

Appendix B – Test result “WiFi 2.4 GHz (802.11b/g/n20/n40)”

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TEST CONDITIONS

Power supply (V):

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

Type of power supply = DC voltage from NGFC 30x30 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 v03r02.

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 1.7.3-859.

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

The data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g, HT0 (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.	Data Rate	SISO A (dBm)	SISO B (dBm)	MIMO 2 (dBm)
802.11b	20	1 / 2412	1 Mbps	16,5	16,5	n/a
		2 / 2417		17,5	17,5	n/a
		6 / 2437		17,5	17,5	n/a
		10 / 2457		17,5	17,5	n/a
		11 / 2462		16,5	16,5	n/a
802.11g	20	1 / 2412	6 Mbps	14	14,5	n/a
		2 / 2417		15,5	15,5	n/a
		3 / 2422		17,5	17,5	n/a
		6 / 2437		17,5	17,5	n/a
		9 / 2452		17,5	17,5	n/a
		10 / 2457		15,5	15,5	n/a
		11 / 2462		12,5	12,5	n/a
802.11n	20	1 / 2412	HT0/HT8	14	14,5	12,00
		2 / 2417		15,5	15,5	13,50
		3 / 2422		17,5	17,5	17,50
		6 / 2437		17,5	17,5	17,50
		9 / 2452		17,5	17,5	17,50
		10 / 2457		15,5	15,5	13,50
		11 / 2462		12,5	12,5	12,00
802.11n*	40	3 / 2422	HT0/HT8	13,5	13,5	9,50
		4 / 2427		14,5	14,5	11,50
		5 / 2432		15,5	15,5	12,00
		6 / 2437		16,5	16,5	13,50
		7 / 2442		16,5	14,5	13,50
		8 / 2447		16	13,5	11,50
		9 / 2452		12,5	11,5	9,50

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-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 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

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)	12.93	12.63	12.93	12.75	12.81	12.63
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)	16.89	16.86	17.10	17.10	16.80	16.77
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)	17.91	17.88	18.09	18.03	17.88	17.91
Measurement uncertainty (kHz)	±21.7					

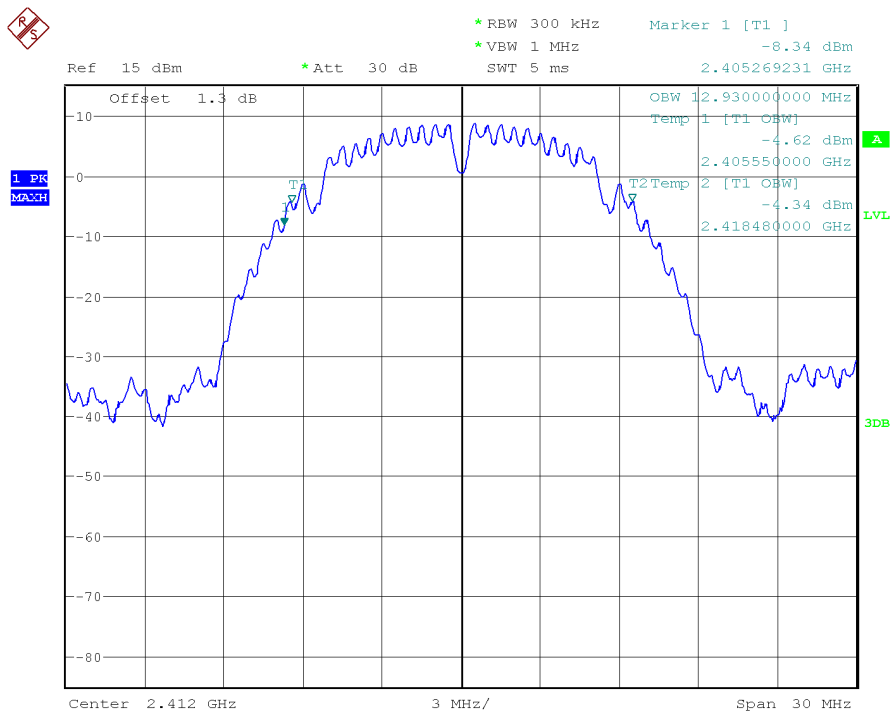
4. WiFi 2.4GHz 802.11 n40 mode

Occupied Bandwidth (see next plots).

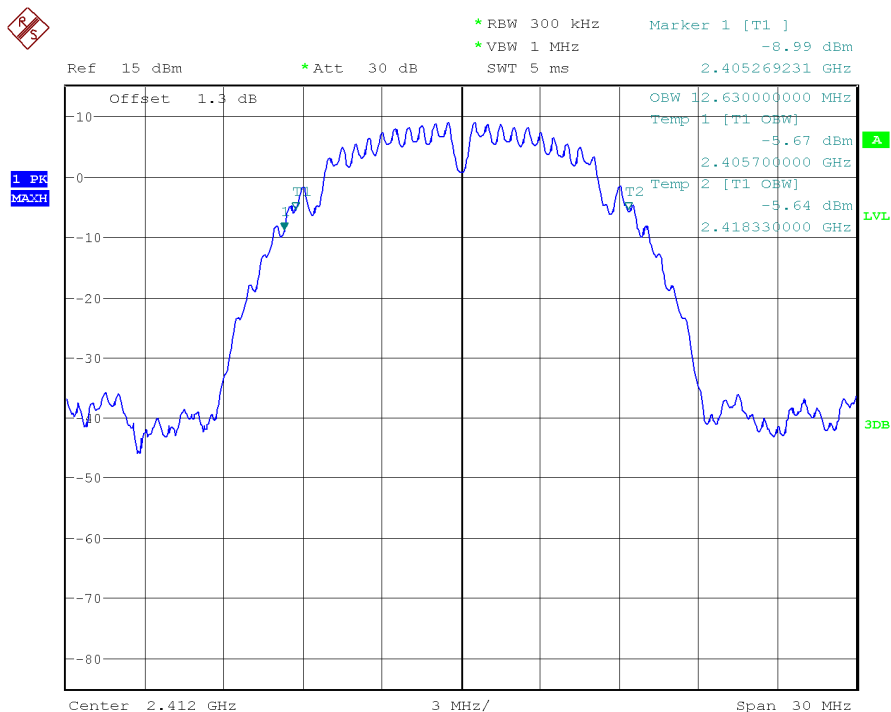
	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
99% bandwidth (MHz)	36.25	36.25	36.35	36.30	36.20	36.20
Measurement uncertainty (kHz)	± 21.7					

1. WiFi 2.4GHz 802.11 b mode

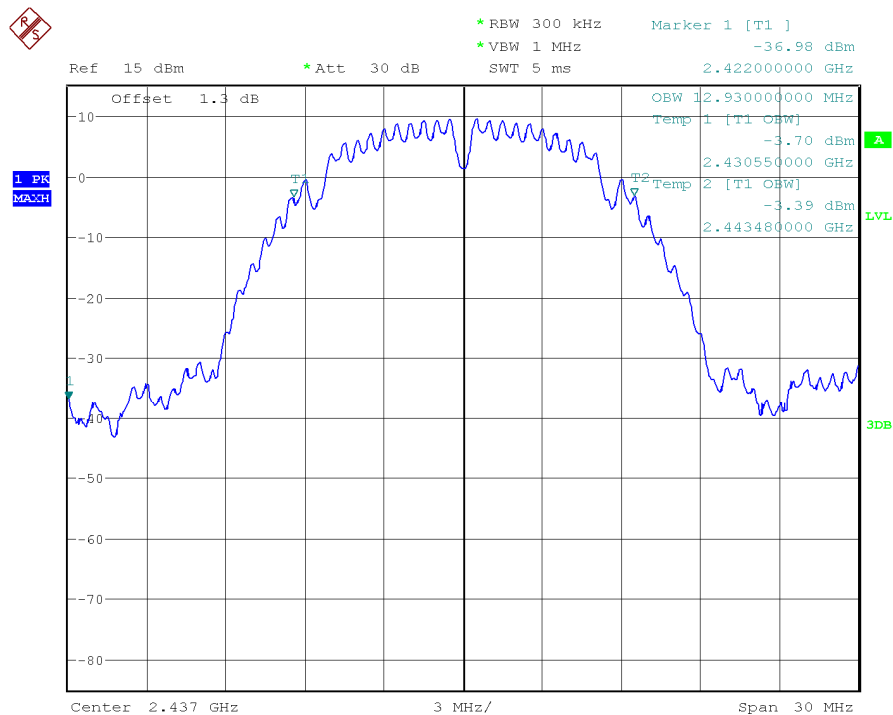
Lowest Channel: 2412 MHz. Chain A



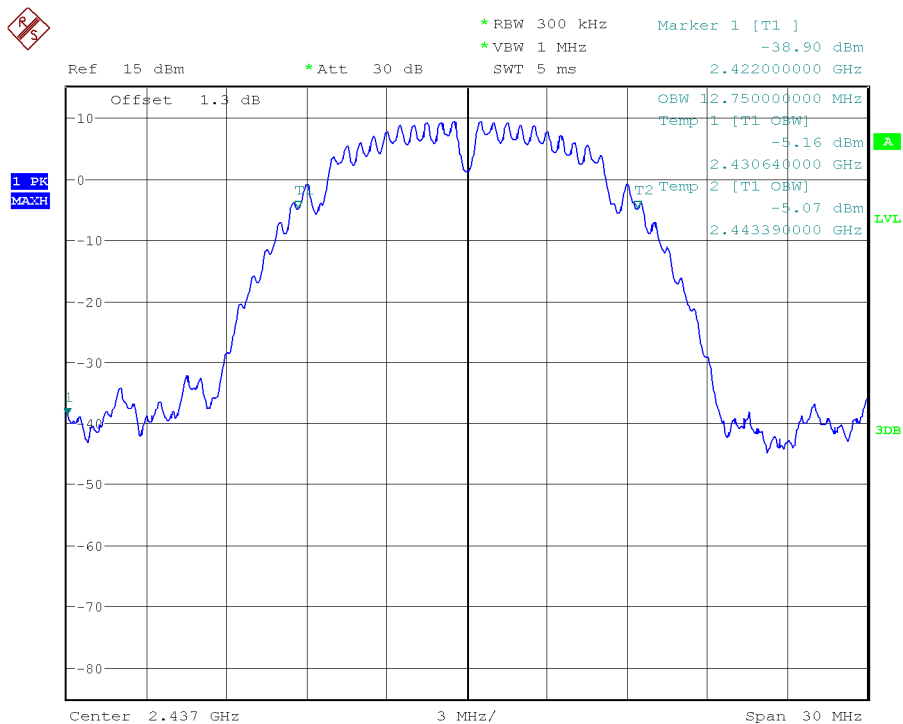
Lowest Channel: 2412 MHz. Chain B.



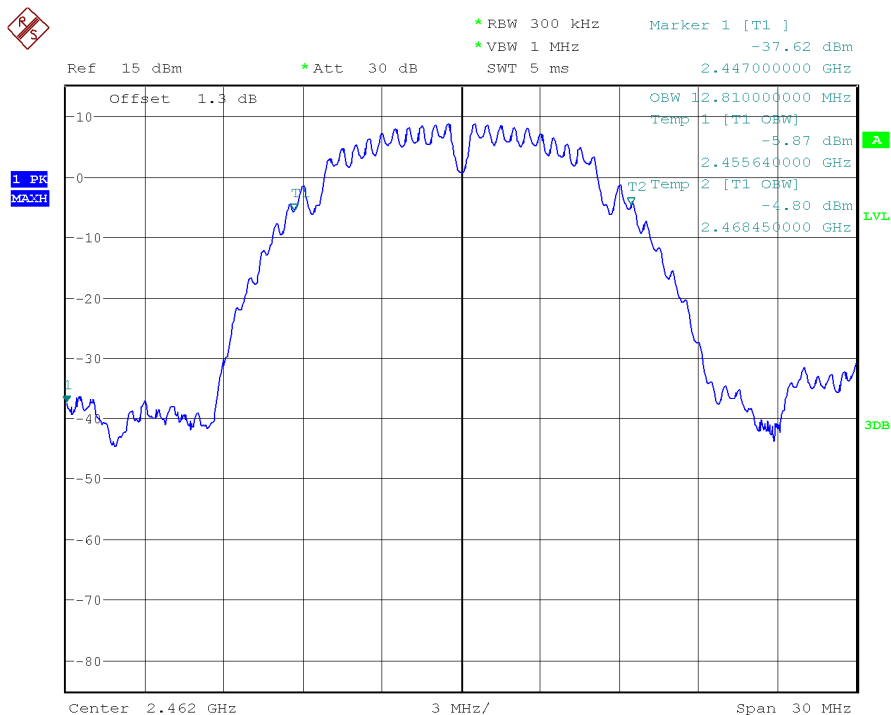
Middle Channel: 2437 MHz. Chain A



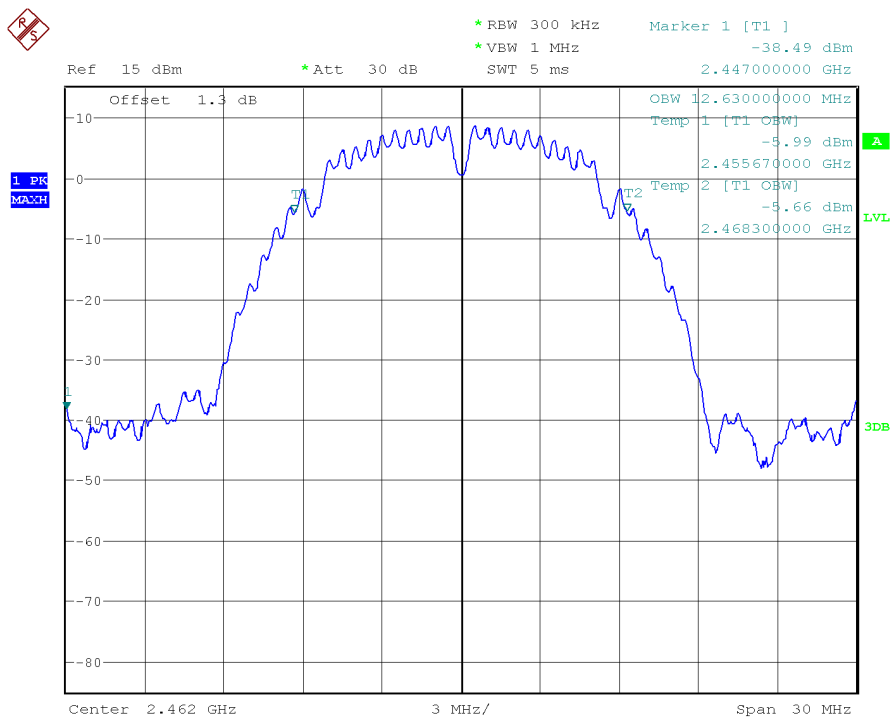
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

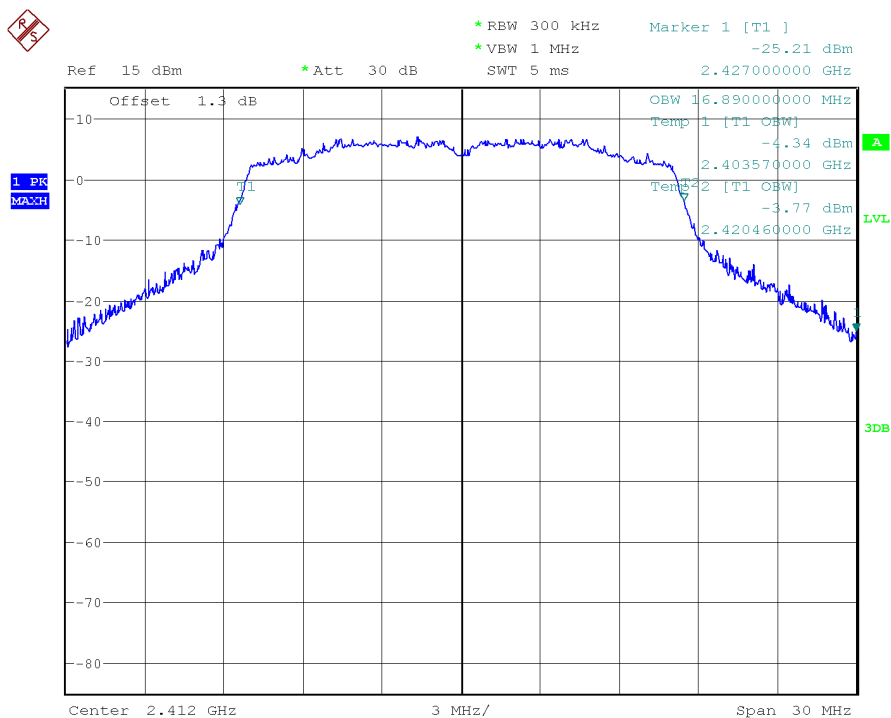


Highest Channel: 2462 MHz. Chain B.

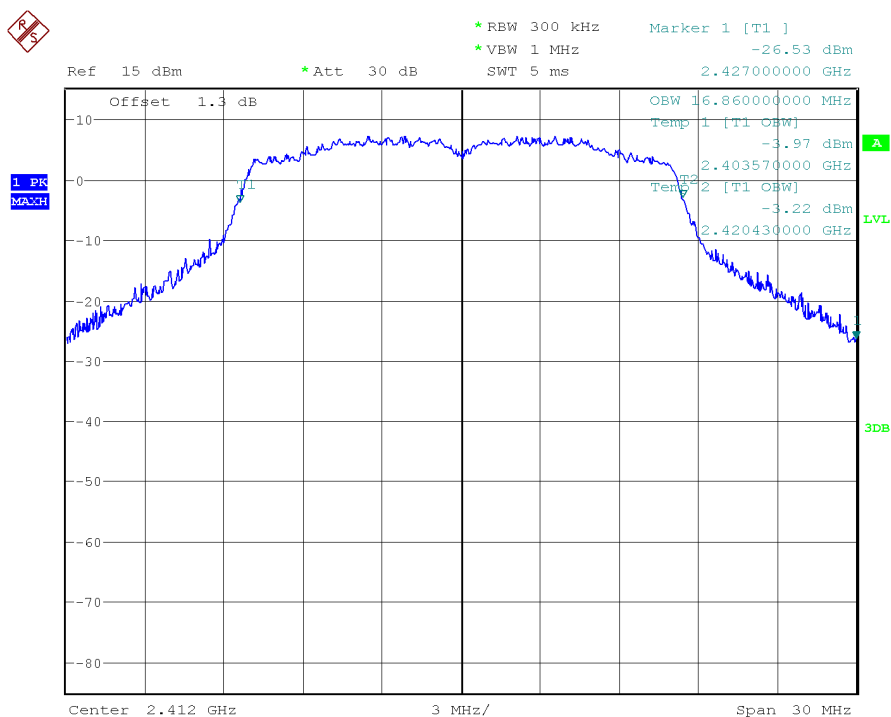


2. WiFi 2.4GHz 802.11 g mode

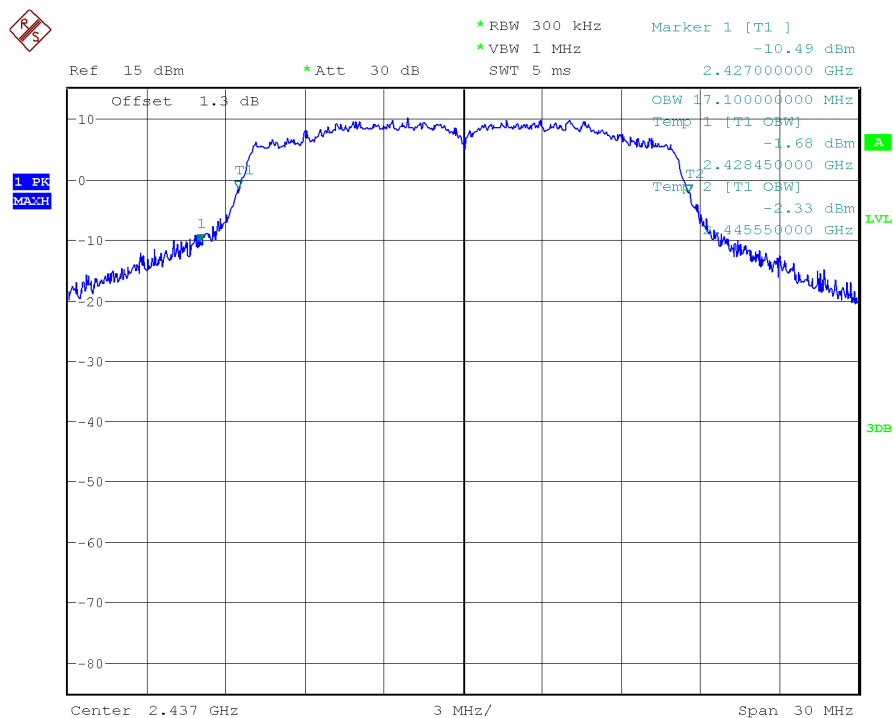
Lowest Channel: 2412 MHz. Chain A



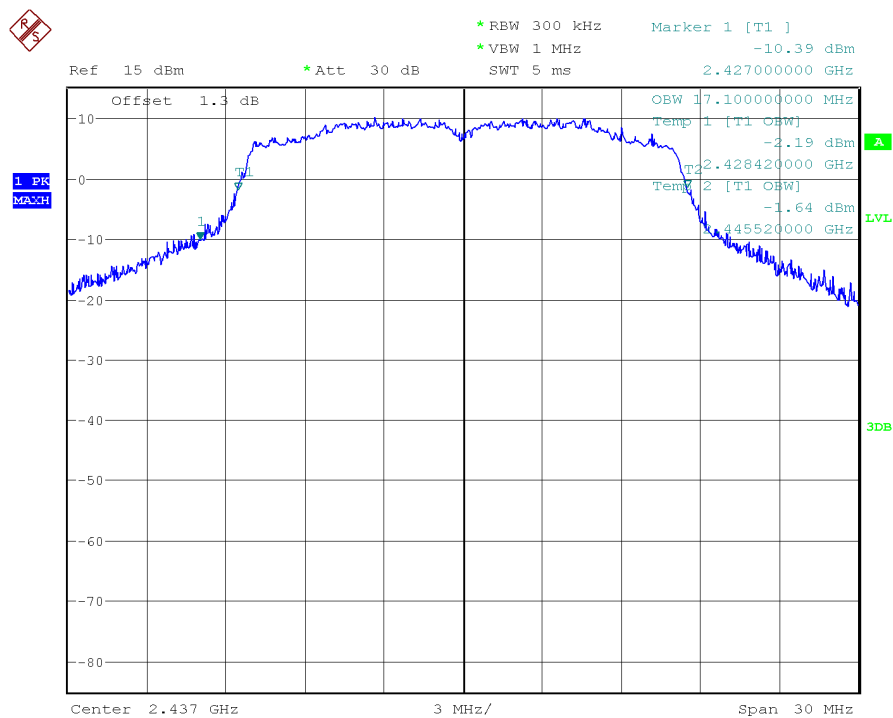
Lowest Channel: 2412 MHz. Chain B



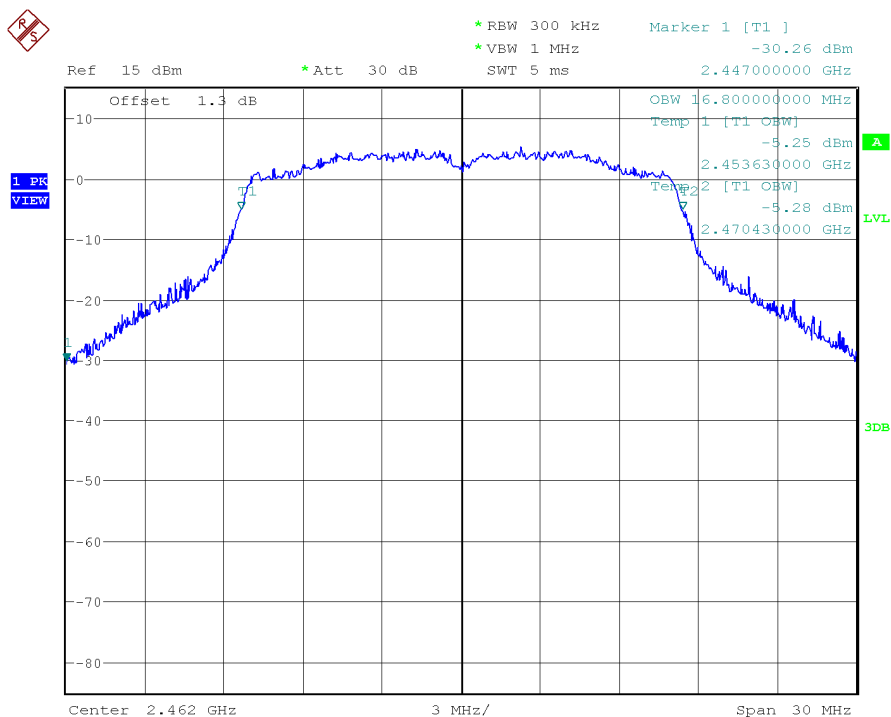
Middle Channel: 2437 MHz. Chain A



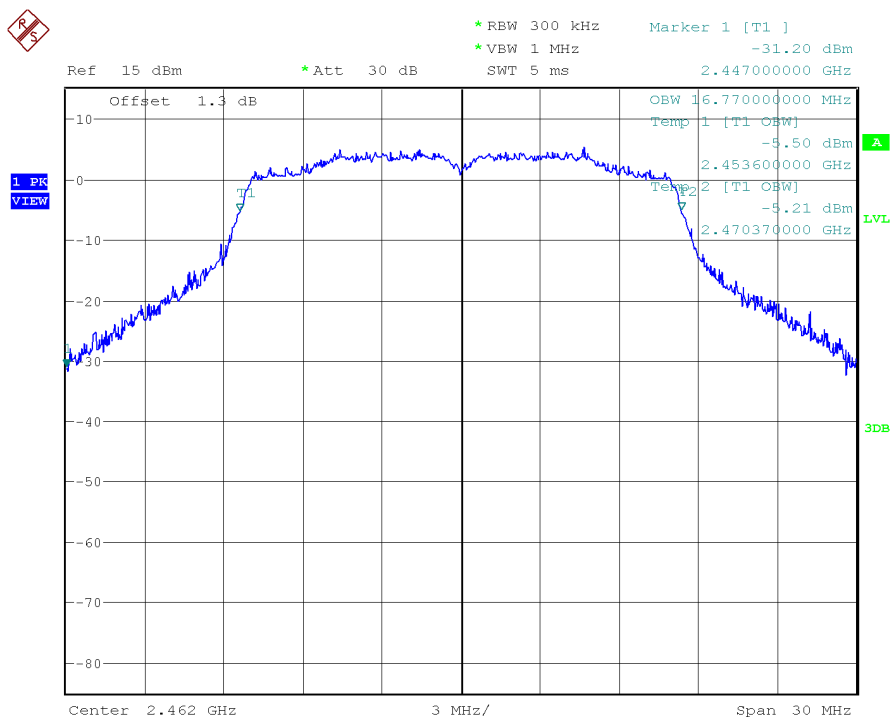
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

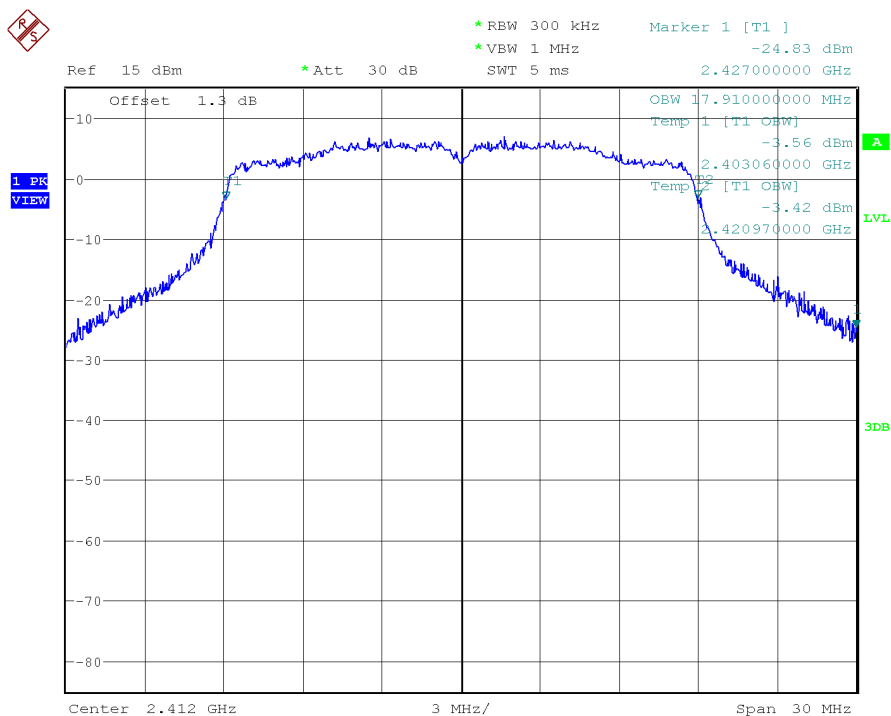


Highest Channel: 2462 MHz. Chain B.

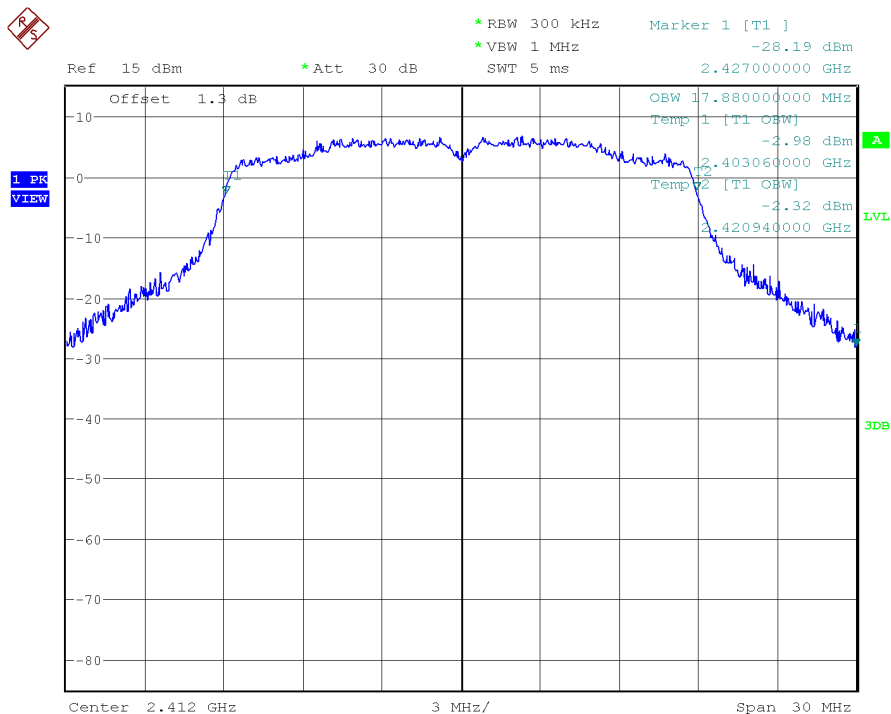


3. WiFi 2.4GHz 802.11 n20 mode

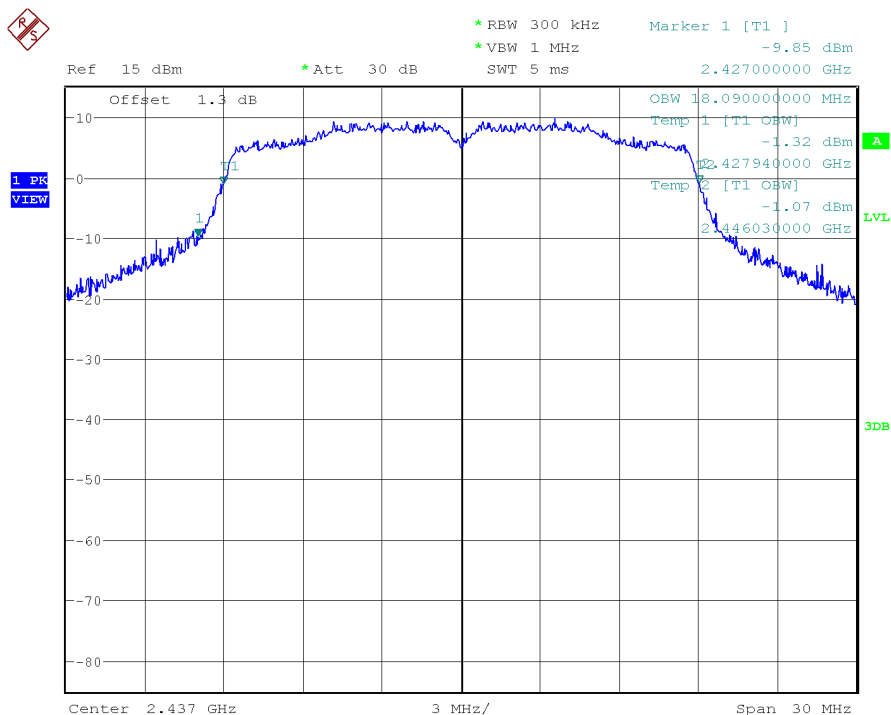
Lowest Channel: 2412 MHz. Chain A



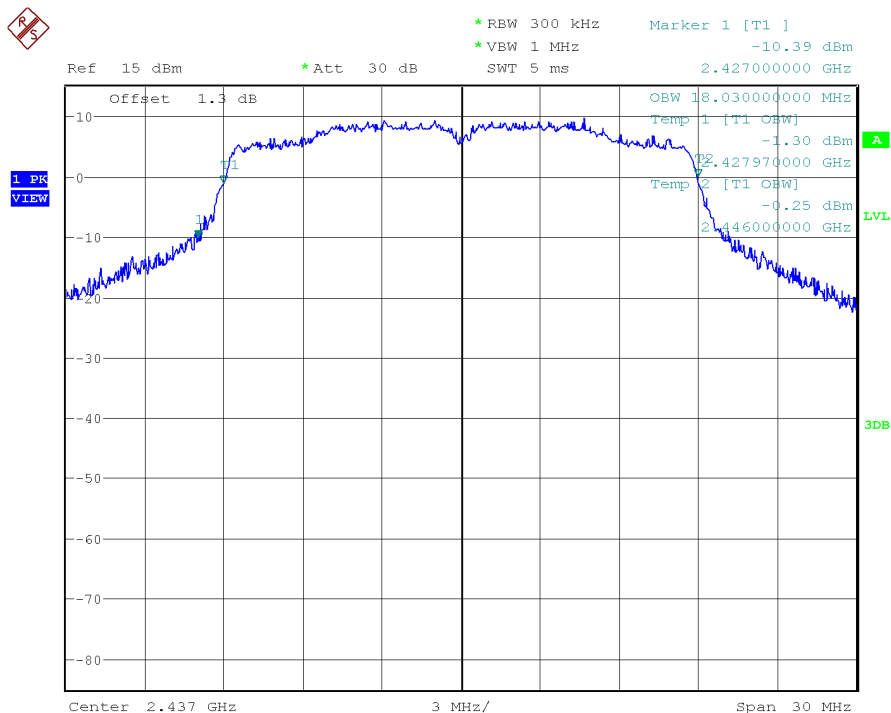
Lowest Channel: 2412 MHz. Chain B



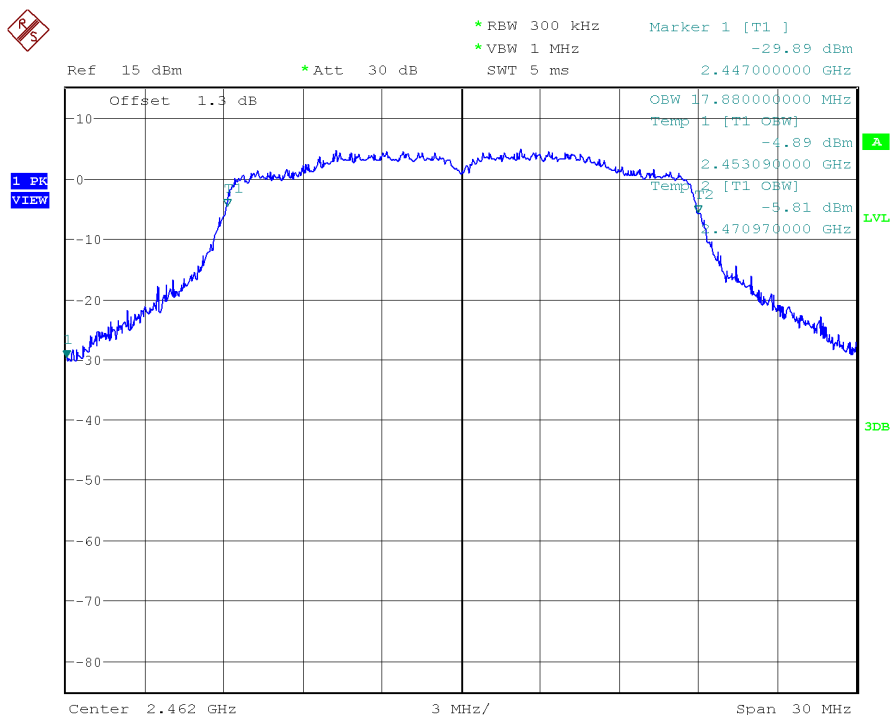
Middle Channel: 2437 MHz. Chain A



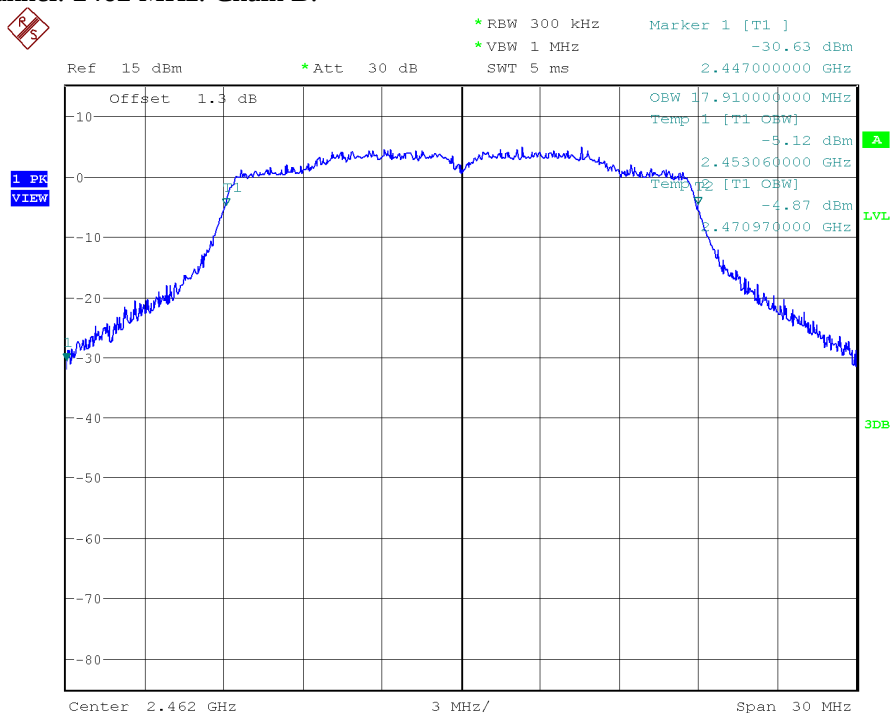
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A.

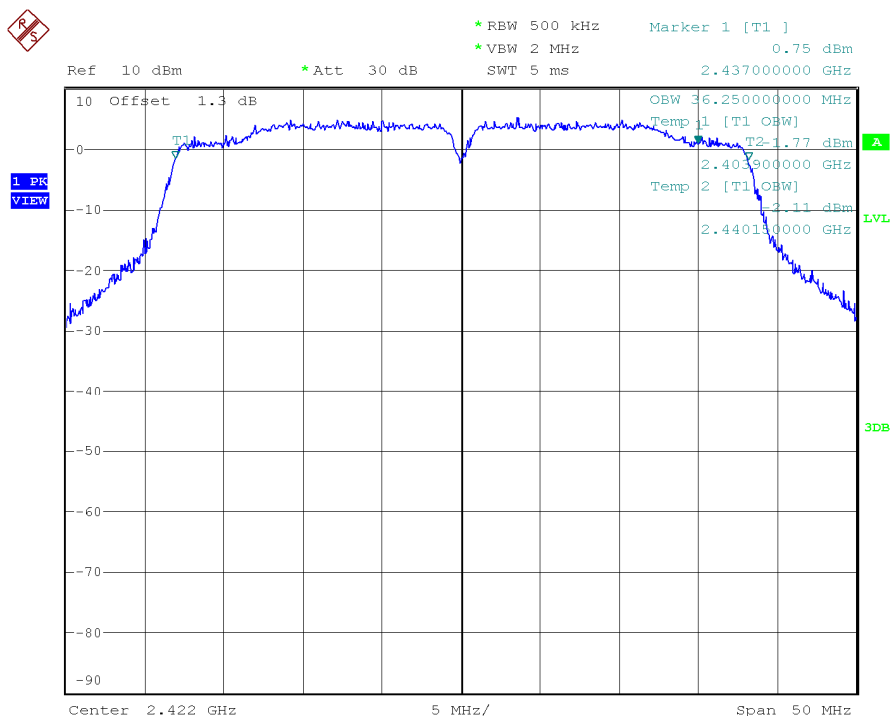


Highest Channel: 2462 MHz. Chain B.

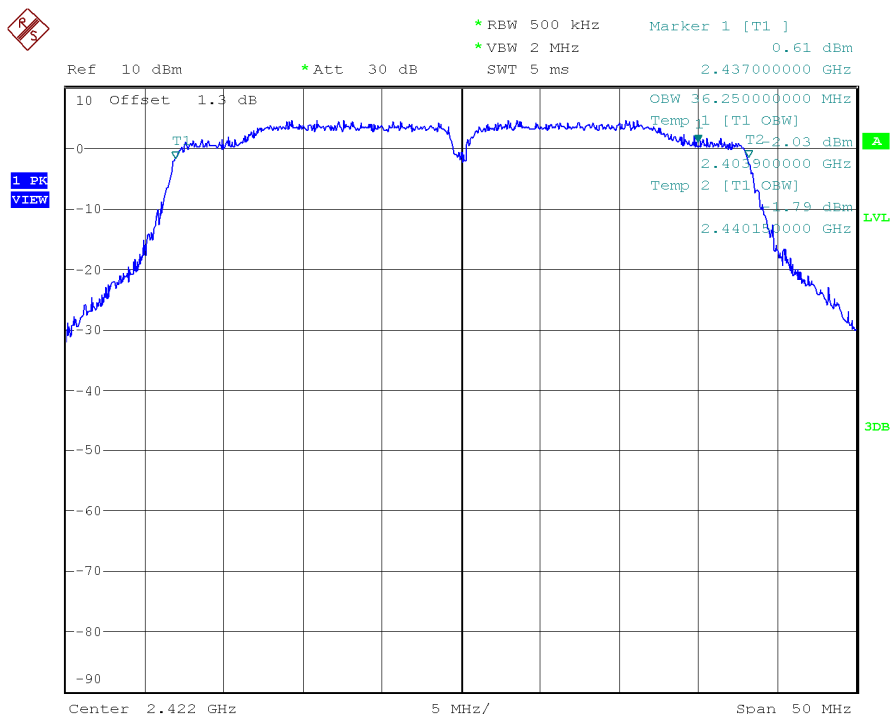


4. WiFi 2.4GHz 802.11 n40 mode

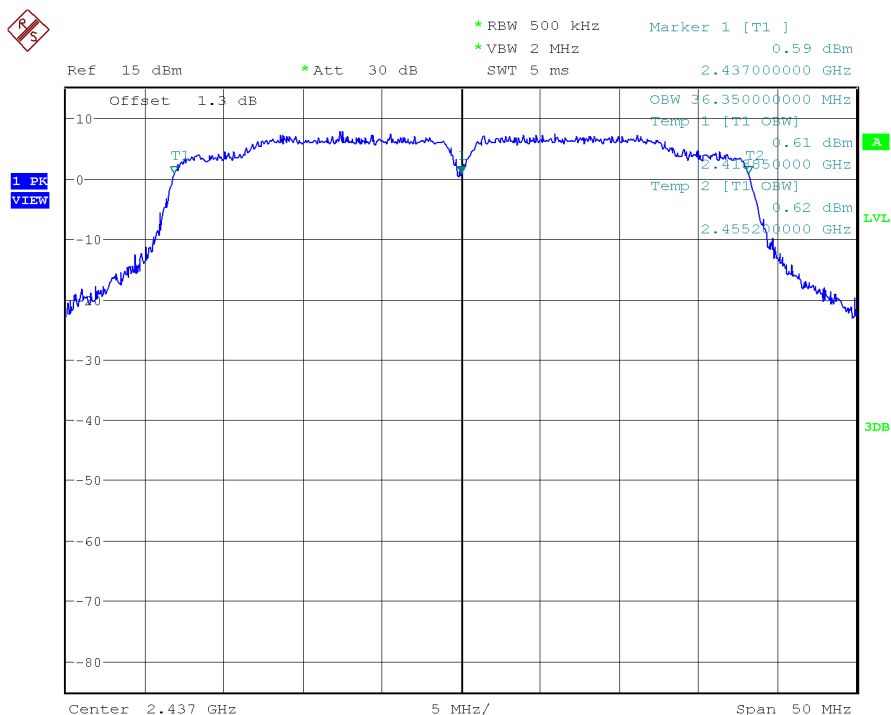
Lowest Channel: 2422 MHz. Chain A



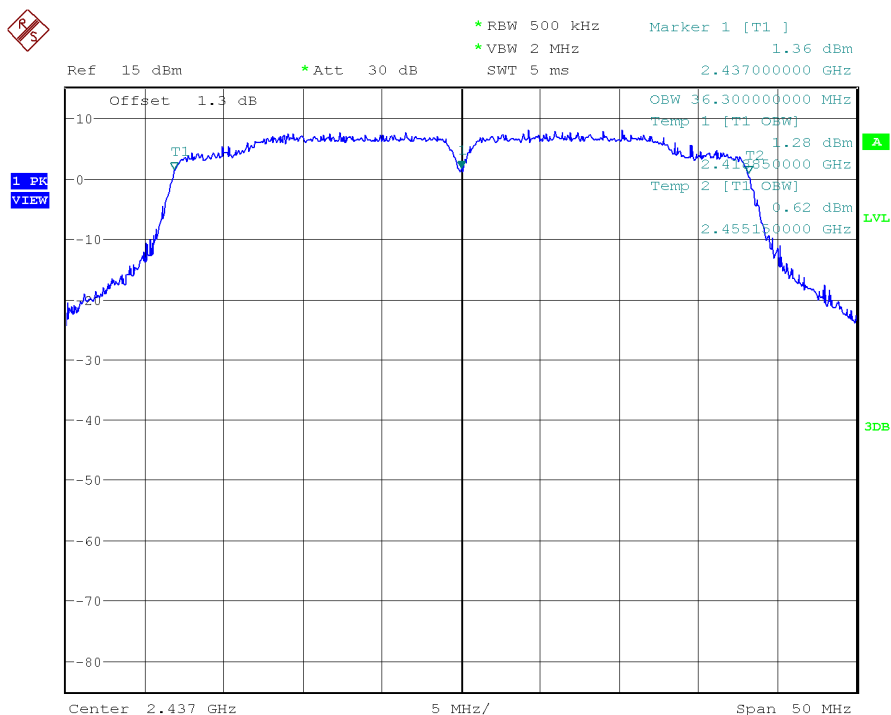
Lowest Channel: 2422 MHz. Chain B



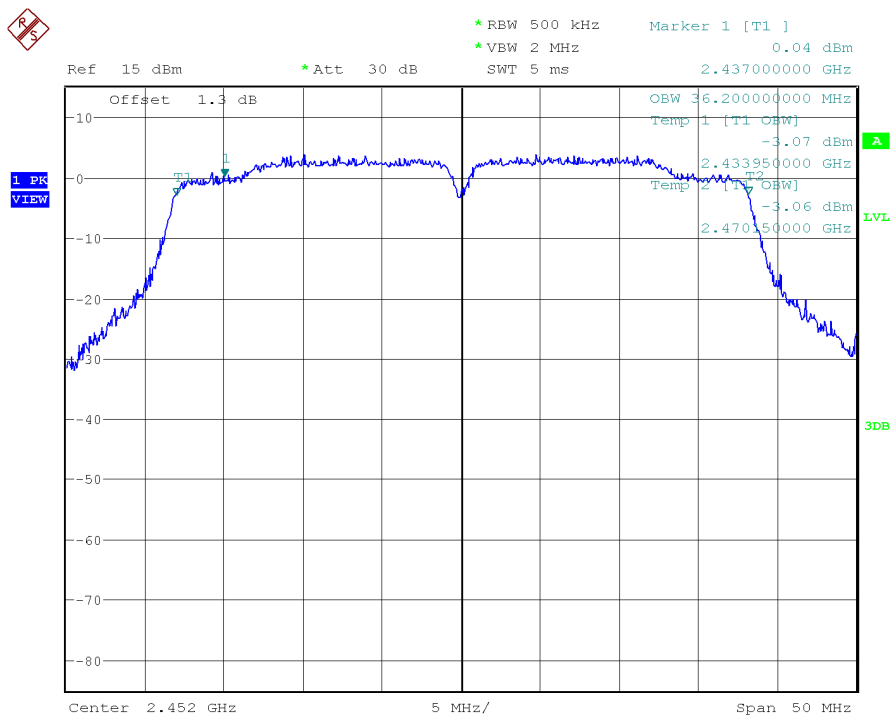
Middle Channel: 2437 MHz. Chain A



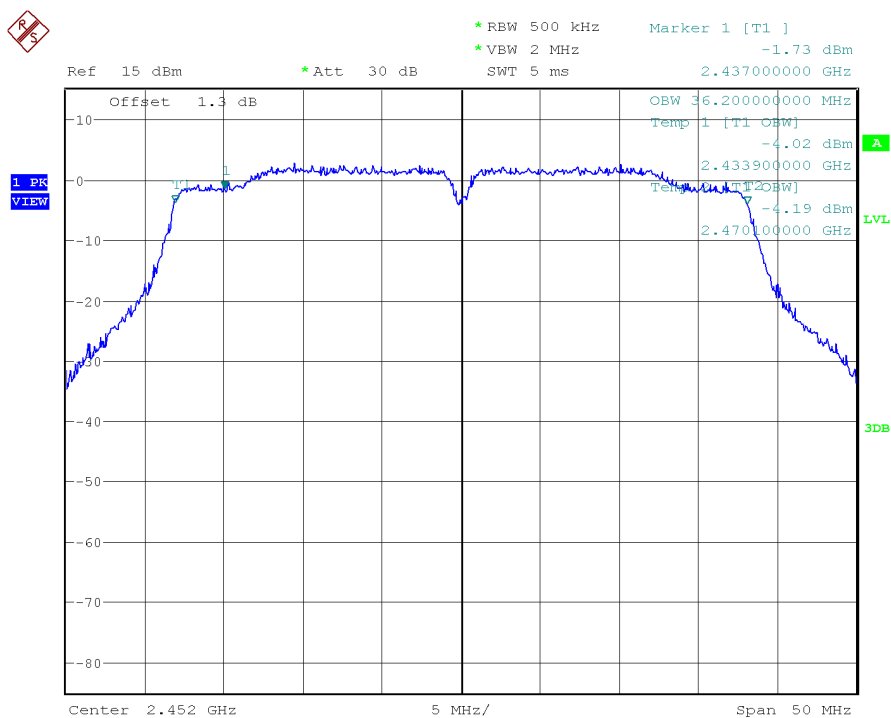
Middle Channel: 2437 MHz. Chain B



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)	10.045	10.064	10.064	10.064	10.032	10.032
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)	15.16	15.16	15.16	15.128	15.128	15.16
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)	15.128	15.16	15.128	15.128	15.128	15.16
Measurement uncertainty (kHz)	±89					

Verdict: PASS

4. WiFi 2.4GHz 802.11 n40 mode

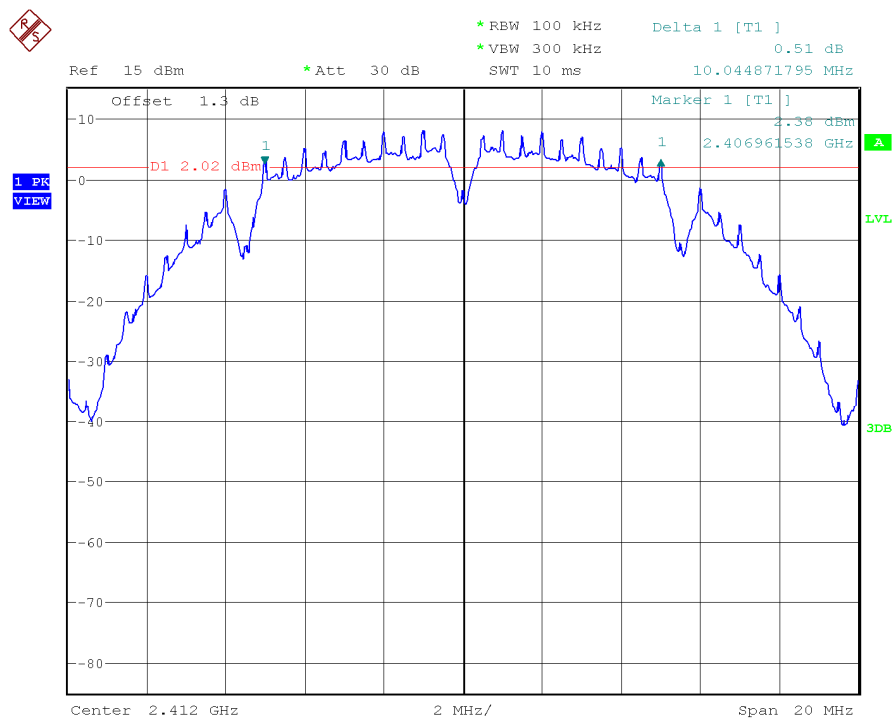
6 dB Bandwidth (see next plots).

	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)	35.128	35.128	35.128	35.128	35.128	35.128
Measurement uncertainty (kHz)	±89					

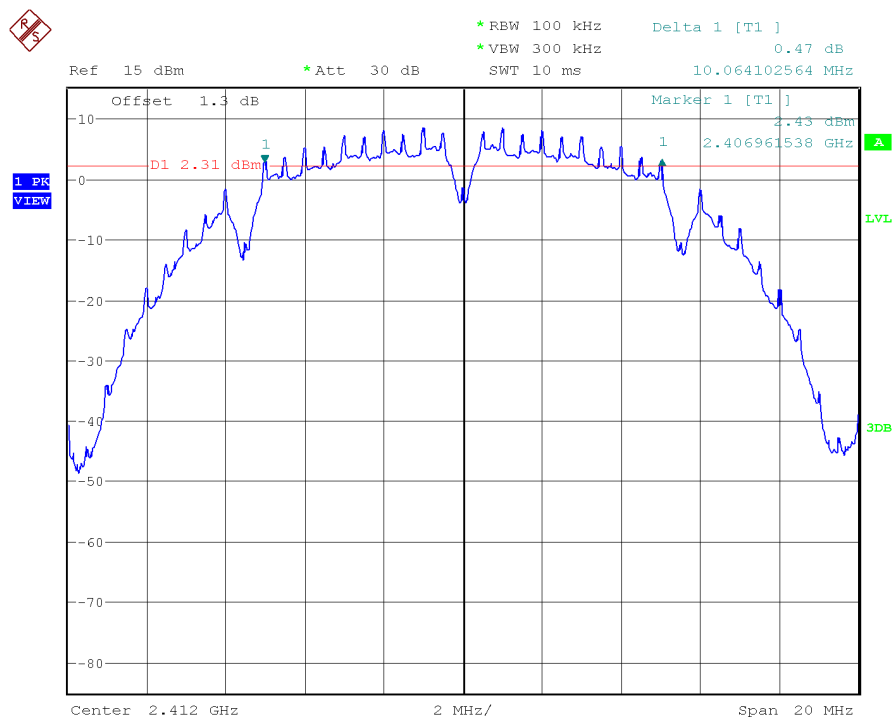
Verdict: PASS

1. WiFi 2.4GHz 802.11 b mode

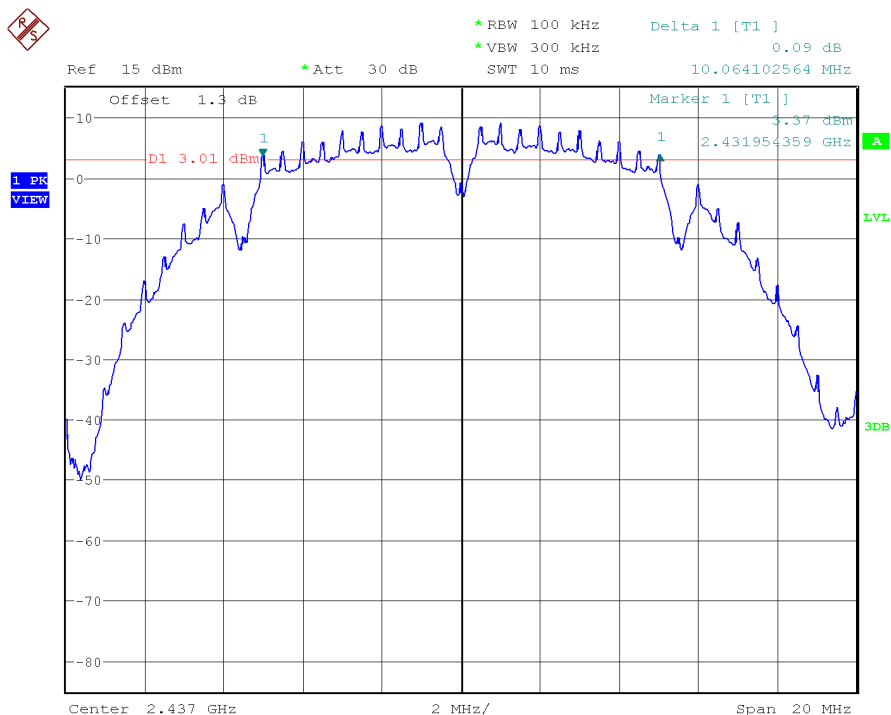
Lowest Channel: 2412 MHz. Chain A.



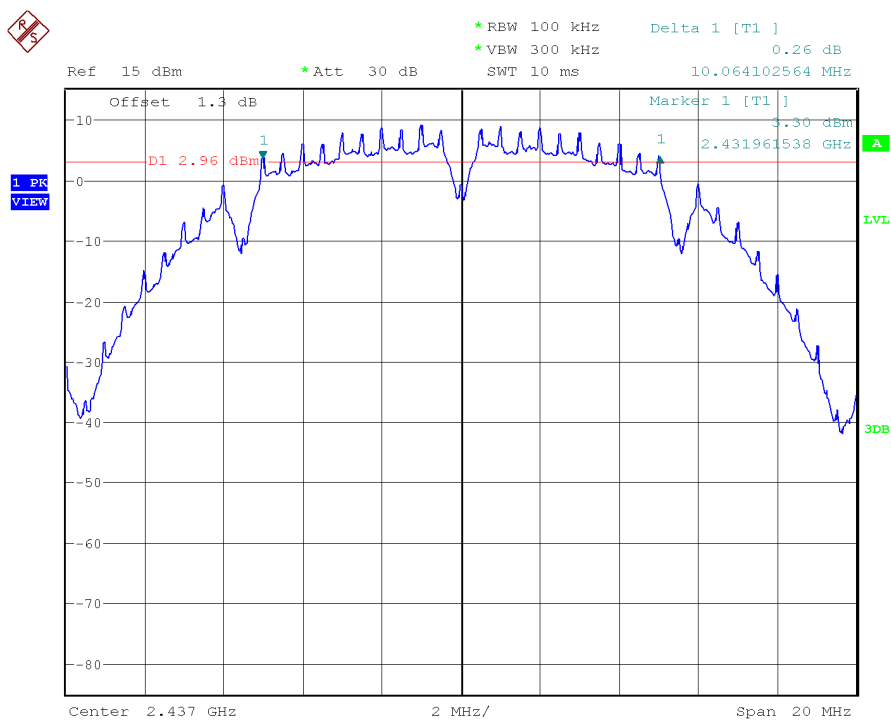
Lowest Channel: 2412 MHz. Chain B.



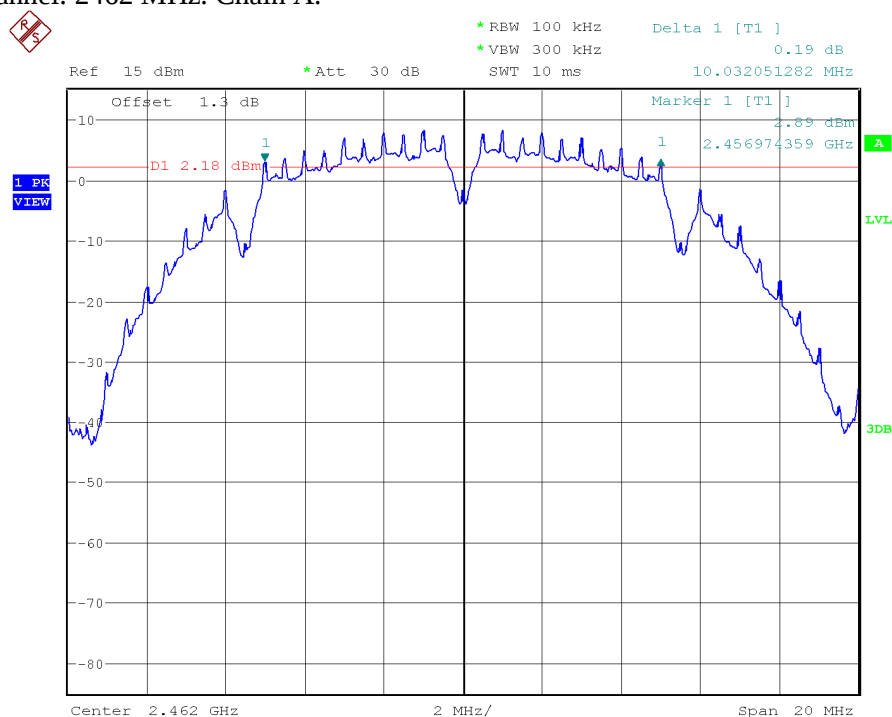
Middle Channel: 2437 MHz. Chain A



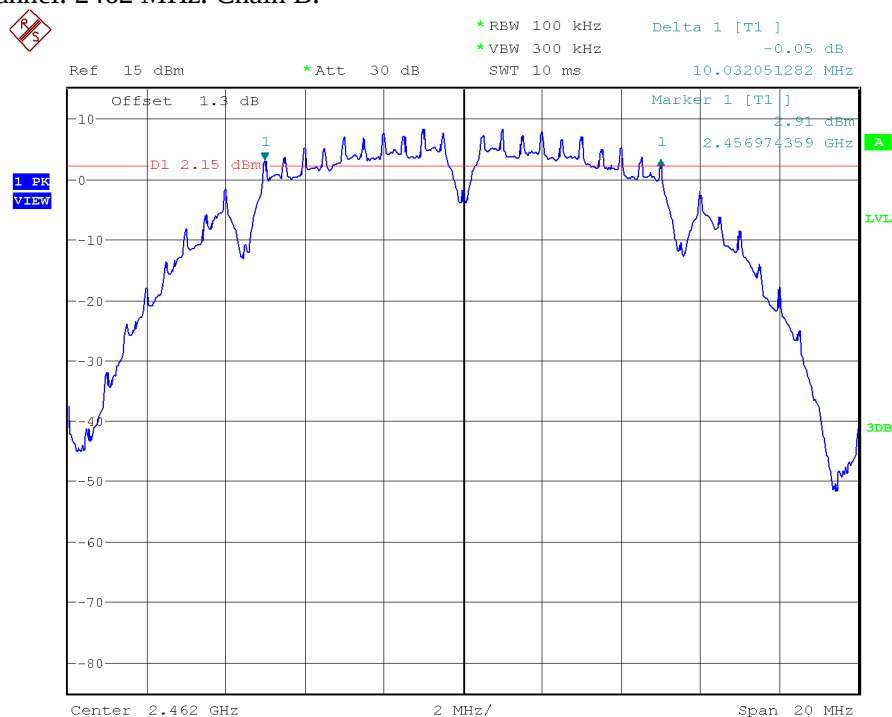
Middle Channel: 2437 MHz. Chain B.



Highest Channel: 2462 MHz. Chain A.

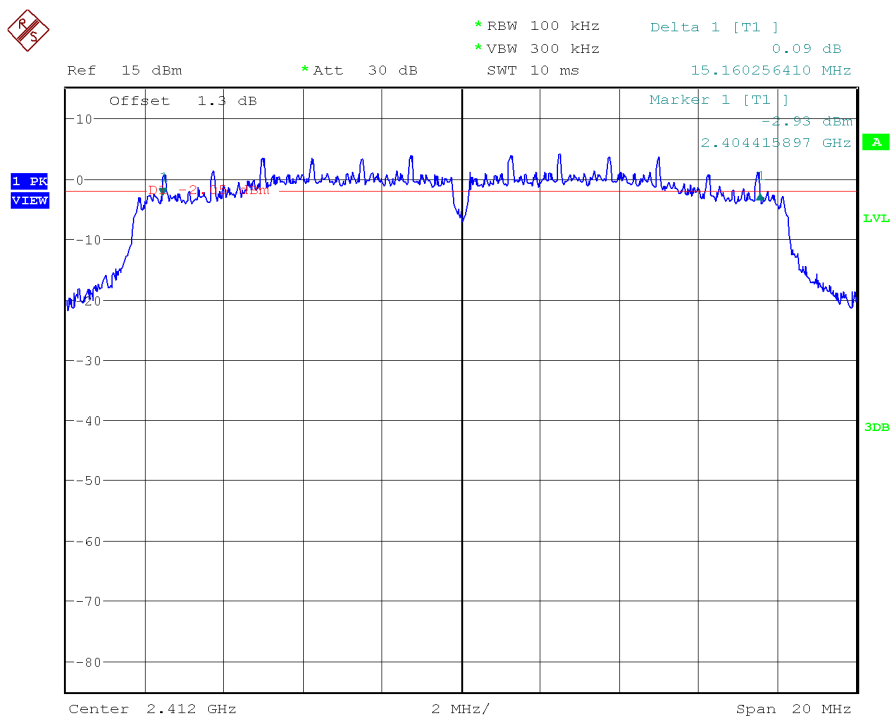


Highest Channel: 2462 MHz. Chain B.

