

FCC LISTED, REGISTRATION NUMBER: 905266

**IC LISTED REGISTRATION NUMBER
IC 4621A-1**

AT4 wireless, S.A.

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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 : 40079RRF.003

Approved by
(name / position & signature) : A. Llamas / RF Lab. Manager

Elaboration date : 2013-10-28

Identification of item tested : 7260SDW

Trademark : INTEL

Model and/or type reference : 7260SDW

Serial number : TA#: H10137-002

WF MAC:001500D08635

BD MAC: 001500D08639

Other identification of the product : Commercial name: 7260SDW

HW version: Engineering Sample

SW version: DRTU 1.7.1-752 & DRTU 1.7.1-777

For OEM factory installation:

FCC ID: PD97260SD

IC: 1000M-7260SD

Features : 802.11 a/b/g/n/ac + BT 4.0

Description : 2x2 antenna configuration, solder-down module

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 (10-1-11 Edition). Unlicensed National Information Infrastructure Devices. General technical requirements. USA FCC Part 15.209 (10-1-11 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 v01r01 dated 04/08/2013. Emissions Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 05/28/2013. 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.																																																																												
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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 conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

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:

<u>Control N°</u>	<u>Description</u>	<u>Model</u>	<u>Serial N°</u>	<u>Date of reception</u>
40079/02	2x2 antenna configuration, solder-down module	7260SDW	TA#: H10137-002 WF MAC: 001500D08635 BD MAC: 001500D08639	05/09/2013

Auxiliary elements used with the sample S/01:

<u>Control N°</u>	<u>Description</u>	<u>Manufacture</u>	<u>Model</u>	<u>Serial N°</u>	<u>Date of reception</u>
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
40079/11	Interface extender cable	---	---	---	26/09/2013
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:

<u>Control Nº</u>	<u>Description</u>	<u>Model</u>	<u>Serial Nº</u>	<u>Date of reception</u>
40079/02	2x2 antenna configuration, solder-down module	7260SDW	TA#: H10137-002 WF MAC: 001500D08635 BD MAC: 001500D08639	05/09/2013

Auxiliary elements used with the sample S/01:

<u>Control Nº</u>	<u>Description</u>	<u>Manufacture</u>	<u>Model</u>	<u>Serial Nº</u>	<u>Date of reception</u>
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
40079/11	Interface extender cable	---	---	---	26/09/2013
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
40079/09	USB cable	---	---	---	26/09/2013

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 2013-09-25 and finished on 2013-10-18.

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. = 22.3 °C Max. = 22.5°C
Relative humidity	Min. = 55.1 % Max. = 57 %
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. = 20.1 °C Max. = 20.9 °C
Relative humidity	Min. = 63 % Max. = 63.5%
Air pressure	Min. = 1020mbar Max. = 1021 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. = 24.5 °C Max. = 25.1 °C
Relative humidity	Min. = 48.2 % Max. = 50.2 %
Air pressure	Min. = 1018 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 40079RRF.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):

$V_{nominal} = 3.3 \text{ Vdc}$

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 (28): 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 v02 dated 05/28/2013.

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, HT4 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT6 (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 1.7.1-752 & DRTU 1.7.1-777”

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	15	15	n/a
			48 / 5240	15	15	n/a
	802.11n	20	36 / 5180	14	14	12.00
			40 / 5200	15	15	13.50
			48 / 5240	15	15	13.50
	802.11n*	40	38 / 5190	11	11	9.00
			46 / 5230	15.5	15.5	13.50
	802.11ac	80	42 / 5210	9,5	10	7.50

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 360°.

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)	17.760	18.000	17.920
26 dB bandwidth (MHz)	26.319	27.012	27.778
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	17.920	18.040	18.000
26 dB bandwidth (MHz)	26.353	28.141	28.563
Measurement uncertainty (kHz)	± 21.7		

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)	18.800	18.720	18.640
26 dB bandwidth (MHz)	27.798	27.296	25.710
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5180 MHz	Middle frequency 5200 MHz	Highest frequency 5240 MHz
99% bandwidth (MHz)	18.600	18.720	18.640
26 dB bandwidth (MHz)	25.576	27.336	25.821
Measurement uncertainty (kHz)	± 21.7		

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
26 dB bandwidth (MHz)	42.416	55.561
99% bandwidth (MHz)	36.400	36.800
Measurement uncertainty (kHz)	±21.7	

CHAIN B

	Lowest frequency 5190 MHz	Highest frequency 5230 MHz
26 dB bandwidth (MHz)	42.821	44.671
99% bandwidth (MHz)	36.400	36.600
Measurement uncertainty (kHz)	±21.7	

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

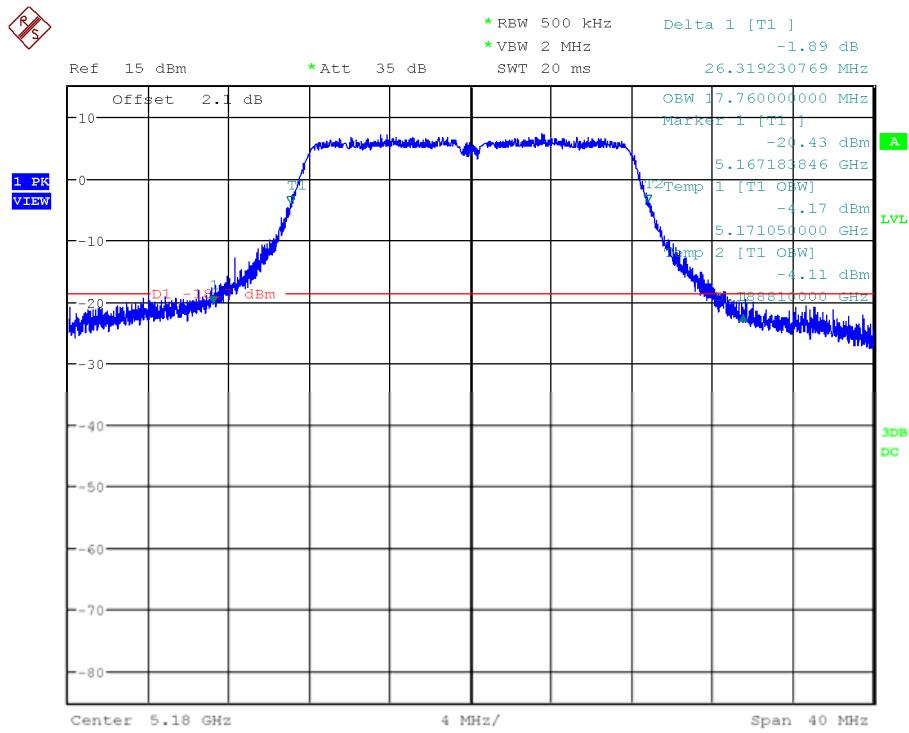
	Frequency 5210 MHz
99% bandwidth (MHz)	75.150
26 dB bandwidth (MHz)	81.782
Measurement uncertainty (kHz)	±21.7

CHAIN B

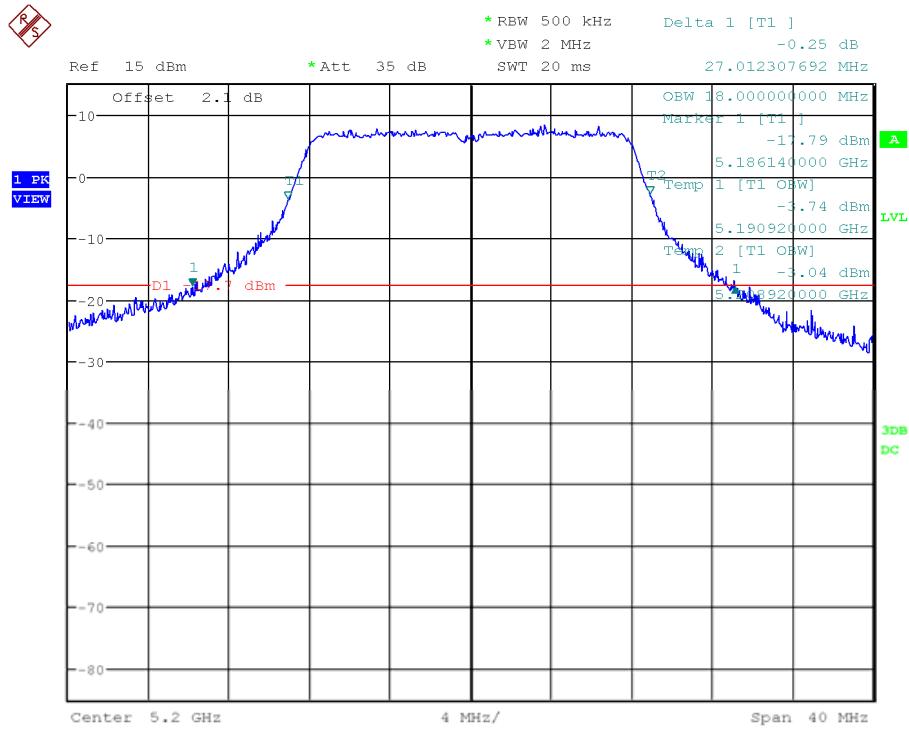
	Frequency 5210 MHz
99% bandwidth (MHz)	75.150
26 dB bandwidth (MHz)	81.250
Measurement uncertainty (kHz)	±21.7

802.11a mode CHAIN A

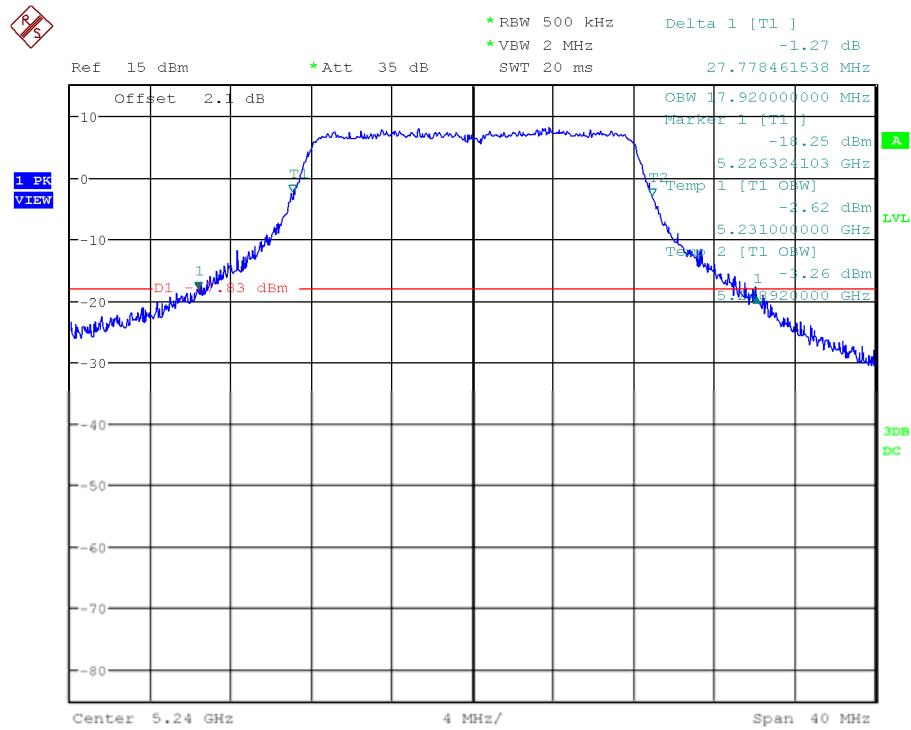
Lowest Channel



Middle Channel

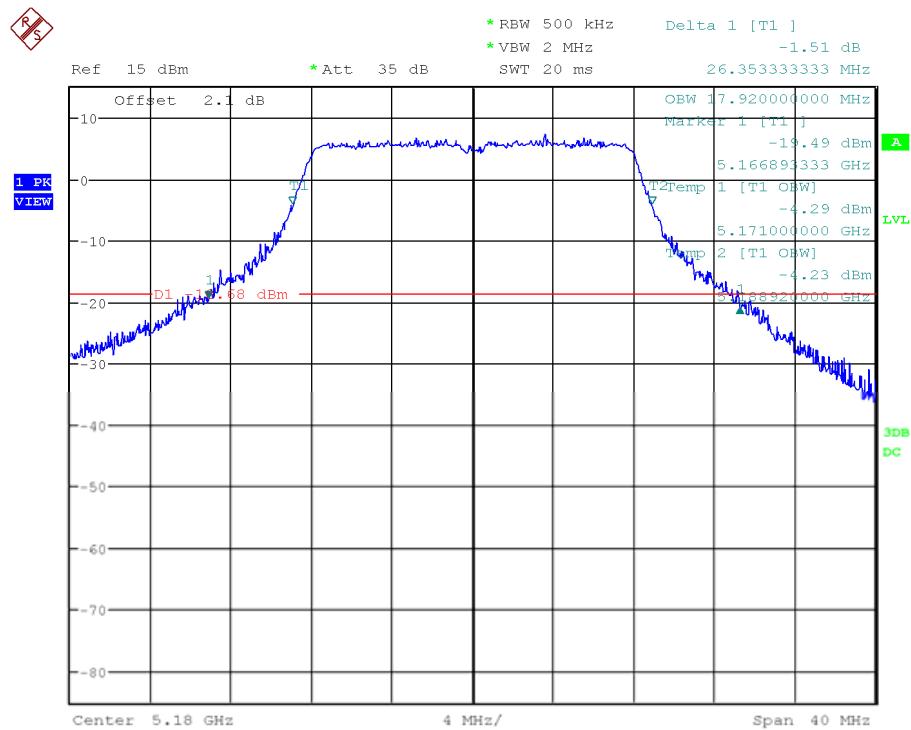


Highest Channel

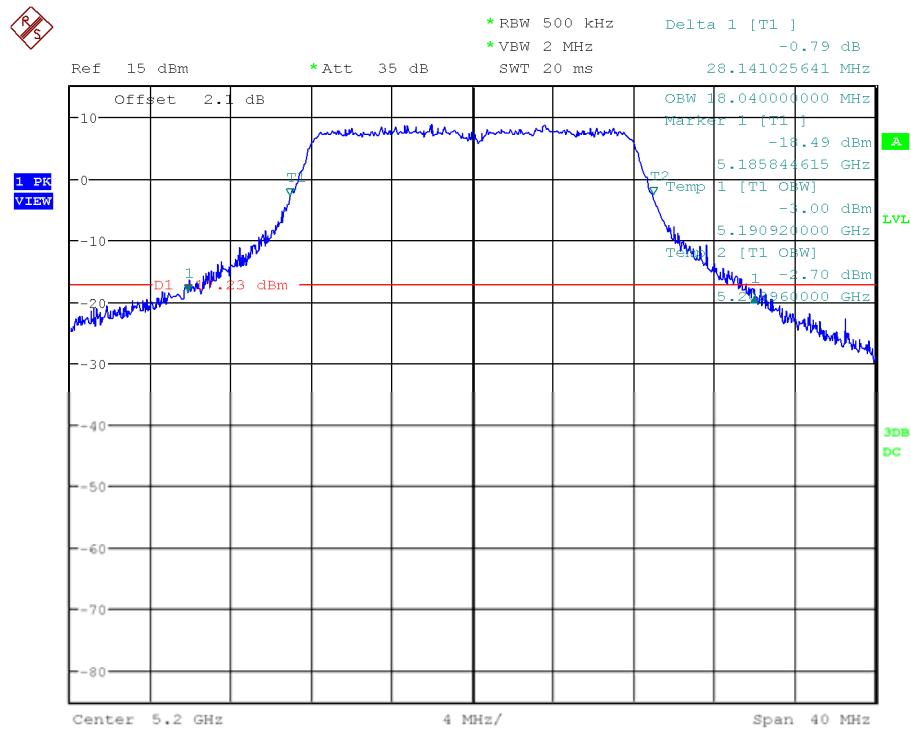


802.11a mode CHAIN B

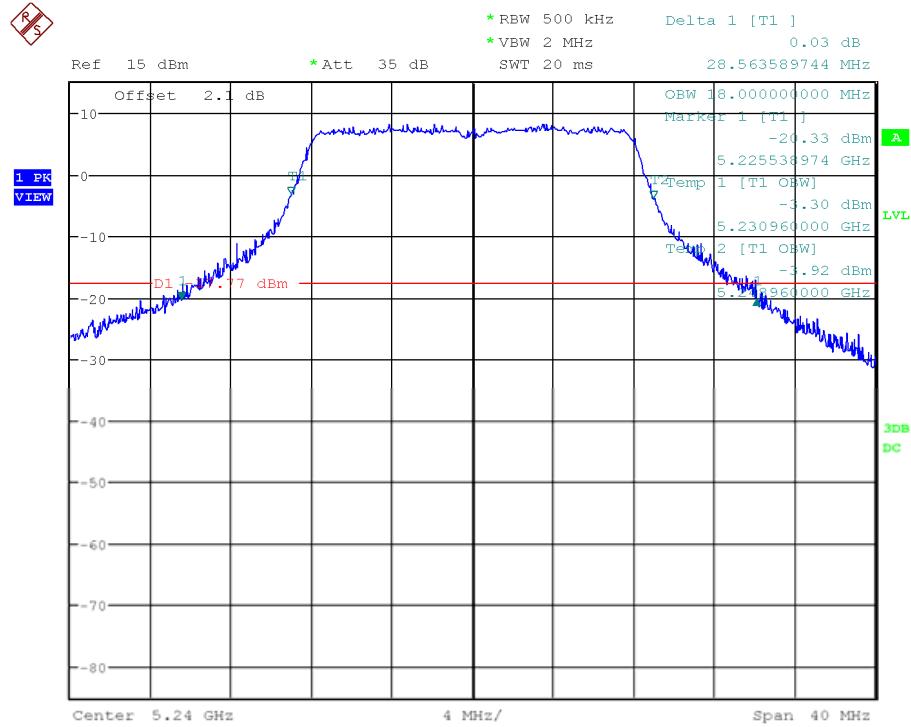
Lowest Channel



Middle Channel

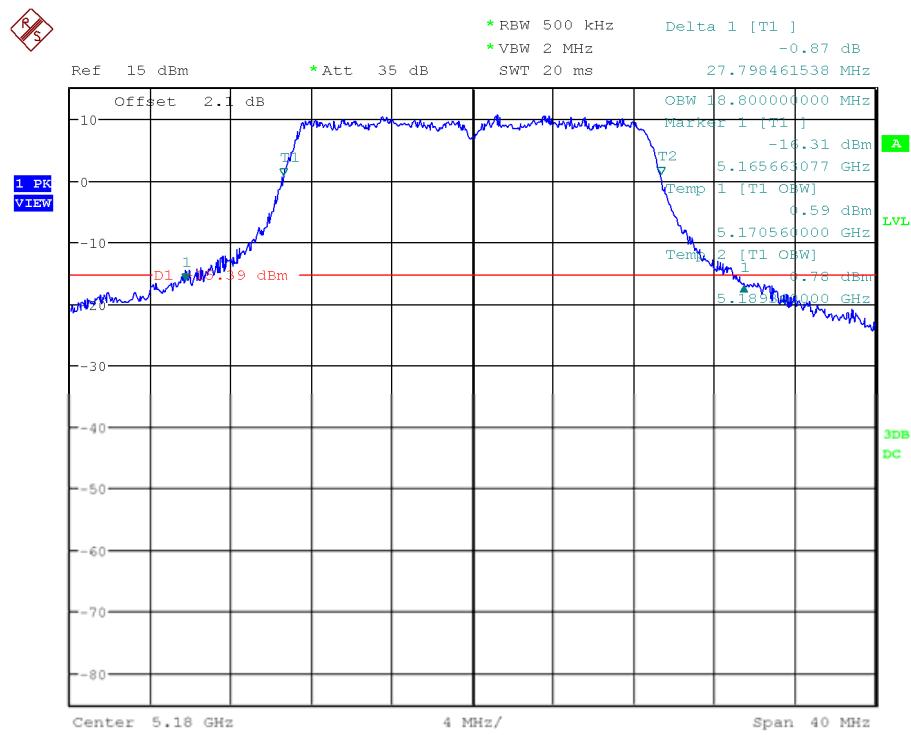


Highest Channel

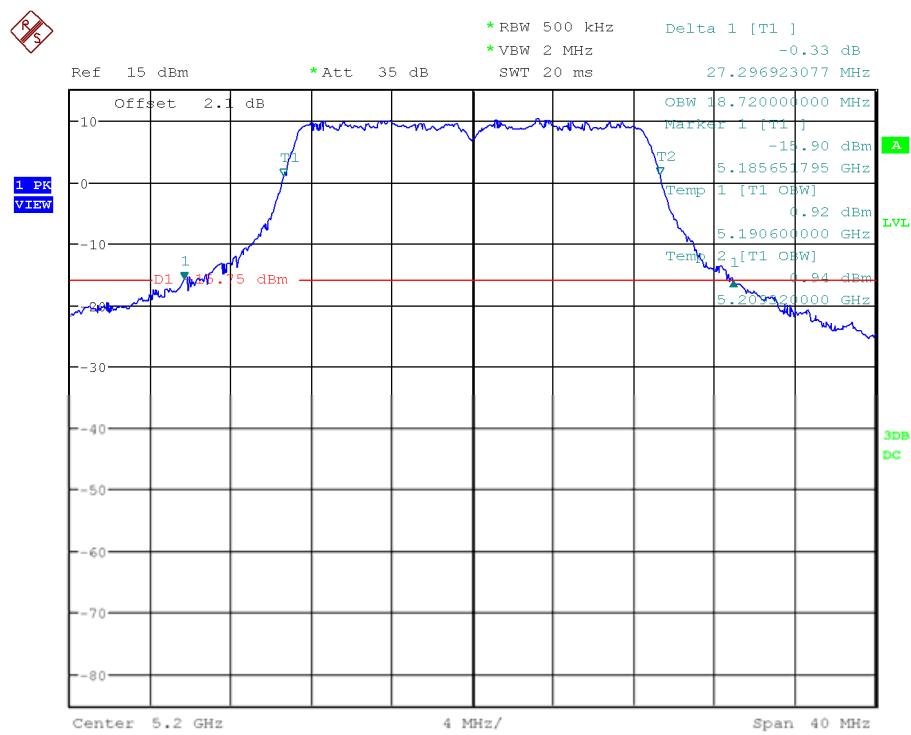


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

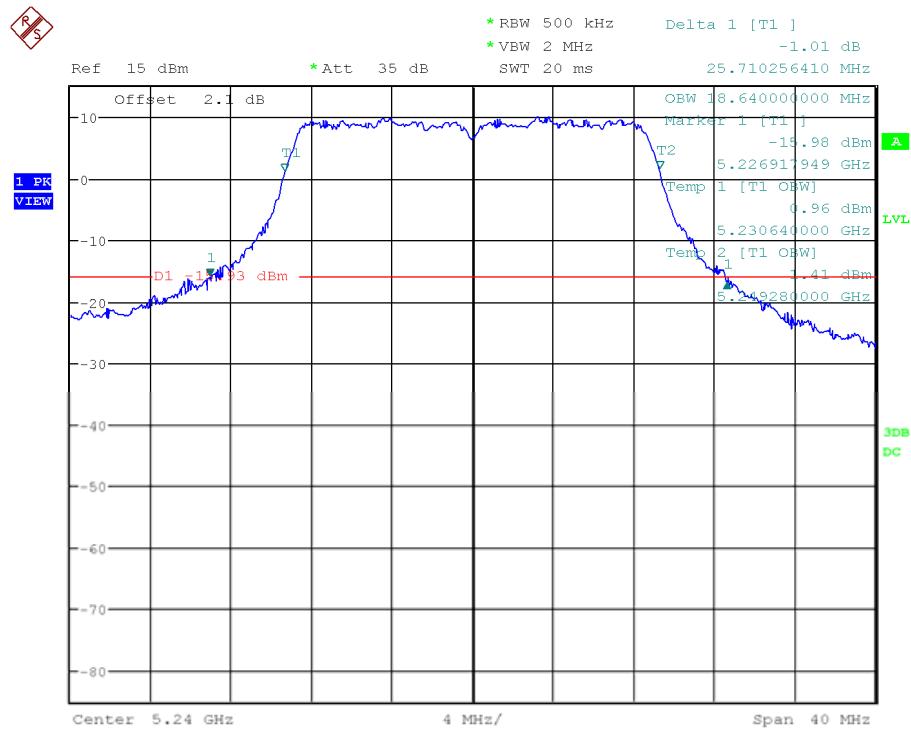
Lowest Channel



Middle Channel

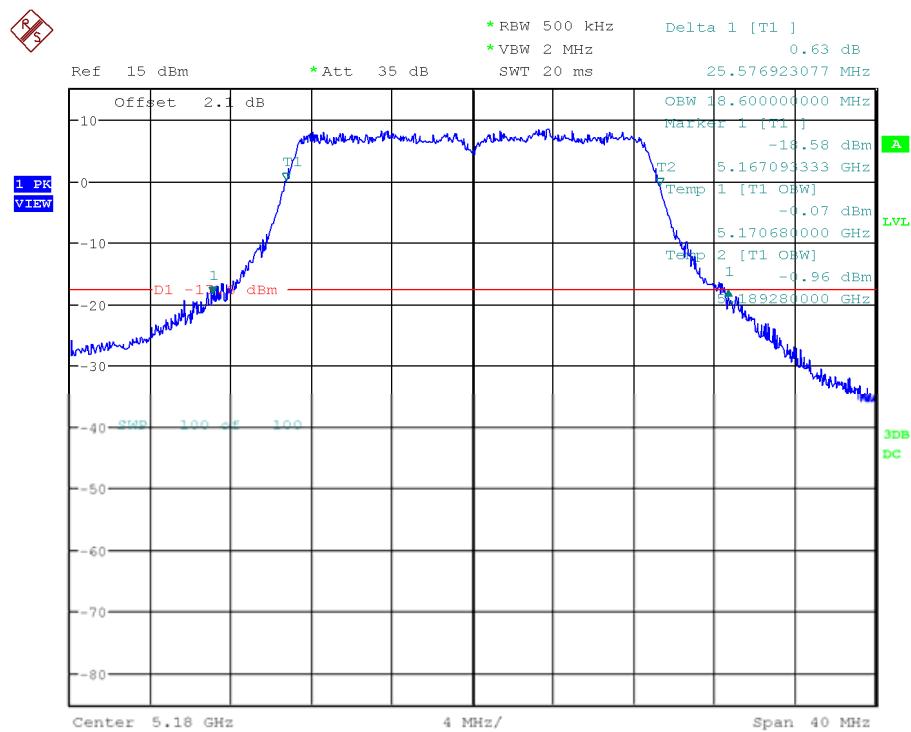


Highest Channel

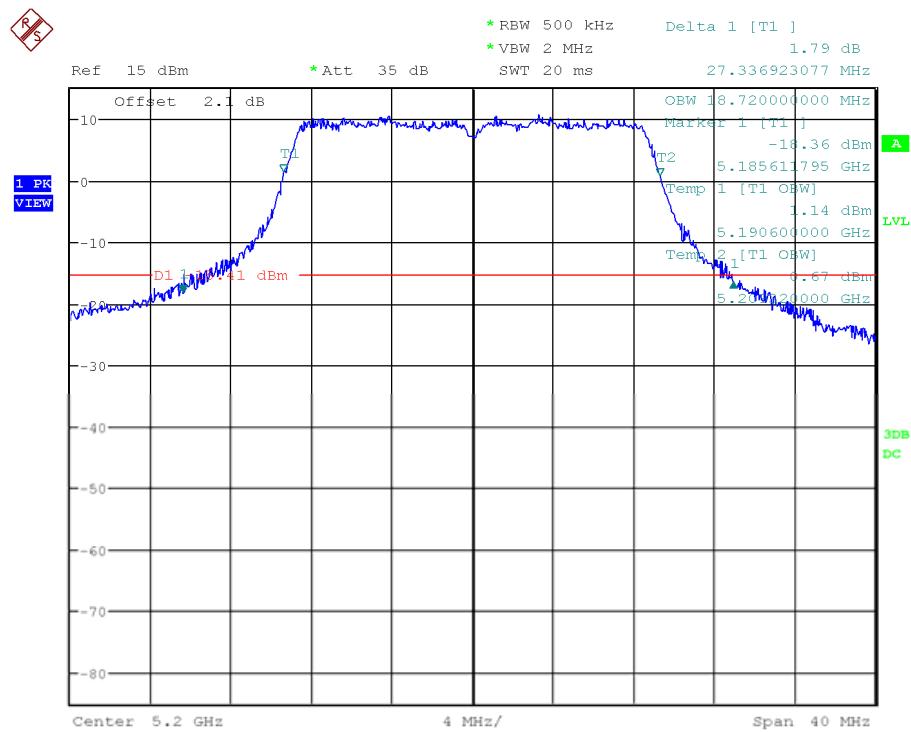


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

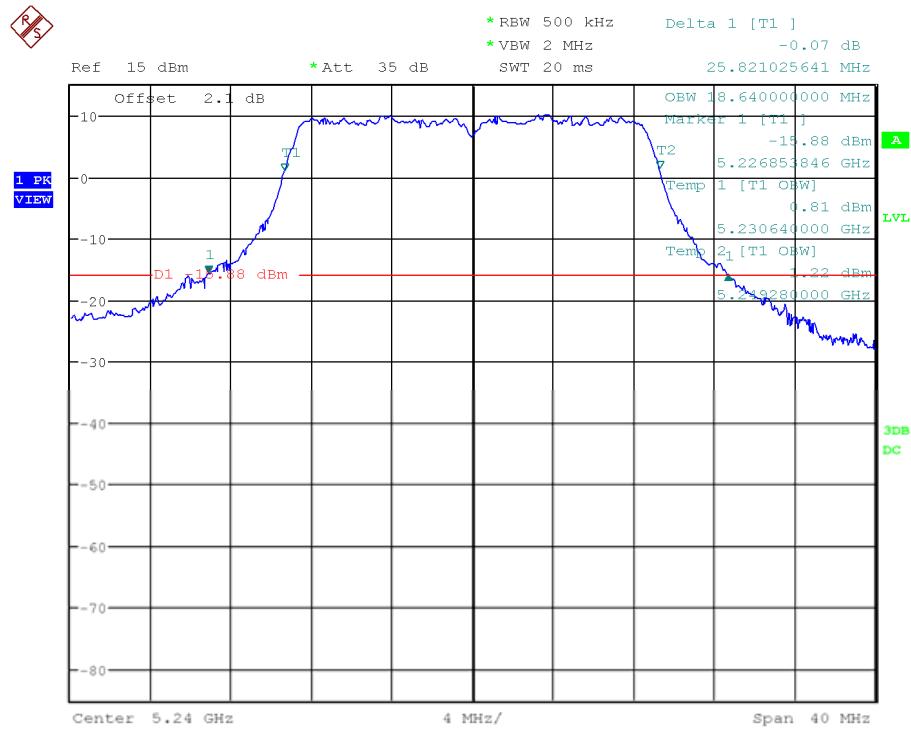
Lowest Channel



Middle Channel

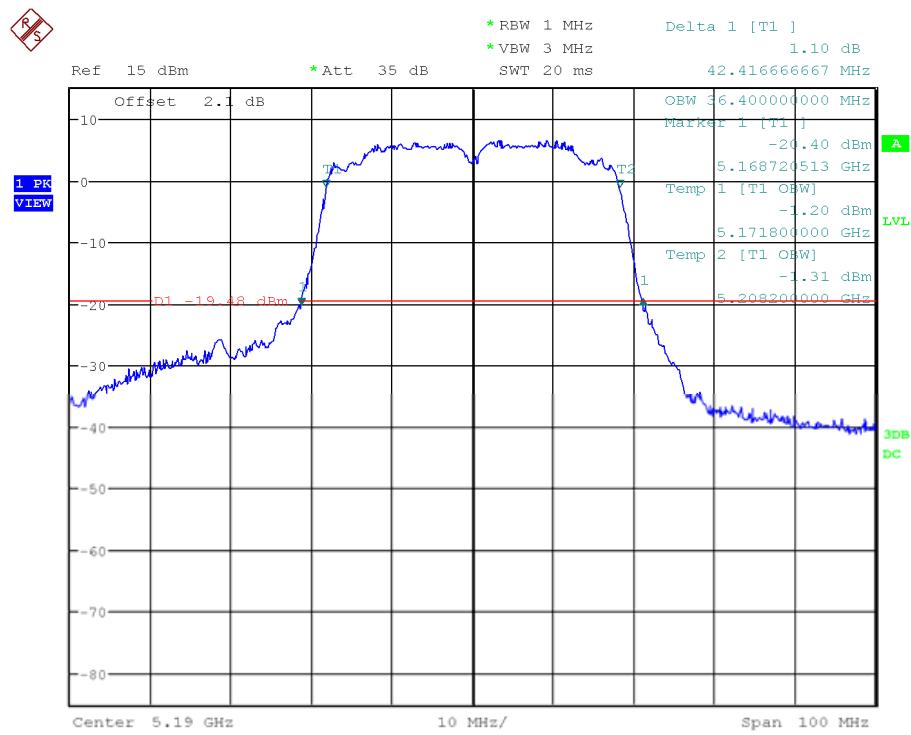


Highest Channel

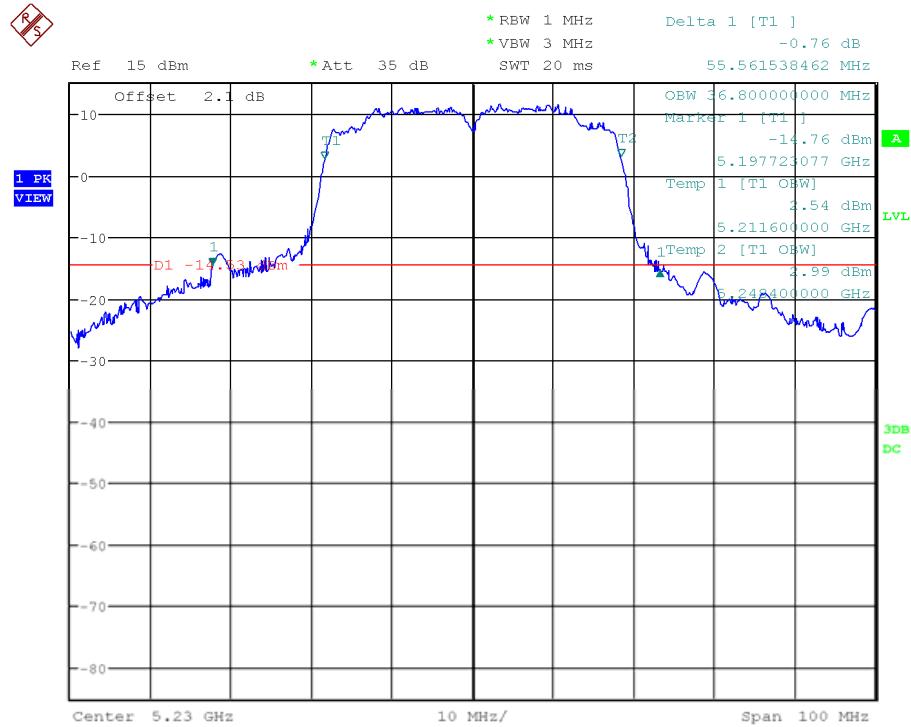


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

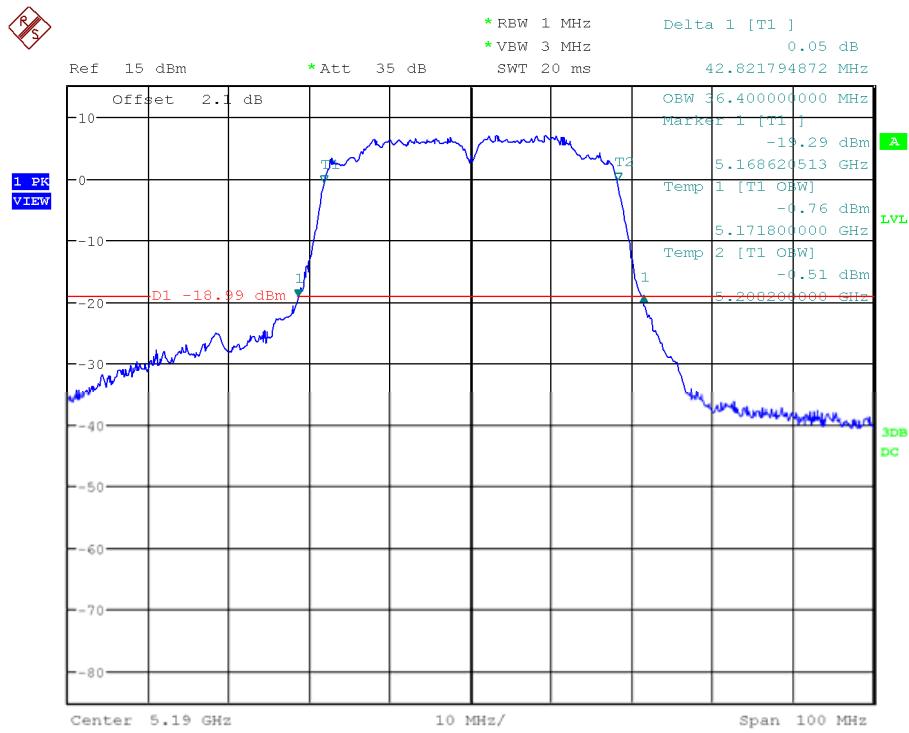


Highest Channel

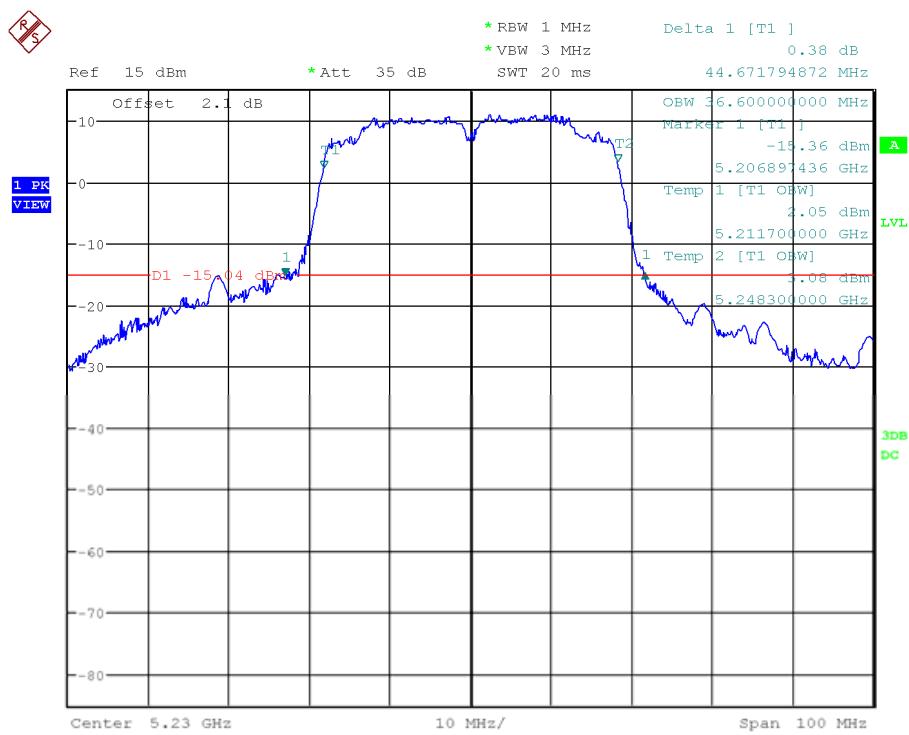


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

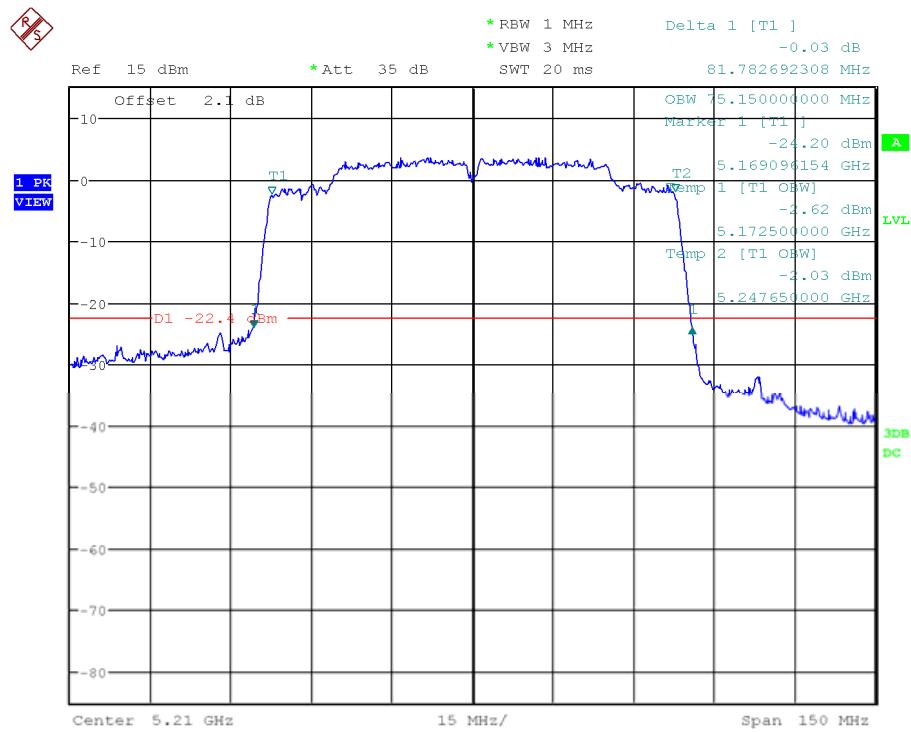
Lowest Channel



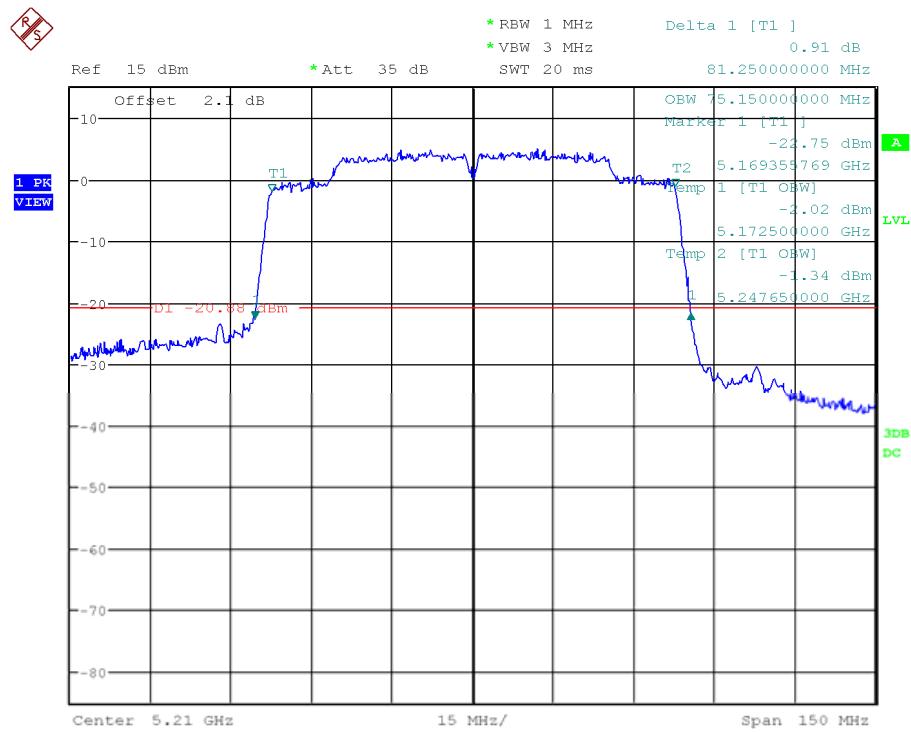
Highest Channel



802.11 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 $4 \text{ dBm} + 10 \log B$, 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 $10 + 10 \log_{10} B$, 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 ($10 \log_{10} B$) 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).

For MIMO mode, the *Measure and add $10 \log(N_{ANT})$ dB*, (where N_{ANT} 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 v02 dated 05/28/2013.

With this technique, spectrum measurements are performed at each output of the device, and the quantity $10 \log(N_{ANT})$ dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

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 Guidance on directional Gain calculations according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 05/28/2013 was used.

The number of transmit antennas (N_{ANT}) are 2 and the number of spatial streams (N_{SS}) 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	13.61	17.21	2.901	6.501
5200 MHz	14.74	18.34	3.811	7.411
5240 MHz	14.81	18.41	3.710	7.310

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	13.71	17.31	3.006	6.006
5200 MHz	15.01	18.61	3.974	6.574
5240 MHz	14.99	18.59	3.983	6.583

Measurement uncertainty = ± 1.5 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	13.65	17.25	3.04	6.64
5200 MHz	14.94	18.54	3.60	7.20
5240 MHz	14.67	18.27	3.76	7.36

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	13.65	17.25	3.06	6.66
5200 MHz	14.72	18.32	3.51	7.11
5240 MHz	14.68	18.28	3.76	7.36

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	11.89	11.71	14.81	18.41
5200 MHz	13.55	13.43	16.50	20.10
5240 MHz	13.65	13.31	16.31	19.91

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	0.23	0.14	3.24	3.15	6.84	6.75
5200 MHz	0.97	0.93	3.98	3.94	7.58	7.54
5240 MHz	0.93	0.98	3.94	3.99	7.54	7.59

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

 Measurement uncertainty = ± 1.5 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	11.24	14.84	-1.73	1.87
5230 MHz	15.65	19.25	2.41	6.01

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	11.36	14.96	-1.65	1.95
5230 MHz	15.51	19.11	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	8.72	8.98	11.86	15.46
5230 MHz	13.62	13.46	16.47	20.07

Measurement uncertainty = ±1.5 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	-4.14	-3.65	-1.13	-0.64	2.47	2.96
5230 MHz	0.69	0.55	3.70	3.56	7.30	7.16

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

Measurement uncertainty = ±1.5 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	9.76	13.36	-5.54	-1.94

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	10.17	13.77	-5.12	-1.52

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	7.40	7.77	10.60	14.20

 Measurement uncertainty = ± 1.5 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	-7.33	-7.11	-4.32	-4.1	-0.72	-0.5

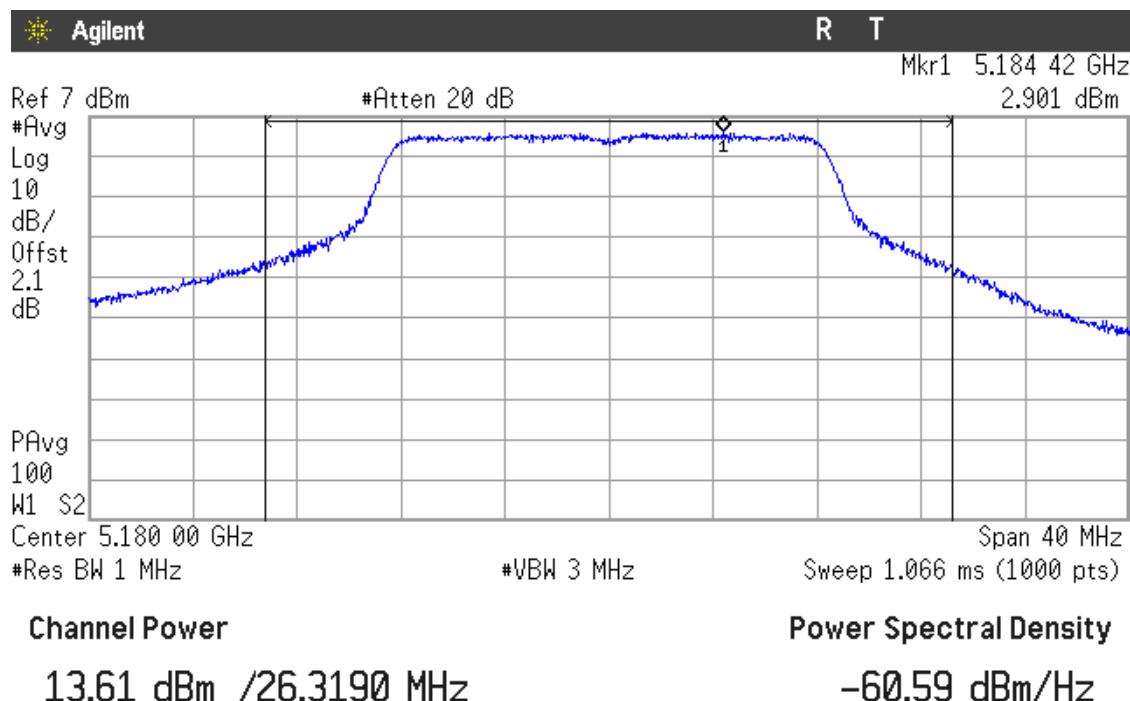
 Note 1: The quantity $10 \log 2$ (two antennas) is added to the spectrum peak value according to document 662911 D01.

 Measurement uncertainty = ± 1.5 dB

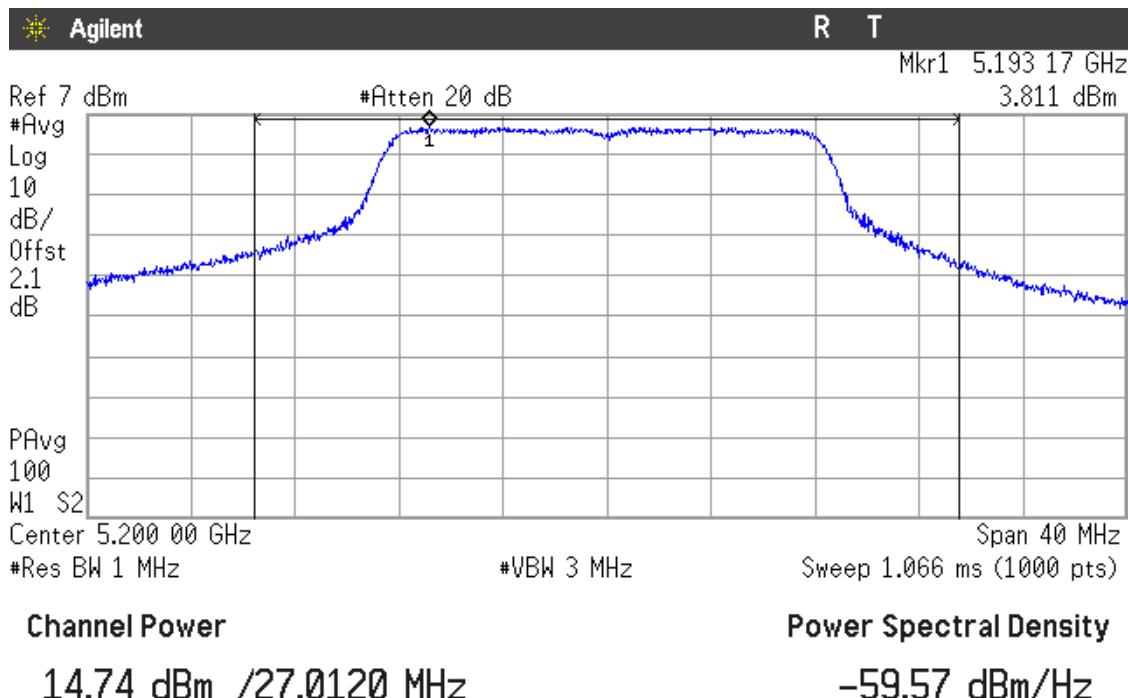
Verdict: Pass

802.11a mode CHAIN A

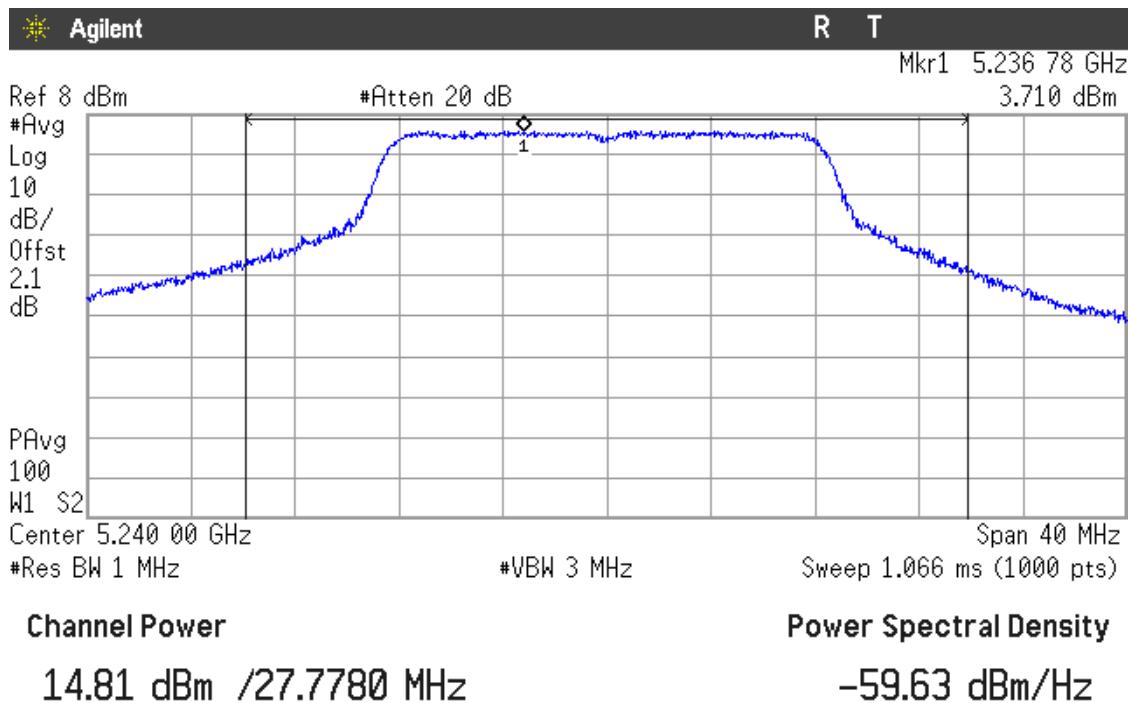
Lowest Channel



Middle Channel

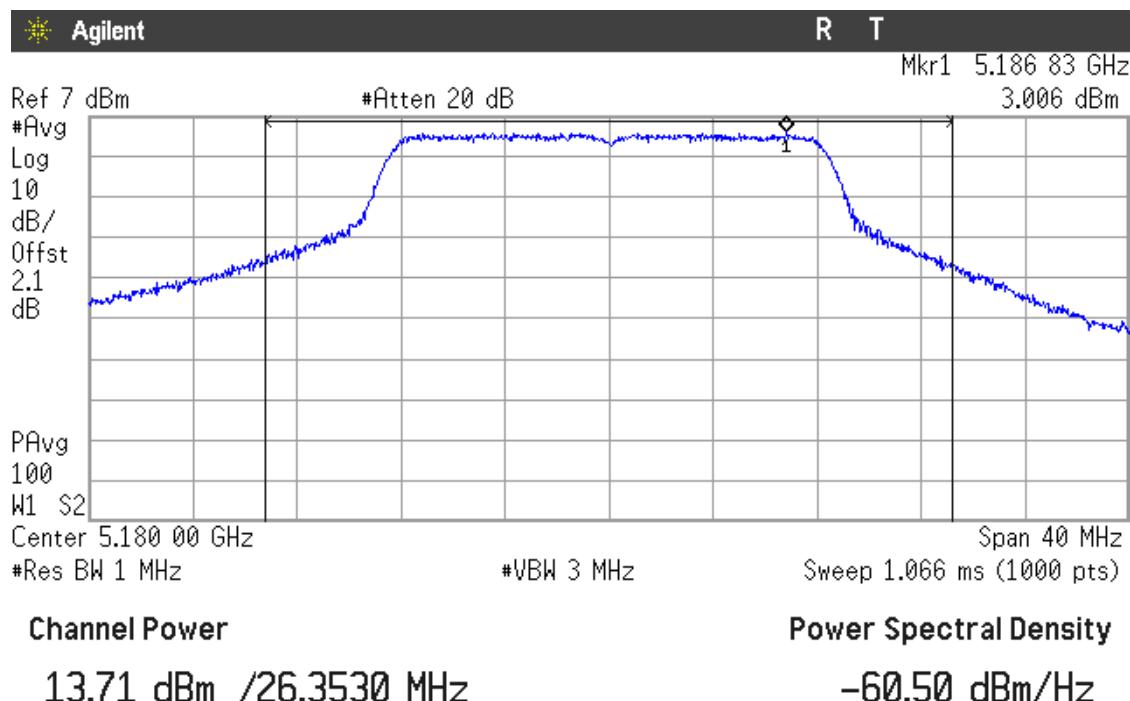


Highest Channel

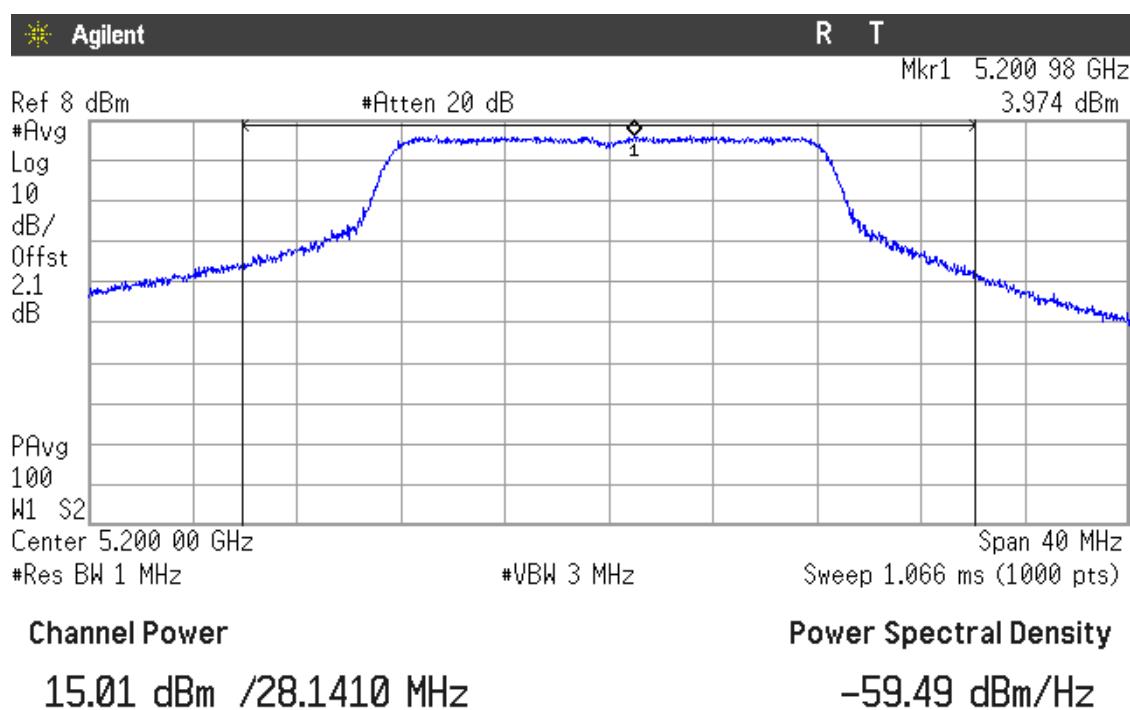


802.11a mode CHAIN B

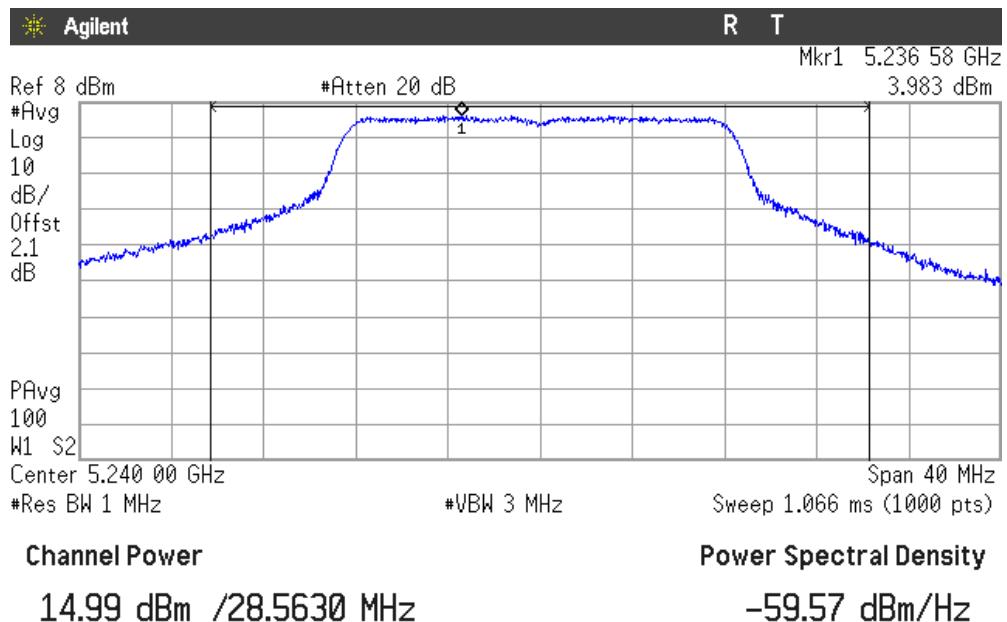
Lowest Channel



Middle Channel

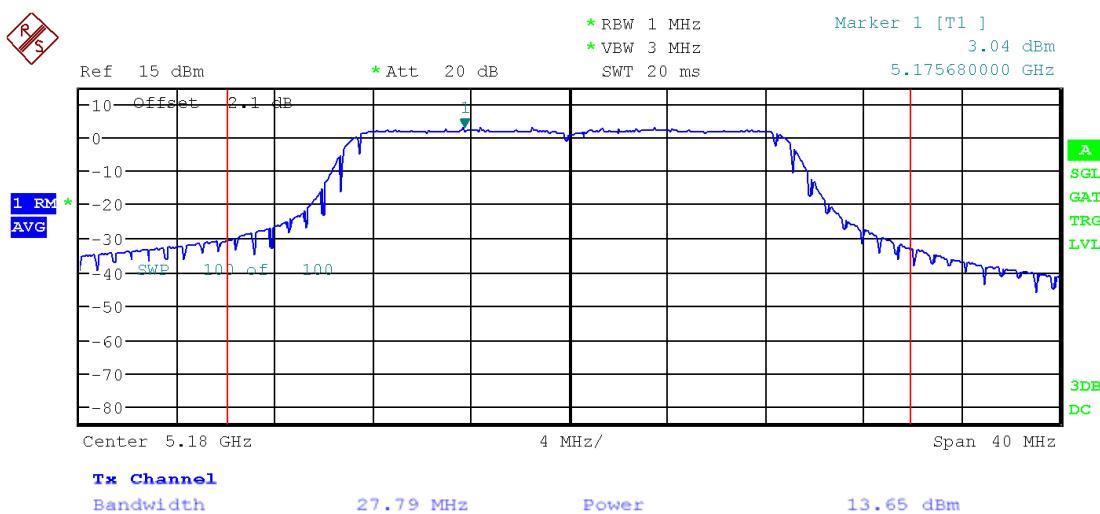


Highest Channel

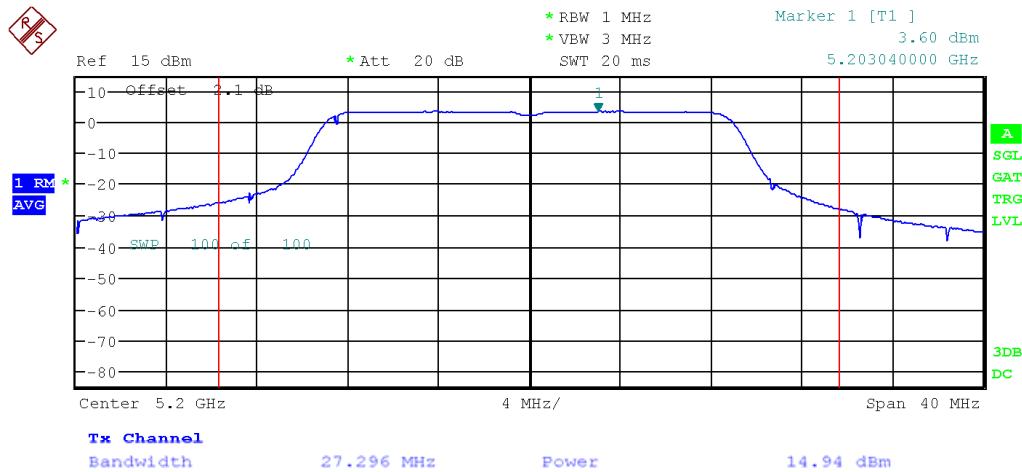


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

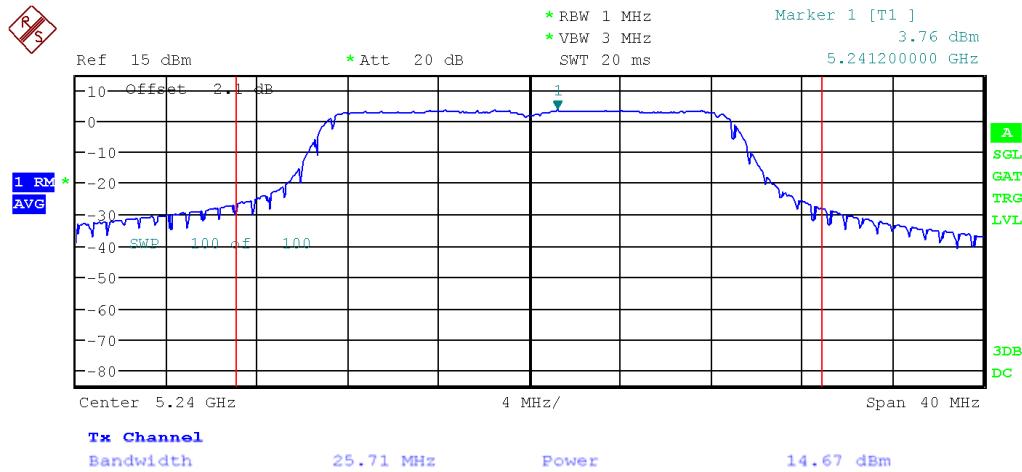
Lowest Channel



Middle Channel

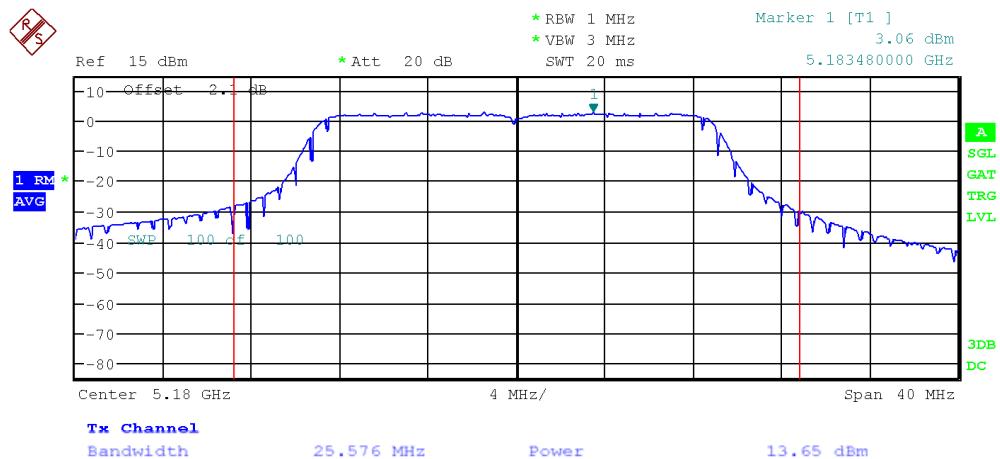


Highest Channel

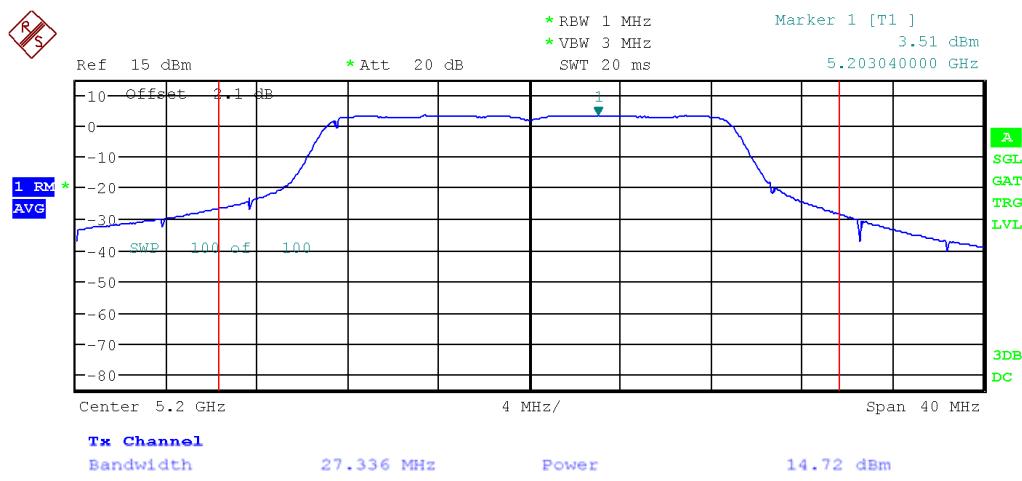


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

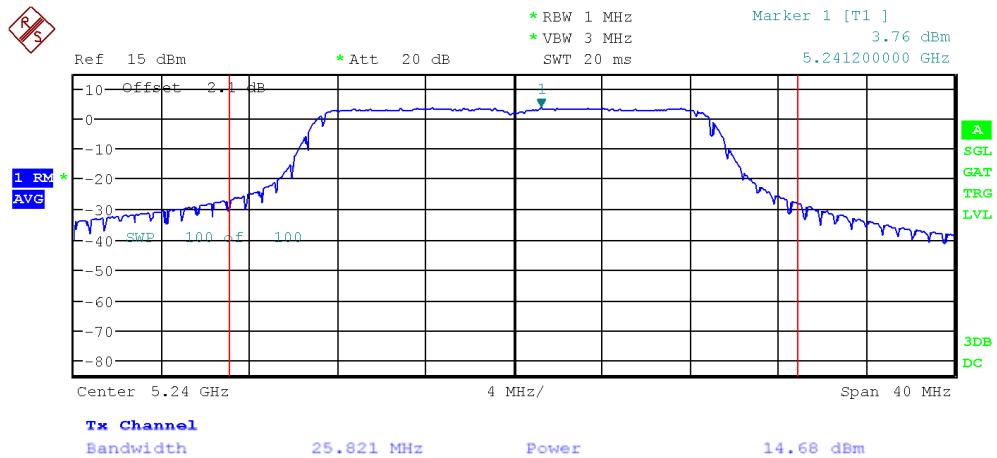
Lowest Channel



Middle Channel

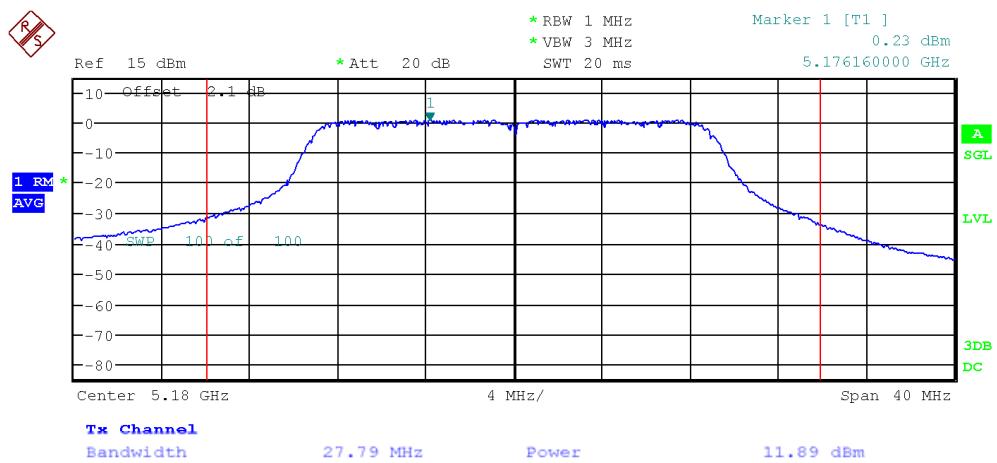


Highest Channel

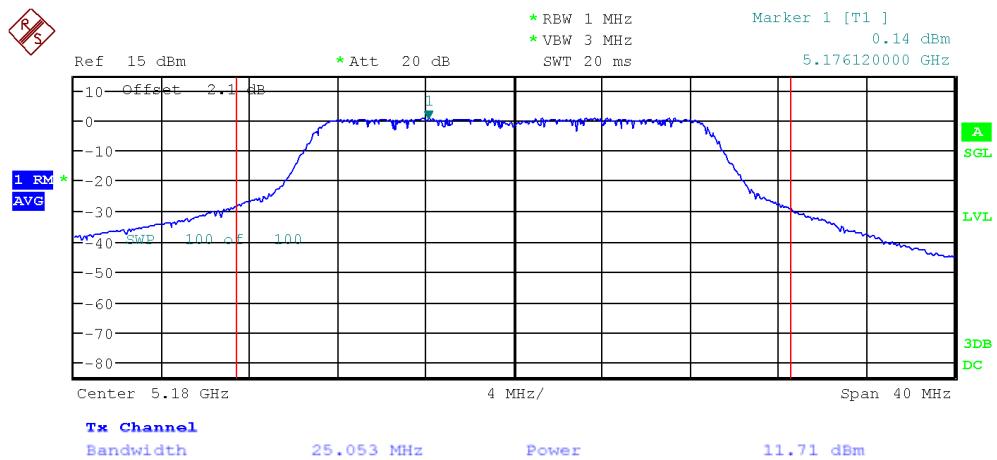


802.11 n20 MHz and 802.11 ac 20 MHz modes MIMO CHAIN A+B

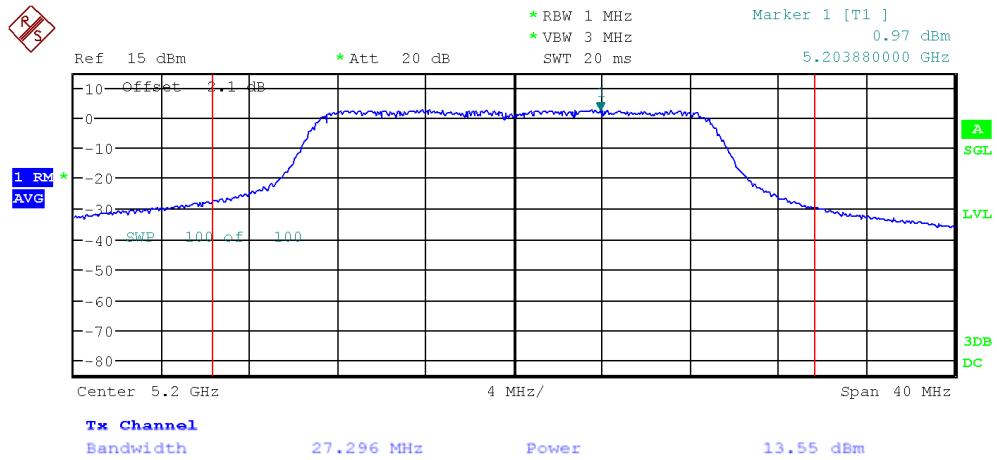
Lowest Channel. Chain A



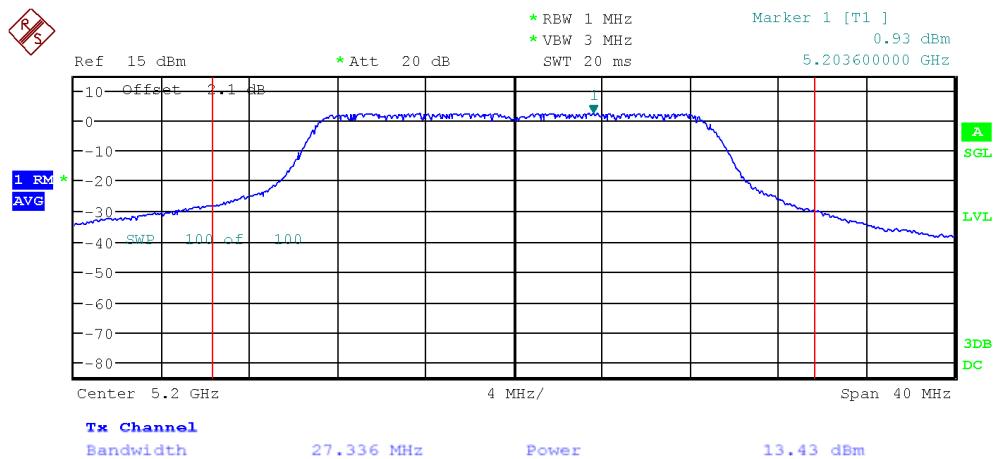
Lowest Channel. Chain B



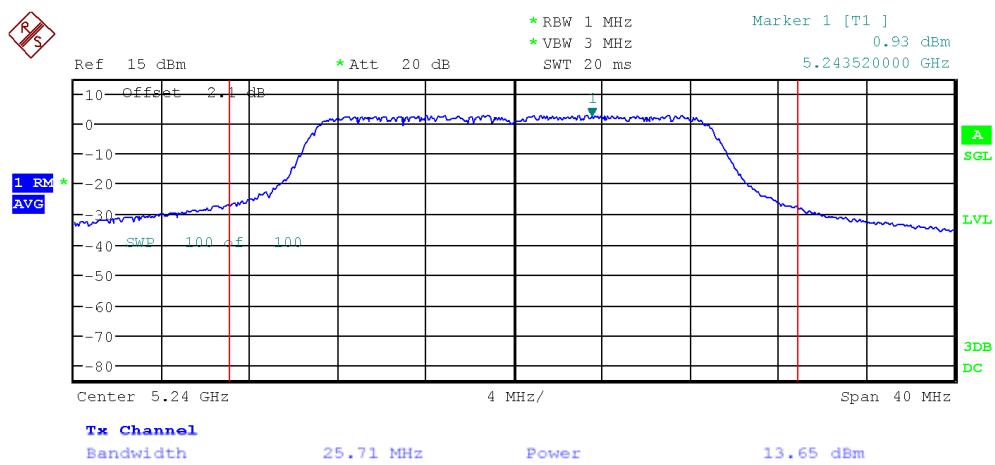
Middle Channel. Chain A.



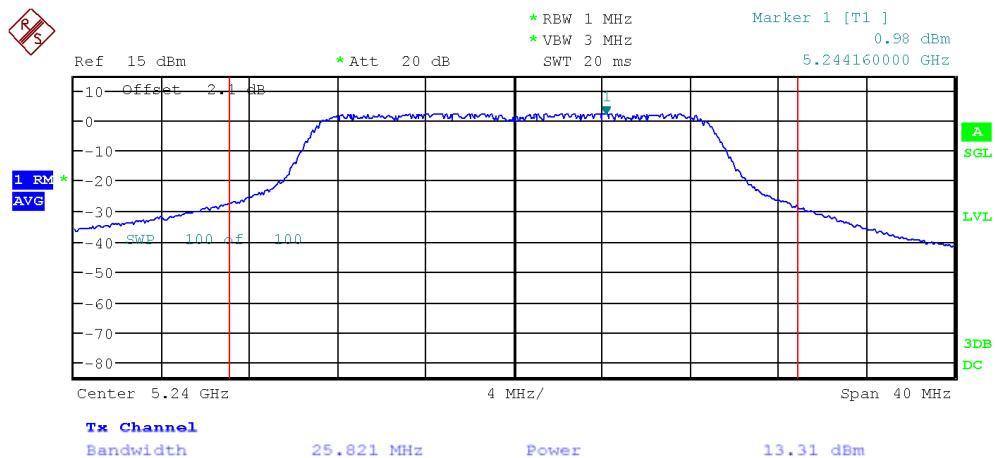
Middle Channel. Chain B.



Highest Channel. Chain A.

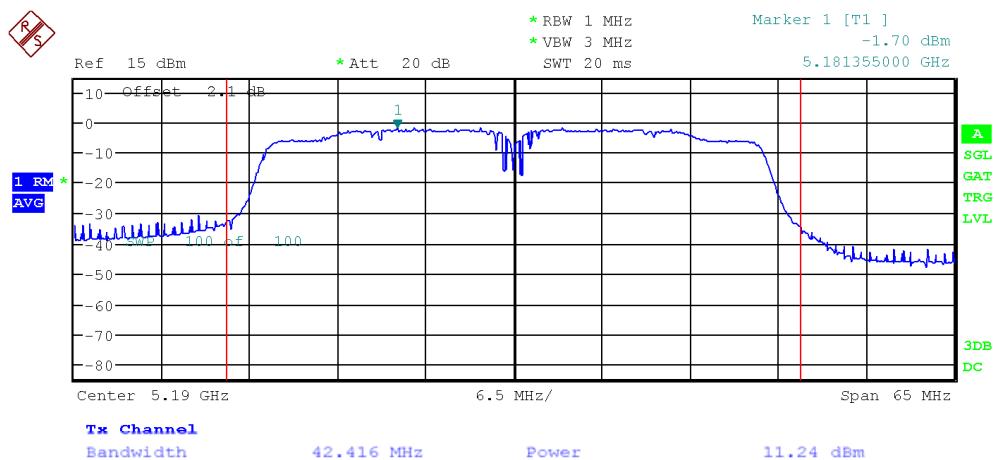


Highest Channel. Chain B.

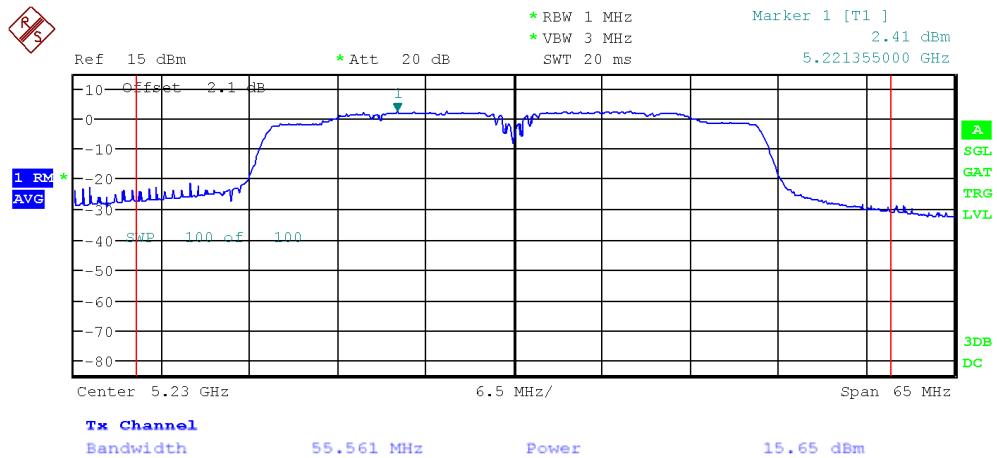


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

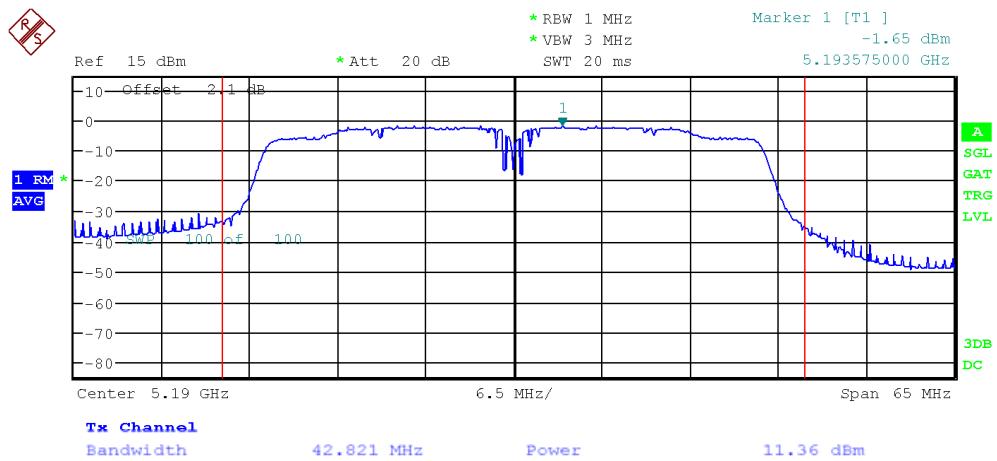


Highest Channel

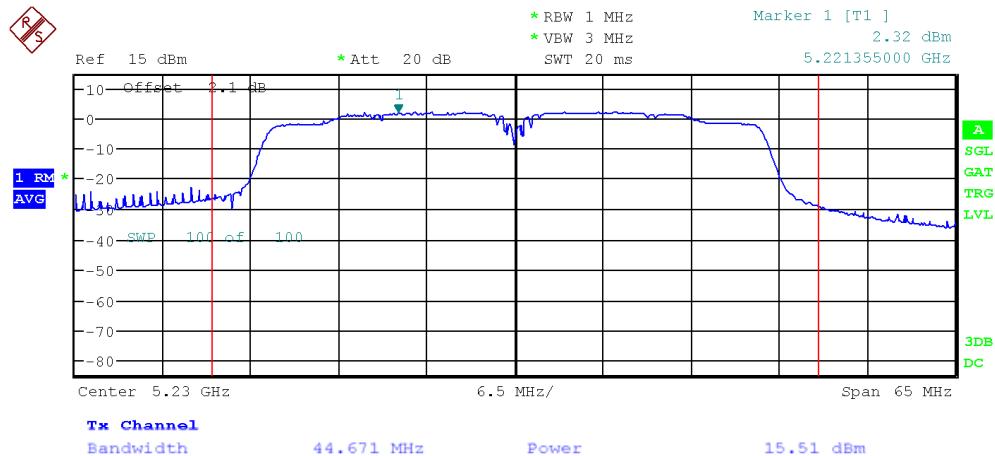


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

Lowest Channel

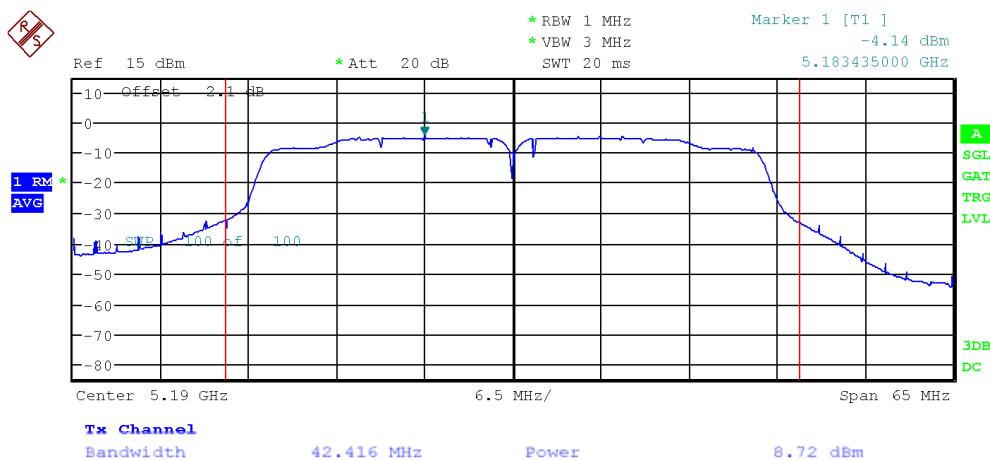


Highest Channel

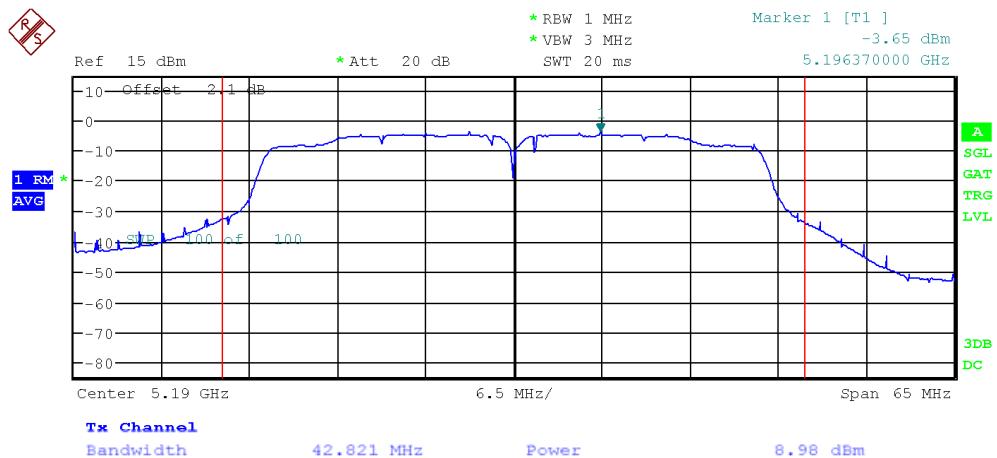


802.11 n40 MHz and 802.11 ac 40 MHz modes MIMO CHAIN A+B

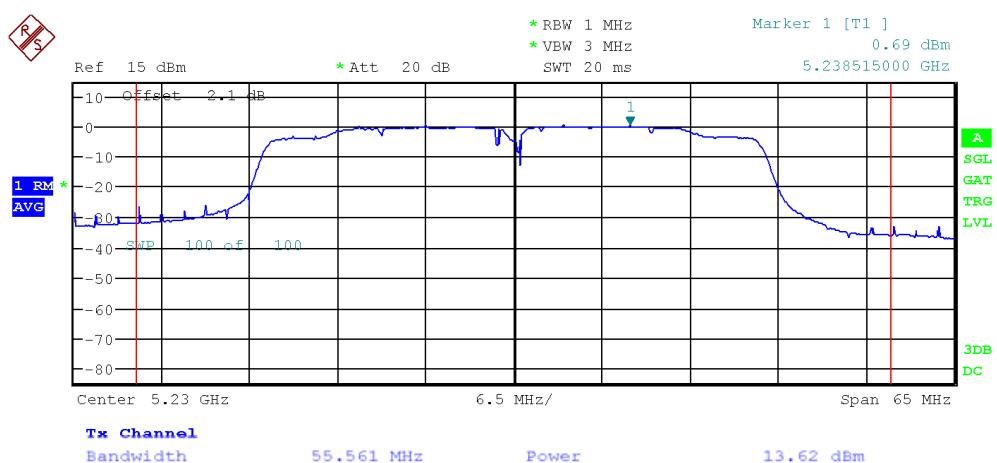
Lowest Channel. Chain A



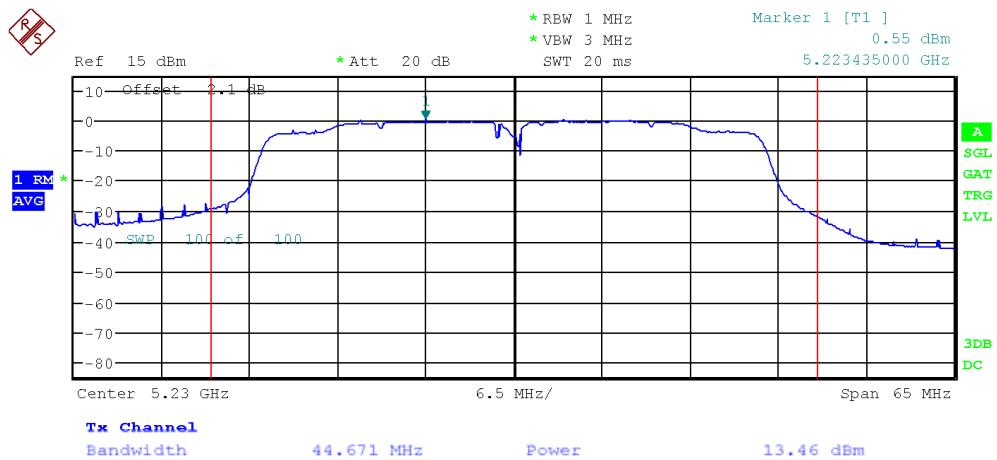
Lowest Channel. Chain B.



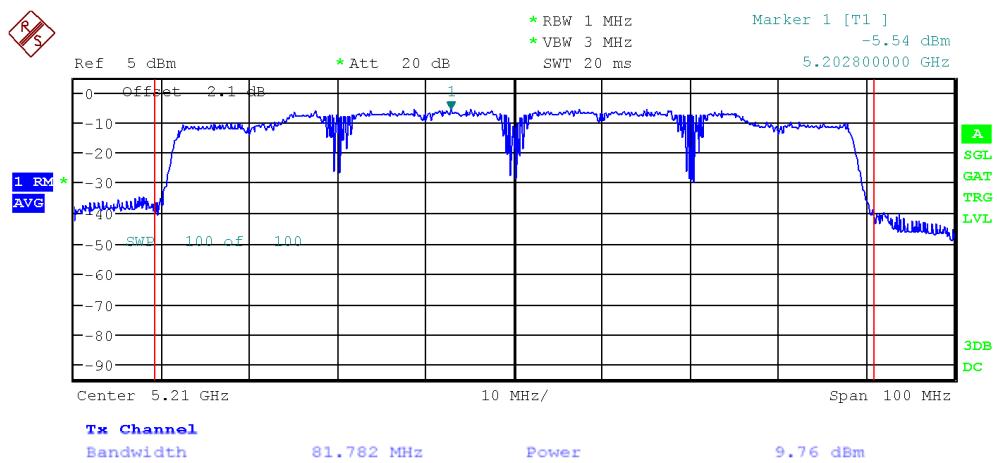
Highest Channel. Chain A.



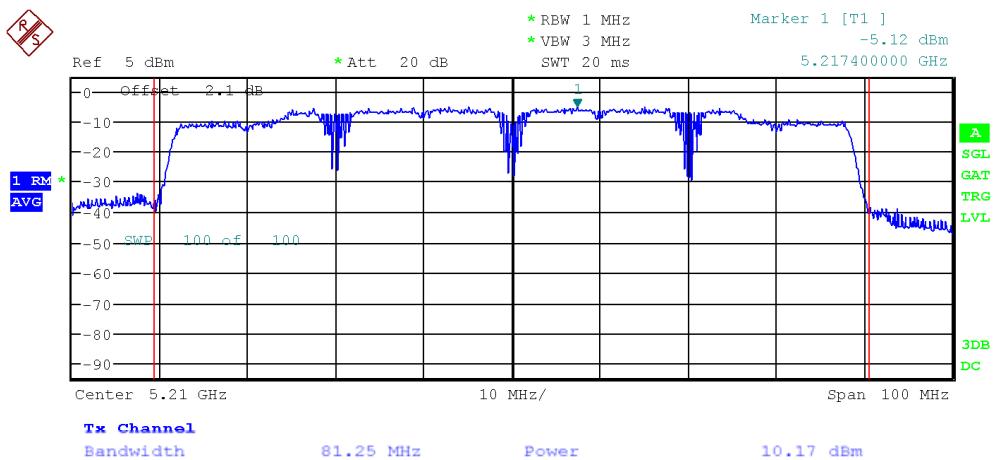
Highest Channel. Chain B.



802.11 ac 80 MHz mode CHAIN A

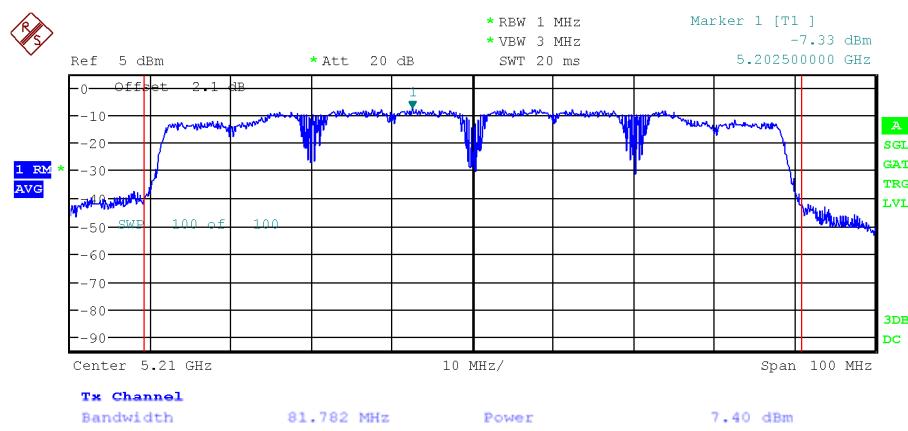


802.11 ac 80 MHz mode CHAIN B

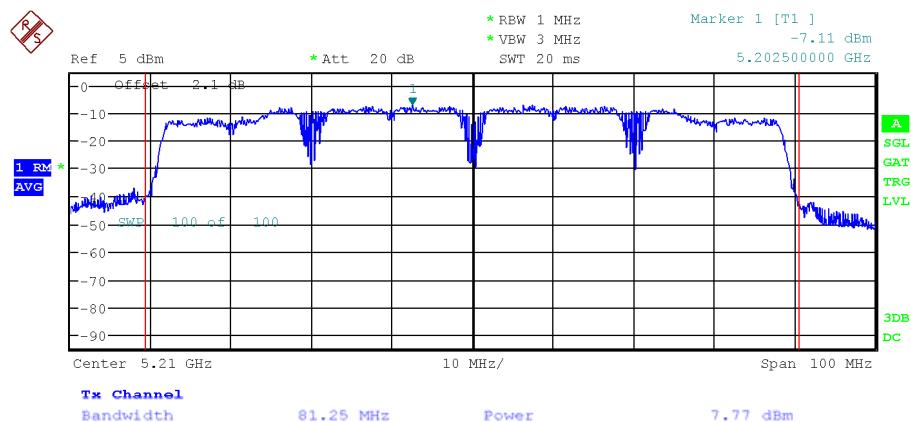


802.11 ac 80 MHz mode MIMO CHAIN A+B

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	13.24	3.81	9.43

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	13.98	3.97	10.01

Measurement uncertainty = ± 1.5 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	13.78	3.60	10.18

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5200 MHz	13.72	3.51	10.21

Measurement uncertainty = ± 1.5 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	11.61	2.41	9.20

CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5230 MHz	11.45	2.32	9.13

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

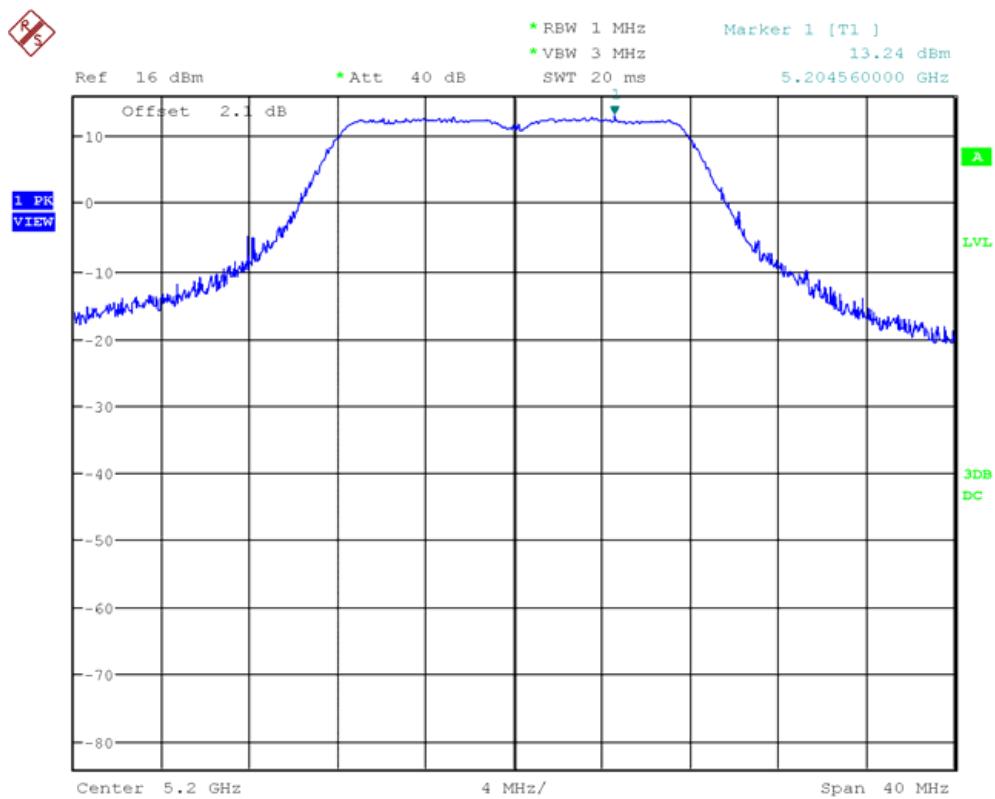
CHAIN A

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5210 MHz	2.76	-5.54	8.3

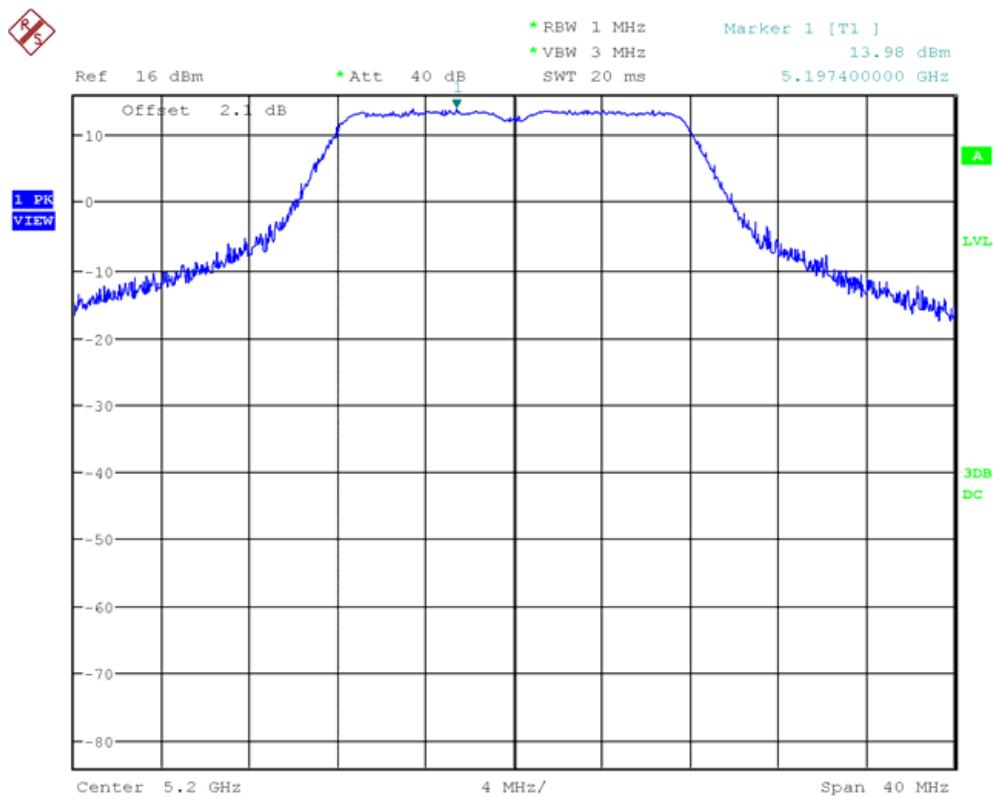
CHAIN B

Frequency	Peak of spectrum (dBm)	Measured PPSD/MHz (dBm)	Peak excursion (dB)
5210 MHz	3.59	-5.12	8.71

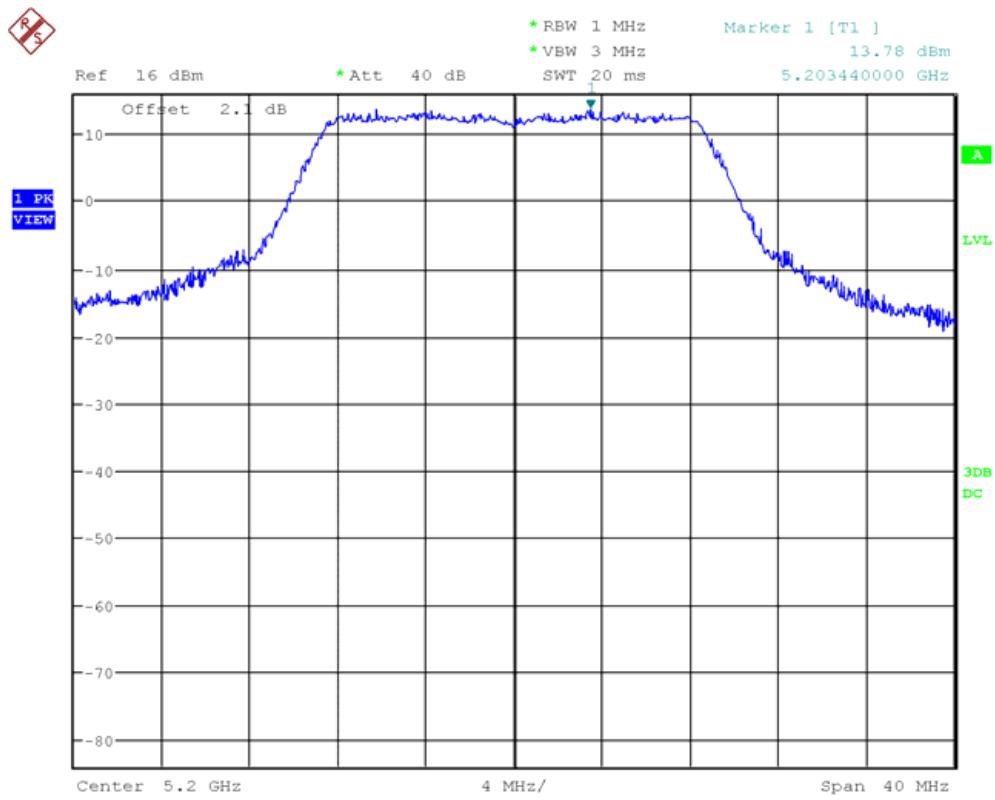
802.11a mode CHAIN A



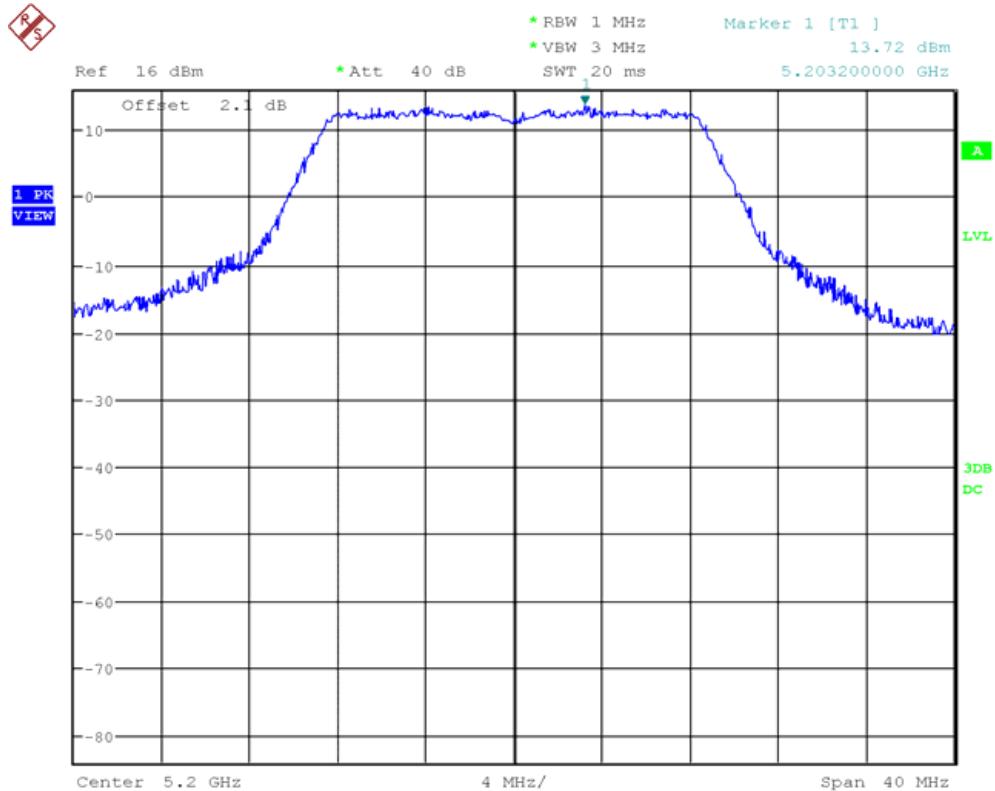
802.11a mode CHAIN B



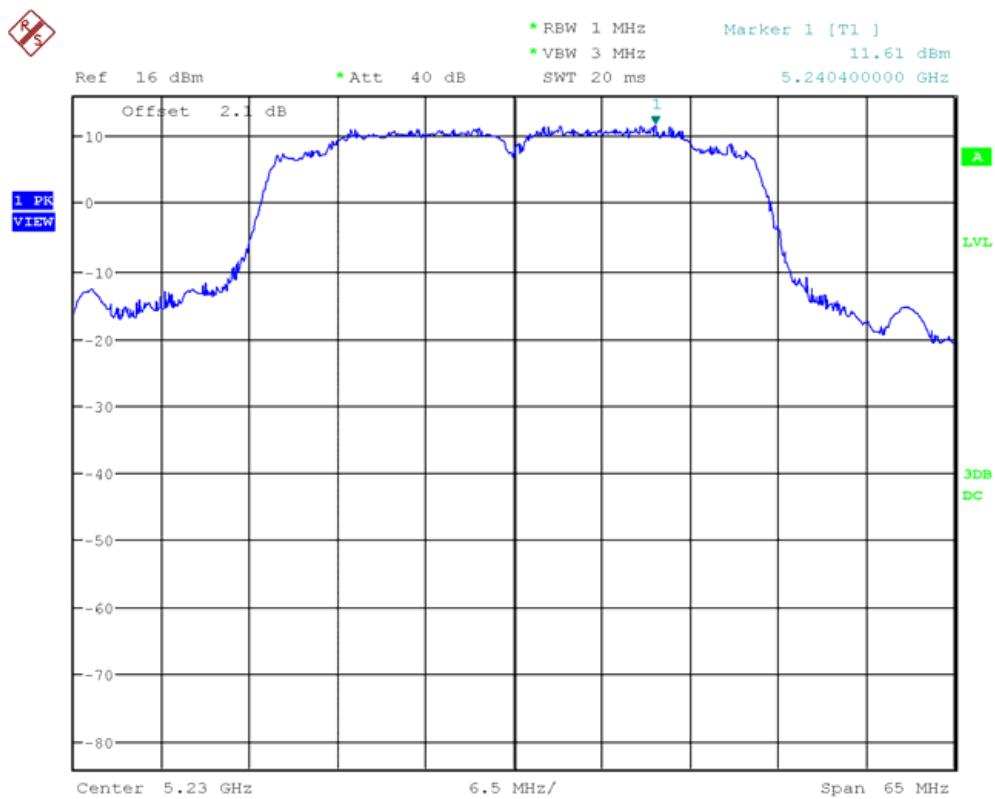
802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A



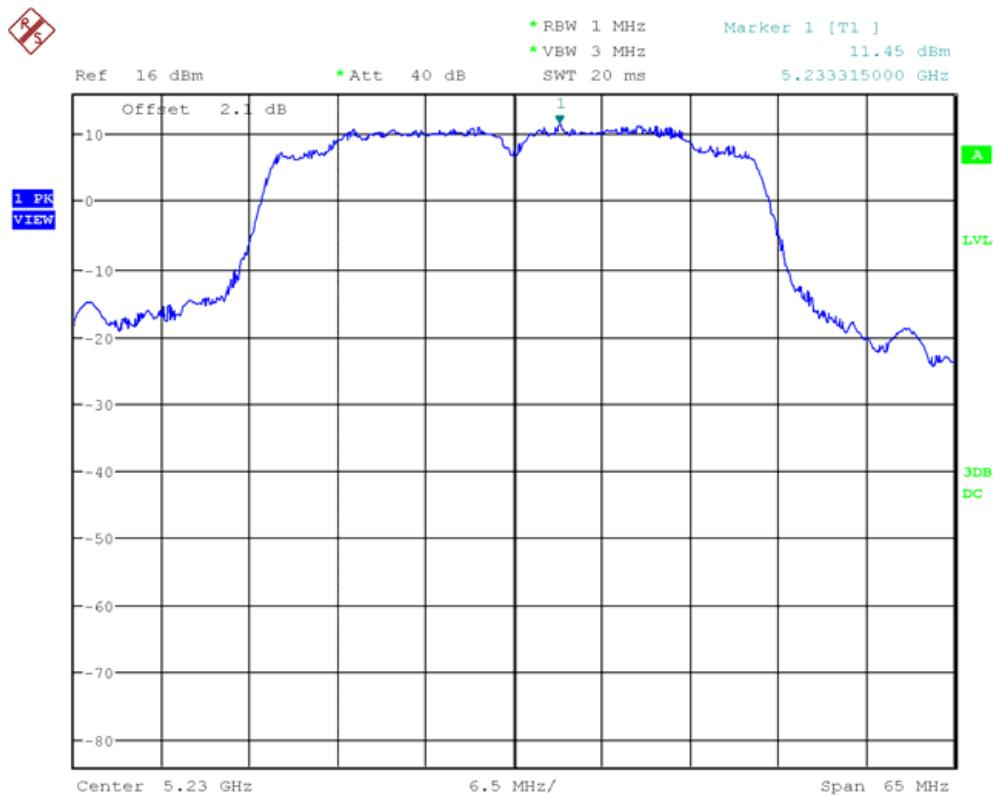
802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B



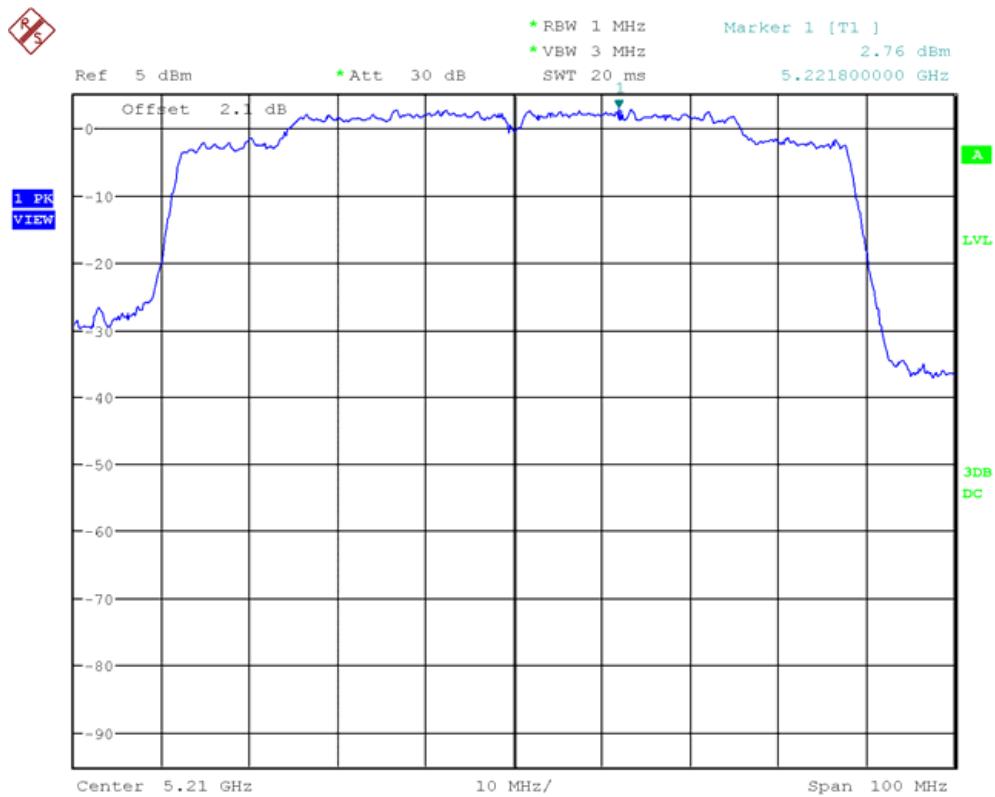
802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A



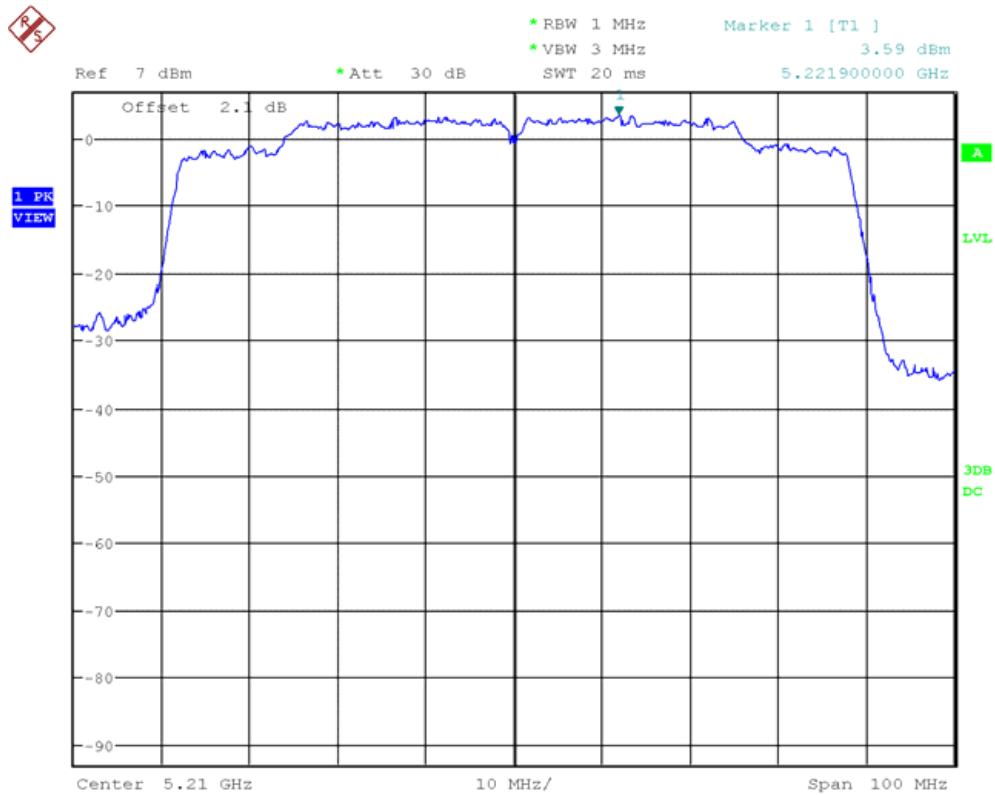
802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B



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 dB μ V/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 (μ V/m)	Field strength (dB μ V/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° 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 (dB μ V/m)	Measurement Uncertainty (dB)
47.494989	V	Quasi-Peak	33.37	± 3.8
142.745490	V	Quasi-Peak	31.01	± 3.8
166.071429	V	Quasi-Peak	36.32	± 3.8
298.256513	H	Quasi-Peak	30.72	± 3.8
663.707414	H	Quasi-Peak	30.78	± 3.8
751.182364	V	Quasi-Peak	30.64	± 3.8

All other peaks are more than 20 dB below the limit.

