FCC LISTED, REGISTRATION NUMBER: 720267 **IC LISTED REGISTRATION NUMBER** **IC 4621A-1**	**AT4 wireless, S.A.** Parque Tecnológico de Andalucía, c/ Severo Ochoa nº 2 29590 Campanillas/ Málaga/ España Tel. 952 61 91 00 - Fax 952 61 91 13 MÁLAGA, C.I.F. A29 507 456 Registro Mercantil de Málaga,Tomo 1169, Libro 82, Folio 133, Hoja MA3729

TEST REPORT

REFERENCE STANDARD:

USA FCC Part 15.407 (U-NII), 15.209

CANADA RSS-210, RSS-Gen

Unlicensed National Information Infrastructure Devices. General technical requirements.

Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.

General Requirements and Information for the Certification of Radio Apparatus.

NIE ..... :	41273RRF.003
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab. Manager
Elaboration date ..... :	2014-03-13

Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2014.03.13 14:35:42 +01'00'

.....

Identification of item tested ..... :	7265NGW
Trademark ..... :	INTEL
Model and/or type reference ..... :	7265NGW (includes family sub-models 7265NGW AN, 7265NGW NB and 7265NGW BN)
Serial number ..... :	TA#: G97996-007 WF MAC:001500E67260 BD MAC: 001500E67264
Other identification of the product ..... :	Commercial name: 7265NGW HW Version: QS SW Version: Test SW: DRTU_1_7_3_859 Op SW: V17.0.0 For OEM factory installation: FCC ID: PD97265NG IC: 1000M-7265NG For user installation: FCC ID: PD97265NGU IC: 1000M-7265NG
Features ..... :	802.11 a/b/g/n/ac Wireless LAN+ BT 4.0
Description ..... :	2x2 PCIe M.2 adapter card

Applicant ..... :	INTEL MOBILE COMMUNICATIONS
Address..... :	100 Center Point Circle, Suite 200, Columbia, South Carolina 29210 USA
CIF/NIF/Passport..... :	No provided data
Contact person:	Steven Hackett

Telephone / Fax ..... :	Tel: 803-216-2344/ FAX: 803-216-2176
e-mail: ..... :	steven.c.hackett@intel.com
Test samples supplier ..... :	Same as applicant
Manufacturer ..... :	Same as applicant

Test method requested .....:	See Standard
Standard .....:	USA FCC Part 15.407 (10–1–12 Edition). Unlicensed National Information Infrastructure Devices. General technical requirements. USA FCC Part 15.209 (10-1-12 Edition): Radiated emission limits; general requirements. Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D01 General UNII Test Procedures v01r03 dated 04/08/2013. Guidance for IEEE 802.11ac and Pre-ac Device Emission Testing 644545 D01 Guidance for IEEE 802.11ac v01r02 dated 10/31/2013. Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013. ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices. CANADA RSS-210 Issue 8 (December 2010). Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment. CANADA RSS-Gen Issue 3 (December 2010). General Requirements and Information for the Certification of Radio Apparatus.
Test procedure .....:	PERF034
Non-standardized test method .....:	N/A
Used instrumentation .....:	Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum Analyzer Agilent E4440A	2012/04	2014/04
2.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
3.	Universal Power Meter R&S NRP-Z11	2012/12	2014/12
4.	Signal Analyzer R&S FSQ8	2012/04	2014/04

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	Hybrid Bilog antenna Sunol Sciences Corporation JB6	2011/05	2014/05
4.	Antenna mast EM 1072 NMT	N.A.	N.A.
5.	Rotating table EM 1084-4. ON	N.A.	N.A.
6.	Double-ridge Guide Horn antenna 1-18 GHz HP 11966E	2011/05	2014/05
7.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J	2011/09	2014/09
8.	EMI Test Receiver R&S ESPI3	2013/12	2015/12
9.	RF pre-amplifier Miteq JS4-12002600-30-5A.	2012/07	2014/07
10.	Multi Device Controller EMCO 2090	N.A.	N.A.
11.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
12.	RF pre-amplifier Miteq AFS5-04001300-15-10P-6.	2012/07	2014/07
13.	RF pre-amplifier Schaffner CPA 9231.	2013/06	2015/06
14.	RF pre-amplifier Schwarzbeck BBV 9718	2014/02	2015/02
14.	RF pre-amplifier Schwarzbeck BBV 9718	2014/02	2015/02

Report template No. .....: FDT08_14

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Competences and guarantees

AT4 wireless, S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless, S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance programme for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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.

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 AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal documents:

PODT000: : Procedimiento para el cálculo de incertidumbres de medida

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
41273/001	2x2 PCIe M.2 adapter card	7265NGW	TA#: G97996-007 WF MAC:001500E67260 BD MAC: 001500E67264	16/01/2014

Auxiliary elements used with the sample S/01:

Control Nº	Description	Manufacture	Model	Serial Nº	Date of reception
38067/28	Laptop PC	DELL	Latitude E5420	CTFQQL1	08/01/2013
38067/29	Cable of the AC/DC Adapter	DELL	---	---	08/01/2013
38067/30	AC/DC Adapter	DELL	LA90PM111	---	08/01/2013
40104B/16	Reference Antenna	SkyCross	WIMAX/WLAN	---	26/09/2013
40104B/17	Reference Antenna	SkyCross	WIMAX/WLAN	---	26/09/2013
38067/36	M2/NGFF extender cable	---	---	---	08/01/2013
38067/37	HMC/NGFF Testing board	INTEL	PCB00390	3902412-252	11/01/2013
38067/38	Adapter of the AC/DC Board Testing	SINPRO	SPU60-102	07990464 1249	11/01/2013
1302	Board 35mmx35mm	---	---	---	---

Usage of samples

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
41273/001	2x2 PCIe M.2 adapter card	7265NGW	TA#: G97996-007 WF MAC:001500E67260 BD MAC: 001500E67264	16/01/2014

Auxiliary elements used with the sample S/02:

Control Nº	Description	Manufacture	Model	Serial Nº	Date of reception
38067/28	Laptop PC	DELL	Latitude E5420	CTFQQL1	08/01/2013
38067/29	Cable of the AC/DC Adapter	DELL	---	---	08/01/2013
38067/30	AC/DC Adapter	DELL	LA90PM111	---	08/01/2013
38067/36	M2/NGFF extender cable	---	---	---	08/01/2013
38067/37	HMC/NGFF Testing board	INTEL	PCB00390	3902412-252	11/01/2013
38067/38	Adapter of the AC/DC Board Testing	SINPRO	SPU60-102	07990464 1249	11/01/2013
1302	Board 35mmx35mm	---	---	---	---

1. Sample S/01 has undergone following test(s).
   All radiated tests indicated in appendix A, B and C.

2. Sample S/02 has undergone following test(s).
   All conducted tests indicated in appendix A, B and C.

Testing period

The performed test started on 2014-02-01 and finished on 2014-03-11.

The tests have been performed at AT4 wireless.

Environmental conditions

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

Temperature	Min. = 18.4 ºC Max. = 22.3 ºC
Relative humidity	Min. =48.4 % Max. = 51.9 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. =17.8 ºC Max. = 20.4 ºC
Relative humidity	Min. = 42.4 % Max. = 49.4 %
Air pressure	Min. = 1017 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

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

Temperature	Min. = 21.7 ºC Max. = 24.4 ºC
Relative humidity	Min. = 39.7 % Max. = 44.4 %
Air pressure	Min. = 1017 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Summary

Considering the results of the performed test according to standard USA FCC Parts 15.407, and 15.209 / RSS-210, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

1: The calculated E.I.R.P. is less than 500 mW (27 dBm) and therefore a TPC mechanism is not required.

2: The compliance is checked through a description of how this requirement is met that is provided by the applicant.

3: Refer to separate test report 41273RRF.004.

Testing verdicts

Not applicable	:	NA
Pass	:	P
Fail	:	F
Not measured	:	NM

I. 5.15 GHz -5.25 GHz Band.

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
15.407 (a) (1) / RSS-210 A9.2. (1)	Power limits. Maximum output power		P		
15.407 (a) (1) / RSS-210 A9.2. (1)	Peak power spectral density		P		
15.407 (b) (1), (7) / RSS-210 A9.2. (1).	Radiated Band-edge emissions compliance (Transmitter).		P		
15.407 (b) (1), (6), (7) / RSS-210 A9.2. (1).	Undesirable radiated emissions (Transmitter)		P		
15.407 (g)	Frequency stability				NM[2]

2: See remarks and comments.

II. 5.25 GHz -5.35 GHz Band.

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
15.407 (a) (2) / RSS-210 A9.2. (2)	Power limits. Maximum output power		P		
15.407 (a) (2) / RSS-210 A9.2. (2)	Peak power spectral density		P		
15.407 (b) (2), (7) / RSS-210 A9.2. (2).	Radiated Band-edge emissions compliance (Transmitter).		P		
15.407 (b) (2), (6), (7) / RSS-210 A9.2. (2).	Undesirable radiated emissions (Transmitter)		P		
15.407 (g)	Frequency stability				NM[2]
15.407 (h) (1) / RSS-210 A9.2. (2).	Transmit Power Control (TPC)	NA[1]			
15.407 (h) (2) / RSS-210 A9.2. (2).	Dynamic Frequency Selection (DFS)		P[3]		

1, 2, 3: See remarks and comments.

III. 5.47 GHz -5.725 GHz Band.

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
15.407 (a) (2) / RSS-210 A9.2. (3)	Power limits. Maximum output power		P		
15.407 (a) (2) / RSS-210 A9.2. (3)	Peak power spectral density		P		
15.407 (b) (3), (7) / RSS-210 A9.2. (3).	Radiated Band-edge emissions compliance (Transmitter).		P		
15.407 (b) (3), (6), (7) / RSS-210 A9.2. (3).	Undesirable radiated emissions (Transmitter)		P		
15.407 (g)	Frequency stability				NM[2]
15.407 (h) (1) / RSS-210 A9.2. (3).	Transmit Power Control (TPC)	NA[1]			
15.407 (h) (2) / RSS-210 A9.2. (3).	Dynamic Frequency Selection (DFS)		P[3]		

1, 2, 3: See remarks and comments.

IV. Common requirements for all bands.

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
15.407 (a) (6)	Peak excursion ratio of the modulation envelope		P		
15.407 (c) / RSS-210 A9.4. (4).	Transmission in case of absence of information to transmit, or operational failure.				NM[2]

2: See remarks and comments.

APPENDIX A: Test results for 5.15 GHz – 5.25 GHz band

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

Type of power supply = DC voltage from HMC/NGFC test board.

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 3.6 dBi

Operating frequencies in the sub-band 5.15-5.25 GHz.

-For IEEE 802.11a, the equipment uses channels 36, 40, 44, 48.

-For IEEE 802.11n, there are two bandwidths:

For 20 MHz bandwidth the equipment uses channels 36, 40, 44, 48.
For 40 MHz bandwidth the equipment uses channels 38, 46.

-For IEEE 802.11ac, there are three bandwidths:

For 20 MHz bandwidth the equipment uses channels 36, 40, 44, 48.
For 40 MHz bandwidth the equipment uses channels 38, 46.
For 80 MHz bandwidth the equipment uses channel 42.

TEST FREQUENCIES:

For WiFi a/n20/ac20:

Lowest channel (36): 5180 MHz

Middle channel (40): 5200 MHz

Highest channel (48): 5240 MHz

For WiFi n40/ac40:

Lowest channel (38): 5190 MHz

Highest channel (46): 5230 MHz

For WiFi ac80:

Middle channel (42): 5210 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.10: 2009 and FCC KDB 789033 D01 General UNII Test Procedures v01r03 and FCC KBD 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013.

For 802.11a mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually but not simultaneously.

For 802.11n/ac modes 802.11n20/ac20 (20 MHz channel bandwidth), 802.11n40/ac40 (40MHz channel bandwidth) and 802.11ac80 (80MHz channel bandwidth) mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually and simultaneously.

For radio testing purposes the card was installed in a test fixture. The test fixture is connected to a laptop computer and dc power supplied. The laptop computer was used to configure the EUT to continuously transmit at a specified output power with different modes and modulation schemes.

The data rates of 6Mb/s for 802.11a, HT0 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT0 (SISO) for 802.11 ac80 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and spurious levels at the band edges.

The field strength at the band edges was evaluated for each mode and on each chain individually on the lowest and highest channels at the rated power for the channel under test. Where the power at the edge channels was lower than the power at the center channels additional measurements were made at the adjacent channels. Single transmission at each chain and simultaneous transmission at both chains modes were fully evaluated.

The PC was using the Intel test utility DRTU Version "DRTU 1.7.3-859"

During transmitter test the EUT was being controlled by the Intel DRTU tool to operate in a continuous transmit mode on the test channels as required and in each of the different modulation modes.

The conducted RF output power at each chain was adjusted according to the client's supplied Target values (see following table) using the Intel DRTU tool and measuring the power by using a calibrated average power meter. Measured values for adjustment were within -0.2 dB/+0.3 dB respect to the Target values.

RF conducted output power target values

	Mode	BW (MHz)	Channel / Freq (MHz).	SISO Chain A (dBm)	SISO Chain B (dBm)	MIMO at both ports A and B (dBm)
5.15-5.25GHz Band	802.11a	20	36 / 5180	14	14	n/a
			40 / 5200	14.5	14.5	n/a
			48 / 5240	14.5	14.5	n/a
	802.11n	20	36 / 5180	14	14	11.50
			40 / 5200	14.5	14.5	11.50
			48 / 5240	14.5	14.5	11.50
	802.11n*	40	38 / 5190	12	13.5	10.00
			46 / 5230	16.5	16.5	14.50
	802.11ac	80	42 / 5210	13.5	13.5	11.50

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer using low loss RF cables with sma type connectors. The reading in the spectrum analyzer is corrected taking into account the cable loss.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 1m for the frequency range 1 GHz-40 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º.

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

99 % and 26 dB Bandwidth

RESULTS

1. 802.11a mode (see next plots).

CHAIN A

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	17.40	17.36	17.40
26 dB bandwidth (MHz)	25.56	25.88	26.12
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	17.40	17.44	17.44
26 dB bandwidth (MHz)	25.68	25.84	25.68
Measurement uncertainty (kHz)	±7		

2. 802.11 n20 MHz and 802.11 ac20 MHz modes. (see next plots).

CHAIN A

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	18.40	18.40	18.40
26 dB bandwidth (MHz)	26.28	26.28	26.76
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	18.40	18.40	18.40
26 dB bandwidth (MHz)	25.68	26.72	26.88
Measurement uncertainty (kHz)	±7		

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes. (see next plots).

CHAIN A

	Lowest frequency 5190 MHz	Highest frequency 5230 MHz
99% bandwidth (MHz)	36.40	36.60
26 dB bandwidth (MHz)	44.40	45.60
Measurement uncertainty (kHz)	±7	

CHAIN B

	Lowest frequency 5190 MHz	Highest frequency 5230 MHz
99% bandwidth (MHz)	36.40	36.50
26 dB bandwidth (MHz)	44.60	45.20
Measurement uncertainty (kHz)	±7	

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

4. 802.11 ac 80 MHz mode. (see next plots).

CHAIN A

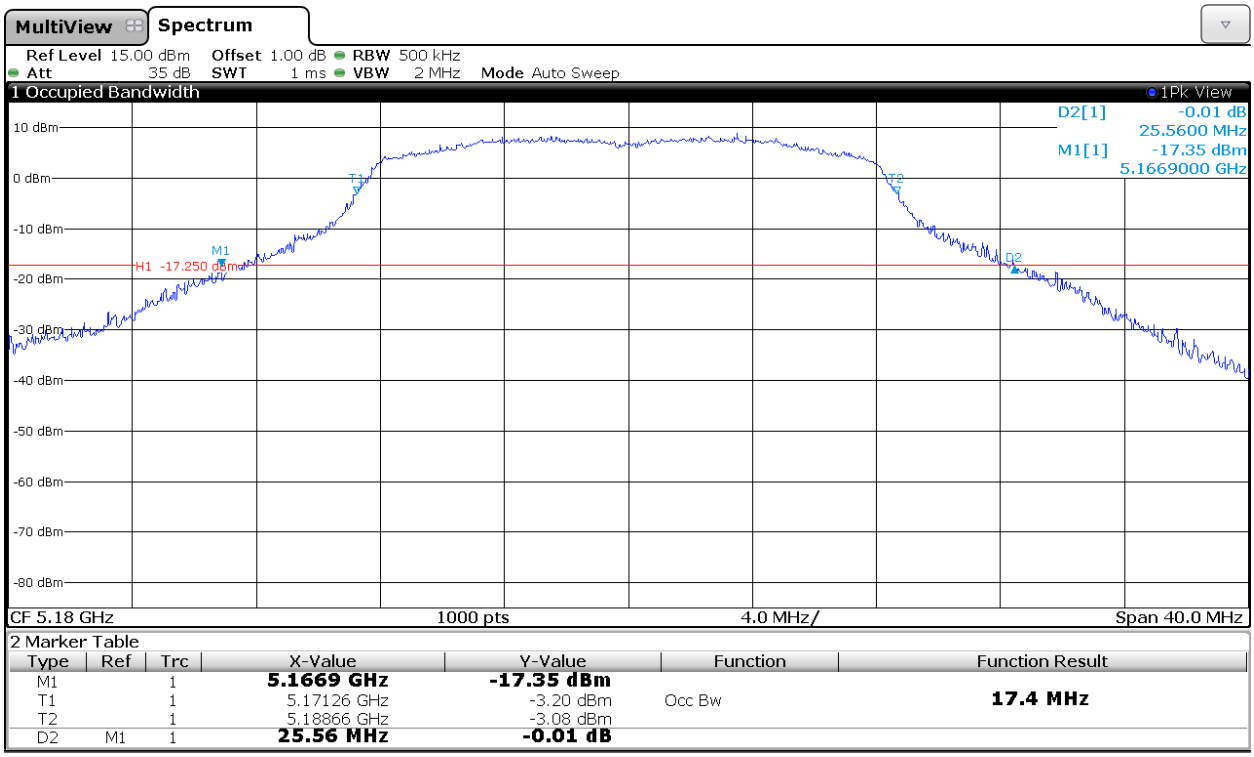
	Frequency 5210 MHz
99% bandwidth (MHz)	75.45
26 dB bandwidth (MHz)	82.50
Measurement uncertainty (kHz)	±7

CHAIN B

	Frequency 5210 MHz
99% bandwidth (MHz)	75.30
26 dB bandwidth (MHz)	82.50
Measurement uncertainty (kHz)	±7

802.11a mode CHAIN A

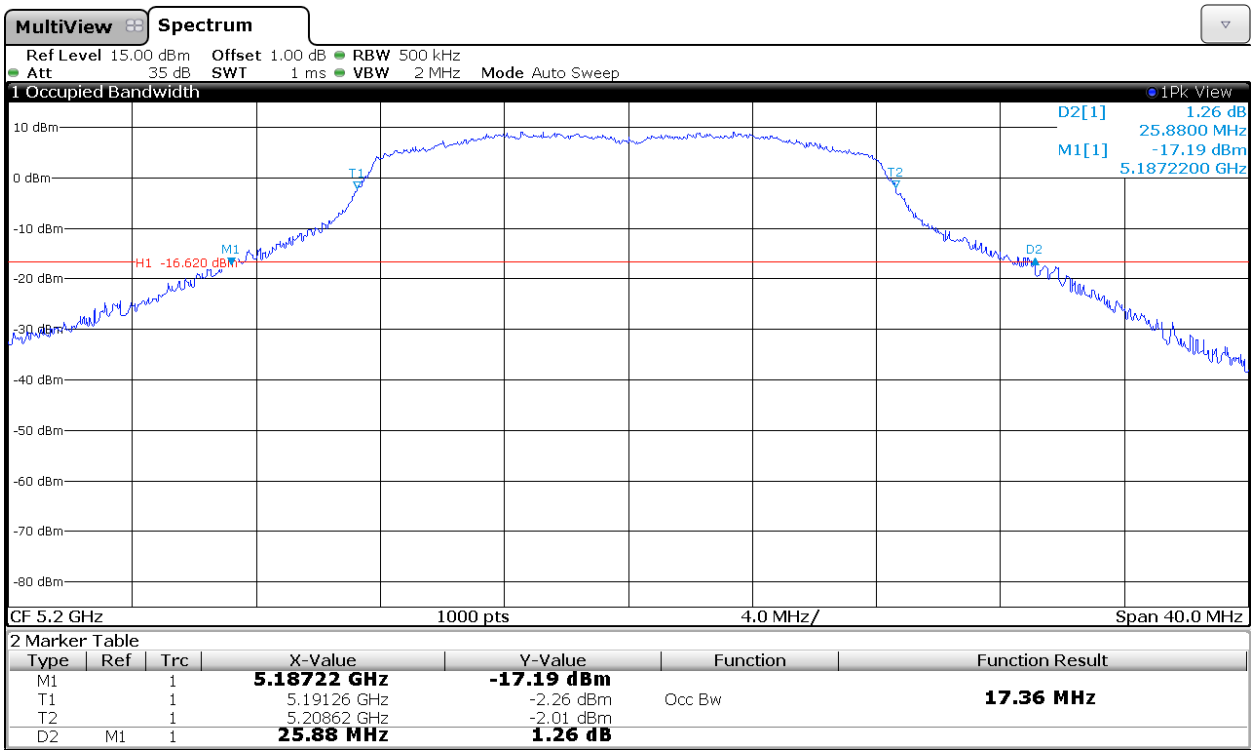
Lowest Channel



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.1669 GHz**	**-17.35 dBm**		
T1		1	5.17126 GHz	-3.20 dBm	Occ Bw	**17.4 MHz**
T2		1	5.18866 GHz	-3.08 dBm		
D2	M1	1	**25.56 MHz**	**-0.01 dB**		

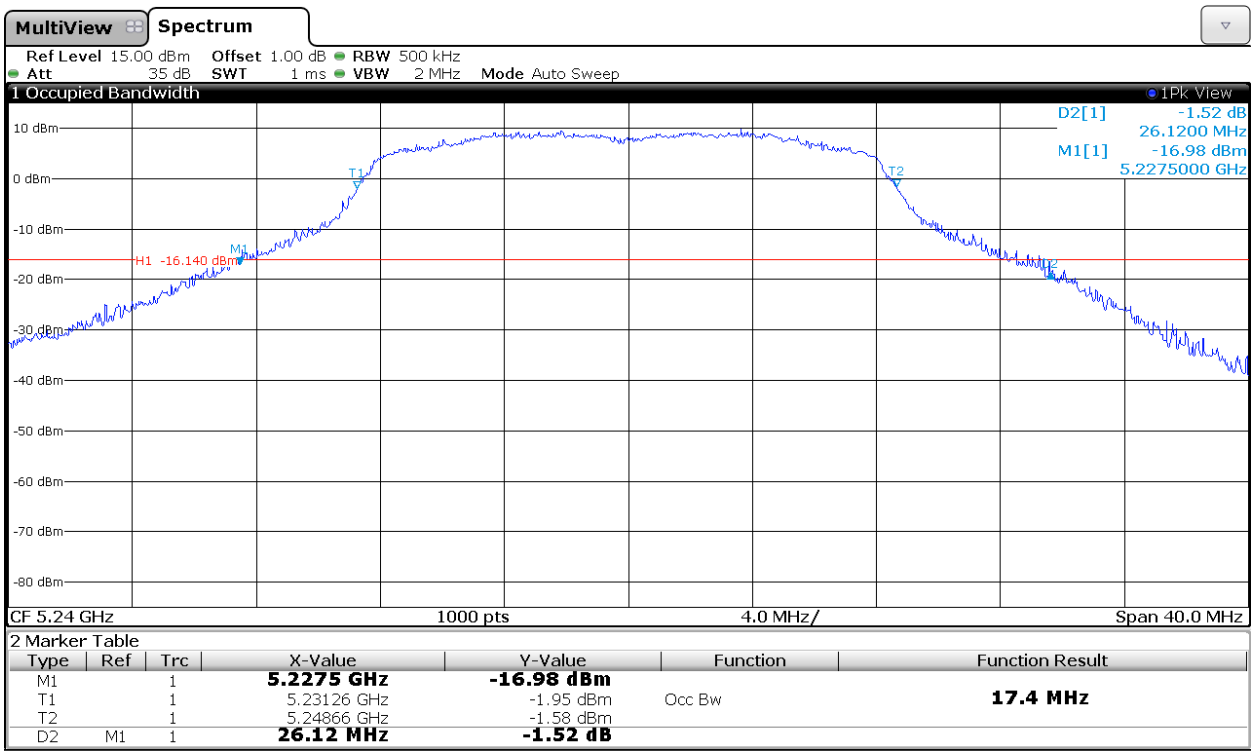
Middle Channel



2 Marker Table

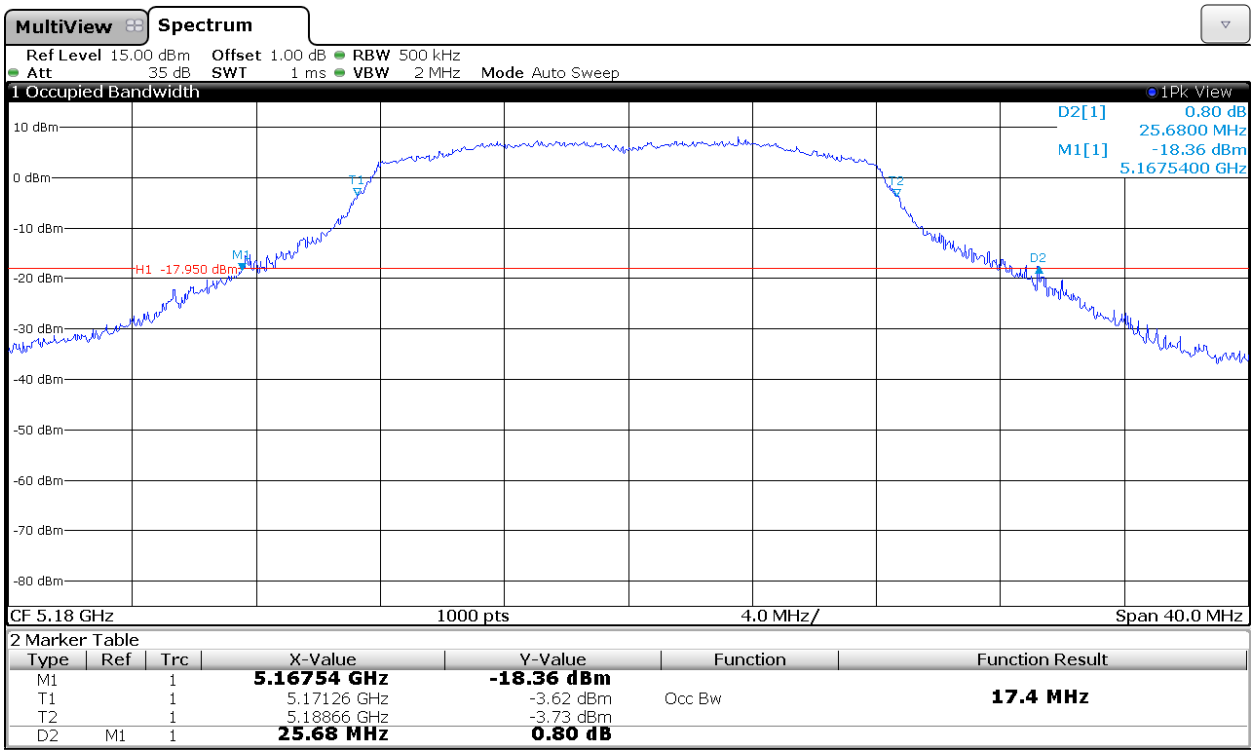
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.18722 GHz**	**-17.19 dBm**		
T1		1	5.19126 GHz	-2.26 dBm	Occ Bw	**17.36 MHz**
T2		1	5.20862 GHz	-2.01 dBm		
D2	M1	1	**25.88 MHz**	**1.26 dB**		

Highest Channel

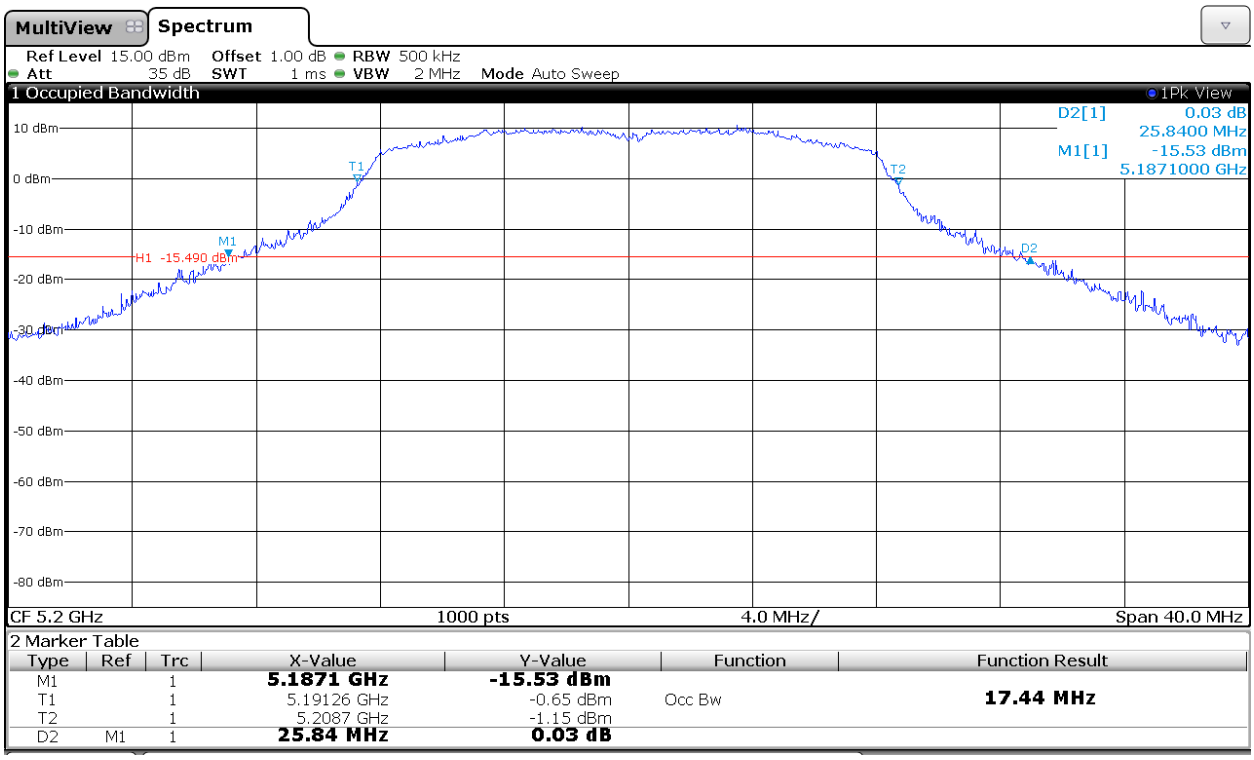


802.11a mode CHAIN B

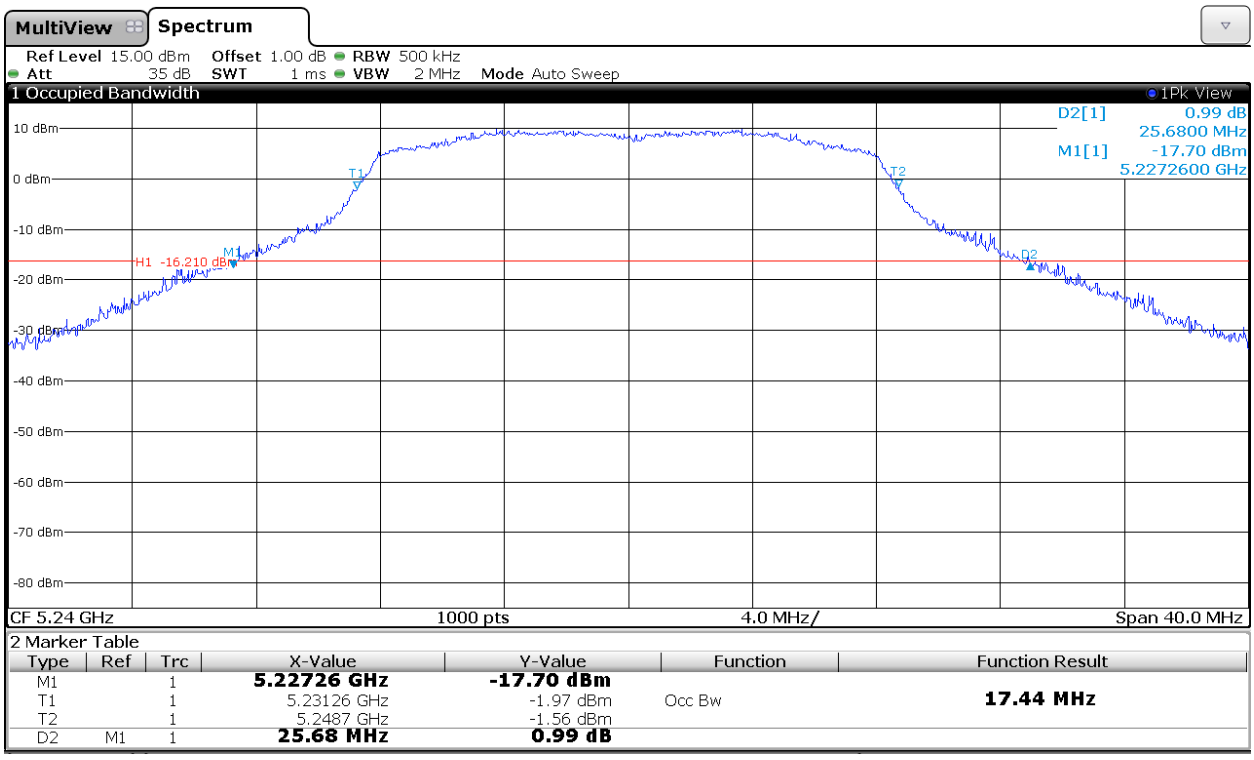
Lowest Channel



Middle Channel

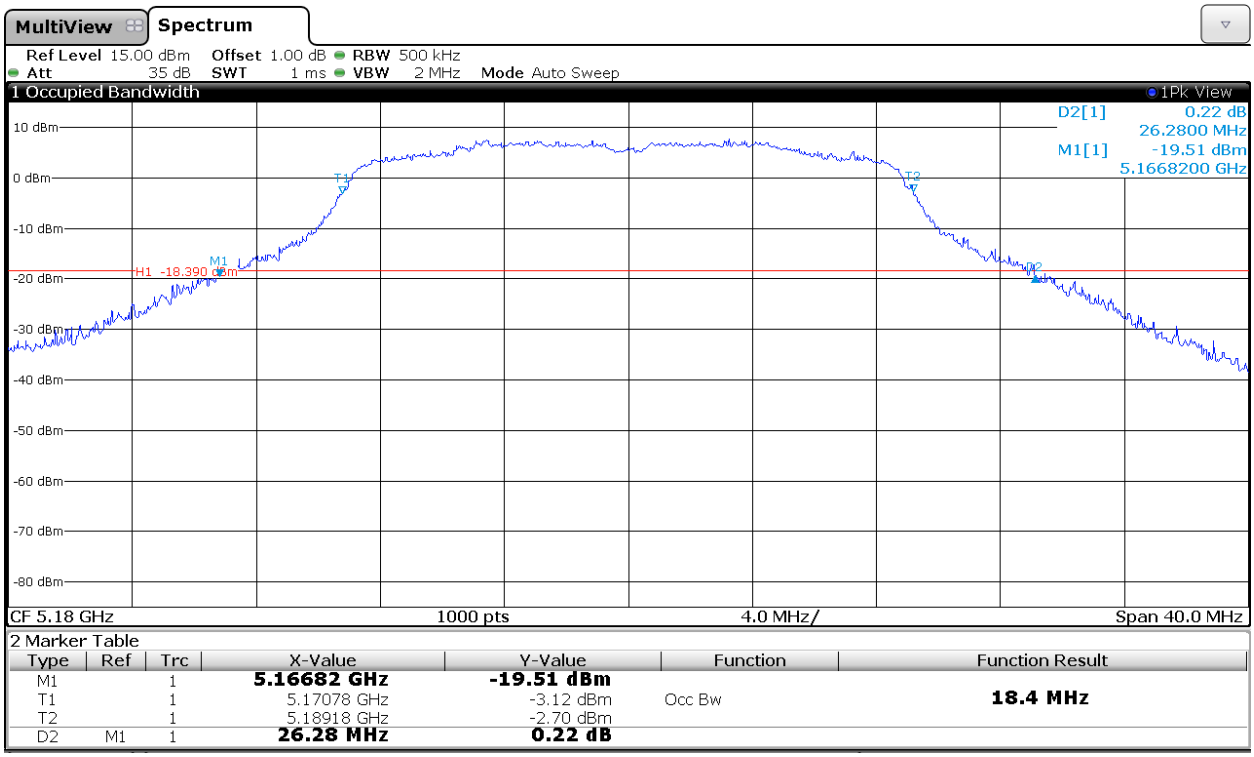


Highest Channel



802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

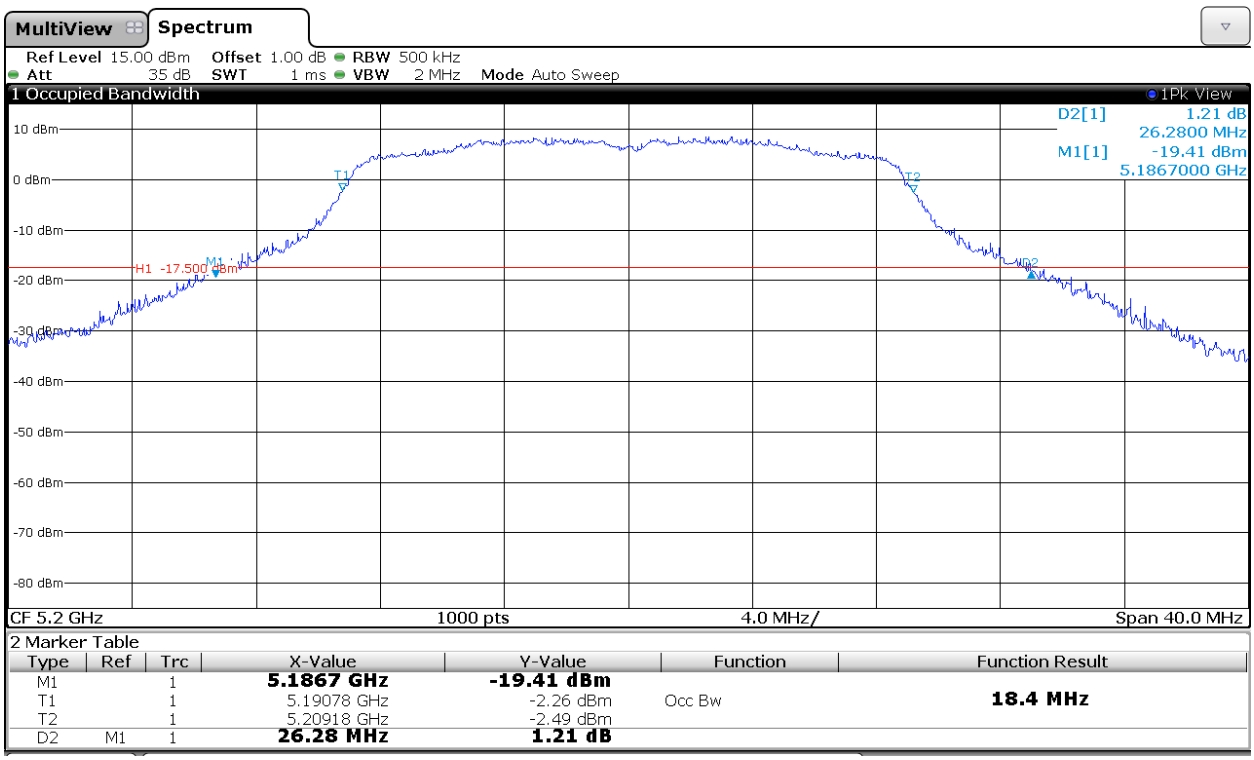
Lowest Channel



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.16682 GHz**	**-19.51 dBm**		
T1		1	5.17078 GHz	-3.12 dBm	Occ Bw	**18.4 MHz**
T2		1	5.18918 GHz	-2.70 dBm		
D2	M1	1	**26.28 MHz**	**0.22 dB**		

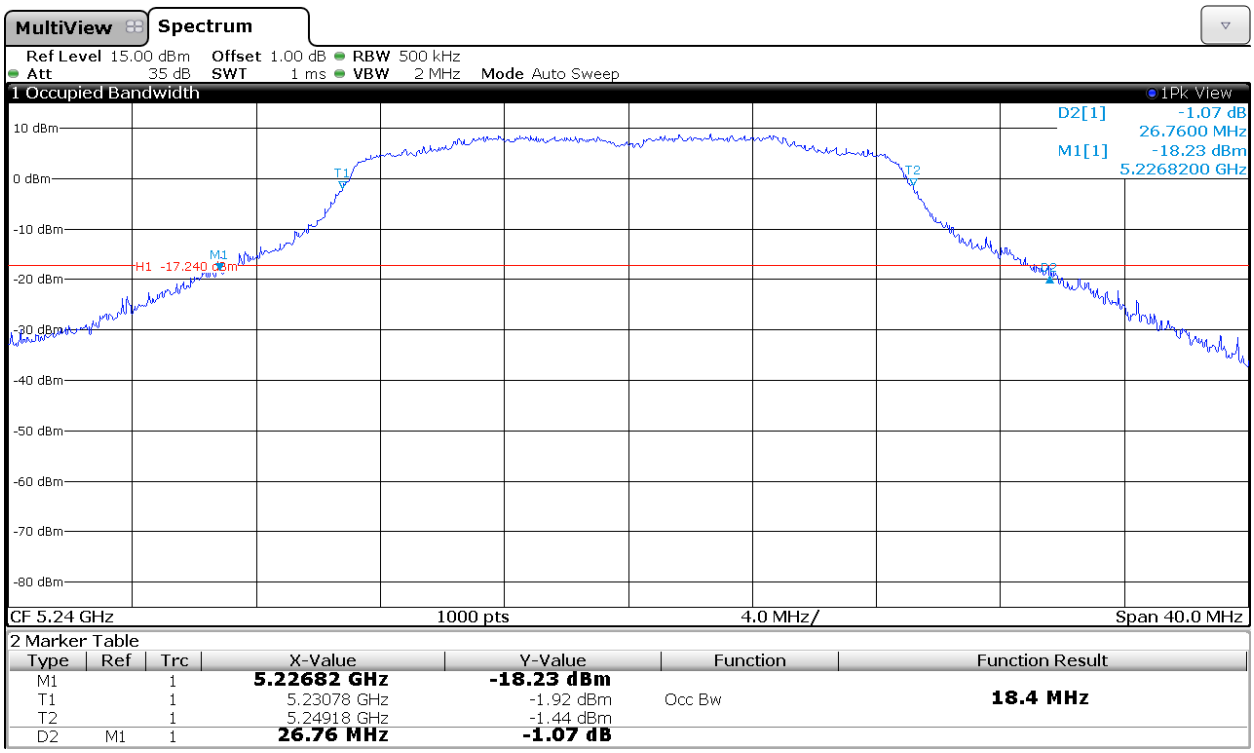
Middle Channel



2 Marker Table

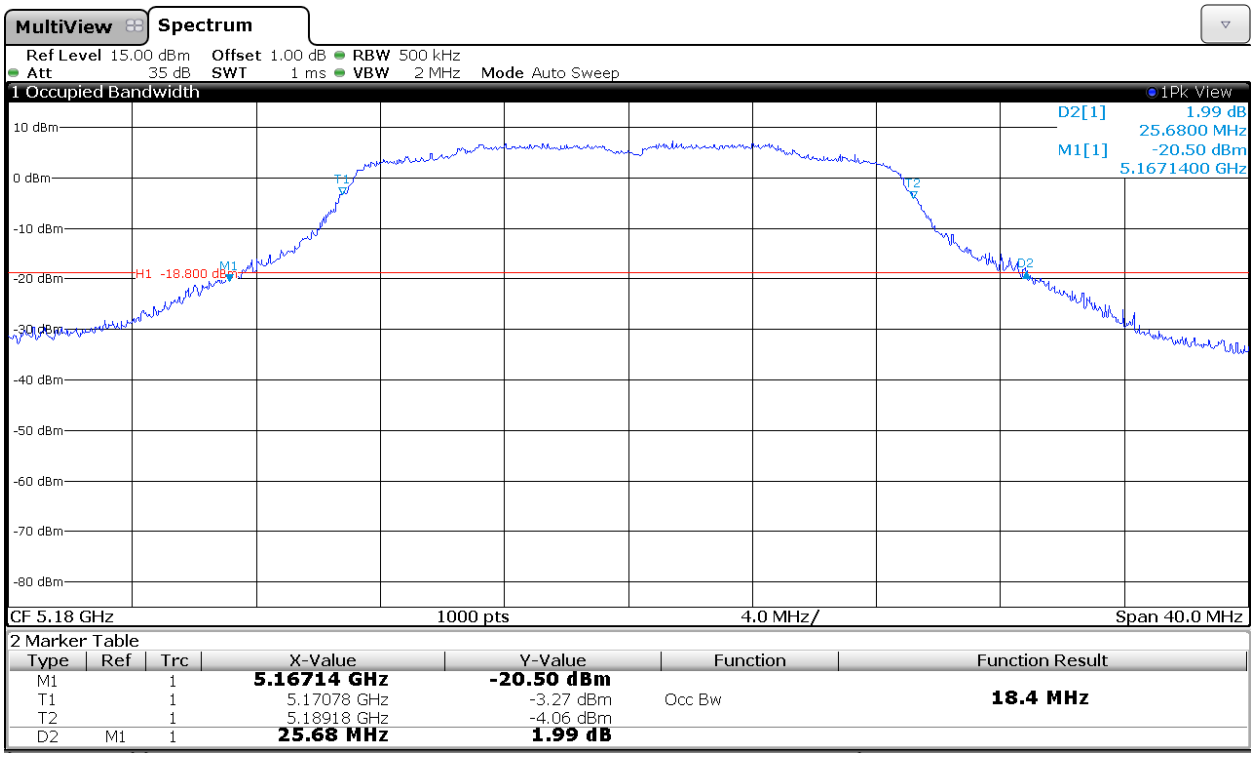
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.1867 GHz**	**-19.41 dBm**		
T1		1	5.19078 GHz	-2.26 dBm	Occ Bw	**18.4 MHz**
T2		1	5.20918 GHz	-2.49 dBm		
D2	M1	1	**26.28 MHz**	**1.21 dB**		