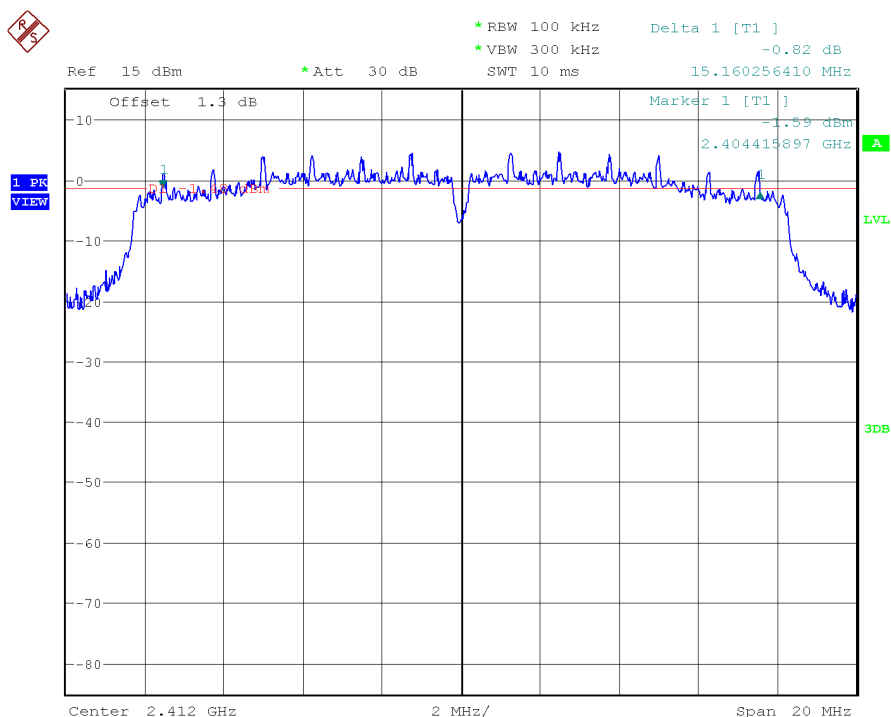


2. WiFi 2.4GHz 802.11 g mode

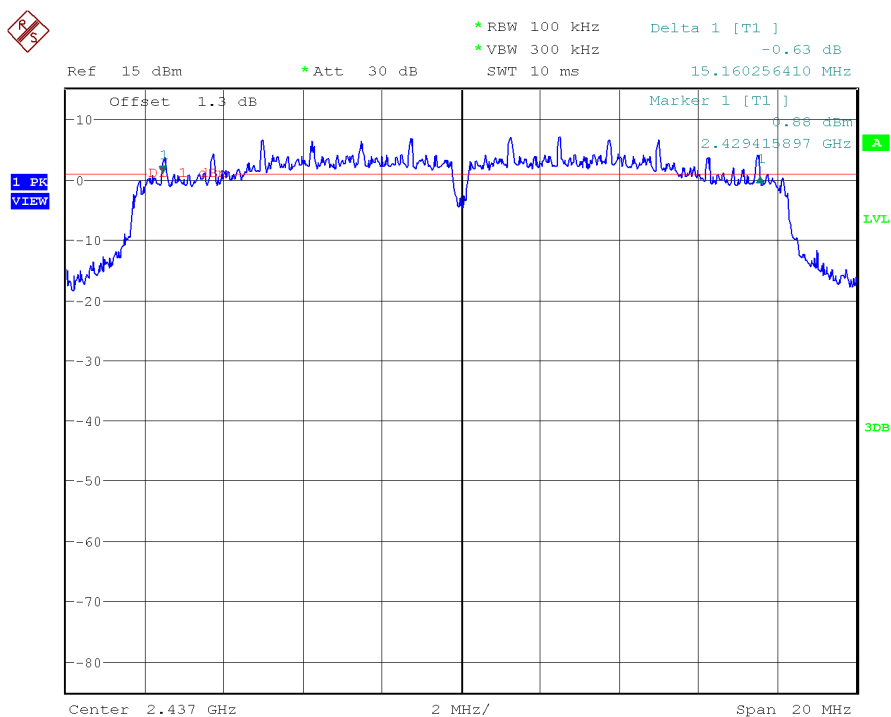
Lowest Channel: 2412 MHz. Chain A



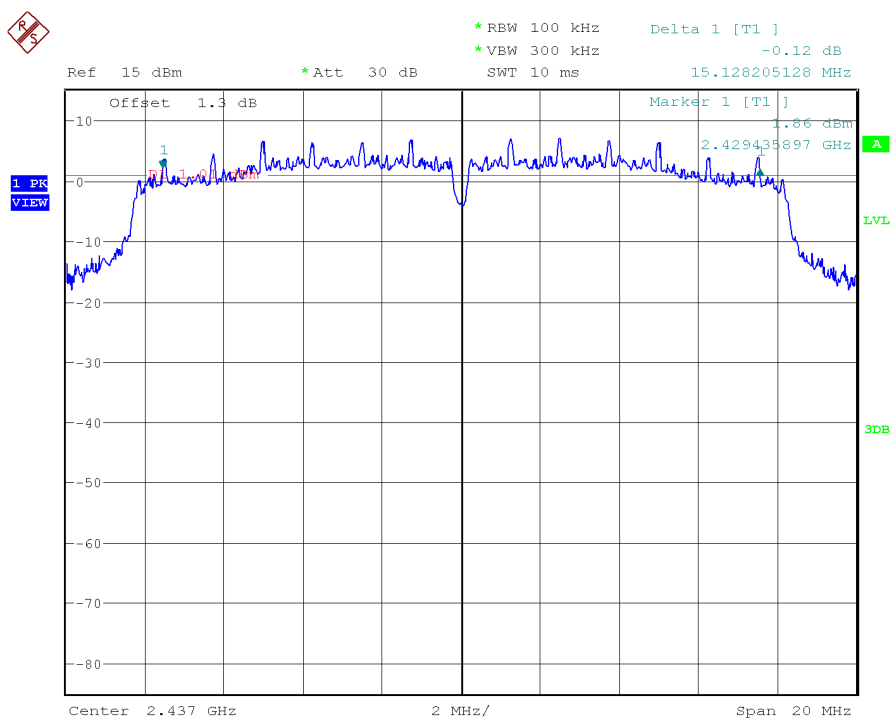
Lowest Channel: 2412 MHz. Chain B



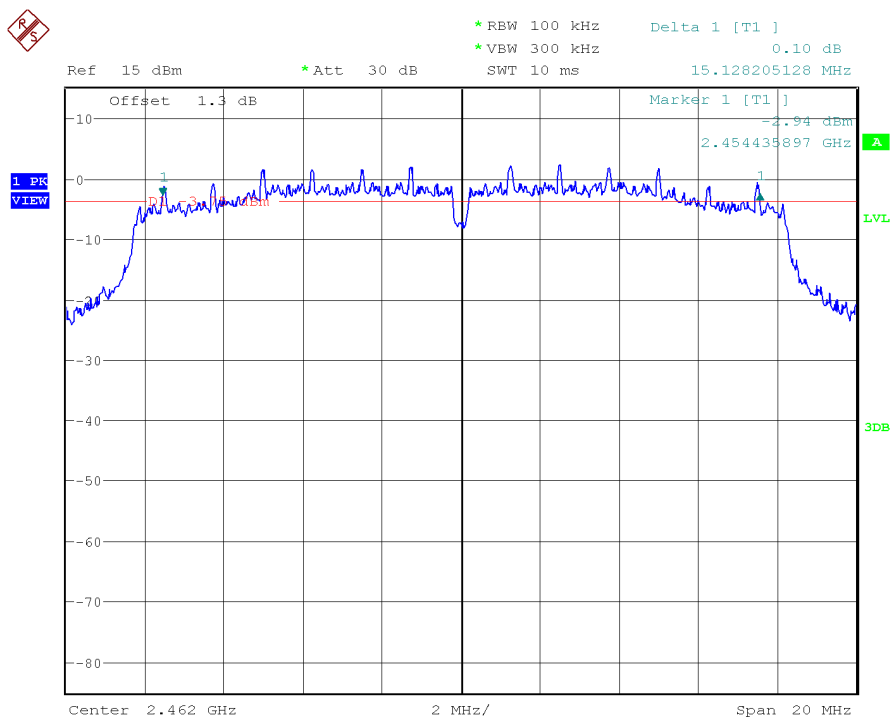
Middle Channel: 2437 MHz. Chain A



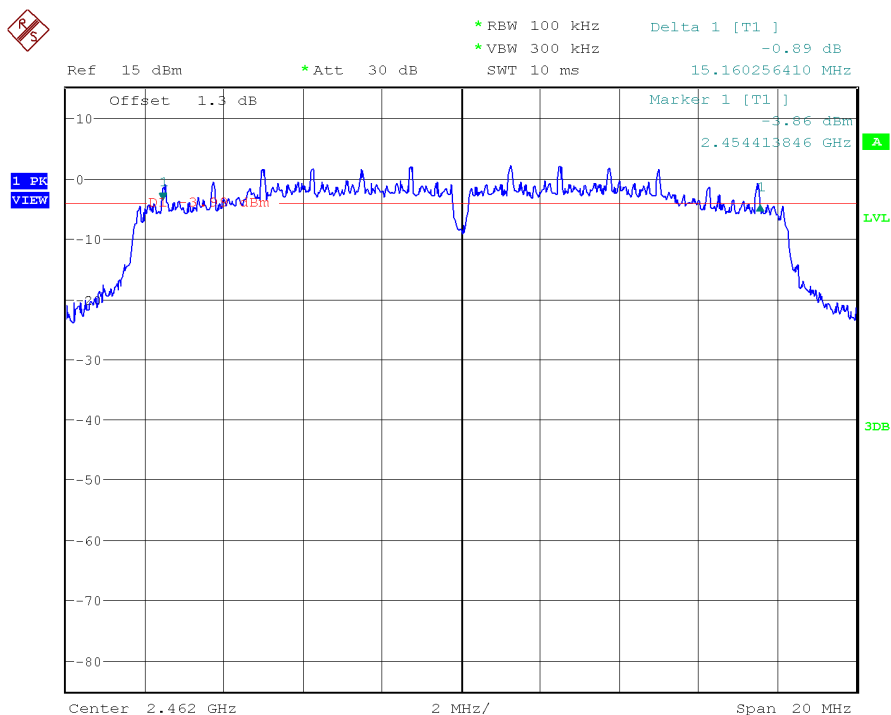
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A

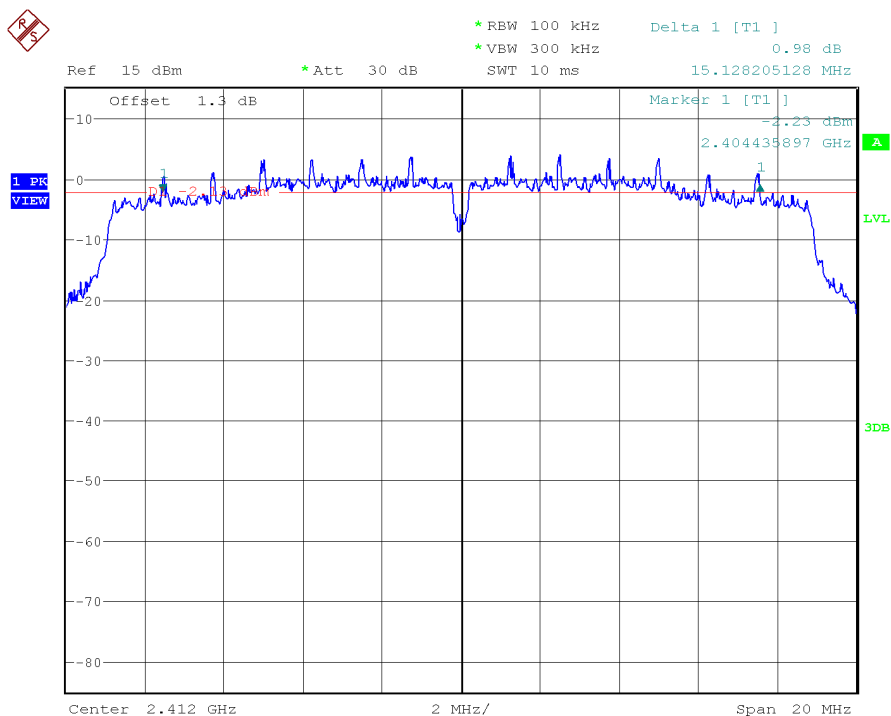


Highest Channel: 2462 MHz. Chain B

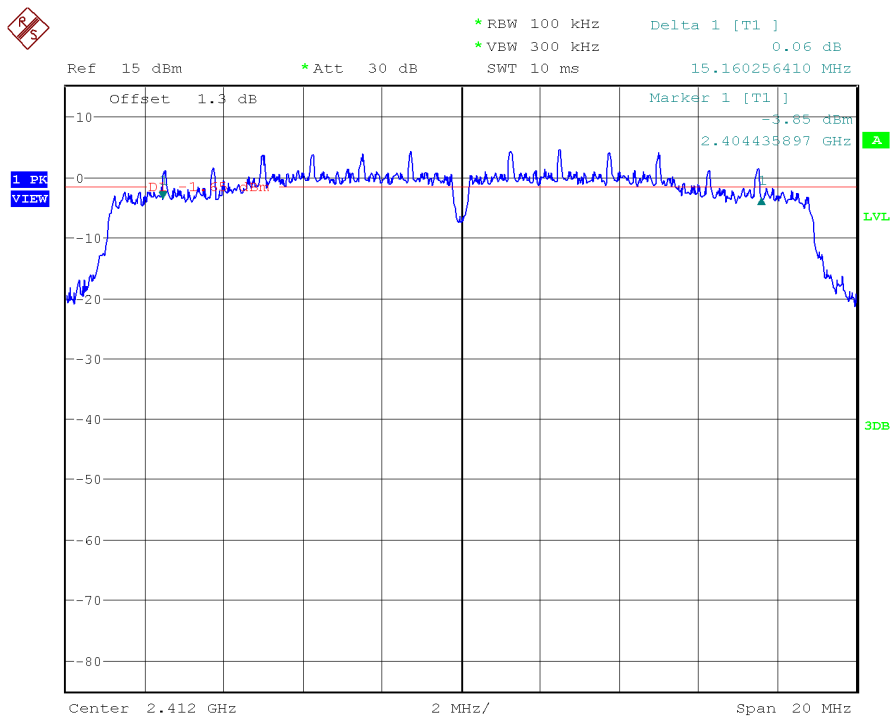


3. WiFi 2.4GHz 802.11 n20 mode

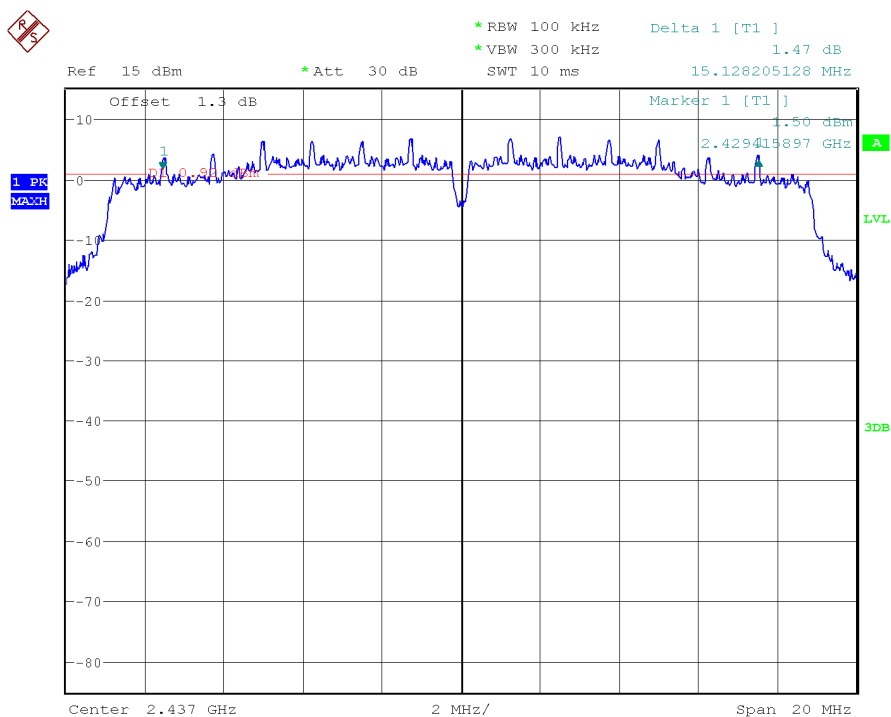
Lowest Channel: 2412 MHz. Chain A



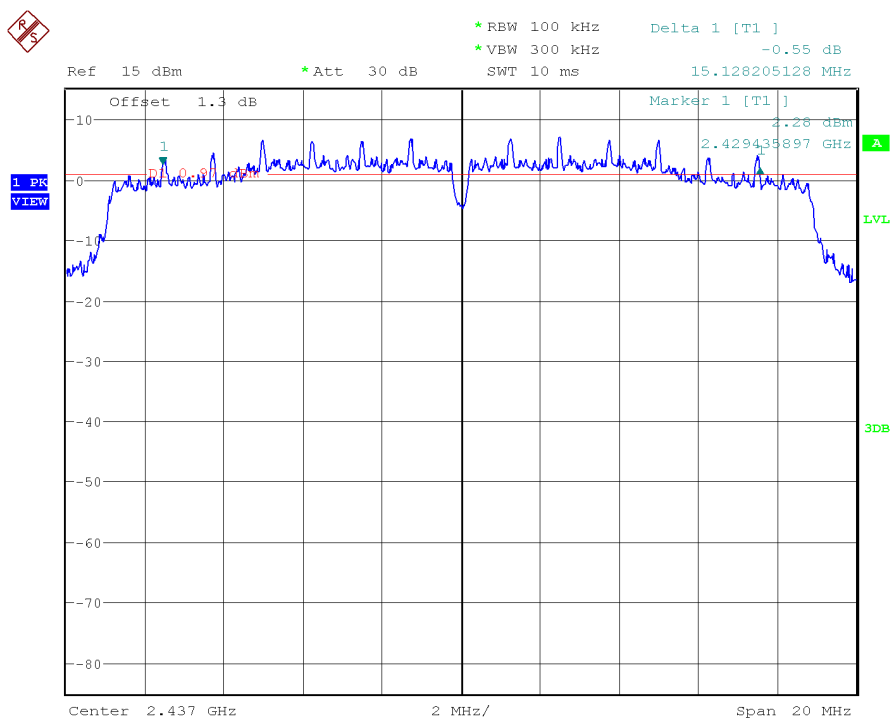
Lowest Channel: 2412 MHz. Chain B



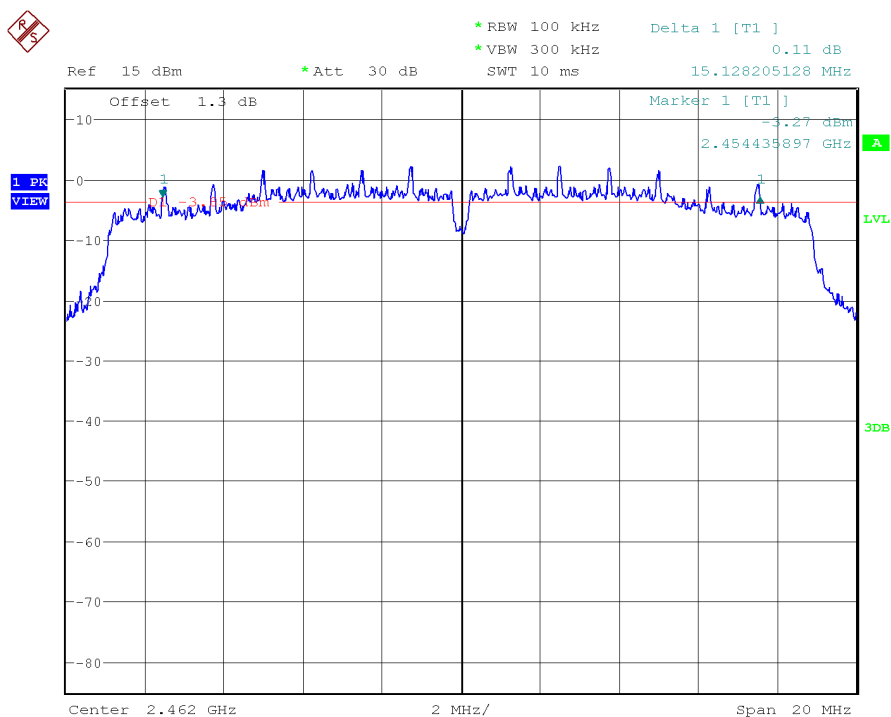
Middle Channel: 2437 MHz. Chain A



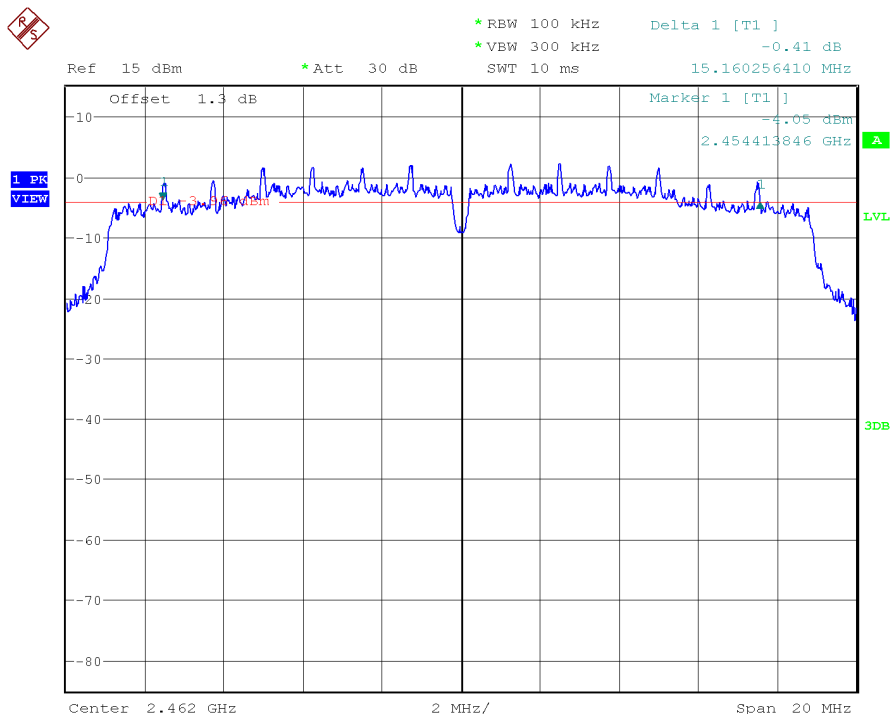
Middle Channel: 2437 MHz. Chain B



Highest Channel: 2462 MHz. Chain A

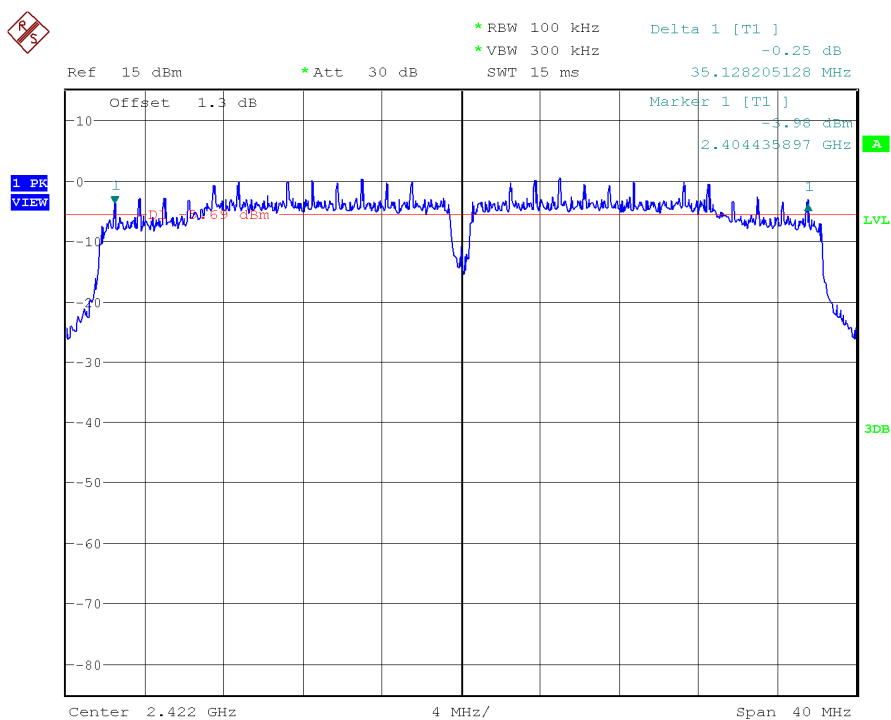


Highest Channel: 2462 MHz. Chain B

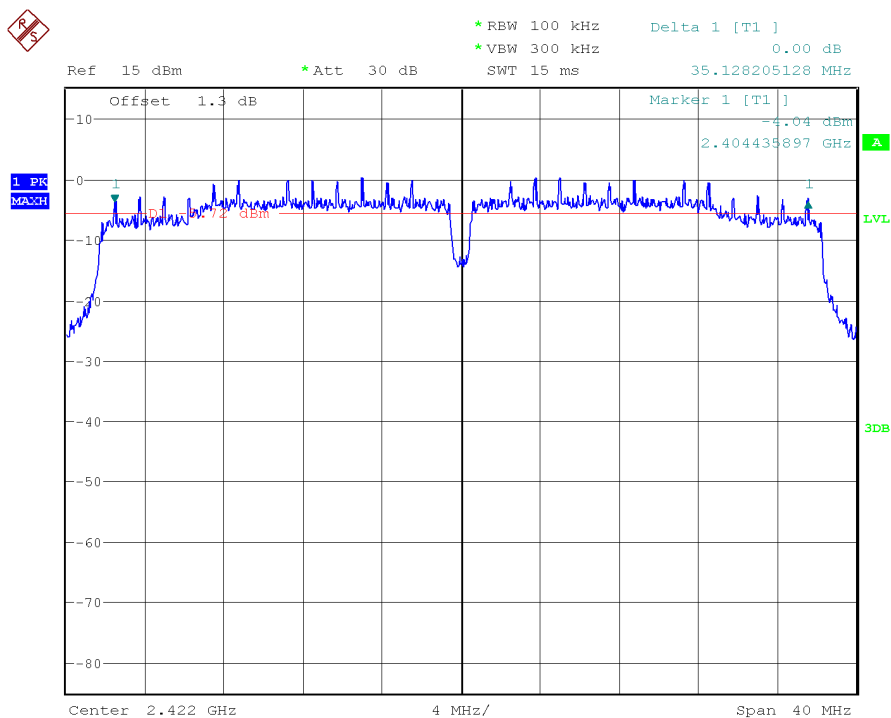


4. WiFi 2.4GHz 802.11 n40 mode

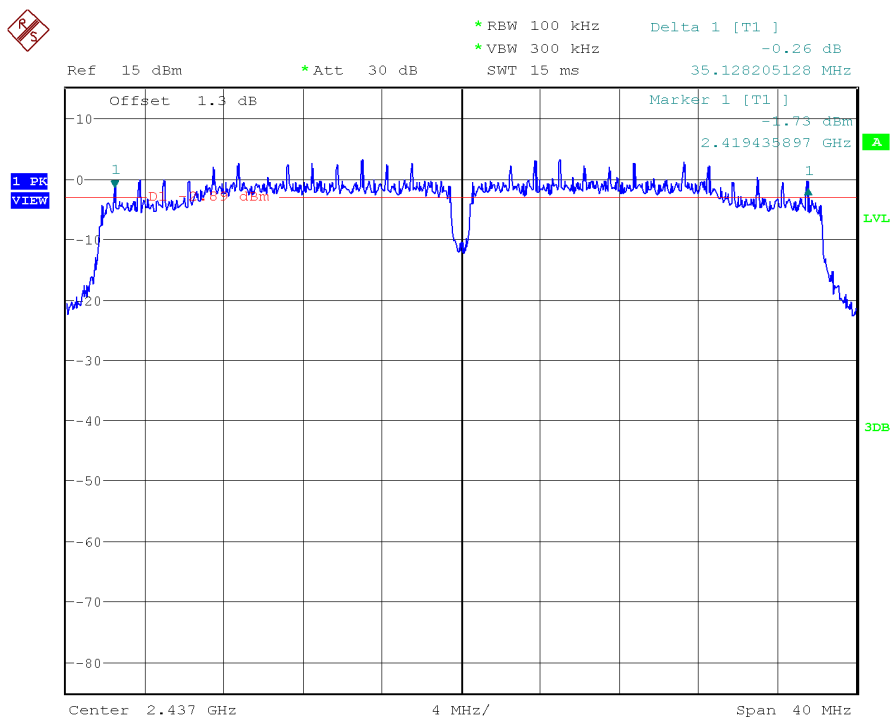
Lowest Channel: 2422 MHz. Chain A



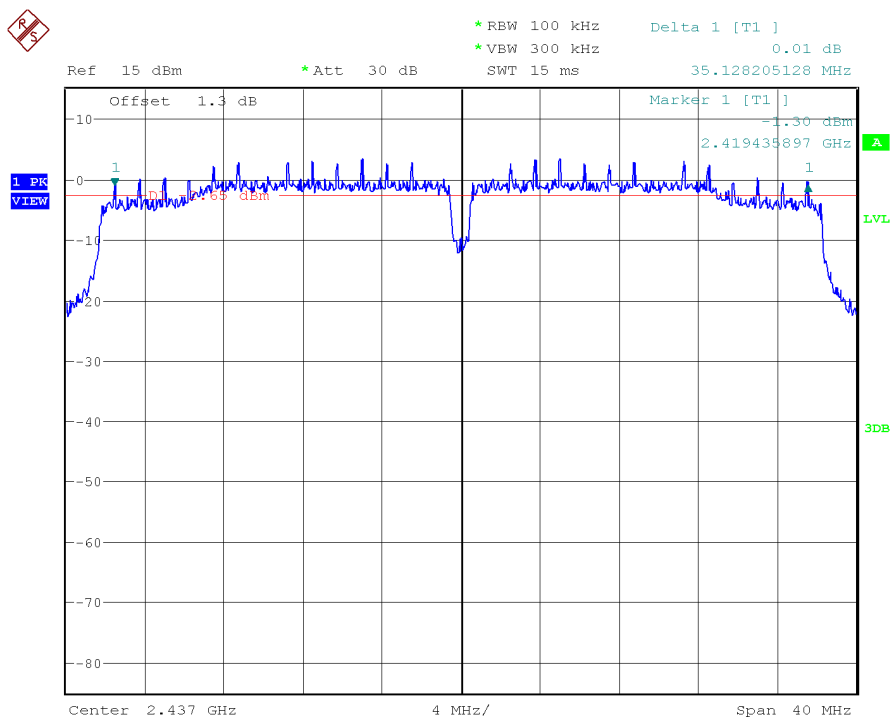
Lowest Channel: 2422 MHz. Chain B



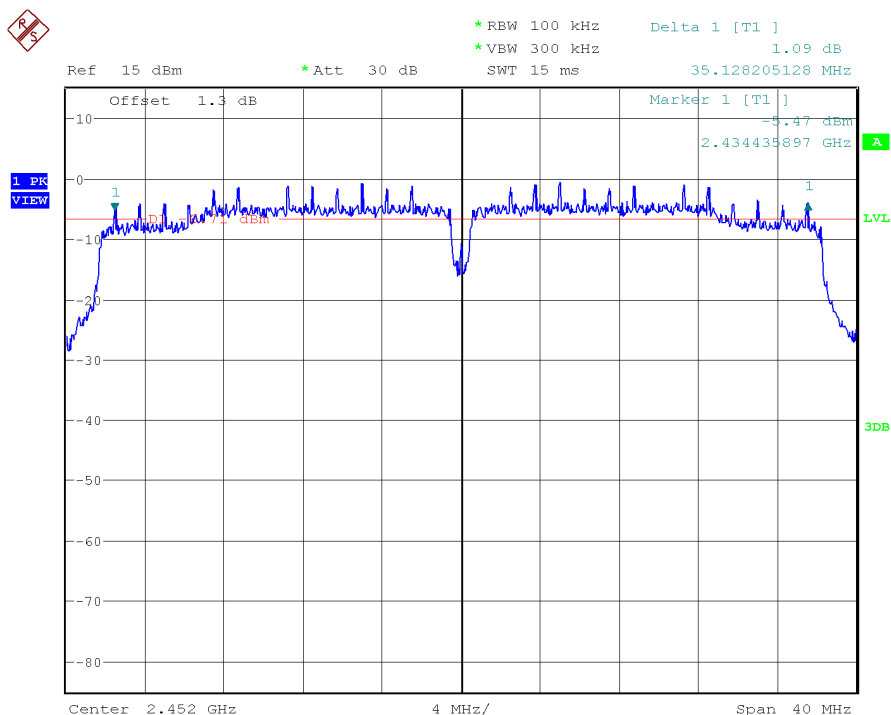
Middle Channel: 2437 MHz. Chain A



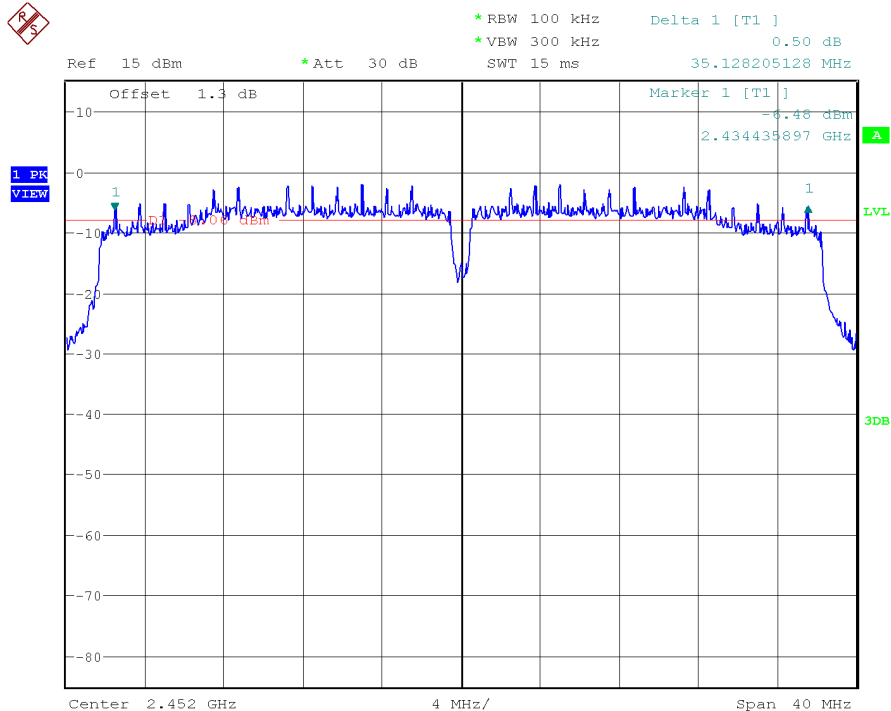
Middle Channel: 2437 MHz. Chain B



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 with peak detector method according to point 2.0. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r02 dated 06/05/2014. This method was used for 802.11g and 802.11n20 modes.

The maximum conducted (average) output power was measured using the method according to point 9.2.2.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r02 dated 06/05/2014. This method was used for 802.11b 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 v02r01 dated 10/31/2013 was used.

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

1. 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)	16.64	16.88	17.66	17.62	16.60	16.85
Maximum EIRP power (dBm)	19.88	20.12	20.90	20.86	19.84	20.09
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) – Peak “integrated method”	15.47	16.23	18.57	18.84	13.71	14.16
Maximum EIRP power (dBm)	18.71	19.47	21.81	22.08	16.95	17.40
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

Conducted (average) output power. These results are for information purposes only.

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)	14.03	14.77	17.22	17.67	12.37	12.81
Maximum EIRP power (dBm)	17.27	18.01	20.46	20.91	15.61	16.05
Measurement uncertainty (dB)	±1.5					

3. WiFi 2.4GHz 802.11 n20 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)	14.75	15.84	18.77	18.66	13.64	14
Maximum EIRP power (dBm)	17.99	19.08	22.01	21.90	16.88	17.24
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)	13.15	13.35	18.89	18.85	13.68	13.53
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	16.26		21.88		16.61	
Maximum EIRP power (dBm)	19.50		25.12		19.85	
Measurement uncertainty (dB)	±1.5		±1.2		±1.5	

Verdict: PASS

Conducted (average) output power. These results are for information purposes only.

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)	14.15	14.34	17.57	17.43	12.26	12.64
Maximum EIRP power (dBm)	17.39	17.58	20.81	20.67	15.50	15.88
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)	11.89	12.15	17.67	17.76	12.29	12.26
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	15.03		20.72		15.28	
Maximum EIRP power (dBm)	18.27		23.96		18.52	
Measurement uncertainty (dB)	±1.5		±1.2		±1.5	

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)	13.73	13.43	16.58	16.36	12.23	11.35
Maximum EIRP power (dBm)	16.97	16.67	19.82	19.60	15.47	14.59
Measurement uncertainty (dB)	±1.5					

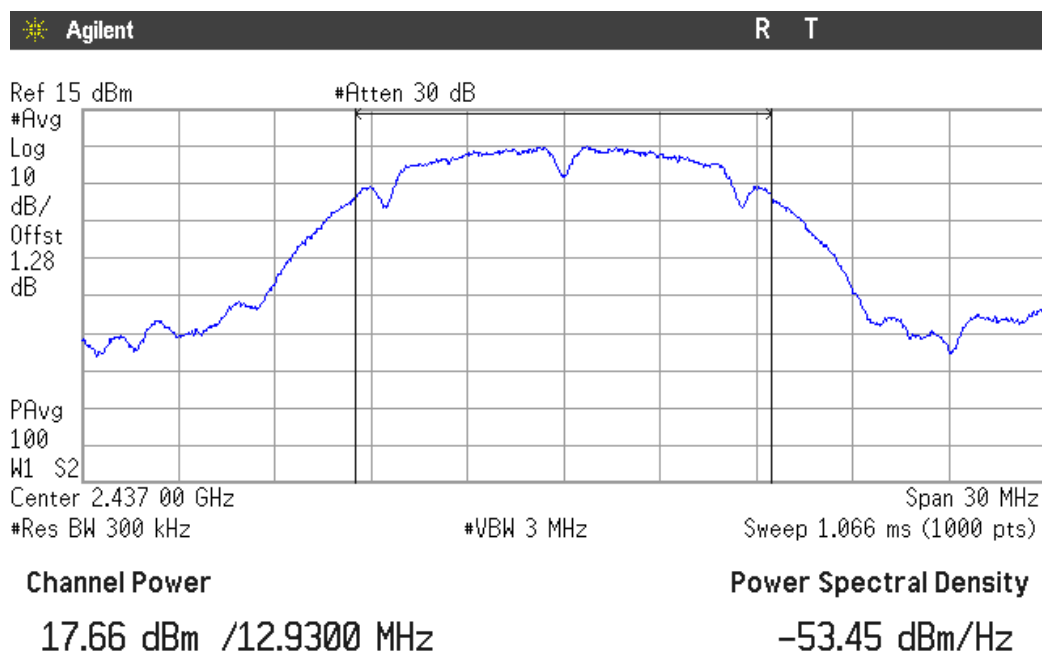
MIMO	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A+B		Chain A+B		Chain A+B	
	Port A	Port B	Port A	Port B	Port A	Port B
Maximum conducted power (dBm)	9.56	9.72	13.66	13.89	9.39	9.88
	Port A+B		Port A+B		Port A+B	
Maximum conducted power (dBm)	12.65		16.78		12.65	
Maximum EIRP power (dBm)	15.89		20.02		15.89	
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

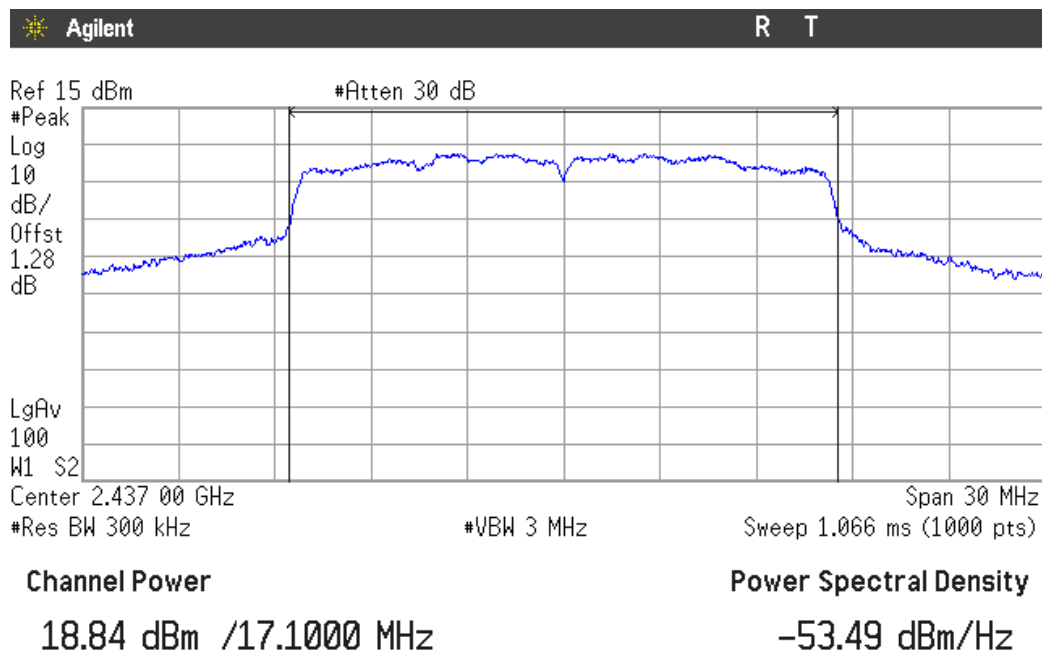
Middle frequency 2437 MHz. Chain A.



2. WiFi 2.4GHz 802.11 g mode

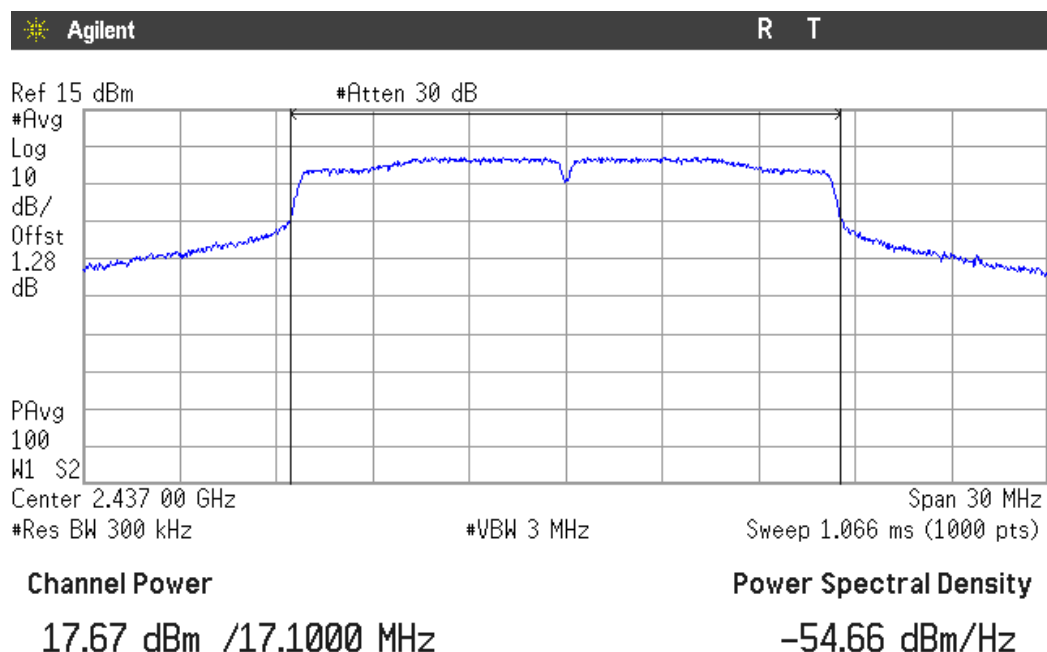
Peak conducted output power.

Middle frequency 2437 MHz. Chain B.



Conducted (average) output power (for information purposes only).

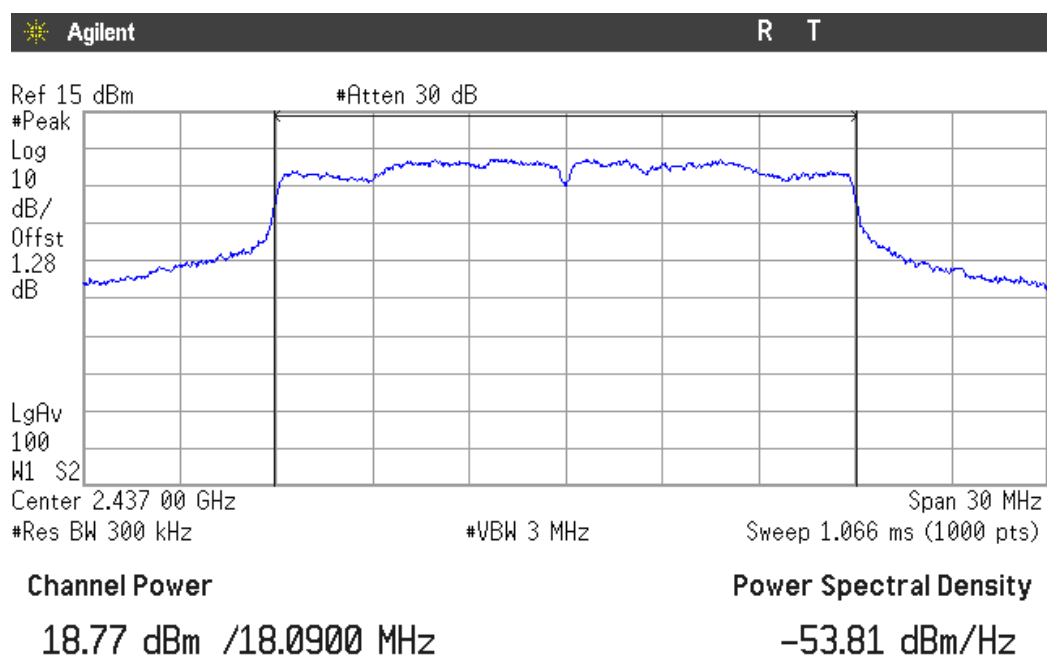
Middle frequency 2437 MHz. Chain B.



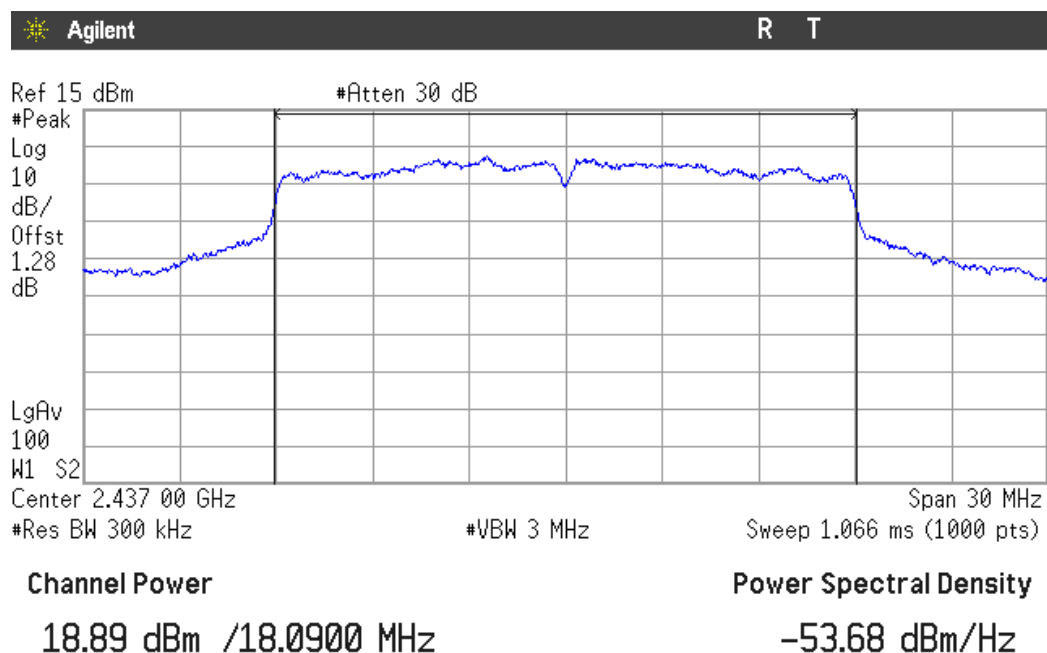
3. WiFi 2.4GHz 802.11 n20 mode

Peak conducted output power.

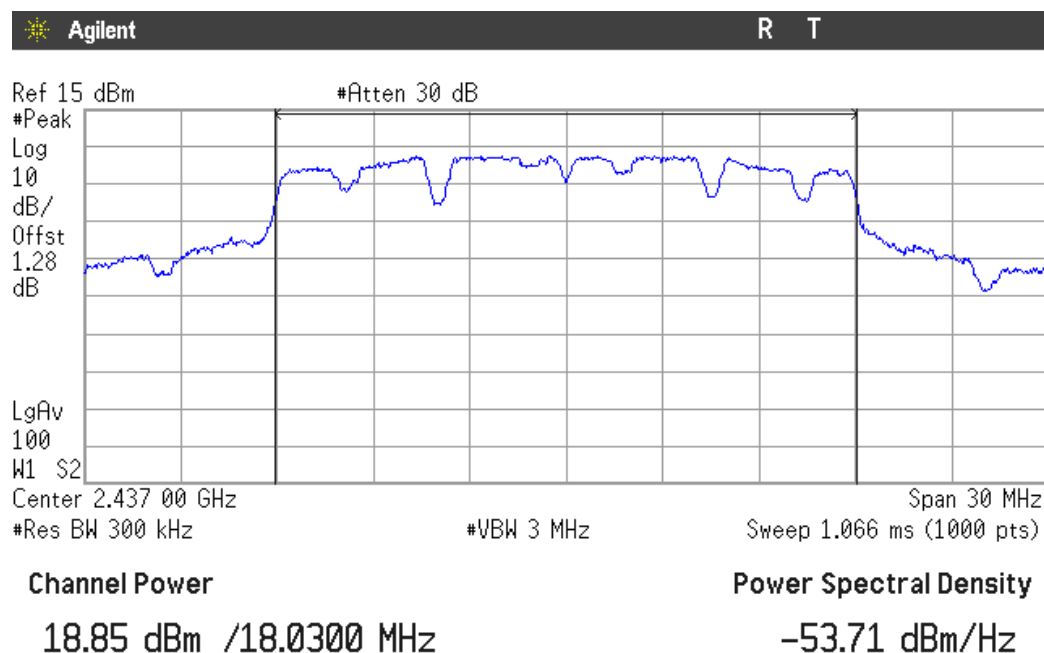
SISO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain A.

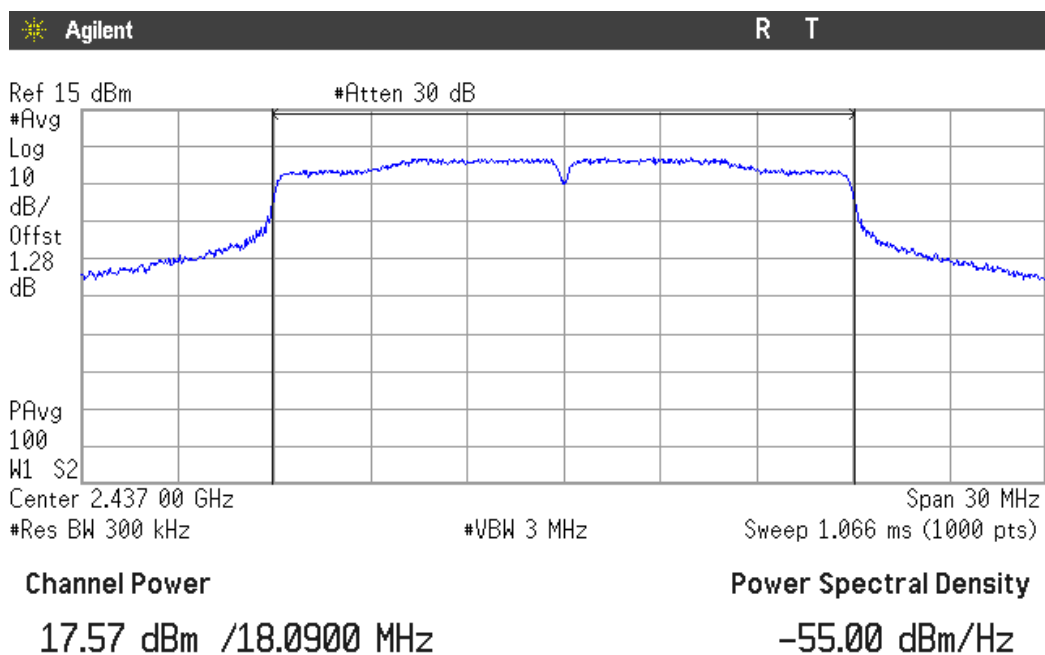


MIMO mode. Middle frequency 2437 MHz. Chain B.

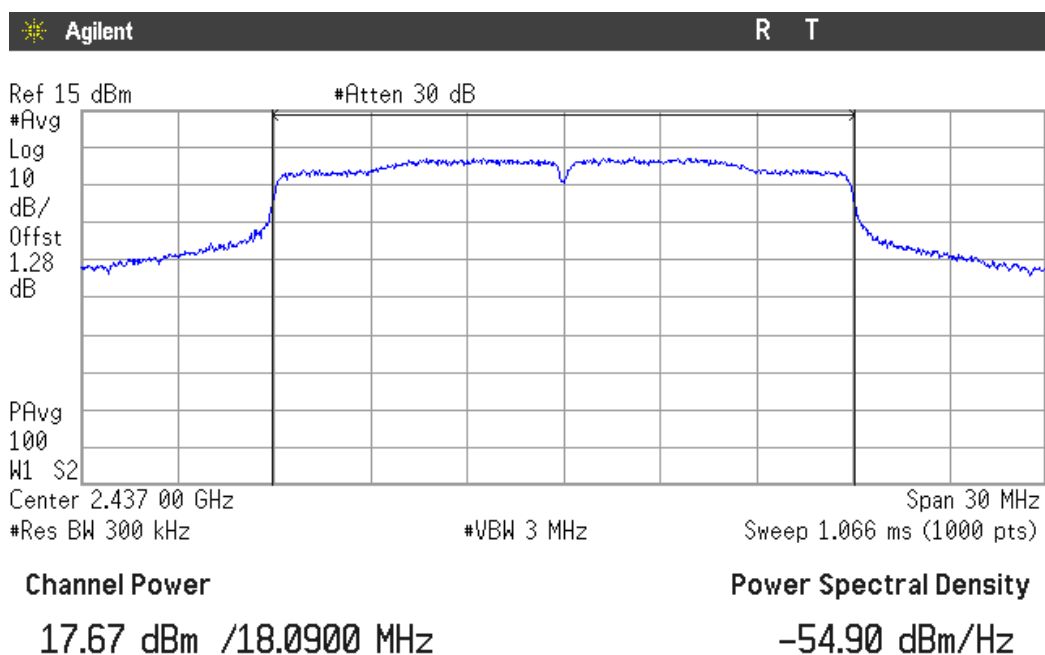


Conducted (average) output power (for information purposes only).

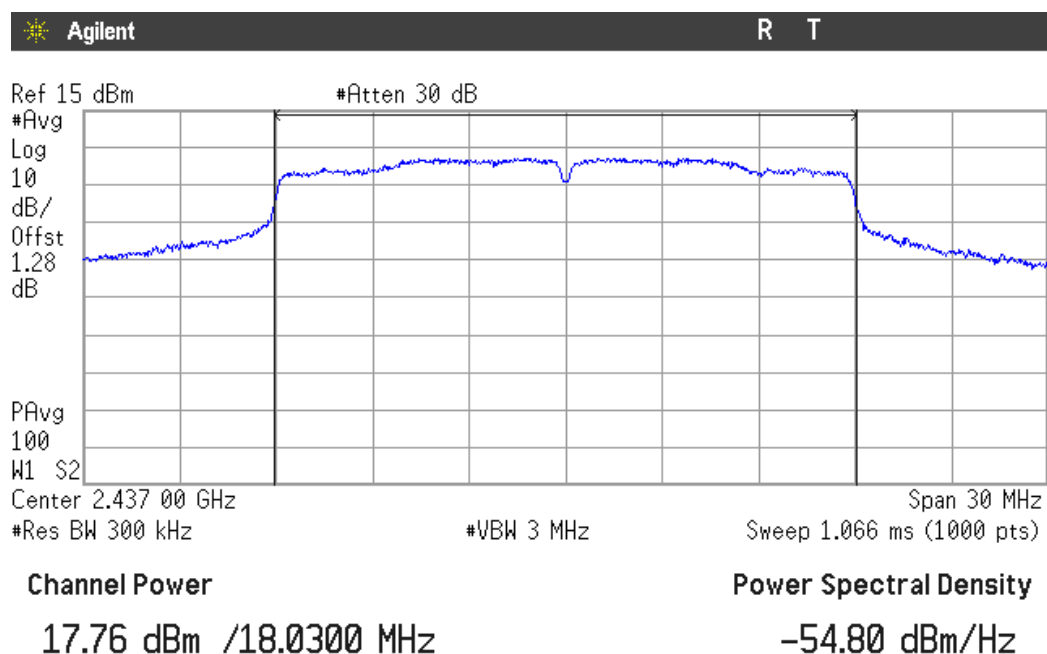
SISO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain A.

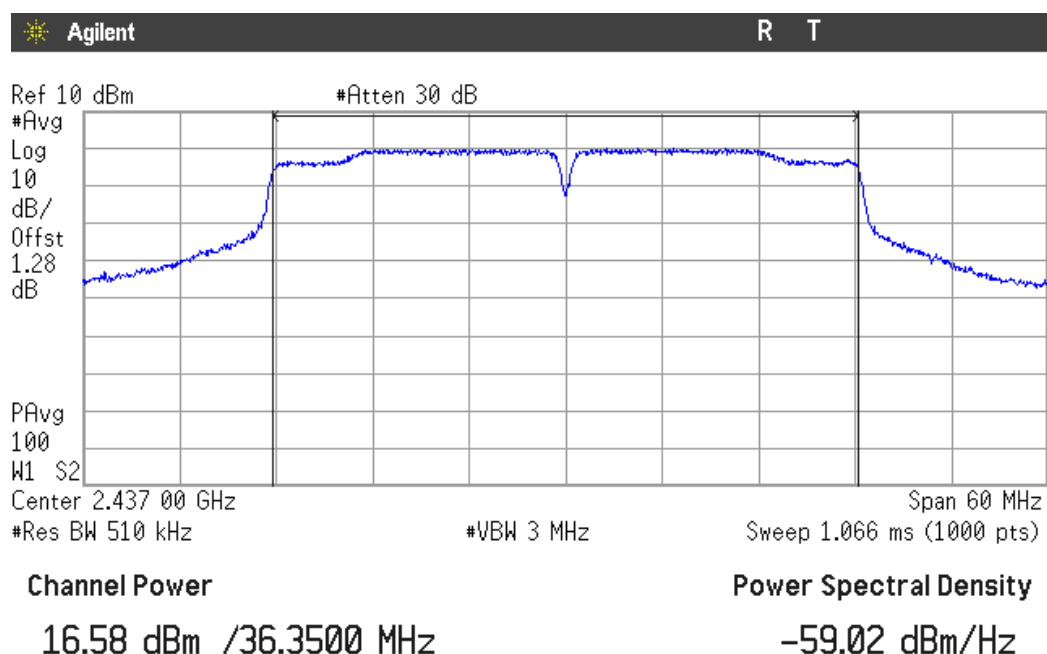


MIMO mode. Middle frequency 2437 MHz. Chain B.

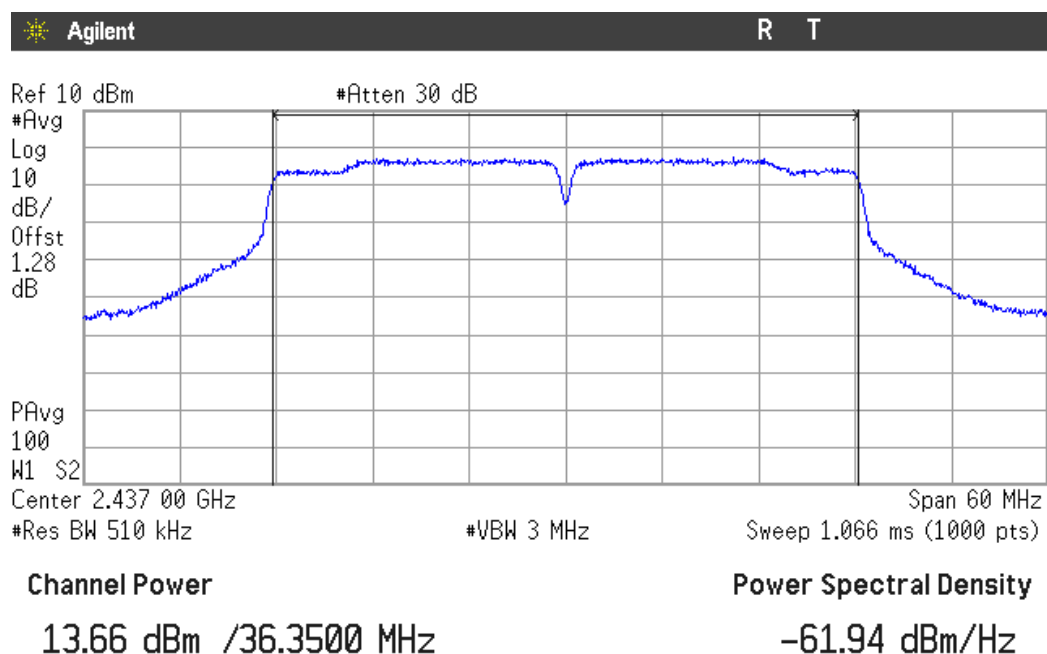


4. WiFi 2.4GHz 802.11 n40 mode

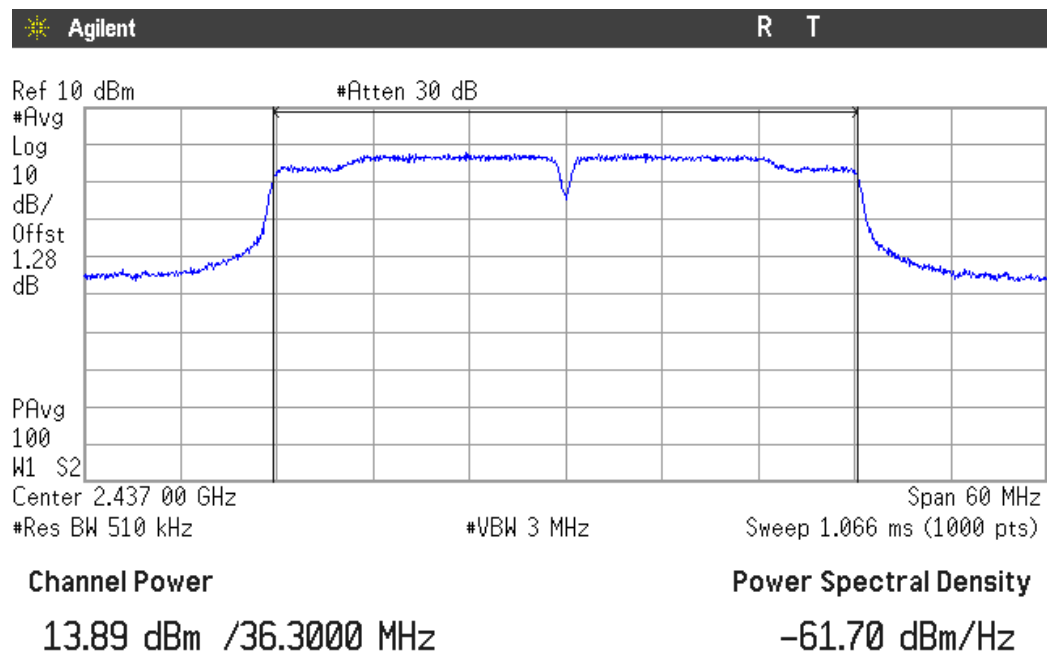
SISO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain A.



MIMO mode. Middle frequency 2437 MHz. Chain B.



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:

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)	7.98	8.14	8.90	8.75	7.44	7.65
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-22.02 / -21.86

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-21.10 / -21.25

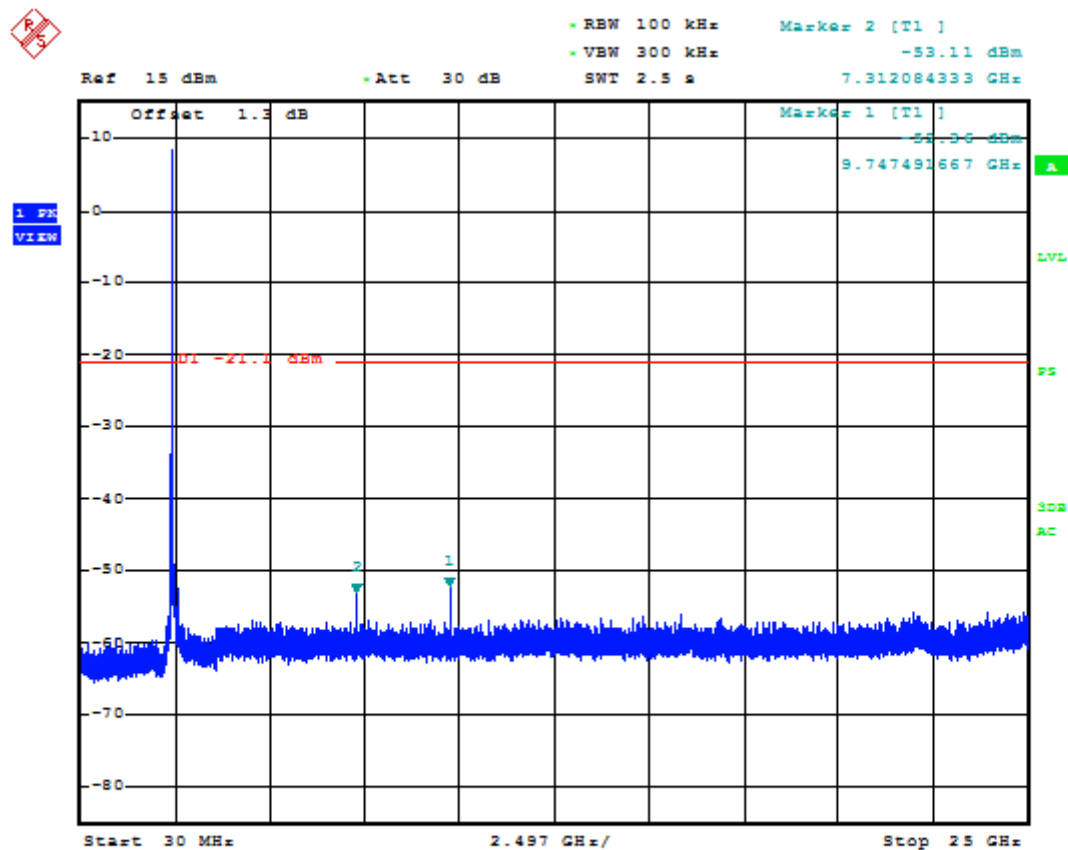
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-22.56 / -22.35

Verdict: PASS

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

Number of sweep points: 30,000.

Plot 30 MHz to 25 GHz:



Date: 26.AUG.2014 11:43:49

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)	4.06	4.43	6.64	6.51	1.37	1.89
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-15.94 / -15.57

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-13.36 / -13.49

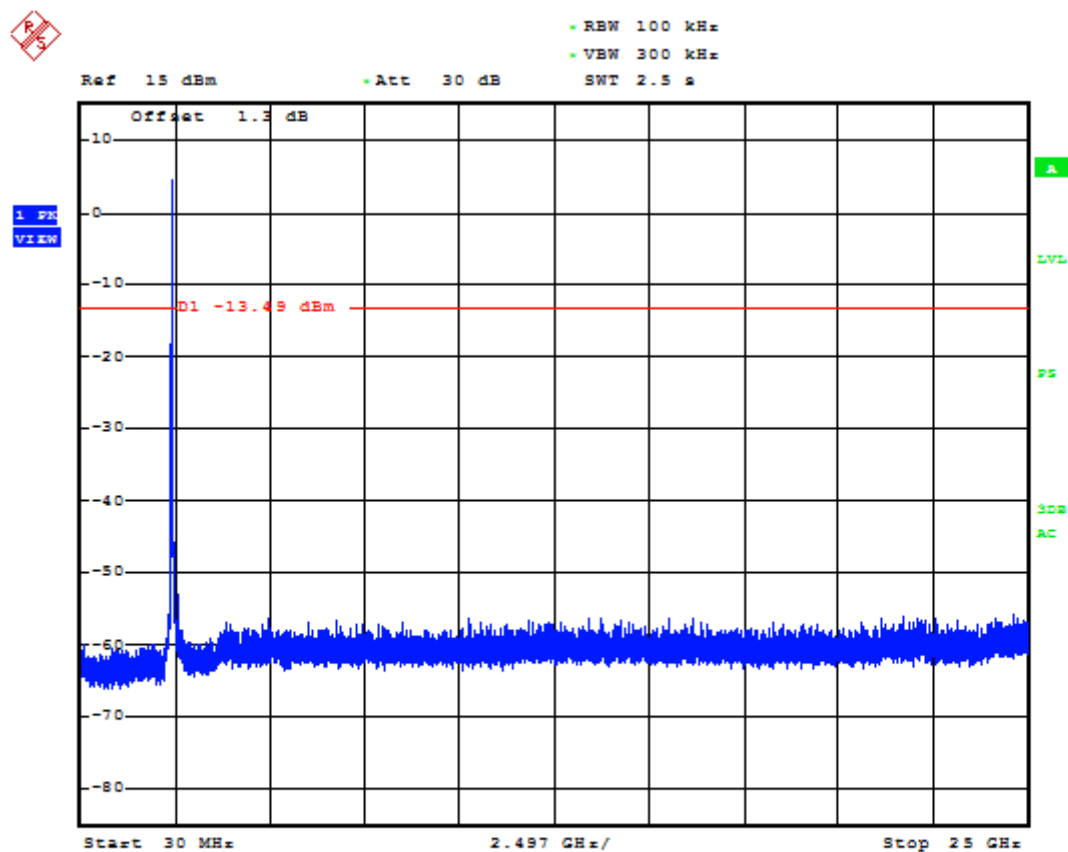
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-18.63/ -18.11

Verdict: PASS

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

Number of sweep points: 30,000.

