 (5725-5850 MHz)

- Low Channel 151 (5755 MHz):



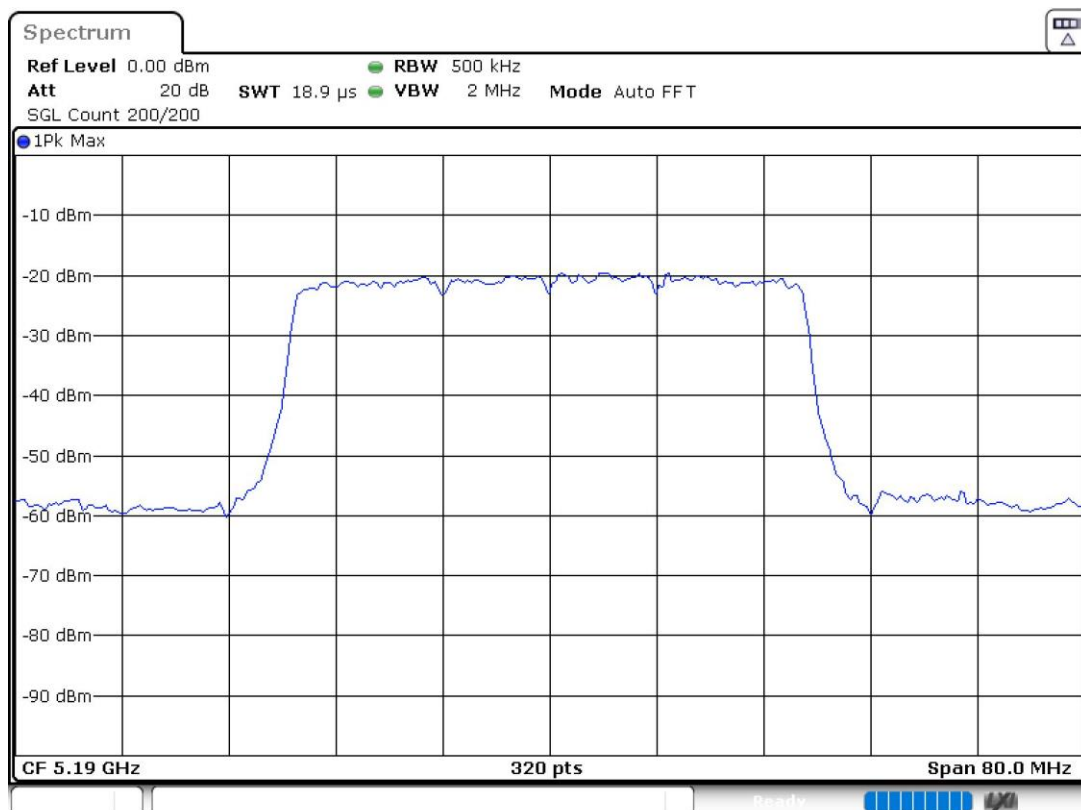
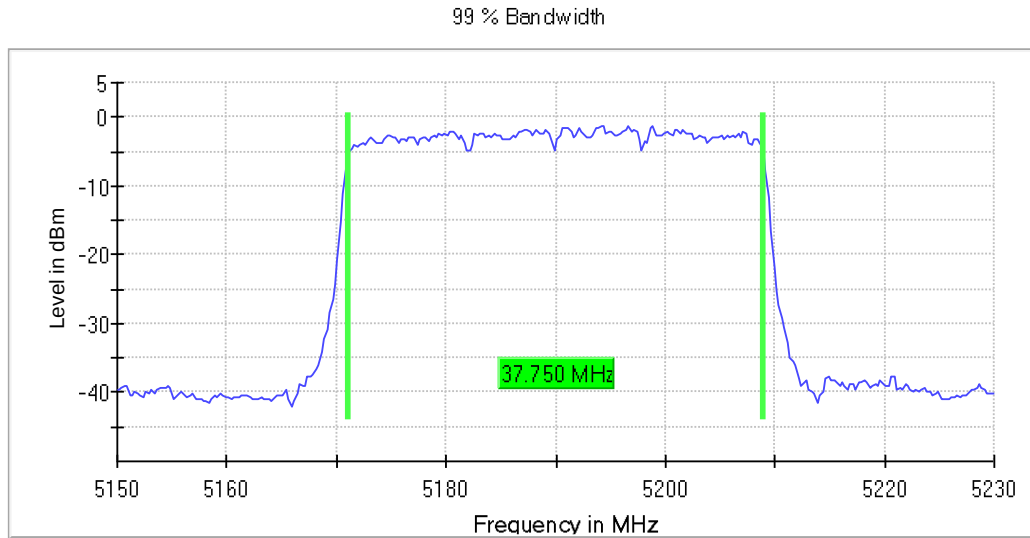
- High Channel 159 (5795 MHz):



