

Test report No:

ISED CABid: ES1909

NIE: 66837RRF.002A1

Test report

USA FCC Part 15.407, 15.209

CANADA RSS-247, RSS-Gen

Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements.

Radiated emission limits; general requirements.

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Nokia Industrial MulteFire Router 700H
(*) Trademark	Nokia
(*) Model and /or type reference	HWNDUSEB1006
Other identification of the product	HW version: A101 SW version: 20210121_01_UESW_MF_DEV_00540_12b1d3b_3f985 03 IMEI TAC: 35999539 FCC ID: 2AVO2MFRTR700H1 ID: 661AF-MFRTR700H1
(*) Features	MulteFire 1.0
Applicant	Nokia Innovations US LLC 600-700 Mountain Ave Murray Hill, NJ, 07974 USA
Test method requested, standard	USA FCC Part 15.407 (10-1-20) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-20) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE

Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager	 2021.08.12 11:41:13 +02'00'
Date of issue	2021-08-12	
Report template No	FDT08_23 (*) "Data provided by the client"	

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Competences and guarantees

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

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

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General conditions

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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.

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 Nokia Industrial MulteFire Router 700H acts as a client device. When connected to an Access Point, it provides wireless data service.

Usage of samples

Samples undergoing test have been selected by: the client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
66837/006	Nokia Industrial MulteFire Router 700H	HWNDUSEB1006	12020003172CPB0001	2021-01-22
66837/007	AC/DC adapter	G0957B-120-200	--	2021-01-22
66837/008	Flag Antenna	--	--	2021-01-22
66837/009	Flag Antenna	--	--	2021-01-22
66837/010	Power Cable	--	--	2021-01-22

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

All radiated tests indicated in Appendixes A, B, C, D and E.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
66837/006	MulteFire Router 700H	HWNDUSEB1006	12020003172CPB0001	2021-01-22
66837/007	AC/DC adapter	G0957B-120-200	--	2021-01-22
66837/010	Power Cable	--	--	2021-01-22

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

All conducted tests indicated in Appendixes A, B, C, D and E.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	RJ45	100	☒	☒	☐		
	USB2.0	4	☒	☒	☐		
			☐	☐	☐		
			☐	☐	☐		
Supplementary information to the ports..... :	N/A						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 10-30 V					
Rated Power	12W max.						
Clock frequencies..... :	XO 12MHz/25MHz/125MHz, SoC 1000MHz/750MHz, DDR 800MHz						
Other parameters							
Software version	20210121_01_UESW_MF_DEV_00540_12b1d3b_3f98503						
Hardware version	A101						
Dimensions in cm (W x H x D) :	10.5 x 16.2 x 2.5						
Mounting position	☒	Wall/Ceiling mounted equipment					
	☒	Table top equipment					
	☒	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Industrial machine mounted equipment; pole					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	5150-5925MHz 3dBi Antenna x 2		Antenna		Shenzhen DongLi		

	12V DC Adapter	Power Supply	Shenzhen Gospell
Accessories (not part of the test item).....:	Description	Type	Manufacturer
Documents as provided by the applicant.....:	Description	File version	Issue date
	TestMac User Guide for Regulatory Certification	N/A	Nov 20, 2020

⁽³⁾ Only for Medical Equipment

Identification of the client

NOKIA INNOVATIONS US LLC
600-700 Mountain Ave
Murray Hill, NJ, 07974 USA

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-02-11
Date (finish)	2021-07-05

Document history

Report number	Date	Description
66837RRF.002	2021-07-28	First release
66837RRF.002A1	2021-08-12	Second release. First modification due to typos in antenna gain value. This modification test report cancels and replaces the test report 66837RRF.002

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: Nicolás Salguero, José Manuel Jiménez, Verónica García, Pablo Redondo, Cristina Calle and Miguel Manuel López.

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	2020/04	2023/04
4. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
5. Preamplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK, BLNA 0160-01N	2021/03	2022/03
6. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
7. RF Preamplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2021/06	2022/06
8. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
9. Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10. EMI Test Receiver 20Hz-40GHz ROHDE AND SCHWARZ ESU40	2019/09	2021/09
11. RF Preamplifier, 30dB 500MHz-18GHz, NARDA AMF-3D-00501800-24-10P	2021/01	2022/01

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	2019/09	2021/09
3. DC Power Supply 40V/40A Rohde & Schwarz NGPE40	N.A.	N.A.
4. Digital Multimeter FLUKE 179	2020/10	2021/10
5. OPEN SWITCH UNIT OSP120 ROHDE AND SCHWARZ	2019/10	2021/10
6. OPEN SWITCH UNIT UP TO 18 GHz OSP150 ROHDE AND SCHWARZ	2019/09	2021/09

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	
Transmitter 99% Occupied Bandwidth		P	
Transmitter 26 dB Emission Bandwidth (EBW)		P	
<u>Supplementary information and remarks:</u>			
None.			

B. 5.15 GHz – 5.25 GHz Band

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)(6) / 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	
<u>Supplementary information and remarks:</u>			
None.			

C. 5.25 GHz – 5.35 GHz Band

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.407 (a) (2) / RSS-247 6.2.2.1 (a)	Transmitter Maximum conducted Output Power	P	
RSS-247 6.2.2.1 (b)	Transmitter Maximum Equivalent Isotropically Radiated Power EIRP	P	
FCC 15.407 (a) (2) / RSS-247 6.2.2.1 (a)	Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b) (2) / RSS-247 6.2.2.2	Transmitter Band Edge Radiated Emissions	P	
FCC 15.407 (b) (2) (6) / RSS-247 6.2.2.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (h) (1) / RSS-247 6.2.2.1	Transmitter Power Control	P	
<u>Supplementary information and remarks:</u>			
(1) None.			

D. 5.47 GHz – 5.725 GHz Band

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.407 (a) (2) / RSS-247 6.2.3.1	Transmitter Maximum conducted Output Power	P	
RSS-247 6.2.3.1	Transmitter Maximum Equivalent Isotropically Radiated Power	P	
FCC 15.407 (a) (2) / RSS-247 6.2.3.1	Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b) (3) / RSS-247 6.2.3.2	Transmitter Band Edge Radiated Emissions	P	
FCC 15.407 (b) (3) (6) / RSS-247 6.2.3.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (h) (1) / RSS-247 6.2.3.1	Transmitter Power Control	P	
<u>Supplementary information and remarks:</u>			
(1) None.			

E. 5.725 GHz – 5.85 GHz Band

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
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: Test Common requirements for all bands

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Section 15.35 Subclause (c) / RSS-Gen 6.10. Transmitter Duty Cycle	14
RSS-Gen 6.6 / RSS-247 6.2. Transmitter 99% Occupied Bandwidth	15
Section 15.407 Subclause 15.403(i) Transmitter 26 dB Emission Bandwidth (EBW)	55

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

SPECIFICATION

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

RESULTS:

The results for all modes having a value > 98%.

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

The client supplied cables with the EUT in order to perform conducted measurements. The measured additional path loss was included in any path loss calculations.

Measurements were performed on all modes for testing.

SISO Antenna Port 1:

Mode: QPSK - 20MHz

	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	17.900	<±40.04
channel 40 (5200 MHz)	17.900	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	17.900	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	17.900	
channel 140 (5700 MHz)	18.000	
channel 149 (5745 MHz)	17.900	
channel 157 (5785 MHz)	17.900	
channel 165 (5825 MHz)	18.000	

Mode: 16QAM - 20MHz

	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	18.000	<±40.04
channel 40 (5200 MHz)	18.000	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	18.000	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	17.900	
channel 140 (5700 MHz)	18.000	
channel 149 (5745 MHz)	17.900	
channel 157 (5785 MHz)	17.900	
channel 165 (5825 MHz)	18.000	

Mode: 64QAM - 20MHz

	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	17.900	<±40.04
channel 40 (5200 MHz)	17.900	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	17.900	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	17.900	
channel 140 (5700 MHz)	17.900	
channel 149 (5745 MHz)	18.000	
channel 157 (5785 MHz)	17.900	
channel 165 (5825 MHz)	17.900	

SISO Antenna Port 2:

Mode: QPSK - 20MHz

	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	17.900	<±40.04
channel 40 (5200 MHz)	17.900	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	17.900	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	18.000	
channel 140 (5700 MHz)	17.900	
channel 149 (5745 MHz)	17.900	
channel 157 (5785 MHz)	17.900	
channel 165 (5825 MHz)	17.900	

Mode: 16QAM - 20MHz

	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	17.900	<±40.04
channel 40 (5200 MHz)	17.900	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	17.900	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	18.000	
channel 140 (5700 MHz)	17.900	
channel 149 (5745 MHz)	18.000	
channel 157 (5785 MHz)	18.000	
channel 165 (5825 MHz)	17.900	

Mode: 64QAM - 20MHz

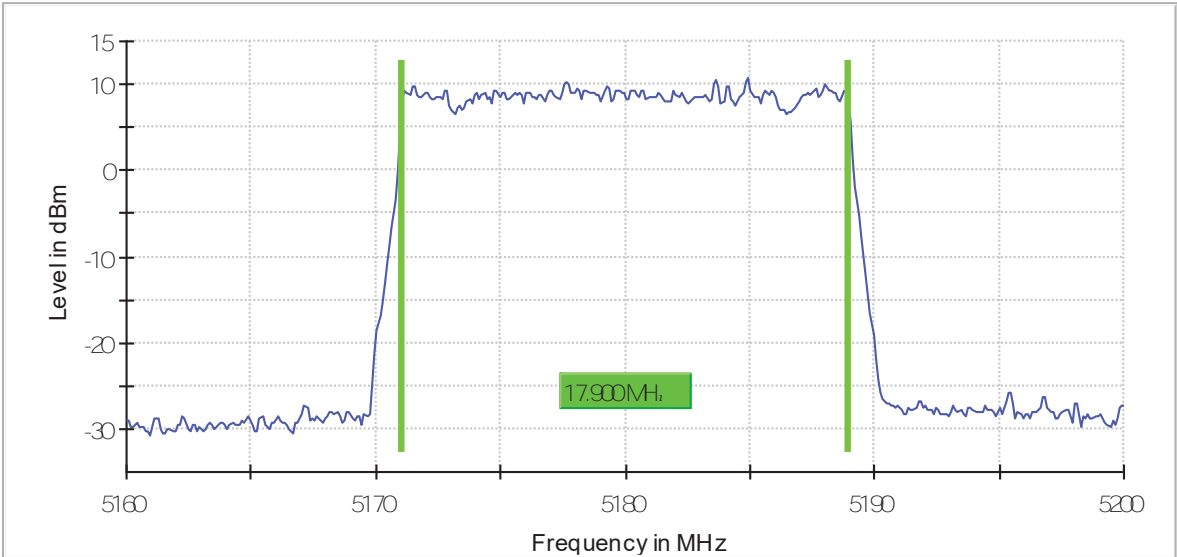
	Occ. BW (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	17.900	<±40.04
channel 40 (5200 MHz)	17.900	
channel 48 (5240 MHz)	17.900	
channel 52 (5260 MHz)	17.900	
channel 56 (5280 MHz)	17.900	
channel 64 (5320 MHz)	17.900	
channel 100 (5500 MHz)	17.900	
channel 116 (5580 MHz)	17.900	
channel 140 (5700 MHz)	17.900	
channel 149 (5745 MHz)	18.000	
channel 157 (5785 MHz)	18.000	
channel 165 (5825 MHz)	17.900	

SISO Antenna Port 1:

Mode: QPSK - 20MHz

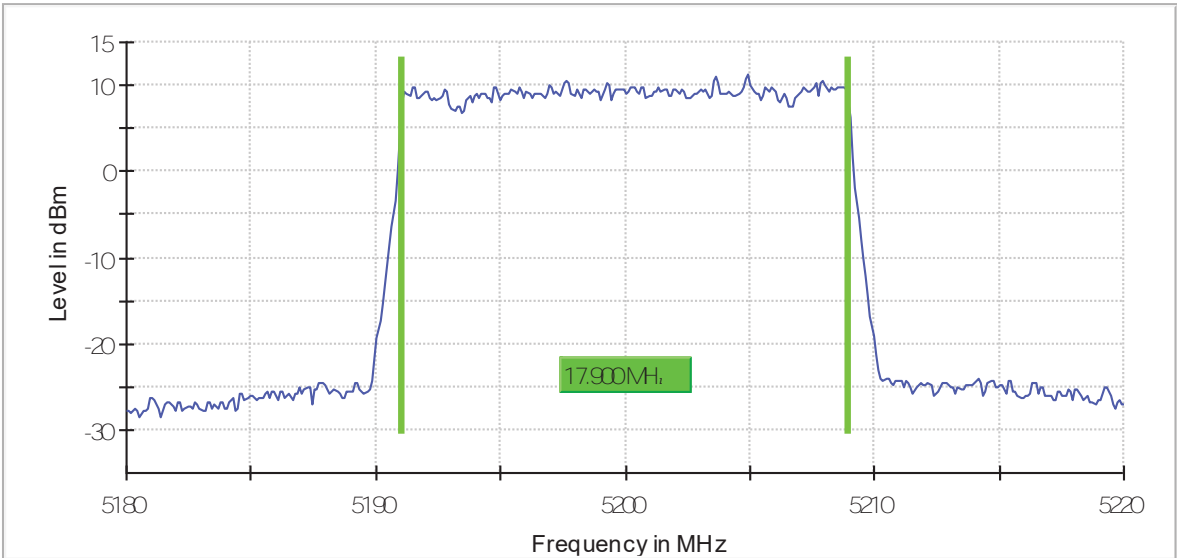
channel 36 (5180 MHz)

99% Bandwidth



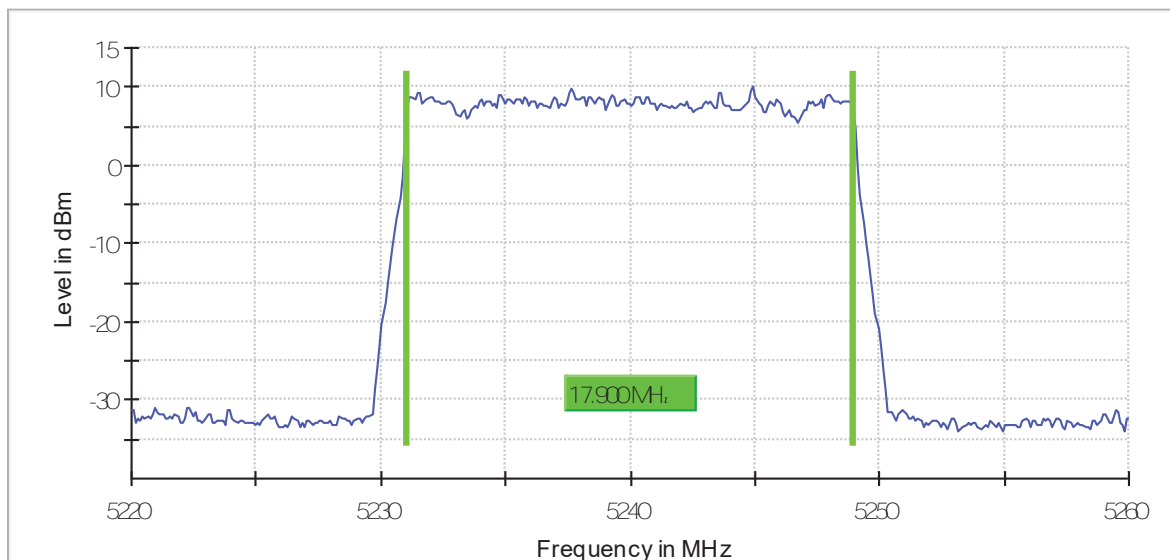
channel 40 (5200 MHz)

99% Bandwidth



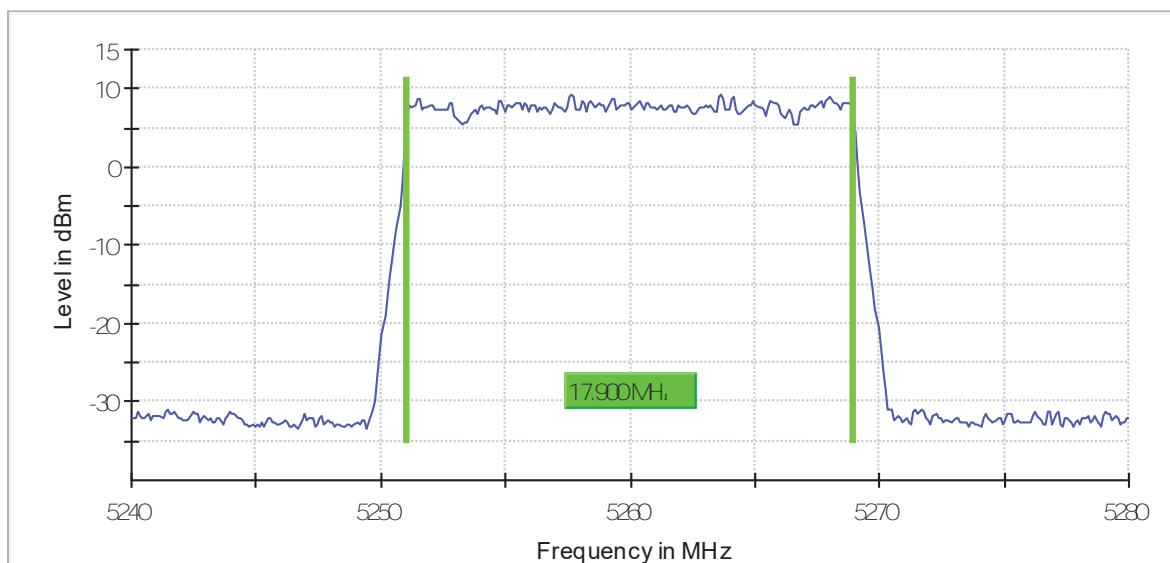
channel 48 (5240 MHz)

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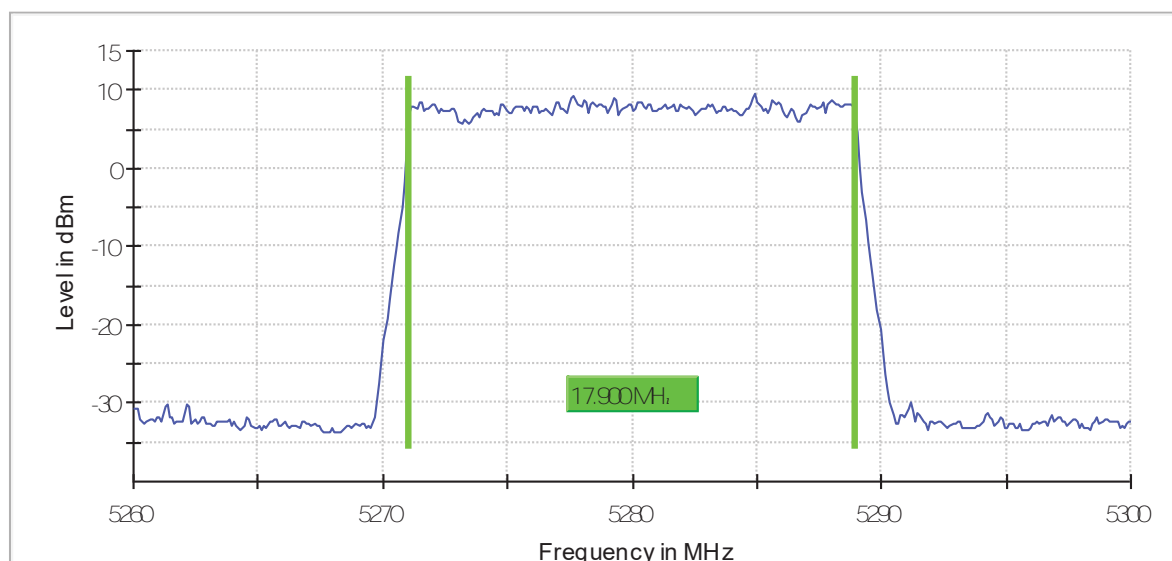
channel 52 (5260 MHz)

99% Bandwidth



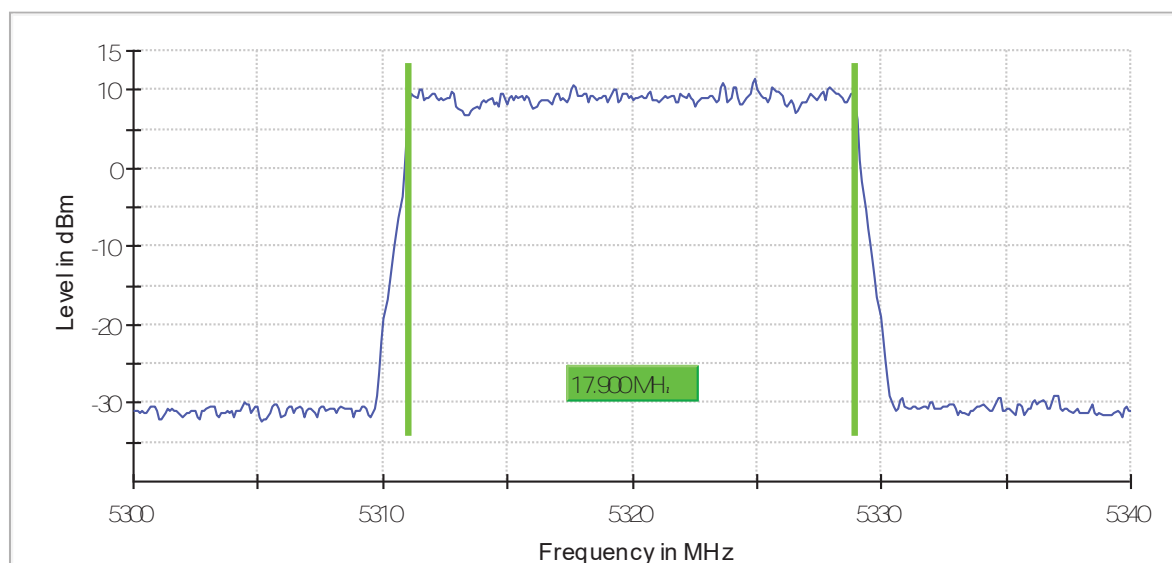
channel 56 (5280 MHz)

99% Bandwidth



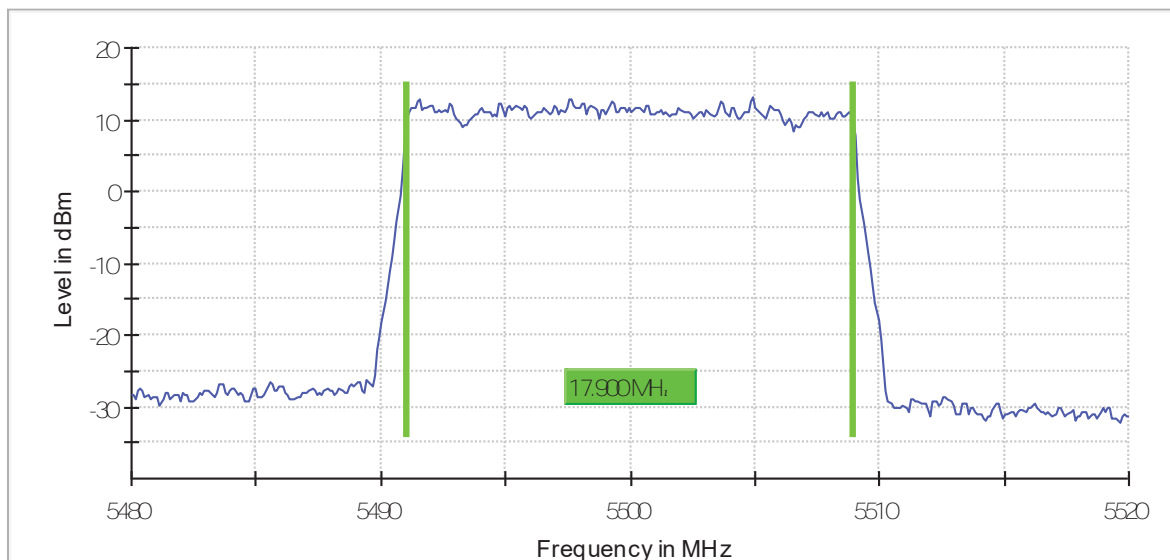
channel 64 (5320 MHz)

99% Bandwidth



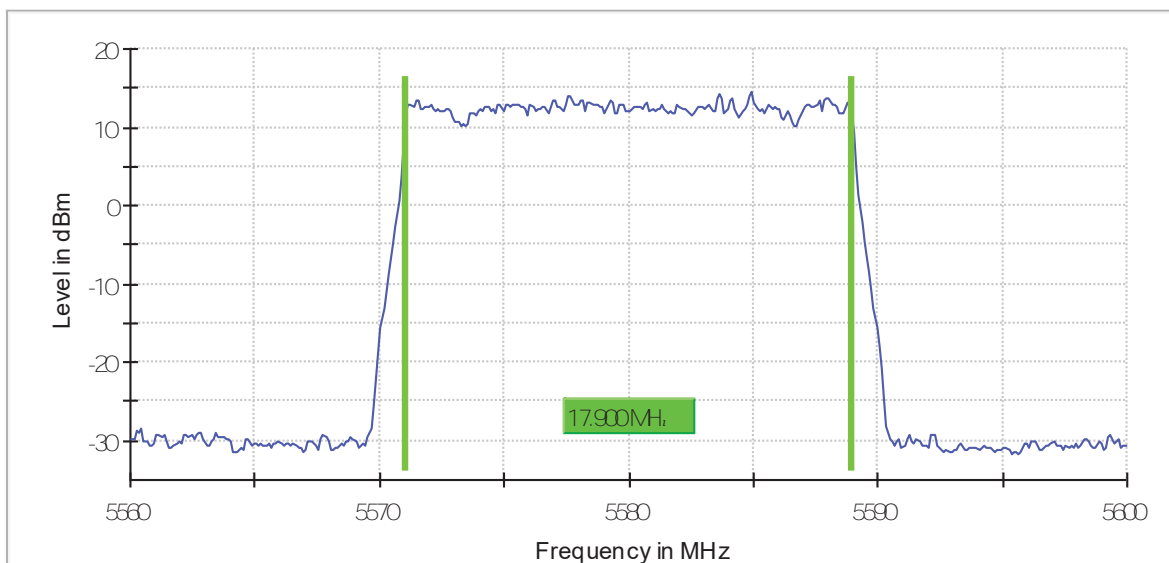
channel 100 (5500 MHz)

99% Bandwidth



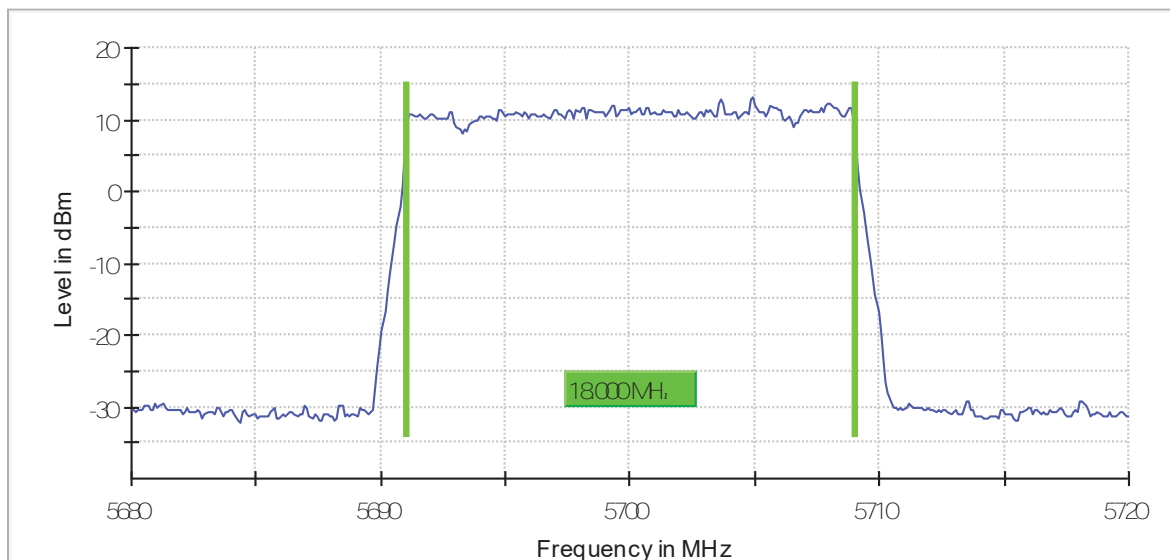
channel 116 (5580 MHz)

99% Bandwidth



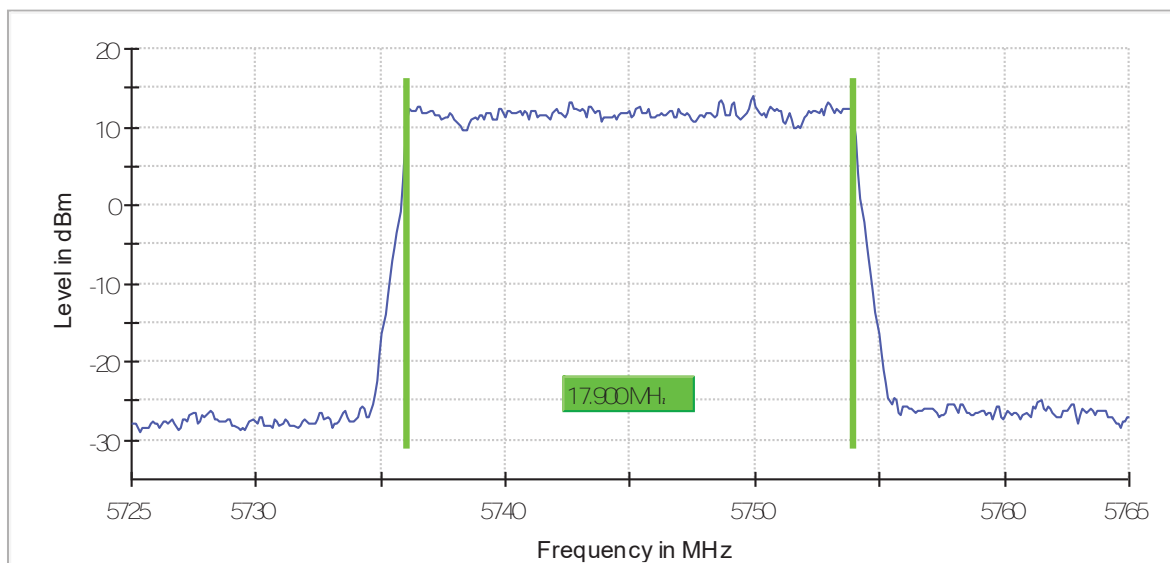
channel 140 (5700 MHz)

99% Bandwidth



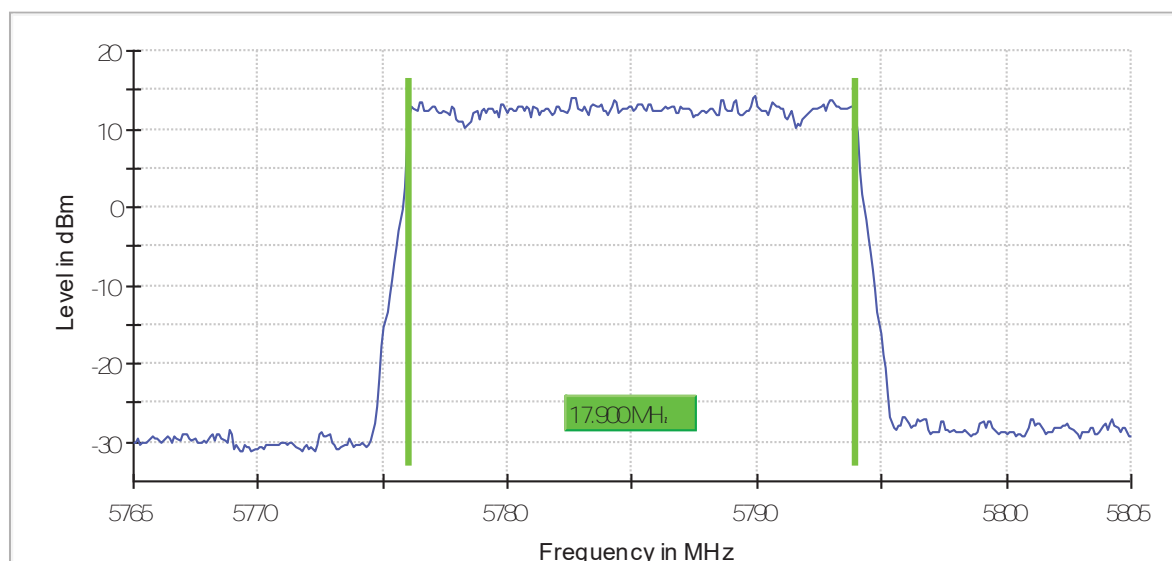
channel 149 (5745 MHz)

99% Bandwidth



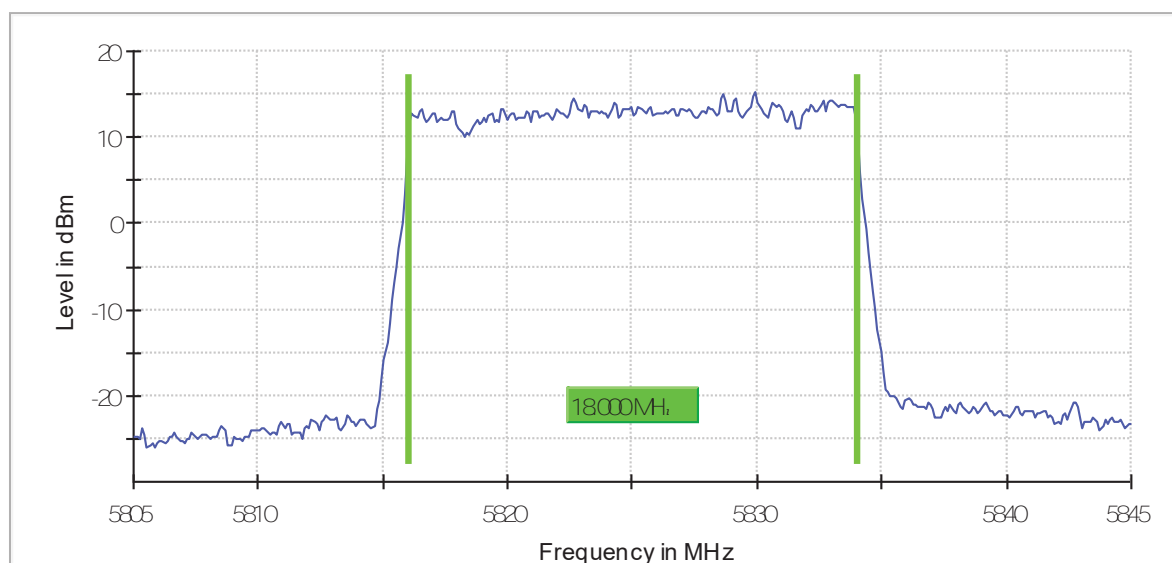
channel 157 (5785 MHz)

99% Bandwidth



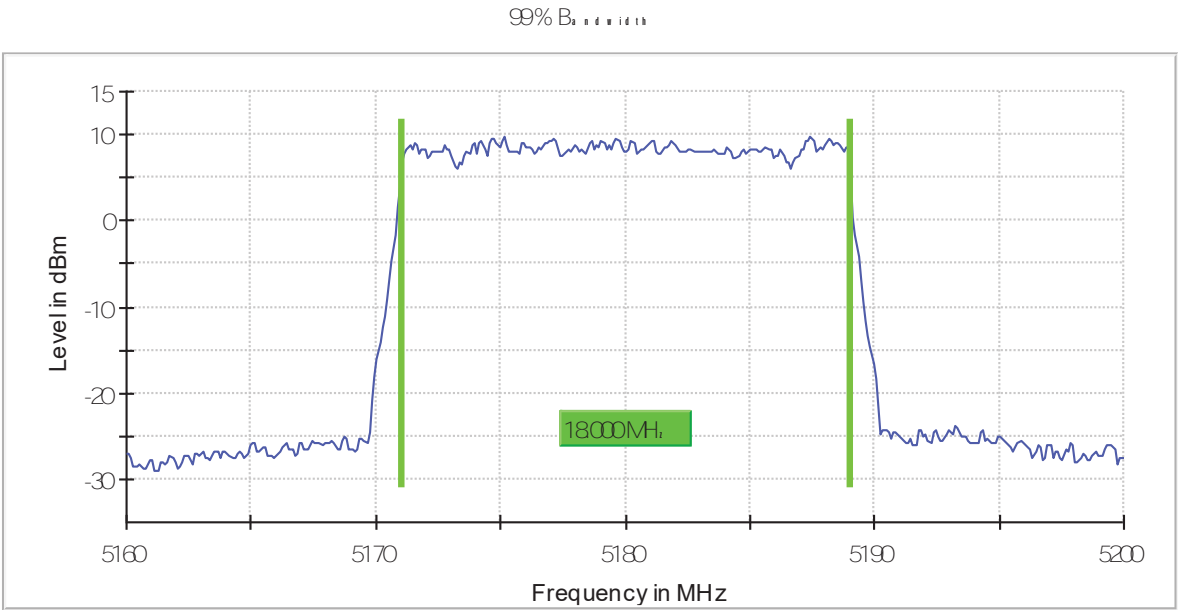
channel 165 (5825 MHz)

99% Bandwidth

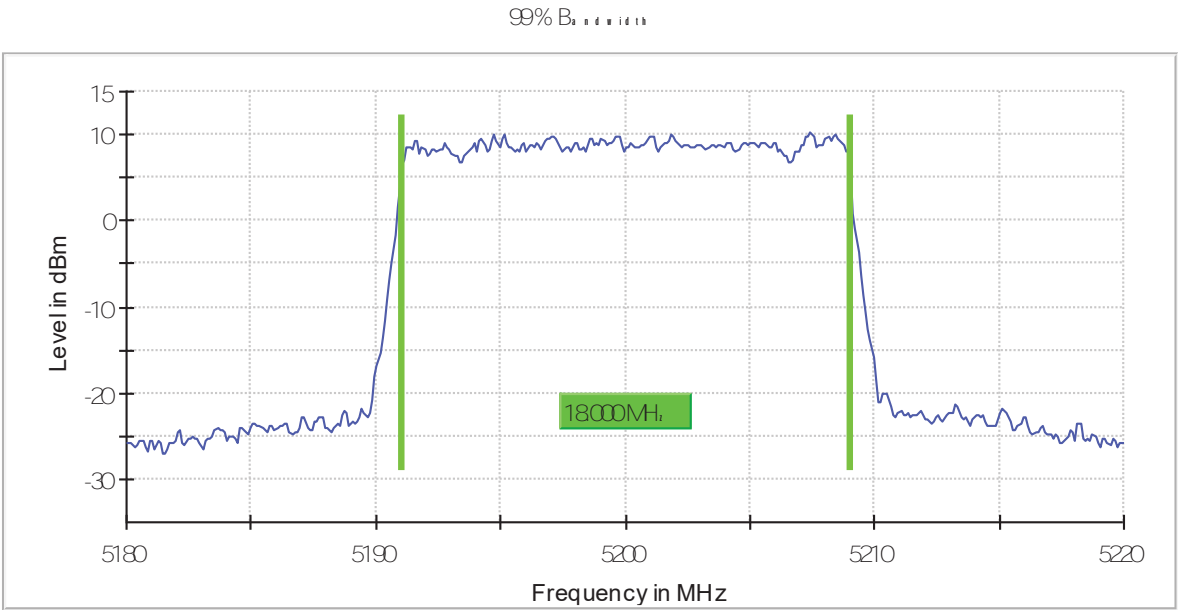


Mode: 16QAM- 20MHz

channel 36 (5180 MHz)

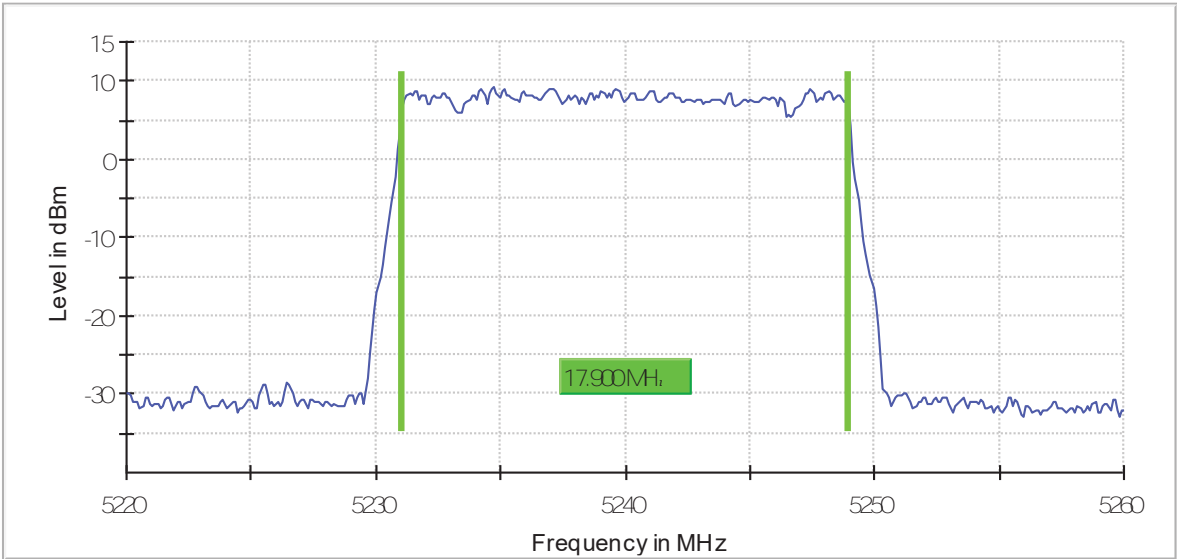


channel 40 (5200 MHz)



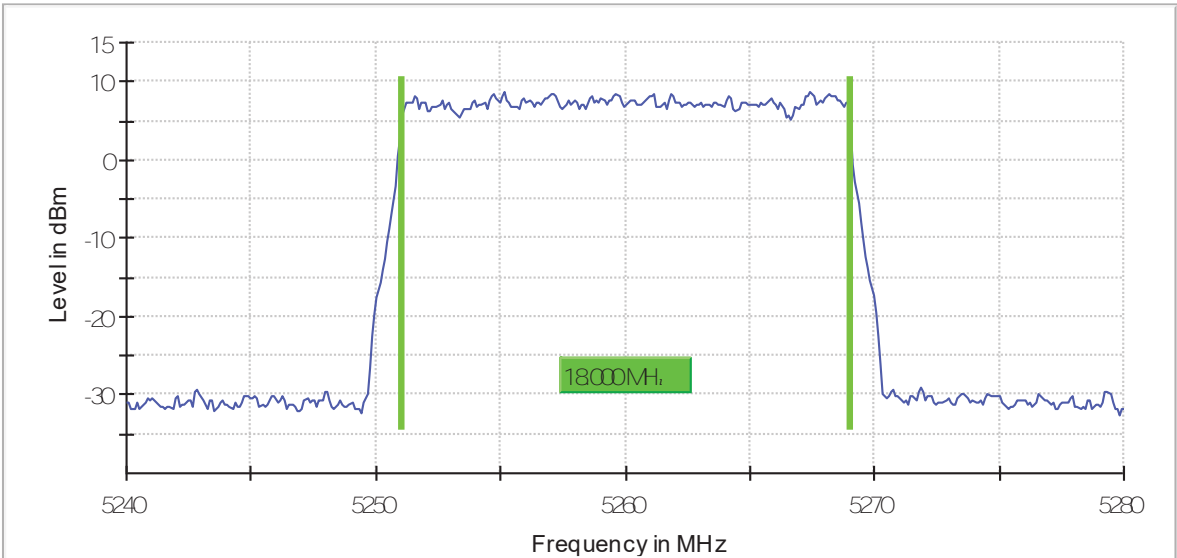
channel 48 (5240 MHz)

99% Bandwidth



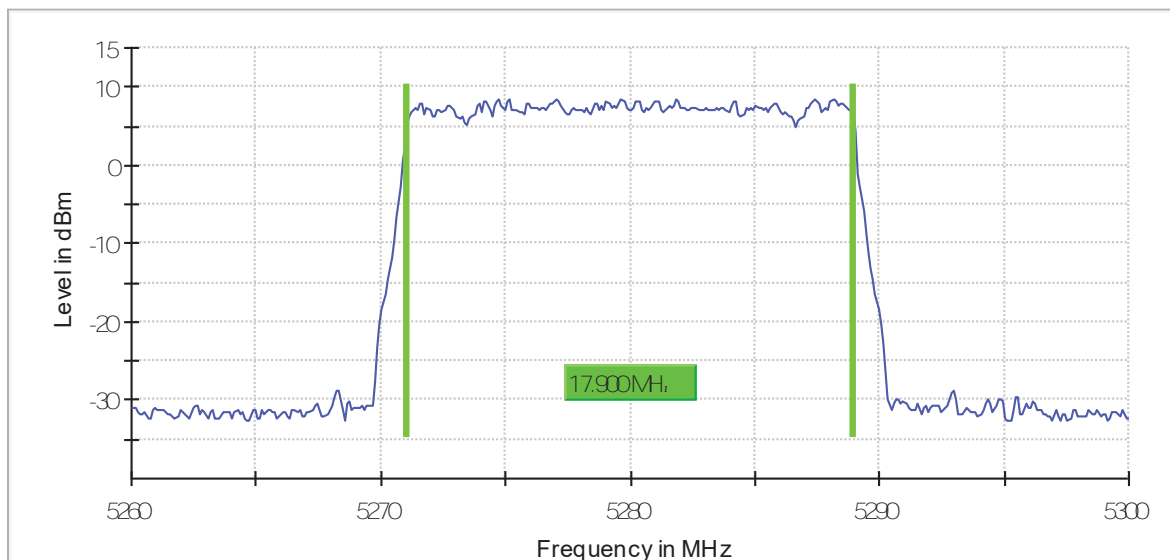
channel 52 (5260 MHz)

99% Bandwidth



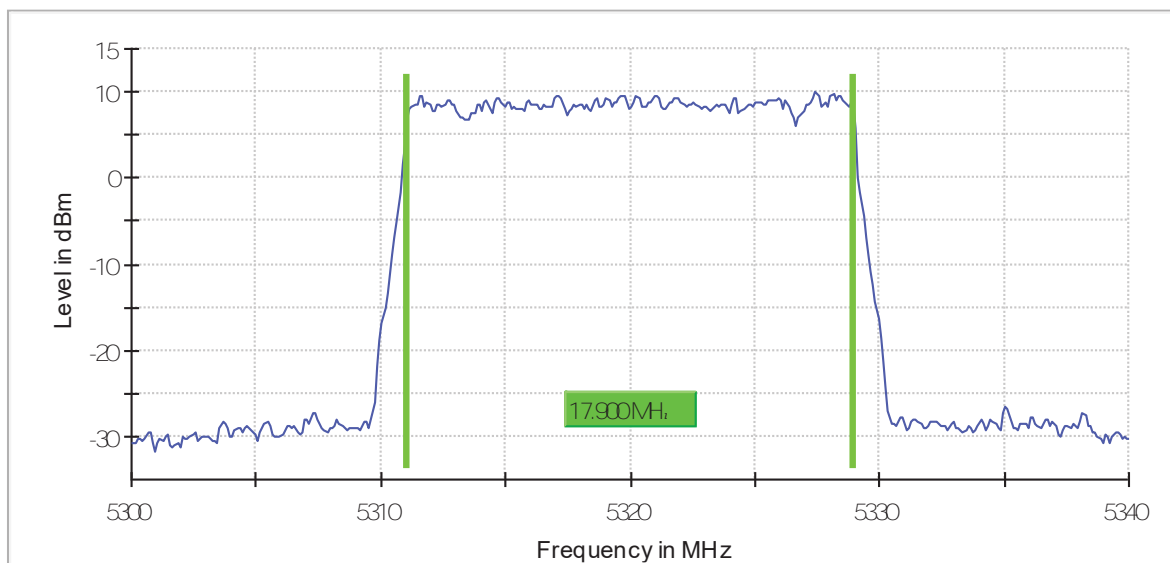
channel 56 (5280 MHz)

99% Bandwidth

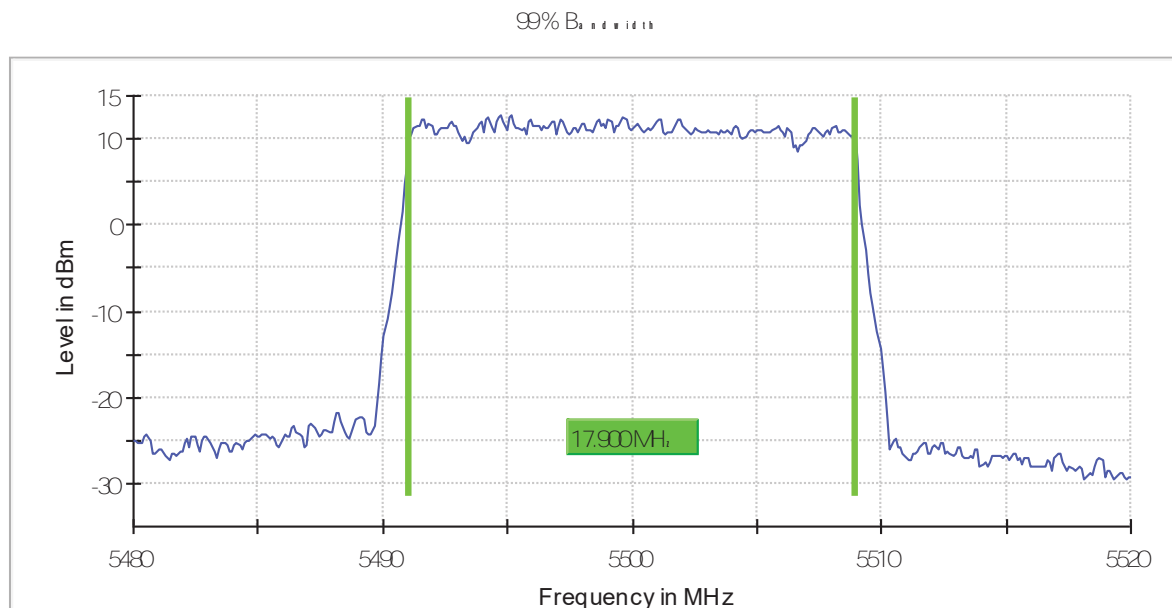


channel 64 (5320 MHz)

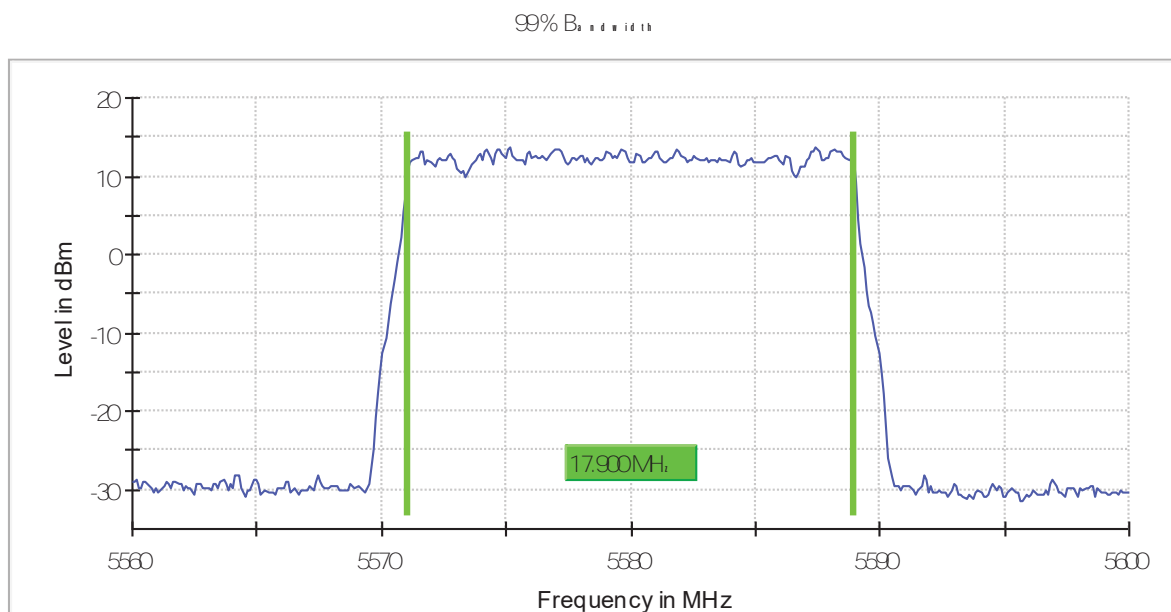
99% Bandwidth



channel 100 (5500 MHz)