Plot 30 MHz to 25 GHz:



Date: 26.AUG.2014 12:11:51

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)	4.10	4.14	6.75	6.55	1.36	1.72
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-15.90 / -15.86

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-13.25 / -13.45

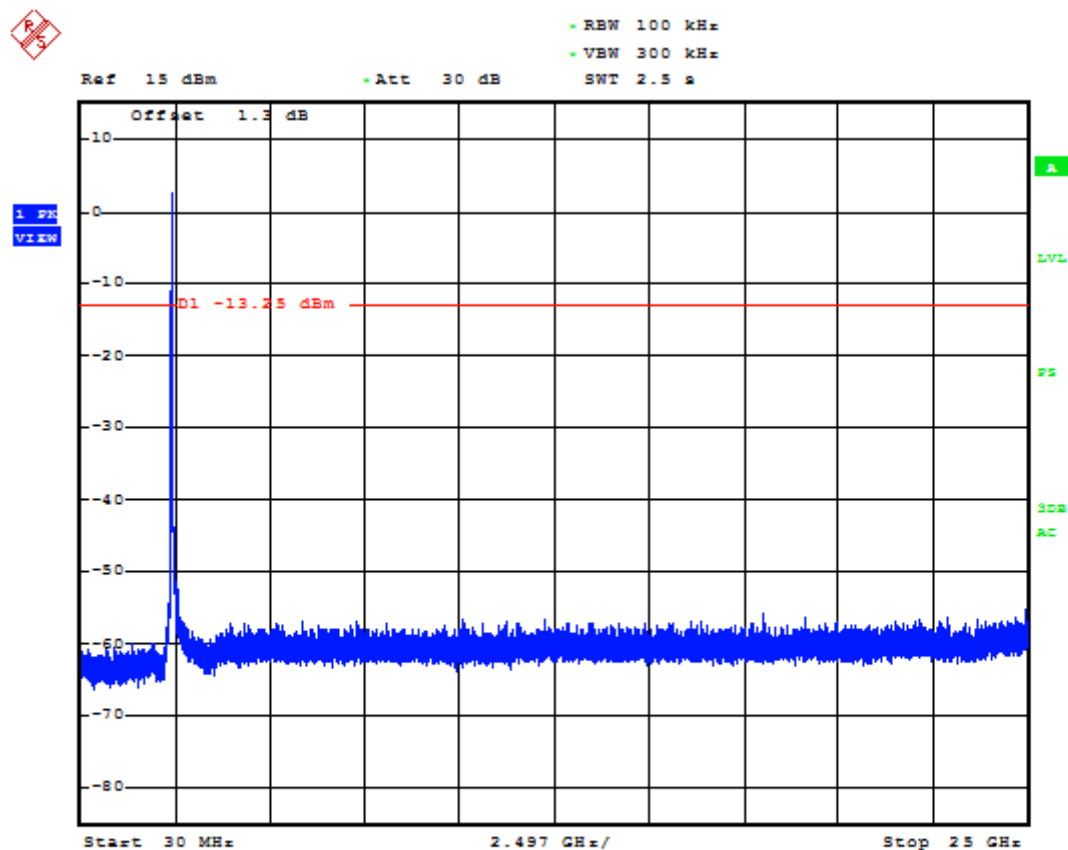
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-18.64/ -18.28

Verdict: PASS

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

Number of sweep points: 30,000.

Plot 30 MHz to 25 GHz



Date: 26.AUG.2014 12:31:43

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)	0.27	0.22	2.33	3.13	-1.32	-2.05
Measurement uncertainty (dB)	±1.5					

Chain A / B:

Lowest frequency 2412 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-29.73 / -29.78

Middle frequency 2437 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-27.67 / -26.87

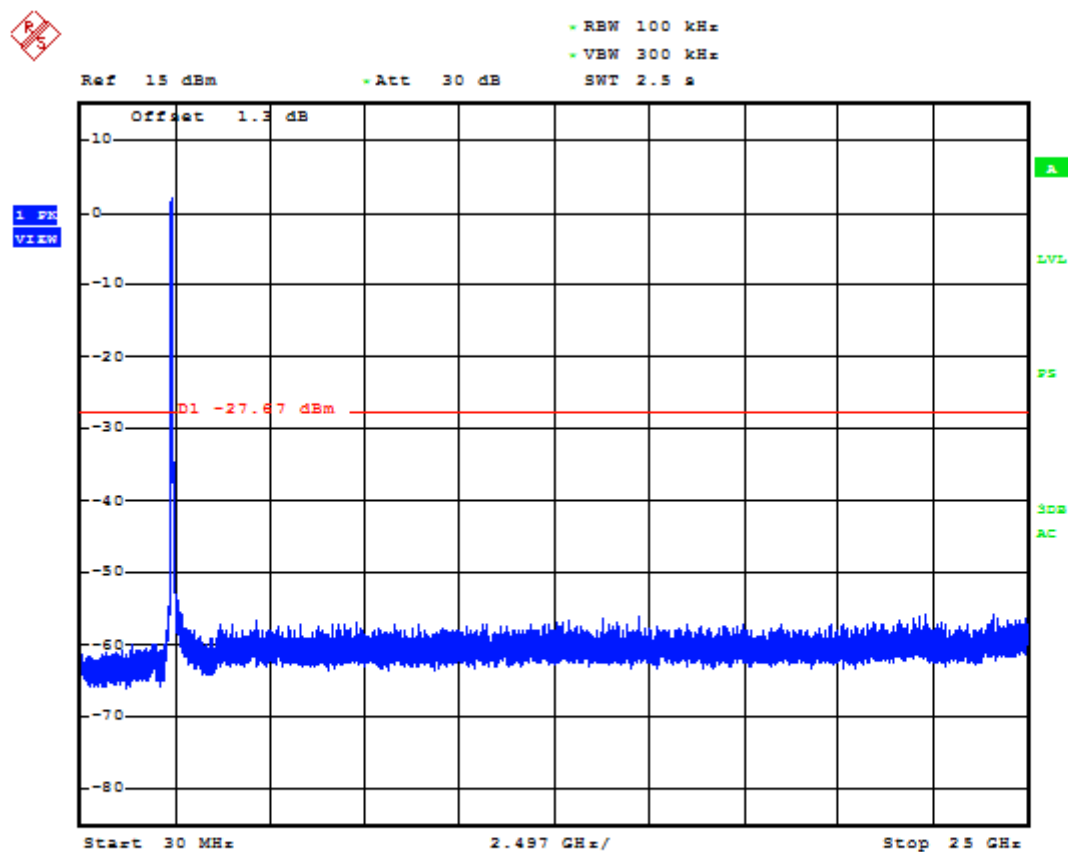
Highest frequency 2462 MHz	Limit (dBm)
All peaks are more than 20 dB below the limit.	-31.32 / -32.05

Verdict: PASS

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

Number of sweep points: 30,000.

Plot 30 MHz to 25 GHz



Date: 26.AUG.2014 12:51:44

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:

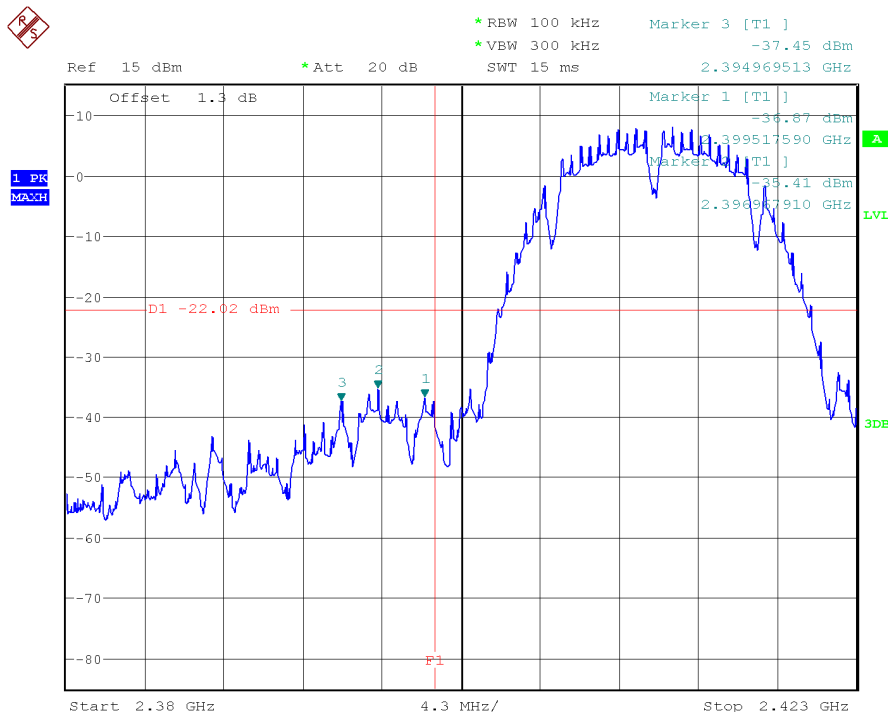
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

LOW FREQUENCY SECTION 2412 MHz. CONDUCTED.

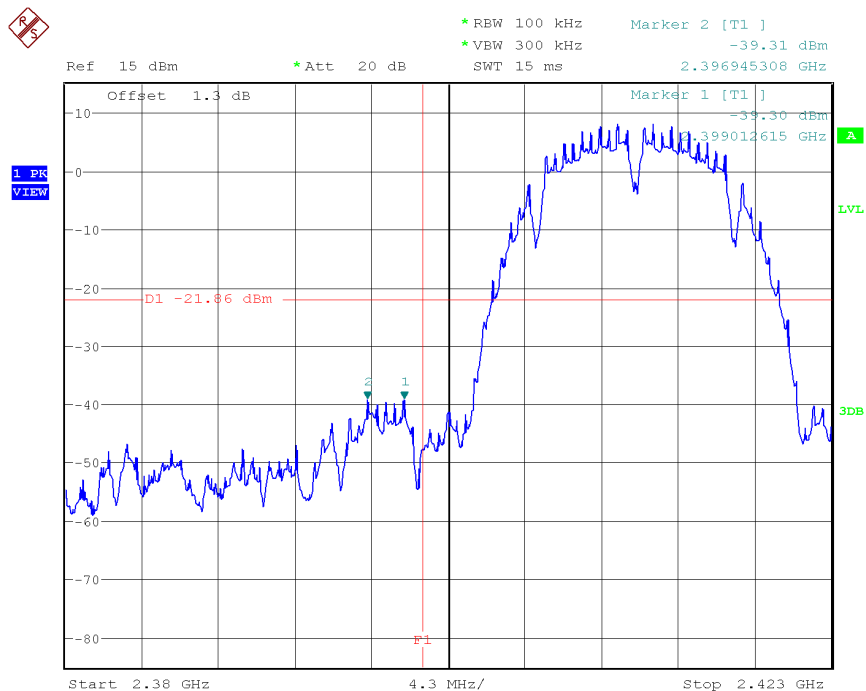
1. WiFi 2.4GHz 802.11 b mode

See next plots.

Chain A



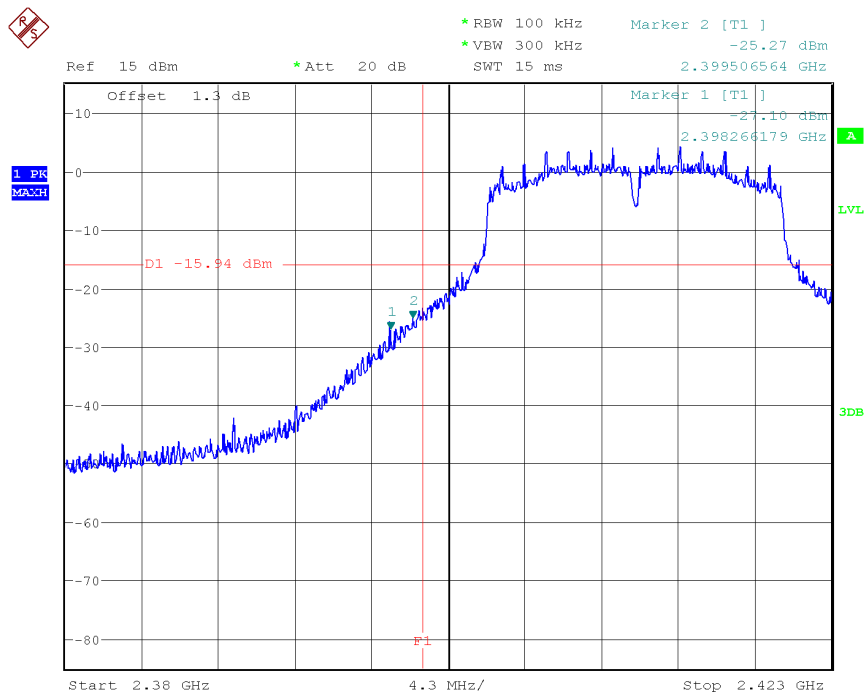
Chain B



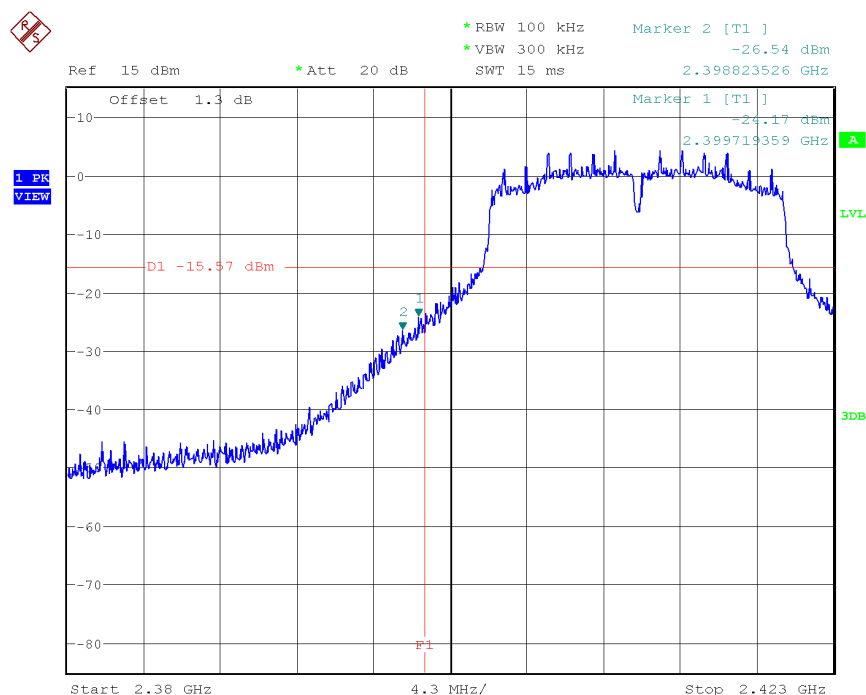
Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode

Chain A



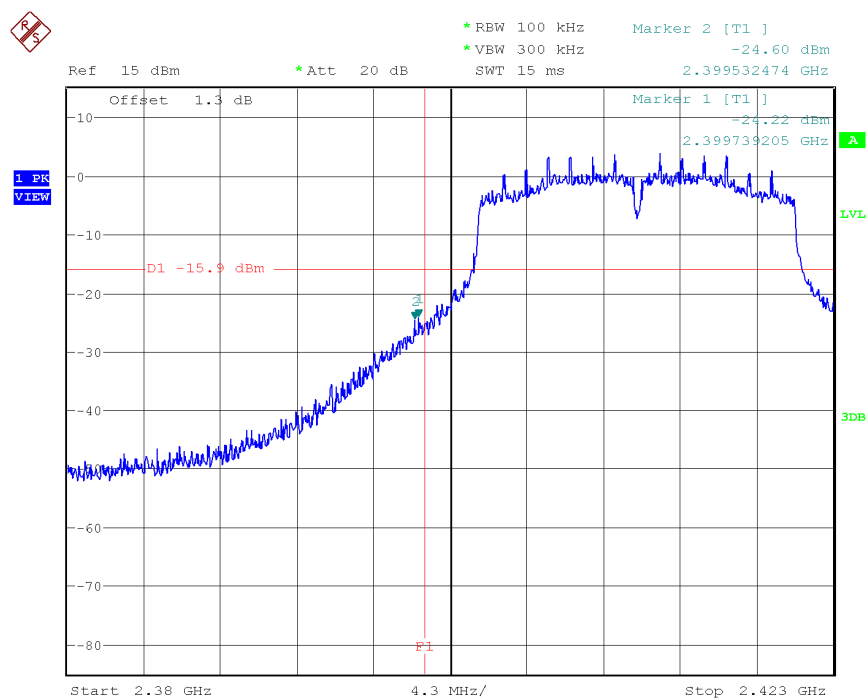
Chain B



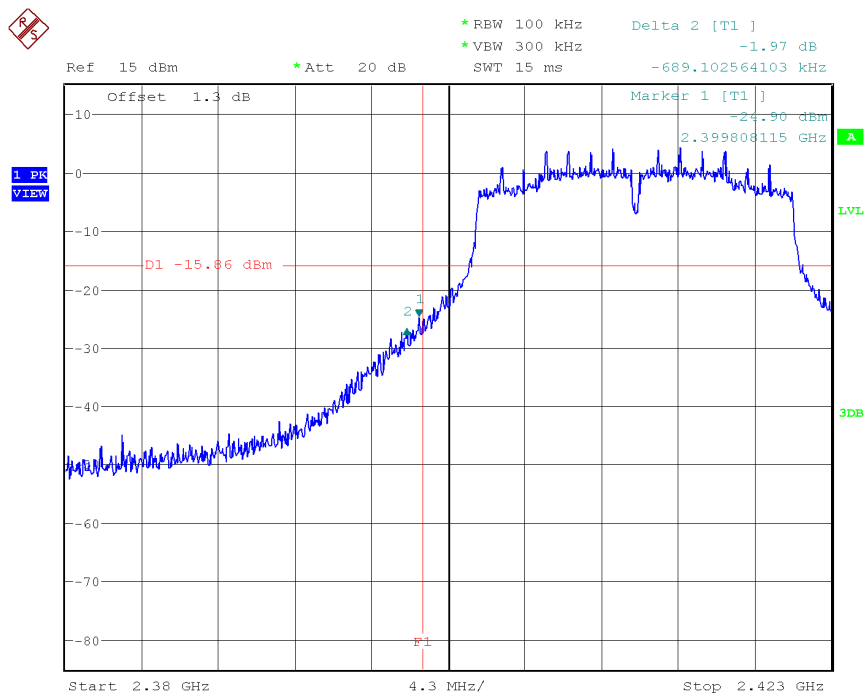
Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

3. WiFi 2.4GHz 802.11 n20 mode

Chain A



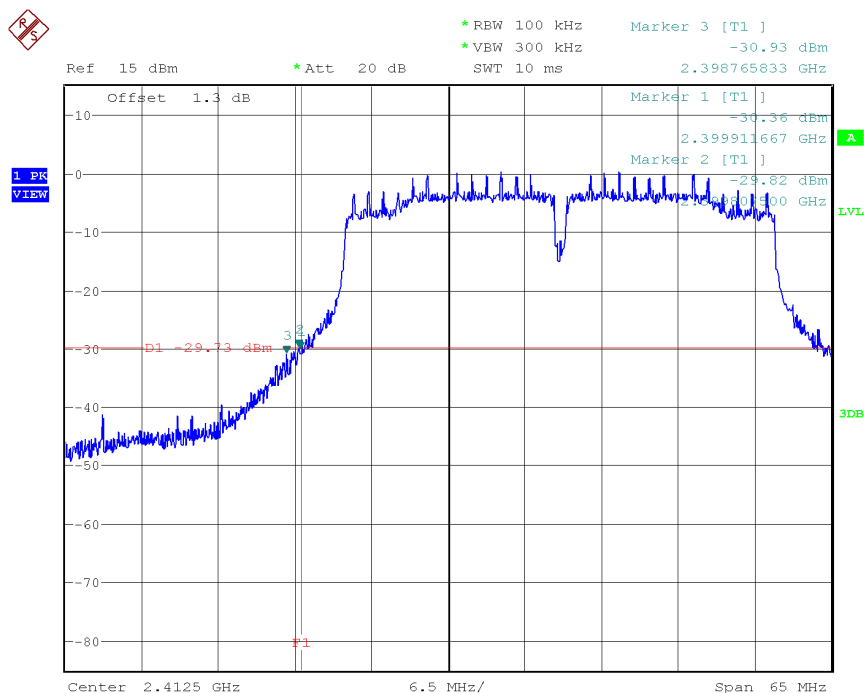
Chain B



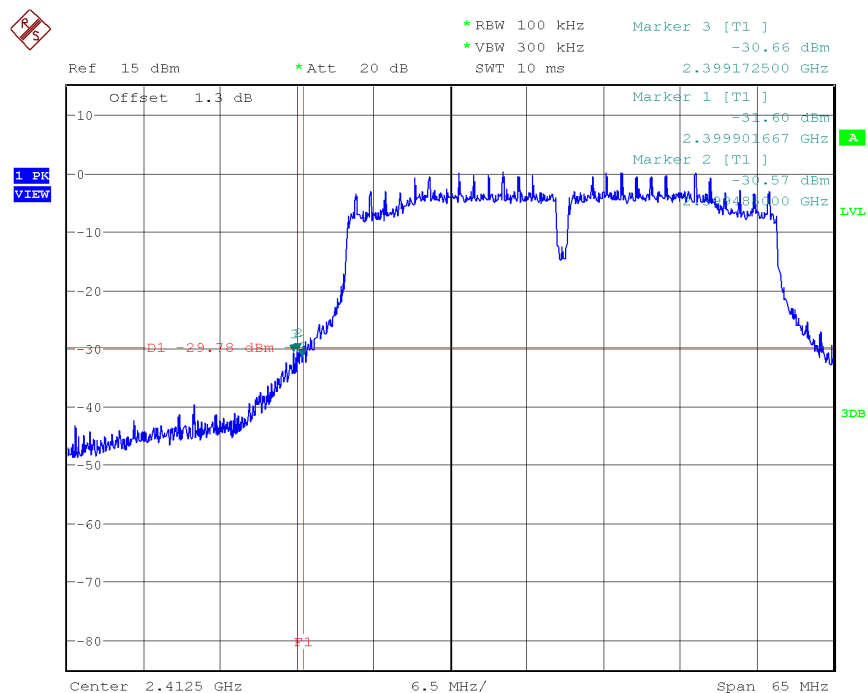
Verdict: PASS (NOTE: The limit is set to -20 dBc since the maximum peak conducted output power was measured for this mode.)

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 v03r02 dated 06/05/2014. This method was used for 802.11b and 802.11n40 modes.

For 802.11g and 802.11n20 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 $10 \log(N_{ANT})$ dB*, (where N_{ANT} is the number of outputs) technique was used according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013.

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

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)	-0.713	-0.180	0.257	0.654	-0.339	-0.013
Measurement uncertainty (dB)	±1.5					

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)	4.08	5.10	7.19	7.26	2.23	2.81
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)	4.20	5.05	7.25	7.39	2.36	2.32
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)	2.48	1.95	-8.28	-8.46	2.81	2.30
Power spectral density (dBm) + 10*Log(2)	5.4903	4.9603	-5.2697	-5.4497	5.8203	5.3103
Measurement uncertainty (dB)	±1.5		±1.2		±1.5	

Verdict: PASS (NOTE: the PKPSD (peak PSD) method was used since the maximum peak conducted output power was measured for this mode. The Middle channel (MIMO A+B) was measured with RBW=3 kHz and VBW=30 kHz.)

4. WiFi 2.4GHz 802.11 n40 mode

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

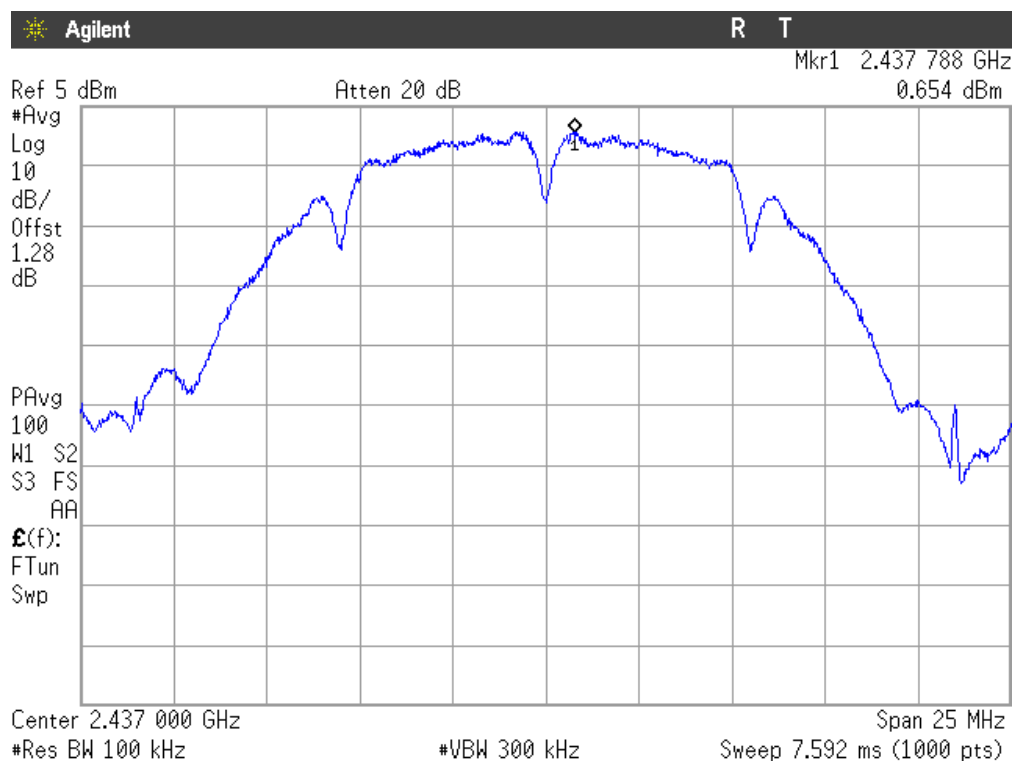
	Lowest frequency 2422 MHz		Middle frequency 2437 MHz		Highest frequency 2452 MHz	
	Chain A	Chain B	Chain A	Chain B	Chain A	Chain B
Power spectral density (dBm)	-9.051	-8.502	-6.007	-5.427	-10.101	-10.990
Measurement uncertainty (dB)	±1.5					

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)	-12.831	-12.805	-8.696	-8.147	-12.449	-12.278
Power spectral density (dBm) + 10*Log(2)	-9.8207	-9.7947	-5.6857	-5.1367	-9.4387	-9.2677
Measurement uncertainty (dB)	±1.5					

Verdict: PASS

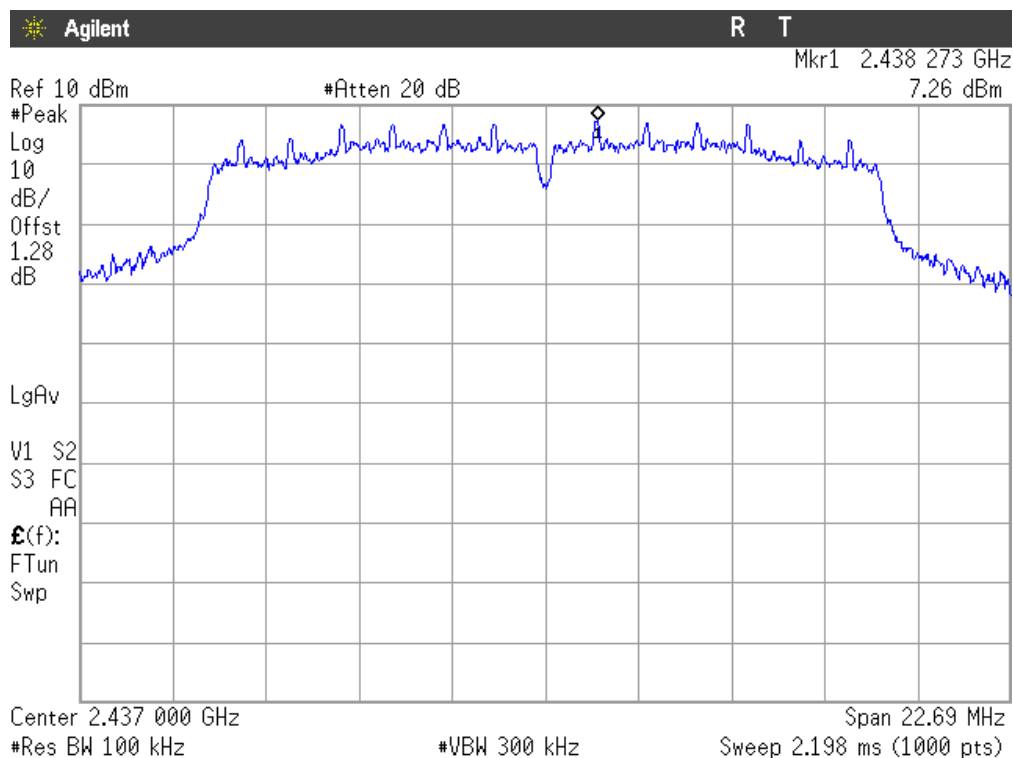
1. WiFi 2.4GHz 802.11 b mode

Middle Channel: 2437 MHz. Chain B.



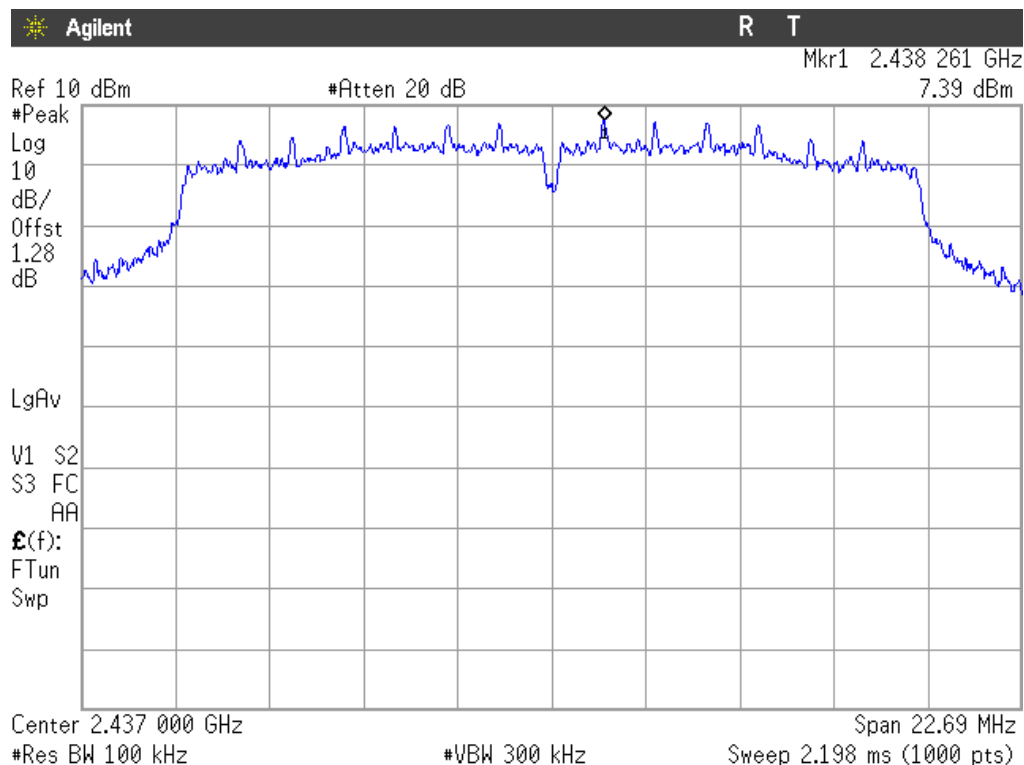
2. WiFi 2.4GHz 802.11 g mode

Middle Channel: 2437 MHz. Chain B.

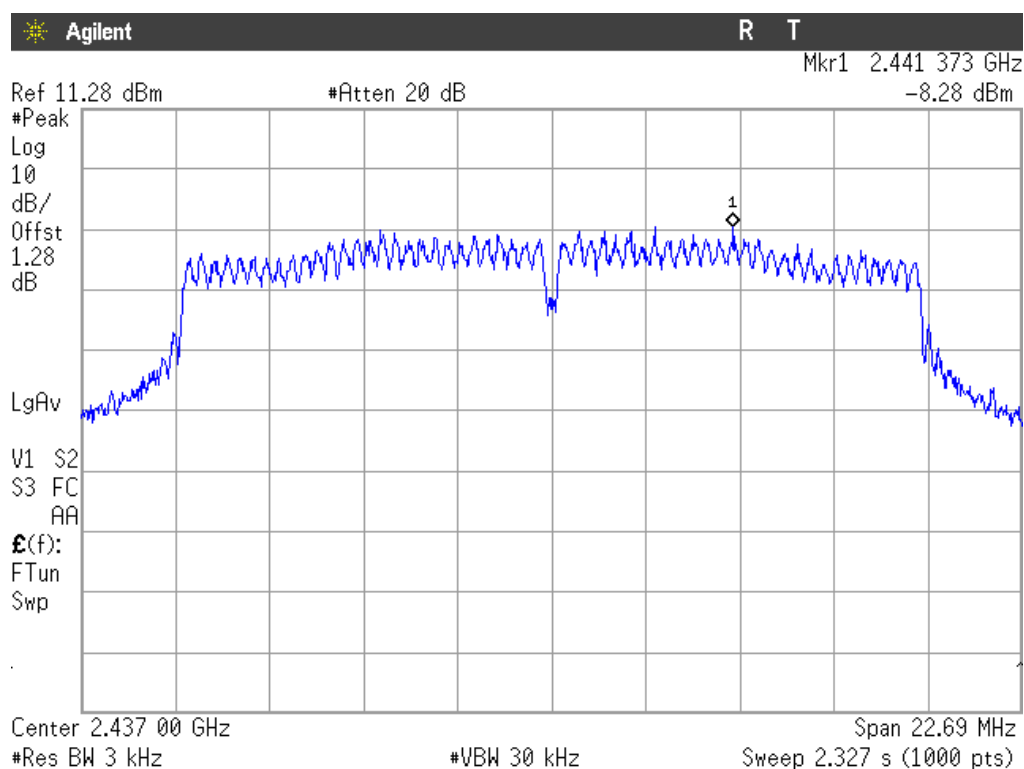


3. WiFi 2.4GHz 802.11 n20 mode

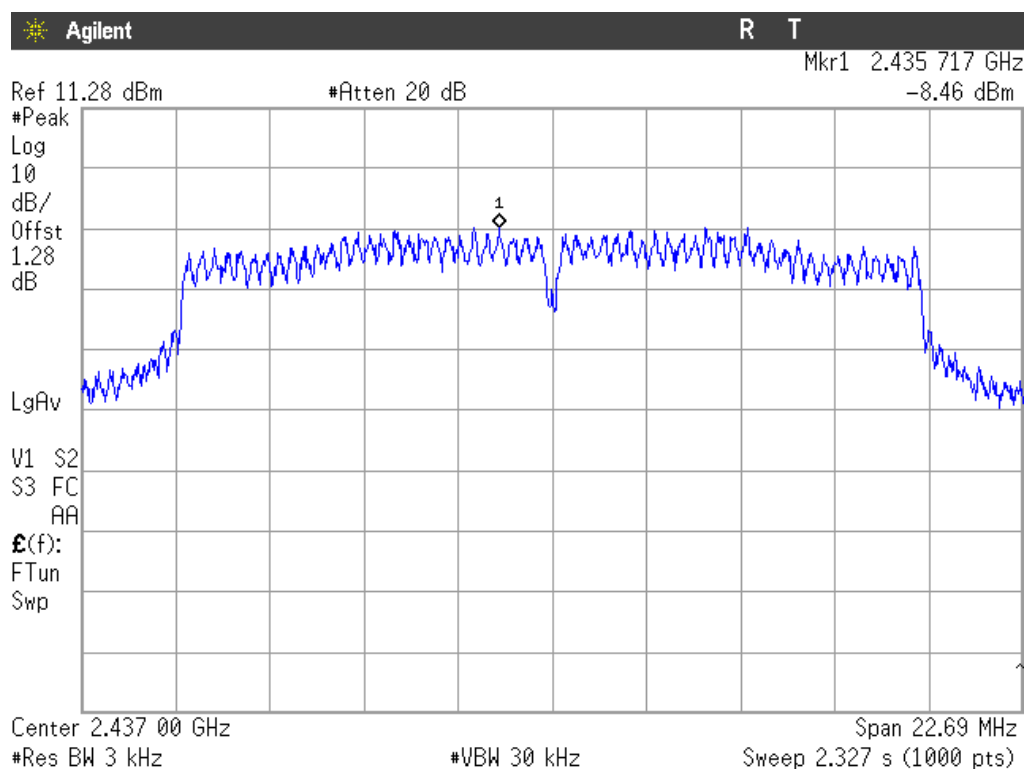
SISO. Middle Channel: 2437 MHz. Chain B.



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

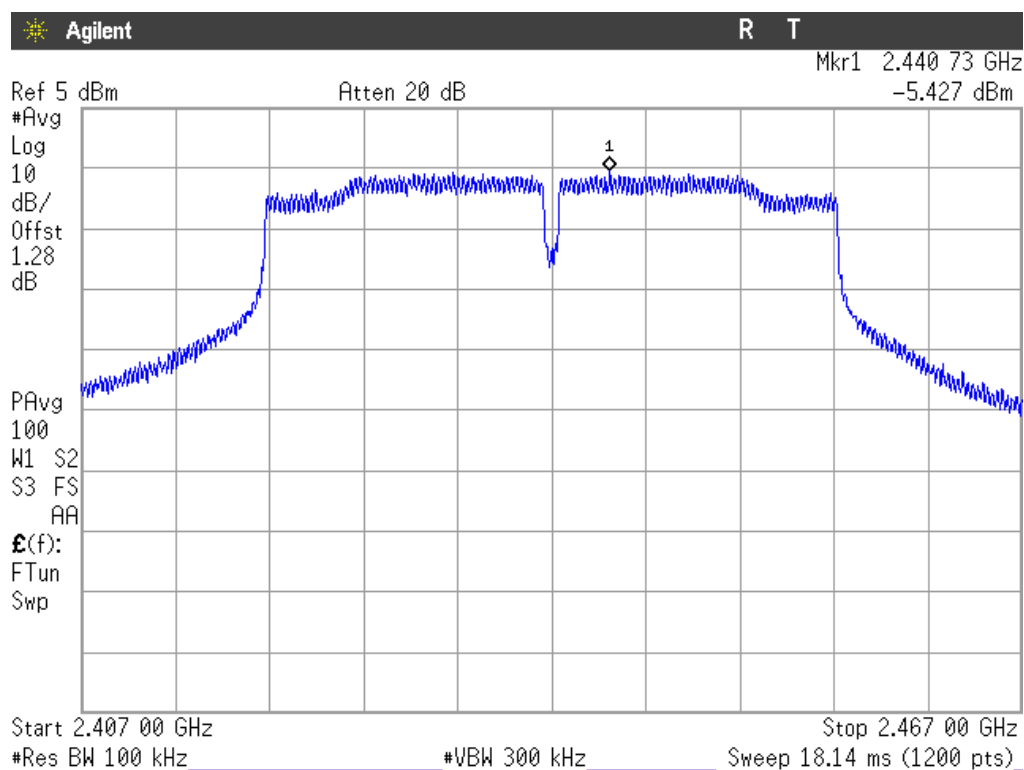


MIMO. Middle Channel: 2437 MHz. Chain A+B. Port B.

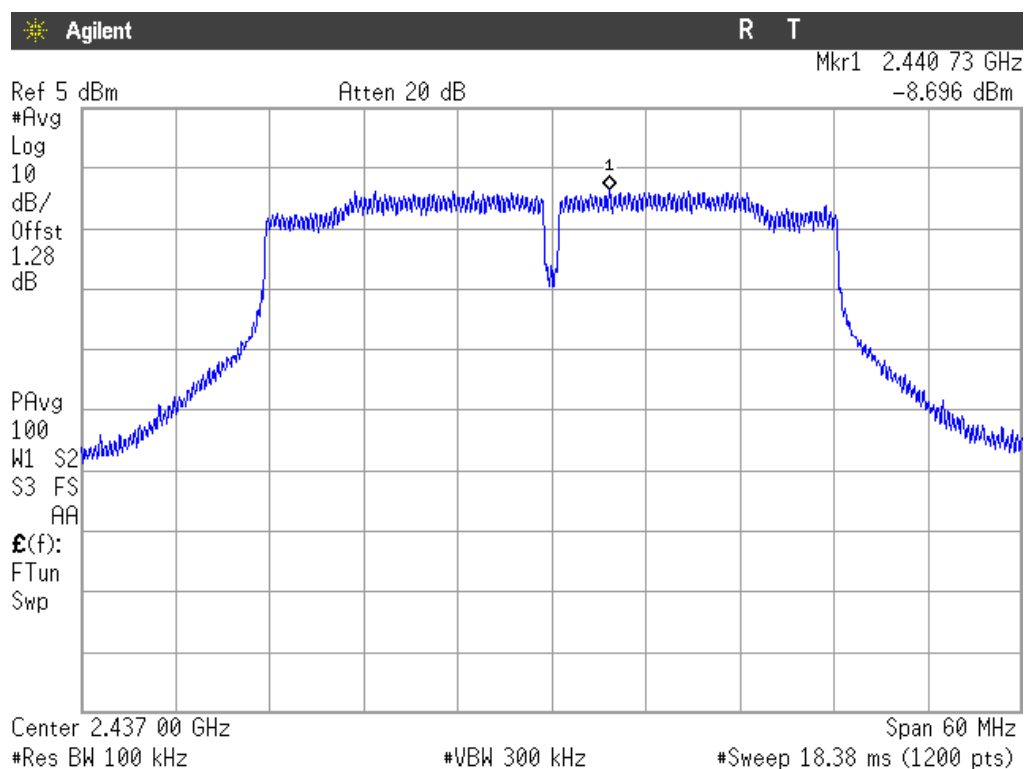


4. WiFi 2.4GHz 802.11 n40 mode

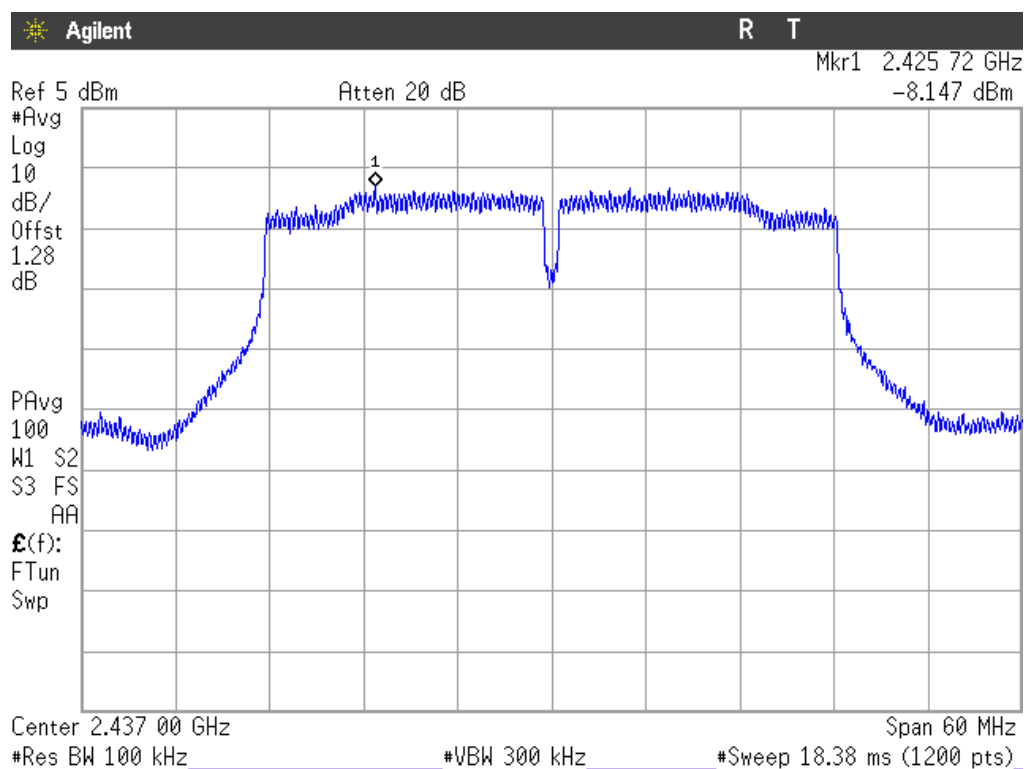
SISO. Middle Channel: 2437 MHz. Chain B.



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



MIMO. Middle Channel: 2437 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 ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 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 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-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 (dB μ V/m)	Measurement Uncertainty (dB)
47.94	PV	Quasi-Peak	29.51	± 4.12
99.59	PV	Quasi-Peak	30.29	± 4.12
143.97	PH	Quasi-Peak	29.6	± 4.12
527.99	PV	Quasi-Peak	25.06	± 4.12
888.54	PH	Quasi-Peak	23.81	± 4.12

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 1-18 GHz was performed to determine the worst case. The lowest and highest channels were measured for out-of-band emissions for the worst case (802.11g).

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

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

1. WiFi 2.4GHz 802.11 b mode.

Note: For the lowest and highest channels the power was adjusted to the values of the adjacent respective channels, which are 1 dB higher, for checking compliance inside the restricted bands for lowest, highest and adjacent channels.

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)
2.386044	PV	Peak	55.9	± 4.00
		RMS	50.01	
2.494280	PV	Peak	47.80	± 4.00
3.056750	PV	Peak	38.05	± 4.00
4.823750	PV	Peak	37.61	± 4.00
7.236750	PV	Peak	43.13	± 4.00
14.422750	PV	Peak	53.99	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389270	PV	Peak	51.00	± 4.00
2.483968	PV	Peak	49.30	± 4.00
2.570633	PV	Peak	49.68	± 4.00
4.823750	PV	Peak	40.70	± 4.00
14.381250	PV	Peak	52.53	± 4.00

1.2. CHANNEL 2: (2417 MHz). Out-of-band spurious emissions 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)
2.389980	PV	Peak	54.57	± 4.00
		RMS	49.36	
2.487083	PV	Peak	49.82	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.387400	PV	Peak	50.42	± 4.00
2.483516	PV	Peak	49.86	± 4.00

1.3. 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)
2.387356	PV	Peak	50.99	± 4.00
2.486946	PV	Peak	49.85	± 4.00
3.035750	PV	Peak	49.51	± 4.00
7.309750	PV	Peak	36.85	± 4.00
9.748250	PV	Peak	48.81	± 4.00
14.426750	PV	Peak	54.28	± 4.00
		RMS	44.26	

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.387124	PV	Peak	51.15	± 4.00
2.486906	PV	Peak	52.17	± 4.00
2.595567	PV	Peak	50.51	± 4.00
4.873750	PV	Peak	36.64	± 4.00
14.468250	PV	Peak	54.01	± 4.00
		RMS	44.23	

1.4. CHANNEL 10: (2457 MHz). Out-of-band spurious emissions 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)
2.372836	PV	Peak	50.17	± 4.00
2.483509	PV	Peak	53.98	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.387620	PV	Peak	48.90	± 4.00
2.483501	PV	Peak	51.79	± 4.00

1.5. 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 (dB μ V/m)	Measurement Uncertainty (dB)
2.385400	PV	Peak	48.41	± 4.00
2.485715	PV	Peak	51.53	± 4.00
3.046250	PV	Peak	36.16	± 4.00
14.452750	PV	Peak	54.16	± 4.00
		RMS	44.44	

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.385400	PV	Peak	48.41	± 4.00
2.485715	PV	Peak	51.53	± 4.00
2.623767	PV	Peak	49.18	± 4.00
14.424250	PV	Peak	53.88	± 4.00

Verdict: PASS

2. WiFi 2.4GHz 802.11 g mode (worst case OFDM)

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

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.39	PV	Peak	58.06	± 4.00
		RMS	44.21	± 4.00
3.054250	PV	Peak	37.52	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.389880	PV	Peak	56.47	± 4.00
		RMS	42.85	± 4.00
2.573633	PV	Peak	49.31	± 4.00
4.825750	PV	Peak	36.16	± 4.00
14.397250	PV	Peak	54.03	± 4.00
		RMS	44.37	± 4.00

2.2. CHANNEL 2: (2417 MHz). Out-of-band spurious emissions inside restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.389720	PV	Peak	59.37	± 4.00
		RMS	45.74	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.389880	PV	Peak	57.23	± 4.00
		RMS	41.54	± 4.00

2.3. CHANNEL 3: (2422 MHz). Out-of-band spurious emissions inside restricted band 2.31-2.39 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389740	PV	Peak	58.59	± 4.00
		RMS	46.09	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389828	PV	Peak	56.24	± 4.00
		RMS	43.88	± 4.00

2.4. 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)
2.38969	PV	Peak	57.53	± 4.00
		RMS	43.13	± 4.00
2.485565	PV	Peak	54.63	± 4.00
		RMS	40.96	± 4.00
3.054250	PV	Peak	37.34	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.38803	PV	Peak	52.28	± 4.00
2.488207	PV	Peak	54.00	± 4.00
		RMS	42.13	± 4.00
2.591900	PV	Peak	50.16	± 4.00
4.875250	PV	Peak	36.9	± 4.00
14.400750	PV	Peak	53.76	± 4.00

2.5. CHANNEL 9: (2452 MHz). Out-of-band spurious emissions inside restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.483569	PV	Peak	59.82	± 4.00
		RMS	45.91	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.484242	PV	Peak	62.76	± 4.00
		RMS	45.67	± 4.00

2.6. CHANNEL 10: (2457 MHz). Out-of-band spurious emissions inside restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.483651	PV	Peak	61.93	± 4.00
		RMS	48.89	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.483773	PV	Peak	59.32	± 4.00
		RMS	43.67	± 4.00

2.7. CHANNEL 11: HIGHEST (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)
2.483512	PV	Peak	61.20	± 4.00
		RMS	46.27	± 4.00
3.053250	PV	Peak	37.51	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.4837962	PV	Peak	56.59	± 4.00
		RMS	41.63	± 4.00
2.624833	PV	Peak	49.38	± 4.00
14.409250	PV	Peak	53.67	± 4.00

Verdict: PASS

3. WiFi 2.4GHz 802.11 n20 mode

3.1. CHANNEL 1 (2412 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)
2.389760	PV	Peak	62.10	± 4.00
		RMS	47.95	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389600	PV	Peak	57.57	± 4.00
		RMS	43.50	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389940	PV	Peak	56.62	± 4.00
		RMS	43.75	± 4.00

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)
2.38968	PV	Peak	59.67	± 4.00
		RMS	46.21	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389970	PV	Peak	56.87	± 4.00
		RMS	41.60	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389960	PV	Peak	57.54	± 4.00
		RMS	44.96	± 4.00

3.2. 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)
2.389300	PV	Peak	63.26	± 4.00
		RMS	49.48	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389200	PV	Peak	56.38	± 4.00
		RMS	43.63	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389510	PV	Peak	64.43	± 4.00
		RMS	49.32	± 4.00

3.4. 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)
2.389640	PV	Peak	56.59	± 4.00
		RMS	42.71	± 4.00
2.483670	PV	Peak	55.82	± 4.00
		RMS	41.46	± 4.00
3.050250	PV	Peak	36.99	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389500	PV	Peak	51.82	± 4.00
2.484394	PV	Peak	54.35	± 4.00
		RMS	42.23	± 4.00
2.597767	PV	Peak	49.36	± 4.00
4.877250	PV	Peak	37.19	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389540	PV	Peak	56.98	± 4.00
		RMS	44.01	± 4.00
2.483668	PV	Peak	60.53	± 4.00
		RMS	44.86	± 4.00
2.593500	PV	Peak	49.40	± 4.00
3.049750	PV	Peak	37.54	± 4.00
4.881250	PV	Peak	40.4	± 4.00

3.5 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)
2.483540	PV	Peak	62.85	± 4.00
		RMS	49.25	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483540	PV	Peak	62.77	± 4.00
		RMS	47.36	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483567	PV	Peak	67.69	± 4.00
		RMS	52.47	± 4.00

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

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.484093	PV	Peak	61.22	± 4.00
		RMS	48.77	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483502	PV	Peak	59.55	± 4.00
		RMS	43.39	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483991	PV	Peak	59.03	± 4.00
		RMS	46.39	± 4.00

3.7. CHANNEL 11 (2462 MHz). Spurious emissions in restricted band 2.4835-2.5 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483730	PV	Peak	61.74	± 4.00
		RMS	47.33	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.484177	PV	Peak	56.34	± 4.00
		RMS	42.36	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483529	PV	Peak	61.72	± 4.00
		Average	48.25	± 4.00

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 (dB μ V/m)	Measurement Uncertainty (dB)
2.389724	PV	Peak	61.85	± 4.00
		RMS	51.99	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.389796	PV	Peak	60.07	± 4.00
		RMS	49.34	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.389572	PV	Peak	56.82	± 4.00
		RMS	48.35	± 4.00

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)
2.389820	PV	Peak	62.05	± 4.00
		RMS	50.54	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389884	PV	Peak	62.47	± 4.00
		RMS	49.84	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389876	PV	Peak	58	± 4.00
		RMS	47.08	± 4.00

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)
2.389964	PV	Peak	61.32	± 4.00
		RMS	50.13	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389876	PV	Peak	61.40	± 4.00
		RMS	48.95	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389724	PV	Peak	56.84	± 4.00
		RMS	46.12	± 4.00

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)
2.384596	PV	Peak	61.90	± 4.00
		RMS	51.39	± 4.00
2.483517	PV	Peak	62.83	± 4.00
		RMS	51.30	± 4.00
3.040750	PV	Peak	36.82	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.389612	PV	Peak	62.71	± 4.00
		RMS	47.93	± 4.00
2.483703	PV	Peak	59.90	± 4.00
		RMS	47.63	± 4.00
3.982250	PV	Peak	34.89	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.385700	PV	Peak	58.81	± 4.00
		RMS	48.18	± 4.00
2.483522	PV	Peak	63.18	± 4.00
		RMS	51.45	± 4.00
3.041250	PV	Peak	37.08	± 4.00

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)
2.483797	PV	Peak	65.49	± 4.00
		RMS	53.26	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483530	PV	Peak	59.47	± 4.00
		RMS	46.71	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.483660	PV	Peak	64.09	± 4.00
		RMS	52.35	± 4.00

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 (dB μ V/m)	Measurement Uncertainty (dB)
2.483948	PV	Peak	65.55	± 4.00
		RMS	53.56	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.484400	PV	Peak	57.74	± 4.00
		RMS	46.67	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
2.484117	PV	Peak	61.31	± 4.00
		RMS	50.26	± 4.00

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)
2.484249	PV	Peak	59.78	± 4.00
		RMS	49.17	± 4.00

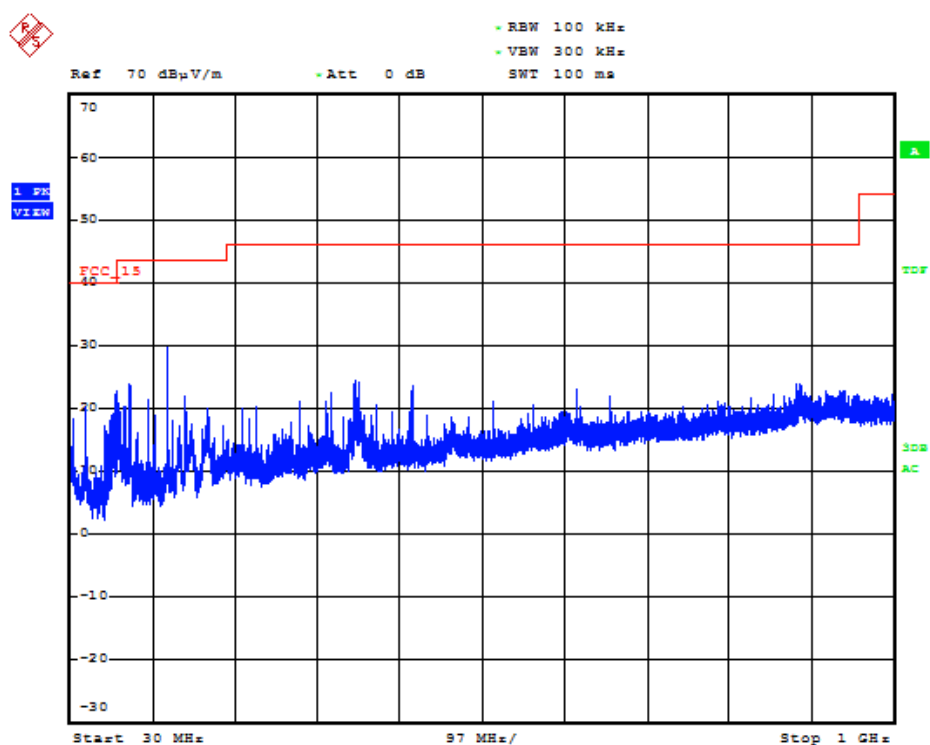
Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.484512	PV	Peak	55.75	± 4.00
		RMS	45.47	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.484520	PV	Peak	59.94	± 4.00
		RMS	49.27	± 4.00

FREQUENCY RANGE 30 MHz-1000 MHz.



Date: 26.AUG.2014 14:33:25

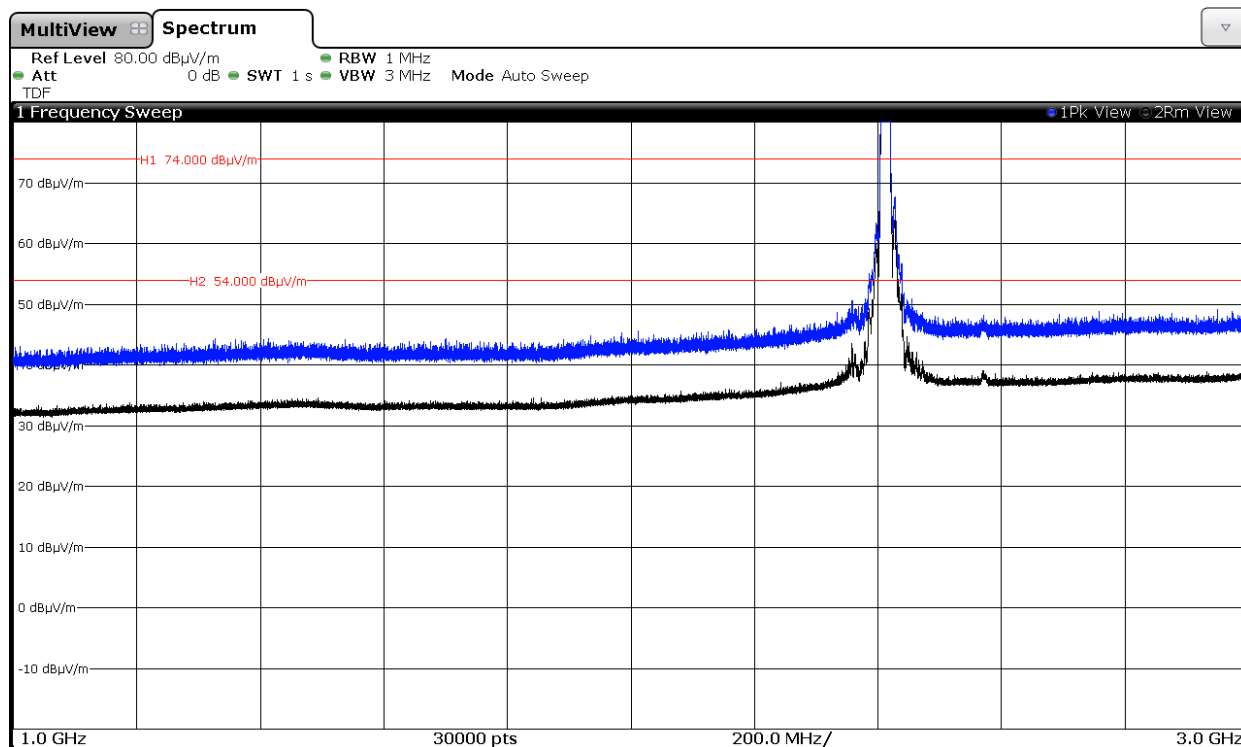
(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

1. WiFi 2.4GHz 802.11 b mode

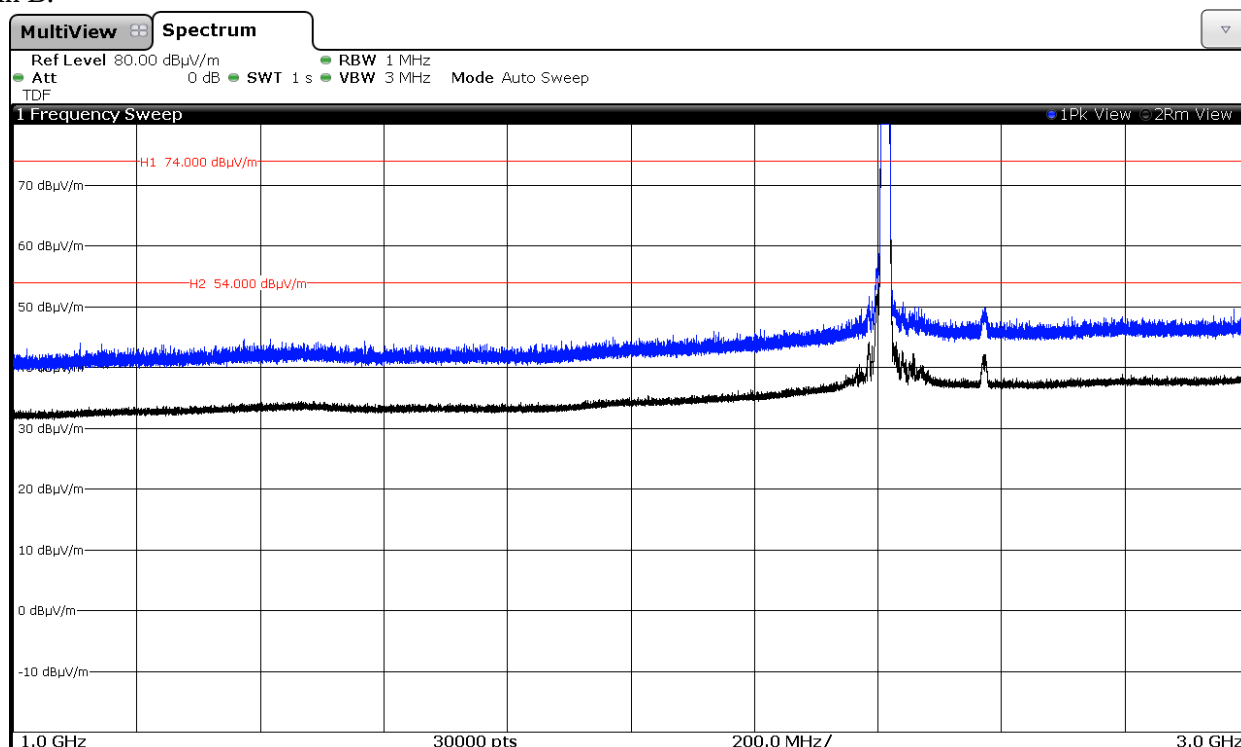
CHANNEL 1 (2412 MHz).

Chain A



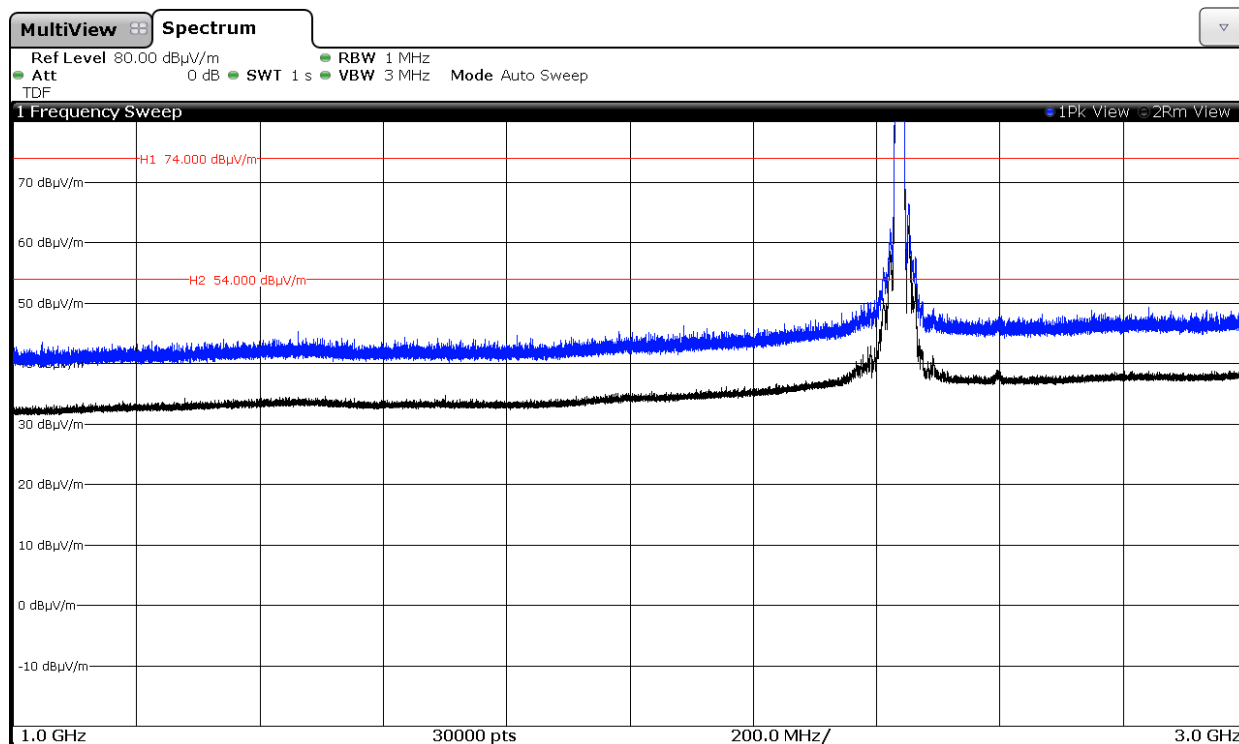
Note: The peak above the limit is the carrier frequency.

Chain B.



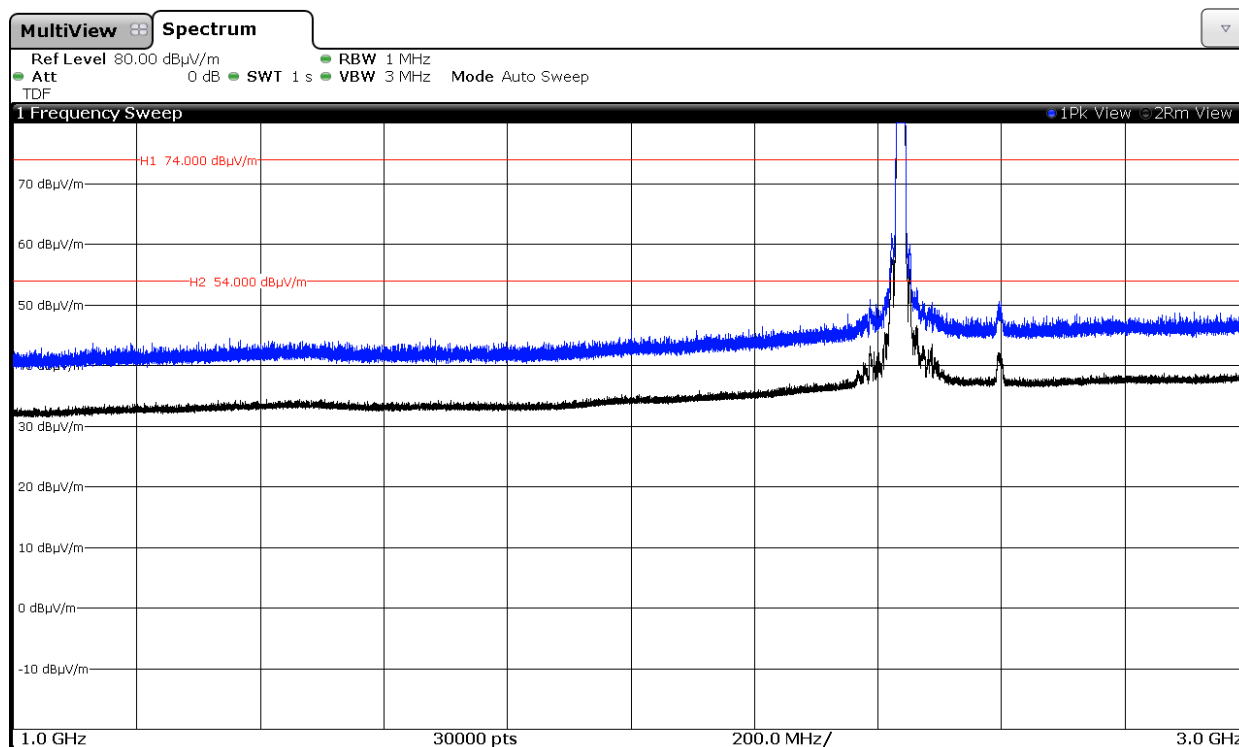
Note: The peak above the limit is the carrier frequency.