Highest Channel

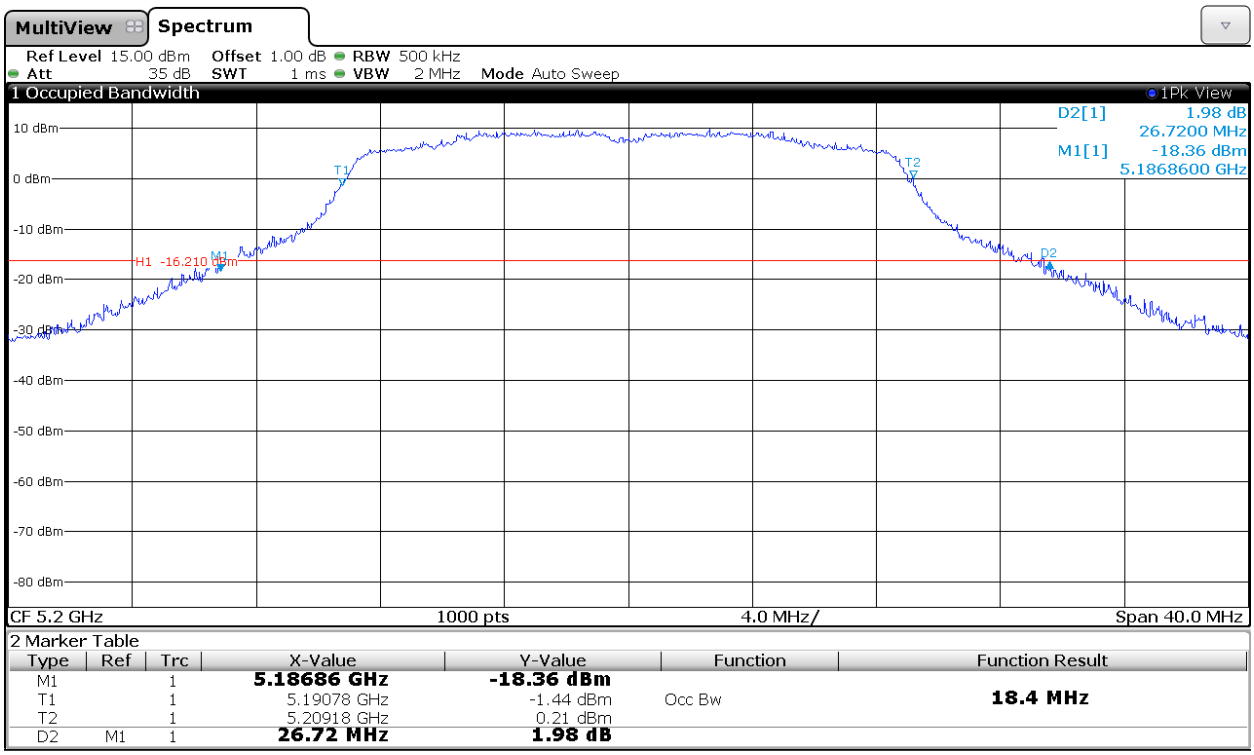


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

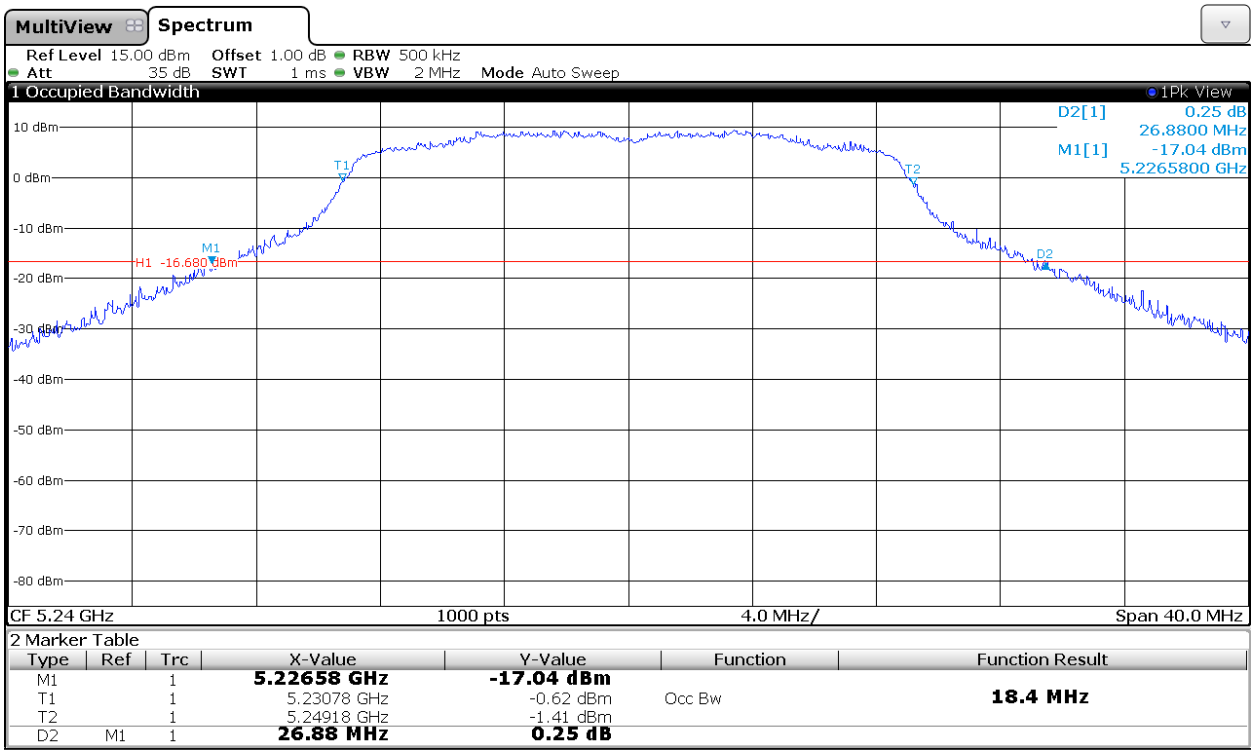
Lowest Channel



Middle Channel

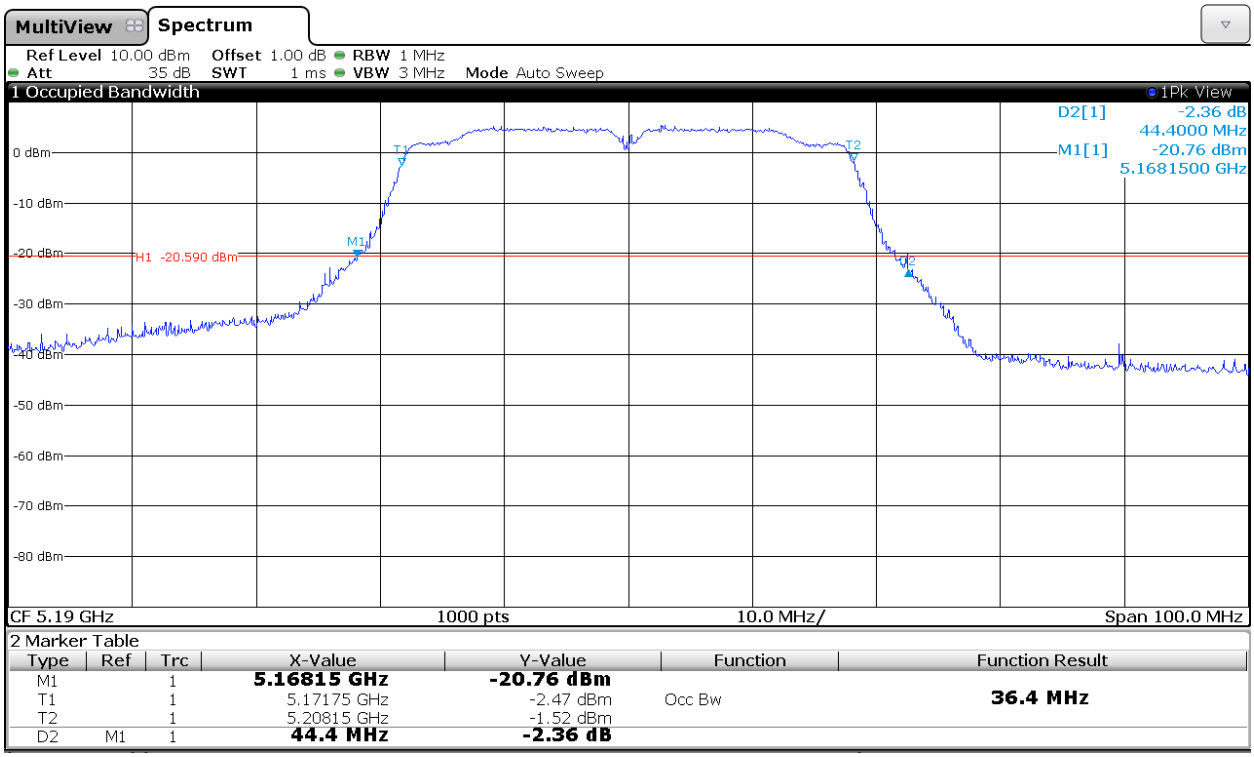


Highest Channel

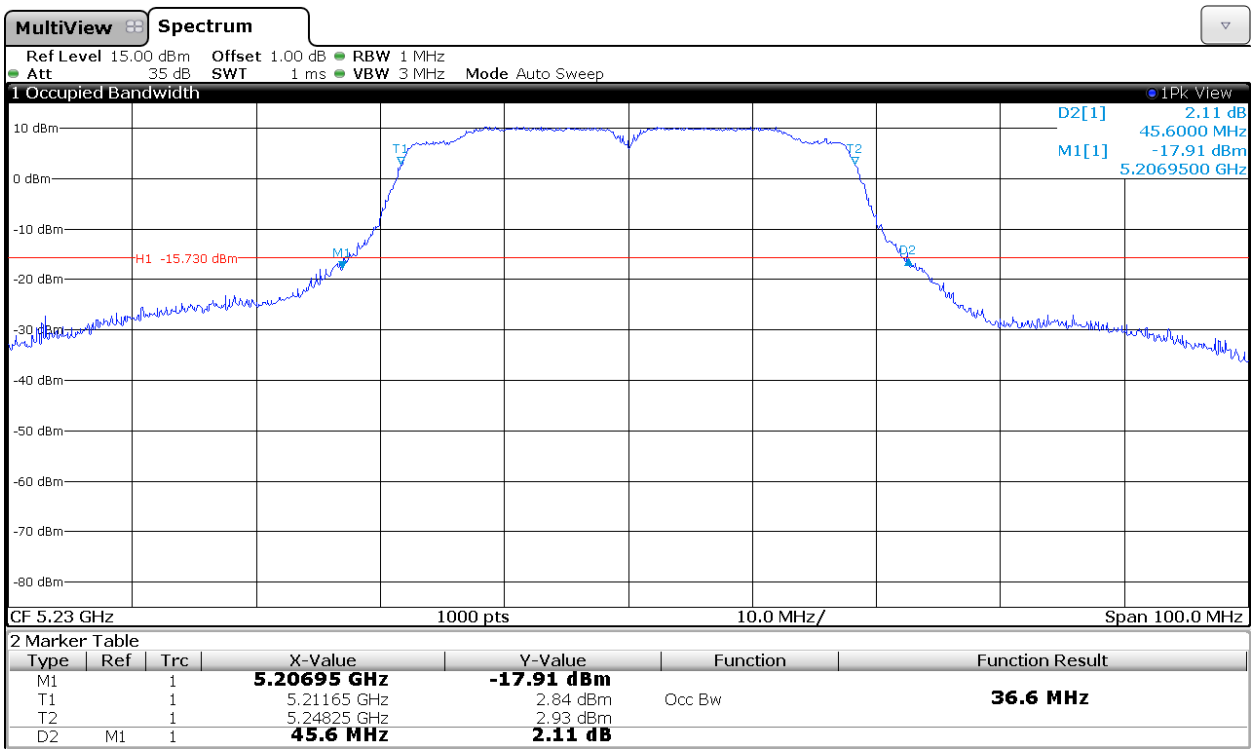


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

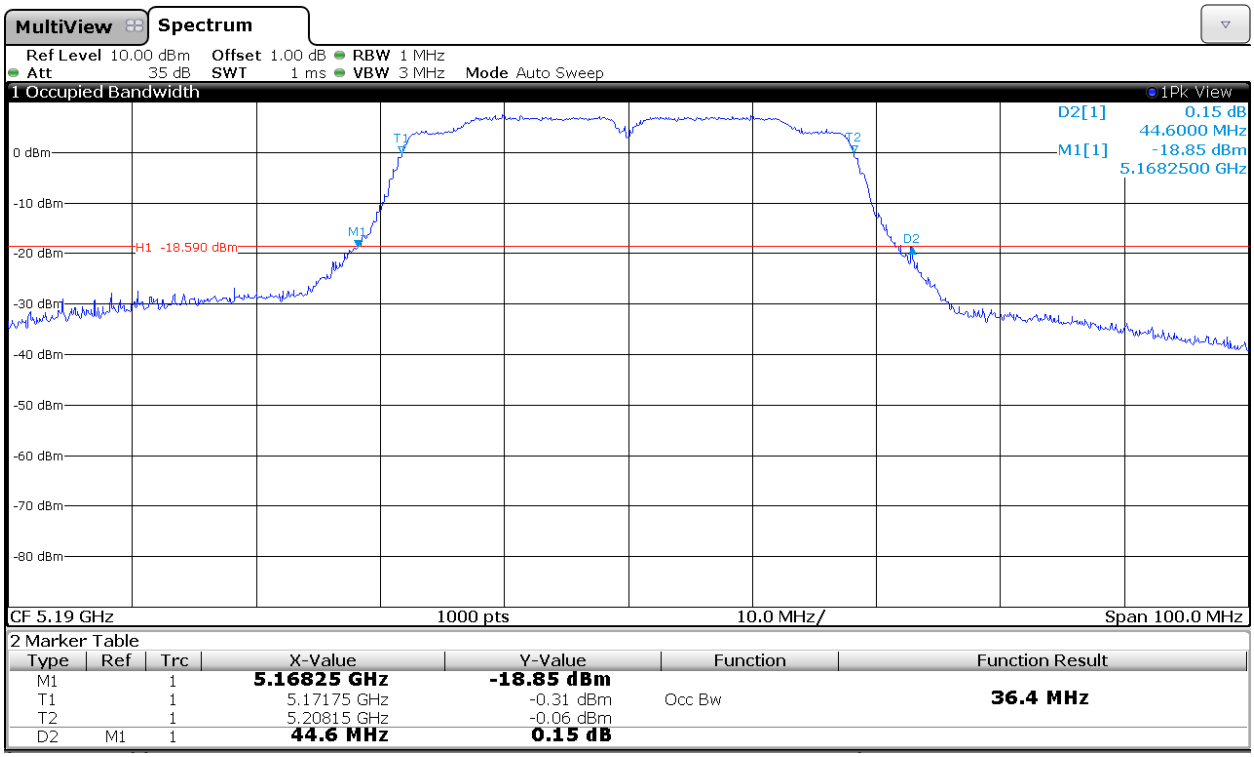


Highest Channel



802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

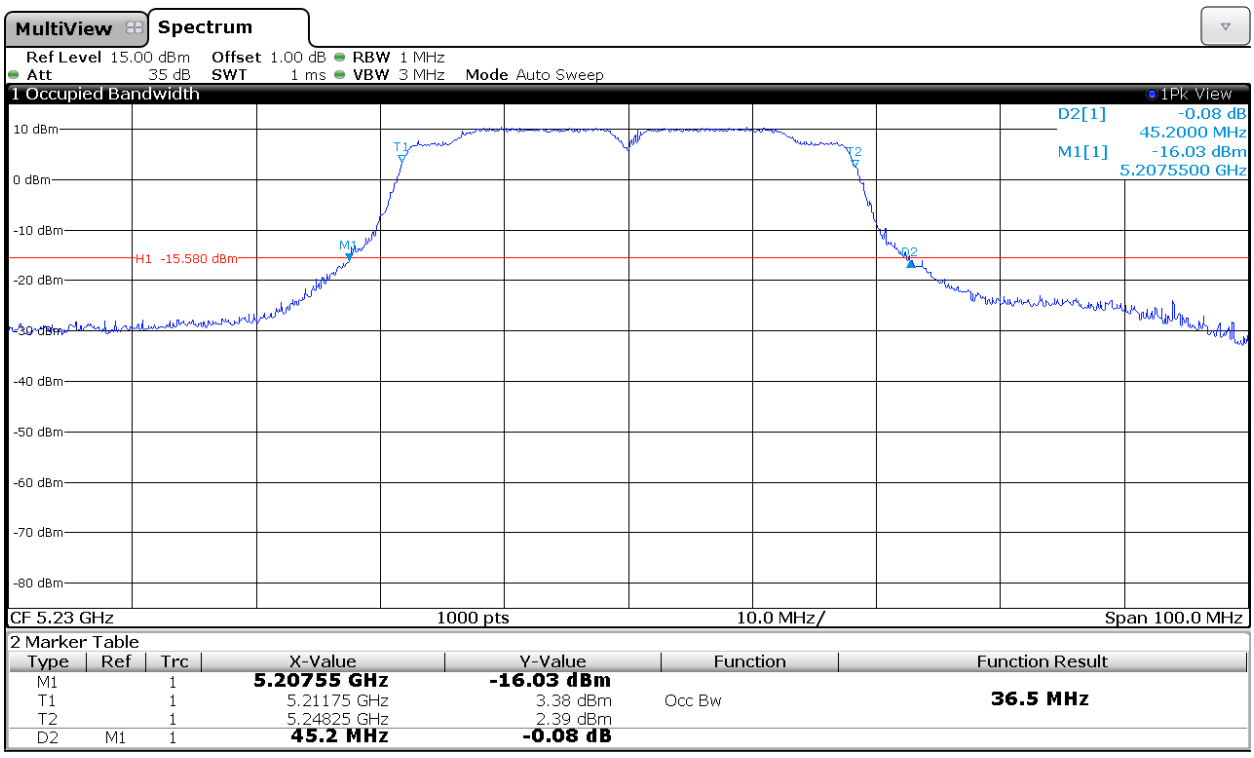
Lowest Channel



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.16825 GHz**	**-18.85 dBm**		
T1		1	5.17175 GHz	-0.31 dBm	Occ Bw	**36.4 MHz**
T2		1	5.20815 GHz	-0.06 dBm		
D2	M1	1	**44.6 MHz**	**0.15 dB**		

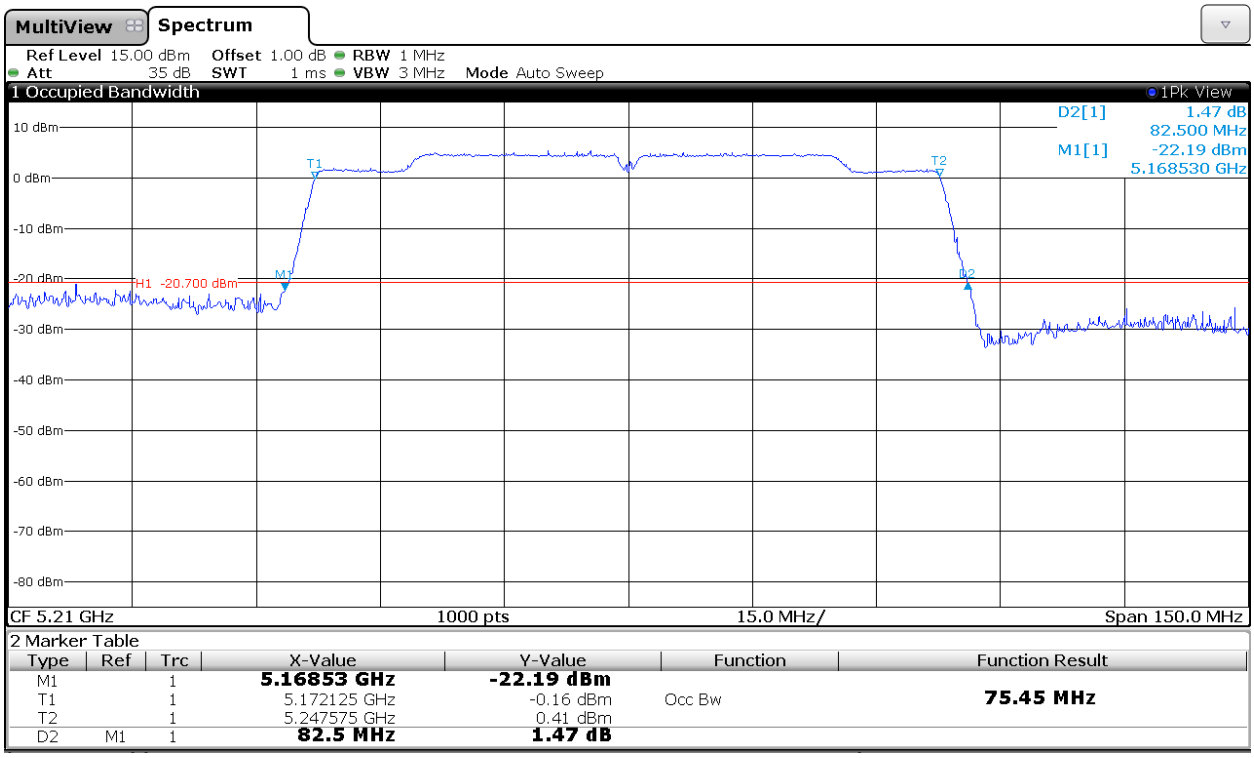
Highest Channel



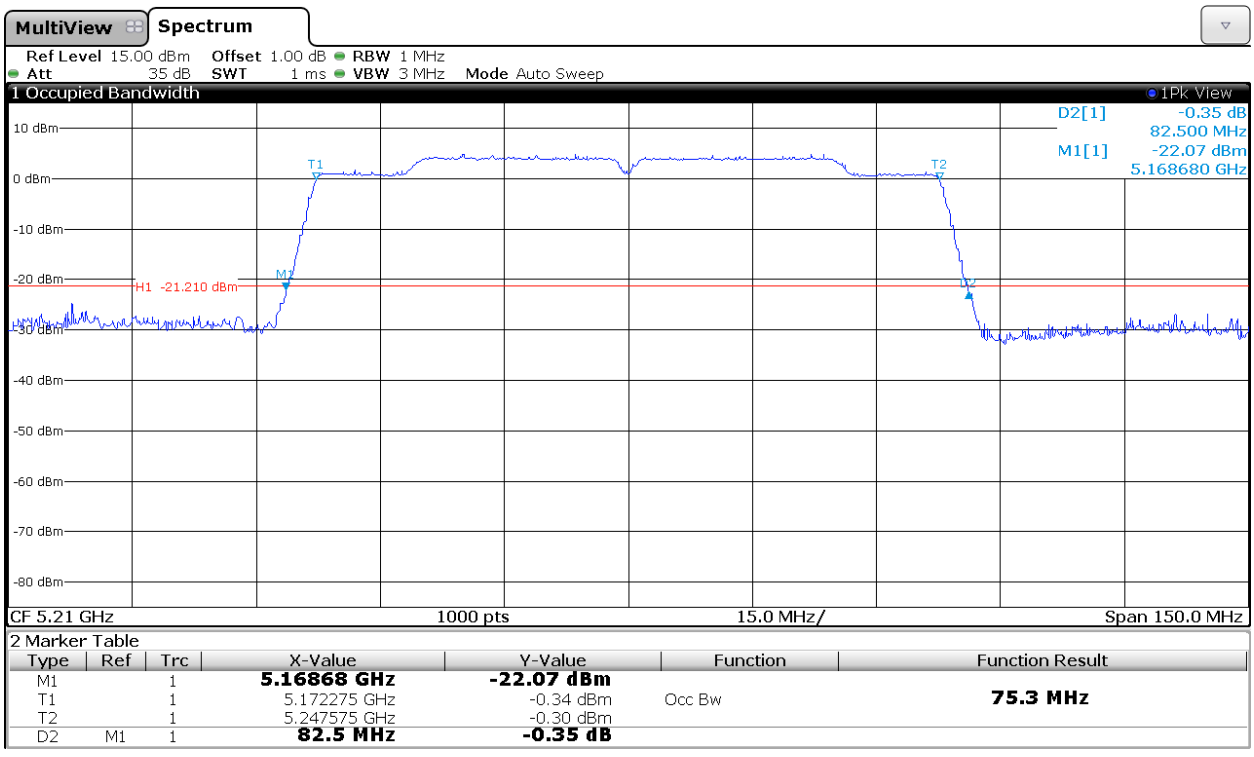
2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**5.20755 GHz**	**-16.03 dBm**		
T1		1	5.21175 GHz	3.38 dBm	Occ Bw	**36.5 MHz**
T2		1	5.24825 GHz	2.39 dBm		
D2	M1	1	**45.2 MHz**	**-0.08 dB**		

802.11 ac 80 MHz mode CHAIN A



802.11 ac 80 MHz mode CHAIN B



Section 15.407 Subclause (a) (1) / RSS-210 A9.2. (1). Maximum output power, Peak power spectral density and antenna gain

SPECIFICATION

FCC 15.407: For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-210: The maximum e.i.r.p. shall not exceed 200 mW (23 dBm) or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average (10 log10 B) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.

RESULTS

The maximum conducted output power was measured using the channel power integration method according to point E) 2) b) (Method SA-1) of Guidance 789033 D01.

In the measure-and-sum approach for MIMO mode, the conducted emission level (*e.g.,* transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units (mW—not dBm).

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

The peak power spectral density (PPSD) was measured using the method according to point F) (Method SA-1) of Guidance 789033 D01.

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

For MIMO mode, the Measure and add 10 log(NANT) dB, (where NANT is the number of outputs) technique was used according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013.
With this technique, spectrum measurements are performed at each output of the device, and the quantity 10 log(NANT) dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

The number of transmit antennas (NANT) are 2 and the number of spatial streams (Nss) are 2 and therefore the Array Gain is 0 dB.

1. 802.11a mode (see next plots).

CHAIN A Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5180 MHz	14.10	17.70	3.81	7.41
5200 MHz	14.45	18.05	3.87	7.47
5240 MHz	14.38	17.98	3.94	7.54

CHAIN B Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5180 MHz	13.79	17.39	3.34	6.94
5200 MHz	14.45	18.05	3.96	7.56
5240 MHz	14.47	18.07	3.96	7.56

Measurement uncertainty = ±1.2 dB

Verdict: PASS

2. 802.11 n20 MHz and 802.11 ac 20 MHz modes. (see next plots).

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

CHAIN A Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5180 MHz	13.73	17.33	3.11	6.71
5200 MHz	14.35	17.95	3.94	7.54
5240 MHz	14.53	18.13	3.97	7.57

CHAIN B Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5180 MHz	13.91	17.51	3.36	6.96
5200 MHz	14.54	18.14	3.91	7.51
5240 MHz	14.49	18.09	3.89	7.49

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm) A+B	Total output power e.i.r.p. (dBm) A+B
5180 MHz	11.49	11.23	14.37	17.97
5200 MHz	11.38	11.48	14.44	18.04
5240 MHz	11.56	11.46	14.52	18.12

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.6 dBi

Frequency	PPSD/MHz Chain A (dBm)	PPSD/MHz Chain B (dBm)	Total PPSD/MHz Chain A (dBm)[1]	Total PPSD/MHz Chain B (dBm)[1]	Total PPSD/MHz Chain A e.i.r.p. (dBm)	Total PPSD/MHz Chain B e.i.r.p. (dBm)
5180 MHz	0.97	0.80	3.98	3.81	7.58	7.41
5200 MHz	0.95	0.93	3.96	3.94	7.56	7.54
5240 MHz	0.92	0.90	3.93	3.91	7.53	7.51

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

Verdict: PASS

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes. (see next plots).

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

CHAIN A Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5190 MHz	11.73	15.33	-2.21	1.39
5230 MHz	16.40	20.00	2.42	6.02

CHAIN B Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5190 MHz	13.12	16.72	-0.81	2.79
5230 MHz	16.20	19.80	2.32	5.92

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm) A+B	Total output power e.i.r.p. (dBm) A+B
5190 MHz	9.87	9.71	12.80	16.40
5230 MHz	13.94	13.94	16.95	20.55

Measurement uncertainty = ±1.2 dB

Verdict: PASS

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.6 dBi

Frequency	PPSD/MHz Chain A (dBm)	PPSD/MHz Chain B (dBm)	Total PPSD/MHz Chain A (dBm)[1]	Total PPSD/MHz Chain B (dBm)[1]	Total PPSD/MHz Chain A e.i.r.p. (dBm)	Total PPSD/MHz Chain B e.i.r.p. (dBm)
5190 MHz	-3.78	-3.98	-0.77	-0.97	2.83	2.63
5230 MHz	-0.42	0.09	2.59	3.10	6.19	6.70

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

Verdict: PASS

4. 802.11 ac 80 MHz mode. (see next plots).

CHAIN A Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5210 MHz	13.69	17.29	-3.27	0.33

CHAIN B Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PPSD/MHz (dBm)	PPSD/MHz e.i.r.p. (dBm)
5210 MHz	13.79	17.39	-3.03	0.57

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.6 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm)	Total output power e.i.r.p. (dBm)
5210 MHz	11.66	11.63	14.65	18.25

Measurement uncertainty = ±1.2 dB

Verdict: PASS

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.6 dBi

Frequency	PPSD/MHz Chain A (dBm)	PPSD/MHz Chain B (dBm)	Total PPSD/MHz Chain A (dBm)[1]	Total PPSD/MHz Chain B (dBm)[1]	Total PPSD/MHz Chain A e.i.r.p. (dBm)	Total PPSD/MHz Chain B e.i.r.p. (dBm)
5210 MHz	-5.04	-5.20	-2.03	-2.19	1.57	1.41

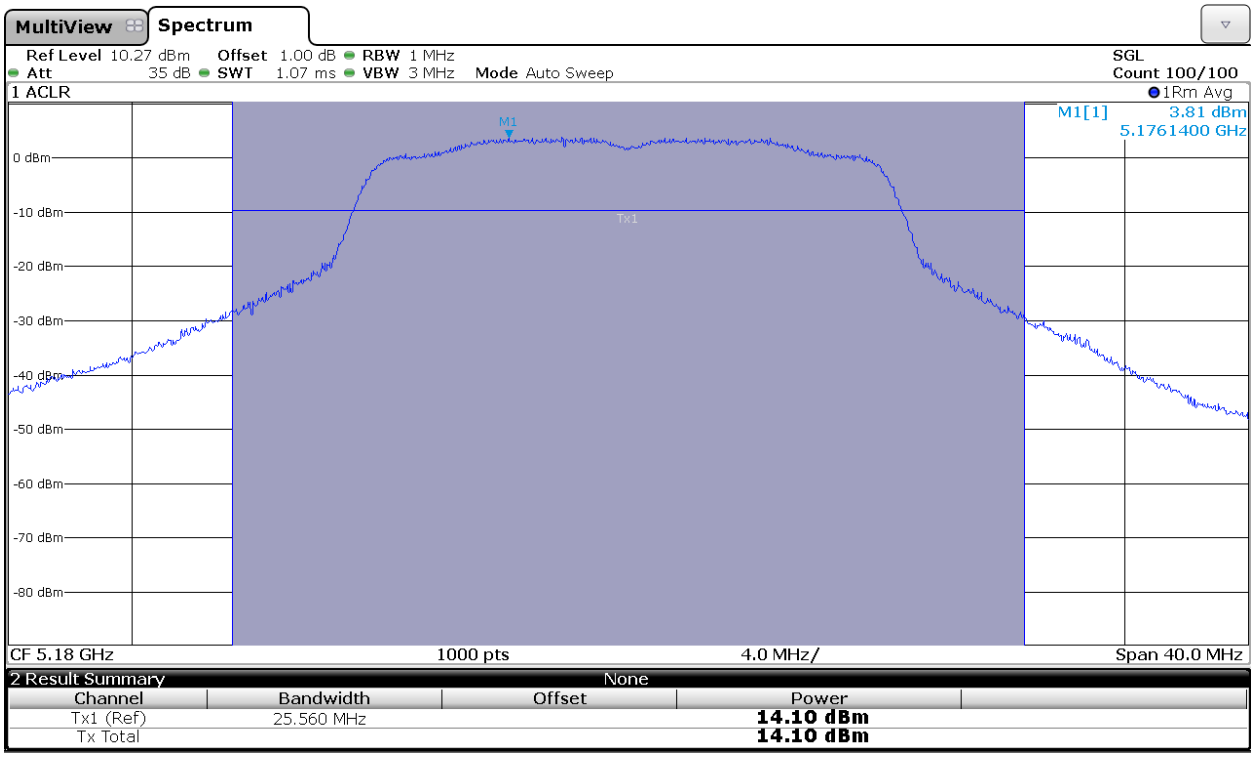
Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

