DEKRA Testing and Certification, S.A.U.
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C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 67442RRF.009

Test Report
USA FCC Part 15.407, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Communications device
(*) Trademark	Ring LLC
(*) Model and /or type reference	5AT3T3
Other identification of the product	FCC ID: 2AEUPBHAXN001 IC: 20271-BHAXN001
(*) Features	--
Applicant	Ring LLC 1523 26th Street, Santa Monica, 90404, California, United States
Test method requested, standard	USA FCC Part 15.407 (10-1-20) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-20) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager 2021.11.03 15:13:50 +01'00'
Date of issue	2021-11-03
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Competences and guarantees 3
General Conditions 3
Uncertainty 3
Data provided by the client 3
Usage of samples 4
Test sample description 5
Identification of the client 6
Testing period and place 6
Document history 6
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Tests results for the U-NII-2C: 5.47 GHz – 5.725 GHz Band 9

Competences and guarantees

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

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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

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Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample of the model number 5AT3T3 is a communications device.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

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	Reception
67442/077	Communications Device	5AT3T3	GCB1ES011307006K	2021/09/07

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Reception
67442/079	AC/DC Adapter	DSA-36PDB FUS	GB51PR0110770RW0	2021/09/07

Sample S/01 has undergone the test(s): All Conducted tests indicated in the Appendix A.

- Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
67442/076	Communications Device	5AT3T3	GCB1ES0113070060	2021/09/07

Auxiliary elements used with the Sample S/03:

Control Nº	Description	Model	Serial Nº	Reception
67442/078	AC/DC Adapter	DSA-36PDB FUS	GB51PR0110770RU3	2021/09/07

Sample S/02 has undergone the test(s): All Radiated tests indicated in the Appendix A.

Test sample description

Ports…… :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient
	AC power port	>3m	Yes	No	
	USB power port	<3m	Yes	Yes	
	Ethernet ports	>3m	Yes	No	
	-				
	-				
	-				

Supplementary information to the ports…… :	-						
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	X	AC: 110V (60Hz).	X			X	
	X	DC: 12V, 3A					
Rated Power .....:	Not provided.						
Clock frequencies.....:	Not provided.						
Other parameters .....:	Not provided.						
Software version .....:	Not provided.						
Hardware version .....:	Not provided.						
Dimensions in cm (W x H x D) ....:	Not provided.						
Mounting position .....:	X	Table top equipment					
		Wall/Ceiling mounted equipment					
		Floor standing equipment					
		Hand-held equipment					
		Other:					

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	-		
Accessories (not part of the test item) .....:	Description	Type	Manufacturer
	-		
Documents as provided by the applicant.....:	Description	File name	Issue date
	-		

Identification of the client

Ring LLC

1523 26th Street, Santa Monica, 90404, California, United States

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-09-07
Date (finish)	2021-10-01

Document history

Report number	Date	Description
67442RRF.009	2021-11-03	First release.

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Daniel Mejías, Victoria Olmedo, Jaime Barranquero, Antonio Manuel Sánchez.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ALBATROSS PROJECTS GMBH P29419	2020/01	2023/01
2.	Shielded Room ALBATROSS PROJECTS GMBH P29419	N/A	N/A
3.	EMI Test Receiver 2Hz-44GHz, ROHDE AND SCHWARZ ESW44	2019/10	2021/10
4.	Ultralog Antenna 30MHz-6GHz, ROHDE AND SCHWARZ HL562E_UPG	2019/10	2022/10
5.	Preamplifier 30 dB 500MHz-18GHz, SCHWARZBECK BBV 9718 C	2021/02	2022/02
6.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
7.	Preamplifier G>30 dB 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11
8.	Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2021/03	2024/03

Conducted Measurements

		Last Calibration	Due Calibration
1.	Shielded Room ETS LINDGREN S101	N/A	N/A
2.	Signal and Spectrum Analyzer 2Hz-50GHz ROHDE AND SCHWARZ FSW50	2021/07	2023/07
3.	Vector Signal Generator 100 KHz-6GHz ROHDE AND SCHWARZ SMU200A	2021/04	2023/04
4.	Signal Generator 9 KHz-6 GHz, ROHDE AND SCHWARZ SMB100A	2019/10	2021/10
5.	Open Switch and Control Platform ROHDE & SCHWARZ OSP-B157W8	2021/03	2023/03
6.	Spectrum Analyzer 9kHz-6GHz ROHDE AND SCHWARZ FSL6	2021/04	2023/04

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

A. U-NII-2C: 5.47 GHz – 5.725 GHz Band:

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.407 (a)(2) / RSS-247 6.2.3.1	Transmitter Maximum Conducted Output Power Transmitter Maximum Equivalent Isotropically Radiated Power	P	
FCC 15.407 (a)(2) / RSS-247 6.2.3.1	Transmitter Maximum Power Spectral Density Transmitter EIRP Spectral Density	P	
FCC 15.407 (b)(3) / RSS-247 6.2.3.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(3) / RSS-247 6.2.3.2	Transmitter Band Edge Radiated Emissions	P	
FCC 15.407 (h)(1) / RSS-247 6.2.2.1	Transmitter Power Control	P	
Supplementary information and remarks: None.			

Appendix A: Tests results for the U-NII-2C: 5.47 GHz – 5.725 GHz Band

INDEX

TEST CONDITIONS 11

FCC 15.407 (a)(2) Transmitter Maximum Conducted Output Power / RSS-247 6.2.3.1 Transmitter Maximum Equivalent Isotropically Radiated Power 17

FCC 15.407 (a)(2) Transmitter Maximum Power Spectral Density / RSS-247 6.2.3.1. Transmitter EIRP Spectral Density 78

FCC 15.407 (b)(1) / RSS-247 6.2.1.2. Out of Band Radiated Emissions 139

FCC 15.407 (b)(1) / RSS-247 6.2.1.2. Band Edge Radiated Emissions 157

FCC Section 15.407(h)(1) / RSS-247 6.2.2.1 Transmitter Power Control 213

TEST CONDITIONS

(*) Declared by the Applicant.

POWER SUPPLY (*):

Vnominal:	110 Vac
Type of Power Supply:	AC/DC Adapter.

ANTENNA (*):

Type of Antennas:	Integral (stamped metal).
Maximum Declared Antenna Gain WLAN1 U-NII-2C:	+5.5 dBi
Maximum Declared Antenna Gain WLAN2 U-NII-2C:	+4.3 dBi

<u>Directional Antenna Gain Calculations for CDD MIMO:</u>

U-NII-2C:

- For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)(ii), directional gain was calculated as (the worst-case):

$N_{SS} = 1$, $N_{ANT} = 2$, $G_{WLAN1} = +5.5$ dBi, $G_{WLAN2} = +4.3$ dBi

$$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$$

Directional Gain = +7.93 dBi

Maximum Declared Antenna Gain MIMO U-NII-2C: +7.93 dBi

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 a20 / n2040 / ac204080 / ax204080 2x2) / U-NII-2C	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO, MIMO with CDD)	
	802.11n HT20: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD)	
	802.11n HT40: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD)	
	802.11ac VHT20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ac VHT40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ac VHT80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ax HE20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ax HE40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
	802.11ax HE80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF)	
Setting of cores / ports:	WLAN1, WLAN2, WLAN12	
Beamforming:	No.	
Frequency Range:	5470 - 5725 MHz	
Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 100	5500
	Low+1: 104	5520
	Middle-1: 116	5580
	High: 140	5700
Straddle Channel U-NII-2C / U-NII-3	Straddle:144	5720
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 102	5510
	Low+1: 110	5550
	Middle: 118 (**)	5590
	High: 134	5670
Straddle Channel U-NII-2C / U-NII-3	Straddle:142	5710
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 106	5530
	High: 122 (**)	5610
Straddle Channel U-NII-2C / U-NII-3	Straddle:138	5690

(**): Channel not allowed in Canada.

POWER SETTINGS (*):

U-NII-2C. FCC and IC:

WLAN1

Channel	Frequency	11a	11n	11ac	11ax
100	5500 MHz	24	24	24	24
104	5520 MHz	24	24	24	24
116	5580 MHz	24	24	24	24
140	5700 MHz	22	22.5	22.5	22
144	5720 MHz	24	24	24	25
102	5510 MHz		23.5	23.5	24
110	5550 MHz		24	23.5	24
118 (**)	5590 MHz		23	23	23.5
134	5670 MHz		22.5	22.5	22
142	5710 MHz		24	24	24
106	5530 MHz			23.5	24
122 (**)	5610 MHz			23	23
138	5690 MHz			24	24

WLAN2

Channel	Frequency	11a	11n	11ac	11ax
100	5500 MHz	22.5	23.5	23.5	23.5
104	5520 MHz	23	23.5	23.5	24
116	5580 MHz	22	22.5	23	23
140	5700 MHz	20	22.5	22.5	21
144	5720 MHz	23	23.5	23.5	24
102	5510 MHz		17.5	18	18.5
110	5550 MHz		23	23	23.5
118 (**)	5590 MHz		23	22	23
134	5670 MHz		22	21.5	21
142	5710 MHz		22.5	22.5	23
106	5530 MHz			19.5	19
122 (**)	5610 MHz			22	22
138	5690 MHz			23	23

WLAN12

Channel	Frequency	11a	11n	11ac	11ax
100	5500 MHz	18	18.5	18.5	18.5
104	5520 MHz	18	18.5	19	18.5
116	5580 MHz	18.5	18.5	19	18
140	5700 MHz	18	18.5	19	19
144	5720 MHz	18.5	19	19	19
102	5510 MHz		17.5	17.5	18
110	5550 MHz		18	18	18.5
118 (**)	5590 MHz		18	18	18.5
134	5670 MHz		17.5	17.5	18
142	5710 MHz		18	18	18.5
106	5530 MHz			18.5	18.5
122 (**)	5610 MHz			18.5	18.5
138	5690 MHz			18.5	18.5

(**): Channel not allowed in Canada.

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

The EUT was tested in the following operating mode:

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

The field strength at the band edges was evaluated for each mode on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied instructions to configure the EUT. The customer supplied a document containing the setup instructions.

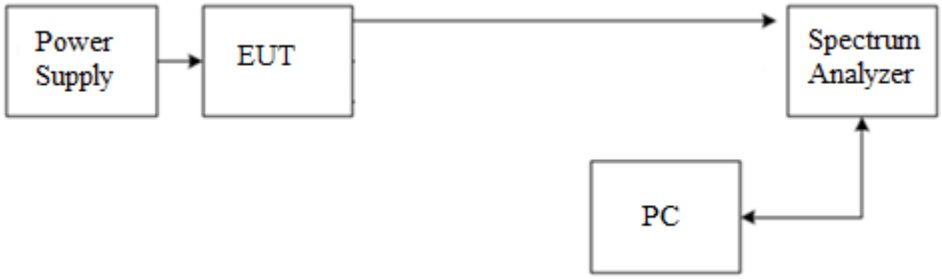
The worst-cases for testing were identified for output power and spurious levels at the band edges which were selected based on preliminary testing that correspond to next data rates:

- 802.11a:	6 Mbps SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11n HT20:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11n HT40:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT20:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT40:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT80:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ax HE20:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ax HE40:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ax HE80:	MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.

CONDUCTED MEASUREMENTS:

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

For all modes:



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) and 1 GHz-18 GHz Double ridge horn antenna is situated at a distance of 3 m and a distance of 1 m for the frequency range 17 GHz-40 GHz (18 GHz-40 GHz horn antenna).

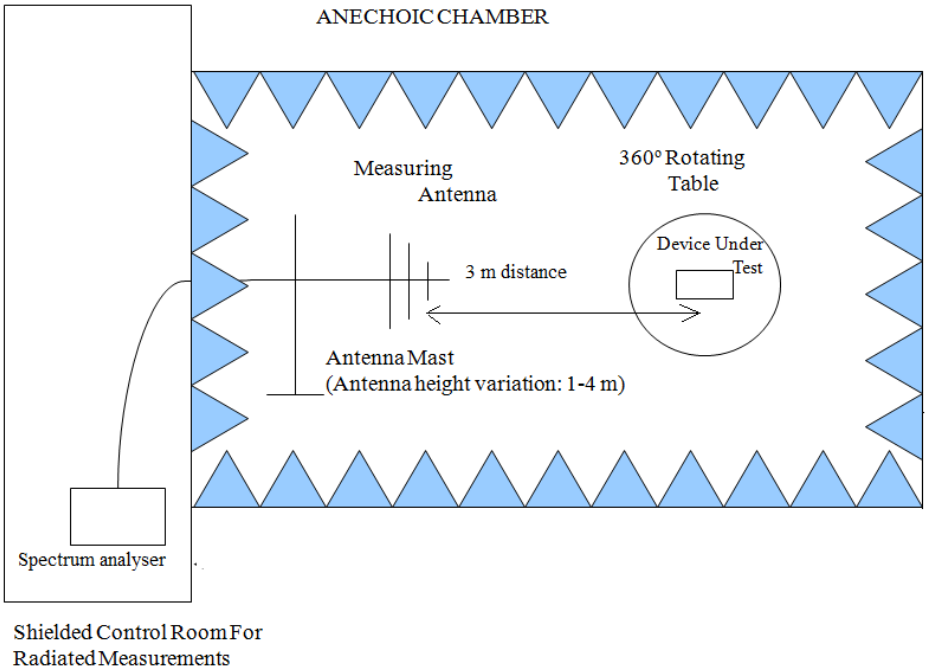
For radiated emissions in the range 17 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform 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 (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

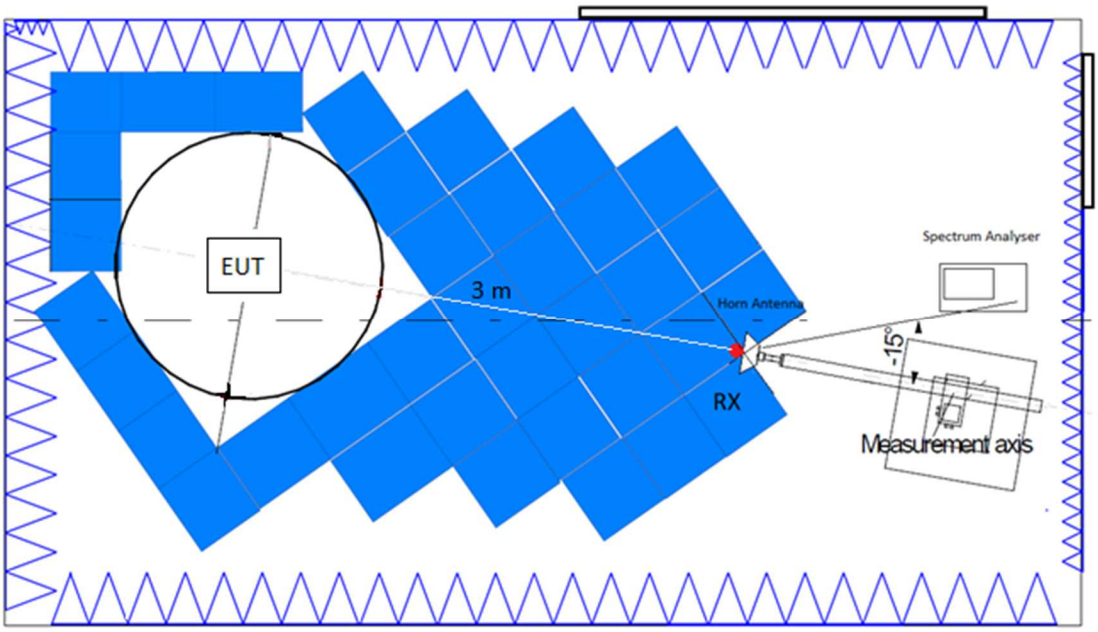
Measurements were made in both horizontal and vertical planes of polarization.

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

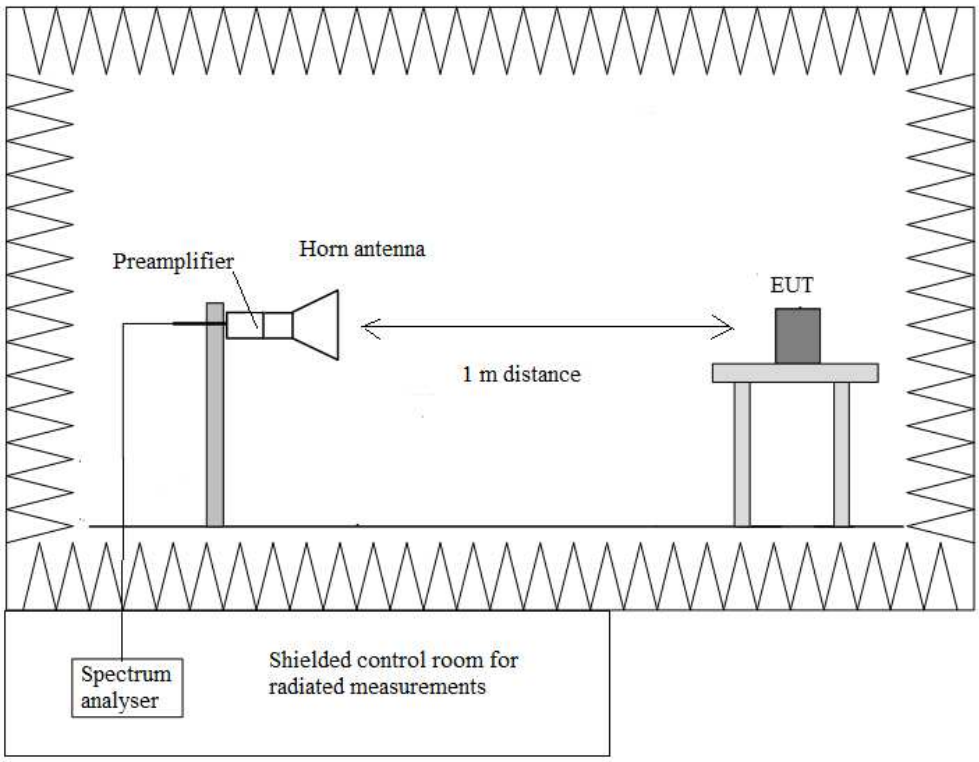
Radiated measurements setup f < 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



FCC 15.407 (a)(2) Transmitter Maximum Conducted Output Power / RSS-247 6.2.3.1 Transmitter Maximum Equivalent Isotropically Radiated Power

SPECIFICATION:

* FCC 15.407 (a)(2): For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

* RSS-247 6.2.3.1: The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$ B, dBm, whichever is less.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$ B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RESULTS:

The maximum conducted output power was measured using the channel power integration method according to point E.2.b) (Method SA-1) of 789033 D02 General UNII Test Procedures New Rules v02r01. When the duty cycle is >98% and the channel power integration method according to point E.2.d) (Method SA-2) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is <98%.

For data rates where the EUT was transmitting at <98% duty cycle, the duty cycle was added to the measured power in order to calculate the total average power during the actual transmission time.

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

- Preliminary tests determined the SISO worst-case: WLAN1.
- Preliminary tests determined the MIMO worst-case: WLAN12.

Maximum Declared Antenna Gain:

- SISO Antenna – WLAN1: +5.5 dBi
- MIMO Antennas – WLAN12:
  - WLAN1: +5.5 dBi
  - WLAN2: +4.3 dBi
  - WLAN12: +7.93 dBi

For the SISO technique, the antenna gain is less than 6 dBi.
For the MIMO technique, the antenna gain is higher than 6 dBi.

FCC and IC power setting:

SISO worst-case:

- Preliminary tests determined the SISO worst-case: WLAN1.

SISO 802.11 a20:

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	23.7	23.5	23.9	22.2
Maximum EIRP Corrected Conducted Power (dBm)	29.2	29	29.4	27.7
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	27.1
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 n20 (HT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	23.5	23.1	23.6	22.2
Maximum EIRP Corrected Conducted Power (dBm)	29	28.6	29.1	27.7
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	23.1
Maximum EIRP Corrected Conducted Power (dBm)	28.6
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	23.4	23.1	23.6	22.2
Maximum EIRP Corrected Conducted Power (dBm)	28.9	28.6	29.1	27.7
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	23.0
Maximum EIRP Corrected Conducted Power (dBm)	28.5
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax20 (HE20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	23.2	22.9	23.4	23.4
Maximum EIRP Corrected Conducted Power (dBm)	28.7	28.4	28.9	28.9
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	23.8
Maximum EIRP Corrected Conducted Power (dBm)	29.3
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	23.7	23.8	23.6	23.6
Maximum EIRP Corrected Conducted Power (dBm)	29.2	29.3	29.1	29.1
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	23.8
Maximum EIRP Corrected Conducted Power (dBm)	29.3
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	23.8	23.3	23.6	23.6
Maximum EIRP Corrected Conducted Power (dBm)	29.3	28.8	29.1	29.1
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	23.8
Maximum EIRP Corrected Conducted Power (dBm)	29.3
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	23.7	23.4	23.7	22.6
Maximum EIRP Corrected Conducted Power (dBm)	29.2	28.9	29.2	28.1
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	23.4
Maximum EIRP Corrected Conducted Power (dBm)	28.9
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted Power (dBm)	21.7	23.4
Maximum EIRP Corrected Conducted Power (dBm)	27.2	28.9
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted Power (dBm)	23.9
Maximum EIRP Corrected Conducted Power (dBm)	29.4
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted Power (dBm)	23.0	23.1
Maximum EIRP Corrected Conducted Power (dBm)	28.5	28.6
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted Power (dBm)	23.7
Maximum EIRP Corrected Conducted Power (dBm)	29.2
Measurement uncertainty (kHz)	<±36.95

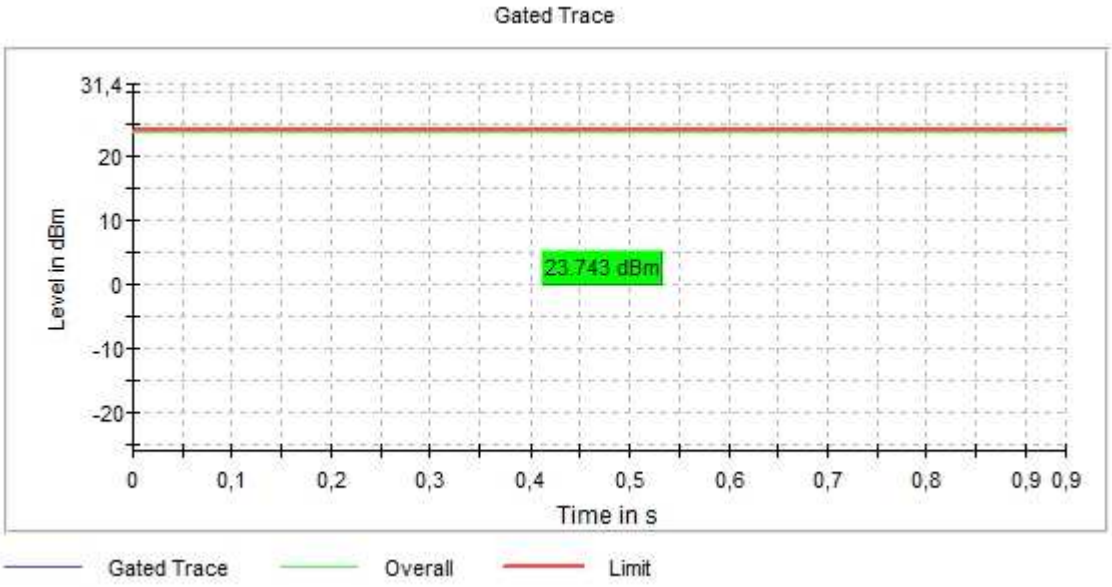
Verdict: PASS

SISO worst-case:

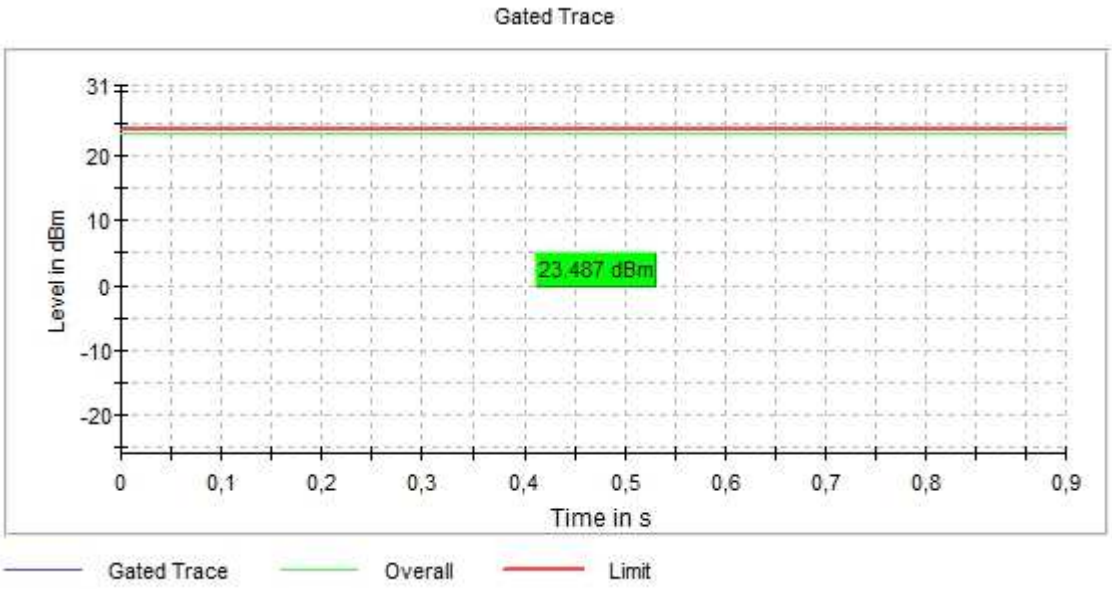
SISO 802.11 a20:

U-NII-2C (5250-5350 MHz)

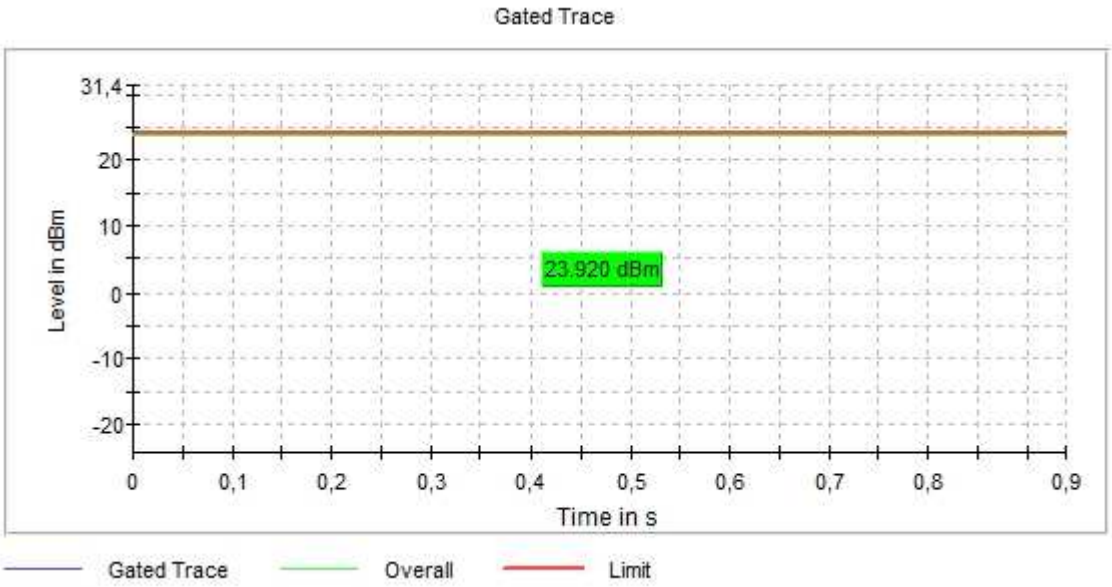
- Low Channel 100 (5500 MHz):



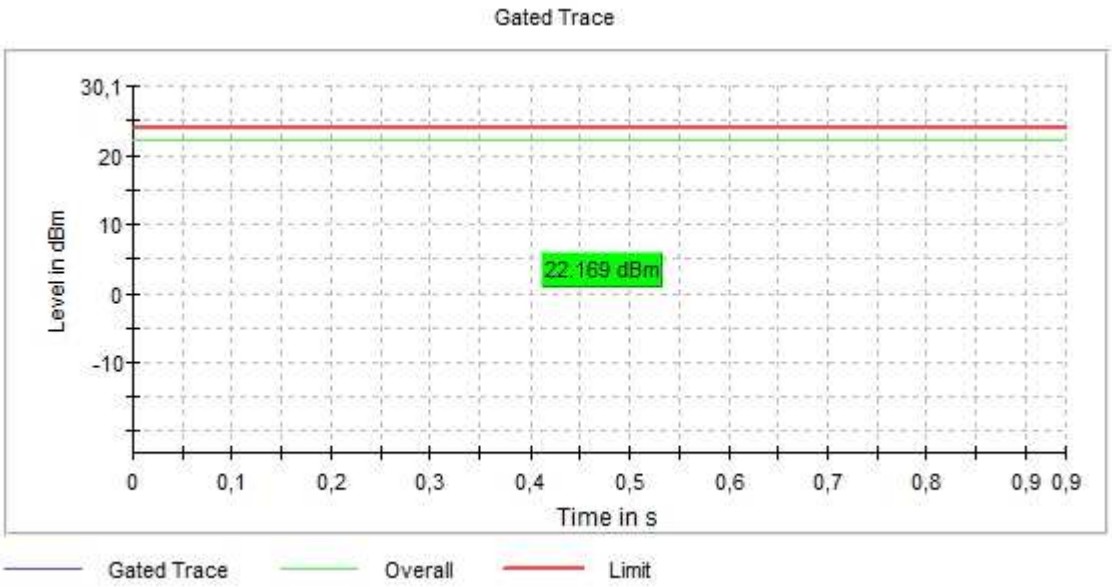
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

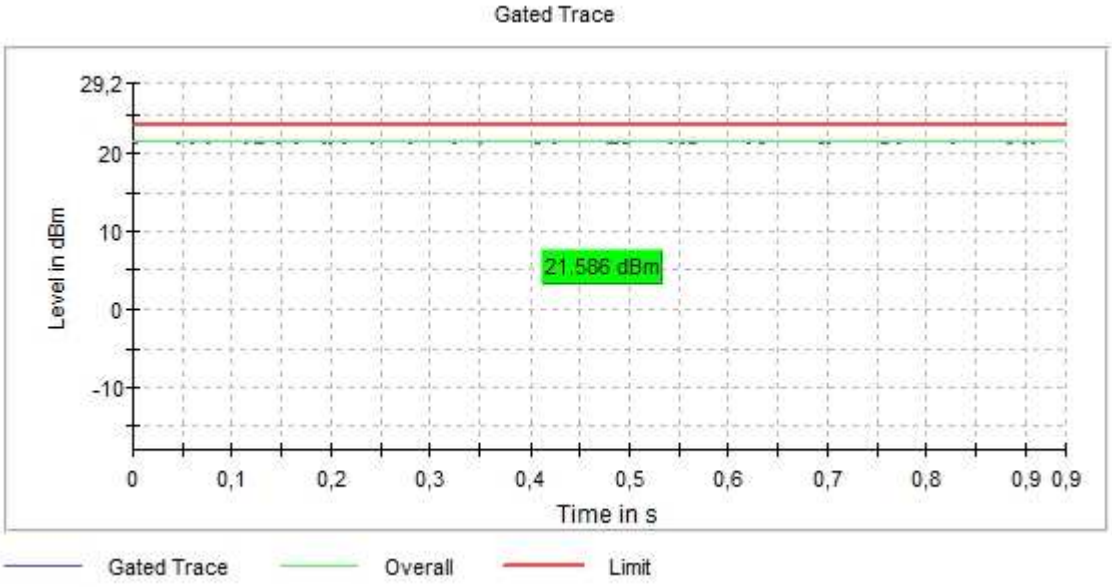


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

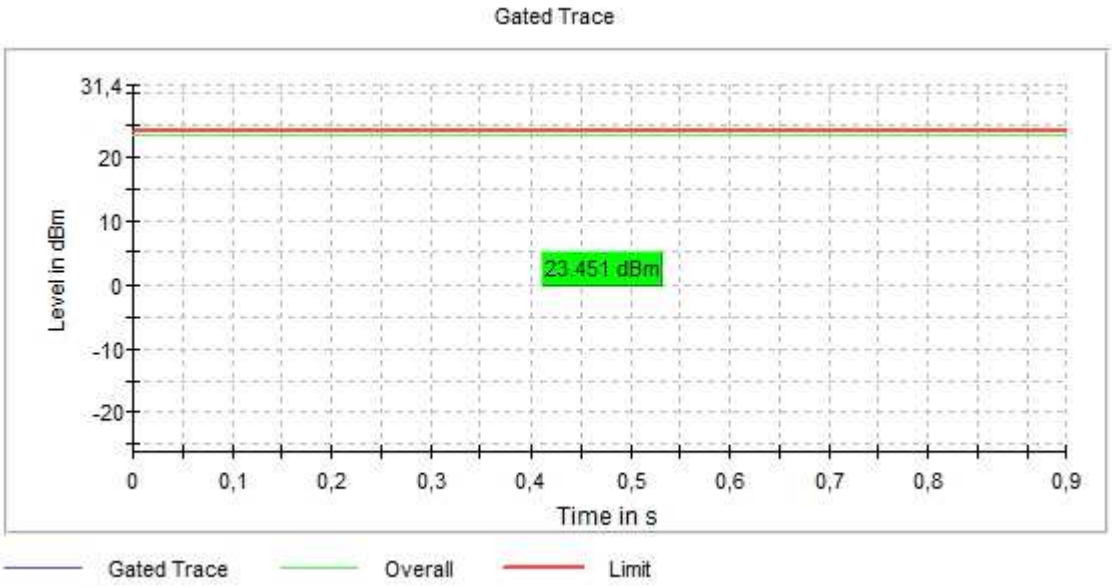
- Straddle Channel 144 (5720 MHz):



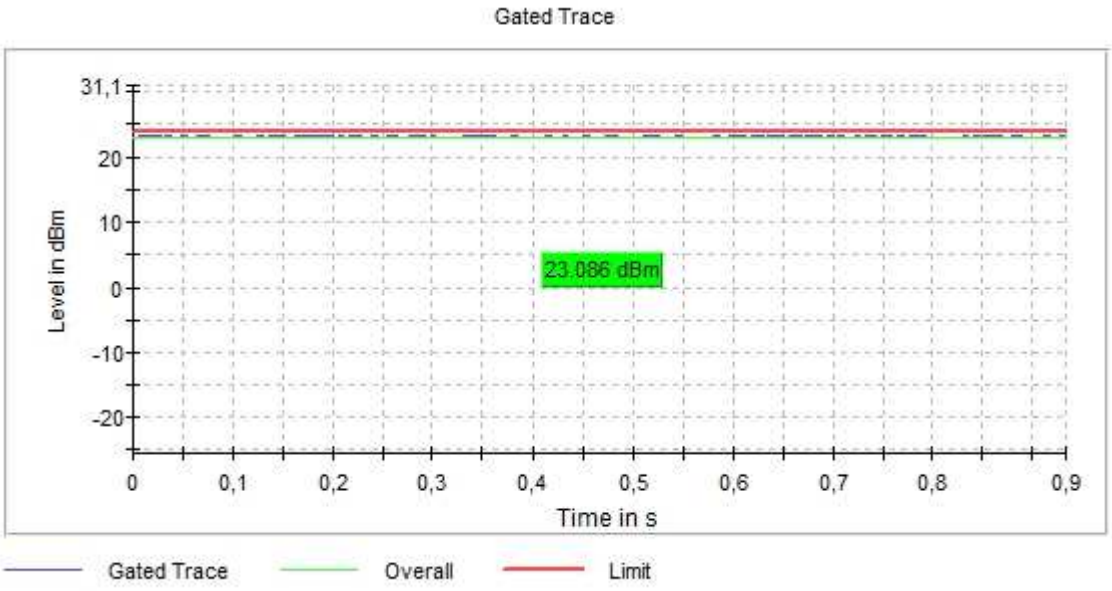
SISO 802.11 n20 (HT20):

U-NII-2C (5250-5350 MHz)