CHANNEL 6 (2437 MHz). Chain A



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

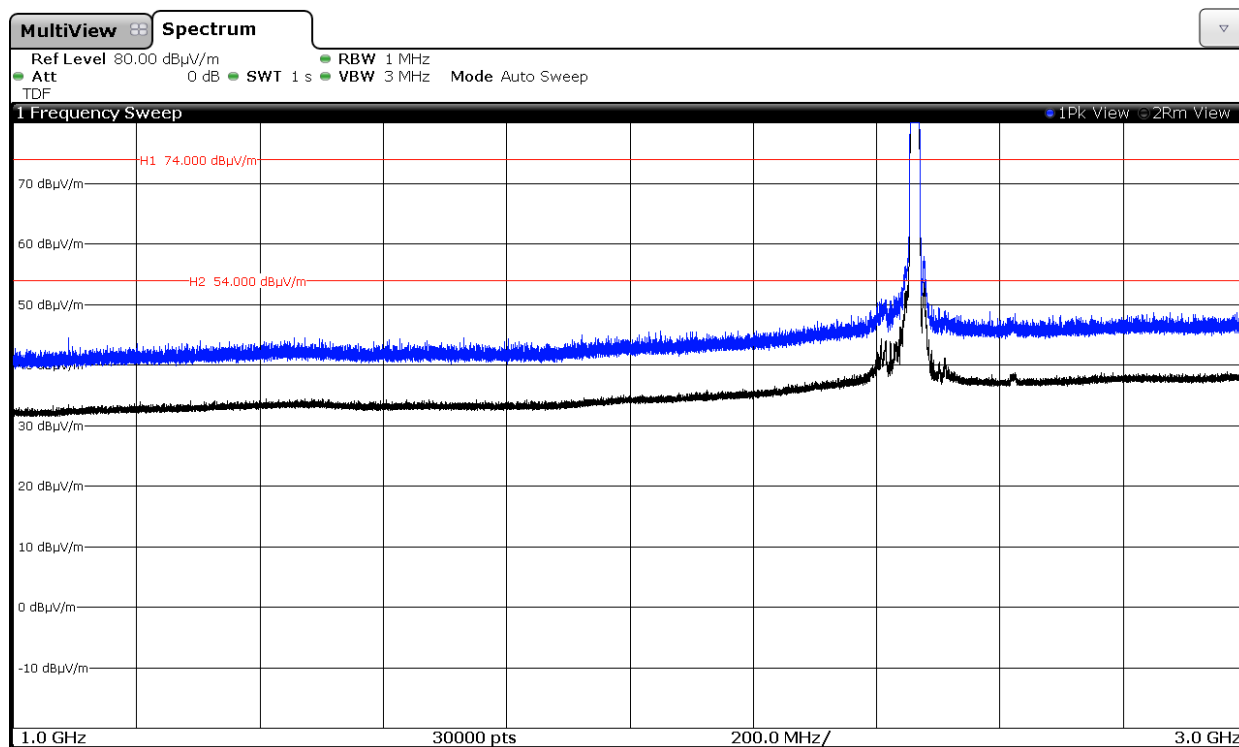
Chain B



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

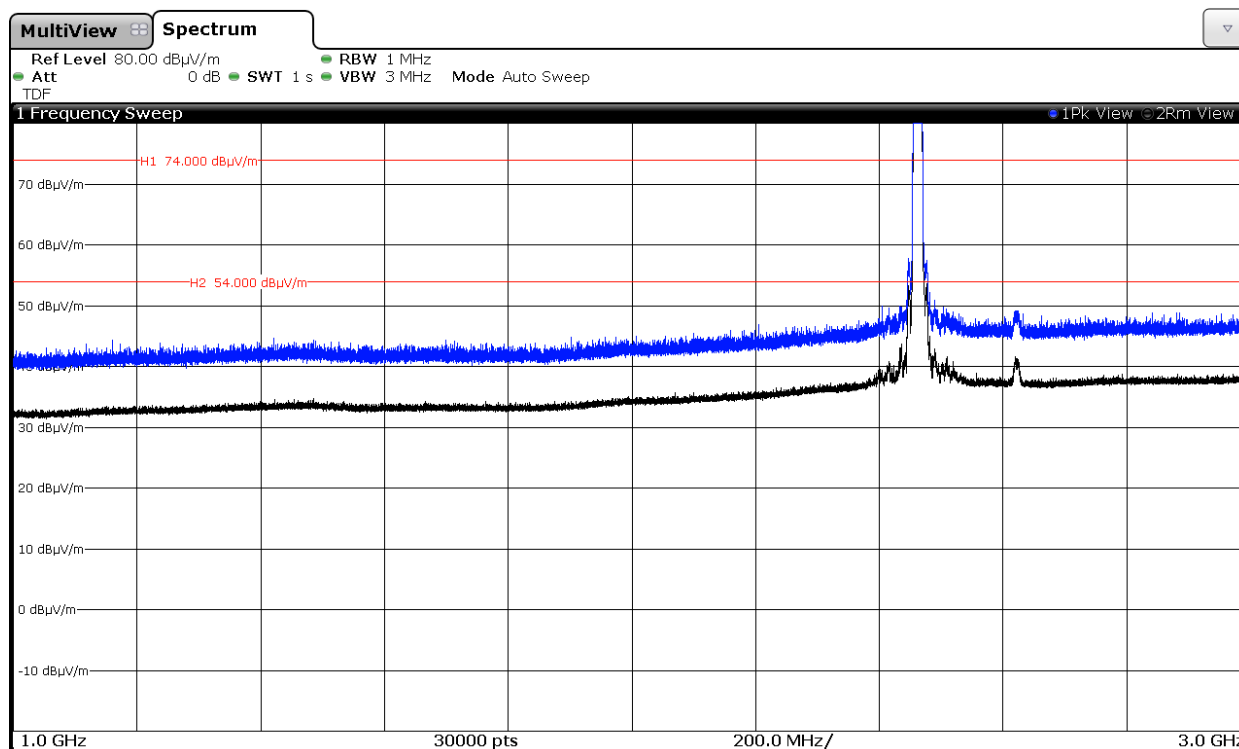
CHANNEL 11 (2462 MHz).

Chain A



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

Chain B

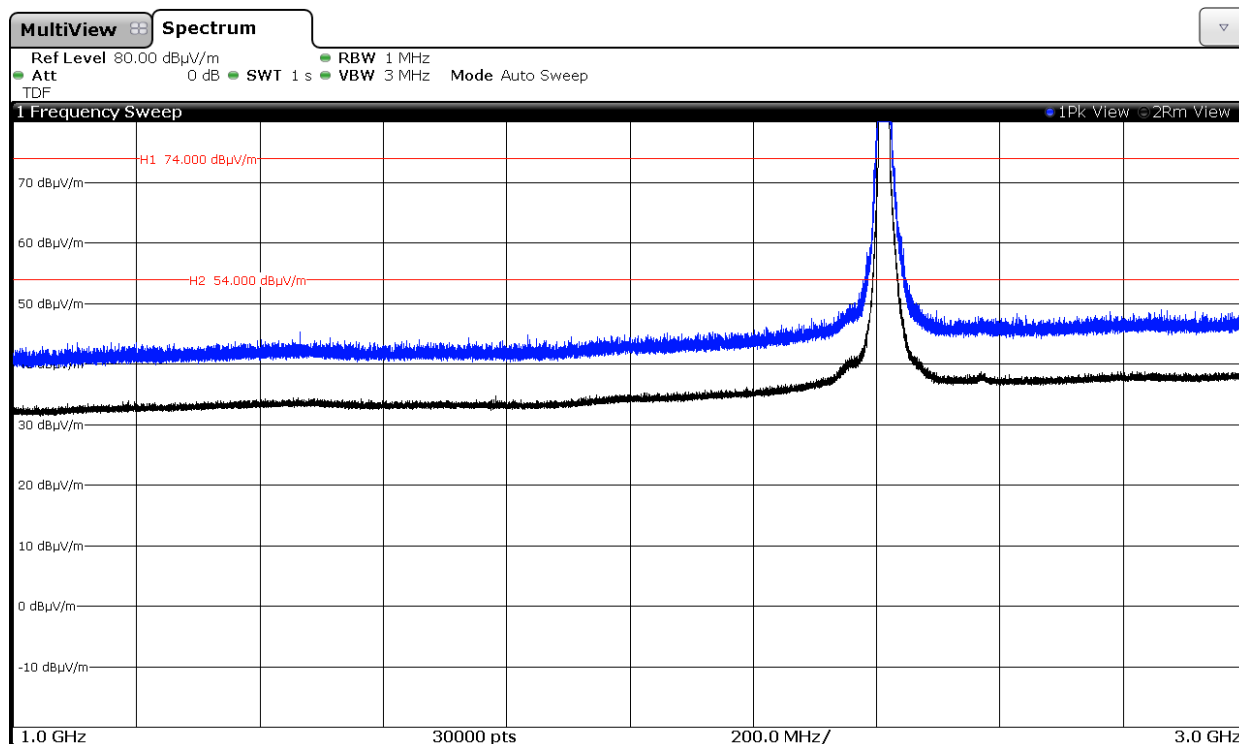


Note: The peak above the limit is the carrier frequency.

2. WiFi 2.4GHz 802.11 g mode (worst case)

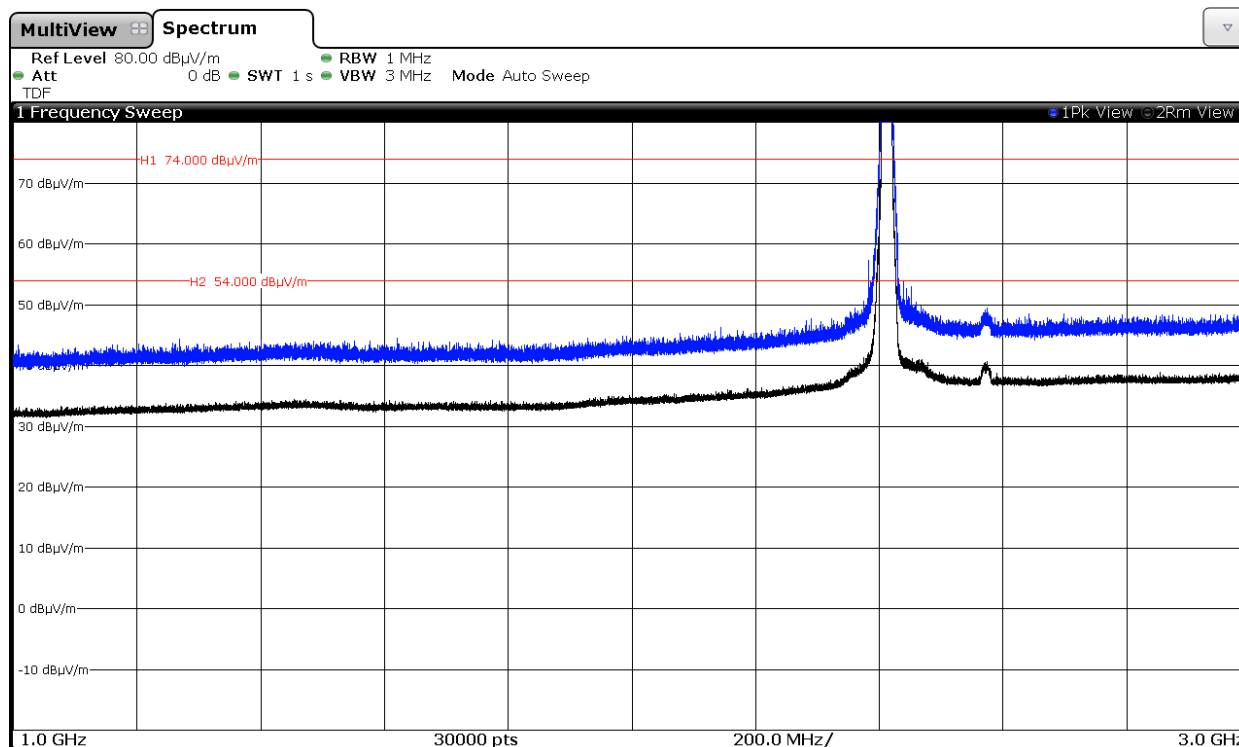
CHANNEL 1 (2412 MHz).

Chain A



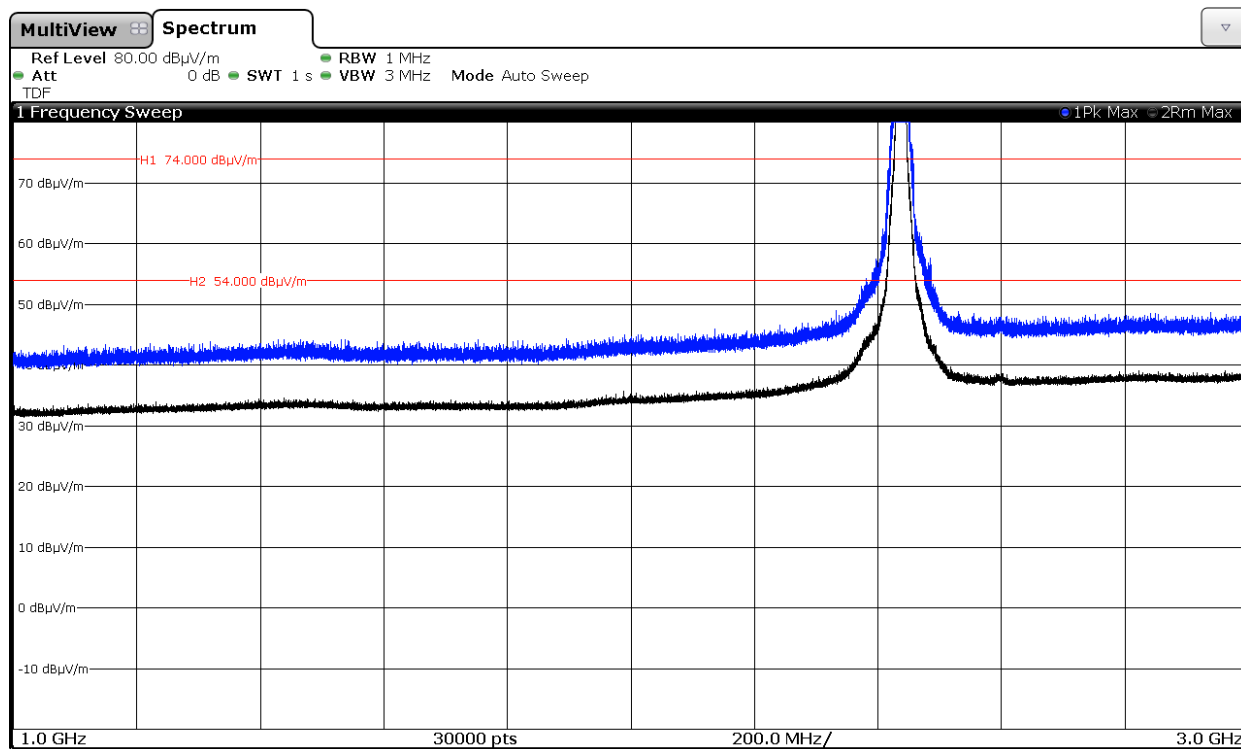
Note: The peak above the limit is the carrier frequency.

Chain B.



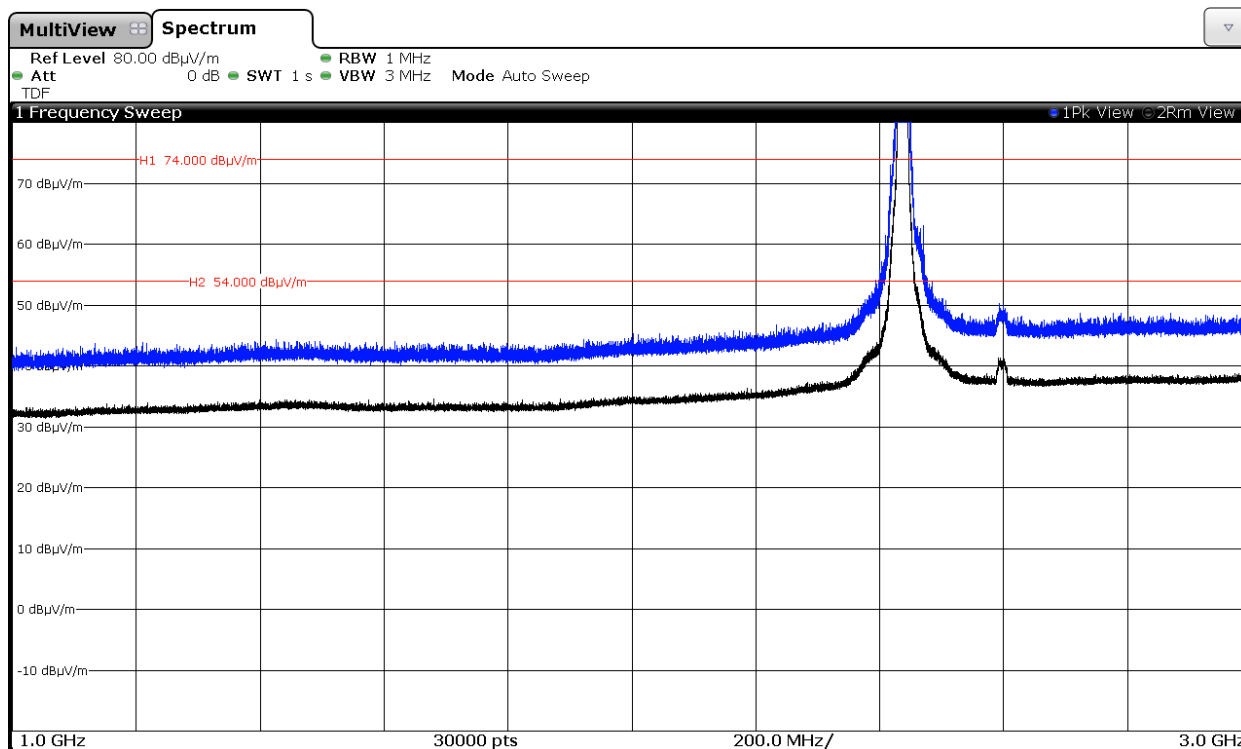
Note: The peak above the limit is the carrier frequency.

CHANNEL 6 (2437 MHz). Chain A



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

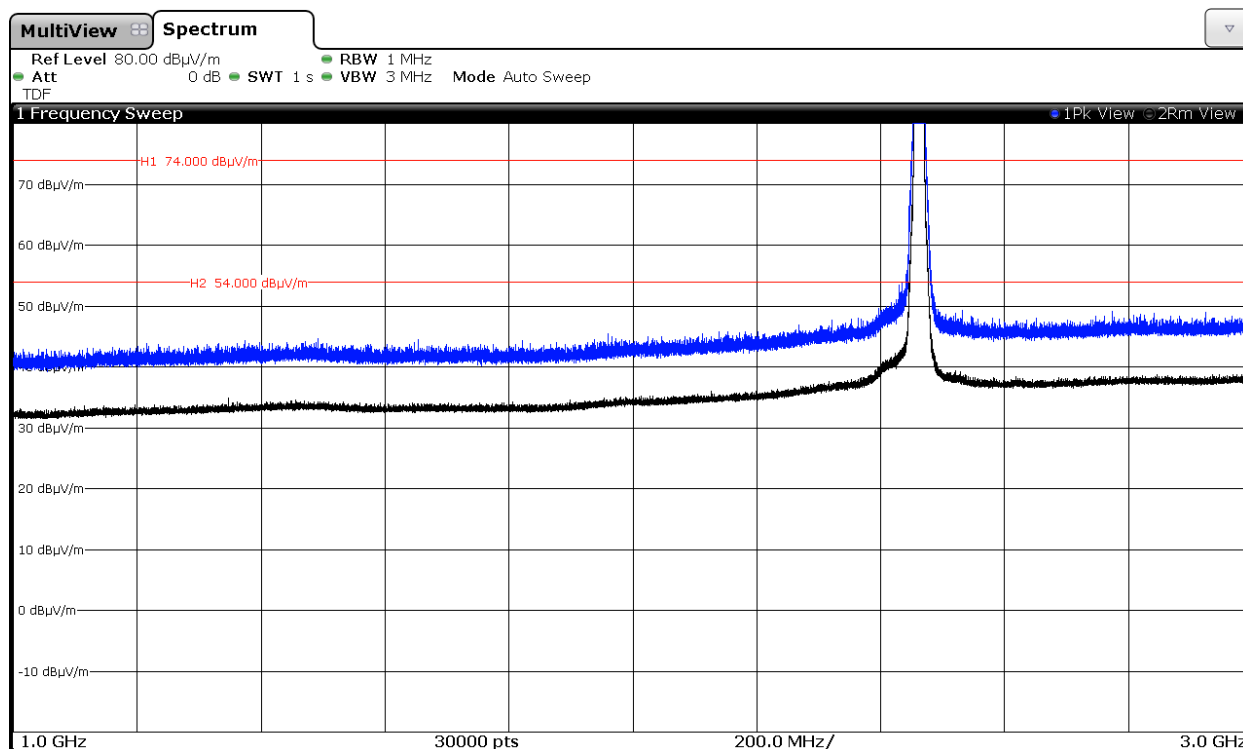
Chain B



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

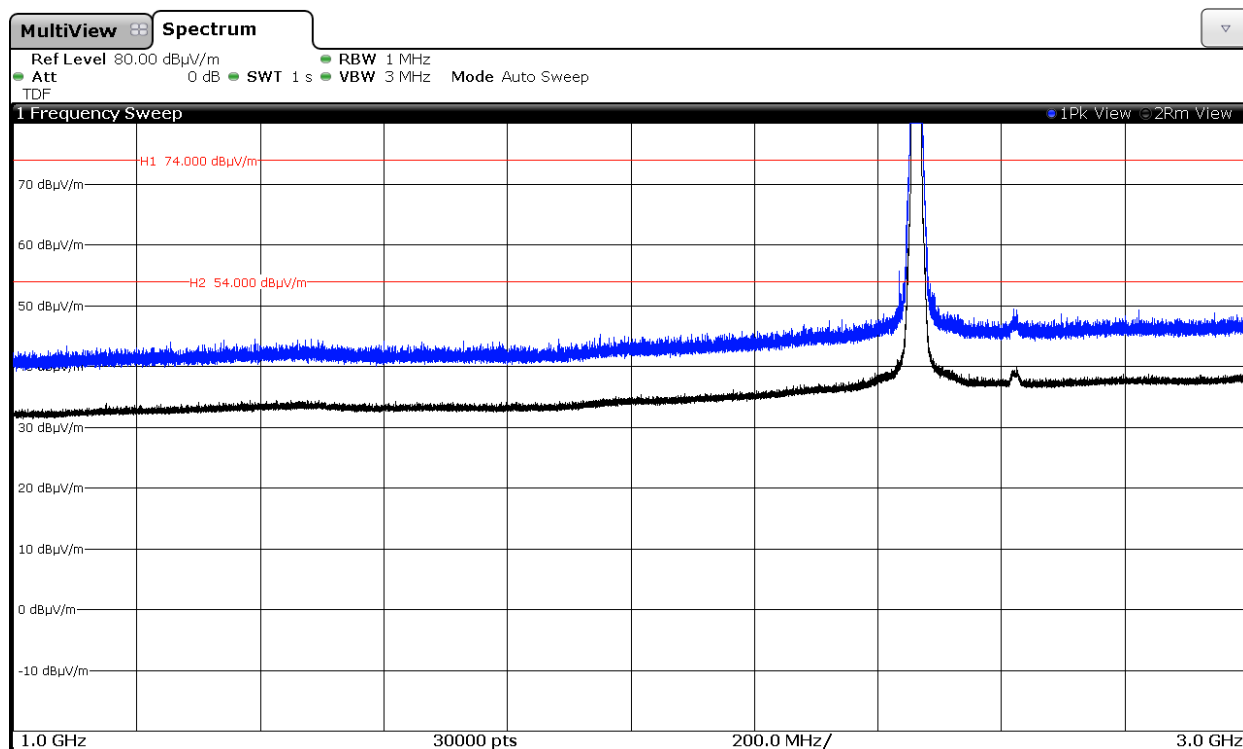
CHANNEL 11 (2462 MHz).

Chain A



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

Chain B

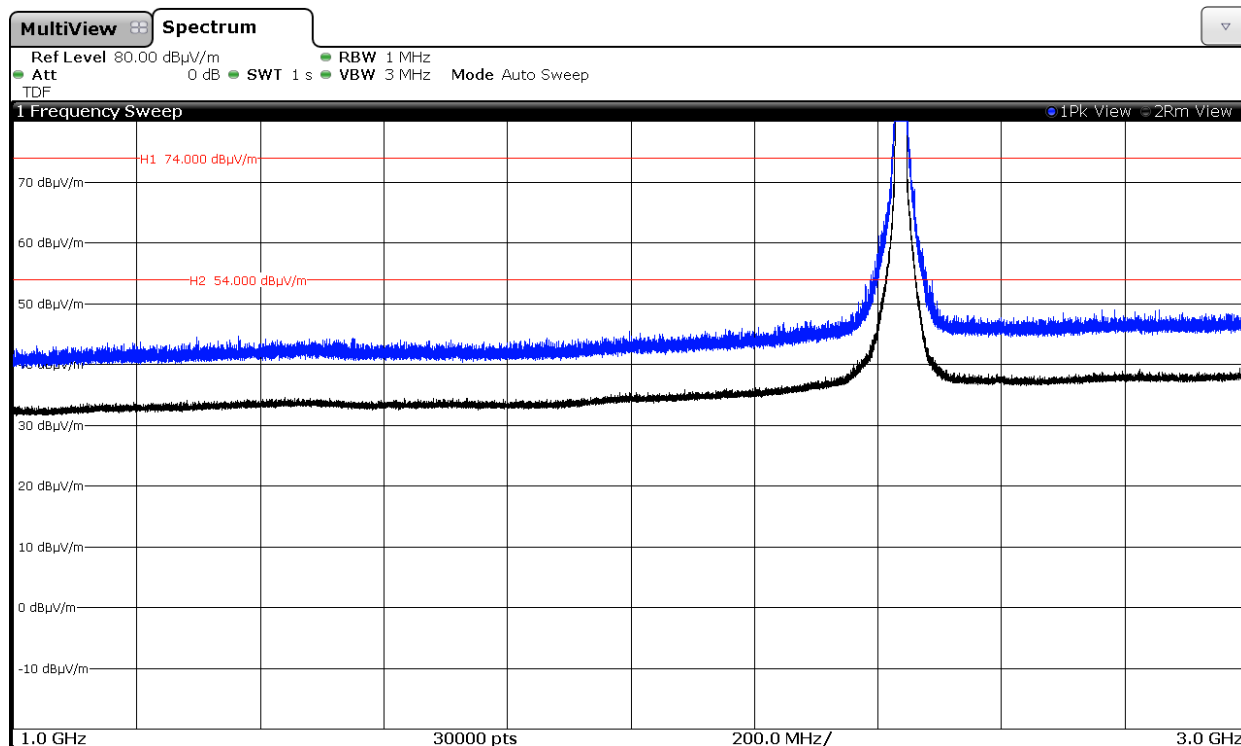


Note: The peak above the limit is the carrier frequency.

3.WiFi 2.4GHz 802.11 n20 mode

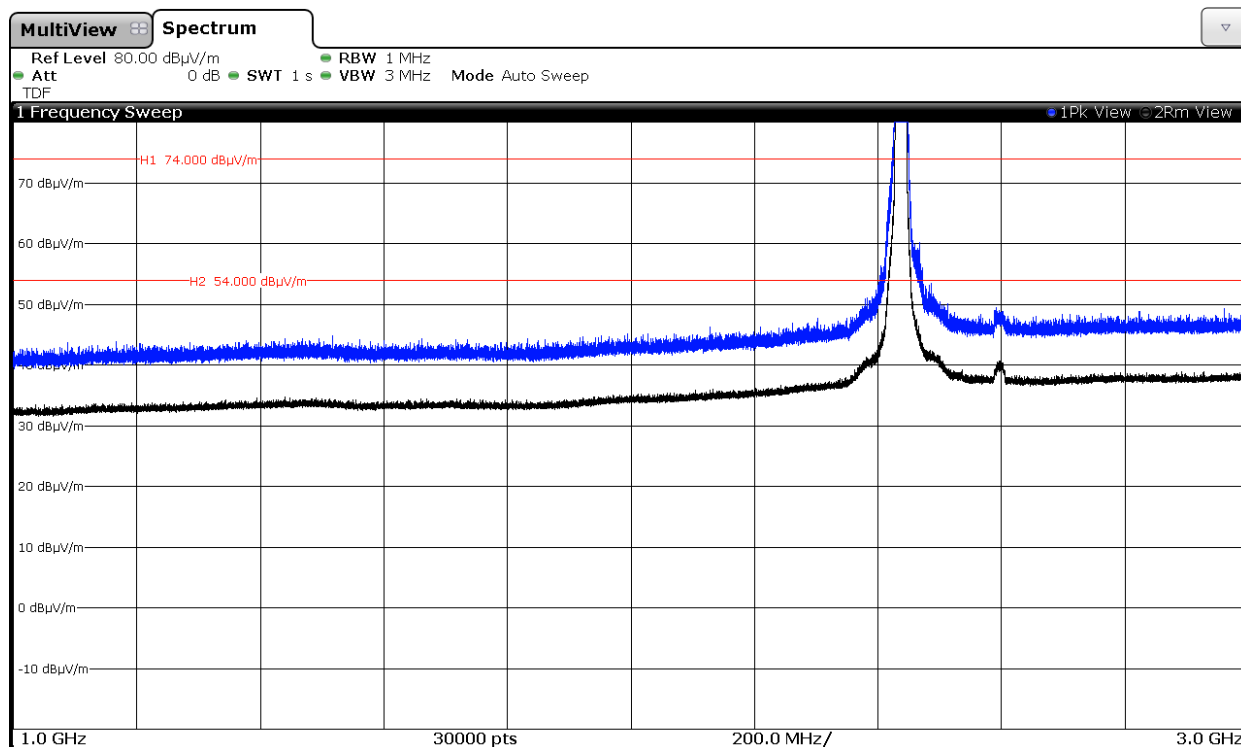
CHANNEL 6 (2437 MHz).

Chain A



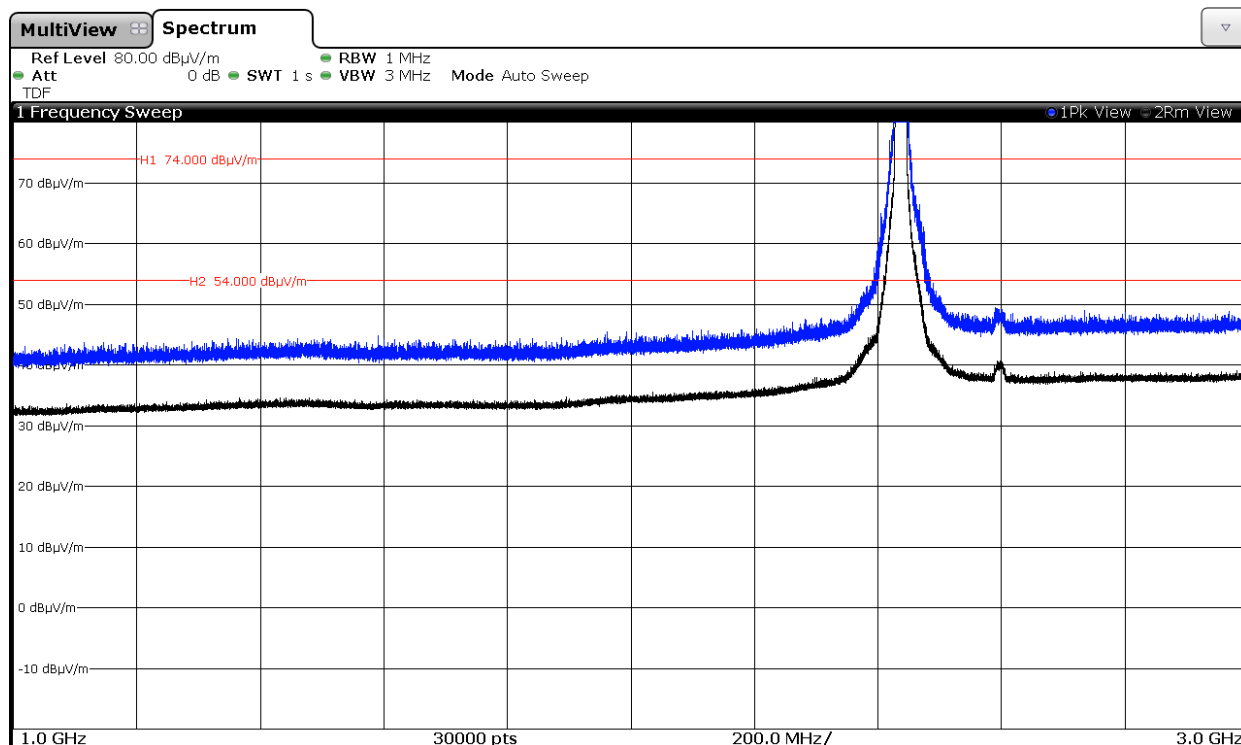
Note: The peak above the limit is the carrier frequency.

Chain B



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

Chain A+B.

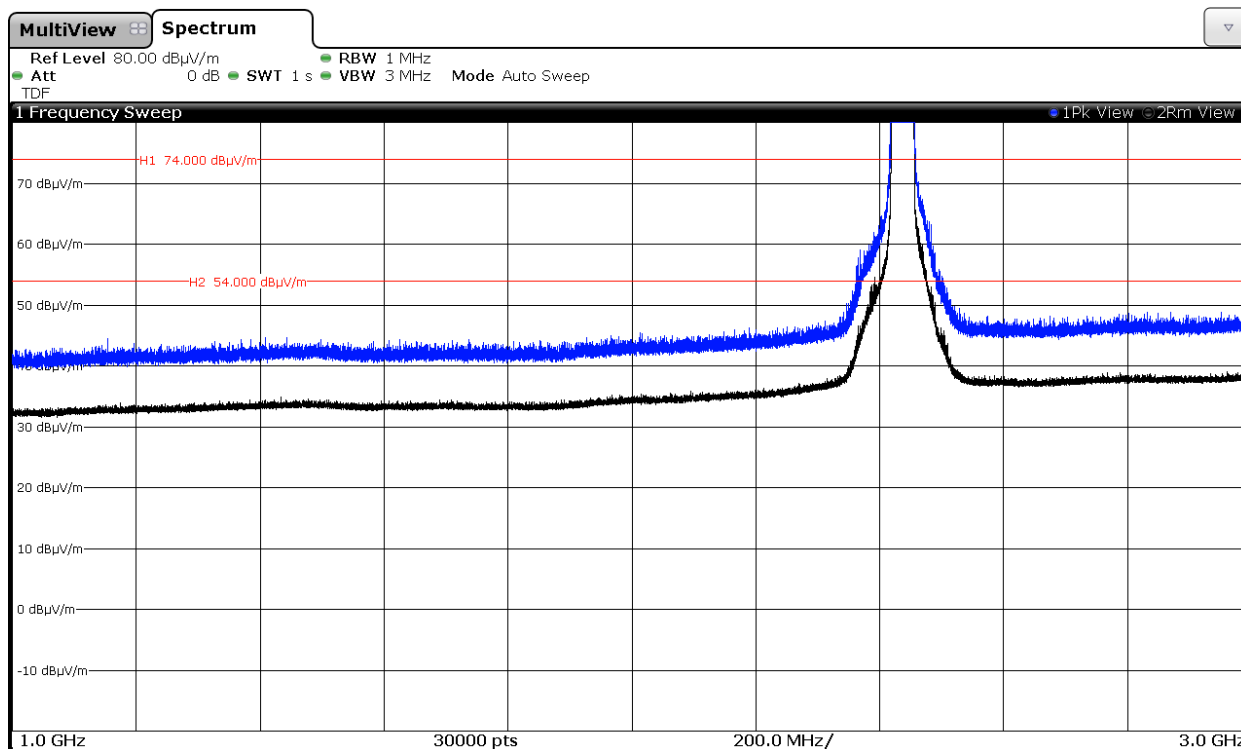


Note: The peak above the limit is the carrier frequency.

4. WiFi 2.4GHz 802.11 n40 mode

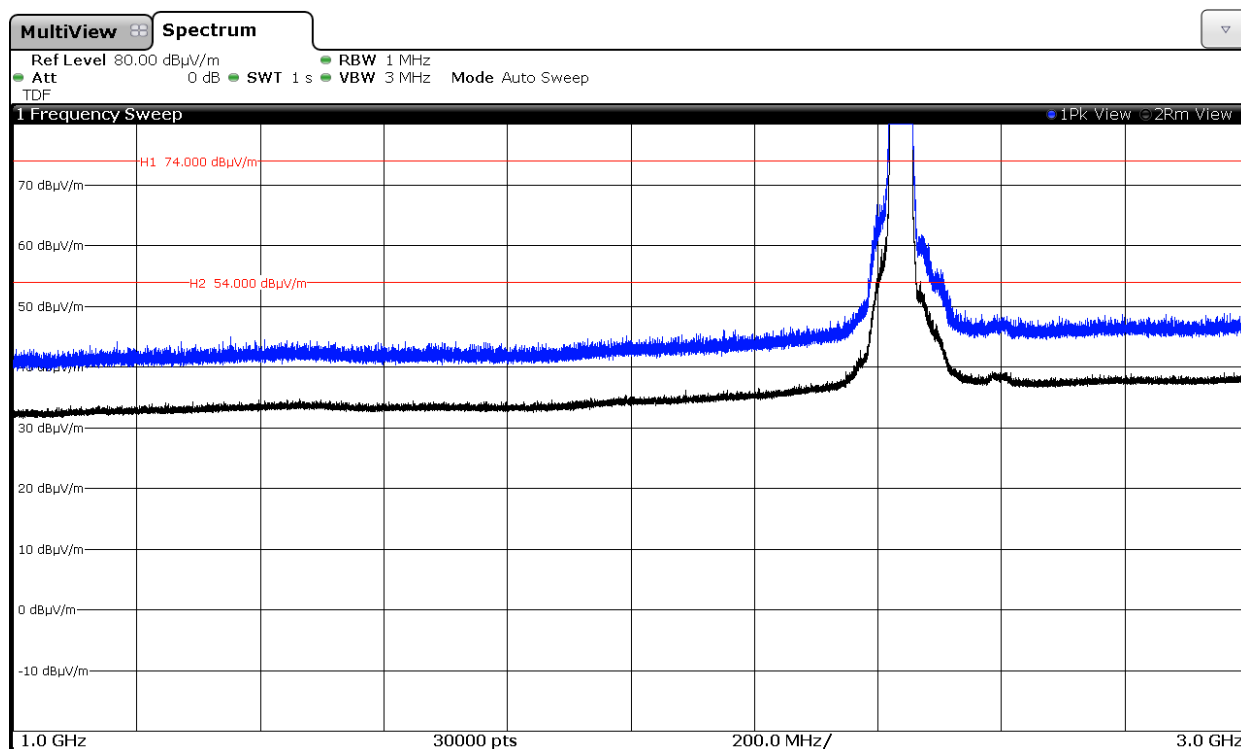
CHANNEL 6 (2437 MHz).

Chain A



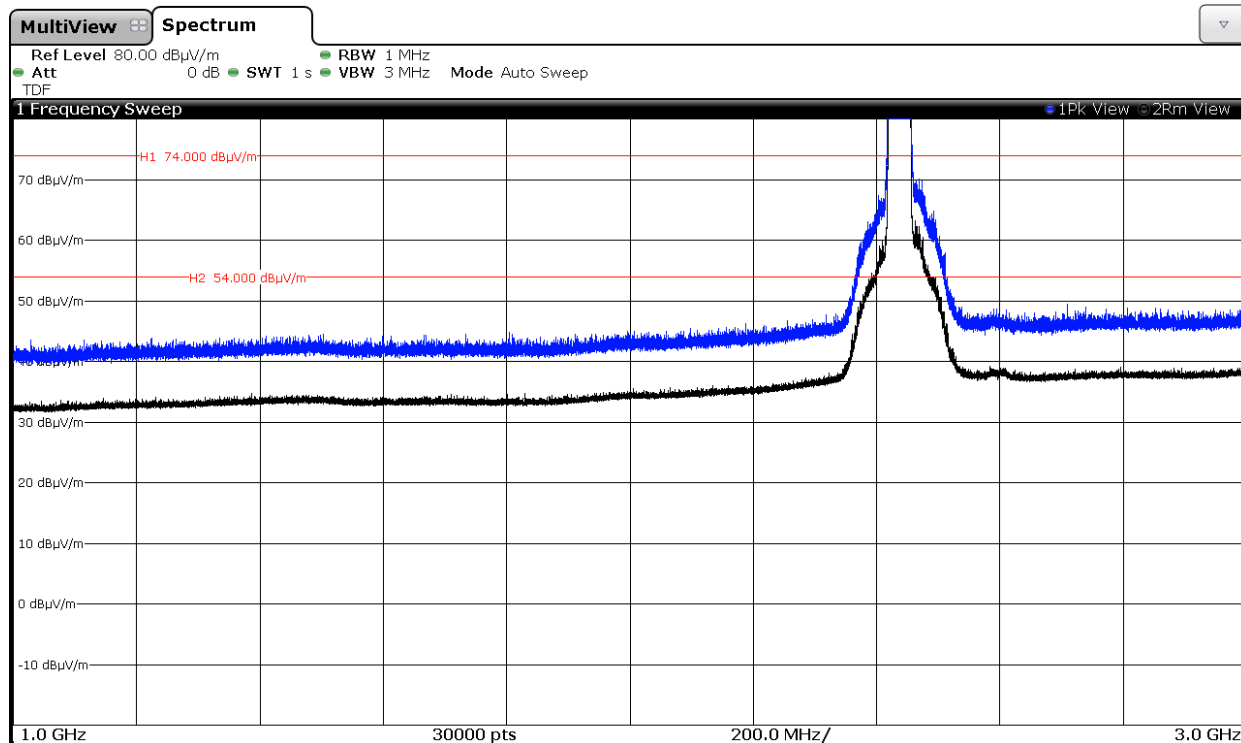
Note: The peak above the limit is the carrier frequency.

Chain B



Note: The peak above the limit is the carrier frequency

Chain A+B.



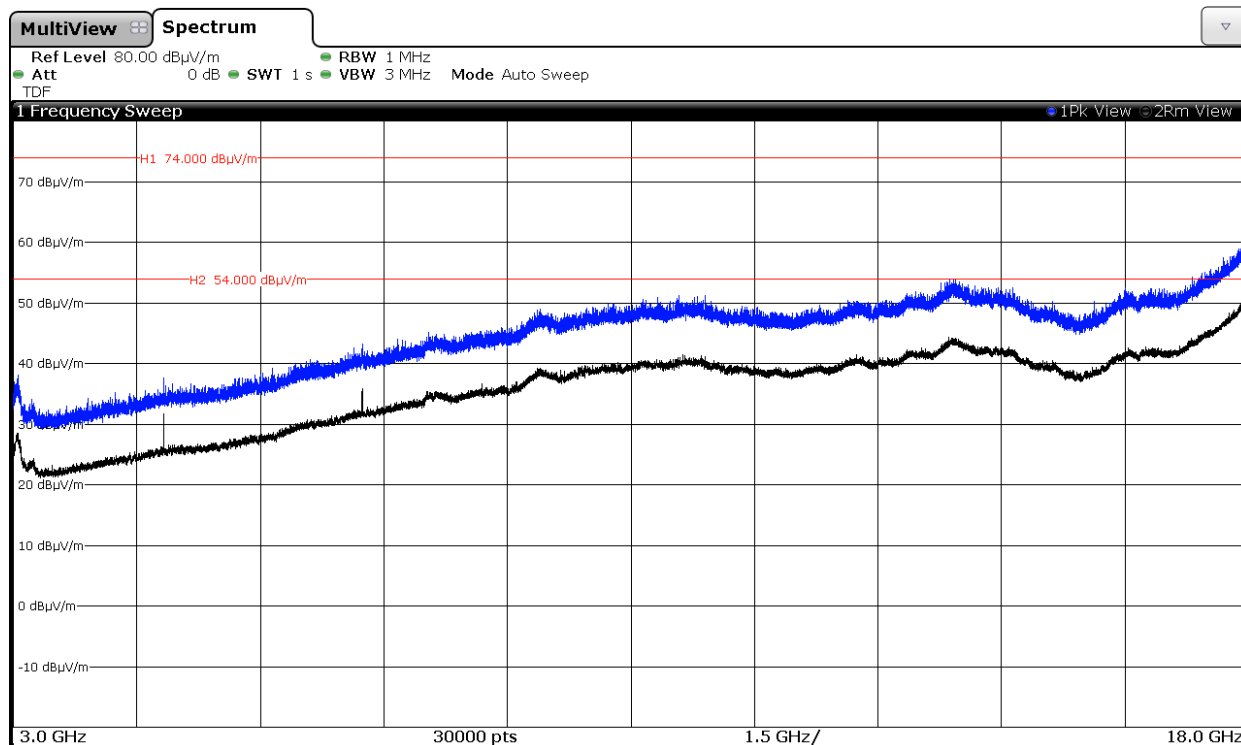
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 18 GHz.

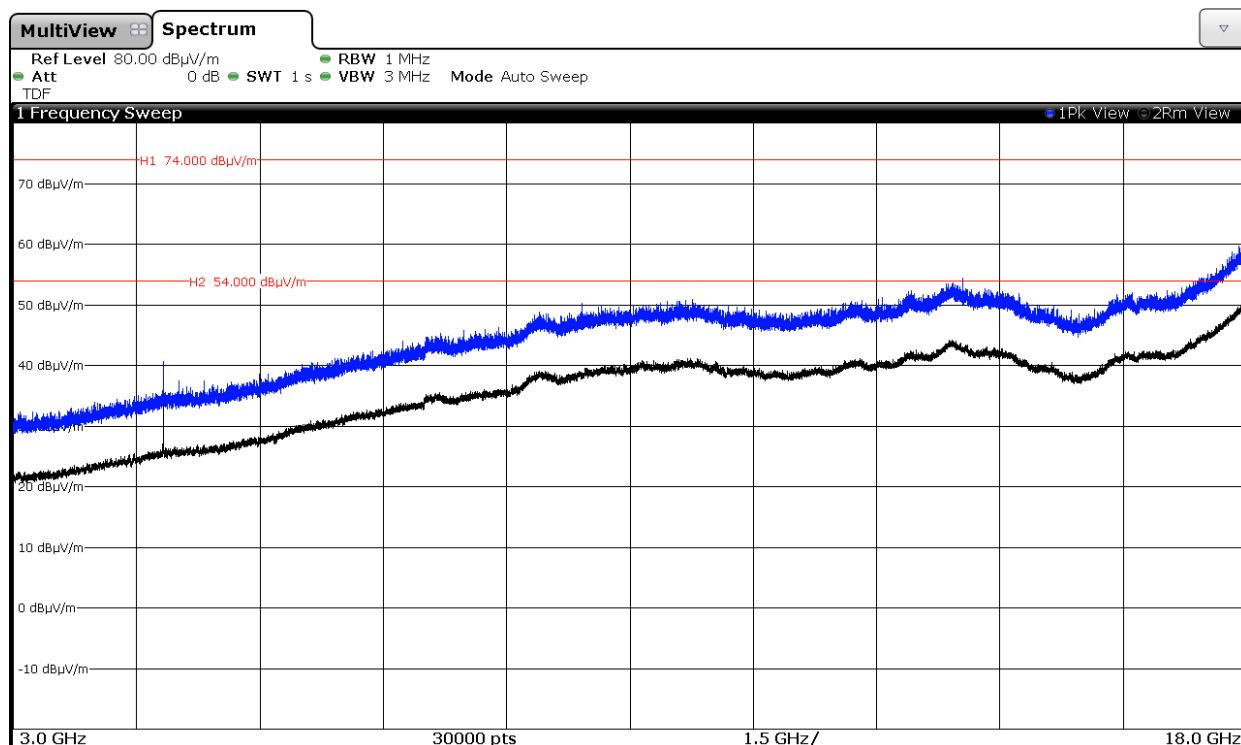
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

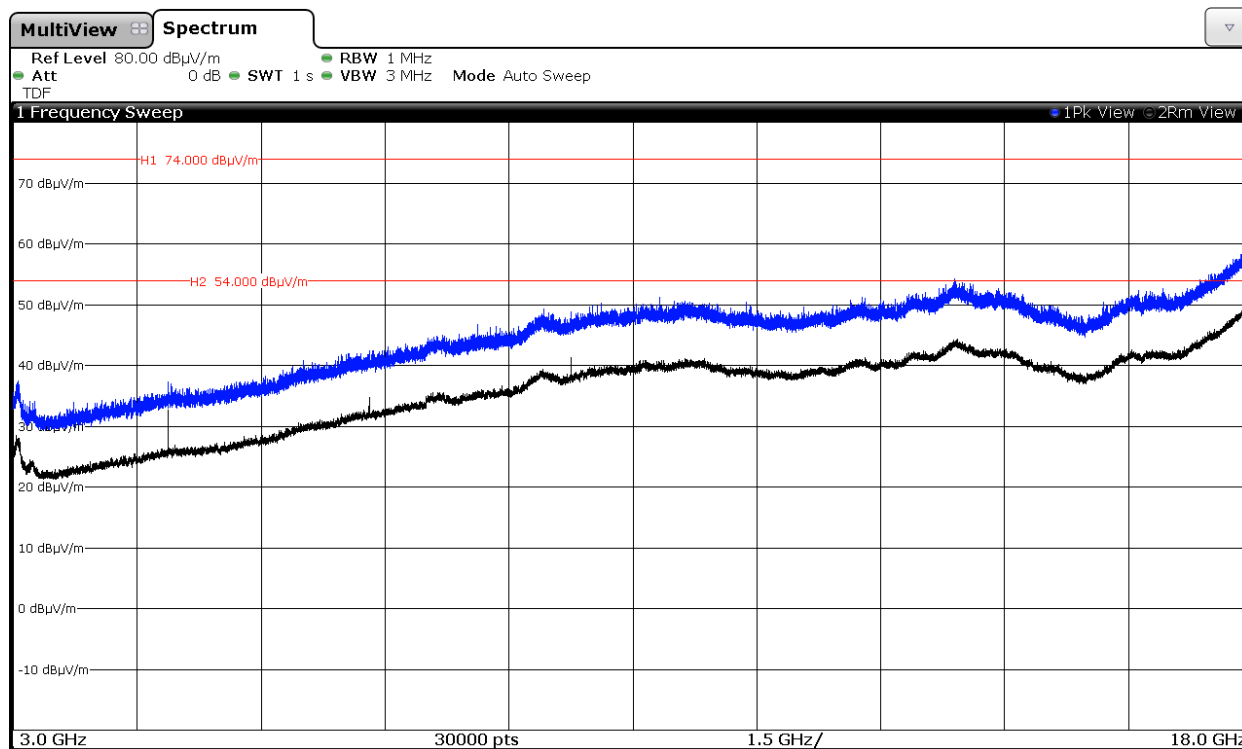


Chain B

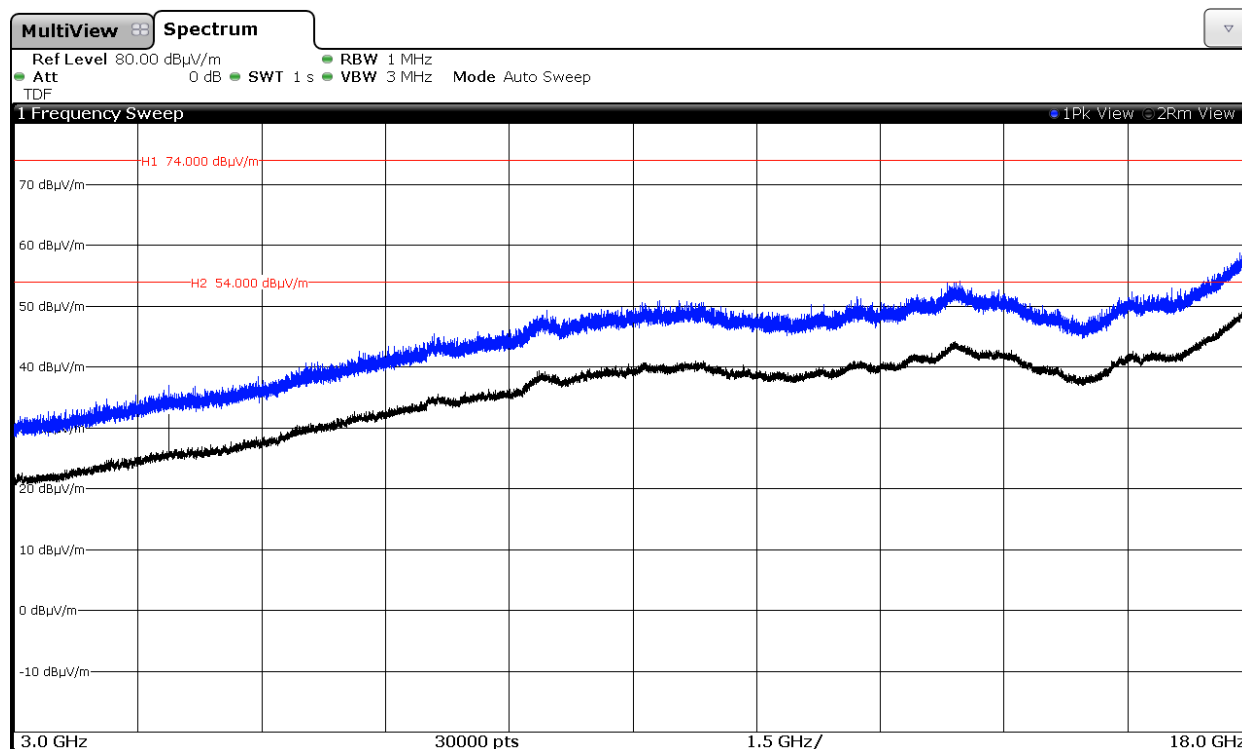


CHANNEL 6 (2437 MHz).

Chain A

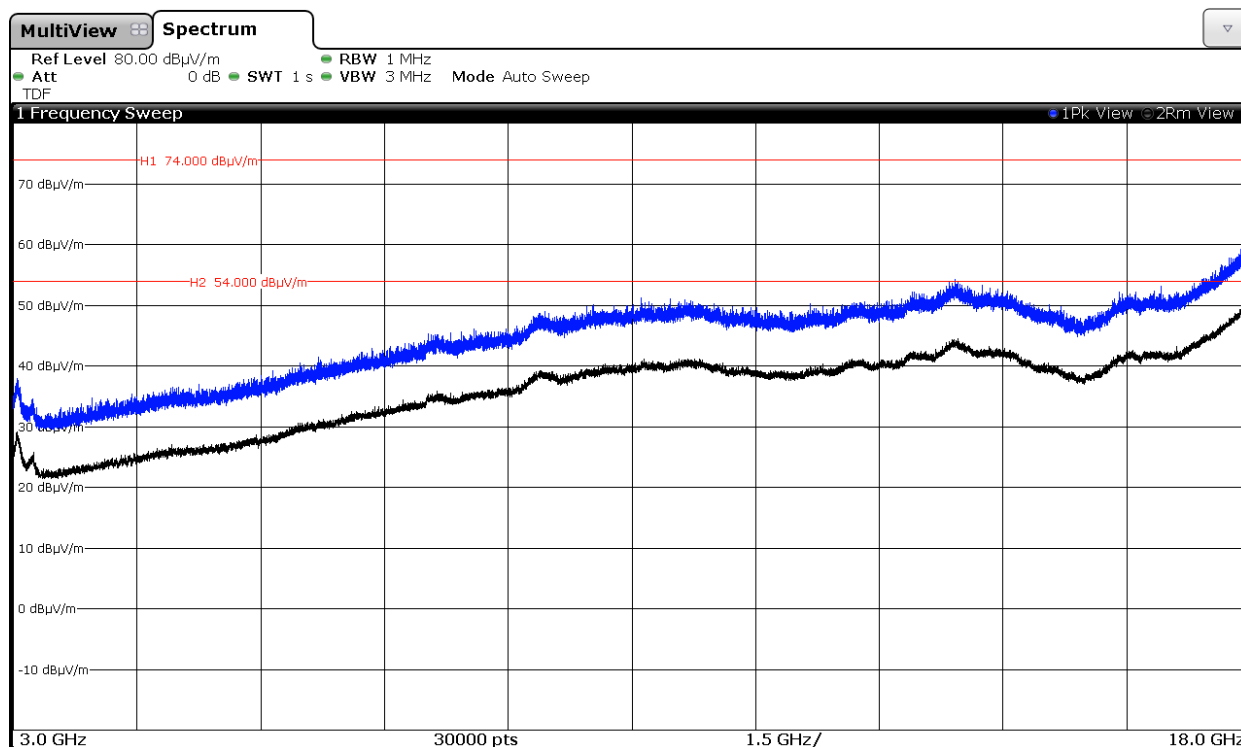


Chain B

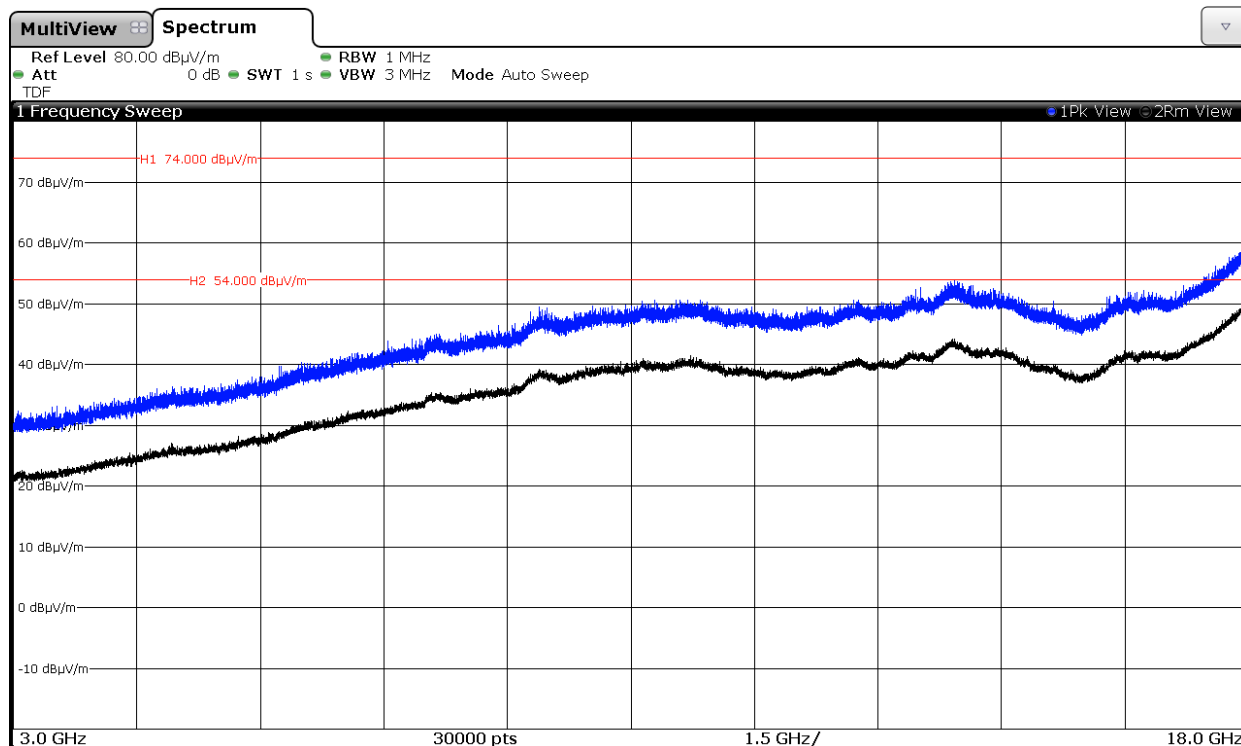


CHANNEL 11 (2462 MHz).

Chain A



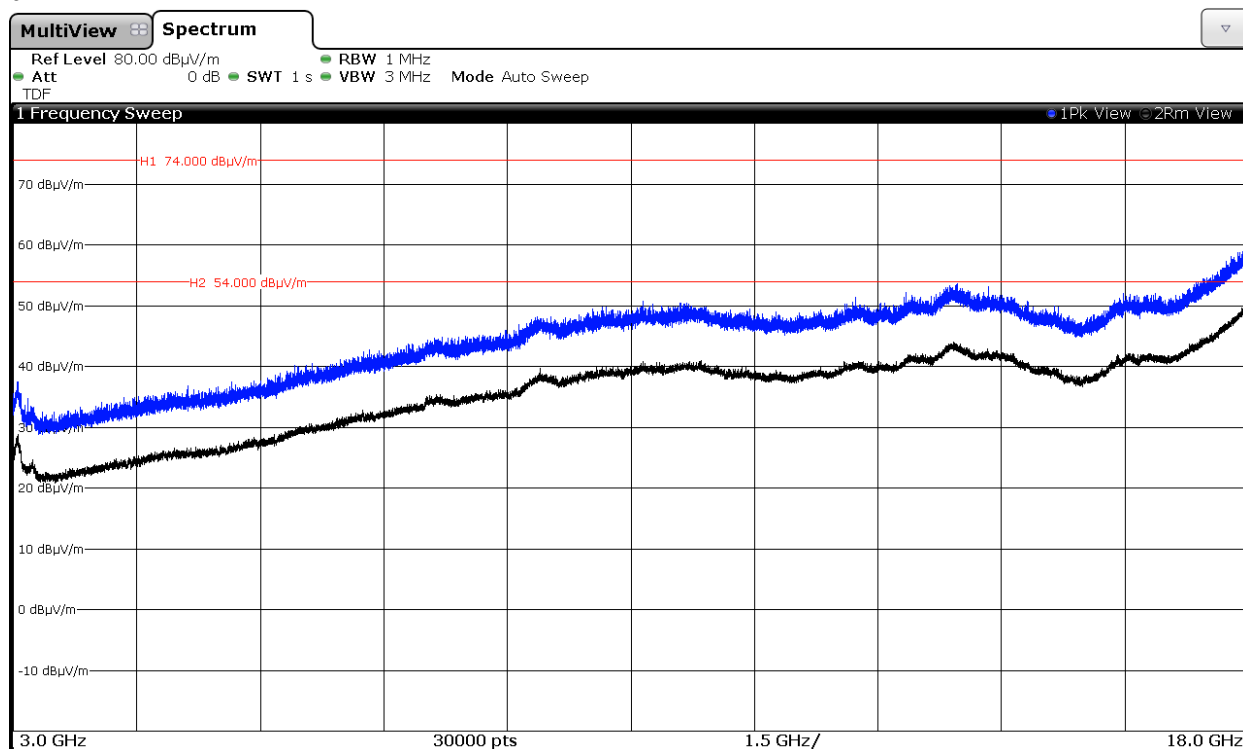
Chain B



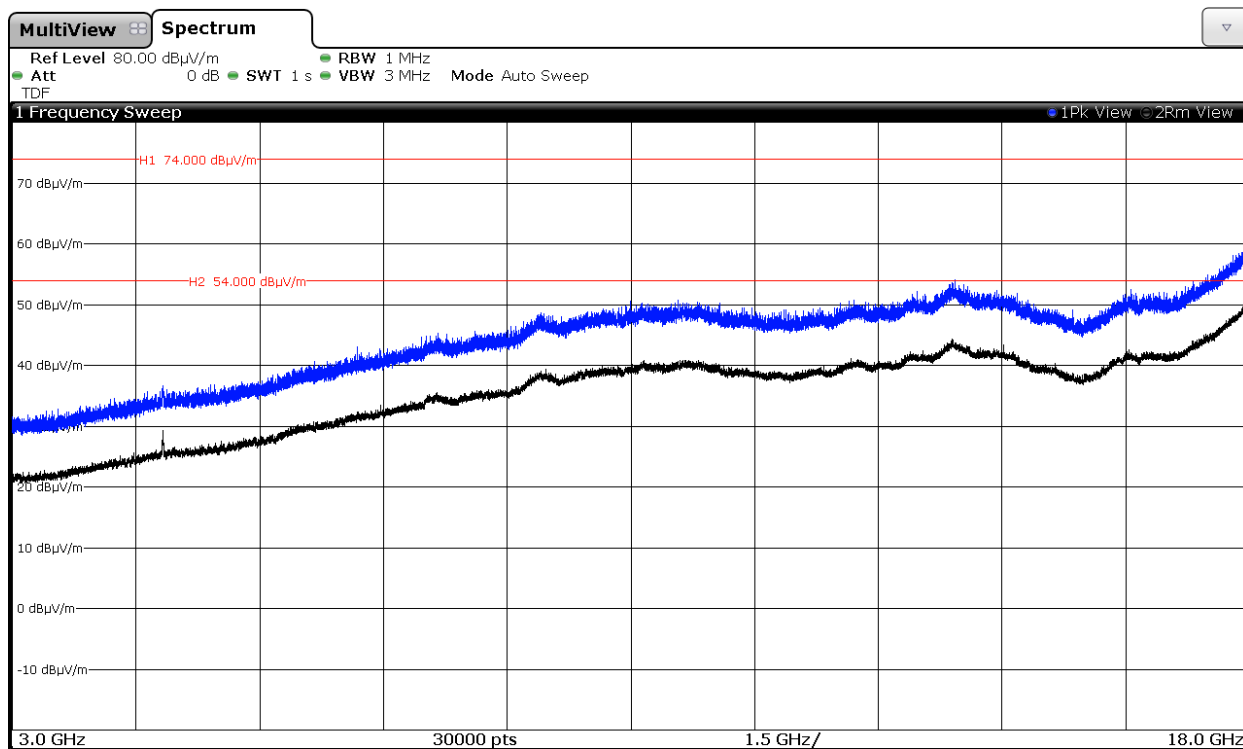
2. WiFi 2.4GHz 802.11 g mode (worst case)

CHANNEL 1 (2412 MHz).

Chain A

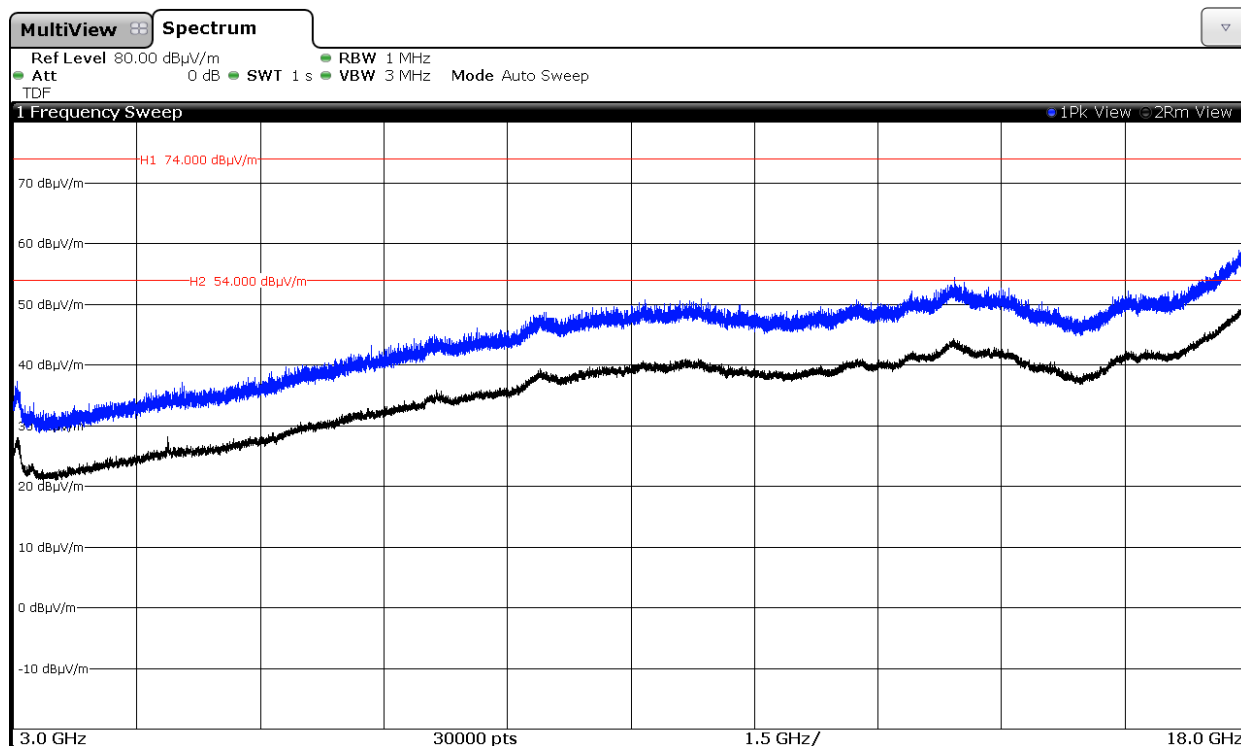


Chain B

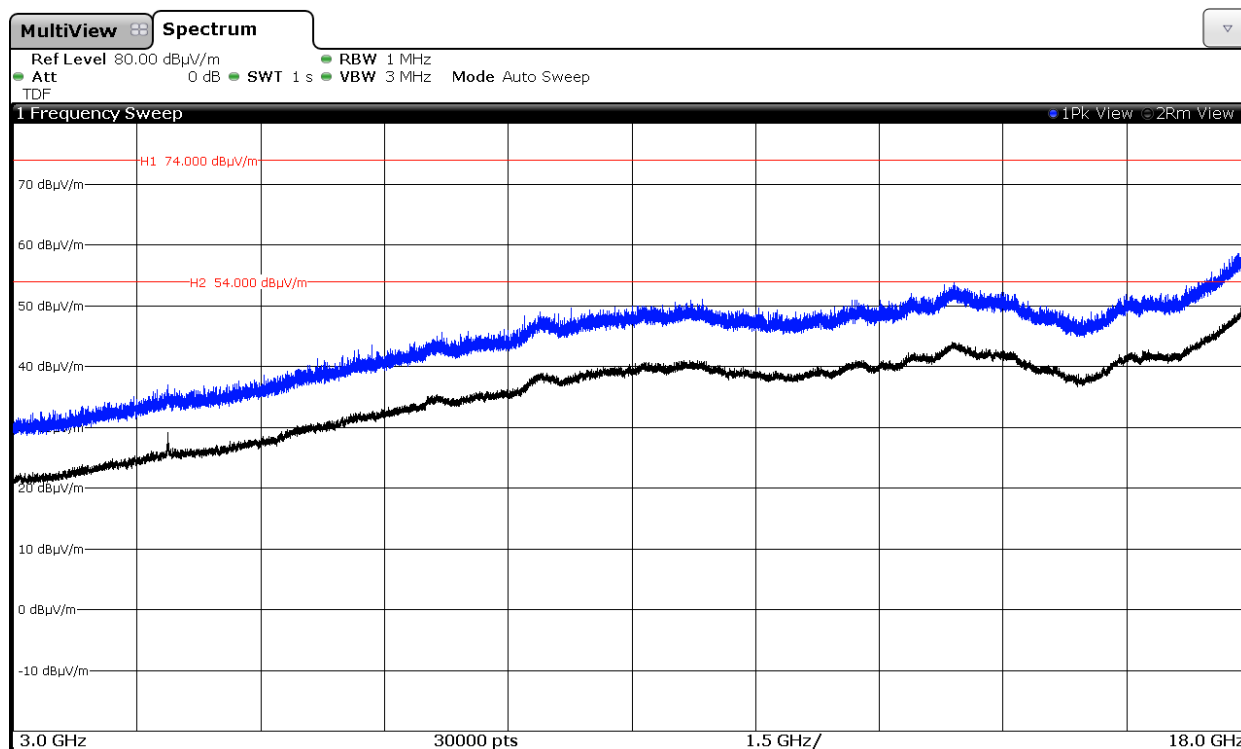


CHANNEL 6 (2437 MHz).

