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Competences and guarantees

DEKRA Testing and Certification 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 covers the performed tests in this report.

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

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

DEKRA Testing and Certification 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 at the time of performance of the test.

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

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

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
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 ≤ ±5.35 dB (with factor k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 1 GHz to 17 GHz is: Measurement uncertainty ≤ ±4.32 dB (with factor k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 17 GHz to 40 GHz is: Measurement uncertainty ≤ ±5.72 dB (with factor k = 2).

The total uncertainty of the measurement system for the conducted testing of EUT is:
RF Output Power: Measurement uncertainty ≤ ±0.99 dB
Power Spectral Density: Measurement uncertainty ≤ ±0.99 dB
6dB Bandwidth: Measurement uncertainty ≤ ±1.14 %
26dB Emission Bandwidth: Measurement uncertainty ≤ ±1.20%
Occupied Channel Bandwidth: Measurement uncertainty ≤ ±1.41 %

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 an automotive infotainment System. The main functionalities are: Navigation, DVD/CD, HDD, USB, voice recognition, different interfaces to the car, Bluetooth and WLAN.

   The Head-unit provides different interfaces like: Auxiliary input, Video In, Video Out APIX3 (for the connection of an external Display), 3 USB interfaces (including support for Apple devices), CAN and 100Base-T1.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of 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	71290C_37.1	Automotive infotainment System	MGU FQ	B49289N055000036	2022-04-11	Equipment Under Test
S/01	71290C_29.1	Power harness	--	--	2022-04-11	Equipment Under Test
S/01	71290C_31.1	BT/WLAN Antenna	--	--	2022-04-11	Equipment Under Test
S/01	71290C_32.1	BT/WLAN Antenna	--	--	2022-04-11	Equipment Under Test
S/01	71290C_26.1	Power cable DC	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_27.1	Ethernet Cable	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_28.1	OABR_converter board	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_30.1	OABR_converter cable	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_33.1	Adapter Fakra Z jack-SMA Plug	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_34.1	Adapter Fakra Z jack-SMA Plug	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_35.1	SMA Adapter	--	--	2022-04-11	Auxiliary Equipment
S/01	71290C_36.1	SMA Adapter	--	--	2022-04-11	Auxiliary Equipment
S/02	71290C_37.1	Automotive infotainment System	MGU FQ	B49289N055000036	2022-04-11	Equipment Under Test
S/02	71290C_29.1	Power harness	--	--	2022-04-11	Equipment Under Test
S/02	71290C_26.1	Power cable DC	--	--	2022-04-11	Auxiliary Equipment

Id	Control Number	Description	Model	Serial No.	Date of Reception	Application
S/02	71290C_27.1	Ethernet Cable	--	--	2022-04-11	Auxiliary Equipment
S/02	71290C_30.1	OABR_converter cable	--	--	2022-04-11	Auxiliary Equipment
S/02	71290C_33.1	Adapter Fakra Z jack-SMA Plug	--	--	2022-04-11	Auxiliary Equipment
S/02	71290C_34.1	Adapter Fakra Z jack-SMA Plug	--	--	2022-04-11	Auxiliary Equipment
S/02	71290C_40.1	OABR_converter board	--	--	2022-04-11	Auxiliary Equipment

Notes referenced to samples during the project:

Id	Type
S/01	Sample for radiated tests.
S/02	Sample for conducted tests.

Test sample description

Ports…… :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)
	BT/WIFI connector – 2X 1 POL ROS 59S2BT-40MA5-1		☒	☒	☐
	USB1 connector – CONM-SM 4POL ROS D4S20Y-40MA5-B		☐	☒	☐
	USB2 connector – CONM-SM 4POL ROS D4S20Y-40MA5-C		☐	☒	☐
	USB3 connector – CONM-SM 4POL ROS D4S20Y-40MA5-E		☐	☒	☐
	APIX3 connector – CONM-SM 4+2POL ROS 99S22A-40MA5-D		☒	☐	☐
	Car Main-connector – CONM 16POL TYC 2300483-s		☒	☐	☐
	AR-CAM connector – CONM 1POL ROS 59S2FT-40MA5-K		☐	☐	☐
	Ethernet BroadR-Reach, 100 BASE-T1		☒	☐	☐
	Ethernet, 1000 BASE-T1		☐	☐	☐
	GNSS connector 1 POL ROS 59S2BT-40MA5-C		☒	☒	☐
	--				

Supplementary information to the ports…… :							
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 13.2 Vdc					
Rated Power .....:	-						
Clock frequencies.....:	-						
Other parameters .....:	-						
Software version .....:	490S_22w09.4-1						

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

(3) Only for Medical Equipment

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH

BECKER-GOERING-STR. 16

76307 KARLSBAD, GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-04-25
Date (finish)	2022-07-14

Document history

Report number	Date	Description
71290RRF.010	2022-10-14	First release
71290RRF.010A1	2022-11-23	Second release, modification due to typos and missing info. This modification test report cancels and replaces the test report 71290RRF.010

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Nicolás Salguero and Javier Miguel Nadales.

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 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2023-08-20
POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	N.A.
DIGITAL MULTIMETER	179	FLUKE	2022-10-19
EMC/RF MEASUREMENT SOFTWARE	WMS32	ROHDE AND SCHWARZ	N.A.
SEMIANECHOIC ABSORBER LINED CHAMBER II	FACT 3 200 STP	ETS LINDGREN	2023-08-28
SHIELDED ROOM	S101	ETS LINDGREN	N.A.

Equipment	Model	Manufacturer	Next Calibration
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	2023-03-17
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.
EMC/RF MEASUREMENT SOFTWARE	EMC32	ROHDE AND SCHWARZ	N.A.

(*) Used for radiated tests before expiration of the calibration period.

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

B. U-NII-1 Band: 5.15 – 5.25 GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.407 (a)(1)(iv)	Transmitter Maximum conducted Output Power	P	--
RSS-247 6.2.1.1	Transmitter Maximum Equivalent Isotropically Radiated Power EIRP	P	--
FCC 15.407 (a)(1)(iv)	Transmitter Maximum Power Spectral Density	P	--
RSS-247 6.2.1.1	Transmitter EIRP Spectral Density	P	--
FCC 15.407 (b)(1) / RSS-247 6.2.1.2	Transmitter Out of Band Radiated Emissions	P	--
FCC 15.407 (b)(1) / RSS-247 6.2.1.2	Transmitter Band Edge Radiated Emissions	P	--
Supplementary information and remarks: None.			

C. U-NII-3 Band: 5.725 – 5.85 GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum conducted Output Power	P	--
FCC 15.247 (e) / RSS-247 6.2.4.1	6 dB bandwidth.	P	--
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum Power Spectral Density	P	--
FCC 15.407 (b)(4) / RSS-247 6.2.4.2	Transmitter Band Edge Radiated Emissions	P	--
FCC 15.407 (b)(4) / RSS-247 6.2.4.2	Transmitter Out of Band Radiated Emissions	P	--
Supplementary information and remarks: None.			