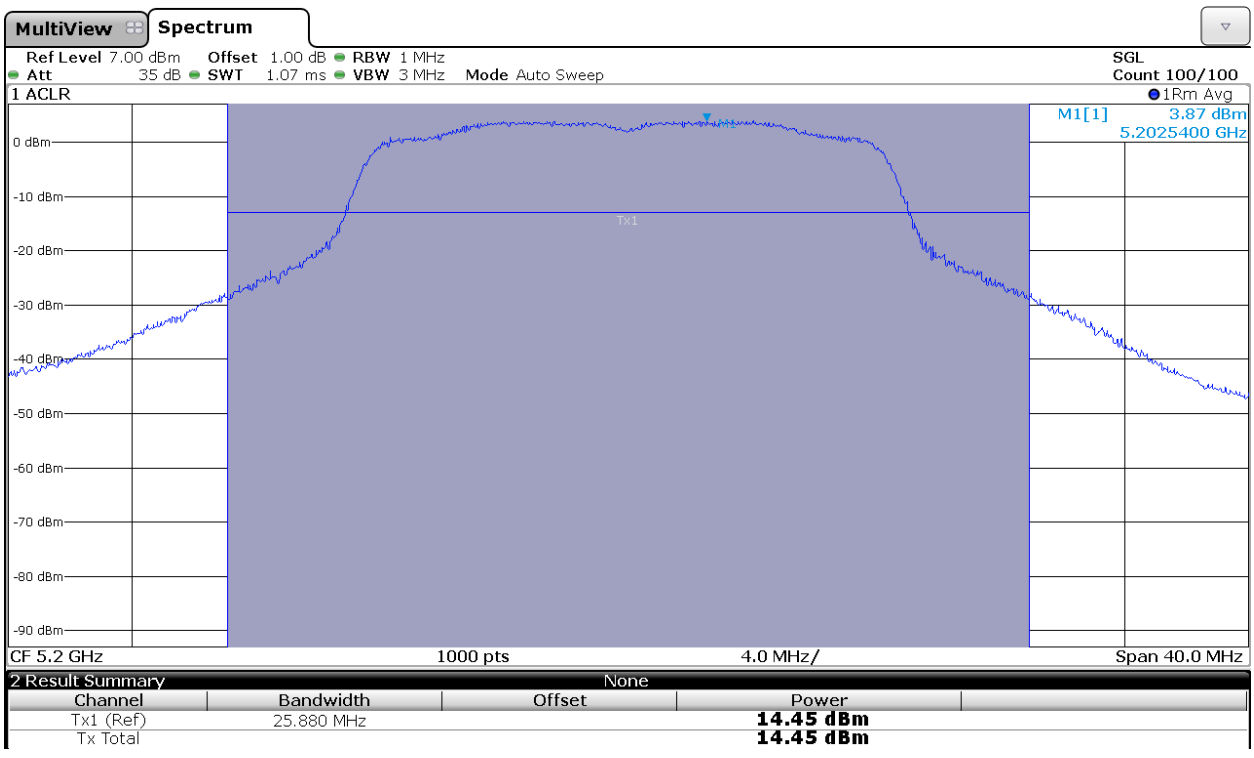
Verdict: PASS

802.11a mode CHAIN A

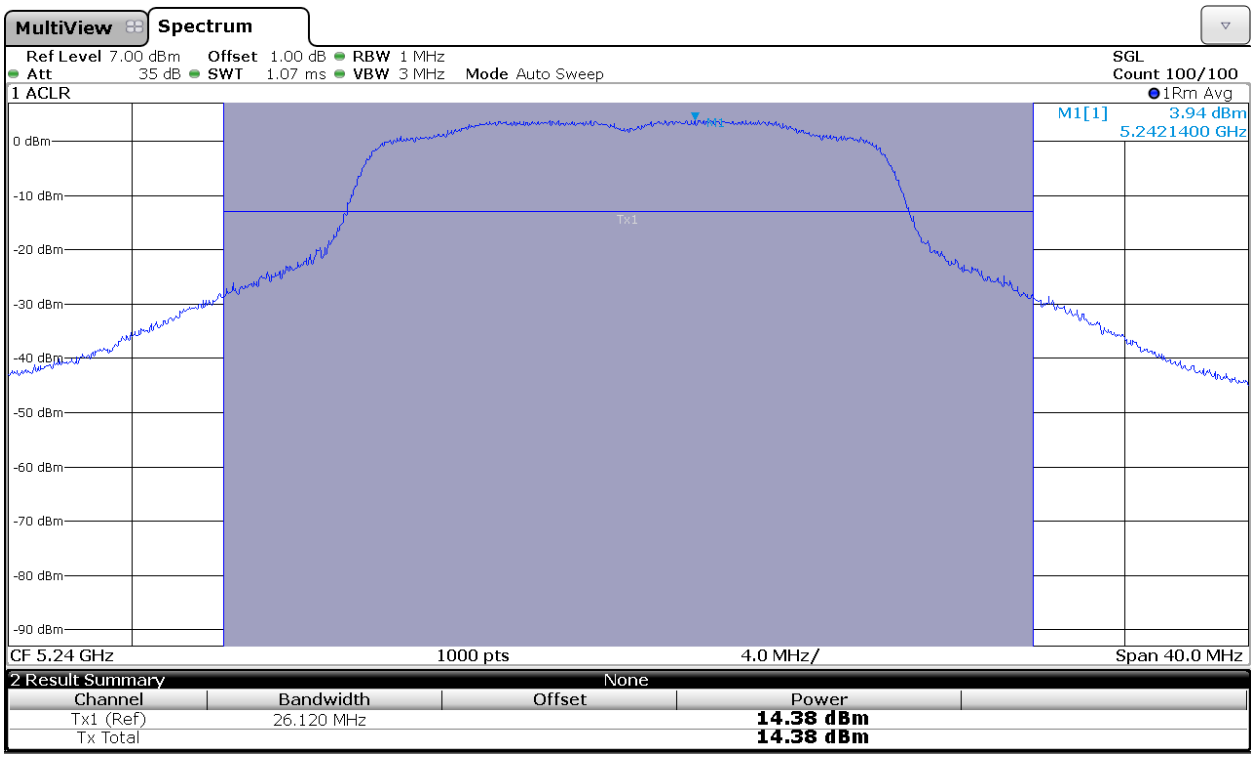
Lowest Channel



Middle Channel

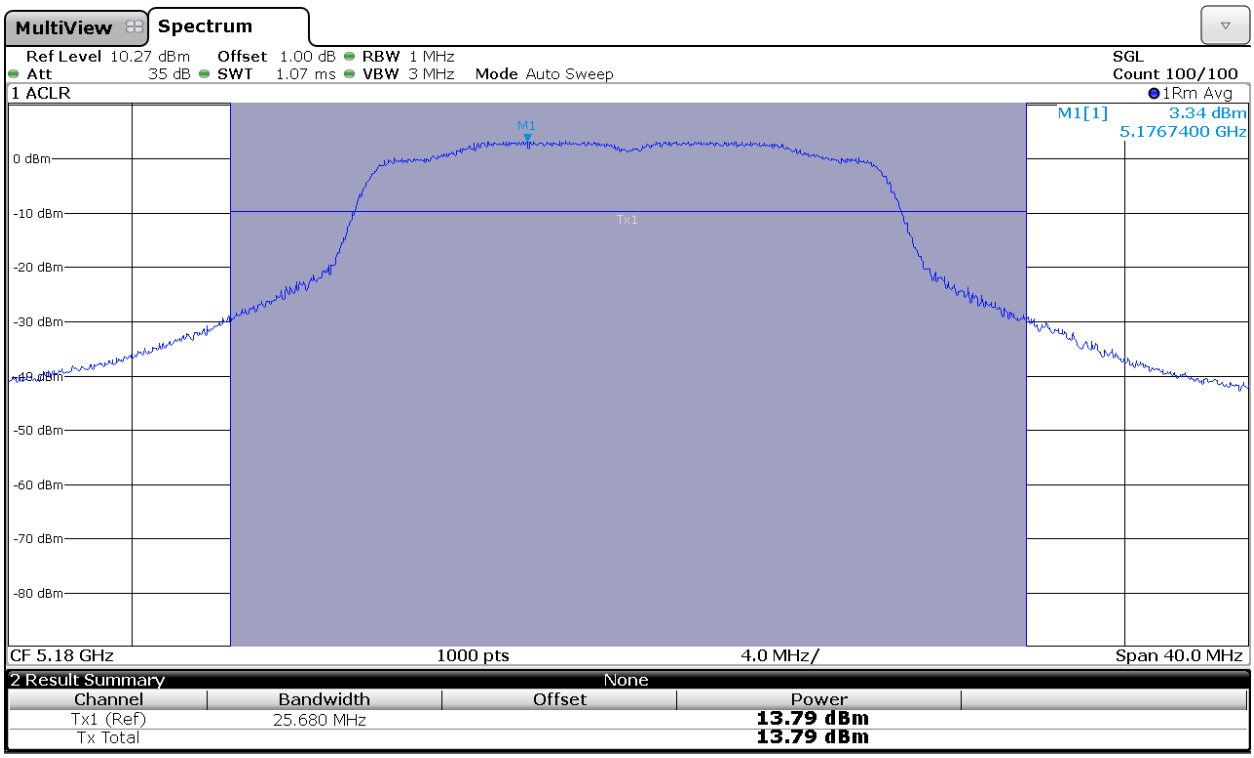


Highest Channel

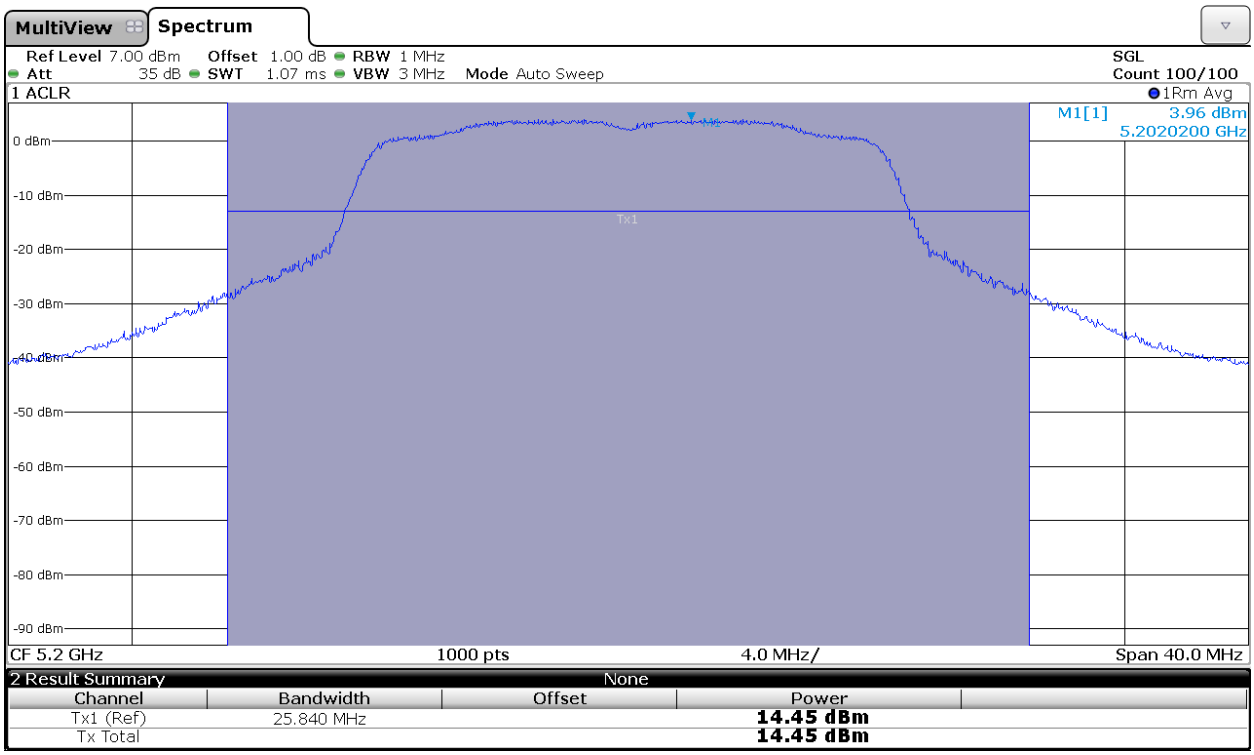


802.11a mode CHAIN B

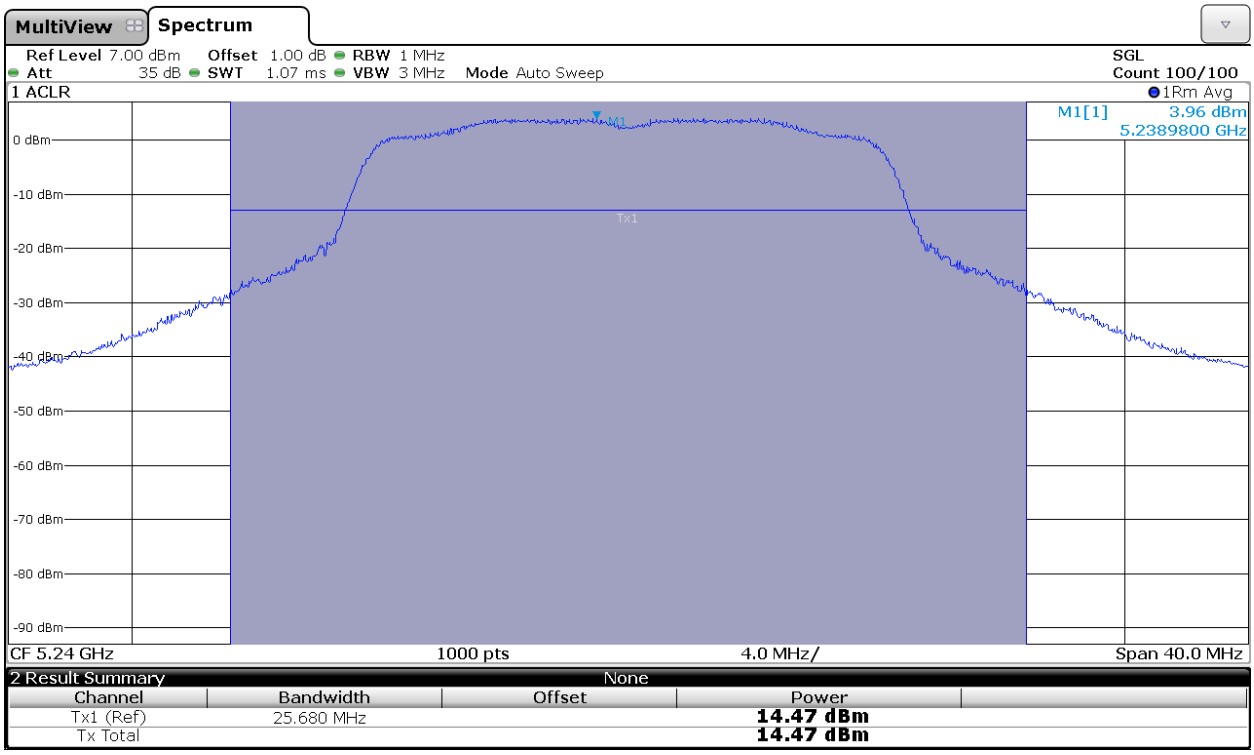
Lowest Channel



Middle Channel

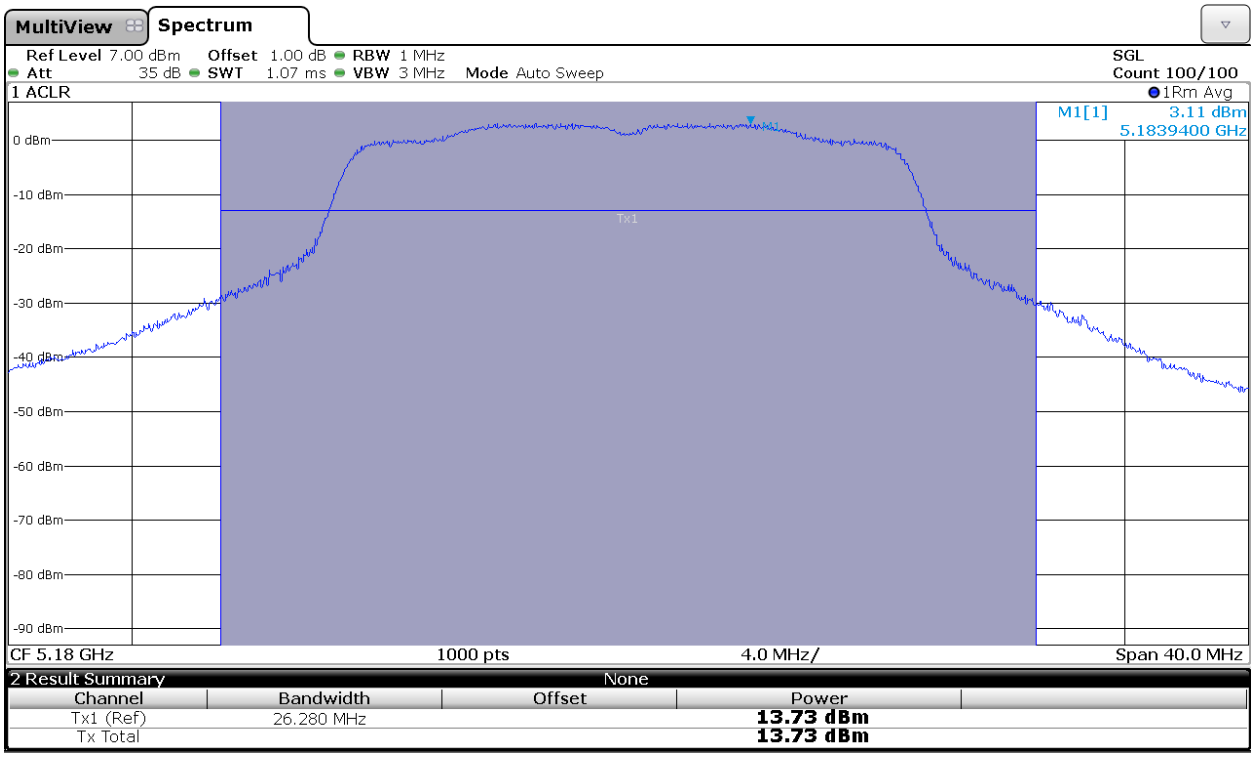


Highest Channel

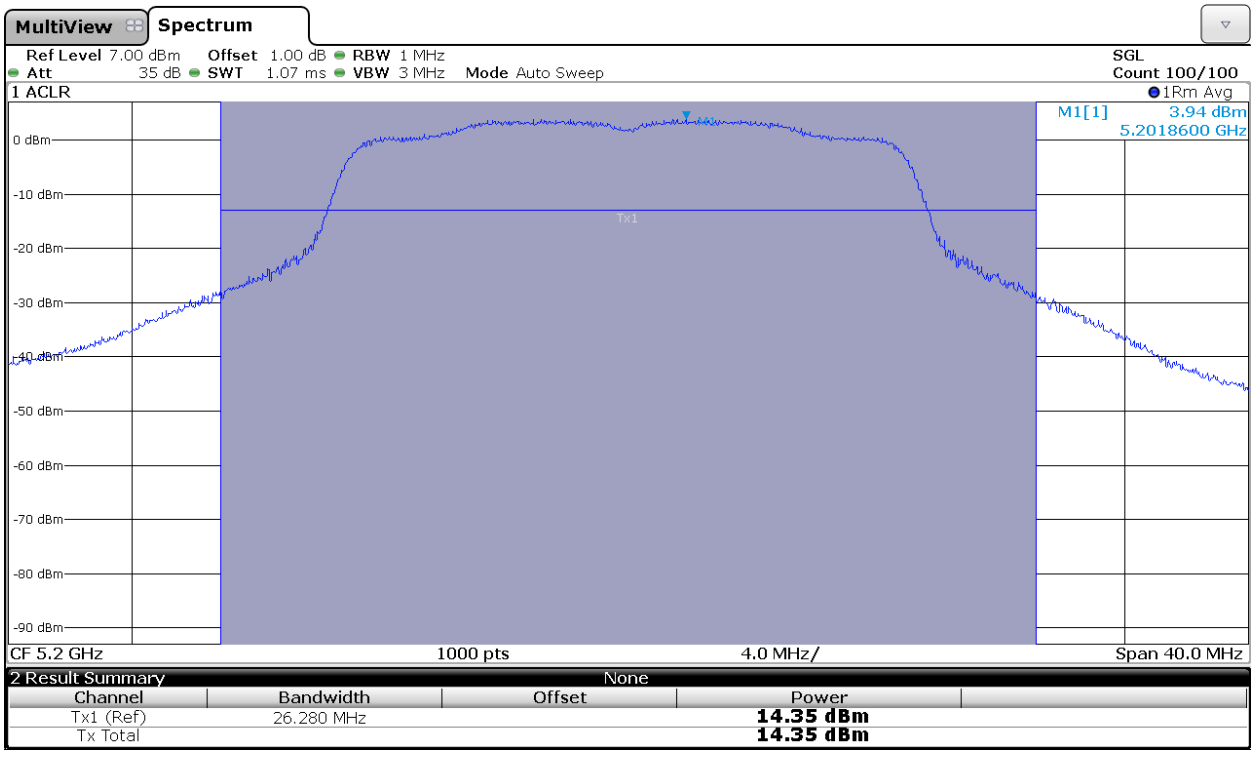


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

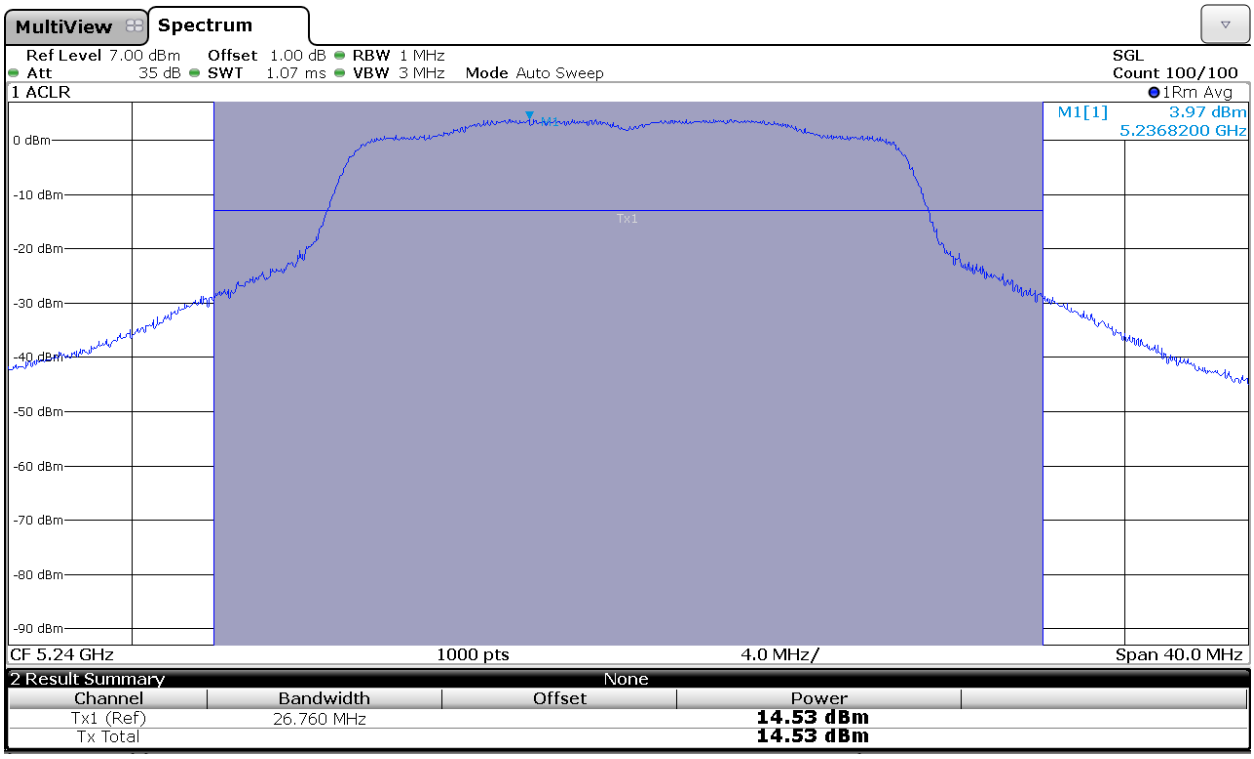
Lowest Channel



Middle Channel

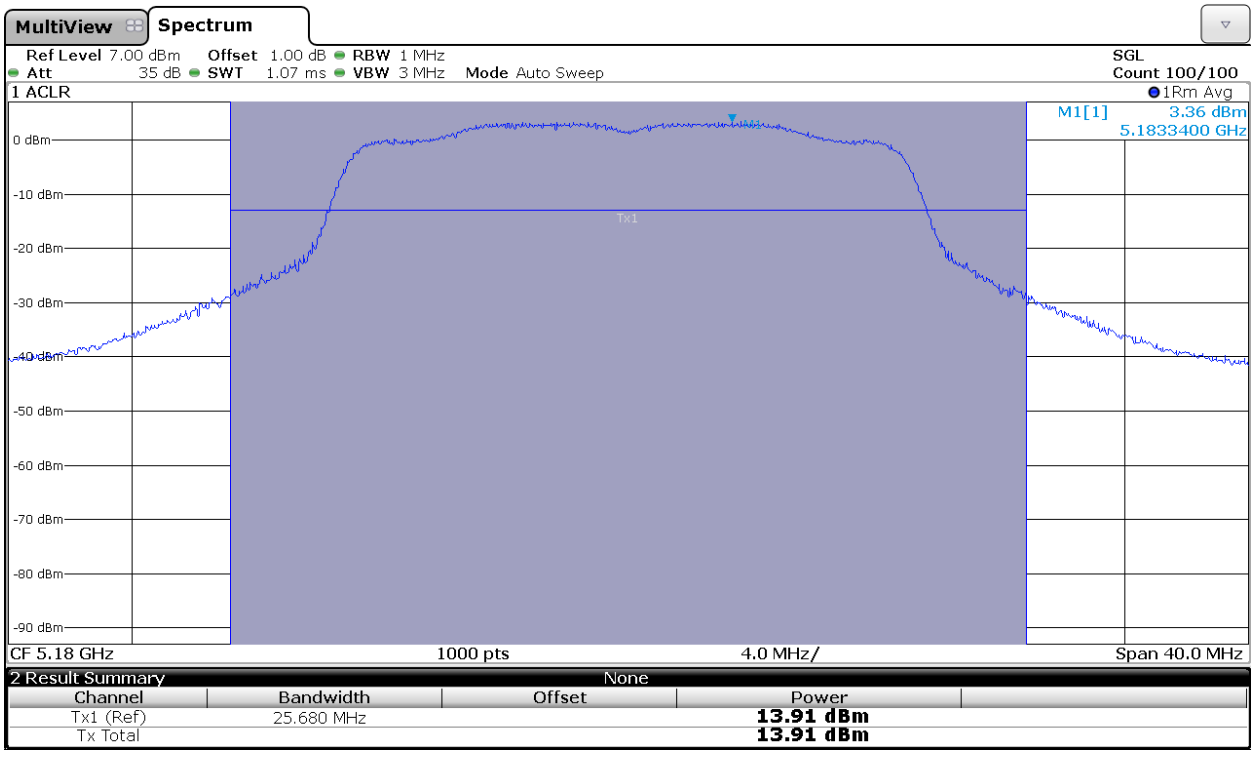


Highest Channel

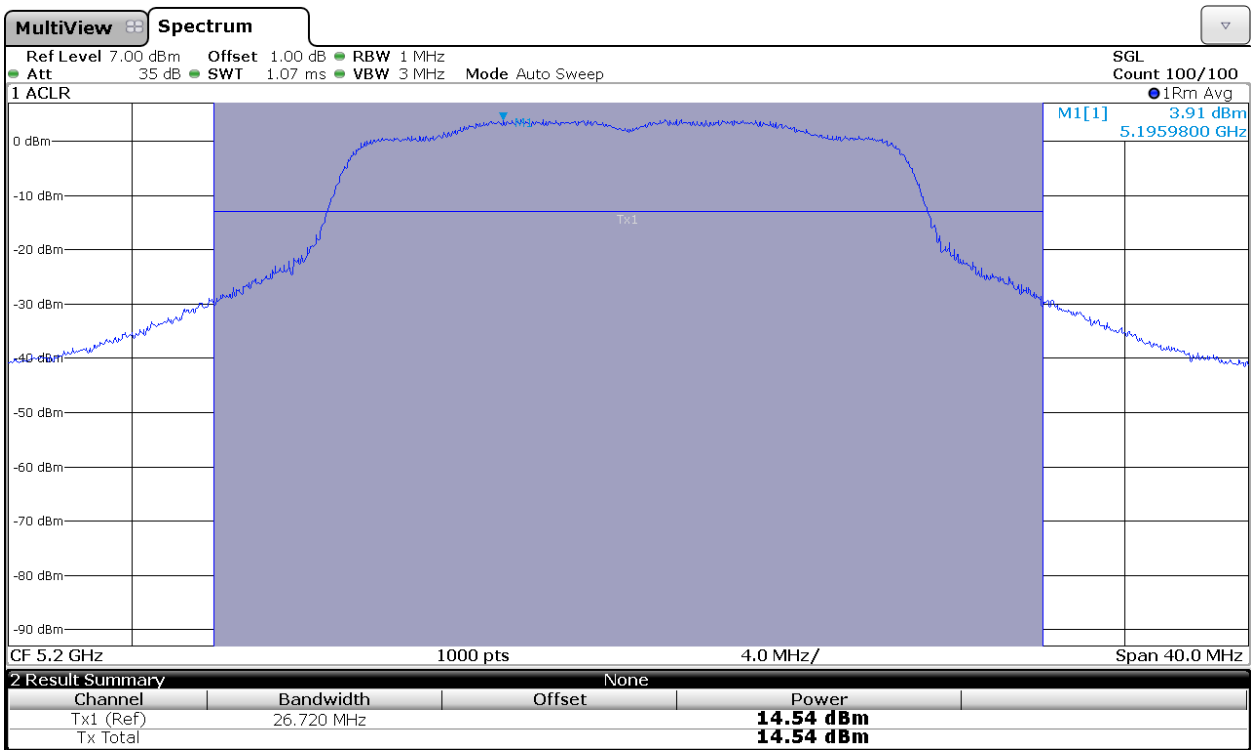


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

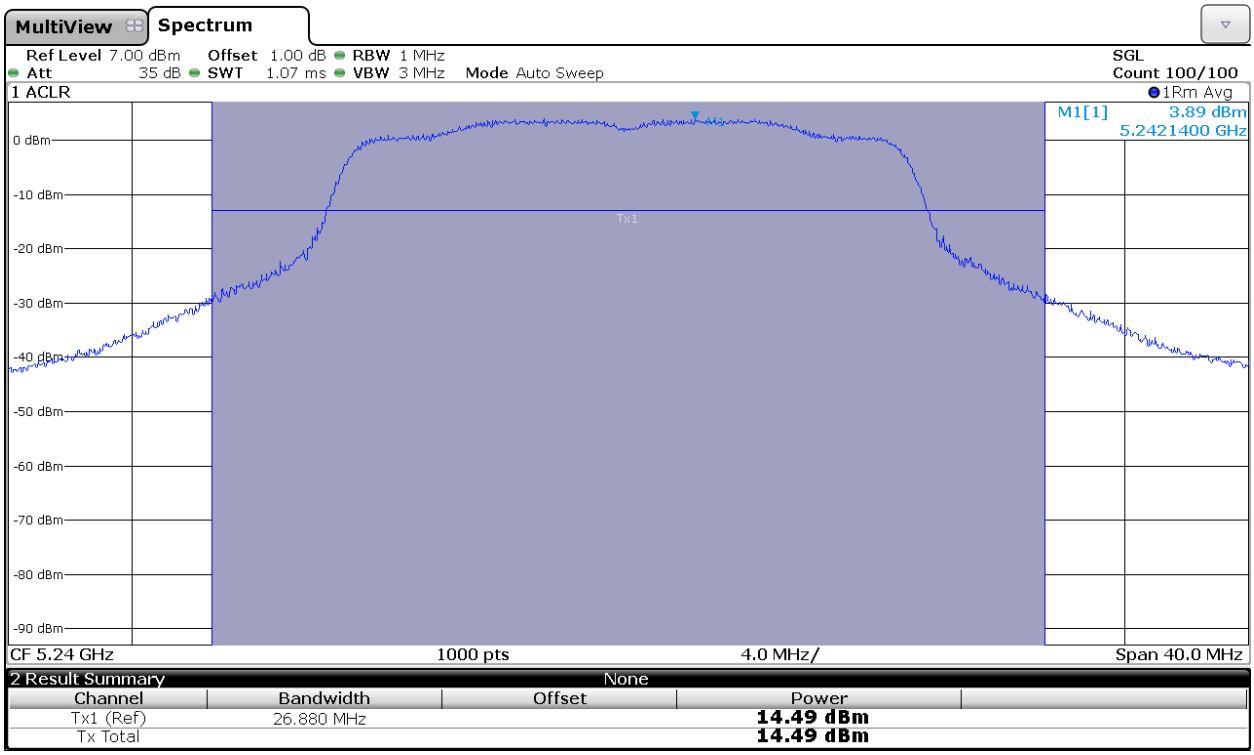
Lowest Channel



Middle Channel

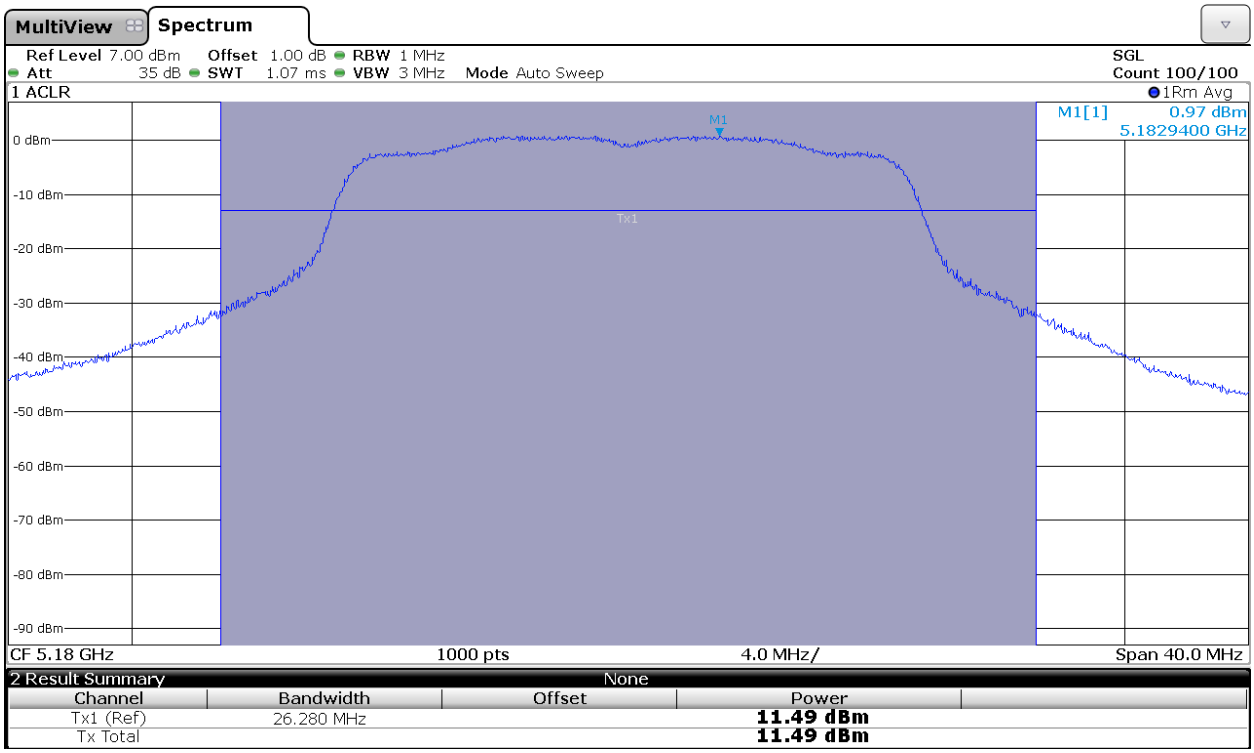


Highest Channel

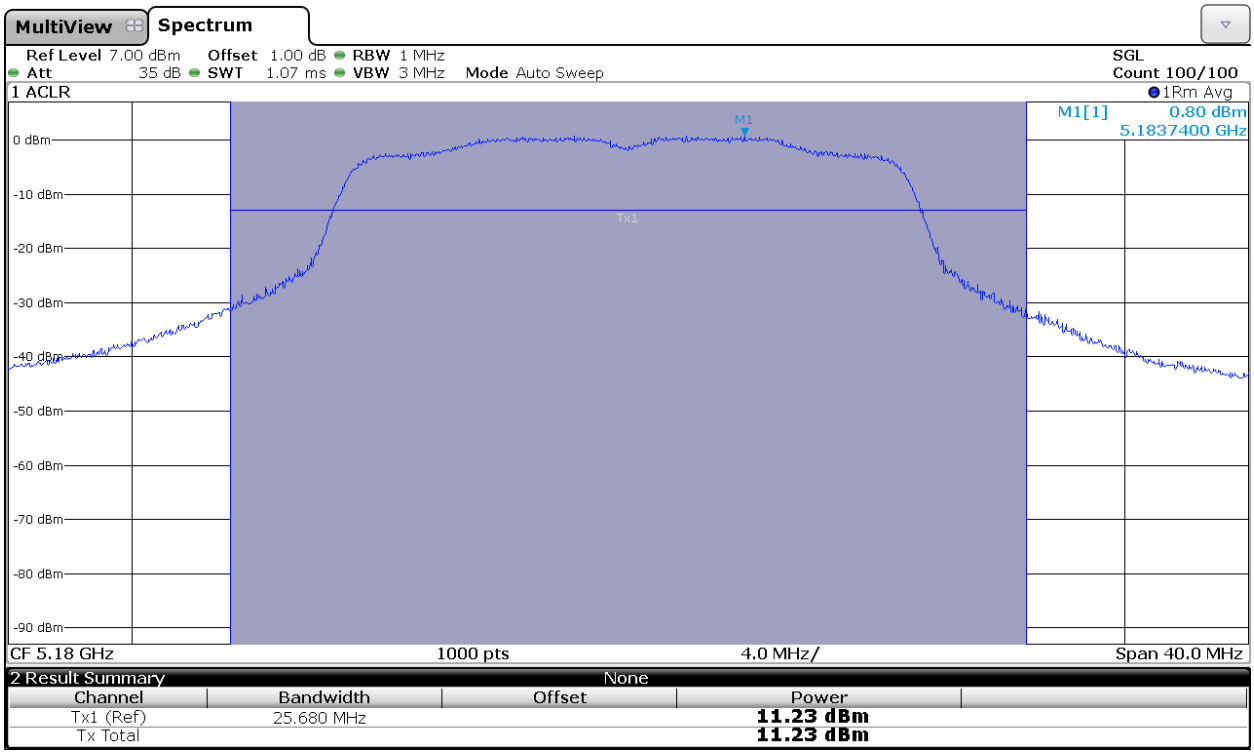


802.11 n20 MHz and 802.11 ac 20 MHz modes MIMO CHAIN A+B

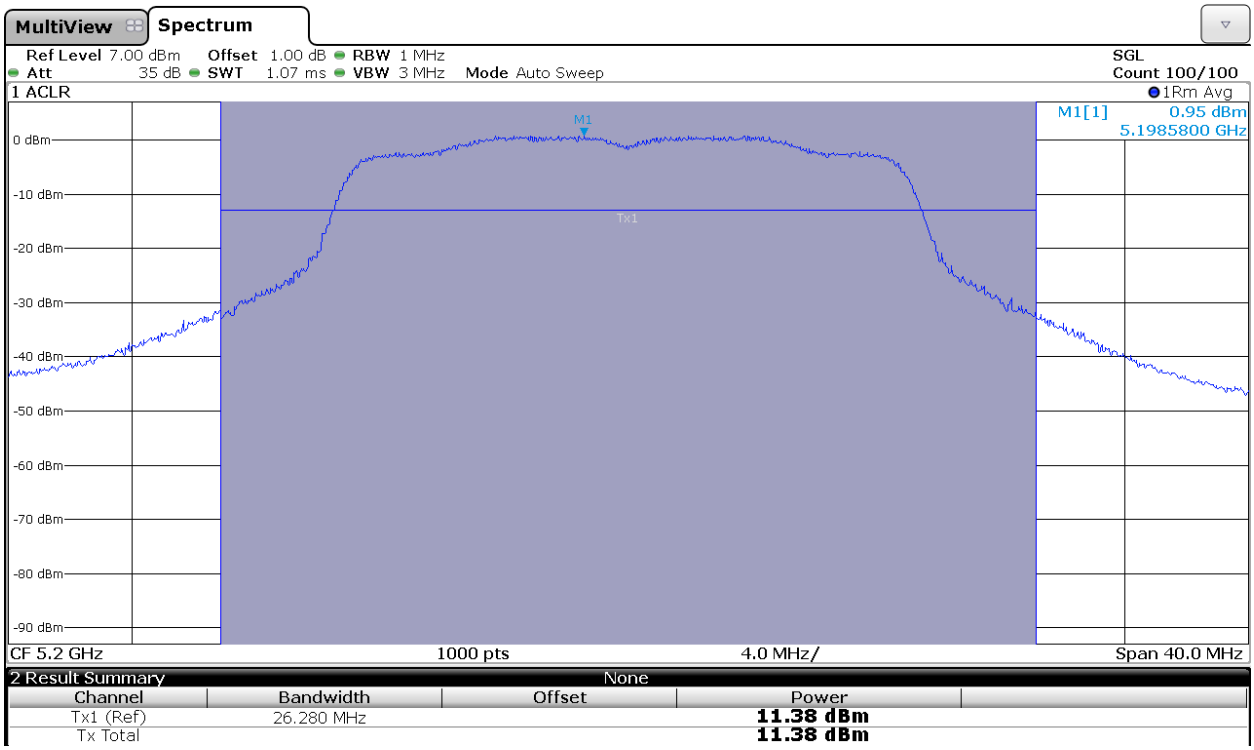
Lowest Channel. Chain A



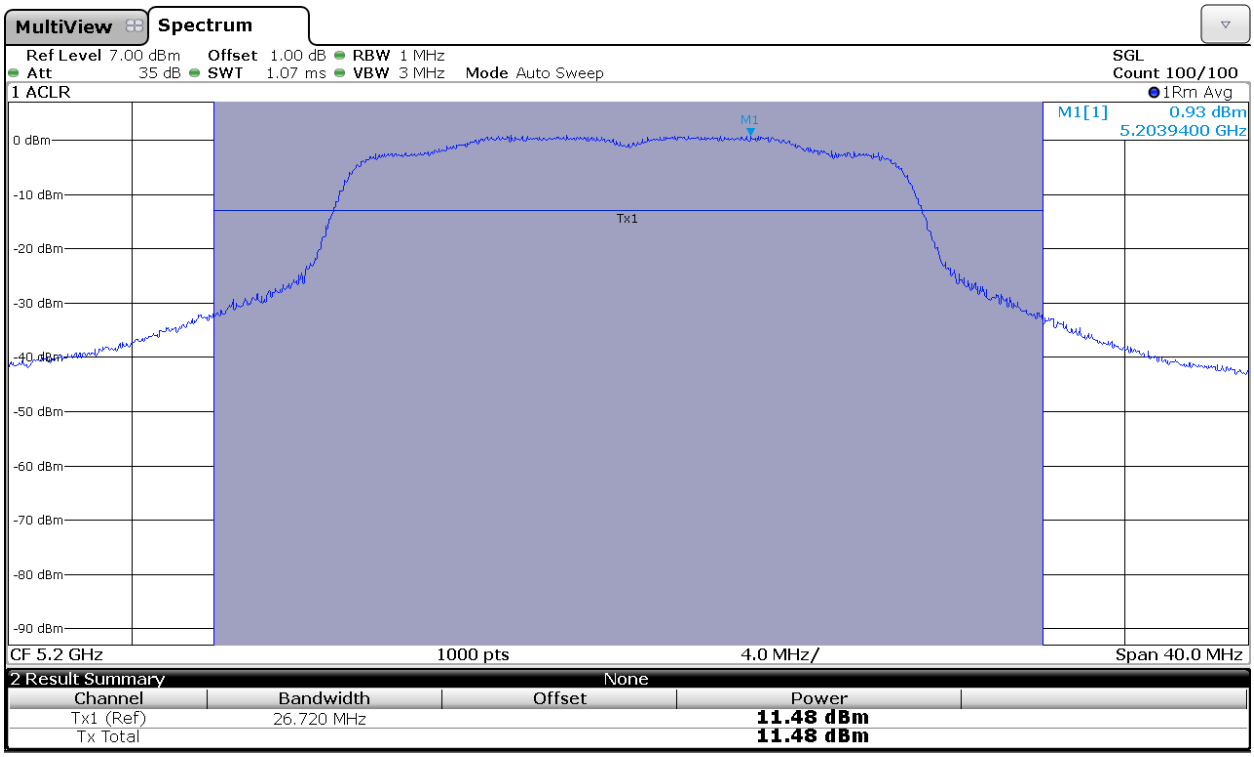
Lowest Channel. Chain B



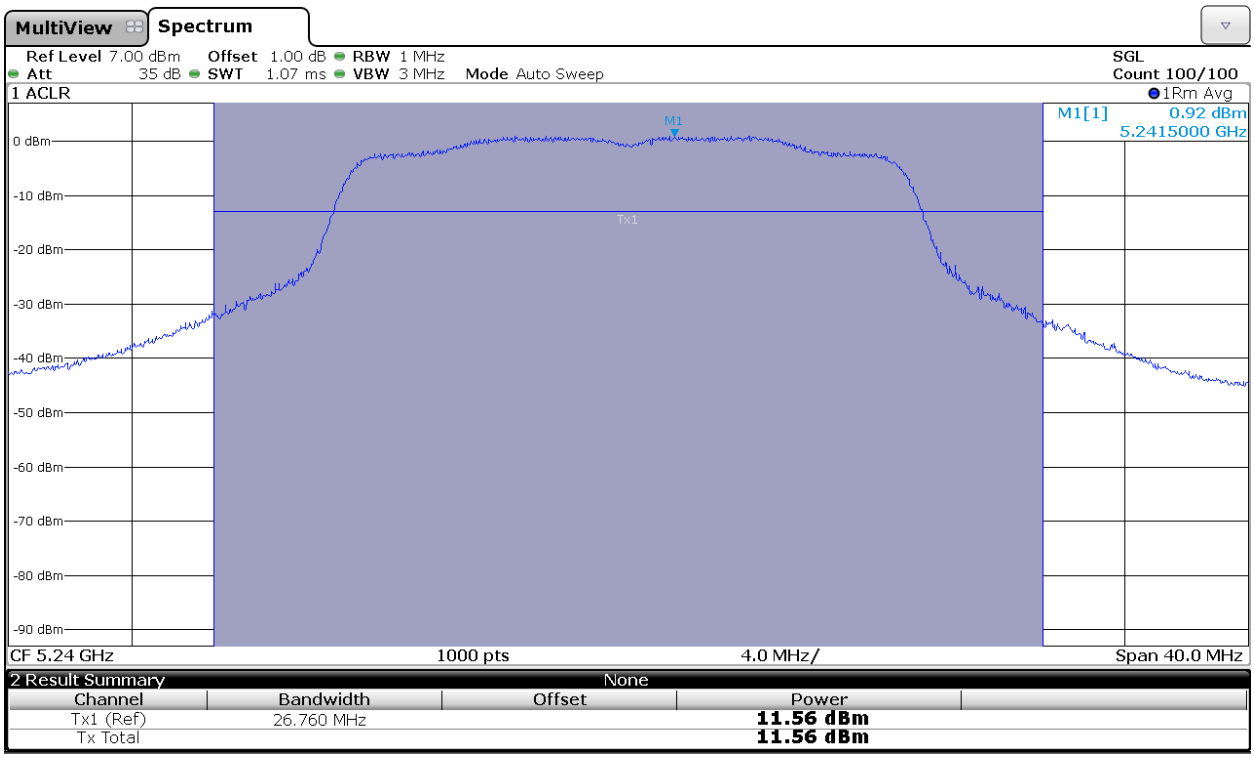
Middle Channel. Chain A.



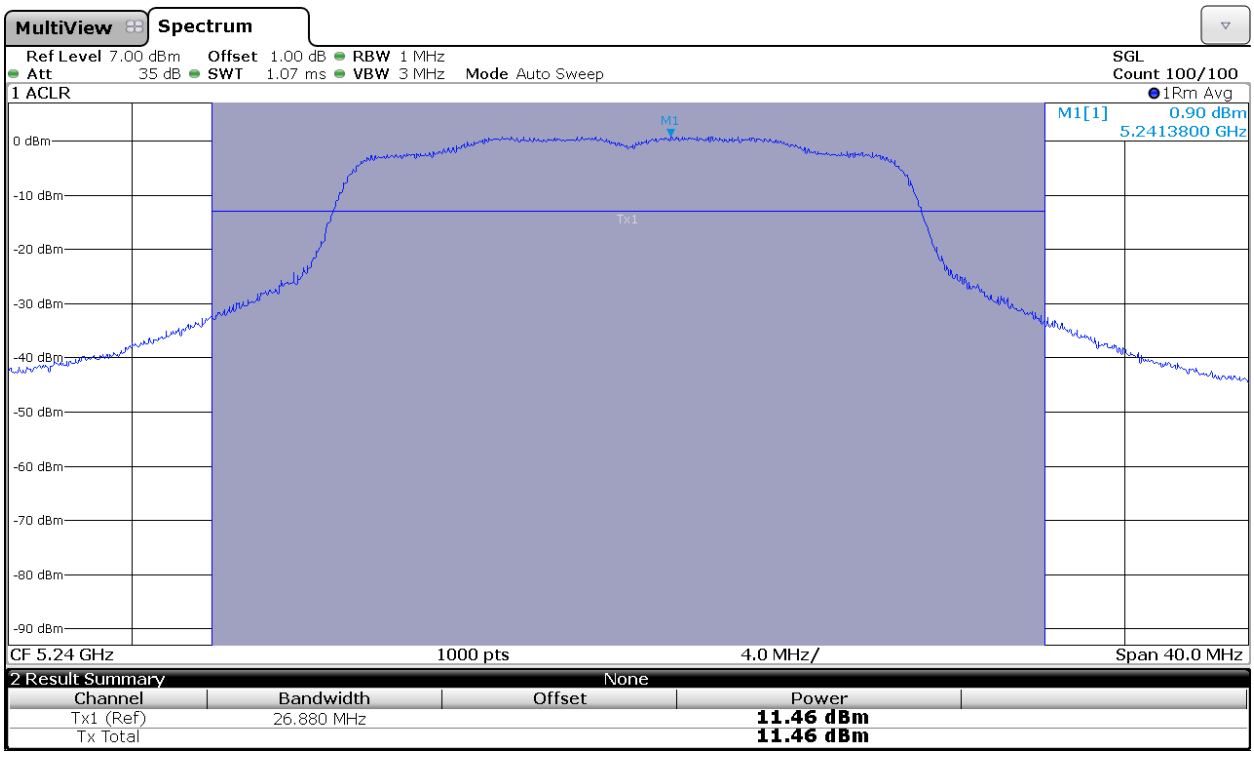
Middle Channel. Chain B.



Highest Channel. Chain A.

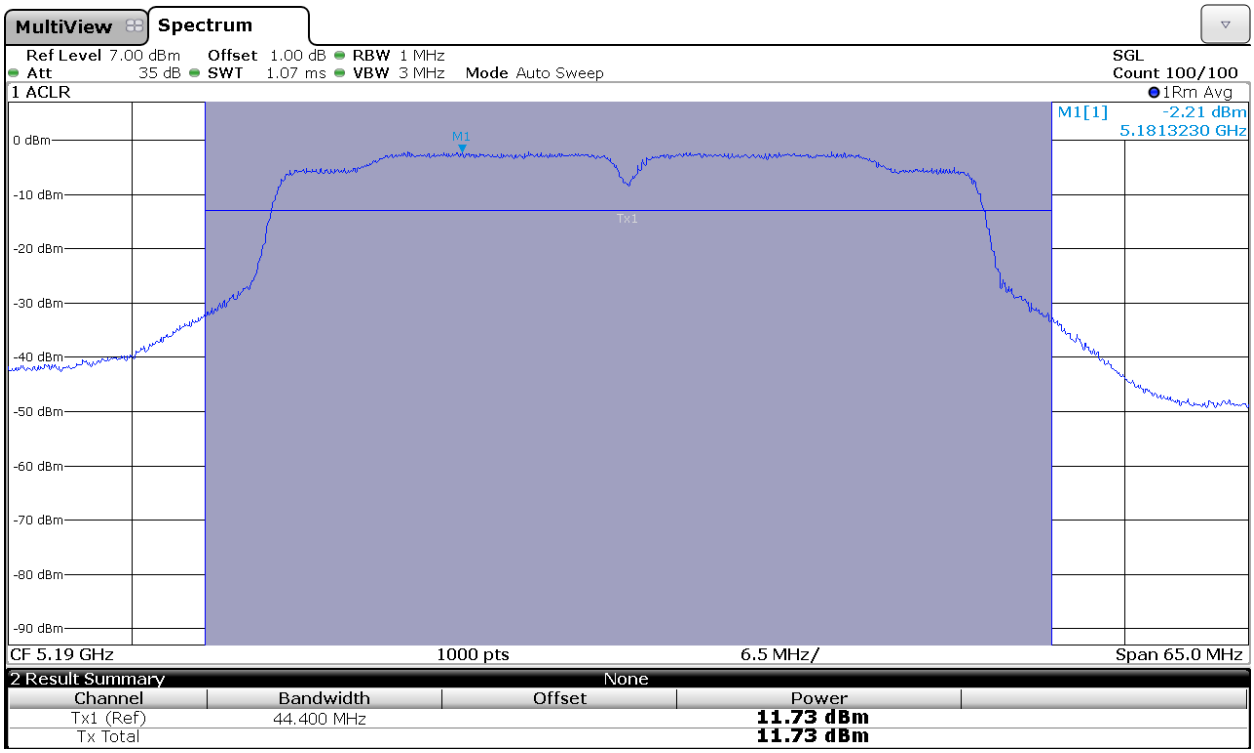


Highest Channel. Chain B.

