FCC LISTED, REGISTRATION NUMBER: 905266 **IC LISTED REGISTRATION NUMBER IC 4621A-1**	**AT4 wireless, S.A.** Parque Tecnológico de Andalucía, c/ Severo Ochoa nº 2 29590 Campanillas/ Málaga/ España Tel. 952 61 91 00 - Fax 952 61 91 13 MÁLAGA, C.I.F. A29 507 456 Registro Mercantil de Málaga,Tomo 1169, Libro 82, Folio 133, Hoja MA3729

TEST REPORT (MODIFICATION 1)

REFERENCE STANDARD:

USA FCC Part 15.247, 15.209

CANADA RSS-210, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

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

General Requirements and Information for the Certification of Radio Apparatus.

MIE ..... :	40079RRF.002
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab. Manager
Elaboration date ..... :	2013-10-22

Alejandro Llamas Rodríguez

Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2013.10.31 13:51:33 +01'00'

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 1.7.1-775 & 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 15.247 10-1-11 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-1-11 Edition: Radiated emission limits; general requirements. Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. Guidance for Emission 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.
Test procedure .....:	PERF034
Non-standardized test method .....:	N/A
Used instrumentation .....:	Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum Analyzer Agilent E4440A	2012/02	2014/02
2.	EMI Test Receiver R&S ESU40	2012/03	2014/03
3.	Universal Power Meter R&S NRP-Z11	2012/12	2014/12

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	Hybrid Bilog antenna Sunol Sciences Corporation JB6	2011/05	2014/05
4.	Antenna mast EM 1072 NMT	N.A.	N.A.
5.	Rotating table EM 1084-4. ON	N.A.	N.A.
6.	Double-ridge Guide Horn antenna 1-18 GHz HP 11966E	2011/05	2014/05
7.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J	2011/09	2014/09
8.	EMI Test Receiver R&S ESIB26	2011/11	2013/11
9.	RF pre-amplifier Miteq JS4-12002600-30-5A.	2012/07	2014/07
10.	Multi Device Controller EMCO 2090	N.A.	N.A.
11.	Spectrum Analyzer Agilent E4440A	2012/02	2014/02
12.	RF pre-amplifier Miteq AFS5-04001300-15-10P-6.	2012/07	2014/07
13.	RF pre-amplifier Schaffner CPA 9231.	2013/06	2015/06
14.	EMI Test Receiver R&S ESU40	2012/03	2014/03

Report template No. .....: FDT08_14

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Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

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

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

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

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

PODT000: : Procedimiento para el cálculo de incertidumbres de medida

Usage of samples

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

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
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:

Control Nº	Description	Manufacture	Model	Serial Nº	Date of reception
38067/28	Laptop PC	DELL	Latitude E5420	CTFQQL1	08/01/2013
38067/29	Cable of the AC/DC Adapter	DELL	---	---	08/01/2013
38067/30	AC/DC Adapter	DELL	LA90PM111	---	08/01/2013
40104B/16	Reference Antenna	SkyCross	WIMAX/WLAN	---	26/09/2013
40104B/17	Reference Antenna	SkyCross	WIMAX/WLAN	---	26/09/2013
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	---	---	---	---
40079/09	USB cable	---	---	---	26/09/2013

Usage of samples

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
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:

Control Nº	Description	Manufacture	Model	Serial Nº	Date of reception
38067/28	Laptop PC	DELL	Latitude E5420	CTFQQL1	08/01/2013
38067/29	Cable of the AC/DC Adapter	DELL	---	---	08/01/2013
38067/30	AC/DC Adapter	DELL	LA90PM111	---	08/01/2013
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 2013-09-13 and finished on 2013-10-15.

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. = 19.1ºC Max. = 22.5ºC
Relative humidity	Min. = 48 % Max. = 55%
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. = 18.4ºC Max. = 20.5ºC
Relative humidity	Min. = 51% Max. = 56%
Air pressure	Min. = 1017 mbar Max. = 1019 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. = 23.1ºC Max. = 25.1ºC
Relative humidity	Min. = 42.5 % Max. = 48.5 %
Air pressure	Min. = 1019 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 15.247 / 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.- No comments.

Testing verdicts

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

1. WiFi 2.4 GHz (802.11b/g/n20/n40)

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a)	6 dB Bandwidth		P		
Section 15.247 Subclause (b) / RSS-210 A8.4. (4)	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations conducted (Transmitter)		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Band-edge emissions compliance (Transmitter)		P		
Section 15.247 Subclause (e) / RSS-210 A8.2. (b)	Power spectral density		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations radiated (Transmitter)		P		

2. WiFi 5.725 – 5.825 GHz (802.11a/n20/n40/ac80)

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a)	6 dB Bandwidth		P		
Section 15.247 Subclause (b) / RSS-210 A8.4. (4)	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations conducted (Transmitter)		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Band-edge emissions compliance (Transmitter)		P		
Section 15.247 Subclause (e) / RSS-210 A8.2. (b)	Power spectral density		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations radiated (Transmitter)		P		

3. Bluetooth Low Energy

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a)	6 dB Bandwidth		P		
Section 15.247 Subclause (b) / RSS-210 A8.4. (4)	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations conducted (Transmitter)		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Band-edge emissions compliance (Transmitter)		P		
Section 15.247 Subclause (e) / RSS-210 A8.2. (b)	Power spectral density		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations radiated (Transmitter)		P		

APPENDIX A: Test results
“WiFi 2.4 GHz (802.11b/g/n20/n40)”

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

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

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 3.24 dBi

TEST FREQUENCIES:

For WiFi 802.11b/g/n20:

Lowest channel (1): 2412 MHz

Middle channel (6): 2437 MHz

Highest channel (11): 2462 MHz

For WiFi 802.11n40:

Lowest channel (3): 2422 MHz

Middle channel (6): 2437 MHz

Highest channel (9): 2452 MHz

The test set-up was made in accordance to the general provisions of FCC DTS Measurement KDB 558074 D01 DTS Meas Guidance v03r01.

For 802.11b/g modes the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually but not simultaneously.

For 802.11n modes 802.11n20 (20 MHz channel bandwidth) and 802.11n40 (40MHz channel bandwidth) 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.

WiFi 2.4 GHz: 802.11b, 802.11g, 802.11n20 (20 MHz channel bandwidth) and 802.11n40 (40MHz channel bandwidth).

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 "OEDRTU 558x86" DRTU 1.7.1-752".

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 data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g, HT4 (SISO)/HT8 (MIMO) for 802.11n20 and n40 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and band edge levels at restricted bands.

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)
802.11b	20	1 / 2412	15	14,5	n/a
		6 / 2437	15	14,5	n/a
		11 / 2462	15	14,5	n/a
802.11g	20	1 / 2412	13,5	13	n/a
		2 / 2417	16	15	n/a
		6 / 2437	16,5	15,5	n/a
		10 / 2457	16	15,5	n/a
		11 / 2462	14	14	n/a
802.11n	20	1 / 2412	13,5	13	12.50
		2 / 2417	16	15	13.50
		6 / 2437	16,5	15,5	13.50
		10 / 2457	16	15,5	13.50
		11 / 2462	14	14	13.50
802.11n*	40	3 / 2422	12	10,5	8.50
		4 / 2427	13	11,5	9.50
		5 / 2432	15,5	13	12.00
		6 / 2437	16	14	13.00
		7 / 2442	15,5	14	13.50
		8 / 2447	15	13,5	13.00
		9 / 2452	14,5	13	12.00

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a calibrated low loss RF cable. The reading in the spectrum analyser is compensated with the cable loss at each measurement frequency.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Occupied Bandwidth

RESULTS

1. WiFi 2.4GHz 802.11 b mode

Occupied Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	14.22	14.25	14.25	14.22	14.25	14.25
Measurement uncertainty (kHz)	±21.7					

2. WiFi 2.4GHz 802.11 g mode

Occupied Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	17.16	17.25	17.67	17.97	17.19	17.19
Measurement uncertainty (kHz)	±21.7					

3. WiFi 2.4GHz 802.11 n20 mode

Occupied Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	18.09	18.12	18.51	18.36	18.12	18.12
Measurement uncertainty (kHz)	±21.7					

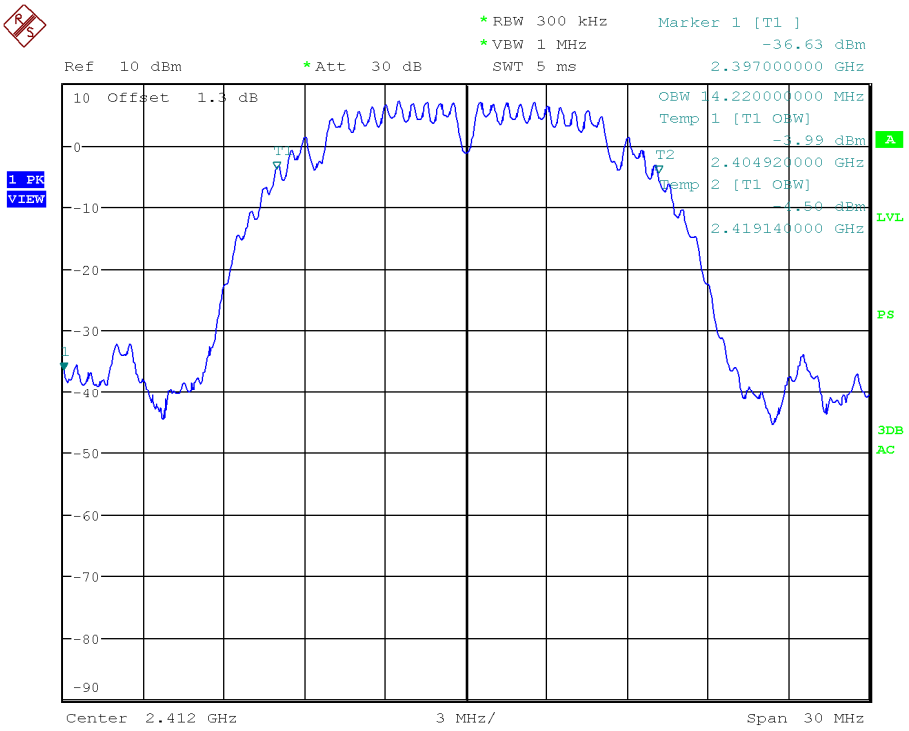
4. WiFi 2.4GHz 802.11 n40 mode

Occupied Bandwidth (see next plots).

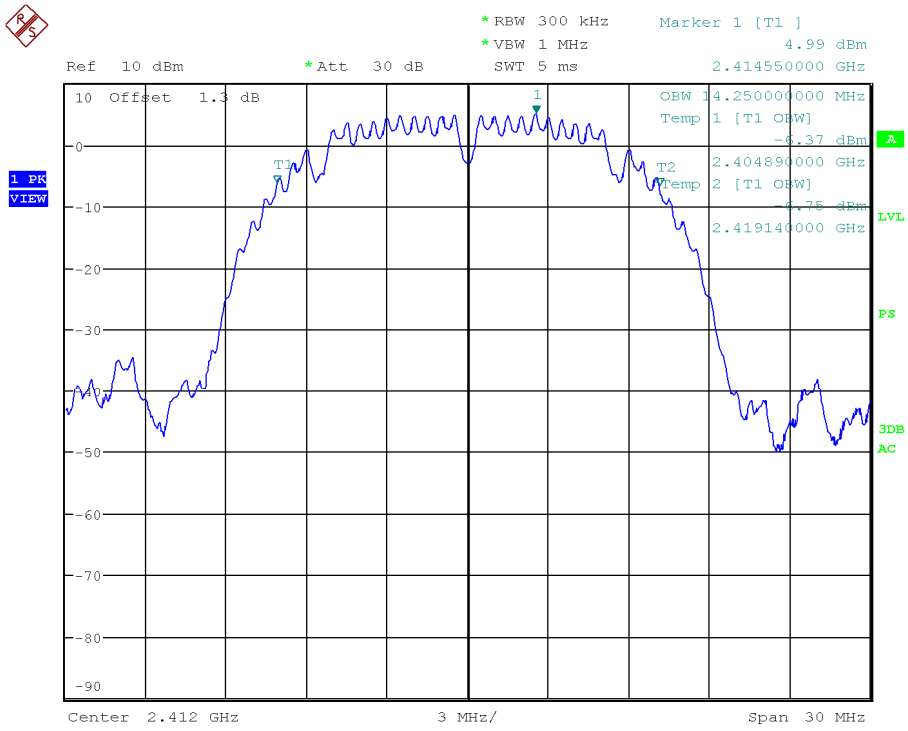
	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	36.05	36.05	36.30	36.10	36.15	36.10
Measurement uncertainty (kHz)	±21.7					

1. WiFi 2.4GHz 802.11 b mode

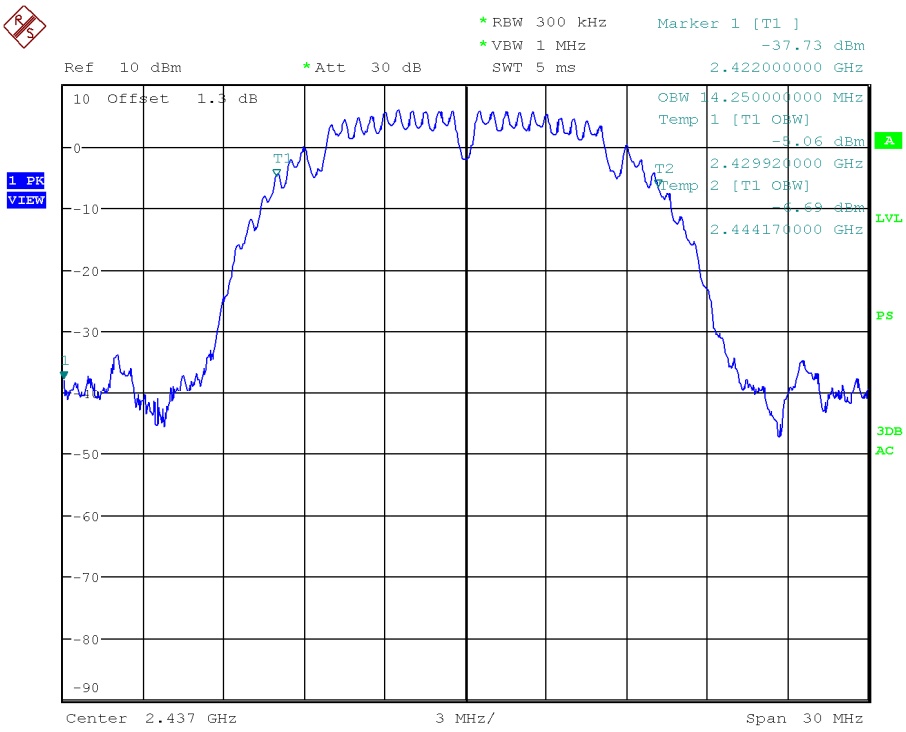
Lowest Channel: 2412 MHz. Chain A



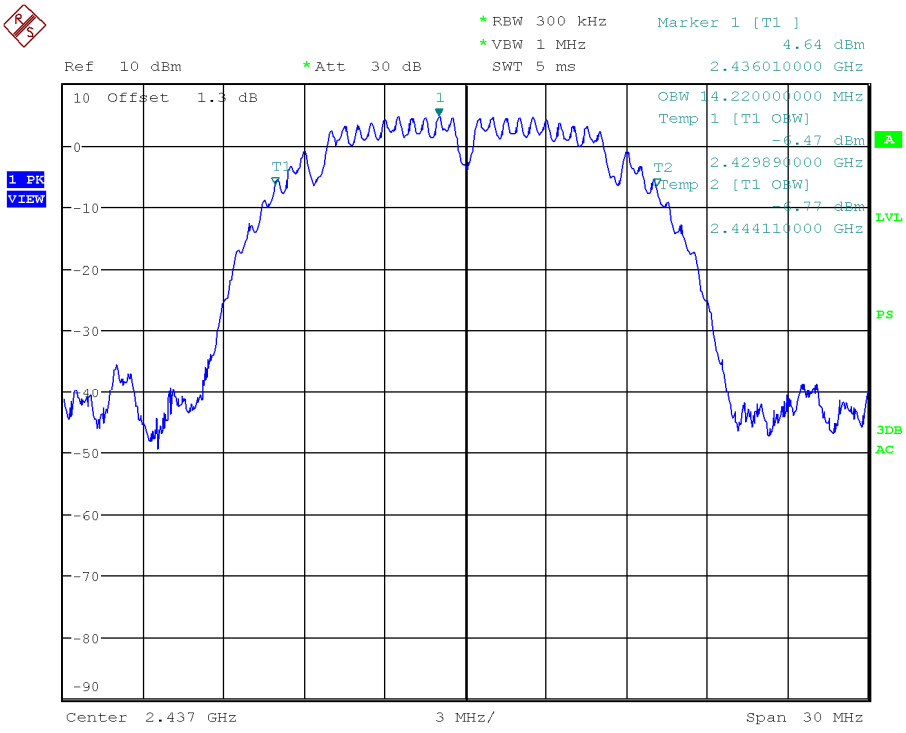
Lowest Channel: 2412 MHz. Chain B.



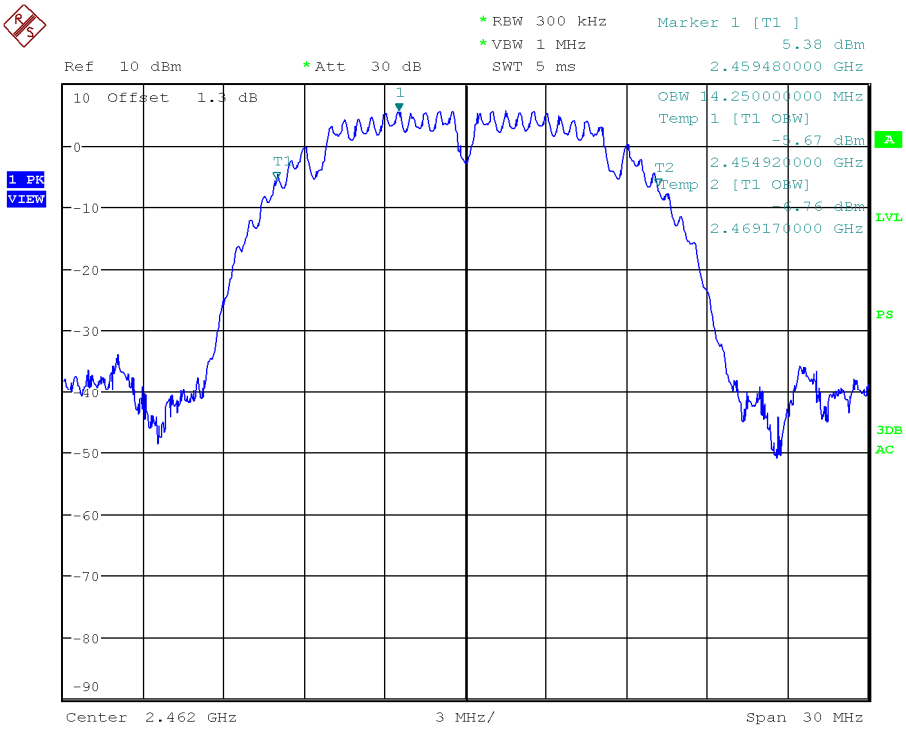
Middle Channel: 2437 MHz. Chain A



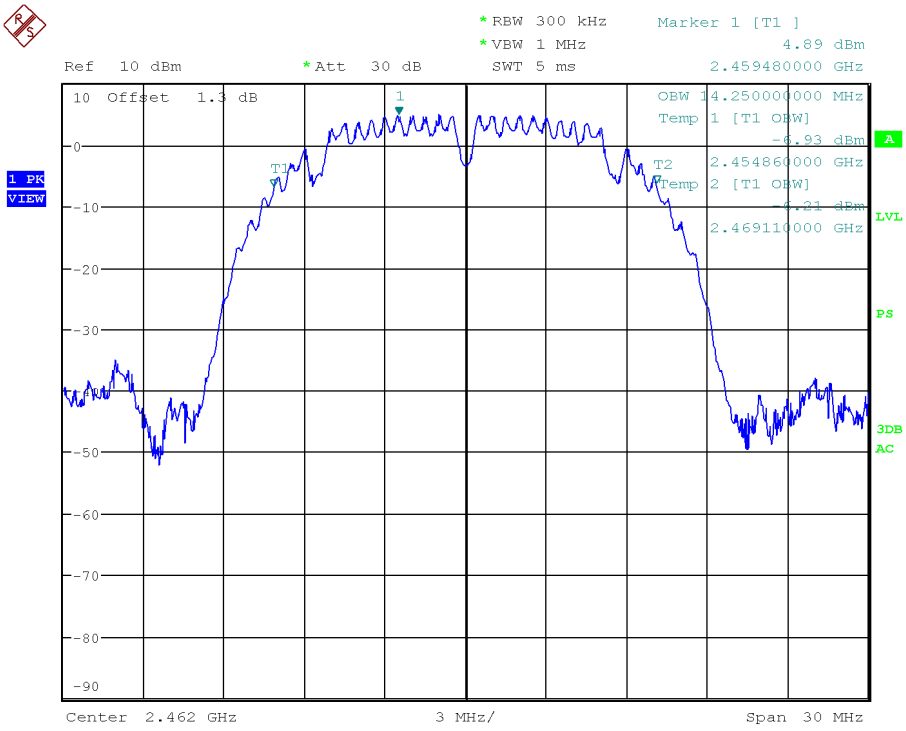
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

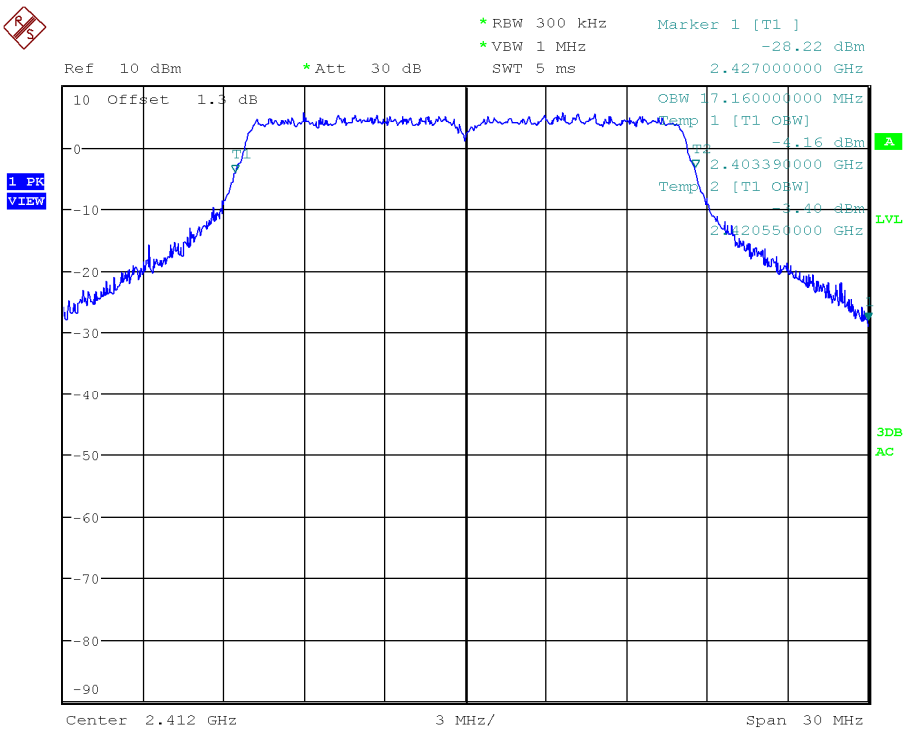


Highest Channel: 2462 MHz. Chain B.

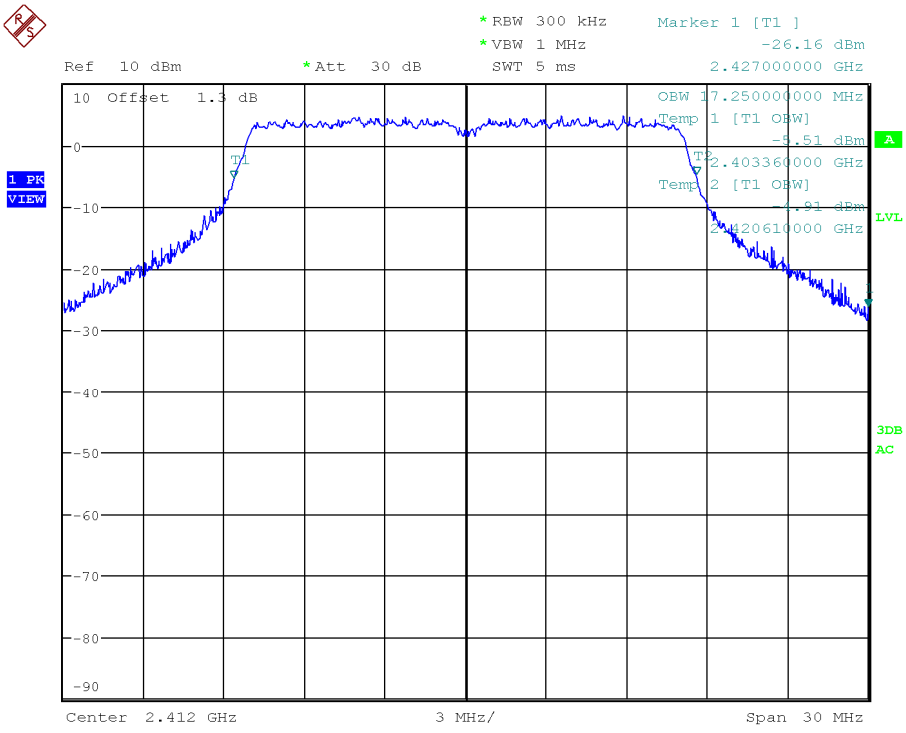


2. WiFi 2.4GHz 802.11 g mode

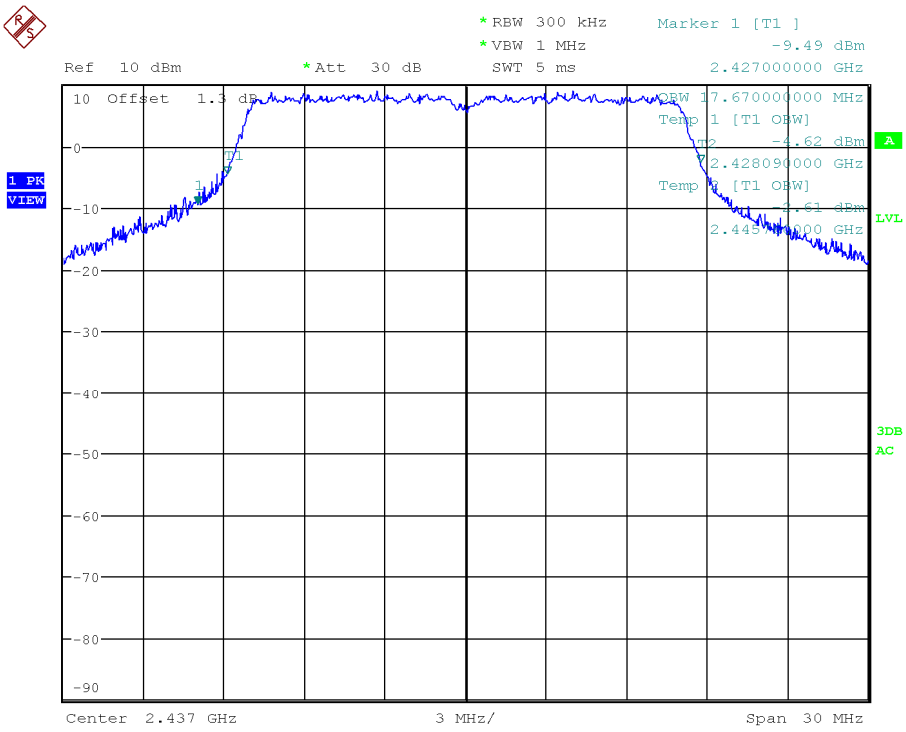
Lowest Channel: 2412 MHz. Chain A



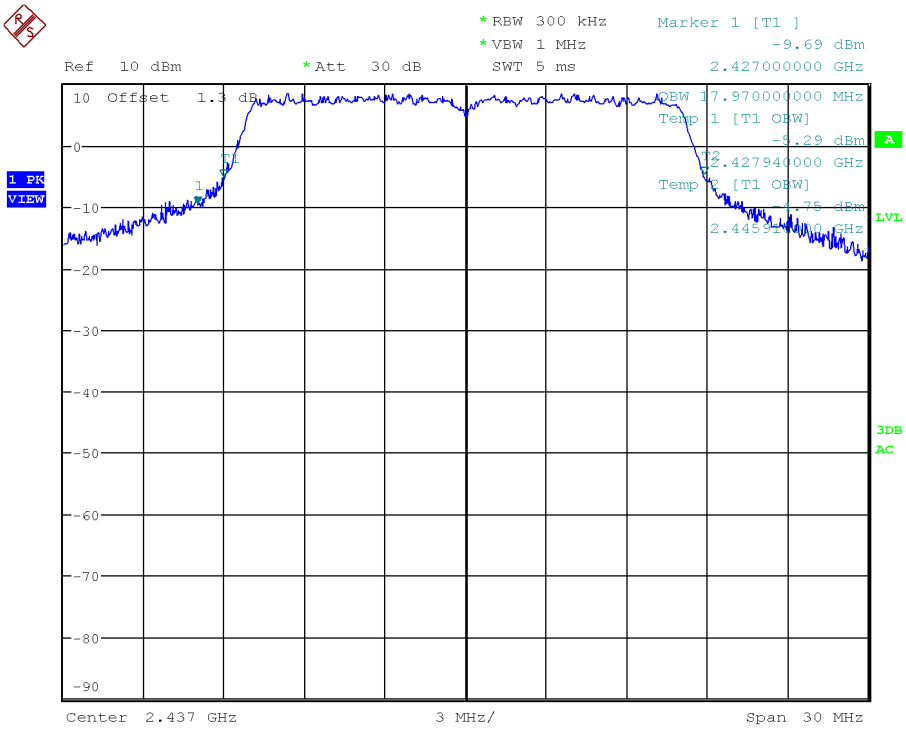
Lowest Channel: 2412 MHz. Chain B



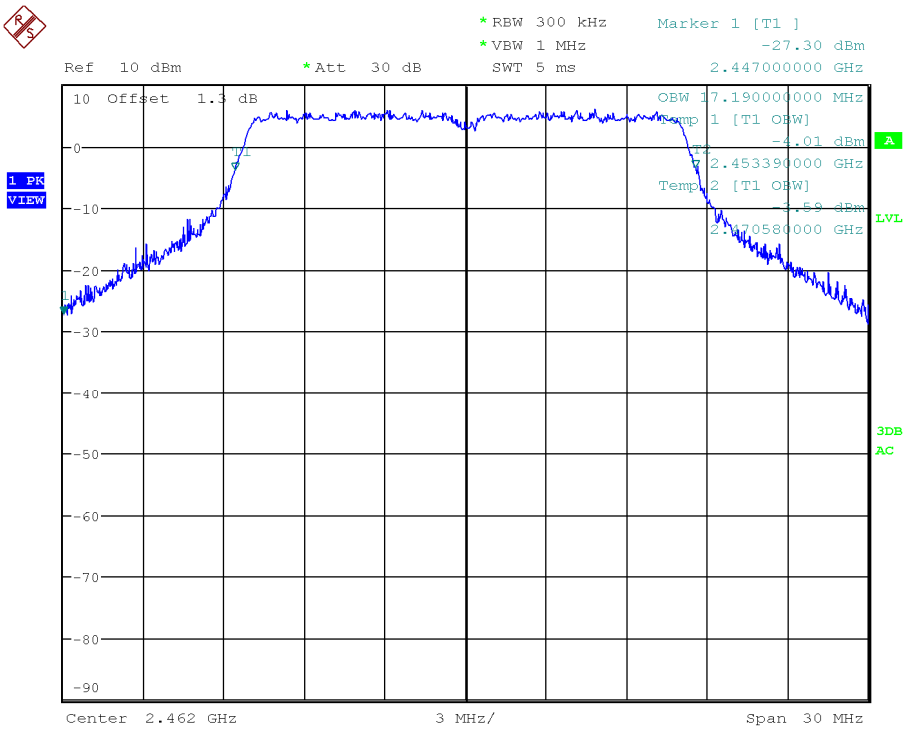
Middle Channel: 2437 MHz. Chain A



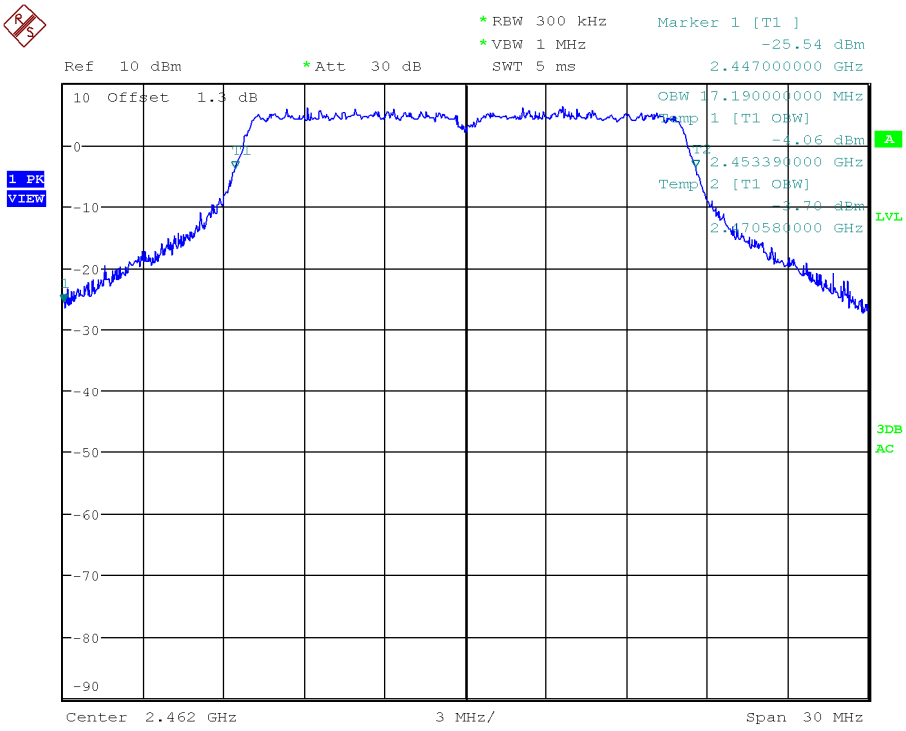
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

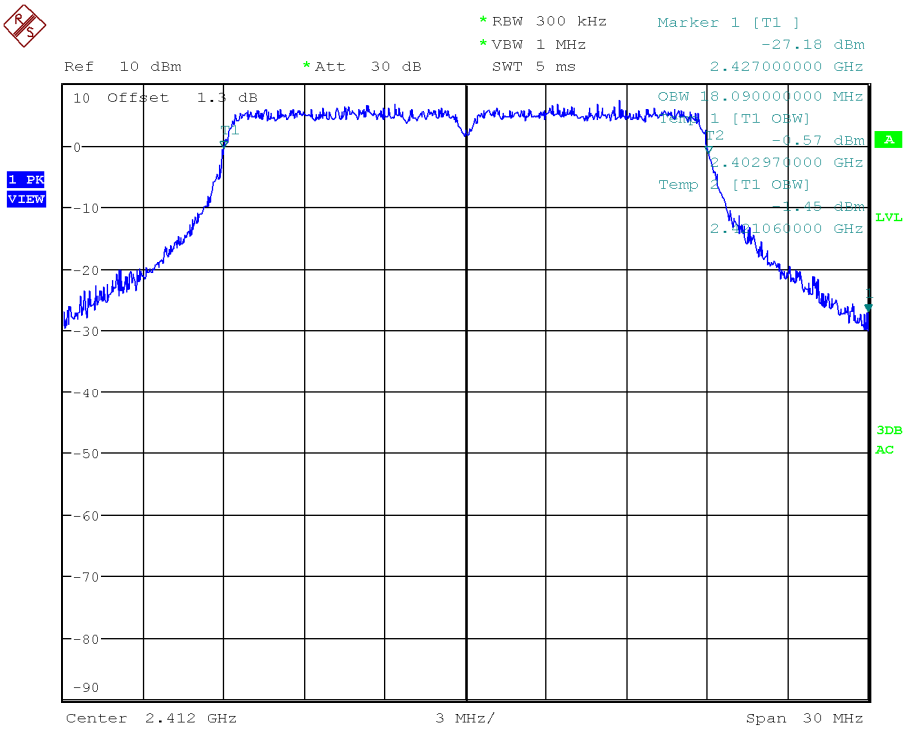


Highest Channel: 2462 MHz. Chain B.

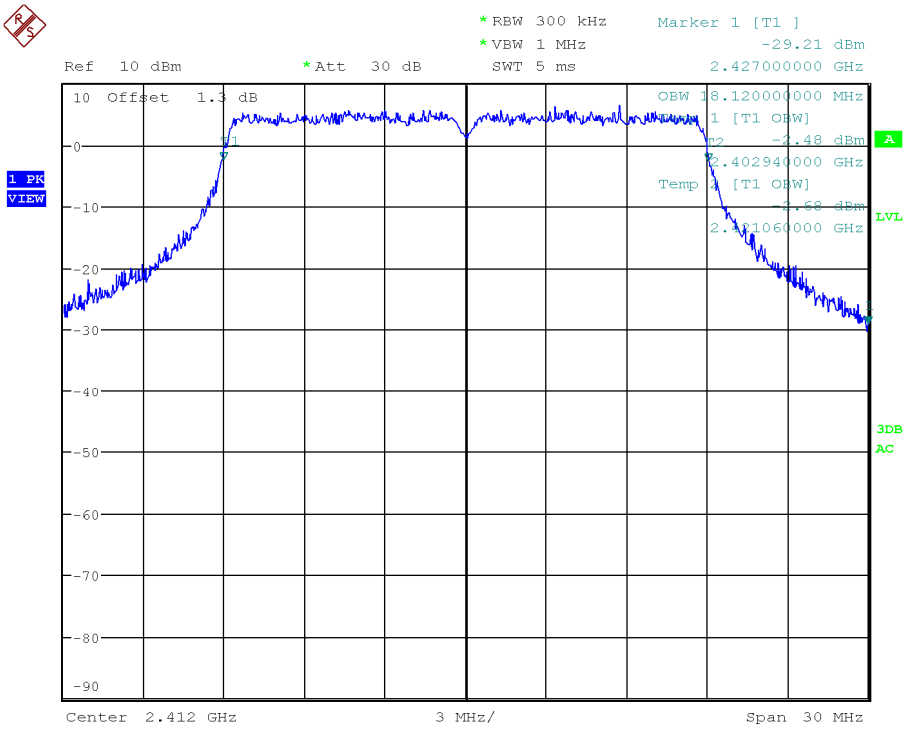


3. WiFi 2.4GHz 802.11 n20 mode

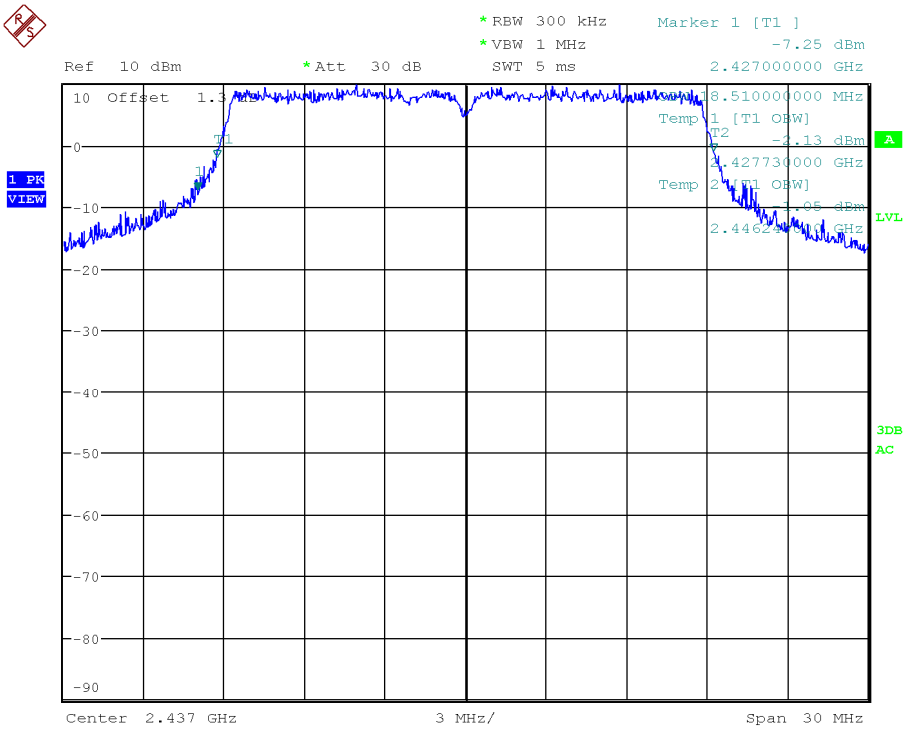
Lowest Channel: 2412 MHz. Chain A



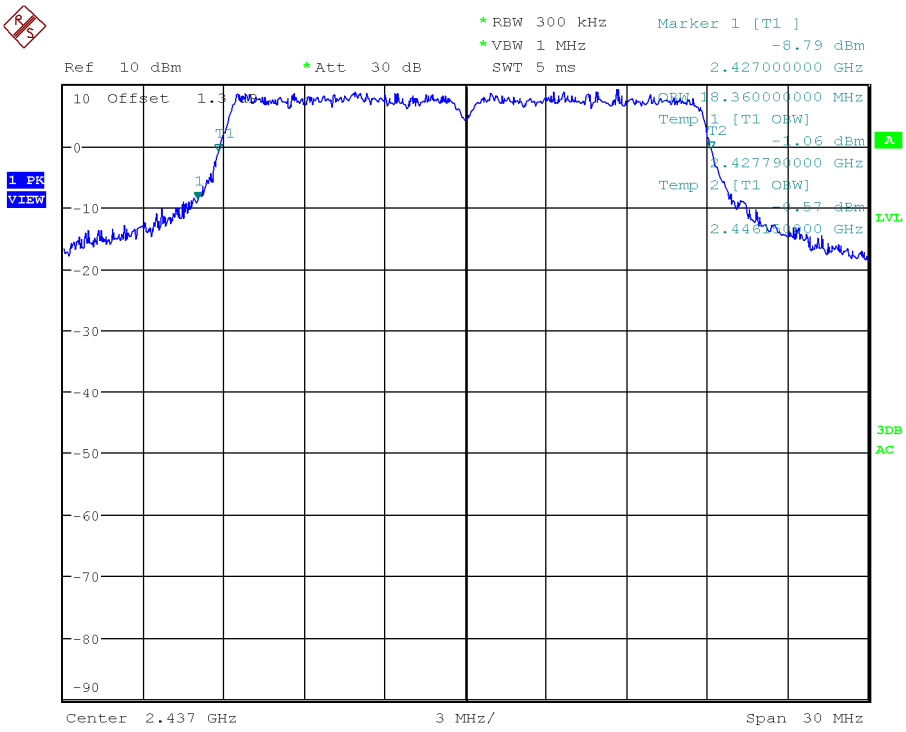
Lowest Channel: 2412 MHz. Chain B



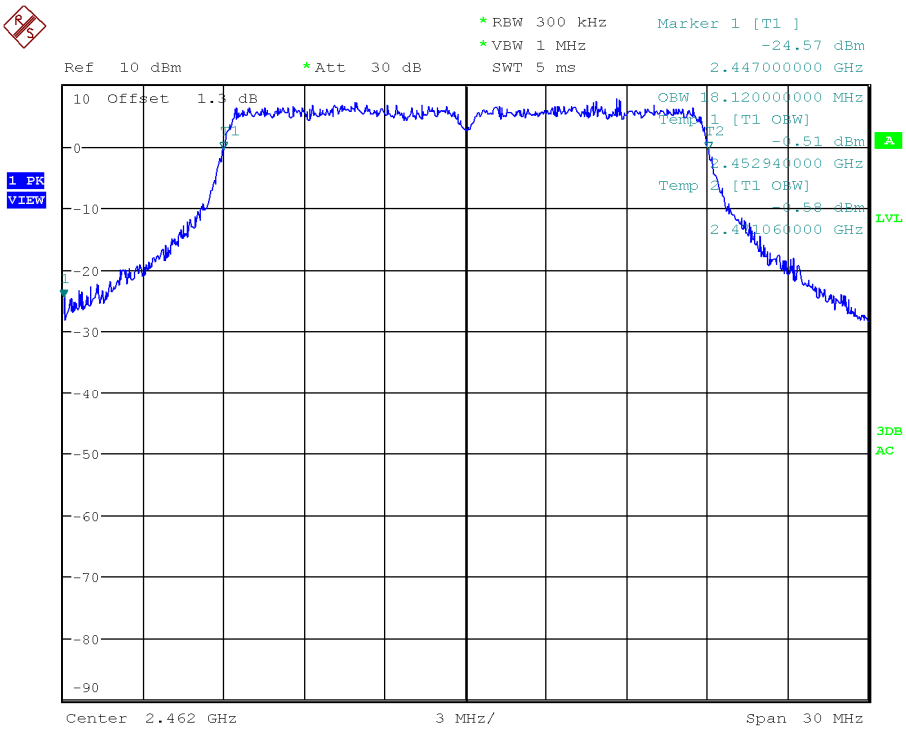
Middle Channel: 2437 MHz. Chain A



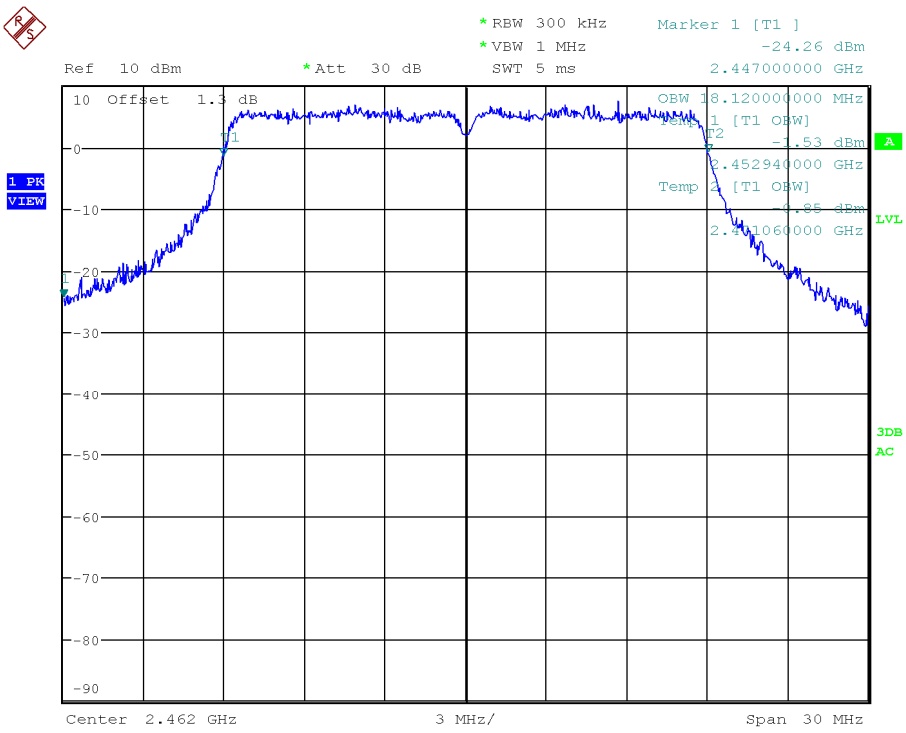
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

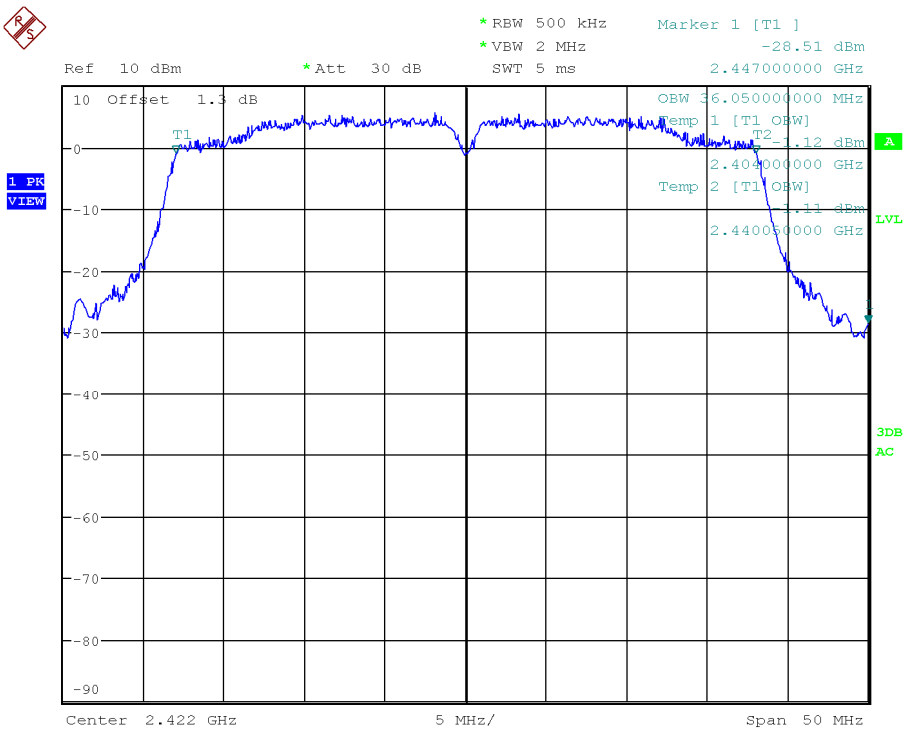


Highest Channel: 2462 MHz. Chain B.

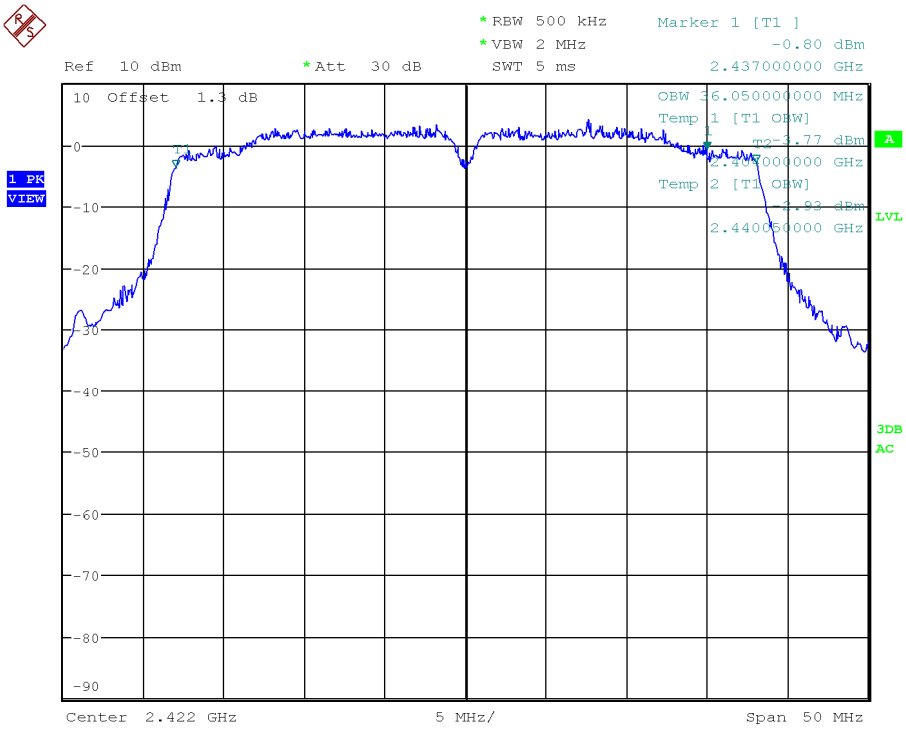


4. WiFi 2.4GHz 802.11 n40 mode

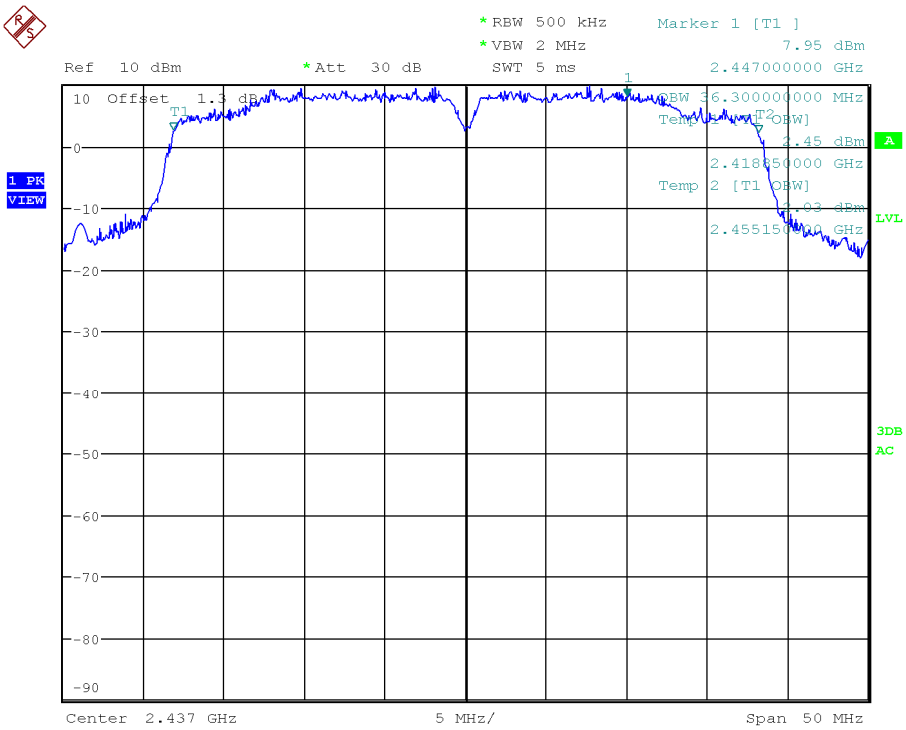
Lowest Channel: 2422 MHz. Chain A



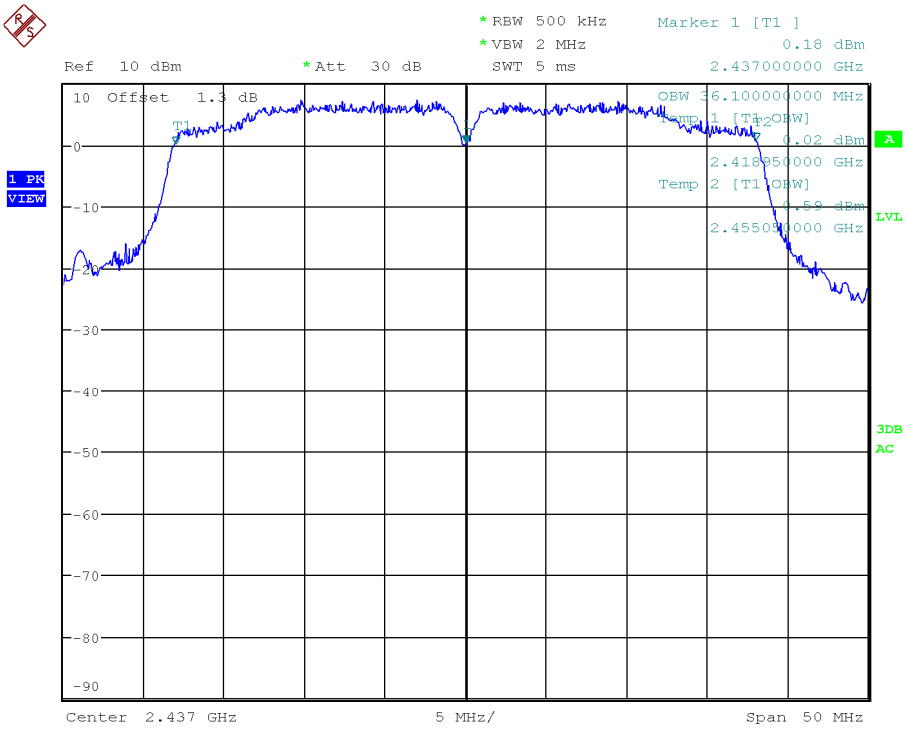
Lowest Channel: 2422 MHz. Chain B



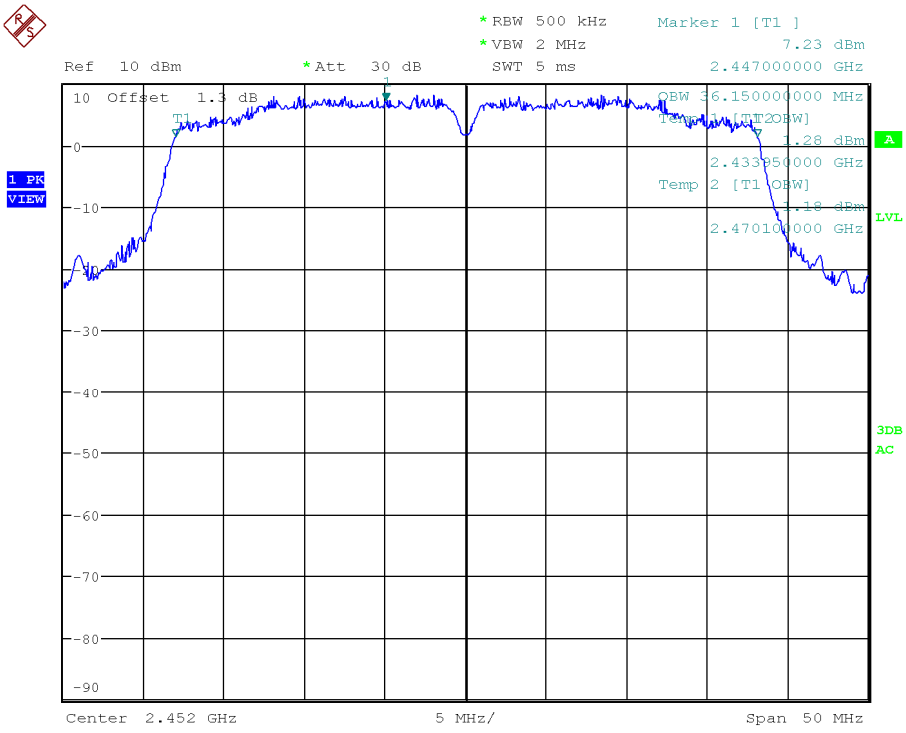
Middle Channel: 2437 MHz. Chain A



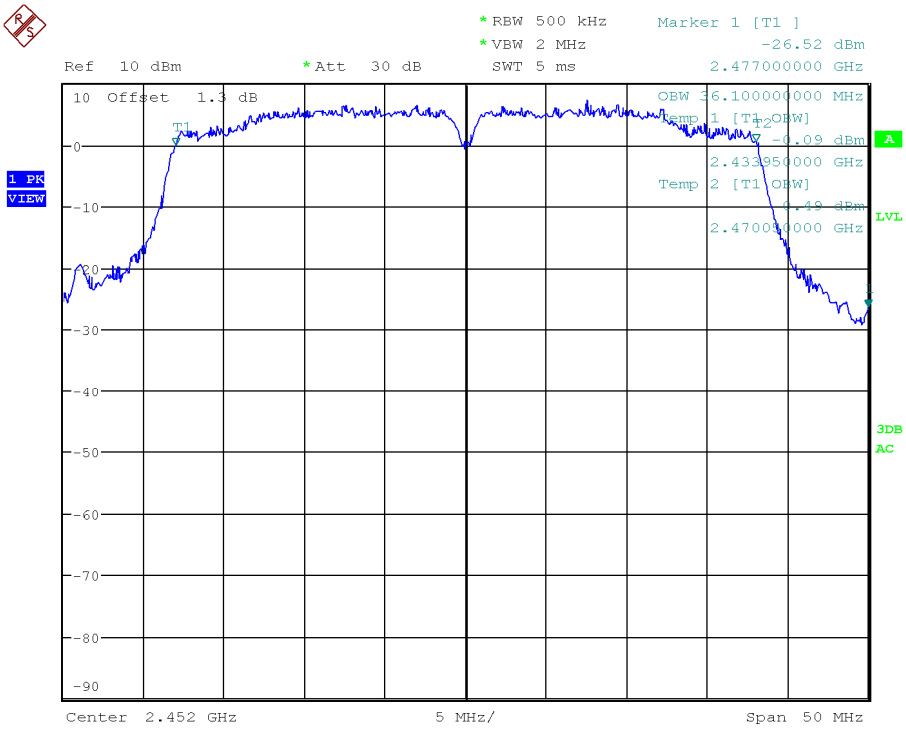
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2452 MHz. Chain A.



Highest Channel: 2452 MHz. Chain B.



Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a). 6 dB Bandwidth

SPECIFICATION

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

1. WiFi 2.4GHz 802.11 b mode

6 dB Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	12.147	12.115	12.115	12.115	12.083	12.115
Measurement uncertainty (kHz)	±89					

Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

6 dB Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	16.378	16.410	16.378	16.378	16.410	16.378
Measurement uncertainty (kHz)	±89					

Verdict: PASS

3. WiFi 2.4GHz 802.11 n20 mode

6 dB Bandwidth (see next plots).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	17.788	17.756	17.756	17.756	17.788	17.756
Measurement uncertainty (kHz)	±89					

Verdict: PASS

4. WiFi 2.4GHz 802.11 n40 mode

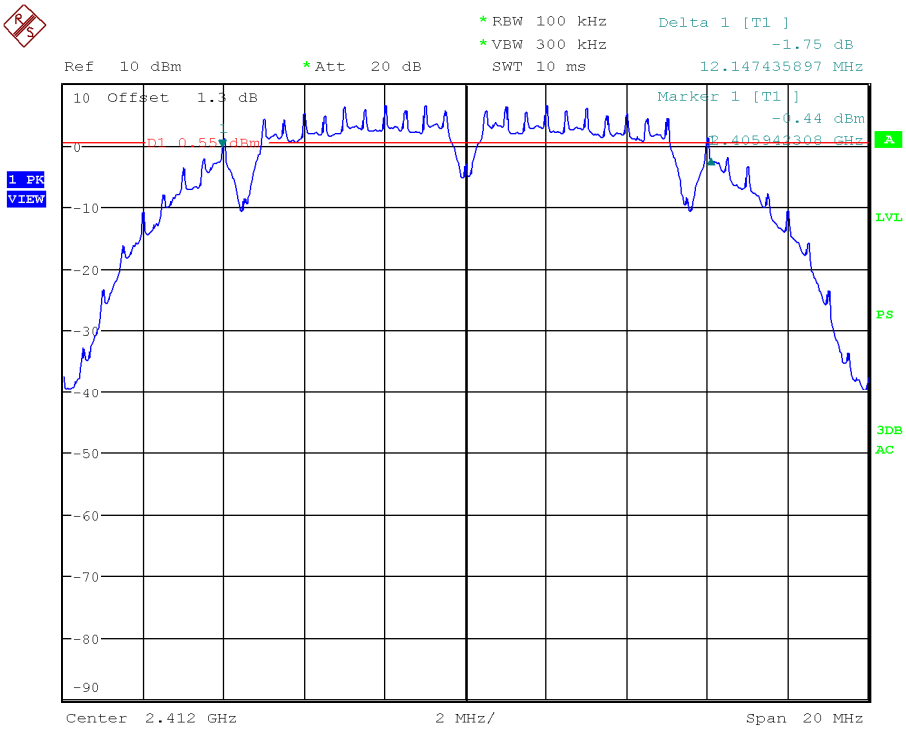
6 dB Bandwidth (see next plots).

	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	35.192	35.192	35.448	35.192	35.256	35.192
Measurement uncertainty (kHz)	±89					

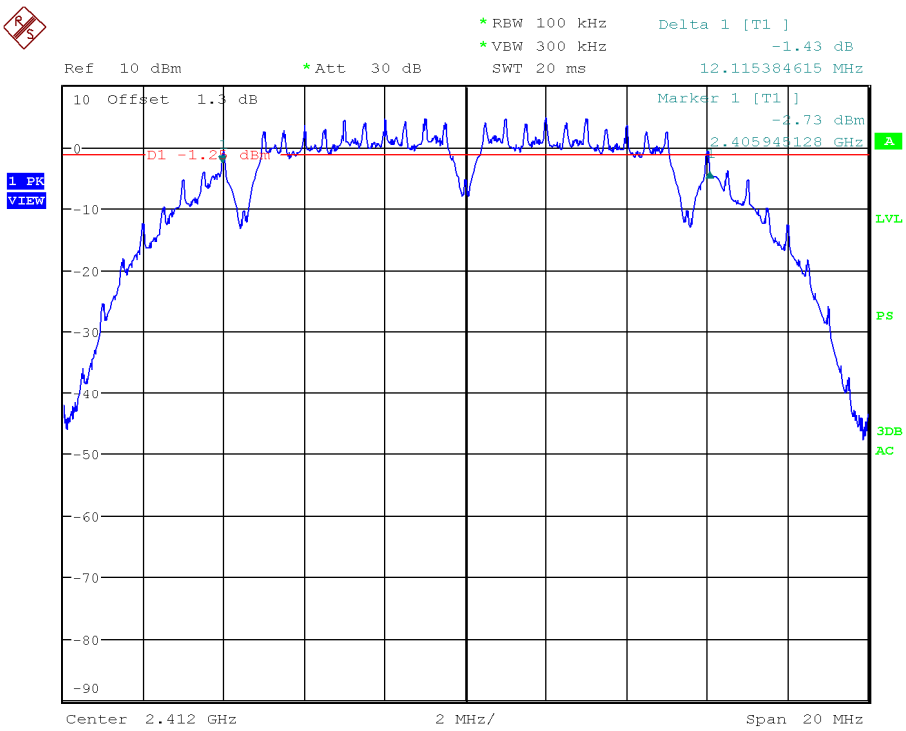
Verdict: PASS

1. WiFi 2.4GHz 802.11 b mode

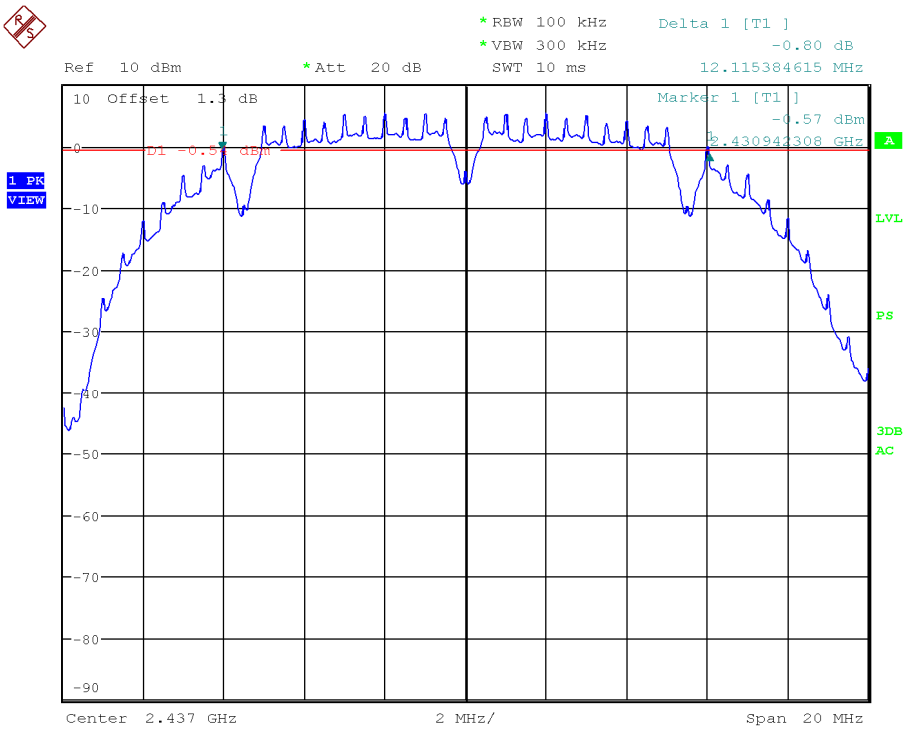
Lowest Channel: 2412 MHz. Chain A.



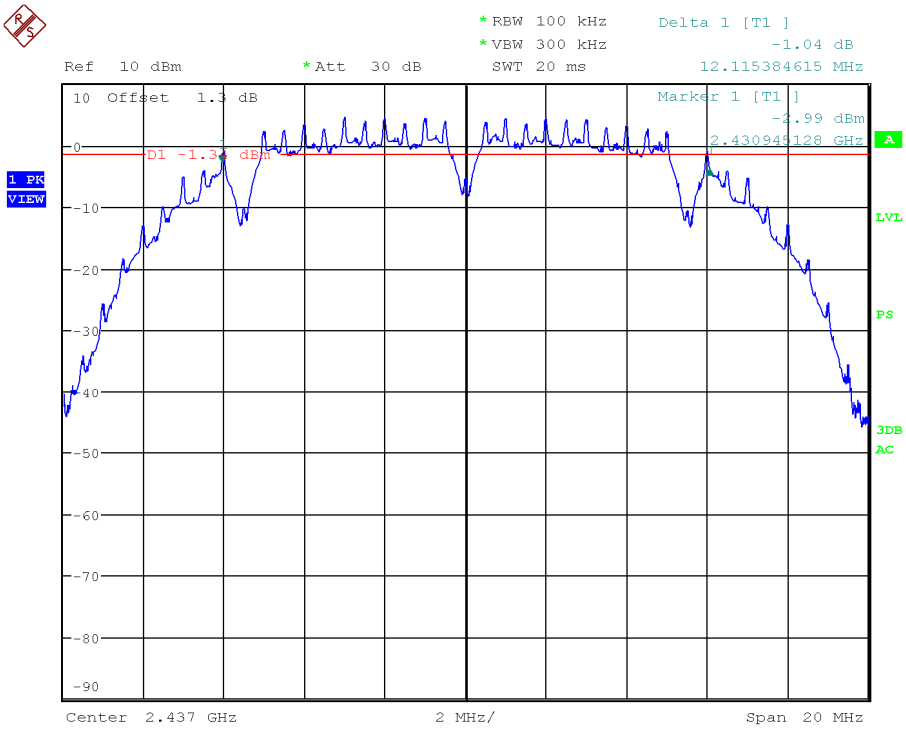
Lowest Channel: 2412 MHz. Chain B.



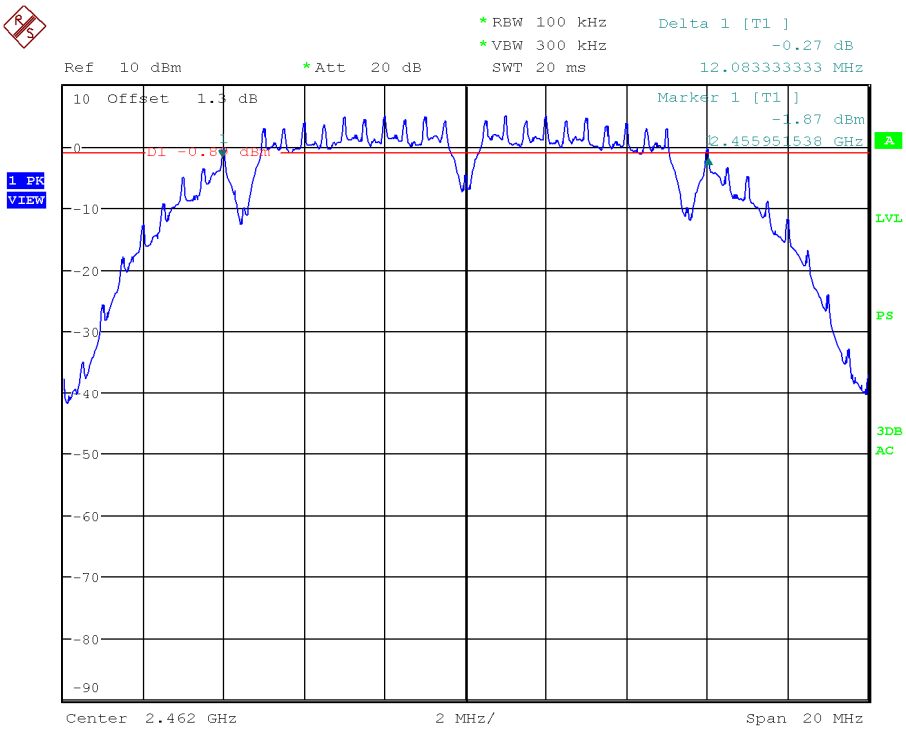
Middle Channel: 2437 MHz. Chain A



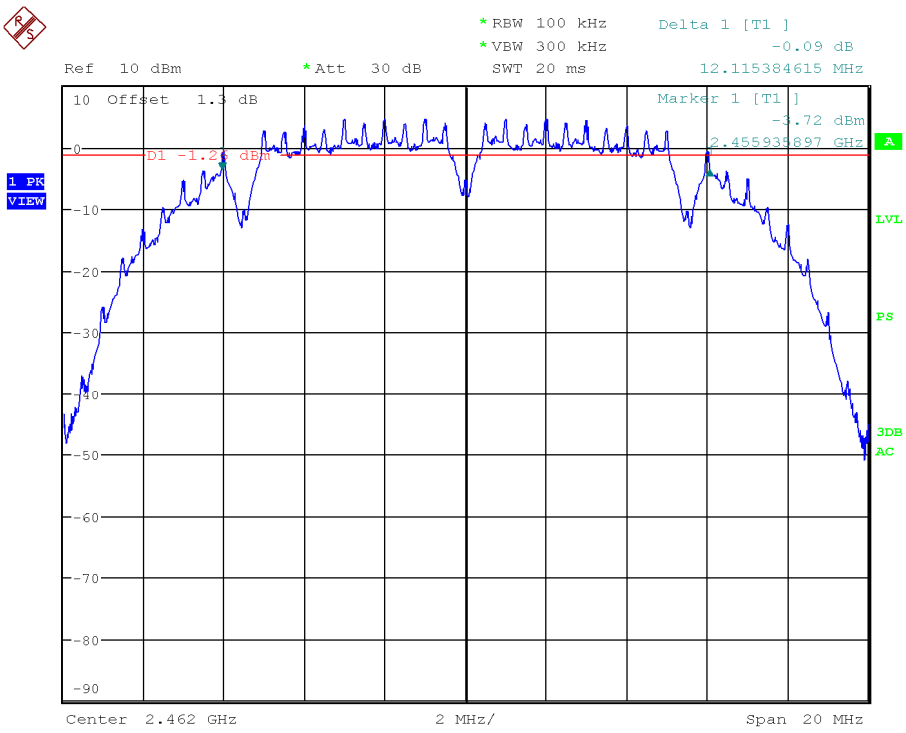
Middle Channel: 2437 MHz. Chain B.



Highest Channel: 2462 MHz. Chain A.

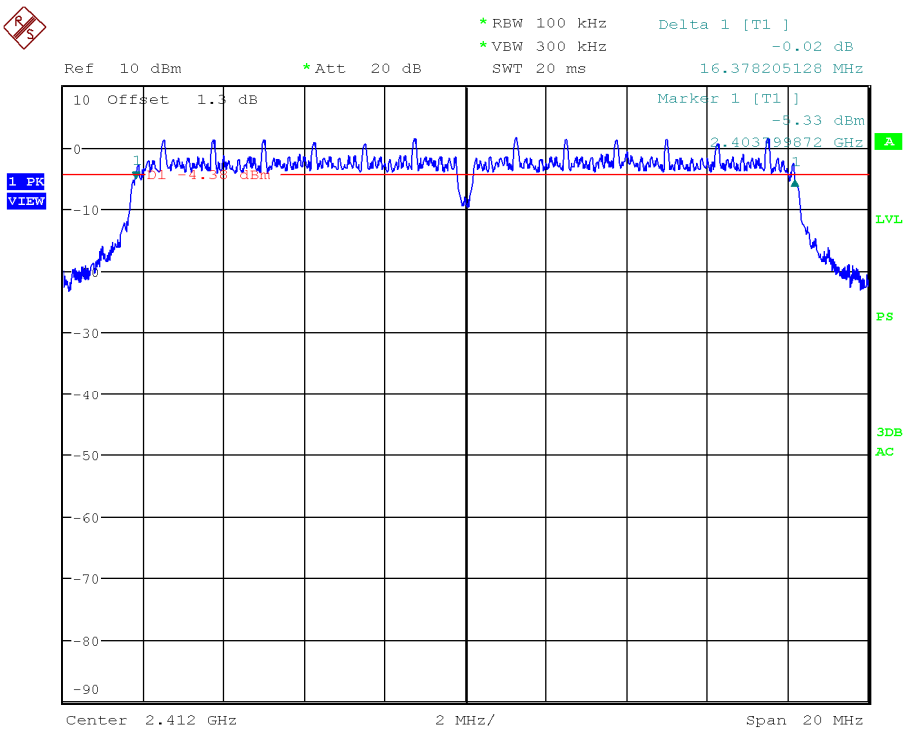


Highest Channel: 2462 MHz. Chain B.

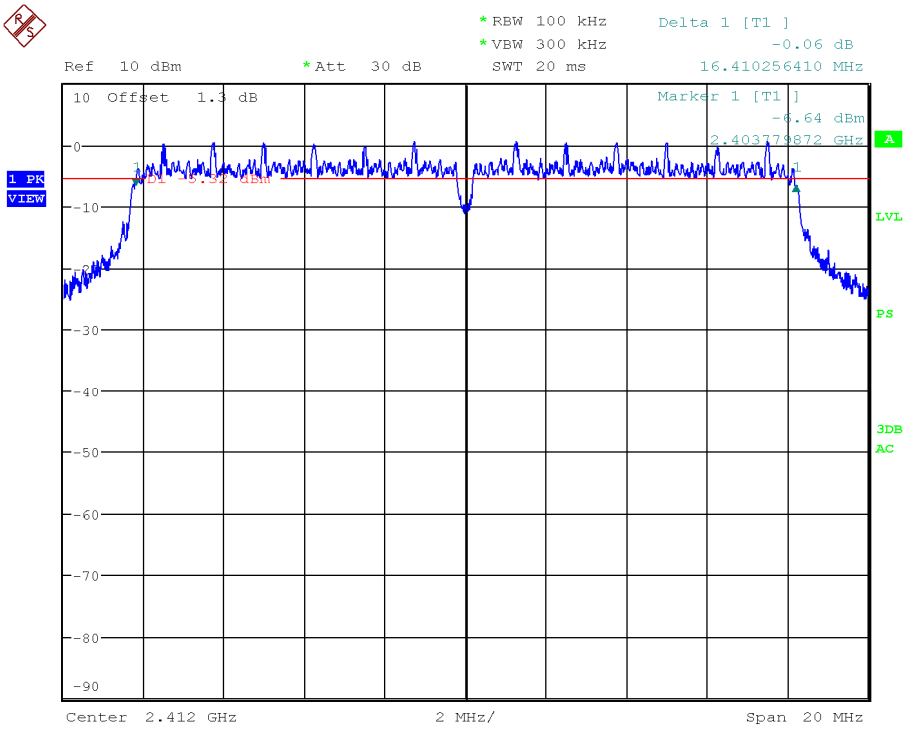


2. WiFi 2.4GHz 802.11 g mode

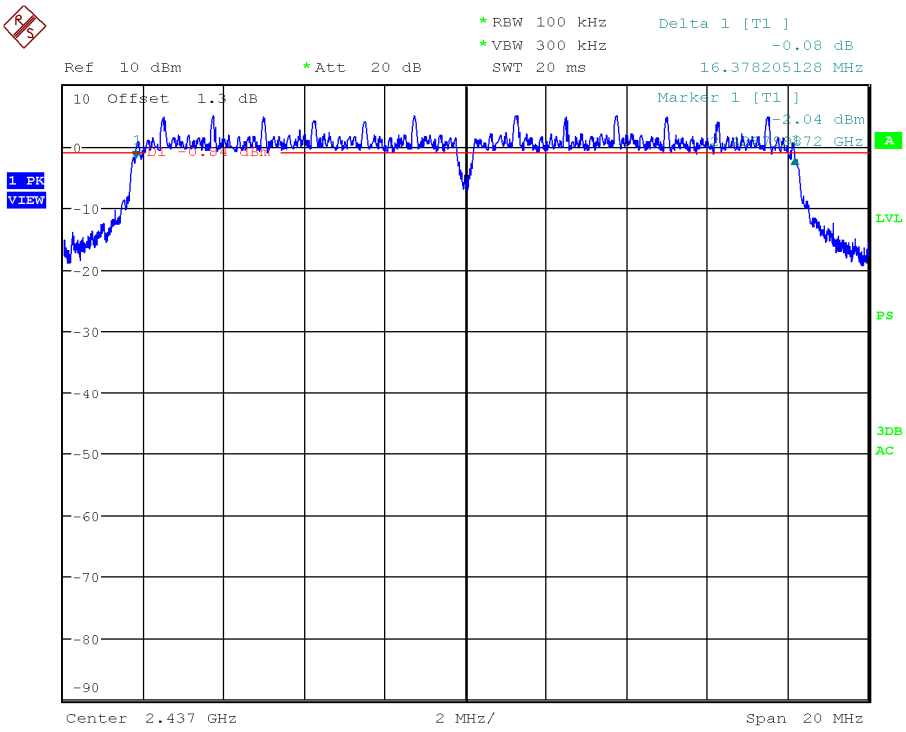
Lowest Channel: 2412 MHz. Chain A



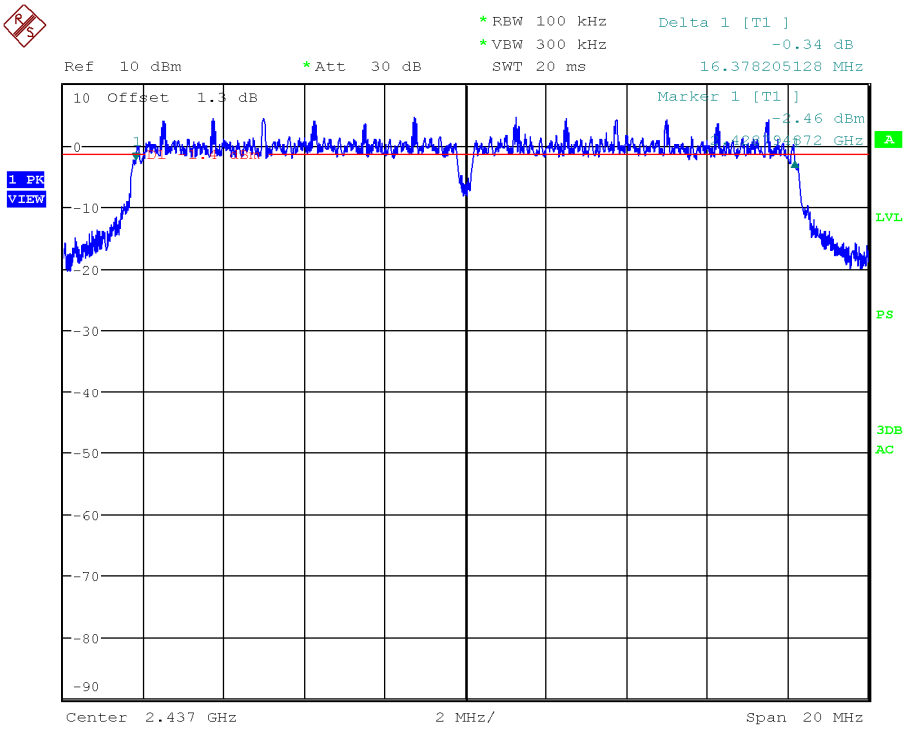
Lowest Channel: 2412 MHz. Chain B



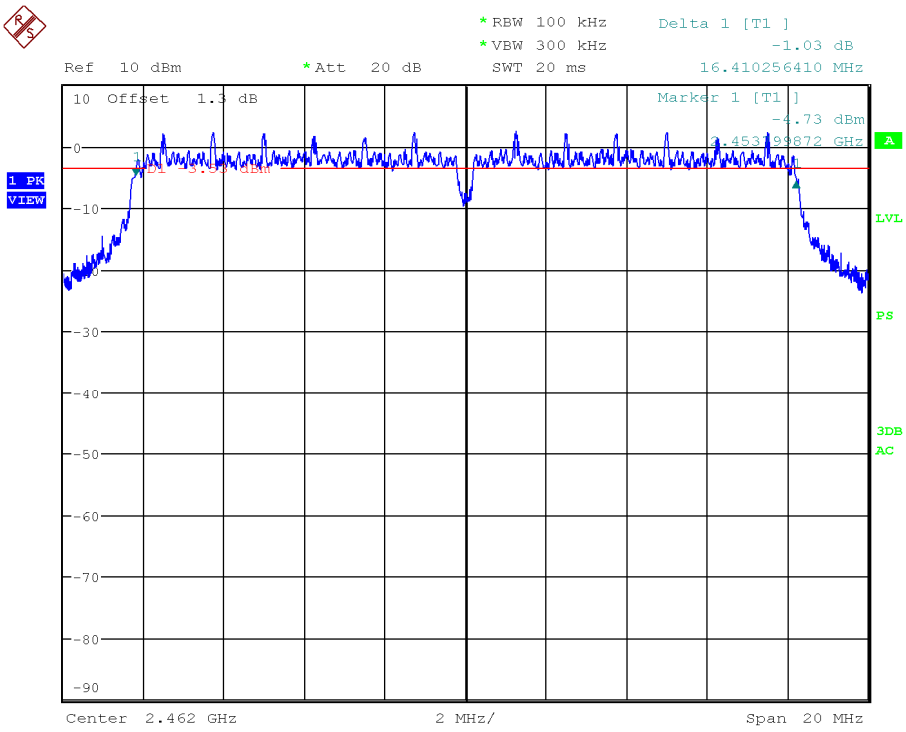
Middle Channel: 2437 MHz. Chain A



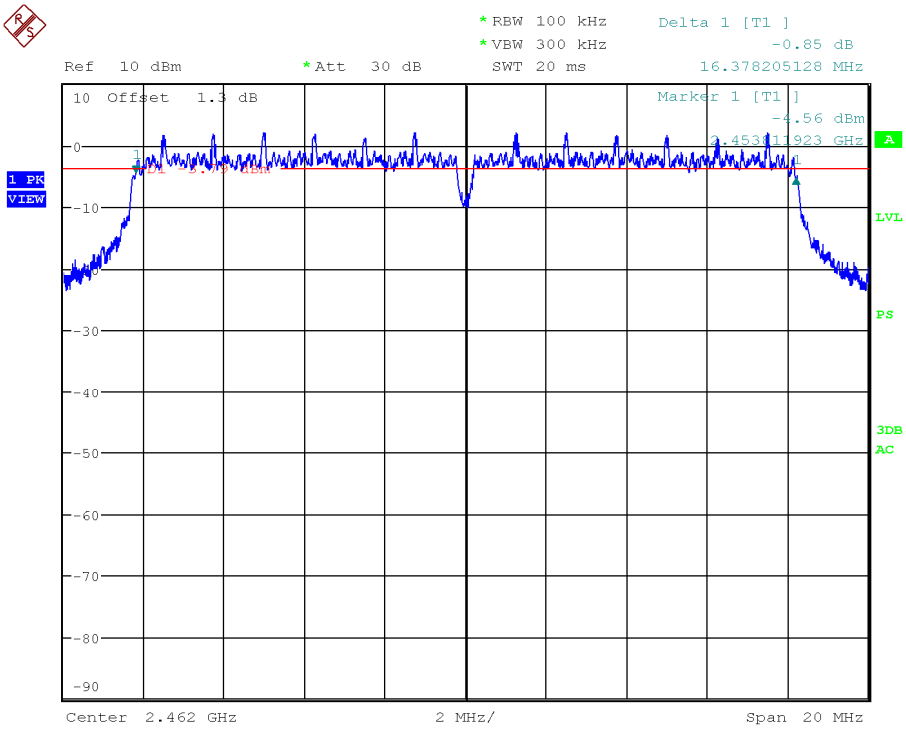
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A

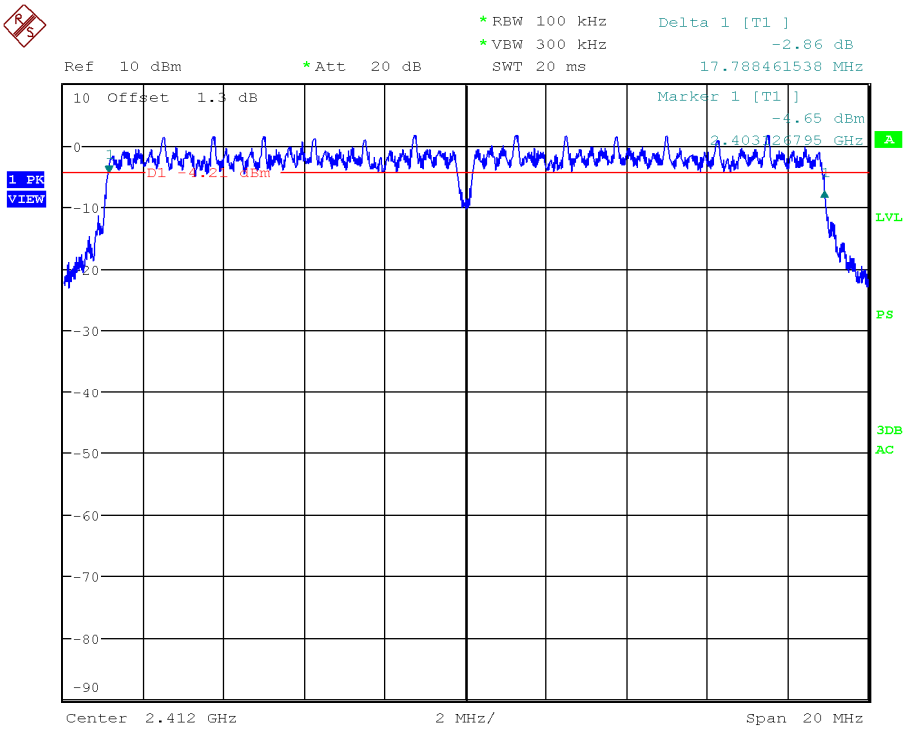


Highest Channel: 2462 MHz. Chain B

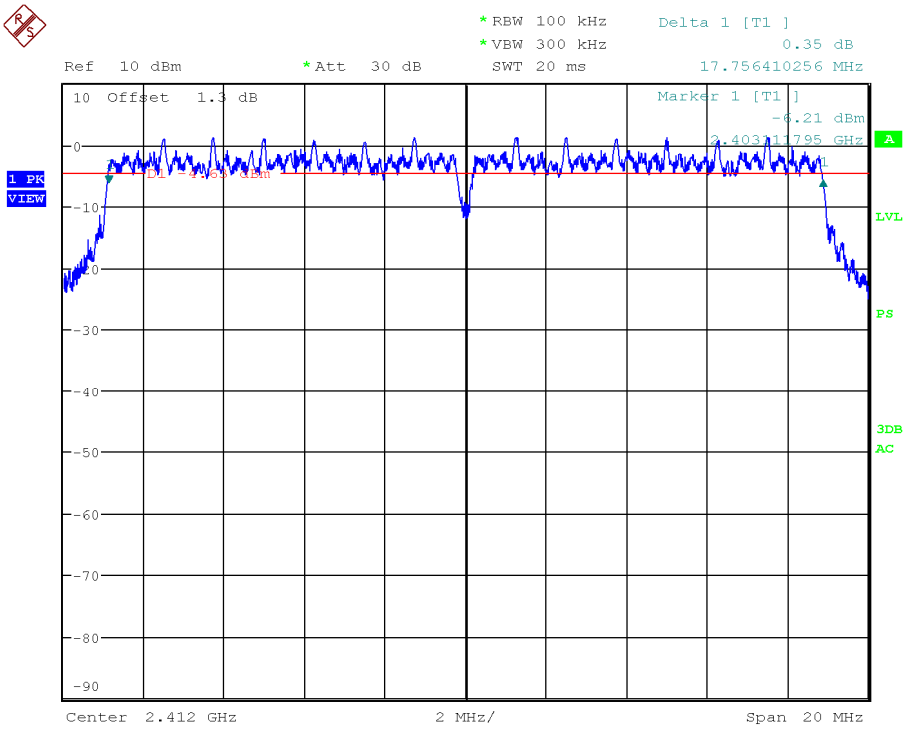


3. WiFi 2.4GHz 802.11 n20 mode

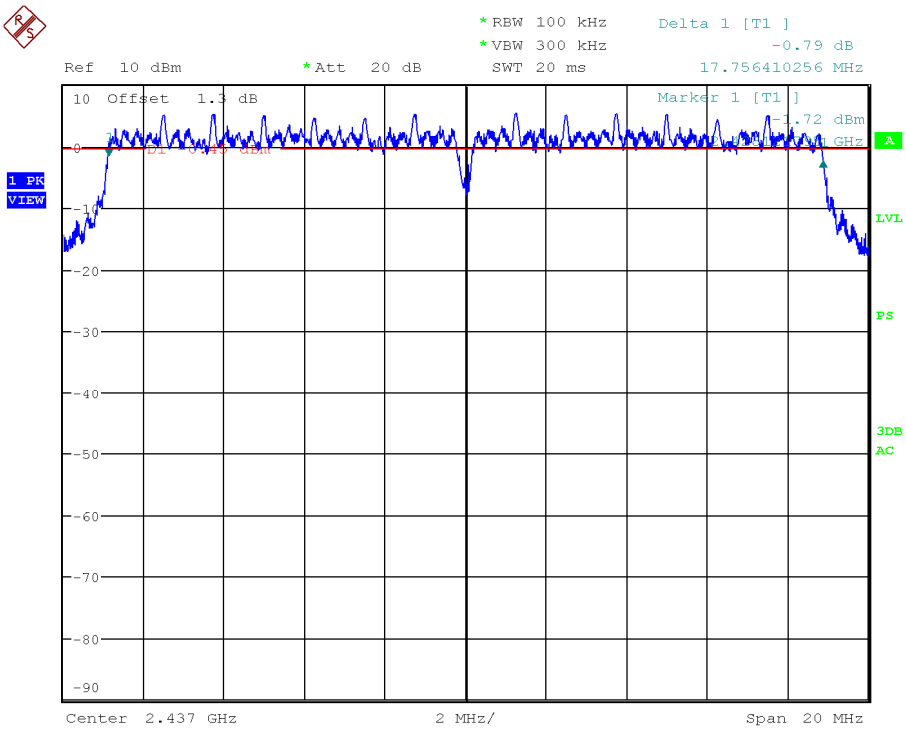
Lowest Channel: 2412 MHz. Chain A



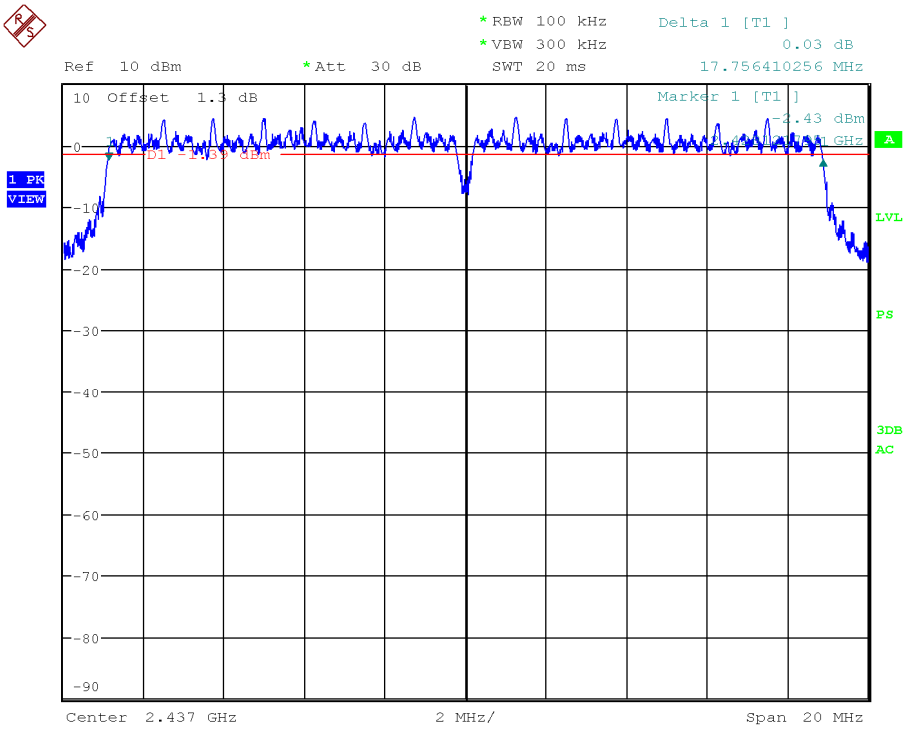
Lowest Channel: 2412 MHz. Chain B



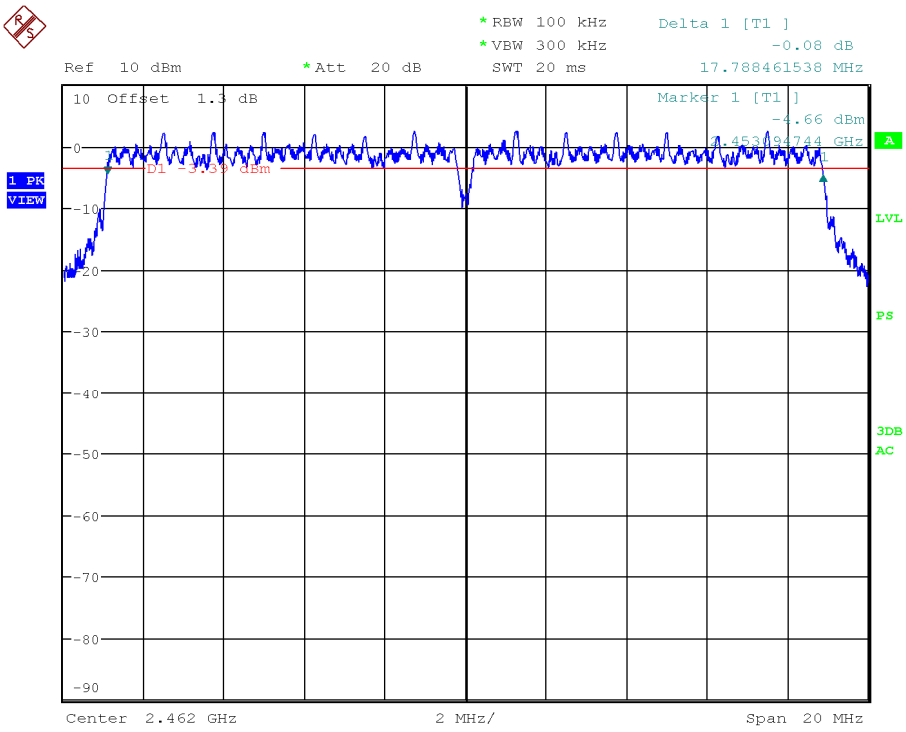
Middle Channel: 2437 MHz. Chain A



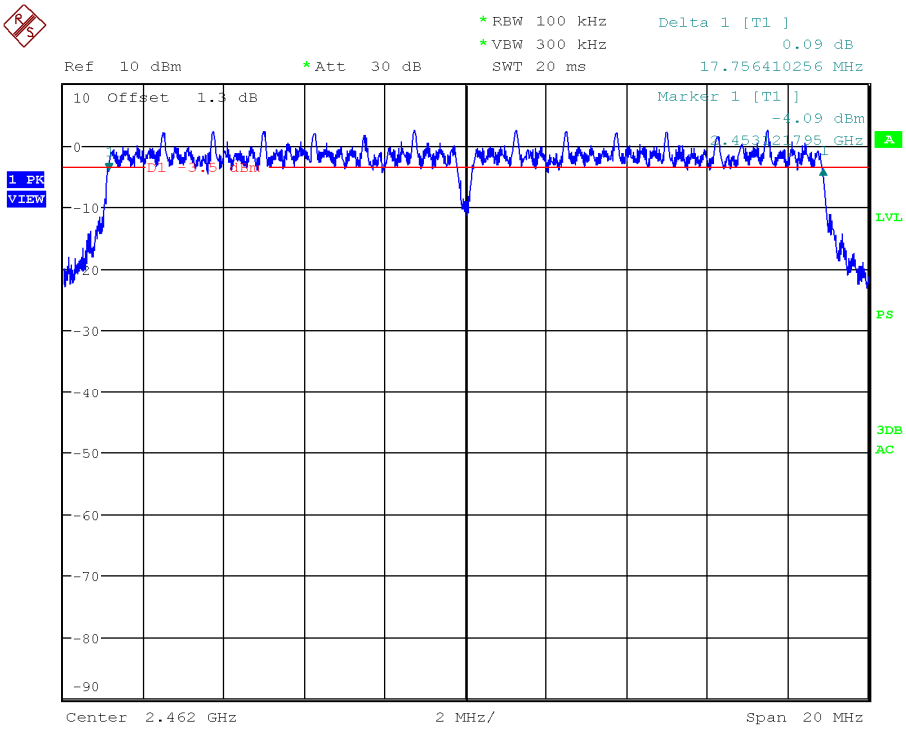
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A

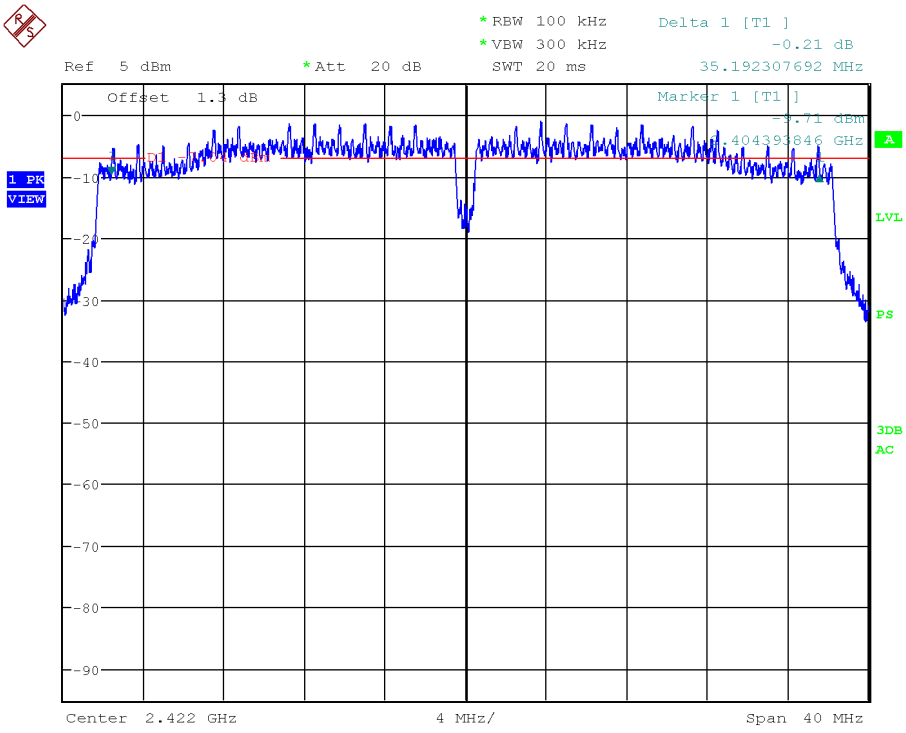


Highest Channel: 2462 MHz. Chain B

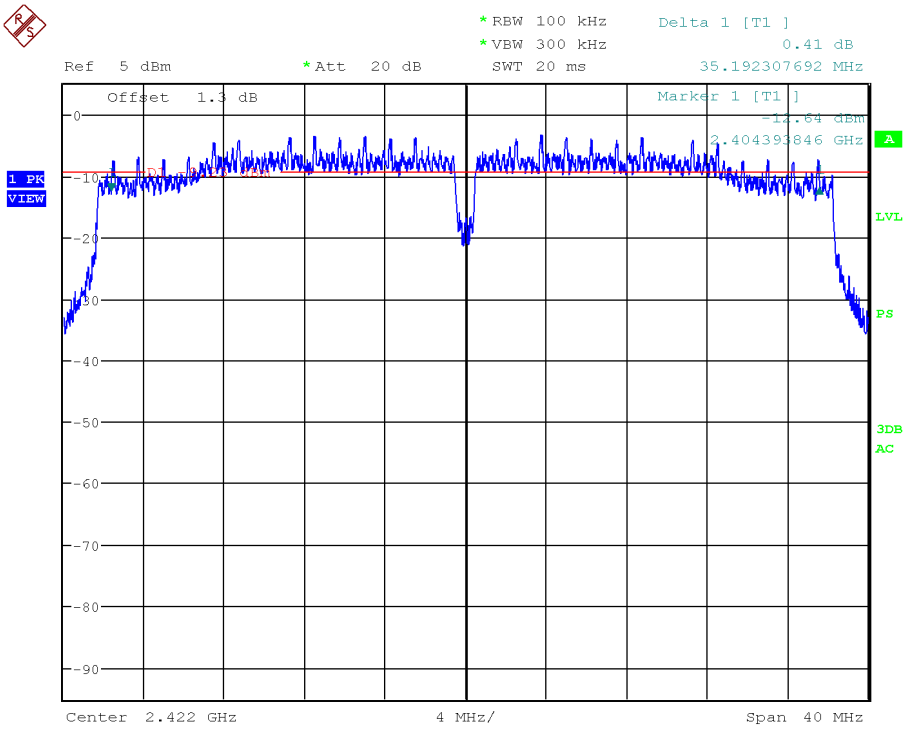


4. WiFi 2.4GHz 802.11 n40 mode

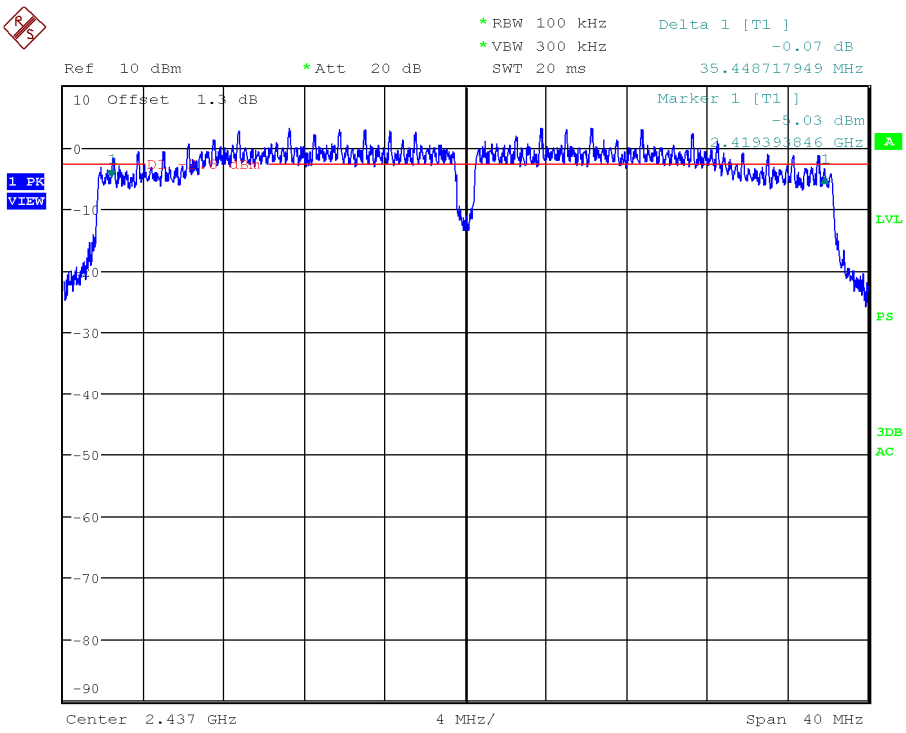
Lowest Channel: 2422 MHz. Chain A



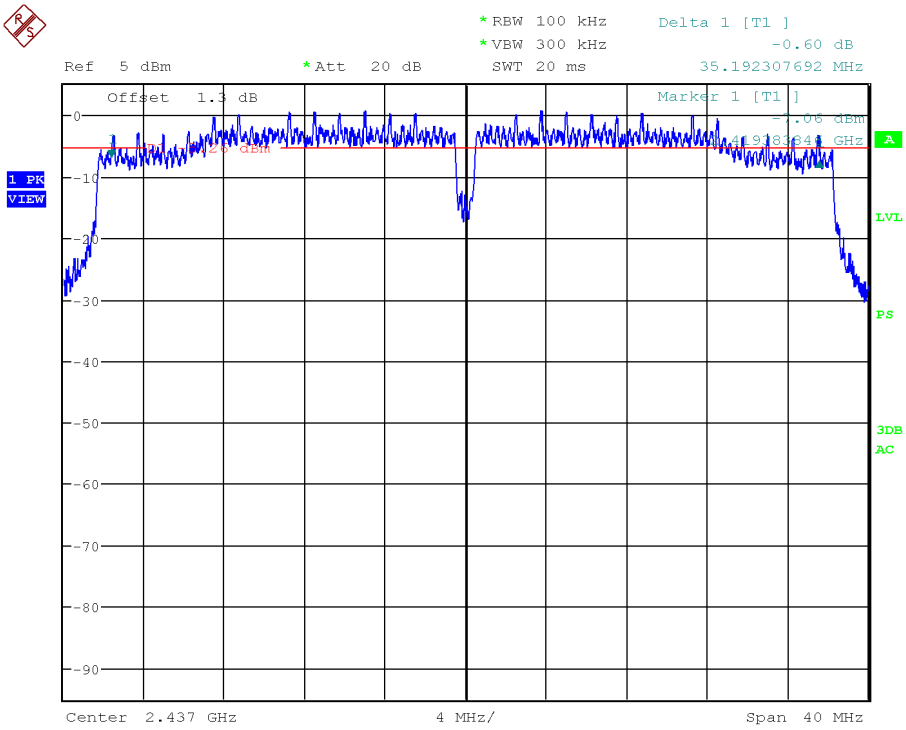
Lowest Channel: 2422 MHz. Chain B



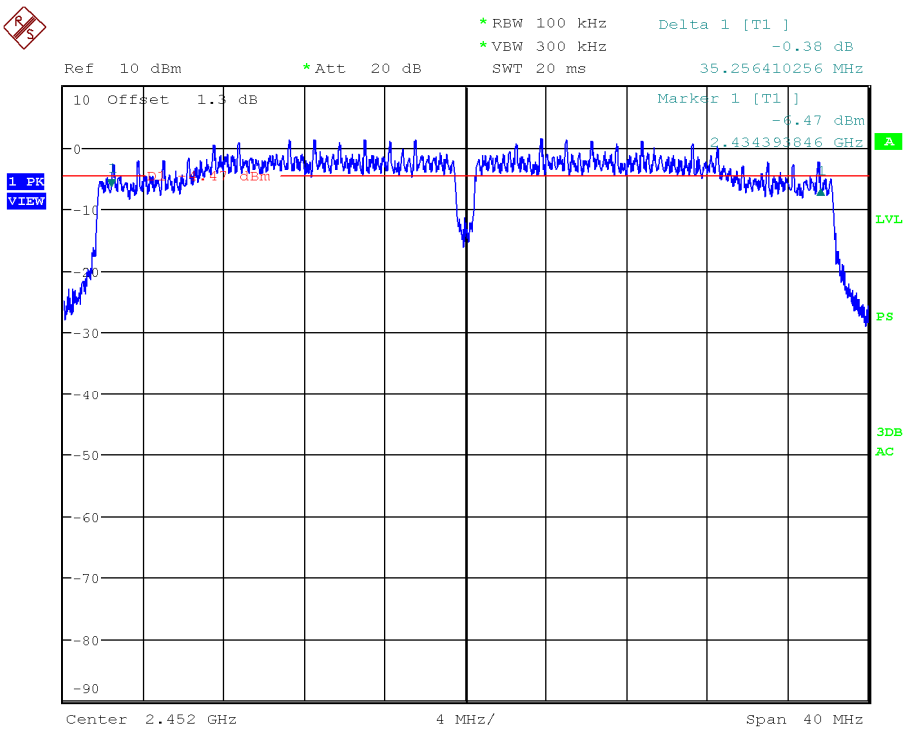
Middle Channel: 2437 MHz. Chain A



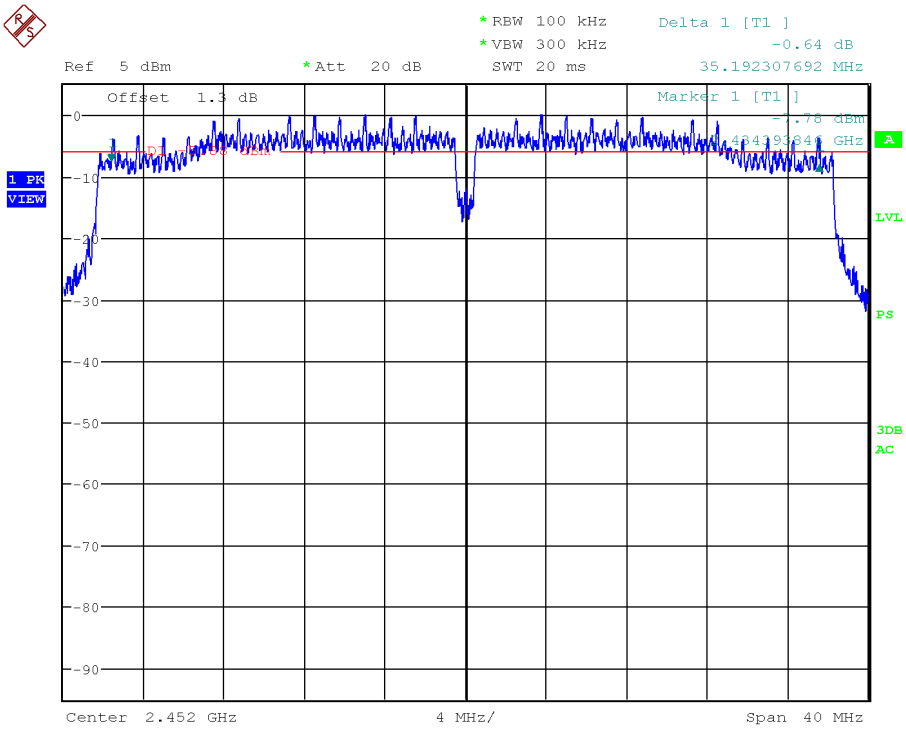
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2452 MHz. Chain A



Highest Channel: 2452 MHz. Chain B



Section 15.247 Subclause (b) / RSS-210 A8.4. (4). Maximum output power and antenna gain

SPECIFICATION

The maximum peak conducted output power of the intentional radiator shall not exceed 1 watt (30 dBm). The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS

The maximum Peak Conducted Output Power was measured using the channel integration method according to point 9.1.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11g mode.

The maximum conducted (average) output power was measured using the method according to point 9.2.1.1. Option a) of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11a, 802.11n20 and 802.11n40 modes.

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

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.
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 5/28/2013 was used.
The number of transmit antennas (N_{ANT}) are 2 and the number of spatial streams (Nss) are 2 and therefore the Array Gain is 0 dB.

1. WiFi 2.4GHz 802.11 b mode

MAXIMUM OUTPUT POWER. Conducted (average) output power (See next plot of worst case: Highest power levels).

Maximum declared antenna gain: 3.24 dBi.