Appendix A: Test Common requirements for all bands

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Transmitter. Duty Cycle

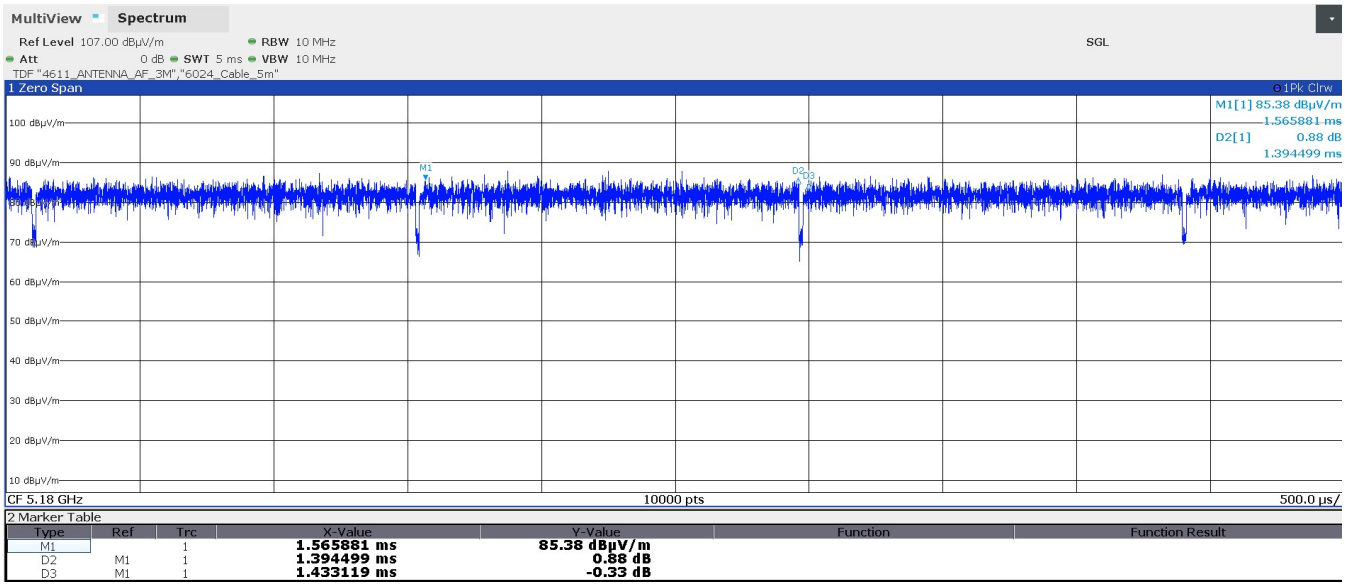
Results

Mode	Sub-band U-NII-1			Sub-band U-NII-3		
	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction (dB)	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction (dB)
802.11a20	1.3945	1.4331	0.12	1.3990	1.4325	0.10
802.11n20	1.2862	1.3412	0.18	1.3057	1.3418	0.12
802.11ac20	1.3151	1.3491	0.11	1.3266	1.3496	0.07
802.11n40	0.6310	0.6473	0.11	0.6309	0.6678	0.25
802.11ac40	0.6414	0.6750	0.22	0.6394	0.6755	0.24
802.11ac80	0.3149	0.3313	0.22	0.3229	0.3392	0.21

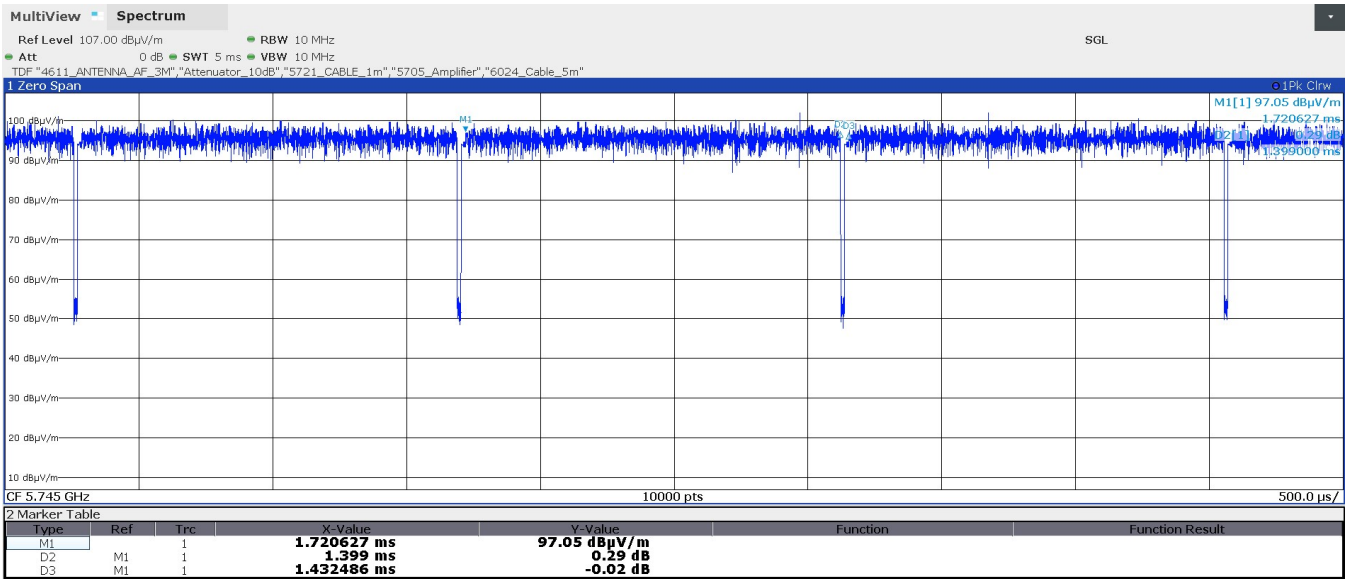
Attachments

Mode 802.11a20 (6 Mbps):

U-NII-1 (5150-5250 MHz)

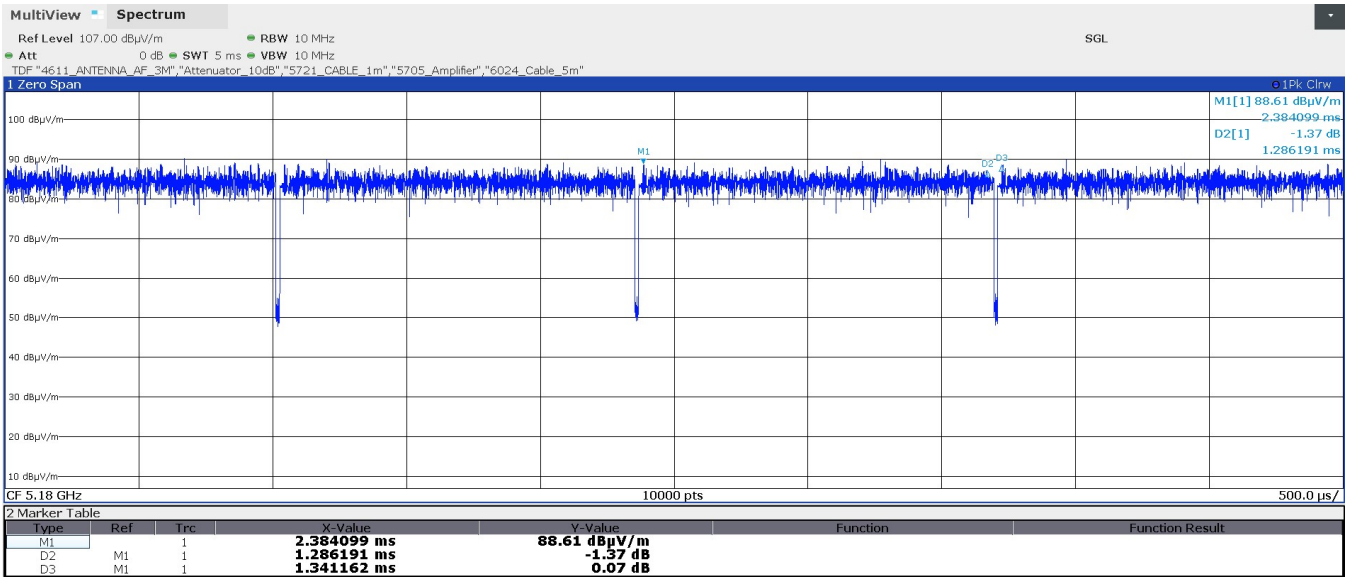


U-NII-3 (5725-5850 MHz)

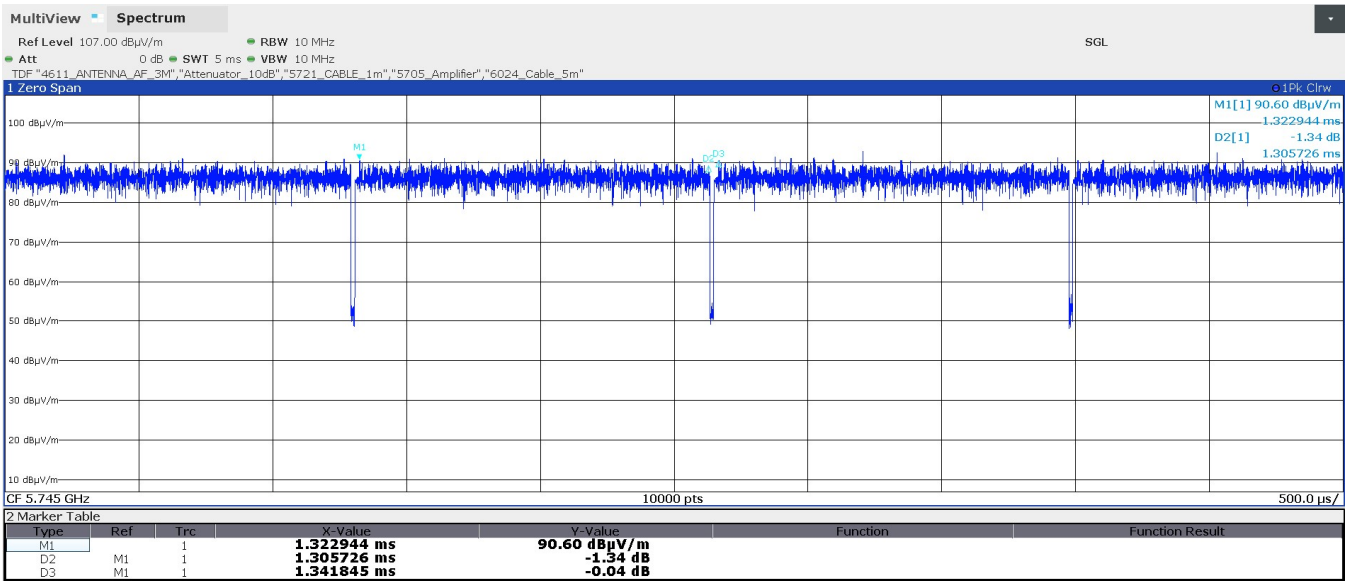


Mode 802.11n20 (HT20 MCS0)