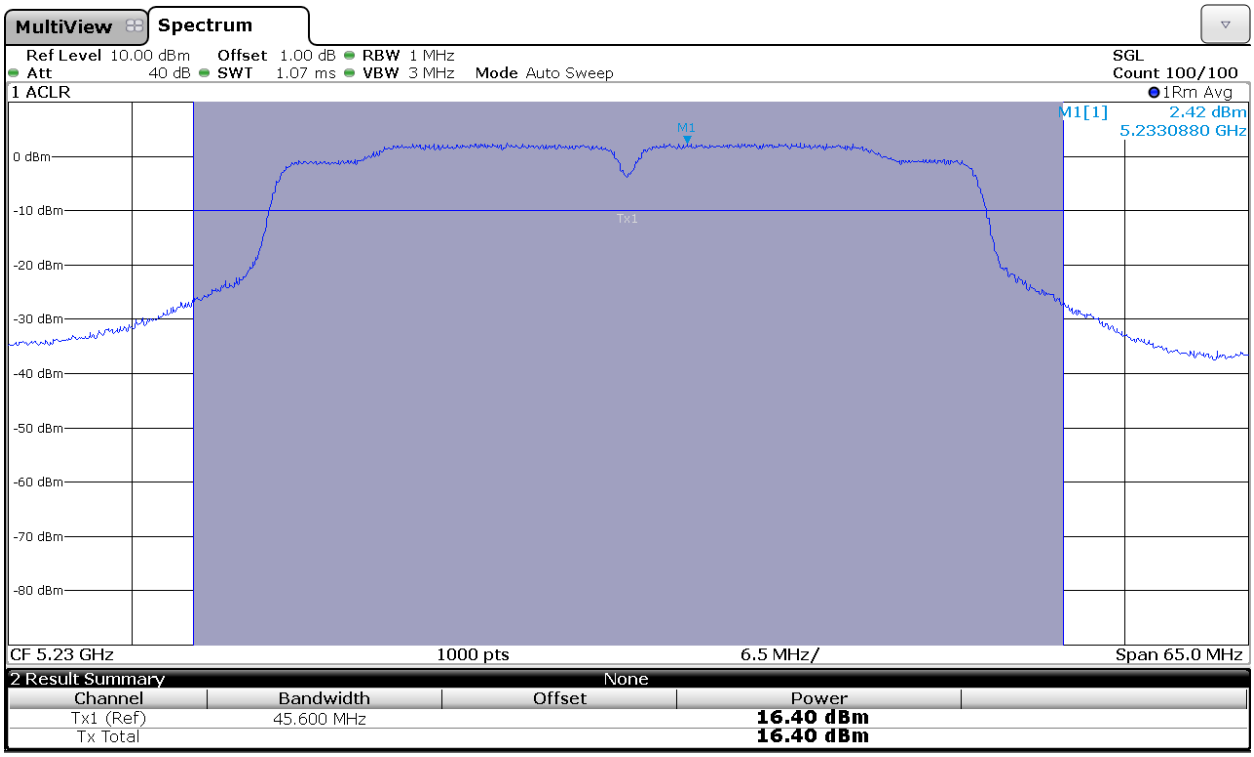


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

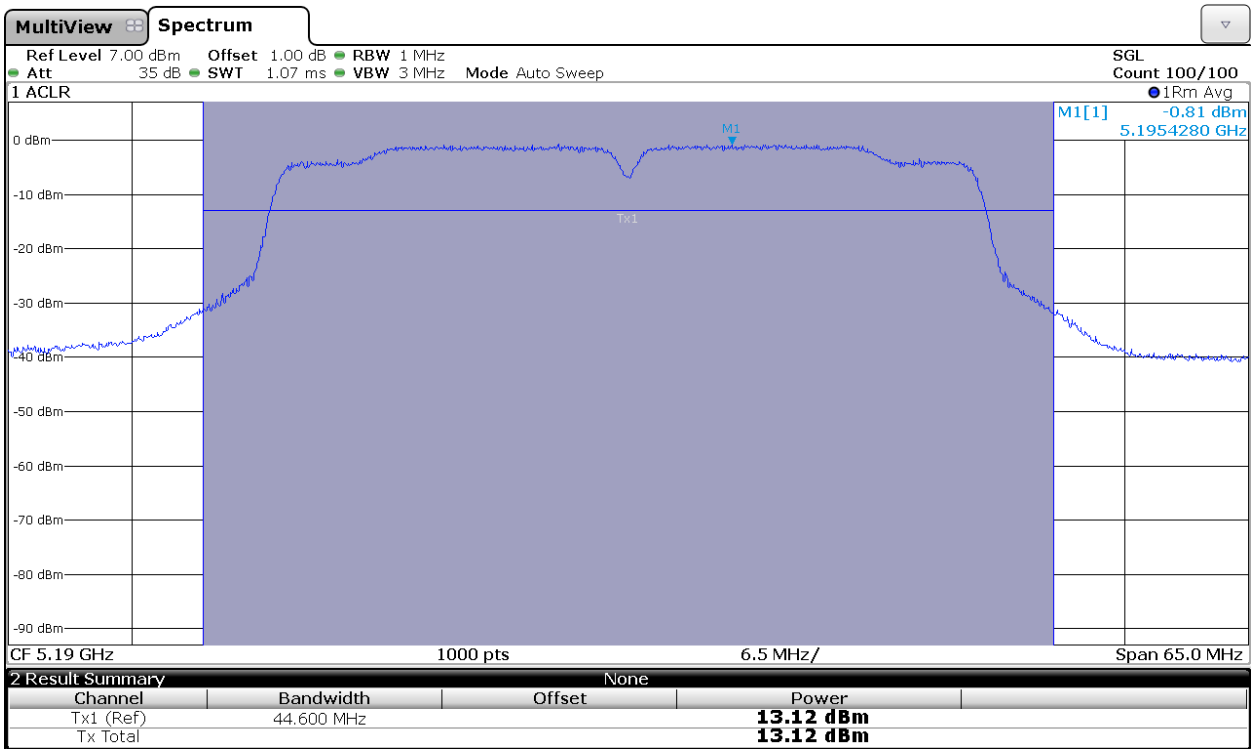


Highest Channel

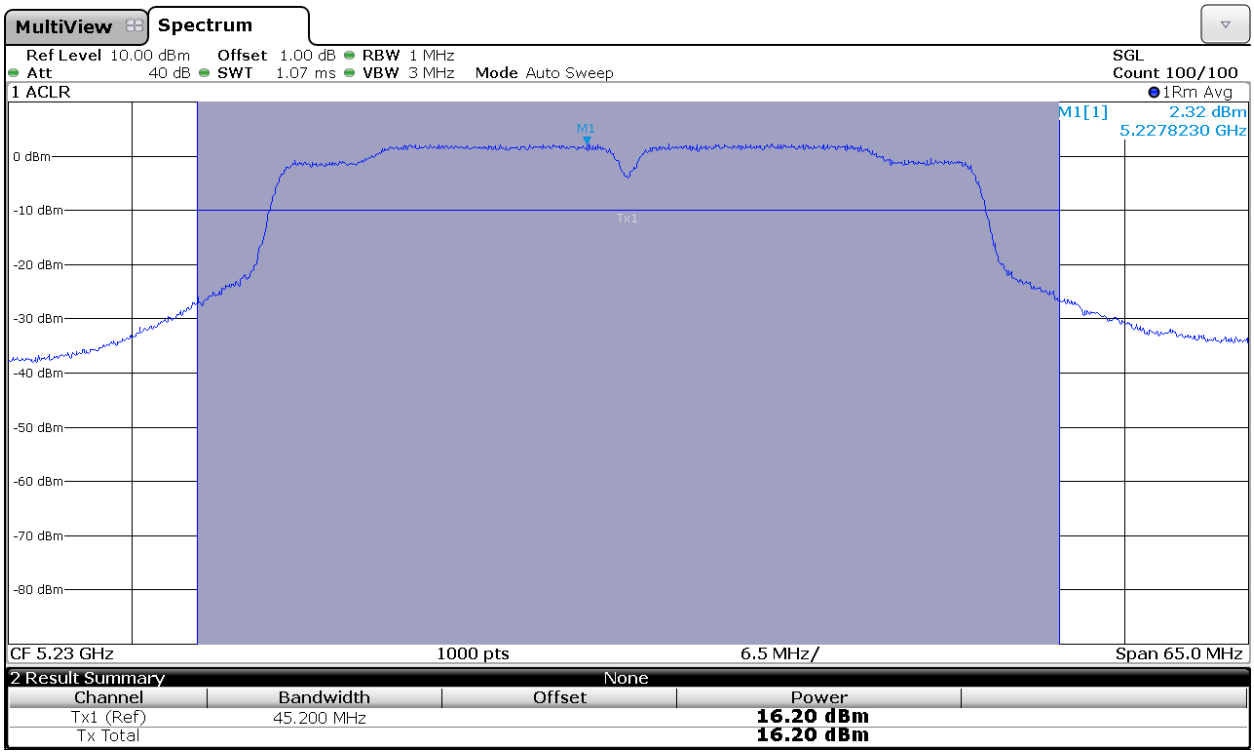


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

Lowest Channel

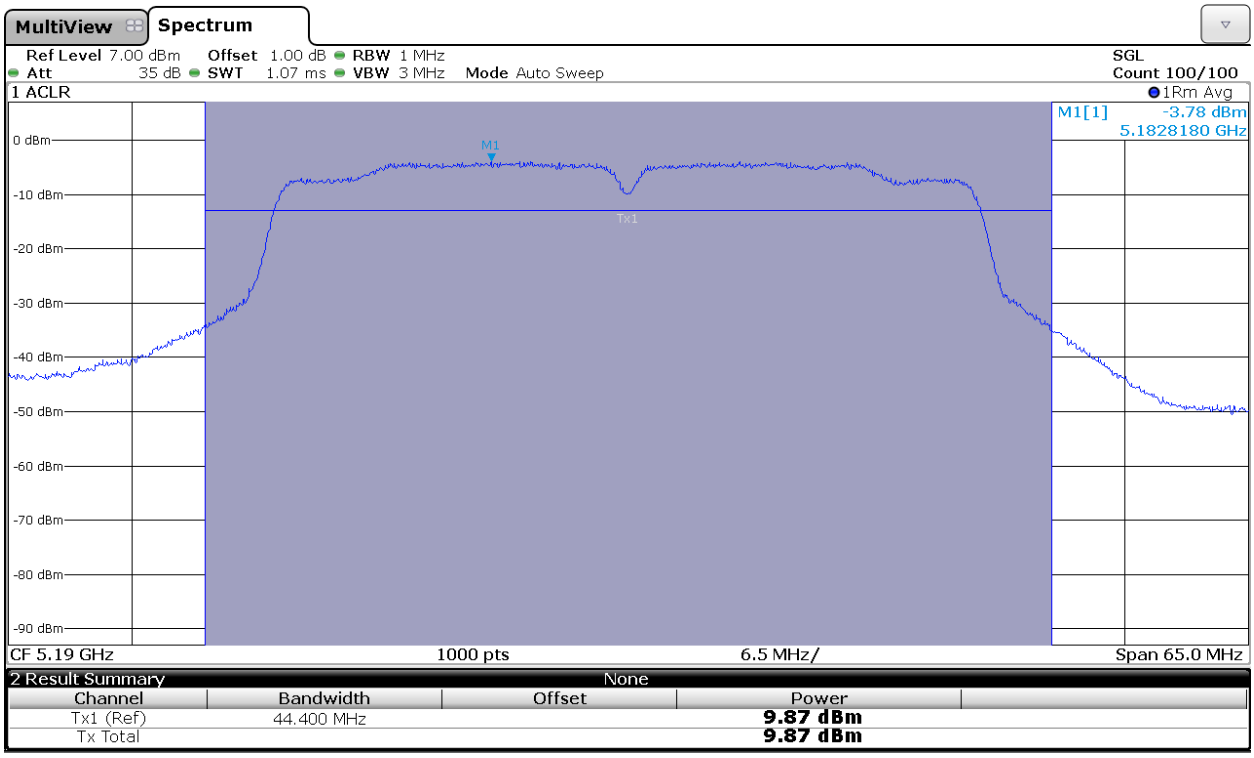


Highest Channel



802.11 n40 MHz and 802.11 ac 40 MHz modes MIMO CHAIN A+B

Lowest Channel. Chain A



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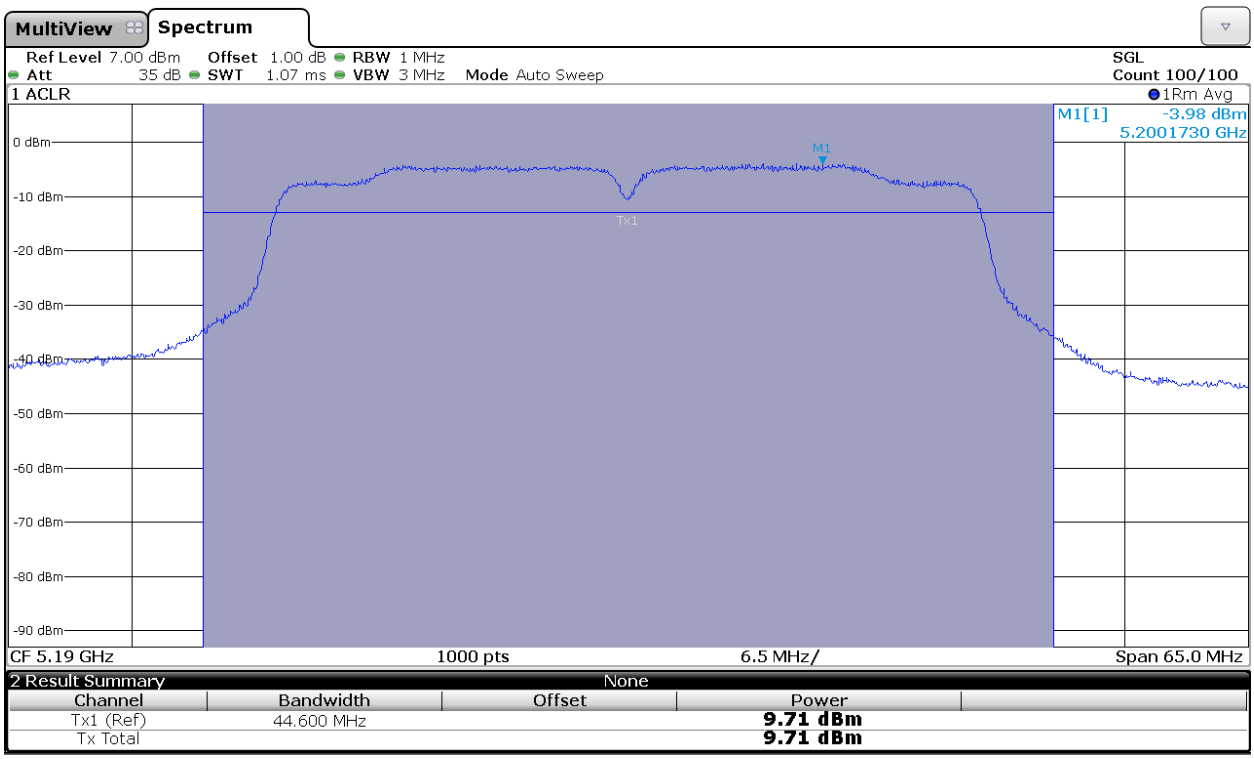
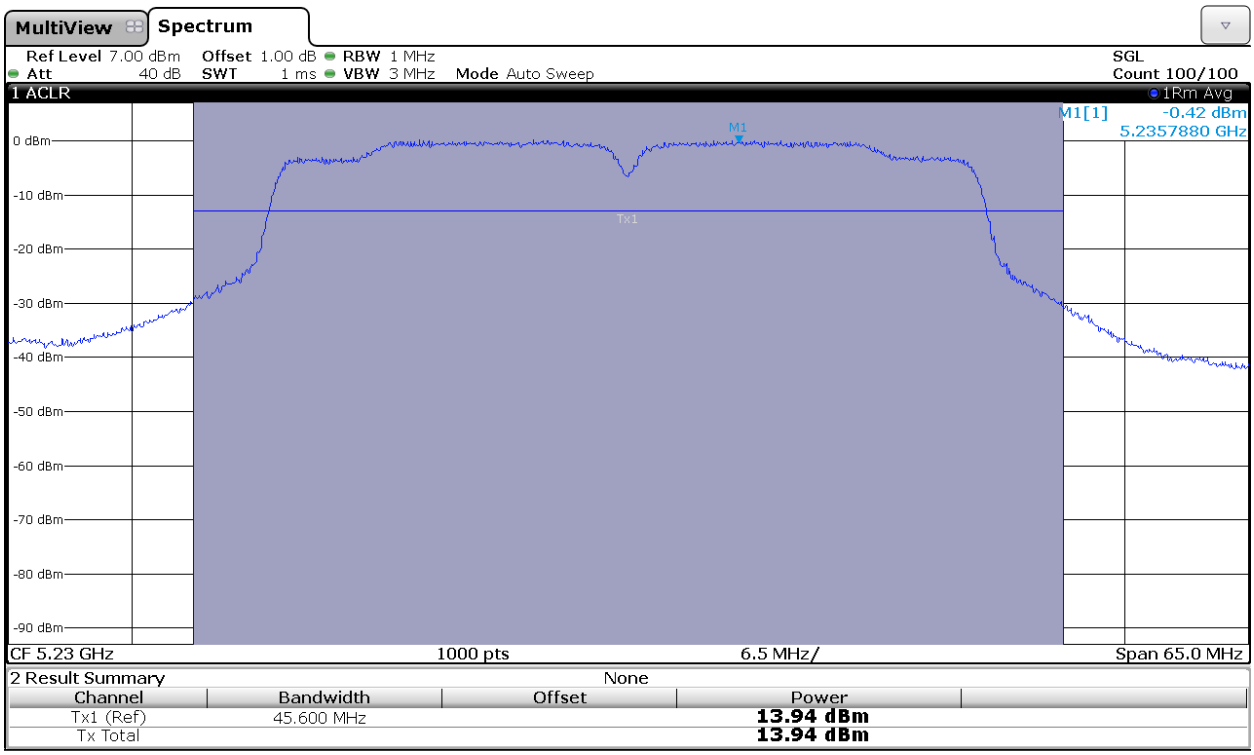
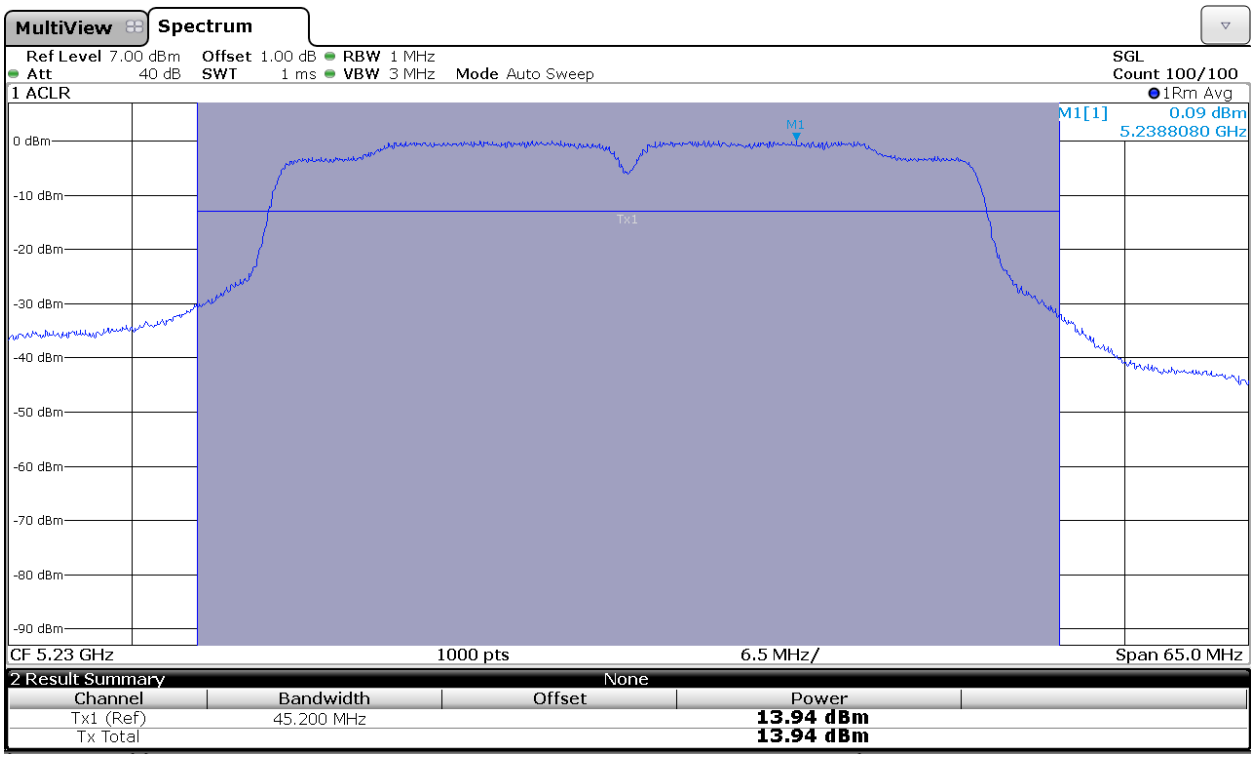
Lowest Channel. Chain B.



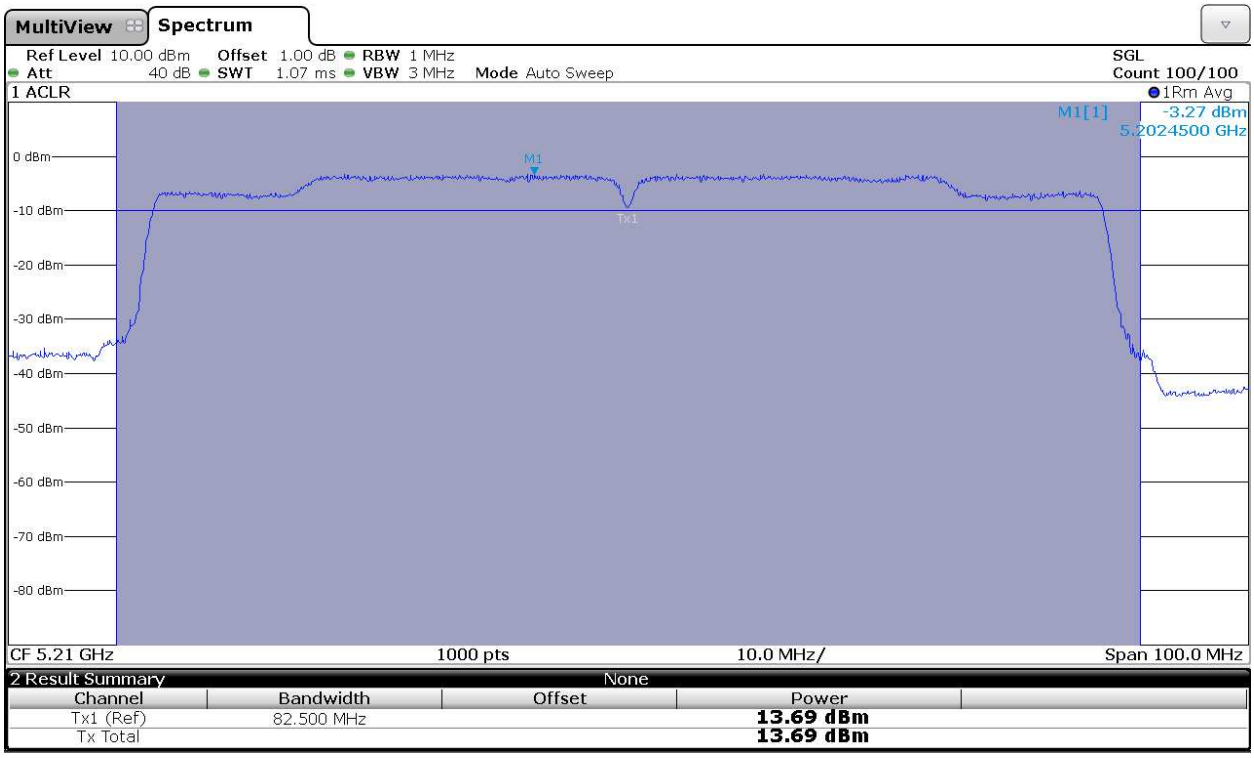
Highest Channel. Chain A.



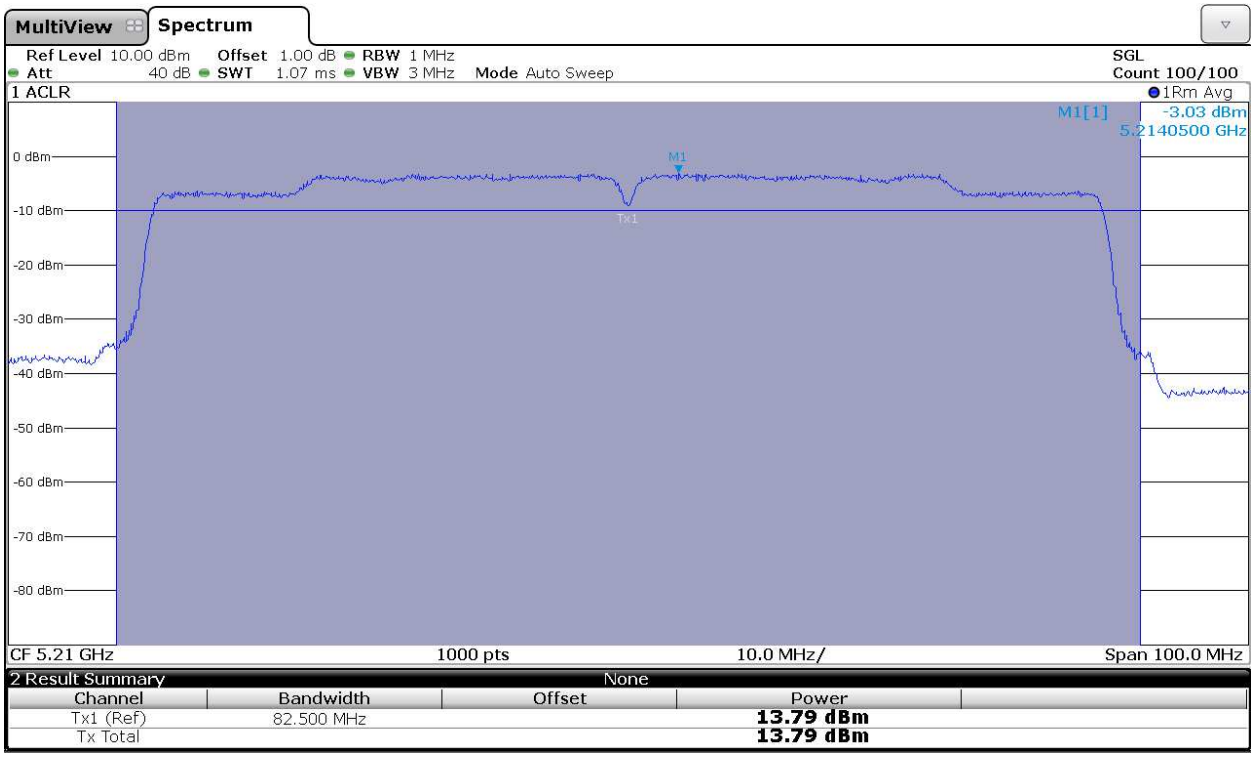
Highest Channel. Chain B.



802.11 ac 80 MHz mode CHAIN A

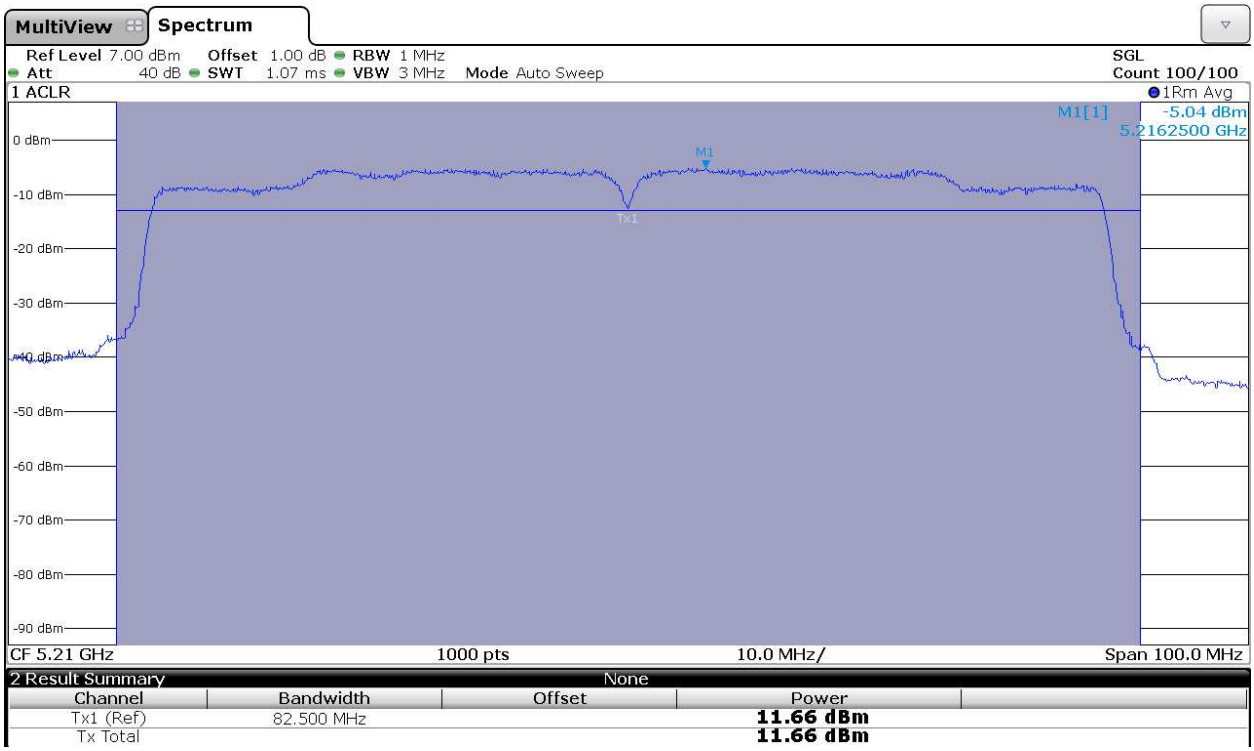


802.11 ac 80 MHz mode CHAIN B

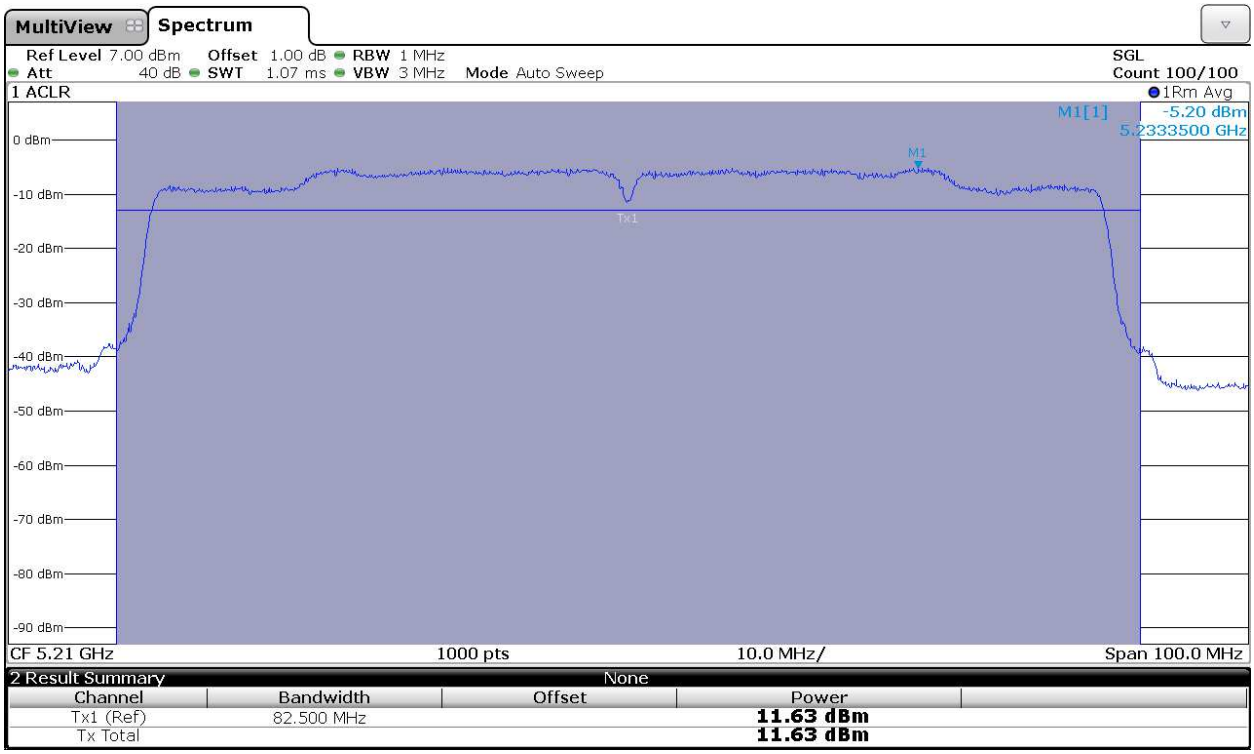


802.11 ac 80 MHz mode MIMO CHAIN A+B

Chain A



Chain B.



Section 15.407 Subclause (a) (6). Peak excursion ratio of the modulation envelope

SPECIFICATION

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

RESULTS

The peak excursion was measured using the method according to point F) of Guidance 789033 D01.

1. 802.11a mode (see next plots).

CHAIN A

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	13.02	3.87	9.15

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	13.51	3.96	9.55

Measurement uncertainty = ±1.2 dB

Verdict: PASS

2. 802.11 n20 MHz and 802.11 ac 20 MHz modes. (see next plots).

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

CHAIN A

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	12.67	3.94	8.73

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	13.54	3.91	9.63

Measurement uncertainty = ±1.2 dB

Verdict: PASS

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes. (see next plots).

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

CHAIN A

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5230 MHz	11.69	2.42	9.27

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5230 MHz	11.52	2.32	9.20

Measurement uncertainty = ±1.2 dB

Verdict: PASS

4. 802.11 ac 80 MHz mode. (see next plots).

CHAIN A

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5210 MHz	6.38	-3.27	9.65

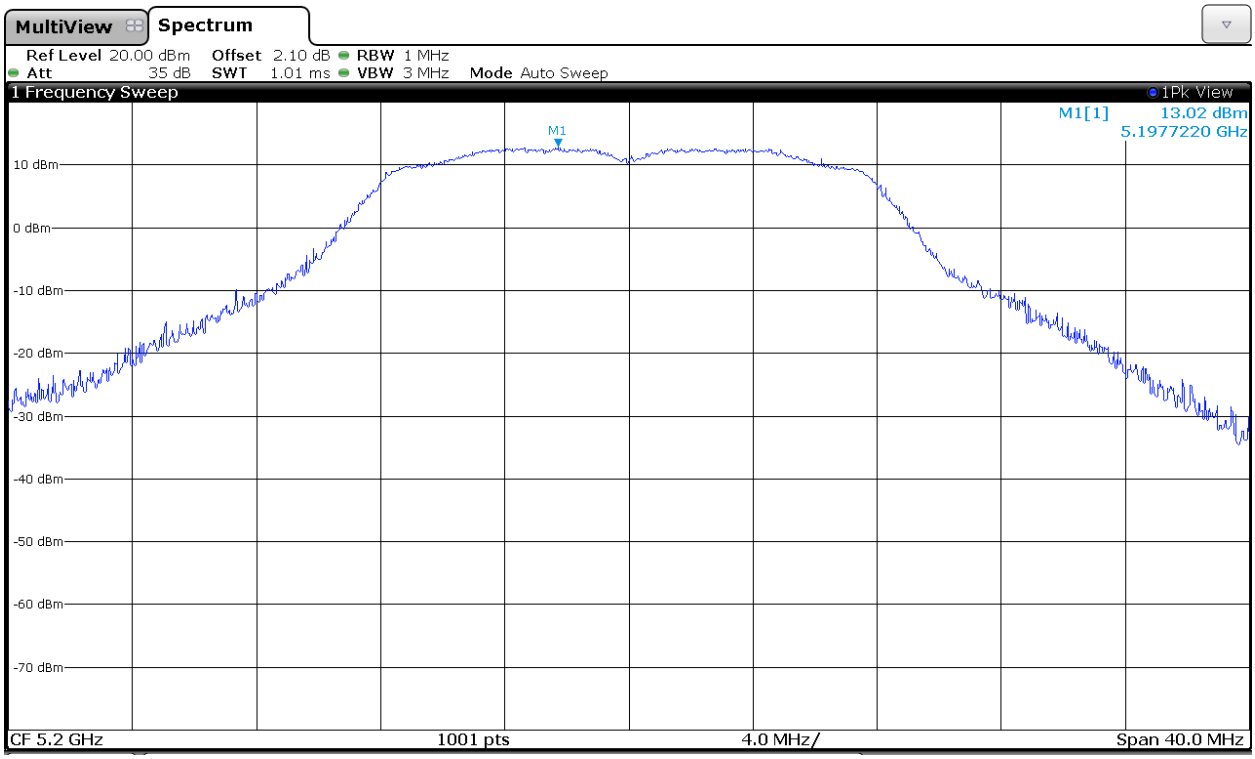
CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5210 MHz	6.81	-3.03	9.84

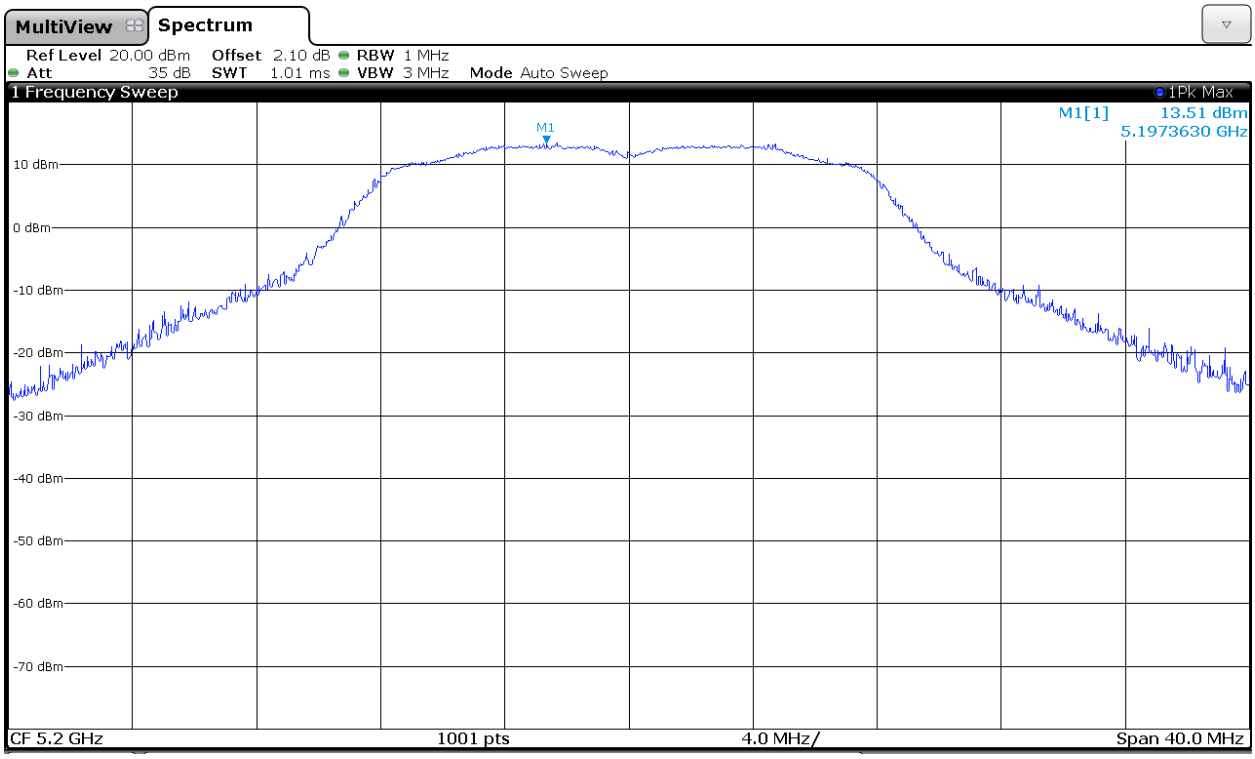
Measurement uncertainty = ±1.2 dB

Verdict: PASS

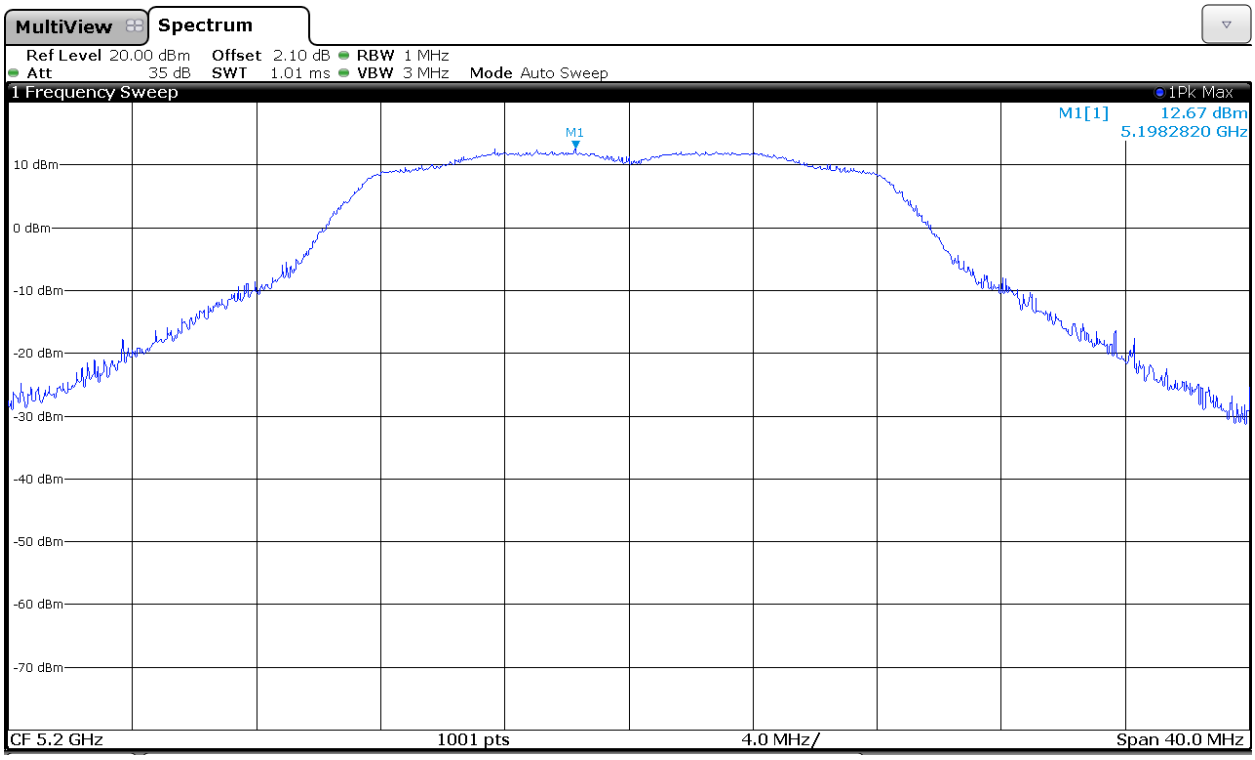
802.11a mode CHAIN A



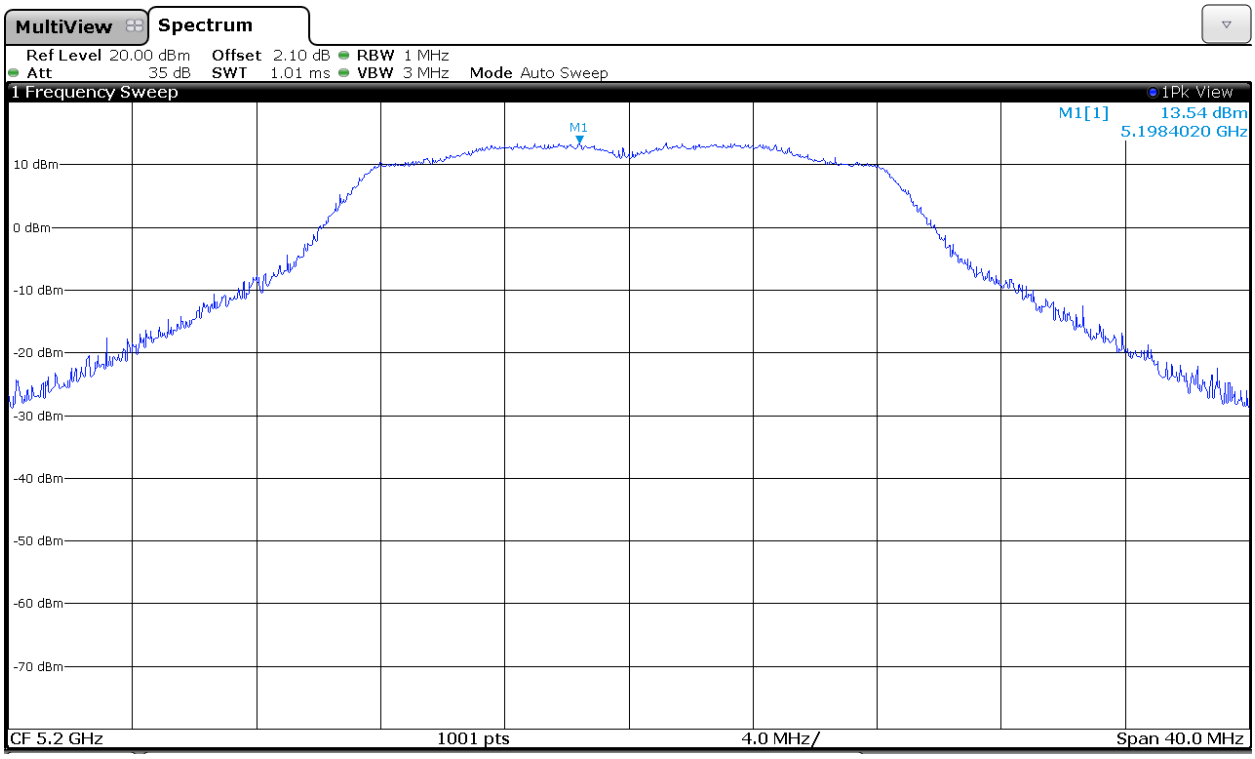
802.11a mode CHAIN B



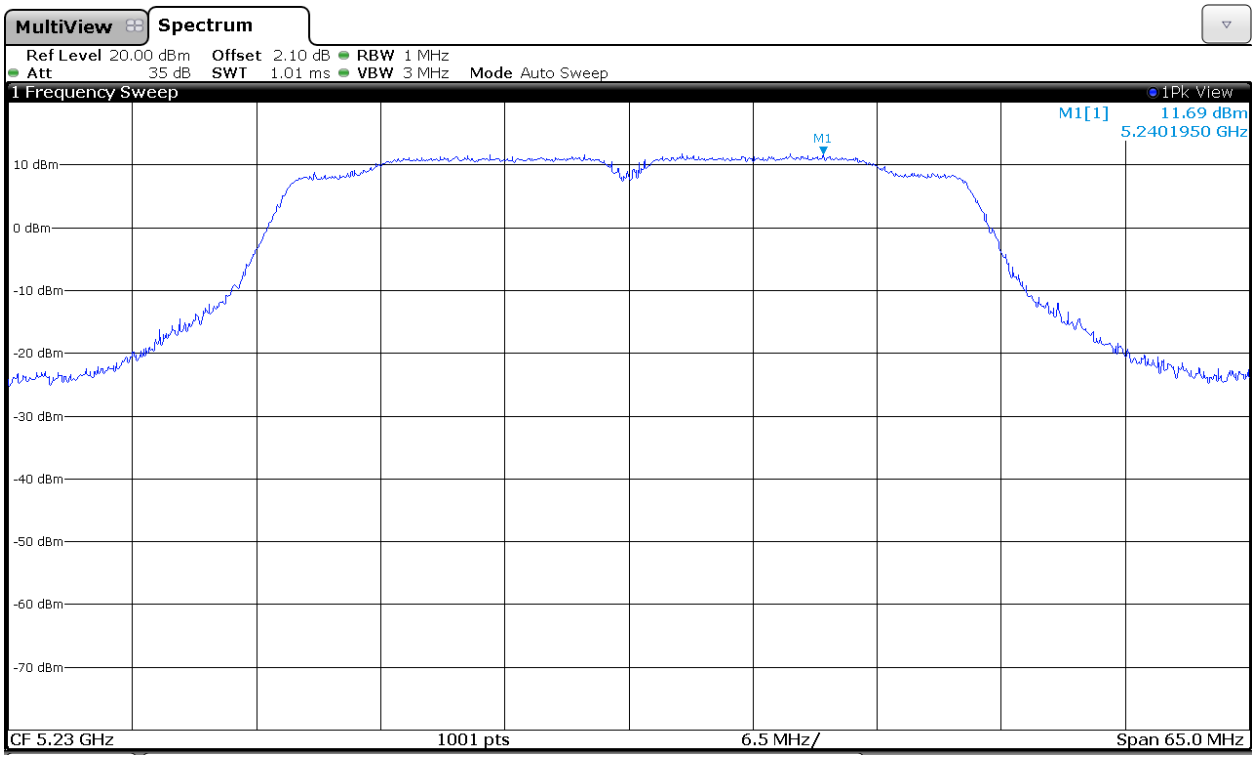
802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A



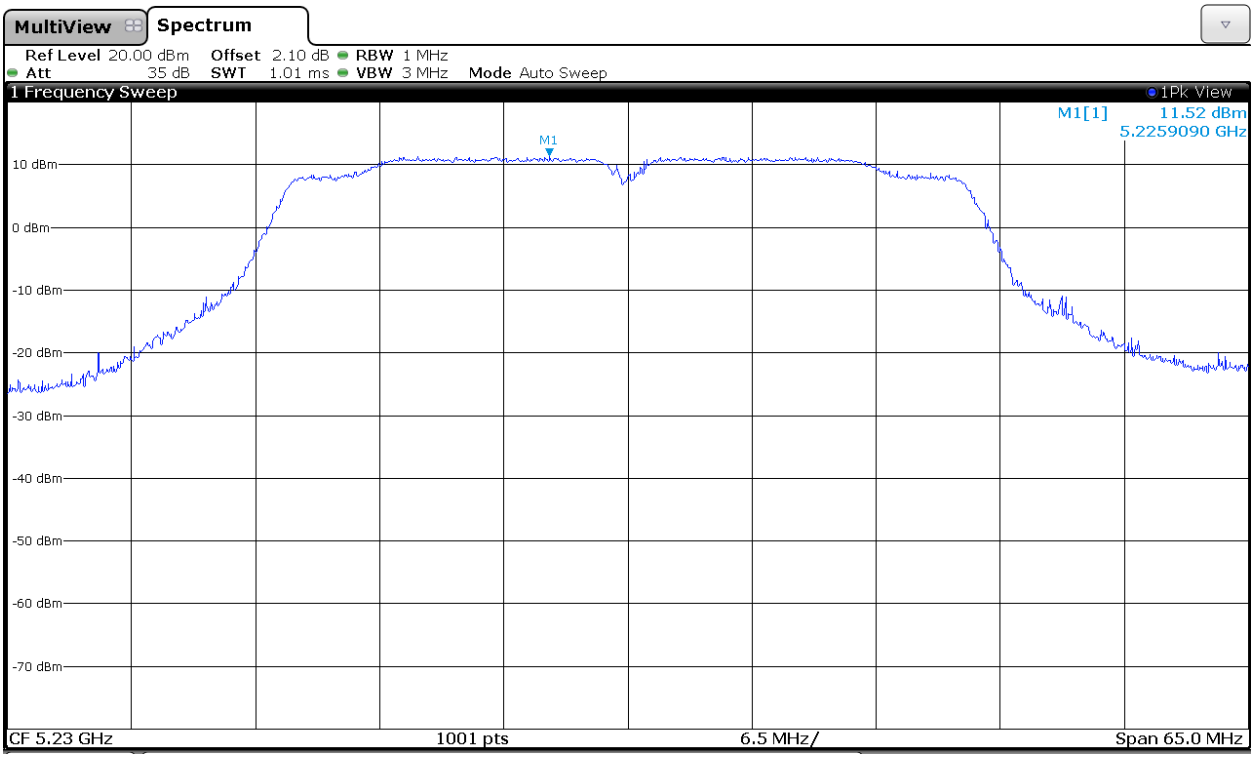
802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B



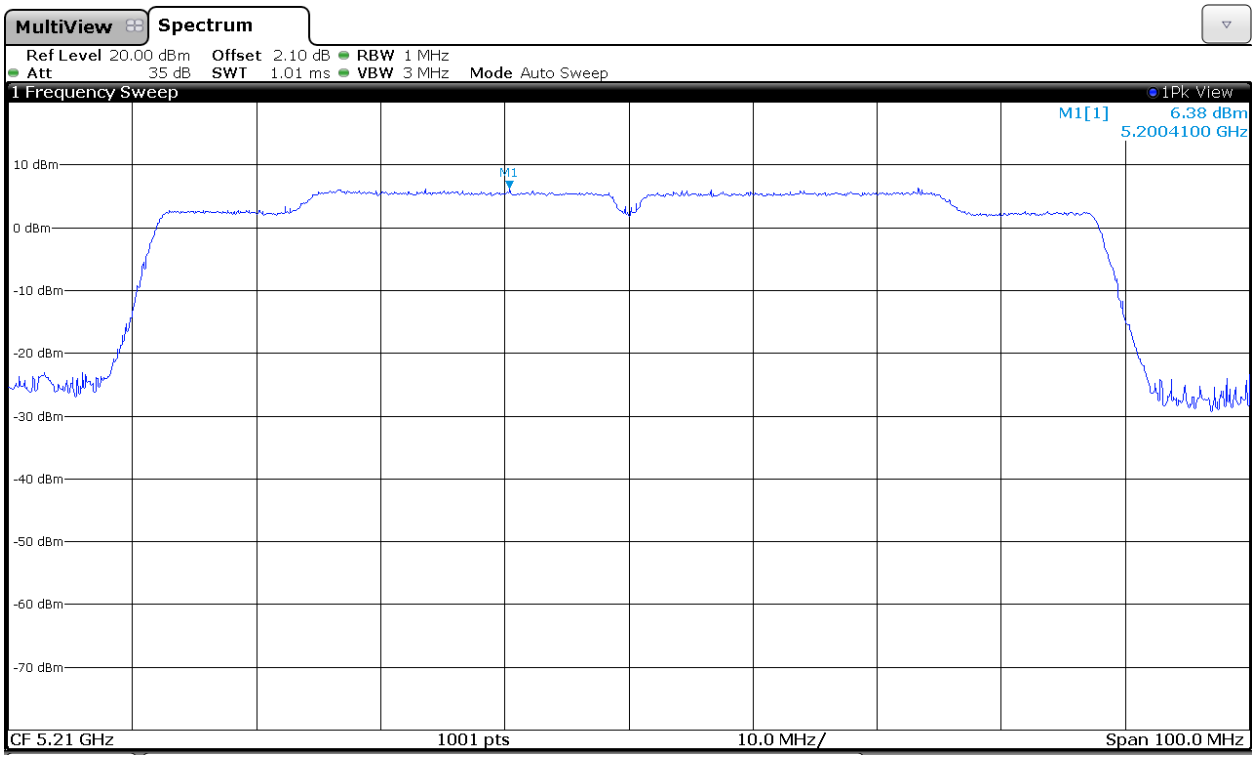
802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A



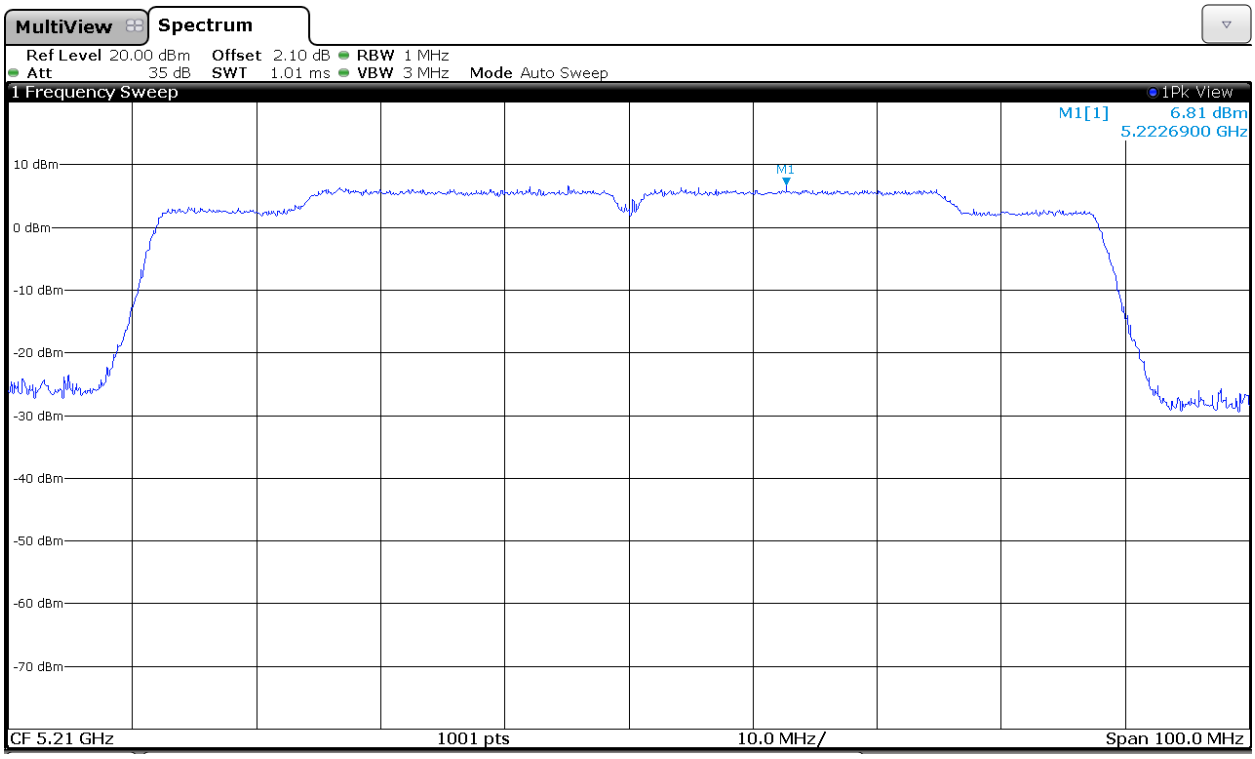
802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B



802.11 ac 80 MHz mode CHAIN A



802.11 ac 80 MHz mode CHAIN B



Section 15.407 Subclause (b) (1) / RSS-210 A.9.2. (1). Undesirable radiated emissions (Transmitter) 1 to 40 GHz

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 360º 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 1m for the frequency range 1 GHz-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.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

Frequency range 30 MHz-1 GHz

The spurious signals detected do not depend on either the operating channel or the modulation mode.