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 dB μ V/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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1497	V	Peak	55.62	\pm 4.09
		Average	48.62	\pm 4.09
15.5394	V	Peak	39.99	\pm 4.09
20.7199	V	Peak	48.38	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.14756	V	Peak	58.91	\pm 4.09
		Average	48.17	\pm 4.09
15.5391	V	Peak	39.79	\pm 4.09
20.7200	V	Peak	39.12	\pm 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1448	V	Peak	58.18	\pm 4.09
		Average	47.91	\pm 4.09
15.5980	V	Peak	41.97	\pm 4.09
20.8000	V	Peak	49.97	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.12628	V	Peak	58.22	\pm 4.09
		Average	48.19	\pm 4.09
15.5982	V	Peak	40.95	\pm 4.09
20.8000	V	Peak	49.73	\pm 4.09

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

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
15.7192	V	Peak	39.98	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
15.7198	V	Peak	38.53	± 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1479	V	Peak	58.19	± 4.09
		Average	48.66	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1419	V	Peak	58.51	± 4.09
		Average	48.18	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1497	V	Peak	58.26	± 4.09
		Average	48.47	± 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1493	V	Peak	58.51	\pm 4.09
		Average	48.19	\pm 4.09
15.5938	V	Peak	40.82	\pm 4.09
20.8000	V	Peak	48.61	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1255	V	Peak	58.88	\pm 4.09
		Average	48.17	\pm 4.09
15.5952	V	Peak	40.38	\pm 4.09
20.8000	V	Peak	48.19	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1255	V	Peak	58.64	\pm 4.09
		Average	48.16	\pm 4.09
15.6010	V	Peak	40.51	\pm 4.09
20.8000	V	Peak	48.08	\pm 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1445	V	Peak	60.40	\pm 4.09
		Average	49.15	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1495	V	Peak	61.05	\pm 4.09
		Average	48.82	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1498	V	Peak	59.29	\pm 4.09
		Average	48.87	\pm 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1448	V	Peak	59.69	\pm 4.09
		Average	48.31	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1469	V	Peak	57.96	\pm 4.09
		Average	48.14	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1409	V	Peak	58.87	\pm 4.09
		Average	48.09	\pm 4.09

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 (dB μ V/m)	Measurement Uncertainty (dB)
5.1274	V	Peak	62.76	\pm 4.09
		Average	51.04	\pm 4.09

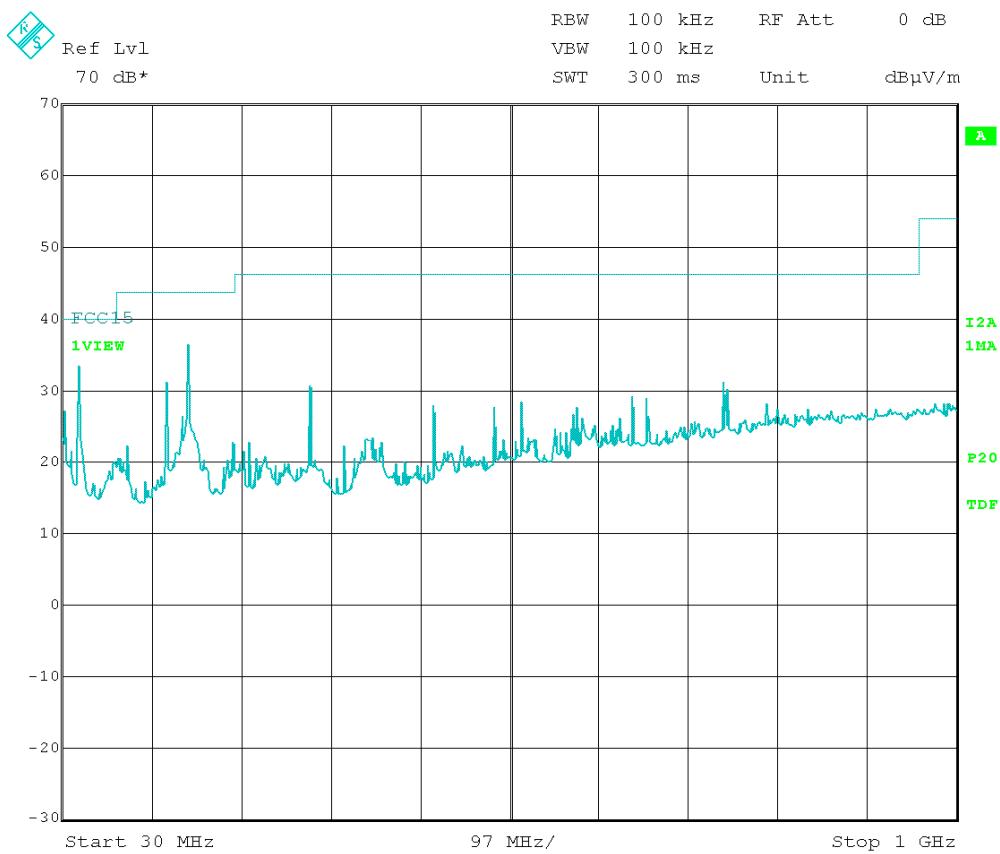
Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1272	V	Peak	60.28	\pm 4.09
		Average	49.87	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.1271	V	Peak	59.91	\pm 4.09
		Average	49.98	\pm 4.09

Verdict: PASS

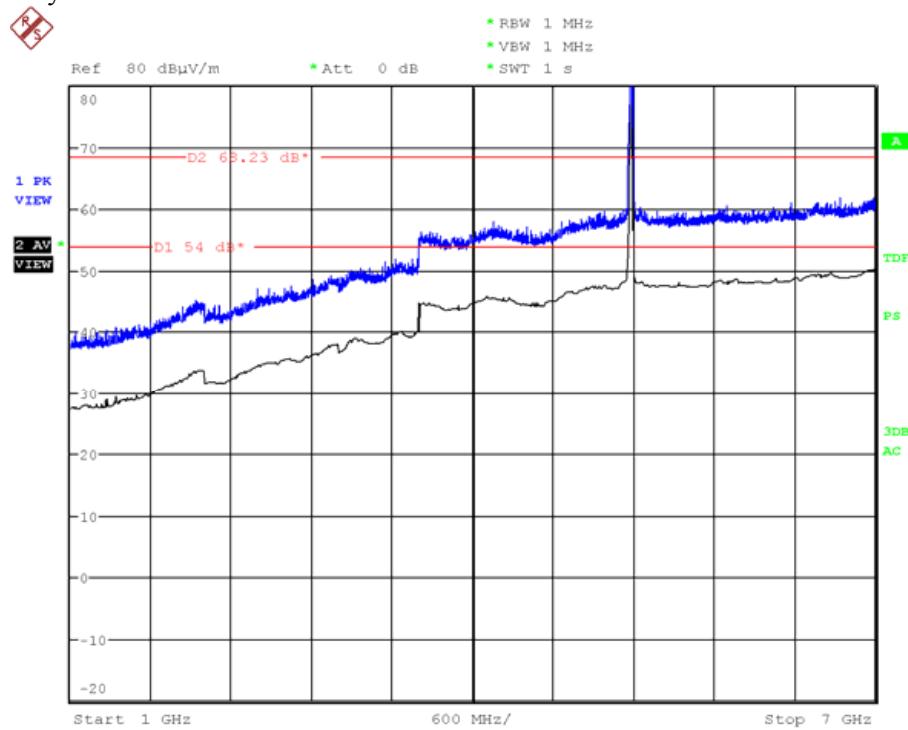
FREQUENCY RANGE 30 MHz-1000 MHz.


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

FREQUENCY RANGE 1 GHz to 7 GHz.

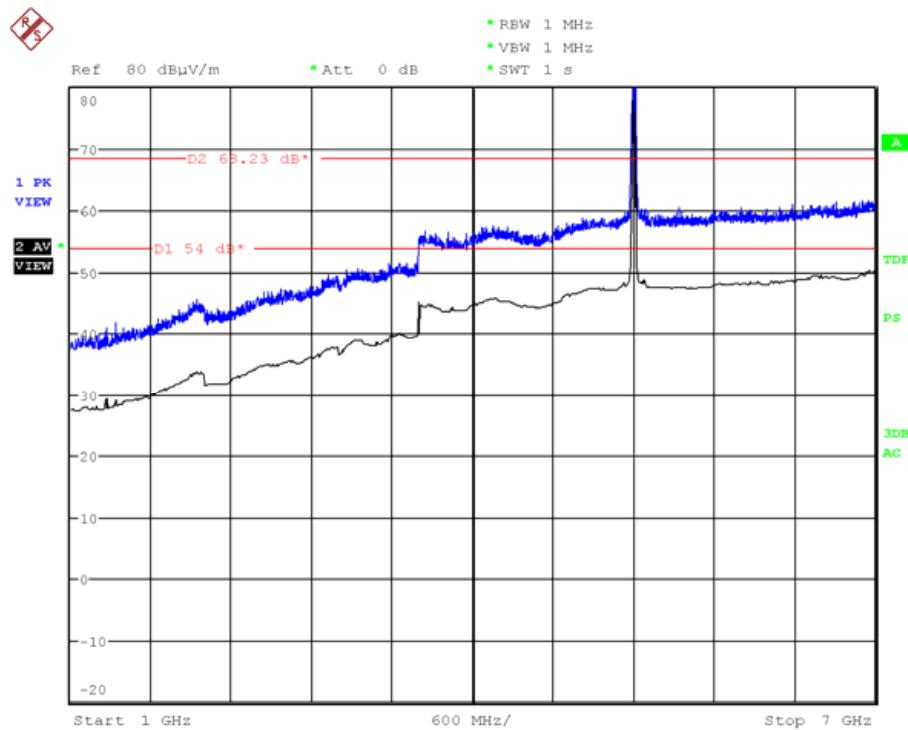
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.



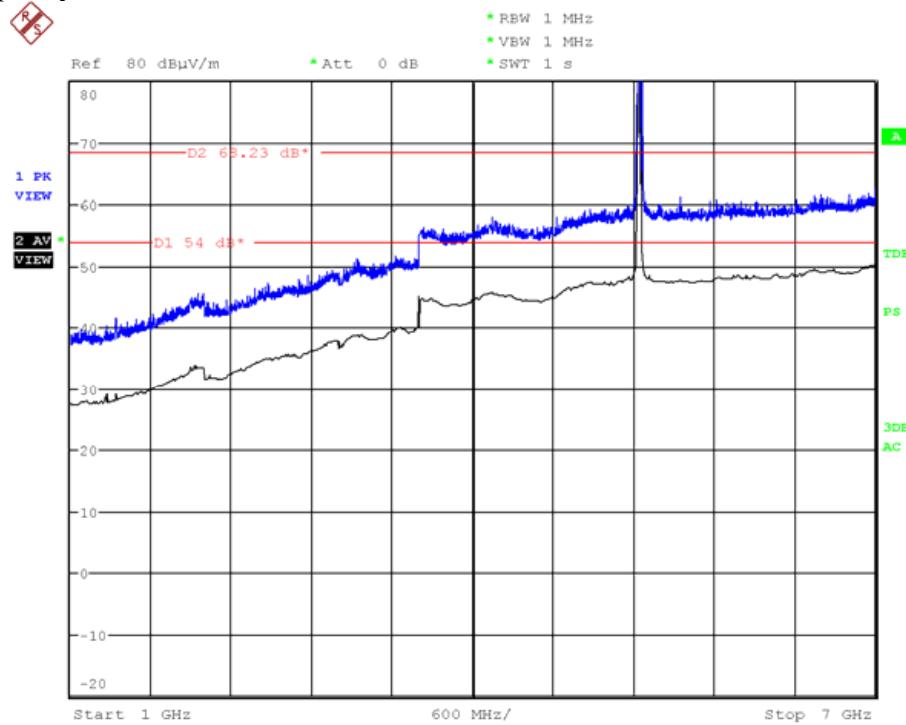
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

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.

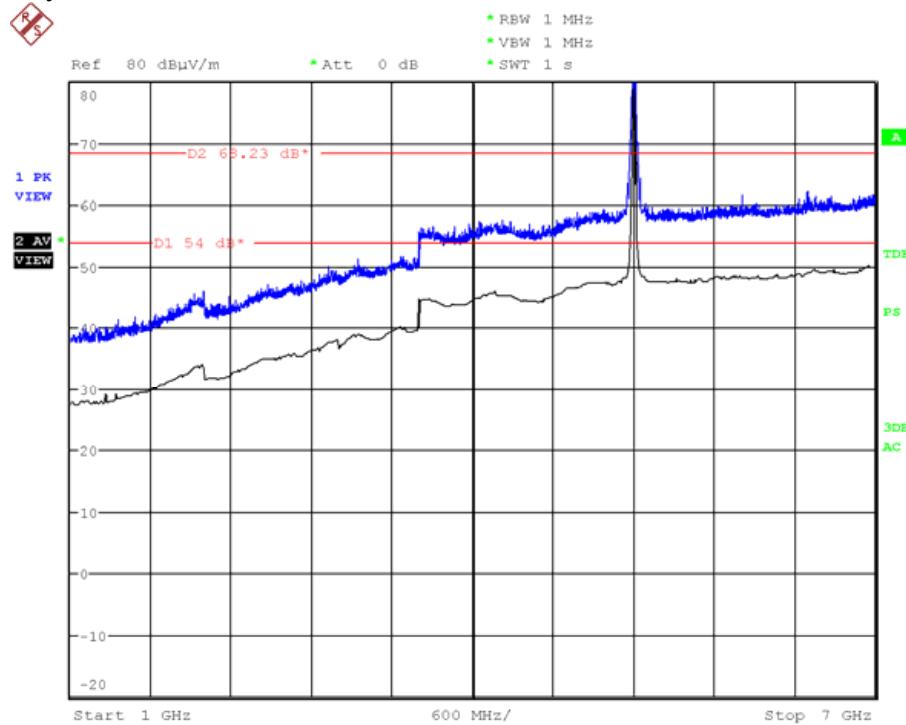
Highest frequency 5240 MHz.



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

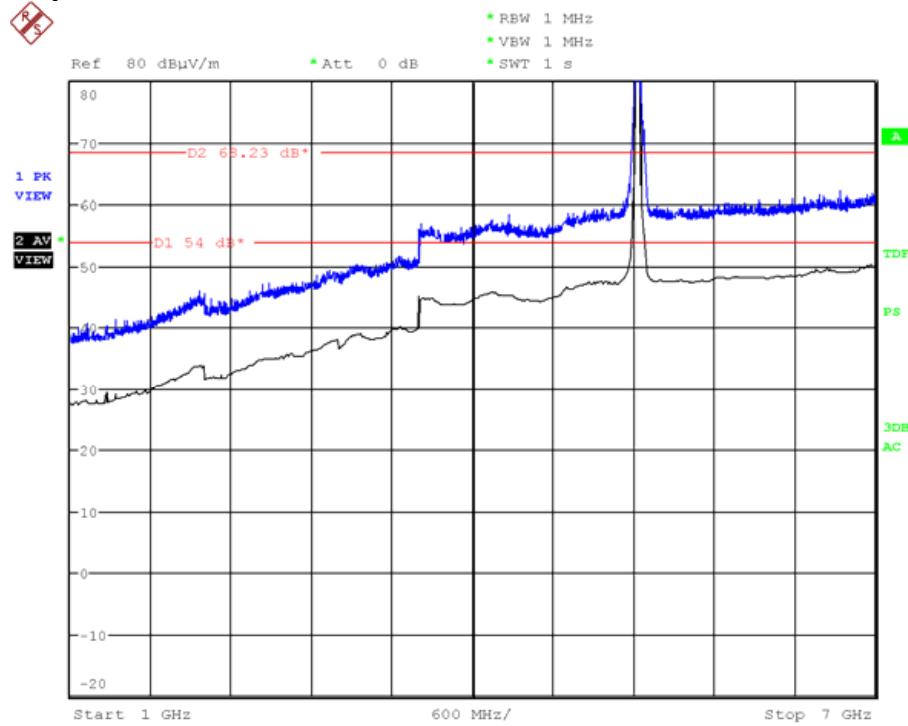
Middle frequency 5200 MHz.



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

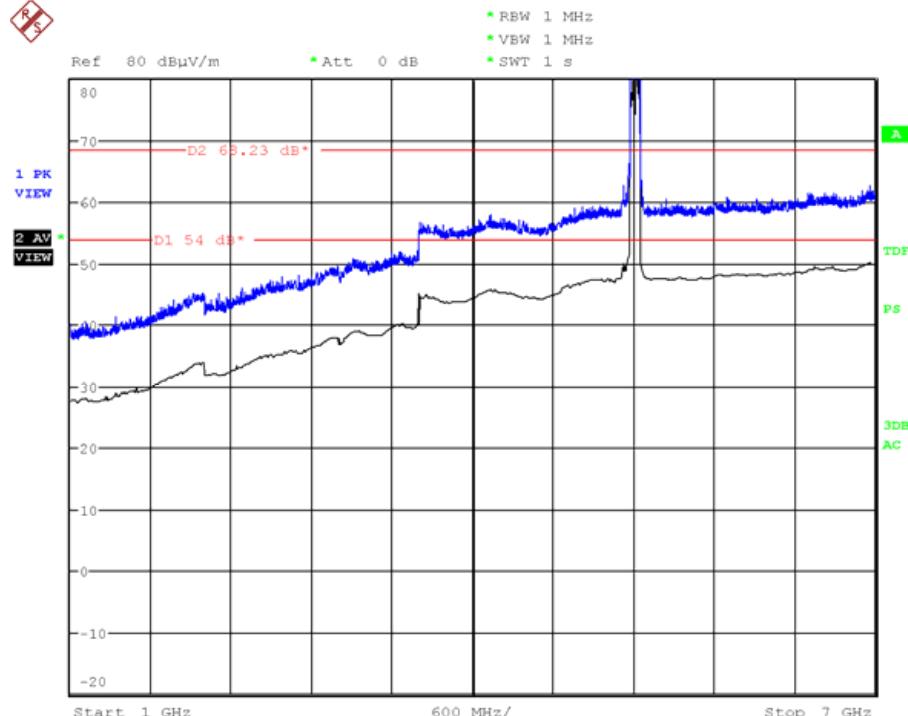
Highest frequency 5230 MHz.



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.



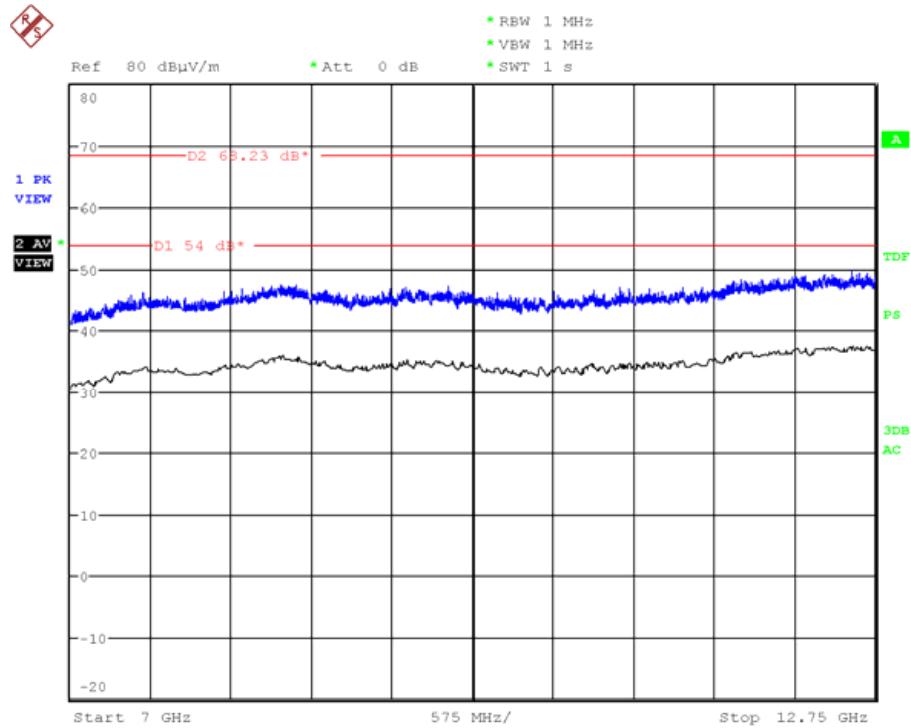
The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B, Chain A+B.

FREQUENCY RANGE 7 GHz to 12.75 GHz.

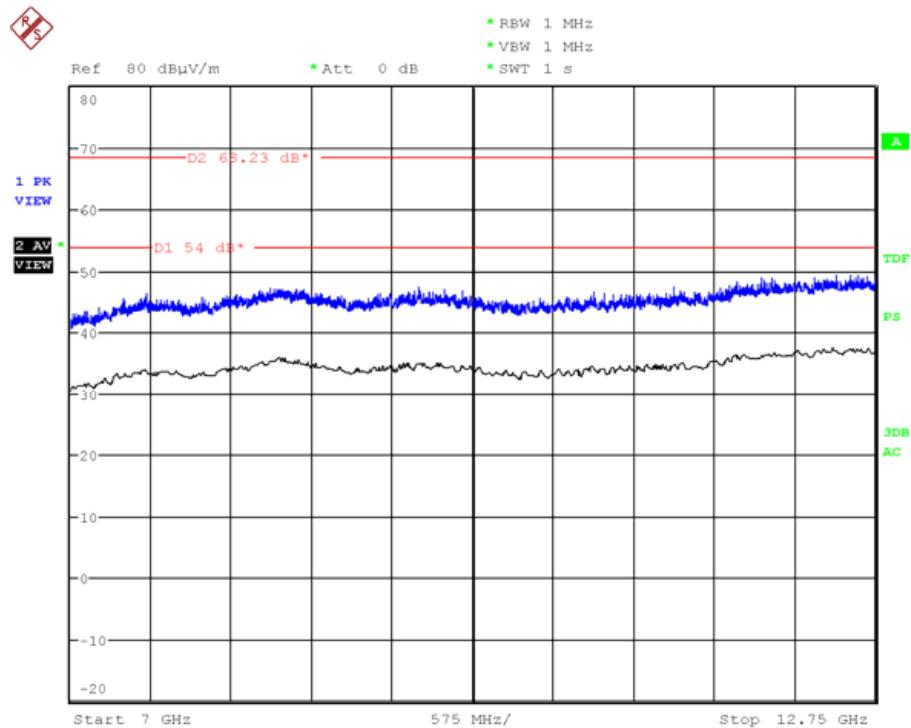
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

Chain A

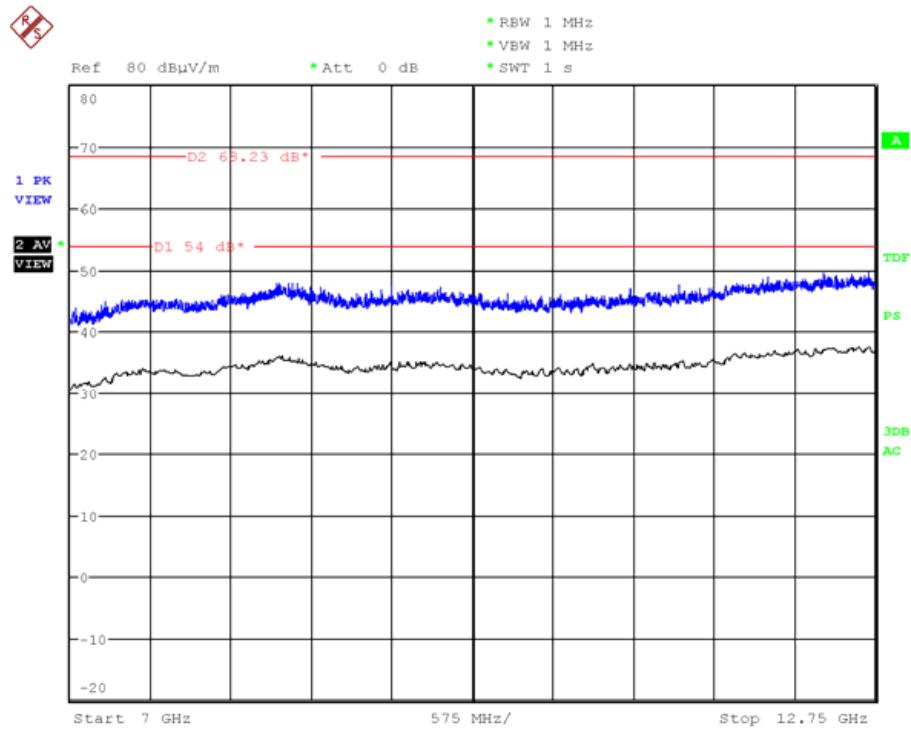


Chain B

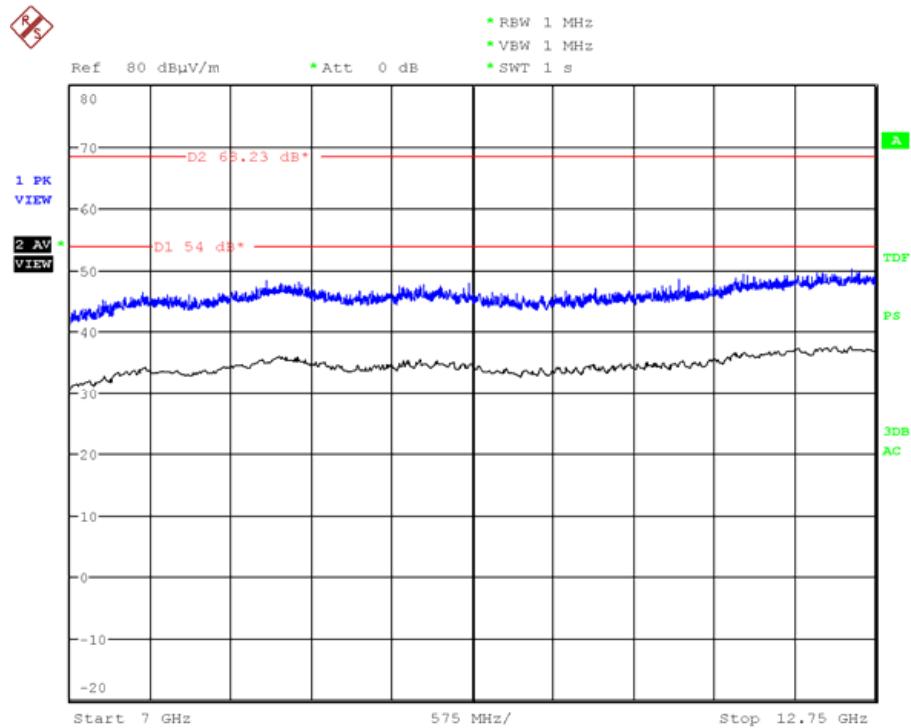


Middle frequency 5200 MHz.

Chain A

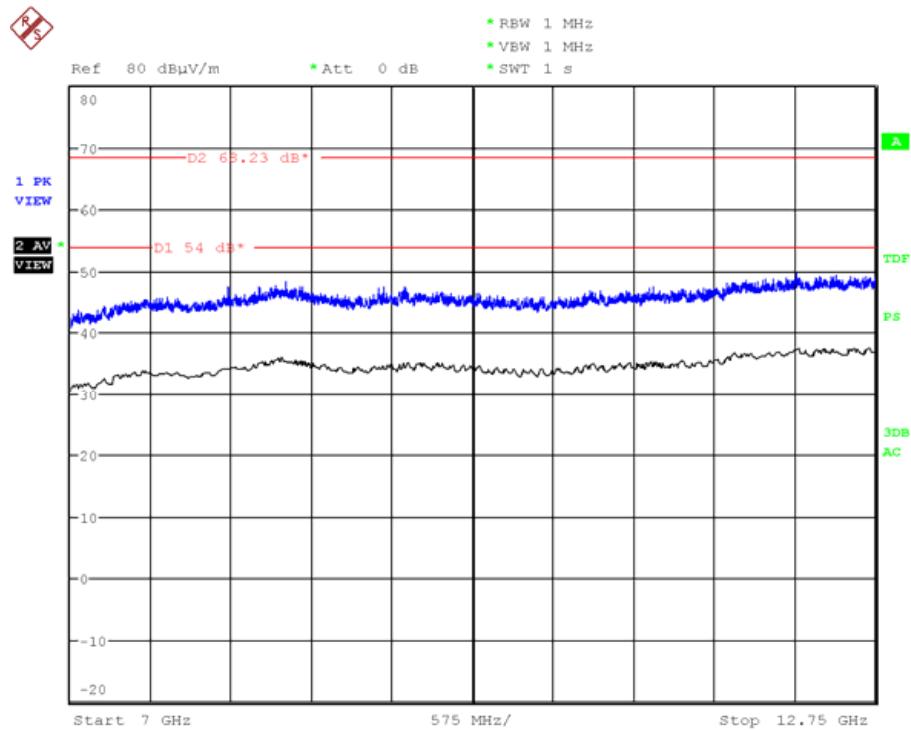


Chain B

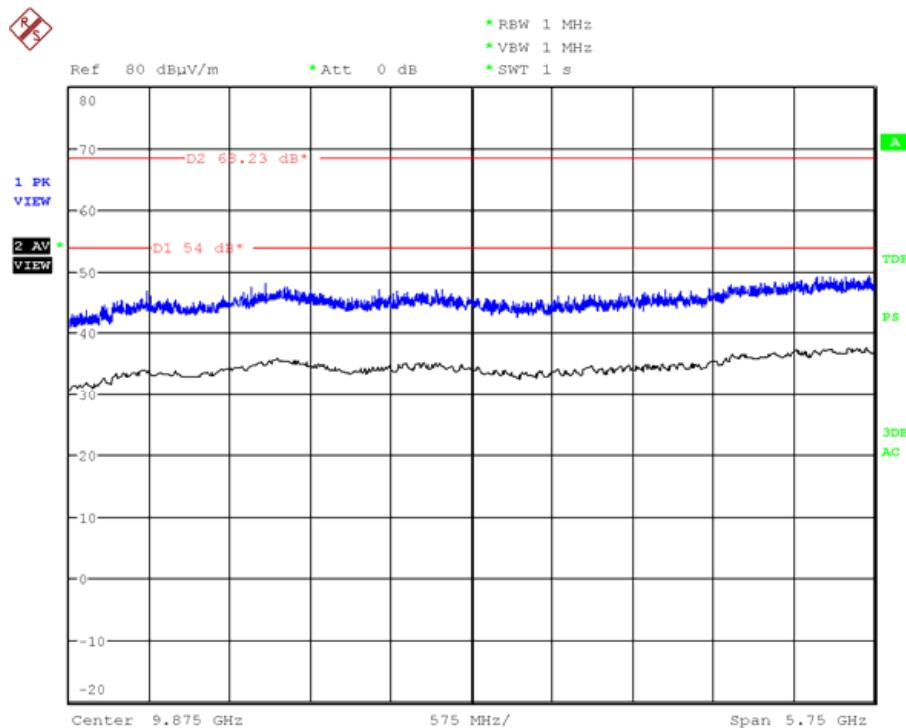


Highest frequency 5240 MHz.

Chain A



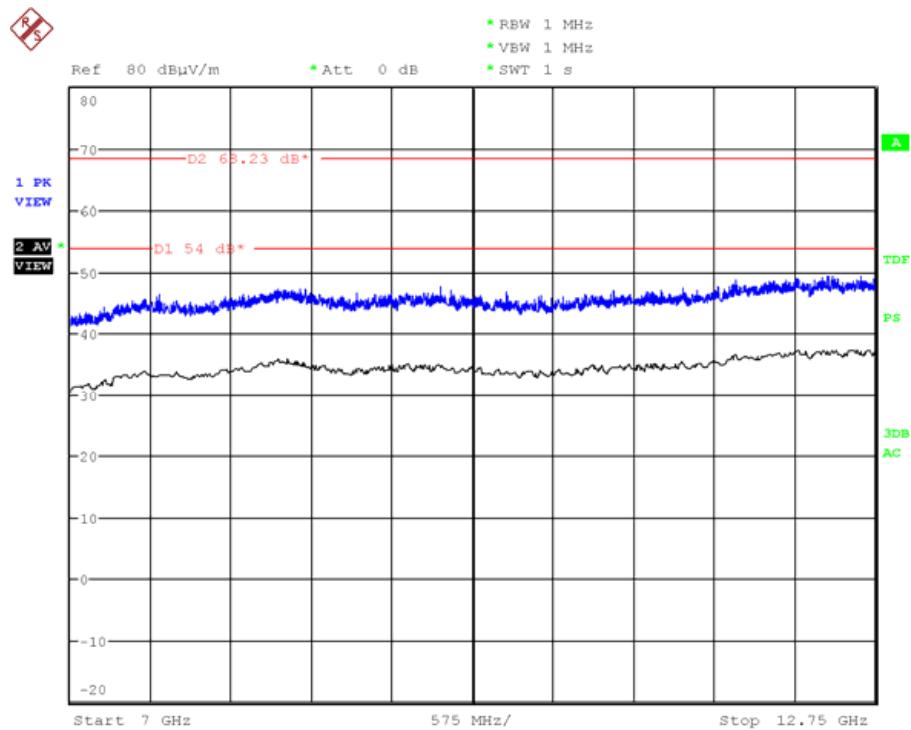
Chain B



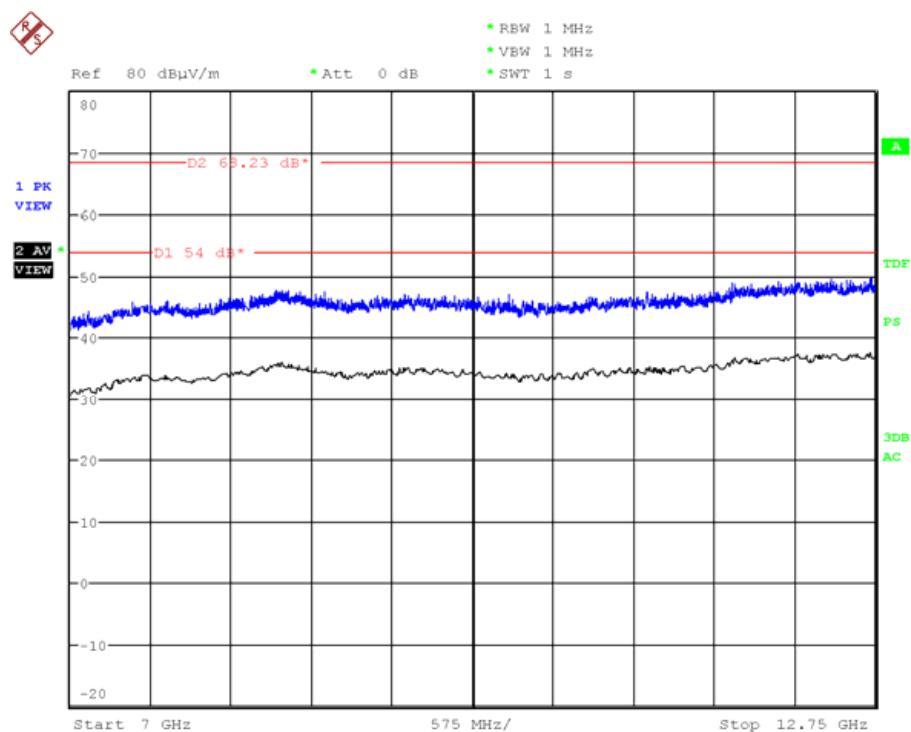
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5200 MHz.

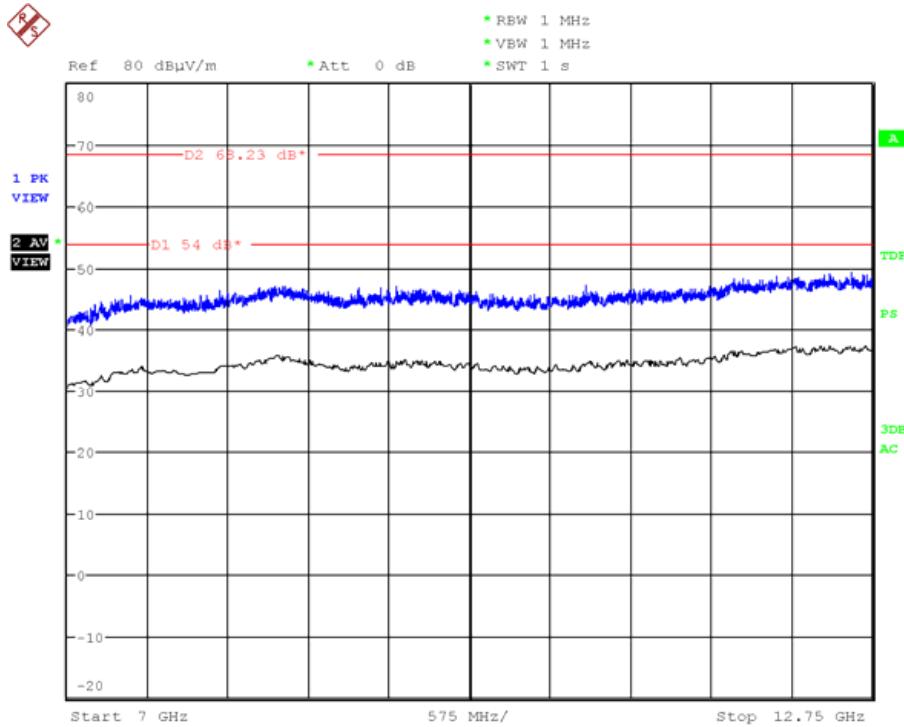
Chain A



Chain B



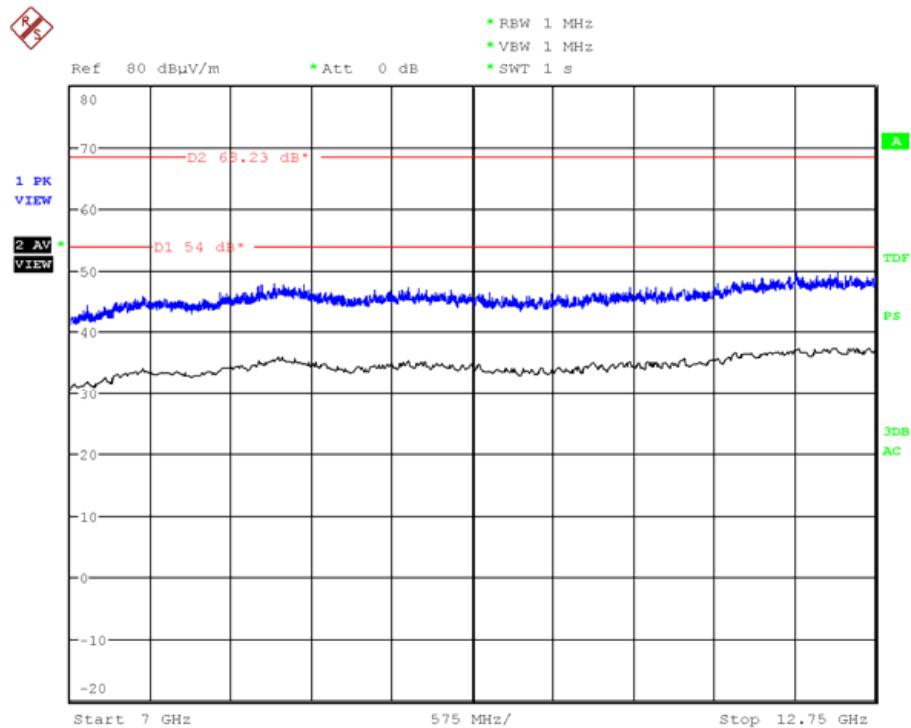
Chain A+B



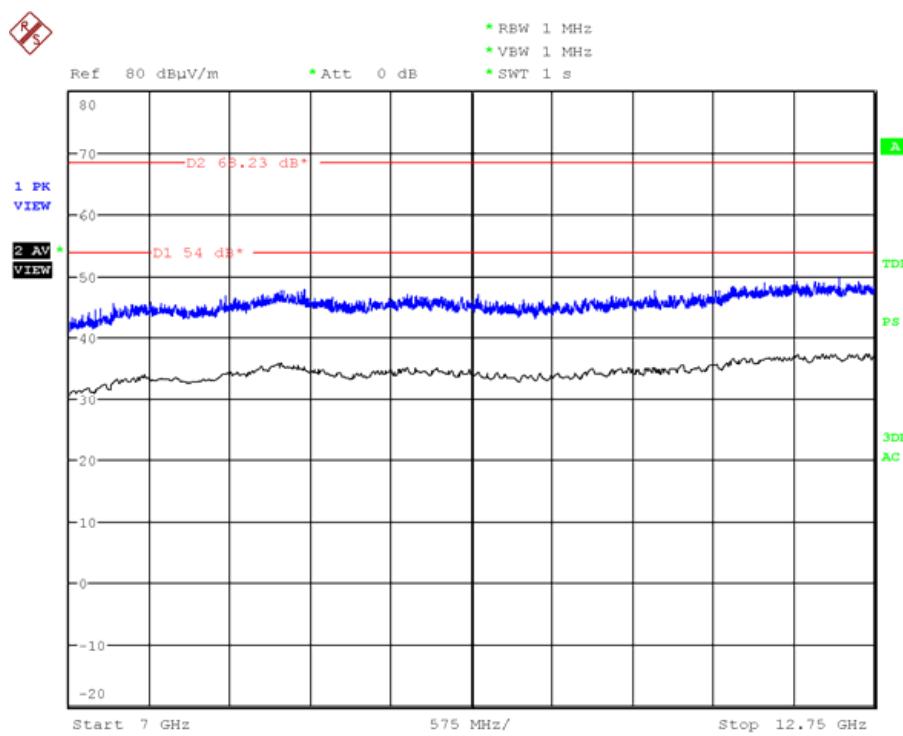
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5230 MHz.

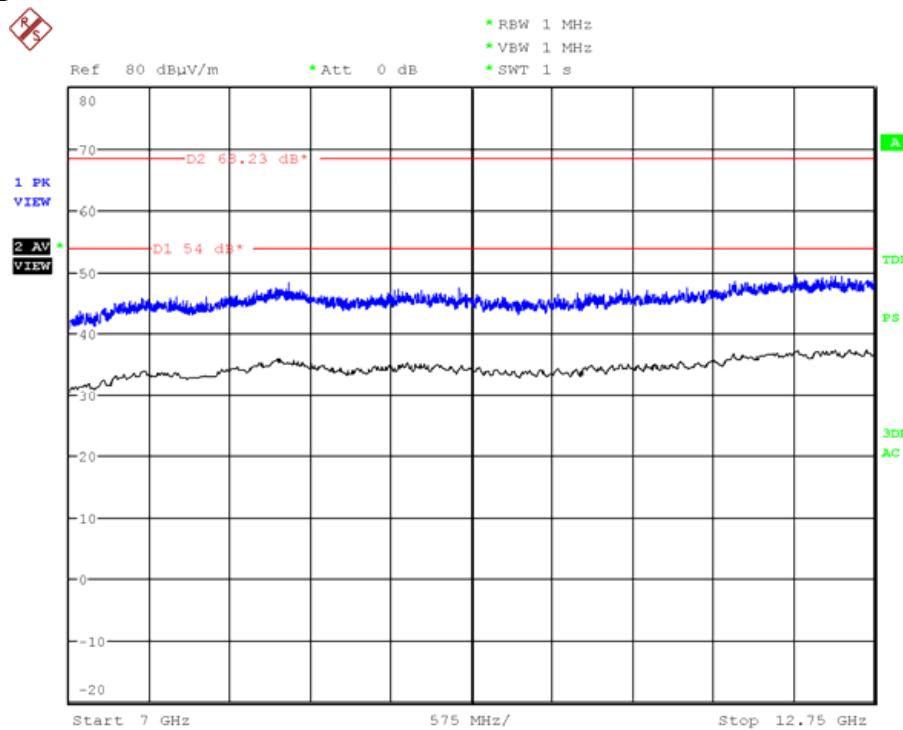
Chain A



Chain B



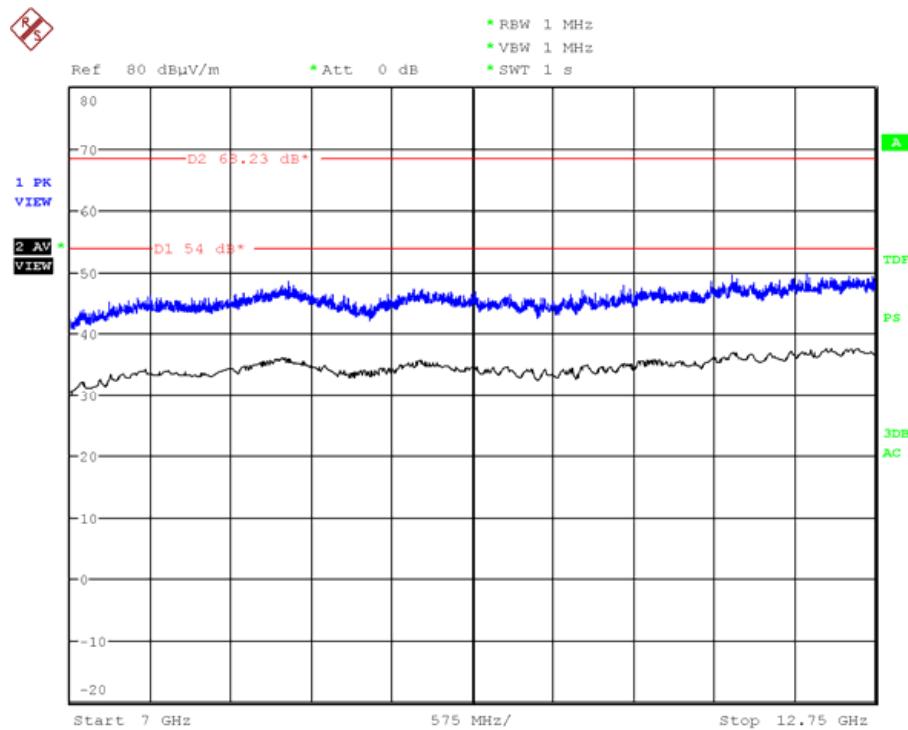
Chain A+B



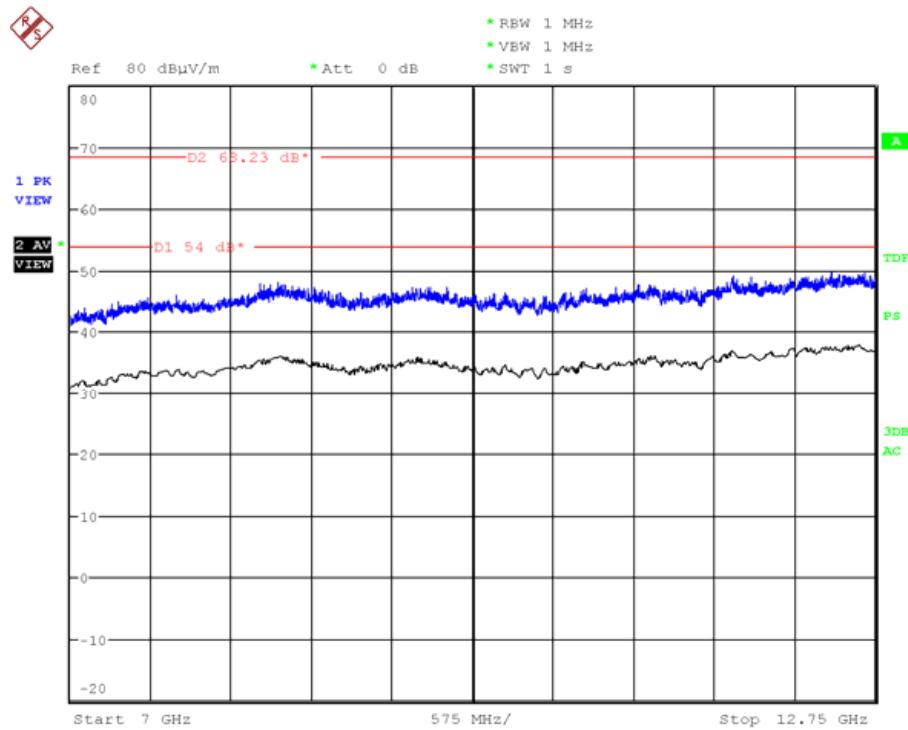
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.

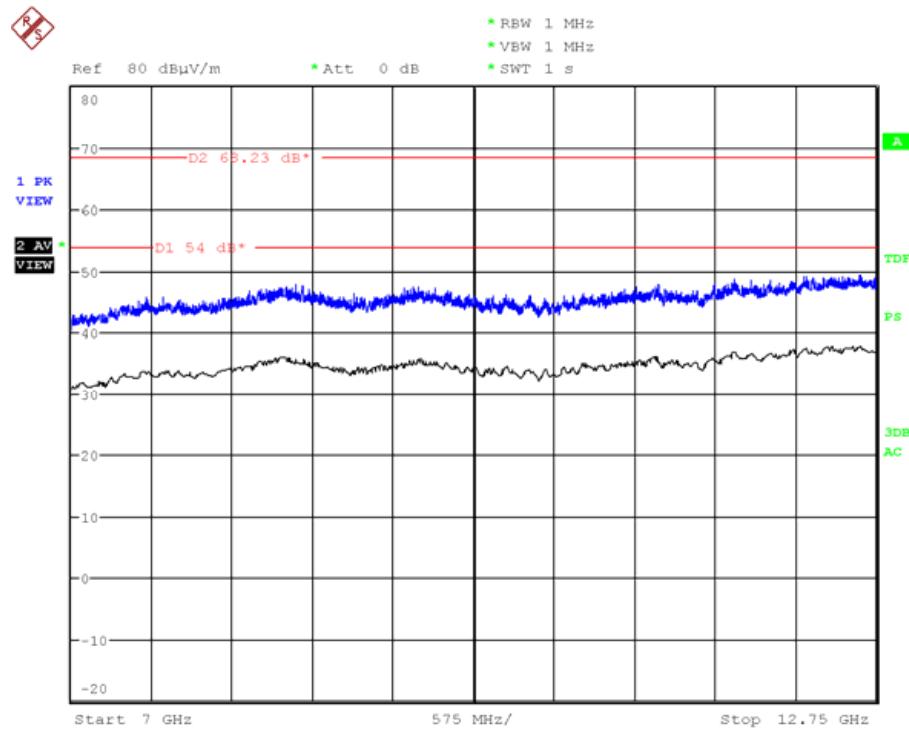
Chain A



Chain B



Chain A+B

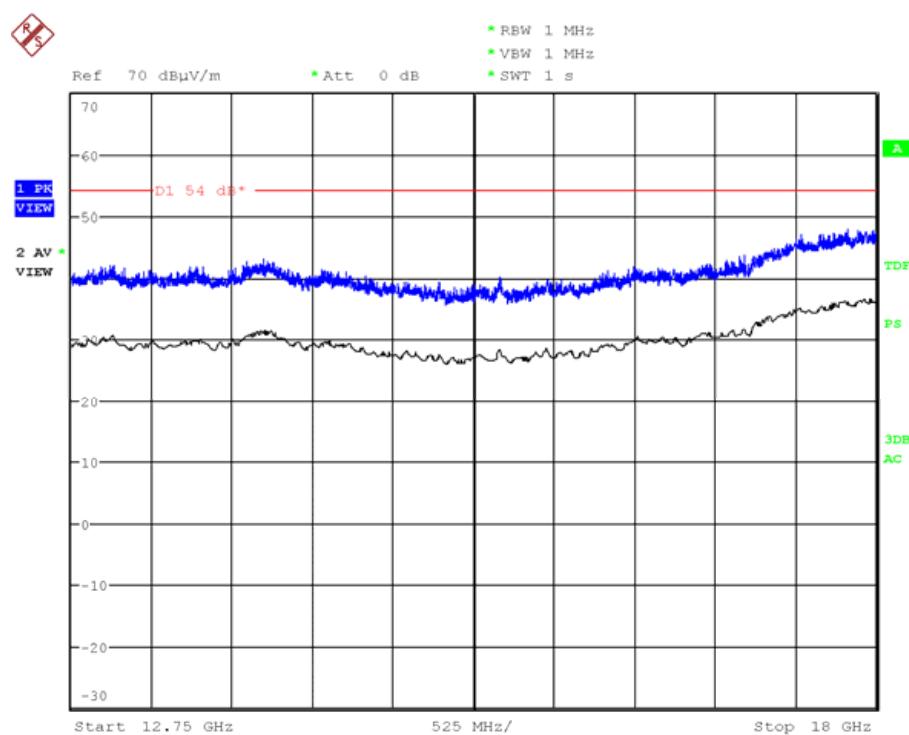


FREQUENCY RANGE 12.75 GHz to 18GHz.

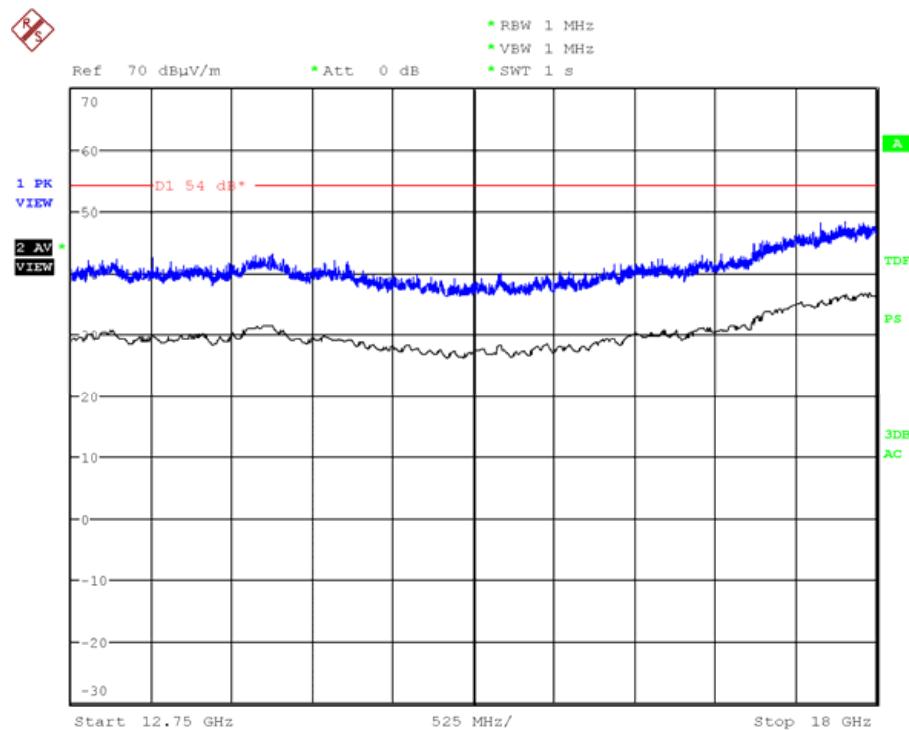
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

Chain A

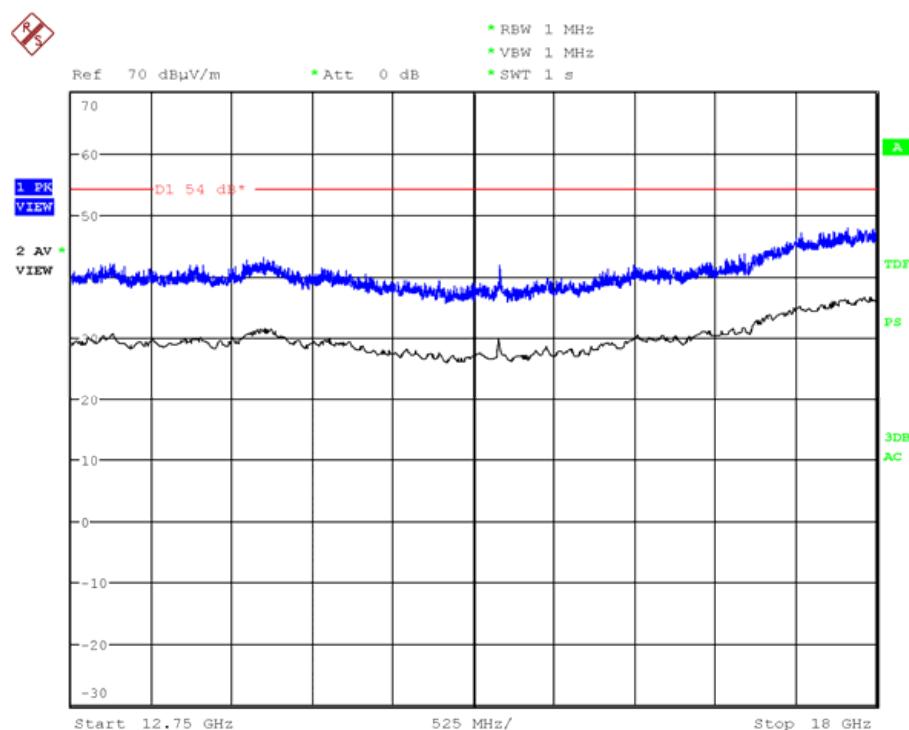


Chain B

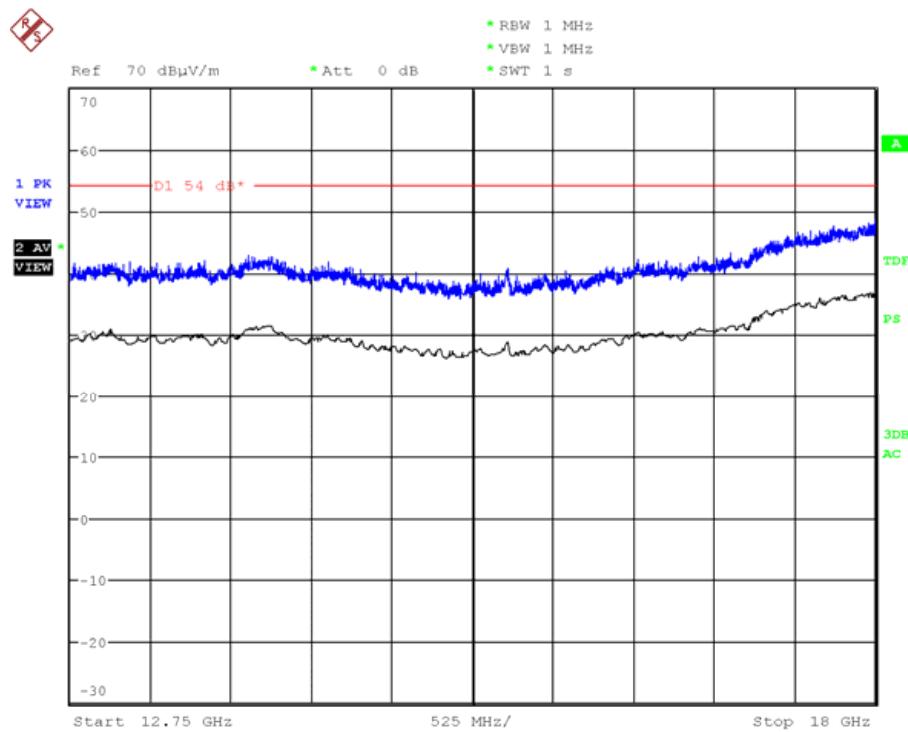


Middle frequency 5200 MHz.

Chain A

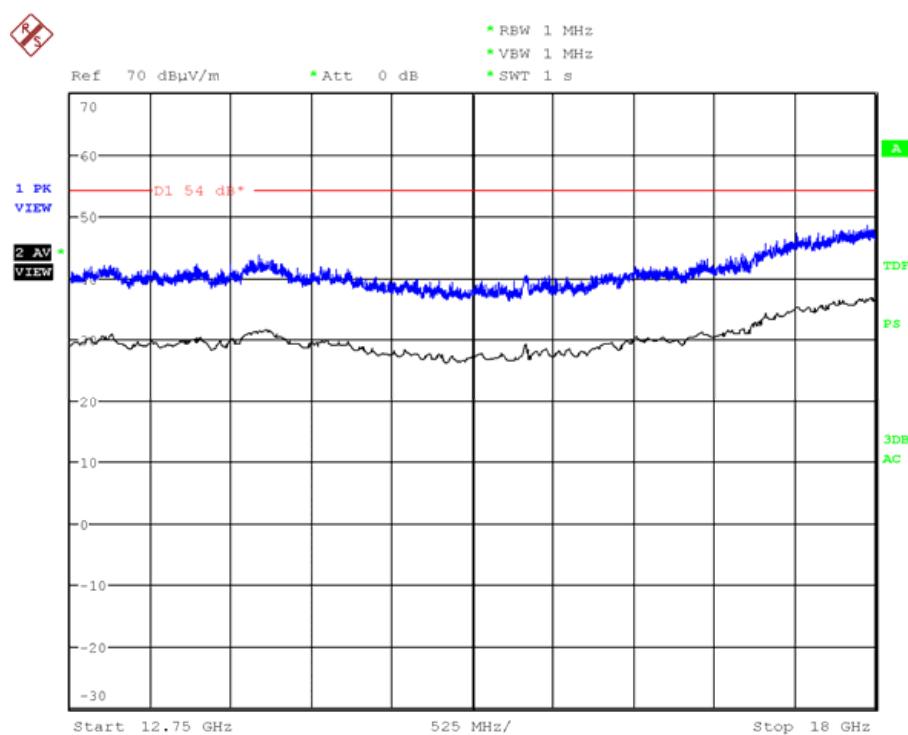


Chain B

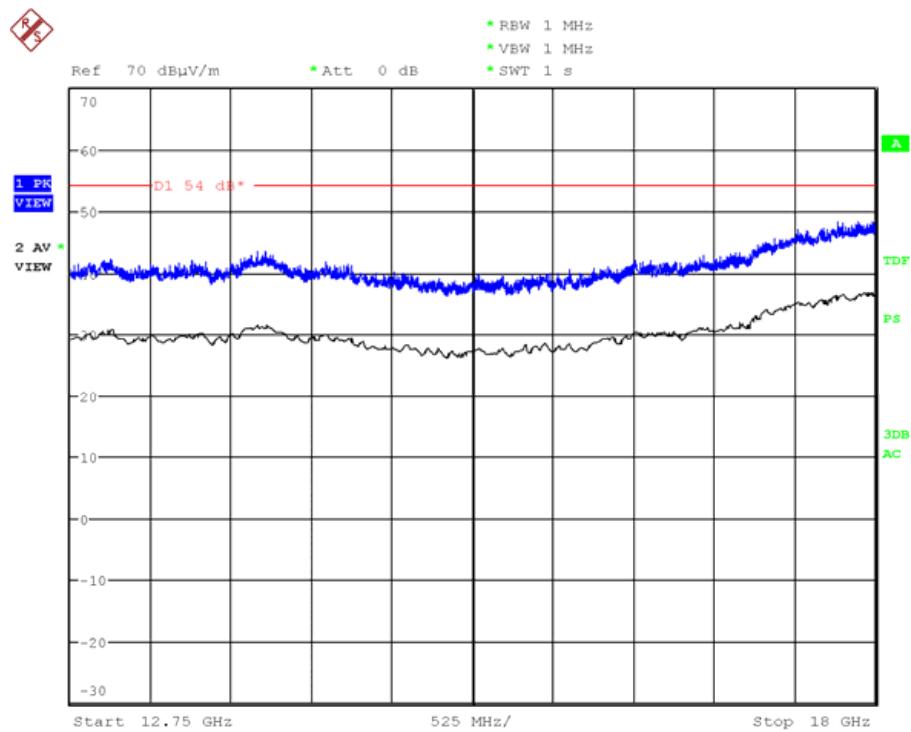


Highest frequency 5240 MHz.

Chain A



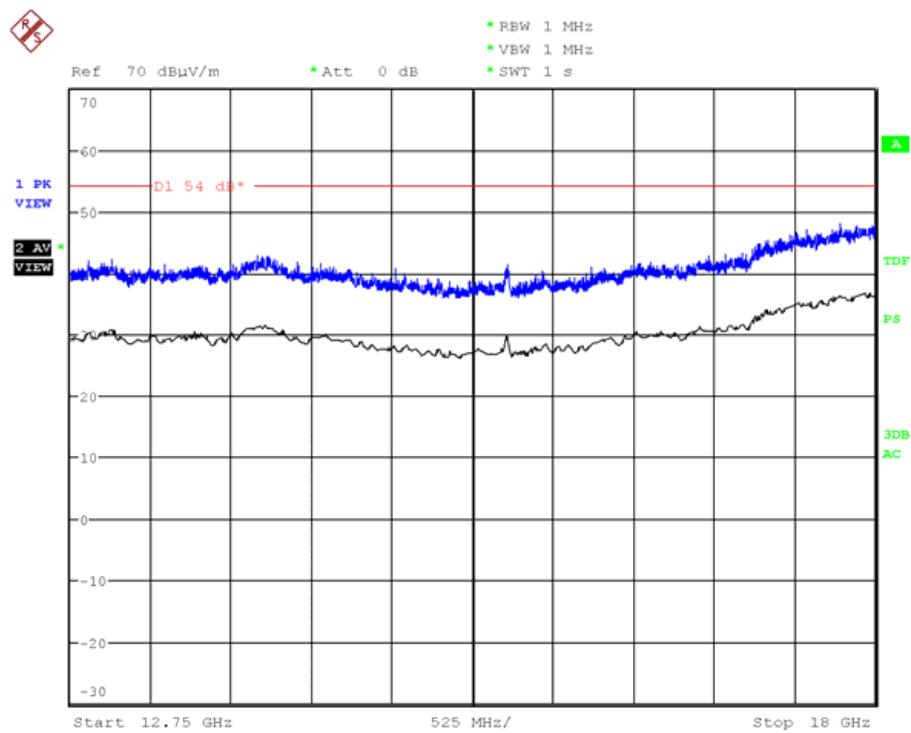
Chain B



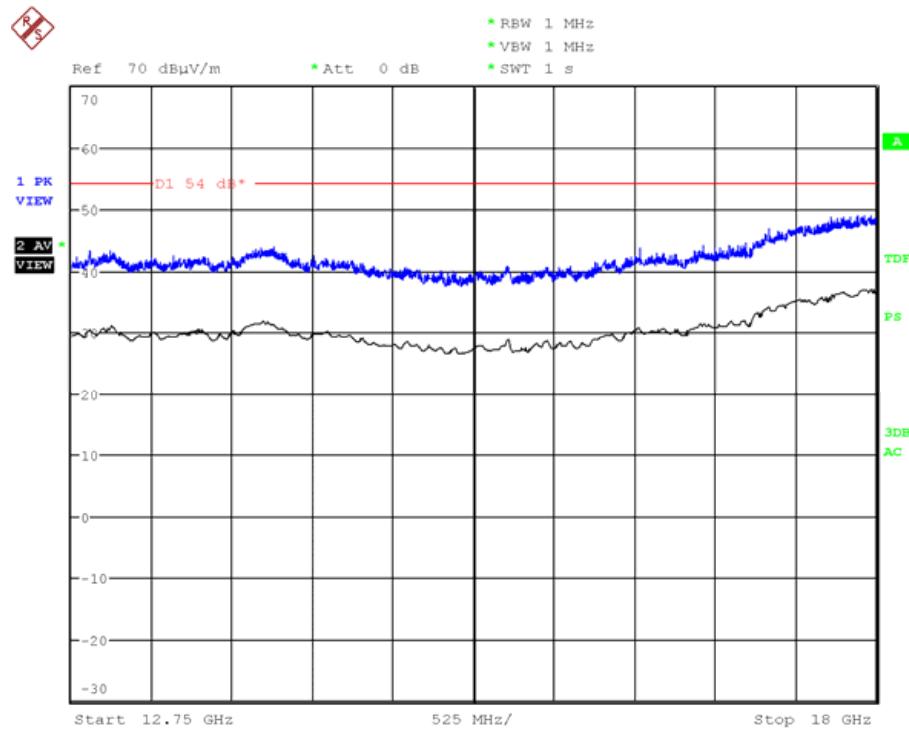
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5200 MHz.

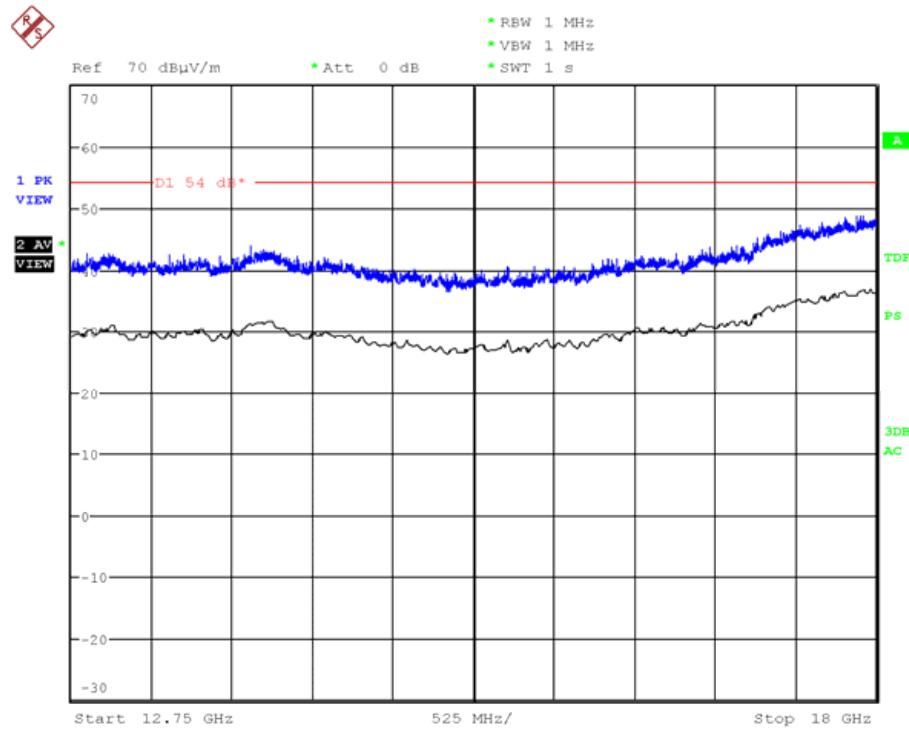
Chain A



Chain B



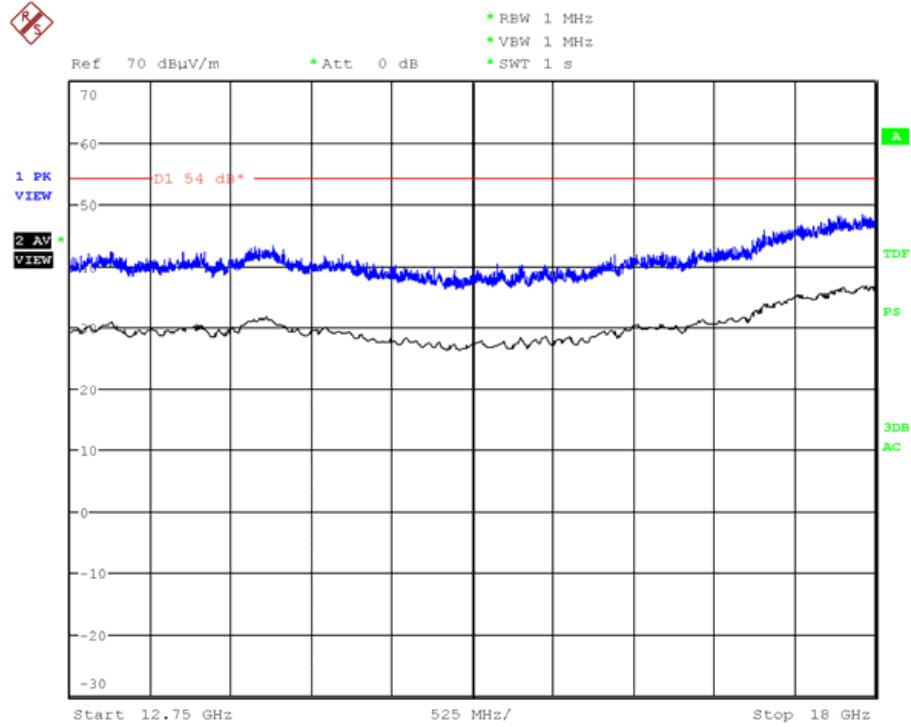
Chain A+B



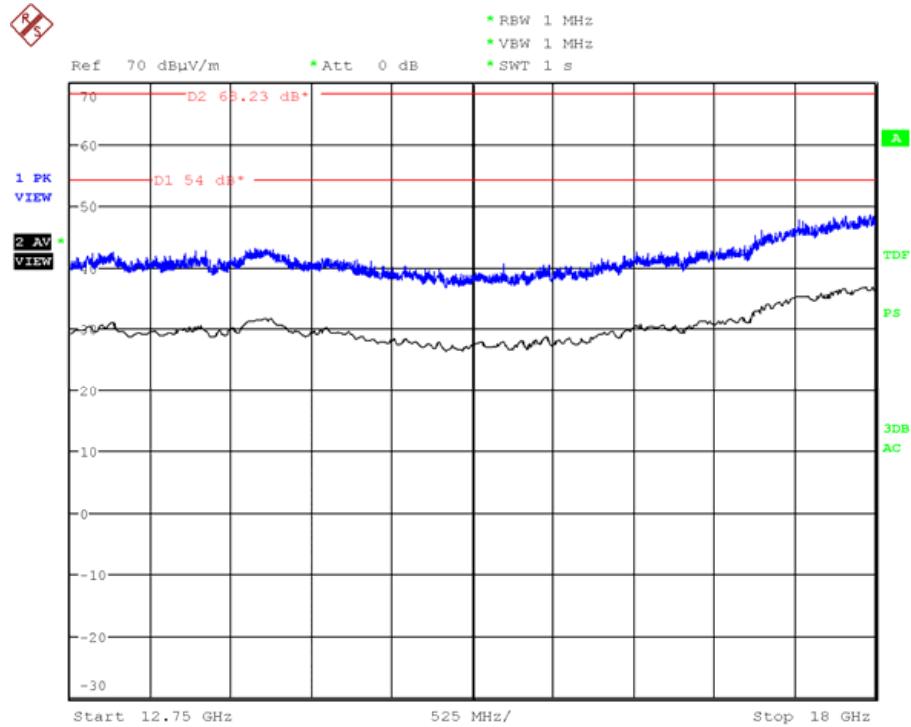
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5230 MHz.

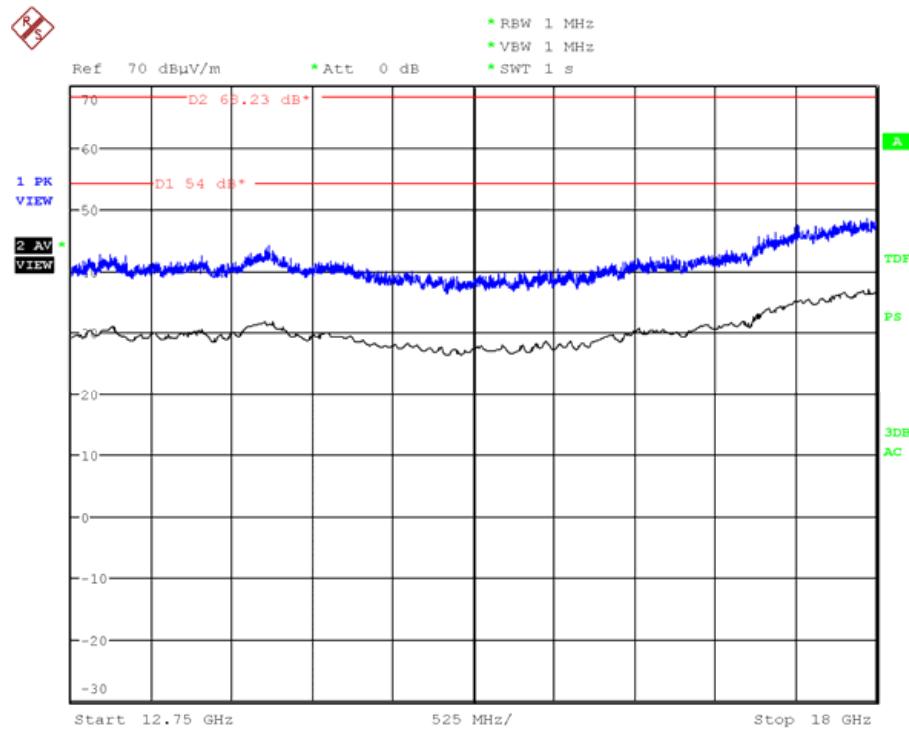
Chain A



Chain B



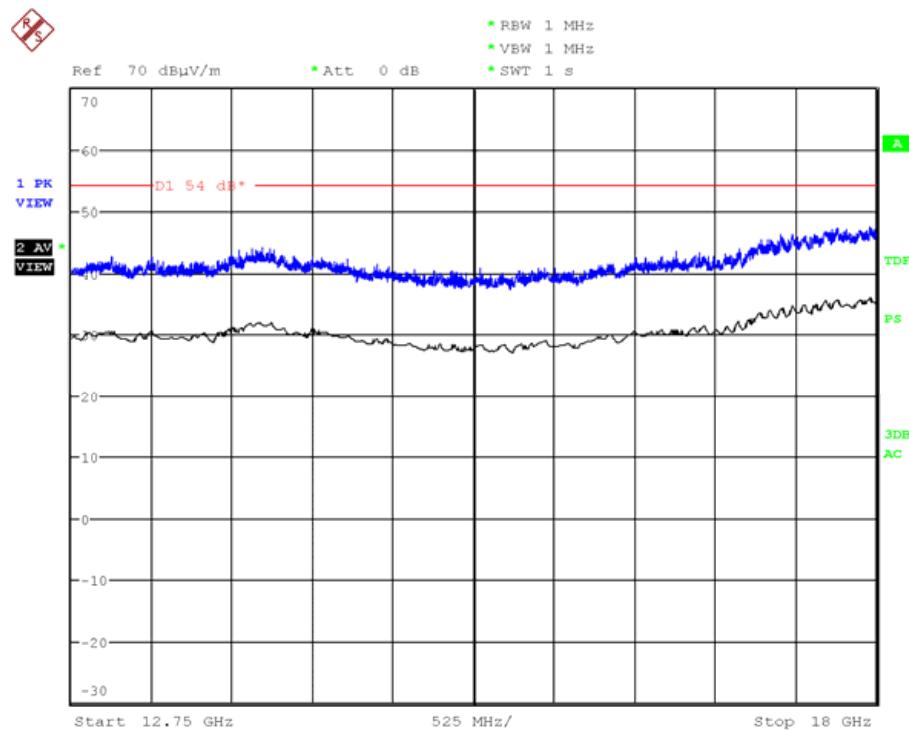
Chain A+B



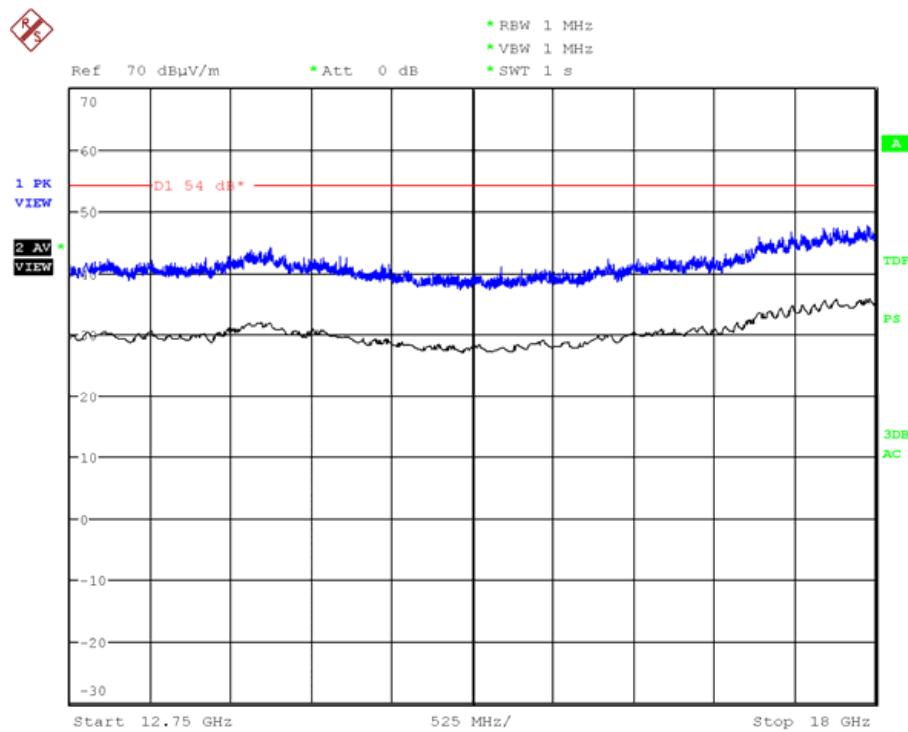
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.

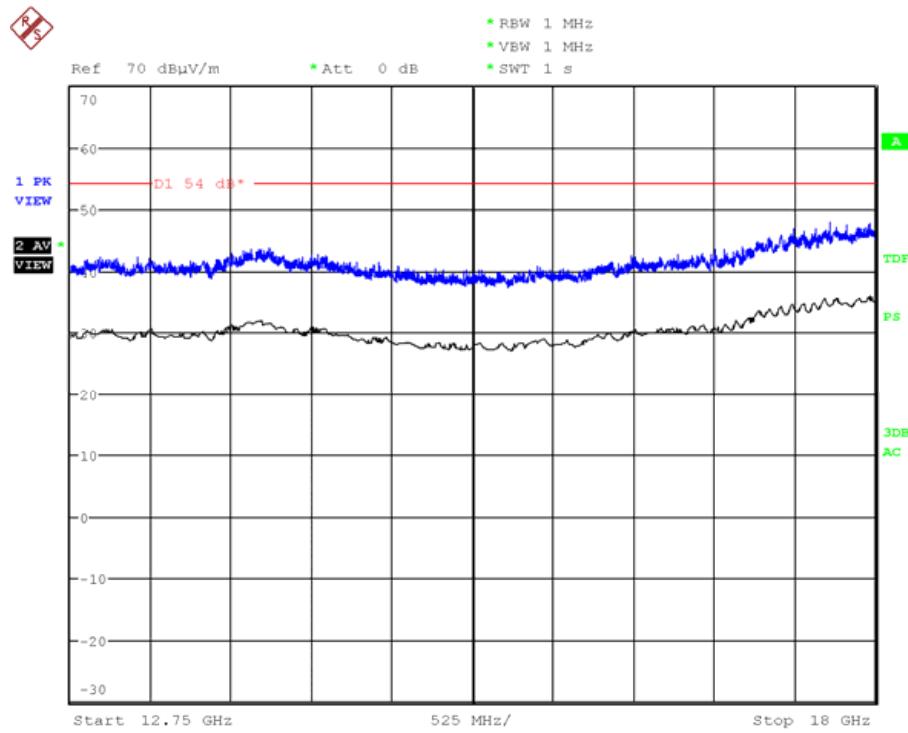
Chain A



Chain B



Chain A+B

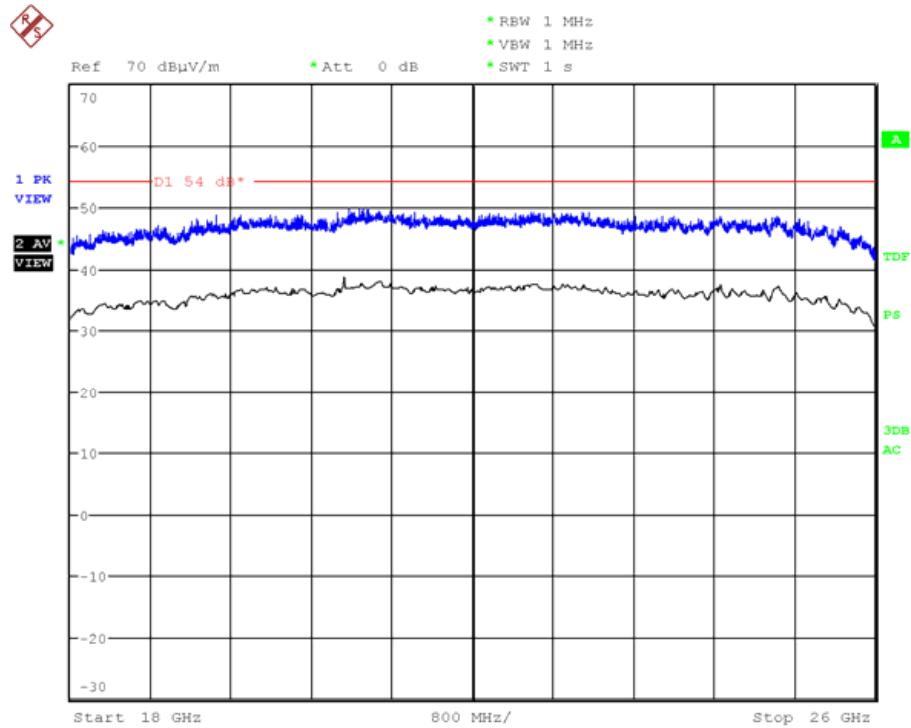


FREQUENCY RANGE 18 GHz to 26 GHz.

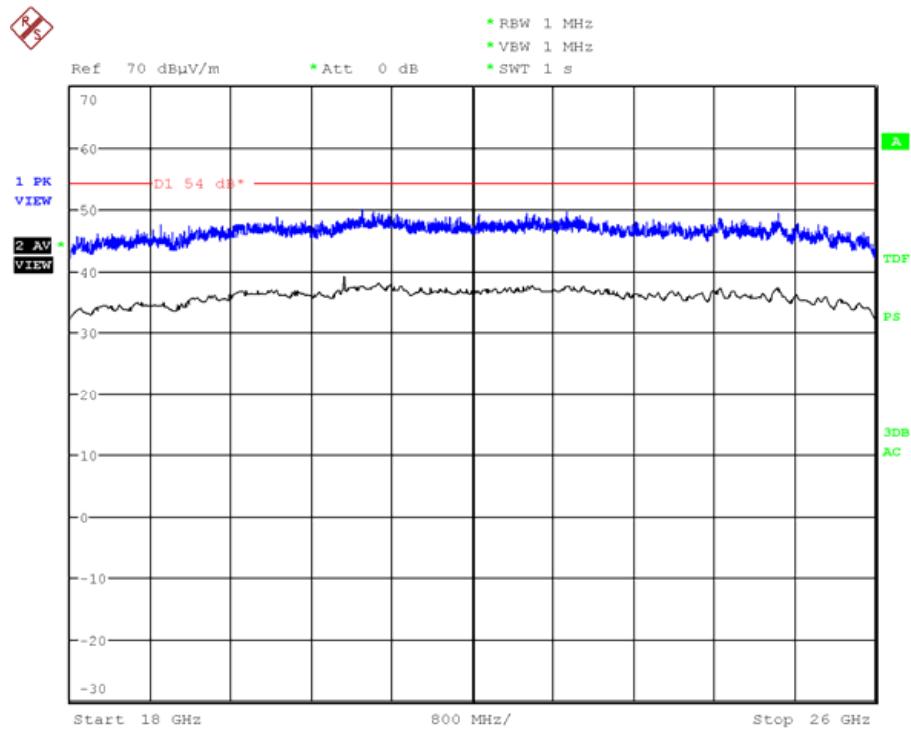
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

Chain A

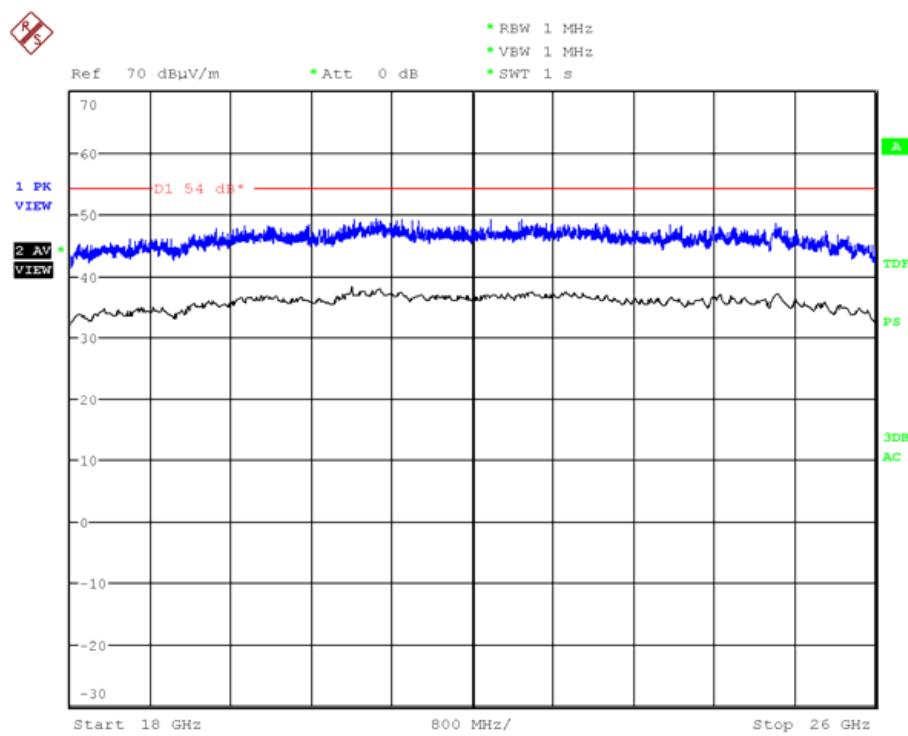


Chain B

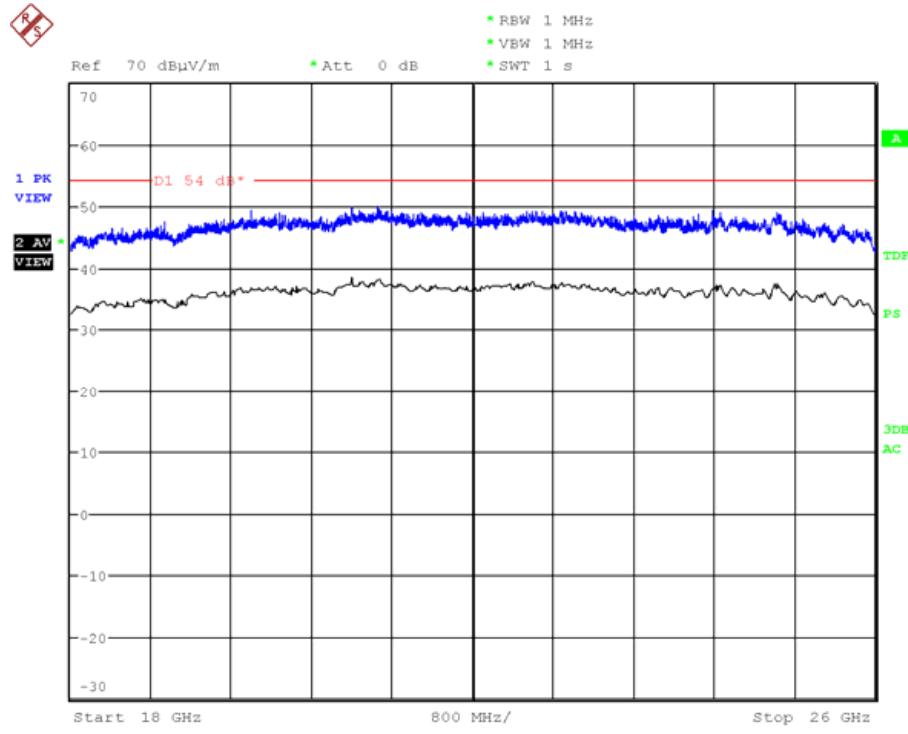


Middle frequency 5200 MHz.

Chain A

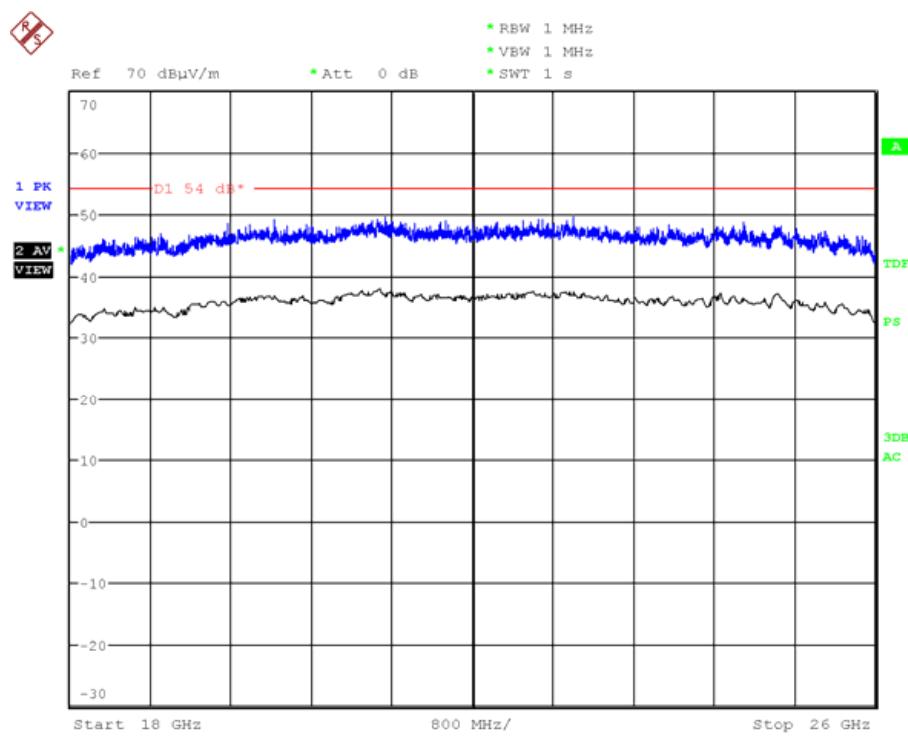


Chain B

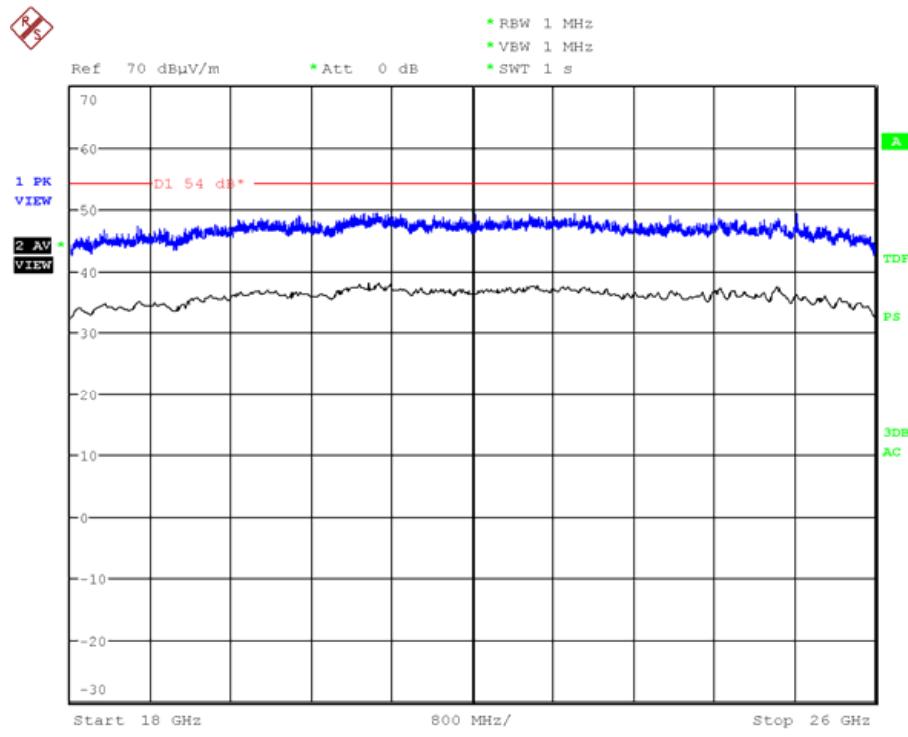


Highest frequency 5240 MHz.

Chain A



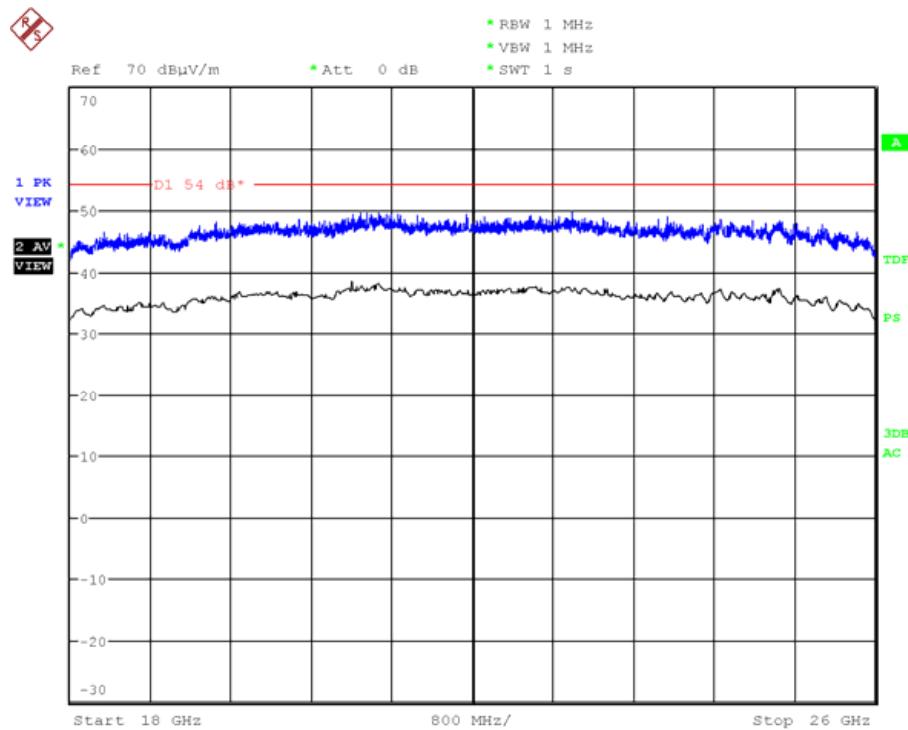
Chain B



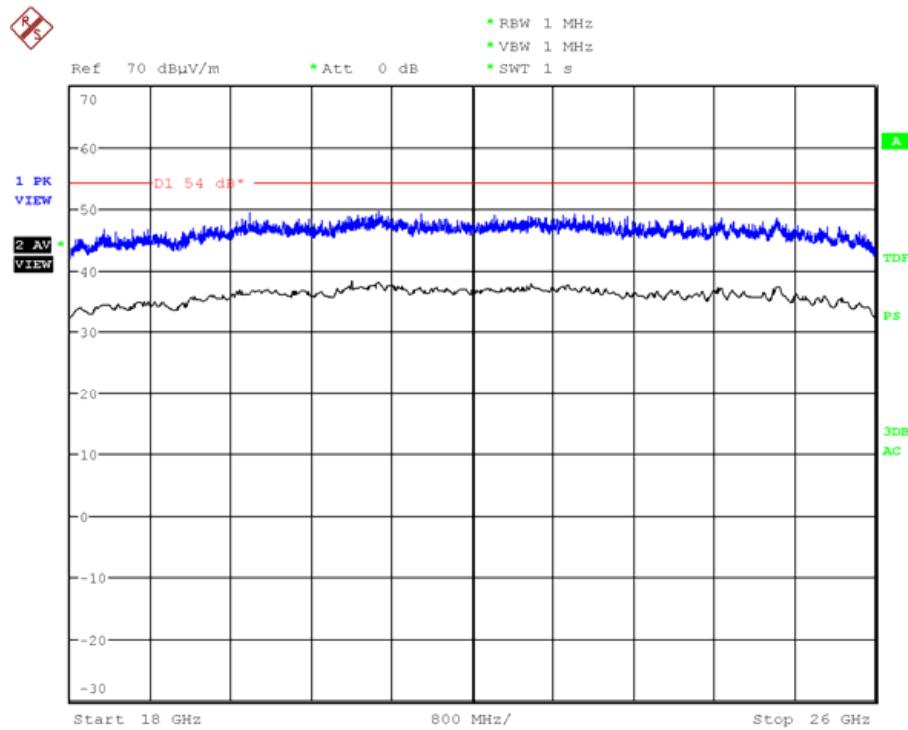
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5200 MHz.

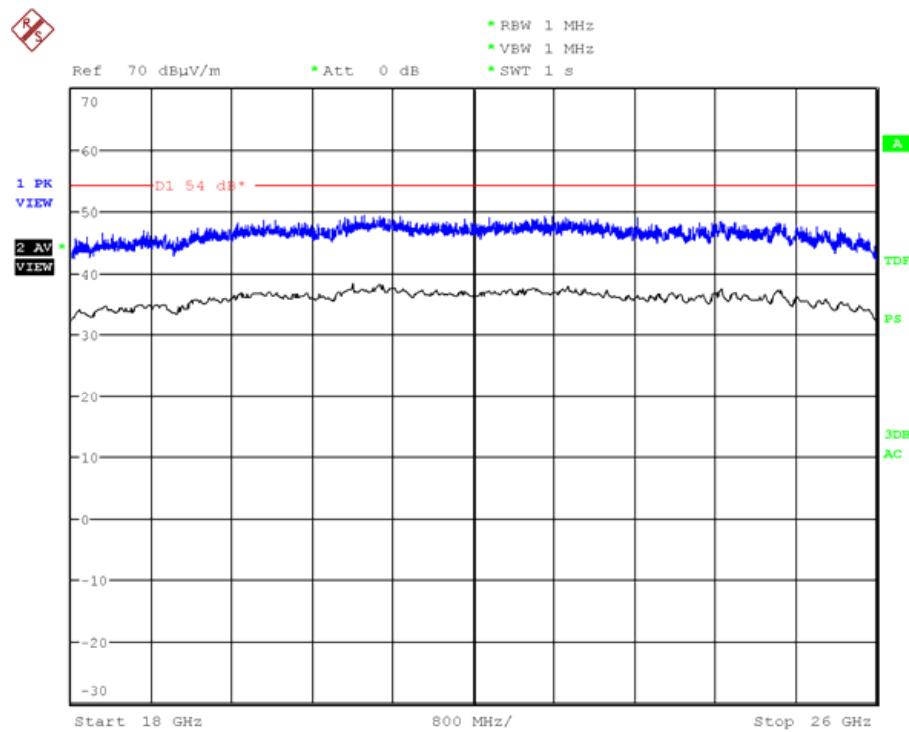
Chain A



Chain B



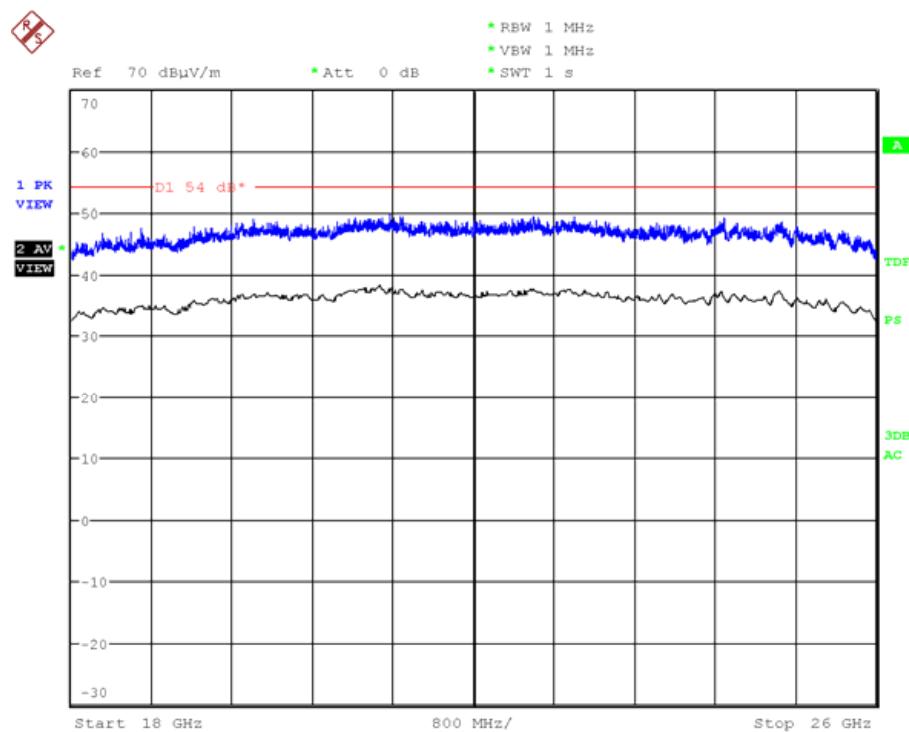
Chain A+B



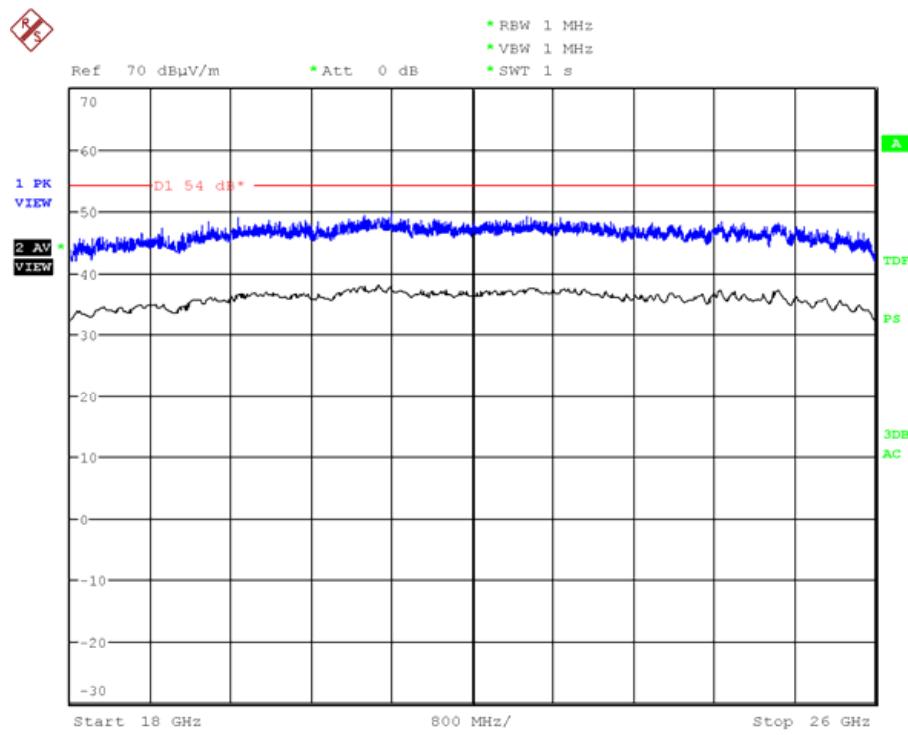
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5230 MHz.

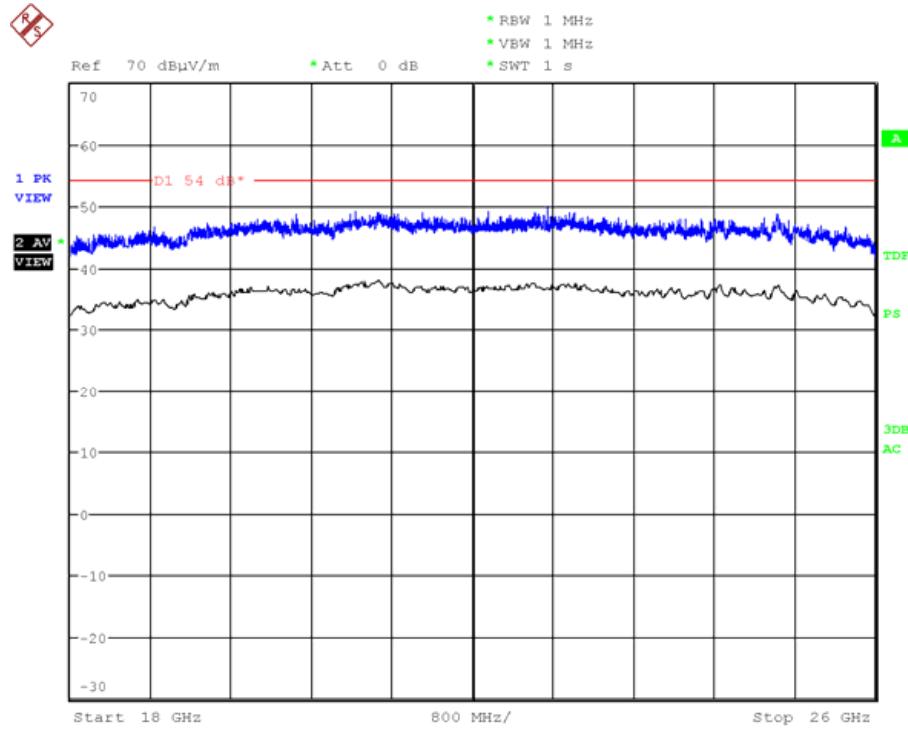
Chain A



Chain B



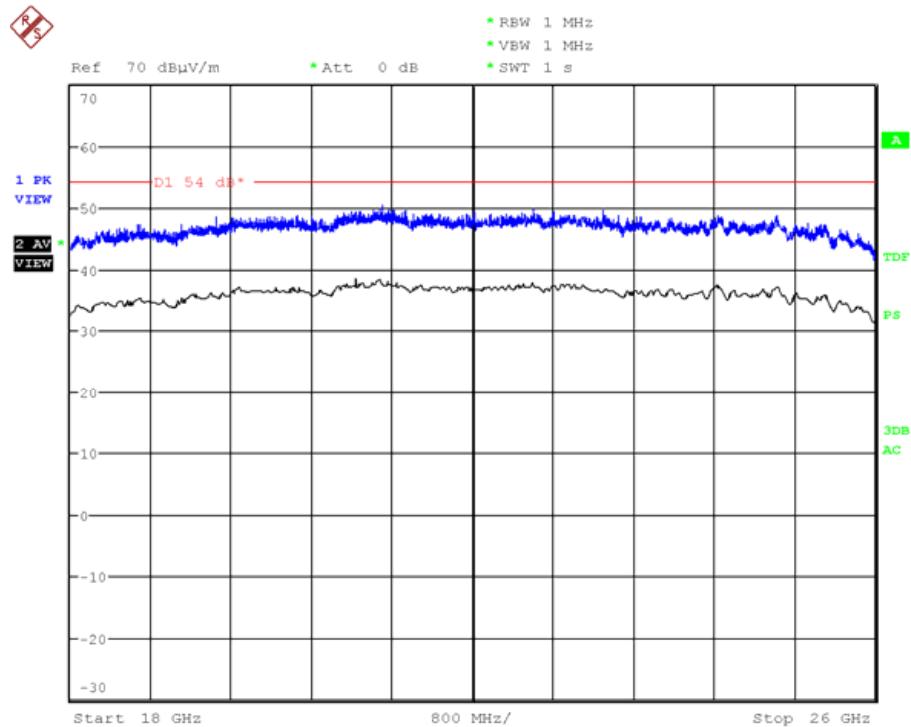
Chain A+B



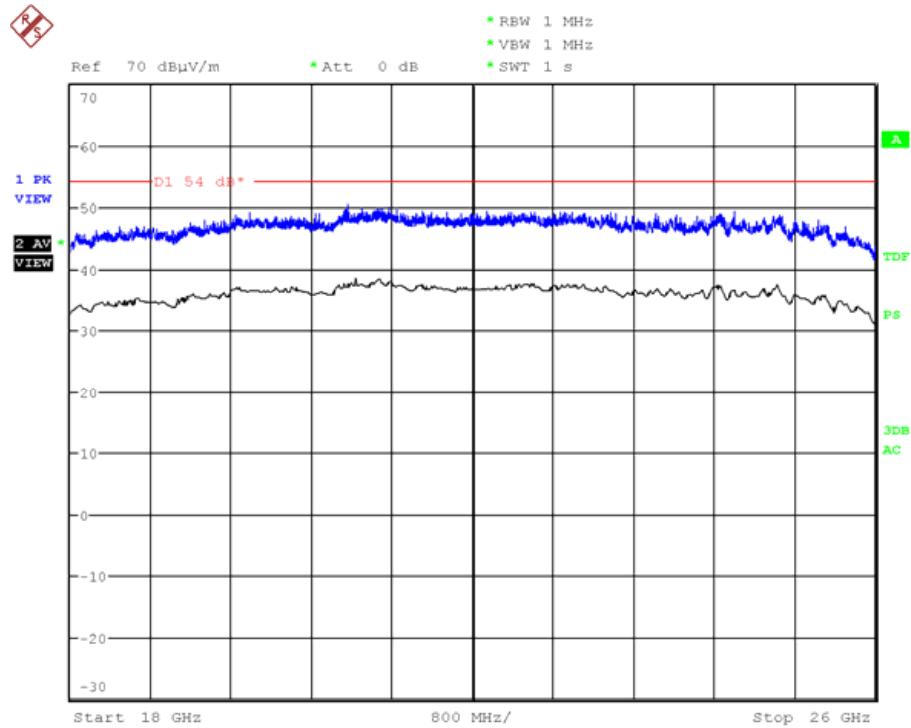
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5210 MHz.

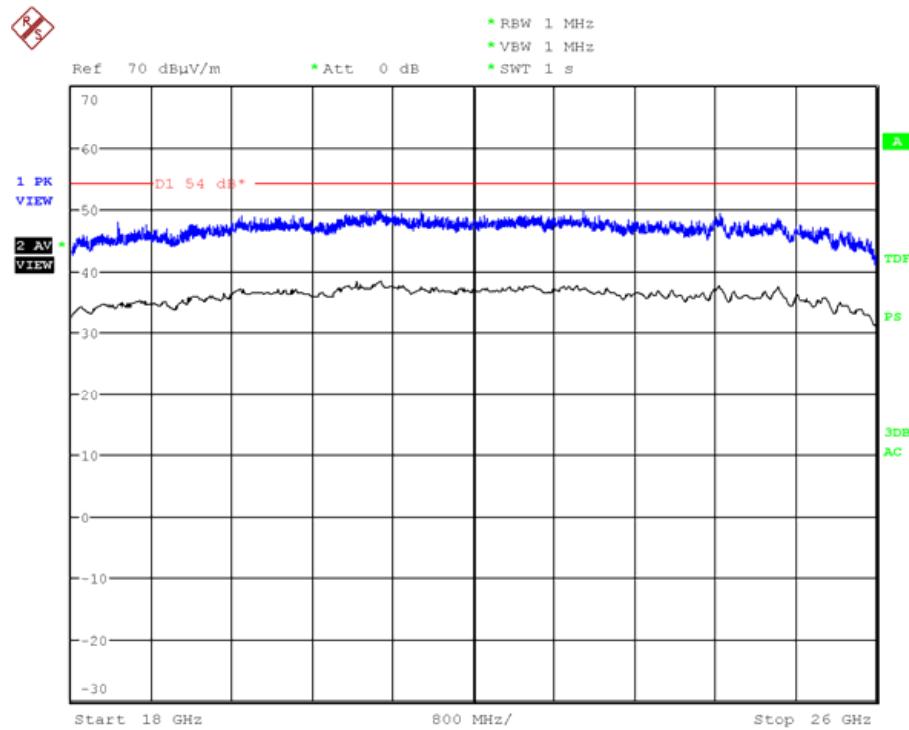
Chain A



Chain B

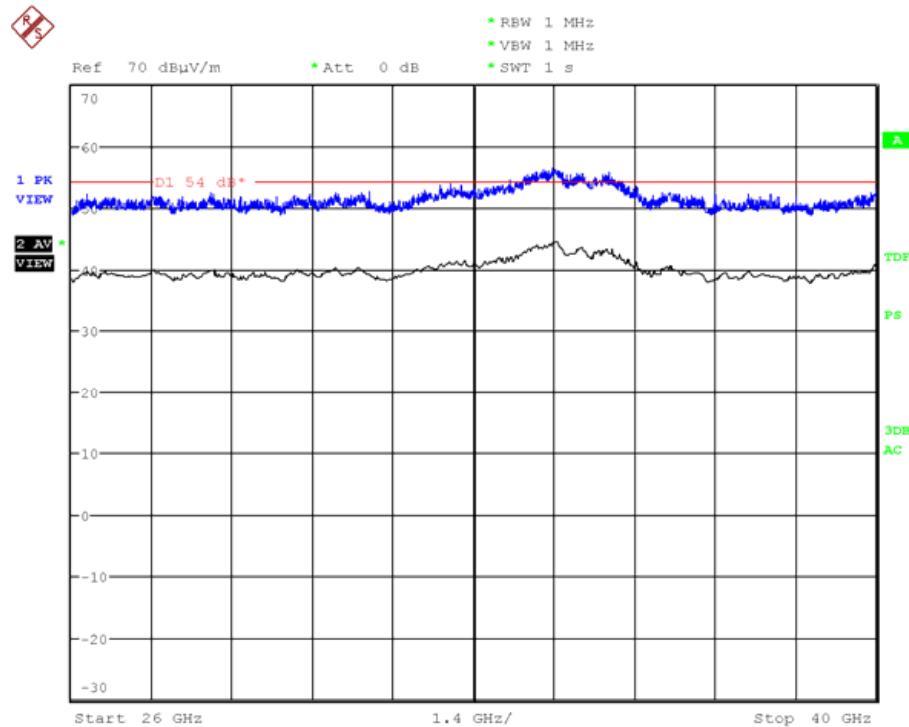


Chain A+B



FREQUENCY RANGE 26 GHz 40GHz.

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



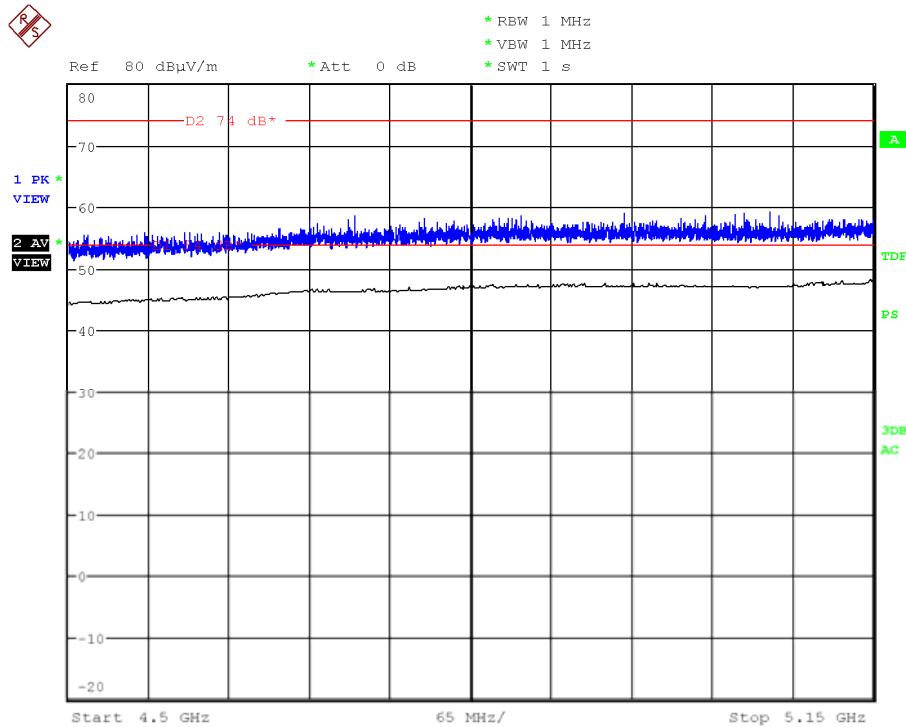
(This plot is valid for both SISO modes and MIMO mode).

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

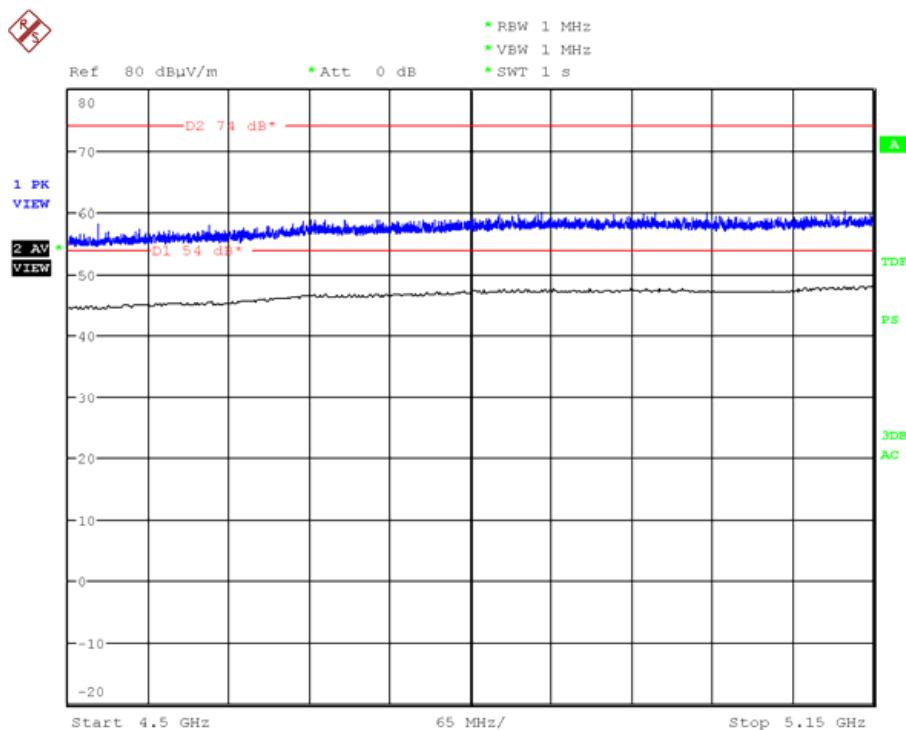
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5180 MHz.

Chain A

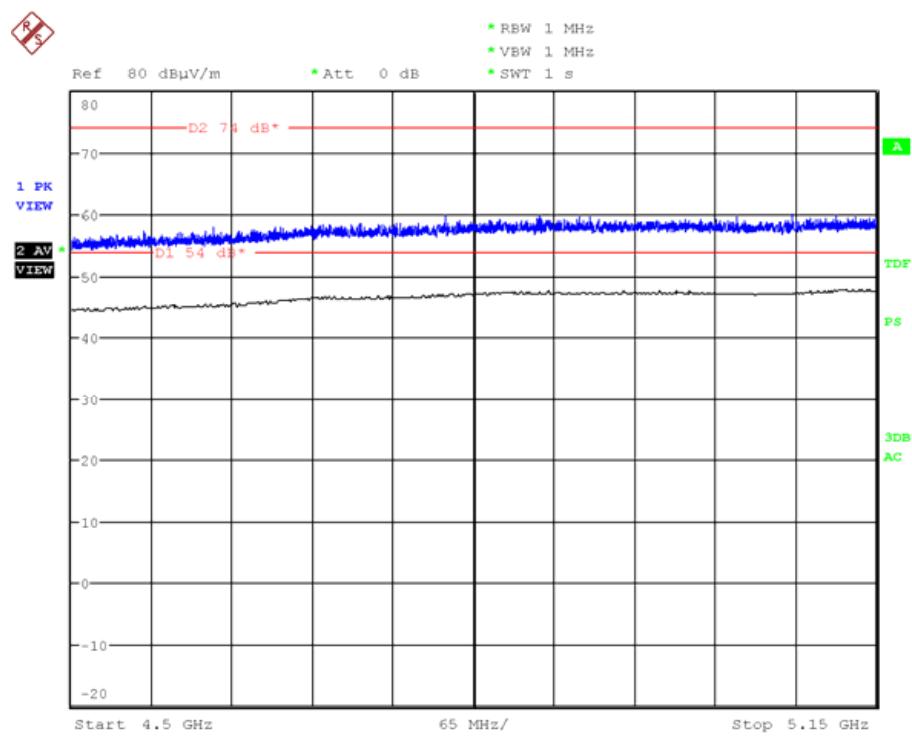


Chain B

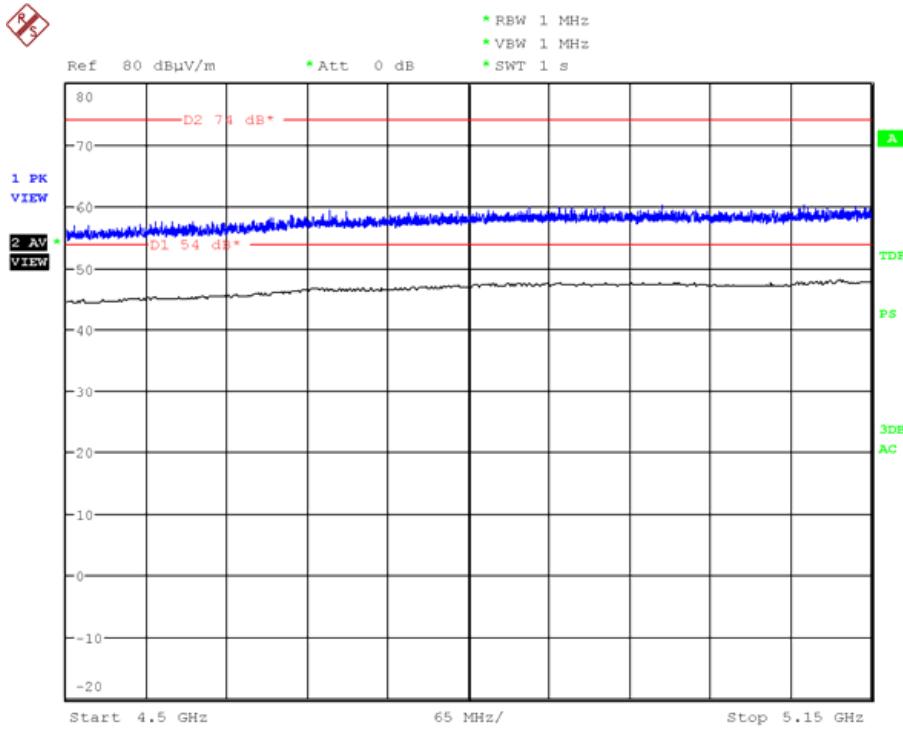


Middle frequency 5200 MHz.