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	15.26	14.62	15.15	14.56	15.27	14.79
Maximum EIRP power (dBm)	18.50	17.86	18.49	17.80	18.51	18.03
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

MAXIMUM OUTPUT POWER. Peak Conducted Output Power (See next plot of worst case: Highest power level).

Maximum declared antenna gain: 3.24 dBi.

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	15.84	14.66	19.13	18.74	16.80	16.25
Maximum EIRP power (dBm)	19.08	17.90	22.37	21.98	20.04	19.49
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

3. WiFi 2.4GHz 802.11 n20 mode

MAXIMUM OUTPUT POWER. Conducted (average) output power (See next plot of worst case: Highest power level).

Maximum declared antenna gain: 3.24 dBi.

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	13.52	12.71	16.73	15.75	14.13	14.01
Maximum EIRP power (dBm)	16.76	15.95	19.97	18.99	17.37	17.25
Measurement uncertainty (dB)	±1.5					

MIMO	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Maximum conducted power (dBm)	12.65	12.09	13.51	13.37	13.29	12.83
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	15.39		16.45		15.84	
Maximum EIRP power (dBm)	18.63		19.69		19.08	
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

4. WiFi 2.4GHz 802.11 n40 mode

MAXIMUM OUTPUT POWER. Conducted (average) output power (See next plot of worst case: Highest power level).
Maximum declared antenna gain: 3.24 dBi.

	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	12.33	10.38	16.49	14.19	14.65	13.35
Maximum EIRP power (dBm)	15.57	13.62	19.73	17.43	17.89	16.59
Measurement uncertainty (dB)	±1.5					

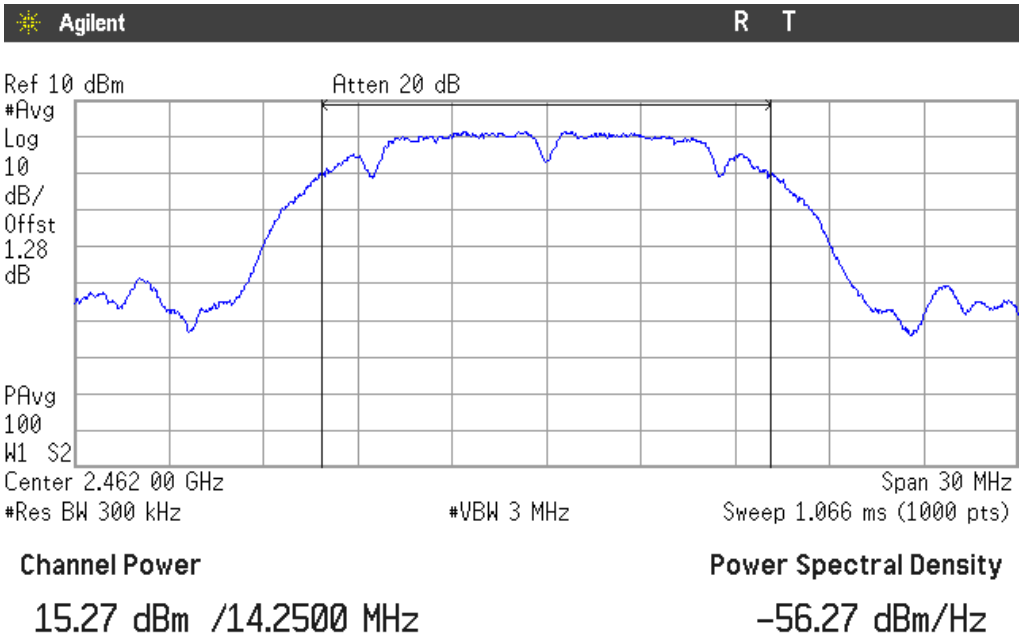
MIMO	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Maximum conducted power (dBm)	8.62	8.64	13.35	13.08	12.66	12.46
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	11.64		16.23		15.47	
Maximum EIRP power (dBm)	14.88		19.47		18.71	
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

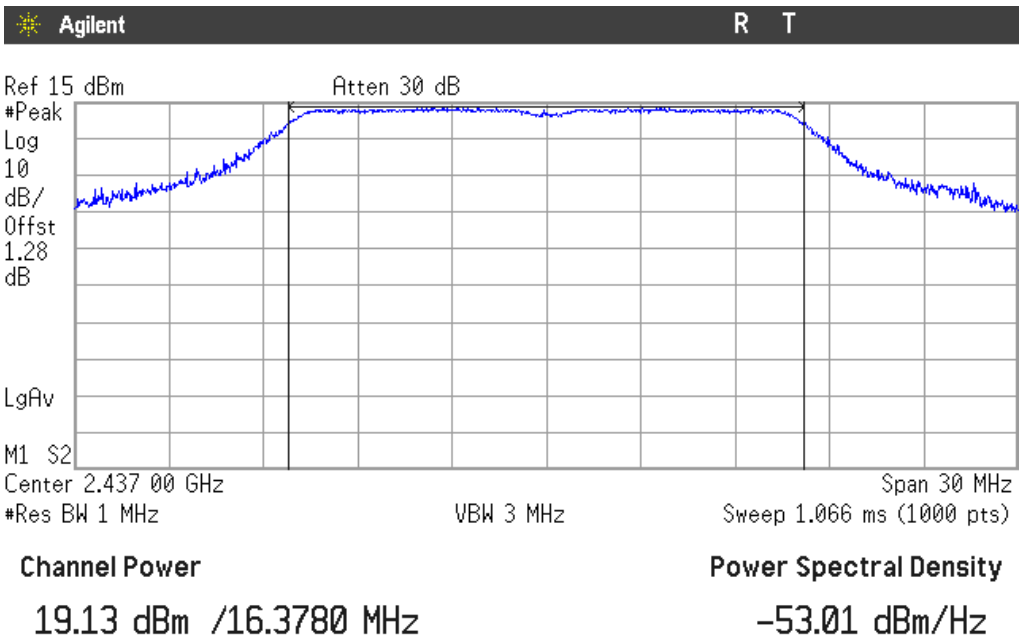
1. WiFi 2.4GHz 802.11 b mode

Highest frequency 2462 MHz. Chain A.



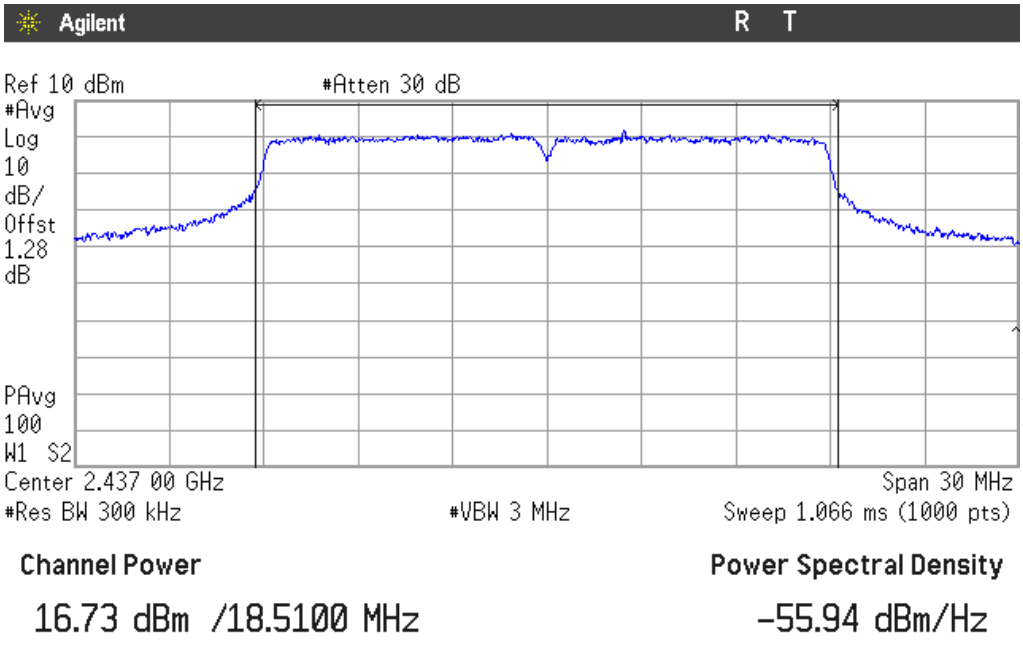
2. WiFi 2.4GHz 802.11 g mode

Middle frequency 2437 MHz. Chain A.

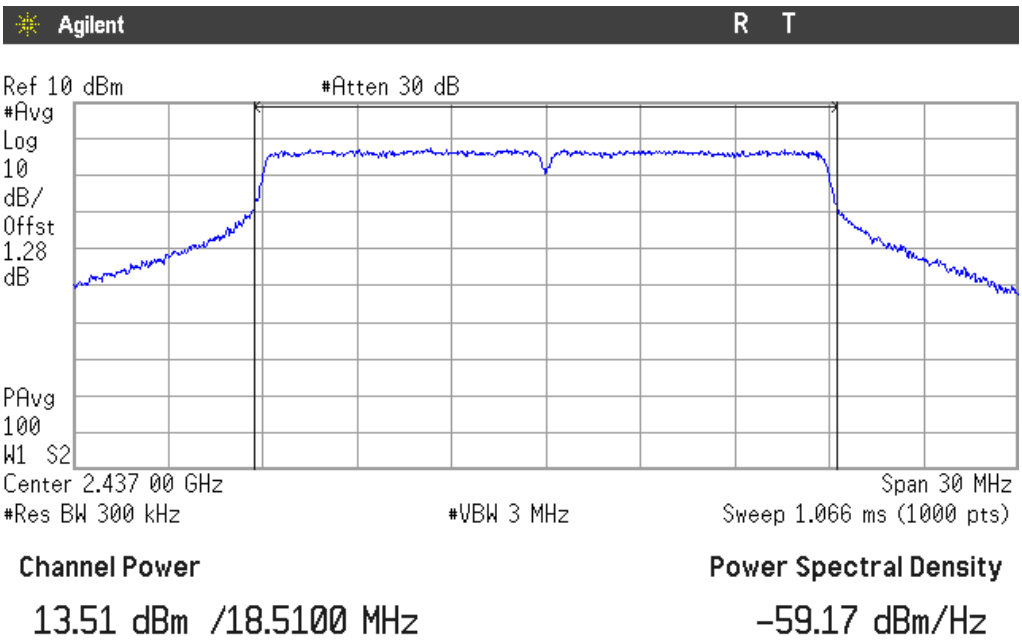


3. WiFi 2.4GHz 802.11 n20 mode

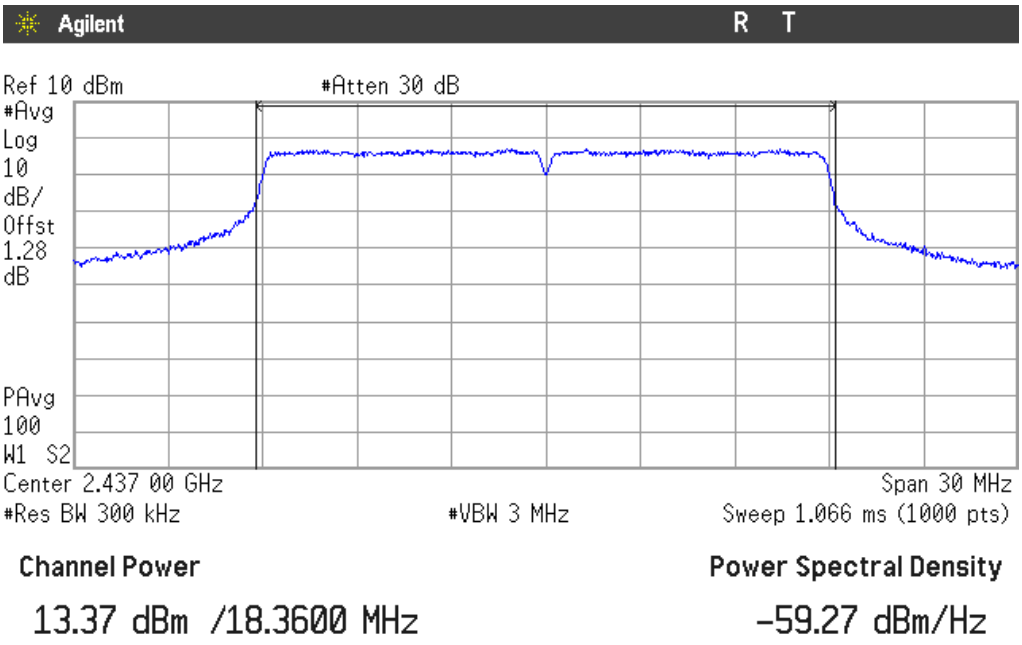
SISO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain A.

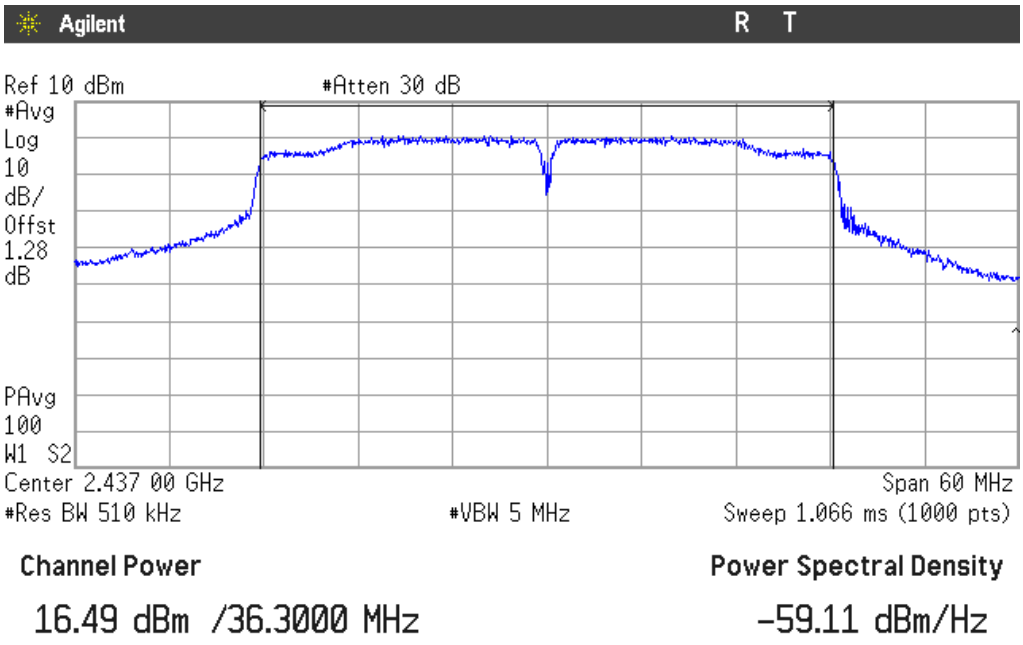


MIMO mode. Middle frequency 2437 MHz. Chain B.

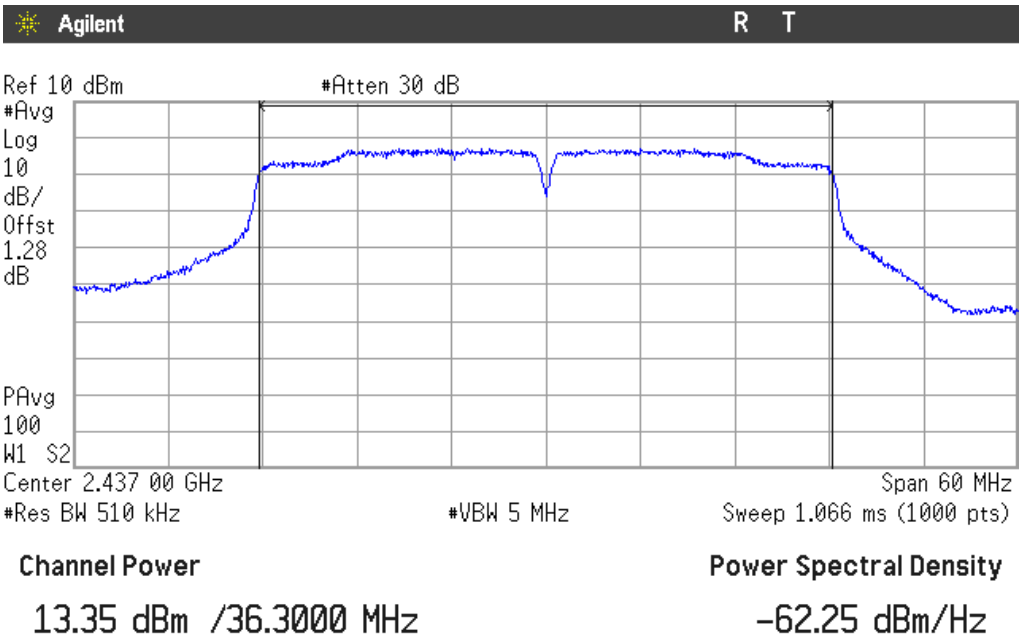


4. WiFi 2.4GHz 802.11 n40 mode

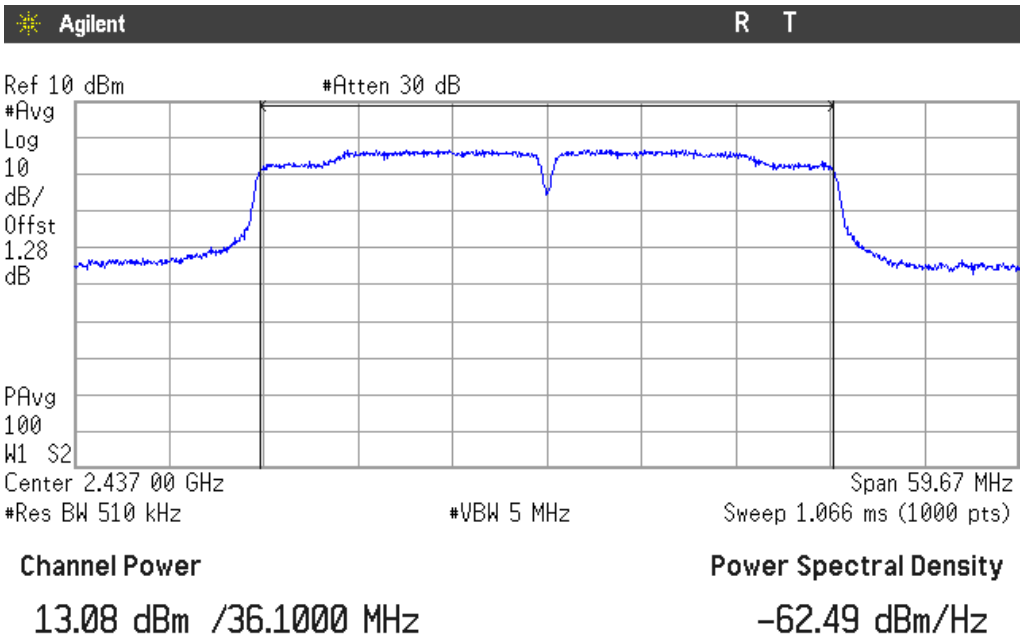
SISO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain B.



SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS: (See next plots)

1. WiFi 2.4GHz 802.11 b mode

Reference Level Measurement

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	5.58	5.56	5.33	4.58	5.16	4.97
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.42 /-24.44

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.67 / -25.42

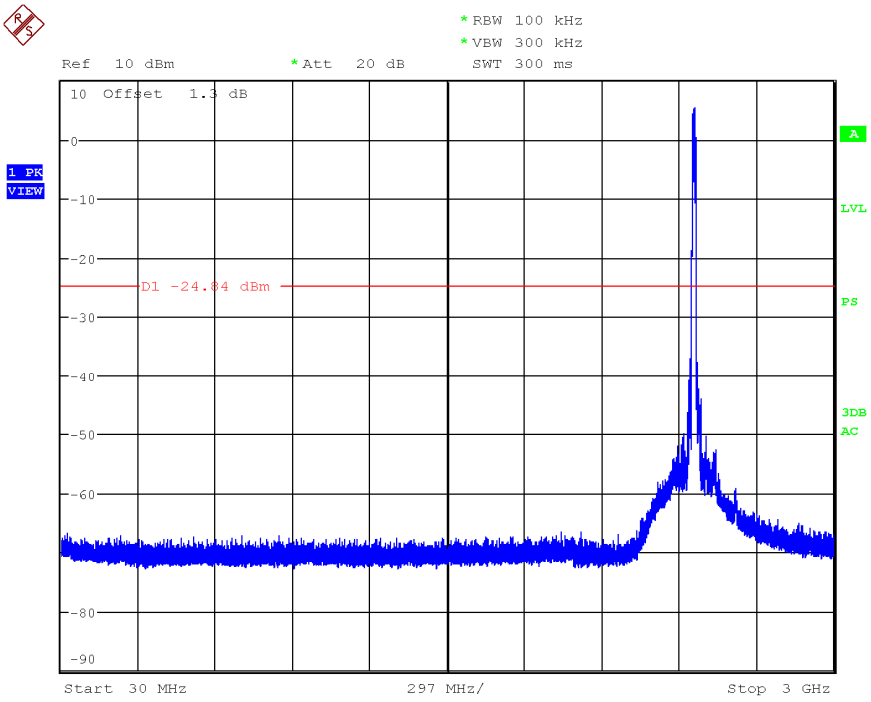
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.84 / -25.03

Verdict: PASS

See next plots of worst case: Mode b. Highest Channel: 2462 MHz. Chain A.

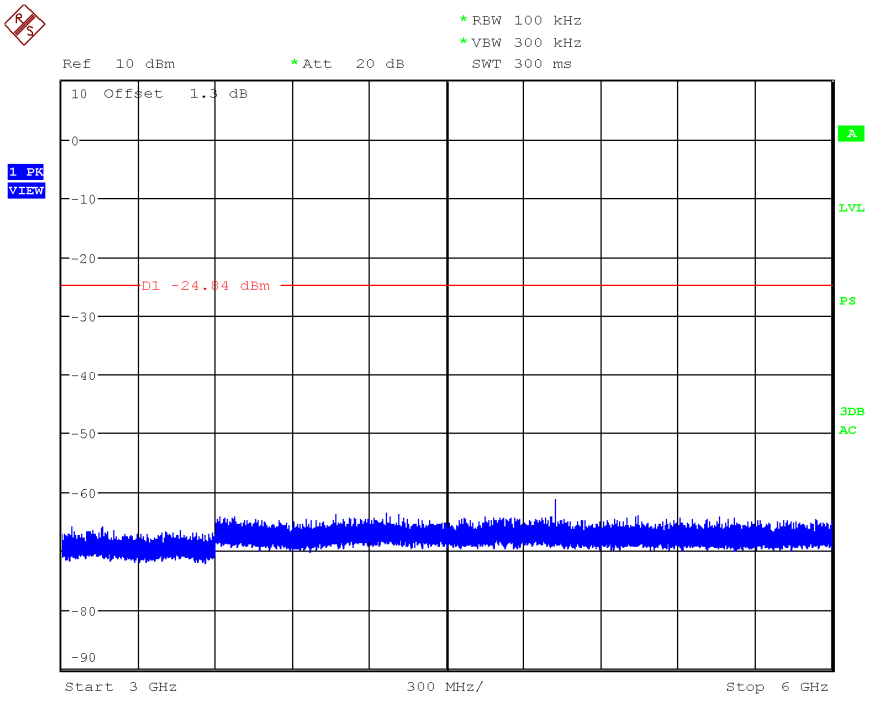
Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz:

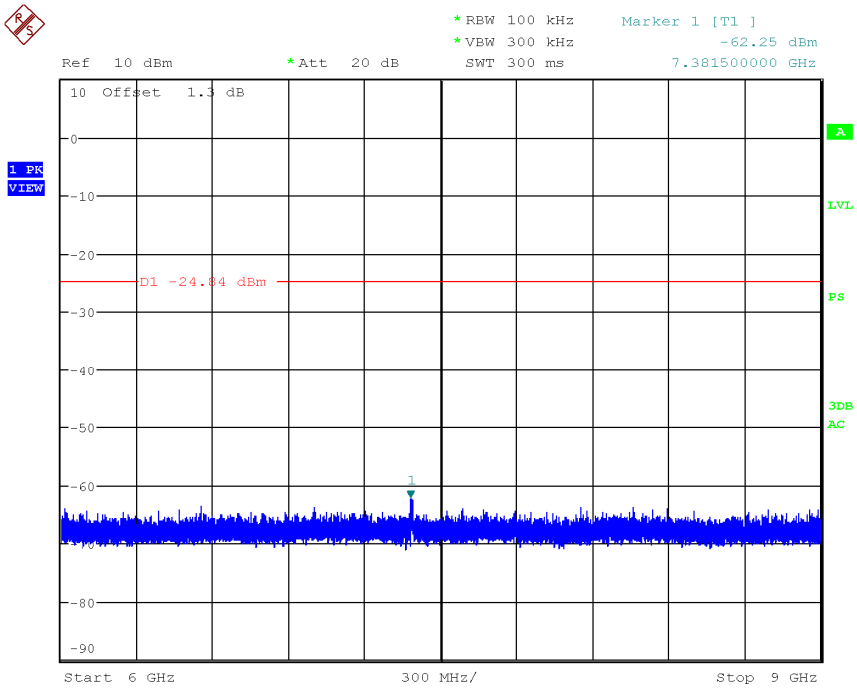


Note: The peak above the limit is the carrier frequency.

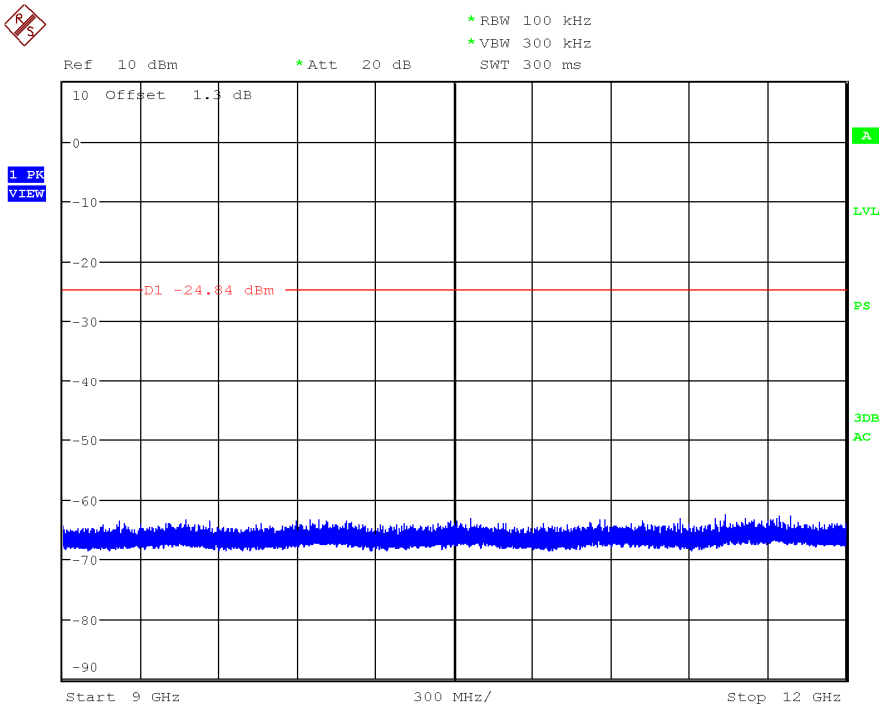
Plot 3 GHz to 6 GHz:



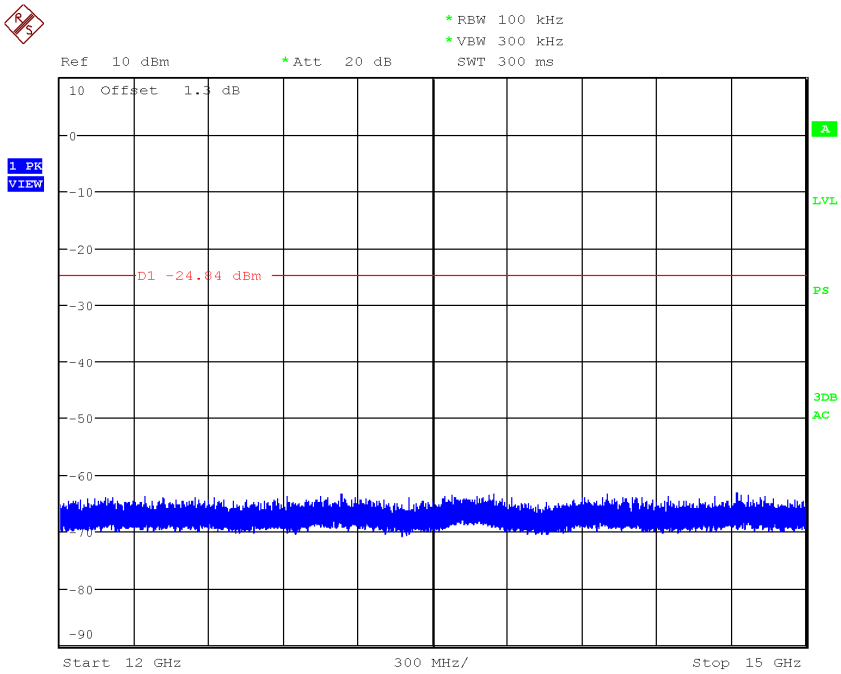
Plot 6 GHz to 9 GHz:



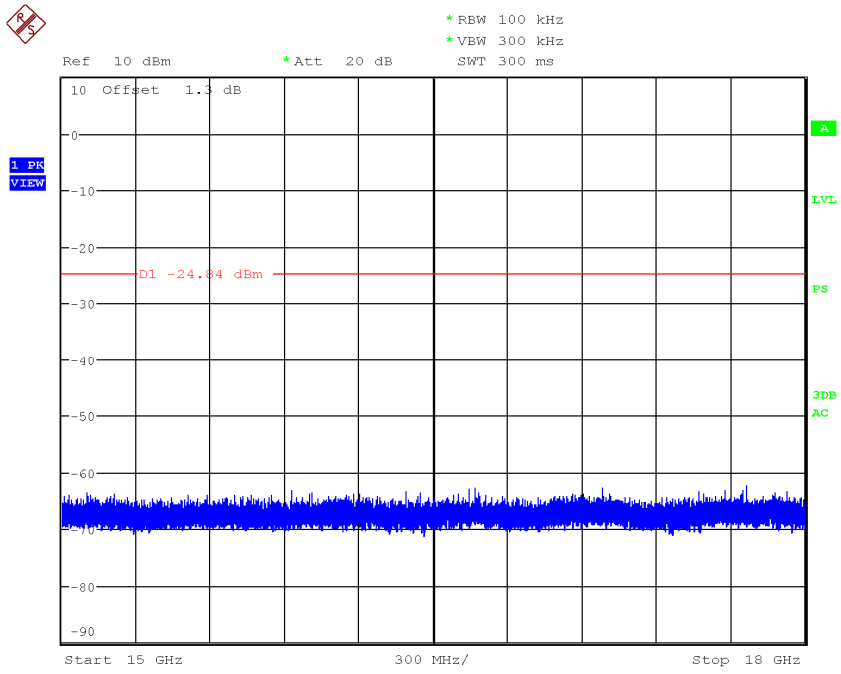
Plot 9 GHz to 12 GHz:



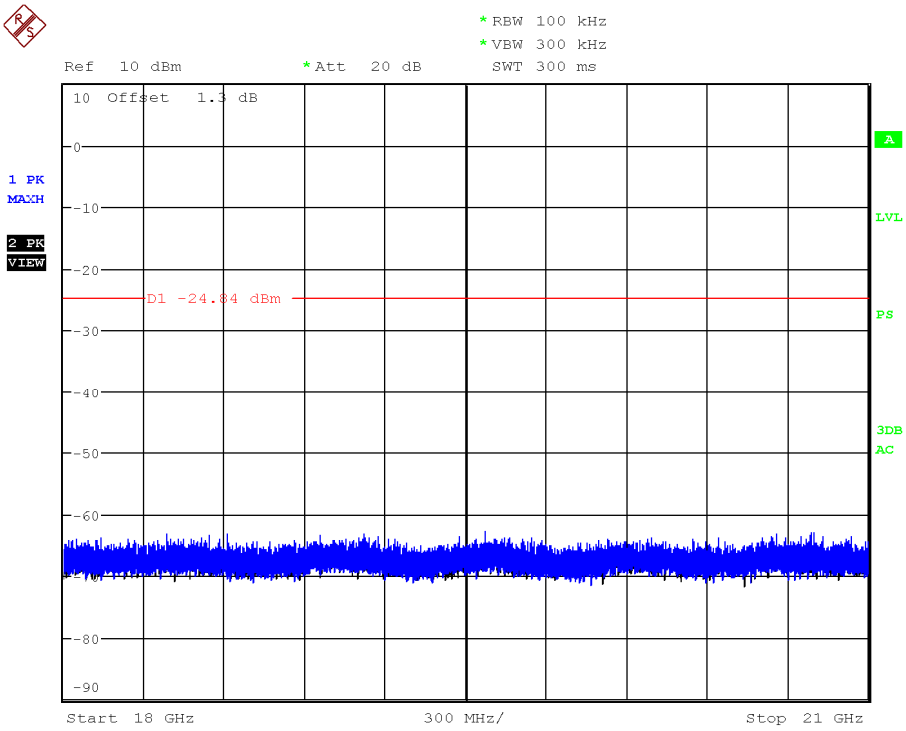
Plot 12 GHz to 15 GHz:



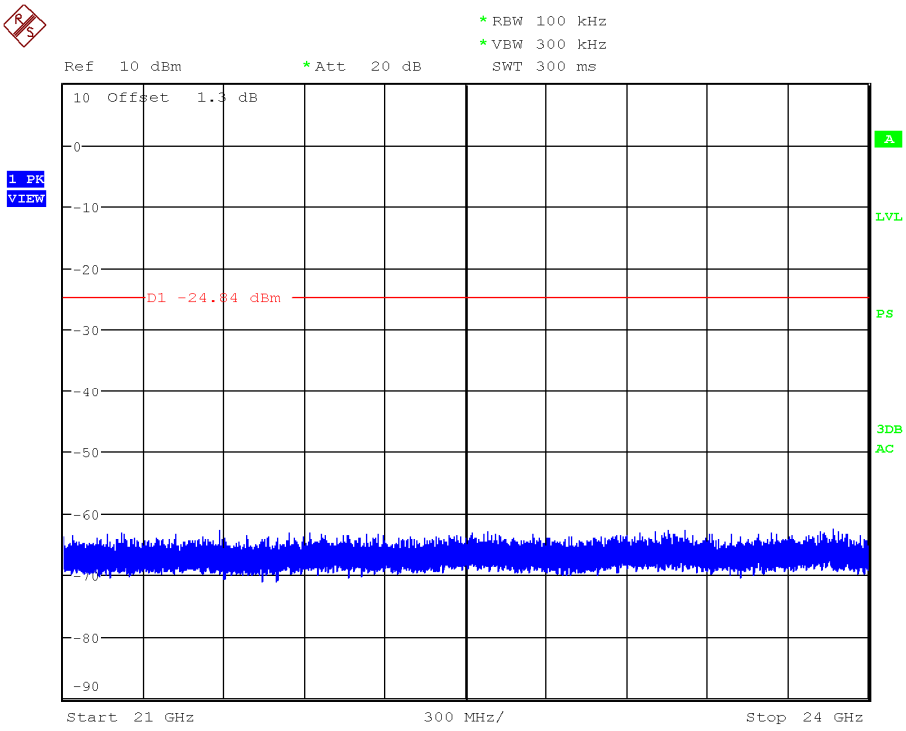
Plot 15 GHz to 18 GHz:



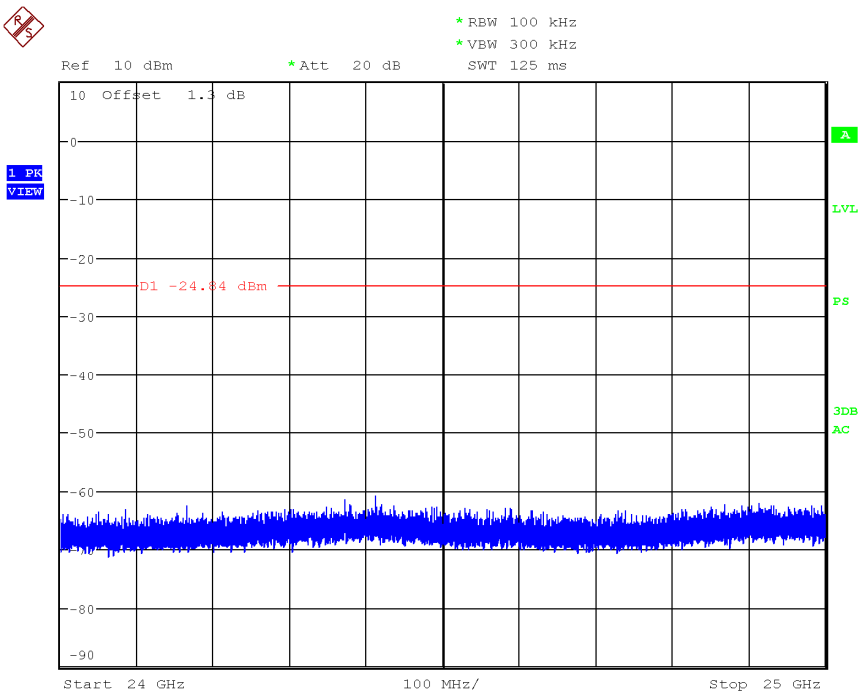
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24GHz to 25 GHz:



2. WiFi 2.4GHz 802.11 g mode

Reference Level Measurement

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	2.76	1.54	5.13	4.87	2.40	2.04
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-17.24 / -18.46

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-14.87 / -15.13

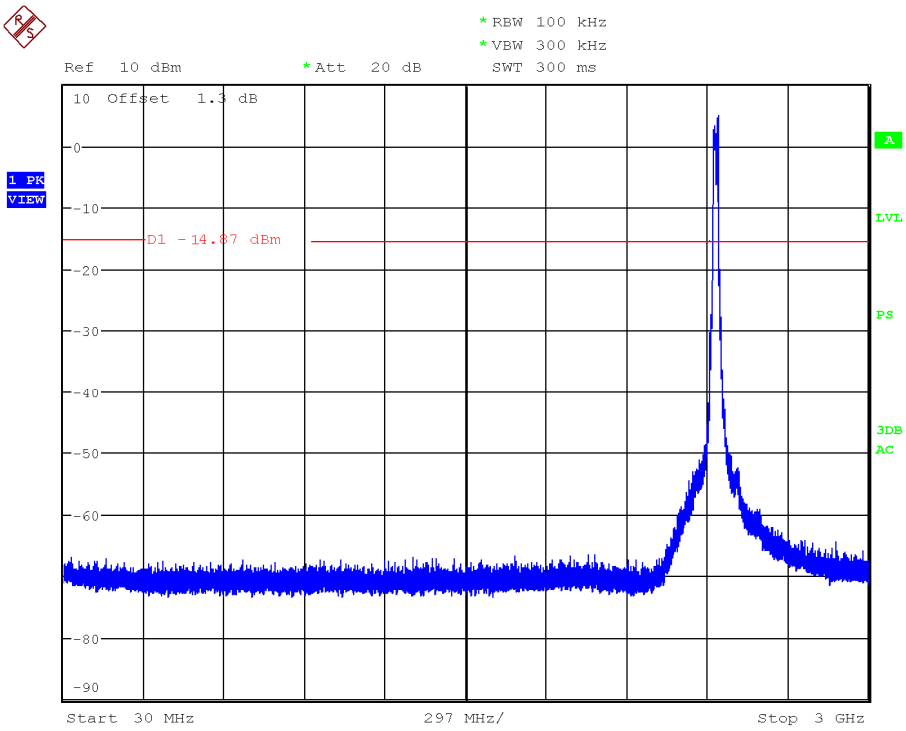
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-17.60 / -17.96

Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

See next plots of worst case: Mode g. Middle Channel: 2437 MHz. Chain A.

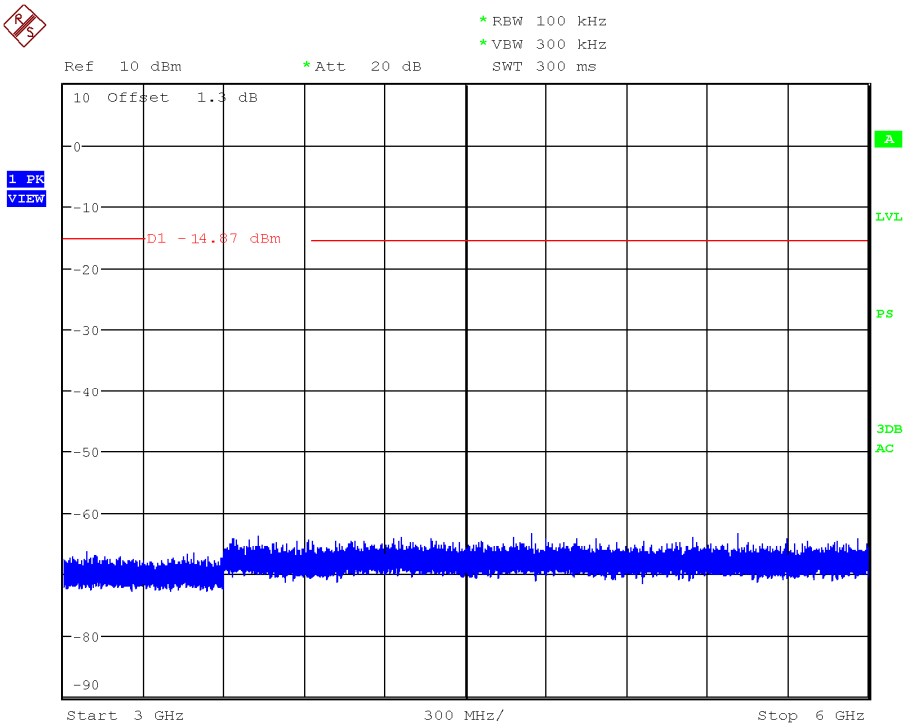
Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz:

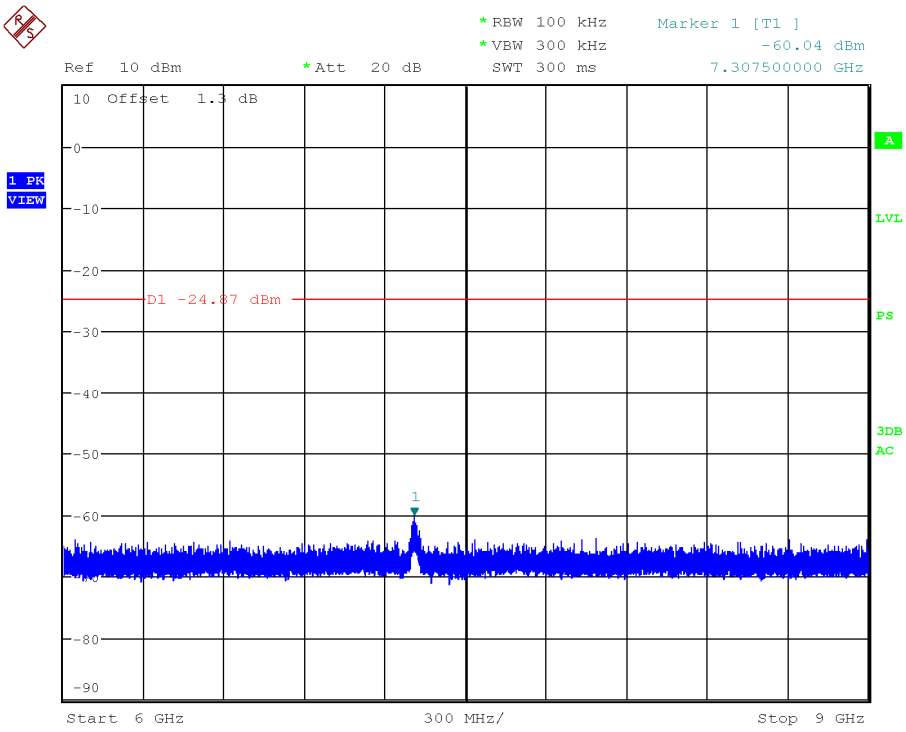


Note: The peak above the limit is the carrier frequency.

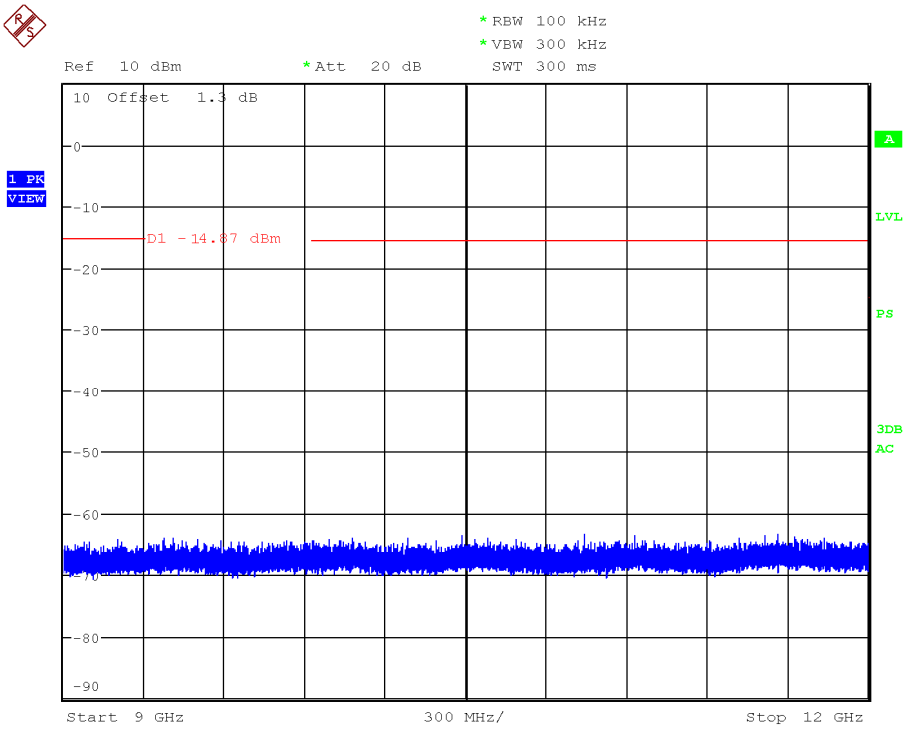
Plot 3 GHz to 6 GHz:



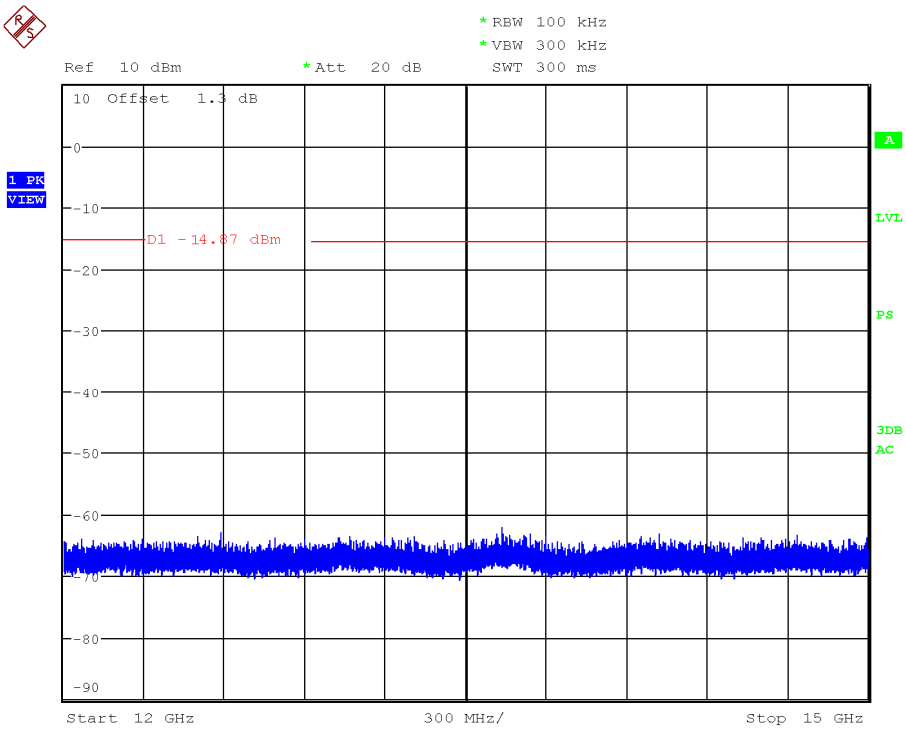
Plot 6 GHz to 9 GHz:



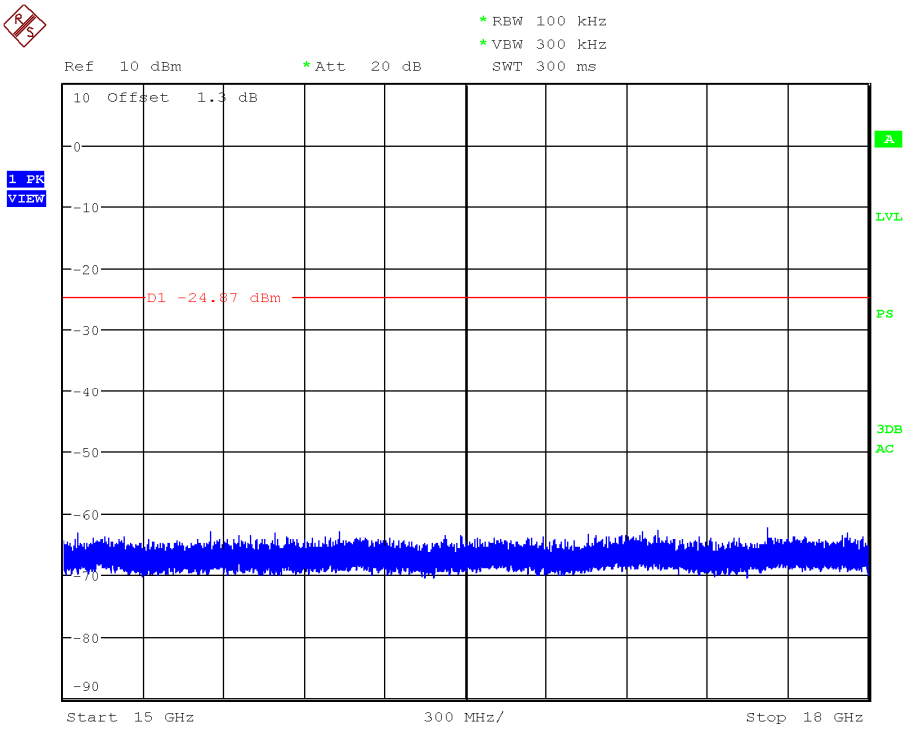
Plot 9 GHz to 12 GHz:



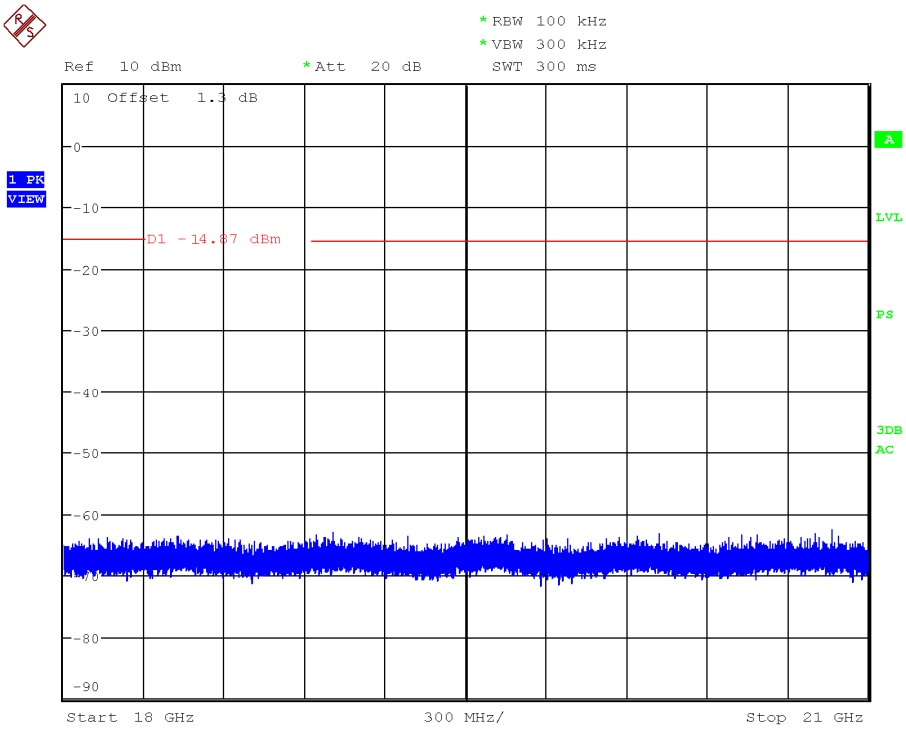
Plot 12 GHz to 15 GHz:



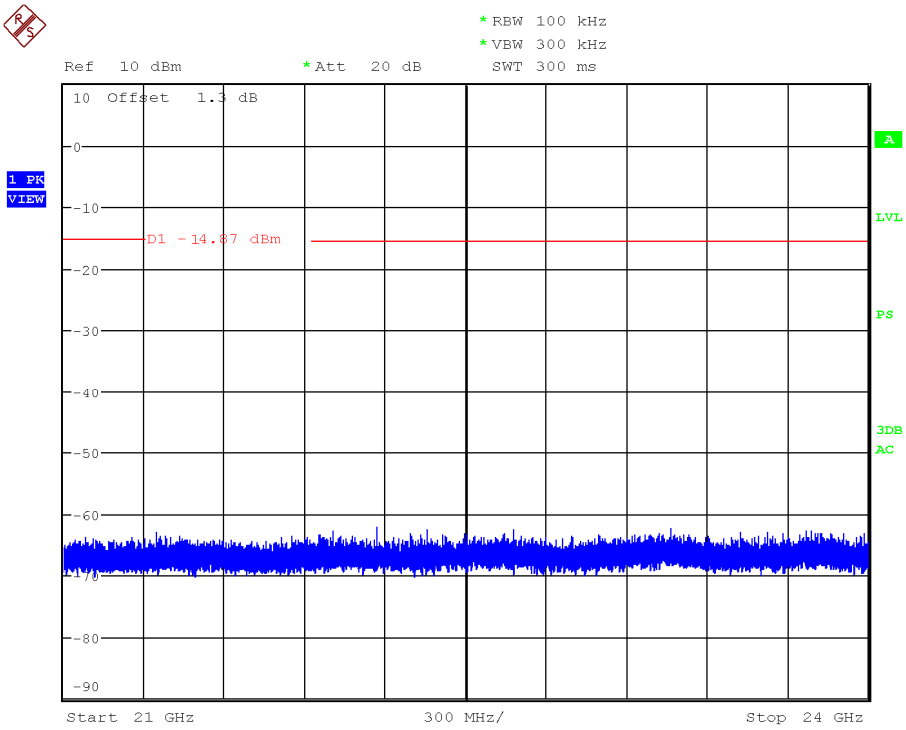
Plot 15 GHz to 18 GHz:



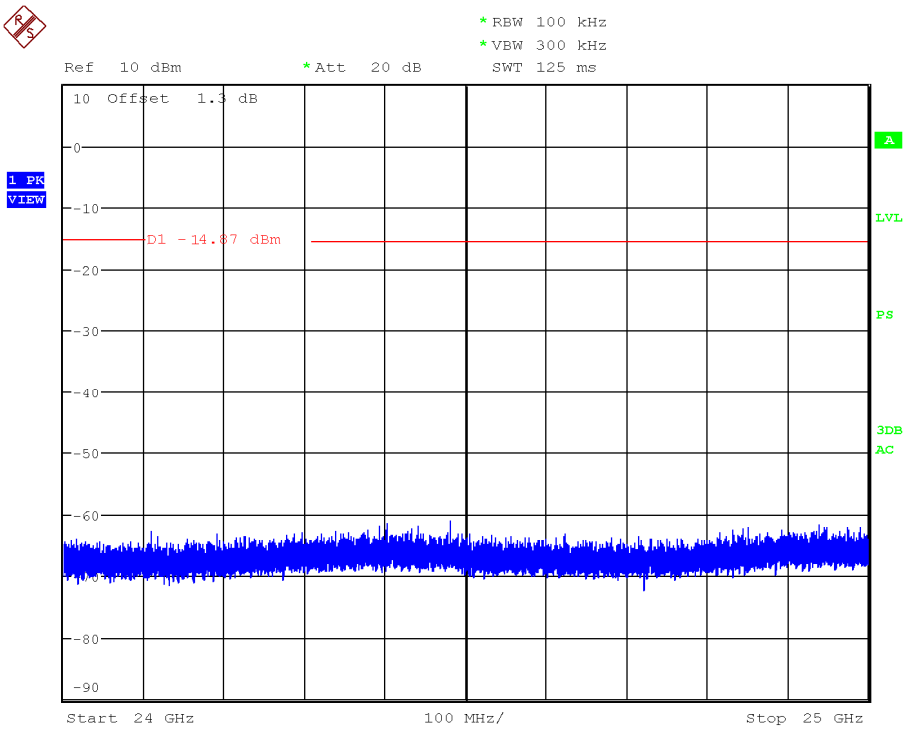
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24GHz to 25 GHz:



3. WiFi 2.4GHz 802.11 n20 mode

Reference Level Measurement

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	2.60	1.63	5.77	4.91	2.85	2.89
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-27.4 / -28.37

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.23 / -25.09

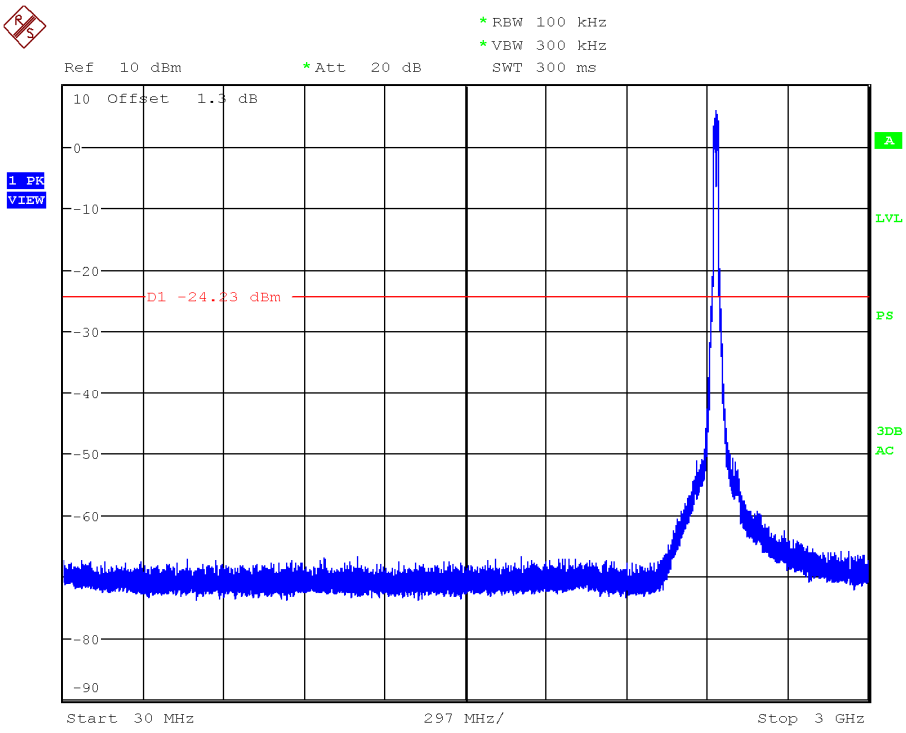
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-27.15 / -27.11

Verdict: PASS

See next plots of worst case: Mode n20. Middle Channel: 2437 MHz. Chain A.

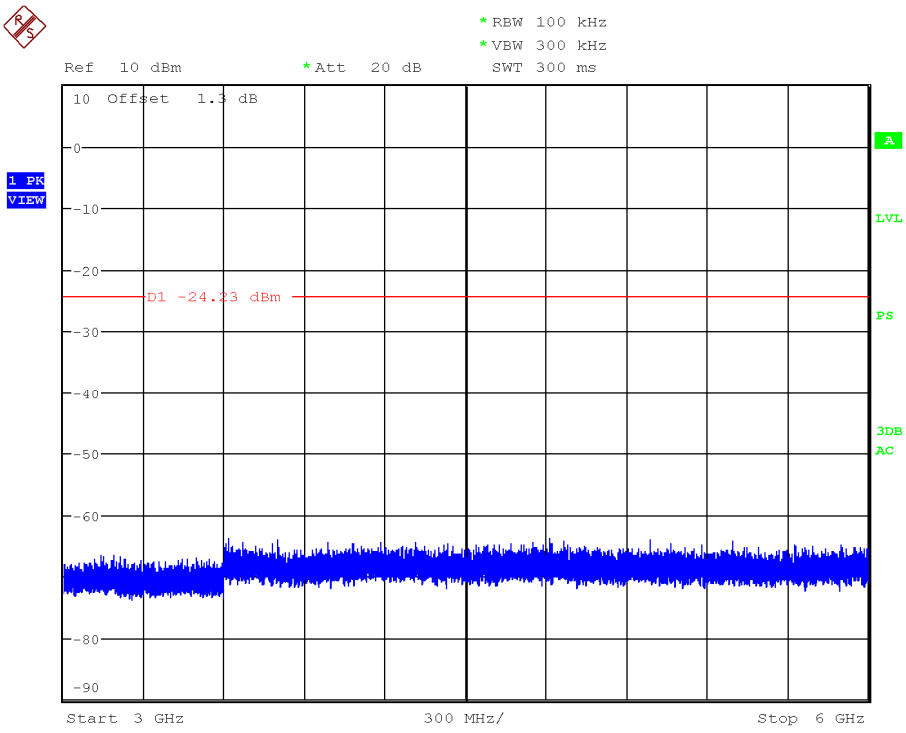
Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz:

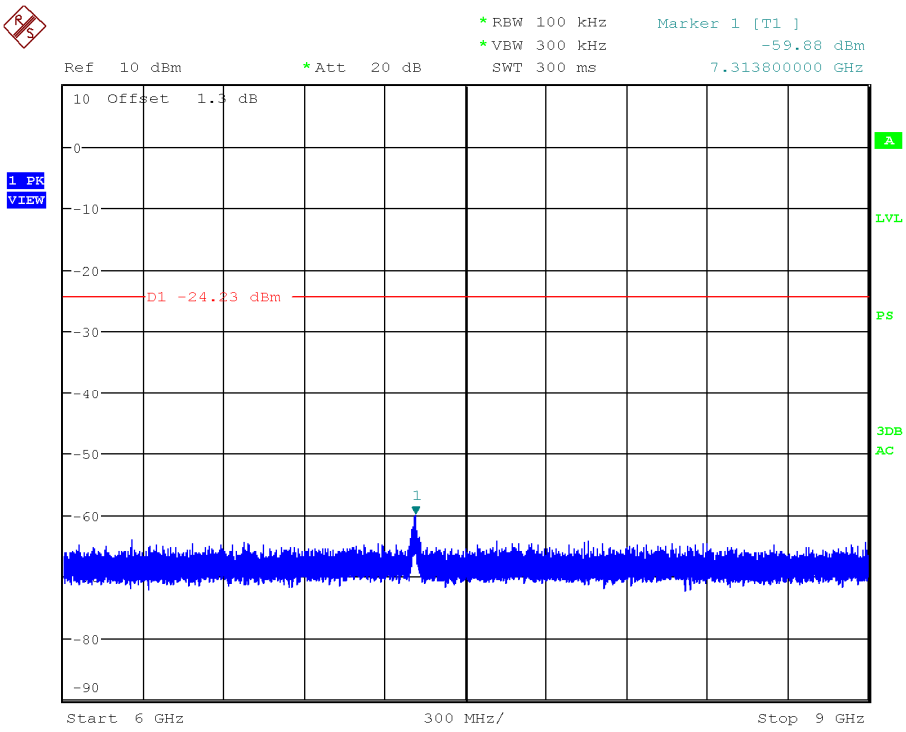


Note: The peak above the limit is the carrier frequency.

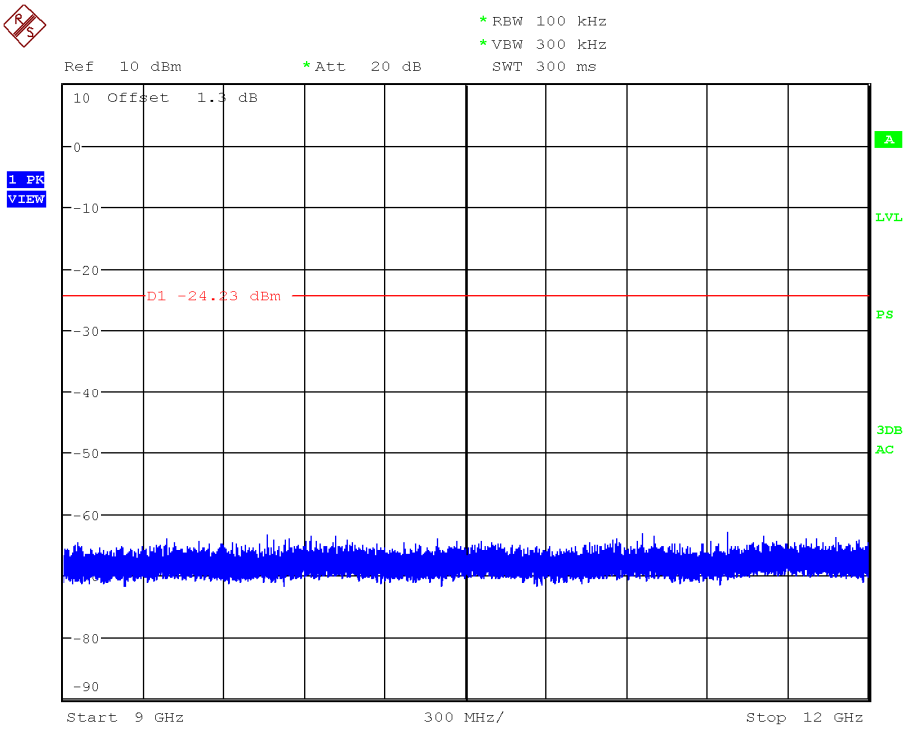
Plot 3 GHz to 6 GHz:



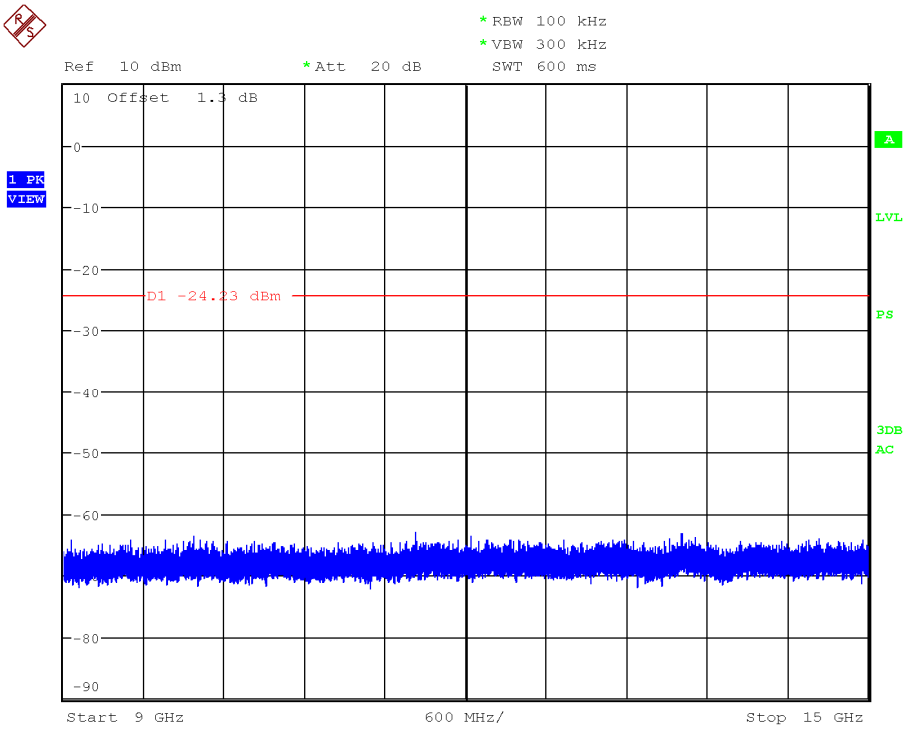
Plot 6 GHz to 9 GHz:



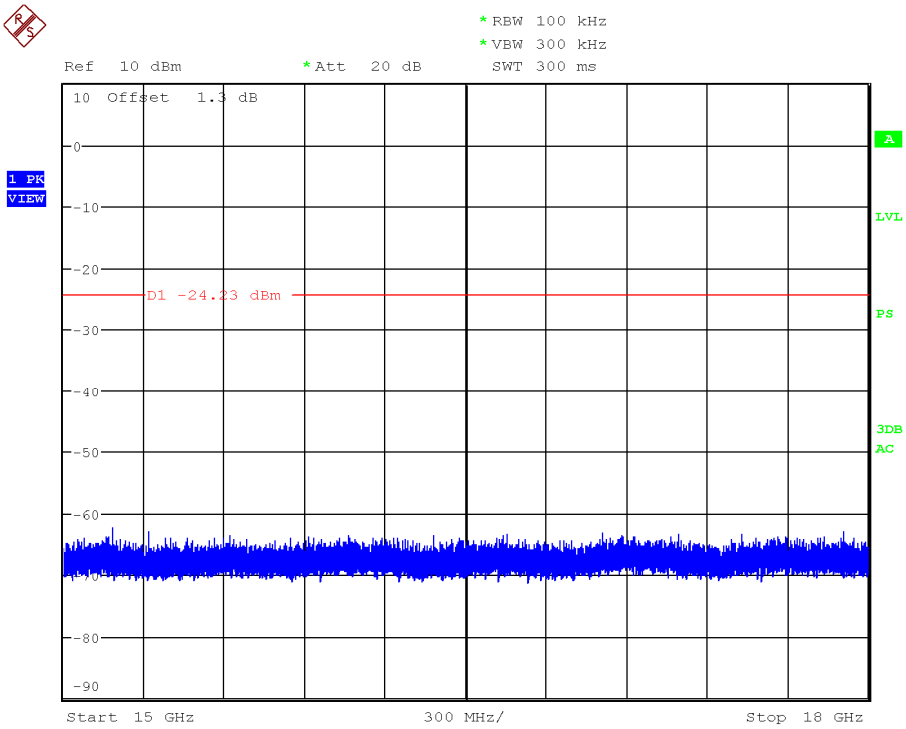
Plot 9 GHz to 12 GHz:



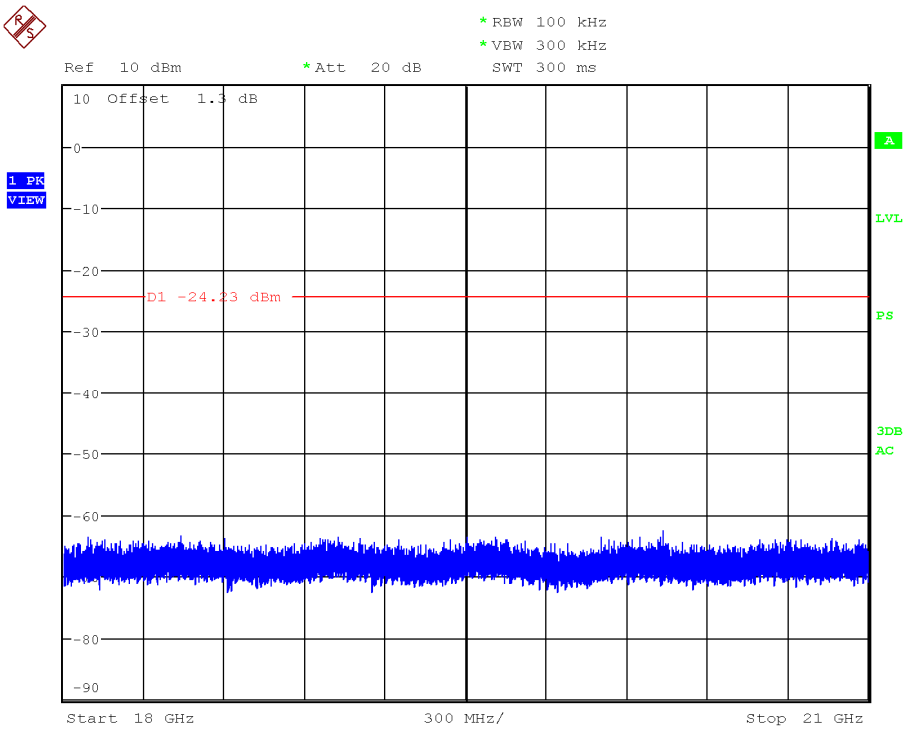
Plot 12 GHz to 15 GHz:



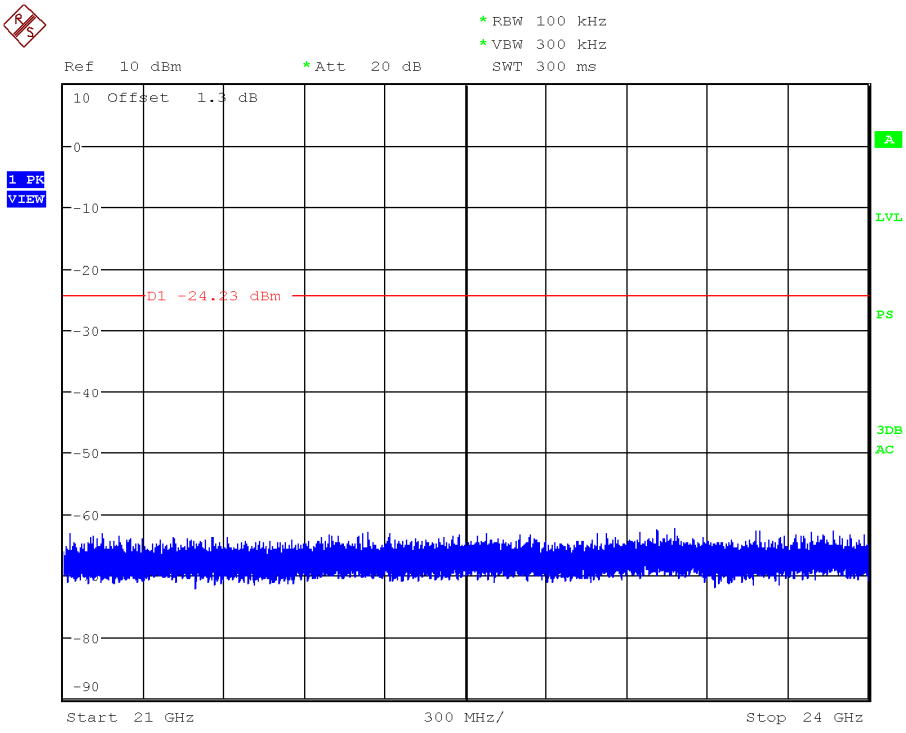
Plot 15 GHz to 18 GHz:



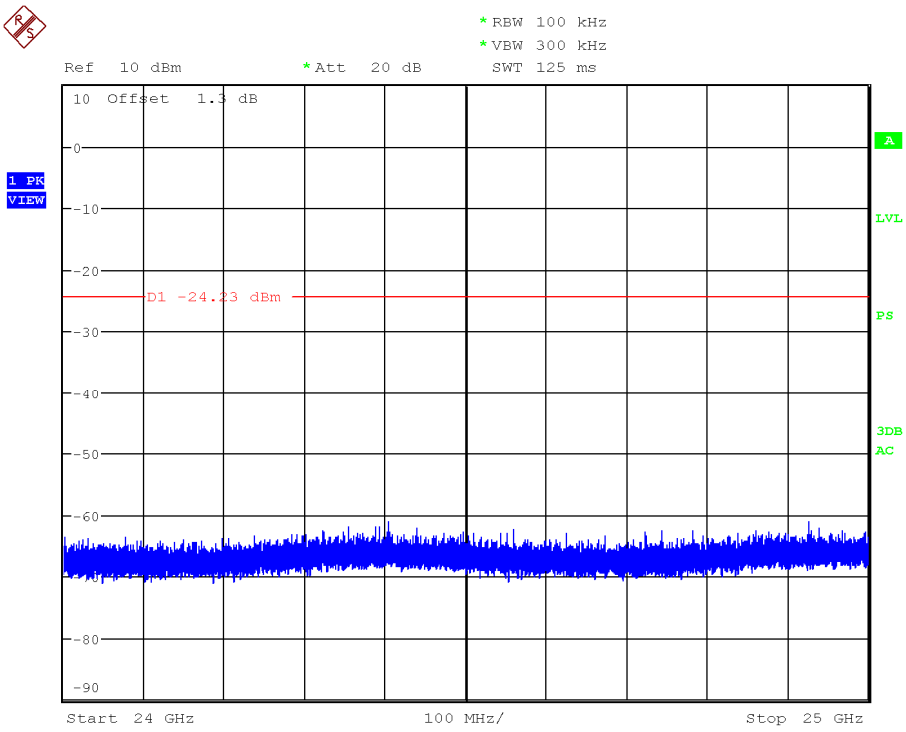
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24GHz to 25 GHz:



4. WiFi 2.4GHz 802.11 n40 mode

Reference Level Measurement

	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	-0.99	-3.35	3.32	0.87	1.69	0.30
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2422 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-30.99 / -33.35

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-26.67 / -29.13

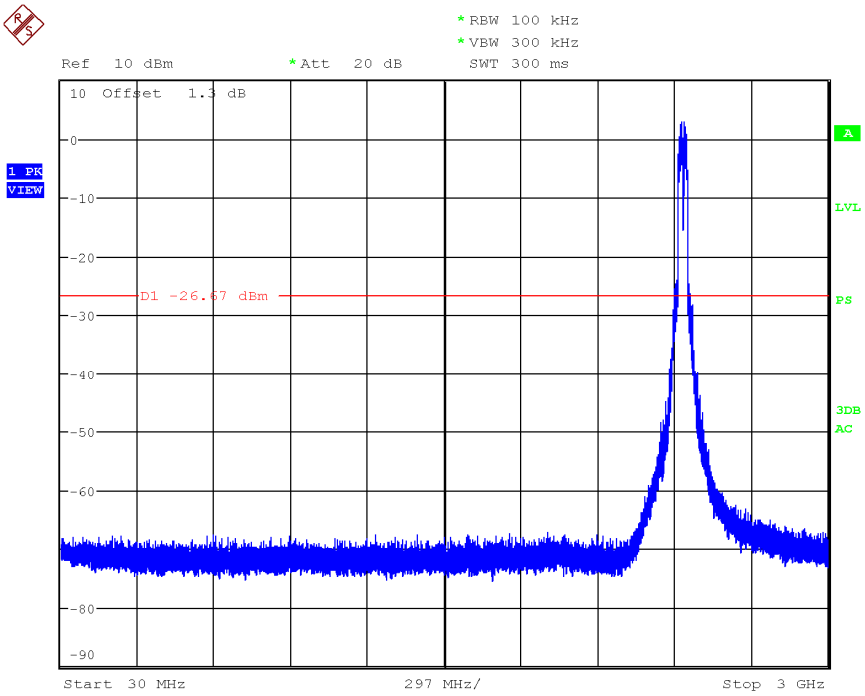
Highest frequency 2452 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-28.31 / -29.70

Verdict: PASS

See next plots of worst case: Mode n40. Middle Channel: 2437 MHz. Chain A.

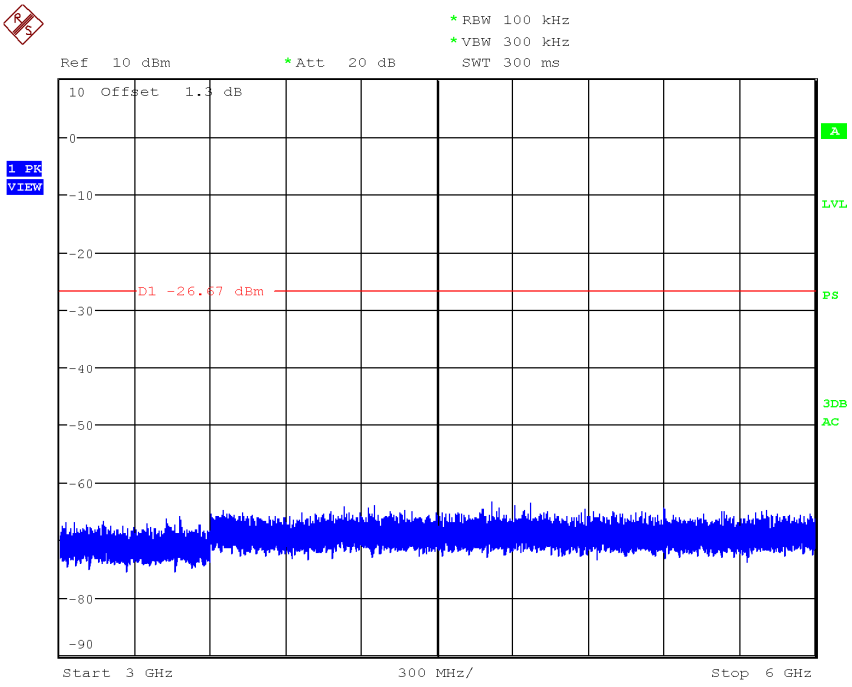
Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz:

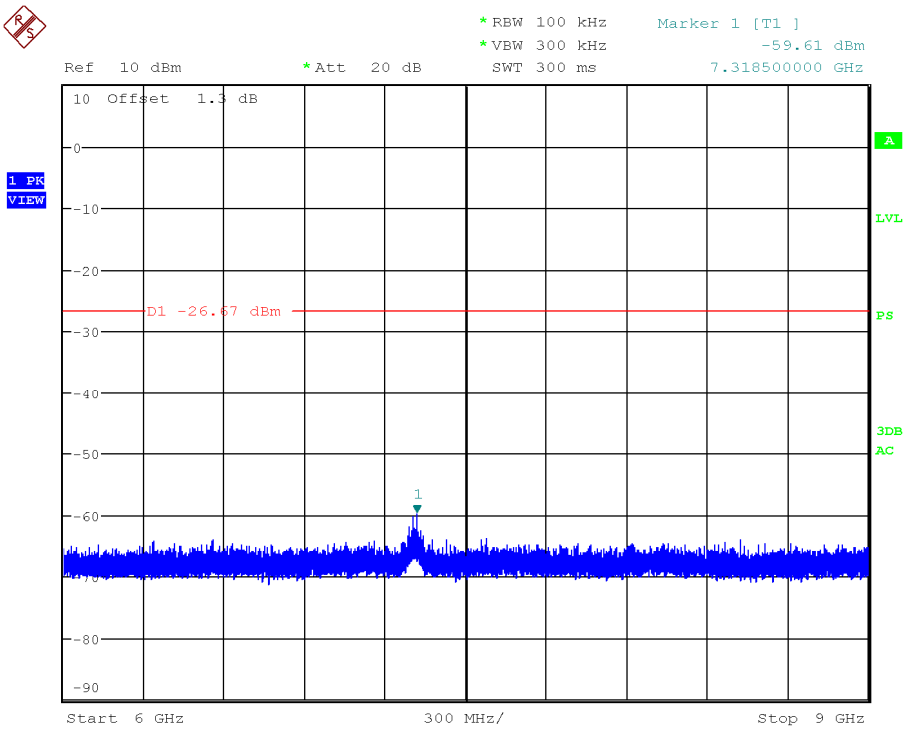


Note: The peak above the limit is the carrier frequency.

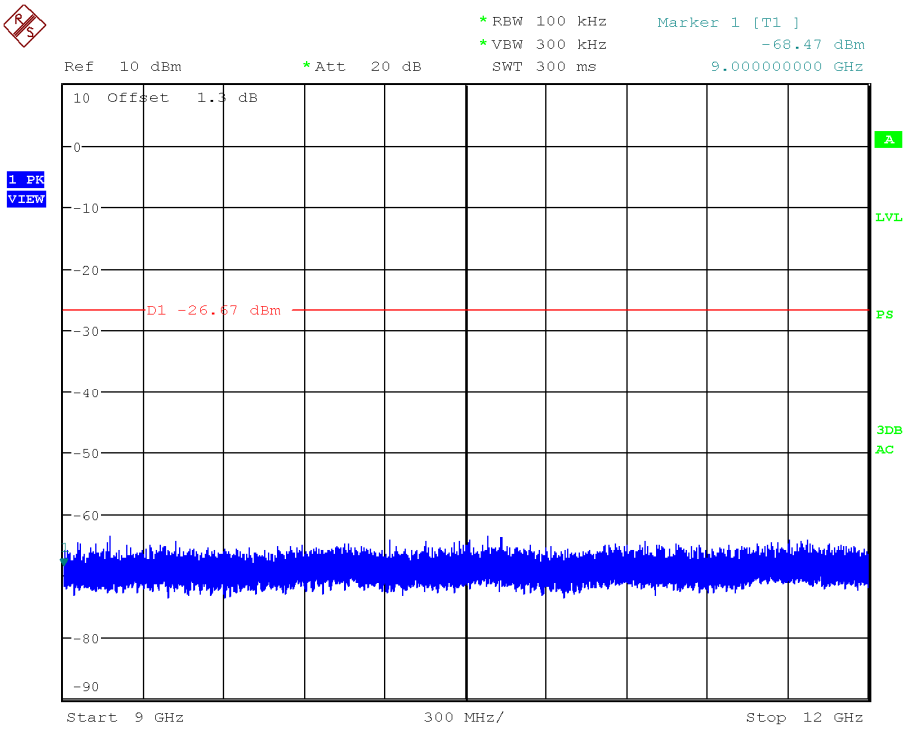
Plot 3 GHz to 6 GHz:



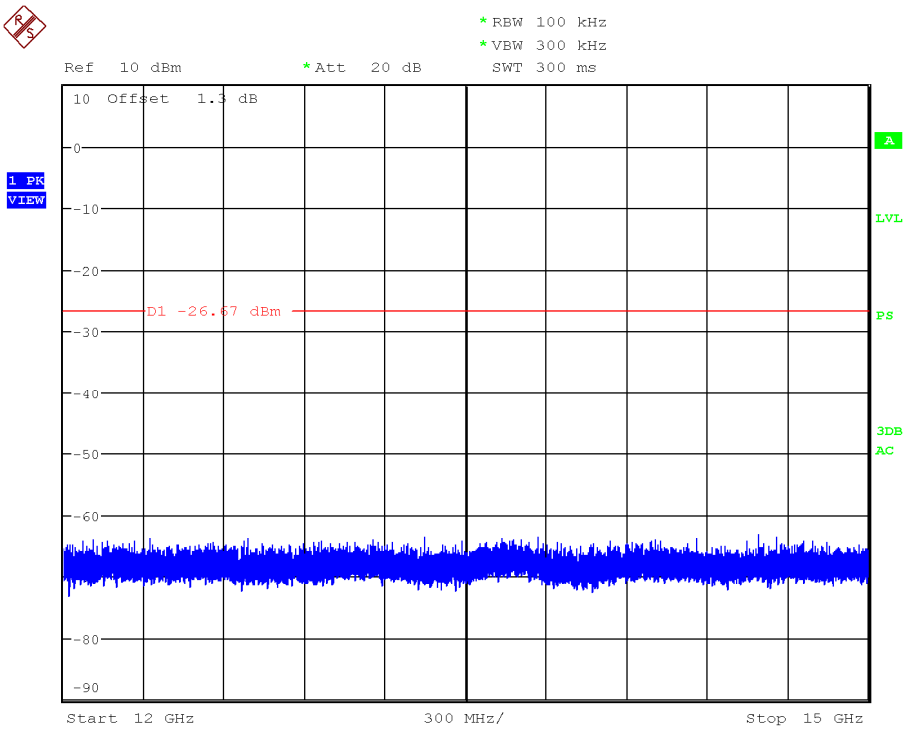
Plot 6 GHz to 9 GHz:



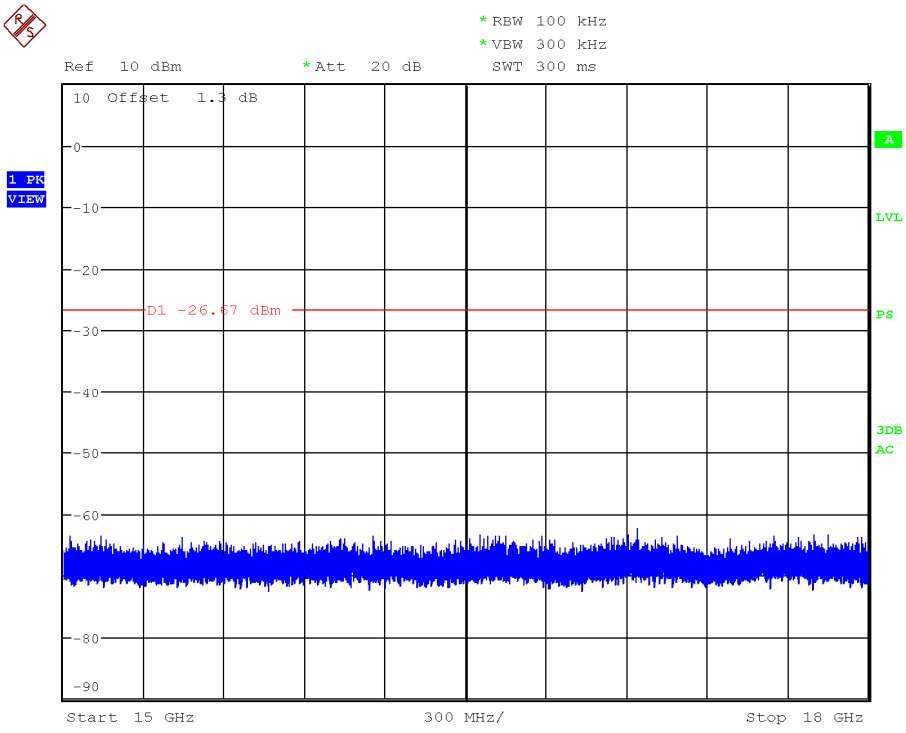
Plot 9 GHz to 12 GHz:



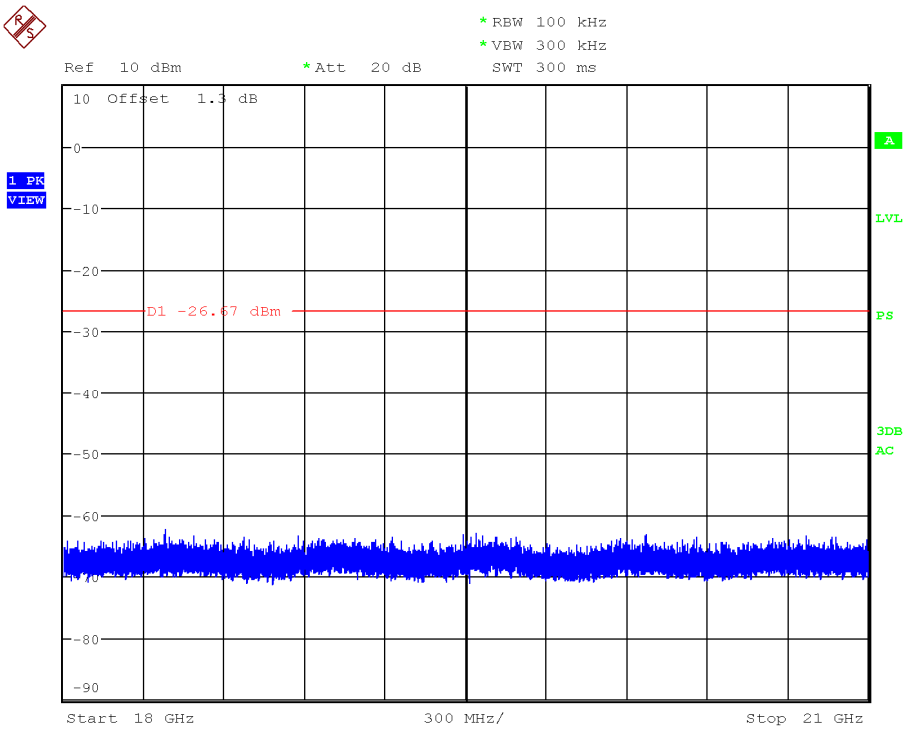
Plot 12 GHz to 15 GHz:



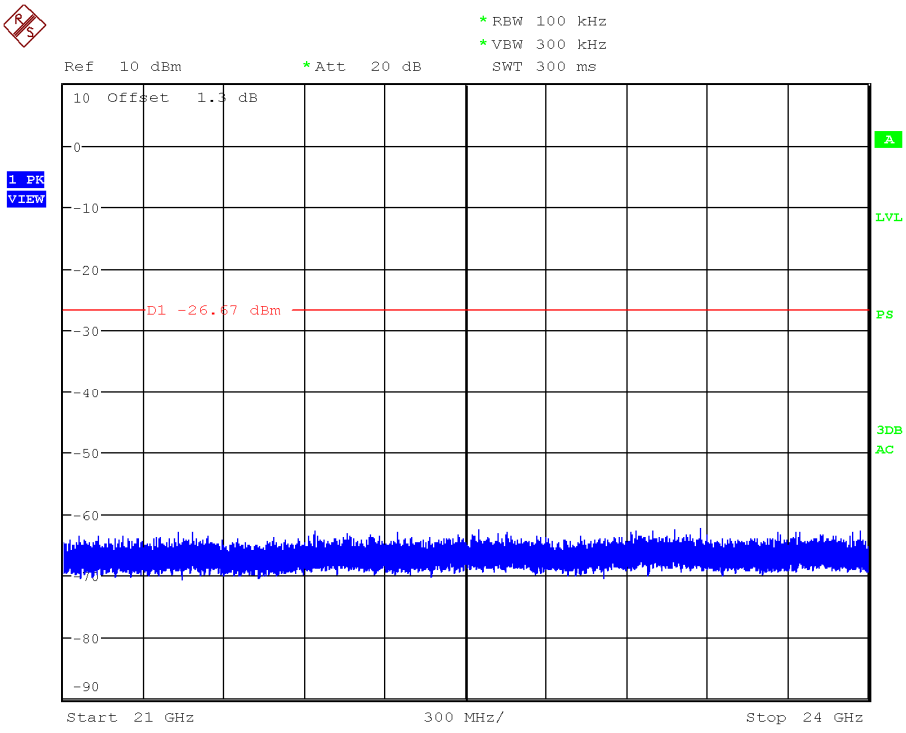
Plot 15 GHz to 18 GHz:



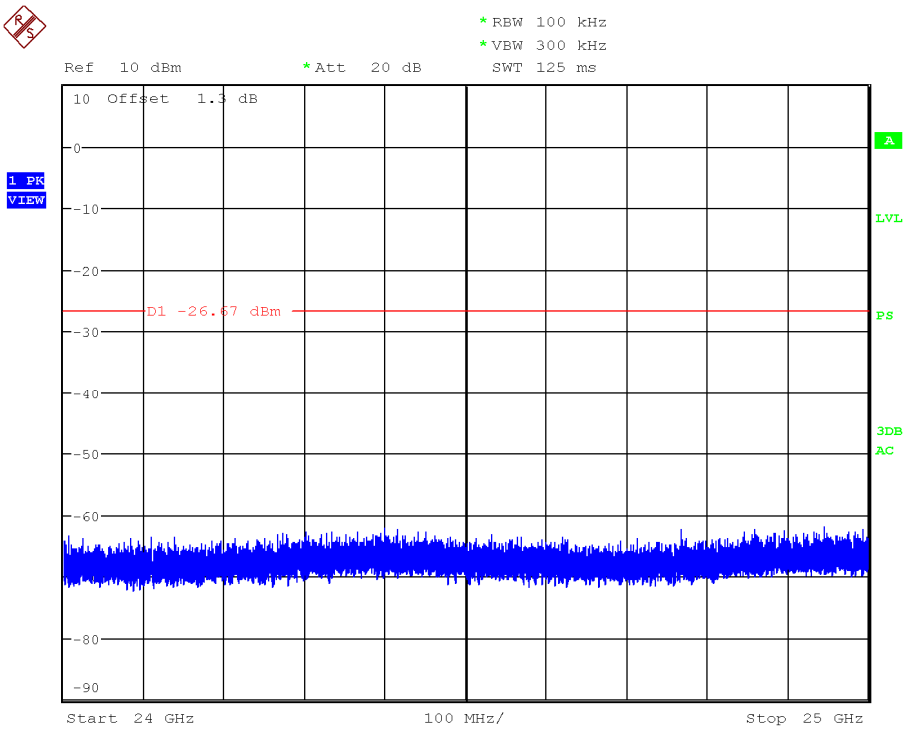
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24GHz to 25 GHz:



Section 15.247 Subclause (d) / RSS-210 A8.5. Band-edge emissions compliance (Transmitter)

SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

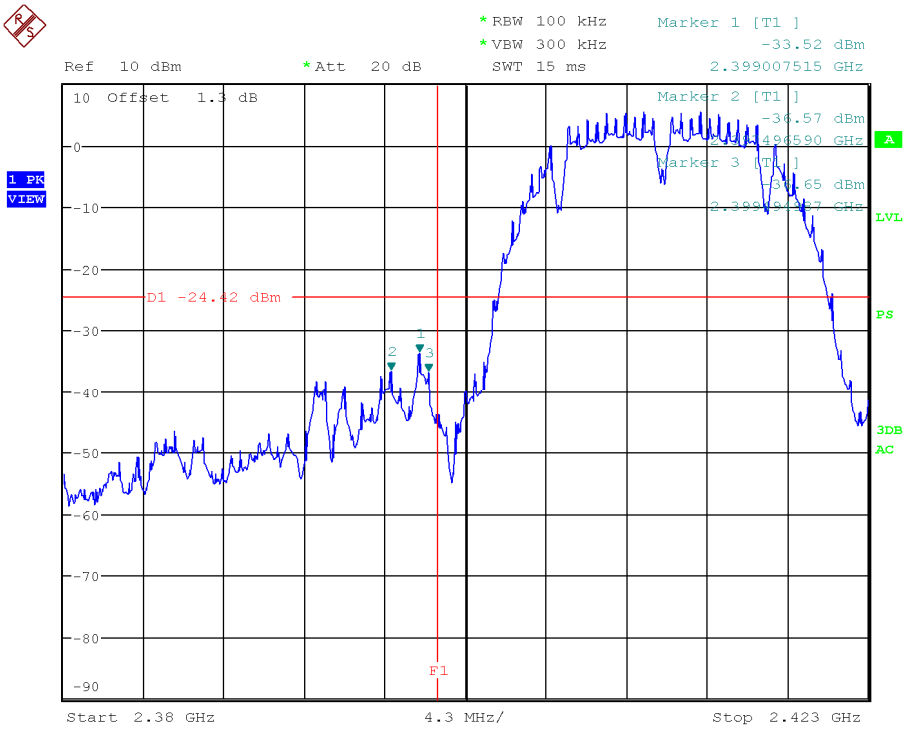
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

LOW FREQUENCY SECTION 2412 MHz. CONDUCTED.

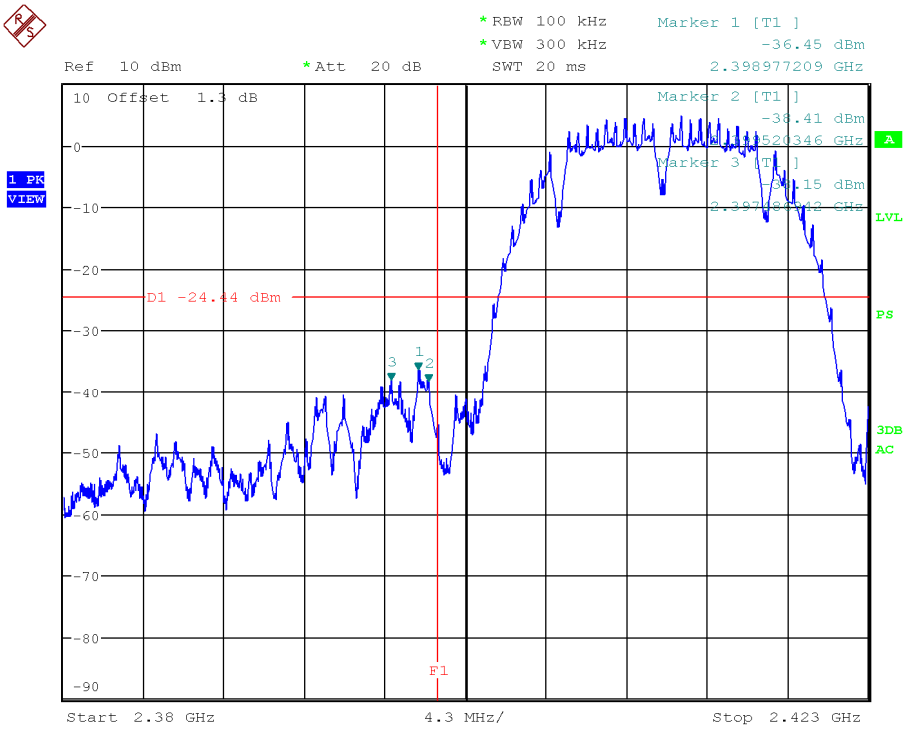
1. WiFi 2.4GHz 802.11 b mode

See next plots.

Chain A



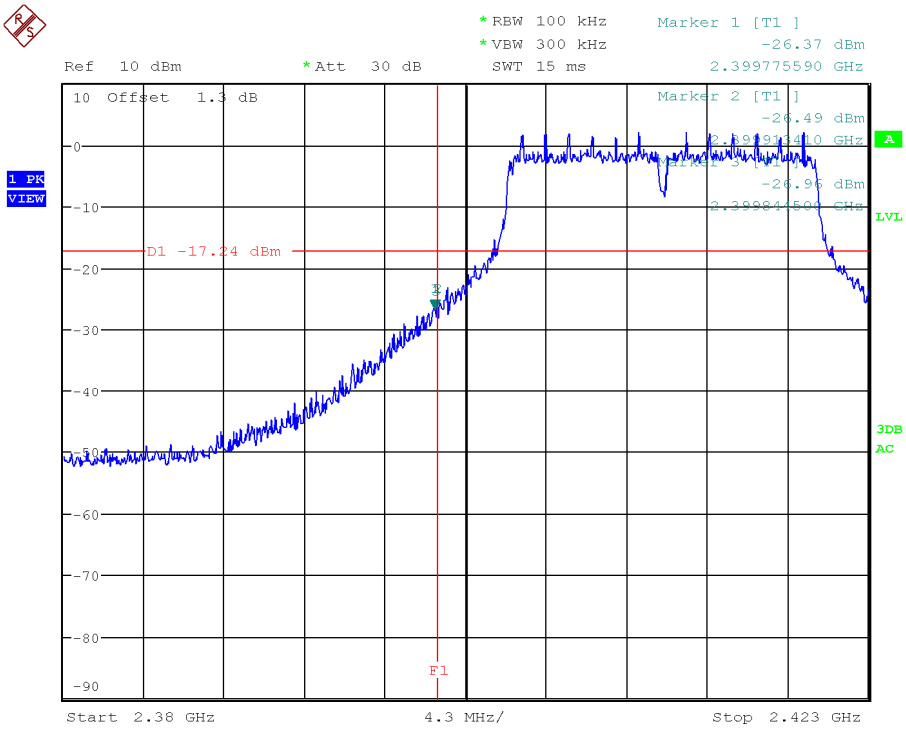
Chain B



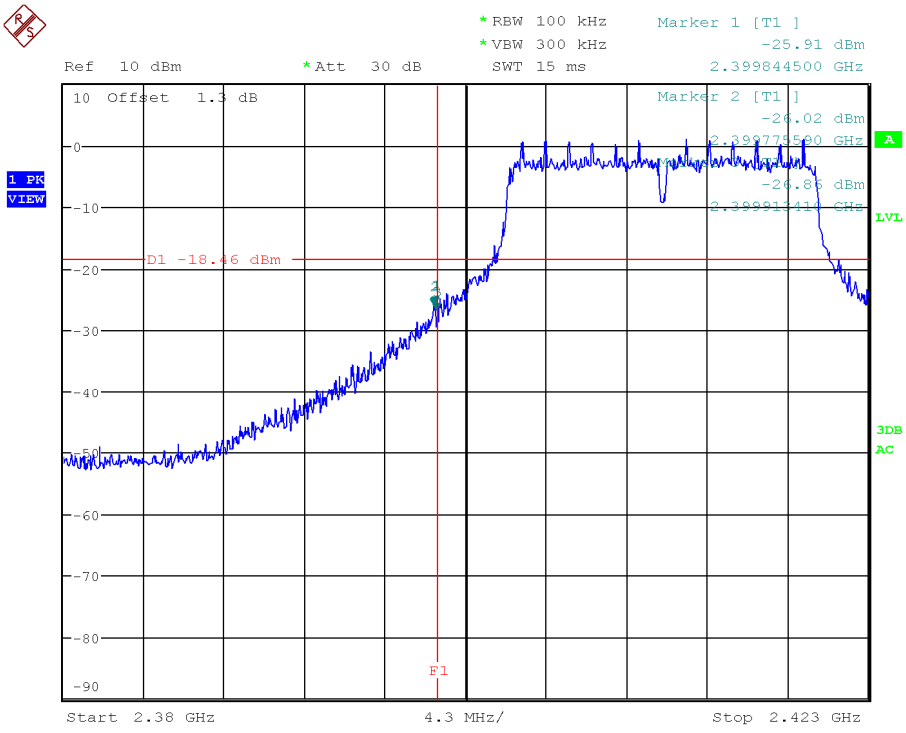
Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

Chain A



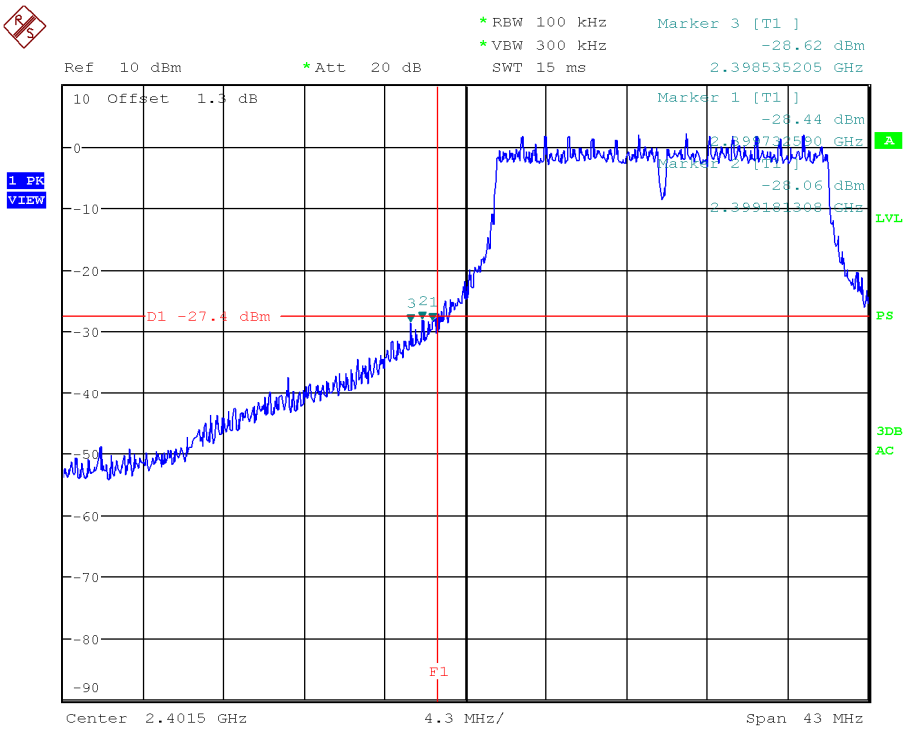
Chain B



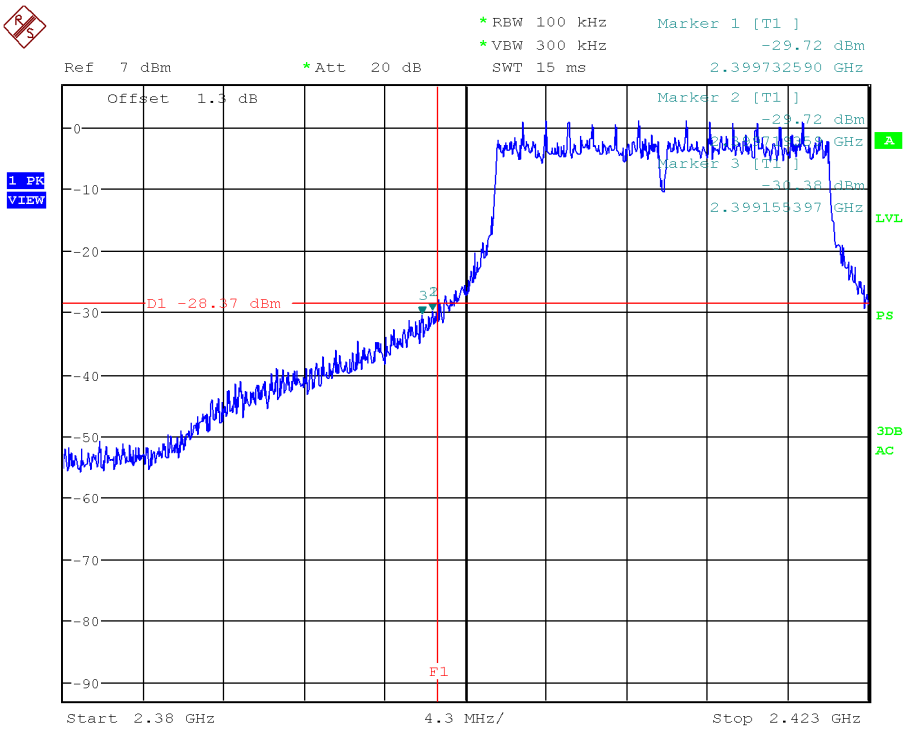
Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

3. WiFi 2.4GHz 802.11 n20 mode

Chain A



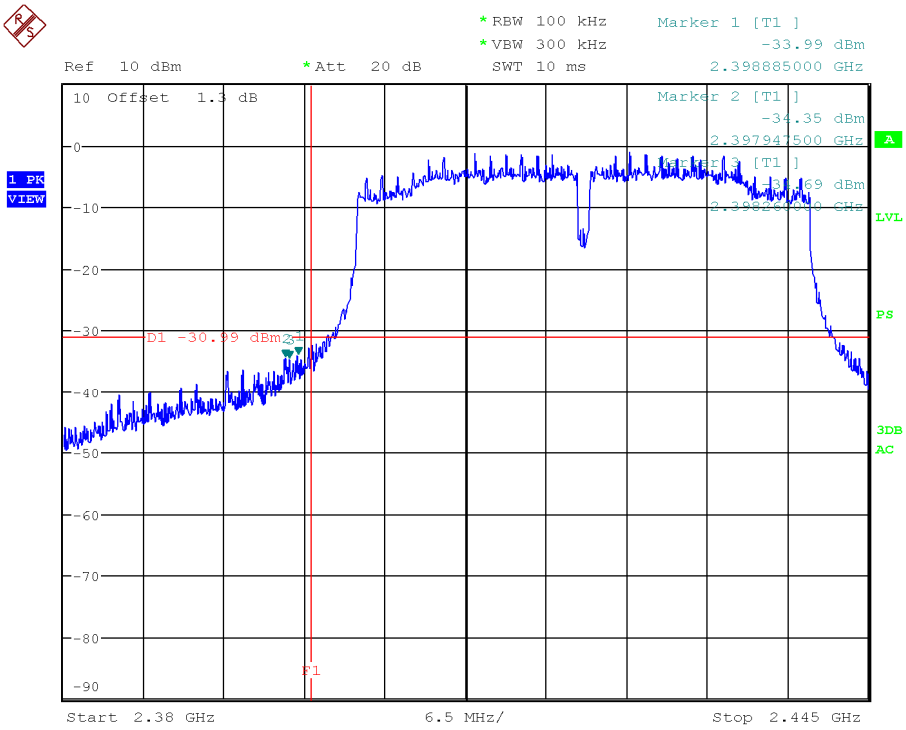
Chain B



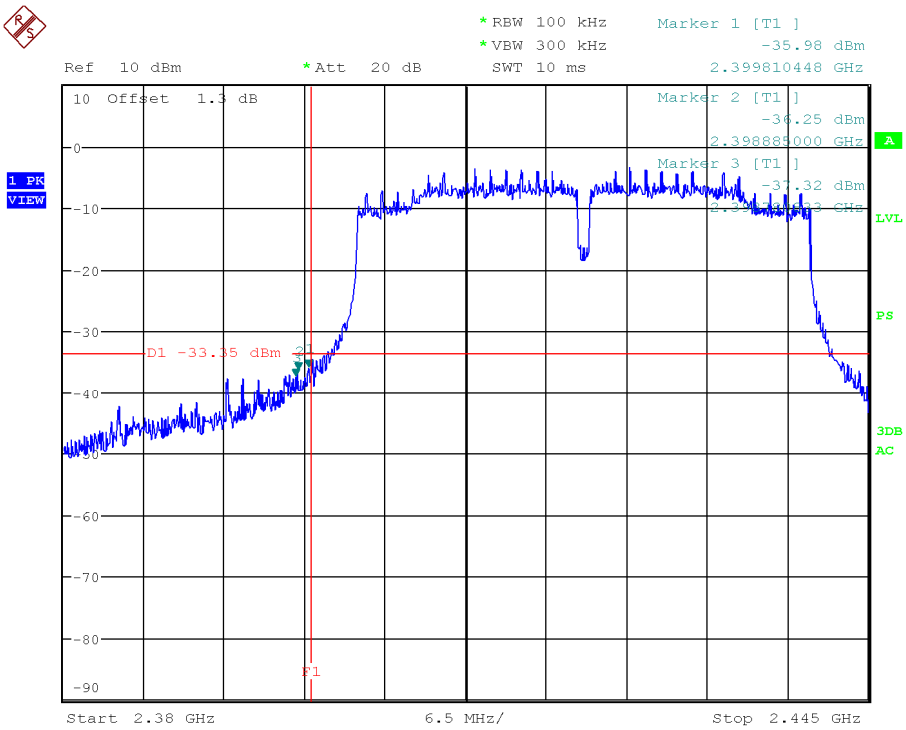
Verdict: PASS

4. WiFi 2.4GHz 802.11 n40 mode

Chain A



Chain B



Verdict: PASS

Section 15.247 Subclause (e) / RSS-210 A8.5. Power spectral density

SPECIFICATION

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

The maximum power spectral density level in the fundamental emission was measured using the method of trace averaging with EUT transmitting at full power throughout each sweep according to point 10.3. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11b, 802.11n20 and 802.11n40 modes.
For 802.11g mode the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode.

For MIMO mode, the *Measure and add 10 log(NANT) dB*, (where *NANT* is the number of outputs) technique was used according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 5/28/2013.
With this technique, spectrum measurements are performed at each output of the device, and the quantity *10 log(NANT)* dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

1. WiFi 2.4GHz 802.11 b mode

Power spectral density (See next plot of worst case = highest level).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-2.887	-3.029	-2.685	-3.569	-2.861	-3.075
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

Power spectral density (See next plot of worst case = highest level).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	2.67	1.79	6.18	5.44	3.40	3.21
Measurement uncertainty (dB)	±1.5					

Verdict: PASS (NOTE: the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode).

3. WiFi 2.4GHz 802.11 n20 mode

Power spectral density (See next plot of worst case = highest level).