U-NII-1 (5150-5250 MHz)

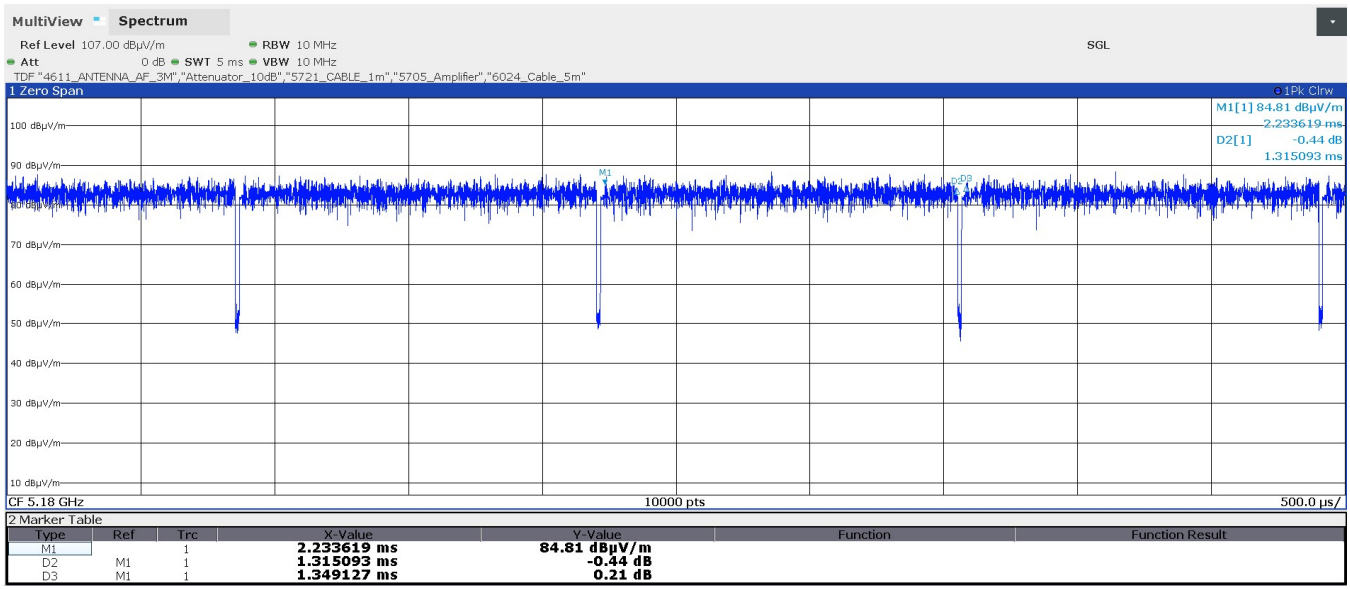


U-NII-3 (5725-5850 MHz)

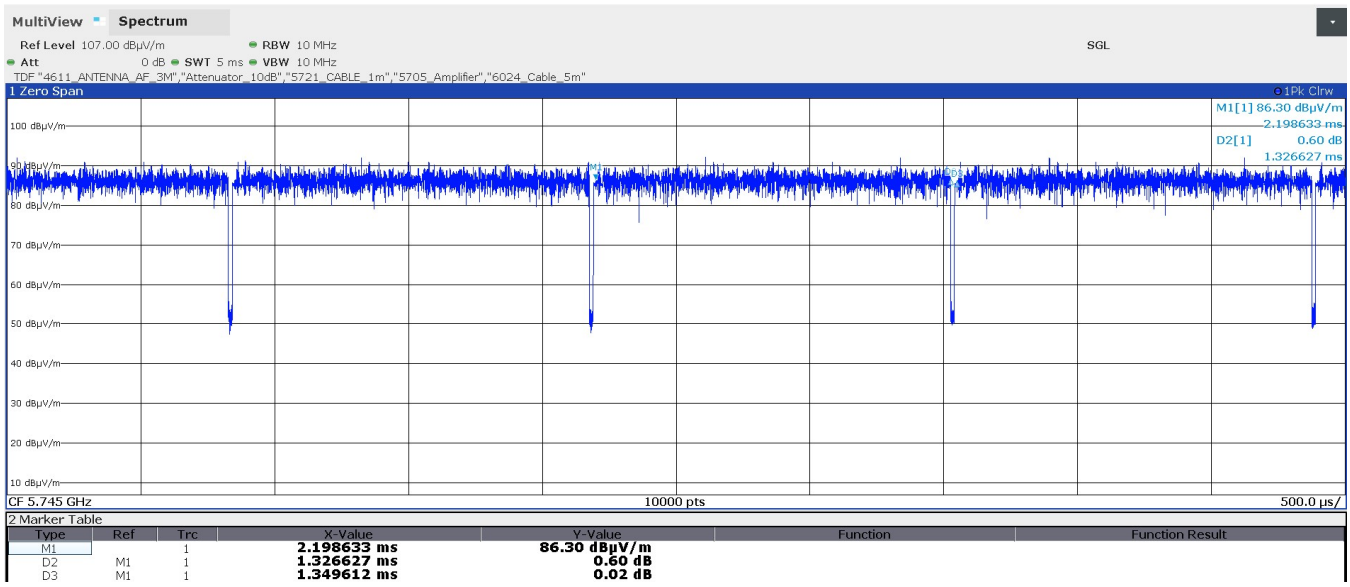


Mode 802.11ac20 (VHT20 MCS0)

U-NII-1 (5150-5250 MHz)

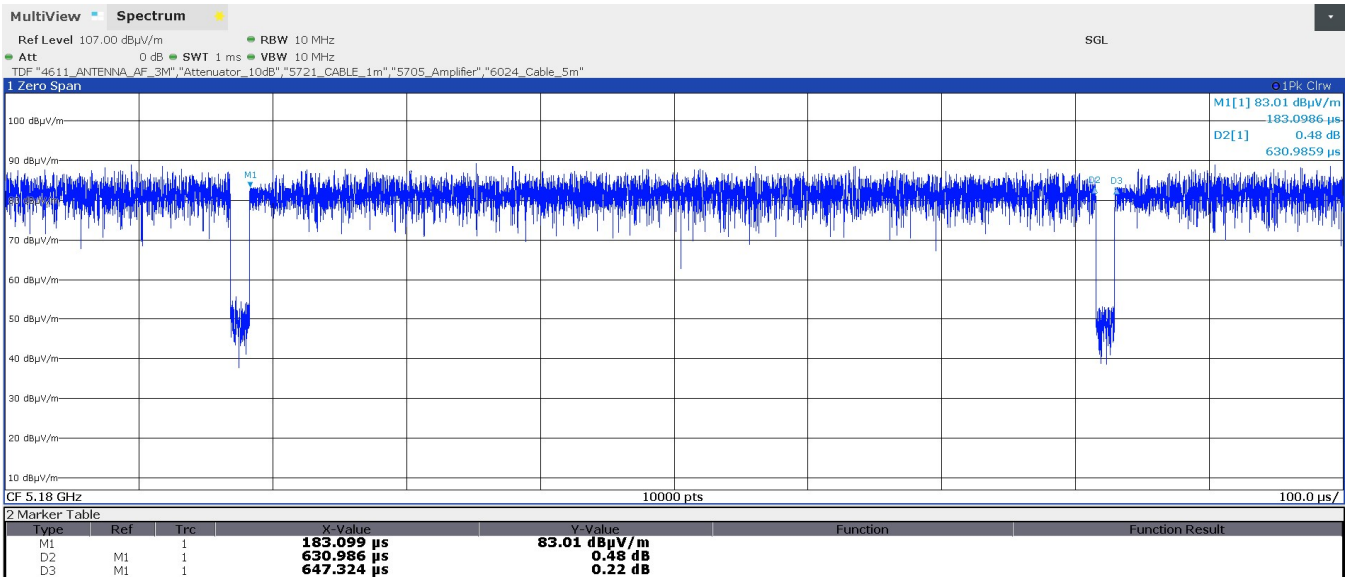


U-NII-3 (5725-5850 MHz)