Chain A



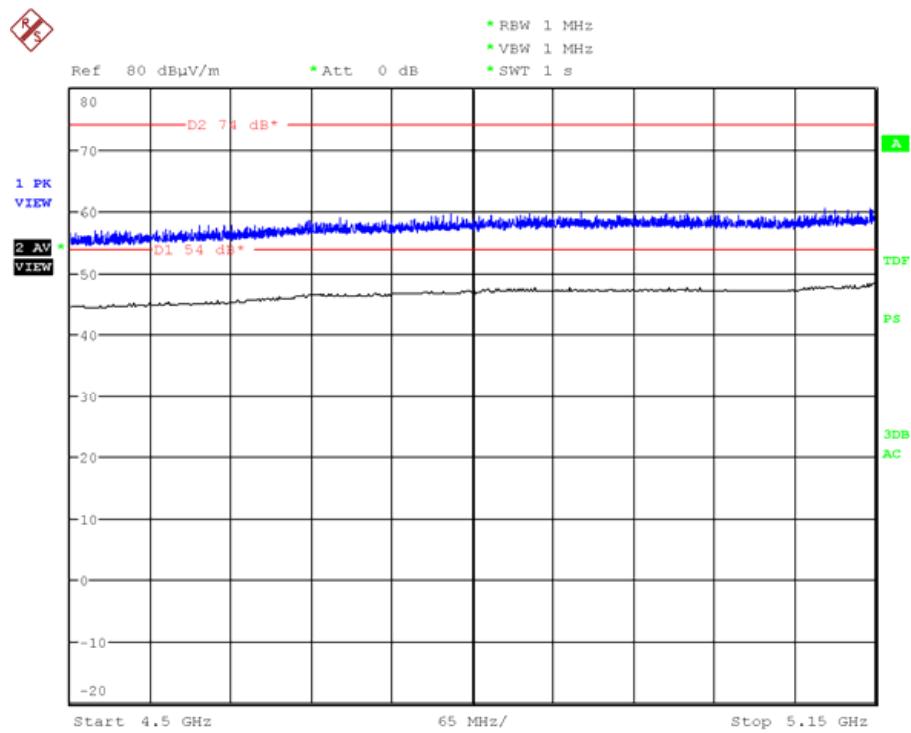
Chain B



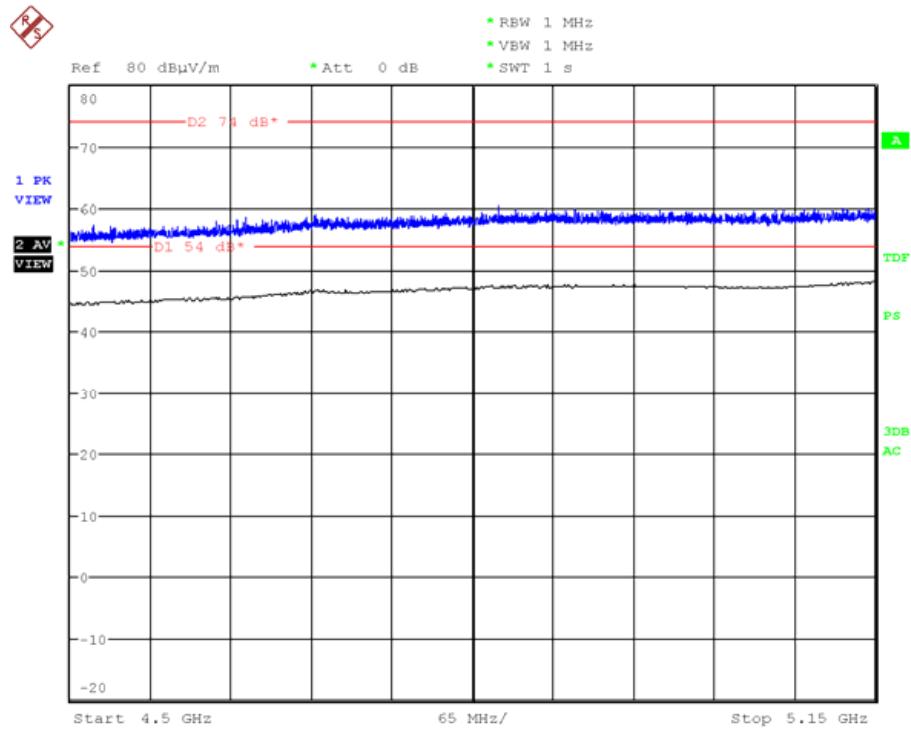
2. WiFi 5GHz 802.11 n20 mode

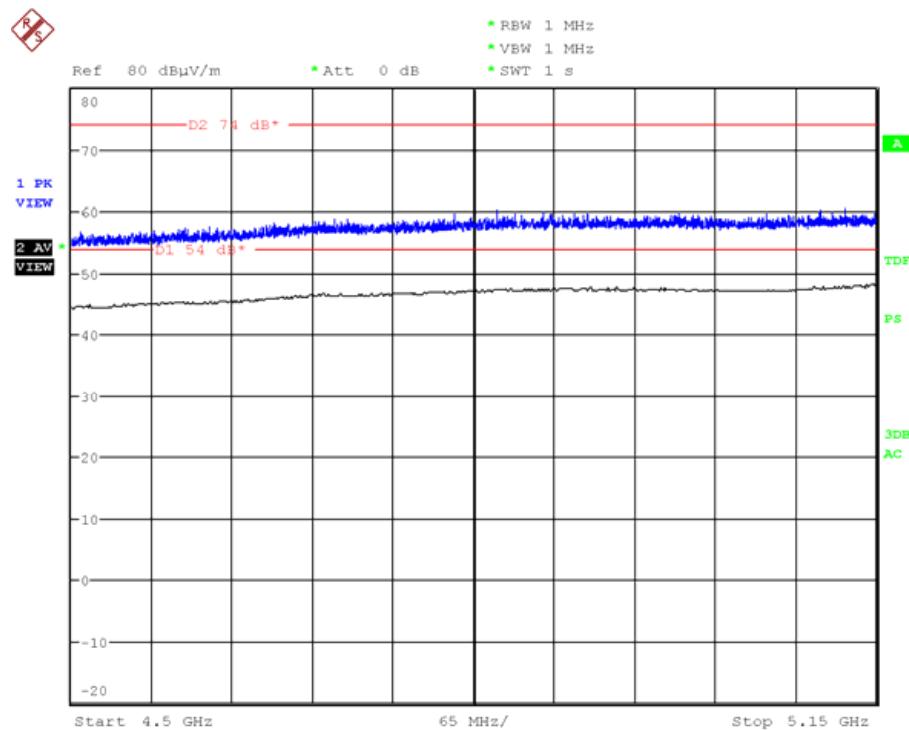
Lowest frequency 5180 MHz.

Chain A

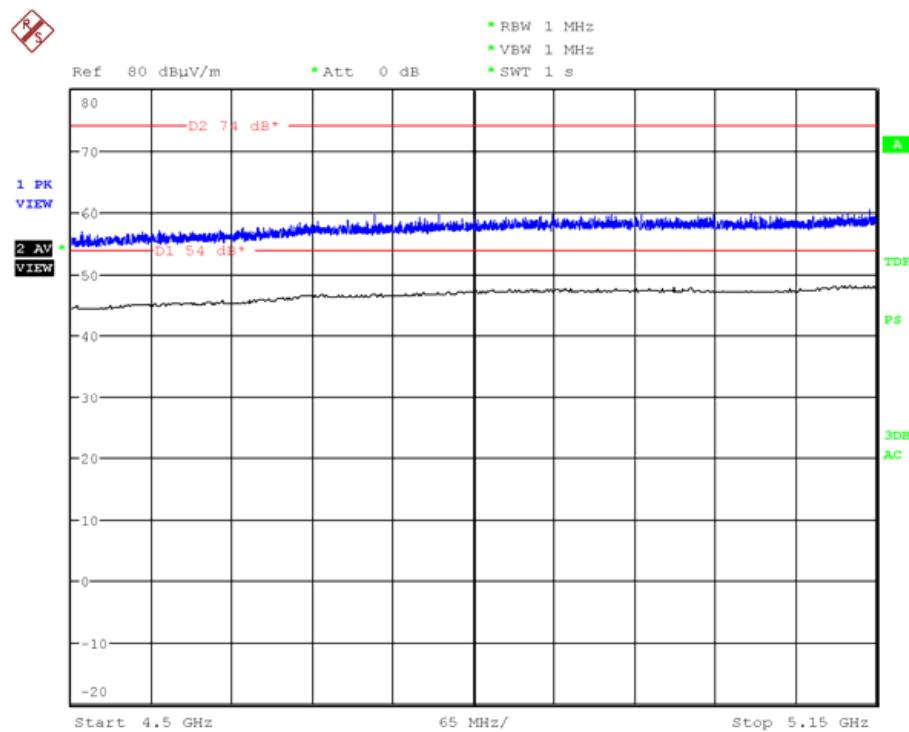


Chain B

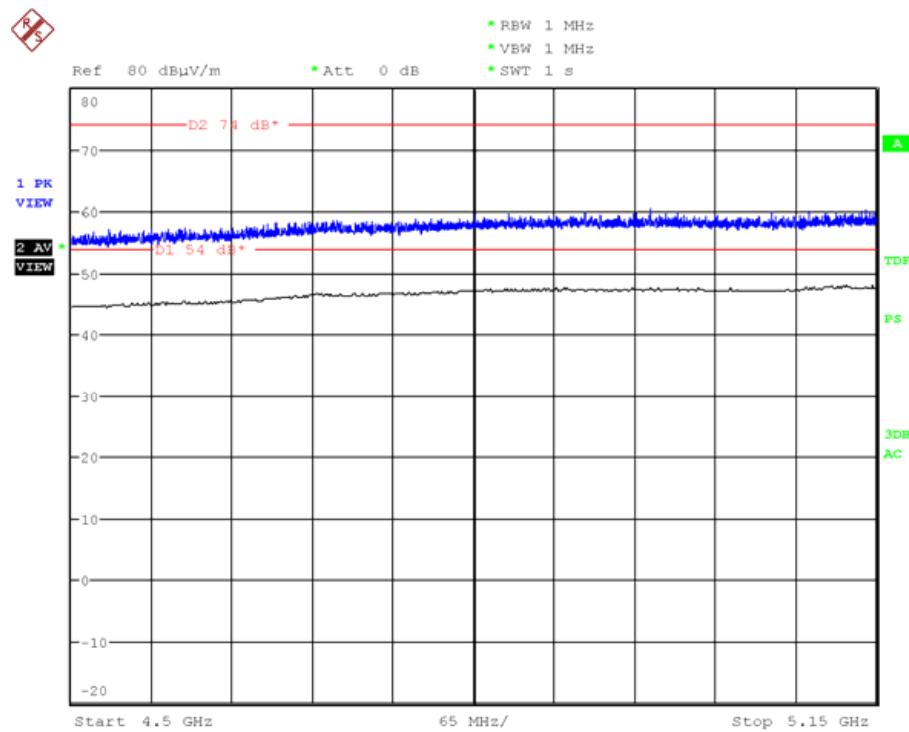


Chain A+B


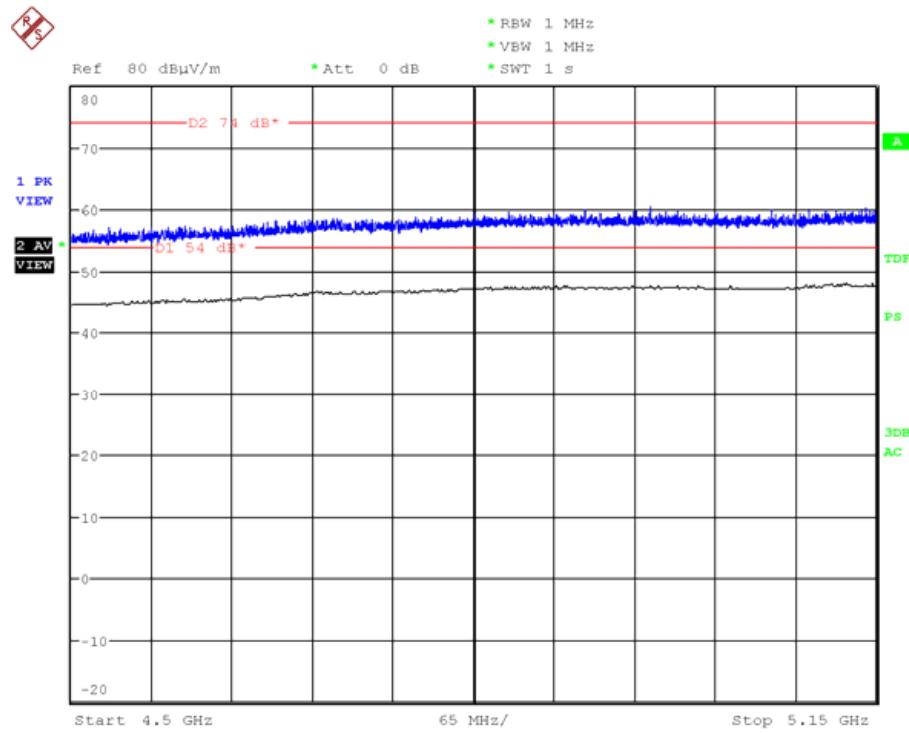
Middle frequency 5200 MHz.

Chain A


Chain B



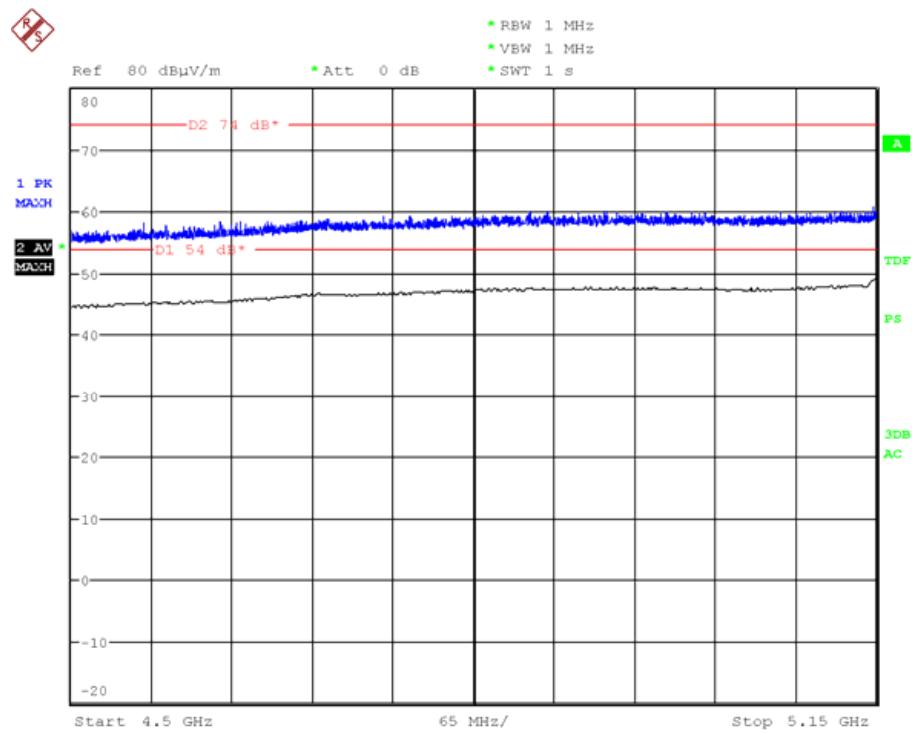
Chain A+B



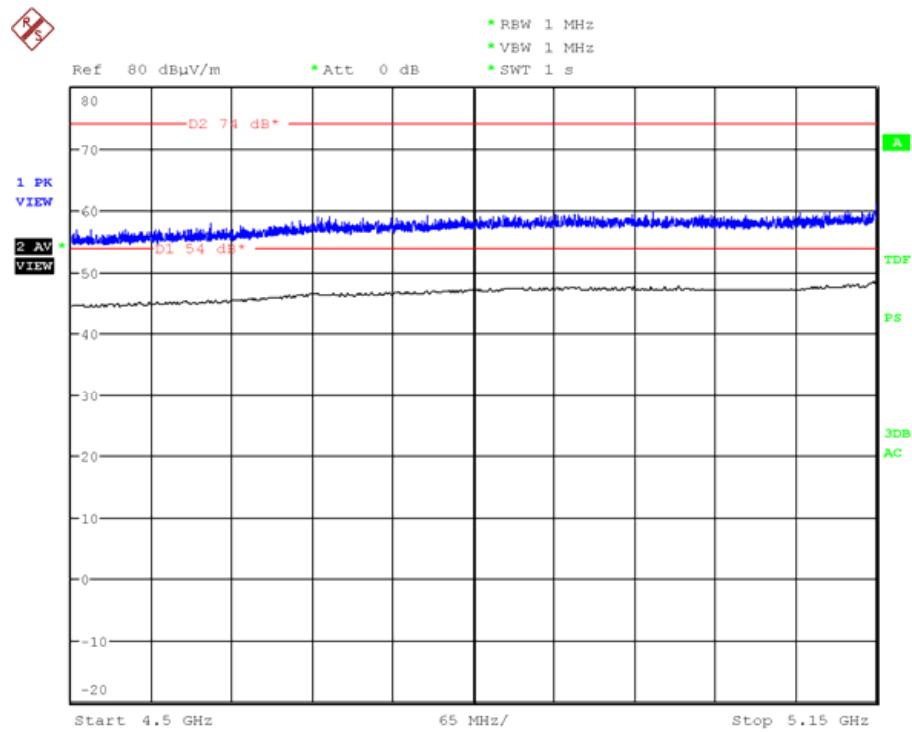
3. WiFi 5GHz 802.11 n40 mode

Lowest frequency 5190 MHz.

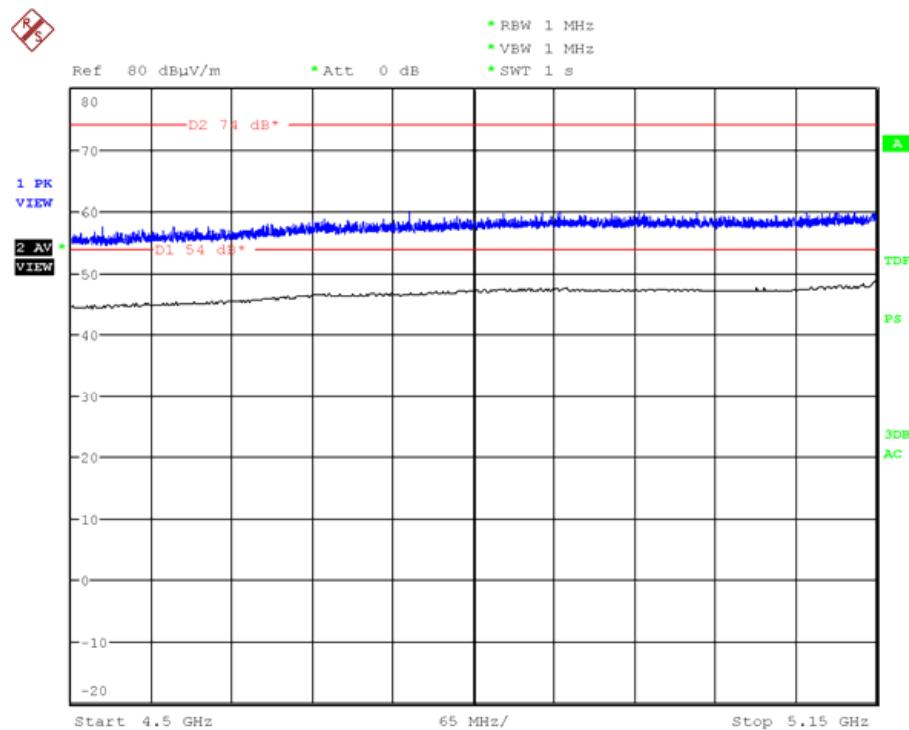
Chain A



Chain B

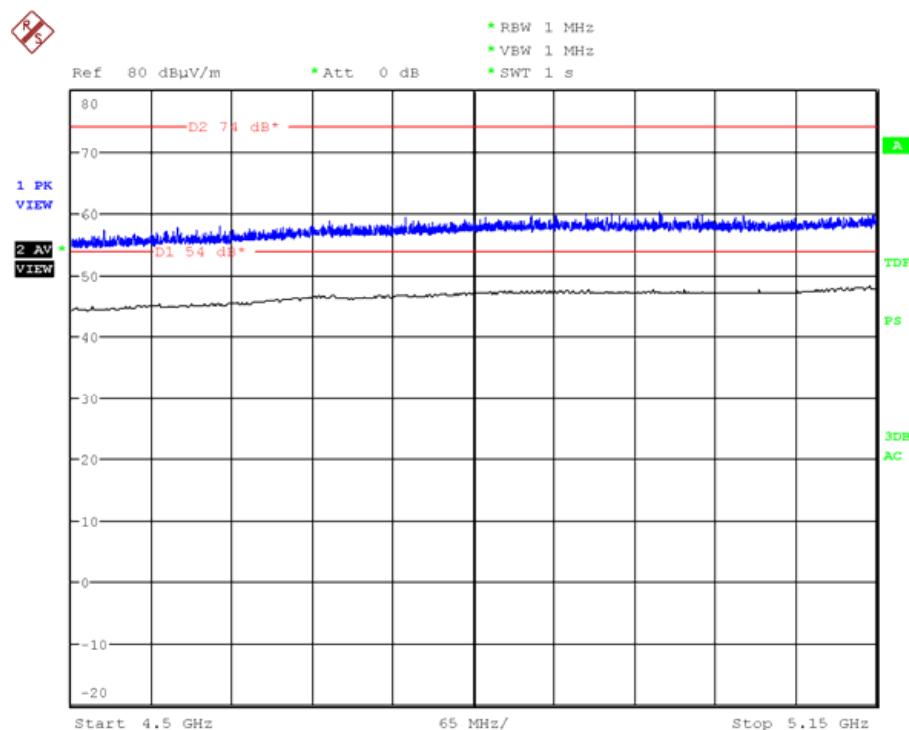


Chain A+B

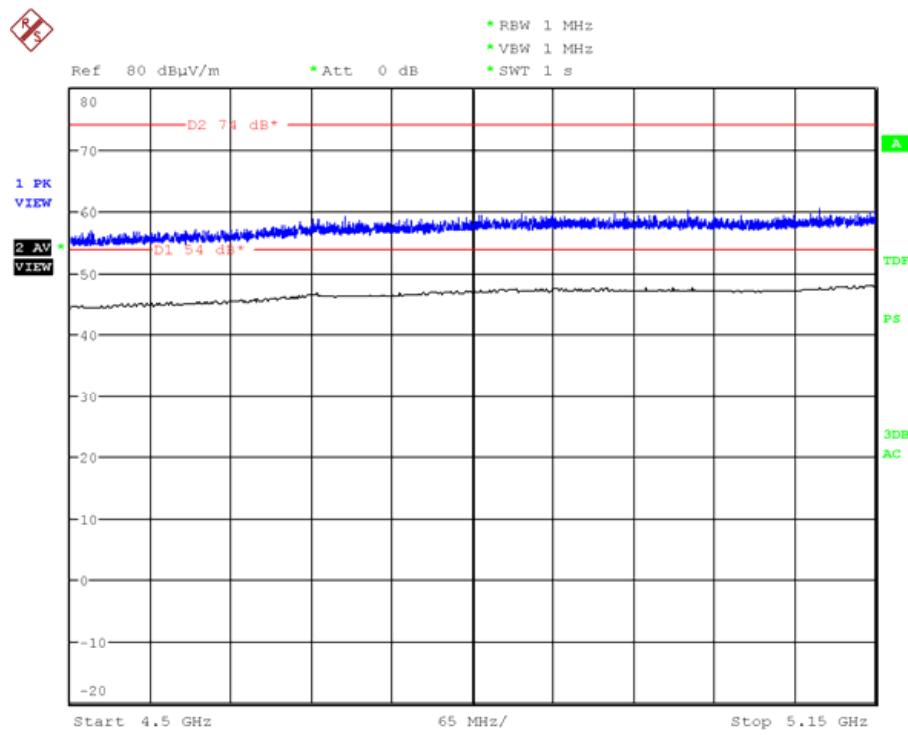


Highest Channel 5230MHz

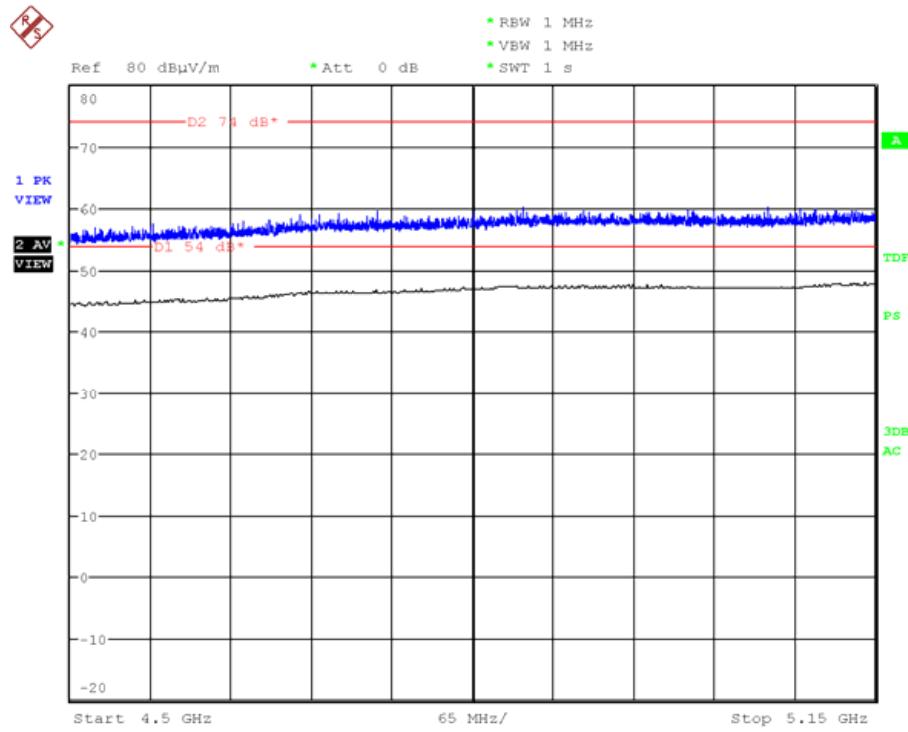
Chain A



Chain B

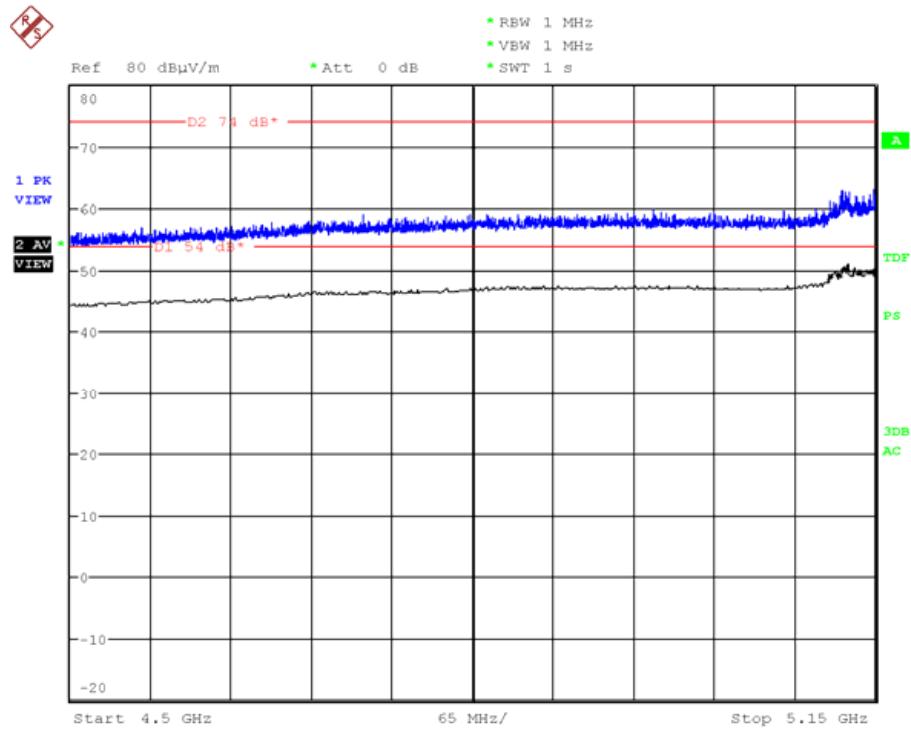


Chain A+B

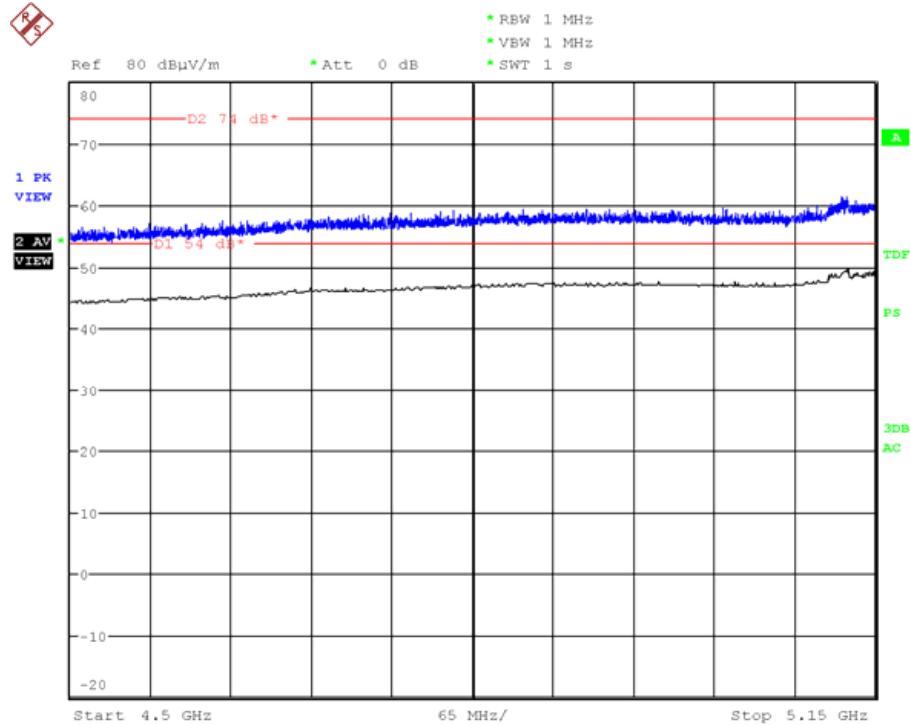


4. WiFi 5GHz 802.11 ac80 mode

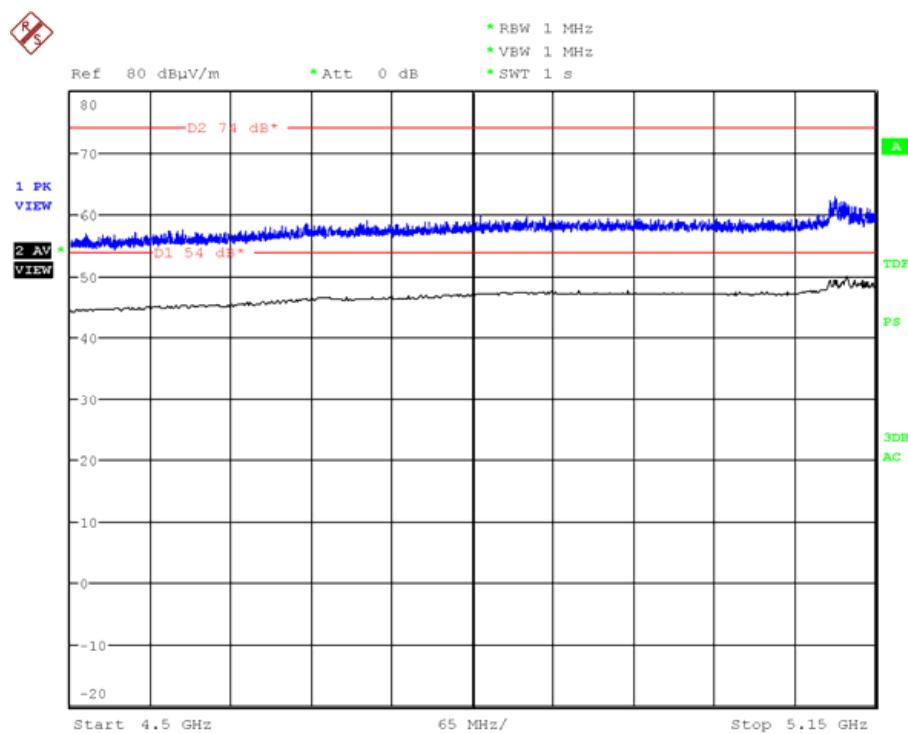
Chain A



Chain B



Chain A+B



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

INDEX

TEST CONDITIONS.....	98
99 % and 26 dB Bandwidth	101
Section 15.407 Subclause (a) (2) / RSS-210 A9.2. (2). Maximum output power, Peak power spectral density and antenna gain	112
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TEST CONDITIONS

Power supply (V):

$V_{nominal} = 3.3 \text{ Vdc}$

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 v02 dated 05/28/2013.

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, HT4 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT6 (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 1.7.1-752 & DRTU 1.7.1-777”

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	15	n/a
			56 / 5280	14	14	n/a
			60 / 5300	15	15	n/a
			64 / 5320	14	14	n/a
	802.11n	20	52 / 5260	15	15	13,50
			56 / 5280	14	14	12,00
			60 / 5300	15	15	13,50
			64 / 5320	14	14	12,50
	802.11n*	40	54 / 5270	15,5	15,5	13,50
			62 / 5310	12,5	13	10,00
	802.11ac	80	58 / 5290	12,5	12,5	10,50

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 360°.

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)	18.150	17.950	17.950
26 dB bandwidth (MHz)	27.450	26.658	26.591
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	18.100	18.000	18.050
26 dB bandwidth (MHz)	27.447	27.297	27.503
Measurement uncertainty (kHz)	± 21.7		

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)	18.650	18.550	18.550
26 dB bandwidth (MHz)	25.654	25.583	25.443
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5260 MHz	Middle frequency 5300 MHz	Highest frequency 5320 MHz
99% bandwidth (MHz)	18.700	18.650	18.600
26 dB bandwidth (MHz)	26.825	25.806	25.573
Measurement uncertainty (kHz)	± 21.7		

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)	36.900	36.300
26 dB bandwidth (MHz)	55.753	42.307
Measurement uncertainty (kHz)	±21.7	

CHAIN B

	Lowest frequency 5270 MHz	Highest frequency 5310 MHz
99% bandwidth (MHz)	36.900	36.300
26 dB bandwidth (MHz)	55.248	42.257
Measurement uncertainty (kHz)	±21.7	

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

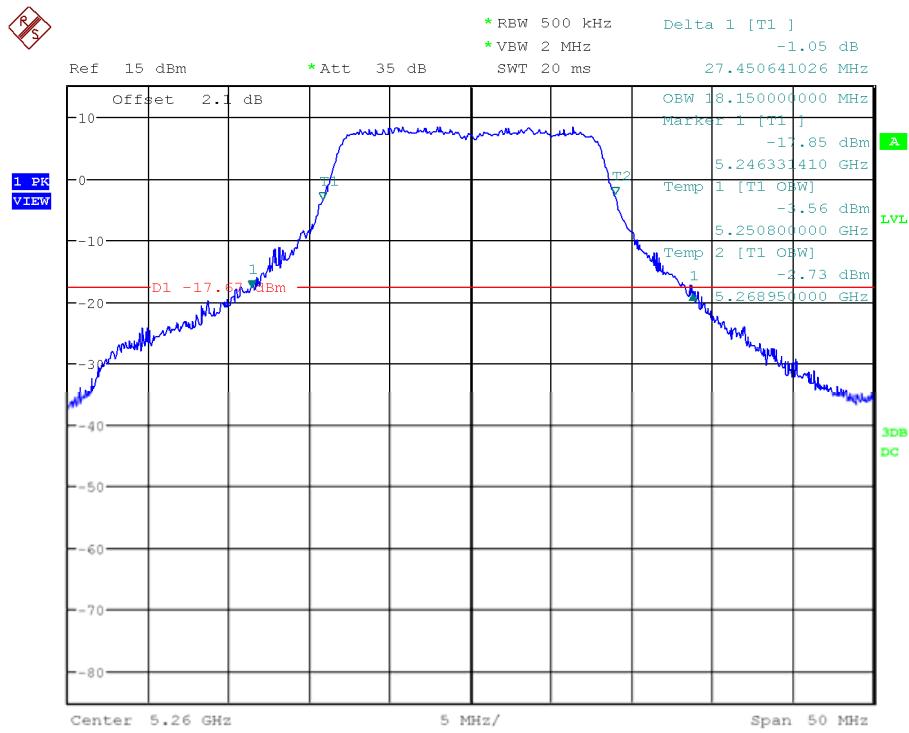
	Frequency 5290 MHz
99% bandwidth (MHz)	75.150
26 dB bandwidth (MHz)	88.221
Measurement uncertainty (kHz)	±21.7

CHAIN B

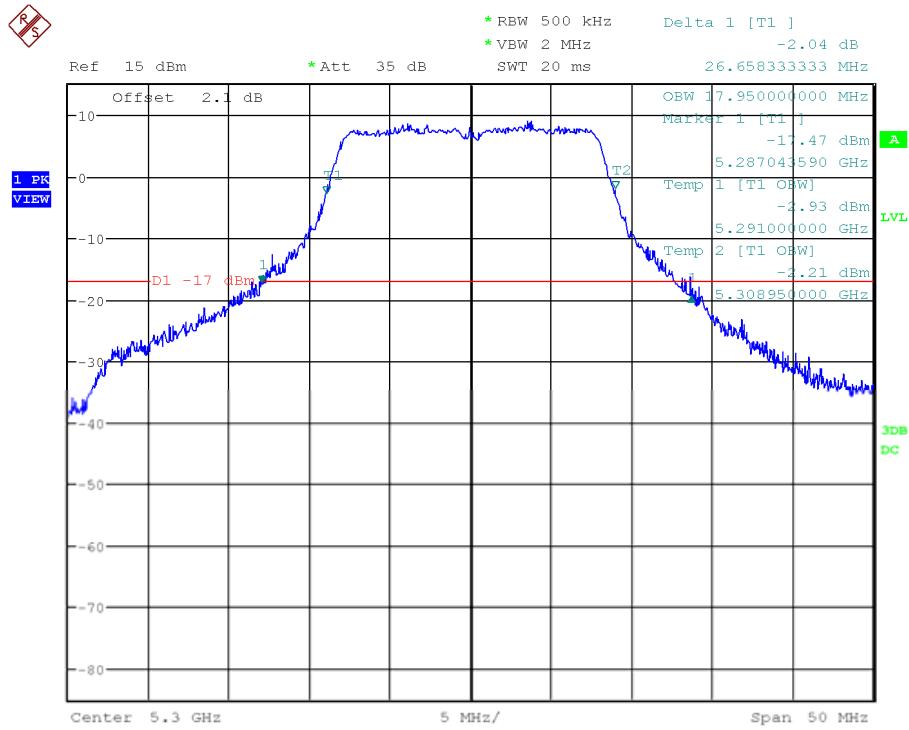
	Frequency 5290 MHz
99% bandwidth (MHz)	75.150
26 dB bandwidth (MHz)	88.369
Measurement uncertainty (kHz)	±21.7

802.11a mode CHAIN A

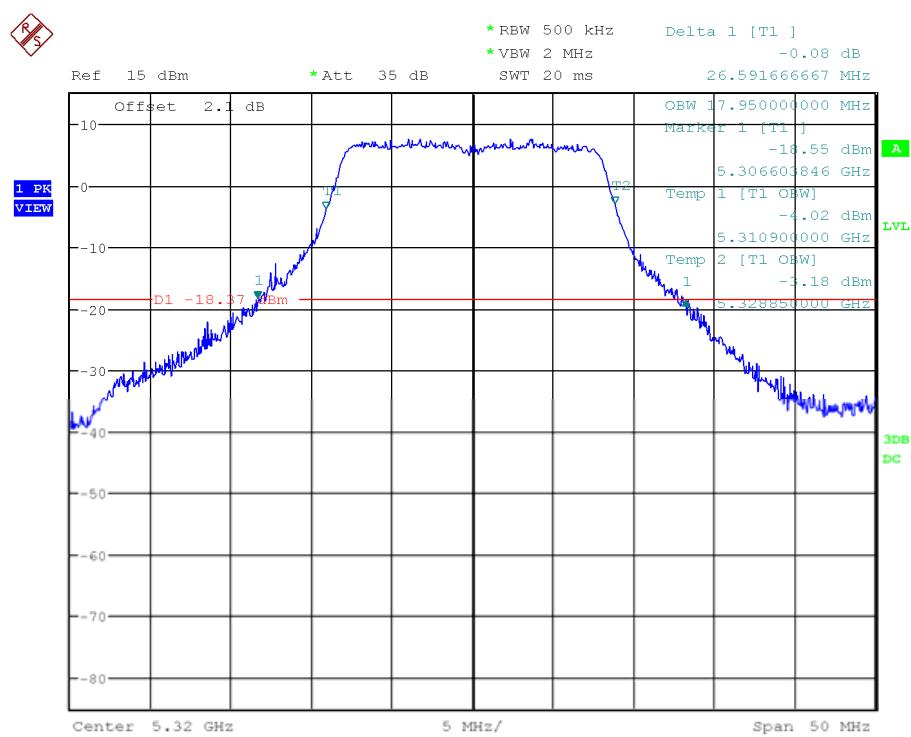
Lowest Channel



Middle Channel

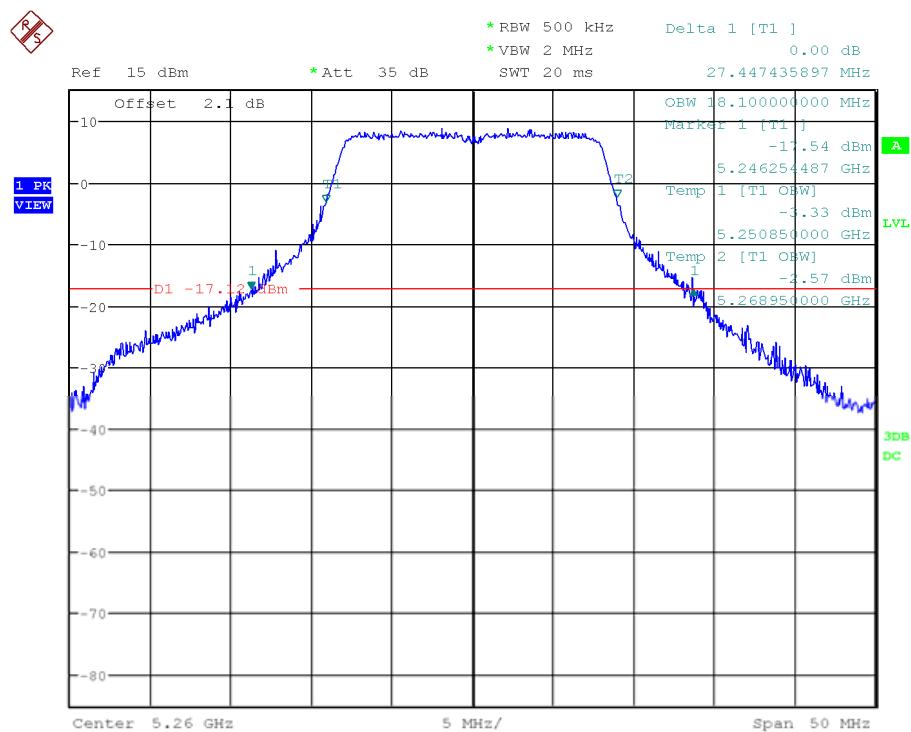


Highest Channel

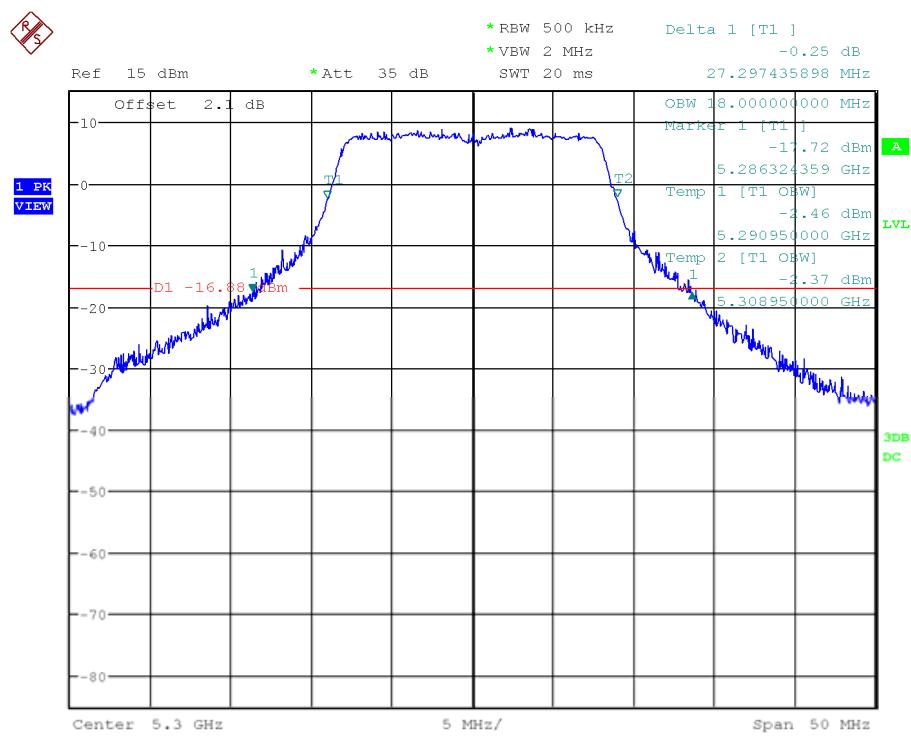


802.11a mode CHAIN B

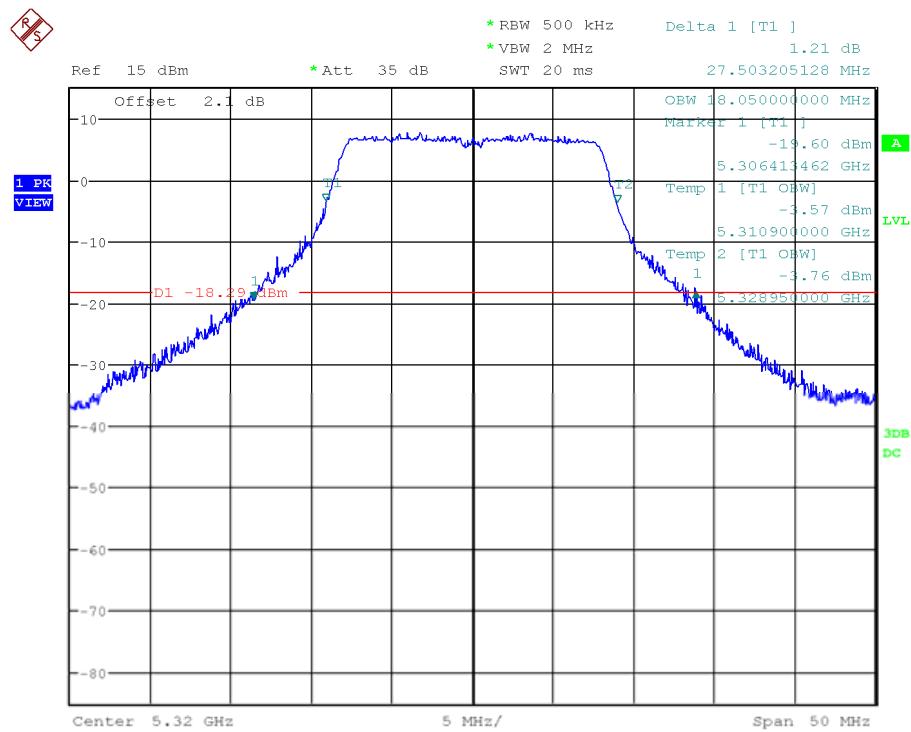
Lowest Channel



Middle Channel

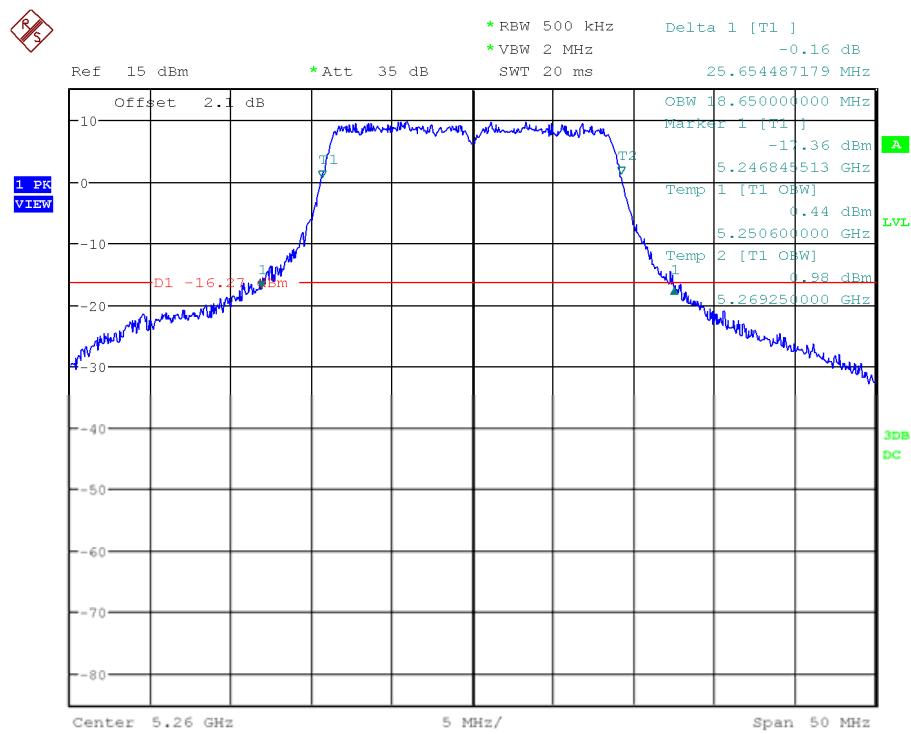


Highest Channel

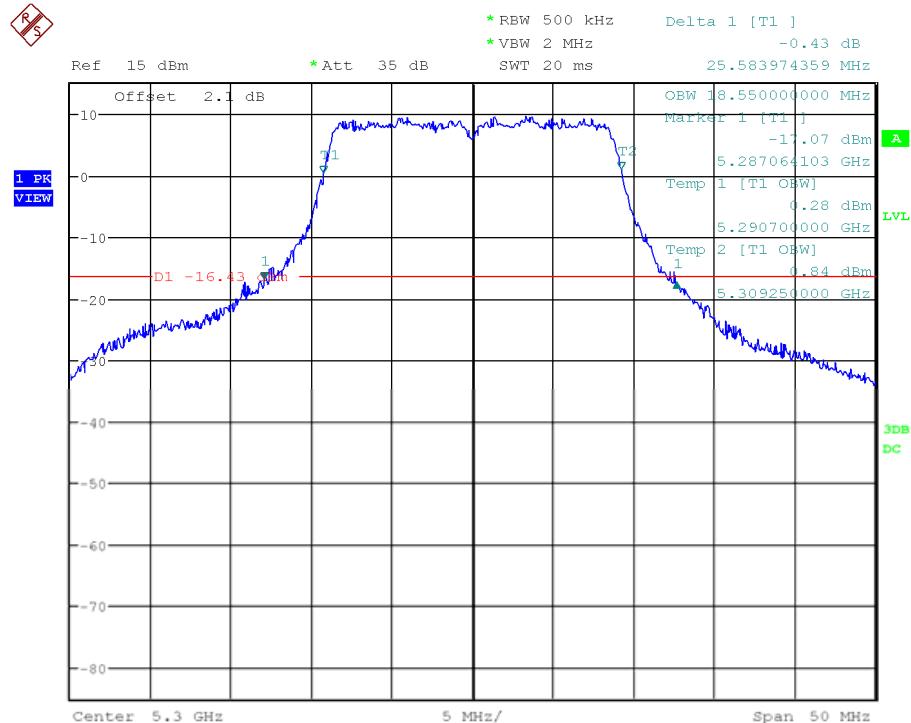


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

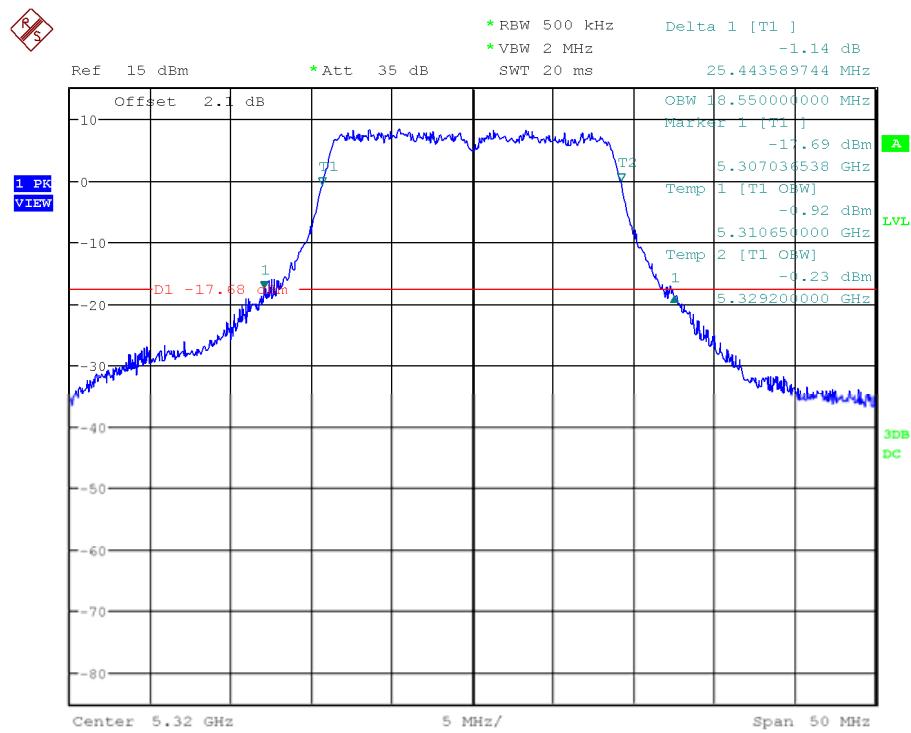
Lowest Channel



Middle Channel

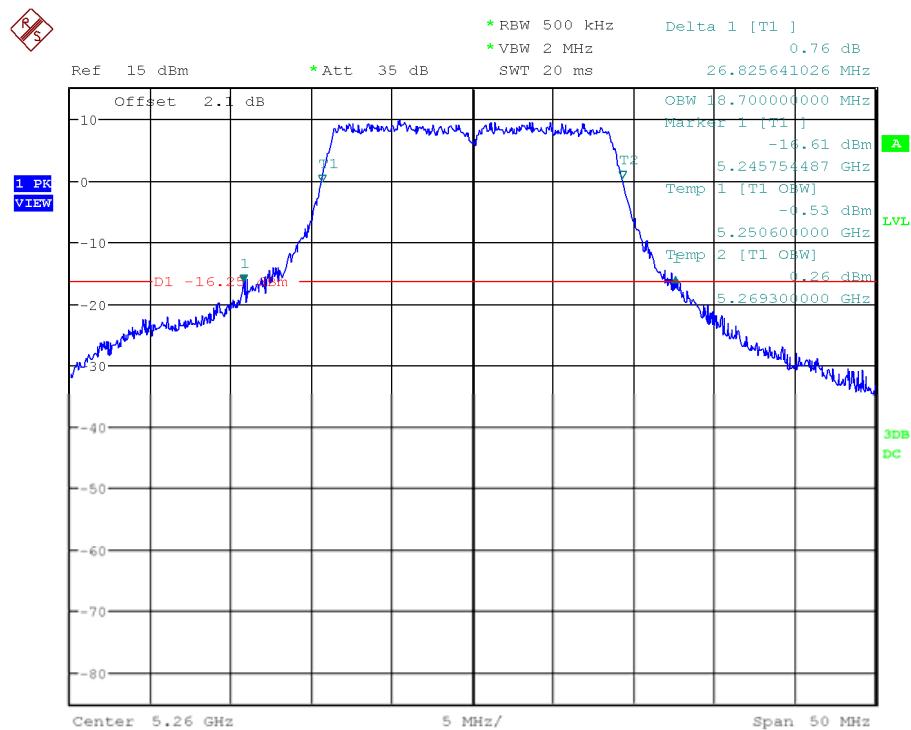


Highest Channel

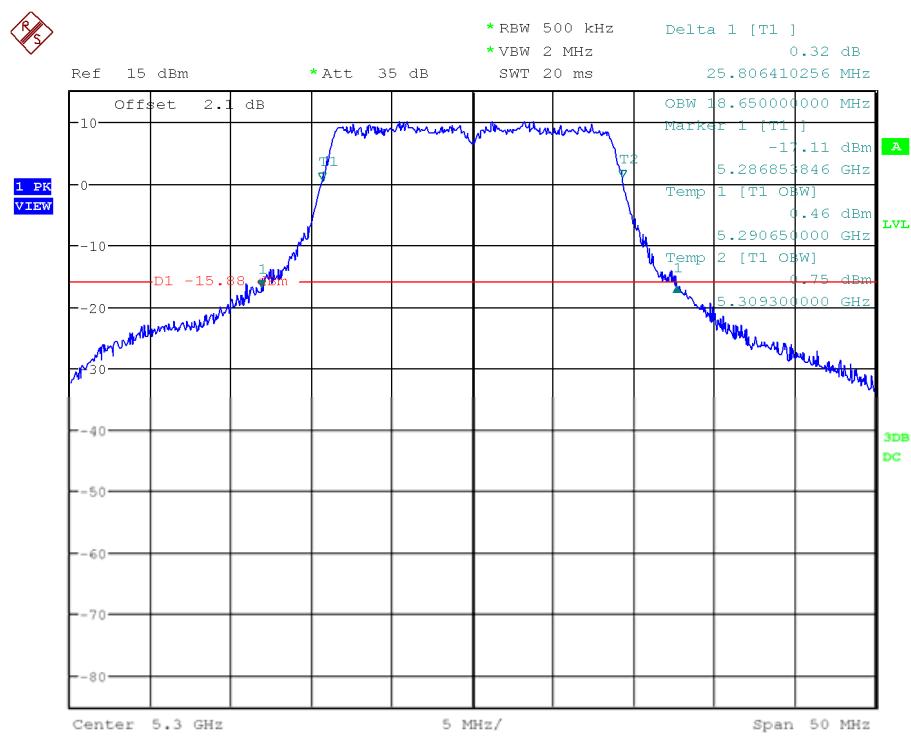


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

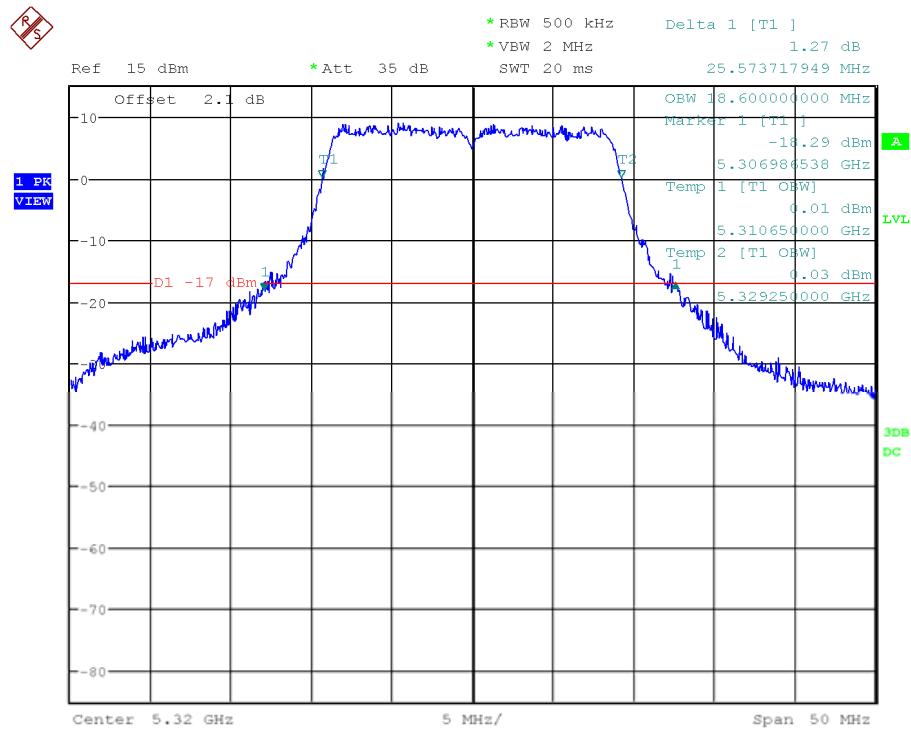
Lowest Channel



Middle Channel

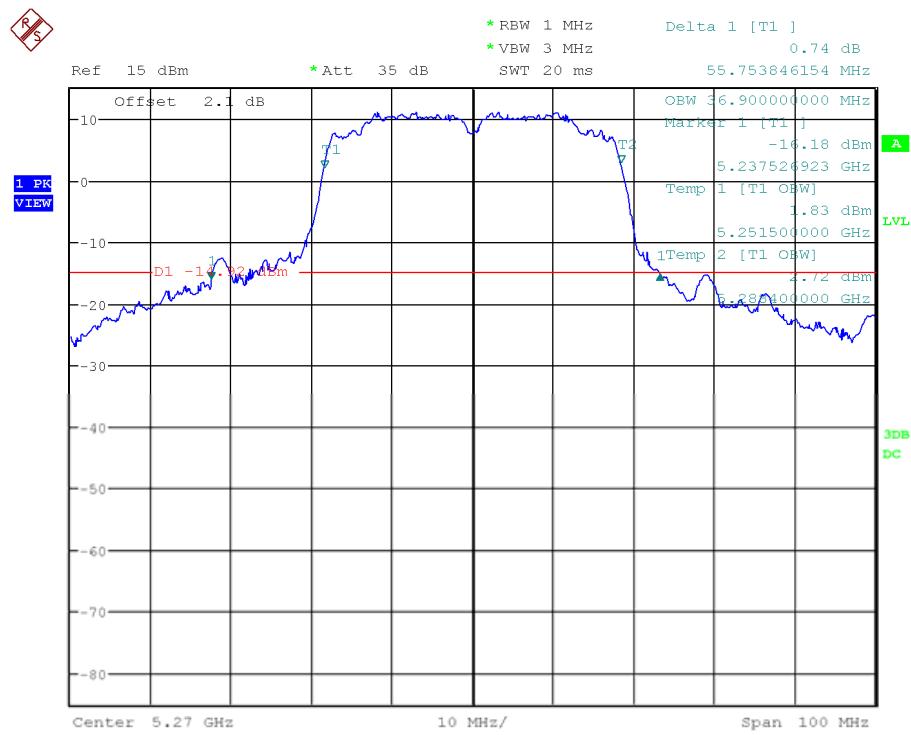


Highest Channel

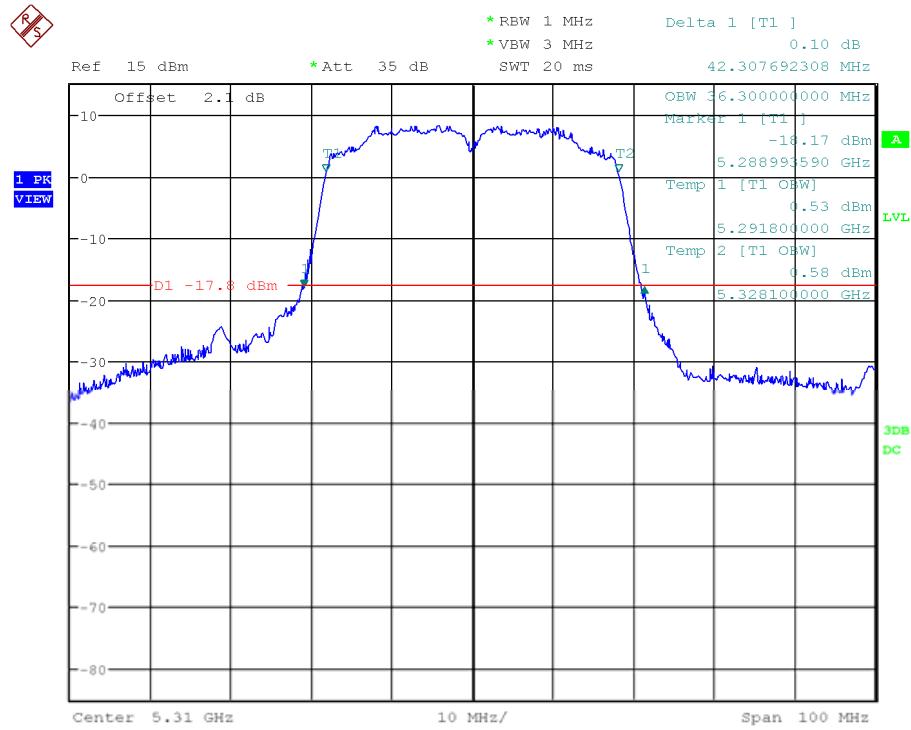


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

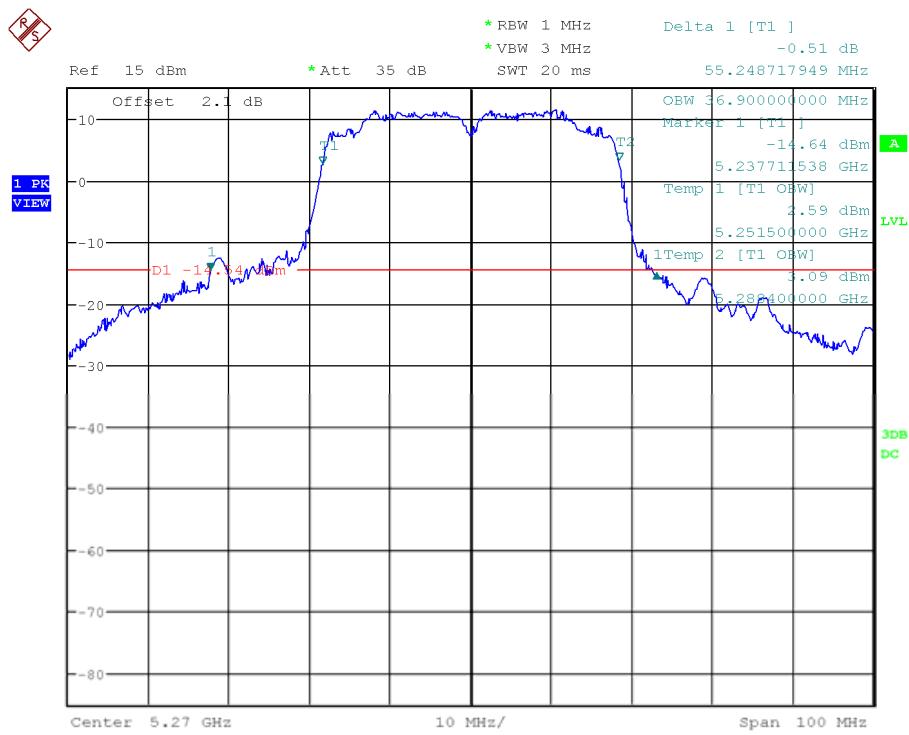


Highest Channel

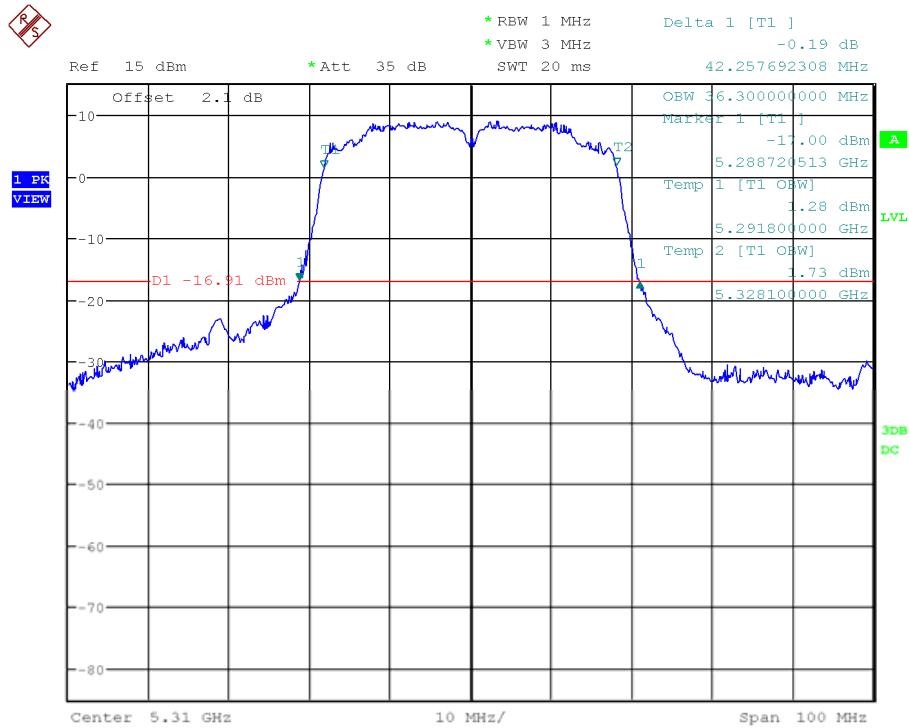


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

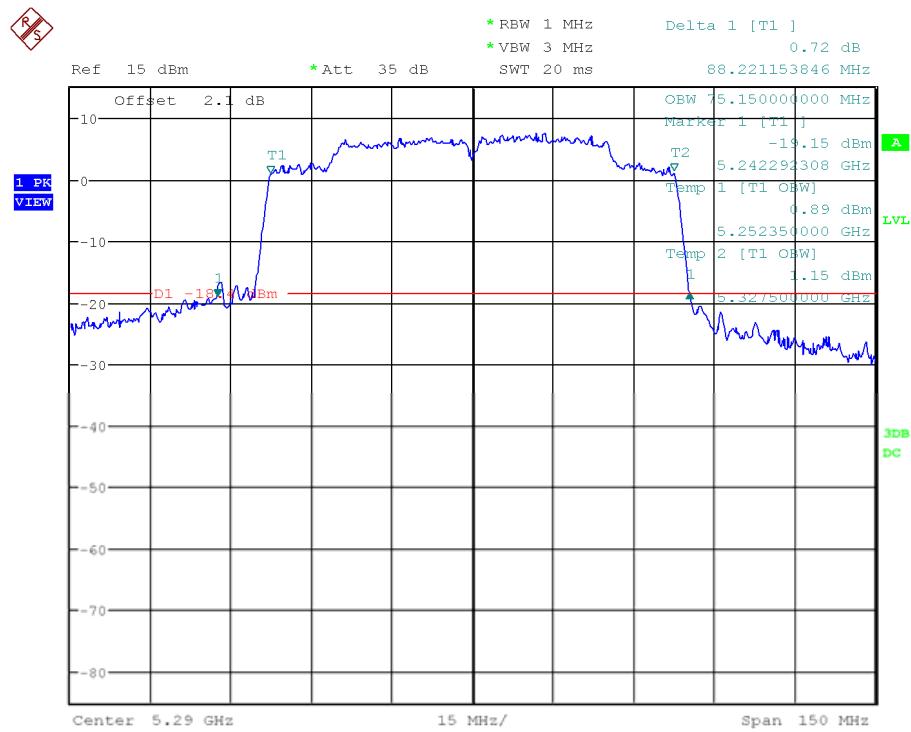
Lowest Channel



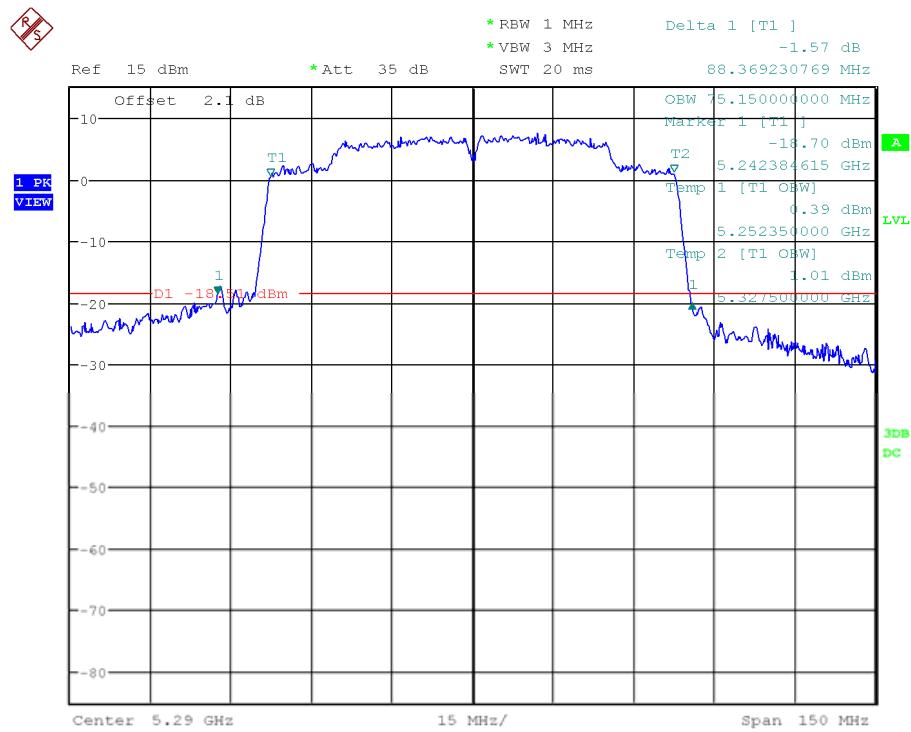
Highest Channel



802.11 ac 80 MHz mode CHAIN A



802.11 ac 80 MHz mode CHAIN B



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

FCC 15.407: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (23.98 dBm) or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak 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 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 conducted output power shall not exceed 250 mW (23.98 dBm) or $11 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average ($10 \log_{10} B$) 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).

For MIMO mode, the *Measure and add $10 \log(N_{ANT})$ dB*, (where N_{ANT} 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 v02 dated 05/28/2013..

With this technique, spectrum measurements are performed at each output of the device, and the quantity $10 \log(N_{ANT})$ dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

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 Guidance on directional Gain calculations according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 05/28/2013. was used.

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 (dB).

For MIMO mode, the Guidance on directional Gain calculations according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 05/28/2013 was used.

The number of transmit antennas (N_{ANT}) are 2 and the number of spatial streams (N_{ss}) are 2 and therefore the Array Gain is 0 dB.

1. 802.11a mode (see next plots).

CHAIN A

Maximum declared antenna gain = 3.7 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)
5260 MHz	14.74	18.34	3.674	7.374
5300 MHz	15.18	18.78	4.594	8.194
5320 MHz	13.76	17.36	2.877	6.577

CHAIN B

Maximum declared antenna gain = 3.7 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)
5260 MHz	14.86	18.46	4.130	7.830
5300 MHz	15.05	18.65	4.120	7.820
5320 MHz	14.08	17.68	3.310	7.010

Measurement uncertainty = ± 1.5 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 = 3.7 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)
5260 MHz	14.96	18.66	4.39	8.09
5300 MHz	14.79	18.49	4.19	7.89
5320 MHz	14.19	17.89	3.59	7.29

CHAIN B

Maximum declared antenna gain = 3.7 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)
5260 MHz	14.88	18.58	4.34	8.04
5300 MHz	14.79	18.49	4.27	7.97
5320 MHz	13.74	17.44	3.11	6.81

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.7 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
5260 MHz	13.73	13.55	16.65	20.35
5300 MHz	13.72	13.77	16.76	20.46
5320 MHz	12.77	12.60	15.61	19.31

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.7 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)
5260 MHz	2.72	2.55	5.73	5.56	9.43	9.13
5300 MHz	2.71	2.78	5.72	5.79	9.42	9.49
5320 MHz	1.66	1.52	4.67	4.53	8.37	8.23

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

 Measurement uncertainty = ± 1.5 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 = 3.7 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)
5270 MHz	15.79	19.49	3.02	6.72
5310 MHz	12.59	16.29	-0.05	3.65

CHAIN B

Maximum declared antenna gain = 3.7 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)
5270 MHz	15.78	19.48	2.87	6.57
5310 MHz	13.15	16.85	0.50	4.20

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.7 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
5270 MHz	13.78	13.46	16.63	20.33
5310 MHz	9.70	9.98	12.97	16.67

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.7 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)
5270 MHz	0.90	0.60	3.91	3.61	7.61	7.31
5310 MHz	-2.94	-2.71	0.07	0.3	3.77	3.77

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

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

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

Maximum declared antenna gain = 3.7 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)
5290 MHz	12.43	16.13	-2.46	1.24

CHAIN B

Maximum declared antenna gain = 3.7 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)
5290 MHz	12.48	16.18	-2.32	1.38

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 3.7 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)
5290 MHz	10.75	10.44	13.61	17.31

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 3.7 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)
5290 MHz	-4.11	-4.47	-1.1	-1.46	2.6	2.24

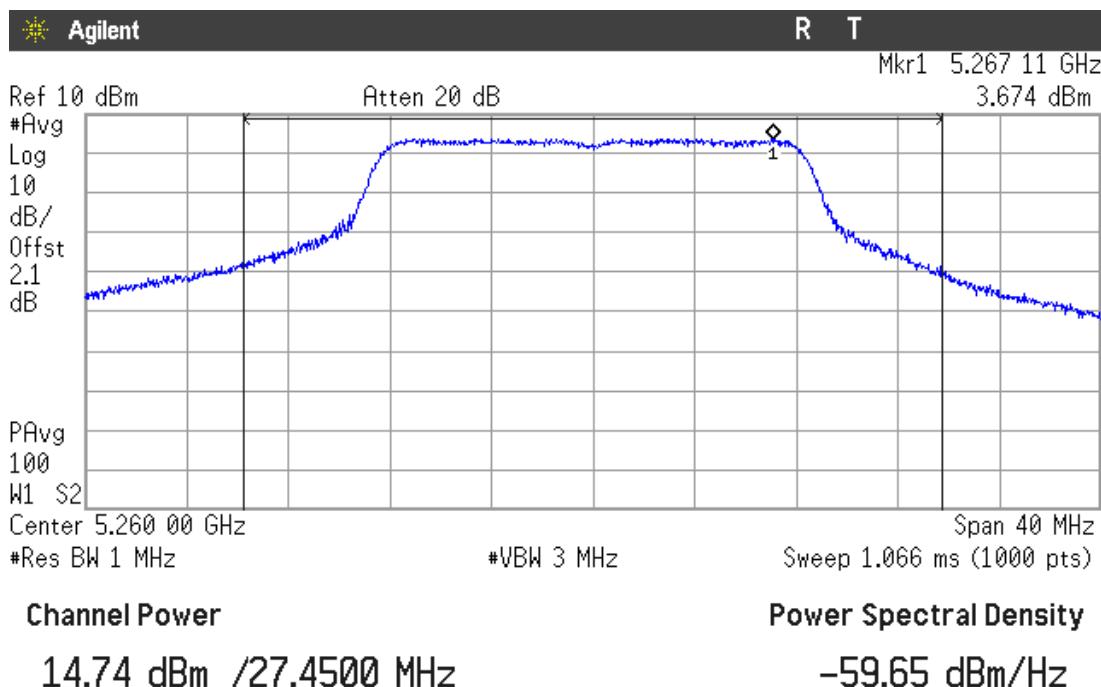
 Note 1: The quantity $10 \log 2$ (two antennas) is added to the spectrum peak value according to document 662911 D01.

 Measurement uncertainty = ± 1.5 dB

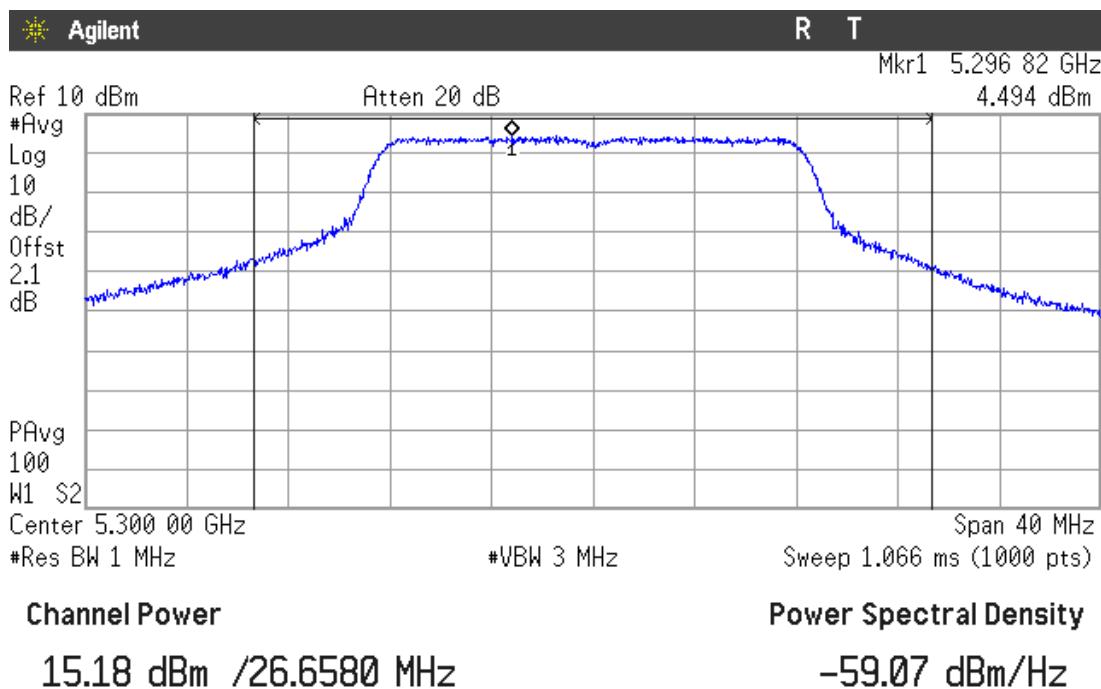
Verdict: Pass

802.11a mode CHAIN A

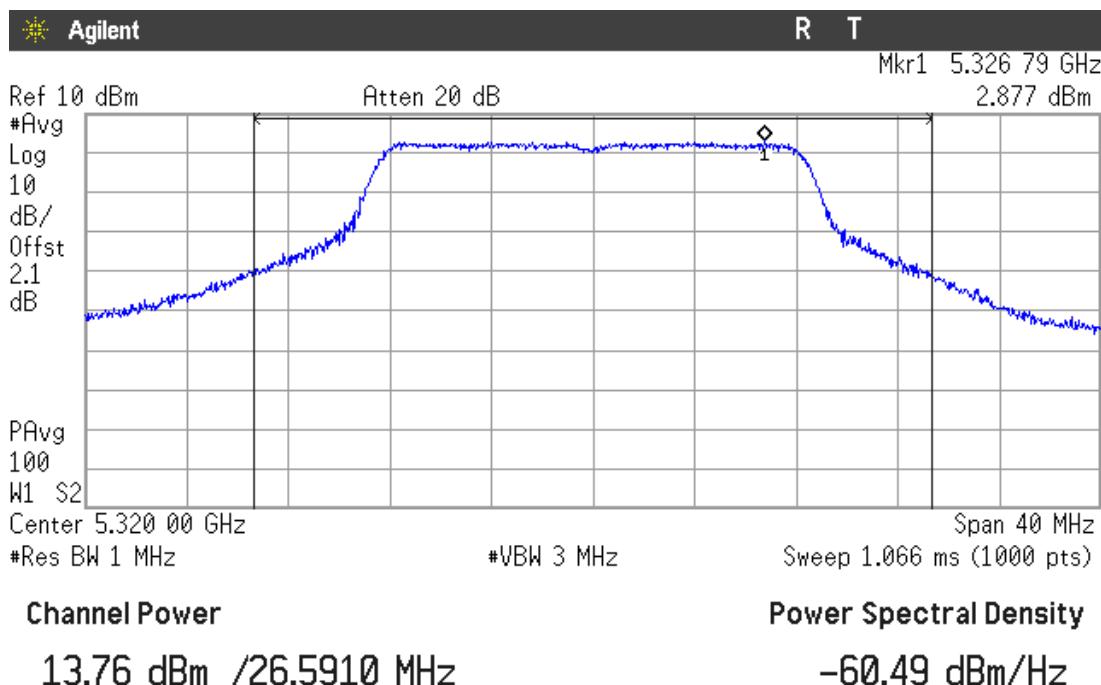
Lowest Channel



Middle Channel

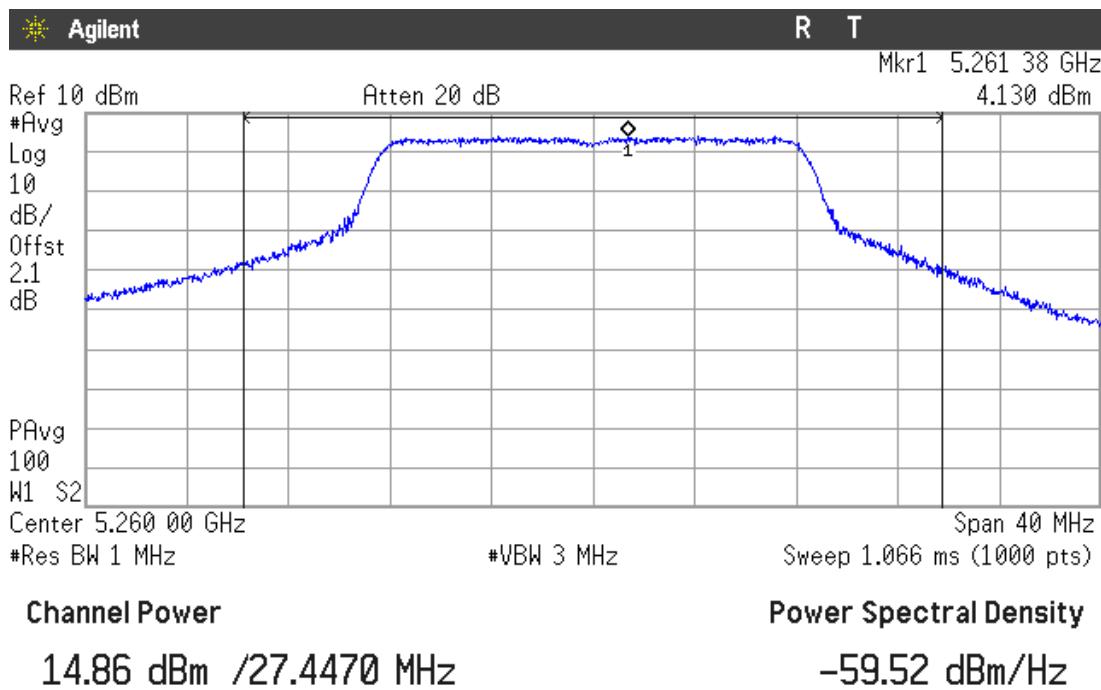


Highest Channel

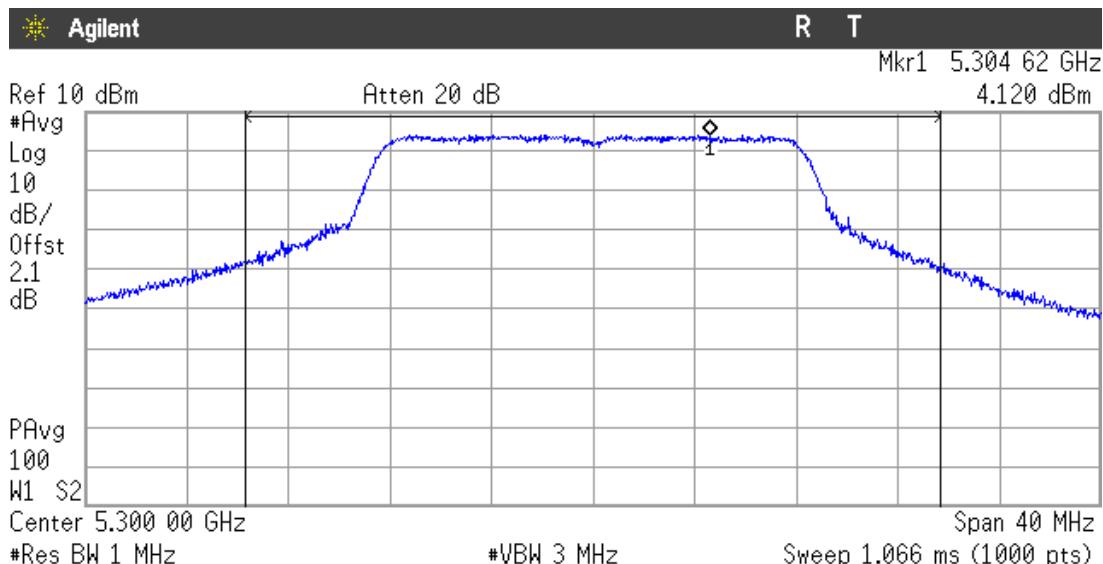


802.11a mode CHAIN B

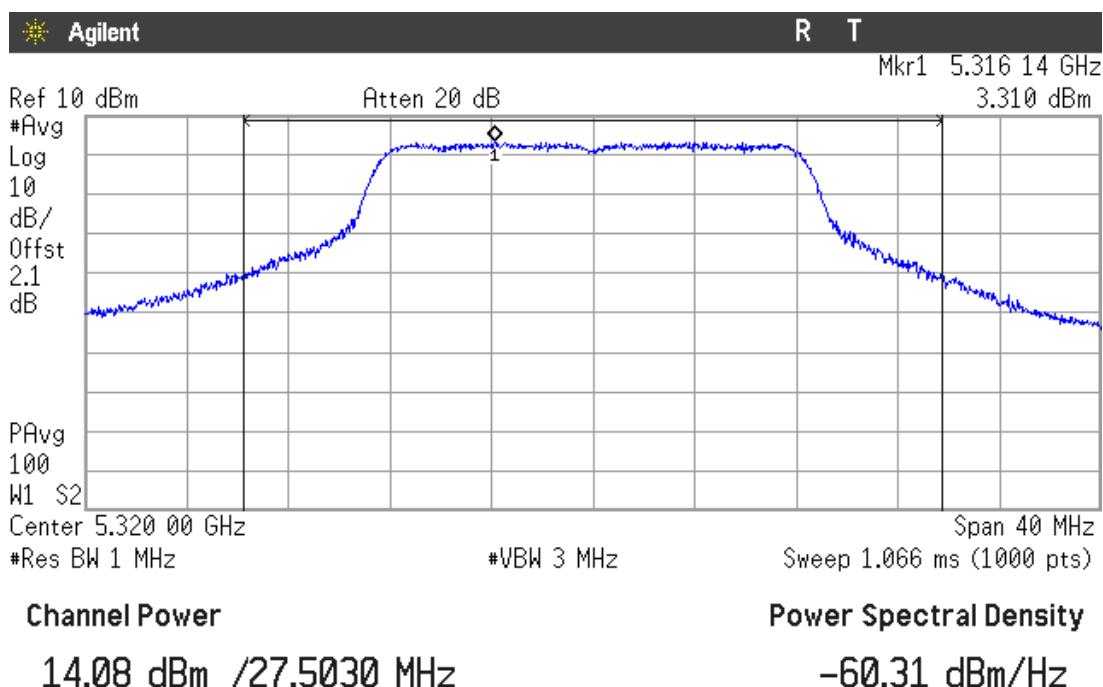
Lowest Channel



Middle Channel

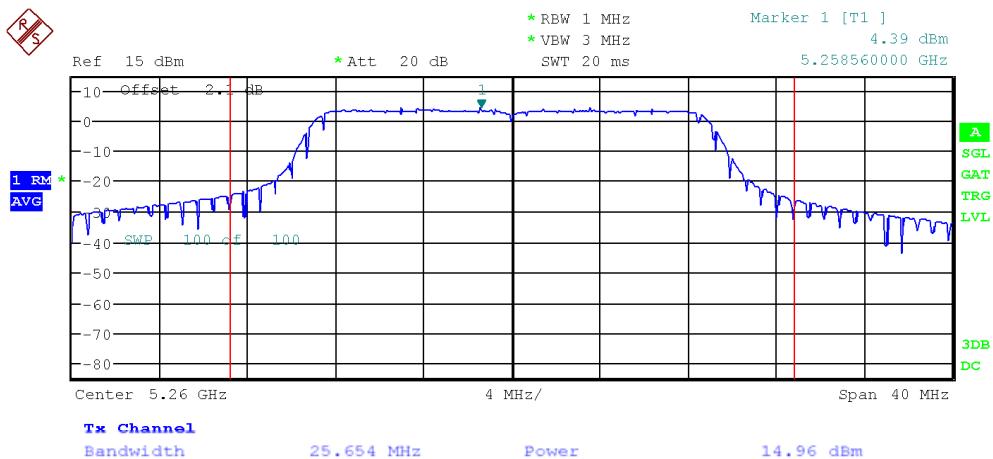


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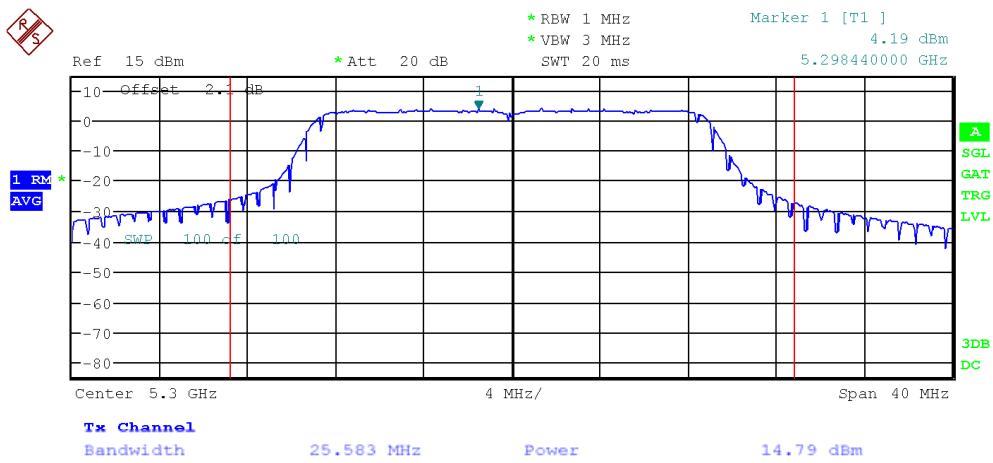


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A

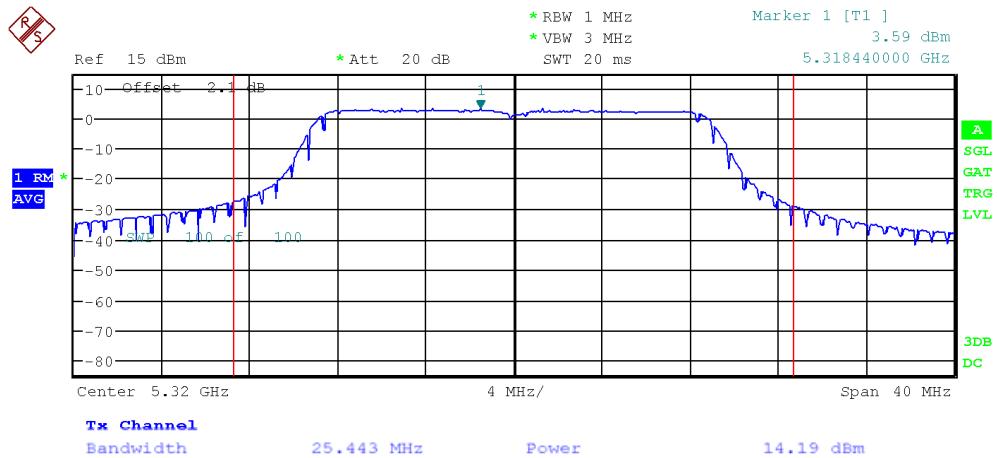
Lowest Channel



Middle Channel

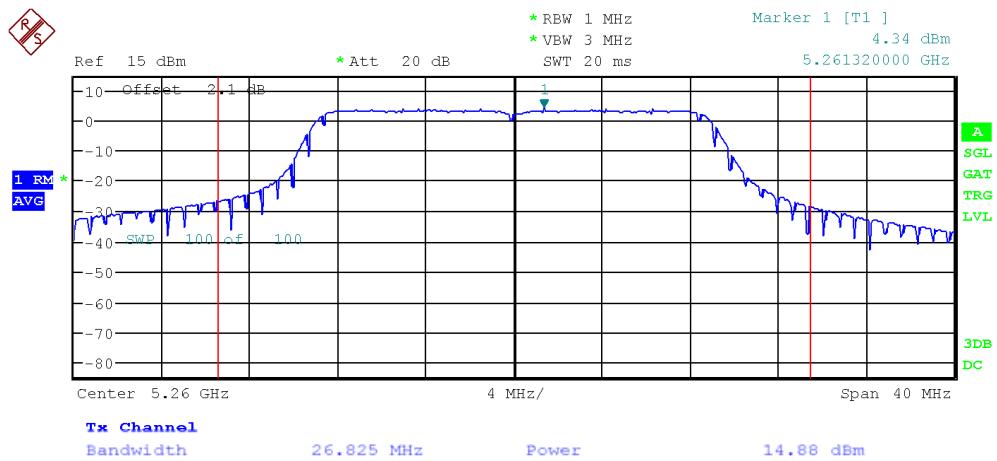


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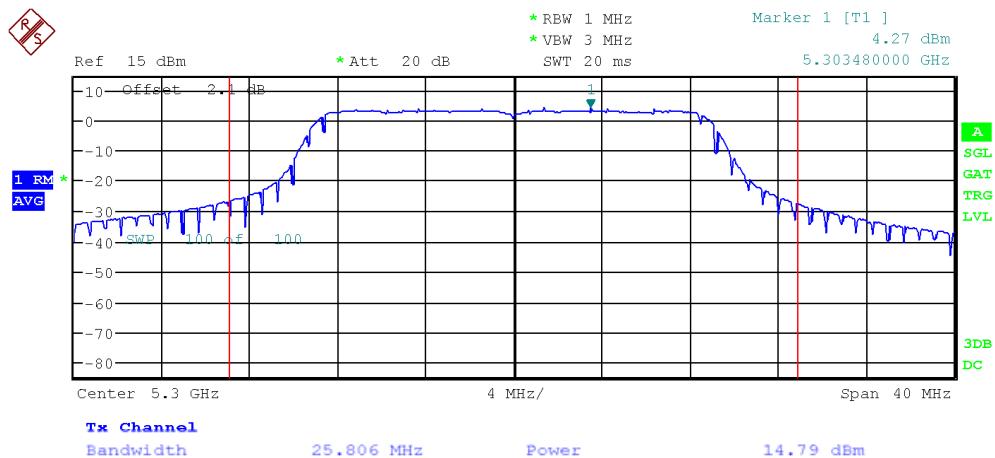


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN B

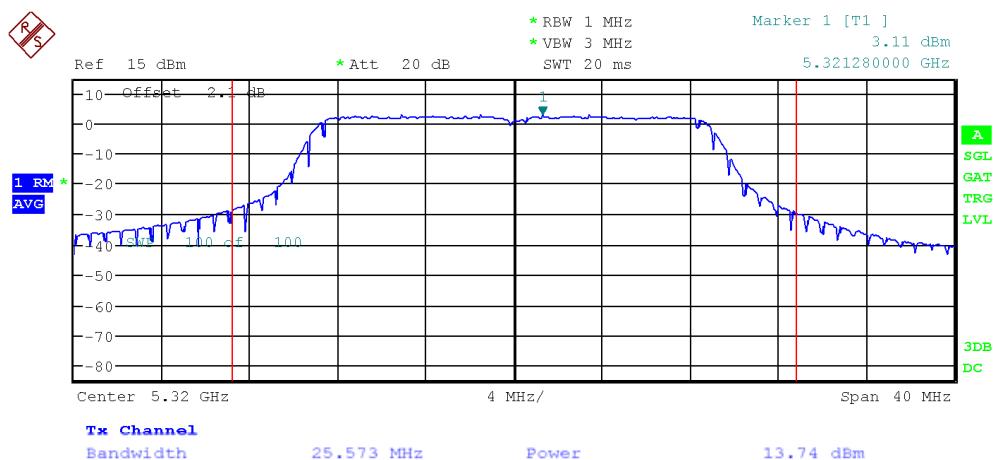
Lowest Channel



Middle Channel

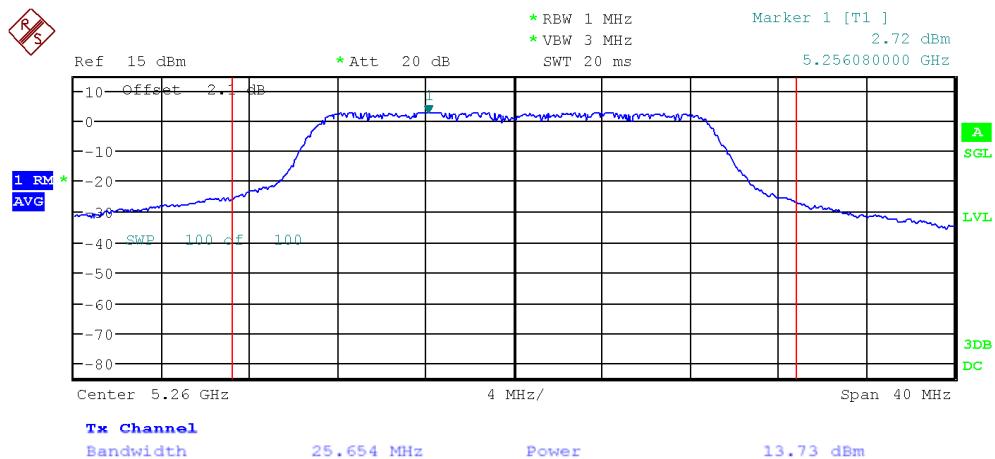


Highest Channel

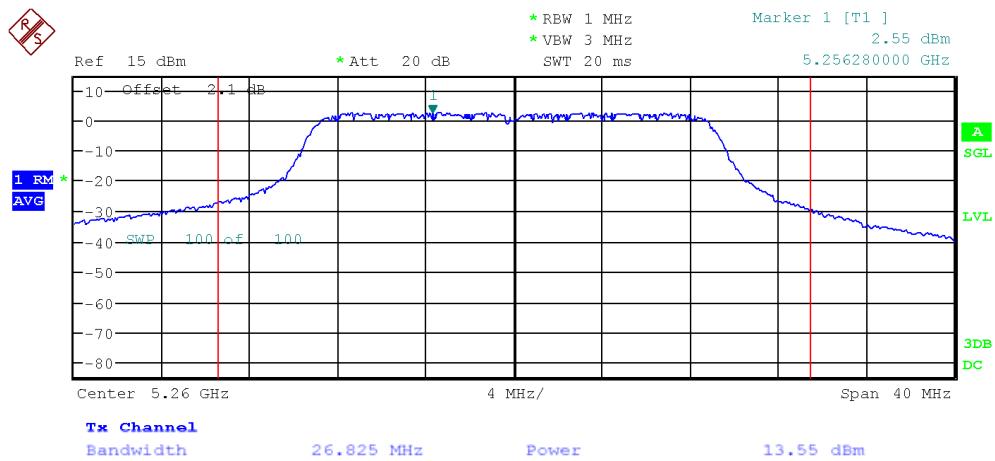


802.11 n20 MHz and 802.11 ac 20 MHz modes CHAIN A+B

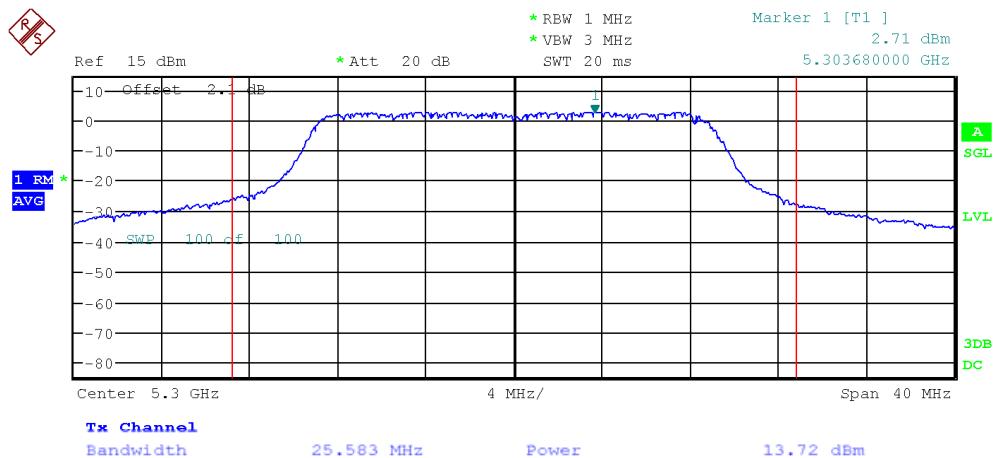
Lowest Channel. Chain A.



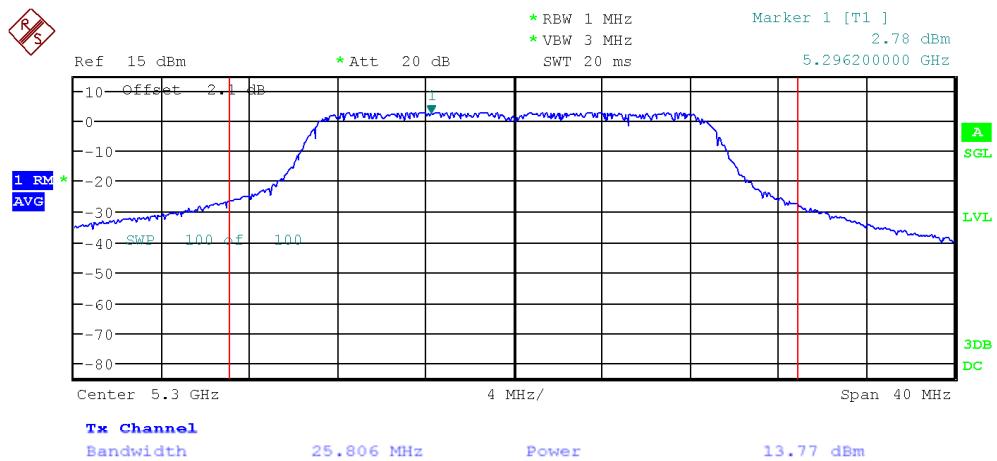
Lowest Channel. Chain B.



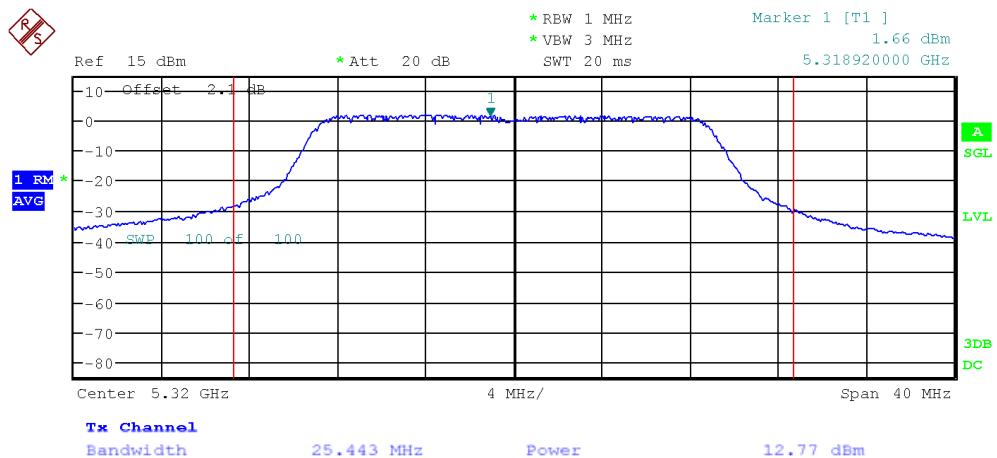
Middle Channel. Chain A.



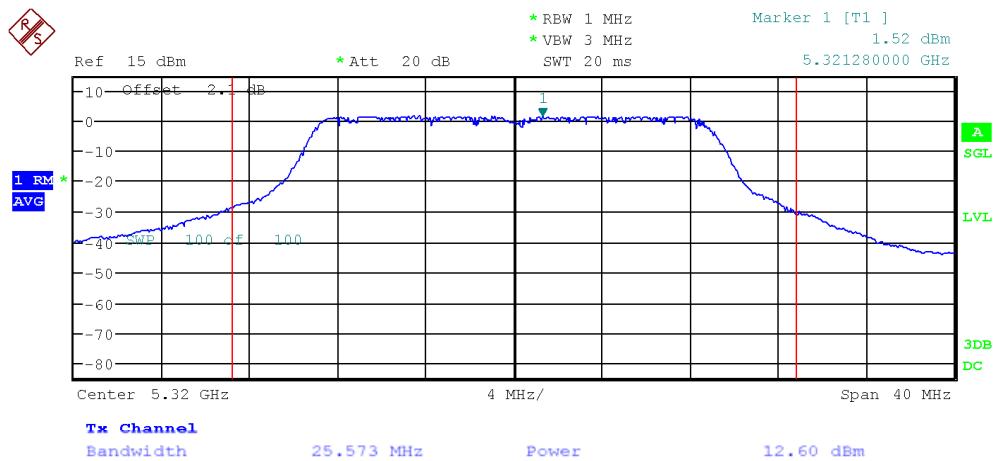
Middle Channel. Chain B.



Highest Channel. Chain A.

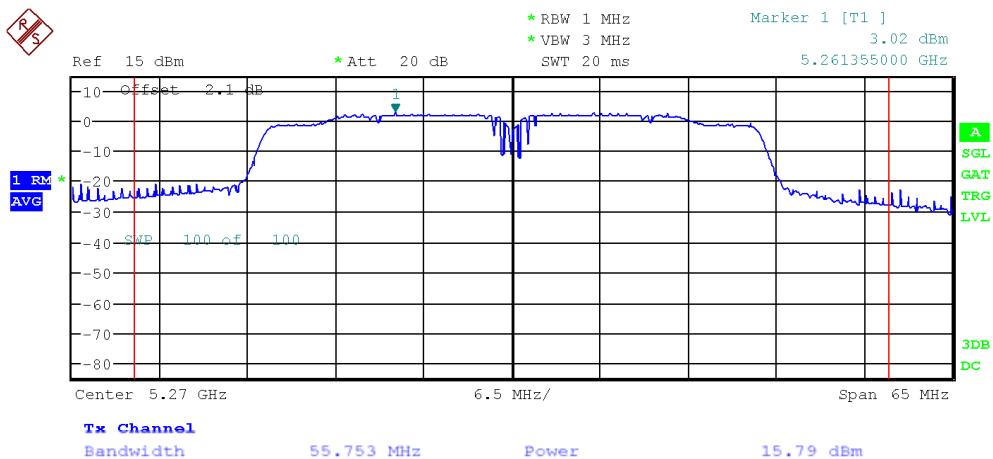


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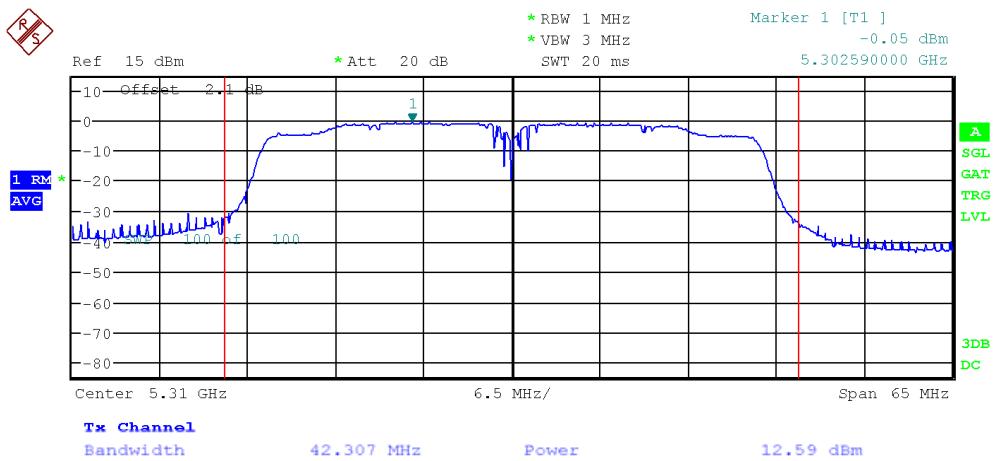


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A

Lowest Channel

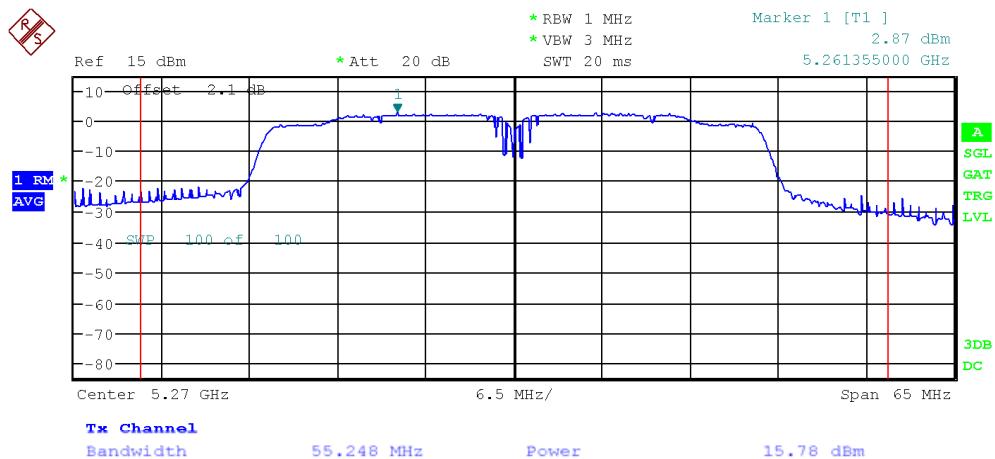


Highest Channel

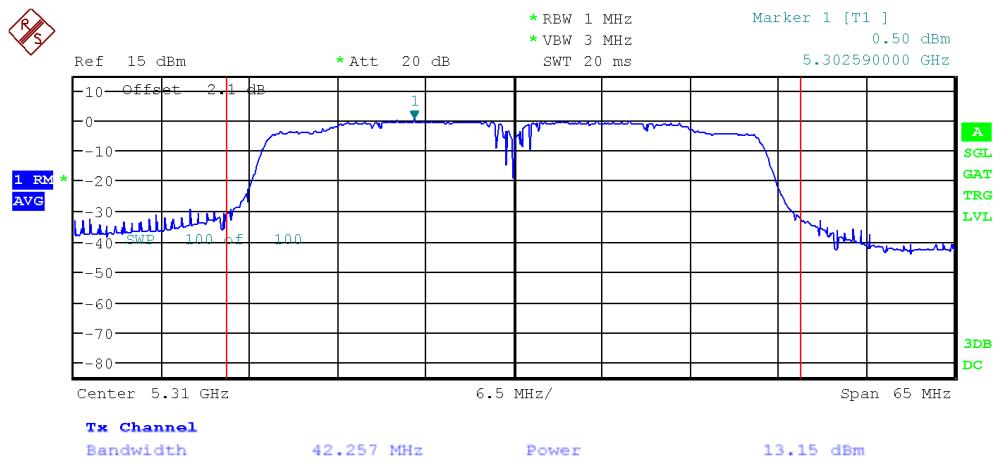


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN B

Lowest Channel

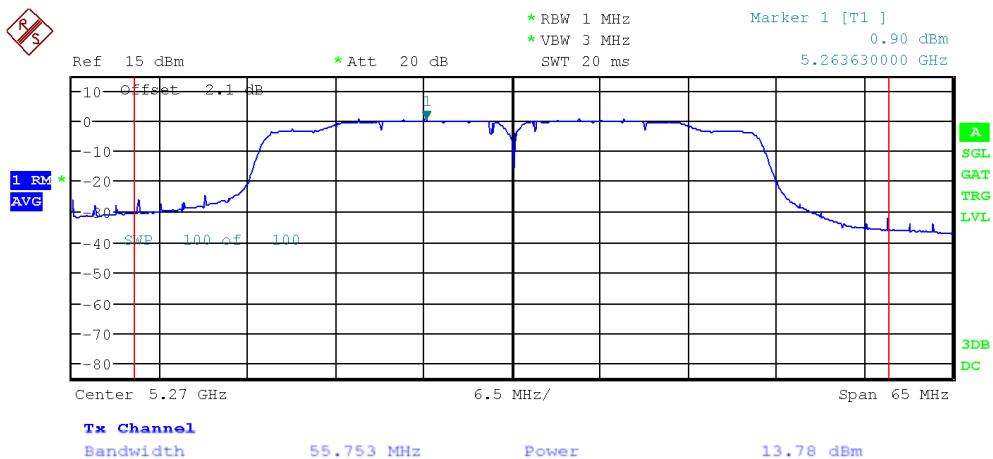


Highest Channel

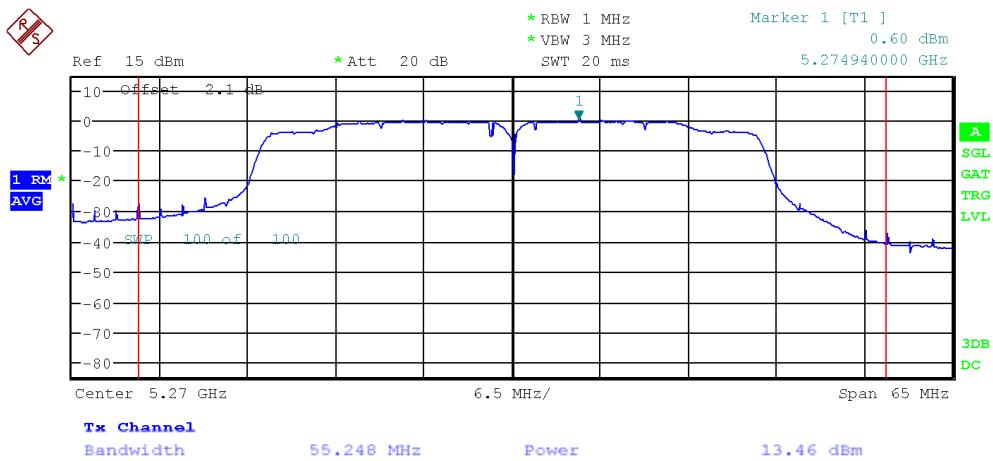


802.11 n40 MHz and 802.11 ac 40 MHz modes CHAIN A+B

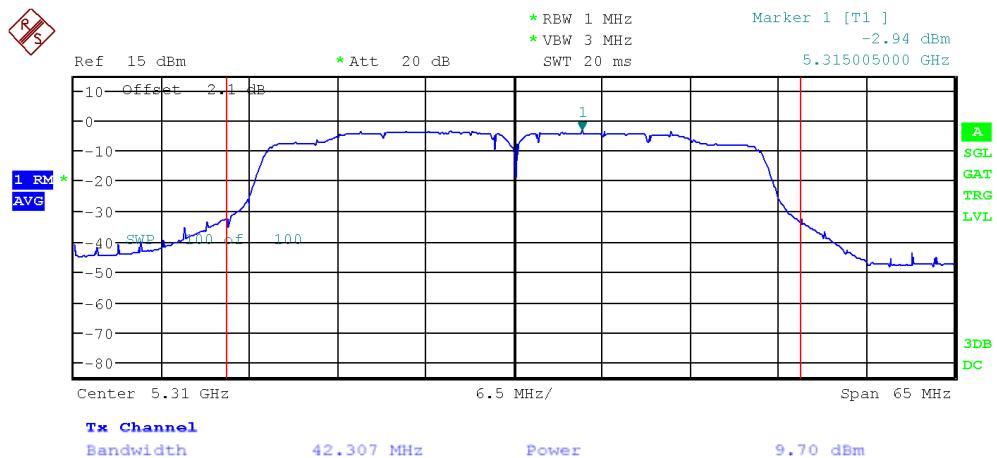
Lowest Channel. Chain A.



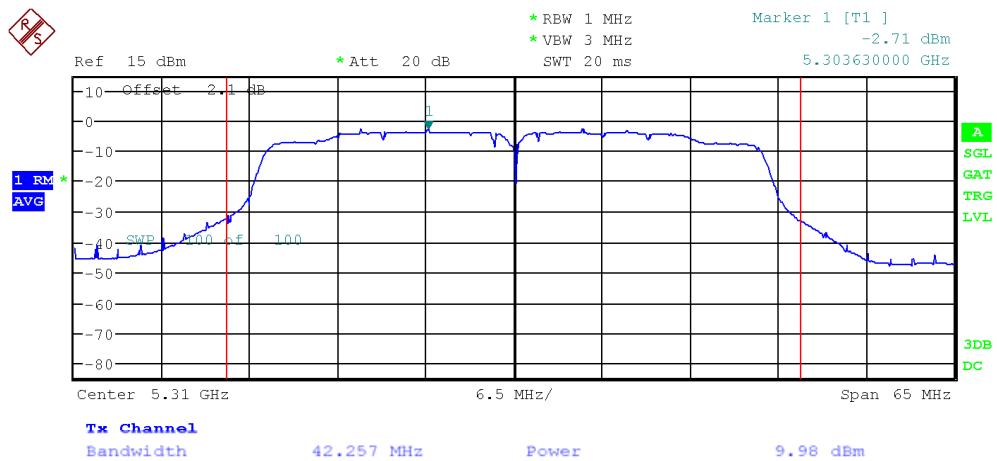
Lowest Channel. Chain B.