	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-6.282	-6.899	-3.605	-4.236	-5.512	-6.357
Measurement uncertainty (dB)	±1.5					

MIMO	Lowest frequency 2412 MHz		Middle frequency 2437 MHz		Highest frequency 2462 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Power spectral density (dBm)	-7.304	-7.994	-6.013	-6.128	-6.347	-7.010
Power spectral density (dBm) + 10*Log(2)	-4.29	-4.98	-3.00	-3.12	-3.34	-4.00
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

4. WiFi 2.4GHz 802.11 n40 mode

Power spectral density (See next plot of worst case= highest level).

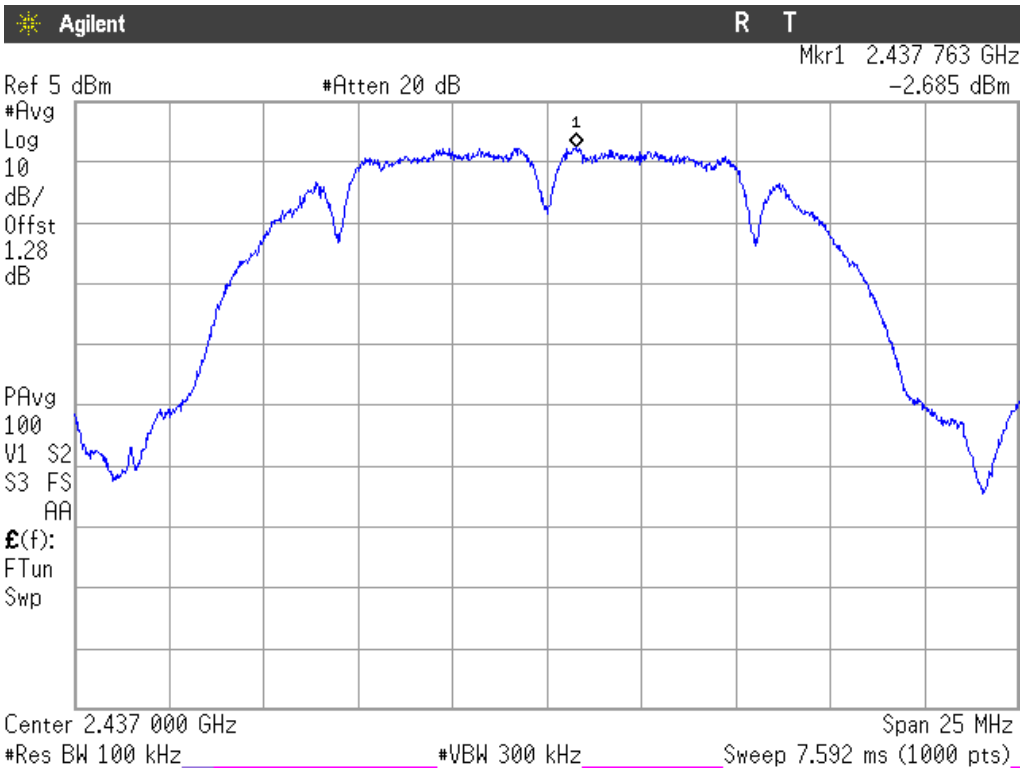
	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-8.969	-10.968	-5.234	-6.776	-6.100	-8.984
Measurement uncertainty (dB)	±1.5					

MIMO	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Power spectral density (dBm)	-13.296	-13.355	-8.706	-9.073	-8.584	-9.024
Power spectral density (dBm) + 10*Log(2)	-10.29	-10.34	-5.70	-6.06	-5.57	-6.01
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

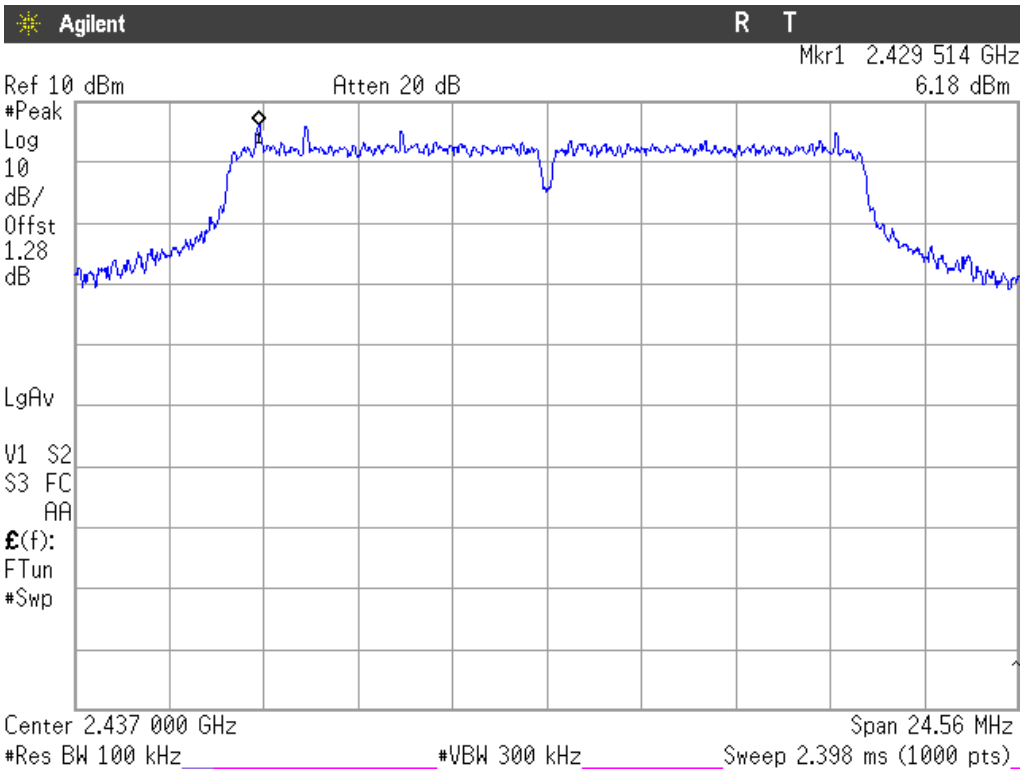
1. WiFi 2.4GHz 802.11 b mode

Middle Channel: 2437 MHz. Chain A.



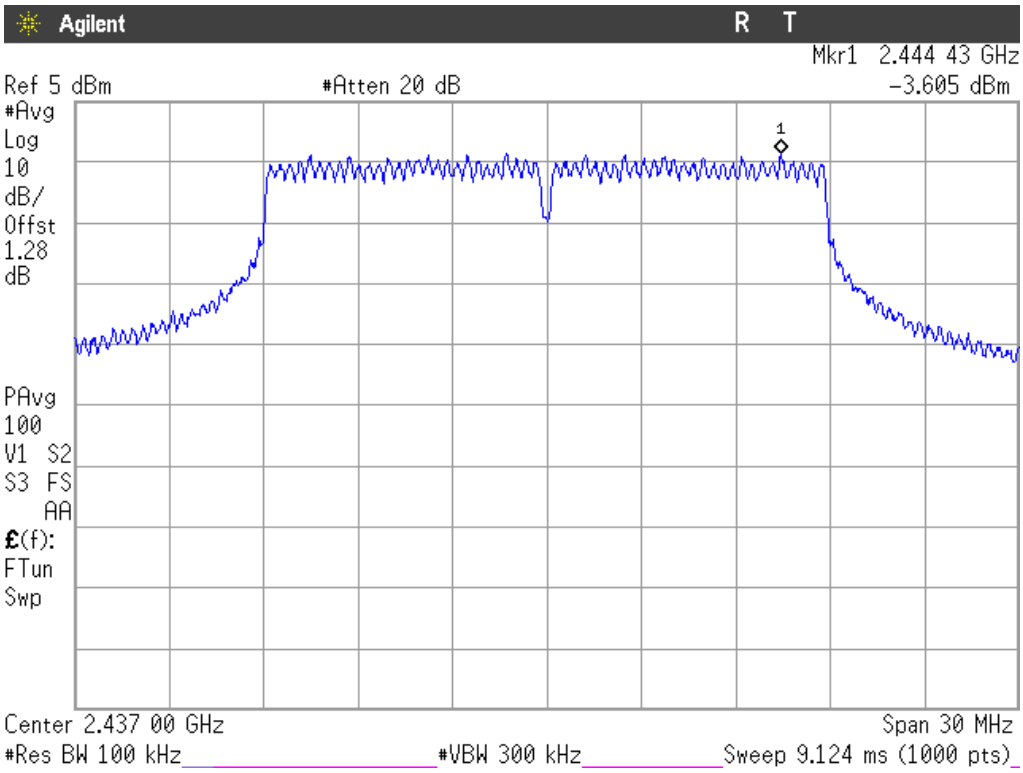
2. WiFi 2.4GHz 802.11 g mode

Middle Channel: 2437 MHz. Chain A.

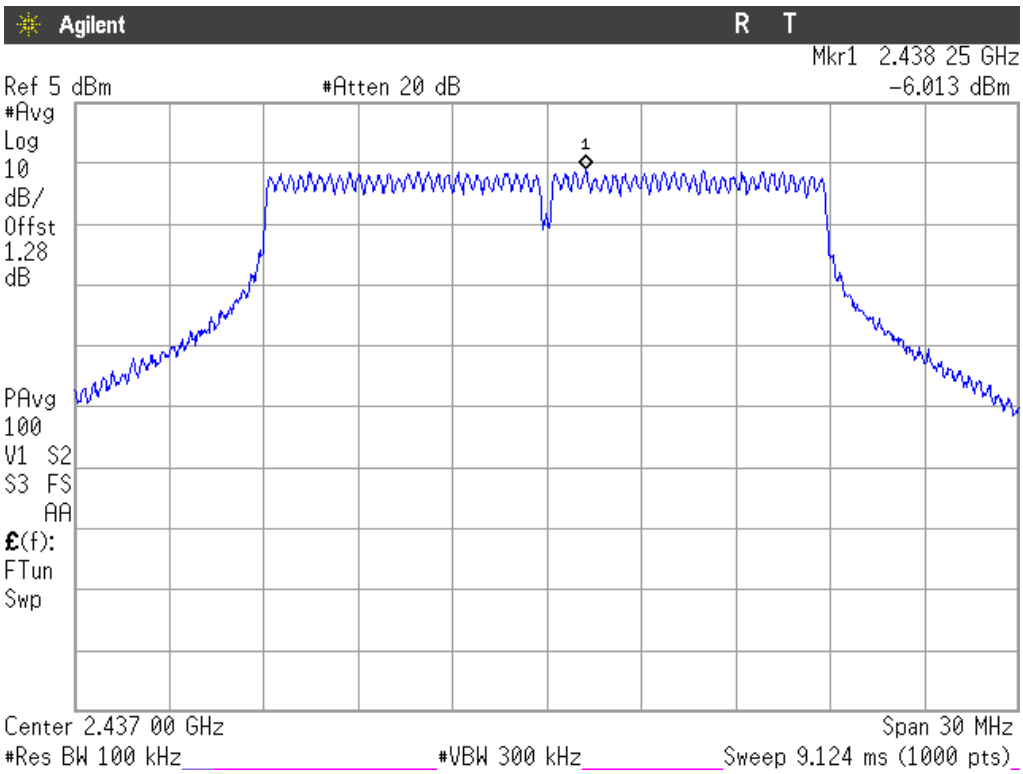


3. WiFi 2.4GHz 802.11 n20 mode

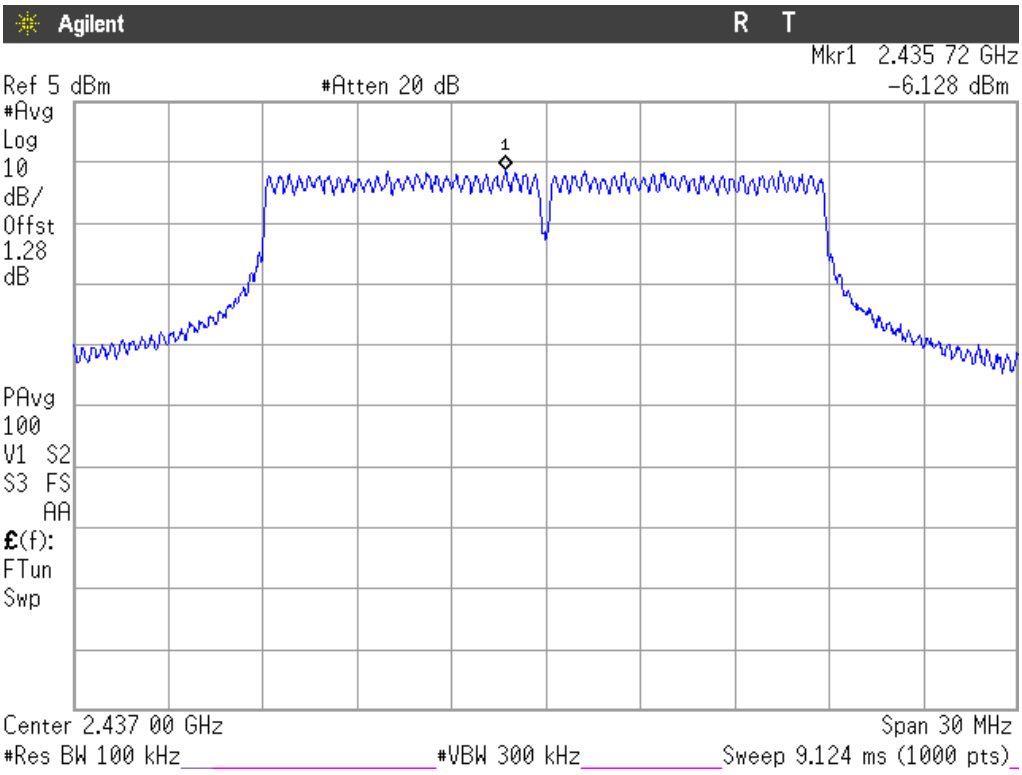
SISO. Middle Channel: 2437 MHz. Chain A.



MIMO. Middle Channel: 2437 MHz. Chain A+B. Port A.

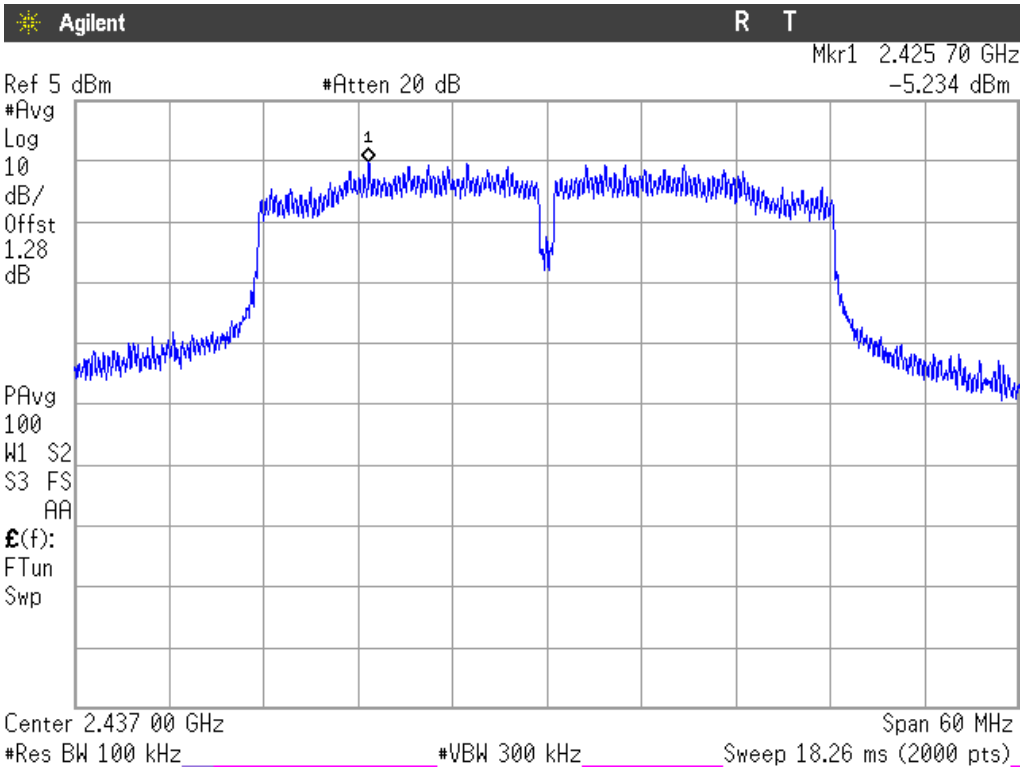


MIMO. Middle Channel: 2437 MHz. Chain A+B. Port B.

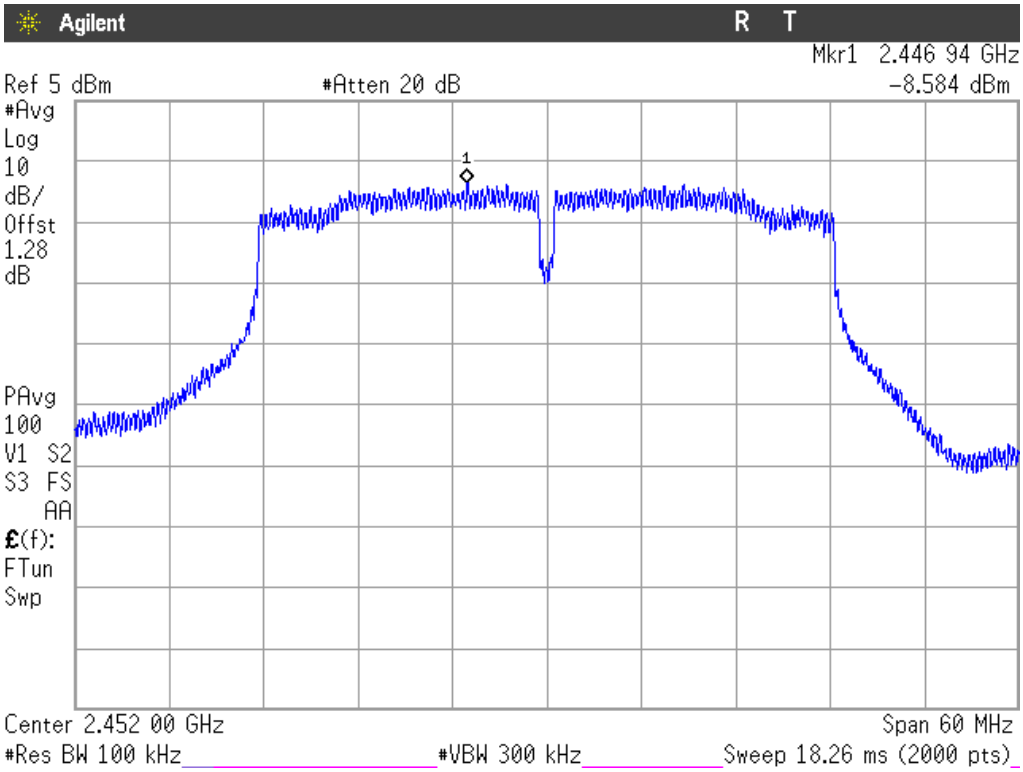


4. WiFi 2.4GHz 802.11 n40 mode

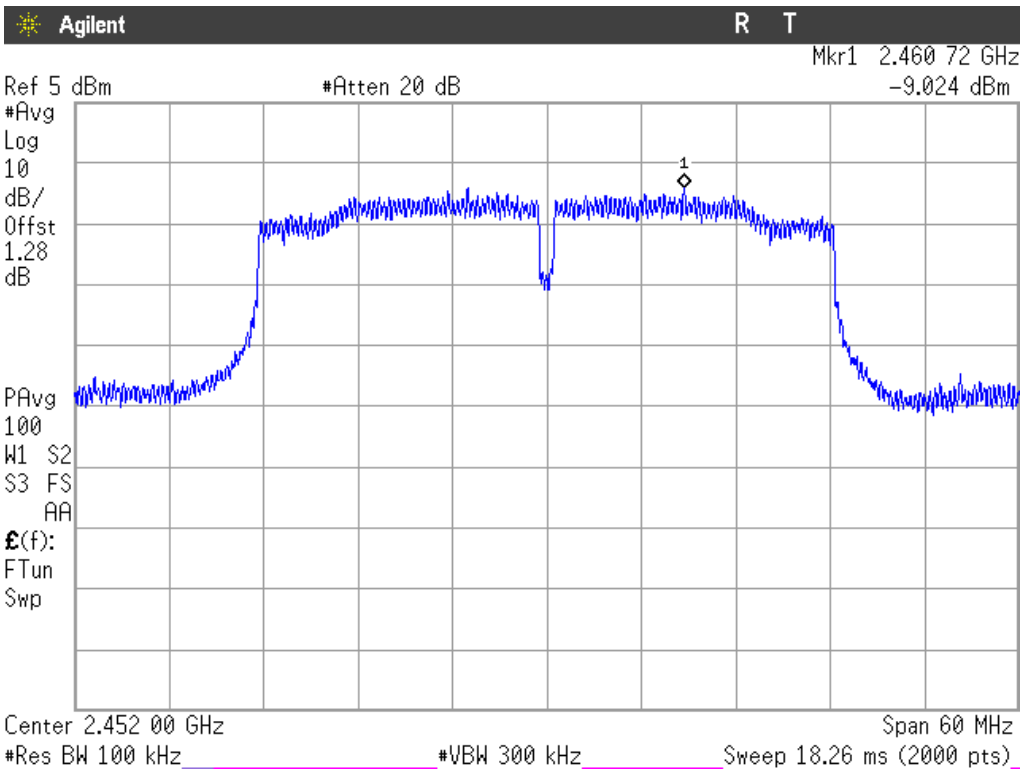
SISO. Middle Channel: 2437 MHz. Chain A.



MIMO. Highest Channel: 2452 MHz. Chain A+B. Port A.



MIMO. Highest Channel: 2452 MHz. Chain A+B. Port B.



SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 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-1000 MHz.

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

Spurious levels closest to the limit:

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
31.943887	PV	Quasi-Peak	37.03	± 3.8
53.326656	PV	Quasi-Peak	31.65	± 3.8
119.418837	PH	Quasi-Peak	33.05	± 3.8
166.0721443	PH	Quasi-Peak	36.77	± 3.8

Frequency range 1 GHz-25 GHz

The results in the next tables show the maximum measured levels in the 1-25 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

For OFDM modulation modes (802.11g, 802.11n20 and 802.11n40), a preliminary measurement in the central channel in the range 1-12.75 GHz was performed to determine the worst case. The lowest and highest channels were measured for out-of-band emissions for the worst case (802.11n20).

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

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

1. WiFi 2.4GHz 802.11 b mode

1.1. CHANNEL 1: LOWEST (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38536	PH	Peak	54.82	± 4.09
		Average	48.66	± 4.09
2.48820	PH	Peak	51.75	± 4.09
4.823903	PV	Peak	40.05	± 4.09
7.233275	PV	Peak	42.56	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38574	PH	Peak	54.00	± 4.09
		Average	46.24	± 4.09
2.49484	PH	Peak	52.05	± 4.09
4.823916	PV	Peak	41.63	± 4.09

1.2. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38918	PH	Peak	53.09	± 4.09
2.48419	PH	Peak	53.76	± 4.09
4.87396	PV	Peak	40.22	± 4.09
7.30817	PV	Peak	43.33	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38612	PH	Peak	52.33	± 4.09
2.48903	PH	Peak	52.45	± 4.09
4.87397	PV	Peak	43.09	± 4.09

1.3. CHANNEL 11: HIGHEST (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38488	PH	Peak	52.77	± 4.09
2.48798	PH	Peak	54.75	± 4.09
		Average	46.93	± 4.09
4.923901	PV	Peak	40.3	± 4.09
7.382933	PV	Peak	42.93	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38582	PH	Peak	52.83	± 4.09
2.48792	PH	Peak	55.12	± 4.09
		Average	42.28	± 4.09
4.923893	PV	Peak	44.56	± 4.09

Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

2.1. CHANNEL 1: LOWEST (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38980	PH	Peak	63.32	± 4.09
		Average	48.24	± 4.09
2.48388	PH	Peak	52.83	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38998	PH	Peak	59.74	± 4.09
		Average	46.46	± 4.09
2.493672	PH	Peak	52.12	± 4.09

2.2. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38986	PH	Peak	55.16	± 4.09
		Average	44.85	± 4.09
2.48379	PH	Peak	53.29	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38992	PH	Peak	53.14	± 4.09
2.48380	PH	Peak	53.05	± 4.09
4.87387	PH	Peak	37.39	± 4.09

2.5. CHANNEL 11: HIGHEST (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38758	H	Peak	52.07	± 4.09
2.483603	H	Peak	58.38	± 4.09
		Average	45.02	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38524	PH	Peak	51.78	± 4.09
2.49750	PH	Peak	51.31	± 4.09

Verdict: PASS

3. WiFi 2.4GHz 802.11 n20 mode (worst case OFDM)

3.1. CHANNEL 1 (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.39000	PH	Peak	63.23	± 4.09
		Average	50.39	± 4.09
7.23298	PV	Peak	42.53	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38944	PH	Peak	52.43	± 4.09
4.824003	PV	Peak	40.53	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38968	PH	Peak	59.71	± 4.09
		Average	48.59	± 4.09
4.82390	PV	Peak	38.69	± 4.09
7.23329	PV	Peak	43.31	± 4.09

3.2. CHANNEL 2 (2417 MHz). Spurious emissions in restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38982	PH	Peak	59.22	± 4.09
		Average	48.73	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.37422	PH	Peak	51.88	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38898	PH	Peak	65.34	± 4.09
		Average	51.55	± 4.09

3.3. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38970	PH	Peak	53.64	± 4.09
2.48426	PH	Peak	53.51	± 4.09
7.30944	PV	Peak	43.49	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38996	PH	Peak	55.34	± 4.09
		Average	43.28	± 4.09
2.484395	PH	Peak	53.1	± 4.09
4.878687	PV	Peak	37.64	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38999	PH	Peak	57.37	± 4.09
		Average	45.09	± 4.09
2.484502	PH	Peak	56.1	± 4.09
		Average	44.29	± 4.09
4.87446	PV	Peak	40.00	± 4.09

3.4. CHANNEL 10 (2457 MHz). Spurious emissions in restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48361	PH	Peak	61.35	± 4.09
		Average	48.62	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48373	PH	Peak	55.61	± 4.09
		Average	45.58	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48394	PH	Peak	65.89	± 4.09
		Average	52.99	± 4.09

3.5. CHANNEL 11 (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48350	PH	Peak	59.18	± 4.09
		Average	47.00	± 4.09
4.92390	PV	Peak	40.30	± 4.09
7.38293	PV	Peak	42.93	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.493499	PH	Peak	53.51	± 4.09
4.923893	PV	Peak	44.56	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.483825	PH	Peak	68.12	± 4.09
		Average	53.04	± 4.09
4.923893	PV	Peak	44.56	± 4.09

4. WiFi 2.4GHz 802.11 n40 mode

4.1. CHANNEL 3 (2422 MHz). Spurious emissions in restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38958	PH	Peak	61.75	± 4.09
		Average	50.51	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3897	PH	Peak	56.65	± 4.09
		Average	45.42	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38958	PH	Peak	59.55	± 4.09
		Average	48.41	± 4.09

4.2. CHANNEL 4 (2427 MHz). Spurious emissions in restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38952	PH	Peak	59.93	± 4.09
		Average	49.87	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.37914	PH	Peak	51.36	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38976	PH	Peak	58.35	± 4.09
		Average	48.55	± 4.09

4.3. CHANNEL 5 (2432 MHz). Spurious emissions in restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38912	PH	Peak	68.42	± 4.09
		Average	53.68	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38802	PH	Peak	51.37	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38928	PH	Peak	61.11	± 4.09
		Average	49.58	± 4.09

4.4. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38946	PH	Peak	68.77	± 4.09
		Average	53.5	± 4.09
2.483616	PH	Peak	64.93	± 4.09
		Average	51.98	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.36704	PH	Peak	52.21	± 4.09
2.494748	PH	Peak	52.23	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.38982	PH	Peak	58.78	± 4.09
		Average	47.33	± 4.09
2.48367	PH	Peak	58.24	± 4.09
		Average	47.34	± 4.09

4.5. CHANNEL 7 (2442 MHz). Spurious emissions in restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.483636	PH	Peak	63.01	± 4.09
		Average	50.81	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.494748	PH	Peak	51.8	± 4.09
		Average	41.75	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.483620	PH	Peak	63.85	± 4.09
		Average	52.58	± 4.09

4.6. CHANNEL 8 (2447 MHz). Spurious emissions in restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48369	PH	Peak	64.27	± 4.09
		Average	52.29	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.49560	PH	Peak	52.13	± 4.09
		Average	41.06	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48470	PH	Peak	65.67	± 4.09
		Average	53.71	± 4.09

4.7. CHANNEL 9 (2452 MHz). Spurious emissions in restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48353	PH	Peak	64.71	± 4.09
		Average	53.82	± 4.09

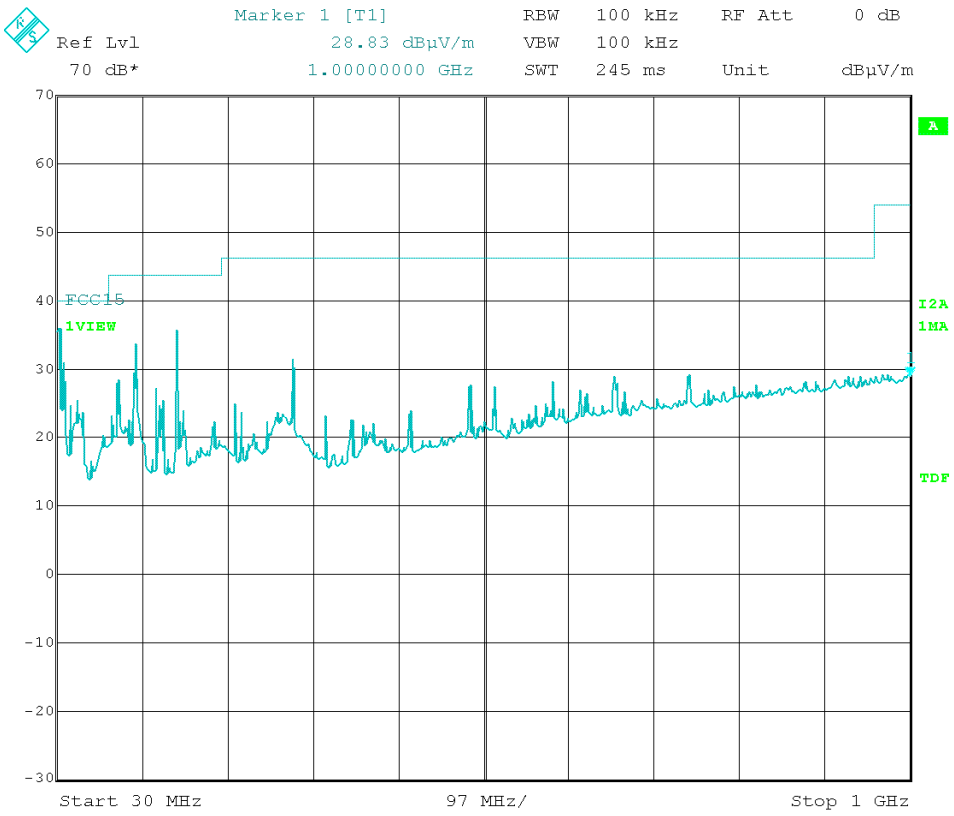
Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48375	PH	Peak	57.06	± 4.09
		Average	45.88	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48424	PH	Peak	64.05	± 4.09
		Average	53.87	± 4.09

FREQUENCY RANGE 30 MHz-1000 MHz.

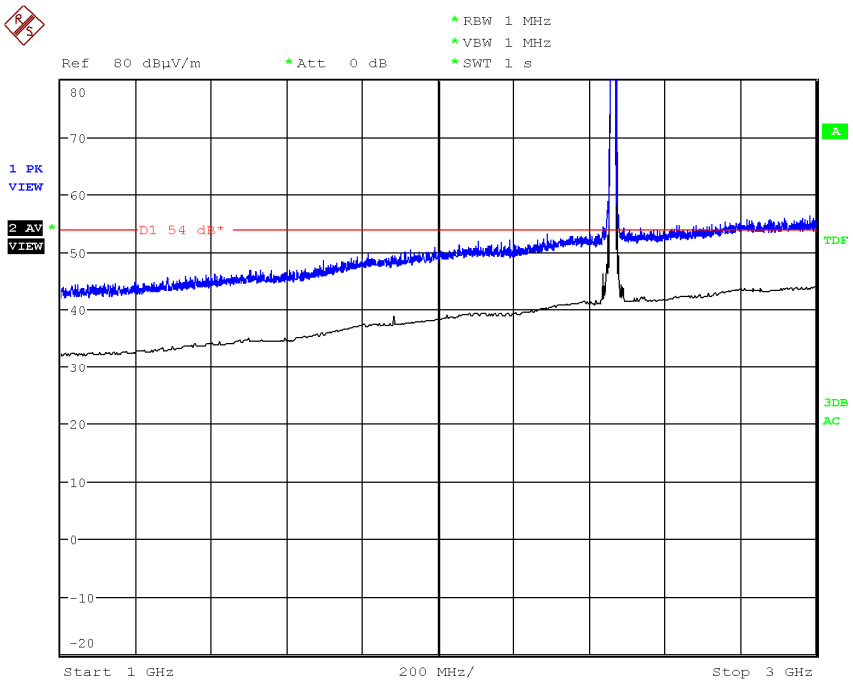


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

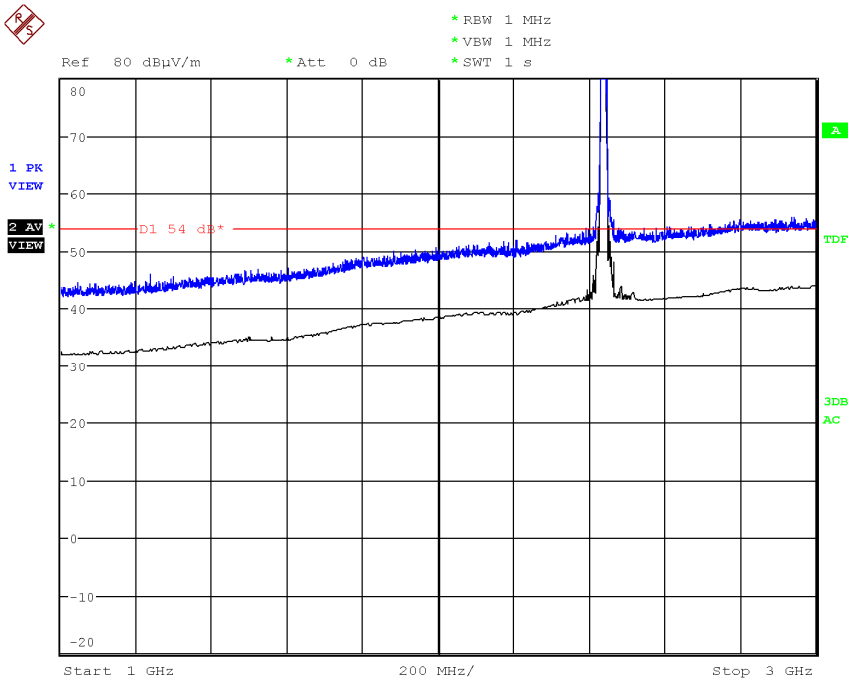
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz). Only the carrier was detected in both chains.



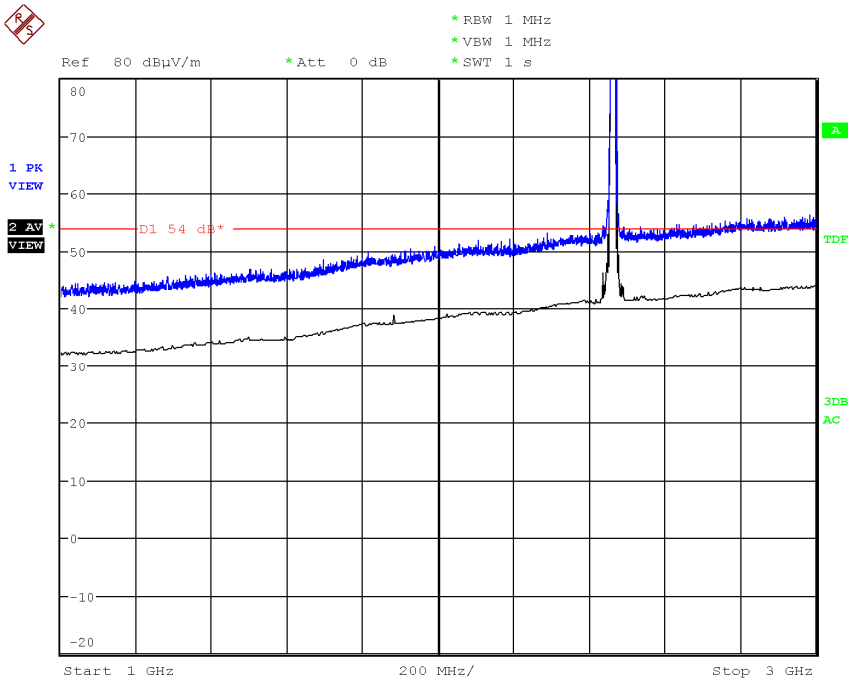
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

CHANNEL 6 (2437 MHz). Only the carrier was detected in both chains.



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

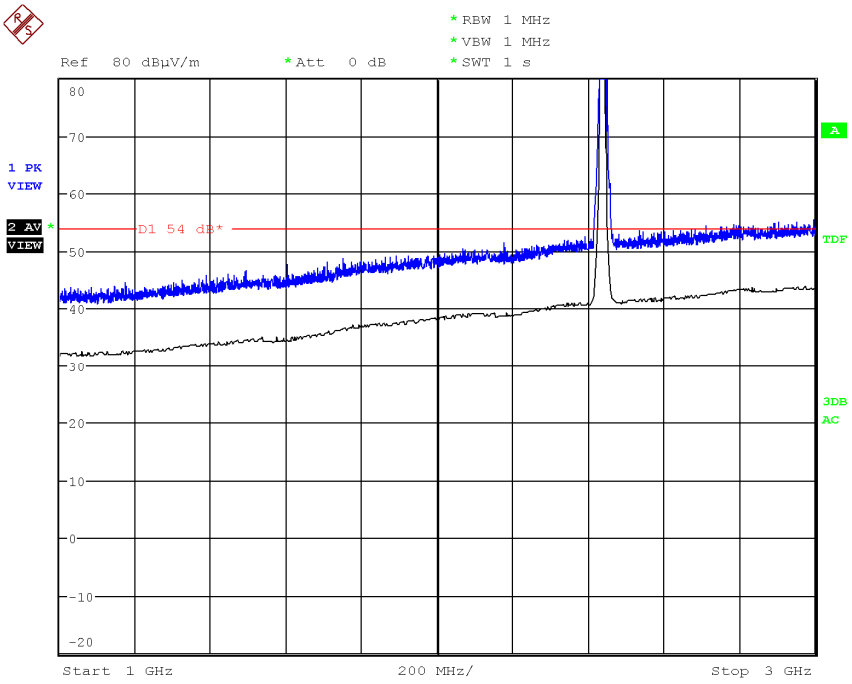
CHANNEL 11 (2462 MHz). Only the carrier was detected in both chains.



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

2. WiFi 2.4GHz 802.11 g mode

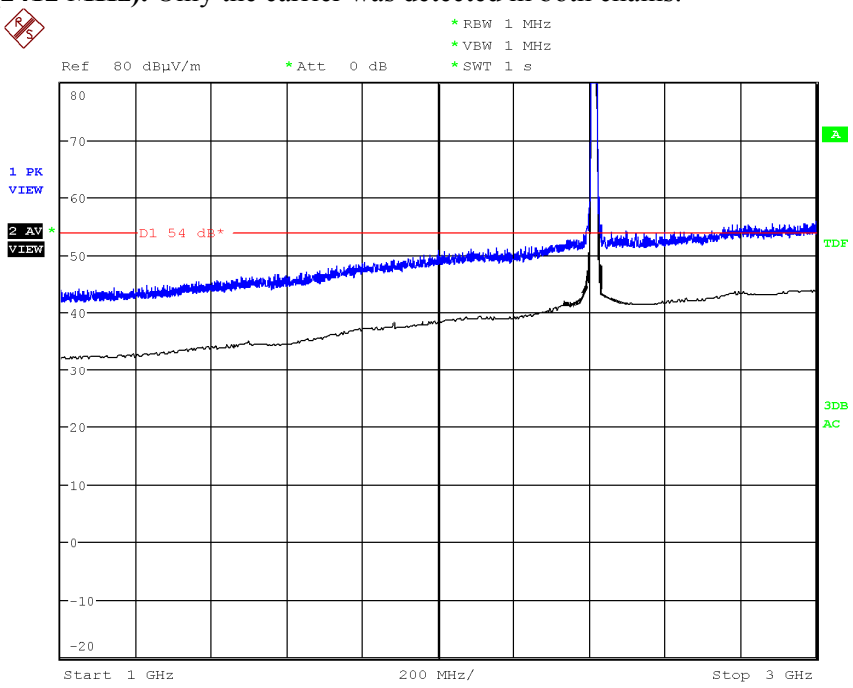
CHANNEL 6 (2437 MHz). Only the carrier was detected in both chains.



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

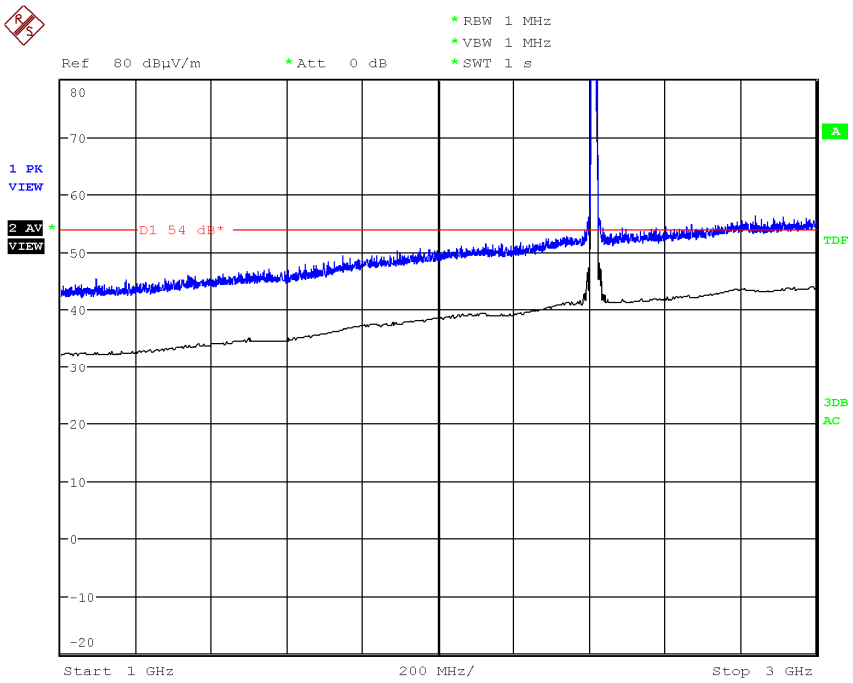
3.WiFi 2.4GHz 802.11 n20 mode (worst case)

CHANNEL 1 (2412 MHz). Only the carrier was detected in both chains.



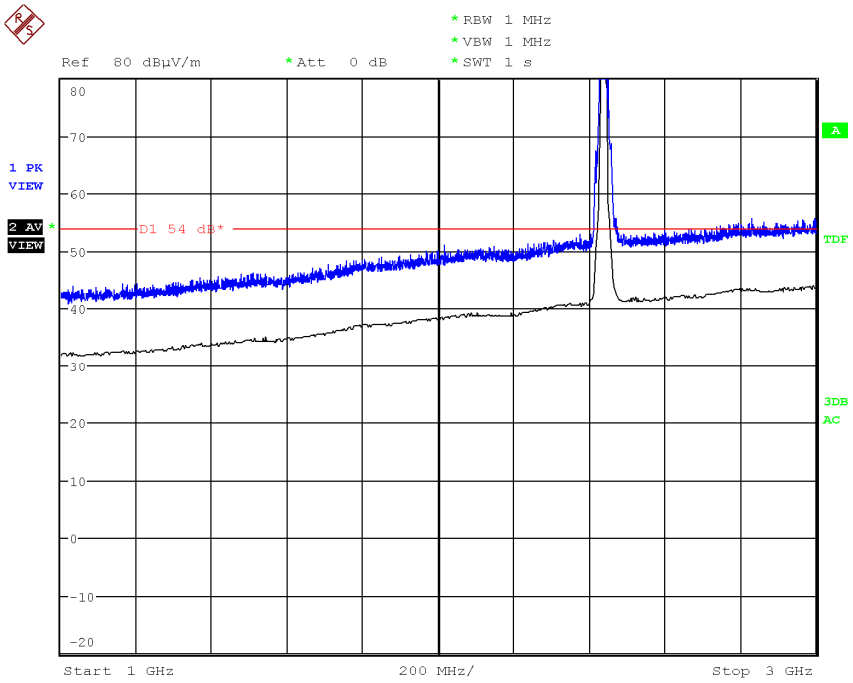
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

Chain A+B.



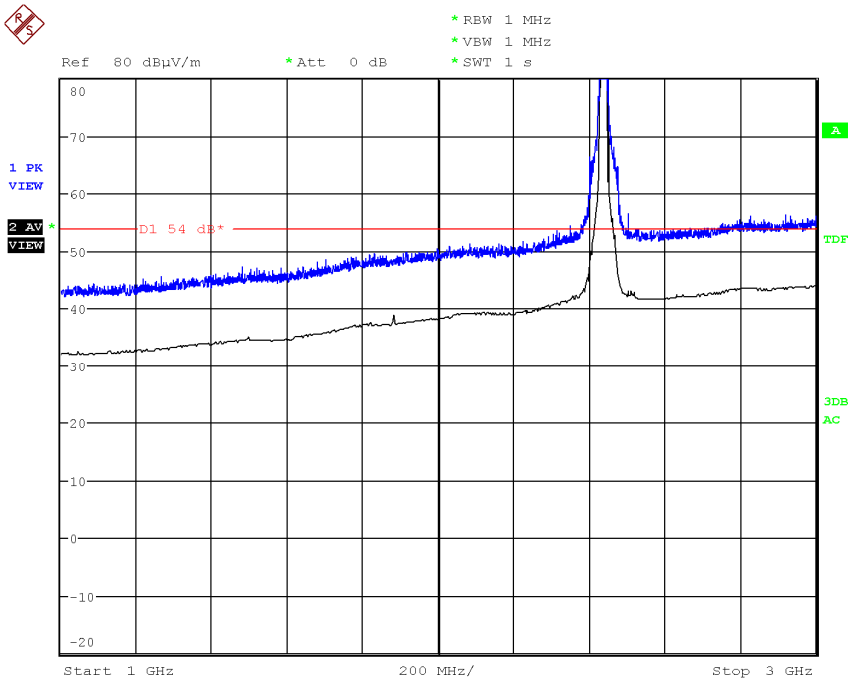
Note: The peak above the limit is the carrier frequency.

CHANNEL 6 (2437 MHz). Only the carrier was detected in both chains.



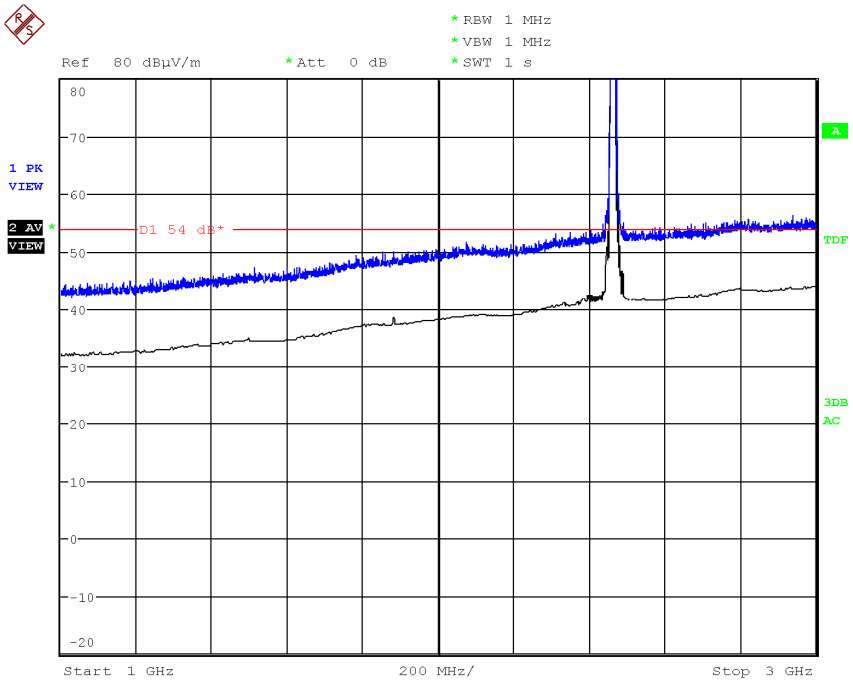
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

Chain A+B.



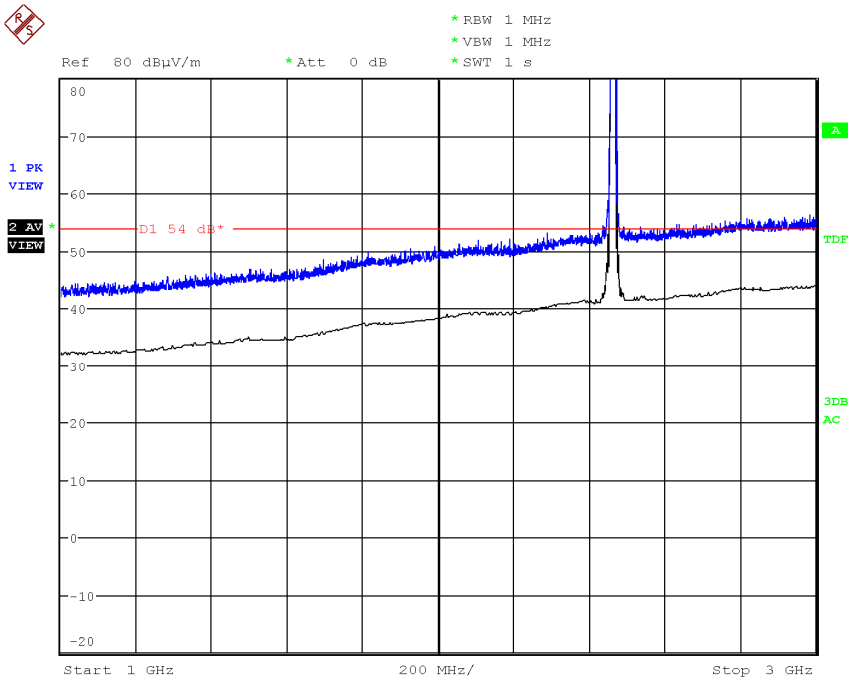
Note: The peak above the limit is the carrier frequency.

CHANNEL 11 (2462 MHz). Only the carrier was detected in both chains.



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

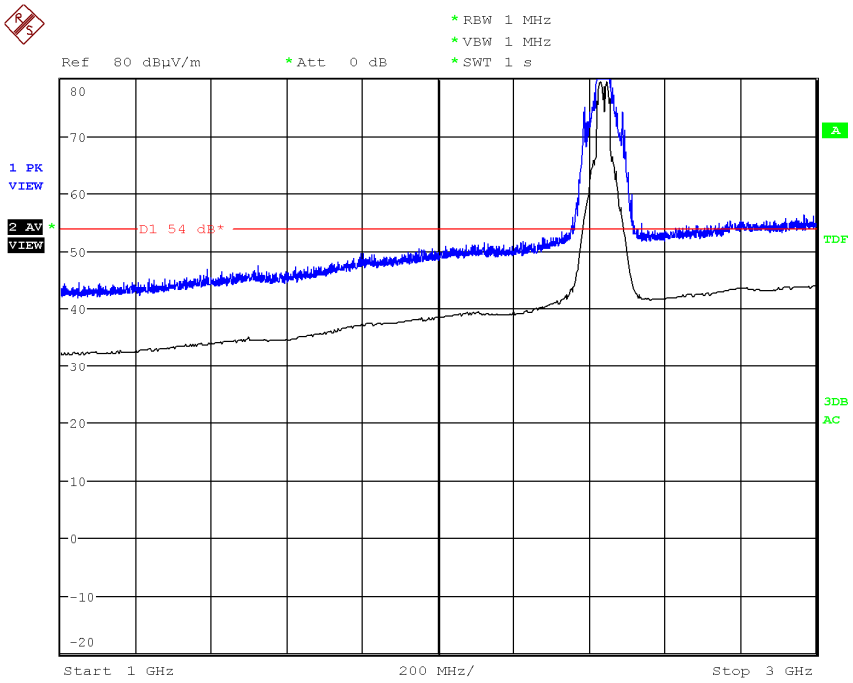
Chain A+B.



Note: The peak above the limit is the carrier frequency.

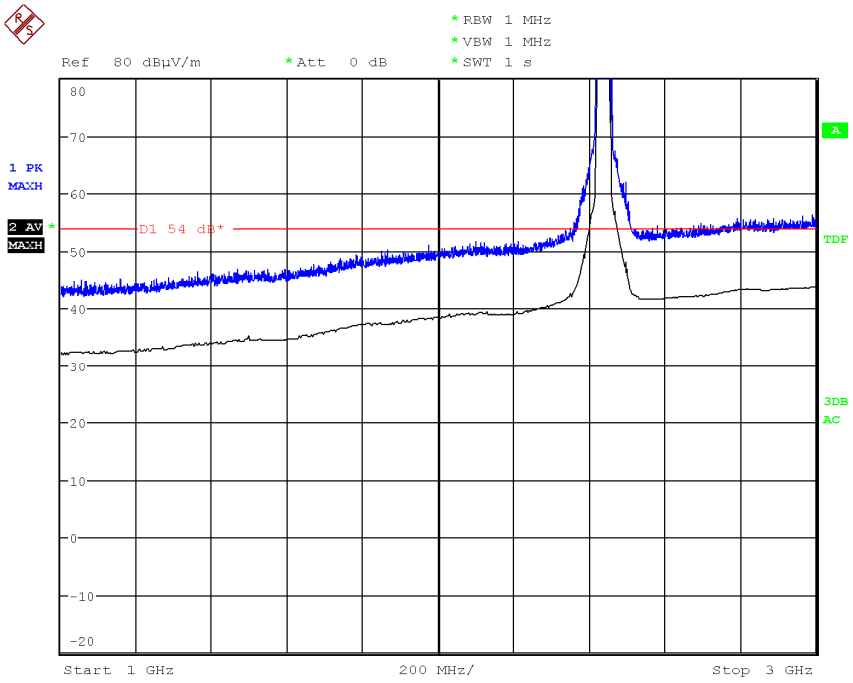
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 6 (2437 MHz). Only the carrier was detected in both chains.



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

Chain A+B.



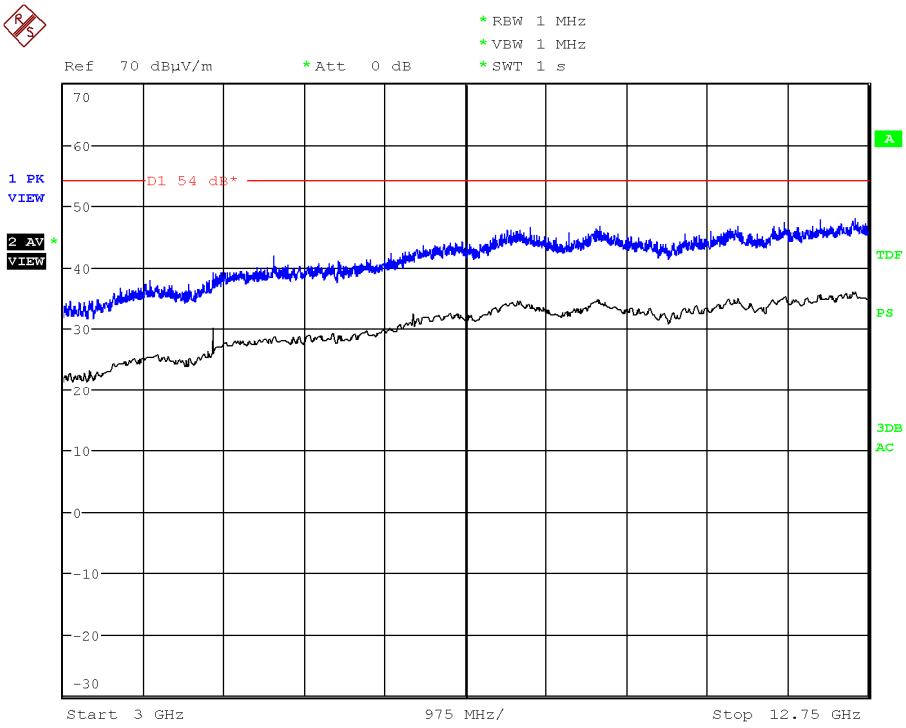
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 12.75 GHz.

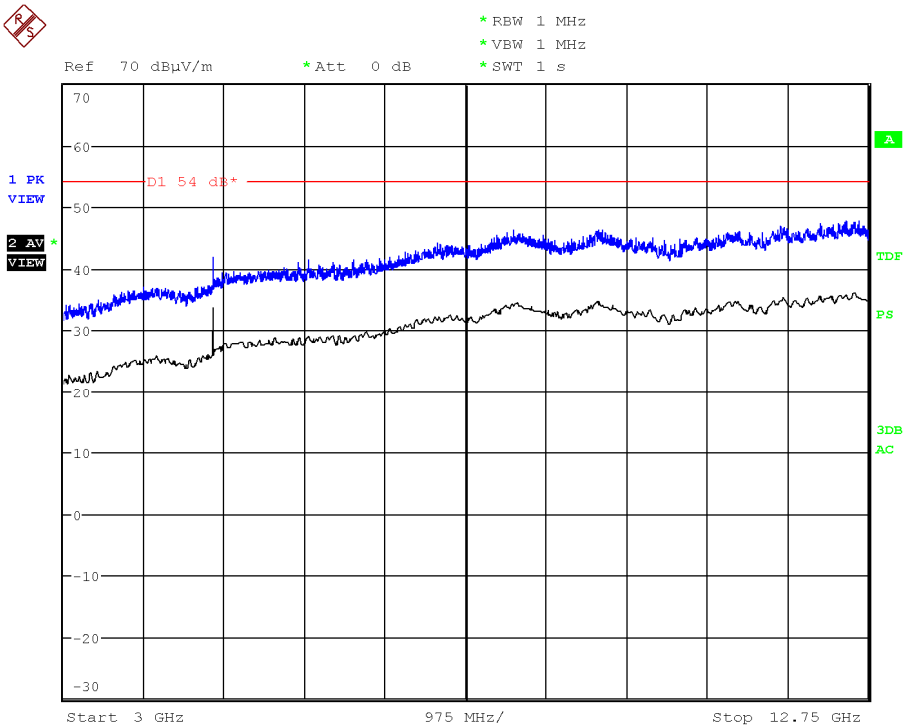
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

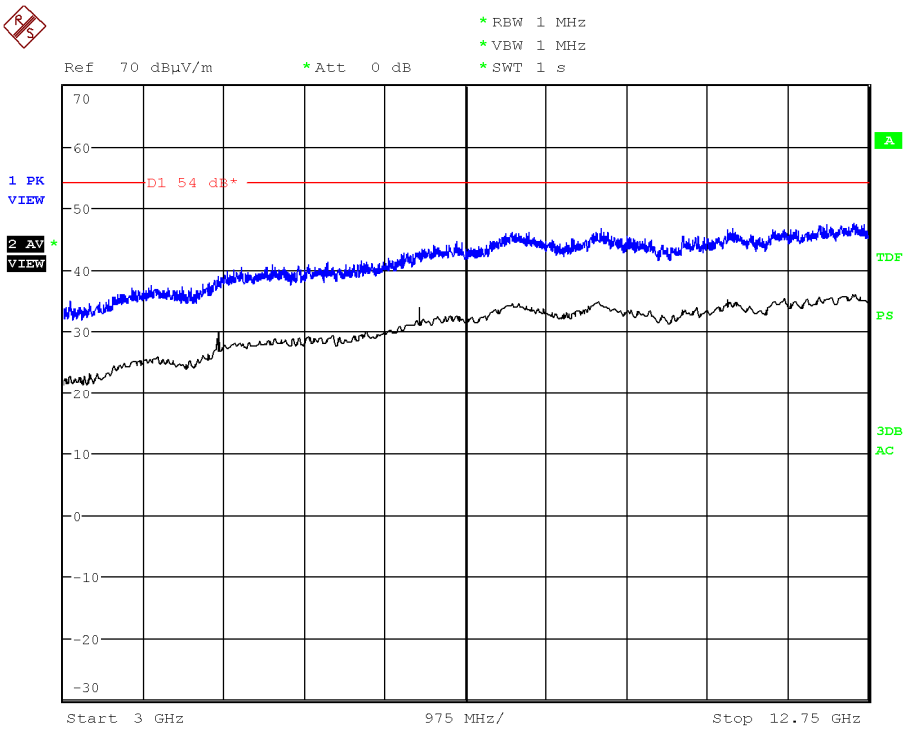


Chain B

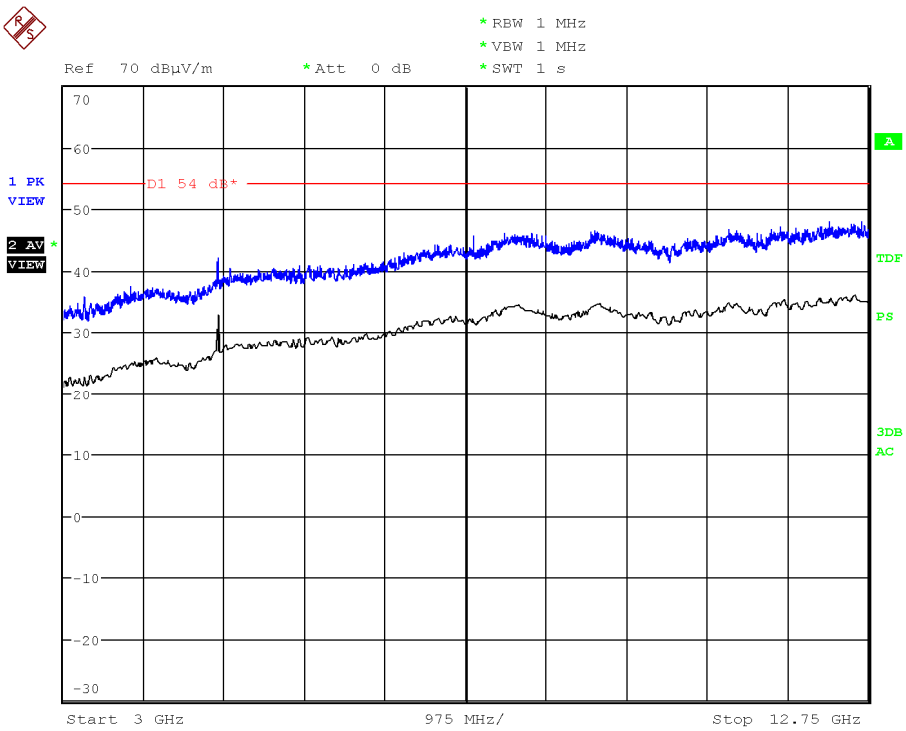


CHANNEL 6 (2437 MHz).

Chain A

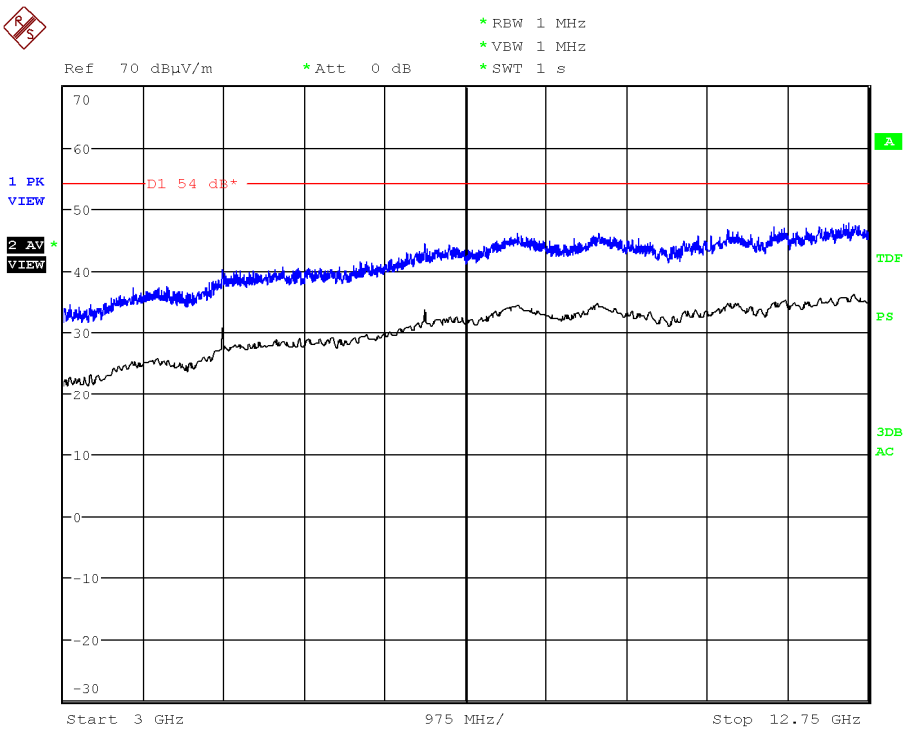


Chain B

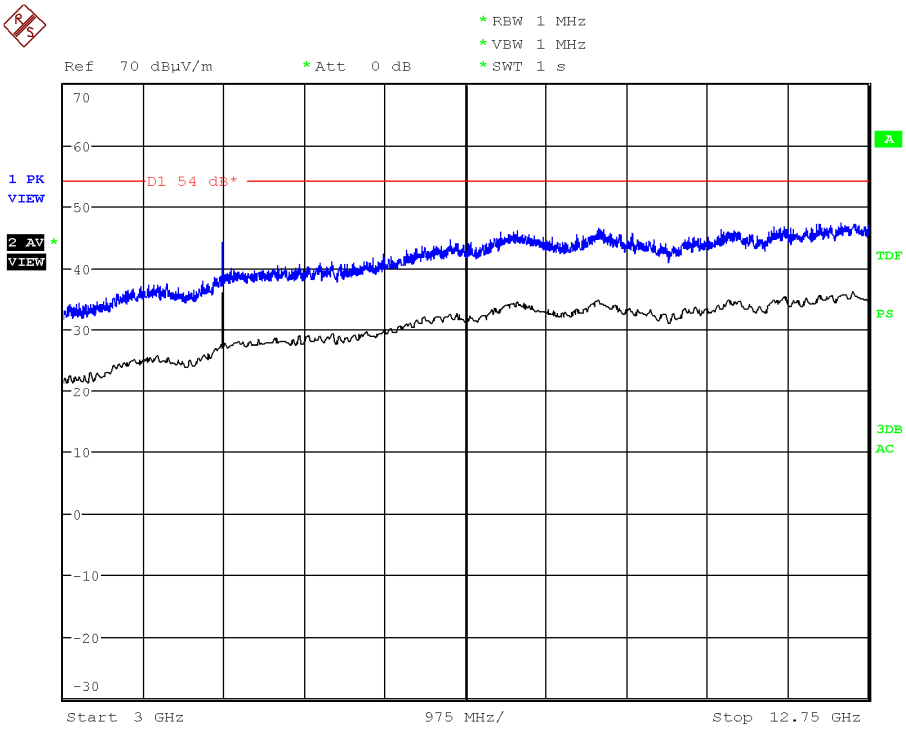


CHANNEL 11 (2462 MHz).

Chain A



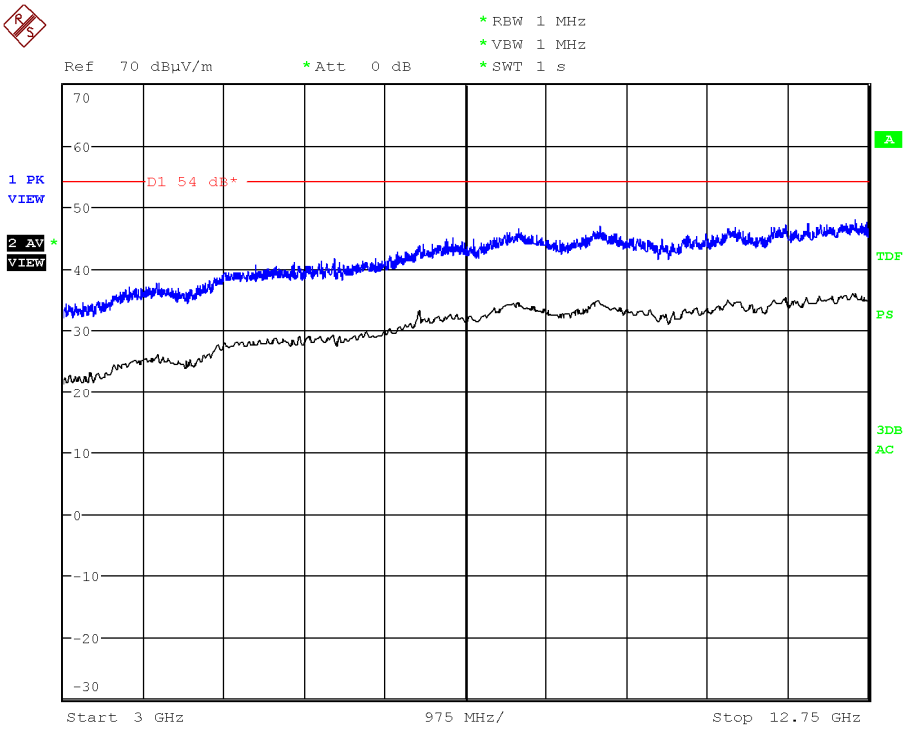
Chain B



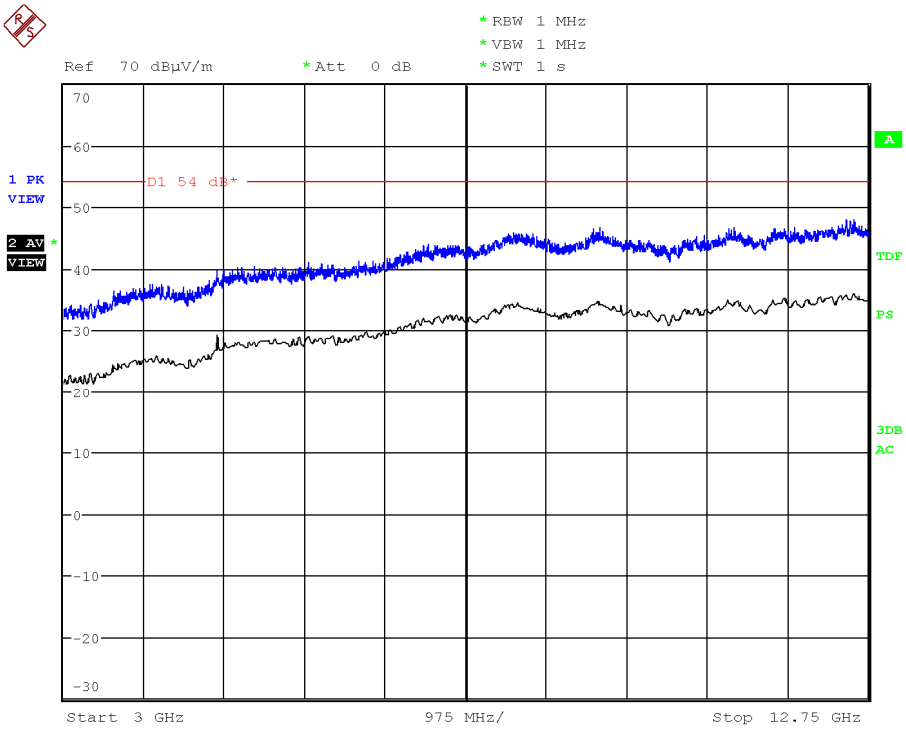
2. WiFi 2.4GHz 802.11 g mode

CHANNEL 6 (2437 MHz).

Chain A



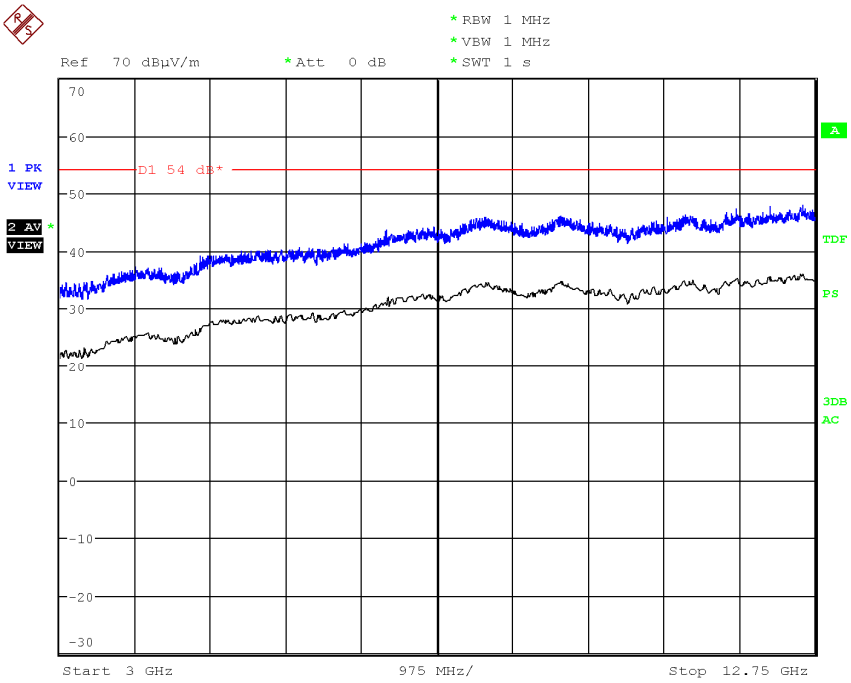
Chain B



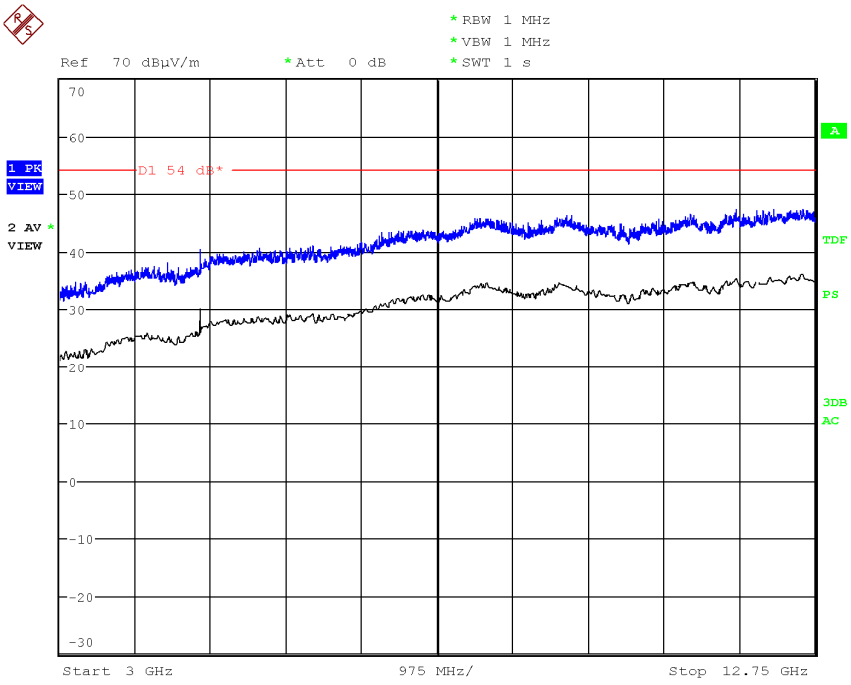
3.WiFi 2.4GHz 802.11 n20 mode (worst case)

CHANNEL 1 (2412 MHz).

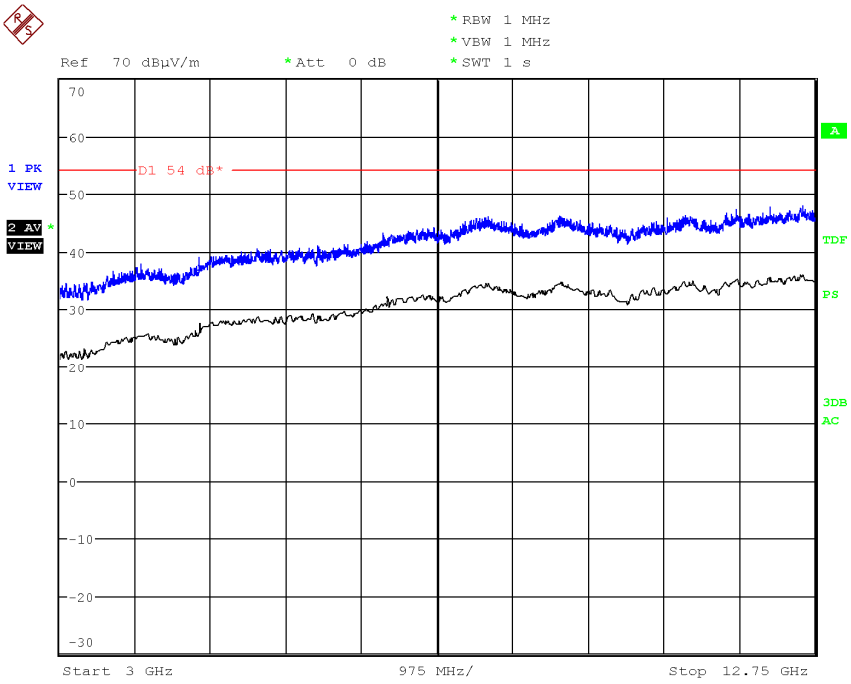
Chain A



Chain B

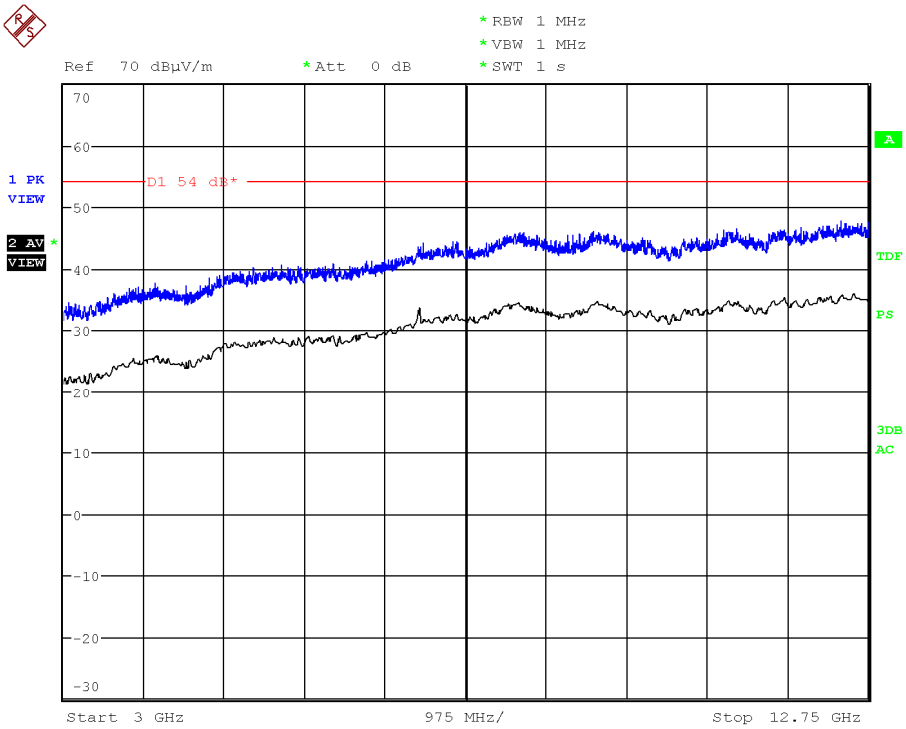


Chain A+B

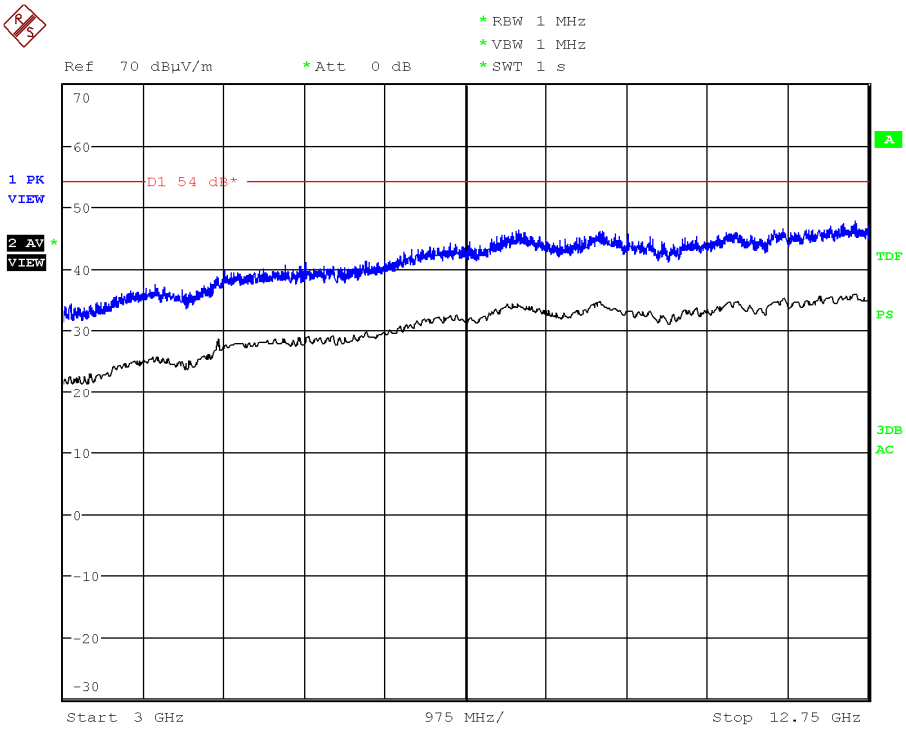


CHANNEL 6 (2437 MHz).

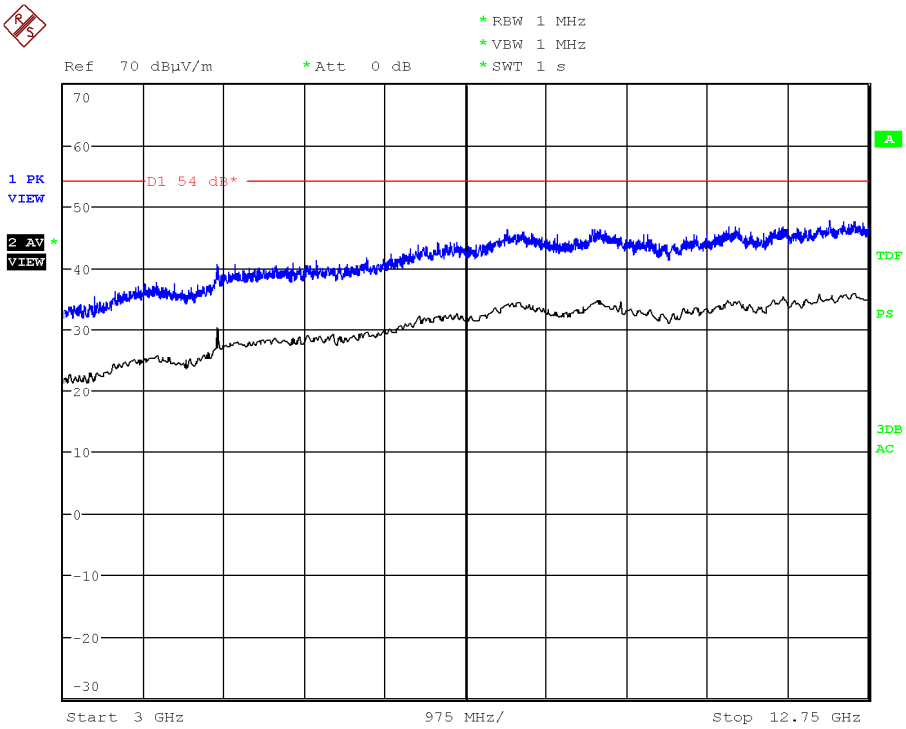
Chain A.



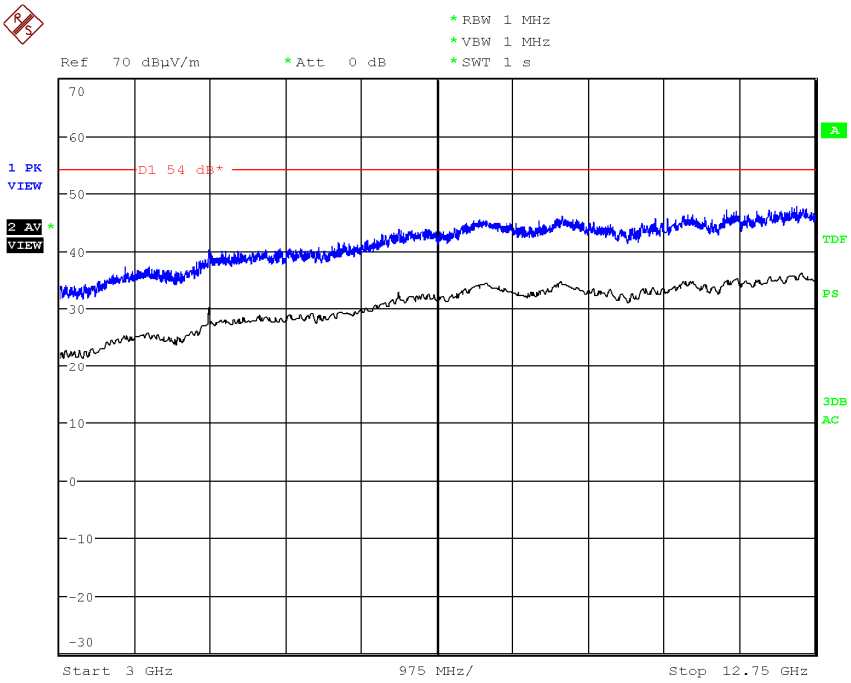
Chain B.



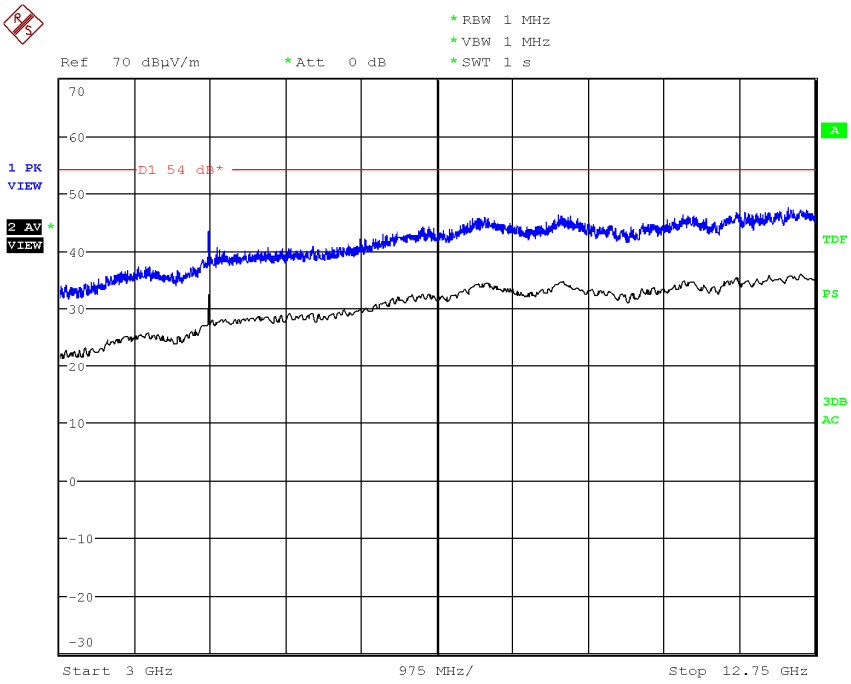
Chain A+B.



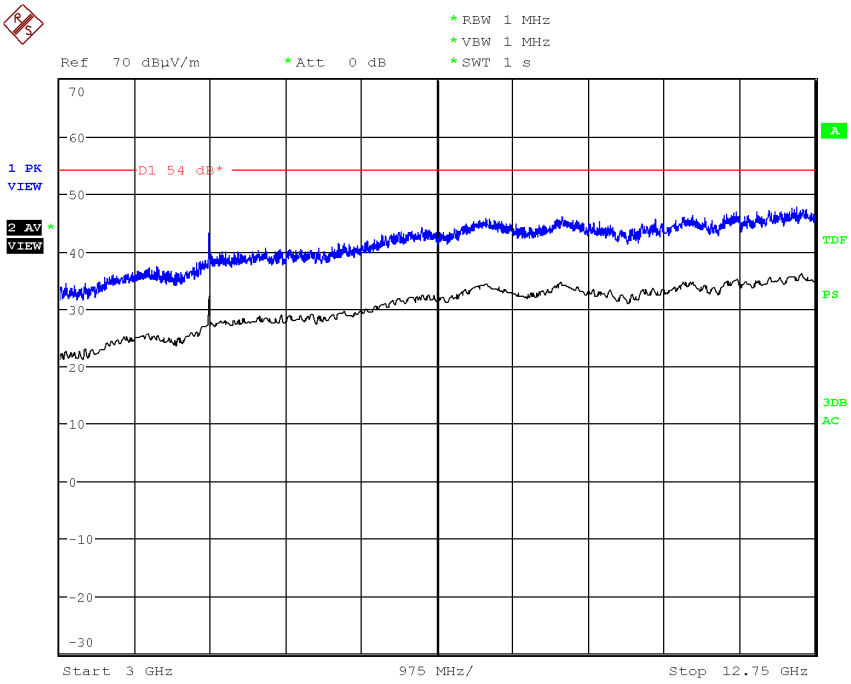
CHANNEL 11 (2462 MHz).
Chain A



Chain B



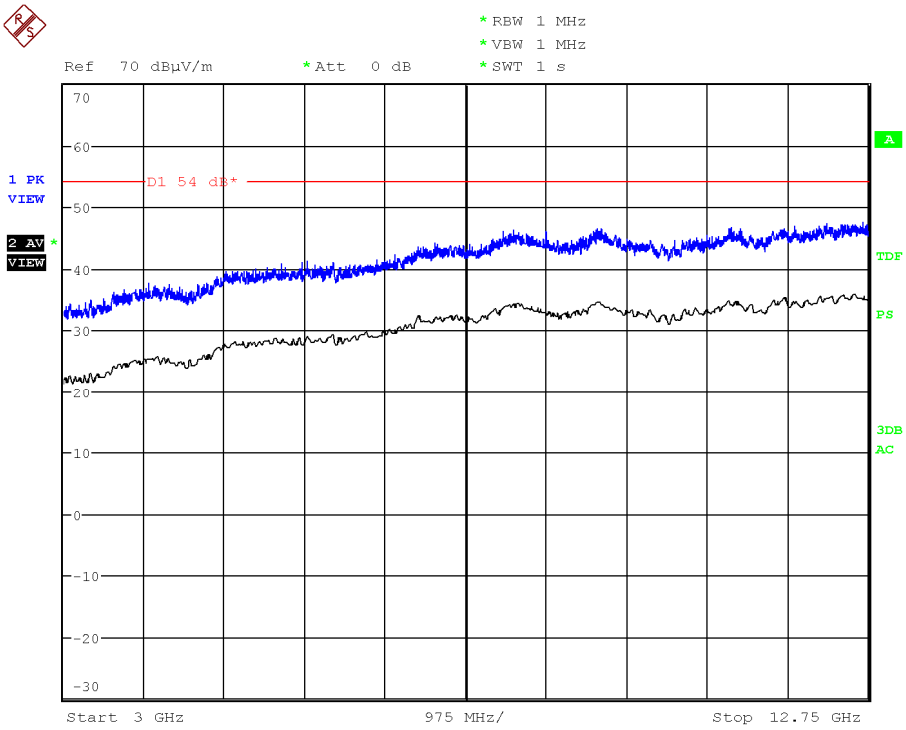
Chain A+B



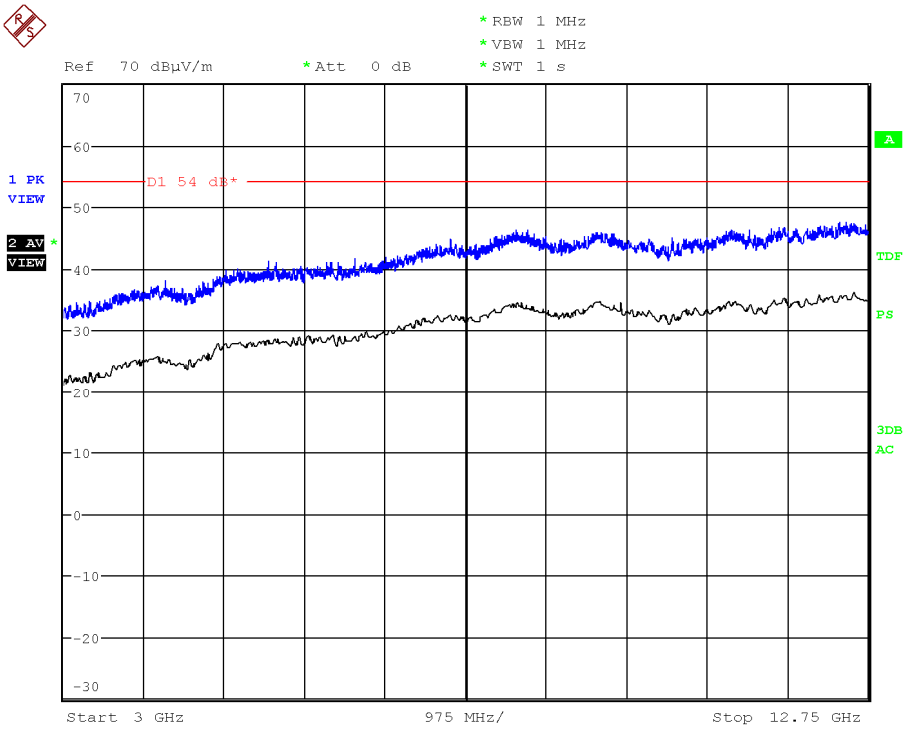
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 6 (2437 MHz).

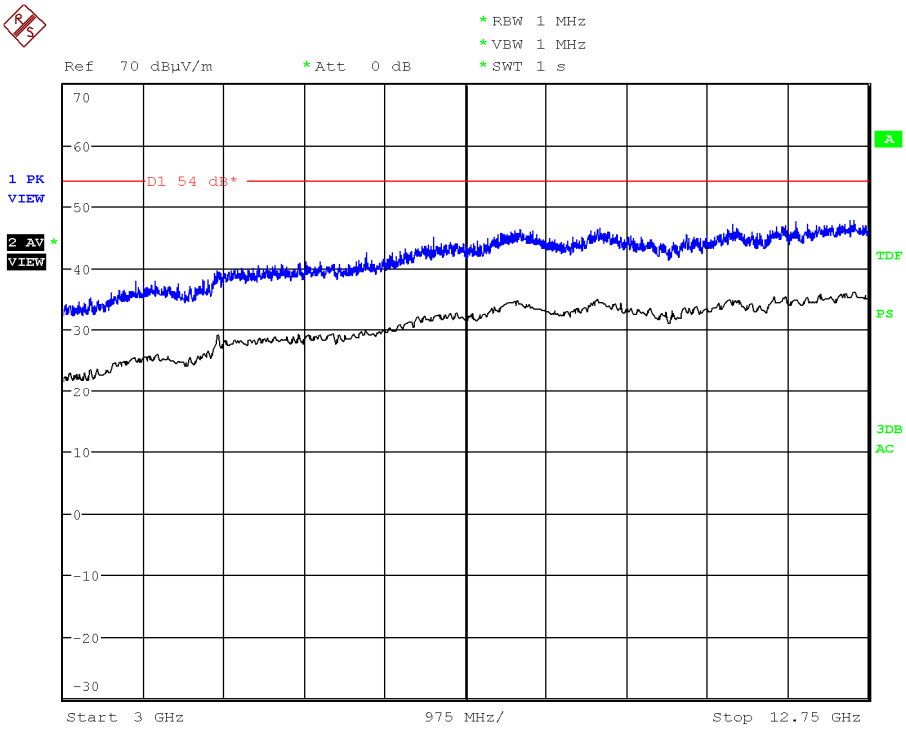
Chain A.



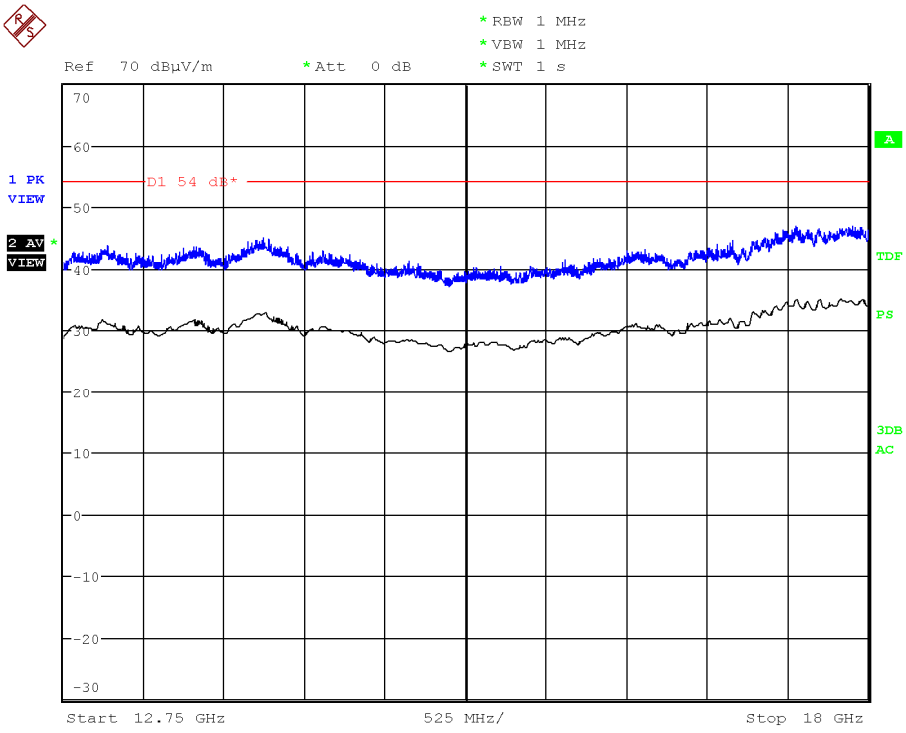
Chain B



Chain A+B

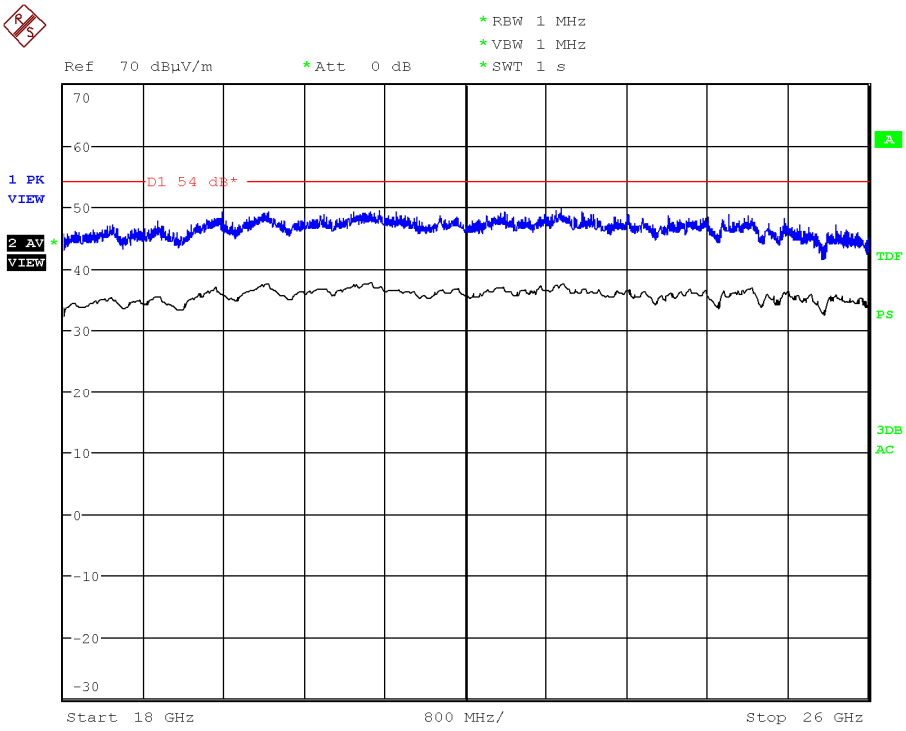


FREQUENCY RANGE 12.75 GHz to 18 GHz. No spurious signals were detected in all modulation modes and channels tested.



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

FREQUENCY RANGE 18 GHz to 25 GHz. No spurious signals were detected.



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

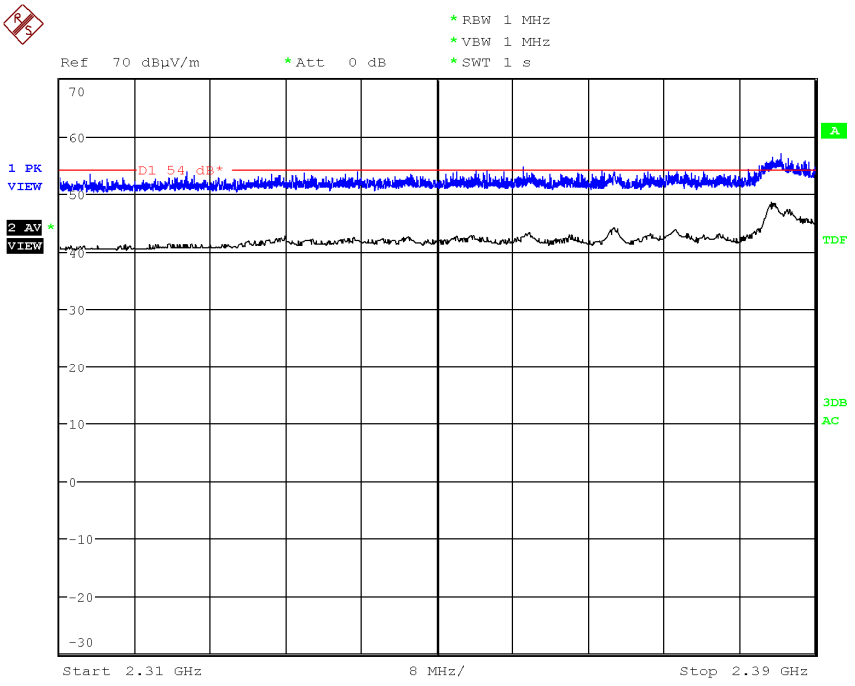
Radiated spurious emissions at band-edges and inside restricted bands 2.31-2.39 GHz and 2.4835 – 2.5 GHz.

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

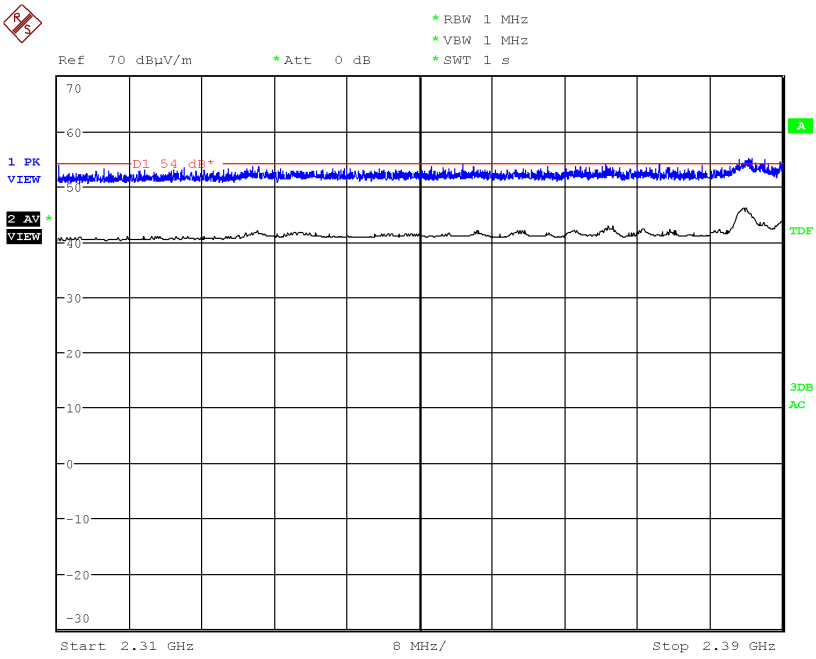
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

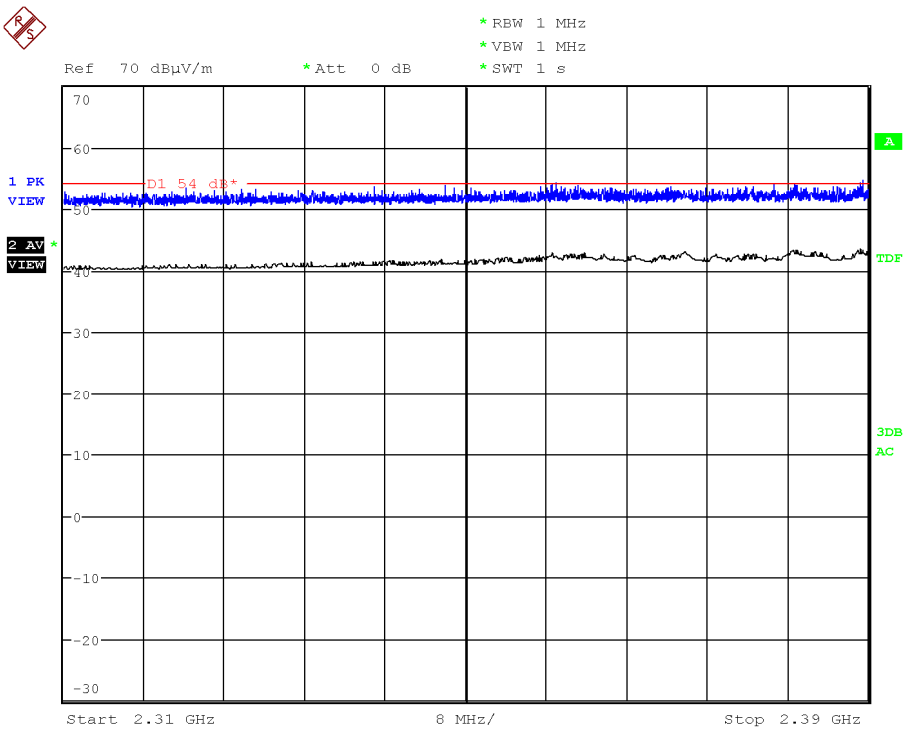


Chain B

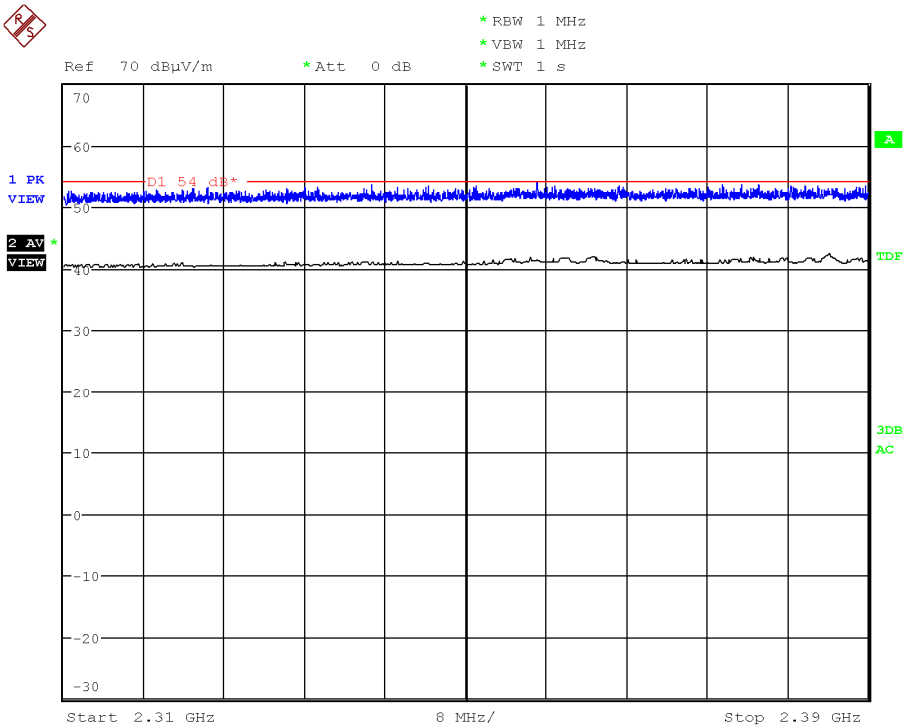


CHANNEL 6 (2437 MHz).

Chain A

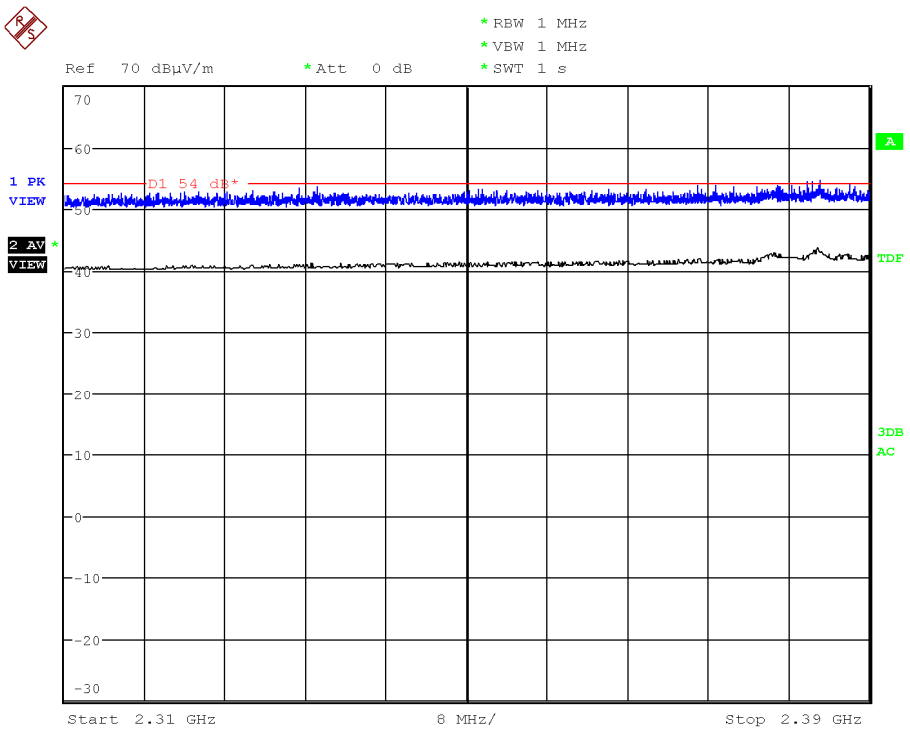


Chain B

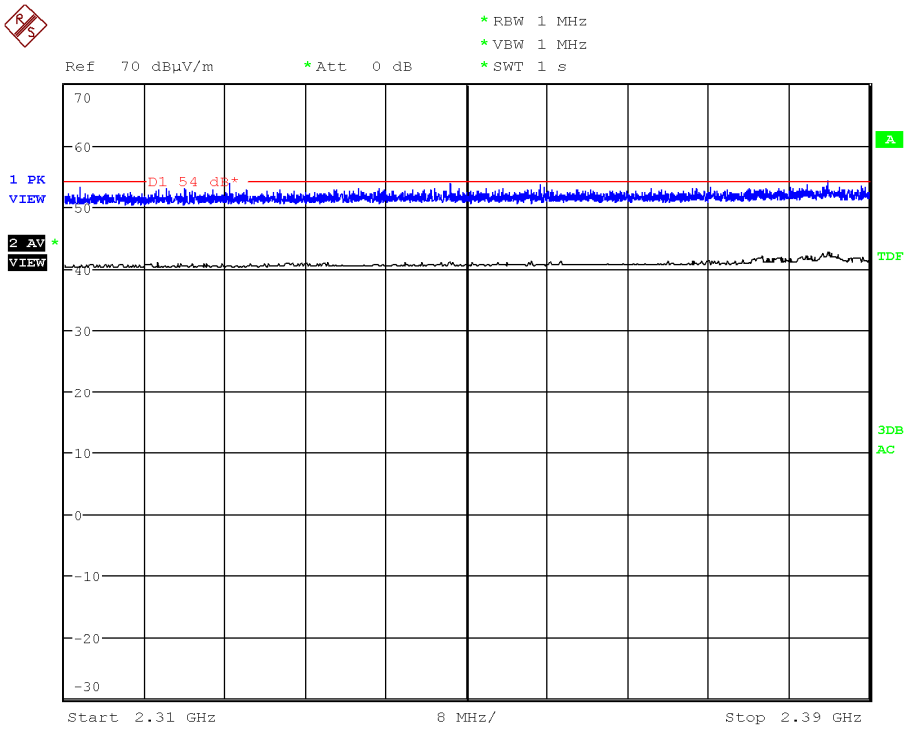


CHANNEL 11 (2462 MHz).