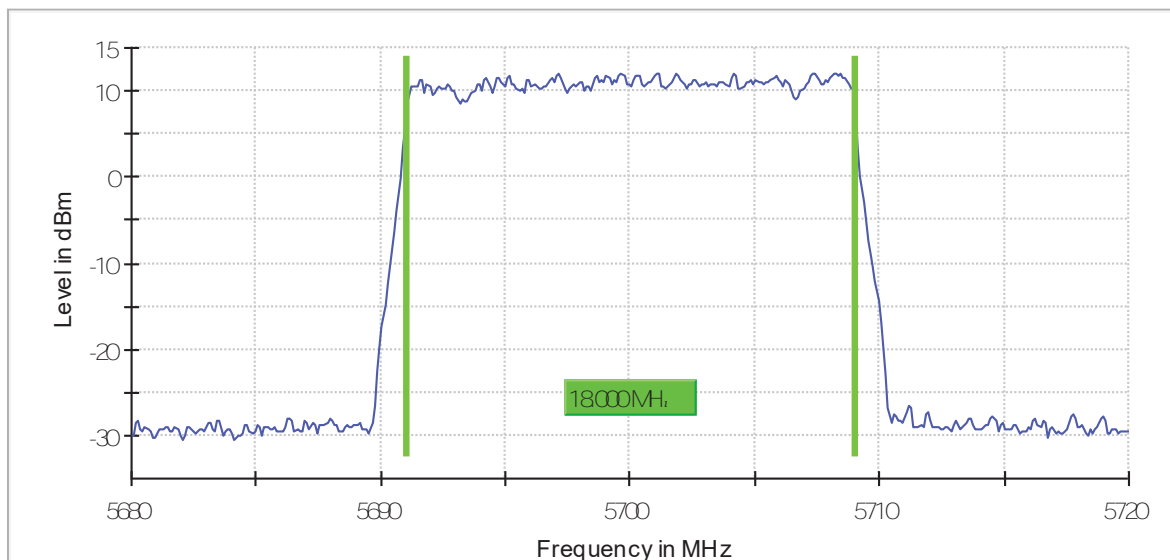


channel 116 (5580 MHz)



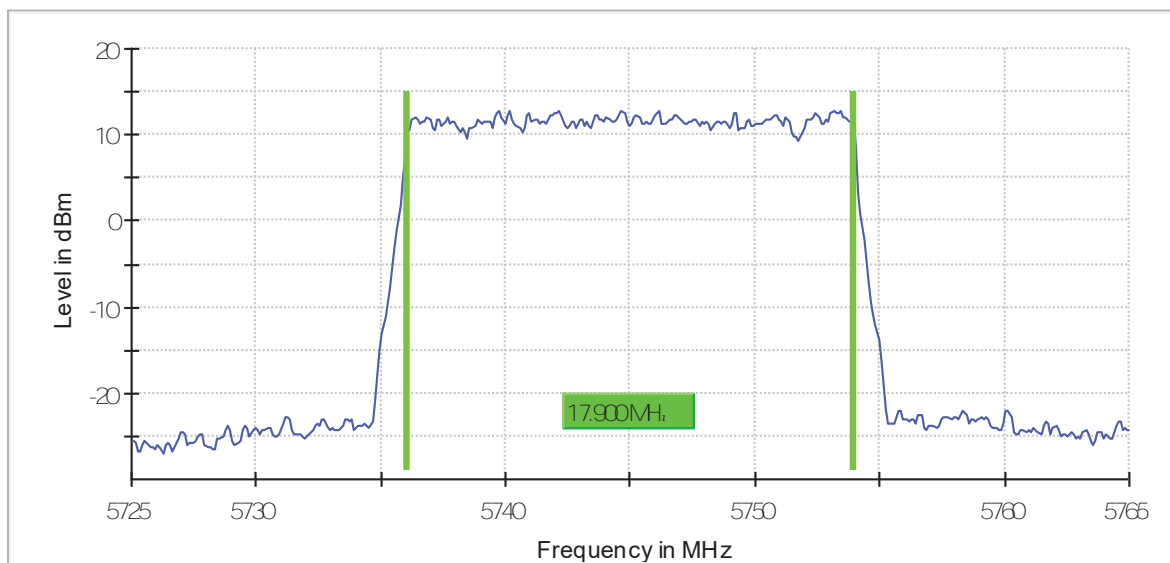
channel 140 (5700 MHz)

99% Bandwidth



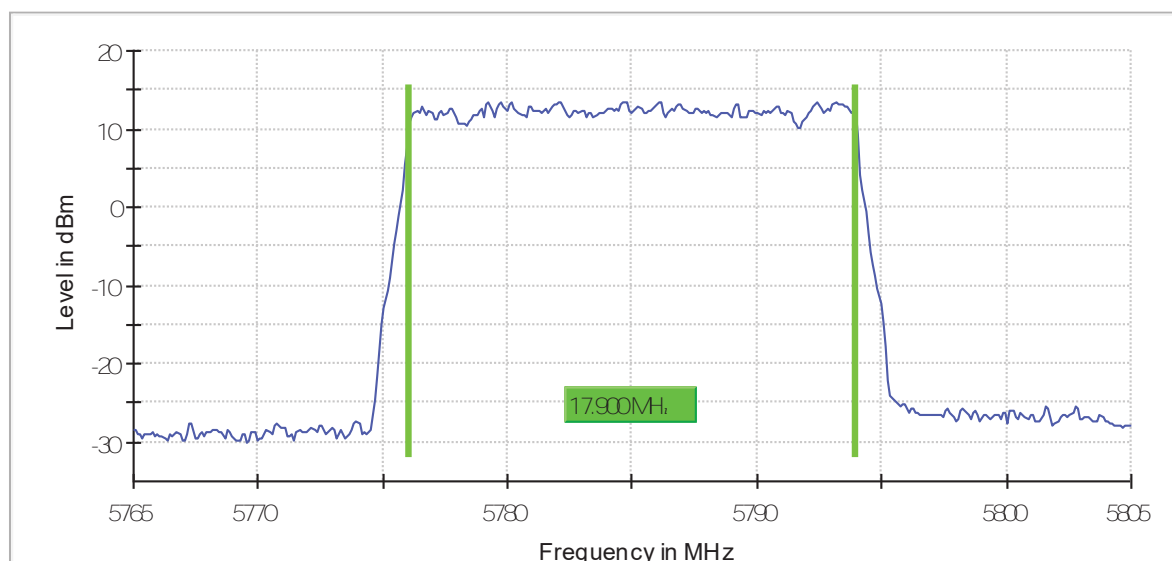
channel 149 (5745 MHz)

99% Bandwidth



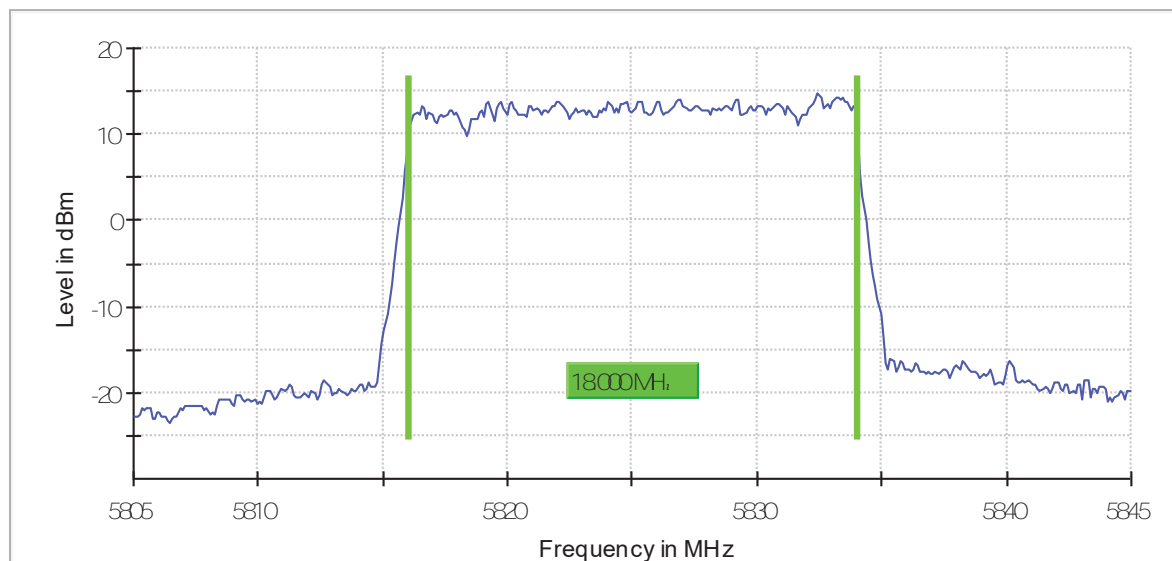
channel 157 (5785 MHz)

99% Bandwidth



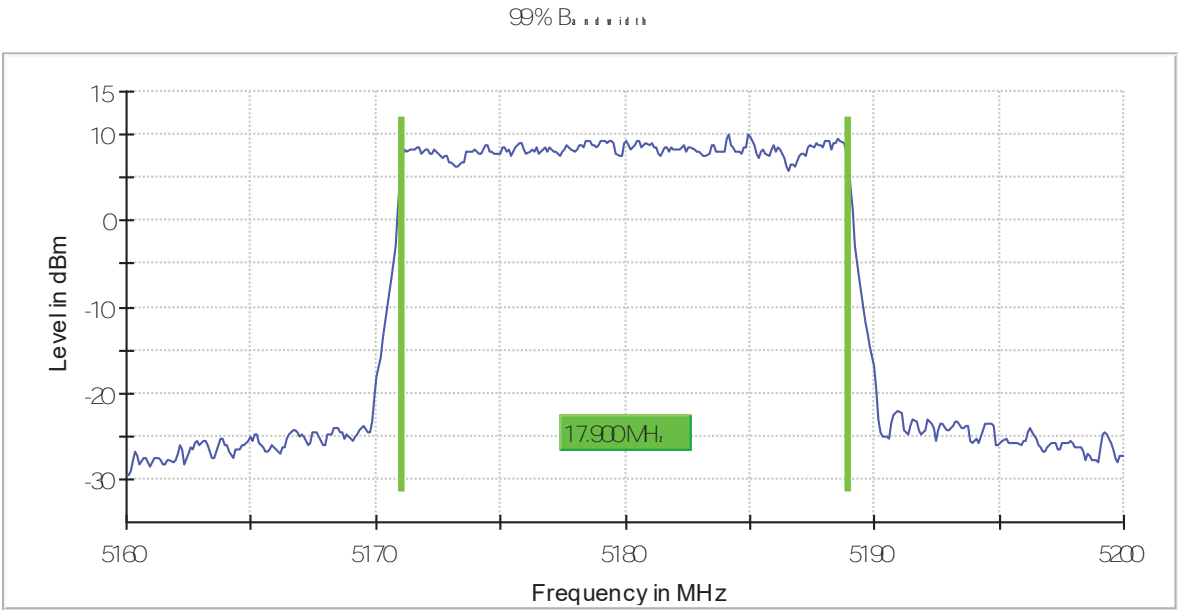
channel 165 (5825 MHz)

99% Bandwidth

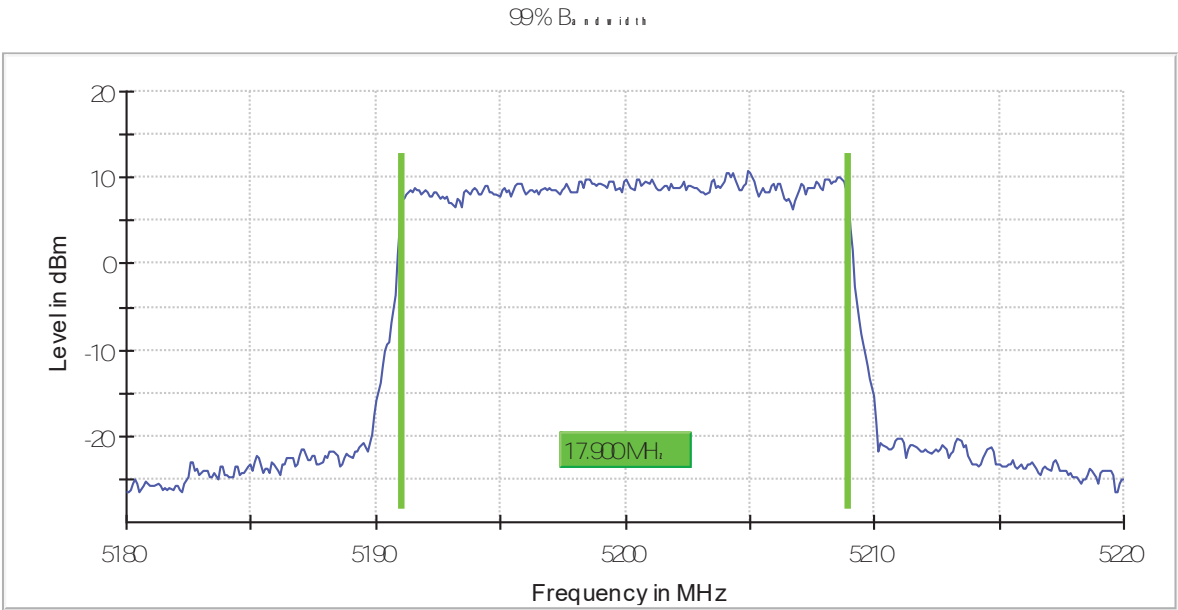


Mode: 64QAM - 20MHz

channel 36 (5180 MHz)

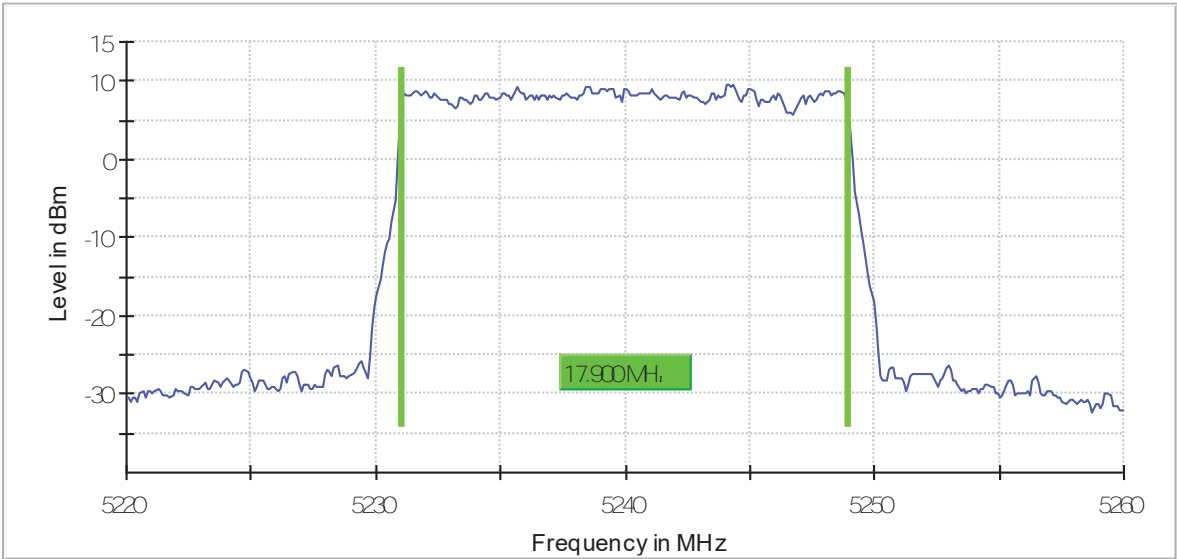


channel 40 (5200 MHz)



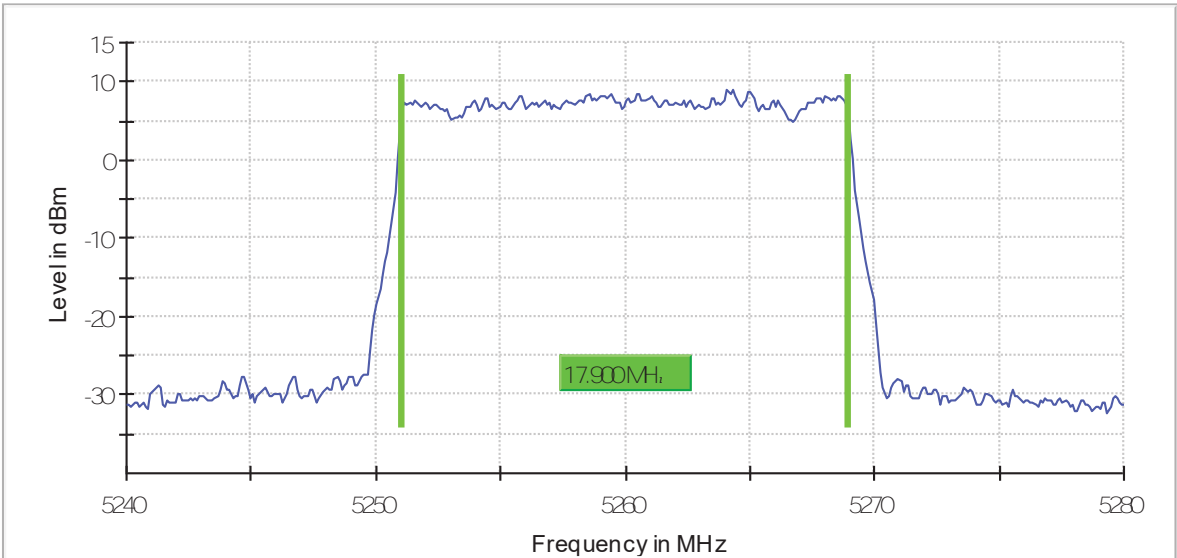
channel 48 (5240 MHz)

99% Bandwidth



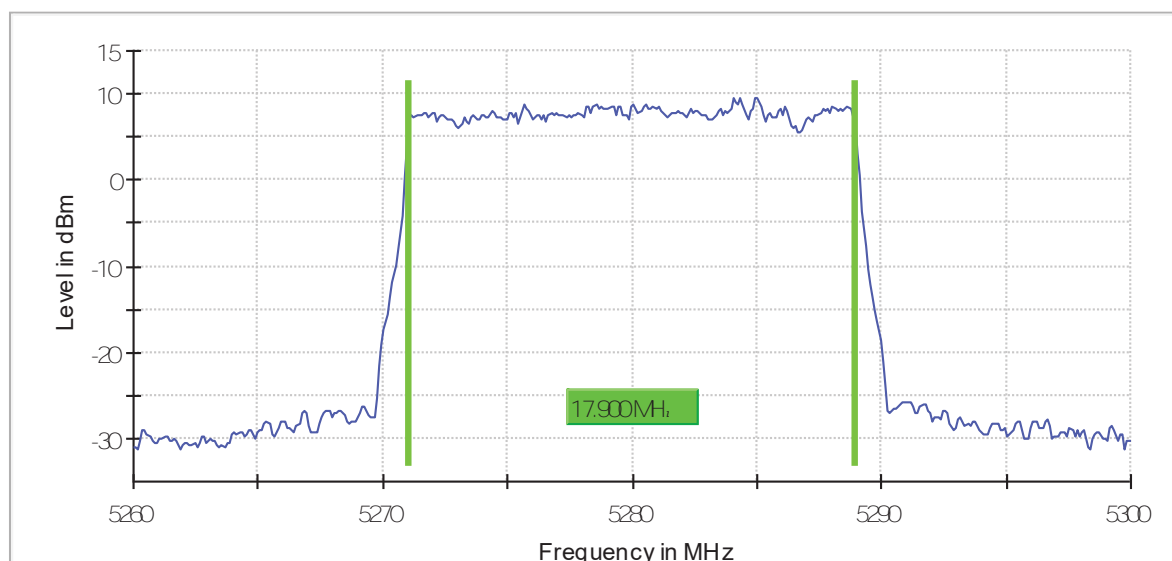
channel 52 (5260 MHz)

99% Bandwidth



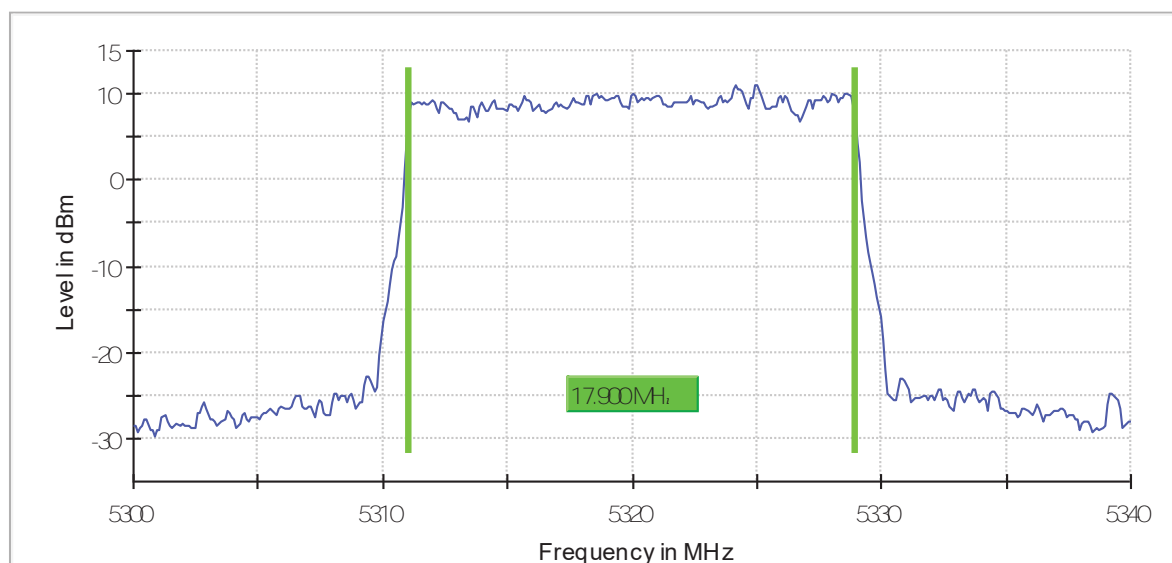
channel 56 (5280 MHz)

99% Bandwidth



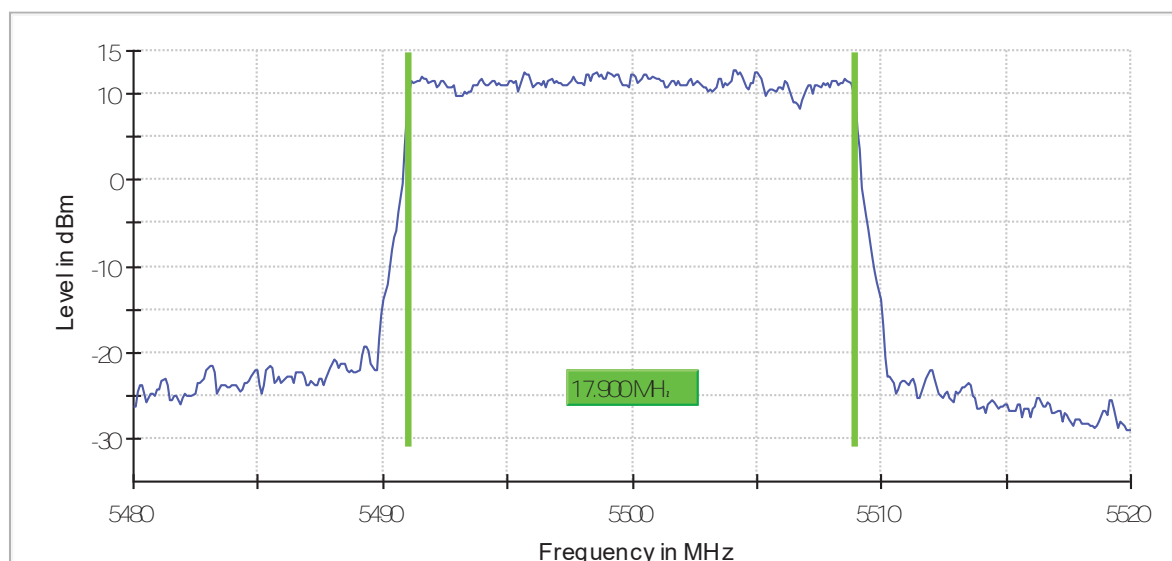
channel 64 (5320 MHz)

99% Bandwidth



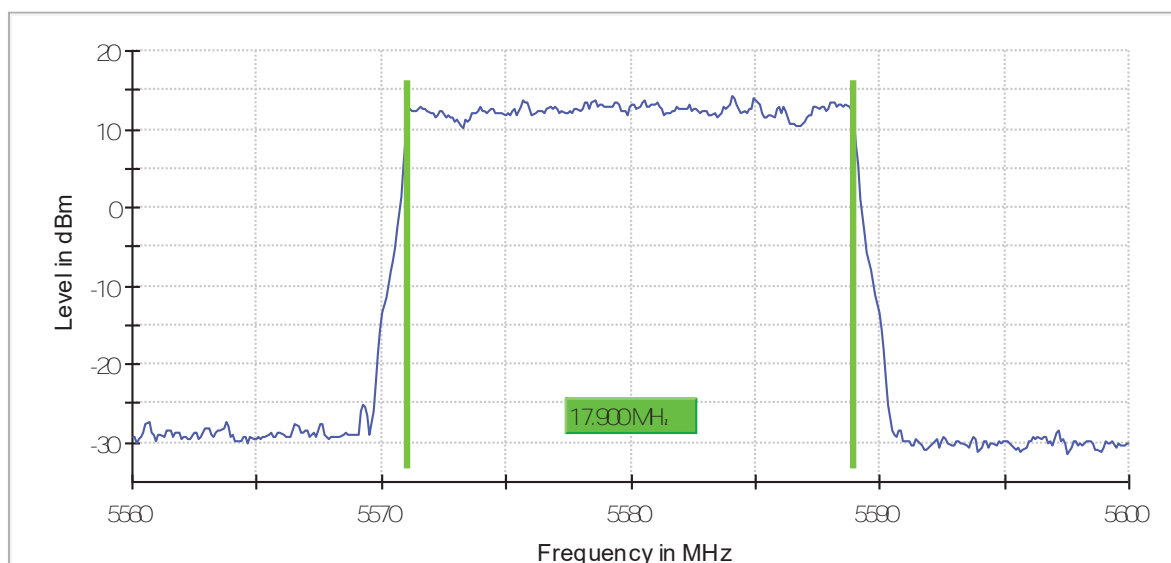
channel 100 (5500 MHz)

99% Bandwidth



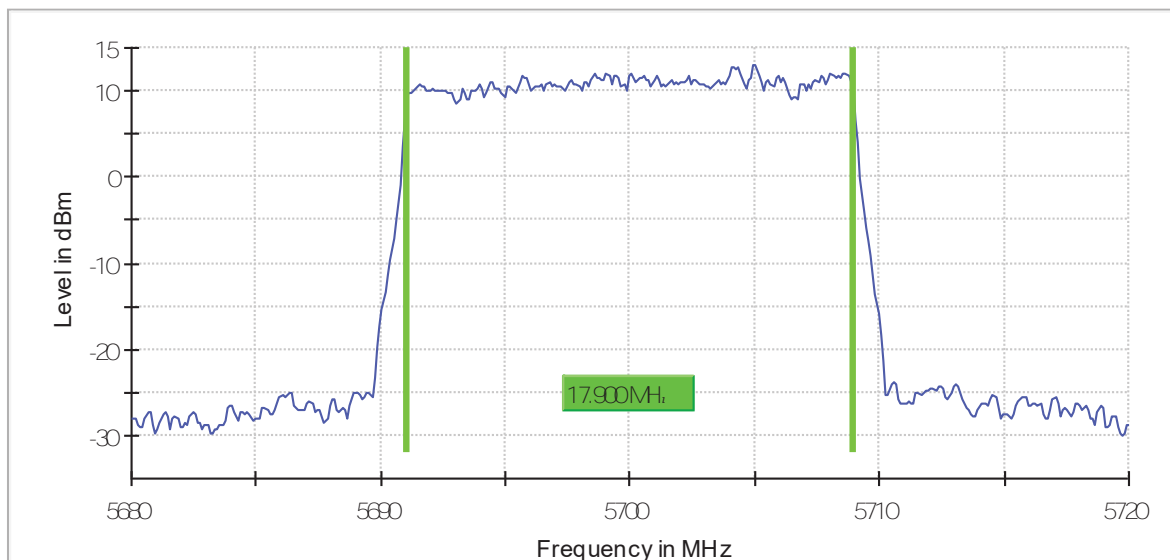
channel 116 (5580 MHz)

99% Bandwidth



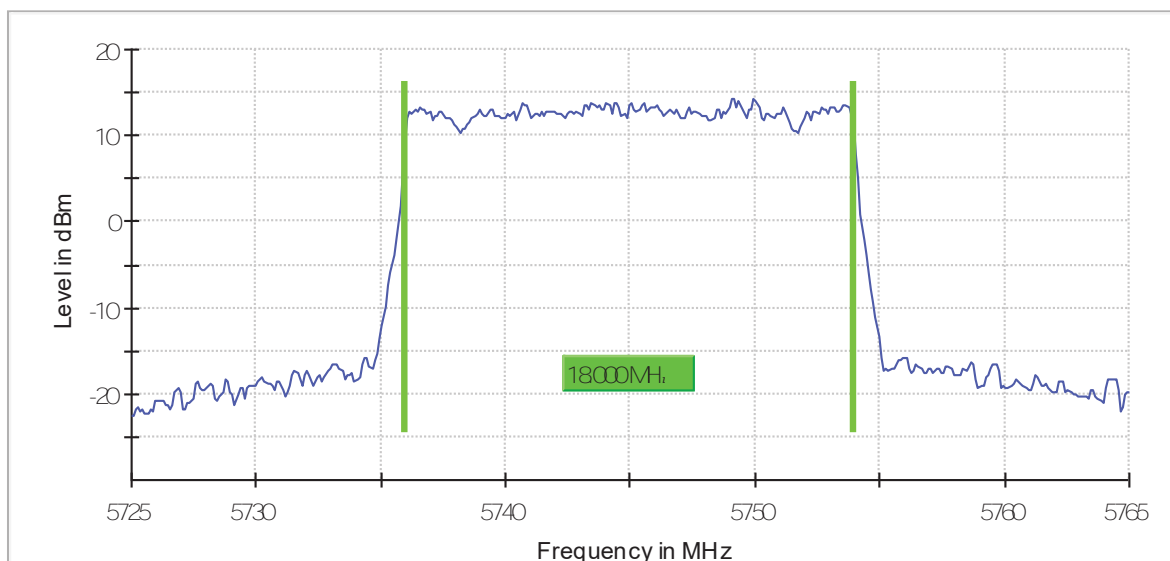
channel 140 (5700 MHz)

99% Bandwidth



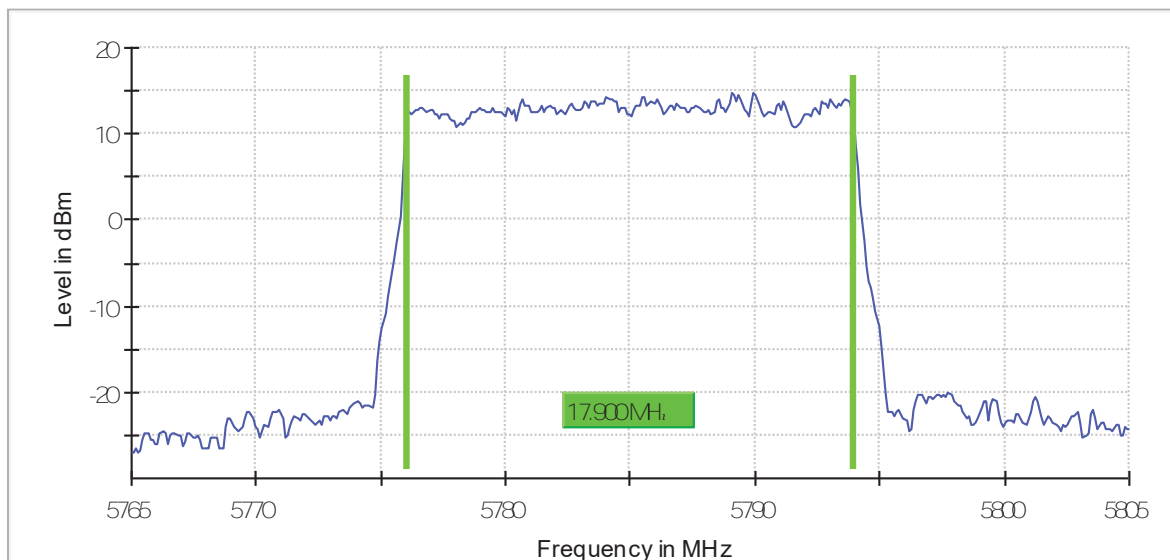
channel 149 (5745 MHz)

99% Bandwidth



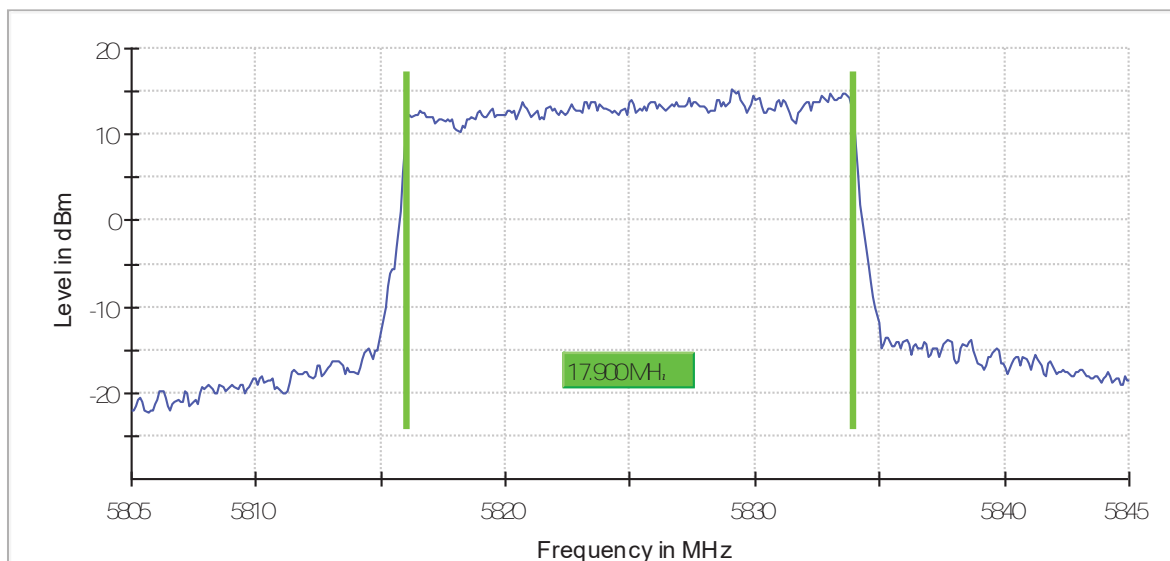
channel 157 (5785 MHz)

99% Bandwidth



channel 165 (5825 MHz)

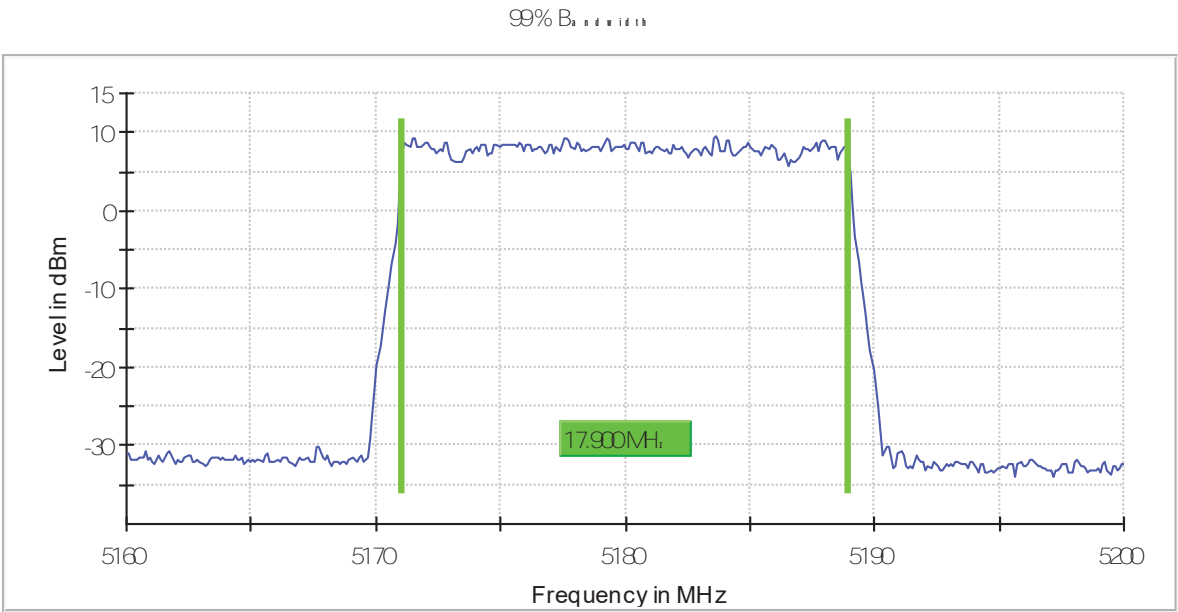
99% Bandwidth



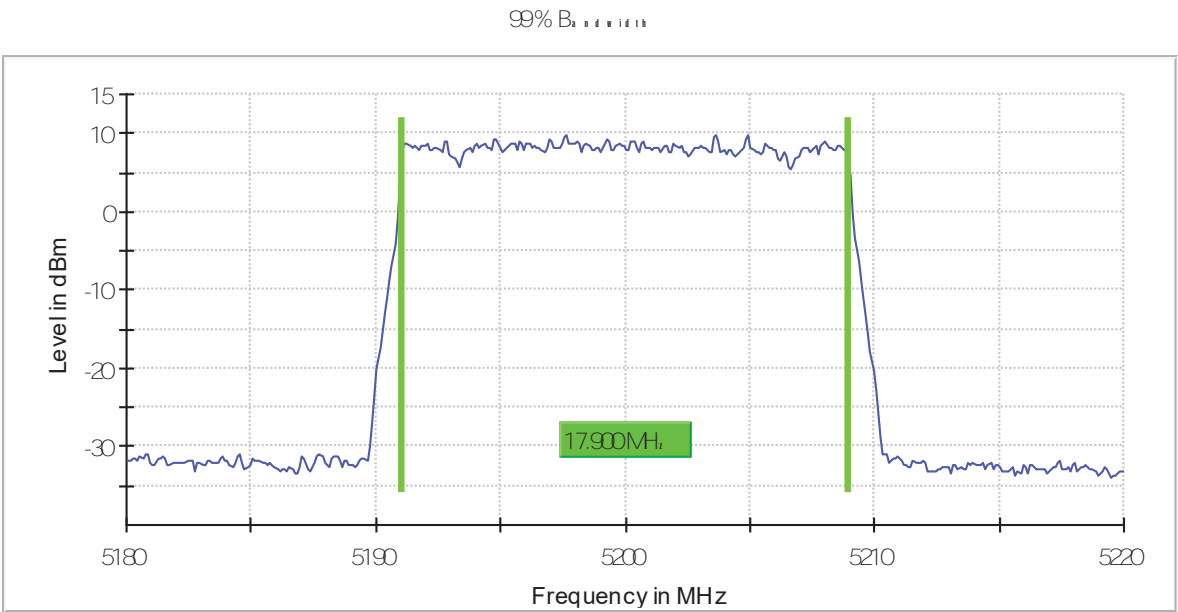
SISO Antenna Port 2:

Mode: QPSK - 20MHz

channel 36 (5180 MHz)

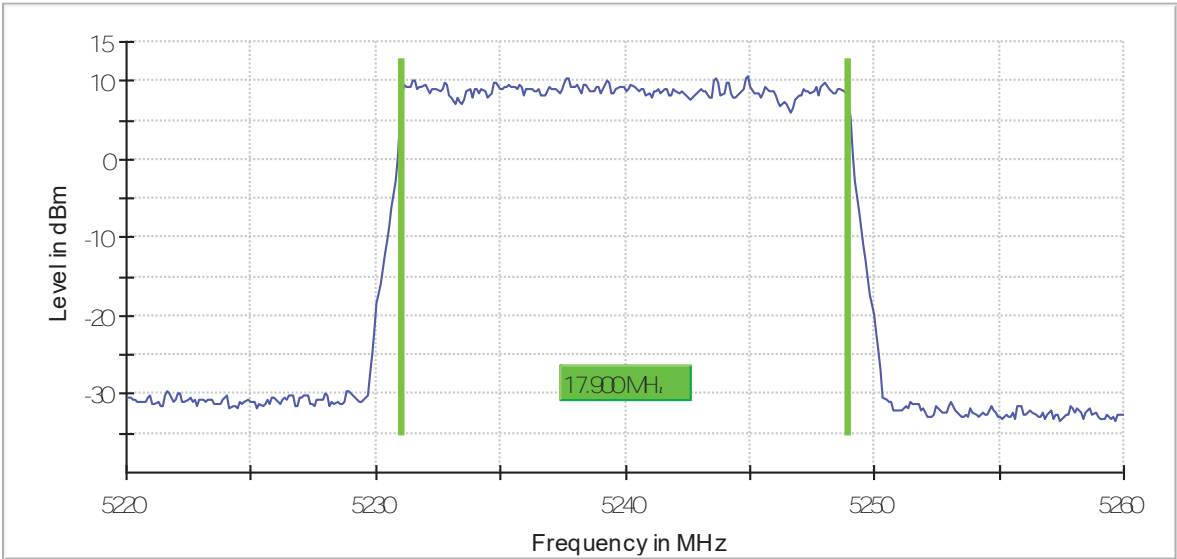


channel 40 (5200 MHz)



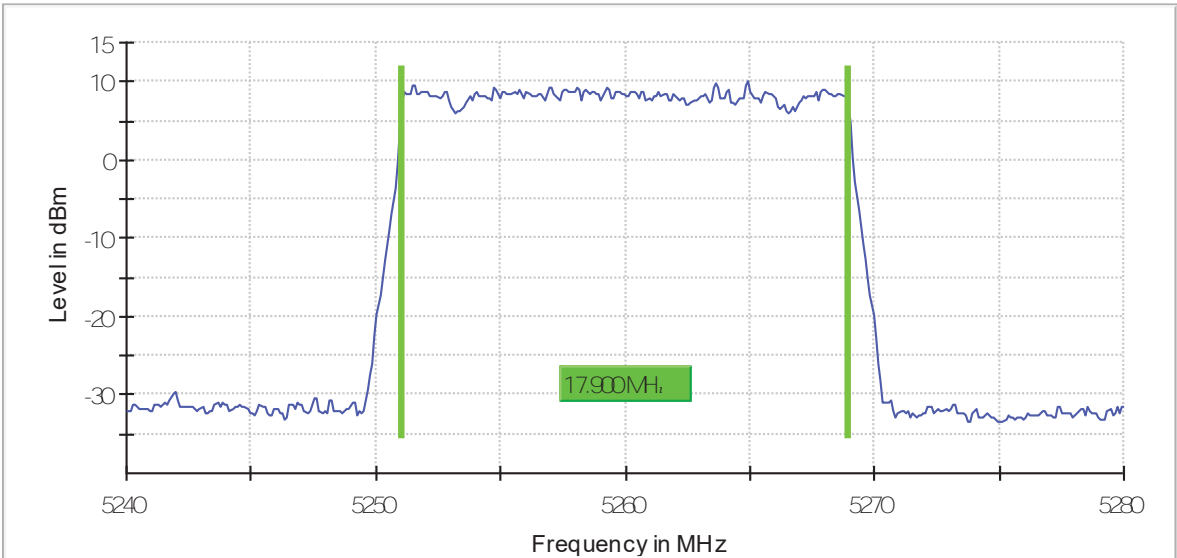
channel 48 (5240 MHz)

99% Bandwidth

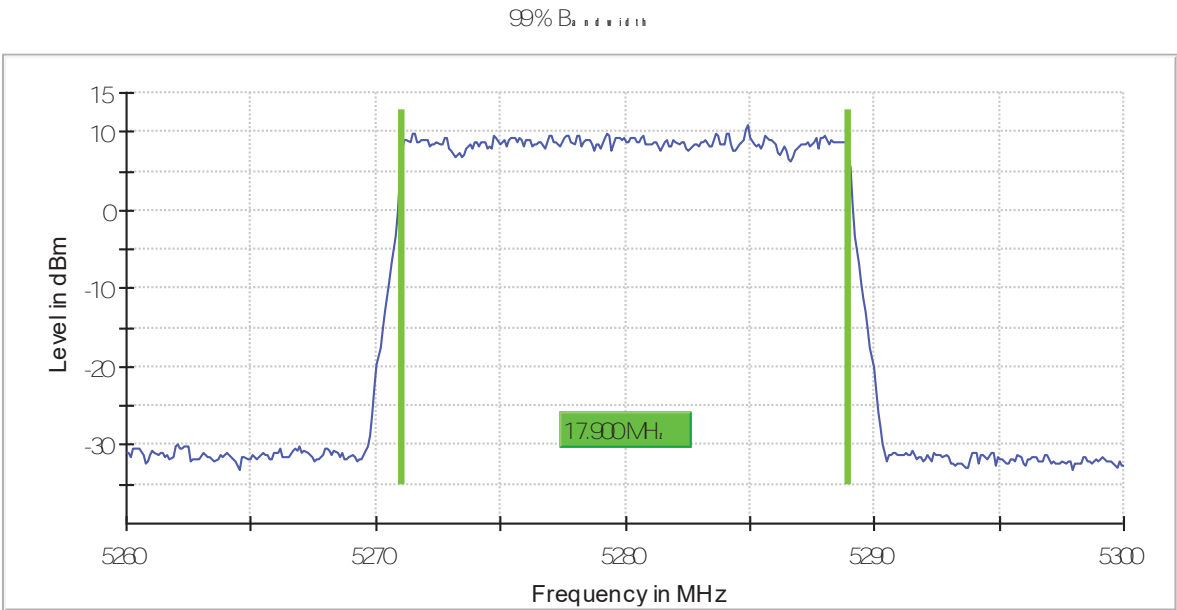


channel 52 (5260 MHz)

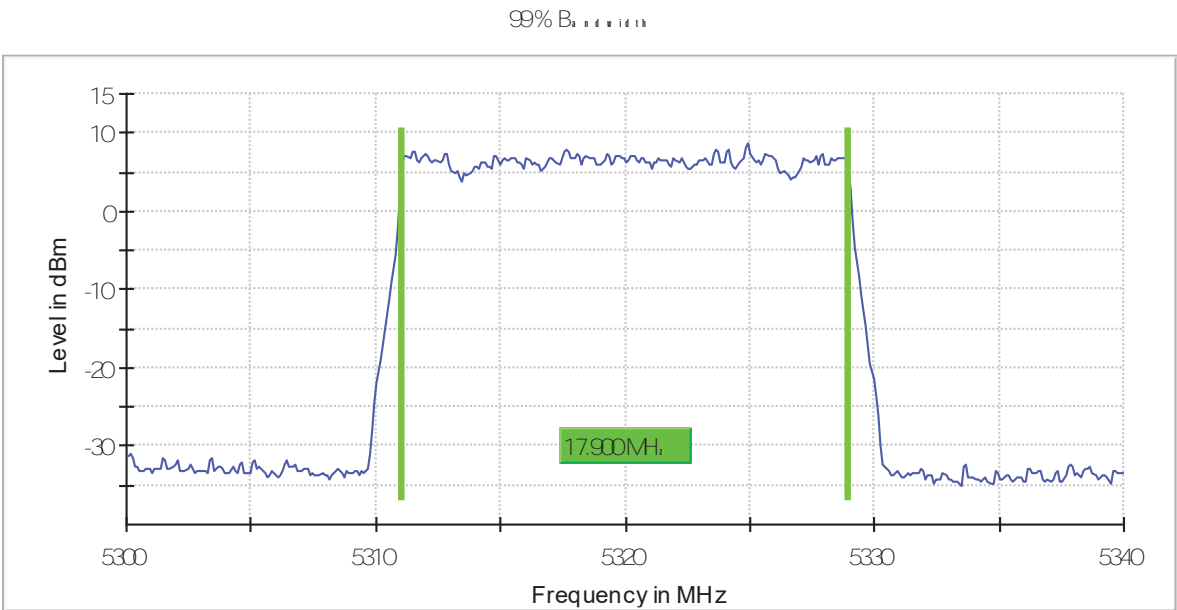
99% Bandwidth



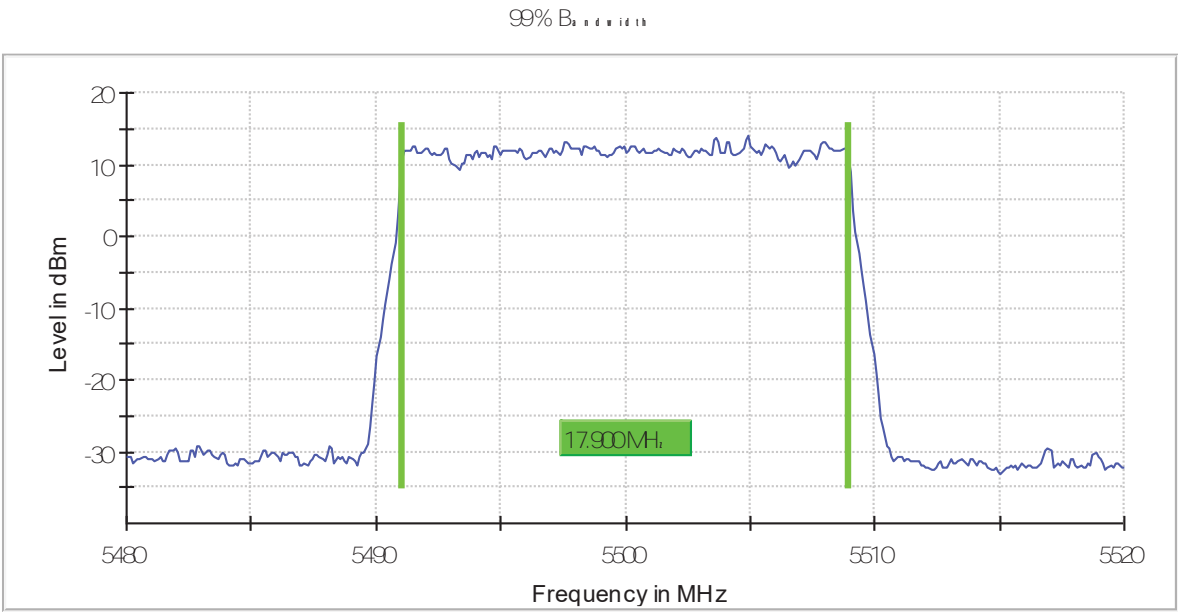
channel 56 (5280 MHz)



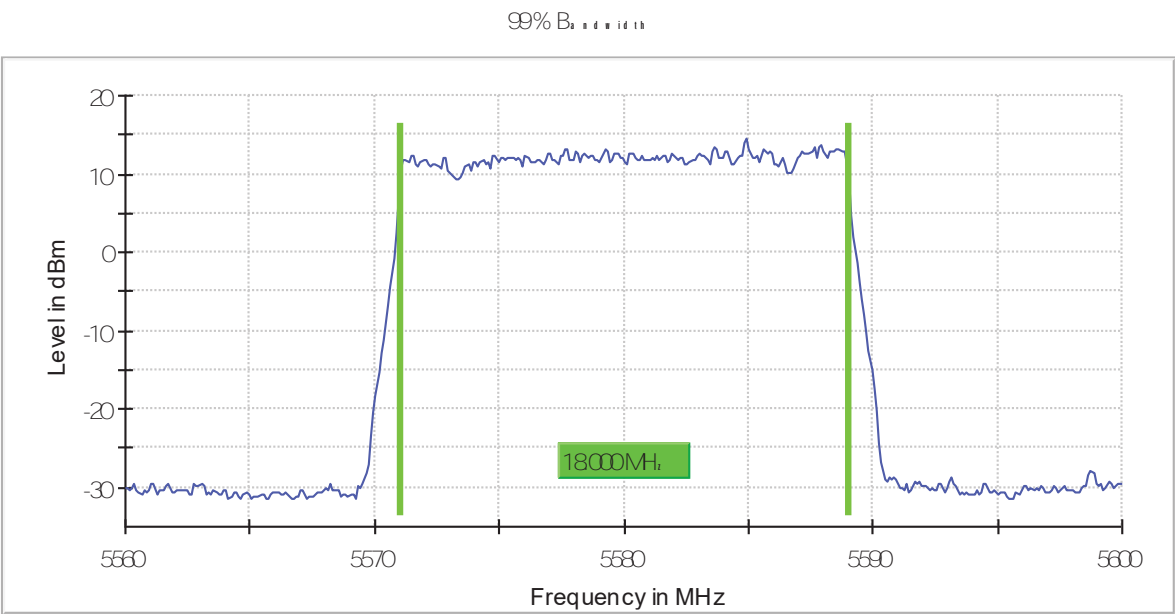
channel 64 (5320 MHz)



channel 100 (5500 MHz)