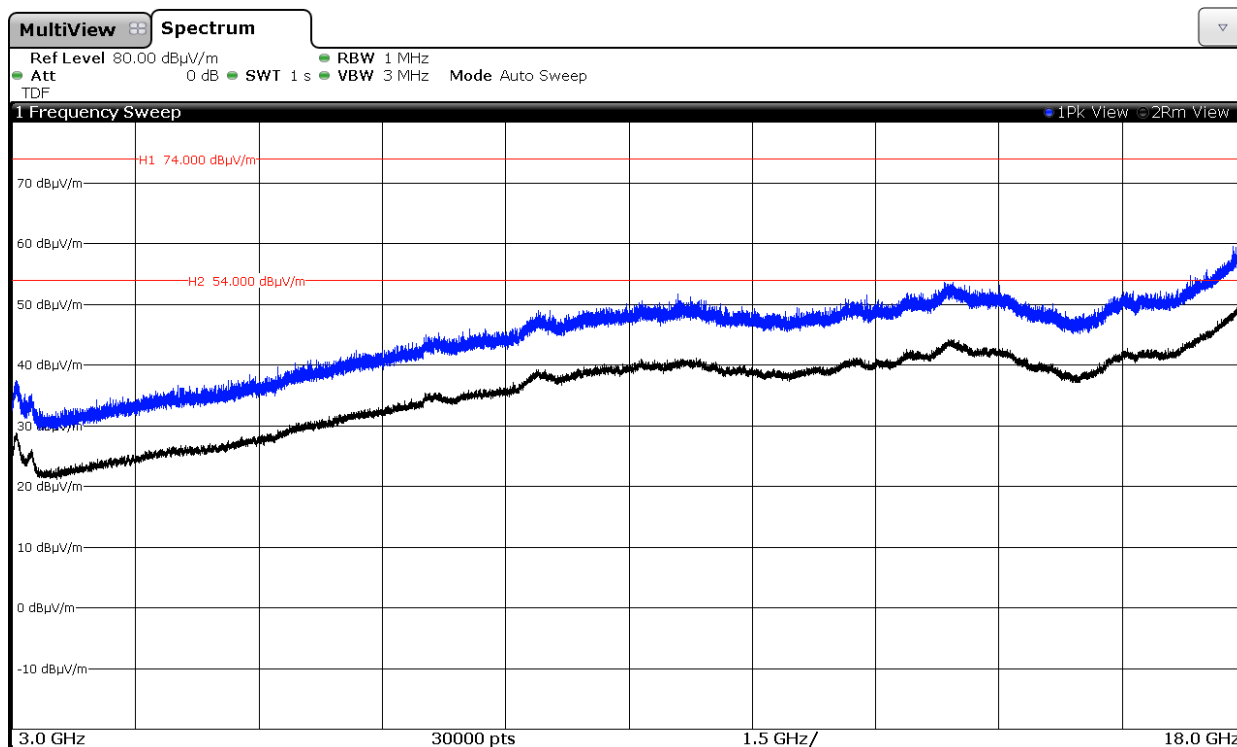
Chain A



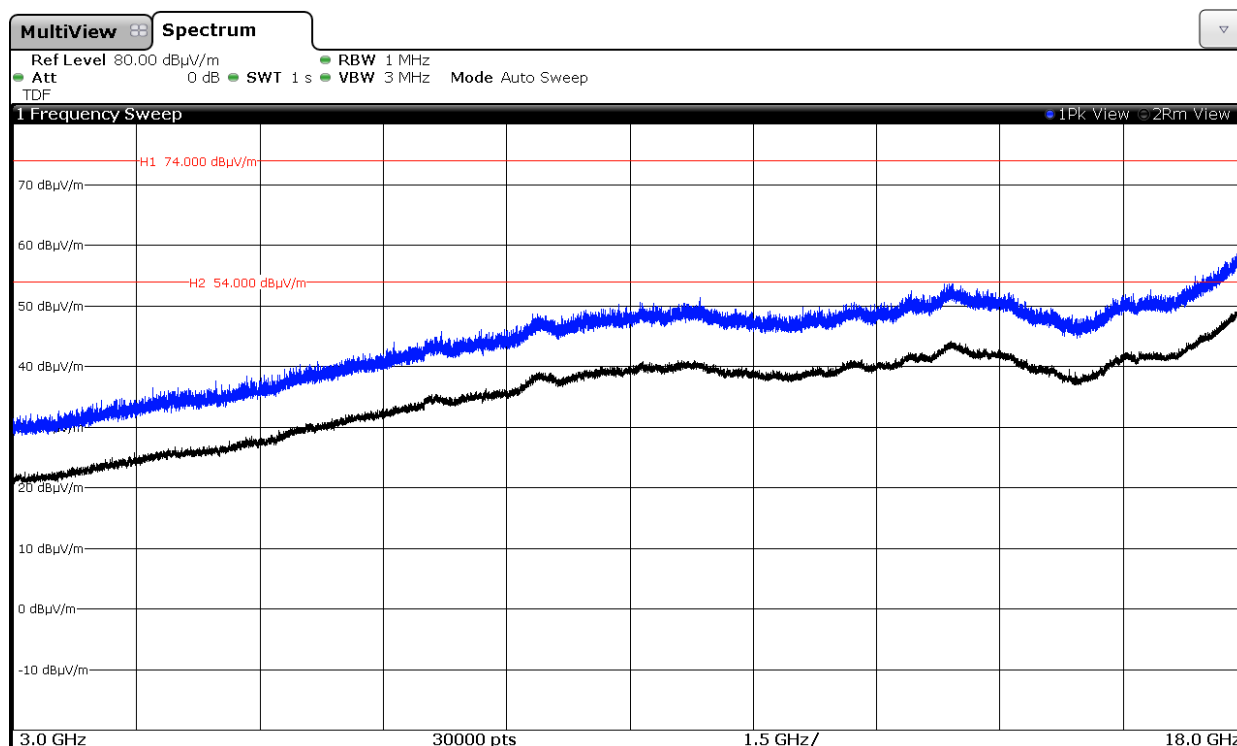
Chain B



CHANNEL 11 (2462 MHz). Chain A



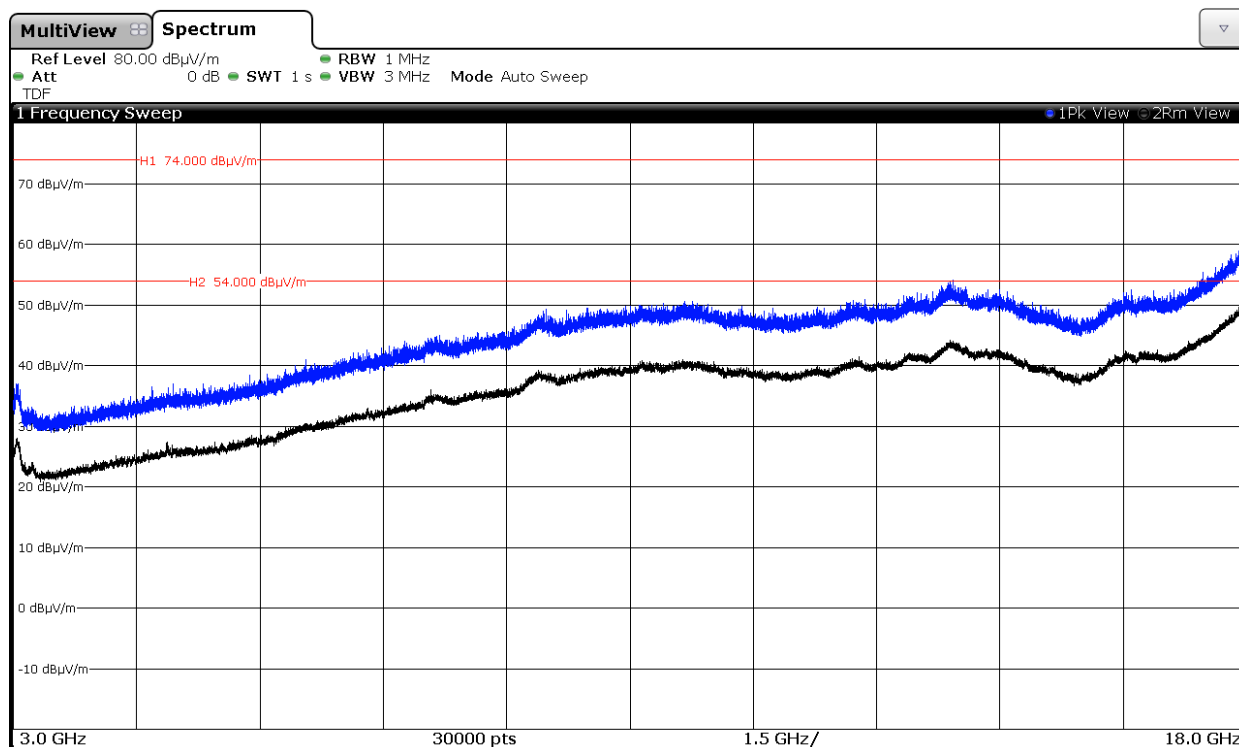
Chain B



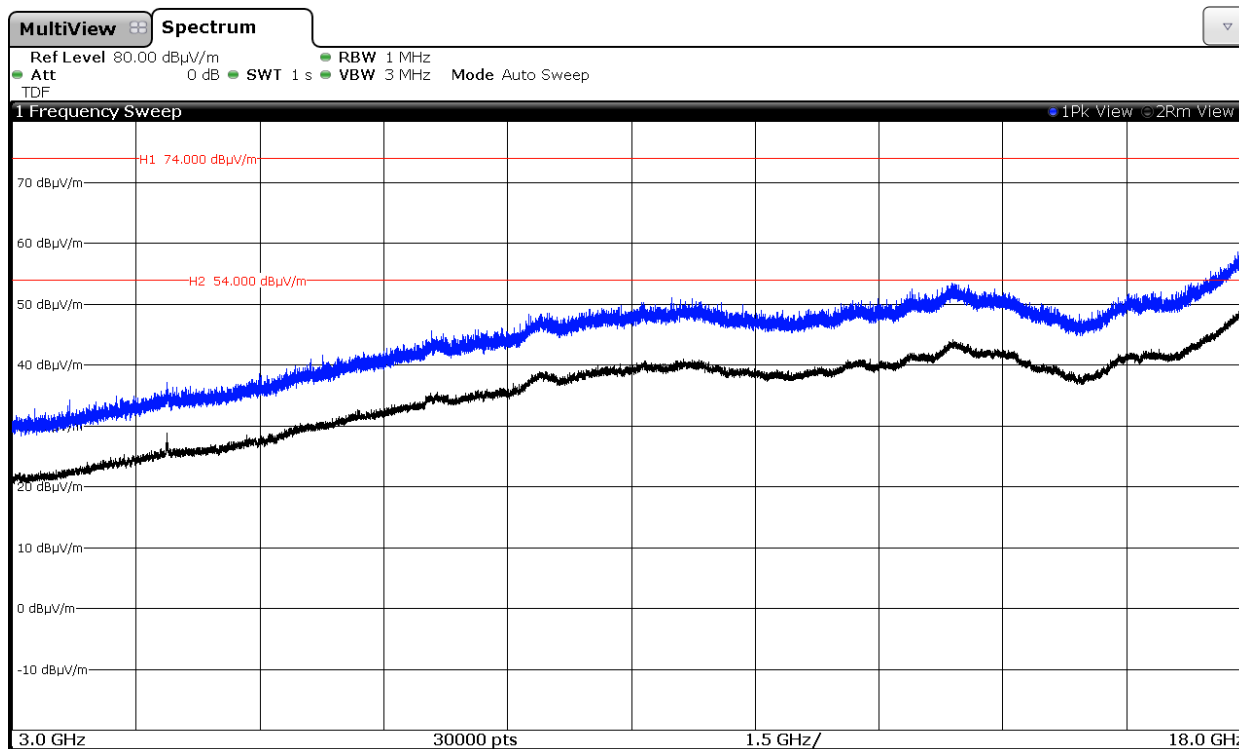
3.WiFi 2.4GHz 802.11 n20 mode

CHANNEL 6 (2437 MHz).

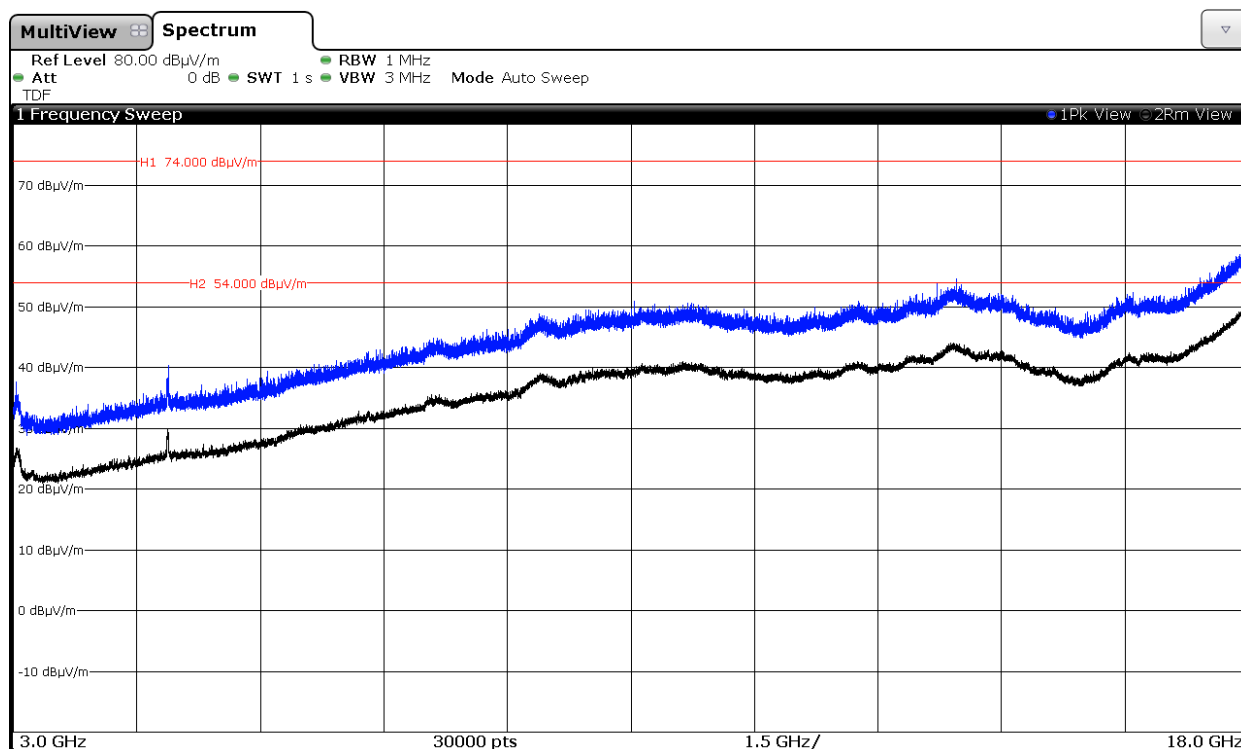
Chain A.



Chain B.



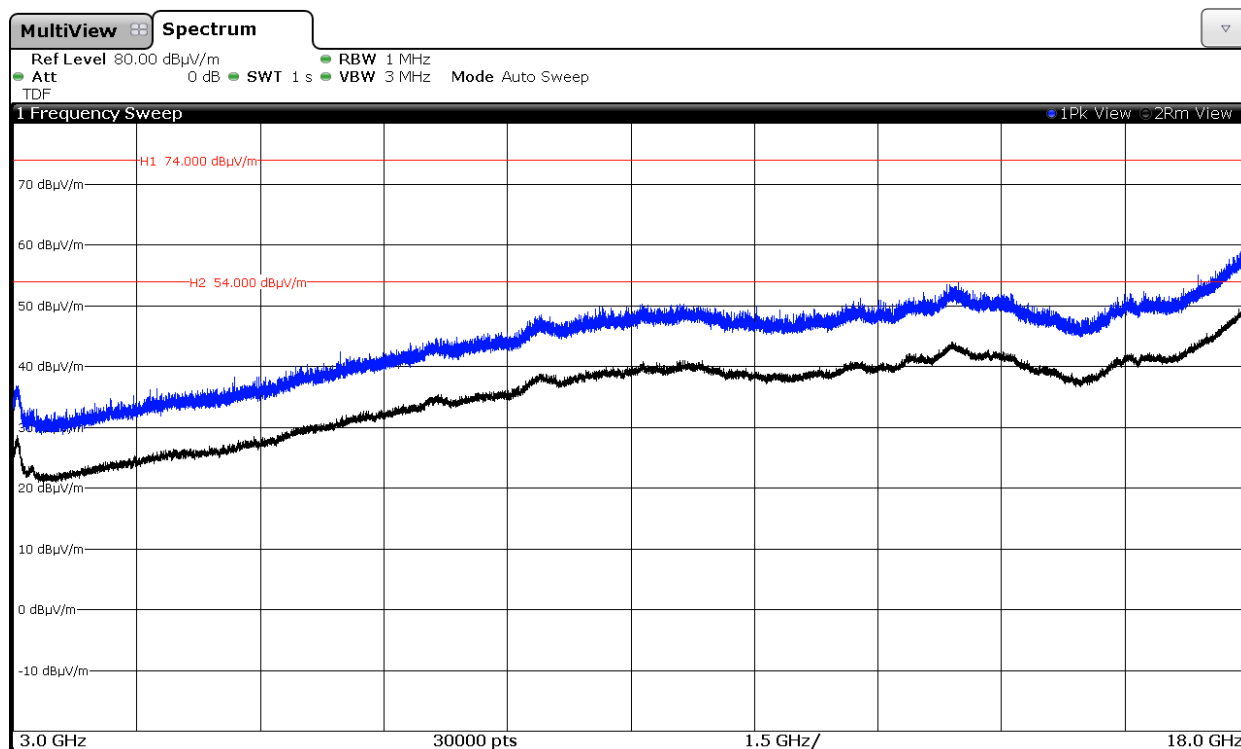
Chain A+B.



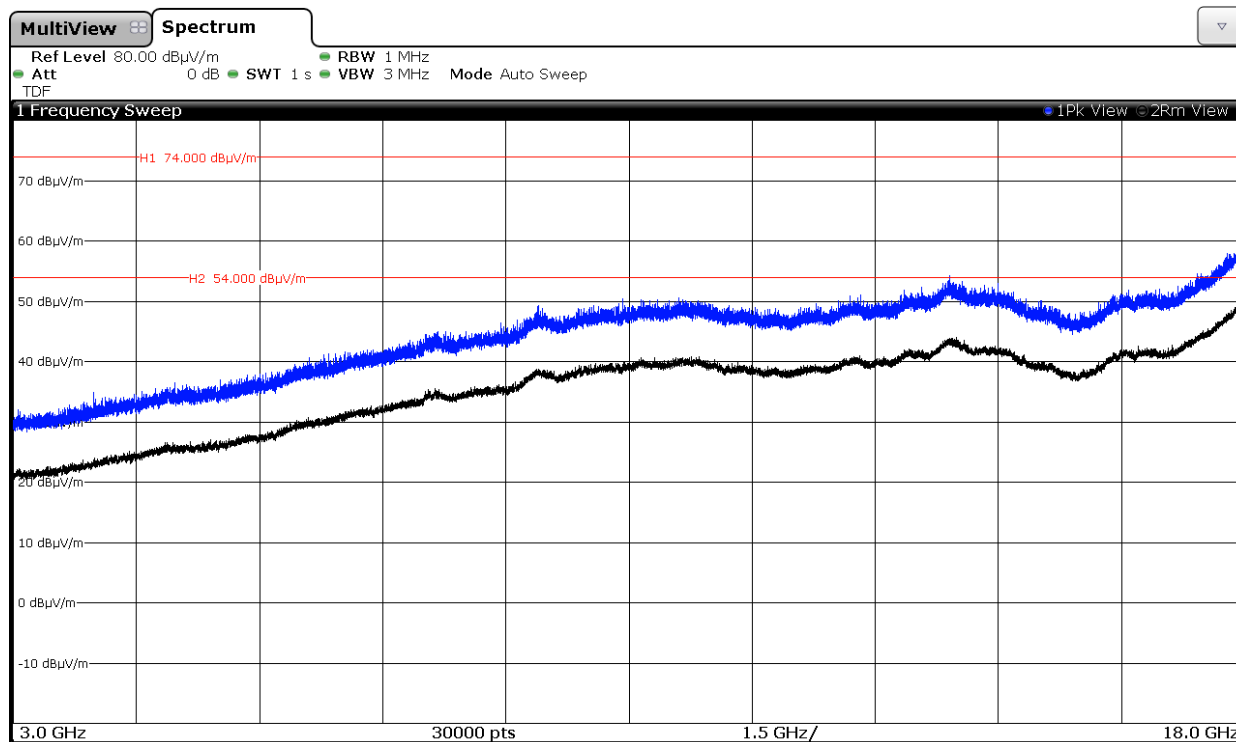
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 6 (2437 MHz).

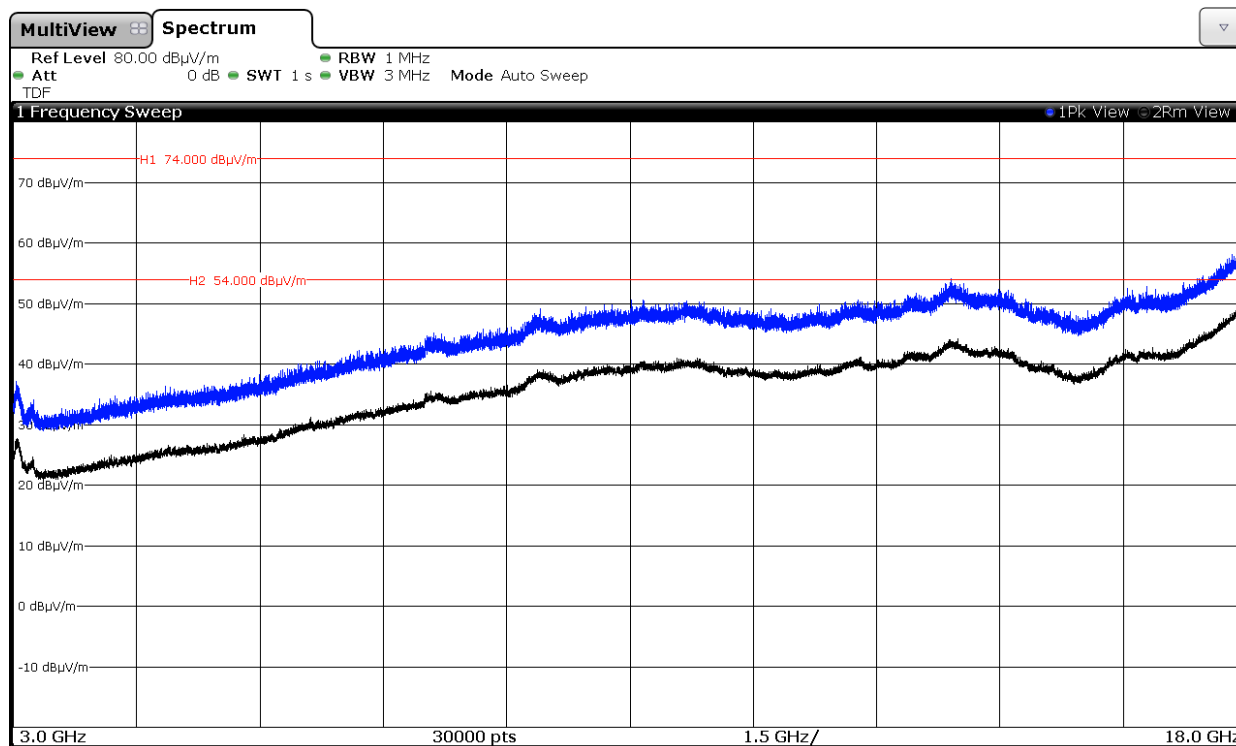
Chain A.



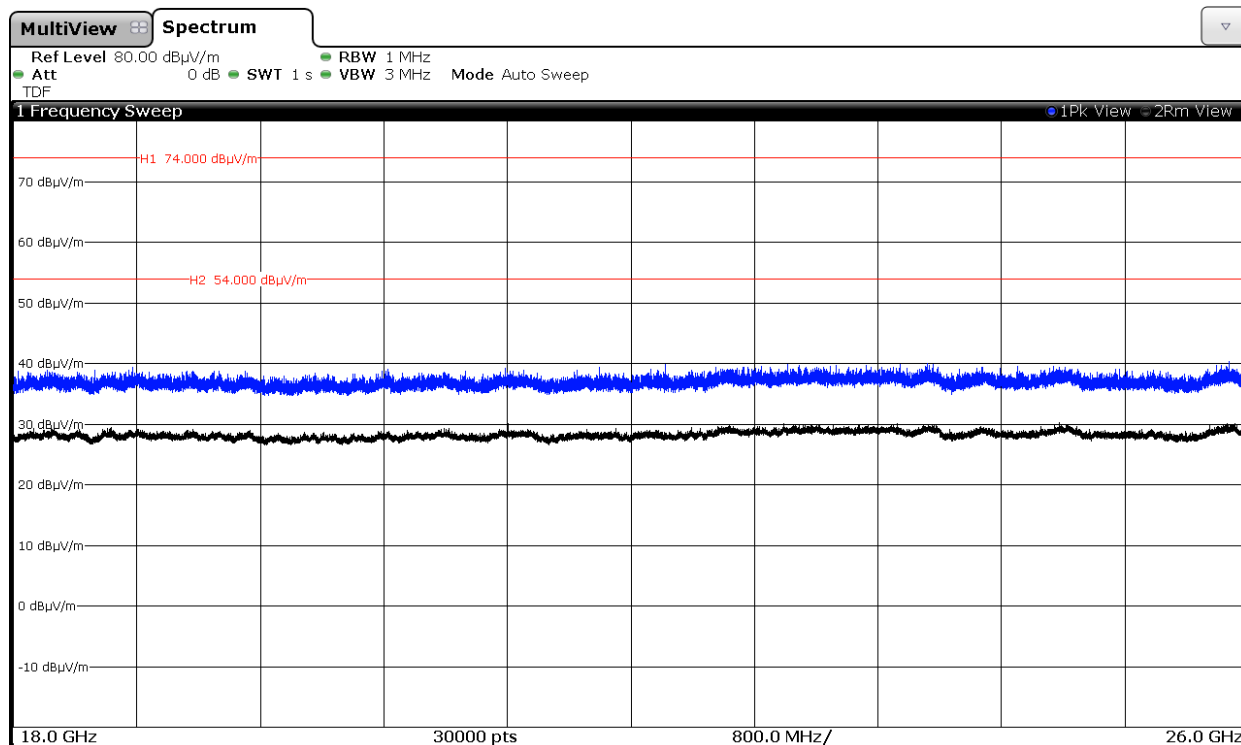
Chain B



Chain A+B



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



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

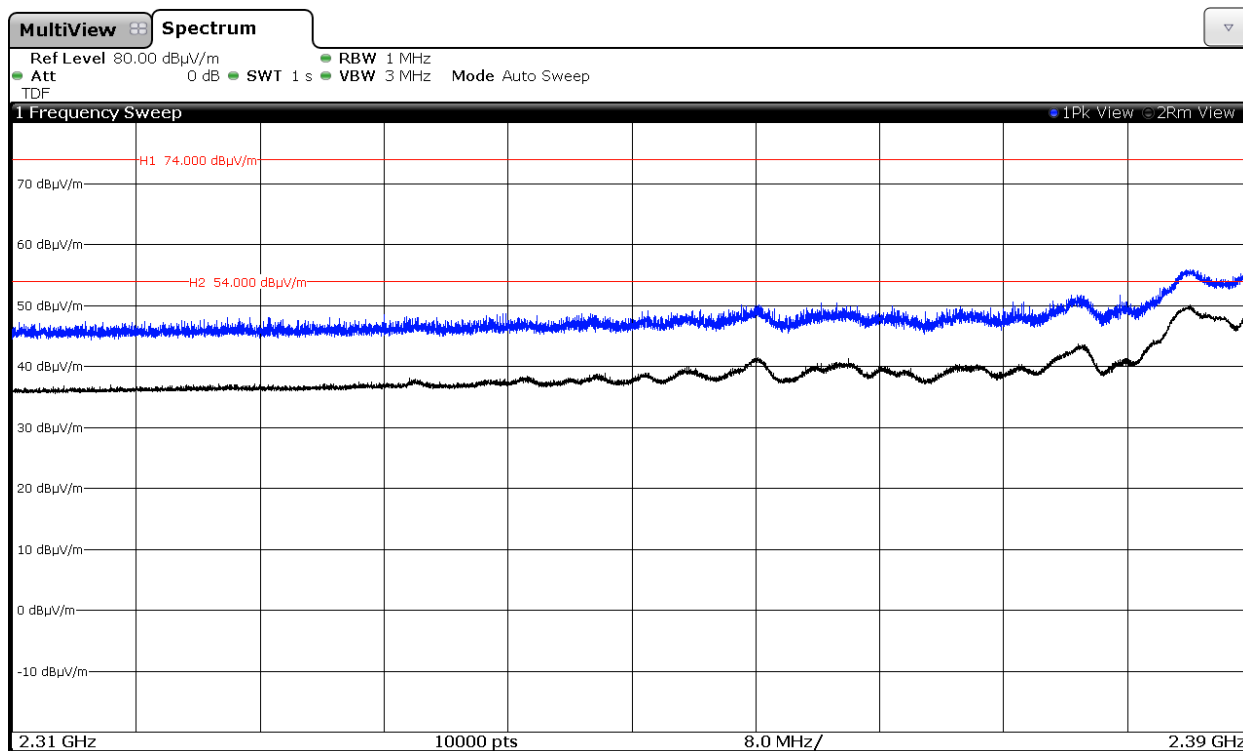
Radiated spurious emissions at band-edges and inside restricted bands 2.31-2.39 GHz and 2.4835 – 2.5 GHz.

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

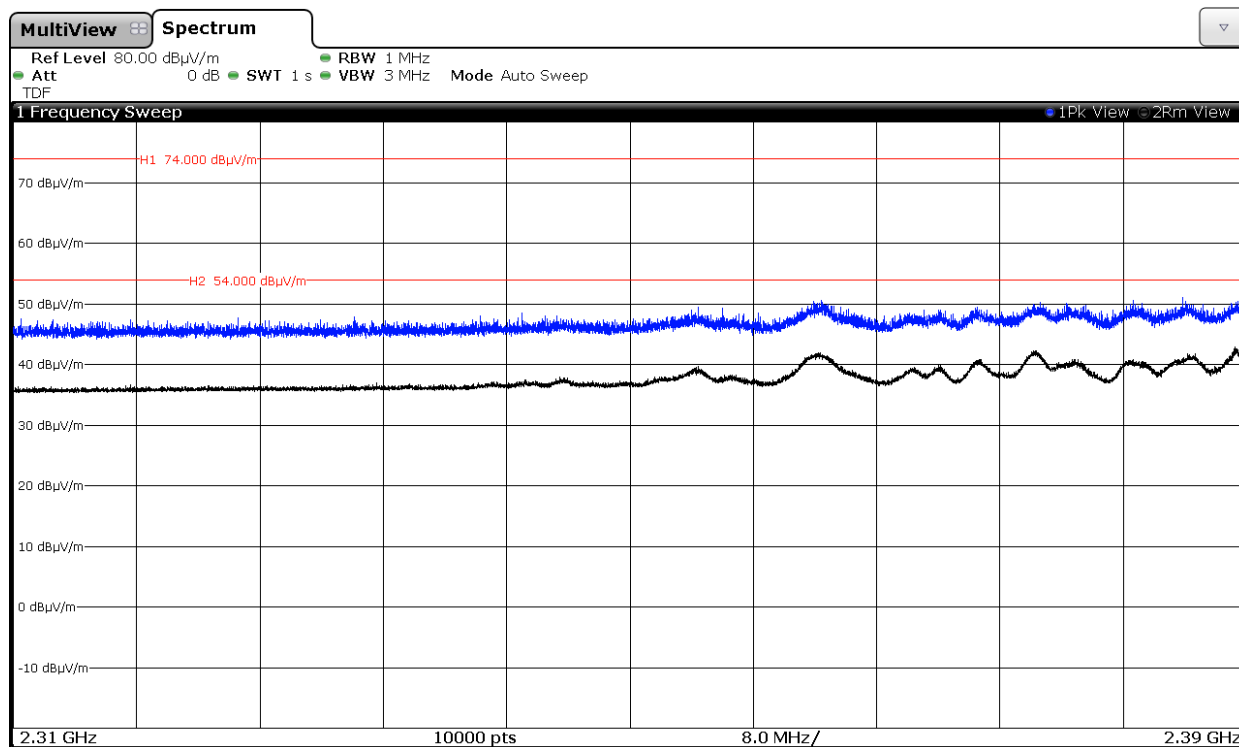
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

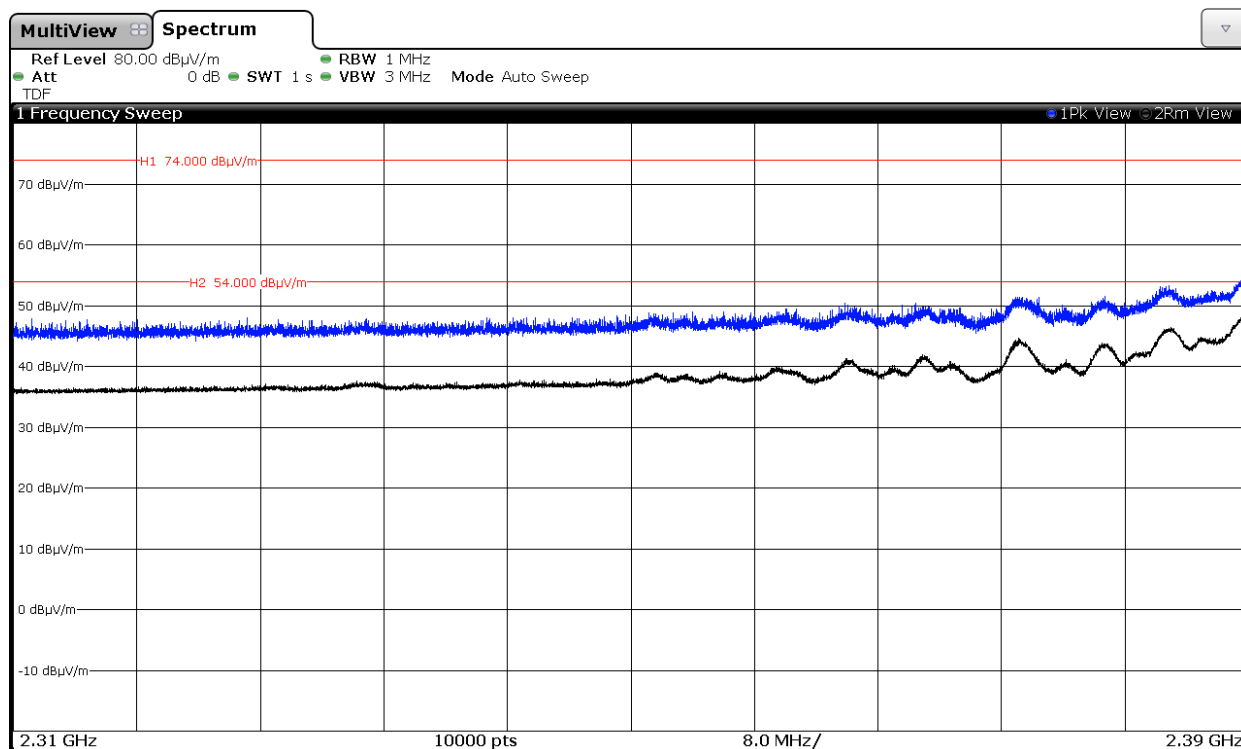


Chain B

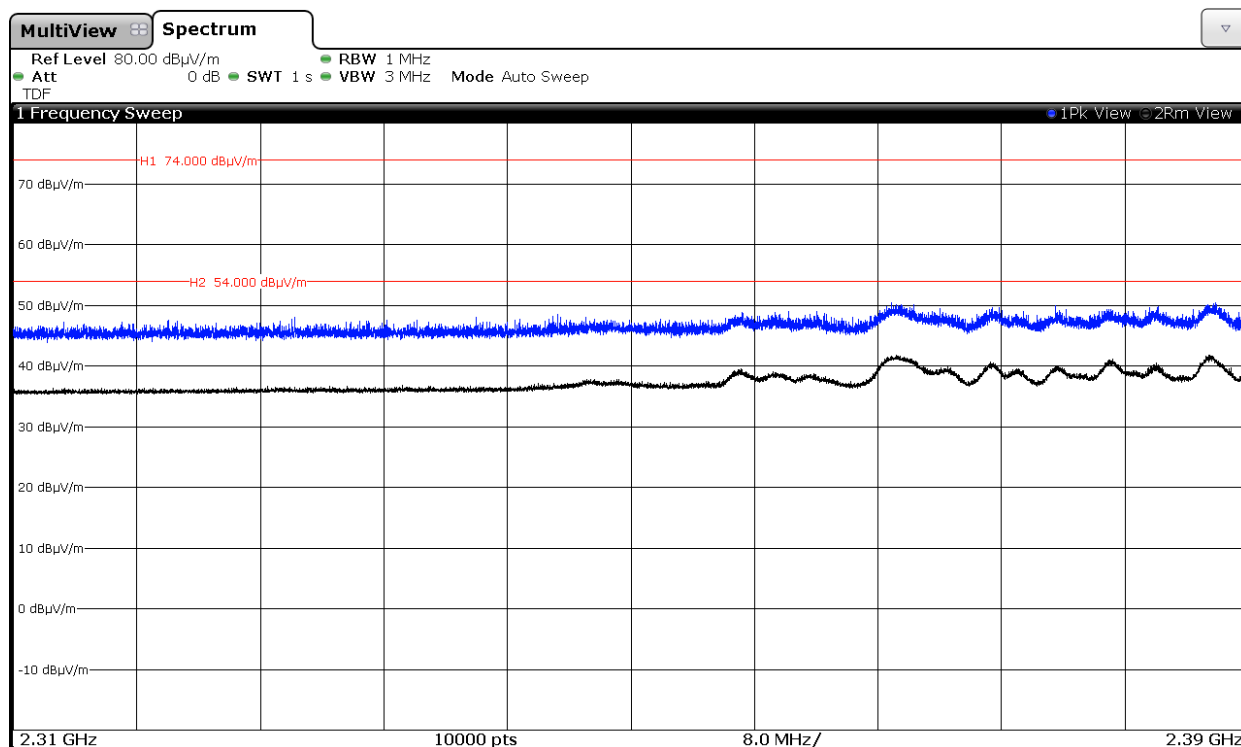


CHANNEL 2 (2417 MHz).

Chain A

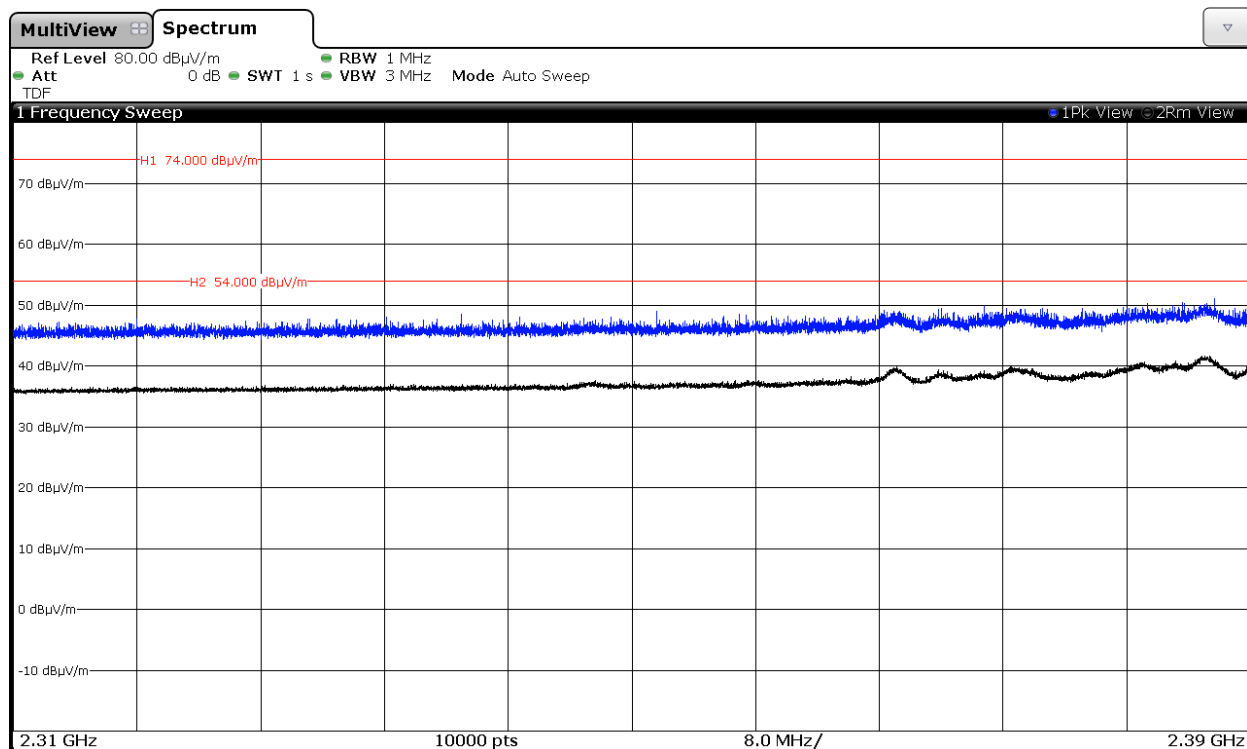


Chain B

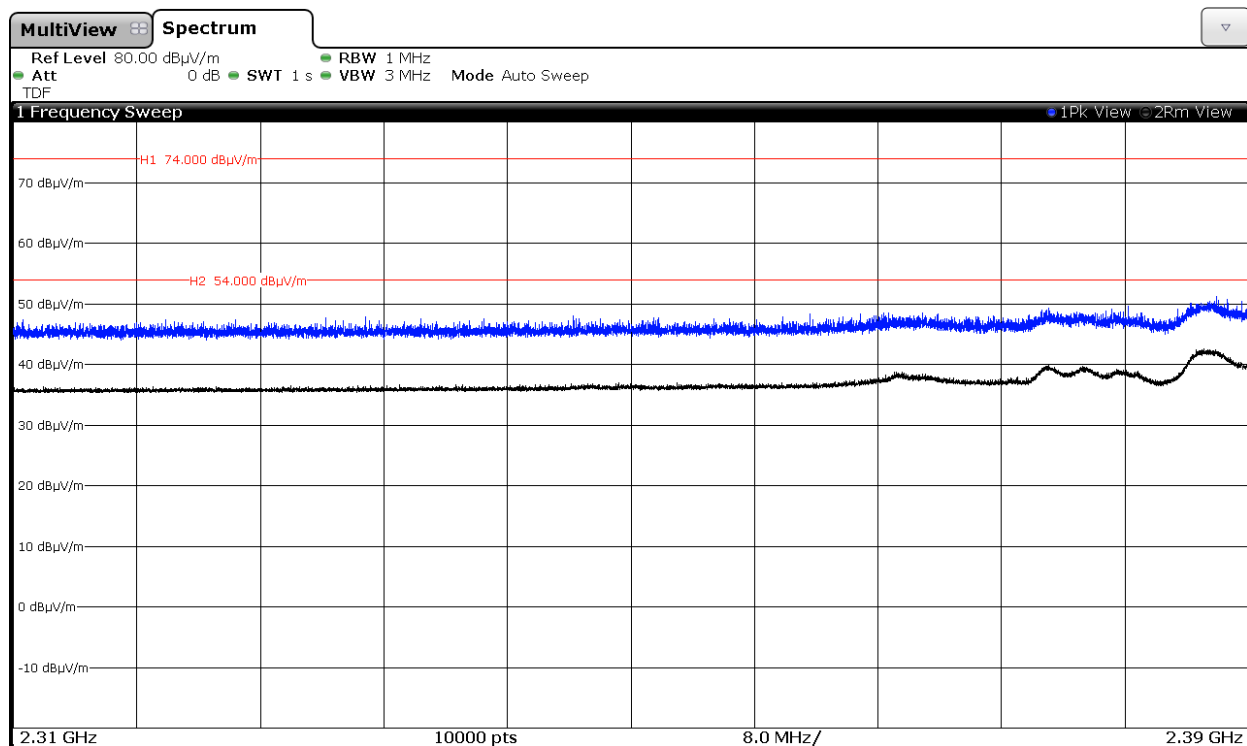


CHANNEL 6 (2437 MHz).

Chain A

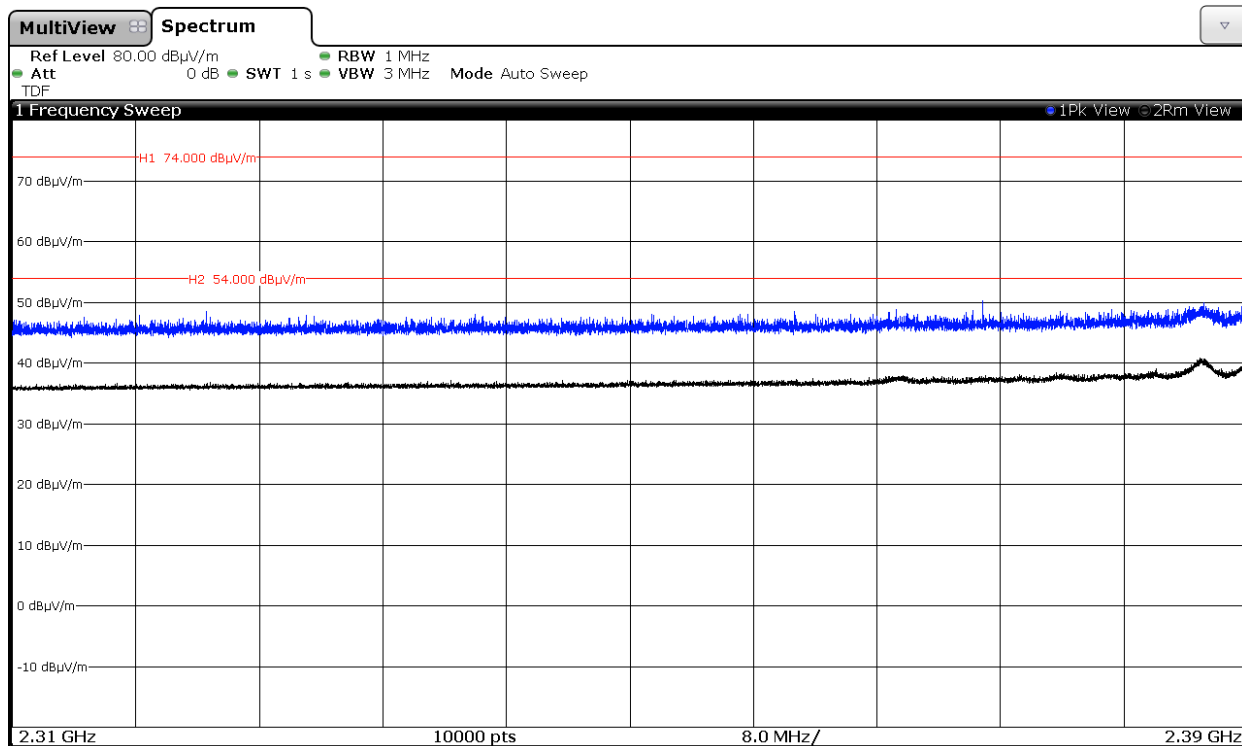


Chain B

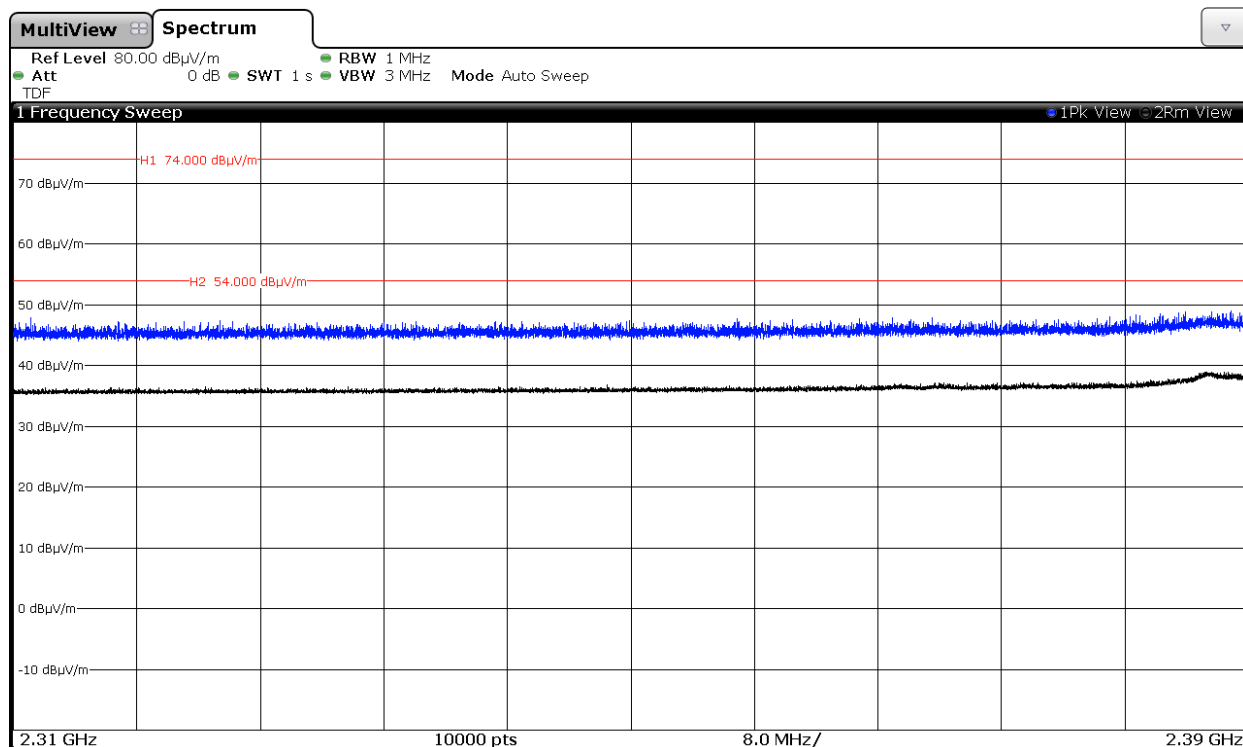


CHANNEL 10(2457 MHz)

Chain A

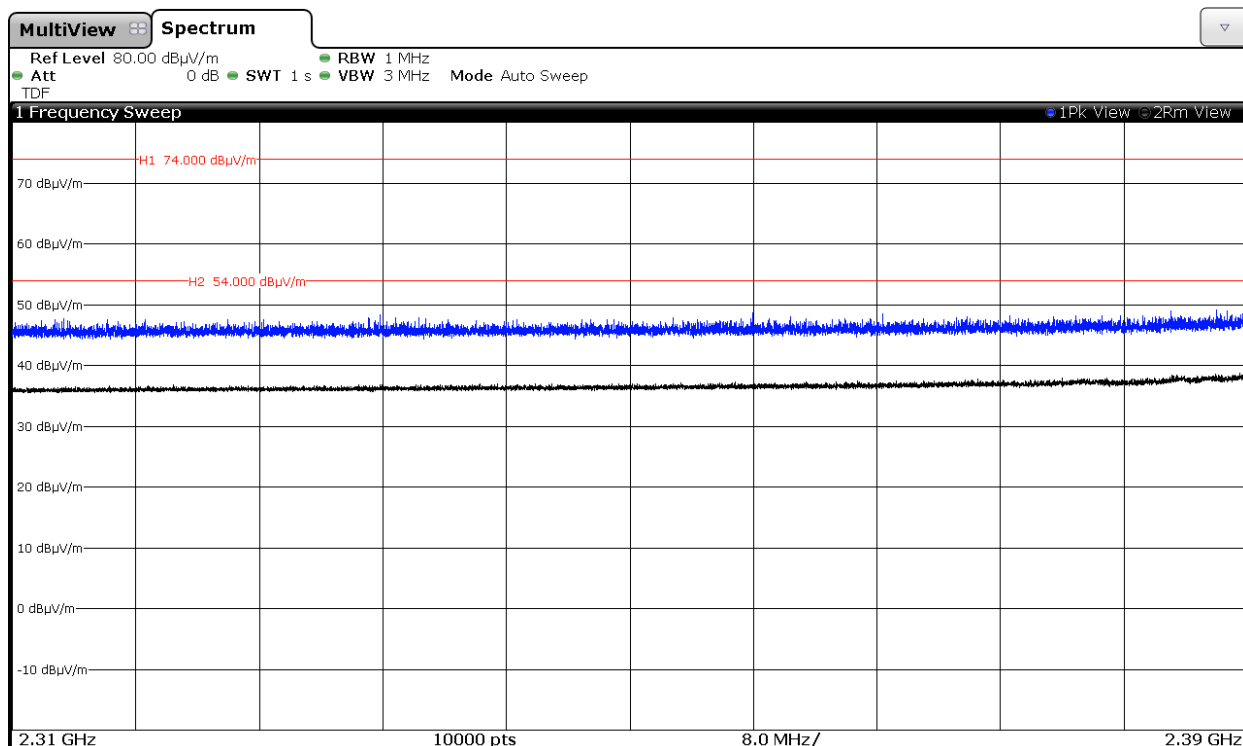


Chain B

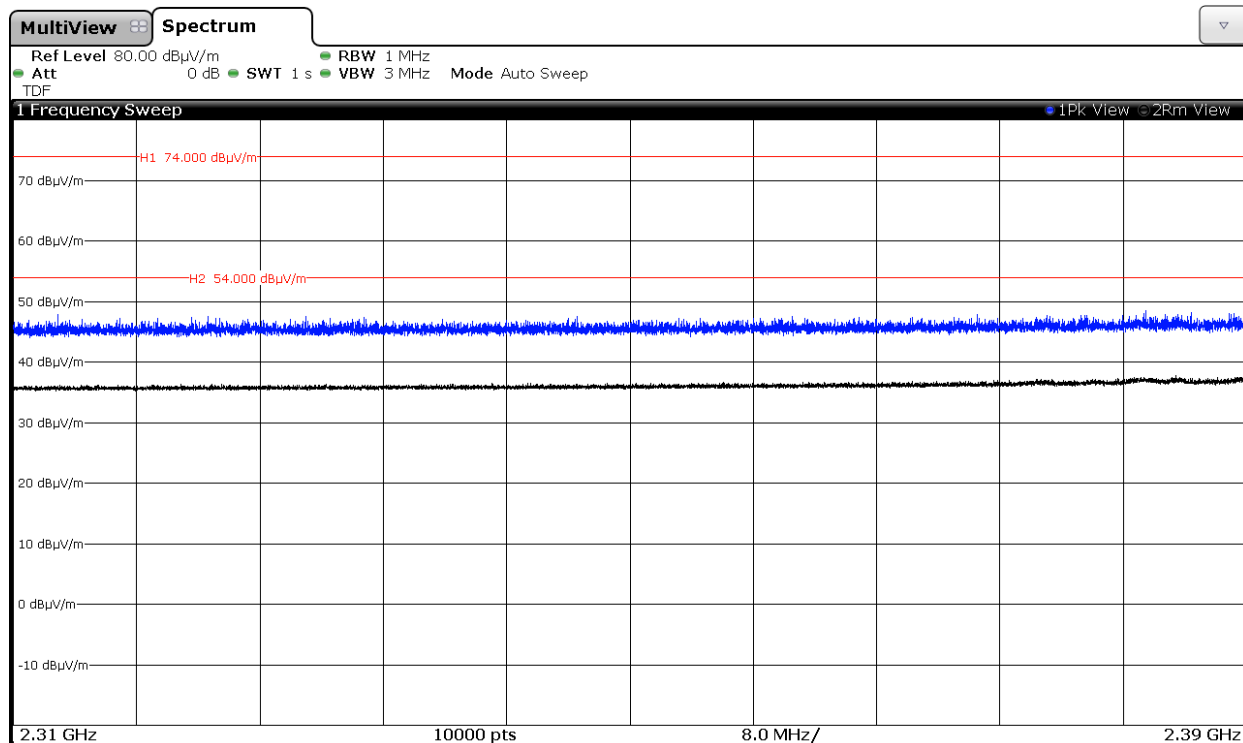


CHANNEL 11 (2462 MHz).

Chain A



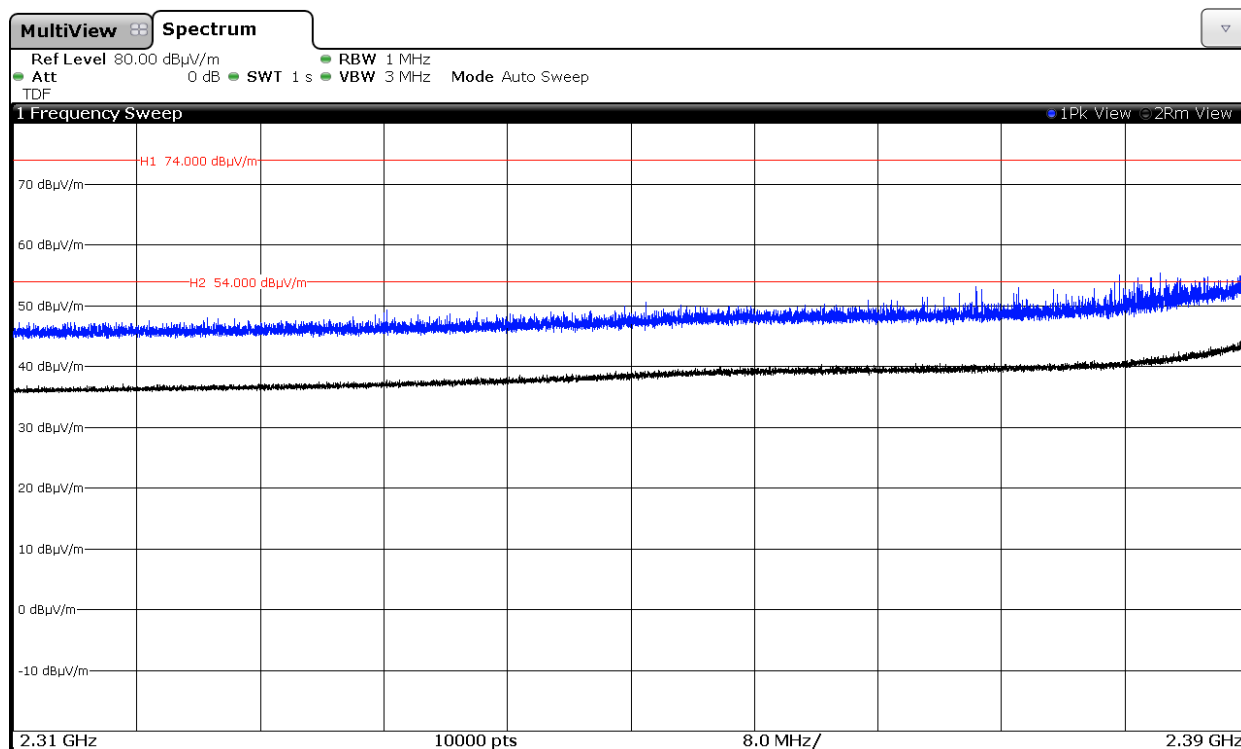
Chain B



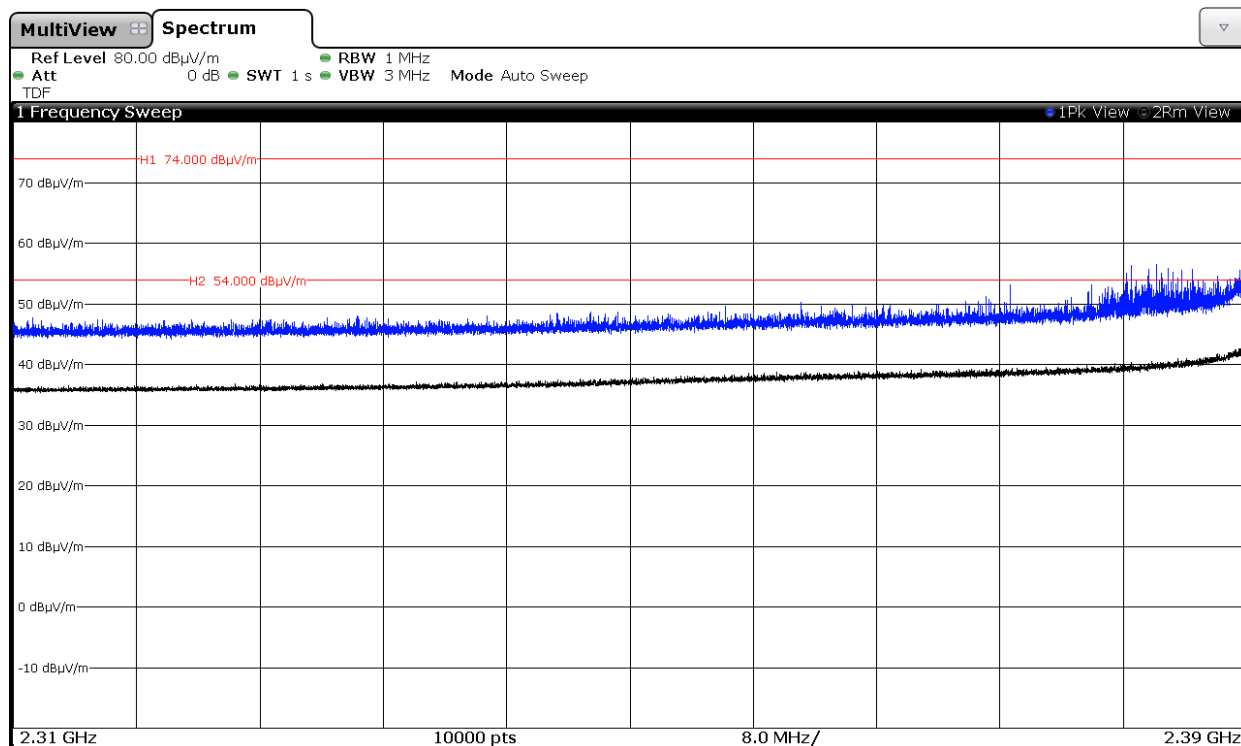
2. WiFi 2.4GHz 802.11 g mode

CHANNEL 1 (2412 MHz).

Chain A

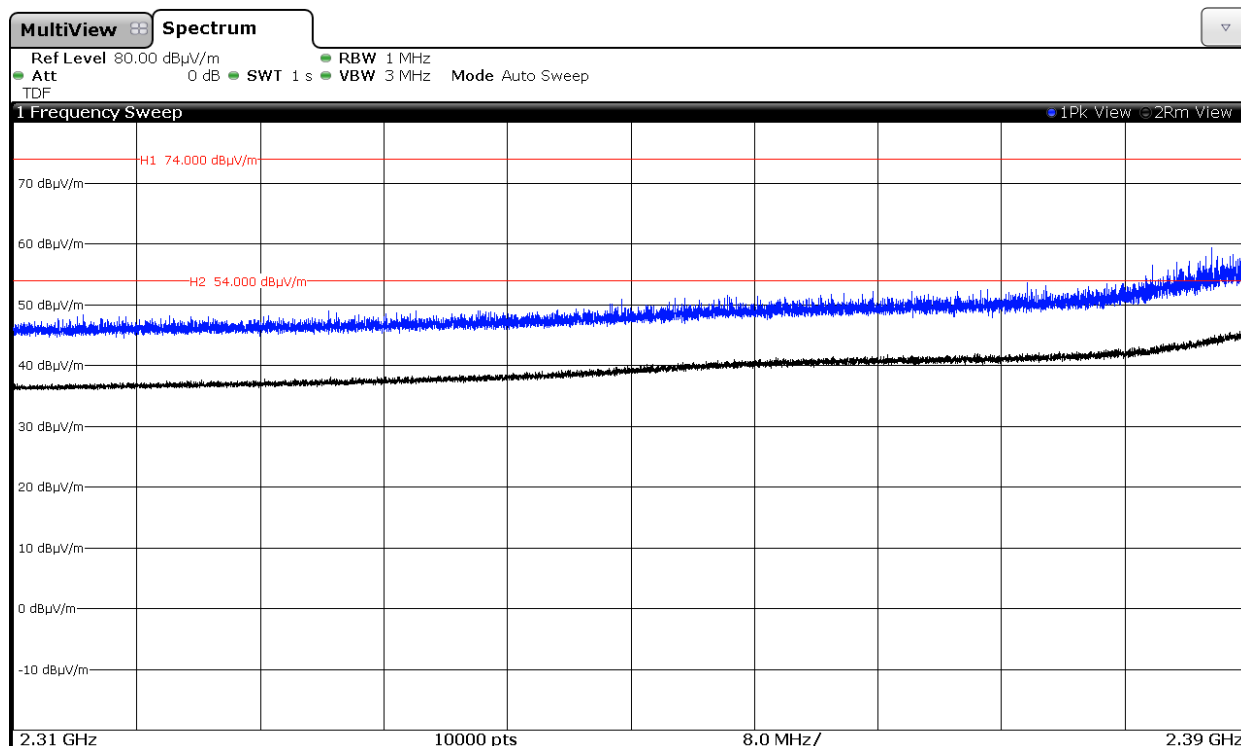


Chain B

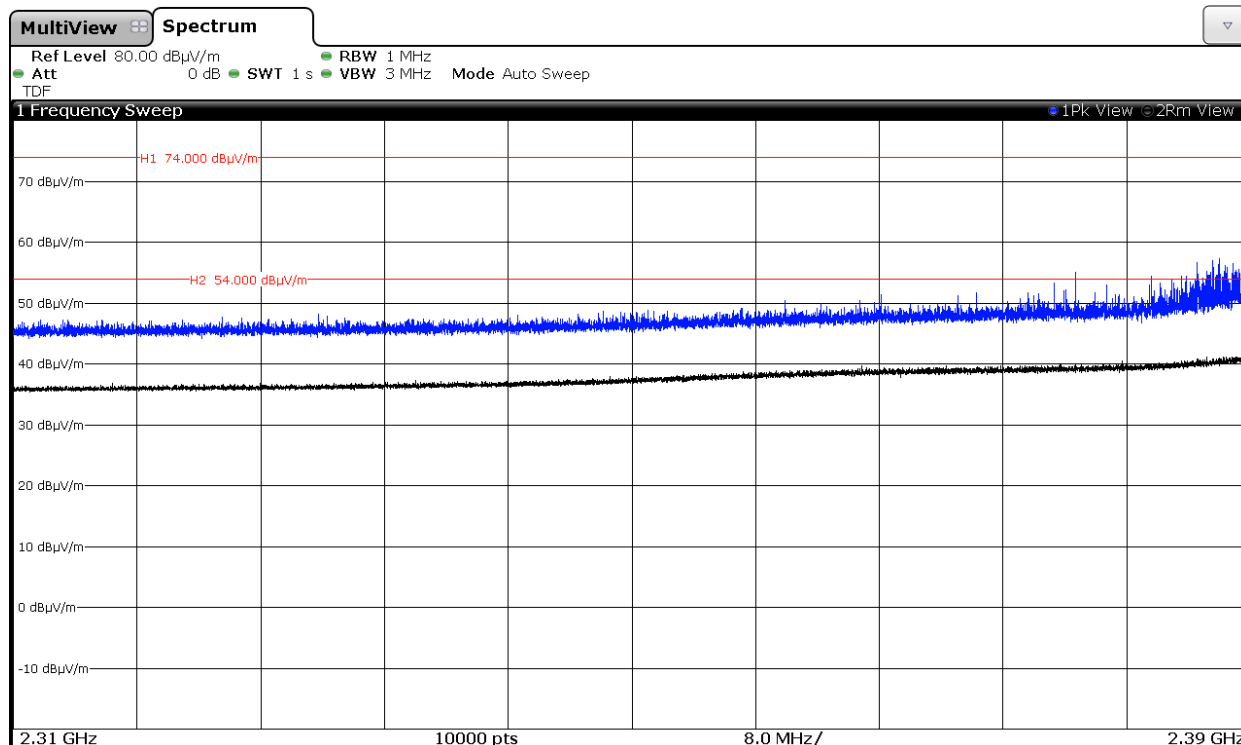


CHANNEL 2 (2417 MHz).