Chain A



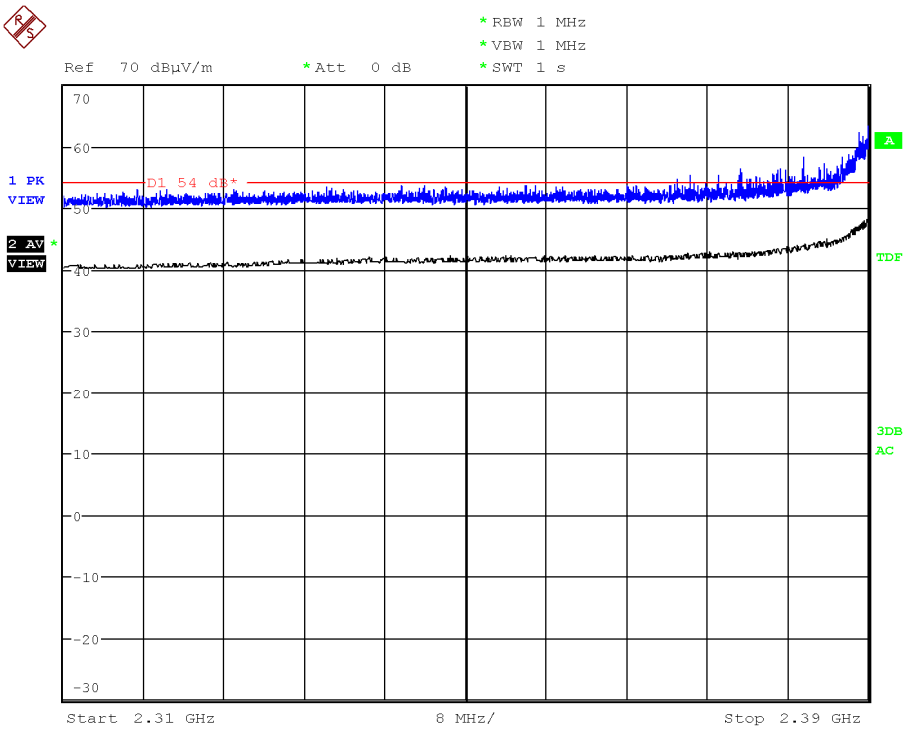
Chain B



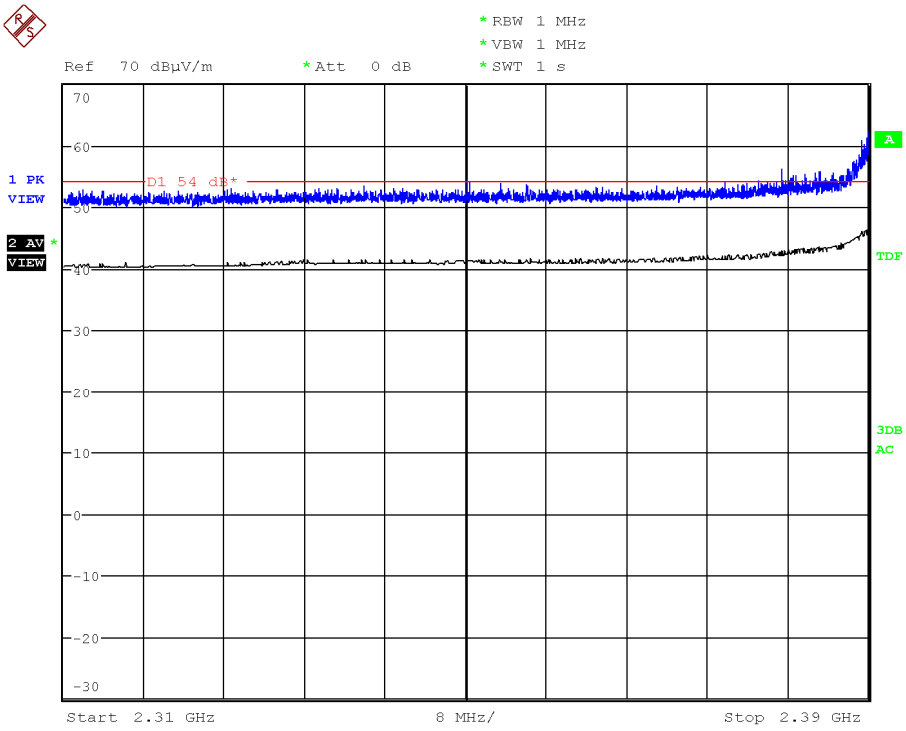
2. WiFi 2.4GHz 802.11 g mode

CHANNEL 1 (2412 MHz).

Chain A

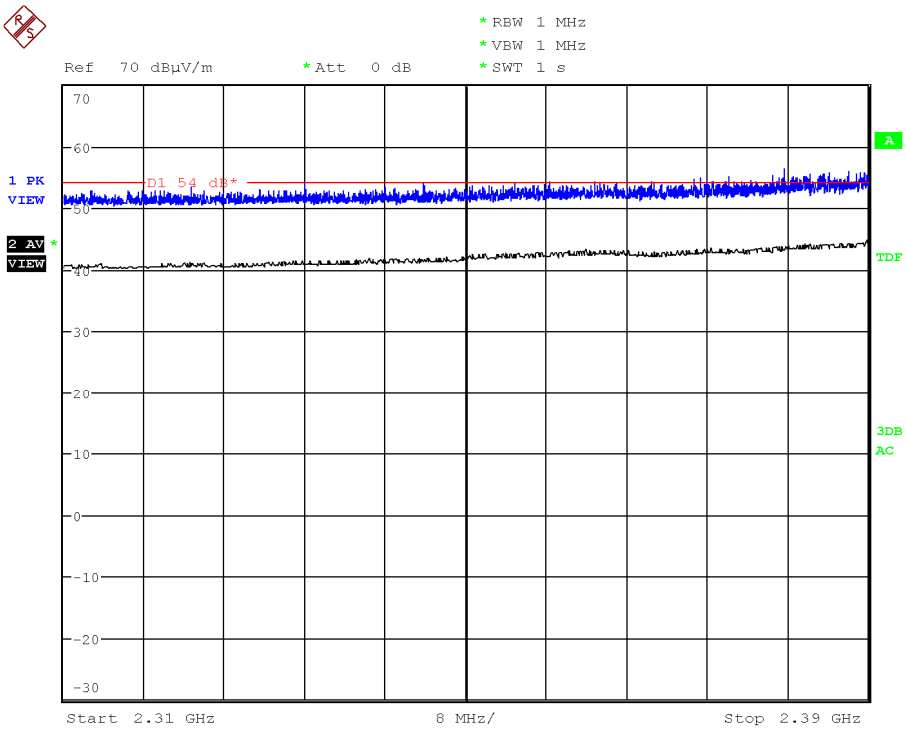


Chain B

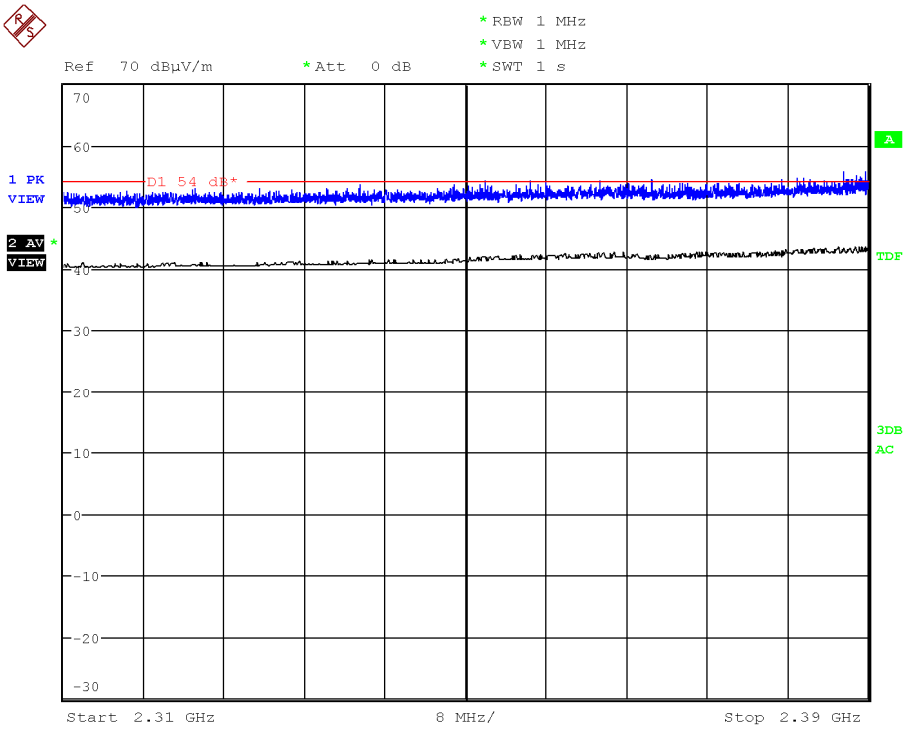


CHANNEL 6 (2437 MHz).

Chain A

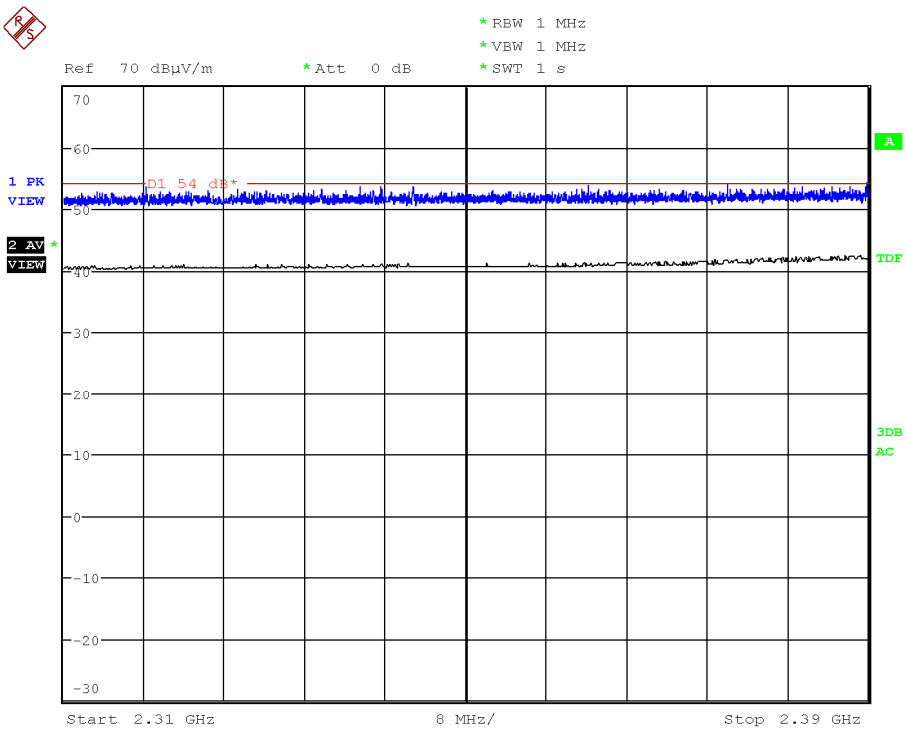


Chain B

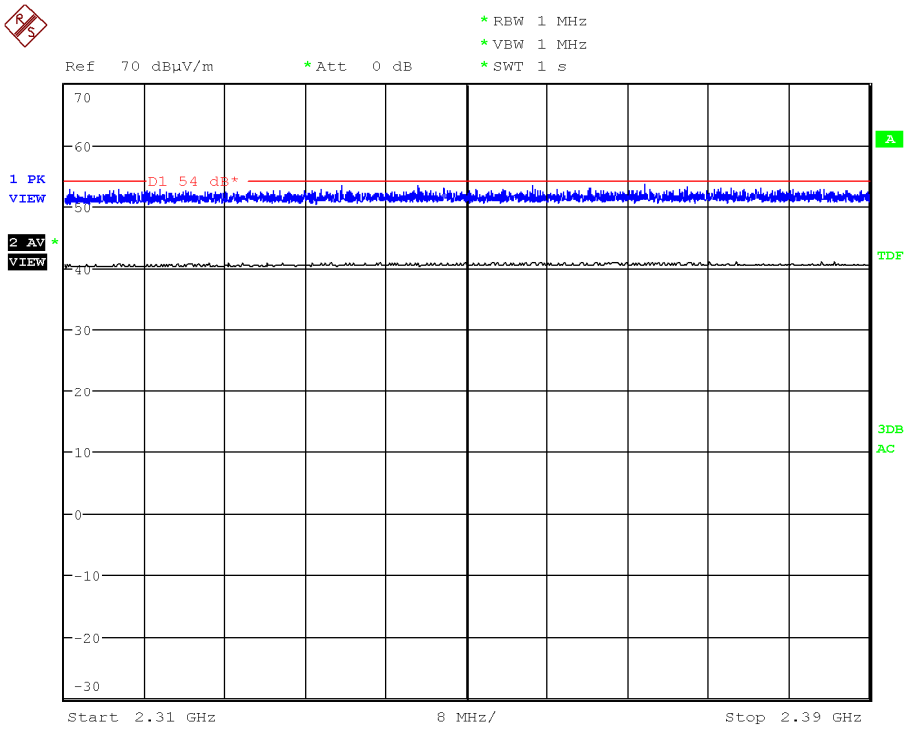


CHANNEL 11 (2462 MHz).

Chain A



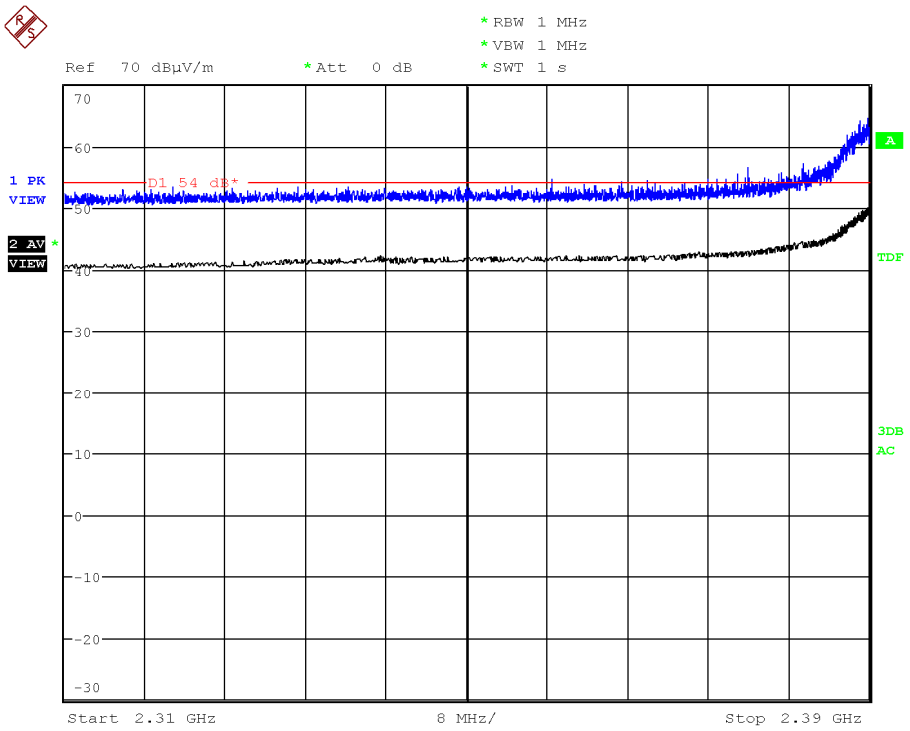
Chain B



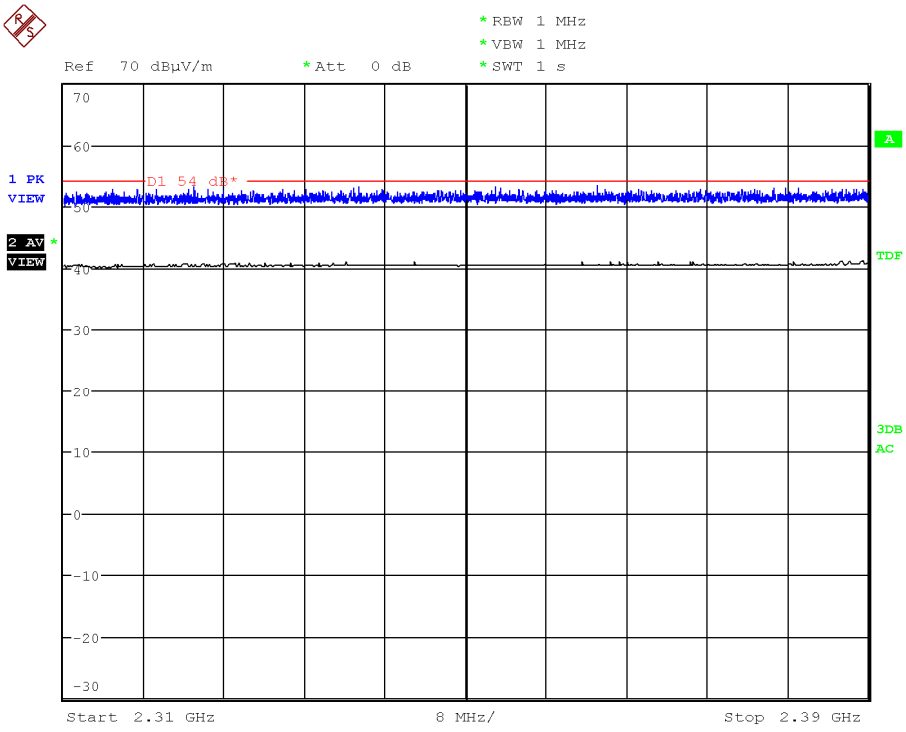
3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 1 (2412 MHz).

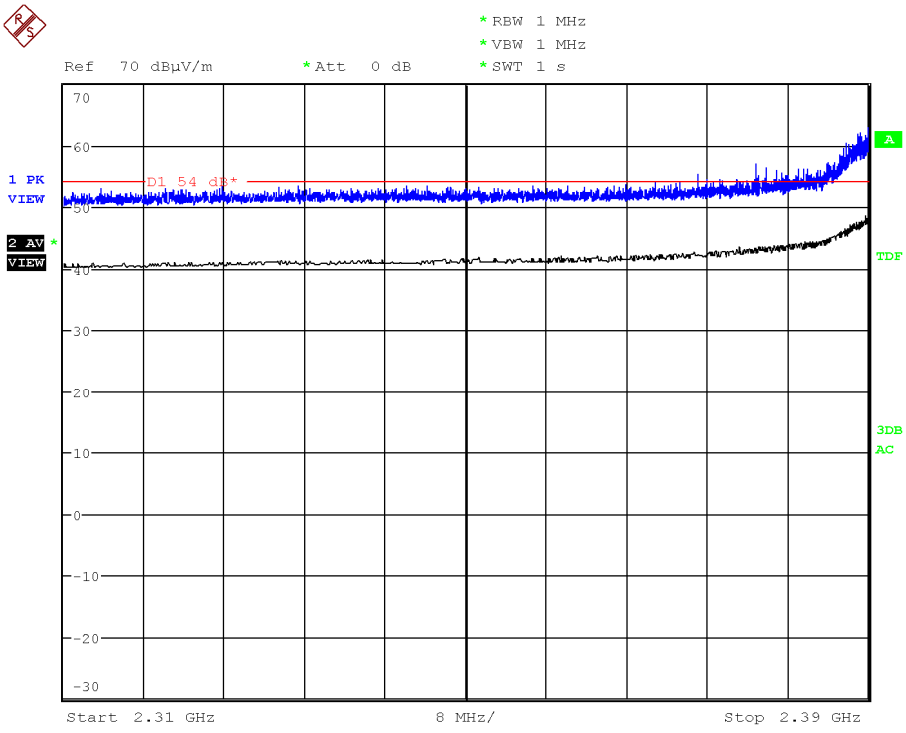
Chain A



Chain B

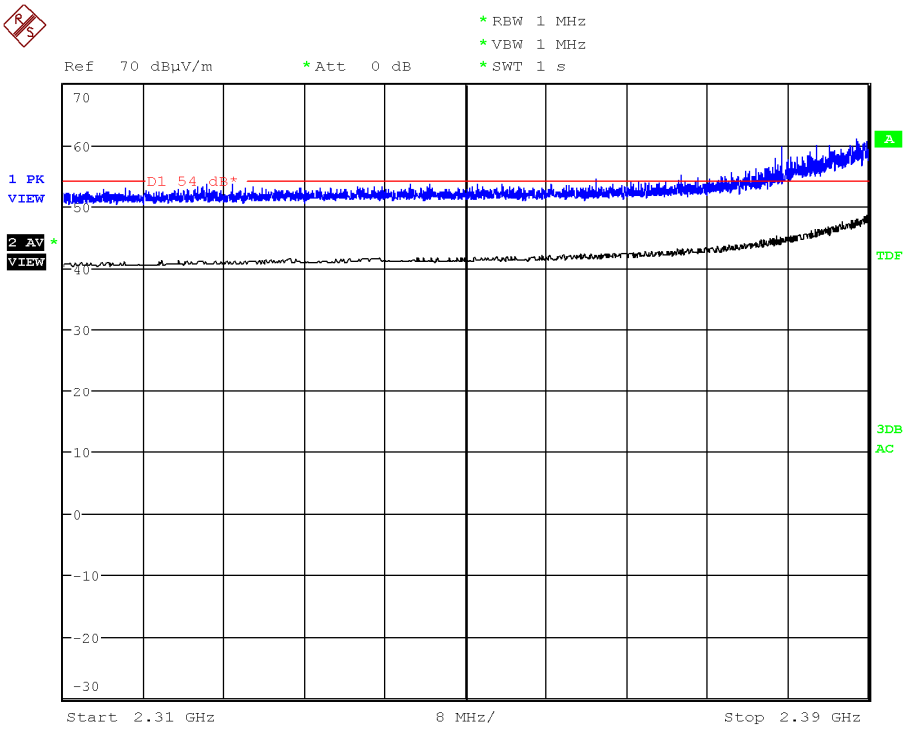


Chain A+B

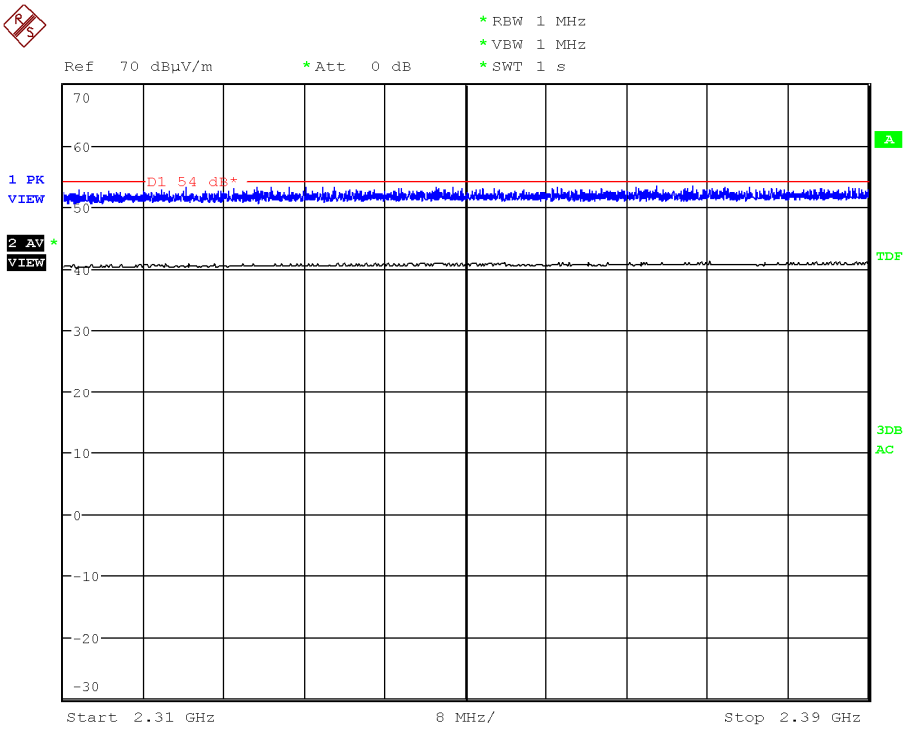


CHANNEL 2 (2417 MHz).

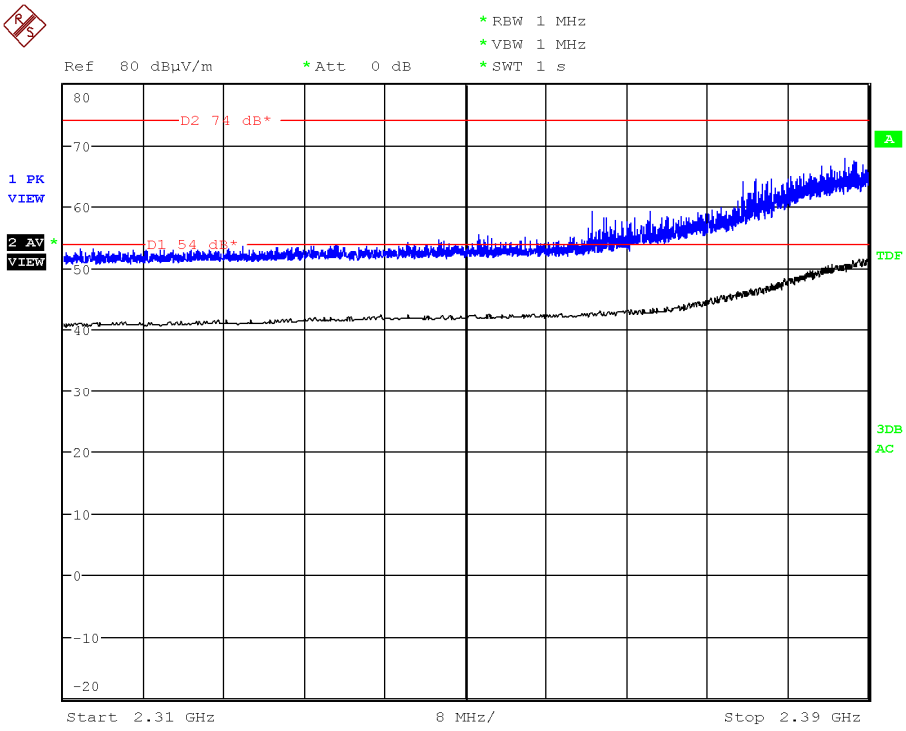
Chain A



Chain B

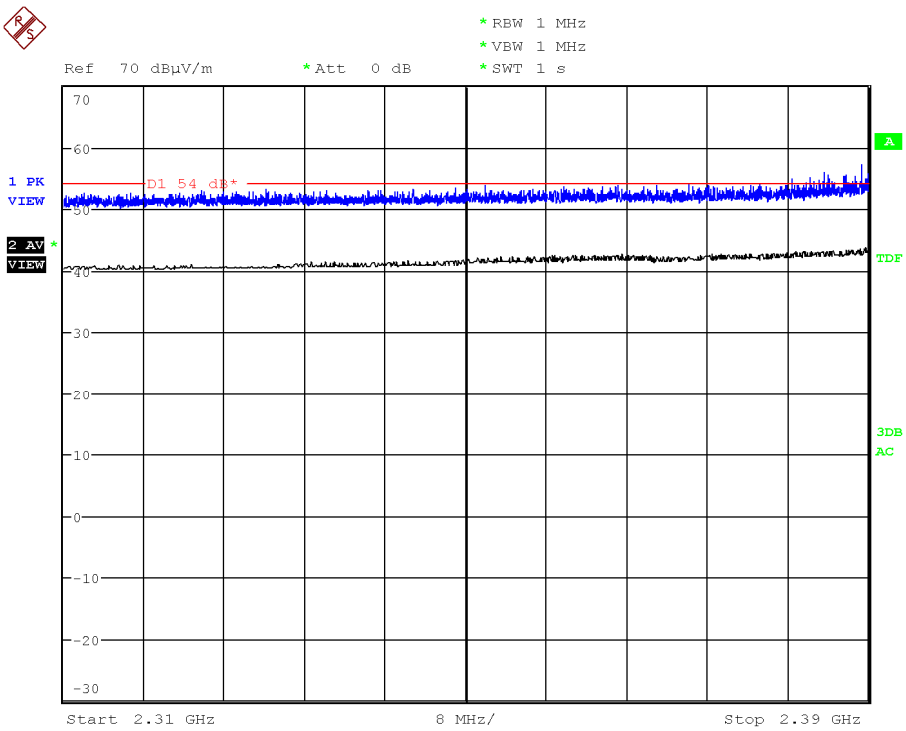


Chain A+B

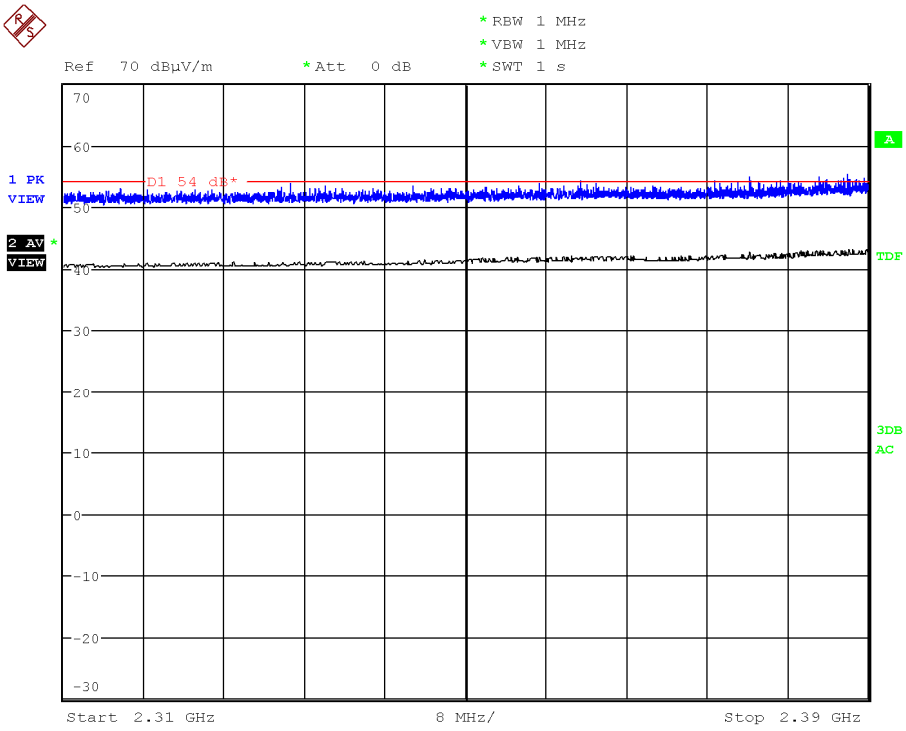


CHANNEL 6 (2437MHz).

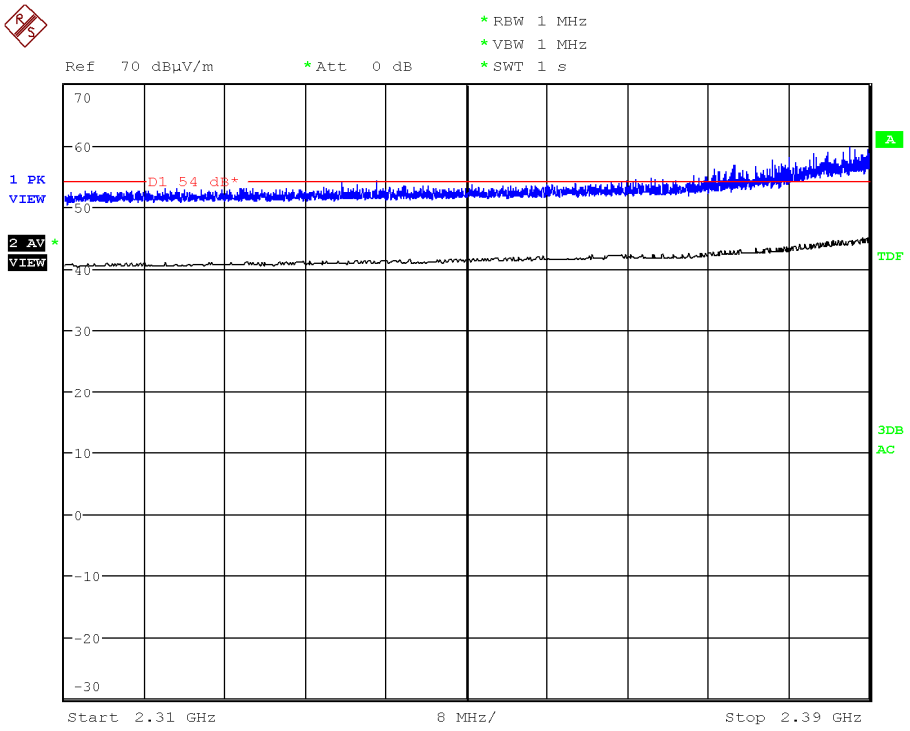
Chain A



Chain B



Chain A+B

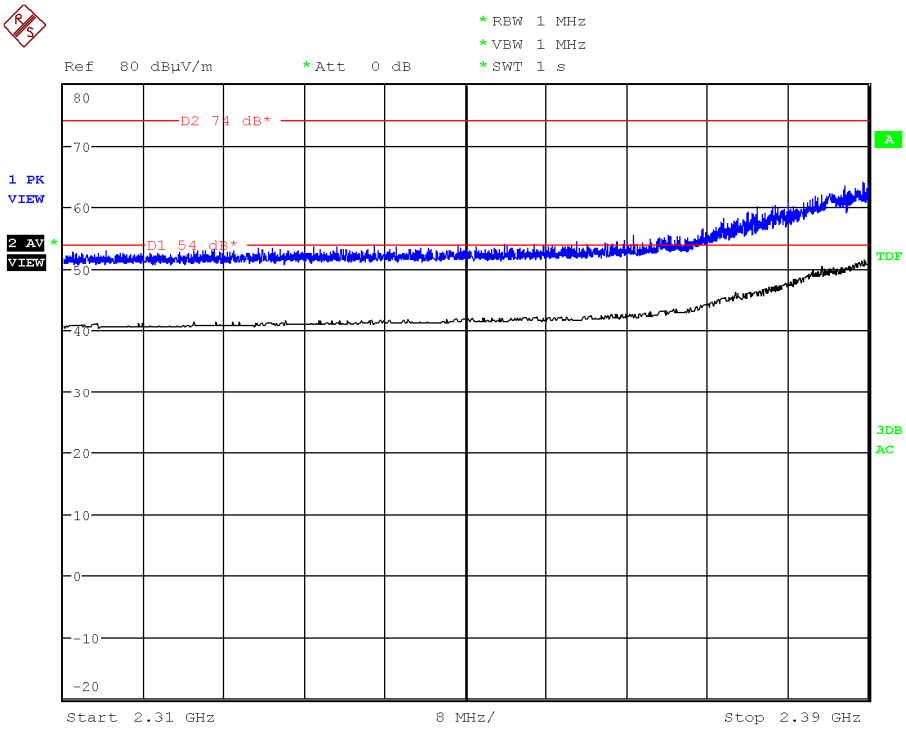


---

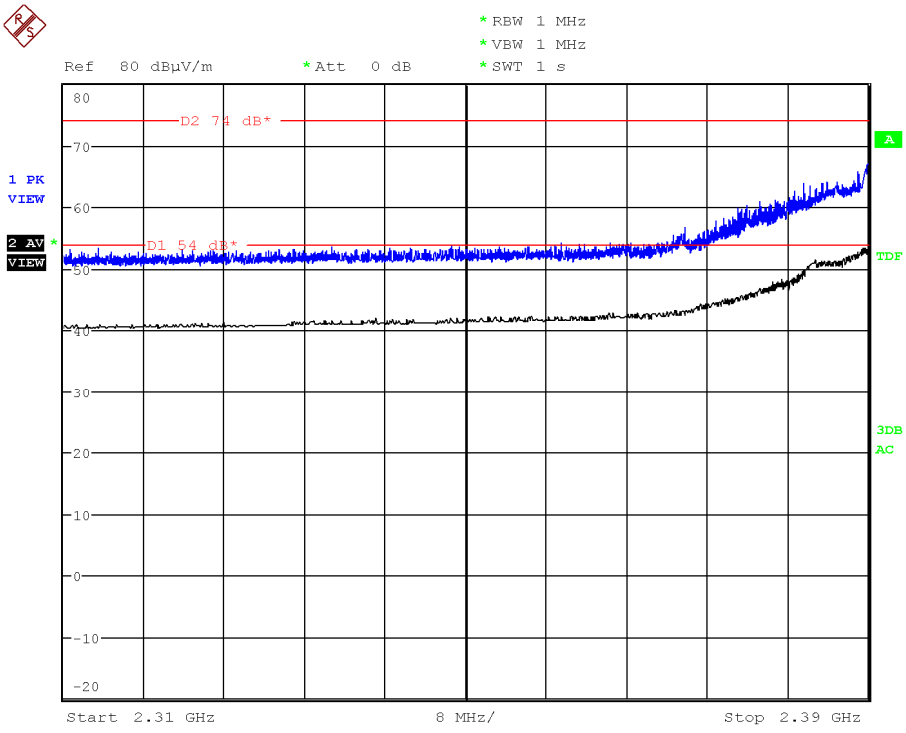
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 3 (2422 MHz).

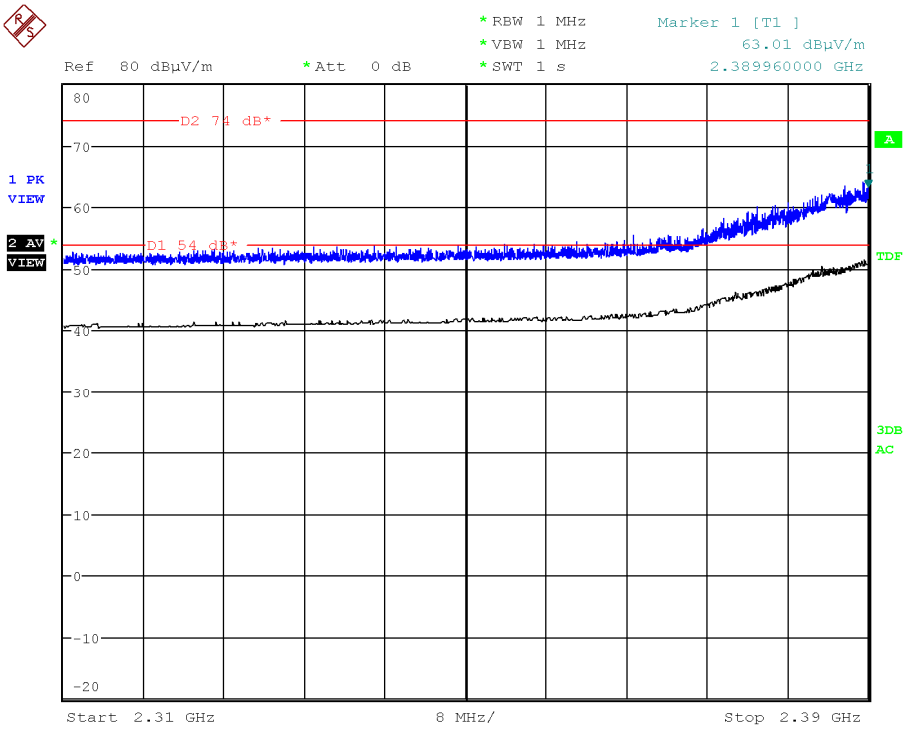
Chain A



Chain B

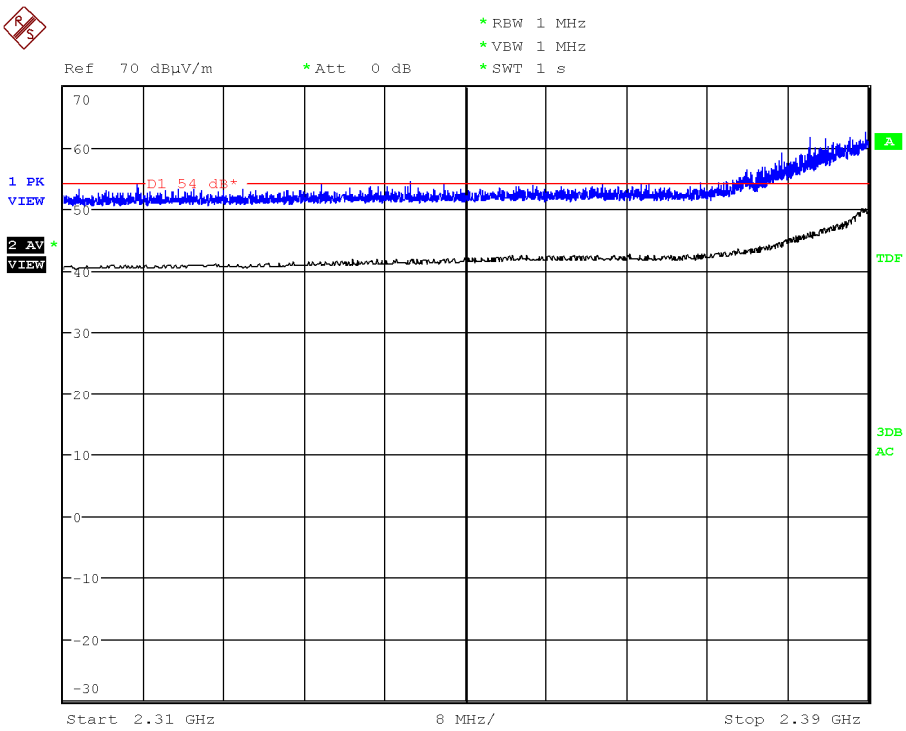


Chain A+B

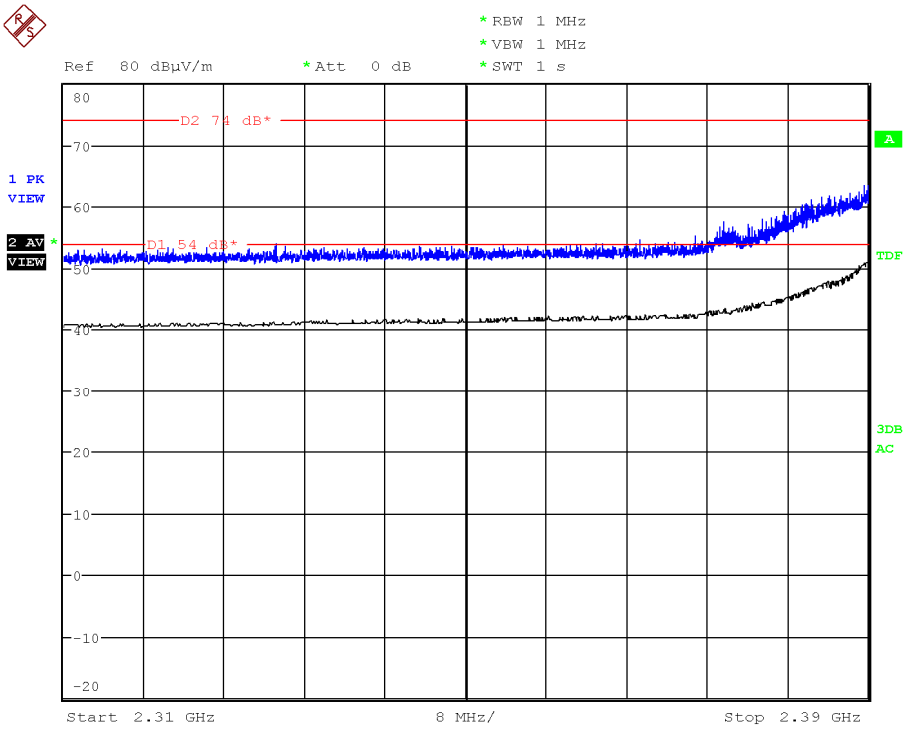


CHANNEL 4 (2427 MHz).

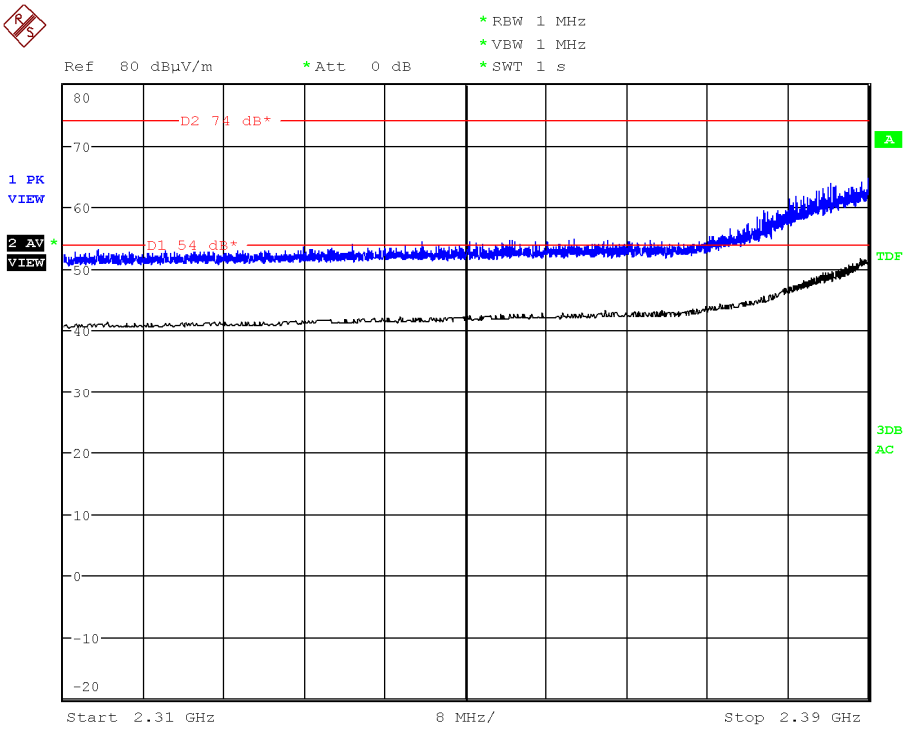
Chain A



Chain B

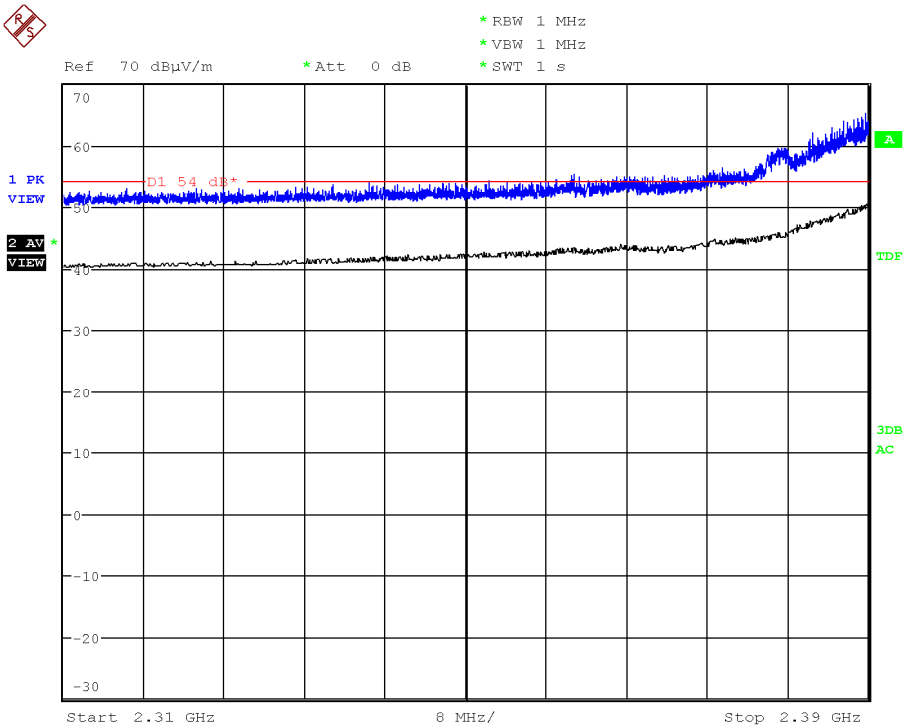


Chain A+B

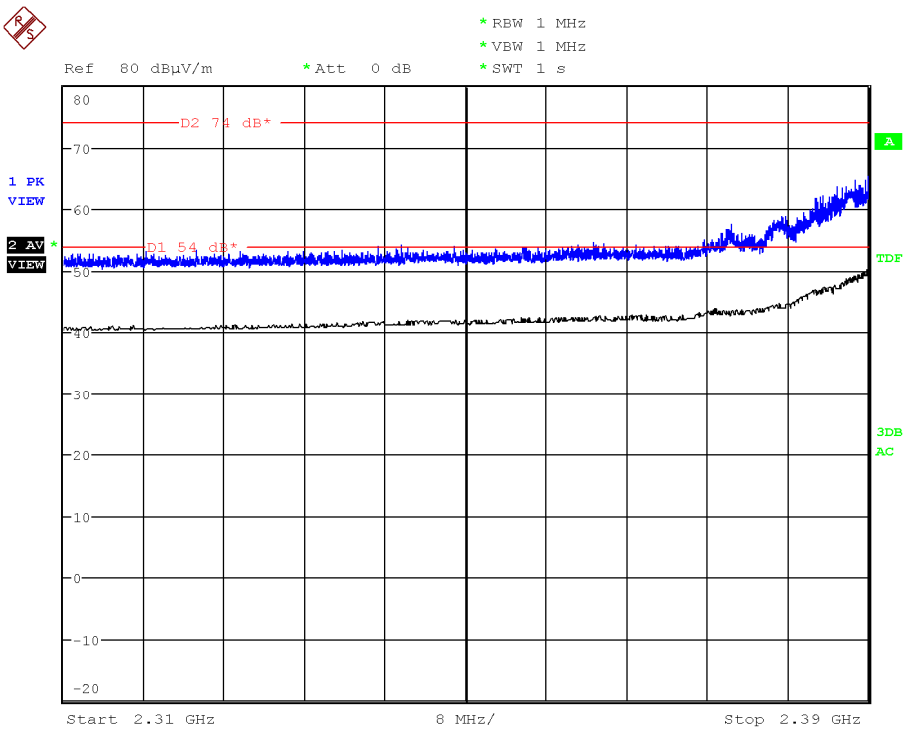


CHANNEL 5 (2432 MHz).

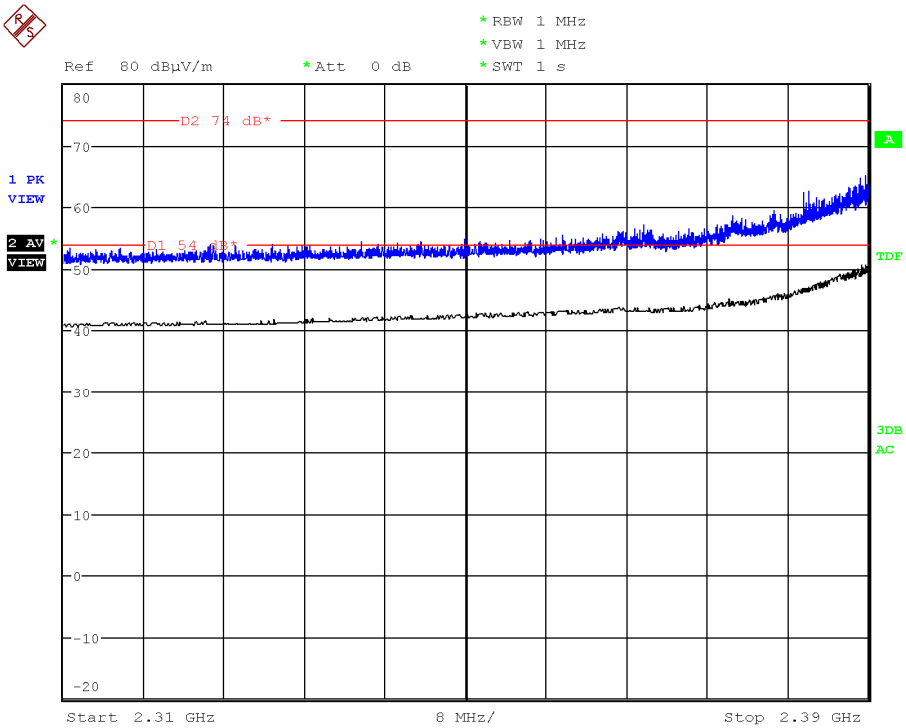
Chain A



Chain B

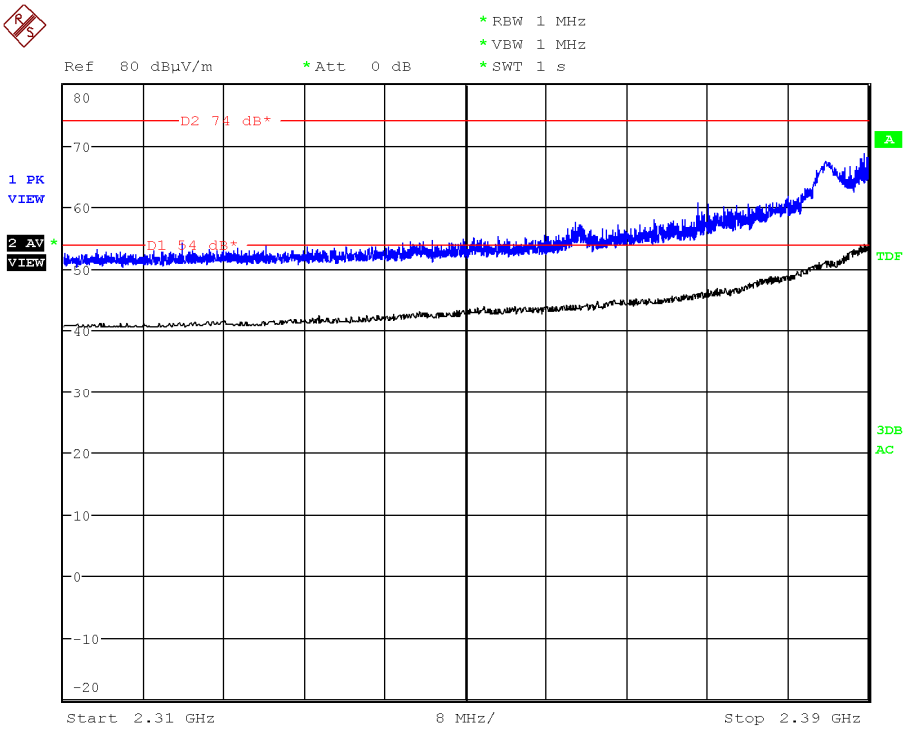


Chain A+B

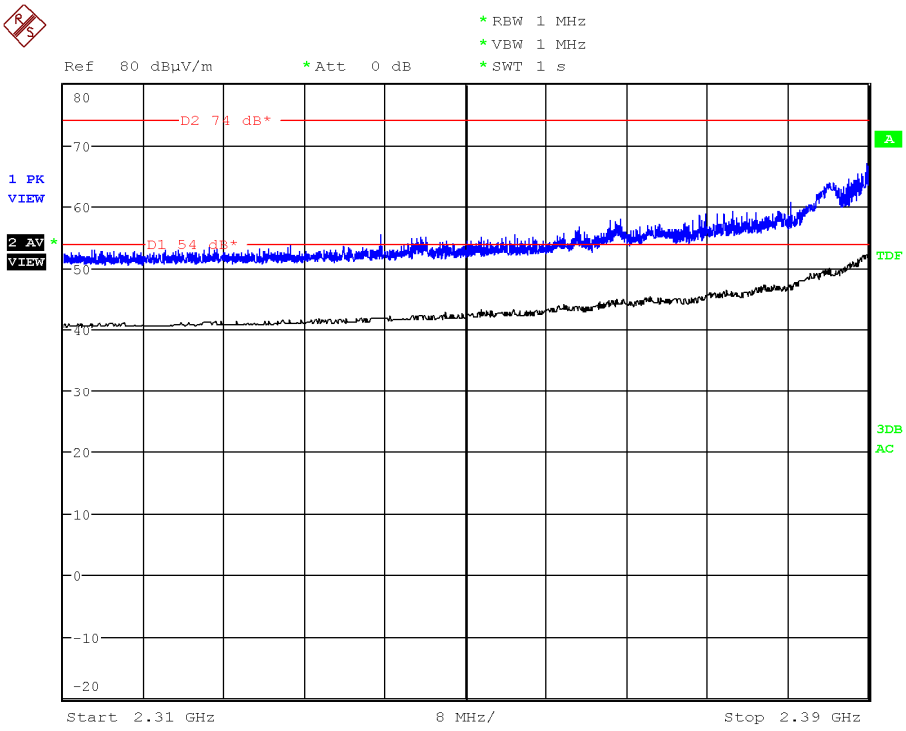


CHANNEL 6 (2437 MHz).

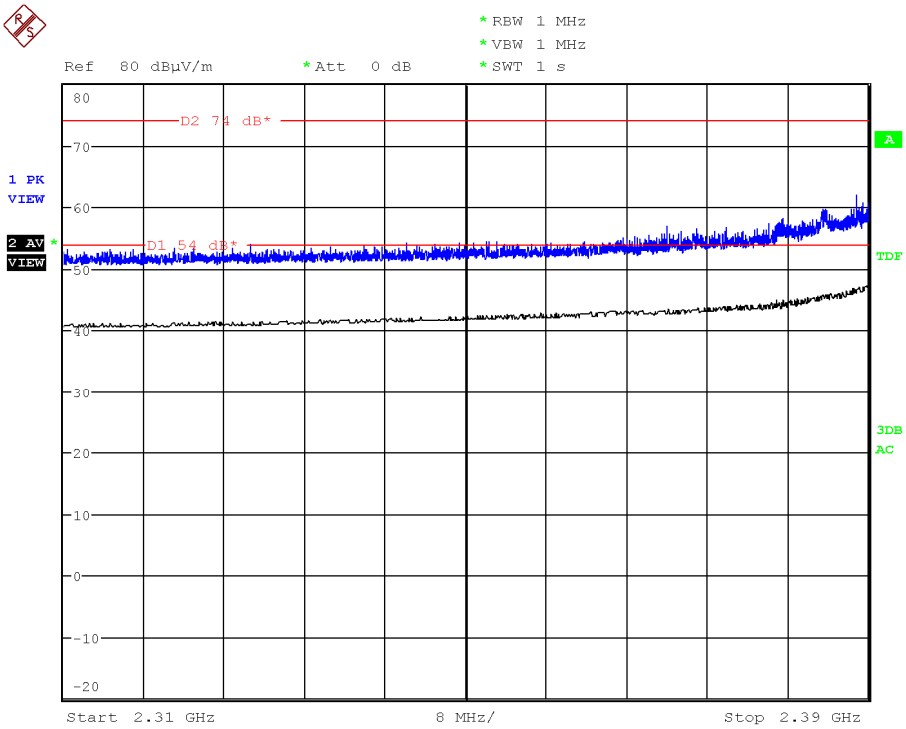
Chain A



Chain B



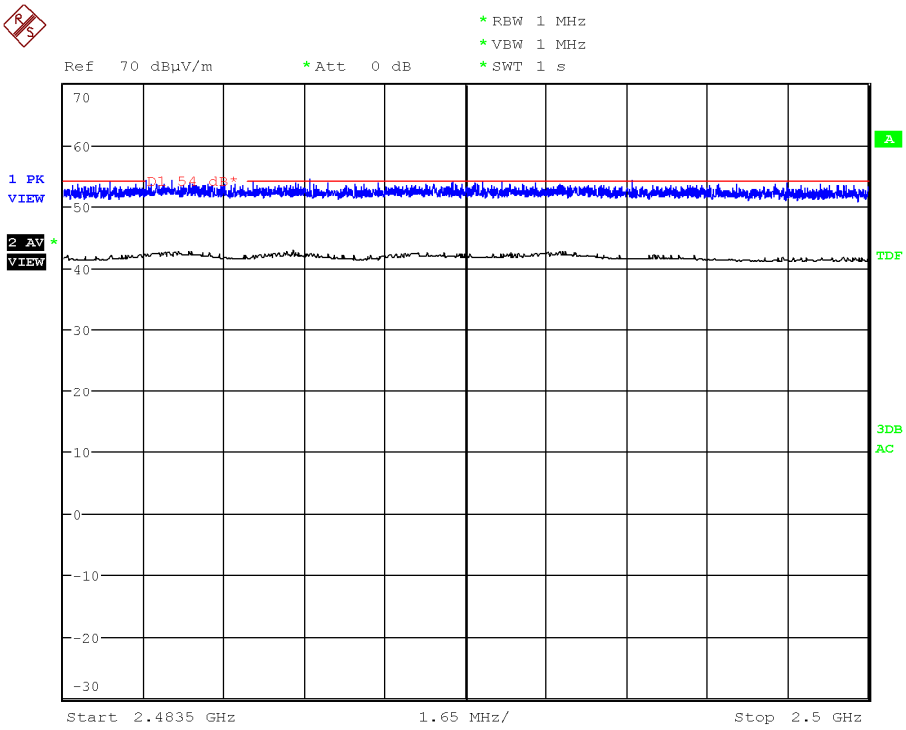
Chain A+B


RBW 1 MHz
VBW 1 MHz
SWT 1 s
Ref 80 dBµV/m
Att 0 dB
D2 74 dB*
D1 54 dB*
1 PK
VIEW
2 AV
VIEW
A
TDF
3DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Start 2.31 GHz
8 MHz/
Stop 2.39 GHz

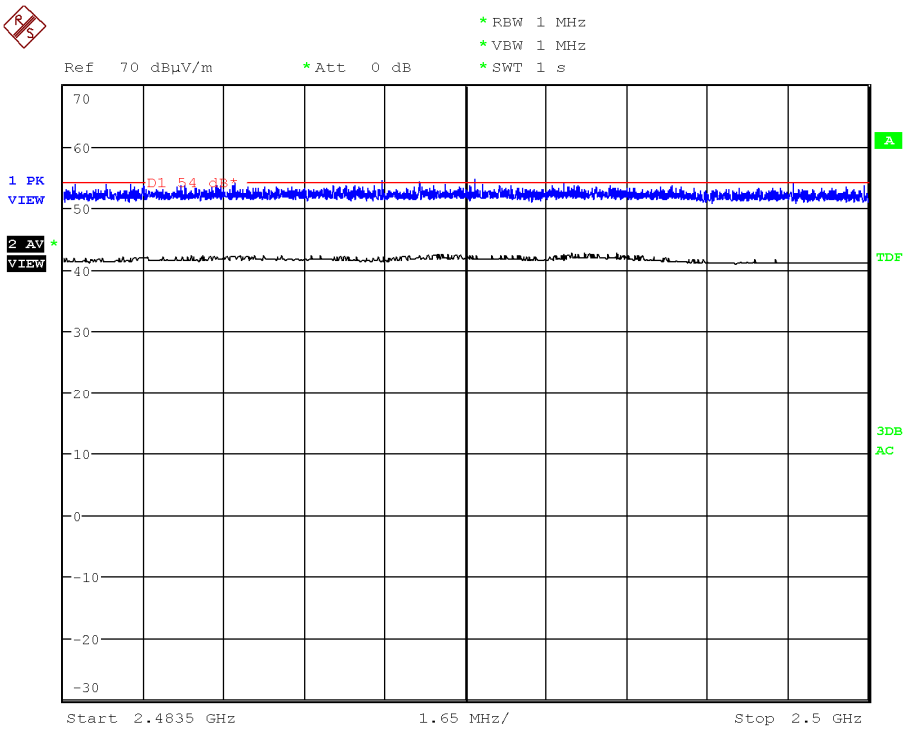
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

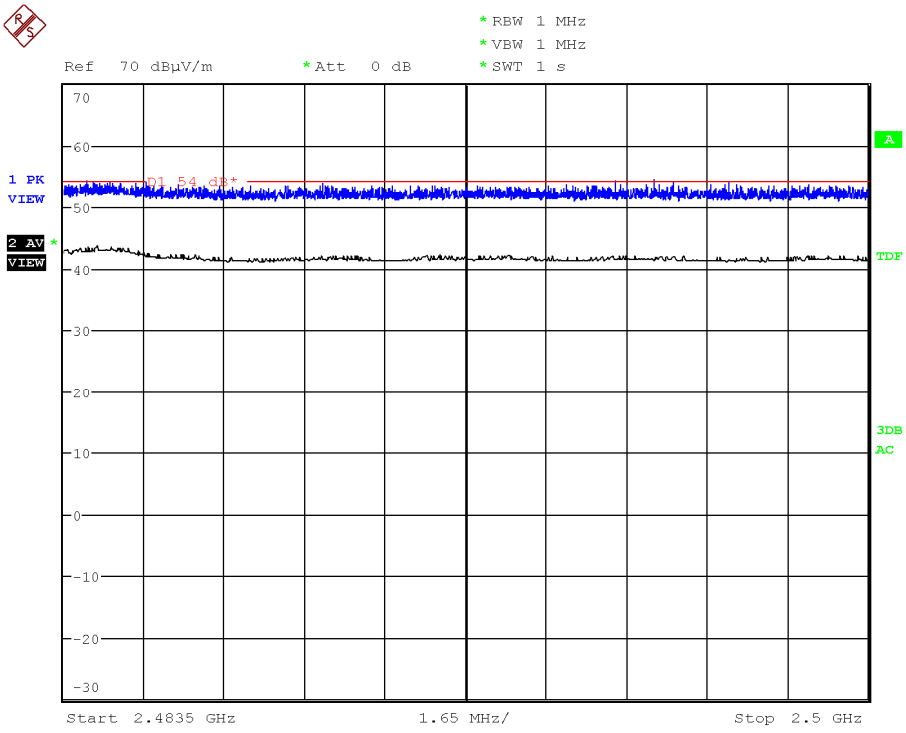


Chain B

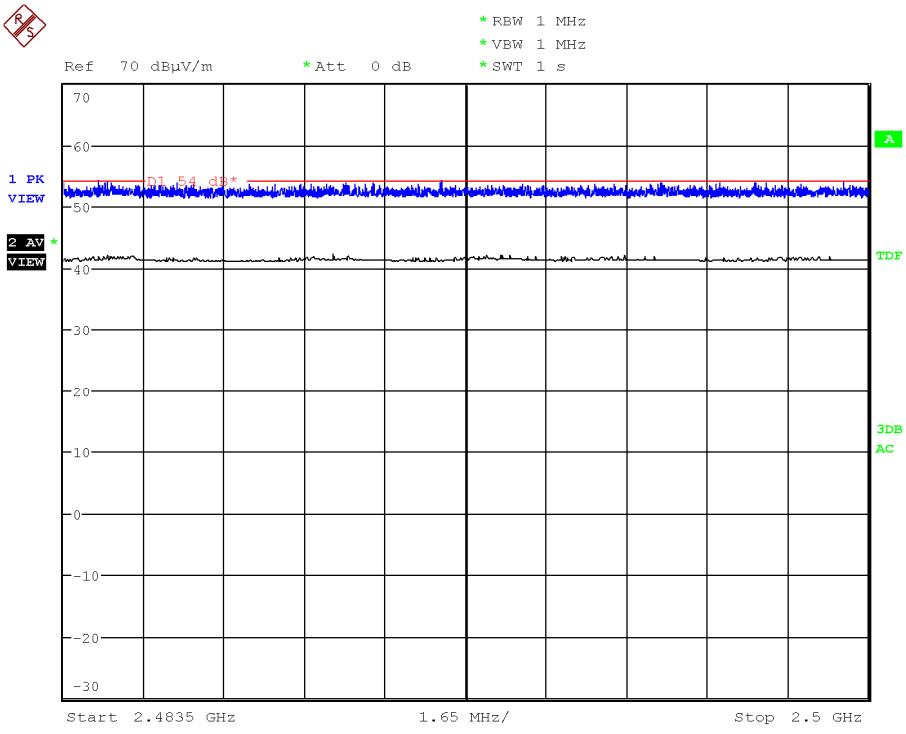


CHANNEL 6 (2437 MHz).

Chain A

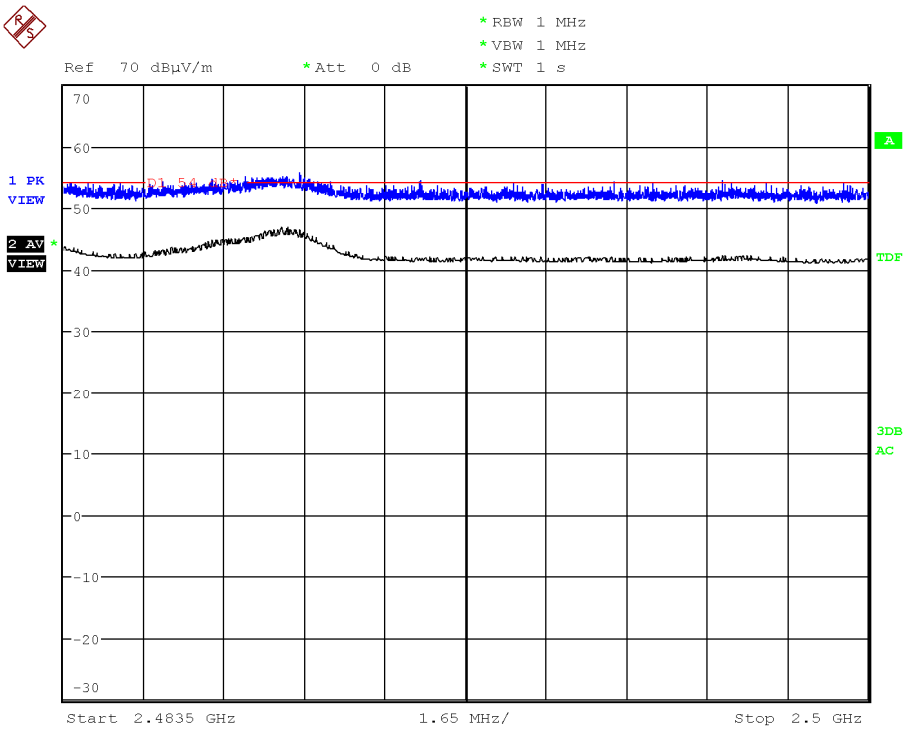


Chain B

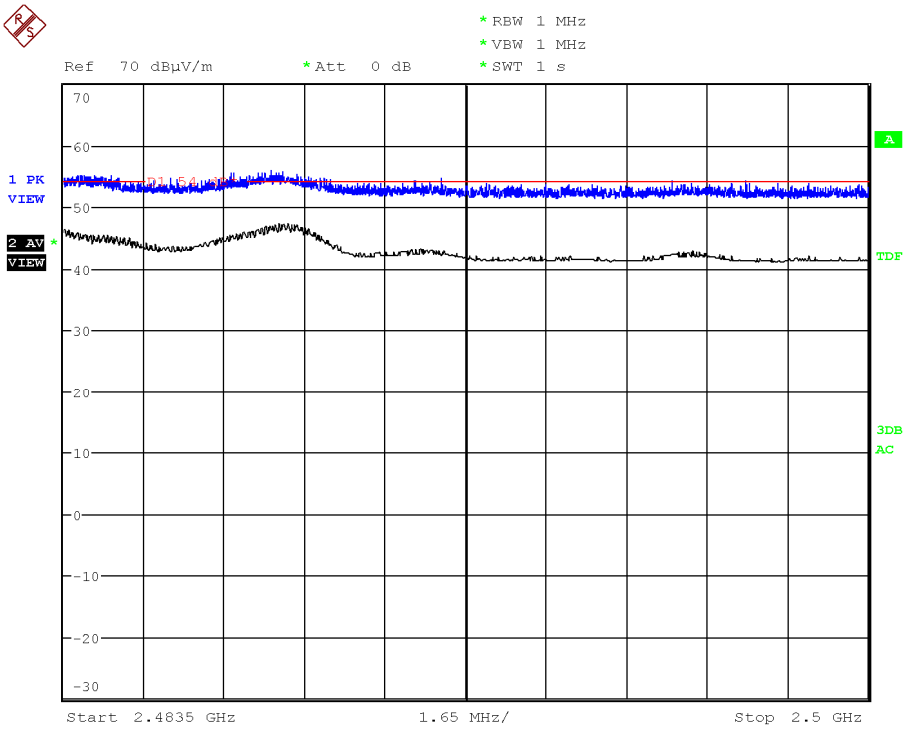


CHANNEL 11 (2462 MHz).

Chain A



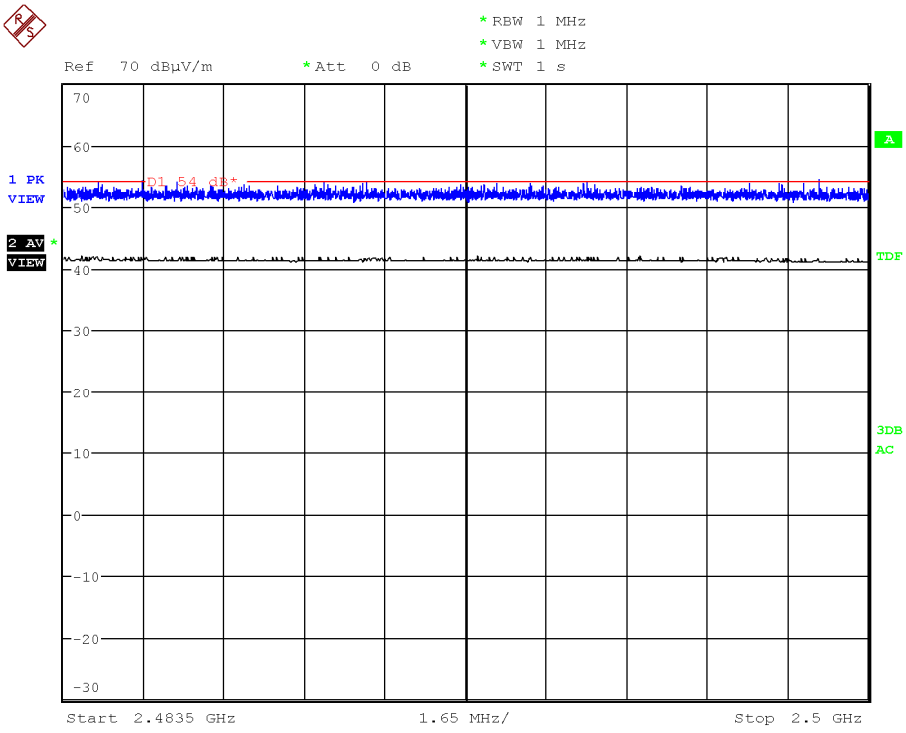
Chain B



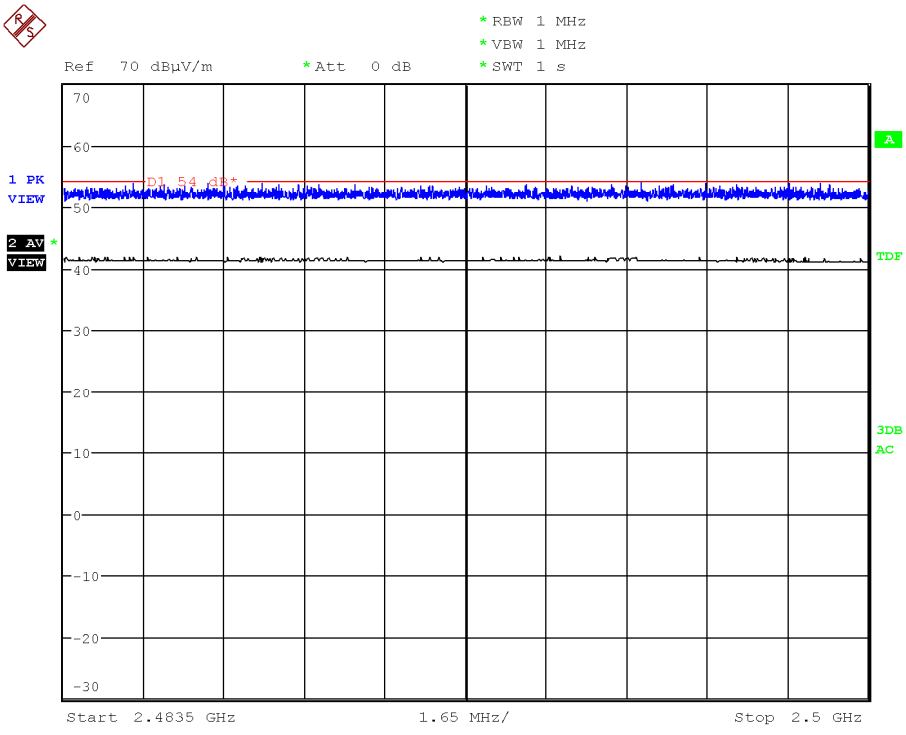
2. WiFi 2.4GHz 802.11 g mode

CHANNEL 1 (2412 MHz).

Chain A

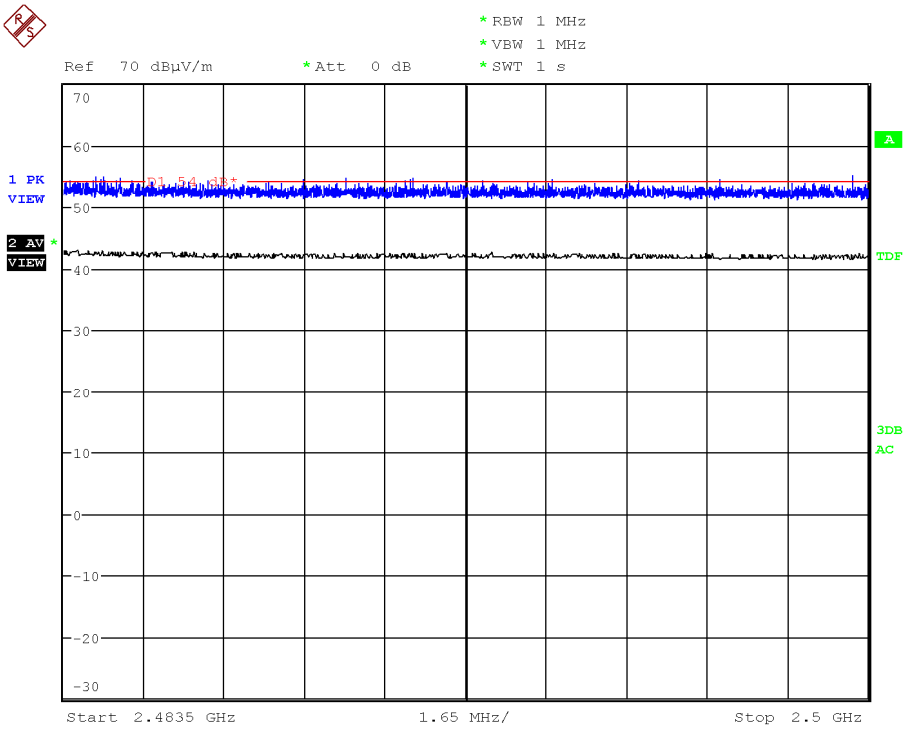


Chain B

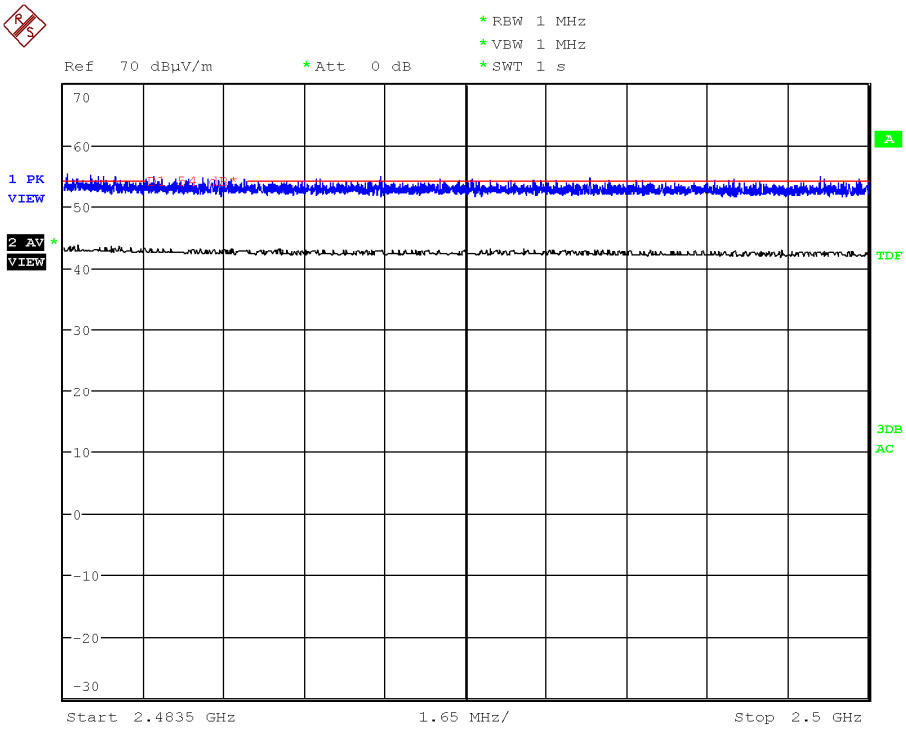


CHANNEL 6 (2437 MHz).

Chain A

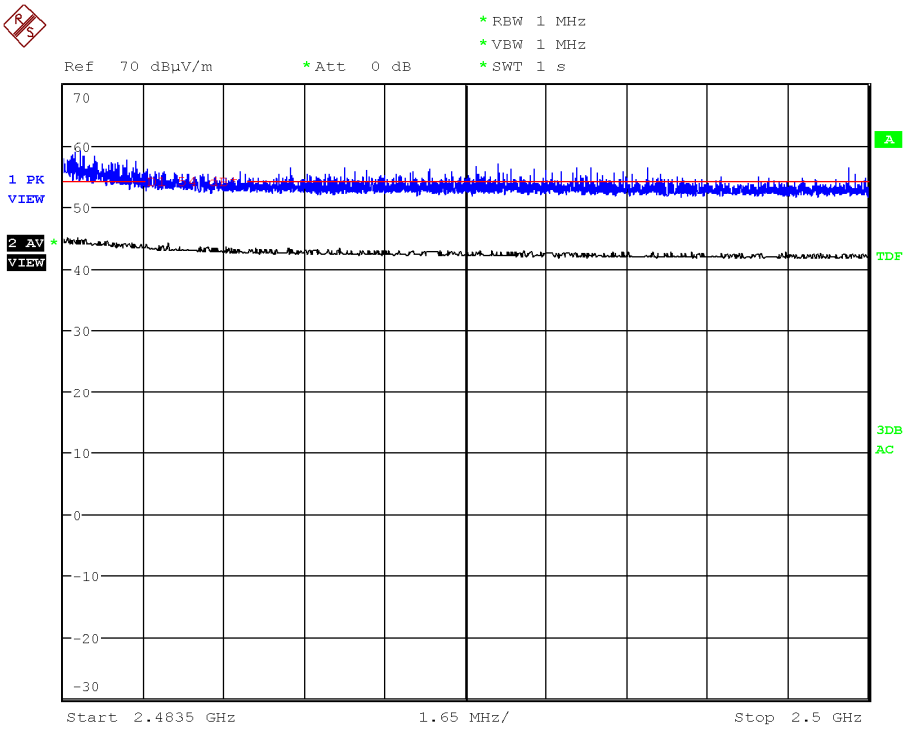


Chain B

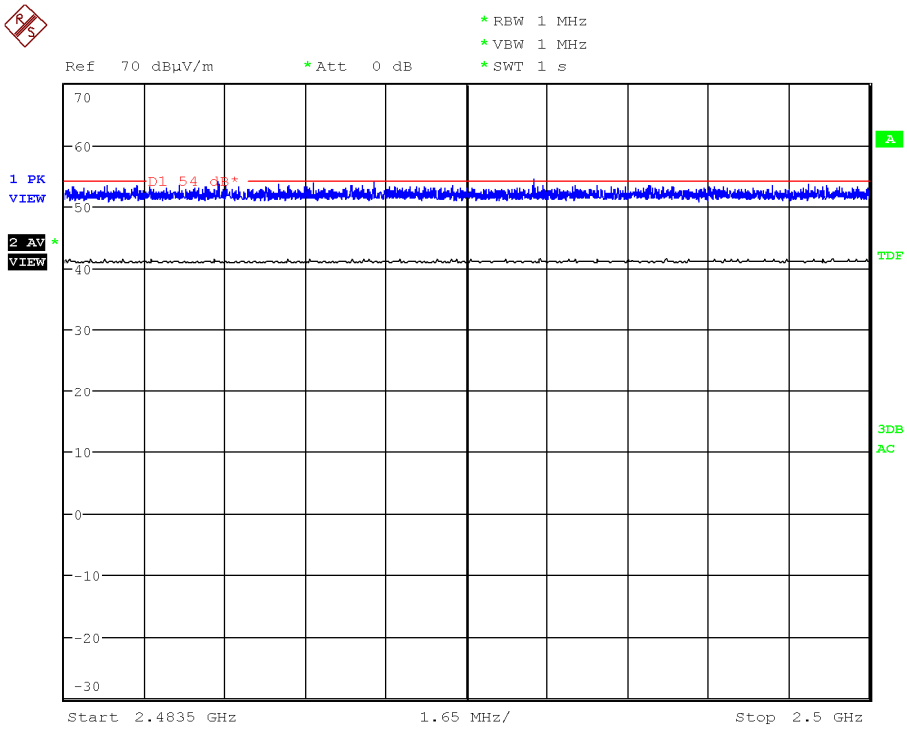


CHANNEL 11 (2462 MHz).

Chain A



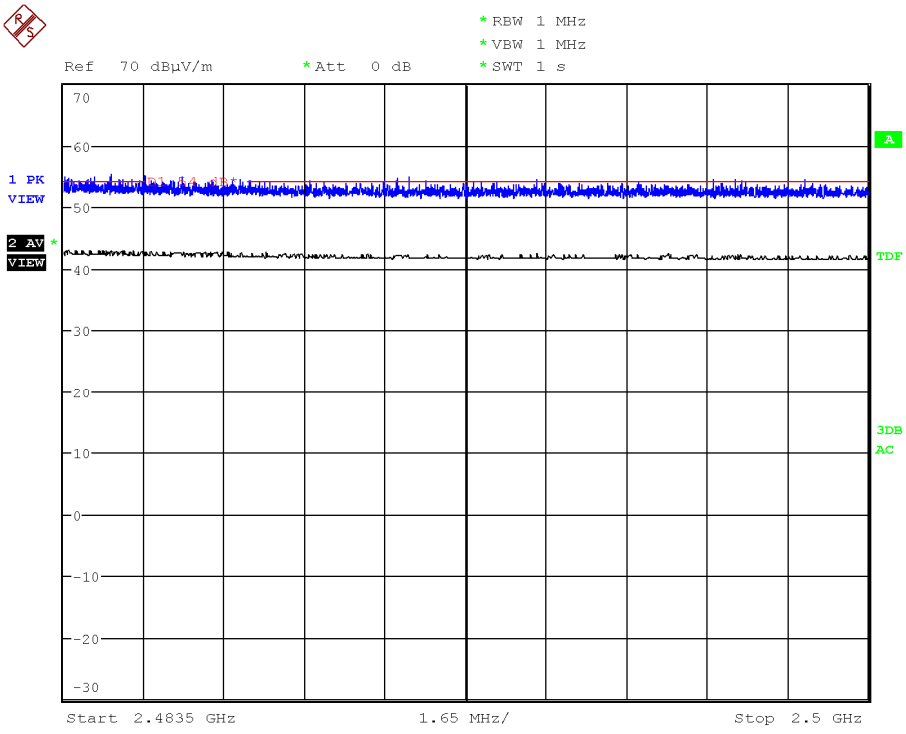
Chain B



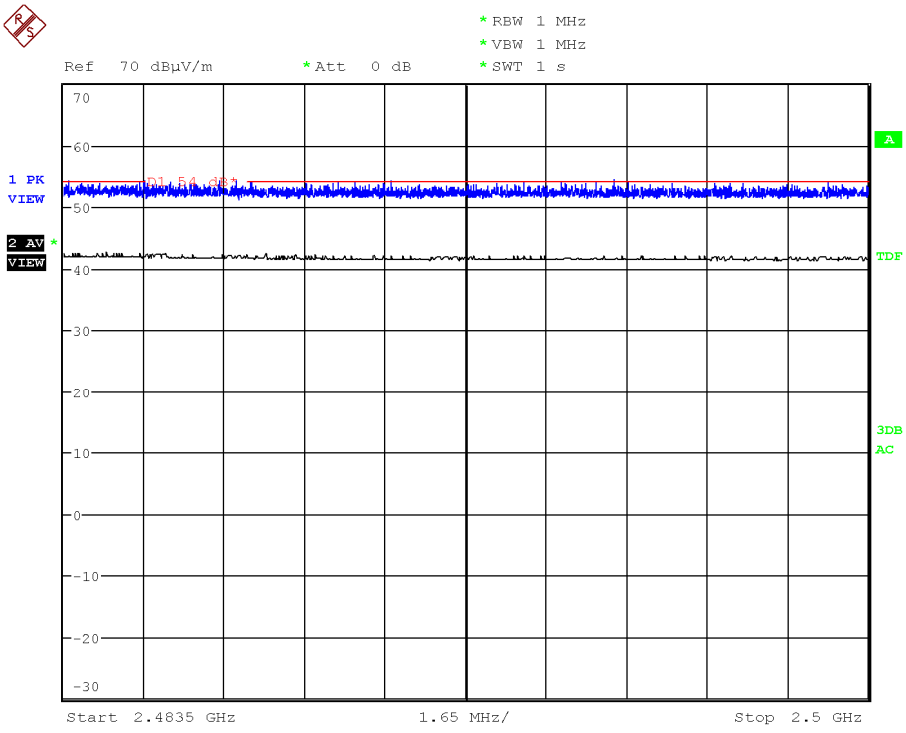
3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 6 (2437 MHz).

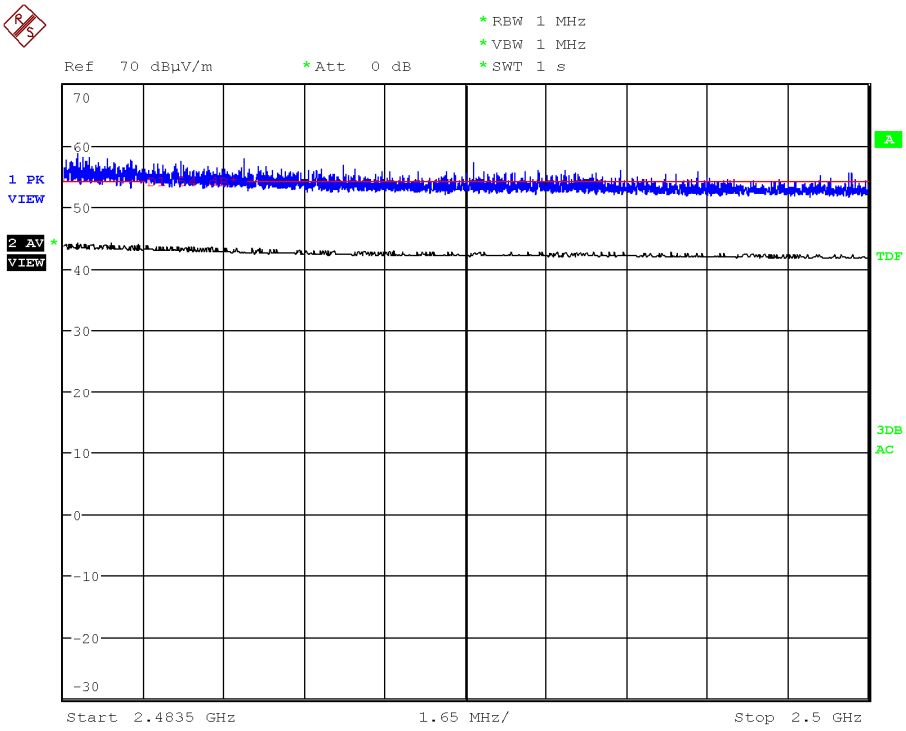
Chain A



Chain B

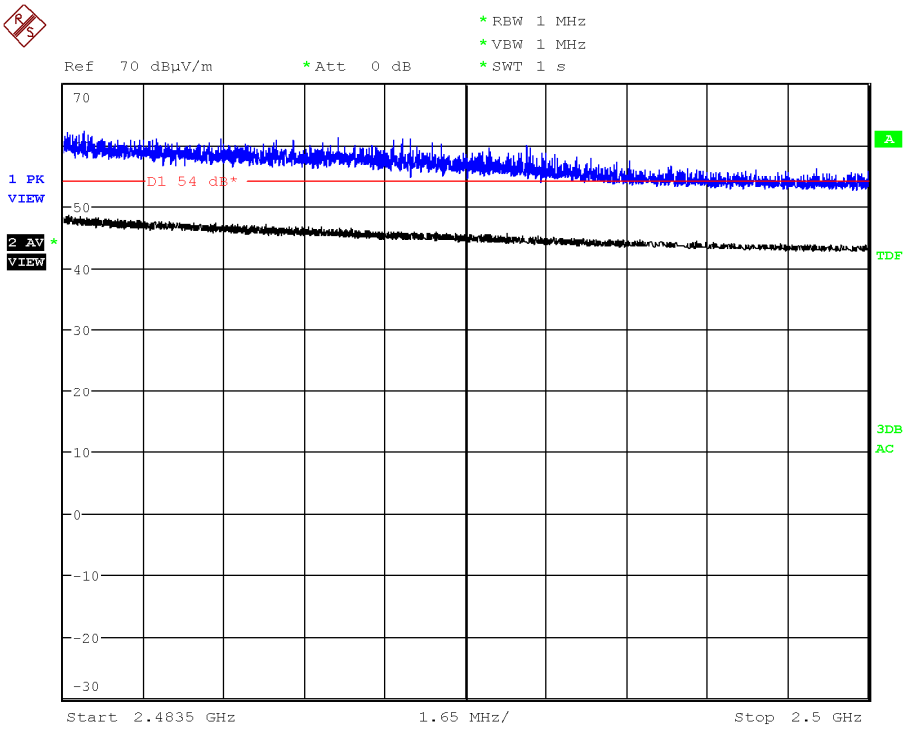


Chain A+B

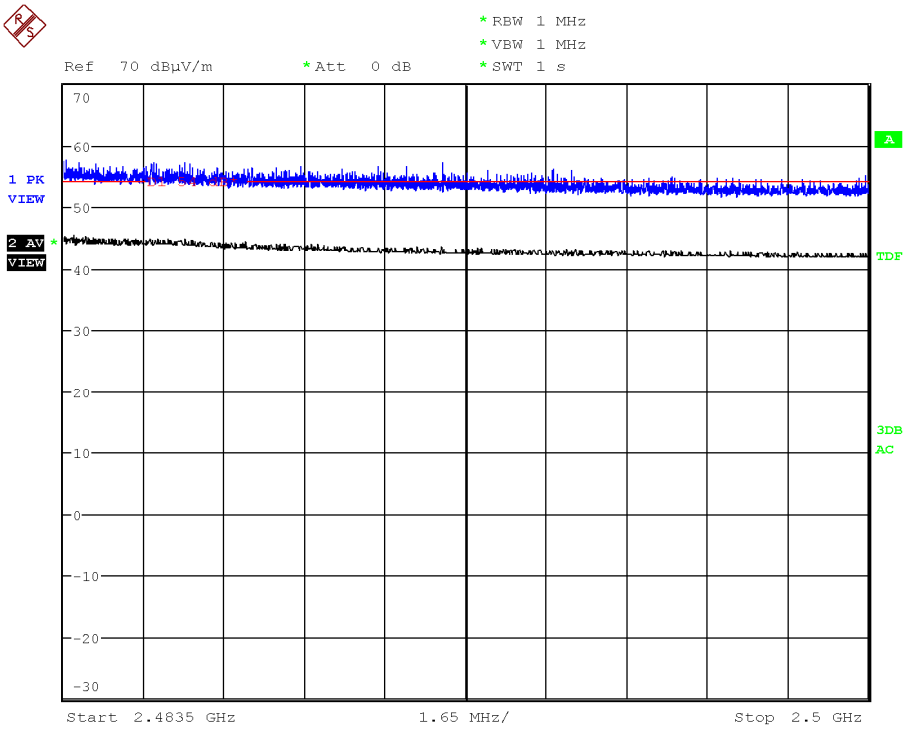


CHANNEL 10 (2457 MHz).

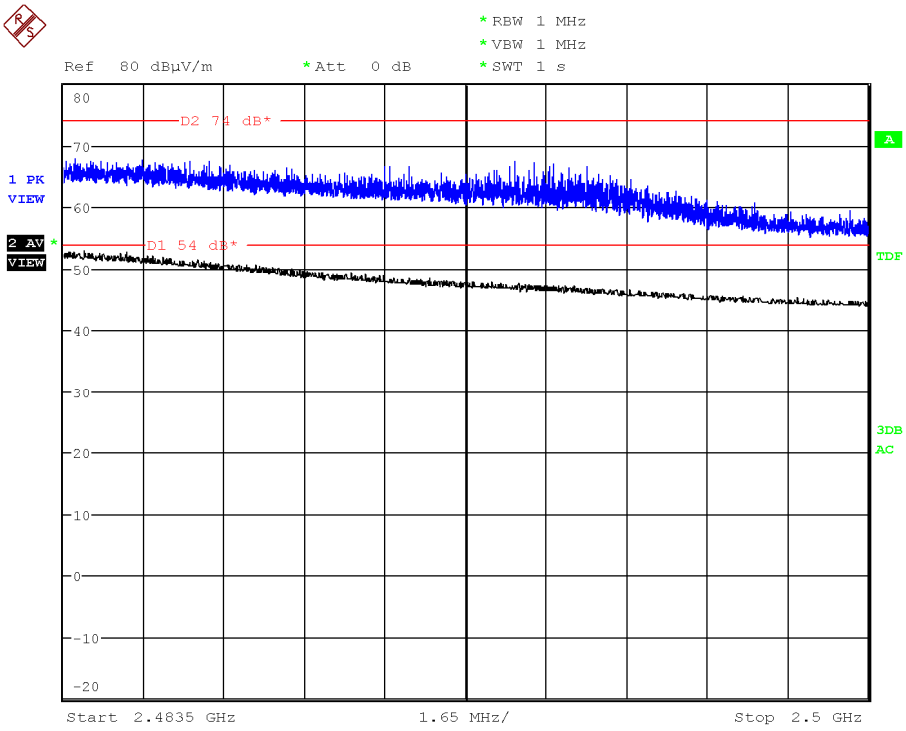
Chain A



Chain B

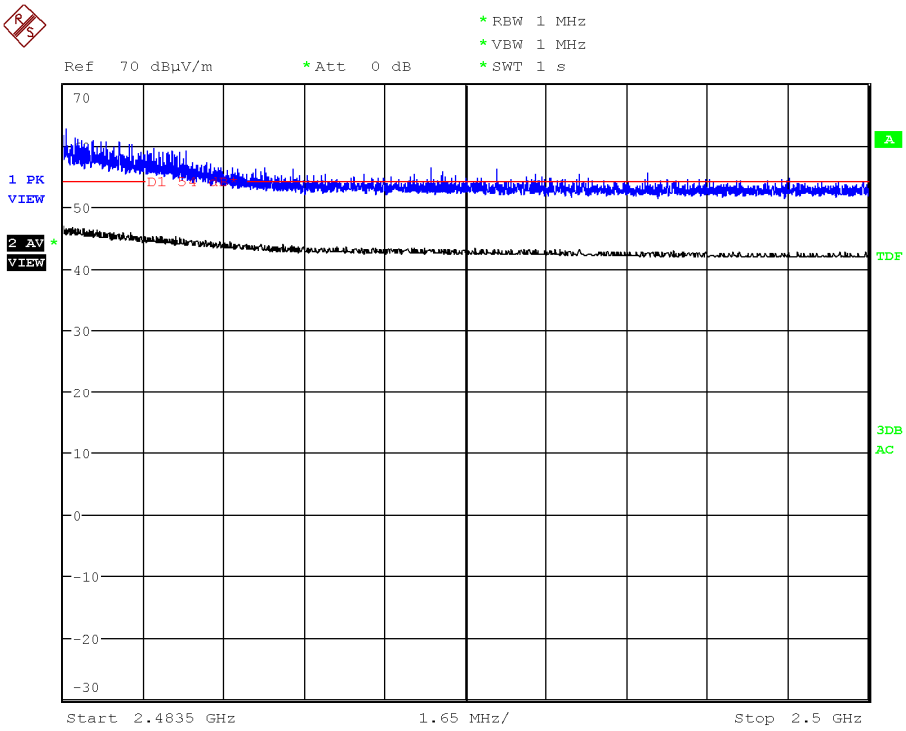


CHAIN A+B

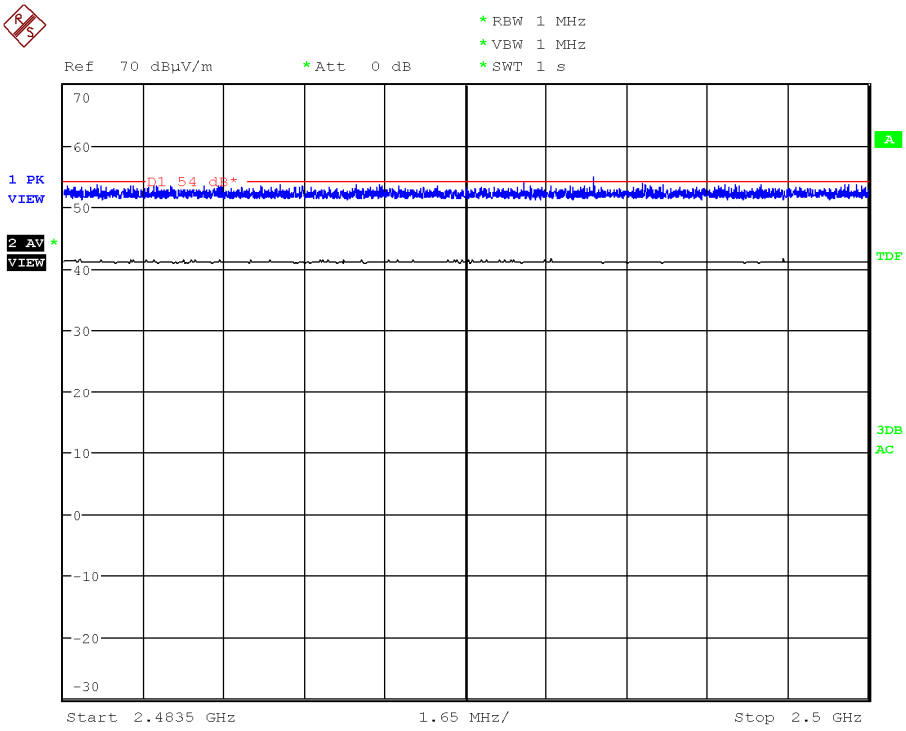


CHANNEL 11 (2462 MHz).

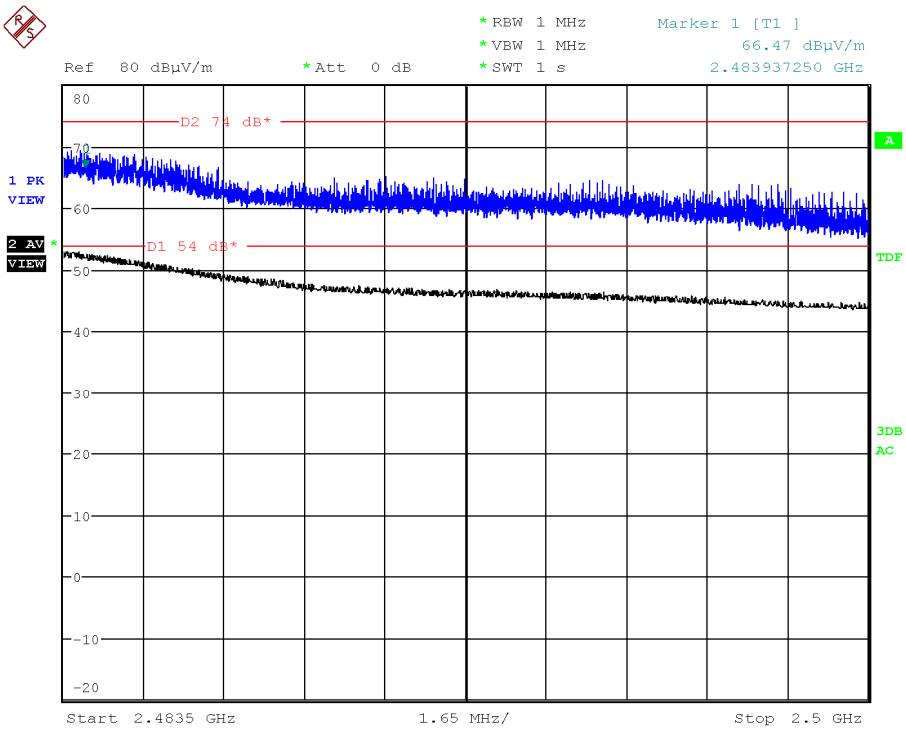
Chain A



Chain B



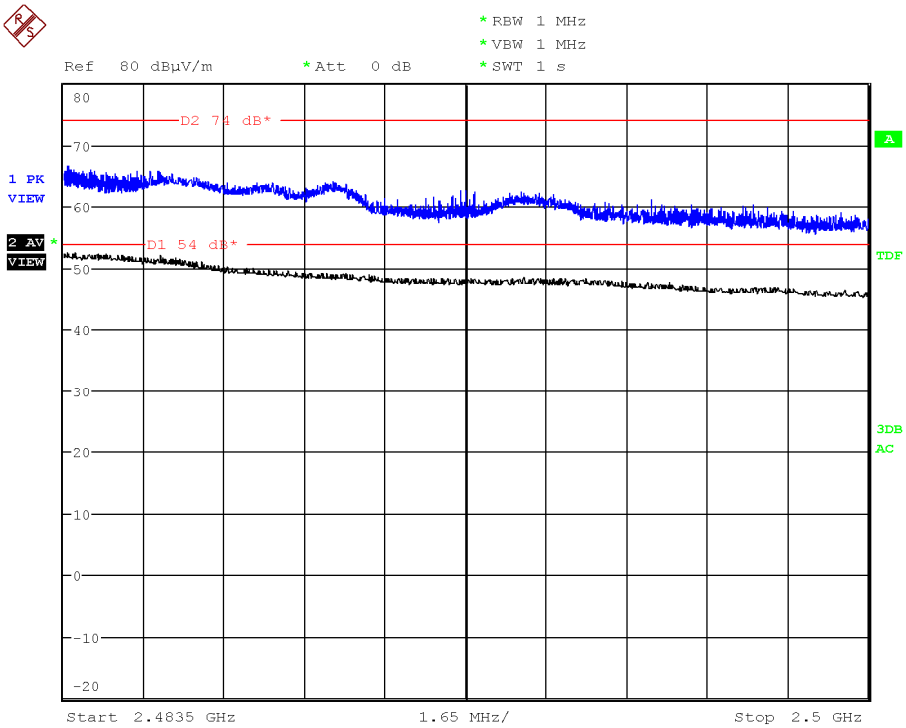
Chain A+B



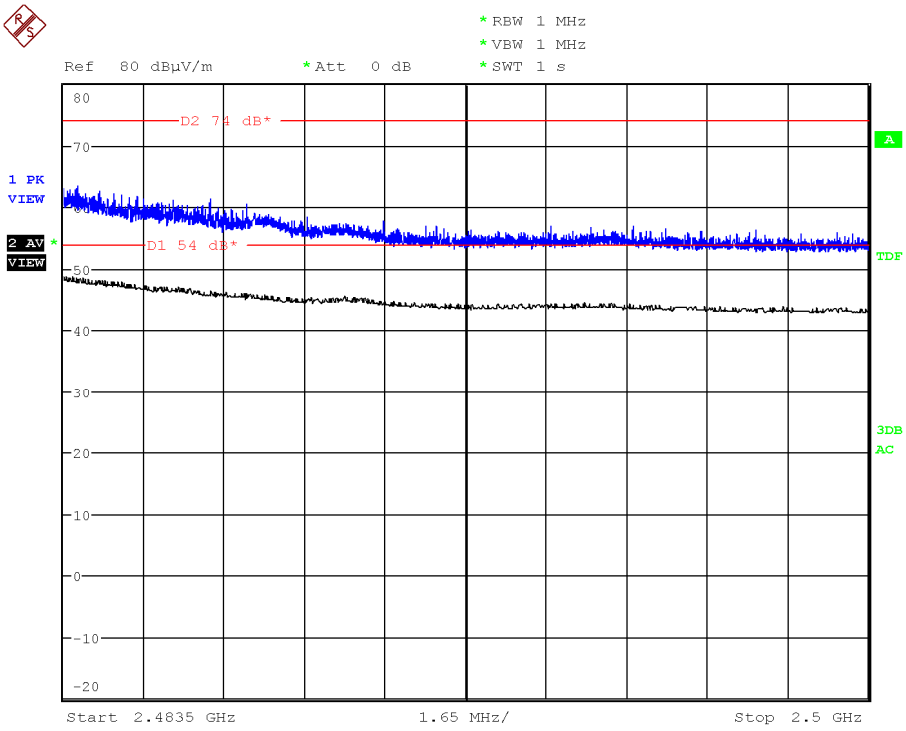
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 6 (2437 MHz).

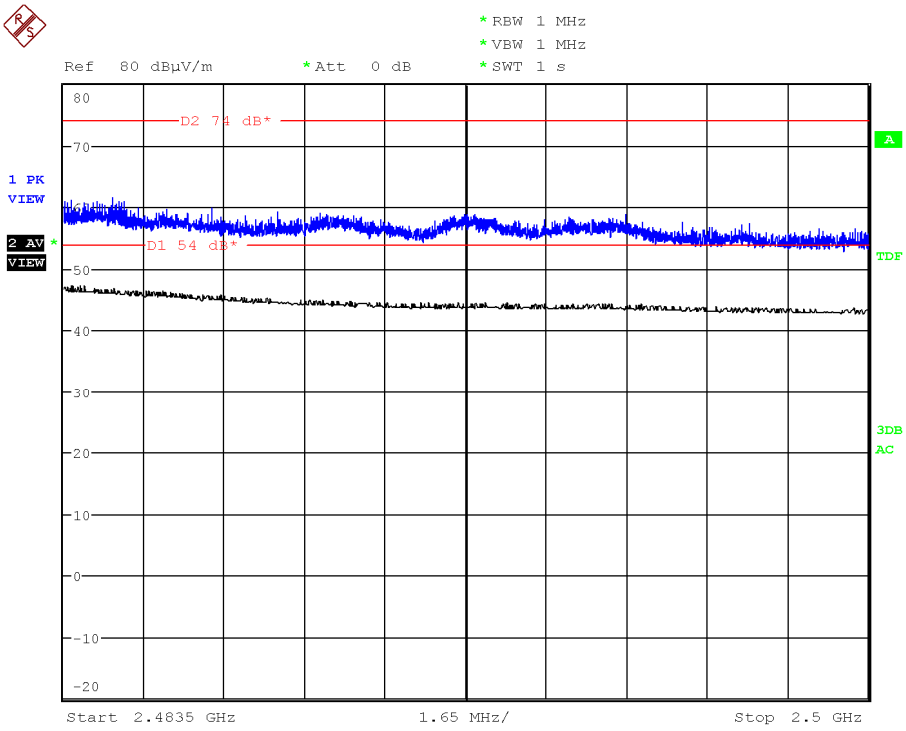
Chain A



Chain B

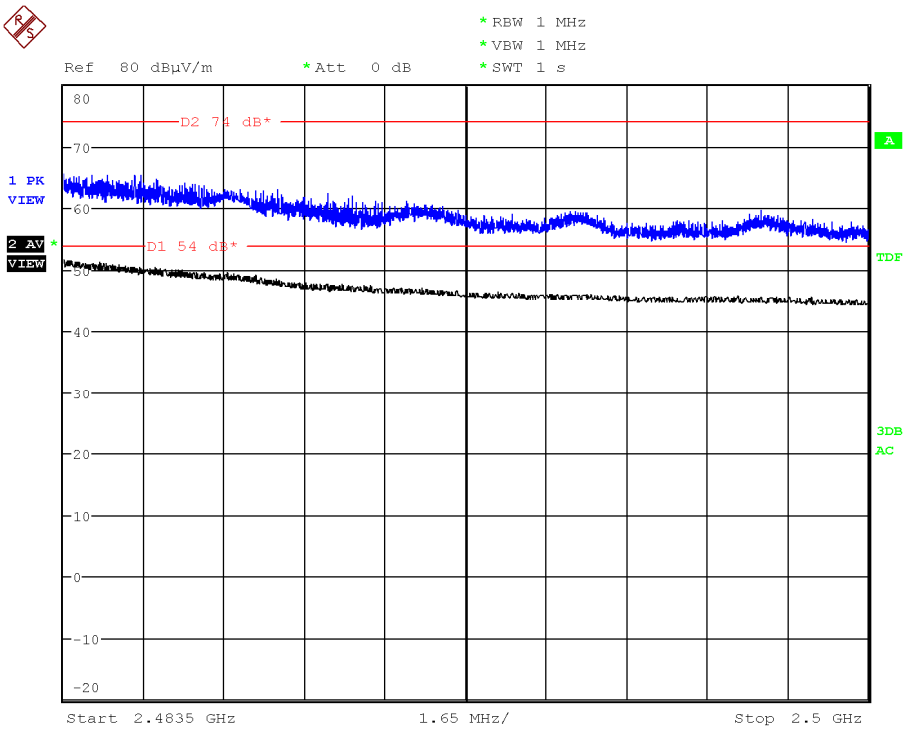


Chain A+B

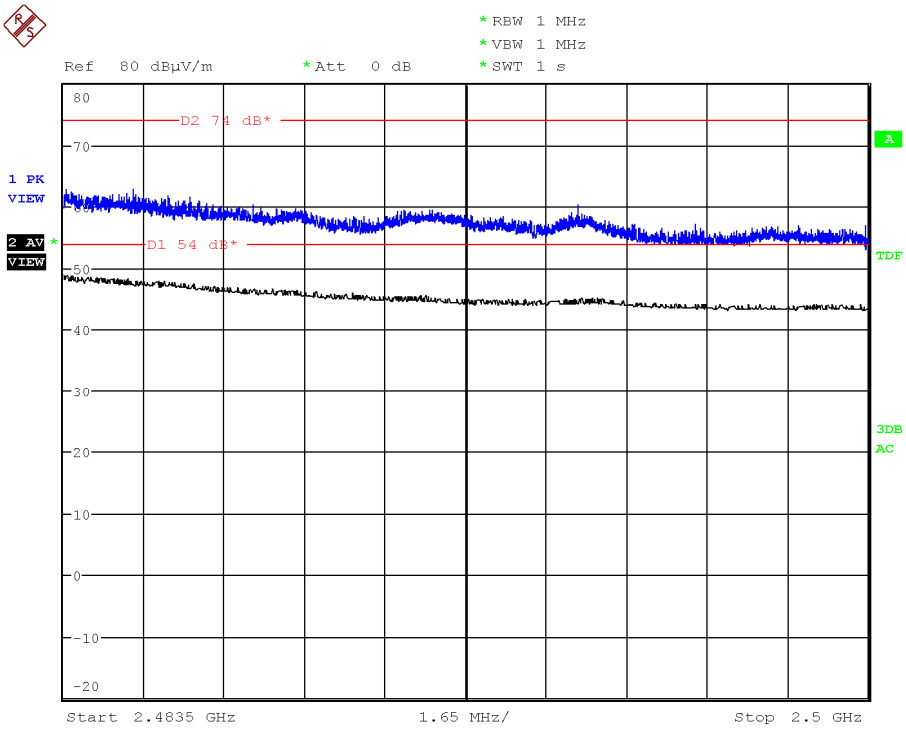


CHANNEL 7 (2442 MHz).