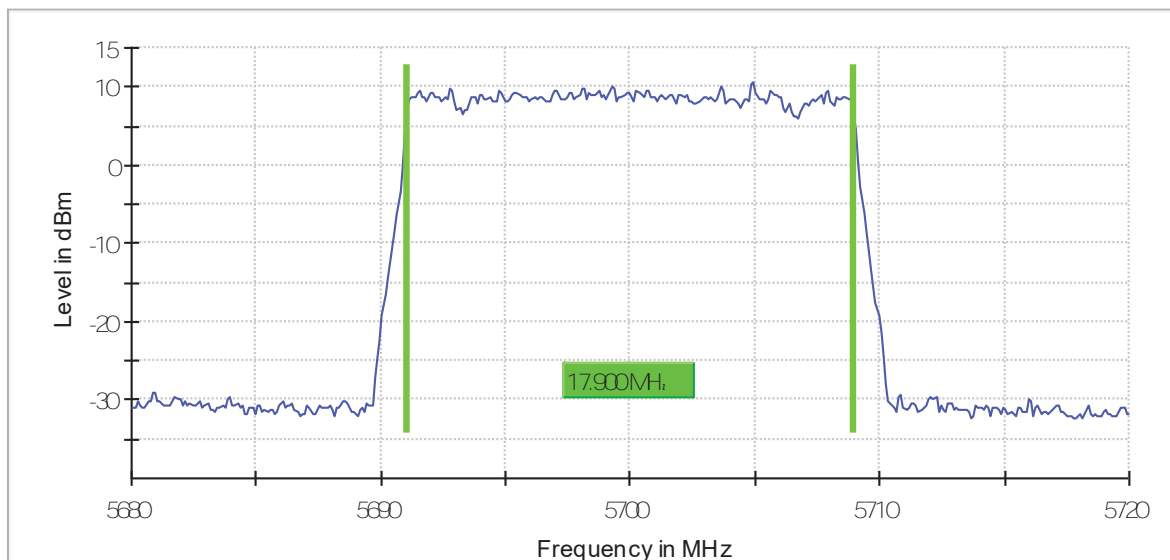


channel 116 (5580 MHz)



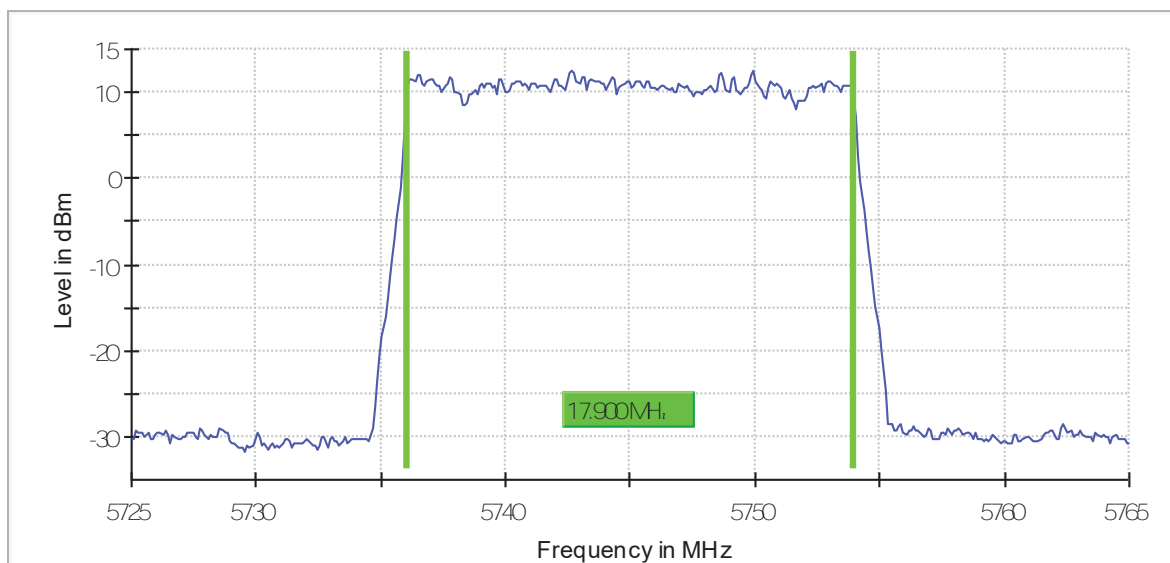
channel 140 (5700 MHz)

99% Bandwidth



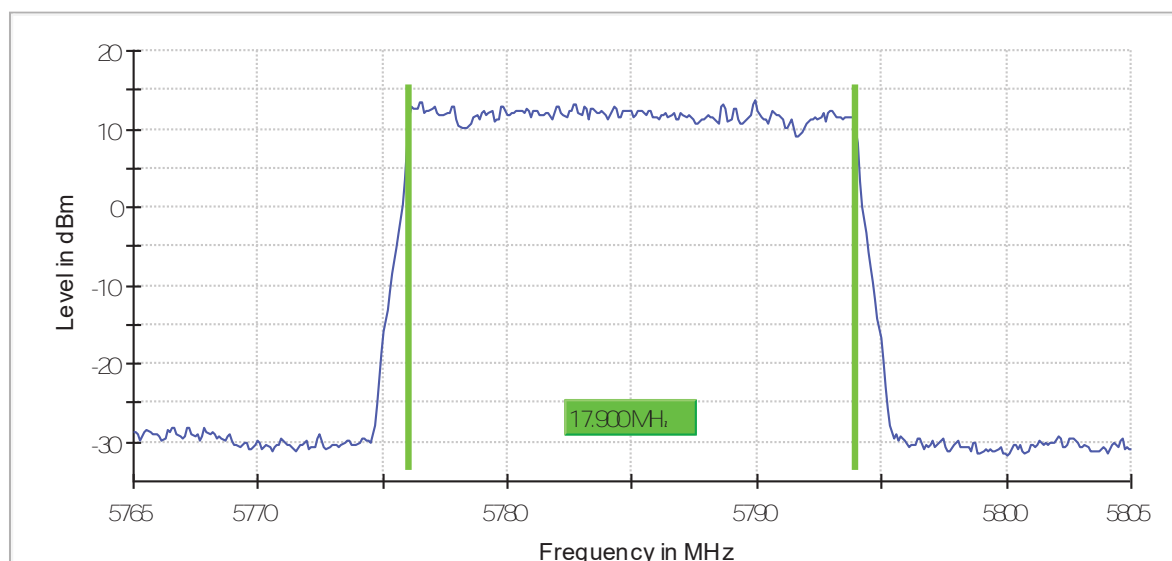
channel 149 (5745 MHz)

99% Bandwidth



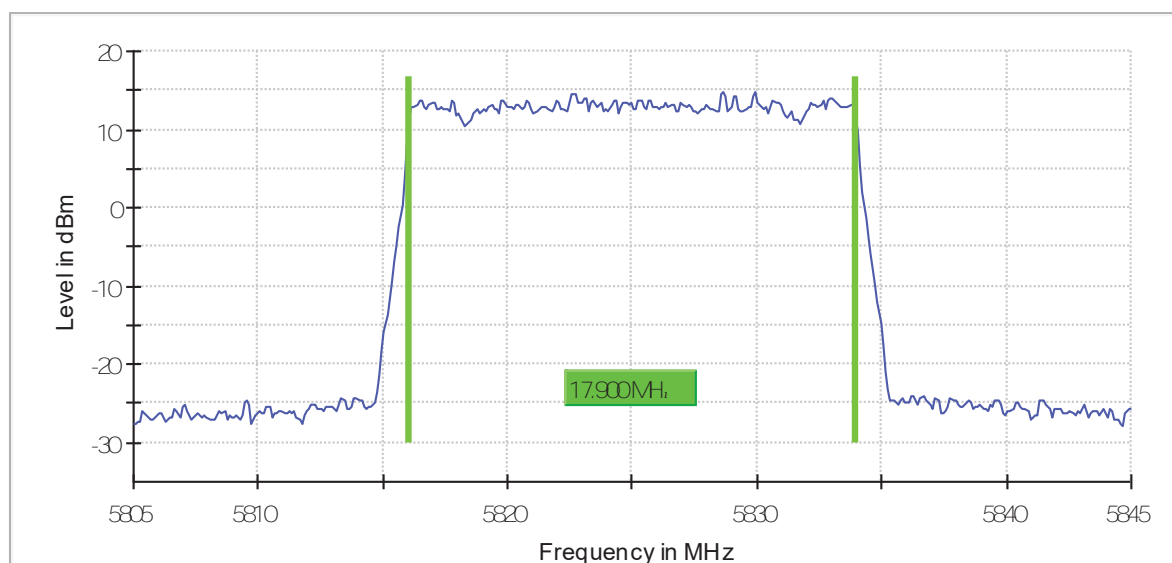
channel 157 (5785 MHz)

99% Bandwidth



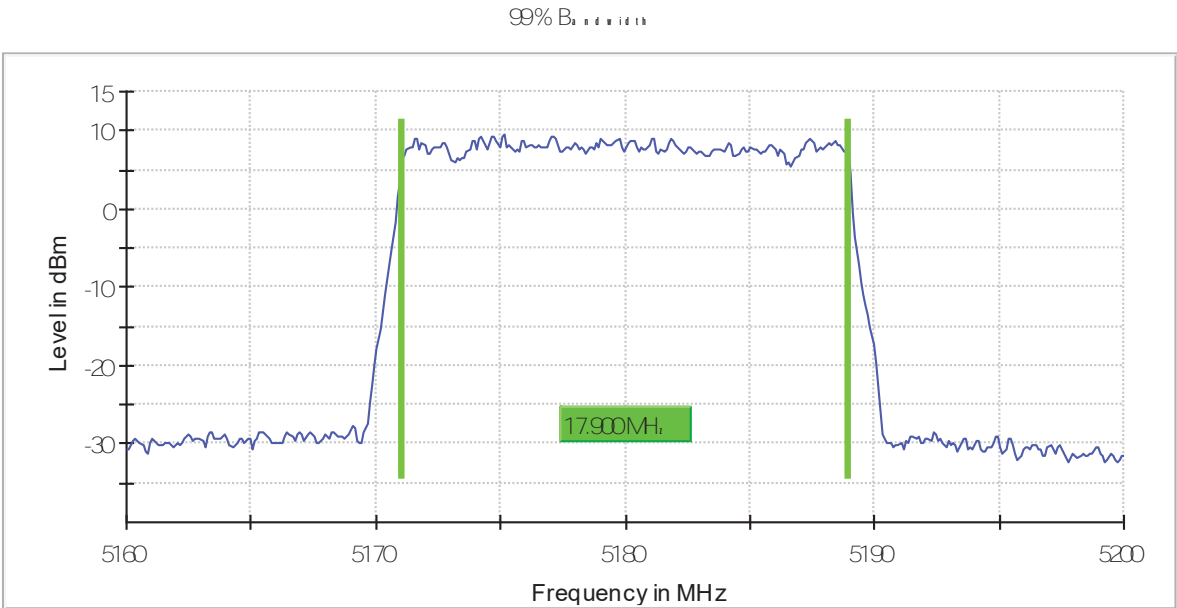
channel 165 (5825 MHz)

99% Bandwidth

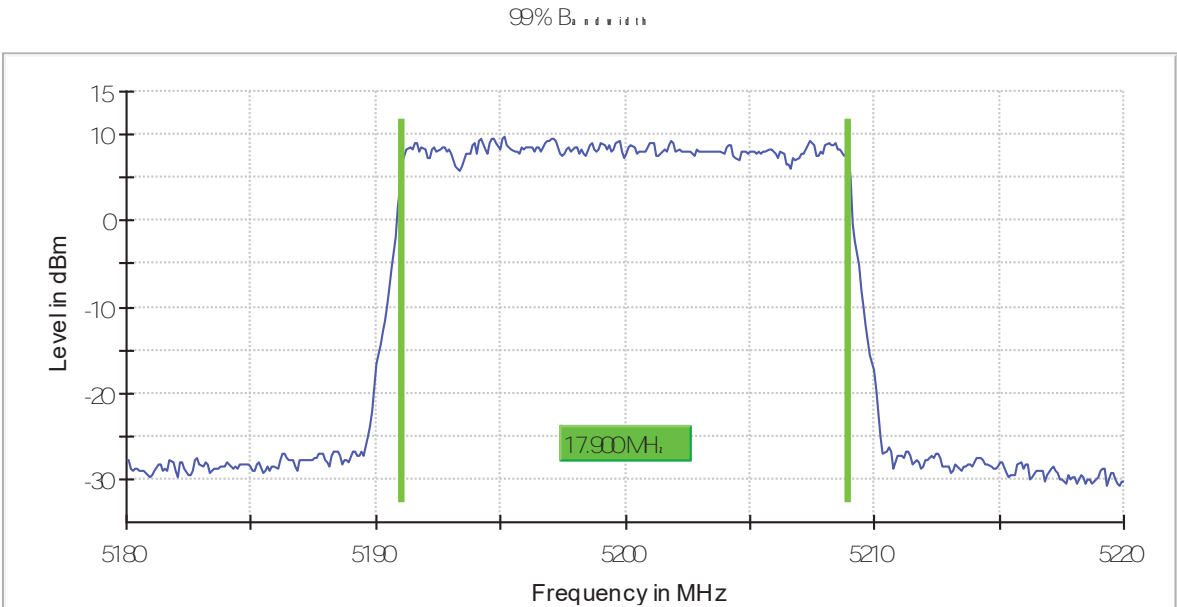


Mode: 16QAM- 20MHz

channel 36 (5180 MHz)

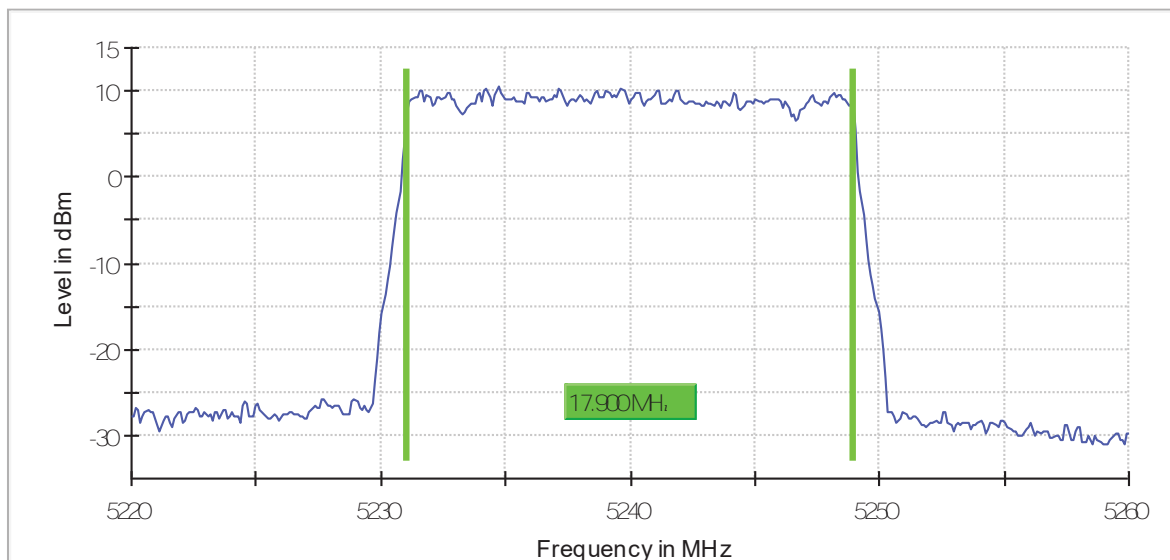


channel 40 (5200 MHz)



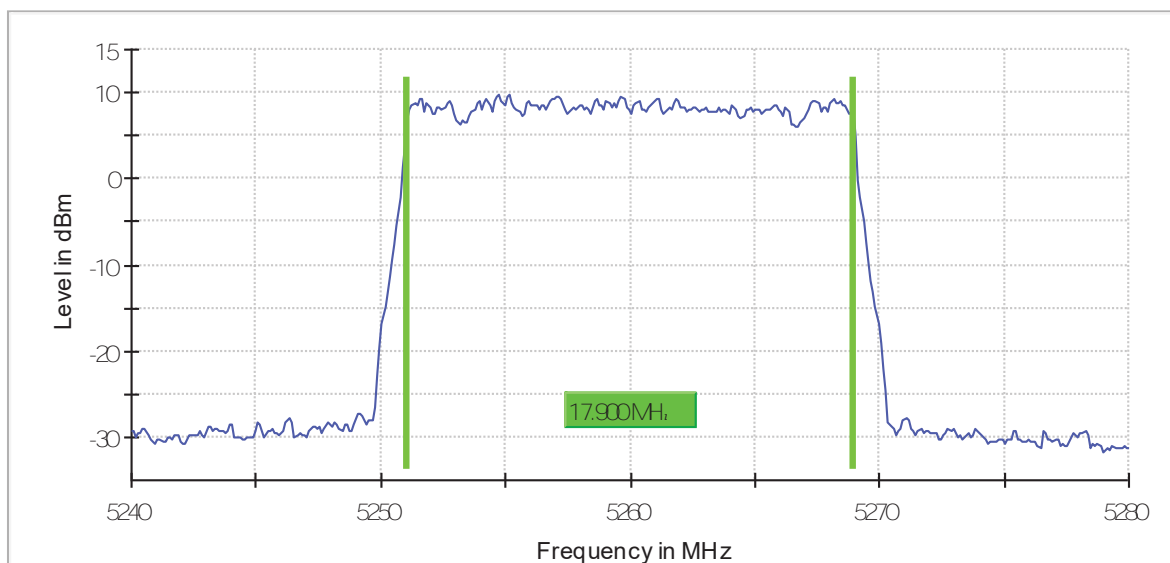
channel 48 (5240 MHz)

99% Bandwidth

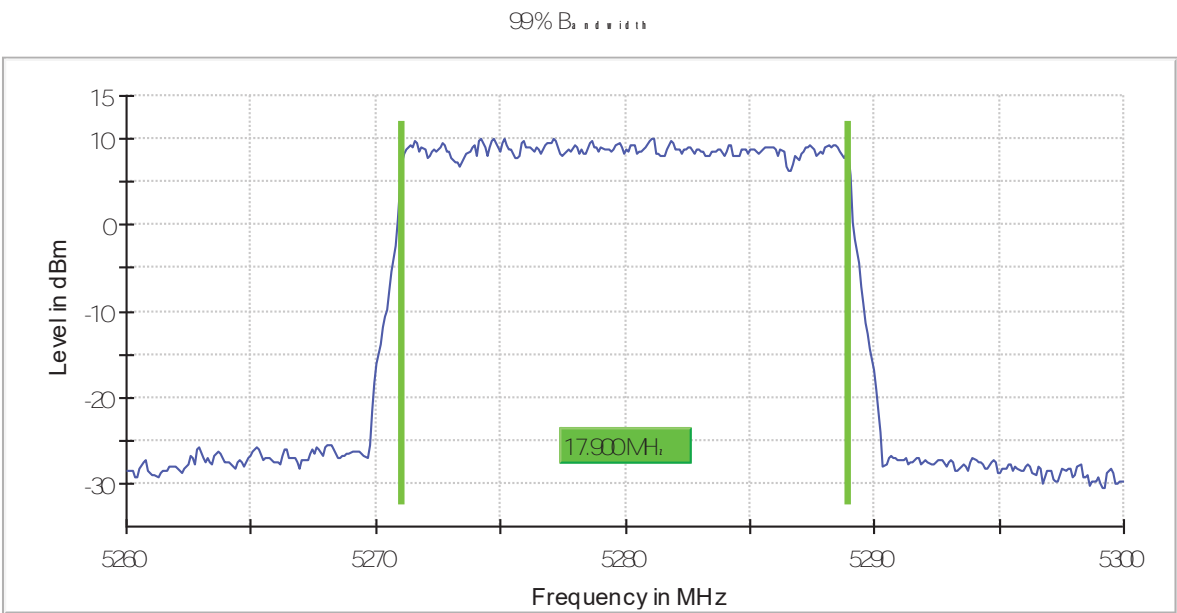


channel 52 (5260 MHz)

99% Bandwidth



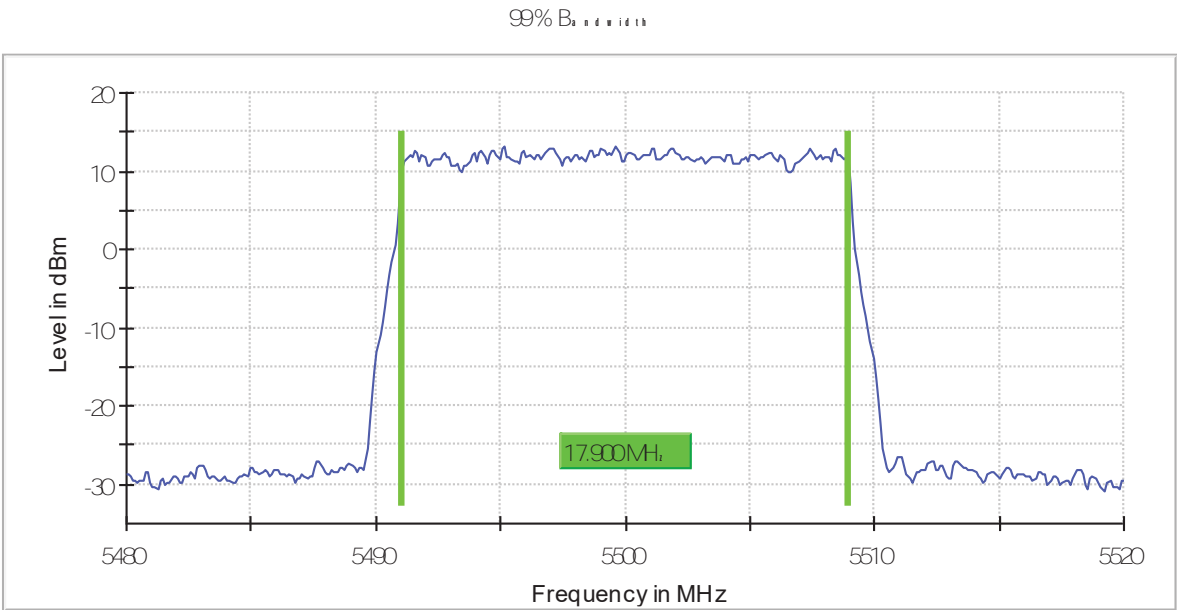
channel 56 (5280 MHz)



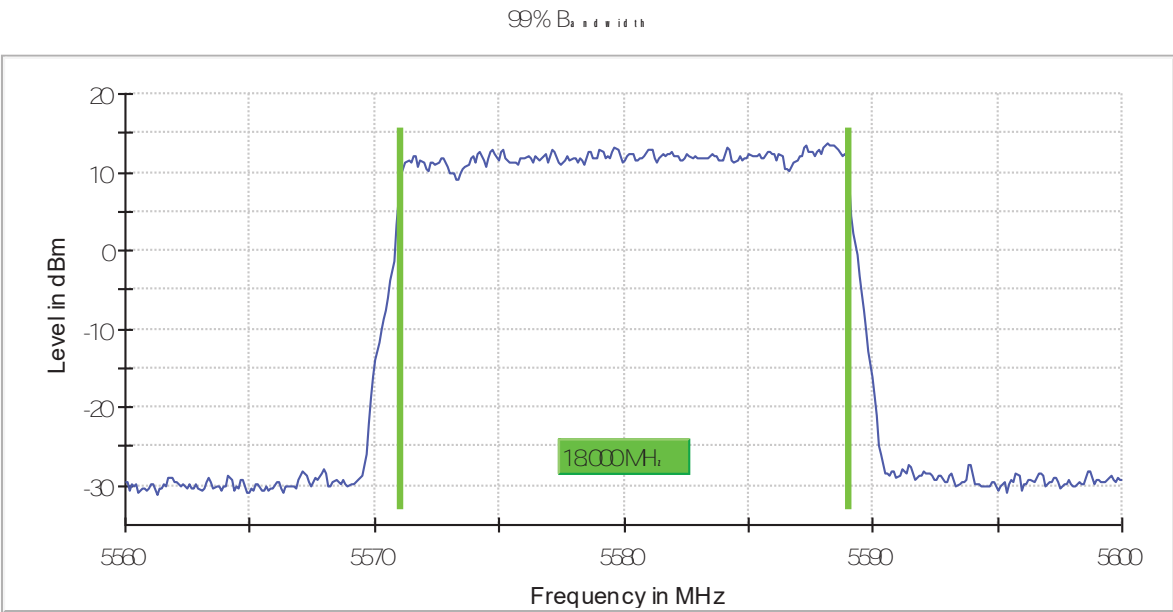
channel 64 (5320 MHz)



channel 100 (5500 MHz)

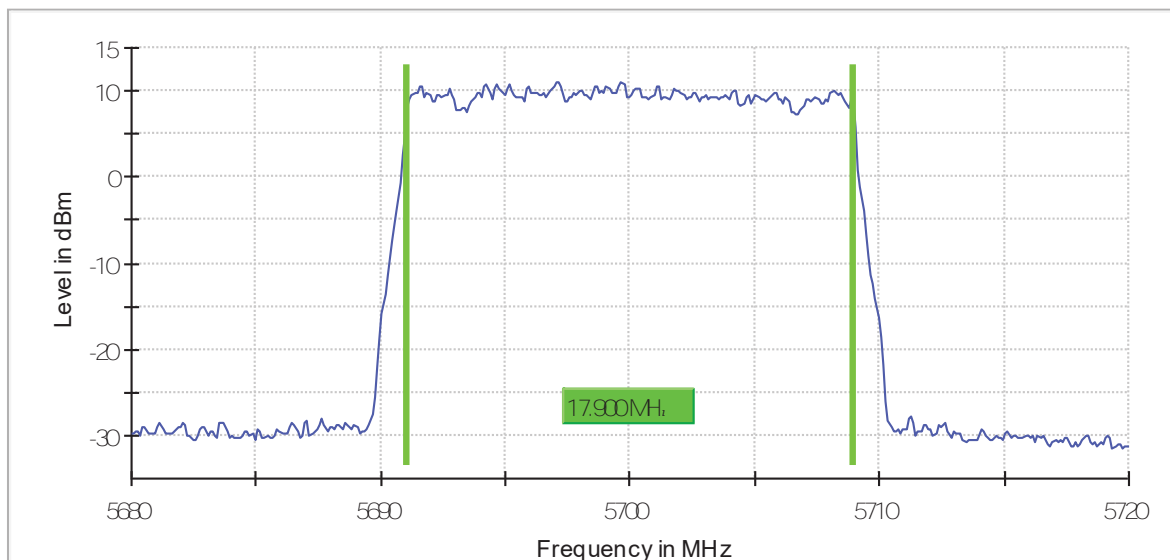


channel 116 (5580 MHz)



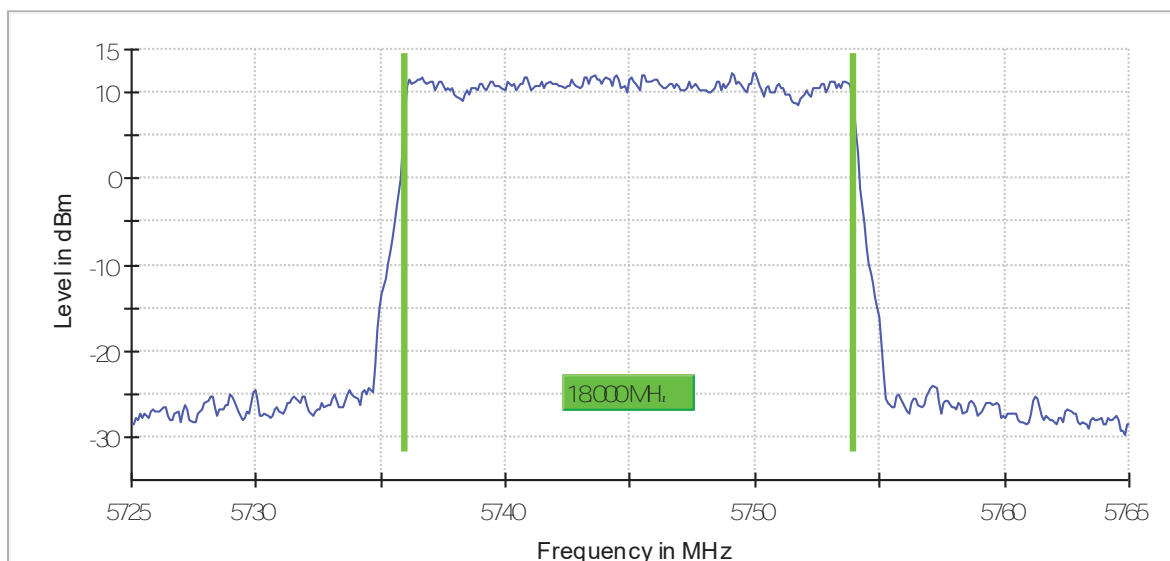
channel 140 (5700 MHz)

99% Bandwidth

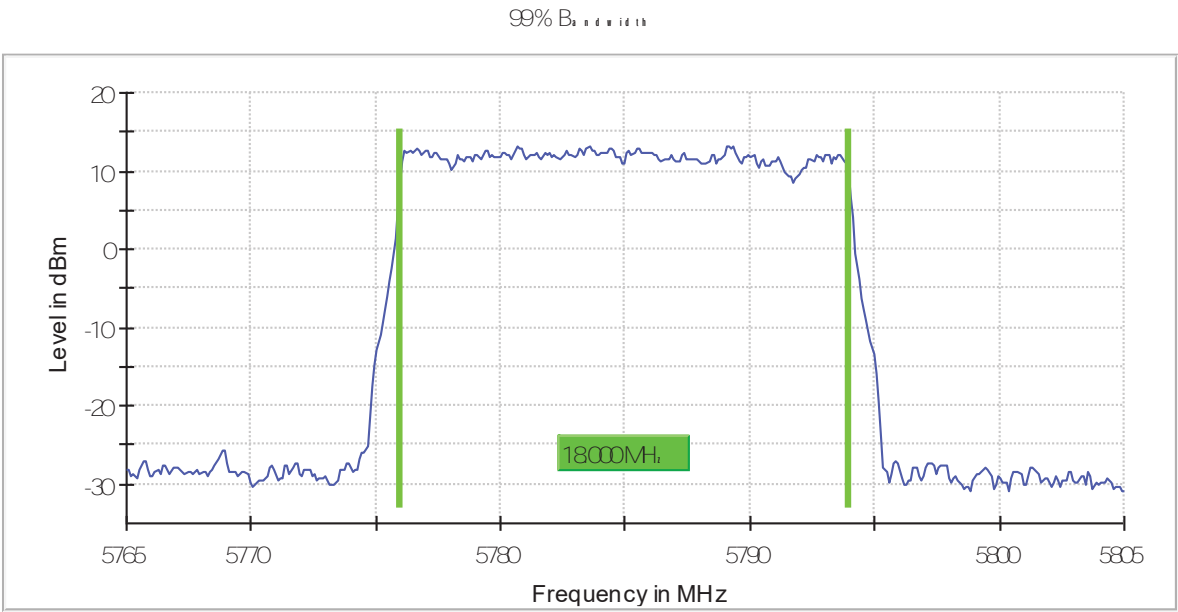


channel 149 (5745 MHz)

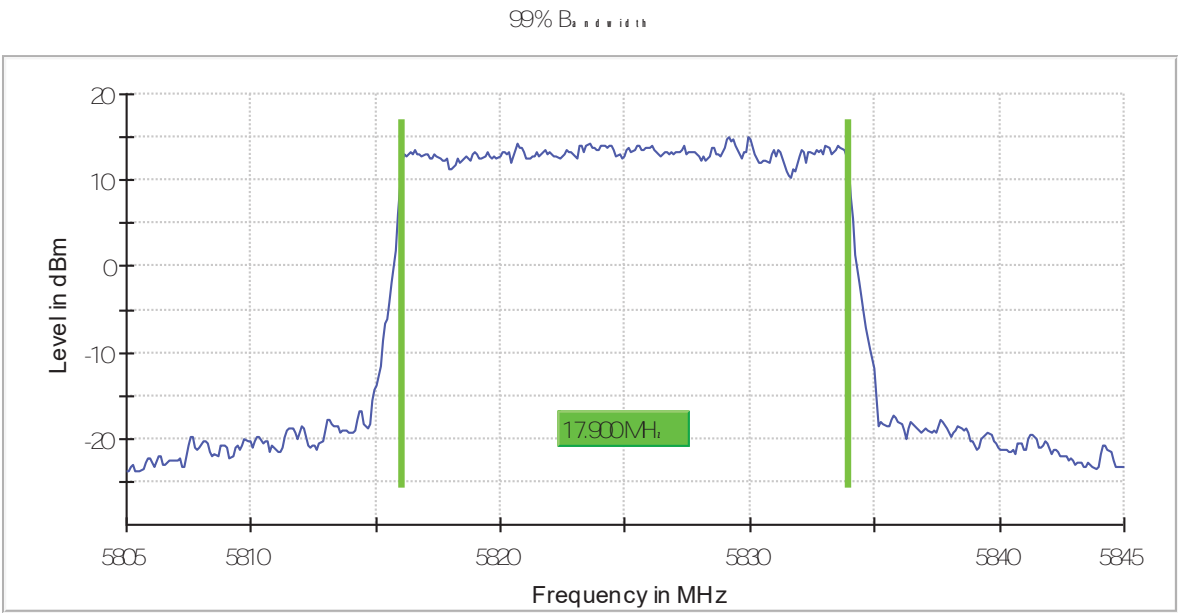
99% Bandwidth



channel 157 (5785 MHz)

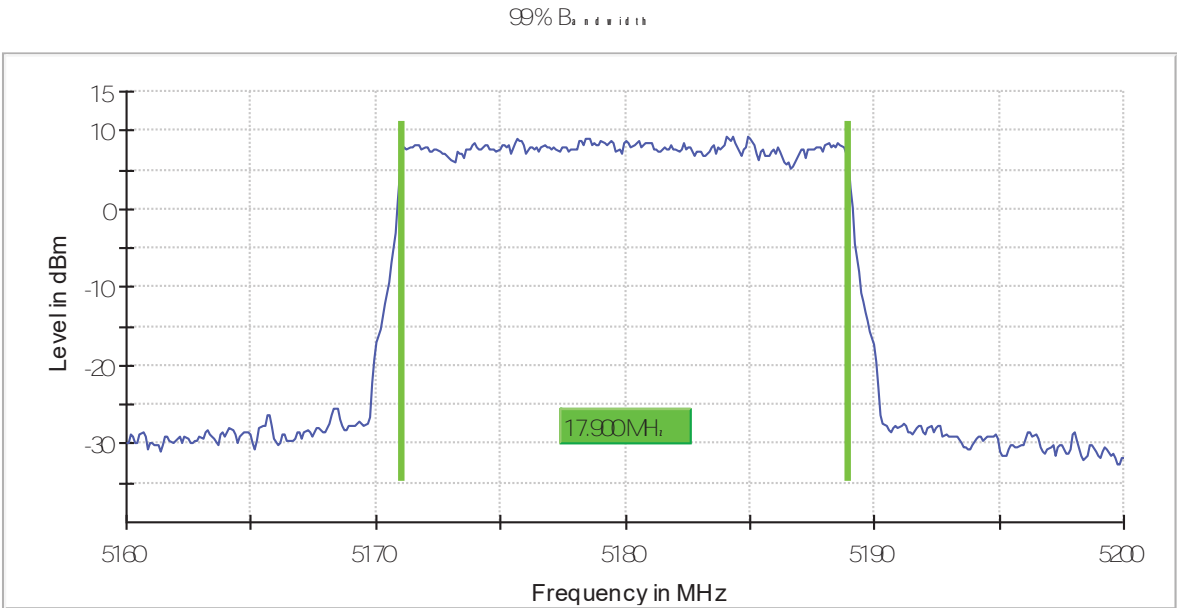


channel 165 (5825 MHz)

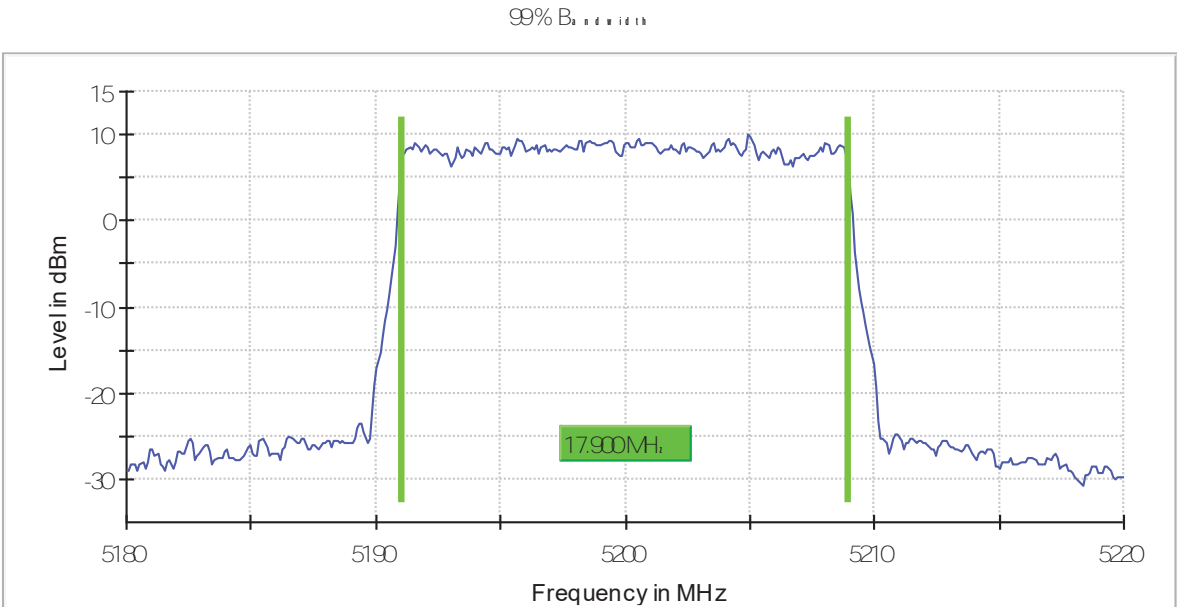


Mode: 64QAM - 20MHz

channel 36 (5180 MHz)

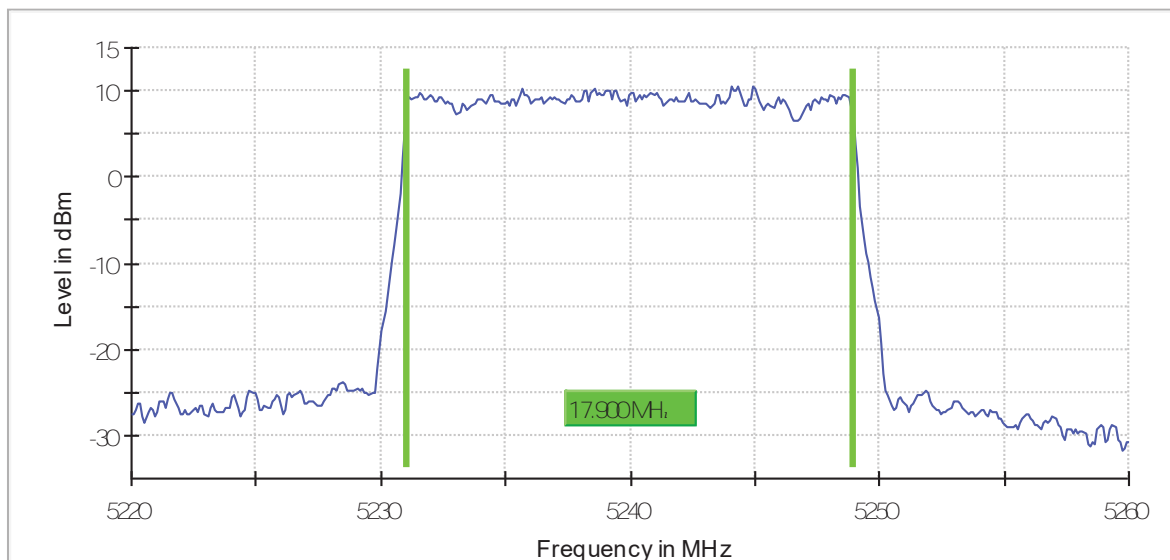


channel 40 (5200 MHz)



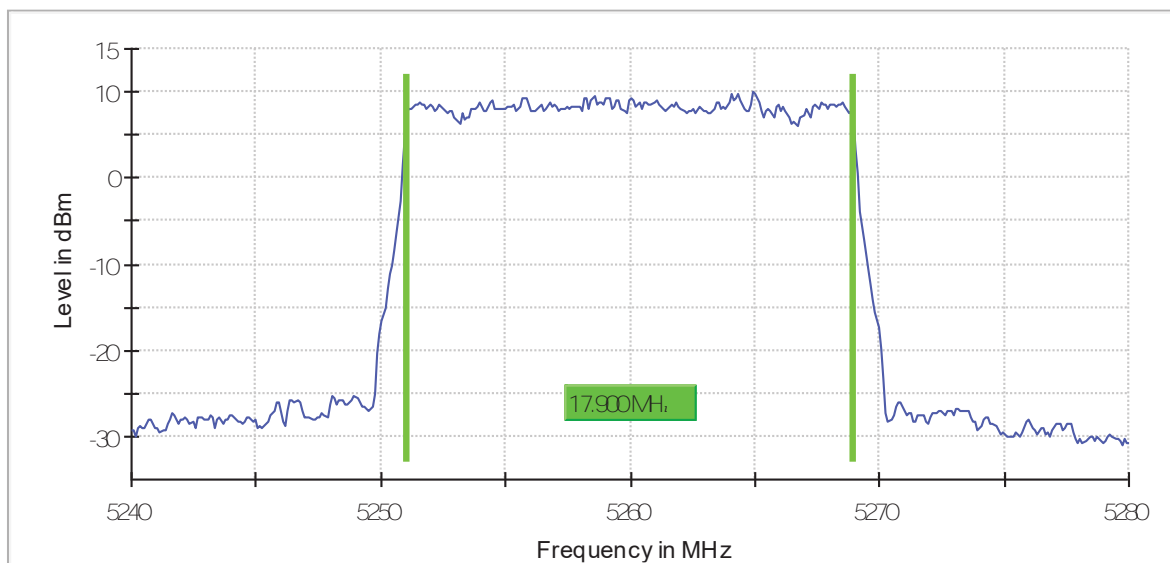
channel 48 (5240 MHz)

99% Bandwidth



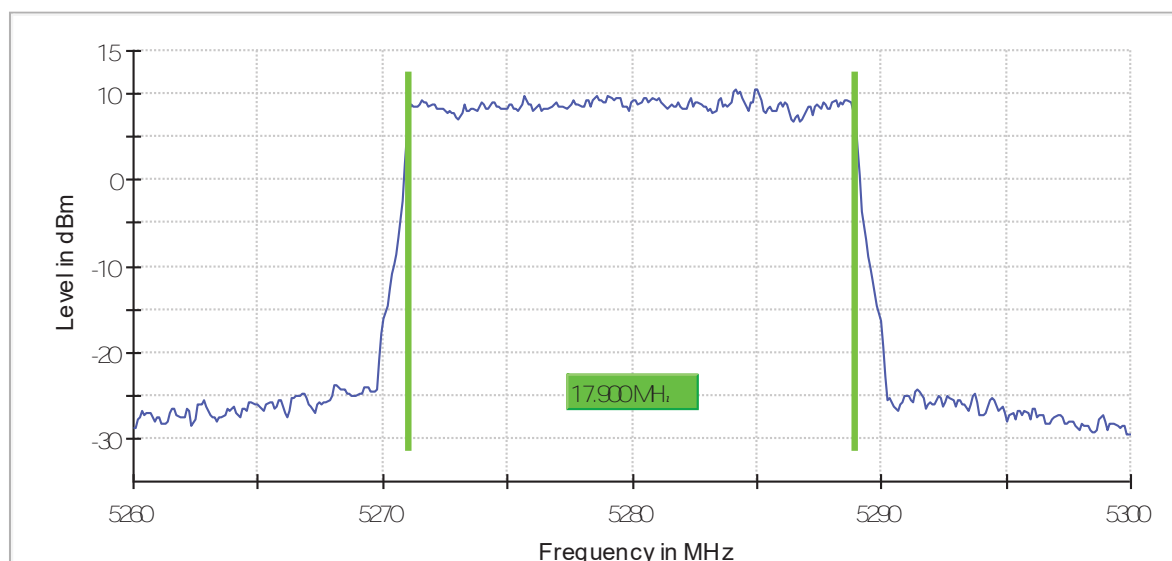
channel 52 (5260 MHz)

99% Bandwidth



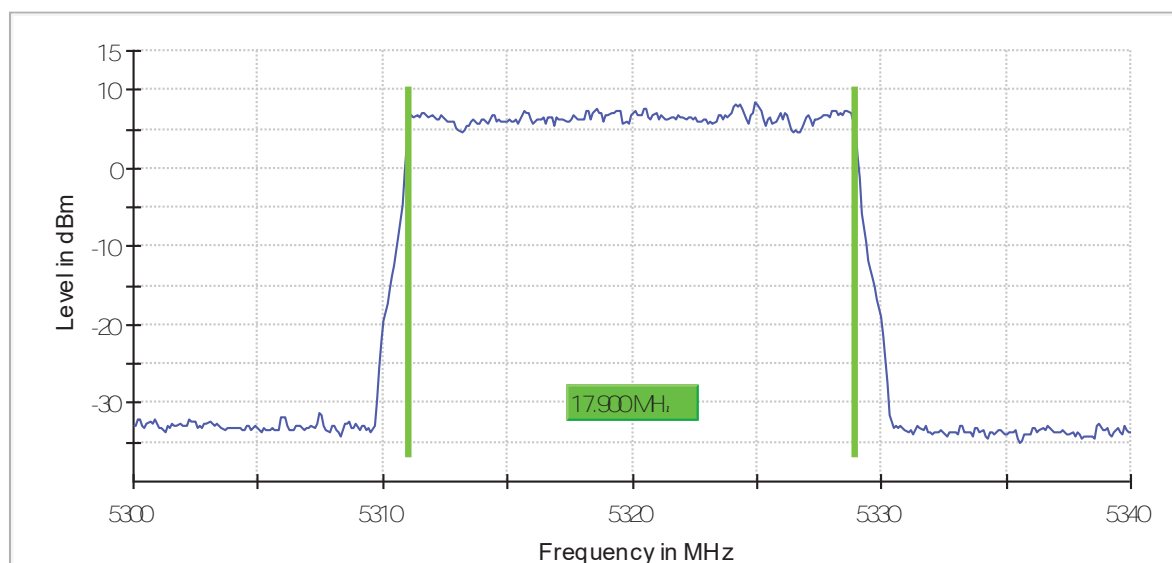
channel 56 (5280 MHz)

99% Bandwidth

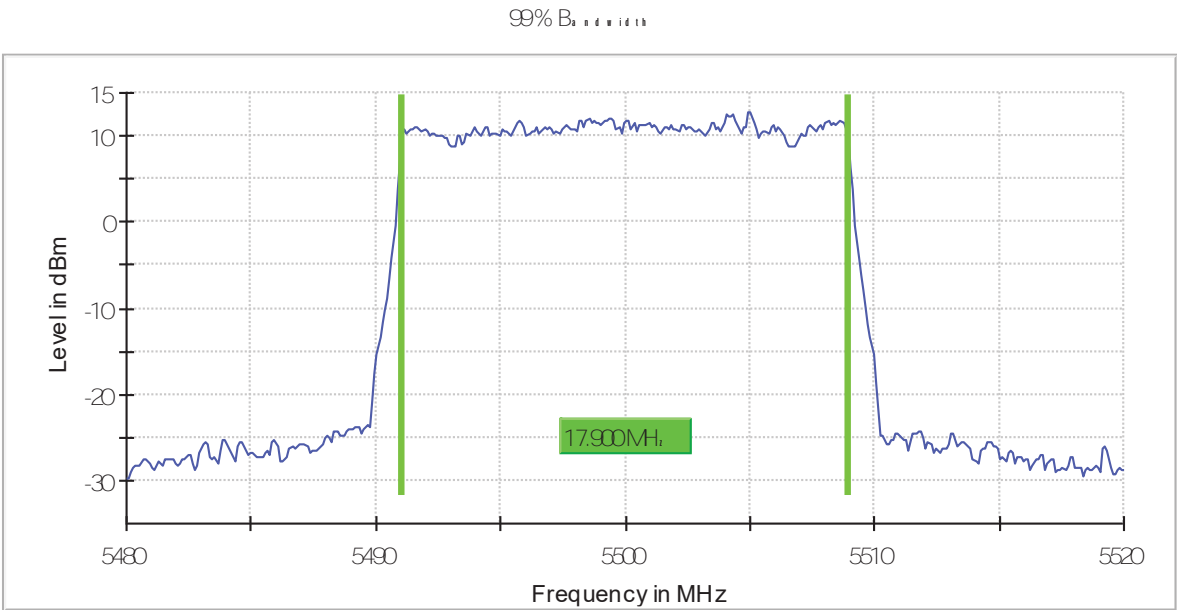


channel 64 (5320 MHz)

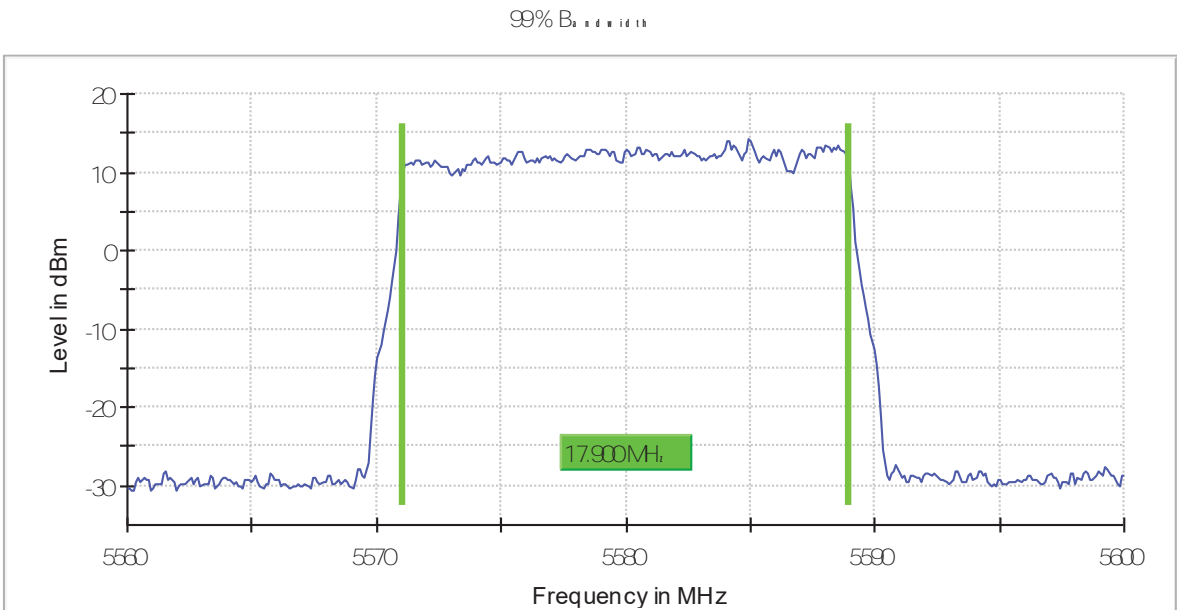
99% Bandwidth



channel 100 (5500 MHz)

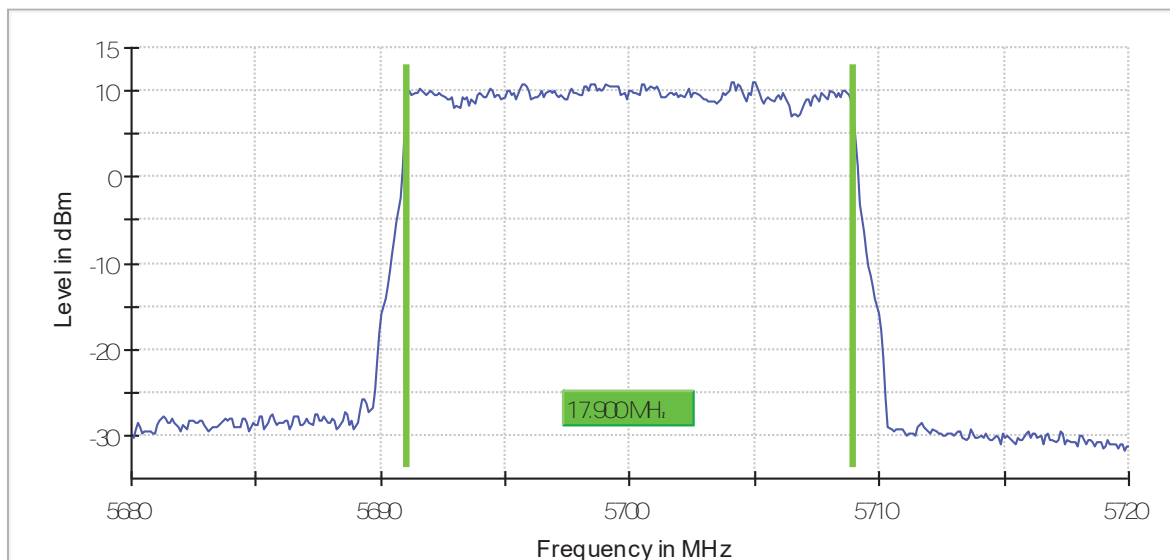


channel 116 (5580 MHz)



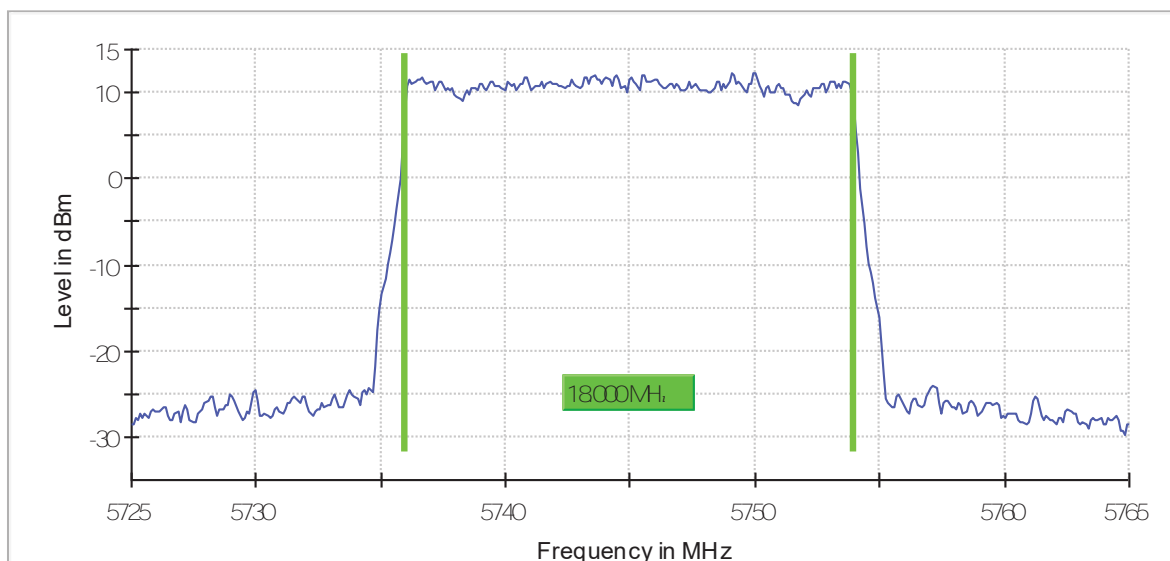
channel 140 (5700 MHz)

99% Bandwidth



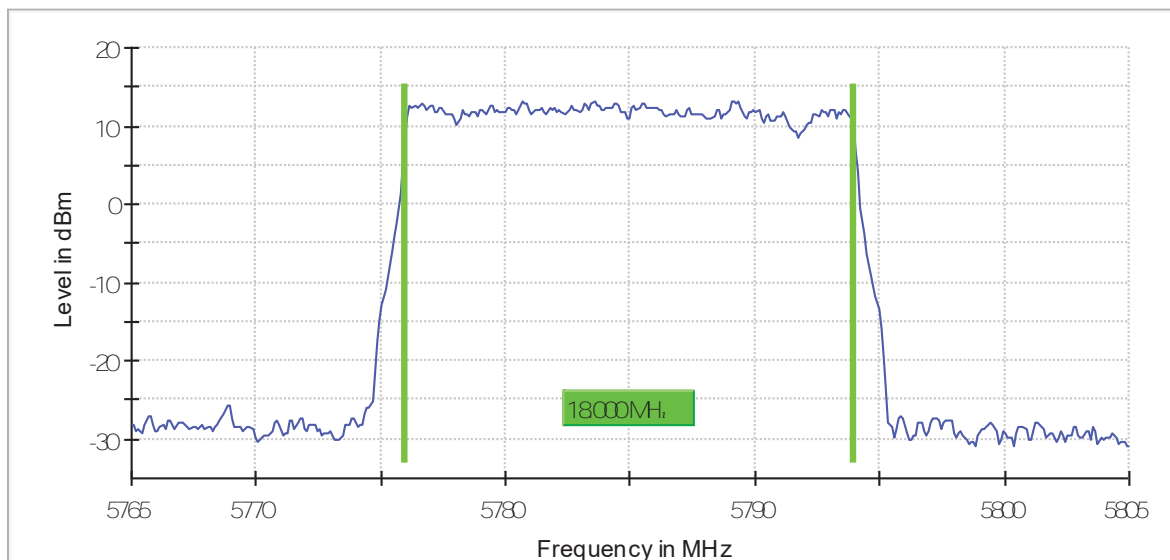
channel 149 (5745 MHz)

99% Bandwidth



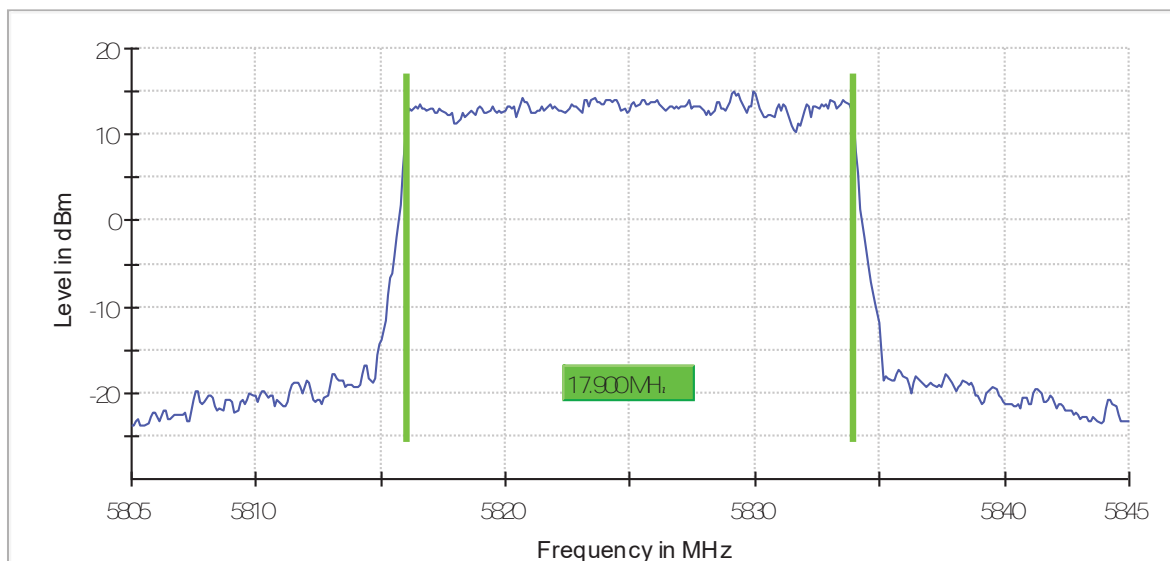
channel 157 (5785 MHz)

99% Bandwidth



channel 165 (5825 MHz)

99% Bandwidth



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

RESULTS:

The 26 dB emission Bandwidth was measured using the method according to point C) 1) of 789033 D02 General UNII Test Procedures New Rules v02r01.