Spurious levels closest to limit:

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
158.04	PV	Quasi-Peak	28.16	± 4.12
257.95	PV	Quasi-Peak	25.83	± 4.12
340.40	PV	Quasi-Peak	32.06	± 4.12
484.93	PV	Quasi-Peak	30.53	± 4.12

Frequency range 1 GHz-40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz range including the restricted band 4.5-5.15 GHz (see next plots).

For OFDM modulation modes (802.11a, 802.11n20, 802.11n40 and 802.11ac80), a preliminary measurement in the central channel in the range 1-18 GHz was performed to determine the worst case. The lowest and highest channels were measured for out-of-band emissions for the worst case (802.11a).

The field strength at the band edges was evaluated for each mode and on each chain individually on the lowest and highest channels at the rated power for the channel under test. Where the power at the edge channels was lower than the power at the center channels additional measurements were made at the adjacent channels. Single transmission at each chain and simultaneous transmission at both chains modes were fully evaluated.

Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14939	V	Peak	55.01	± 4.00
		Average	44.26	± 4.00
10.36024	V	Peak	49.31	± 4.00
15.53920	V	Peak	58.19	± 4.00
		Average	48.69	± 4.00
20.71950	V	Peak	51.96	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14874	V	Peak	56.19	± 4.00
		Average	44.84	± 4.00
15.54084	V	Peak	54.73	± 4.00
		Average	45.29	± 4.00
20.72050	V	Peak	51.32	± 4.00

Middle frequency 5200 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14663	V	Peak	53.85	± 4.00
10.39981	V	Peak	48.62	± 4.00
15.60006	V	Peak	63.55	± 4.00
		Average	53.01	± 4.00
20.79950	V	Peak	52.41	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14858	V	Peak	54.77	± 4.00
		Average	44.92	± 4.00
15.59991	V	Peak	60.76	± 4.00
		Average	49.53	± 4.00
20.7995	V	Peak	51.93	± 4.00

Highest frequency 5240 MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
10.47996	V	Peak	50.49	± 4.00
15.71786	V	Peak	65.11	± 4.00
		Average	53.42	± 4.00
20.95950	V	Peak	51.46	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
15.72092	V	Peak	60.32	± 4.00
		Average	49.83	± 4.00
20.95950	V	Peak	50.53	± 4.00

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

Lowest frequency 5180 MHz. Spurious emissions inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14907	V	Peak	54.77	± 4.00
		Average	44.33	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14915	V	Peak	55.10	± 4.00
		Average	45.14	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14703	V	Peak	56.74	± 4.00
		Average	44.51	± 4.00

Middle frequency 5200 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14996	V	Peak	55.22	± 4.00
		Average	44.23	± 4.00
10.40025	V	Peak	48.77	± 4.00
15.60072	V	Peak	61.21	± 4.00
		Average	52.68	± 4.00
20.79950	V	Peak	52.36	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14638	V	Peak	54.98	± 4.00
		Average	44.94	± 4.00
15.60037	V	Peak	59.61	± 4.00
		Average	49.42	± 4.00
20.80050	V	Peak	51.61	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14671	V	Peak	56.50	± 4.00
		Average	44.31	± 4.00
15.59902	V	Peak	59.36	± 4.00
		Average	49.52	± 4.00
20.7995	V	Peak	52.08	± 4.00

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Lowest frequency 5190 MHz. Spurious emissions inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14955	V	Peak	57.42	± 4.00
		Average	47.18	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14866	V	Peak	56.98	± 4.00
		Average	48.66	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14963	V	Peak	55.23	± 4.00
		Average	45.27	± 4.00

Highest frequency 5230 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14907	V	Peak	56.91	± 4.00
		Average	47.17	± 4.00
15.69495	V	Peak	61.61	± 4.00
		Average	52.15	± 4.00
20.91950	V	Peak	51.75	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14996	V	Peak	56.93	± 4.00
		Average	46.49	± 4.00
15.69977	V	Peak	57.70	± 4.00
		Average	47.34	± 4.00
20.91950	V	Peak	51.04	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14809	V	Peak	55.37	± 4.00
		Average	43.52	± 4.00
10.46020	V	Peak	49.01	± 4.00
15.69070	V	Peak	58.43	± 4.00
		Average	47.44	± 4.00
20.92050	V	Peak	52.10	± 4.00

Verdict: PASS

4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 4.5-5.15 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14809	V	Peak	64.90	± 4.00
		Average	52.05	± 4.00
15.65629	V	Peak	52.33	± 4.00
20.83950	V	Peak	51.00	± 4.00

Chain B

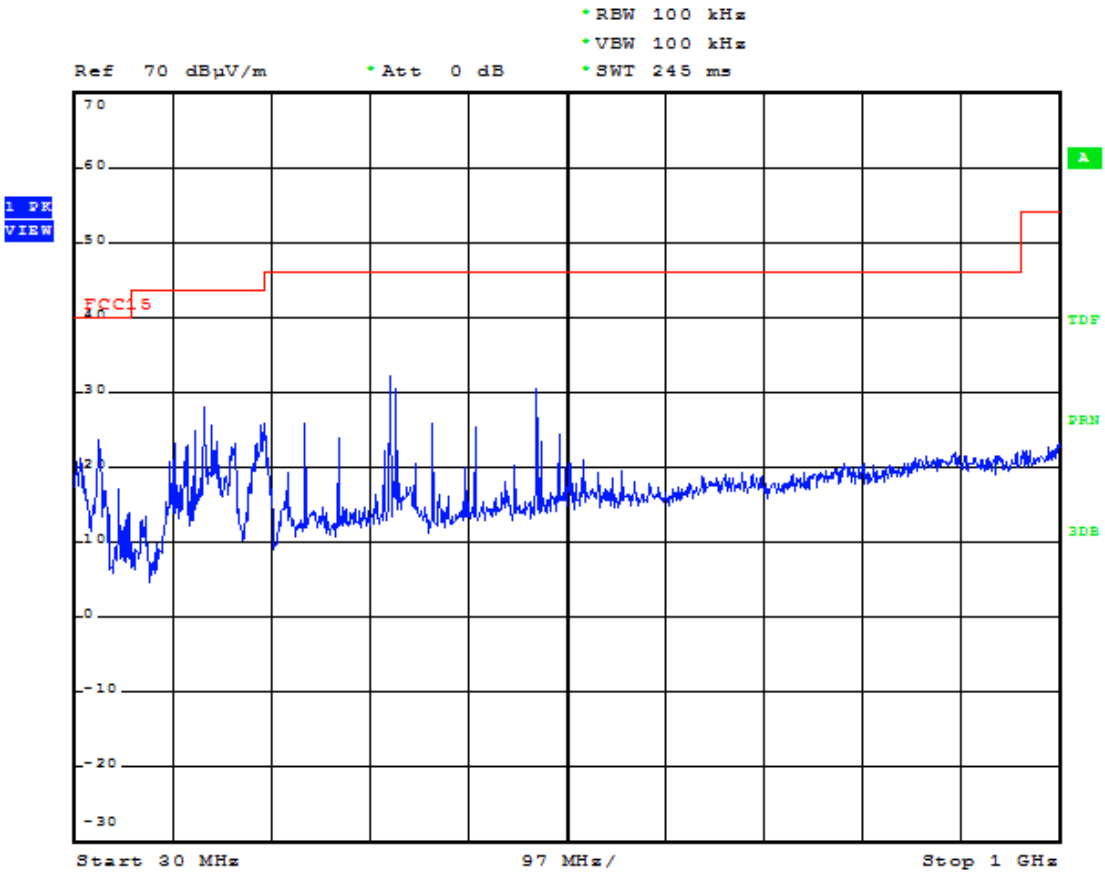
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14598	V	Peak	63.12	± 4.00
		Average	49.58	± 4.00
20.84050	V	Peak	50.54	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.14200	V	Peak	58.09	± 4.00
		Average	47.34	± 4.00
20.83950	V	Peak	50.87	± 4.00

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

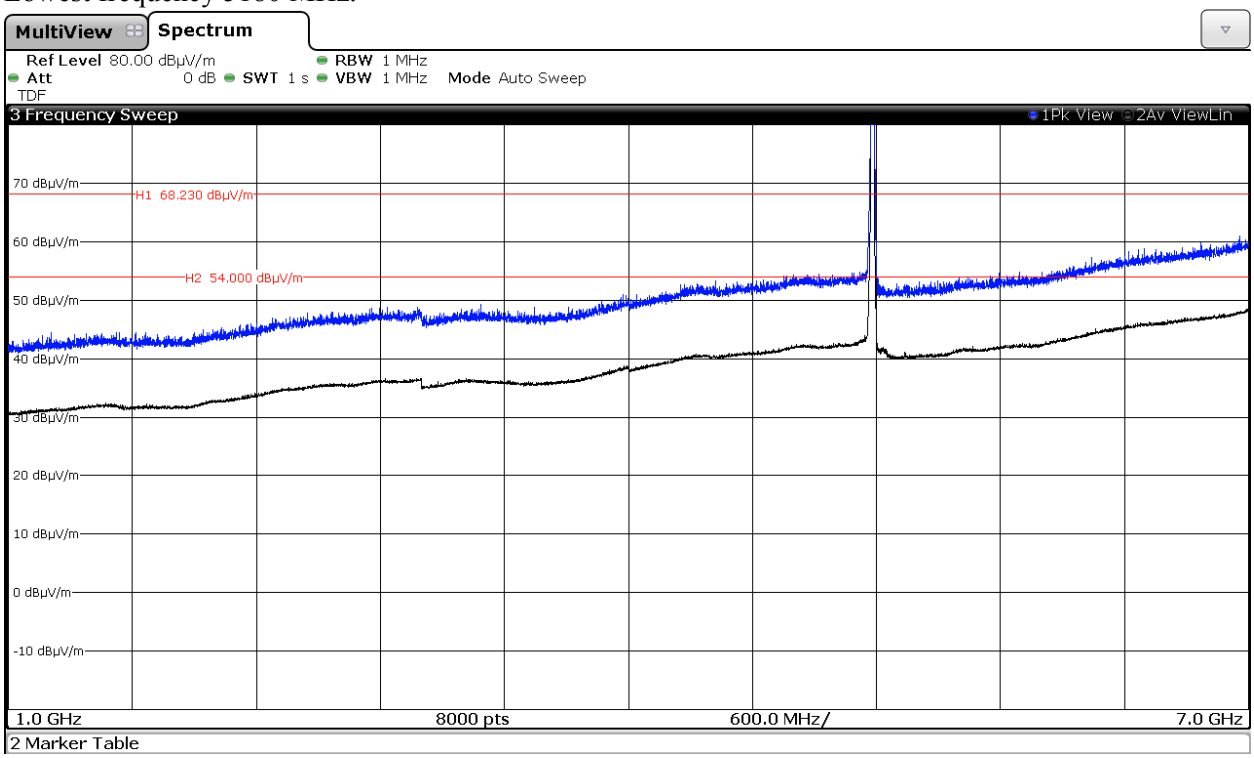


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 7 GHz.

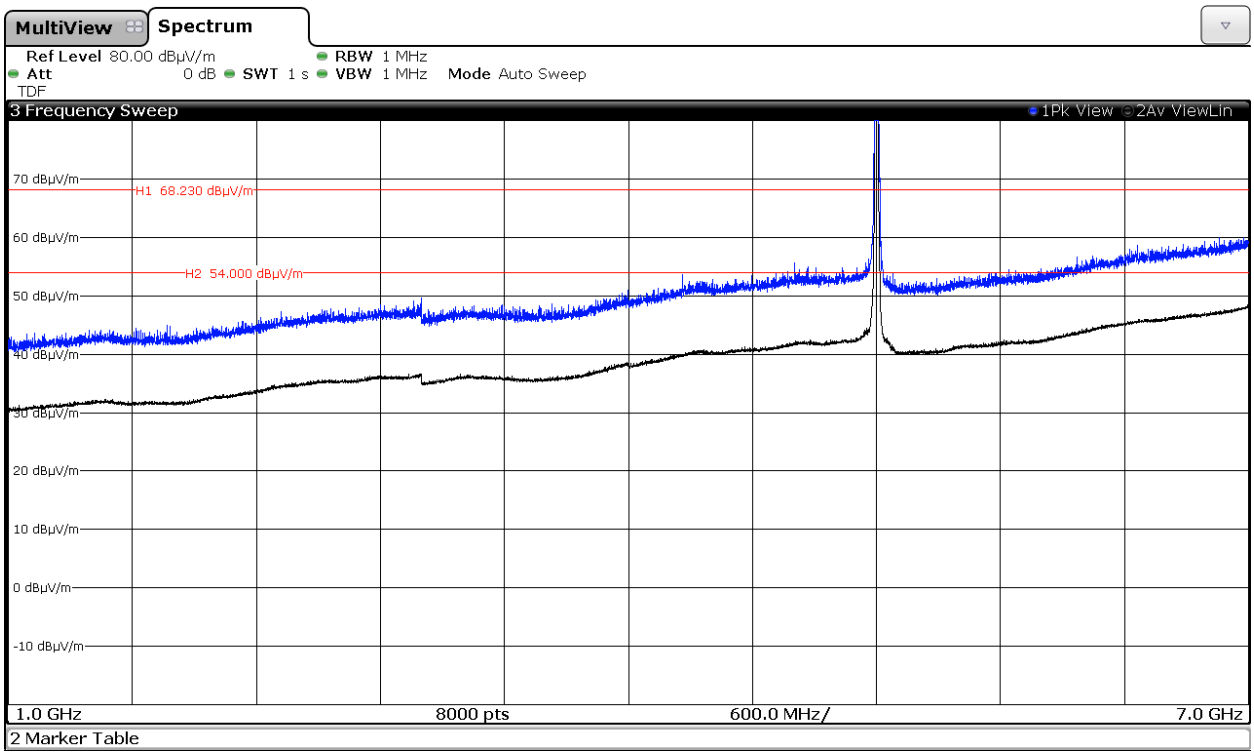
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.



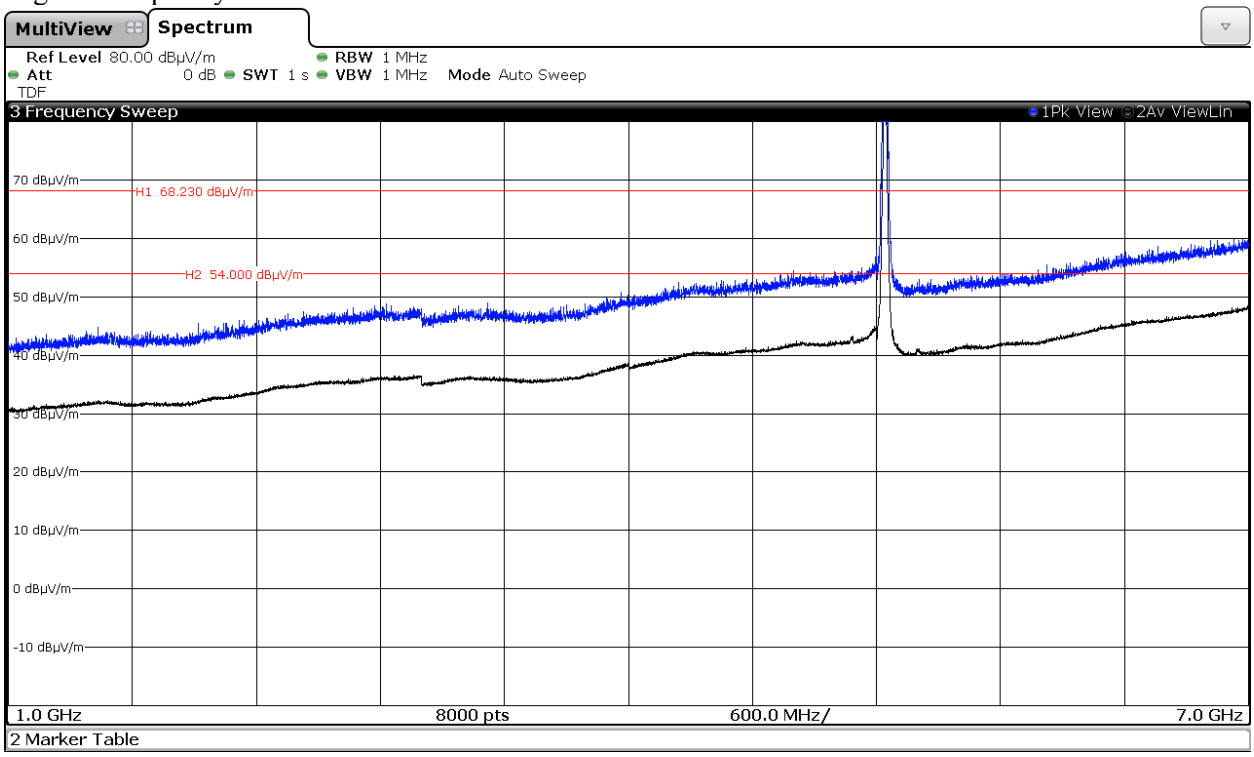
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

Middle frequency 5200 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

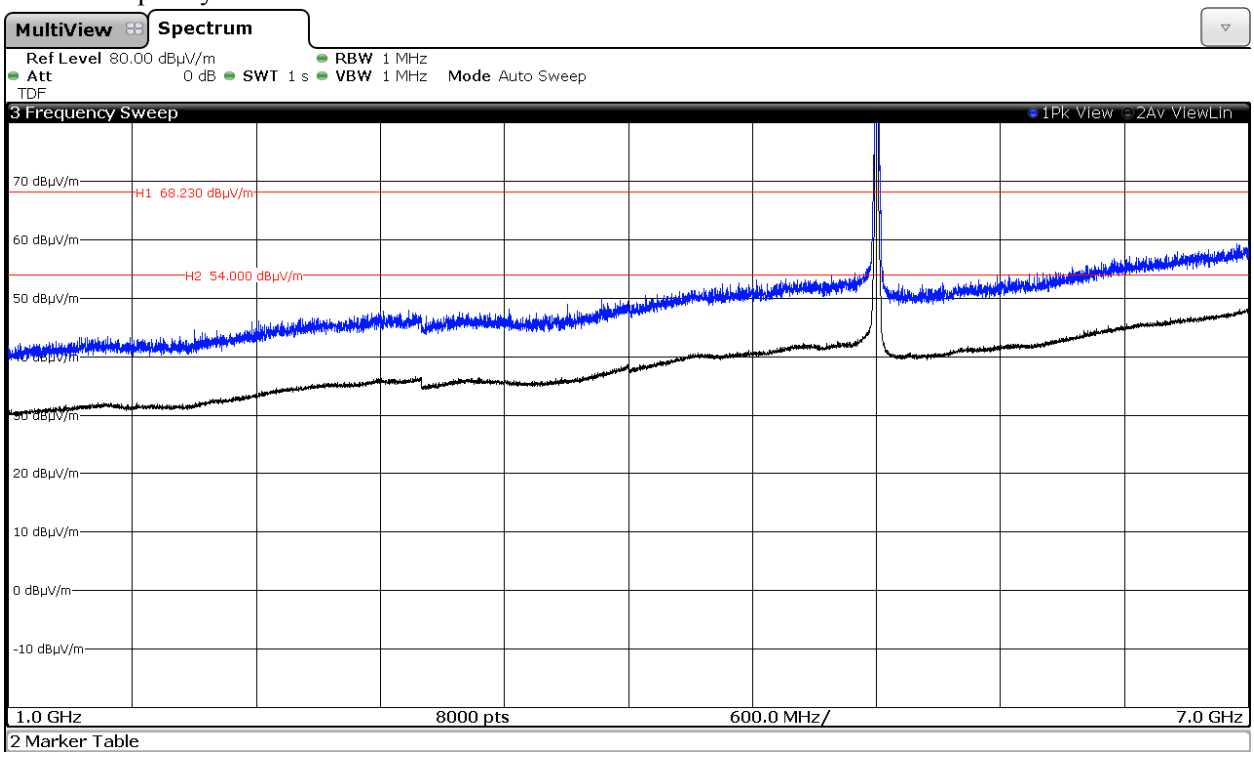
Highest frequency 5240 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

2. WiFi 5GHz 802.11 n20 mode

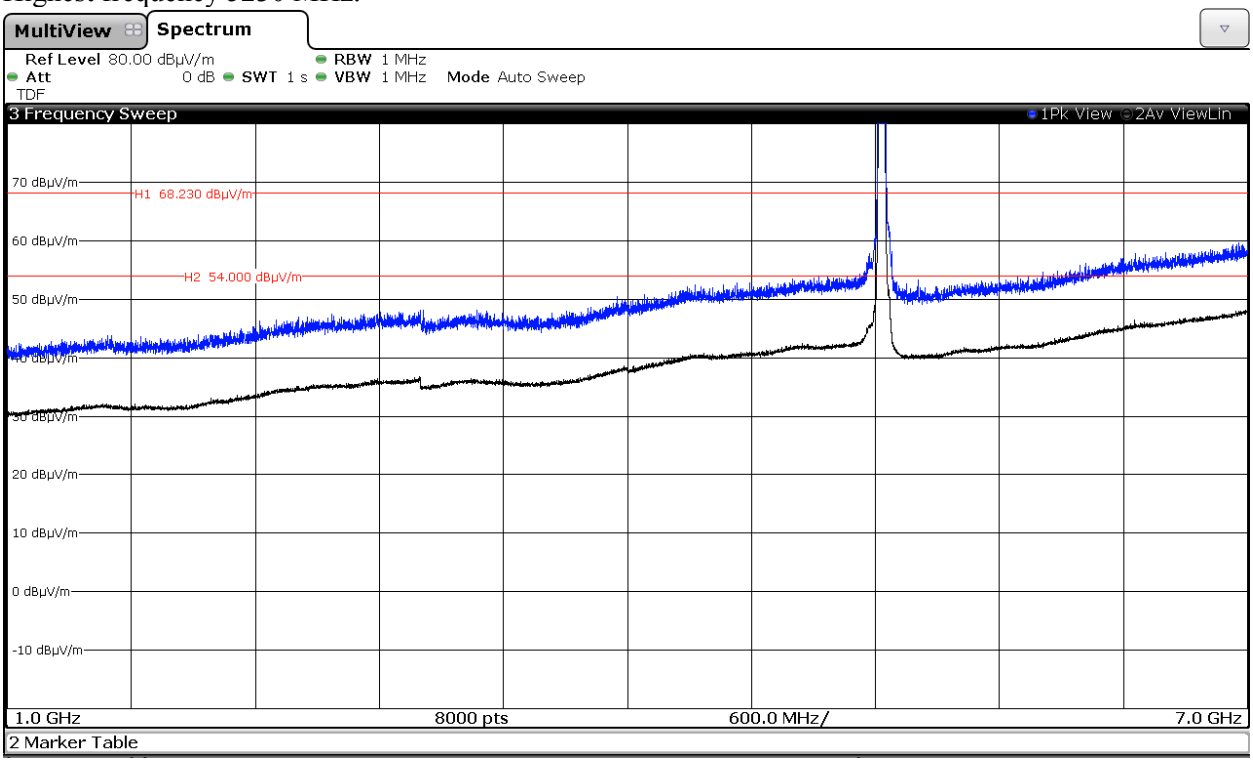
Middle frequency 5200 MHz.



The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B, Chain A+B.

3. WiFi 5GHz 802.11 n40 mode

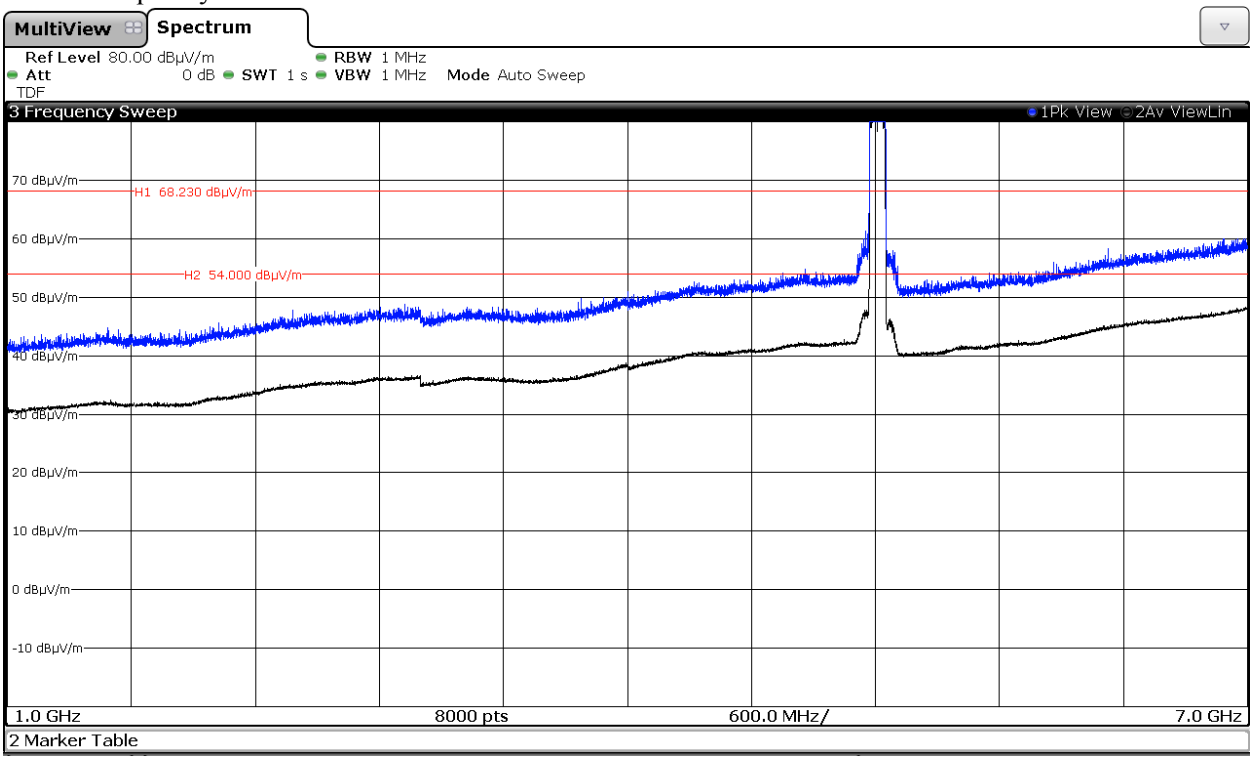
Highest frequency 5230 MHz.



The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B, Chain A+B.

4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.



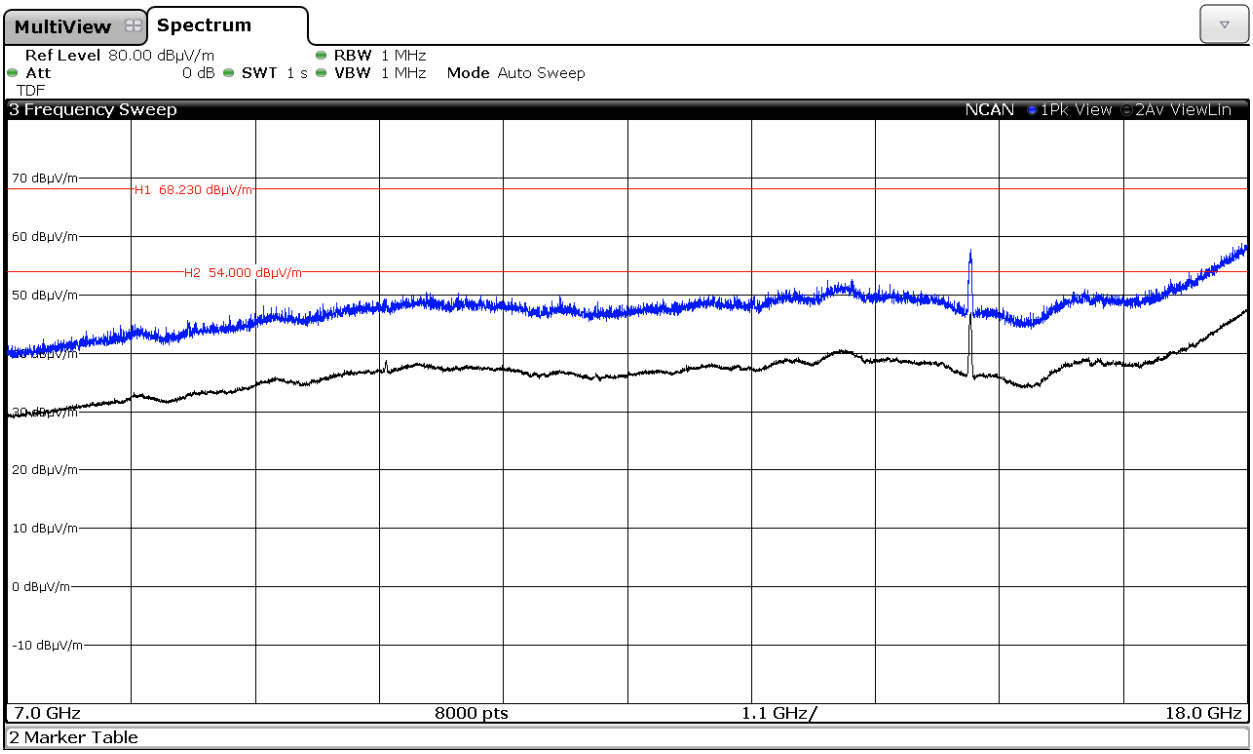
The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B, Chain A+B.

FREQUENCY RANGE 7 GHz to 18 GHz.

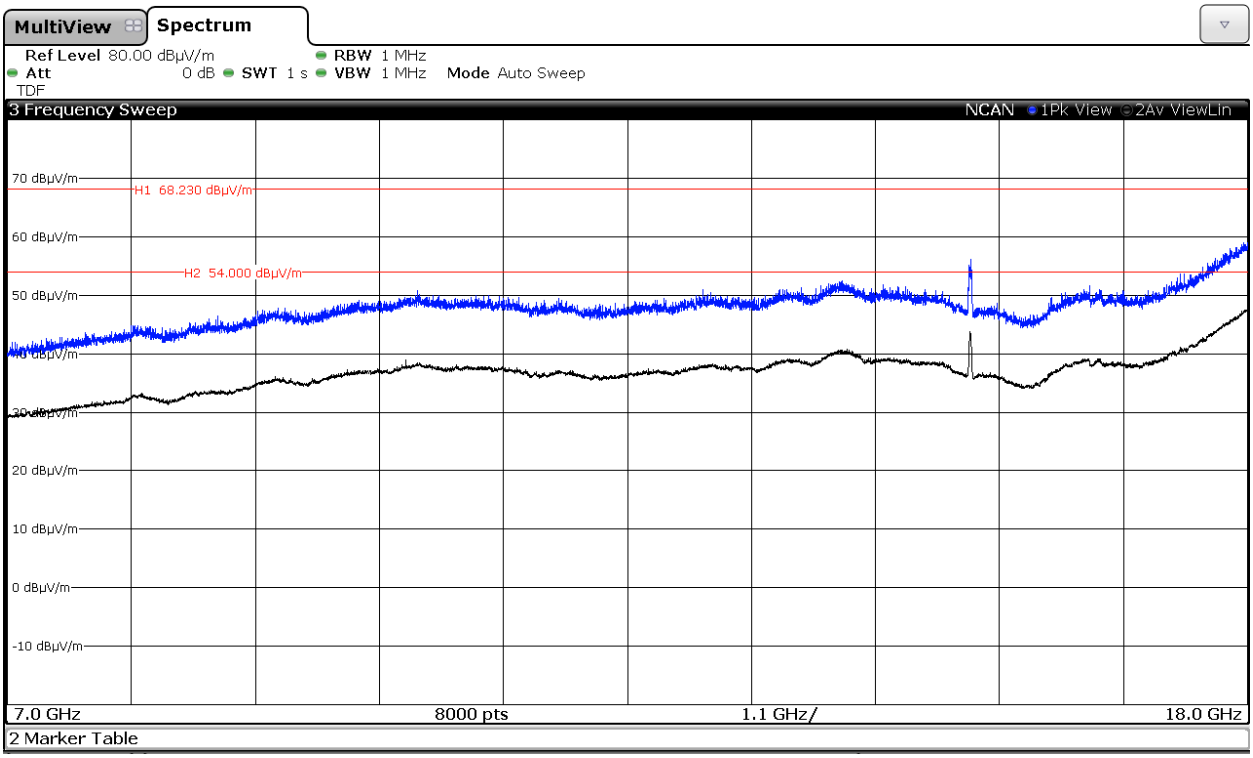
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

Chain A

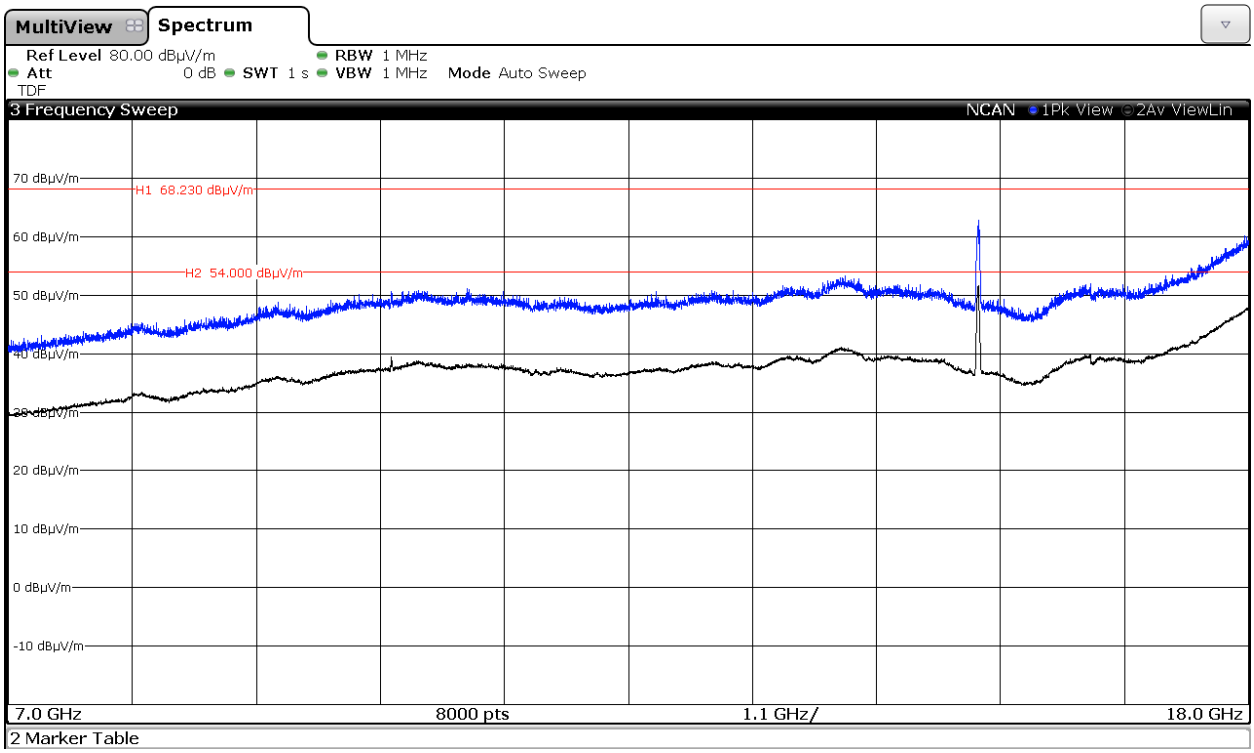


Chain B

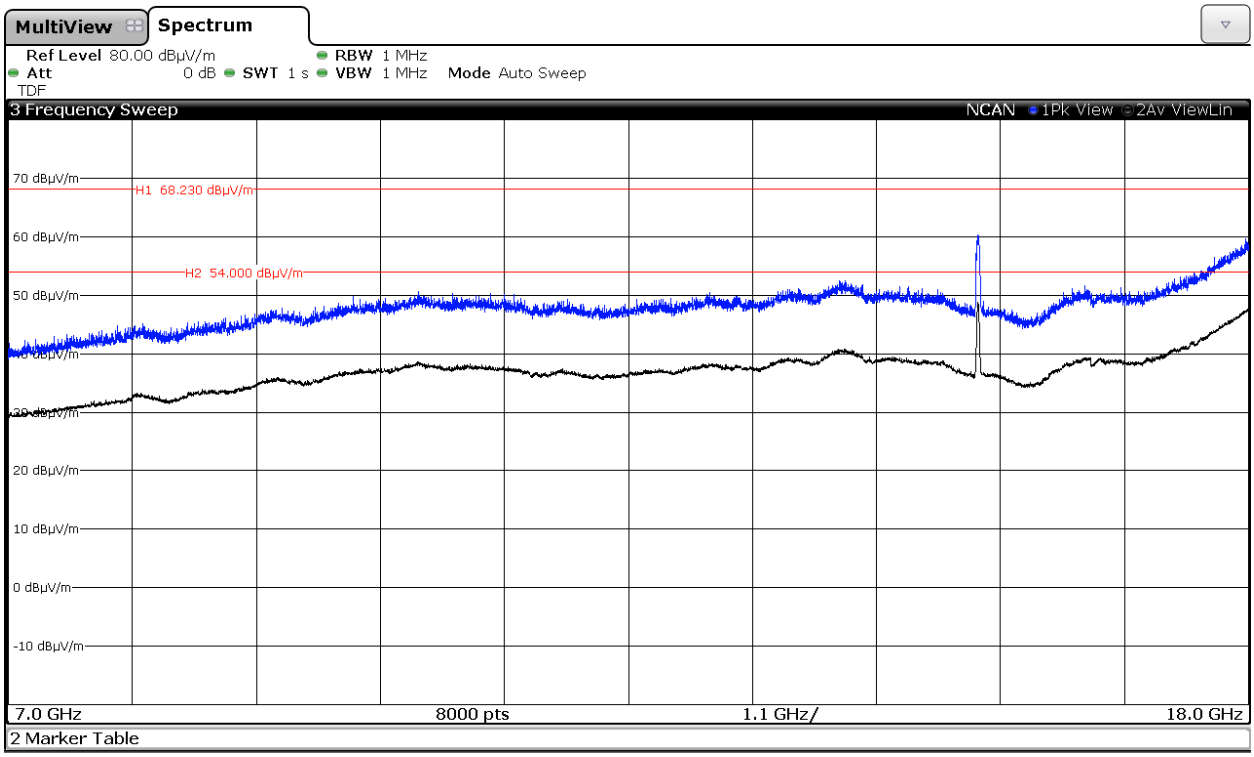


Middle frequency 5200 MHz.

Chain A

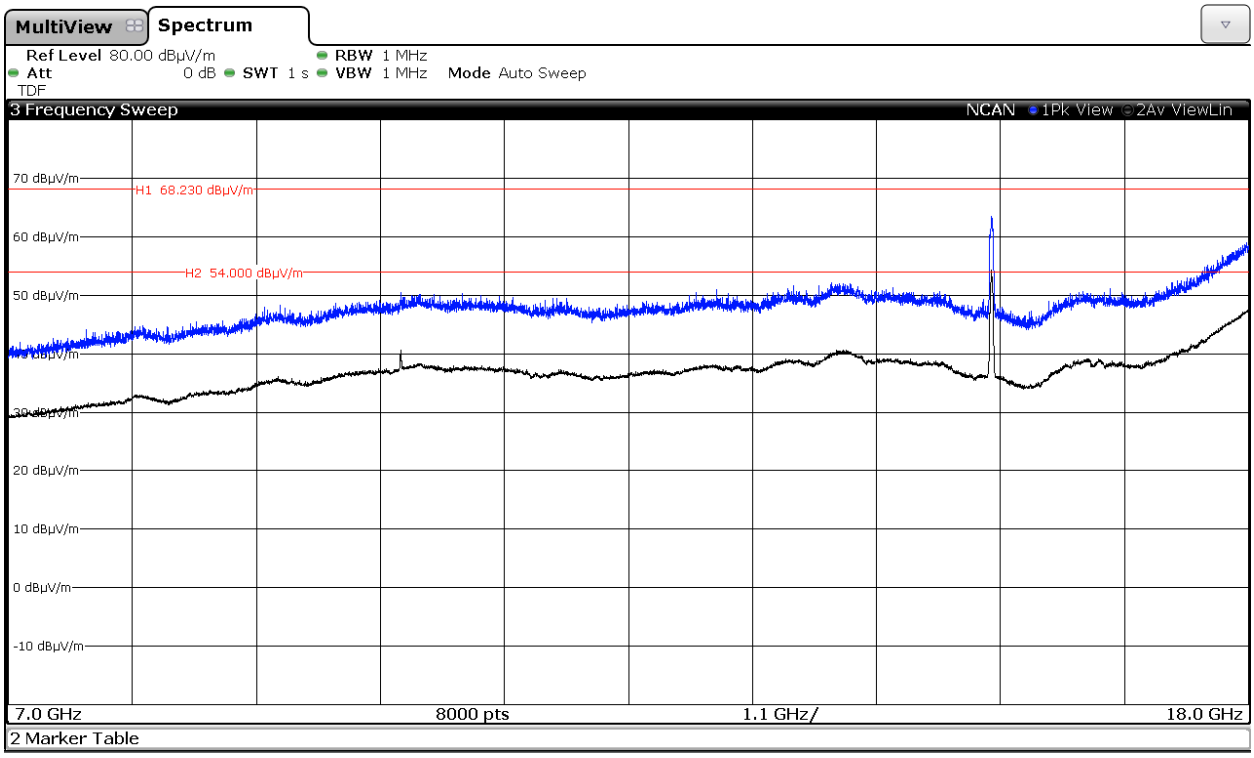


Chain B

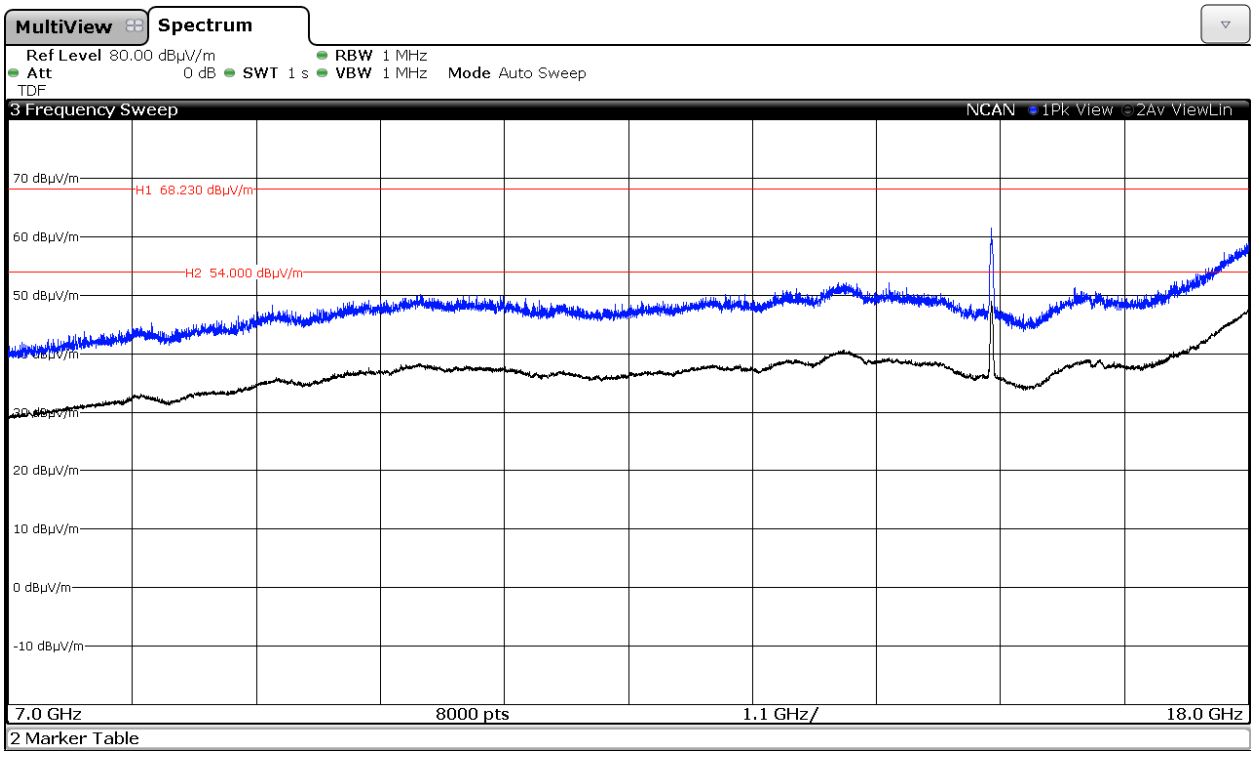


Highest frequency 5240 MHz.