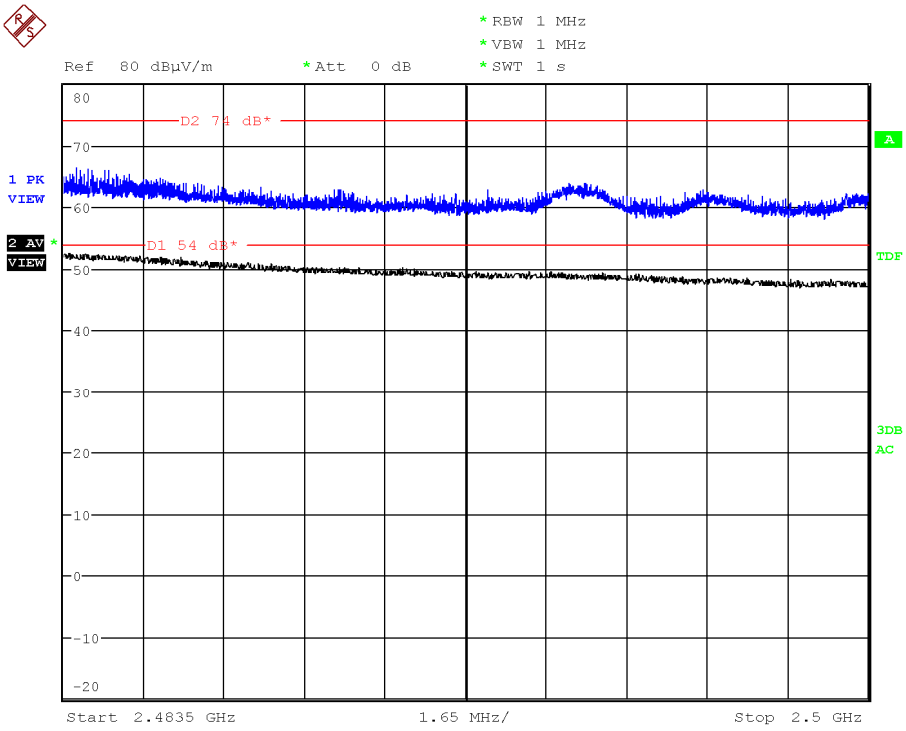
Chain A



Chain B

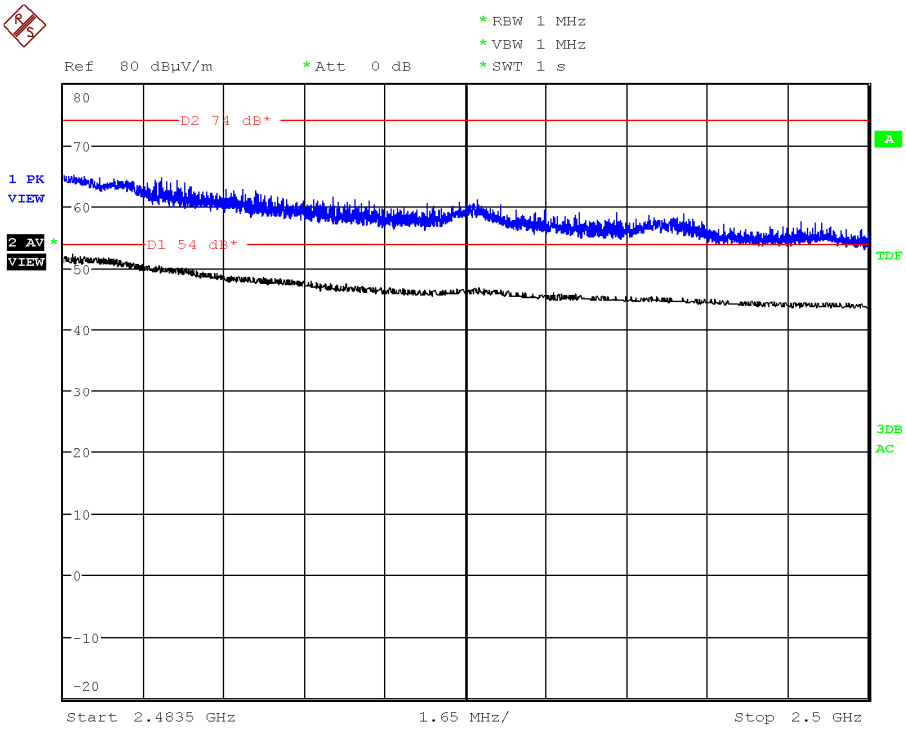


Chain A+B

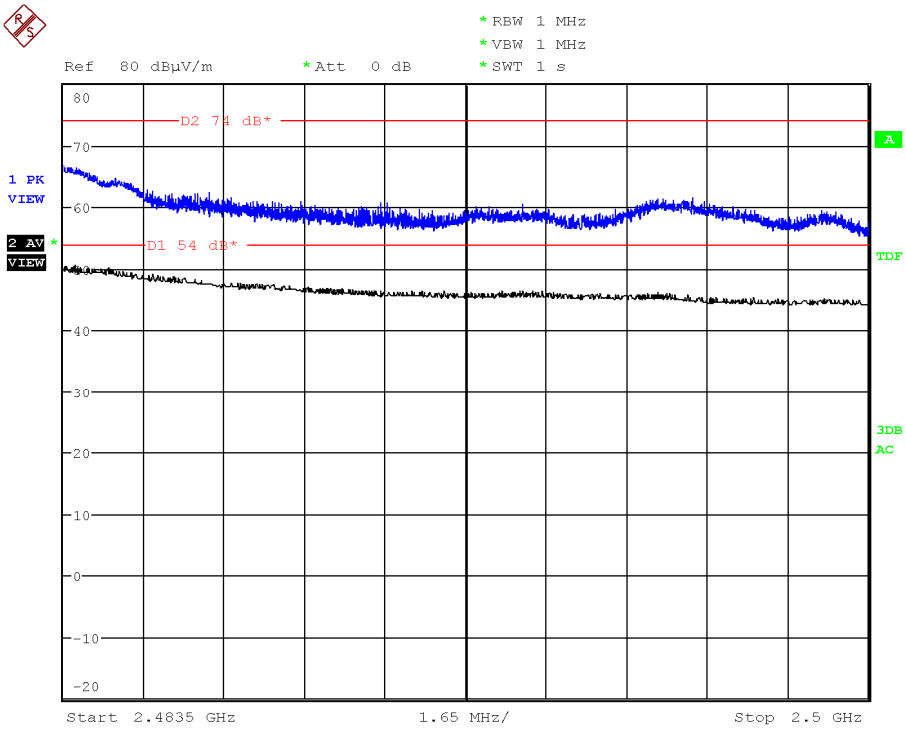


CHANNEL 8 (2447 MHz).

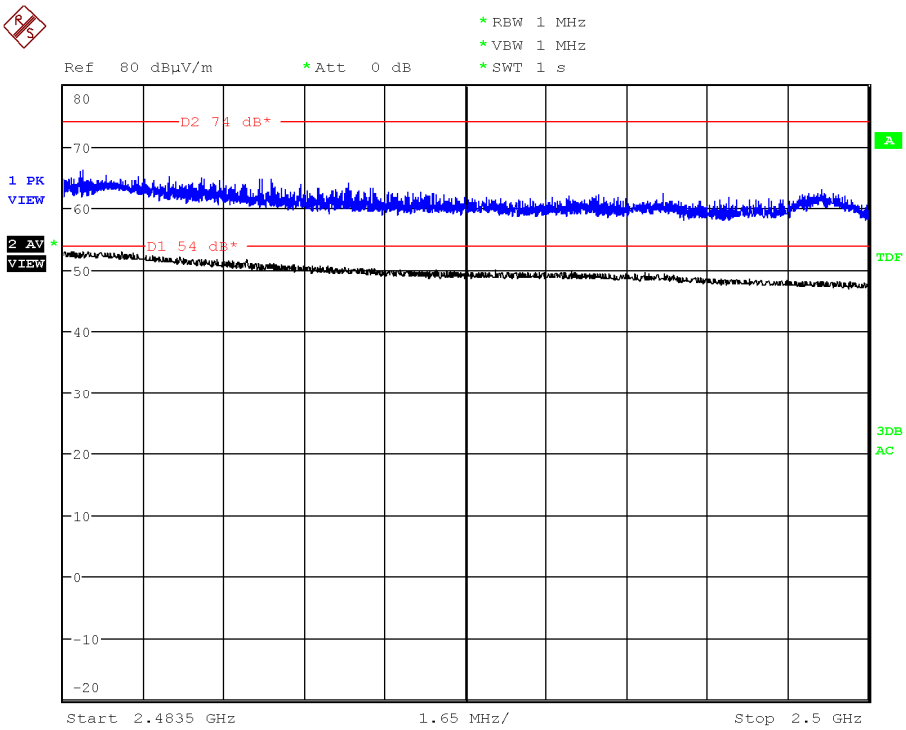
Chain A



Chain B

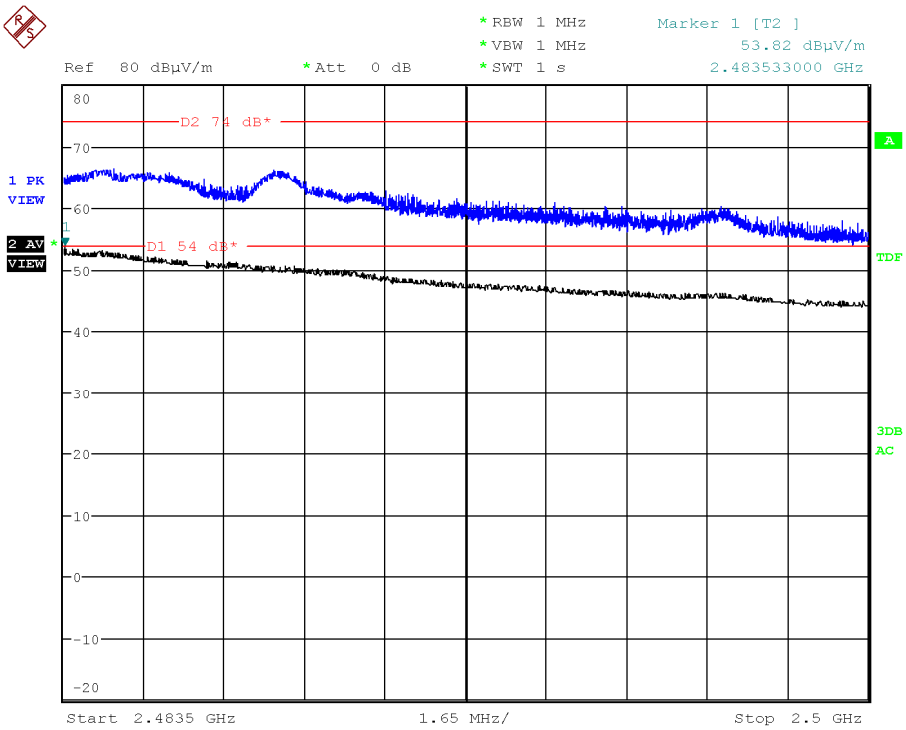


Chain A+B

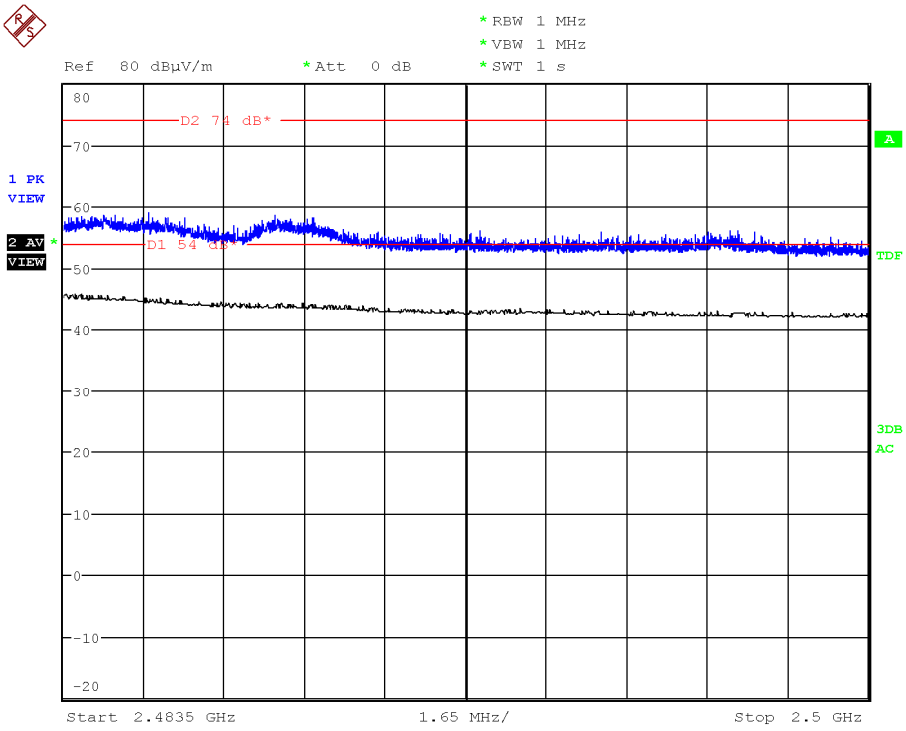


CHANNEL 9 (2452 MHz).

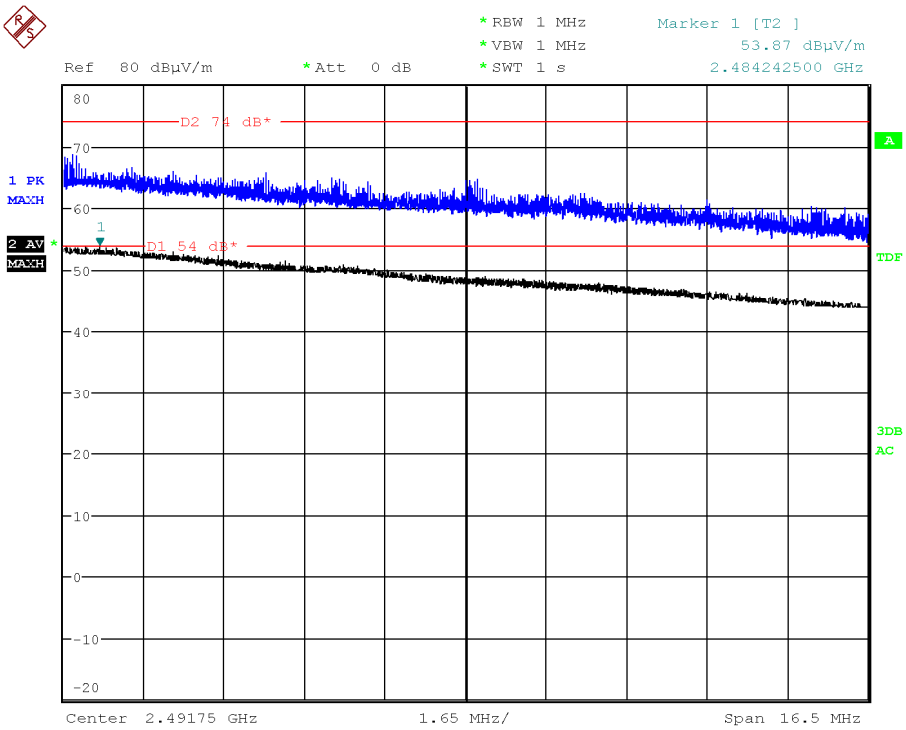
Chain A



Chain B



Chain A+B


* RBW 1 MHz
* VBW 1 MHz
* SWT 1 s
Marker 1 [T2]
53.87 dBµV/m
2.484242500 GHz
Ref 80 dBµV/m
* Att 0 dB
D2 74 dB*
D1 54 dB*
1 PK
MAXH
2 AV
MAXH
A
TDF
3DB
AC
Center 2.49175 GHz
1.65 MHz/
Span 16.5 MHz

APPENDIX B: Test results “WiFi 5.725-5.825 GHz (802.11a/n20/n40/ac80)”

INDEX

TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

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

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 5 dBi

Operating frequencies in the sub-band 5.725-5.825 GHz.

-For IEEE 802.11a, the equipment uses channels 149,153,157,161,165.

-For IEEE 802.11n, there are two bandwidths:

For 20 MHz bandwidth the equipment uses channels 149,153,157,161,165.
For 40 MHz bandwidth the equipment uses channels 151 and 159.

-For IEEE 802.11ac80 (80 MHz bandwidth) the equipment uses channel 155.

TEST FREQUENCIES:

For WiFi a/n20:

Lowest channel (149): 5745 MHz

Middle channel (157): 5785 MHz

Highest channel (165): 5825 MHz

For WiFi n40:

Lowest channel (151): 5755 MHz

Highest channel (159): 5795 MHz

For WiFi ac80:

Middle channel (155): 5775 MHz

The test set-up was made in accordance to the general provisions of FCC DTS Measurement KDB 558074 D01 DTS Meas Guidance v03r01.

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

For 802.11n modes 802.11n20 (20 MHz channel bandwidth), 802.11n40 (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 PC was using the Intel test utility DRTU Version "OEDRTU 558x86" 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 data rates of 6Mb/s for 802.11a, HT4 (SISO)/HT8 (MIMO) for 802.11n20 and n40, and VHT6 (SISO)/(MIMO) 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 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)
802.11a	20	149 / 5745	16.5	16.5	n/a
		157 / 5785	16.5	16.5	n/a
		165 / 5825	16.5	16.5	n/a
802.11n	20	149 / 5745	16.5	16.5	13.50
		157 / 5785	16.5	16.5	13.50
		165 / 5825	16.5	16.5	13.50
802.11n*	40	151 / 5755	16.5	16.5	13.50
		159 / 5795	16.5	16.5	13.50
802.11ac	80	155 / 5775	15	15	13.50

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a calibrated low loss RF cable. The reading in the spectrum analyser is compensated with the cable loss at each measurement frequency.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-40 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

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

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Occupied Bandwidth

RESULTS

1. WiFi 5GHz 802.11 a mode

Occupied Bandwidth (see next plots).

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	17.288	17.843	17.240	17.817	17.361	17.952
Measurement uncertainty (kHz)	±21.7					

2. WiFi 5GHz 802.11 n20 mode

Occupied Bandwidth (see next plots).

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	18.144	18.340	18.060	18.333	18.356	18.371
Measurement uncertainty (kHz)	±21.7					

3. WiFi 5GHz 802.11 n40 mode

Occupied Bandwidth (see next plots).

	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	36.029	36.106	35.948	36.137
Measurement uncertainty (kHz)	±21.7			

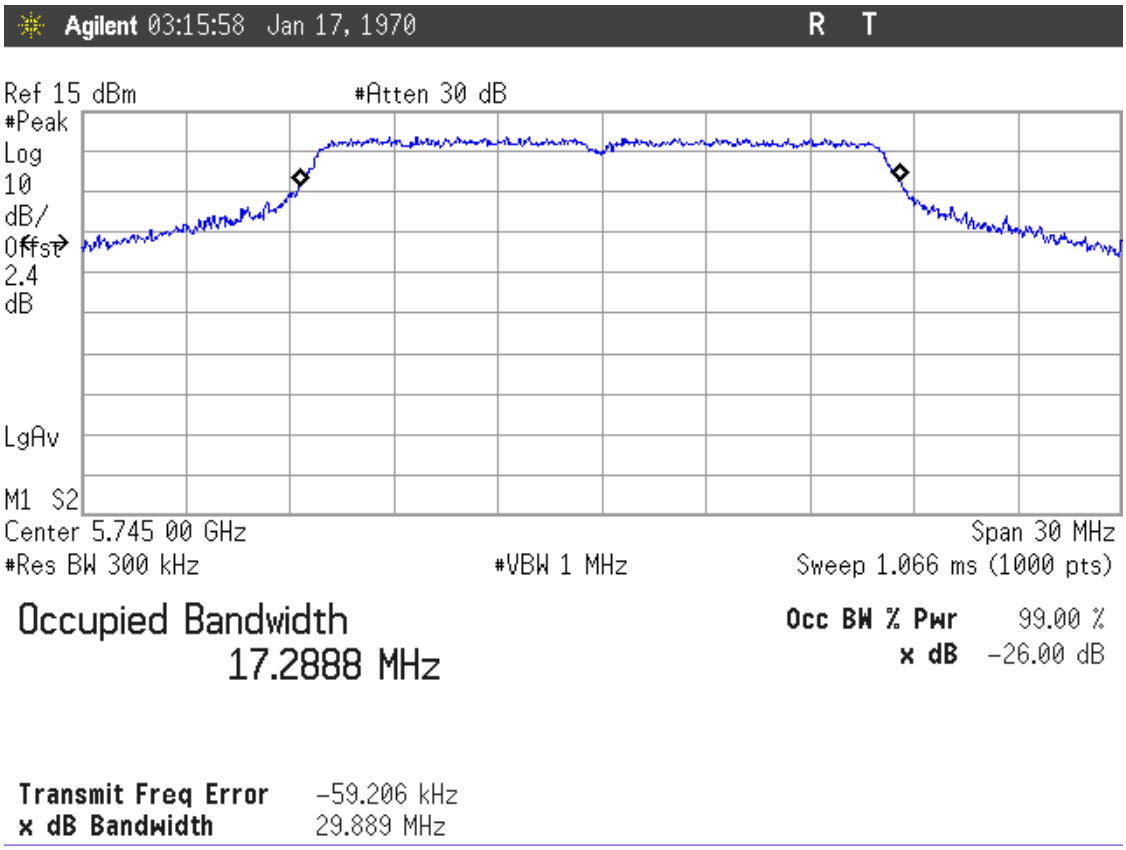
4. WiFi 5GHz 802.11 ac80 mode

Occupied Bandwidth (see next plots).

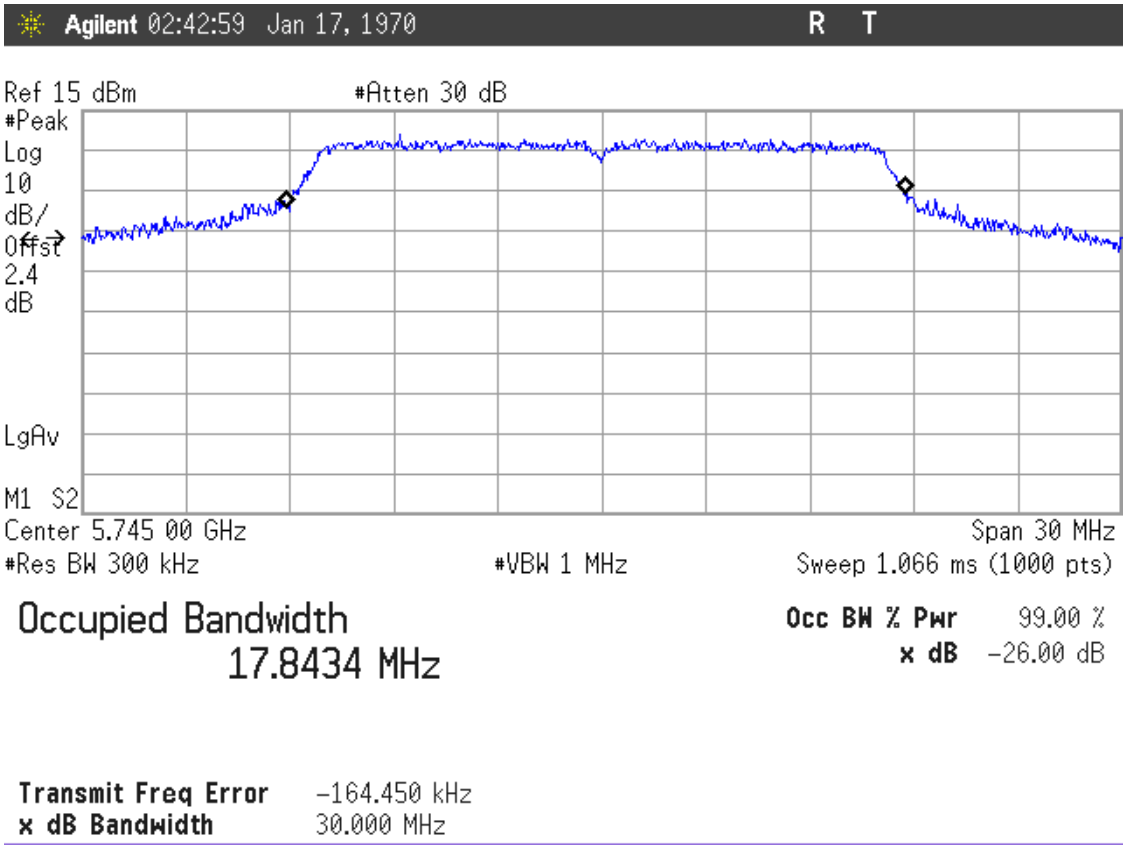
	Middle frequency 5775 MHz	
	Chain A	Chain B
99% bandwidth (MHz)	74.953	75.026
Measurement uncertainty (kHz)	±21.7	

1. WiFi 5GHz 802.11 a mode

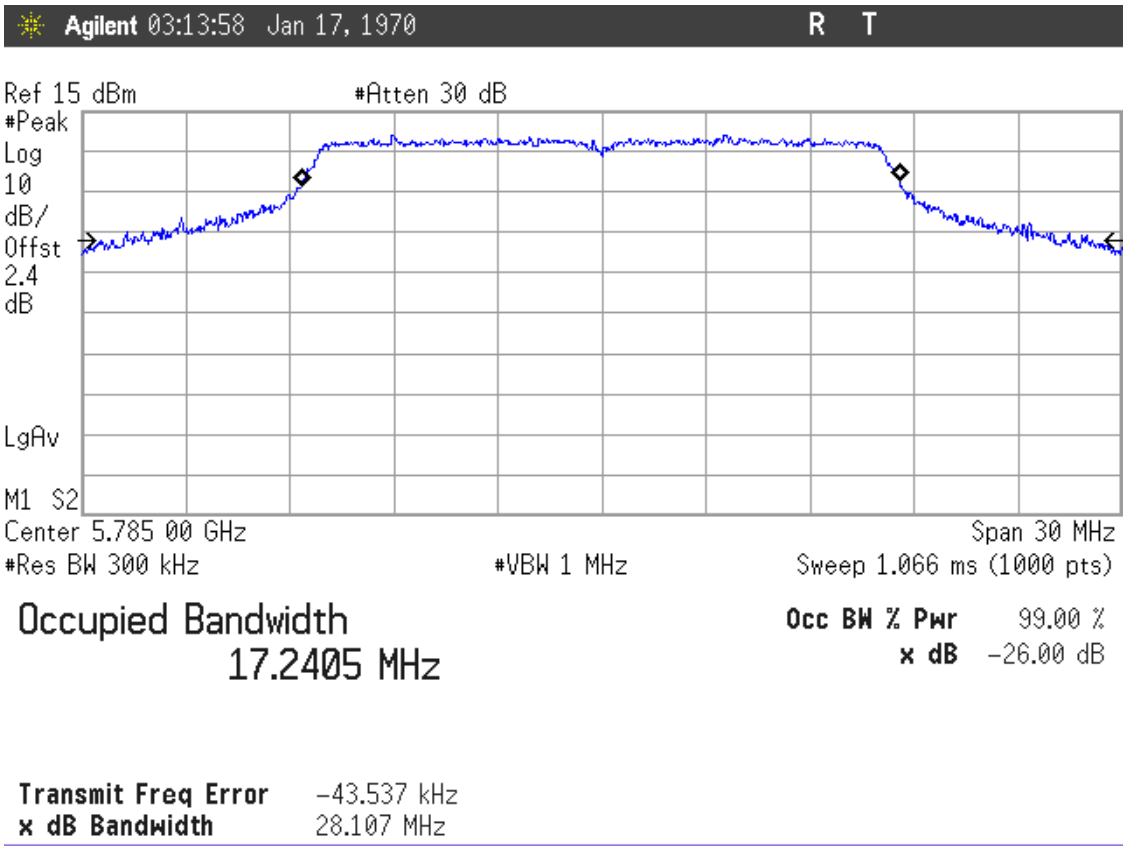
Lowest Channel: 5745 MHz. Chain A



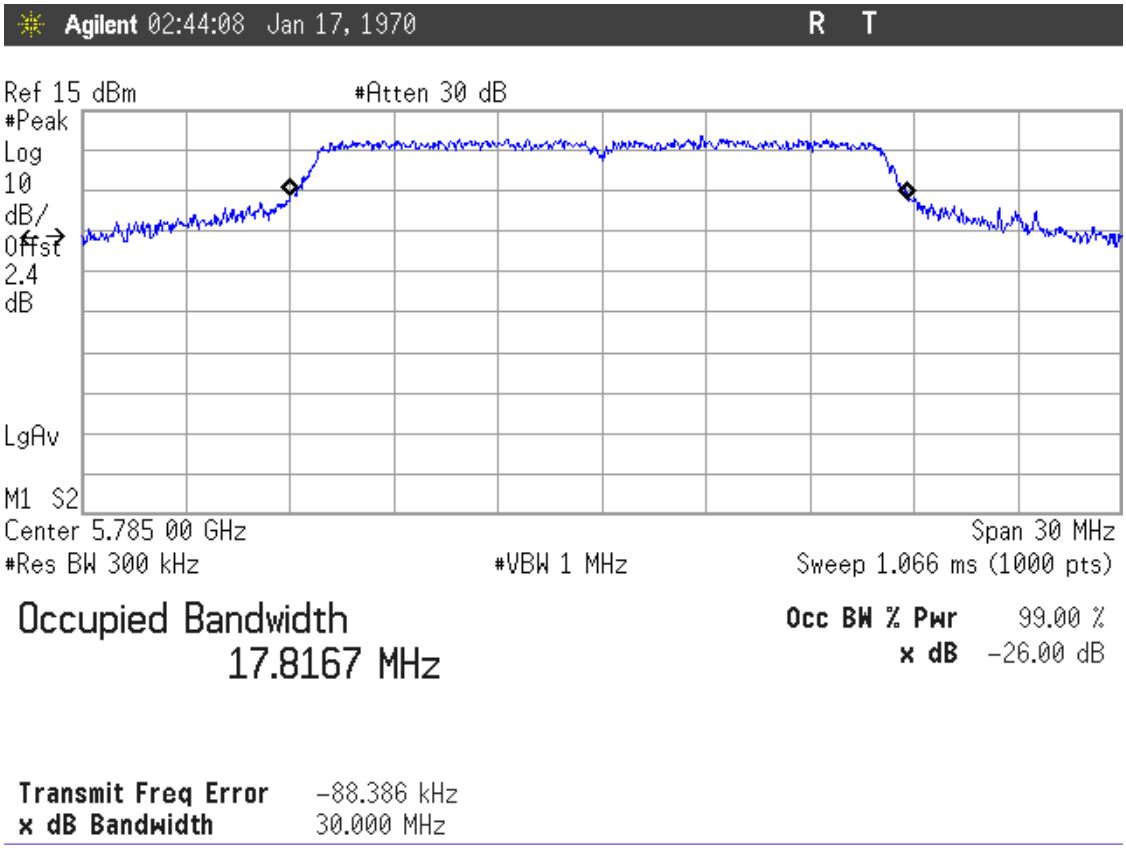
Lowest Channel: 5745 MHz. Chain B



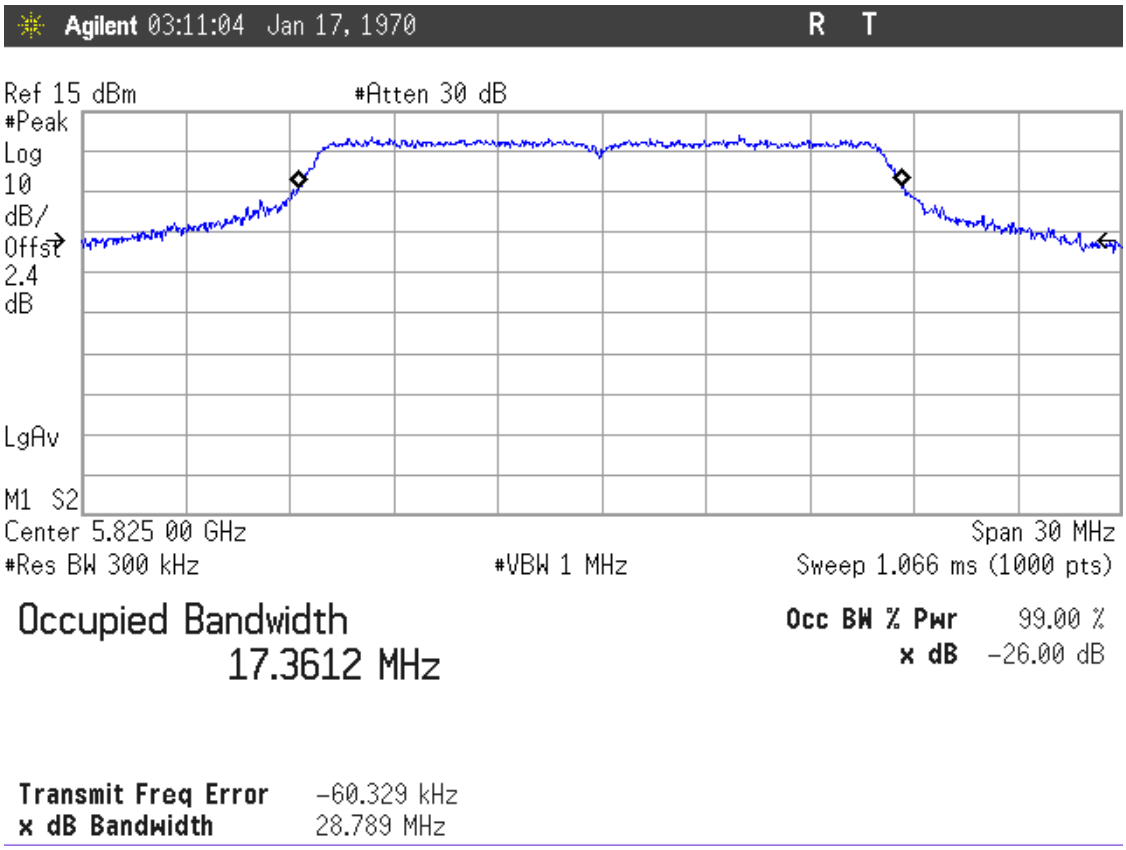
Middle Channel: 5785 MHz. Chain A



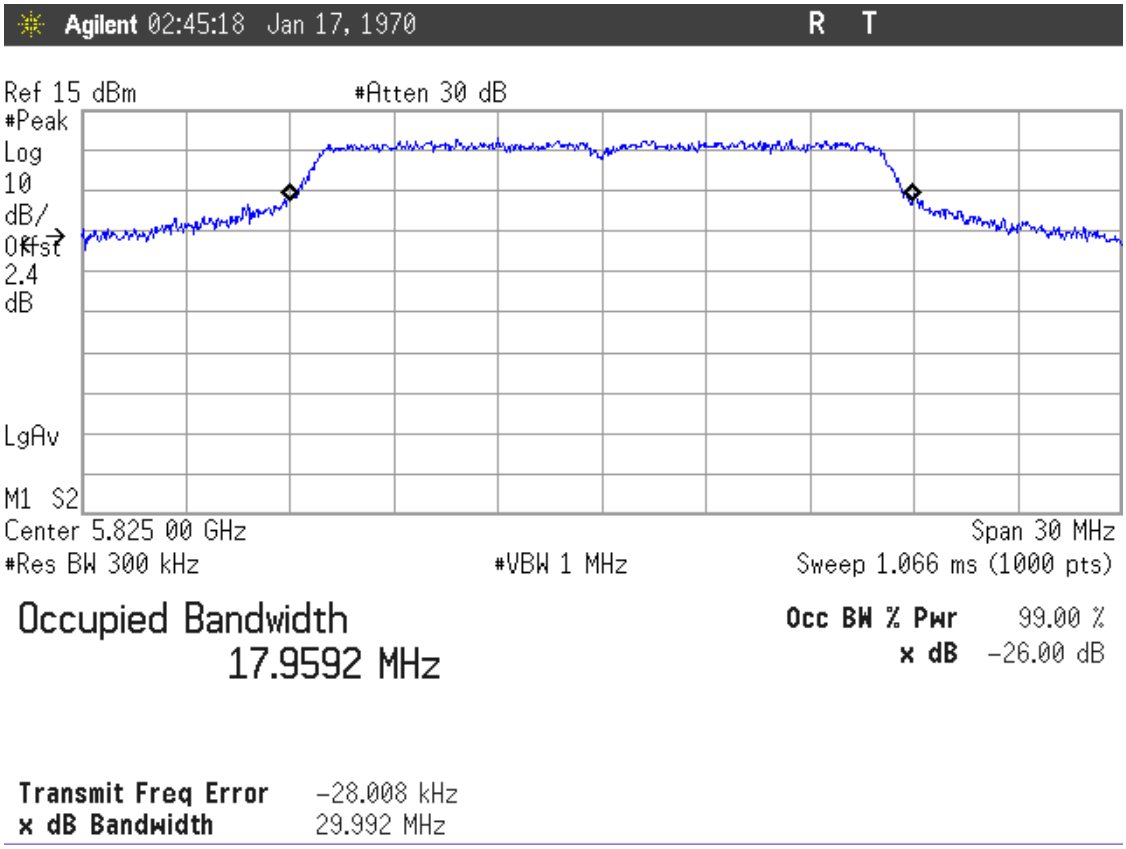
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

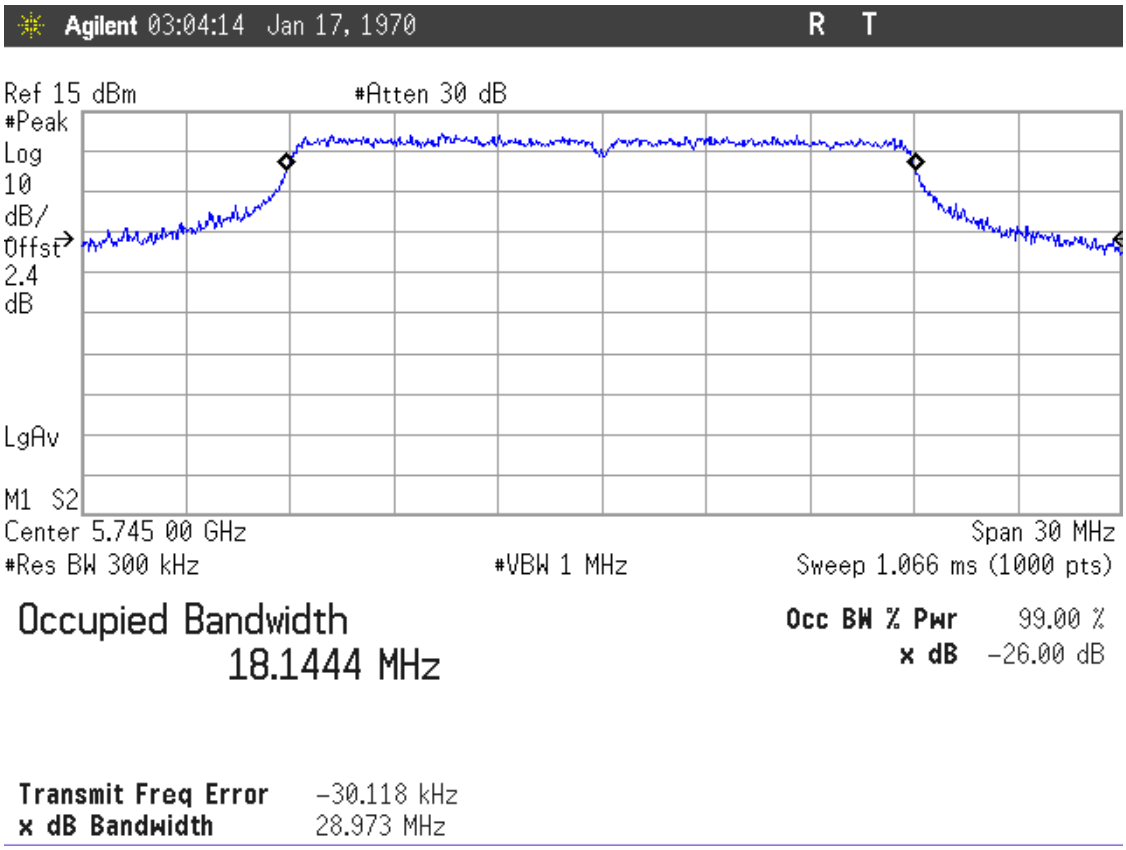


Highest Channel: 5825 MHz. Chain B

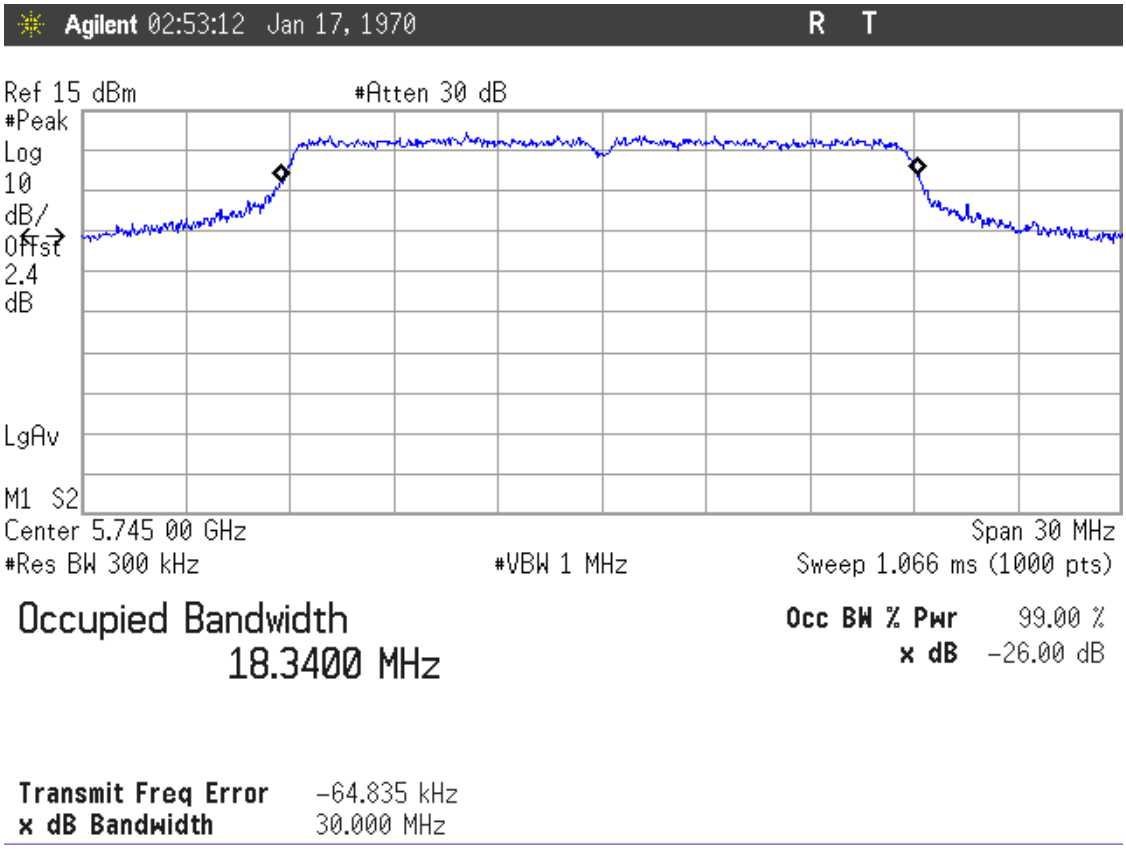


2. WiFi 5GHz 802.11 n20 mode

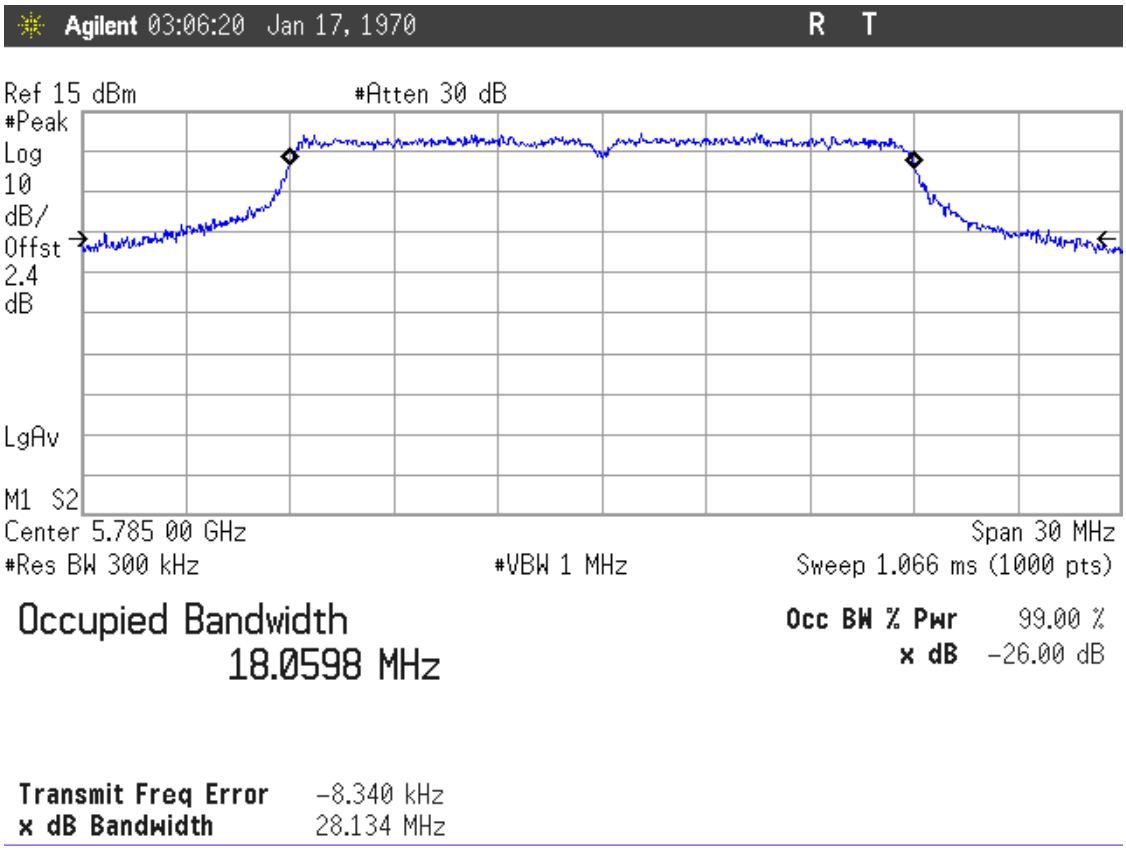
Lowest Channel: 5745 MHz. Chain A



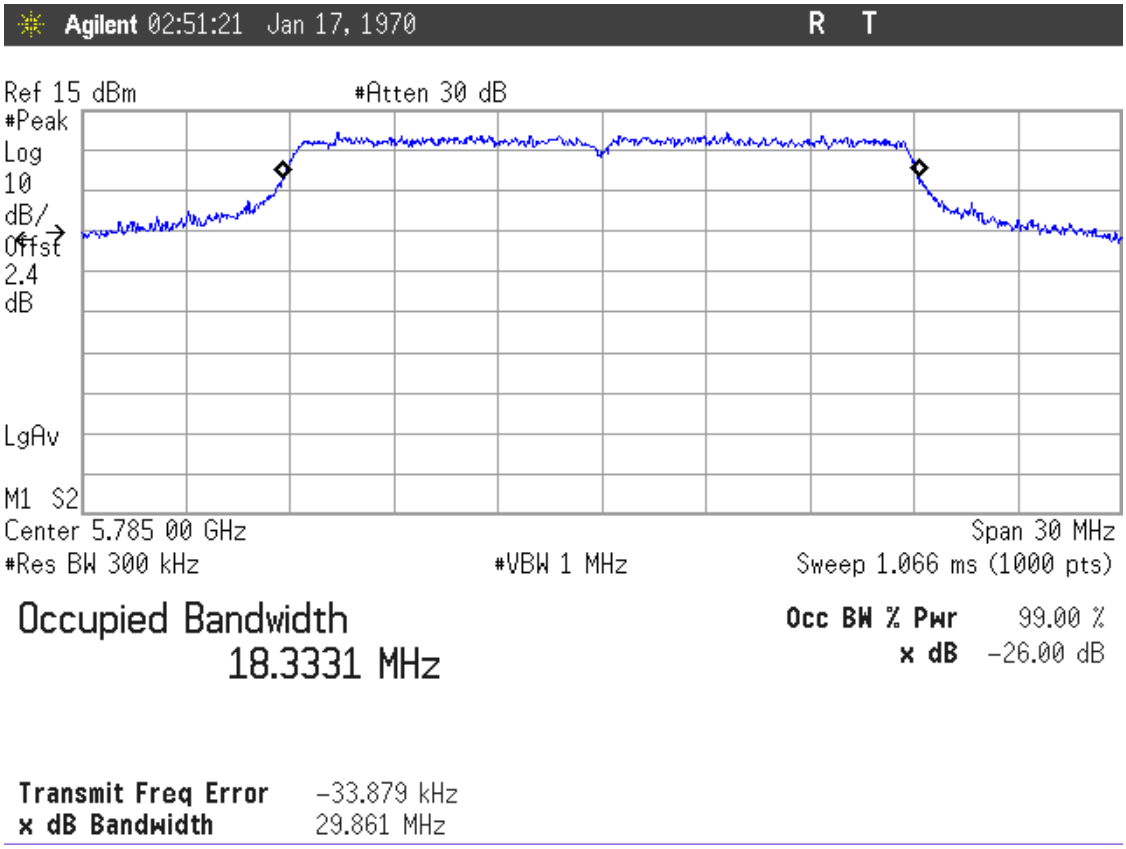
Lowest Channel: 5745 MHz. Chain B



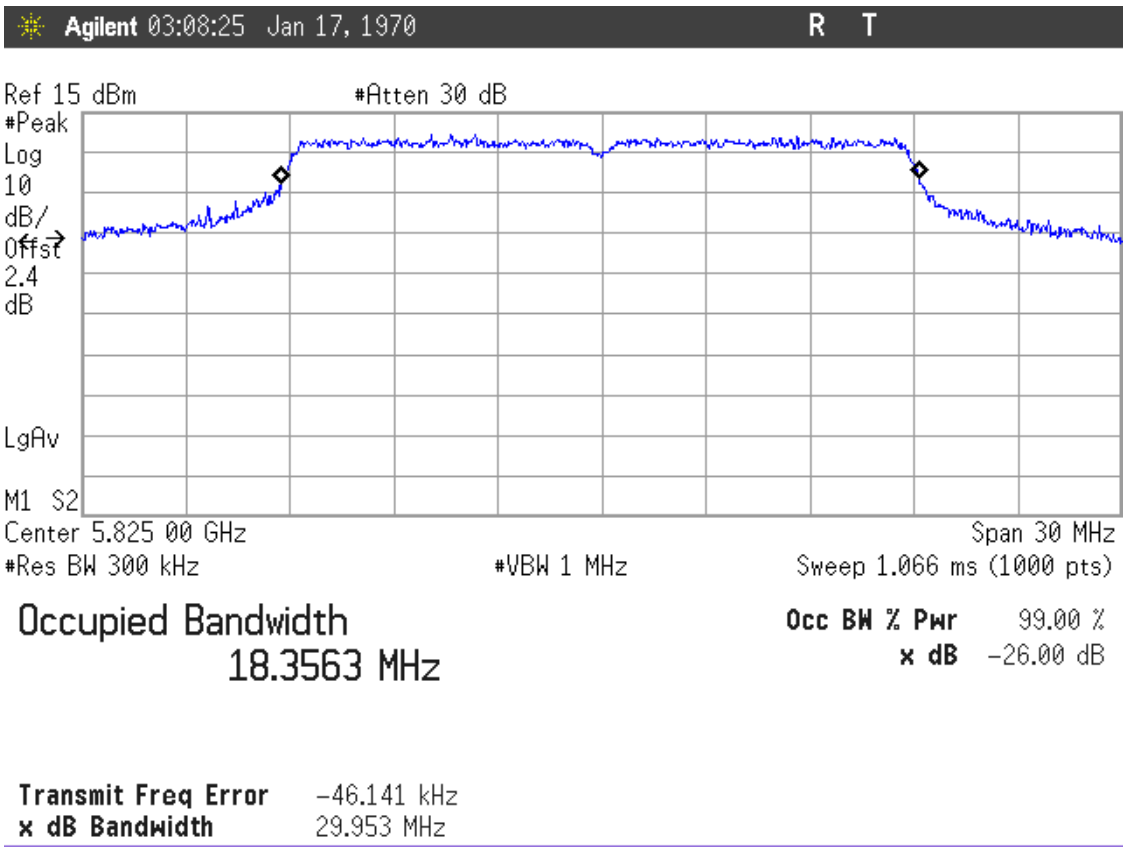
Middle Channel: 5785 MHz. Chain A



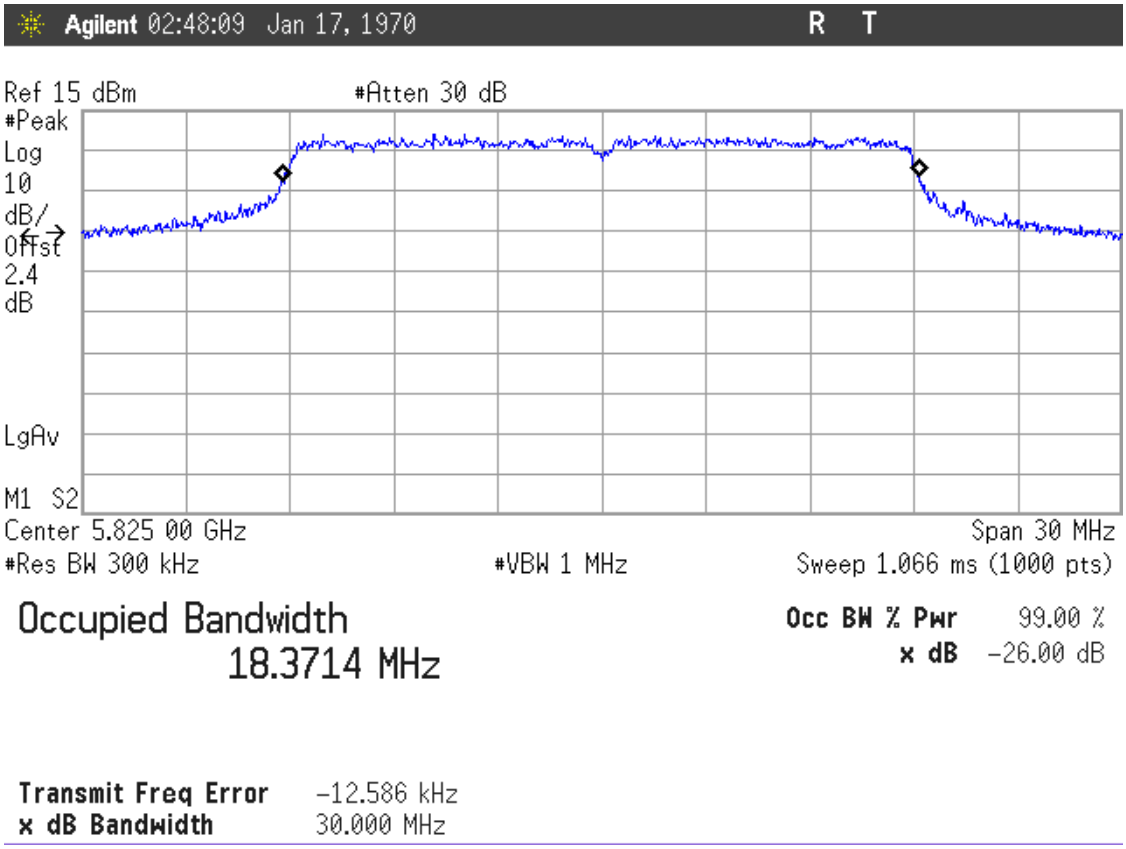
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

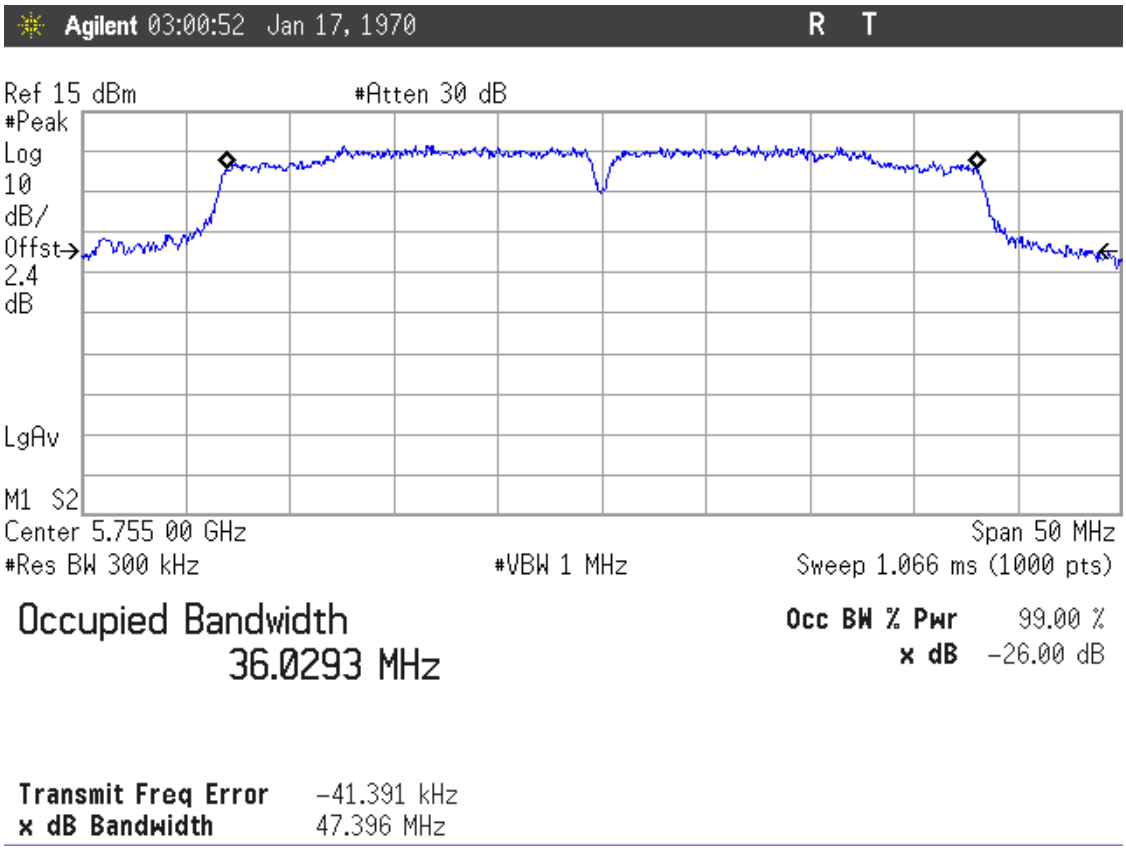


Highest Channel: 5825 MHz. Chain B

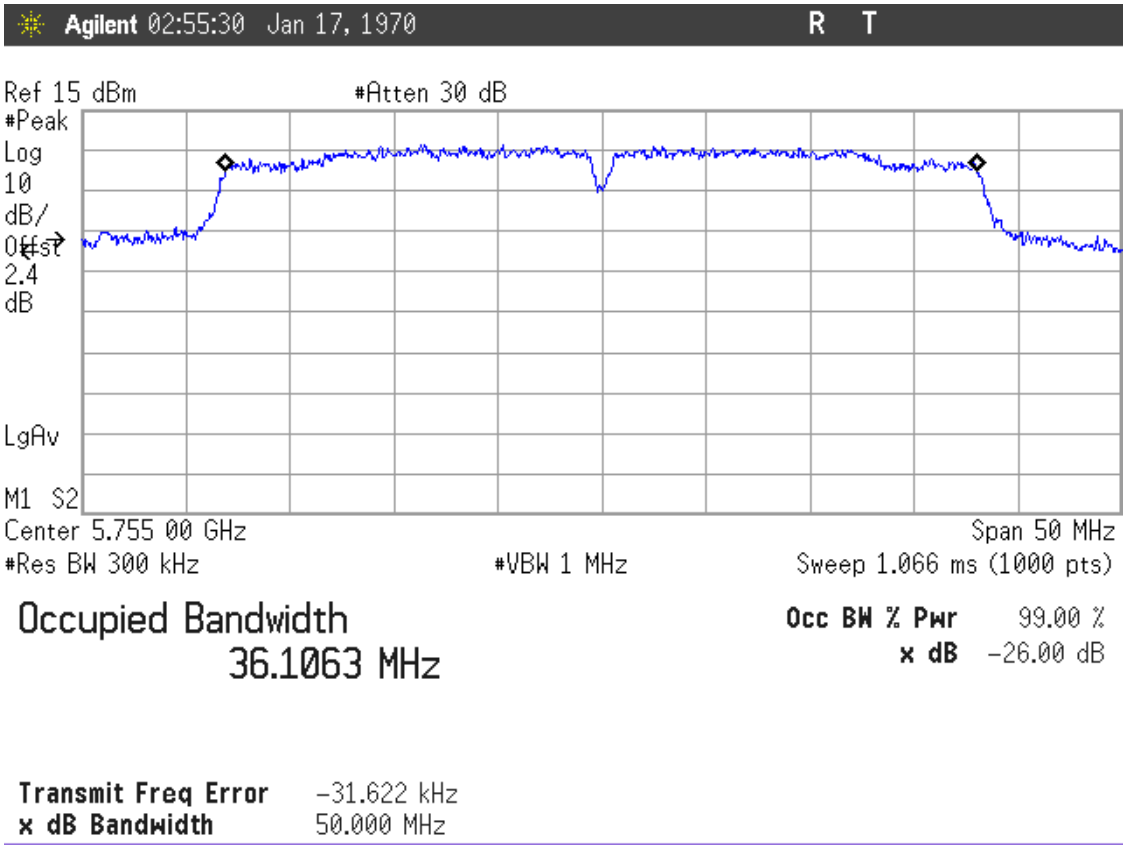


3. WiFi 5GHz 802.11 n40 mode

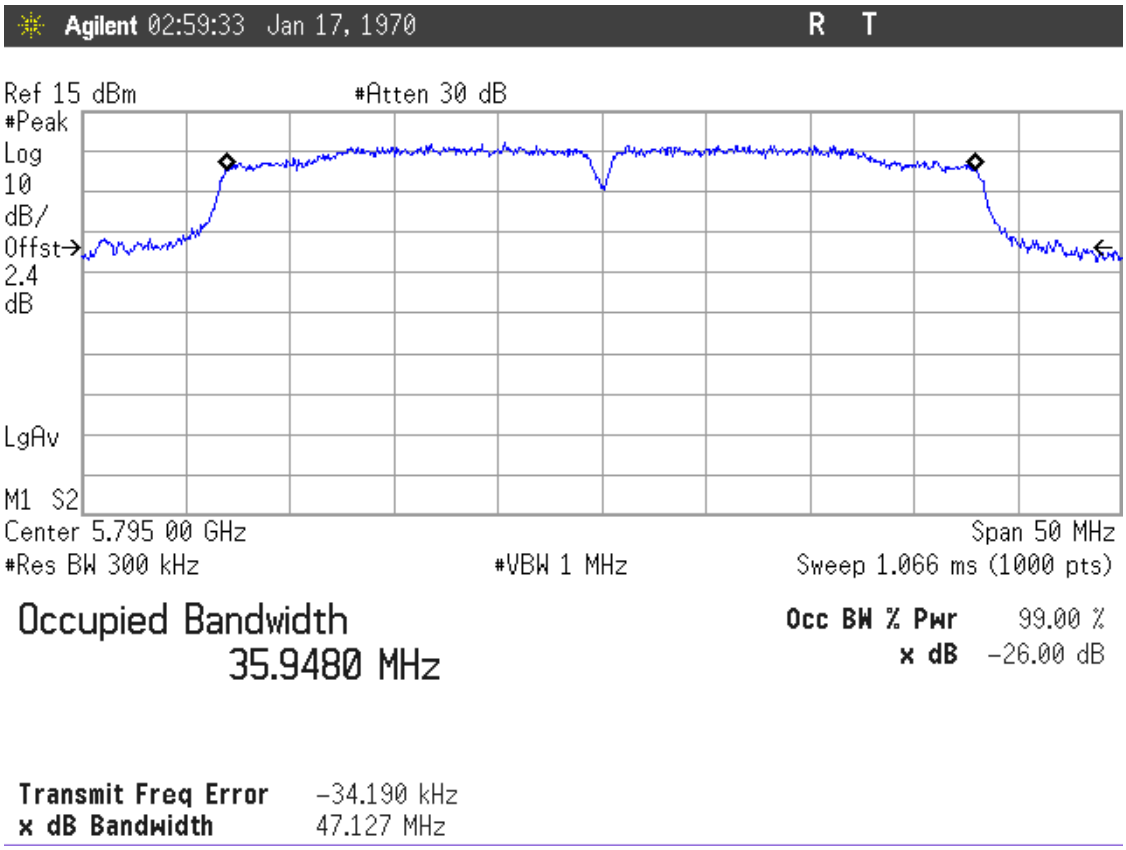
Lowest Channel: 5755 MHz. Chain A



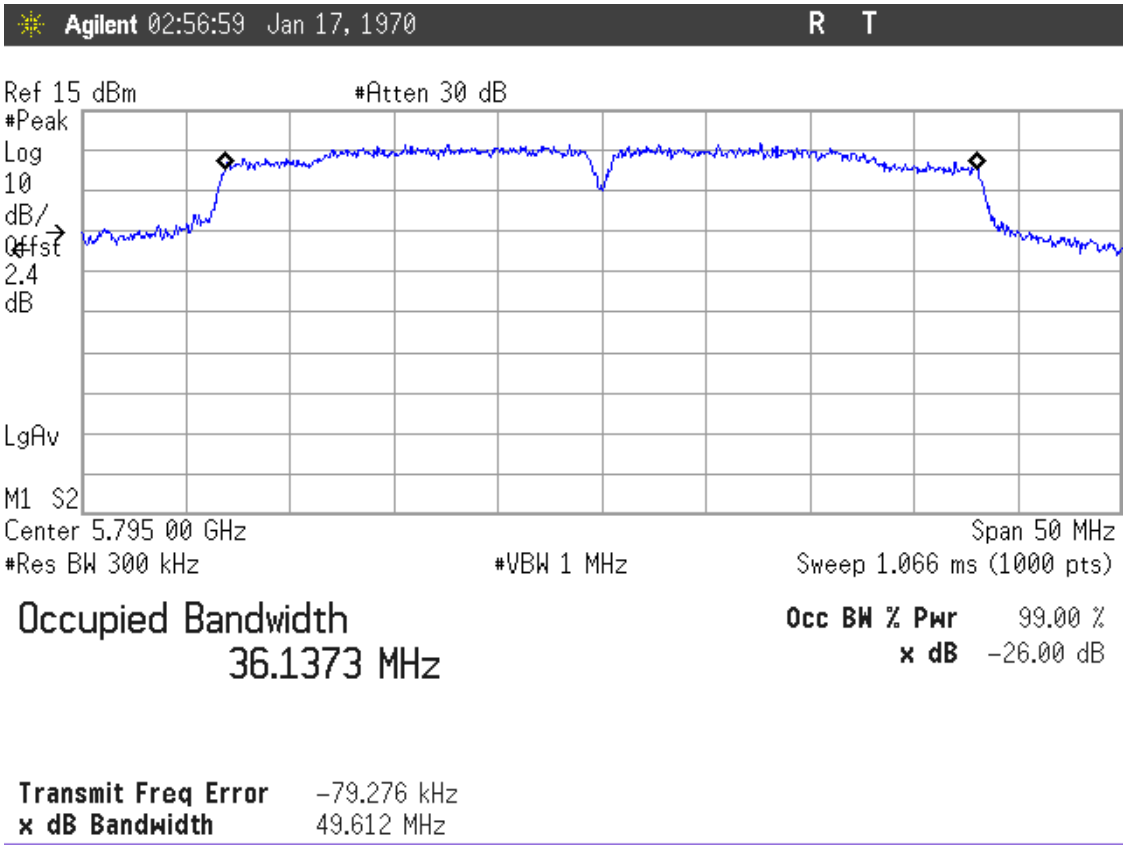
Lowest Channel: 5755 MHz. Chain B



Highest Channel: 5795 MHz. Chain A

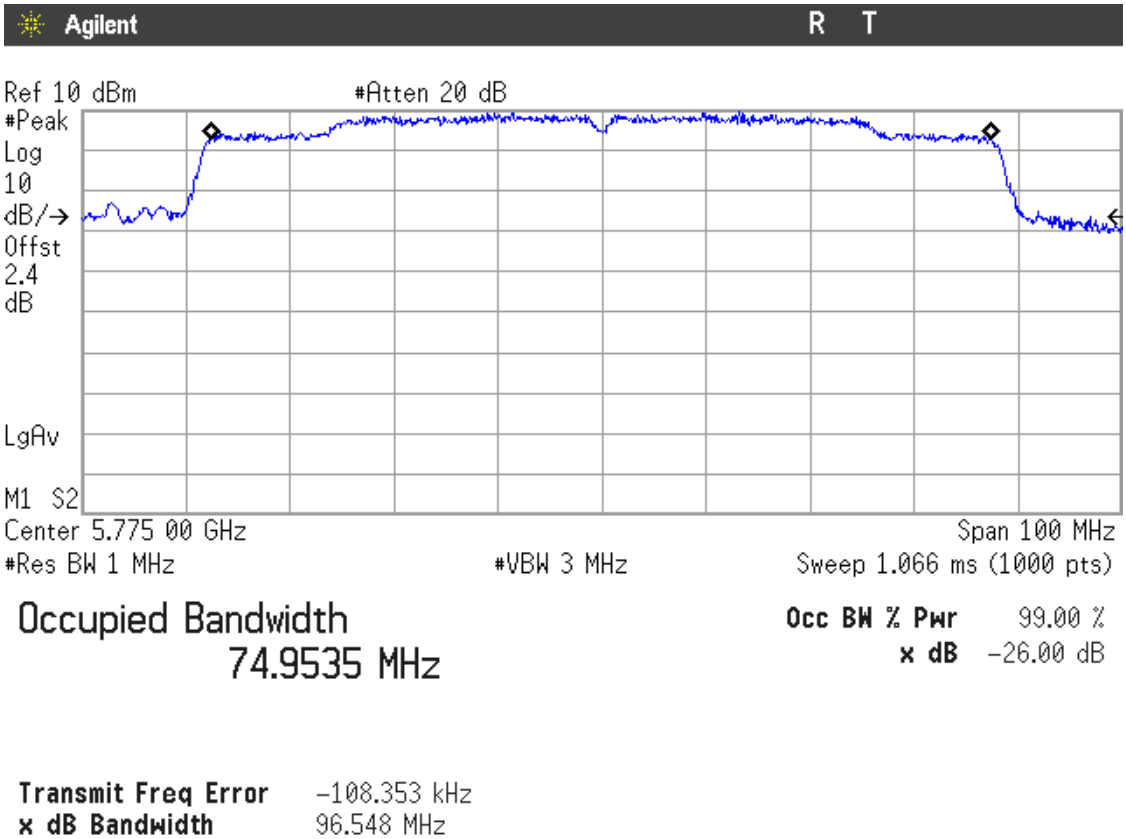


Highest Channel: 5795 MHz. Chain B

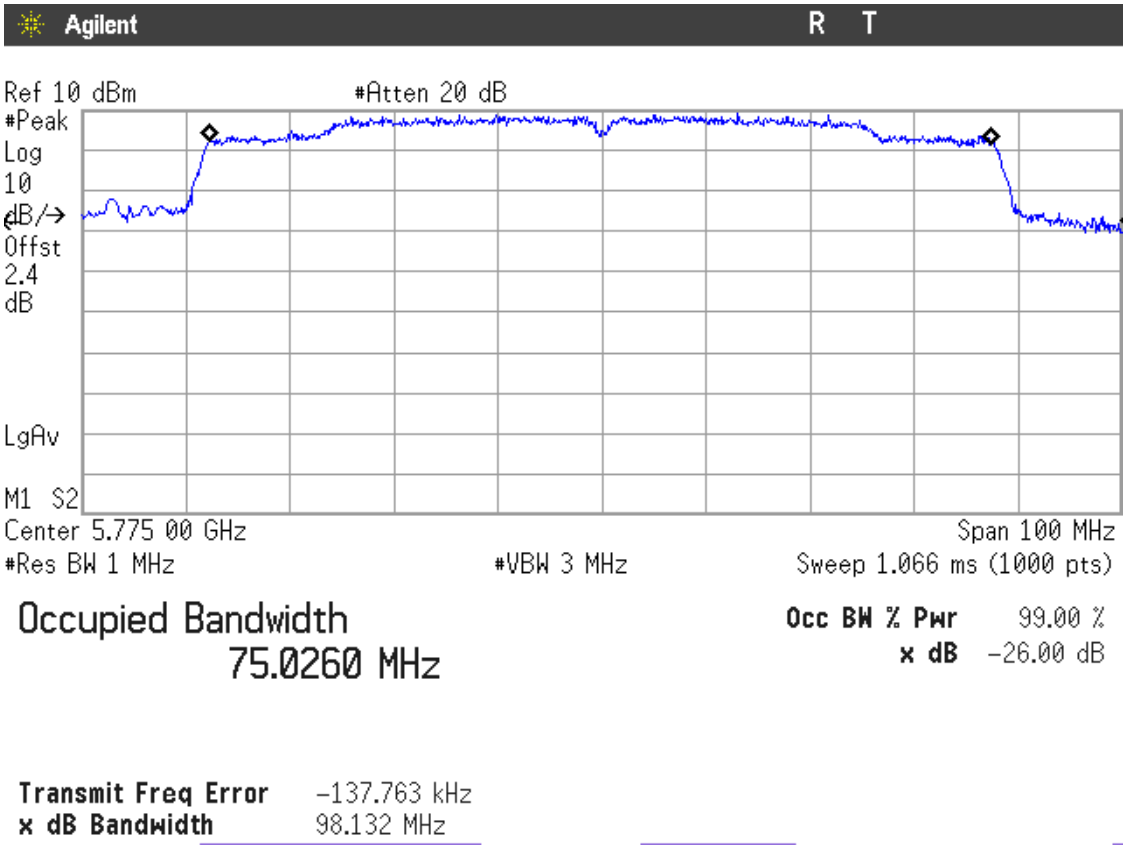


4. WiFi 5GHz 802.11 ac80 mode

Middle Channel: 5775 MHz. Chain A



Middle Channel: 5775 MHz. Chain B



Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a). 6 dB Bandwidth

SPECIFICATION

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

6 dB Bandwidth (see next plots).

1. WiFi 5GHz 802.11 a mode

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	16.378	16.378	16.346	16.378	16.410	16.346
Measurement uncertainty (kHz)	±89					

2. WiFi 5GHz 802.11 n20 mode

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	17.756	17.788	17.724	17.711	17.724	17.756
Measurement uncertainty (kHz)	±89					

3. WiFi 5GHz 802.11 n40 mode

	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A	Chain B	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	35.448	35.769	35.128	35.192
Measurement uncertainty (kHz)	±21.7			

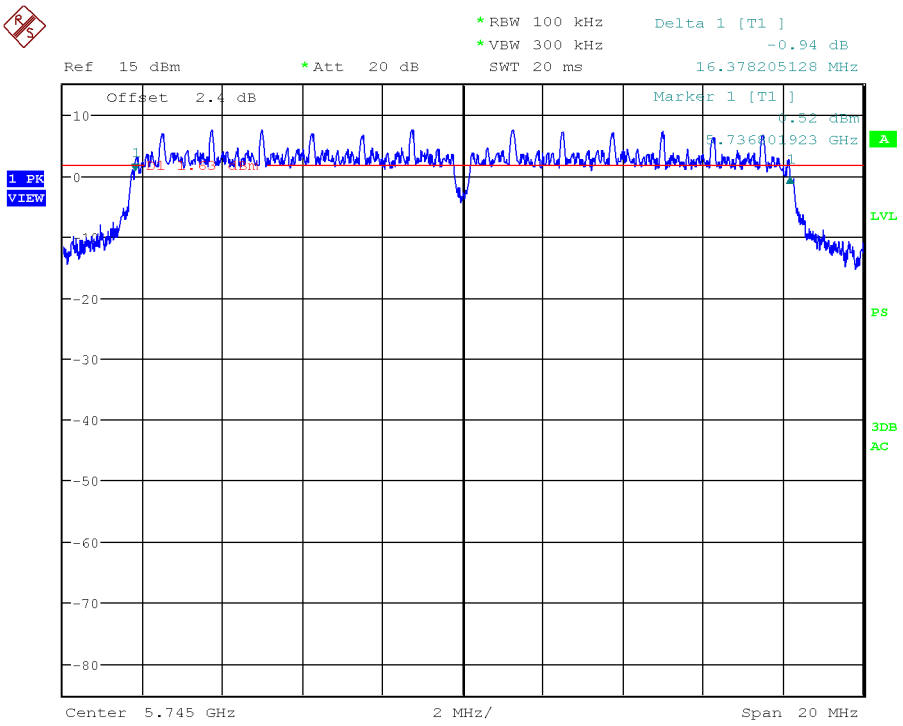
4. WiFi 5GHz 802.11 ac80 mode

	Middle frequency 5775 MHz	
	Chain A	Chain B
6 dB Spectrum bandwidth (MHz)	75.12	72.63
Measurement uncertainty (kHz)	±21.7	

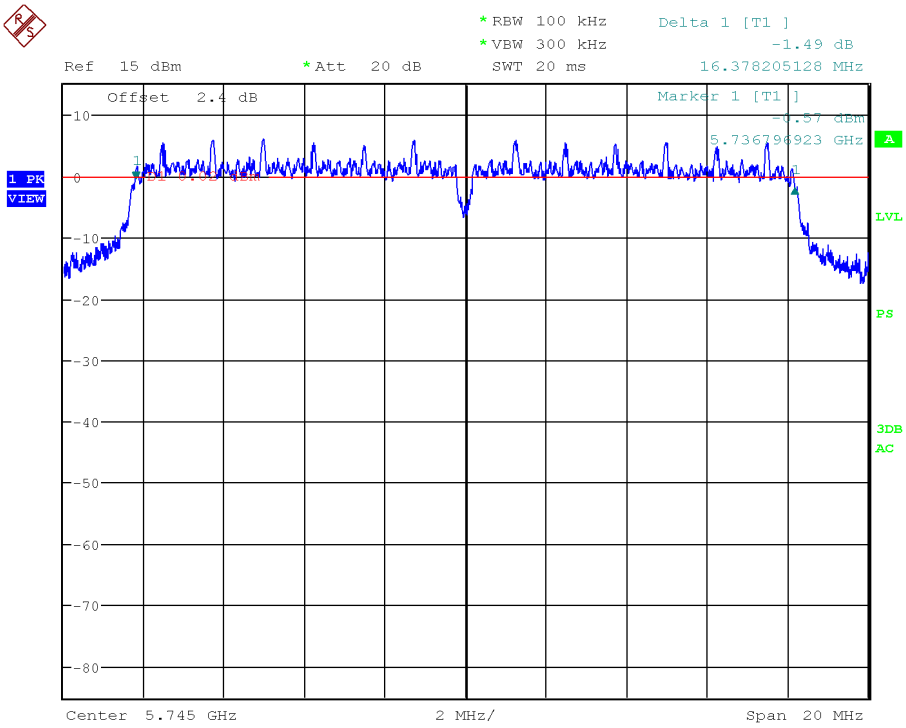
Verdict: PASS

1. WiFi 5GHz 802.11 a mode

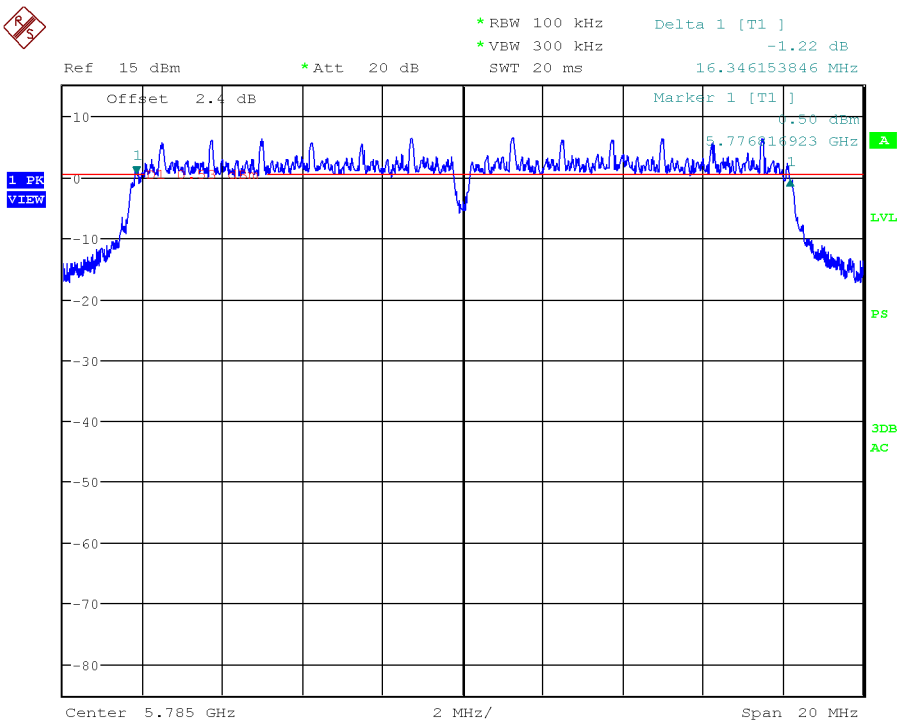
Lowest Channel: 5745 MHz. Chain A



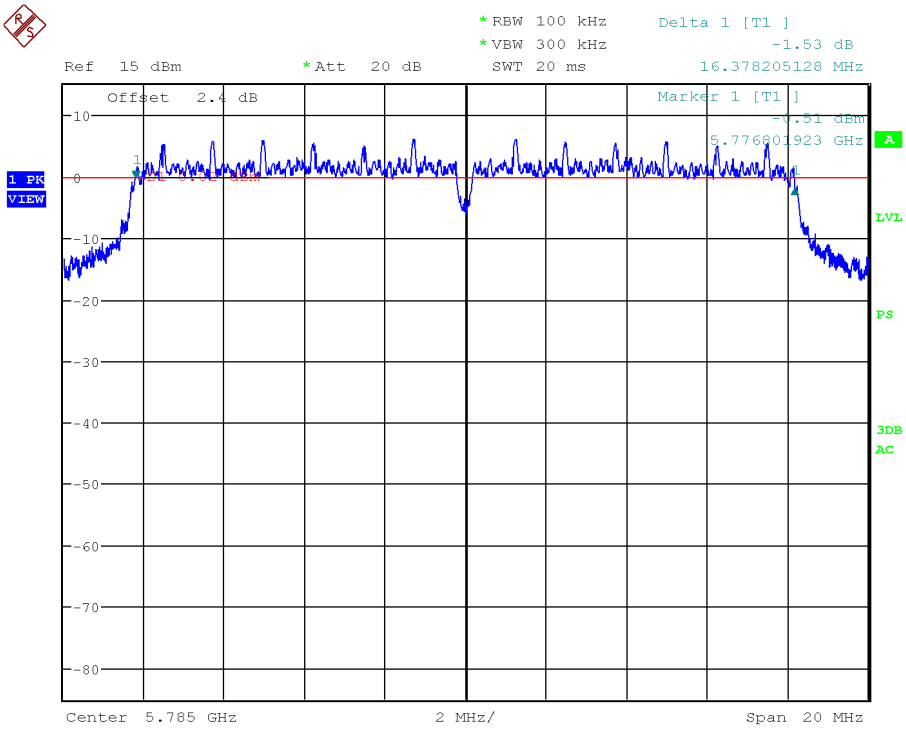
Lowest Channel: 5745 MHz. Chain B



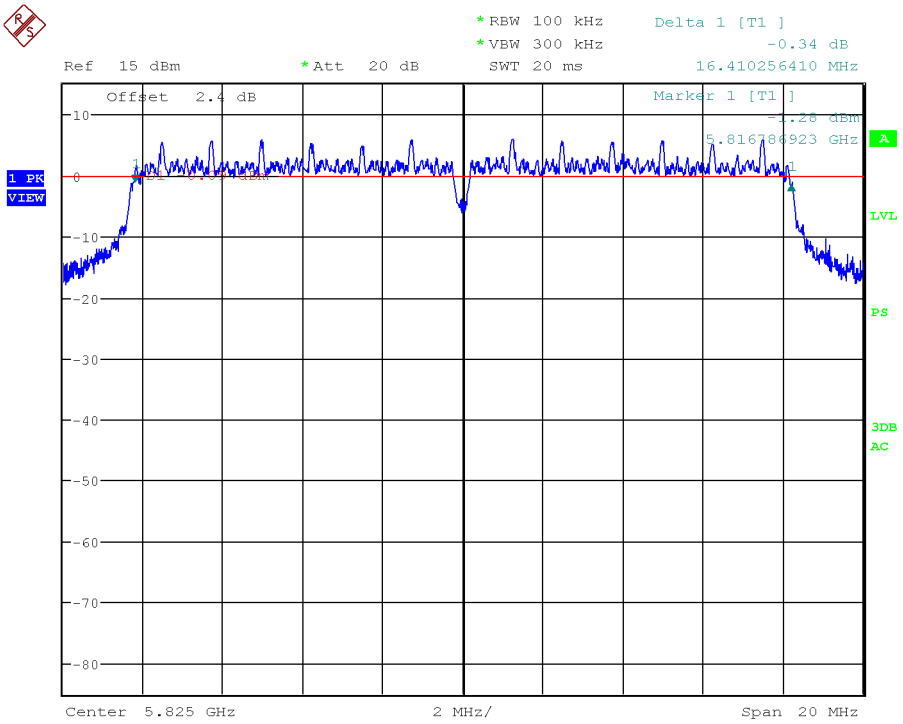
Middle Channel: 5785 MHz. Chain A



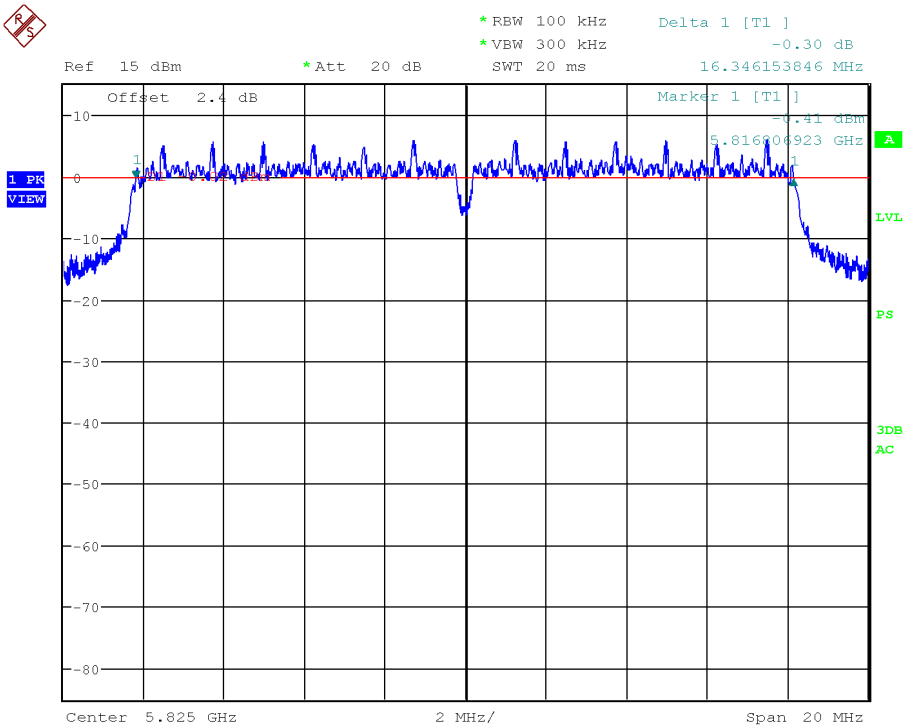
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

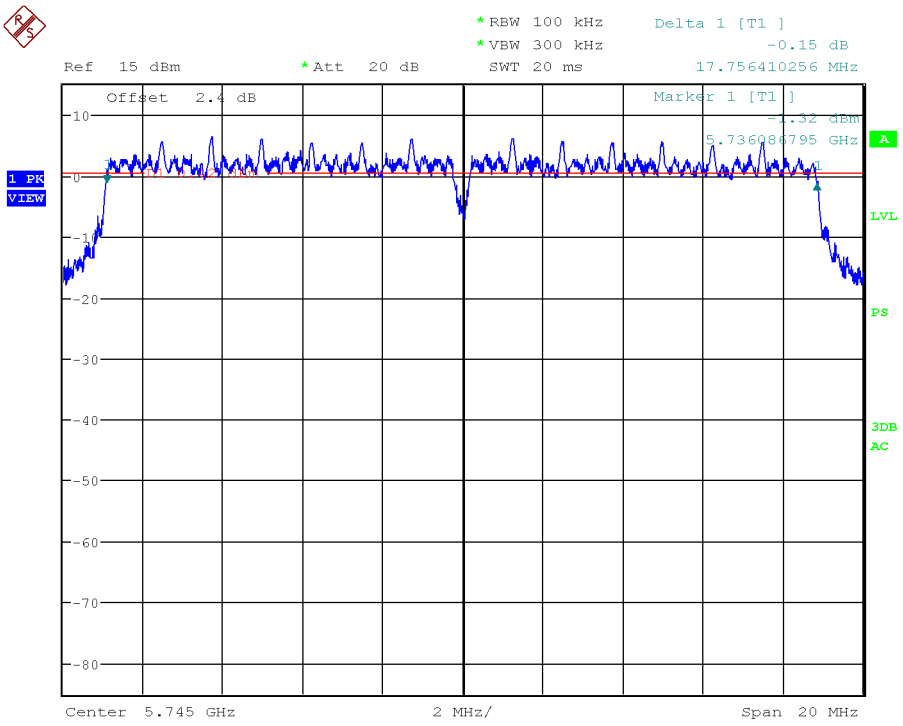


Highest Channel: 5825 MHz. Chain B

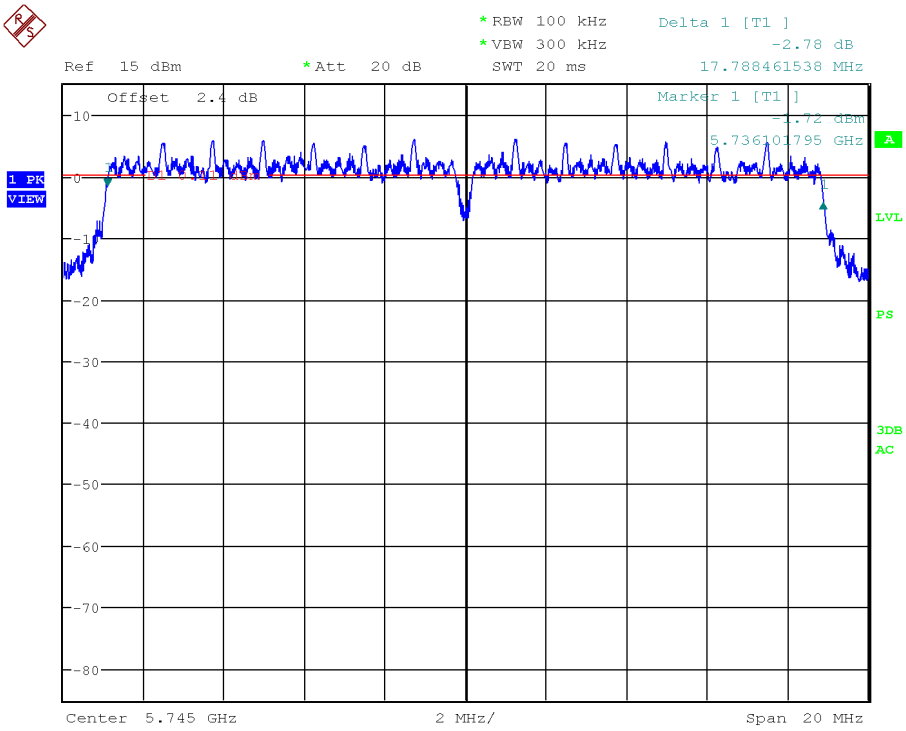


2. WiFi 5GHz 802.11 n20 mode

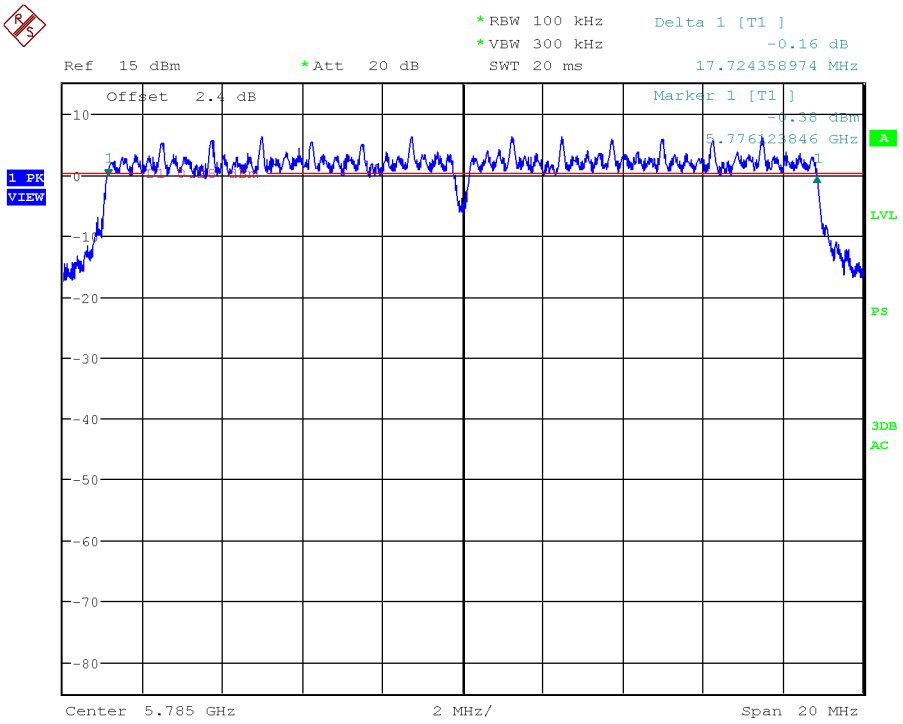
Lowest Channel: 5745 MHz. Chain A



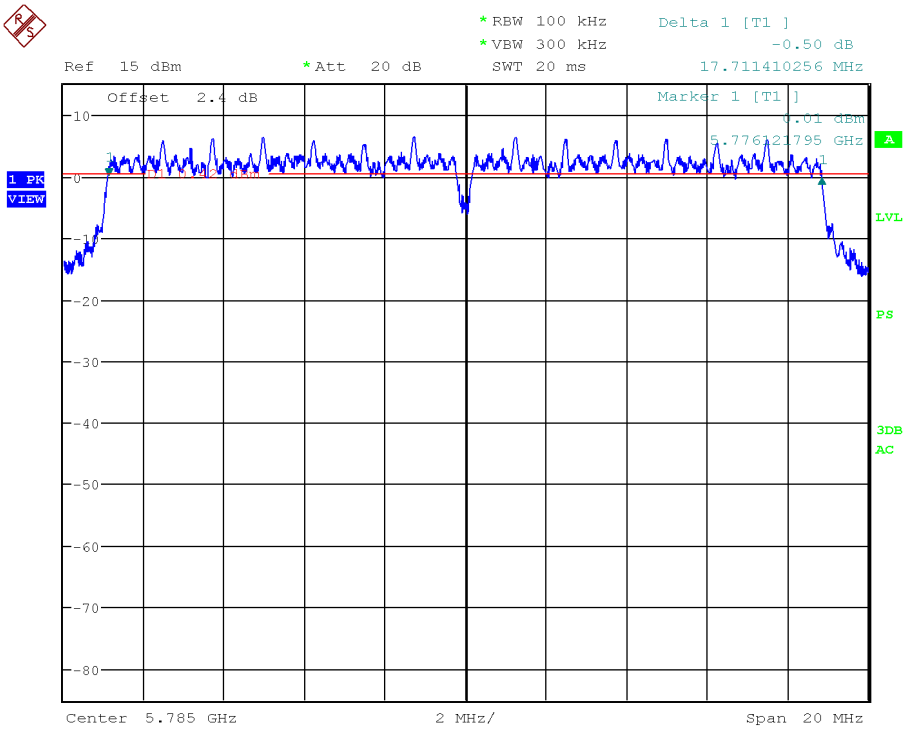
Lowest Channel: 5745 MHz. Chain B



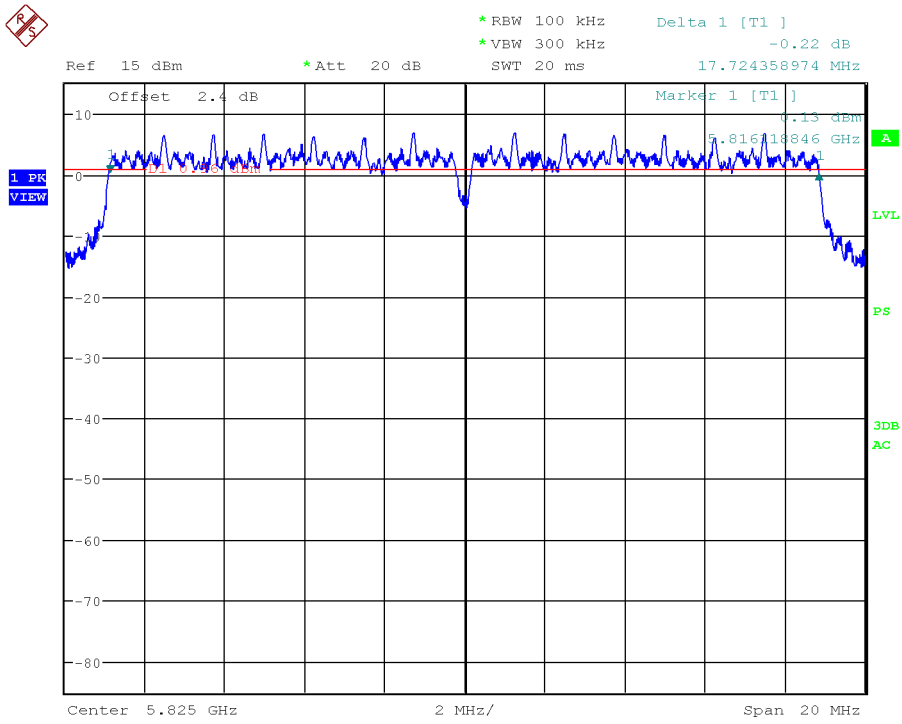
Middle Channel: 5785 MHz. Chain A



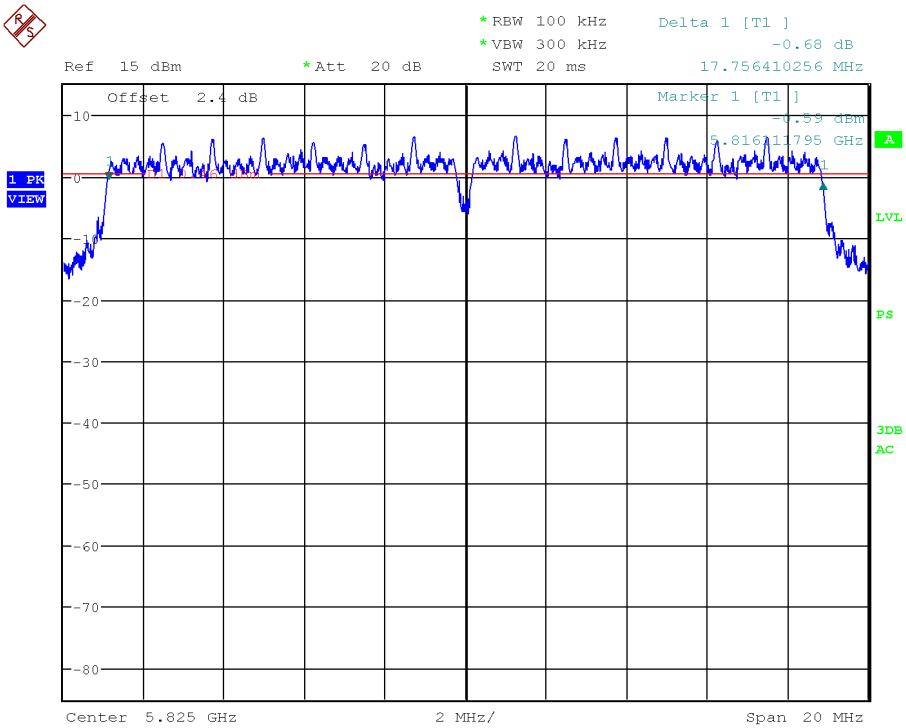
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

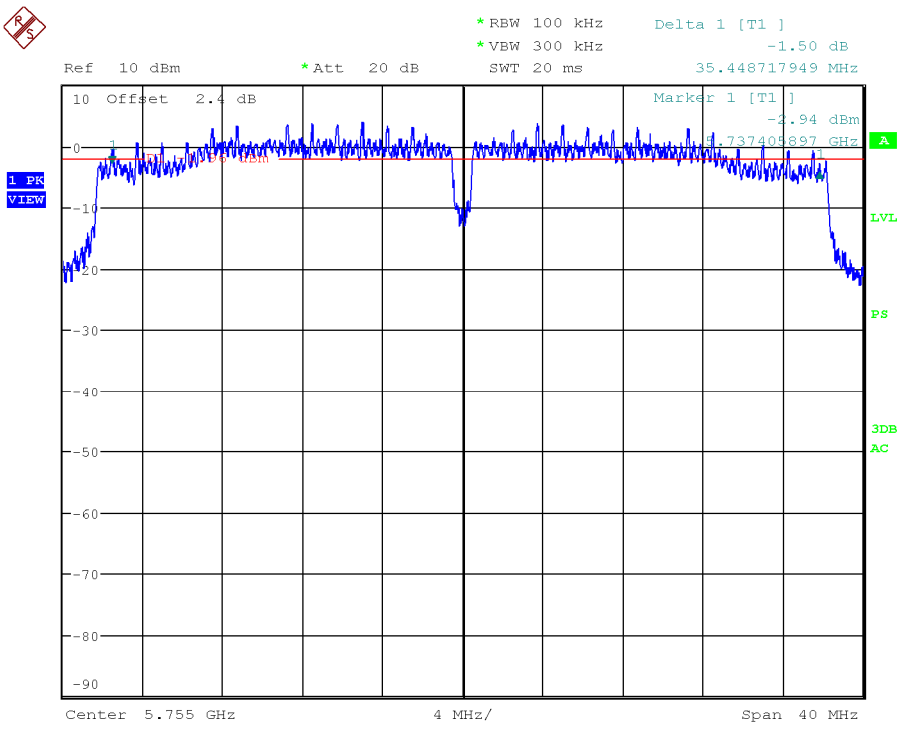


Highest Channel: 5825 MHz. Chain B

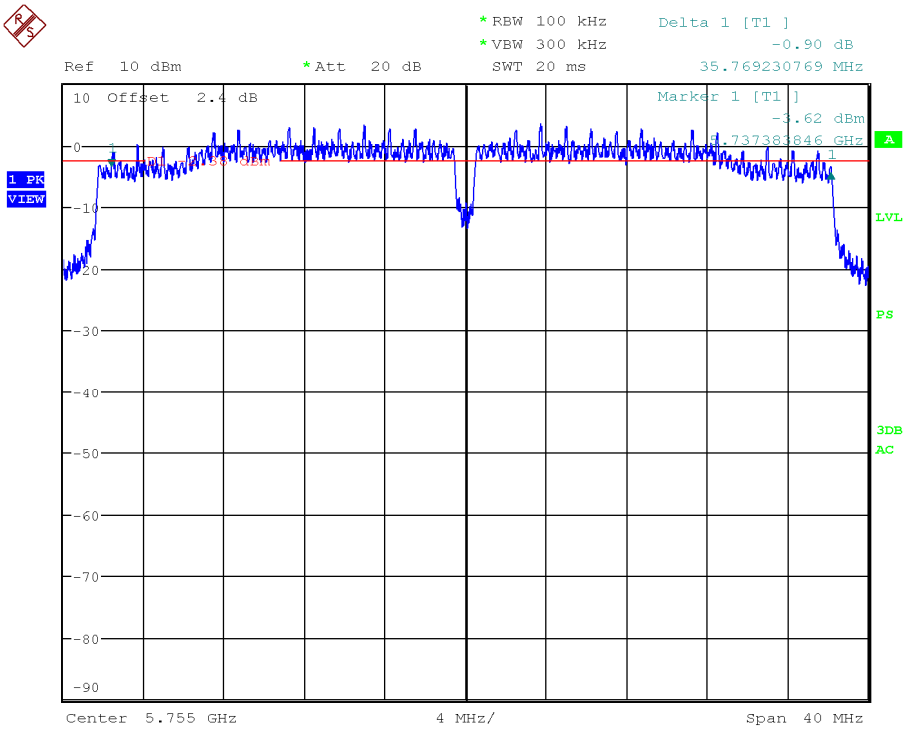


3. WiFi 5GHz 802.11 n40 mode

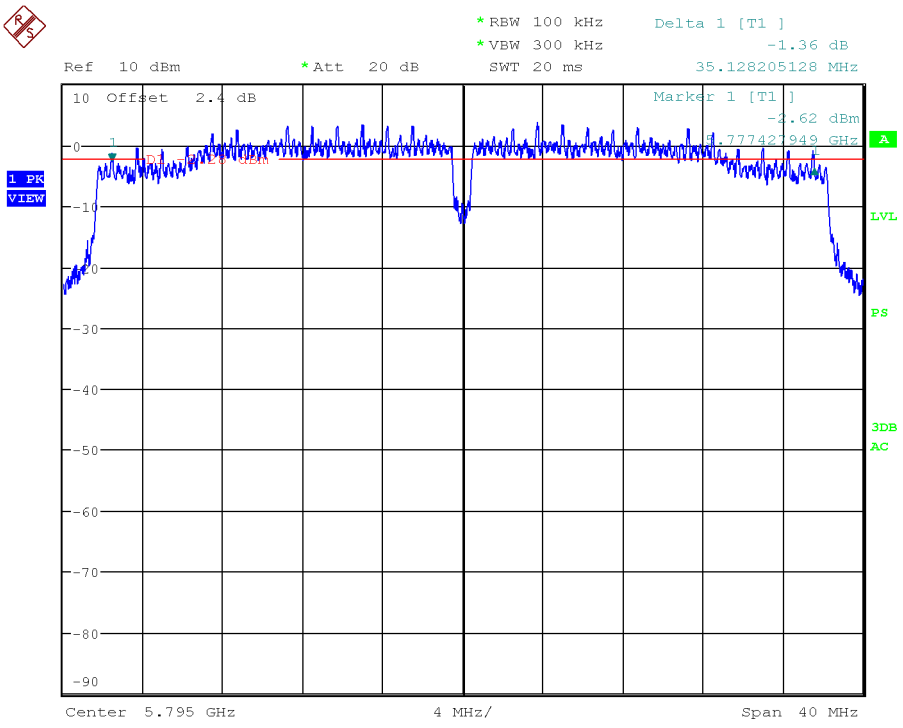
Lowest Channel: 5755 MHz. Chain A



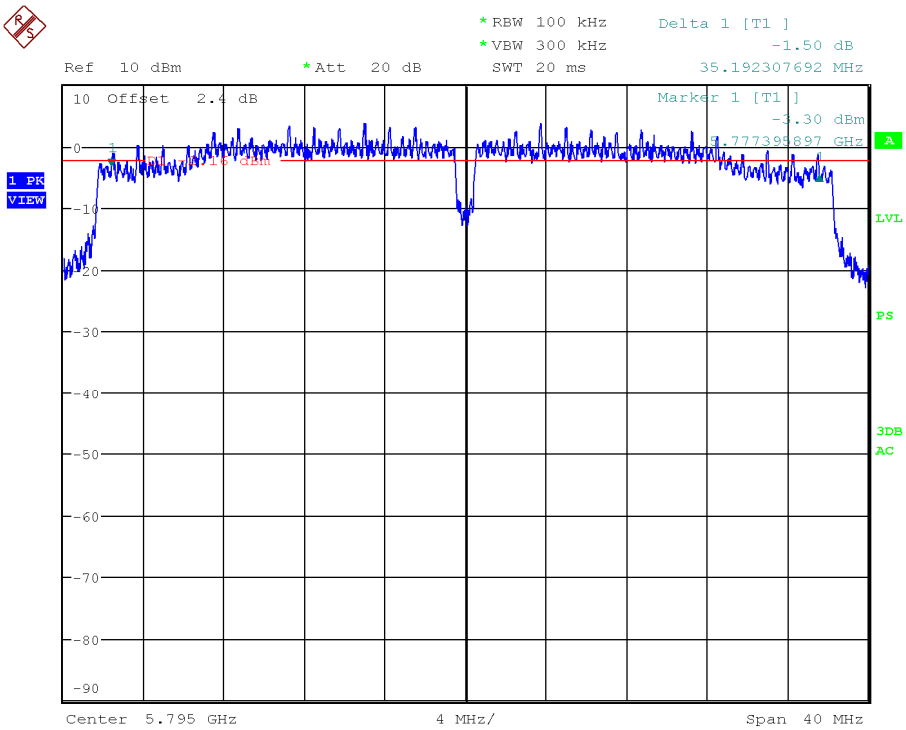
Lowest Channel: 5755 MHz. Chain B



Highest Channel: 5795 MHz. Chain A

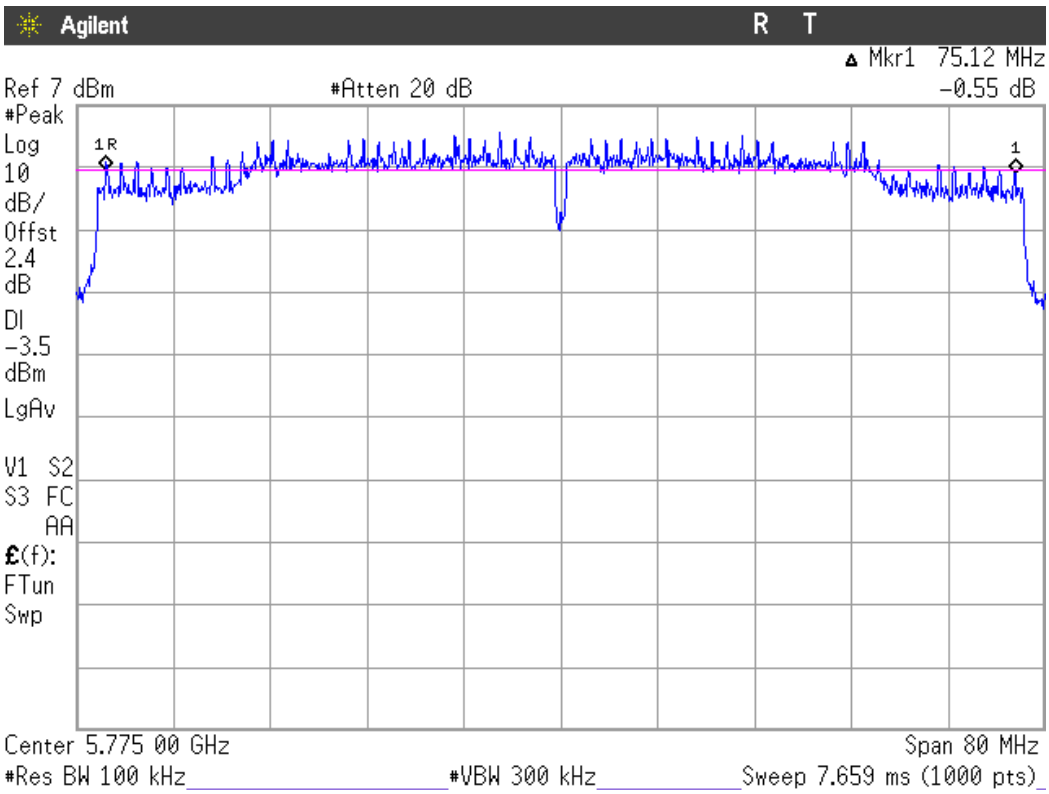


Highest Channel: 5795 MHz. Chain B

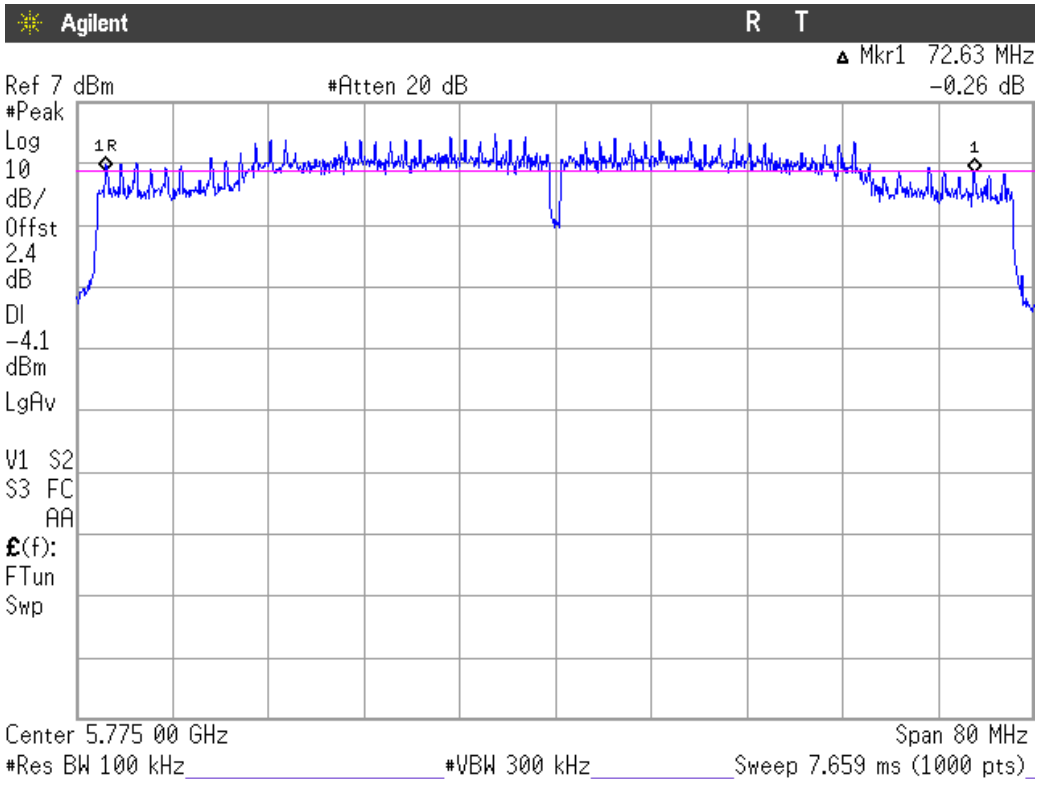


4. WiFi 5GHz 802.11 ac80 mode

Middle Channel: 5775 MHz. Chain A



Middle Channel: 5775 MHz. Chain B



Section 15.247 Subclause (b) / RSS-210 A8.4. (4). Maximum output power and antenna gain

SPECIFICATION

The maximum peak conducted output power of the intentional radiator shall not exceed 1 watt (30 dBm). The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS

The maximum Peak Conducted Output Power was measured using the channel integration method according to point 9.1.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11n40 and 802.11ac80 modes.

The maximum conducted (average) output power was measured using the method according to point 9.2.1.1. Option a) of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11a and 802.11n20 modes.

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

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.
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 5/28/2013 was used.
The number of transmit antennas (N_{ANT}) are 2 and the number of spatial streams (Nss) are 2 and therefore the Array Gain is 0 dB.

MAXIMUM OUTPUT POWER. (See next plots of worst case: highest power).

Declared maximum antenna gain: 5 dBi.

1. WiFi 5GHz 802.11 a mode

Conducted (average) output power.

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	16.87	16.72	16.74	16.74	16.91	16.84
Maximum EIRP power (dBm)	21.87	21.72	21.74	21.74	21.91	21.84
Measurement uncertainty (dB)	±1.5					

2. WiFi 5GHz 802.11 n20 mode

Conducted (average) output power.

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	16.94	16.92	16.93	16.88	16.92	16.84
Maximum EIRP power (dBm)	21.94	21.92	21.93	21.88	21.92	21.84
Measurement uncertainty (dB)	±1.5					

MIMO	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Maximum conducted power (dBm)	13.89	13.73	13.45	13.65	13.57	13.33
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	16.82		16.56		16.34	
Maximum EIRP power (dBm)	21.82		21.56		21.34	
Measurement uncertainty (dB)	±1.5					

3. WiFi 5GHz 802.11 n40 mode

Peak Conducted Output Power.