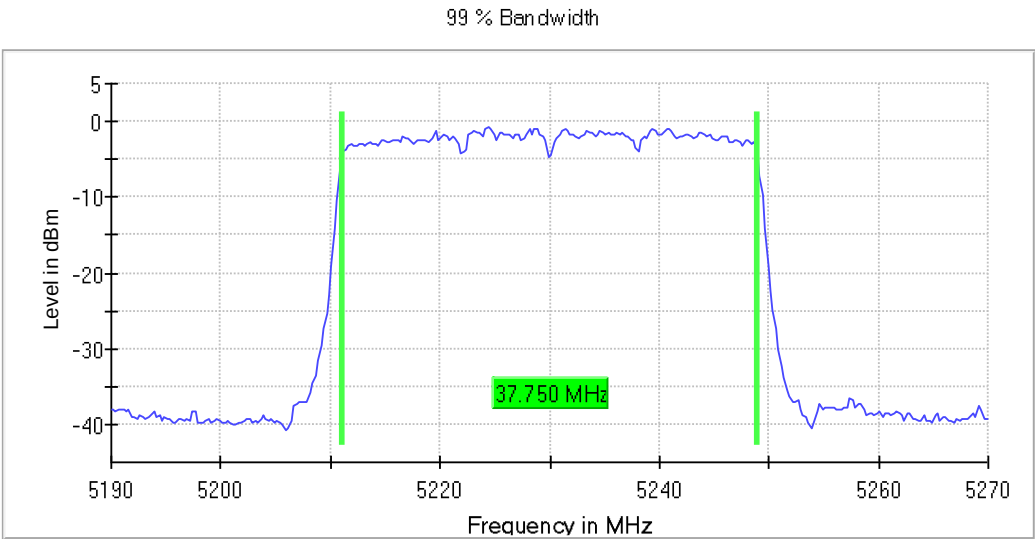
SISO 802.11 ax40 (HE40) – SU Full-channel allocation:

U-NII-1 (5150-5250 MHz)

- Low Channel 38 (5190 MHz):

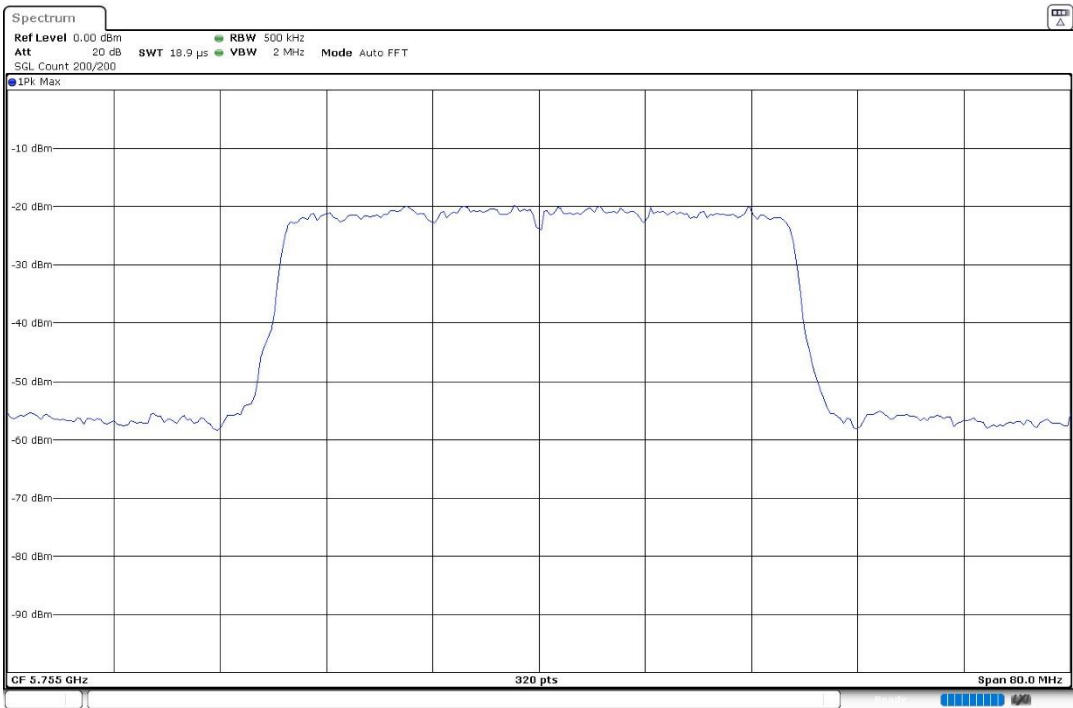
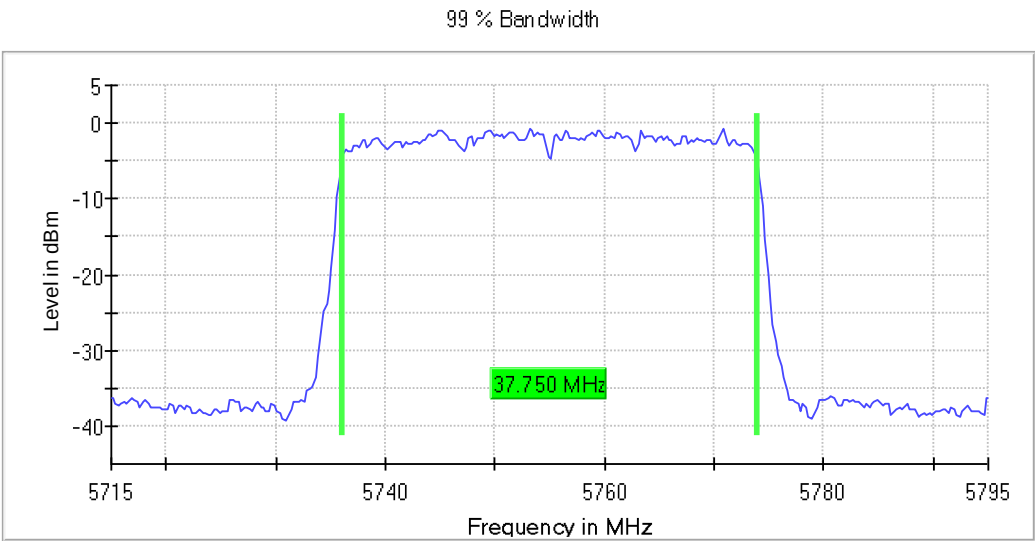