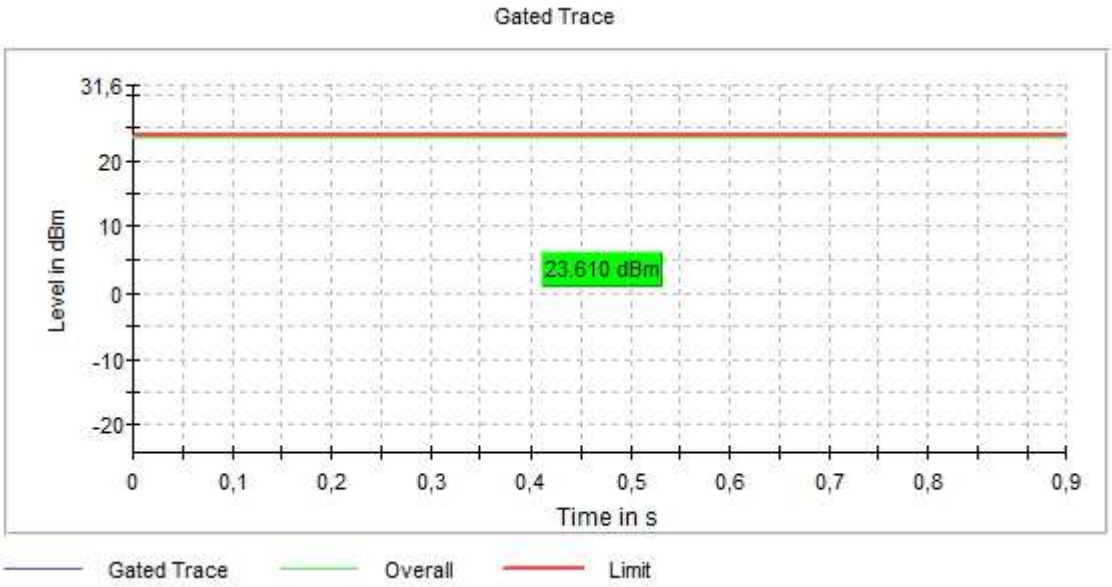
- Low Channel 100 (5500 MHz):



- Low+1 Channel 104 (5520 MHz):



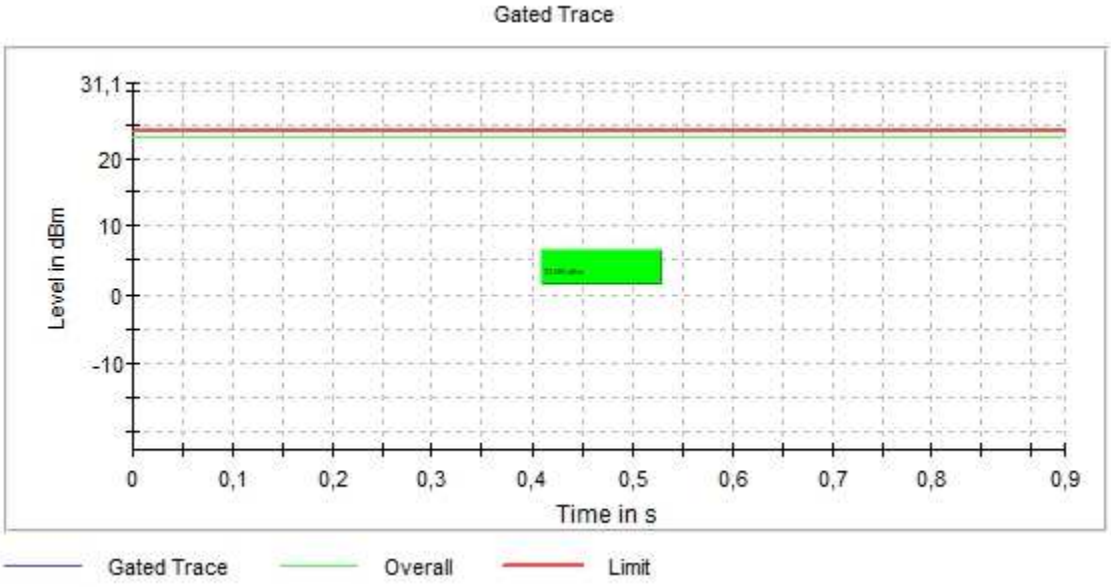
- Middle-1 Channel 116 (5580 MHz):



- High Channel 140 (5700 MHz):

STRADDLE CHANNEL

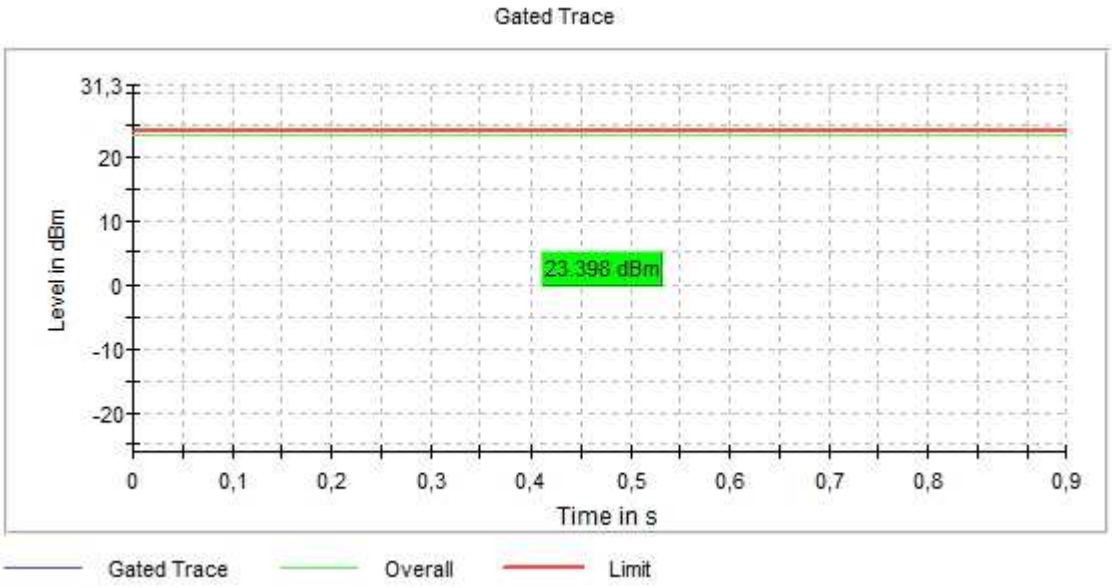
- Straddle Channel 144 (5720 MHz):



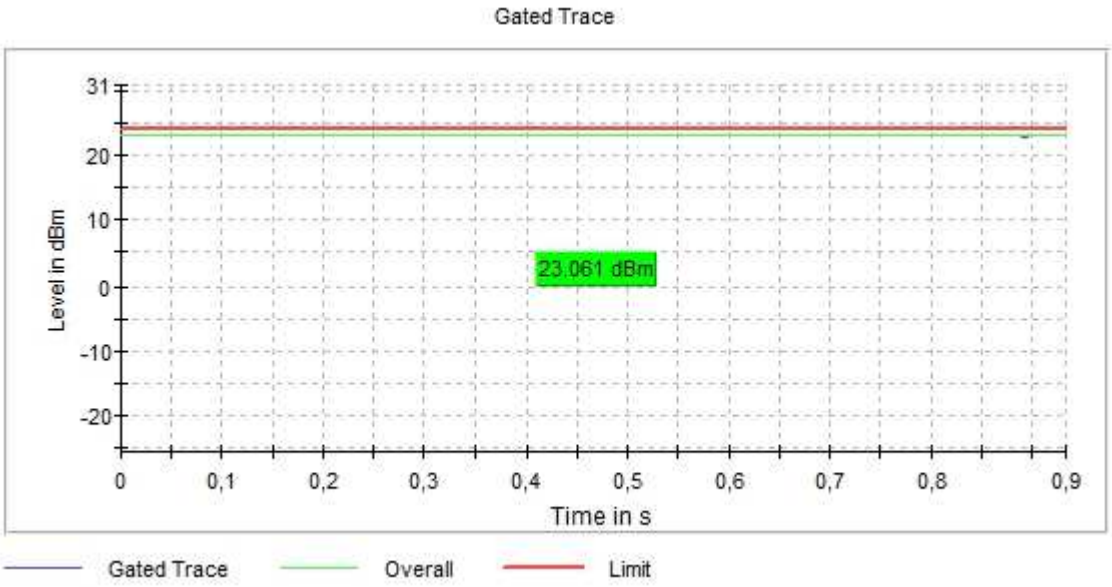
SISO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz)

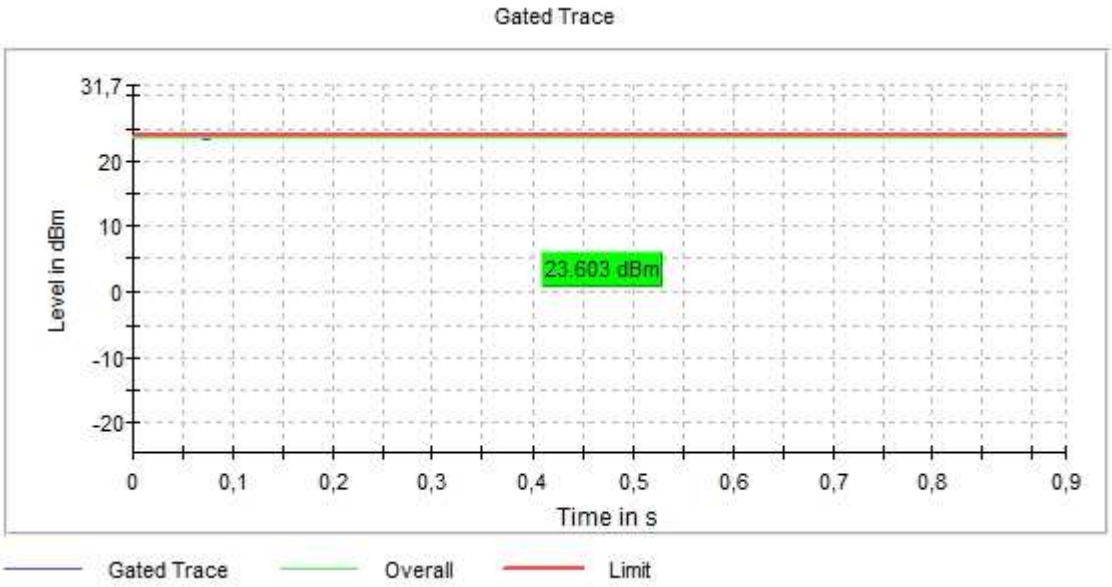
- Low Channel 100 (5500 MHz):



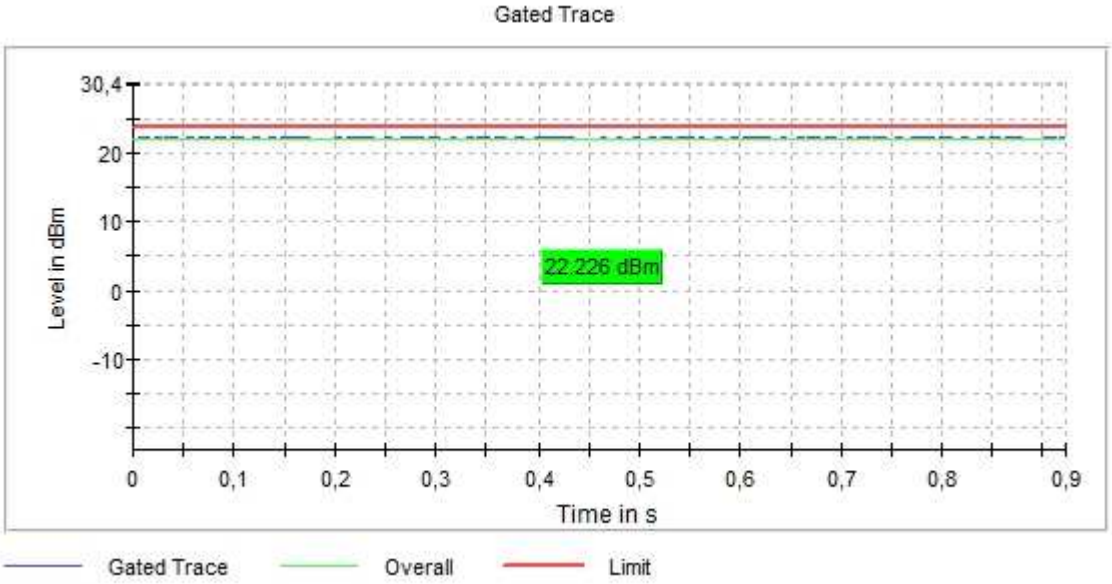
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

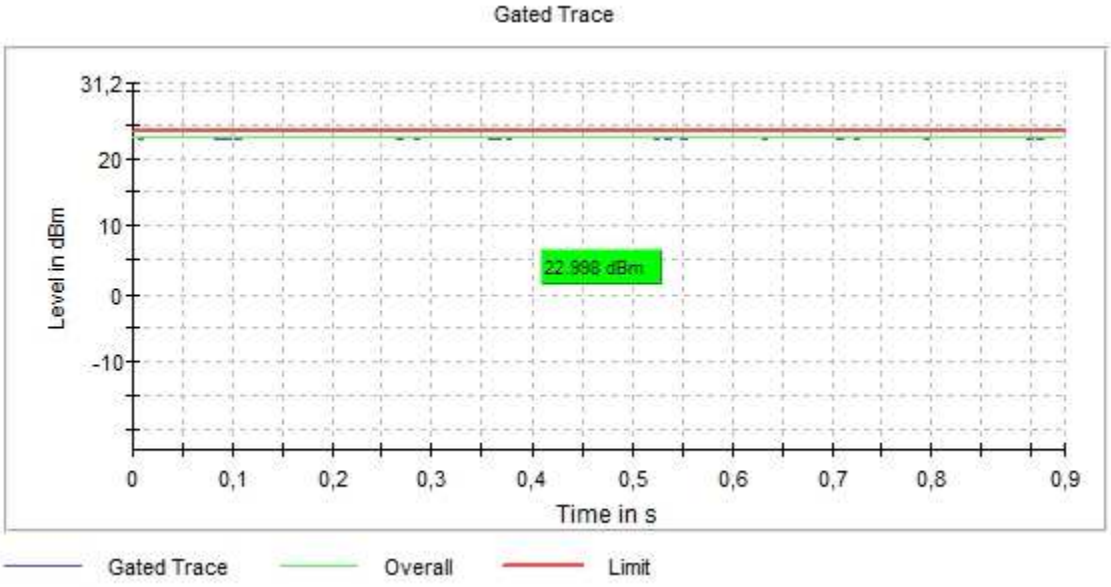


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

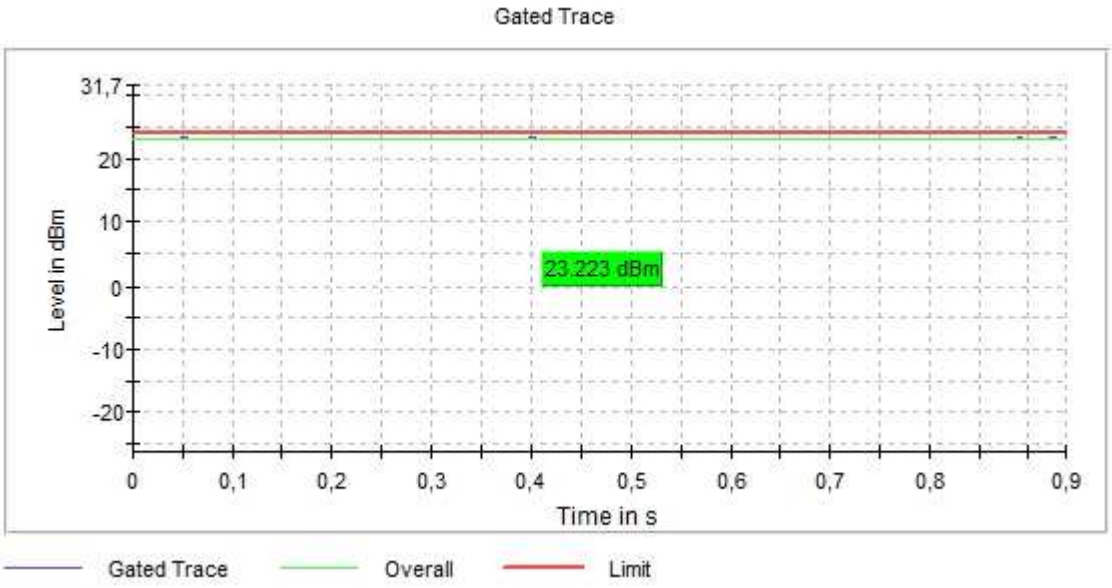
- Straddle Channel 144 (5720 MHz):



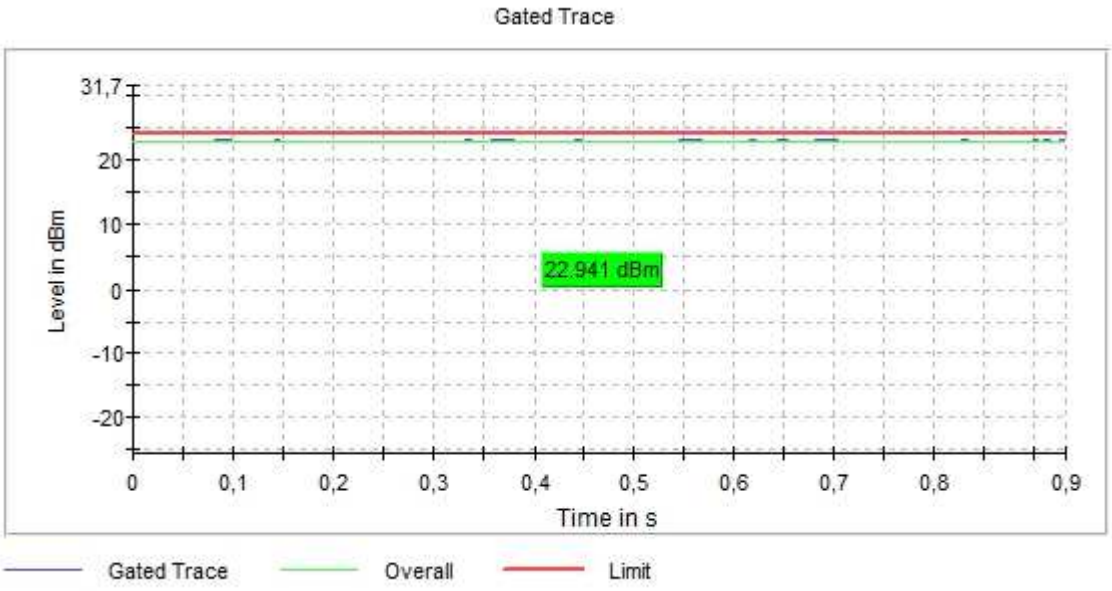
SISO 802.11 ax20 (HE20):

U-NII-2C (5250-5350 MHz)

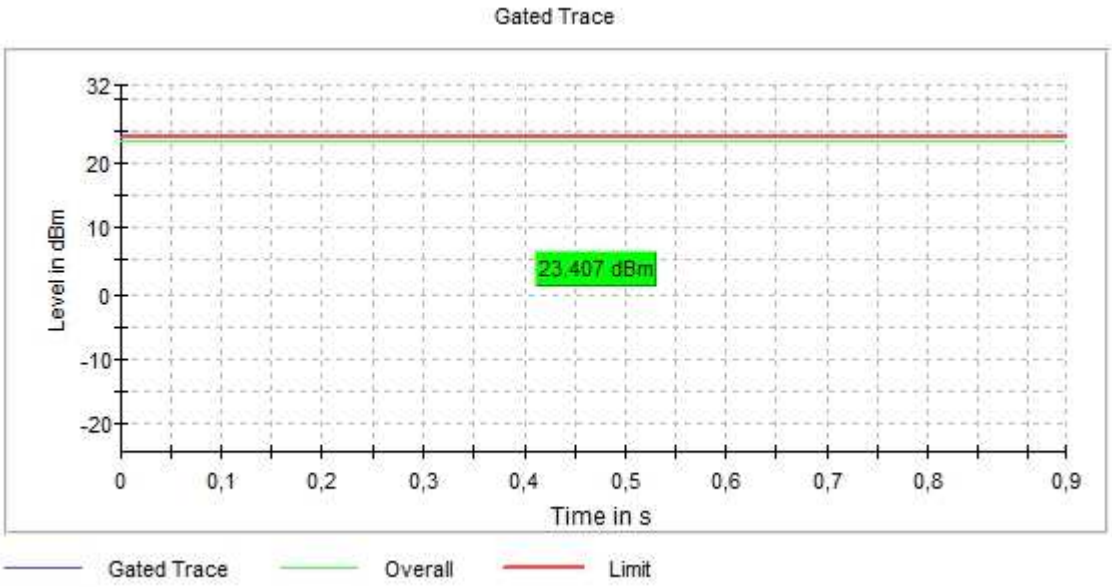
- Low Channel 100 (5500 MHz):



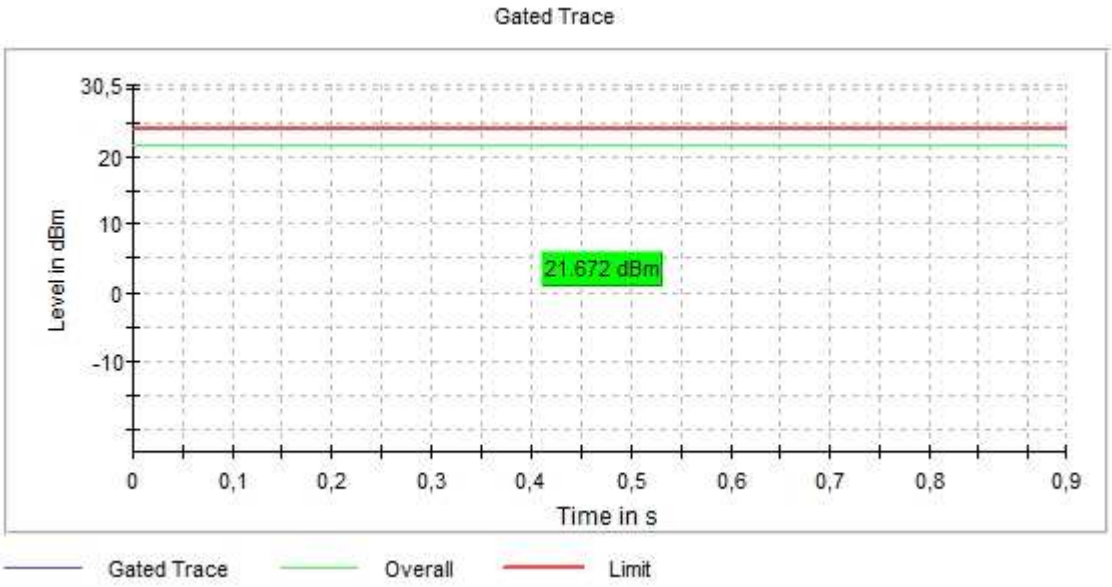
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

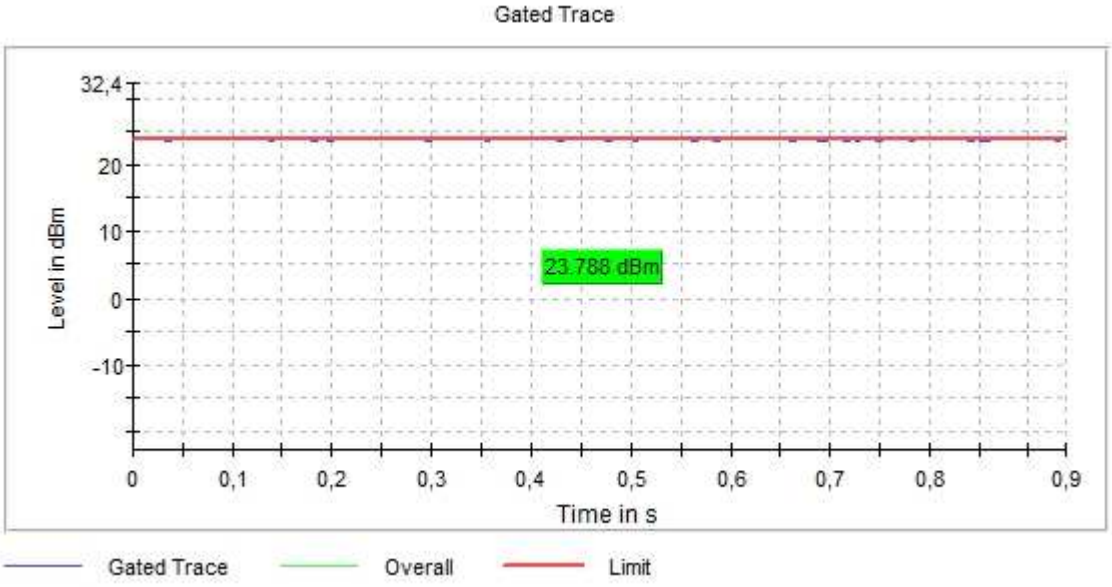


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

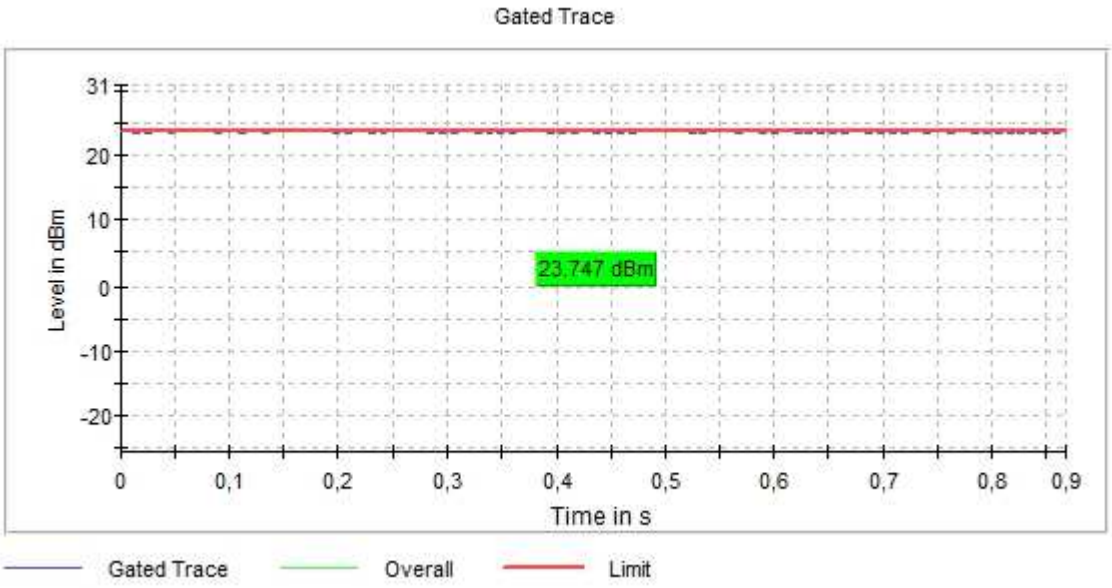
- Straddle Channel 144 (5720 MHz):



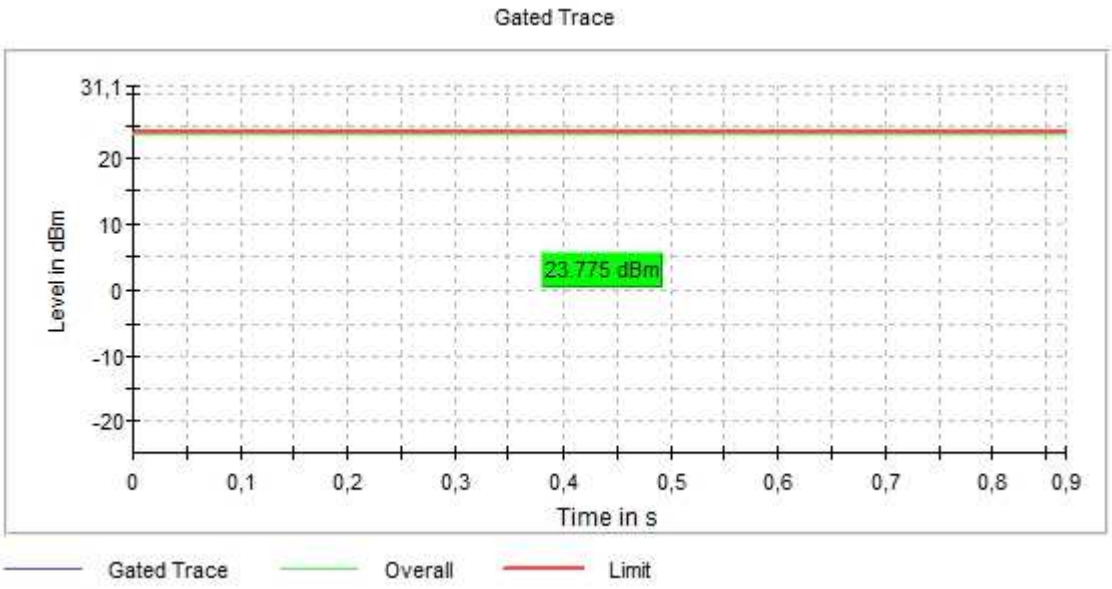
SISO 802.11 n40 (VHT40):

U-NII-2C (5470-5725 MHz)

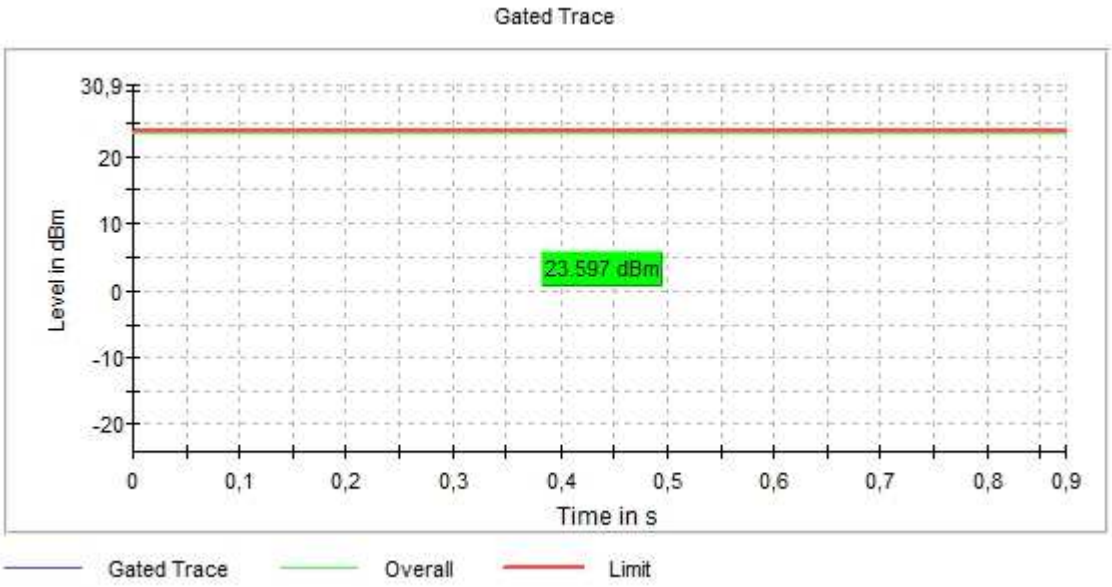
- Low Channel 102 (5510 MHz):



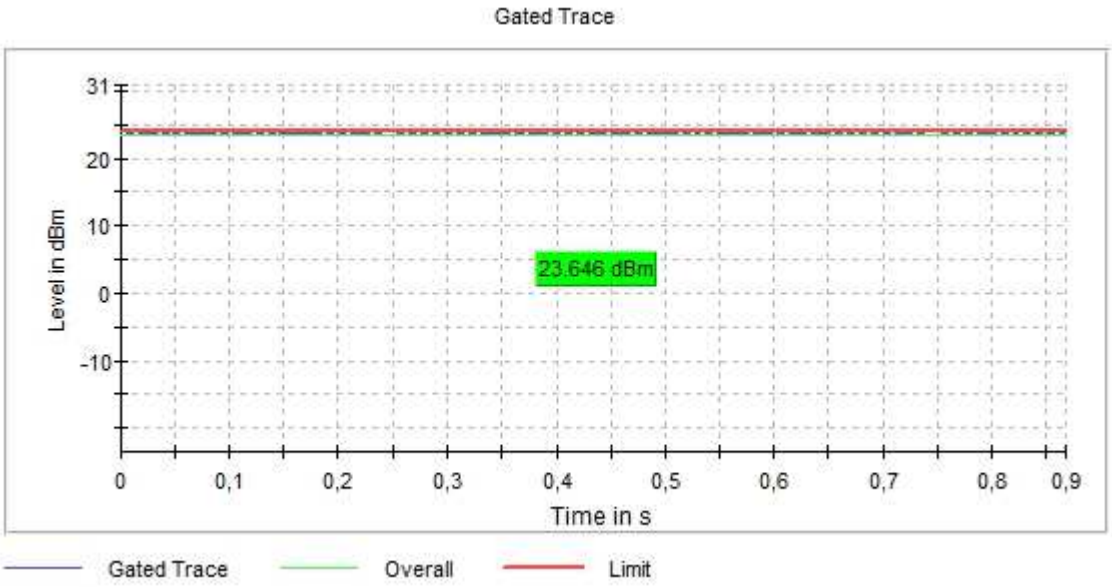
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

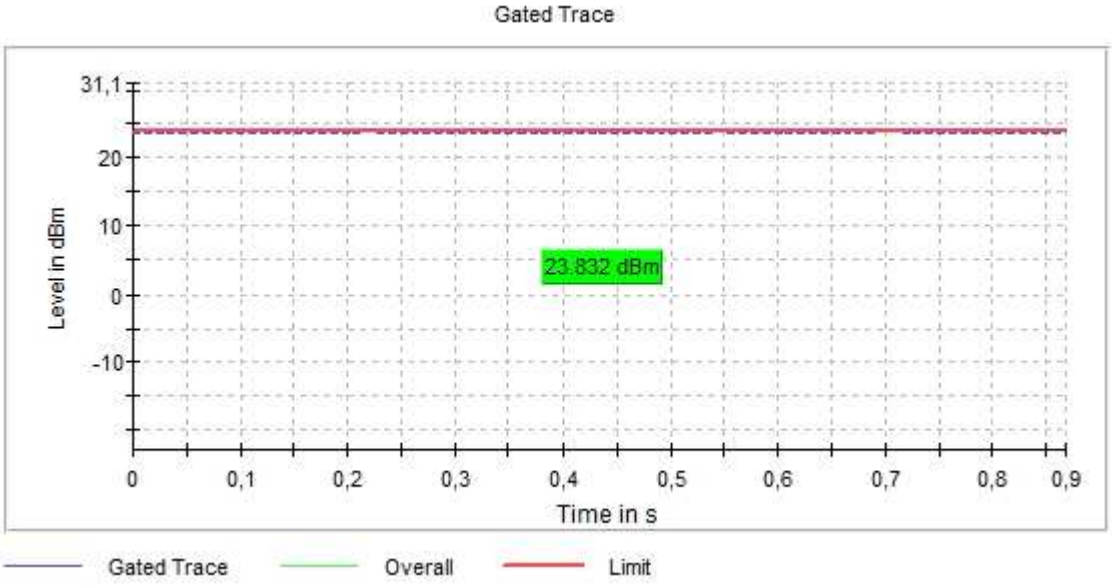


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

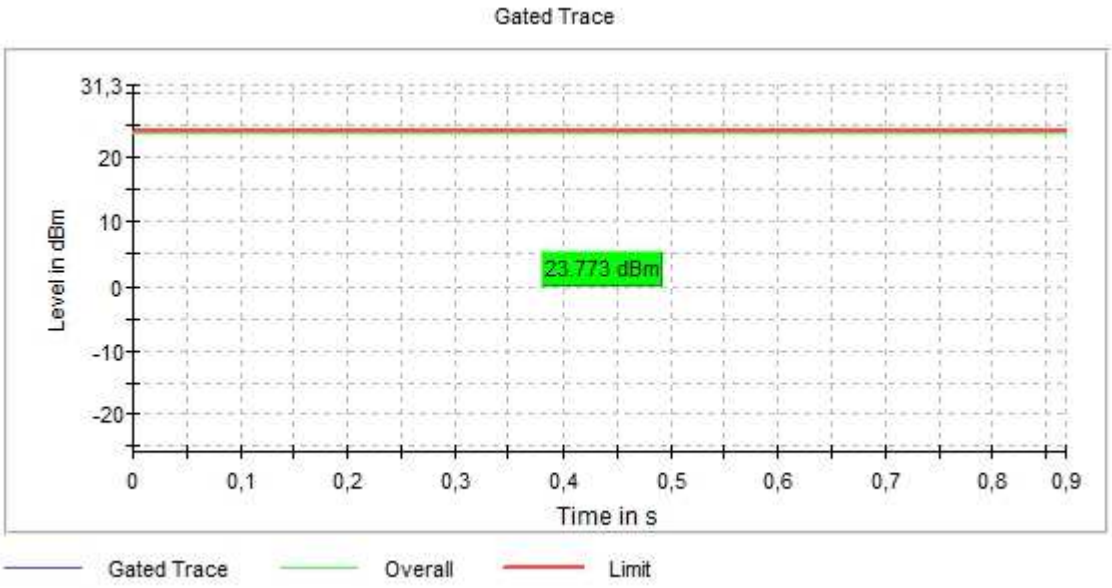
- Straddle Channel 142 (5710 MHz):