	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A	Chain B	Chain A	Chain B
Maximum conducted power (dBm)	19.66	19.43	19.56	19.36
Maximum EIRP power (dBm)	24.66	24.43	24.56	24.36
Measurement uncertainty (dB)	±1.5			

MIMO	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B
Maximum conducted power (dBm)	16.02	16.50	16.54	16.08
	Port A+B		Port A+B	
Maximum conducted power (dBm)	19.28		19.09	
Maximum EIRP power (dBm)	24.28		24.09	
Measurement uncertainty (dB)	±1.5			

Verdict: PASS

4. WiFi 5GHz 802.11 ac80 mode

Peak Conducted Output Power.

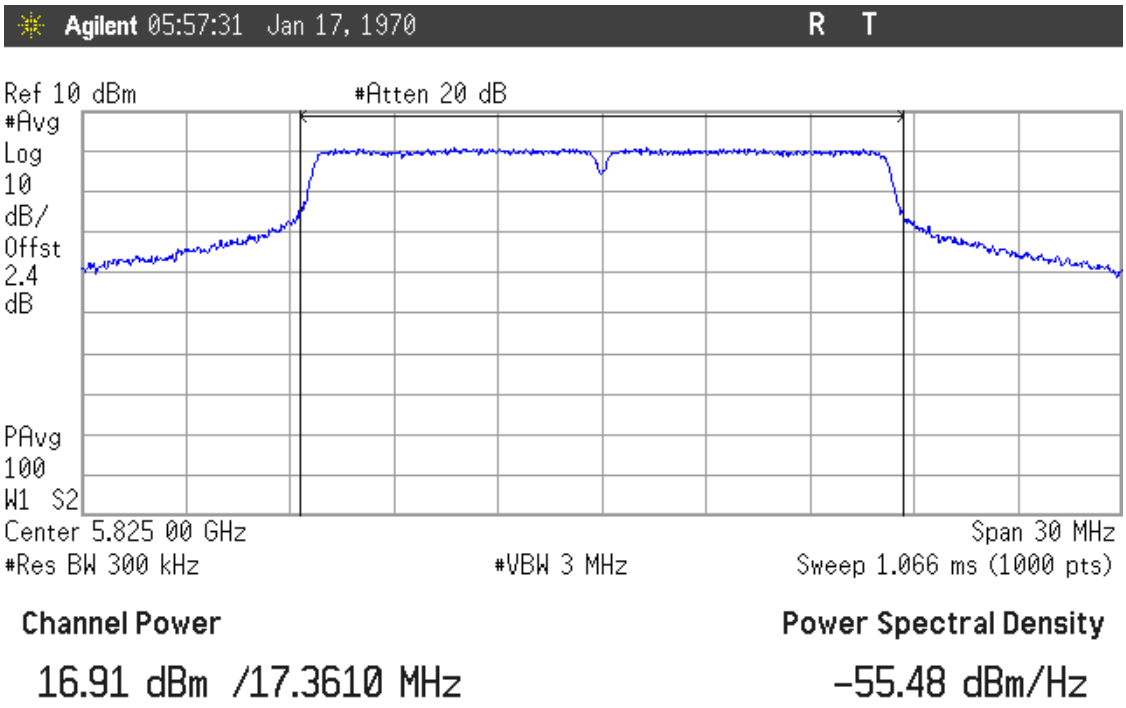
	Middle frequency 5775 MHz	
	Chain A	Chain B
Maximum conducted power (dBm)	17.90	17.71
Maximum EIRP power (dBm)	22.90	22.71
Measurement uncertainty (dB)	±1.5	

MIMO	Middle frequency 5775 MHz	
	Chain A+B	
	Port A	Port B
Maximum conducted power (dBm)	16.21	16.12
	Port A+B	
Maximum conducted power (dBm)	19.18	
Maximum EIRP power (dBm)	24.18	
Measurement uncertainty (dB)	±1.5	

Verdict: PASS

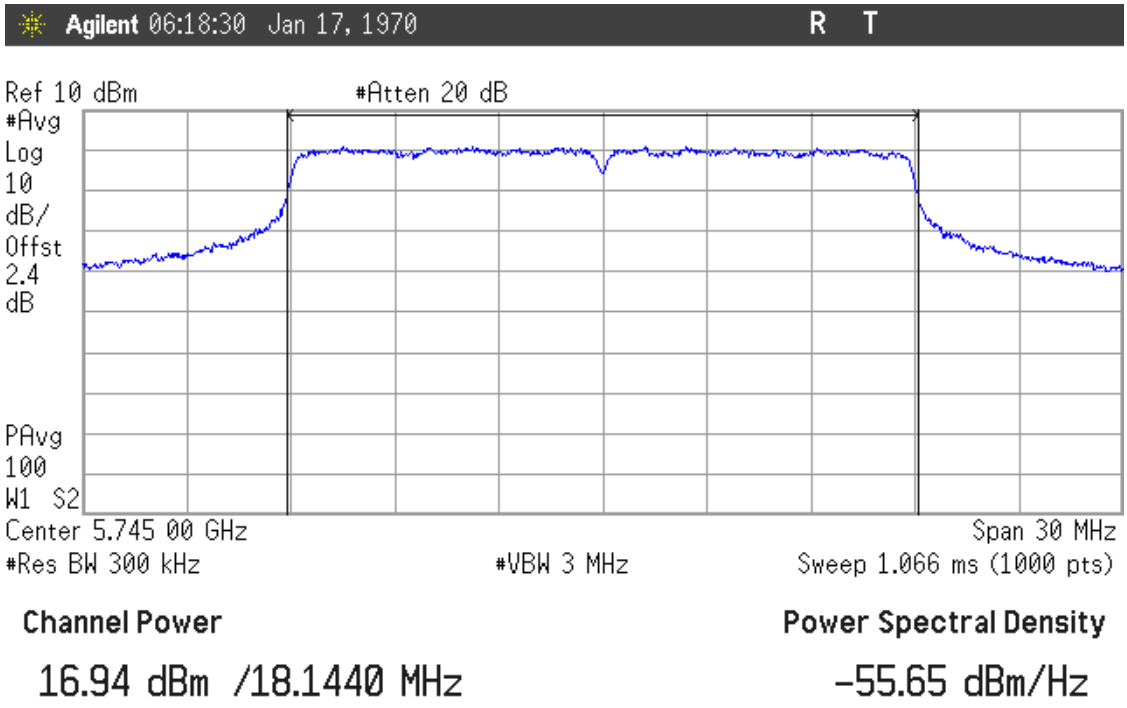
1. WiFi 5GHz 802.11 a mode

Highest Channel: 5825 MHz. Chain A

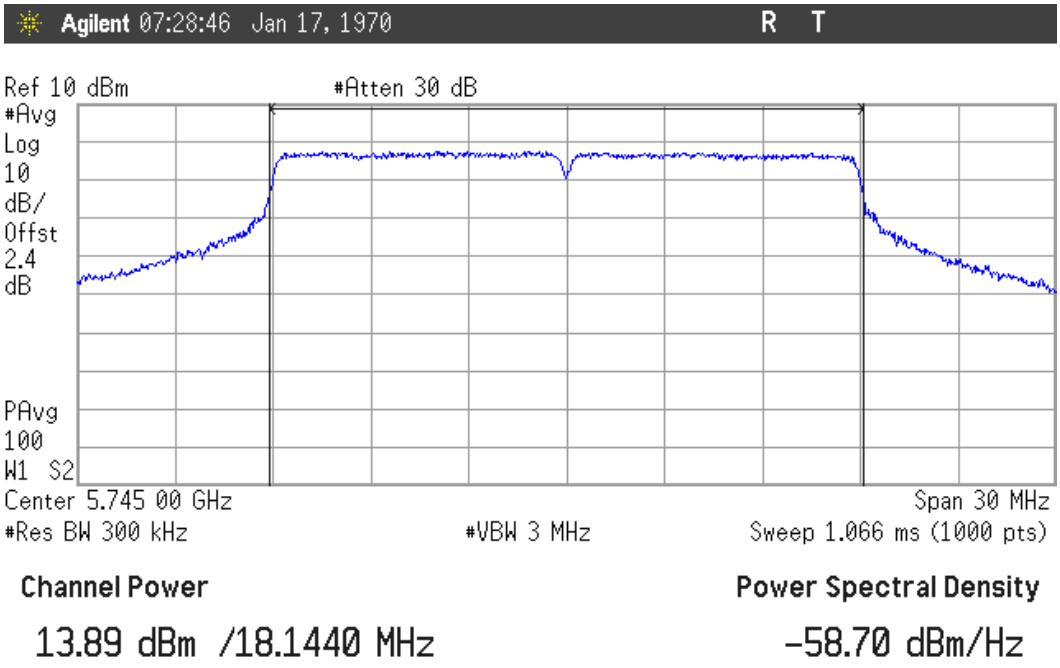


2. WiFi 5GHz 802.11 n20 mode

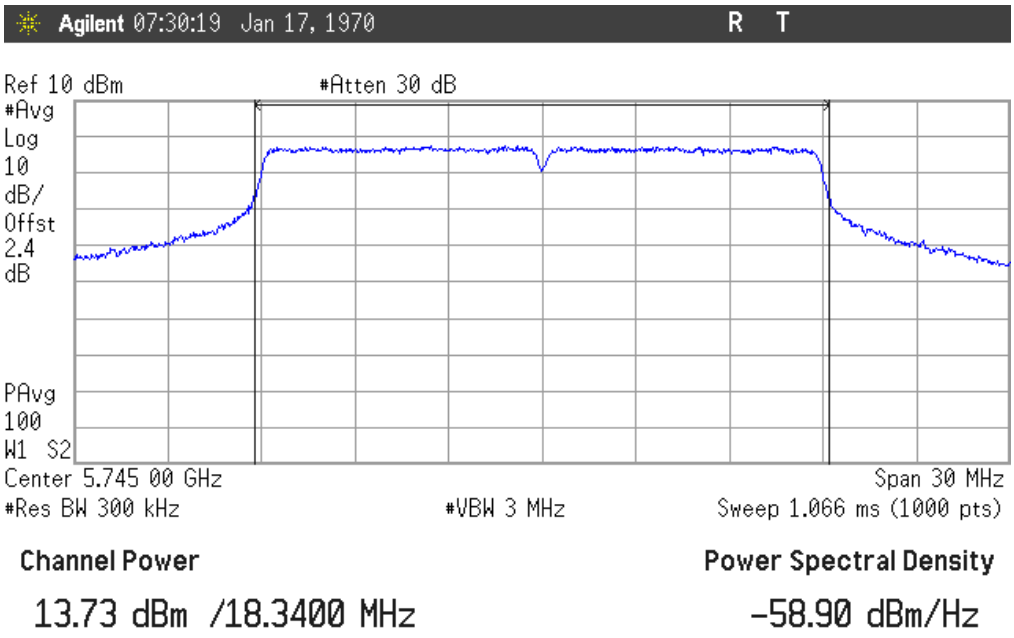
SISO. Lowest Channel: 5745 MHz. Chain A



MIMO. Lowest Channel: 5745 MHz. Chain A+B. Port A

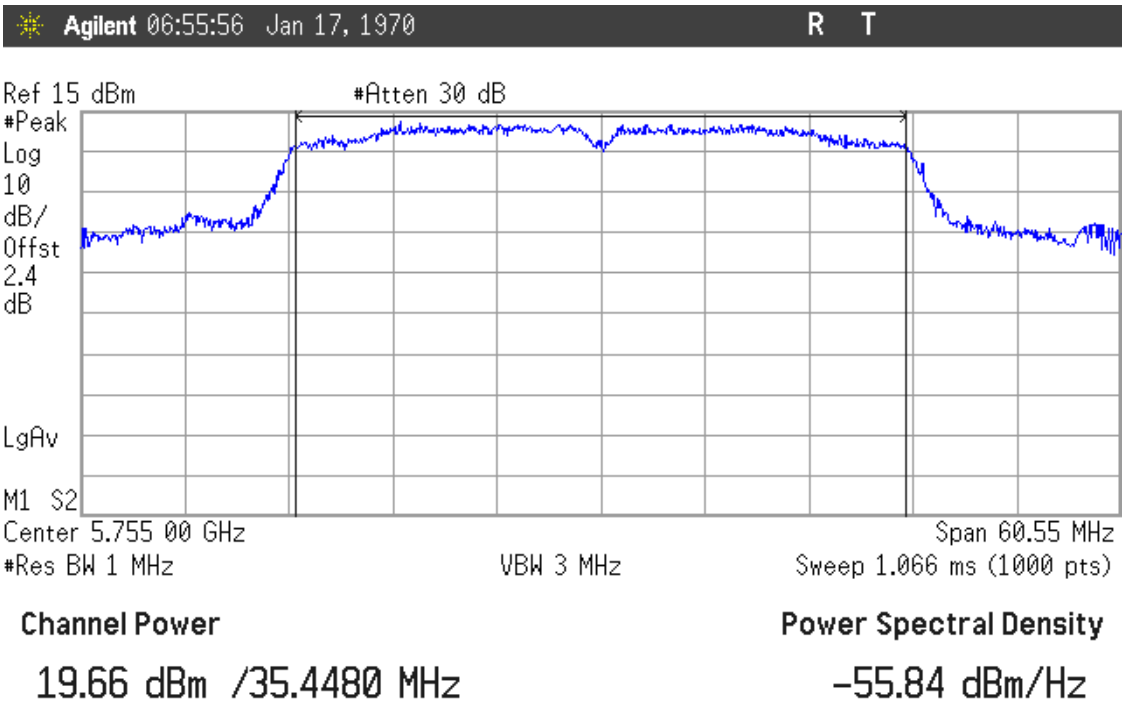


Lowest Channel: 5745 MHz. Chain A+B. Port B

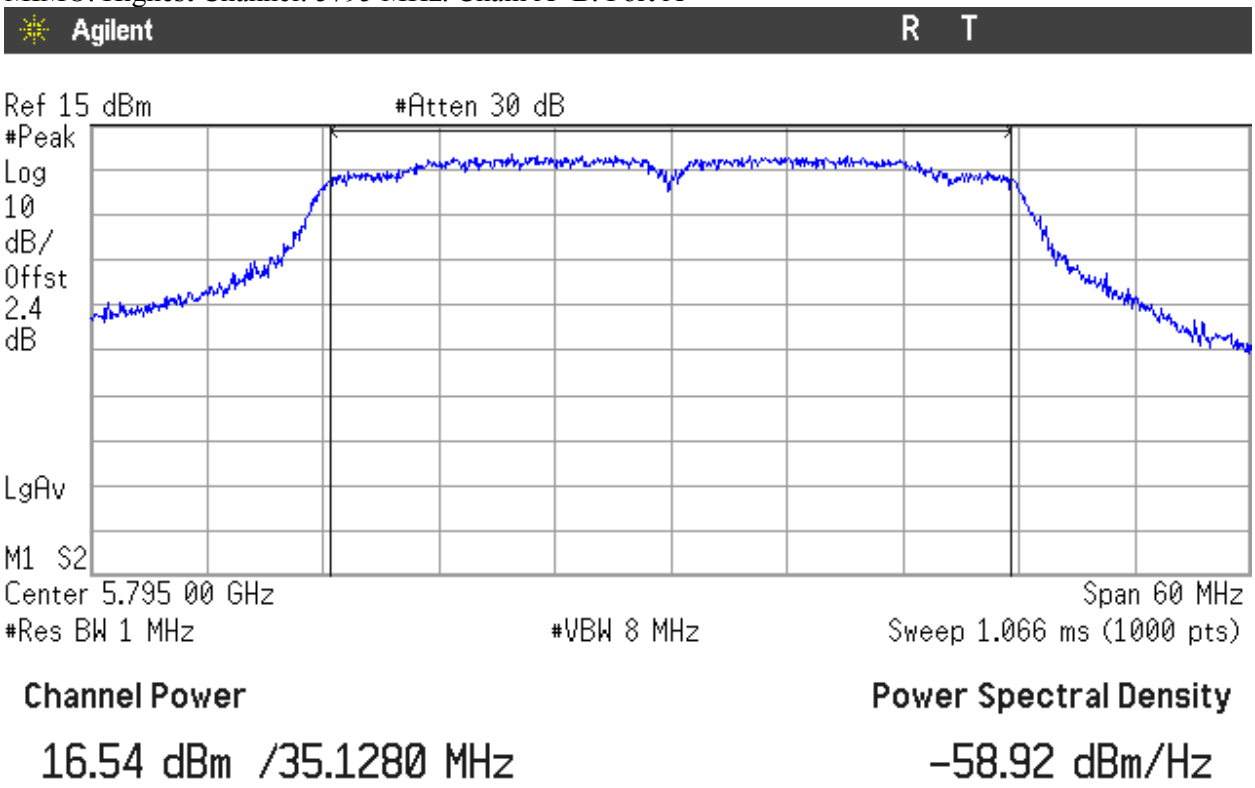


3. WiFi 5GHz 802.11 n40 mode

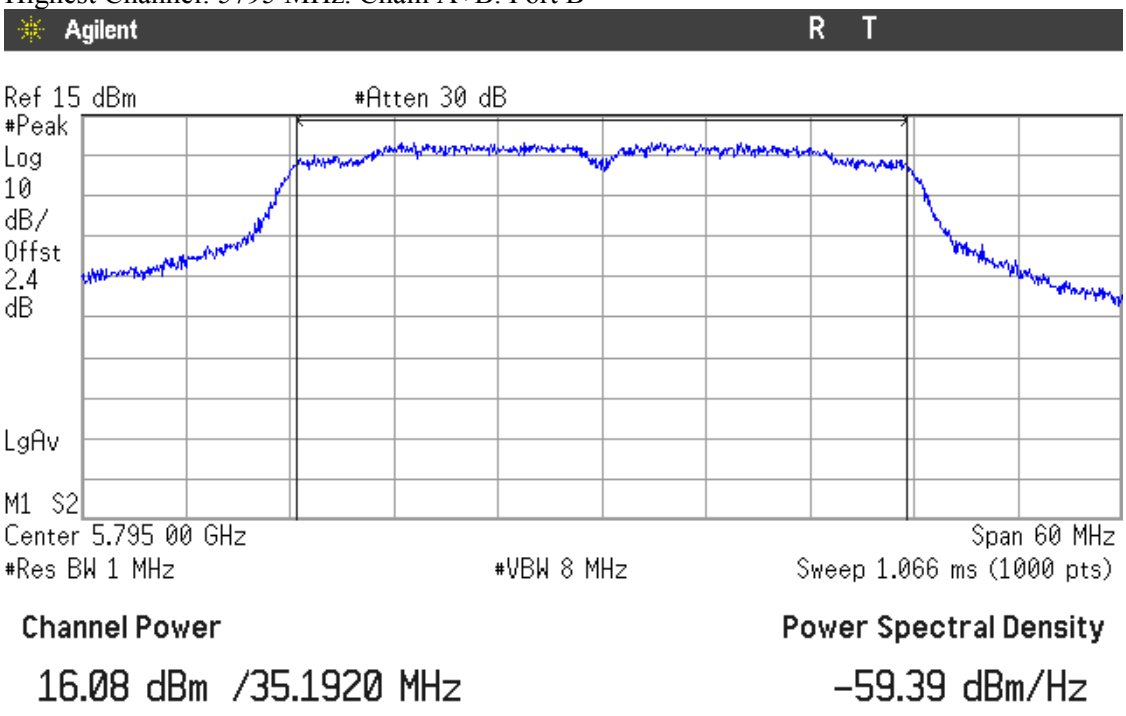
SISO. Lowest Channel: 5755 MHz. Chain A



MIMO. Highest Channel: 5795 MHz. Chain A+B. Port A

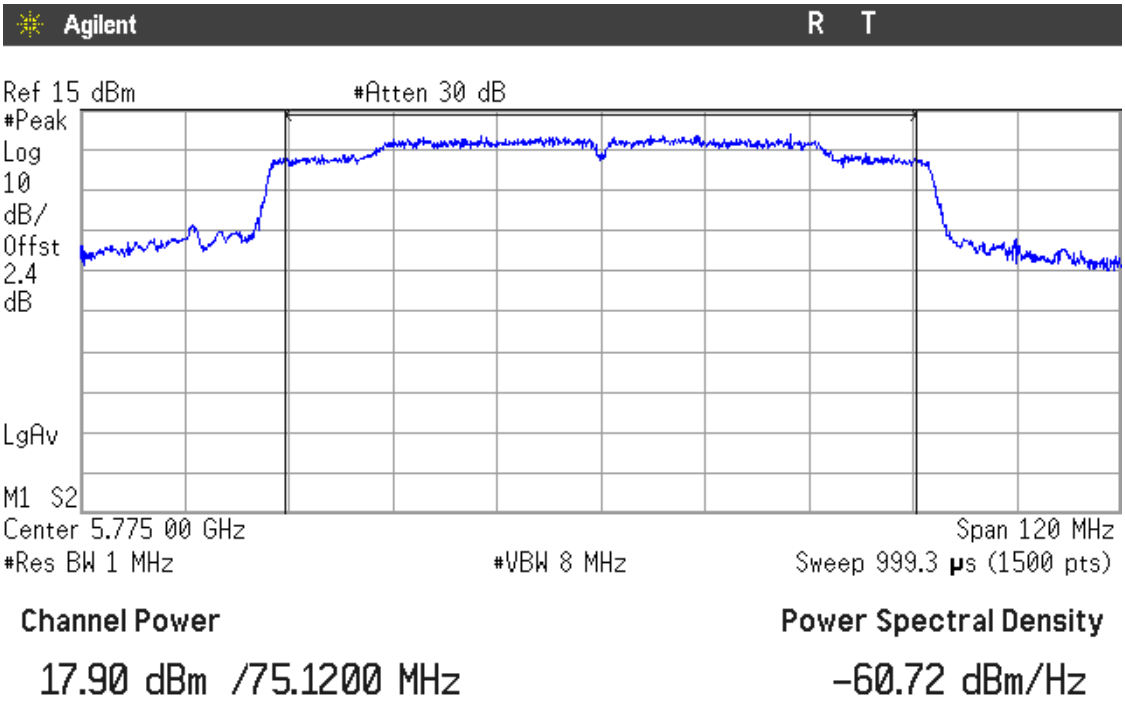


Highest Channel: 5795 MHz. Chain A+B. Port B

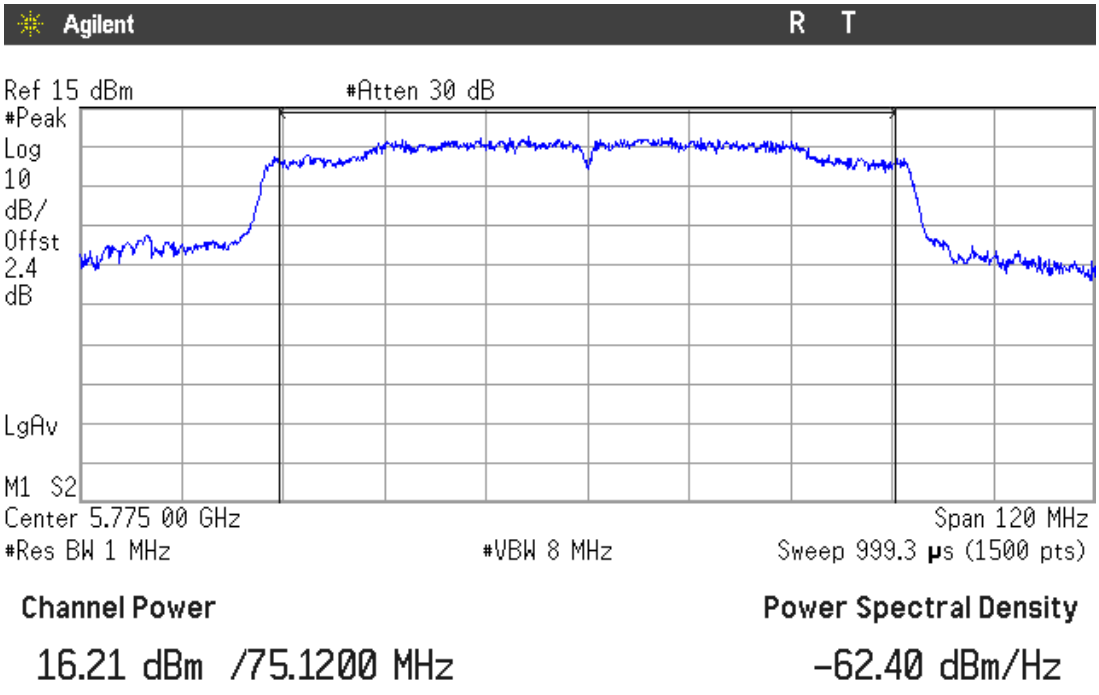


4. WiFi 5GHz 802.11 ac80 mode

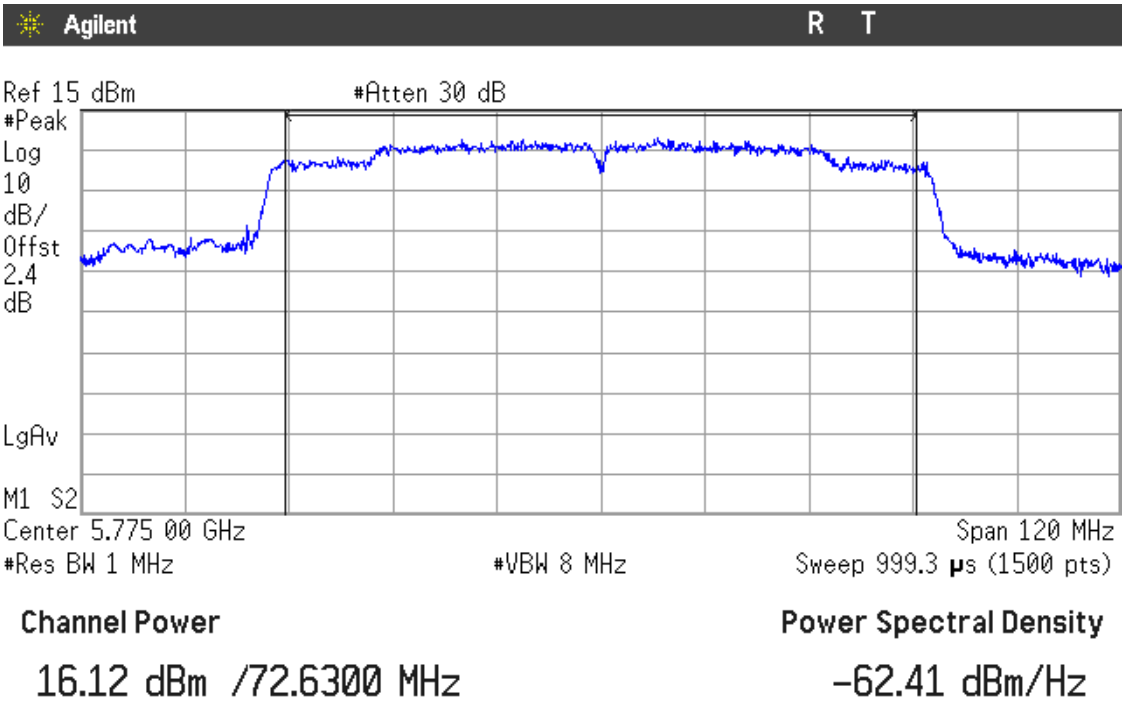
SISO. Middle Channel: 5775 MHz. Chain A.



MIMO. Middle Channel: 5775 MHz. Chain A+B. Port A



MIMO. Middle Channel: 5775 MHz. Chain A+B. Port B



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

1. WiFi 5GHz 802.11 a mode

Reference Level Measurement

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	6.66	6.44	5.71	6.48	5.85	6.61
Measurement uncertainty (dB)	±1.5					

Chain A / Chain B

Lowest frequency 5745 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-23.34 / -23.56

Middle frequency 5785 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.29 / -23.52

Highest frequency 5825 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.15 / -23.39

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

Reference Level Measurement

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	5.78	6.54	5.58	6.92	6.40	7.09
Measurement uncertainty (dB)	±1.5					

Chain A / Chain B

Lowest frequency 5745 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.22 / -23.46

Middle frequency 5785 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-24.42 / -23.08

Highest frequency 5825 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-23.60 / -22.91

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Reference Level Measurement

	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A	Chain B	Chain A	Chain B
Reference Level Measurement (dBm)	3.45	4.11	3.90	4.27
Measurement uncertainty (dB)	±1.5			

Chain A / Chain B

Lowest frequency 5755 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-16.55 / -15.89

Highest frequency 5795 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-16.1 / -15.73

Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

4. WiFi 5GHz 802.11 ac80 mode

Reference Level Measurement

	Middle frequency 5775 MHz	
	Chain A	Chain B
Reference Level Measurement (dBm)	1.52	1.67
Measurement uncertainty (dB)	±1.5	

Chain A / Chain B

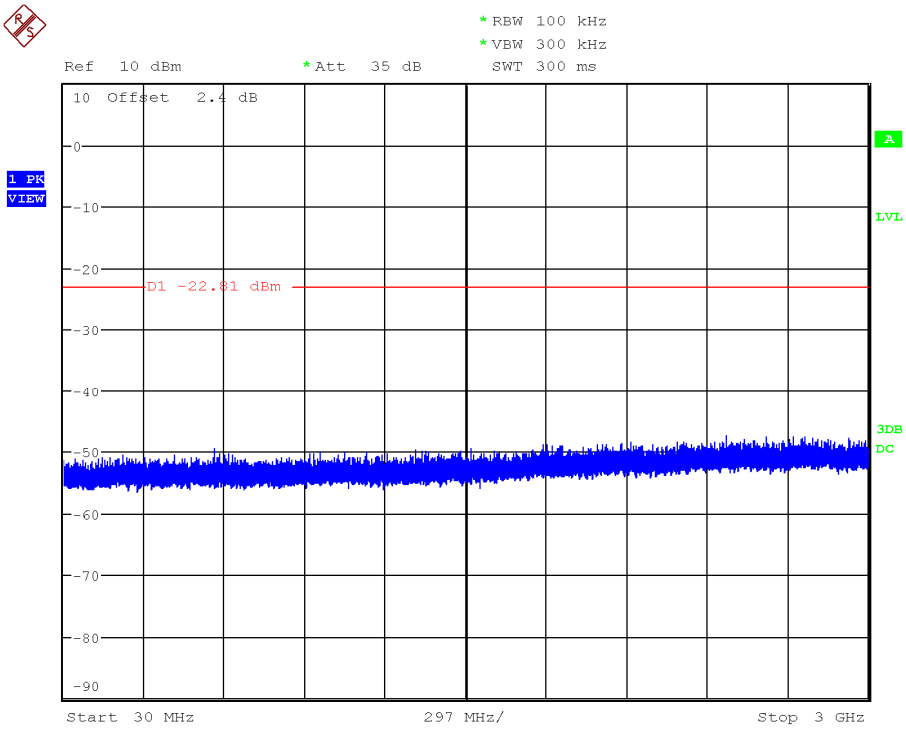
Middle frequency 5775 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-18.48 / -18.33

Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

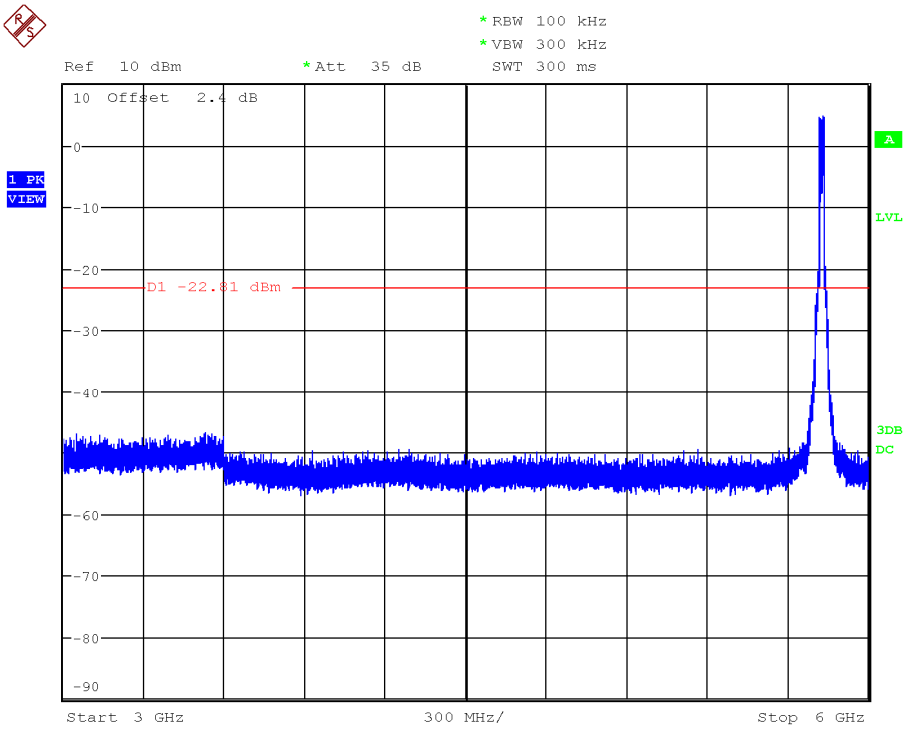
See next plot of worst case: Mode n20. Highest Channel. Chain B: 5825 MHz.

Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz:

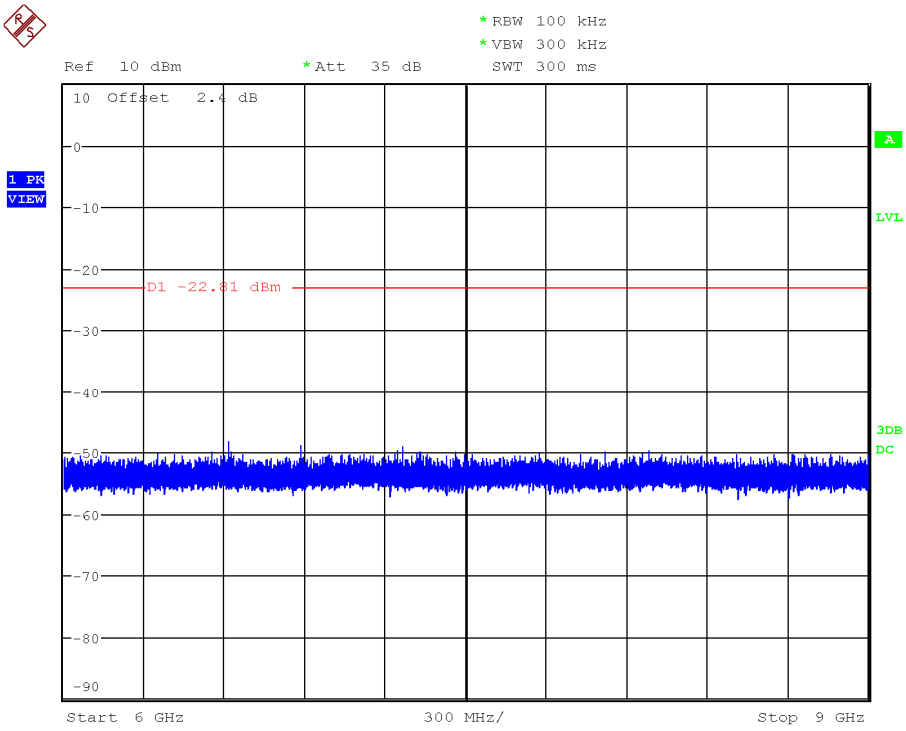


Plot 3 GHz to 6 GHz:

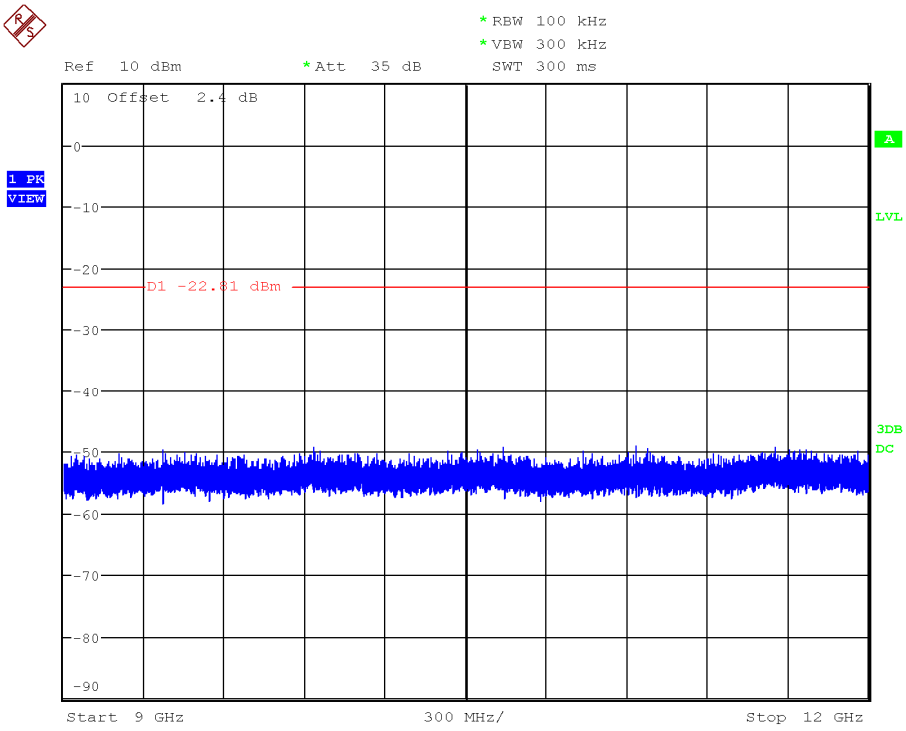


Note: The peak above the limit is the carrier frequency.

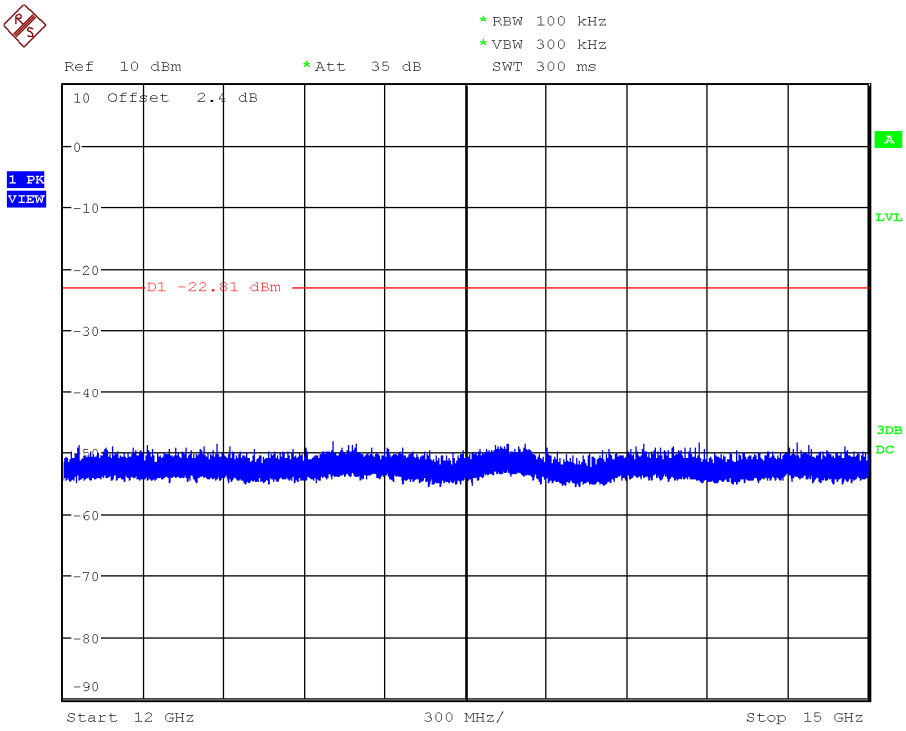
Plot 6 GHz to 9 GHz:



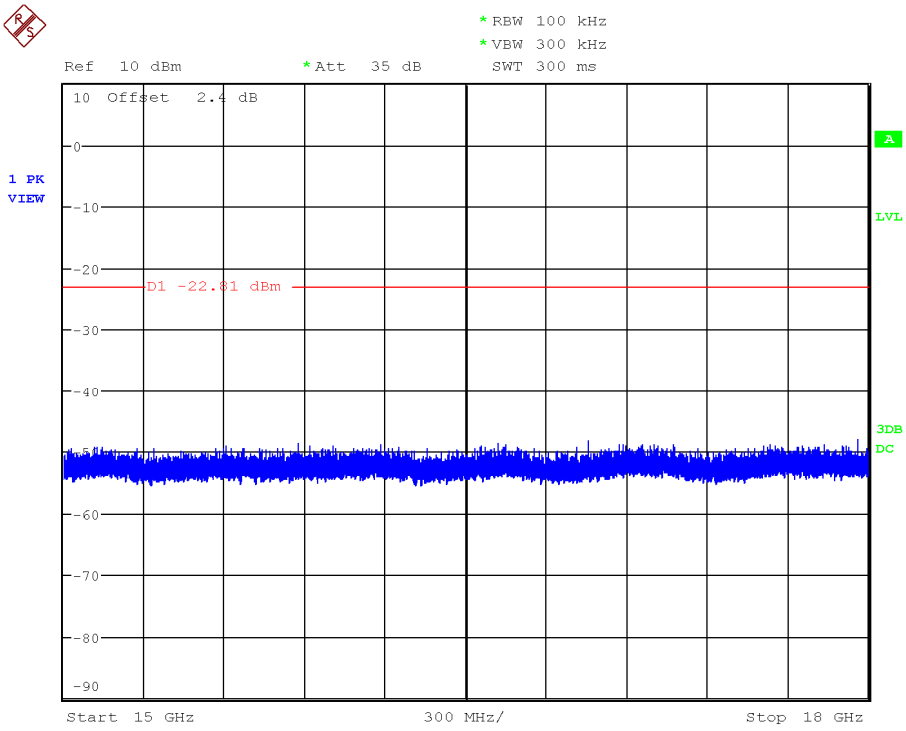
Plot 9 GHz to 12 GHz:



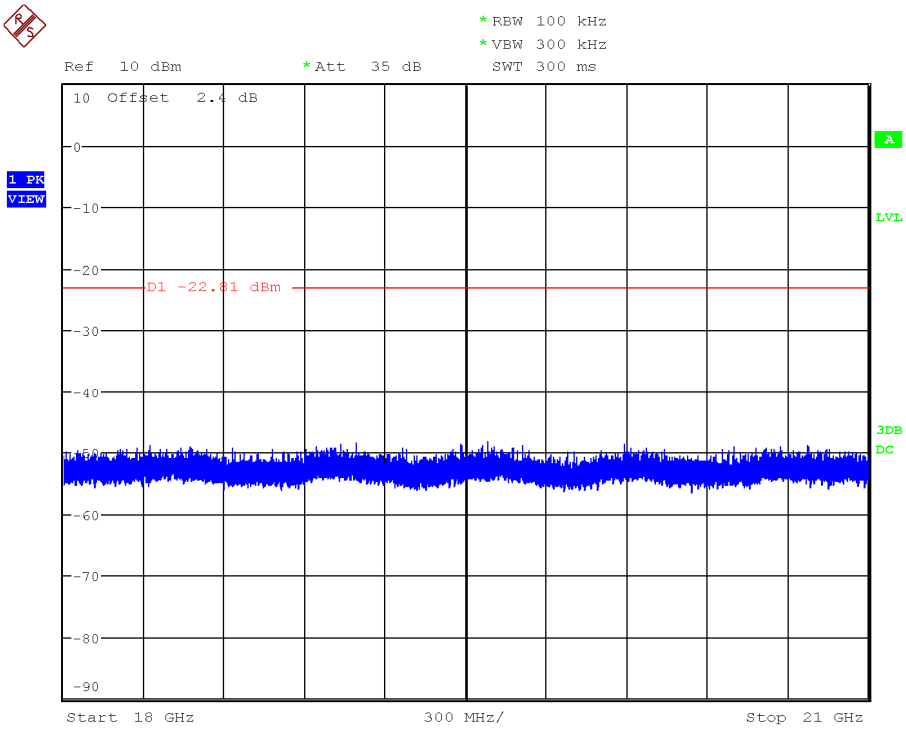
Plot 12 GHz to 15 GHz:



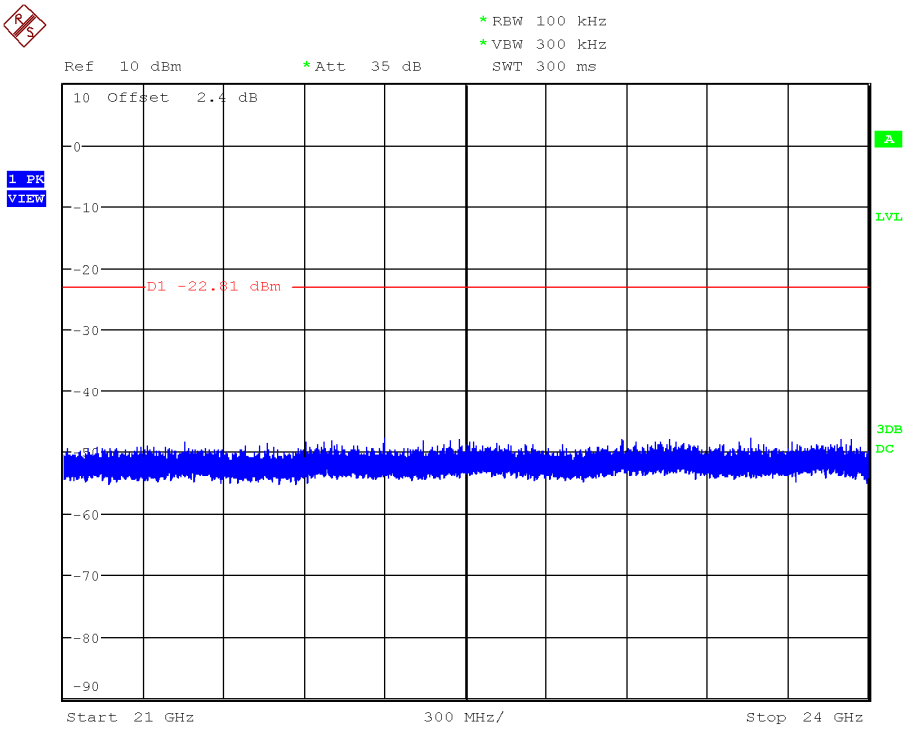
Plot 15 GHz to 18 GHz:



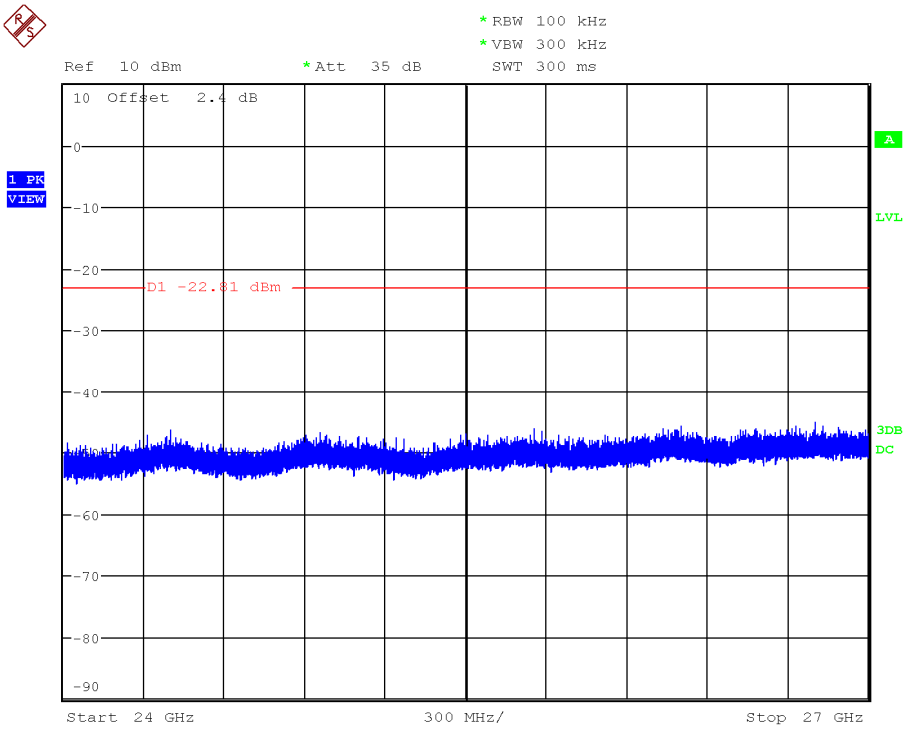
Plot 18 GHz to 21 GHz:



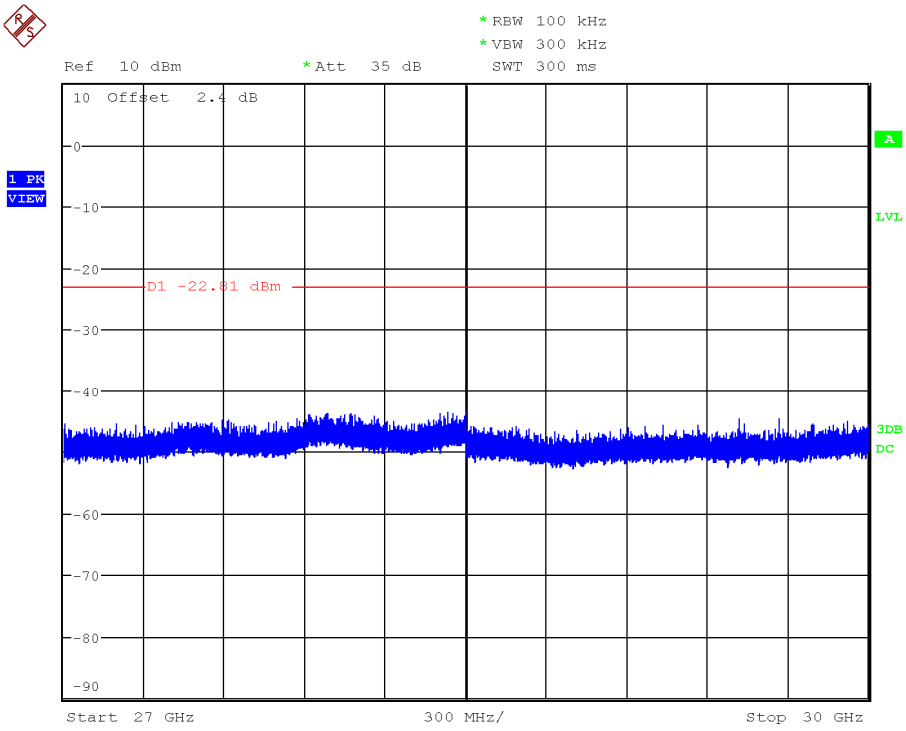
Plot 21 GHz to 24 GHz:



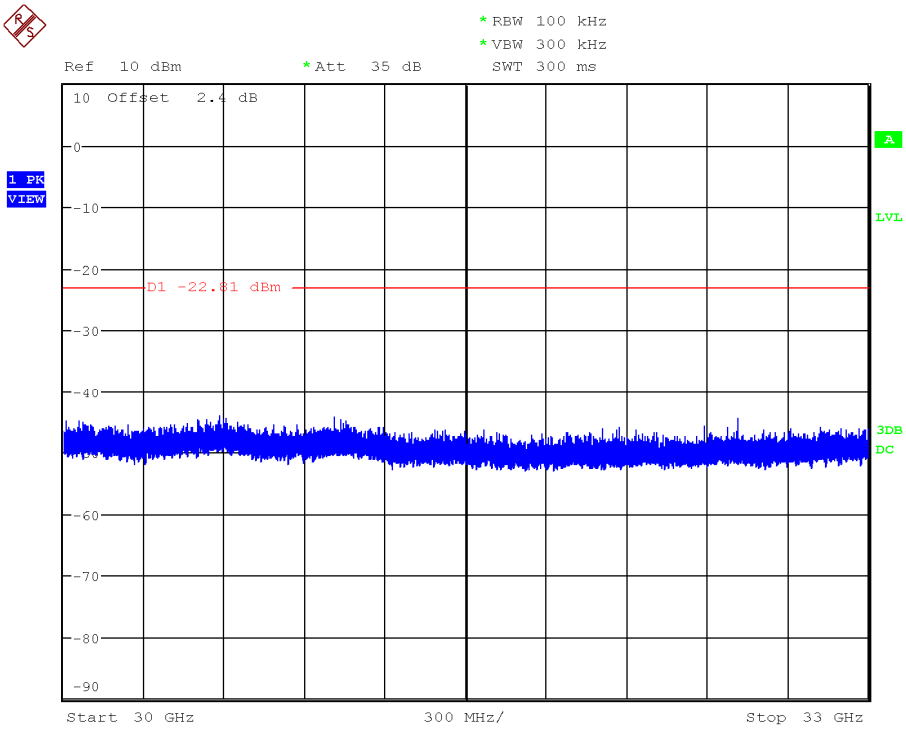
Plot 24 GHz to 27 GHz:



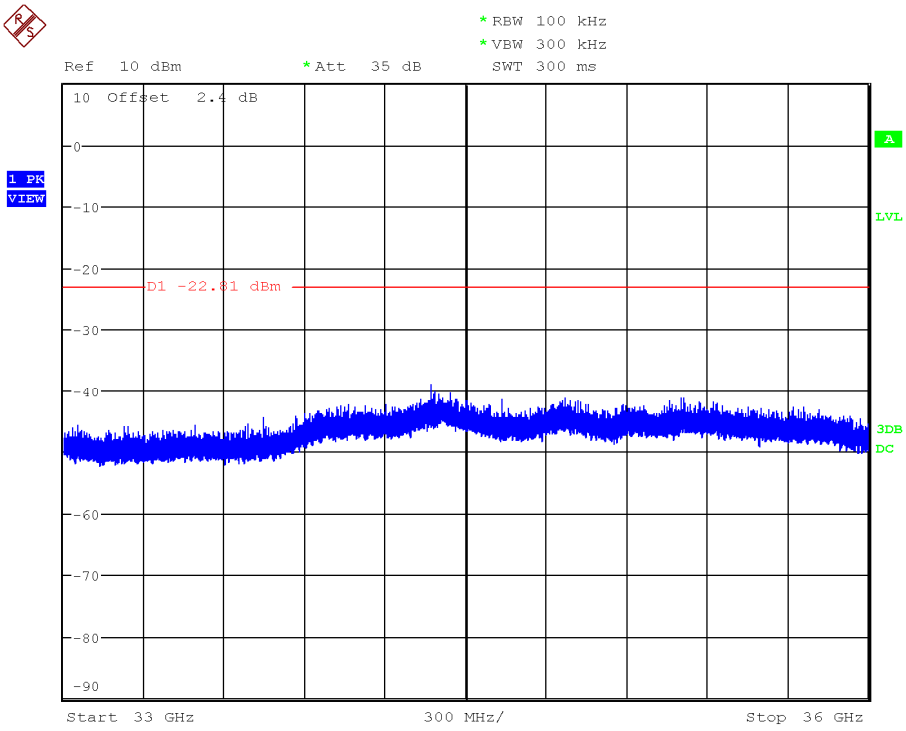
Plot 27 GHz to 30 GHz:



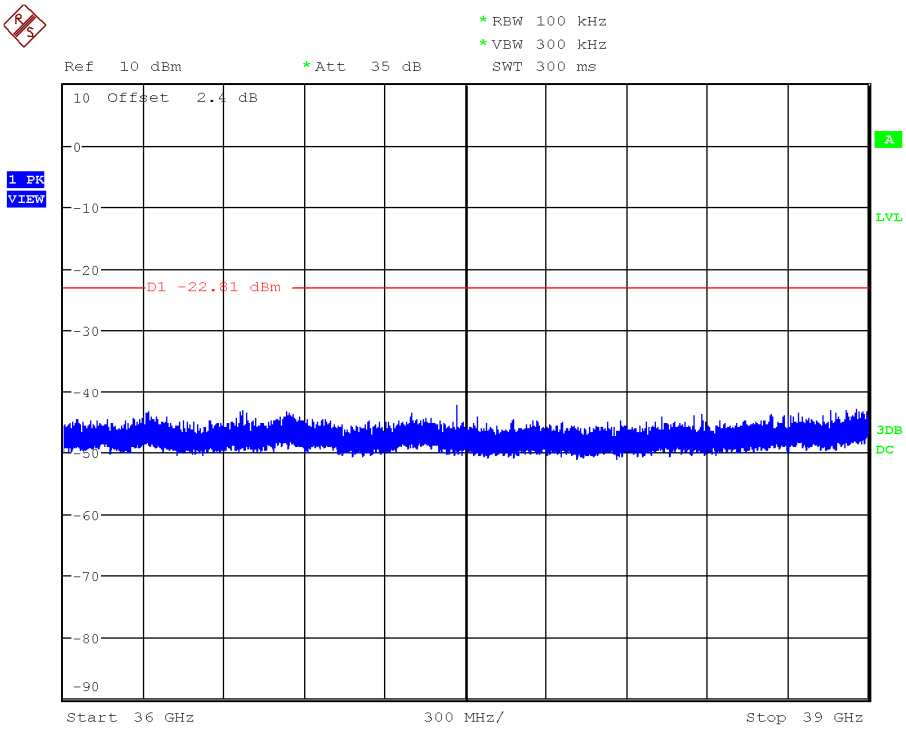
Plot 30 GHz to 33 GHz:



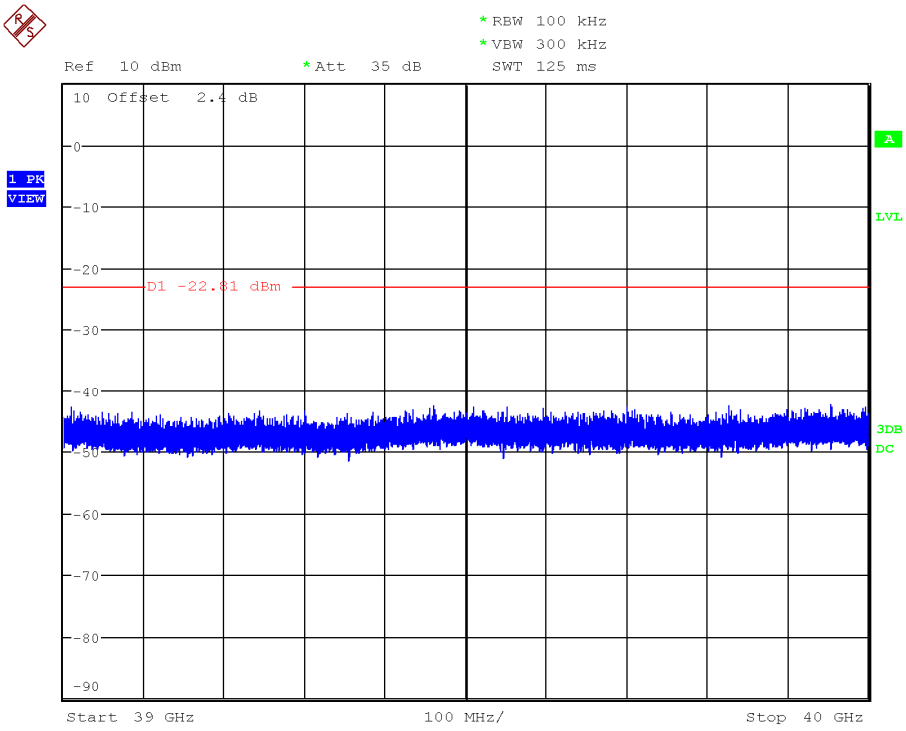
Plot 33 GHz to 36 GHz:



Plot 36 GHz to 39 GHz:



Plot 39 GHz to 40 GHz:



SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

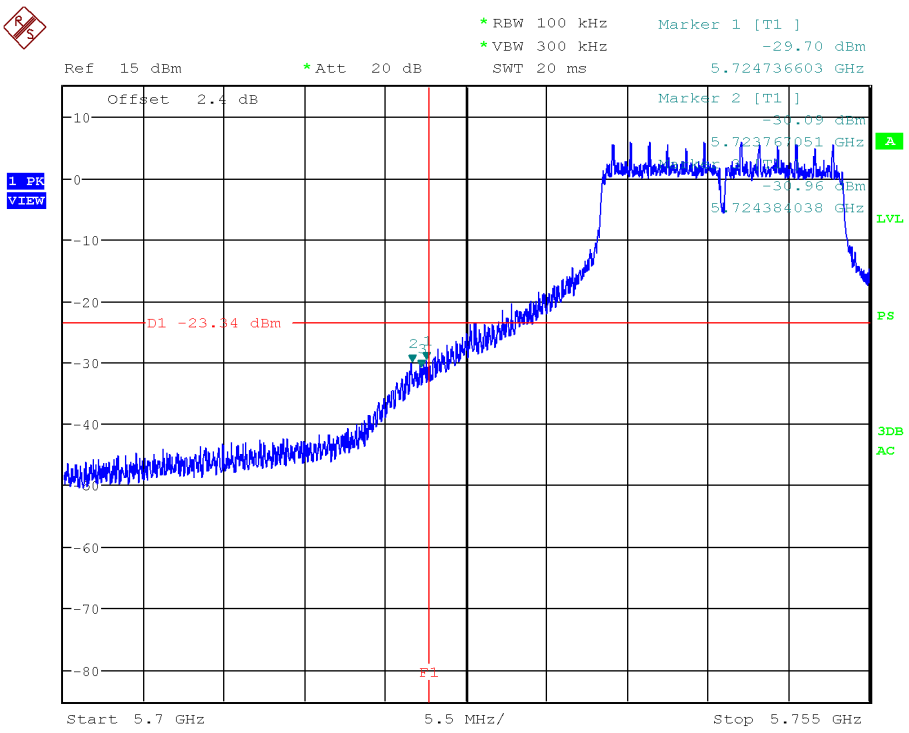
RESULTS:

1. WiFi 5GHz 802.11 a mode

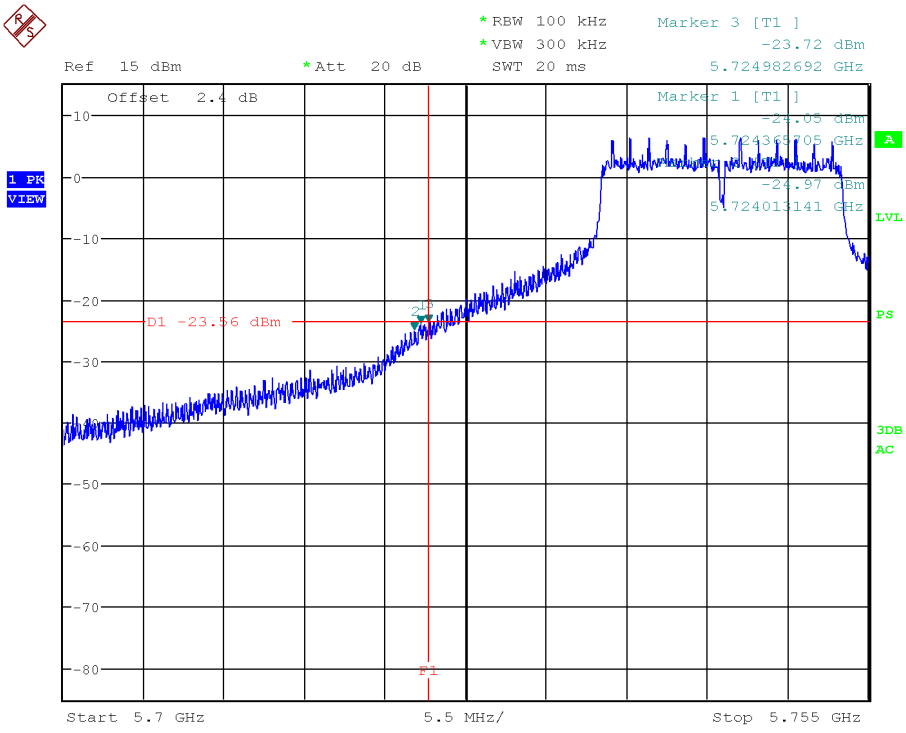
LOW FREQUENCY SECTION 5745 MHz. CONDUCTED.

See next plots.

Chain A



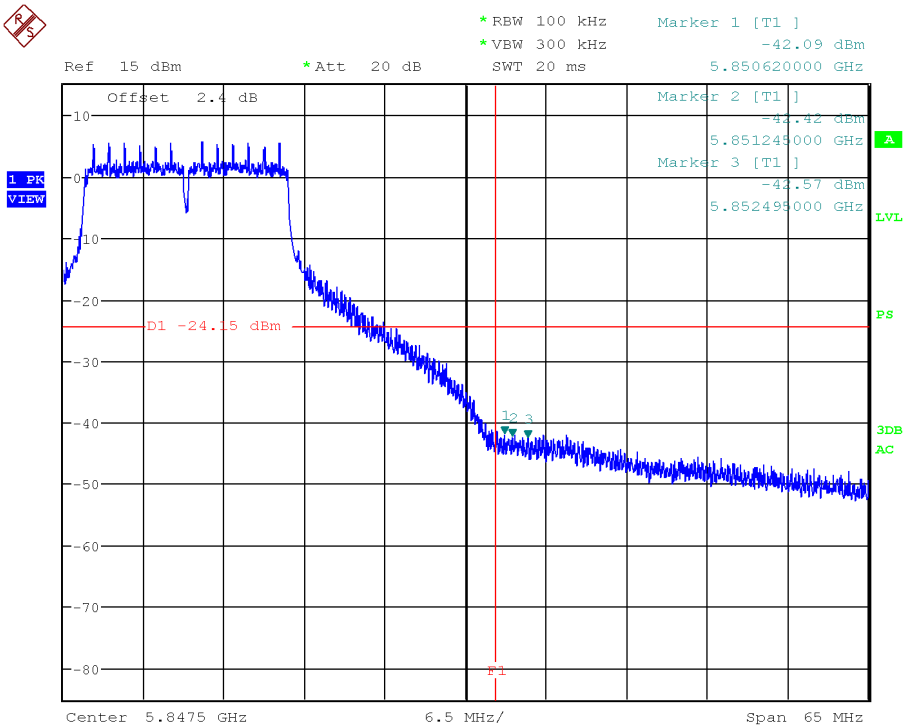
Chain B



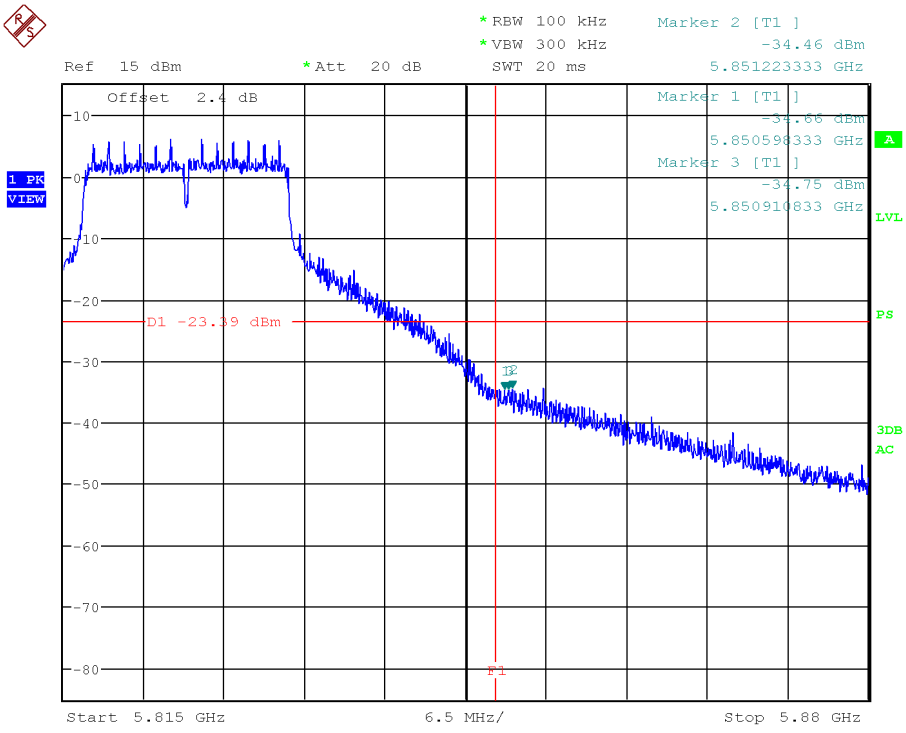
HIGH FREQUENCY SECTION 5825 MHz. CONDUCTED.

See next plots.

Chain A



Chain B



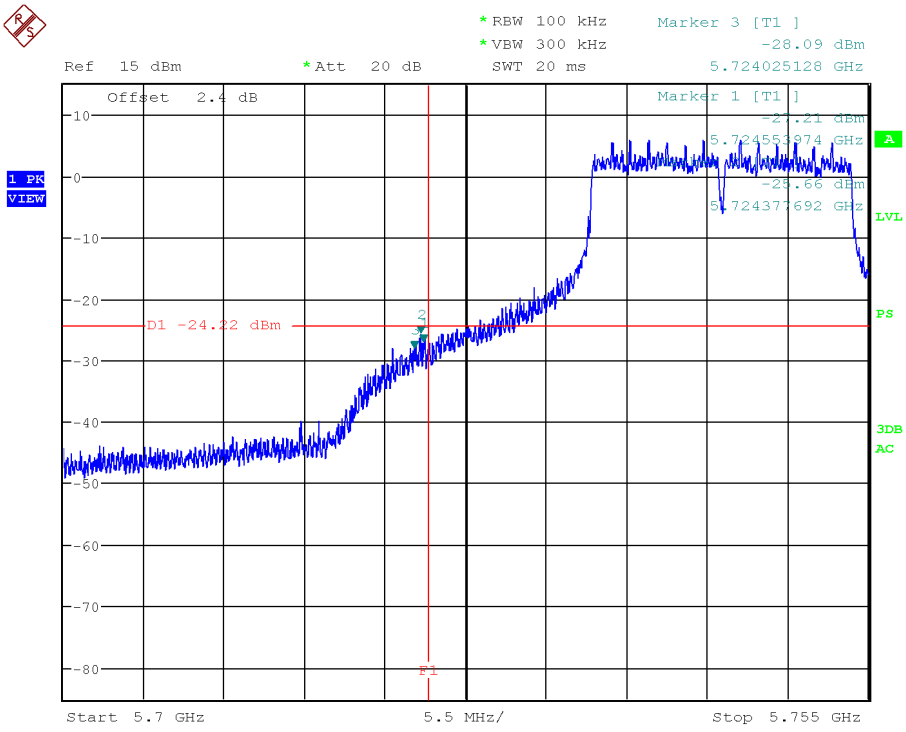
Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

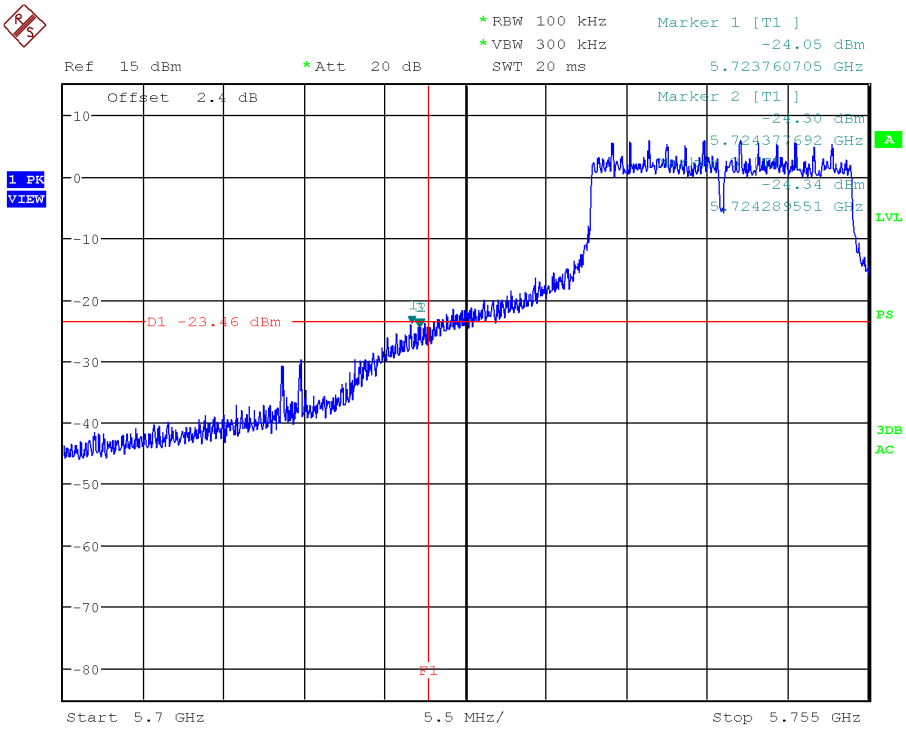
LOW FREQUENCY SECTION 5745 MHz. CONDUCTED.

See next plots.

Chain A



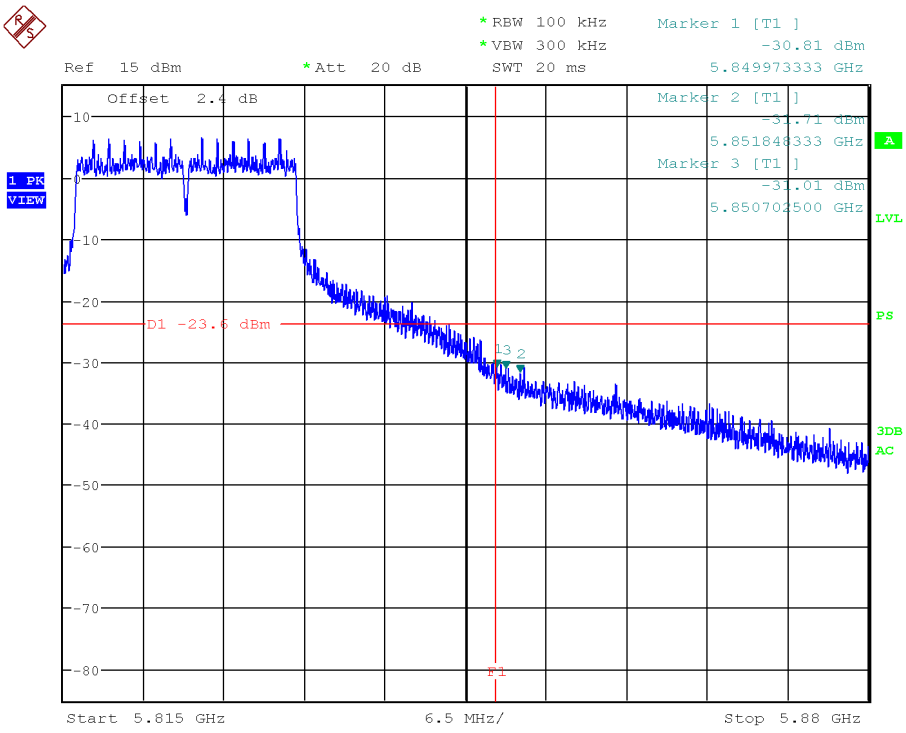
Chain B



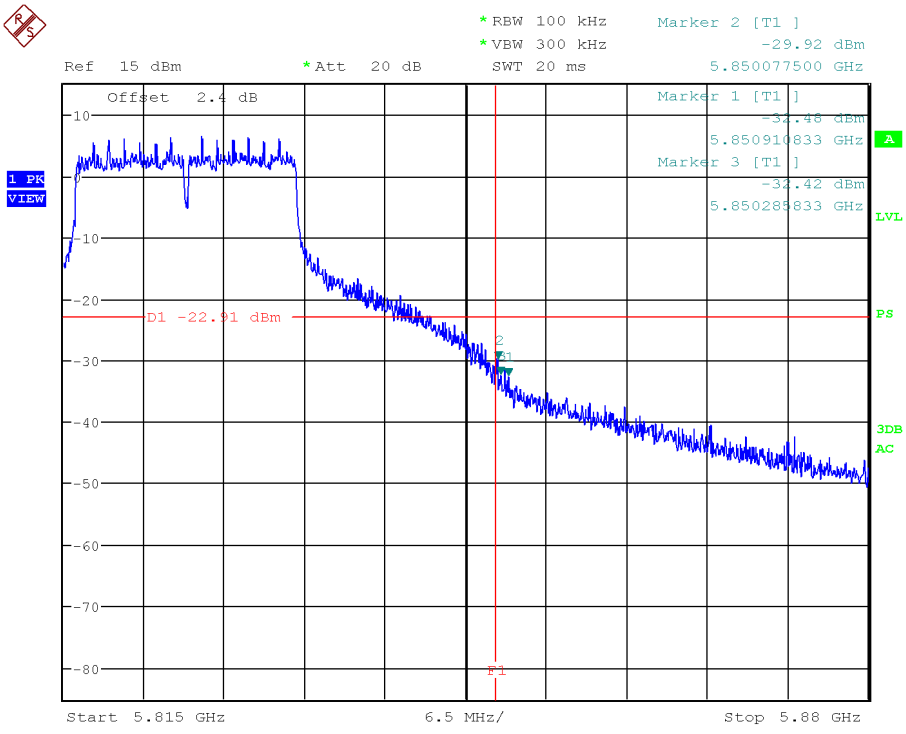
HIGH FREQUENCY SECTION 5825 MHz. CONDUCTED.

See next plots.

Chain A



Chain B



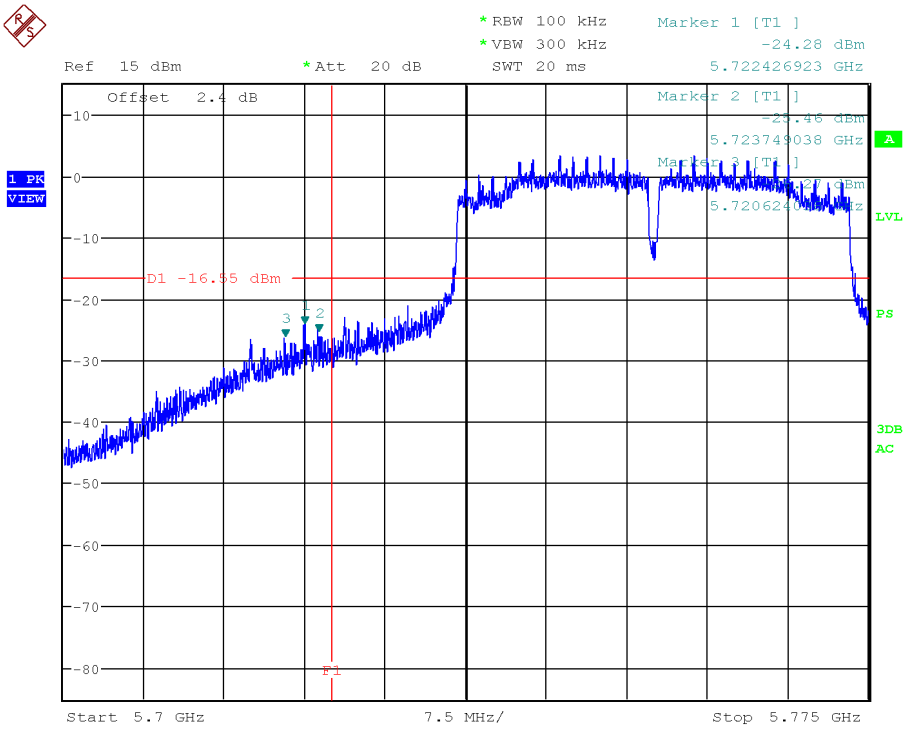
Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

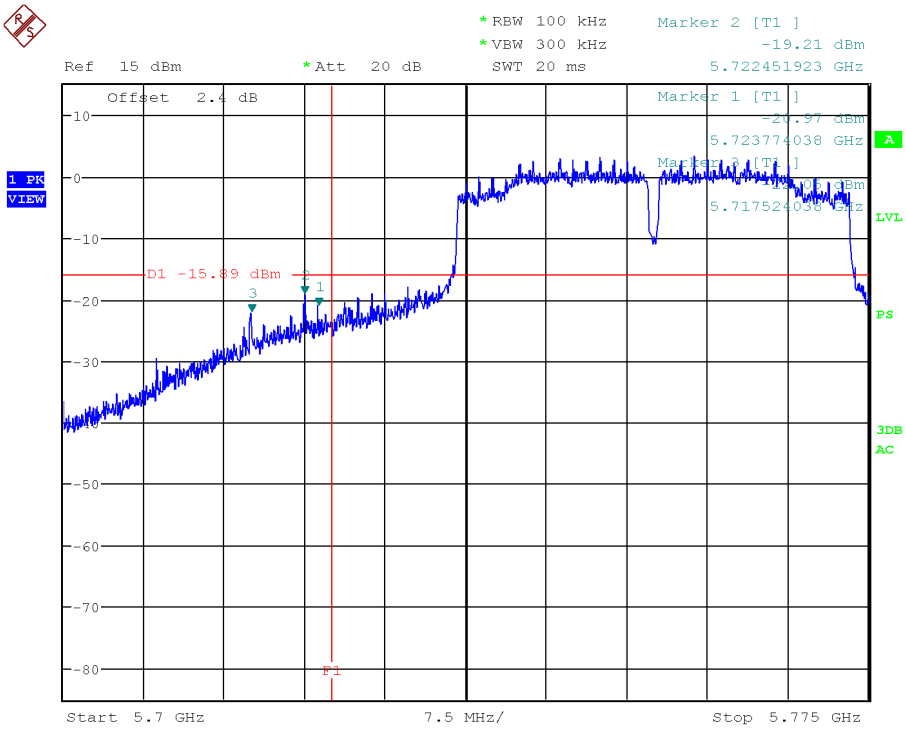
LOW FREQUENCY SECTION 5755 MHz. CONDUCTED.

See next plots.

Chain A



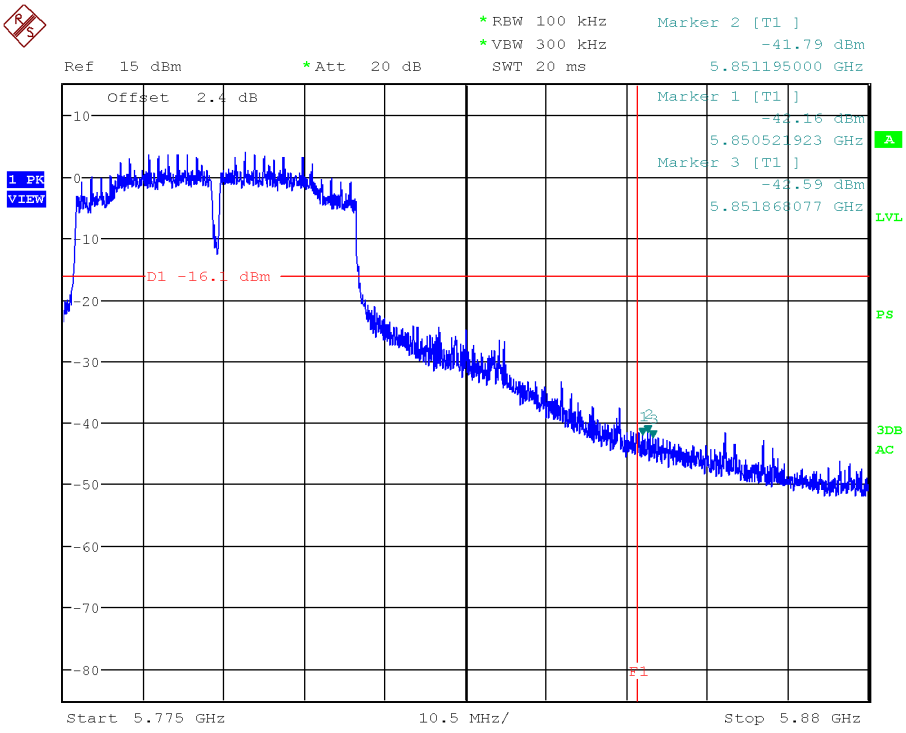
Chain B



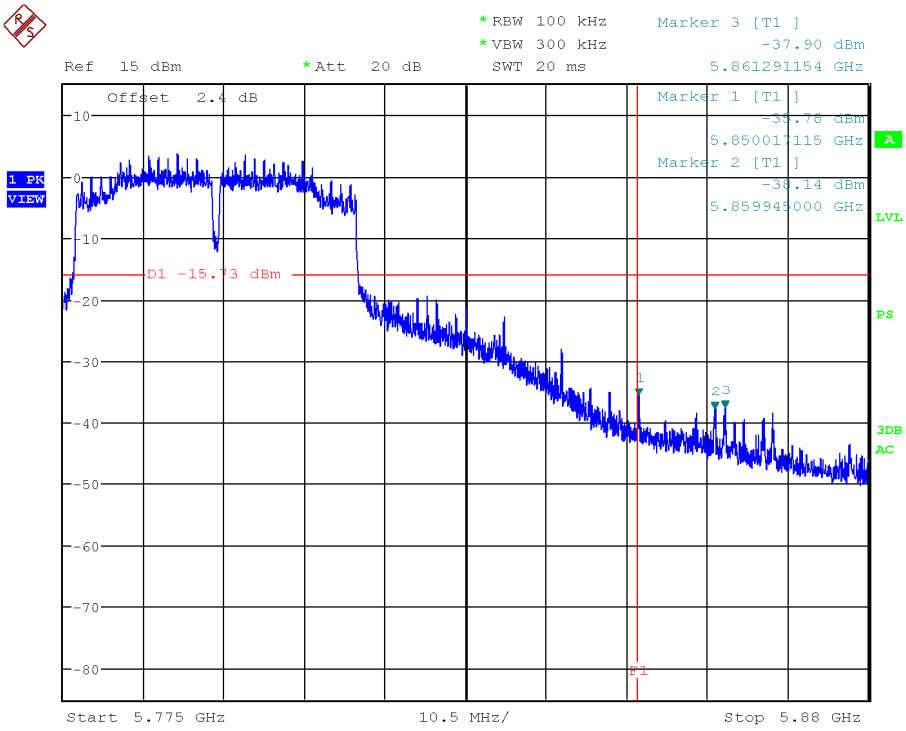
HIGH FREQUENCY SECTION 5795 MHz. CONDUCTED.

See next plots.

Chain A



Chain B



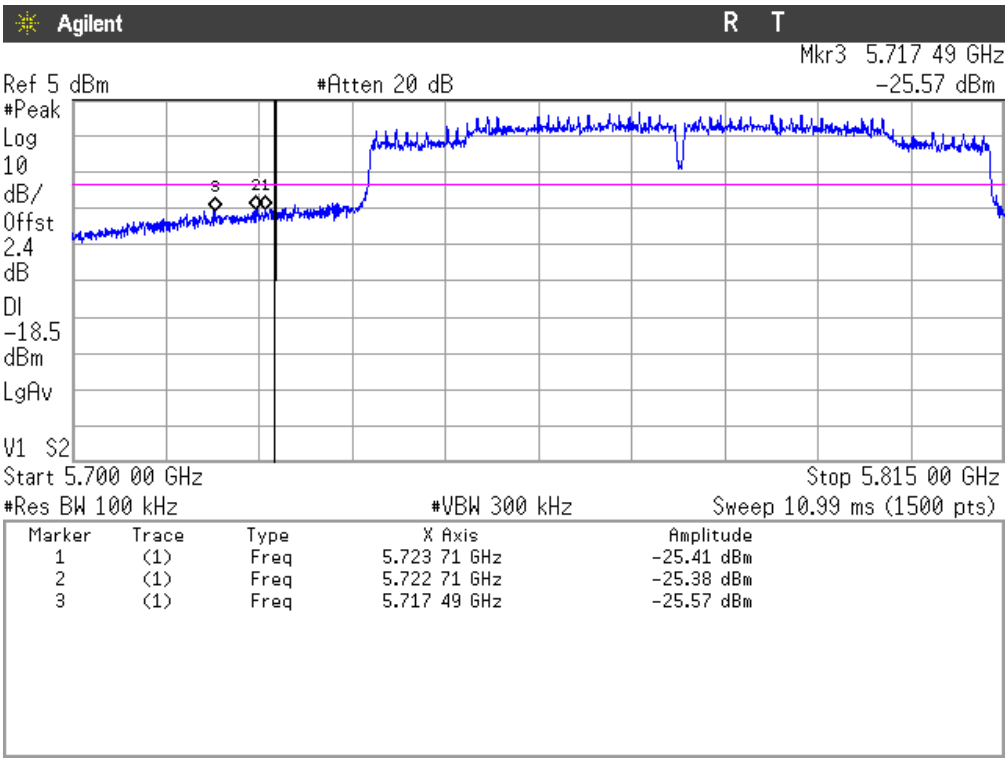
Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

4. WiFi 5GHz 802.11 ac80 mode

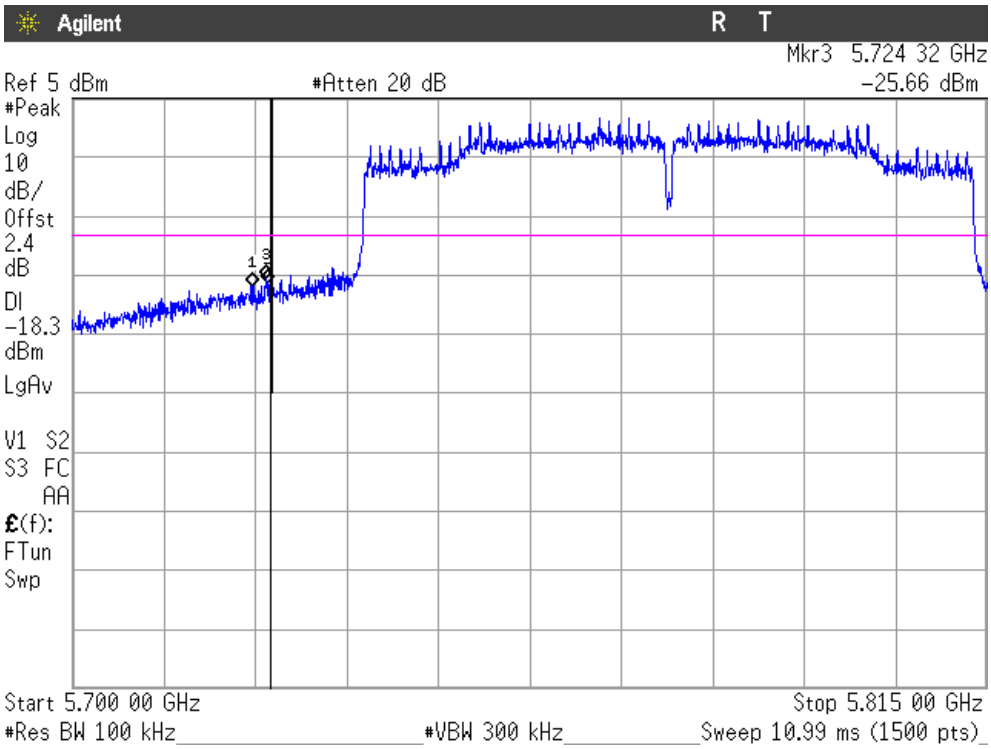
LOW FREQUENCY SECTION 5755 MHz. CONDUCTED.

See next plots.

Chain A



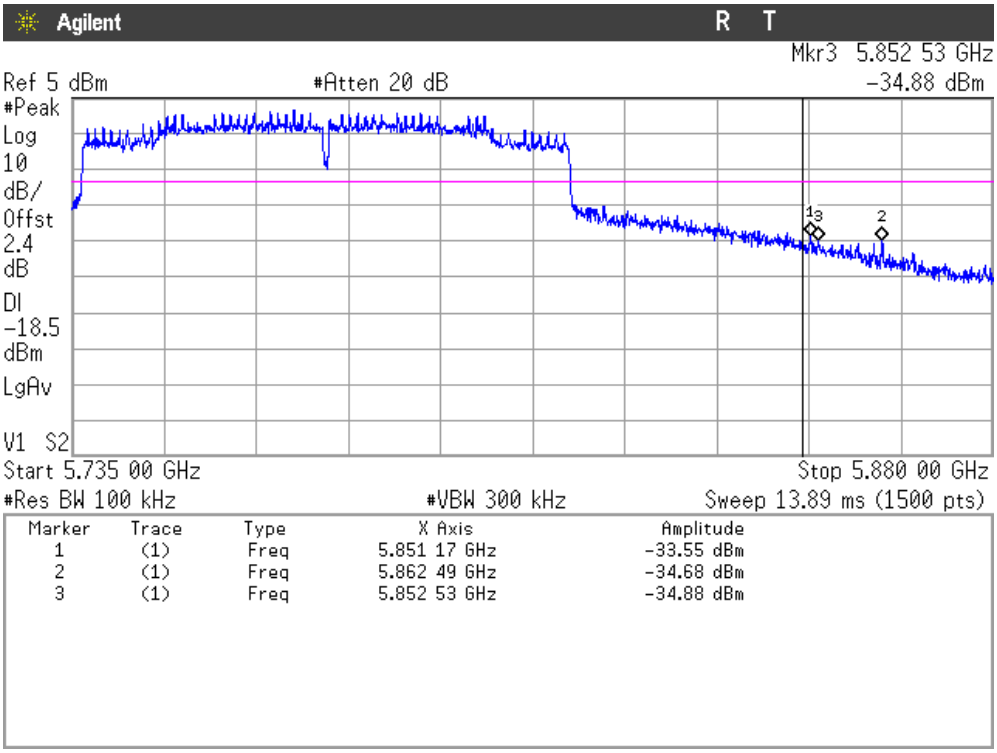
Chain B



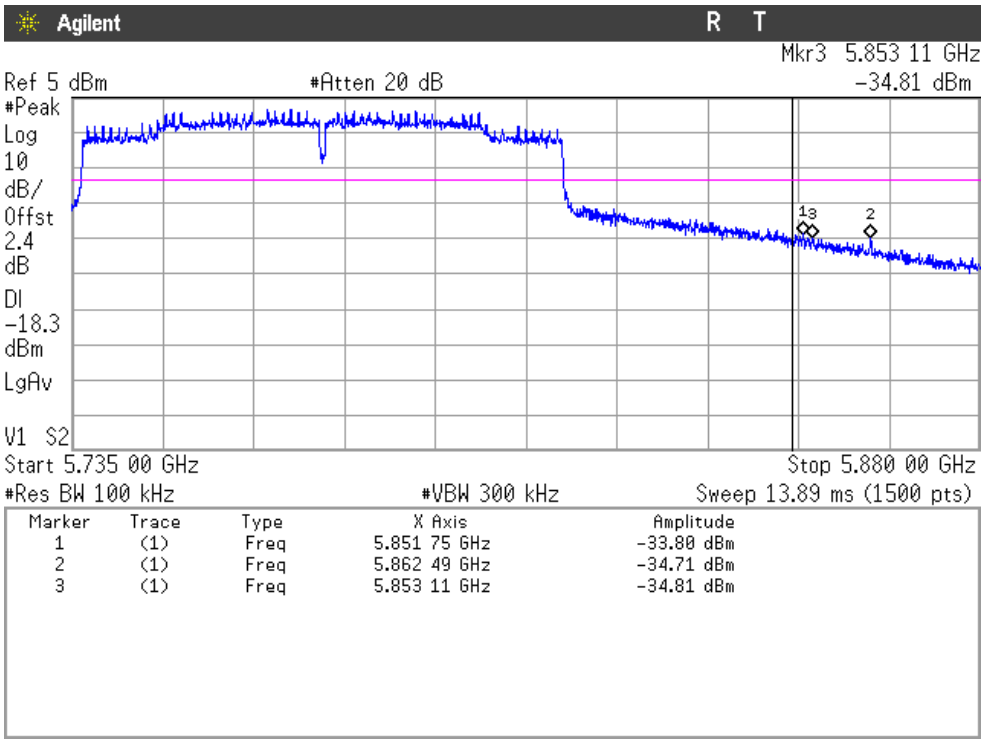
HIGH FREQUENCY SECTION 5775 MHz. CONDUCTED.

See next plots.

Chain A



Chain B



Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

Section 15.247 Subclause (e) / RSS-210 A8.5. Power spectral density

SPECIFICATION

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

The maximum power spectral density level in the fundamental emission was measured using the method of trace averaging with EUT transmitting at full power throughout each sweep according to point 10.3. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. This method was used for 802.11a and 802.11n20 modes.
For 802.11n40 and 802.11ac80 modes the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode.

For MIMO mode, the *Measure and add 10 log(NANT) dB*, (where *NANT* is the number of outputs) technique was used according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02 dated 5/28/2013.
With this technique, spectrum measurements are performed at each output of the device, and the quantity *10 log(NANT)* dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

1. WiFi 5GHz 802.11 a mode

Power spectral density (See next plots of worst case = highest level).

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-2.918	-2.012	-3.150	-2.620	-3.045	-3.274
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

Power spectral density (See next plots of worst case = highest level).

	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-2.707	-2.324	-3.070	-2.359	-1.877	-2.382
Measurement uncertainty (dB)	±1.5					

MIMO	Lowest frequency 5745 MHz		Middle frequency 5785 MHz		Highest frequency 5825 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Power spectral density (dBm)	-5.752	-5.859	-6.477	-6.524	-6.235	-5.794
Power spectral density (dBm) + 10*Log(2)	-2.74	-2.85	-3.47	-3.51	-3.22	-2.78
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Power spectral density (See next plots of worst case = highest level).

	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-9.76	-8.94	-10.25	-10.55
Measurement uncertainty (dB)	±1.5			

MIMO	Lowest frequency 5755 MHz		Highest frequency 5795 MHz	
	Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B
Power spectral density (dBm)	-12.97	-12.06	-13.95	-13.20
Power spectral density (dBm) + 10*Log(2)	-9,96	-9,05	-10,94	-10,19
Measurement uncertainty (dB)	±1.5			

Verdict: PASS (NOTE: the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode).

4. WiFi 5GHz 802.11 ac80 mode

Power spectral density (See next plots of worst case = highest level).

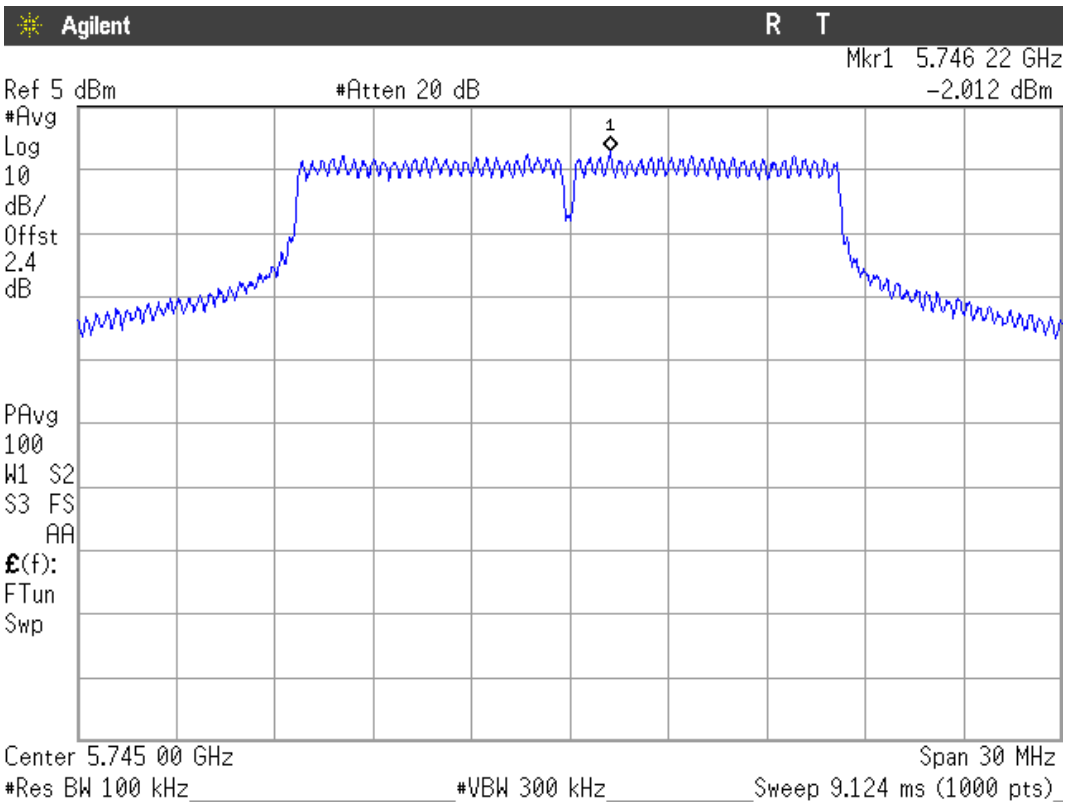
SISO	Middle frequency 5775 MHz	
	Chain A	Chain B
Power spectral density (dBm) in 3 kHz bandwidth	-9.26	-10.81
Measurement uncertainty (dB)	±1.5	

MIMO	Lowest frequency 5755 MHz	
	Chain A+B	
	Port A	Port B
Power spectral density (dBm) in 3 kHz bandwidth	-12.13	-10.76
Power spectral density (dBm) in 3 kHz bandwidth + 10*Log(2)	-9.12	-7.75
Measurement uncertainty (dB)	±1.5	

Verdict: PASS (NOTE: the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode).

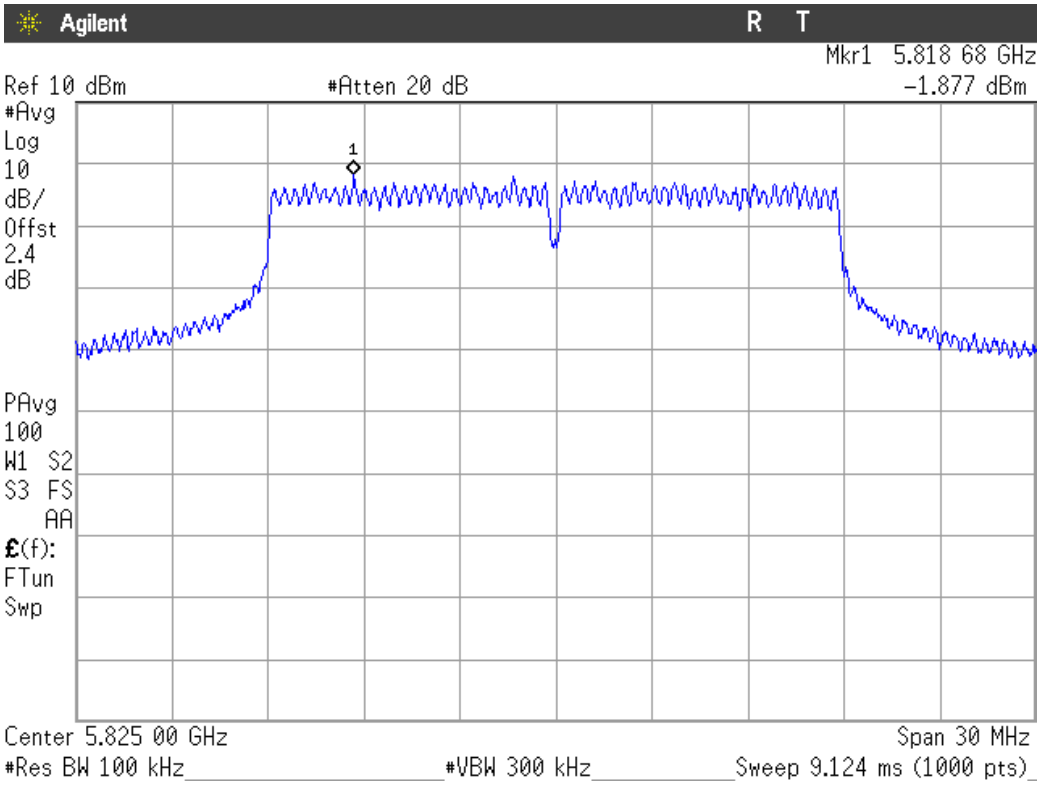
1. WiFi 5GHz 802.11 a mode

Lowest Channel: 5745 MHz. Chain B.

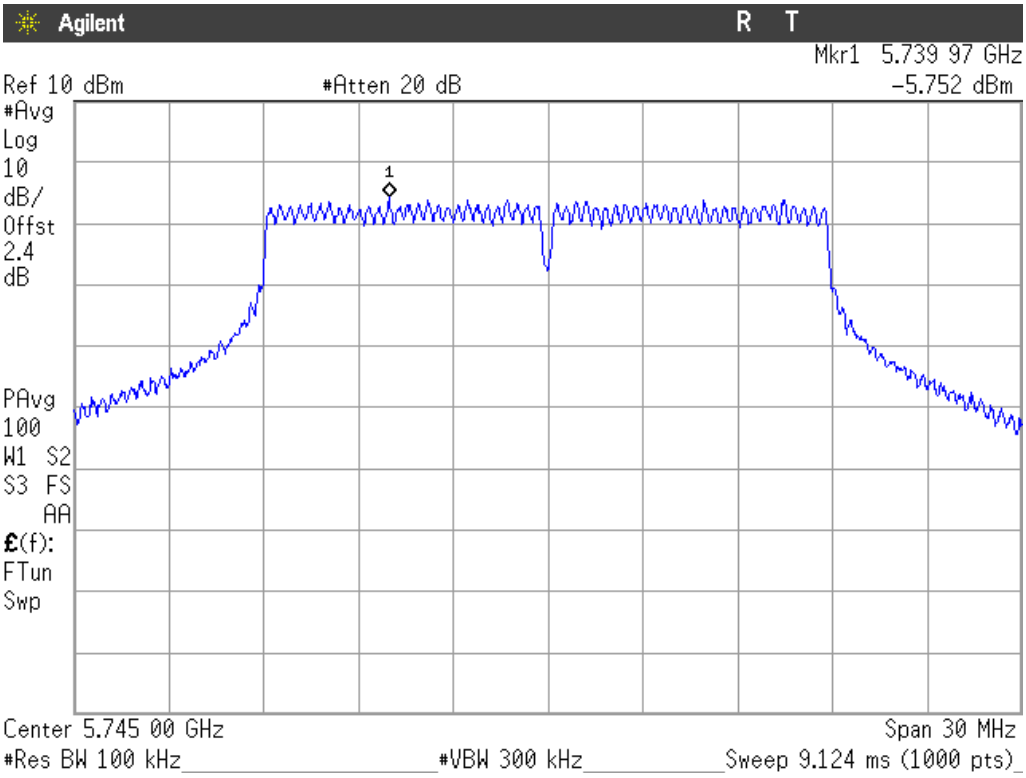


2. WiFi 5GHz 802.11 n20 mode

SISO. Highest Channel: 5825 MHz. Chain A.

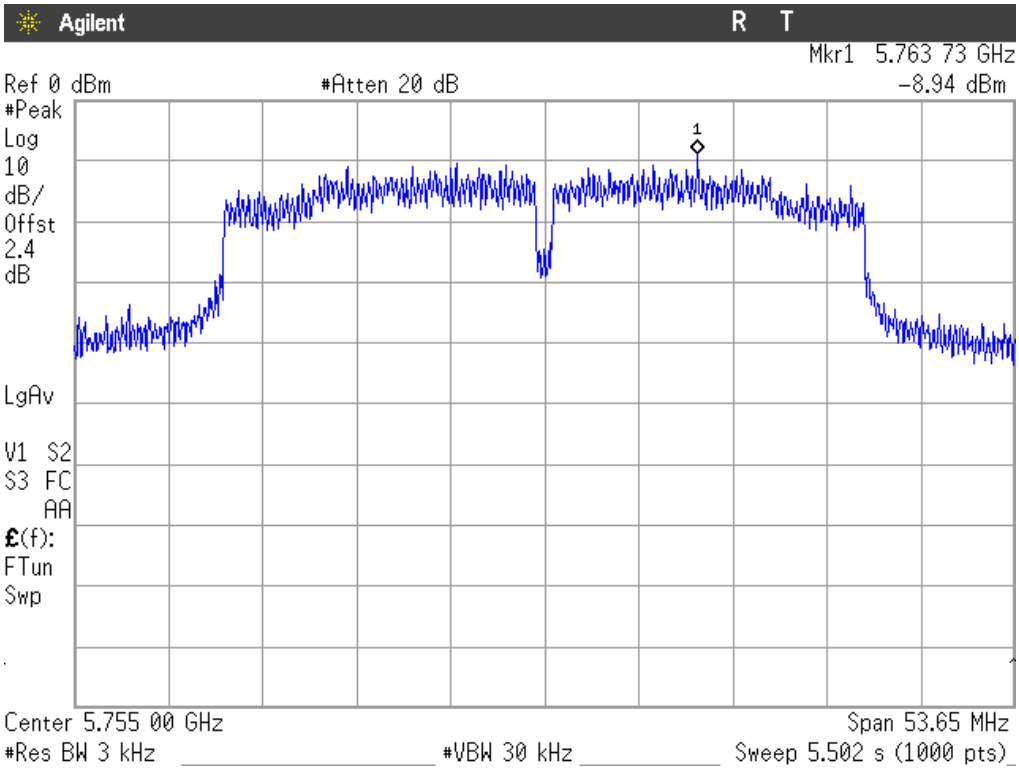


MIMO. Lowest Channel: 5745 MHz. Chain A+B. Port A.

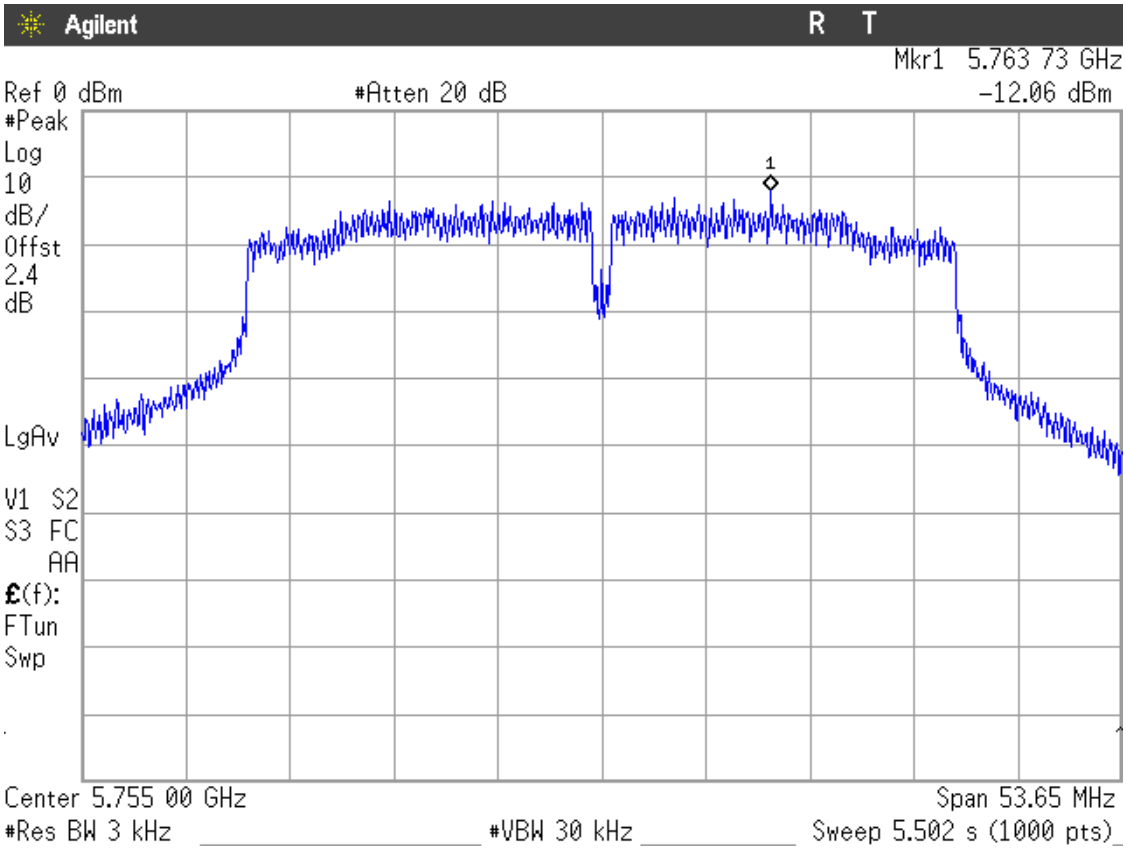


3. WiFi 5GHz 802.11 n40 mode

SISO. Lowest frequency 5755 MHz. Chain B.

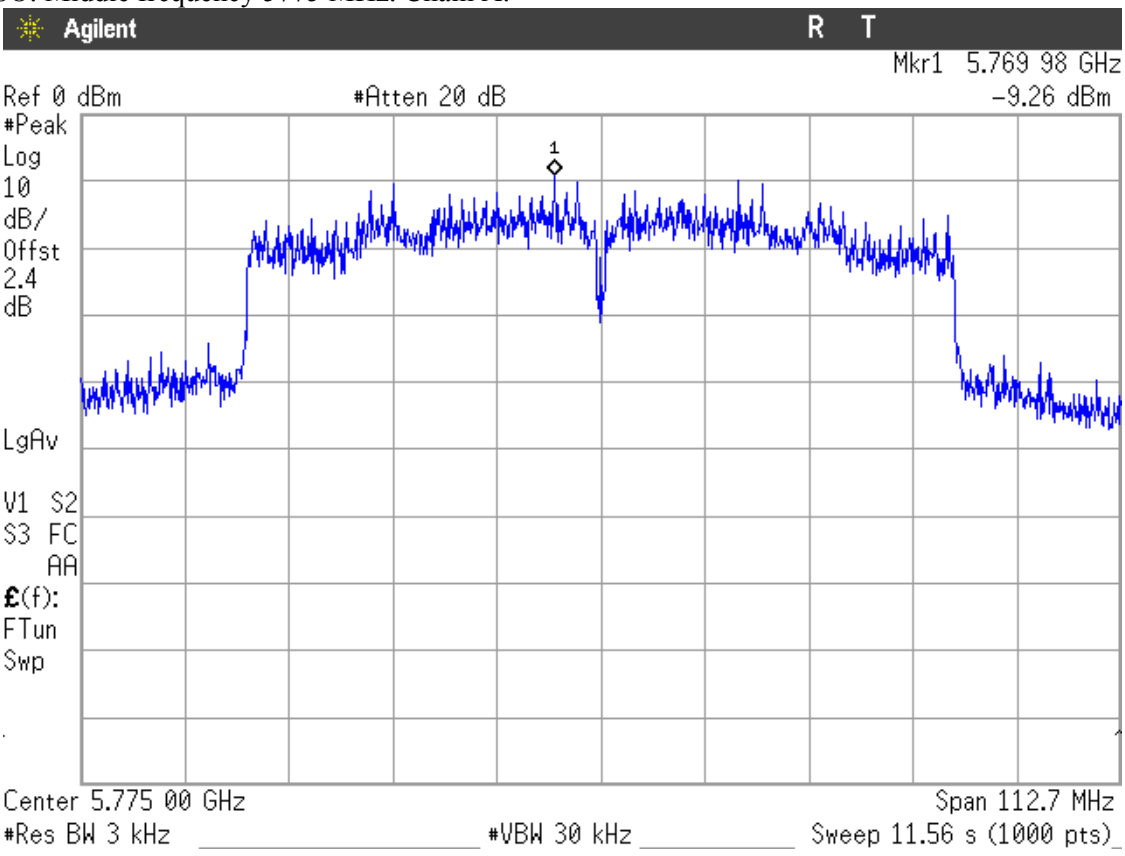


MIMO. Lowest frequency 5755 MHz. Chain A+B. Port A.