Chain A

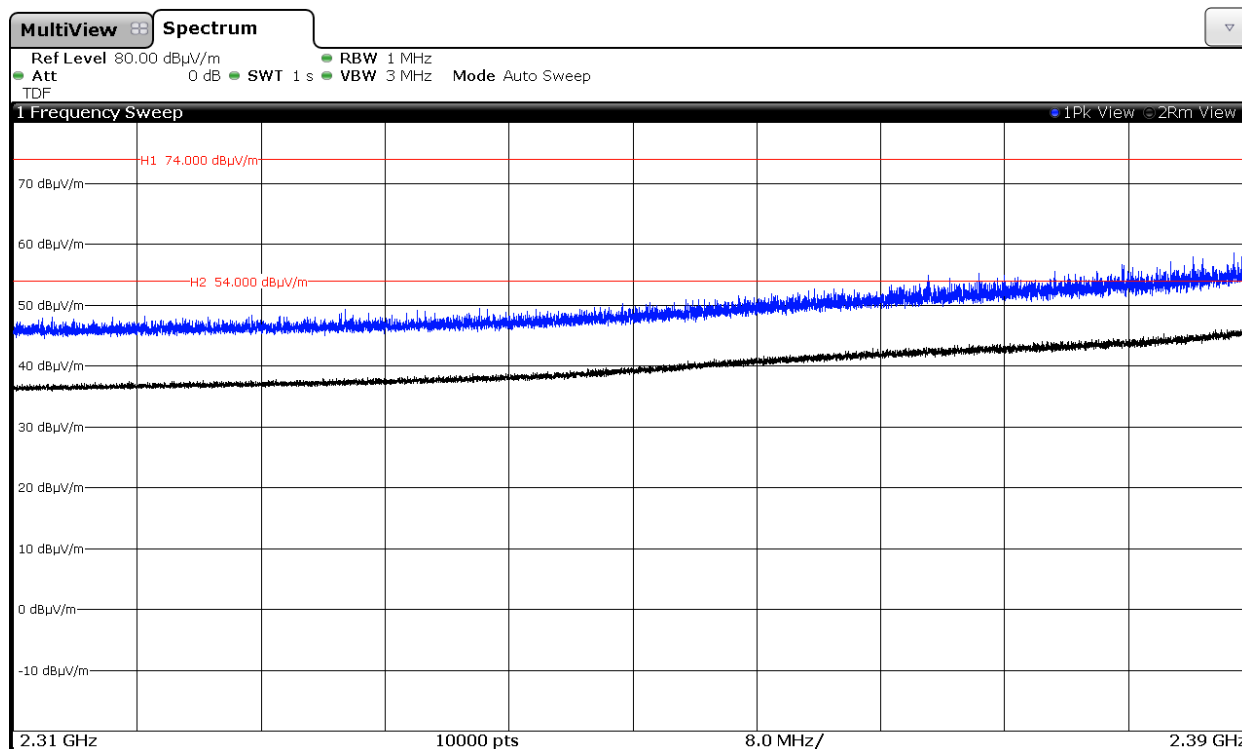


Chain B

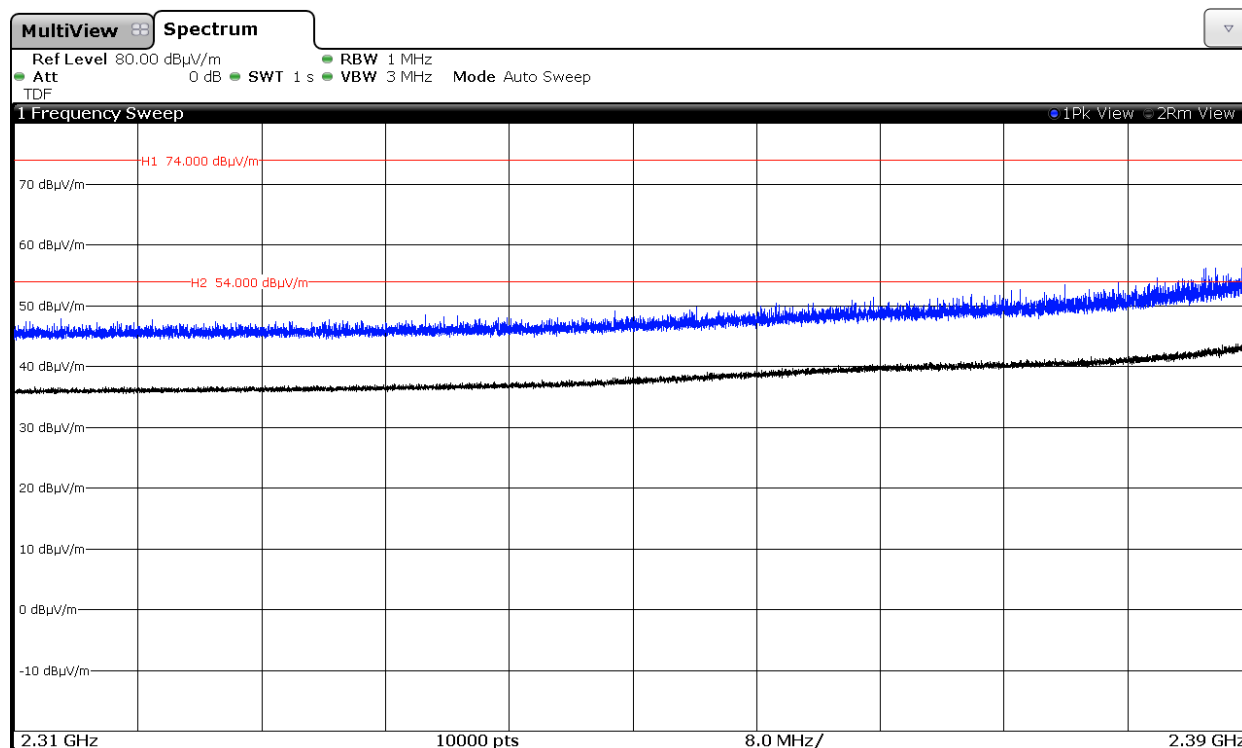


CHANNEL 3 (2422 MHz).

Chain A

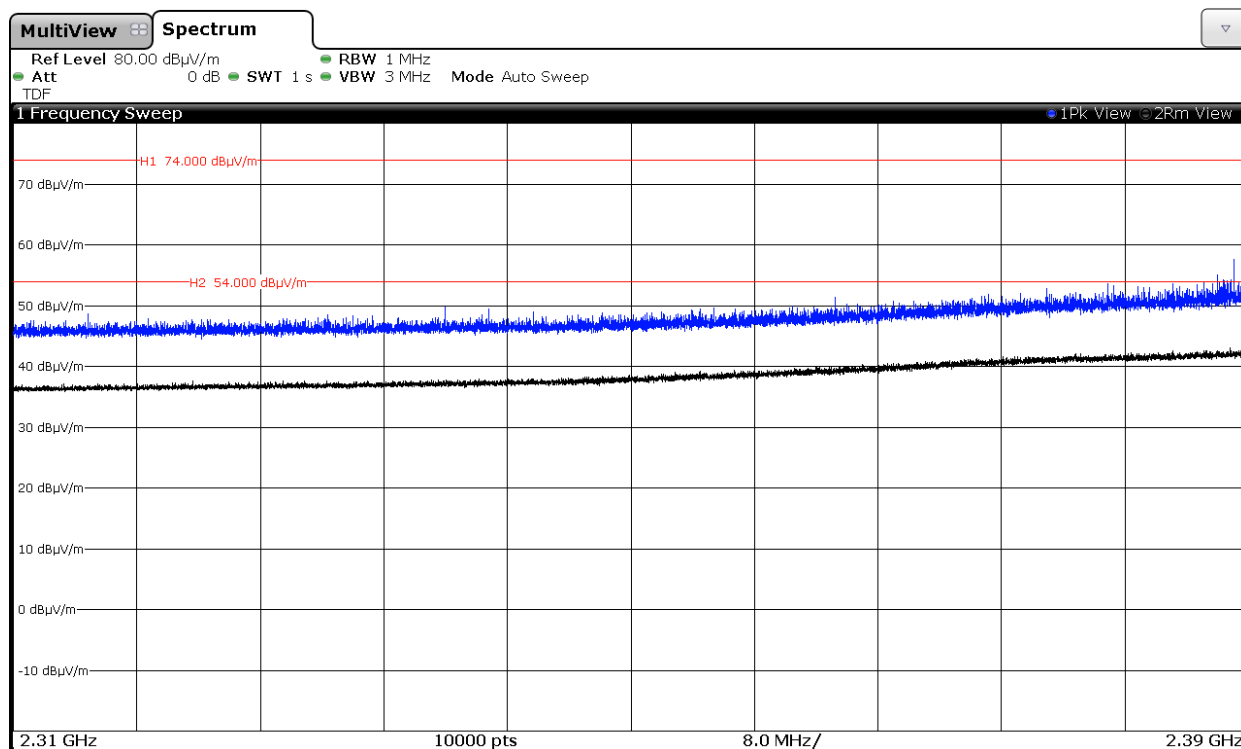


Chain B

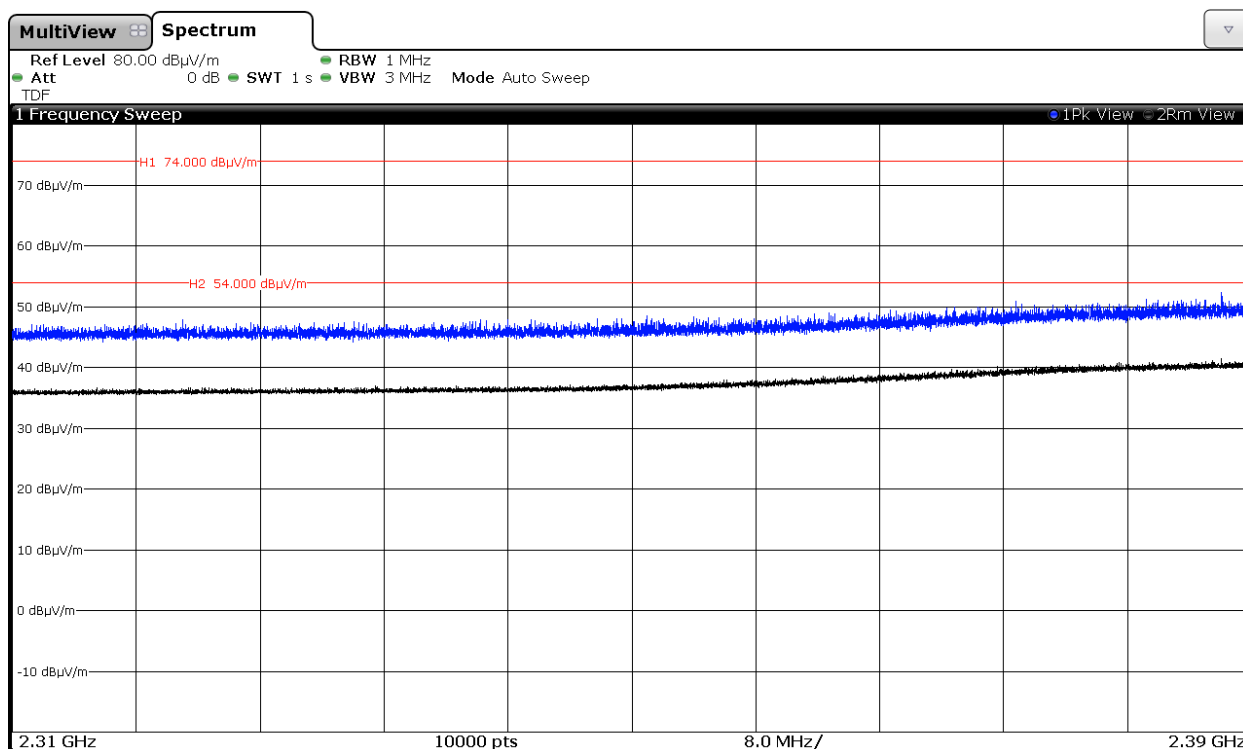


CHANNEL 6 (2437 MHz).

Chain A



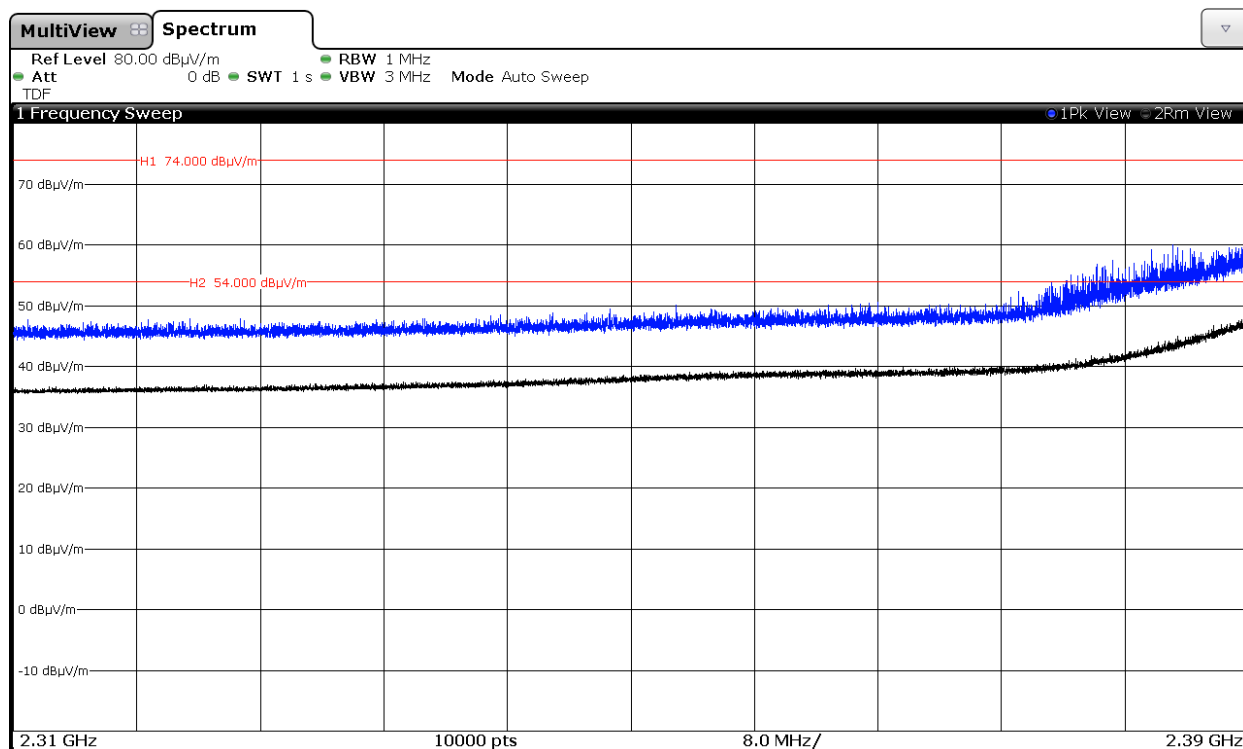
Chain B



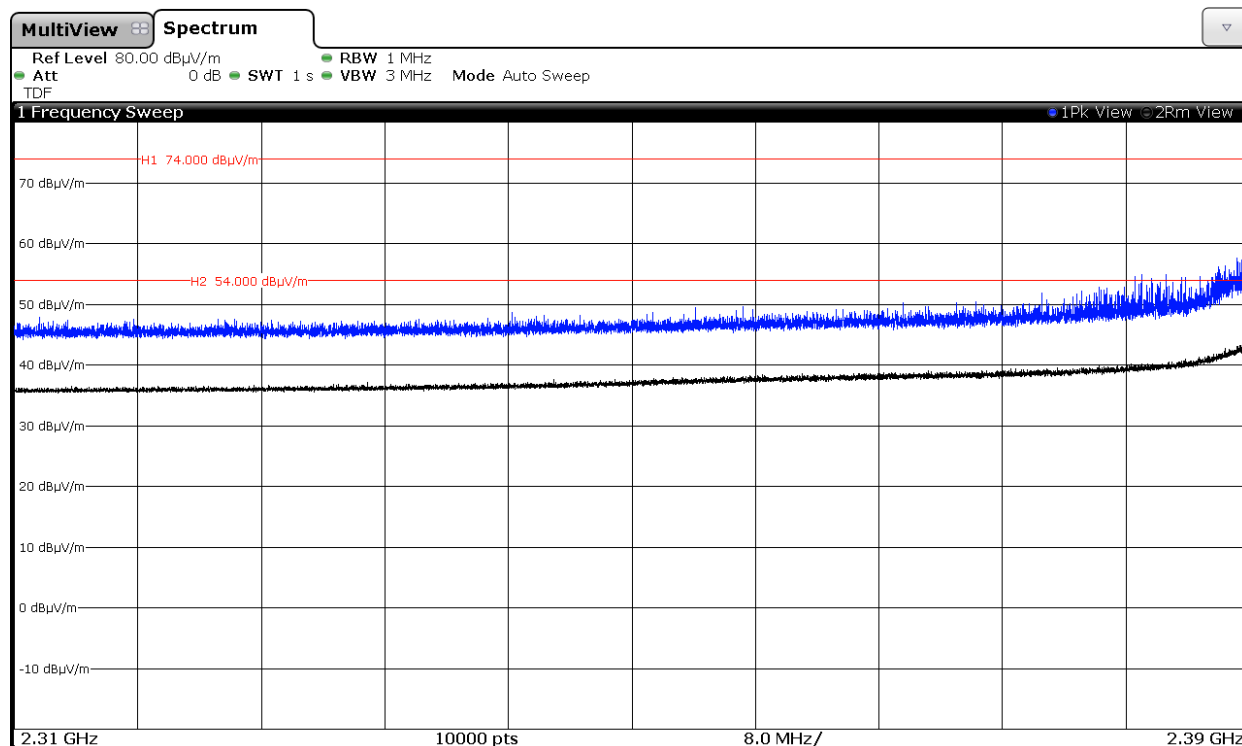
3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 1 (2412 MHz).

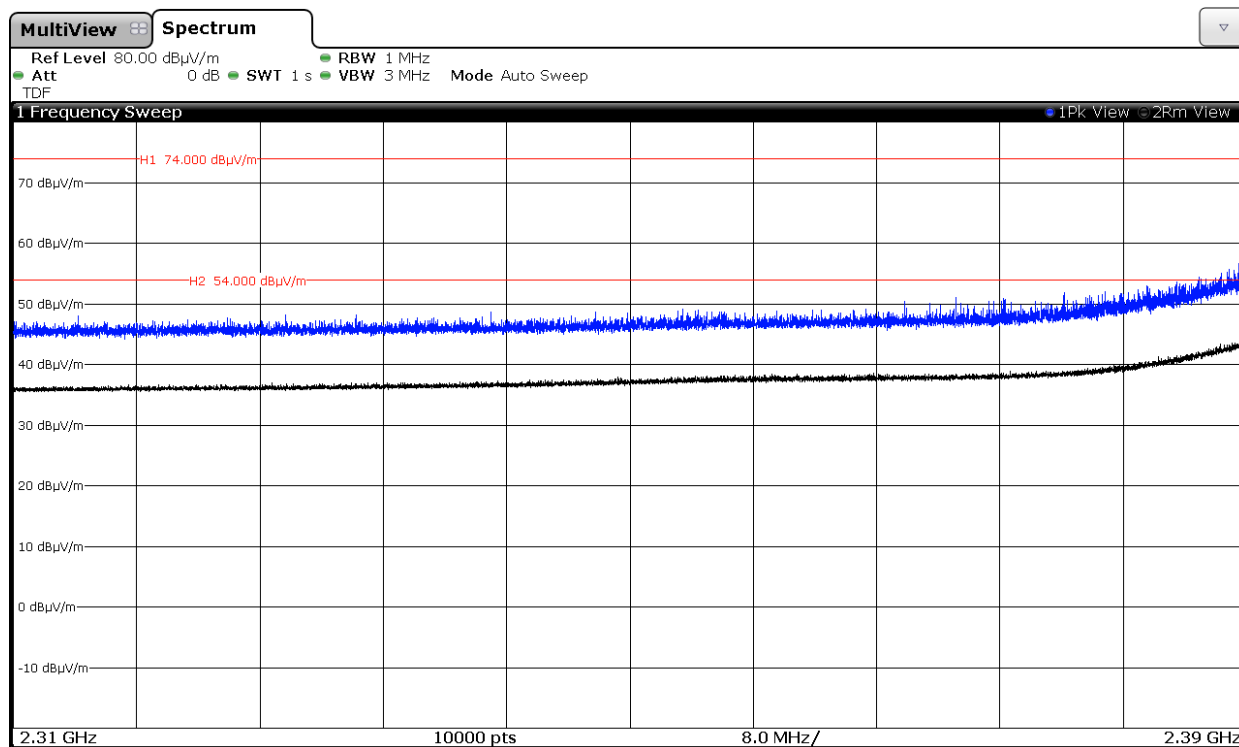
Chain A



Chain B

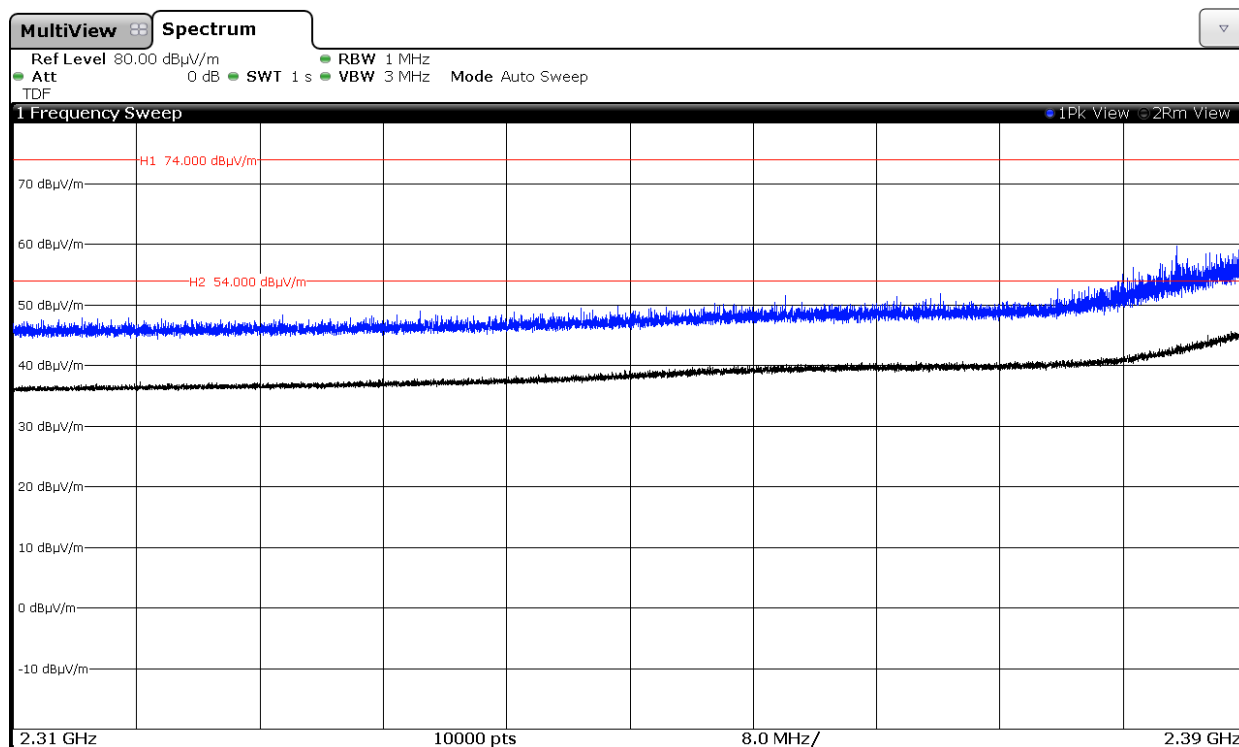


Chain A+B

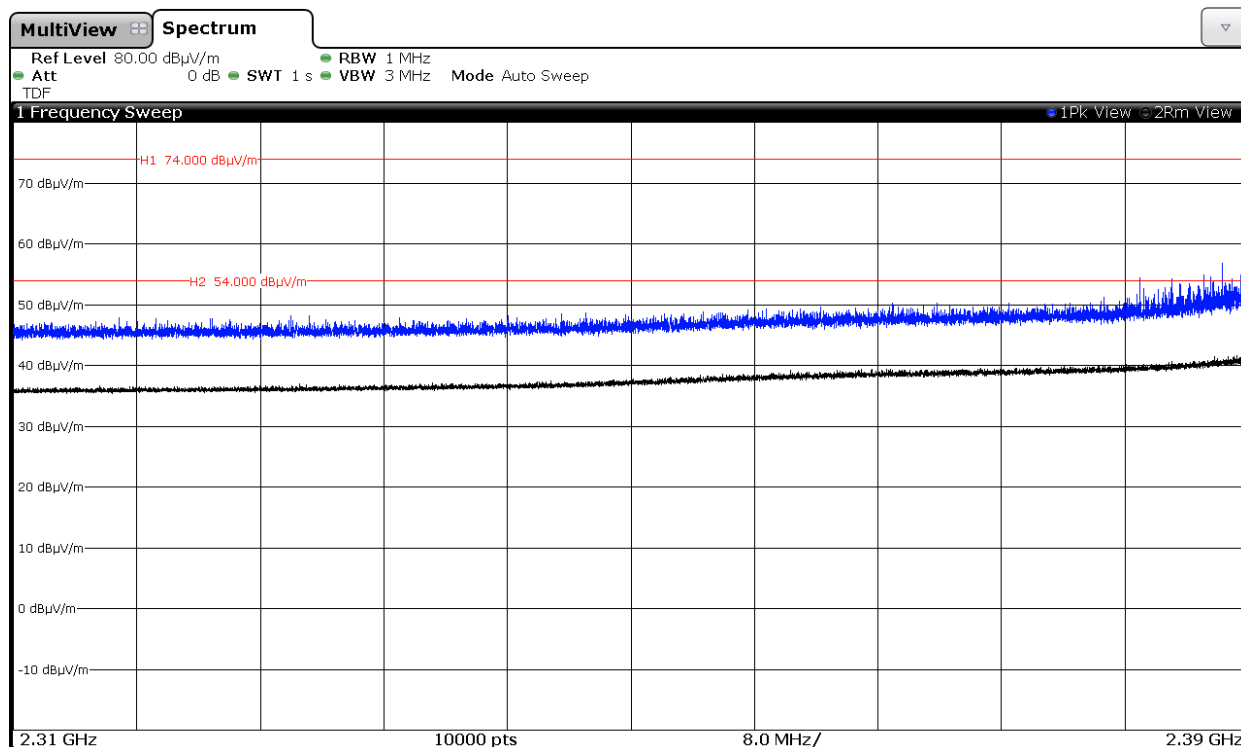


CHANNEL 2 (2417 MHz).

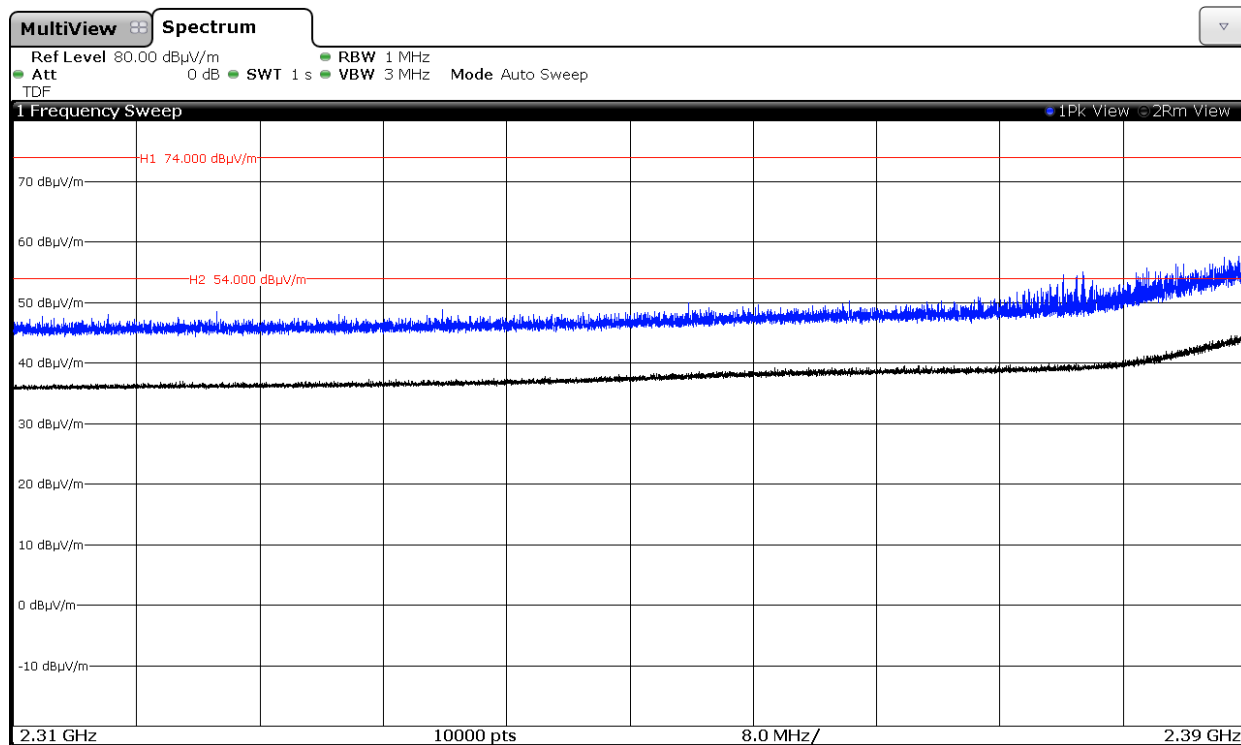
Chain A



Chain B

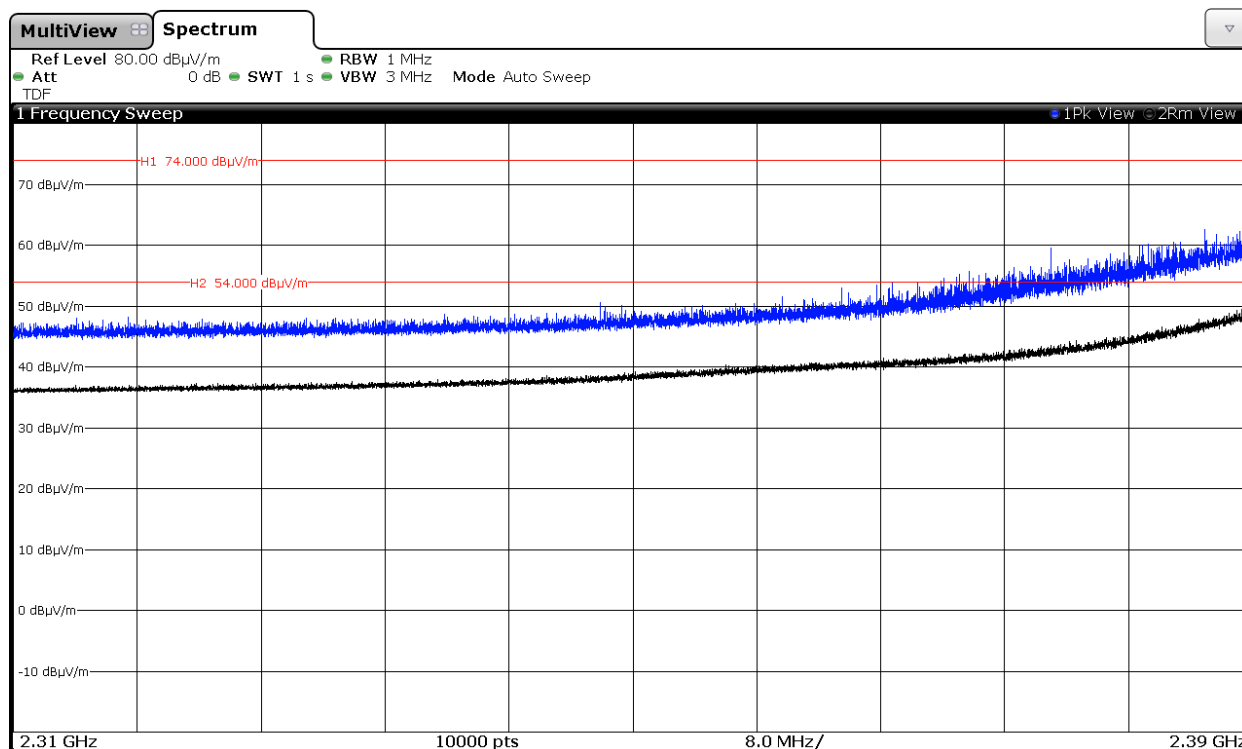


Chain A+B

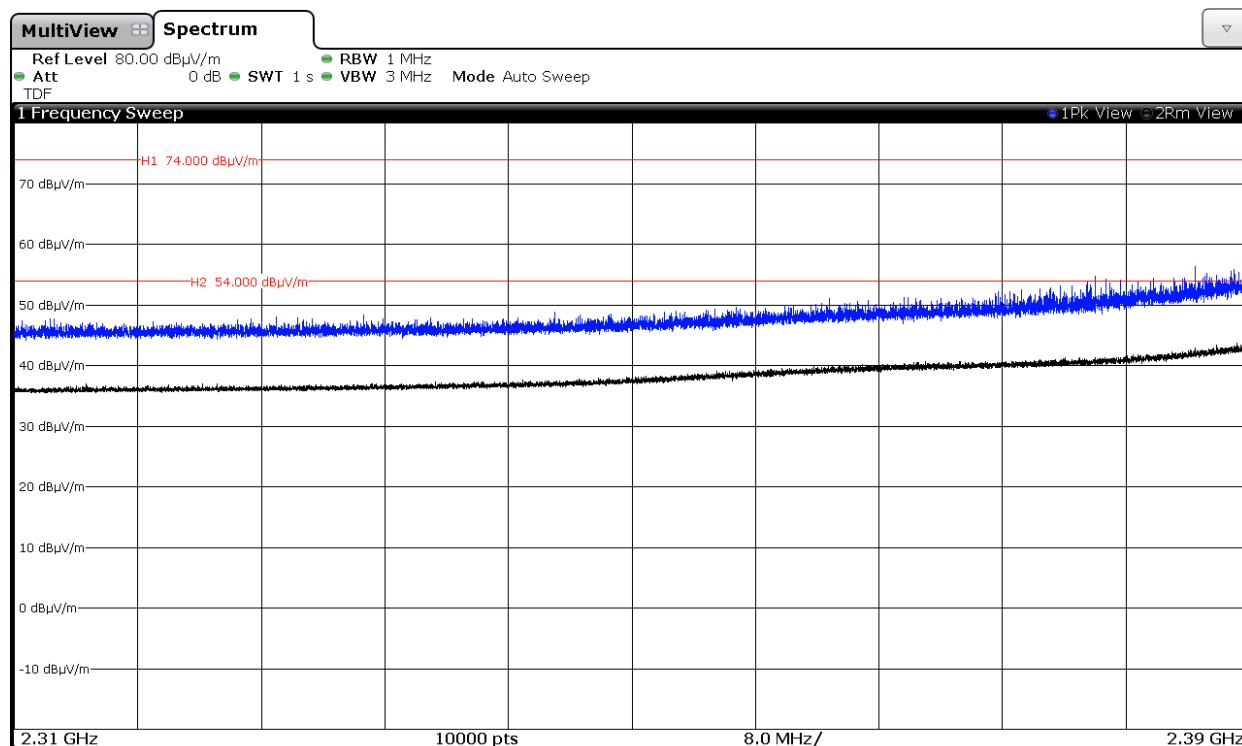


CHANNEL 3 (2422MHz).

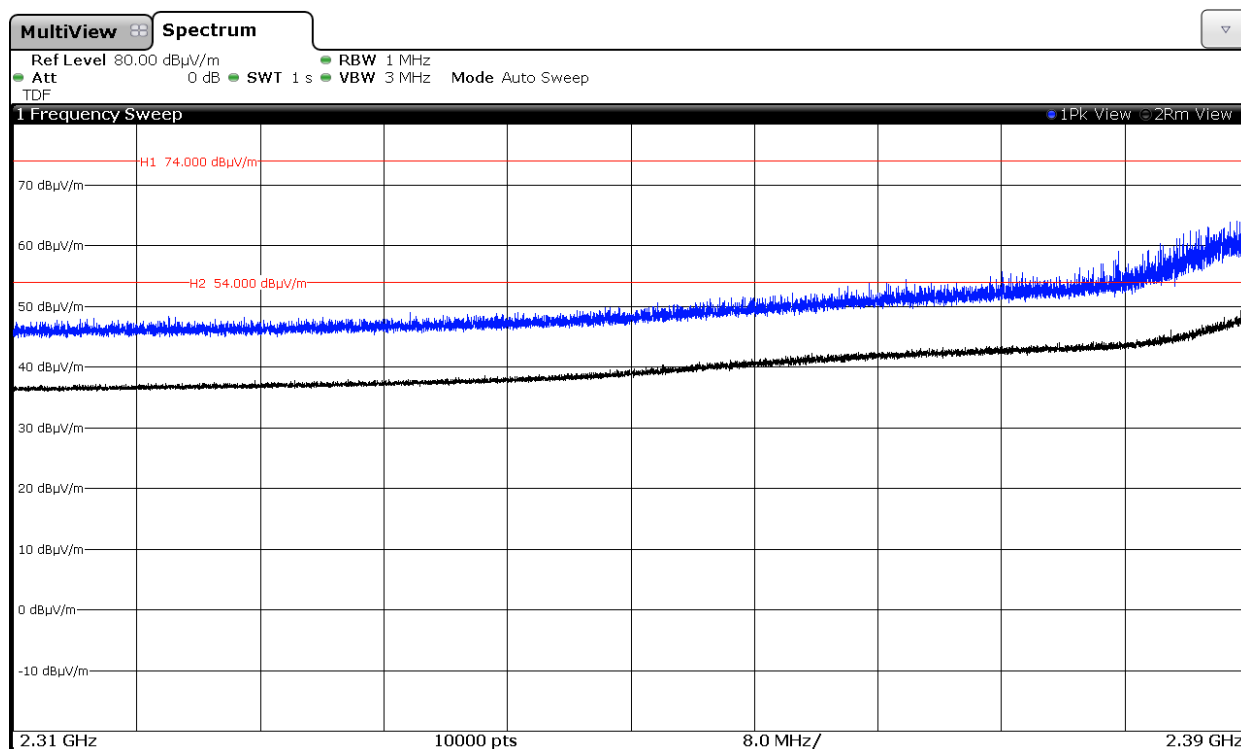
Chain A



Chain B

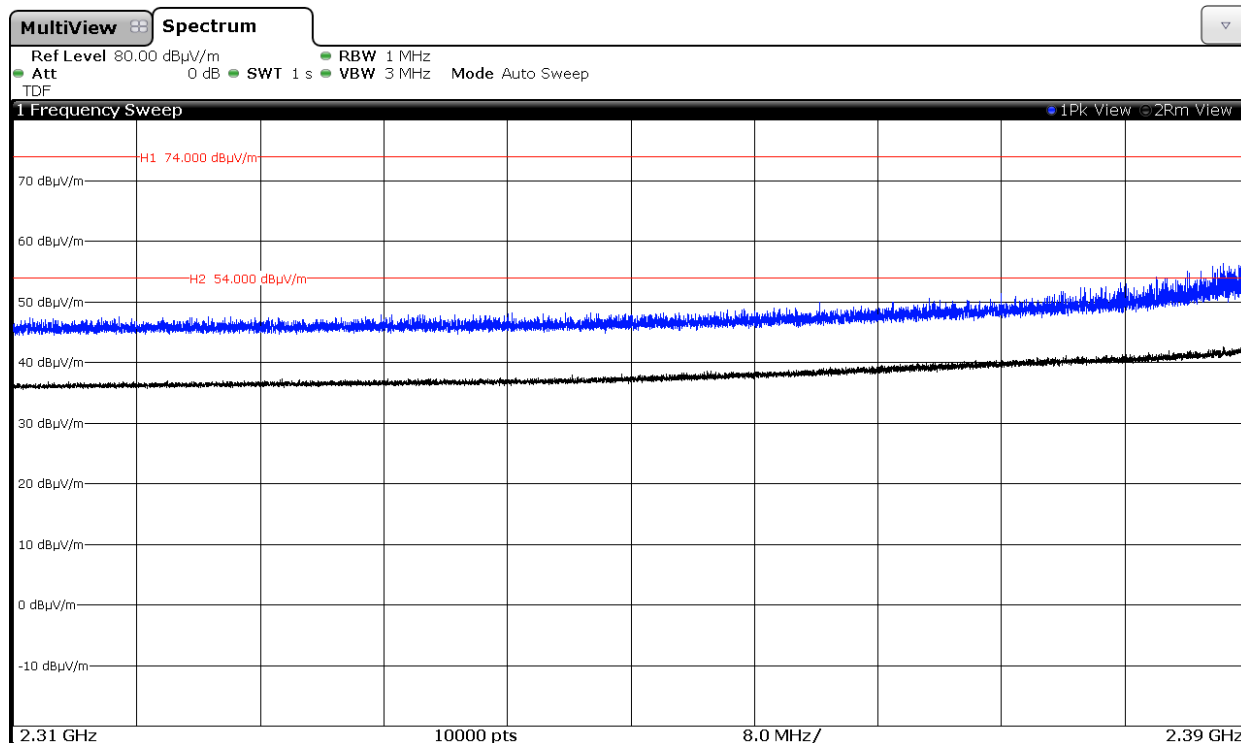


Chain A+B

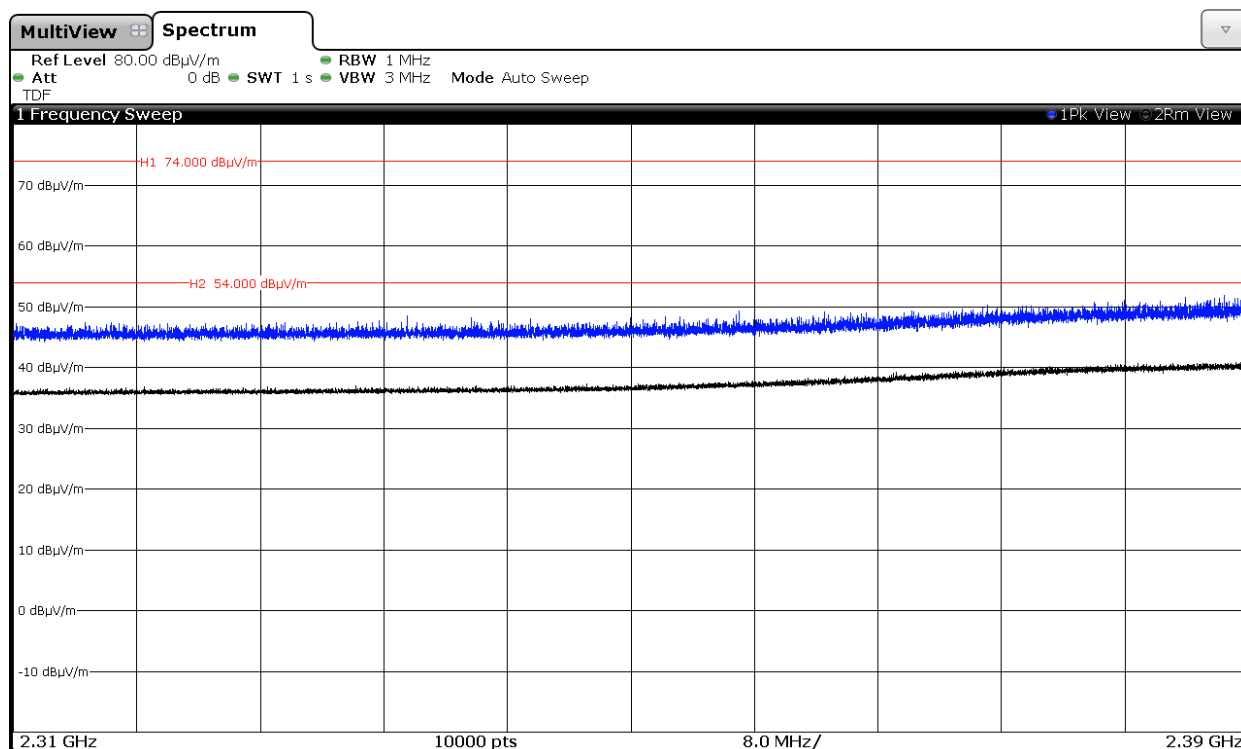


CHANNEL 6 (2437MHz).

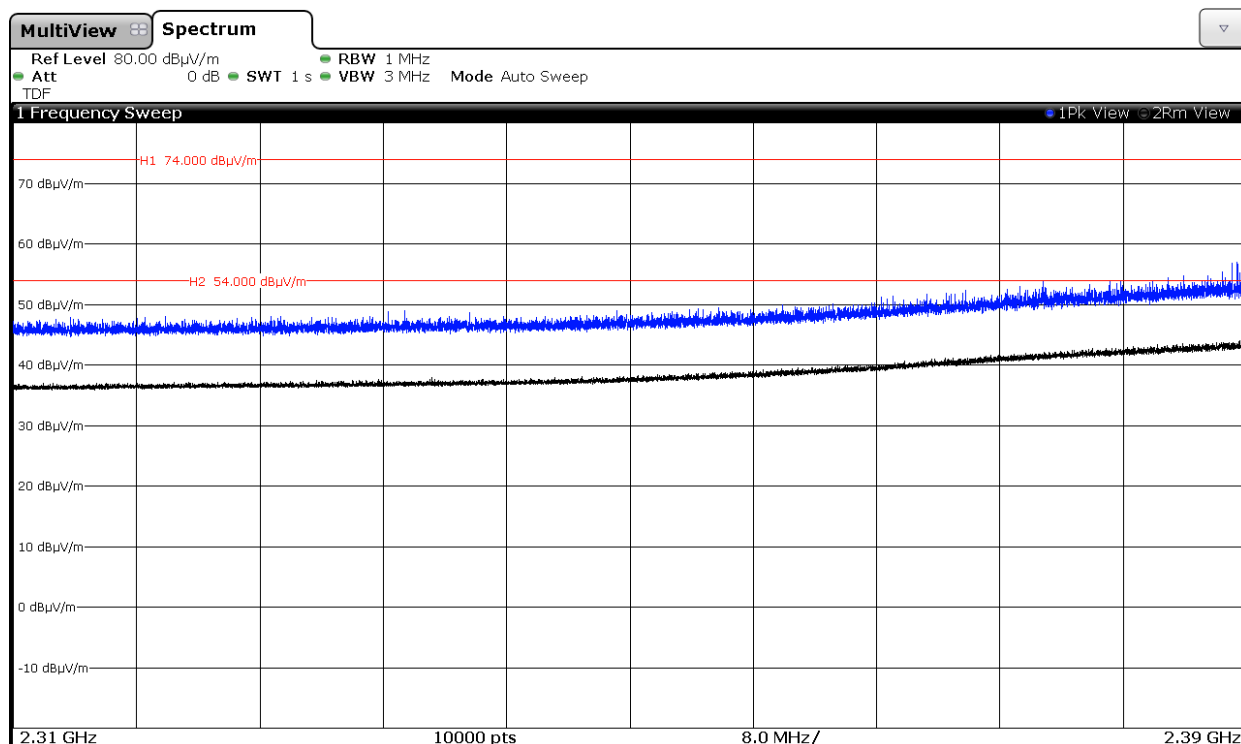
Chain A



Chain B



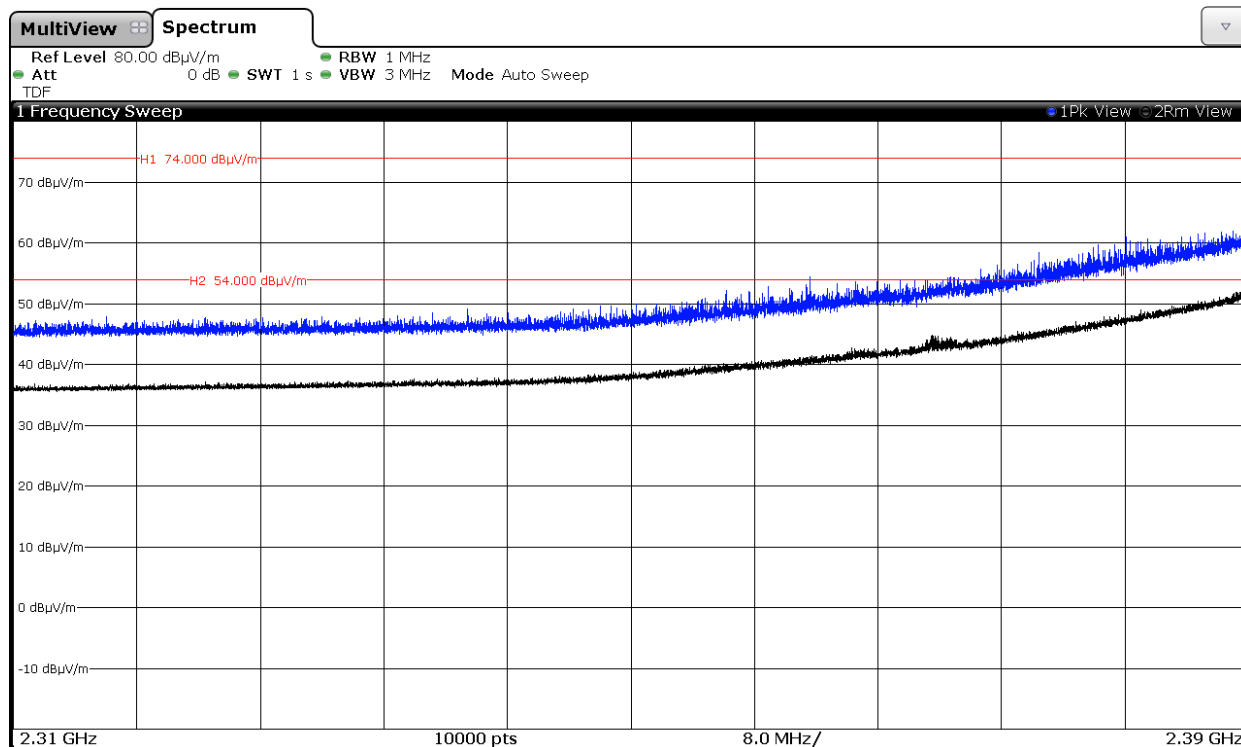
Chain A+B



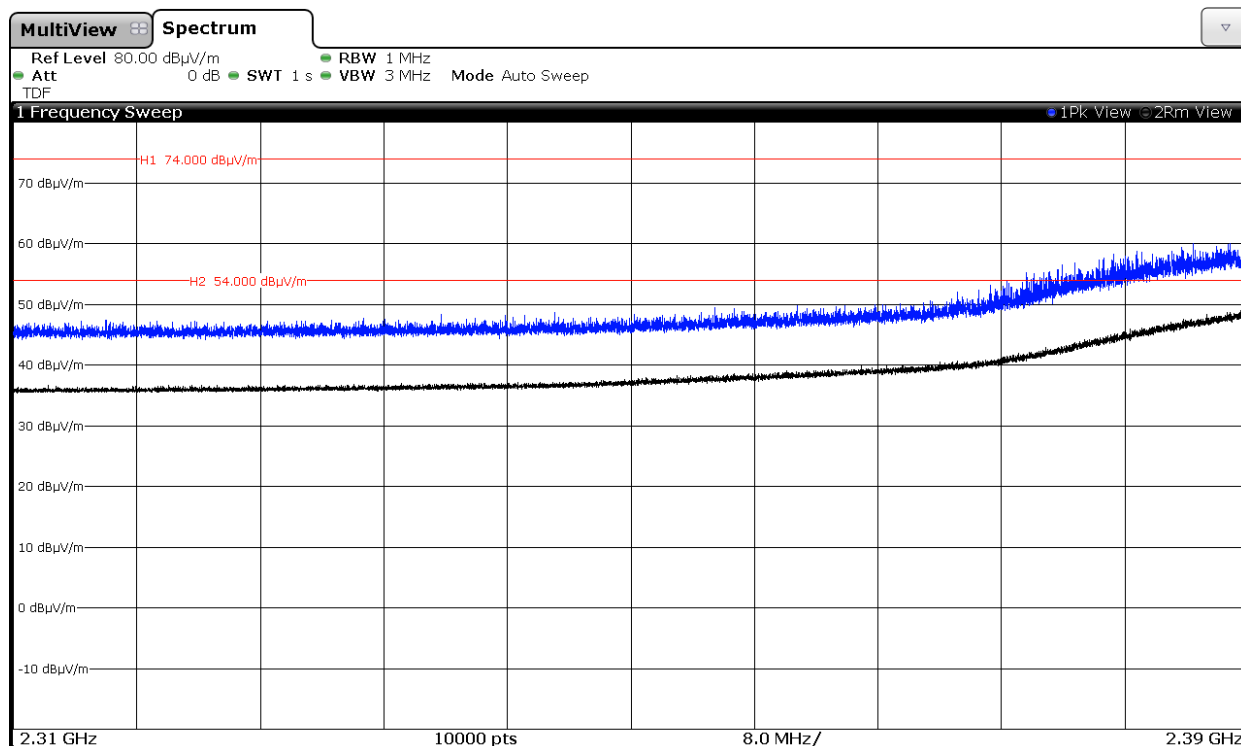
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 3 (2422 MHz).

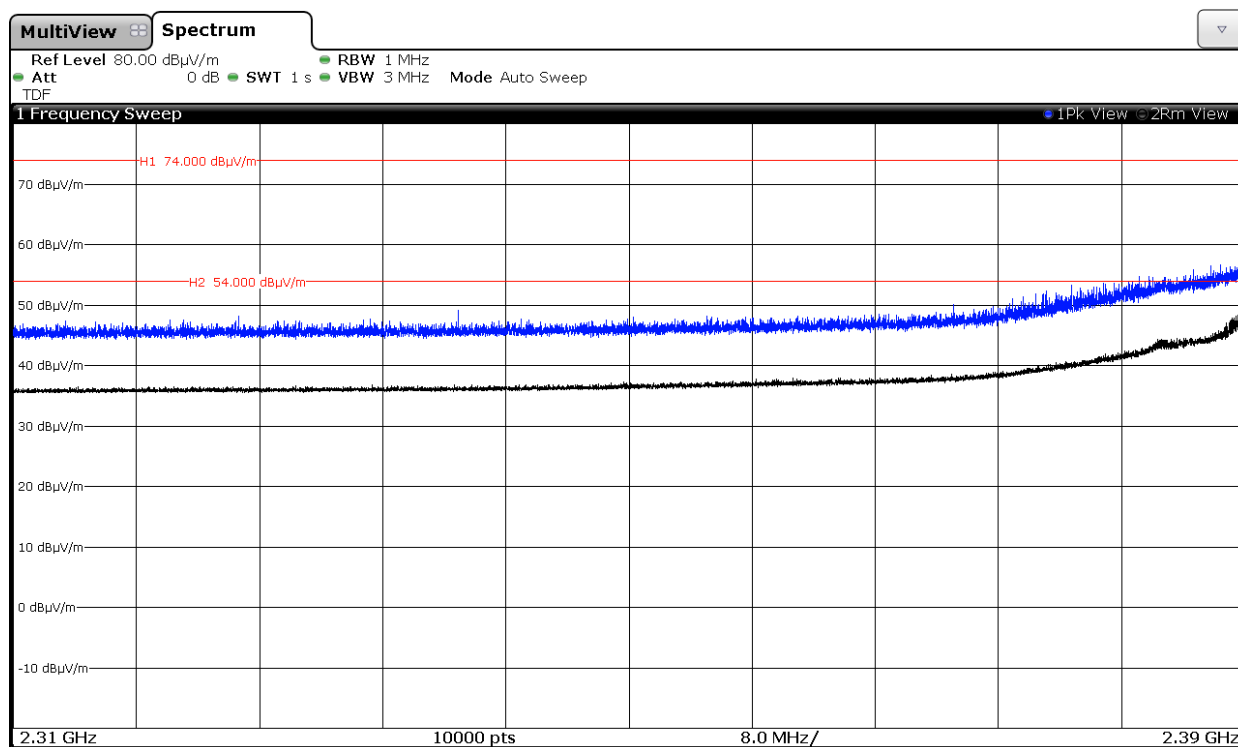
Chain A



Chain B

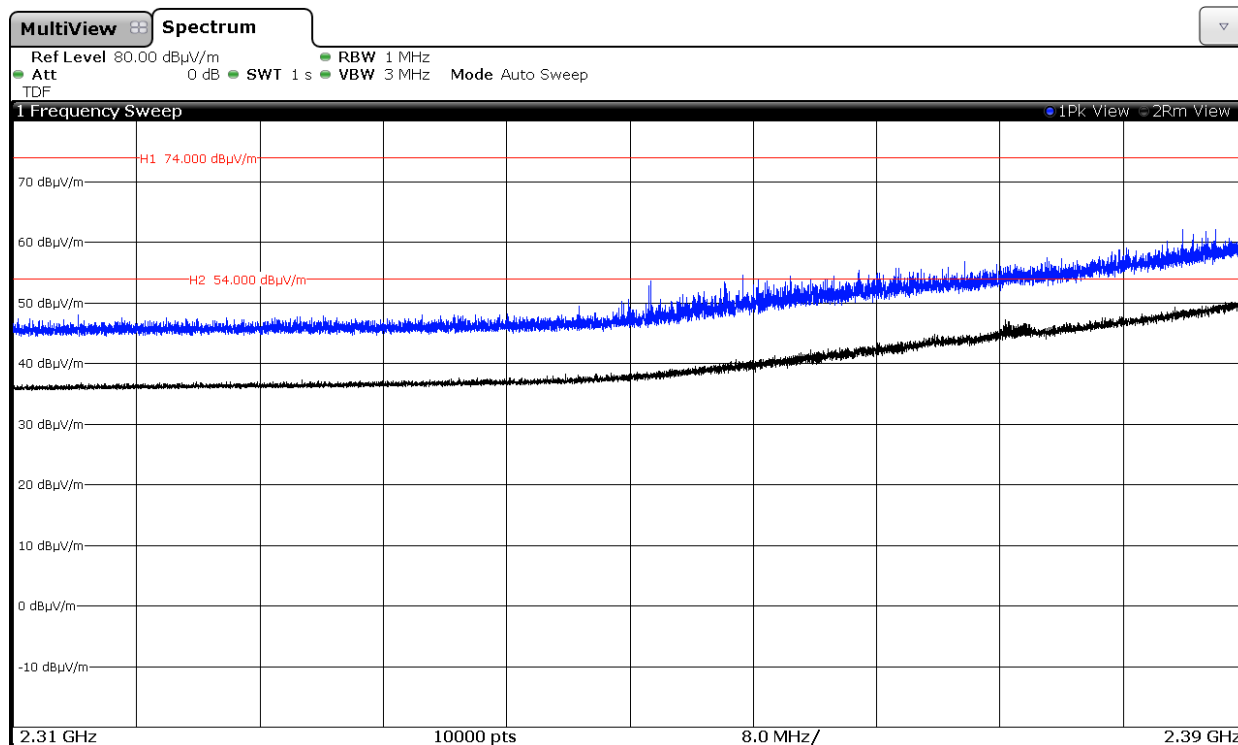


Chain A+B

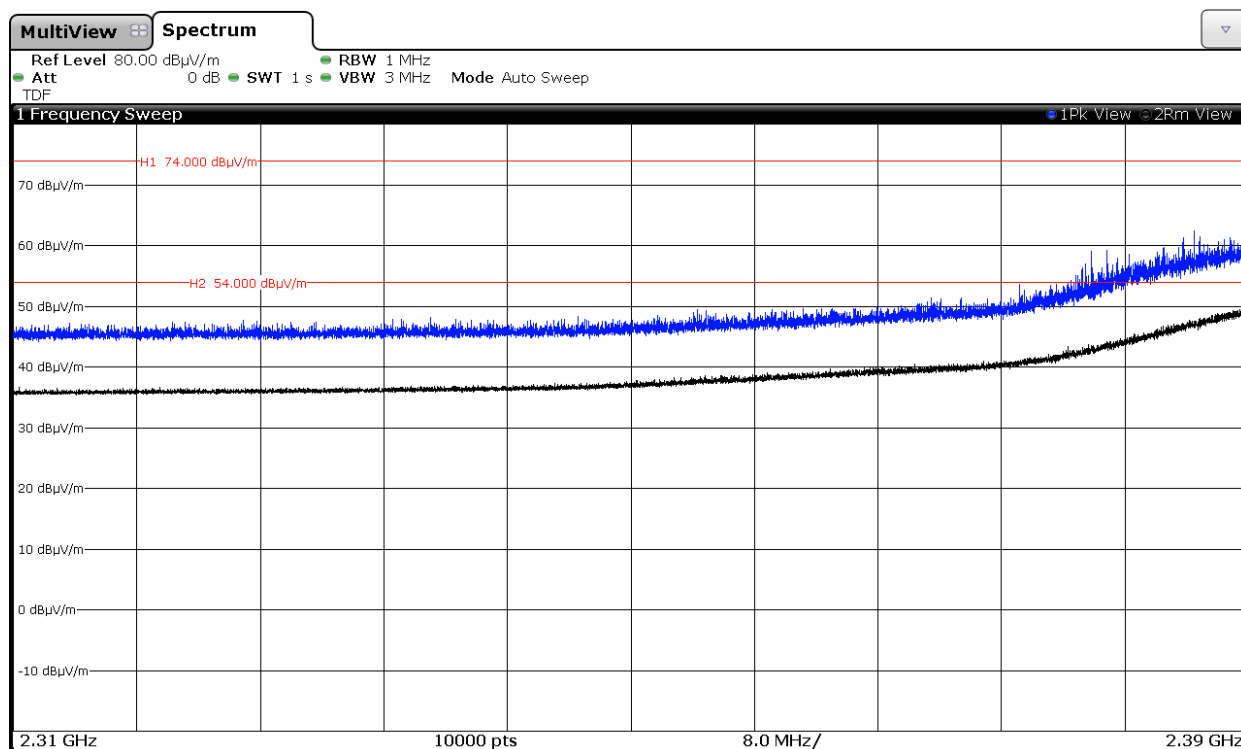


CHANNEL 4 (2427 MHz).

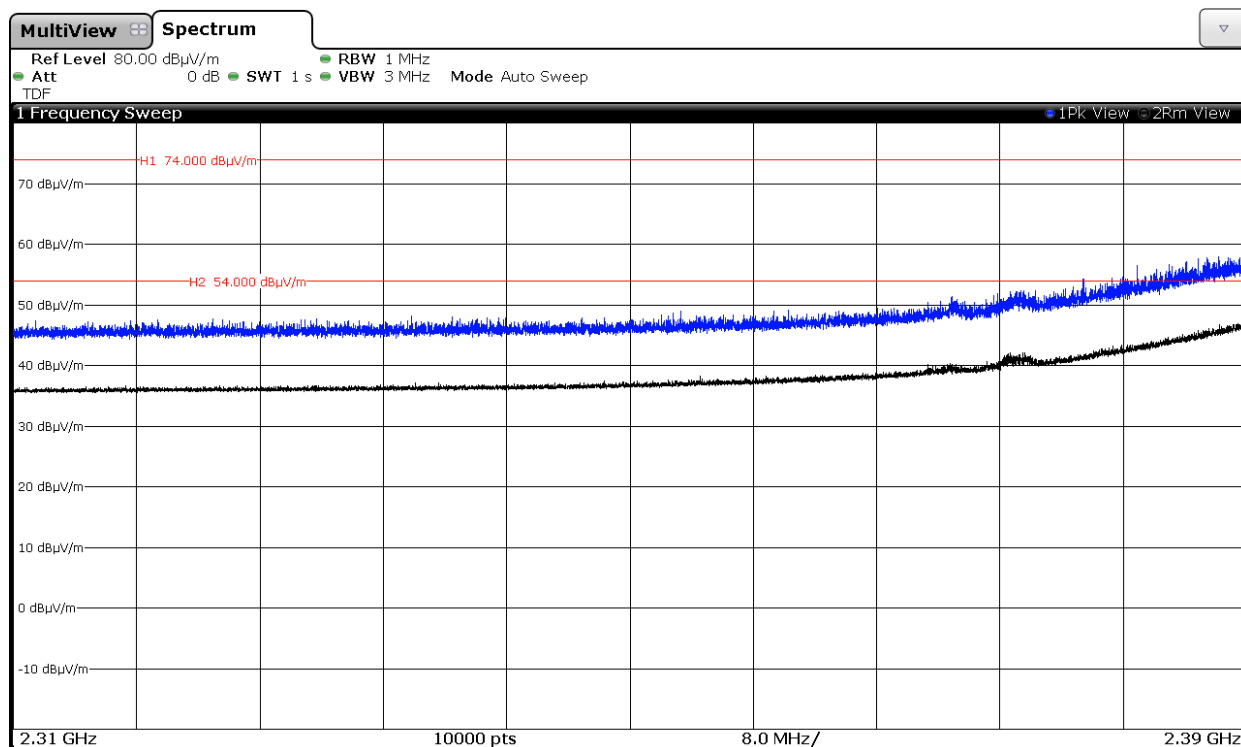
Chain A



Chain B

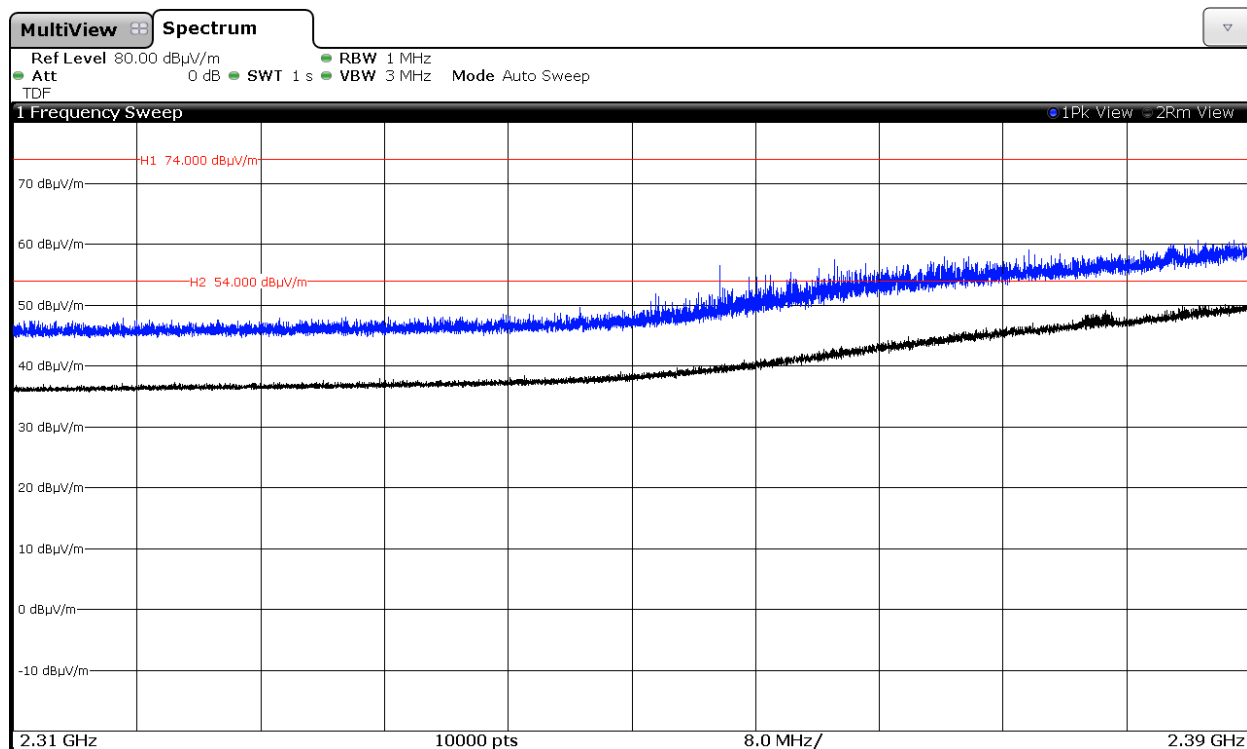


Chain A+B

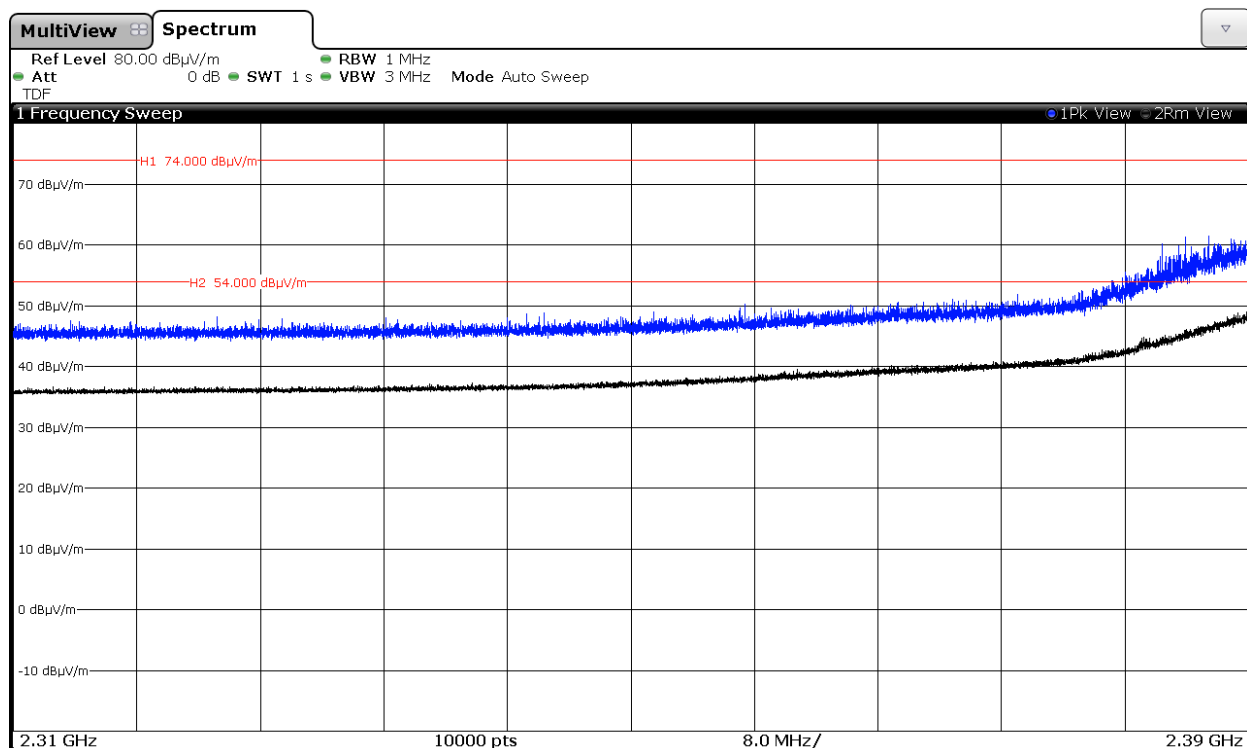


CHANNEL 5 (2432 MHz).