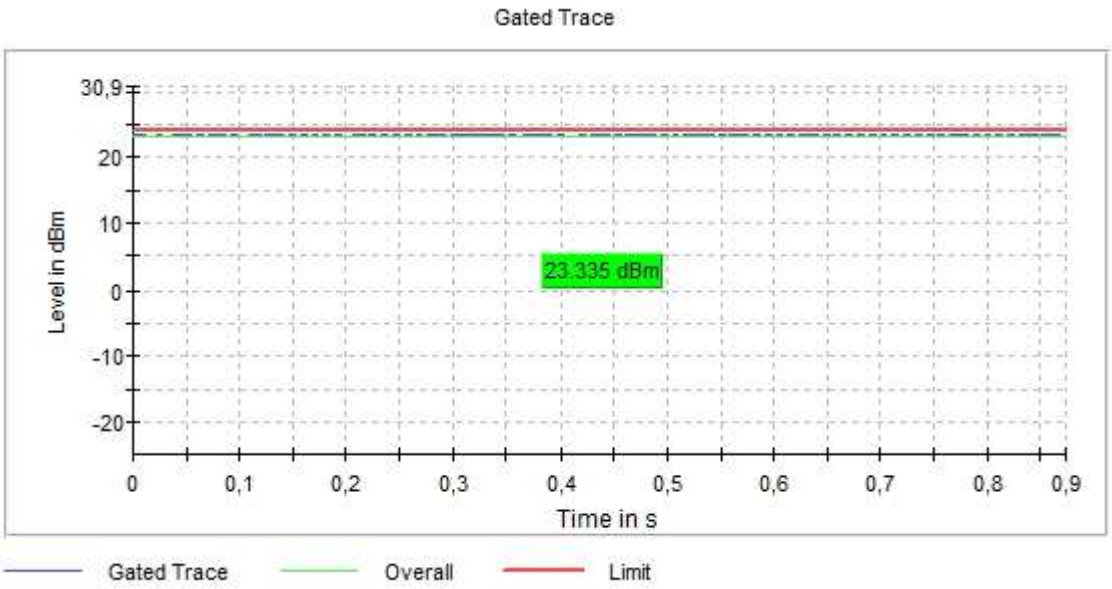
SISO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz)

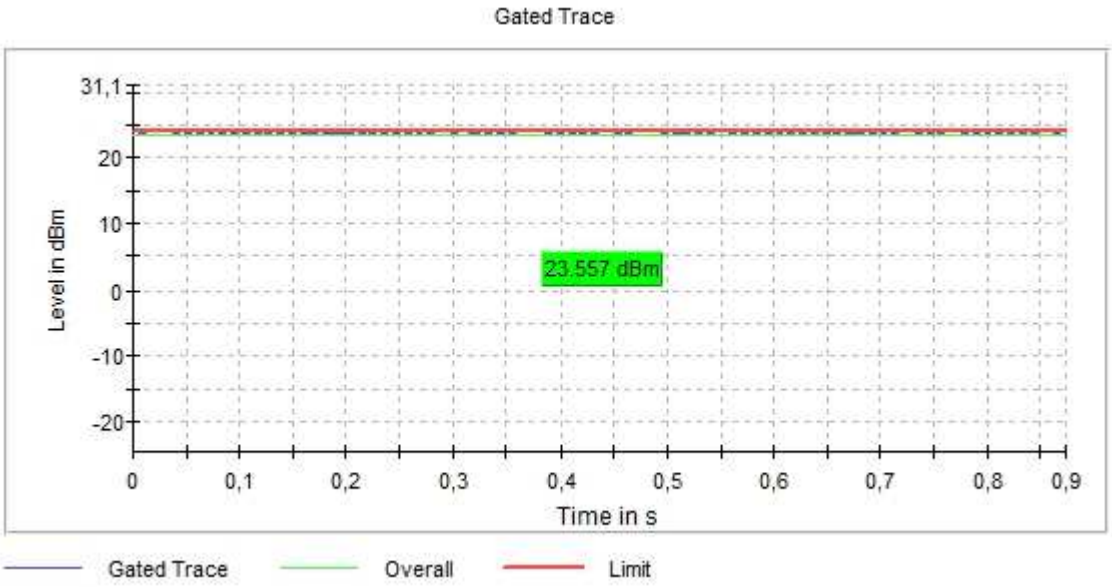
- Low Channel 102 (5510 MHz):



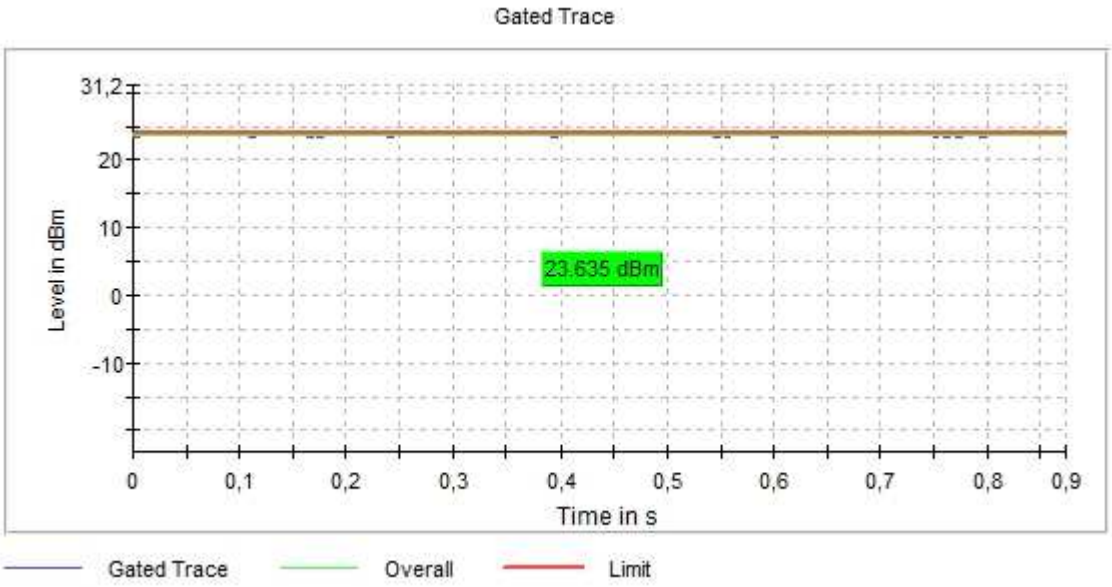
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

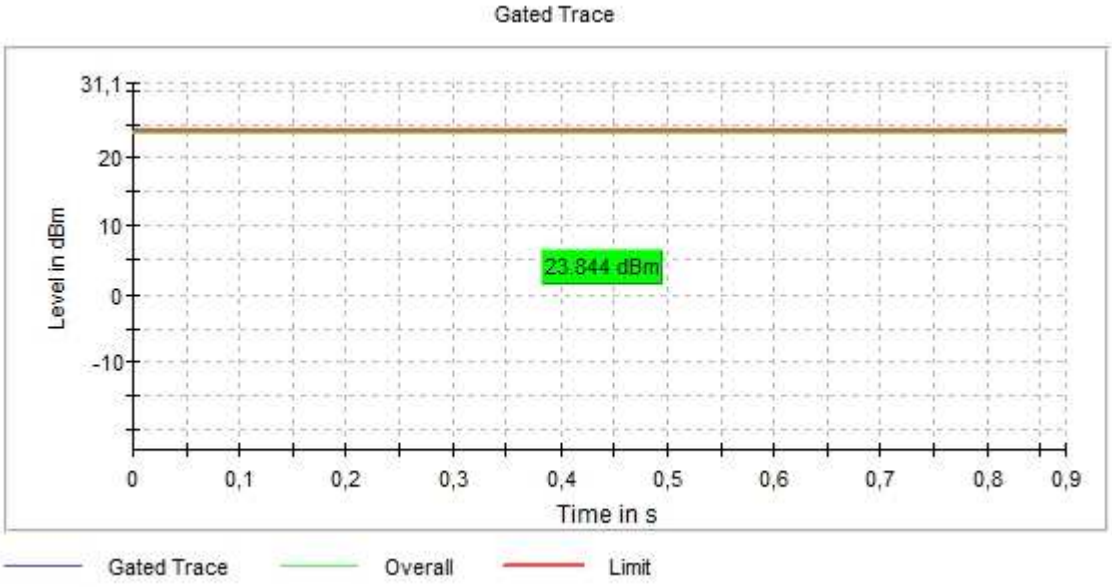


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

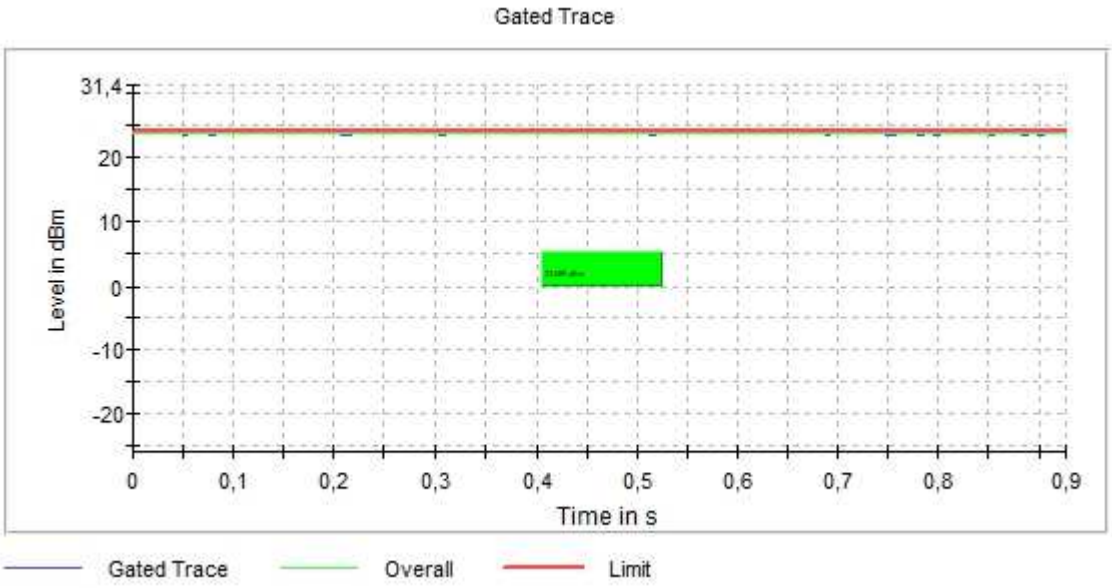
- Straddle Channel 142 (5710 MHz):



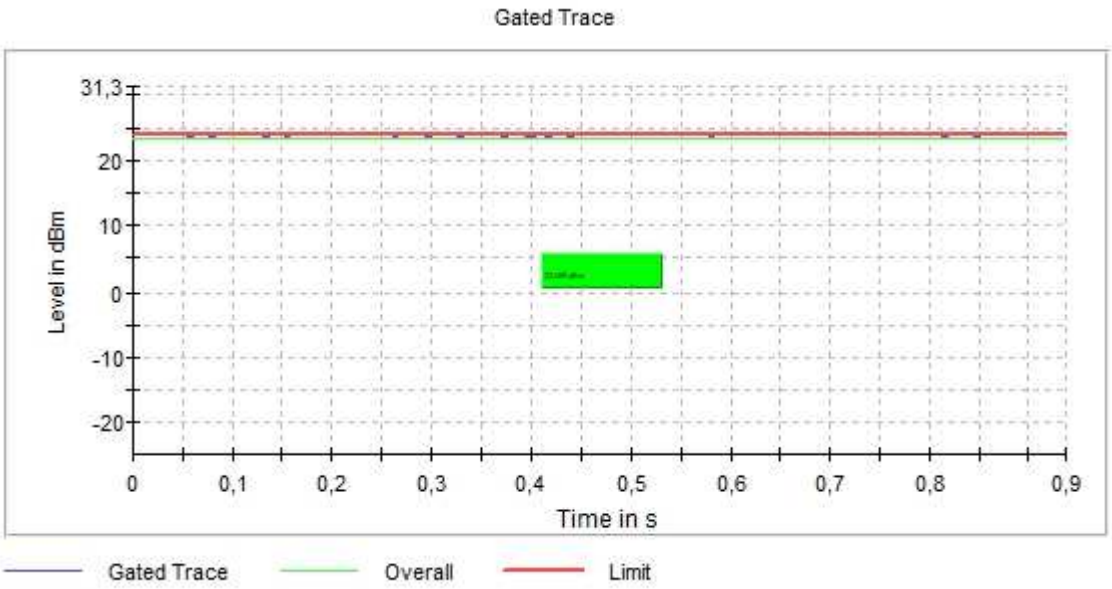
SISO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz)

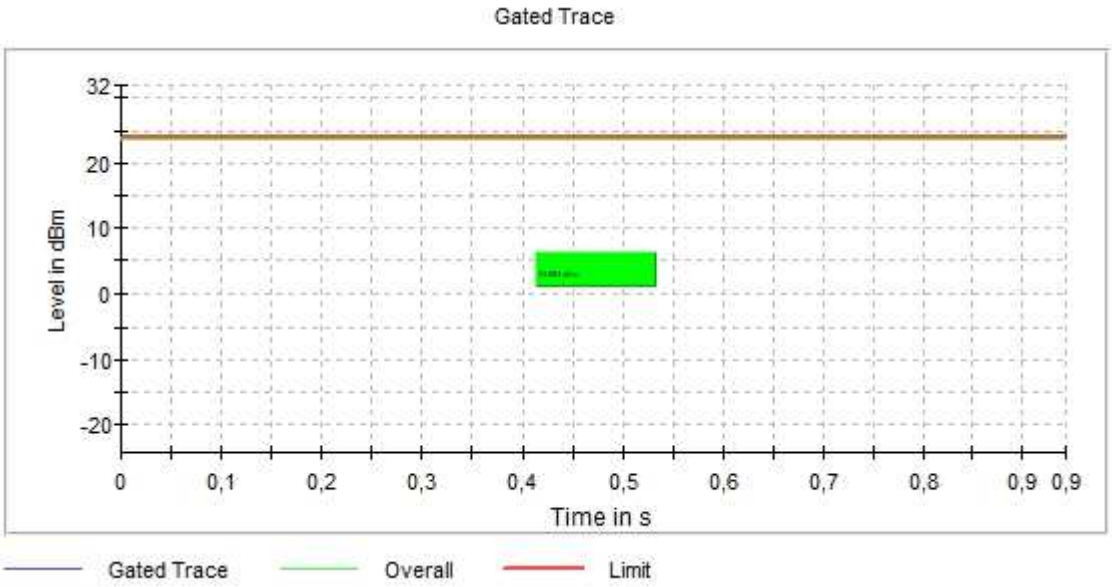
- Low Channel 102 (5510 MHz):



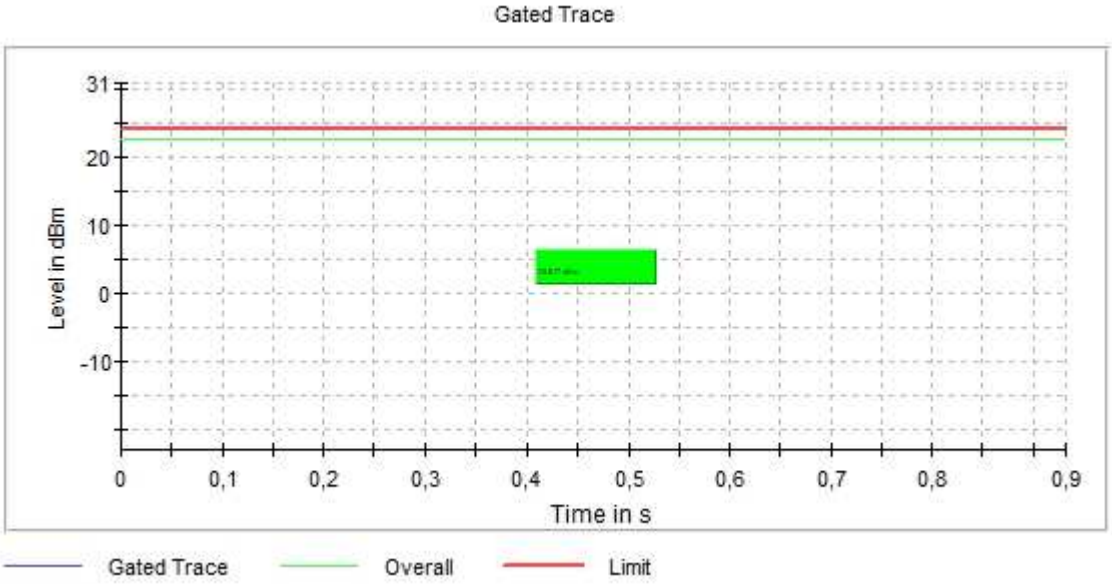
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):



- High Channel 134 (5670 MHz):



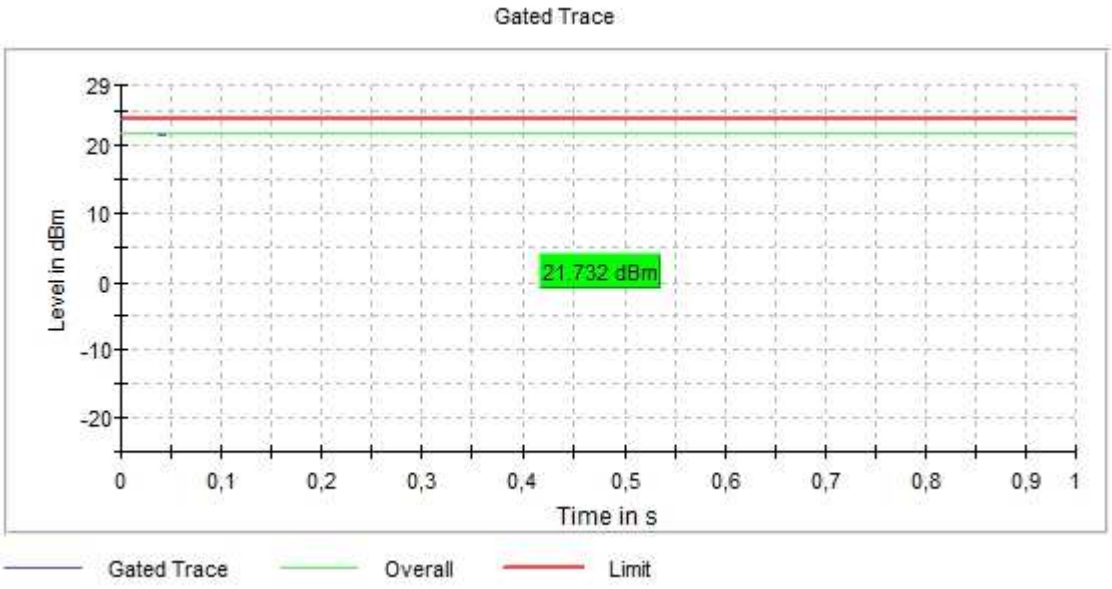
STRADDLE CHANNEL

- Straddle Channel 142 (5710 MHz):

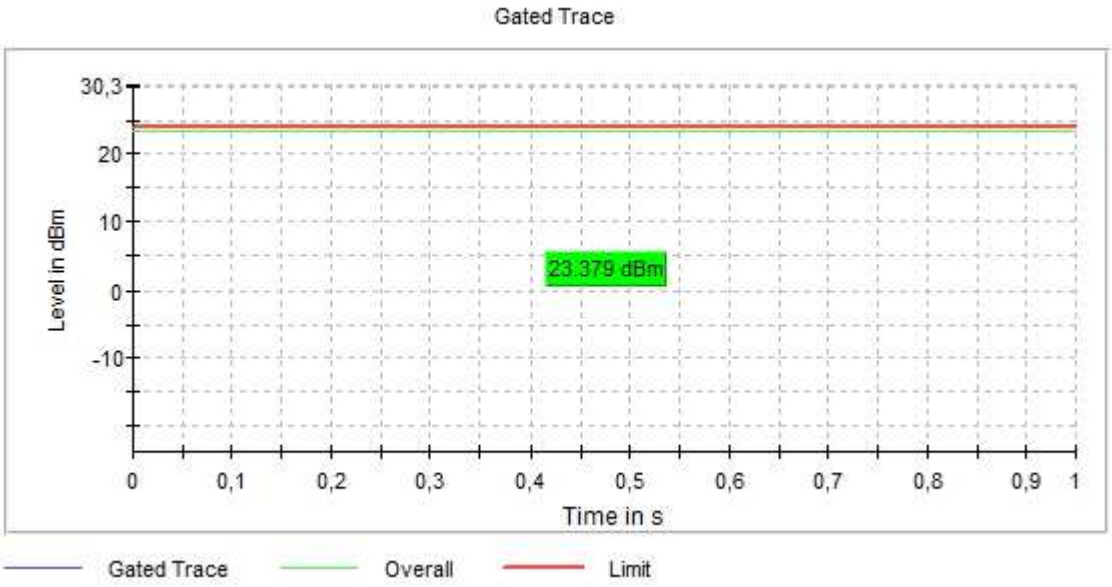
SISO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

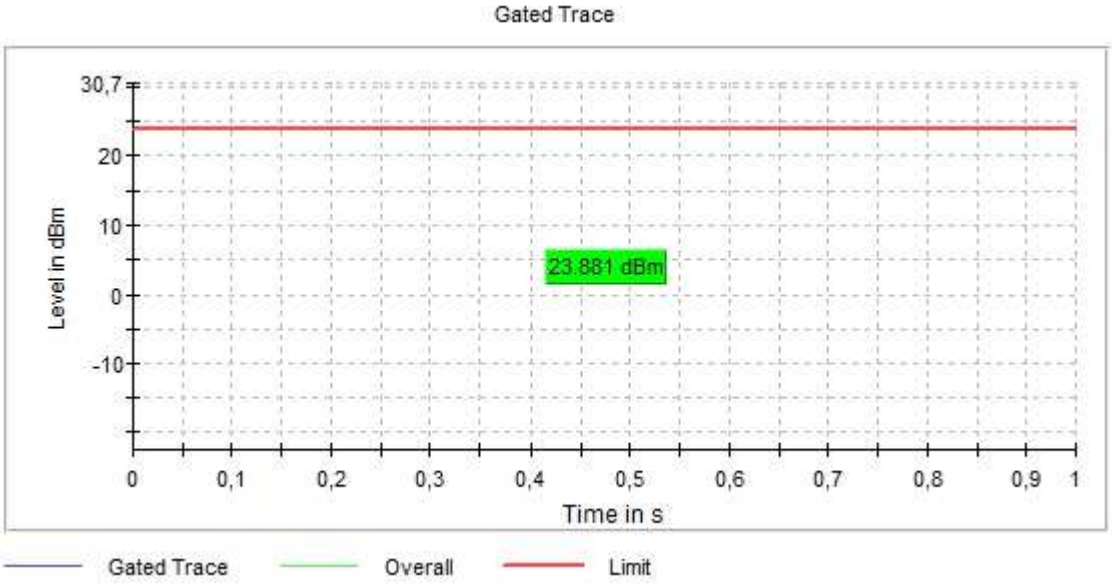


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

- Straddle Channel 138 (5690 MHz):

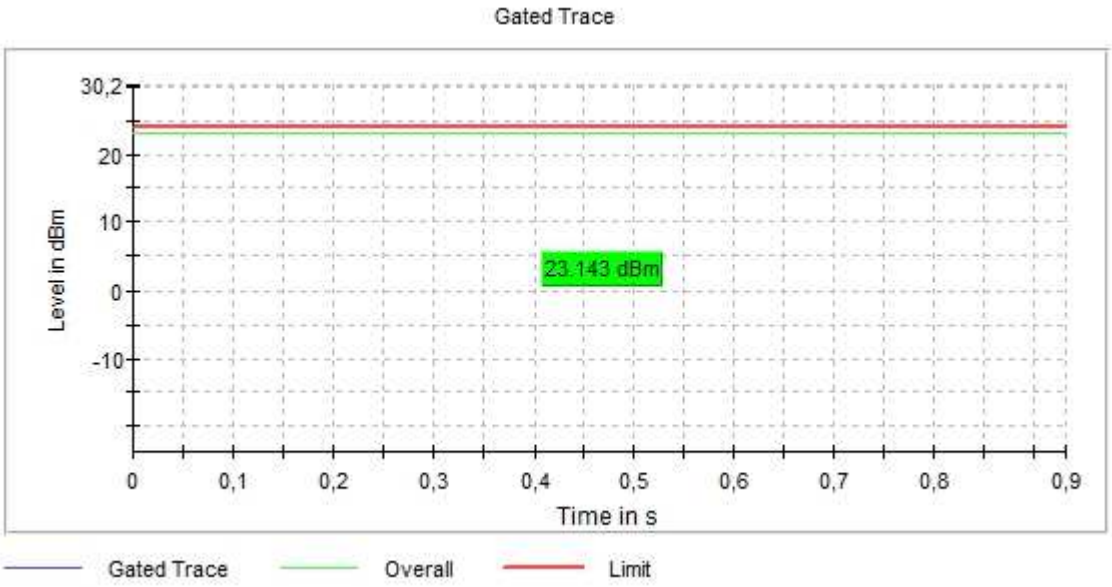


SISO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz)

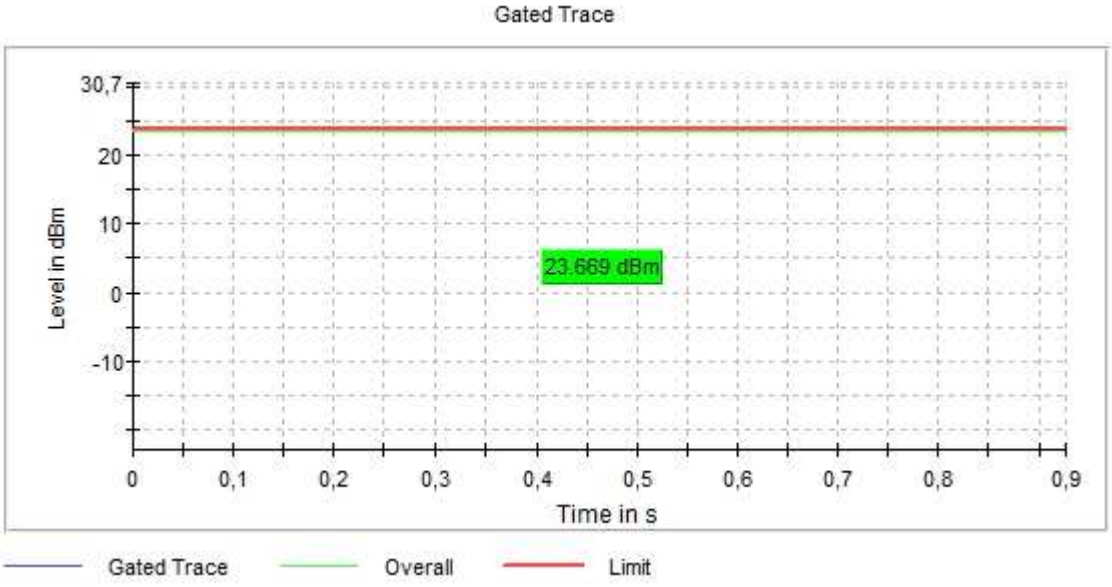
- Low Channel 106 (5530 MHz):

- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

- Straddle Channel 138 (5690 MHz):



FCC and IC power setting:

MIMO worst-case:

- Preliminary tests determined the MIMO worst-case: WLAN12.

MIMO 802.11 a20:

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	21.9	21.6	22.0	21.7
Maximum EIRP Corrected Conducted Power (dBm)	29.83	29.53	29.93	29.63
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.53
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 n20 (HT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	22.0	21.7	21.6	21.7
Maximum EIRP Corrected Conducted Power (dBm)	27.93	29.63	29.53	29.63
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.53
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	21.5	21.7	21.7	21.7
Maximum EIRP Corrected Conducted Power (dBm)	29.43	29.63	29.63	29.63
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.53
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax20 (HE20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted Power (dBm)	21.7	21.5	21.1	22.0
Maximum EIRP Corrected Conducted Power (dBm)	29.63	29.43	29.03	29.93
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted Power (dBm)	21.5
Maximum EIRP Corrected Conducted Power (dBm)	29.43
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	21.7	21.7	22.0	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.63	29.63	29.93	29.53
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	21.5
Maximum EIRP Corrected Conducted Power (dBm)	29.43
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	21.7	21.7	22.0	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.63	29.63	29.93	29.53
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	21.5
Maximum EIRP Corrected Conducted Power (dBm)	29.43
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted Power (dBm)	21.7	21.7	22.0	21.7
Maximum EIRP Corrected Conducted Power (dBm)	29.63	29.63	29.93	29.63
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.53
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted Power (dBm)	21.7	21.9
Maximum EIRP Corrected Conducted Power (dBm)	29.63	29.83
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted Power (dBm)	21.8
Maximum EIRP Corrected Conducted Power (dBm)	29.73
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted Power (dBm)	21.5	21.7
Maximum EIRP Corrected Conducted Power (dBm)	29.43	29.63
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted Power (dBm)	21.6
Maximum EIRP Corrected Conducted Power (dBm)	29.53
Measurement uncertainty (kHz)	<±36.95

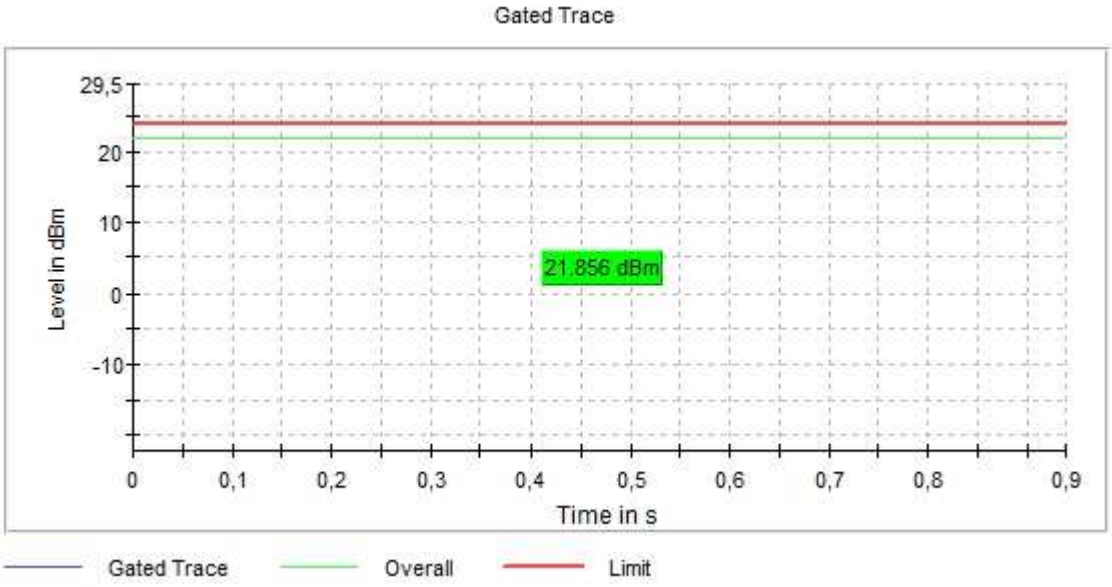
Verdict: PASS

MIMO worst-case:

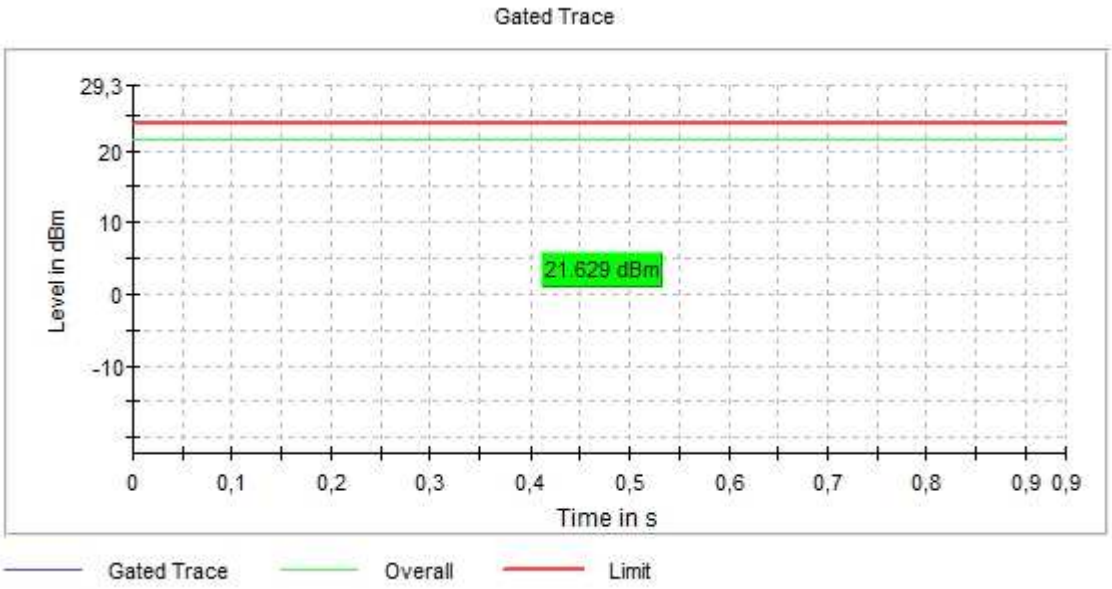
MIMO 802.11 a20:

U-NII-2C (5250-5350 MHz)

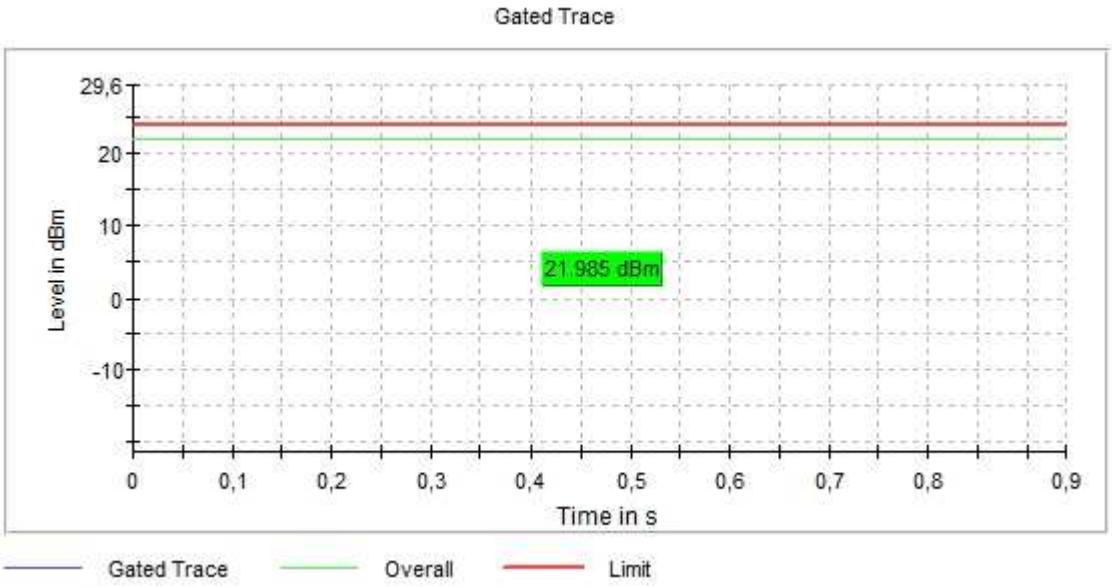
- Low Channel 100 (5500 MHz):