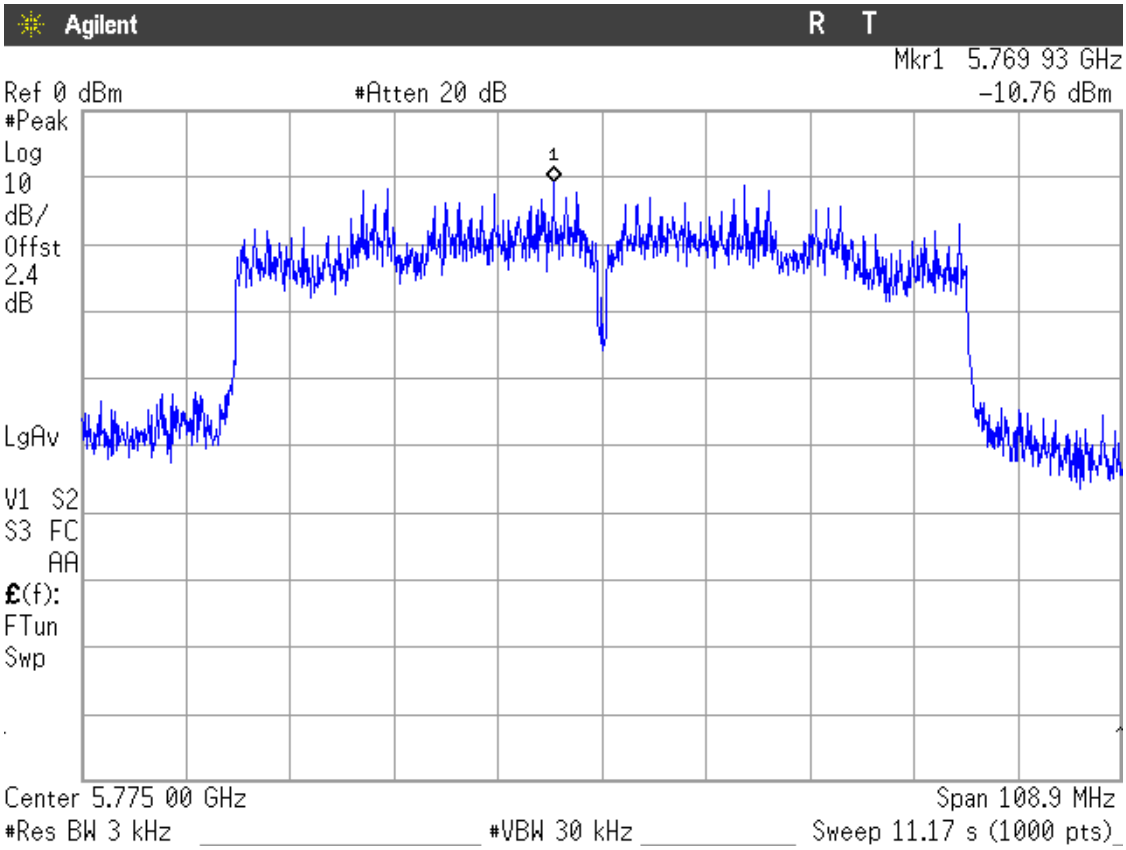


4. WiFi 5GHz 802.11 ac80 mode

SISO. Middle frequency 5775 MHz. Chain A.



MIMO. Middle frequency 5775 MHz. Chain A+B. Port B.



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations radiated (Transmitter)

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at 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-1000 MHz.

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

Spurious levels closest to the limit:

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
31.943887	PV	Quasi-Peak	33.10	± 3.8
47.494989	PV	Quasi-Peak	32.51	± 3.8
595.671342	PH	Quasi-Peak	30.42	± 3.8
663.707414	PH	Quasi-Peak	31.01	± 3.8
747.294589	PV	Quasi-Peak	30.42	± 3.8

Frequency range 1 GHz-40 GHz.

For the 4 OFDM modulation modes (802.11a, 802.11n20, 802.11n40 a 802.11ac80), a preliminary measurement in the central channel was performed in the range 1-12.75 GHz to determine the worst case. The lowest and highest channels were measured for out-of-band emissions for the worst case (802.11a).

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

1. WiFi 5GHz 802.11 a mode

Lowest frequency 5745 MHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.2374	PV	Peak	46.34	± 4.09
22.9800	PV	Peak	51.49	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.2335	PV	Peak	56.40	± 4.09
		Average	44.73	± 4.09
22.9799	PV	Peak	51.47	± 4.09

Middle frequency 5785 MHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3548	PV	Peak	47.28	± 4.09
23.1399	PV	Peak	51.91	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3595	PV	Peak	52.42	± 4.09
23.1398	PV	Peak	51.80	± 4.09

Highest frequency 5825 MHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.4700	PV	Peak	46.16	± 4.09
23.3000	PV	Peak	49.04	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.4789	PV	Peak	53.45	± 4.09
23.29999	PV	Peak	51.55	± 4.09

2. WiFi 5GHz 802.11 n20 mode

Middle frequency 5785 MHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3582	PV	Peak	46.12	± 4.09
23.1400	PV	Peak	51.79	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3556	PV	Peak	51.59	± 4.09
23.1400	PV	Peak	50.92	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3569	PV	Peak	51.05	± 4.09
23.1400	PV	Peak	51.43	± 4.09

3. WiFi 5GHz 802.11 n40 mode

Middle frequency 5785 MHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3826	PV	Peak	46.12	± 4.09
23.1800	PV	Peak	50.15	± 4.09

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3752	PV	Peak	50.79	± 4.09
23.1799	PV	Peak	49.78	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3752	PV	Peak	49.81	± 4.09
23.1800	PV	Peak	50.51	± 4.09

4. WiFi 5GHz 802.11 ac80 mode

Middle frequency 5775 MHz

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
23.1000	PV	Peak	50.69	± 4.09

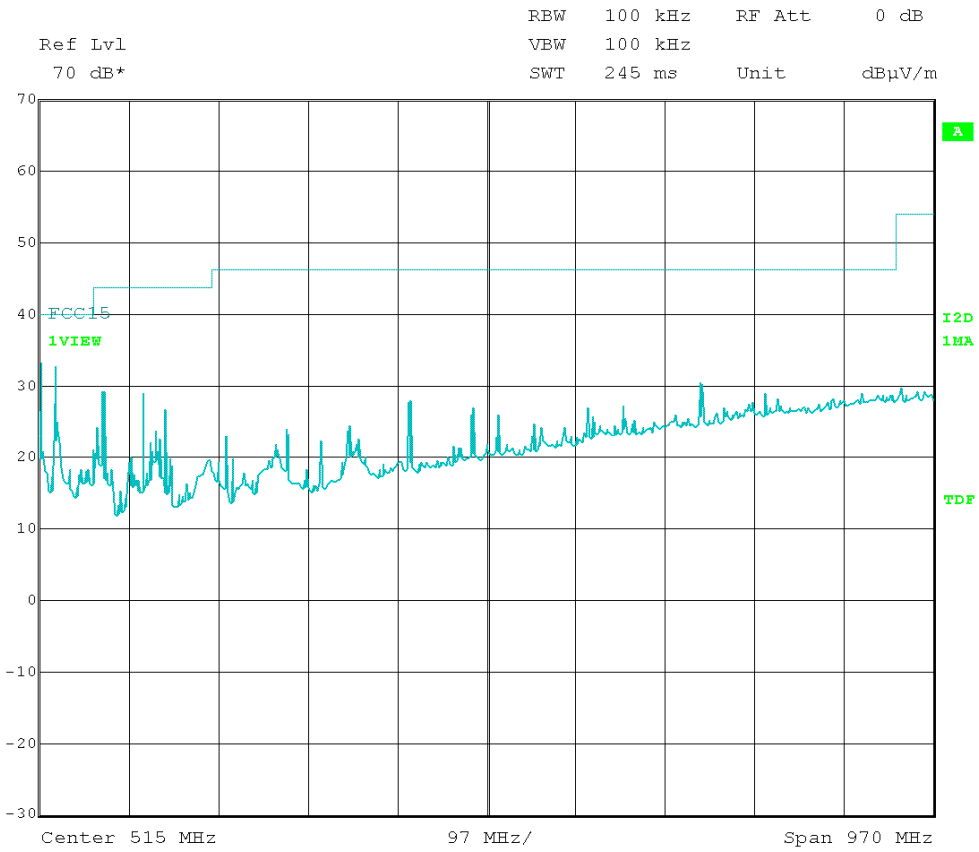
Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.308125	PV	Peak	38.40	± 4.09
23.1000	PV	Peak	49.90	± 4.09

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.3582	PV	Peak	49.93	± 4.09
23.1000	PV	Peak	49.81	± 4.09

FREQUENCY RANGE 30 MHz-1000 MHz.

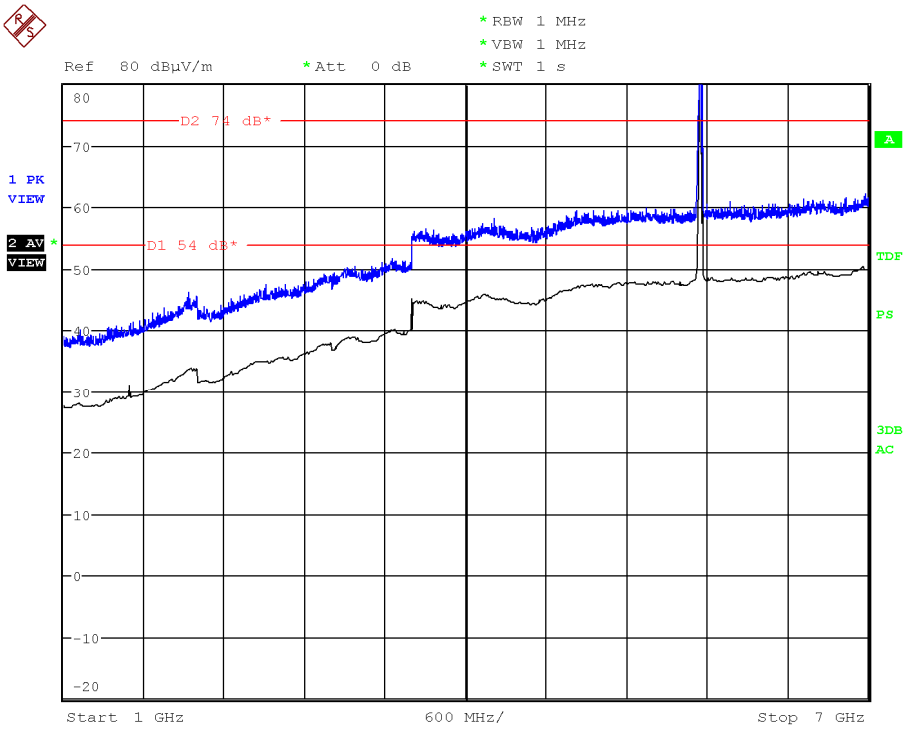


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 7 GHz.

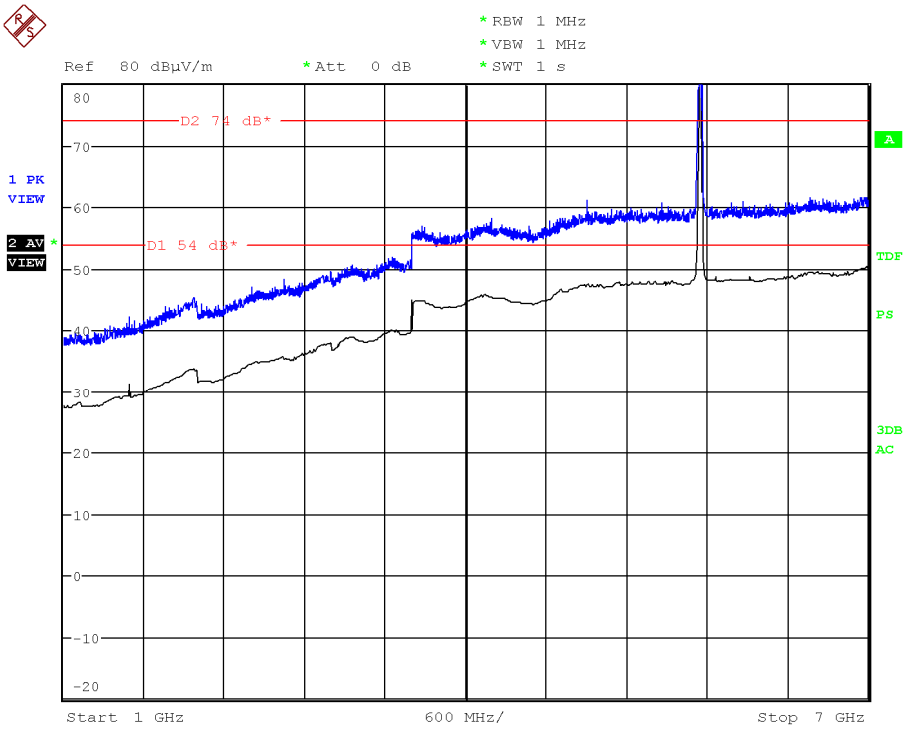
1. WiFi 5GHz 802.11 a mode

Lowest Channel: 5745 MHz. Chain A



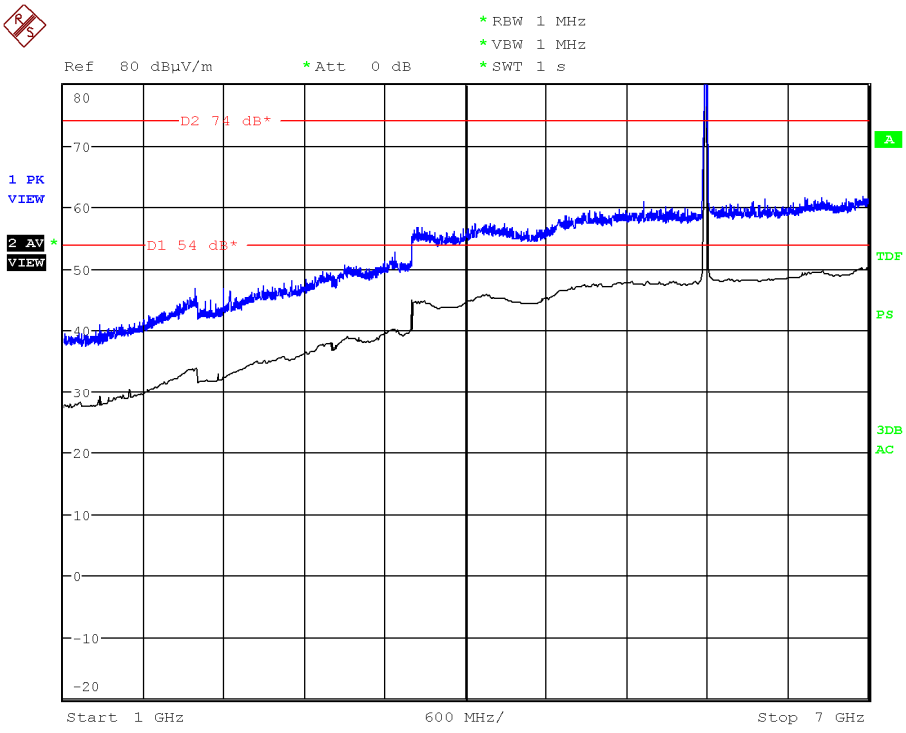
Note: The peak above the limit is the carrier frequency.

Lowest Channel: 5745 MHz. Chain B



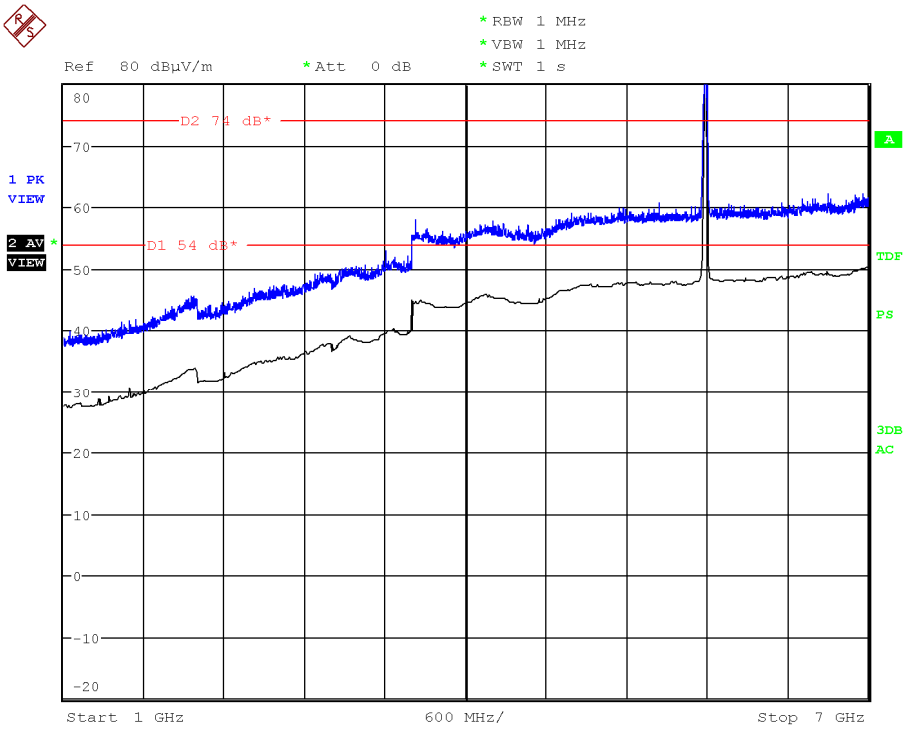
Note: The peak above the limit is the carrier frequency.

Middle Channel: 5785 MHz. Chain A



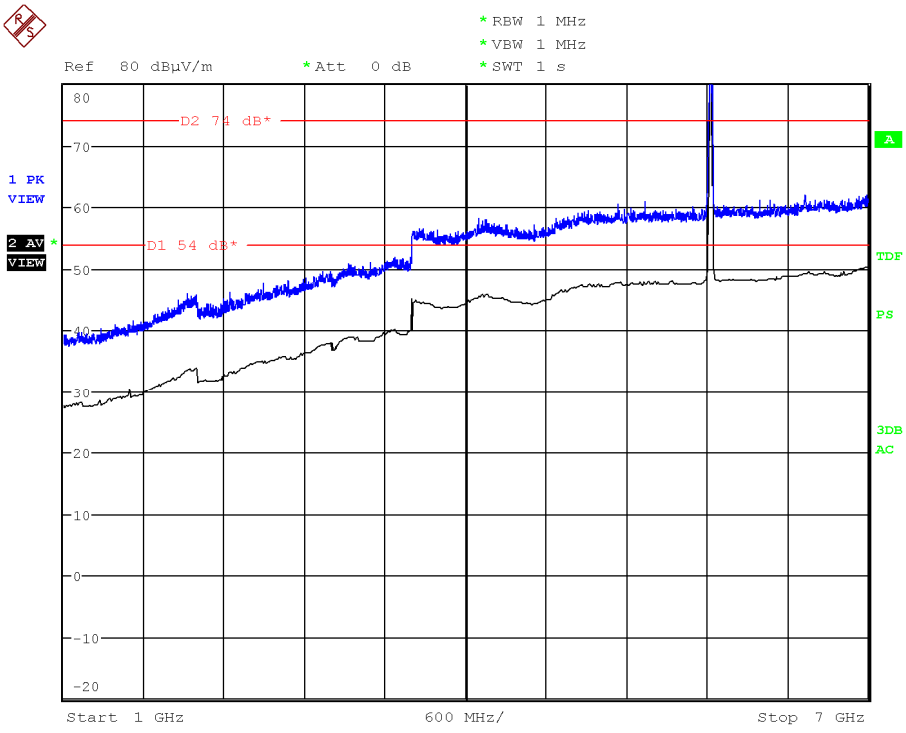
Note: The peak above the limit is the carrier frequency.

Middle Channel: 5785 MHz. Chain B



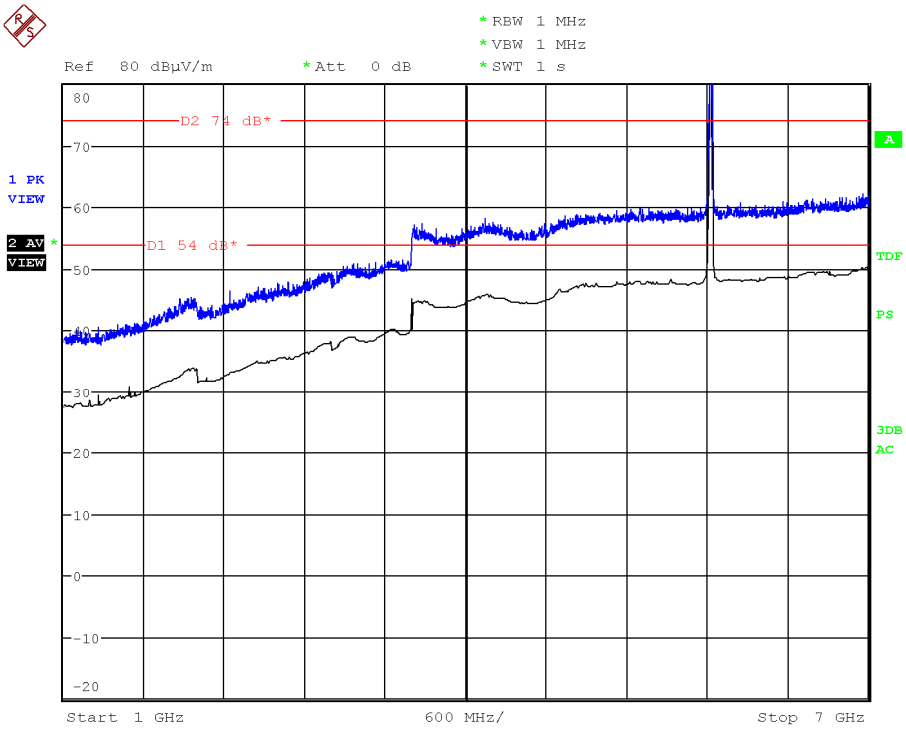
Note: The peak above the limit is the carrier frequency.

Highest Channel: 5825 MHz. Chain A



Note: The peak above the limit is the carrier frequency.

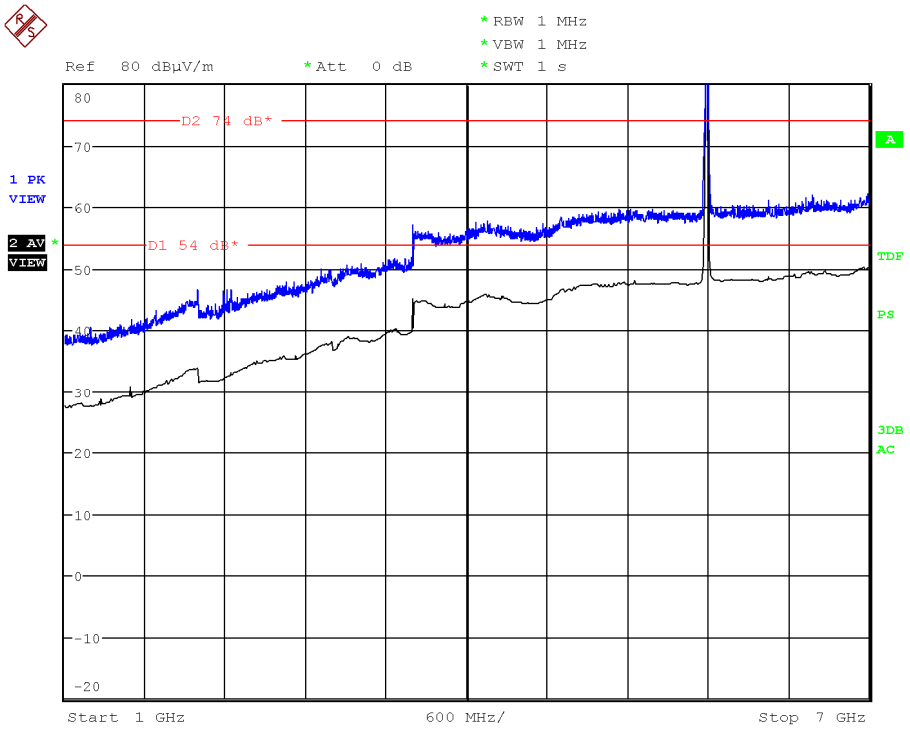
Highest Channel: 5825 MHz. Chain B



Note: The peak above the limit is the carrier frequency.

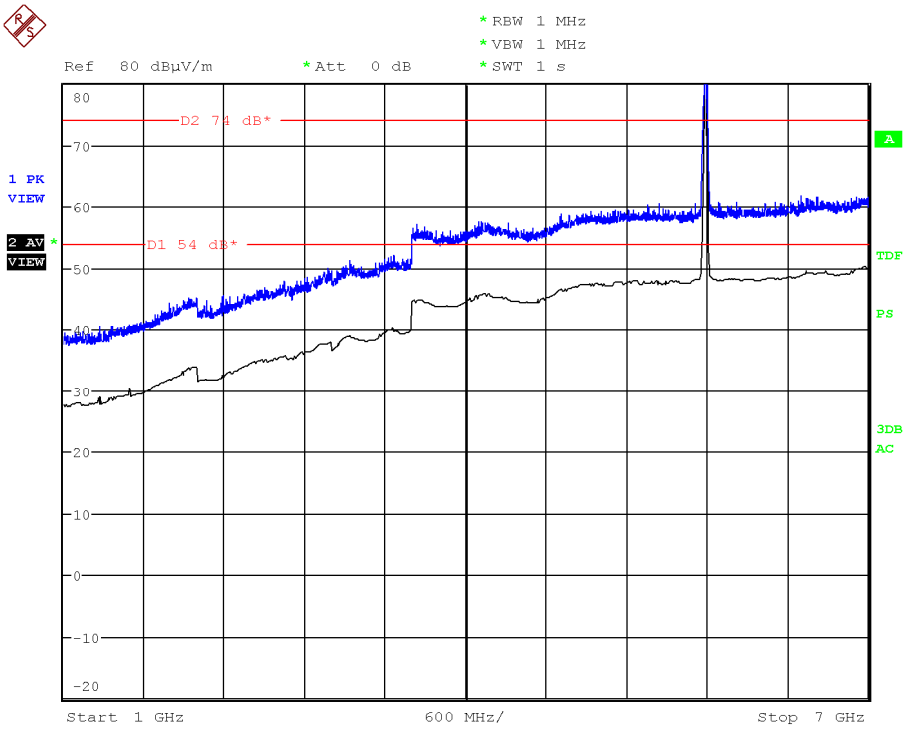
2. WiFi 5GHz 802.11 n20 mode

Middle Channel: 5785 MHz. Chain A



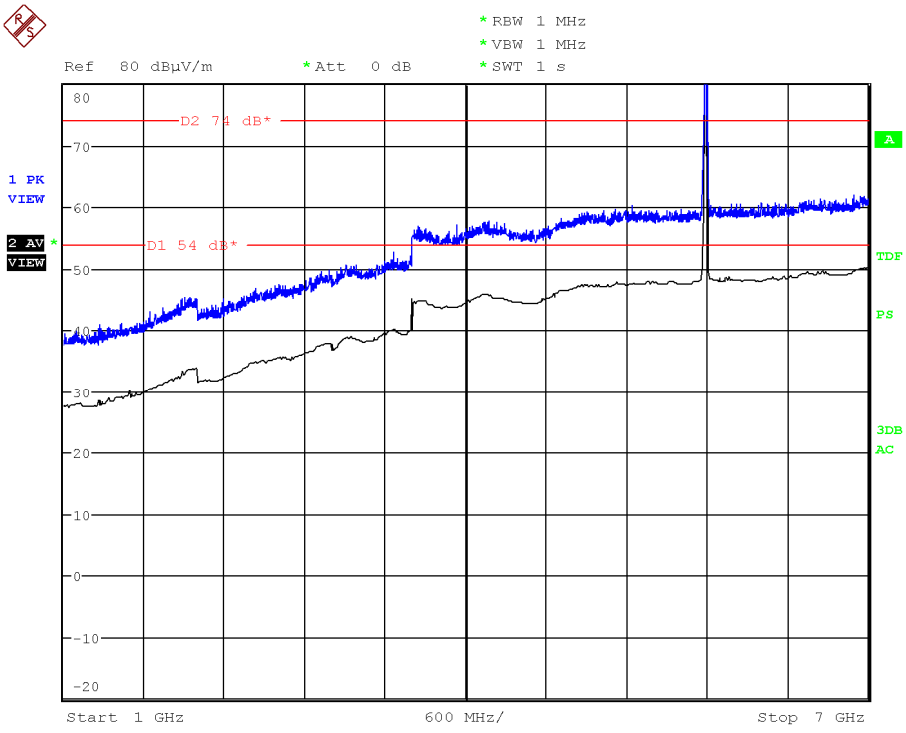
Note: The peak above the limit is the carrier frequency.

Middle Channel: 5785 MHz. Chain B



Note: The peak above the limit is the carrier frequency.

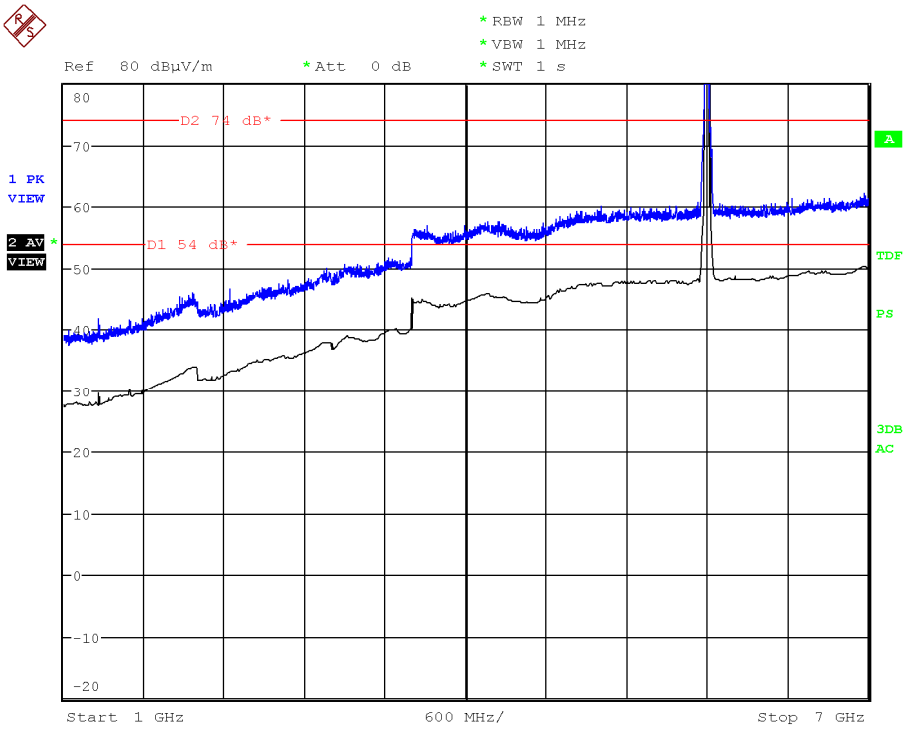
Middle Channel: 5785 MHz. Chain A+B



Note: The peak above the limit is the carrier frequency.

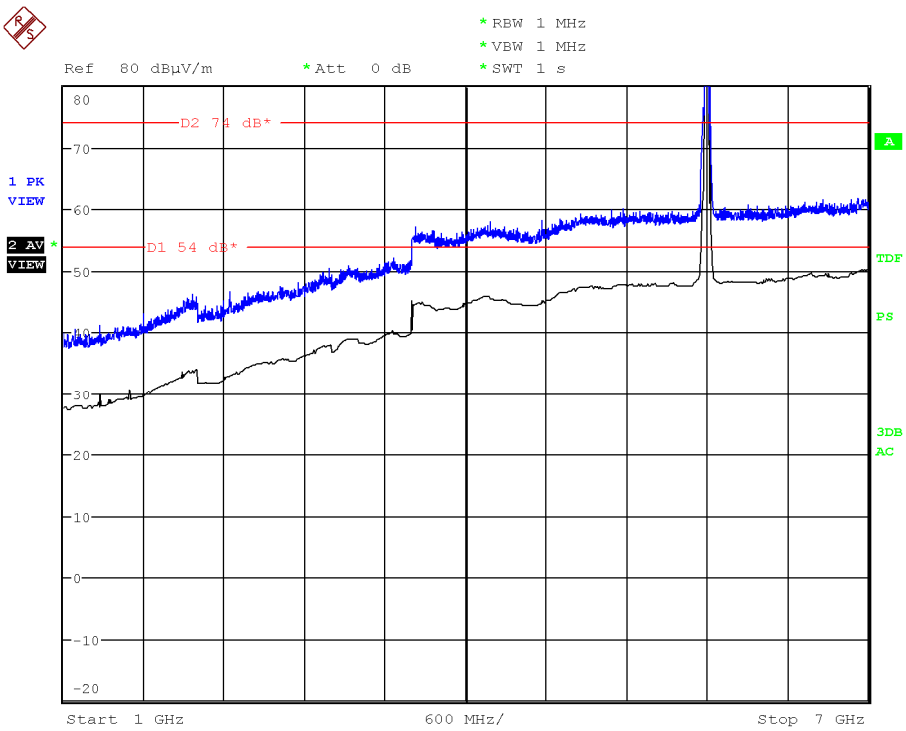
3. WiFi 5GHz 802.11 n40 mode

Highest Channel: 5795 MHz. Chain A



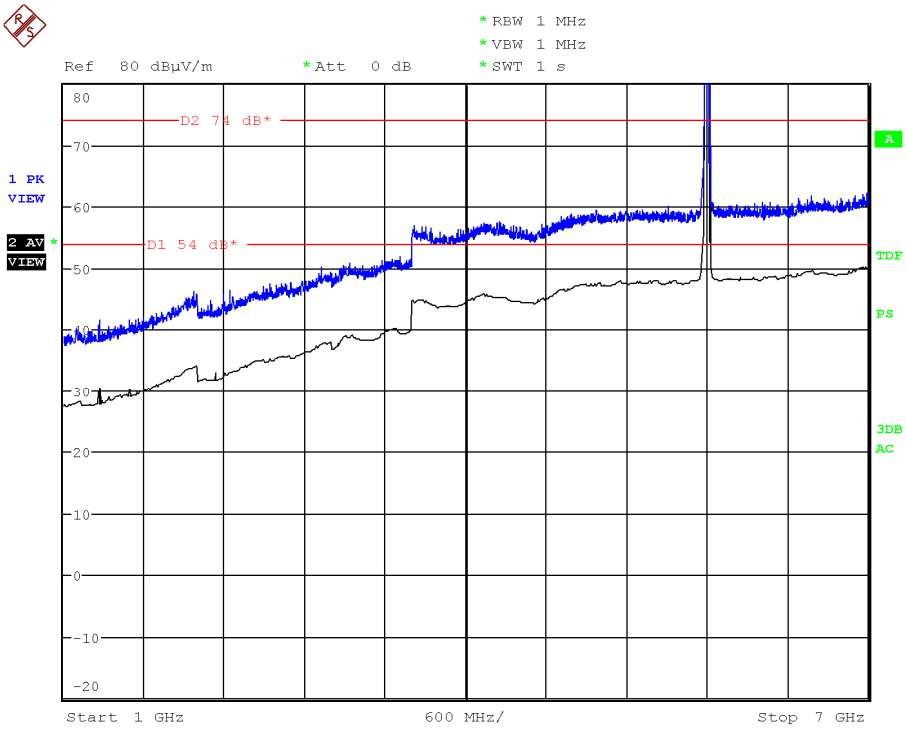
Note: The peak above the limit is the carrier frequency.

Highest Channel: 5795 MHz. Chain B



Note: The peak above the limit is the carrier frequency.

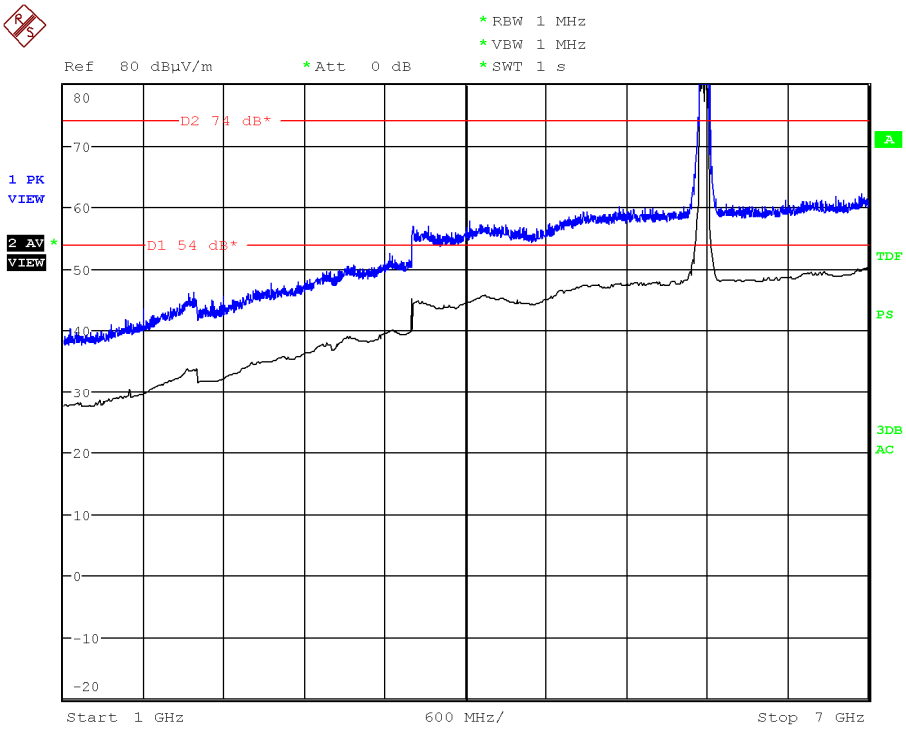
Highest Channel: 5795 MHz. Chain A+B



Note: The peak above the limit is the carrier frequency.

4. WiFi 5GHz 802.11 ac80 mode

Middle Channel: 5775 MHz.

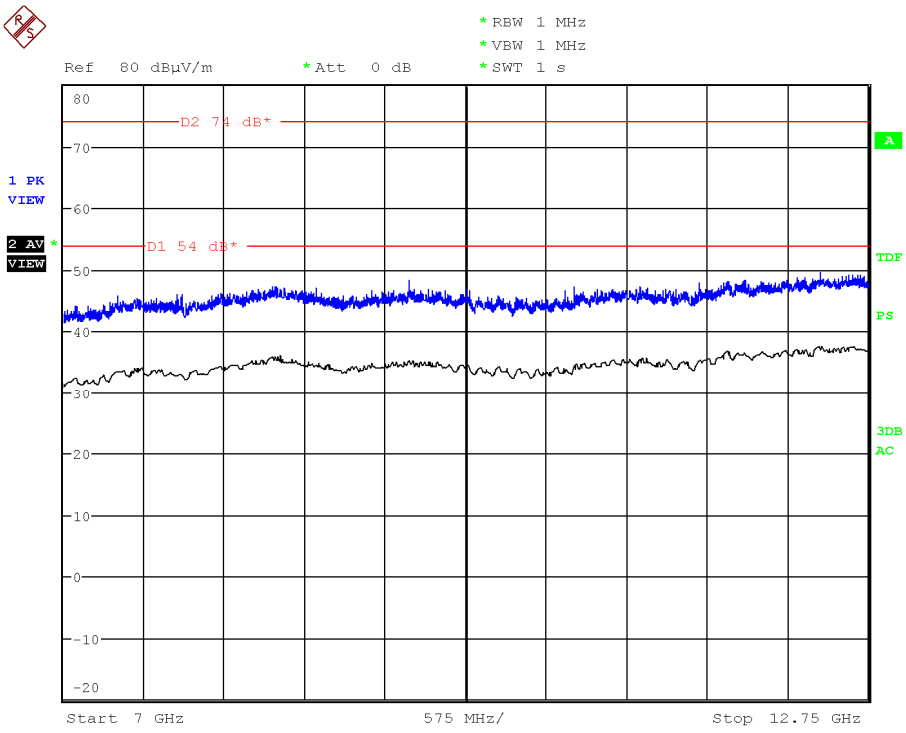


Note: The peak above the limit is the carrier frequency. This plot is valid for Chain A, Chain B and Chain A+B.

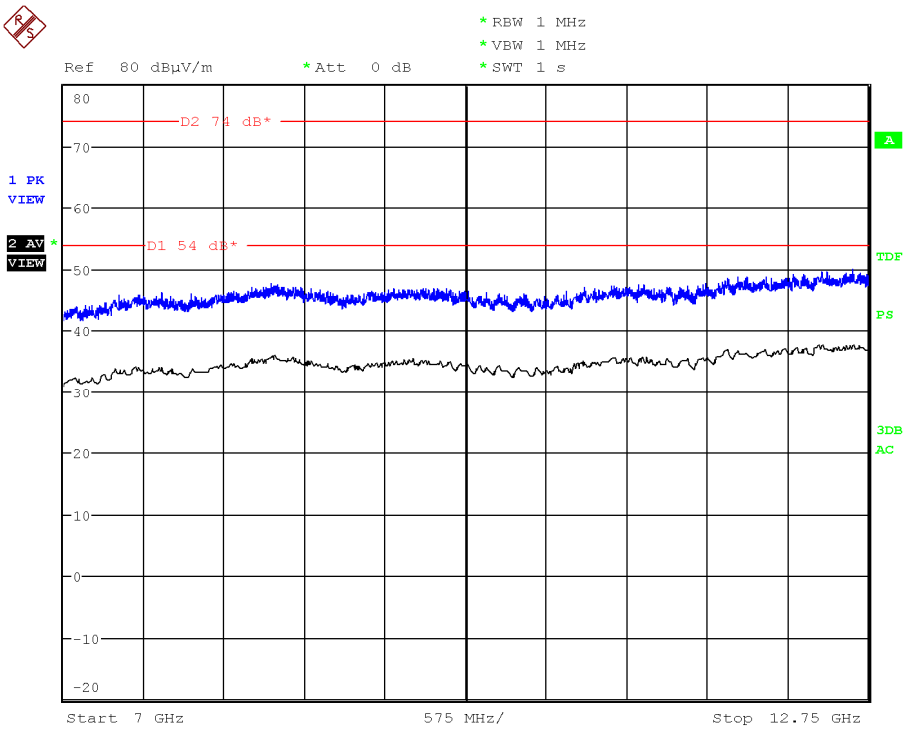
FREQUENCY RANGE 7 GHz to 12 GHz.

1. WiFi 5GHz 802.11 a mode

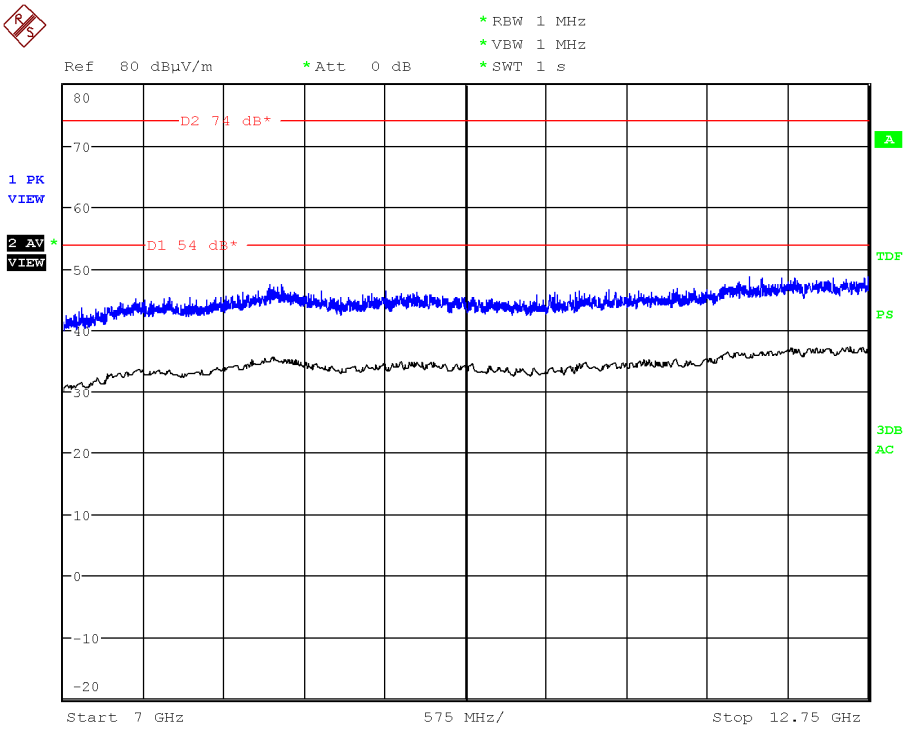
Lowest Channel: 5745 MHz. Chain A



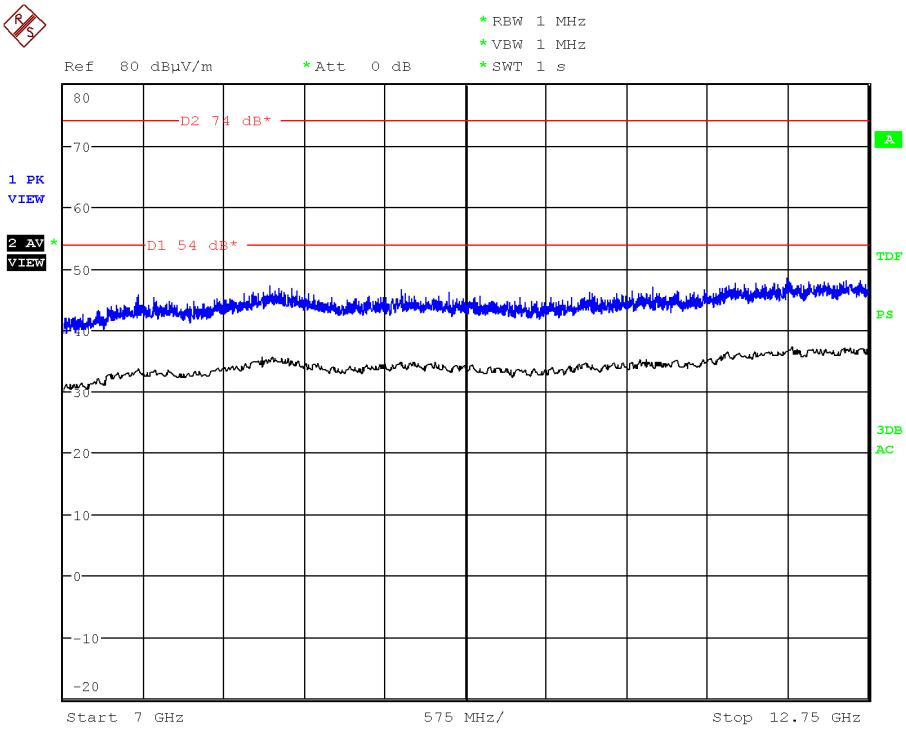
Lowest Channel: 5745 MHz. Chain B



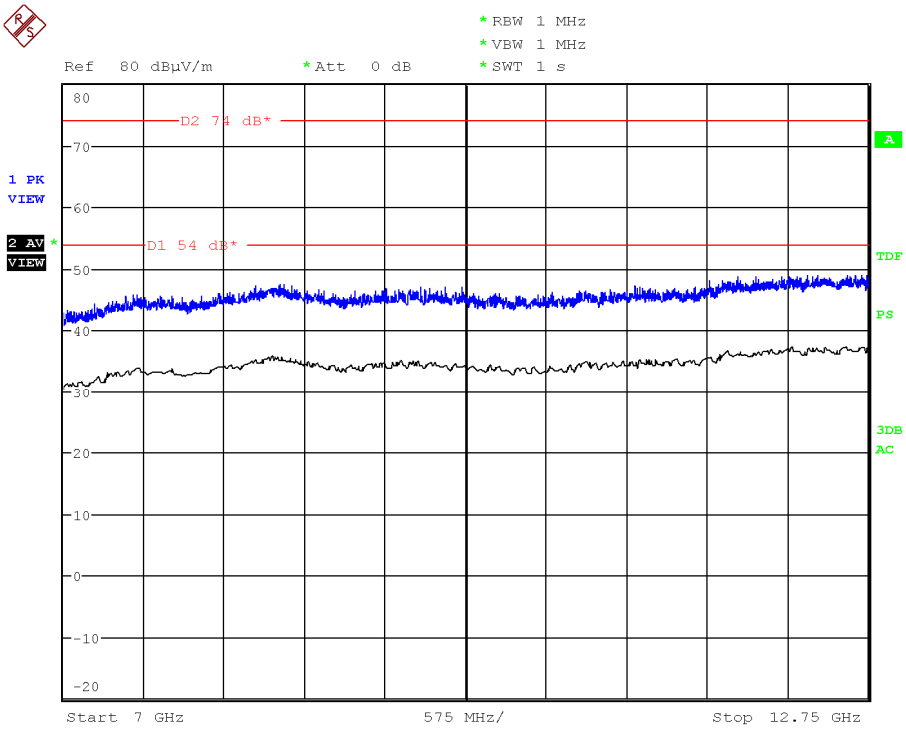
Middle Channel: 5785 MHz. Chain A



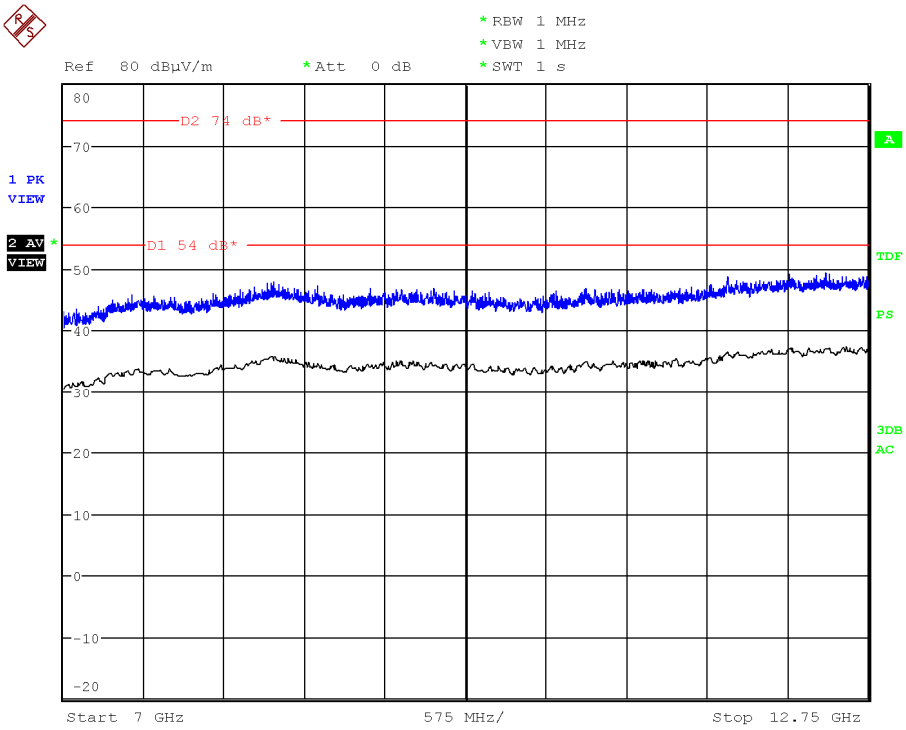
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

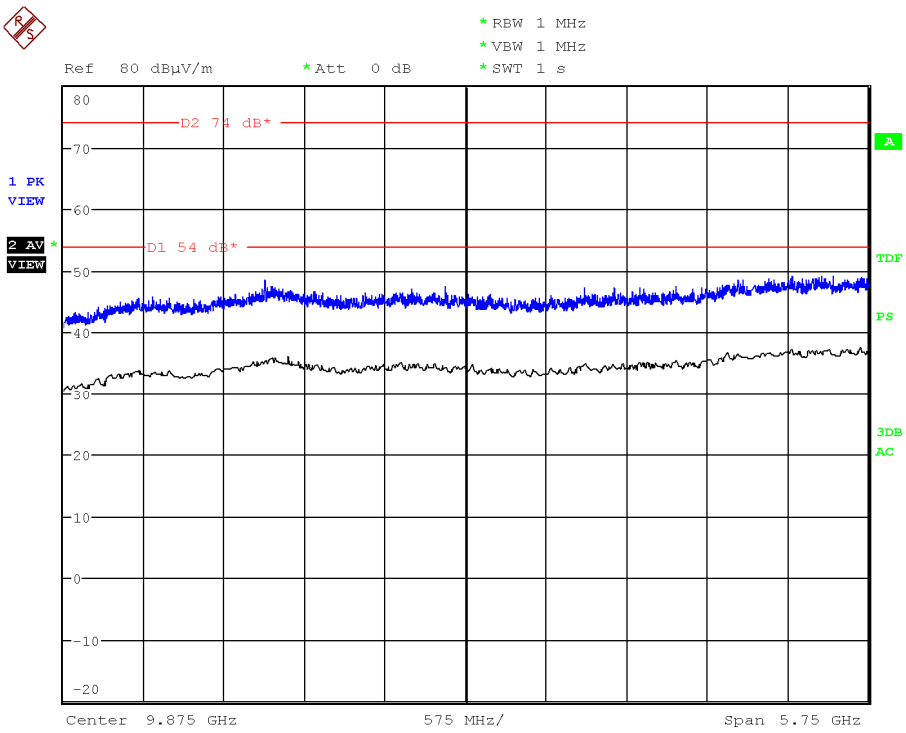


Highest Channel: 5825 MHz. Chain B

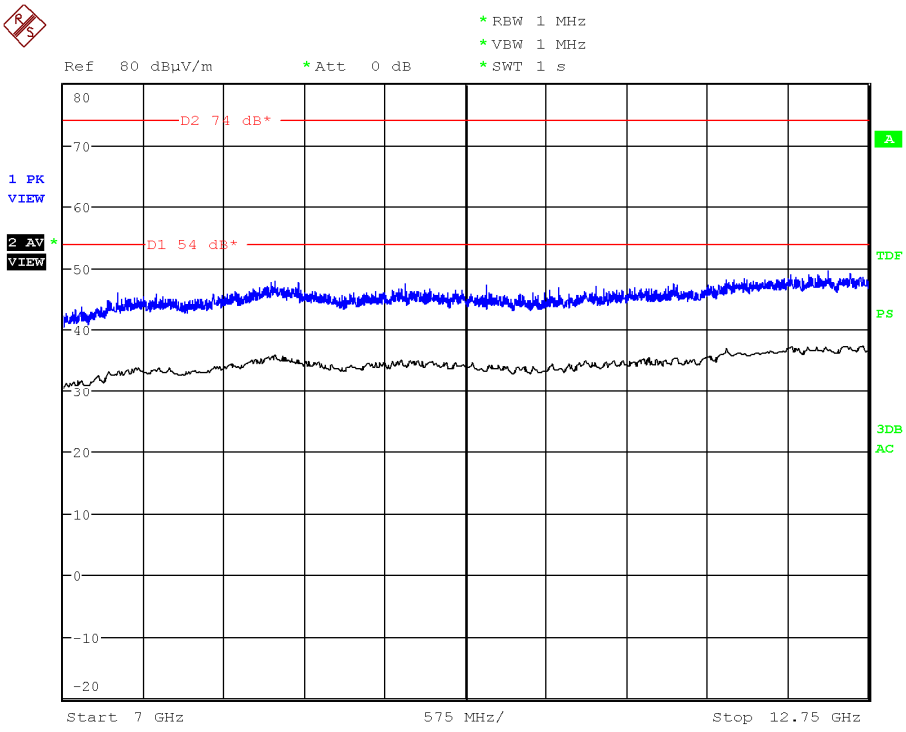


2. WiFi 5GHz 802.11 n20 mode

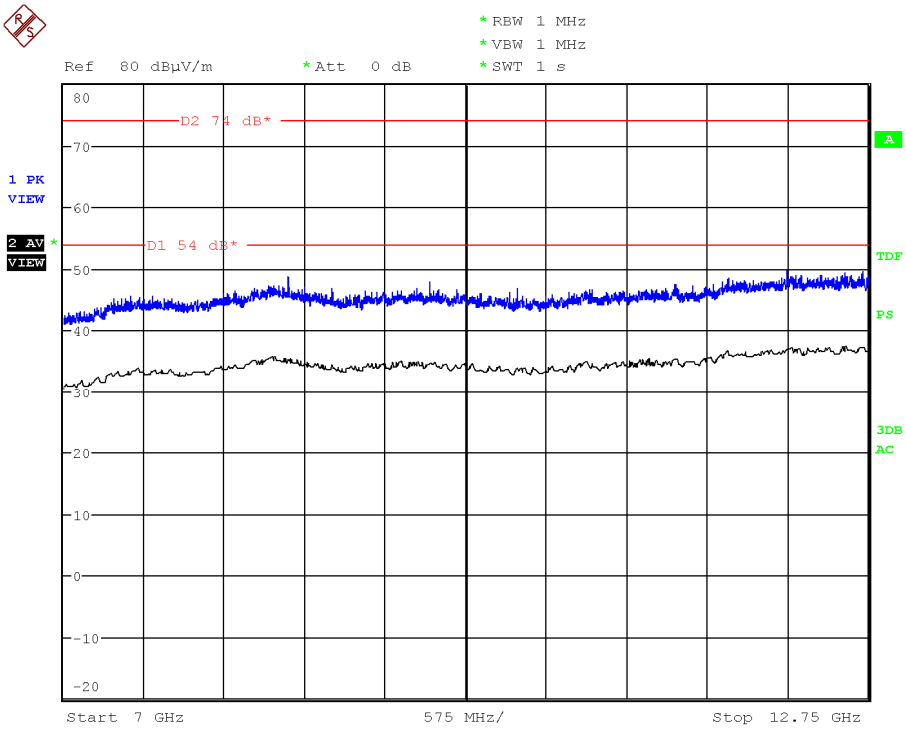
Middle Channel: 5785 MHz. Chain A



Middle Channel: 5785 MHz. Chain B

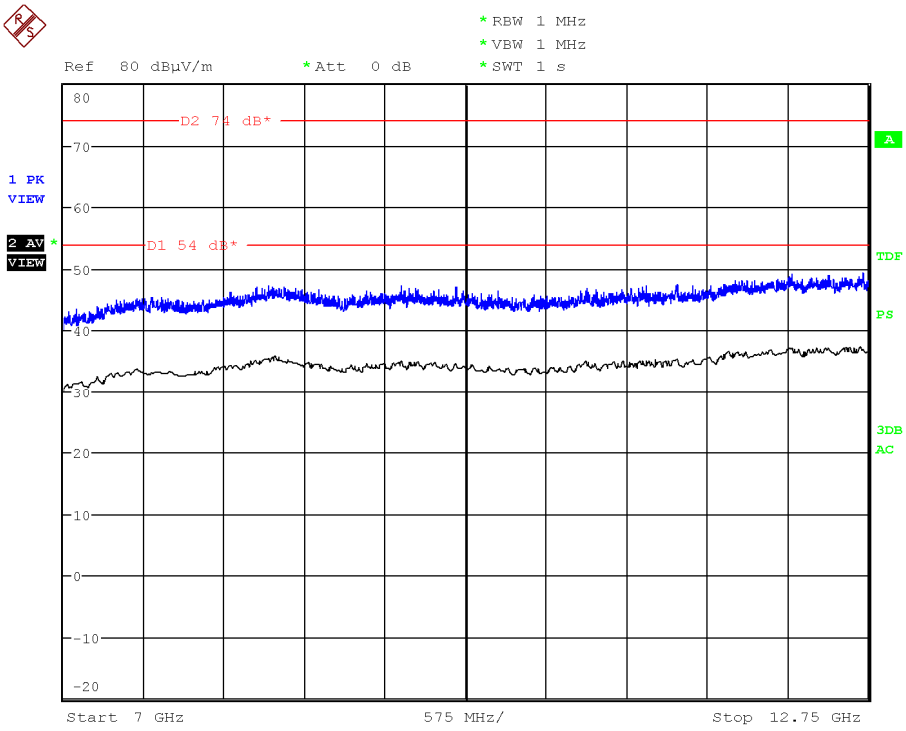


Middle Channel: 5785 MHz. Chain A+B

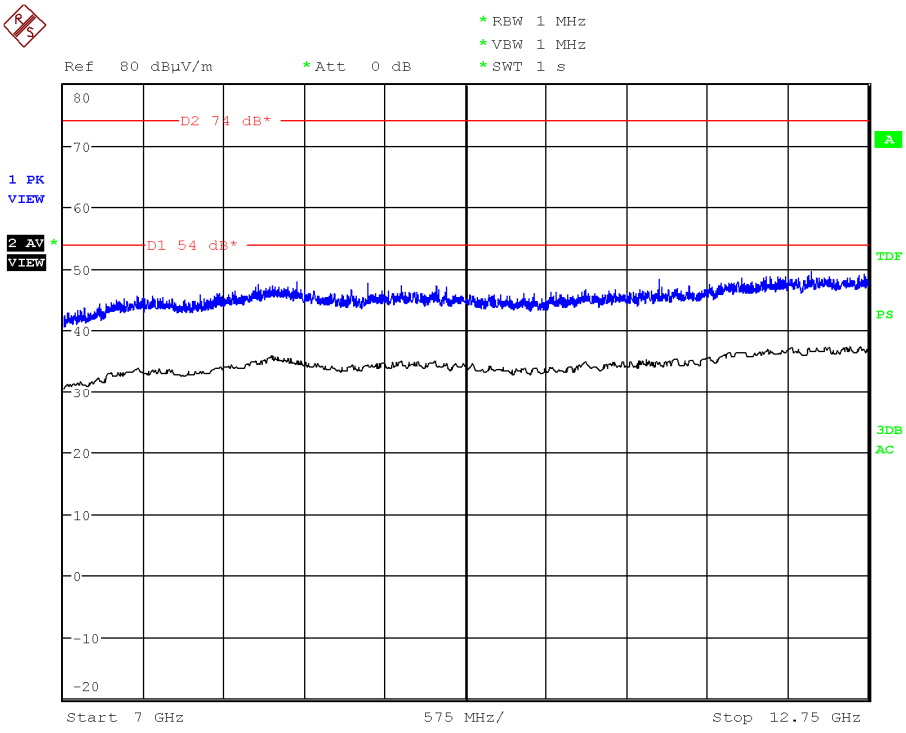


3. WiFi 5GHz 802.11 n40 mode

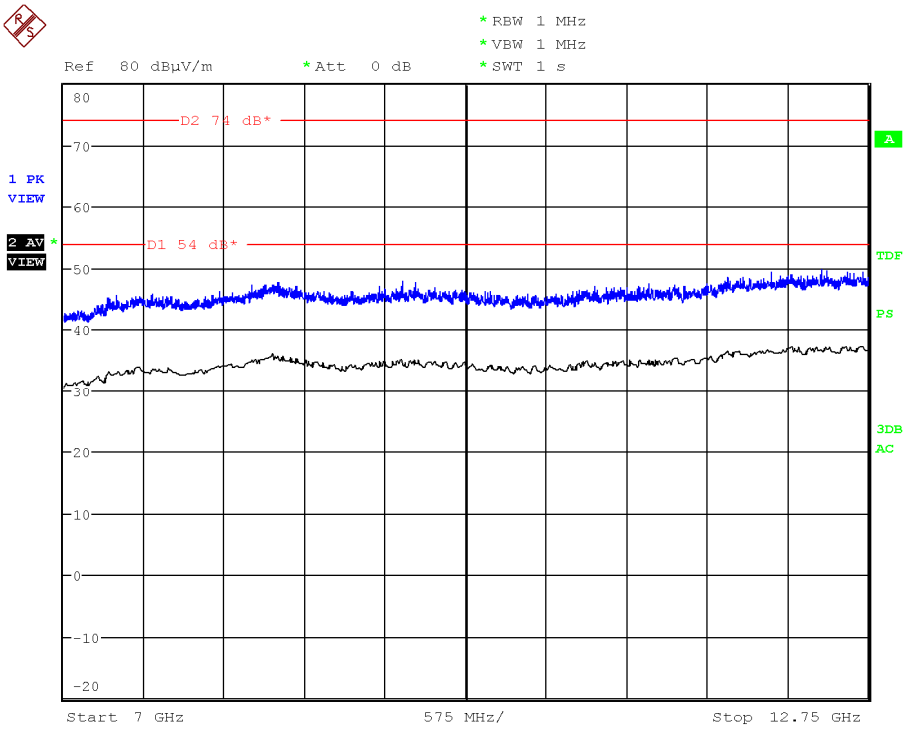
Highest Channel: 5795 MHz. Chain A



Highest Channel: 5795 MHz. Chain B

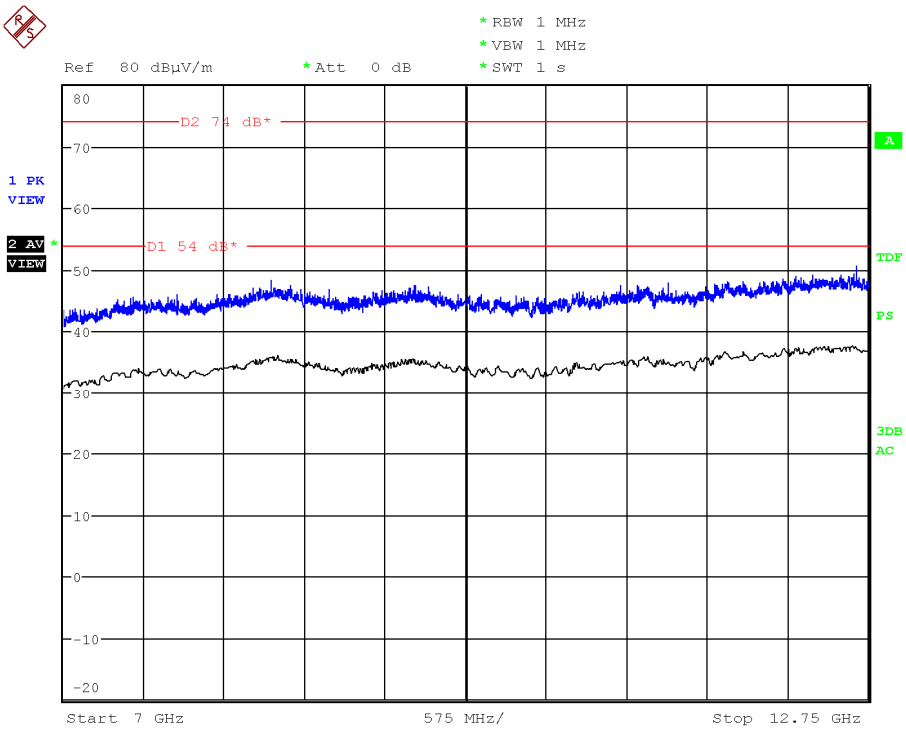


Highest Channel: 5795 MHz. Chain A+B

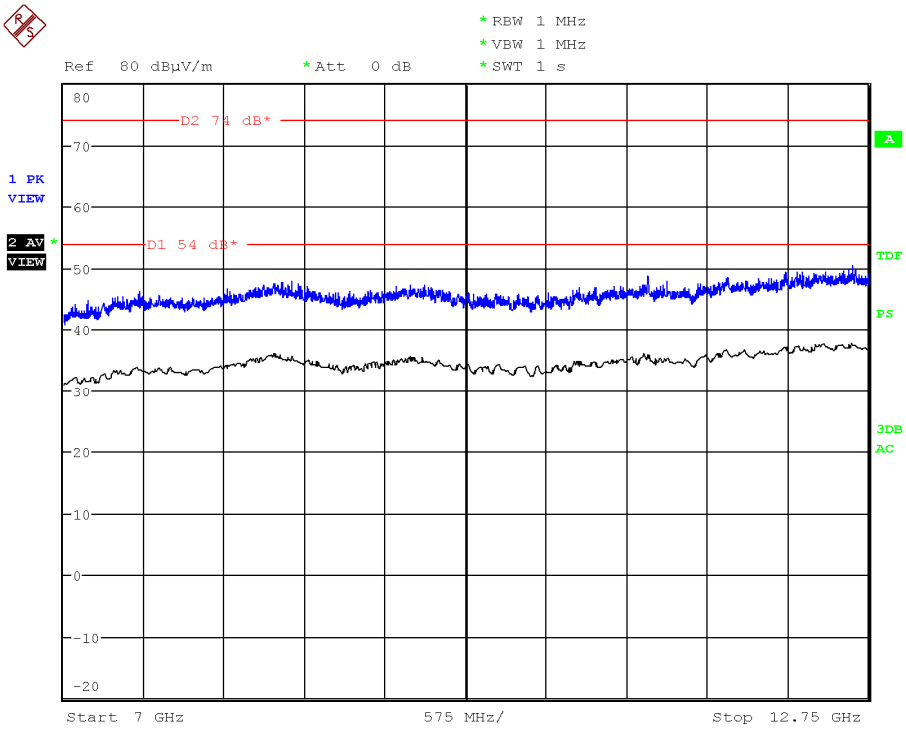


4. WiFi 5GHz 802.11 ac80 mode

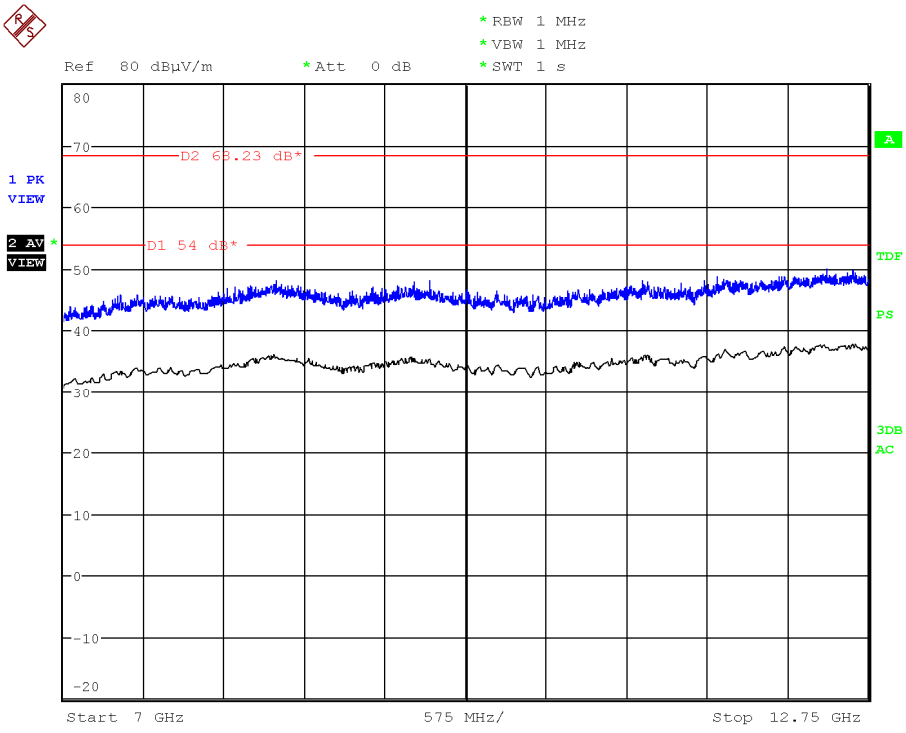
Middle Channel: 5775 MHz. Chain A.



Middle Channel: 5775 MHz. Chain B.



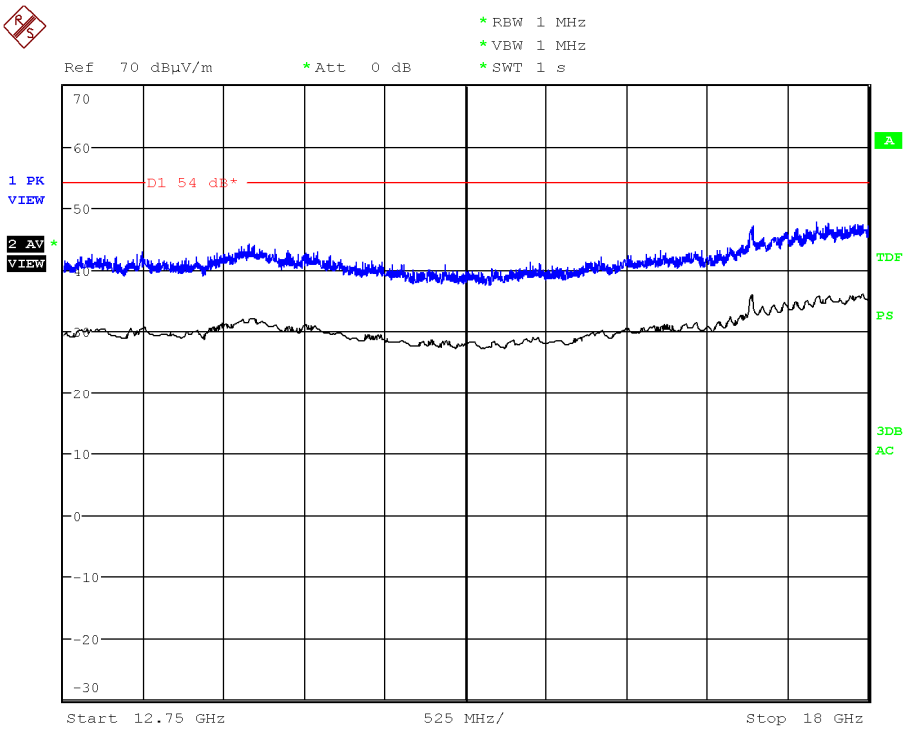
Middle Channel: 5775 MHz. Chain A+B.



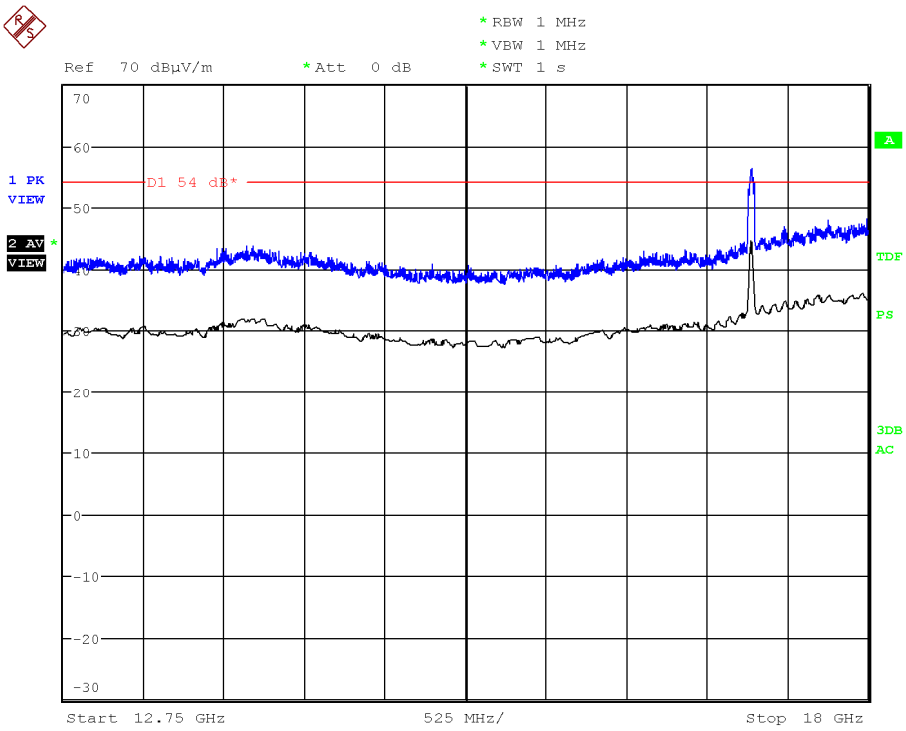
FREQUENCY RANGE 12 GHz to 18 GHz.

1. WiFi 5GHz 802.11 a mode

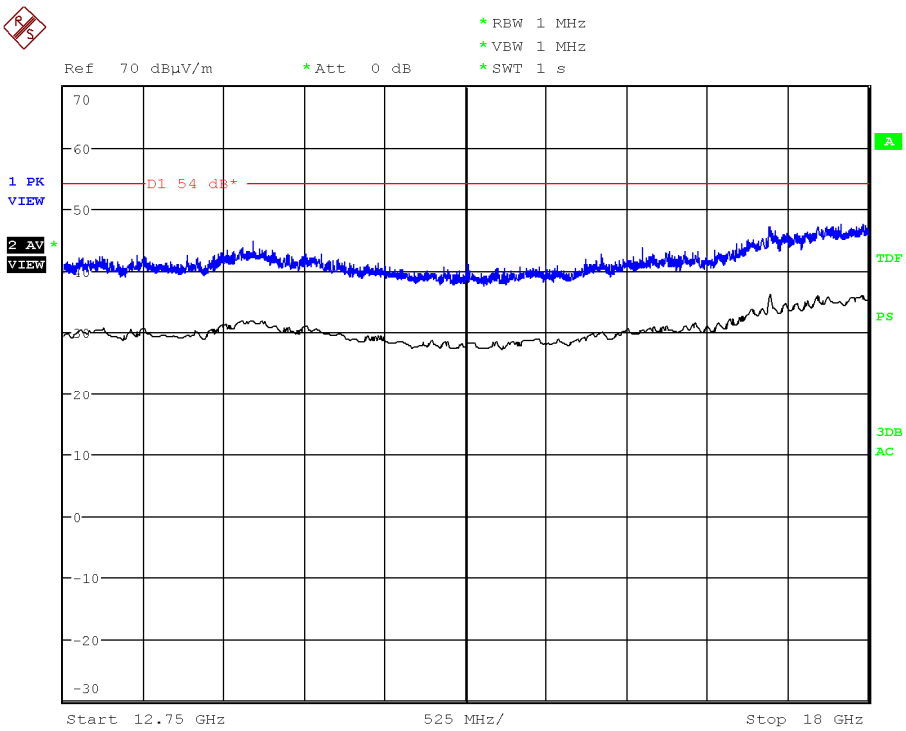
Lowest Channel: 5745 MHz. Chain A



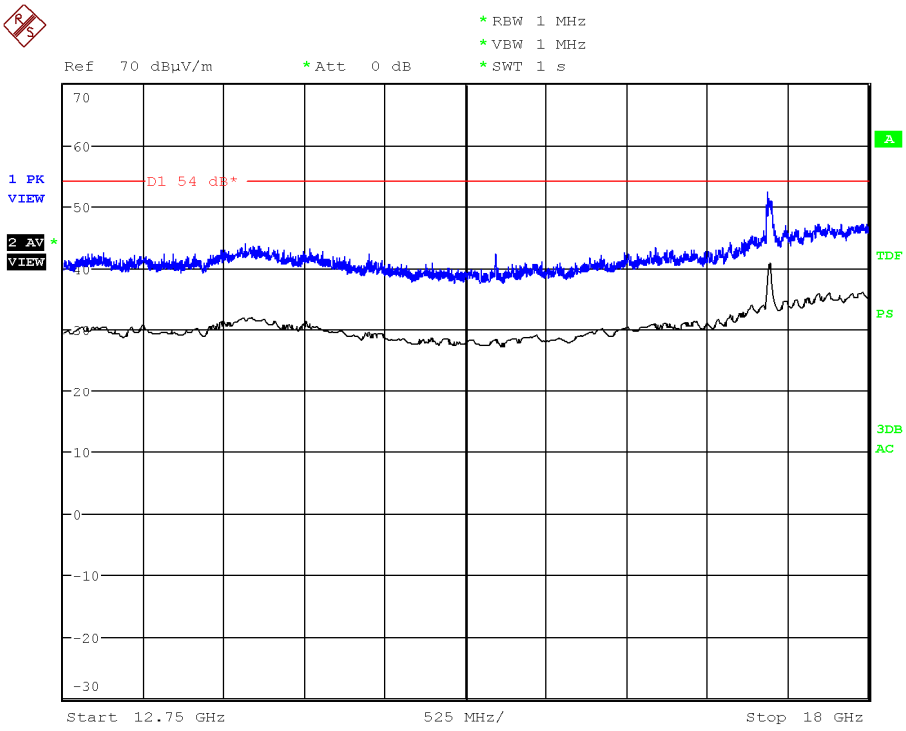
Lowest Channel: 5745 MHz. Chain B



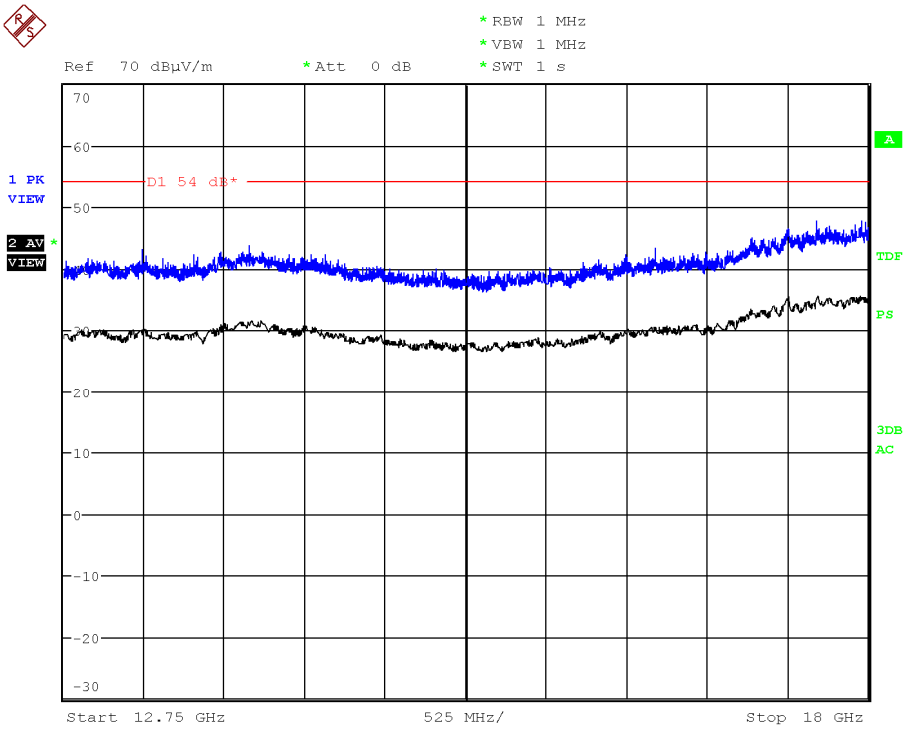
Middle Channel: 5785 MHz. Chain A



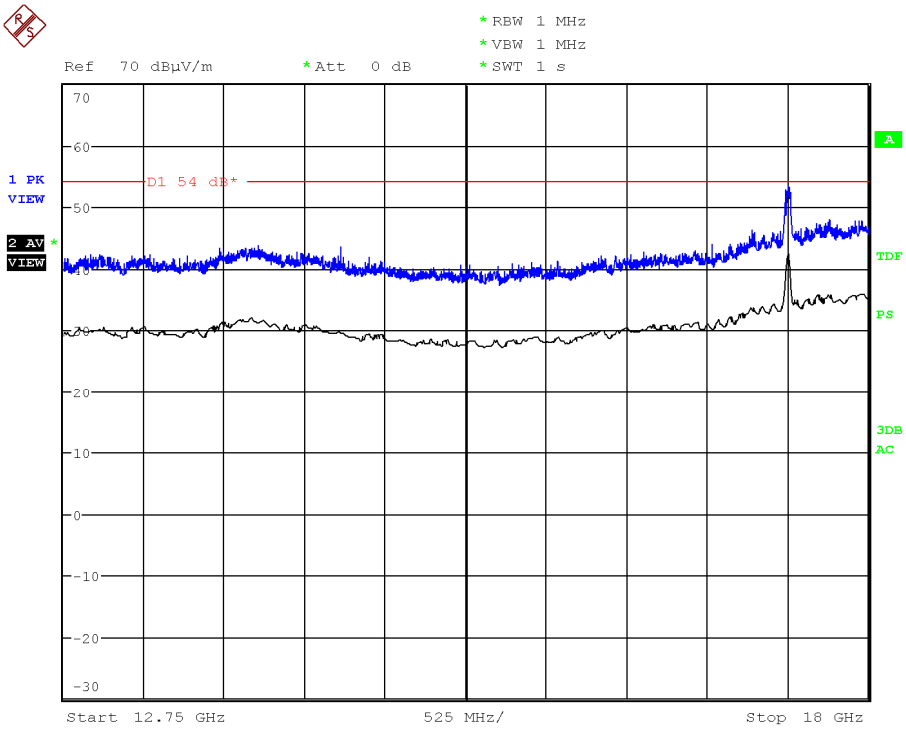
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

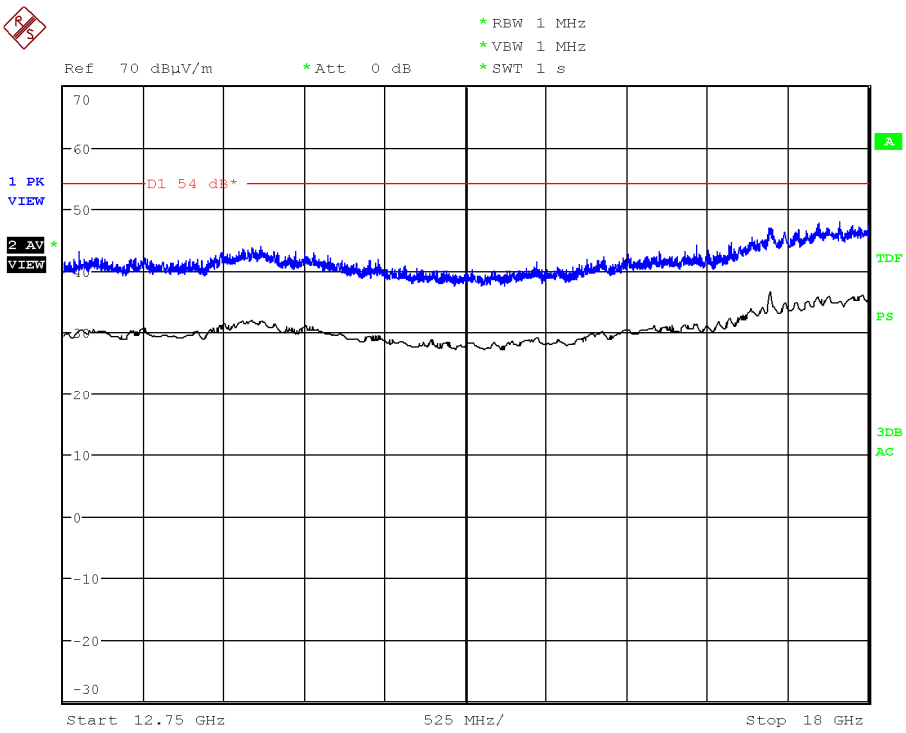


Highest Channel: 5825 MHz. Chain B

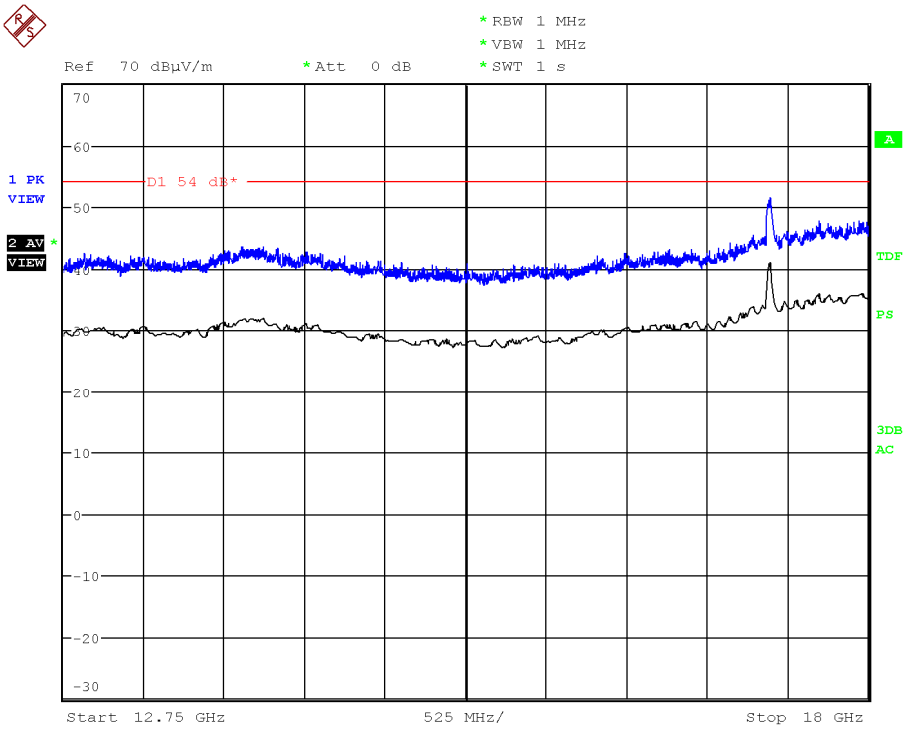


2. WiFi 5GHz 802.11 n20 mode

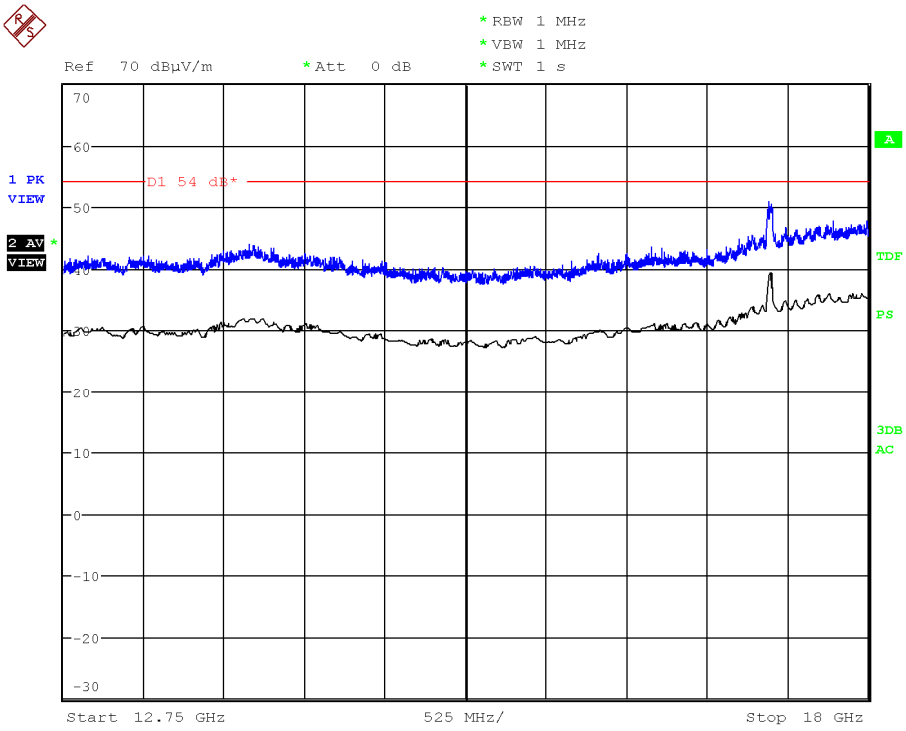
Middle Channel: 5785 MHz. Chain A



Middle Channel: 5785 MHz. Chain B

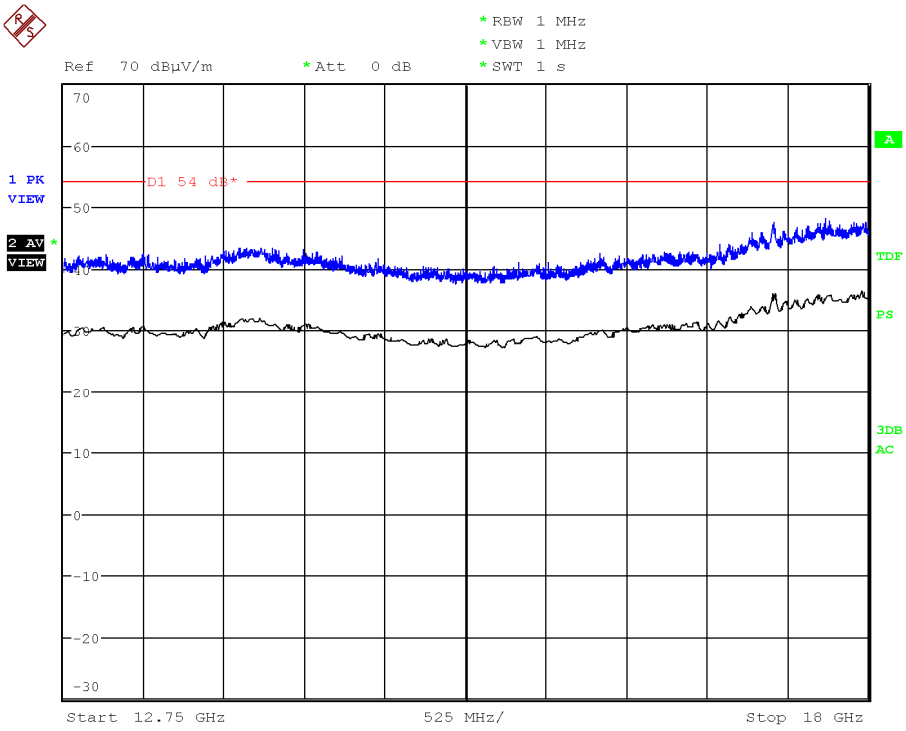


Middle Channel: 5785 MHz. Chain A+B

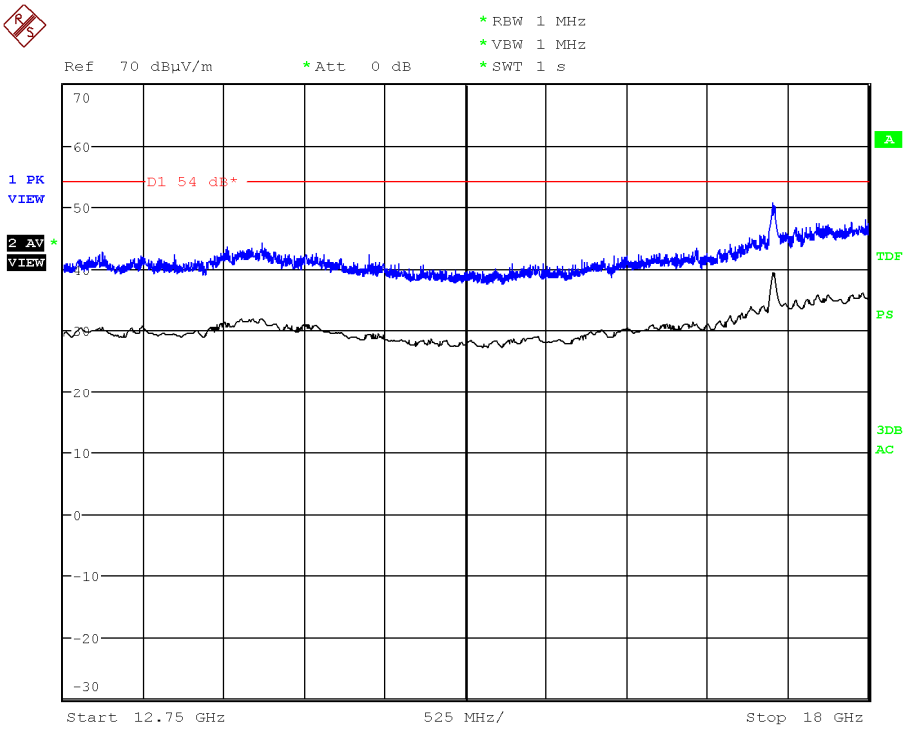


3. WiFi 5GHz 802.11 n40 mode

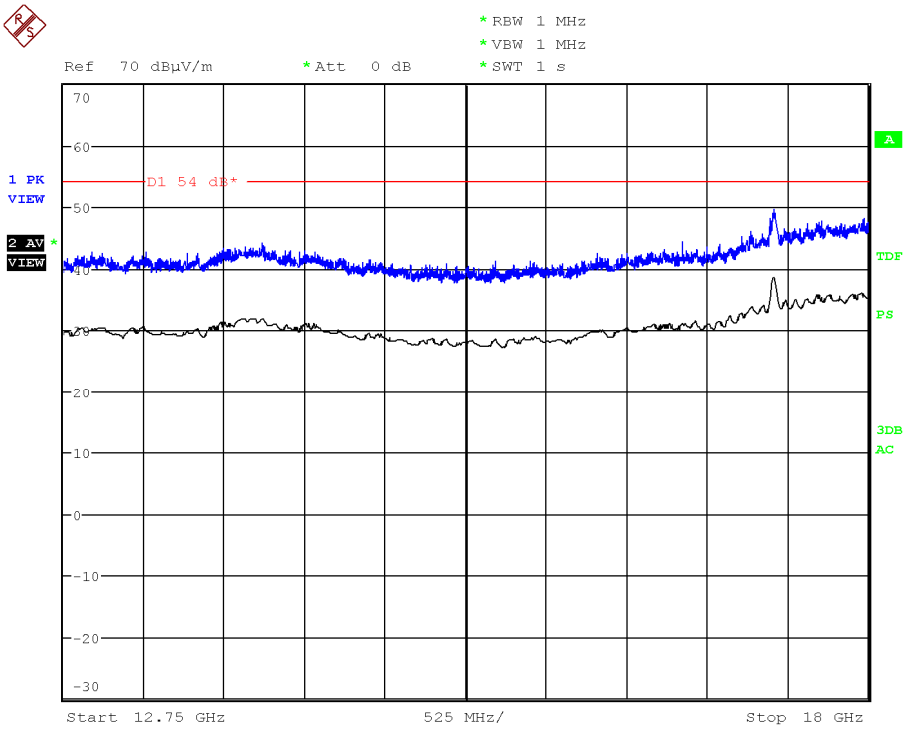
Highest Channel: 5795 MHz. Chain A



Highest Channel: 5795 MHz. Chain B

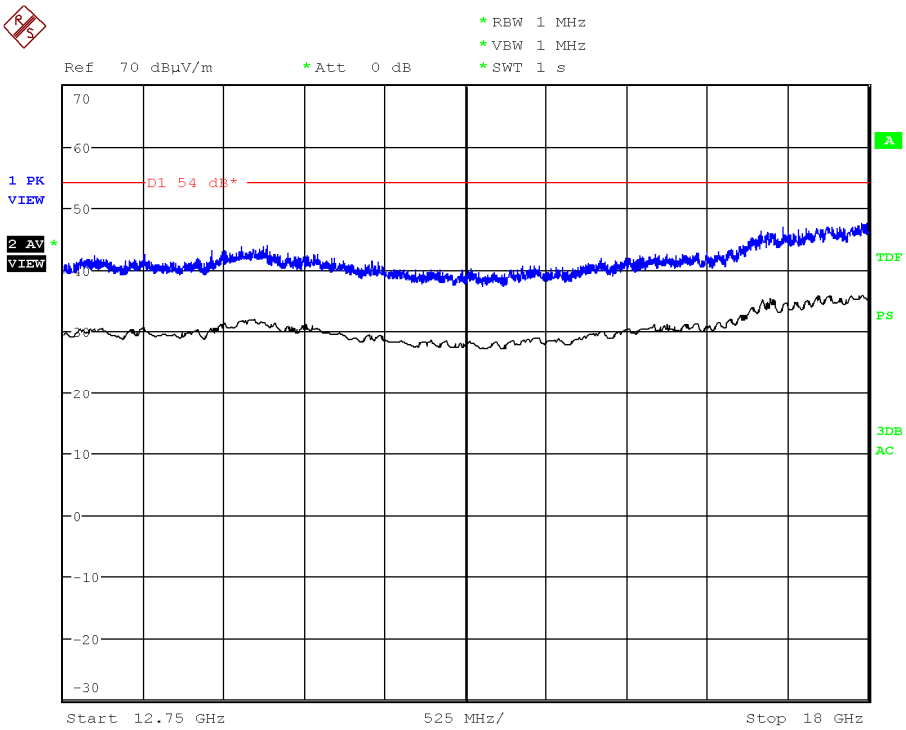


Highest Channel: 5795 MHz. Chain A+B

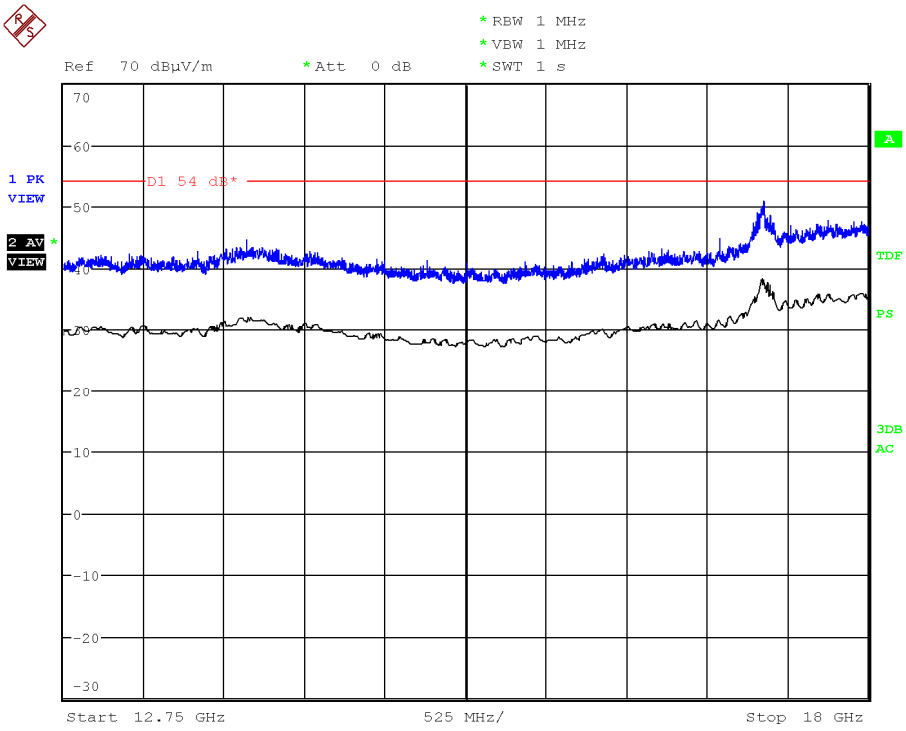


4. WiFi 5GHz 802.11 ac80 mode

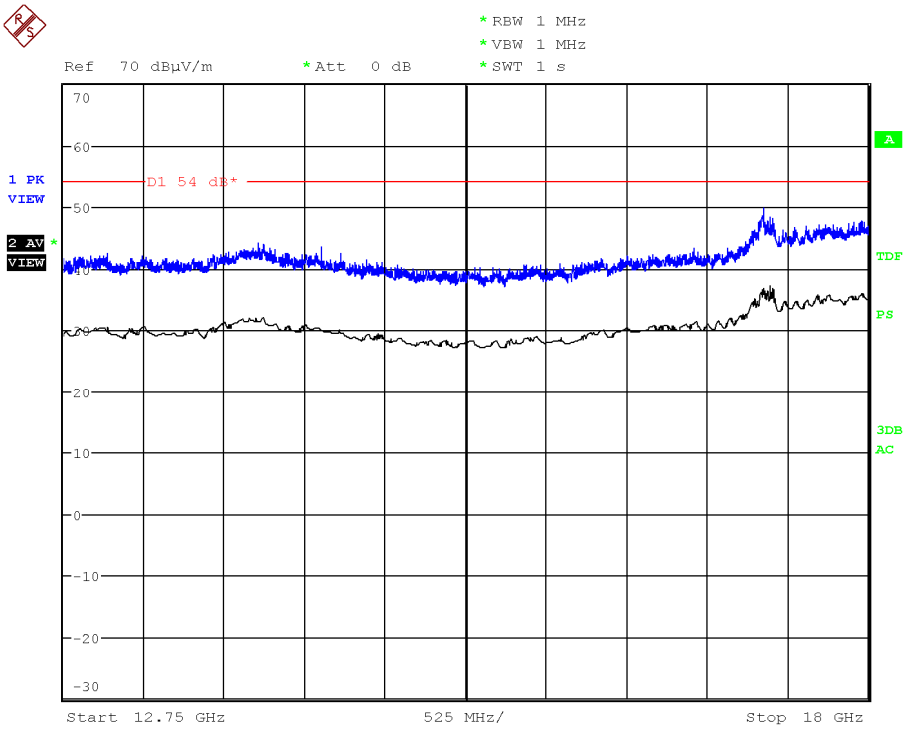
Middle Channel: 5775 MHz. Chain A.



Middle Channel: 5775 MHz. Chain B.



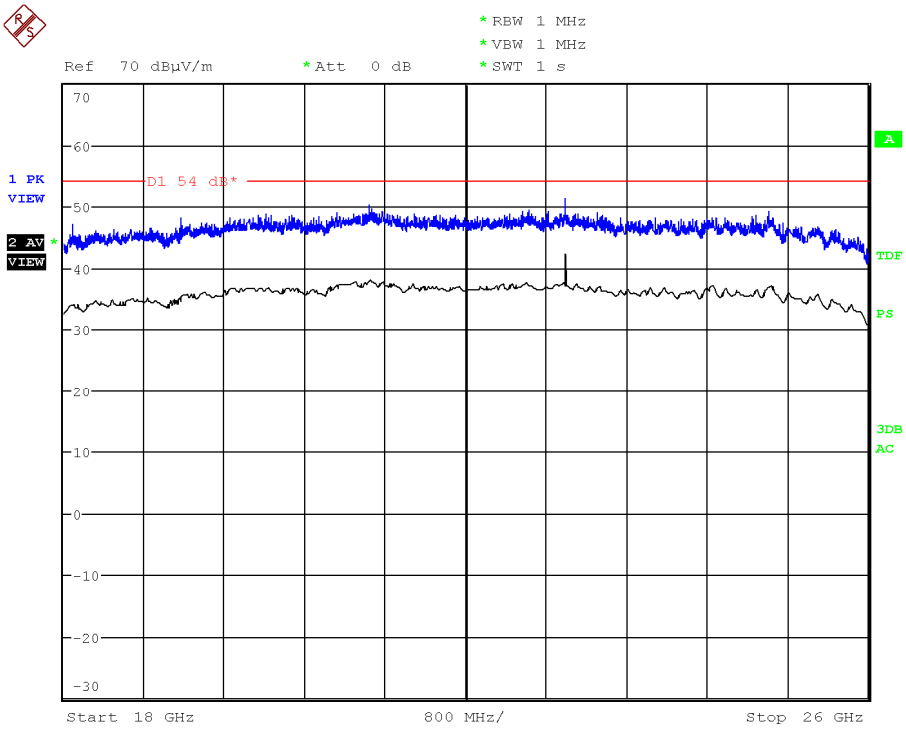
Middle Channel: 5775 MHz. Chain A+B.



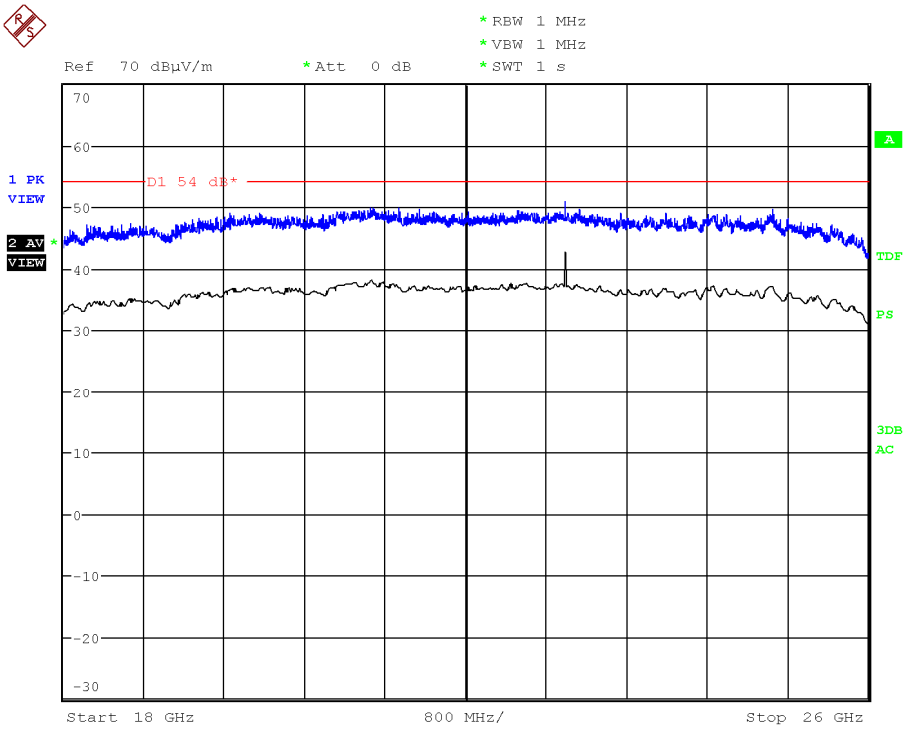
FREQUENCY RANGE 18 GHz to 26 GHz.