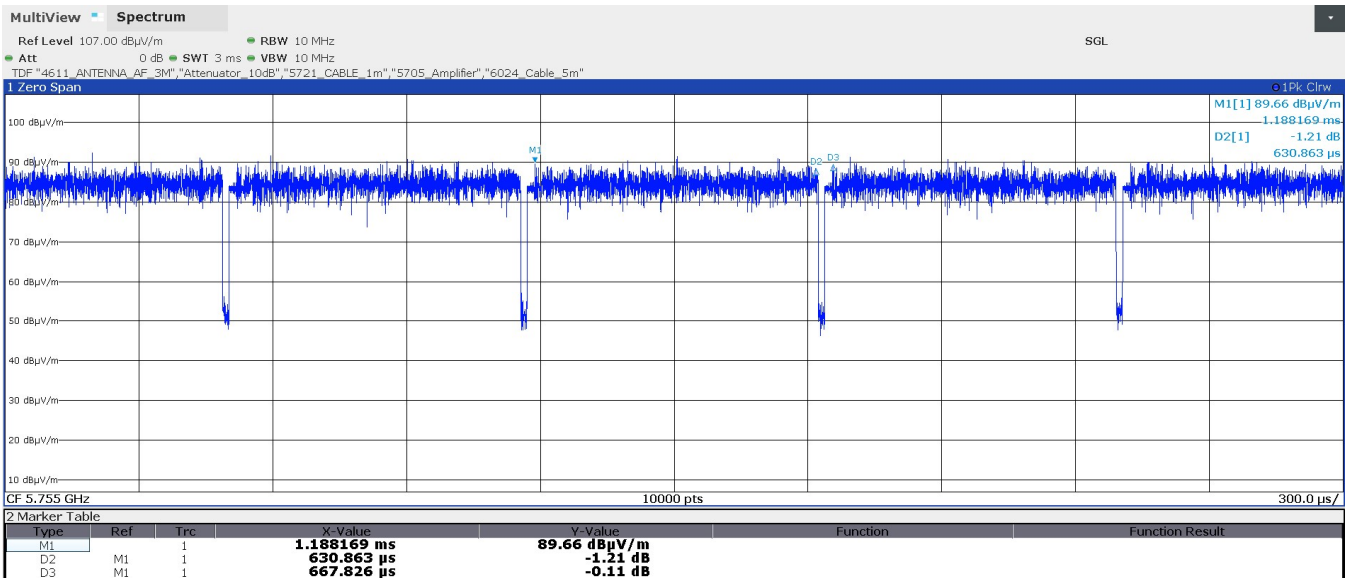


Mode 802.11n40 (HT40 MCS0)

U-NII-1 (5150-5250 MHz)

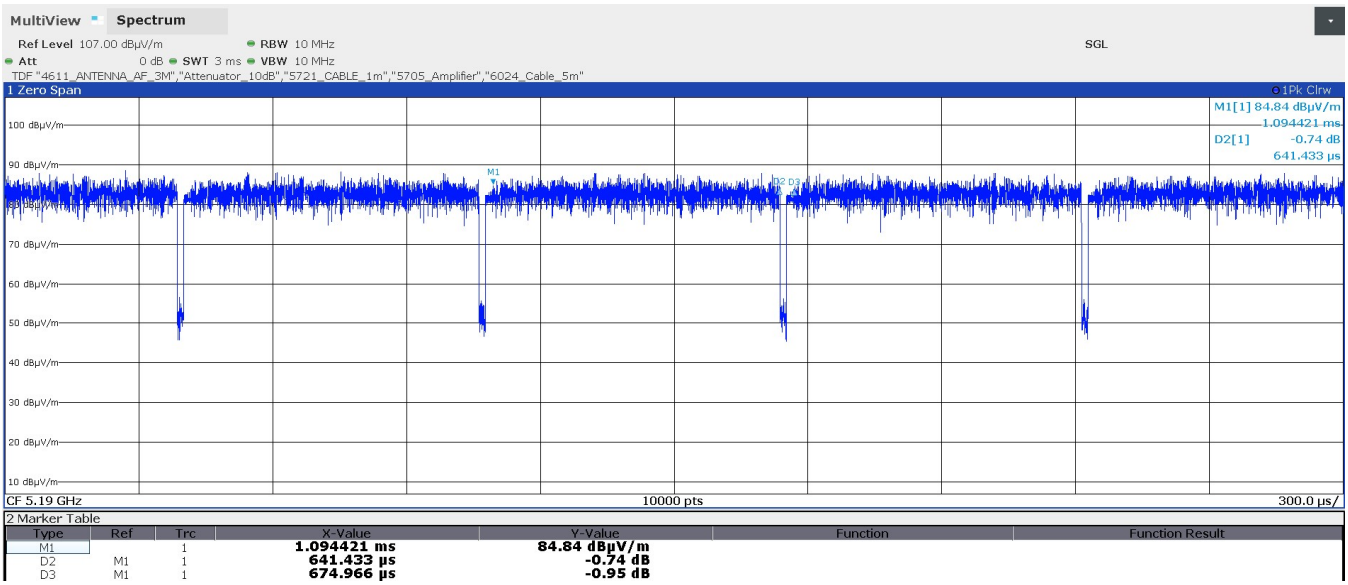


U-NII-3 (5725-5850 MHz)

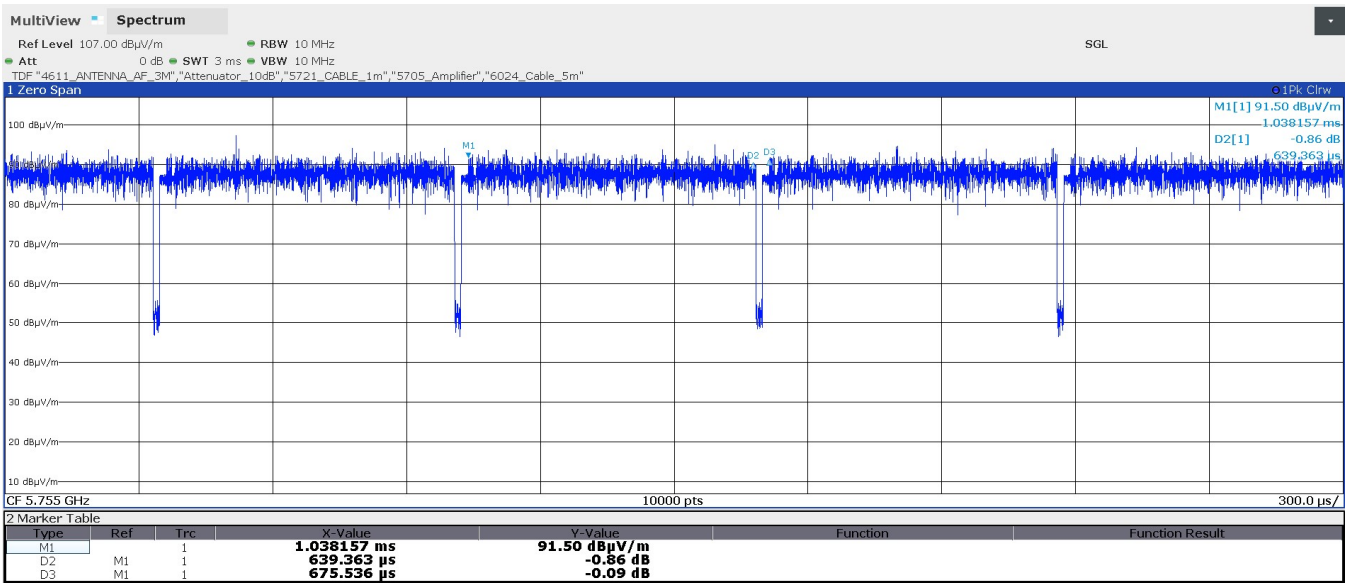


Mode 802.11ac40 (VHT40 MCS0)

U-NII-1 (5150-5250 MHz)