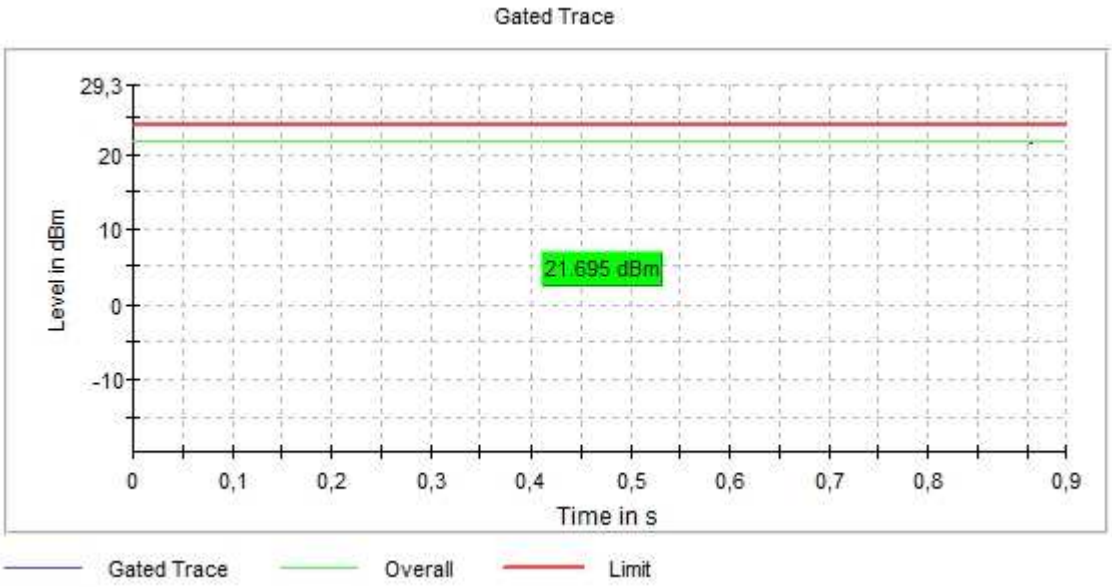
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

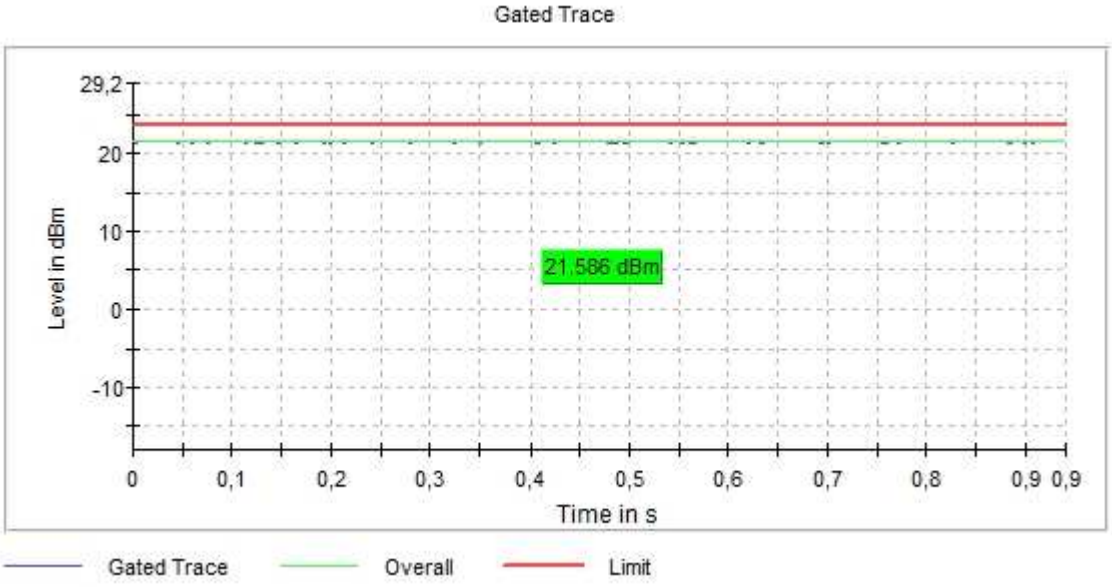


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

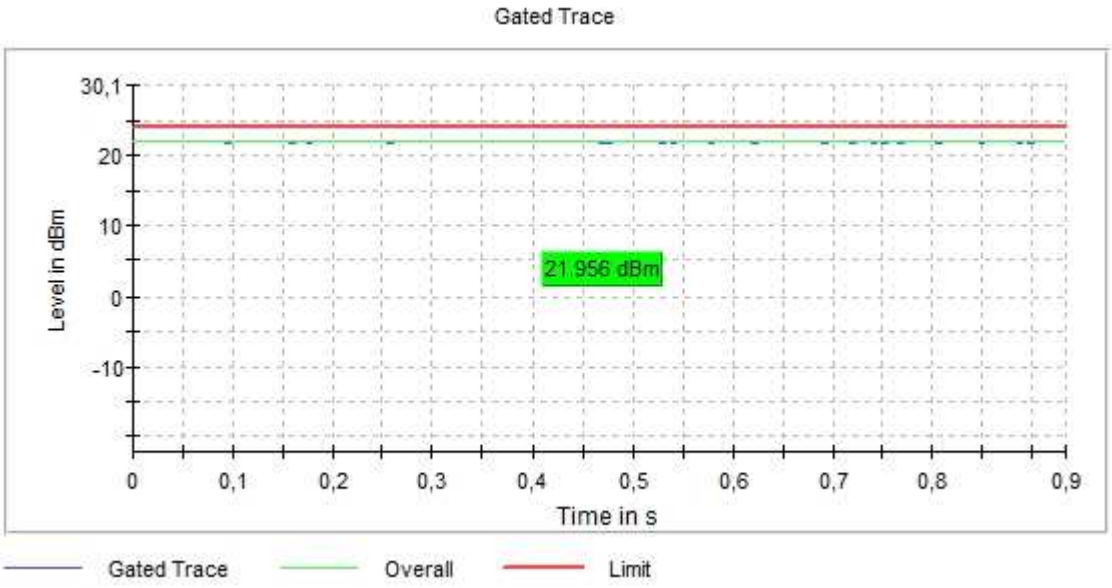
- Straddle Channel 144 (5720 MHz):



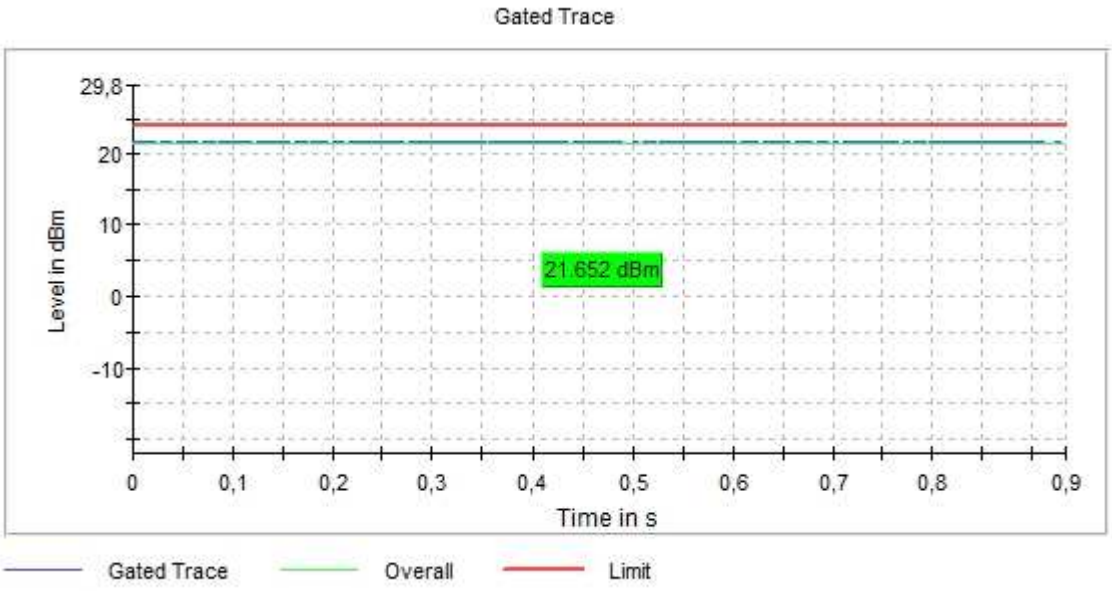
MIMO 802.11 n20 (HT20):

U-NII-2C (5250-5350 MHz)

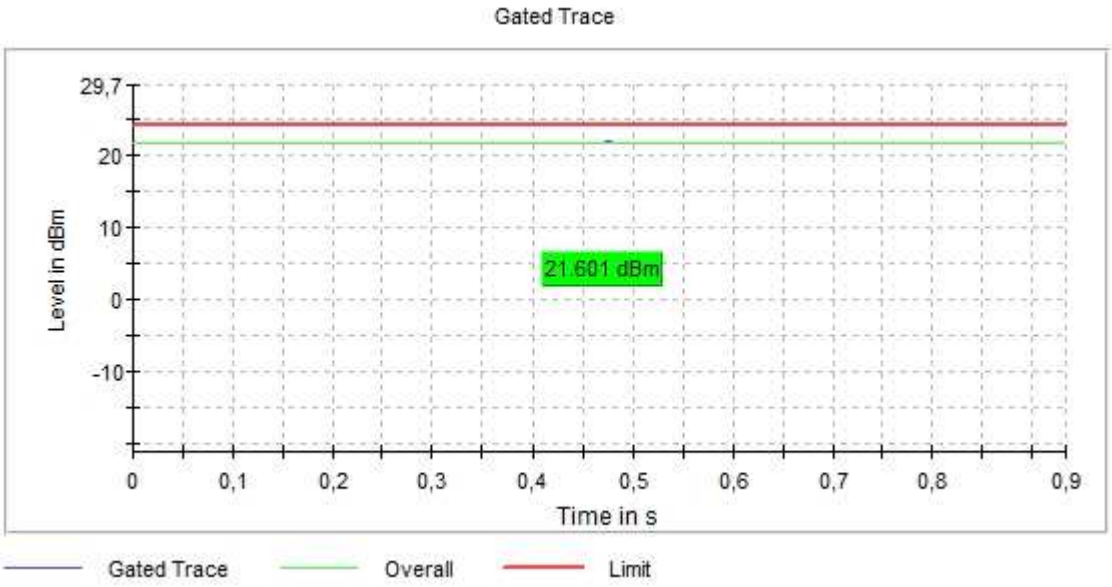
- Low Channel 100 (5500 MHz):



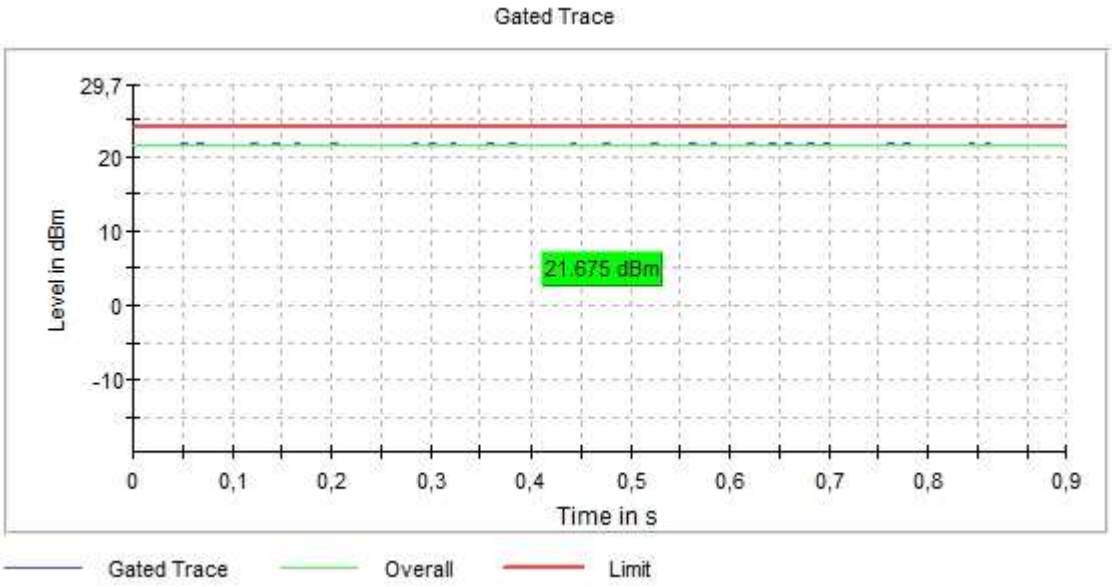
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

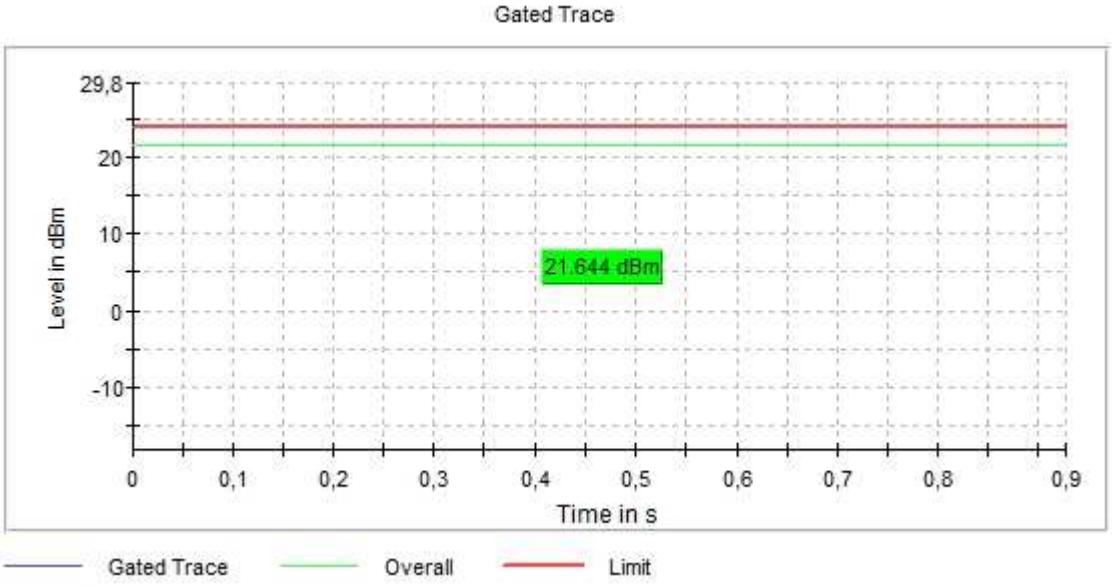


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

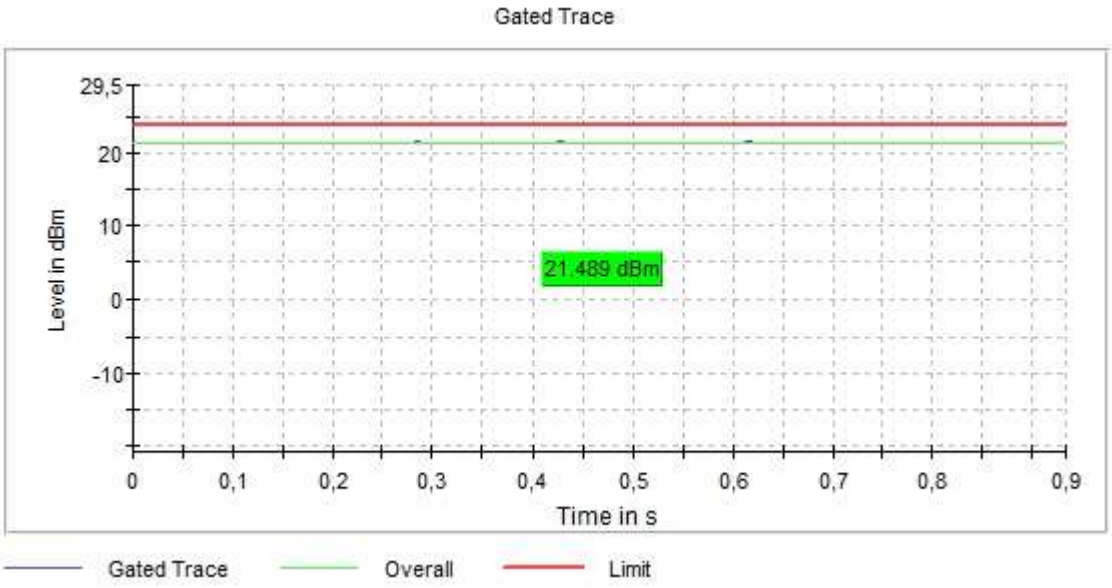
- Straddle Channel 144 (5720 MHz):



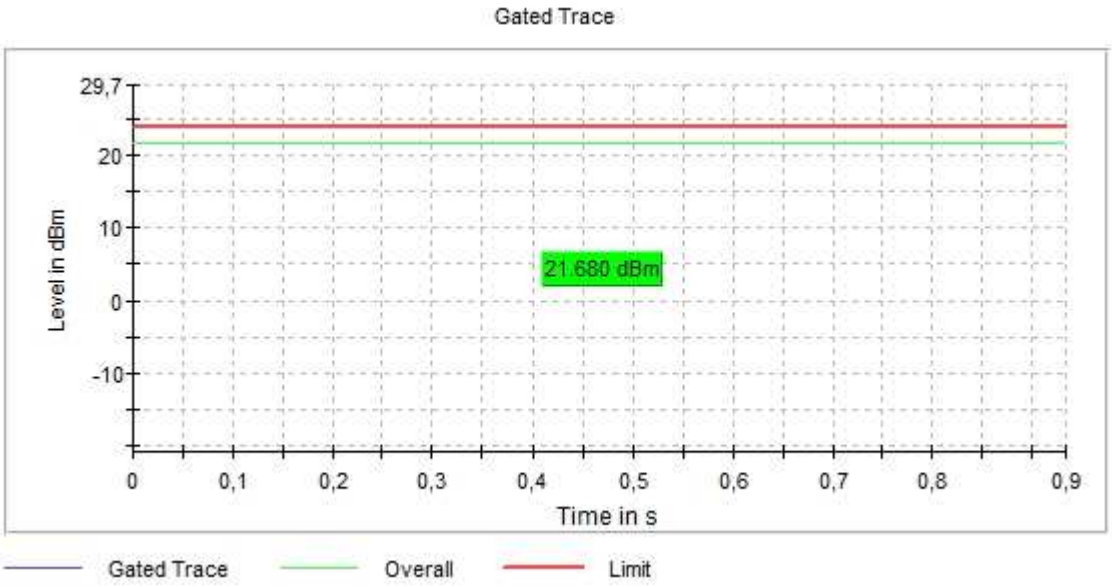
MIMO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz)

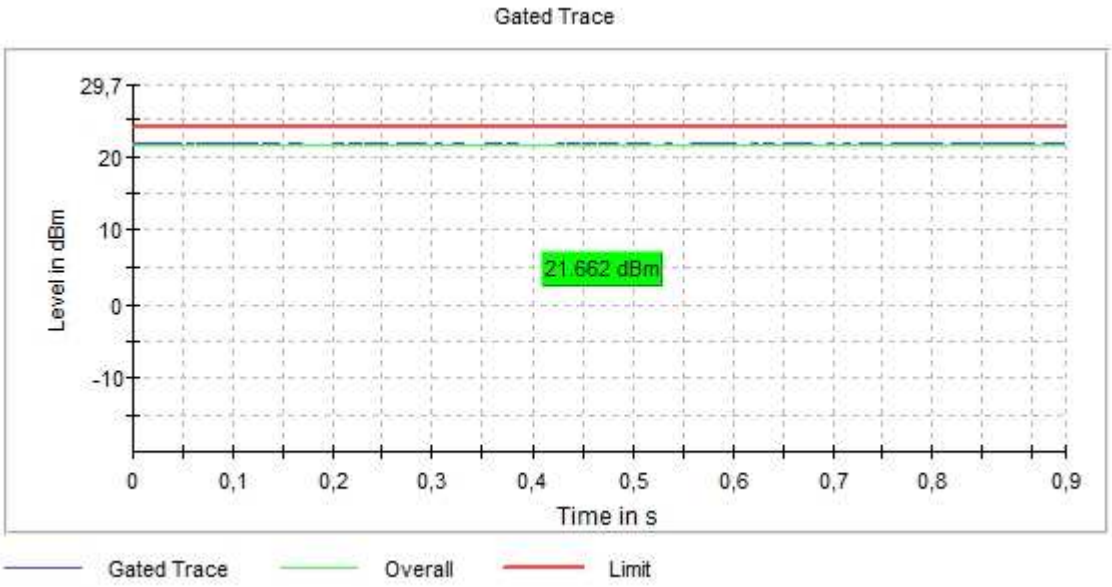
- Low Channel 100 (5500 MHz):



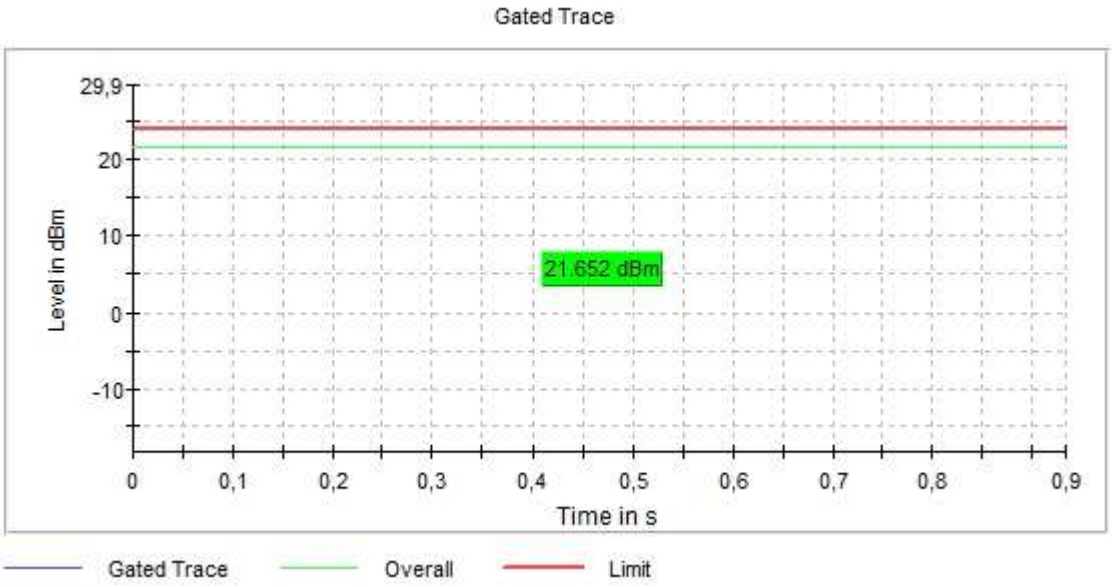
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

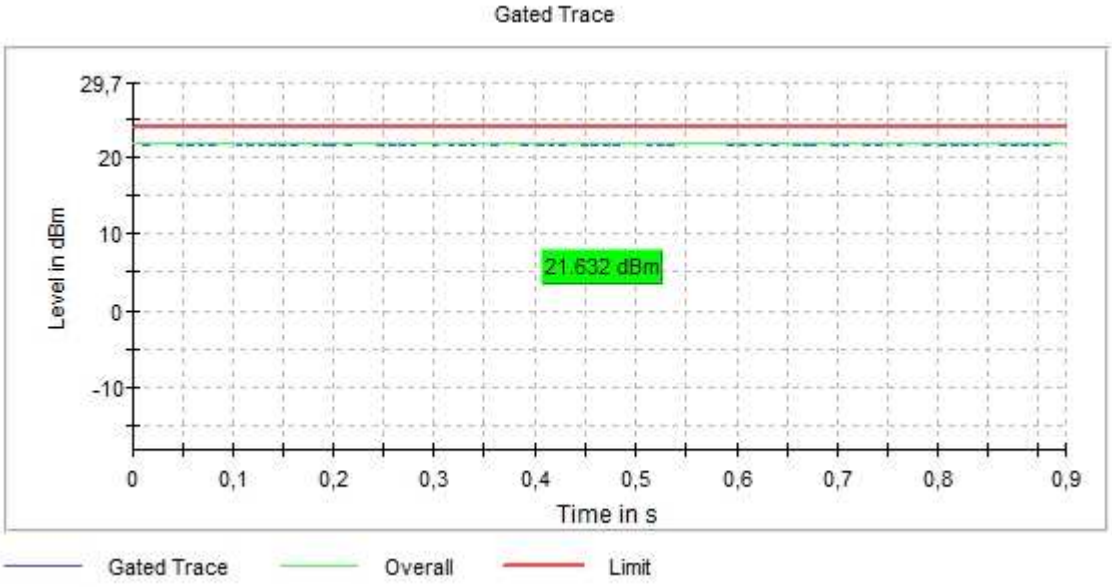


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

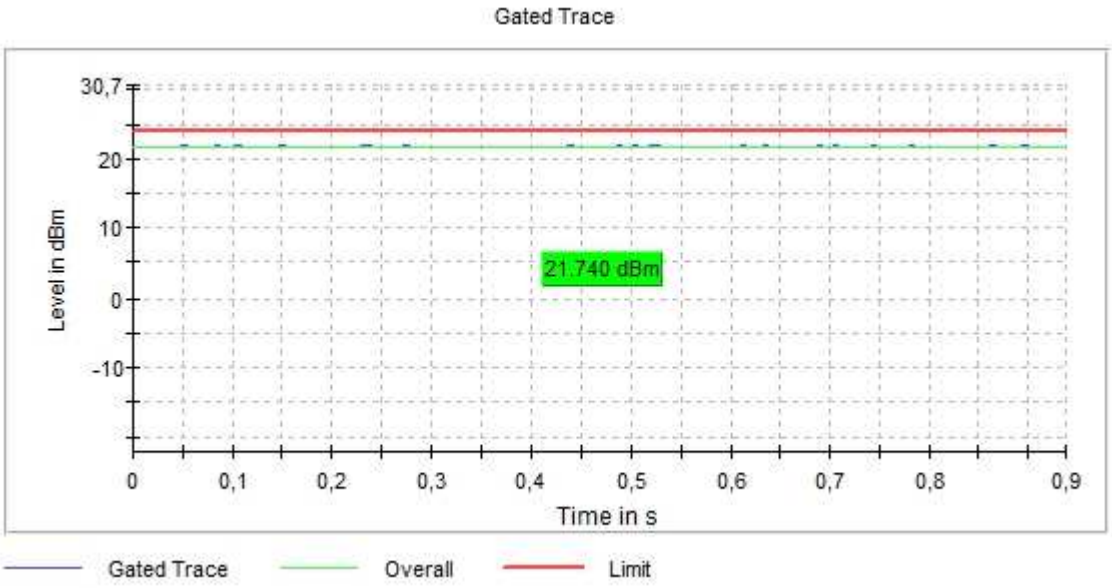
- Straddle Channel 144 (5720 MHz):



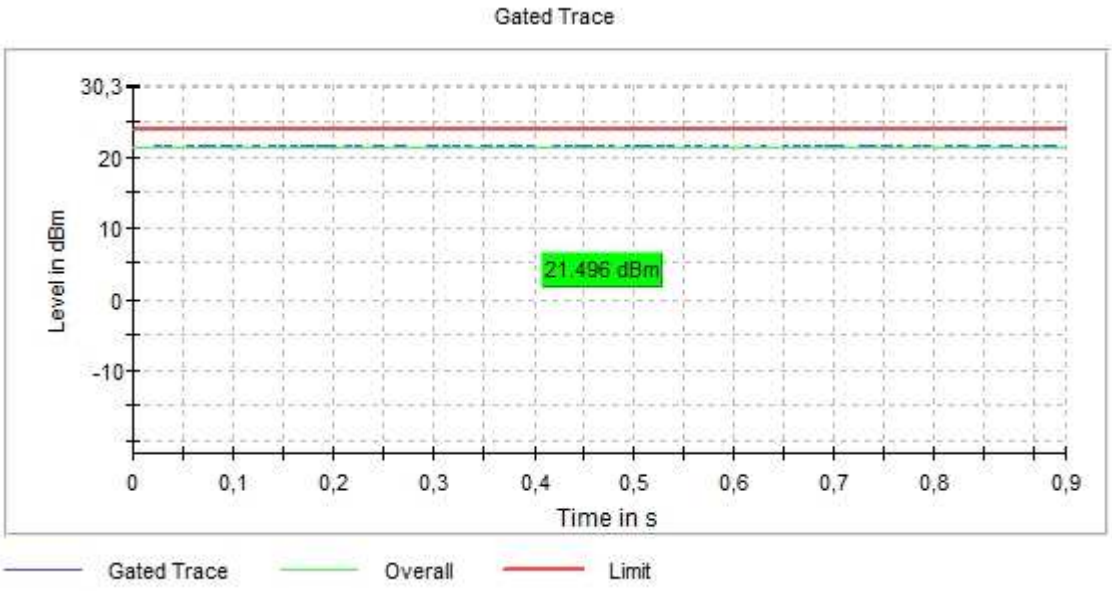
MIMO 802.11 ax20 (HE20):

U-NII-2C (5250-5350 MHz)

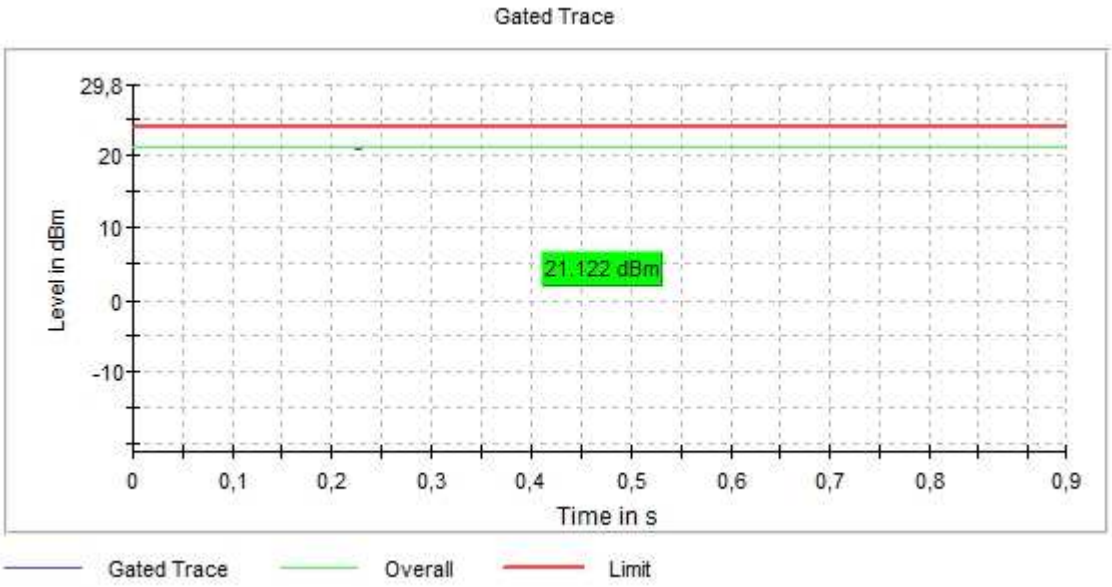
- Low Channel 100 (5500 MHz):



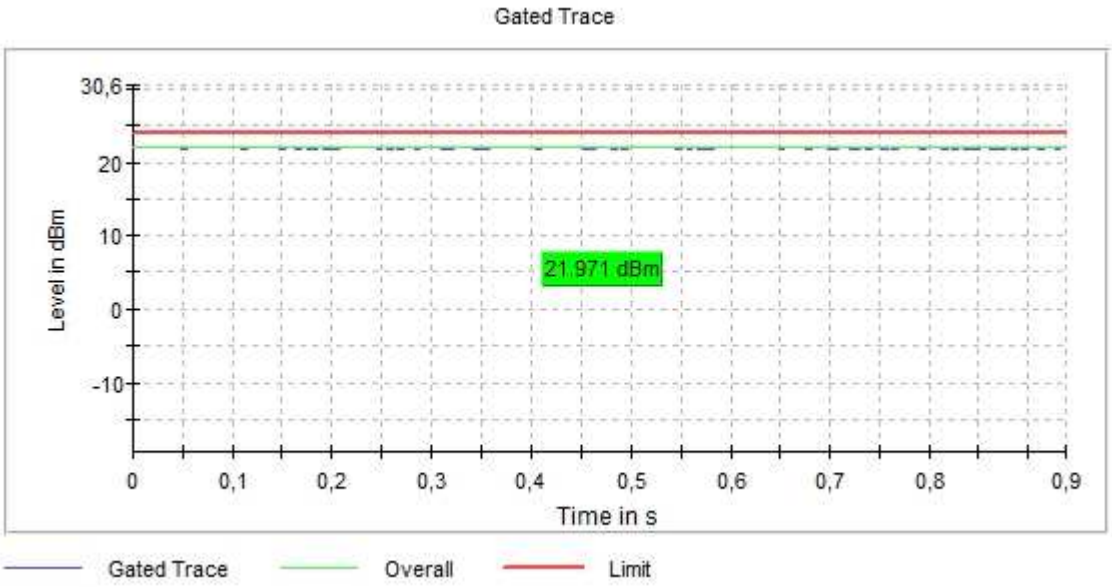
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

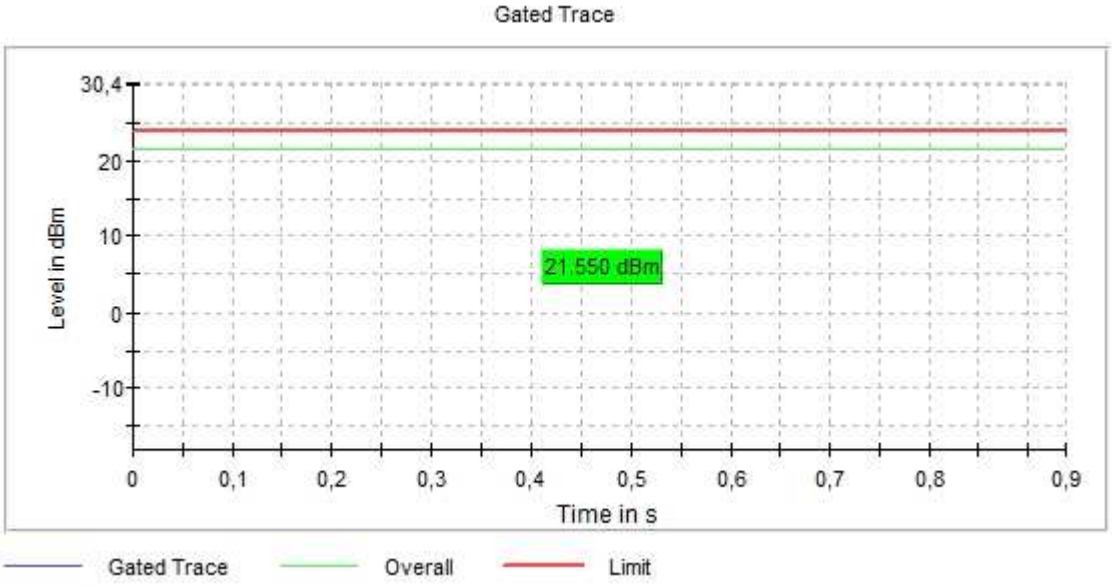


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

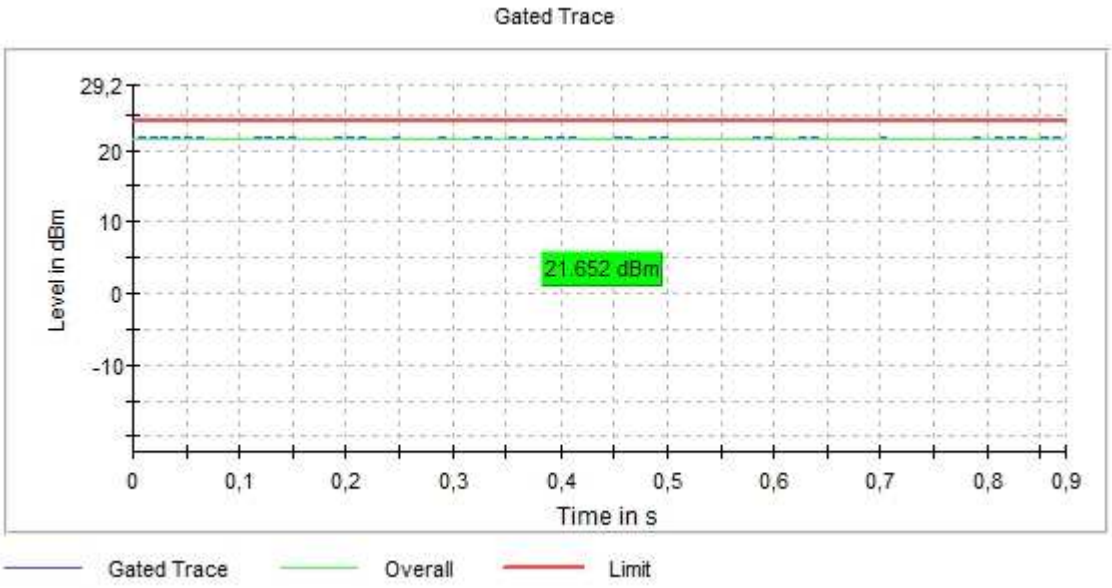
- Straddle Channel 144 (5720 MHz):