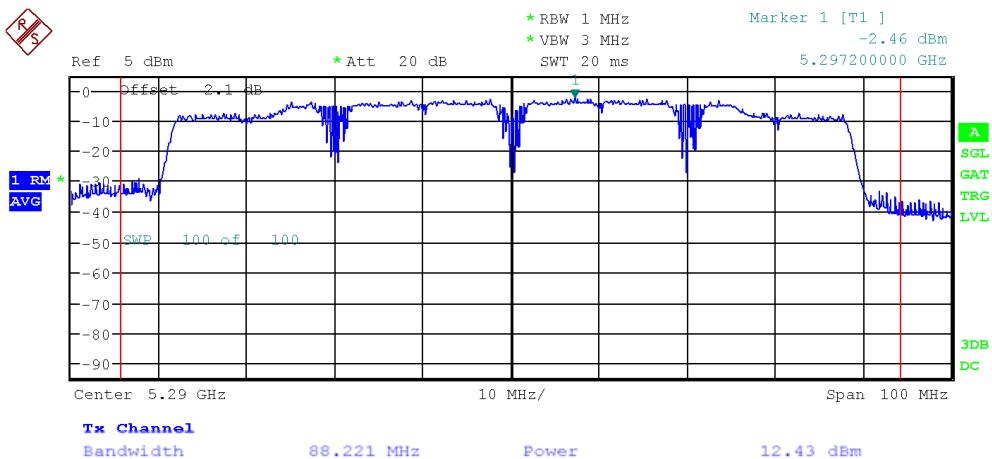
Highest Channel Chain A.



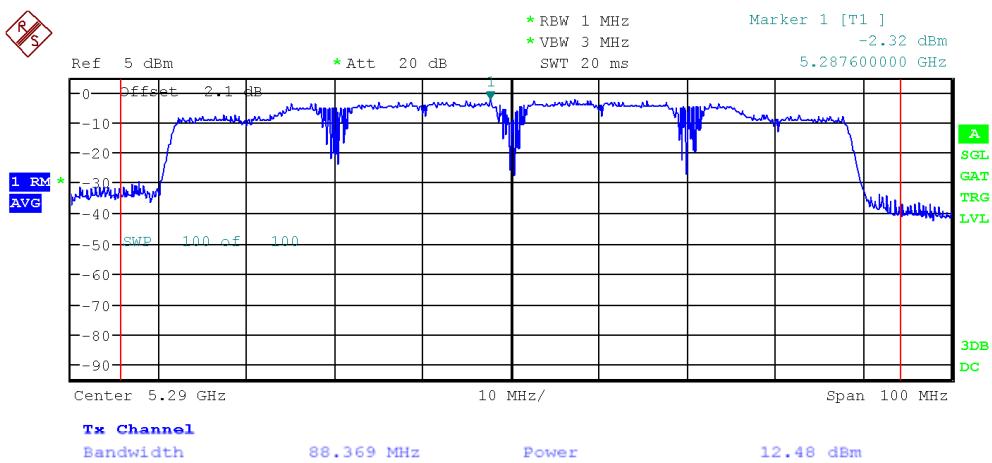
Highest Channel Chain B.



802.11 ac 80 MHz mode CHAIN A

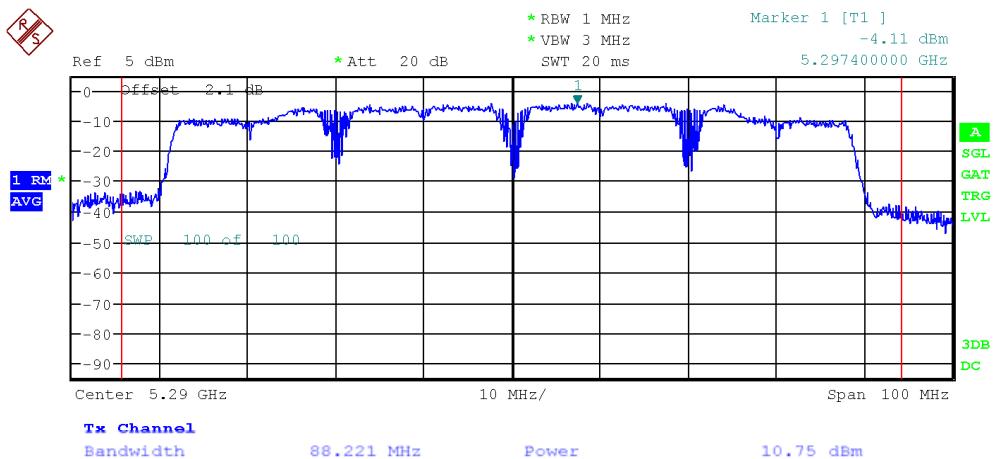


802.11 ac 80 MHz mode CHAIN B

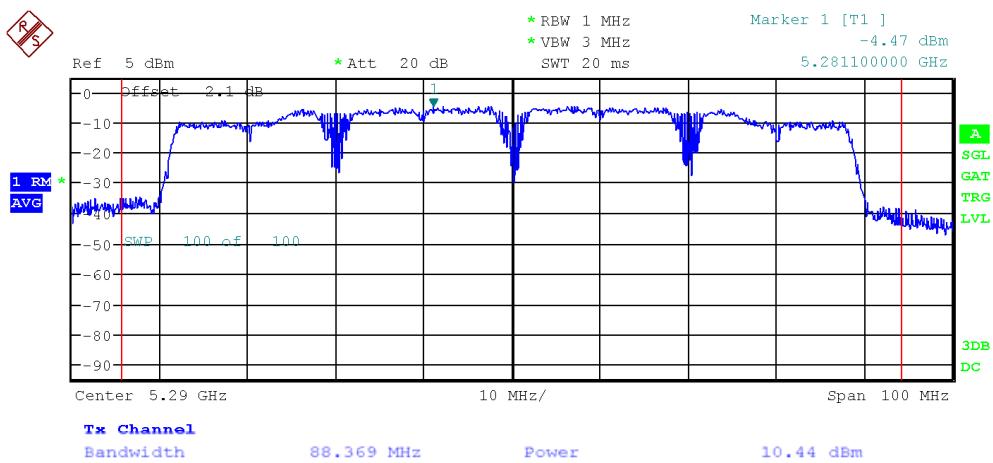


802.11 ac 80 MHz mode CHAIN A+B

Chain A.



Chain B.



**Section 15.407 Subclause (b) (2) / RSS-210 A9.2. (2). Undesirable radiated emissions (Transmitter)
1 to 40 GHz**

SPECIFICATION

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.23 dB μ V/m at 3 m distance). Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

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 (μ V/m)	Field strength (dB μ V/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° 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.

See test results in Appendix A for details.

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 5.35-5.46 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 dB μ V/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 5260 MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
15.779	V	Peak	40.39	\pm 4.09
21.0300	V	Peak	49.95	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
15.7821	V	Peak	38.83	\pm 4.09
21.0400	V	Peak	49.5	\pm 4.09

Middle frequency 5300 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3903	V	Peak	58.95	± 4.09
		Average	48.23	± 4.09
15.9016	V	Peak	40.11	± 4.09
21.1900	V	Peak	50.89	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3868	V	Peak	58.41	± 4.09
		Average	48.26	± 4.09
21.1900	V	Peak	50.54	± 4.09

Highest frequency 5320 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3508	V	Peak	58.61	± 4.09
		Average	48.22	± 4.09
21.2799	V	Peak	50.83	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3939	V	Peak	58.40	± 4.09
		Average	48.26	± 4.09
21.2799	V	Peak	49.87	± 4.09

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode.

Middle frequency 5300MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4294	V	Peak	58.31	\pm 4.09
		Average	48.19	\pm 4.09
15.9053	V	Peak	39.93	\pm 4.09
21.2000	V	Peak	49.29	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4266	V	Peak	58.66	\pm 4.09
		Average	48.24	\pm 4.09
21.2000	V	Peak	49.6	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3817	V	Peak	58.95	\pm 4.09
		Average	48.27	\pm 4.09
21.2000	V	Peak	49.89	\pm 4.09

Highest frequency 5320 MHz. Spurious emissions inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.38993	V	Peak	58.95	\pm 4.09
		Average	48.33	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3517	V	Peak	58.79	± 4.09
		Average	48.36	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3531	V	Peak	58.34	± 4.09
		Average	48.61	± 4.09

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5310 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3500	V	Peak	58.56	± 4.09
		Average	48.49	± 4.09
21.2400	V	Peak	50.58	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3532	V	Peak	58.37	± 4.09
		Average	48.26	± 4.09
21.2400	V	Peak	48.75	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3507	V	Peak	59.2	± 4.09
		Average	48.31	± 4.09
21.2400	V	Peak	49.08	± 4.09

Verdict: PASS

4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5290 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3536	V	Peak	61.41	\pm 4.09
		Average	49.32	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.35279	V	Peak	59.43	\pm 4.09
		Average	48.54	\pm 4.09

Chain A+B

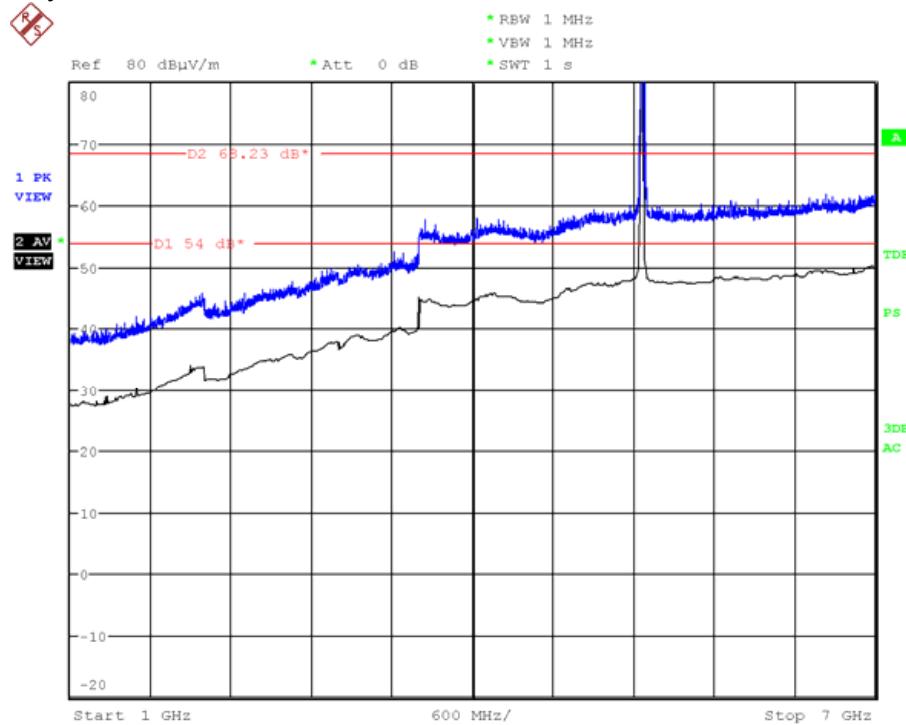
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.35279	V	Peak	59.43	\pm 4.09
		Average	48.54	\pm 4.09
21.16	V	Peak	48.96	\pm 4.09

Verdict: PASS

FREQUENCY RANGE 1 GHz to 7 GHz.

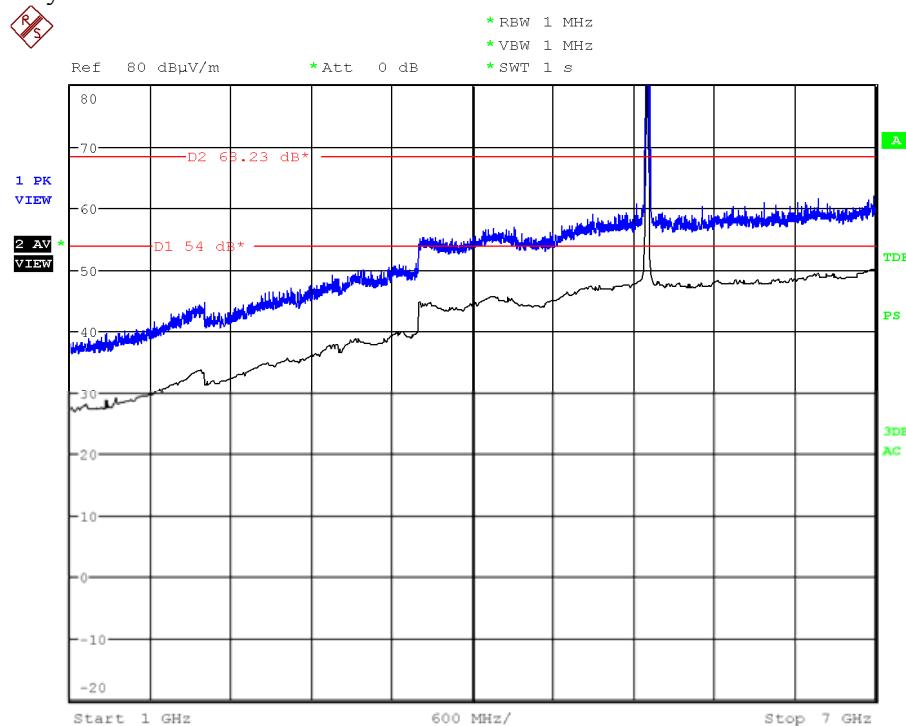
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5260 MHz.



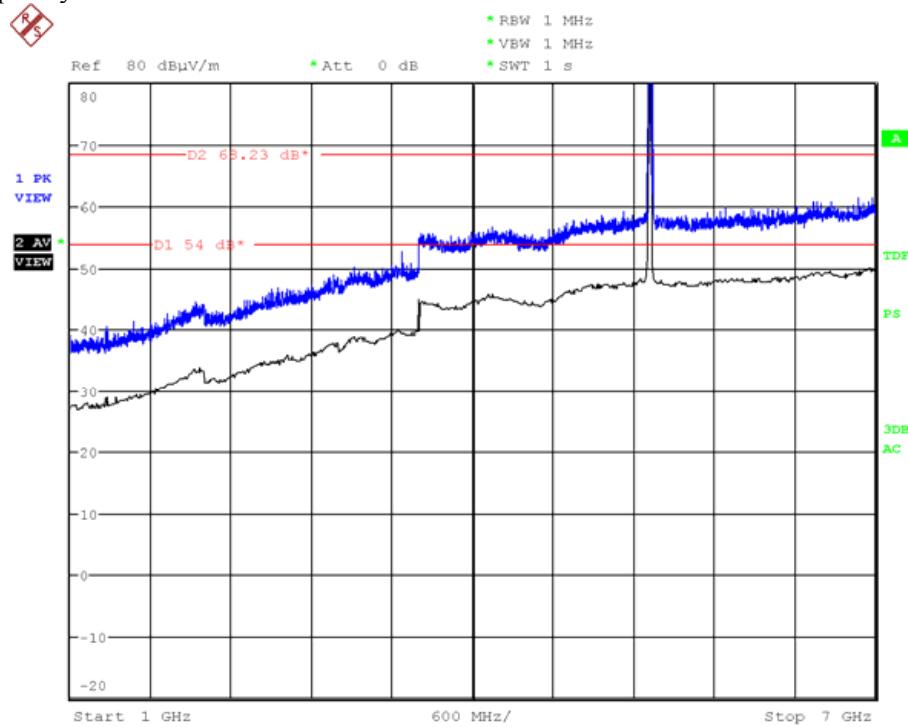
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

Middle frequency 5300 MHz.



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

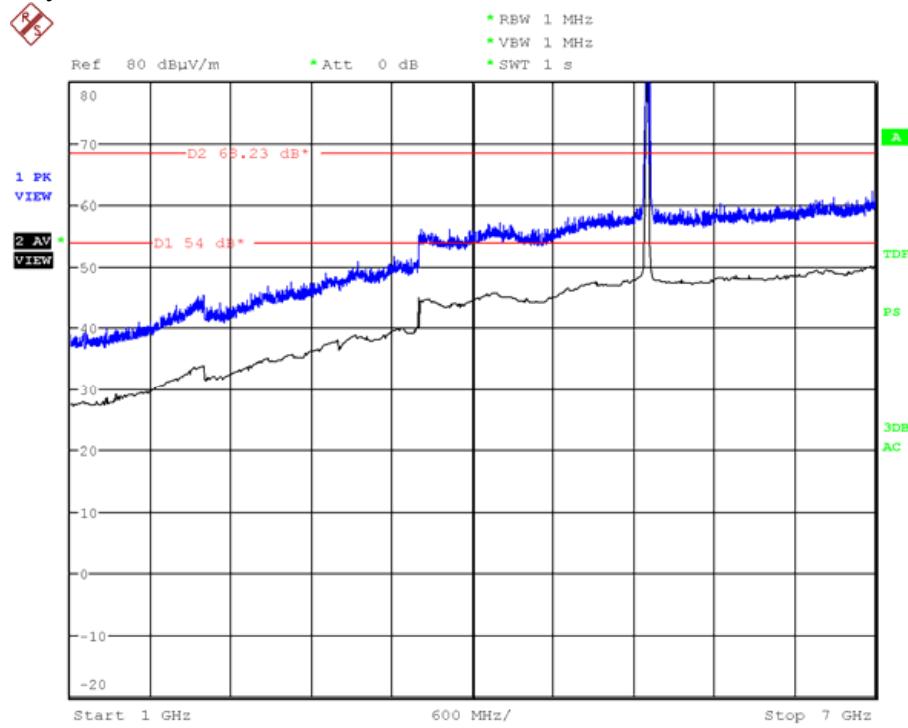
Highest frequency 5320 MHz.



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

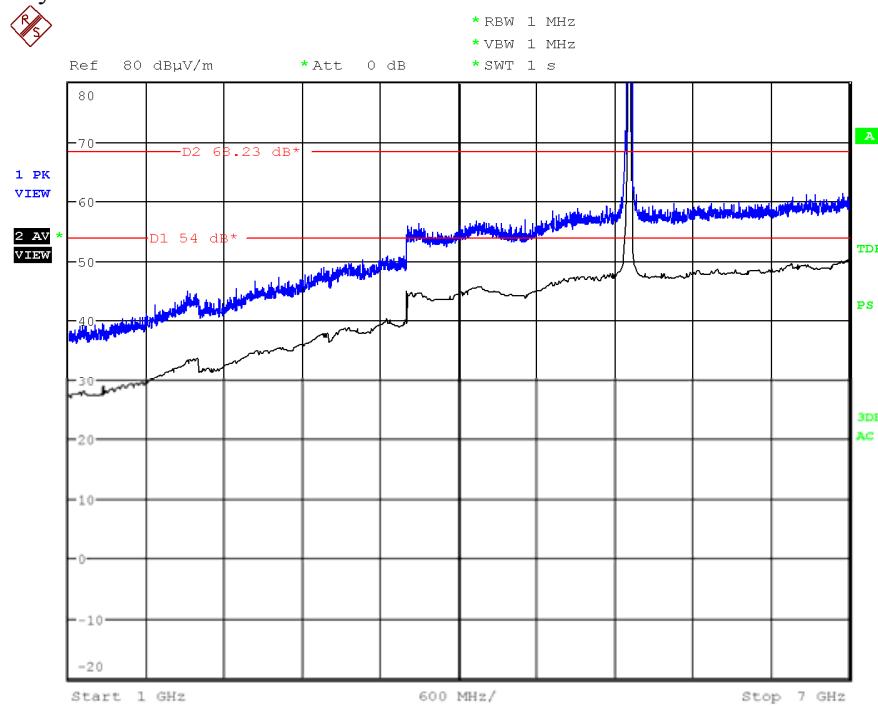
Middle frequency 5300 MHz.



Note: 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

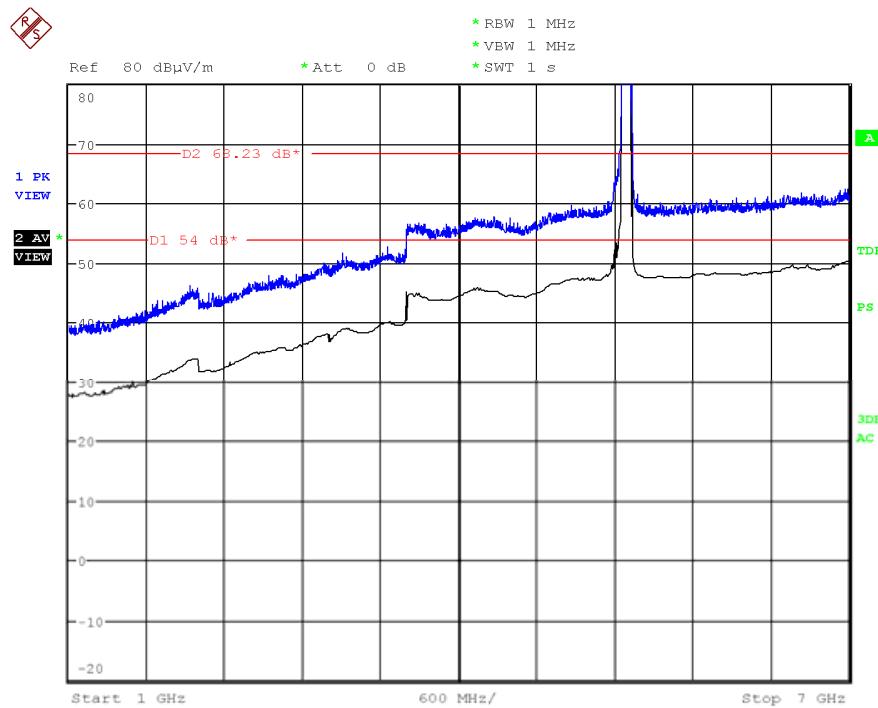
Highest frequency 5310 MHz.



Note: 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 5290 MHz.



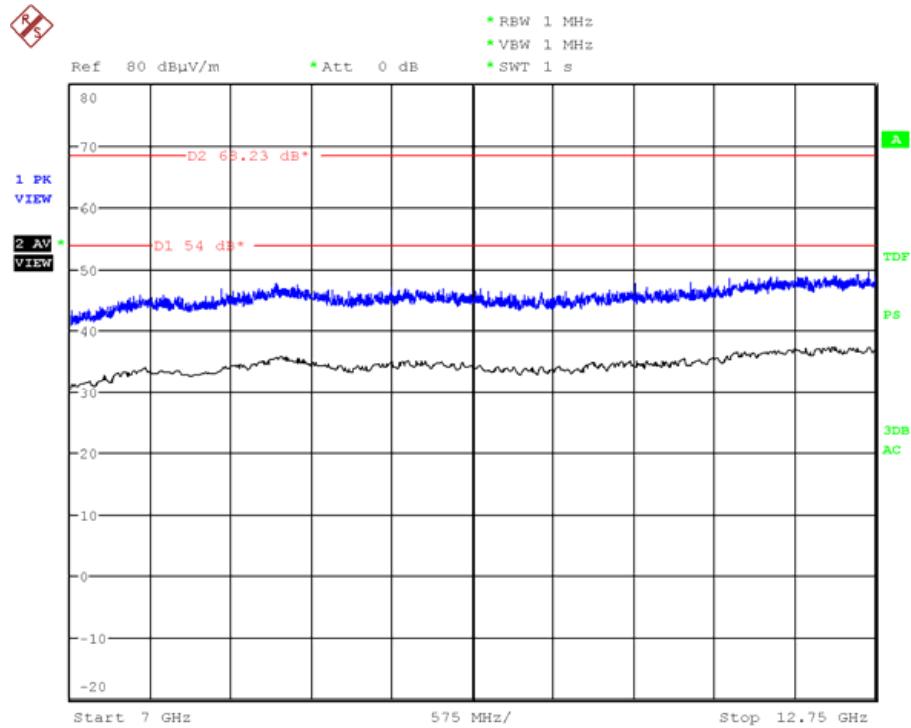
Note: The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B, Chain A+B.

FREQUENCY RANGE 7 GHz to 12.75 GHz.

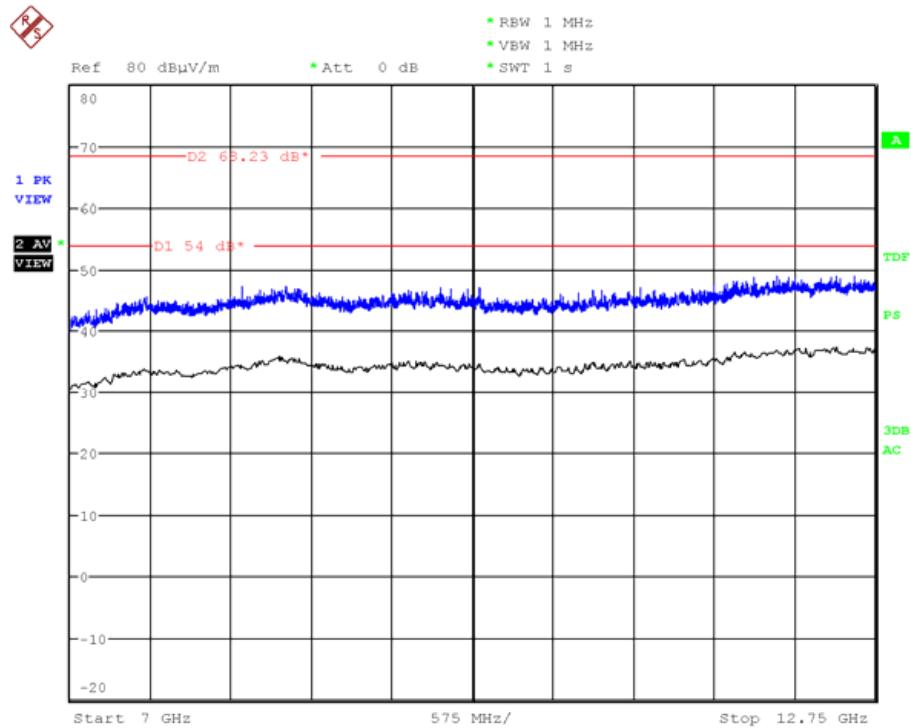
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5260 MHz.

Chain A

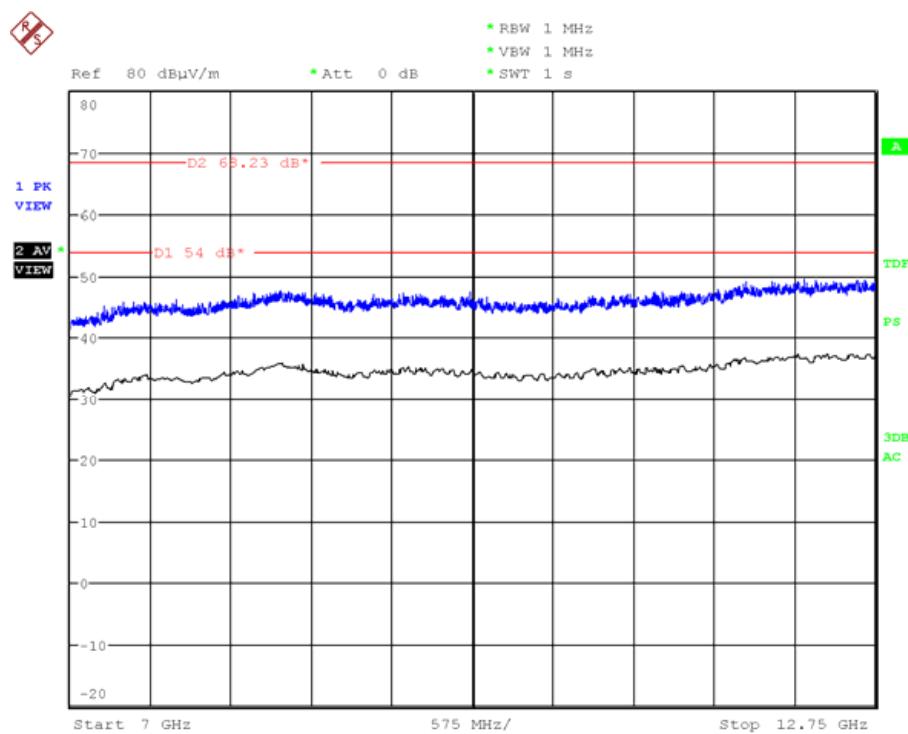


Chain B

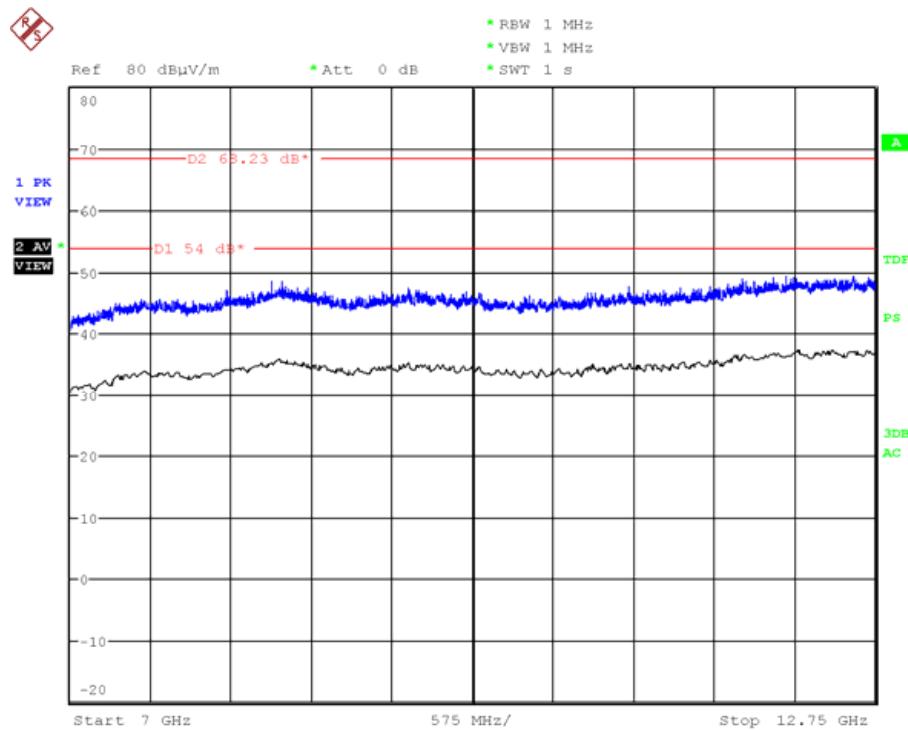


Middle frequency 5300 MHz.

Chain A

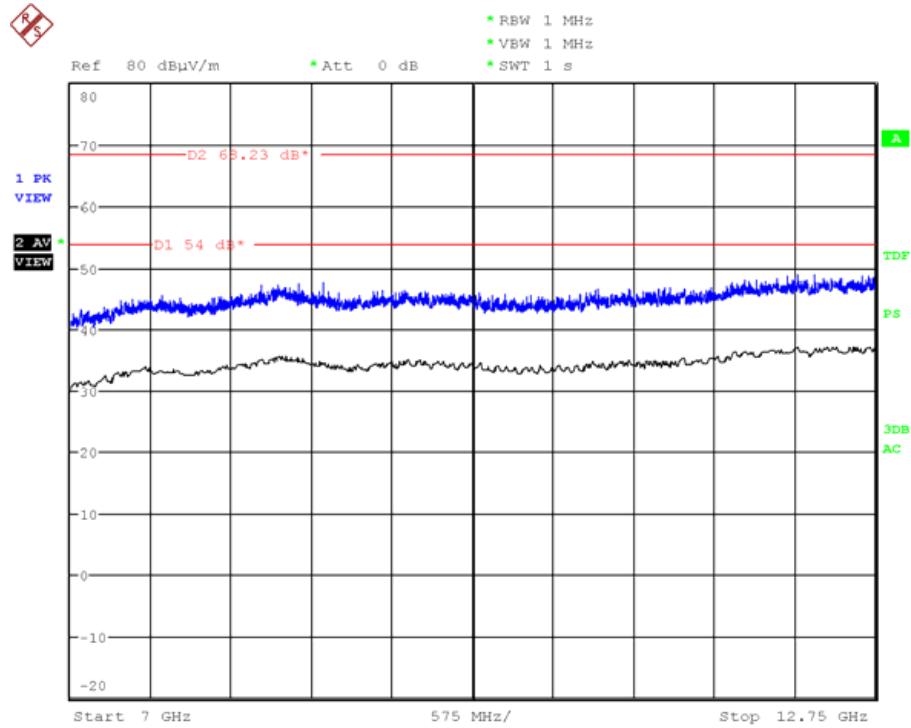


Chain B

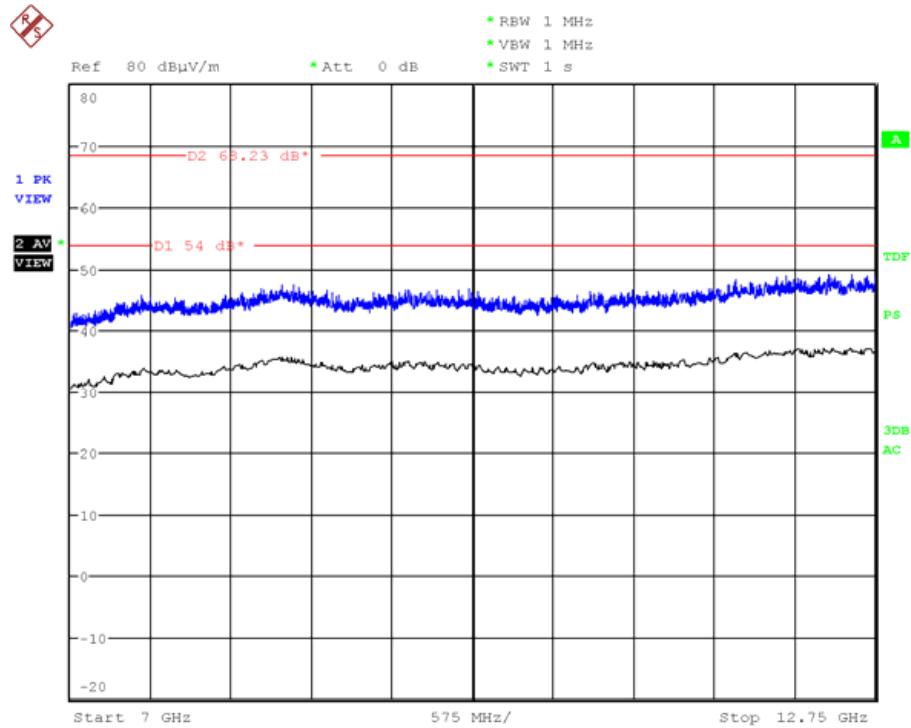


Highest frequency 5320 MHz.

Chain A



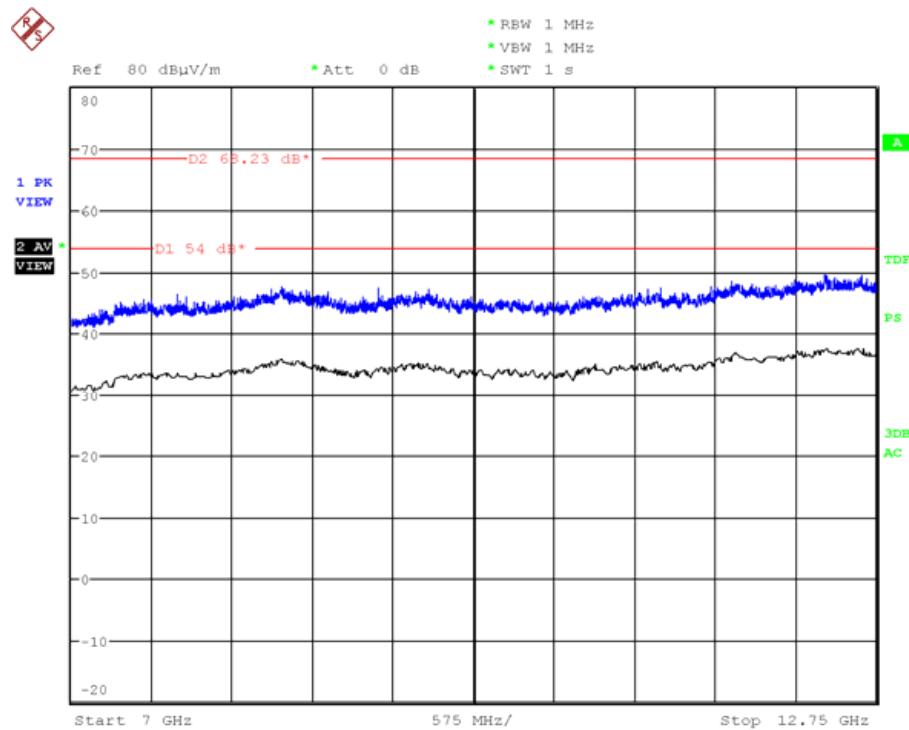
Chain B



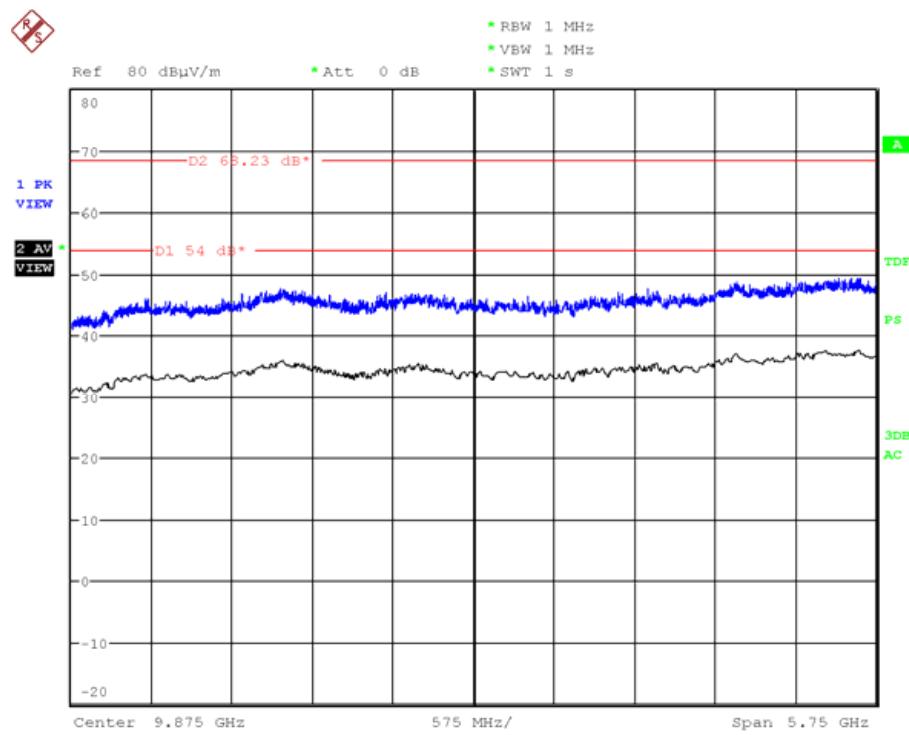
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5300 MHz.

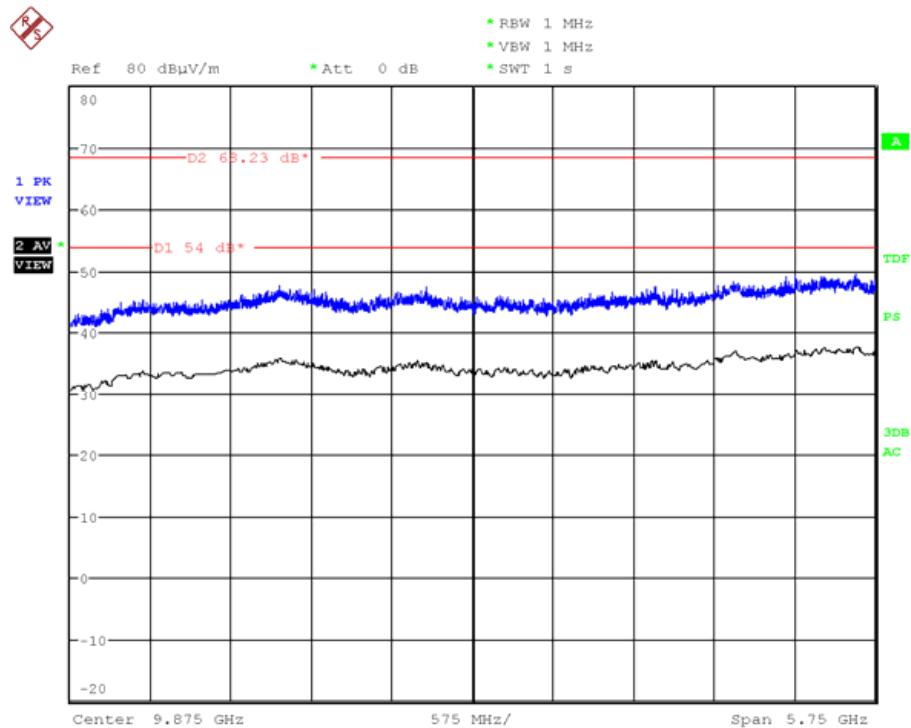
Chain A



Chain B



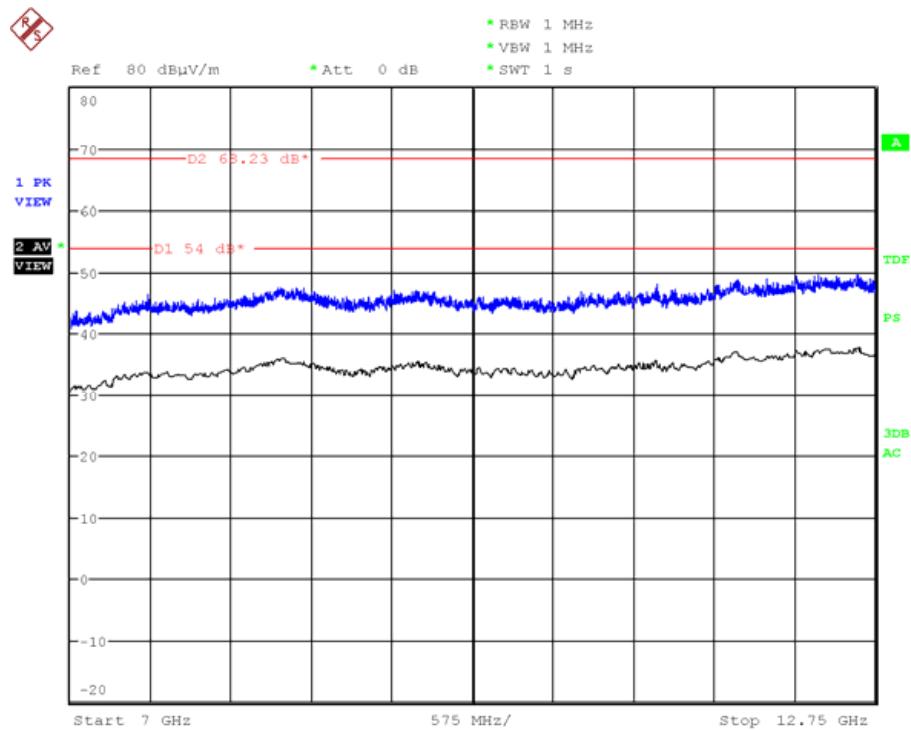
Chain A+B



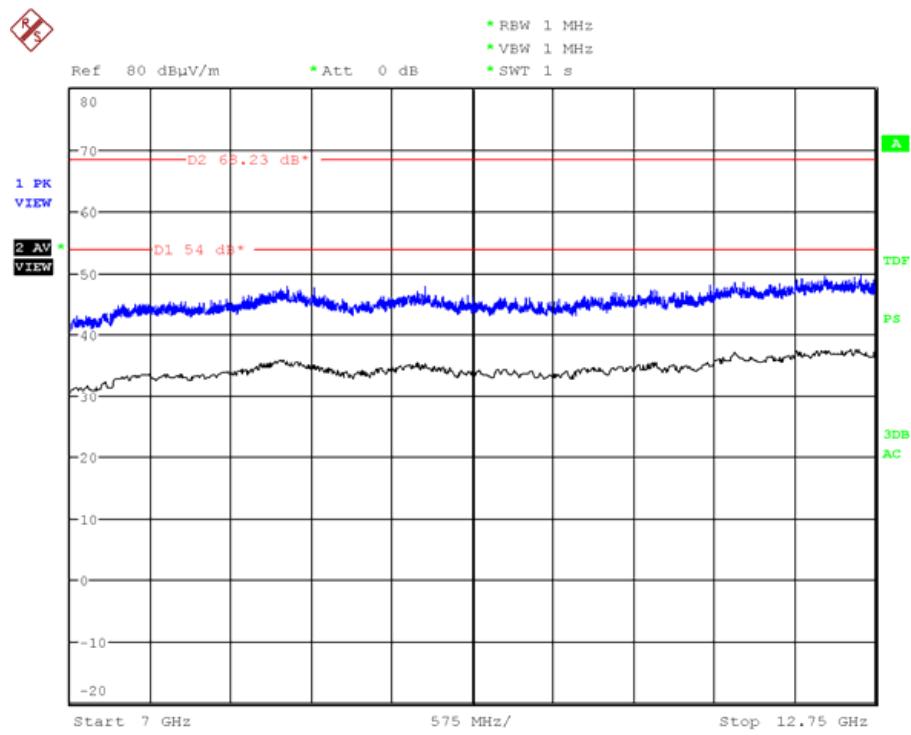
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5310 MHz.

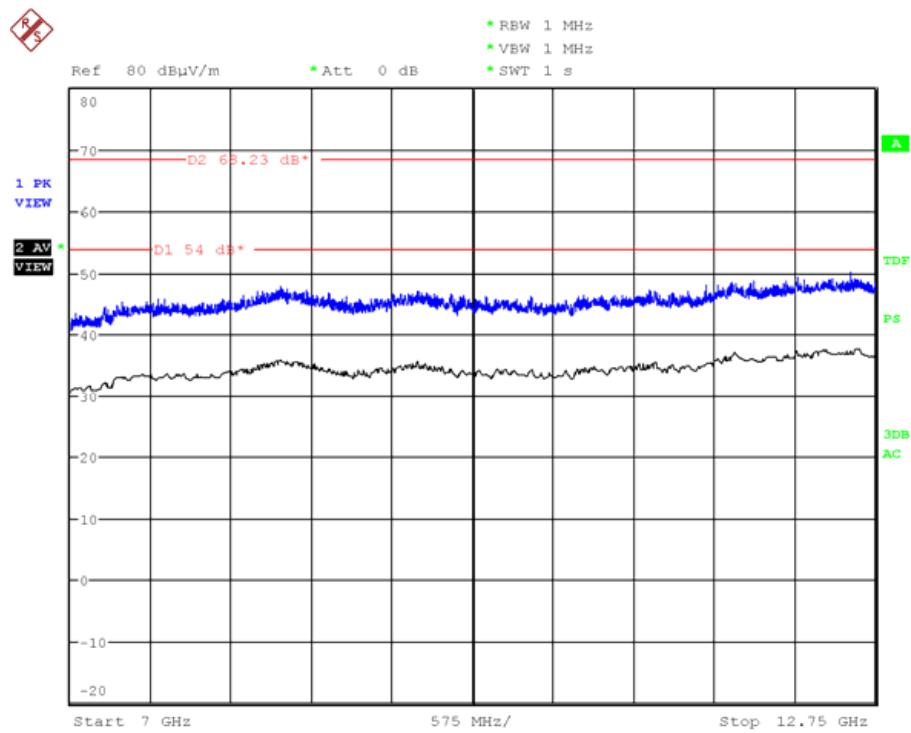
Chain A



Chain B

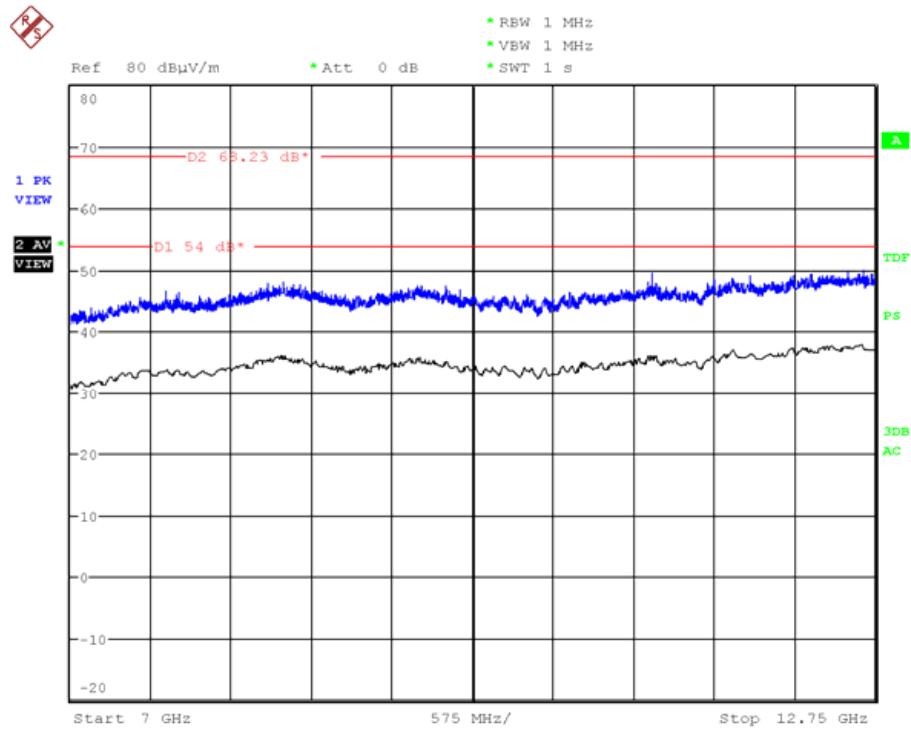


Chain A+B

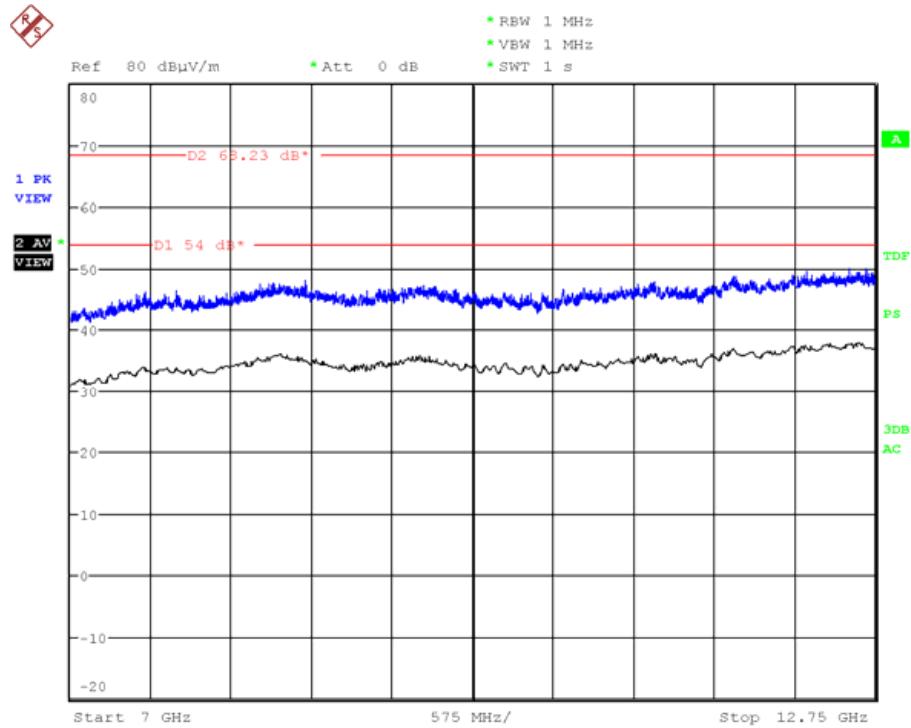


4. WiFi 5GHz 802.11 ac80 mode

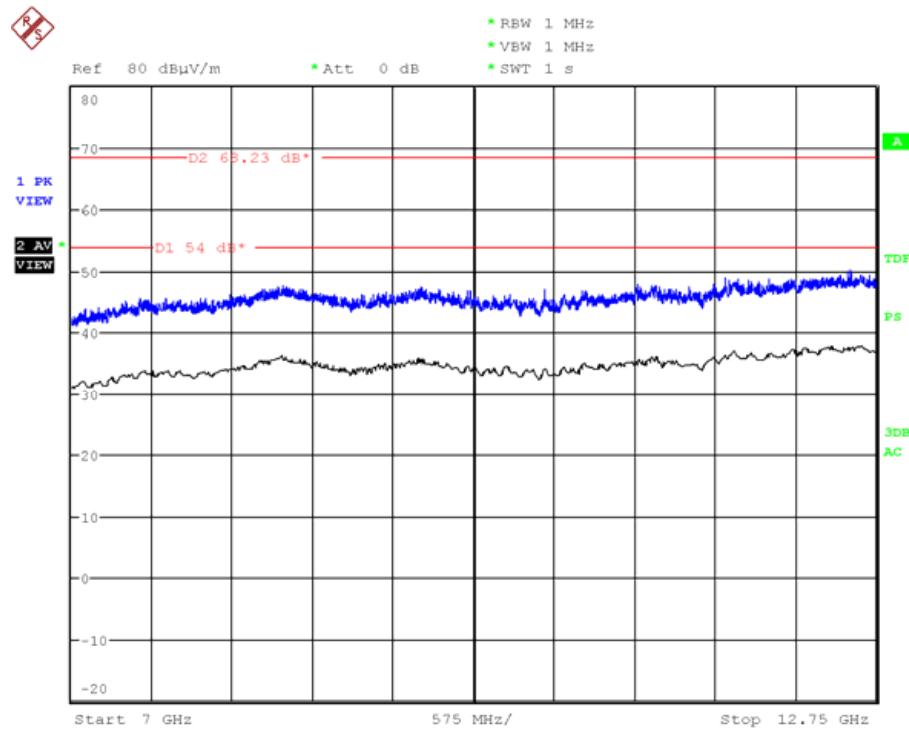
Chain A



Chain B



Chain A+B

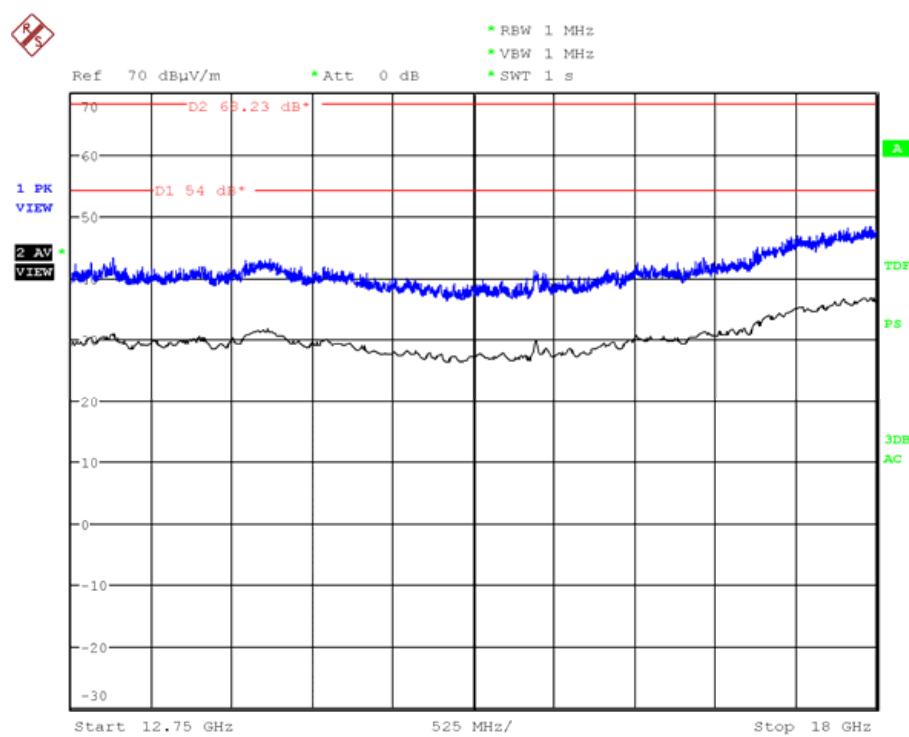


FREQUENCY RANGE 12.75 GHz to 18GHz.

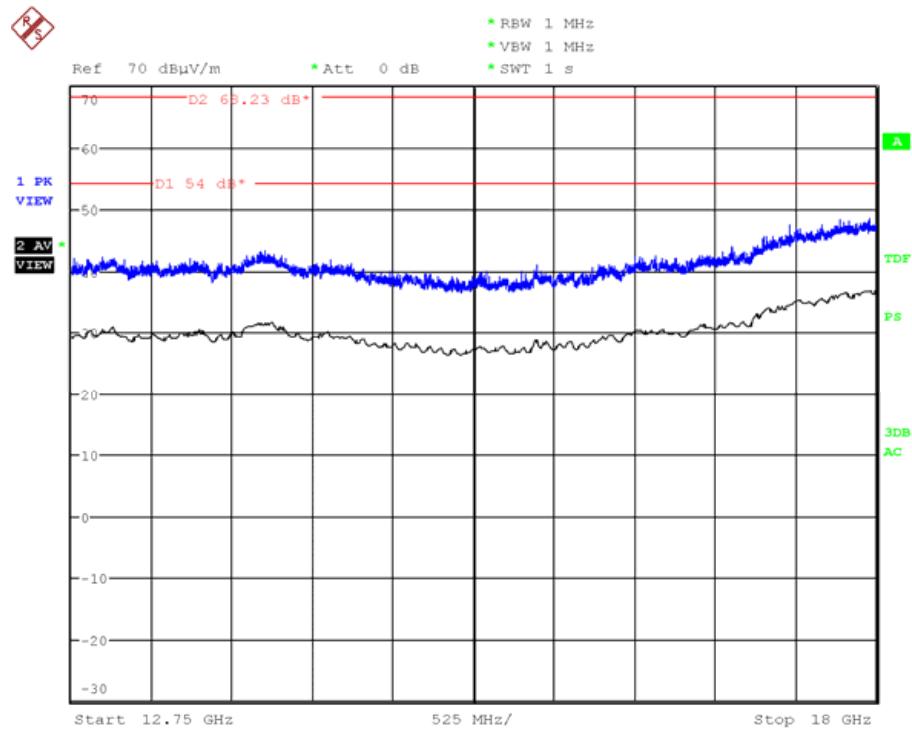
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5260 MHz.

Chain A

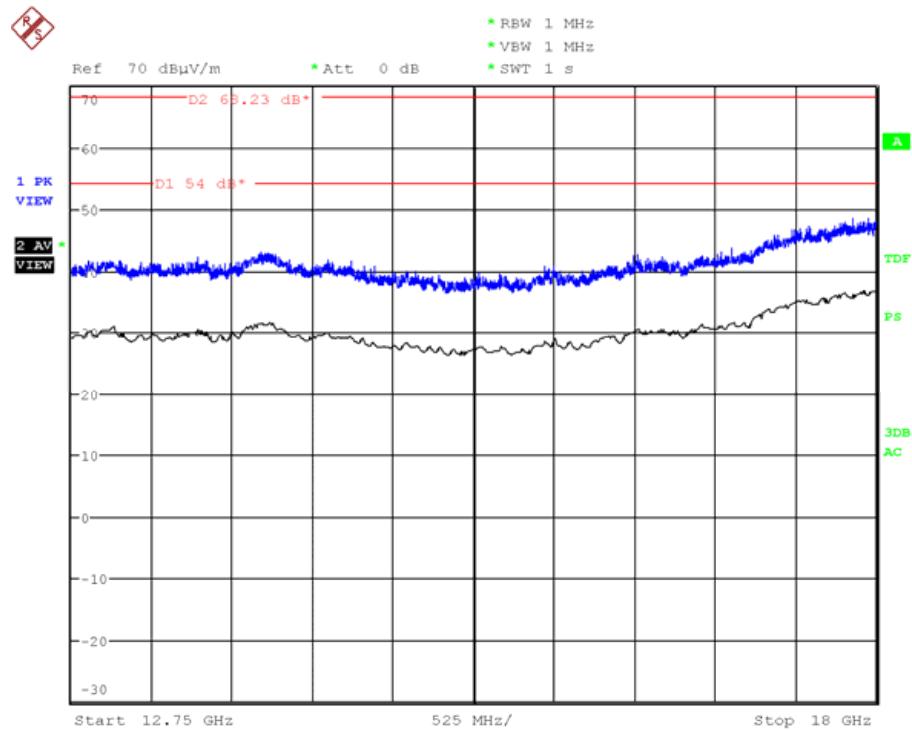


Chain B

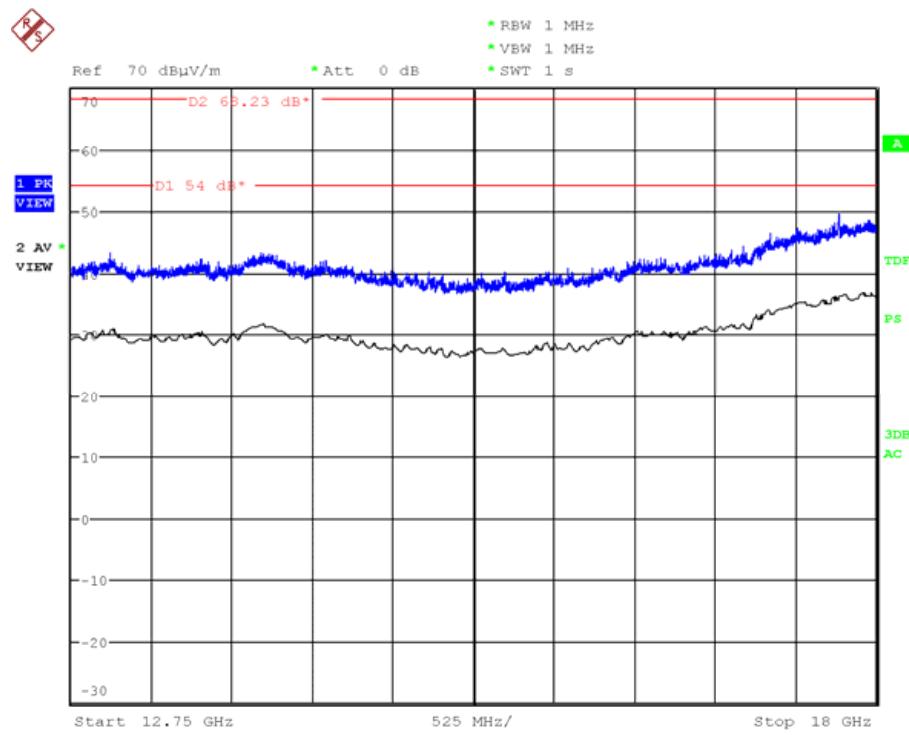


Middle frequency 5300 MHz.

Chain A

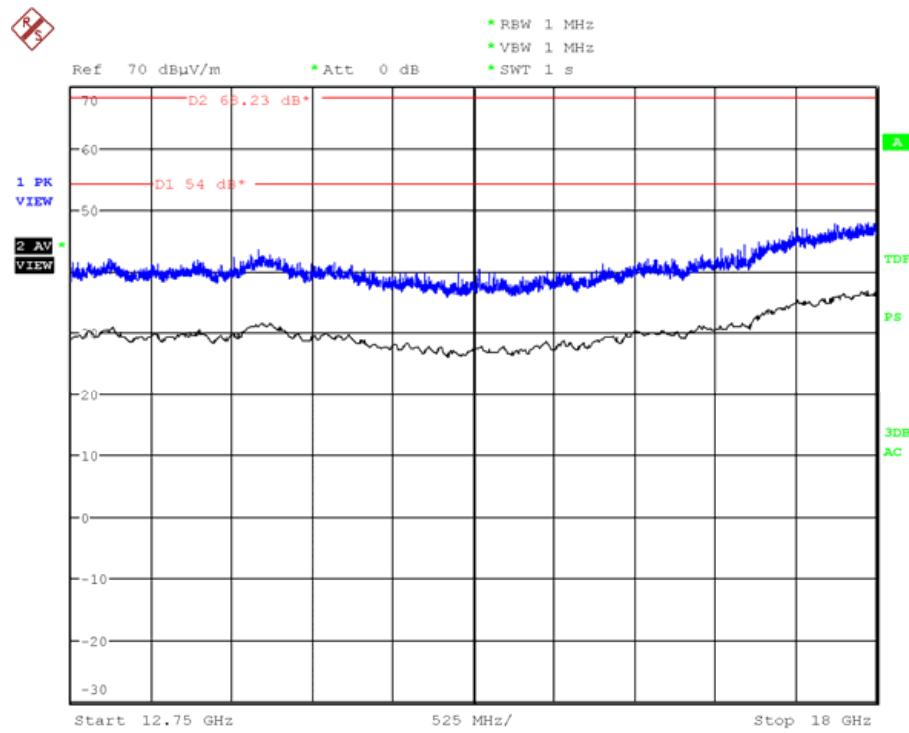


Chain B

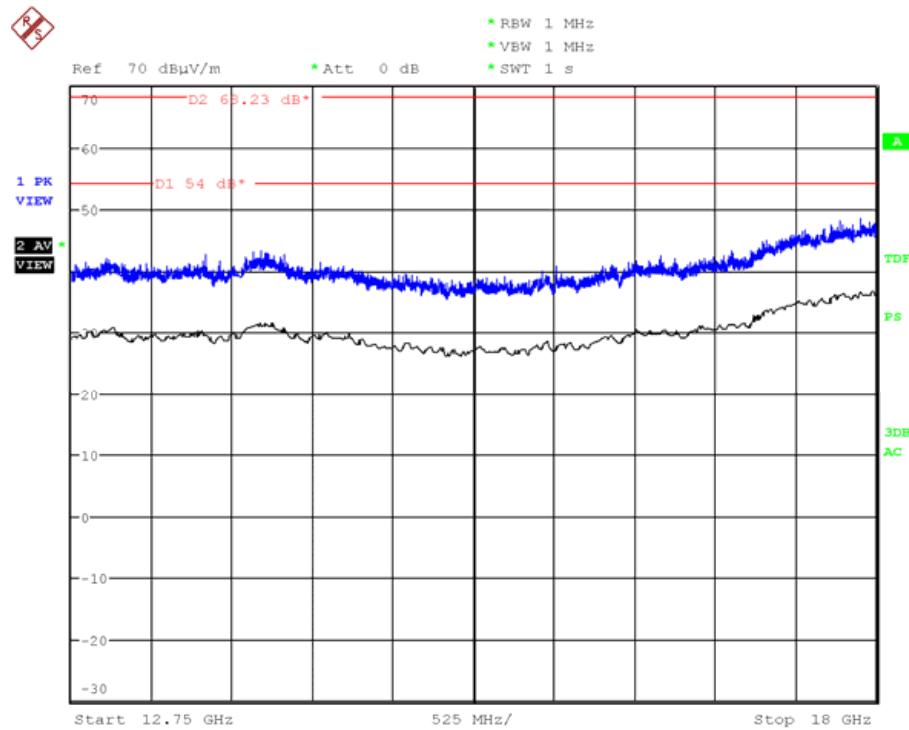


Highest frequency 5320 MHz.

Chain A



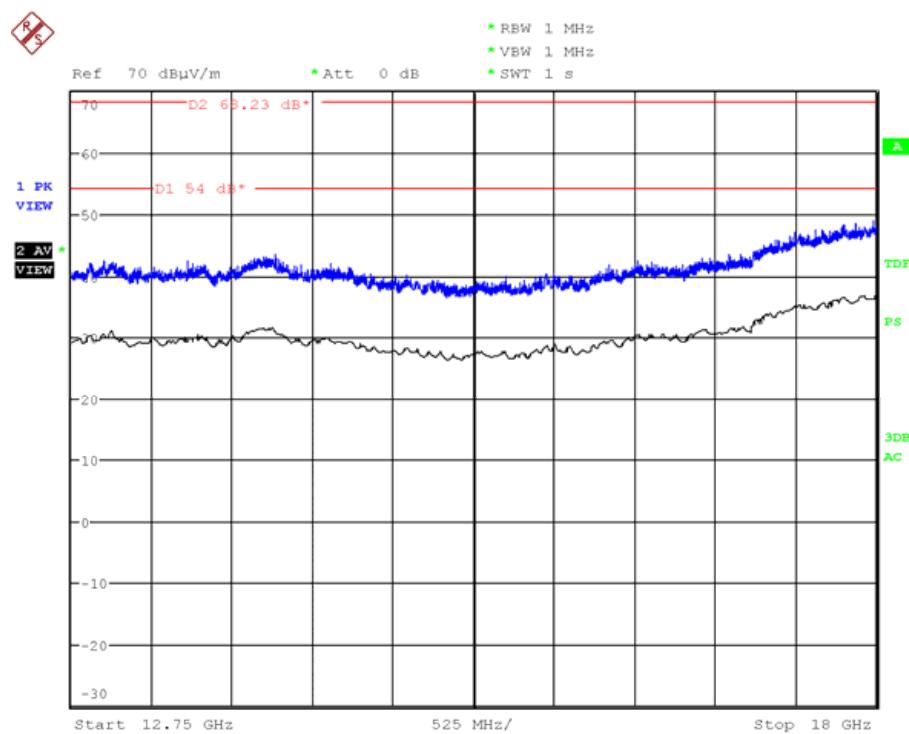
Chain B



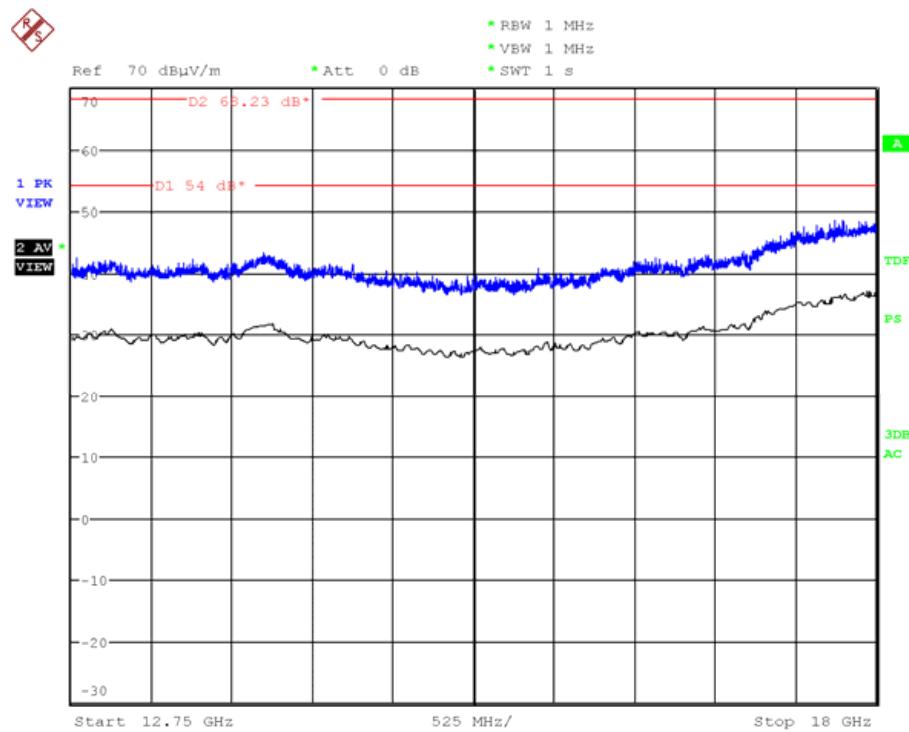
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5300 MHz.

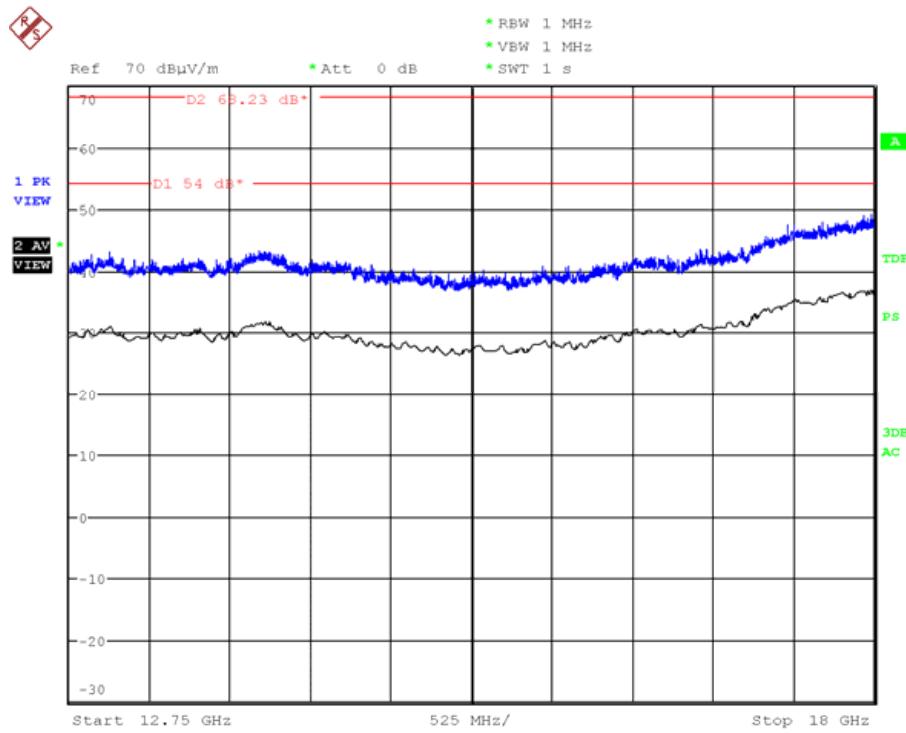
Chain A



Chain B



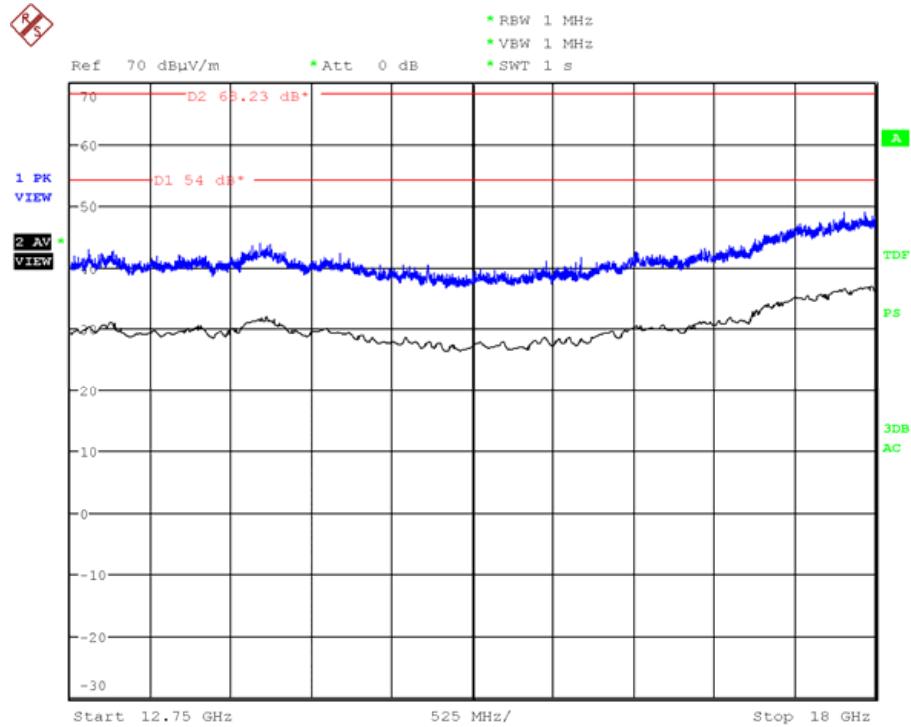
Chain A+B



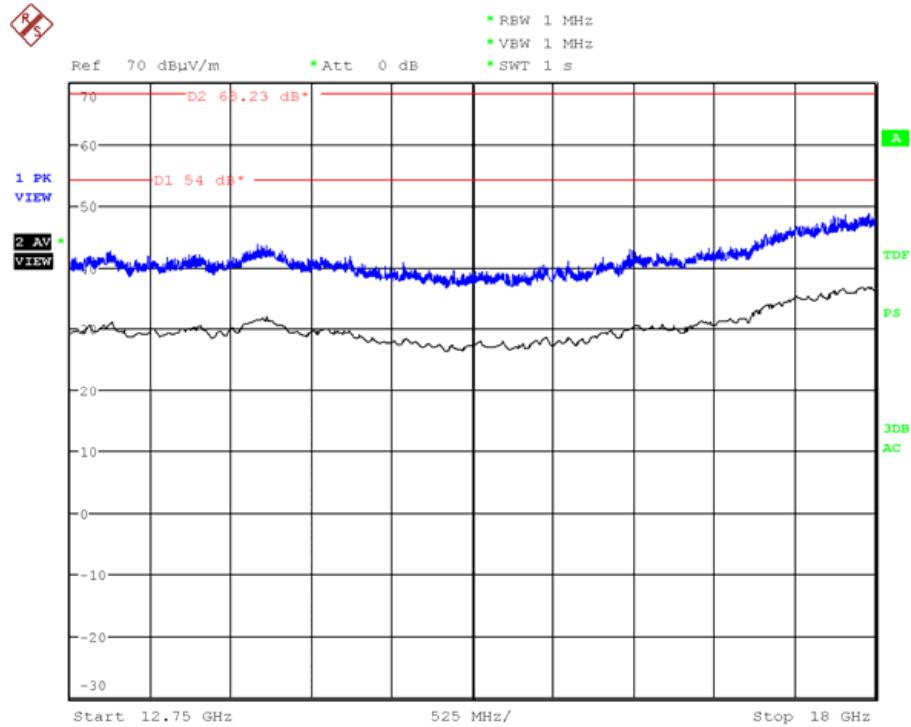
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5310MHz.

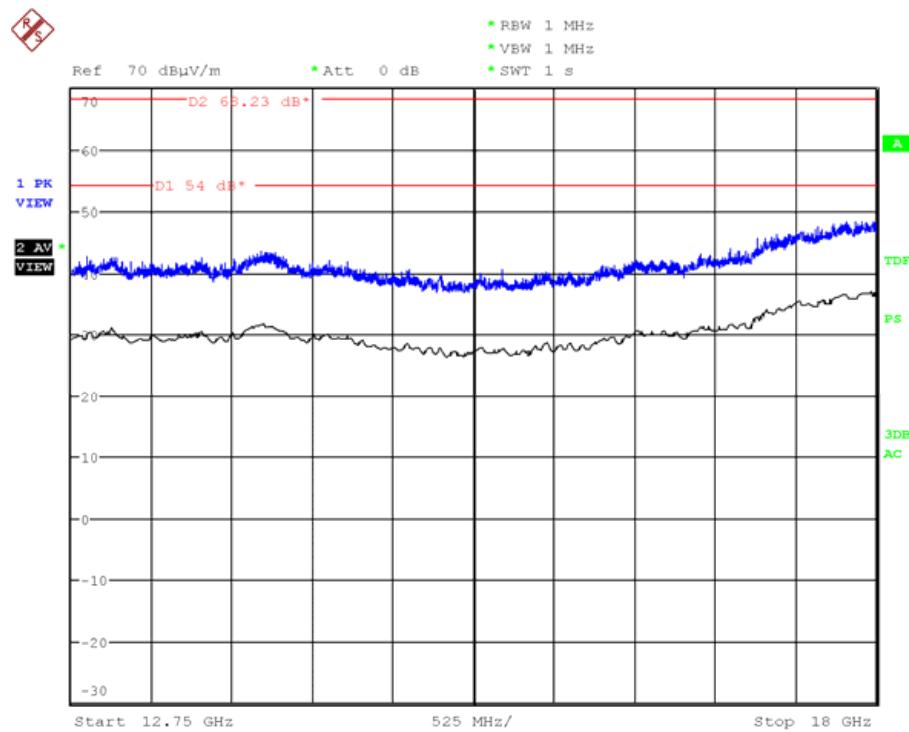
Chain A



Chain B

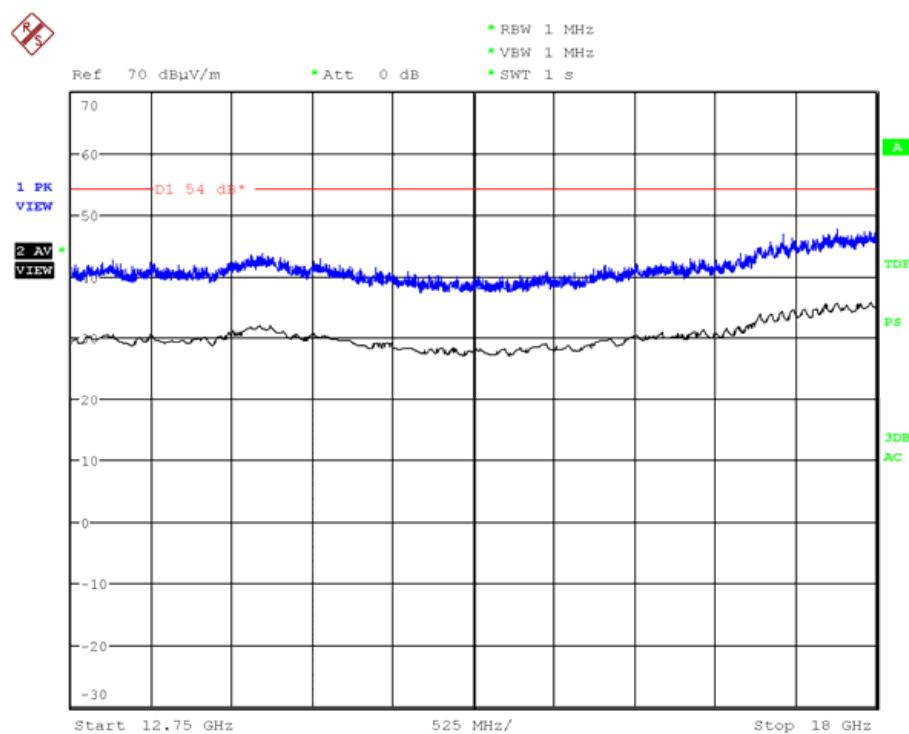


Chain A+B

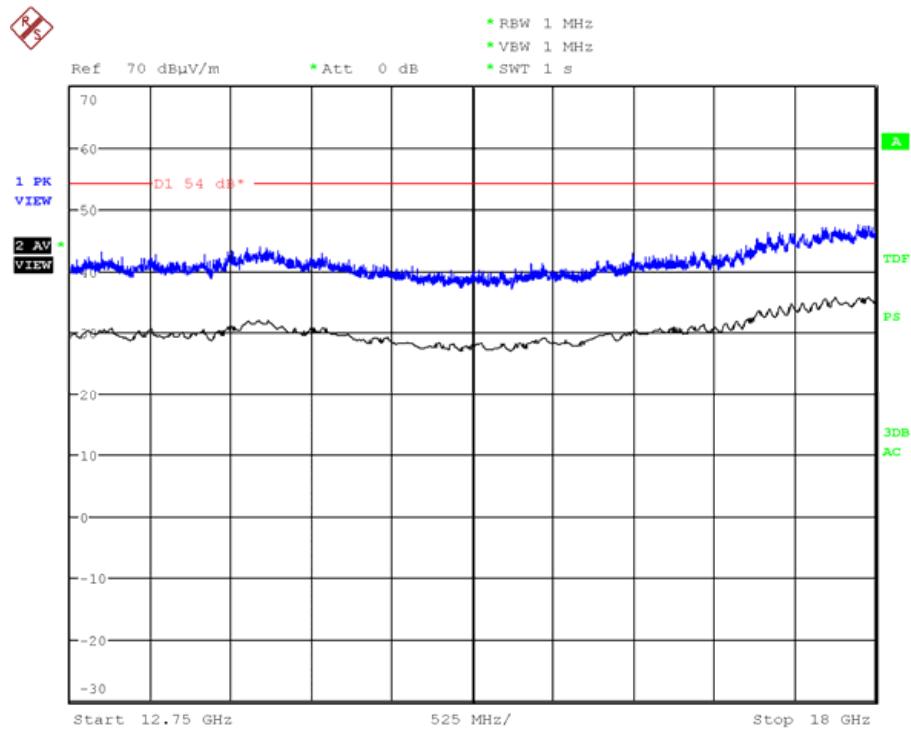


4. WiFi 5GHz 802.11 ac80 mode

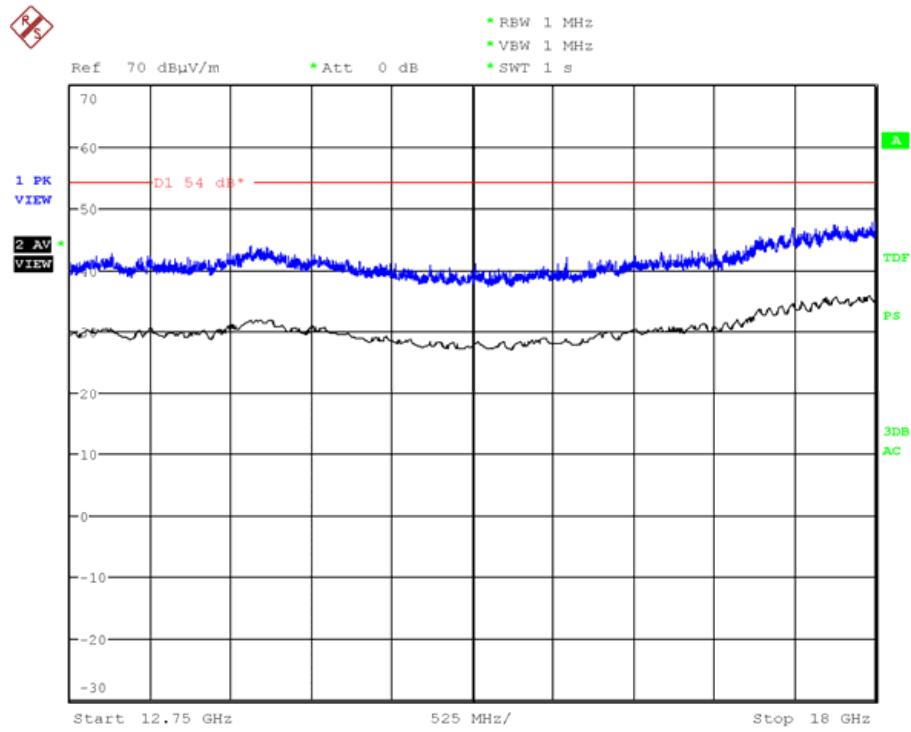
Middle frequency 5290 MHz
Chain A



Chain B



Chain A+B

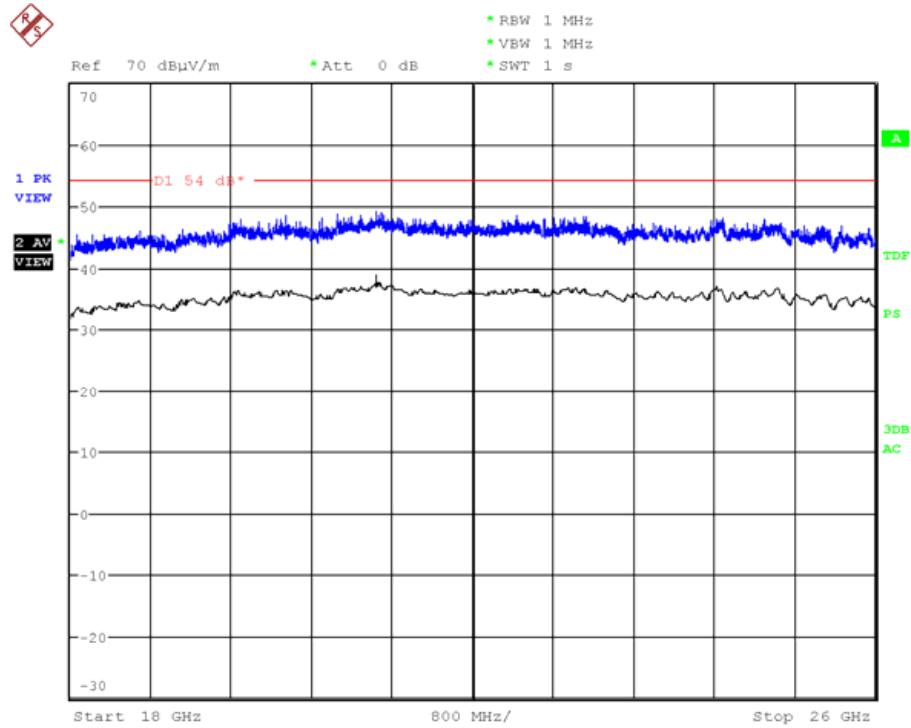


FREQUENCY RANGE 18 GHz to 26GHz.

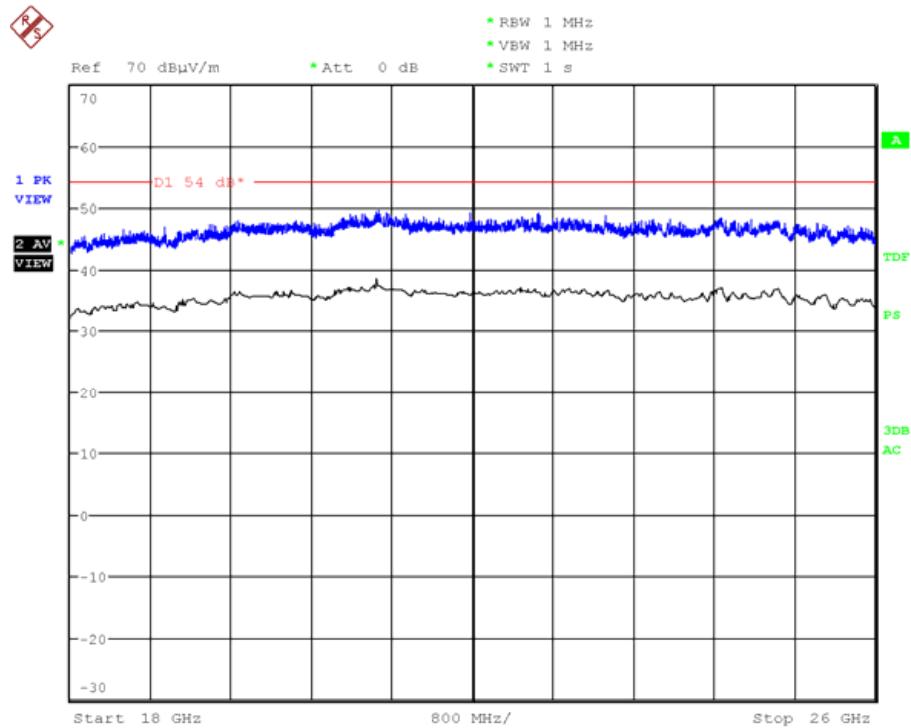
1. WiFi 5GHz 802.11 a mode

Lowest frequency 5260 MHz.

Chain A

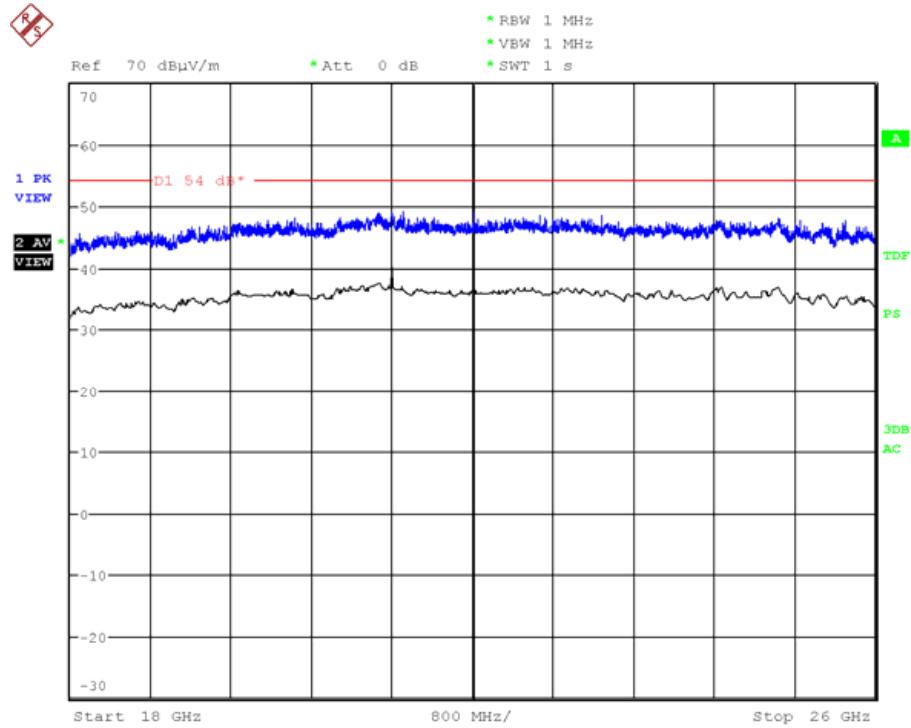


Chain B

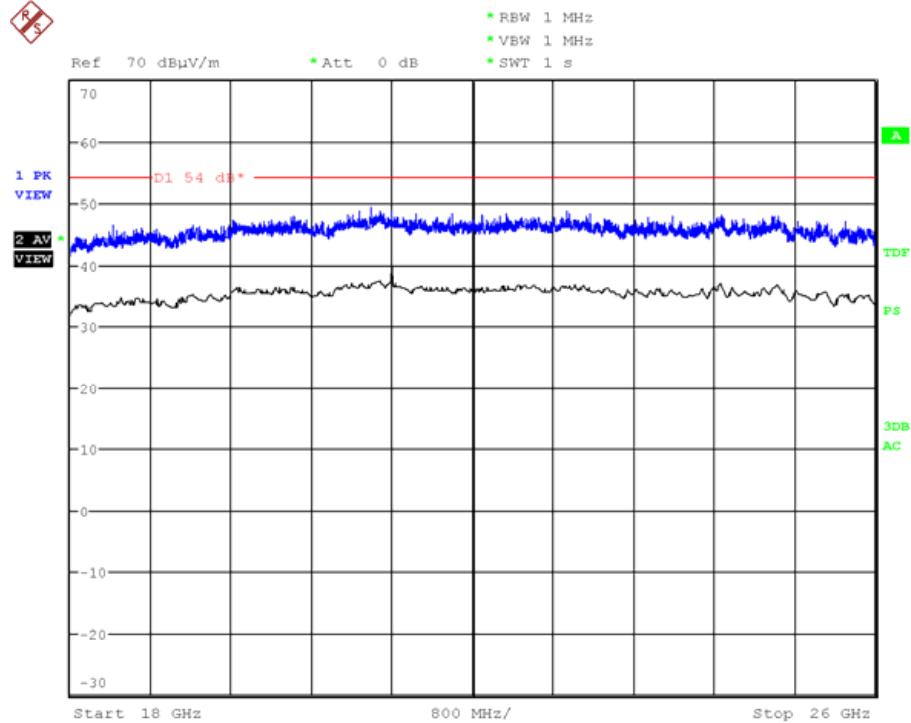


Middle frequency 5300 MHz.

Chain A

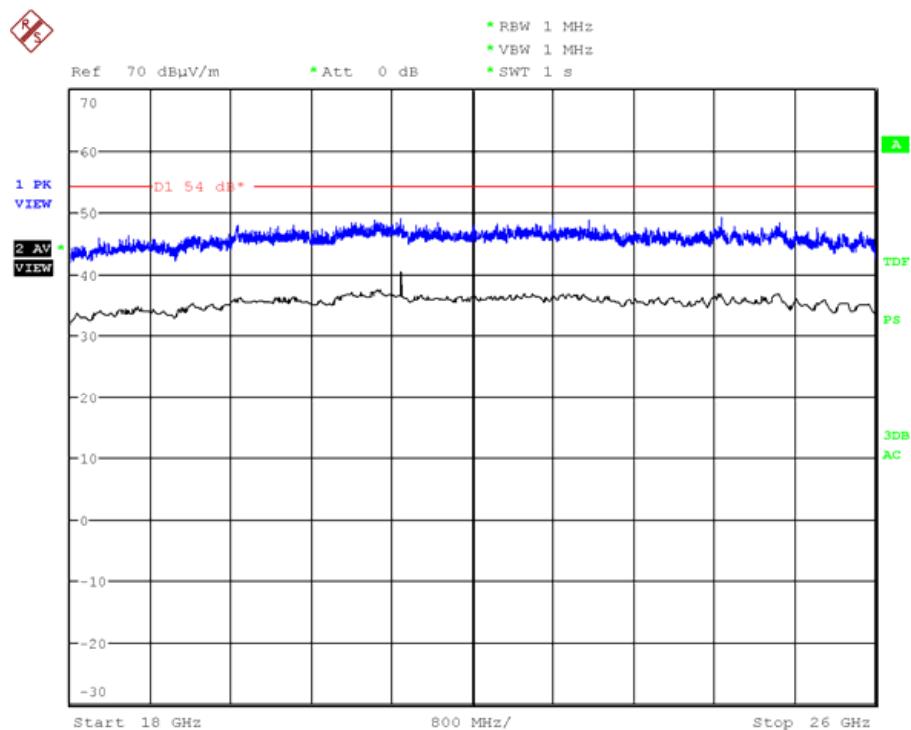


Chain B

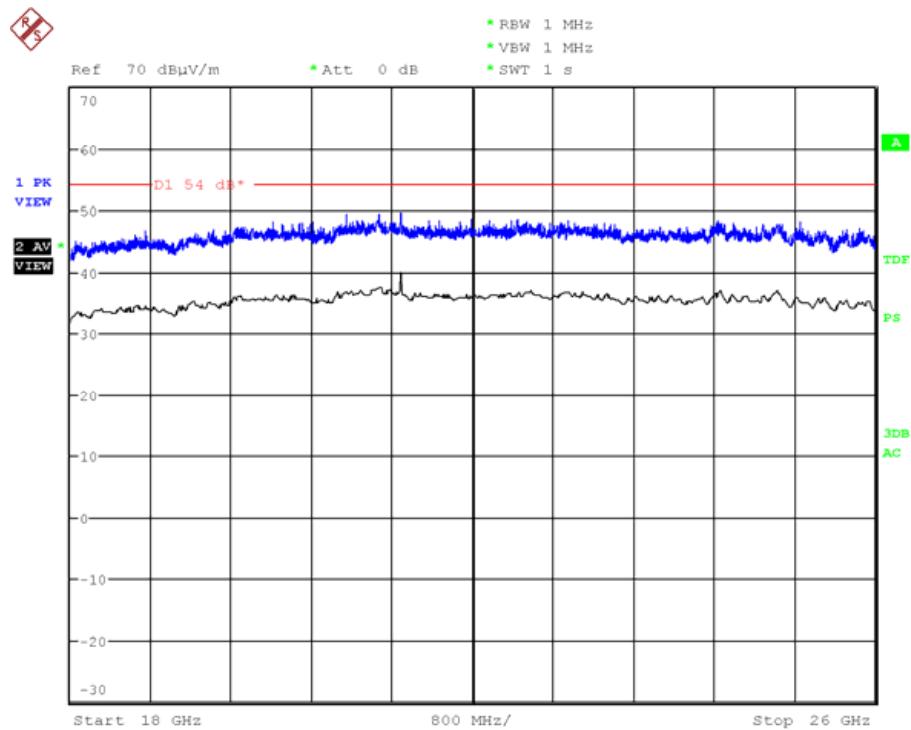


Highest frequency 5320 MHz.

Chain A



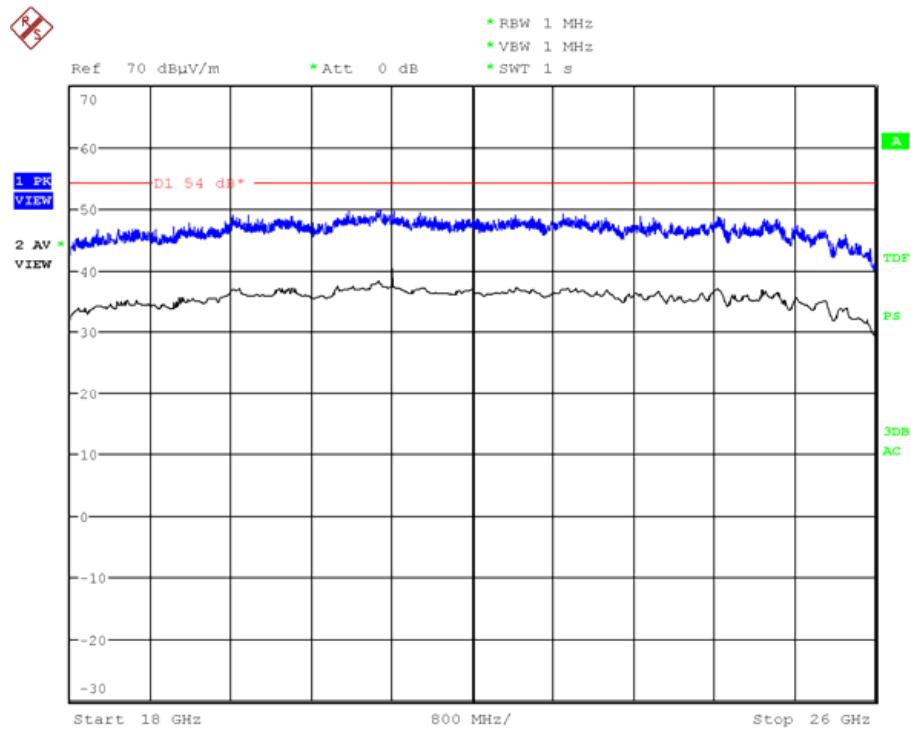
Chain B



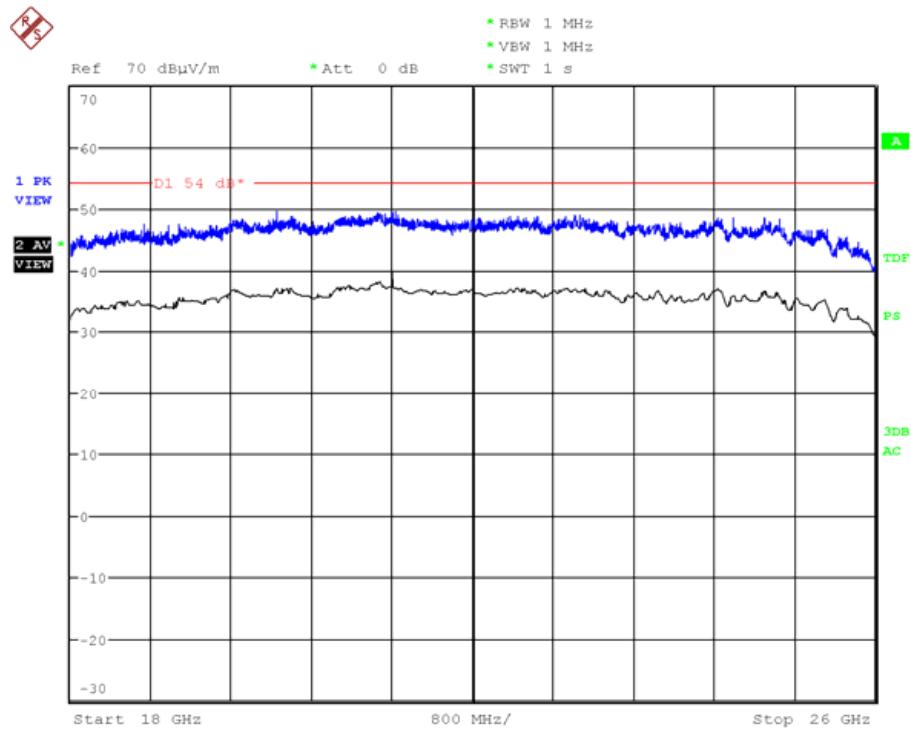
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5300 MHz.

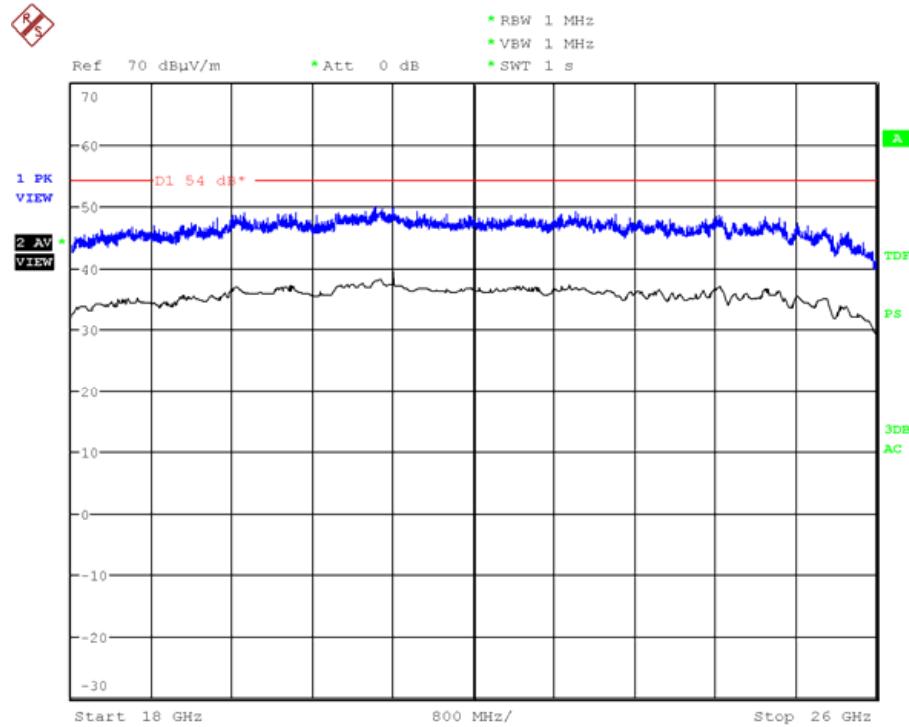
Chain A



Chain B



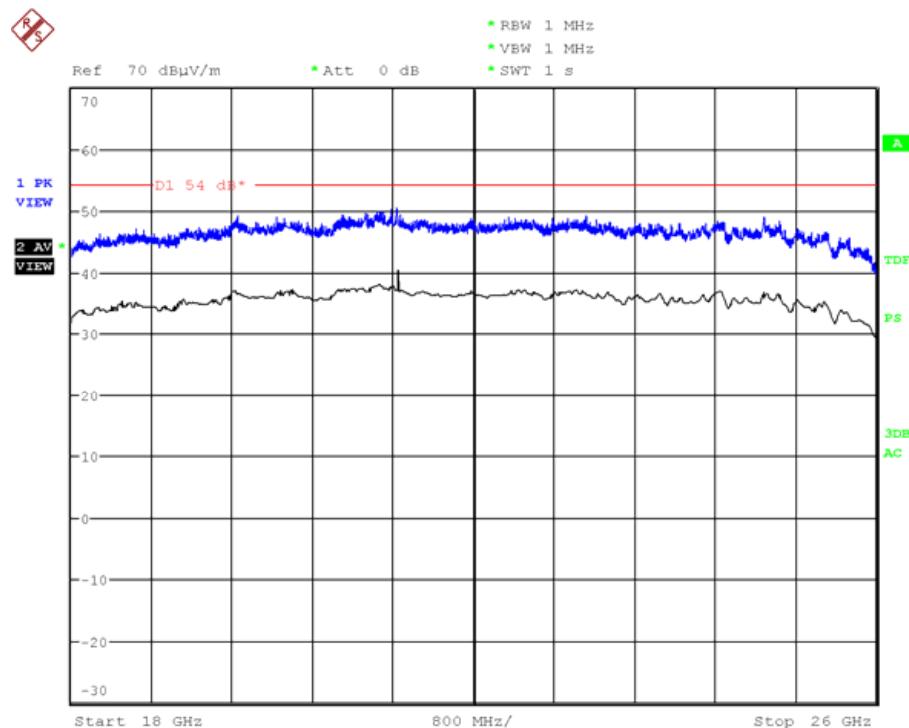
Chain A+B



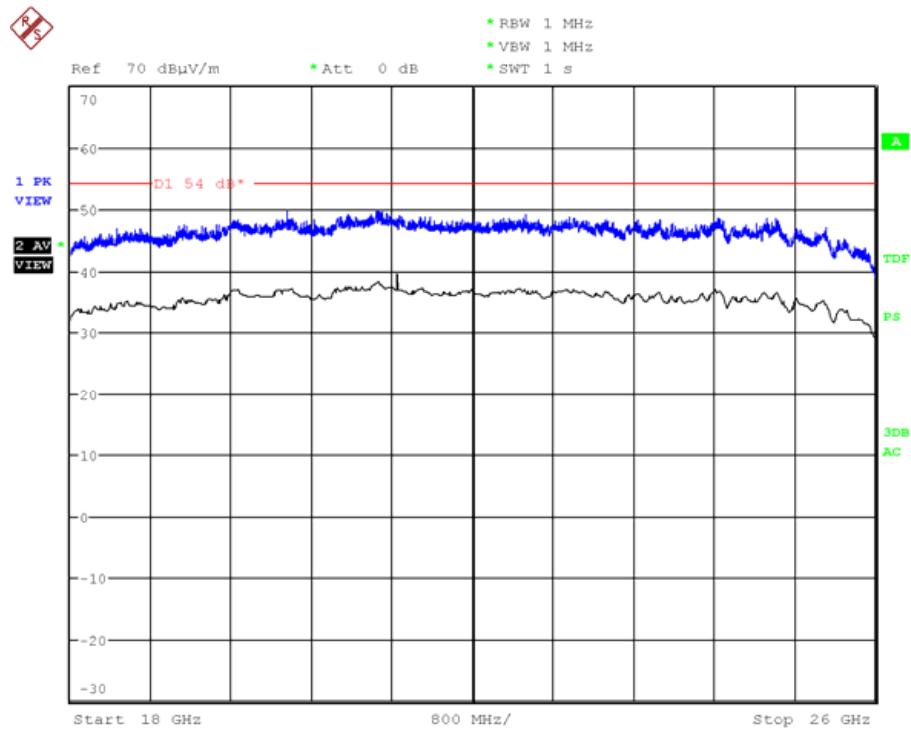
3. WiFi 5GHz 802.11 n40 mode

Highest frequency 5310 MHz.

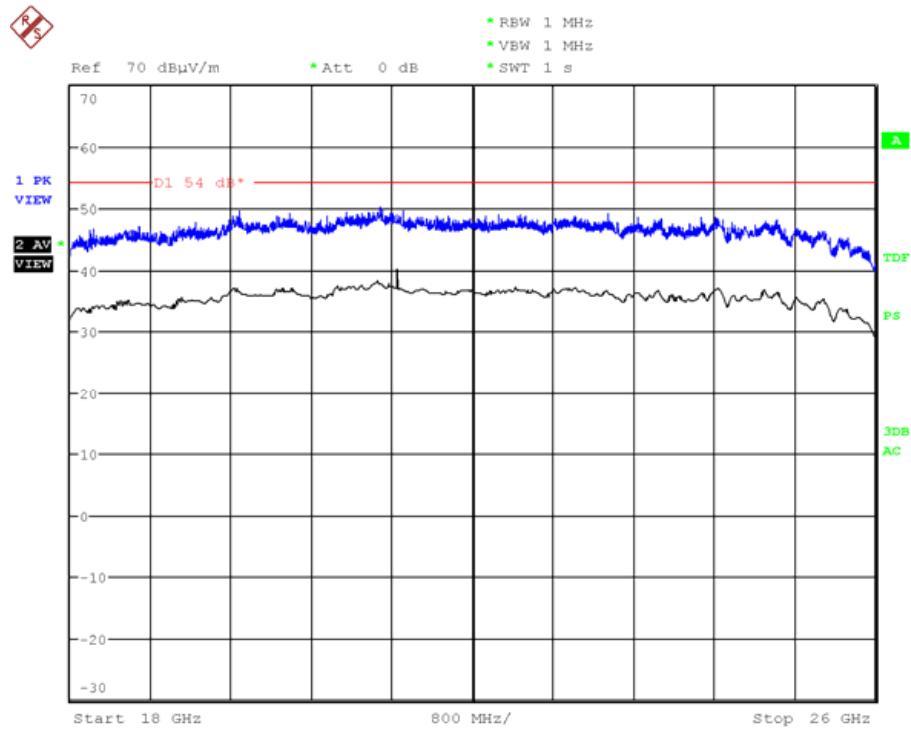
Chain A



Chain B



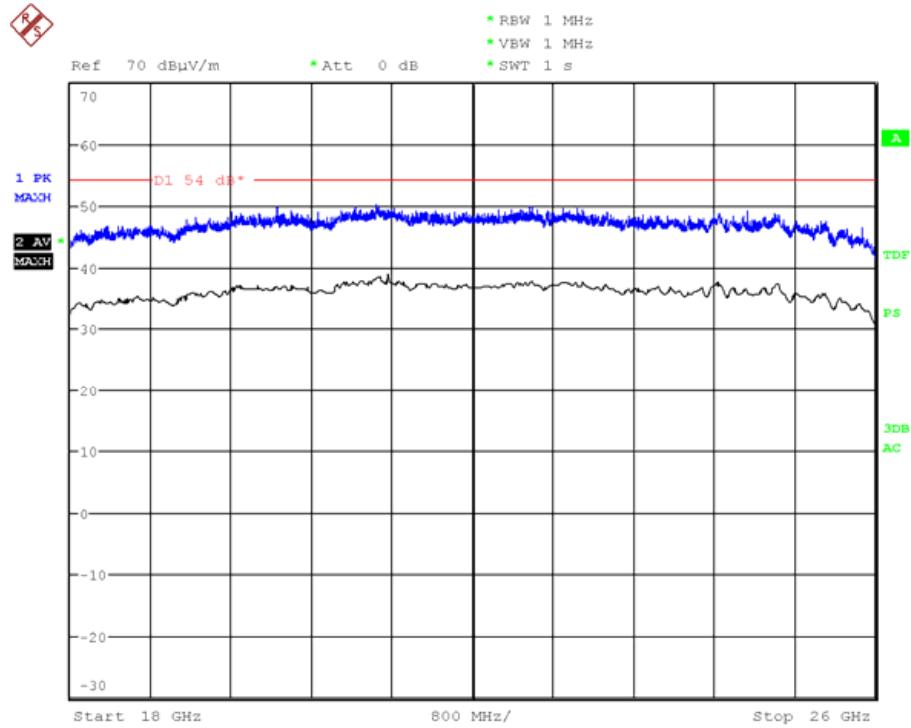
Chain A+B



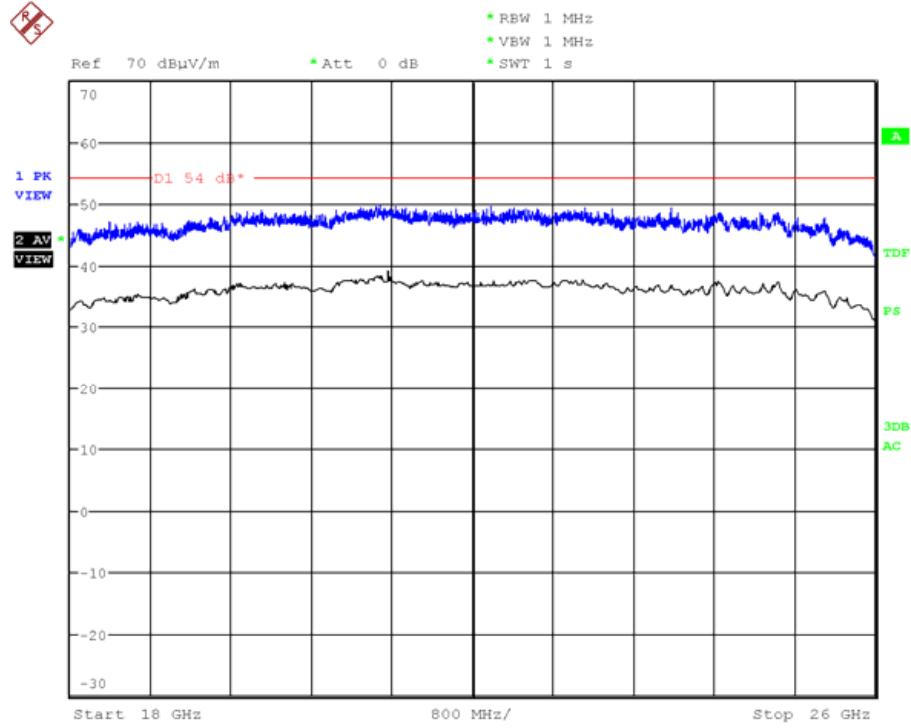
4. WiFi 5GHz 802.11 ac80 mode

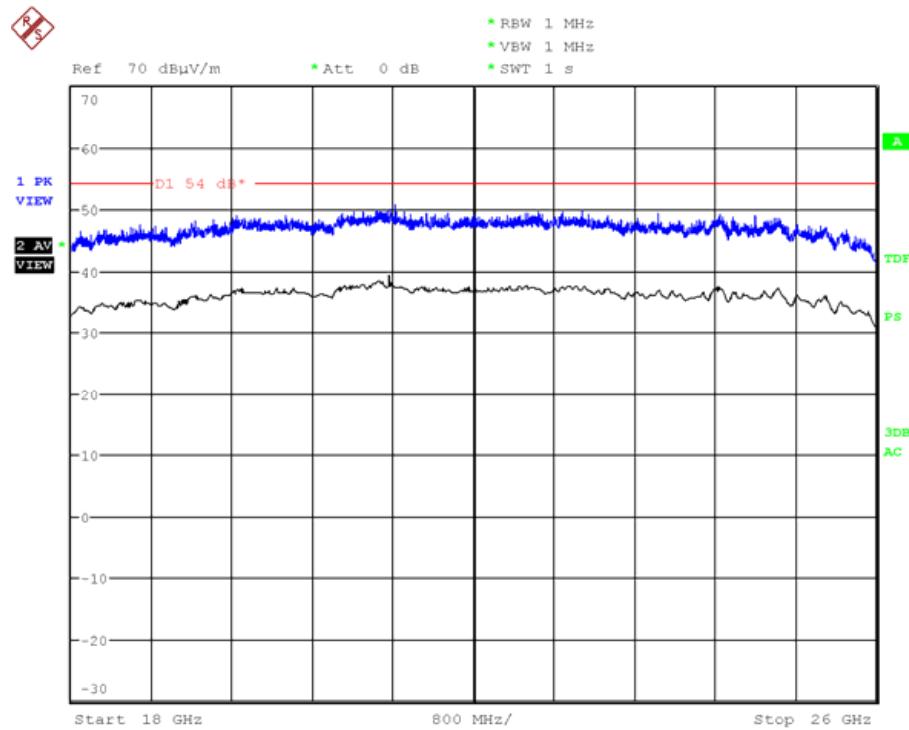
Middle frequency 5290 MHz

Chain A



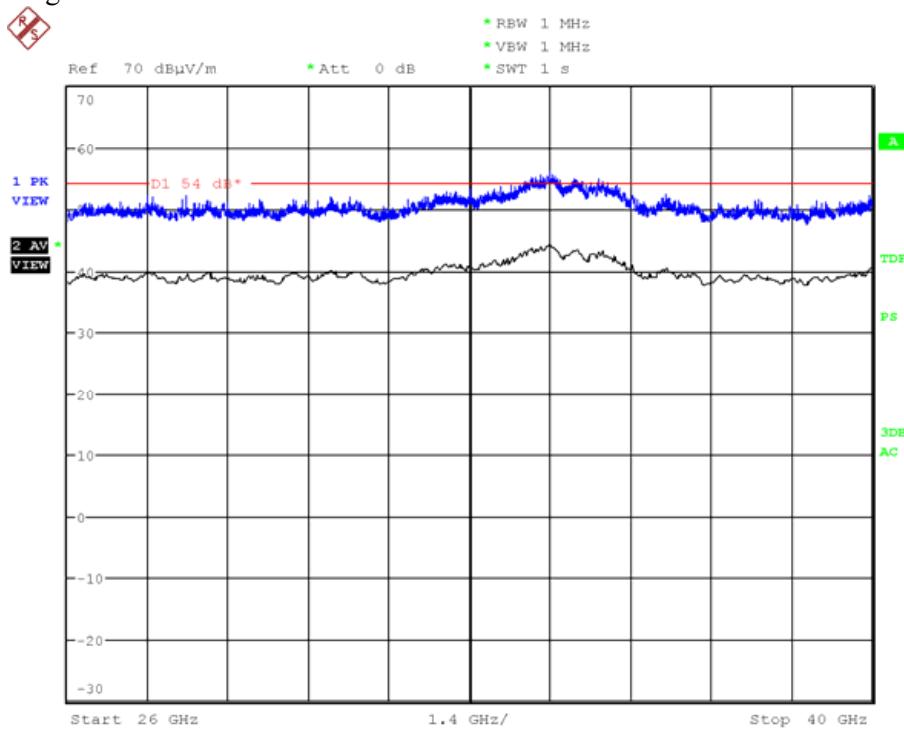
Chain B



Chain A+B


FREQUENCY RANGE 26 GHz 40GHz.

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



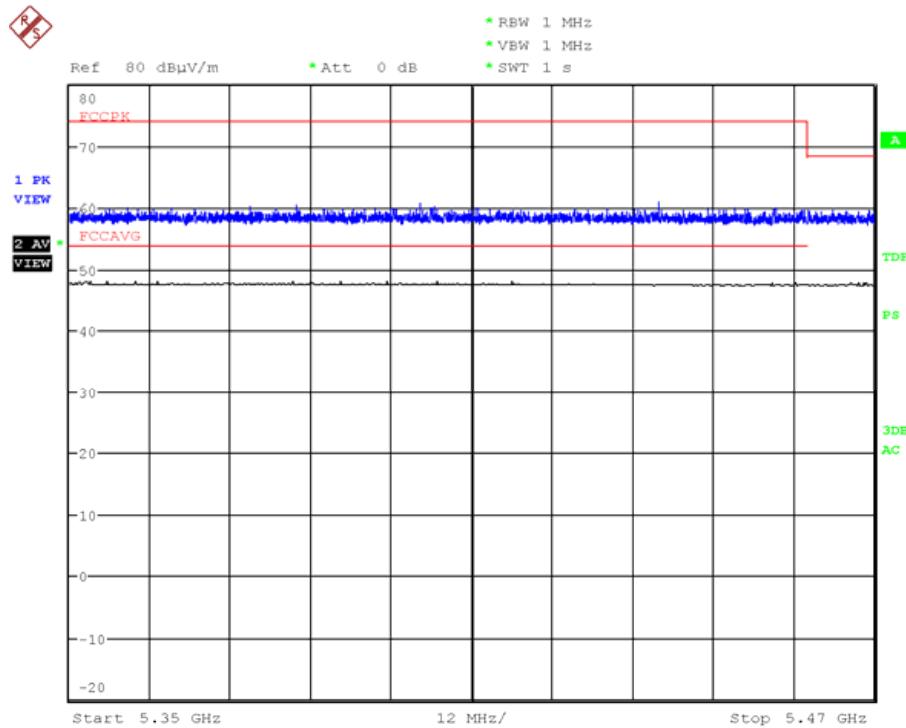
(This plot is valid for both SISO and MIMO).