Measurements were performed on all modes for testing.

SISO Antenna Port 1:

Mode: QPSK – 20MHz

	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	19.700	<±40.04
channel 40 (5200 MHz)	19.600	
channel 48 (5240 MHz)	19.700	
channel 52 (5260 MHz)	19.700	
channel 56 (5280 MHz)	19.600	
channel 64 (5320 MHz)	19.600	
channel 100 (5500 MHz)	19.700	
channel 116 (5580 MHz)	19.700	
channel 140 (5700 MHz)	19.600	

Mode: 16QAM – 20MHz

	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	19.900	<±40.04
channel 40 (5200 MHz)	19.900	
channel 48 (5240 MHz)	20.000	
channel 52 (5260 MHz)	19.900	
channel 56 (5280 MHz)	20.000	
channel 64 (5320 MHz)	19.900	
channel 100 (5500 MHz)	19.800	
channel 116 (5580 MHz)	19.900	
channel 140 (5700 MHz)	19.900	

Mode: 64QAM – 20MHz

	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	20.000	<±40.04
channel 40 (5200 MHz)	19.900	
channel 48 (5240 MHz)	19.900	
channel 52 (5260 MHz)	19.900	
channel 56 (5280 MHz)	19.800	
channel 64 (5320 MHz)	19.800	
channel 100 (5500 MHz)	19.900	
channel 116 (5580 MHz)	19.900	
channel 140 (5700 MHz)	19.800	

SISO Antenna Port 2:

Mode: QPSK – 20MHz

	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	19.700	<±40.04
channel 40 (5200 MHz)	19.700	
channel 48 (5240 MHz)	19.700	
channel 52 (5260 MHz)	19.700	
channel 56 (5280 MHz)	19.700	
channel 64 (5320 MHz)	19.700	
channel 100 (5500 MHz)	19.700	
channel 116 (5580 MHz)	19.600	
channel 140 (5700 MHz)	19.700	

Mode: 16QAM – 20MHz

	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	19.900	<±40.04
channel 40 (5200 MHz)	19.800	
channel 48 (5240 MHz)	19.800	
channel 52 (5260 MHz)	20.000	
channel 56 (5280 MHz)	19.900	
channel 64 (5320 MHz)	19.900	
channel 100 (5500 MHz)	19.900	
channel 116 (5580 MHz)	19.900	
channel 140 (5700 MHz)	19.800	

Mode: 64QAM – 20MHz

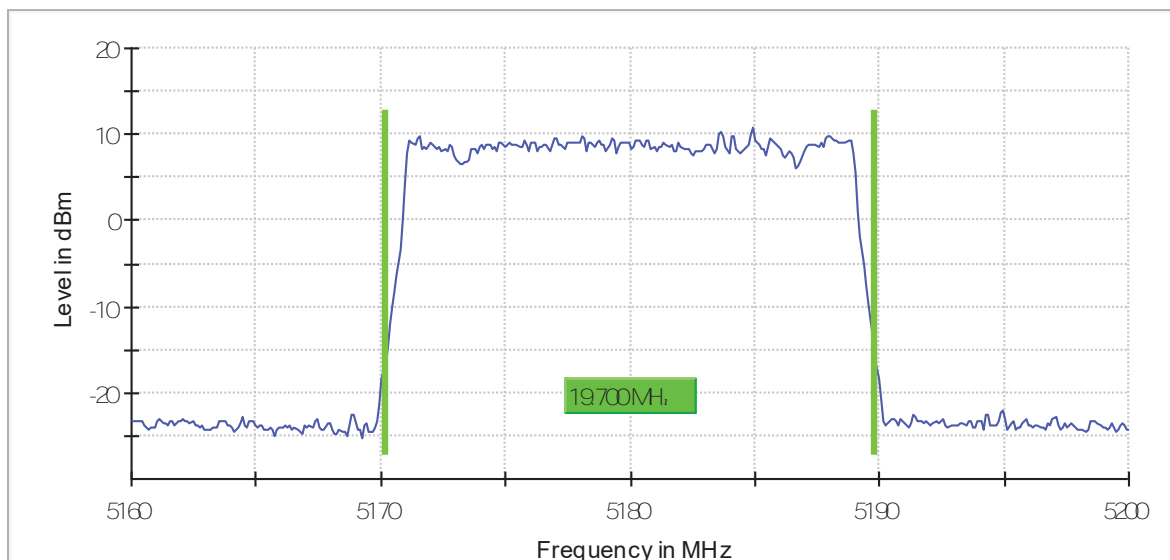
	26dB Emission Bandwidth (MHz)	Measurement uncertainty (KHz)
channel 36 (5180 MHz)	19.900	<±40.04
channel 40 (5200 MHz)	19.900	
channel 48 (5240 MHz)	19.900	
channel 52 (5260 MHz)	19.900	
channel 56 (5280 MHz)	19.900	
channel 64 (5320 MHz)	19.900	
channel 100 (5500 MHz)	19.900	
channel 116 (5580 MHz)	19.800	
channel 140 (5700 MHz)	19.900	

SISO Antenna Port 1:

Mode: QPSK – 20MHz

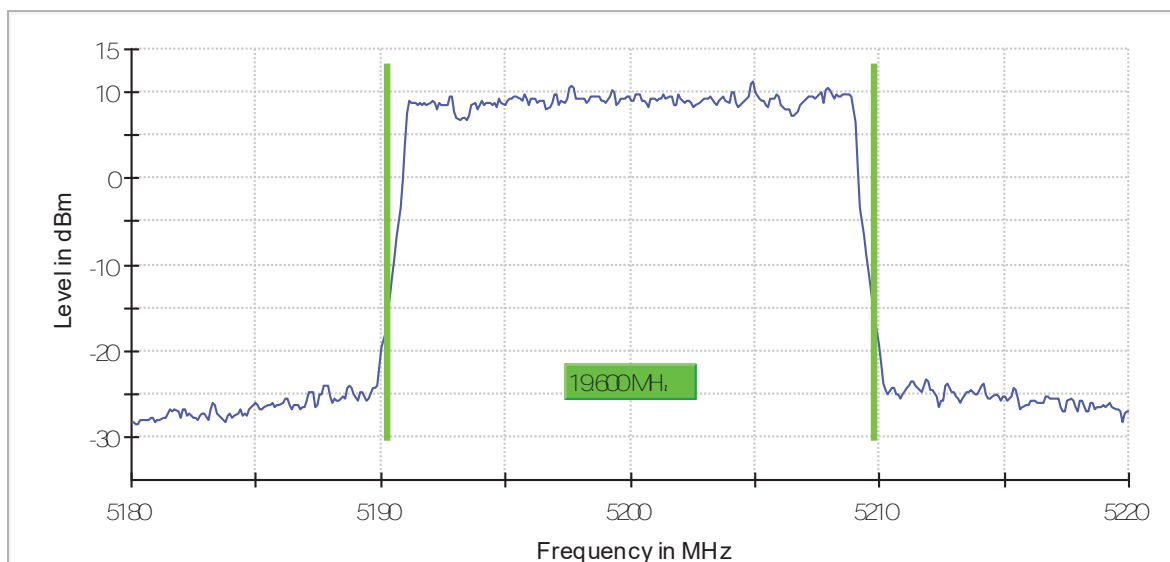
channel 36 (5180 MHz)

26 dB Bandwidth



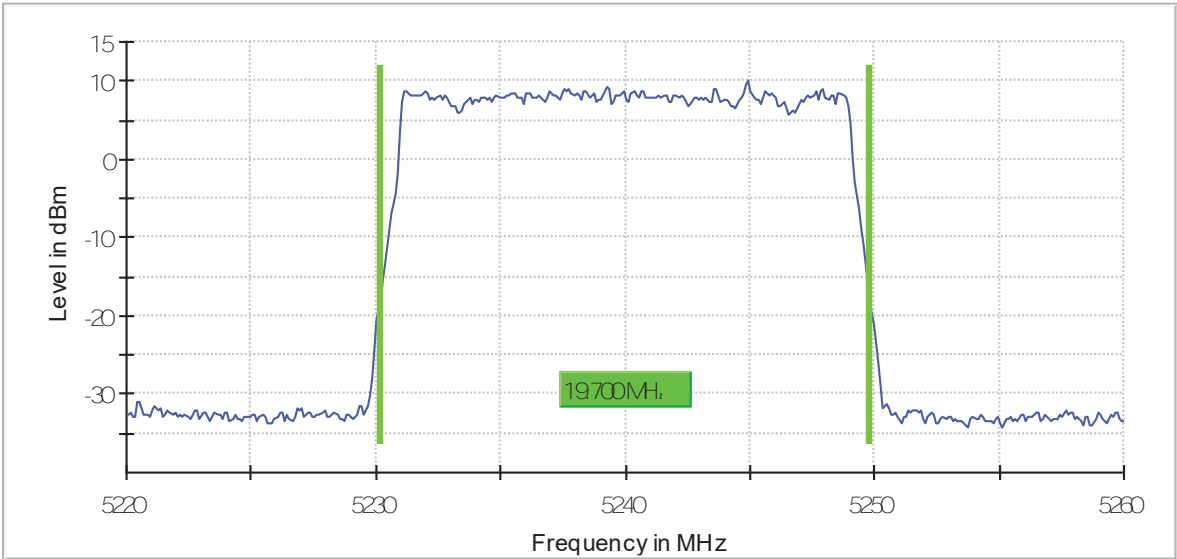
channel 40 (5200 MHz)

26 dB Bandwidth



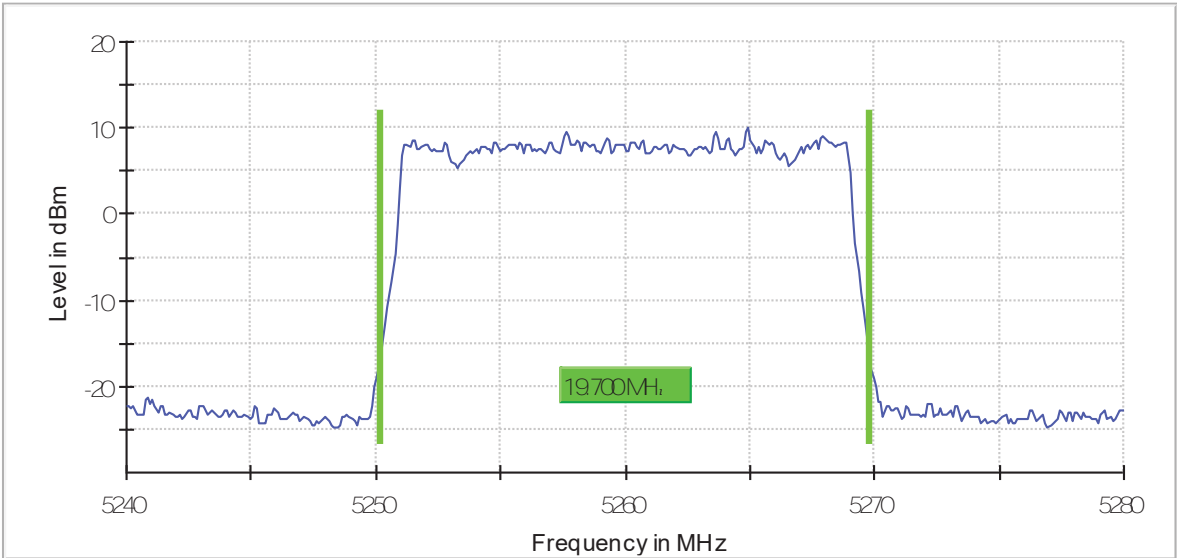
channel 48 (5240 MHz)

26 dB Bandwidth



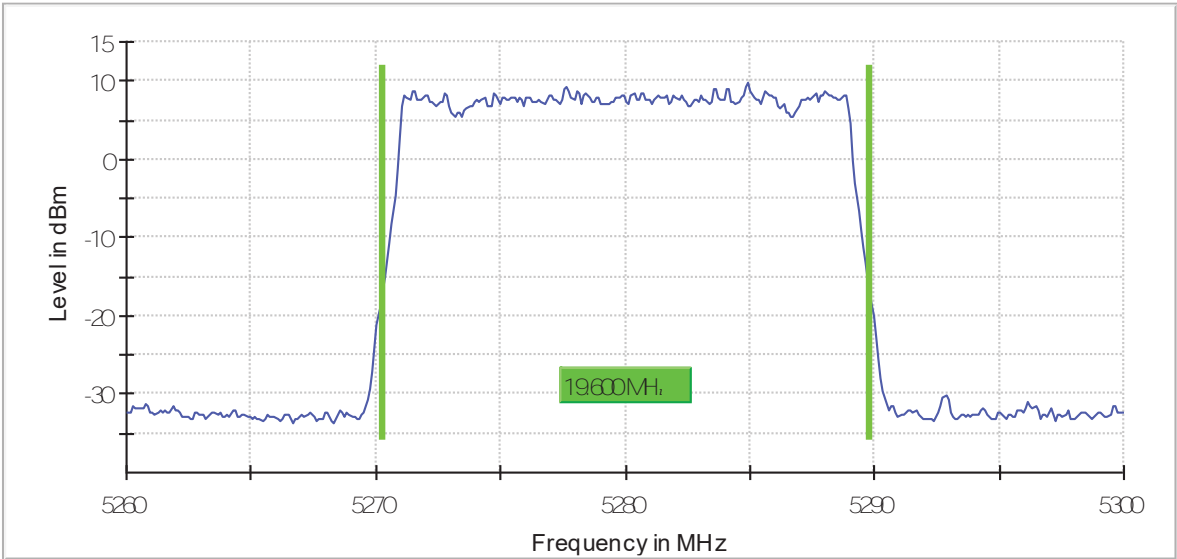
channel 52 (5260 MHz)

26 dB Bandwidth



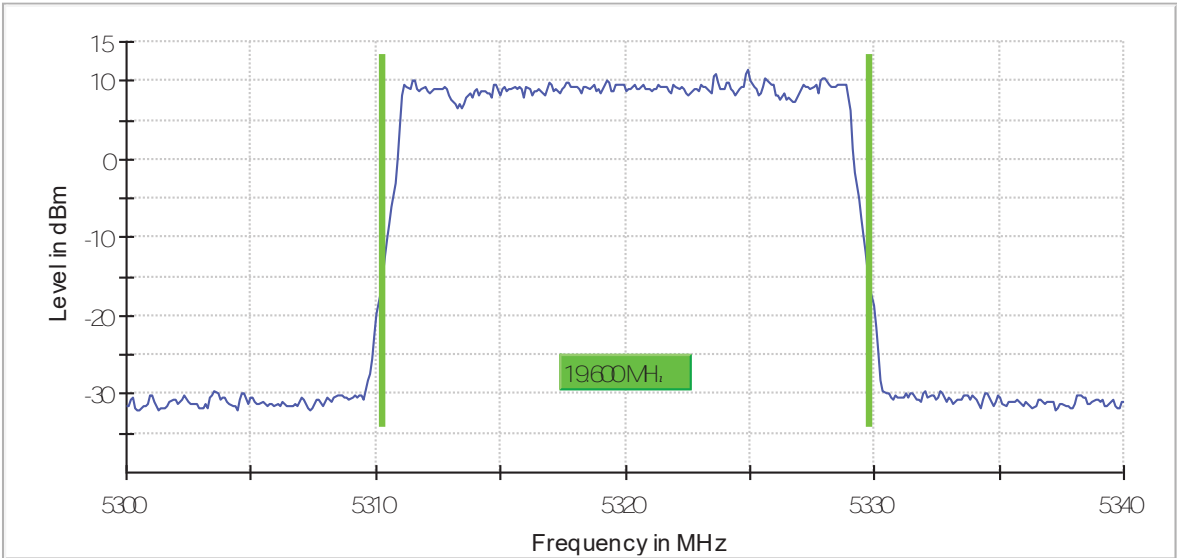
channel 56 (5280 MHz)

26 dB Bandwidth



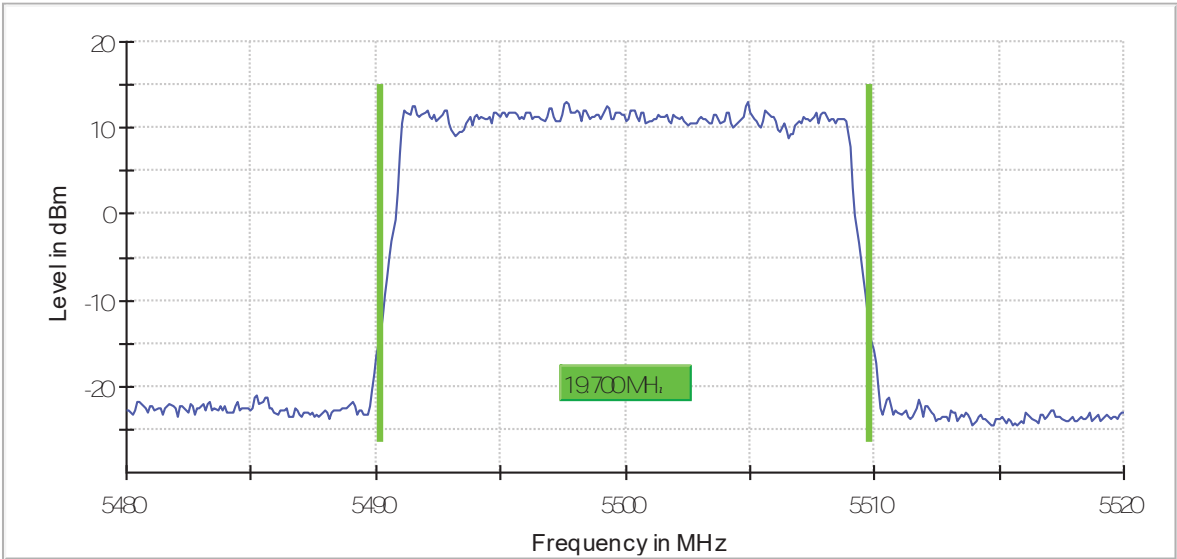
channel 64 (5320 MHz)

26 dB Bandwidth



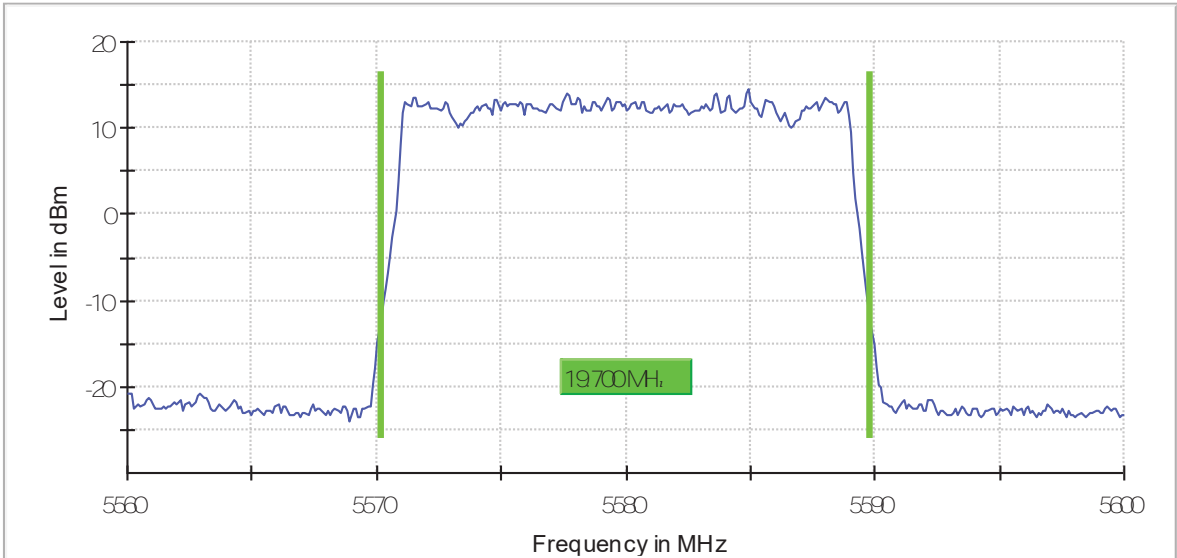
channel 100 (5500 MHz)

26 MHz bandwidth



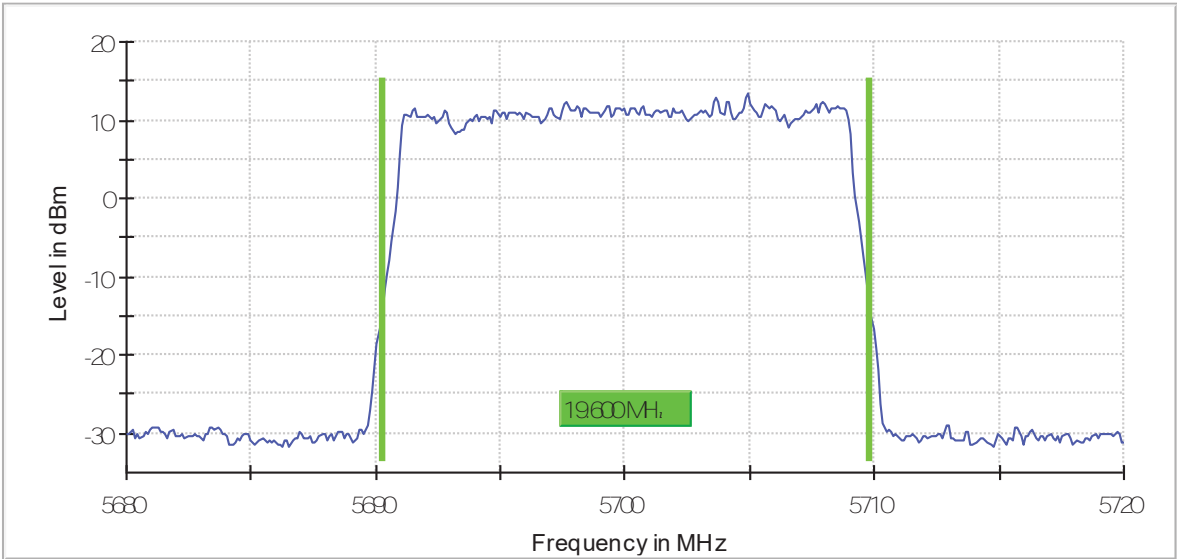
channel 116 (5580 MHz)

26 MHz bandwidth



channel 140 (5700 MHz)

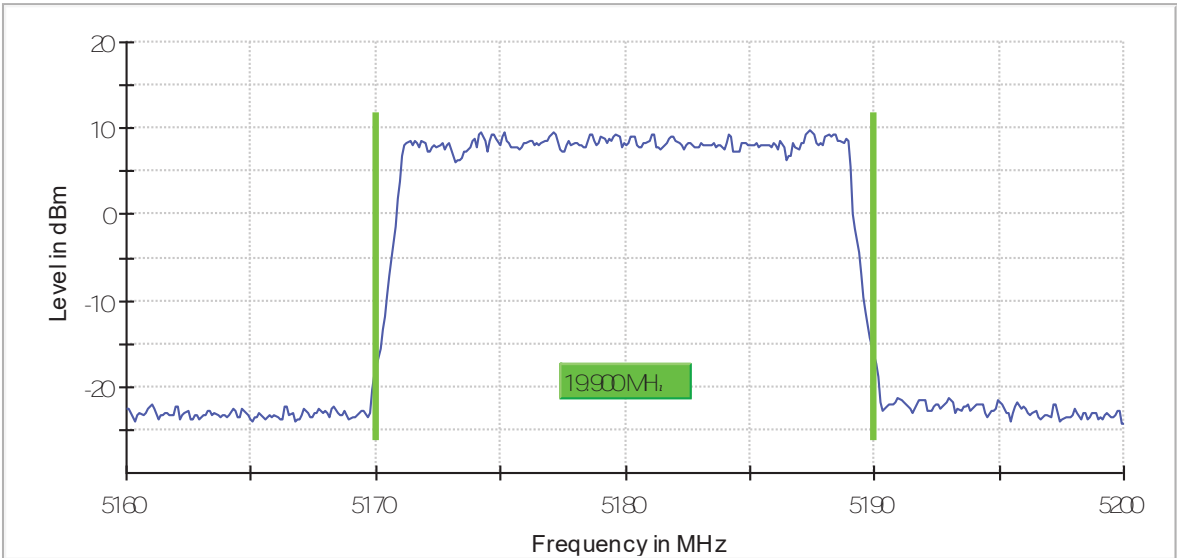
26 dB Bandwidth



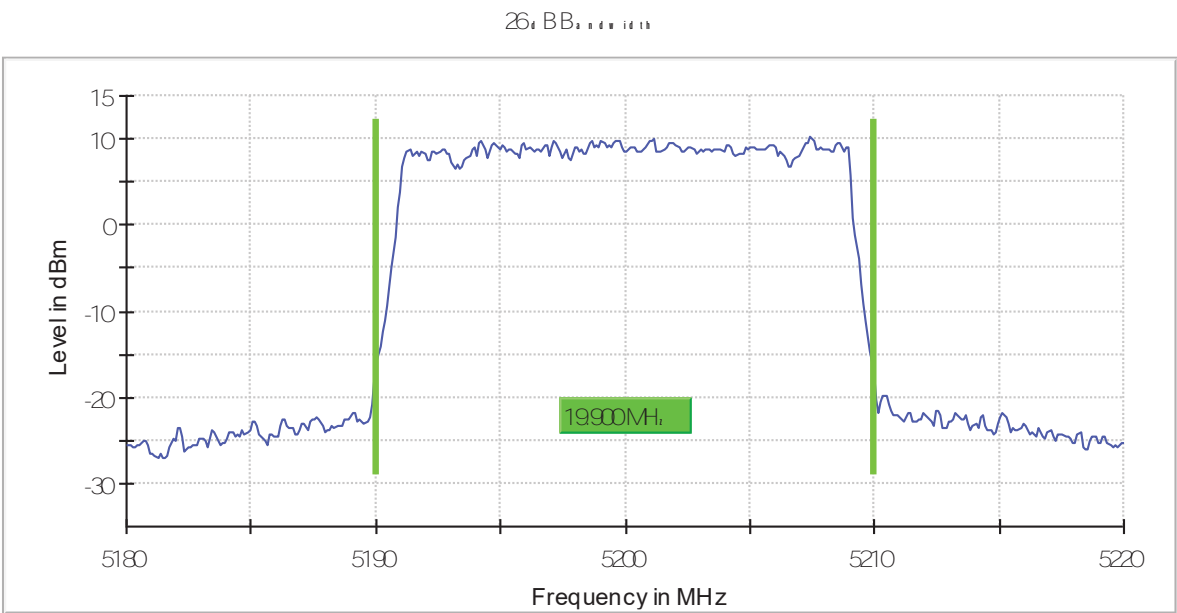
Mode: 16QAM – 20MHz

channel 36 (5180 MHz)

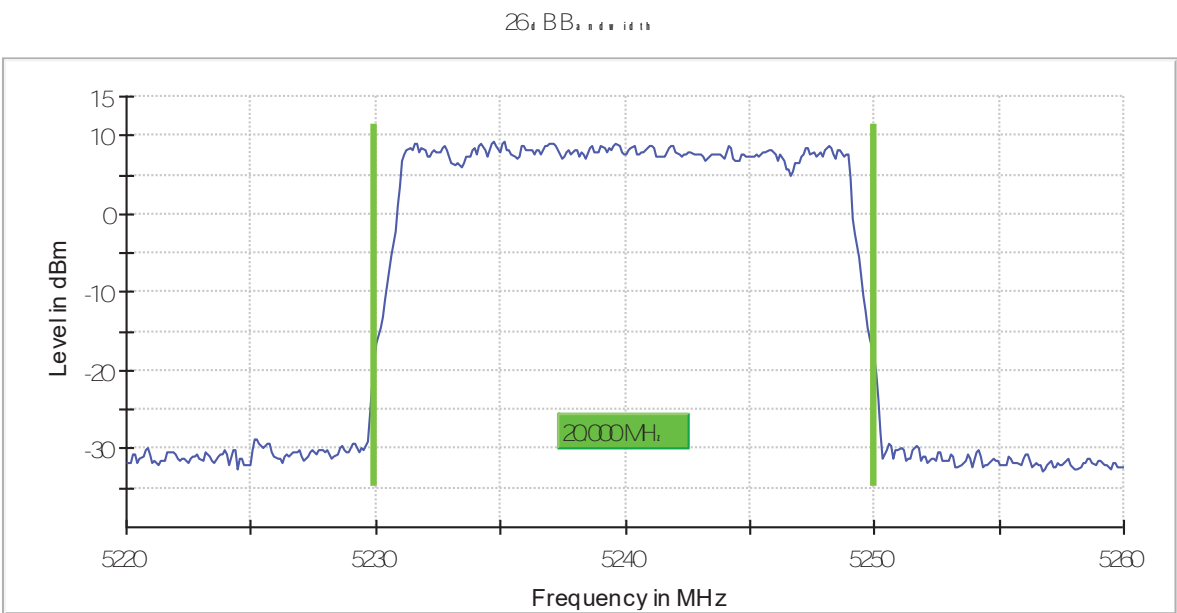
26 dB Bandwidth



channel 40 (5200 MHz)

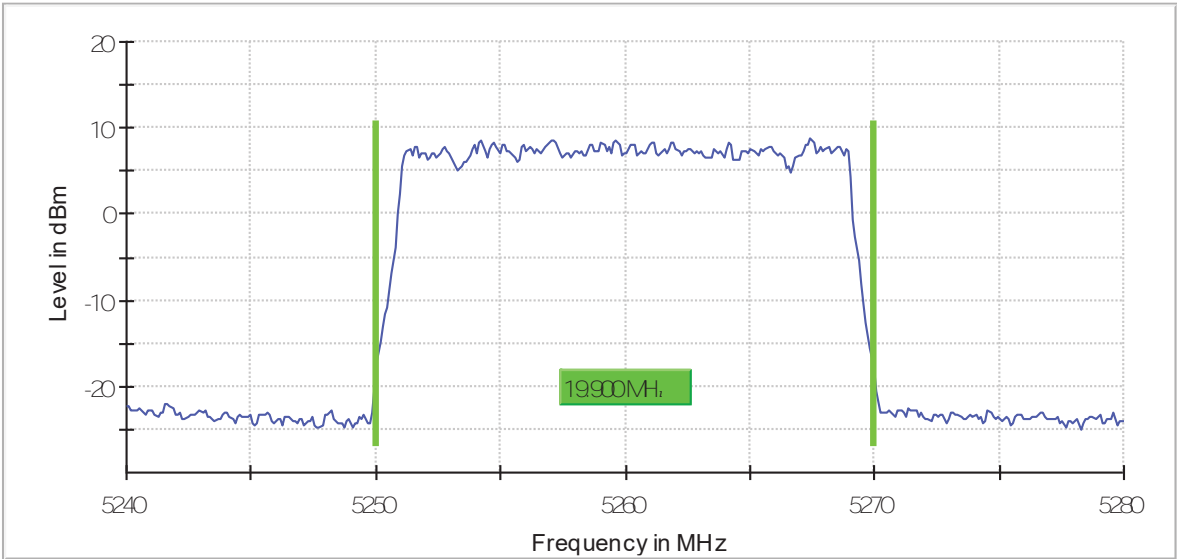


channel 48 (5240 MHz)



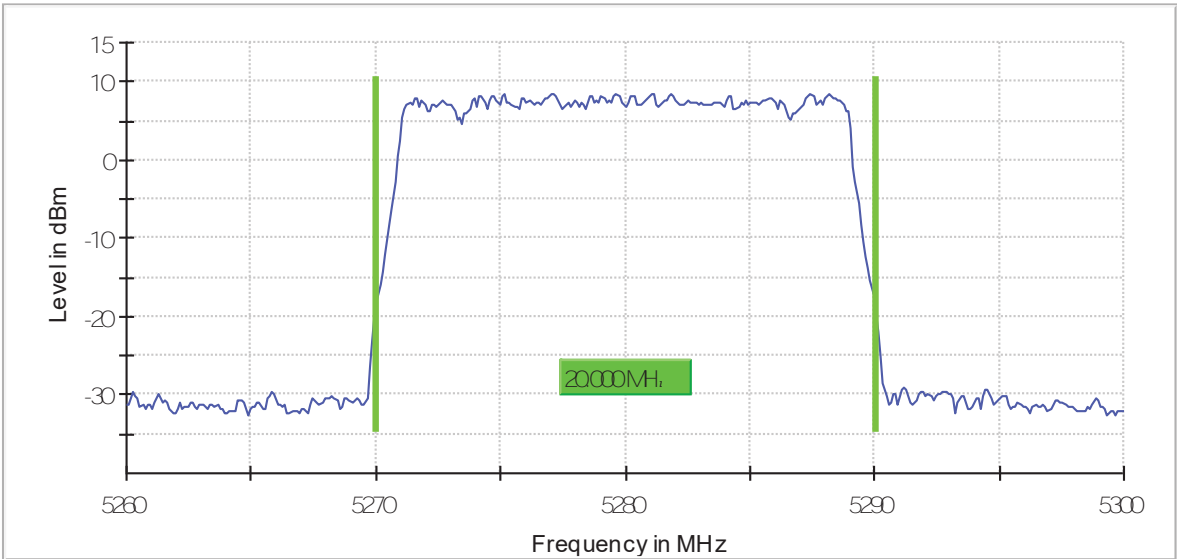
channel 52 (5260 MHz)

26 dB Bandwidth



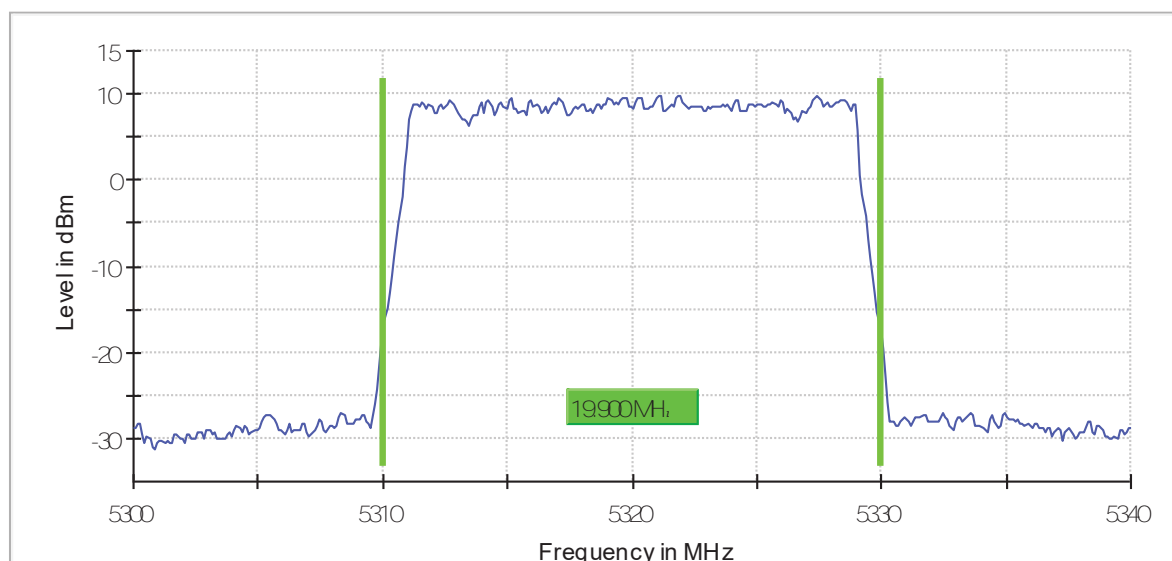
channel 56 (5280 MHz)

26 dB Bandwidth



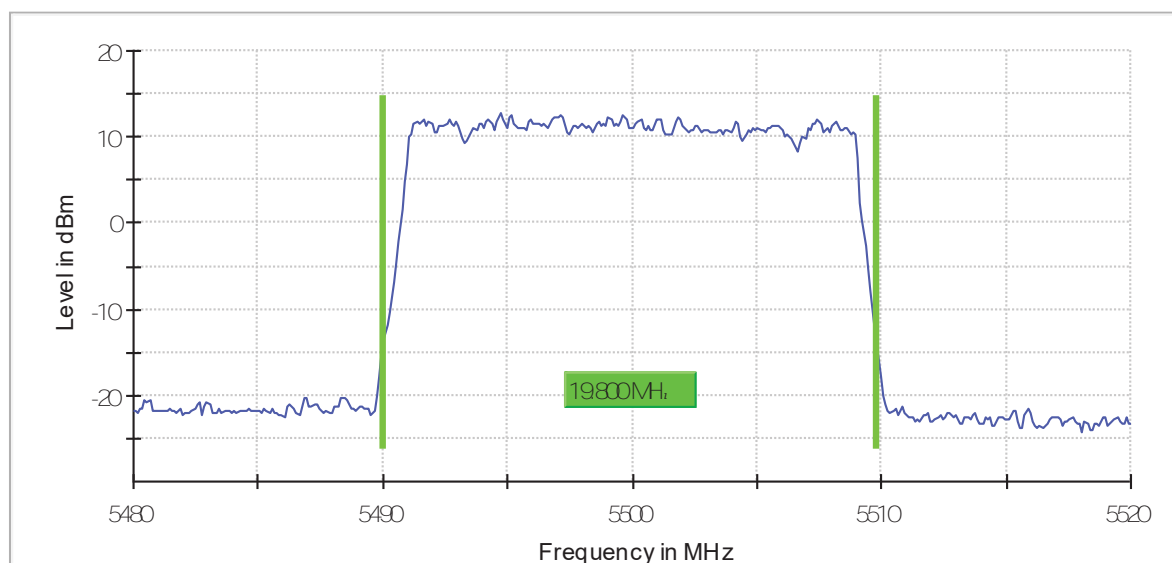
channel 64 (5320 MHz)

26 dB Bandwidth



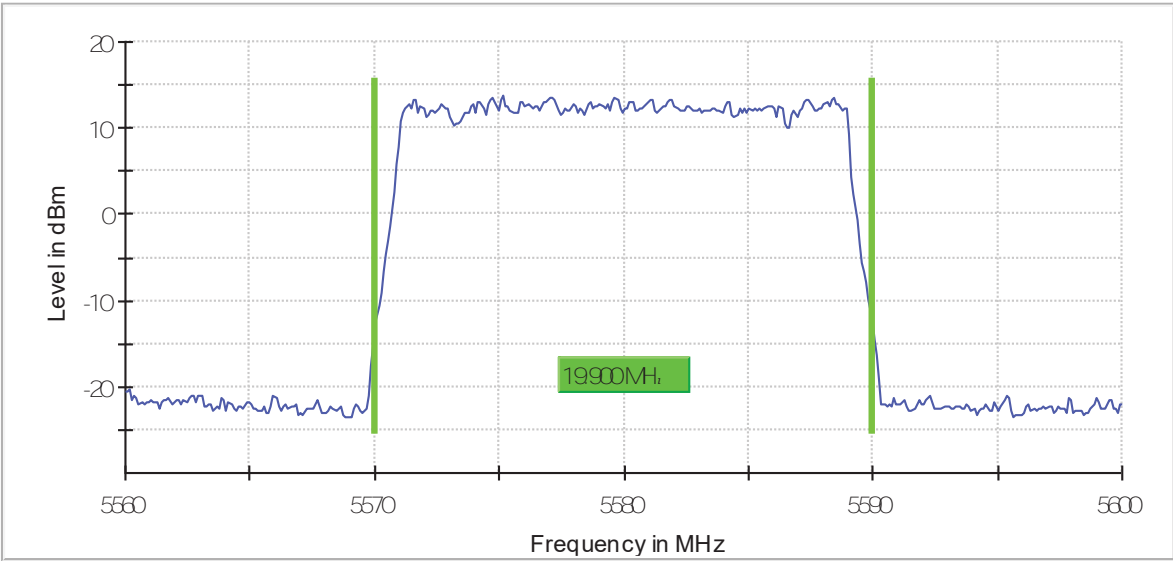
channel 100 (5500 MHz)

26 dB Bandwidth



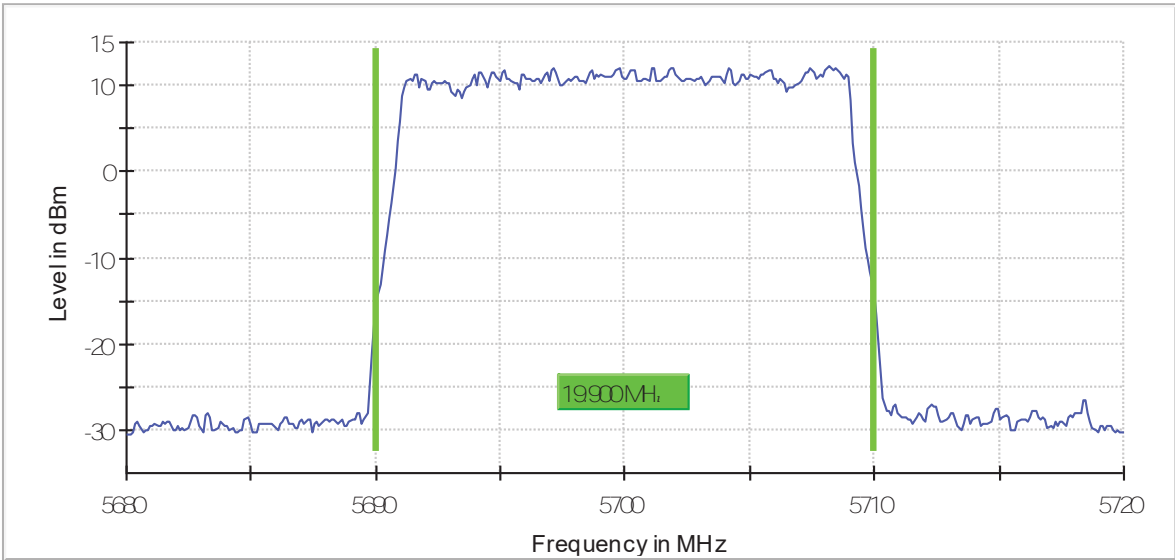
channel 116 (5580 MHz)

26.8 BB bandwidth



channel 140 (5700 MHz)

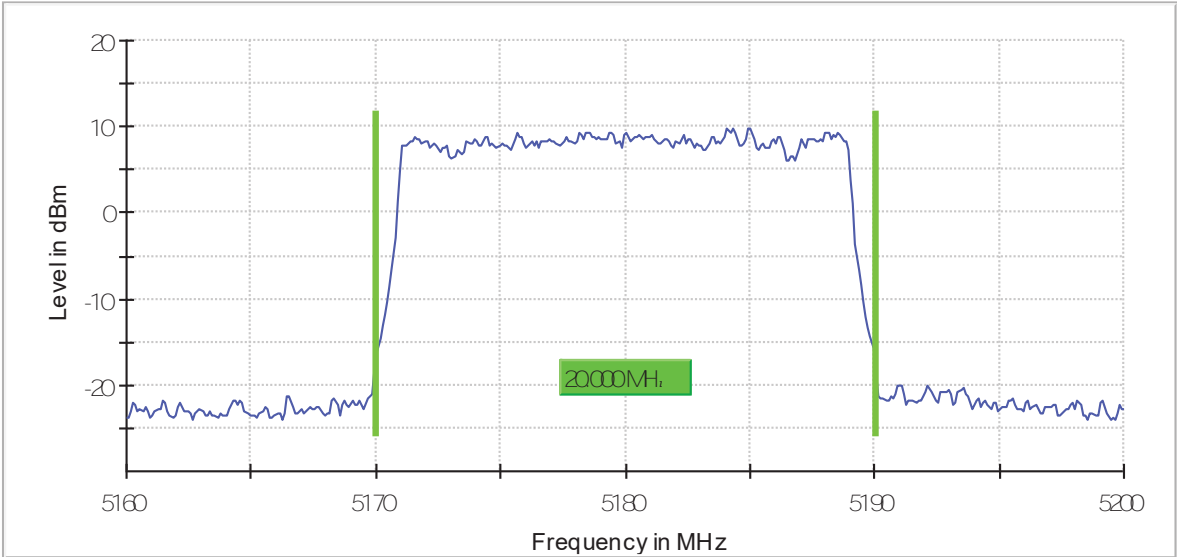
26.8 BB bandwidth



Mode: 64QAM – 20MHz

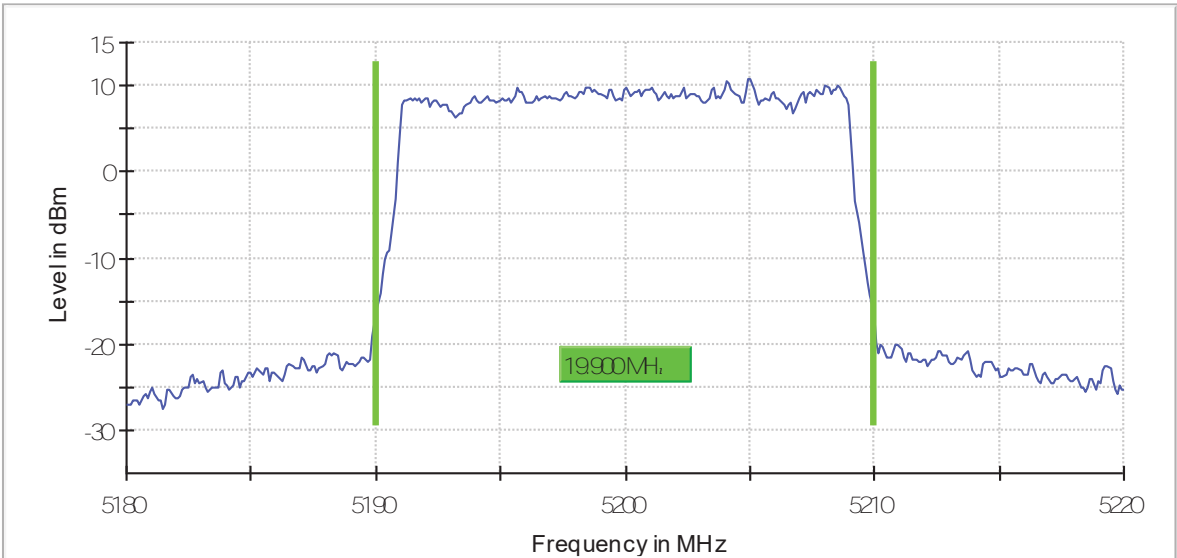
channel 36 (5180 MHz)