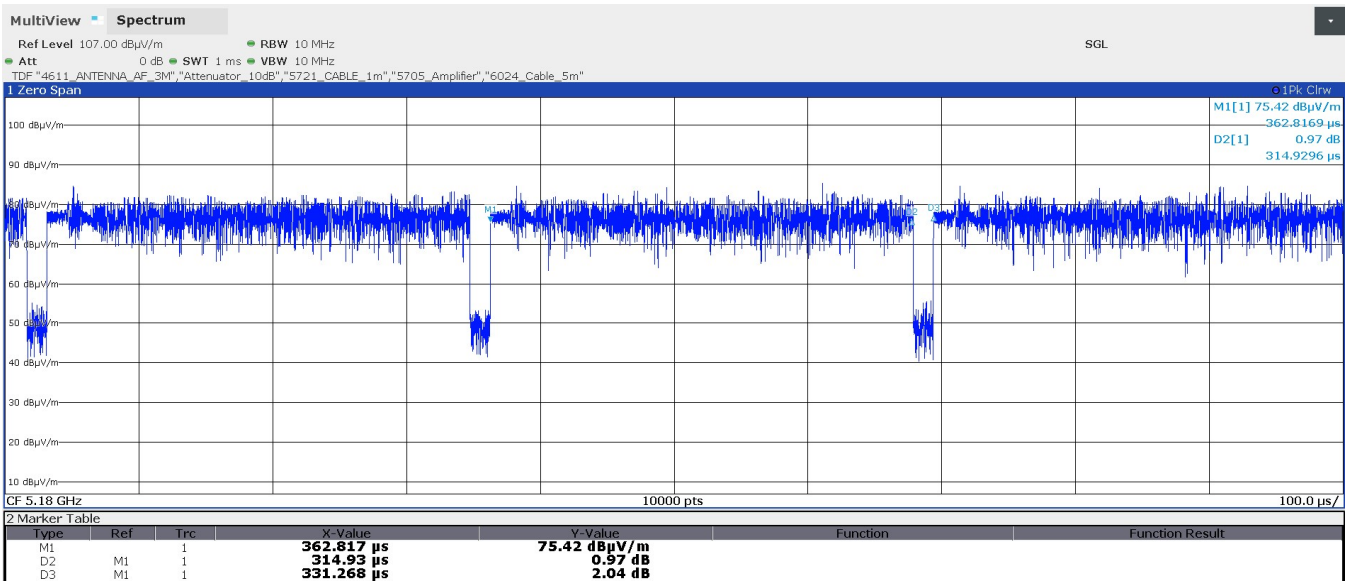


U-NII-3 (5725-5850 MHz)

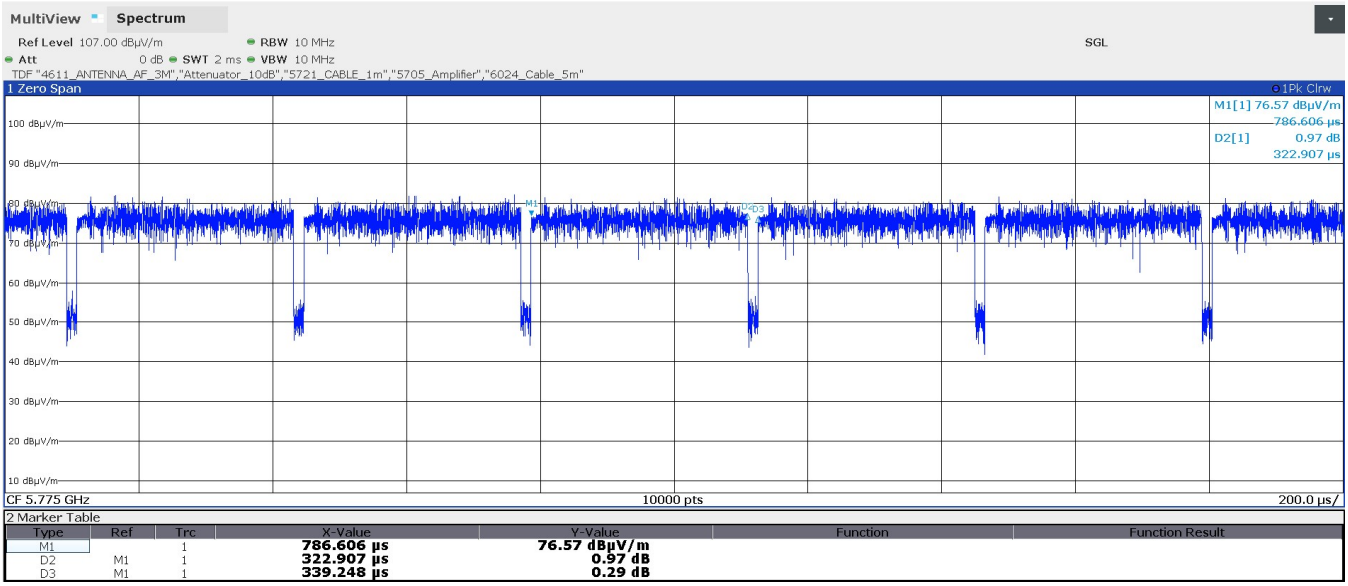


Mode 802.11ac80 (VHT80 MCS0)

U-NII-1 (5150-5250 MHz)



U-NII-3 (5725-5850 MHz)



Transmitter. 99% Occupied Bandwidth

Results

Mode 802.11 a20:

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	16.70	16.60	16.70

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)	16.70	16.70	16.70

Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.70	17.70	17.70

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)	17.70	17.70	17.70

Mode 802.11 ac20 (VHT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.70	17.70	17.70

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)	17.60	17.70	17.60

Mode 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)	36.25	36.25

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.50	36.25

Mode 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)	36.25	36.25

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.50	36.25

Mode 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	76.50

U-NII-3 (5725-5850 MHz)

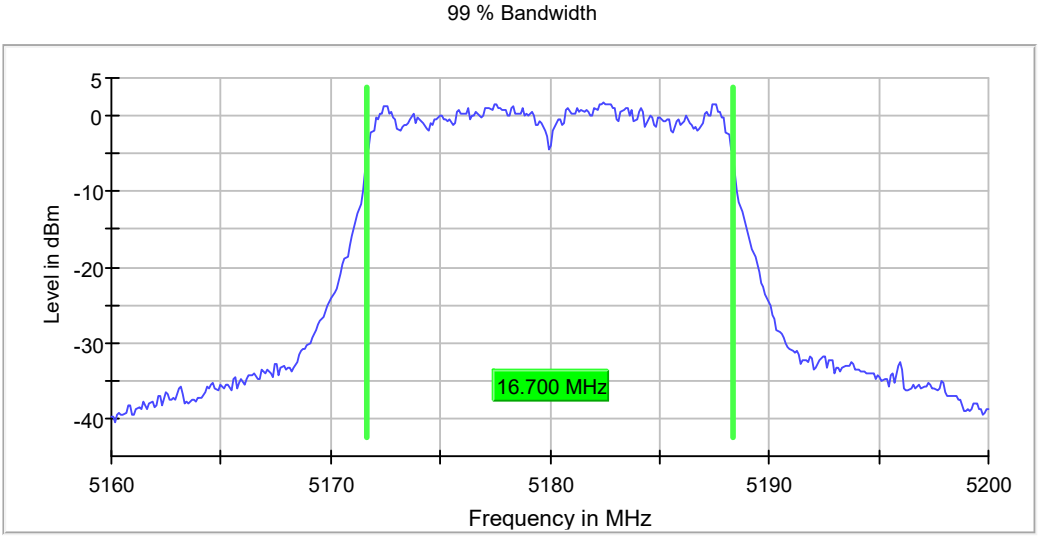
Channels	Single Channel 155 (5775 MHz)
99% Occupied Bandwidth (MHz)	77.00