Radiated spurious emissions at band-edges and inside restricted band 5.35 – 5.46 GHz.

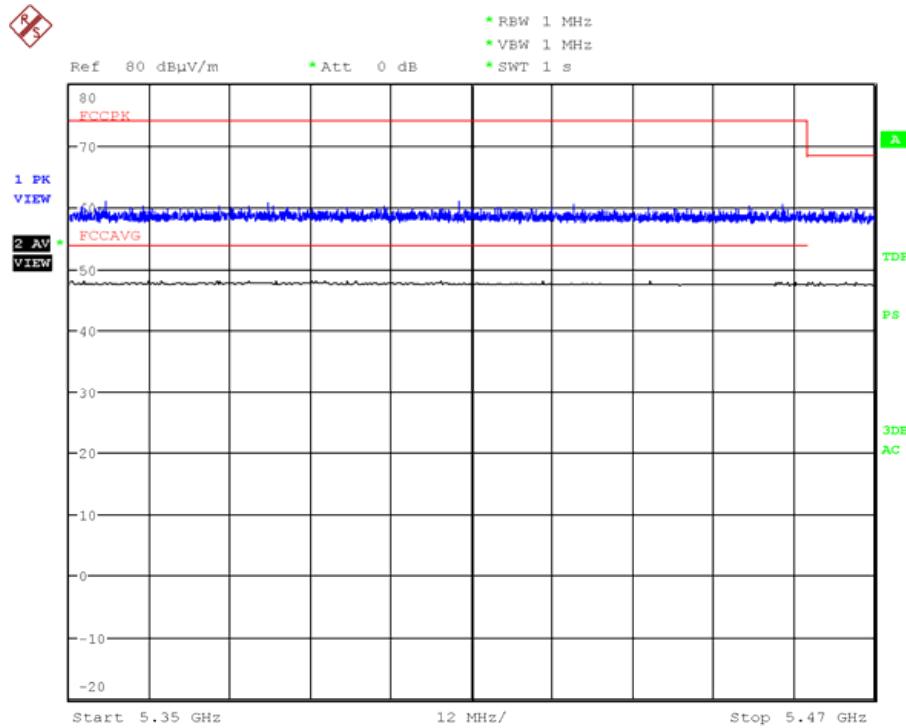
1. WiFi 5GHz 802.11 a mode

Middle frequency 5300 MHz.

Chain A

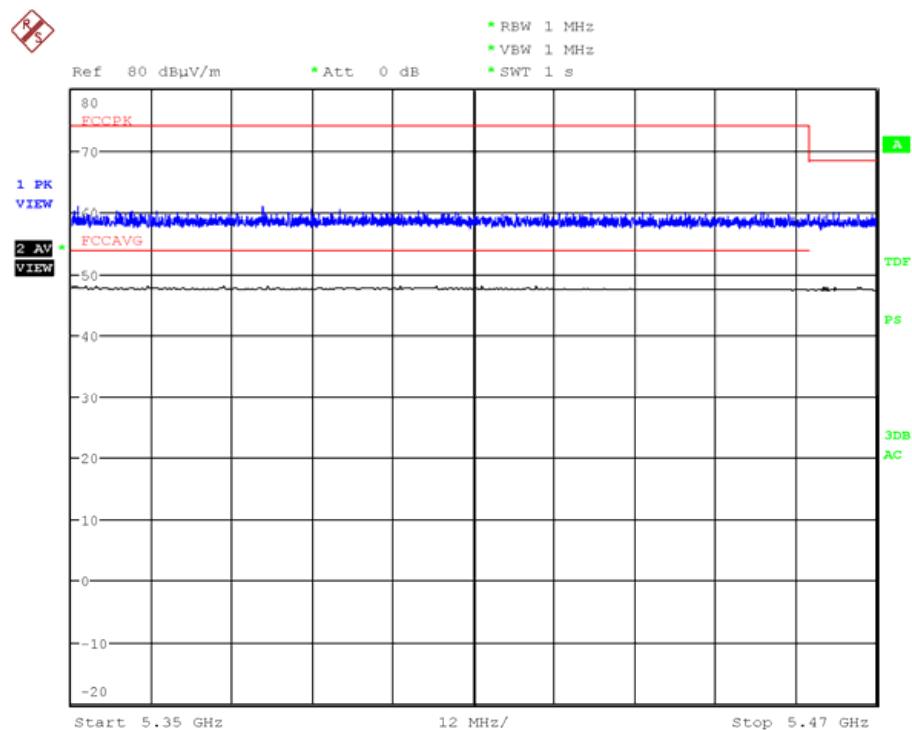


Chain B

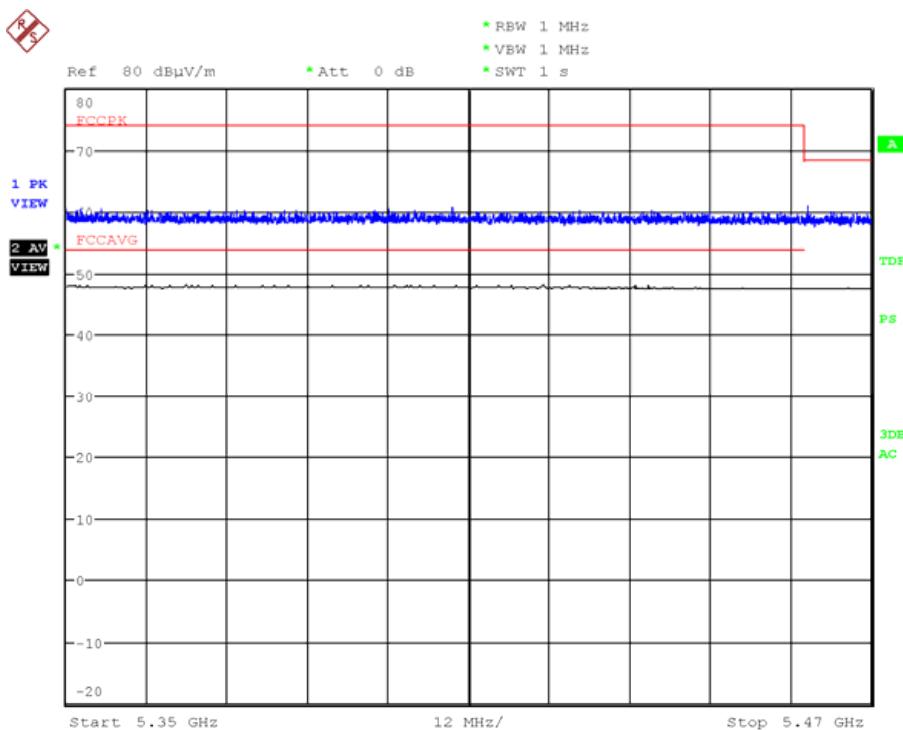


Highest frequency 5320 MHz.

Chain A



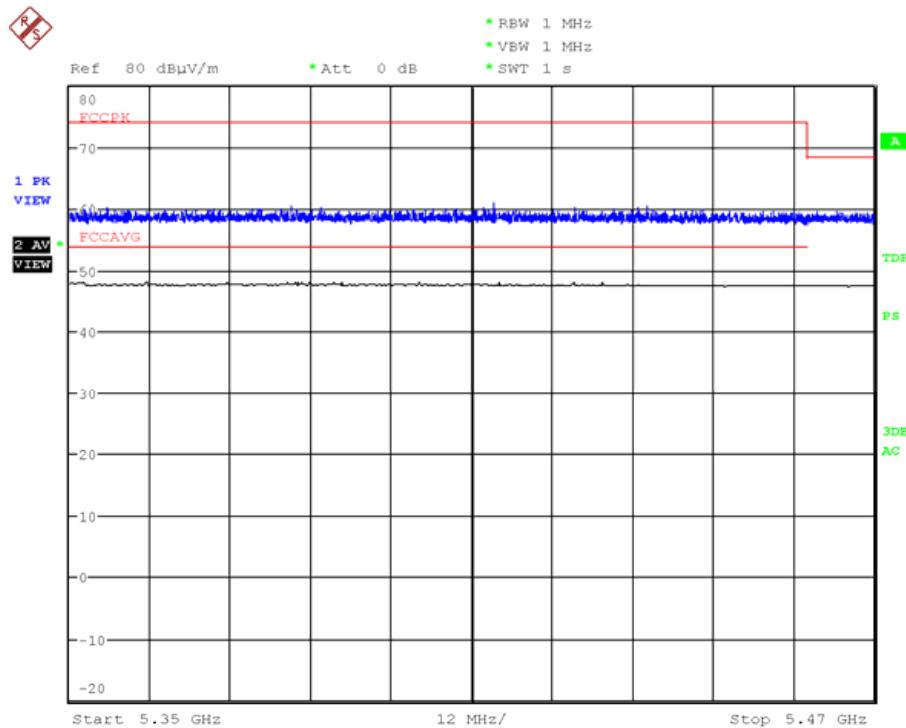
Chain B



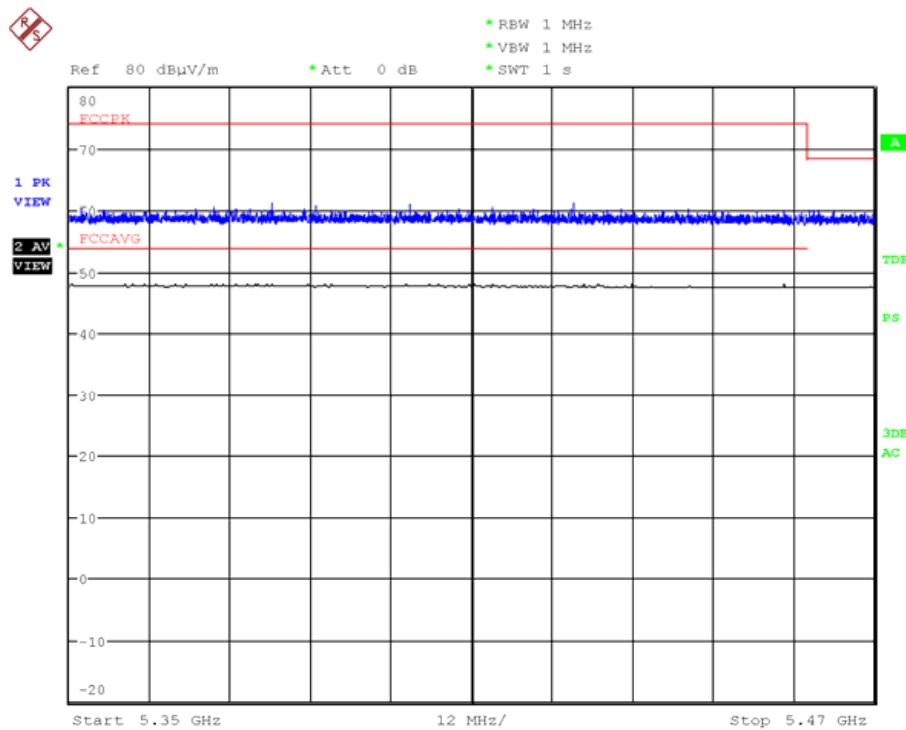
2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5300 MHz.

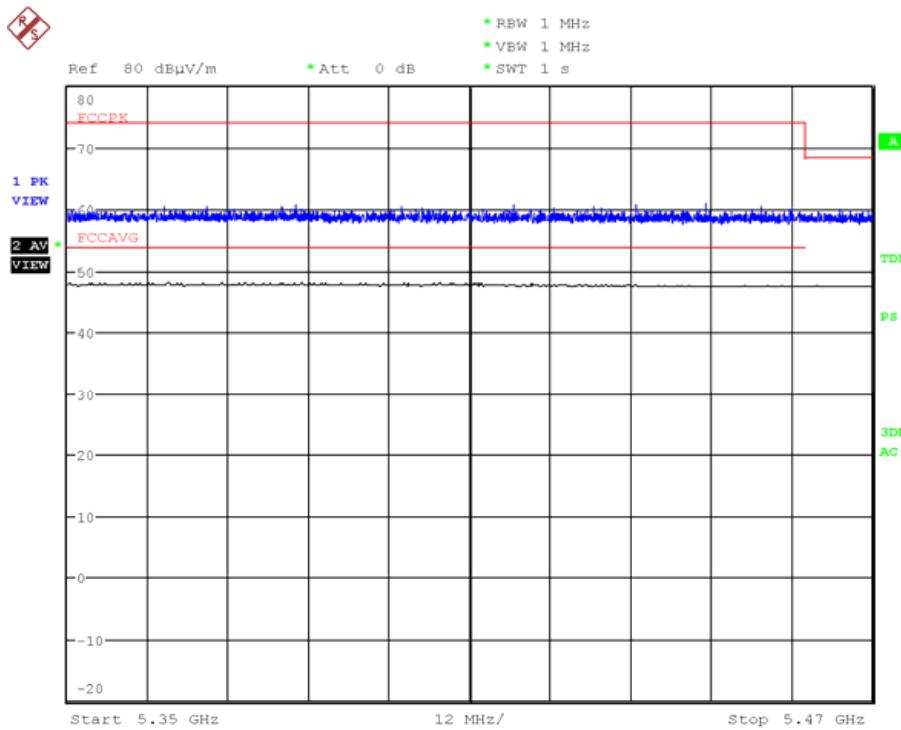
Chain A



Chain B

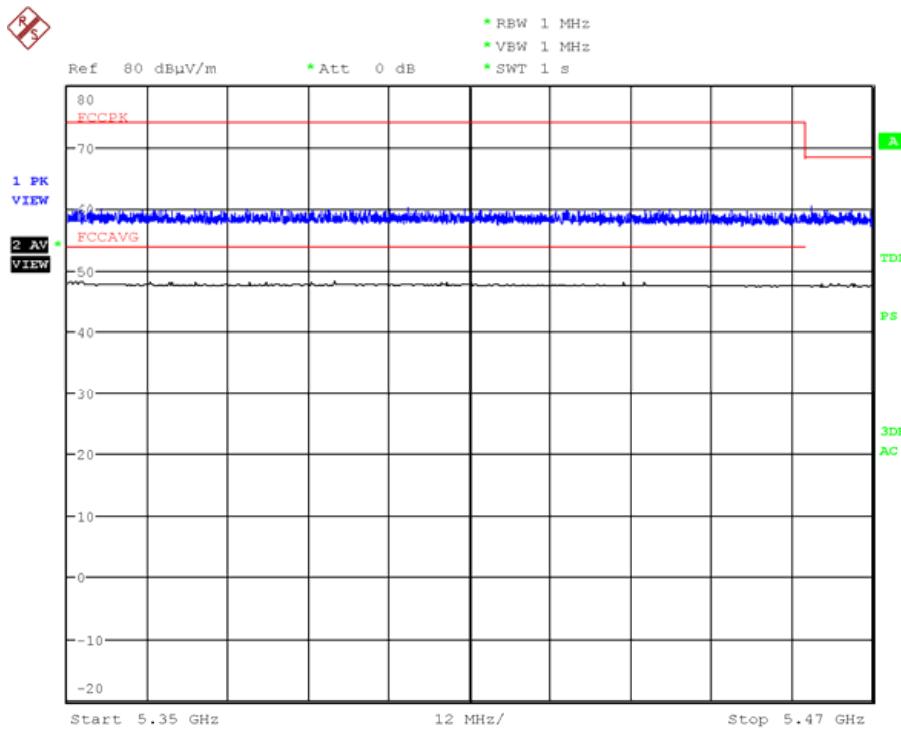


Chain A+B

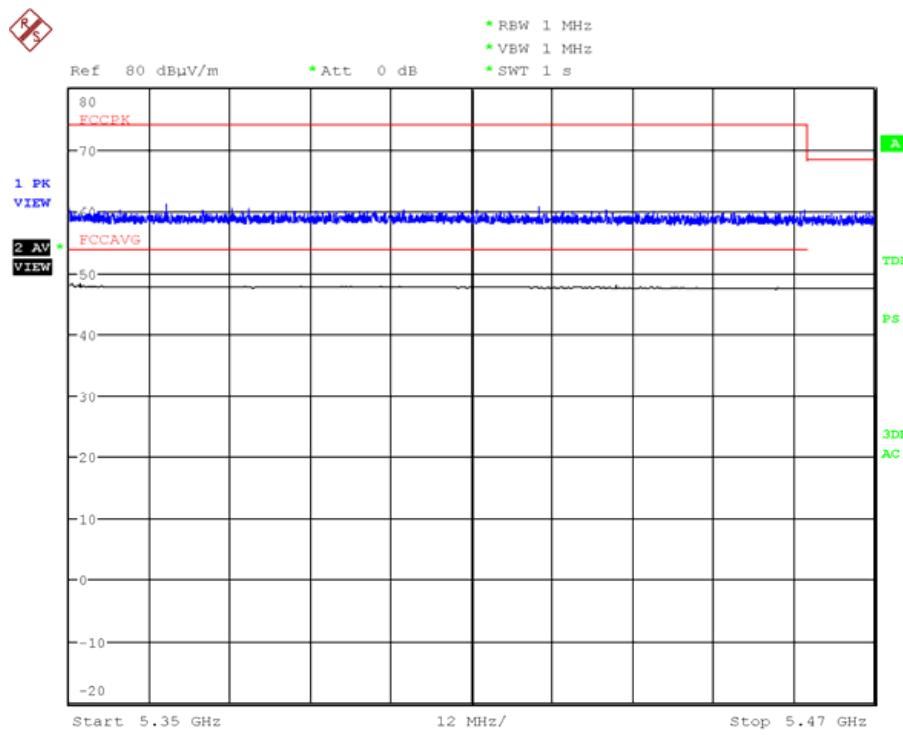


Highest frequency 5320 MHz.

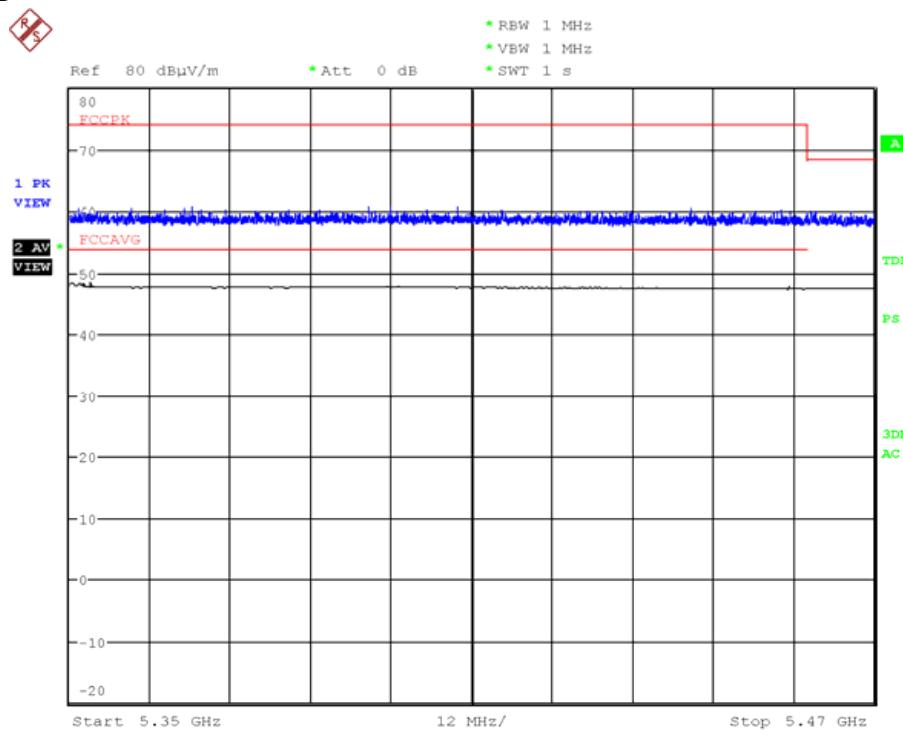
Chain A



Chain B



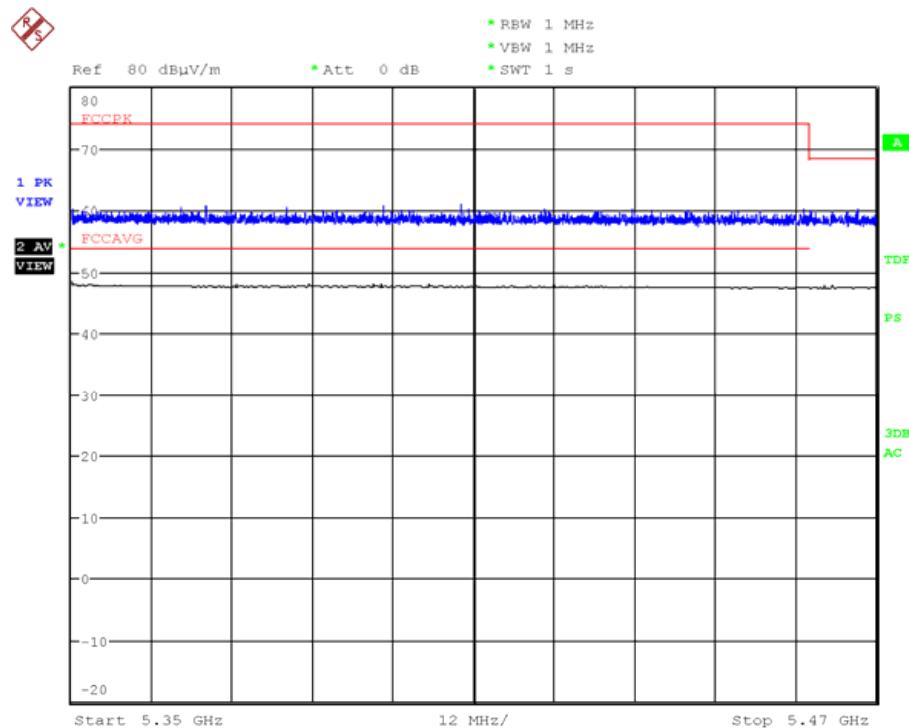
Chain A+B



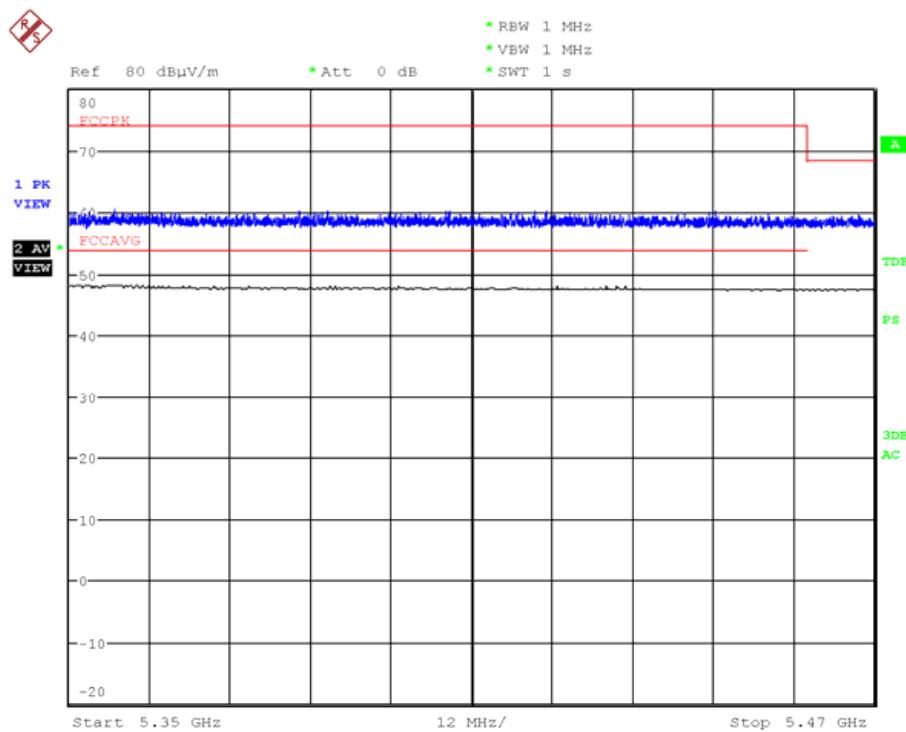
3. WiFi 5GHz 802.11 n40 mode

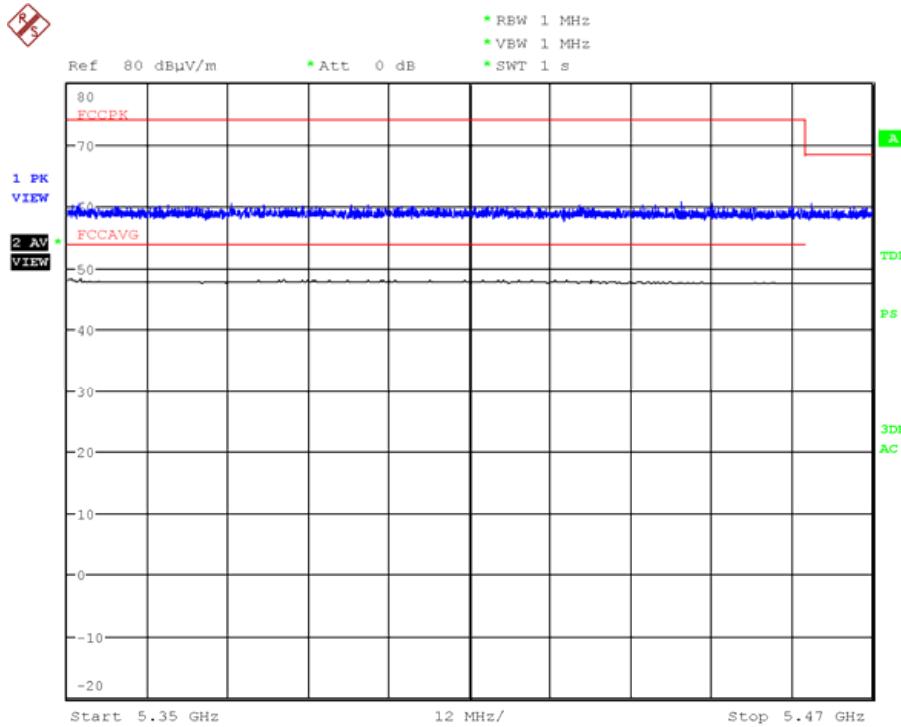
Highest frequency 5310 MHz.

Chain A

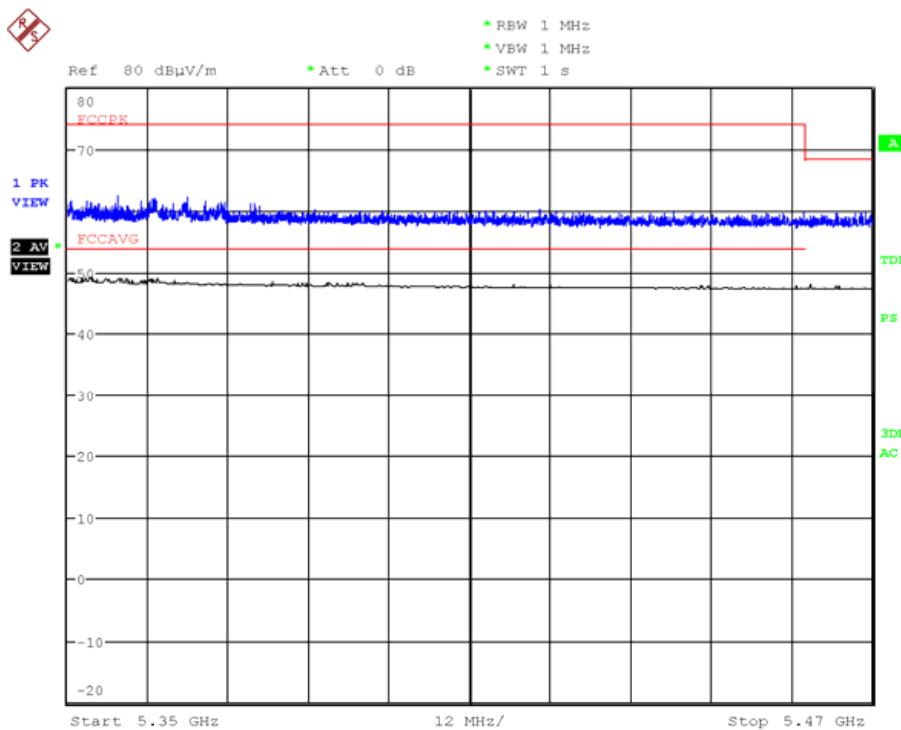


Chain B

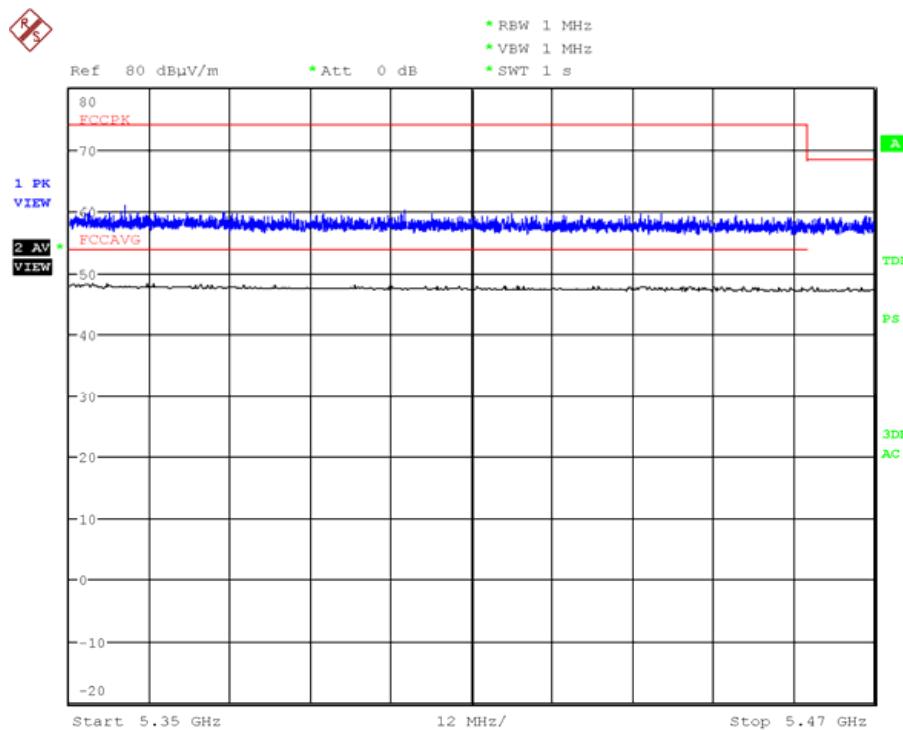


Chain A+B

4. WiFi 5GHz 802.11 ac80 mode

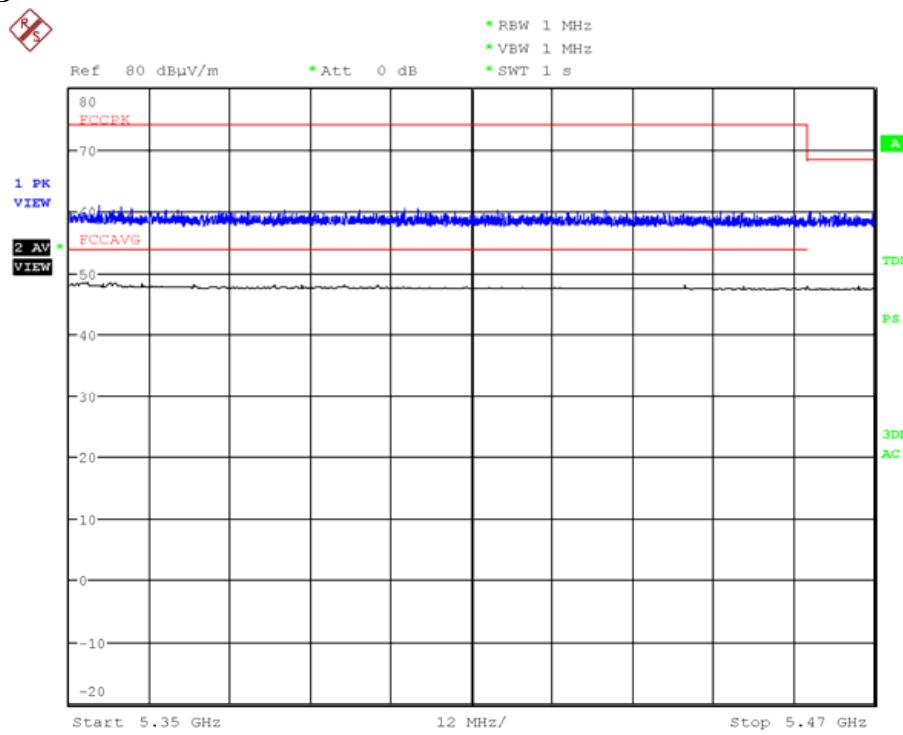
Middle frequency 5290 MHz.

Chain A


Chain B



Chain A+B



APPENDIX C: Test results for 5.47 GHz – 5.725 GHz band

INDEX

TEST CONDITIONS.....	175
99 % and 26 dB Bandwidth	178
Section 15.407 Subclause (a) (2) / RSS-210 A9.2. (3). Maximum output power, Peak power spectral density and antenna gain	201
Section 15.407 Subclause (b) (3) / RSS-210 A9.2. (3). Undesirable radiated emissions (Transmitter) 1 to 40 GHz.....	241

TEST CONDITIONS

Power supply (V):

$V_{nominal} = 3.3 \text{ Vdc}$

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

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 4.8 dBi

Operating frequencies in the sub-band 5.47-5.725 GHz.

-For IEEE 802.11a, the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

-For IEEE 802.11n, there are two bandwidths:

For 20 MHz bandwidth the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

For 40 MHz bandwidth the equipment uses channels 102, 110, 118, 126, 134.

-For IEEE 802.11ac, there are three bandwidths:

For 20 MHz bandwidth the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144.

For 40 MHz bandwidth the equipment uses channels 102, 110, 118, 126, 134, 142.

For 80 MHz bandwidth the equipment uses channels 106, 122, 138.

TEST FREQUENCIES:

For WiFi a/n20/ac20:

Lowest channel (100): 5500 MHz

Middle channel (120): 5600 MHz

Highest channel (140) 5700 MHz for 802.11n20 and 5720 MHz (144) for 802.11ac20

For WiFi n40/ac40:

Lowest channel (102): 5510 MHz

Middle channel (118): 5590 MHz

Highest channel (134) 5670 MHz for 802.11n40 and 5710 MHz (142) for 802.11ac40

For WiFi ac80:

Lowest channel (106): 5530 MHz

Middle channel (122): 5610 MHz

Highest channel (138): 5690 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 v02 dated 05/28/2013.

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, HT4 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT6 (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 1.7.1-752 & DRTU 1.7.1-777”

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.	SISO Chain A (dBm)	SISO Chain B (dBm)	MIMO at both ports A and B (dBm)
5.47–5.725 GHz Band					
802.11a	20	100 / 5500	12	12	n/a
		104 / 5520	16,5	16,5	n/a
		120 / 5600	16,5	16,5	n/a
		136 / 5680	16	15	n/a
		140 / 5700	11,5	13	n/a
802.11n	20	100 / 5500	12	12	9,00
		104 / 5520	16,5	16,5	13,50
		120 / 5600	16,5	16,5	13,50
		136 / 5680	16	15	13,50
		140 / 5700	11,5	13	11,00
802.11n*	40	102 / 5510	9	9	7,00
		110 / 5550	16,5	16,5	13,50
		118 / 5590	16,5	16,5	13,50
		134 / 5670	15,5	14,5	12,00
802.11ac	20	144 / 5720	16,5	16,5	13,50
802.11ac	40	142 / 5710	16,5	16,5	13,50
802.11ac	80	106 / 5530	8,5	8,5	6,50
		122 / 5610	13	13	11,50
		138 / 5690	15	15	13,50

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 360°.

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 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	17.900	19.000	17.950
26 dB bandwidth (MHz)	27.010	33.008	26.871
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	17.950	21.550	18.050
26 dB bandwidth (MHz)	26.379	39.832	27.795
Measurement uncertainty (kHz)	± 21.7		

2. 802.11 n20 MHz and 802.11 ac 20 MHz (except channel 144) modes. (see next plots).

CHAIN A

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	18.600	19.250	18.550
26 dB bandwidth (MHz)	24.869	31.528	25.317
Measurement uncertainty (kHz)	± 21.7		

CHAIN B

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	18.650	19.450	18.650
26 dB bandwidth (MHz)	24.839	33.532	26.149
Measurement uncertainty (kHz)	± 21.7		

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

802.11 ac 20MHz (channel 144):

CHAIN A

	Frequency 5720 MHz
99% bandwidth (MHz)	23.220
26 dB bandwidth (MHz)	27.876 in UNII_3, 16.049 in UNII_4 and 43.934 (Total)
Measurement uncertainty (kHz)	±21.7

CHAIN B

	Frequency 5720 MHz
99% bandwidth (MHz)	22.500
26 dB bandwidth (MHz)	26.001 in UNII_3, 15.425 in UNII_4 and 41.482 (Total)
Measurement uncertainty (kHz)	±21.7

3. 802.11 n40 MHz and 802.11 ac 40 MHz (except channel 142) modes. (see next plots).

CHAIN A

	Lowest frequency 5510 MHz	Middle frequency 5590 MHz	Highest frequency 5670 MHz
99% bandwidth (MHz)	36.500	38.500	37.000
26 dB bandwidth (MHz)	42.302	72.275	62.128
Measurement uncertainty (kHz)	±21.7		

CHAIN B

	Lowest frequency 5510 MHz	Middle frequency 5590 MHz	Highest frequency 5670 MHz
99% bandwidth (MHz)	36.400	37.500	36.600
26 dB bandwidth (MHz)	42.212	66.826	45.953
Measurement uncertainty (kHz)	±21.7		

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

802.11 ac 40MHz (channel 142):

CHAIN A

	Frequency 5710 MHz
99% bandwidth (MHz)	37.200
26 dB bandwidth (MHz)	45.787 in UNII_3, 11.171 in UNII_4 and 56.844 (Total)
Measurement uncertainty (kHz)	±21.7

CHAIN B

	Frequency 5710 MHz
99% bandwidth (MHz)	37.600
26 dB bandwidth (MHz)	50.369 in UNII_3, 13.189 in UNII_4 and 63.510 (Total)
Measurement uncertainty (kHz)	±21.7

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

CHAIN A

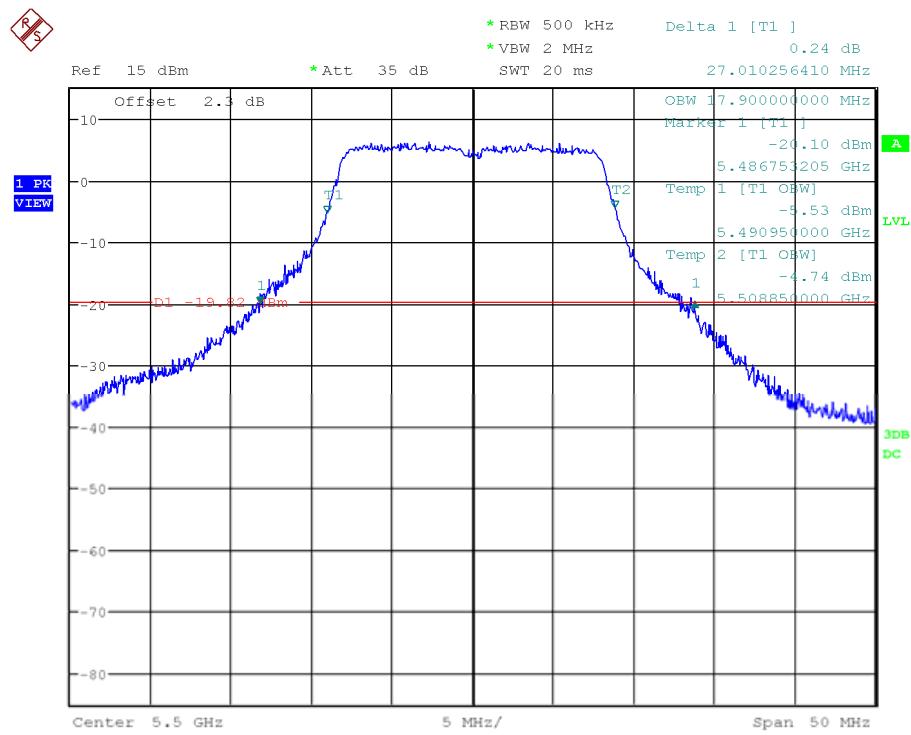
	Lowest frequency 5530 MHz	Highest frequency 5610 MHz	Highest frequency 5690 MHz
99% bandwidth (MHz)	75.000	75.150	75.450
26 dB bandwidth (MHz)	81.009	88.021	87.088 in UNII_3+5.598 in UNII_4 and 92.617 (Total)
Measurement uncertainty (kHz)	±21.7		

CHAIN B

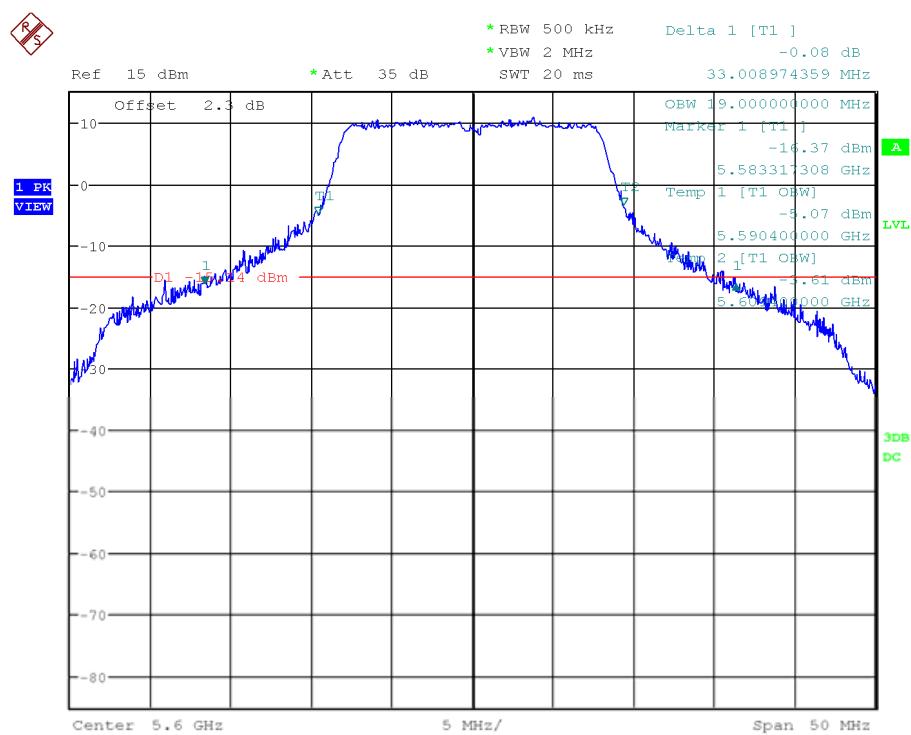
	Lowest frequency 5530 MHz	Highest frequency 5610 MHz	Highest frequency 5690 MHz
99% bandwidth (MHz)	74.850	75.150	75.750
26 dB bandwidth (MHz)	81.730	88.130	96.153 in UNII_3+ 18.509 in UNII_4 and 114.663 (Total)
Measurement uncertainty (kHz)	±21.7		

802.11a mode CHAIN A

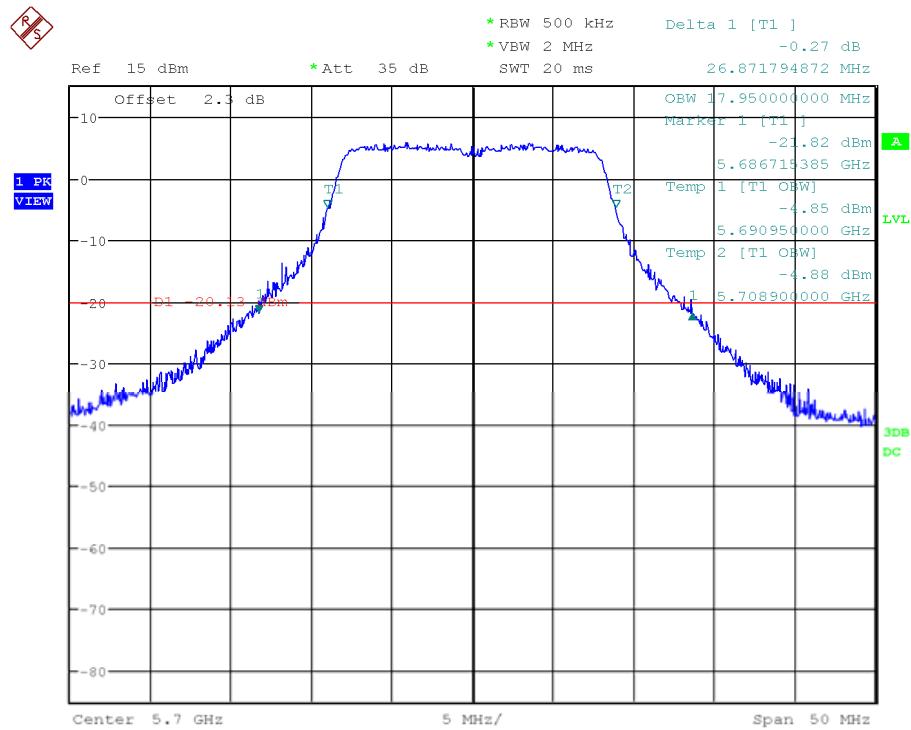
Lowest Channel



Middle Channel

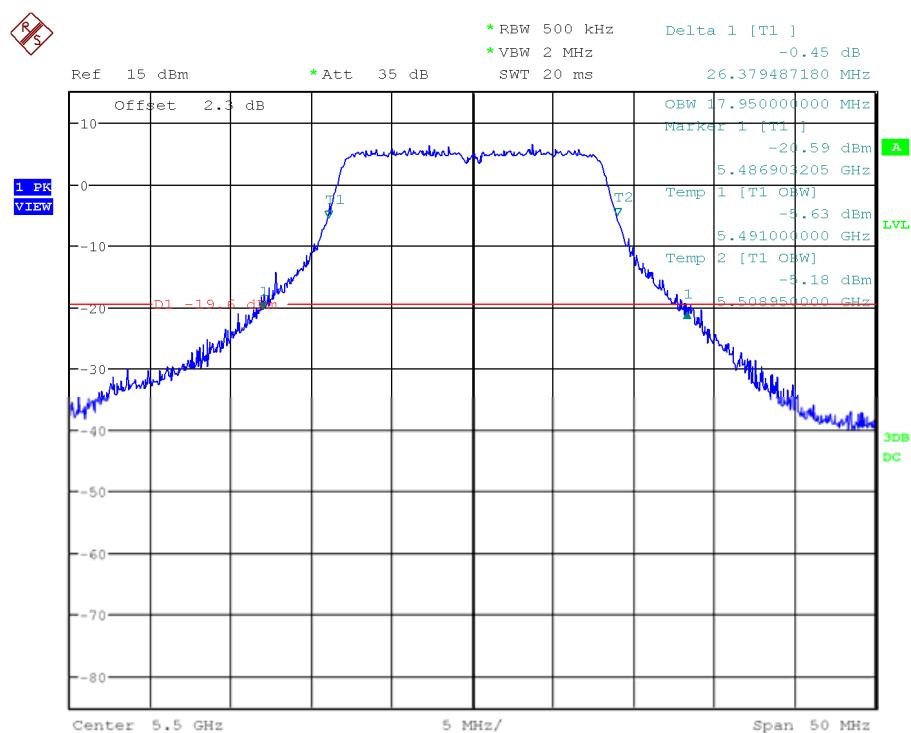


Highest Channel

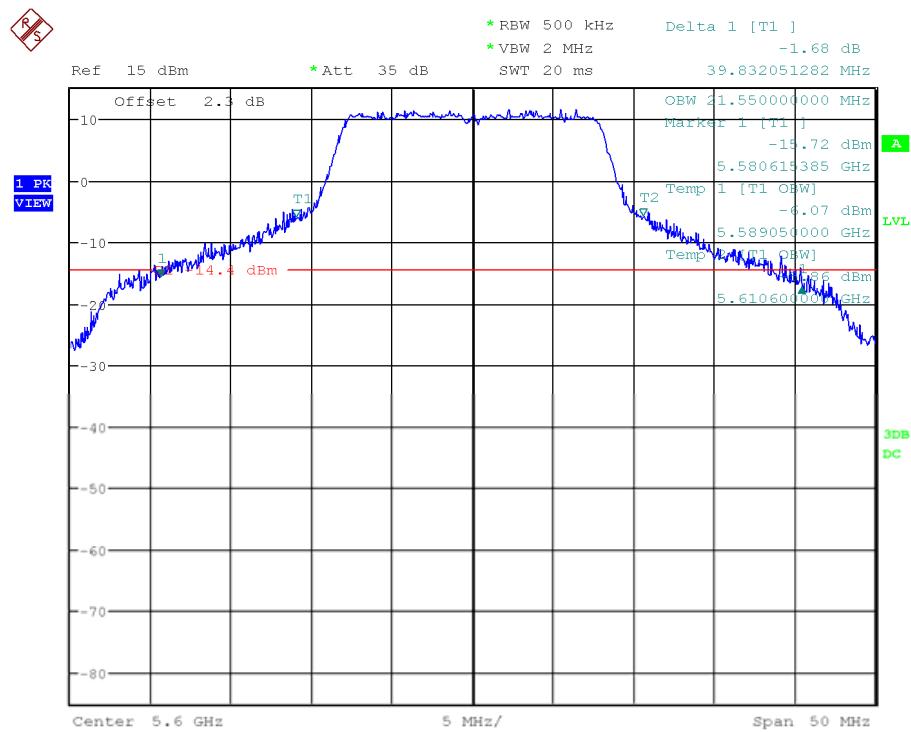


802.11a mode CHAIN B

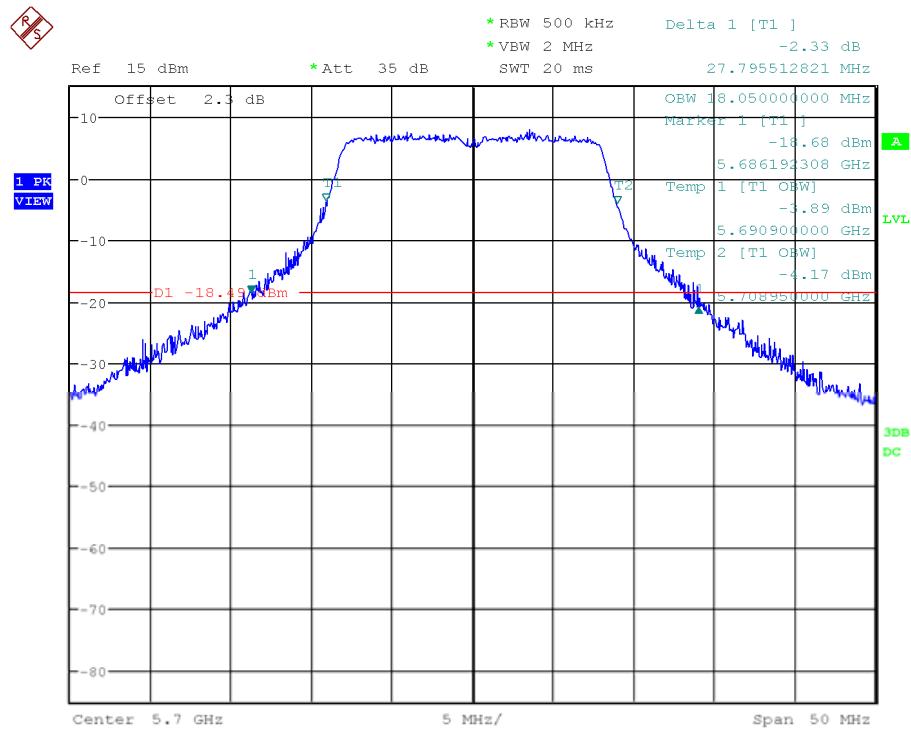
Lowest Channel



Middle Channel

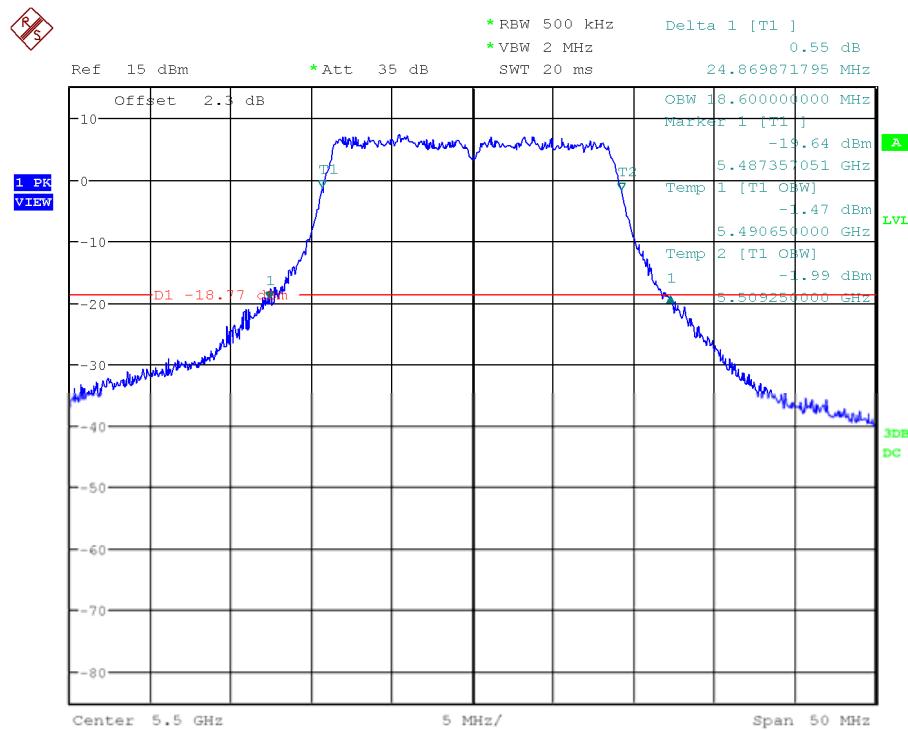


Highest Channel

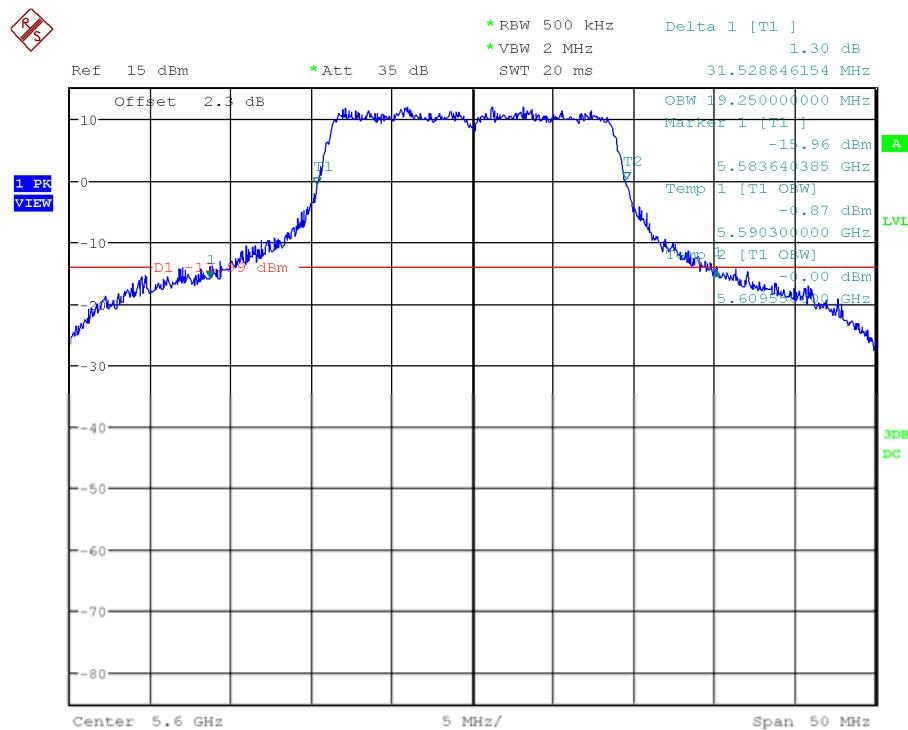


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN A

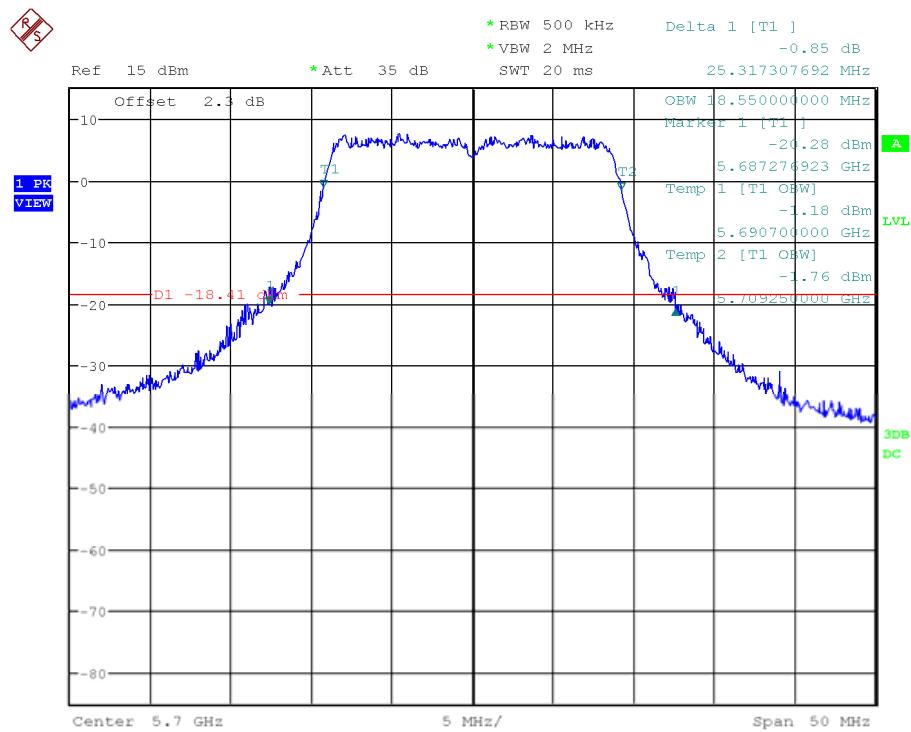
Lowest Channel



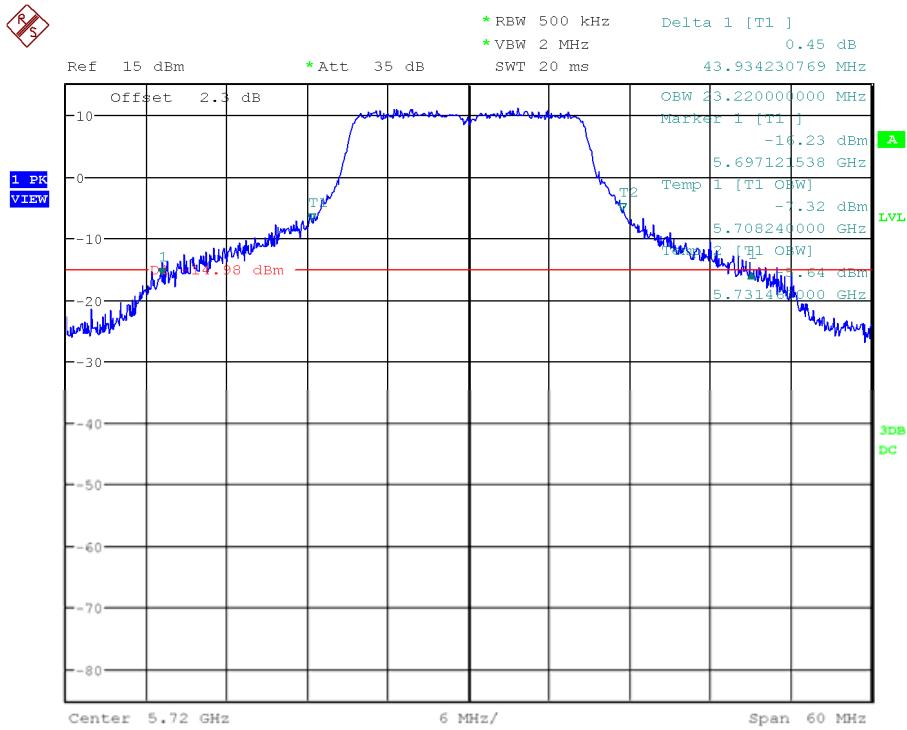
Middle Channel



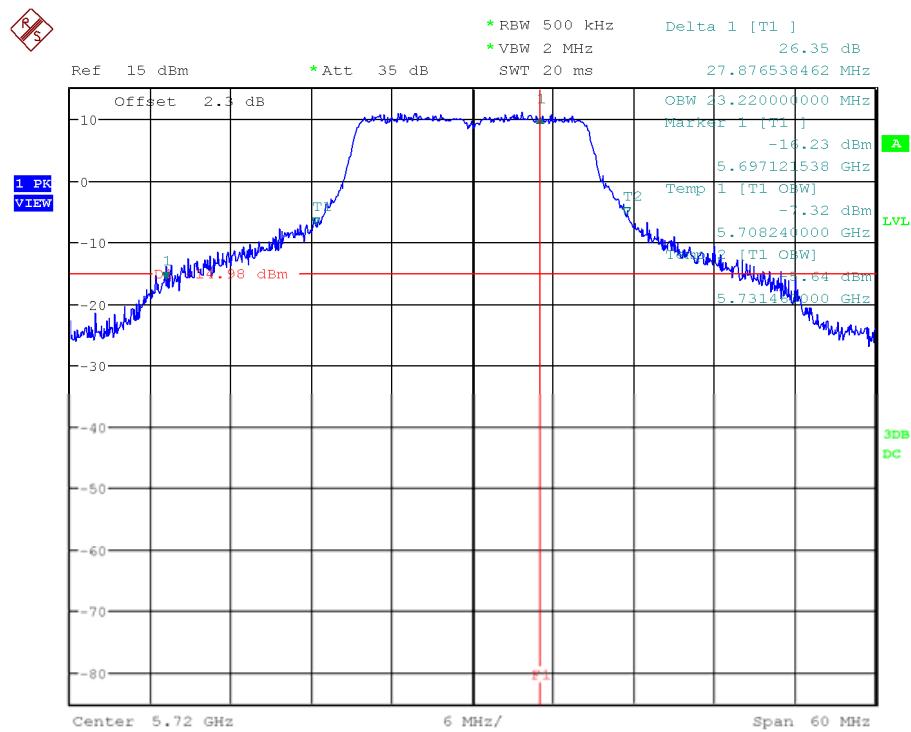
Highest Channel



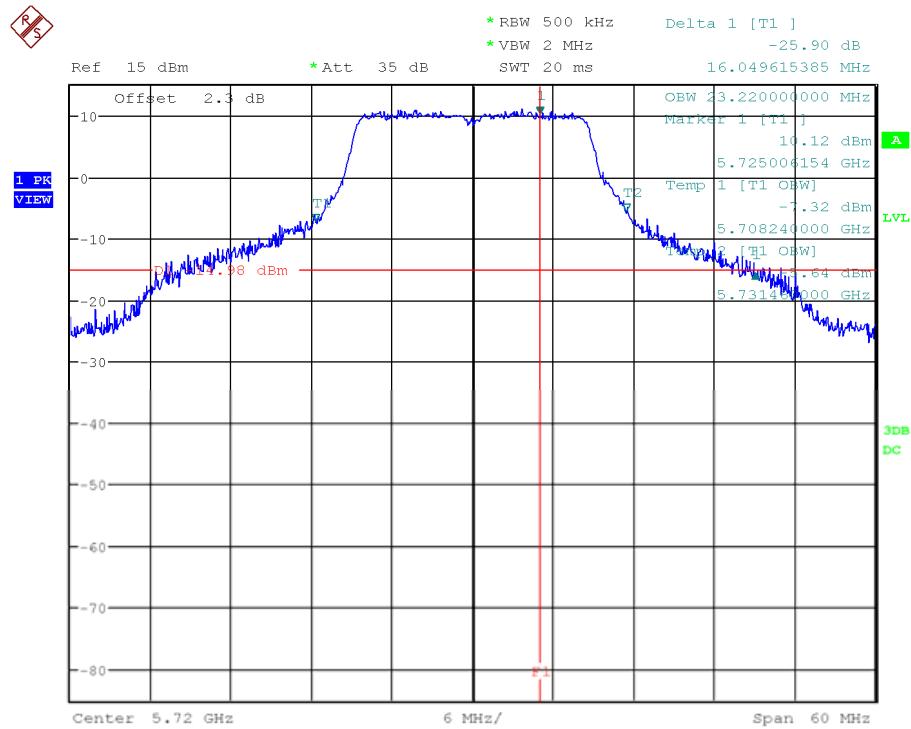
802.11 ac 20MHz: Channel 144. Total Bandwidth



26 dB BW inside UNII_3 sub-band:

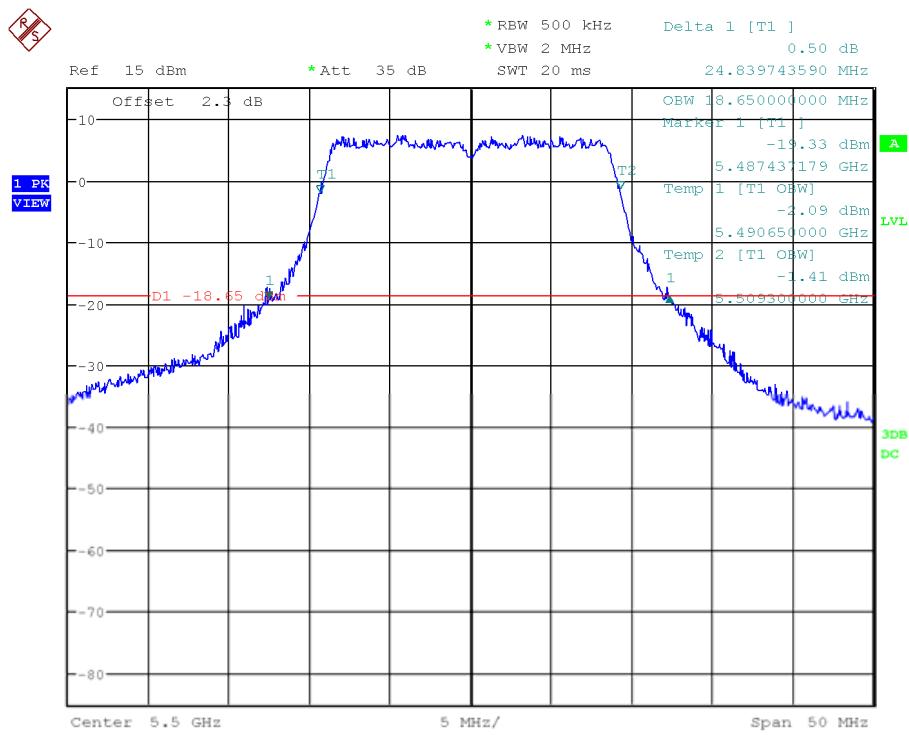


26 dB BW inside UNII_4 sub-band:

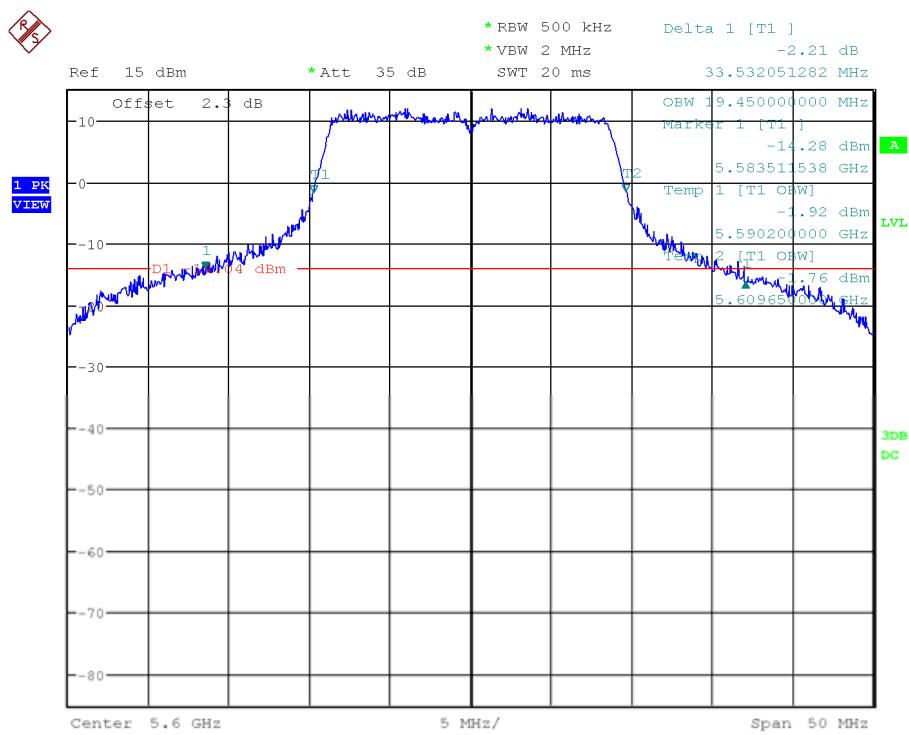


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN B

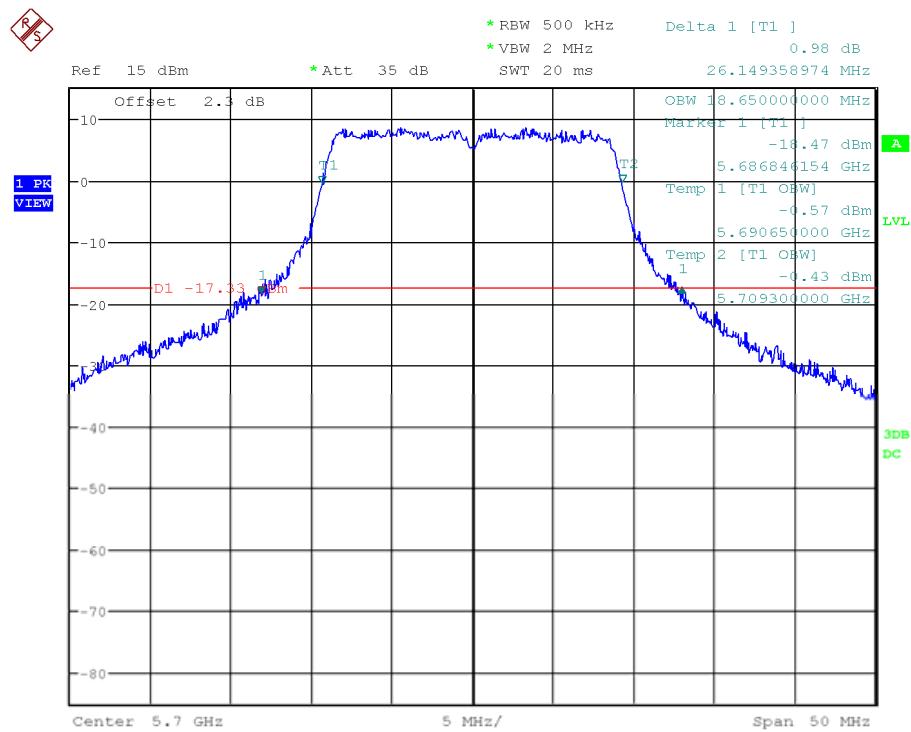
Lowest Channel



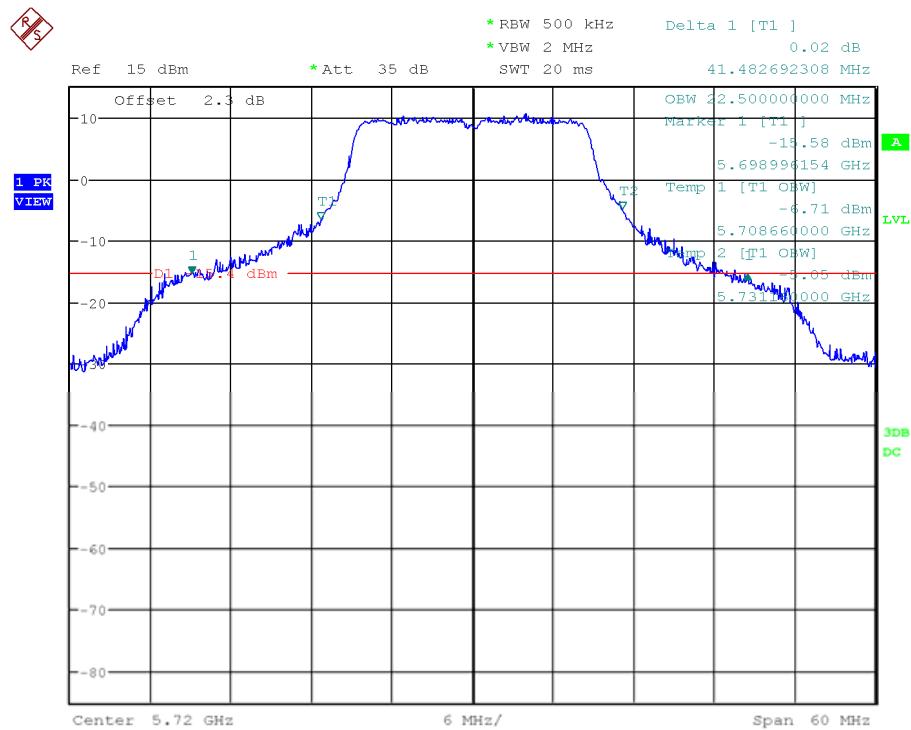
Middle Channel



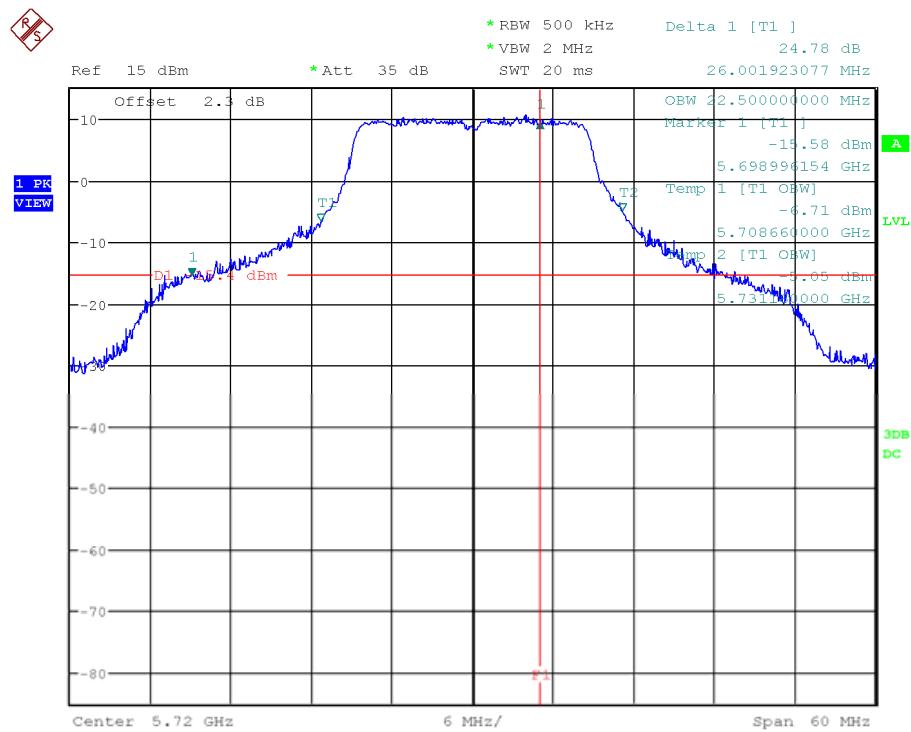
Highest Channel



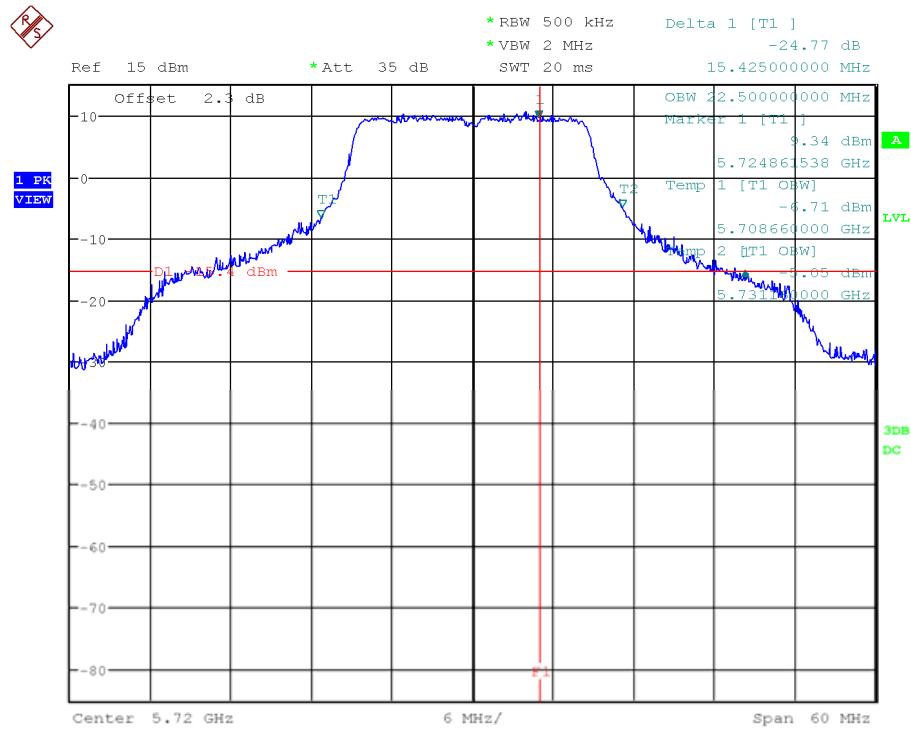
802.11 ac 20MHz: Channel 144. Total Bandwidth.



26 dB BW inside UNII_3 sub-band:

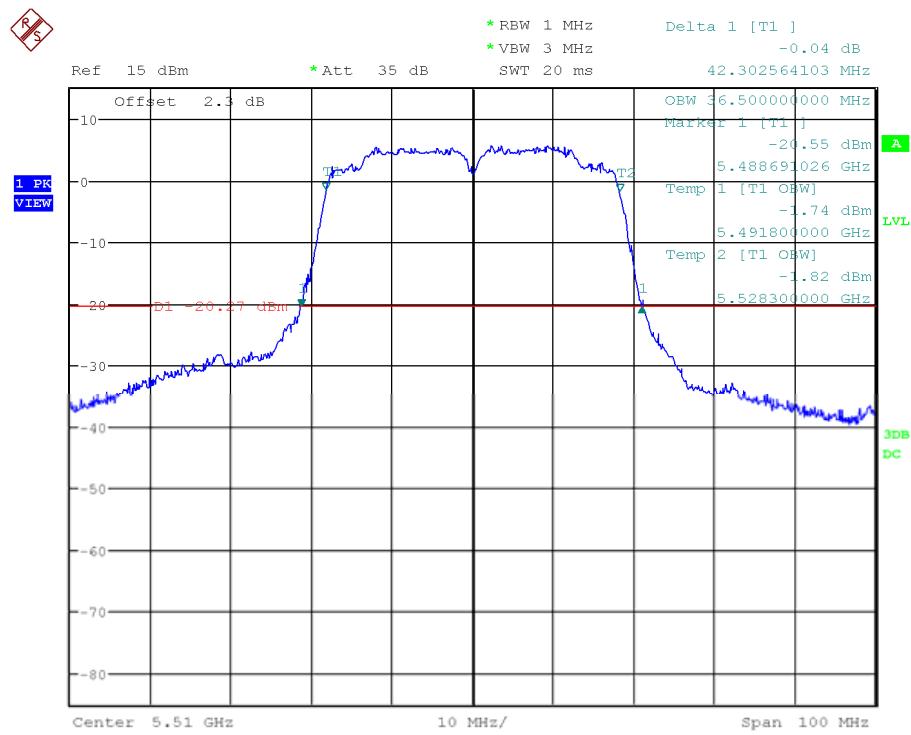


26 dB BW inside UNII_4 sub-band:

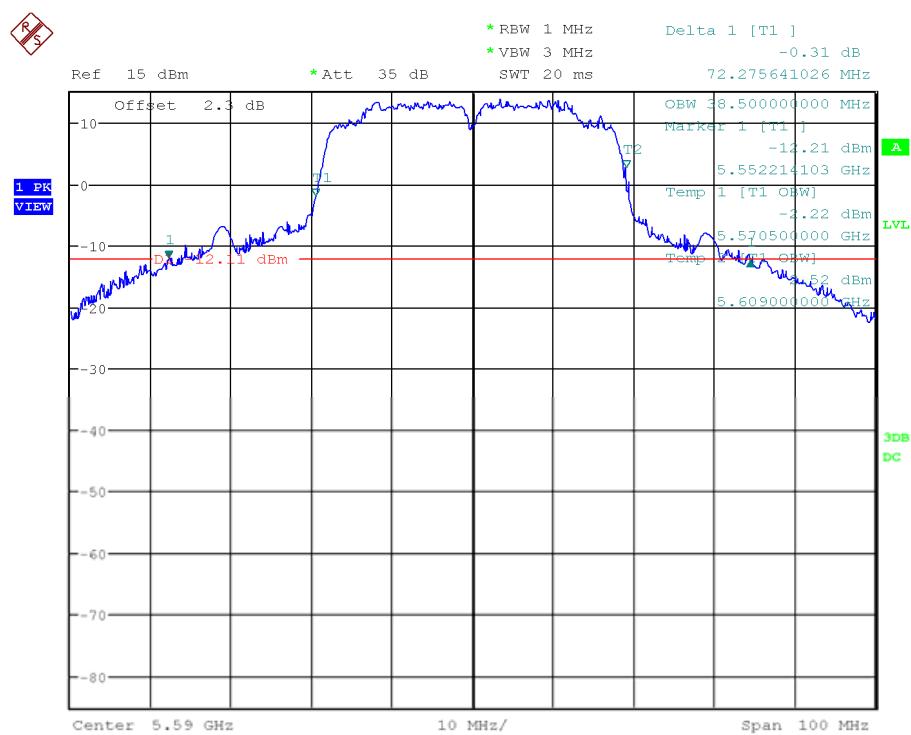


802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142) CHAIN A

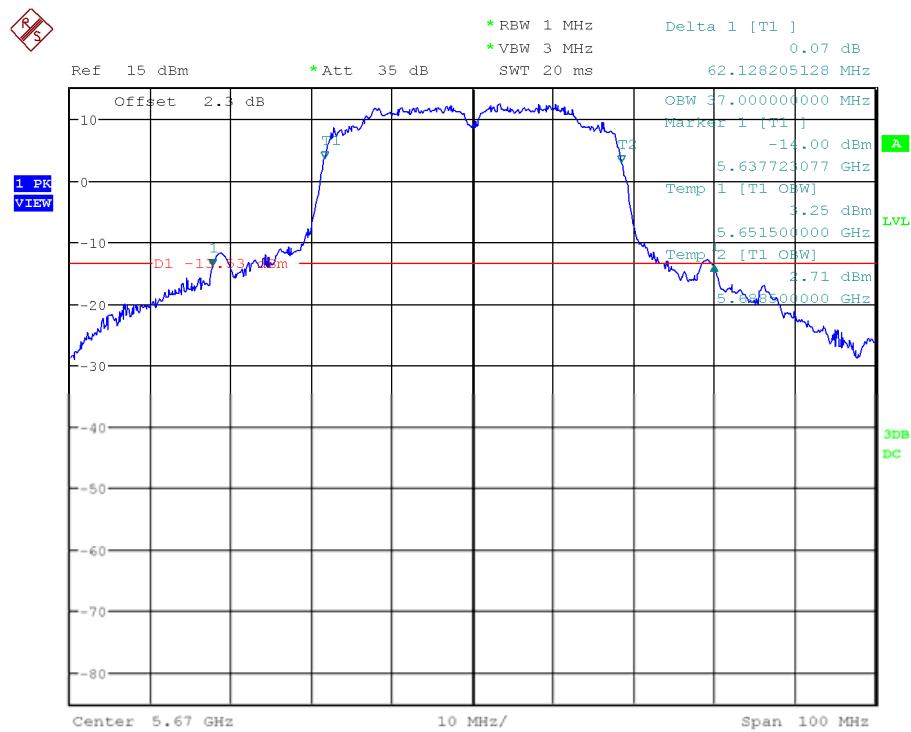
Lowest Channel



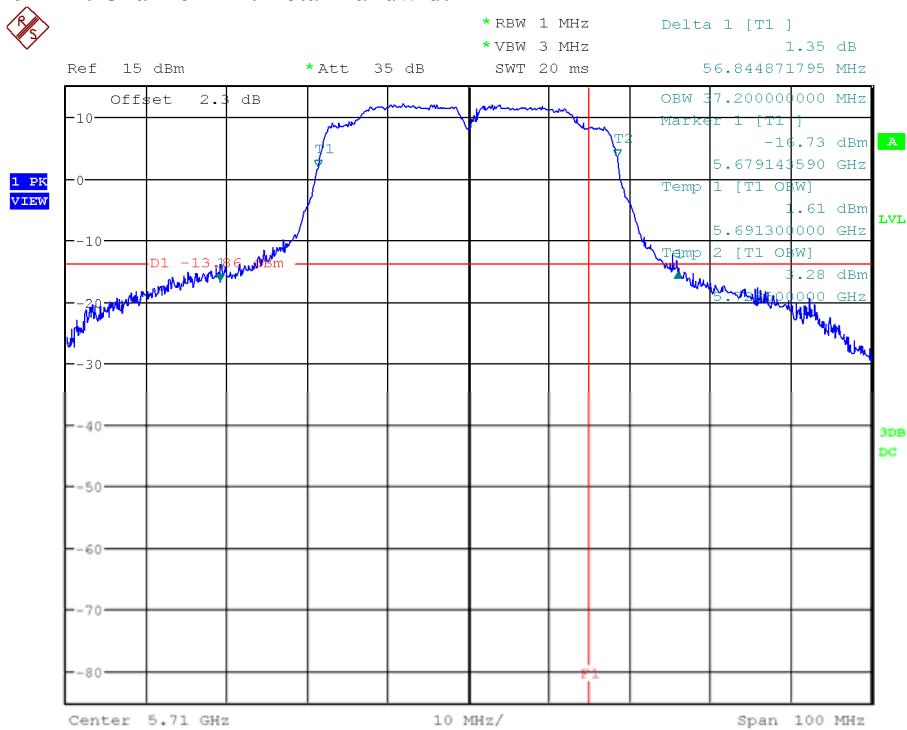
Middle Channel



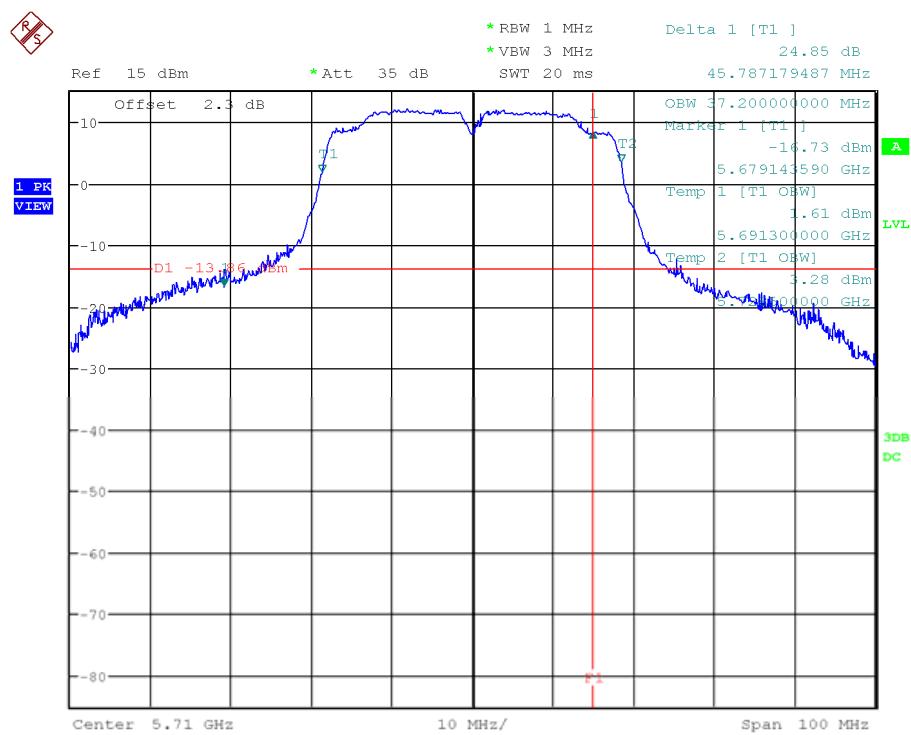
Highest Channel



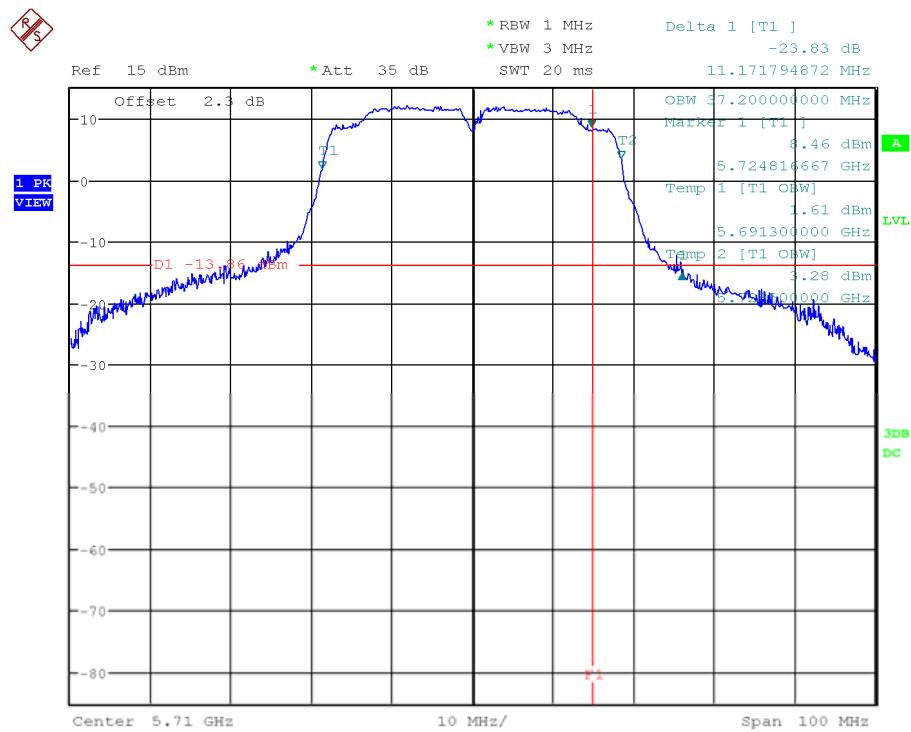
802.11 ac 40MHz: Channel 142. Total Bandwidth



26 dB BW inside UNII_3 sub-band:

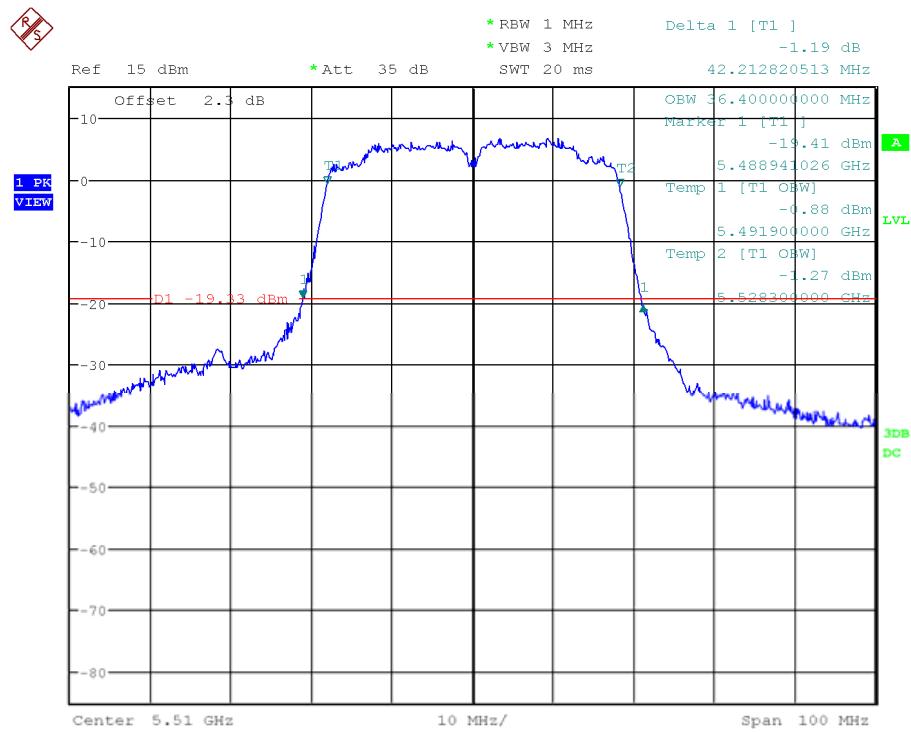


26 dB BW inside UNII_4 sub-band:

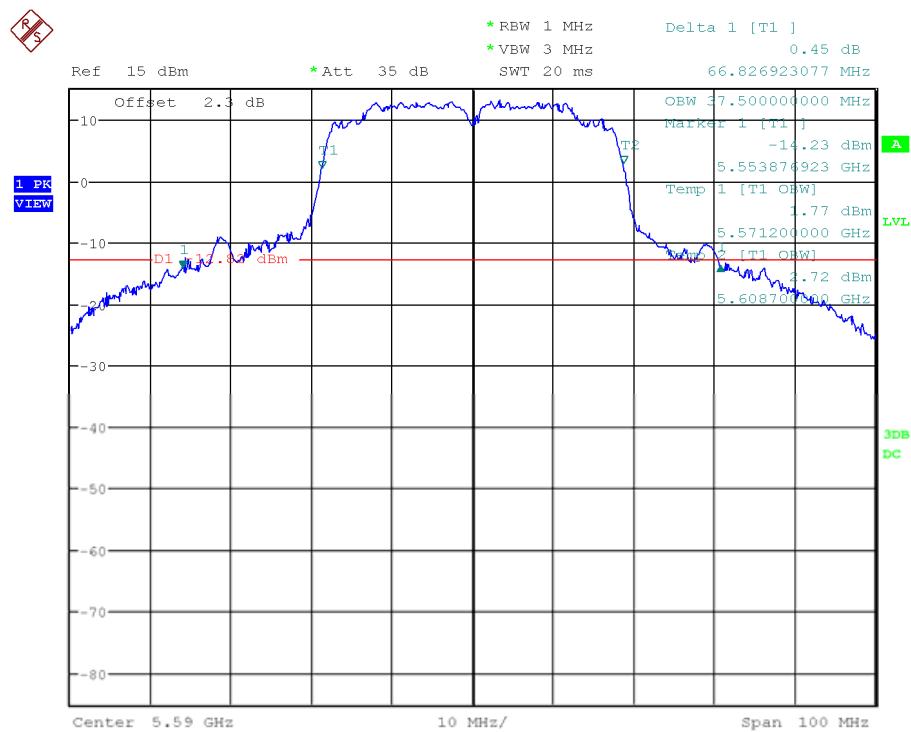


802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142) CHAIN B

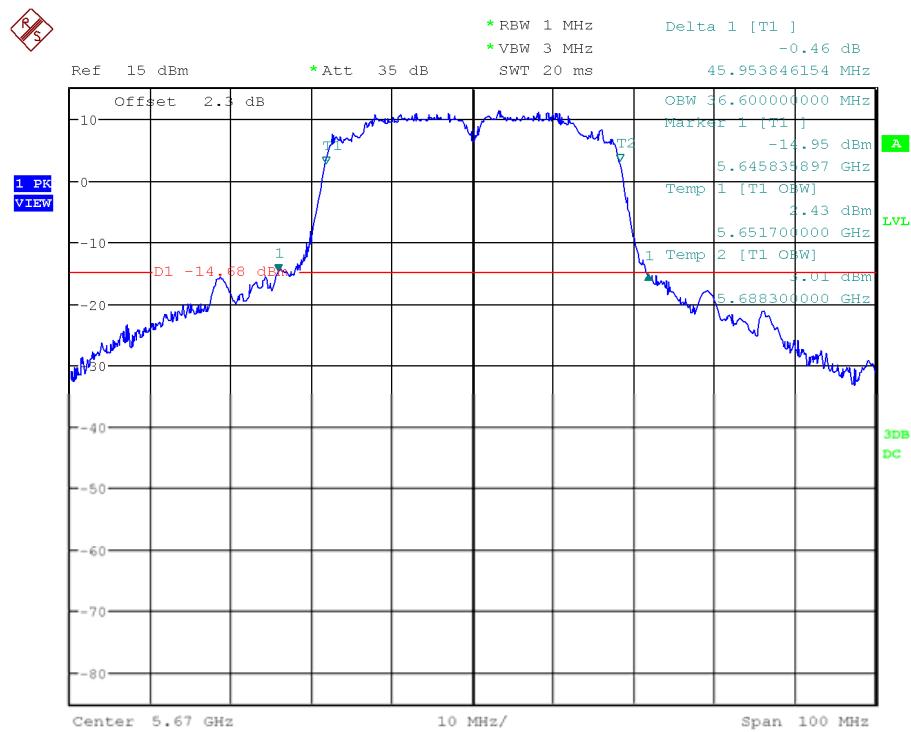
Lowest Channel



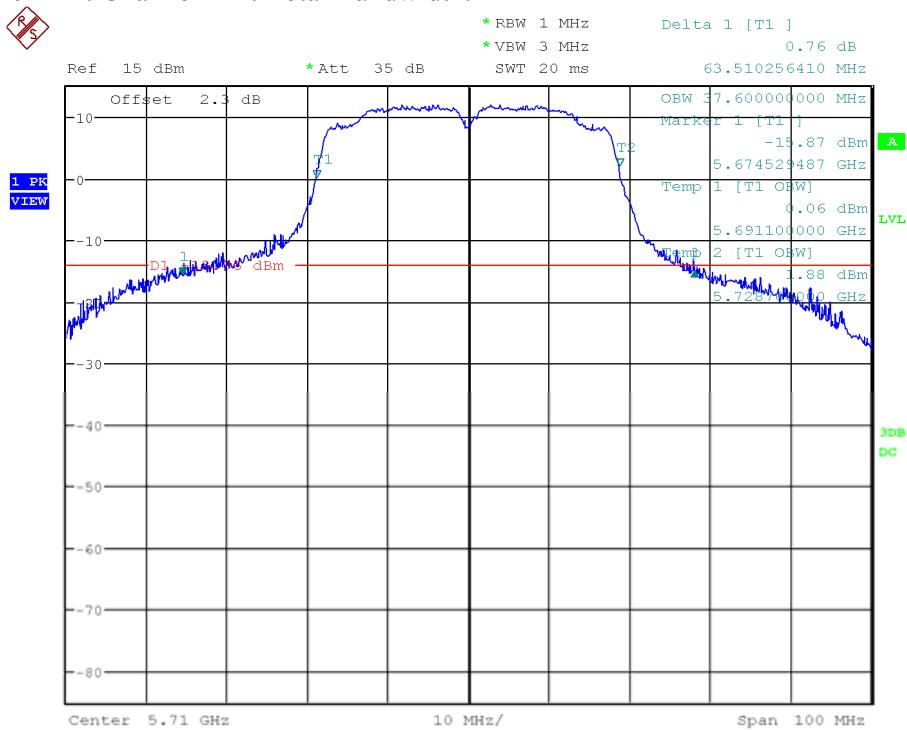
Middle Channel



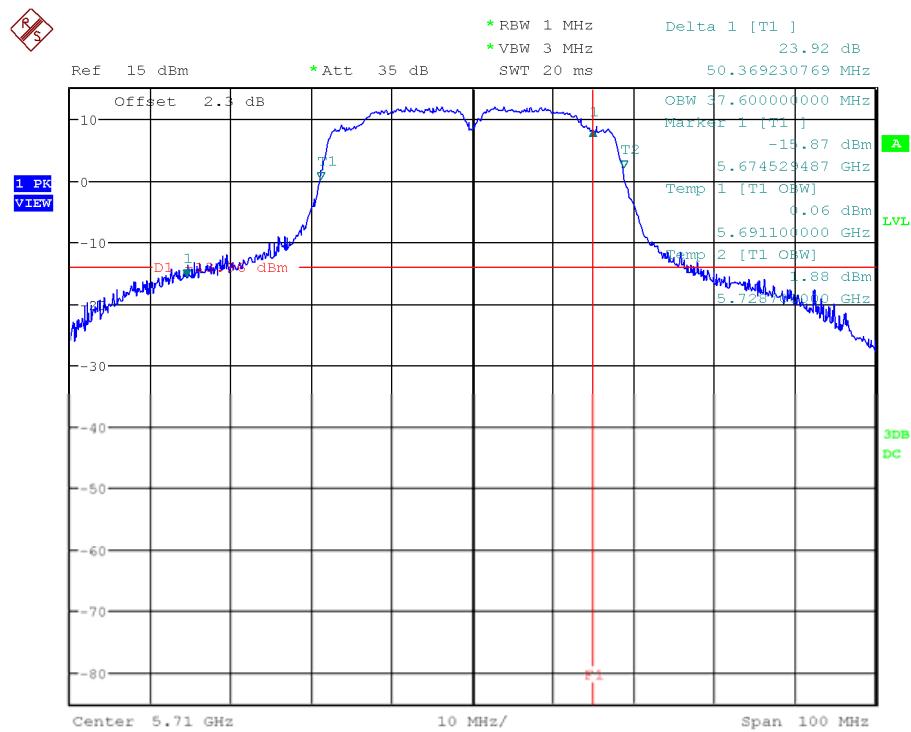
Highest Channel



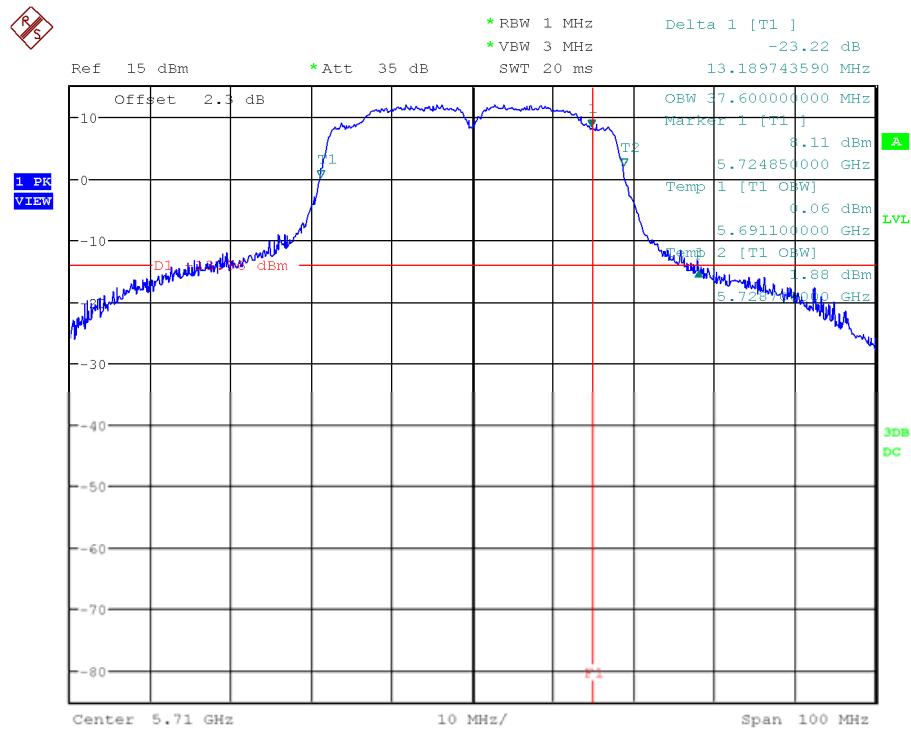
802.11 ac 40MHz: Channel 142. Total Bandwidth.



26 dB BW inside UNII_3 sub-band:

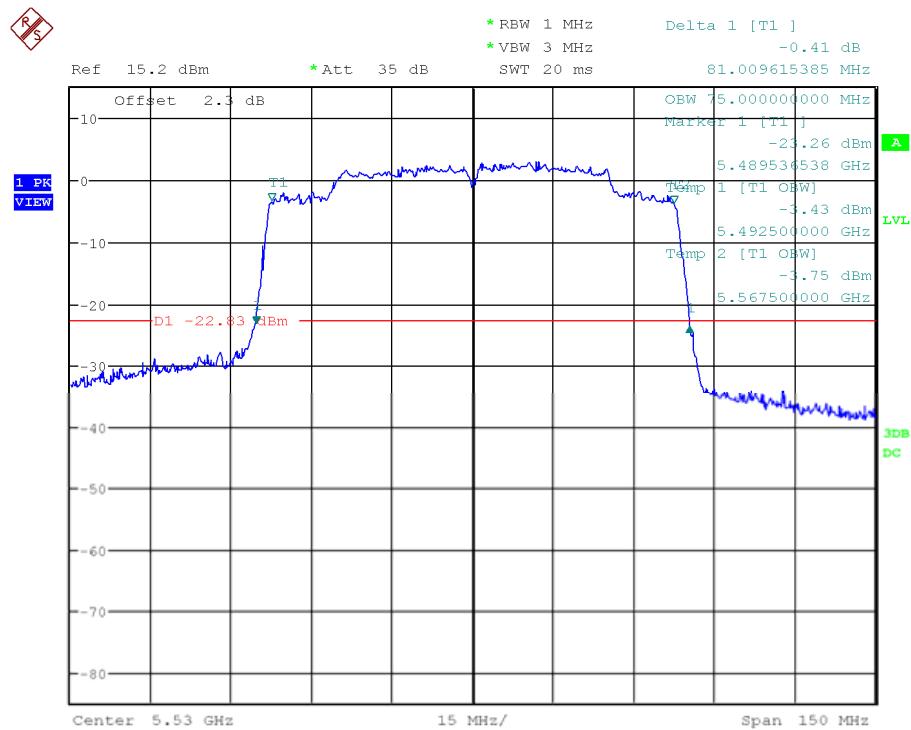


26 dB BW inside UNII_4 sub-band:

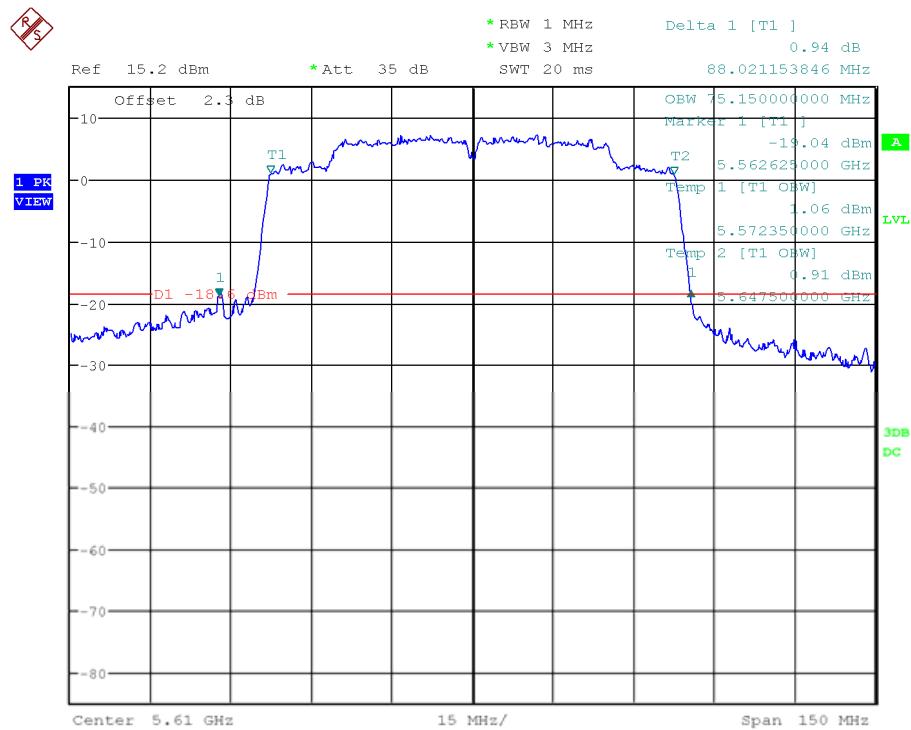


802.11 ac 80 MHz mode (except channel 138) CHAIN A

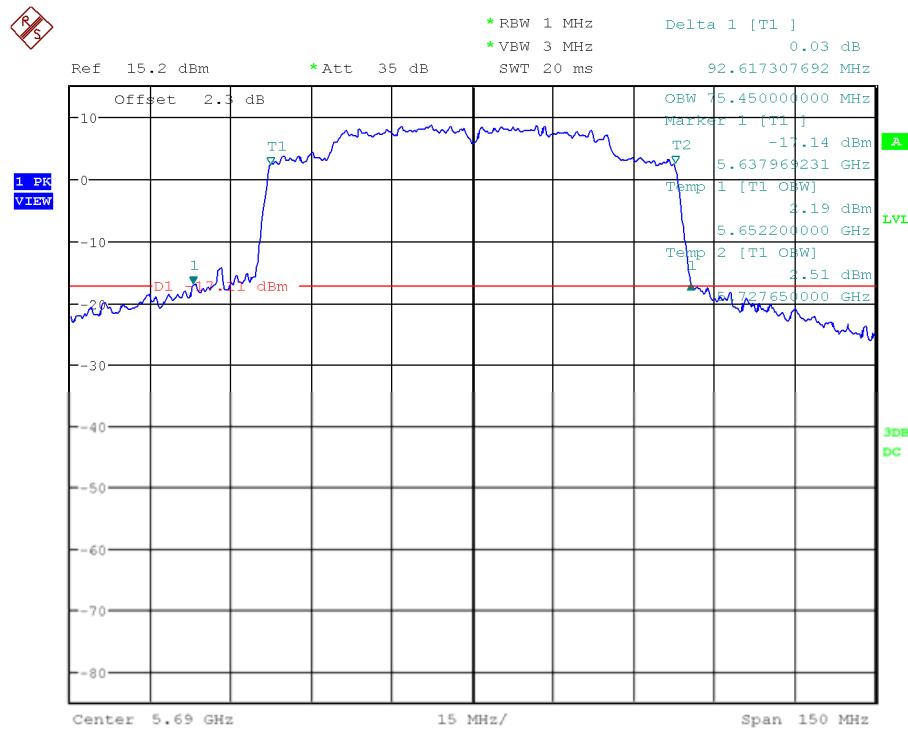
Lowest Channel



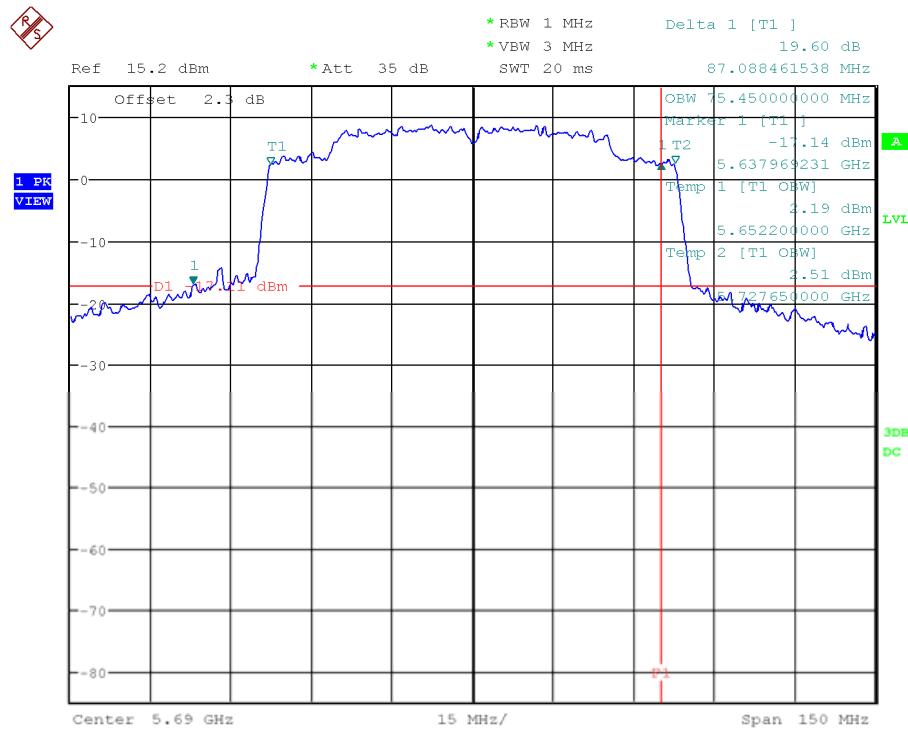
Middle Channel



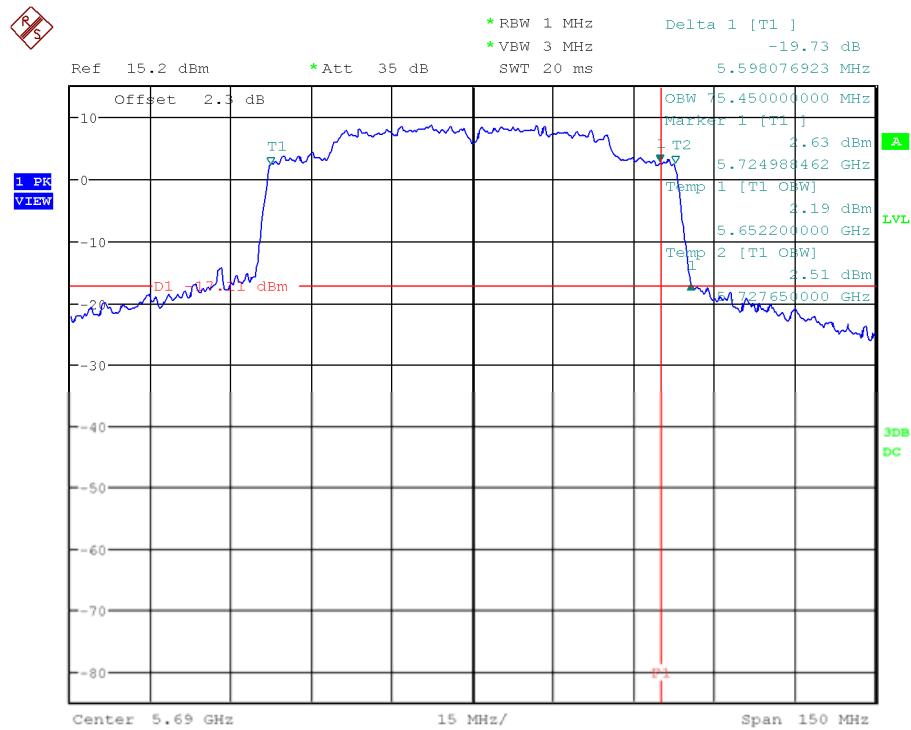
802.11 ac 80MHz: Channel 138. Total Bandwidth.



26 dB BW inside UNII_3 sub-band:

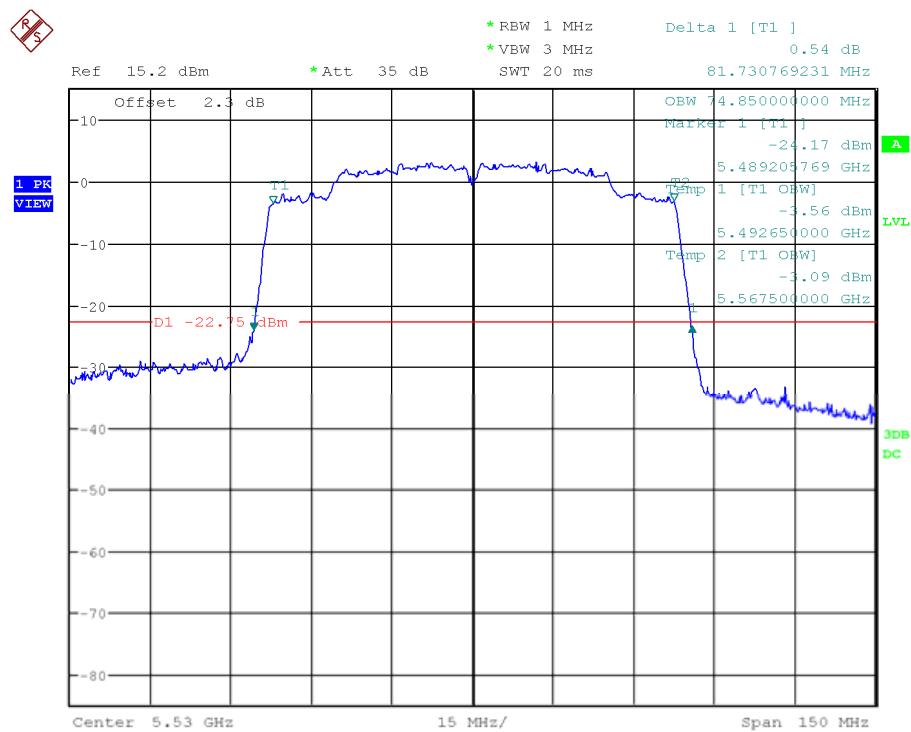


26 dB BW inside UNII_4 sub-band:

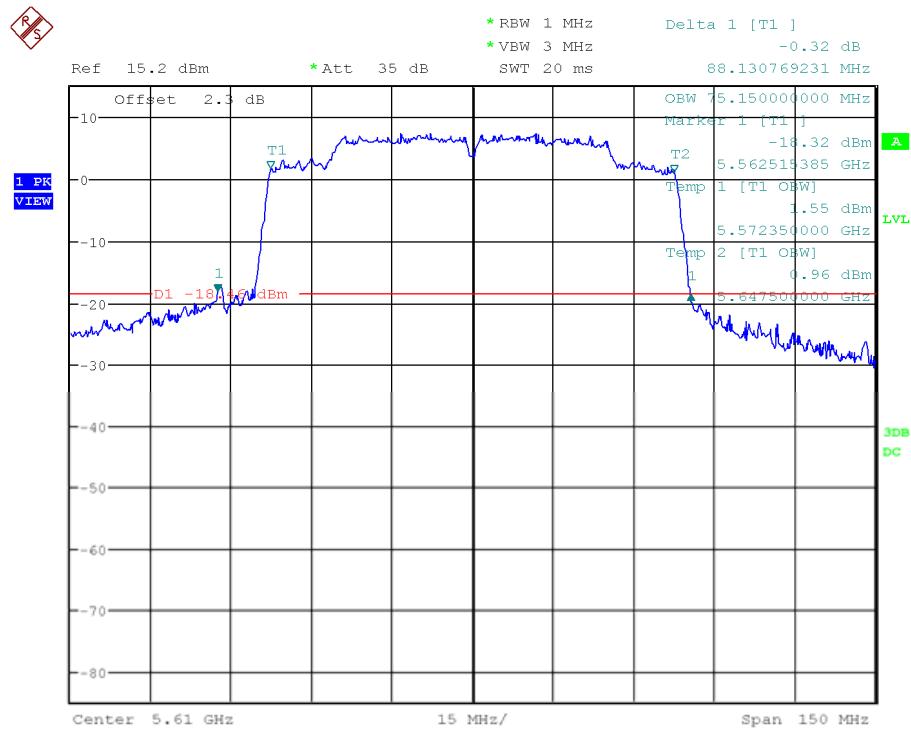


802.11 ac 80 MHz mode (except channel 138) CHAIN B

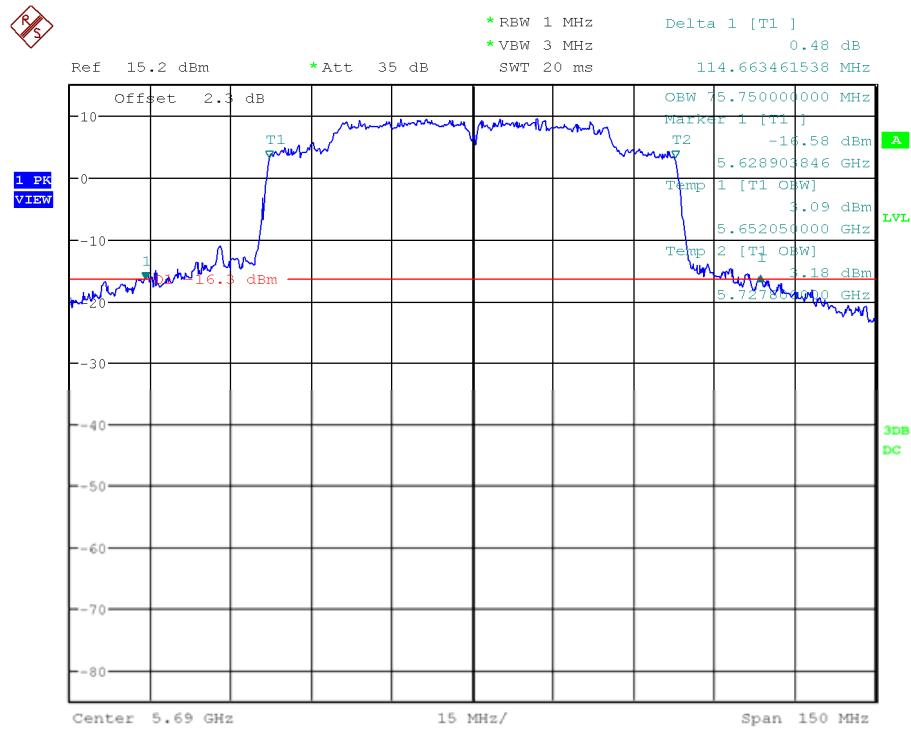
Lowest Channel



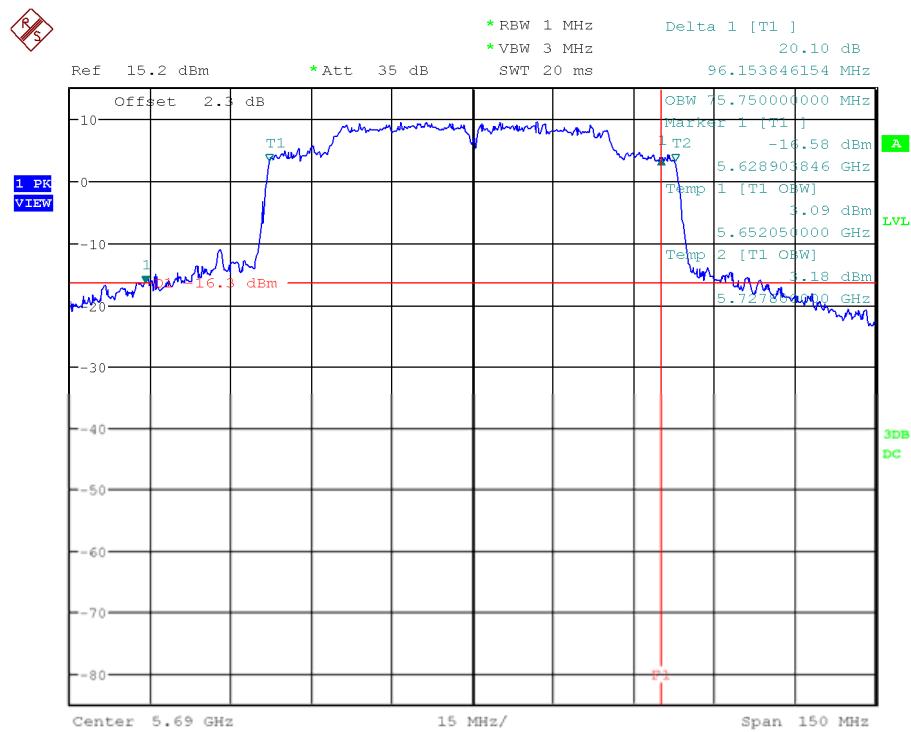
Middle Channel



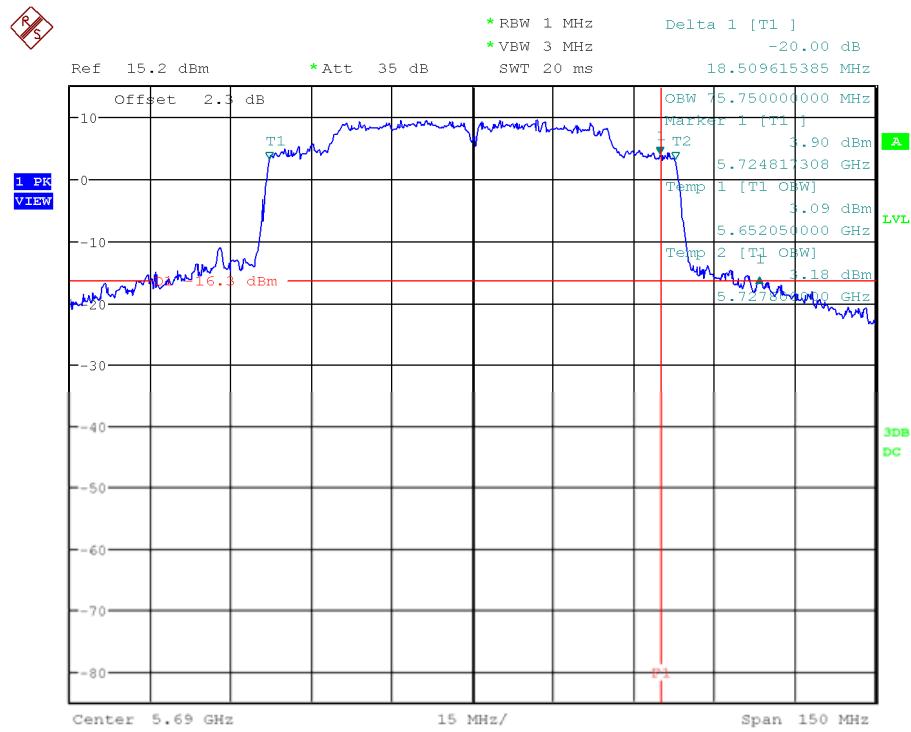
802.11 ac 80MHz: Channel 138. Total Bandwidth.