1. WiFi 5GHz 802.11 a mode

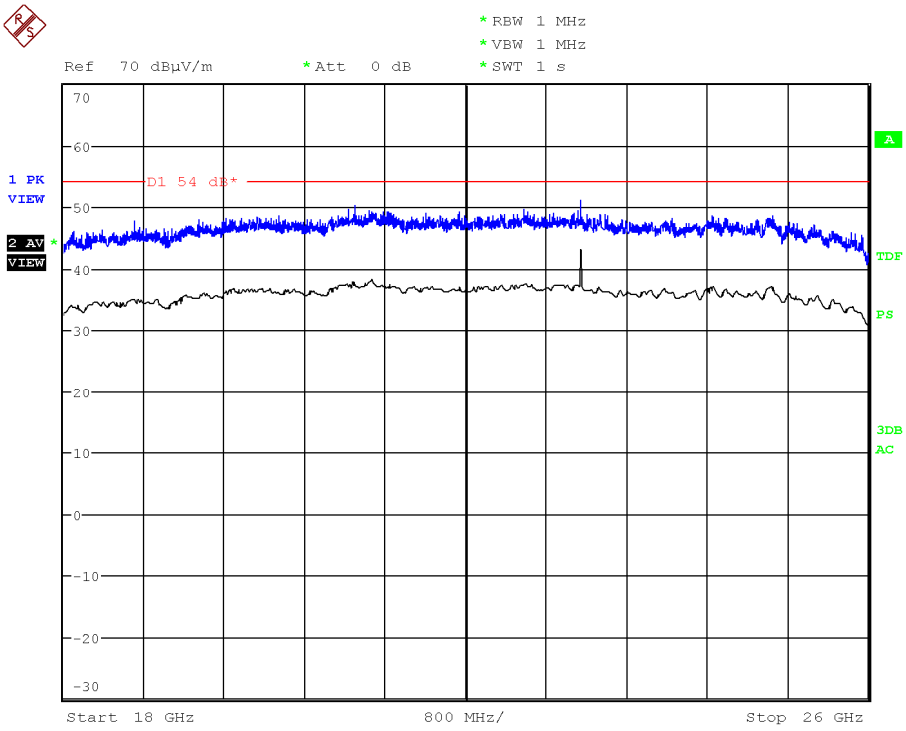
Lowest Channel: 5745 MHz. Chain A



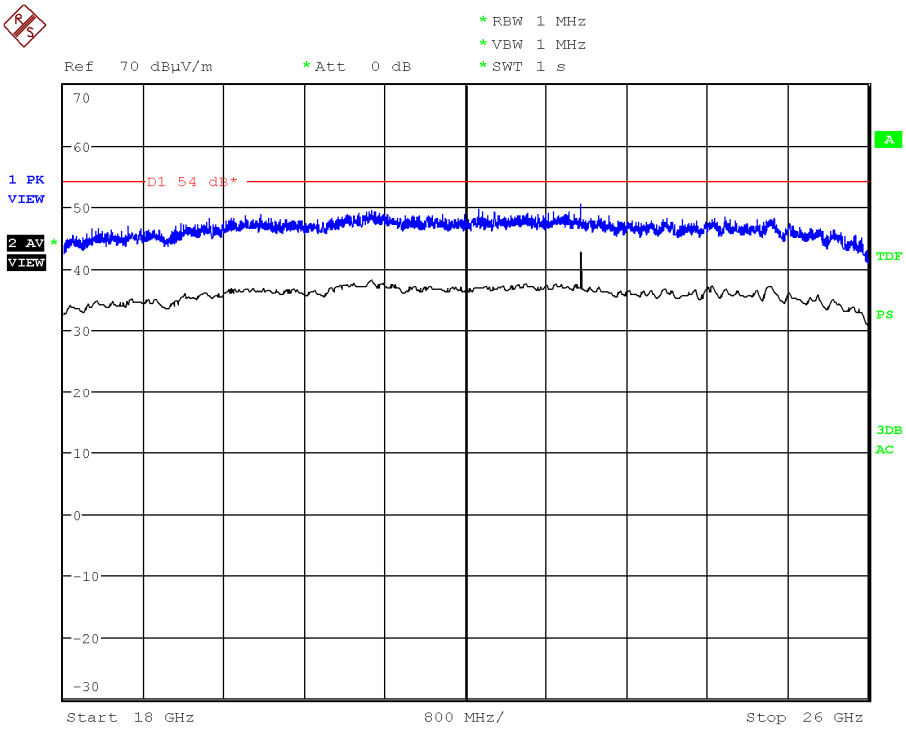
Lowest Channel: 5745 MHz. Chain B



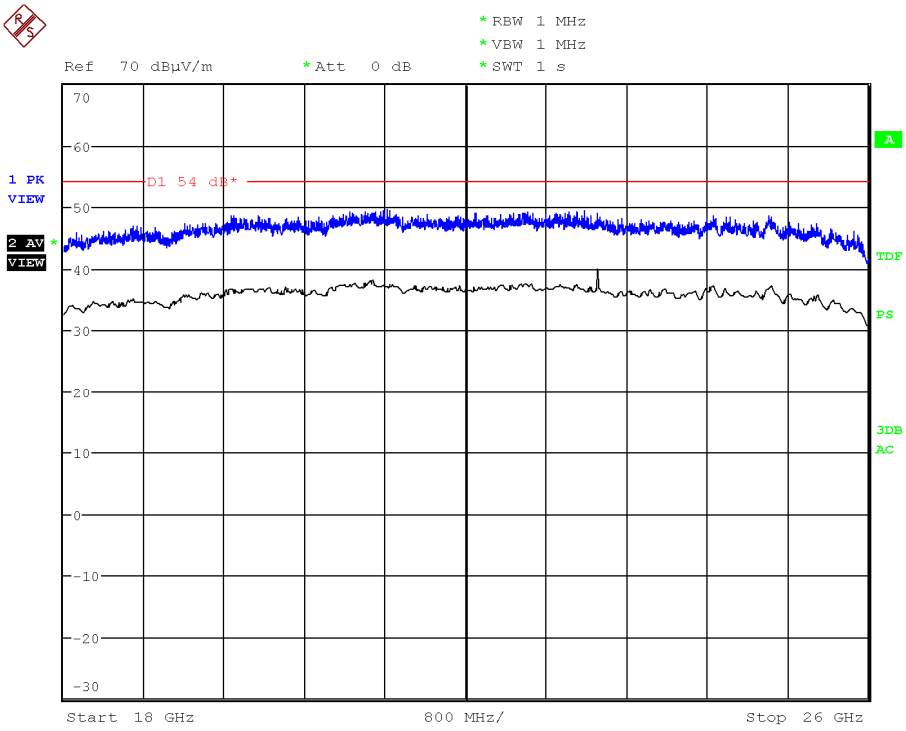
Middle Channel: 5785 MHz. Chain A



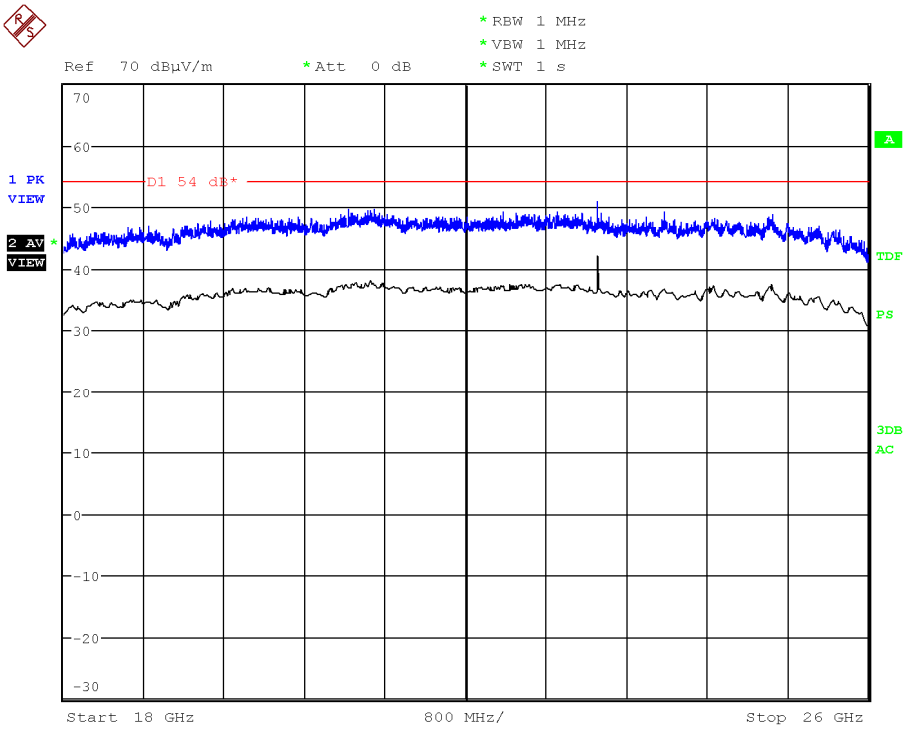
Middle Channel: 5785 MHz. Chain B



Highest Channel: 5825 MHz. Chain A

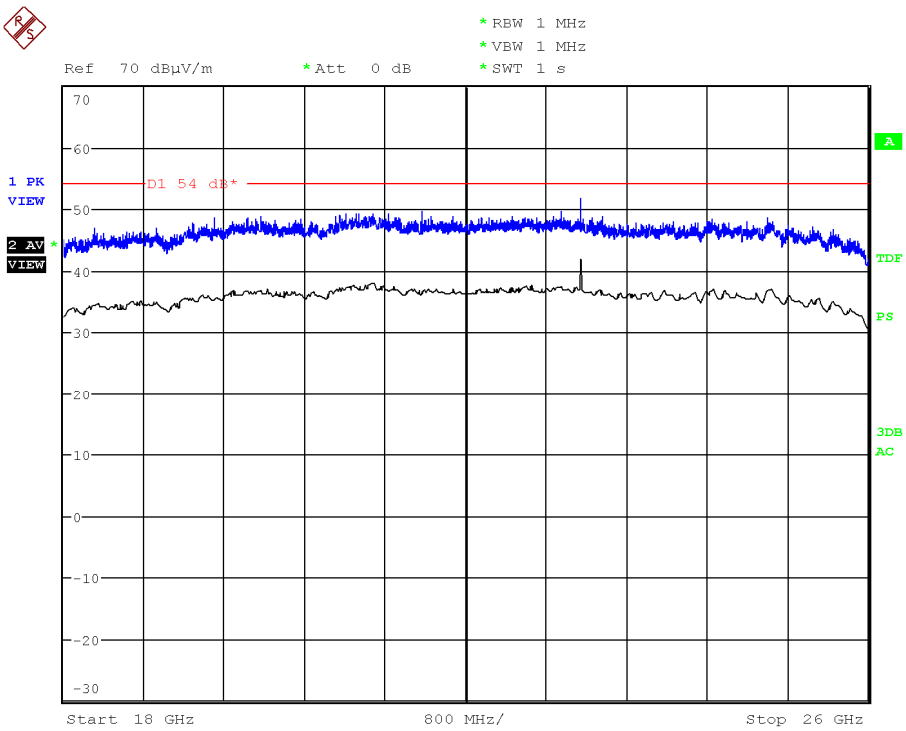


Highest Channel: 5825 MHz. Chain B

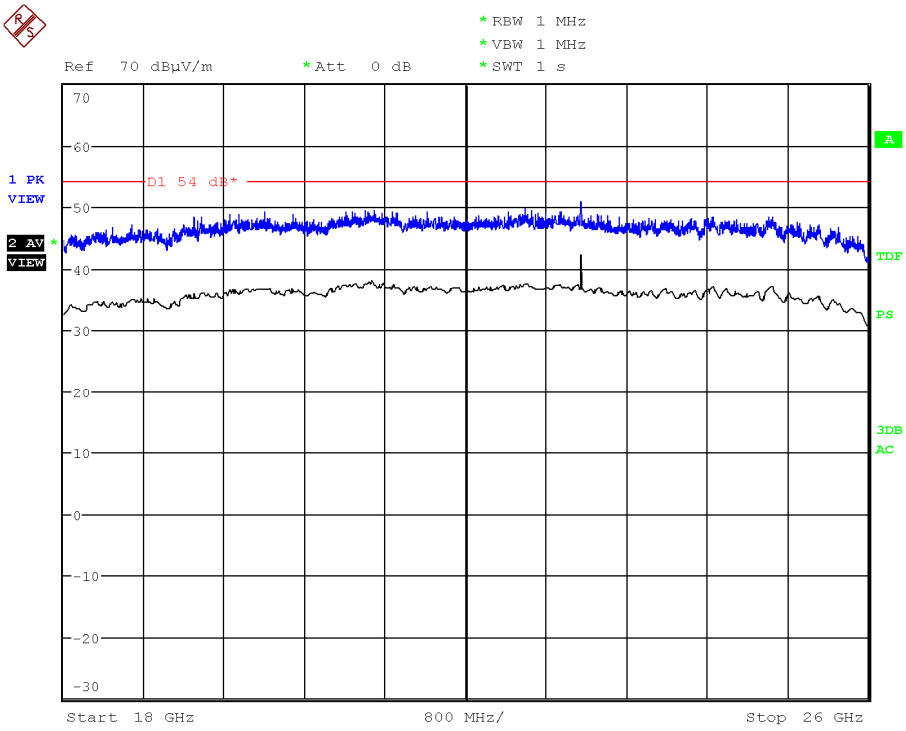


2. WiFi 5GHz 802.11 n20 mode

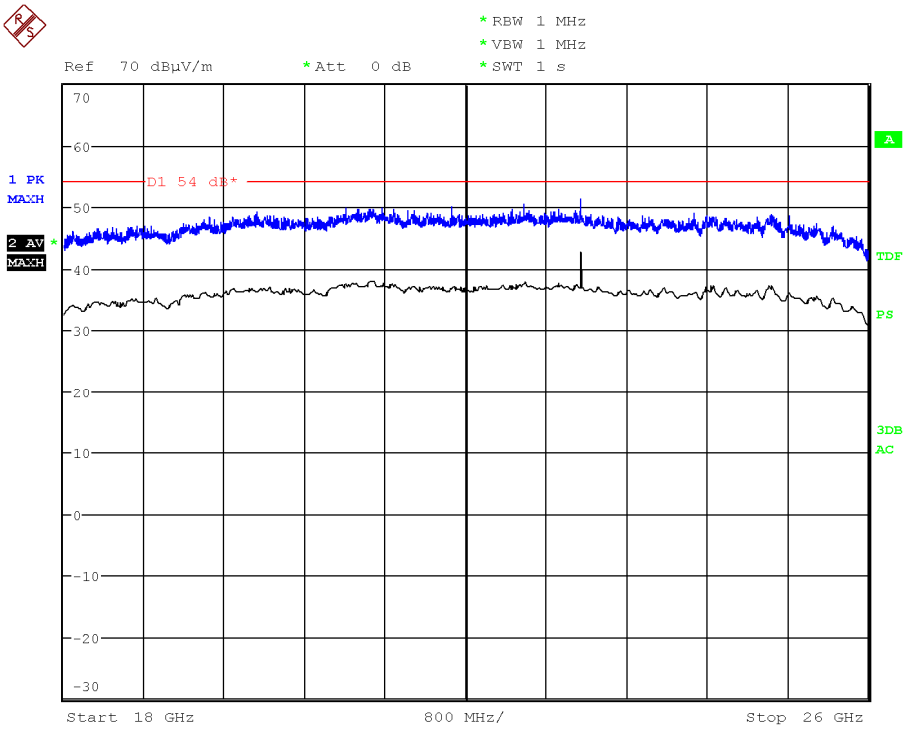
Middle Channel: 5785 MHz. Chain A



Middle Channel: 5785 MHz. Chain B

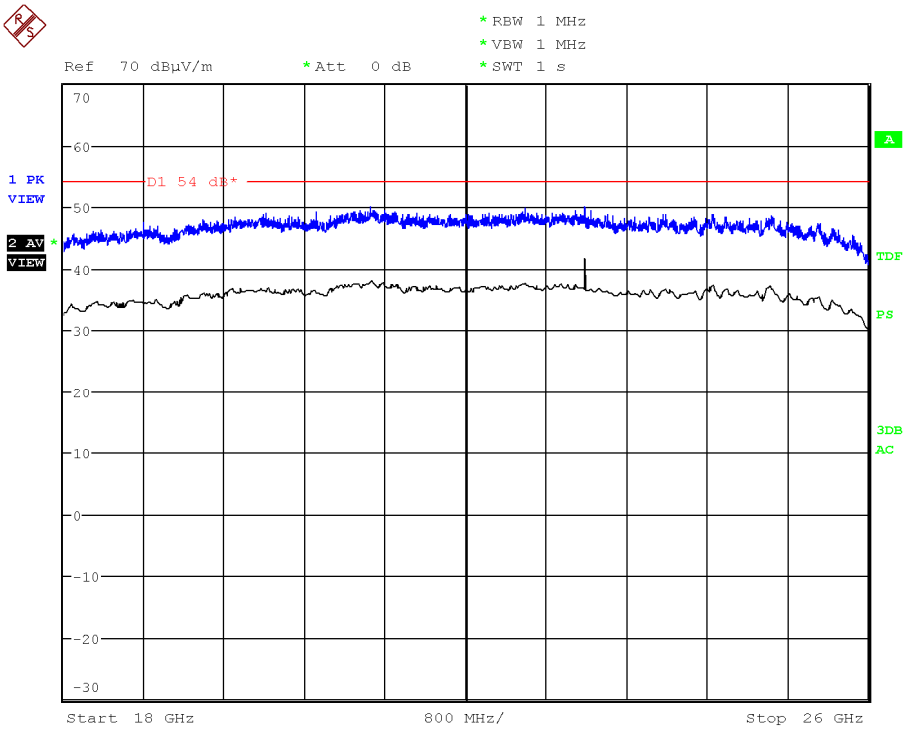


Middle Channel: 5785 MHz. Chain A+B

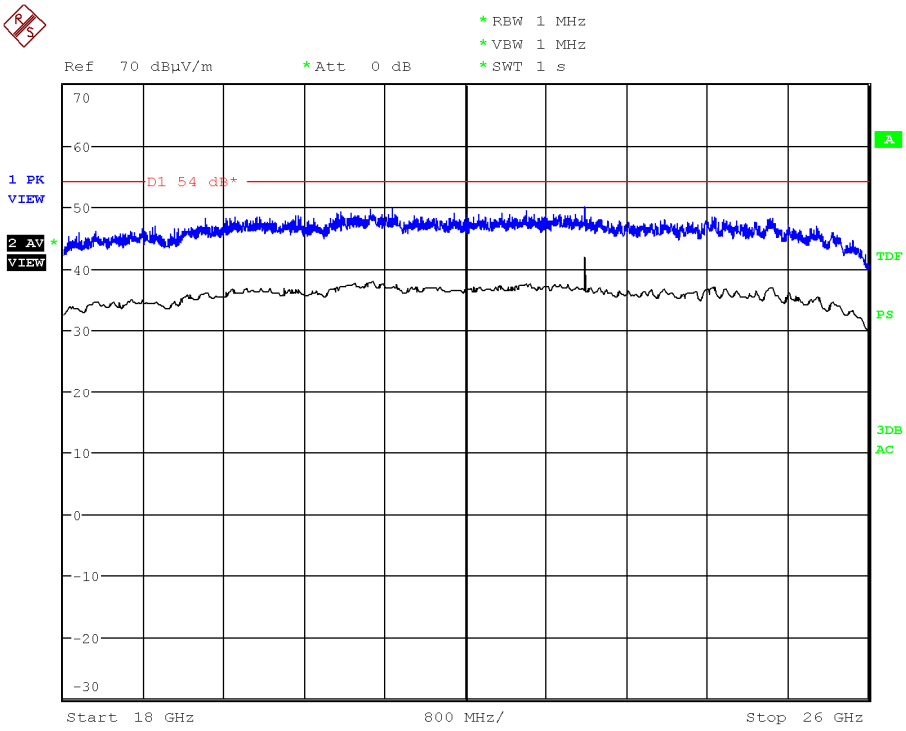


3. WiFi 5GHz 802.11 n40 mode

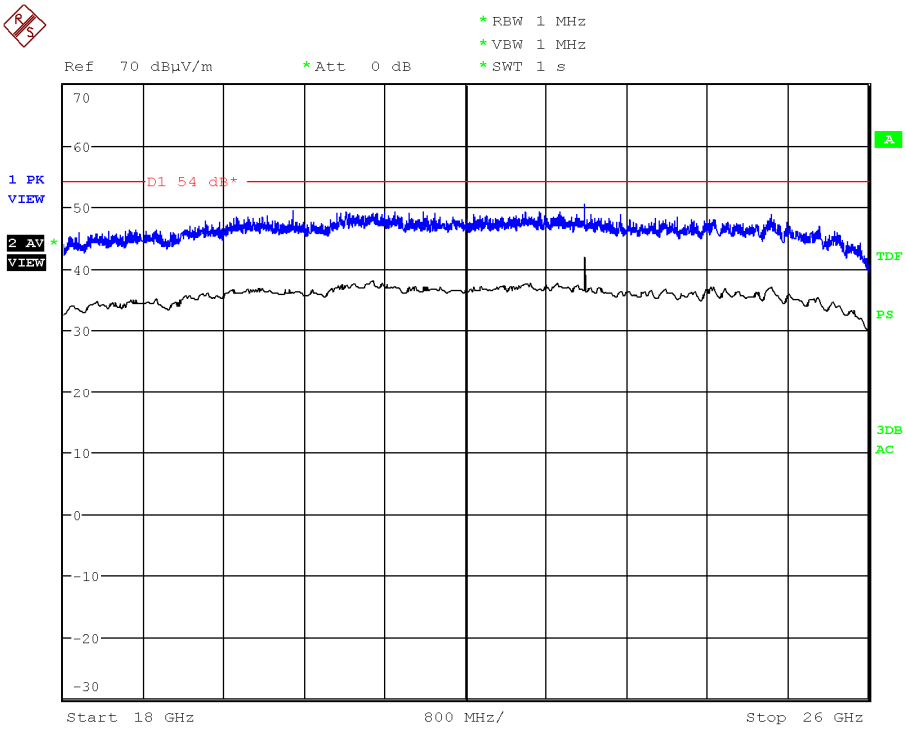
Highest Channel: 5795 MHz. Chain A



Highest Channel: 5795 MHz. Chain B

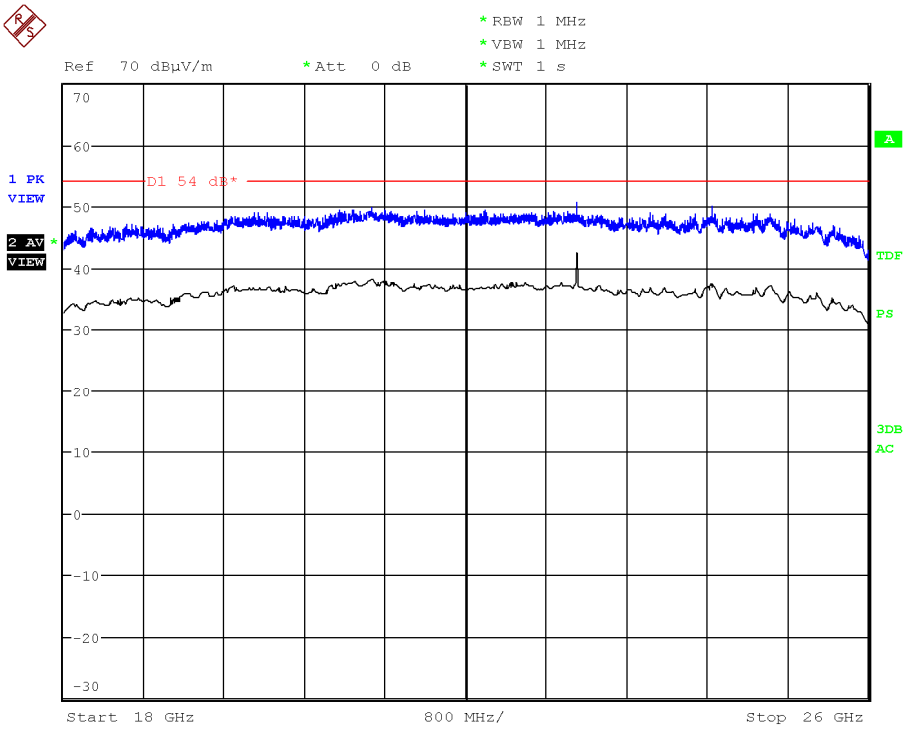


Highest Channel: 5795 MHz. Chain A+B

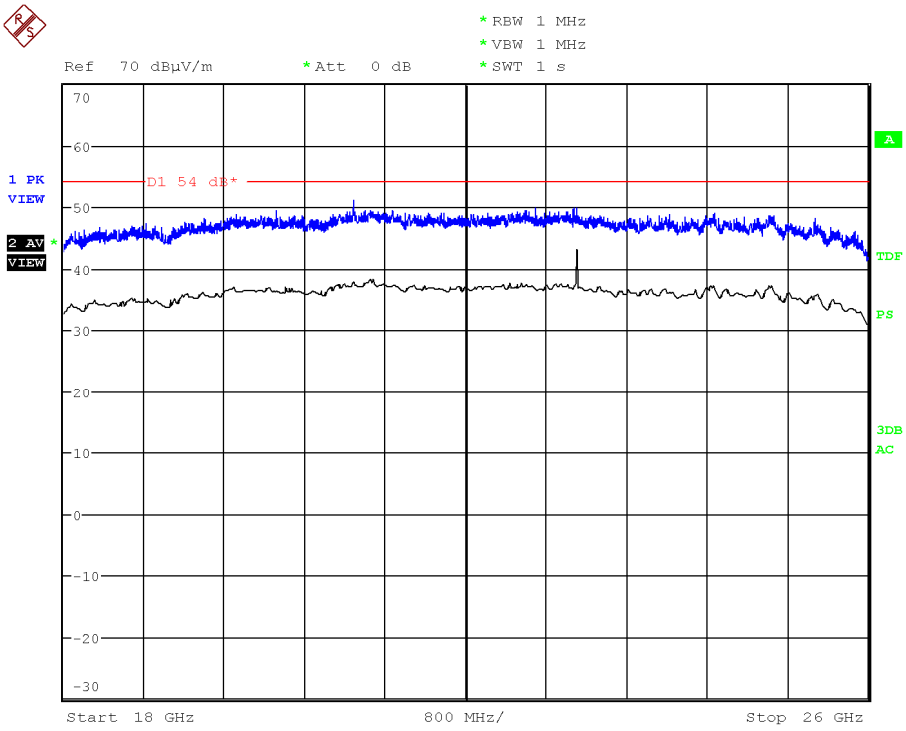


4. WiFi 5GHz 802.11 ac80 mode

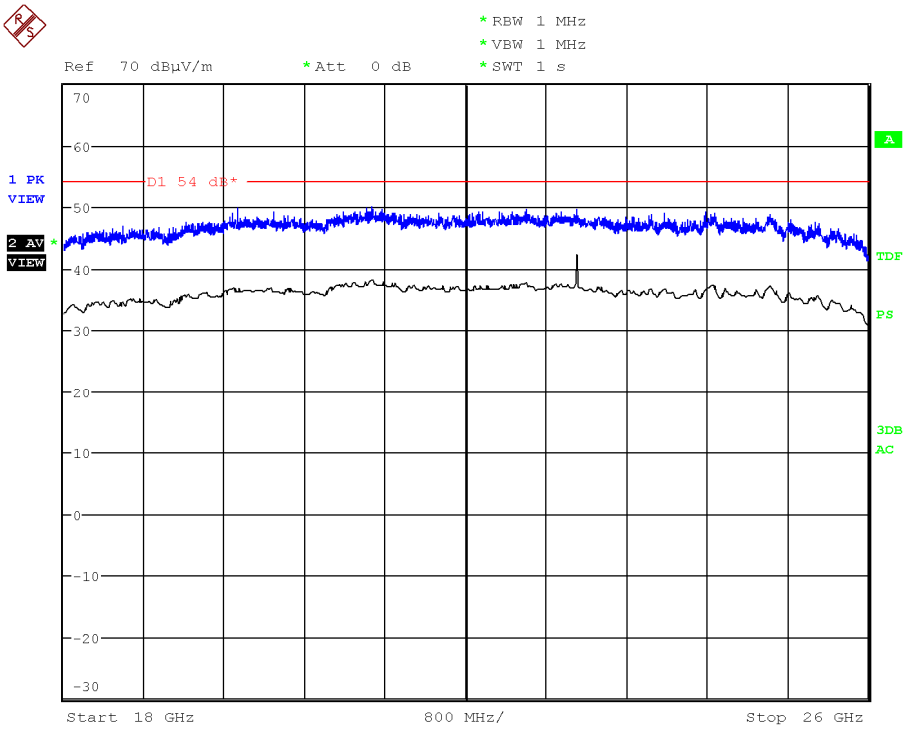
Middle Channel: 5775 MHz. Chain A.



Middle Channel: 5775 MHz. Chain B.

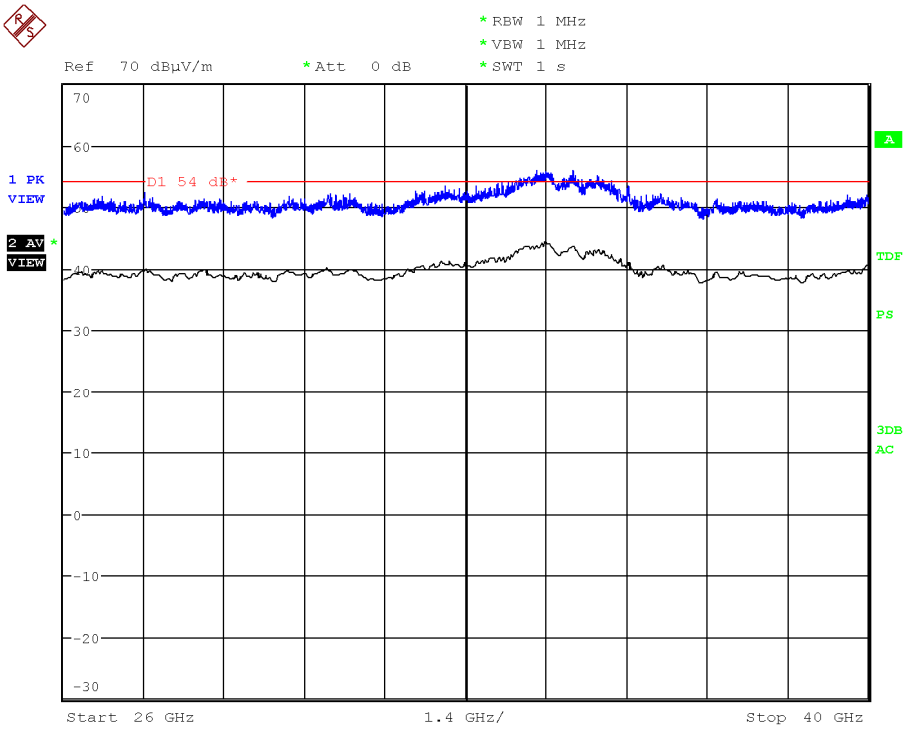


Middle Channel: 5775 MHz. Chain A+B.



FREQUENCY RANGE 26 GHz to 40 GHz.

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



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

APPENDIX C: Test results
“Bluetooth Low Energy”

INDEX

TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

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

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 3.24 dBi

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2440 MHz

Highest channel: 2480 MHz

For Bluetooth LE operation mode the transmission is at CHAIN B RF output.

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.

The PC was using the Intel test utility DRTU Version "OEDRTU 558x86" DRTU 1.7.1-775".

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and connected to the spectrum analyzer using a low loss calibrated RF cable. The measurement readings are corrected with the cable loss (dB).

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

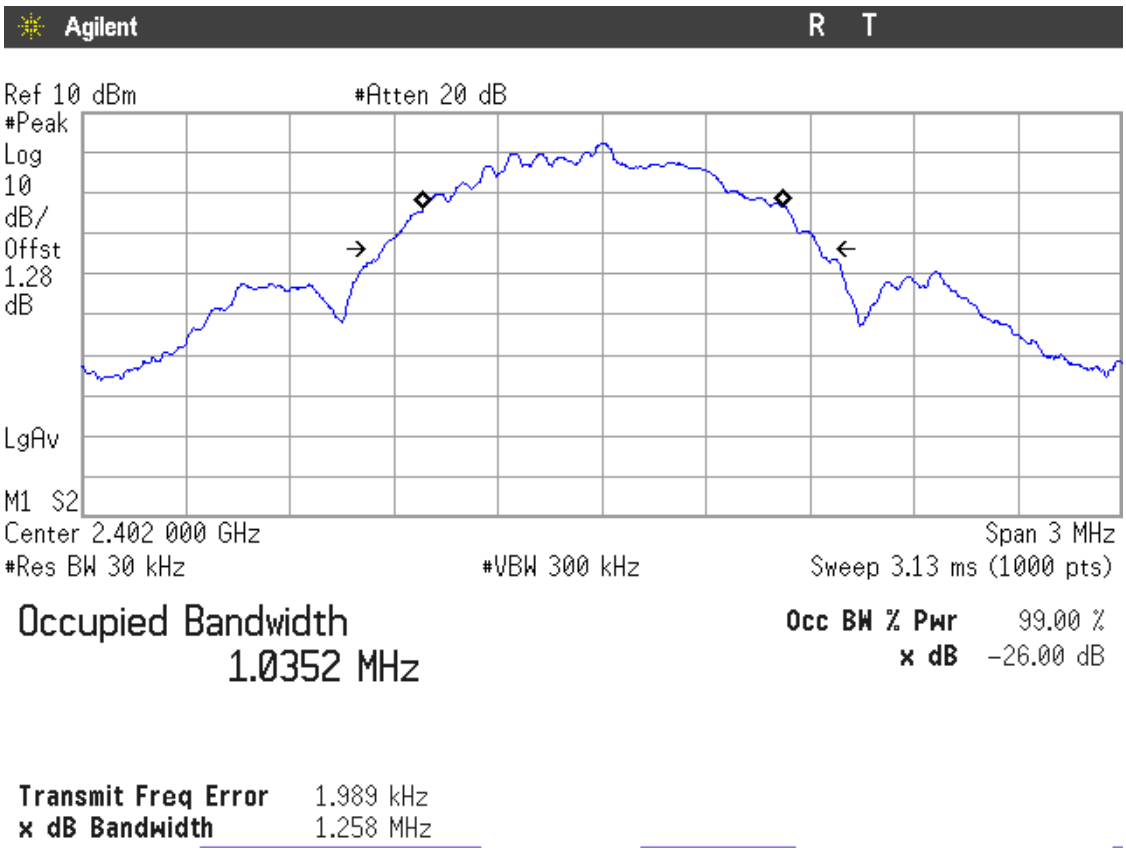
Occupied bandwidth

RESULTS

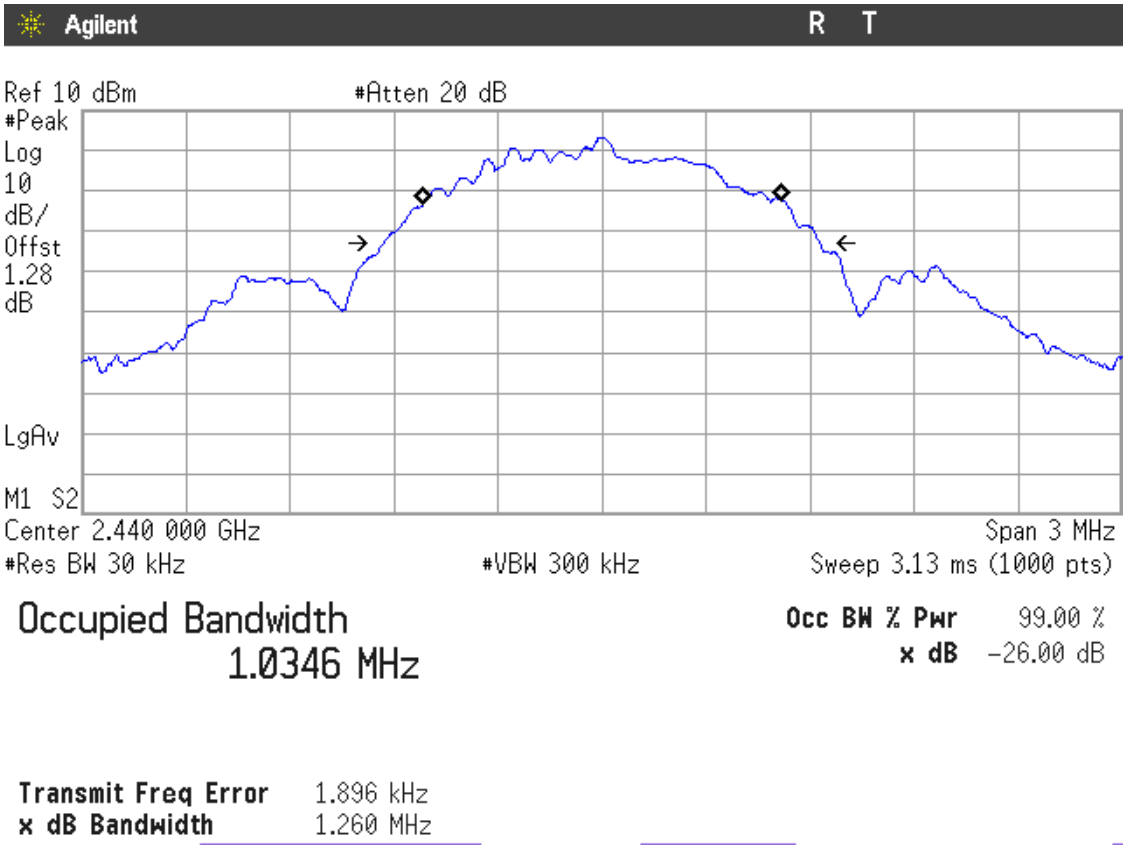
(see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.0352	1.0346	1.0339
-26 dBc bandwidth (MHz)	1.258	1.260	1.259
Measurement uncertainty (kHz)	±21.7		

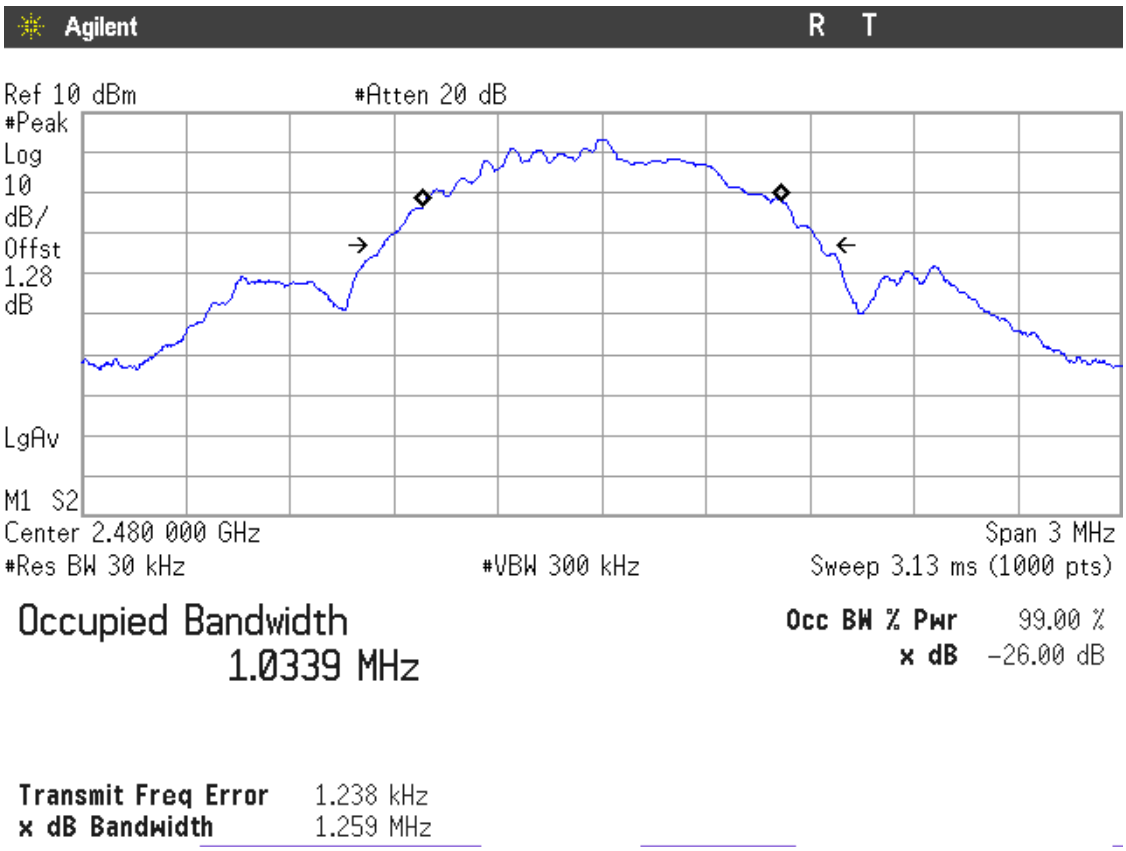
Lowest Channel



Middle Channel



Highest channel



SPECIFICATION

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

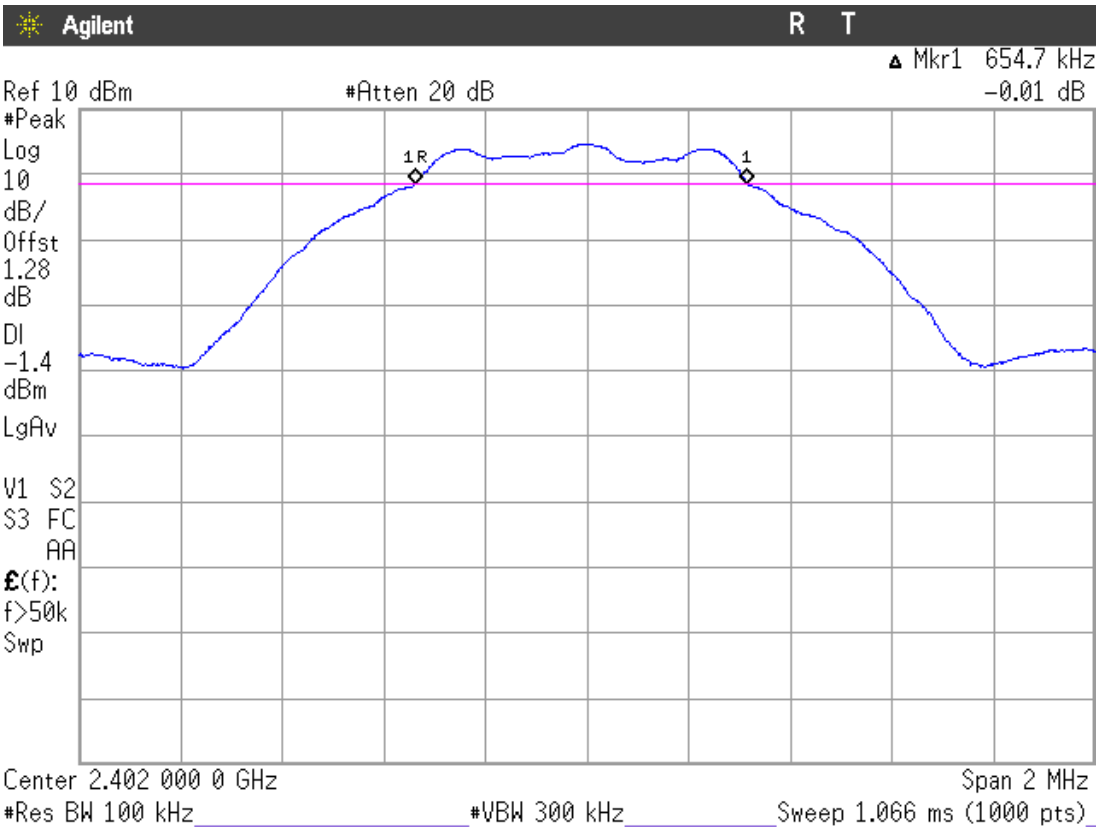
6 dB Bandwidth (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (kHz)	654.7	664.7	670.7
Measurement uncertainty (kHz)	±21.7		

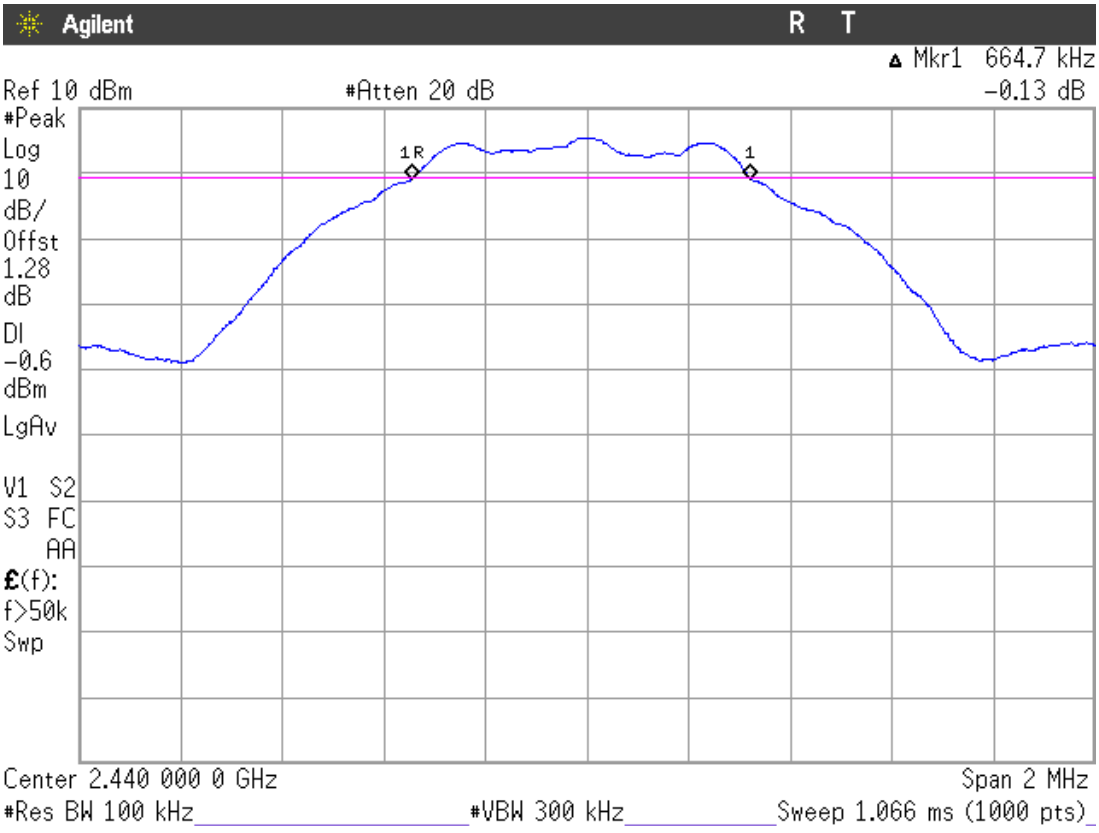
Verdict: PASS

6 dB BANDWIDTH.

Lowest Channel

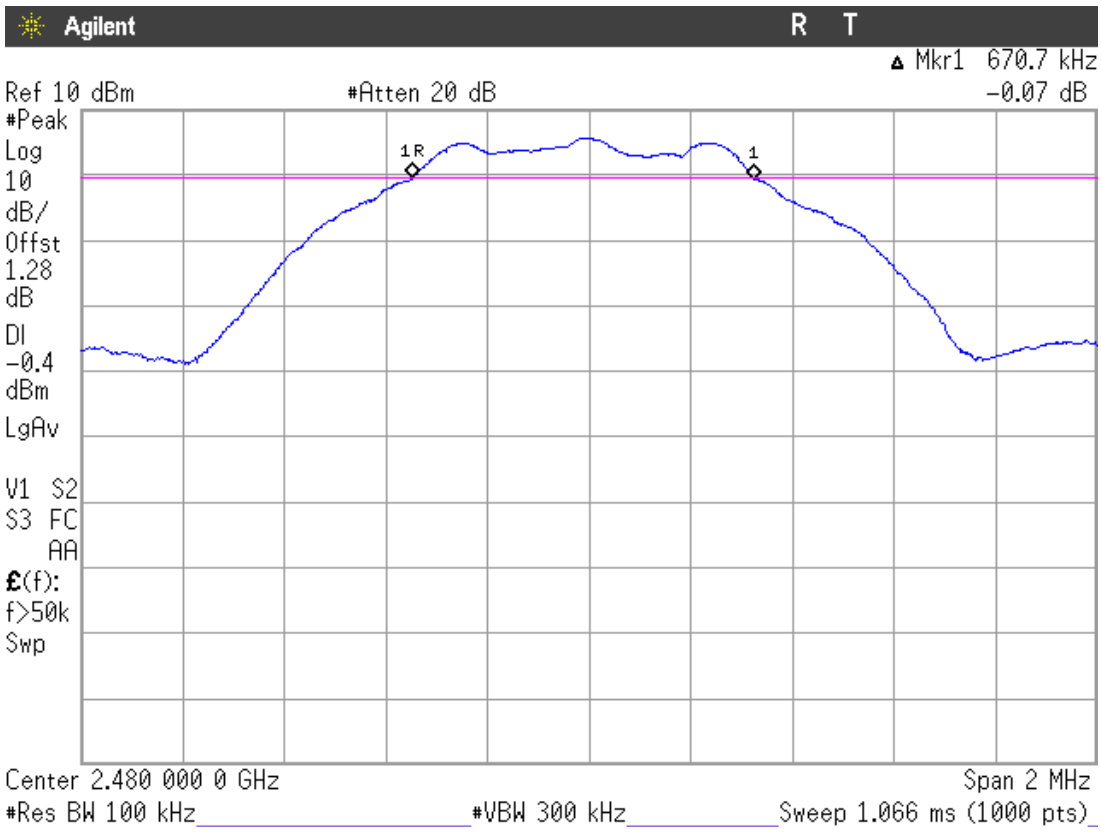


Middle Channel



6 dB BANDWIDTH.

Highest Channel



Section 15.247 Subclause (b) / RSS-210 A8.4. (4). Maximum output power and antenna gain

SPECIFICATION

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS

The maximum conducted (average) output power was measured using the method according to point 9.2.1.1. Option a) of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013.

MAXIMUM OUTPUT POWER. See next plots.

Maximum declared antenna gain: 3.24 dBi.

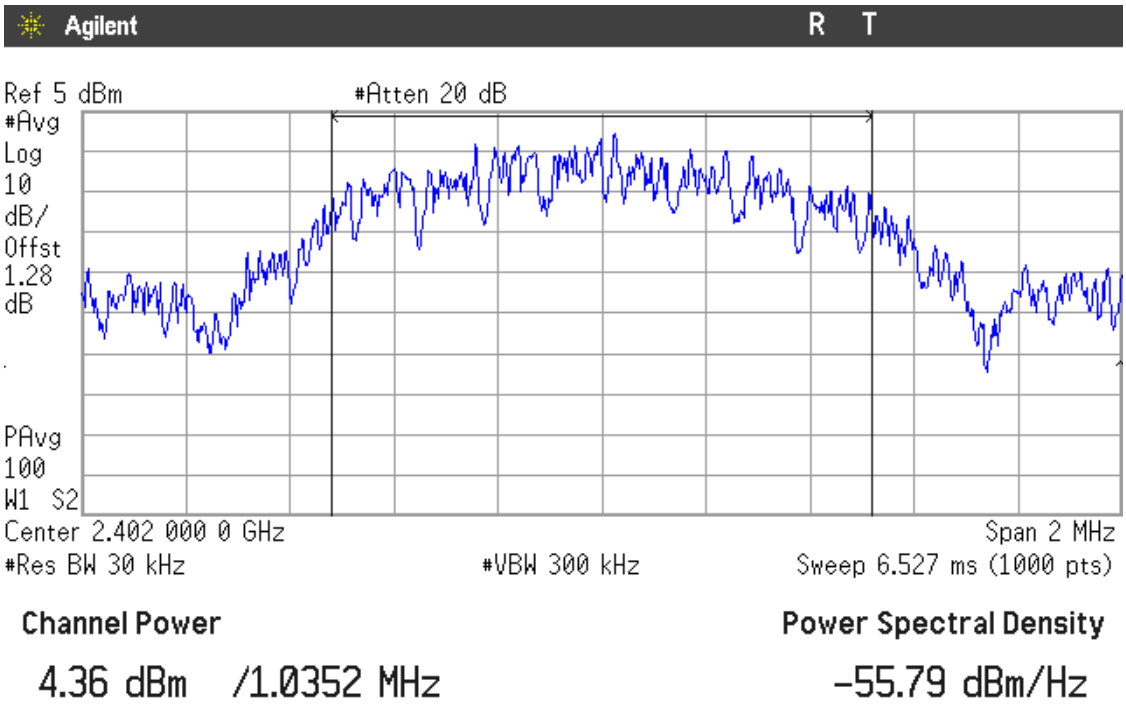
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	4.36	4.61	4.83
Maximum EIRP power (dBm)	7.60	7.85	8.07
Measurement uncertainty (dB)	±1.5		

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

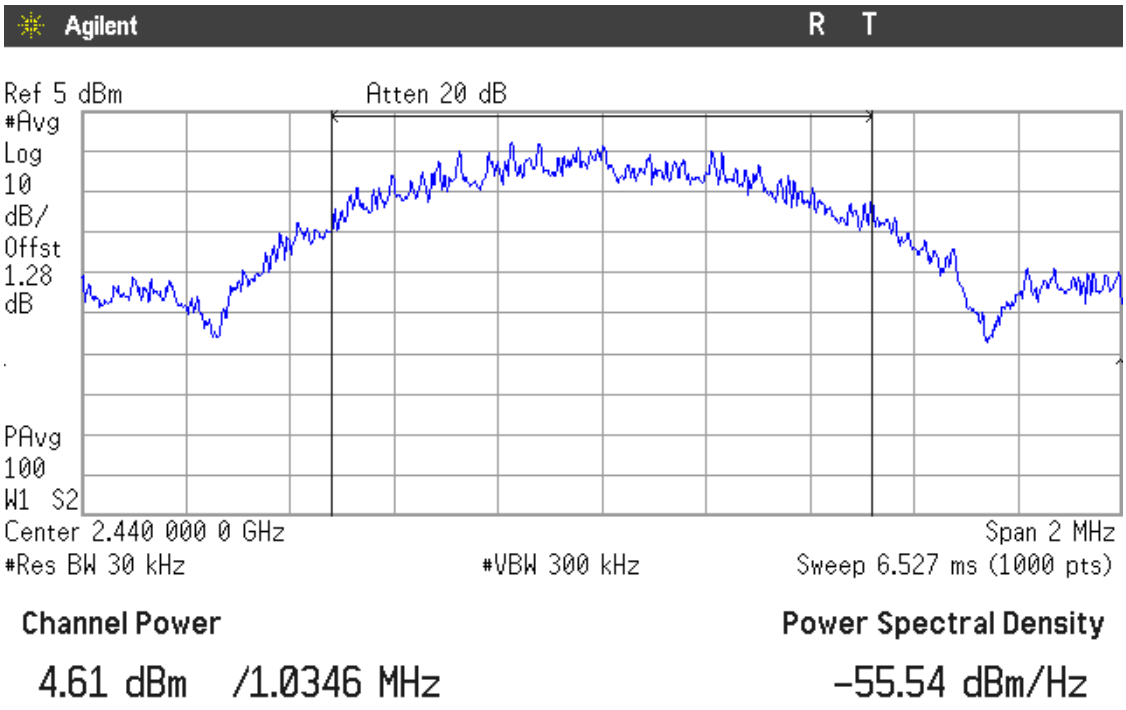
Verdict: PASS

1. CONDUCTED PEAK POWER.

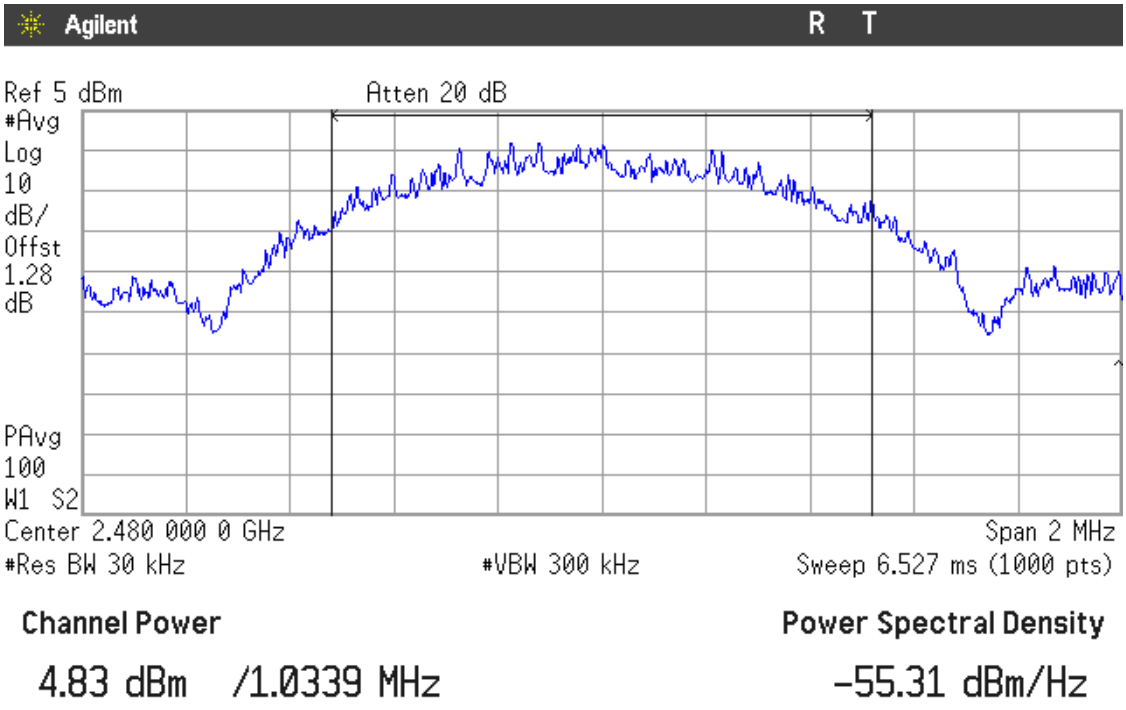
Lowest frequency



Middle frequency



Highest frequency



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

Reference Level Measurement

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Reference Level Measurement (dBm)	3.84	4.83	5.56
Measurement uncertainty (dB)	±1.5		

Lowest frequency 2402 MHz			
Spurious frequency (GHz)	Emission Level (dBm)	Limit (dBm)	Measurement Uncertainty (dB)
2.482223	-44.11	-26.16	± 1.50
2.541828	-45.07	-26.16	± 1.50
2.561925	-44.75	-26.16	± 1.50

Middle frequency 2440 MHz			
Spurious frequency (GHz)	Emission Level (dBm)	Limit (dBm)	Measurement Uncertainty (dB)
2.520246	-42.61	-25.17	± 1.50
2.580042	-44.01	-25.17	± 1.50
2.599743	-44.09	-25.17	± 1.50

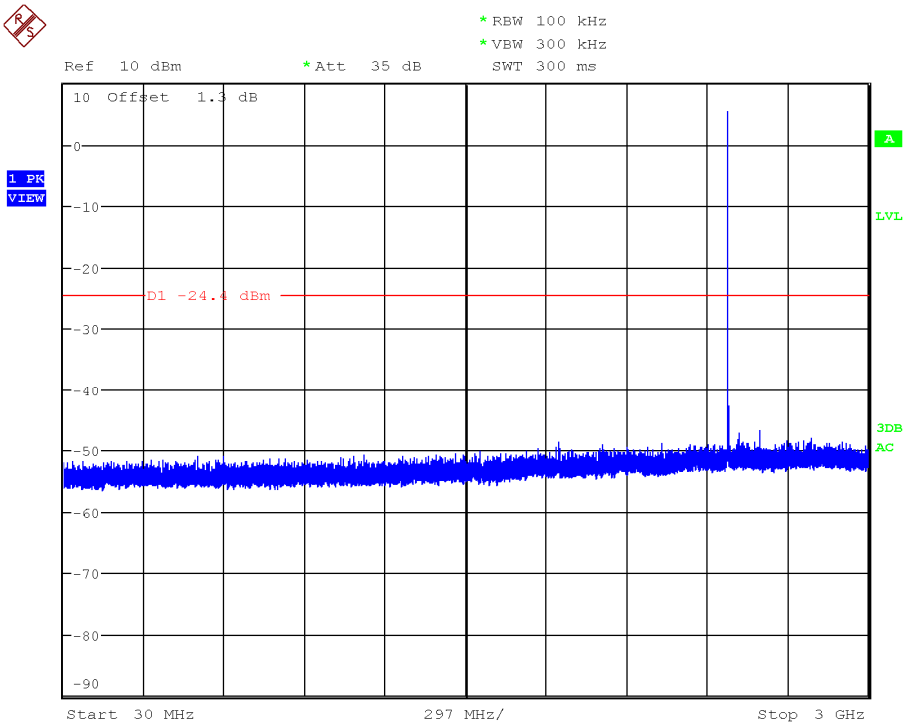
Highest frequency 2480 MHz			
Spurious frequency (GHz)	Emission Level (dBm)	Limit (dBm)	Measurement Uncertainty (dB)
2.559747	-41.39	-24.44	± 1.50
2.599941	-43.43	-24.44	± 1.50
2.620236	-43.42	-24.44	± 1.50

Verdict: PASS

See next plot of worst case: Highest frequency 2480 MHz.

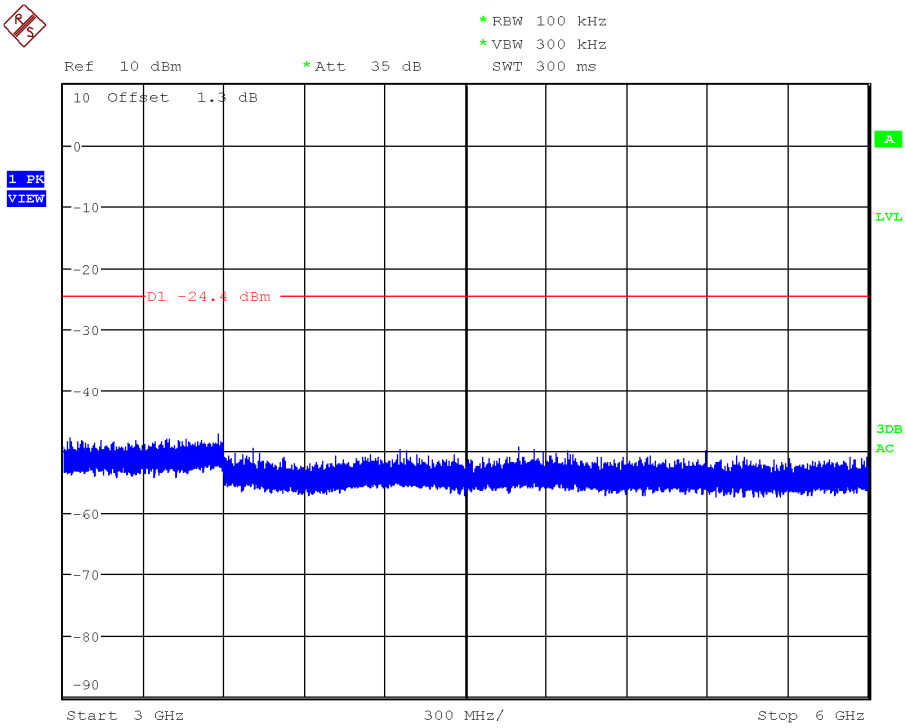
Number of sweep points: 30,001.

Plot 30 MHz to 3 GHz

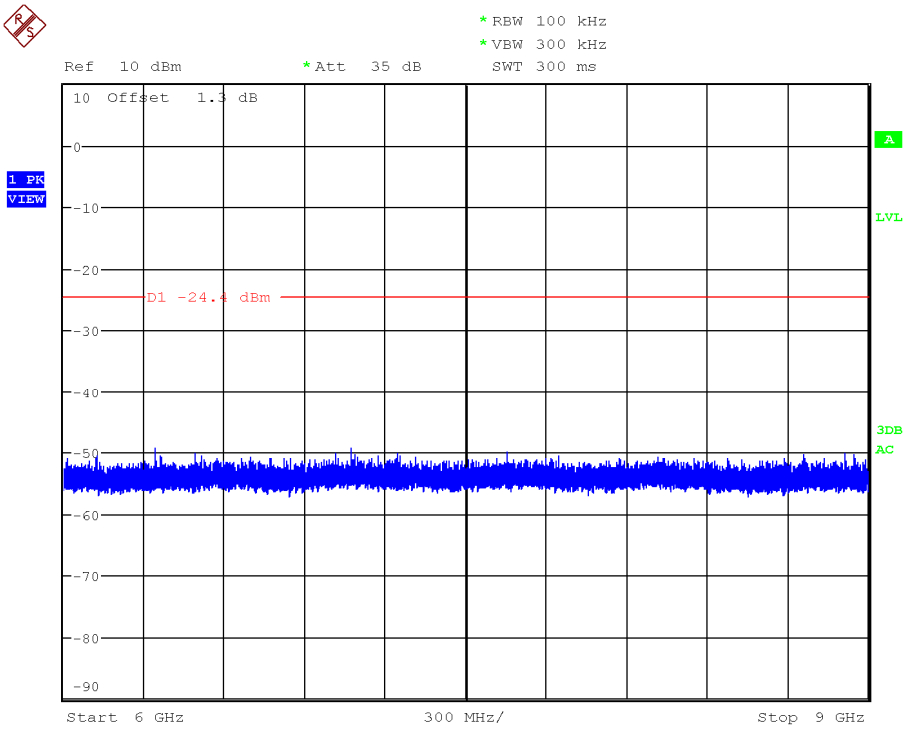


Note: The peak above the limit is the carrier frequency.

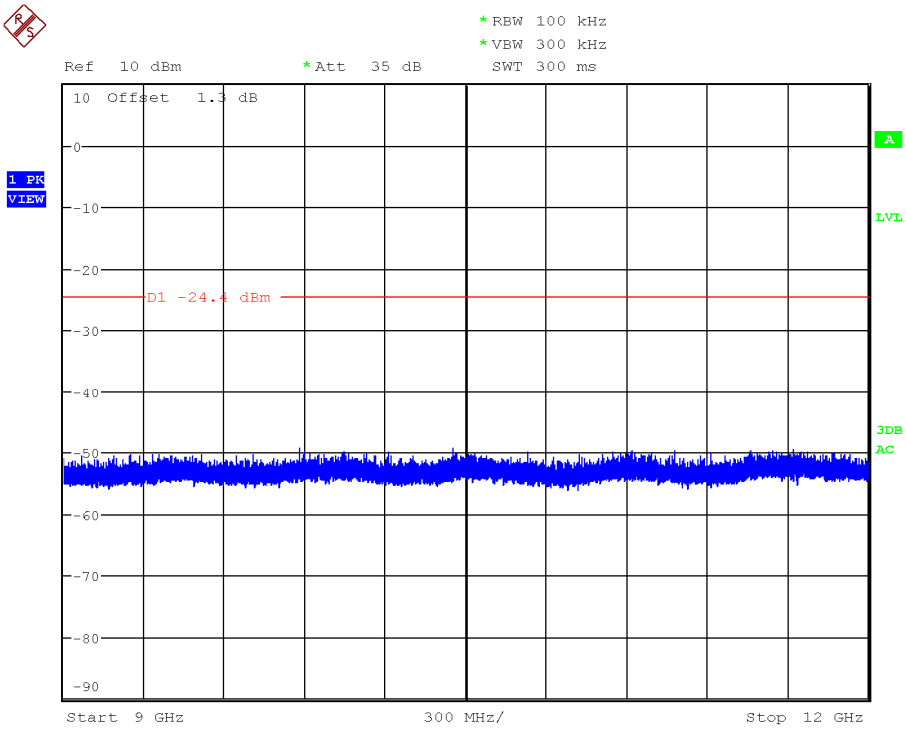
Plot 3 GHz to 6 GHz:



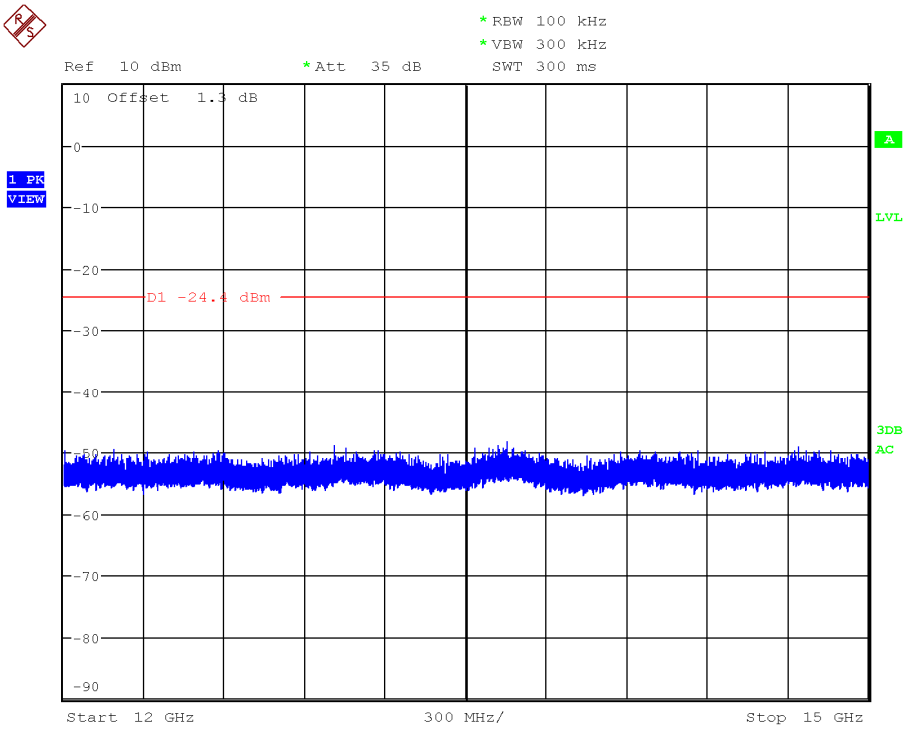
Plot 6 GHz to 9 GHz:



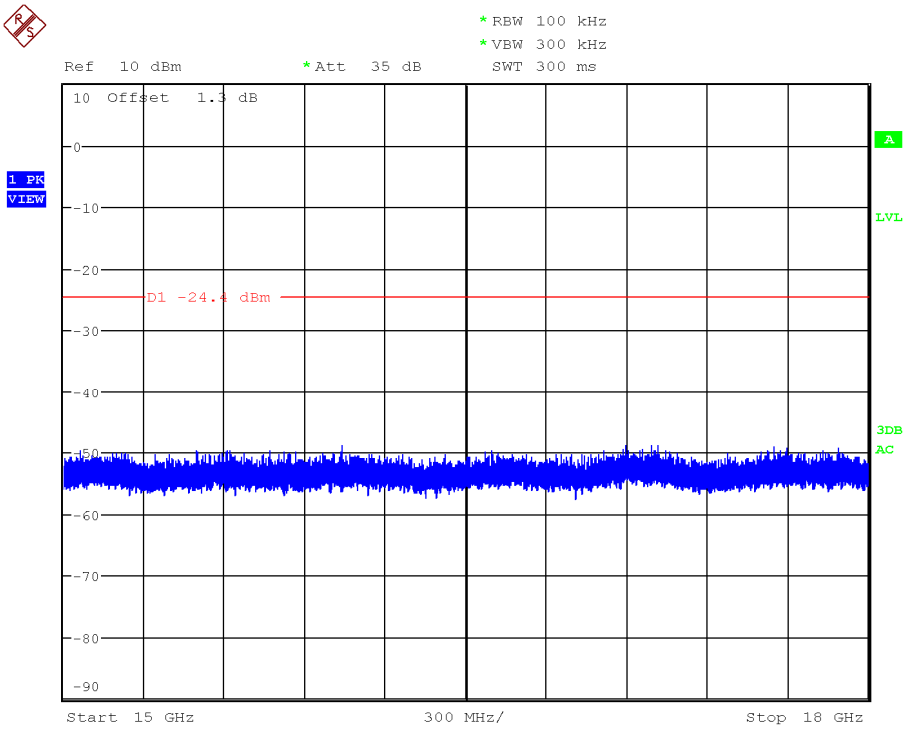
Plot 9 GHz to 12 GHz:



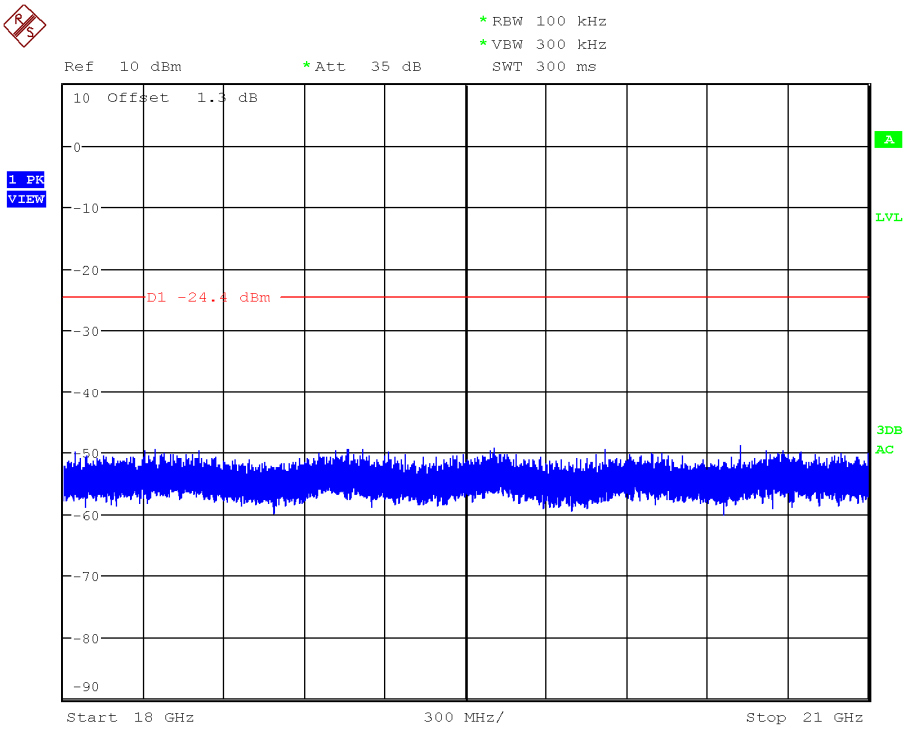
Plot 12 GHz to 15 GHz:



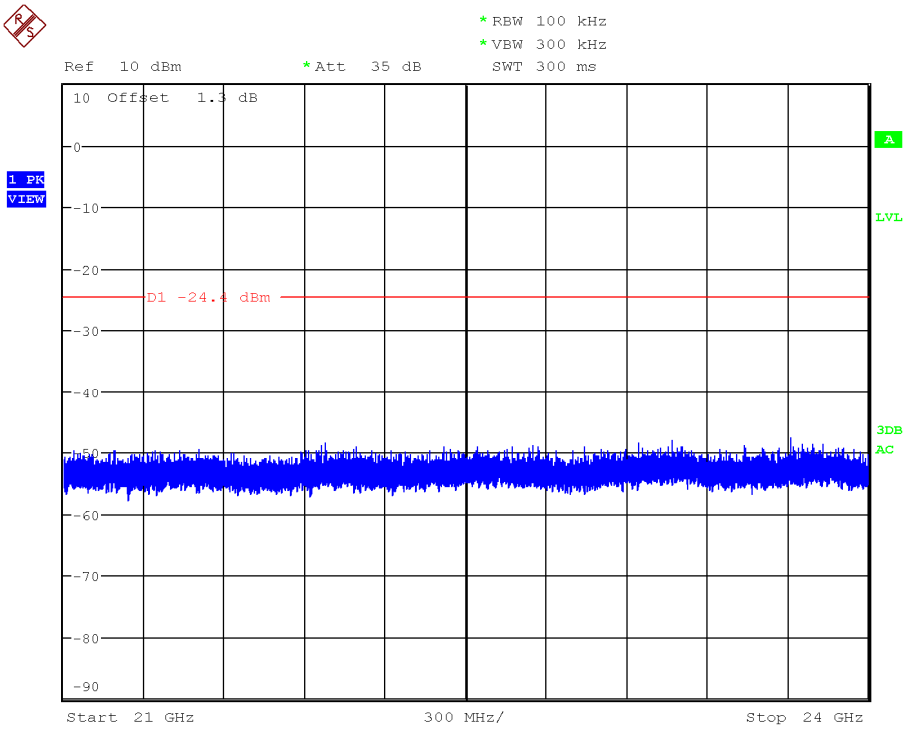
Plot 15 GHz to 18 GHz:



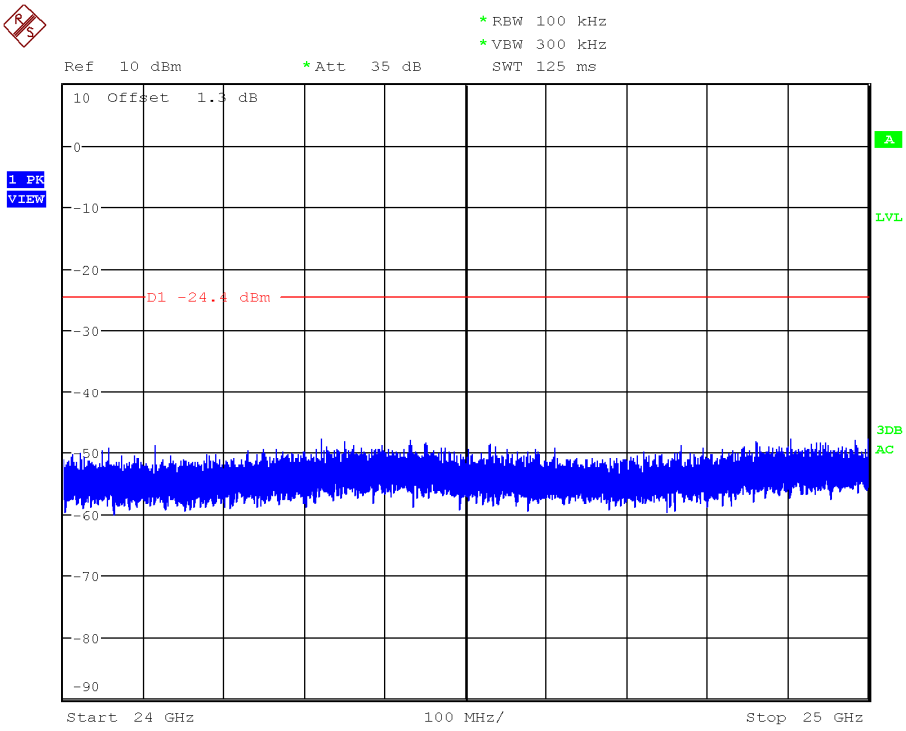
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24GHz to 25 GHz:



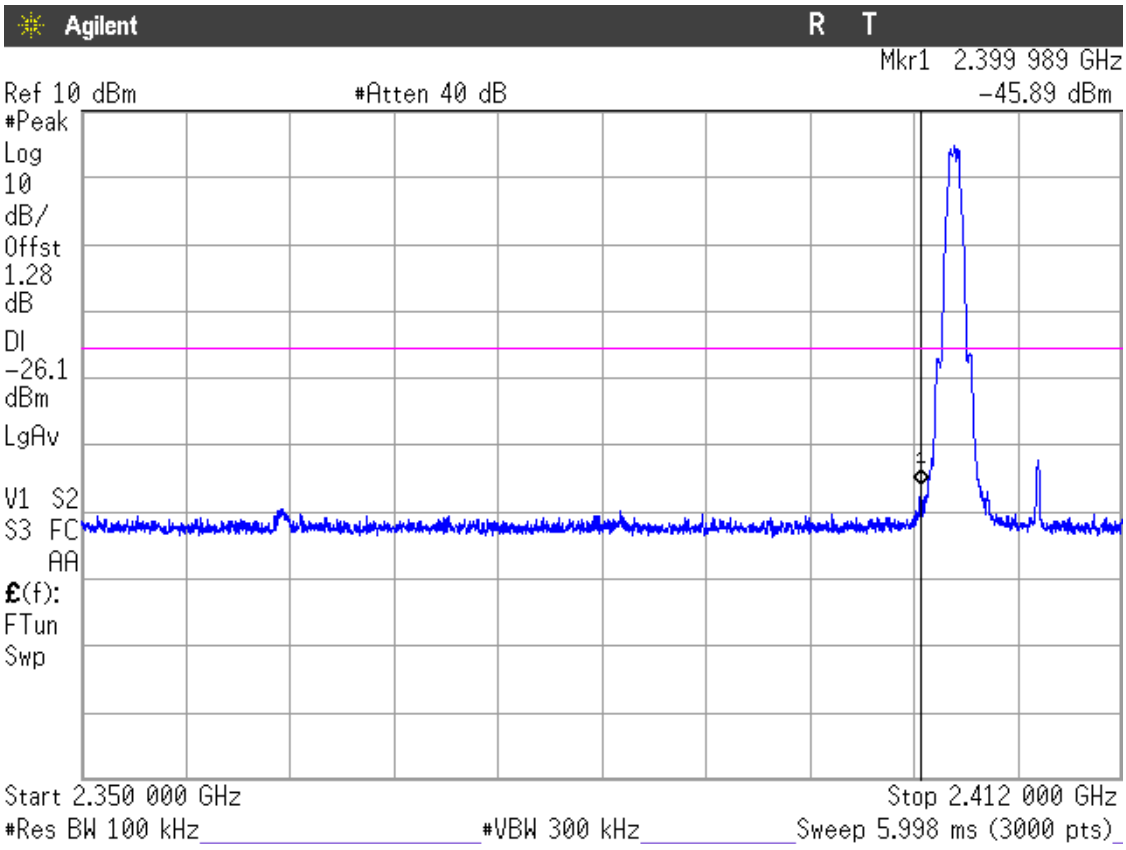
SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

RESULTS:

1. LOW FREQUENCY SECTION. CONDUCTED.

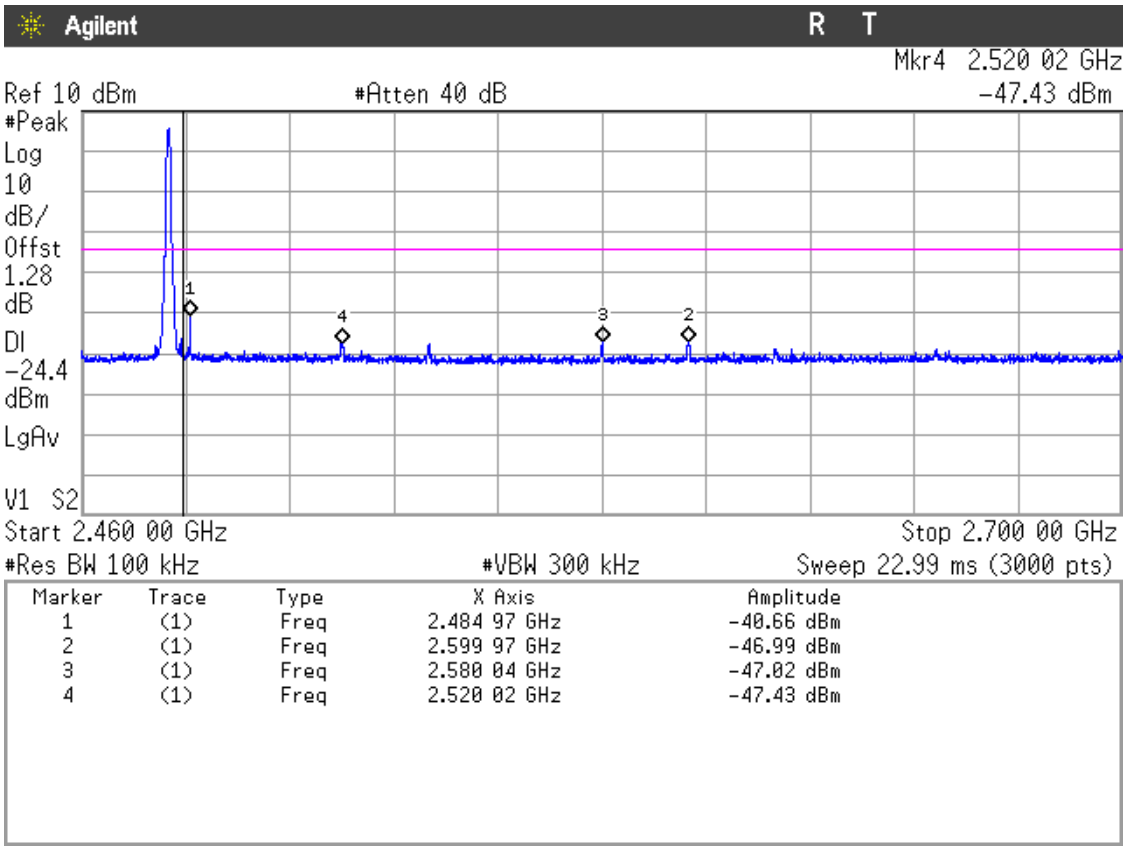
See next plot.



Verdict: PASS

2. HIGH FREQUENCY SECTION. CONDUCTED.

See next plot.



Verdict: PASS

Section 15.247 Subclause (e) / RSS-210 A8.5. Power spectral density

SPECIFICATION

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

The maximum power spectral density level in the fundamental emission was measured according to point 10.2. PKPSD (peak PSD) of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013.

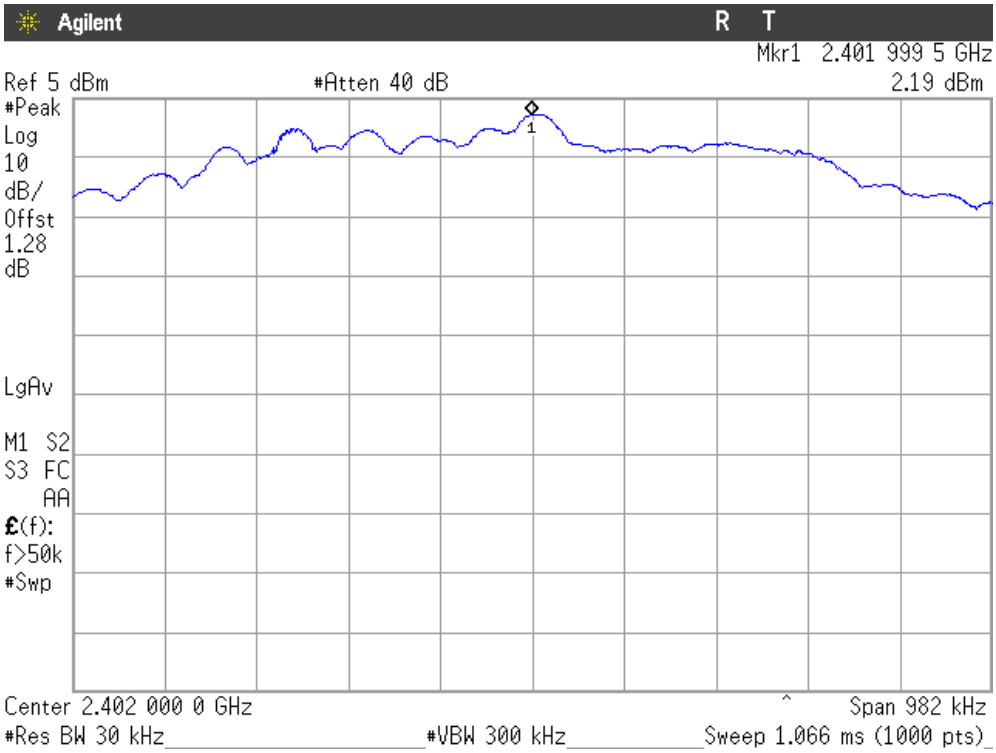
Power spectral density (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	2.19	2.98	3.24
Measurement uncertainty (dB)	±1.5		

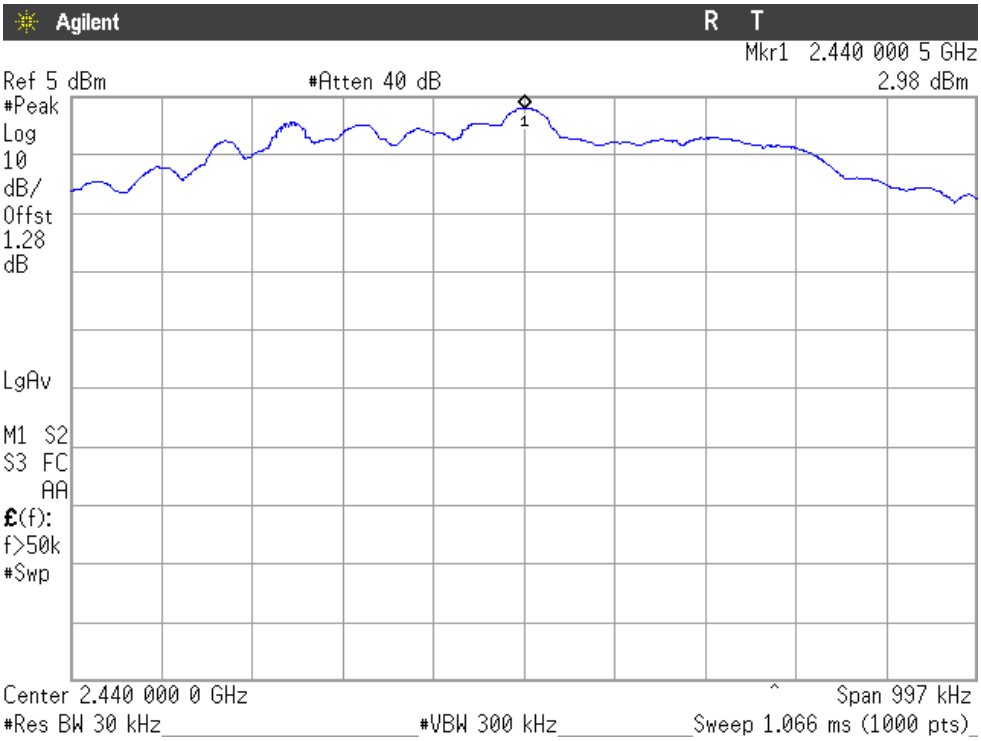
Verdict: PASS

Power spectral density.

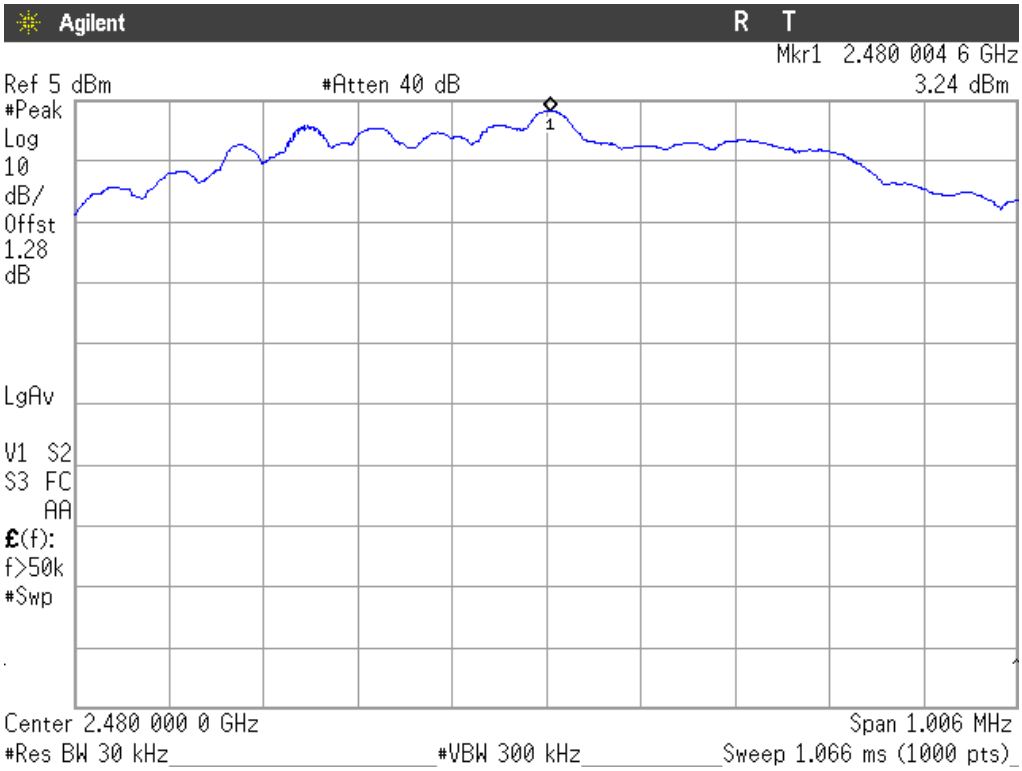
Lowest Channel



Middle Channel



Highest Channel



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations radiated (Transmitter)

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 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-1000 MHz.

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-25 GHz

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

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3620	PH	Peak	52.27	± 4.09
2.4989	PH	Peak	52.02	± 4.09
2.5220	PH	Peak	53.21	± 4.09
2.7884	PH	Peak	54.59	± 4.09
		Average	43.70	± 4.09

2. CHANNEL: MIDDLE (2440 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3800	PH	Peak	52.19	± 4.09
2.4801	PH	Peak	52.24	± 4.09
2.4999	PH	Peak	52.61	± 4.09
2.5599	PH	Peak	52.74	± 4.09
4.8799	PV	Peak	39.67	± 4.09

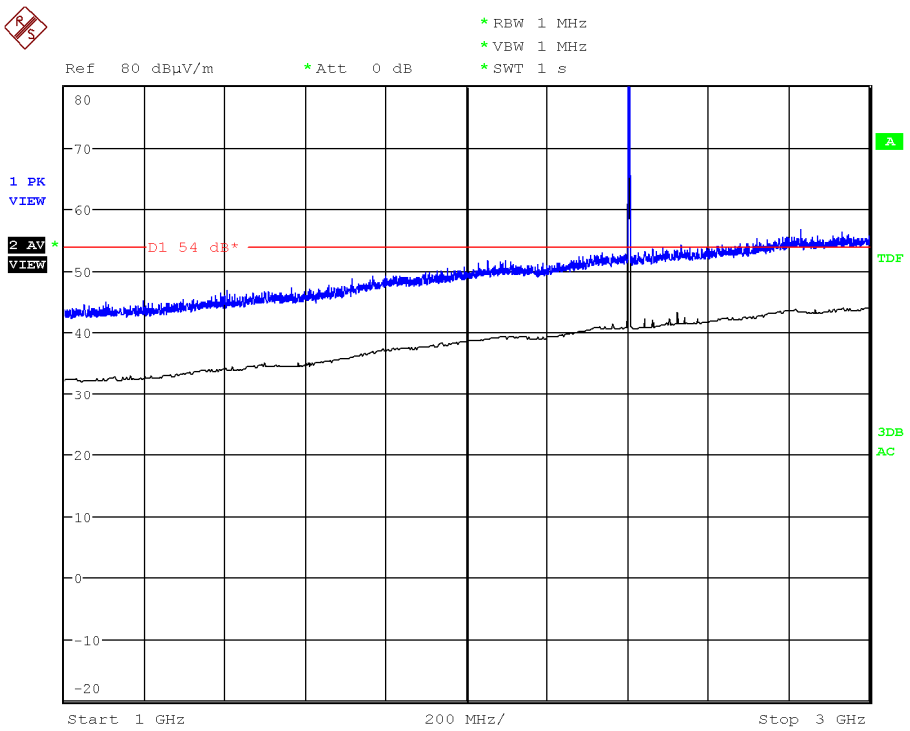
3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3743	PH	Peak	50.98	± 4.09
2.4835	PH	Peak	55.54	± 4.09
		Average	51.43	± 4.09
2.5998	PH	Peak	53.13	± 4.09

Verdict: PASS

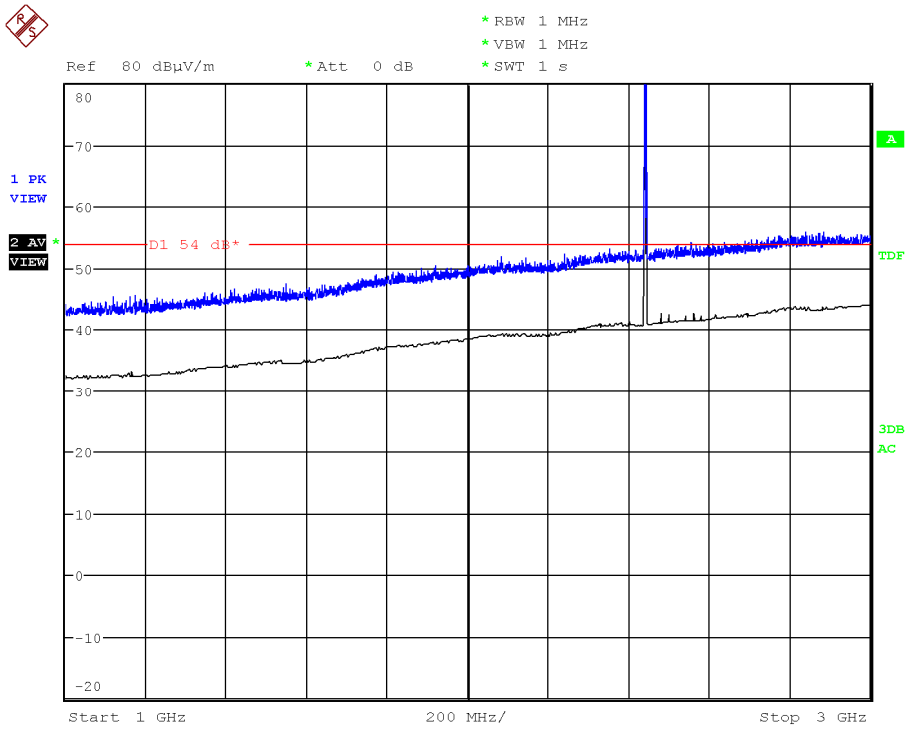
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: Lowest (2402 MHz).



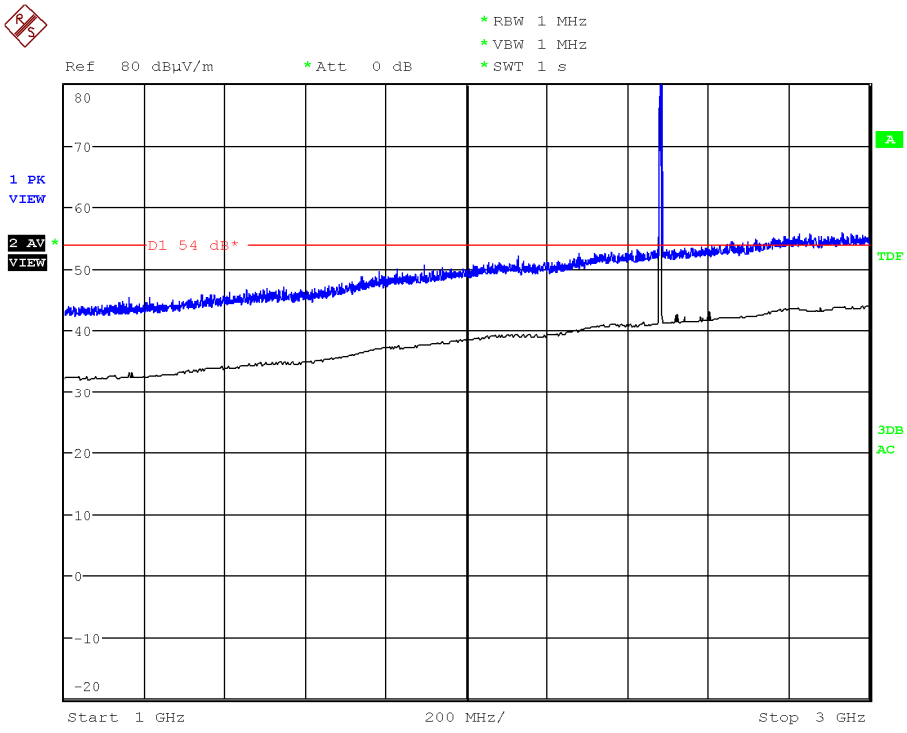
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2440 MHz).



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

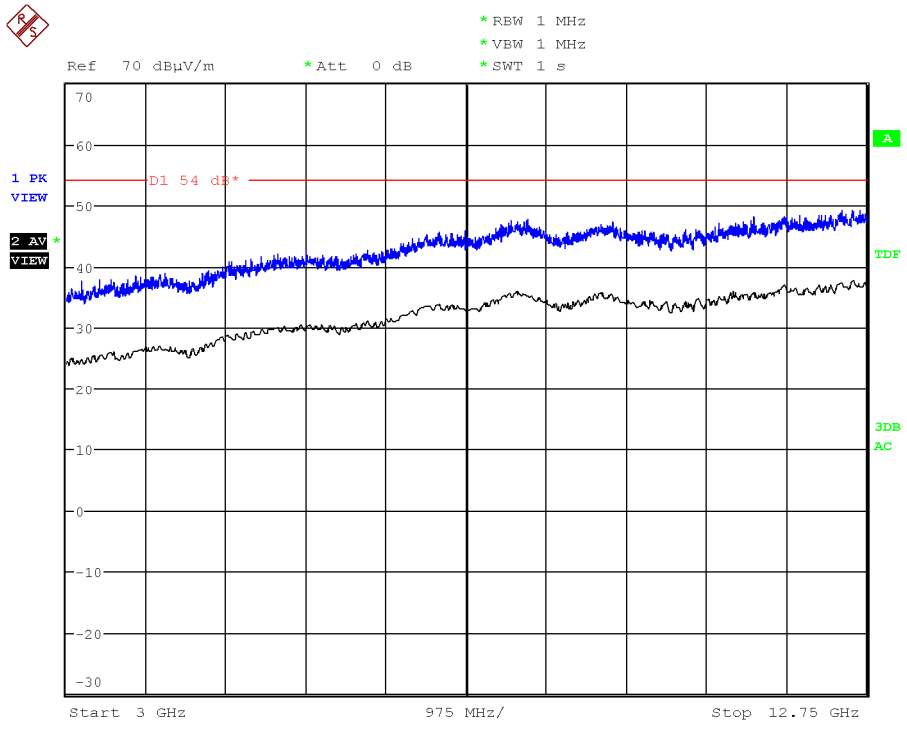
CHANNEL: Highest (2480 MHz).



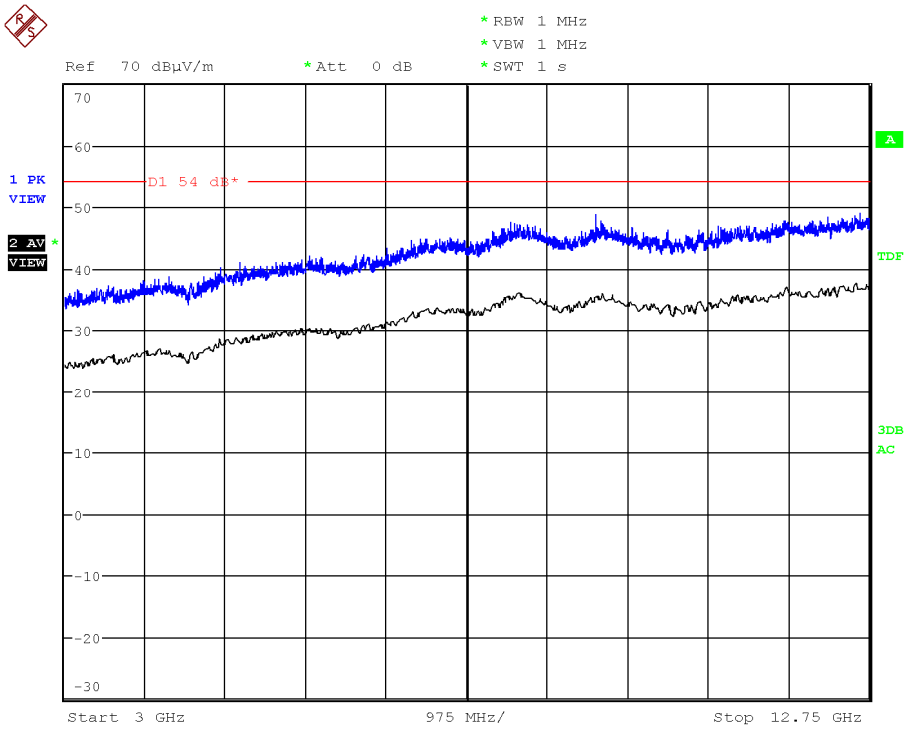
Note: The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 12.75 GHz.

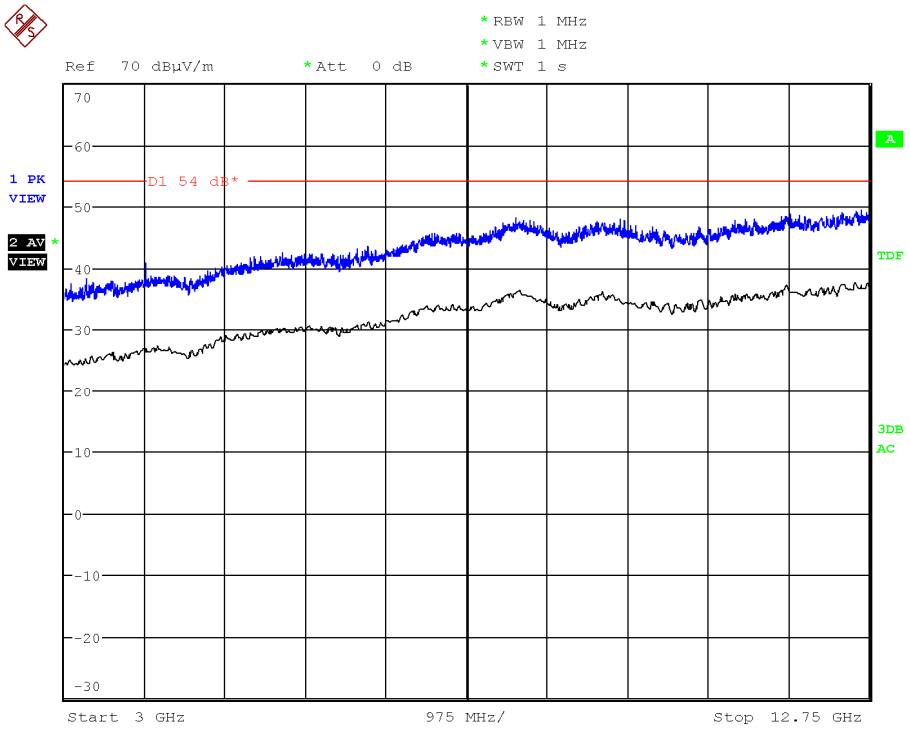
CHANNEL: Lowest (2402 MHz).



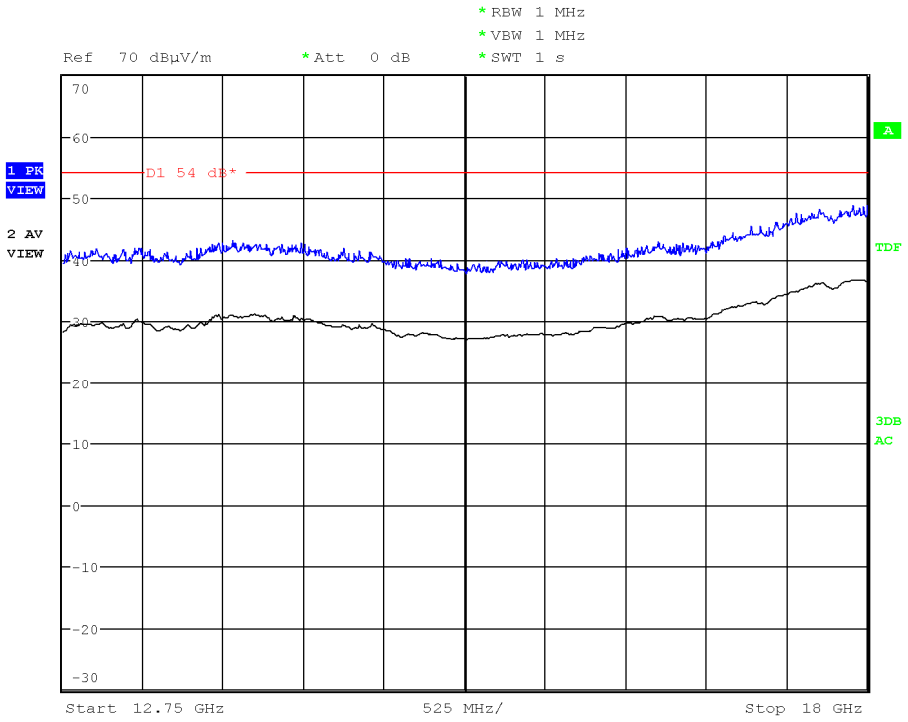
CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).

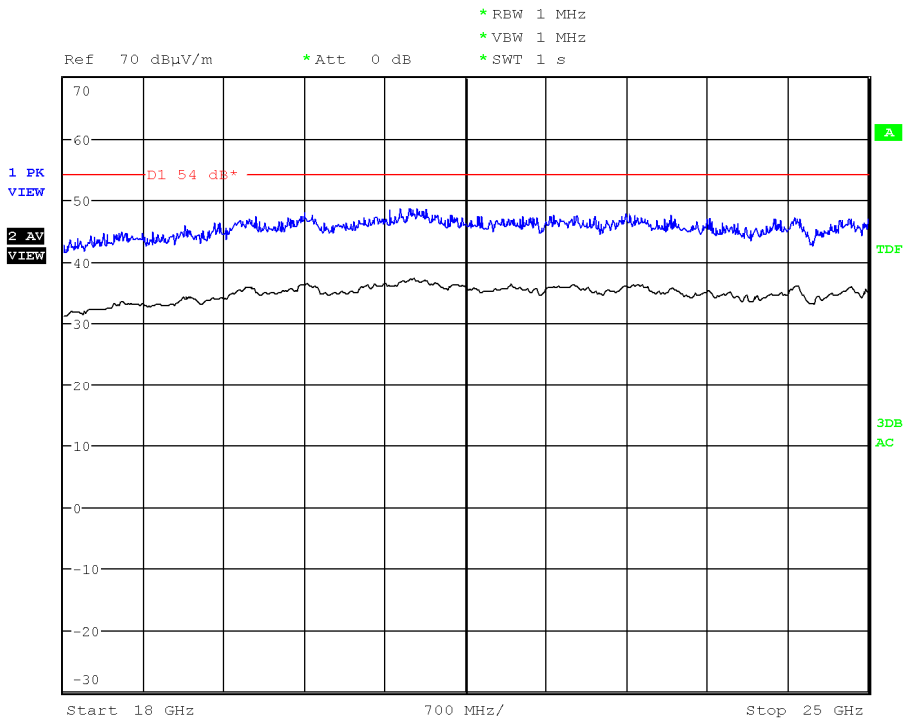


FREQUENCY RANGE 12.75 GHz to 18 GHz.



(This plot is valid for all three channels).

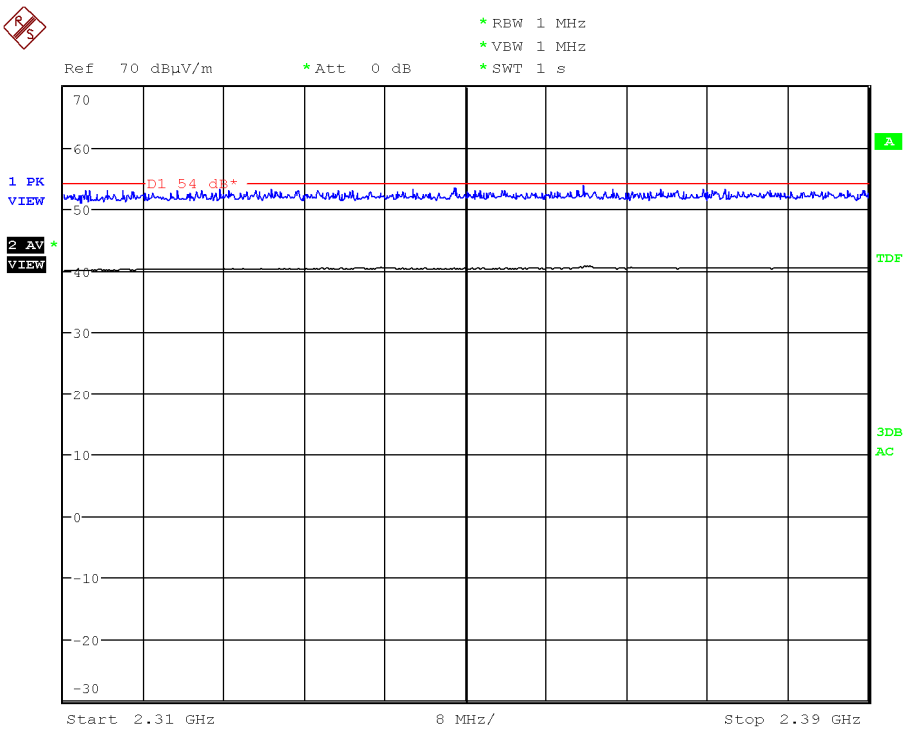
FREQUENCY RANGE 18 GHz to 25 GHz.



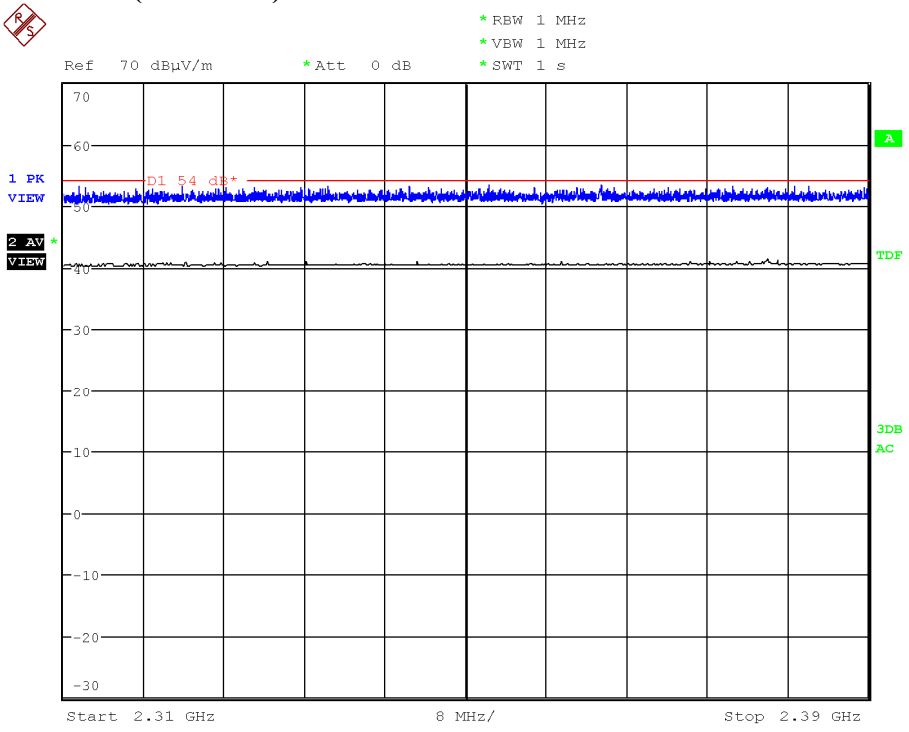
(This plot is valid for all three channels).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

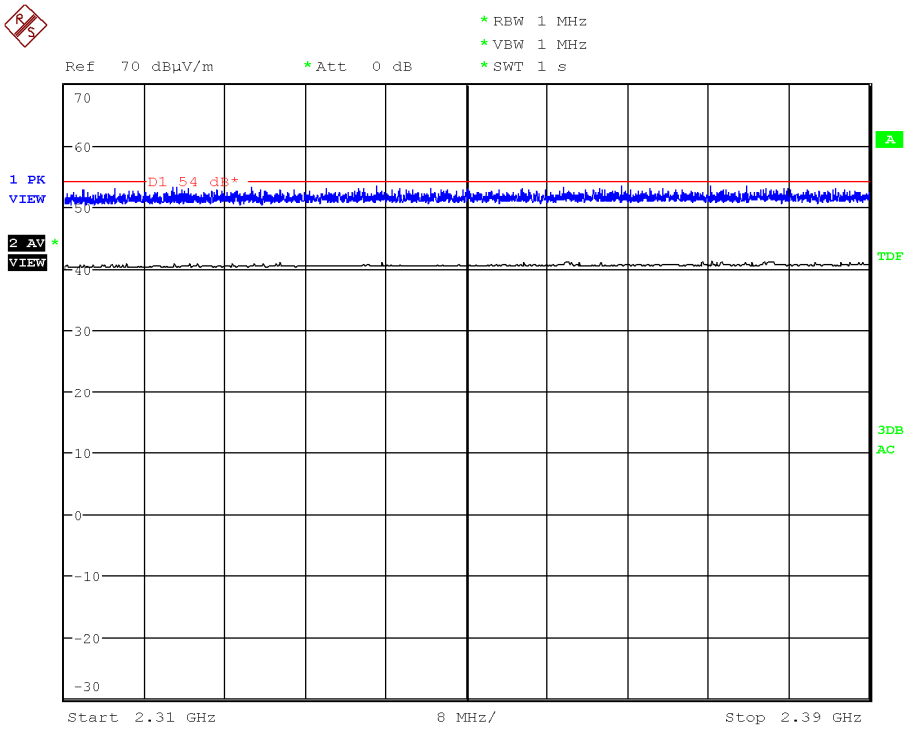
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).

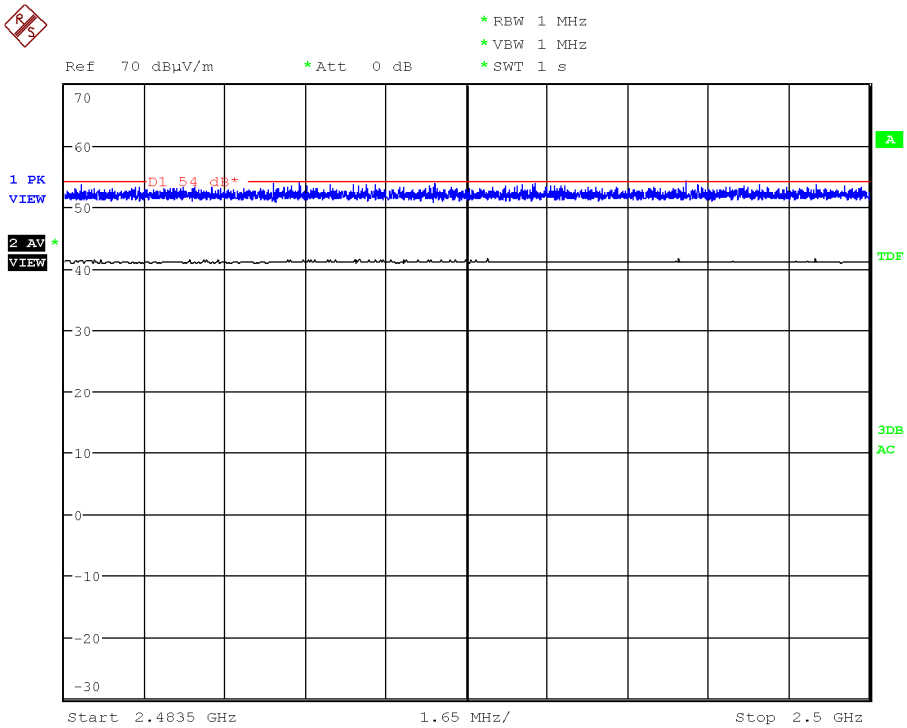


CHANNEL: Highest (2480 MHz).

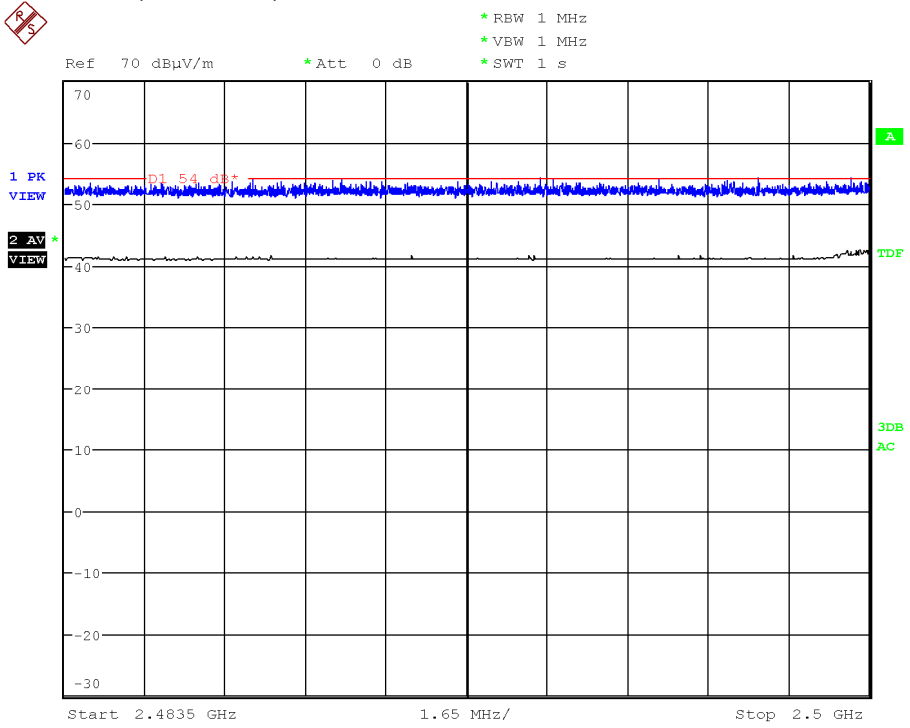


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).