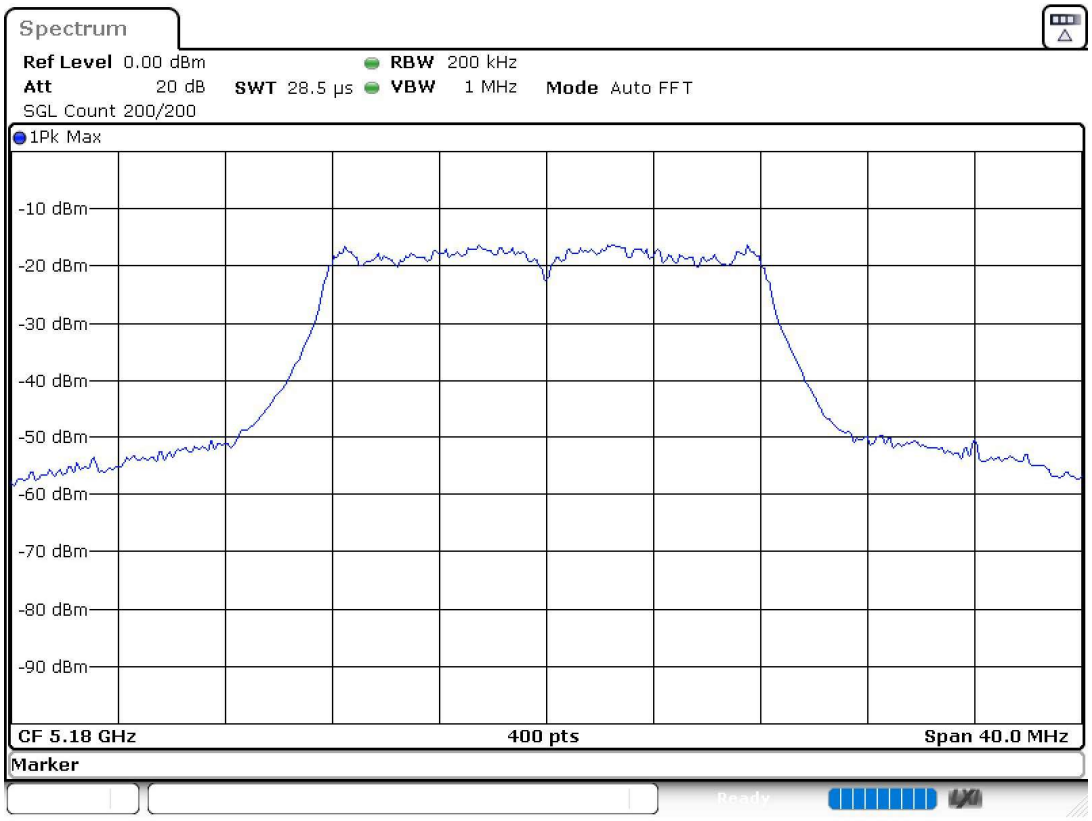
Attachments

Mode 802.11 a20:

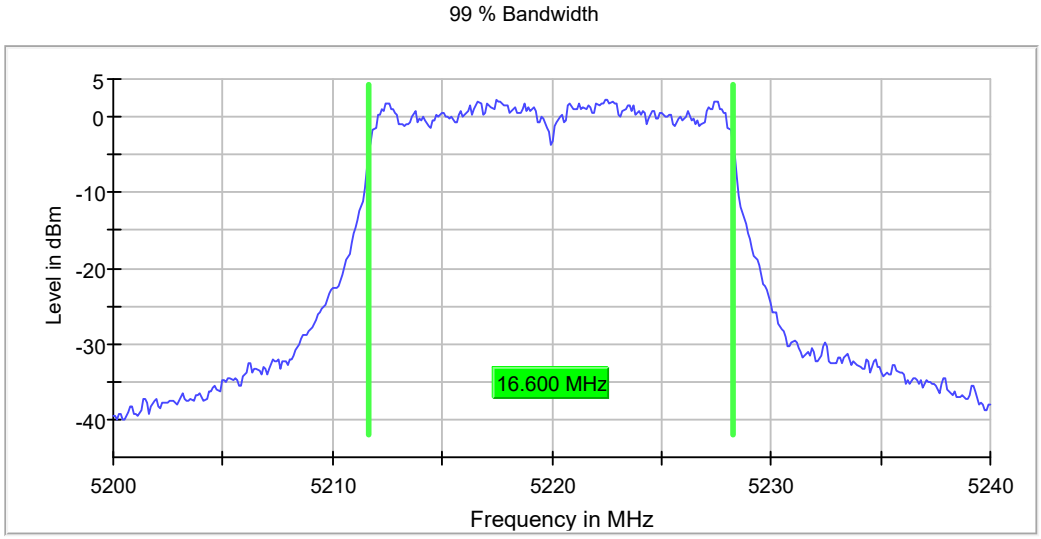
U-NII-1 (5150-5250 MHz)

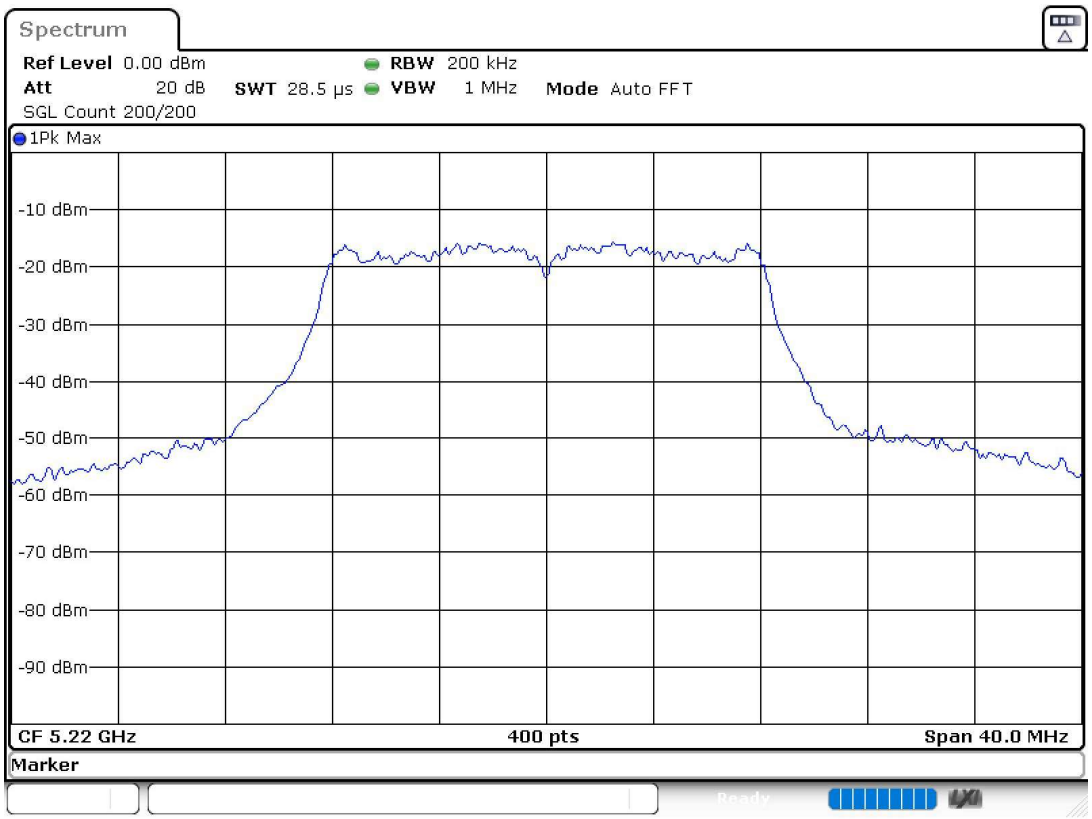
- Low Channel 36 (5180 MHz):