- High Channel 46 (5230 MHz):

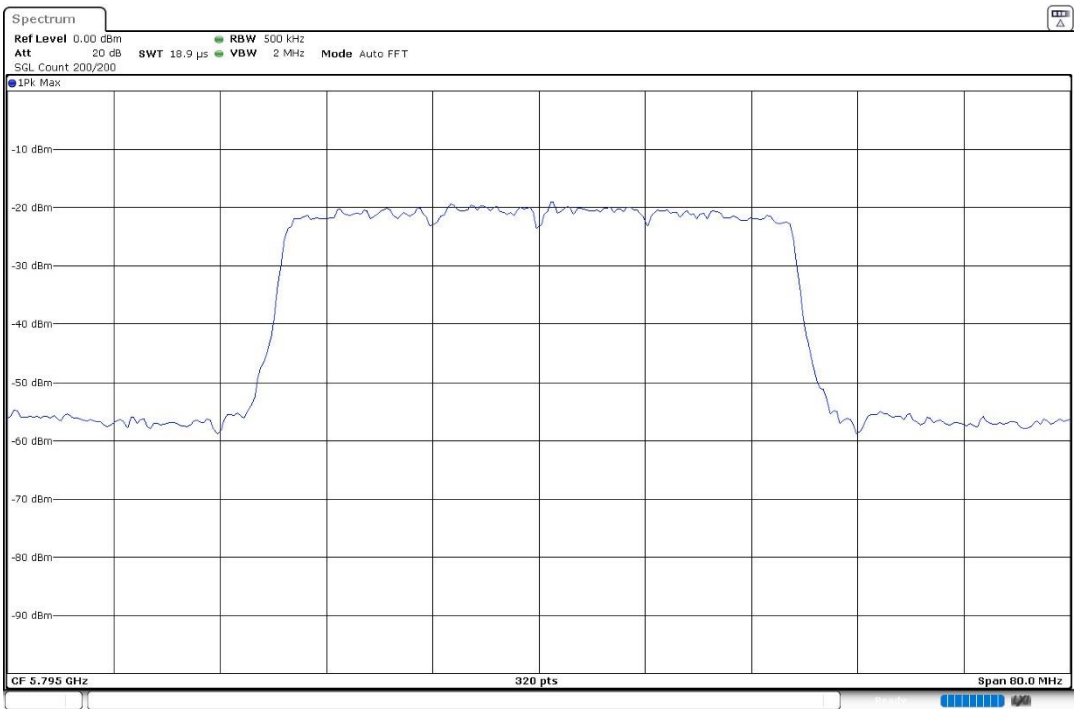
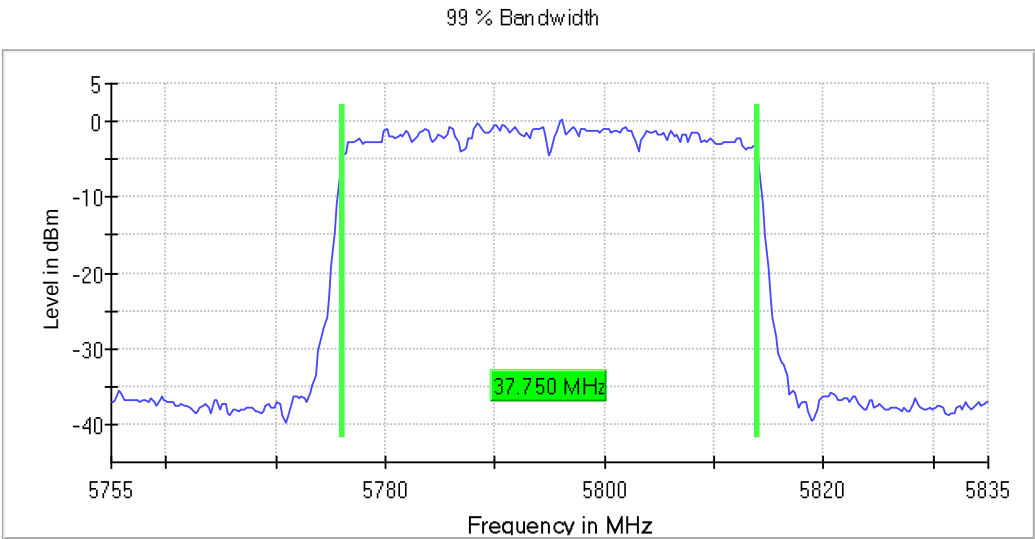