26 dB BW inside UNII_3 sub-band:



26 dB BW inside UNII_4 sub-band:



Section 15.407 Subclause (a) (2) / RSS-210 A9.2. (3). Maximum output power, Peak power spectral density and antenna gain

SPECIFICATION

FCC 15.407: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (23.97 dBm) or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak 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 peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W (30 dBm) or $17 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 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: For the band 5.47-5.725 GHz the maximum conducted output power shall not exceed 250 mW (23.97 dBm) or $10 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W (30 dBm) or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

For the band 5.725–5.825 GHz the maximum conducted output power shall not exceed 1.0 W (30 dBm) or $17 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average ($10 \log_{10} B$) 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.

For channel 144 ac20MHz, channel 142 ac40 MHz and channel 138 ac80MHz the maximum conducted output power was measured using the method according to point H) 2) b) (ii) (Integration across the entire U-NII band) of the Guidance for IEEE 802.11ac and Pre-ac Device Emissions Testing “Guidance 644545 V01 for IEEE802.11ac”. 644545 D01 Guidance for IEEE 802.11ac v01r01 dated 04/08/2013.

Conducted output power within a U-NII band: Integrate over the band or integrate over a span including the 26-dB EBWs of transmission segments within the band or integrate over 26-dB EBW of each transmission segment in the band and sum.

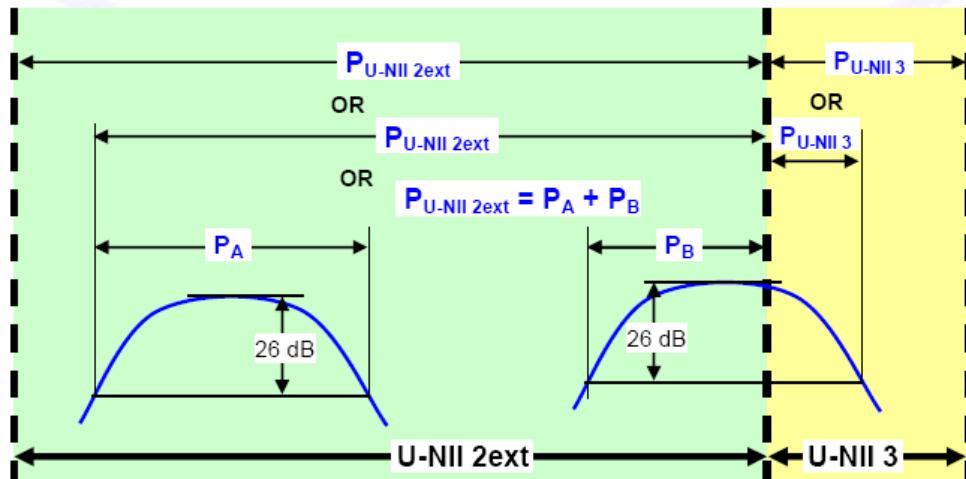


Figure 6. Conducted Output Power Measurement Examples

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).

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 = 4.8 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)
5500 MHz	11.81	16.61	1.01	5.81
5600 MHz	16.62	21.42	5.91	10.71
5700 MHz	11.23	16.03	0.332	5.132

CHAIN B

Maximum declared antenna gain = 4.8 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)
5500 MHz	11.94	16.74	1.039	5.839
5600 MHz	16.88	21.68	5.827	10.627
5700 MHz	13.49	18.29	2.429	7.229

Measurement uncertainty = ± 1.5 dB

Verdict: Pass

2. 802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144). (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 = 4.8 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)
5500 MHz	11.75	16.55	1.04	5.84
5600 MHz	16.50	21.30	6.43	11.23
5700 MHz	11.81	16.61	1.27	6.07

CHAIN B

Maximum declared antenna gain = 4.8 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)
5500 MHz	11.90	16.70	1.16	5.96
5600 MHz	16.78	21.58	6.77	11.57
5700 MHz	13.39	18.19	2.87	7.67

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 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
5500 MHz	8.79	9.12	11.97	16.77
5600 MHz	13.32	13.54	16.44	21.24
5700 MHz	10.88	11.36	14.37	19.17

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 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)
5500 MHz	-2.24	-1.90	0.77	1.11	5.57	5.91
5600 MHz	2.34	2.56	5.35	5.57	10.15	10.37
5700 MHz	-0.17	0.28	2.84	3.29	7.64	8.09

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

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

802.11 ac 20MHz. Channel 144
CHAIN A

Maximum declared antenna gain = 4.8 dBi

Frequency	PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band		Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5720 MHz	4.68	4.67	9.48	9.47	14.87	9.63	19.67	14.43

CHAIN B

Maximum declared antenna gain = 4.8 dBi

Frequency	PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band		Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5720 MHz	4.37	4.78	9.17	9.58	14.69	9.65	19.49	14.45

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm)		Total output power e.i.r.p. (dBm)	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5720 MHz	11.81	6.84	11.81	6.88	14.82	9.87	19.62	14.67

Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PPSD/MHz per sub-band Chain A (dBm)		PPSD/MHz per sub-band Chain B (dBm)		Total PPSD/MHz per sub-band Chain A (dBm) ¹		Total PPSD/MHz per sub-band Chain B (dBm) ¹		Total PPSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PPSD/MHz per sub-band Chain B e.i.r.p. (dBm)	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5720 MHz	1.56	2.25	1.83	2.14	4.57	5.26	4.84	5.15	9.37	10.06	9.64	9.95

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

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142). (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 = 4.8 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)
5510 MHz	9.04	13.84	-3.91	0.89
5590 MHz	16.88	21.68	4.13	8.93
5670 MHz	15.72	20.52	2.76	7.56

CHAIN B

Maximum declared antenna gain = 4.8 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)
5510 MHz	9.36	14.16	-3.39	1.41
5590 MHz	16.79	21.59	4.13	8.93
5670 MHz	14.76	19.56	1.81	6.61

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 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
5510 MHz	7.01	7.24	10.14	14.94
5590 MHz	13.80	13.49	16.66	21.46
5670 MHz	12.13	12.23	15.19	19.99

Measurement uncertainty = ±1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 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)
5510 MHz	-6.12	-5.39	-3.11	-2.38	1.69	2.42
5590 MHz	1.47	0.35	4.48	3.36	9.28	8.16
5670 MHz	-0.69	-0.62	2.32	2.39	7.12	11.92

Measurement uncertainty = ±1.5 dB

Verdict: Pass

802.11 ac 40MHz. Channel 142.
CHAIN A

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5710 MHz	15.91	3.6	20.71	8.4	2.88	-0.67	7.68	4.13

CHAIN B

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5710 MHz	15.67	3.17	20.47	7.97	2.54	-0.94	7.34	3.86

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm) per sub-band		Total output power e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5710 MHz	13.2	0.78	12.97	0.75	16.09	3.77	20.89	8.57

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PPSD/MHz per sub-band Chain A (dBm)		PPSD/MHz per sub-band Chain B (dBm)		Total PPSD/MHz per sub-band Chain A (dBm) ¹		Total PPSD/MHz per sub-band Chain B (dBm) ¹		Total PPSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PPSD/MHz Chain B e.i.r.p. per sub-band (dBm)	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5710 MHz	0.5	-2.93	0.27	-2.69	3.51	0.08	3.28	0.32	8.31	4.88	8.08	5.11

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

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

4. 802.11 ac 80 MHz mode (except channel 138). (see next plots).

CHAIN A

Maximum declared antenna gain = 4.8 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)
5530 MHz	8.72	13.52	-6.21	-1.41
5610 MHz	13.01	17.81	-1.93	2.87

CHAIN B

Maximum declared antenna gain = 4.8 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)
5530 MHz	8.90	13.70	-5.70	-0.90
5610 MHz	13.39	18.19	-1.44	3.36

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 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
5530 MHz	6.71	6.66	9.7	14.50
5610 MHz	11.87	11.88	14.89	19.69

Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 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)
5530 MHz	-7.71	-7.96	-4.7	-4.95	0.1	-0.15
5610 MHz	-2.45	-3.06	0.56	-0.05	5.36	4.75

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

Measurement uncertainty = ± 1.5 dB

Verdict: Pass

802.11 ac 80MHz. Channel 138.
CHAIN A

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5690 MHz	14.74	-2.57	19.54	2.23	-0.75	-6.38	4.05	-1.58

CHAIN B

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PPSD/MHz (dBm) per sub-band		PPSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5690 MHz	14.67	-2.41	19.47	-2.39	-0.90	-6.69	3.9	-1.89

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm) per sub-band		Total output power e.i.r.p. (dBm) per sub-band	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5690 MHz	13.07	-3.70	13.03	-3.18	16.06	-0.42	20.86	4.38

 Measurement uncertainty = ± 1.5 dB

Verdict: Pass

MIMO CHAIN A+B. PPSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PPSD/MHz per sub-band Chain A (dBm)		PPSD/MHz per sub-band Chain B (dBm)		Total PPSD/MHz per sub-band Chain A (dBm) ¹		Total PPSD/MHz per sub-band Chain B (dBm) ¹		Total PPSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PPSD/MHz per sub-band Chain B e.i.r.p. (dBm)	
	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4	UNII_3	UNII_4
5690 MHz	-1.67	-7.57	-2.26	-7.23	1.34	0.75	-4.56	-4.22	6.14	5.55	0.24	0.58

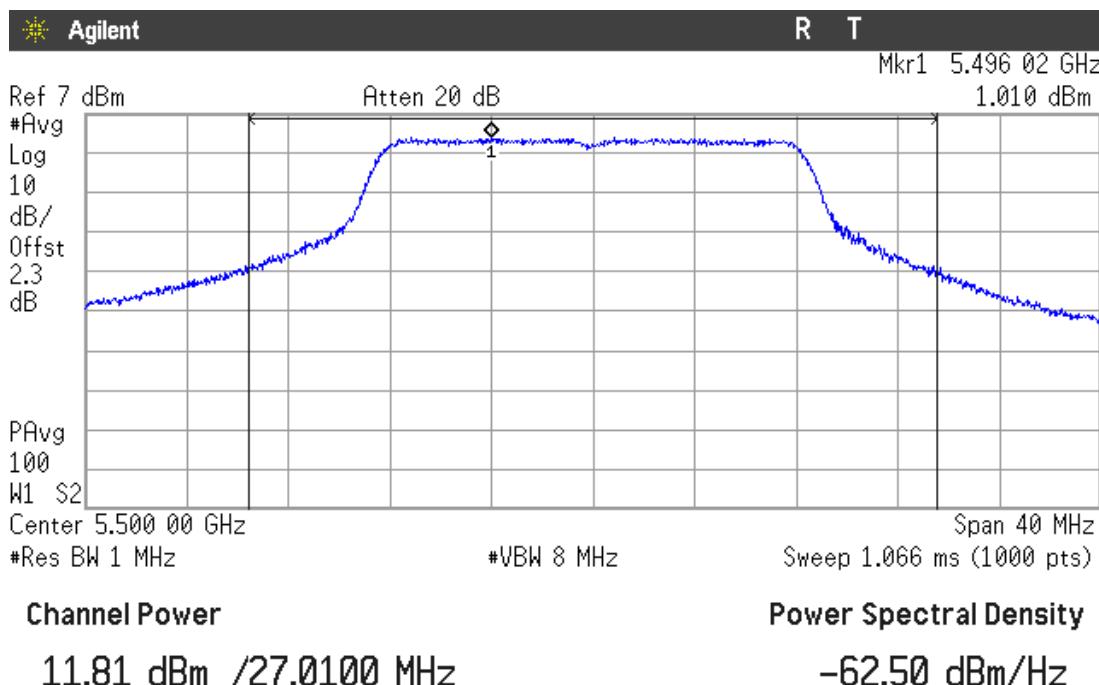
 Note 1: The quantity $10 \log 2$ (two antennas) is added to the spectrum peak value according to document 662911 D01.

 Measurement uncertainty = ± 1.5 dB

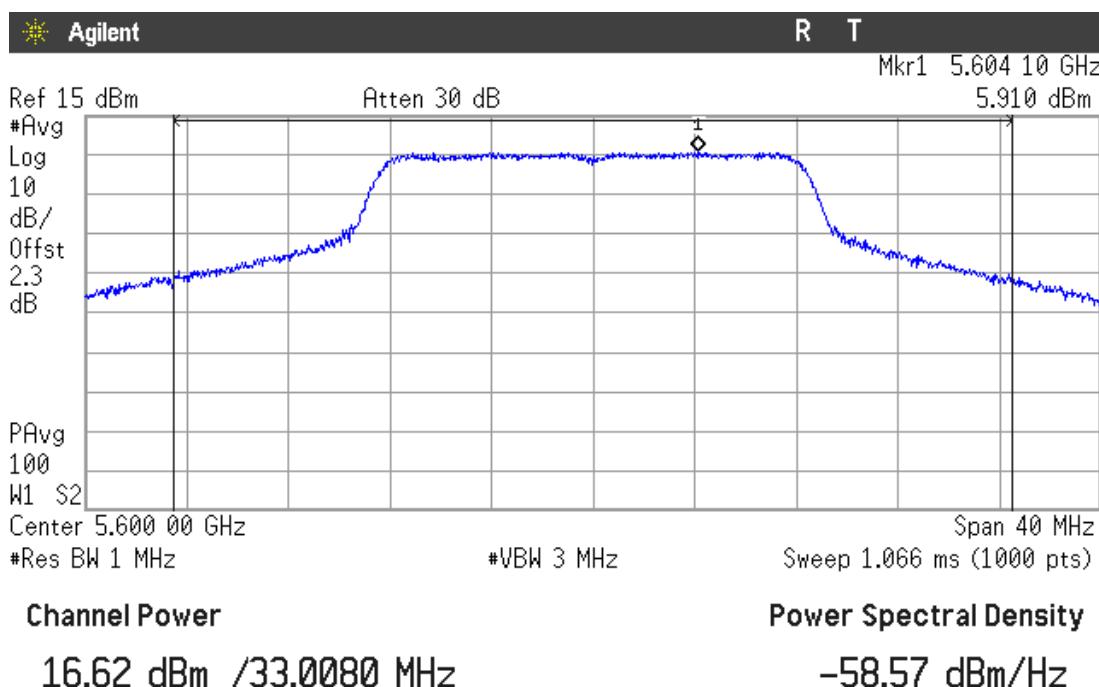
Verdict: Pass

802.11a mode CHAIN A

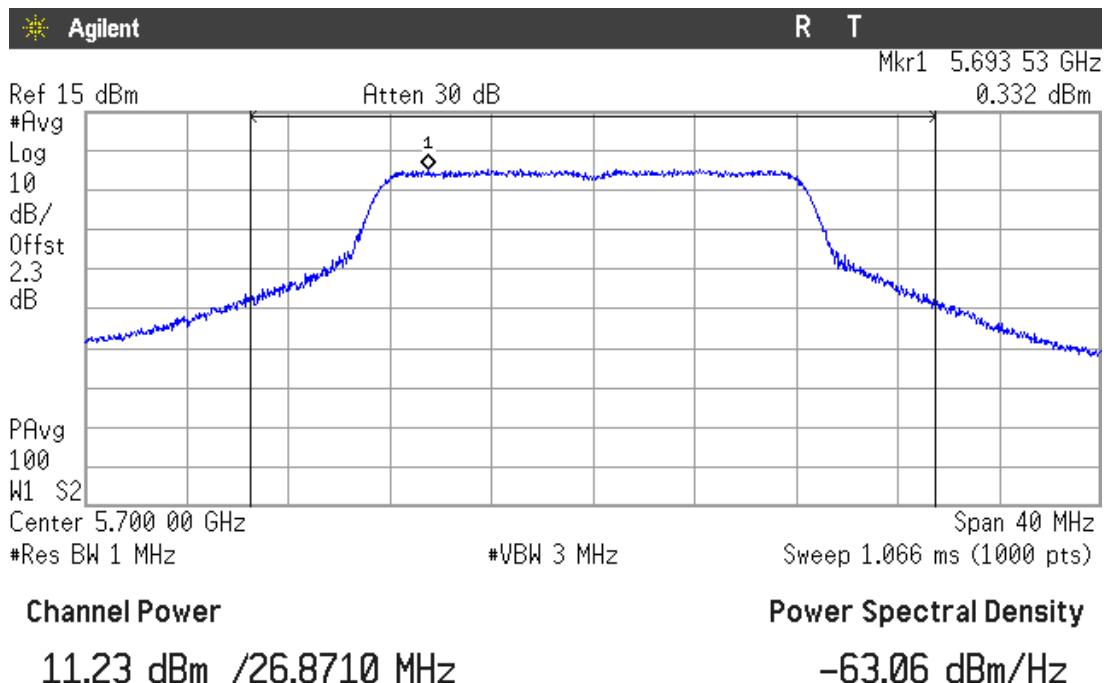
Lowest Channel



Middle Channel

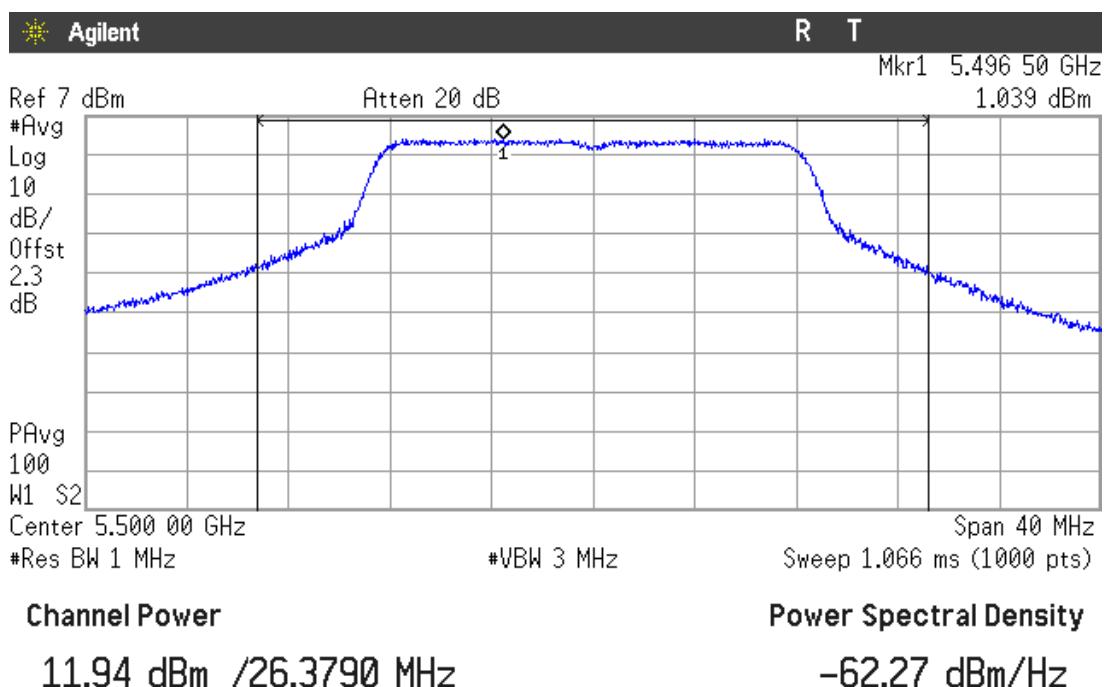


Highest Channel

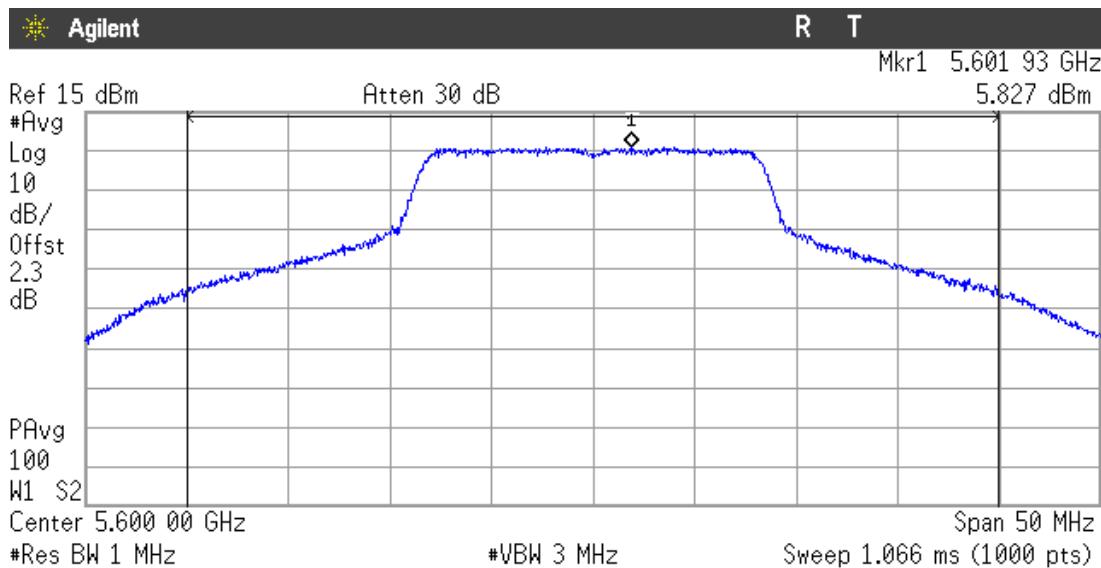


802.11a mode CHAIN B

Lowest Channel



Middle Channel



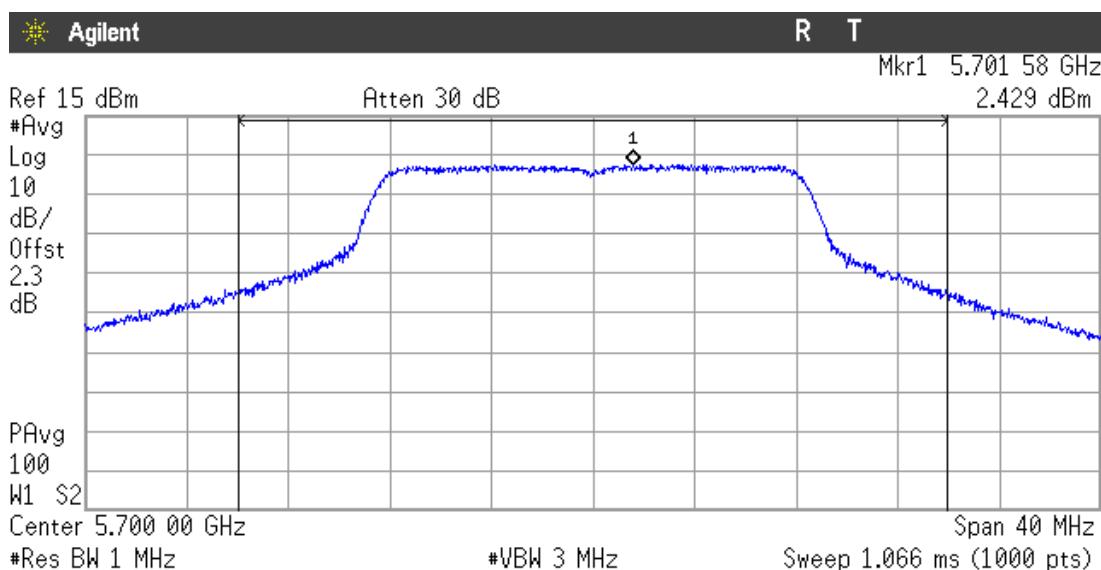
Channel Power

16.88 dBm /39.8320 MHz

Power Spectral Density

-59.12 dBm/Hz

Highest Channel



Channel Power

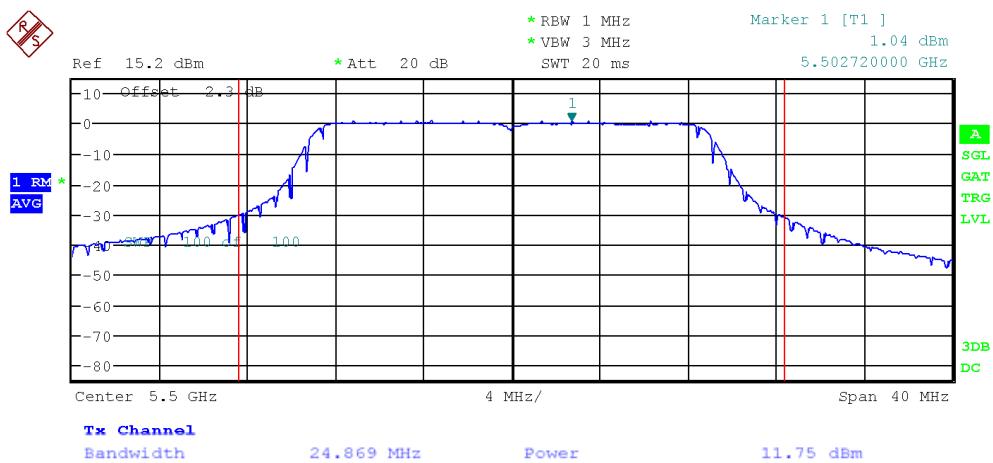
13.49 dBm /27.7950 MHz

Power Spectral Density

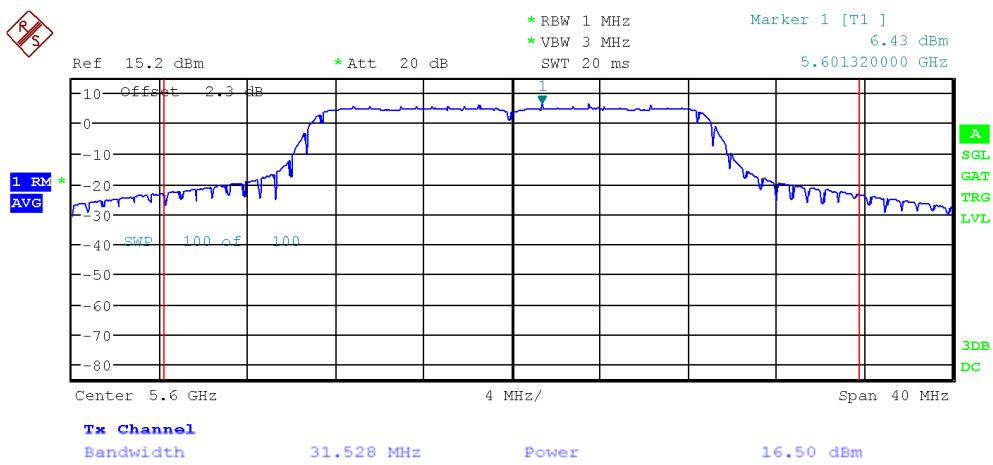
-60.95 dBm/Hz

802.11 n20 MHz modes (except channel 144) CHAIN A

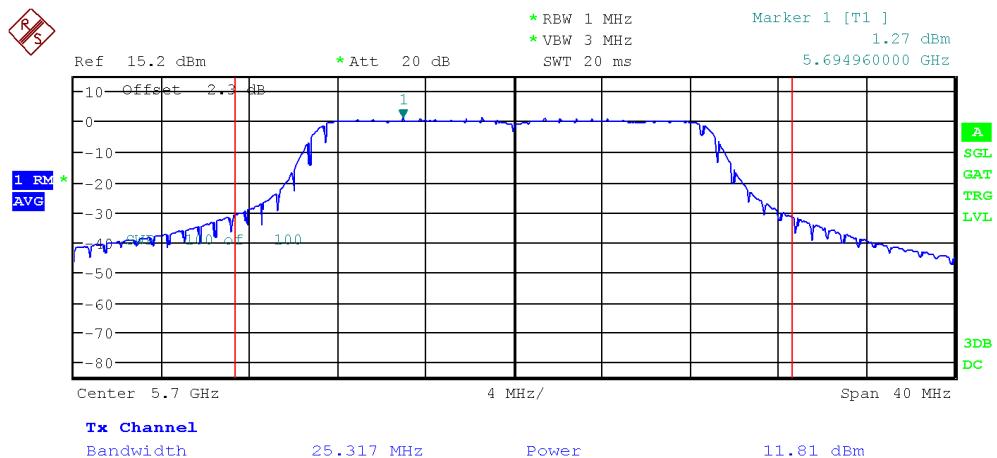
Lowest Channel



Middle Channel

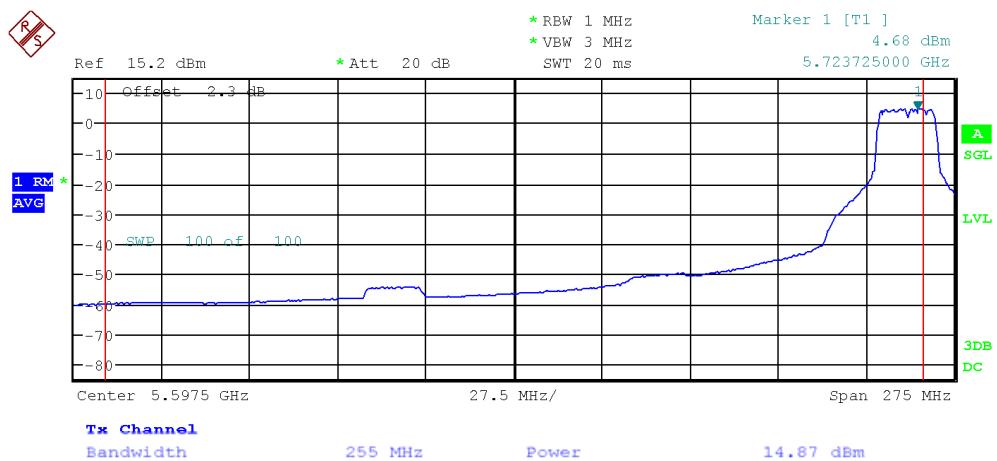


Highest Channel

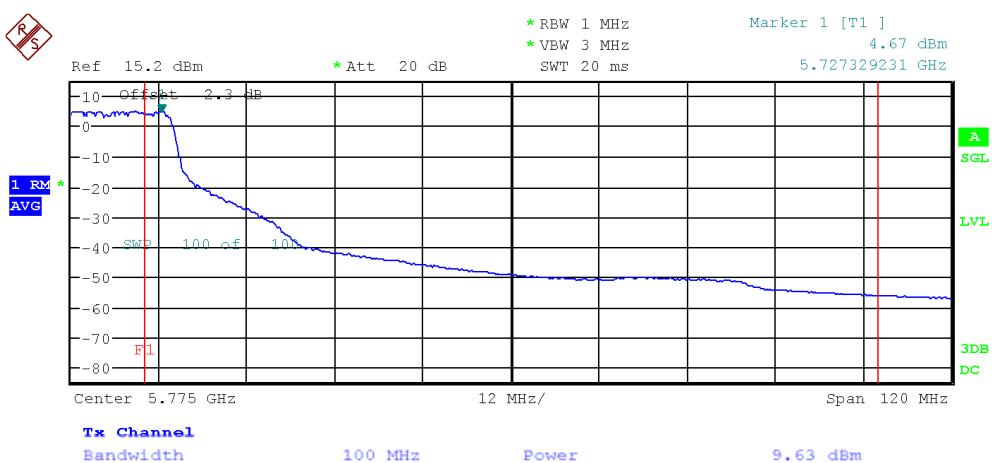


802.11 ac 20MHz : Channel 144

Power and PPSD in sub-band UNII_3:

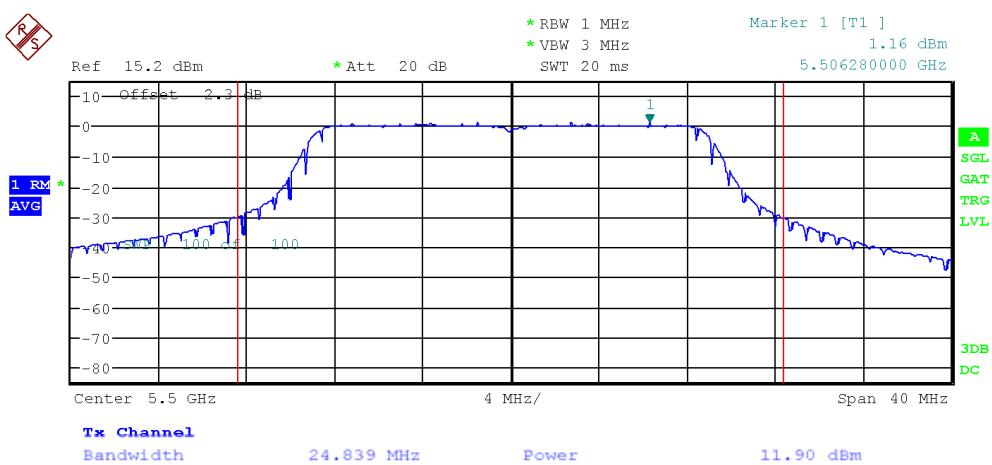


Power and PPSD in sub-band UNII_4:

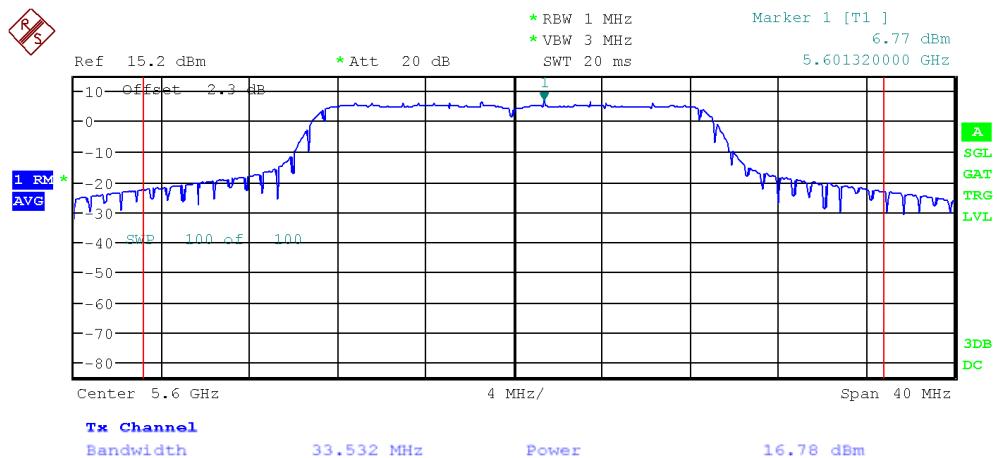


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN B

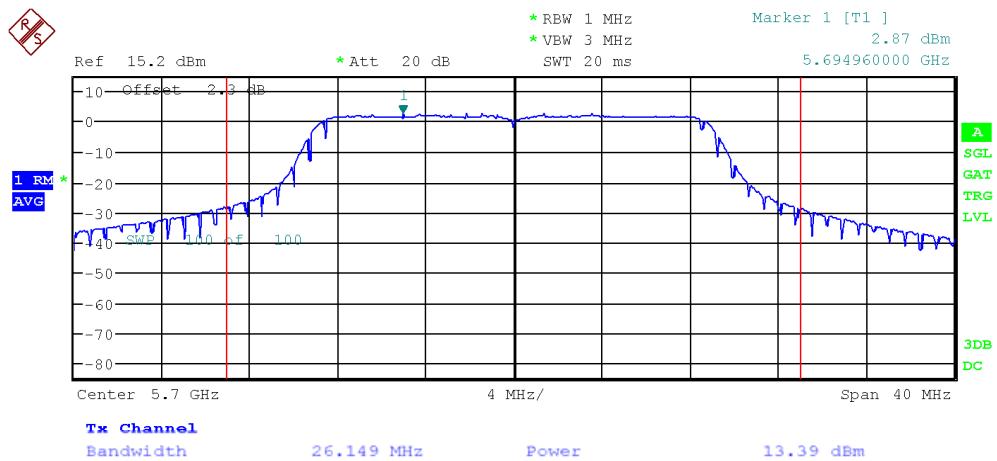
Lowest Channel



Middle Channel

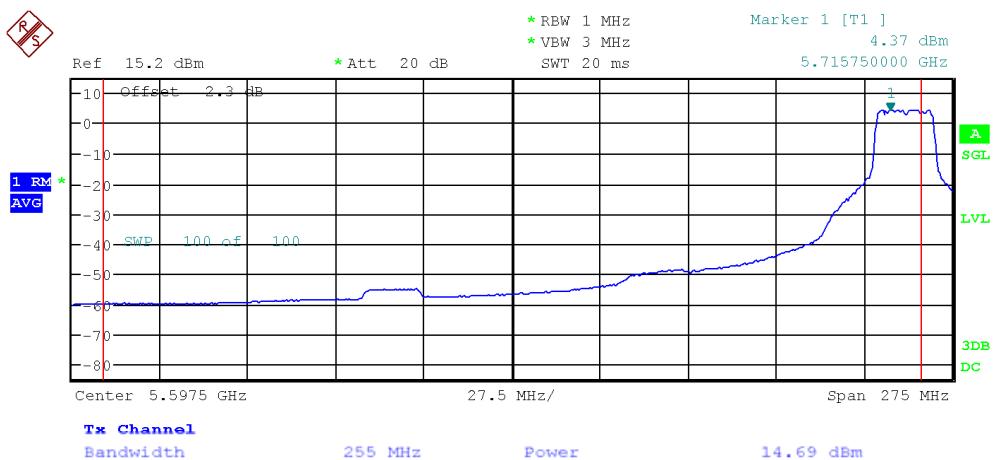


Highest Channel

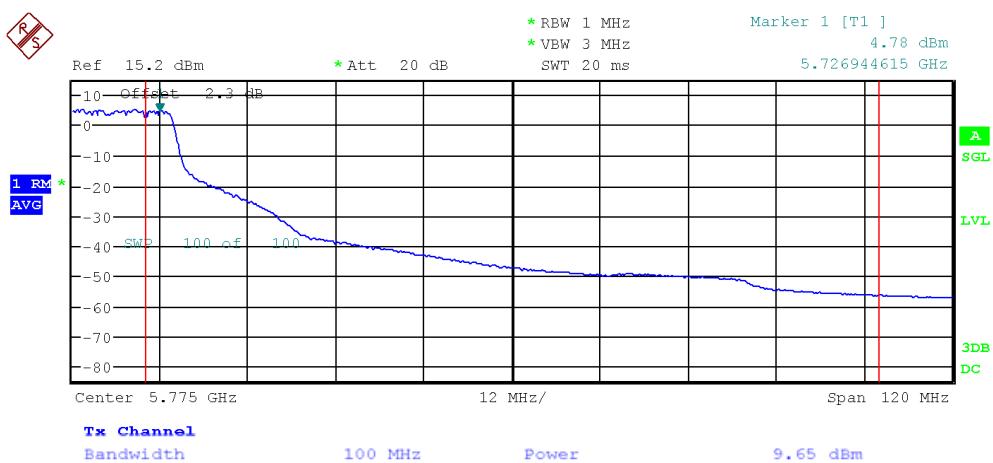


802.11 ac 20MHz : Channel 144

Power and PPSD in sub-band UNII_3:

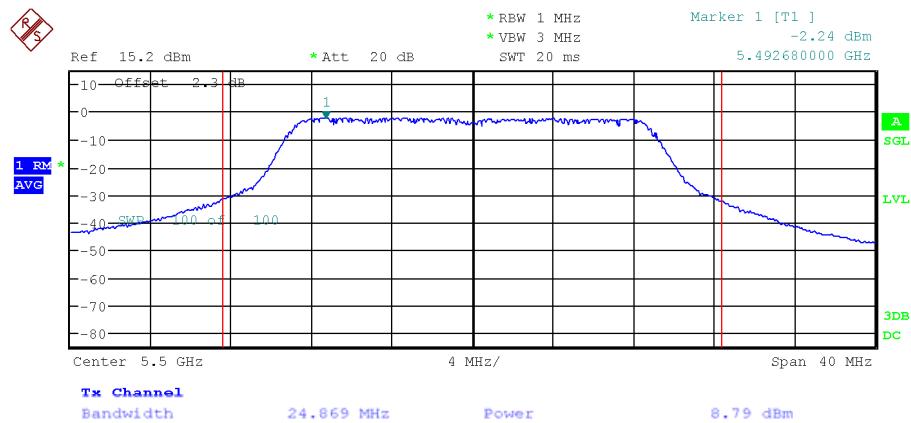


Power and PPSD in sub-band UNII_4:

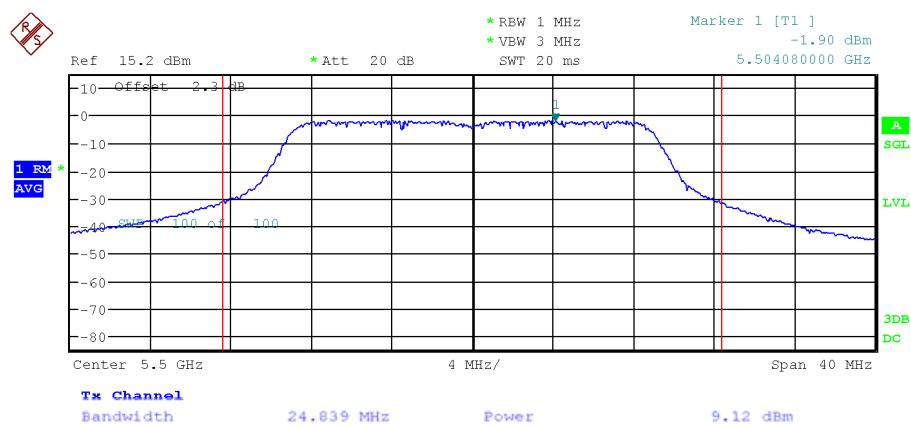


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) MIMO CHAIN A+B

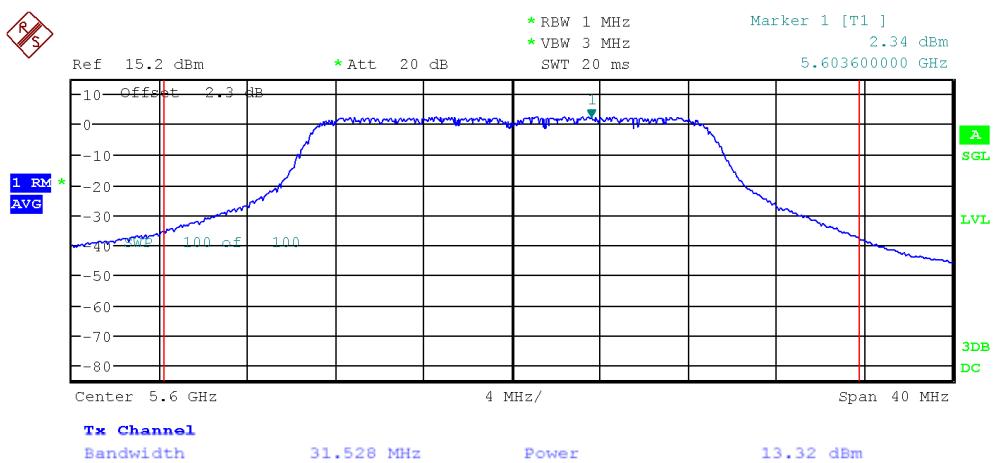
Lowest Channel. Chain A



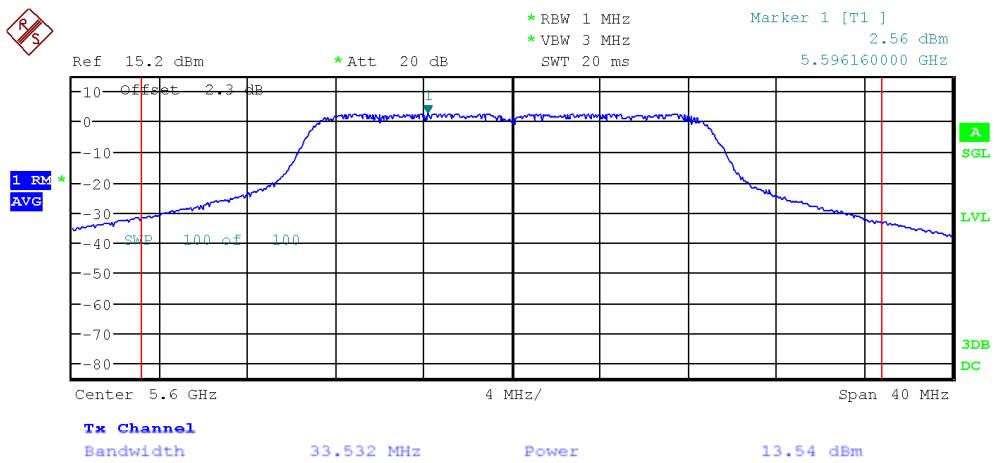
Lowest Channel. Chain B



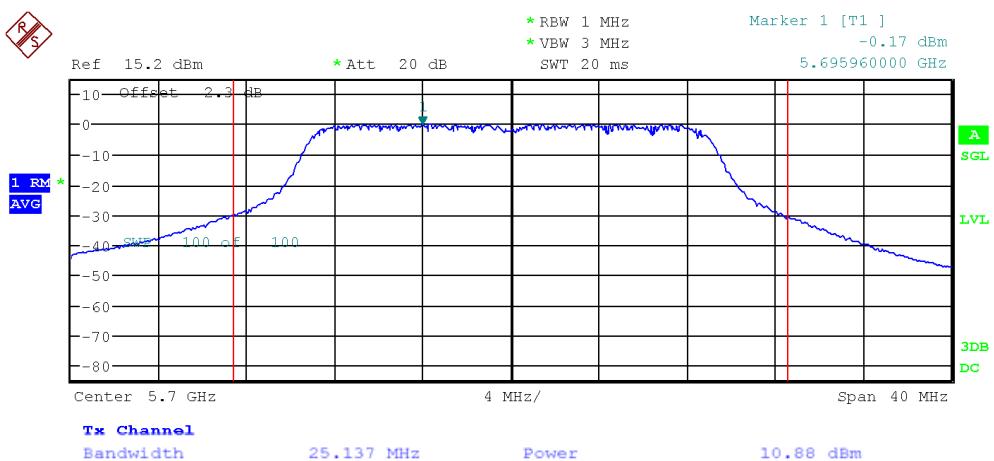
Middle Channel. Chain A



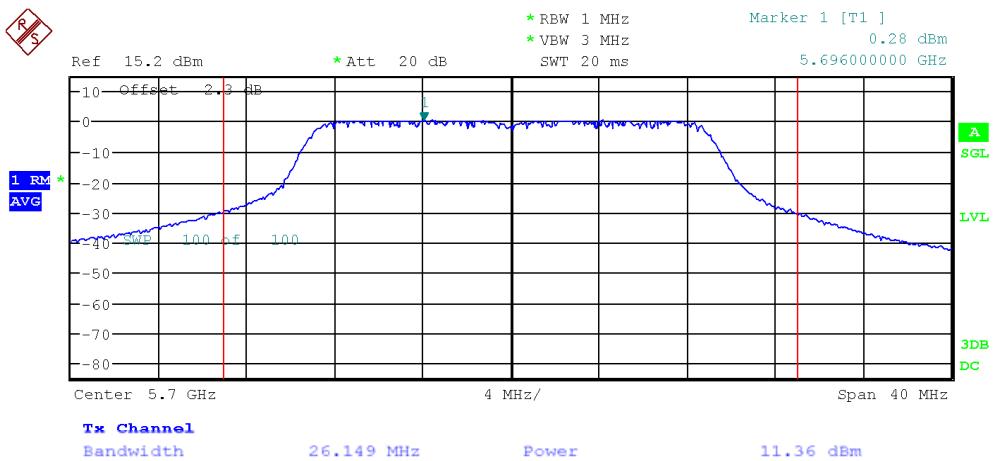
Middle Channel. Chain B



Highest Channel. Chain A

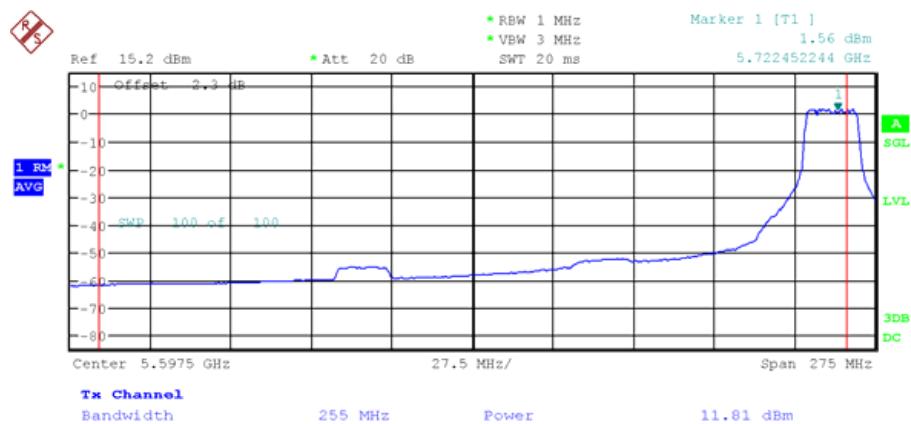


Highest Channel. Chain B

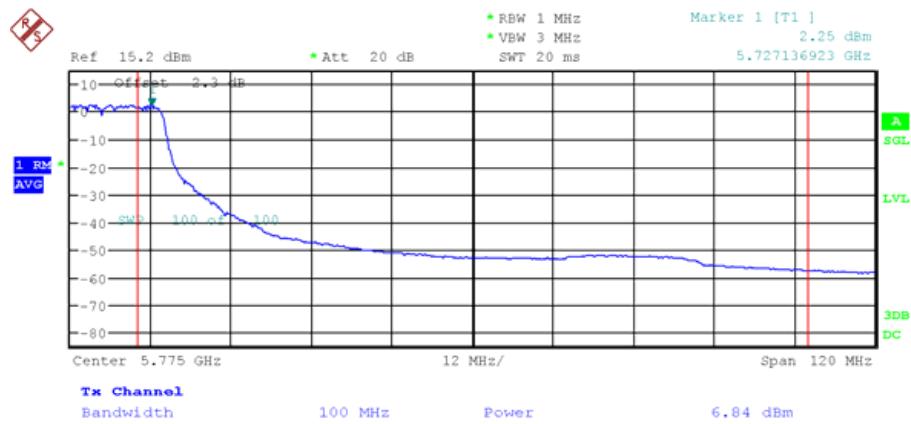


802.11 ac 20MHz : Channel 144

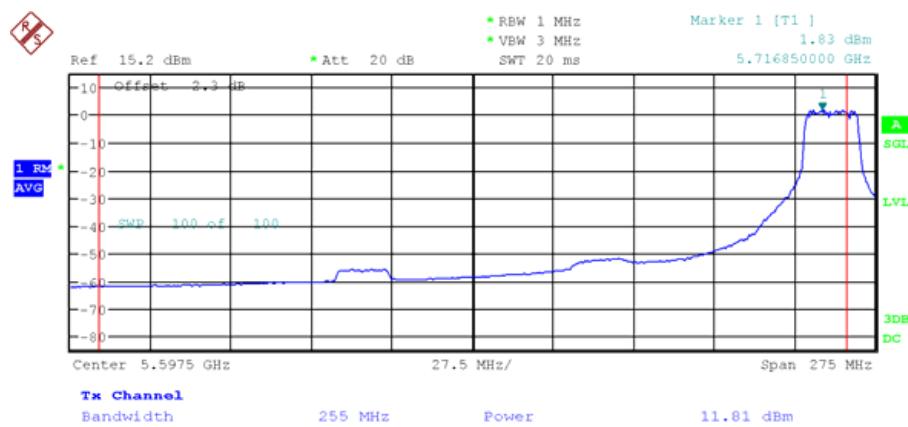
Power and PPSD in sub-band UNII_3: Chain A



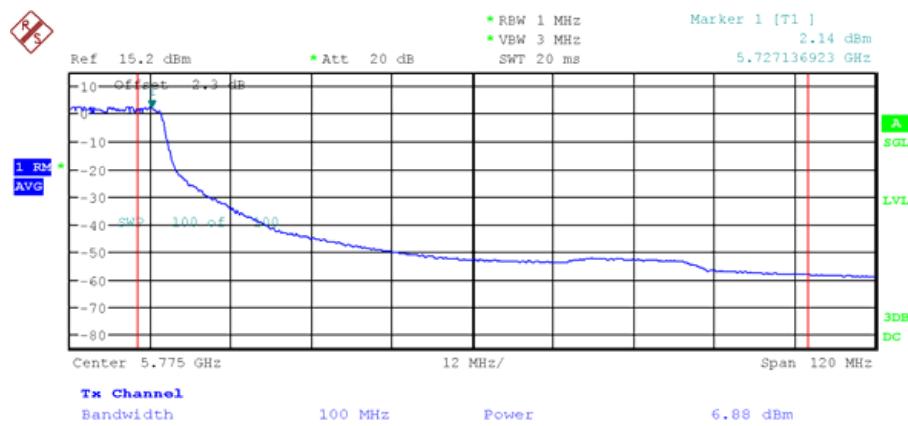
Power and PPSD in sub-band UNII_4: Chain A



Power and PPSD in sub-band UNII_3: Chain B

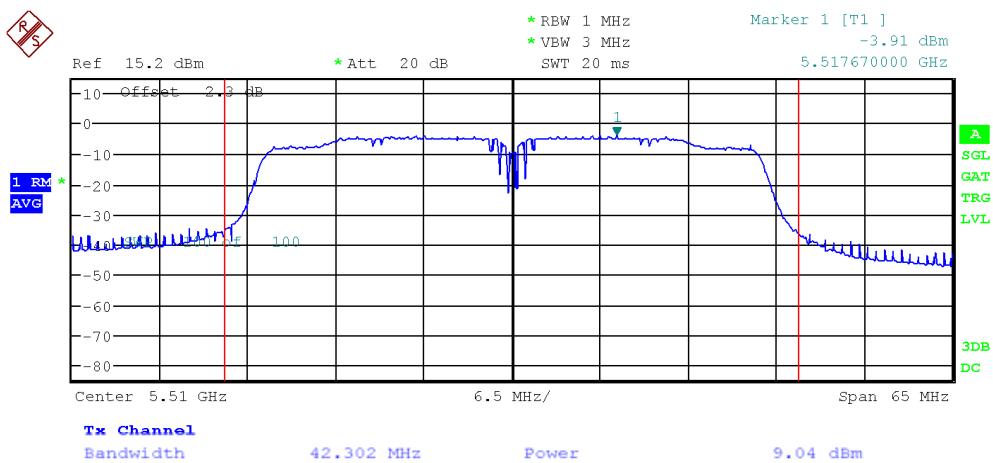


Power and PPSD in sub-band UNII_4: Chain B

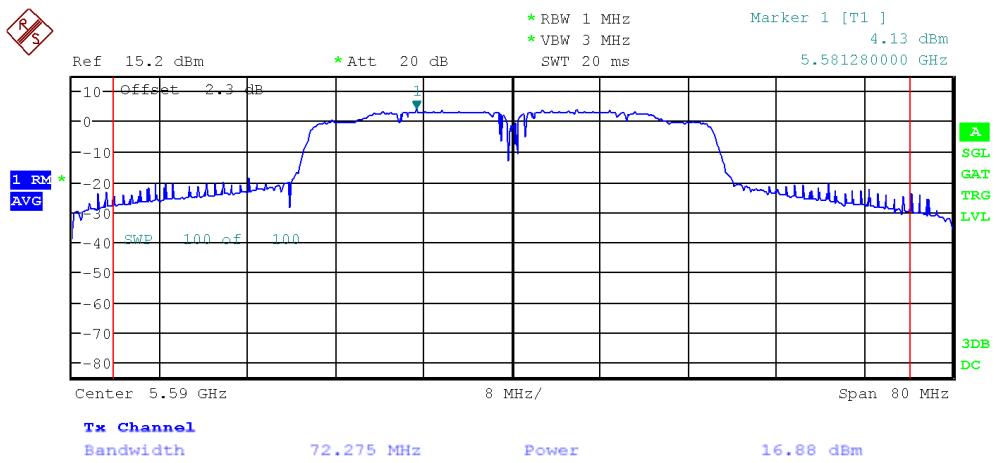


802.11 n40 MHz modes (except channel 142) CHAIN A

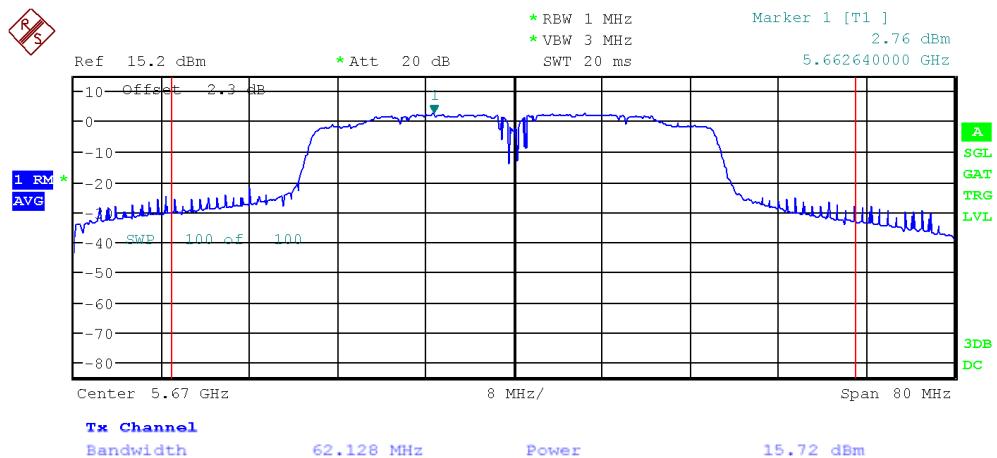
Lowest Channel



Middle Channel

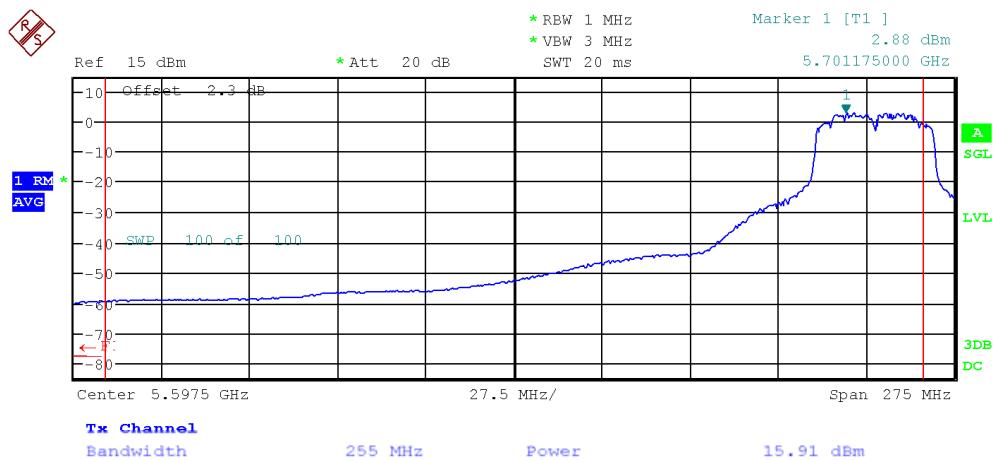


Highest Channel

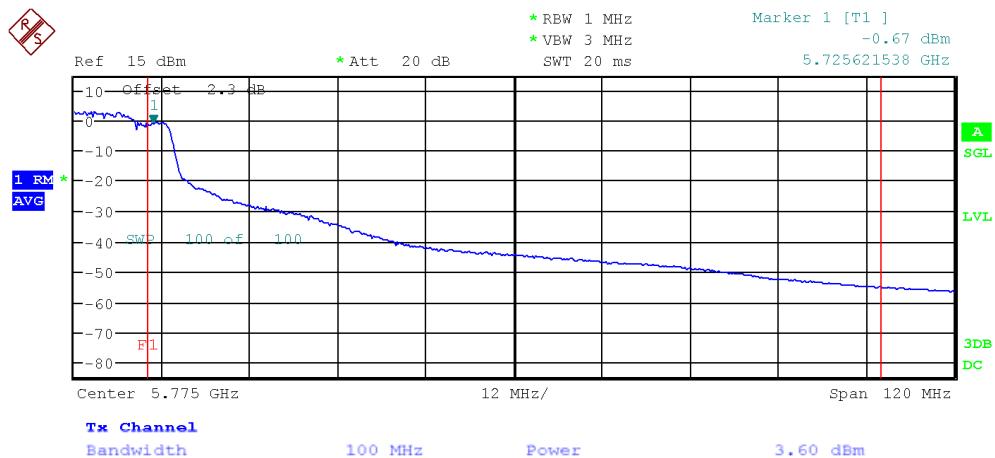


802.11 ac 40MHz : Channel 142

Power and PPSD in sub-band UNII_3:

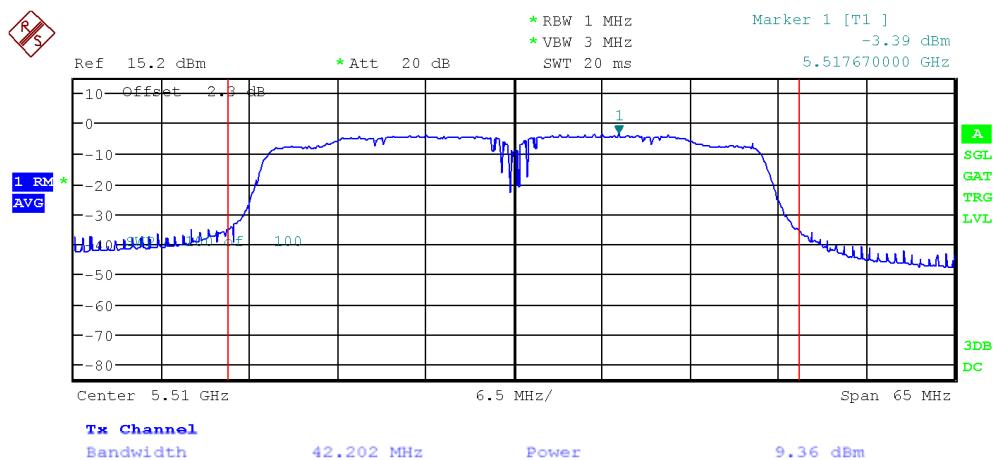


Power and PPSD in sub-band UNII_4:

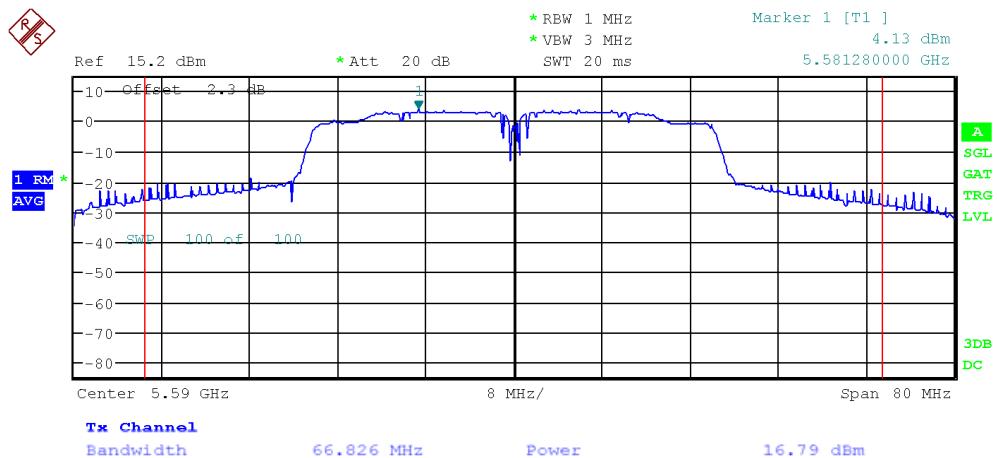


802.11 n40 MHz modes (except channel 142) CHAIN B

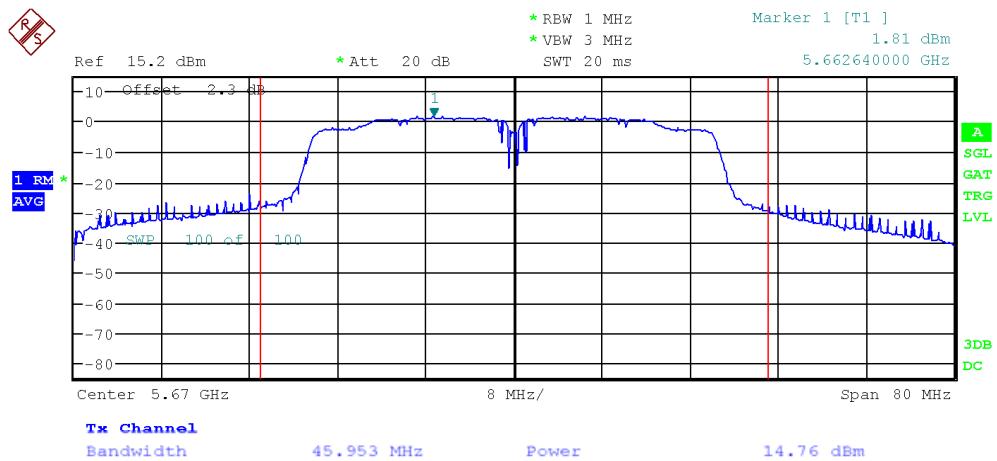
Lowest Channel



Middle Channel

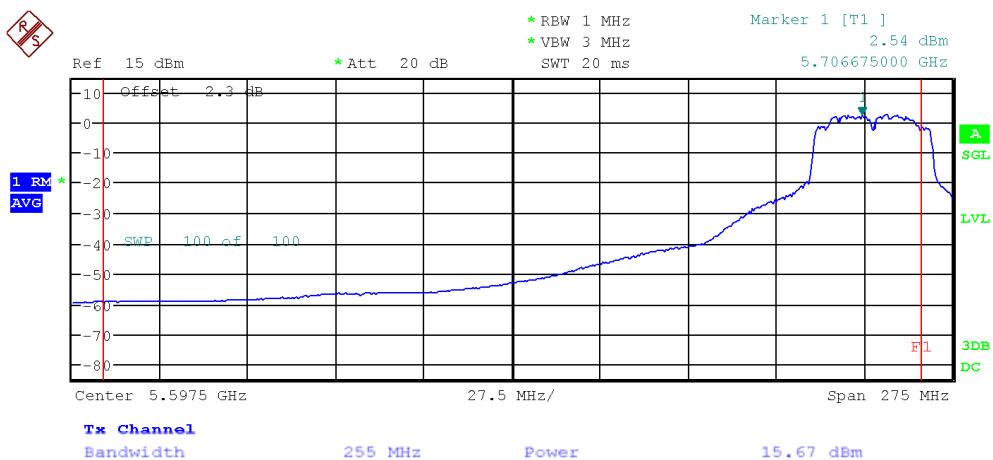


Highest Channel

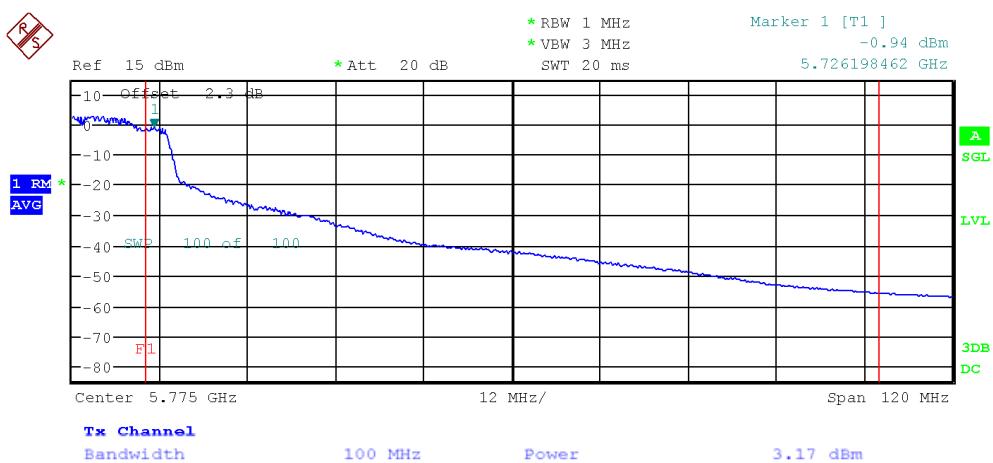


802.11 ac 40MHz : Channel 142

Power and PPSD in sub-band UNII_3:

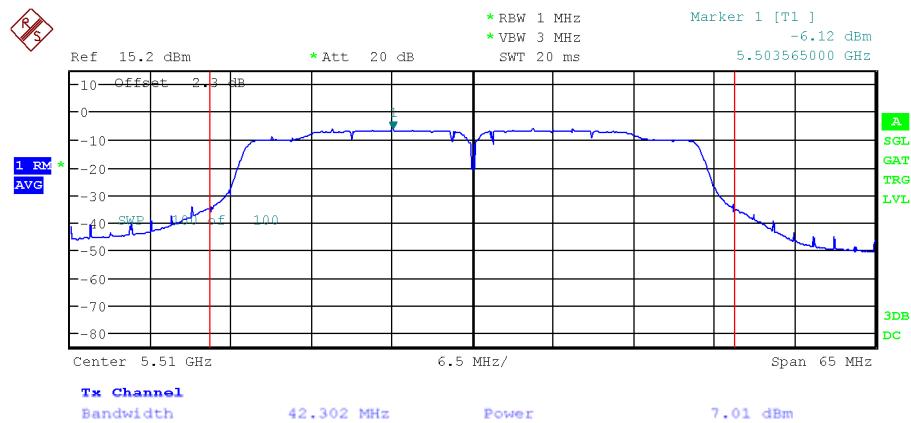


Power and PPSD in sub-band UNII_4:

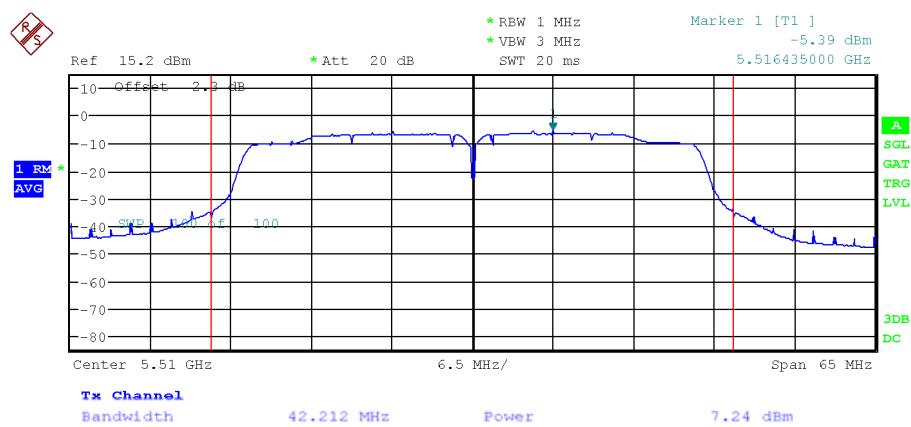


802.11 n40 MHz modes (except channel 142) CHAIN A+B

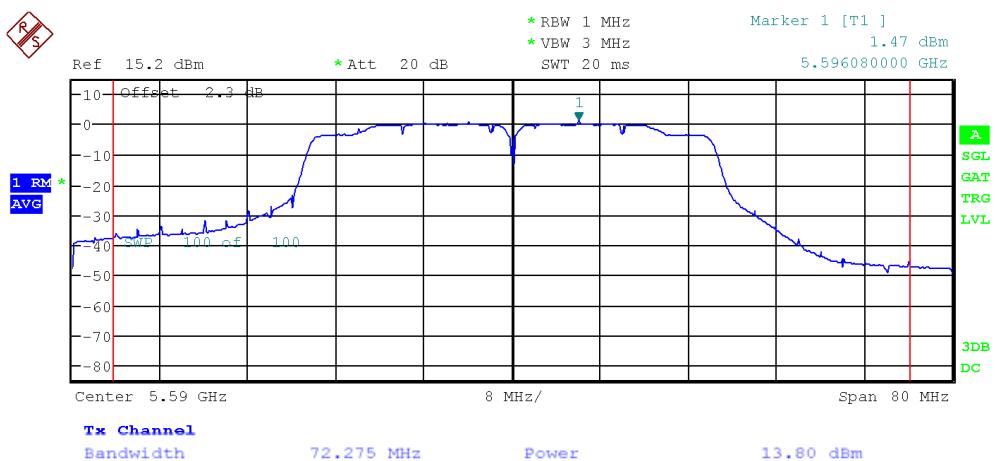
Lowest Channel. Chain A



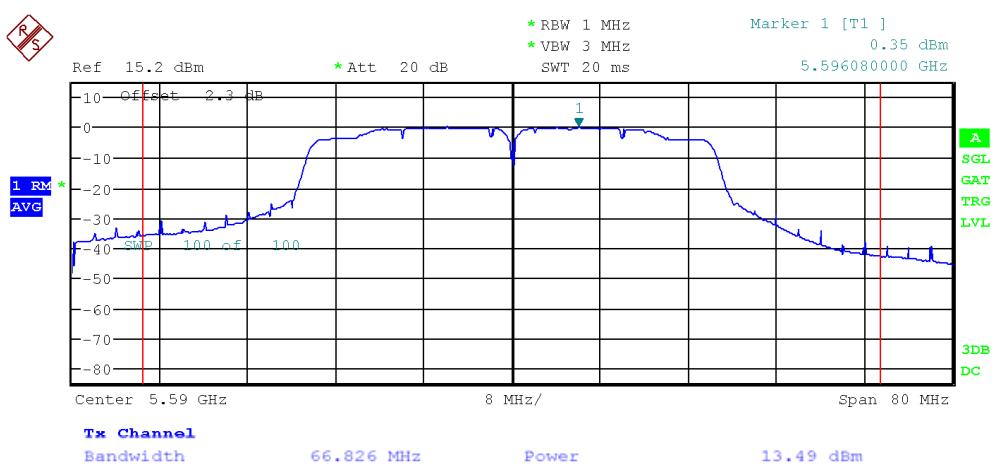
Lowest Channel. Chain B



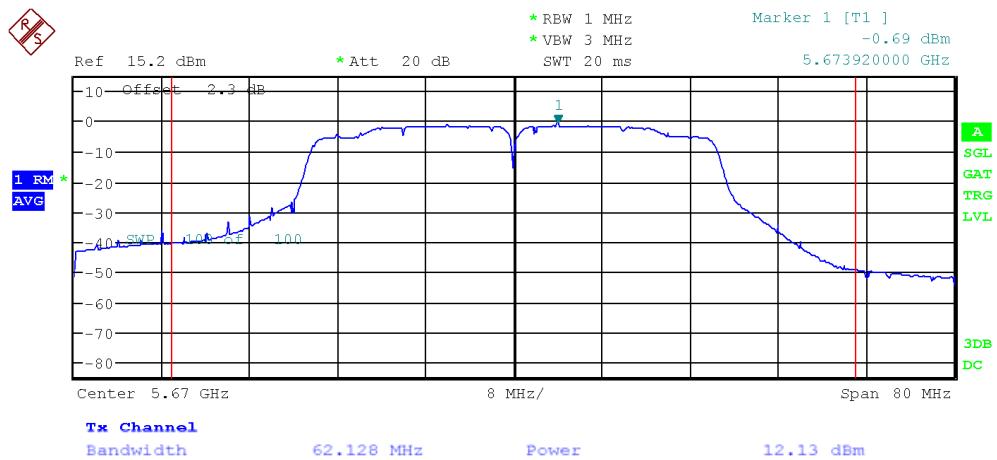
Middle Channel. Chain A



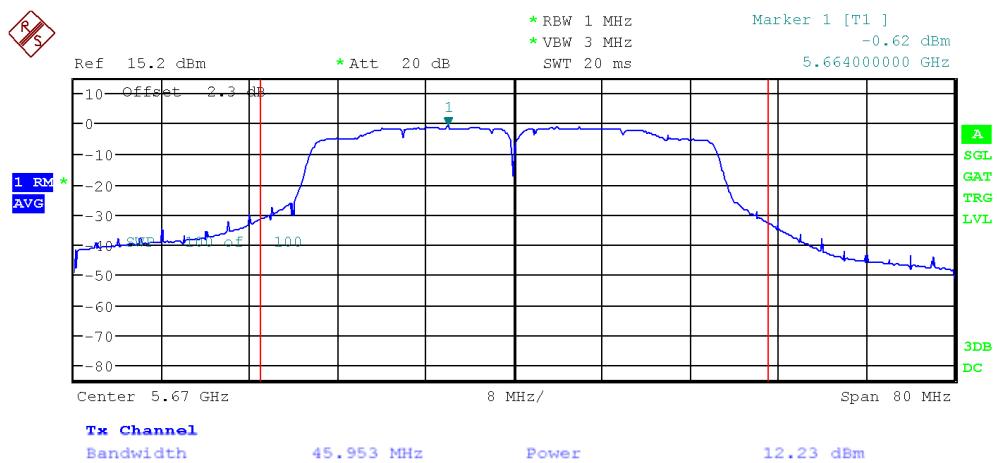
Middle Channel. Chain B



Highest Channel. Chain A

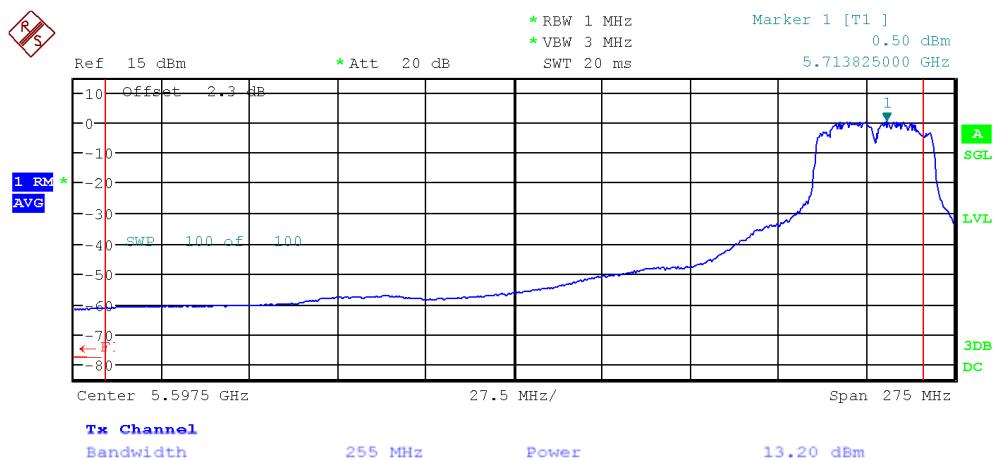


Highest Channel. Chain B

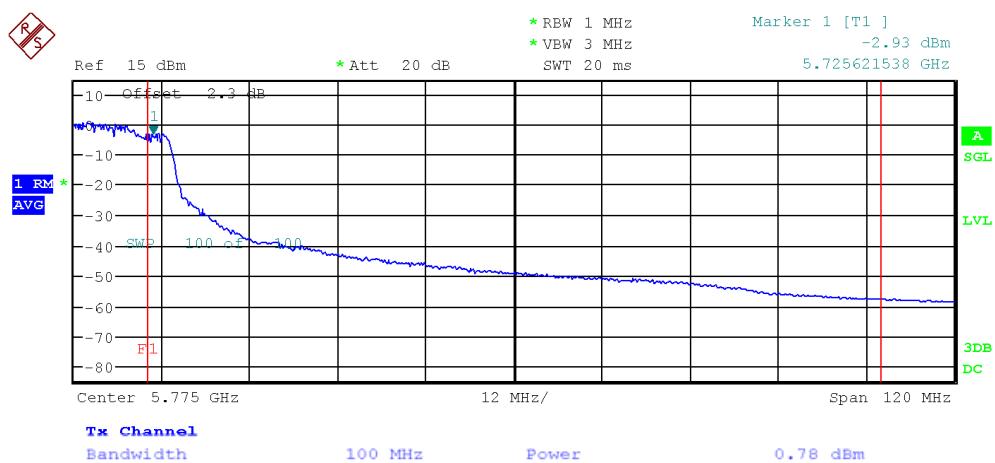


802.11 ac40MHz : Channel 142

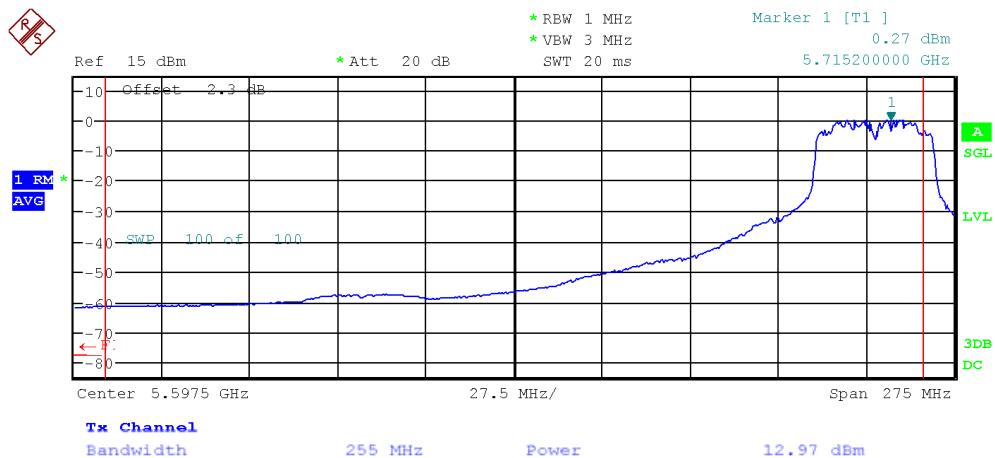
Power and PPSD in sub-band UNII_3: Chain A



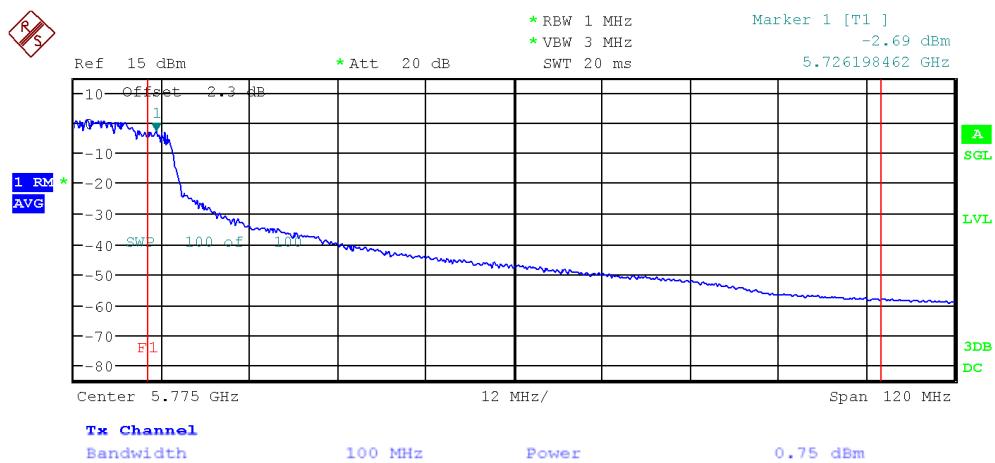
Power and PPSD in sub-band UNII_4: Chain A



Power and PPSD in sub-band UNII_3: Chain B

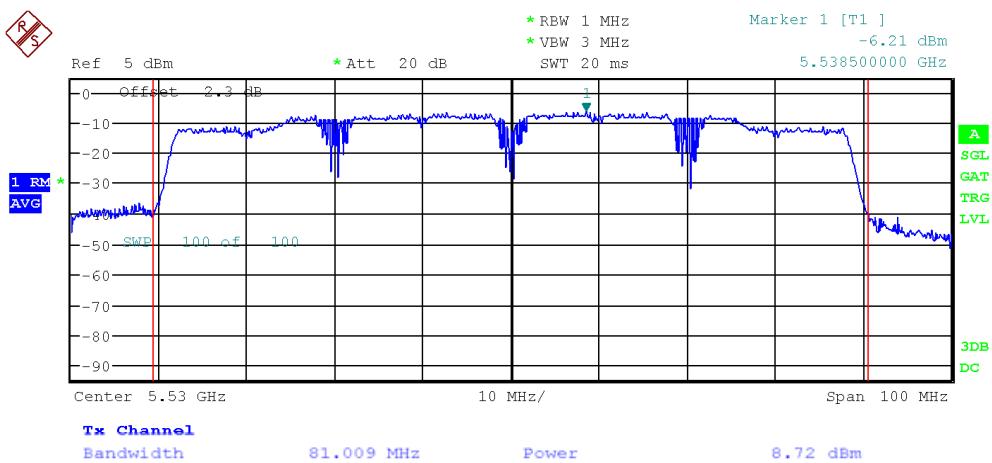


Power and PPSD in sub-band UNII_4: Chain B

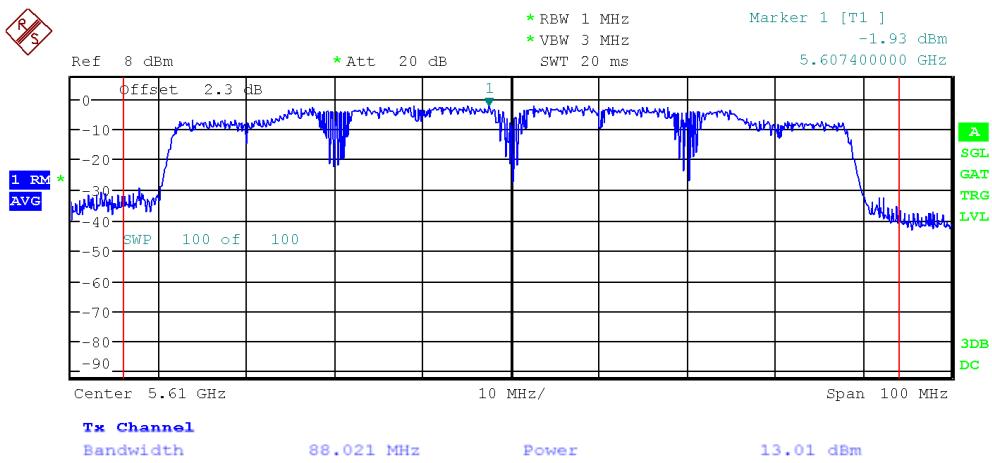


802.11 ac80 MHz modes (except channel 138) CHAIN A

Lowest Channel

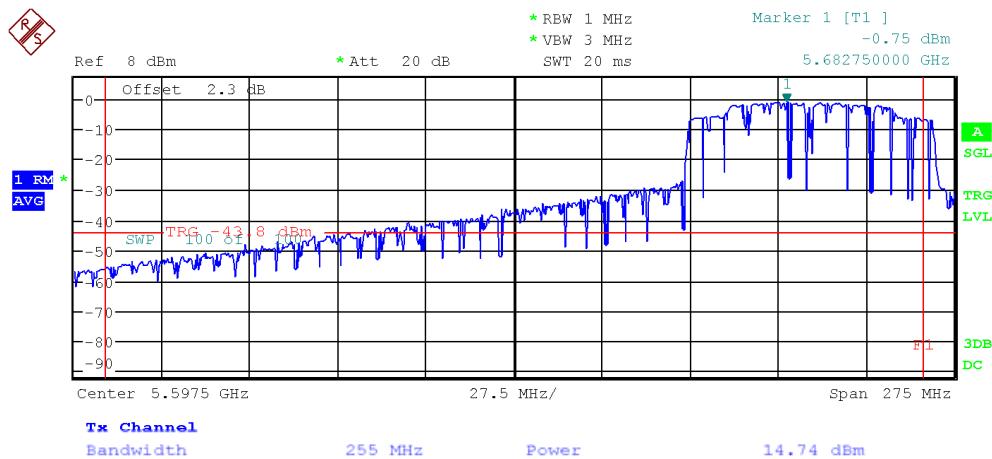


Highest Channel

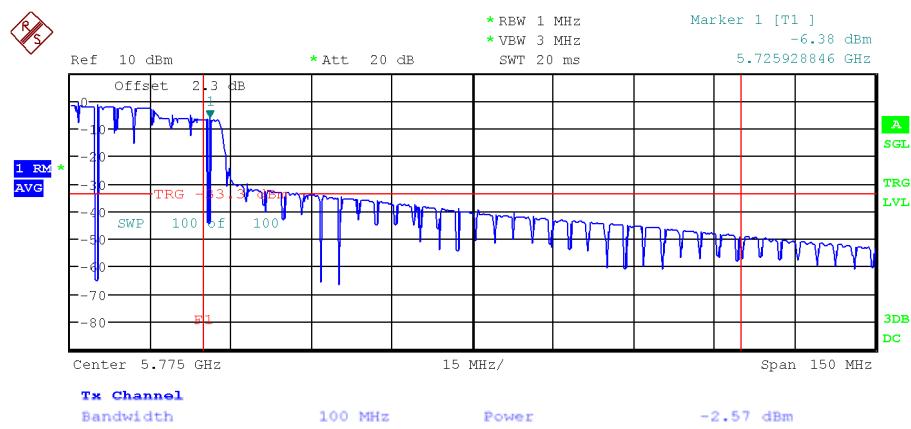


802.11 ac80MHz : Channel 138

Power and PPSD in sub-band UNII_3:

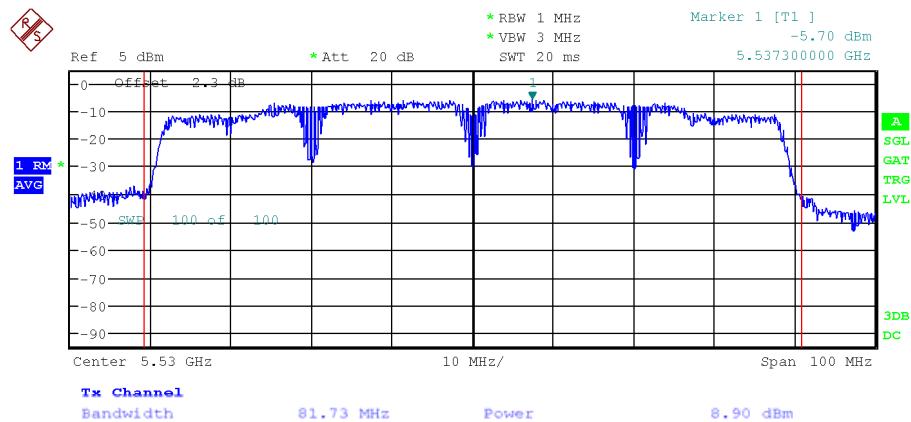


Power and PPSD in sub-band UNII_4:

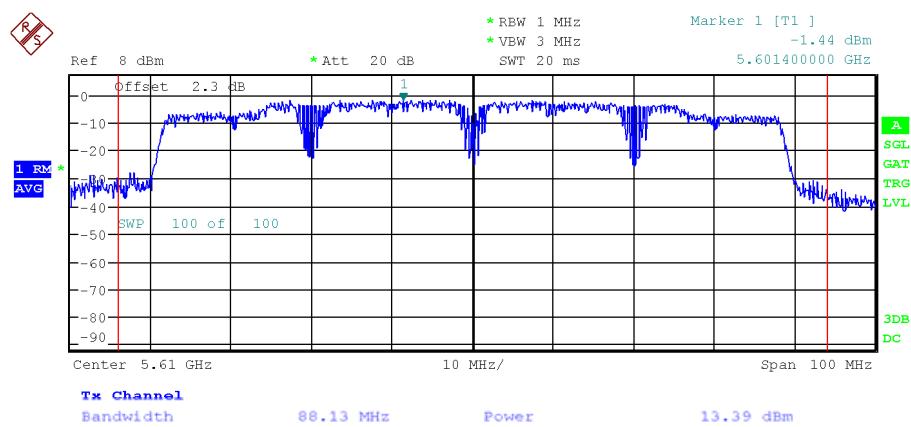


802.11 ac80 MHz modes (except channel 138) CHAIN B

Lowest Channel



Middle Channel

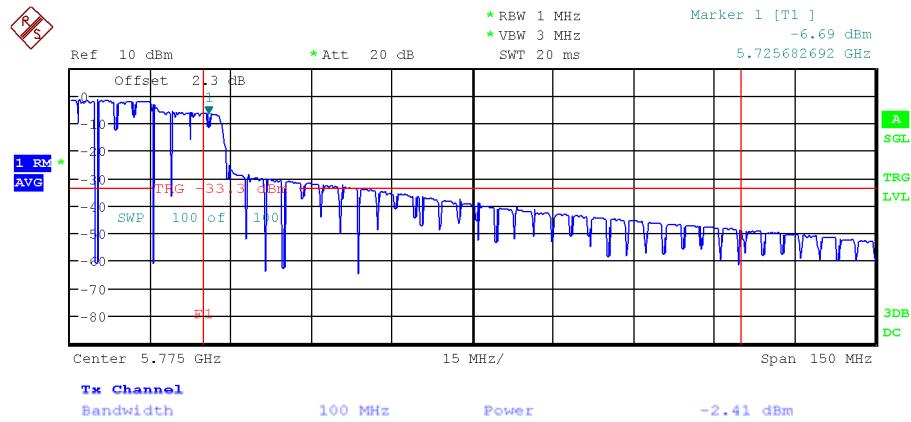


802.11 ac80MHz : Channel 138

Power and PPSD in sub-band UNII_3:

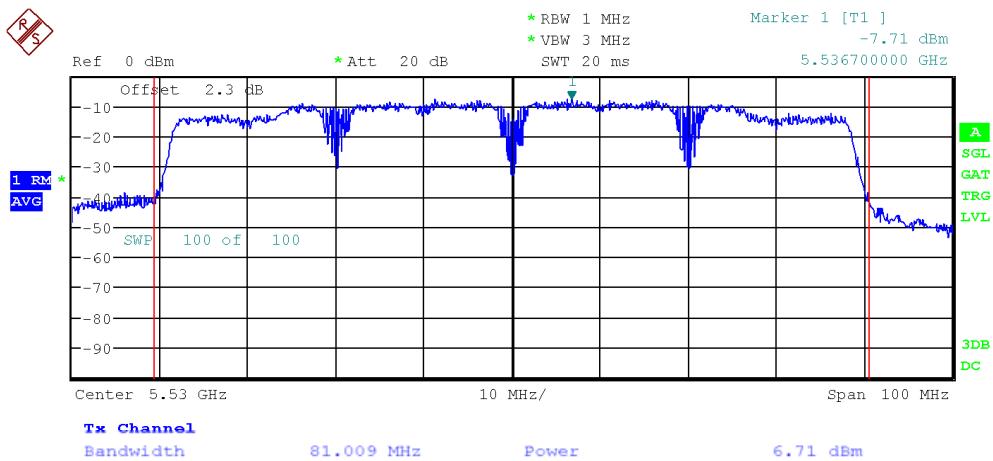


Power and PPSD in sub-band UNII_4:

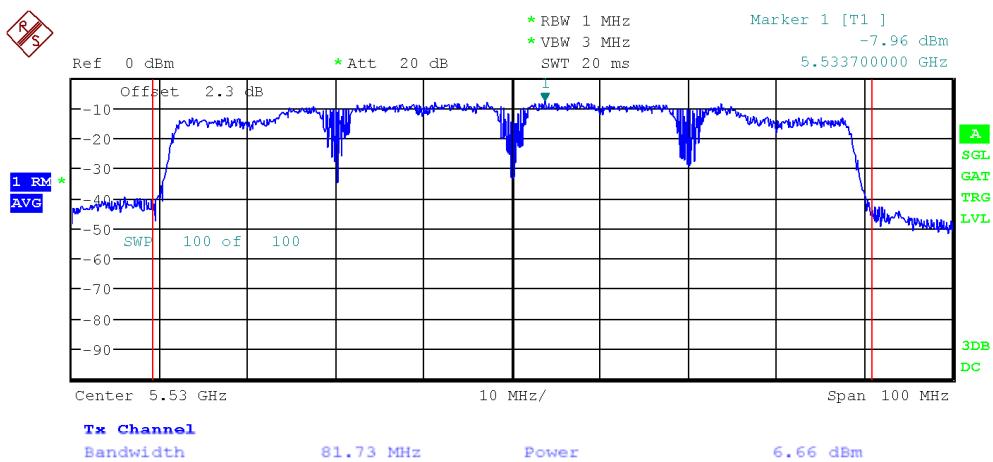


802.11 ac80 MHz modes (except channel 138) CHAIN A+B

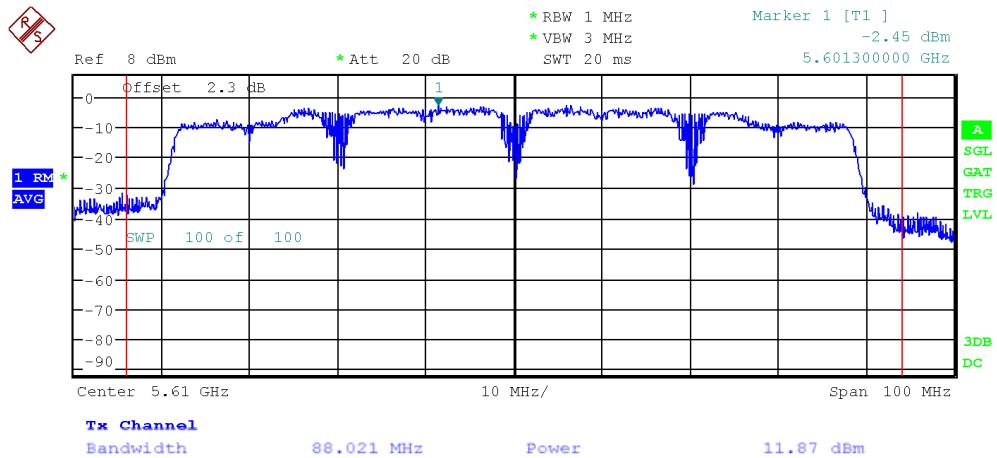
Lowest Channel. Chain A.



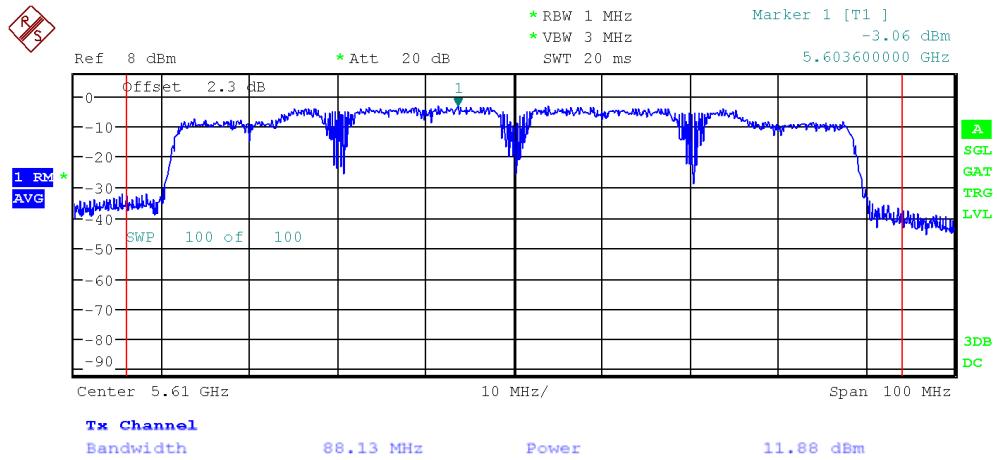
Lowest Channel. Chain B.



Highest Channel. Chain A.

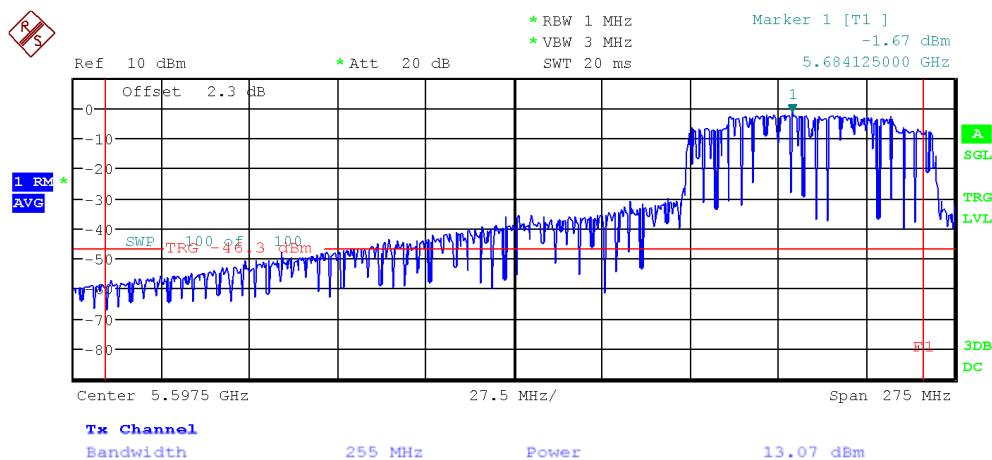


Highest Channel. Chain B.

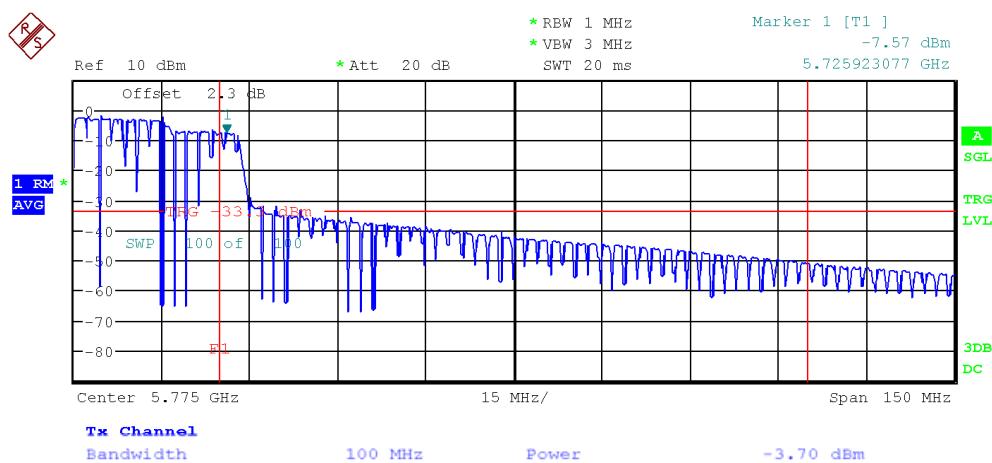


802.11 ac80MHz : Channel 138 CHAIN A+B

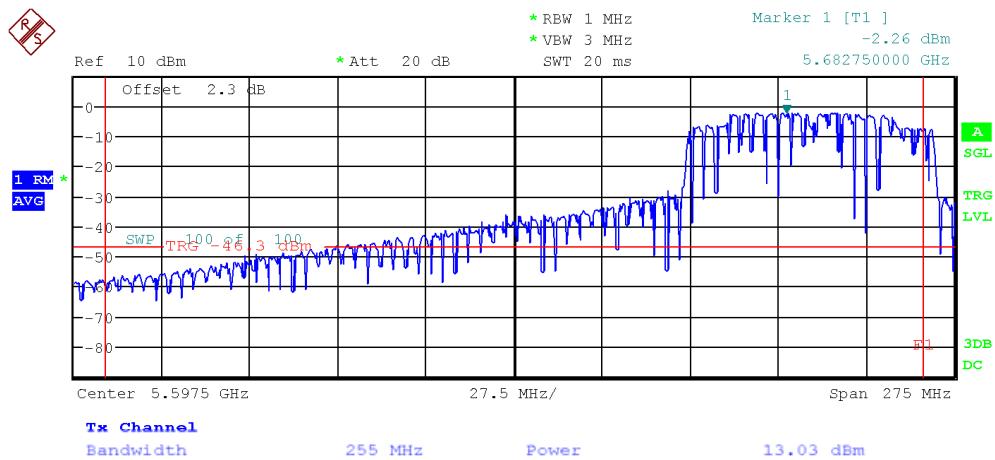
Power and PPSD in sub-band UNII_3: Chain A



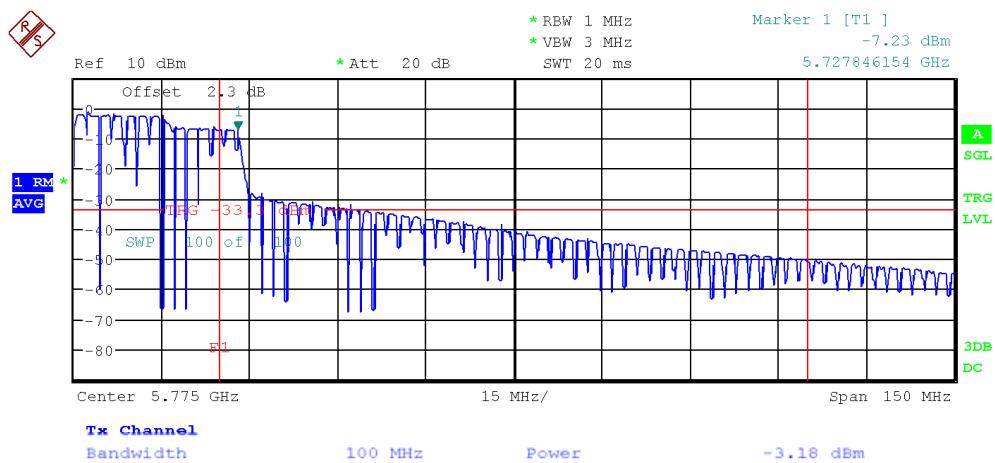
Power and PPSD in sub-band UNII_4: Chain A



Power and PPSD in sub-band UNII_3: Chain B



Power and PPSD in sub-band UNII_4: Chain B



**Section 15.407 Subclause (b) (3) / RSS-210 A9.2. (3). Undesirable radiated emissions (Transmitter)
1 to 40 GHz**

SPECIFICATION

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz ($68.23 \text{ dB}\mu\text{V/m}$ 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 ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	$2400/F(\text{kHz})$	-	300
0.490-1.705	$24000/F(\text{kHz})$	-	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° 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.

See test results in Appendix A for details.

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 5.35-5.46 GHz and adjacent bands 5.46-5.47 GHz and 5.725-5.825 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 channel was measured for out-of-band emissions for the worst case (802.11a). The highest channel was measured for out-of-band emissions for channel 144 (ac20 mode 5720 MHz) since the adjusted transmit power is higher than channel 140 (802.11a mode 5700 MHz) in both SISO and MIMO modes.

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 dB μ V/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 (100) 5500 MHz. Out-of-band spurious in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4687	V	Peak	59.08	± 4.09
		Average	48.35	± 4.09
21.9999	V	Peak	50.75	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.42590	V	Peak	58.13	± 4.09
		Average	48.30	± 4.09
22.0000	V	Peak	48.78	± 4.09

Middle frequency (120) 5600 MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.8018	V	Peak	43.67	\pm 4.09
22.3999	V	Peak	50.44	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.8004	V	Peak	48.95	\pm 4.09
22.3999	V	Peak	49.07	\pm 4.09

Highest frequency (140) 5700 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8212	V	Peak	59.00	\pm 4.09
		Average	48.75	\pm 4.09
22.8000	V	Peak	49.10	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.7255	V	Peak	59.01	\pm 4.09
		Average	48.74	\pm 4.09
17.1022	V	Peak	48.98	\pm 4.09
22.8000	V	Peak	47.97	\pm 4.09

Channel 104 (5520 MHz): Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4472	V	Peak	58.11	± 4.09
		Average	48.48	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4384	V	Peak	58.04	± 4.09
		Average	48.41	± 4.09

Channel 136 (5680 MHz). Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8099	V	Peak	59.85	± 4.09
		Average	48.75	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8133	V	Peak	58.94	± 4.09
		Average	48.73	± 4.09

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

Lowest frequency (100) 5500 MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4689	V	Peak	58.72	\pm 4.09
		Average	48.33	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.3611	V	Peak	58.47	\pm 4.09
		Average	48.24	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4050	V	Peak	58.82	\pm 4.09
		Average	48.18	\pm 4.09

Middle frequency (120) 5600MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.8014	V	Peak	44.37	\pm 4.09
22.3991	V	Peak	49.08	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.8017	V	Peak	47.60	\pm 4.09
22.3999	V	Peak	49.39	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.7975	V	Peak	43.62	\pm 4.09
22.3999	V	Peak	48.38	\pm 4.09

Highest frequency (140) 5700 MHz. Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.7970	V	Peak	58.63	± 4.09
		Average	48.76	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.7253	V	Peak	58.76	± 4.09
		Average	48.81	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8242	V	Peak	58.75	± 4.09
		Average	48.7	± 4.09

Channel 104 (5520 MHz): Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46028	V	Peak	58.68	± 4.09
		Average	48.93	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.4643	V	Peak	58.86	± 4.09
		Average	48.42	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.42965	V	Peak	59.05	\pm 4.09
		Average	48.26	\pm 4.09

Channel 136 (5680 MHz). Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.82358	V	Peak	59.07	\pm 4.09
		Average	48.74	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.81925	V	Peak	59.13	\pm 4.09
		Average	48.75	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.82213	V	Peak	58.82	\pm 4.09
		Average	48.74	\pm 4.09

802.11 ac 20MHz:

Channel 144 (5720 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.1625	V	Peak	45.26	\pm 4.09
22.8800	V	Peak	50.31	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.1547	V	Peak	46.38	\pm 4.09
		Peak	49.16	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.1574	V	Peak	46.89	\pm 4.09
		Peak	48.74	\pm 4.09

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Lowest frequency (102) 5510MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46995	V	Peak	58.9	\pm 4.09
		Average	49.25	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46952	V	Peak	58.09	\pm 4.09
		Average	48.34	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46928	V	Peak	59.48	\pm 4.09
		Average	48.24	\pm 4.09

Middle frequency (118) 5590 MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
22.3600	V	Peak	48.12	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.7606	V	Peak	46.22	\pm 4.09
22.3599	V	Peak	48.16	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.7775	V	Peak	43.32	\pm 4.09
22.3600	V	Peak	48.53	\pm 4.09

Highest frequency (134) 5670MHz. Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.81243	V	Peak	59.25	\pm 4.09
		Average	48.72	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.82315	V	Peak	58.95	\pm 4.09
		Average	48.78	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.81648	V	Peak	59.41	\pm 4.09
		Average	48.74	\pm 4.09

Channel 110 (5550 MHz). 5510MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest spurious levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46382	V	Peak	60.57	± 4.09
		Average	50.23	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46442	V	Peak	59.03	± 4.09
		Average	49.09	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46722	V	Peak	60.37	± 4.09
		Average	48.50	± 4.09

802.11 ac 40MHz:

Channel 142 (5710 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
22.84	V	Peak	48.55	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.137687	V	Peak	49.85	± 4.09
22.84	V	Peak	49.27	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.139	V	Peak	46.56	± 4.09
22.84	V	Peak	50.33	± 4.09

Verdict: PASS

4. WiFi 5GHz 802.11 ac80 mode

Lowest frequency (106) 5530MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest spurious levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.44756	V	Peak	60.71	\pm 4.09
		Average	50.16	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.44732	V	Peak	60.25	\pm 4.09
		Average	49.74	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.44732	V	Peak	60.05	\pm 4.09
		Average	50.33	\pm 4.09

Middle frequency (122) 5610MHz. Out-of-band spurious emissions in the 1-40 GHz range and emissions inside restricted band 5.725-5.825 GHz adjacent bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8193	V	Peak	58.63	\pm 4.09
	V	Average	48.32	\pm 4.09
22.4400	V	Peak	49.22	\pm 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8249	V	Peak	59.95	\pm 4.09
	V	Average	48.56	\pm 4.09
16.8603	V	Peak	44.35	\pm 4.09
22.4400	V	Peak	48.79	\pm 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.8214	V	Peak	61.39	± 4.09
	V	Average	48.21	± 4.09
16.8642	V	Peak	42.46	± 4.09
22.4400	V	Peak	48.27	± 4.09

802.11 ac 80MHz:

Channel 138 (5690 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
22.76	V	Peak	47.29	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.0712	V	Peak	48.17	± 4.09
22.76	V	Peak	48.2	± 4.09

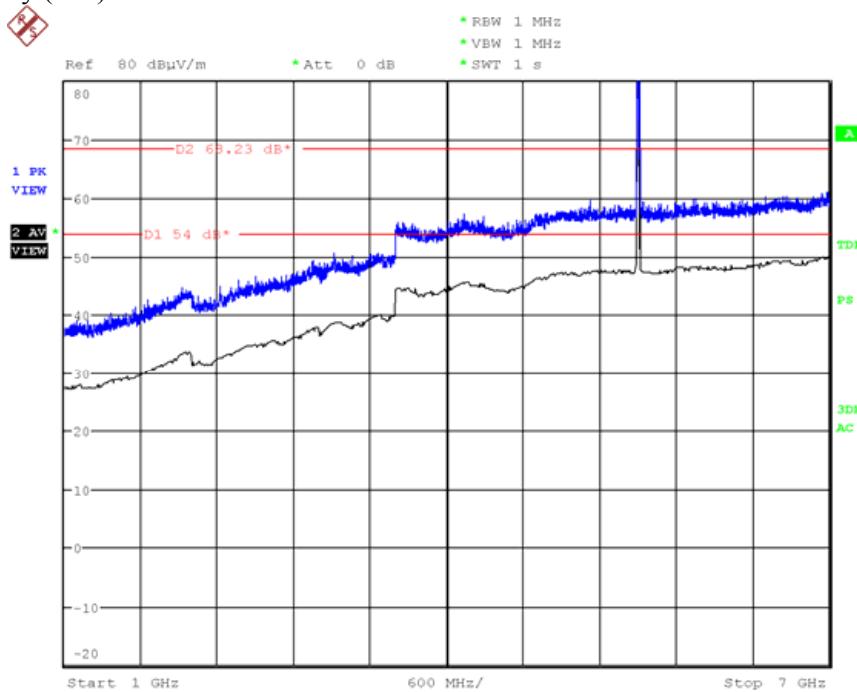
Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.07	V	Peak	46.25	± 4.09
22.76	V	Peak	48.7	± 4.09

Verdict: PASS

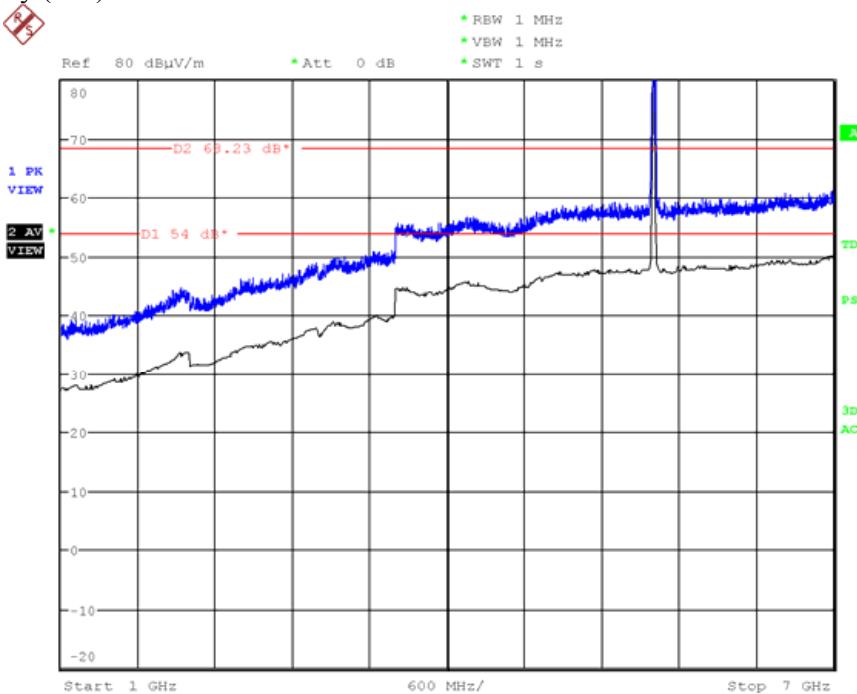
FREQUENCY RANGE 1 GHz to 7 GHz.
WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.



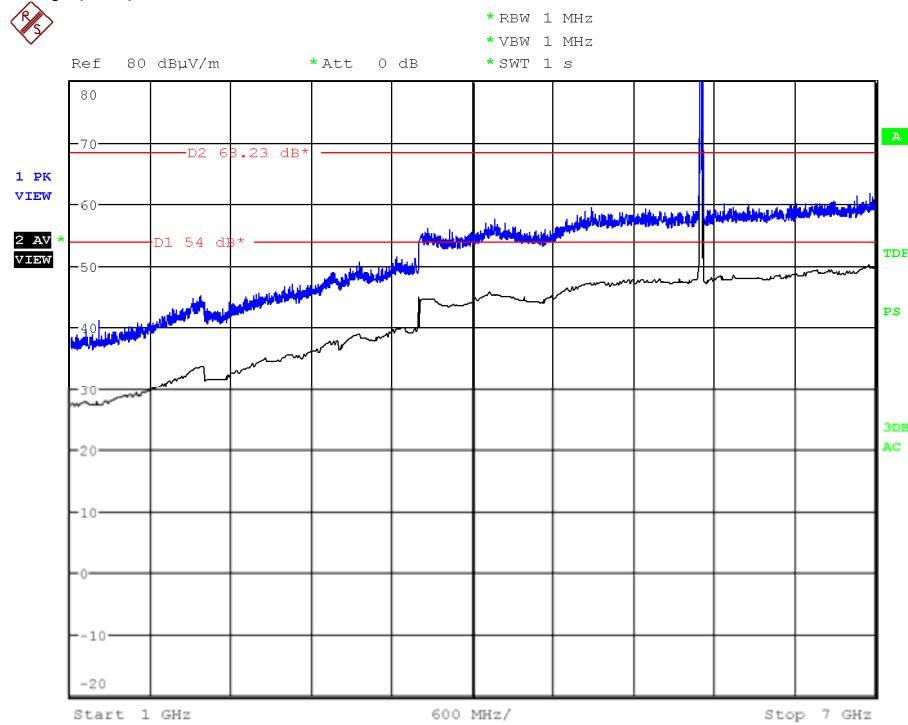
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

Middle frequency (120) 5600 MHz.