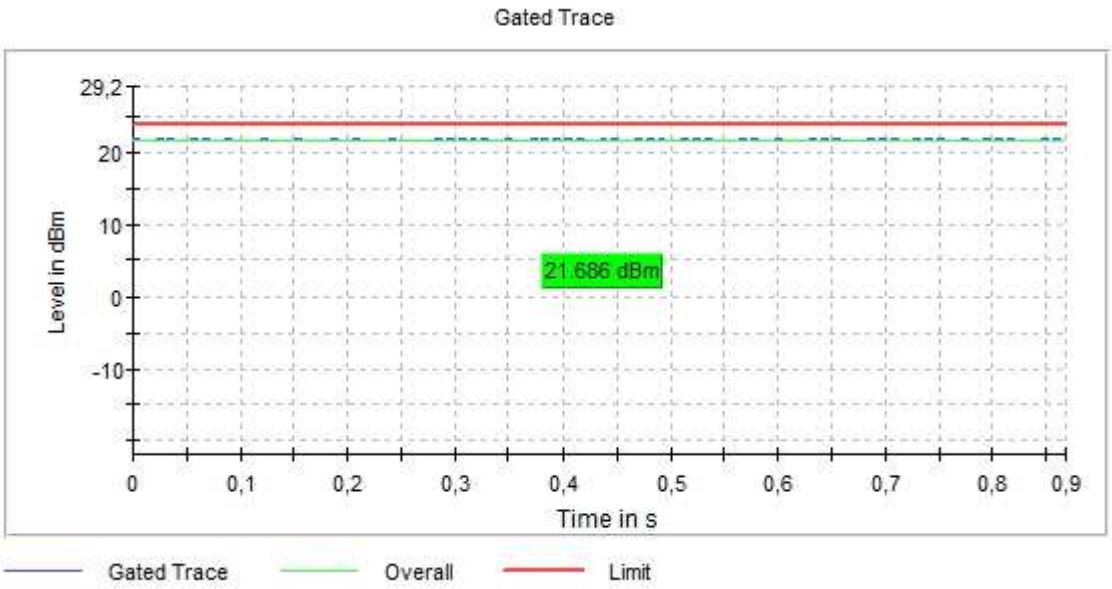
MIMO 802.11 n40 (VHT40):

U-NII-2C (5470-5725 MHz)

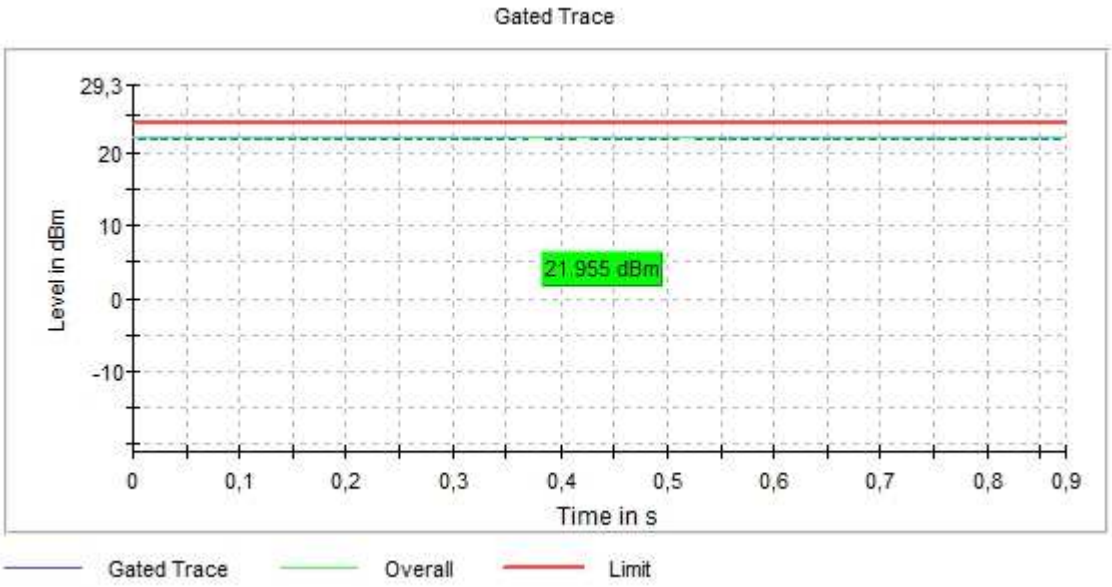
- Low Channel 102 (5510 MHz):



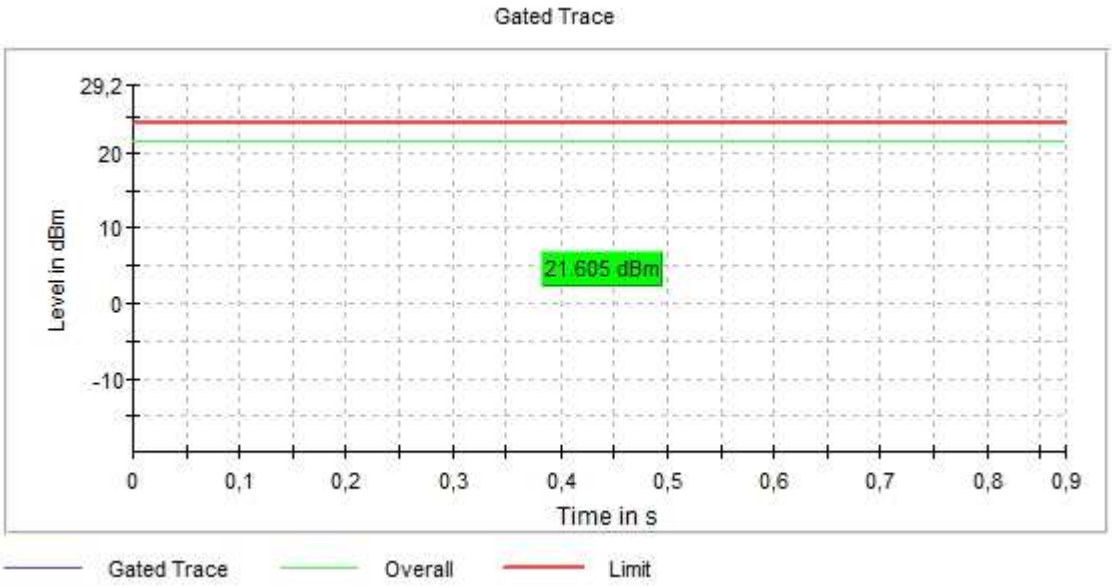
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

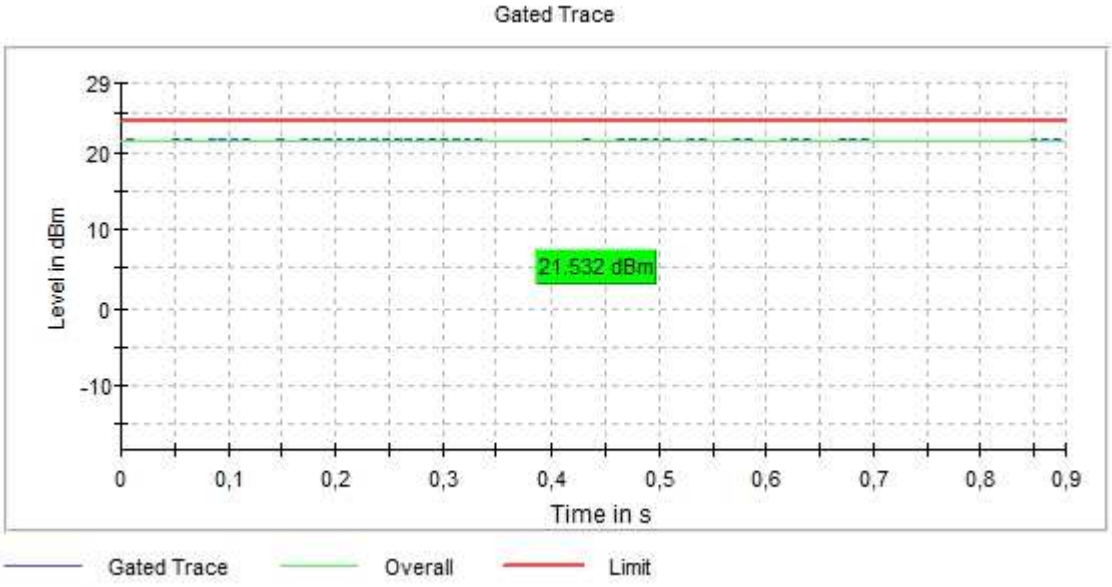


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

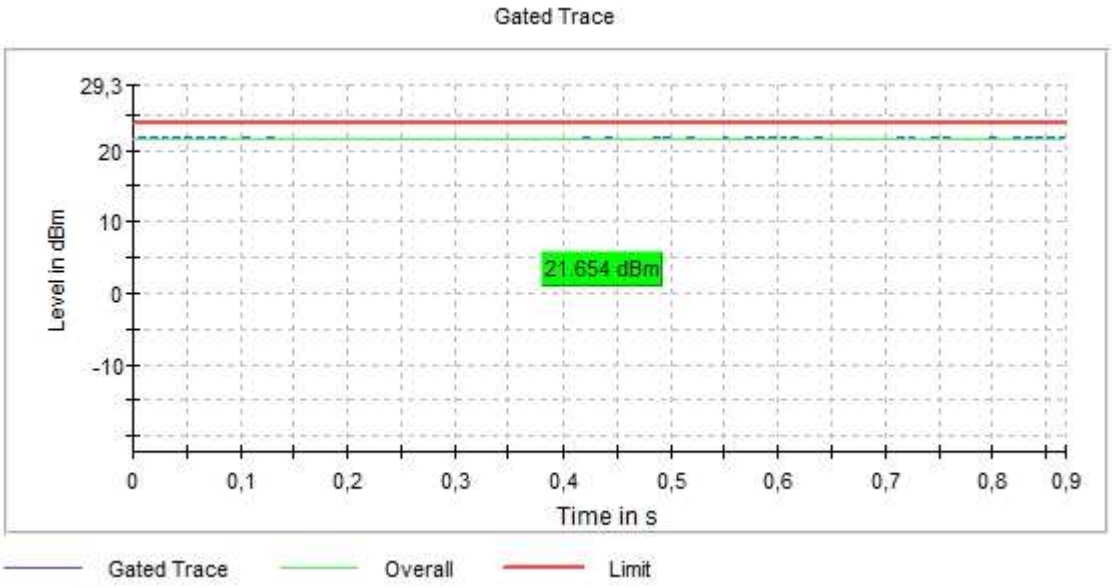
- Straddle Channel 142 (5710 MHz):



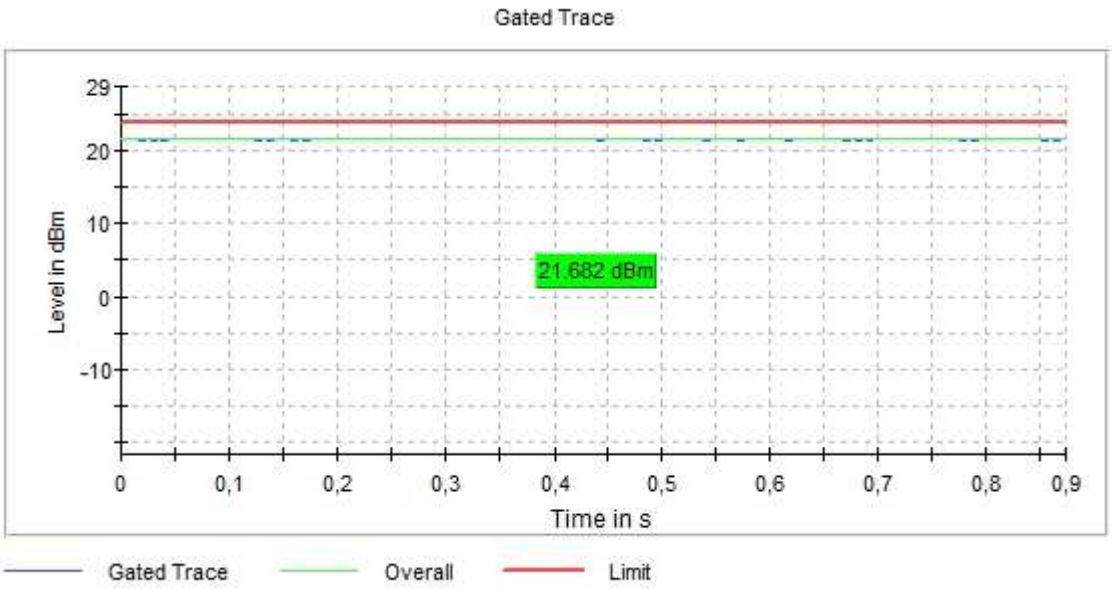
MIMO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz)

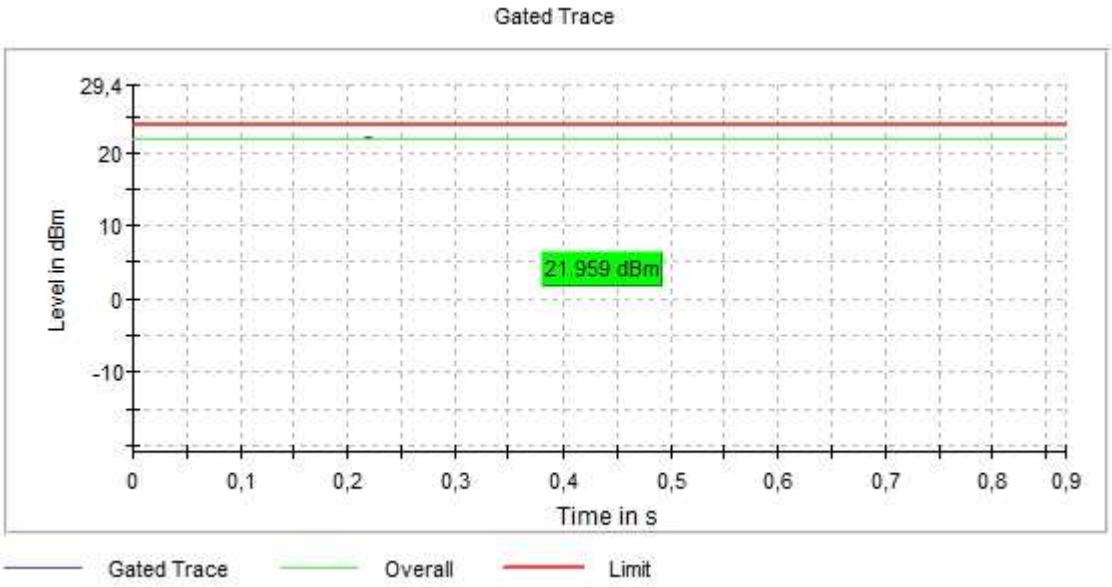
- Low Channel 102 (5510 MHz):



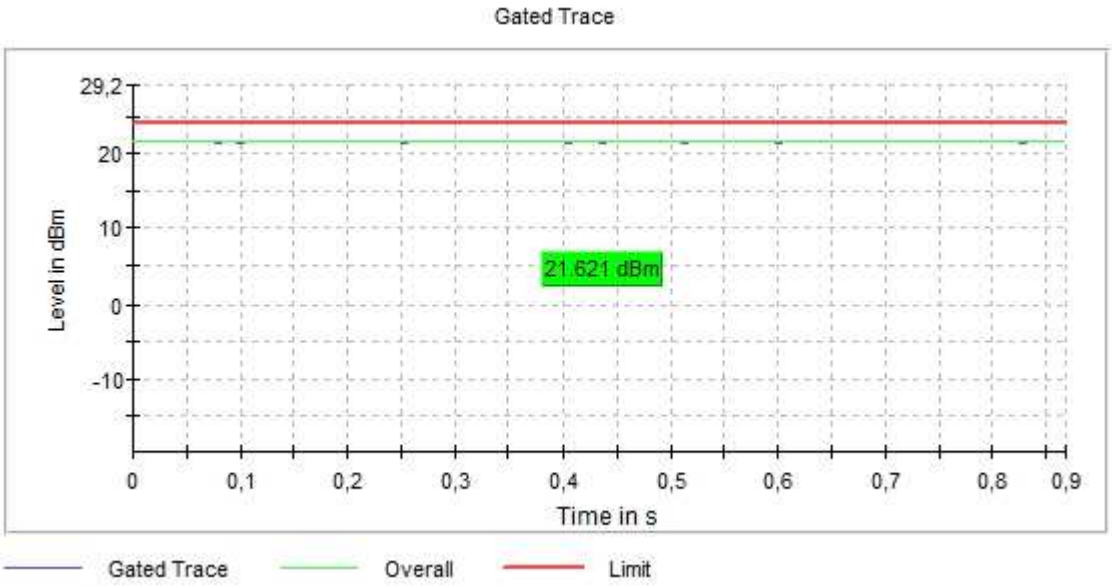
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

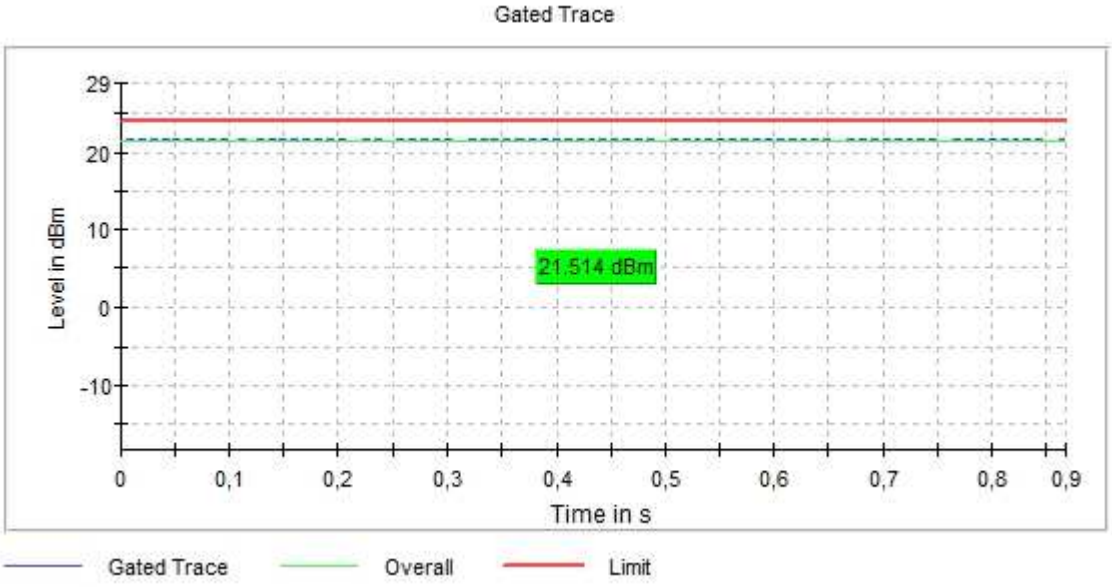


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

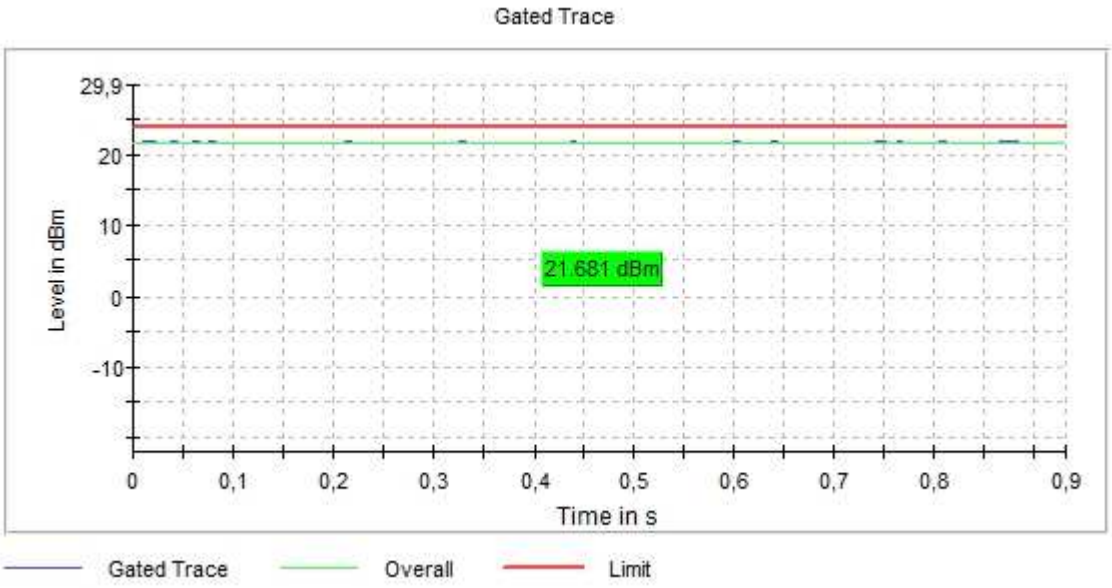
- Straddle Channel 142 (5710 MHz):



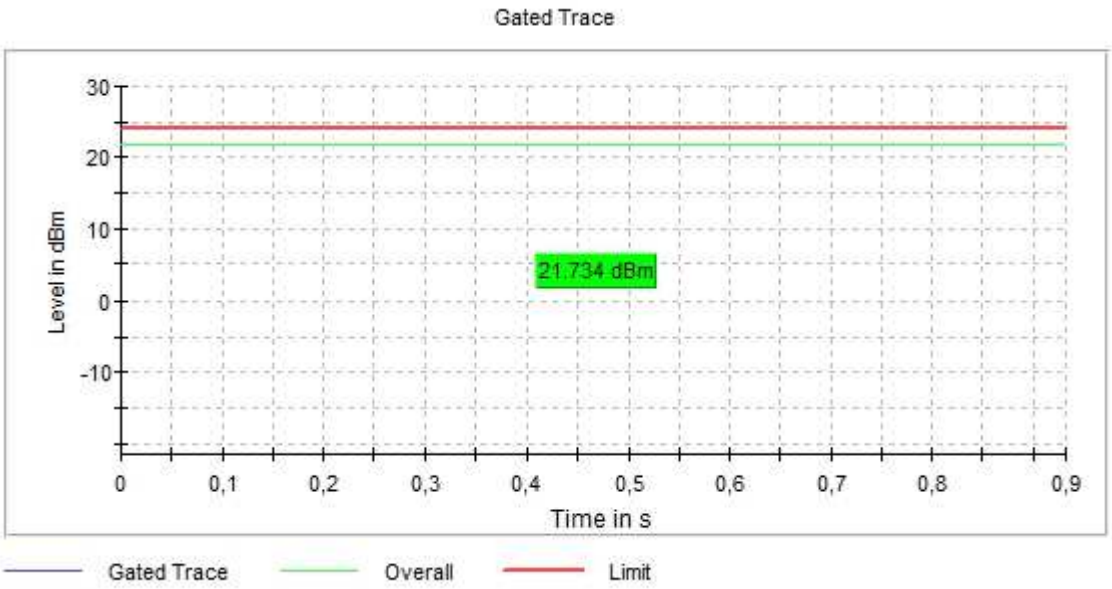
MIMO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz)

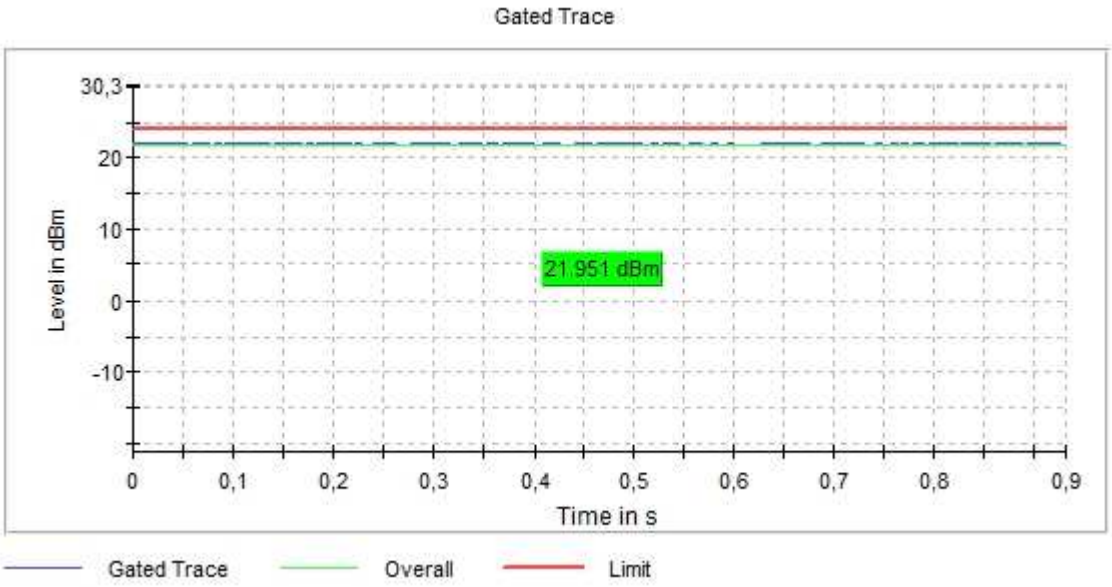
- Low Channel 102 (5510 MHz):



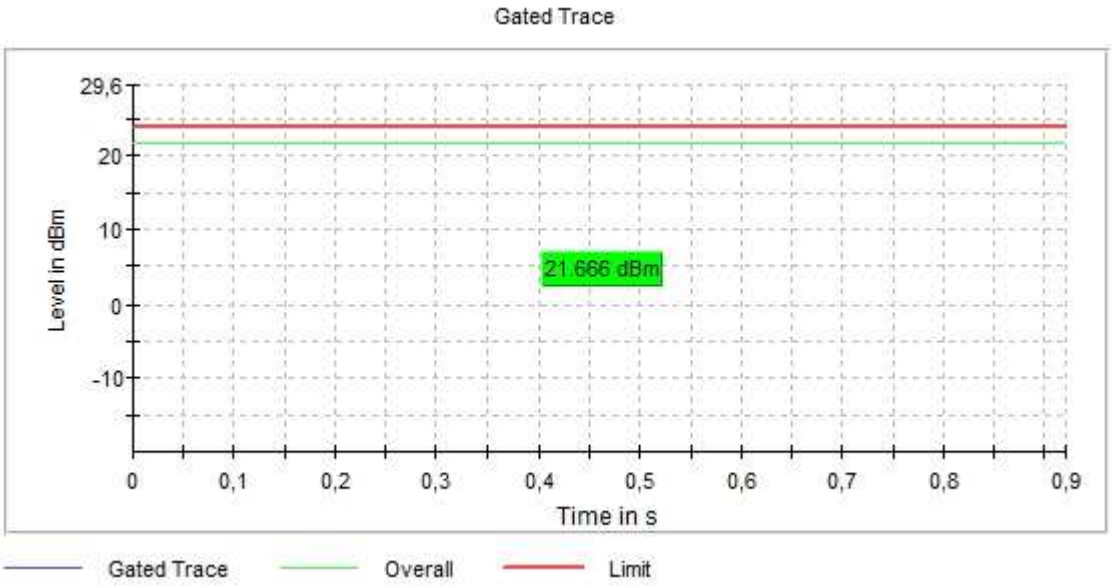
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

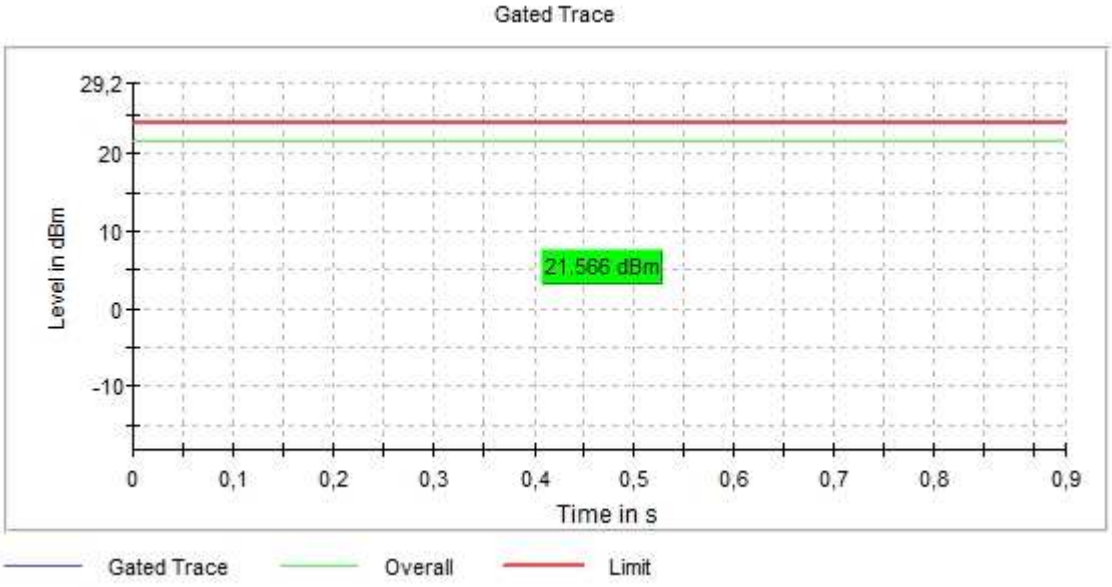


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

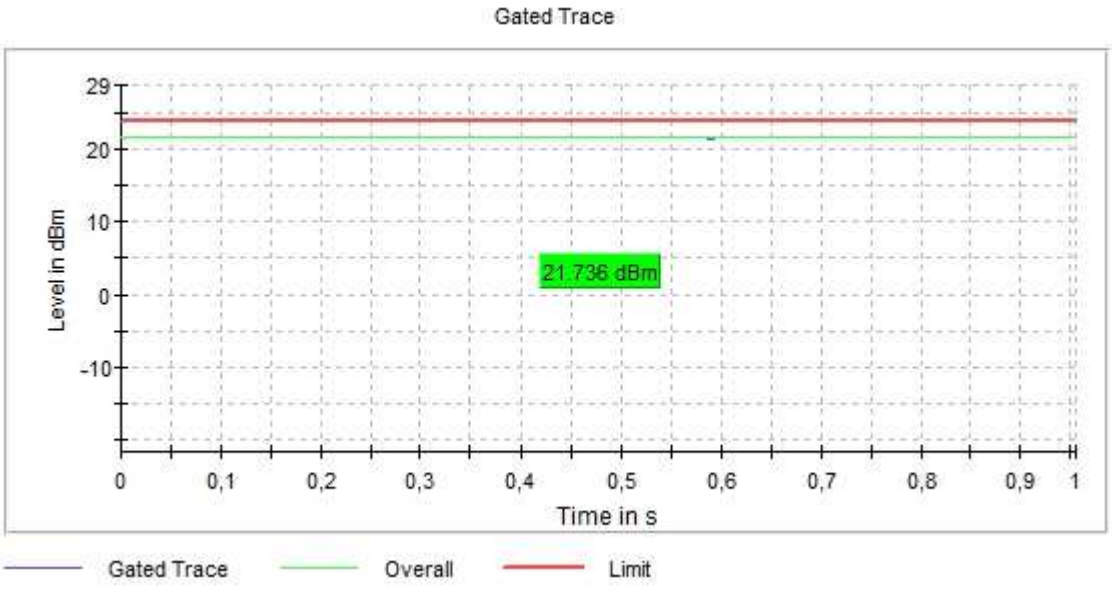
- Straddle Channel 142 (5710 MHz):



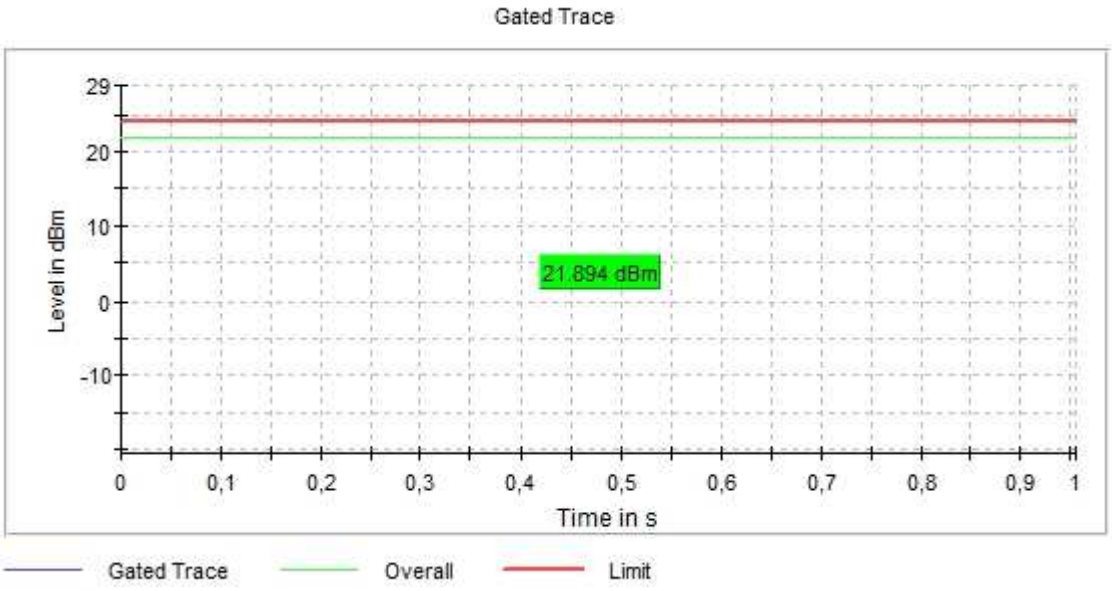
MIMO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