U-NII-3 (5725-5850 MHz)

- Low Channel 151 (5755 MHz):



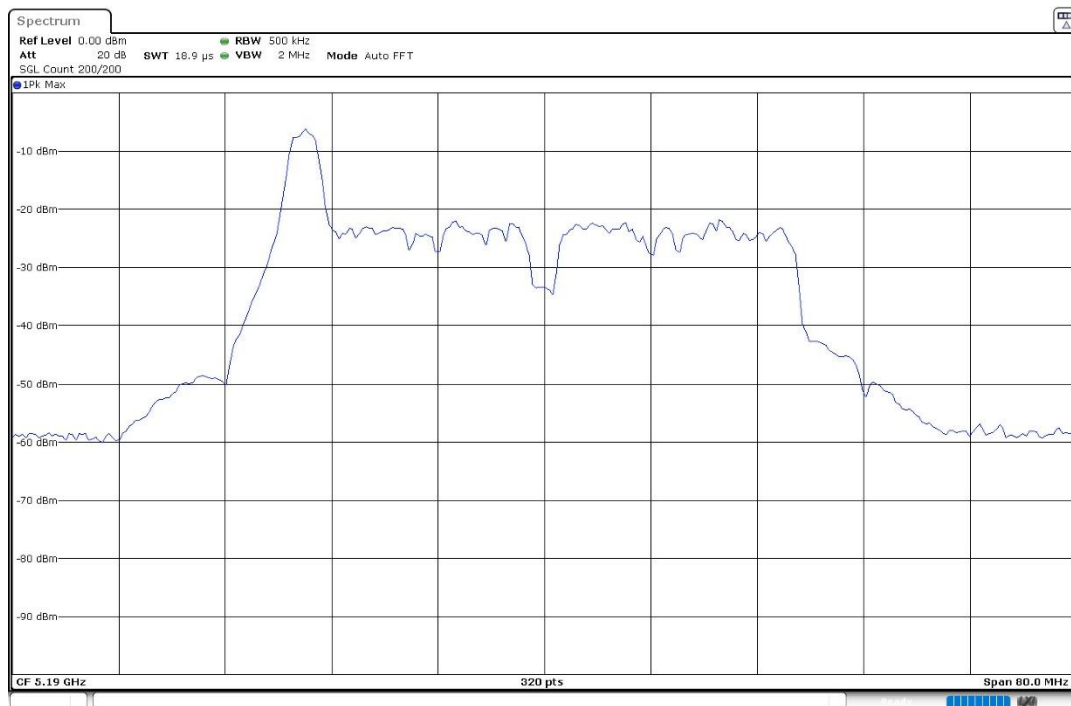
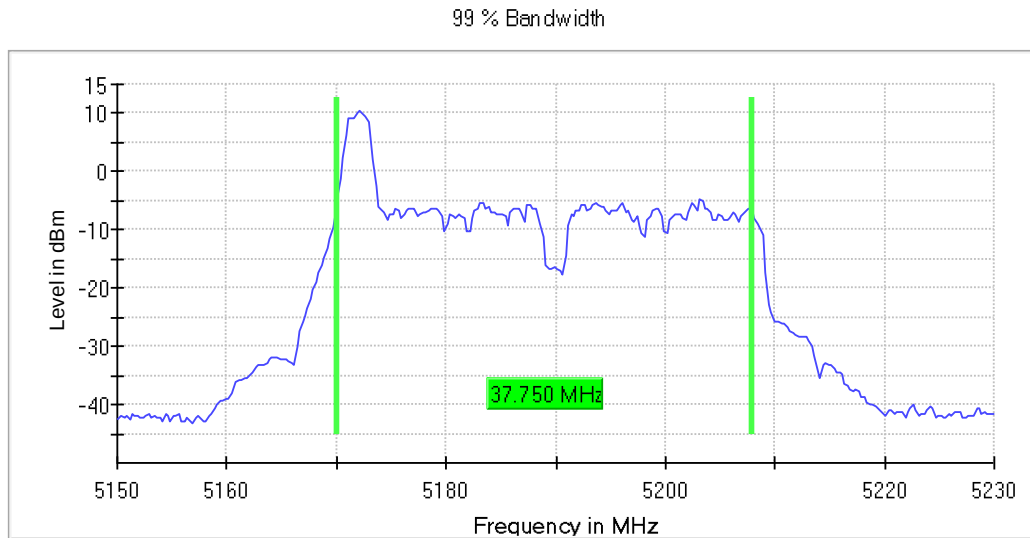
- High Channel 159 (5795 MHz):