Chain A

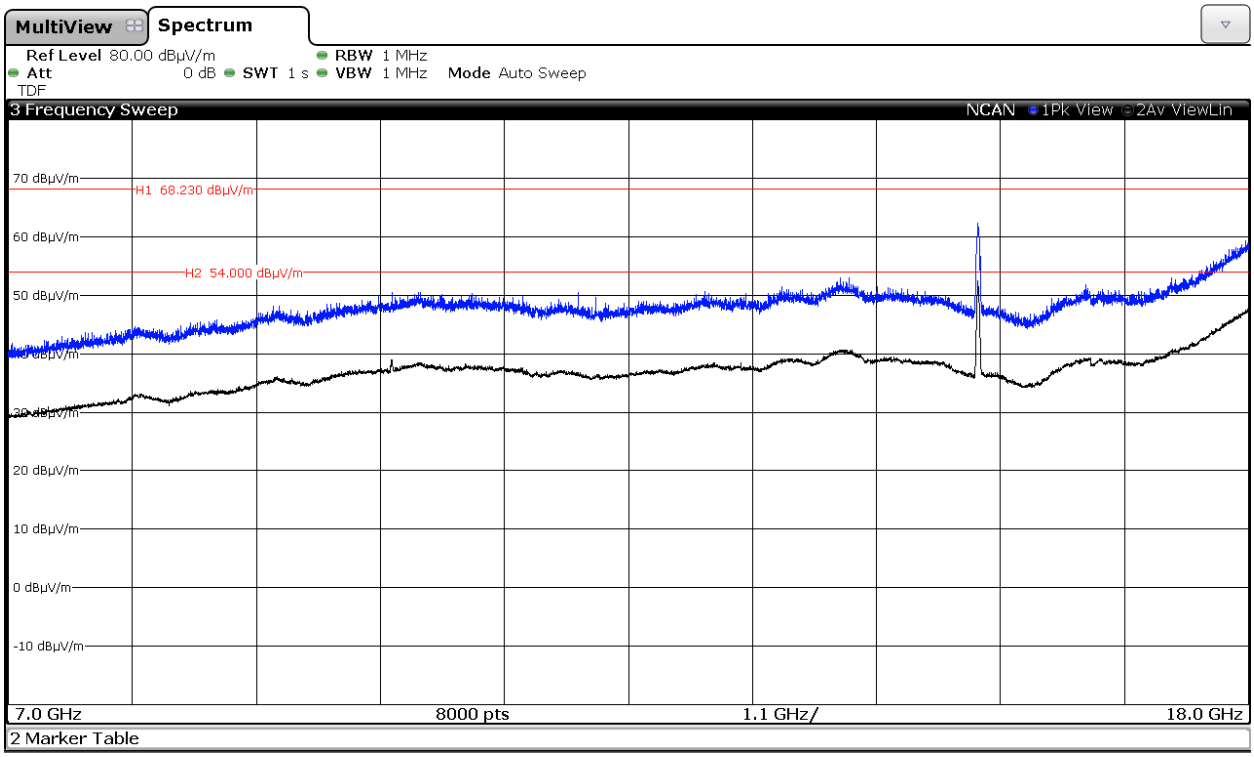


Chain B

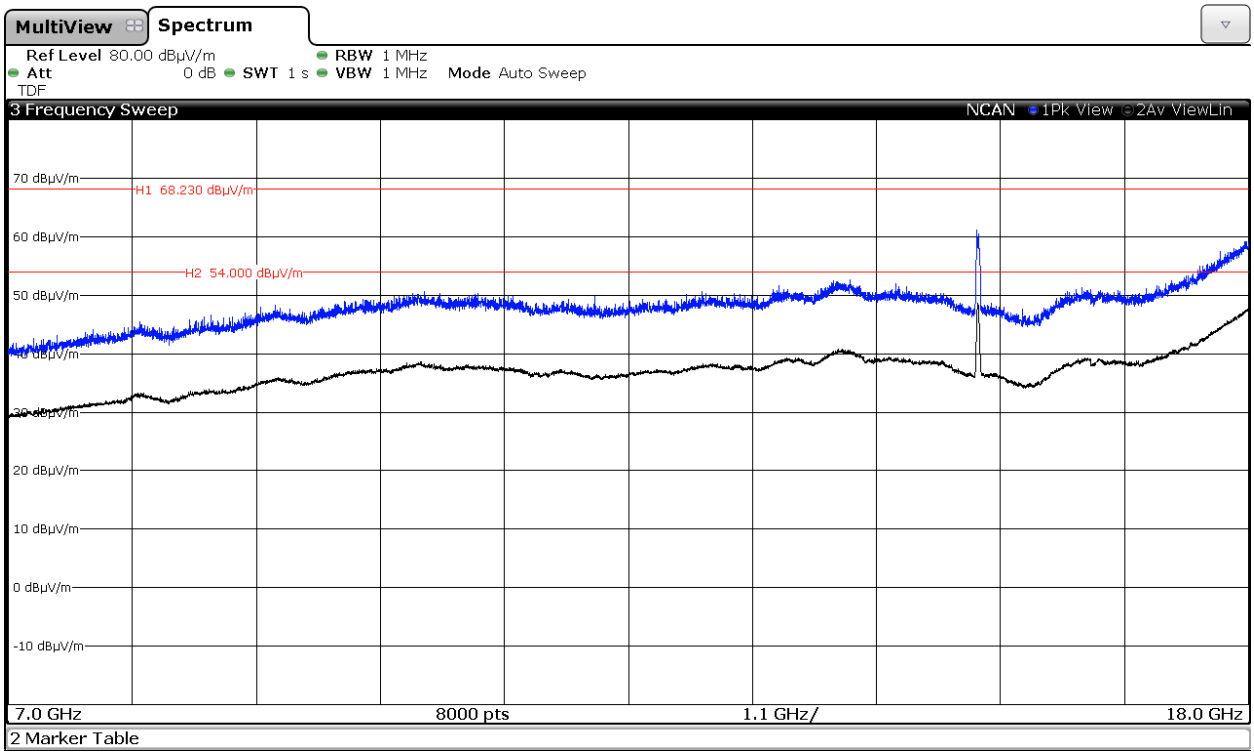


2. WiFi 5GHz 802.11 n20 mode

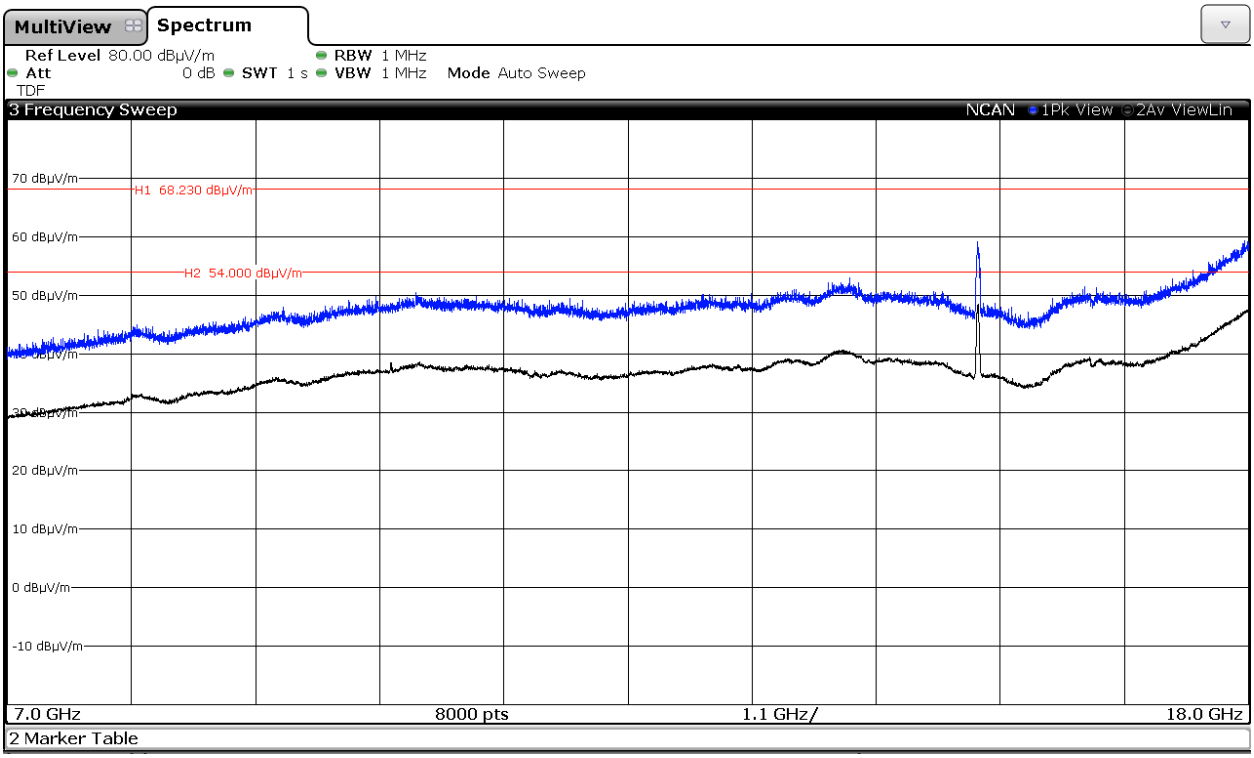
Middle frequency 5200 MHz.
Chain A



Chain B

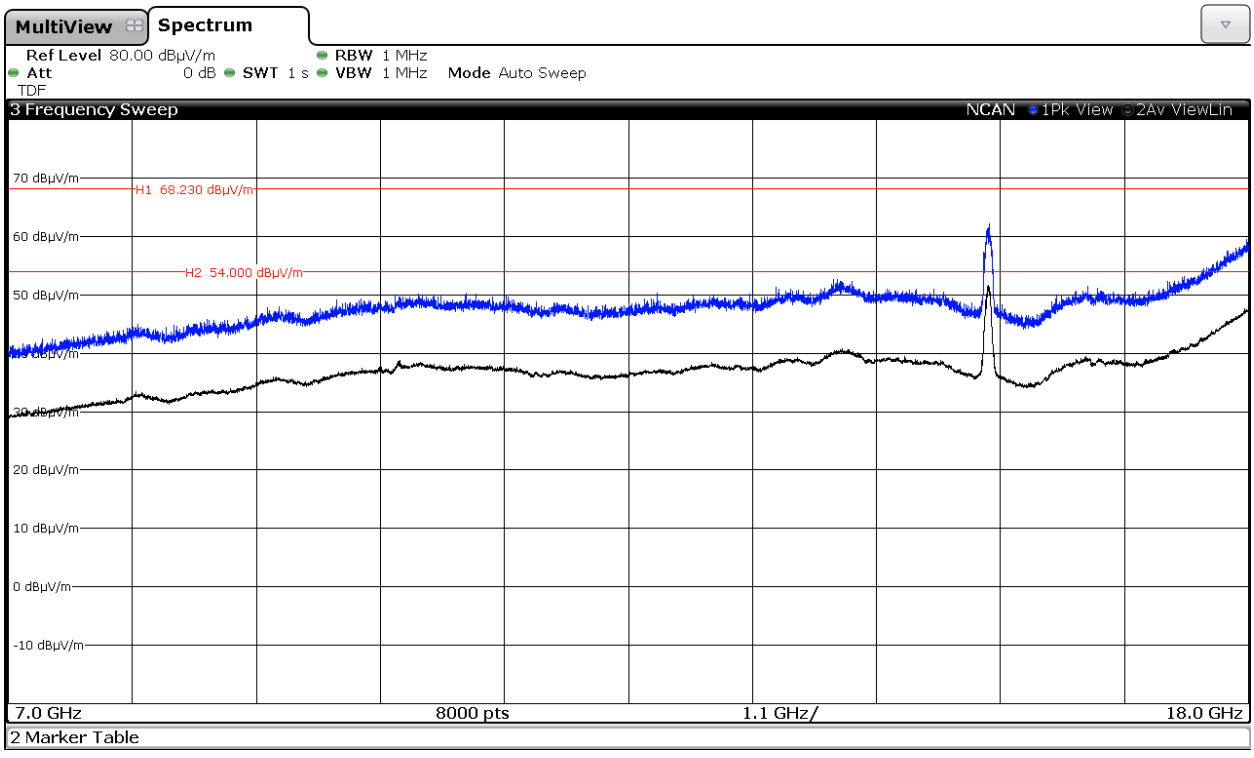


Chain A+B

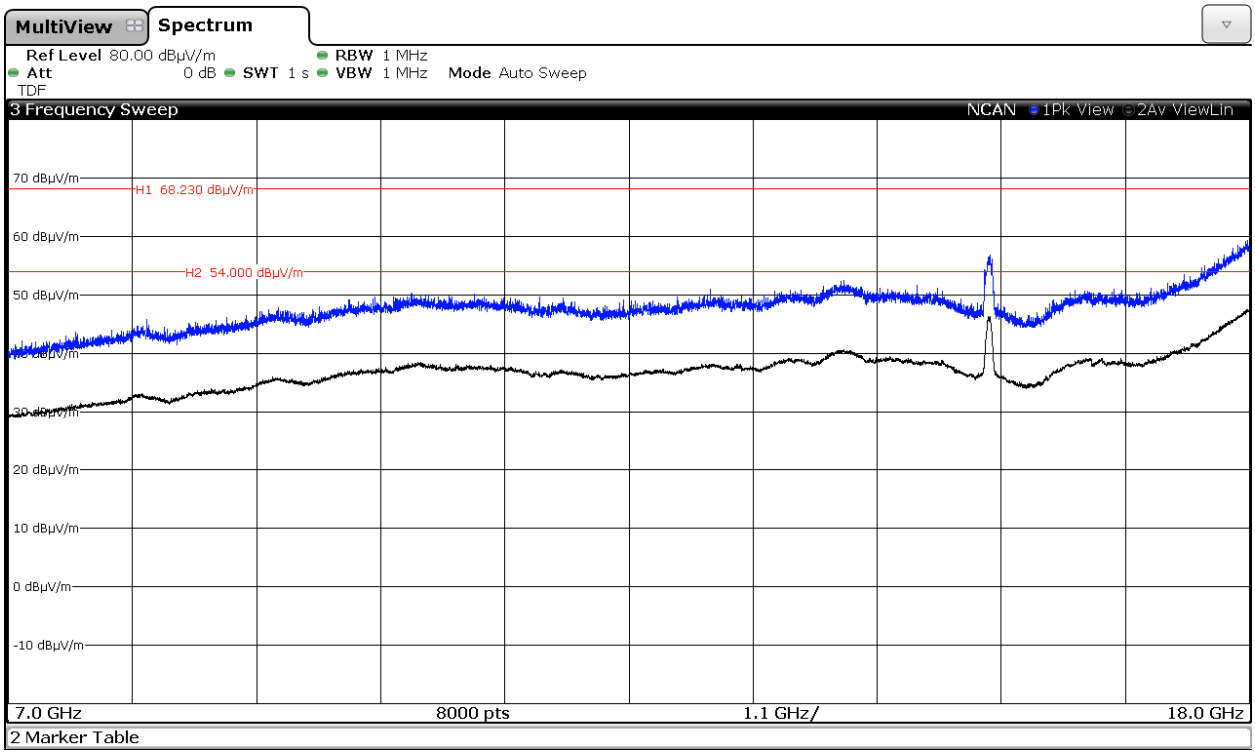


3. WiFi 5GHz 802.11 n40 mode

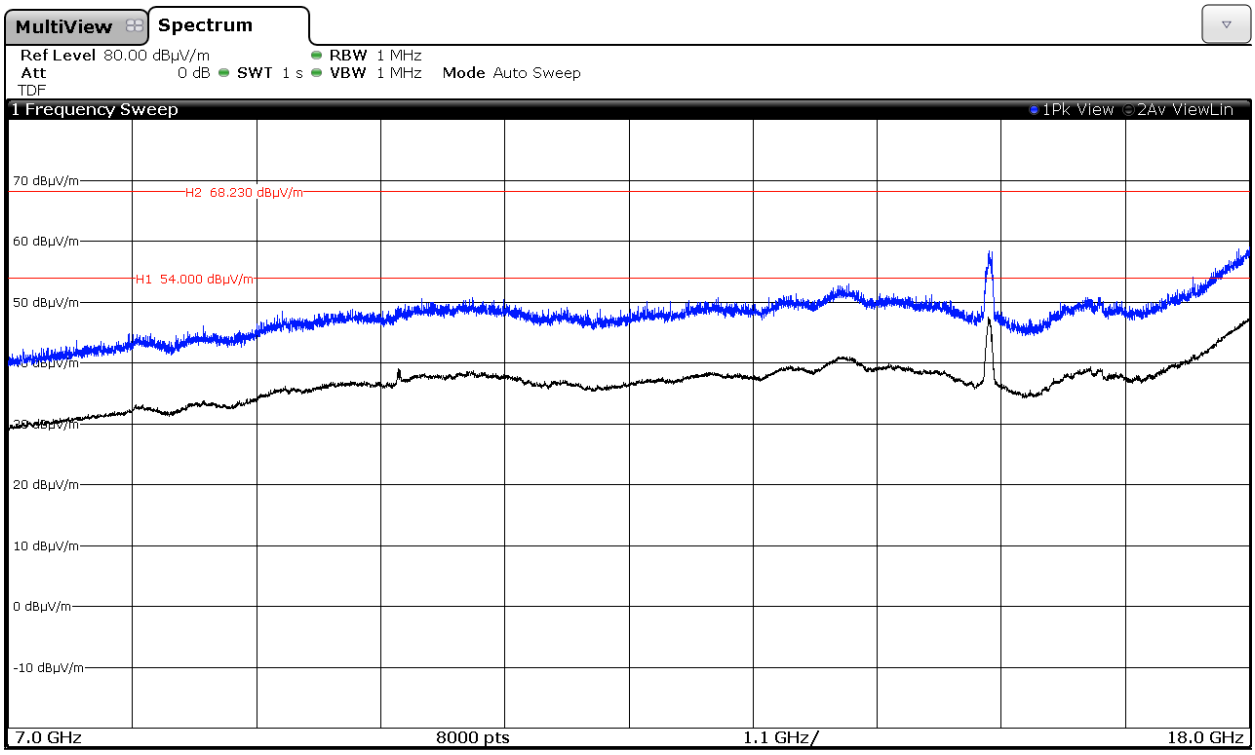
Highest frequency 5230 MHz.
Chain A



Chain B



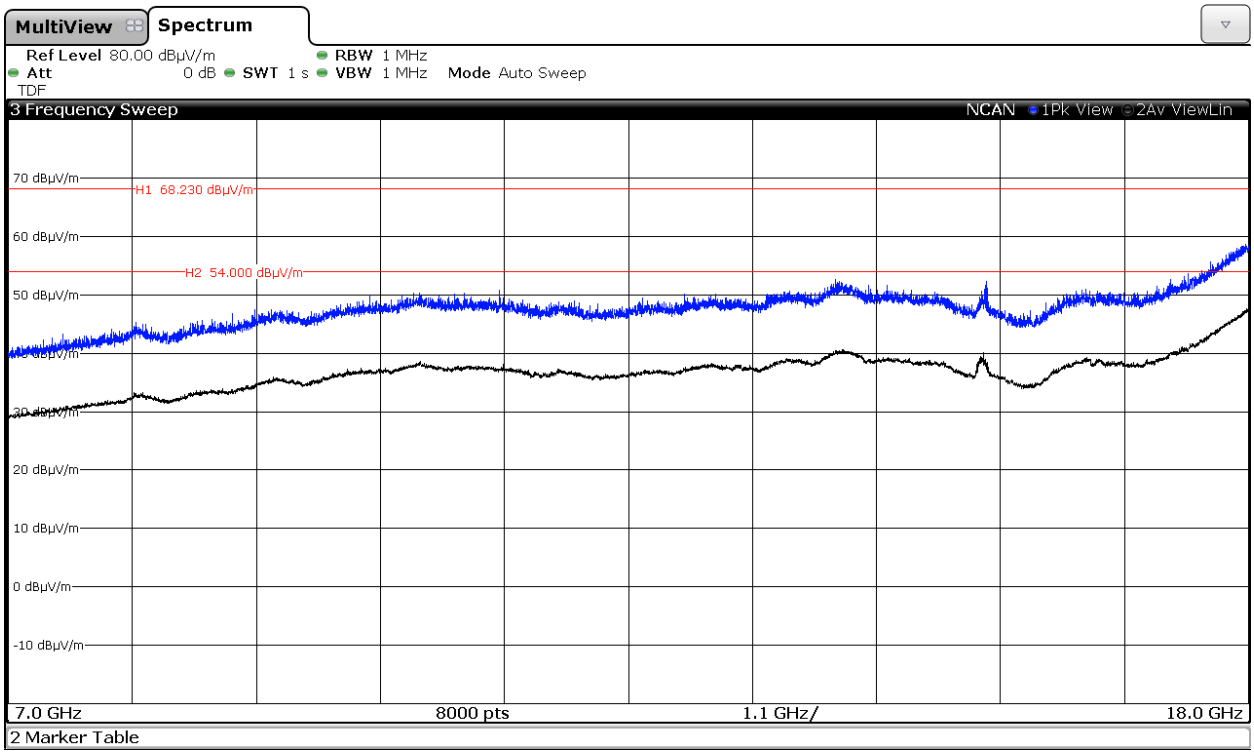
Chain A+B



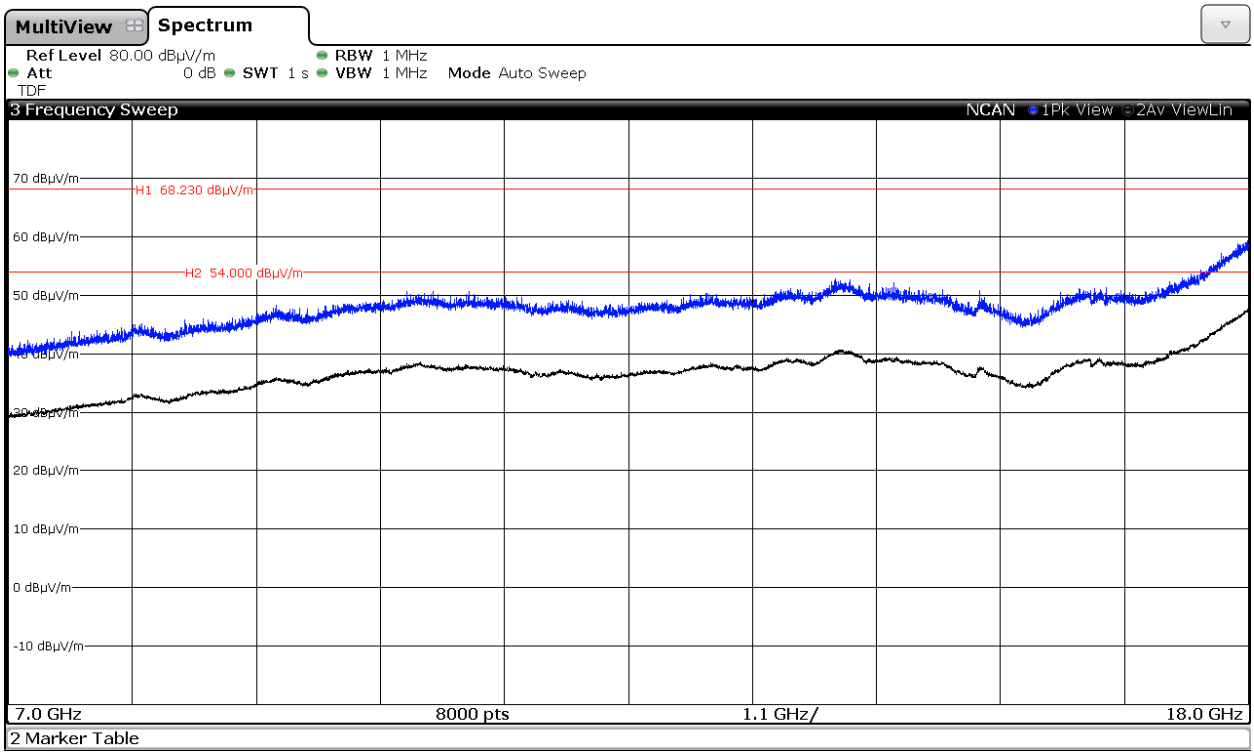
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.

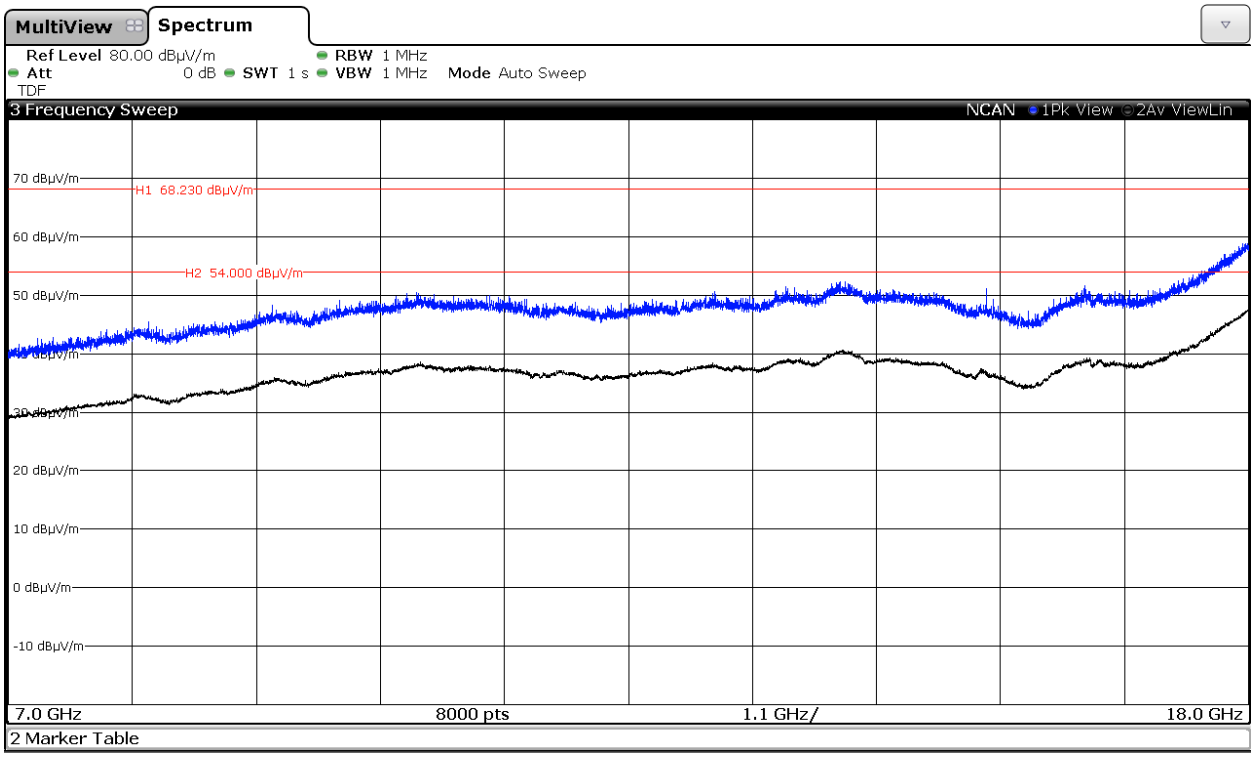
Chain A



Chain B



Chain A+B

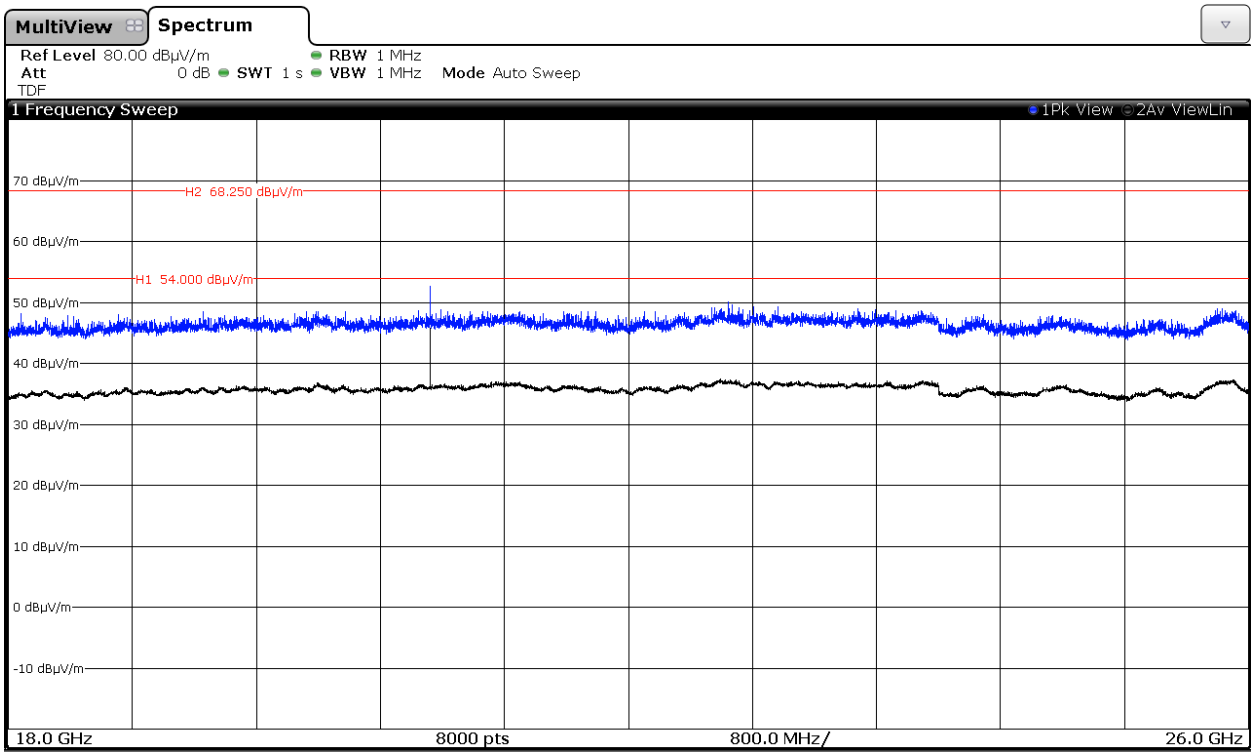


FREQUENCY RANGE 18 GHz to 26 GHz.

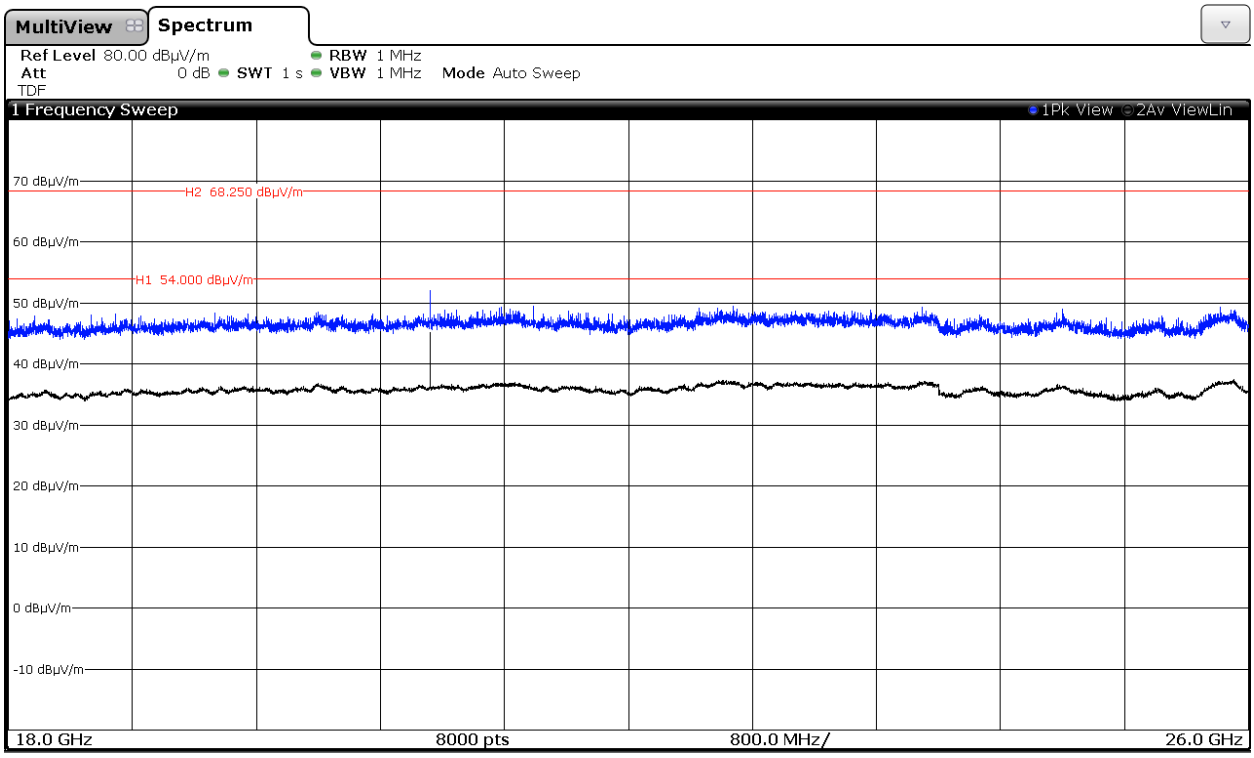
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