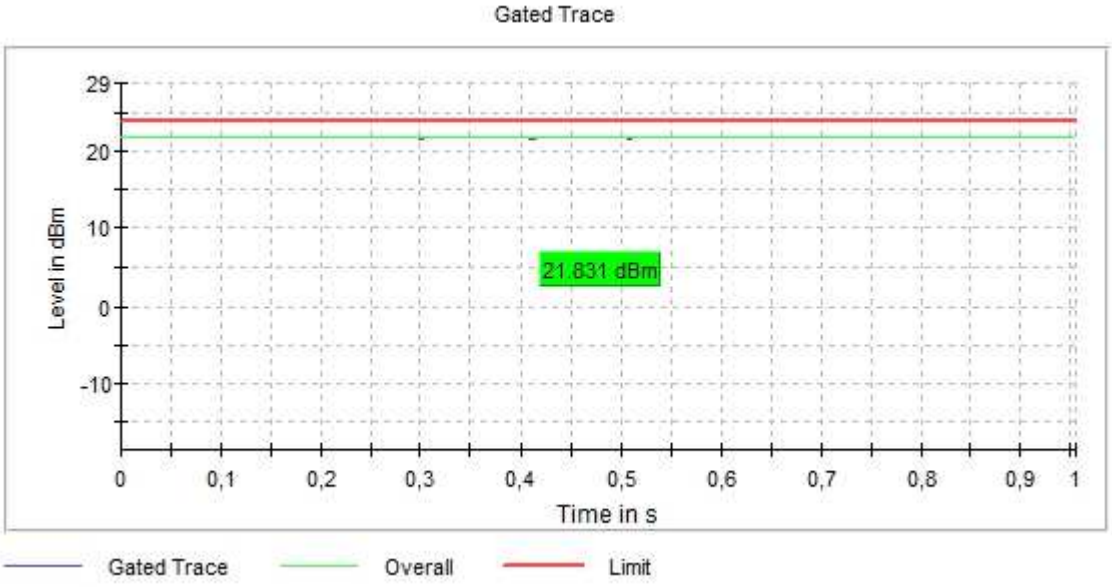


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

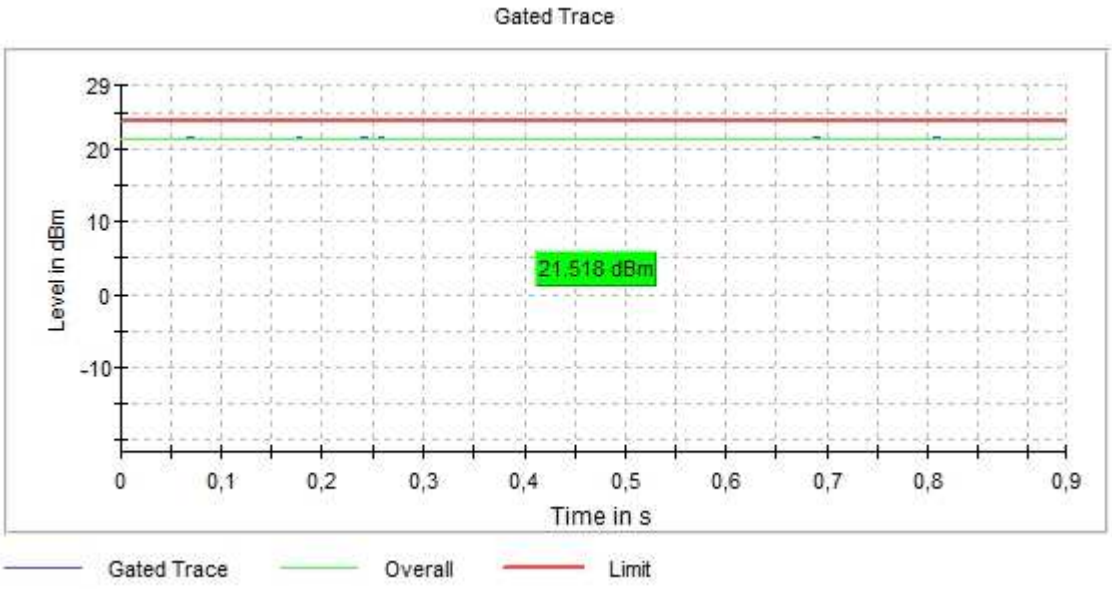
- Straddle Channel 138 (5690 MHz):



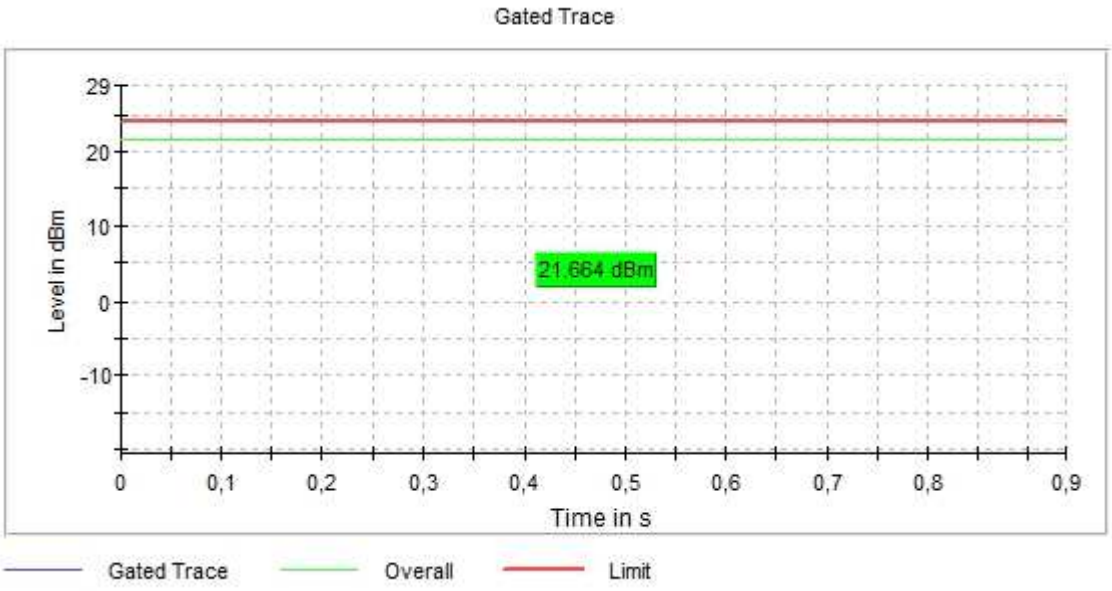
MIMO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):



- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

- Straddle Channel 138 (5690 MHz):

FCC 15.407 (a)(2) Transmitter Maximum Power Spectral Density / RSS-247 6.2.3.1. Transmitter EIRP Spectral Density

SPECIFICATION:

* FCC 15.407 (a)(2): For the 5.47-5.725 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

* RSS-247 6.2.3.1: The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$ B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RESULTS:

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

The PSD test uses the same setup as the transmitter maximum conducted output power test.

The result of the Peak PSD was measured by colocating a marker on the peak of the signal and the results are in the tables below.

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

- Preliminary tests determined the SISO worst-case: WLAN1.
- Preliminary tests determined the MIMO worst-case: WLAN12.

Maximum Declared Antenna Gain:

- SISO Antenna – WLAN1: +5.5 dBi
- MIMO Antennas – WLAN12:
  - WLAN1: +5.5 dBi
  - WLAN2: +4.3 dBi
  - WLAN12: +7.93 dBi

For the SISO technique, the antenna gain is less than 6 dBi.
For the MIMO technique, the antenna gain is higher than 6 dBi.

FCC and IC power setting:

SISO worst-case:

- Preliminary tests determined the SISO worst-case: WLAN1.

SISO 802.11 a20:

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	10.658	10.029	10.328	9.175
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.883
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 n20 (HT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	9.868	9.380	9.583	8.854
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.993
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	10.001	9.475	9.612	8.942
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.912
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax20 (HE20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	9.476	9.034	9.193	8.137
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	9.528
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	7.602	7.069	6.276	8.052
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	7.040
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	6.125	5.393	6.383	6.098
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	6.748
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	6.440	5.936	6.511	6.174
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	6.505
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted PSD (dBm)	1.728	3.332
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted PSD (dBm)	3.927
Measurement uncertainty (kHz)	<±36.95

SISO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted PSD (dBm)	2.852	2.926
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted PSD (dBm)	3.577
Measurement uncertainty (kHz)	<±36.95

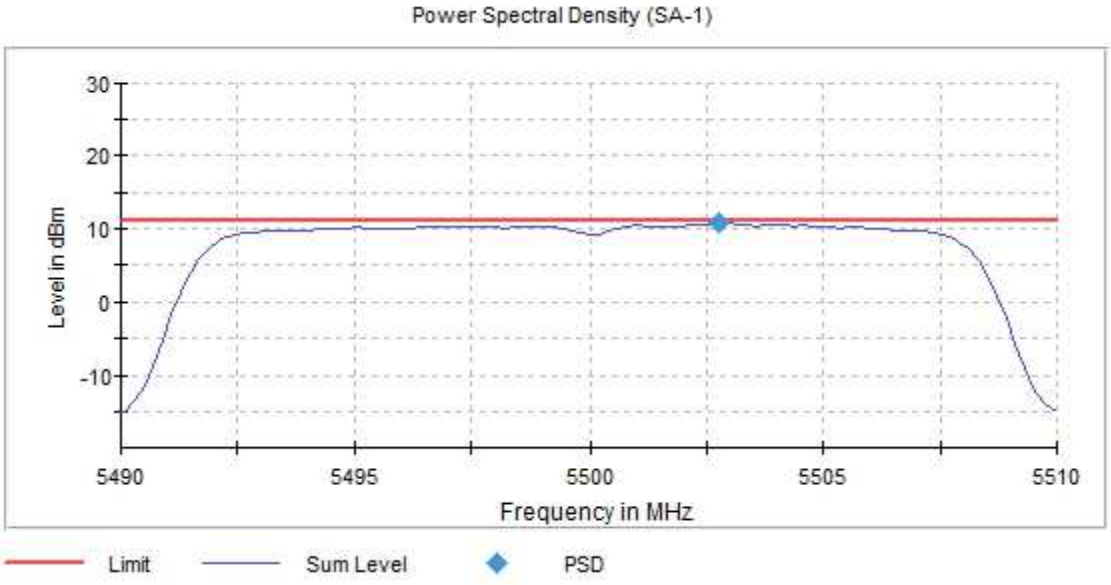
Verdict: PASS

SISO worst-case:

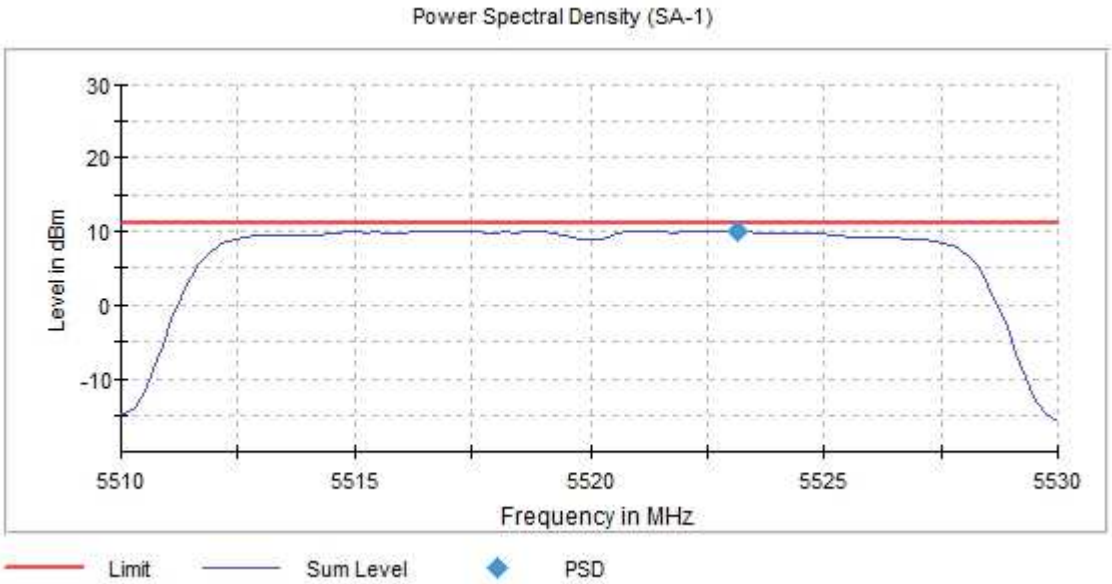
SISO 802.11 a20:

U-NII-2C (5250-5350 MHz)

- Low Channel 100 (5500 MHz):

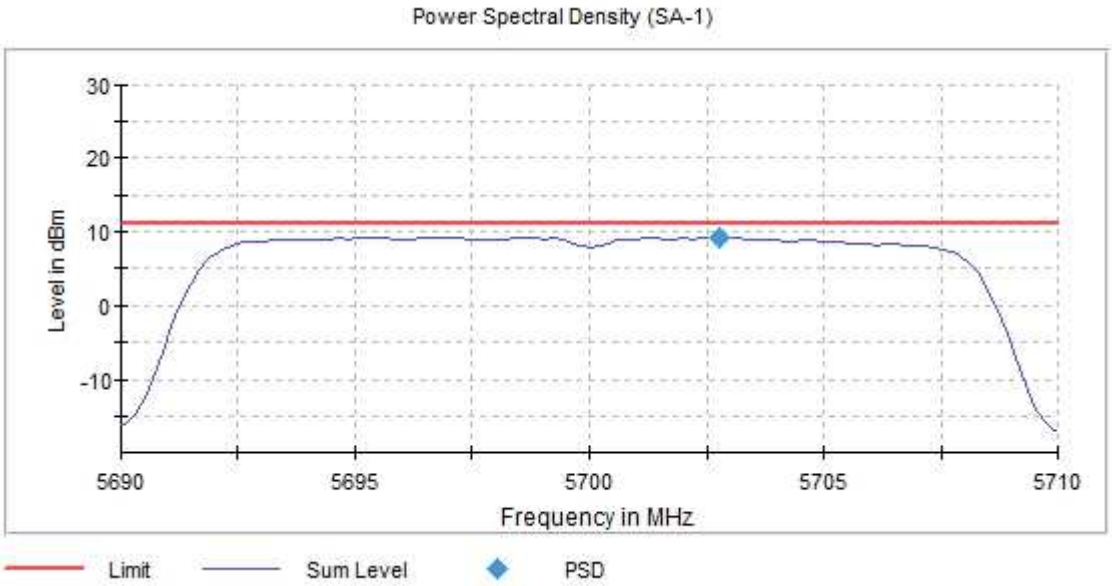


- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

- High Channel 140 (5700 MHz):



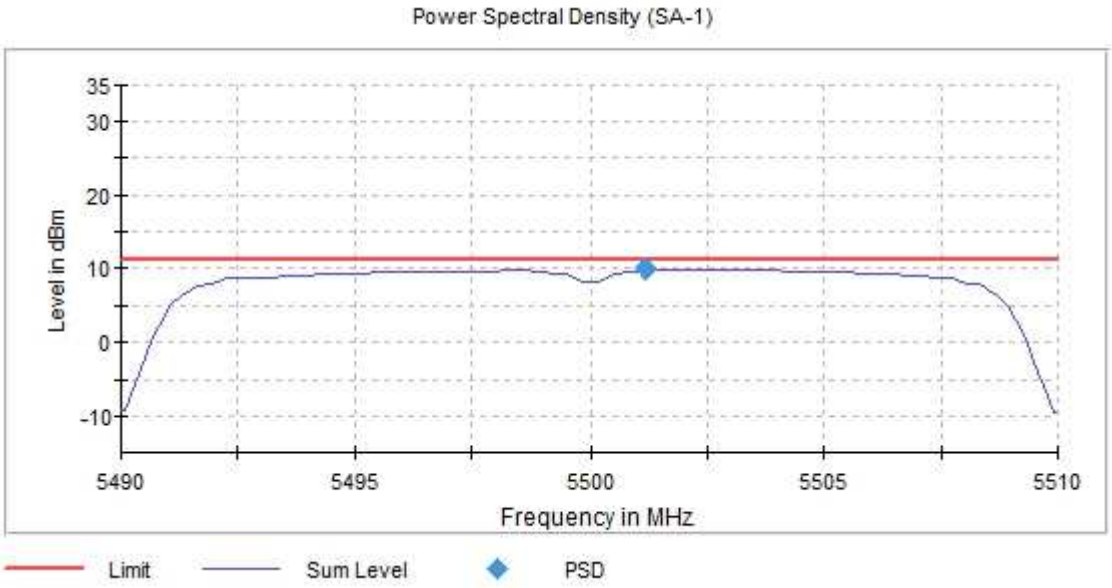
STRADDLE CHANNEL

- Straddle Channel 144 (5720 MHz):

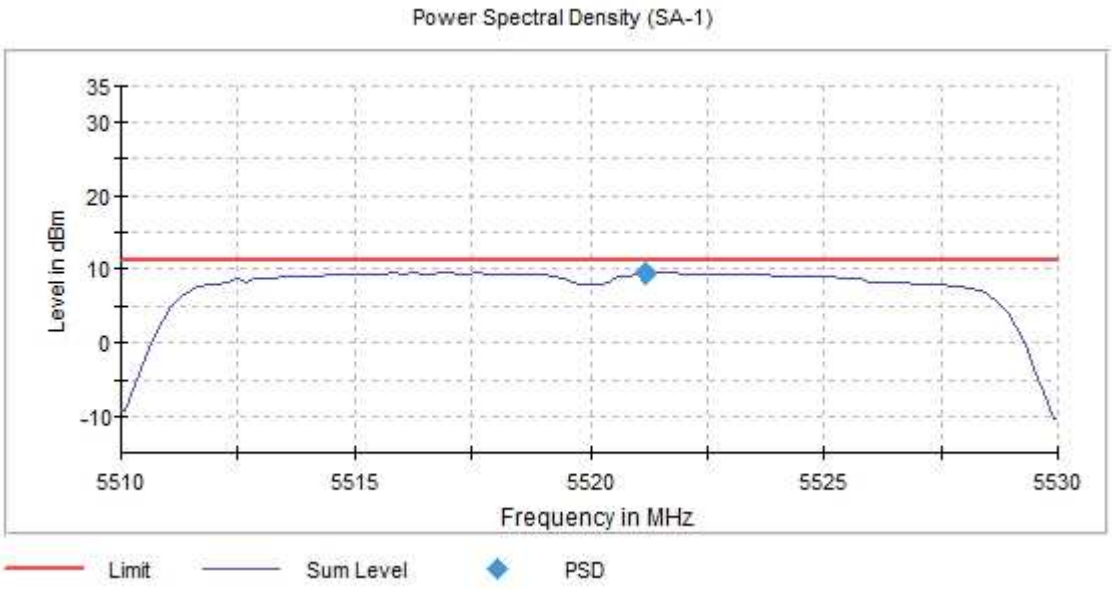
SISO 802.11 n20 (HT20):

U-NII-2C (5250-5350 MHz)

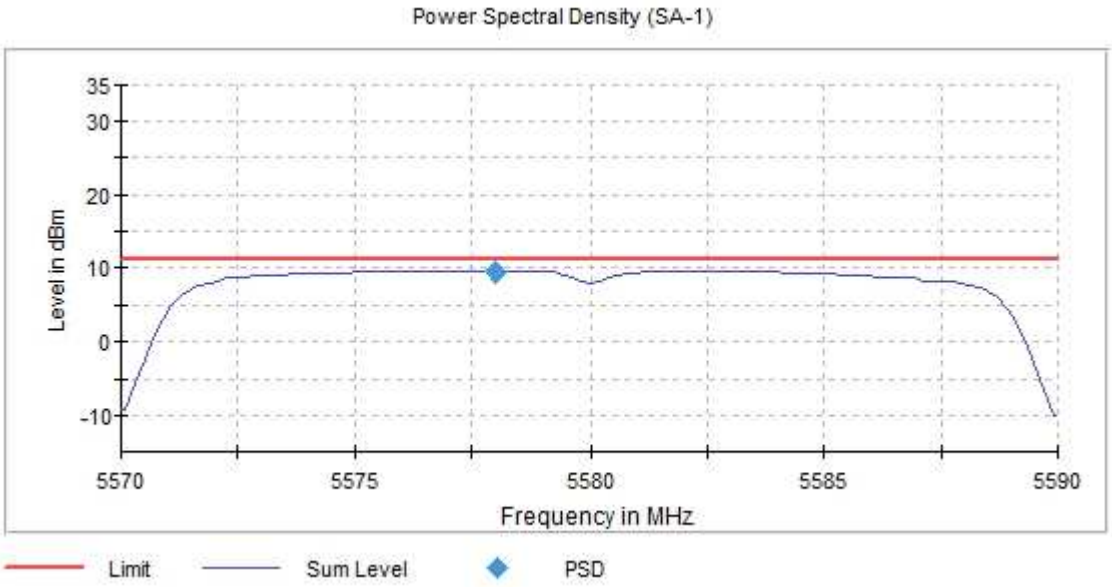
- Low Channel 100 (5500 MHz):



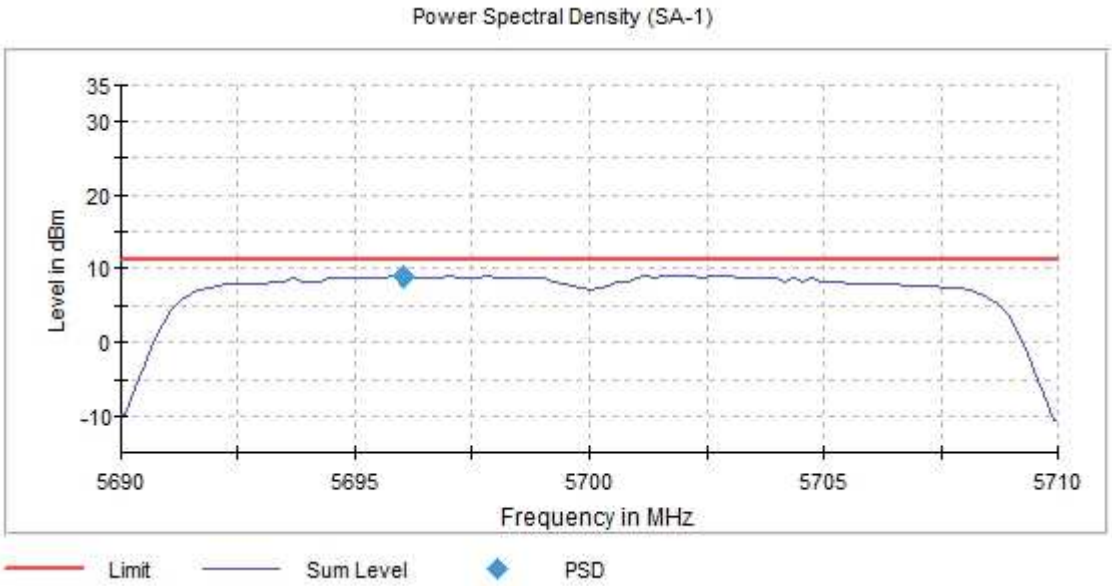
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):



- High Channel 140 (5700 MHz):



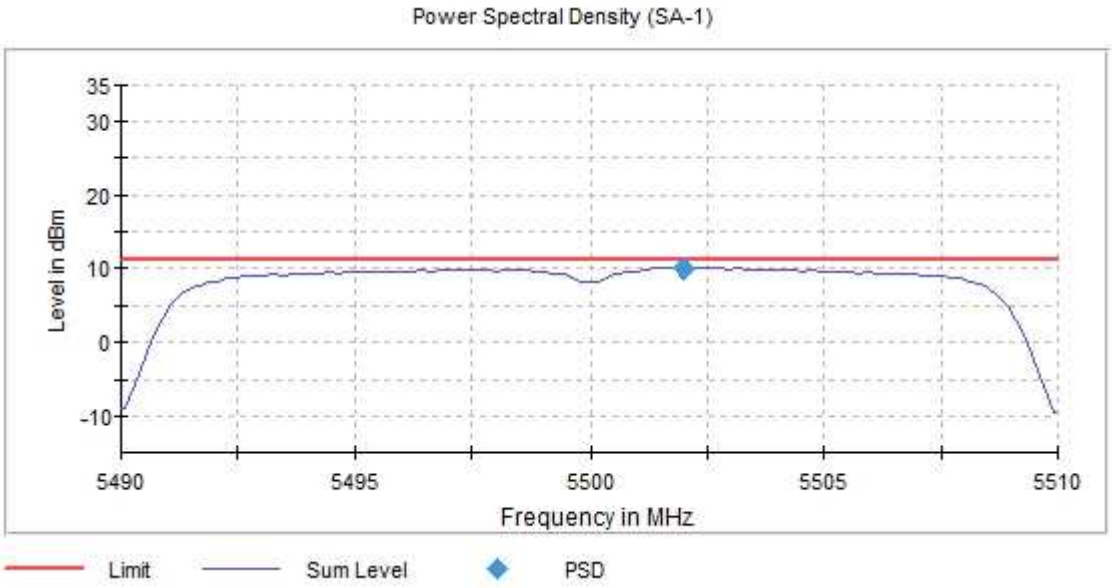
STRADDLE CHANNEL

- Straddle Channel 144 (5720 MHz):

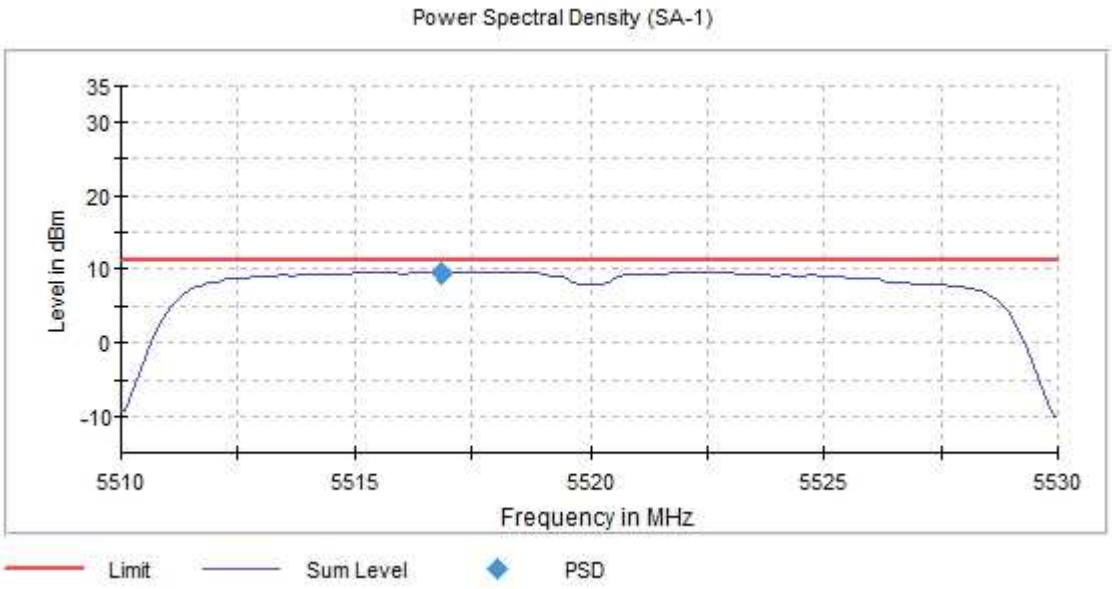
SISO 802.11 ac20 (VHT20):

U-NII-2C (5250-5350 MHz)

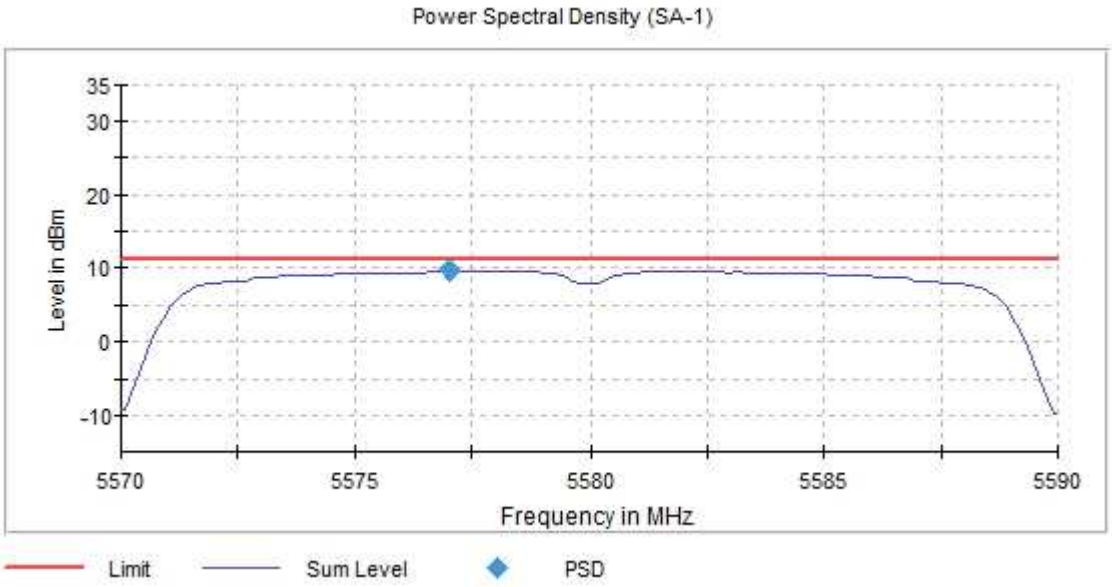
- Low Channel 100 (5500 MHz):



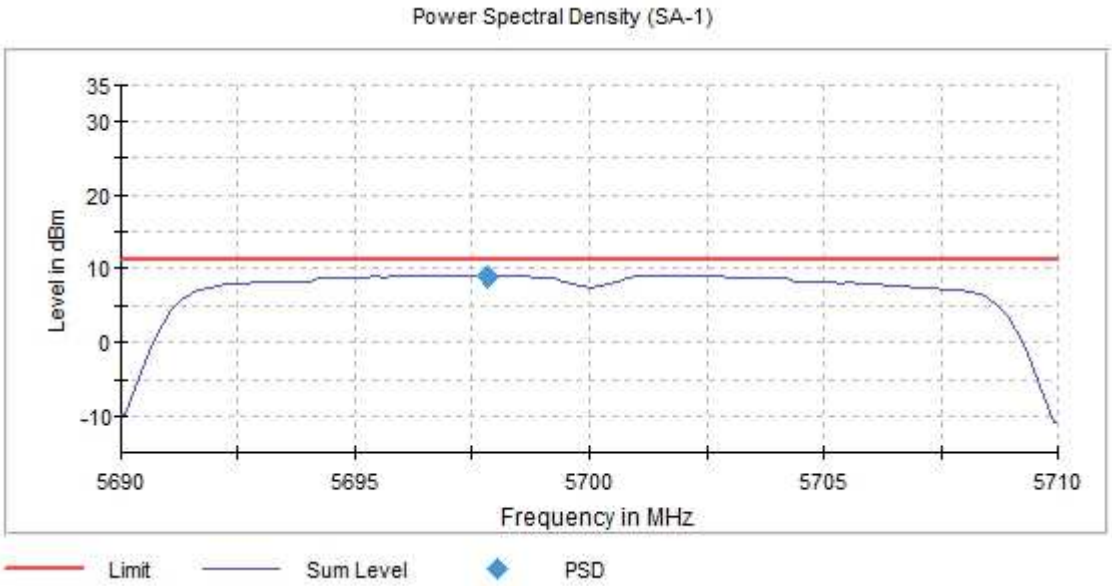
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

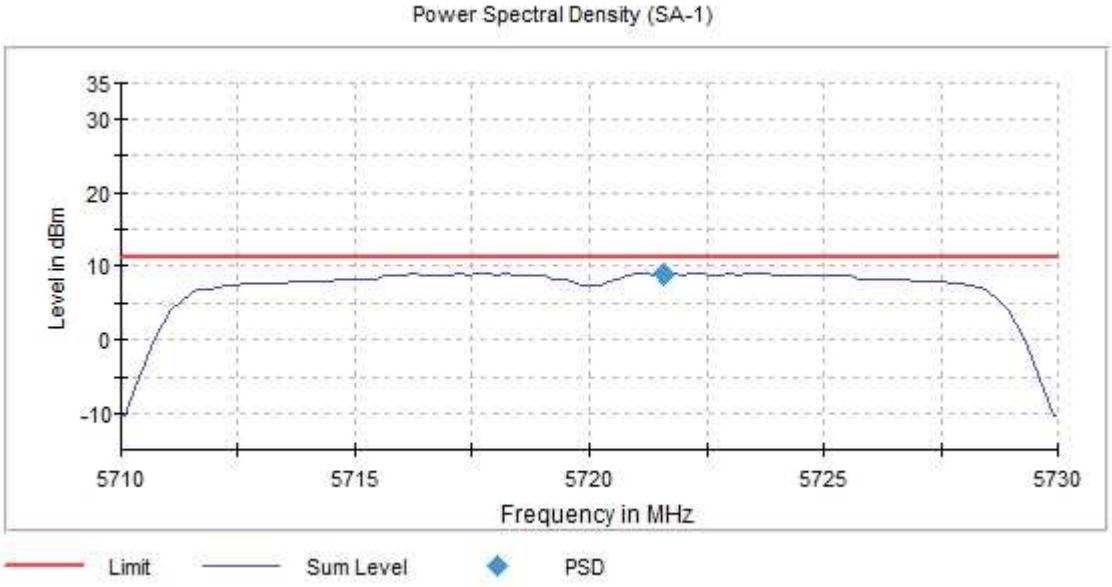


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

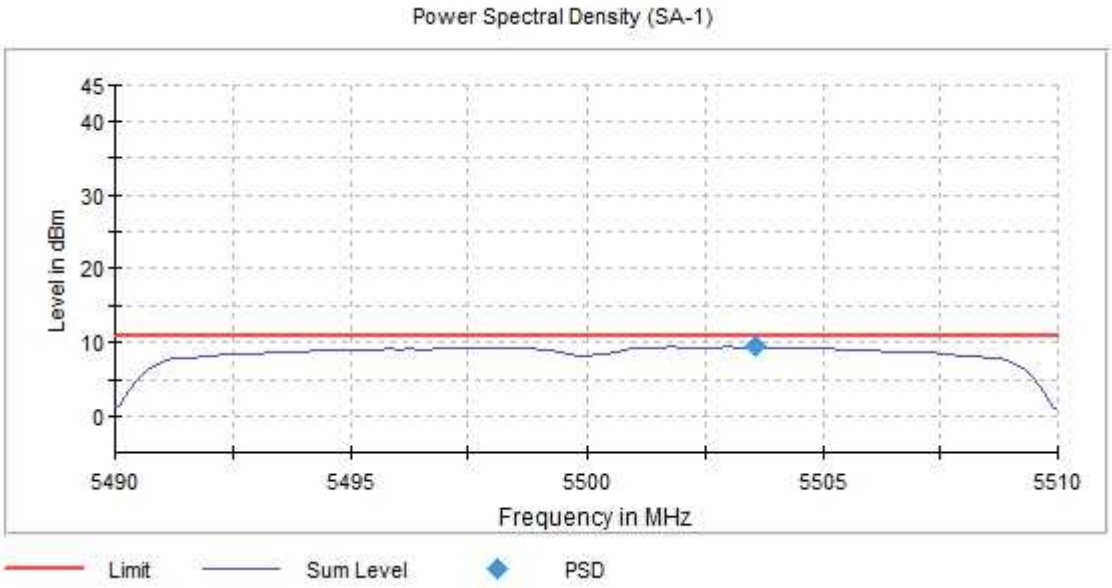
- Straddle Channel 144 (5720 MHz):



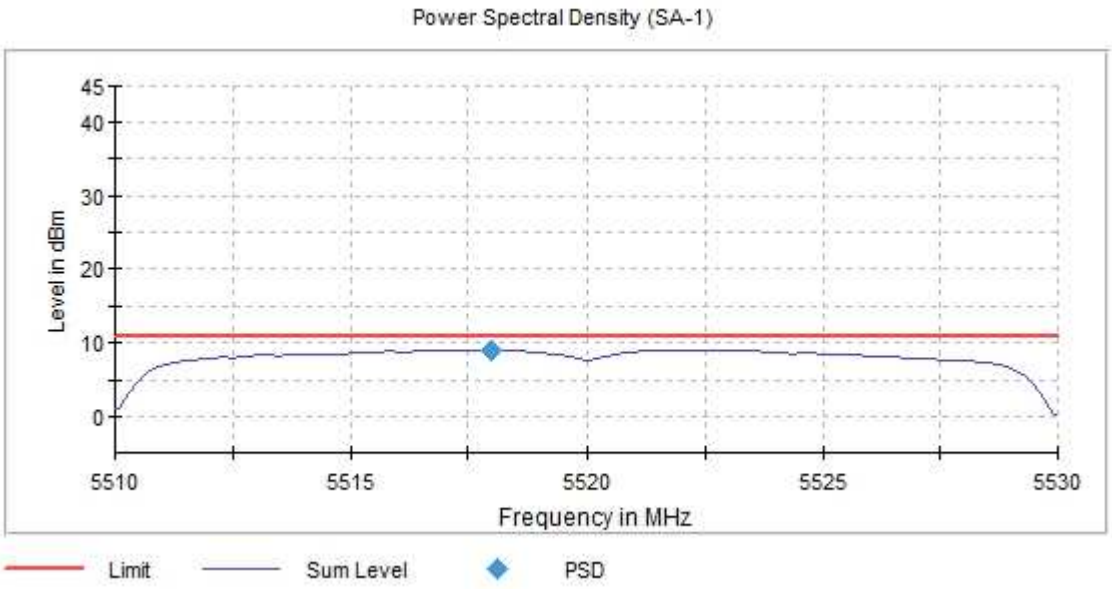
SISO 802.11 ax20 (HE20):