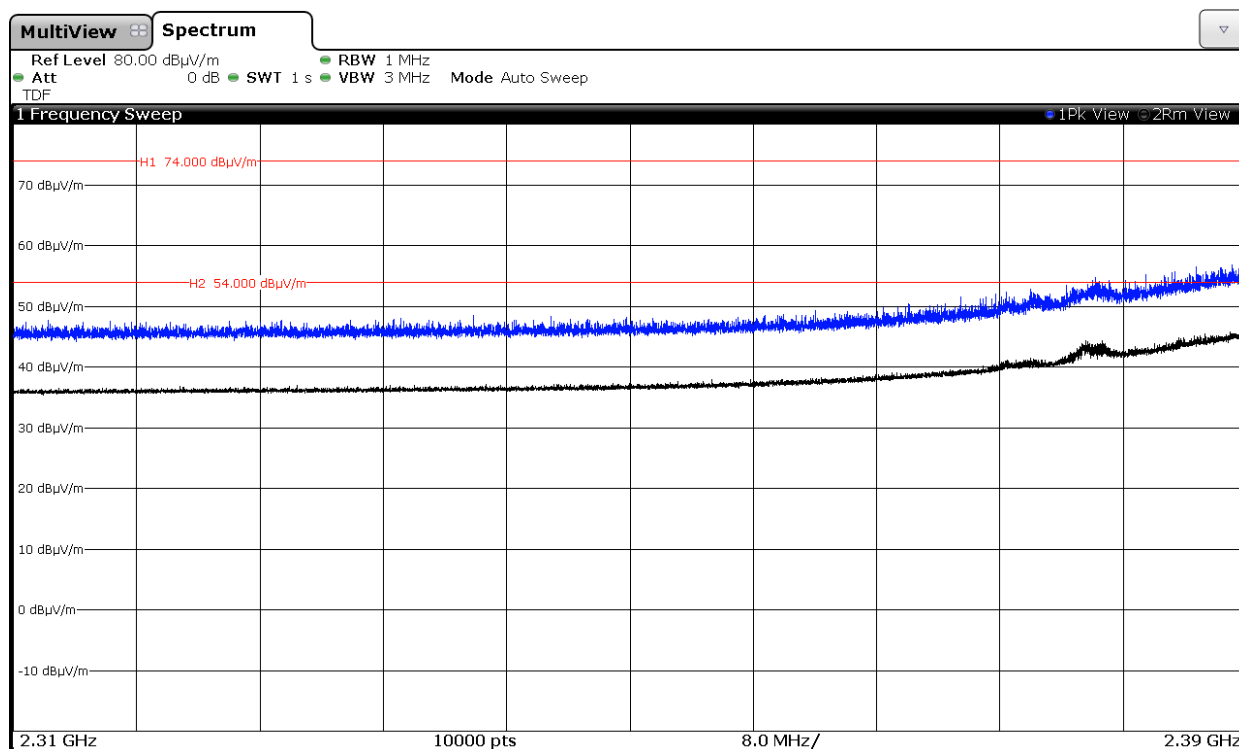
Chain A



Chain B

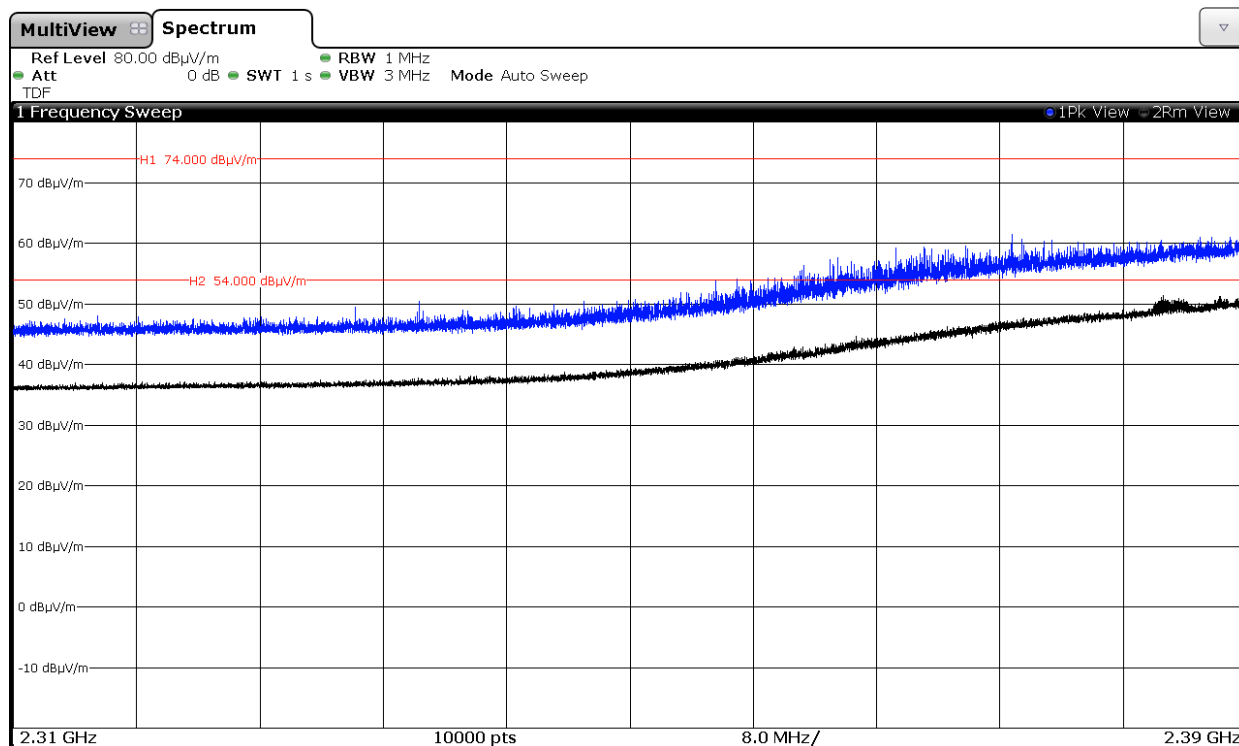


Chain A+B

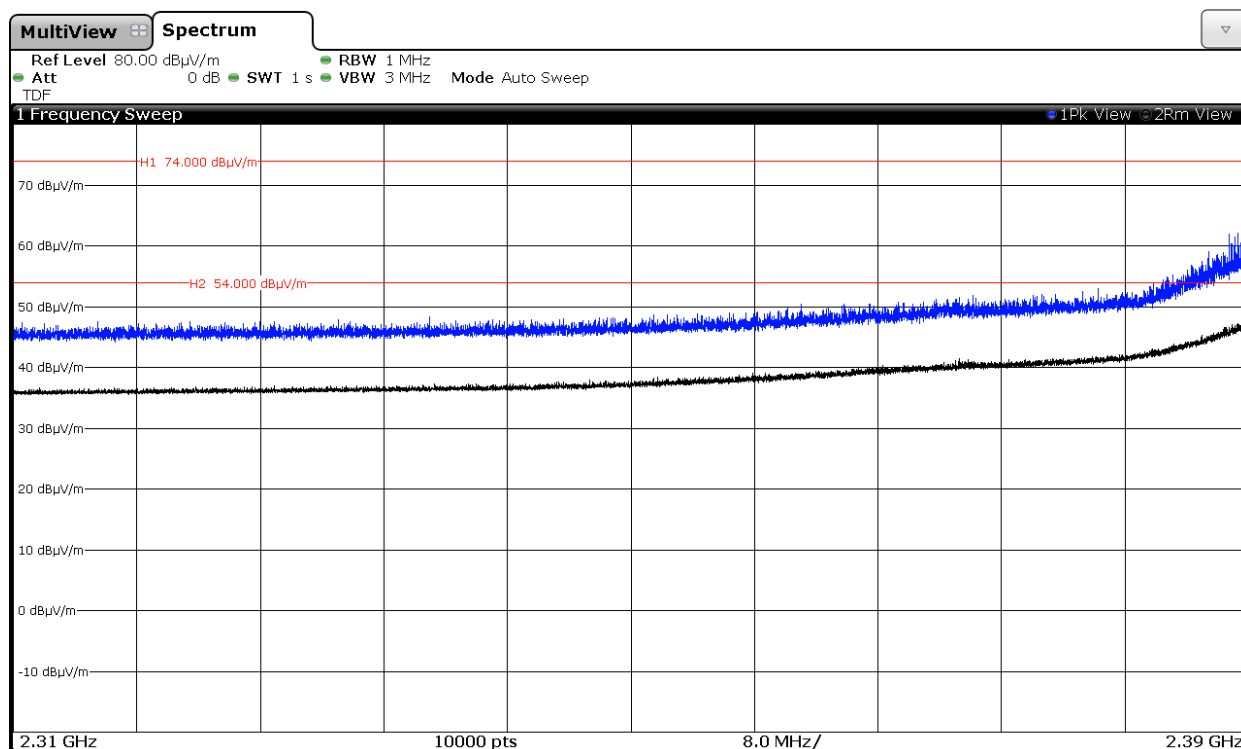


CHANNEL 6 (2437 MHz).

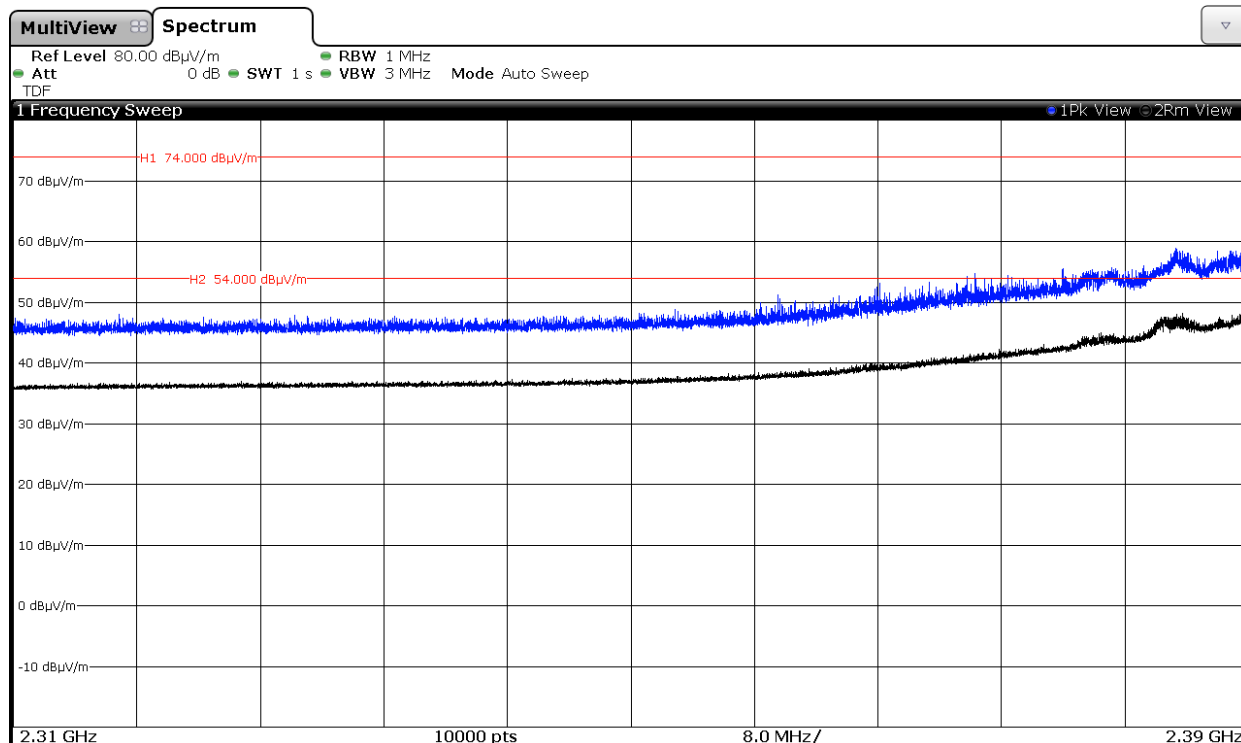
Chain A



Chain B



Chain A+B

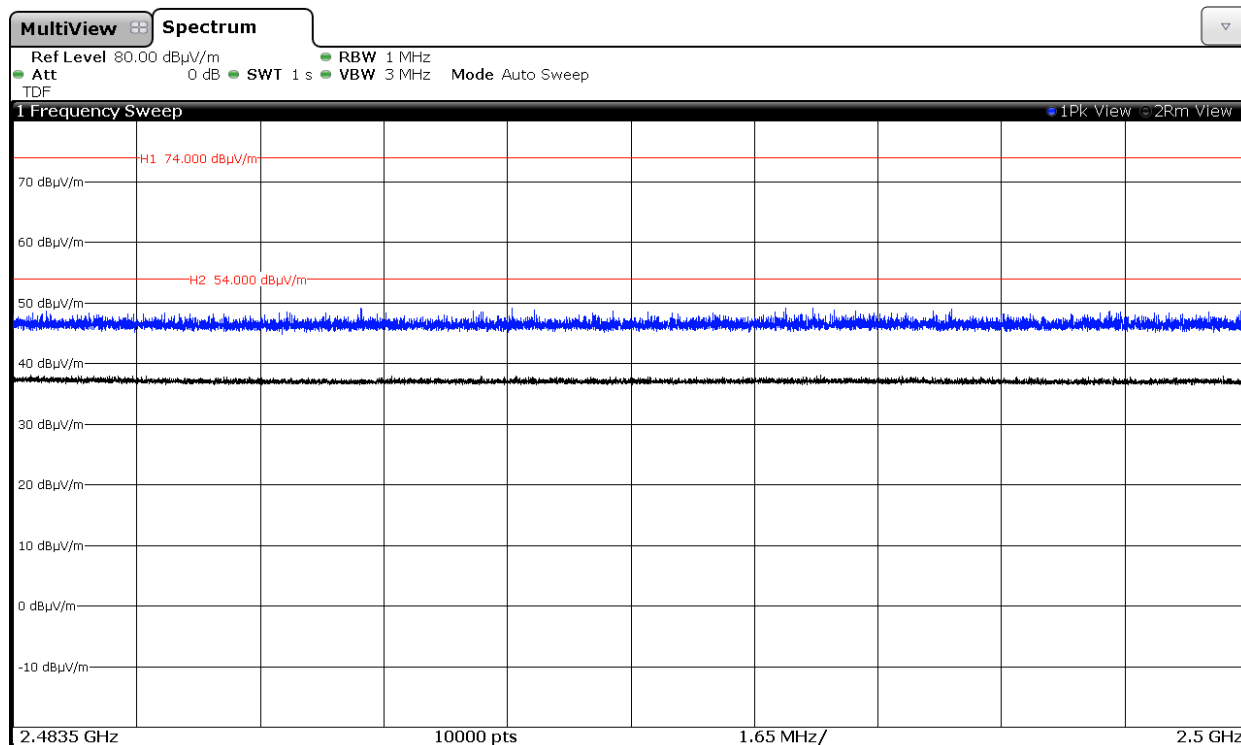


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

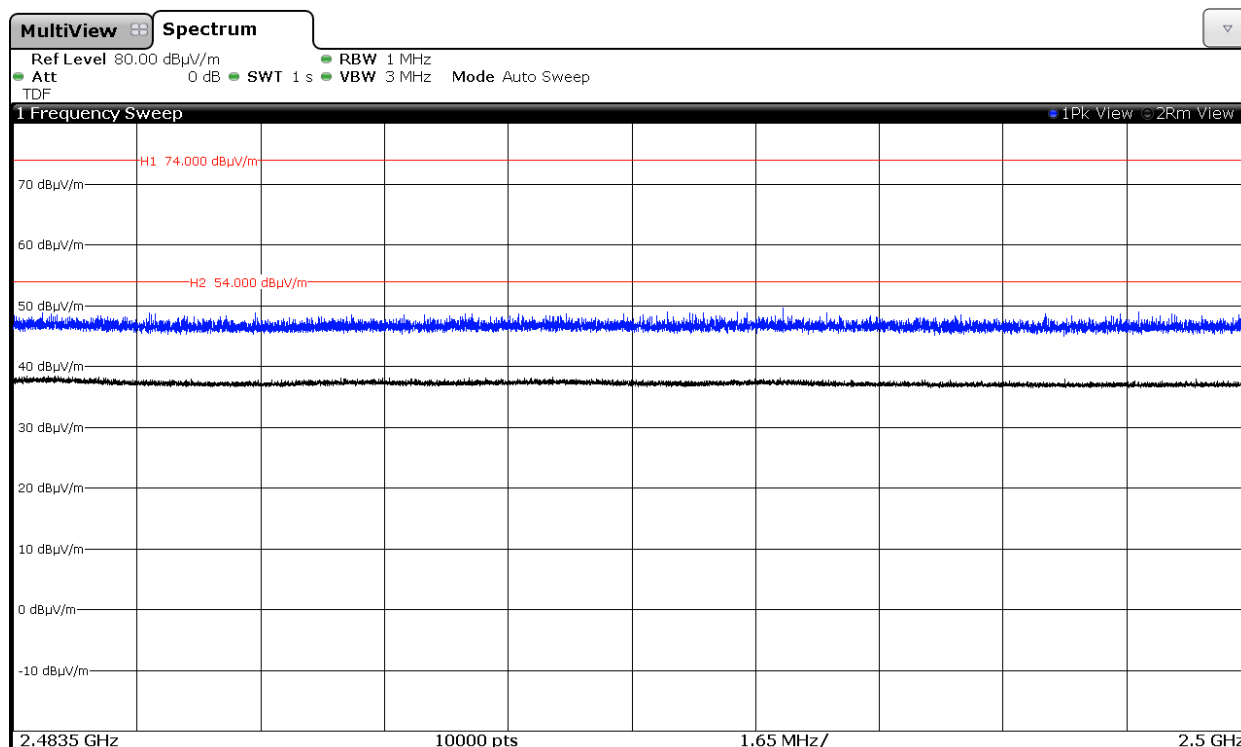
1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).

Chain A

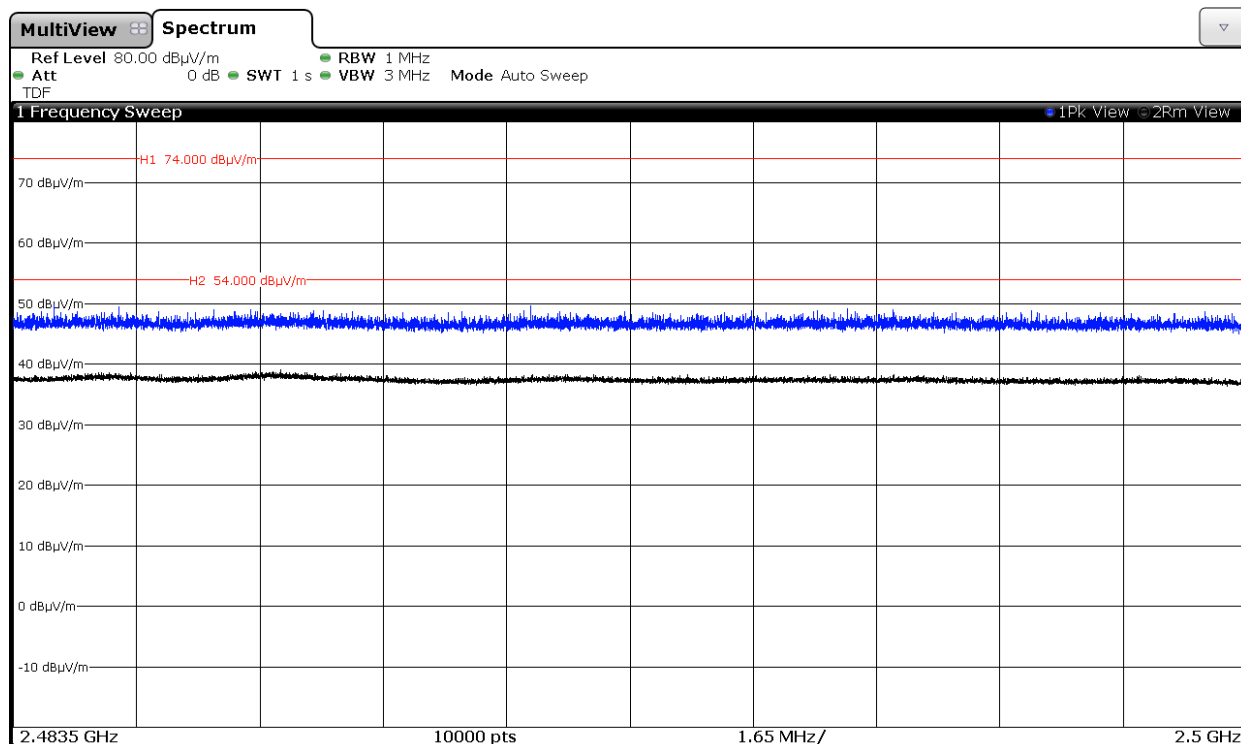


Chain B

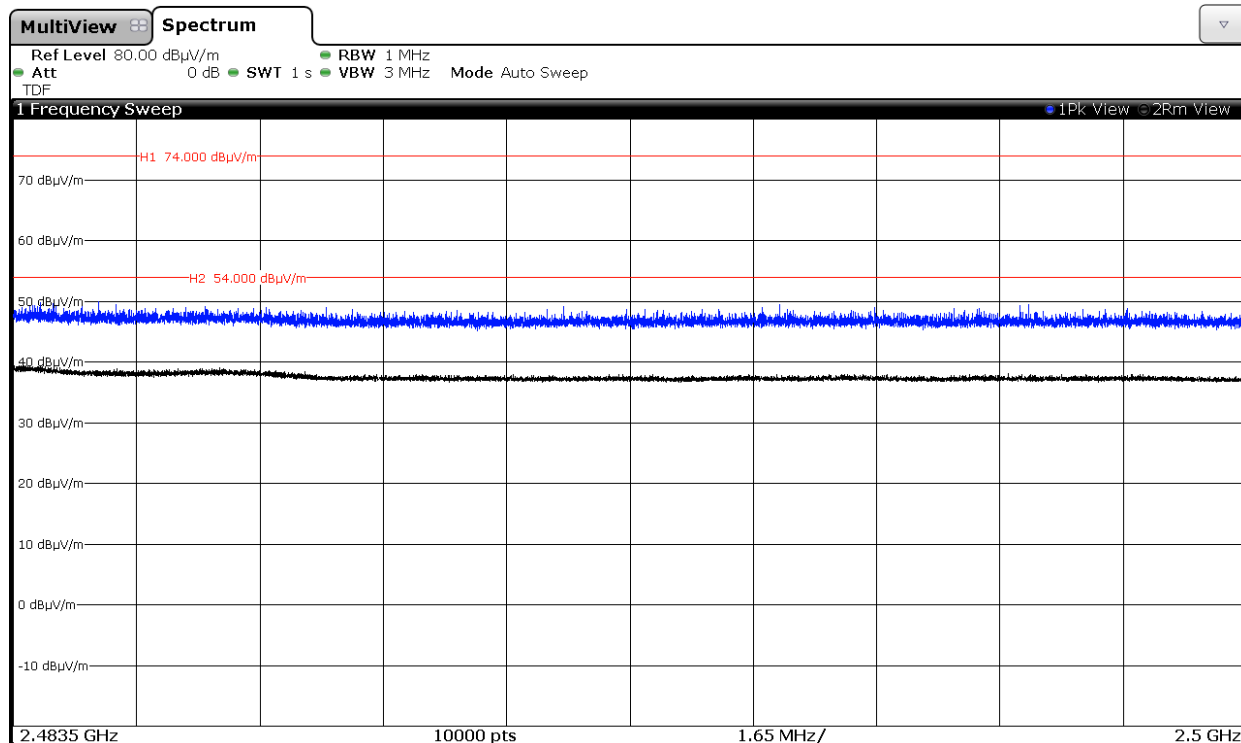


CHANNEL 2 (2417 MHz).

Chain A

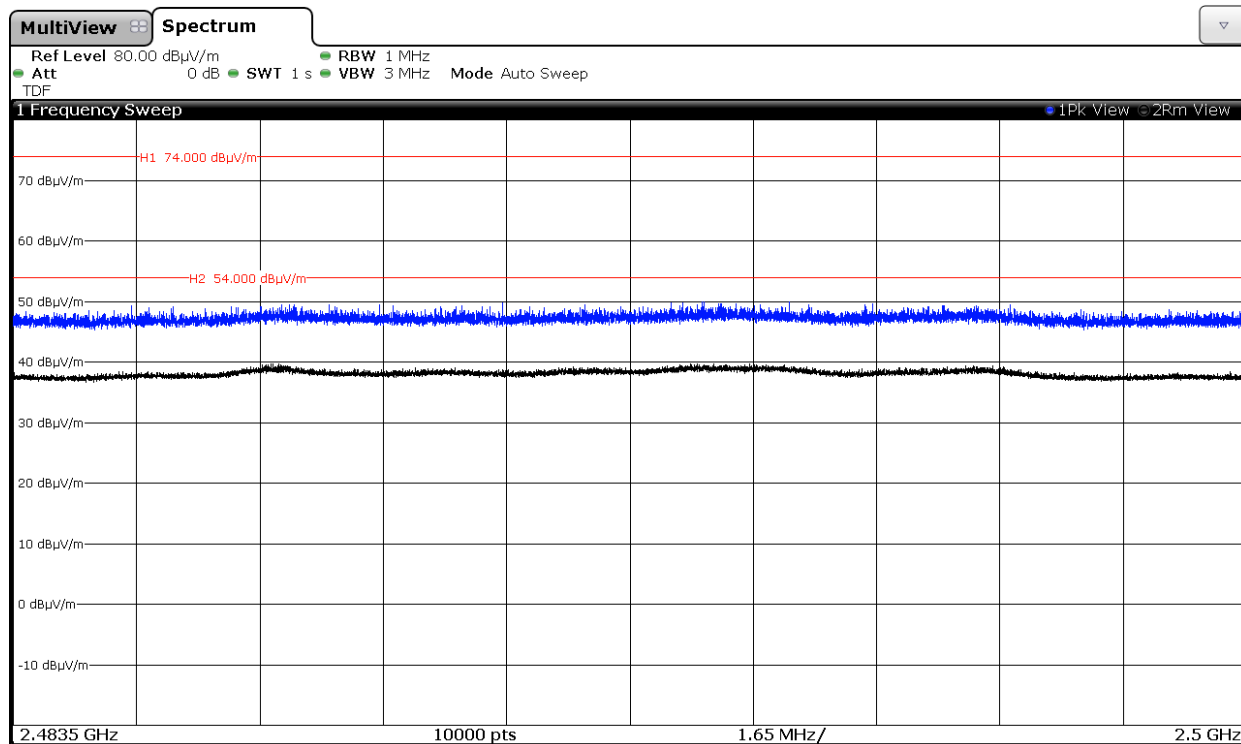


Chain B

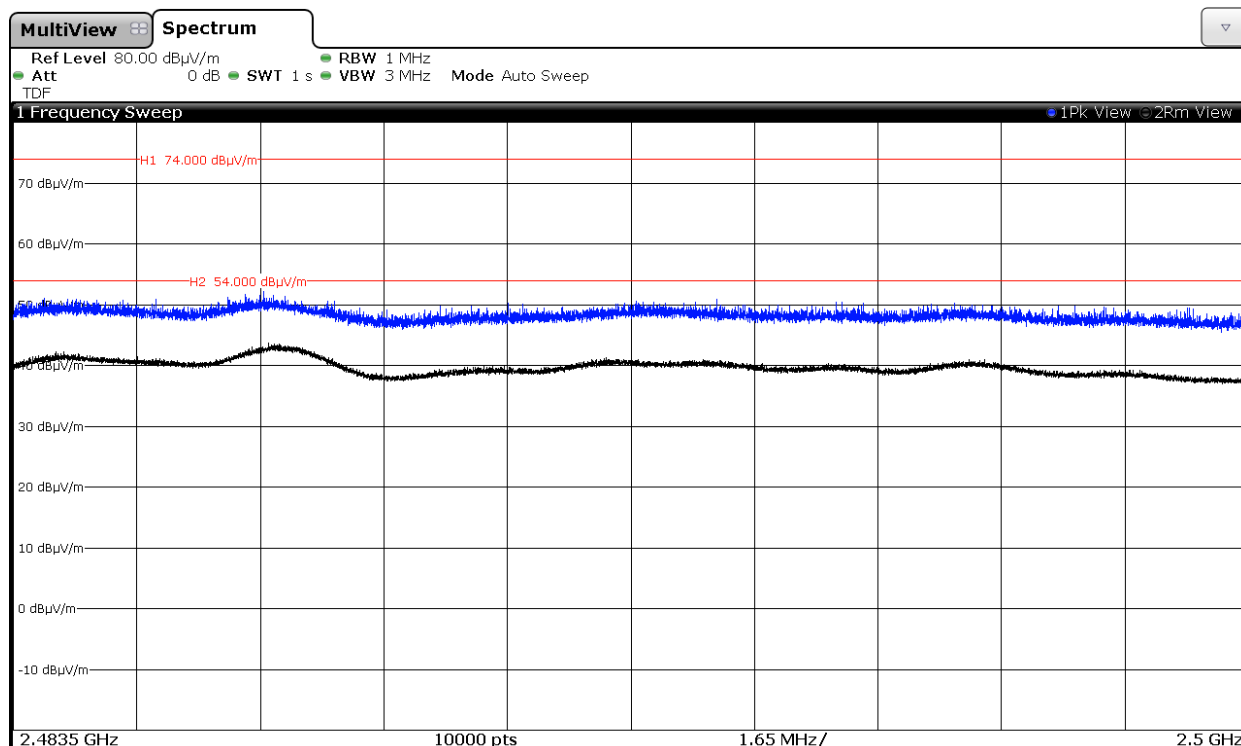


CHANNEL 6 (2437 MHz).

Chain A

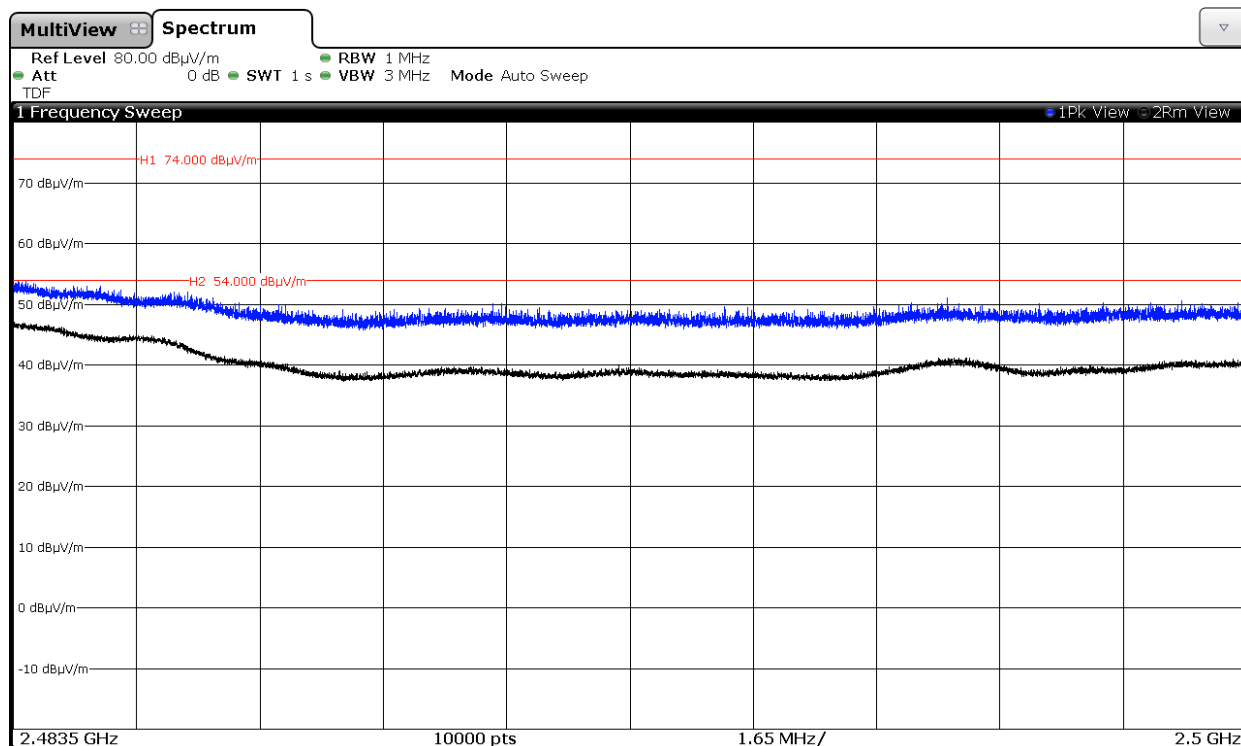


Chain B

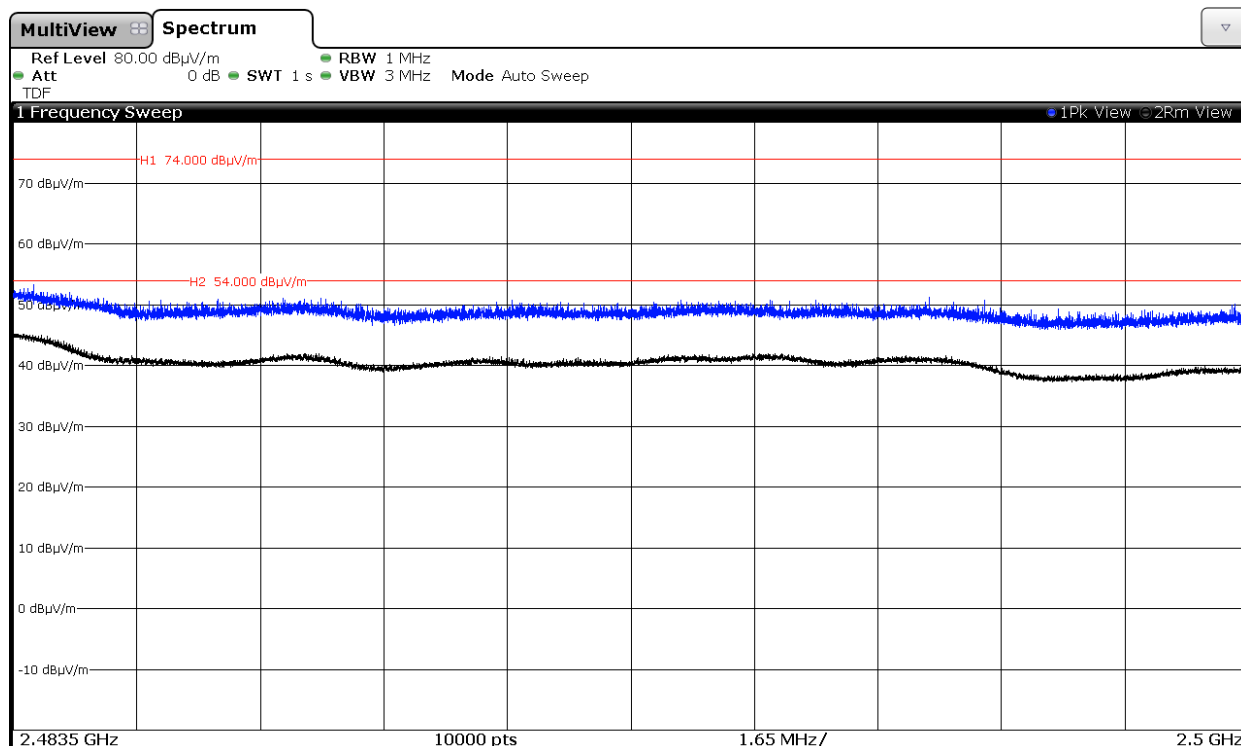


CHANNEL 10 (2457 MHz).

Chain A

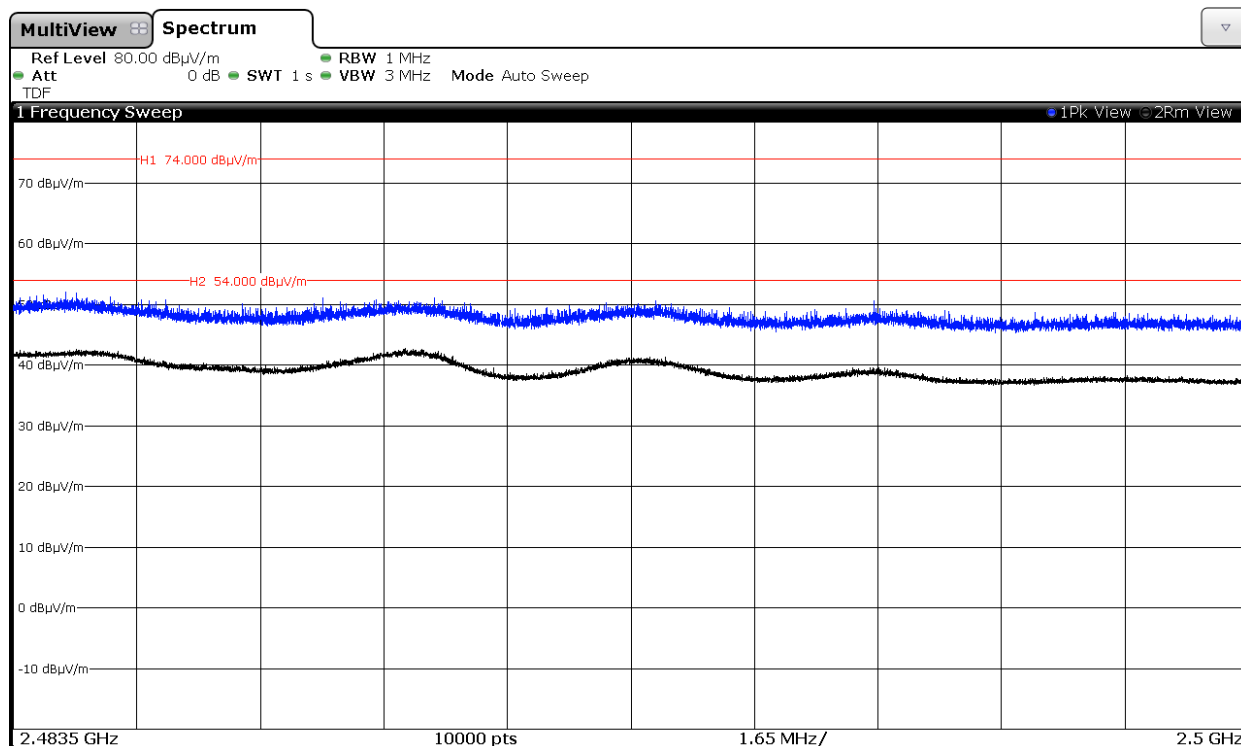


Chain B

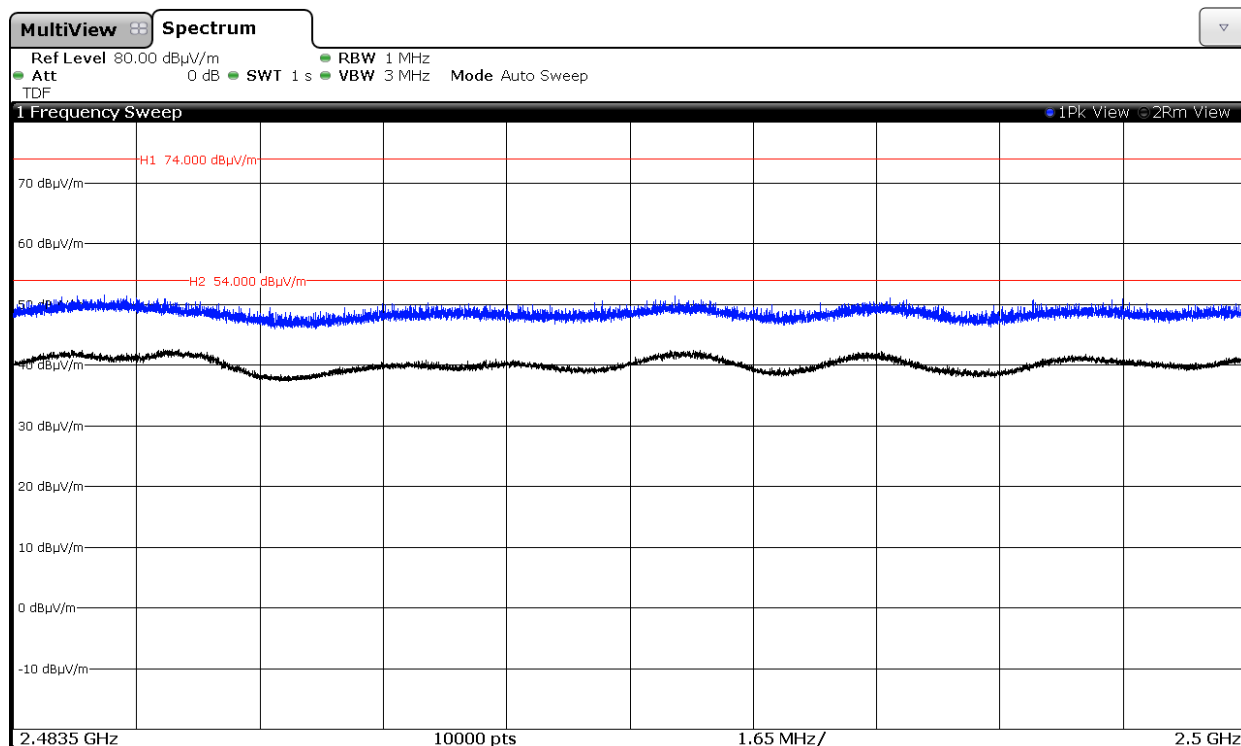


CHANNEL 11 (2462 MHz).

Chain A



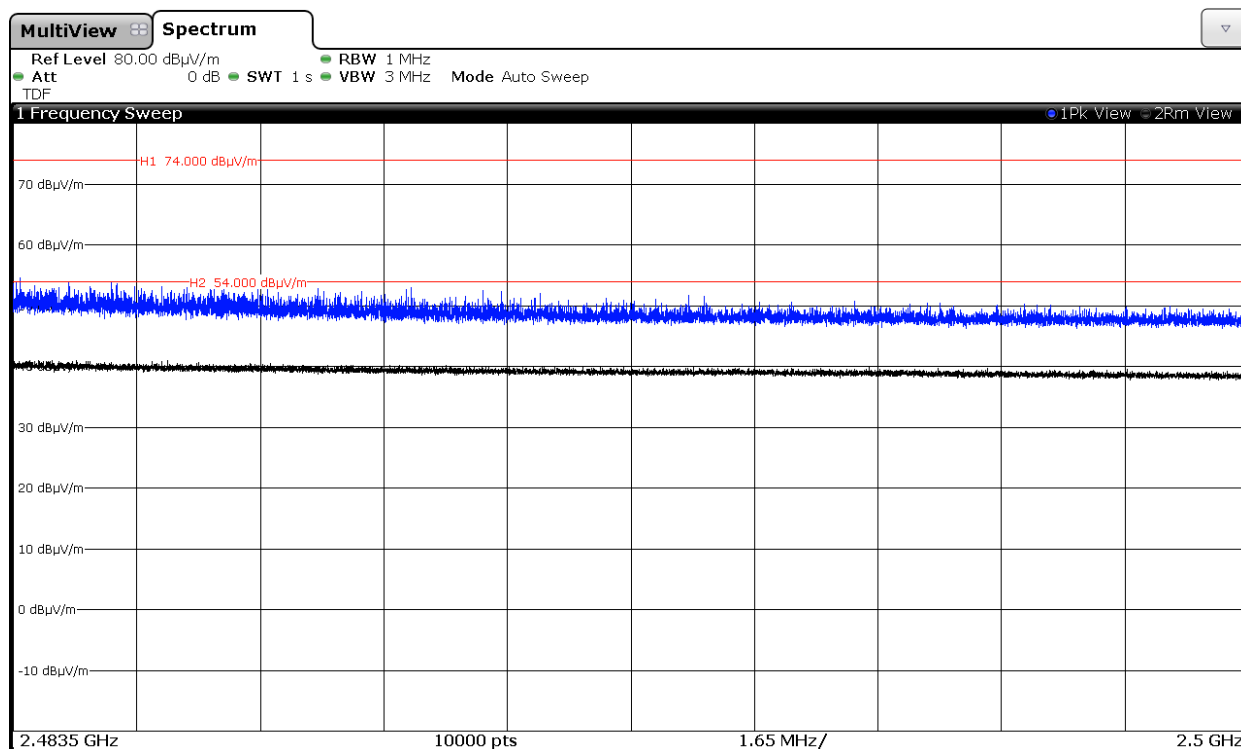
Chain B



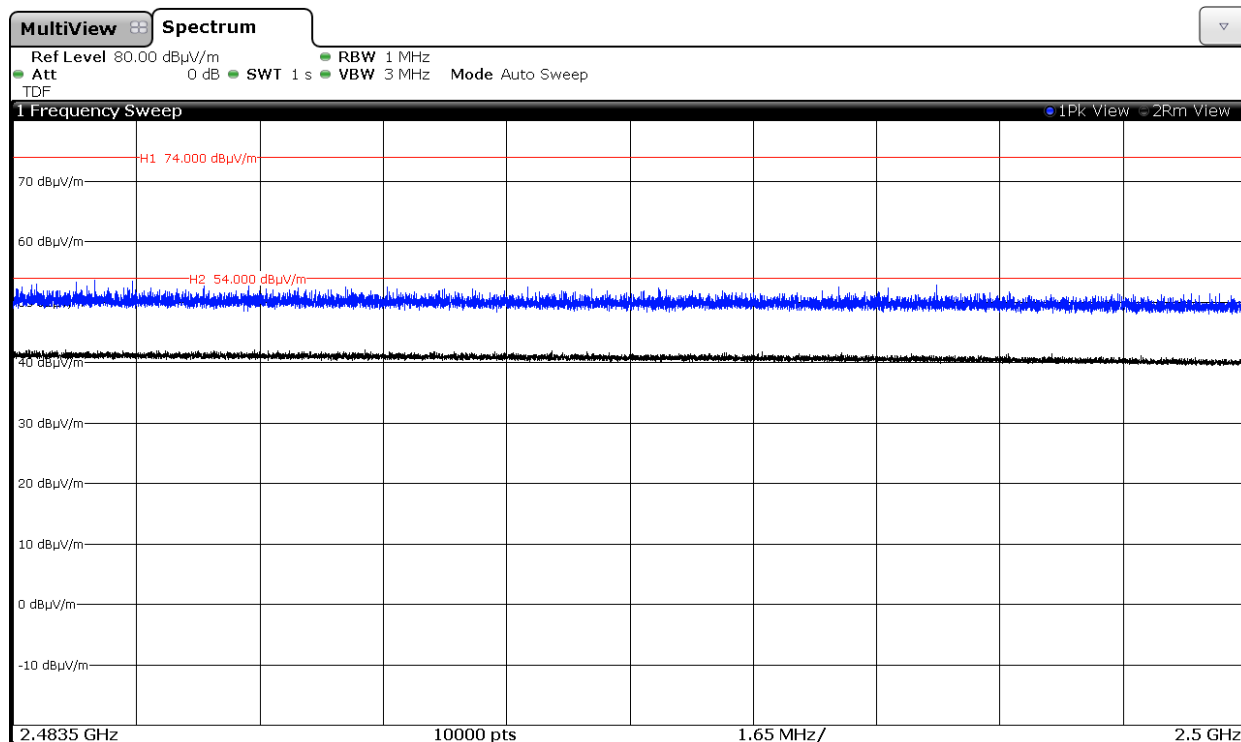
2. WiFi 2.4GHz 802.11 g mode

CHANNEL 6 (2437 MHz).

Chain A

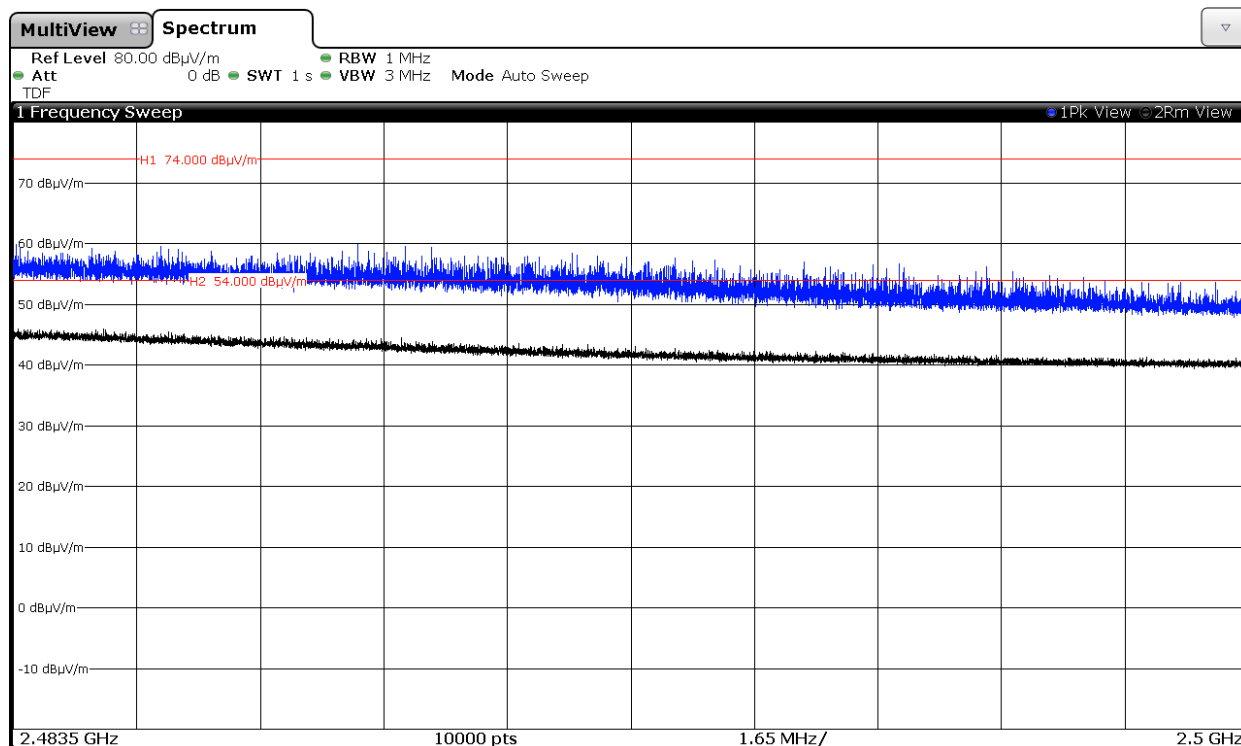


Chain B

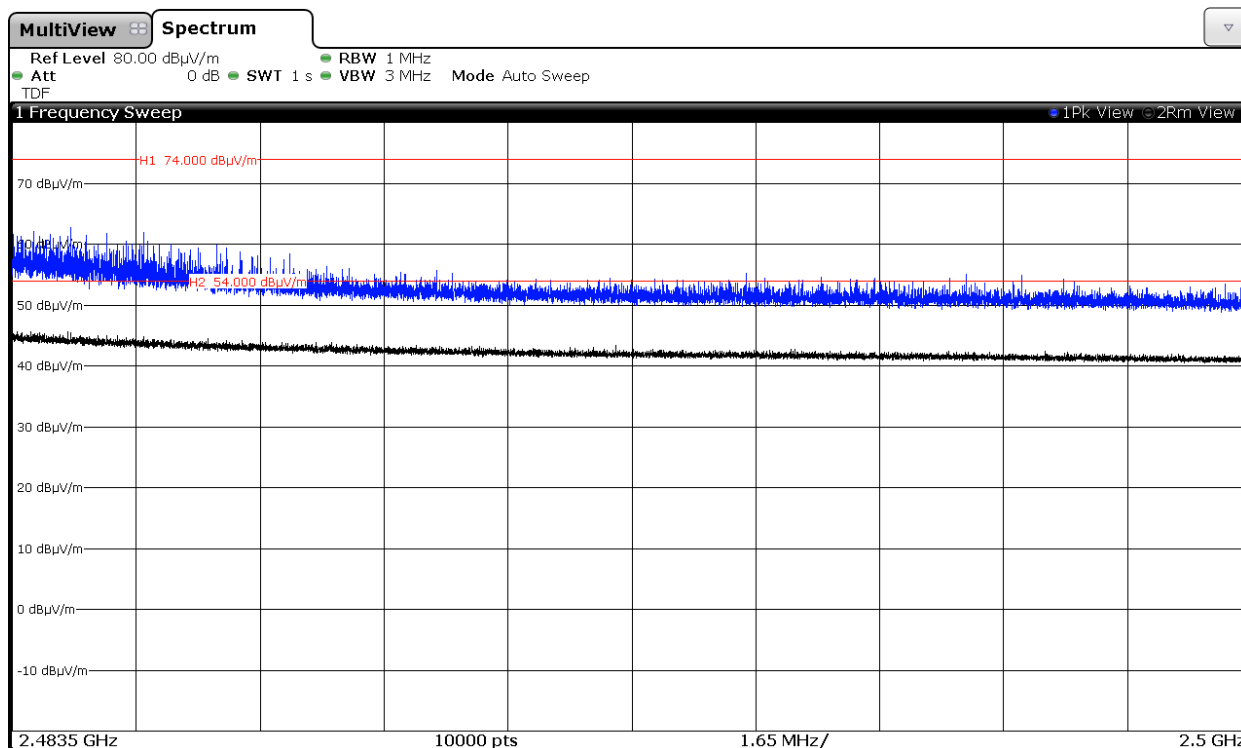


CHANNEL 9 (2452 MHz).

Chain A

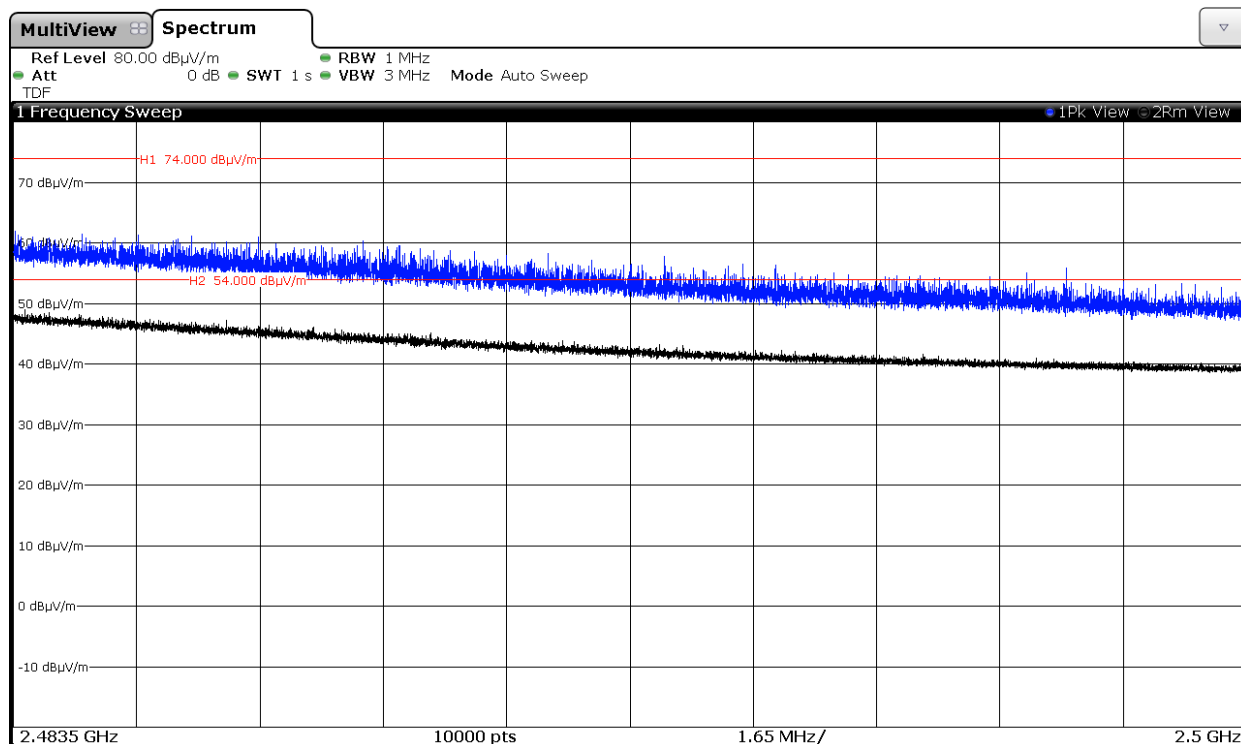


Chain B

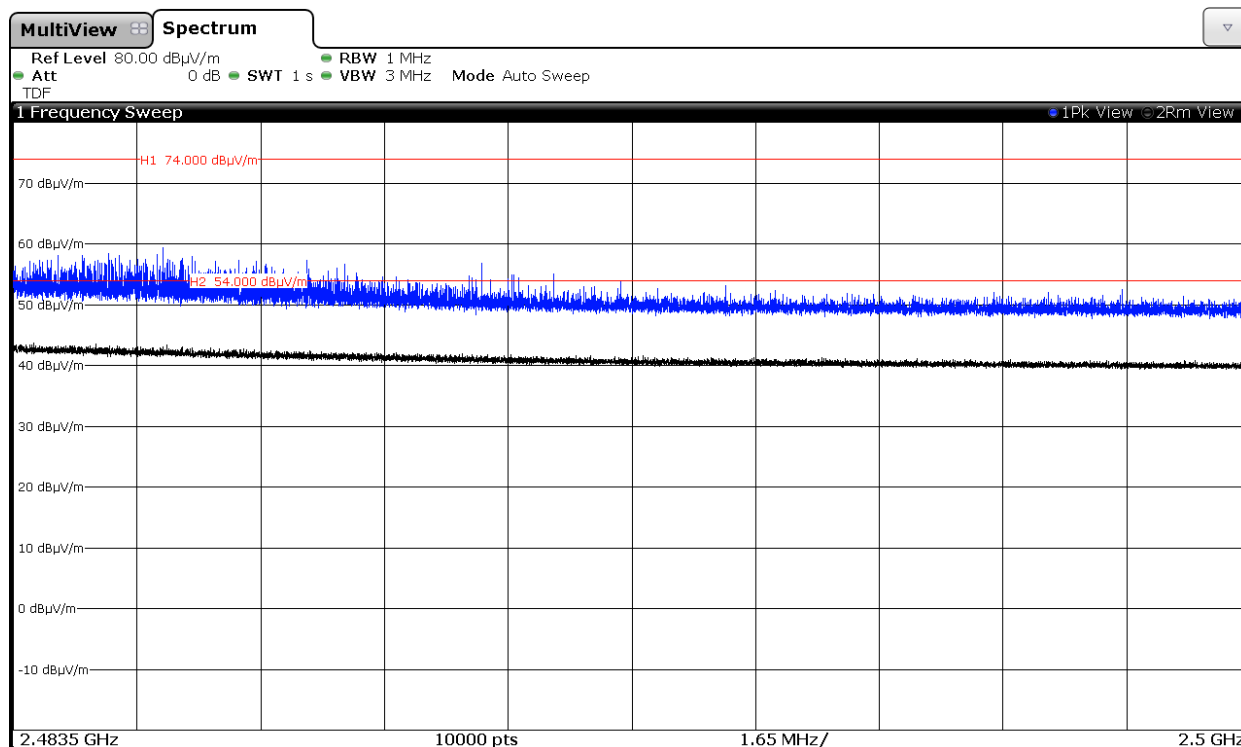


CHANNEL 10 (2457 MHz).

Chain A

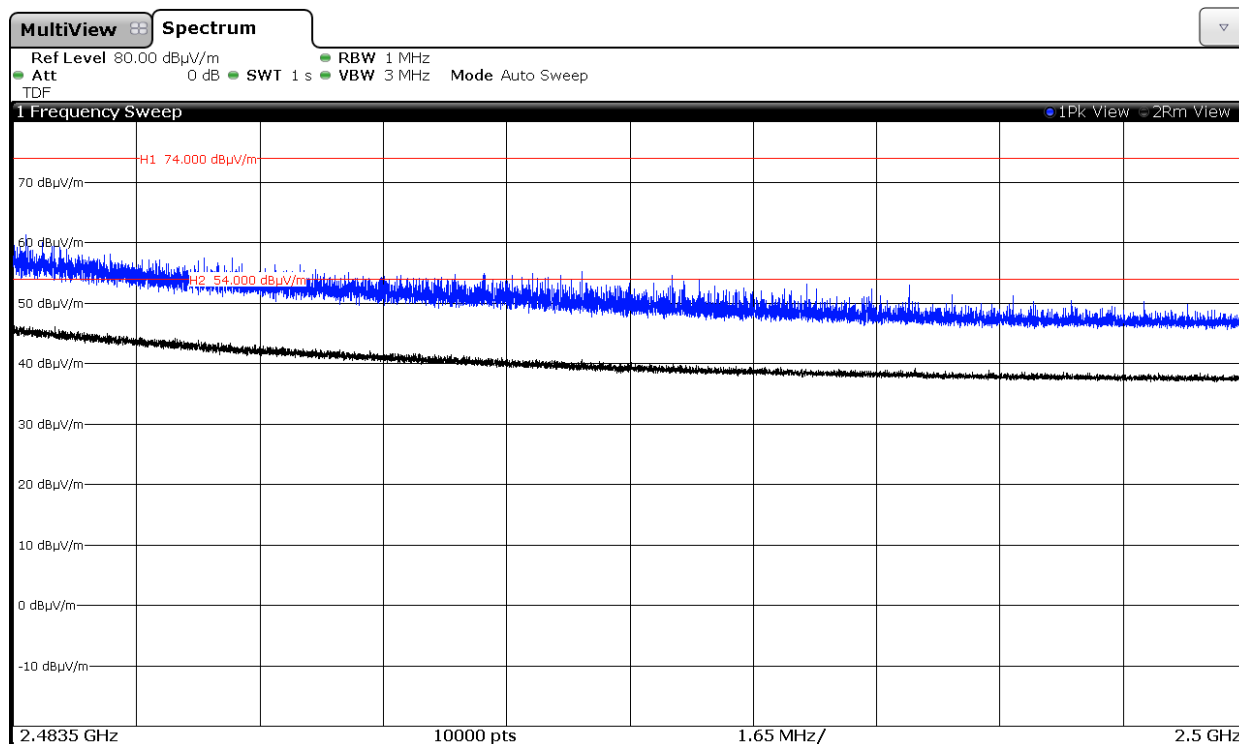


Chain B

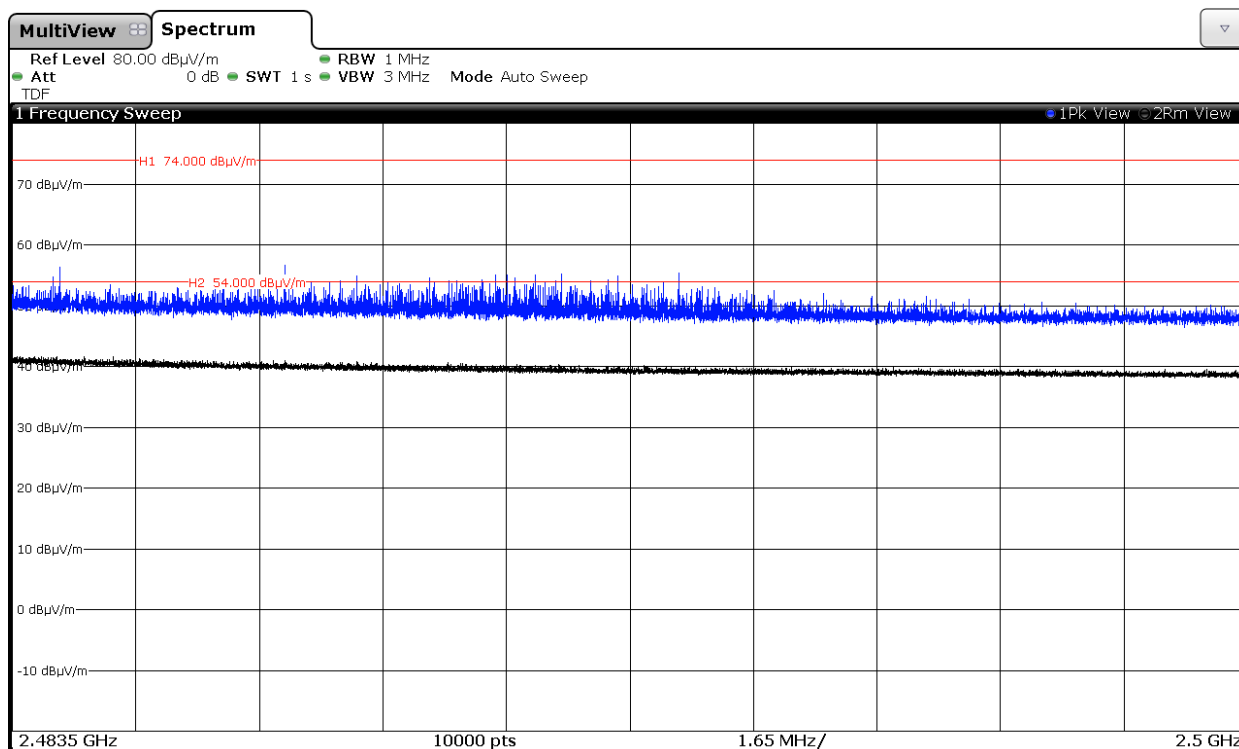


CHANNEL 11 (2462 MHz).