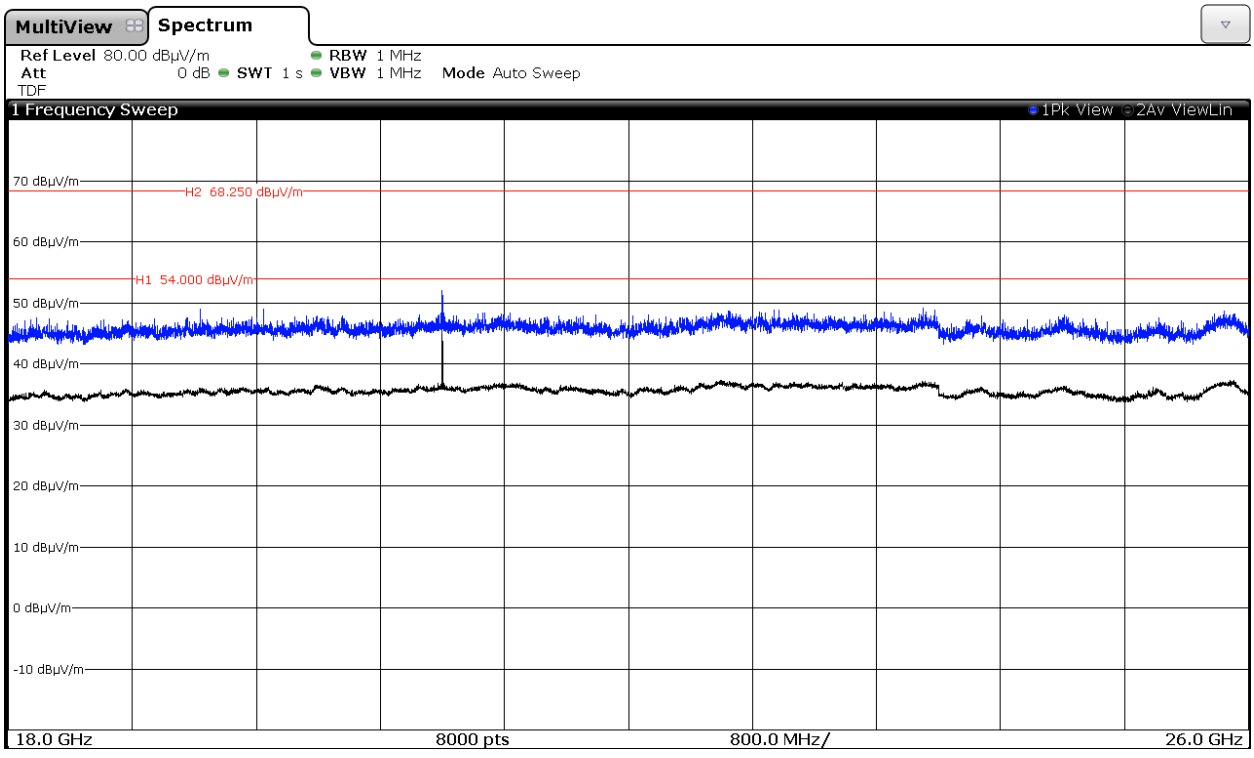
Chain A



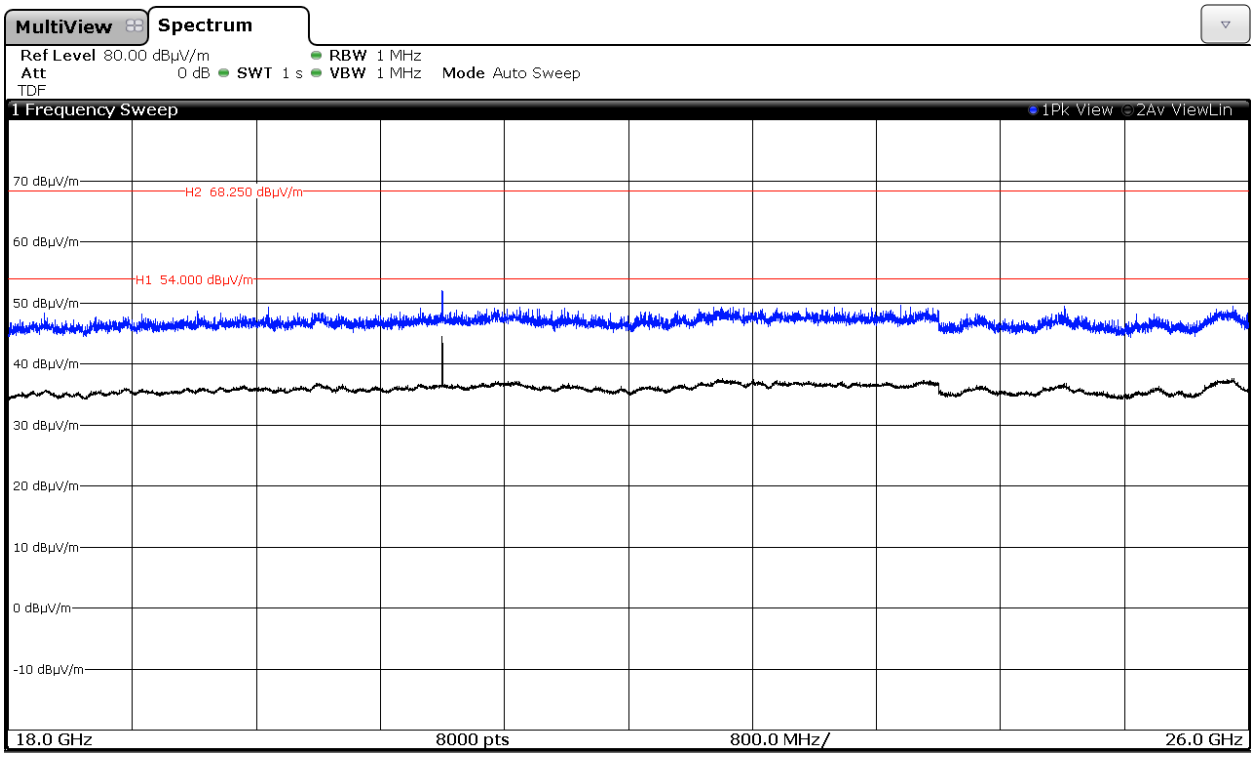
Chain B



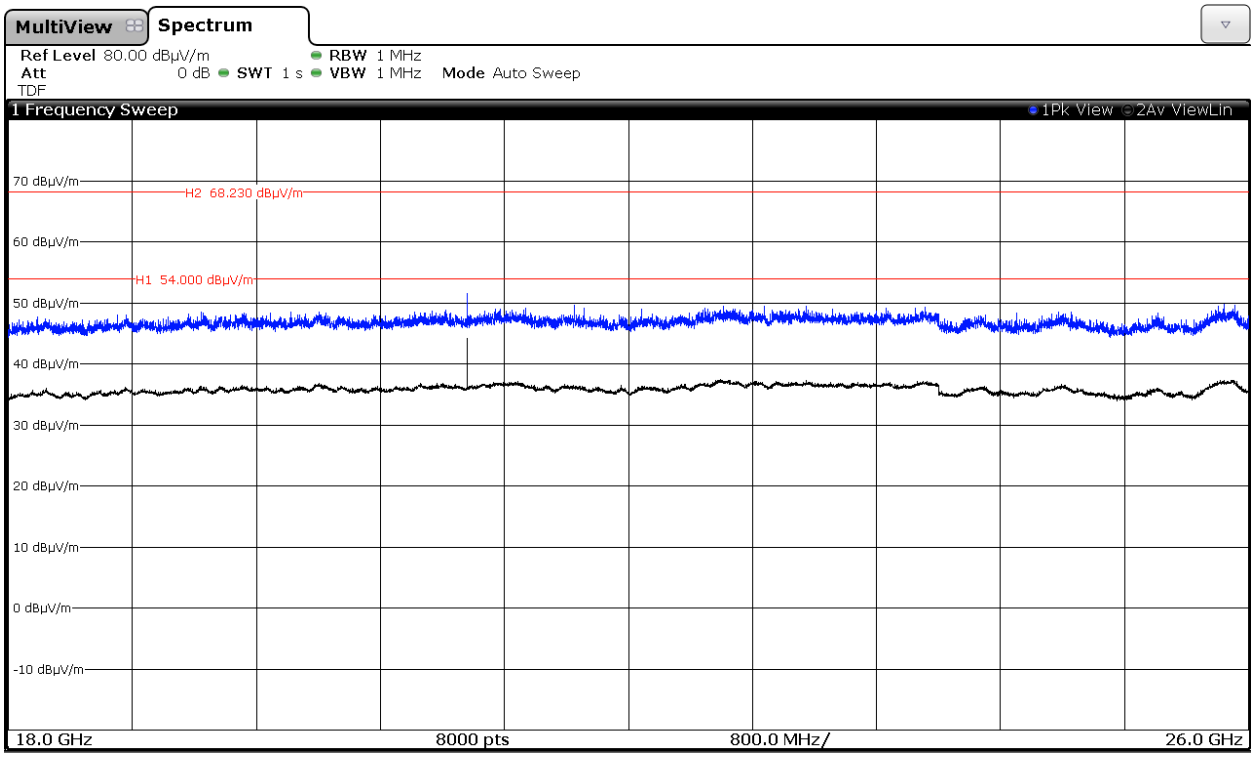
Middle frequency 5200 MHz.
Chain A



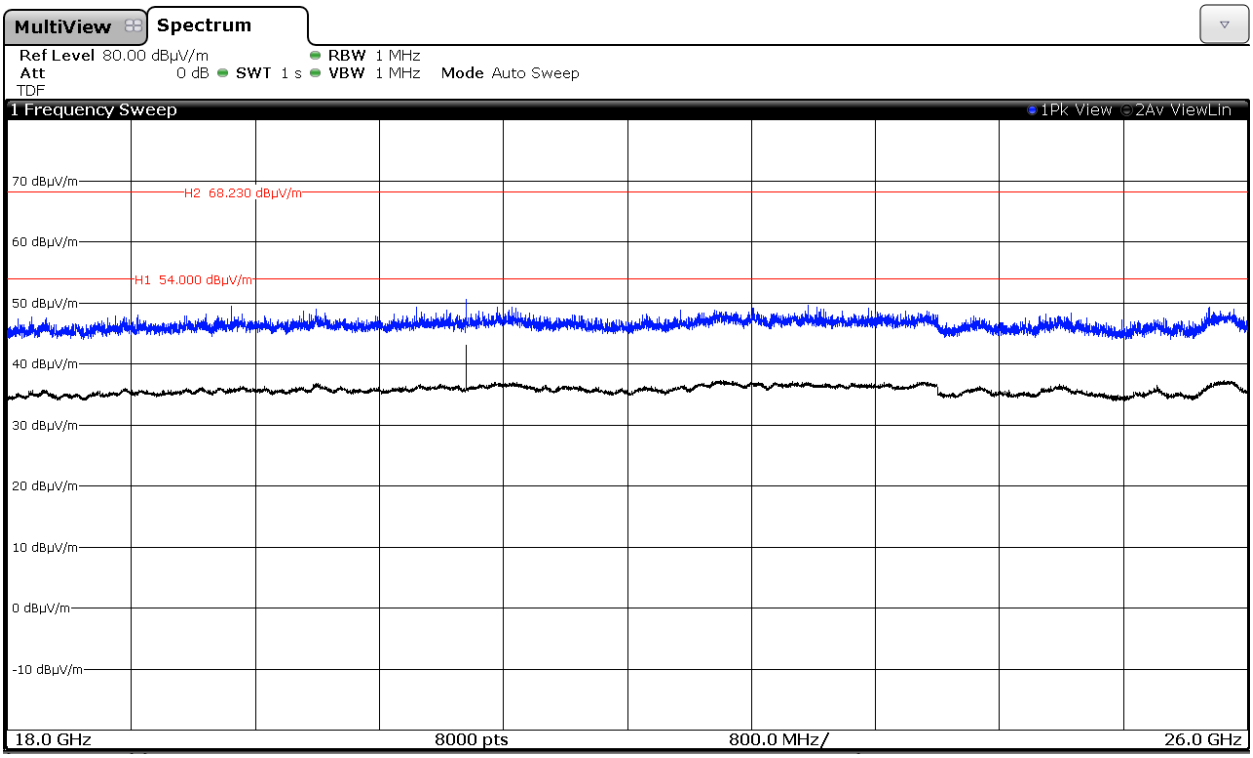
Chain B



Highest frequency 5240 MHz.
Chain A

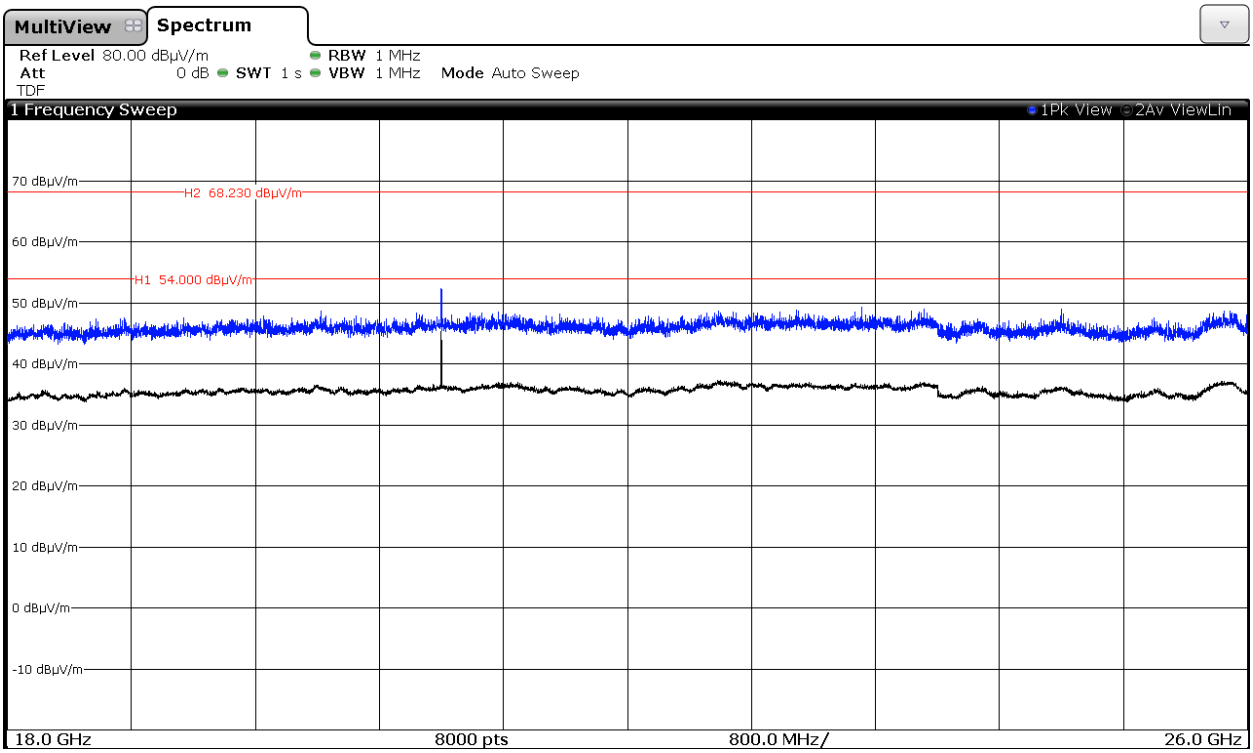


Chain B

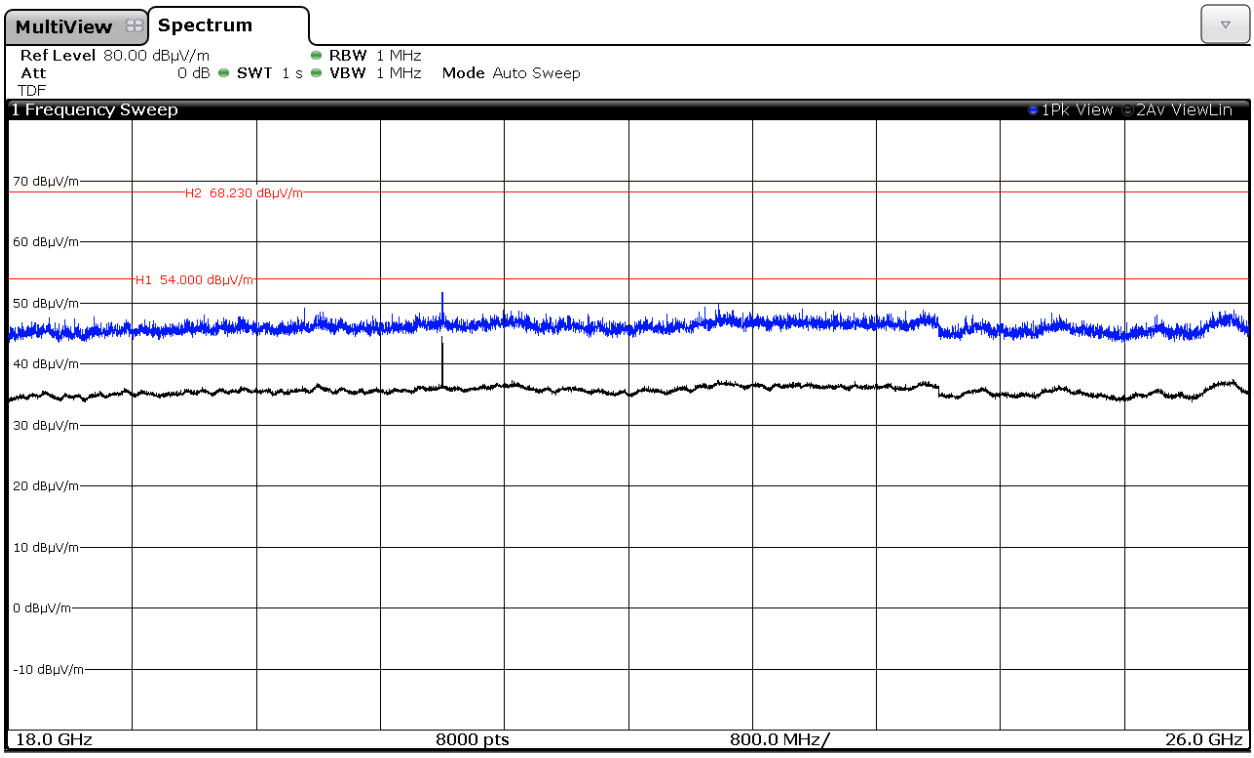


2. WiFi 5GHz 802.11 n20 mode

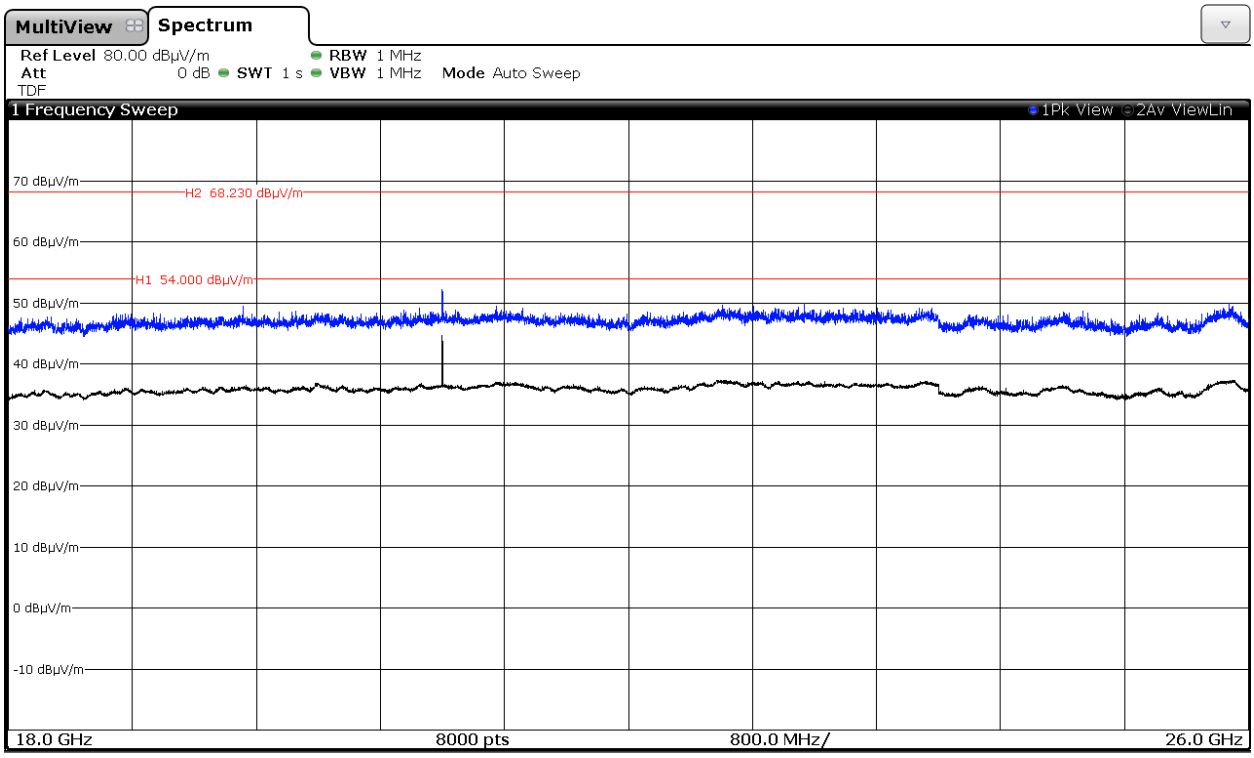
Middle frequency 5200 MHz.
Chain A



Chain B



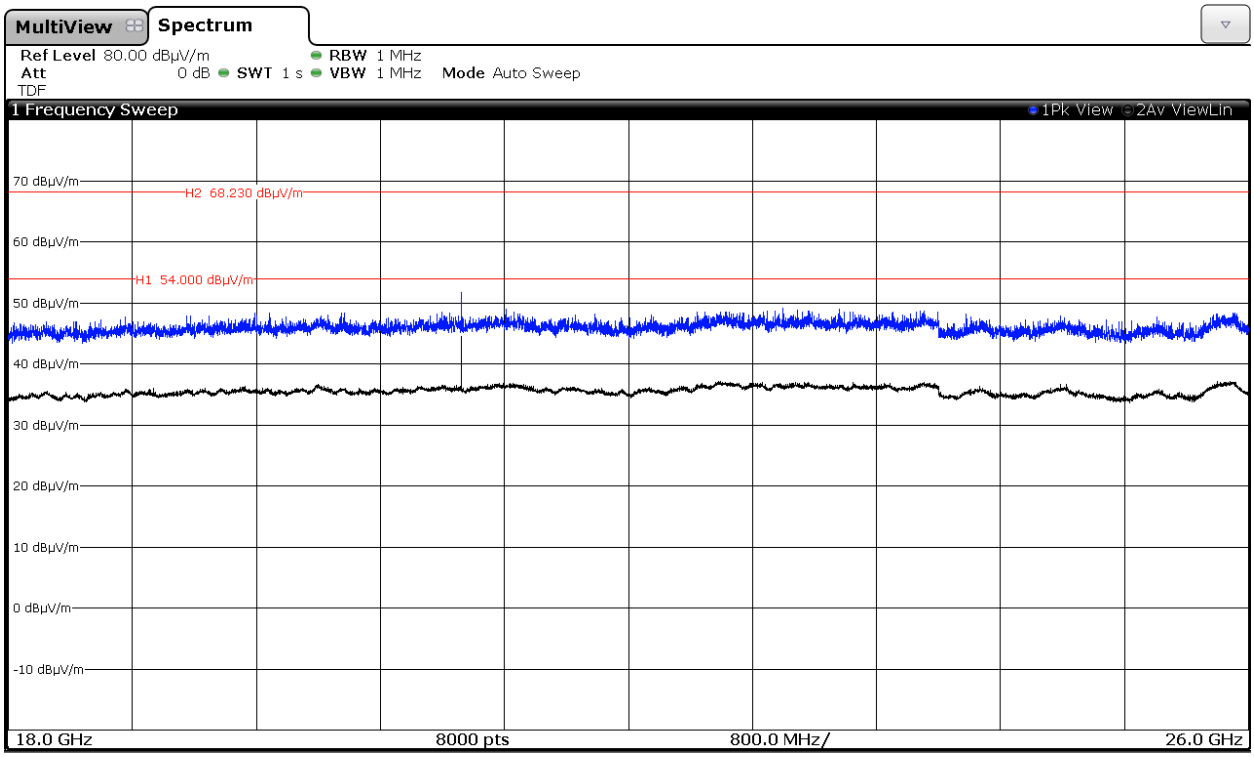
Chain A+B



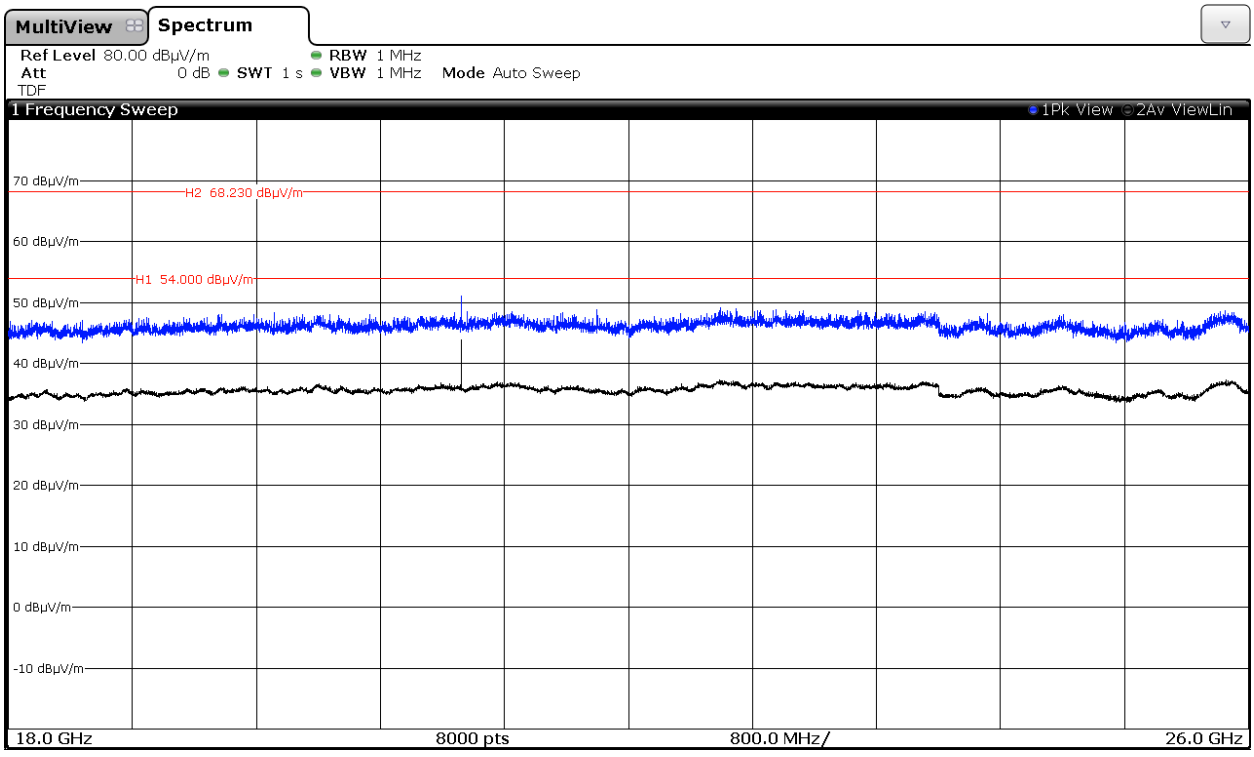
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5230 MHz.

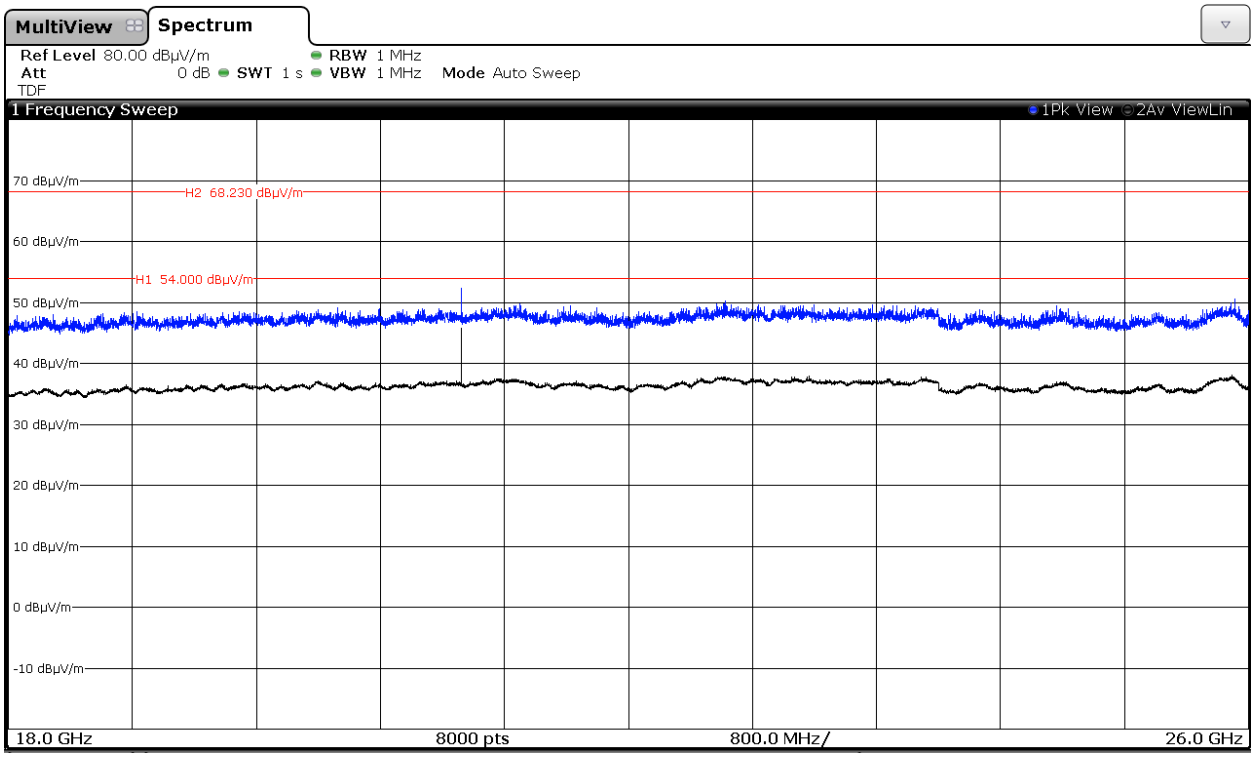
Chain A



Chain B



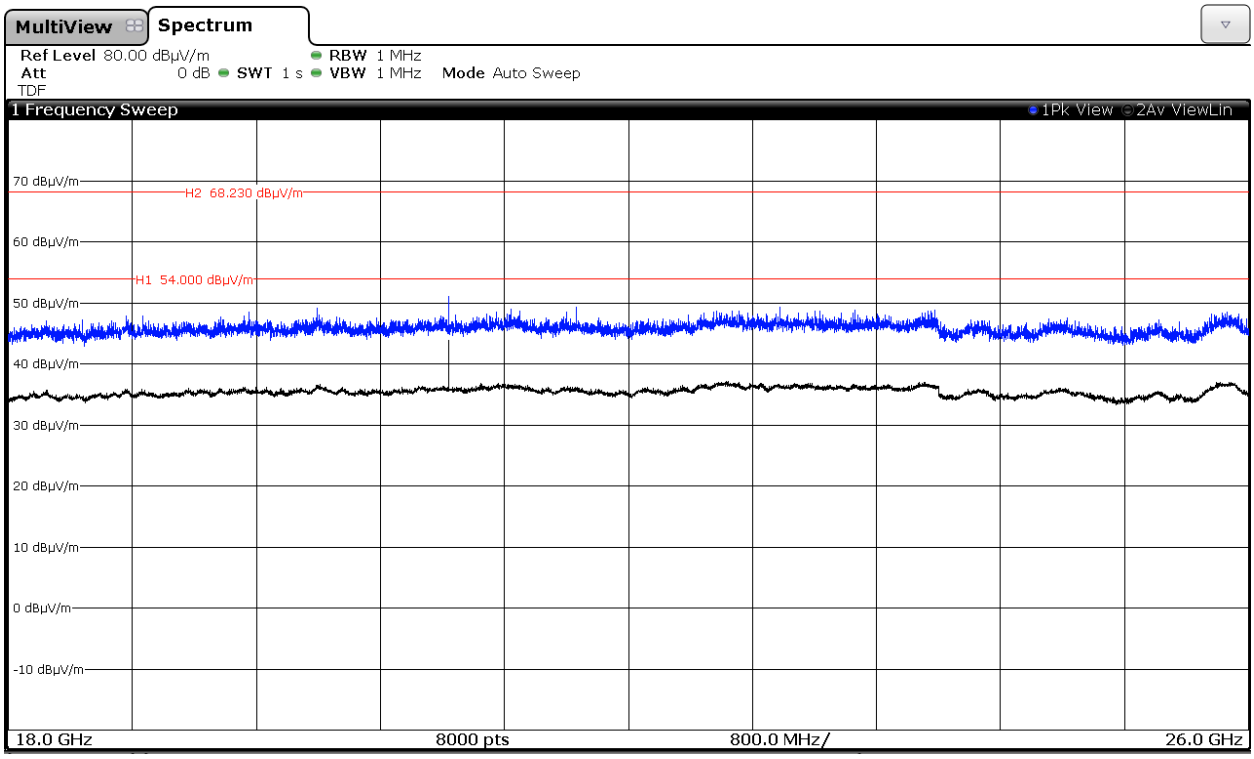
Chain A+B



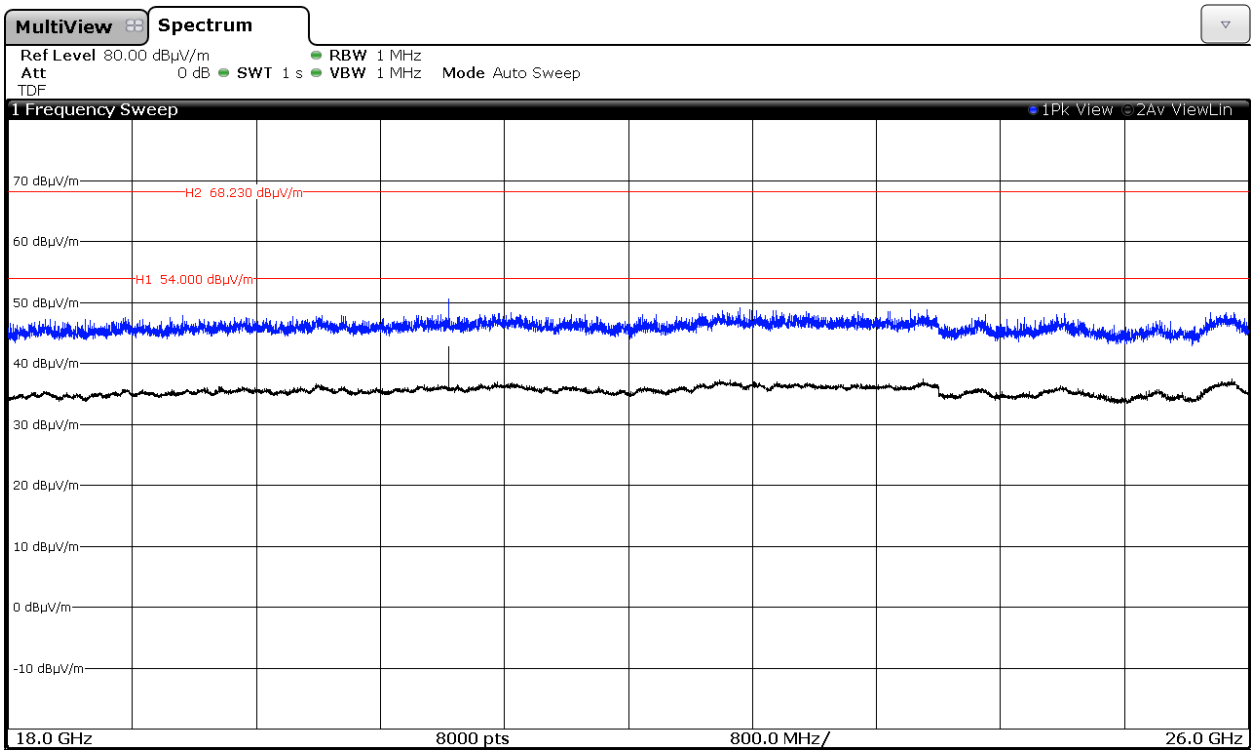
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.

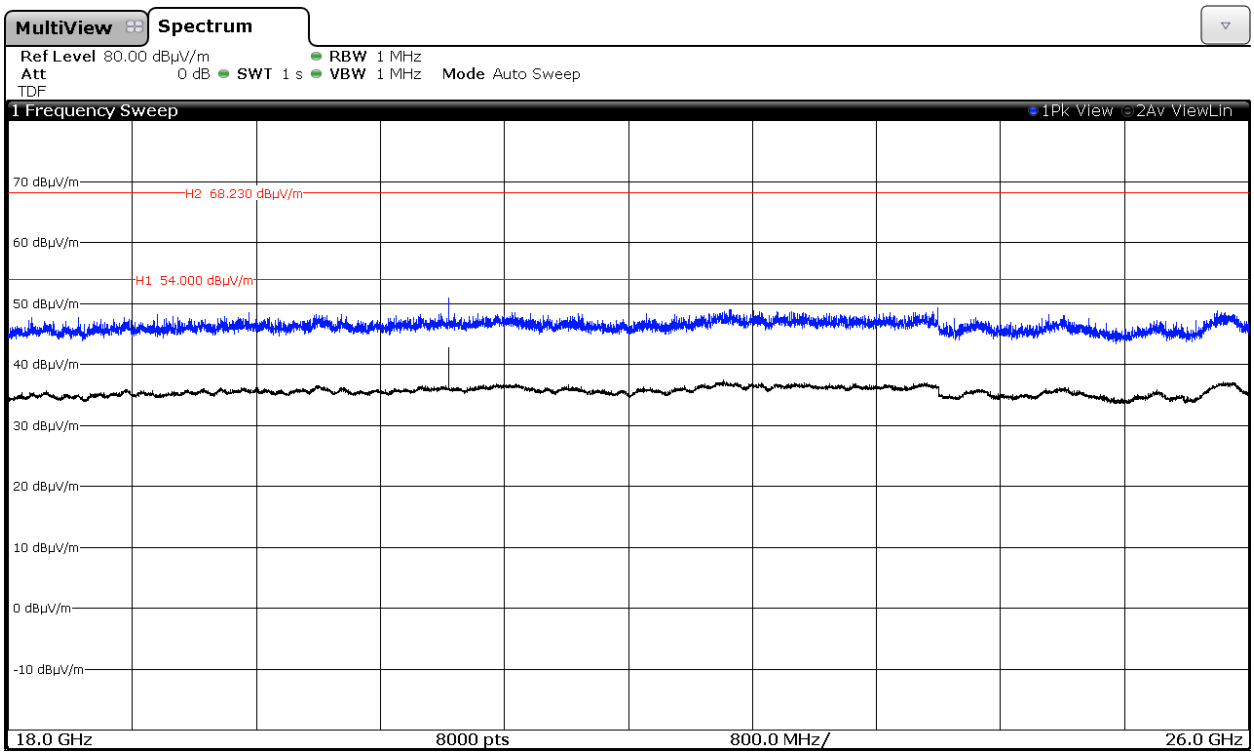
Chain A



Chain B

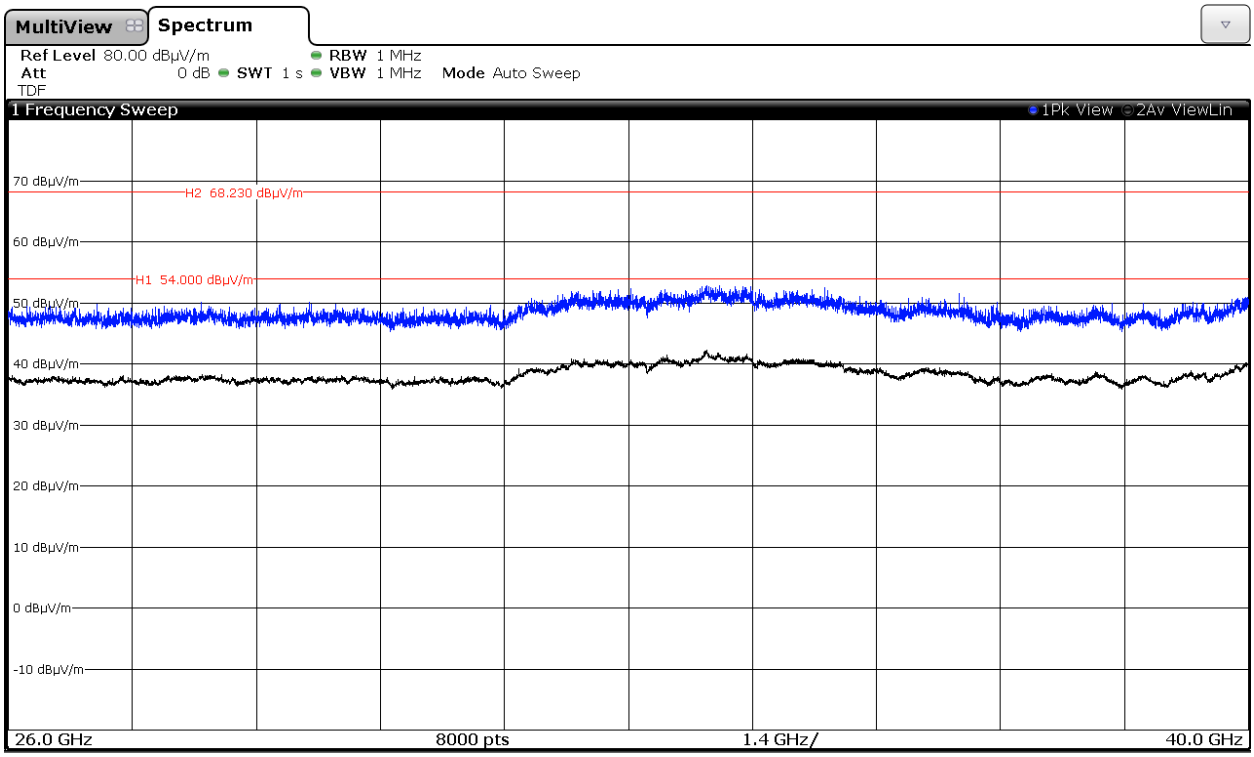


Chain A+B



FREQUENCY RANGE 26 GHz 40GHz.

No spurious signals were found in all modulations and channels tested.



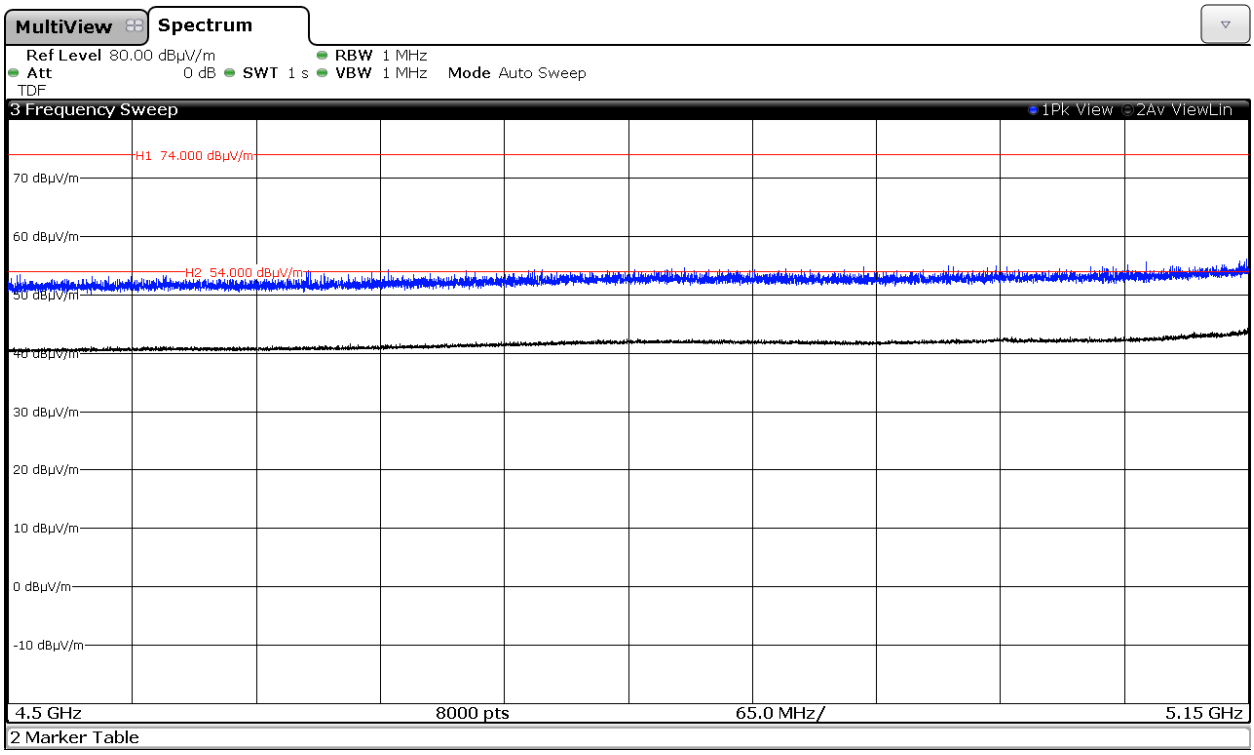
(This plot is valid for both SISO modes and MIMO mode).

Radiated spurious emissions at band-edges and inside restricted band 4.5 – 5.15 GHz.

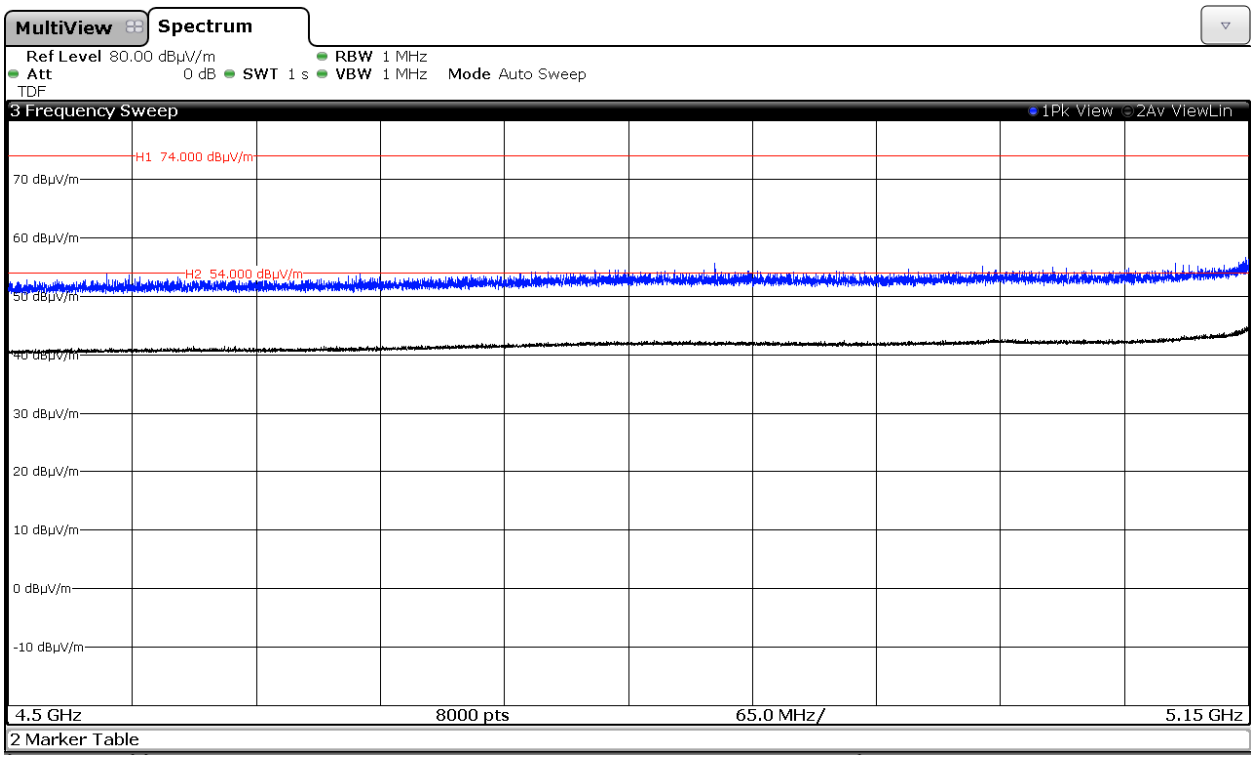
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