26 dB Bandwidth

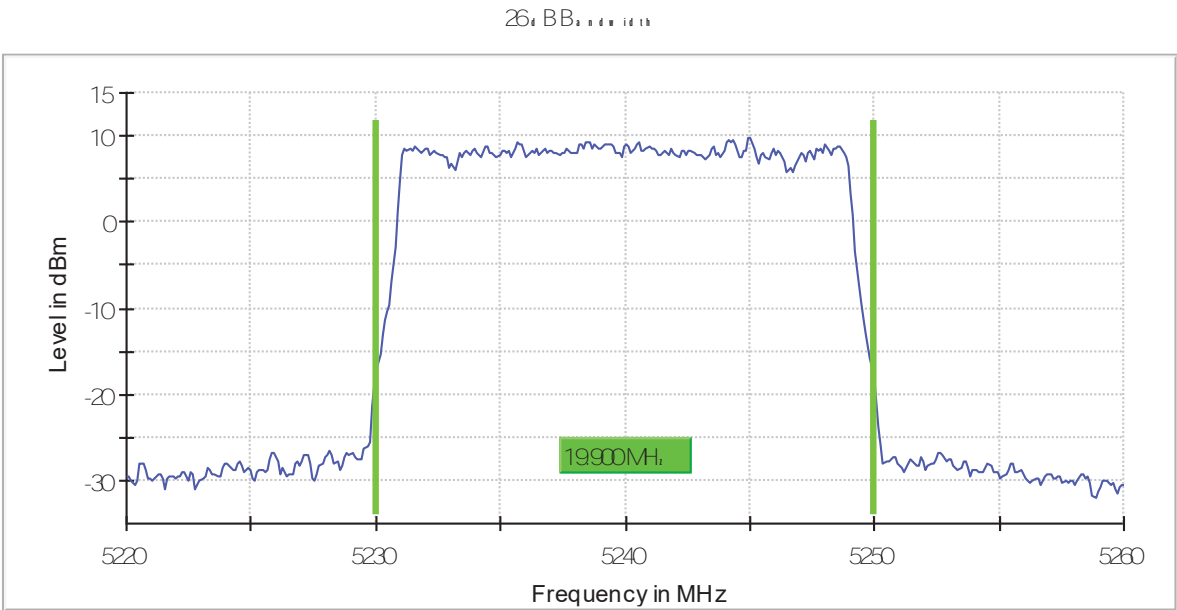


channel 40 (5200 MHz)

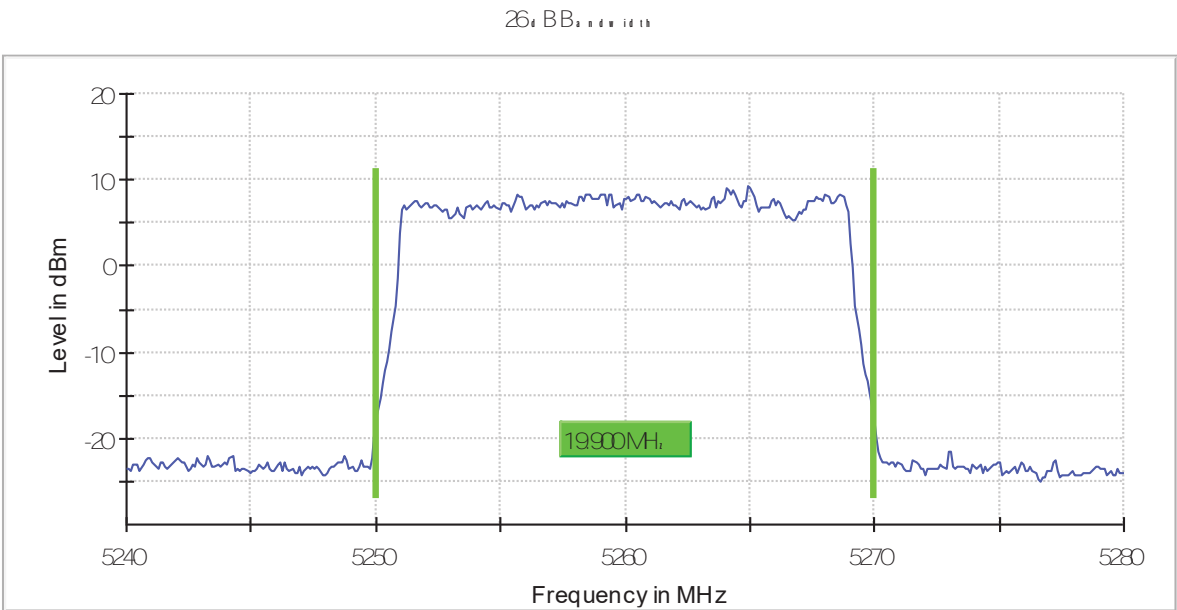
26 dB Bandwidth



channel 48 (5240 MHz)

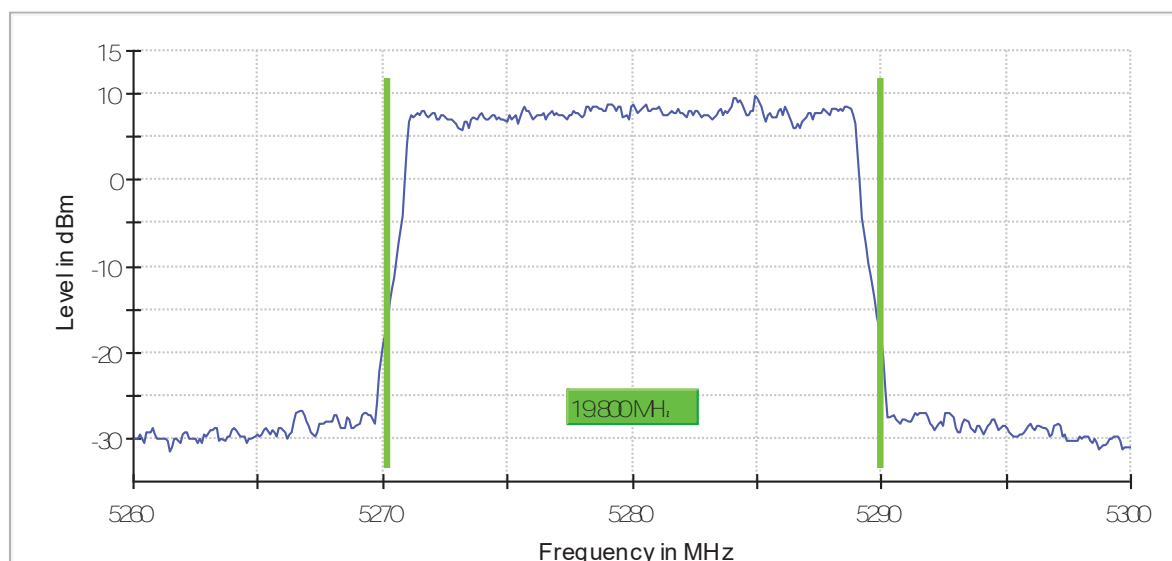


channel 52 (5260 MHz)



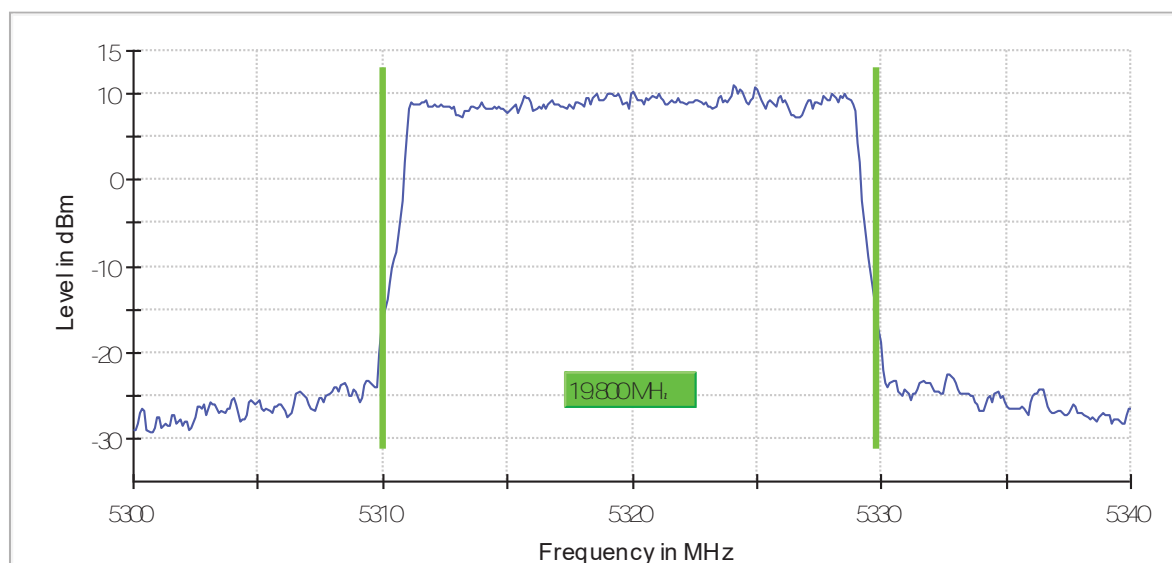
channel 56 (5280 MHz)

26 dB Bandwidth



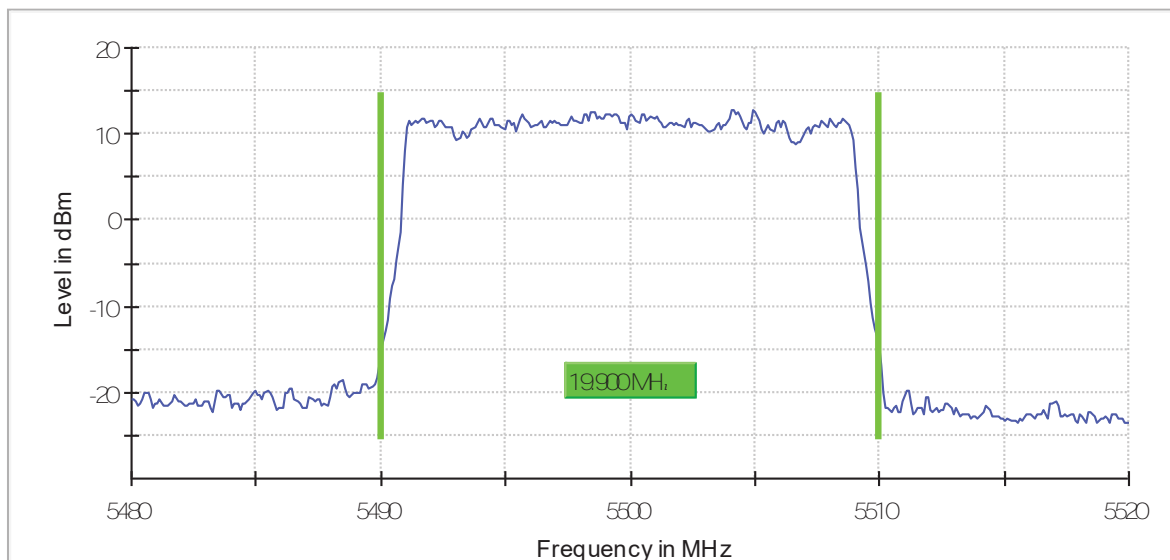
channel 64 (5320 MHz)

26 dB Bandwidth



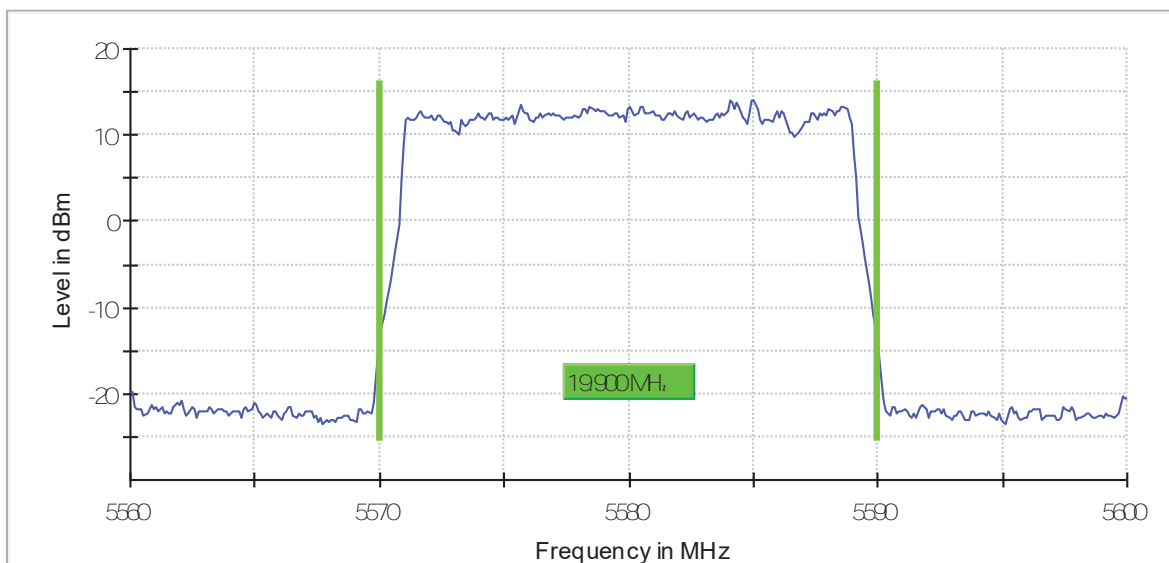
channel 100 (5500 MHz)

26 dB Bandwidth



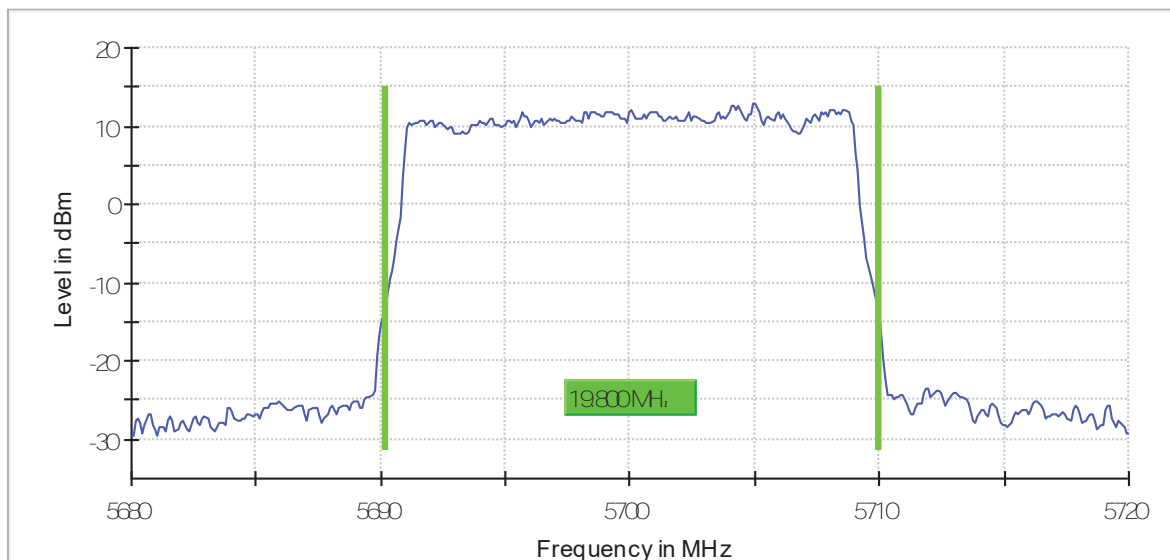
channel 116 (5580 MHz)

26 dB Bandwidth



channel 140 (5700 MHz)

26 dB Bandwidth

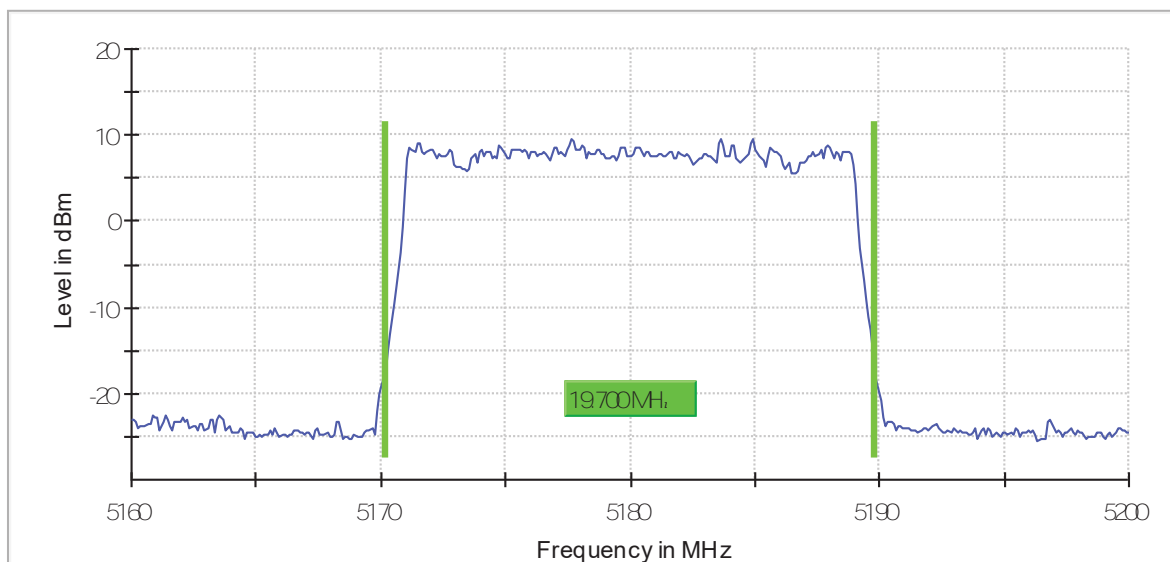


SISO Antenna Port 2:

Mode: QPSK – 20MHz

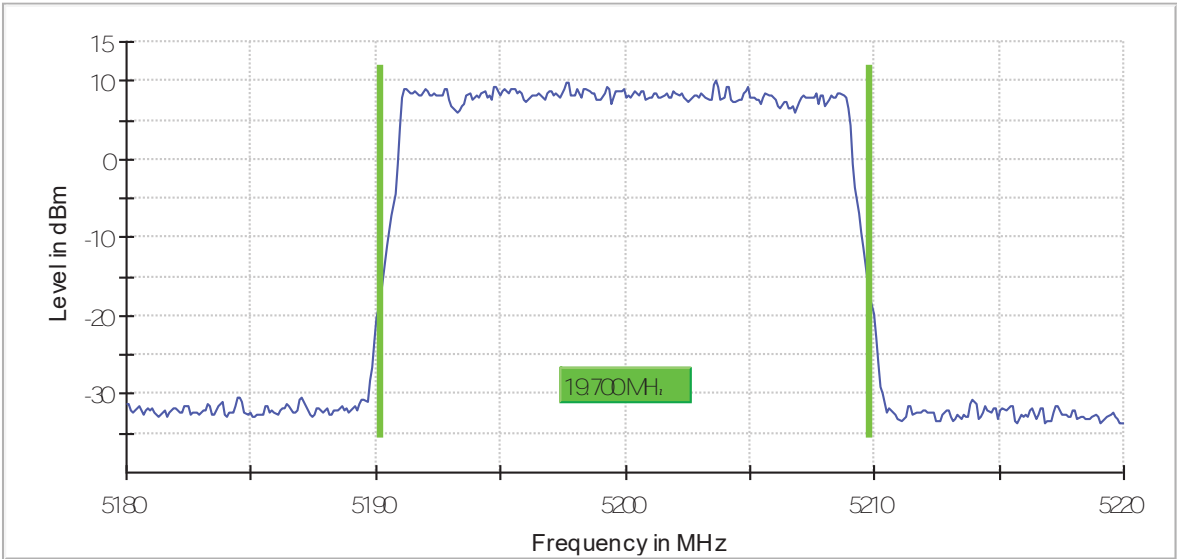
channel 36 (5180 MHz)

26 dB Bandwidth



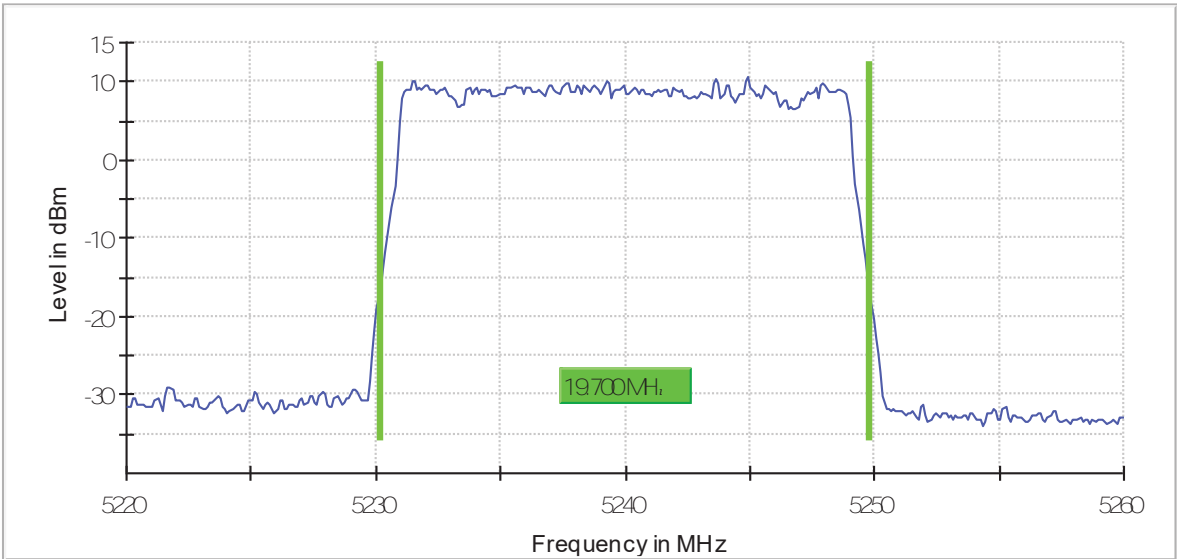
channel 40 (5200 MHz)

26 dB Bandwidth

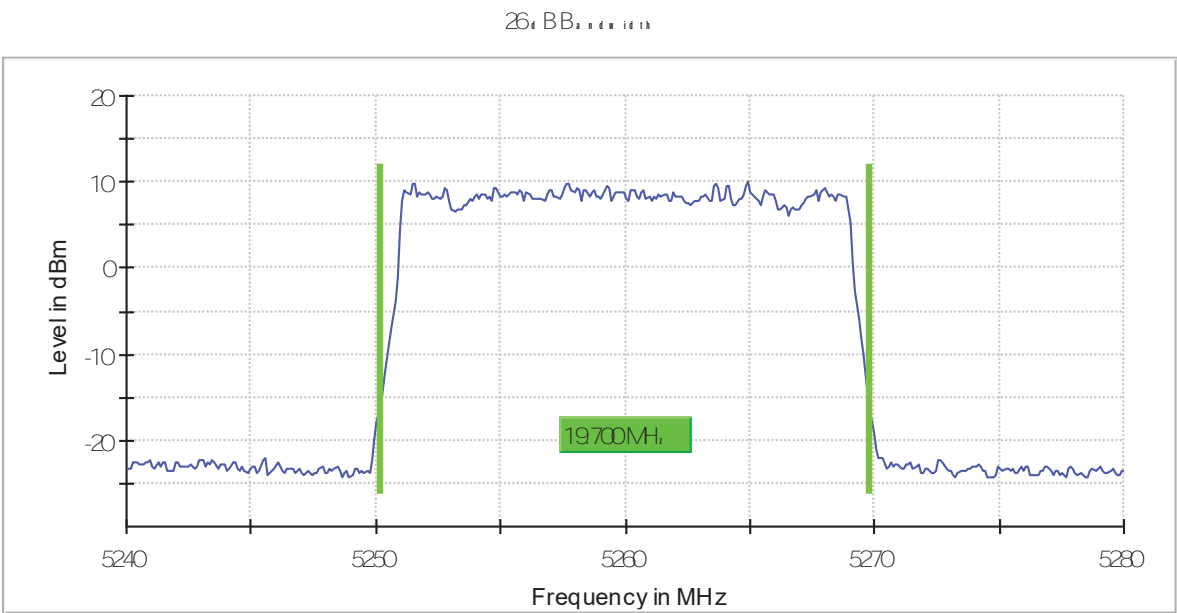


channel 48 (5240 MHz)

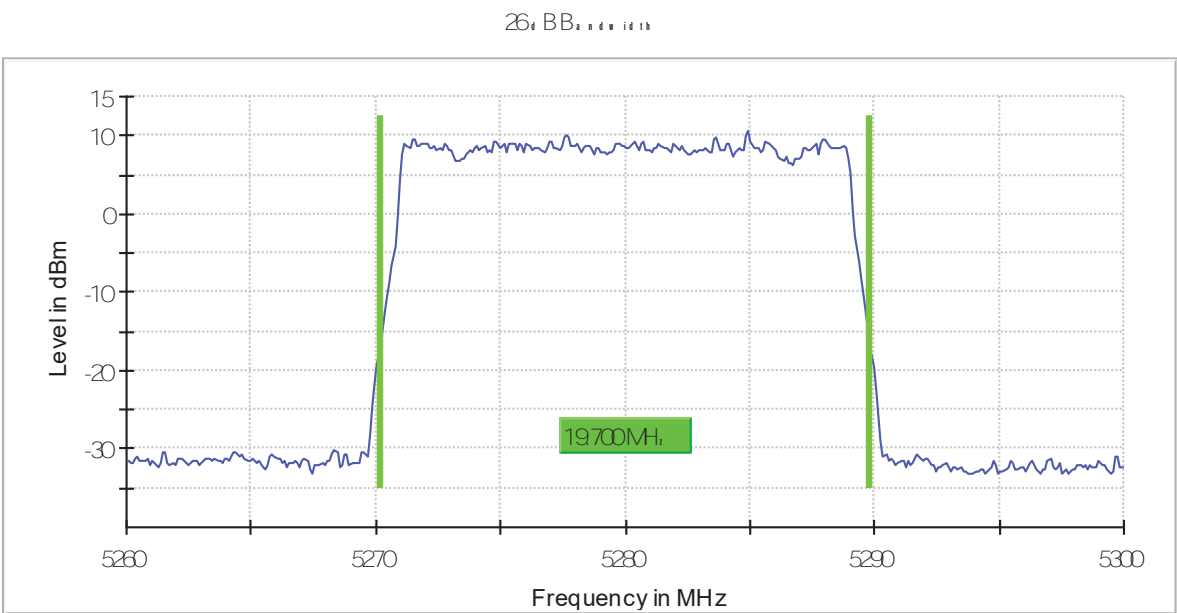
26 dB Bandwidth



channel 52 (5260 MHz)

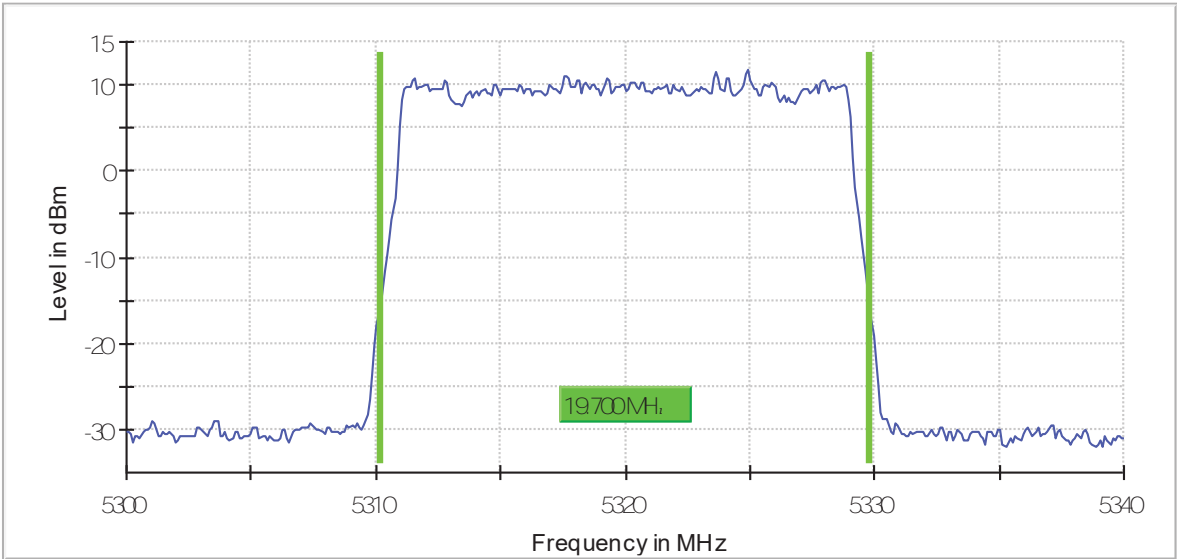


channel 56 (5280 MHz)



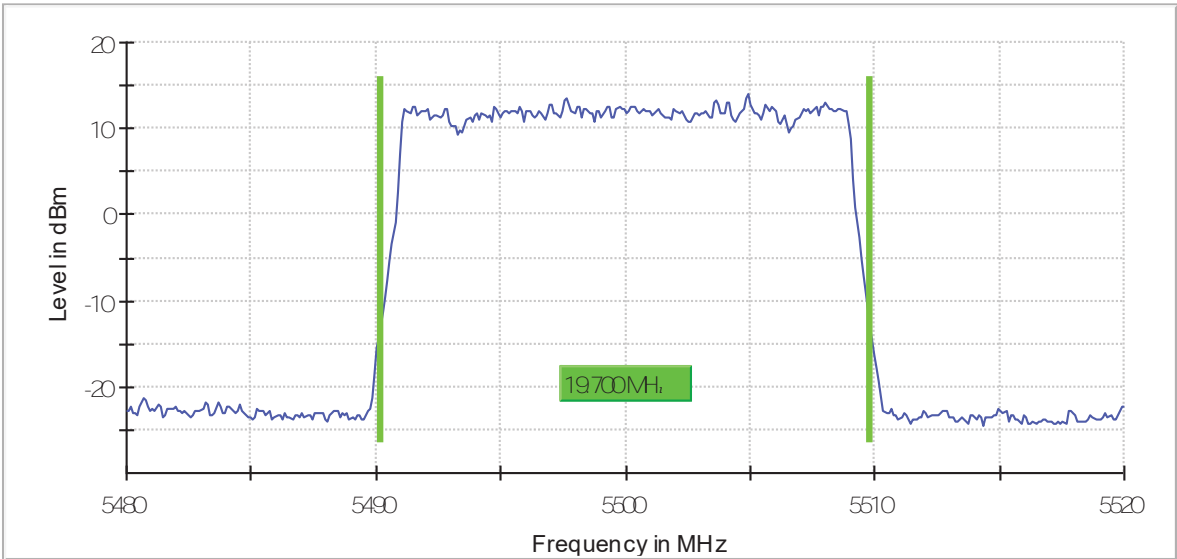
channel 64 (5320 MHz)

26 dB Bandwidth



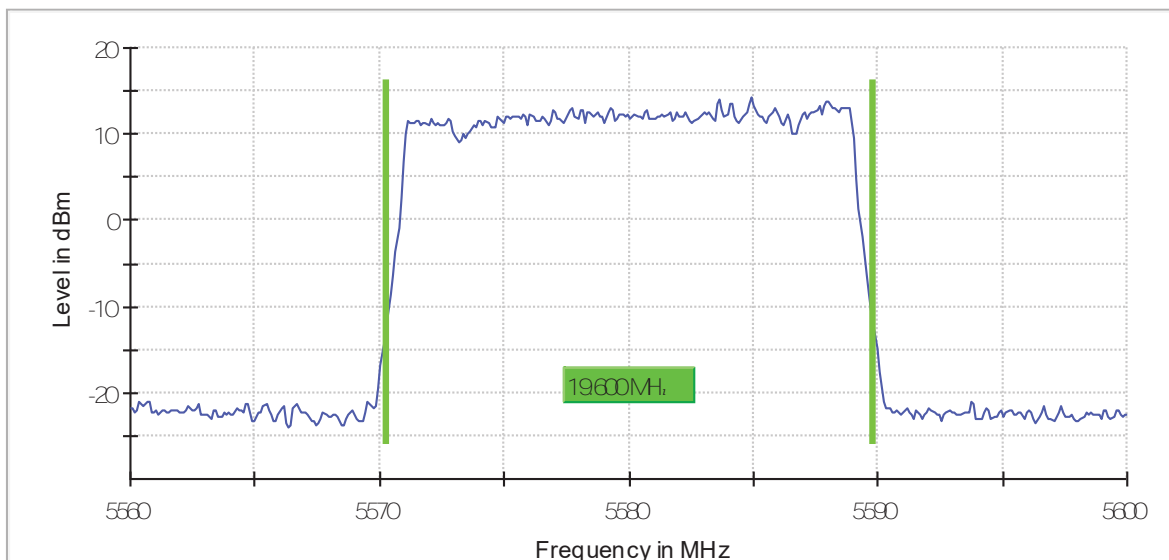
channel 100 (5500 MHz)

26 dB Bandwidth



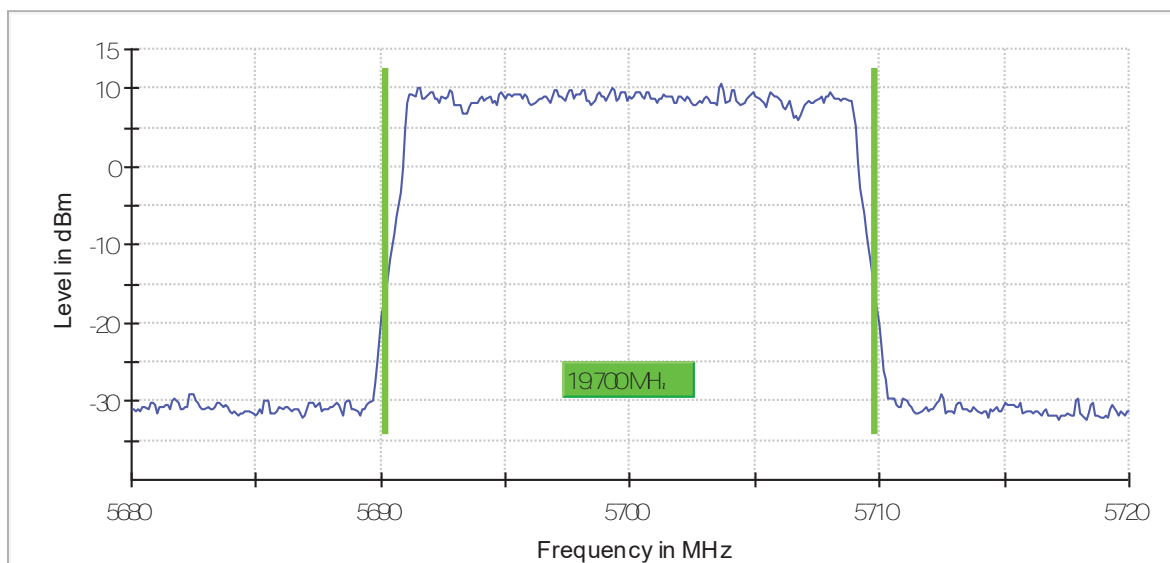
channel 116 (5580 MHz)

26.8 BB bandwidth



channel 140 (5700 MHz)

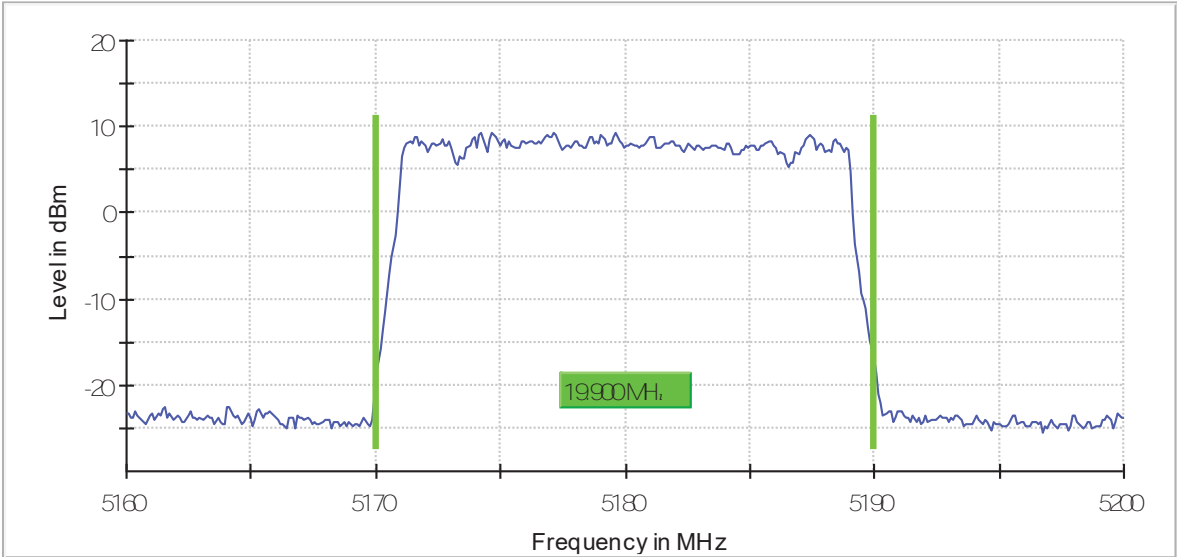
26.8 BB bandwidth



Mode: 16QAM – 20MHz

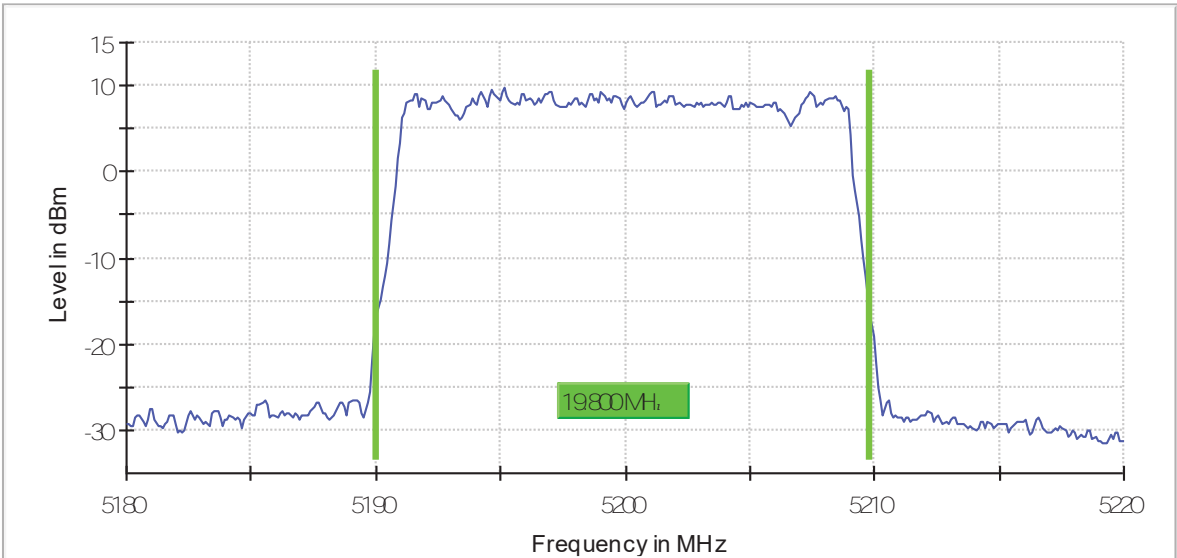
channel 36 (5180 MHz)

26 dB Bandwidth

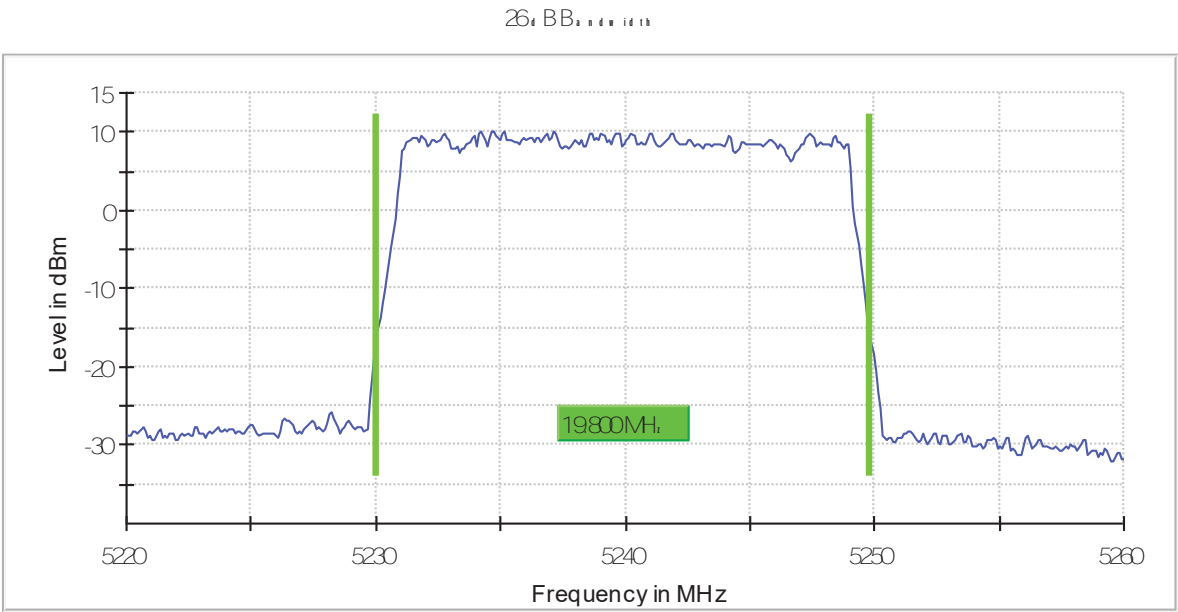


channel 40 (5200 MHz)

26 dB Bandwidth



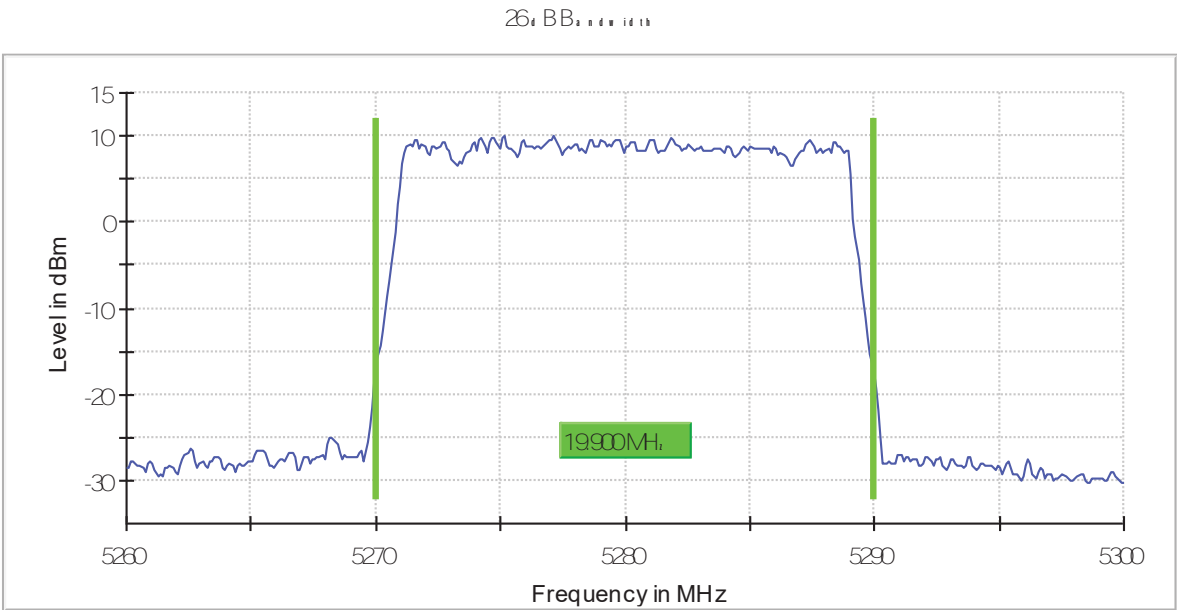
channel 48 (5240 MHz)



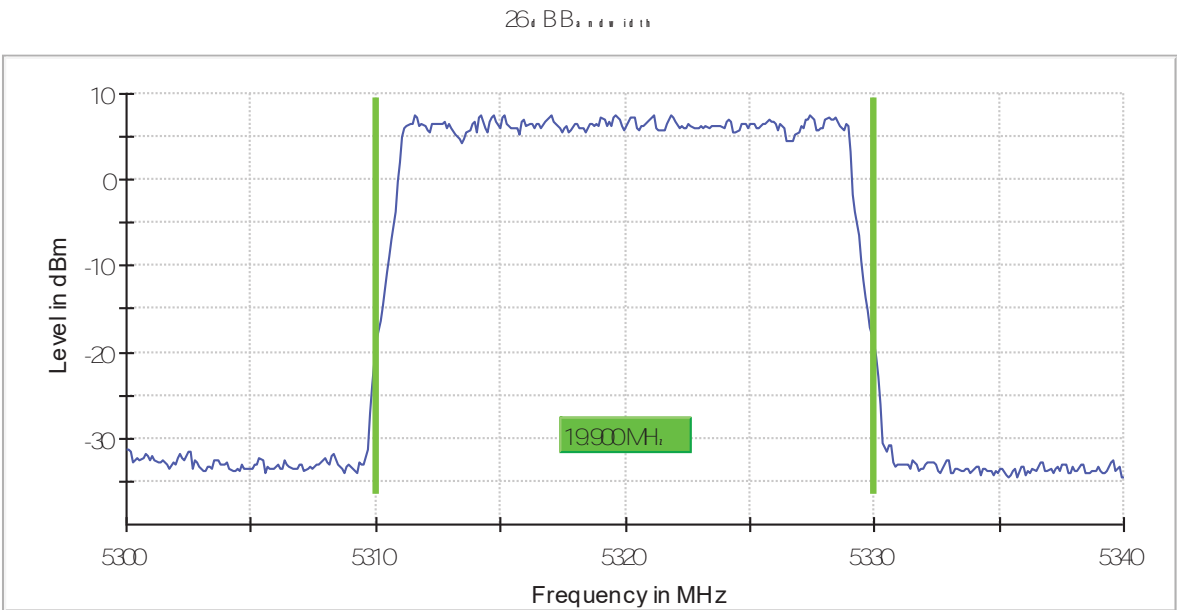
channel 52 (5260 MHz)



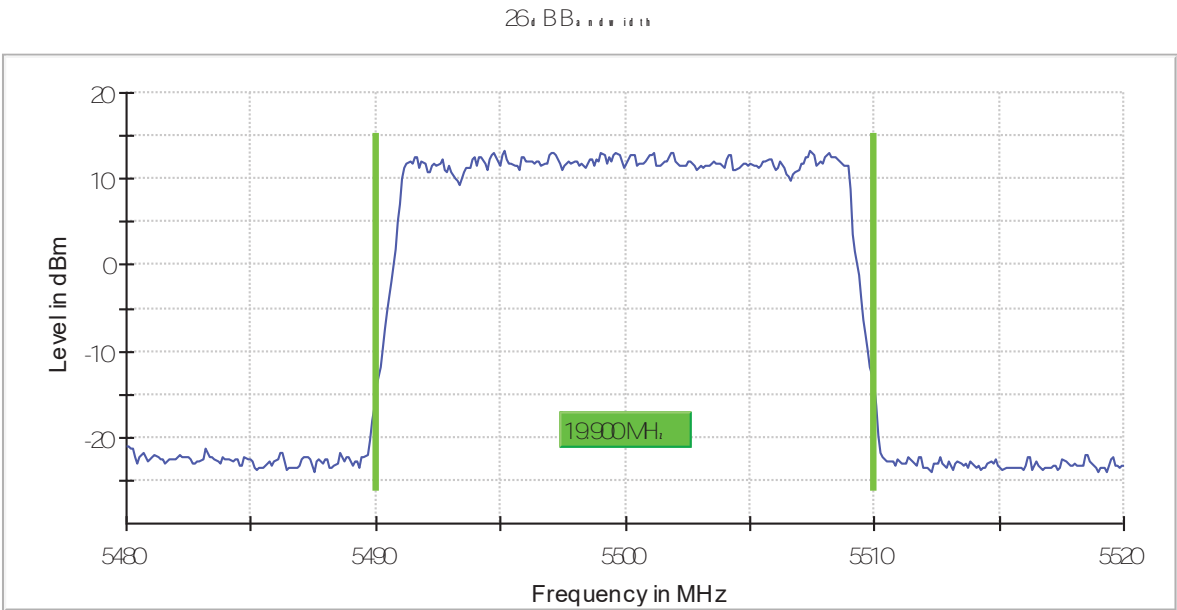
channel 56 (5280 MHz)



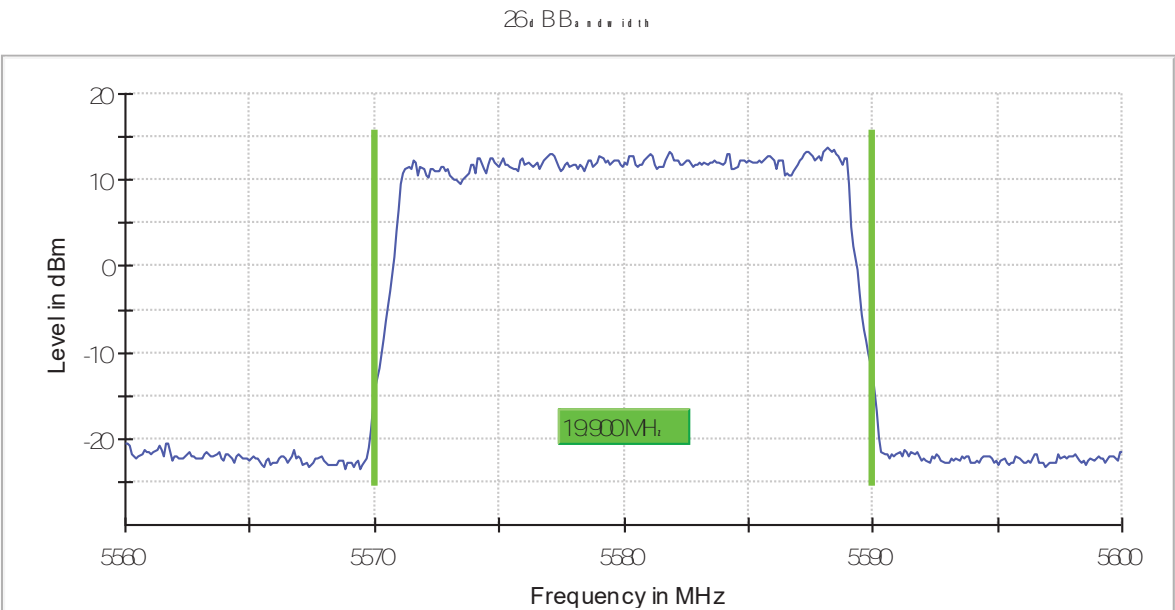
channel 64 (5320 MHz)



channel 100 (5500 MHz)

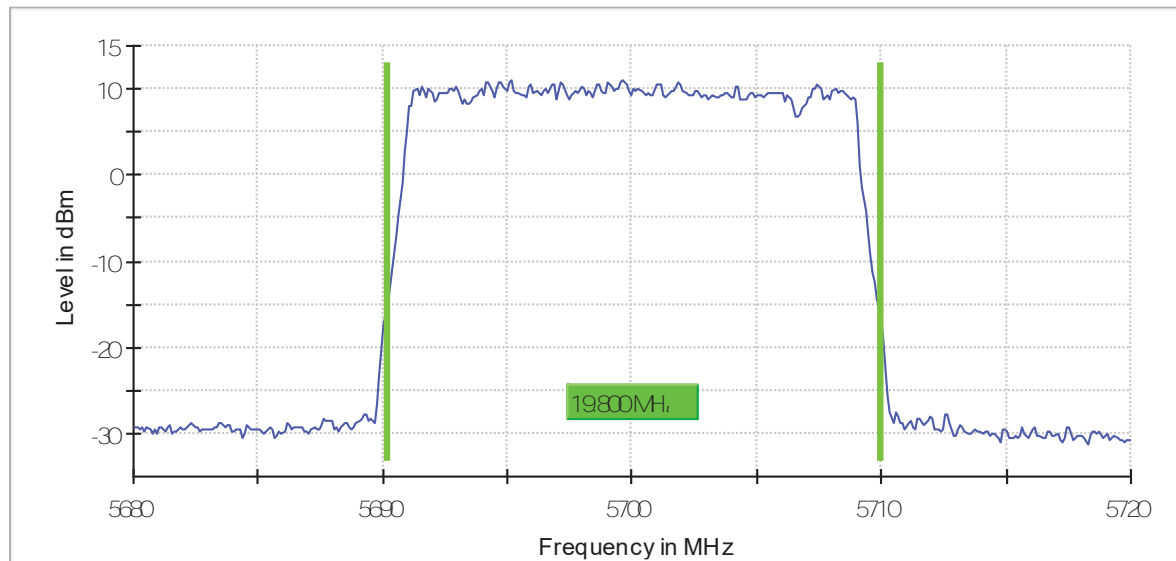


channel 116 (5580 MHz)



channel 140 (5700 MHz)