Chain A



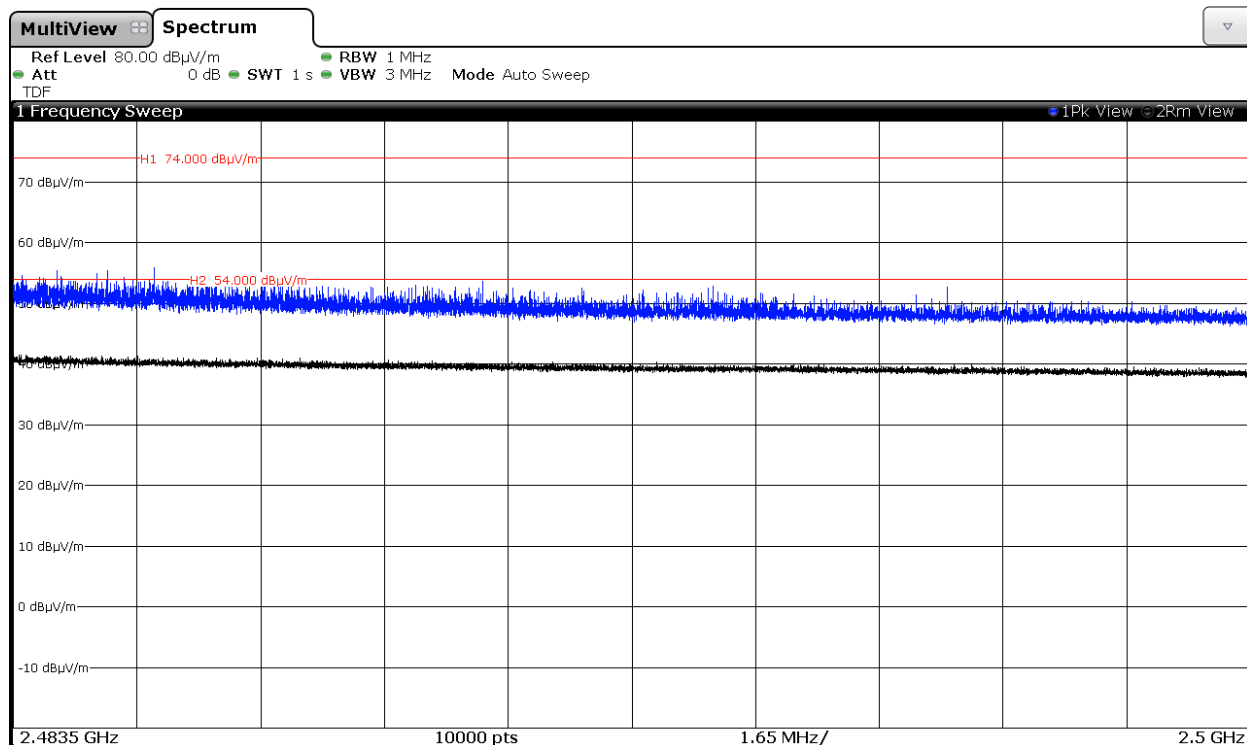
Chain B



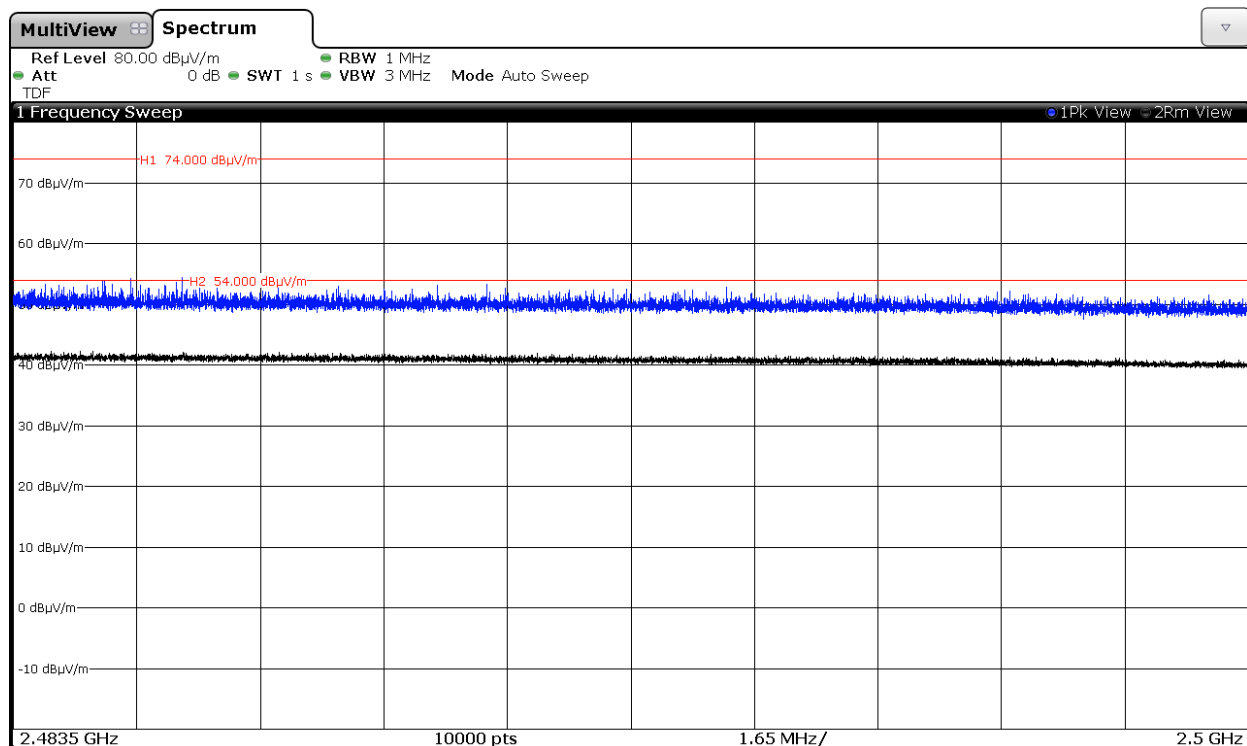
3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 6 (2437 MHz).

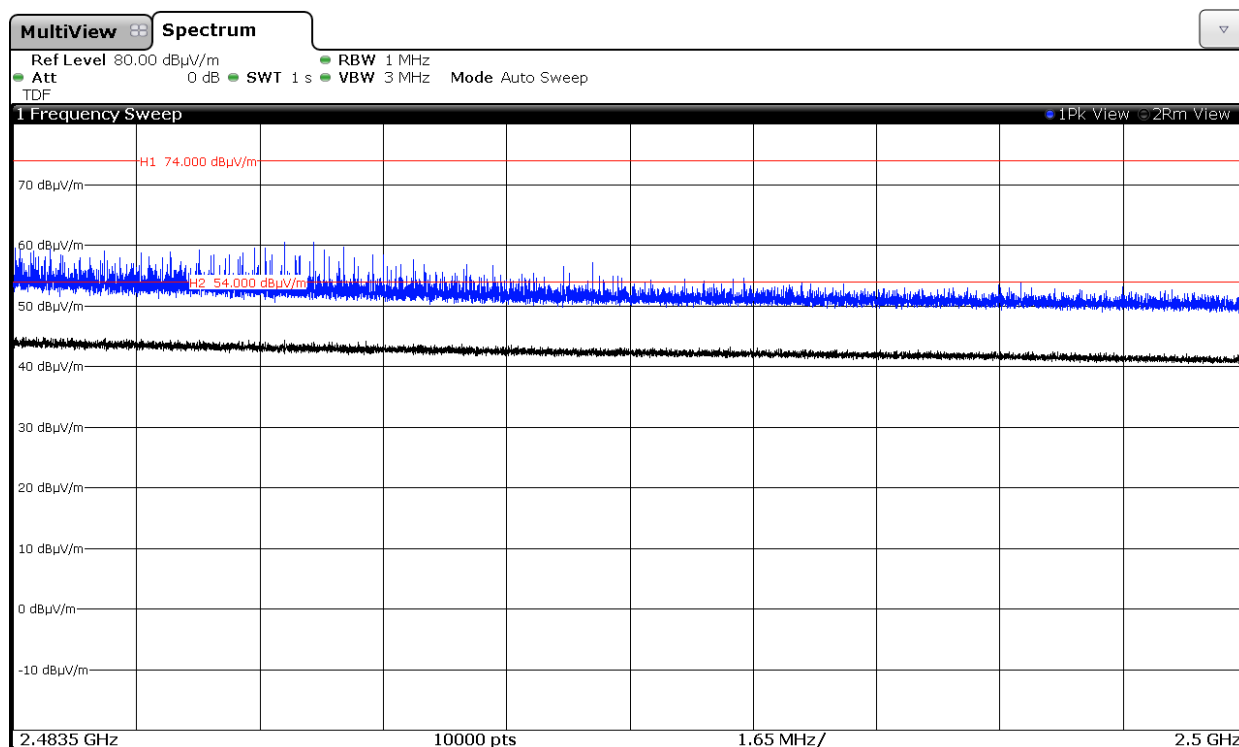
Chain A



Chain B

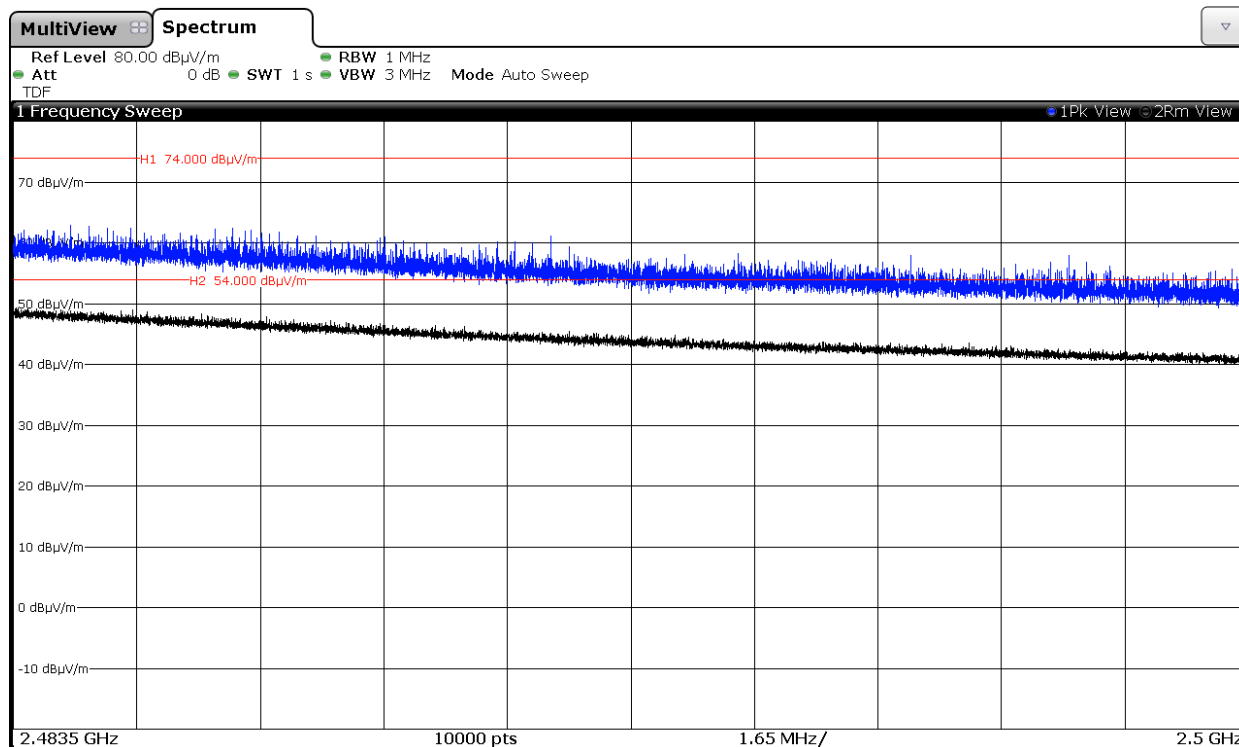


Chain A+B

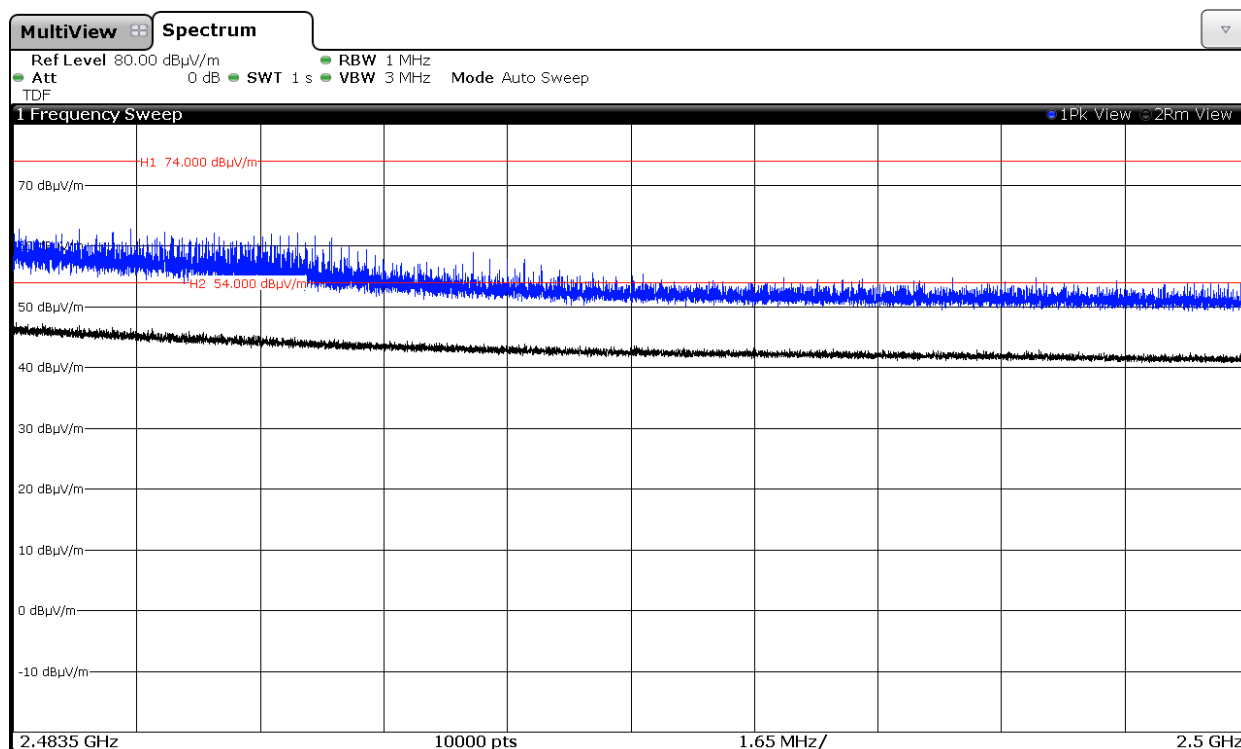


CHANNEL 9 (2452 MHz).

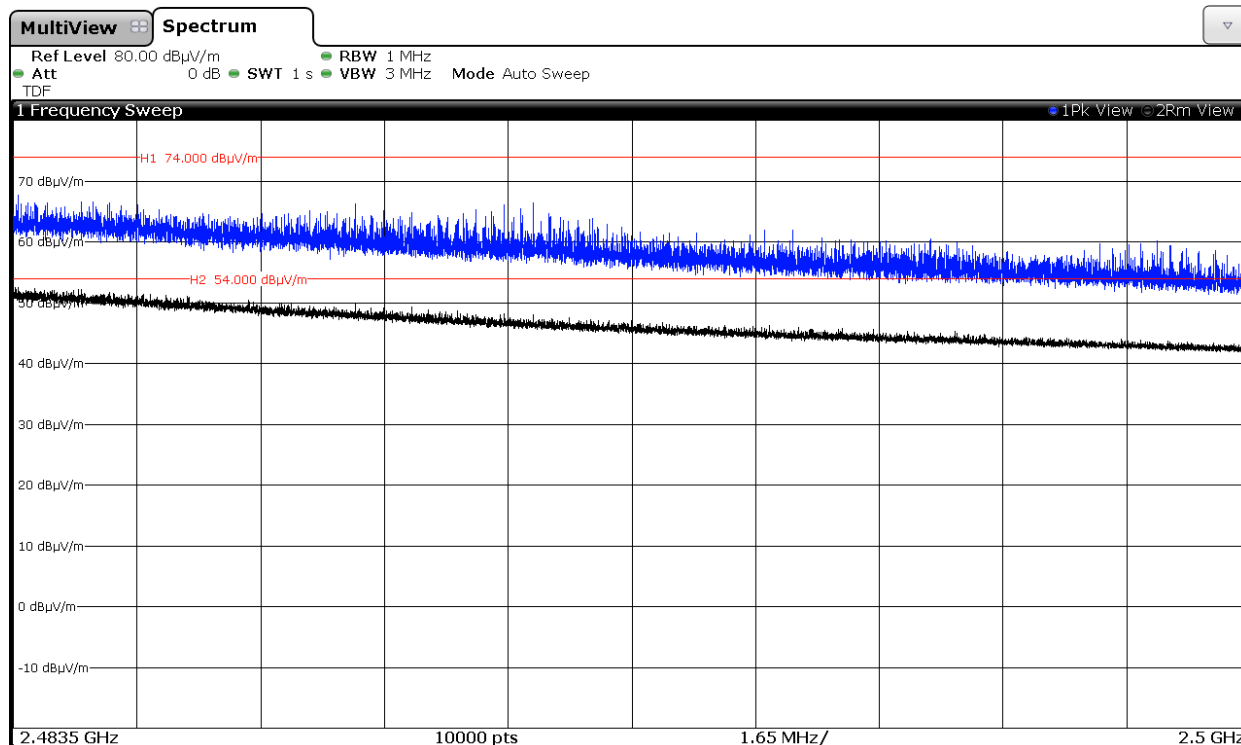
Chain A



Chain B

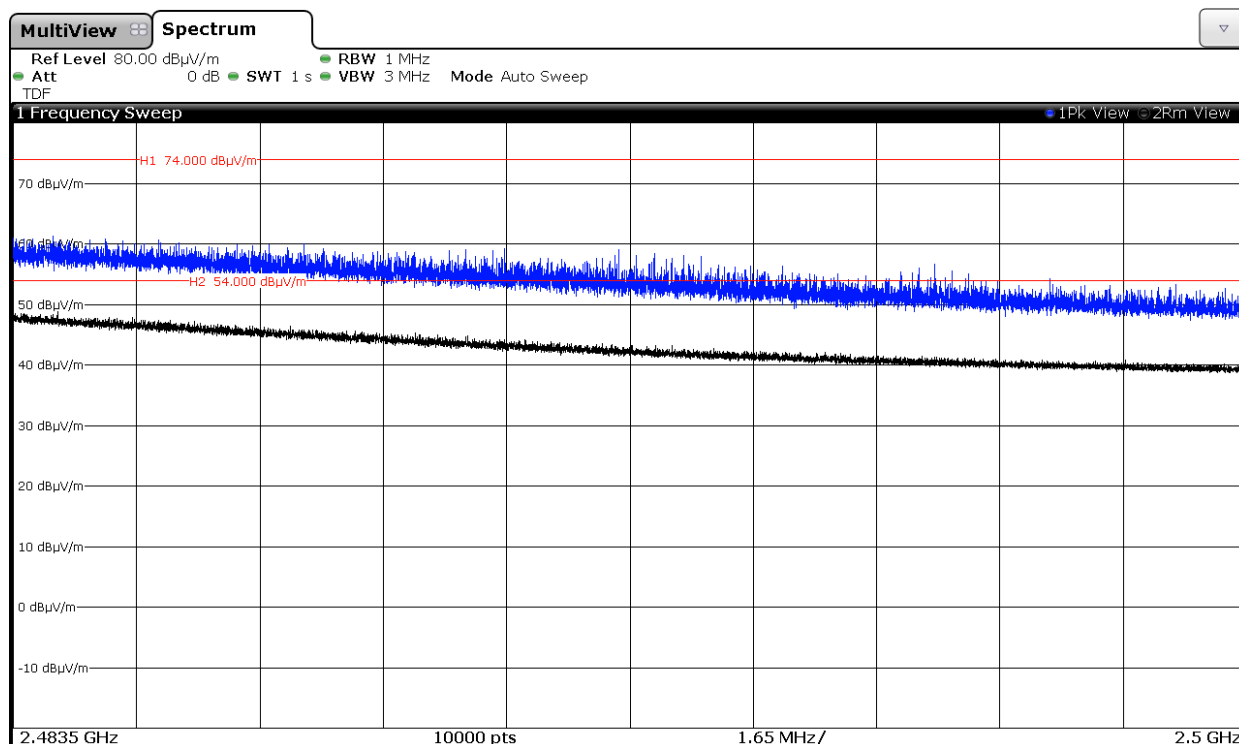


Chain A+B

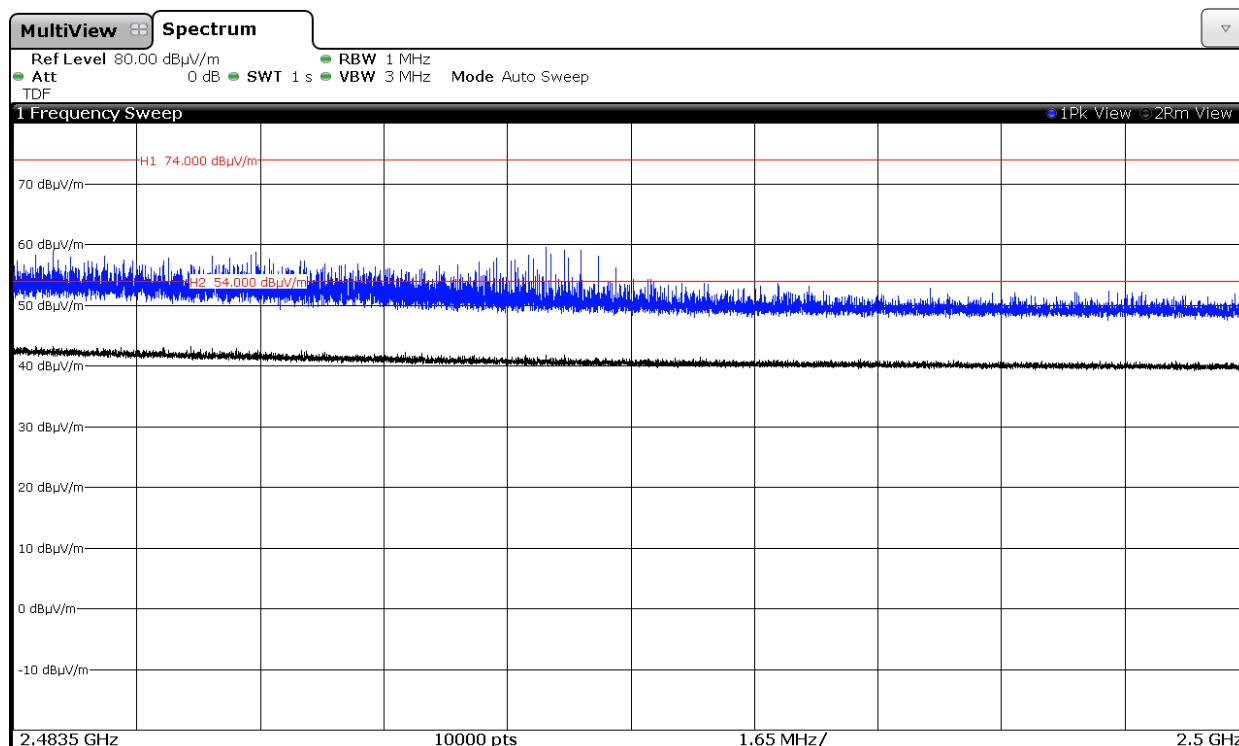


CHANNEL 10 (2457 MHz).

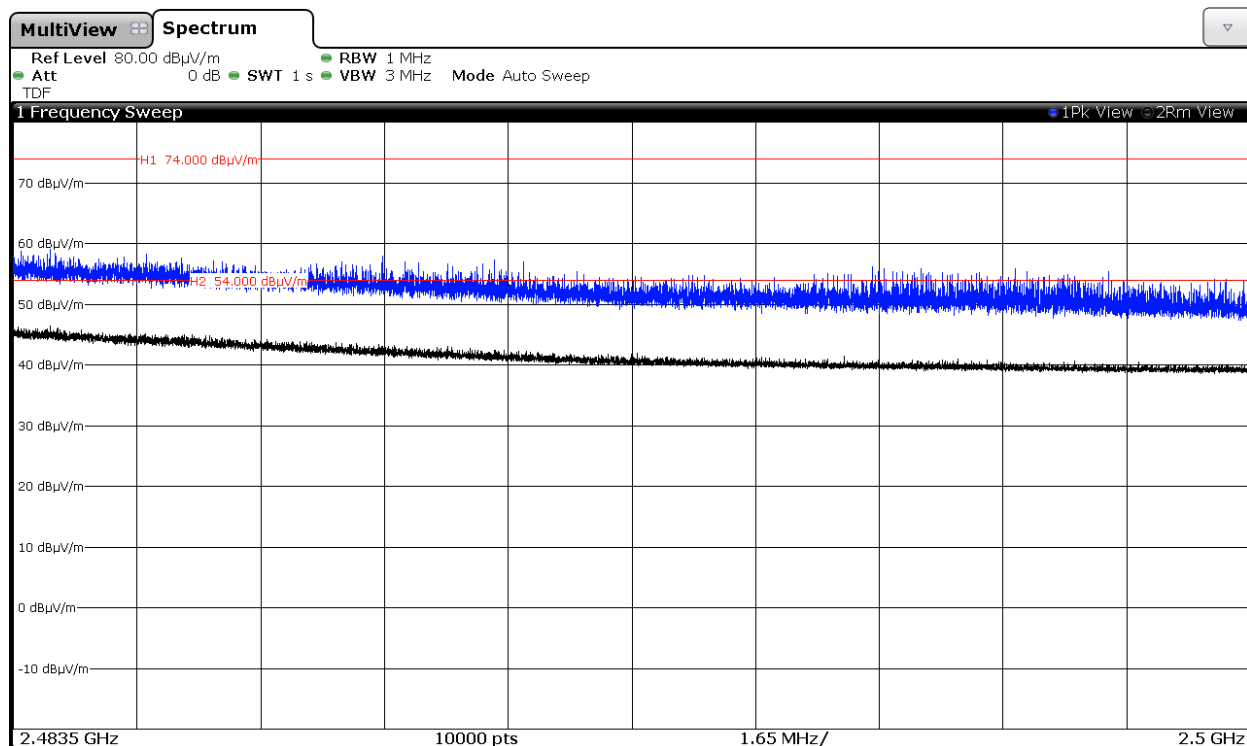
Chain A



Chain B

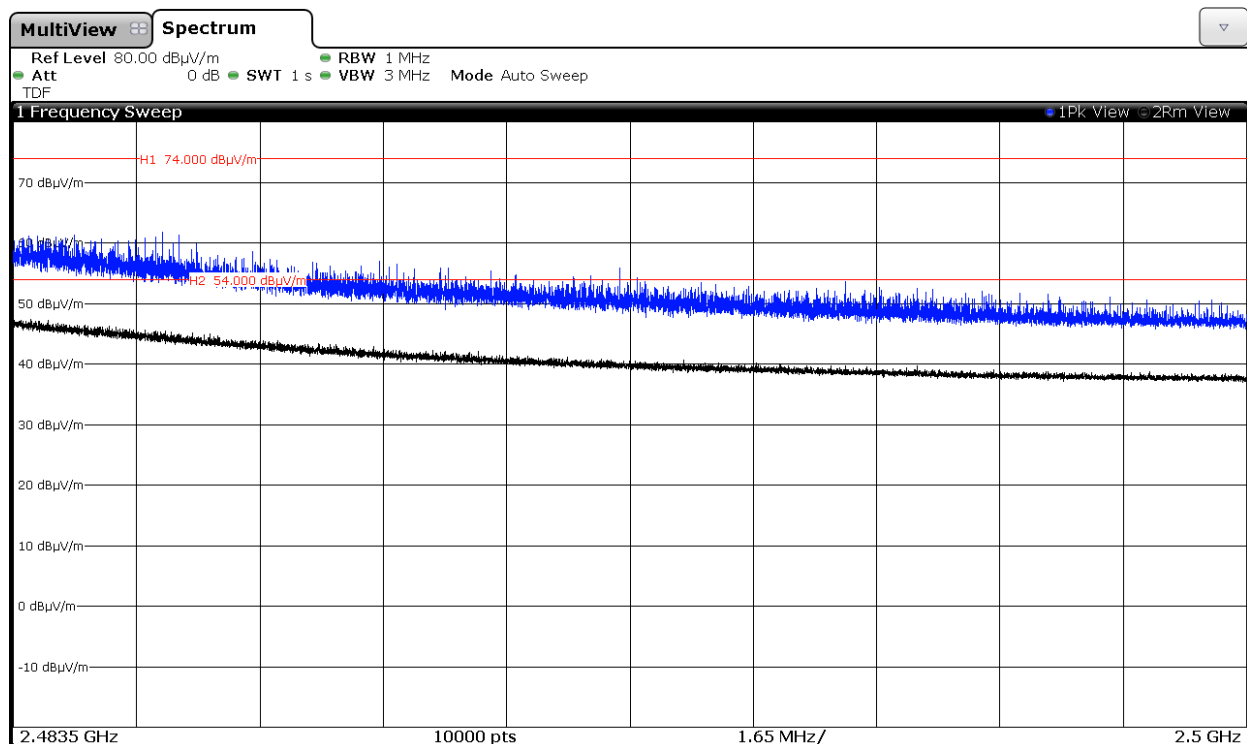


CHAIN A+B

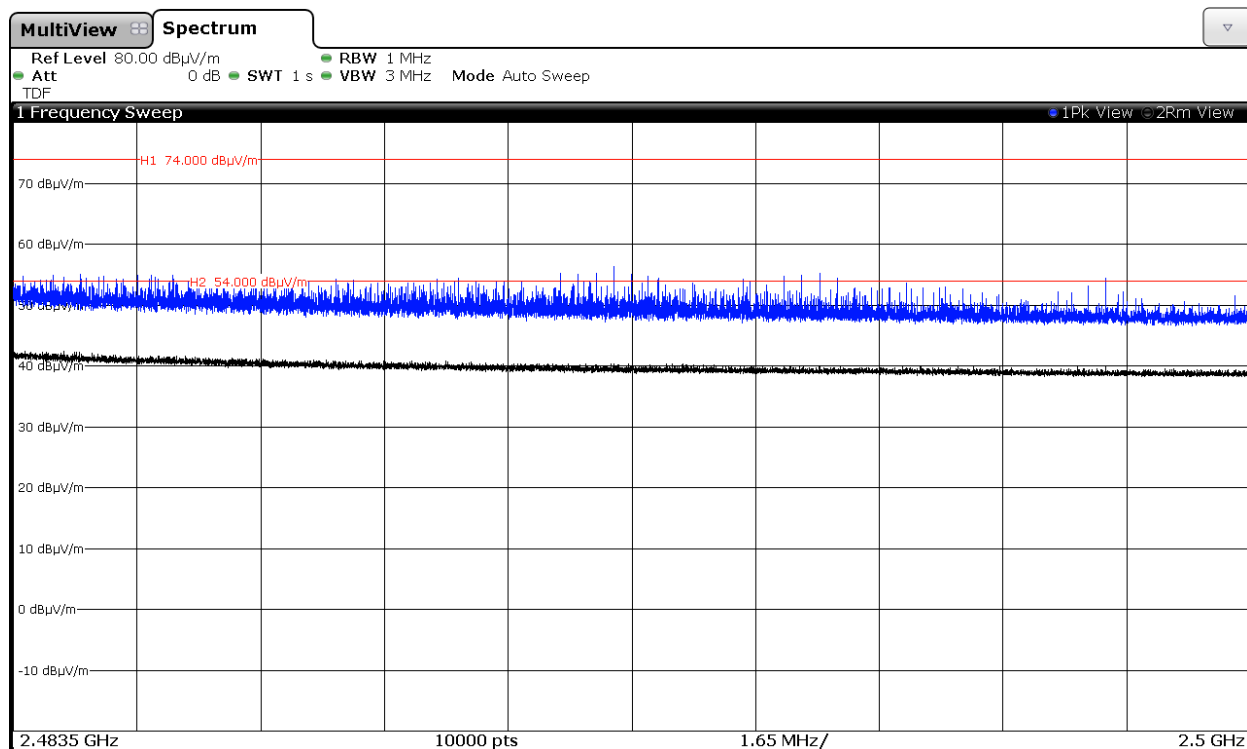


CHANNEL 11 (2462 MHz).

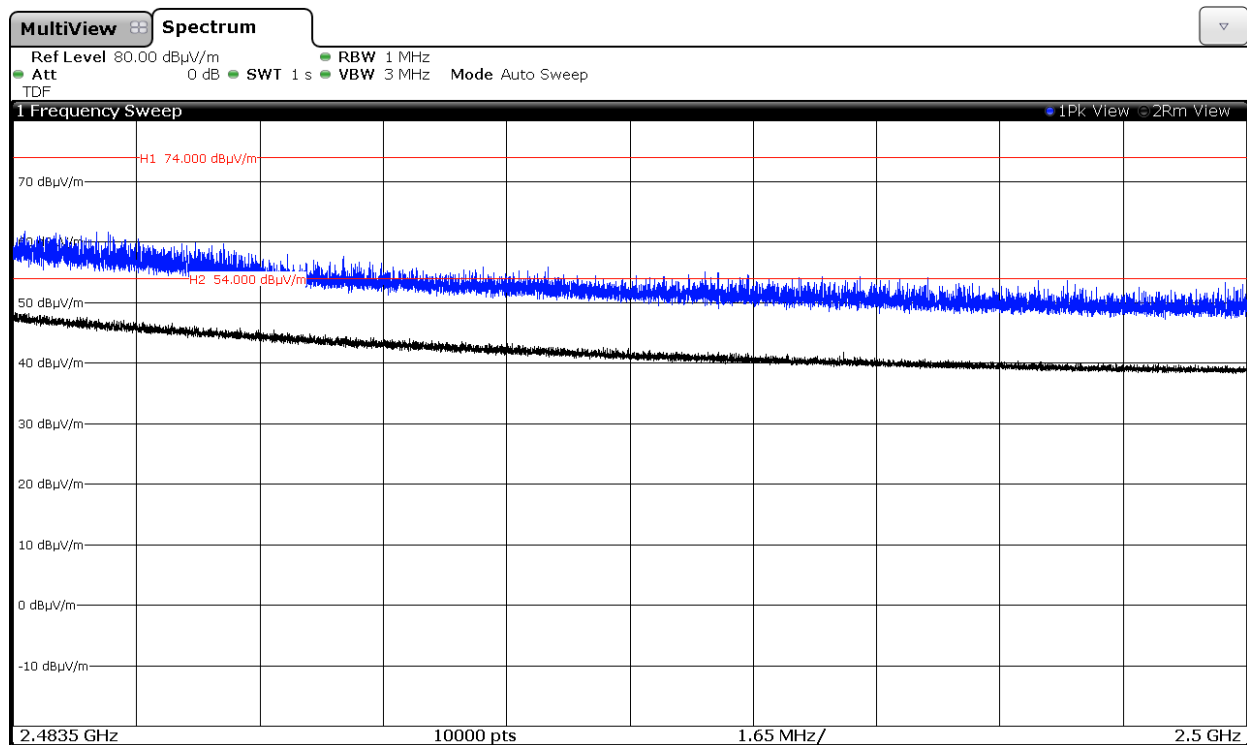
Chain A



Chain B



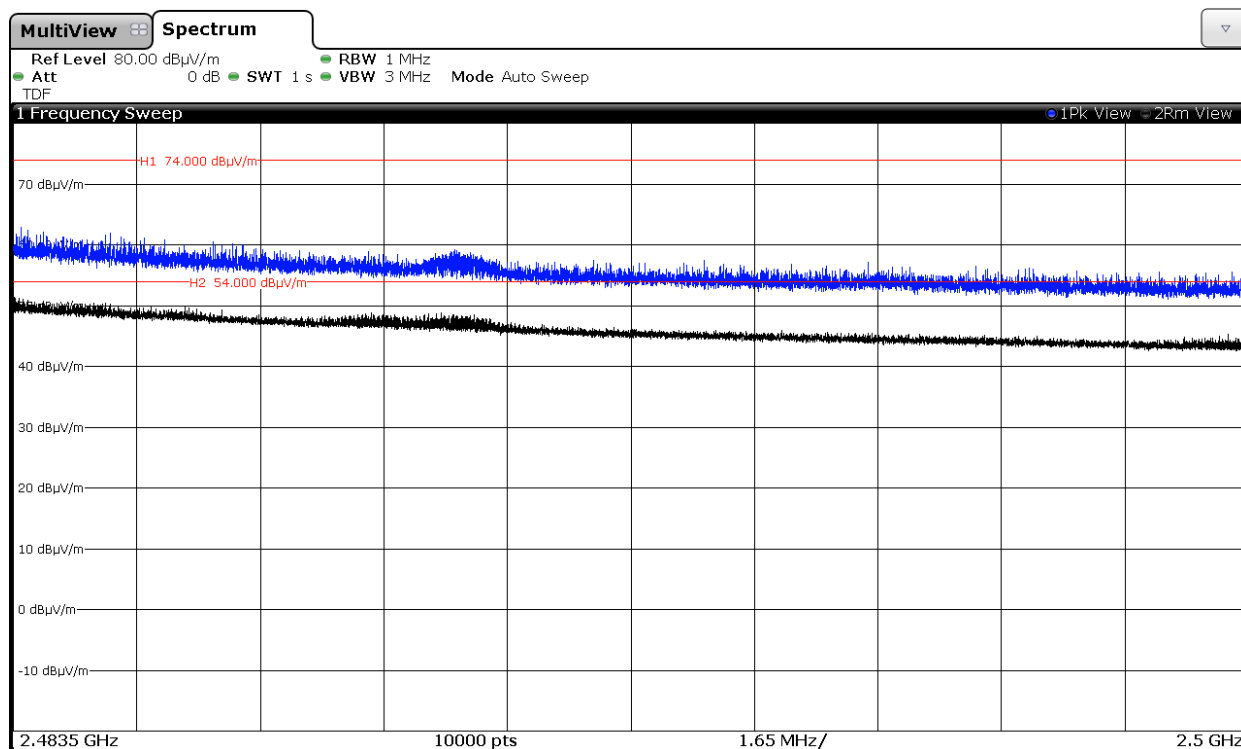
Chain A+B



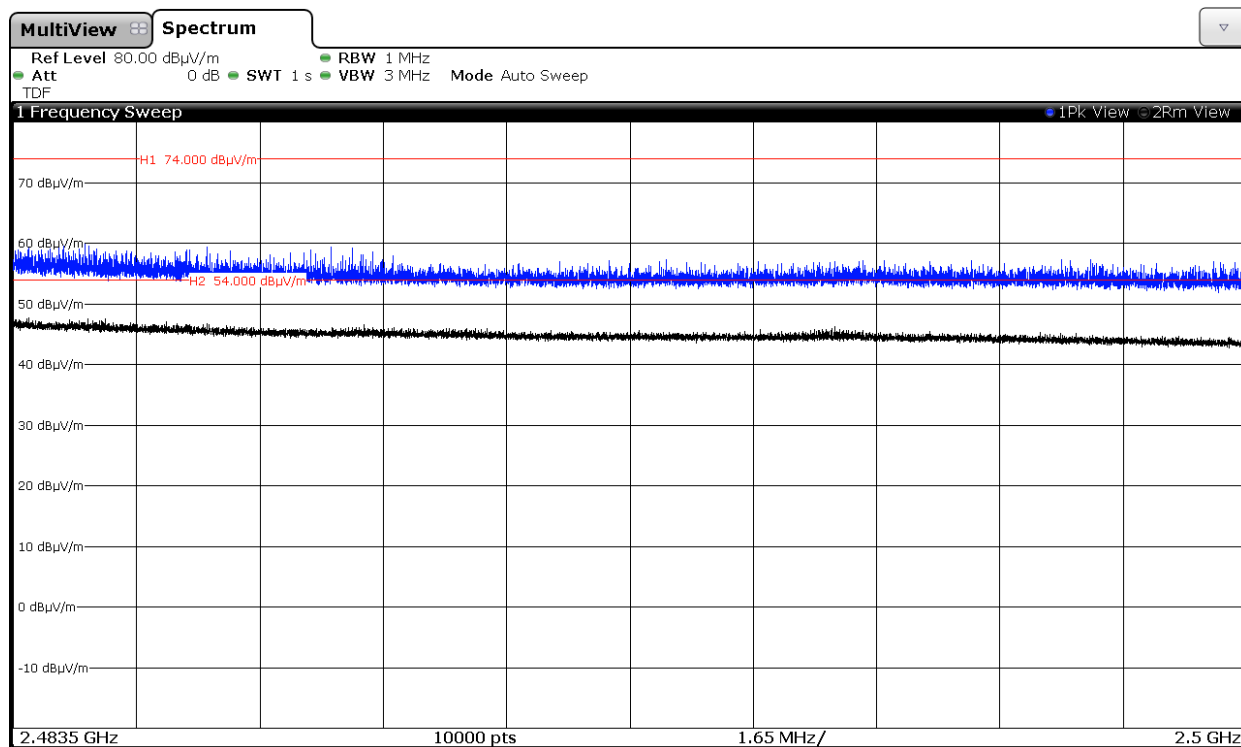
4. WiFi 2.4GHz 802.11 n40 mode

CHANNEL 6 (2437 MHz).

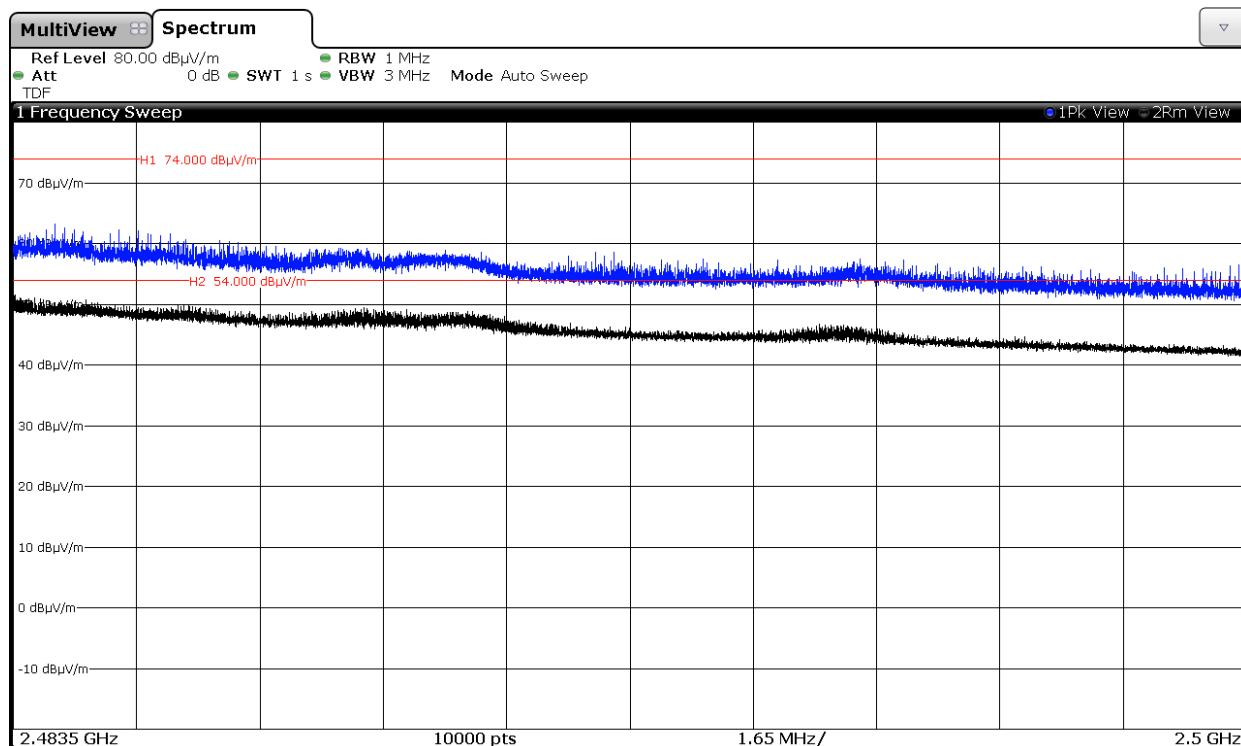
Chain A



Chain B

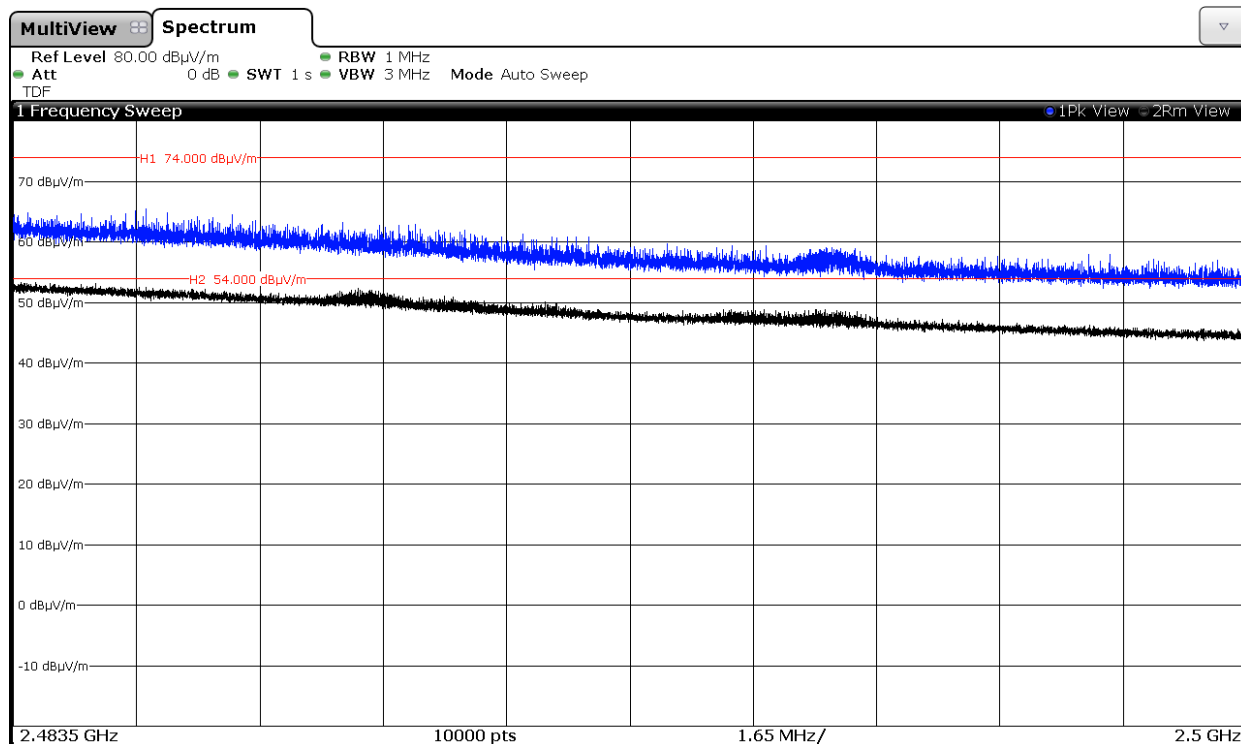


Chain A+B

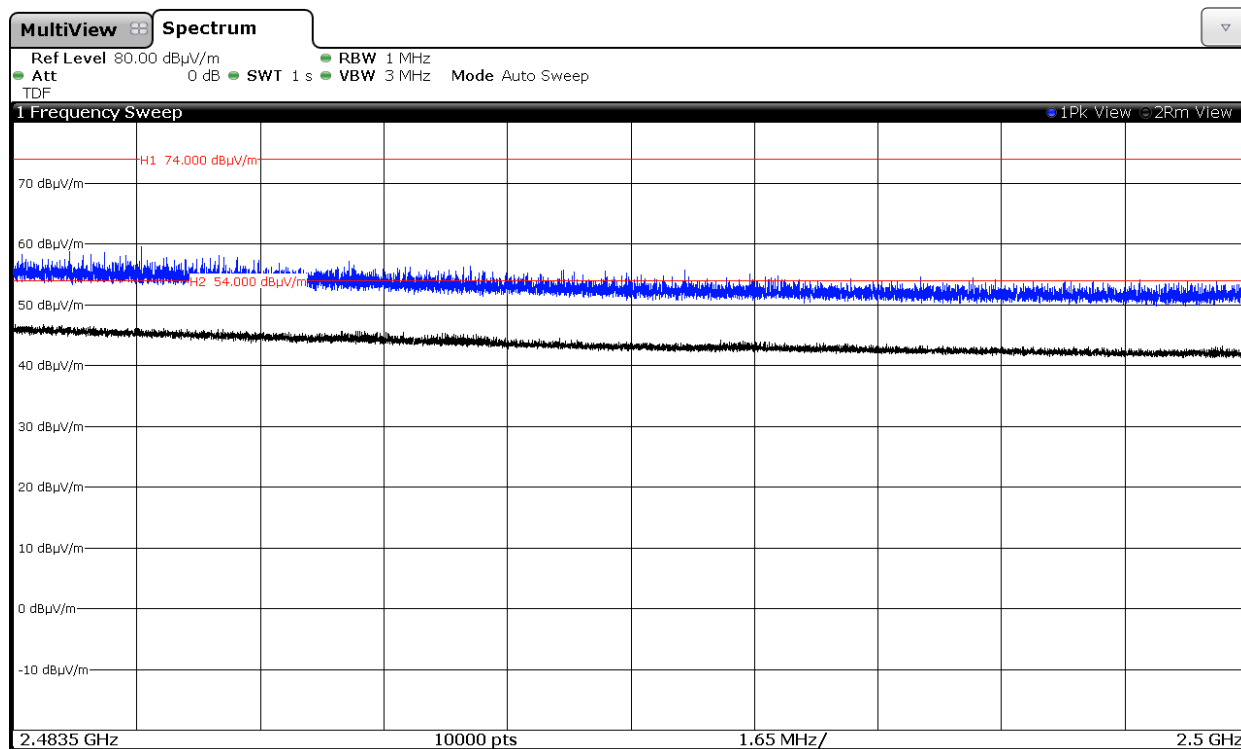


CHANNEL 7 (2442 MHz).

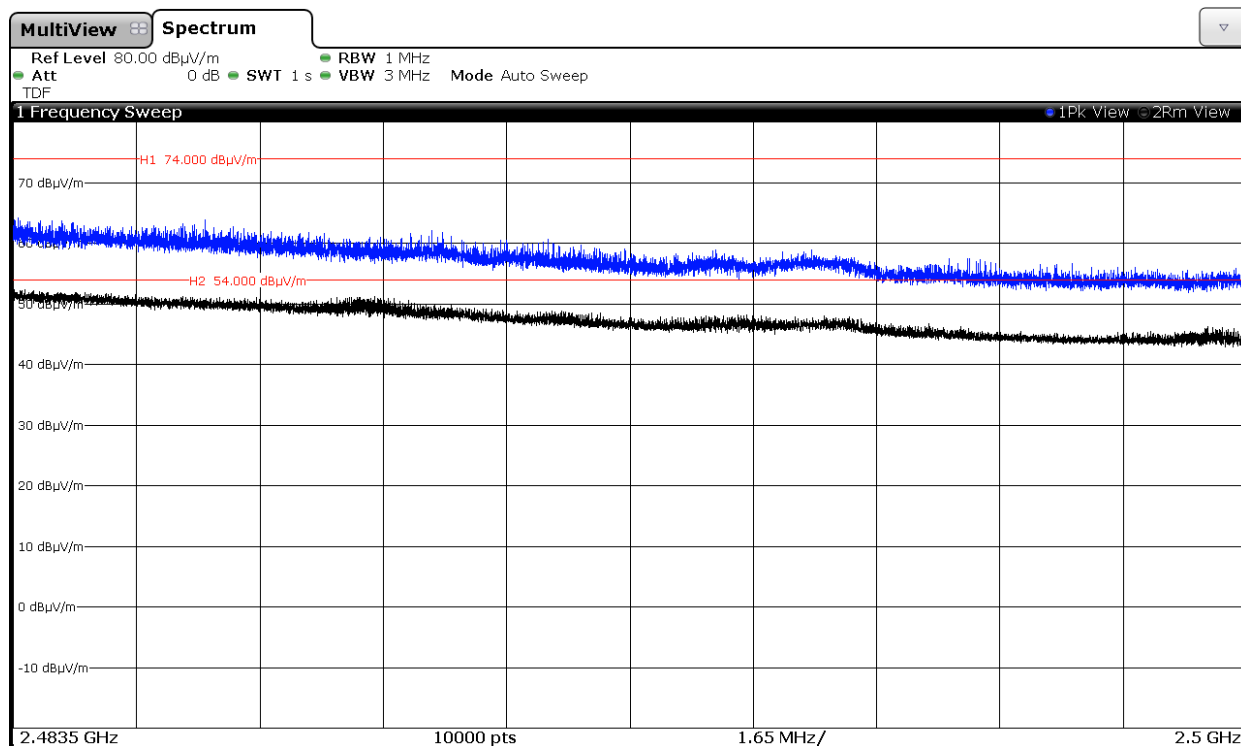
Chain A



Chain B

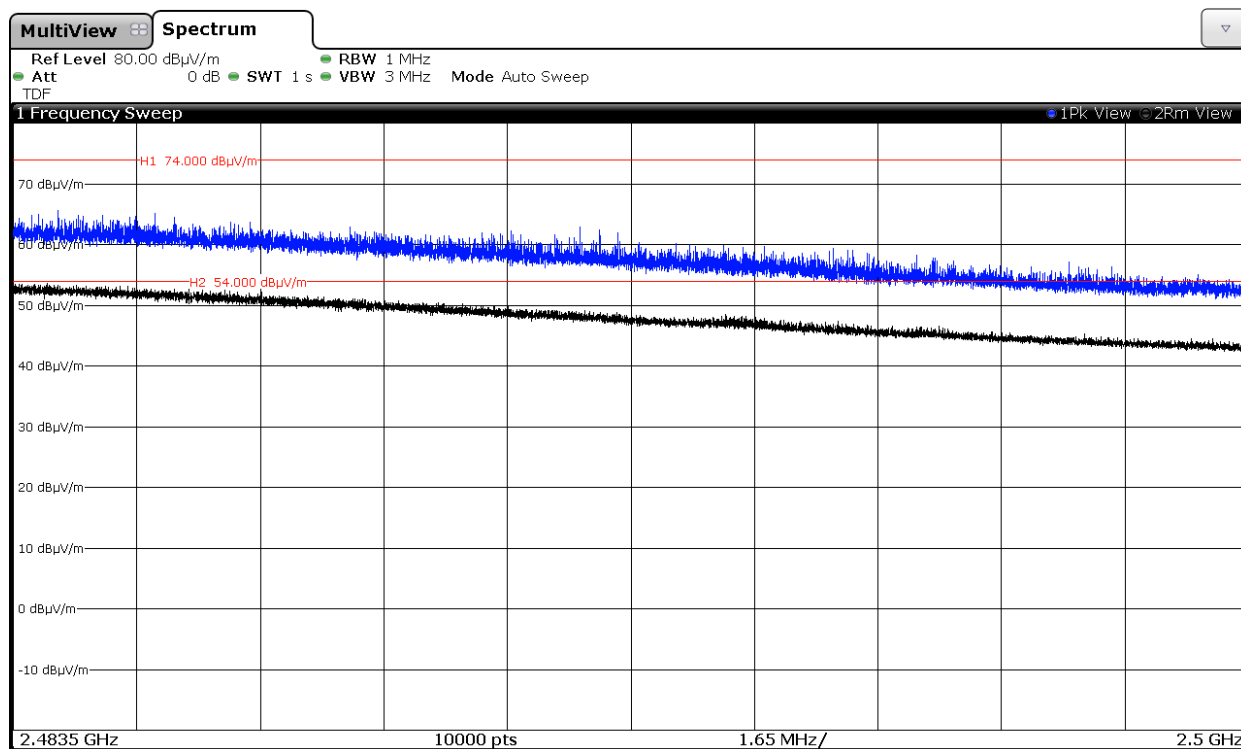


Chain A+B

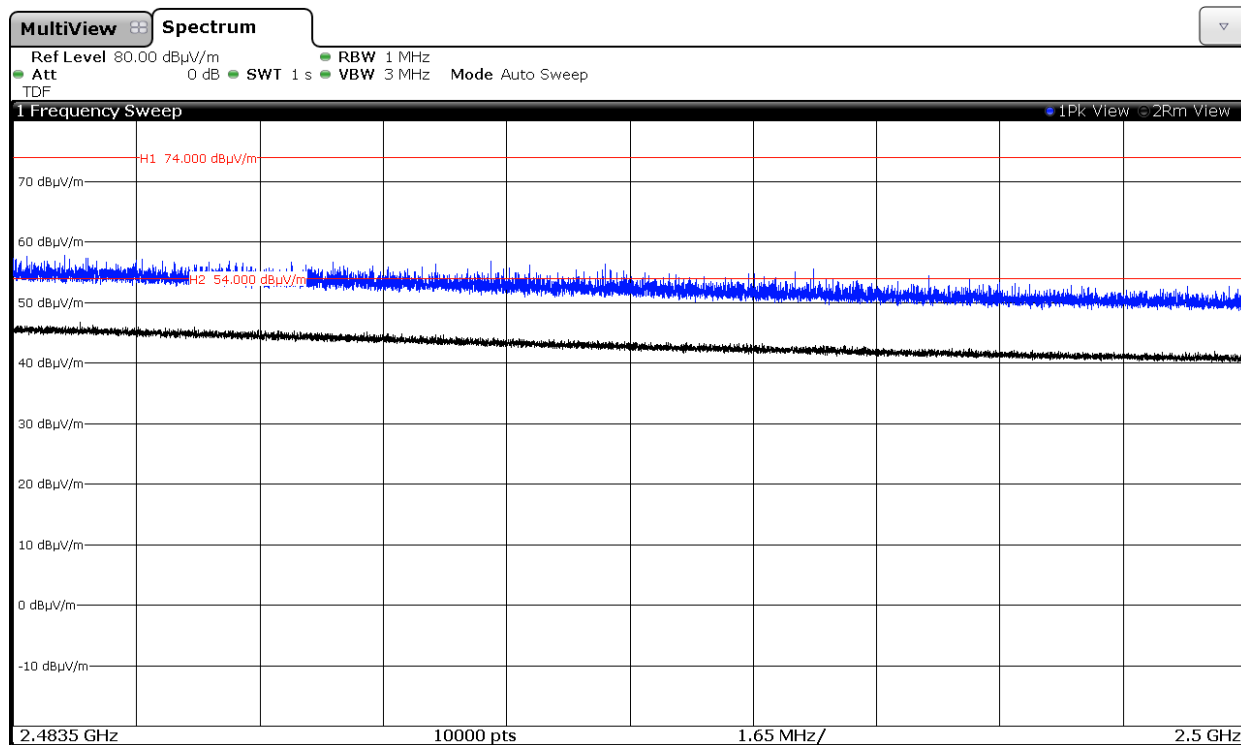


CHANNEL 8 (2447 MHz).

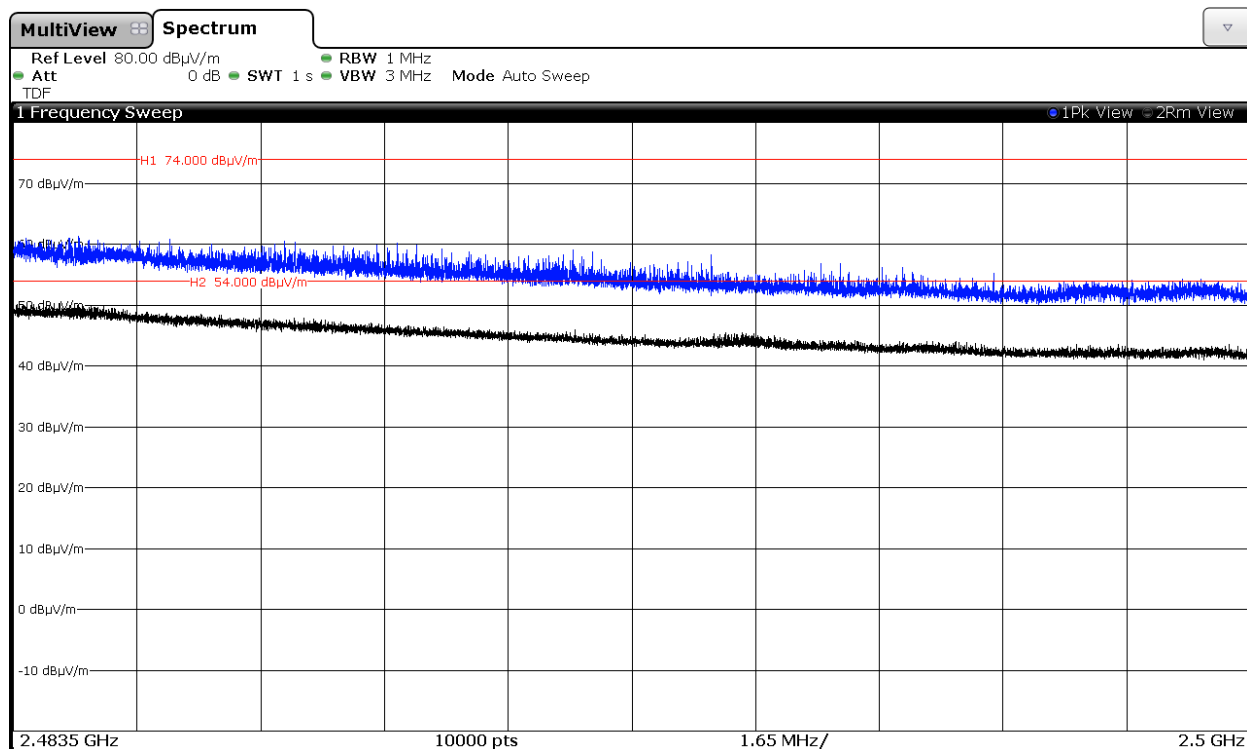
Chain A



Chain B

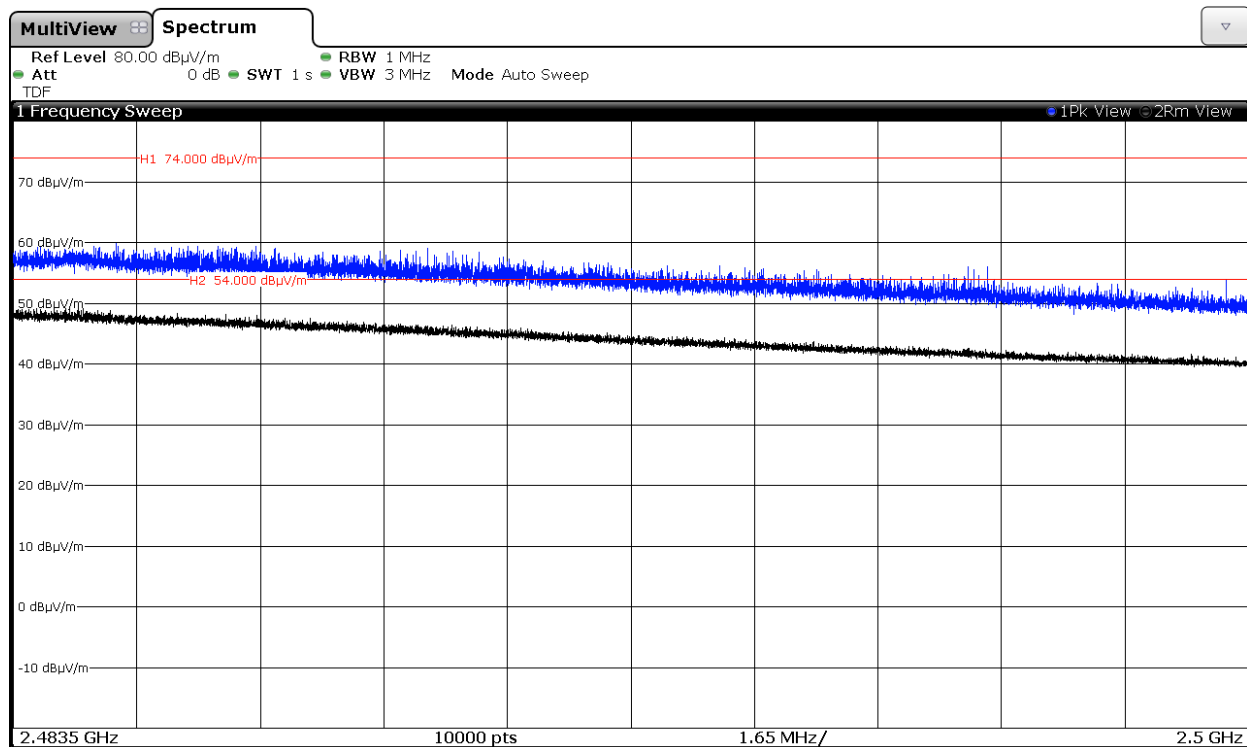


Chain A+B

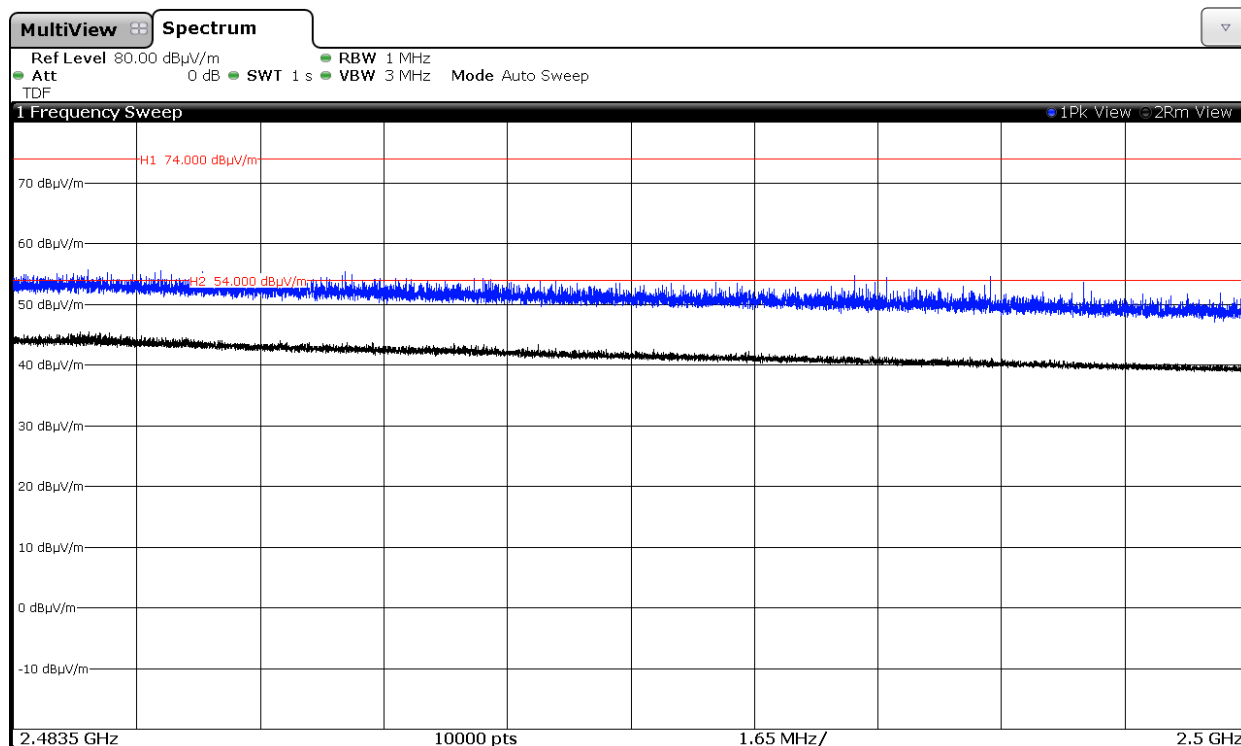


CHANNEL 9 (2452 MHz).

Chain A



Chain B



Chain A+B