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

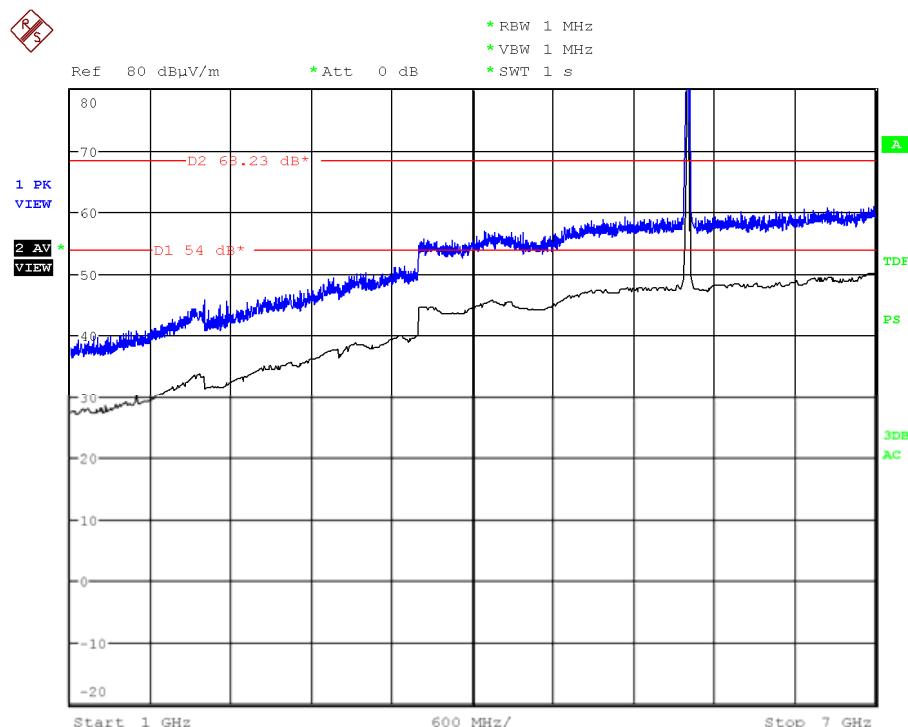
Highest frequency (140) 5700 MHz.



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

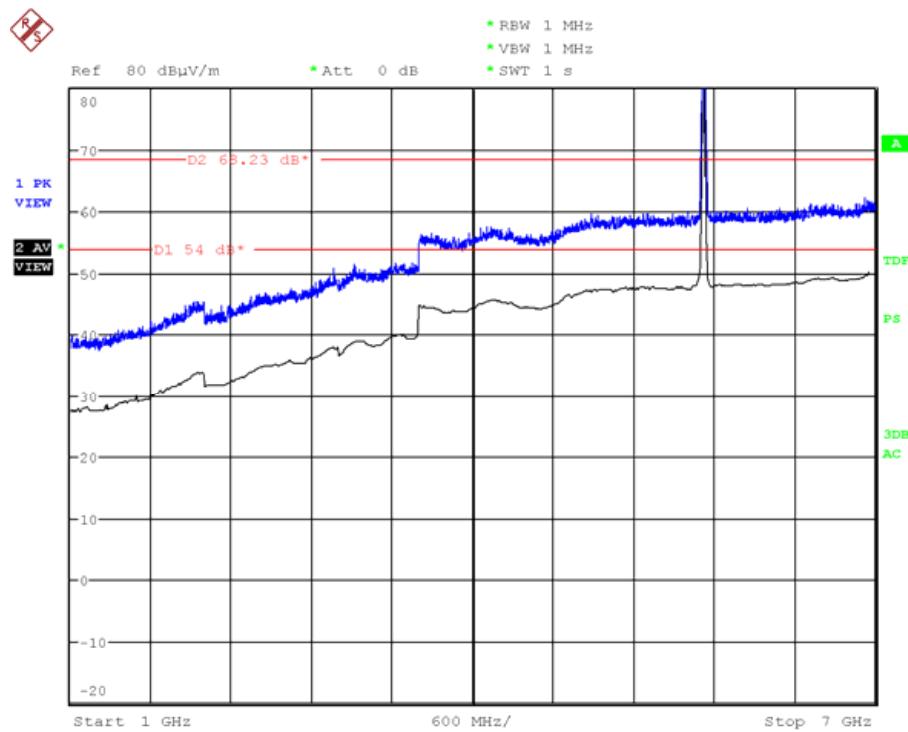
2. WiFi 5GHz 802.11 n20 mode

Middle frequency (120) 5600 MHz.



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

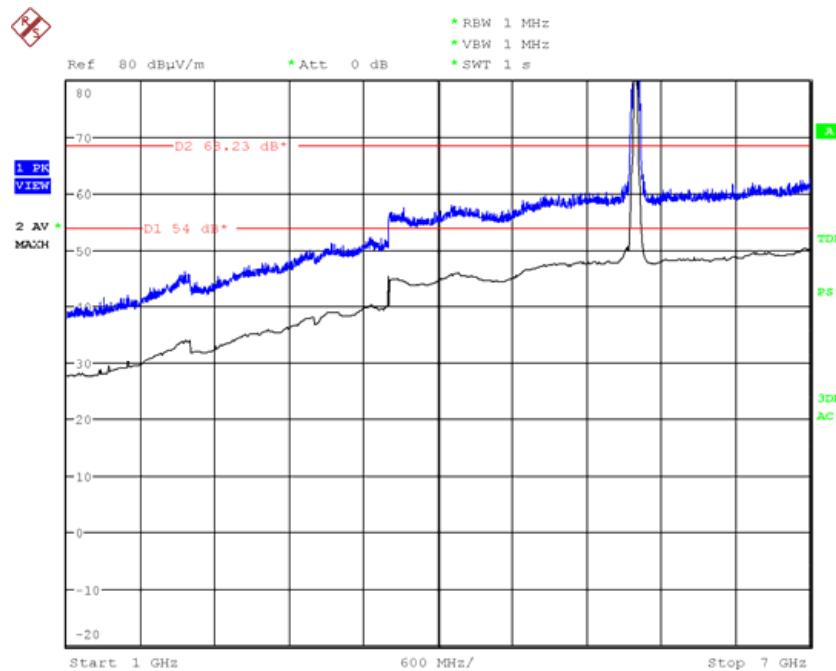
802.11ac20 mode: CH 144 5720 MHz.



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

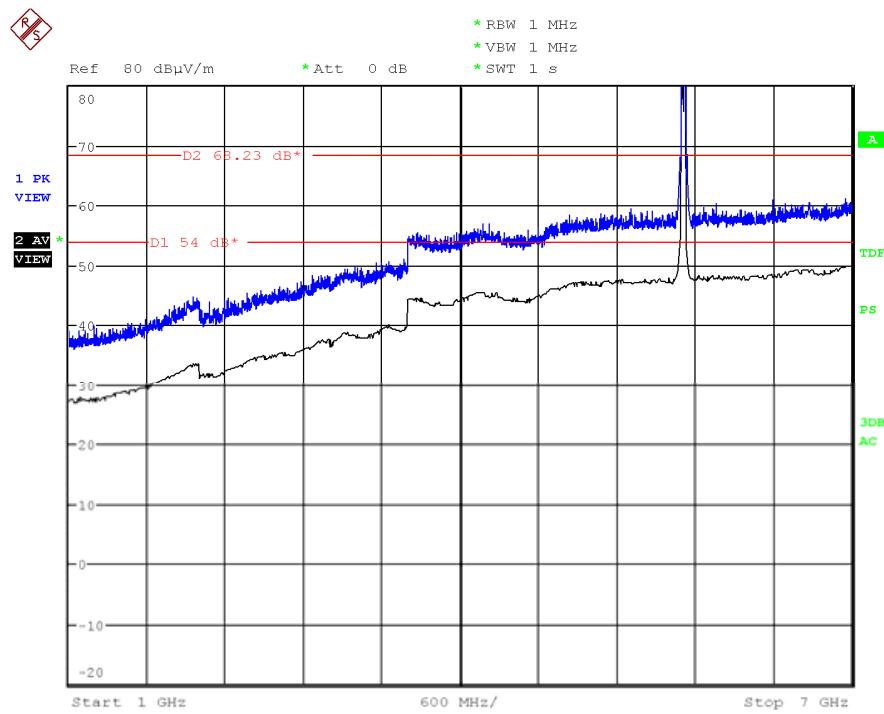
3. WiFi 5GHz 802.11 n40 mode

Middle frequency (118) 5590 MHz.



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

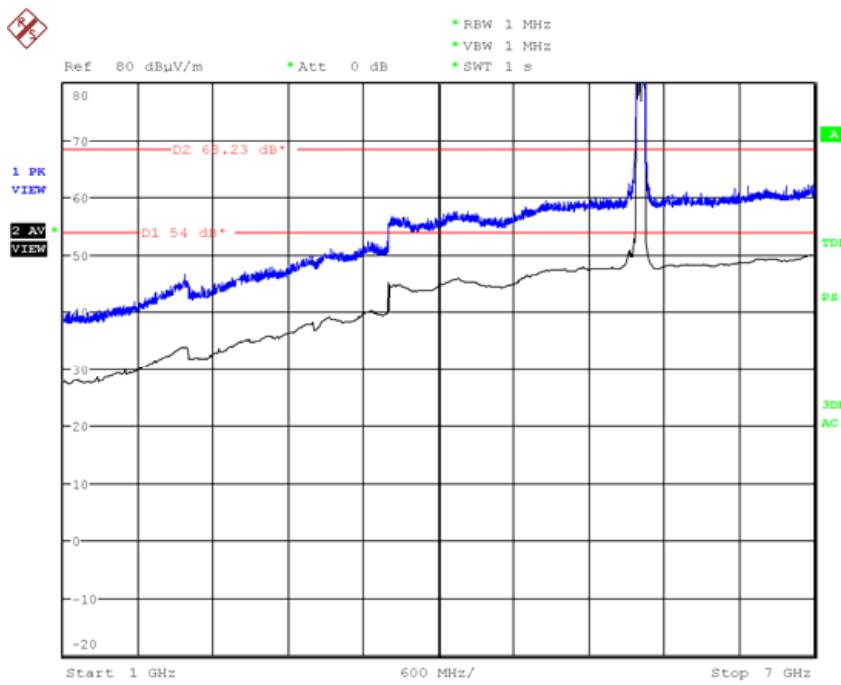
802.11ac40 mode: CH 142 5710 MHz.



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

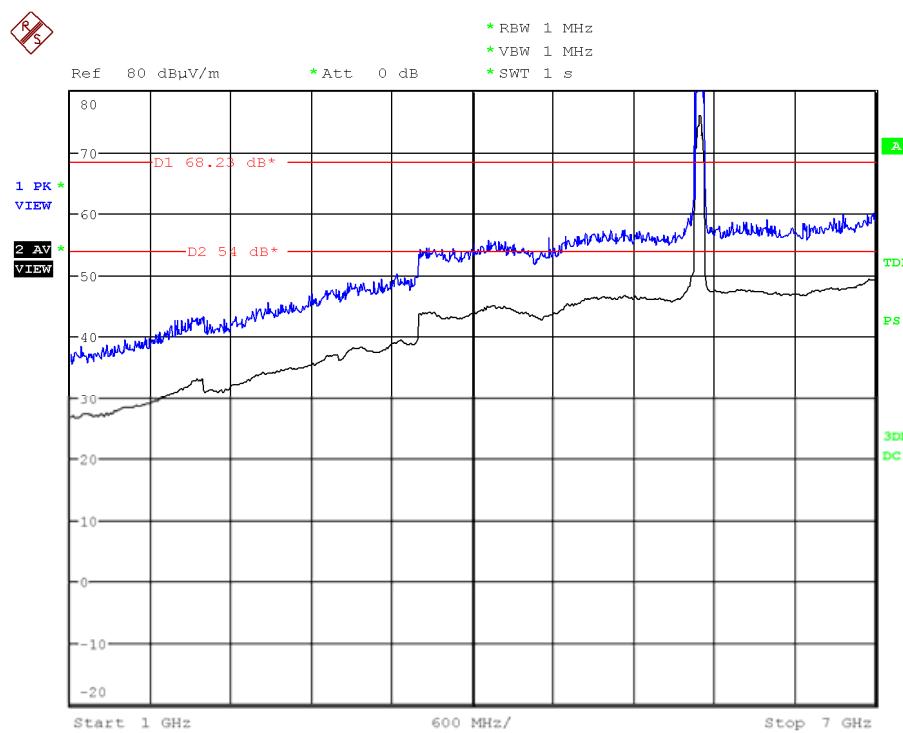
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency (122) 5610 MHz.



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

802.11ac80 mode: CH 138 5690 MHz.



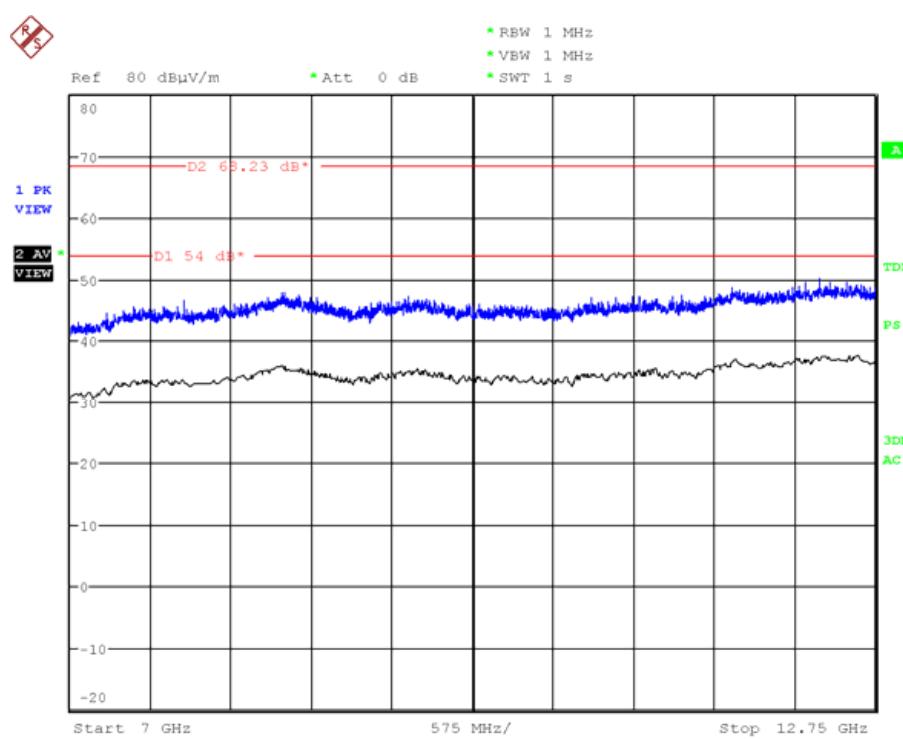
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

FREQUENCY RANGE 7 GHz to 12.75 GHz.

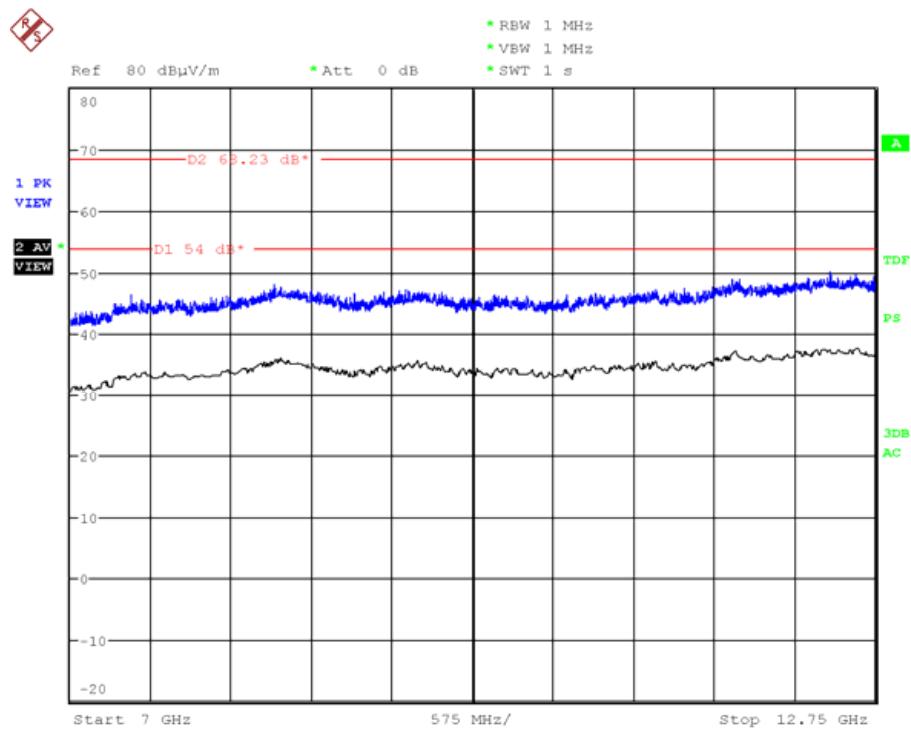
1. WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.

Chain A

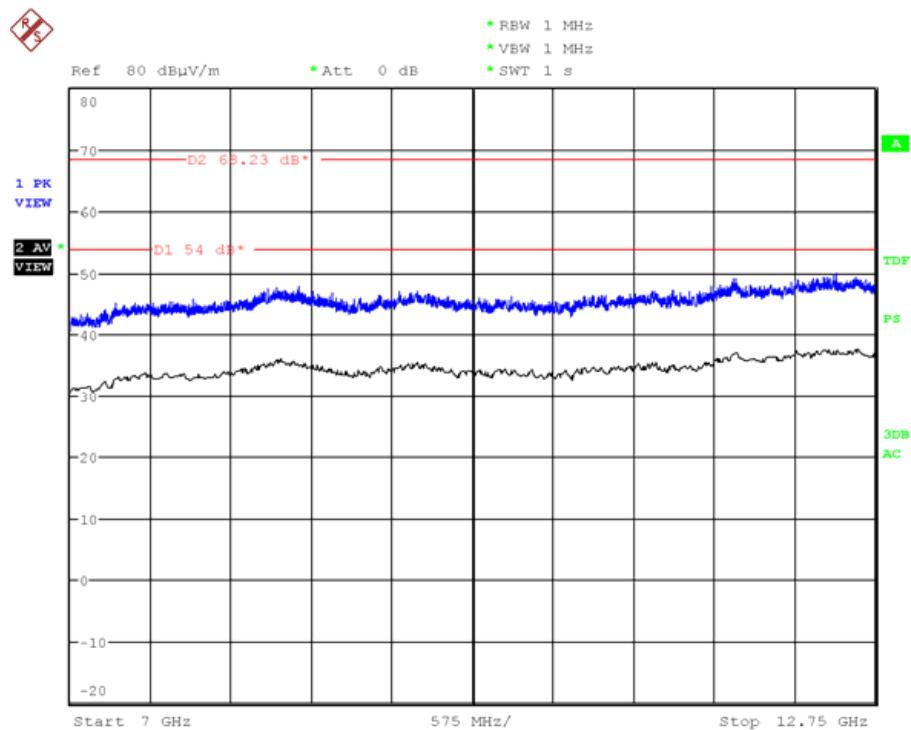


Chain B

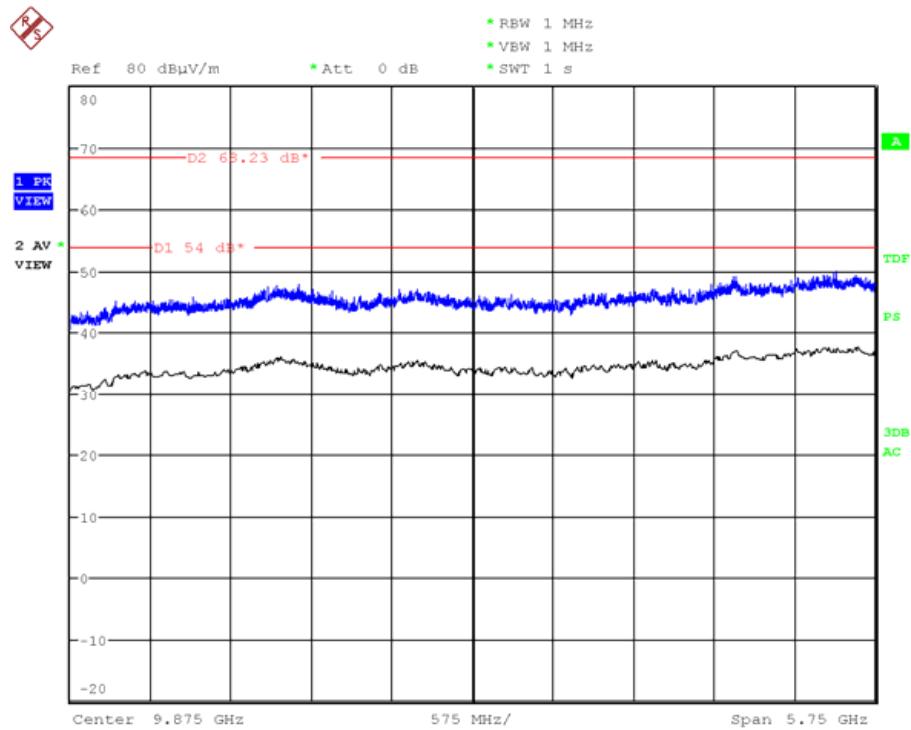


Middle frequency (120) 5600 MHz.

Chain A

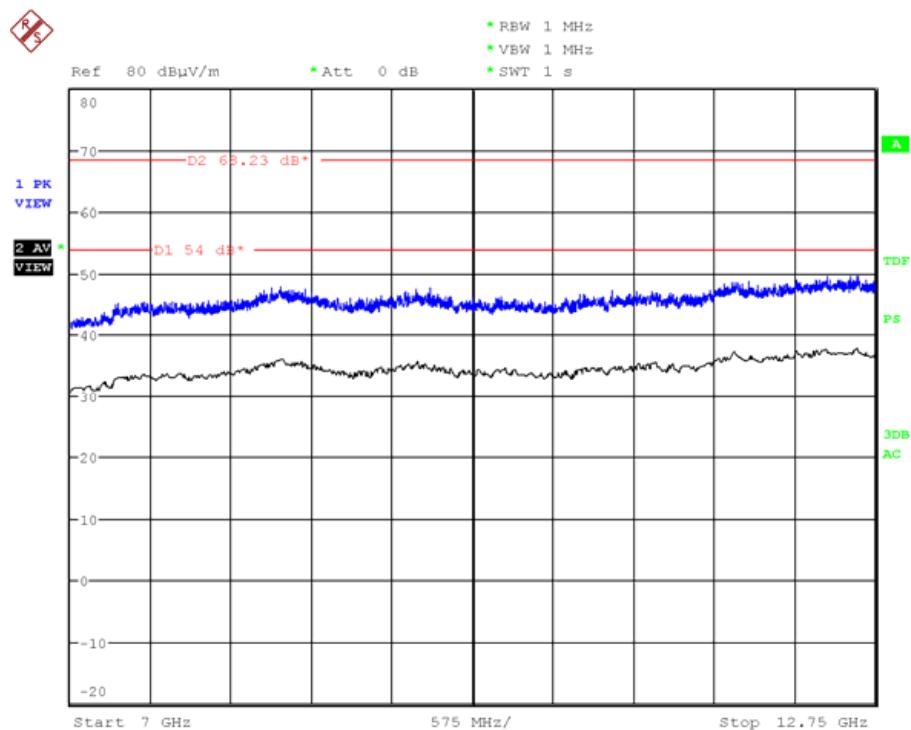


Chain B

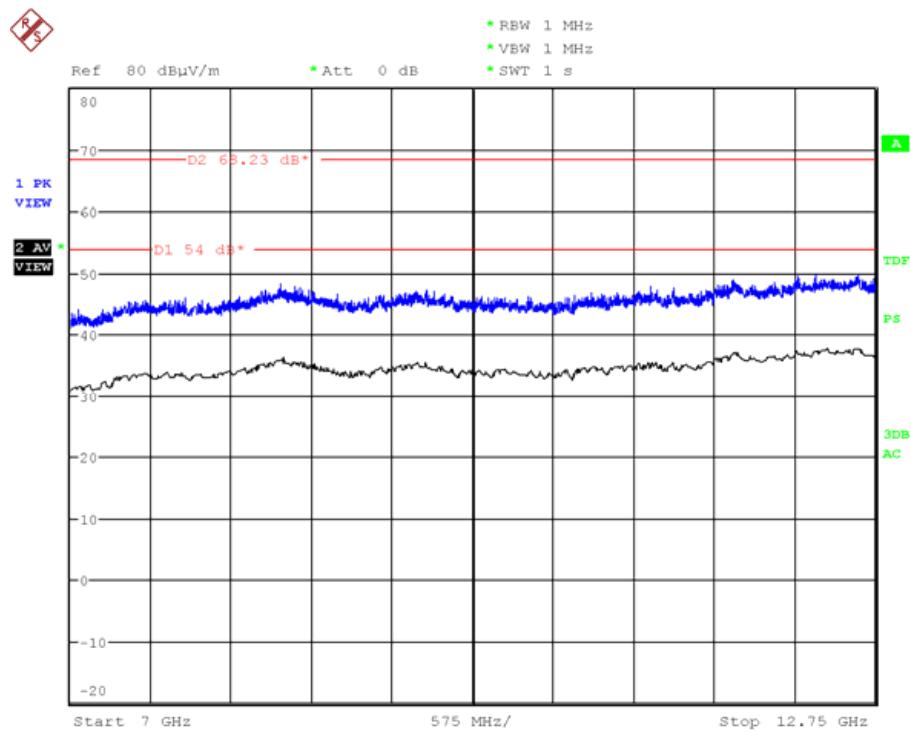


2. WiFi 5GHz 802.11 n20 mode

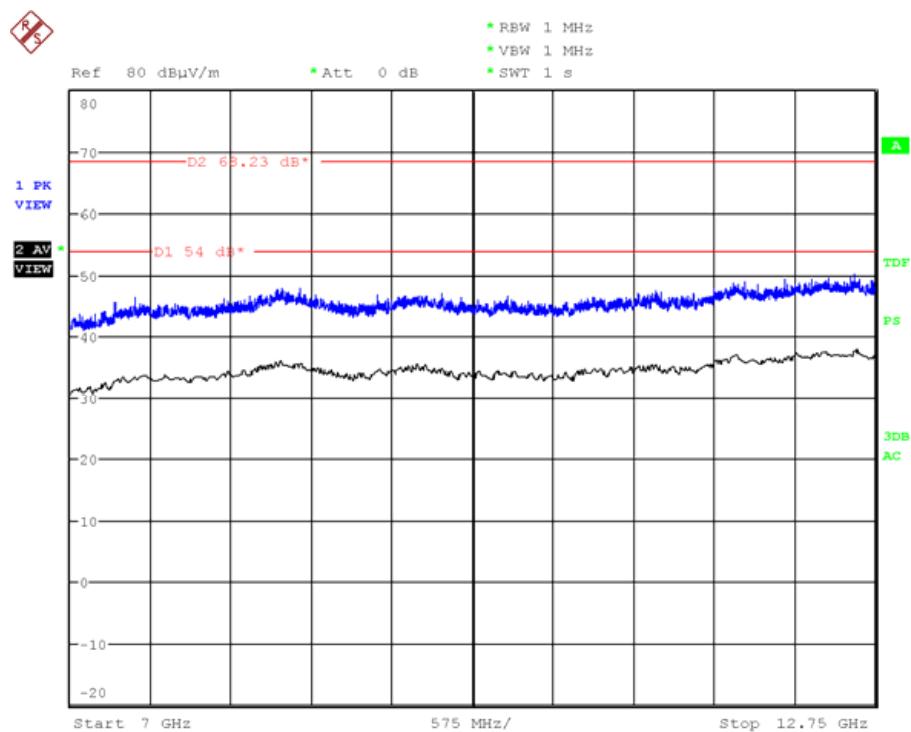
Middle frequency (120) 5600 MHz.
 Chain A



Chain B

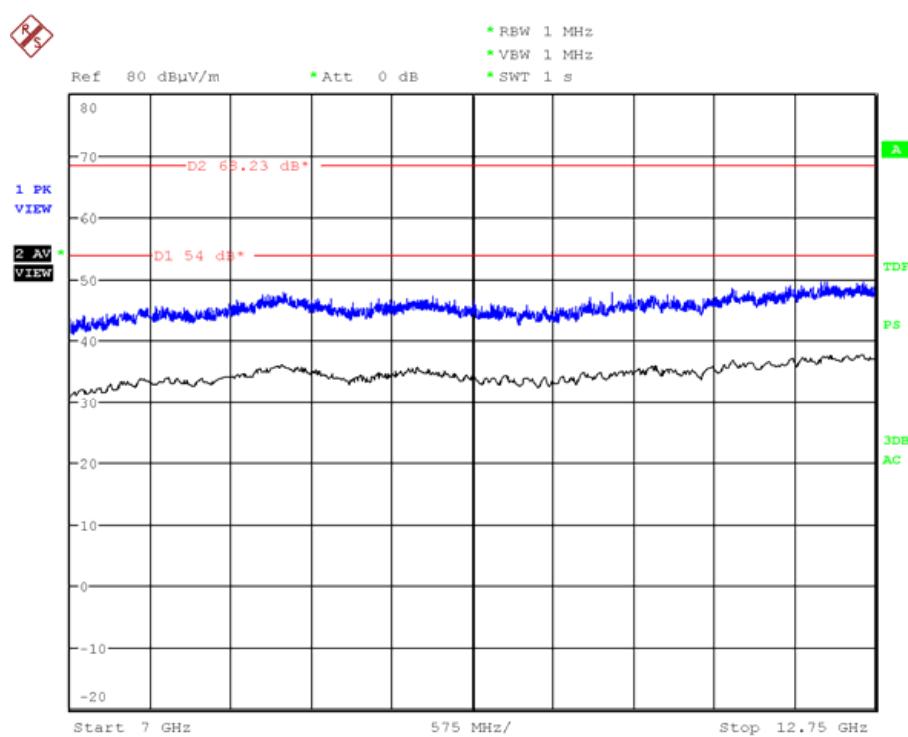


Chain A+B

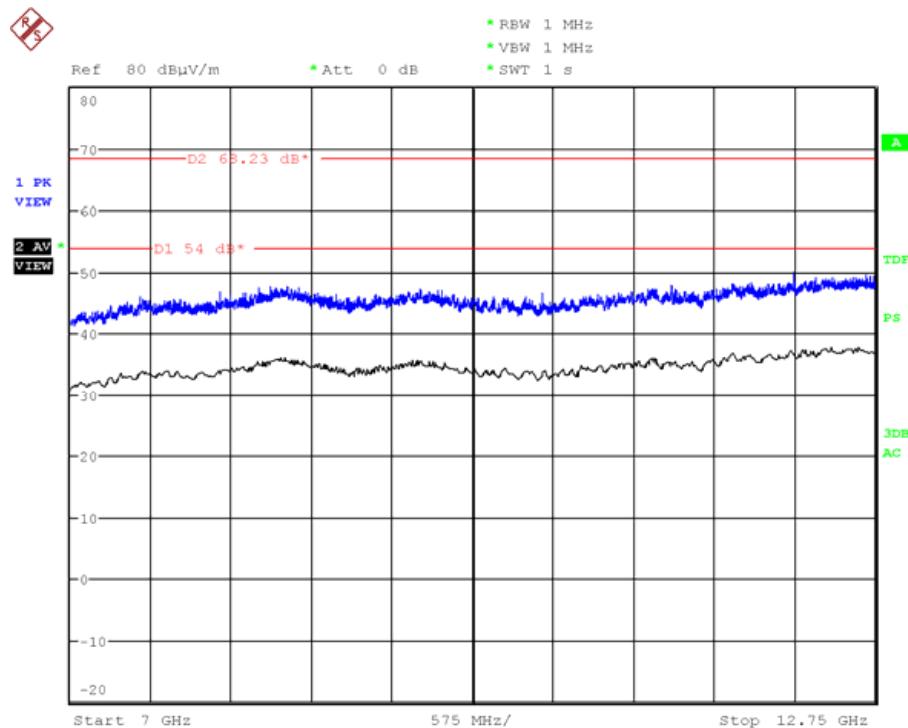


802.11ac20 mode: CH 144 (5720 MHz)

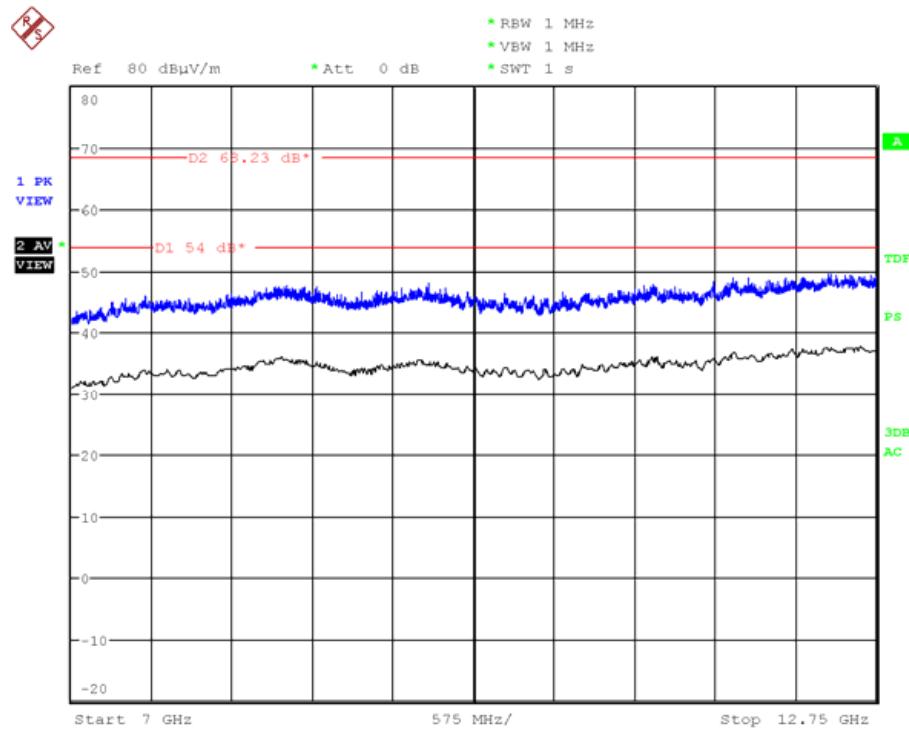
Chain A



Chain B

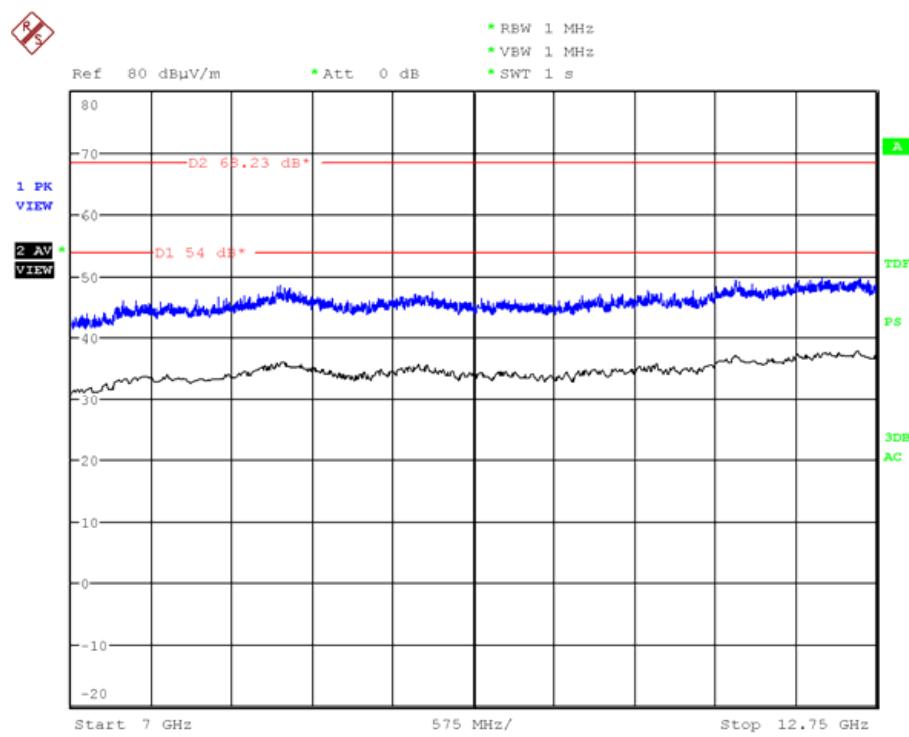


Chain A+B

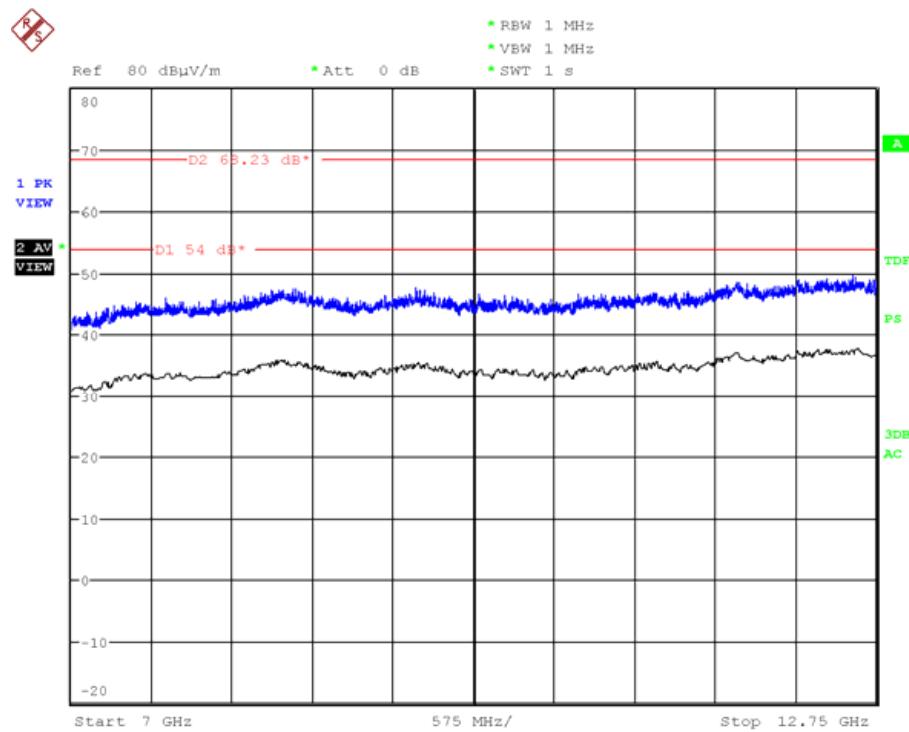


3. WiFi 5GHz 802.11 n40 mode

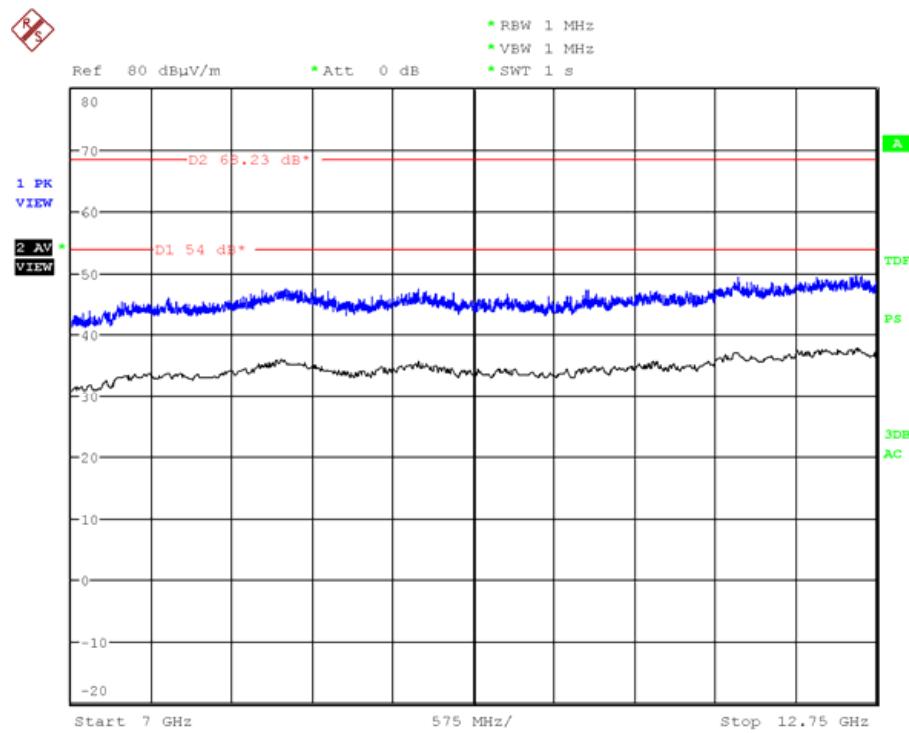
Middle frequency (118) 5590 MHz.
Chain A



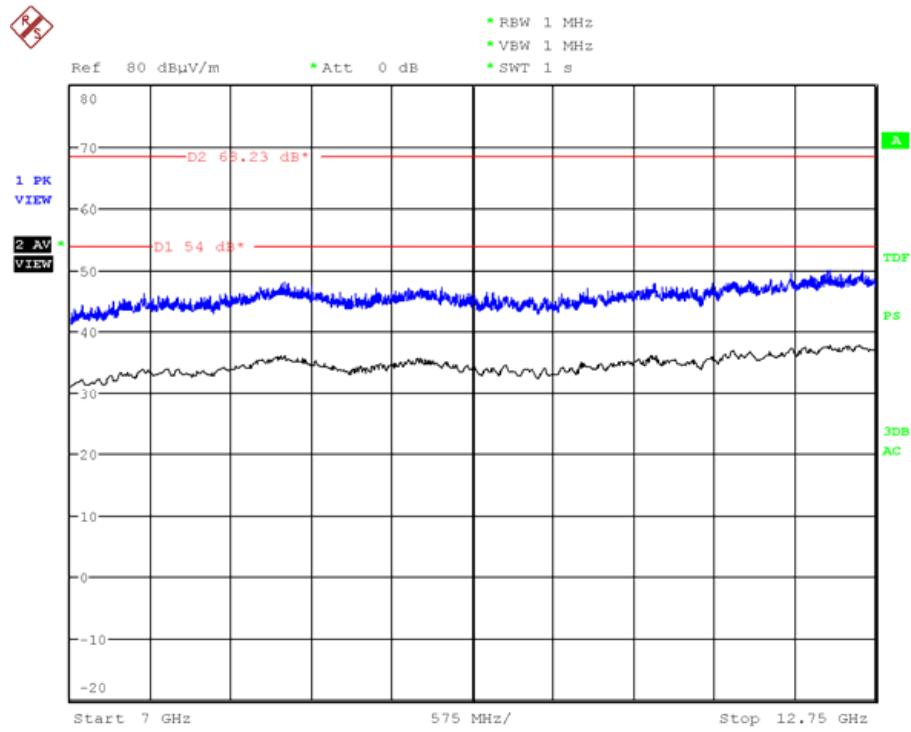
Chain B



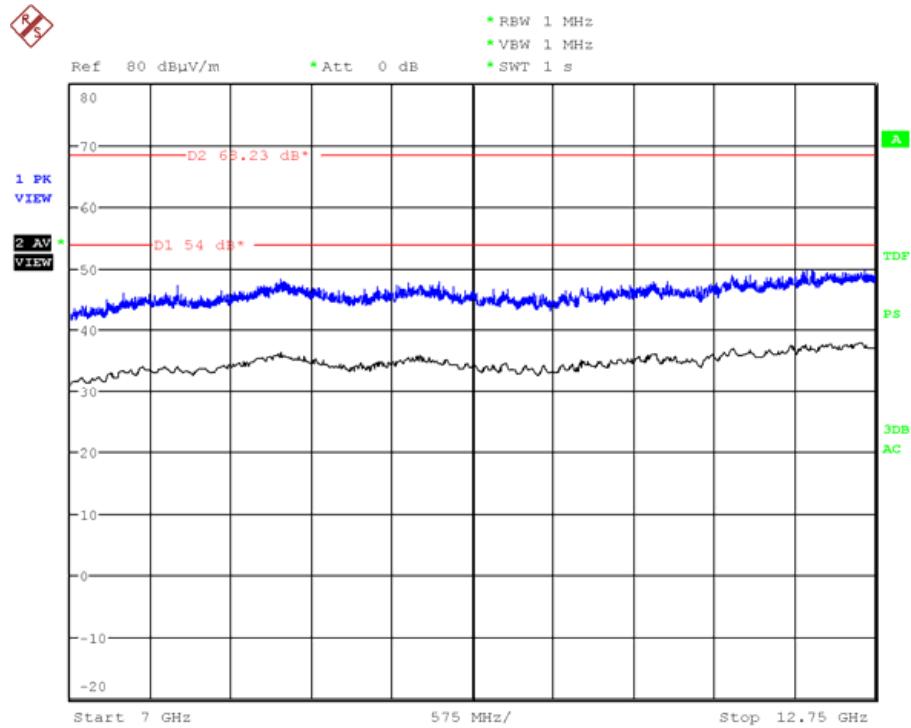
Chain A+B



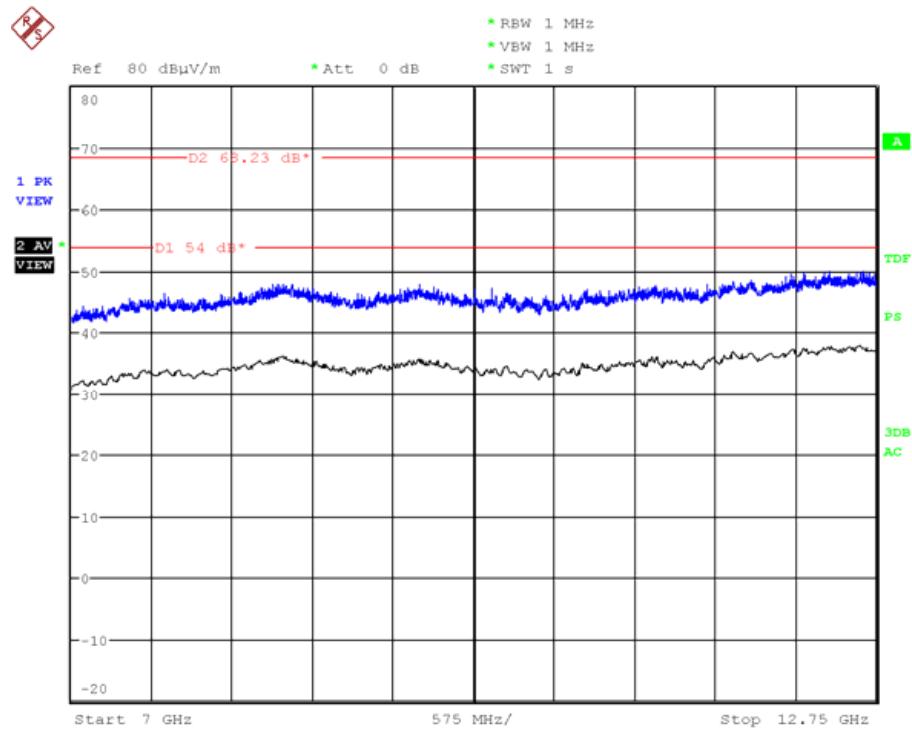
802.11ac40 mode: CH 142 (5710 MHz)
Chain A



Chain B

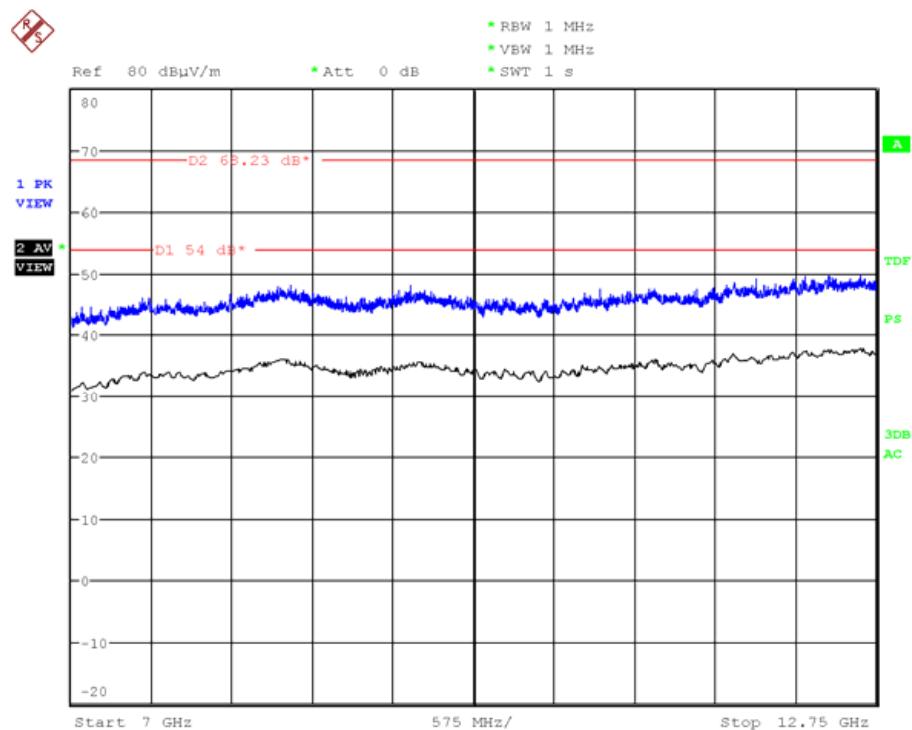


Chain A+B

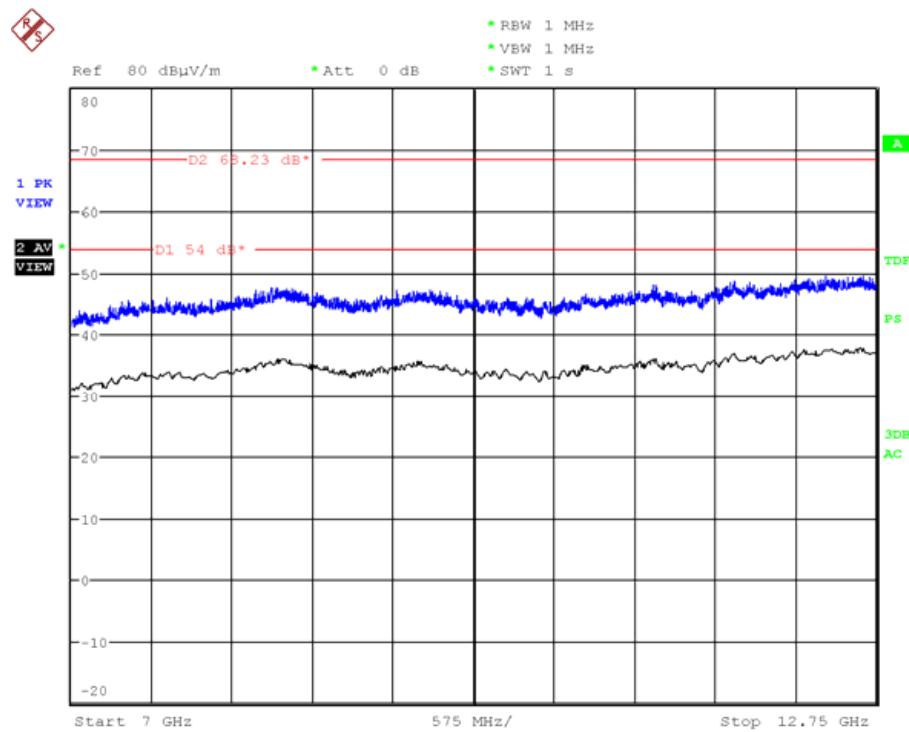


4. WiFi 5GHz 802.11 ac80 mode

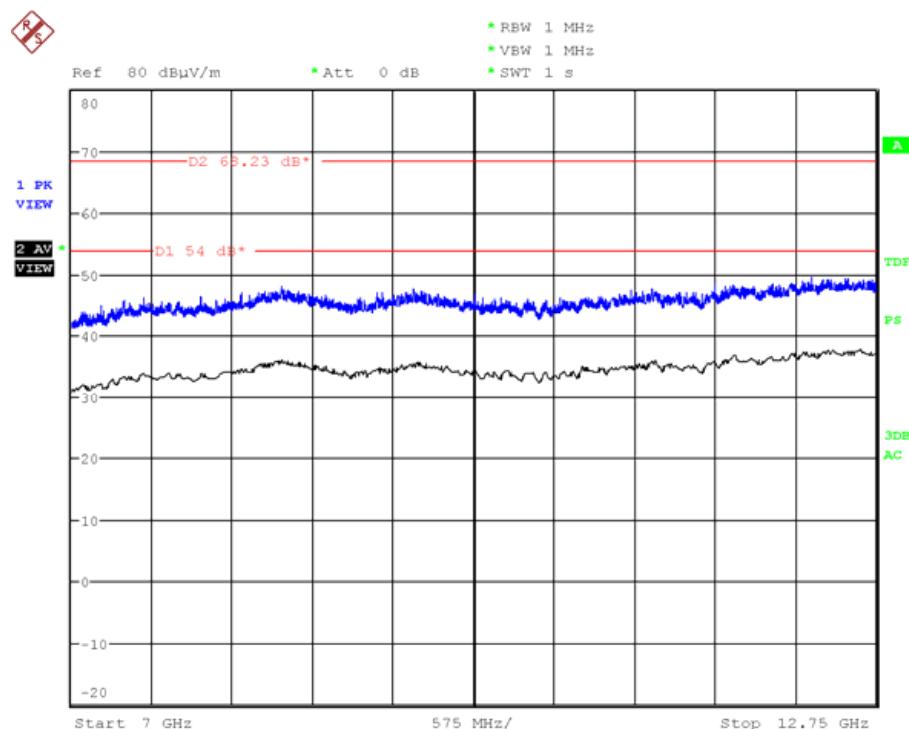
Middle frequency (122) 5610 MHz.
 Chain A



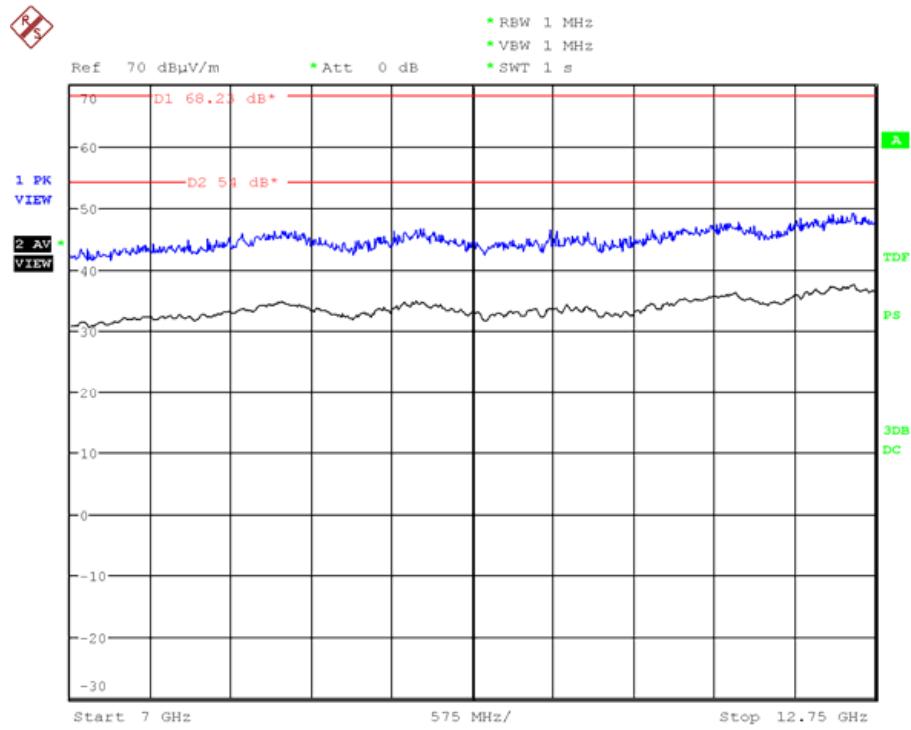
Chain B



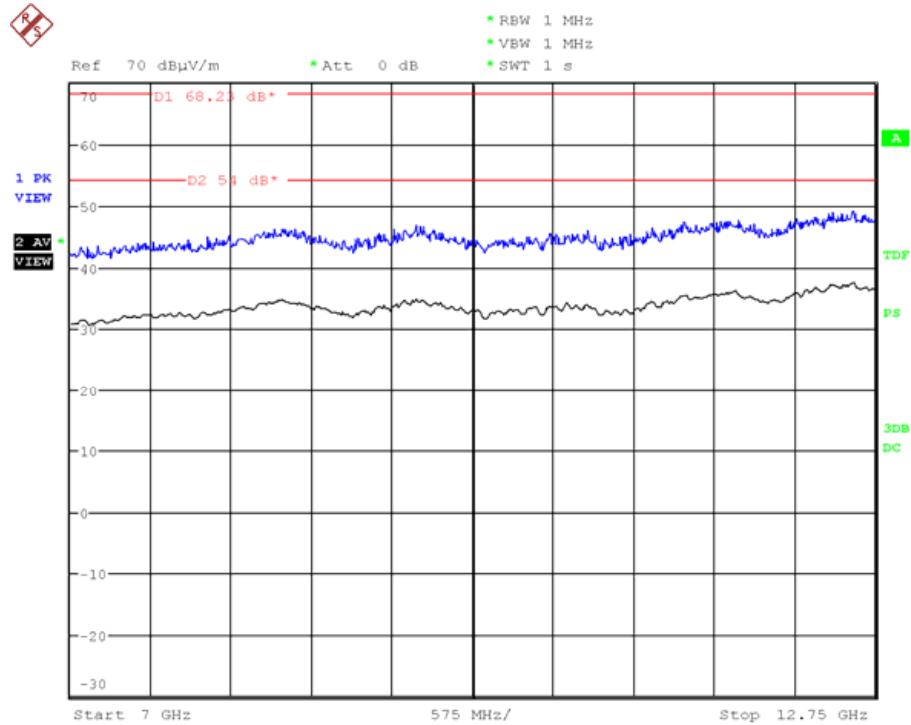
Chain A+B



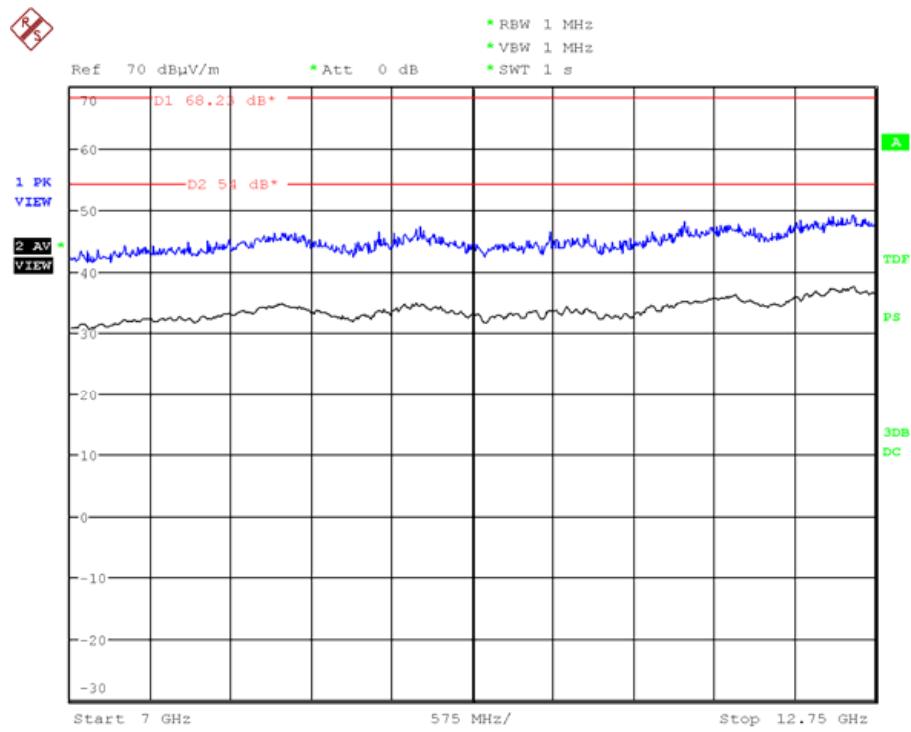
802.11ac80 mode: CH 138 (5690 MHz)
Chain A



Chain B



Chain A+B

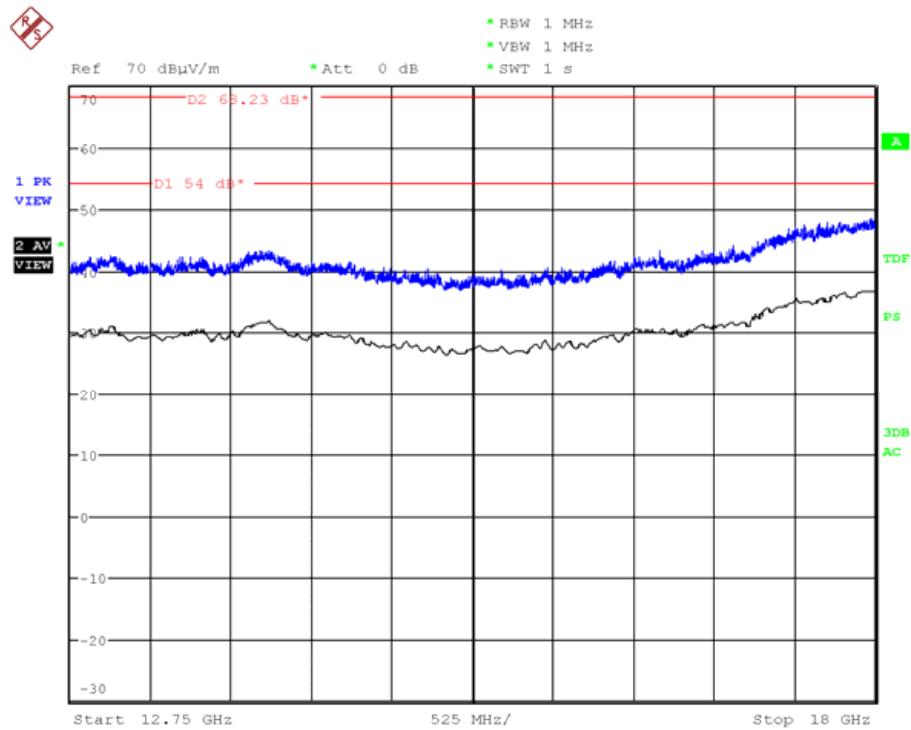


FREQUENCY RANGE 12.75 GHz to 18 GHz.

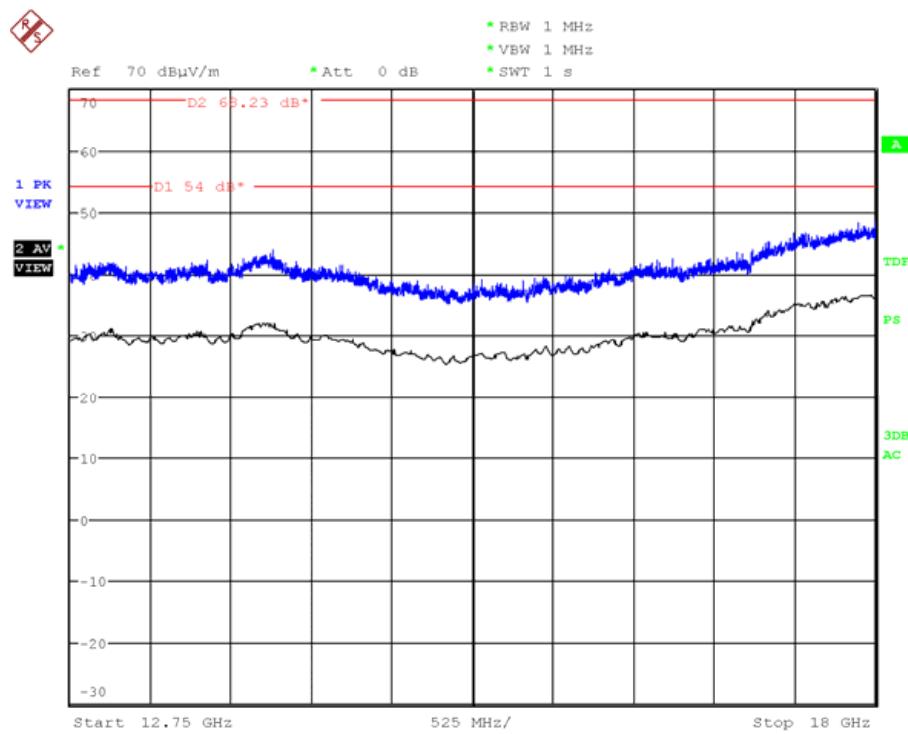
1. WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.

Chain A

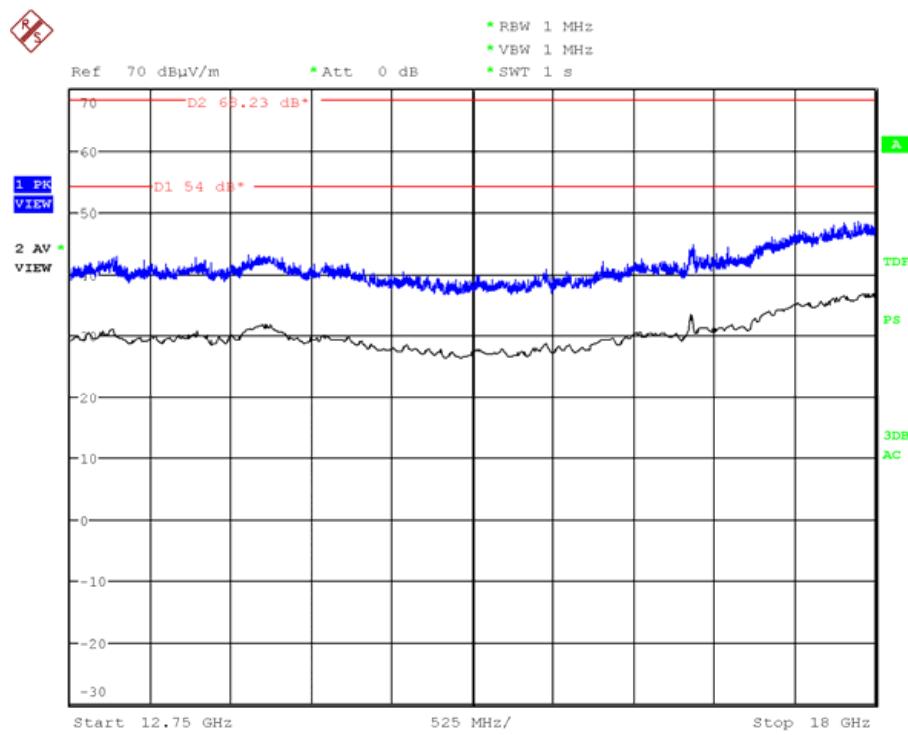


Chain B

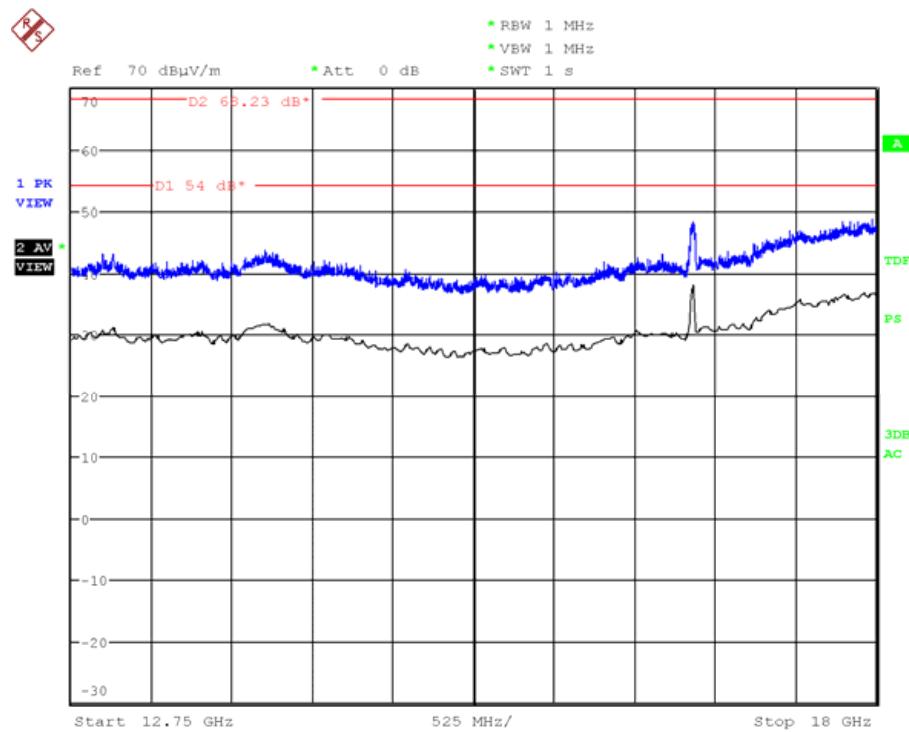


Middle frequency (120) 5600 MHz.

Chain A

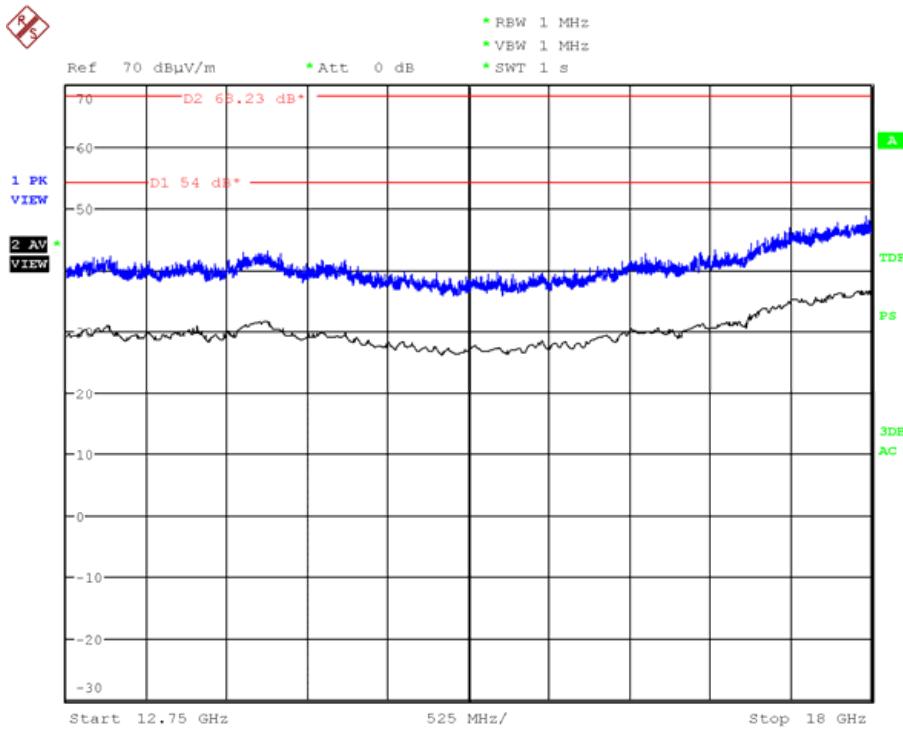


Chain B

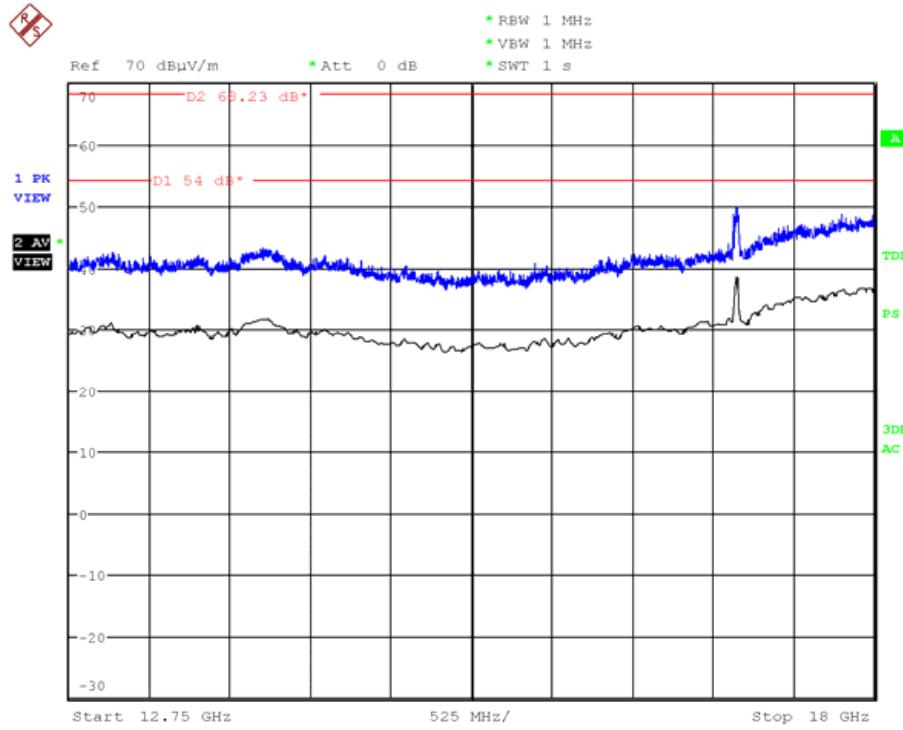


Highest frequency (140) 5700 MHz.

Chain A

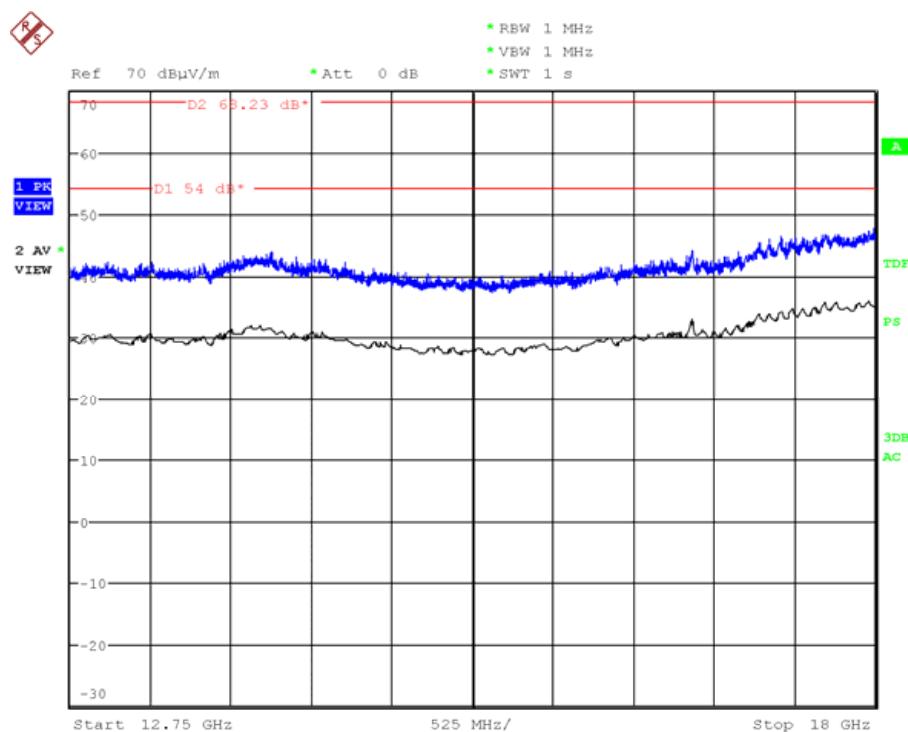


Chain B

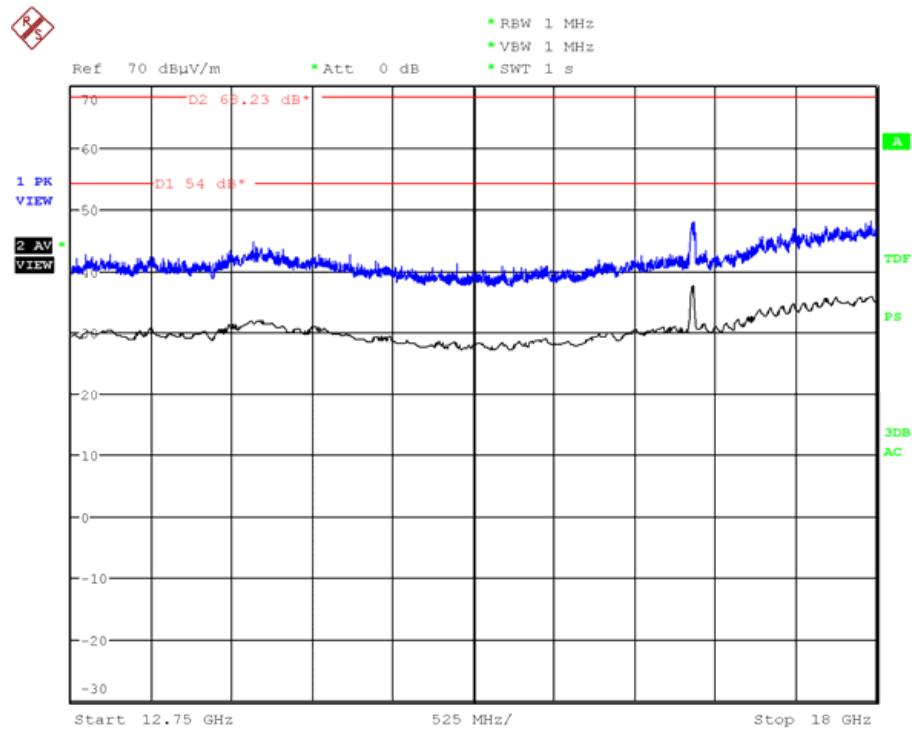


2. WiFi 5GHz 802.11 n20 mode

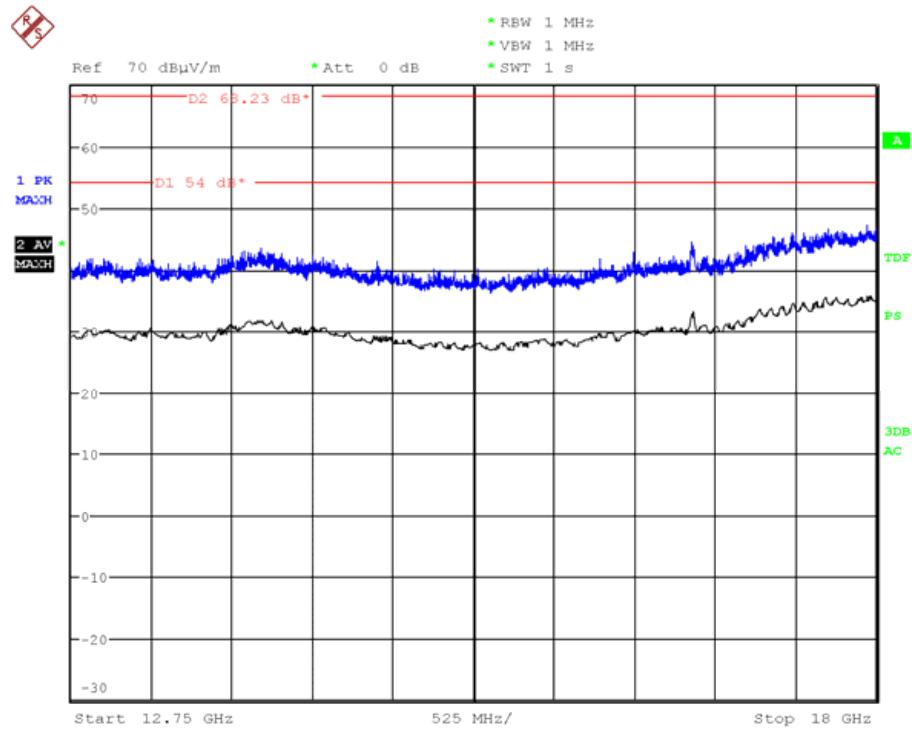
Middle frequency (120) 5600 MHz.
Chain A



Chain B

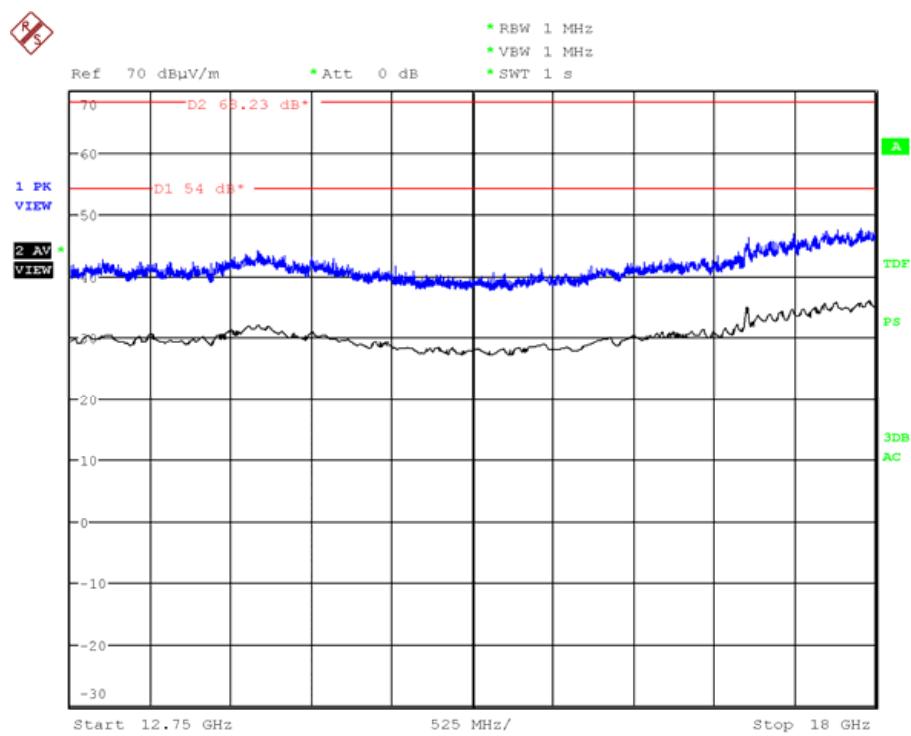


Chain A+B

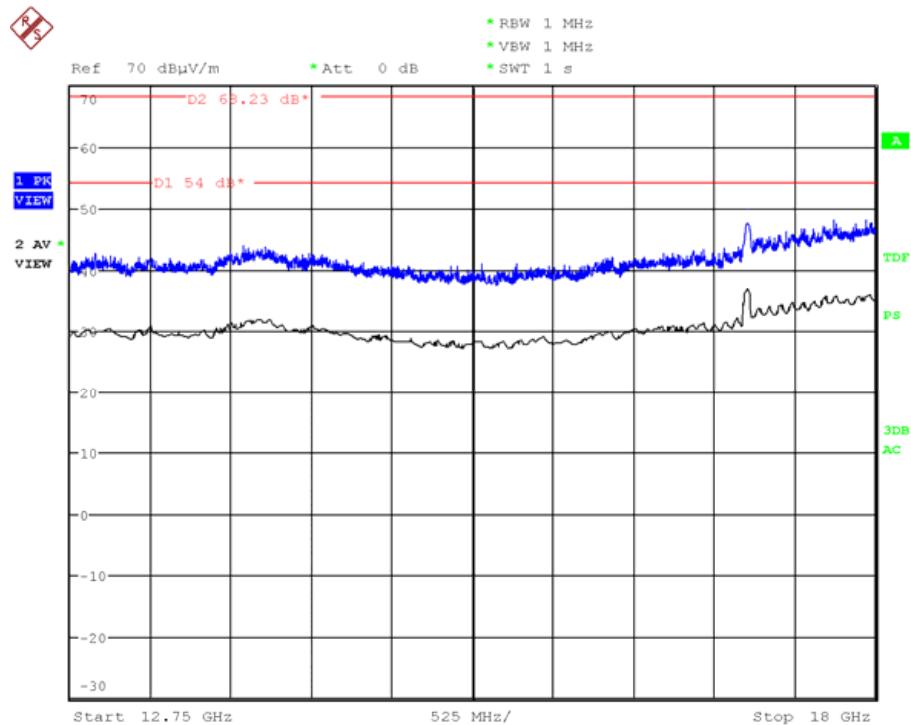


802.11ac20 mode: CH 144 (5720 MHz)

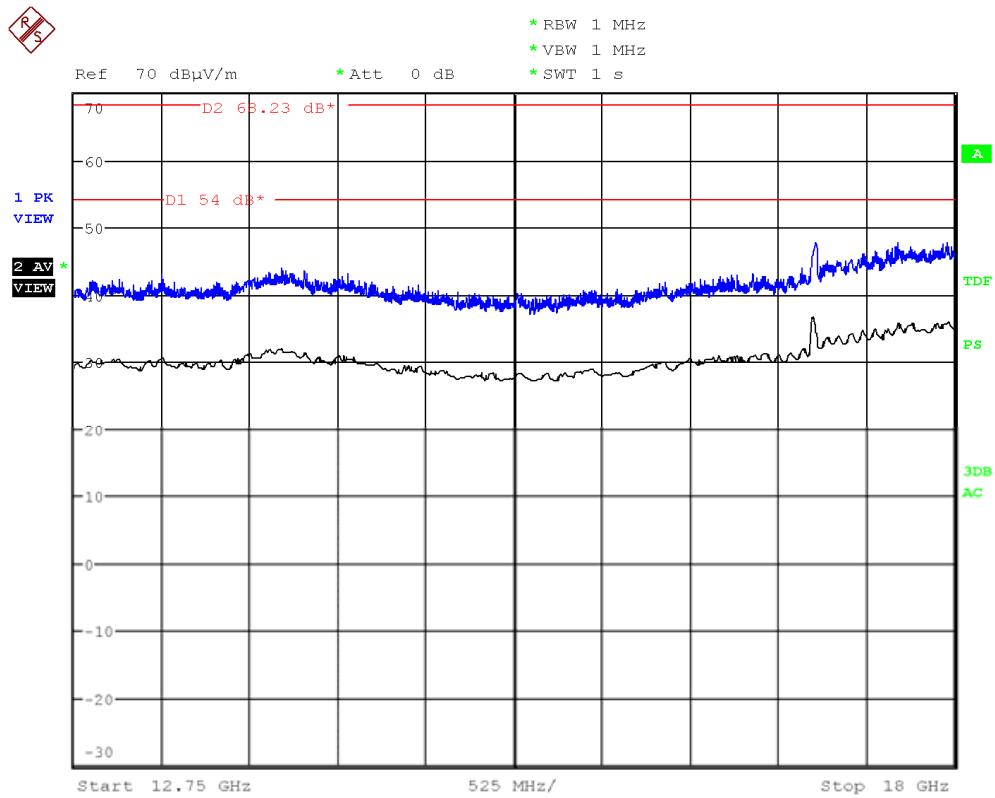
Chain A



Chain B



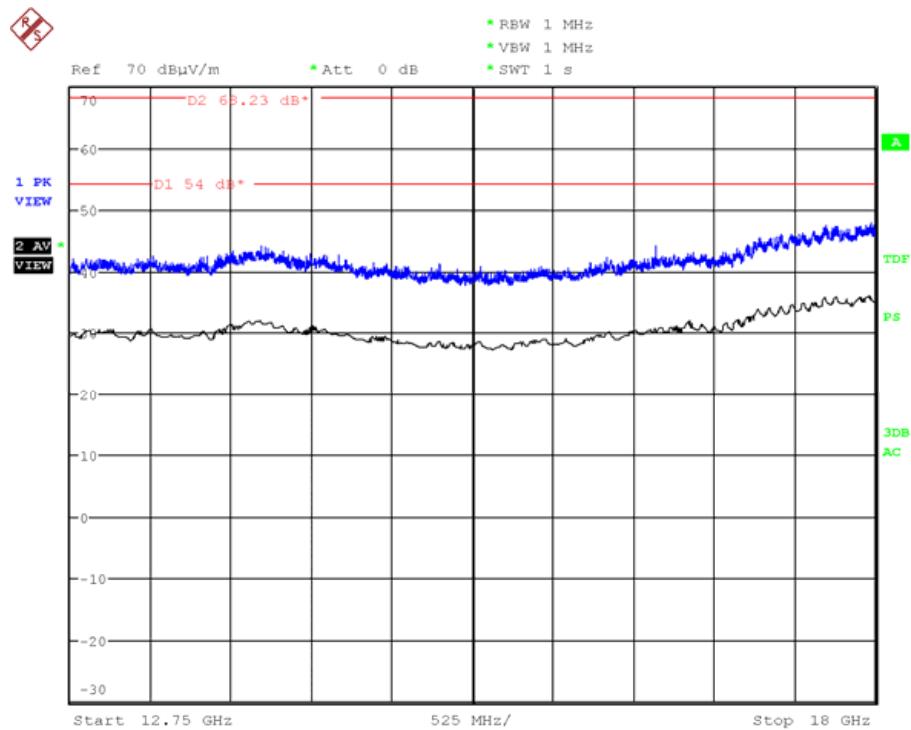
Chain A+B



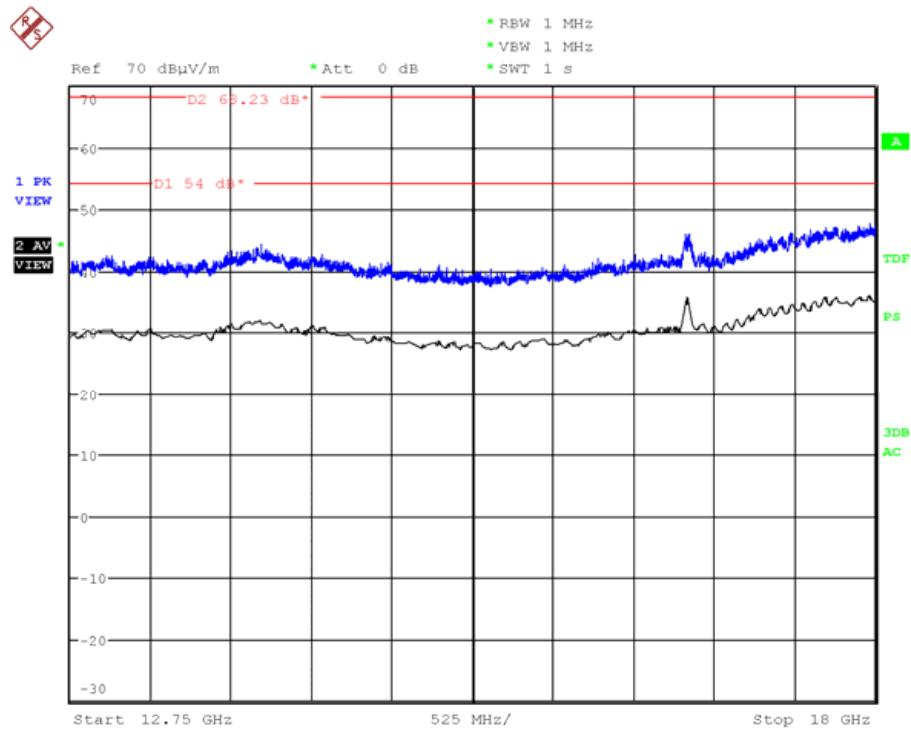
3. WiFi 5GHz 802.11 n40 mode

Middle frequency (118) 5590 MHz.

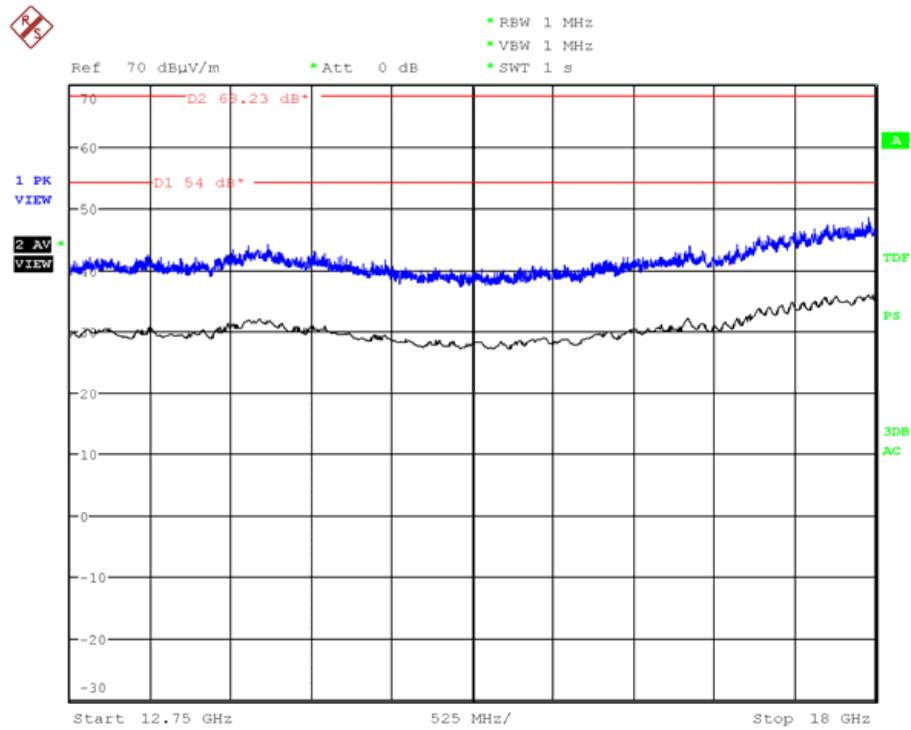
Chain A



Chain B

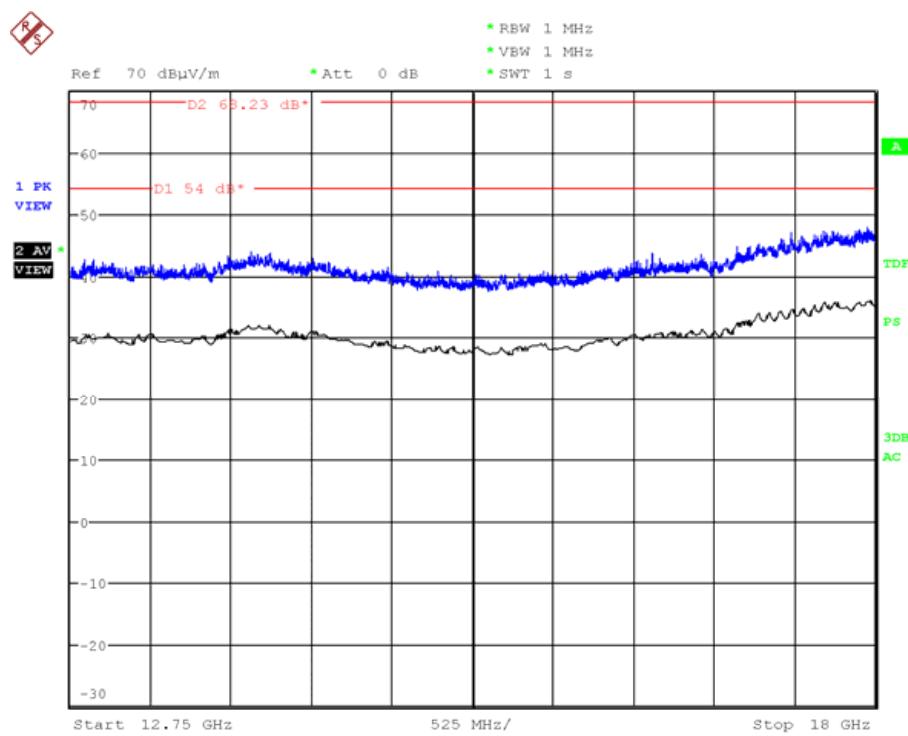


Chain A+B

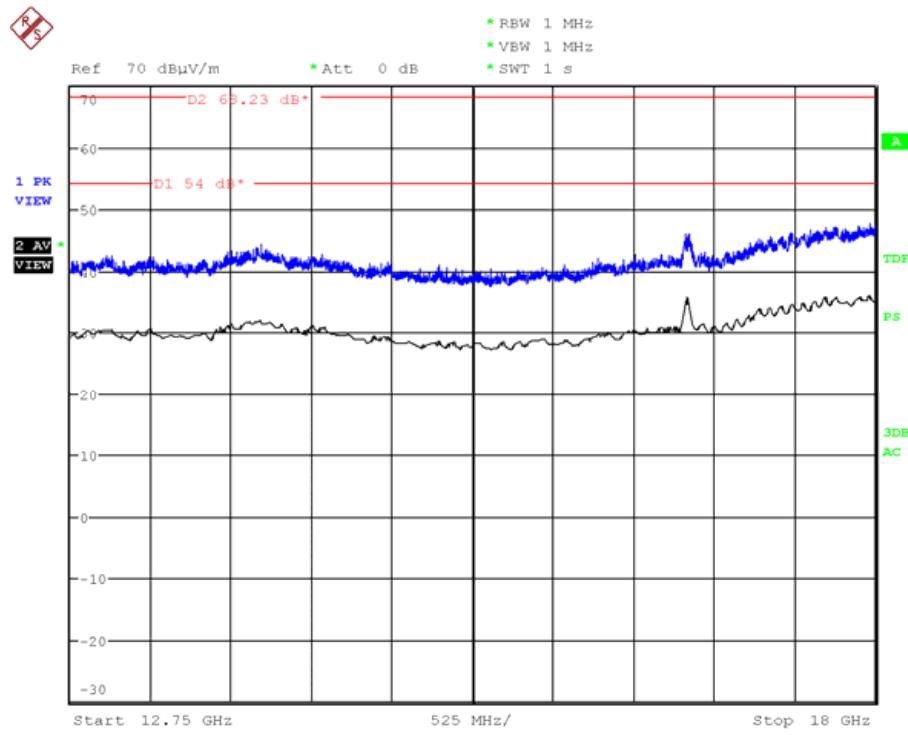


802.11ac40 mode: CH 142 (5710 MHz)

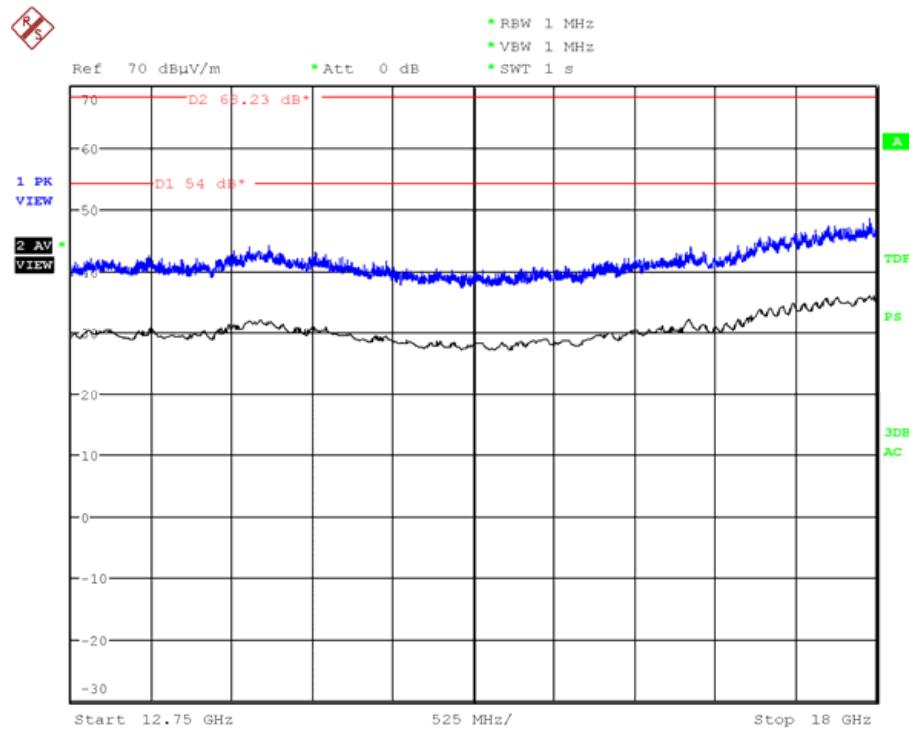
Chain A



Chain B



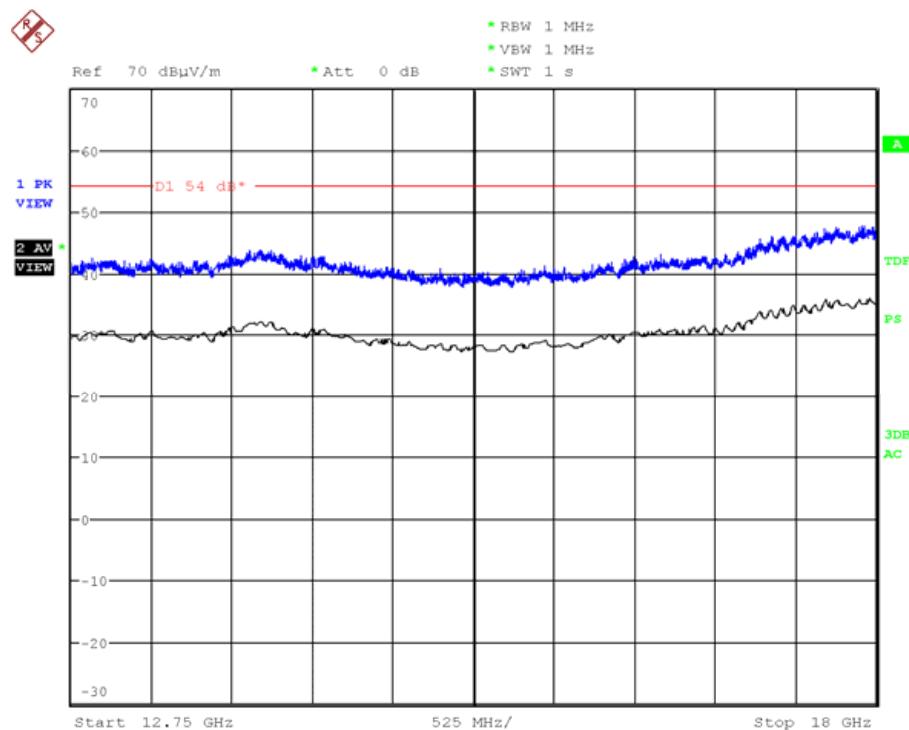
Chain A+B



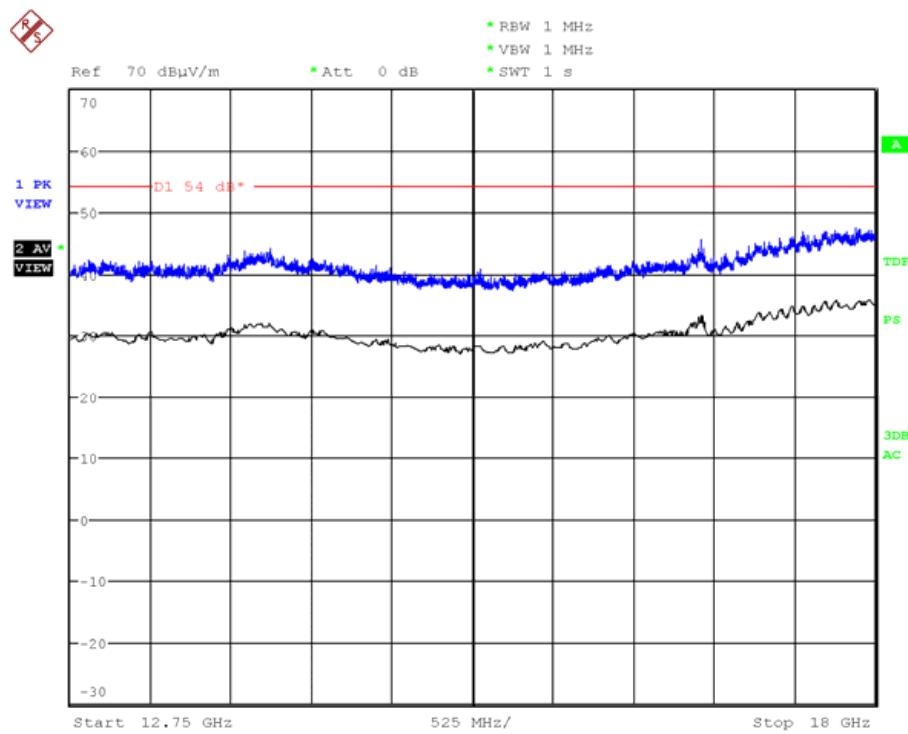
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency (122) 5610 MHz.

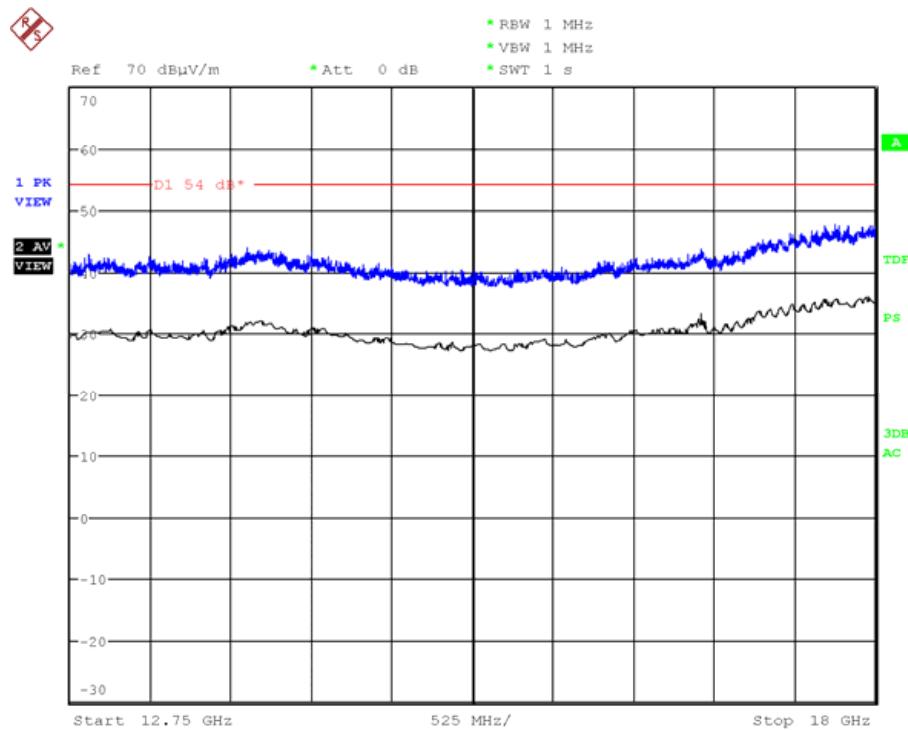
Chain A



Chain B

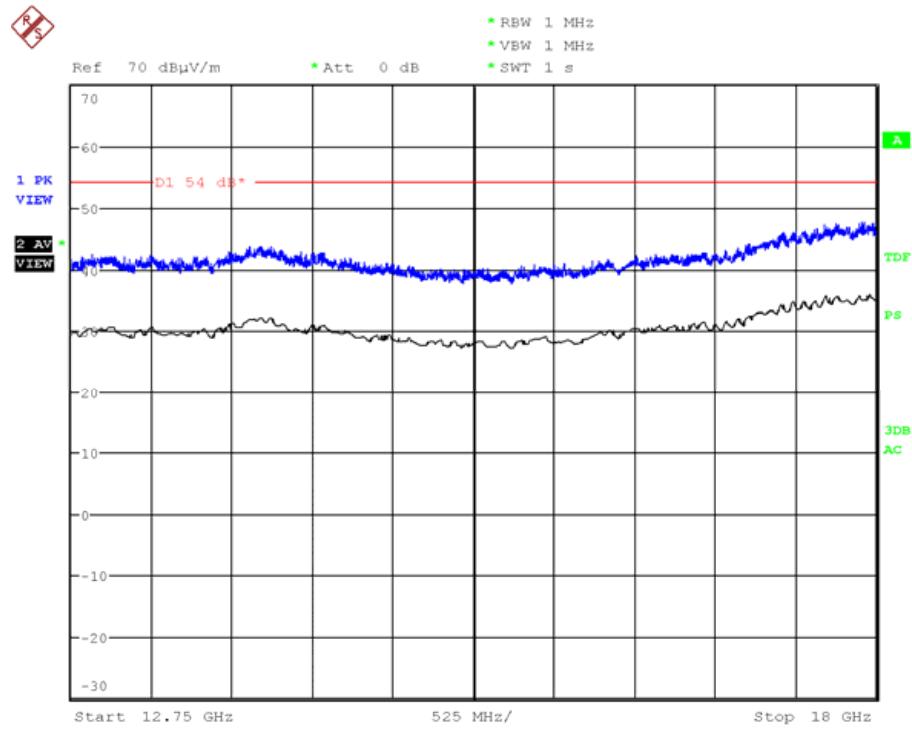


Chain A+B

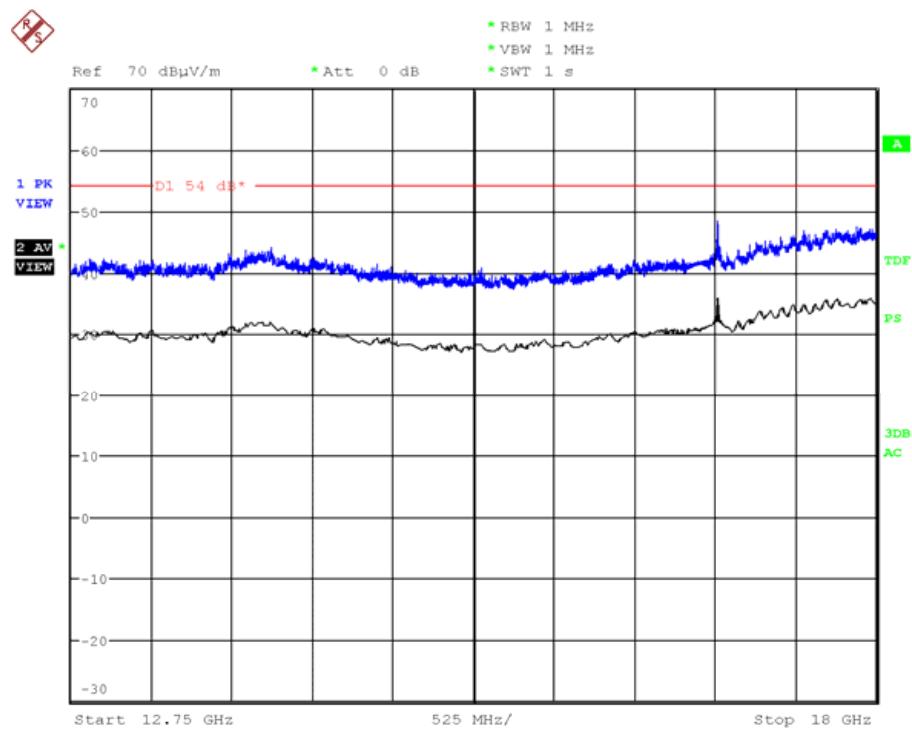


802.11ac80 mode: CH 138 (5690 MHz)

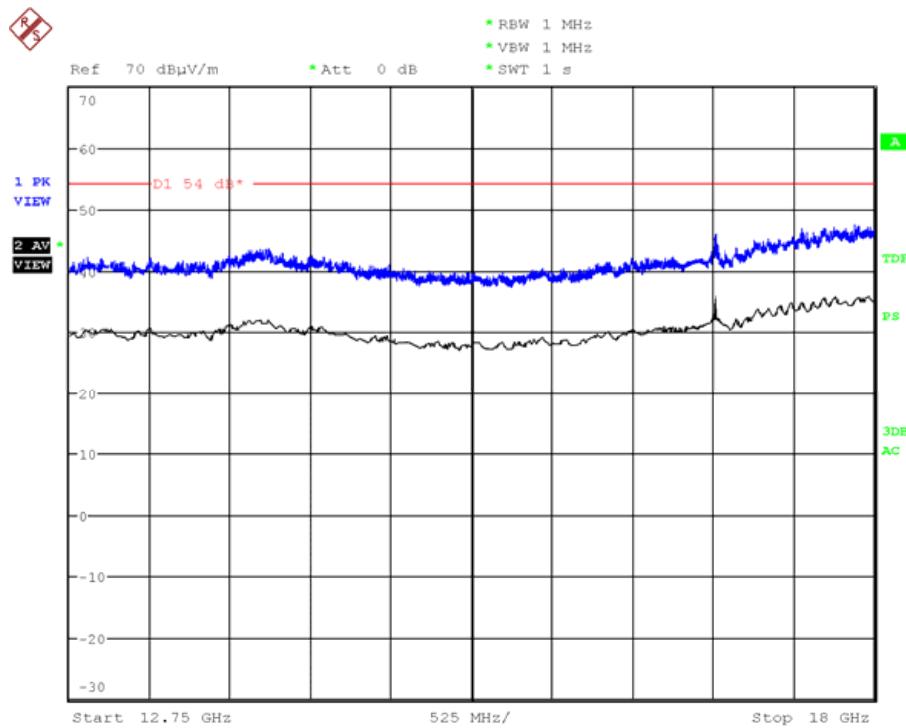
Chain A



Chain B



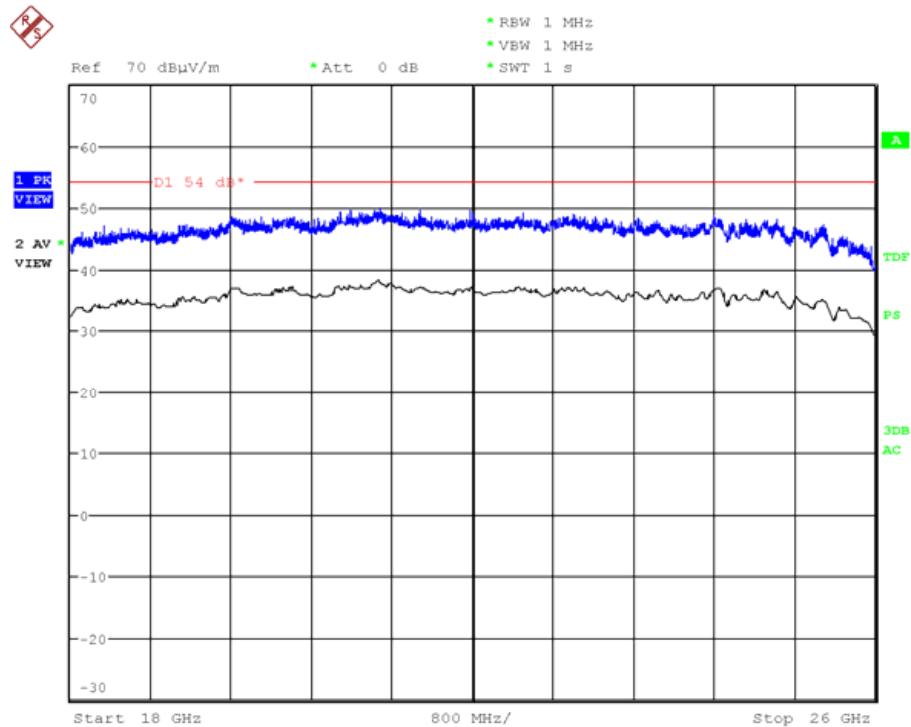
Chain A+B



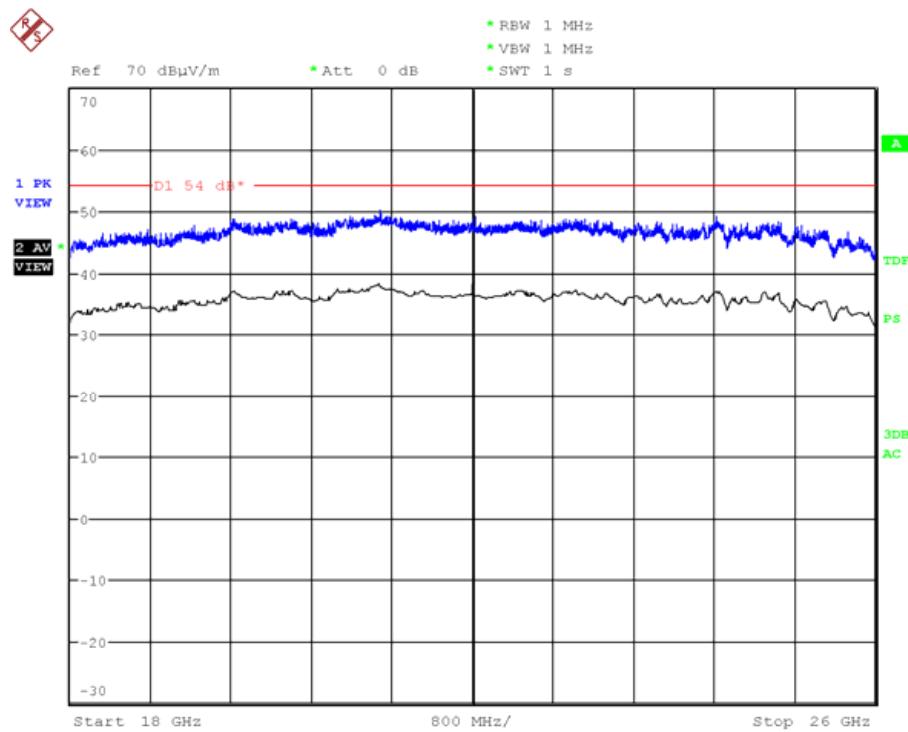
FREQUENCY RANGE 18 GHz to 26 GHz.

1. WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.
Chain A

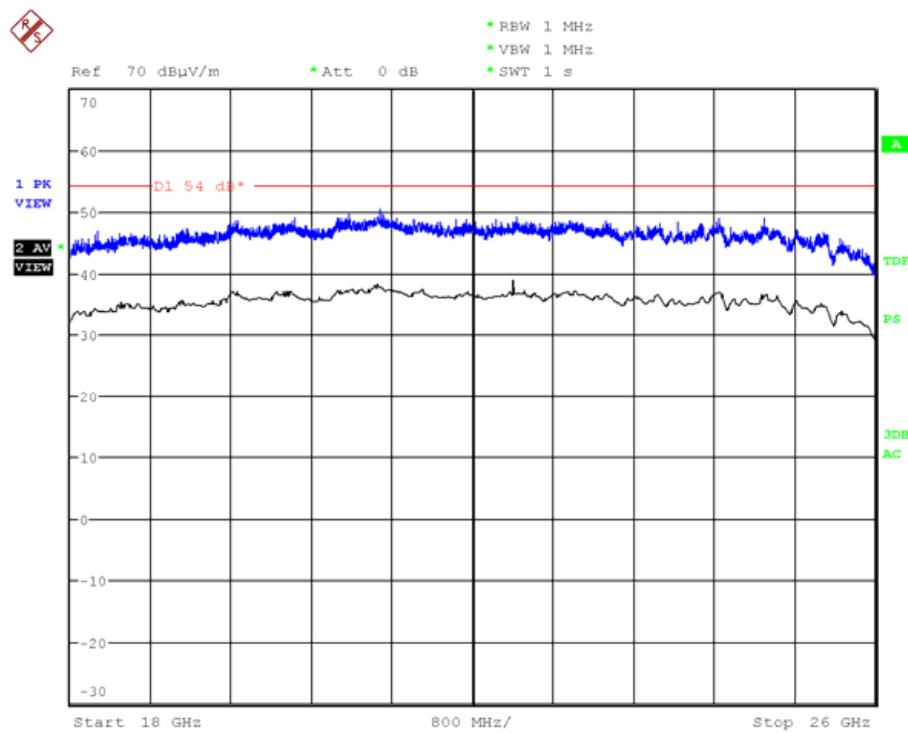


Chain B

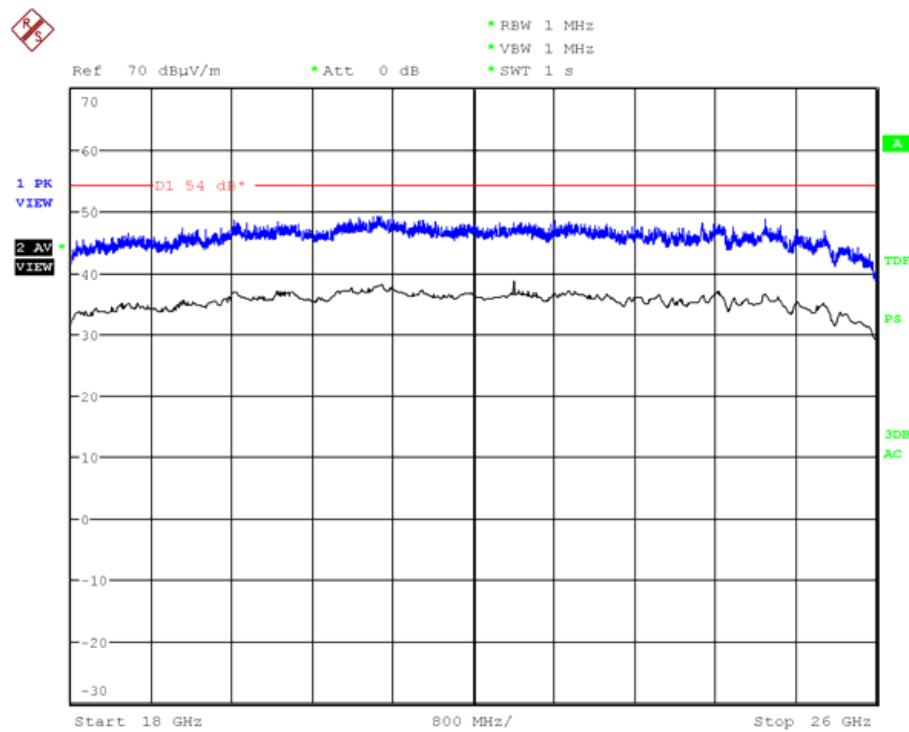


Middle frequency (120) 5600 MHz.