U-NII-2C (5250-5350 MHz)

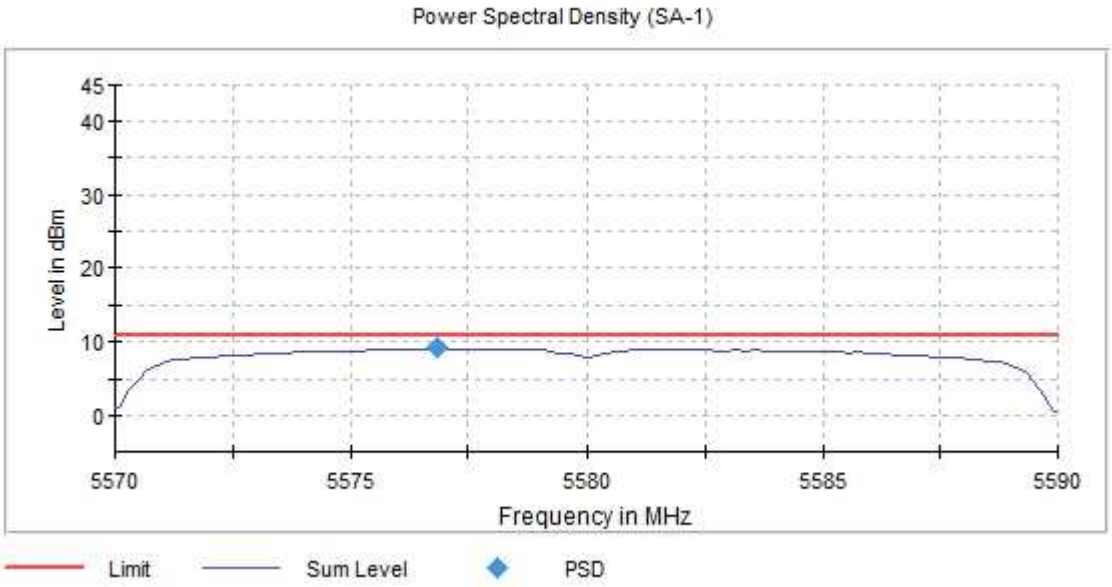
- Low Channel 100 (5500 MHz):



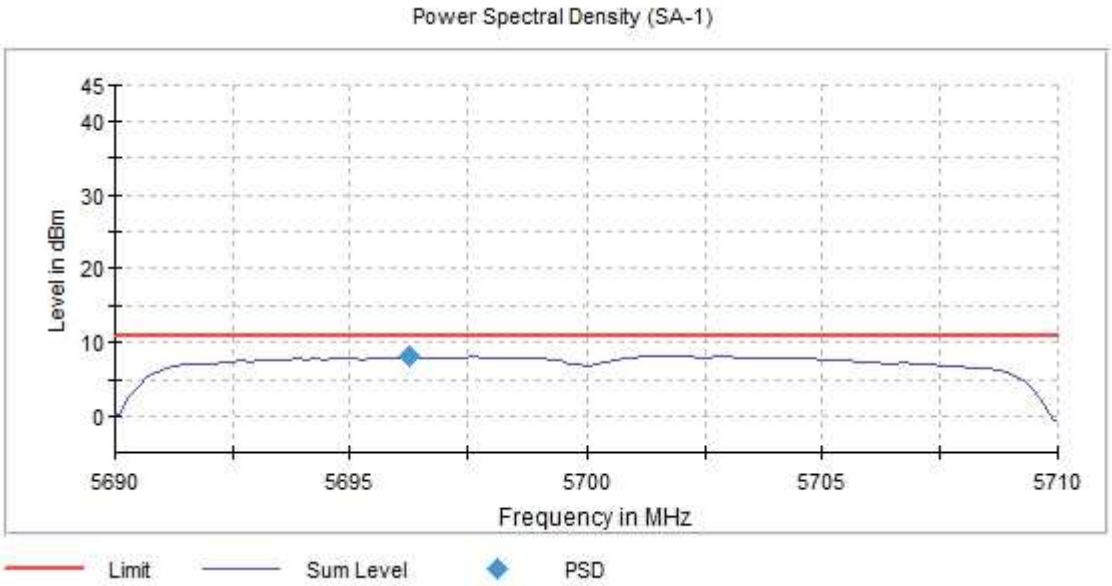
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

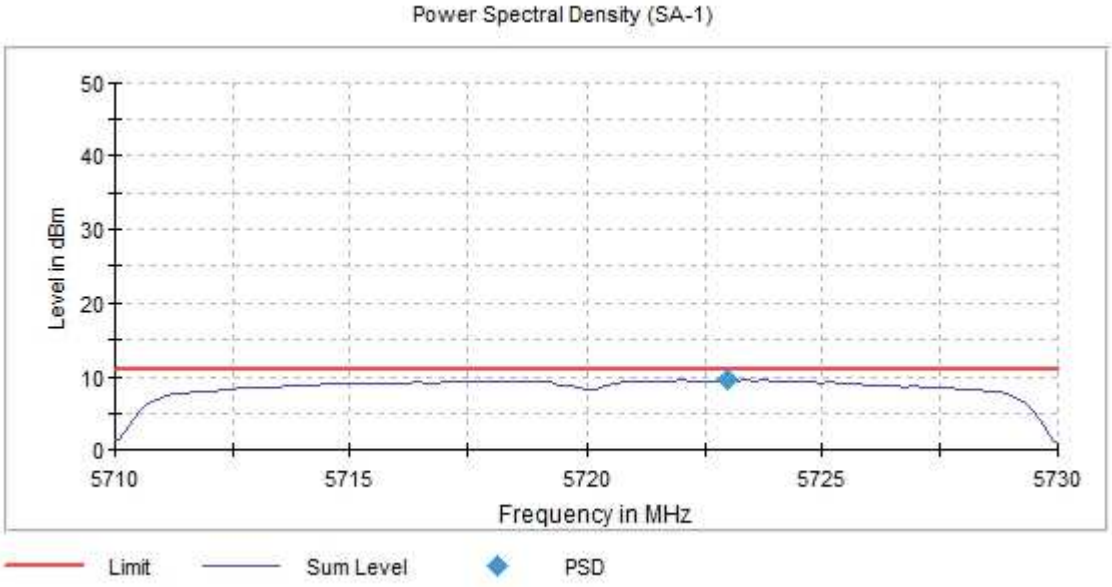


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

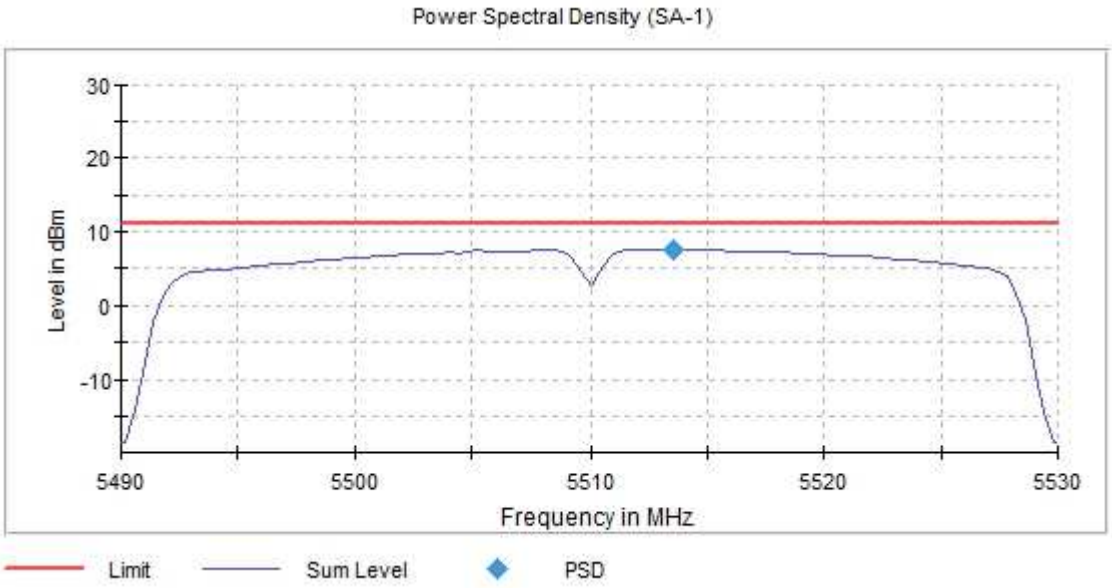
- Straddle Channel 144 (5720 MHz):



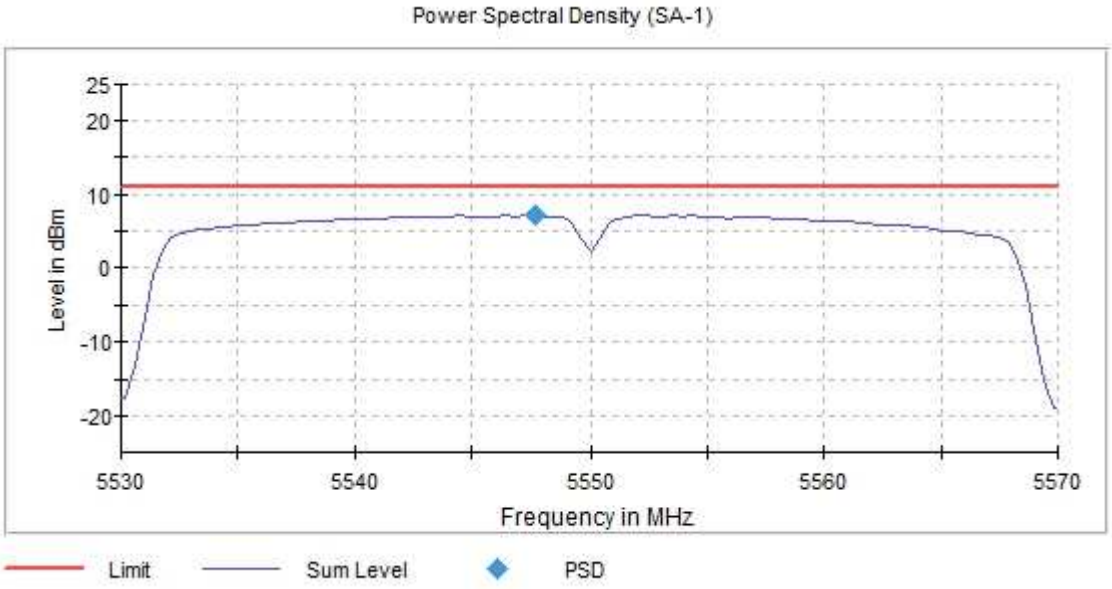
SISO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz)

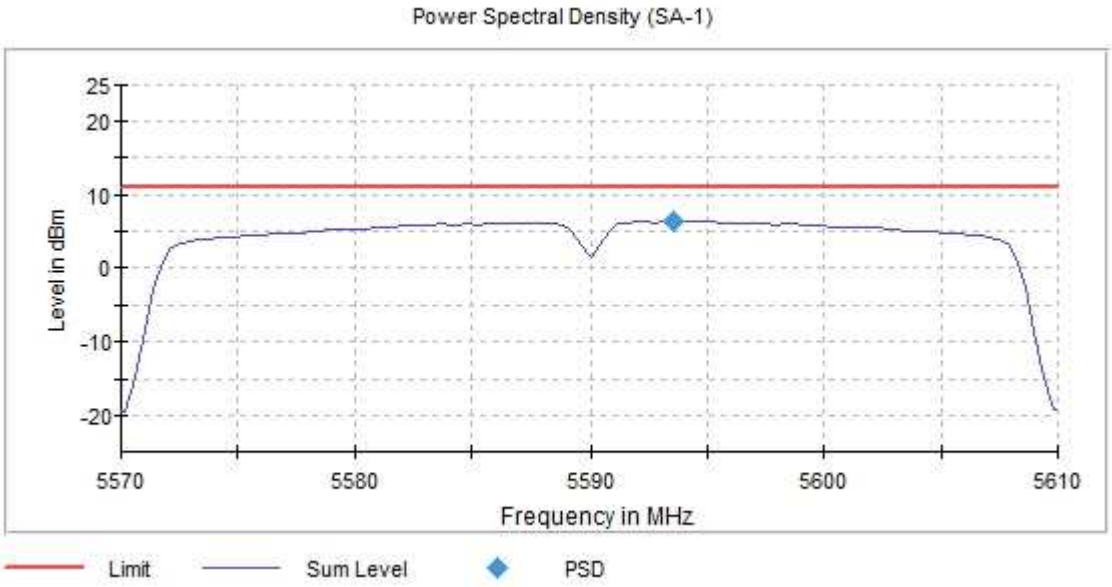
- Low Channel 102 (5510 MHz):



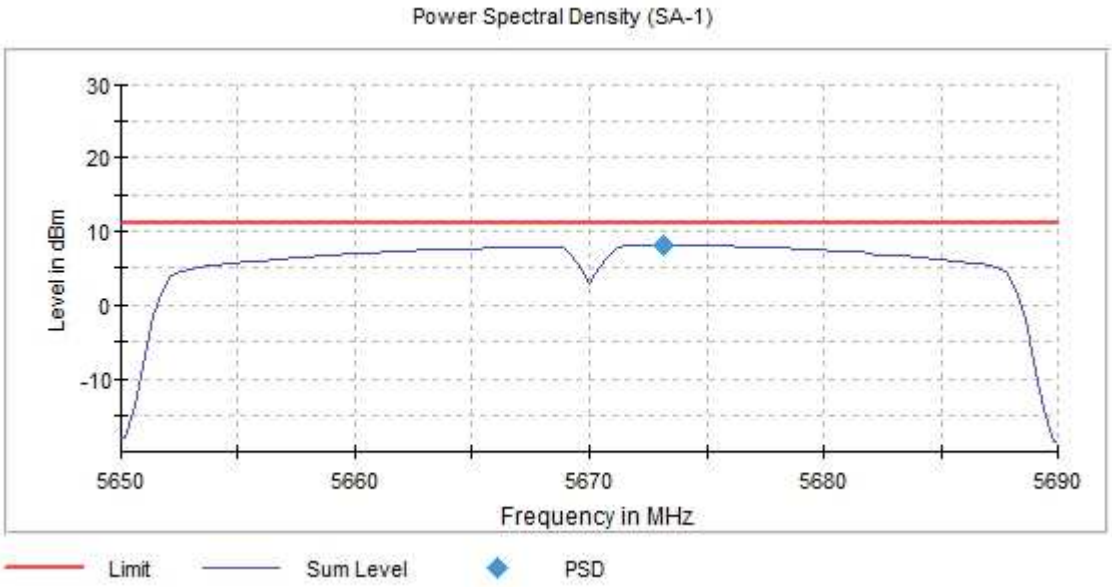
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

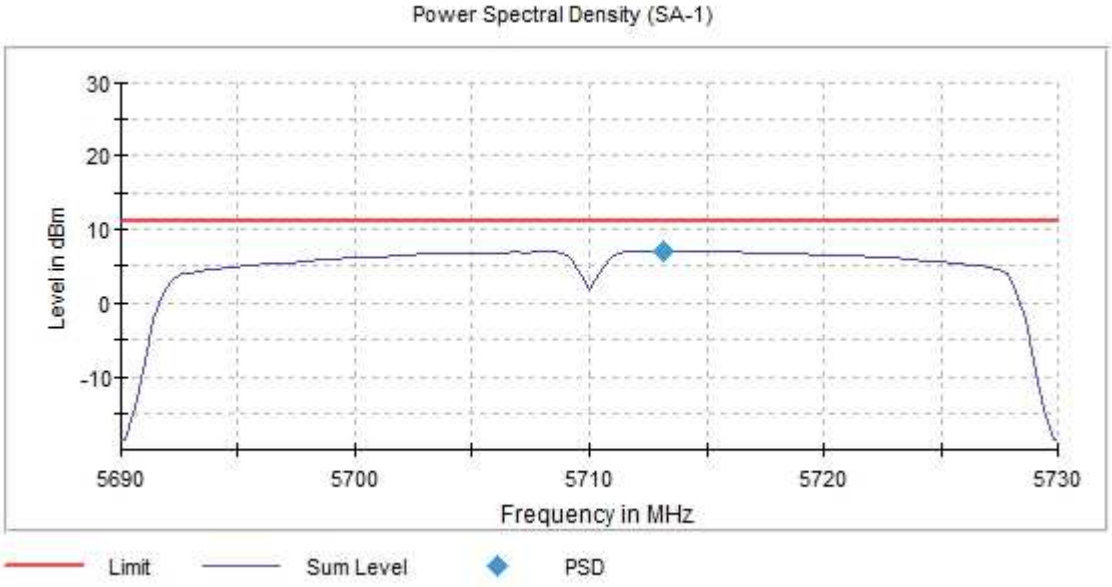


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

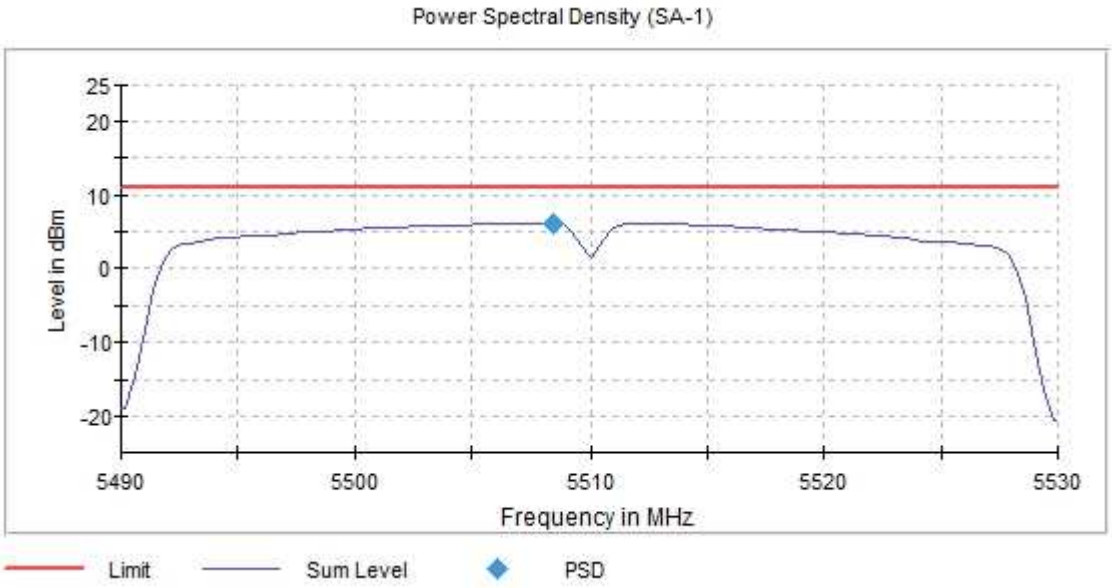
- Straddle Channel 142 (5710 MHz):



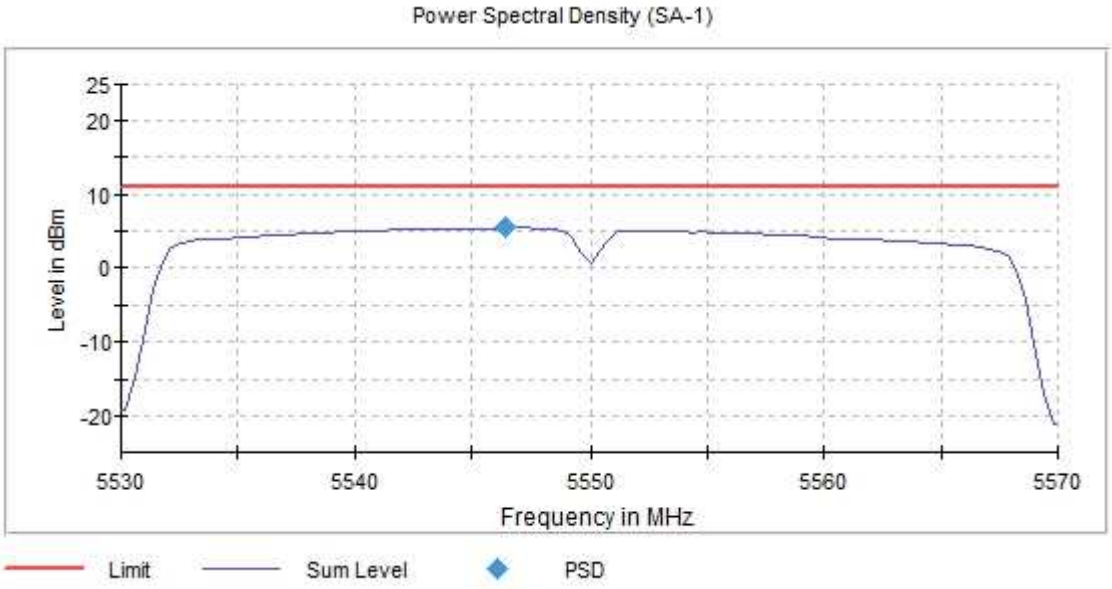
SISO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz)

- Low Channel 102 (5510 MHz):

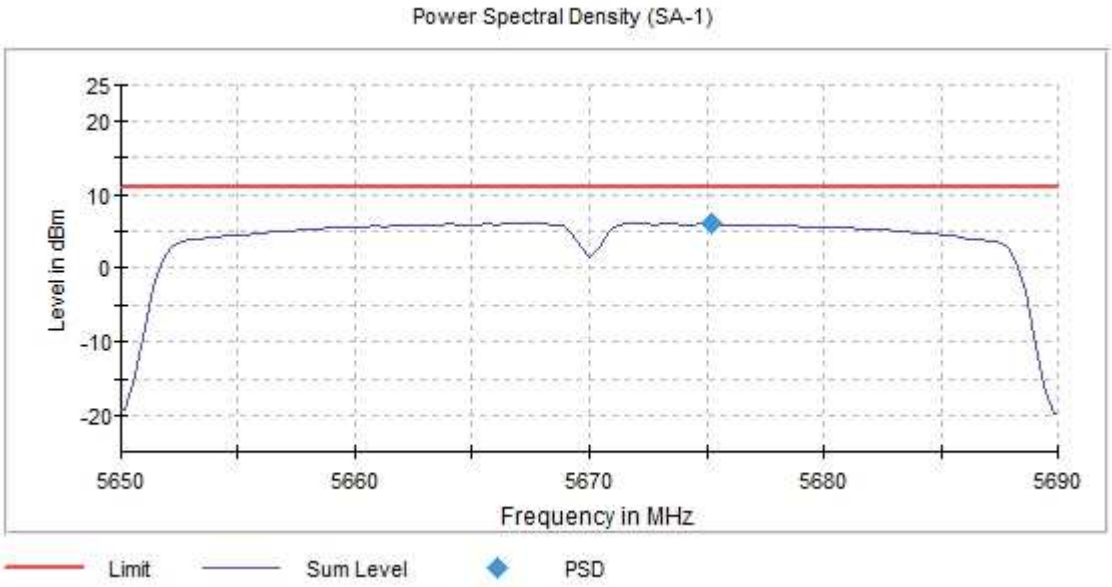


- Low+1 Channel 110 (5550 MHz):



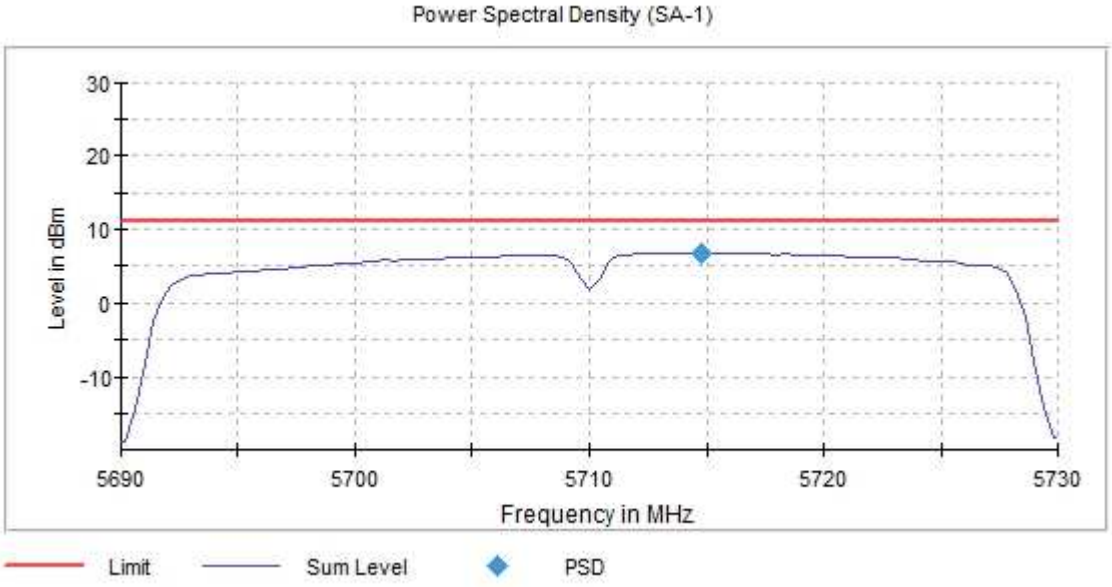
- Middle Channel 118 (5590 MHz):

- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

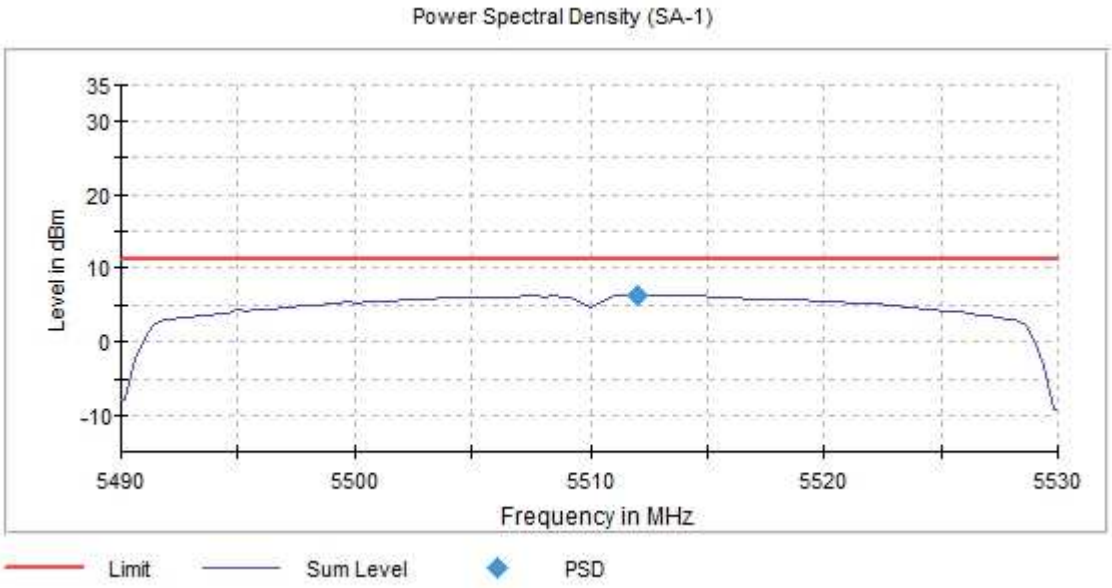
- Straddle Channel 142 (5710 MHz):



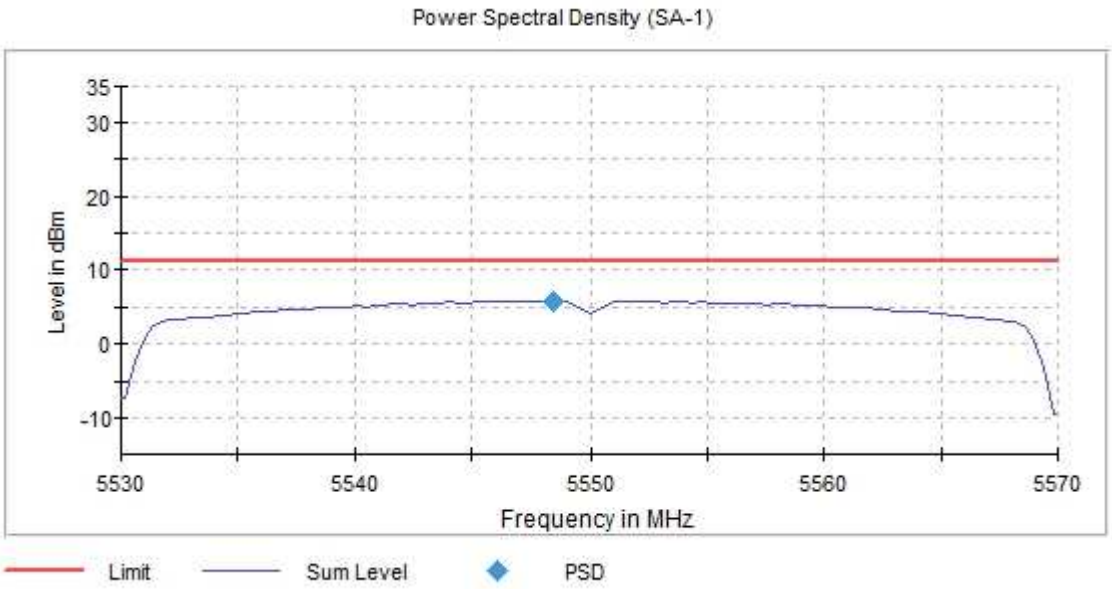
SISO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz)

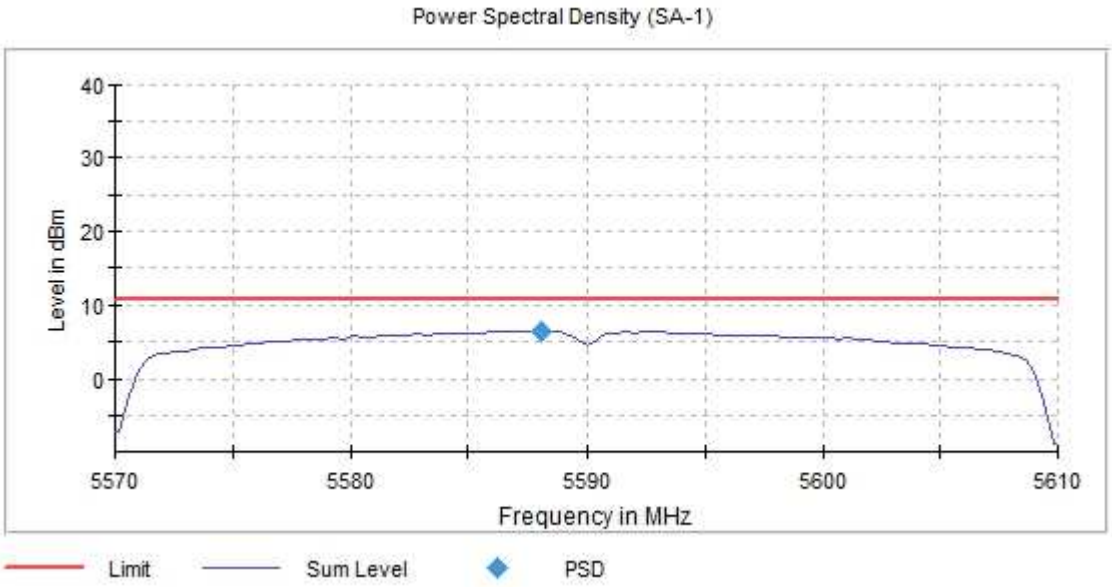
- Low Channel 102 (5510 MHz):



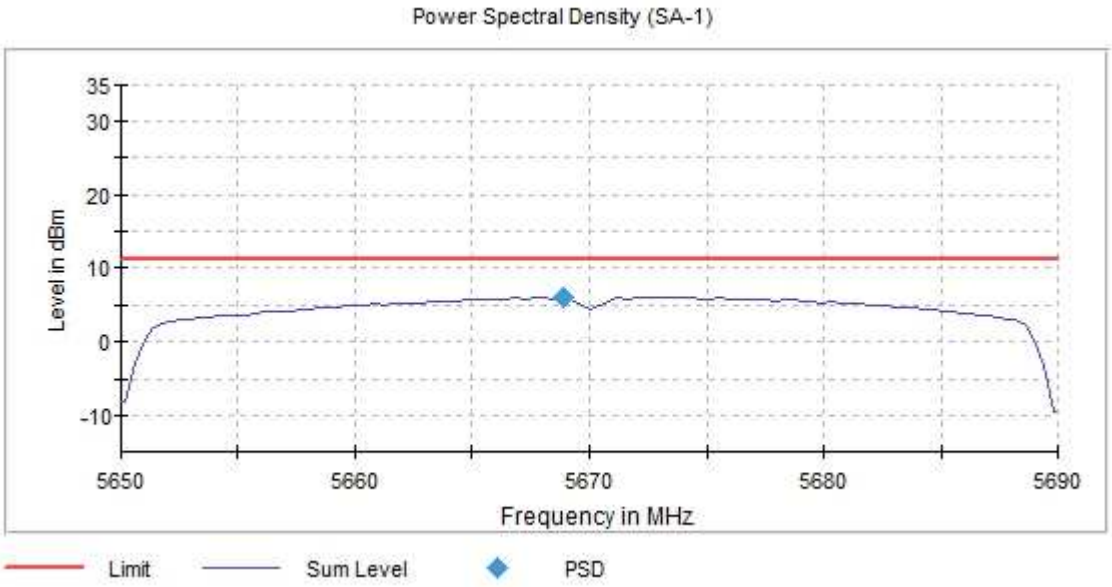
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