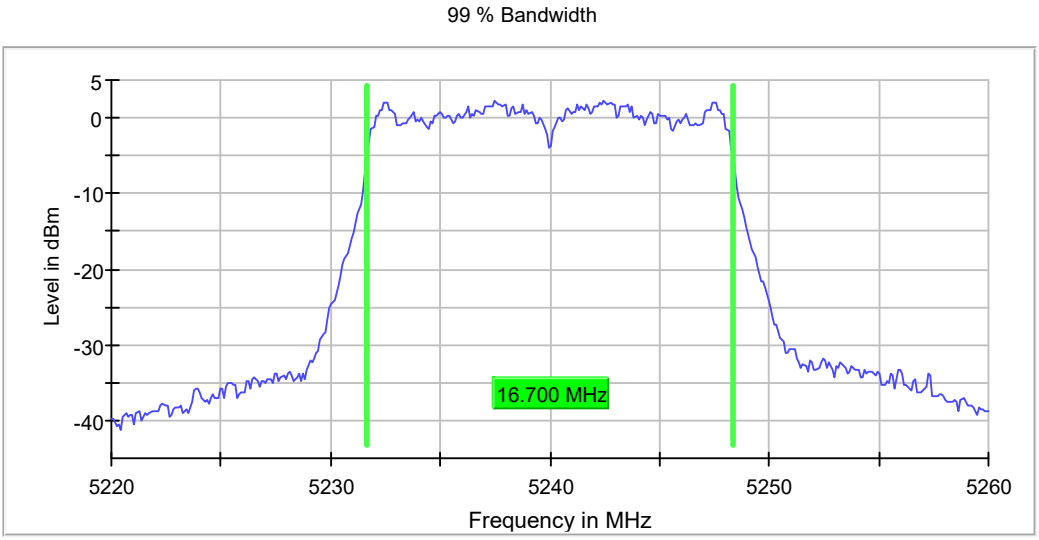


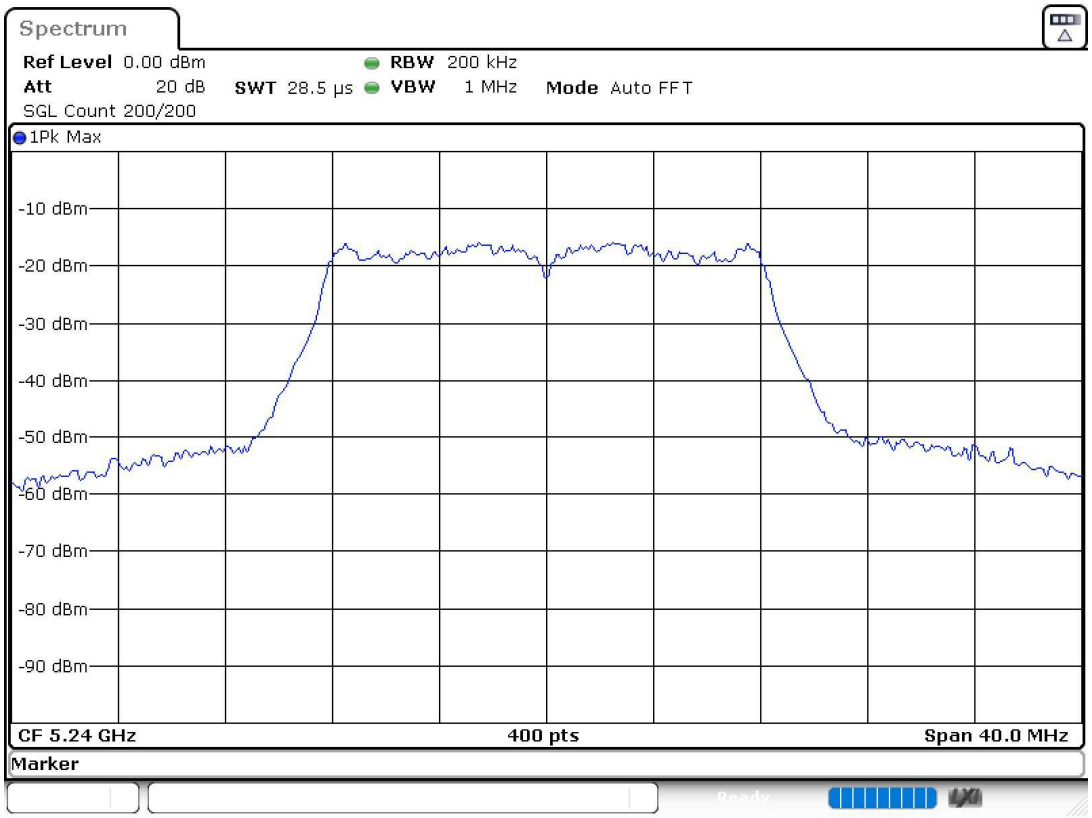
- Middle Channel 44 (5220 MHz):





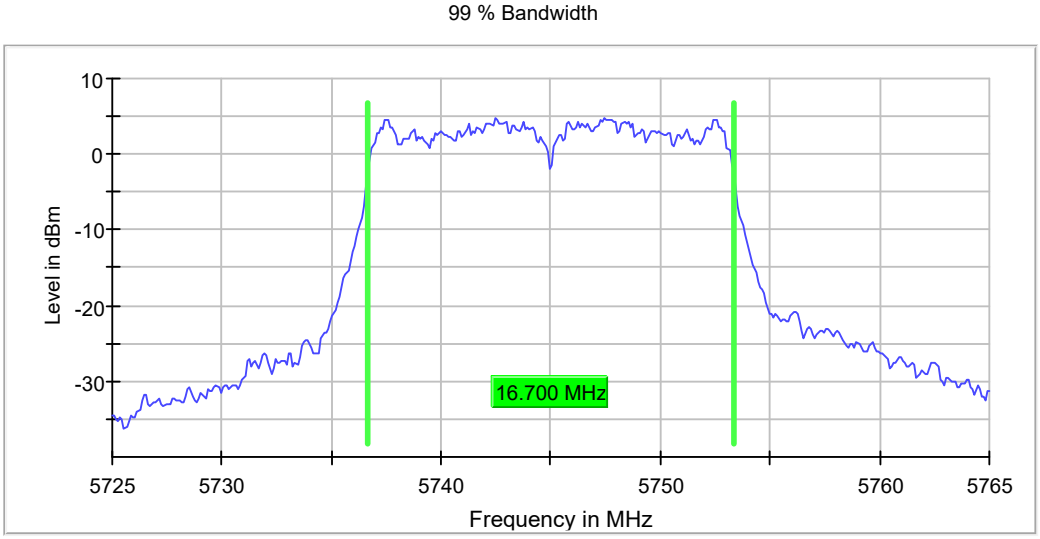
- High Channel 48 (5240 MHz):

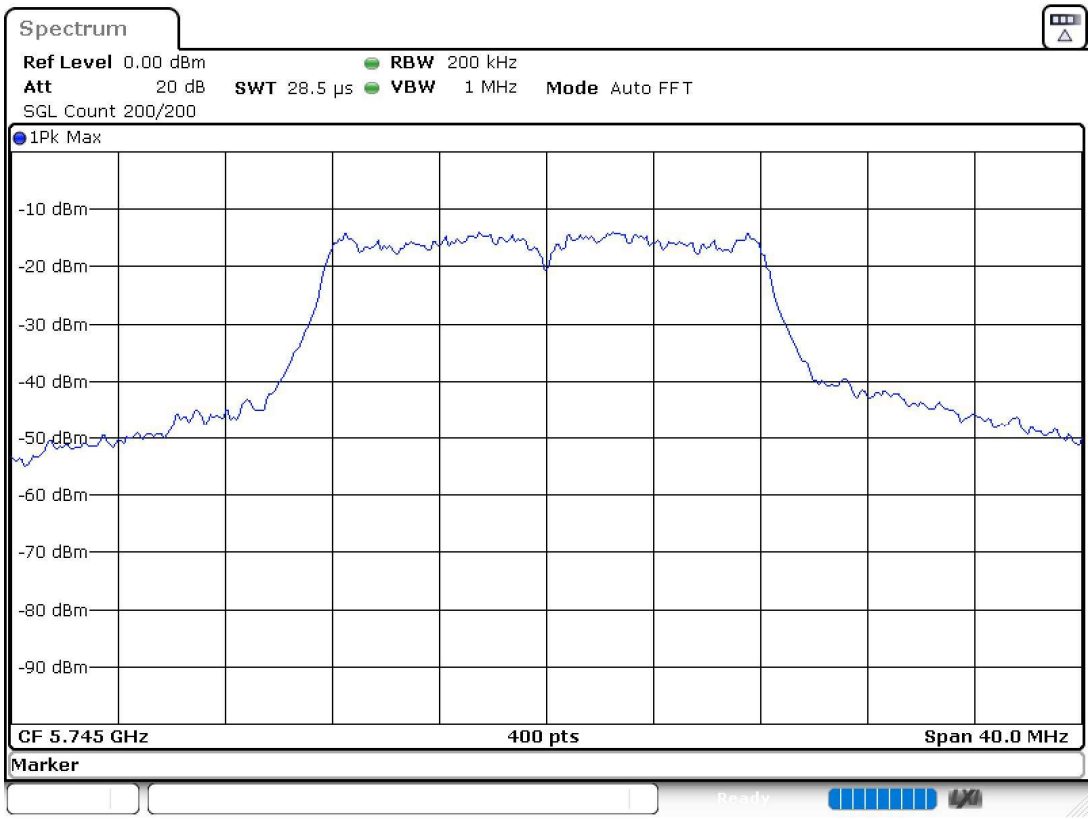




U-NII-3 (5725-5850 MHz)