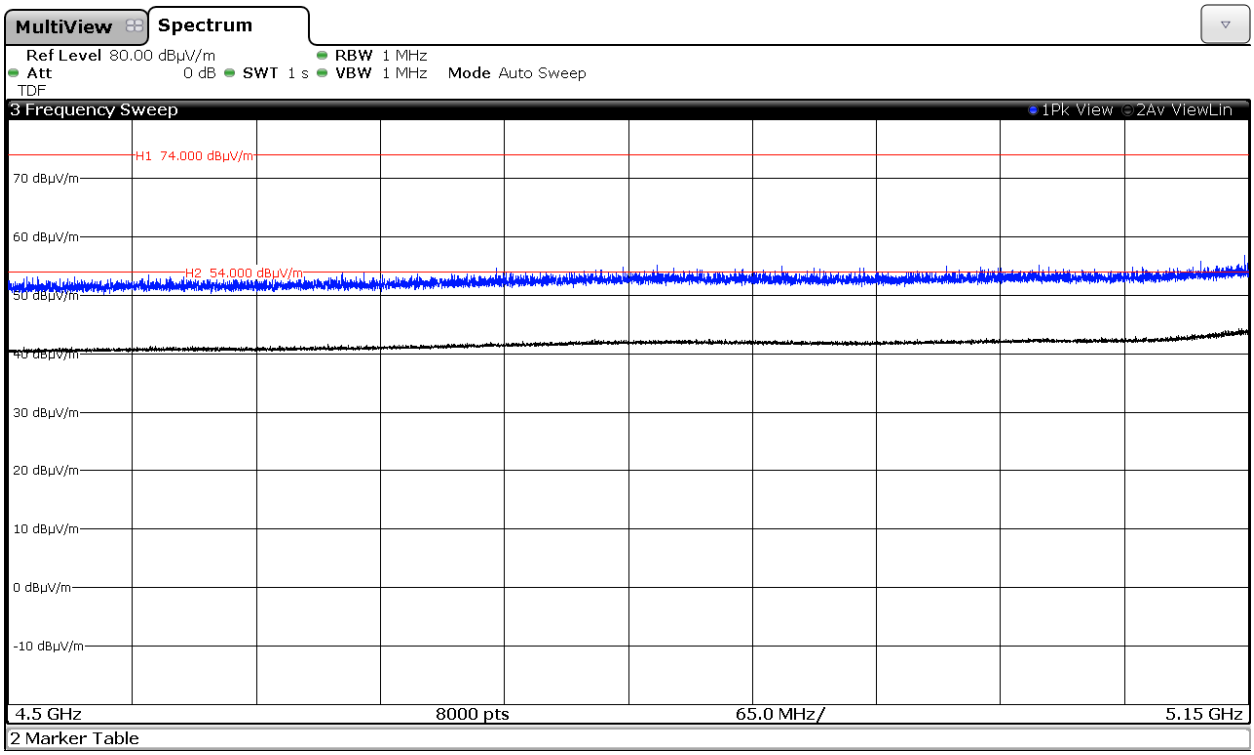
Chain A



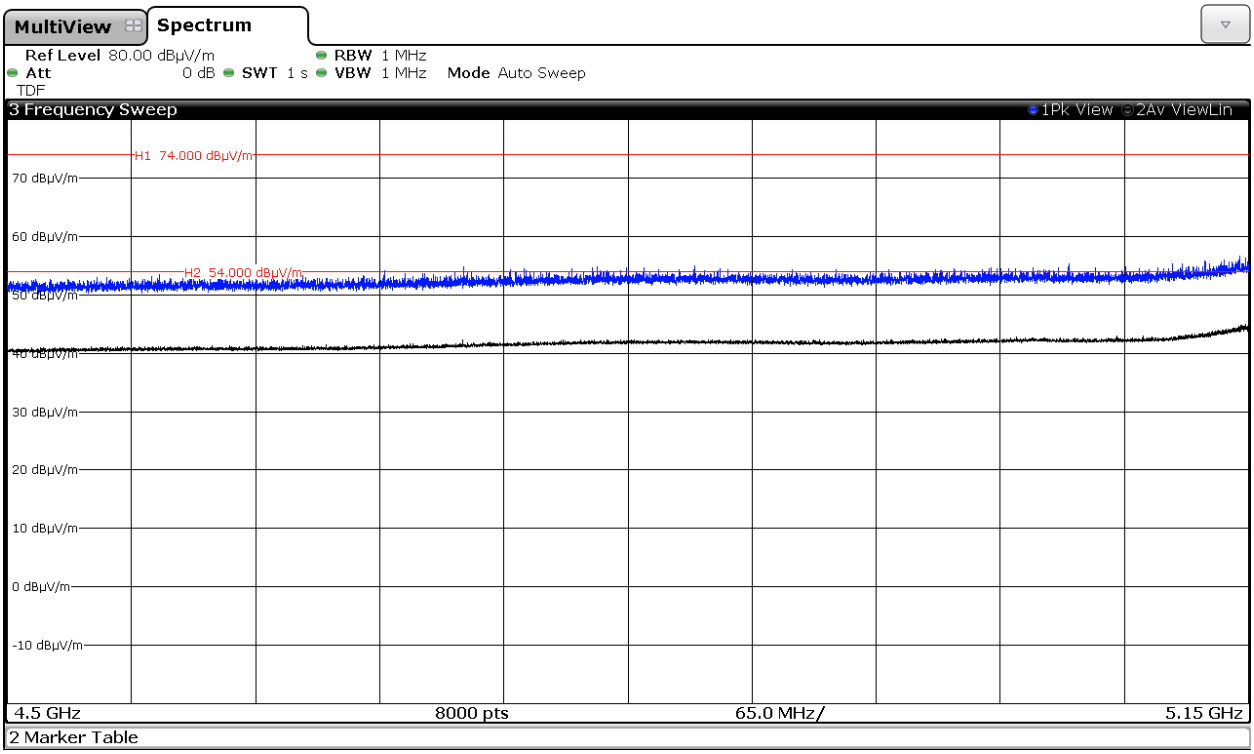
Chain B



Middle frequency 5200 MHz.
Chain A

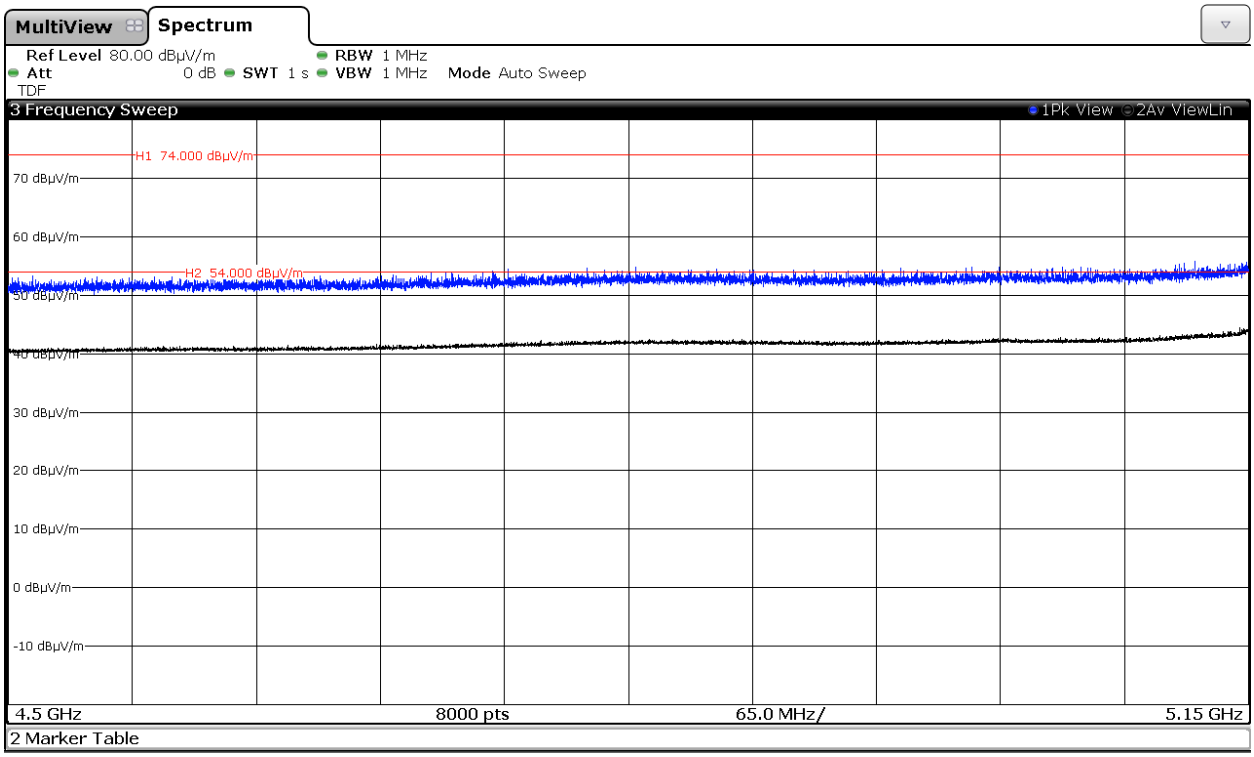


Chain B

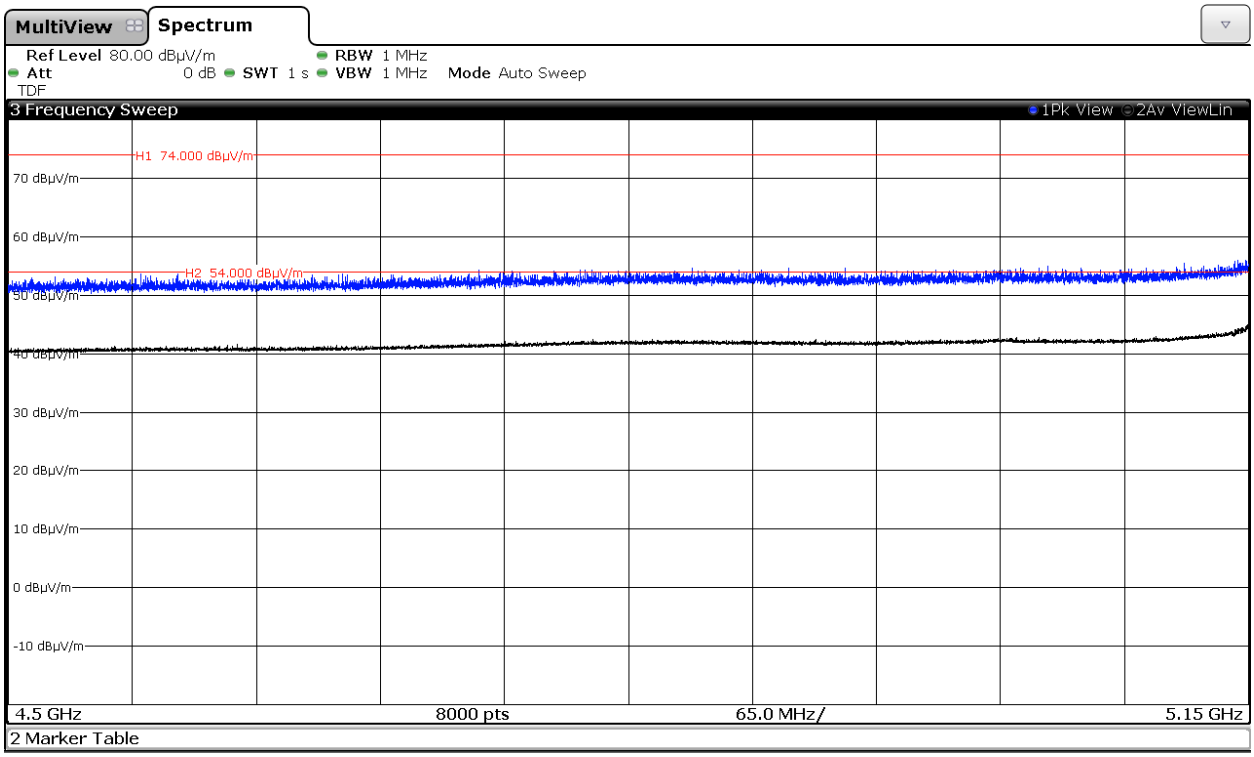


2. WiFi 5GHz 802.11 n20 mode

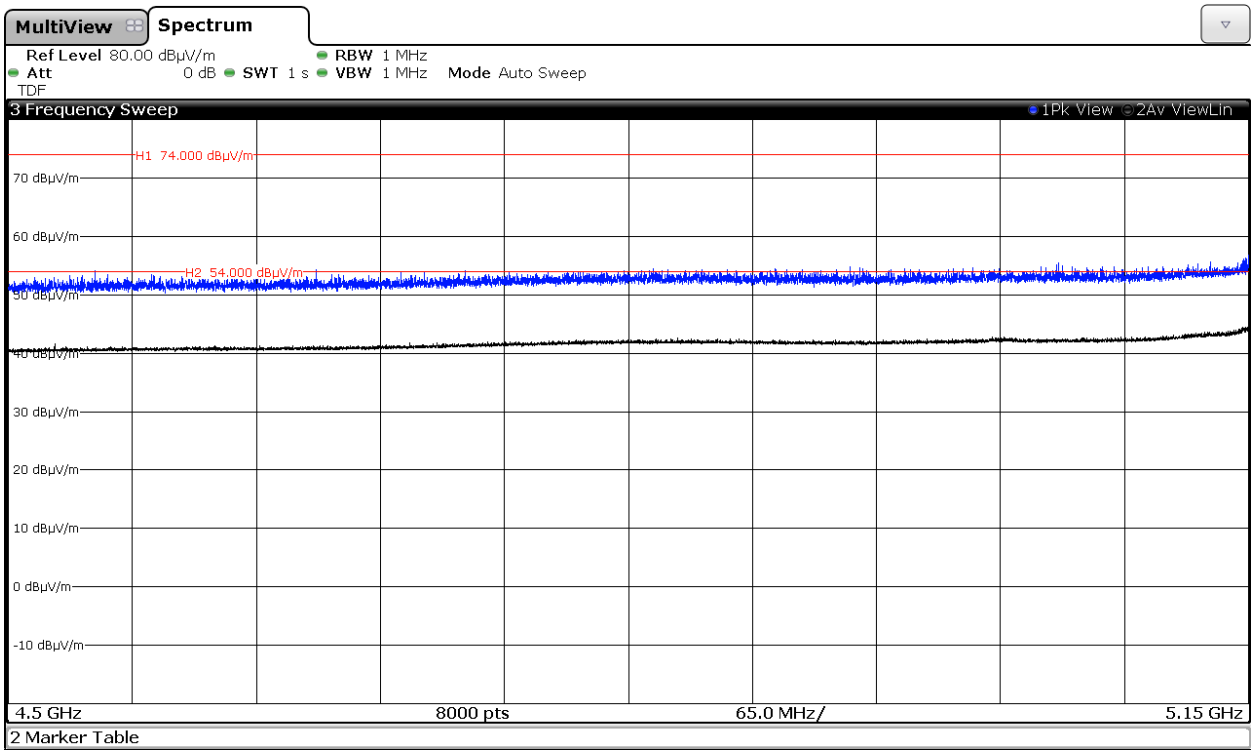
Lowest frequency 5180 MHz.
Chain A



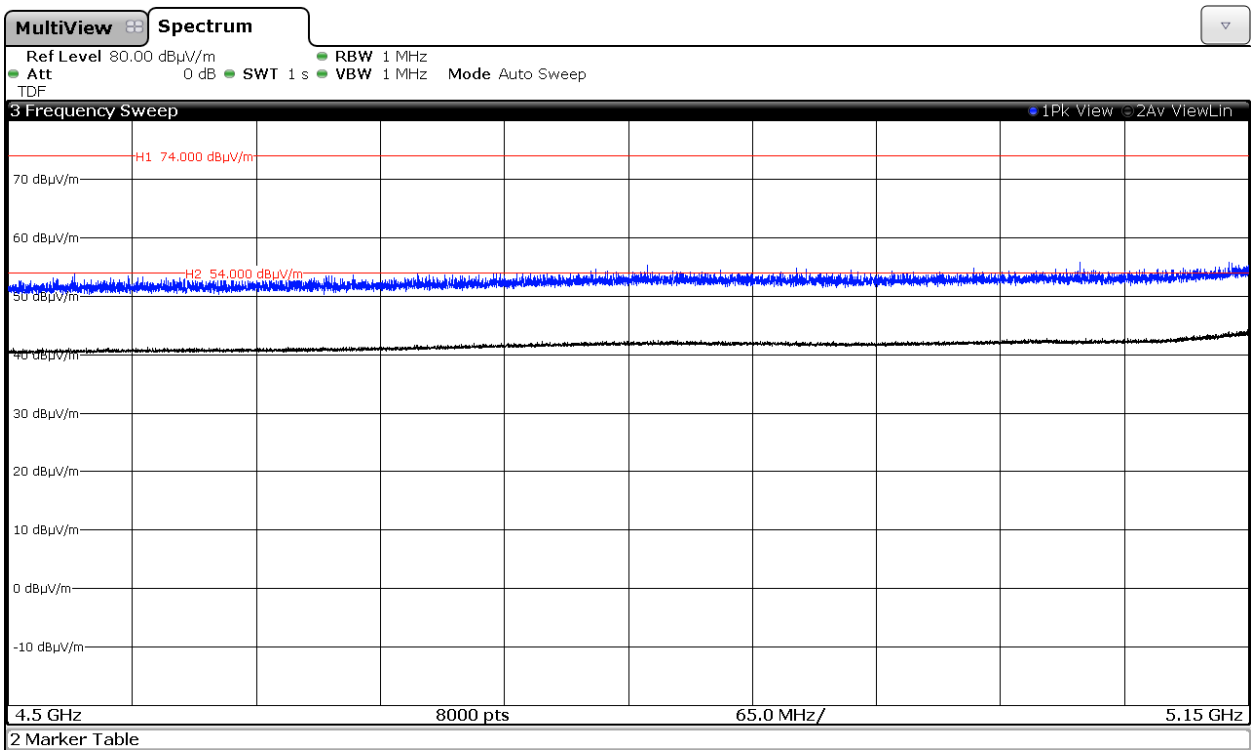
Chain B



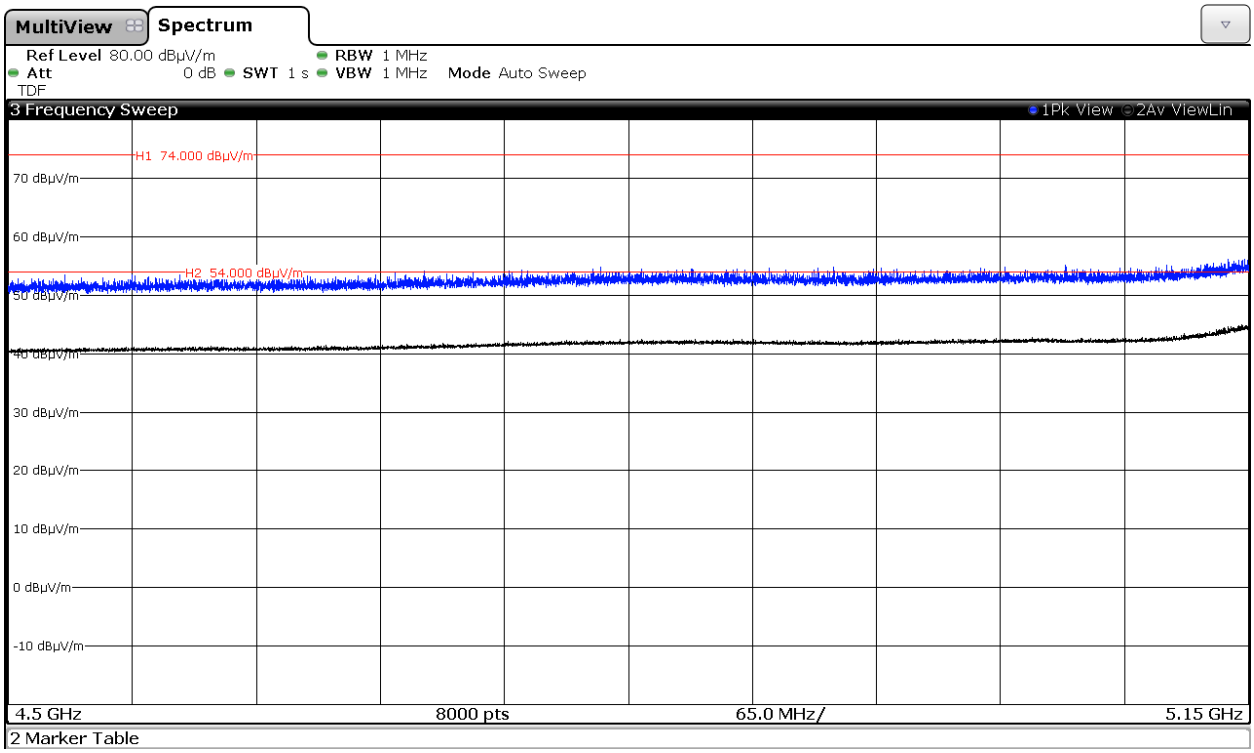
Chain A+B



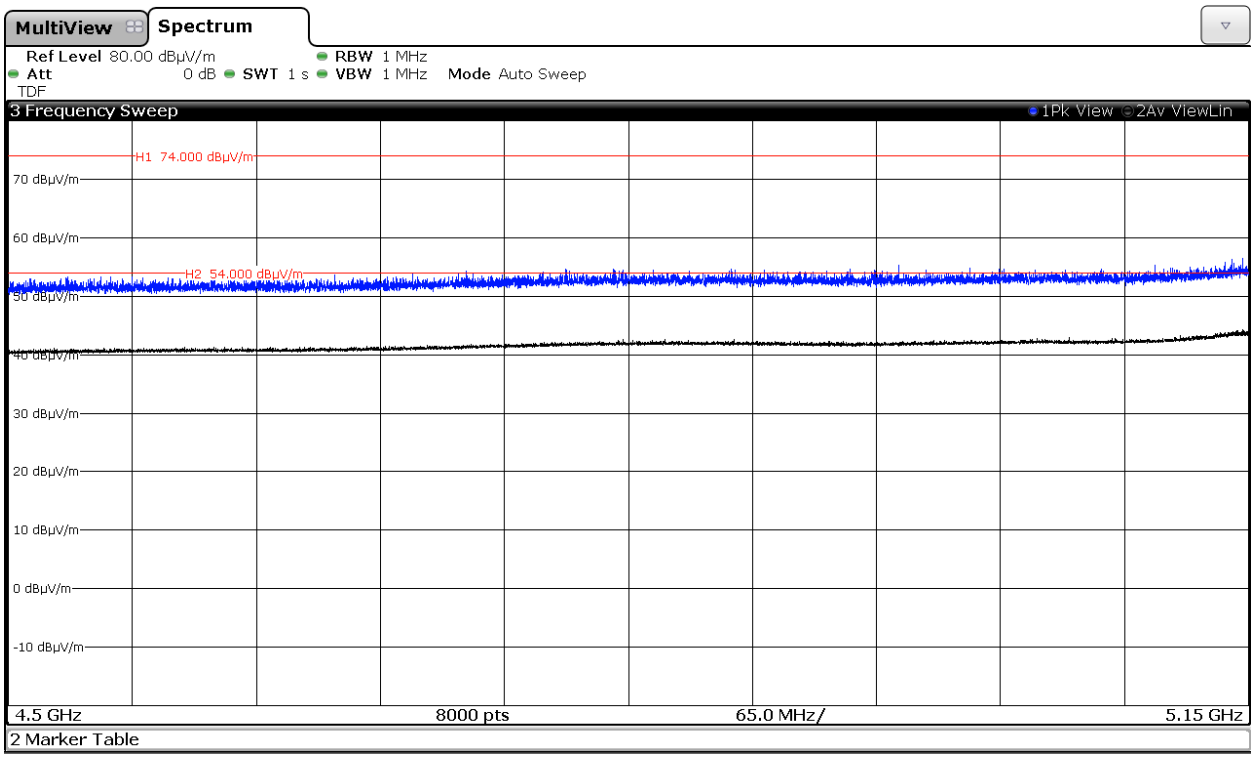
Middle frequency 5200 MHz.
Chain A



Chain B

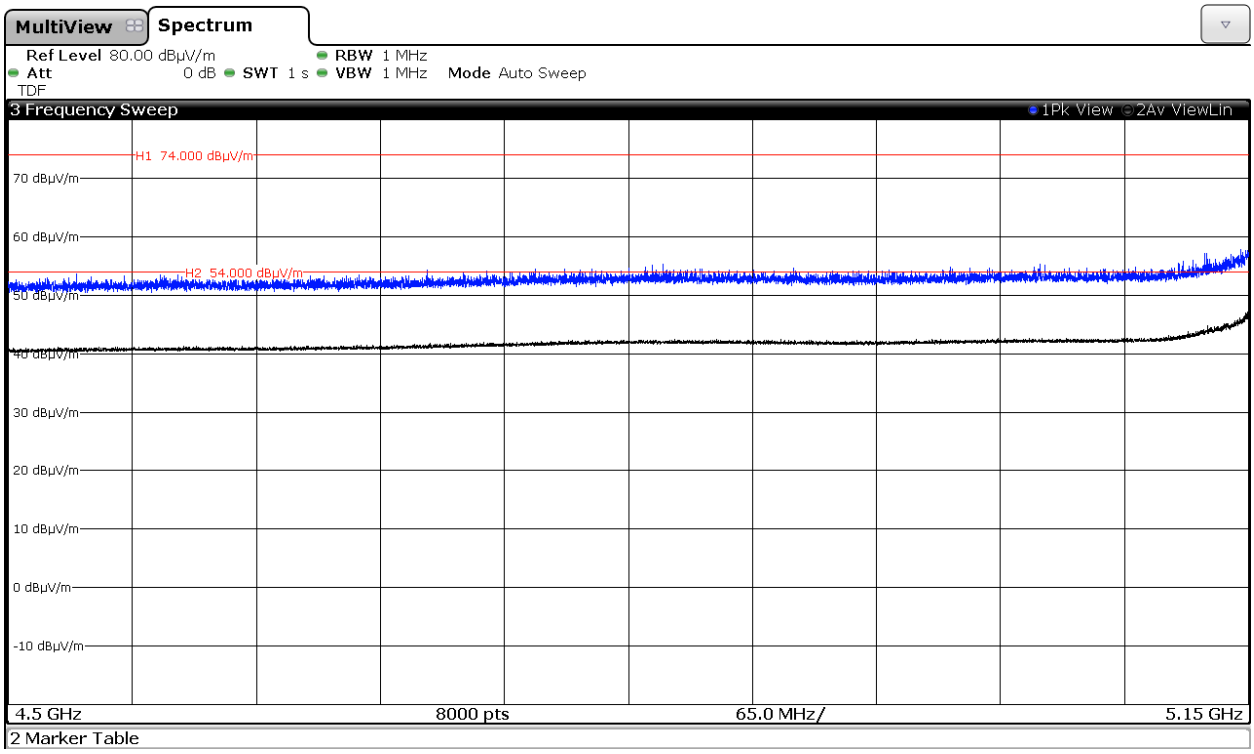


Chain A+B

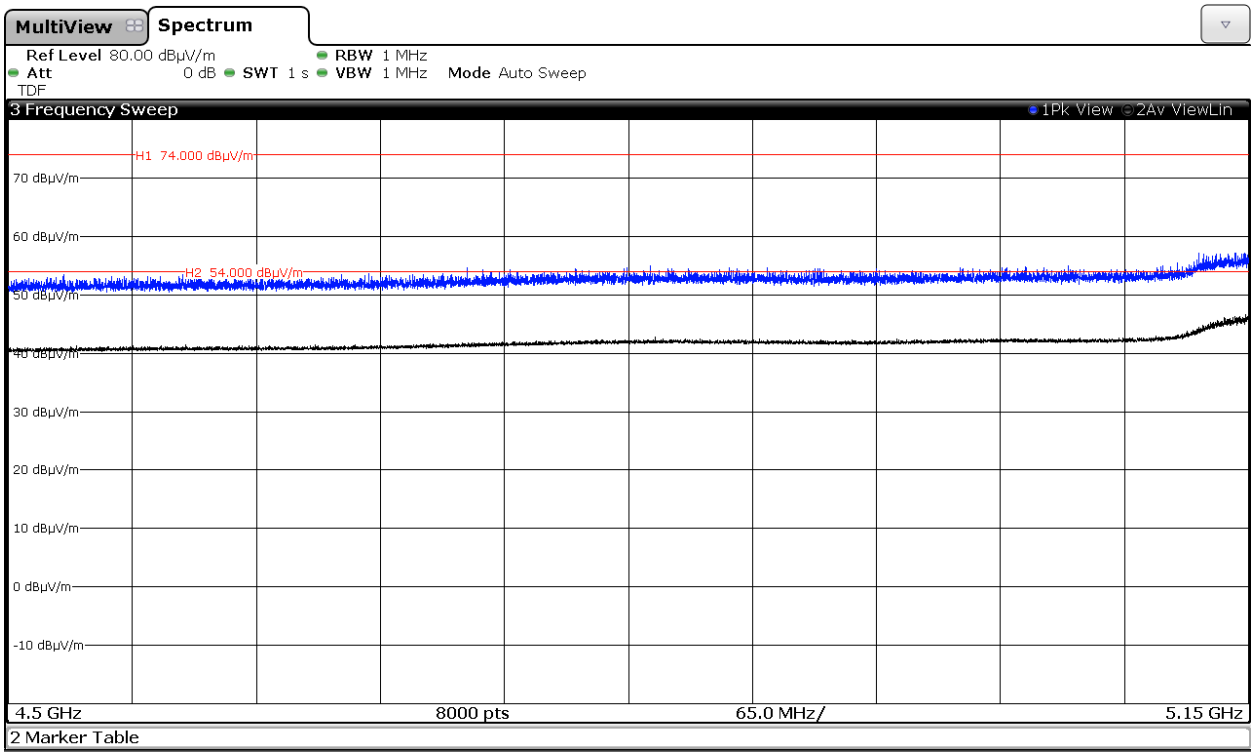


3. WiFi 5GHz 802.11 n40 mode

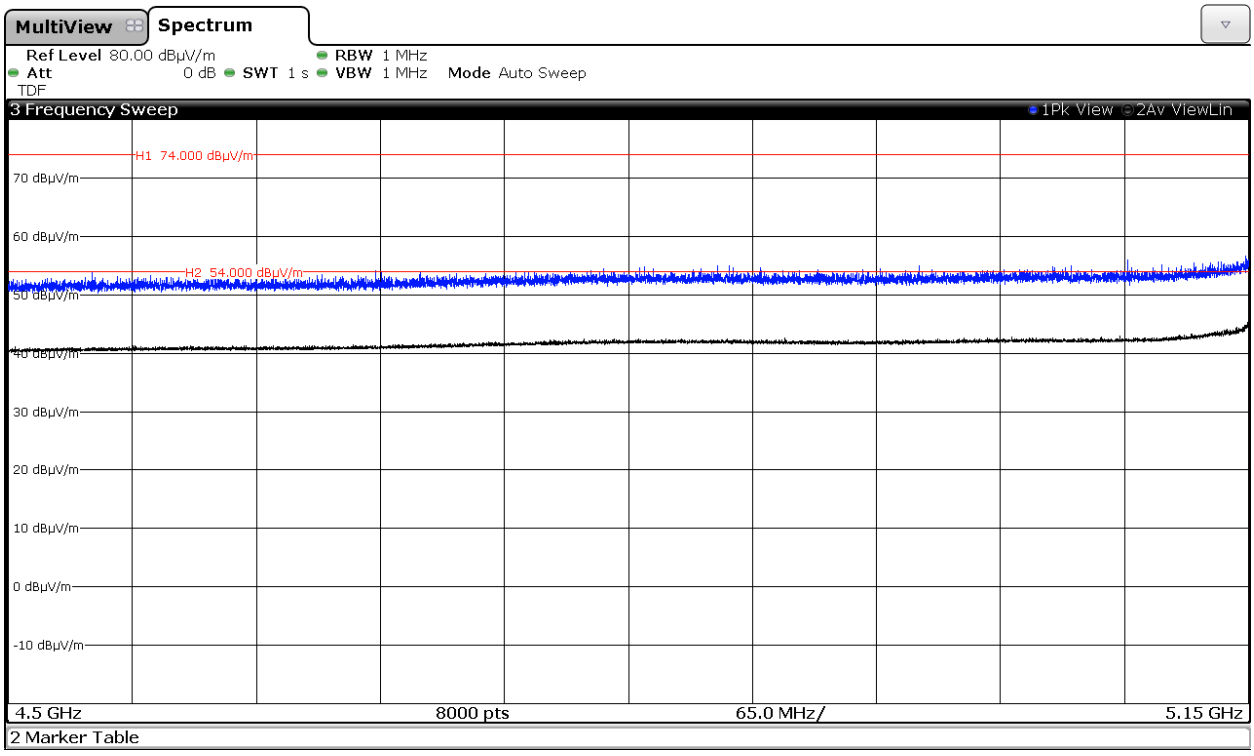
Lowest frequency 5190 MHz.
Chain A



Chain B

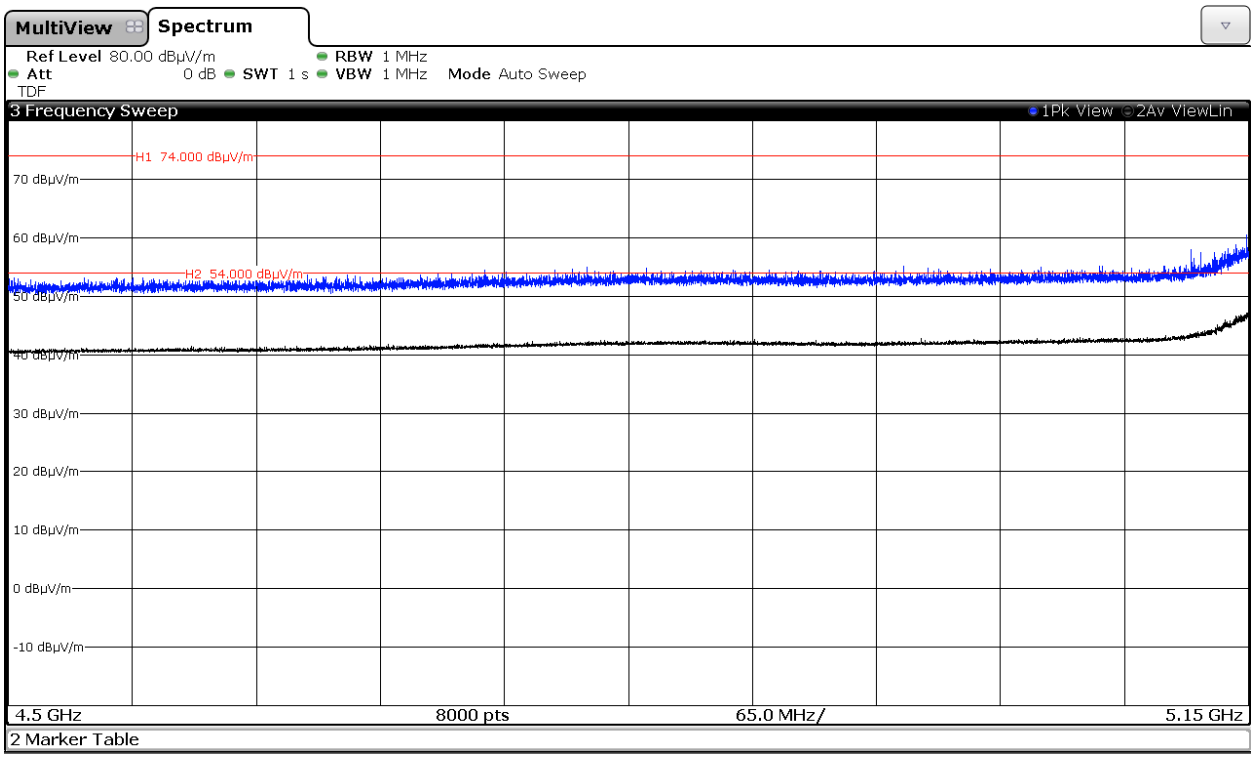


Chain A+B

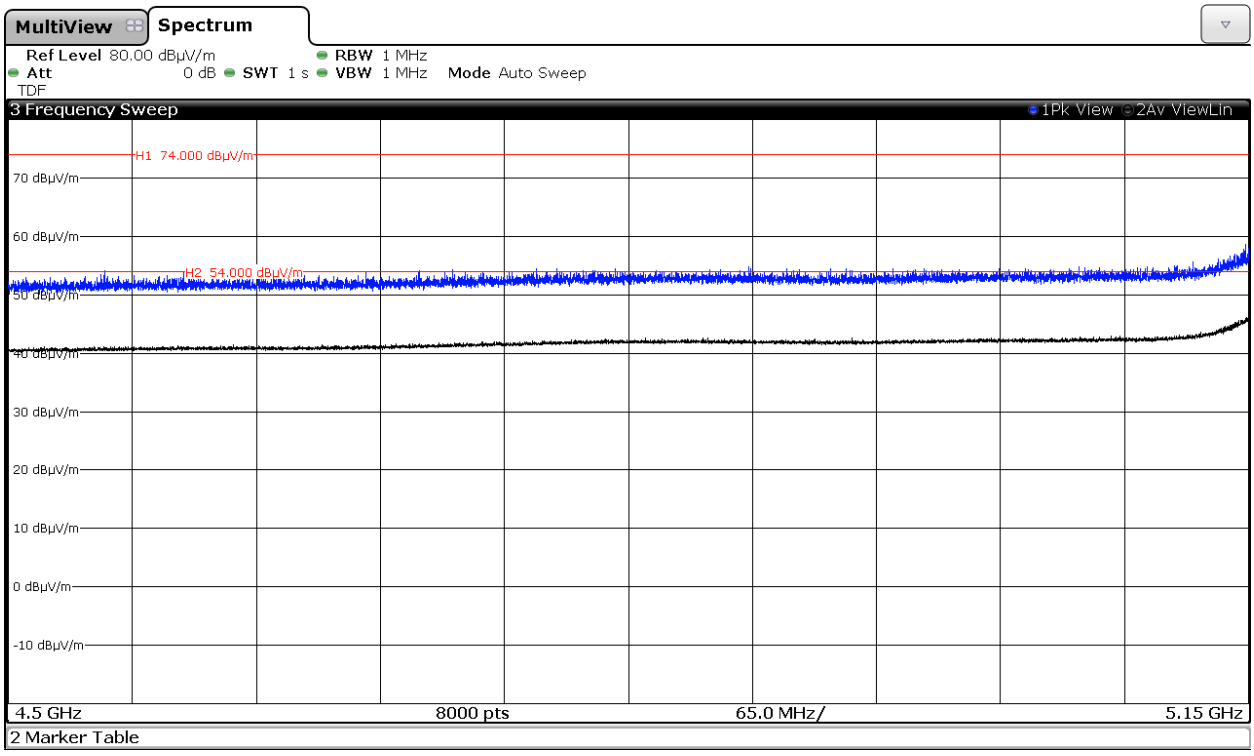


Highest Channel 5230MHz

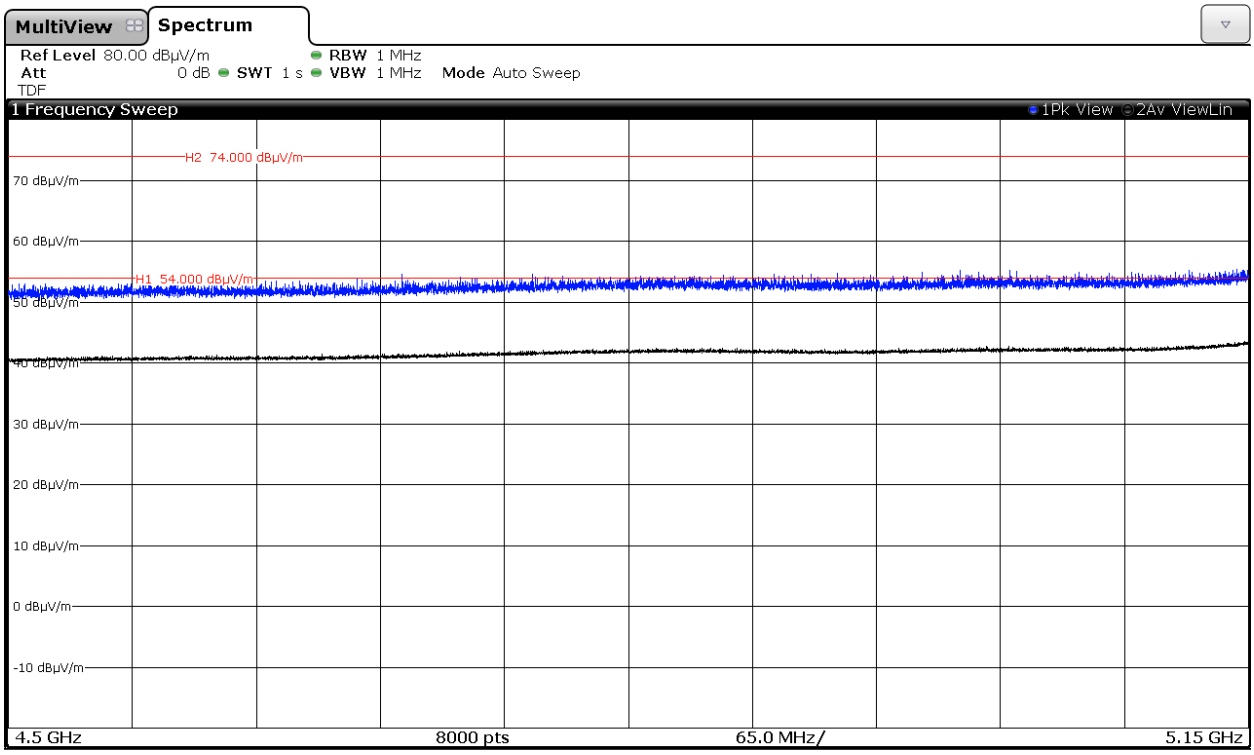
Chain A



Chain B

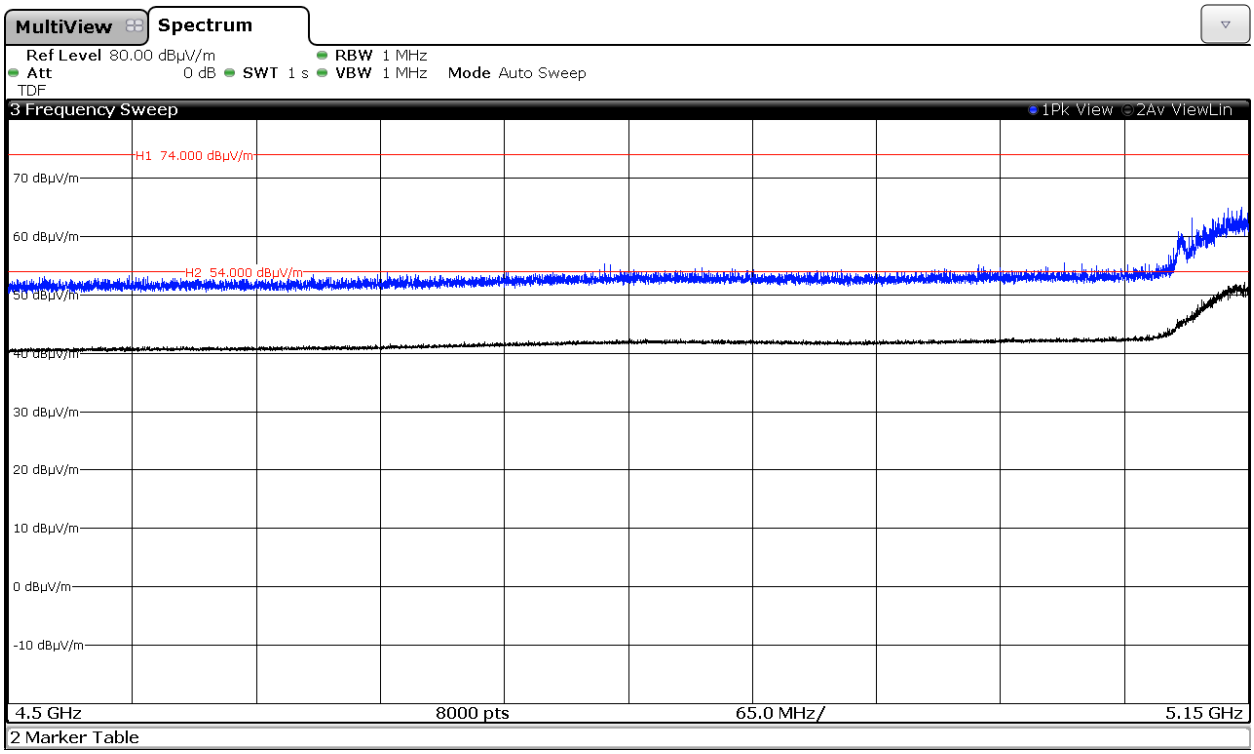


Chain A+B

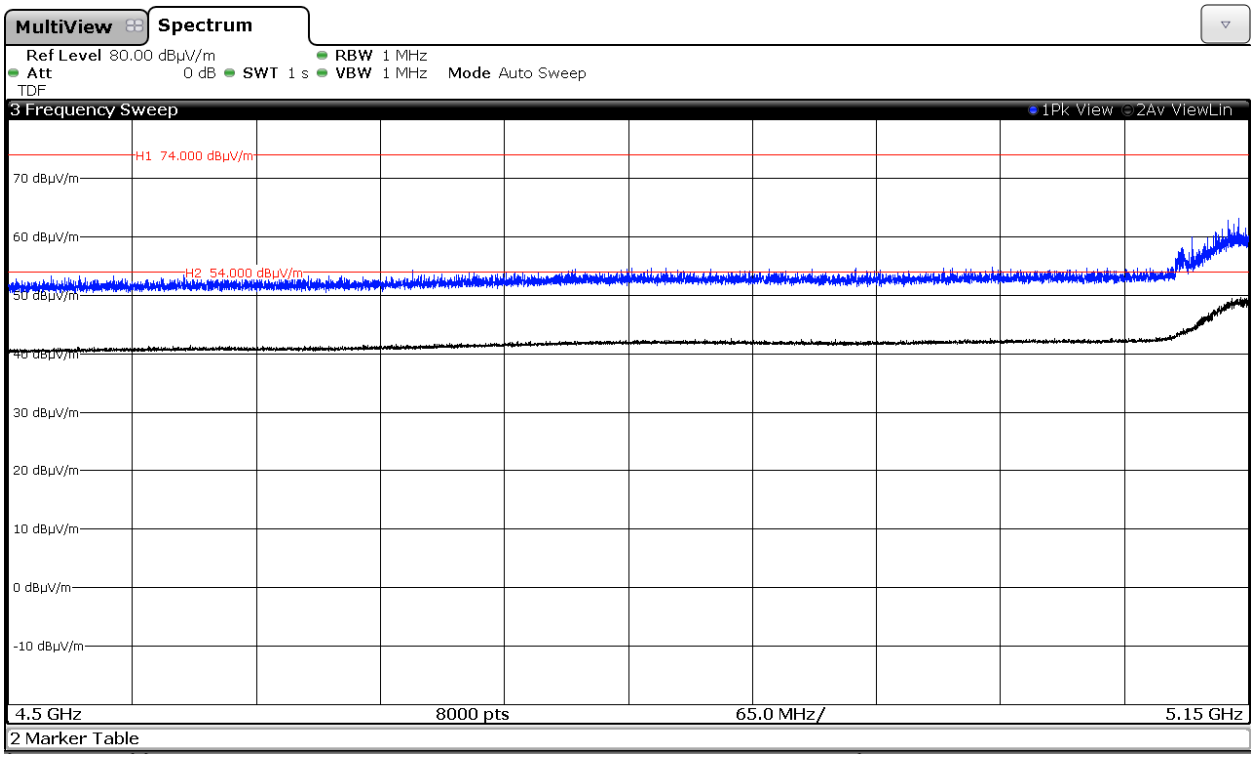


4. WiFi 5GHz 802.11 ac80 mode

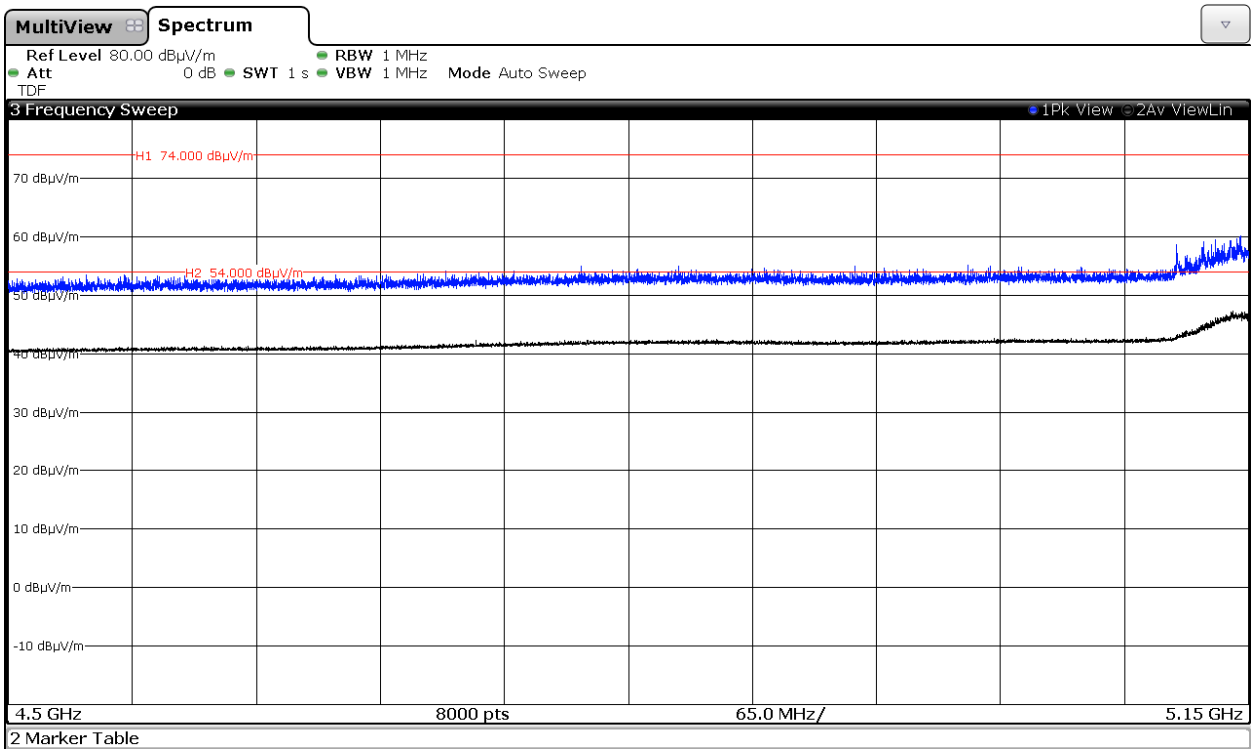
Chain A



Chain B



Chain A+B


MultiView
Spectrum
Ref Level 80.00 dBµV/m
RBW 1 MHz
Att 0 dB SWT 1 s VBW 1 MHz Mode Auto Sweep
TDF
3 Frequency Sweep
1Pk View 2Av ViewLin
H1 74.000 dBµV/m
H2 54.000 dBµV/m
70 dBµV/m
60 dBµV/m
50 dBµV/m
40 dBµV/m
30 dBµV/m
20 dBµV/m
10 dBµV/m
0 dBµV/m
-10 dBµV/m
4.5 GHz
8000 pts
65.0 MHz/
5.15 GHz
2 Marker Table

APPENDIX B: Test results for 5.25 GHz – 5.35 GHz band

INDEX

TEST CONDITIONS.....93
99 % and 26 dB Bandwidth 96
Section 15.407 Subclause (a) (2) / RSS-210 A9.2. (2). Maximum output power, Peak power spectral density and antenna gain 107
Section 15.407 Subclause (b) (2) / RSS-210 A9.2. (2). Undesirable radiated emissions (Transmitter) 1 to 40 GHz.....127

TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

Type of power supply = DC voltage from HMC/NGFC test board.

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 3.7 dBi

Operating frequencies in the sub-band 5.25-5.35 GHz.

-For IEEE 802.11a, the equipment uses channels 52, 56, 60, 64.

-For IEEE 802.11n, there are two bandwidths:

For 20 MHz bandwidth the equipment uses channels 52, 56, 60, 64.
For 40 MHz bandwidth the equipment uses channels 54, 62.

-For IEEE 802.11ac, there are three bandwidths:

For 20 MHz bandwidth the equipment uses channels 52, 56, 60, 64.
For 40 MHz bandwidth the equipment uses channels 54, 62.
For 80 MHz bandwidth the equipment uses channel 58.

TEST FREQUENCIES:

For WiFi a/n20/ac20:

Lowest channel (52): 5260 MHz

Middle channel (60): 5300 MHz

Highest channel (64): 5320 MHz

For WiFi n40/ac40:

Lowest channel (54): 5270 MHz

Highest channel (62): 5310 MHz

For WiFi ac80:

Middle channel (58): 5290 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.10: 2009 and FCC KDB 789033 D01 General UNII Test Procedures v01r03 and FCC KBD 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013.

For 802.11a mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually but not simultaneously.

For 802.11n/ac modes 802.11n20/ac20 (20 MHz channel bandwidth), 802.11n40/ac40 (40MHz channel bandwidth) and 802.11ac80 (80MHz channel bandwidth) mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually and simultaneously.

For radio testing purposes the card was installed in a test fixture. The test fixture is connected to a laptop computer and dc power supplied. The laptop computer was used to configure the EUT to continuously transmit at a specified output power with different modes and modulation schemes.

The data rates of 6Mb/s for 802.11a, HT0 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT0 (SISO) for 802.11 ac80 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and spurious levels at the band edges.

The field strength at the band edges was evaluated for each mode and on each chain individually on the lowest and highest channels at the rated power for the channel under test. Where the power at the edge channels was lower than the power at the center channels additional measurements were made at the adjacent channels. Single transmission at each chain and simultaneous transmission at both chains modes were fully evaluated.

The PC was using the Intel test utility DRTU Version "DRTU 1.7.3-859".

During transmitter test the EUT was being controlled by the Intel DRTU tool to operate in a continuous transmit mode on the test channels as required and in each of the different modulation modes.

The conducted RF output power at each chain was adjusted according to the client's supplied Target values (see following table) using the Intel DRTU tool and measuring the power by using a calibrated average power meter. Measured values for adjustment were within -0.2 dB/+0.3 dB respect to the Target values.

RF conducted output power target values

	Mode	BW (MHz)	Channel / Freq (MHz).	SISO Chain A (dBm)	SISO Chain B (dBm)	MIMO at both ports A and B (dBm)
5.25-5.35GHz Band	802.11a	20	52 / 5260	15.5	16	n/a
			56 / 5280	15.5	16	n/a
			60 / 5300	15.5	16	n/a
			64 / 5320	13.5	13.5	n/a
	802.11n	20	52 / 5260	15.5	16	13.50
			56 / 5280	15.5	16	13.50
			60 / 5300	15.5	16	13.50
			64 / 5320	13.5	13.5	11.50
	802.11n*	40	54 / 5270	16.5	16.5	16.50
			62 / 5310	13.5	13.5	11.50
	802.11ac	80	58 / 5290	13.5	13.5	11.50

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer using low loss RF cables with sma type connectors. The reading in the spectrum analyzer is corrected taking into account the cable loss.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 1m for the frequency range 1 GHz-40 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º.

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

99 % and 26 dB Bandwidth

RESULTS

1. 802.11a mode (see next plots).

CHAIN A

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	17.40	17.40	17.40
26 dB bandwidth (MHz)	24.96	26.04	25.28
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	17.52	17.48	17.40
26 dB bandwidth (MHz)	27.20	26.64	26.24
Measurement uncertainty (kHz)	±7		

2. 802.11 n20 MHz and 802.11 ac 20 MHz modes. (see next plots).

CHAIN A

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	18.40	18.48	18.40
26 dB bandwidth (MHz)	25.92	26.36	26.40
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	18.48	18.48	18.40
26 dB bandwidth (MHz)	27.28	26.52	25.76
Measurement uncertainty (kHz)	±7		

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes. (see next plots).

CHAIN A

	Lowest frequency 5270 MHz	Highest frequency 5310 MHz
99% bandwidth (MHz)	36.60	36.40
26 dB bandwidth (MHz)	46.30	44.90
Measurement uncertainty (kHz)	±7	

CHAIN B

	Lowest frequency 5270 MHz	Highest frequency 5310 MHz
99% bandwidth (MHz)	36.70	36.50
26 dB bandwidth (MHz)	47.50	44.60
Measurement uncertainty (kHz)	±7	

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

4. 802.11 ac 80 MHz mode. (see next plots).

CHAIN A

	Frequency 5290 MHz
99% bandwidth (MHz)	75.30
26 dB bandwidth (MHz)	82.20
Measurement uncertainty (kHz)	±7

CHAIN B

	Frequency 5290 MHz
99% bandwidth (MHz)	75.45
26 dB bandwidth (MHz)	82.65
Measurement uncertainty (kHz)	±7