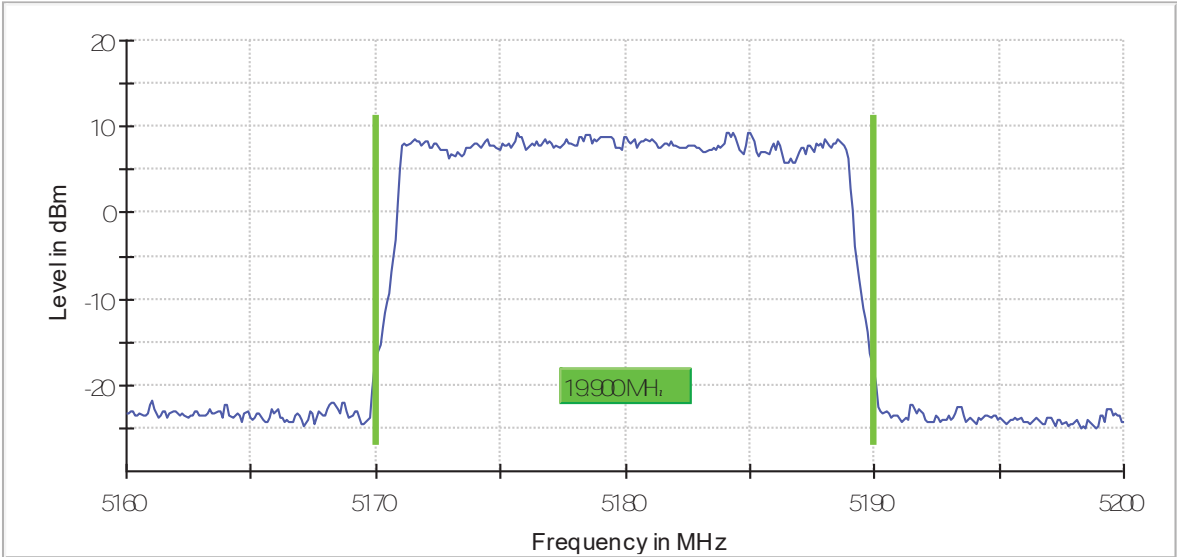
26 dB Bandwidth



Mode: 64QAM – 20MHz

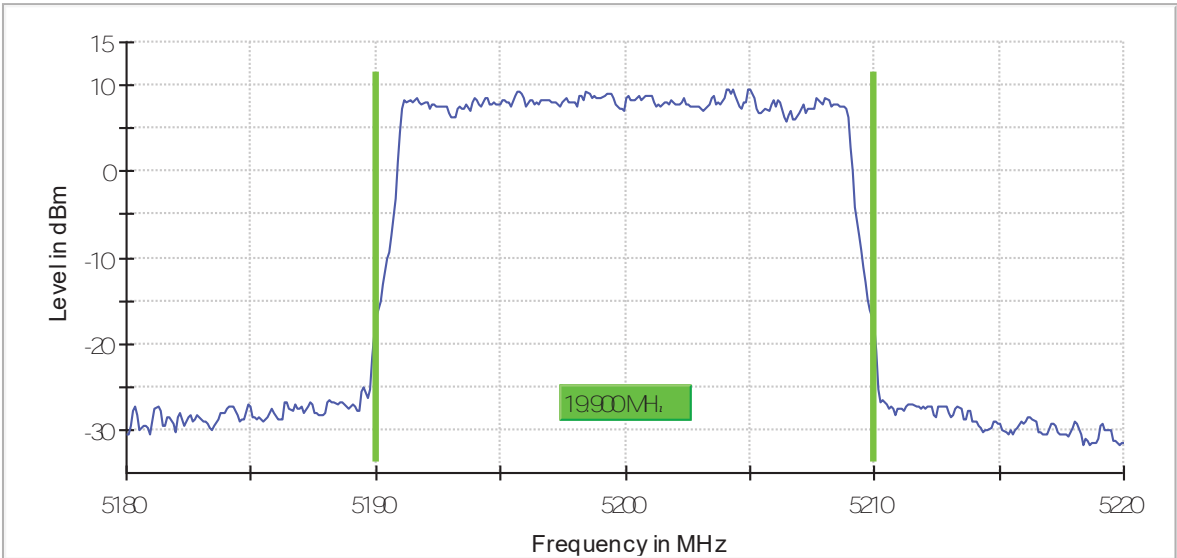
channel 36 (5180 MHz)

26 dB Bandwidth

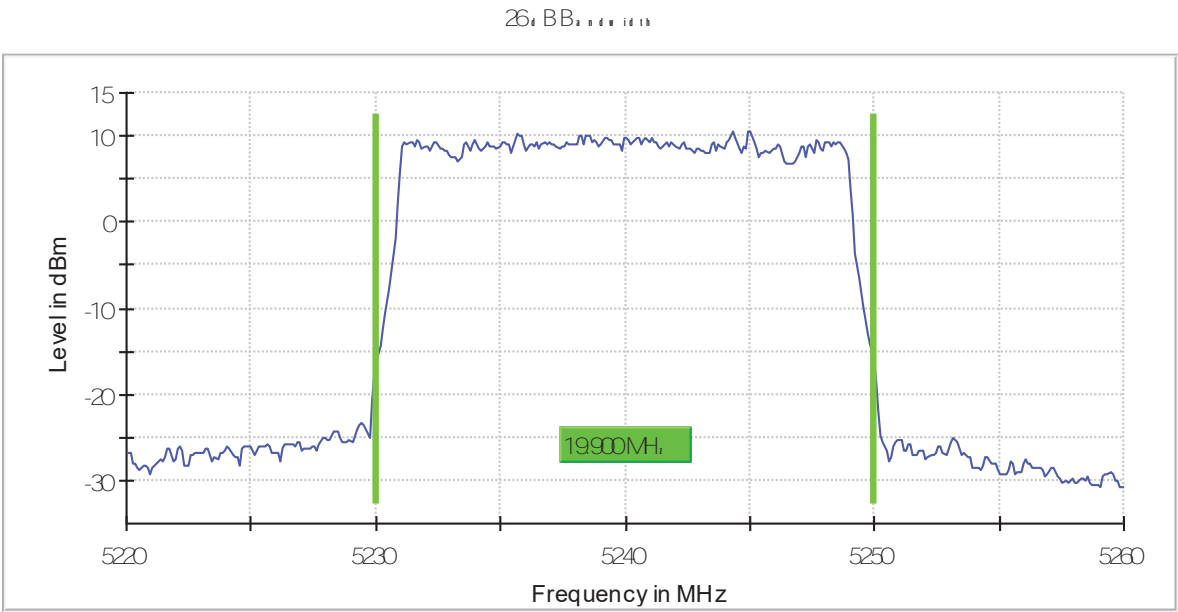


channel 40 (5200 MHz)

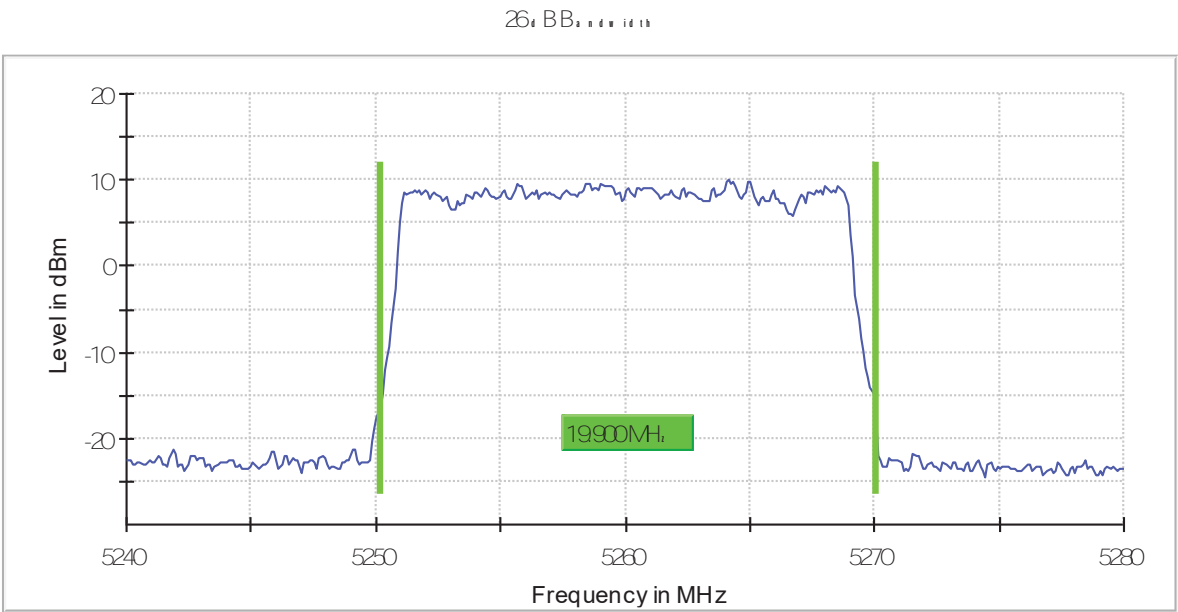
26 dB Bandwidth



channel 48 (5240 MHz)

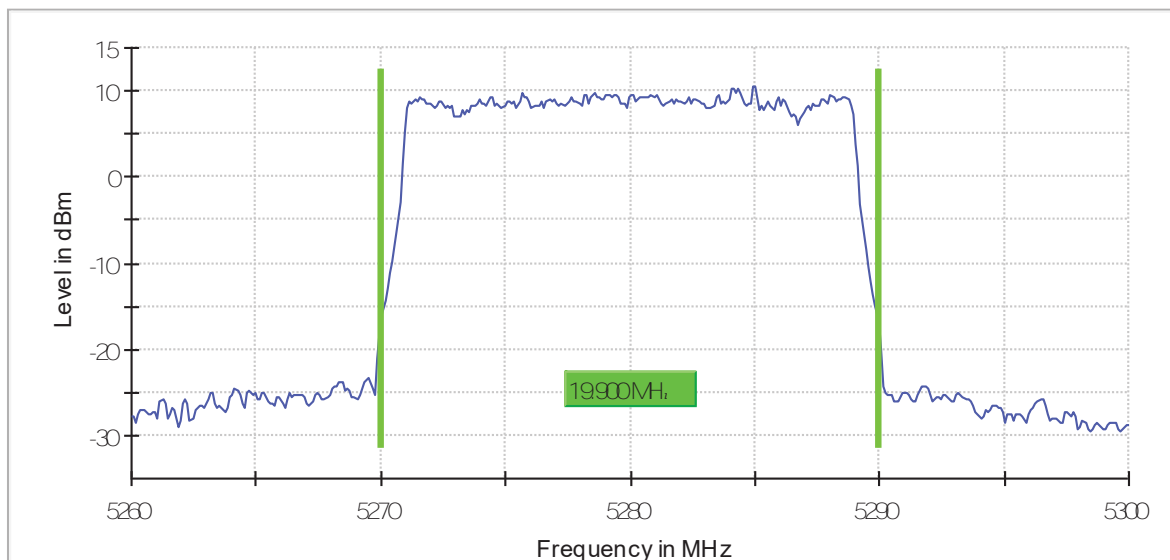


channel 52 (5260 MHz)



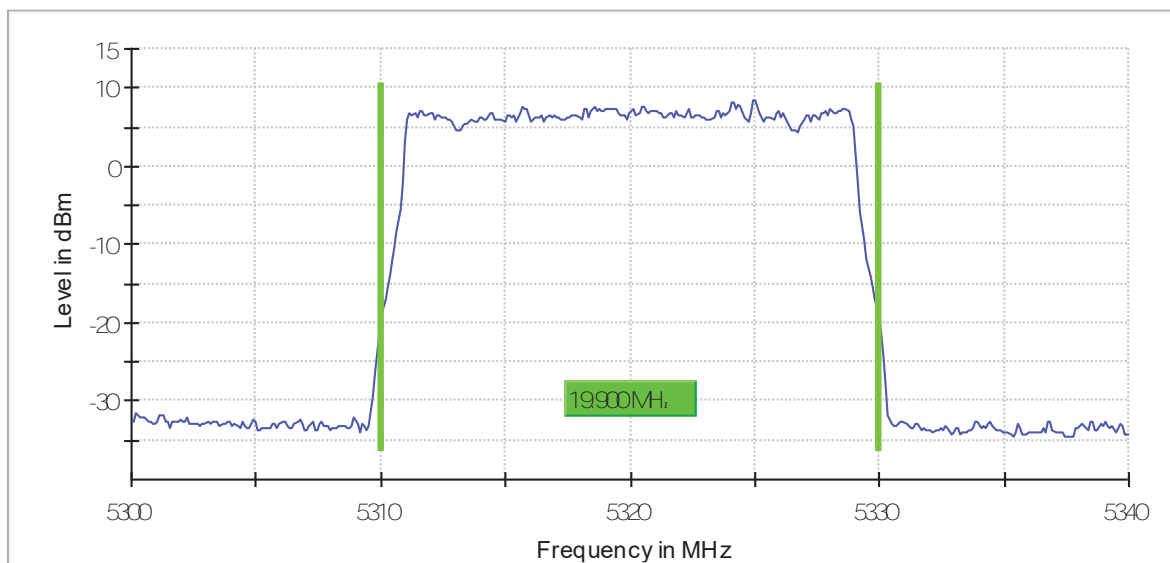
channel 56 (5280 MHz)

26 dB Bandwidth

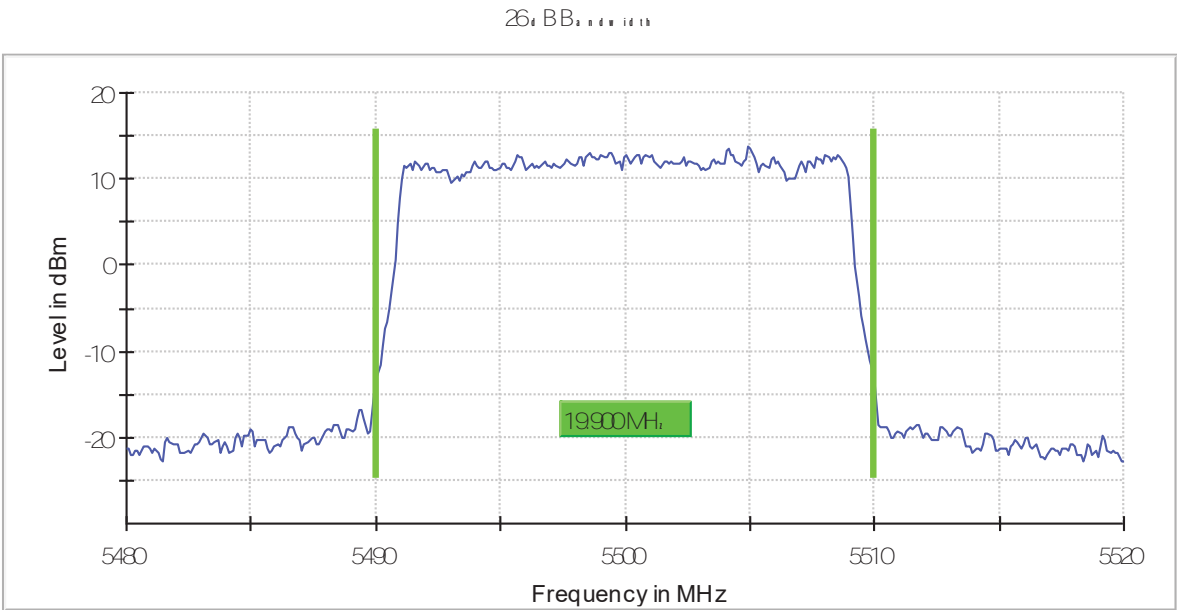


channel 64 (5320 MHz)

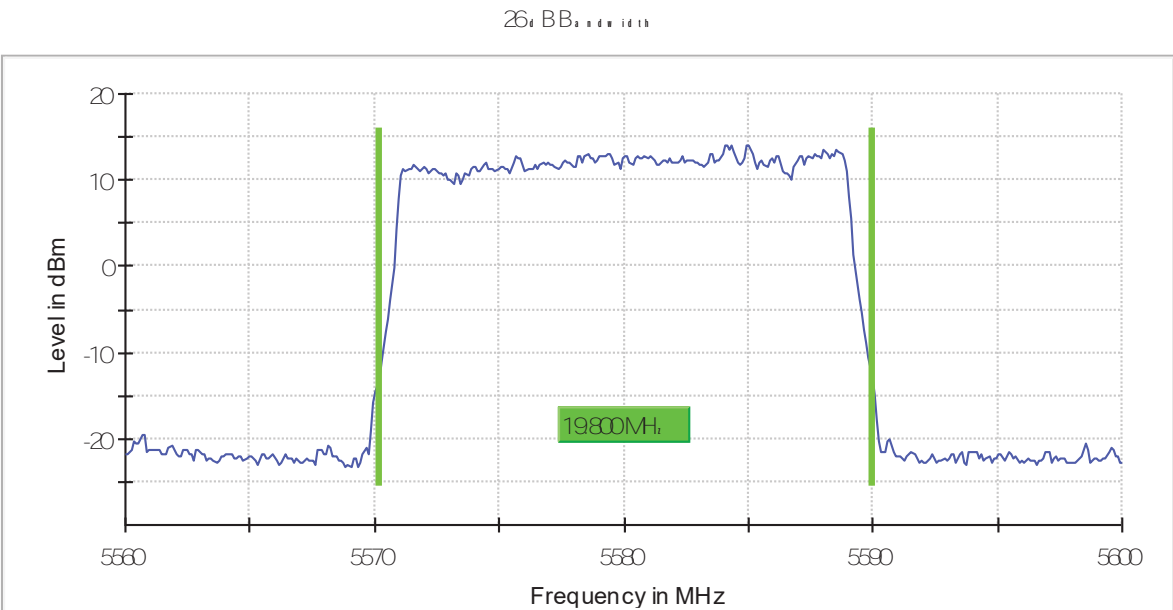
26 dB Bandwidth



channel 100 (5500 MHz)

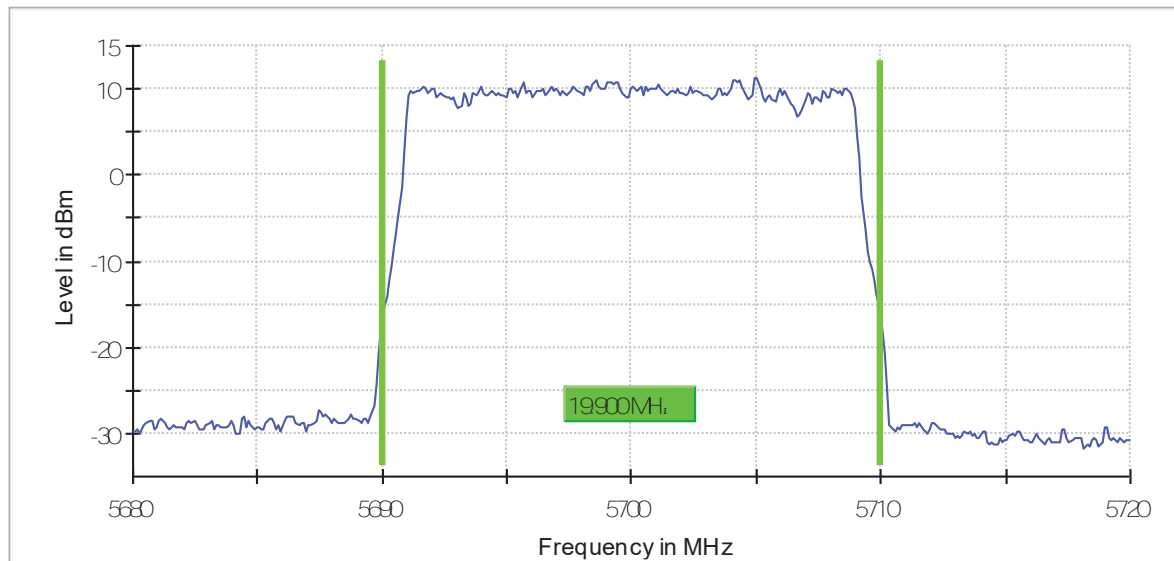


channel 116 (5580 MHz)



channel 140 (5700 MHz)

26.8 MHz bandwidth



Appendix B: Test result for 5.15GHz – 5.25GHz.

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TEST CONDITIONS

Power supply (V):

Vnominal = 120 Vac

Type of power supply = AC/DC voltage main supply.

Type of antenna = External antenna.

Declared Gain for antenna (maximum):

G_{ANTENNA SISO1} = 3 dBi

G_{ANTENNA SISO2} = 3 dBi

Technology Tested:	MulteFire 1.0	
Modes:	QPSK, 16QAM, 64QAM	
Antena ports:	1, 2	
Beamforming:	No	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 36	5180
	Middle: 40	5200
	Highest: 48	5240

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

The EUT was tested in the following operating mode:

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

The field strength at the band edges was evaluated for each mode for the channel under test.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes. FCC and Canada power setting used during the test were different to be in compliance with both limits.

SISO Port 1:

Channel	Channel Frequency (MHz)	FCC Attenuation Value	CANADA Attenuation value
Lowest: 36	5180	2	6
Middle: 40	5200	2	6
Highest: 48	5240	3	6

SISO Port 2:

Channel	Channel Frequency (MHz)	FCC Attenuation Value	CANADA Attenuation value
Lowest: 36	5180	0	4
Middle: 40	5200	0	4
Highest: 48	5240	0	5

CONDUCTED MEASUREMENTS:

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



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

RADIATED MEASUREMENTS

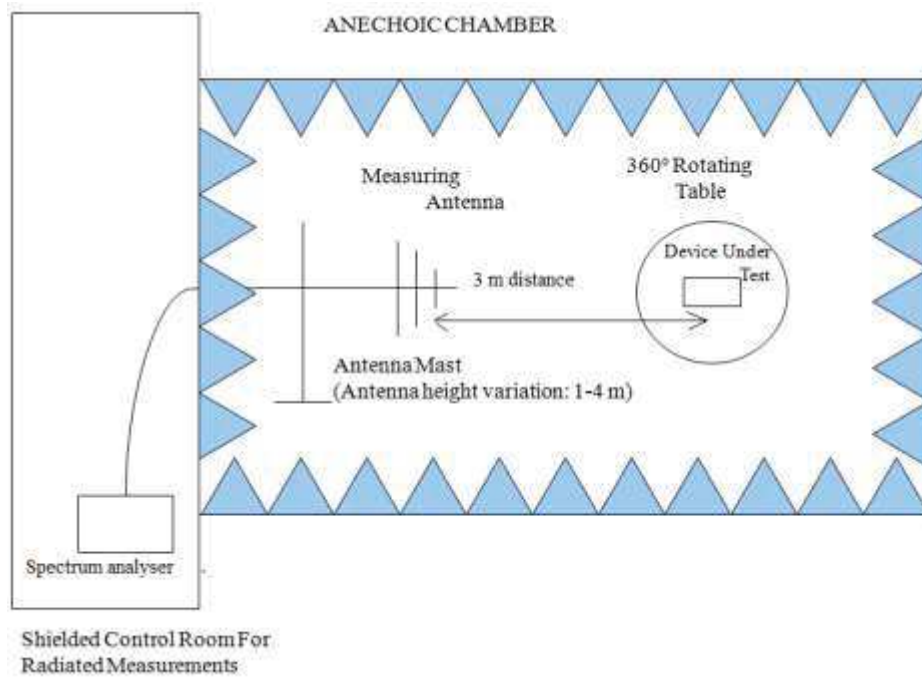
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and The EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

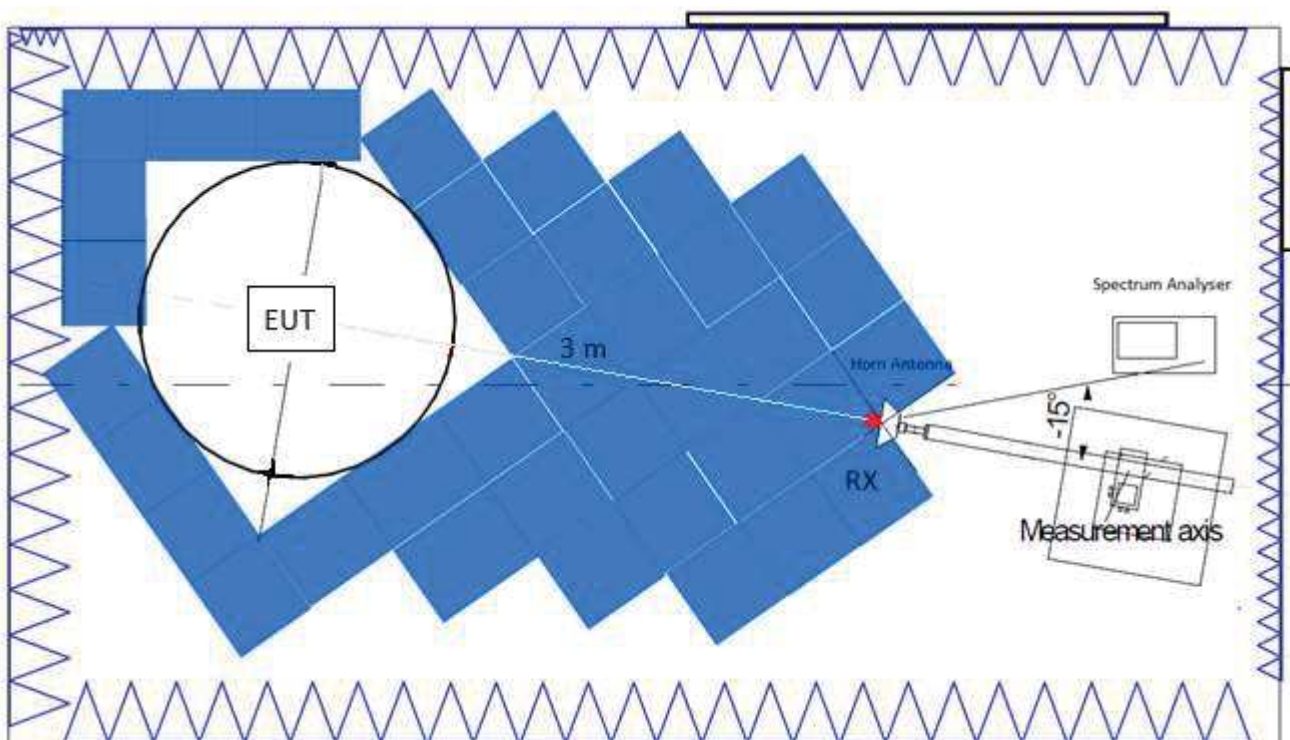
The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

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

Radiated measurements setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



FCC Section 15.407 Subclause (a)(1)(iv). Transmitter Maximum Conducted Output Power / RSS-247 Clause 6.2.1.1. Transmitter Maximum Equivalent Isotropically Radiated Power

SPECIFICATION

FCC 15.407: For client devices in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24 dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247: The maximum e.i.r.p. shall not exceed 200 mW (23 dBm) or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

RESULTS:

The maximum conducted output power was measured using the channel power integration method according to point E) 3) b) (Method PM-G) of 789033 D02 General UNII Test Procedures New Rules v02r01.

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

SISO Antenna Port 1:

FCC Power setting:

Mode: QPSK - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	21.50	21.59	21.54
Conducted Power Limit (dBm)	24		
Margin (dB)	2.50	2.41	2.46
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	21.64	22.01	21.51
Conducted Power Limit (dBm)	24		
Margin (dB)	2.36	1.99	2.49
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	21.90	22.04	21.31
Conducted Power Limit (dBm)	24		
Margin (dB)	2.10	1.96	2.69
Measurement uncertainty (dB)	<±1.20		

Canada power setting

Mode: QPSK - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	17.74	17.88	18.25
Maximum EIRP power (dBm)	20.74	20.88	21.25
EIRP power Limit (dBm)	22.528		
Margin (dB)	1.78	1.64	1.27
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	17.81	17.93	18.31
Maximum EIRP power (dBm)	20.81	20.93	21.31
EIRP power Limit (dBm)	22.528		
Margin (dB)	1.71	1.59	1.21
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	17.81	17.95	18.32
Maximum EIRP power (dBm)	20.81	20.95	21.32
EIRP power Limit (dBm)	22.528		
Margin (dB)	1.71	1.57	1.21
Measurement uncertainty (dB)	<±1.20		

SISO Antenna Port 2:

FCC Power setting:

Mode: QPSK - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	21.09	20.86	21.95
Conducted Power Limit (dBm)	24		
Margin (dB)	2.91	3.14	2.05
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	20.79	21.10	22.18
Conducted Power Limit (dBm)	24		
Margin (dB)	3.21	2.90	1.82
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	20.76	20.81	21.92
Conducted Power Limit (dBm)	24		
Margin (dB)	3.24	3.19	2.08
Measurement uncertainty (dB)	<±1.20		

Canada power setting

Mode: QPSK - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	18.15	17.56	17.62
Maximum EIRP power (dBm)	21.15	20.56	20.62
EIRP power Limit (dBm)	22.528		
Margin (dB)	1.37	1.96	1.91
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	17.46	17.78	17.86
Maximum EIRP power (dBm)	20.46	20.78	20.86
EIRP power Limit (dBm)	22.528		
Margin (dB)	2.06	1.74	1.66
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

Antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
Max. conducted power (dBm)	17.46	17.76	17.85
Maximum EIRP power (dBm)	20.46	20.76	20.85
EIRP power Limit (dBm)	22.528		
Margin (dB)	2.06	1.77	1.67
Measurement uncertainty (dB)	<±1.20		

FCC Section 15.407 Subclause (a) (1) (iv). Transmitter Maximum Power Spectral Density / RSS-247 Clause 6.2.1.1. Transmitter EIRP Spectral Density

FCC 15.407: The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz 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.

RSS-247: The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RESULTS

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

The PSD test uses the same setup than the transmitter maximum conducted output power test. The result of the Peak PSD was measured by setting a marker on the peak of the signal and the results are in the tables below.

SISO Antenna Port 1:

FCC power setting

Mode: QPSK - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	10.21	10.17	10.07
PSD Limit (dBm/MHz)	11		
Margin (dB)	0.79	0.83	0.93
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	10.29	10.47	10.05
PSD Limit (dBm/MHz)	11		
Margin (dB)	0.71	0.53	0.95
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	10.56	10.56	9.86
PSD Limit (dBm/MHz)	11		
Margin (dB)	0.44	0.44	1.14
Measurement uncertainty (dB)	<±1.20		

Canada power setting

Mode: QPSK - 20MHz

Declared antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.54	6.39	6.94
e.i.r.p PSD (dBm/MHz)	9.54	9.39	9.94
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.46	0.61	0.06
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

Declared antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.52	6.39	6.94
e.i.r.p PSD (dBm/MHz)	9.52	9.39	9.94
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.48	0.61	0.06
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

Declared antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.49	6.44	6.87
e.i.r.p PSD (dBm/MHz)	9.49	9.44	9.87
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.51	0.56	0.13
Measurement uncertainty (dB)	<±1.20		

SISO Antenna Port 2:

FCC power setting

Mode: QPSK - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	9.65	9.70	10.69
PSD Limit (dBm/MHz)	11		
Margin (dB)	1.35	1.30	0.31
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	9.59	9.85	10.86
PSD Limit (dBm/MHz)	11		
Margin (dB)	1.41	1.15	0.14
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	9.51	9.55	10.53
PSD Limit (dBm/MHz)	11		
Margin (dB)	1.49	1.45	0.47
Measurement uncertainty (dB)	<±1.20		

Canada power setting

Mode: QPSK - 20MHz

Declared antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.87	6.29	6.23
e.i.r.p PSD (dBm/MHz)	9.87	9.29	9.23
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.13	0.71	0.77
Measurement uncertainty (dB)	<±1.20		

Mode: 16QAM - 20MHz

Declared antenna gain: 3 dBi

	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.31	6.55	6.57
e.i.r.p PSD (dBm/MHz)	9.31	9.55	9.57
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.69	0.45	0.43
Measurement uncertainty (dB)	<±1.20		

Mode: 64QAM - 20MHz

Declared antenna gain: 3 dBi

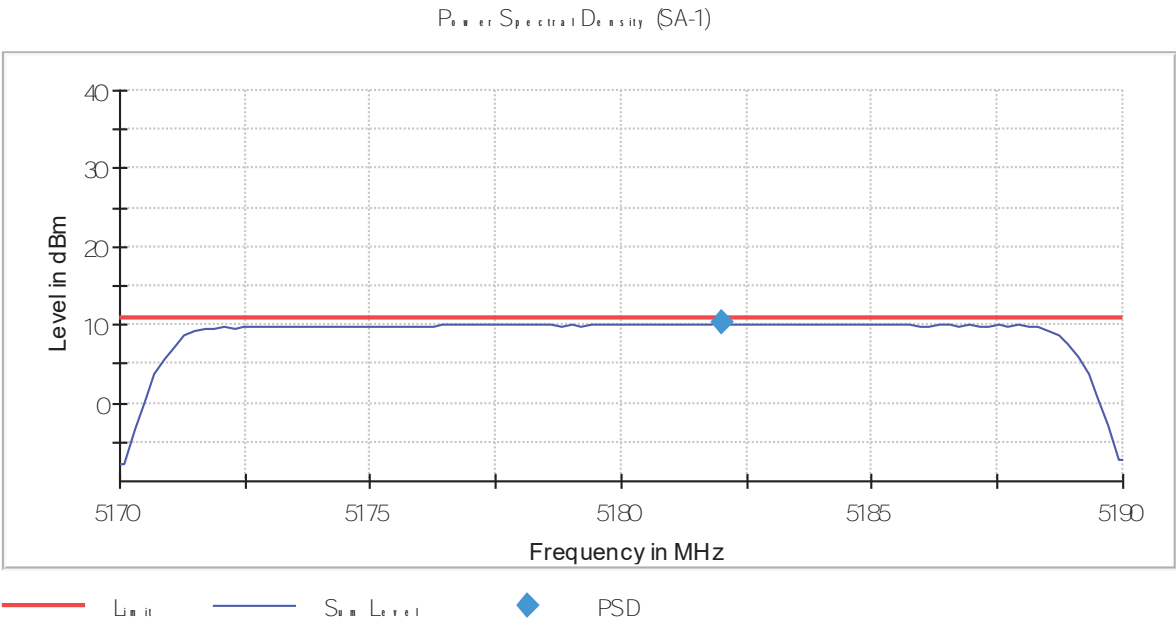
	channel 36 5180 MHz	channel 40 5200 MHz	channel 48 5240 MHz
PSD (dBm/MHz)	6.28	6.51	6.48
e.i.r.p PSD (dBm/MHz)	9.28	9.51	9.48
e.i.r.p PSD Limit (dBm/MHz)	10		
Margin (dB)	0.72	0.49	0.52
Measurement uncertainty (dB)	<±1.20		

SISO Antenna Port 1:

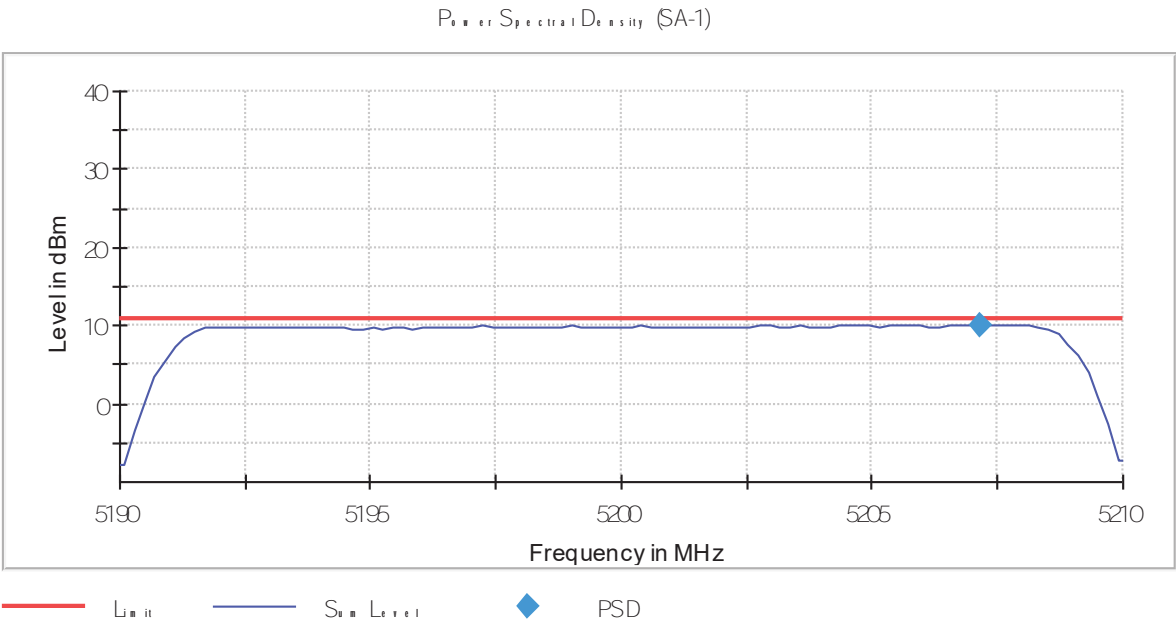
FCC power setting

QPSK- 20MHz:

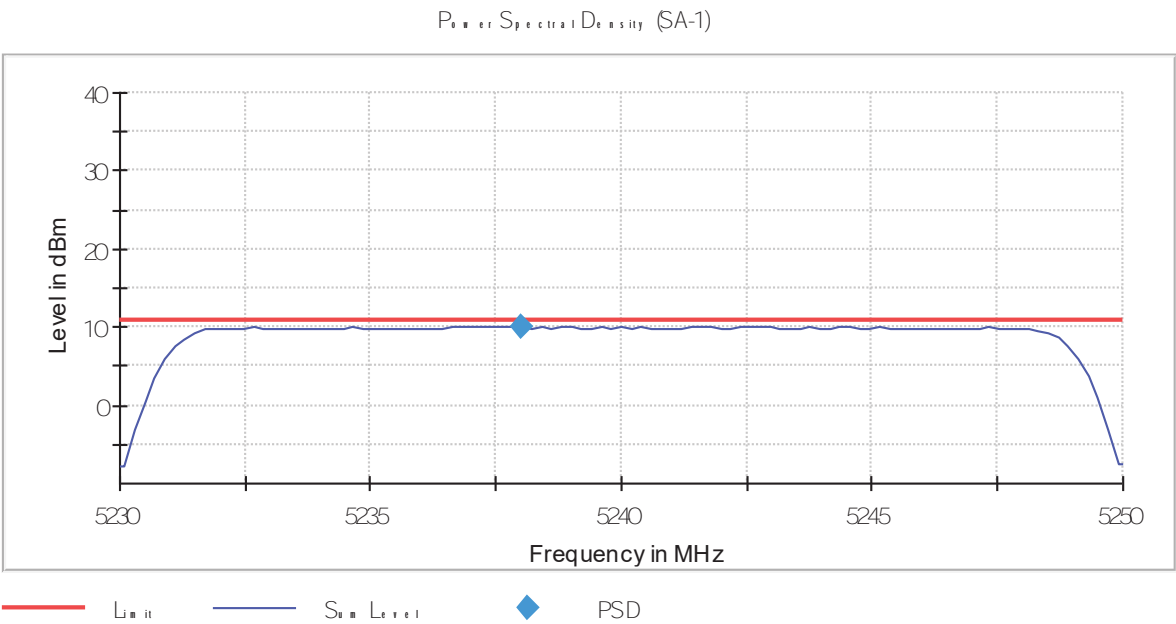
- Low Channel 36:



- Middle Channel 40:

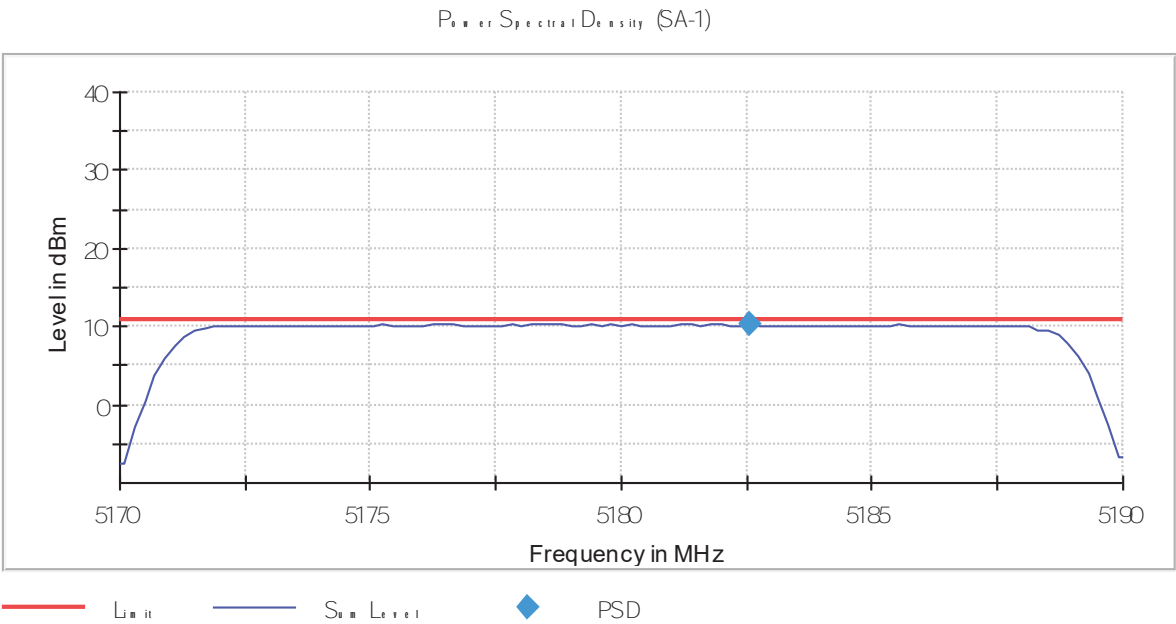


- High Channel 48:

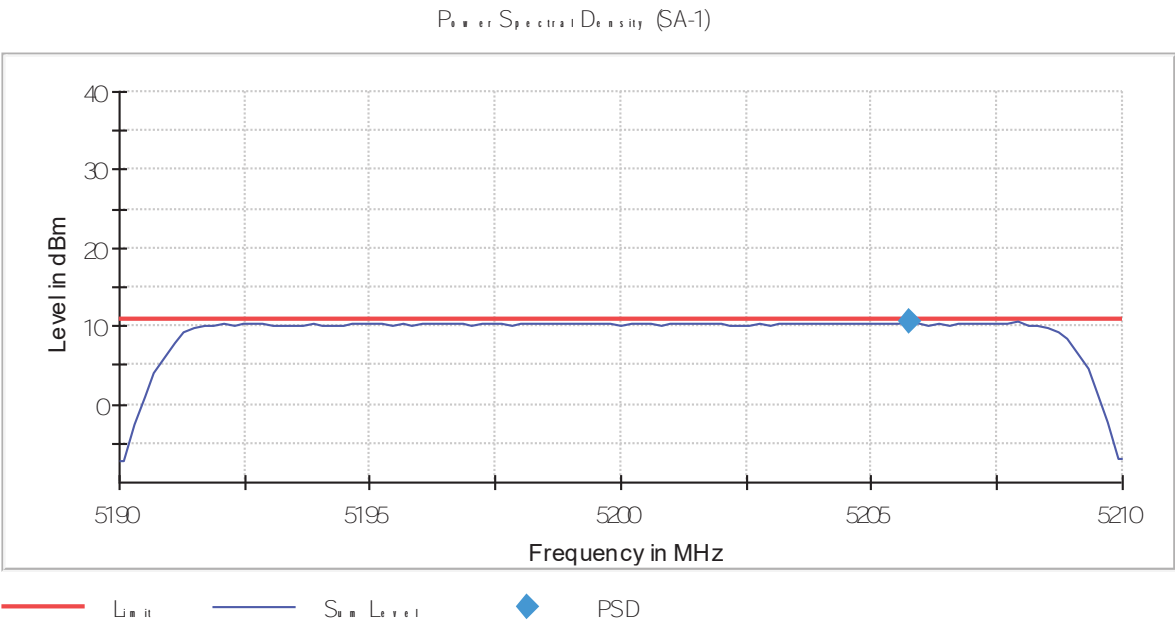


16QAM- 20MHz:

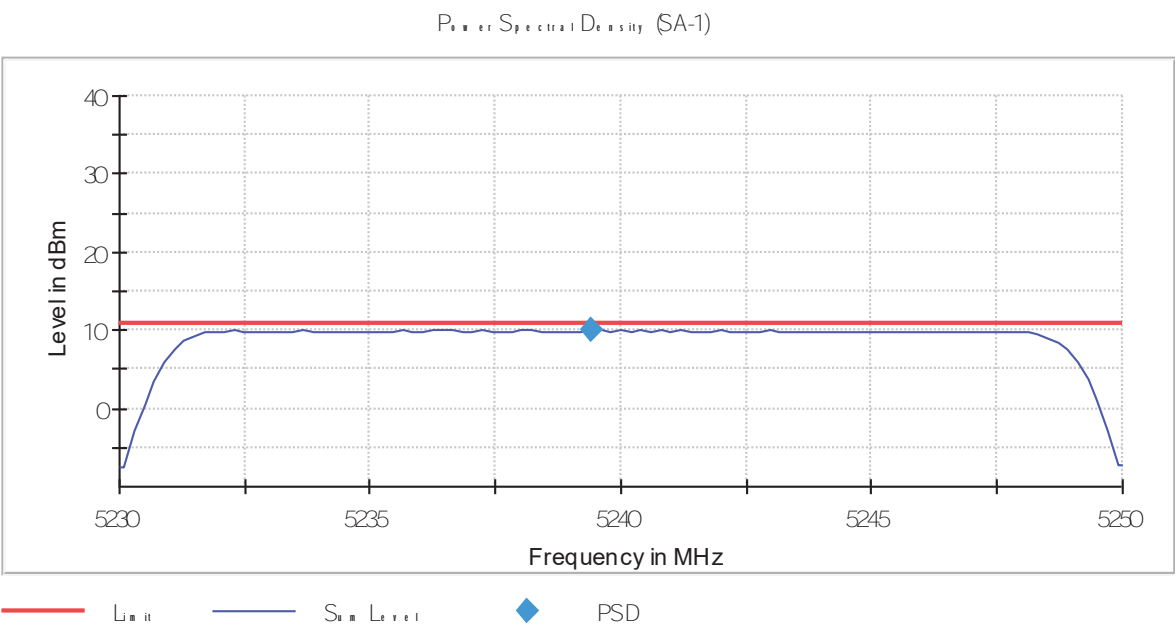
- Low Channel 36:



- Middle Channel 40:

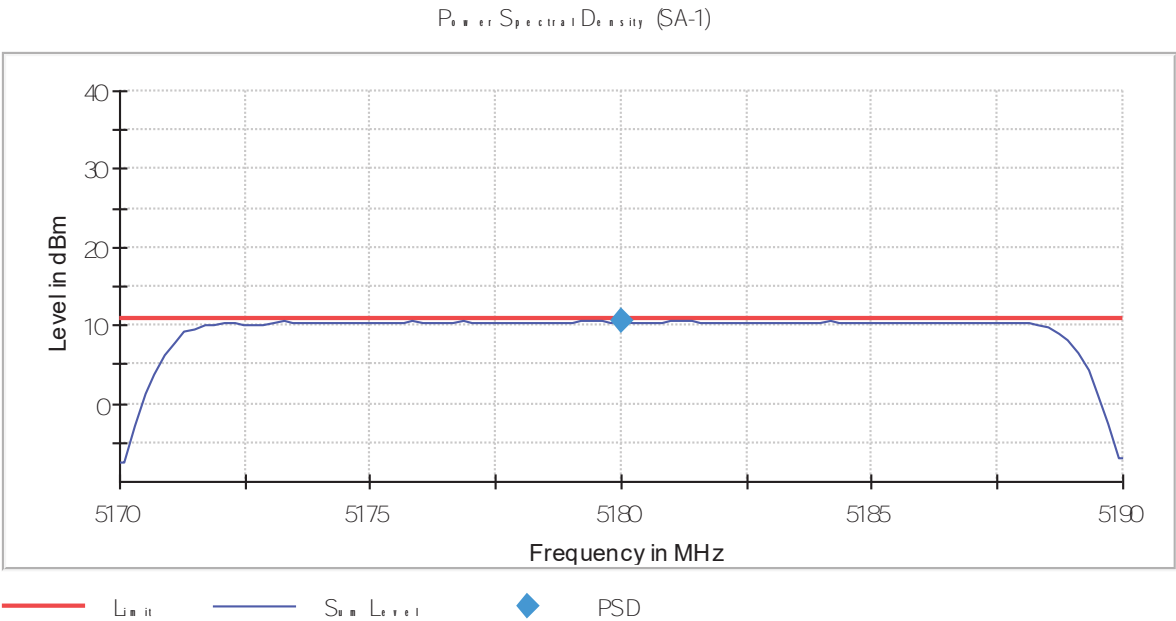


- High Channel 48:

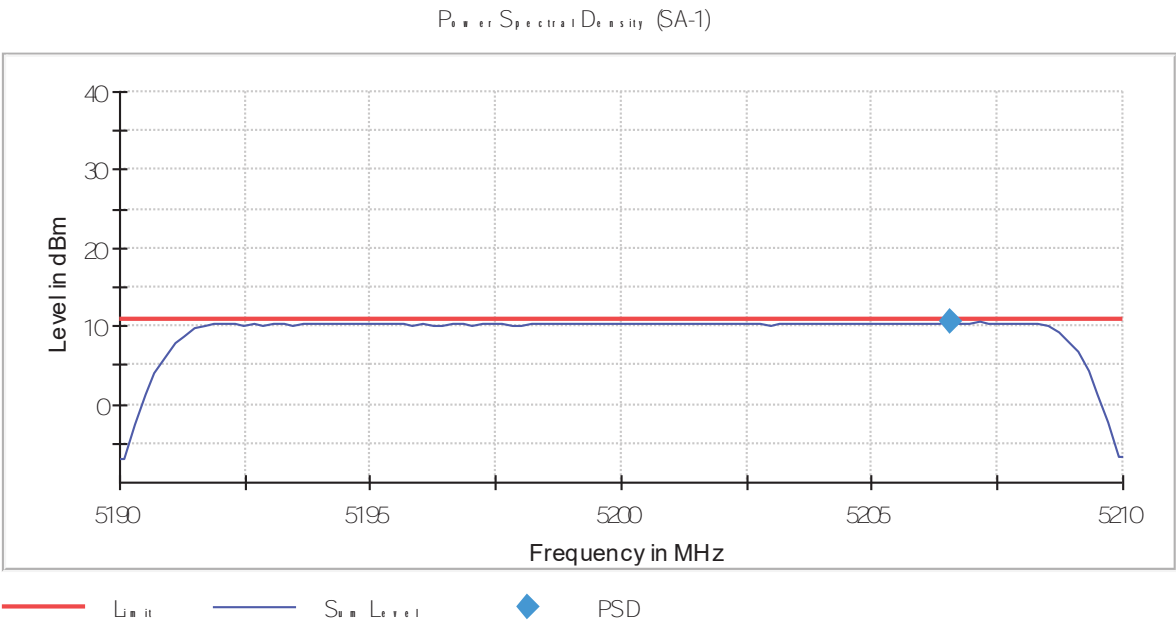


64QAM- 20MHz:

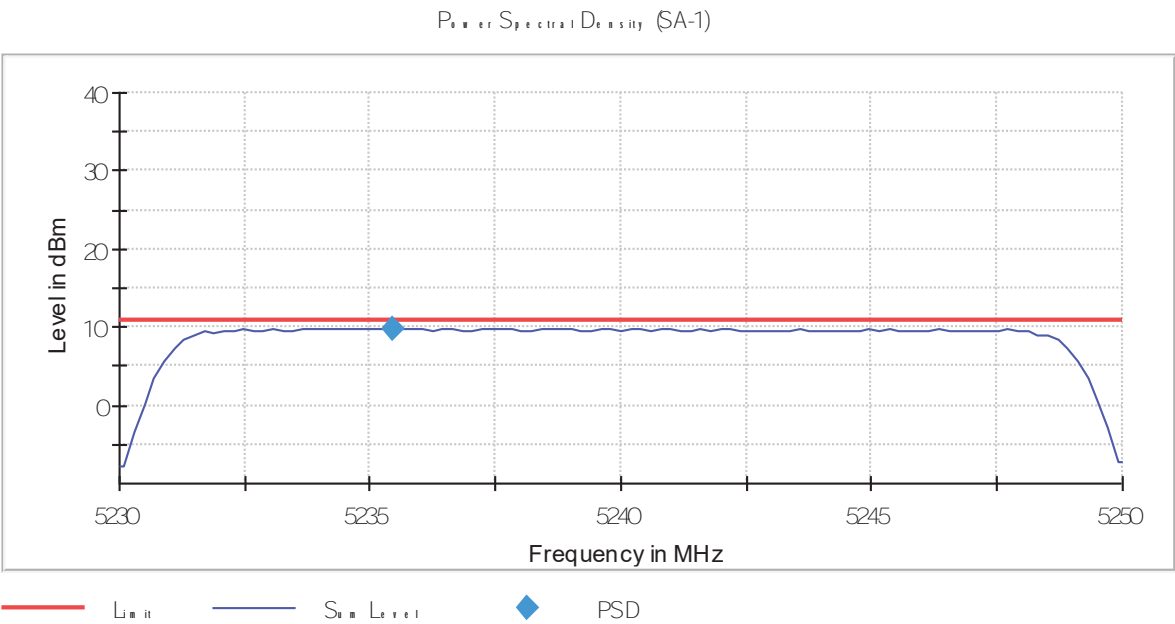
- Low Channel 36:



- Middle Channel 40:



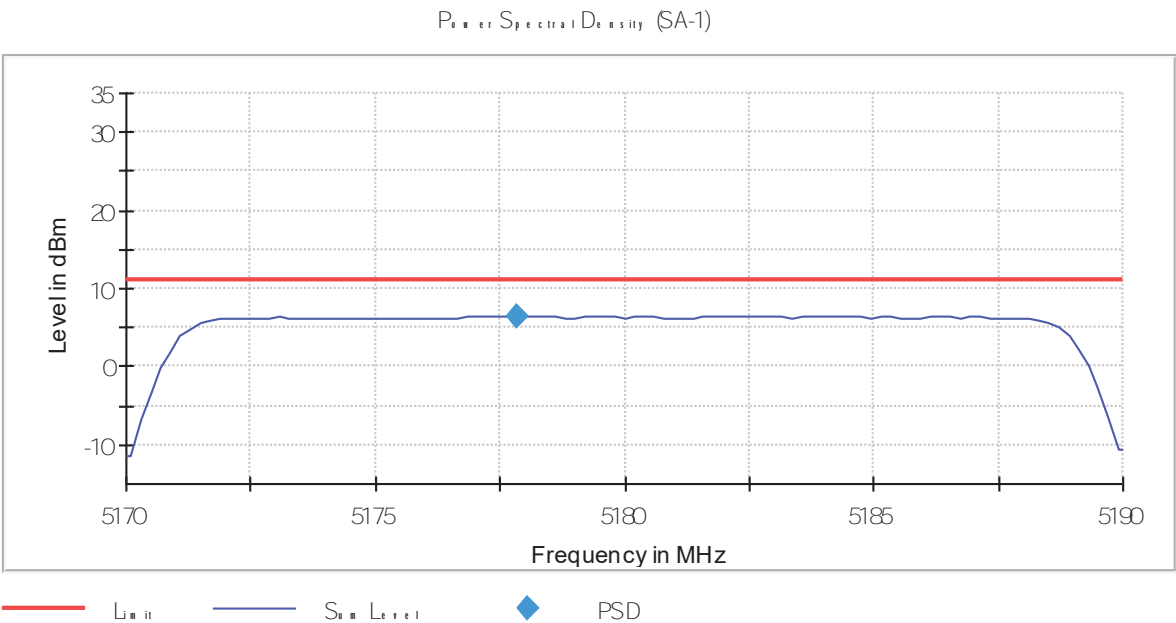
- High Channel 48:



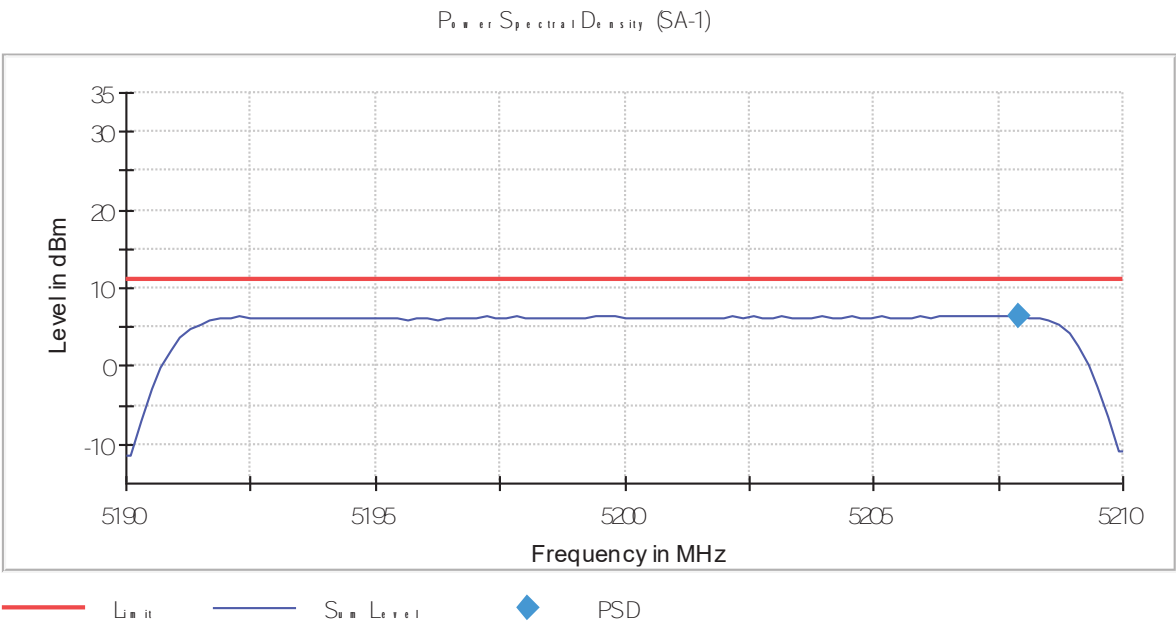
CANADA power setting

QPSK- 20MHz:

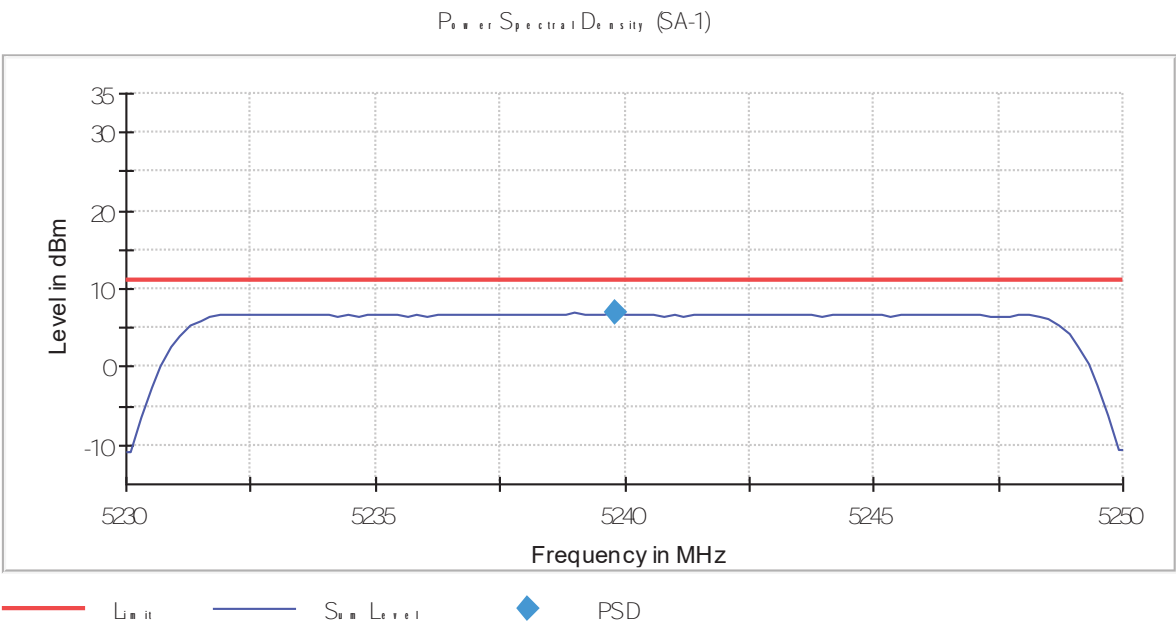
- Low Channel 36:



- Middle Channel 40:

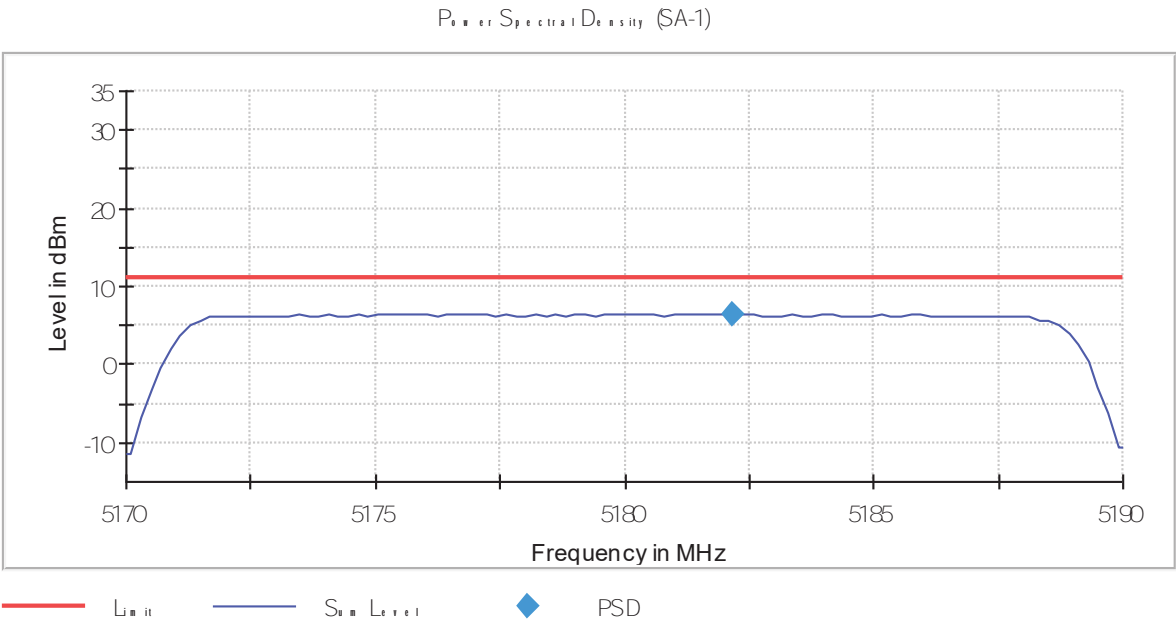


- High Channel 48:

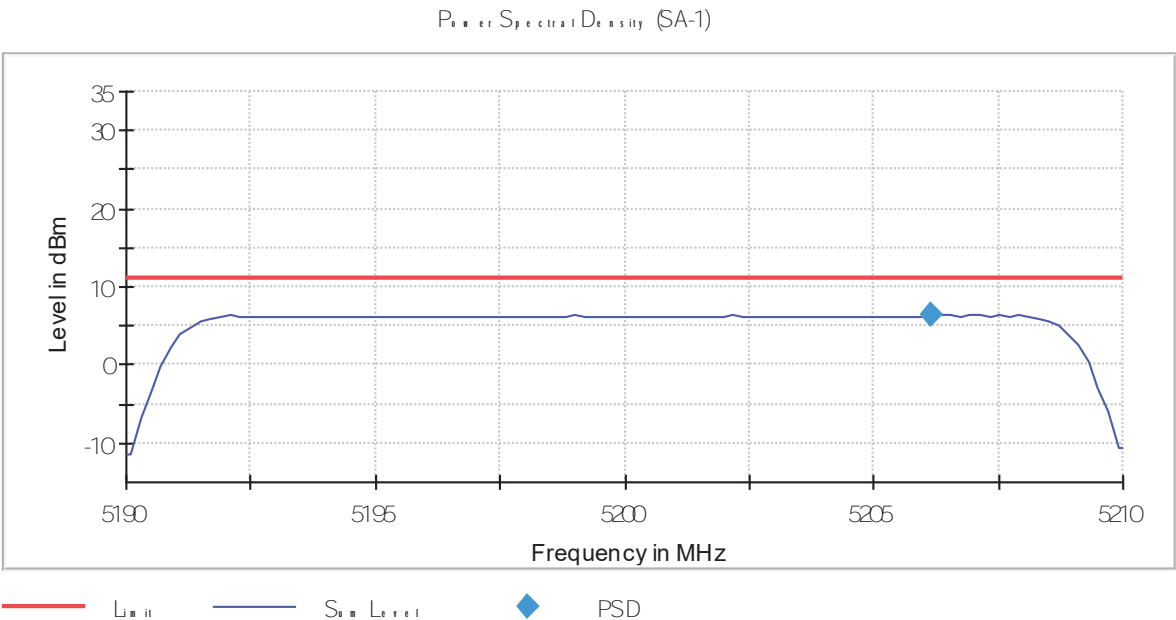


16QAM- 20MHz:

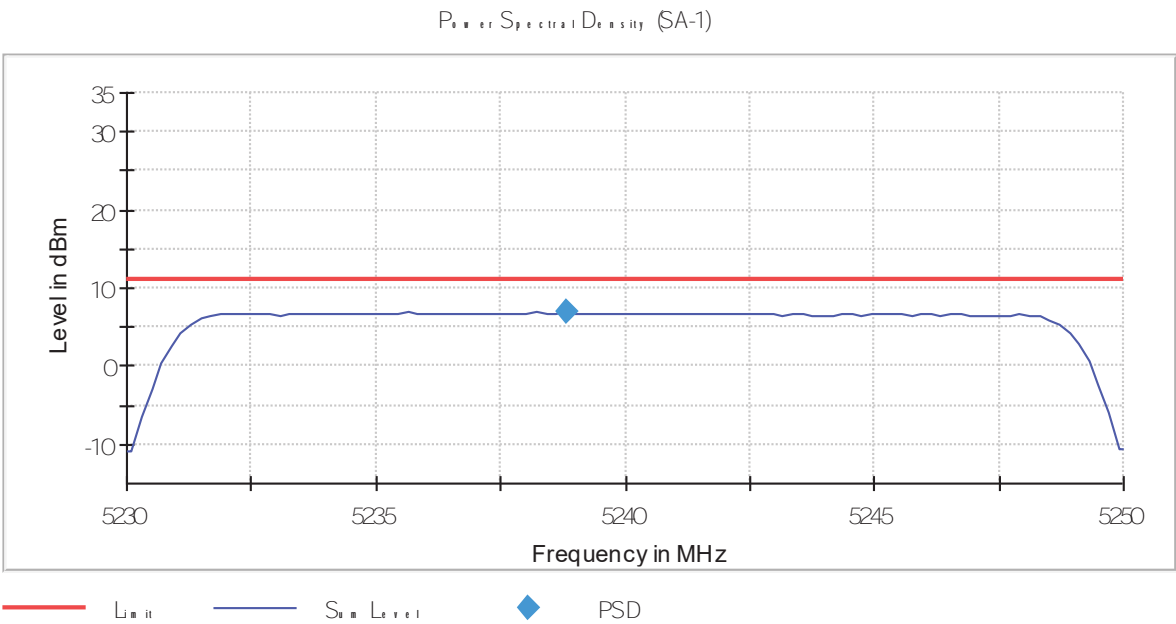
- Low Channel 36:



- Middle Channel 40:

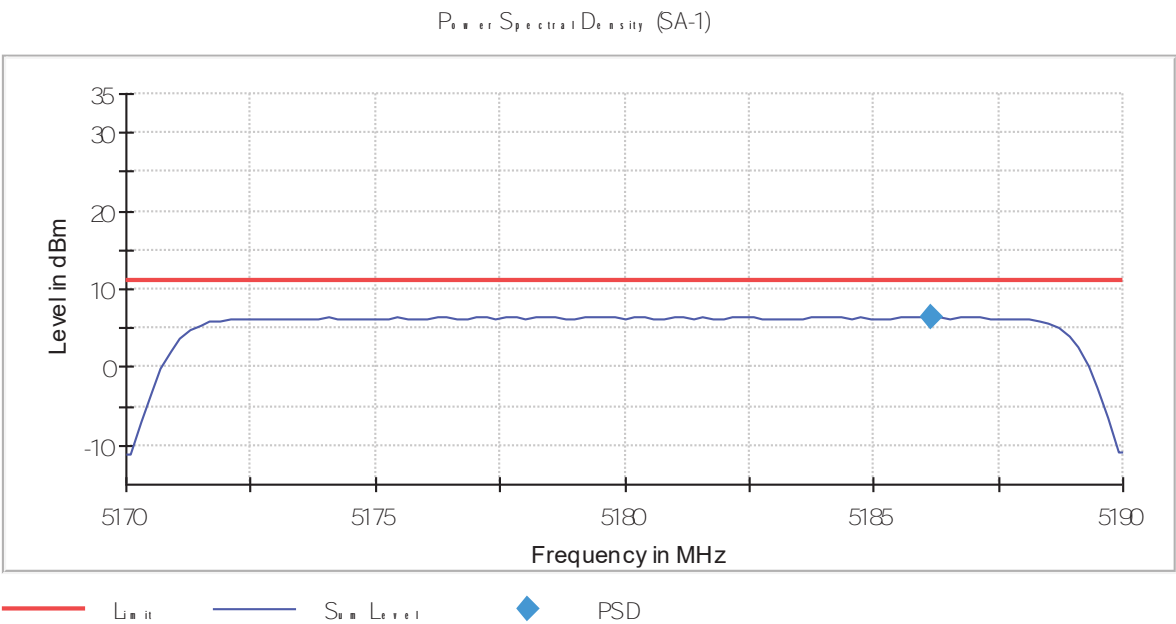


- High Channel 48:

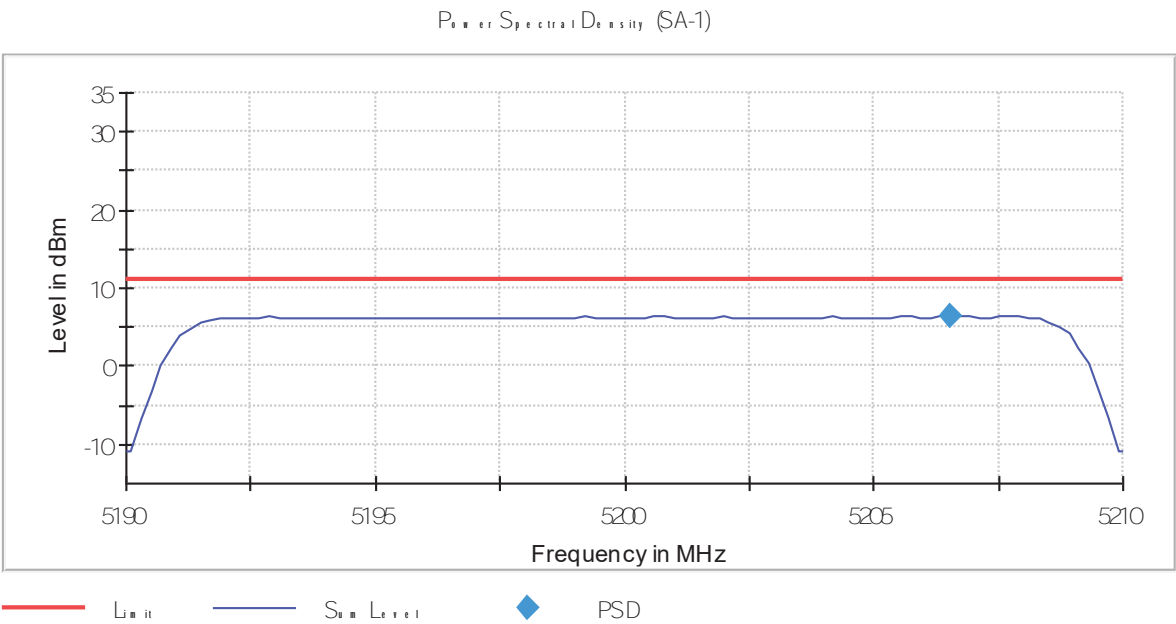


64QAM- 20MHz:

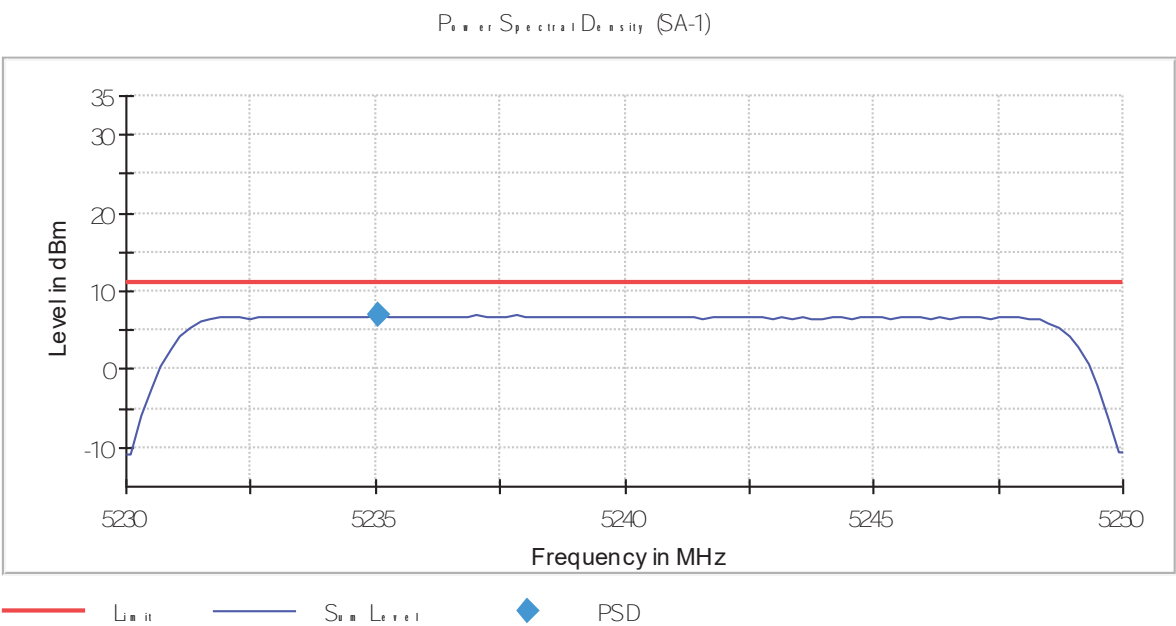
- Low Channel 36:



- Middle Channel 40:



- High Channel 48:

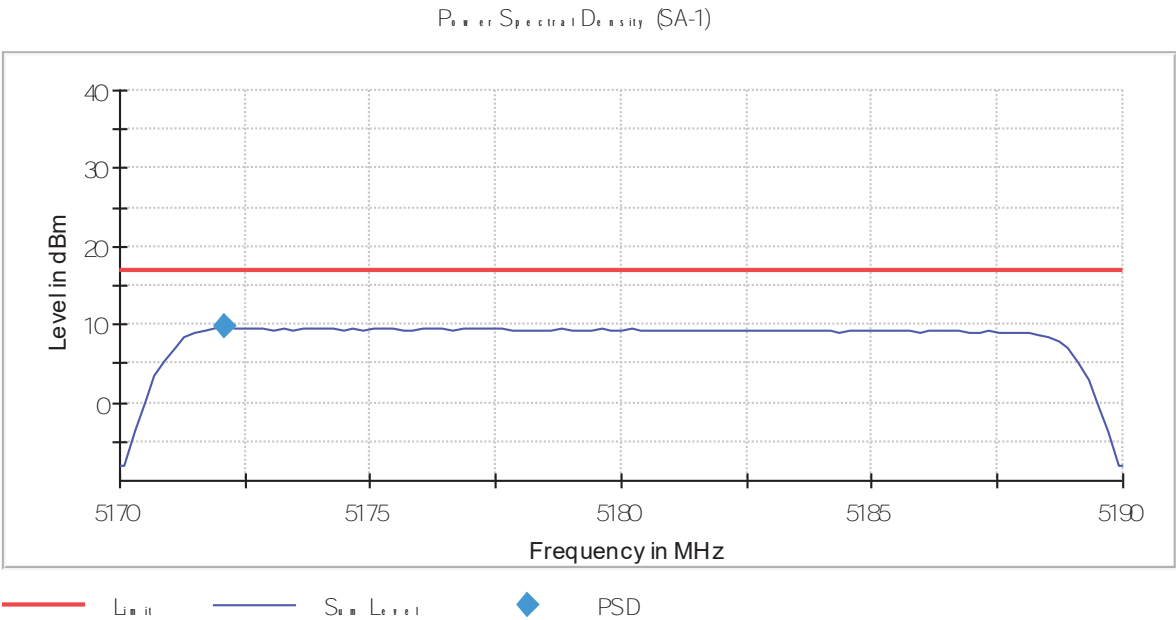


SISO Antenna Port 2:

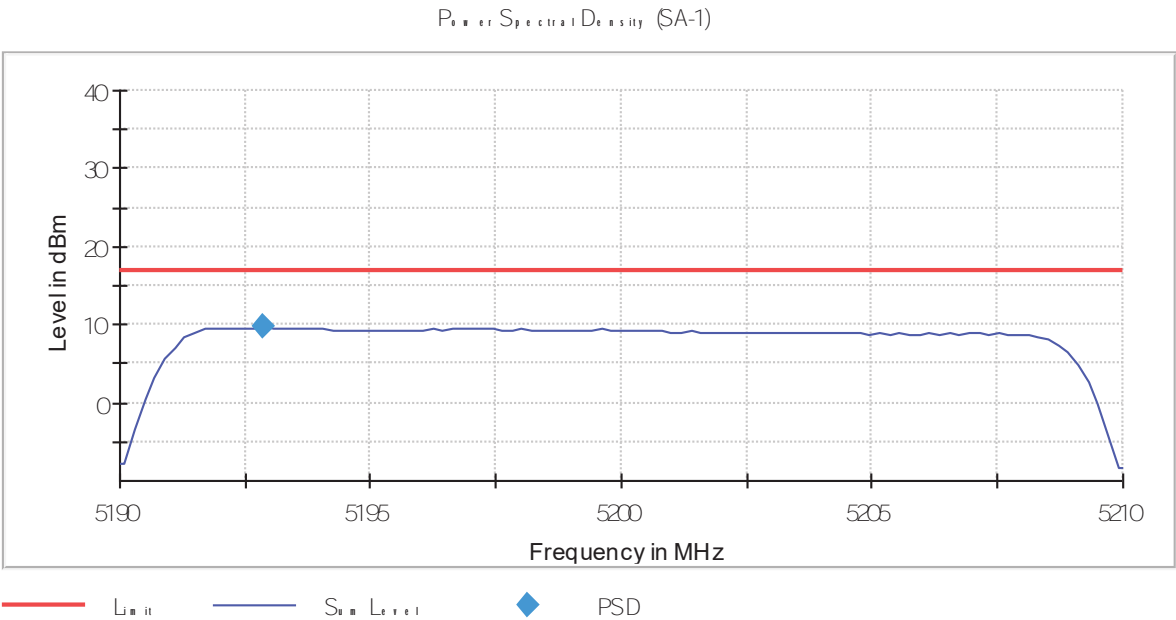
FCC power setting

QPSK- 20MHz:

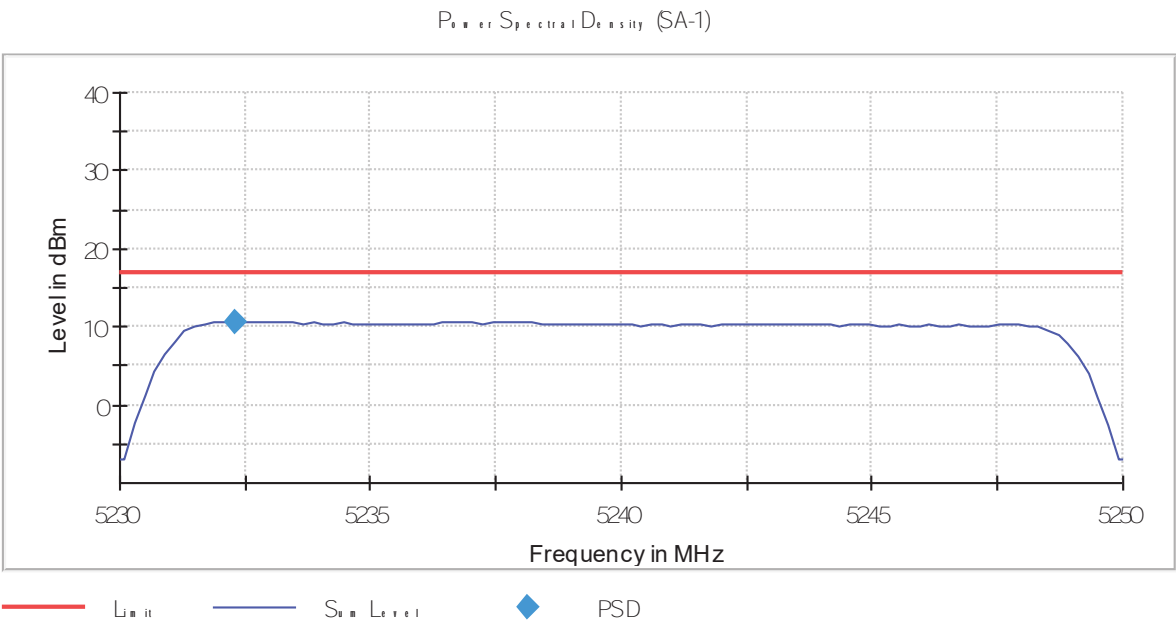
- Low Channel 36:



- Middle Channel 40:

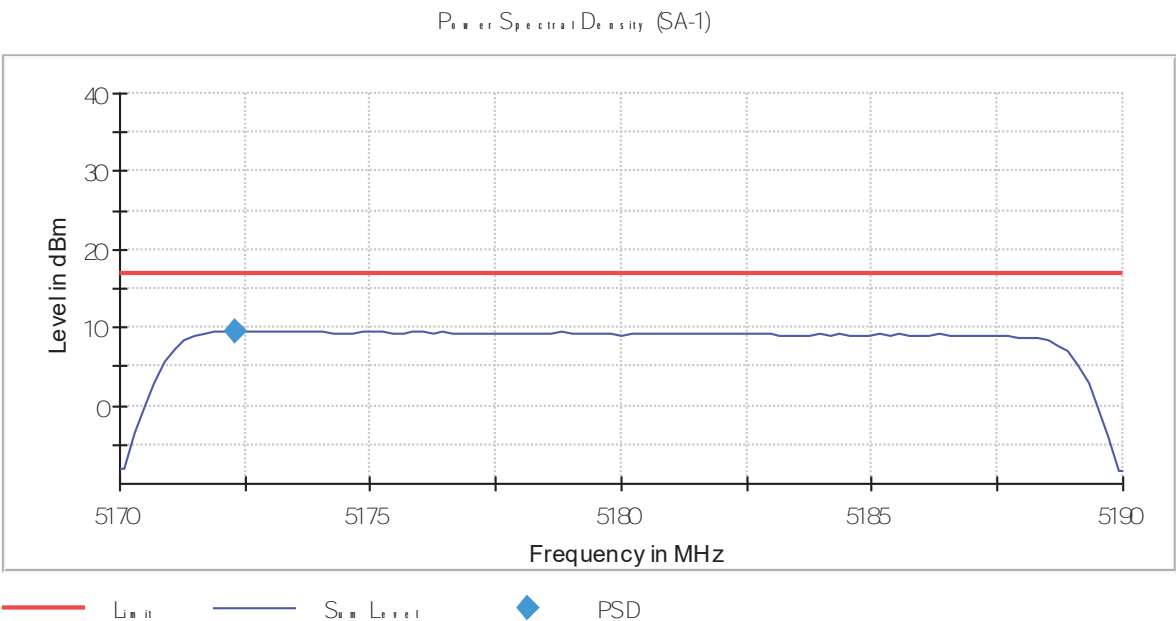


- High Channel 48:

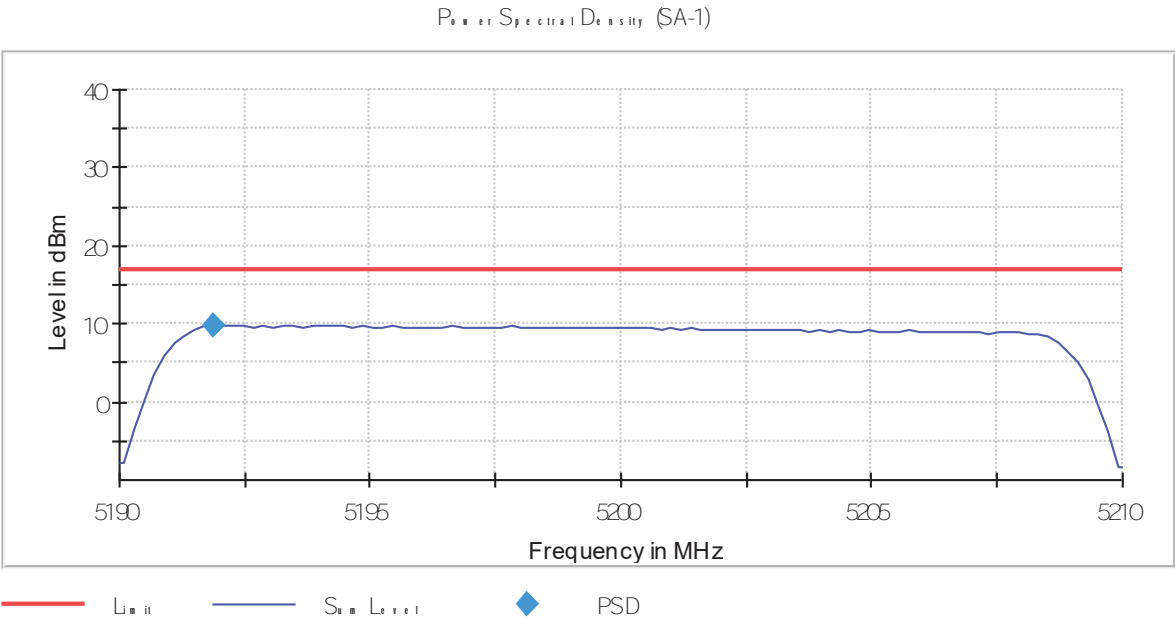


16QAM- 20MHz:

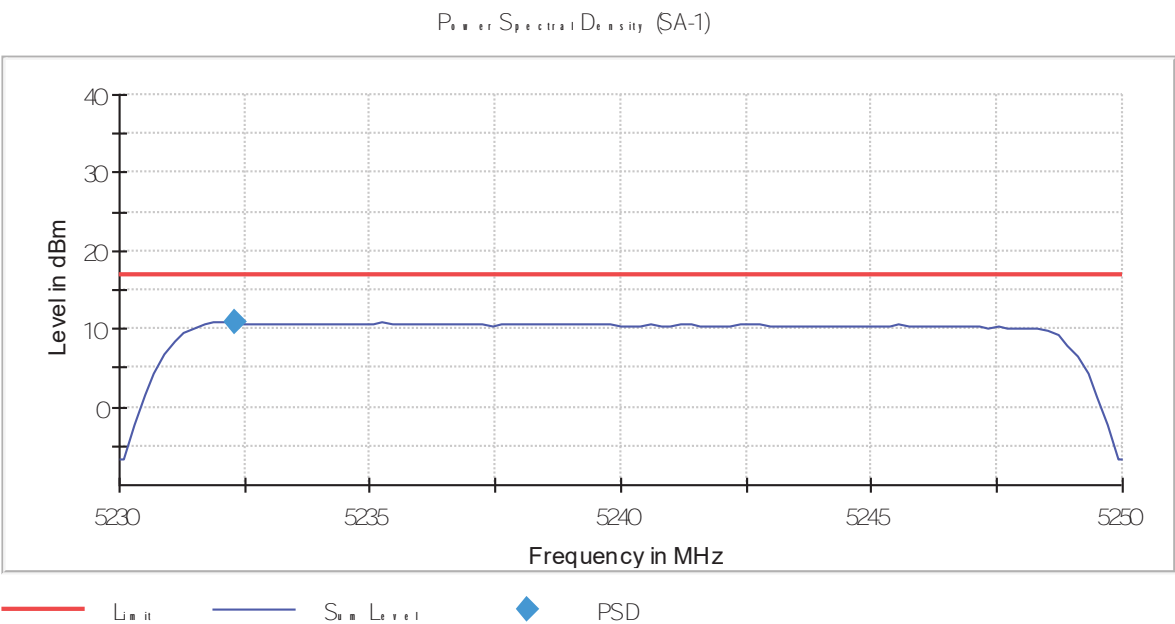
- Low Channel 36:



- Middle Channel 40:

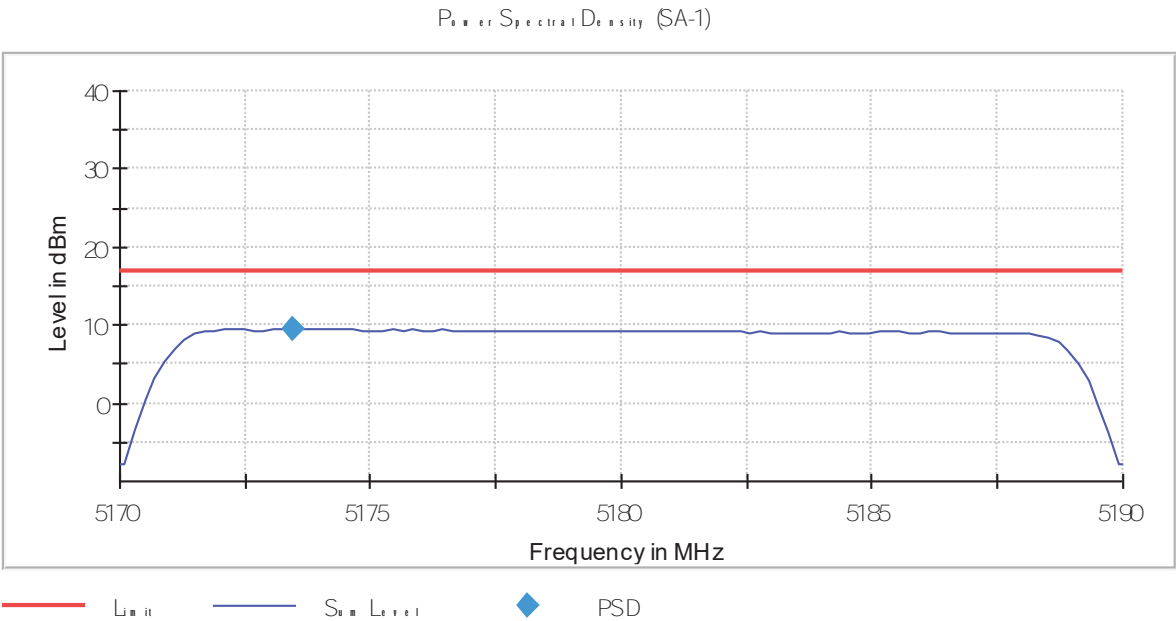


- High Channel 48:

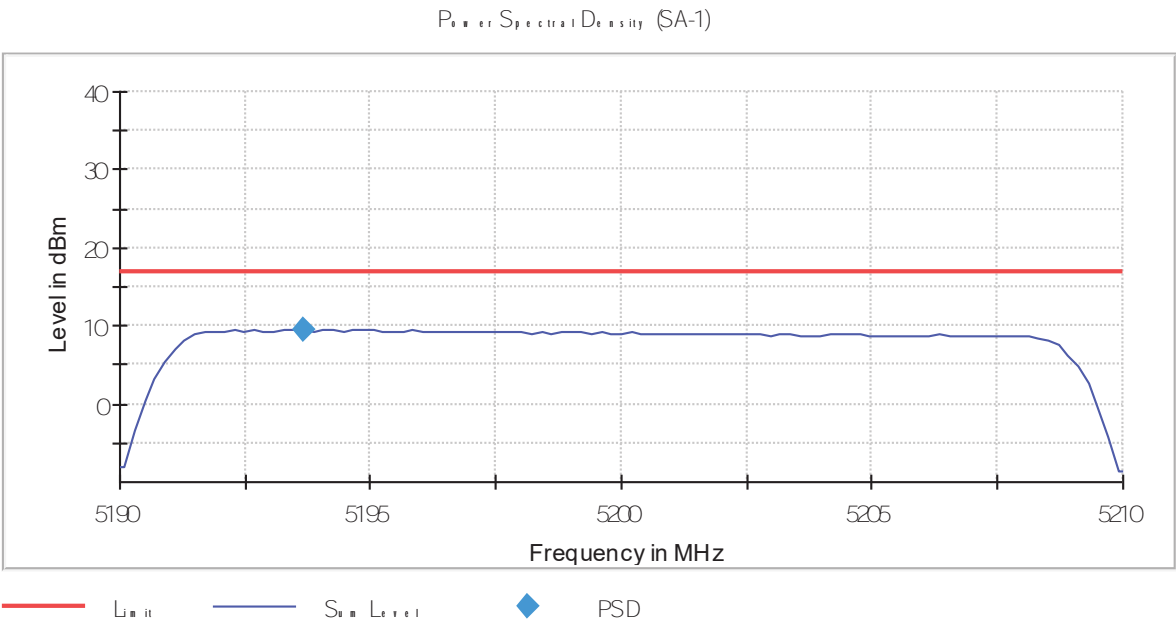


64QAM- 20MHz:

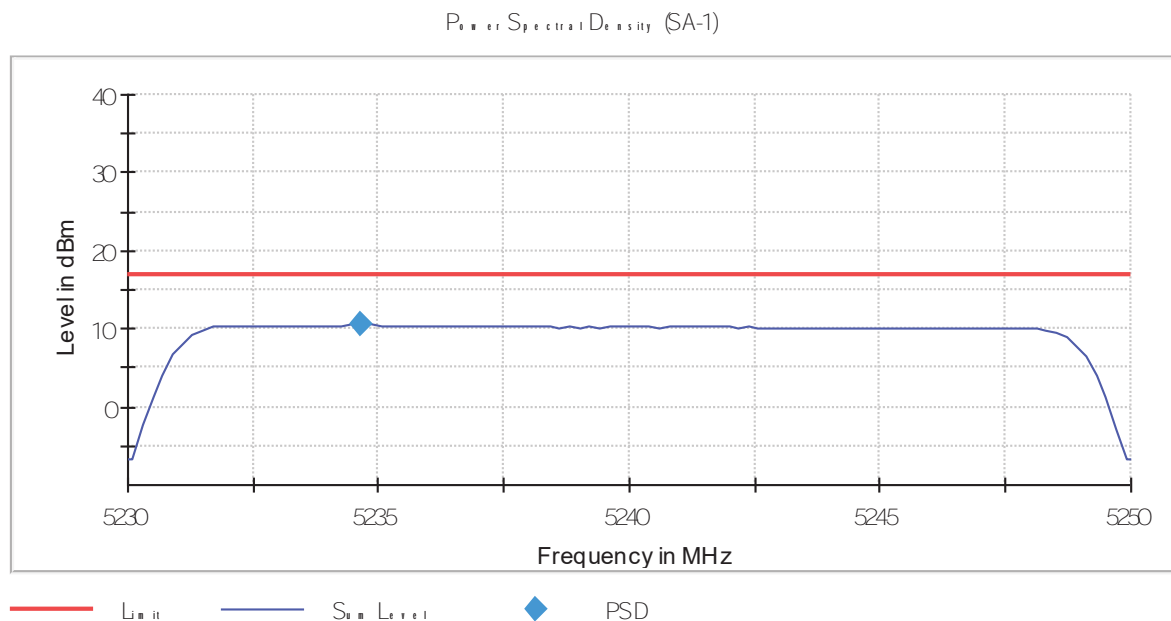
- Low Channel 36:



- Middle Channel 40:



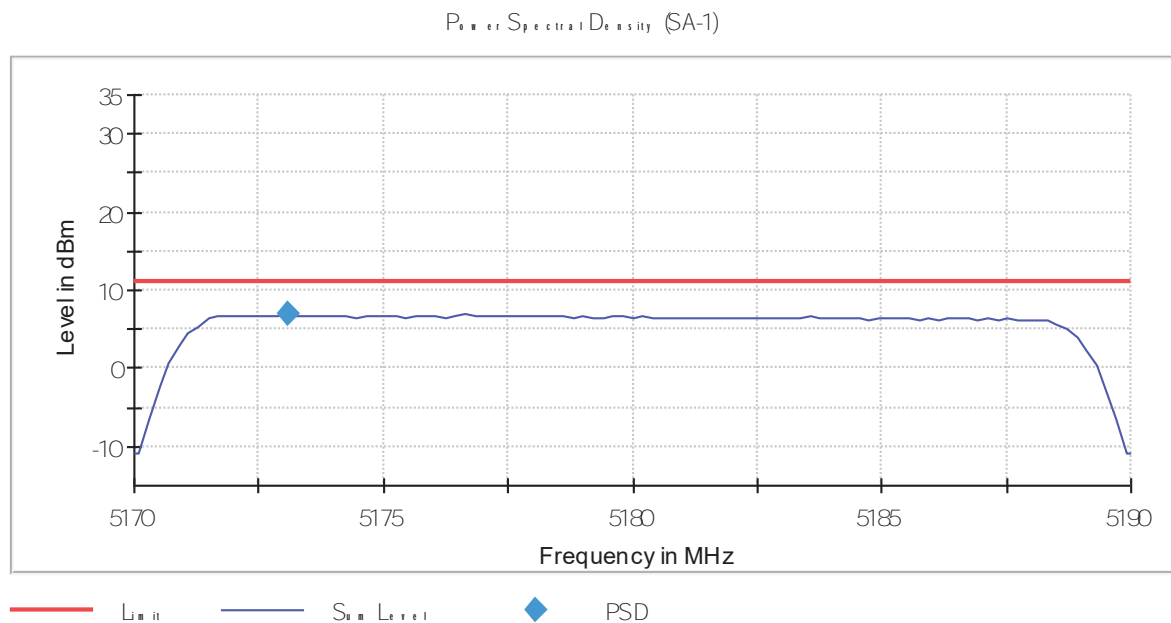
- High Channel 48:



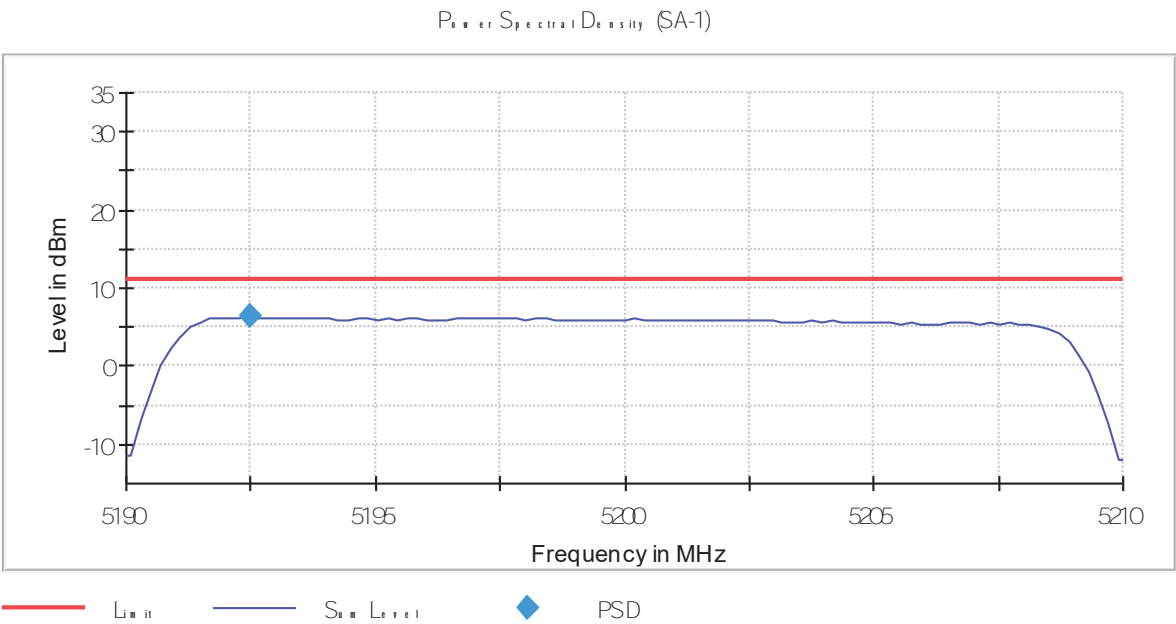
CANADA power setting

QPSK- 20MHz:

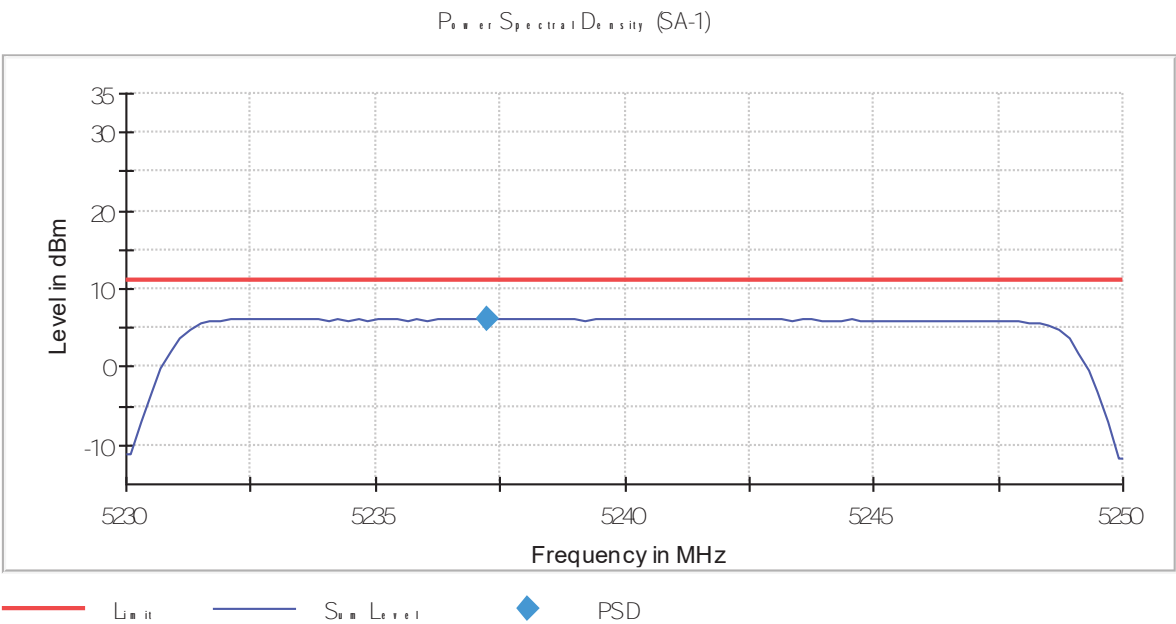
- Low Channel 36:



- Middle Channel 40:

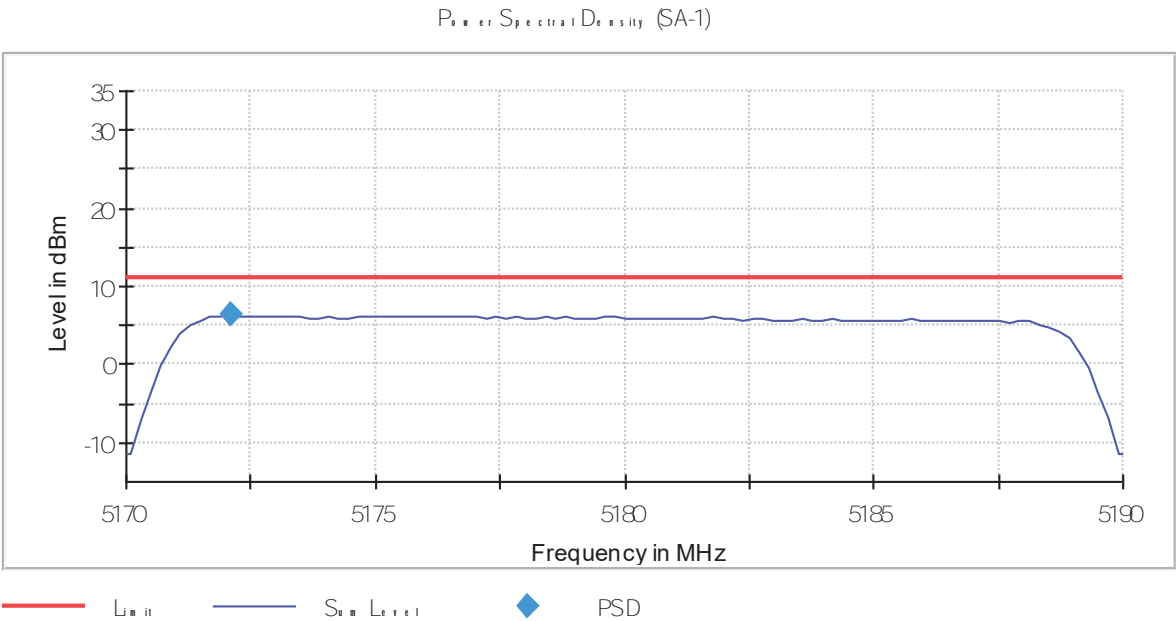


- High Channel 48:

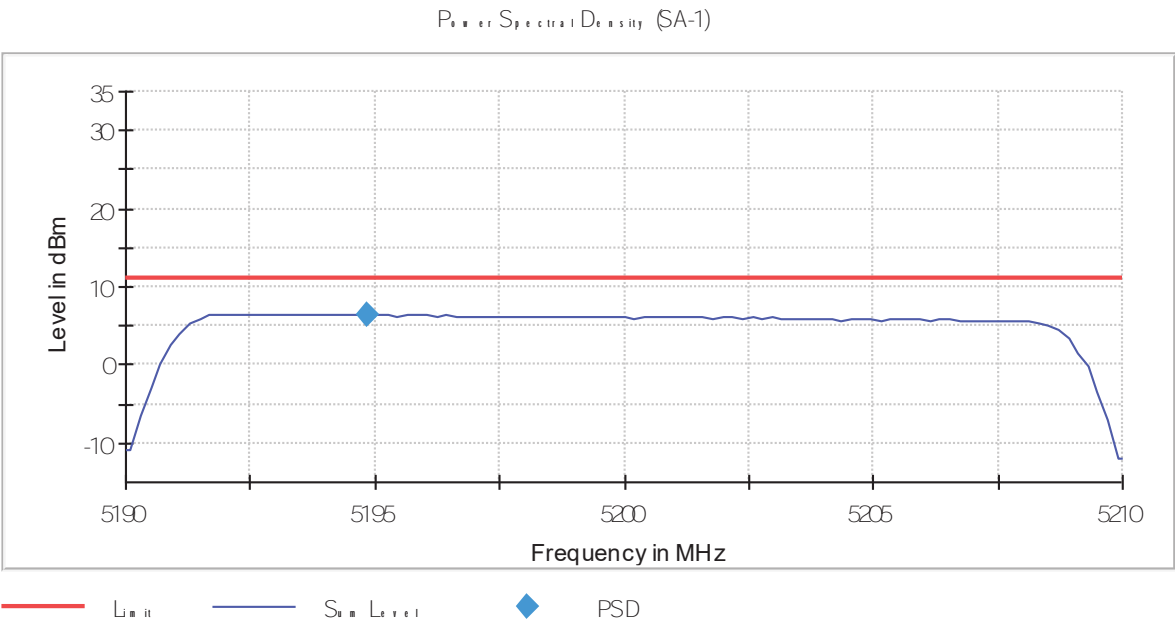


16QAM- 20MHz:

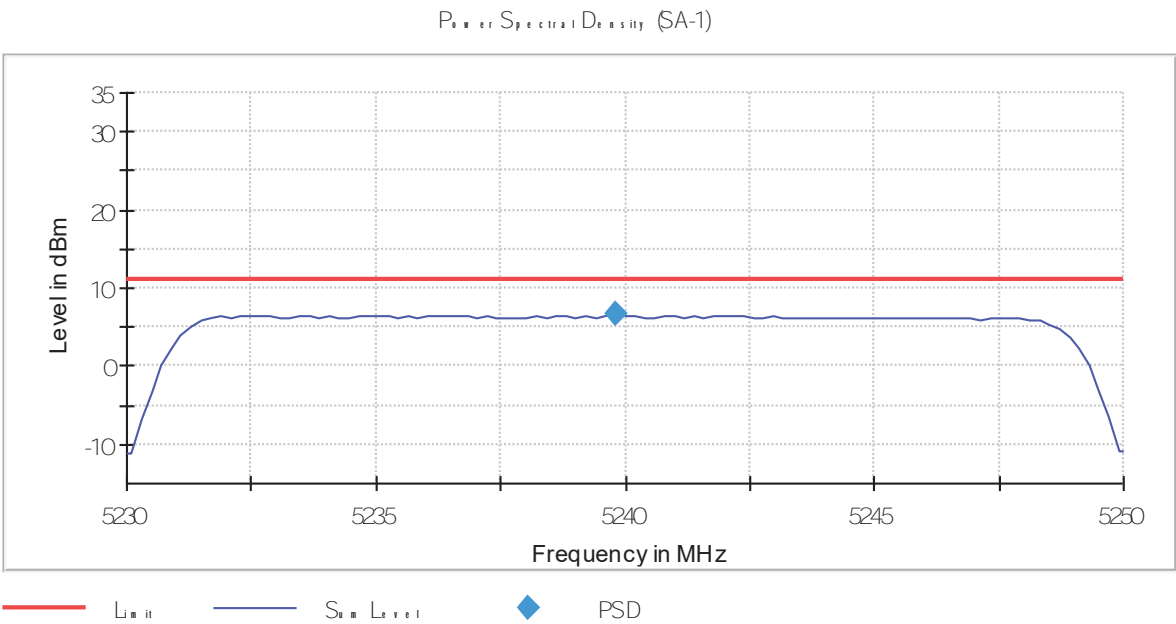
- Low Channel 36:



- Middle Channel 40:

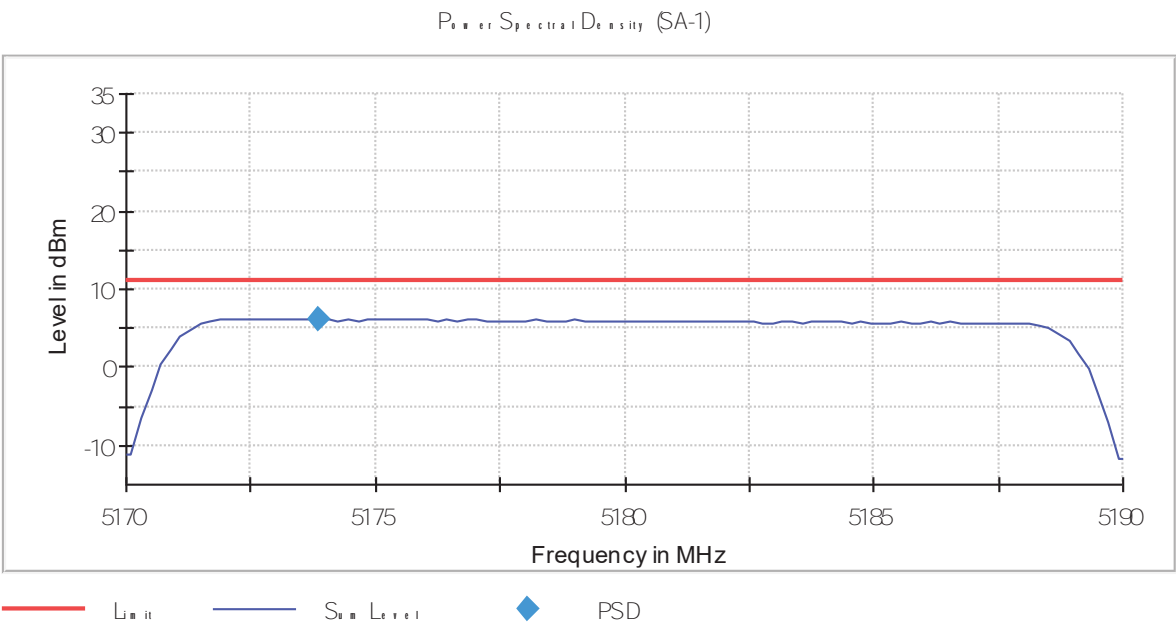


- High Channel 48:

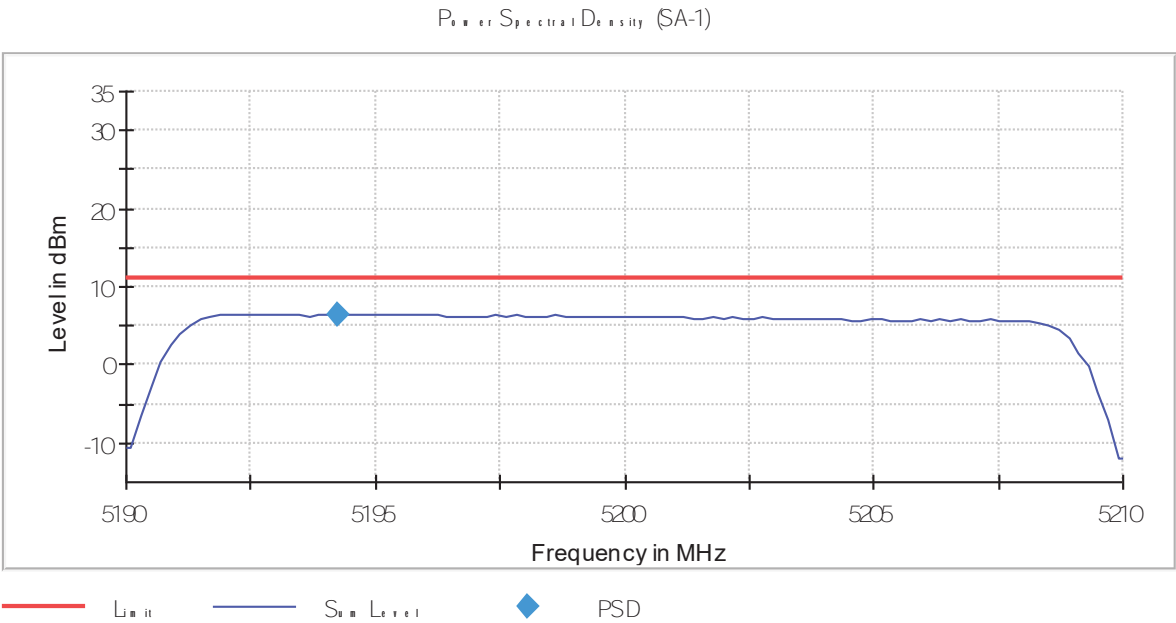


64QAM- 20MHz:

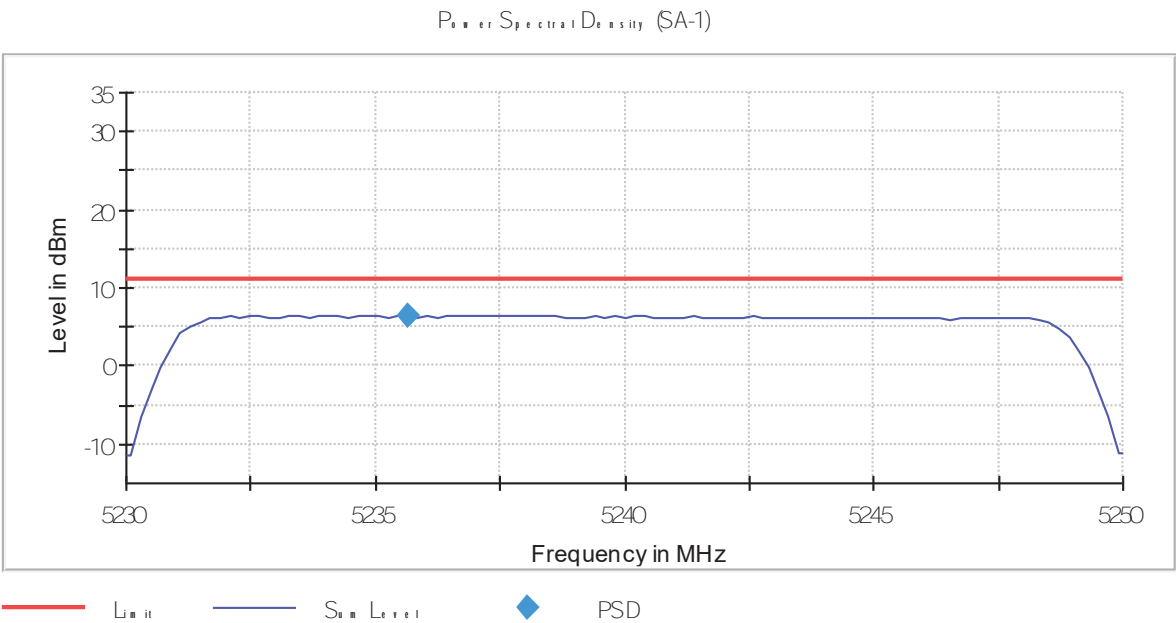
- Low Channel 36:



- Middle Channel 40:



- High Channel 48:



FCC Section 15.407(b)(1)(6) /RSS-247 6.2.1.2. Transmitter Out of Band Radiated Emissions

SPECIFICATION

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dBμV/m at 3 m distance).

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 corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-40 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

A preliminary scan determined the antenna port 2 and the 64QAM modulation as the worst case. The following tables and plots show the results for the worst case modulation.

SISO Antenna Port 2

Frequency range 30 MHz-1000 MHz.

Note: The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
30.7760	Vertical	Quasi-Peak	22.57	40	17.43	± 4.99
39.9425	Vertical	Quasi-Peak	25.27	40	14.73	± 4.99
45.9080	Vertical	Quasi-Peak	31.86	40	8.14	± 4.99
60.4580	Vertical	Quasi-Peak	28.92	40	11.00	± 4.99
68.7515	Vertical	Quasi-Peak	31.25	40	8.75	± 4.99
875.0640	Vertical	Quasi-Peak	38.40	46.00	7.60	± 4.99

Frequency range 1 GHz-40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz frequency range.

Mode 64QAM:

Channel 36

- Radiated spurious signals were detected at less than 20 dB respect to the limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
1849.6000	Horizontal	Peak	49.02	68.23	19.21	± 4.98
2178.8000	Horizontal	Peak	50.00	68.23	18.23	± 4.98
2586.0000	Horizontal	Peak	52.06	68.23	16.17	± 4.98

Channel 40

- Radiated spurious signals were detected at less than 20 dB respect to the limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
2085.6000	Horizontal	Peak	49.02	68.23	19.21	± 4.98
2600.8000	Horizontal	Peak	50.80	68.23	17.43	± 4.99

Channel 48

- Radiated spurious signals were detected at less than 20 dB respect to the limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Uncertainty (dB)
2142.2000	Horizontal	Peak	48.28	68.23	19.95	± 4.98
2586.8000	Horizontal	Peak	50.89	68.23	17.34	± 4.98

Measurement Uncertainty (dB): 1GHz to 17GHz $\leq \pm 4.98$

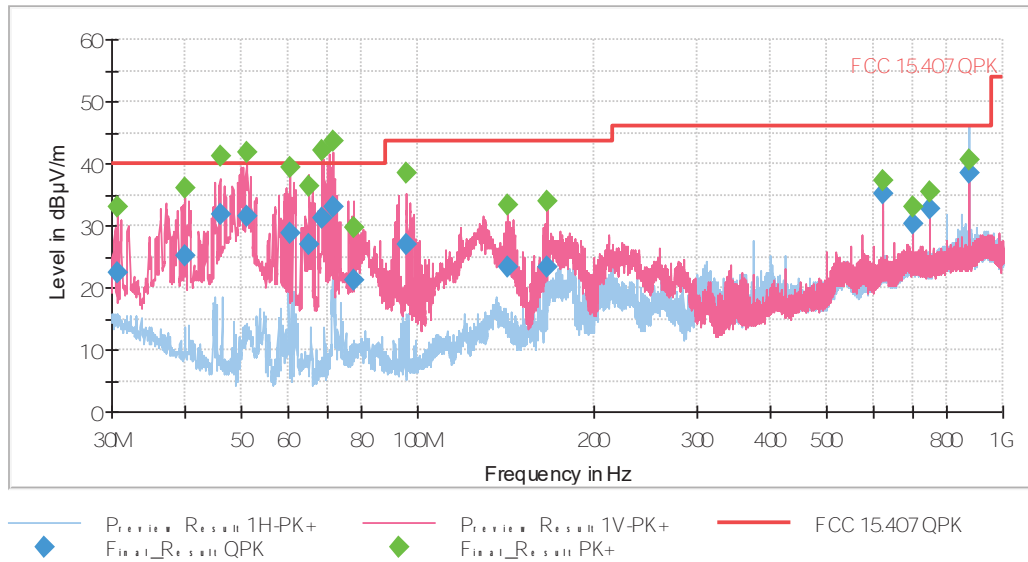
17GHz to 26.5GHz $\leq \pm 5.08$

26.5GHz to 40GHz $\leq \pm 5.33$

Verdict: PASS

SISO Antenna Port 2:

FREQUENCY RANGE 30 MHz-1000 MHz.

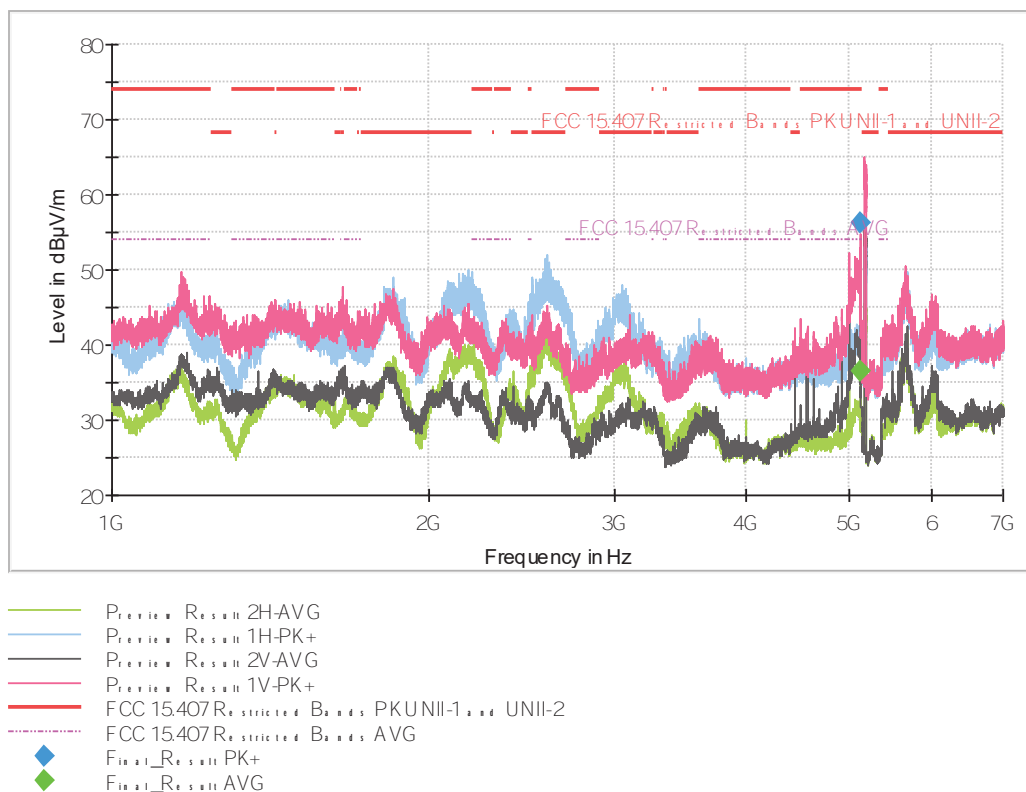


This plot is valid for all channels.

FREQUENCY RANGE 1 GHz to 7 GHz.

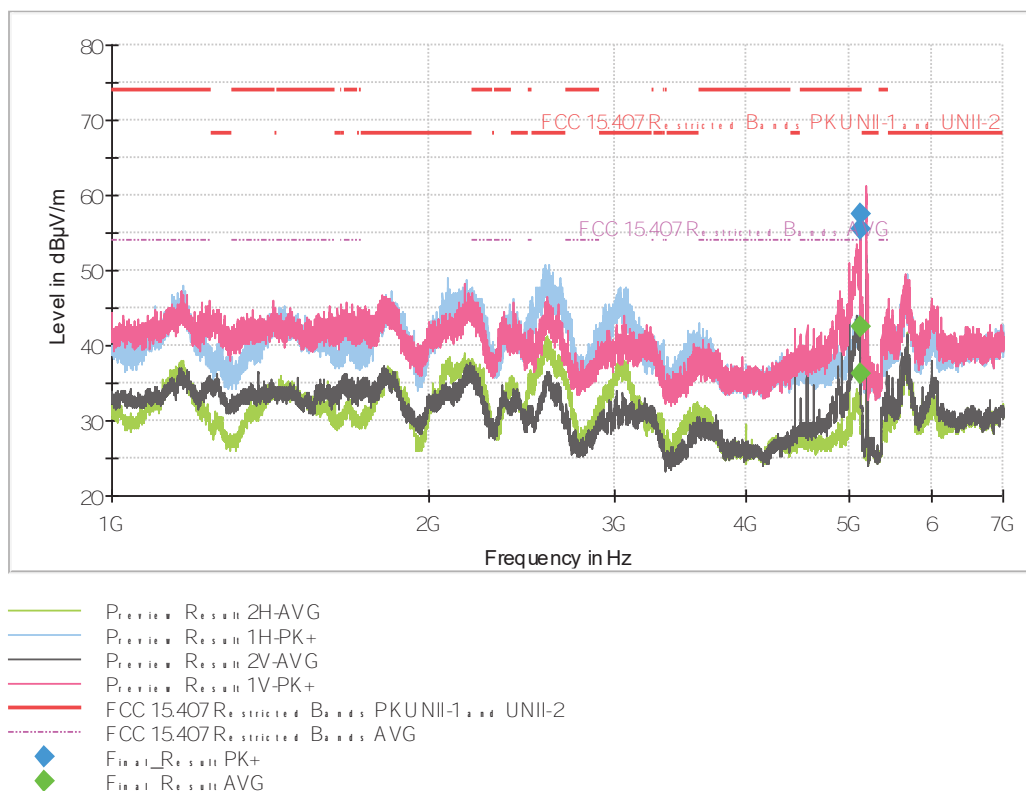
Mode 64QAM:

Channel 36



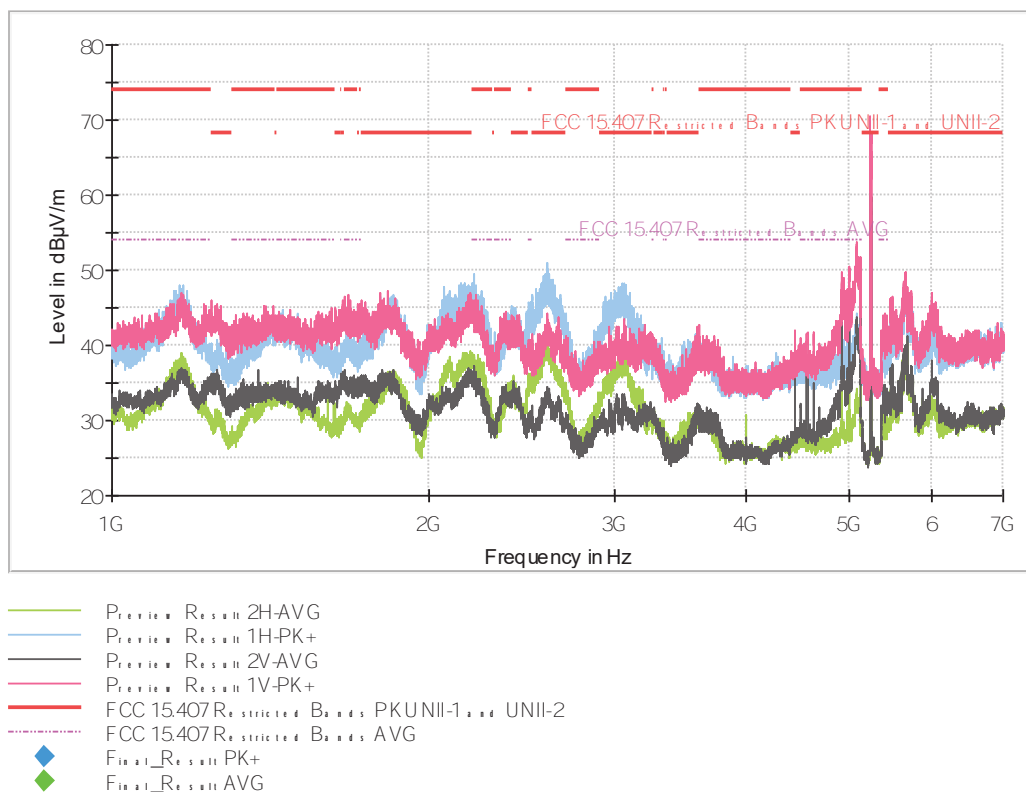
Note: The peak shown in the plot above the limit is the carrier frequency.

Channel 40



Note: The peak shown in the plot above the limit is the carrier frequency

Channel 48

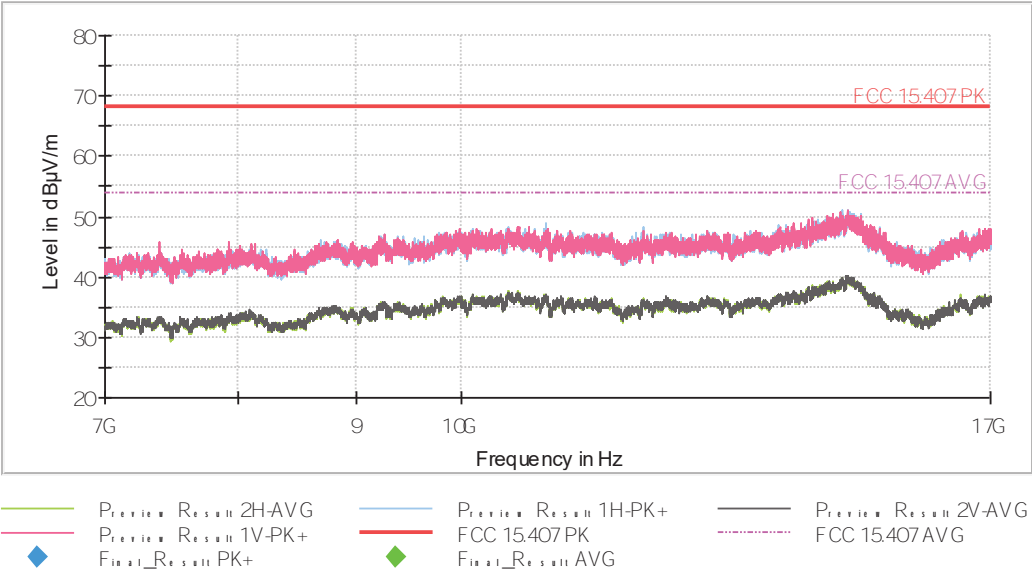


Note: The peak shown in the plot above the limit is the carrier frequency

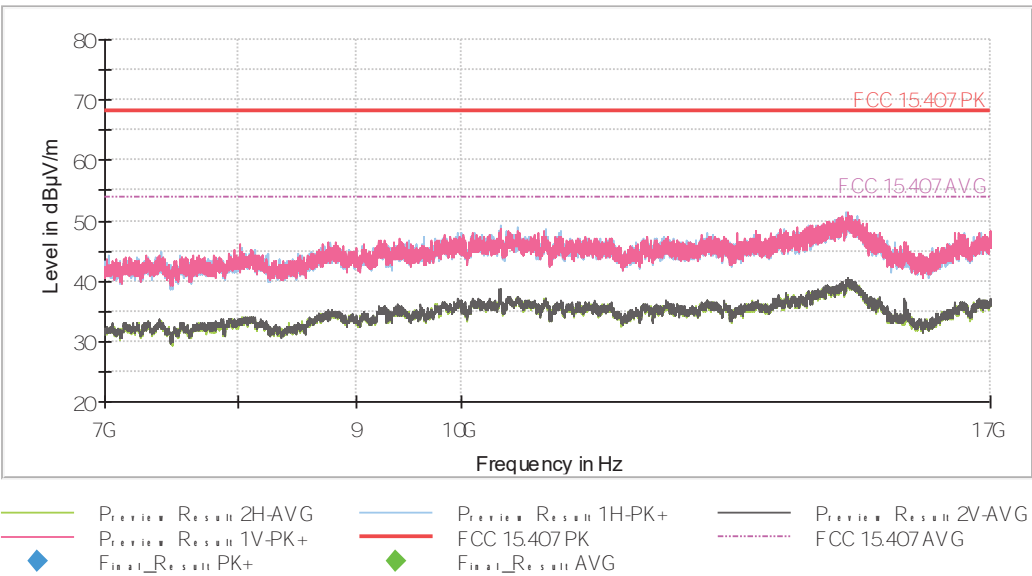
FREQUENCY RANGE 7 GHz to 17 GHz.

Mode 64QAM:

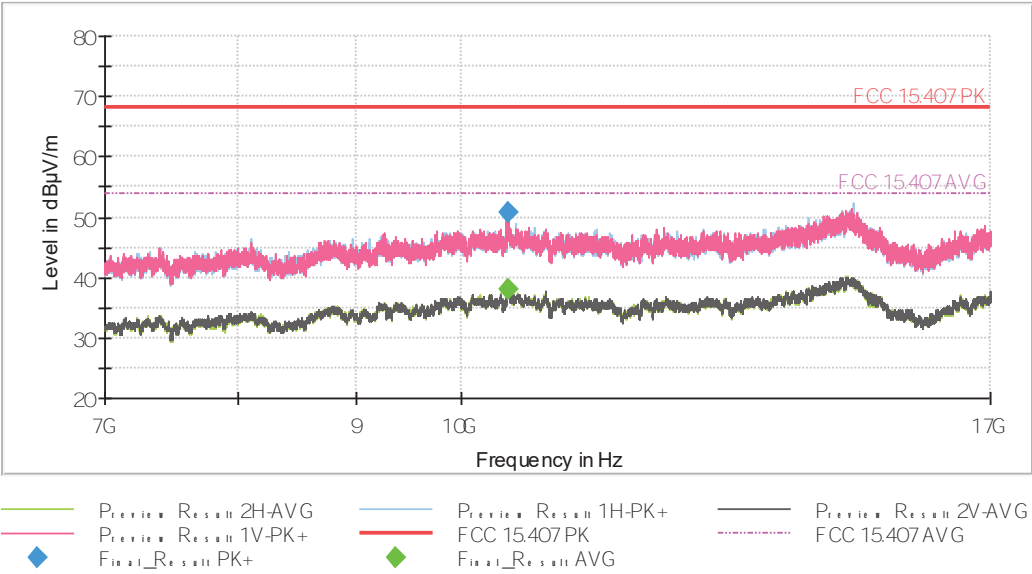
Channel 36



Channel 40



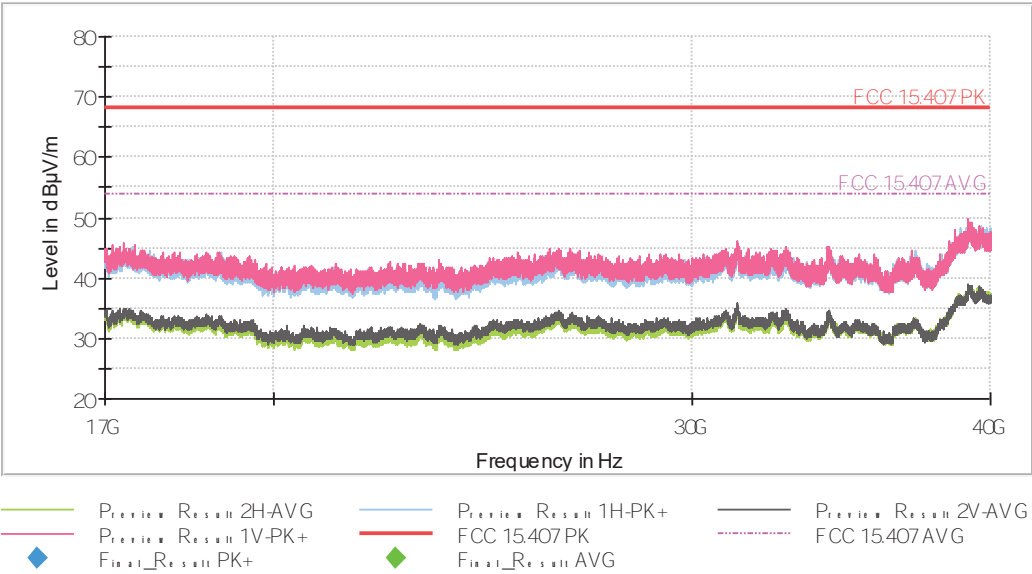
Channel 48



FREQUENCY RANGE 17 GHz to 40 GHz.

Mode 64QAM:

This plot is valid for all channels.



FCC Section 15.407 Subclause (b) (1) / RSS-247 6.2.1.2. Transmitter Band Edge Radiated Emissions.

SPECIFICATION

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.20 dBμV/m at 3 m distance).

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 corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

All emissions outside of the 5.15-5.35GHz band shall not exceed an EIRP of -27dBm/MHz. There are restricted bands of operation below band edge at 4.5-5.15 GHz also above the upper band edge at 5.35-5.46GHz therefore the provision of FCC Part 15.205 apply.

Field strength measurements using peak and average detector were performed in the restricted bands below 5.15GHz and above 5.35 GHz.

A preliminary scan determined the antenna port 2 as the worst case.

Test performed on the following worst cases modes in all relevant tests channels:

SISO Antenna Port 2:
Results for Mode: QPSK - 20 MHz

Results: Peak / Channel 36

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5147.5000	Vertical	65.92	74	8.08	<± 3.98	PASS

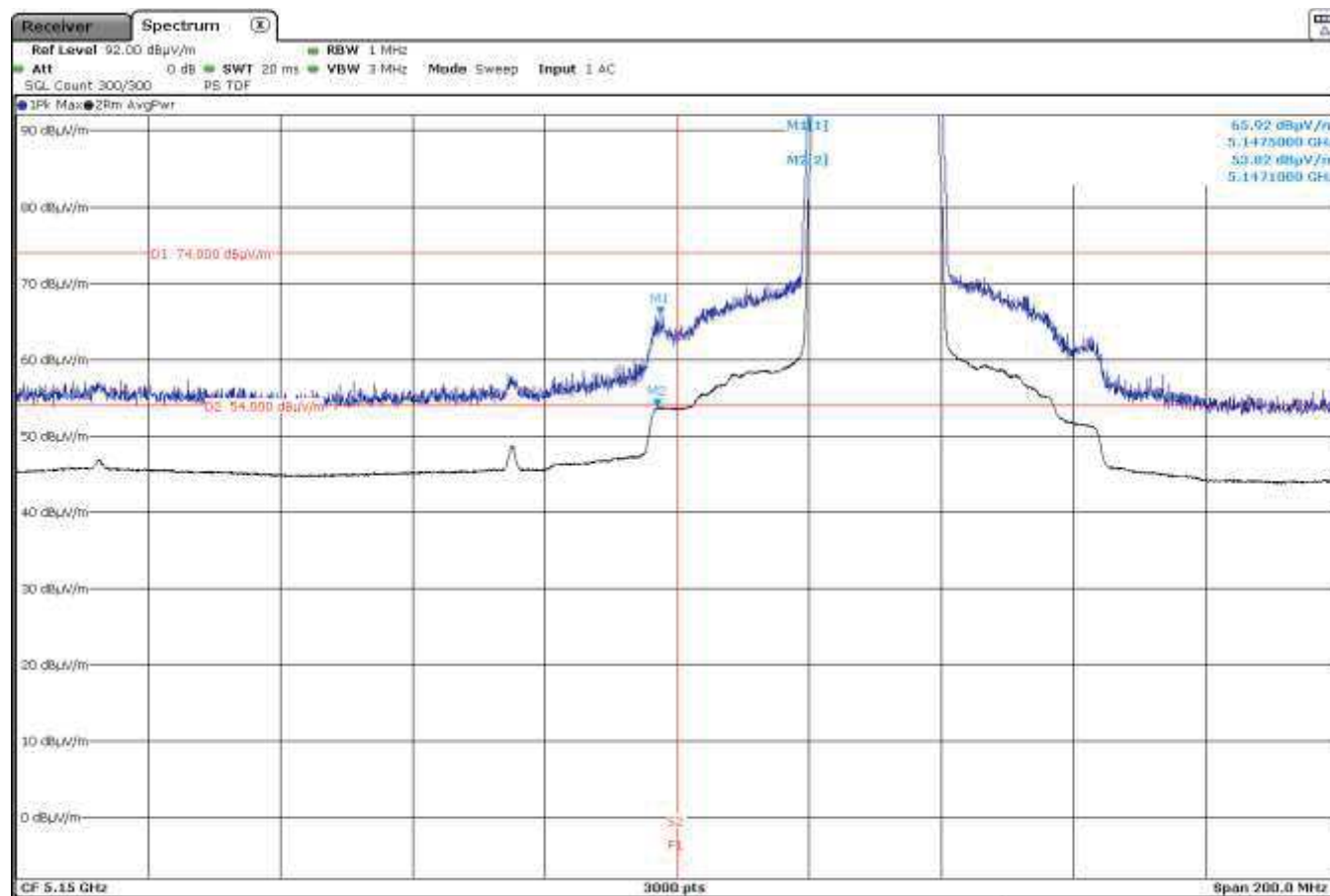
Results: Average / Channel 36

Frequency (MHz)	Antenna Polarity	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5147.1000	Vertical	53.82	54	0.18	<± 3.98	PASS

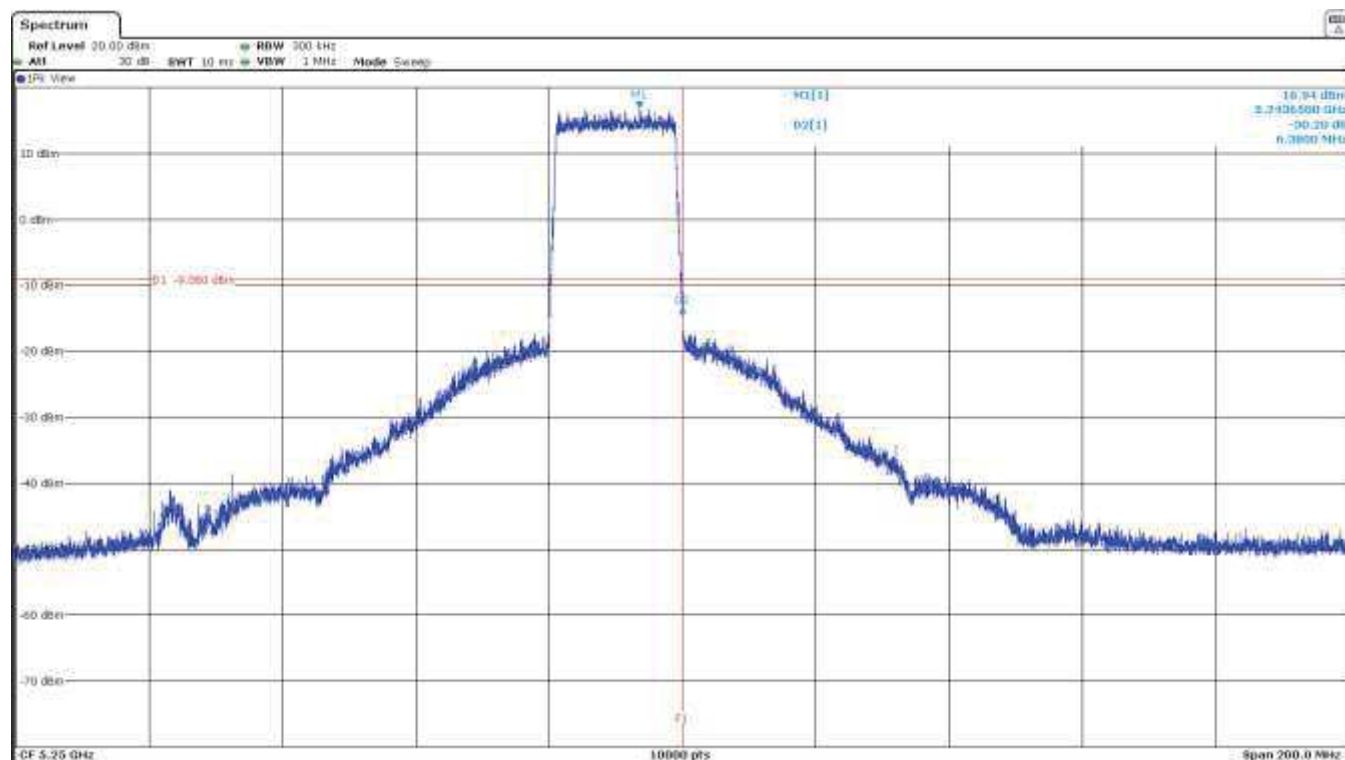
Results: Peak / Channel 48 RSS Band Edge

Frequency (MHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5250.03	-30.20	-26dBc	4.20	<± 3.98	PASS

4500 MHz to 5150 MHz Lower Band Edge Channel 36



5250 MHz to 5350 MHz RSS Band Edge Channel 48



Results: 16QAM - 20 MHz

Results: Peak / Channel 36

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5146.8670	Vertical	65.79	74	8.21	<± 3.98	PASS

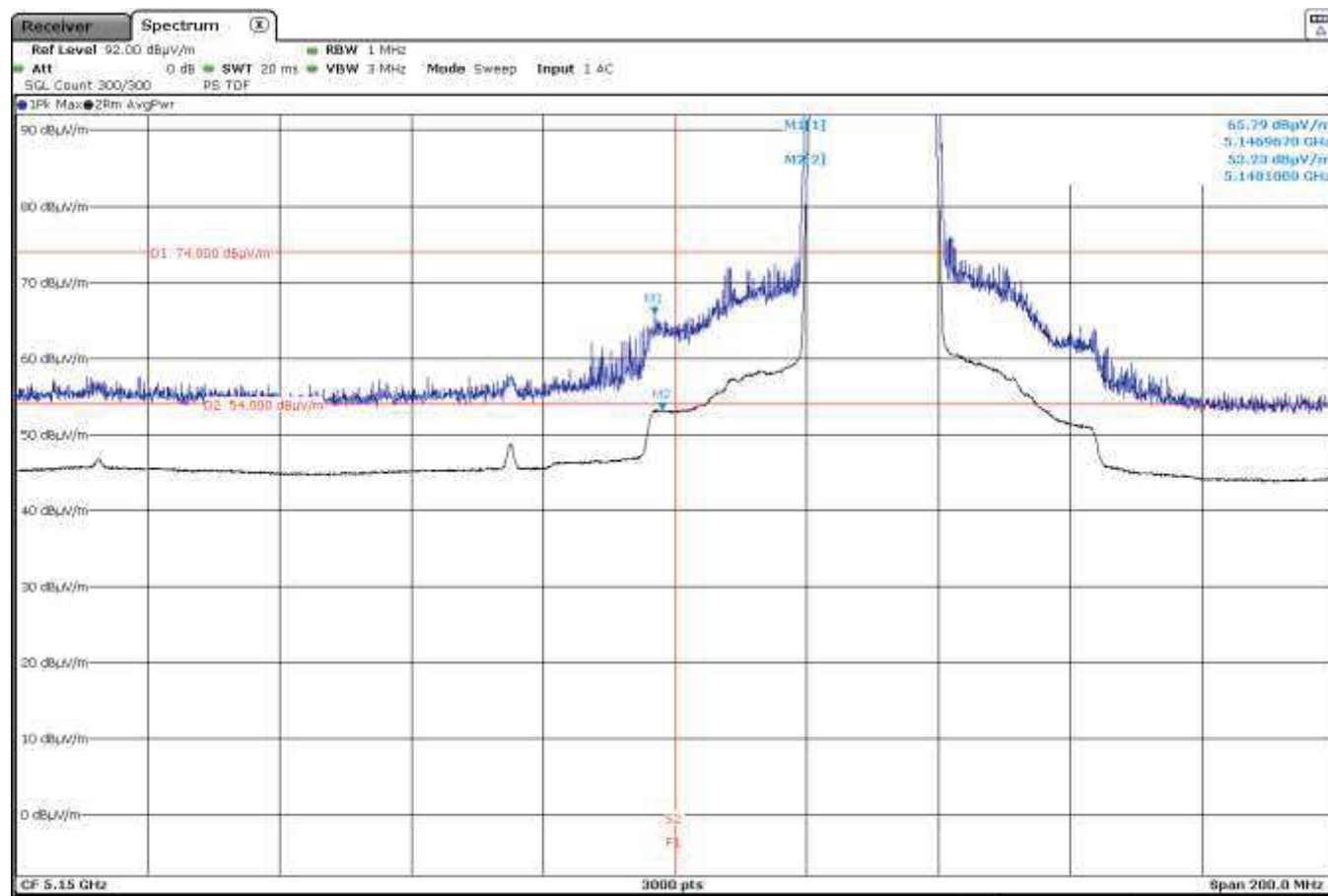
Results: Average / Channel 36

Frequency (MHz)	Antenna Polarity	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5148.1000	Vertical	53.23	54	0.77	<± 3.98	PASS

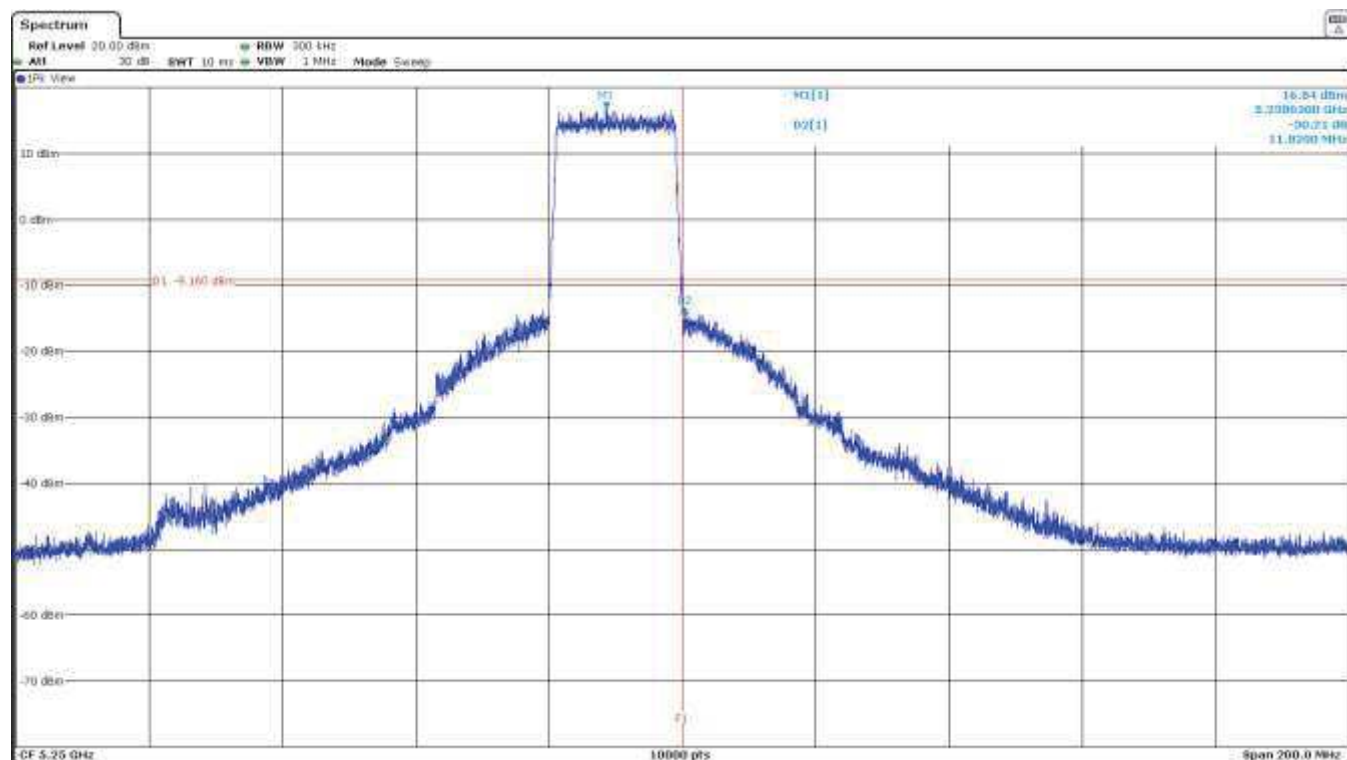
Results: Peak / Channel 48 RSS Band Edge

Frequency (MHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5250.45	-30.21	-26dBc	4.21	<± 3.98	PASS

4500 MHz to 5150 MHz Lower Band Edge Channel 36



5250 MHz to 5350 MHz RSS Band Edge Channel 48



Results: 64QAM - 20 MHz

Results: Peak / Channel 36

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5147.5670	Vertical	67.26	74	6.74	<± 3.98	PASS

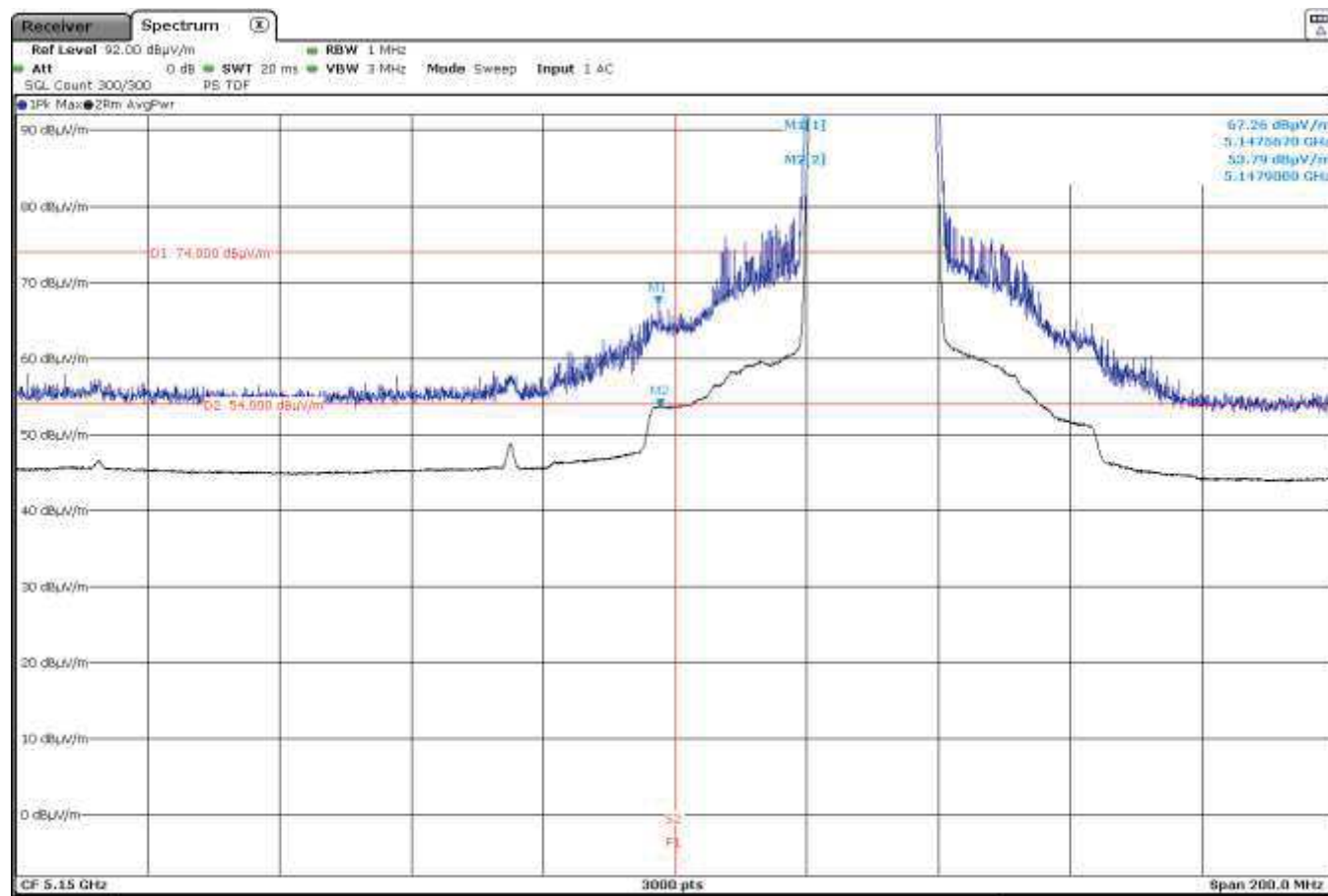
Results: Average / Channel 36

Frequency (MHz)	Antenna Polarity	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5147.9000	Vertical	53.79	54	0.21	<± 3.98	PASS

Results: Peak / Channel 48 RSS Band Edge

Frequency (MHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5250.83	-28.38	-26dBc	2.38	<± 3.98	PASS

4500 MHz to 5150 MHz Lower Band Edge Channel 36



5250 MHz to 5350 MHz RSS Band Edge Channel 48