Chain A

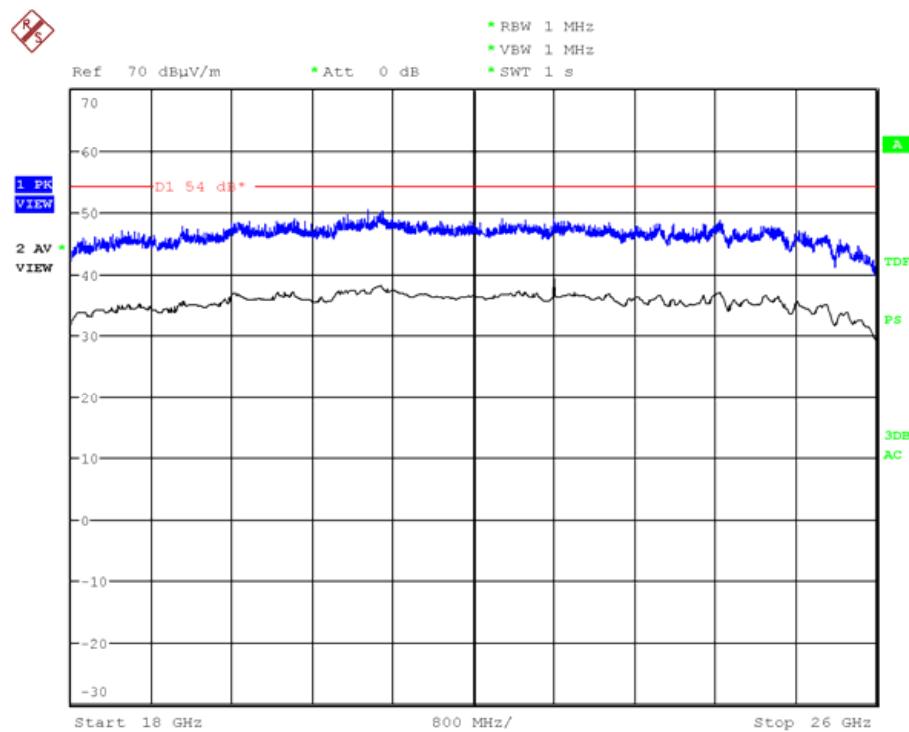


Chain B

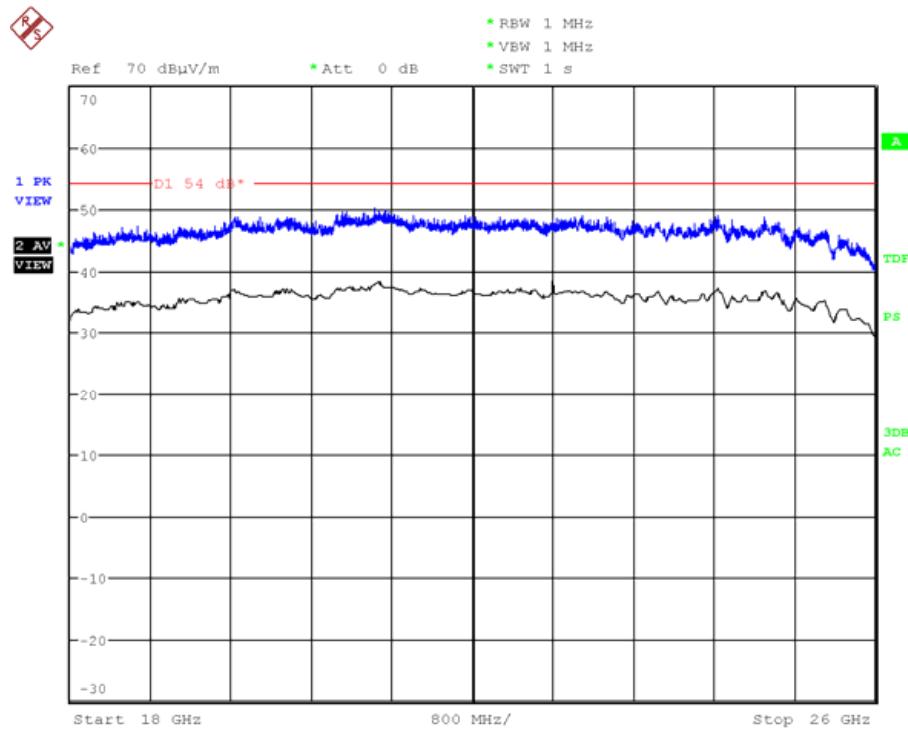


Highest frequency (140) 5700 MHz.

Chain A

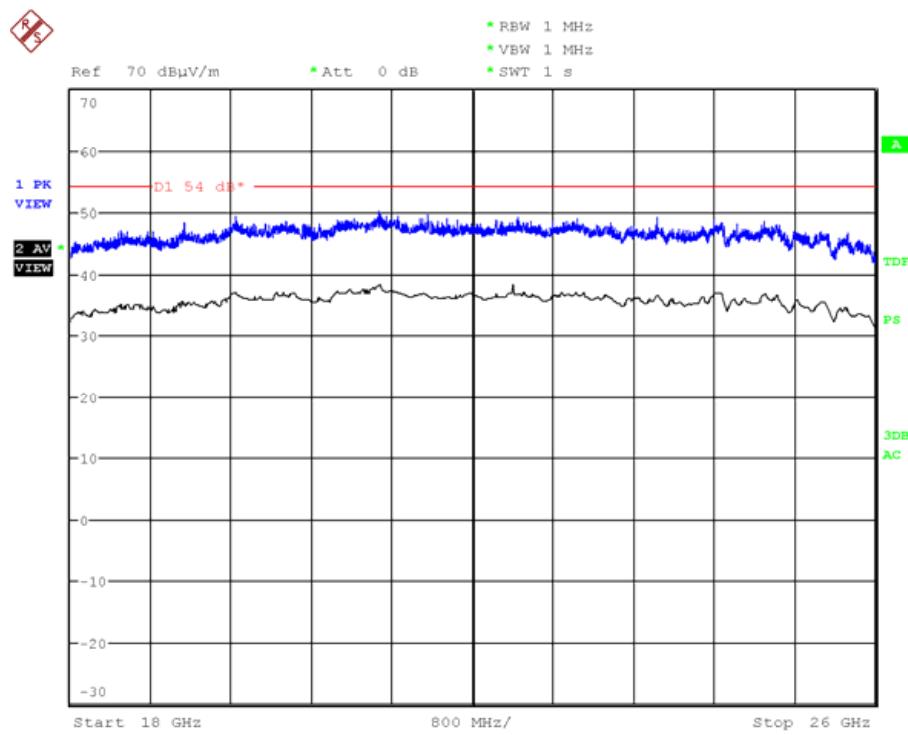


Chain B

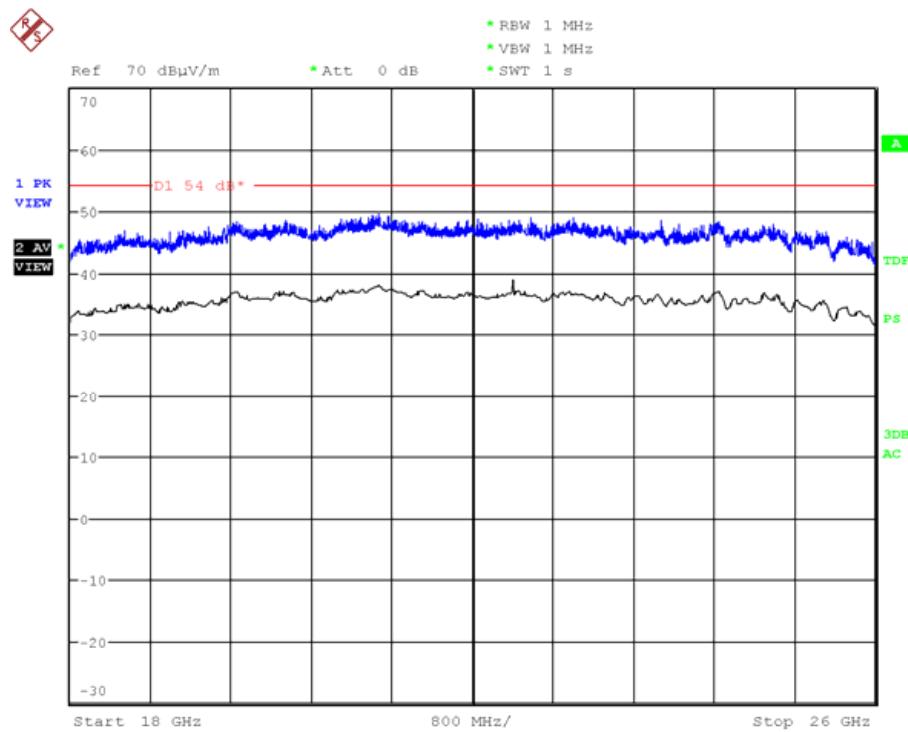


2. WiFi 5GHz 802.11 n20 mode

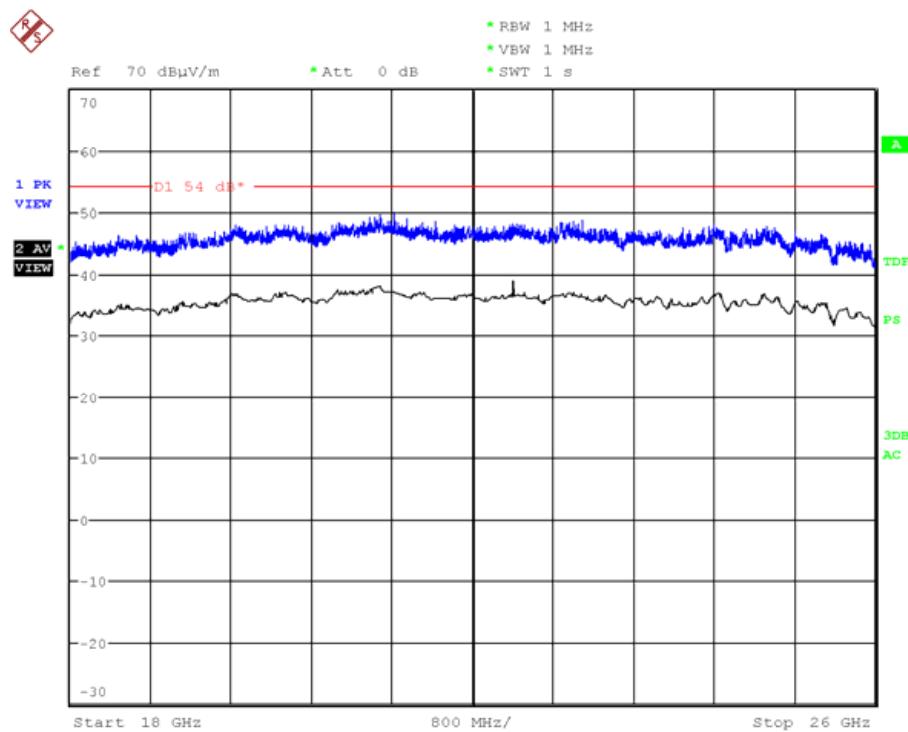
Middle frequency (120) 5600 MHz.
Chain A



Chain B

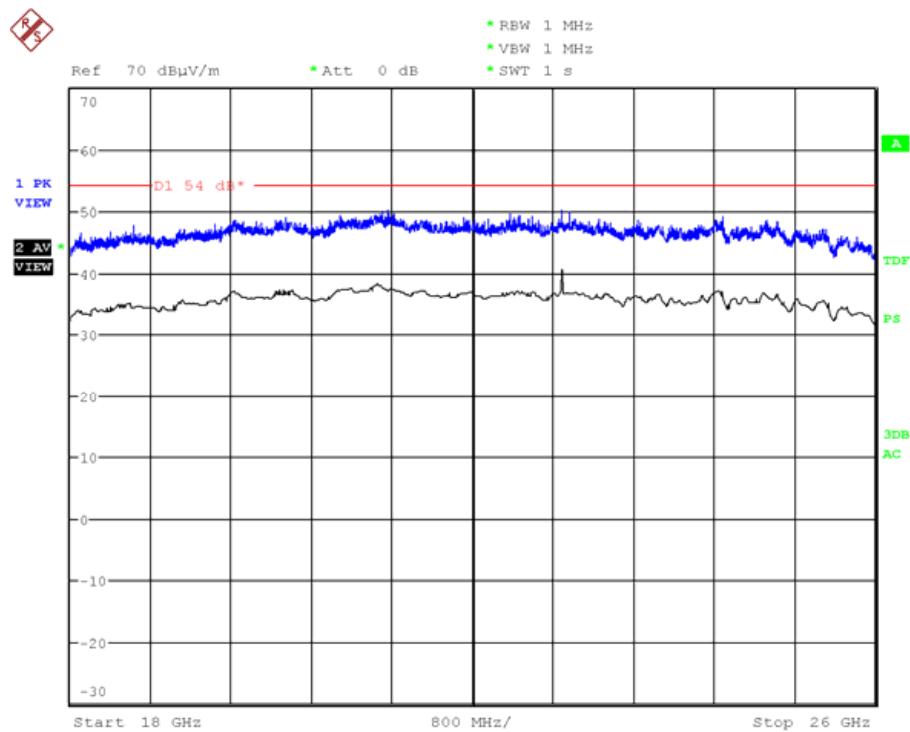


Chain A+B

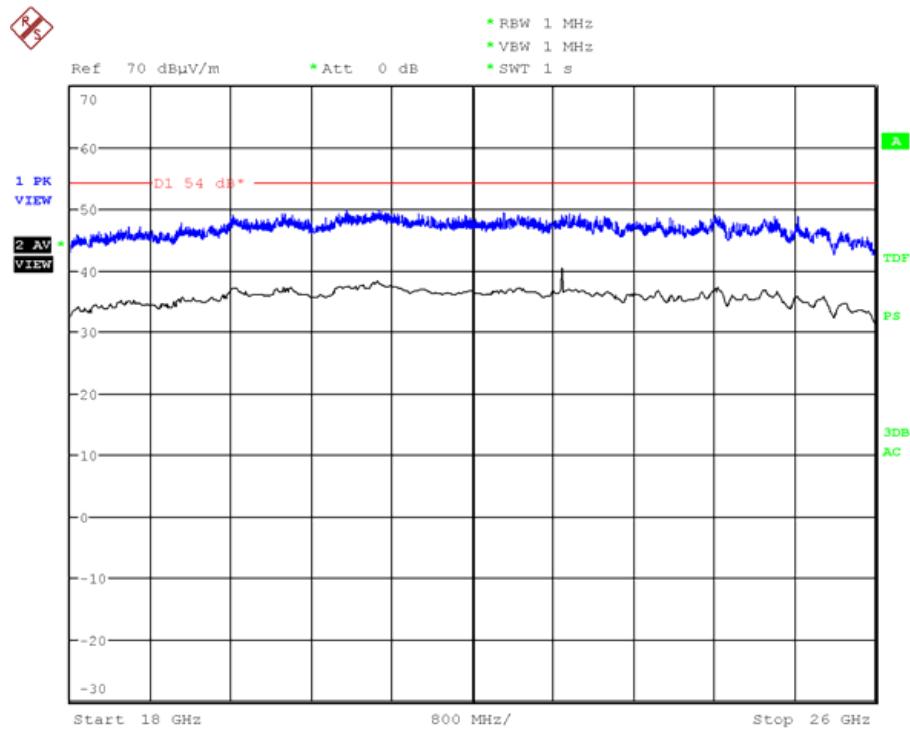


802.11ac20 mode: CH 144 (5720 MHz)

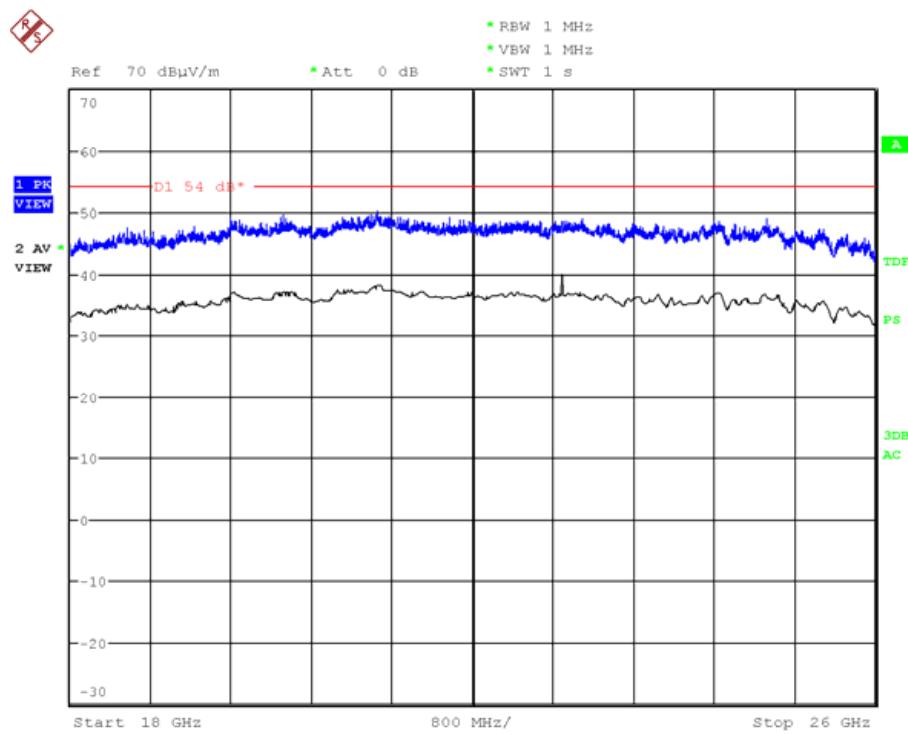
Chain A



Chain B



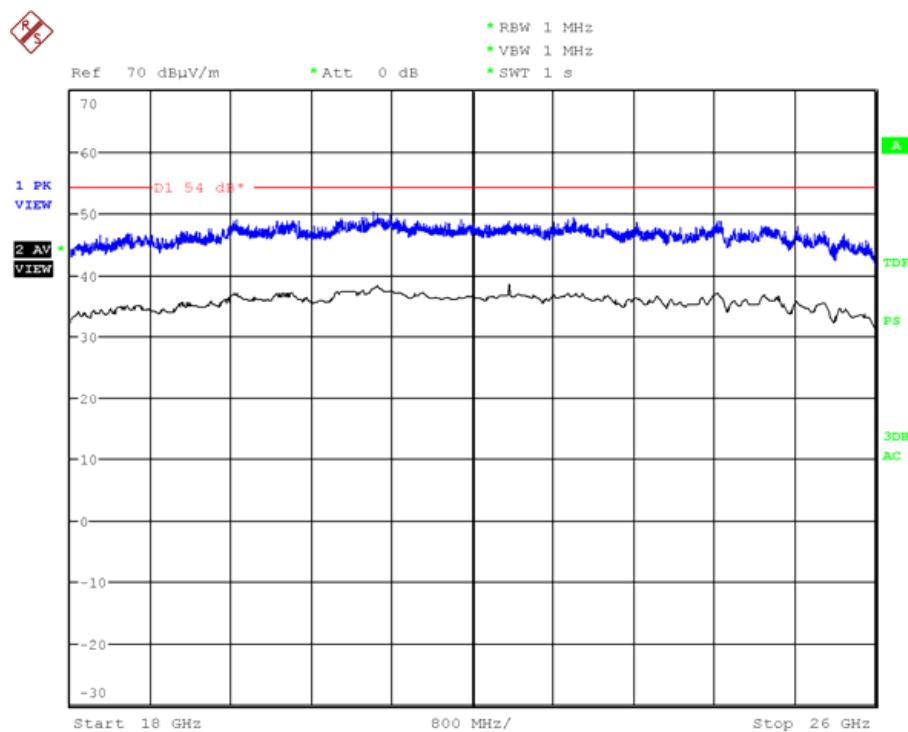
Chain A+B



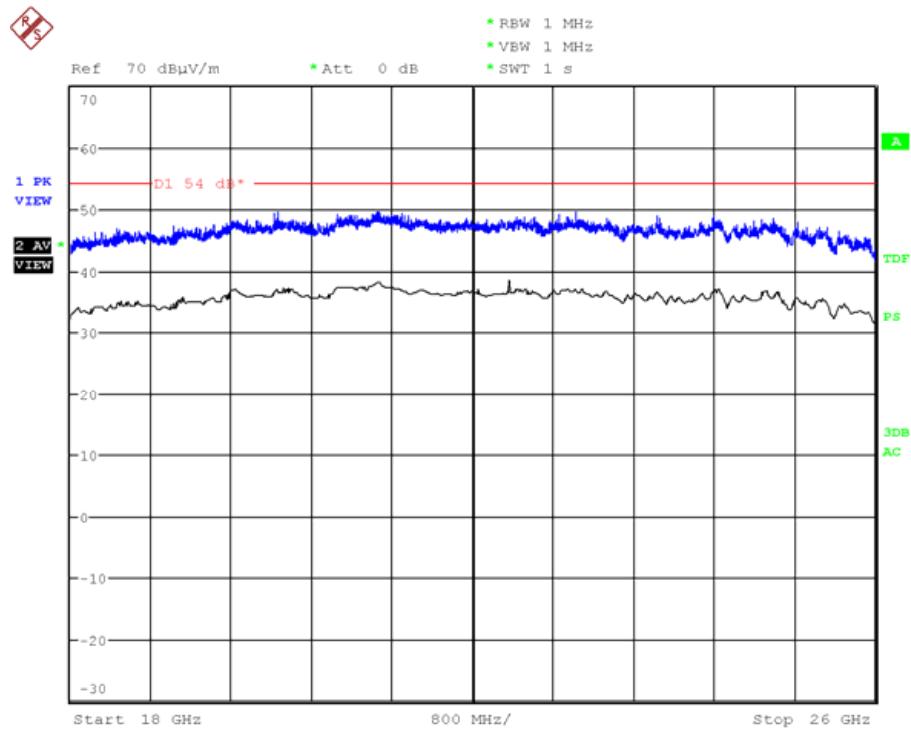
3. WiFi 5GHz 802.11 n40 mode

Middle frequency (118) 5590 MHz.

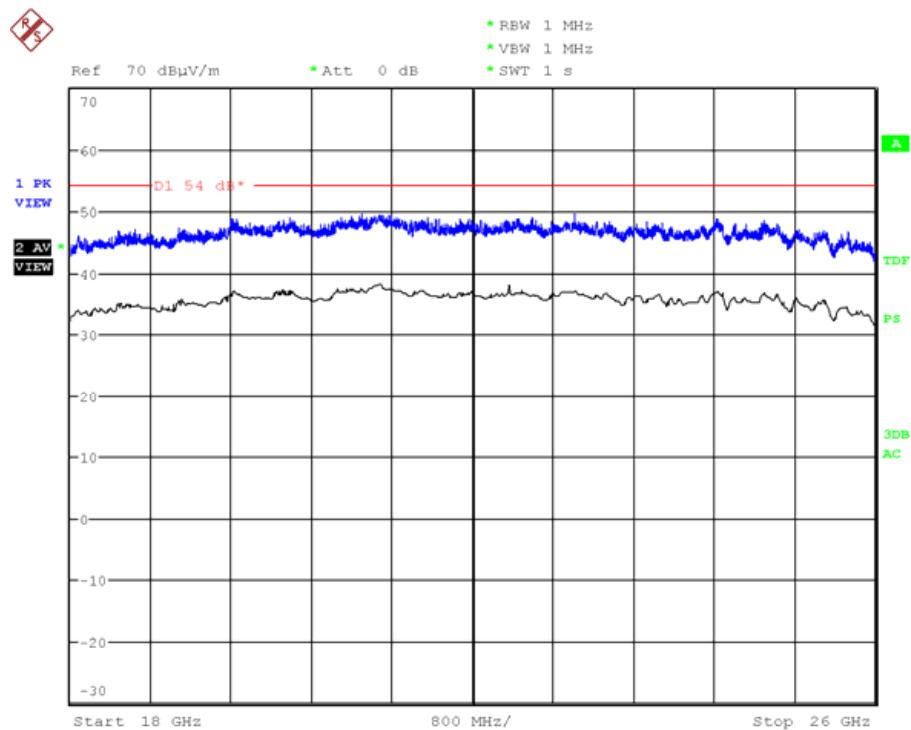
Chain A



Chain B

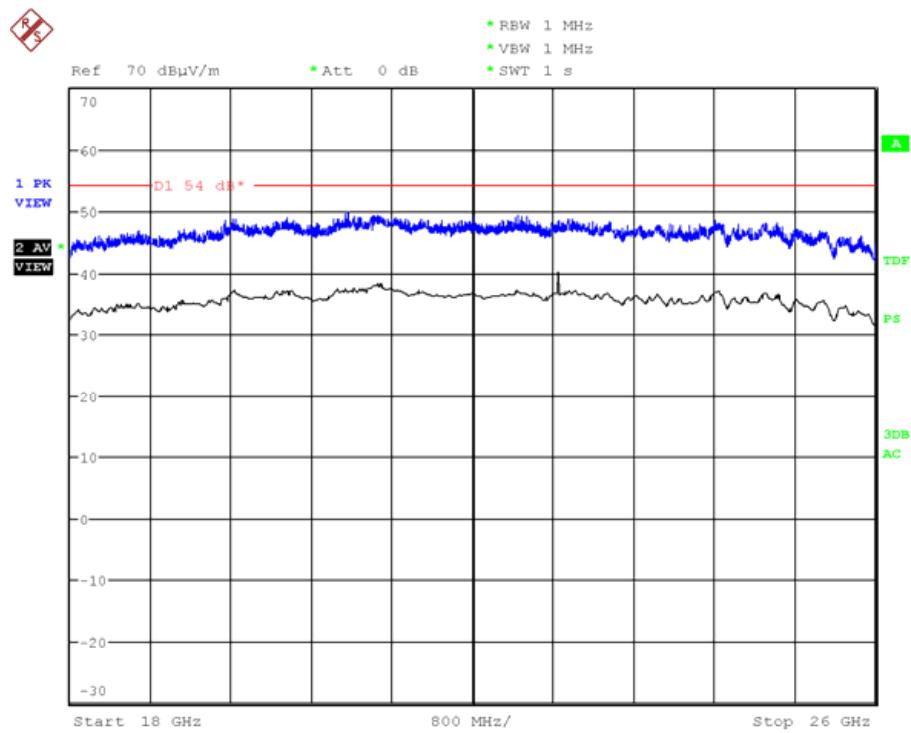


Chain A+B

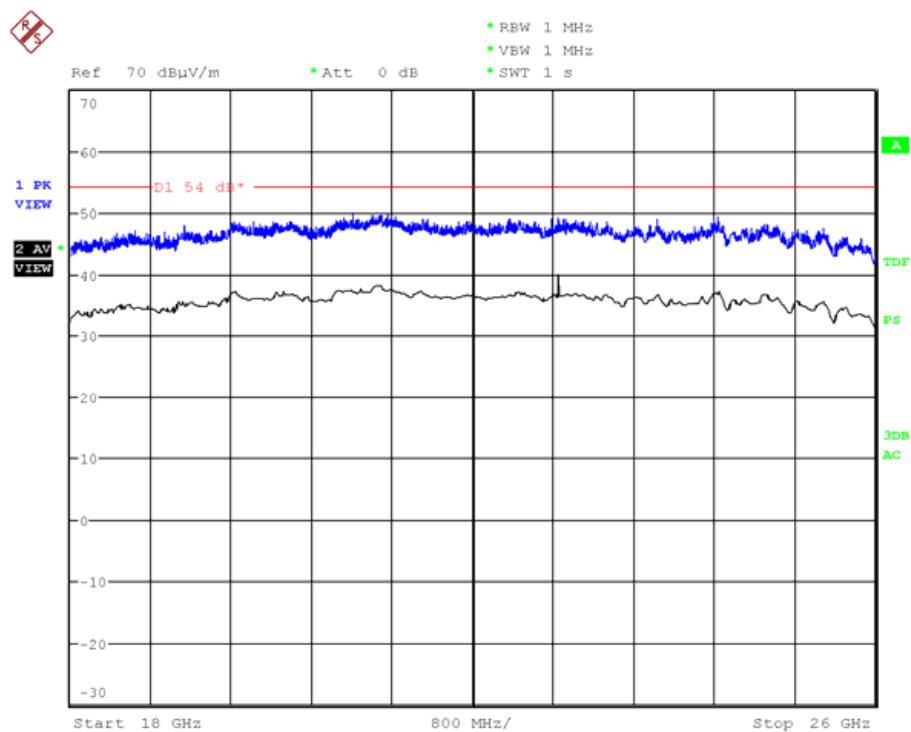


802.11ac20 mode: CH 142 (5710 MHz)

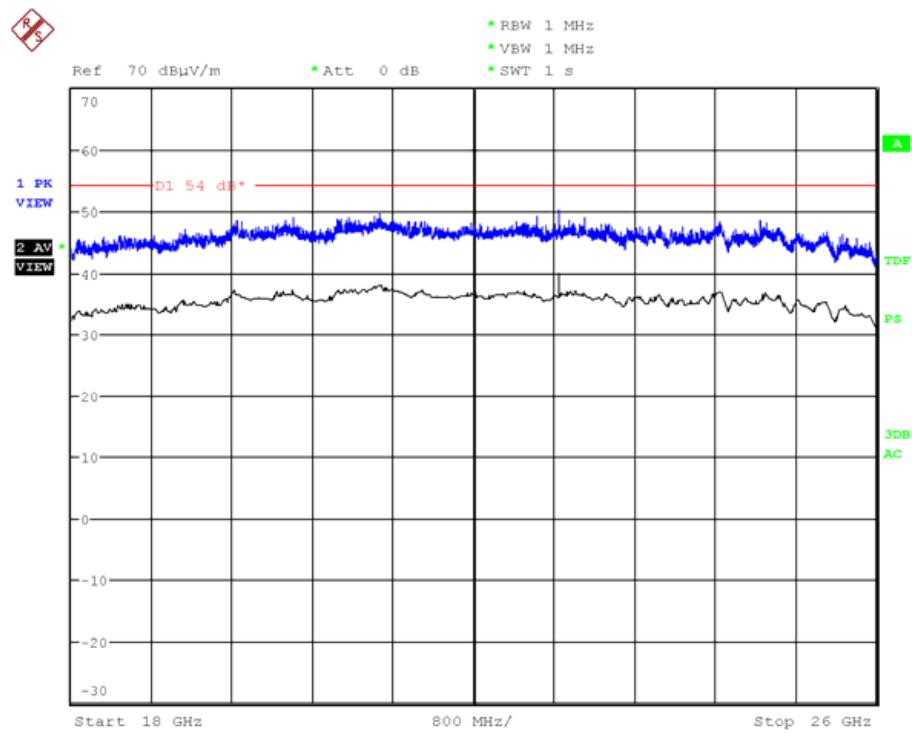
Chain A



Chain B

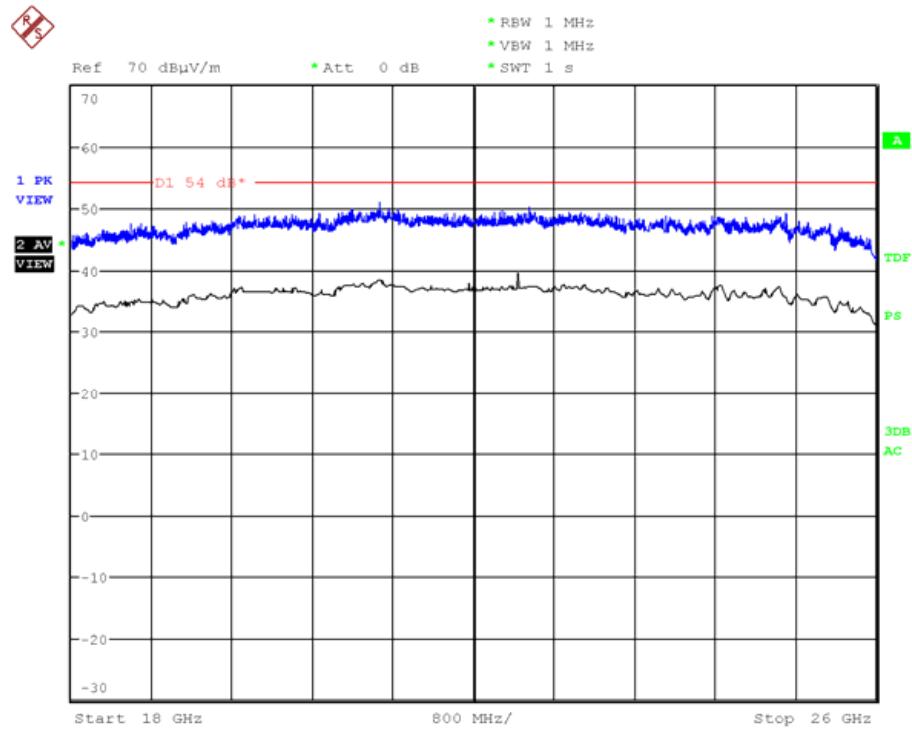


Chain A+B

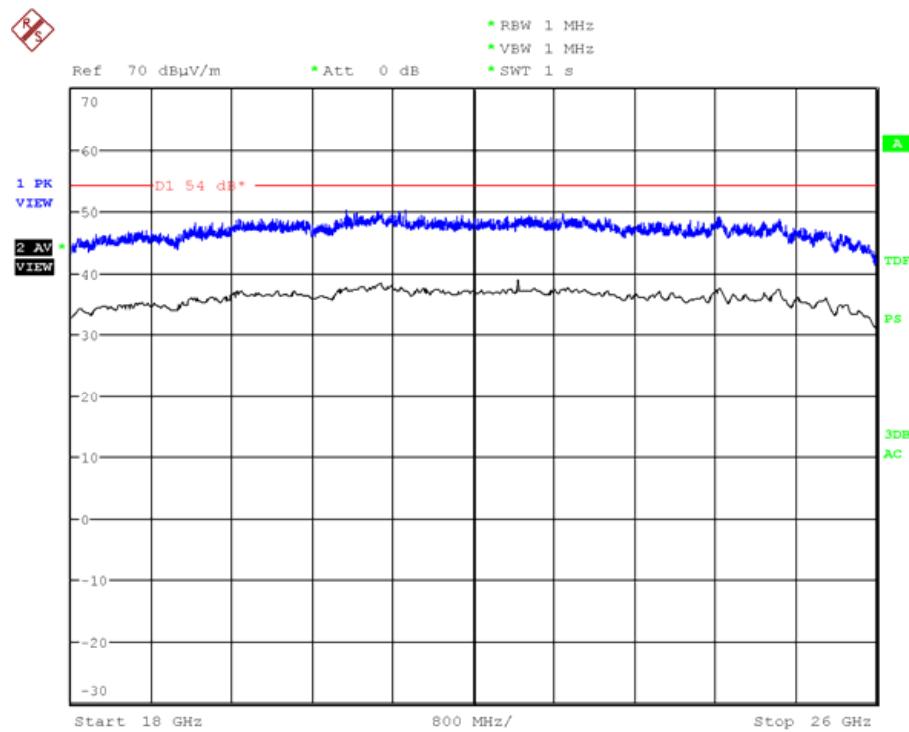


4. WiFi 5GHz 802.11 ac80 mode

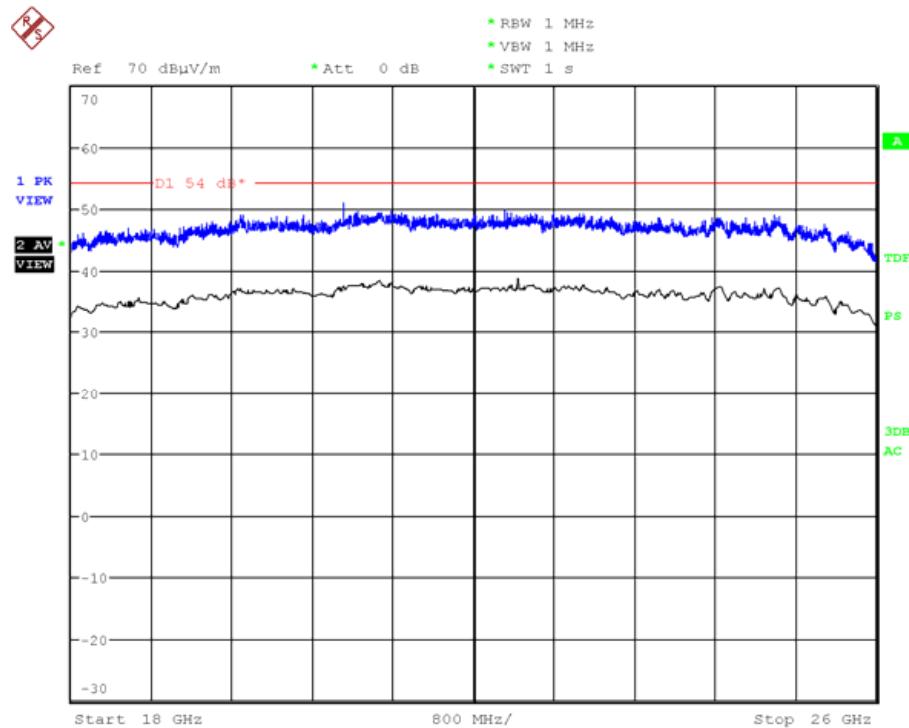
Middle frequency (122) 5610 MHz.
Chain A



Chain B

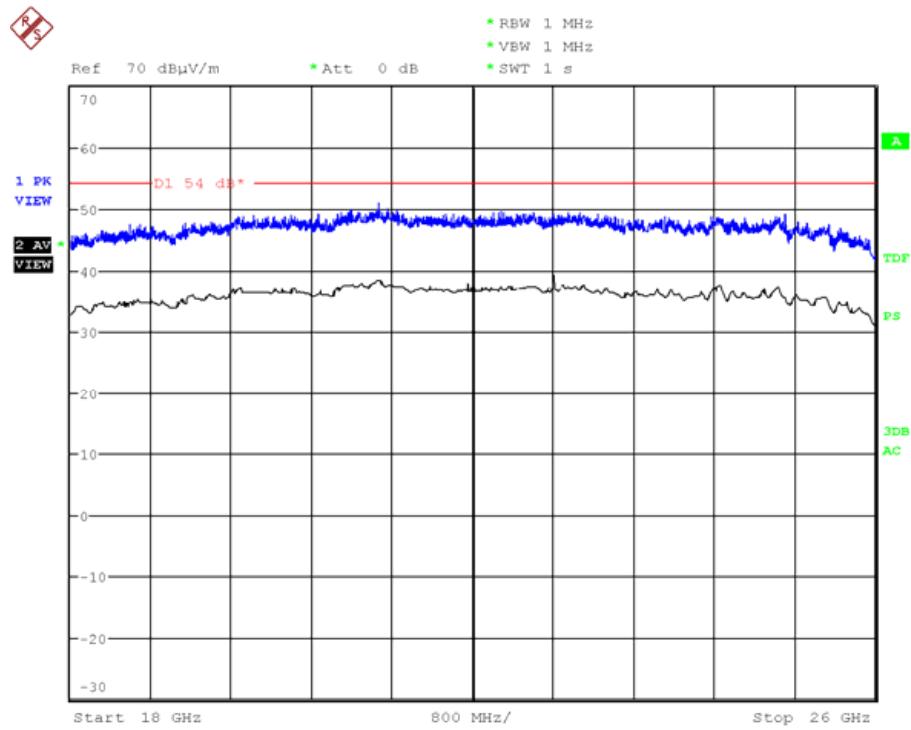


Chain A+B

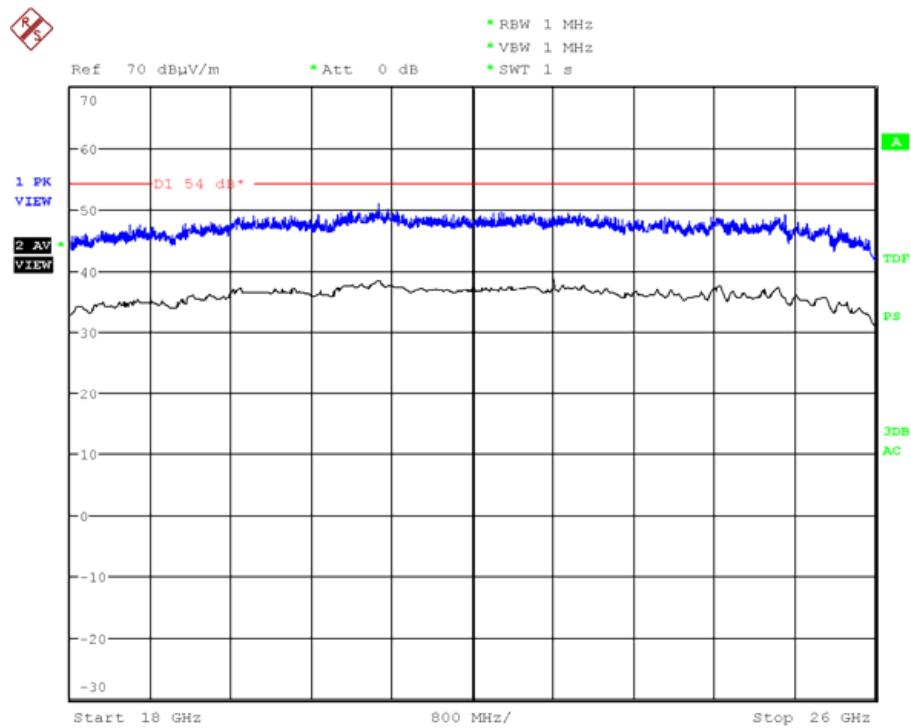


802.11ac80 mode: CH 138 (5690 MHz)

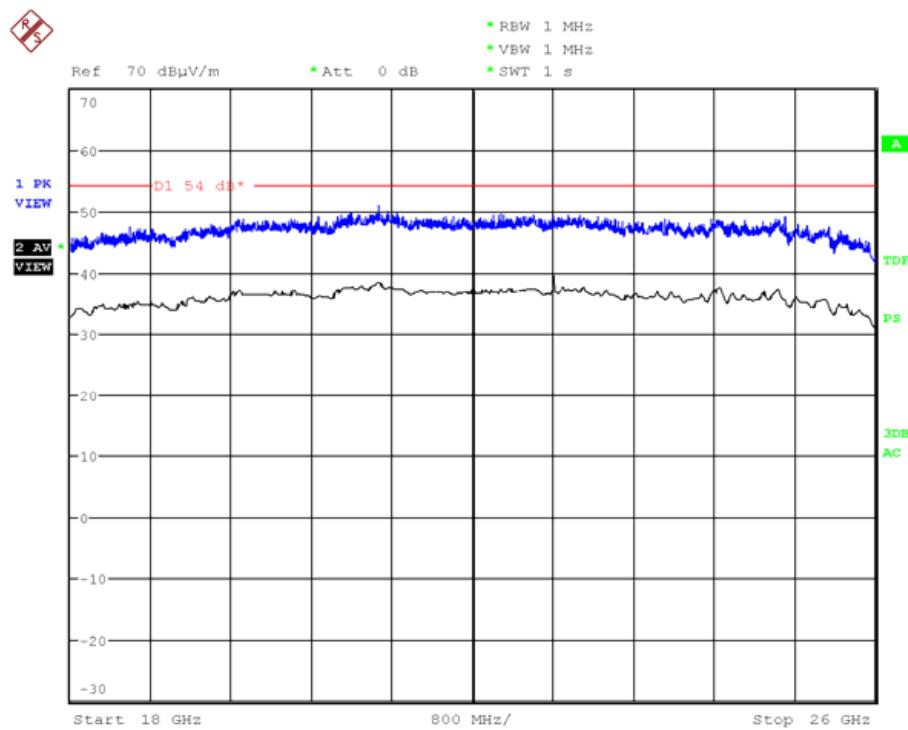
Chain A



Chain B

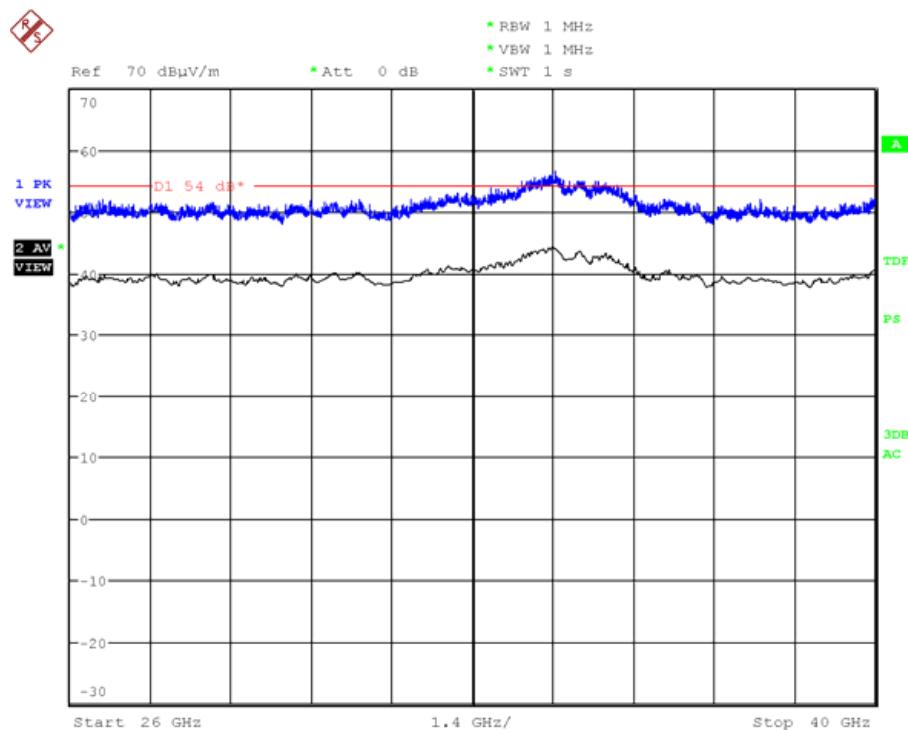


Chain A+B



FREQUENCY RANGE 26GHz to 40GHz.

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

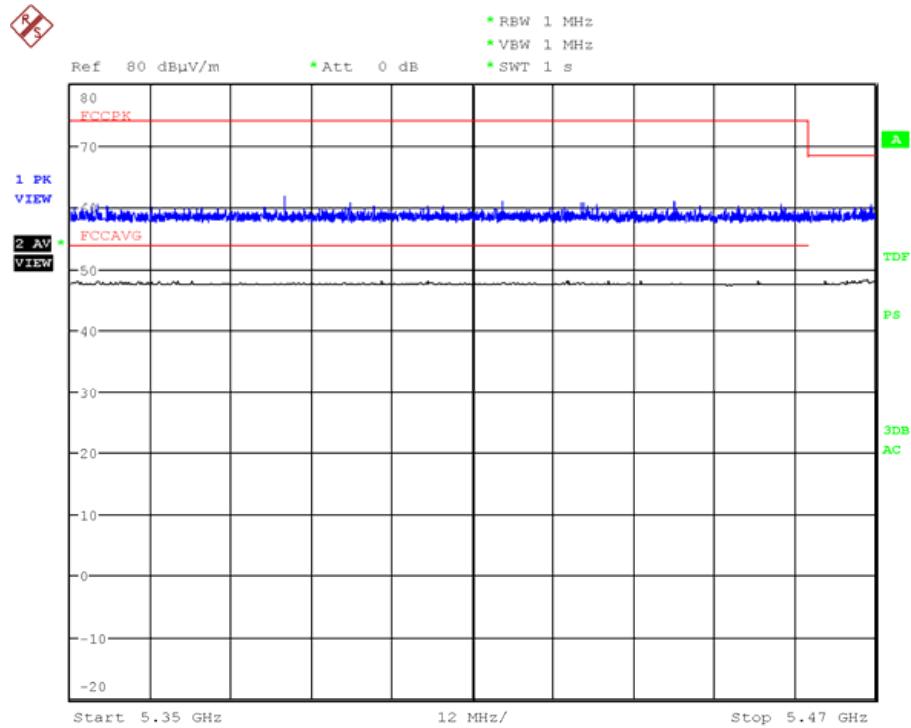


(This plot is valid for both SISO and MIMO).

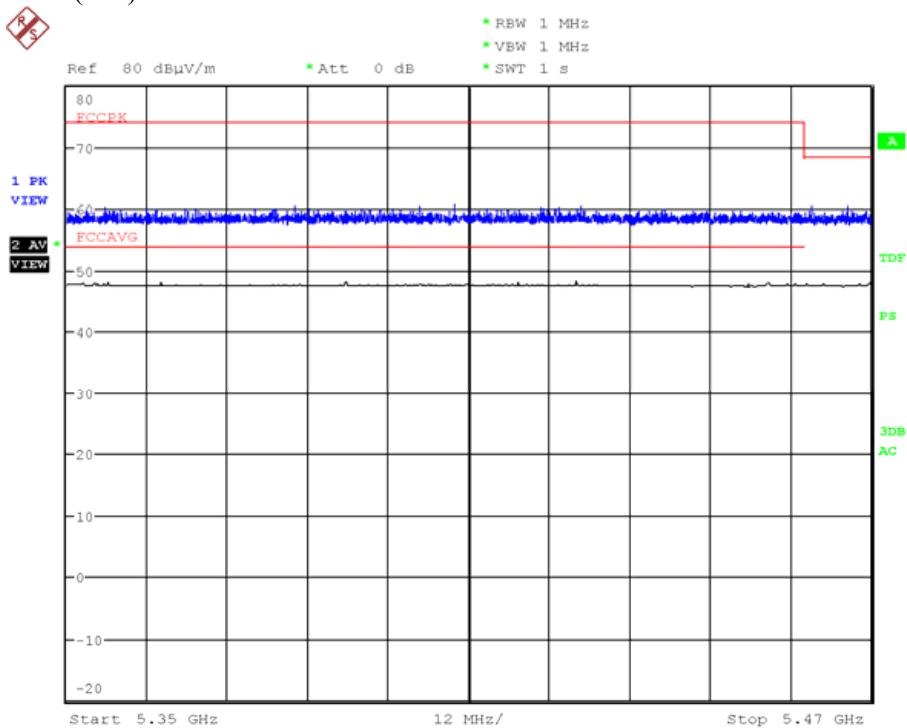
Radiated spurious emissions at band-edges and inside restricted band 5.35 – 5.46 GHz and adjacent band 5.46 – 5.47 GHz.

1. WiFi 5GHz 802.11 a mode

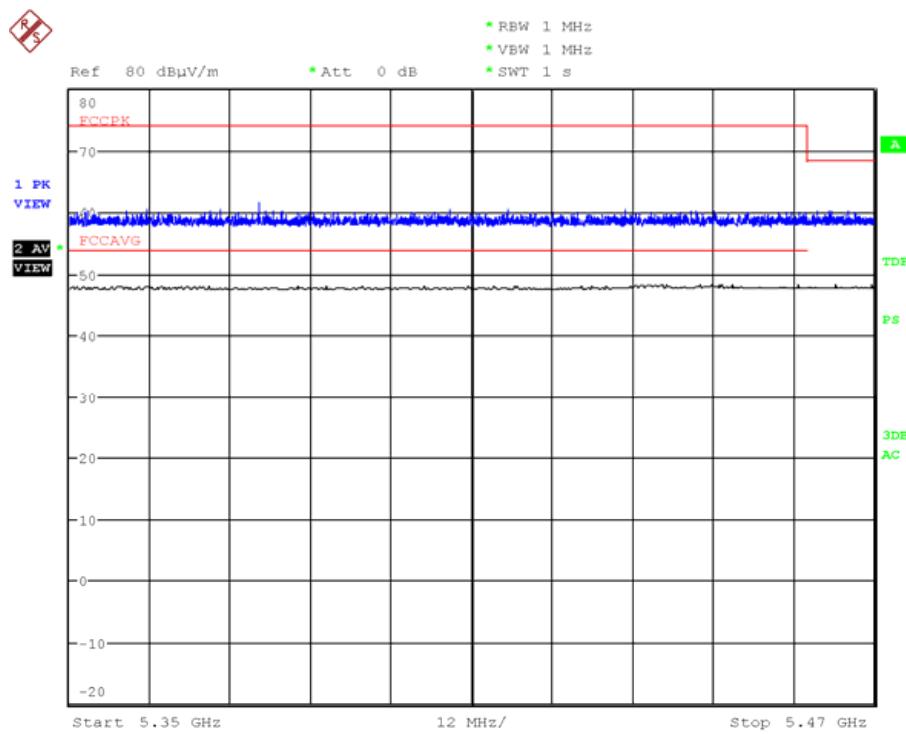
Lowest Channel (100) 5500 MHz. Chain A.



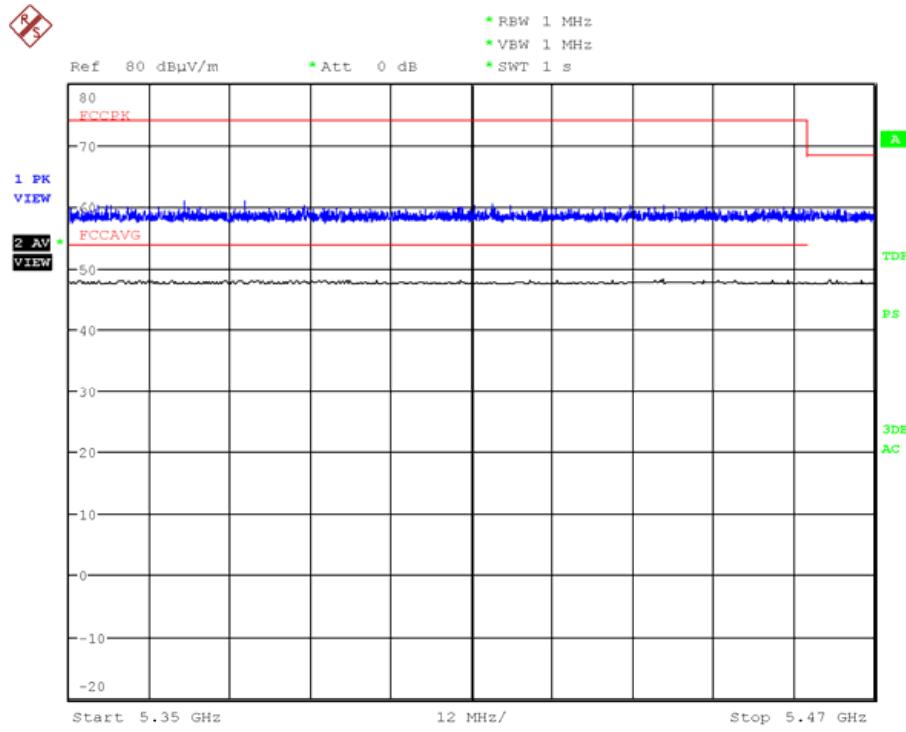
Lowest Channel (100) 5500MHz. Chain B.



Channel 104. 5520MHz. Chain A.

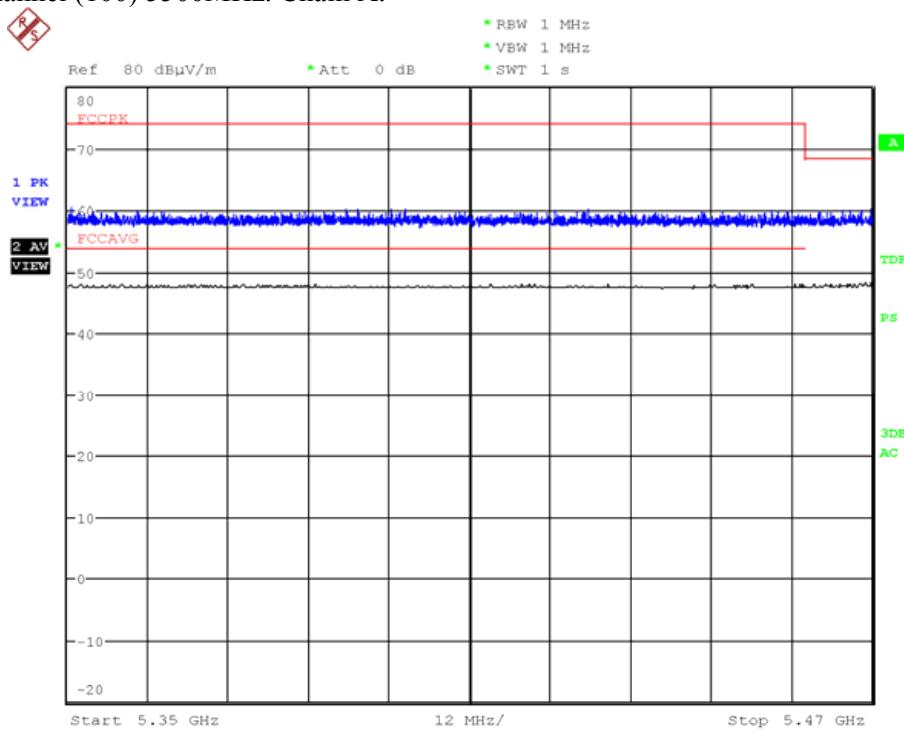


Channel 104. 5520MHz. Chain B.

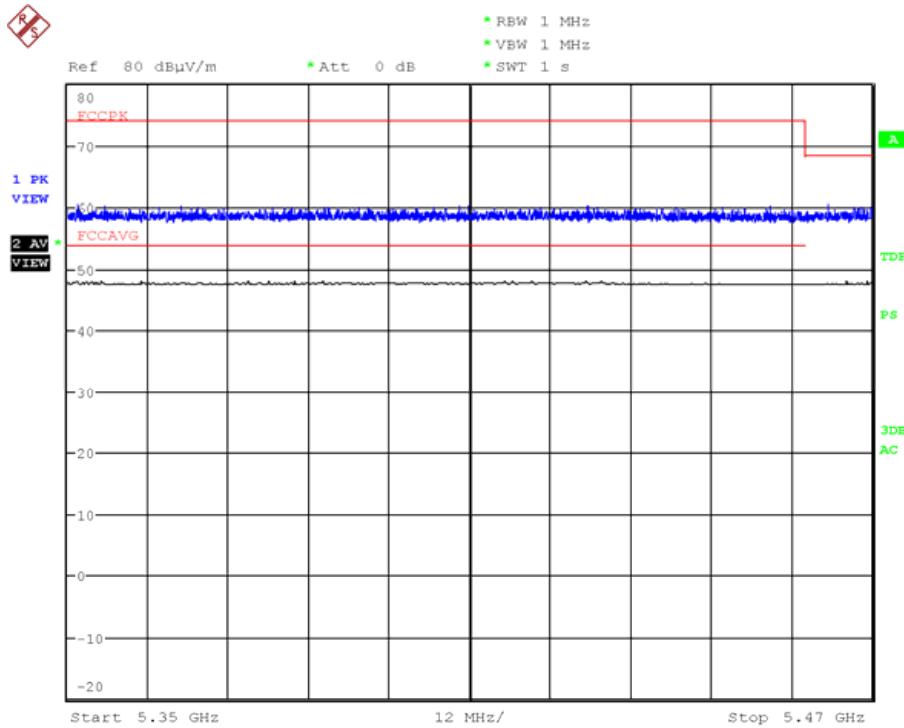


2. WiFi 5GHz 802.11 n20 mode

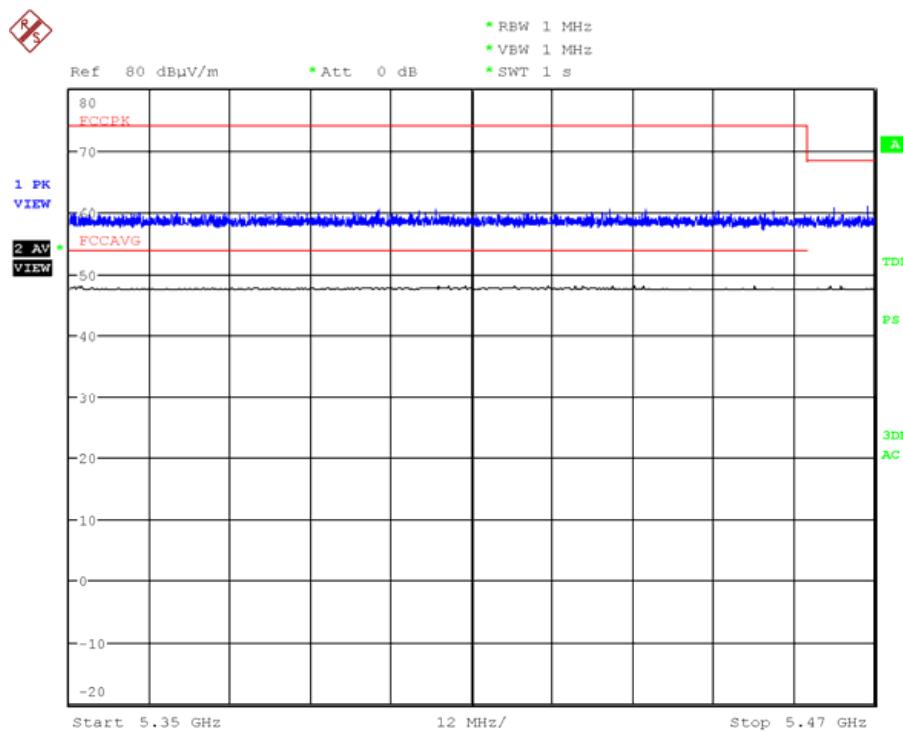
Lowest Channel (100) 5500MHz. Chain A.



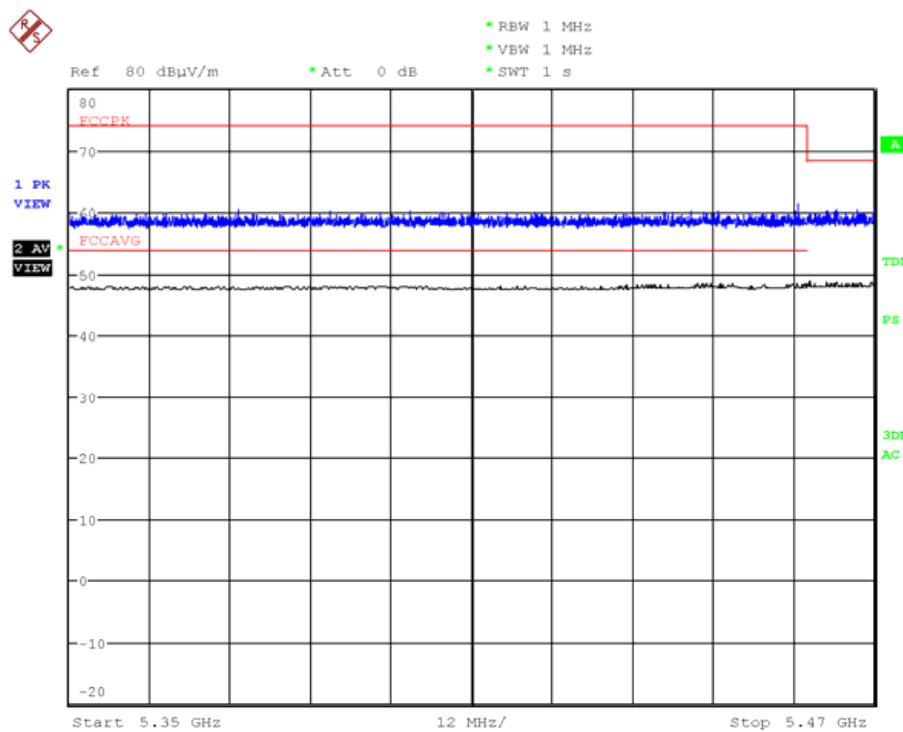
Lowest Channel (100) 5500MHz. Chain B.



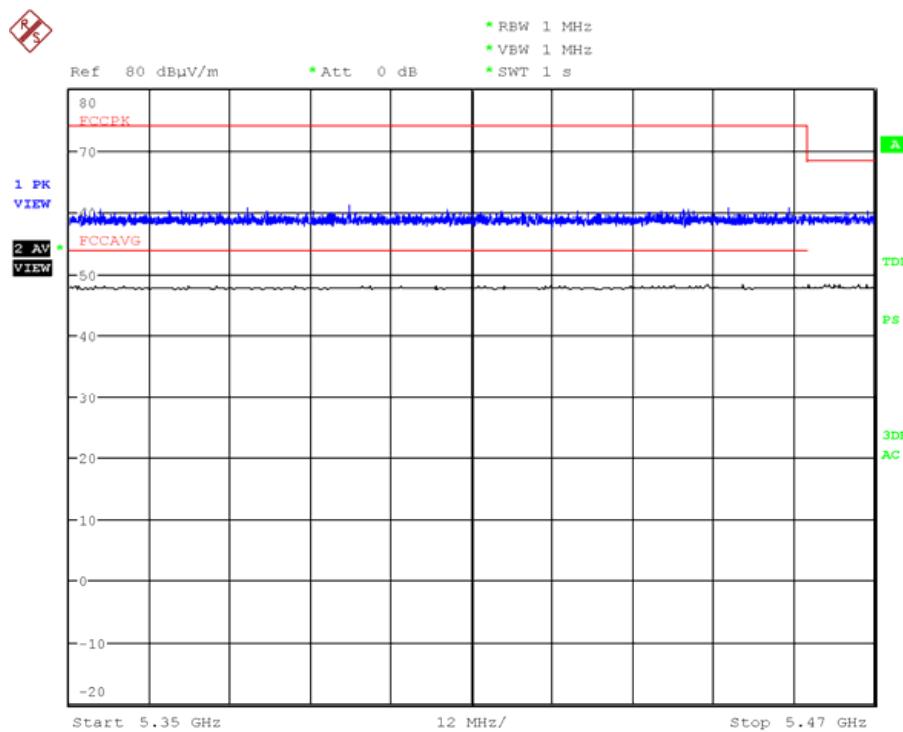
Lowest Channel (100) 5500MHz. Chain A+B.



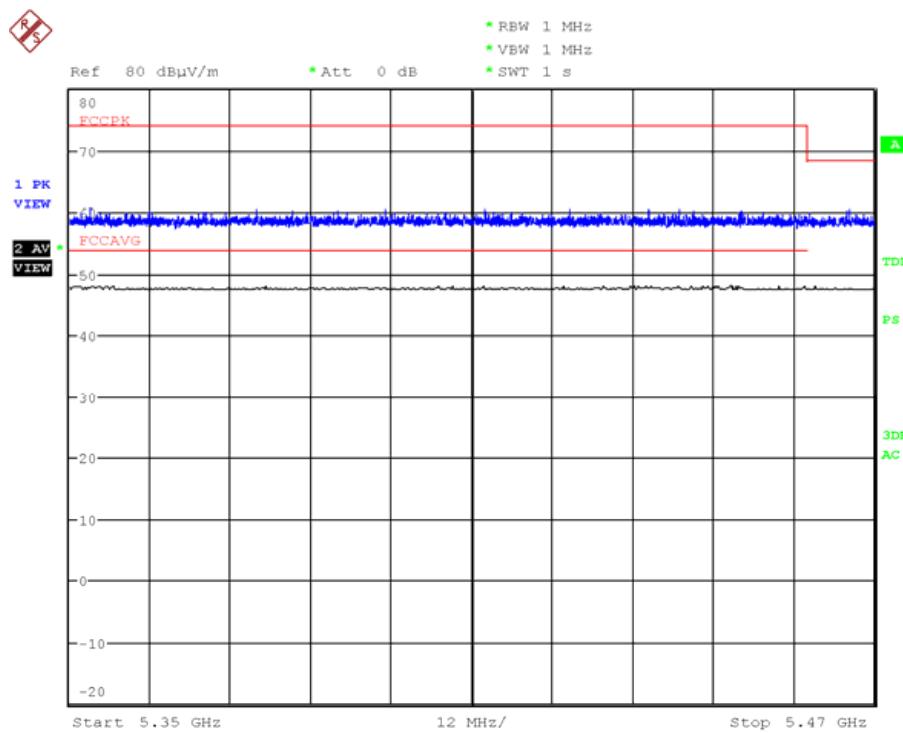
Channel 104. 5520MHz. Chain A.



Channel 104. 5520MHz. Chain B.

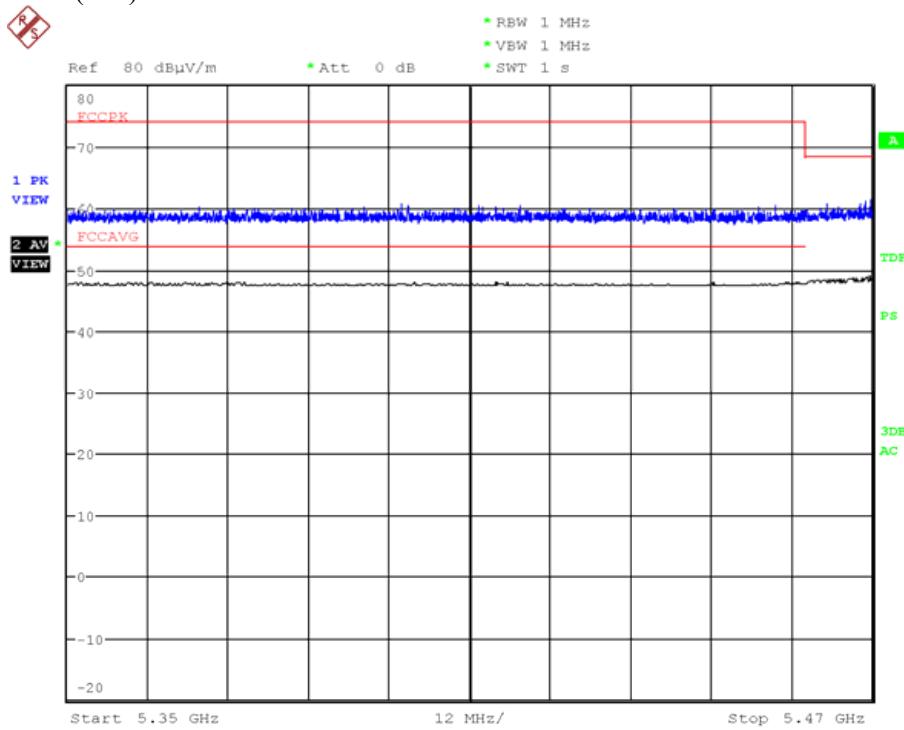


Channel 104. 5520MHz. Chain A+B.

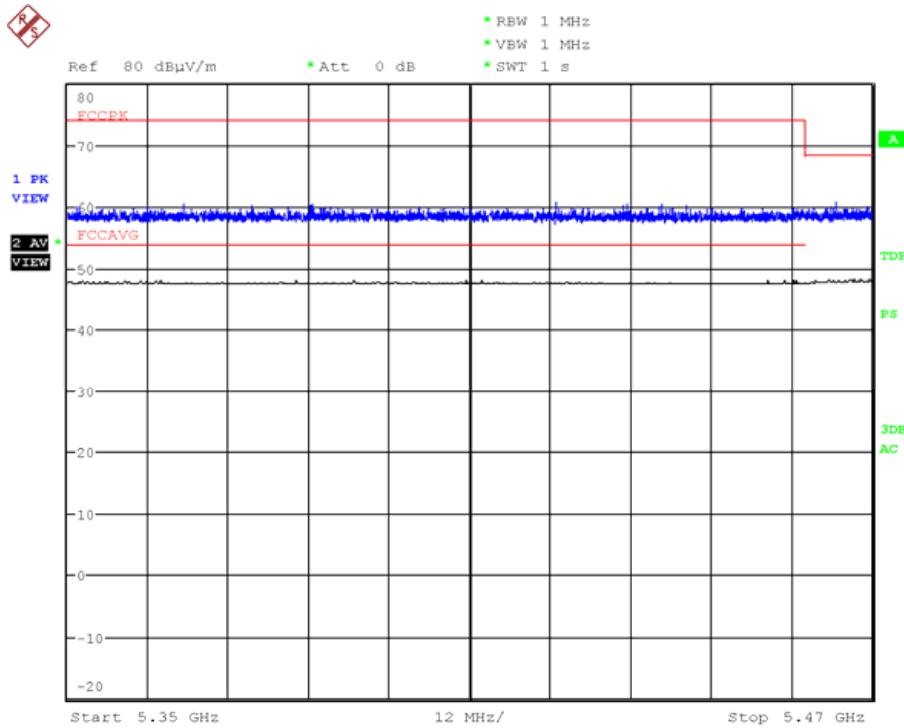


3. WiFi 5GHz 802.11 n40 mode

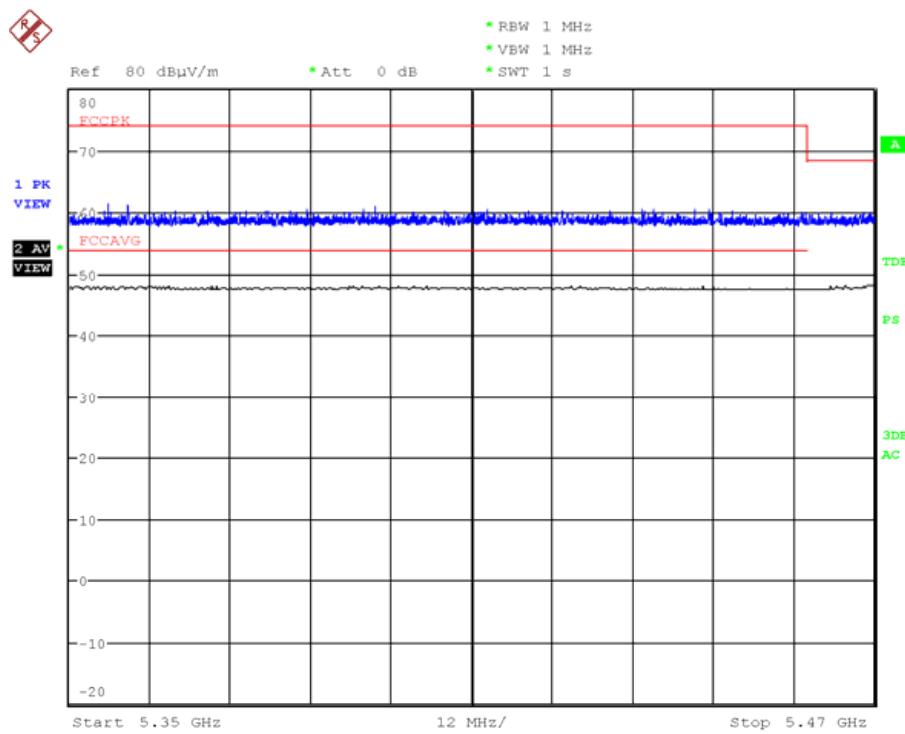
Lowest Channel (102) 5510MHz. Chain A.



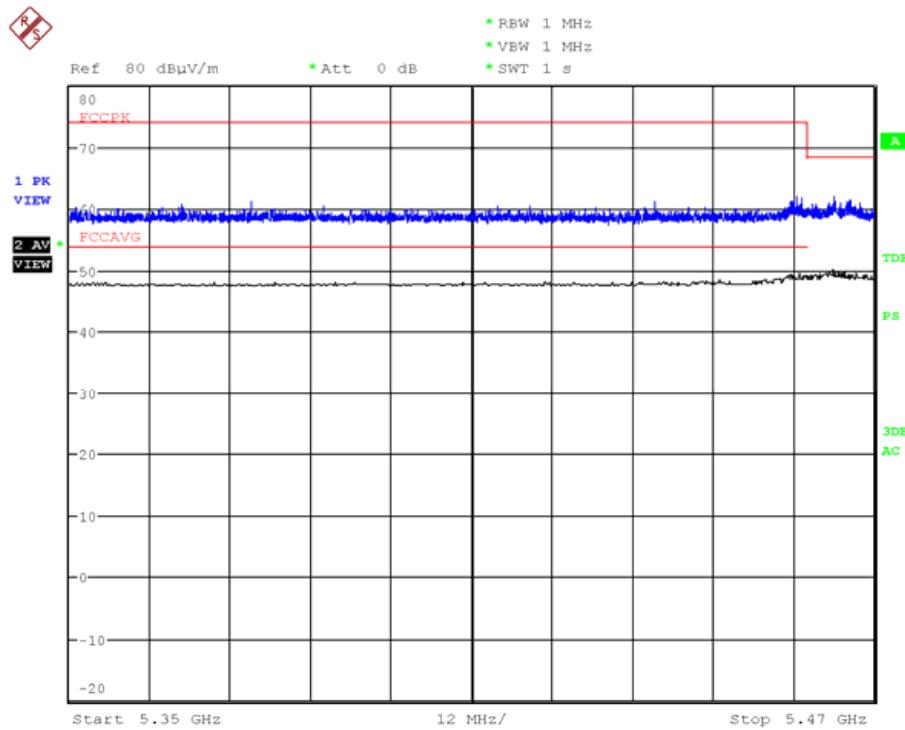
Lowest Channel (102) 5510MHz. Chain B.



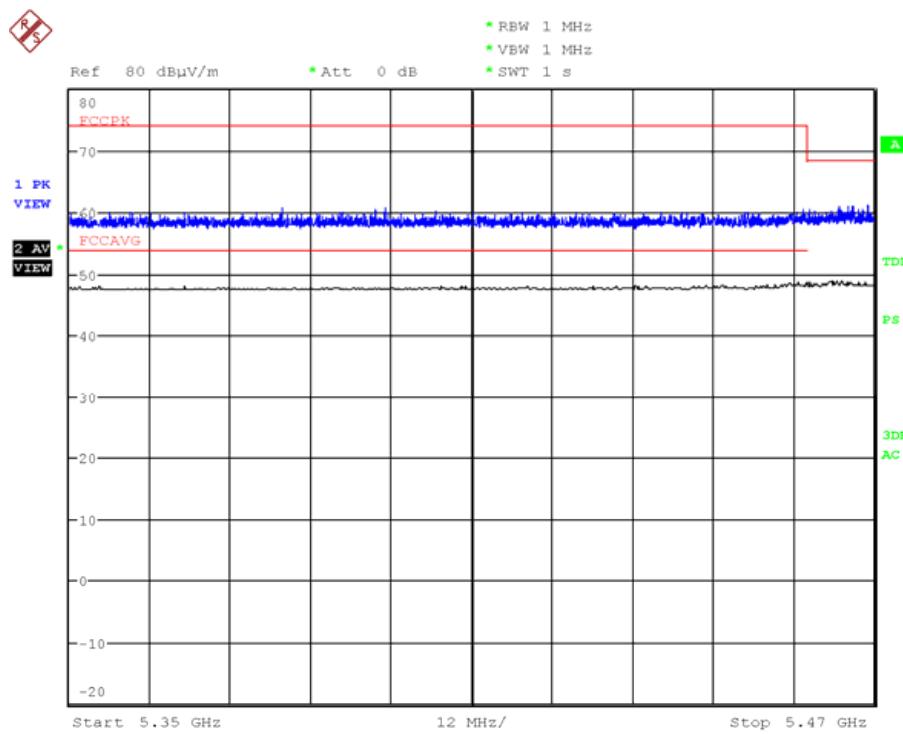
Lowest Channel (102) 5510MHz. Chain A+B.



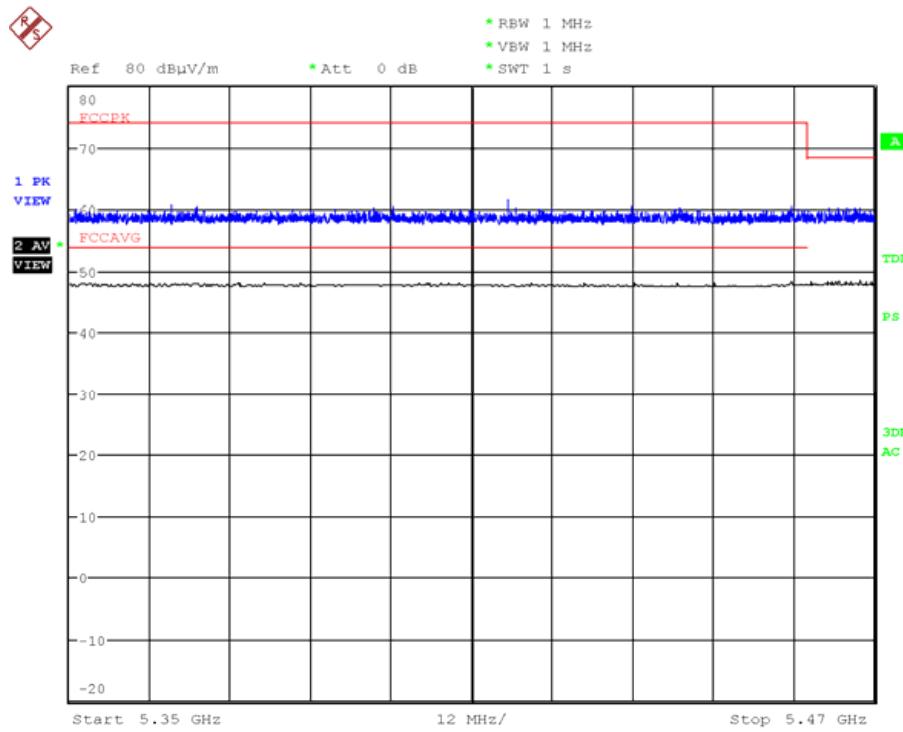
Channel 110F. 5550MHz. Chain A.



Channel 110F. 5550MHz. Chain B.

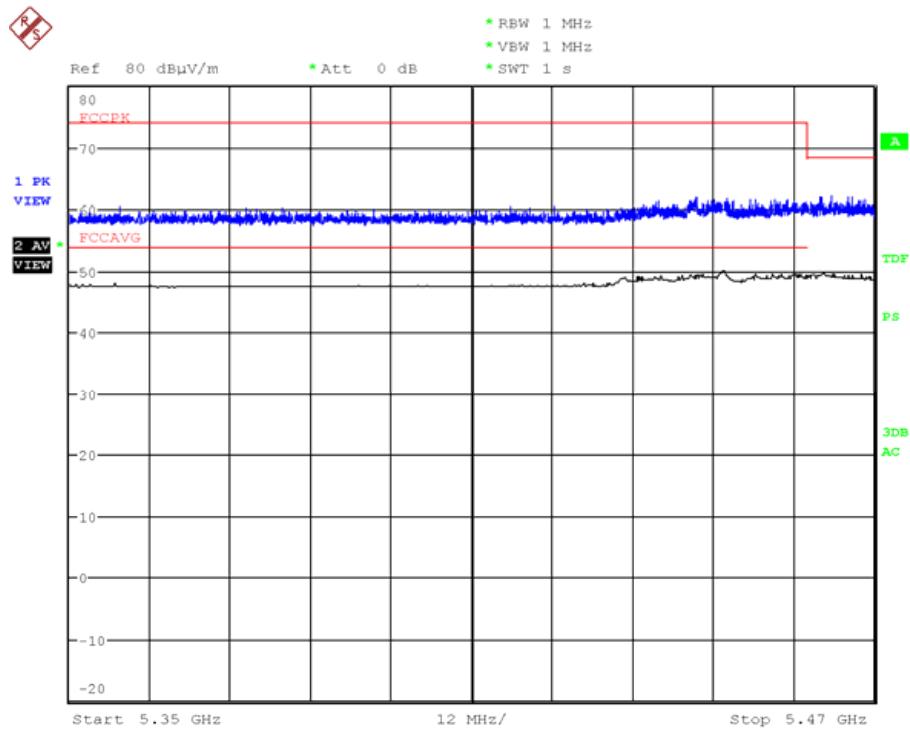


Channel 110F. 5550MHz. Chain A+B.

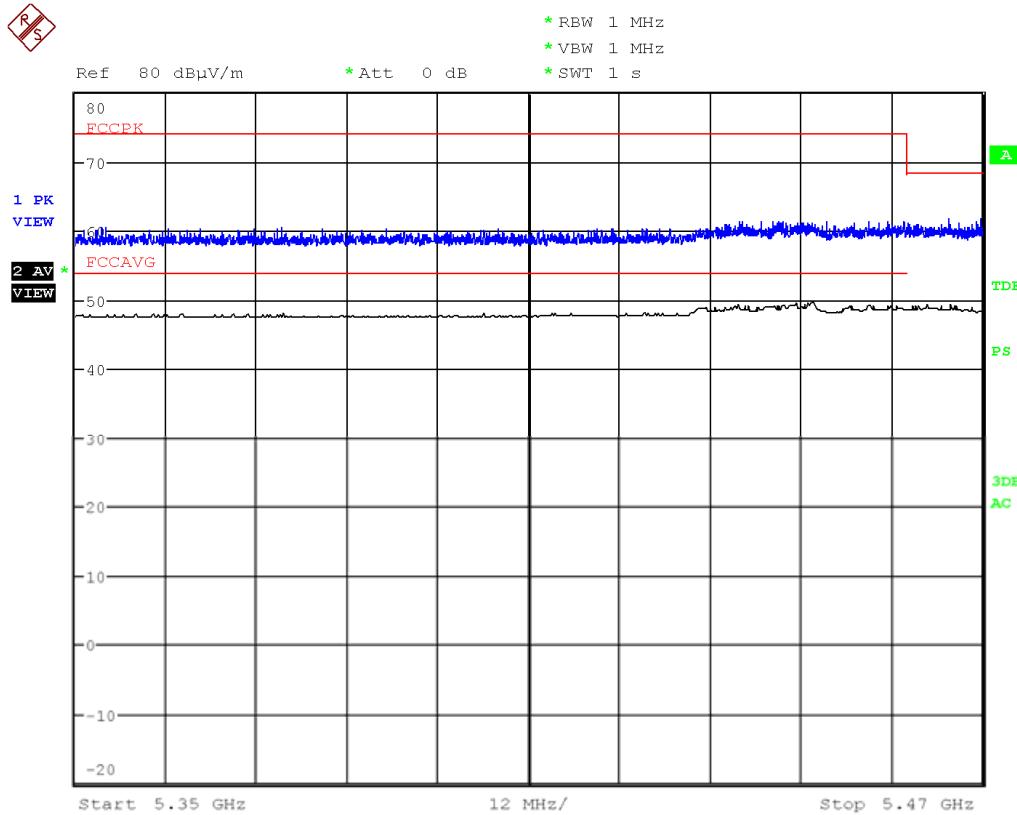


4. WiFi 5GHz 802.11 ac80 mode

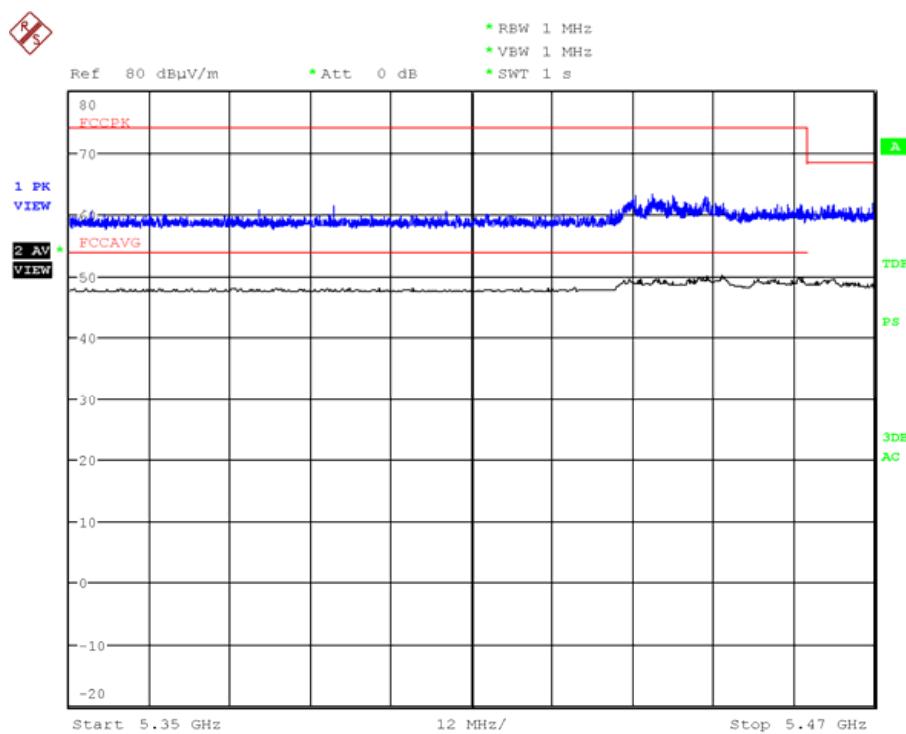
Lowest Channel (106) 5530MHz. Chain A.



Lowest Channel (106) 5530MHz. Chain B.



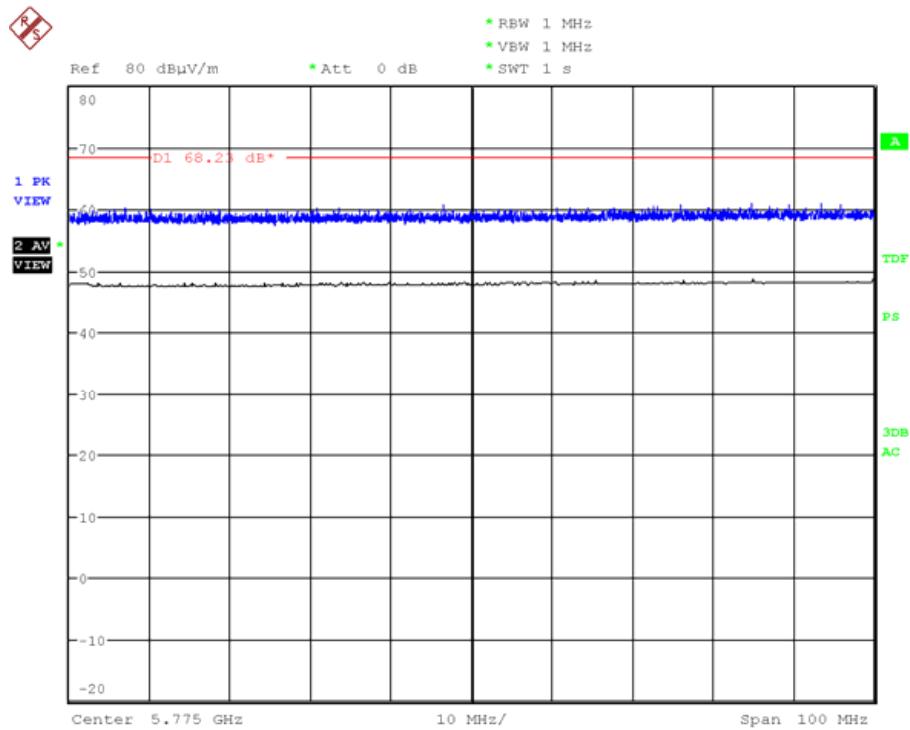
Lowest Channel (106) 5530MHz. Chain A+B.



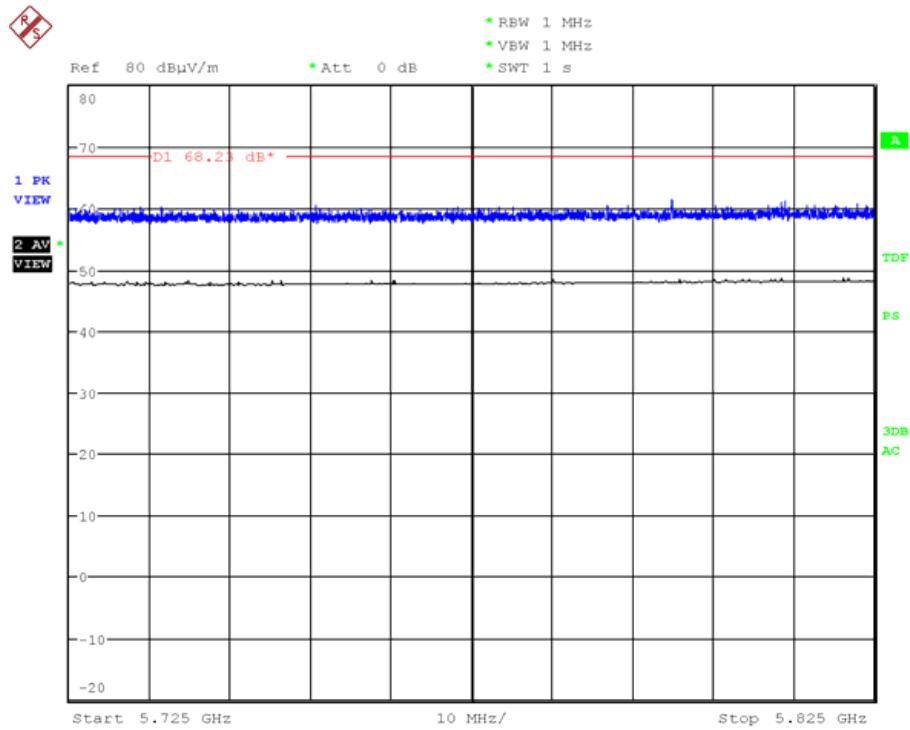
Radiated spurious emissions at band-edges and inside adjacent band 5.725 – 5.825 GHz.

1. WiFi 5GHz 802.11 a mode

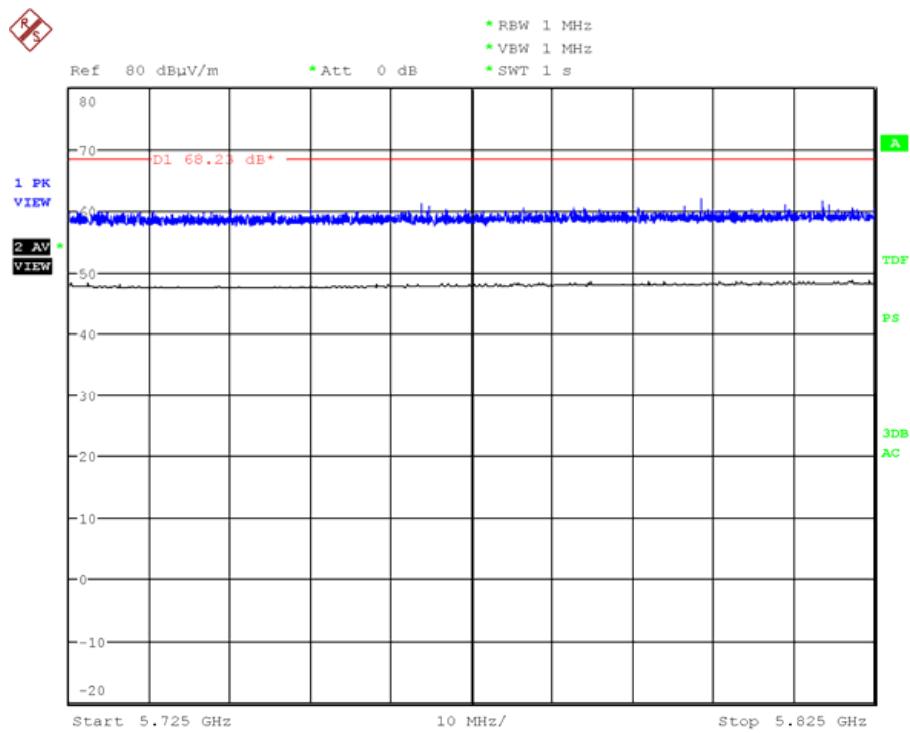
Channel 136. 5680MHz. Chain A.



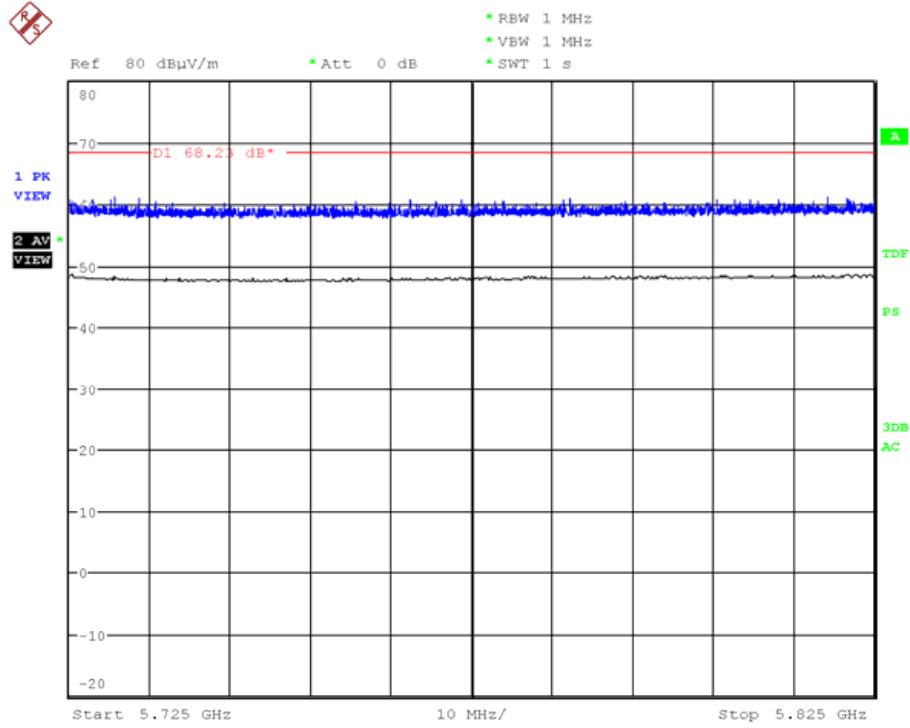
Channel 136. 5680MHz. Chain B.



Highest Channel (140) 5700 MHz. Chain A.

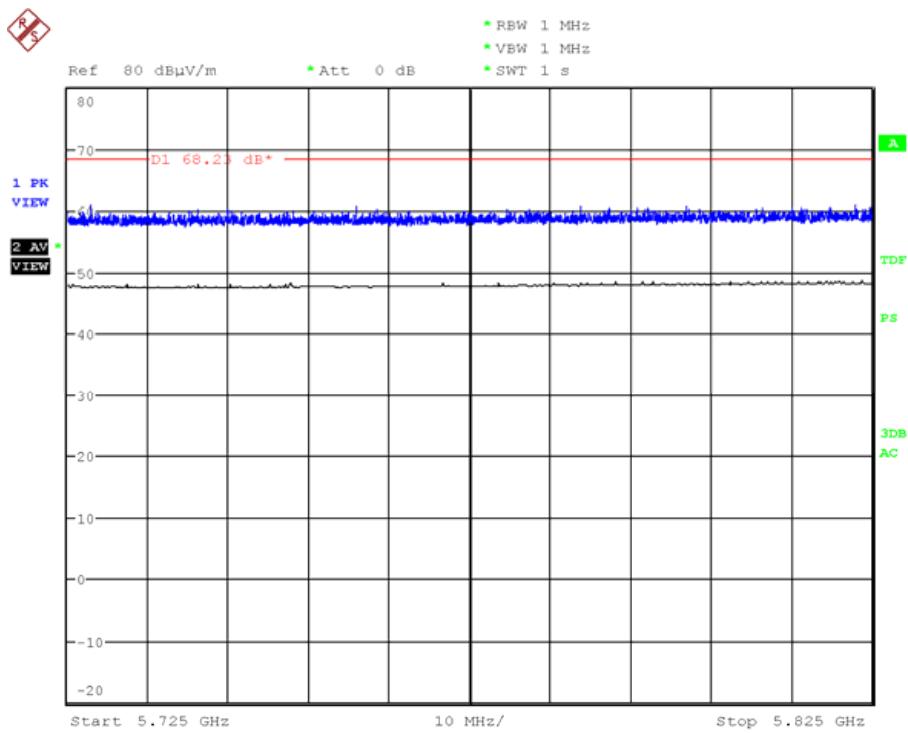


Highest Channel (140) 5700 MHz. Chain B.

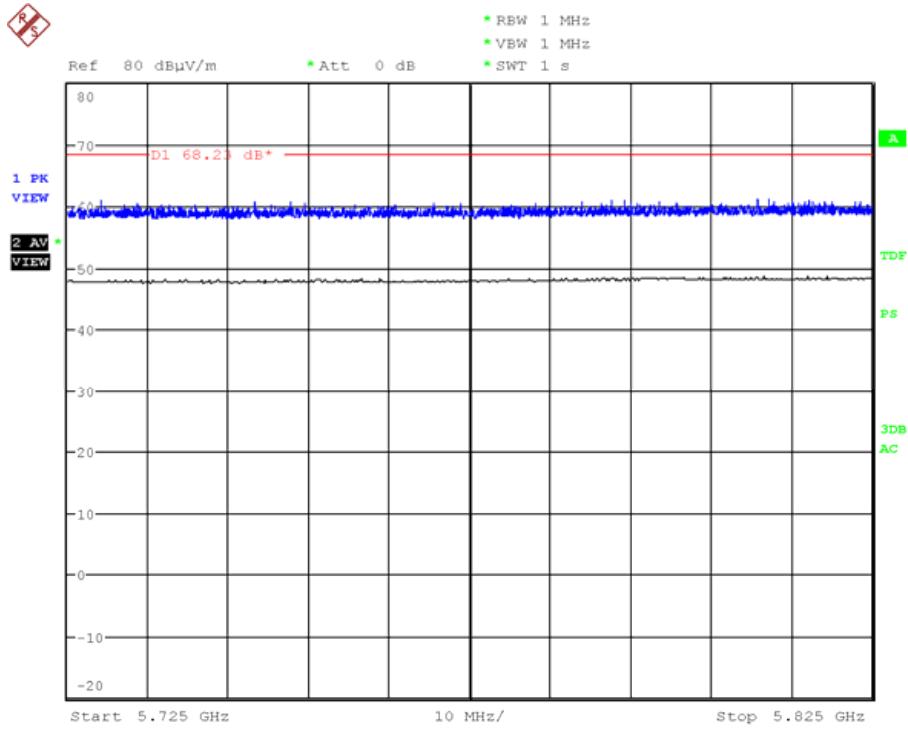


2. WiFi 5GHz 802.11 n20 mode

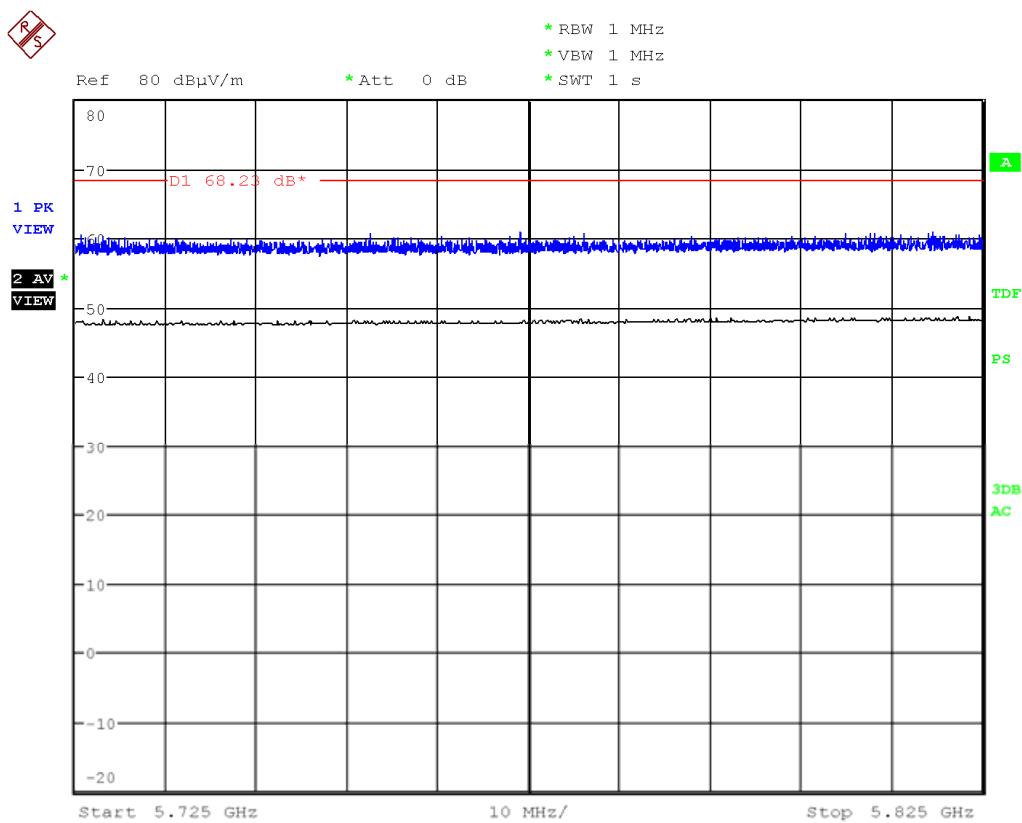
Channel 136. 5680MHz. Chain A.



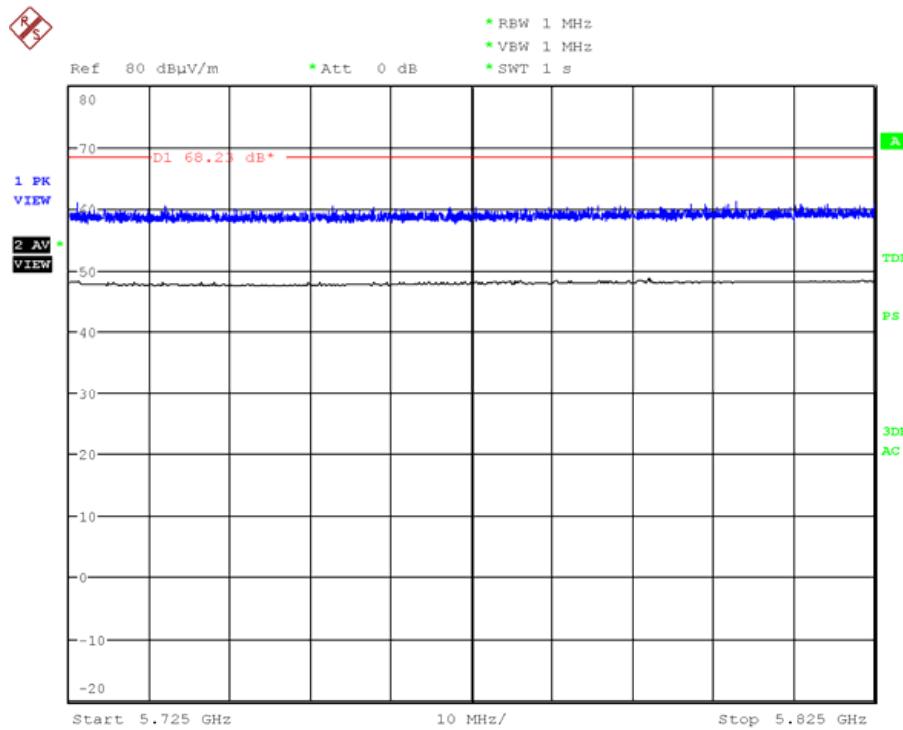
Channel 136. 5680MHz. Chain B.



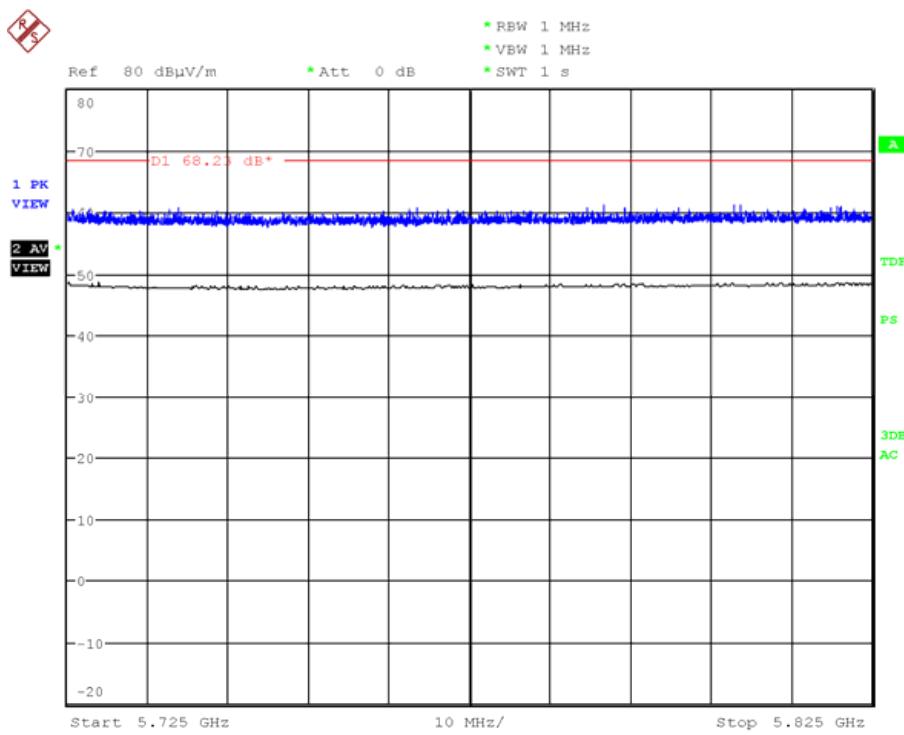
Channel 136. 5680MHz. Chain A+B.



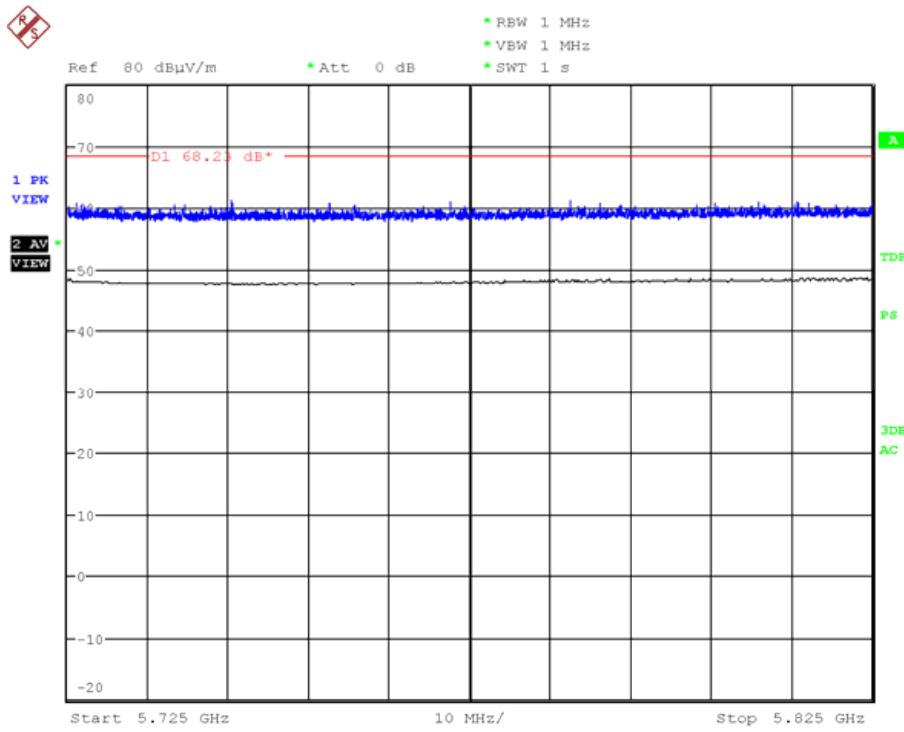
Highest Channel (140) 5700 MHz. Chain A.



Highest Channel (140) 5700 MHz. Chain B.

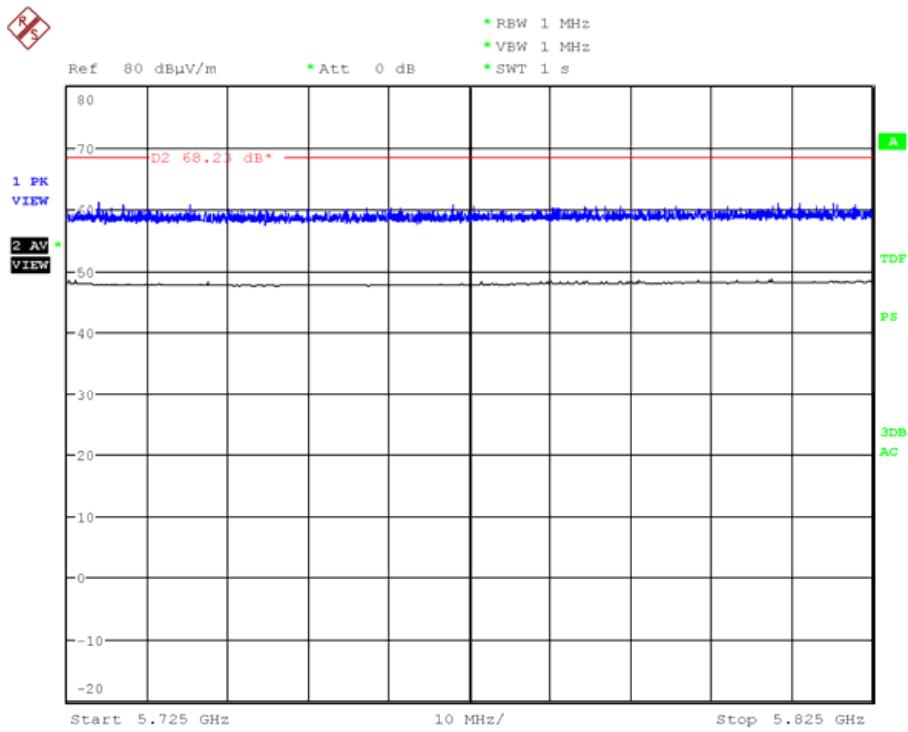


Highest Channel (140) 5700 MHz. Chain A+B.

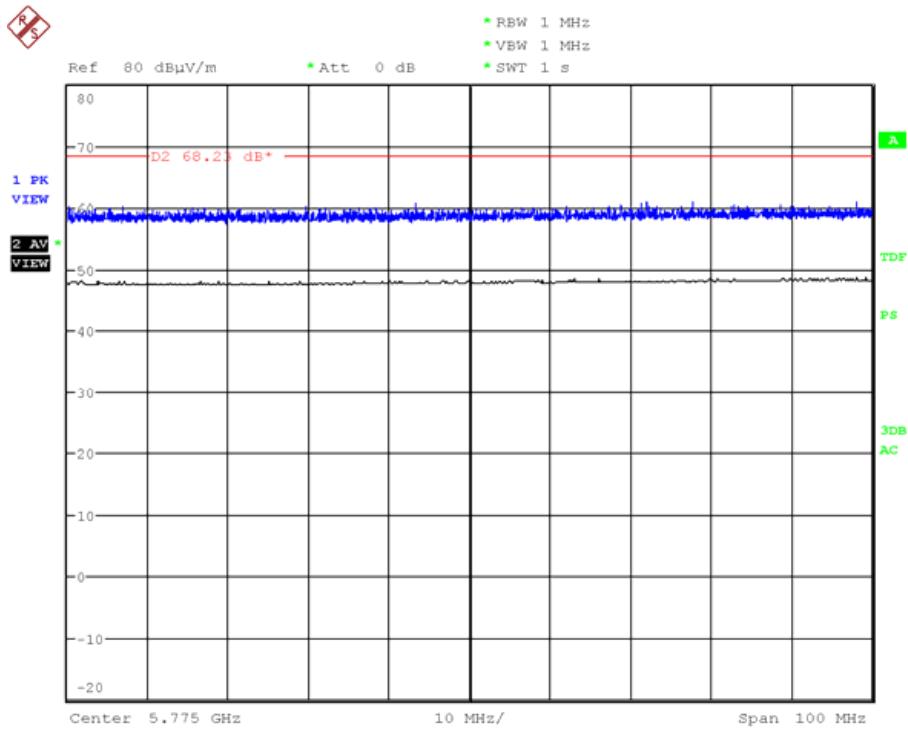


3. WiFi 5GHz 802.11 n40 mode

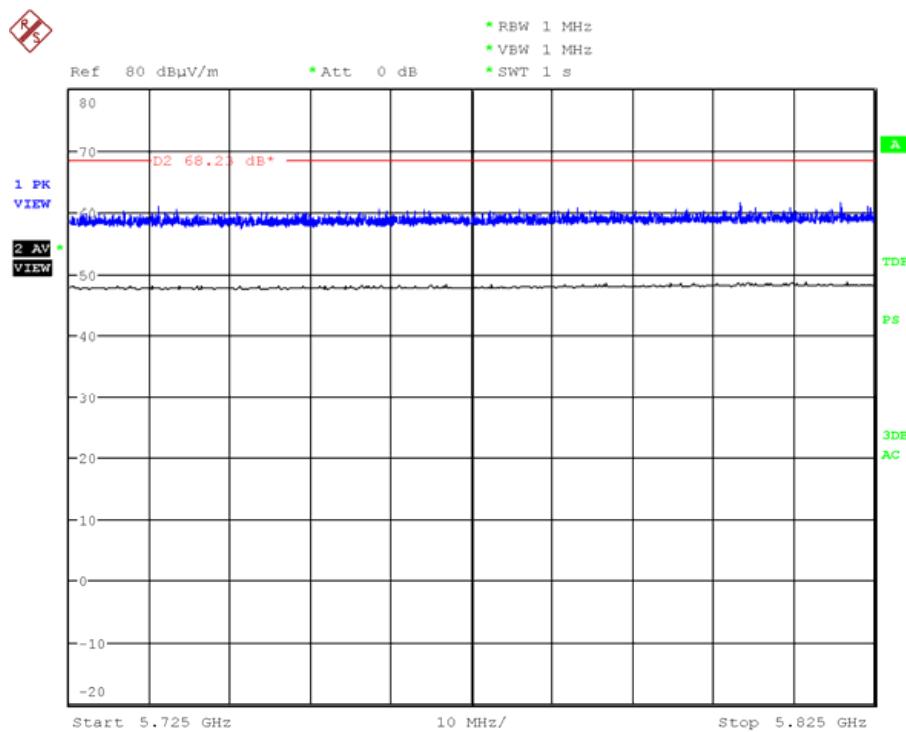
Highest Channel (134) 5670 MHz. Chain A.



Highest Channel (134) 5670 MHz. Chain B.

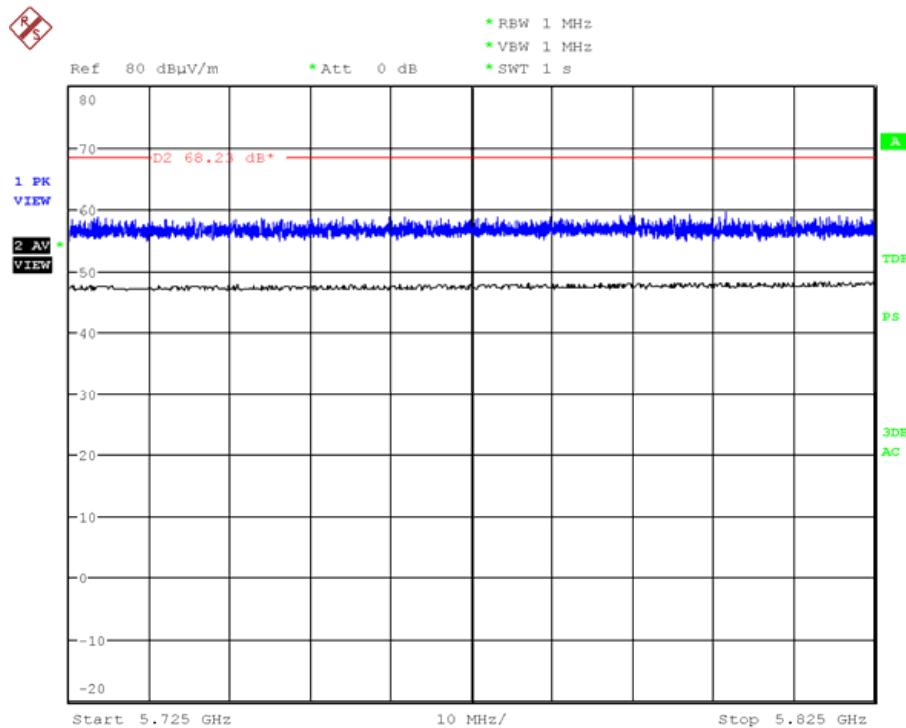


Highest Channel (134) 5670 MHz. Chain A+B.

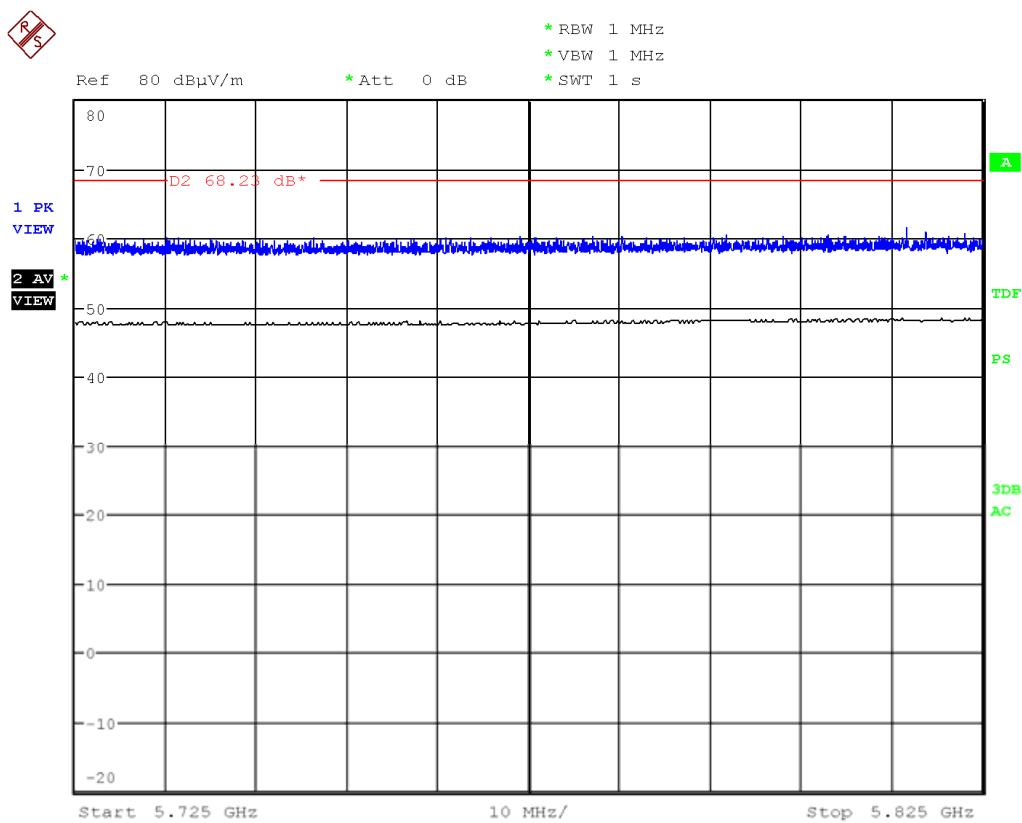


4. WiFi 5GHz 802.11 ac80 mode

Middle Channel (122) 5610 MHz. Chain A.



Middle Channel (122) 5610 MHz. Chain B.



Middle Channel (122) 5610 MHz. Chain A+B.