SISO 802.11 ax40 (HE40) – RU Subcarrier allocation (RU26):

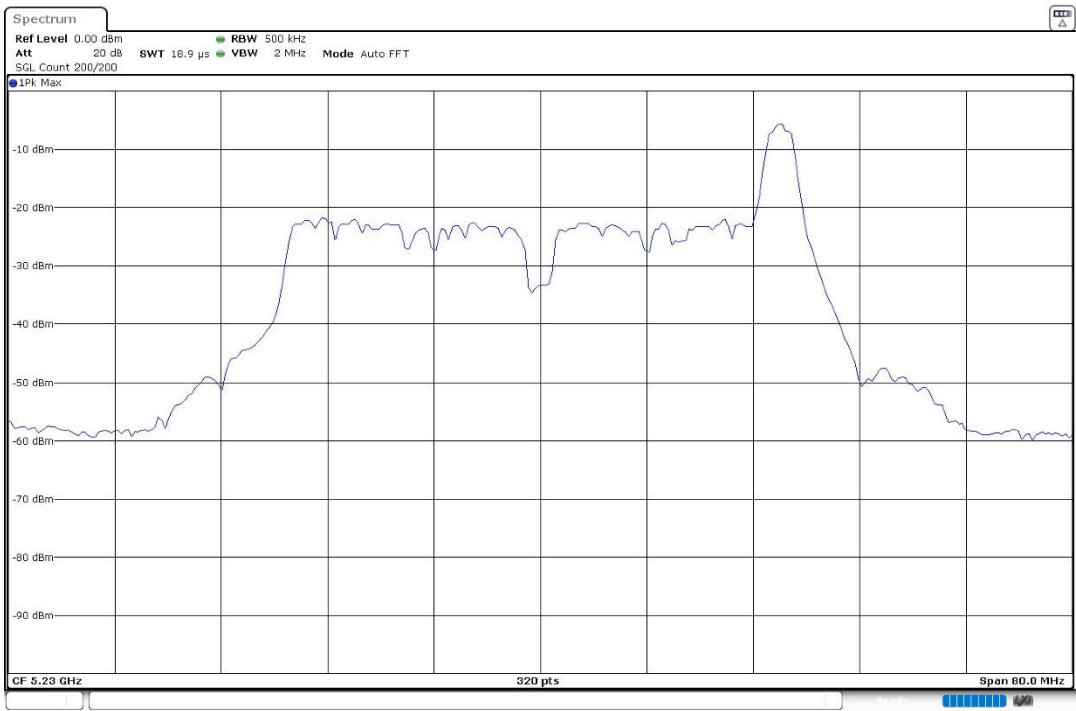
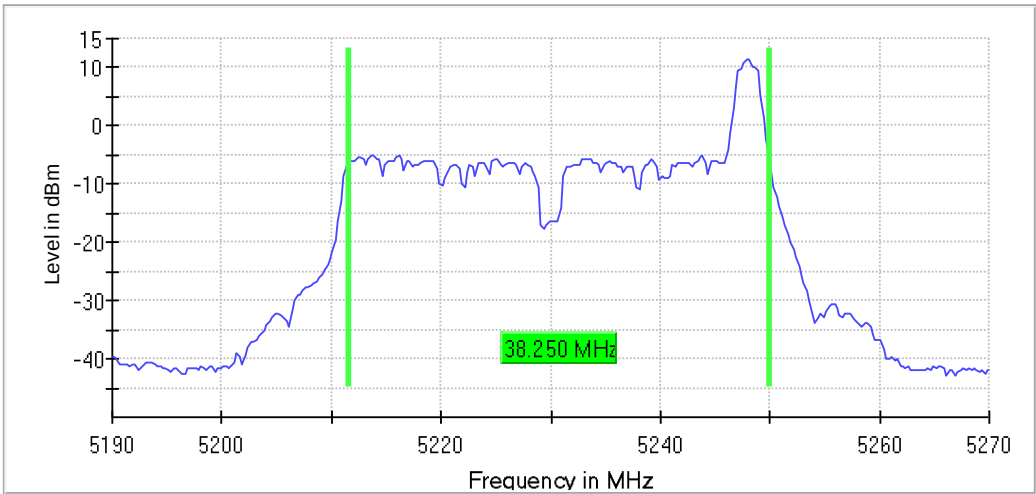
U-NII-1 (5150-5250 MHz)