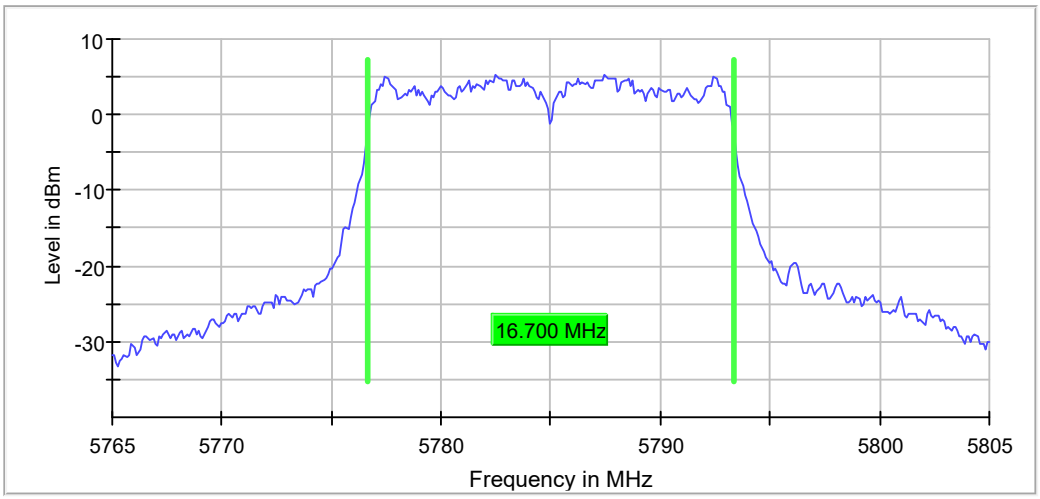
- Low Channel 149 (5745 MHz):

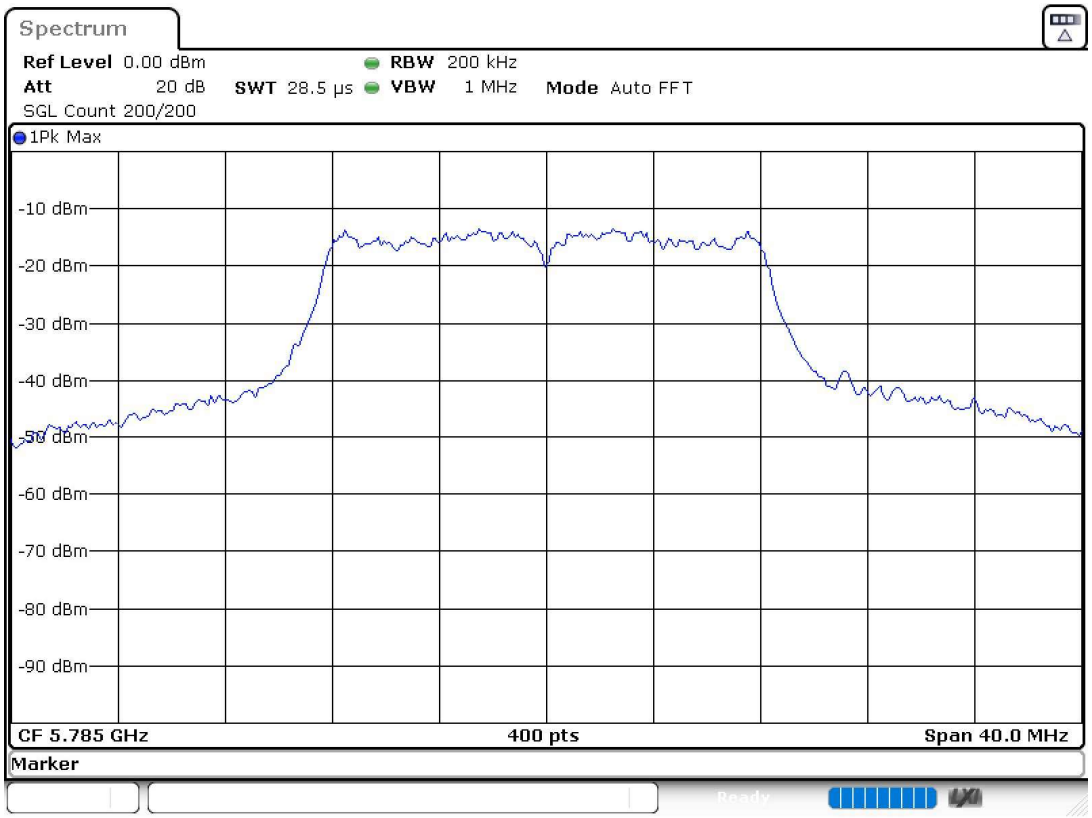




- Middle Channel 157 (5785 MHz):

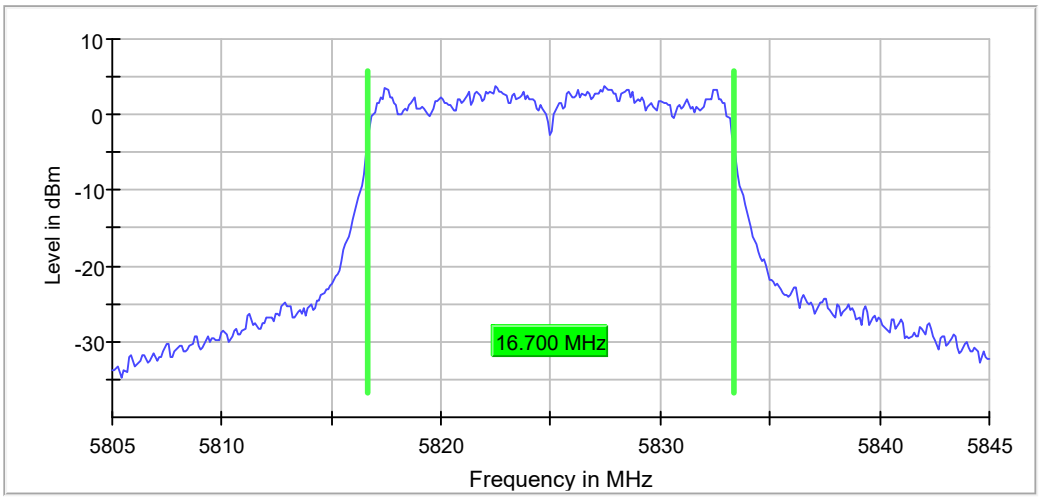
99 % Bandwidth

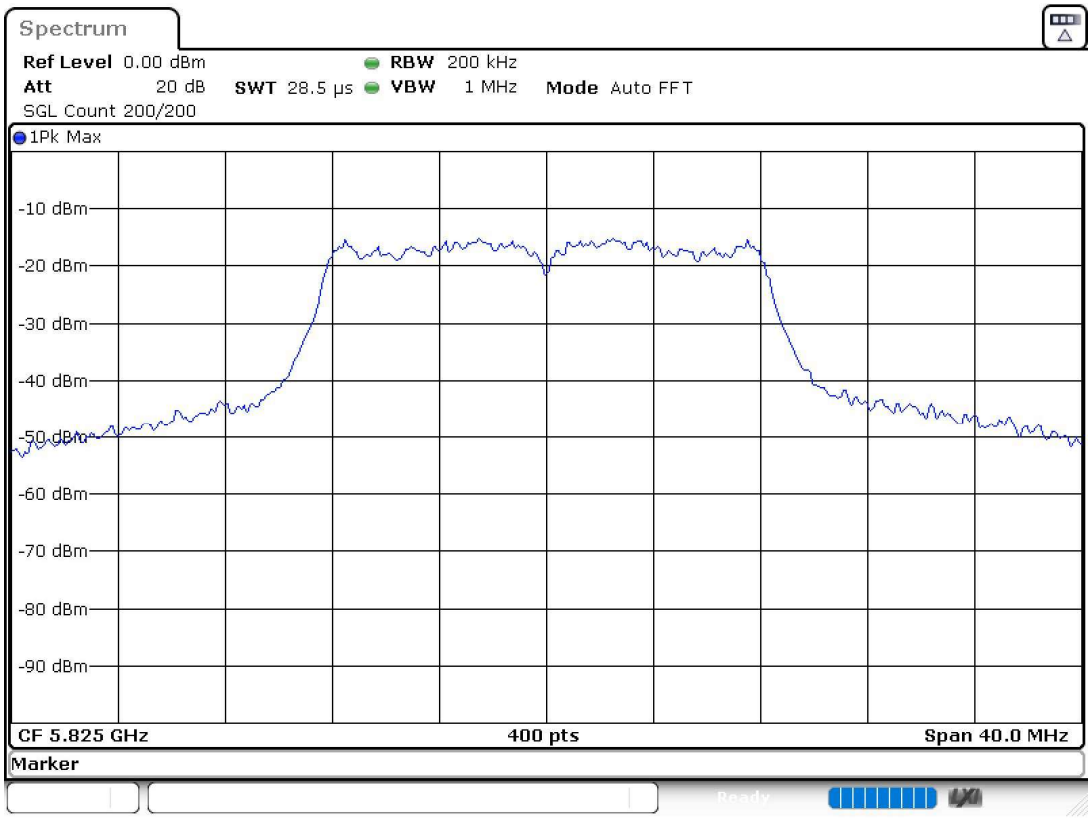




- High Channel 165 (5825 MHz):

99 % Bandwidth





Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

- Low Channel 36 (5180 MHz):