- Low Channel 38 (5190 MHz) / RU26 Offset 0:



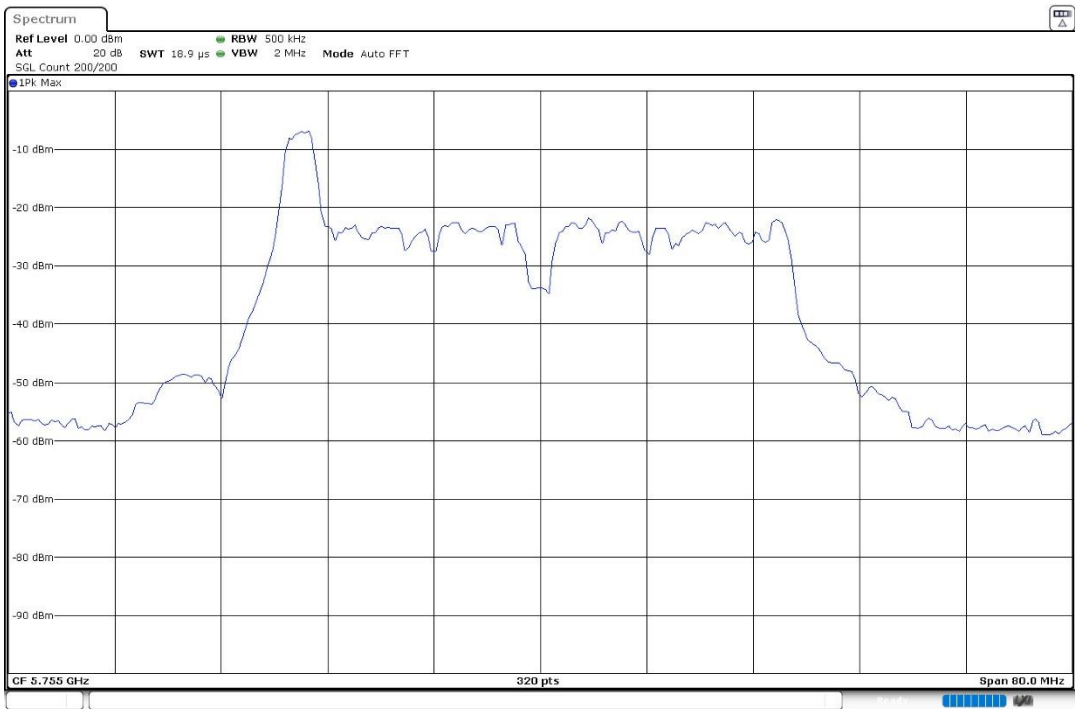
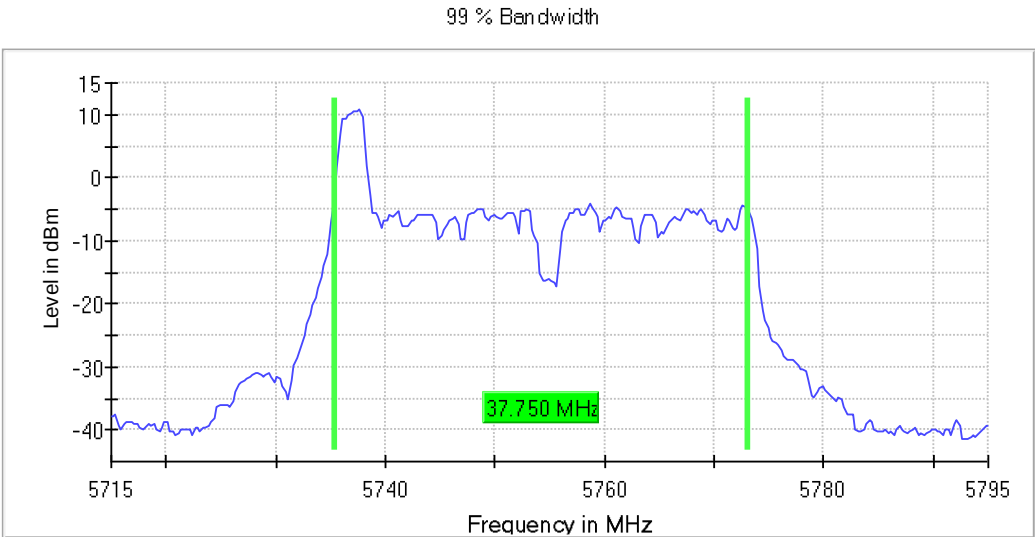
- High Channel 46 (5230 MHz) / RU26 Offset 17:

99 % Bandwidth



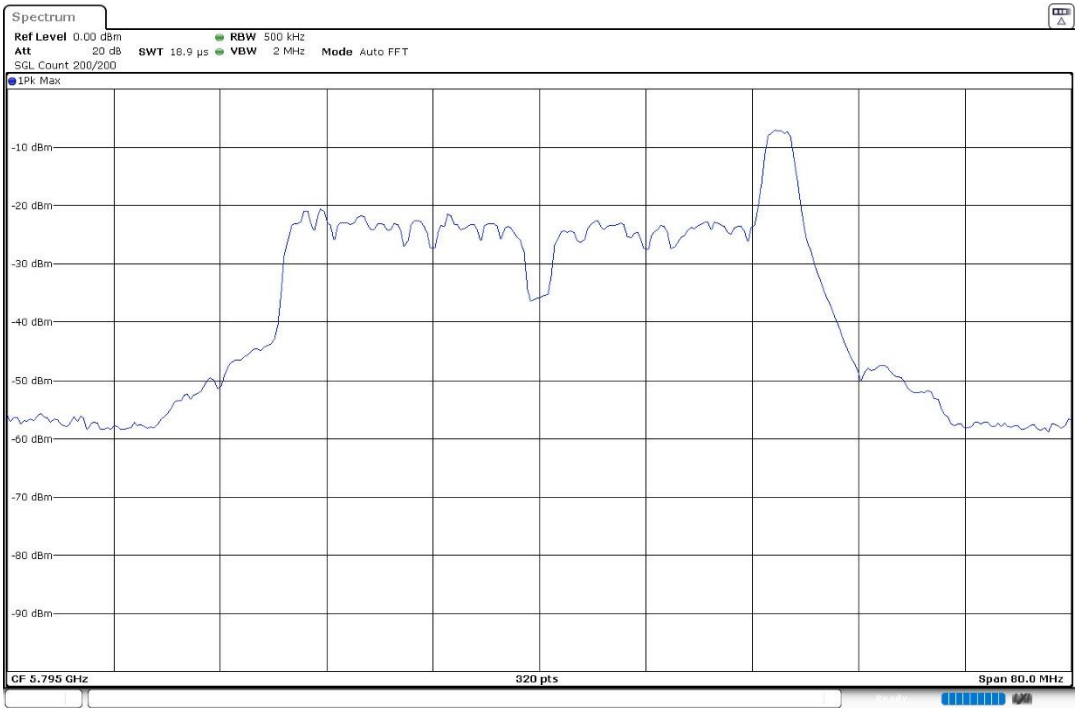
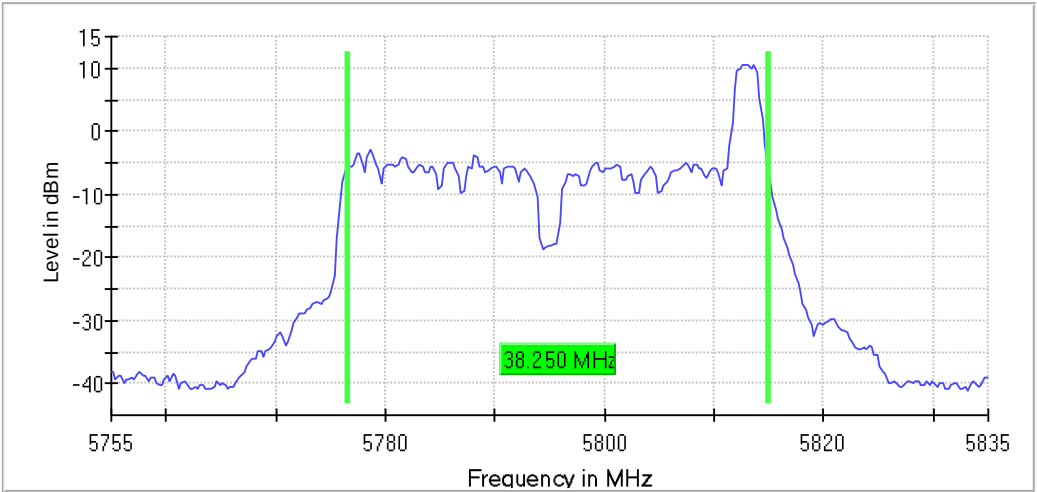
U-NII-3 (5725-5850 MHz)

- Low Channel 151 (5755 MHz) / RU26 Offset 0:



- High Channel 159 (5795 MHz) / RU26 Offset 17:

99 % Bandwidth

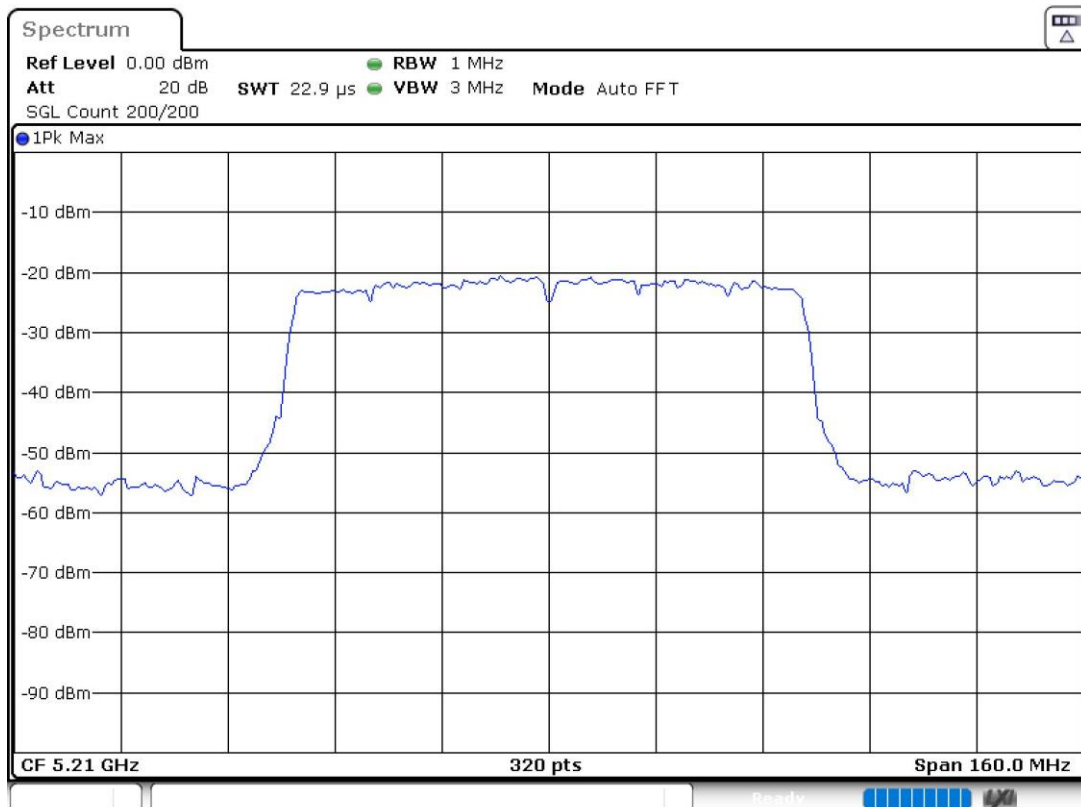
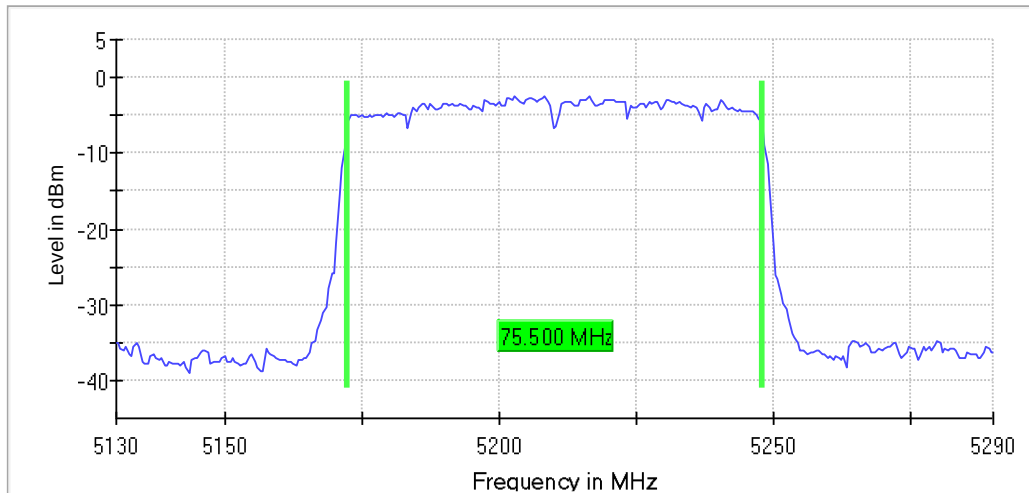


SISO 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

- Single Channel 42 (5210 MHz):

99 % Bandwidth



U-NII-3 (5725-5850 MHz)

- Single Channel 155 (5775 MHz):