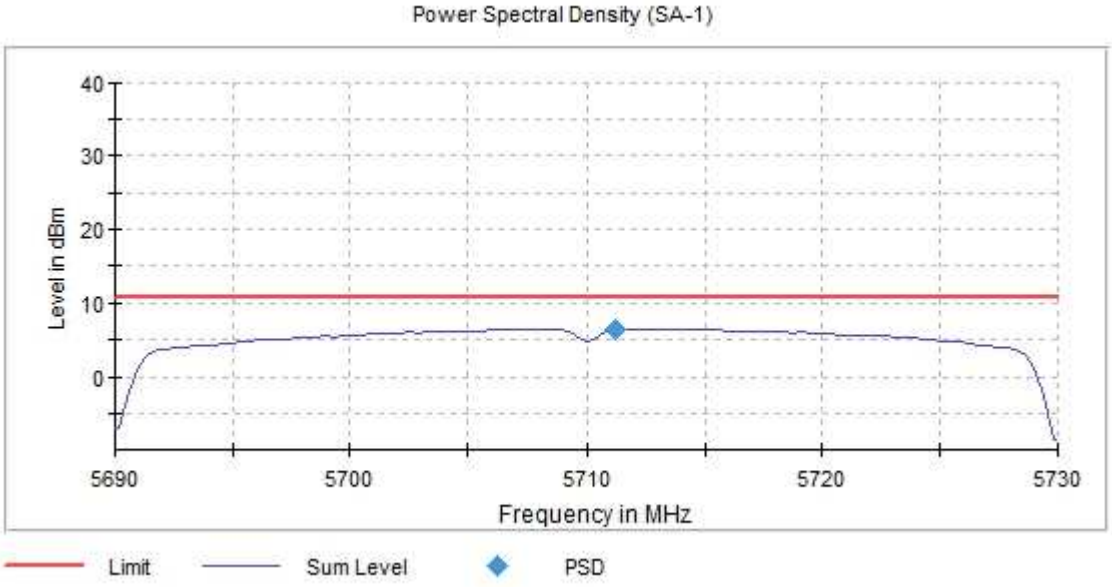


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

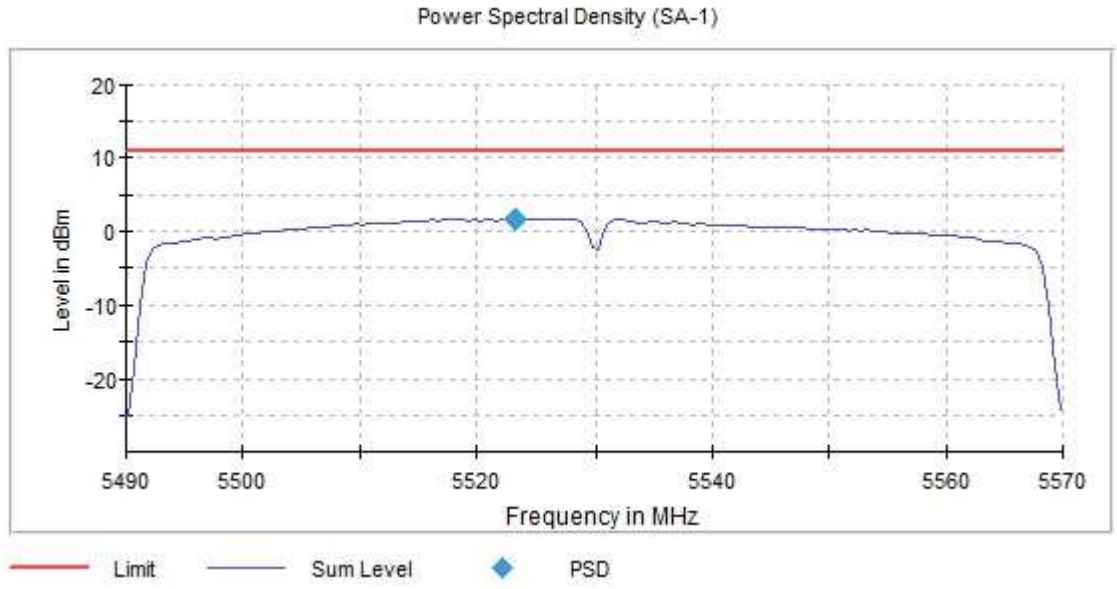
- Straddle Channel 142 (5710 MHz):



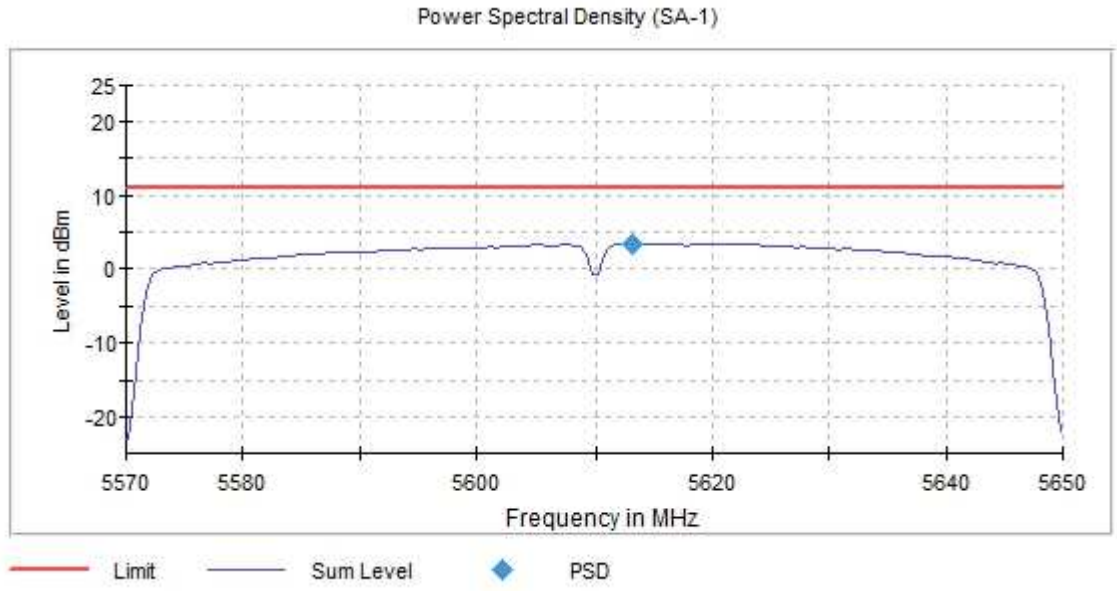
SISO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

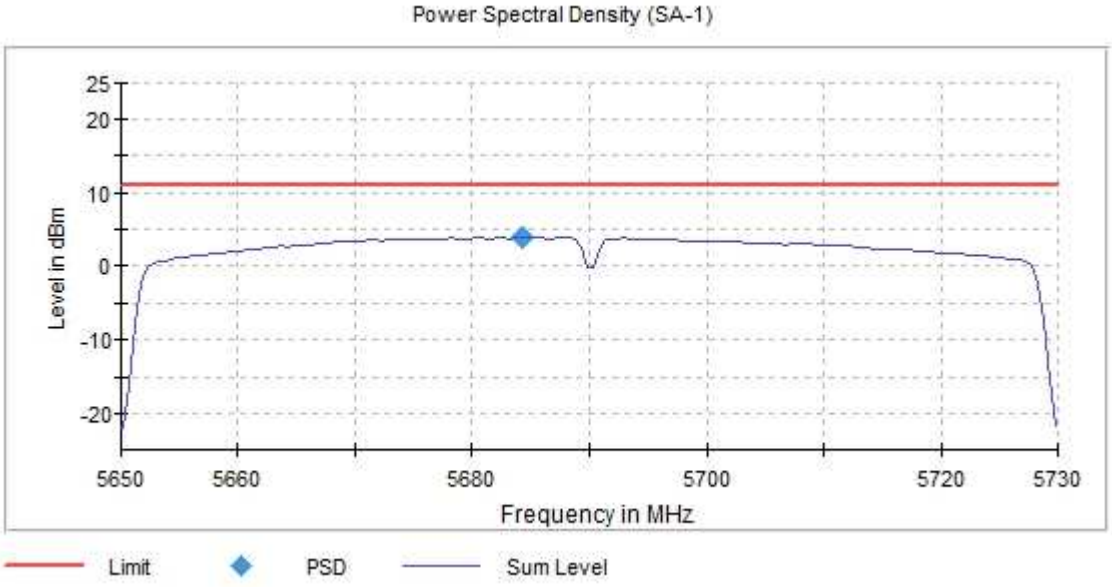


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

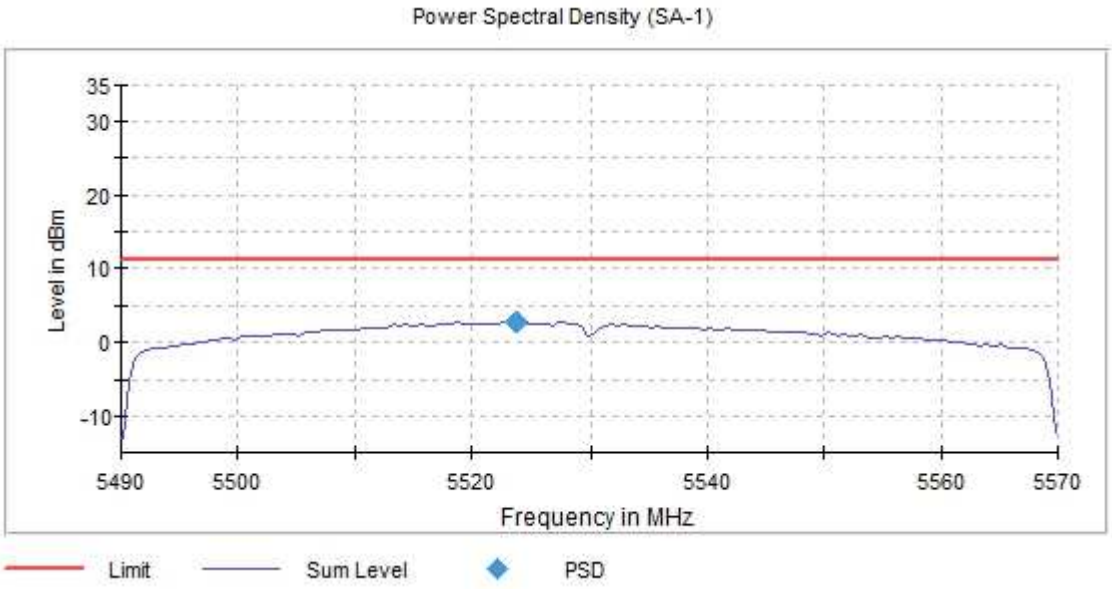
- Straddle Channel 138 (5690 MHz):



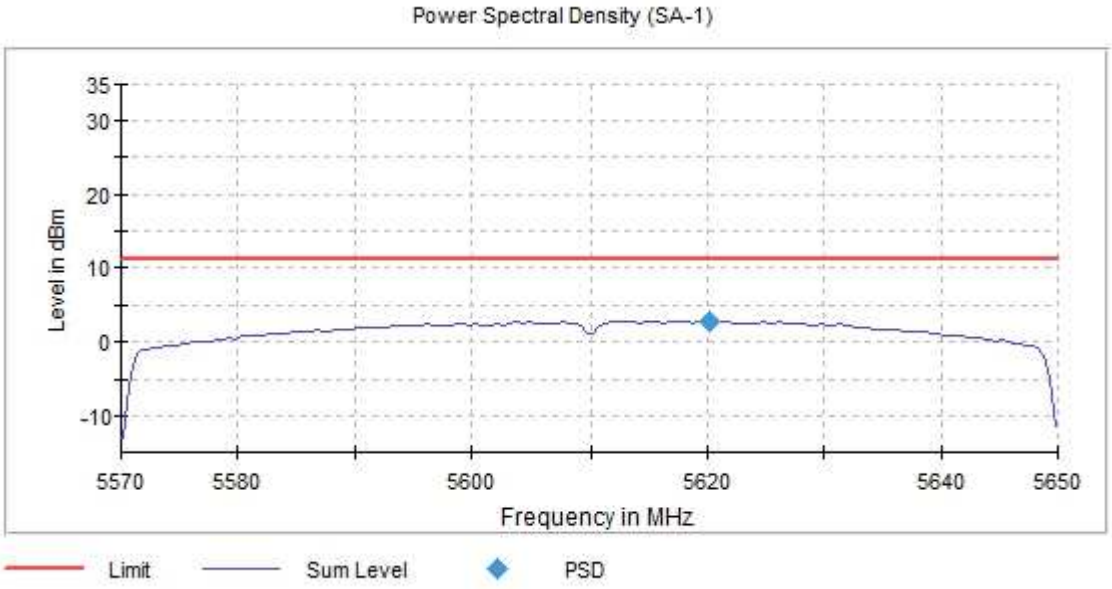
SISO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

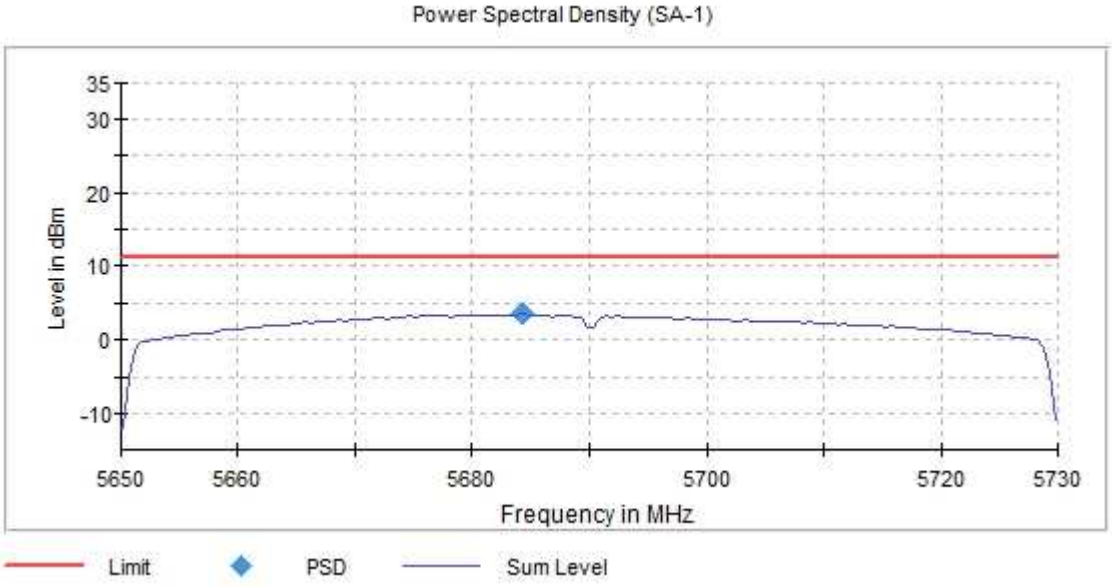


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

- Straddle Channel 138 (5690 MHz):



FCC and IC power setting:

MIMO worst-case:

- Preliminary tests determined the MIMO worst-case: WLAN12.

MIMO 802.11 a20:

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	8.771	8.341	8.412	8.793
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.575
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 n20 (HT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	8.334	8.105	7.942	8.616
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.206
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac20 (VHT20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	7.215	7.206	7.177	8.237
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	8.111
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax20 (HE20):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 100 (5500 MHz)	Low+1 Channel 104 (5520 MHz)	Middle-1 Channel 116 (5580 MHz)	High Channel 140 (5700 MHz)
Maximum Corrected Conducted PSD (dBm)	7.910	7.595	7.117	8.556
Measurement uncertainty (kHz)	<±36.95			

Straddle Channel (5720 MHz):

Channel	Straddle Channel 144 (5720 MHz)
Maximum Corrected Conducted PSD (dBm)	7.838
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	5.394	4.741	5.301	5.902
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	5.094
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	5.280	4.894	5.111	5.608
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	5.150
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 102 (5510 MHz)	Low+1 Channel 110 (5550 MHz)	Middle Channel 118 (5590 MHz) (**)	High Channel 134 (5670 MHz)
Maximum Corrected Conducted PSD (dBm)	5.574	5.241	5.337	5.650
Measurement uncertainty (kHz)	<±36.95			

(**): Channel not allowed in Canada.

Straddle Channel (5710 MHz):

Channel	Straddle Channel 142 (5710 MHz)
Maximum Corrected Conducted PSD (dBm)	1.048
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted PSD (dBm)	2.549	2.632
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted PSD (dBm)	2.203
Measurement uncertainty (kHz)	<±36.95

MIMO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz):

Channels	Low Channel 106 (5530 MHz)	High Channel 122 (5610 MHz) (**)
Maximum Corrected Conducted PSD (dBm)	2.204	2.281
Measurement uncertainty (kHz)	<±36.95	

(**): Channel not allowed in Canada.

Straddle Channel (5690 MHz):

Channel	Straddle Channel 138 (5690 MHz)
Maximum Corrected Conducted PSD (dBm)	1.957
Measurement uncertainty (kHz)	<±36.95

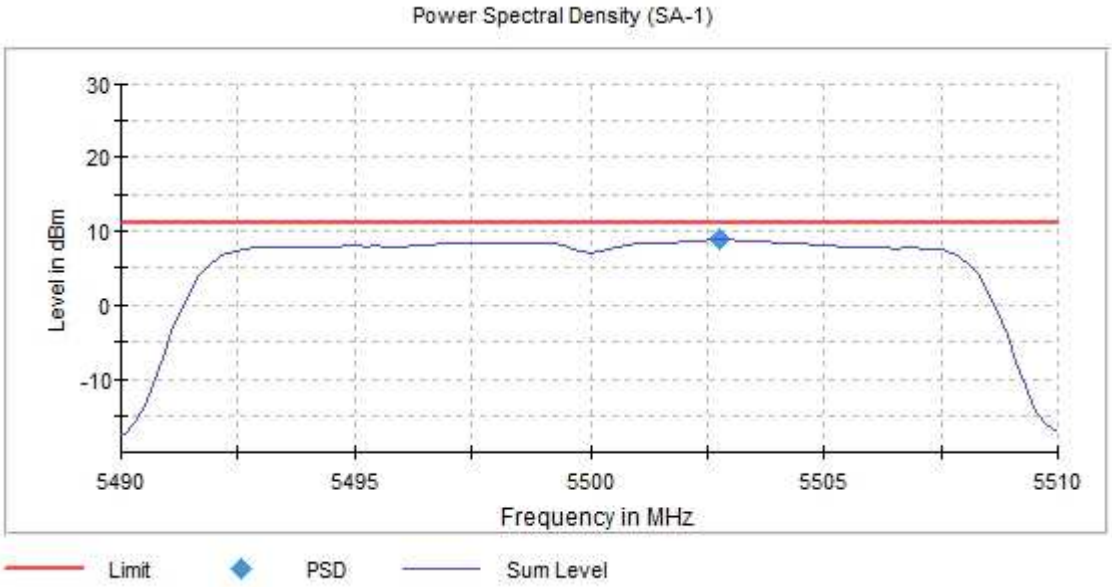
Verdict: PASS

MIMO worst-case:

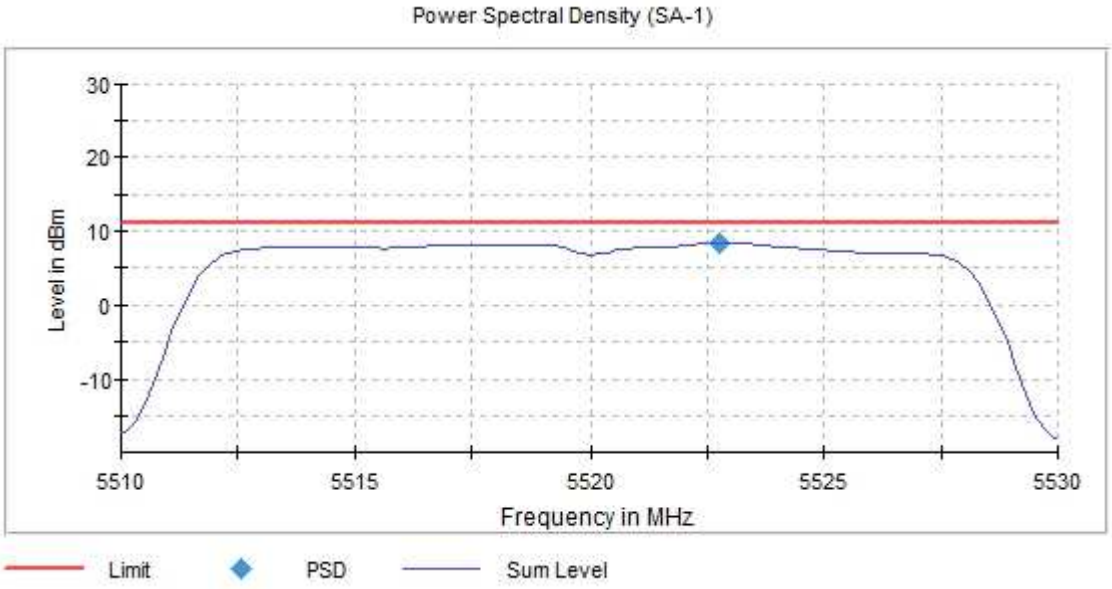
MIMO 802.11 a20:

U-NII-2C (5250-5350 MHz)

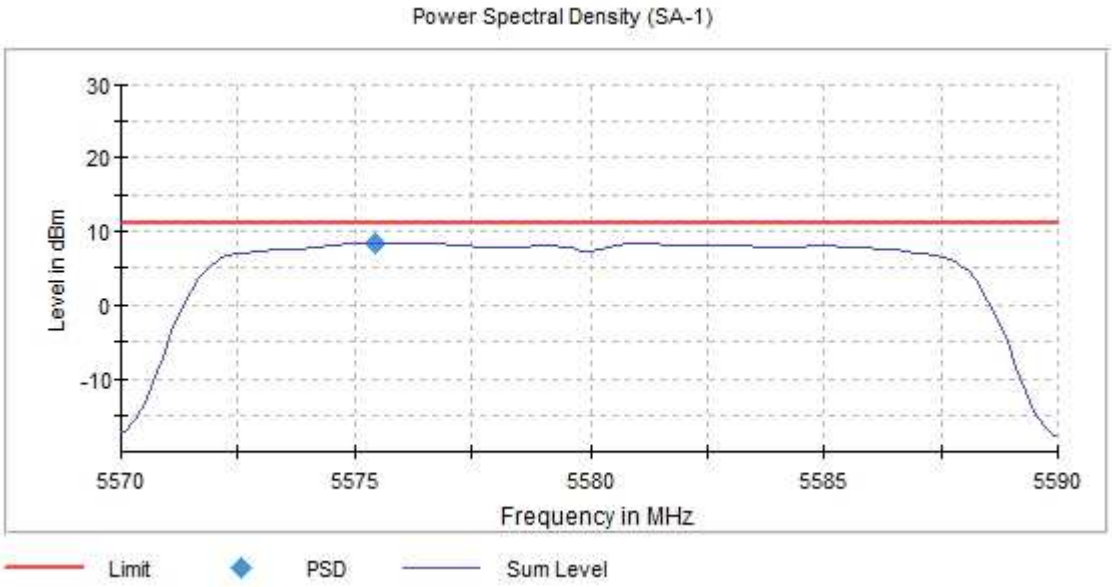
- Low Channel 100 (5500 MHz):



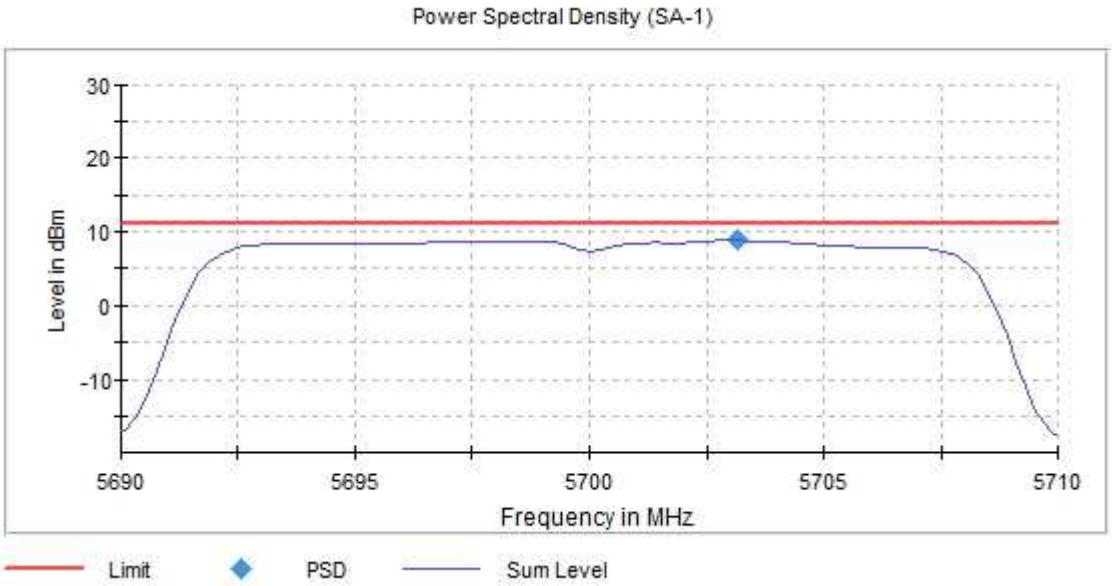
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

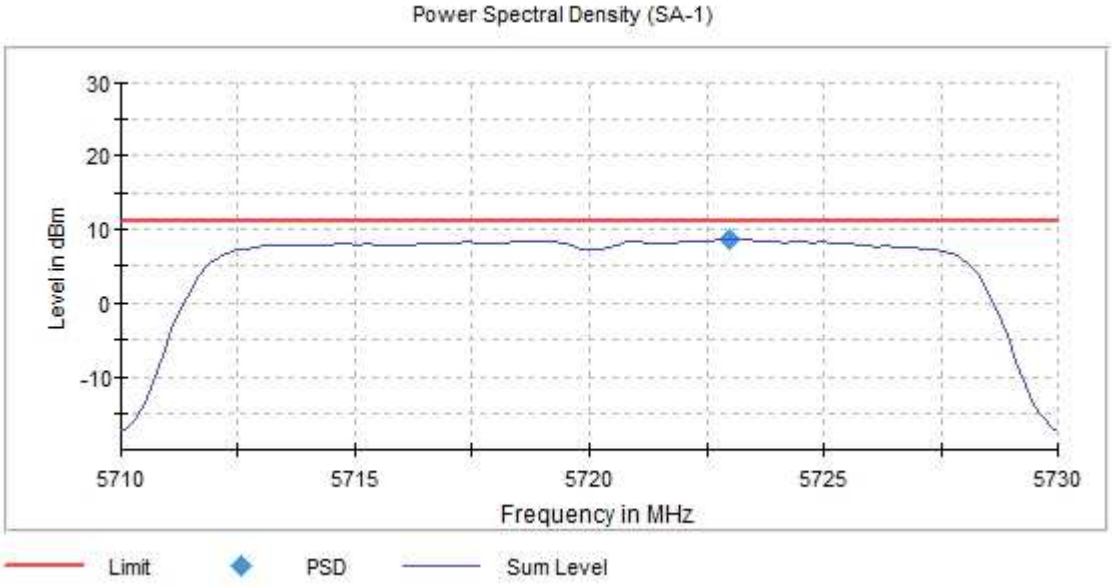


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

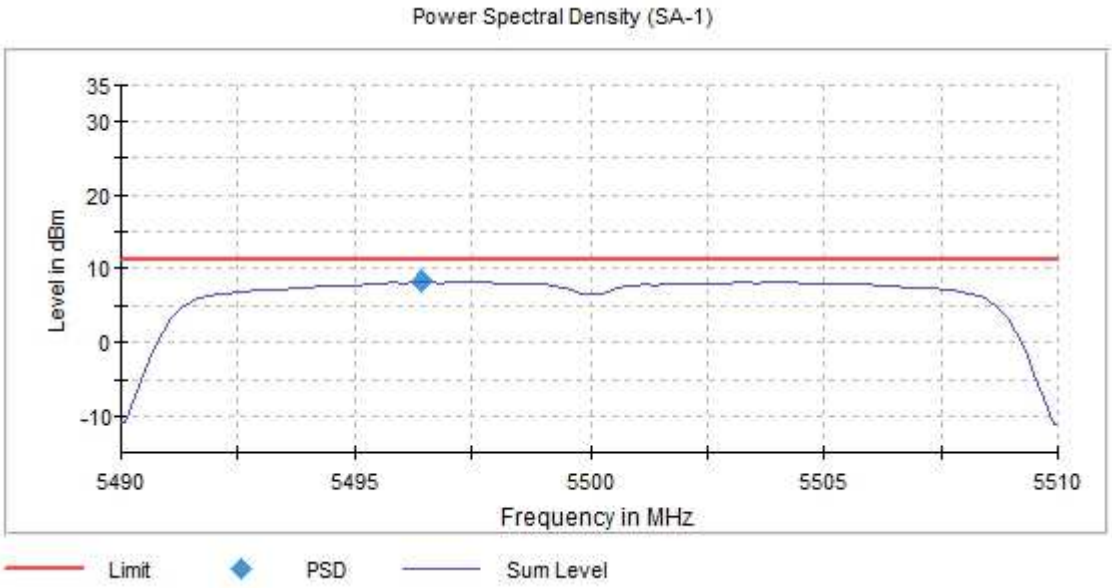
- Straddle Channel 144 (5720 MHz):



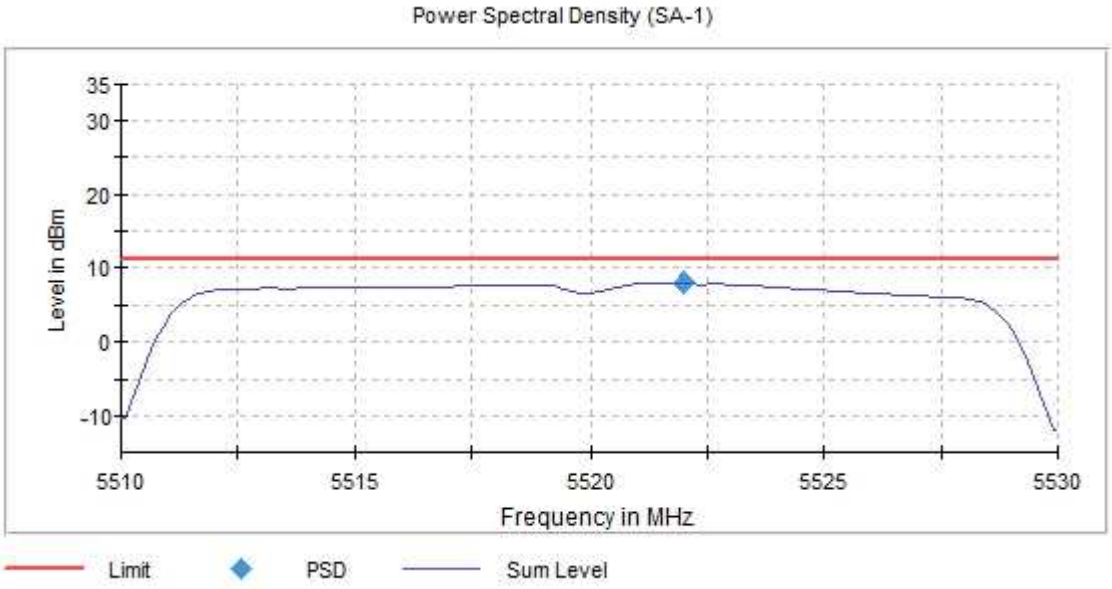
MIMO 802.11 n20 (HT20):

U-NII-2C (5250-5350 MHz)

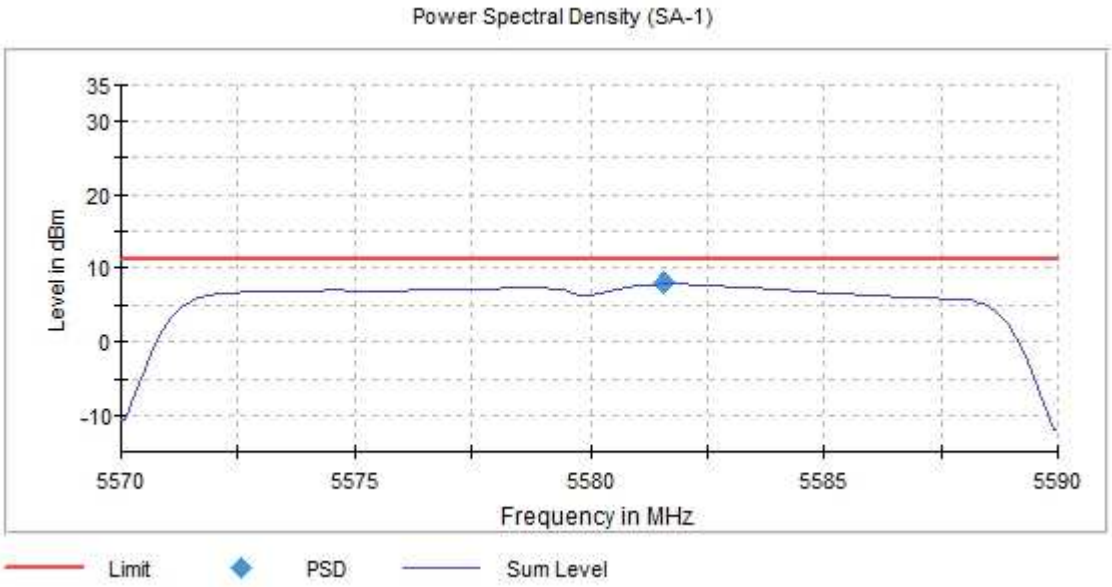
- Low Channel 100 (5500 MHz):



- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):



- High Channel 140 (5700 MHz):

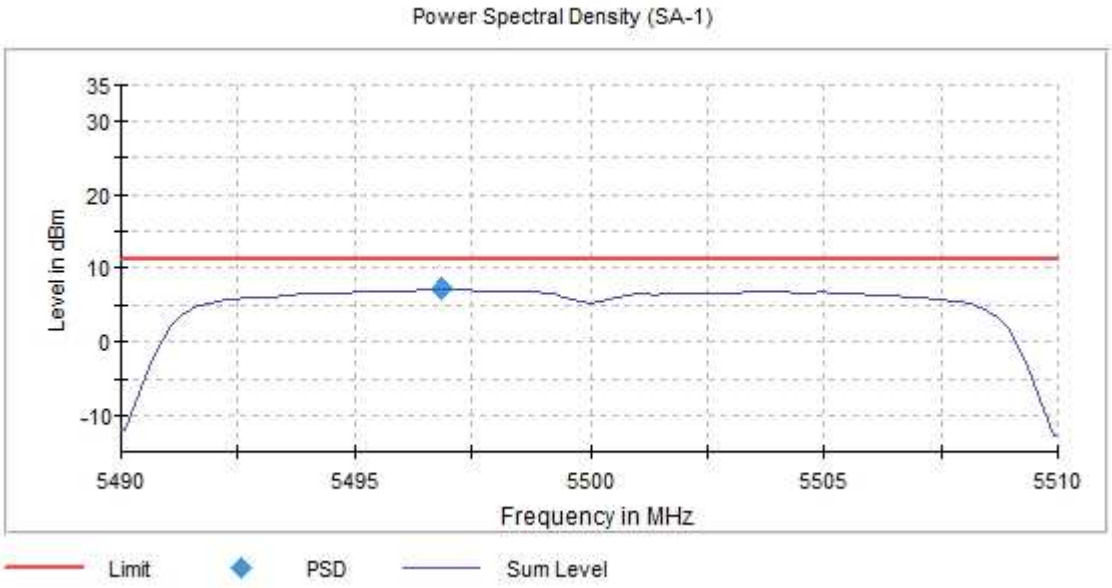
STRADDLE CHANNEL

- Straddle Channel 144 (5720 MHz):

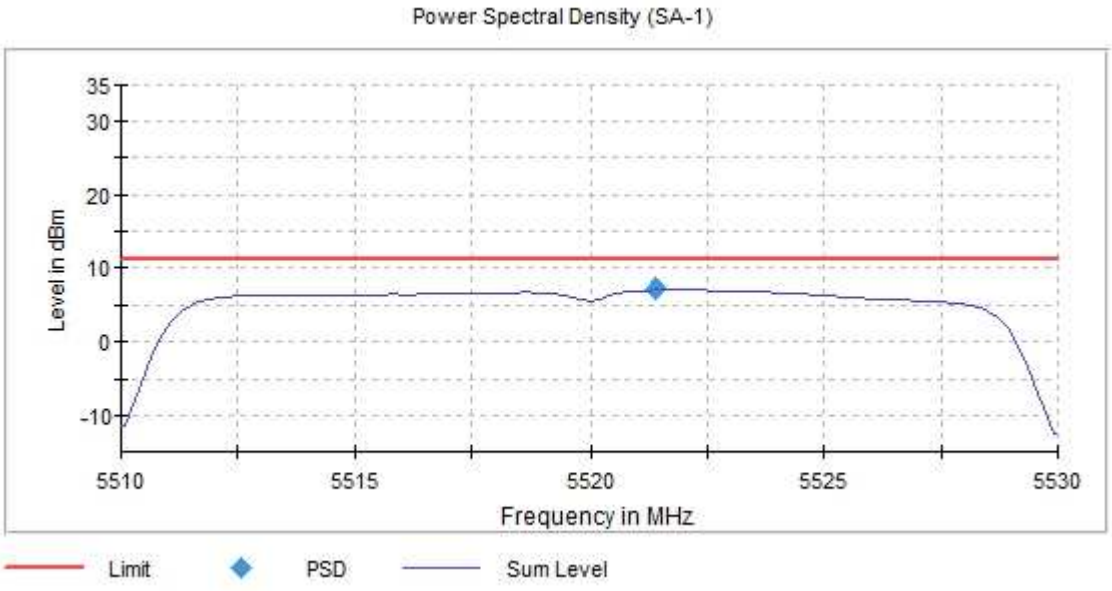
MIMO 802.11 ac20 (VHT20):

U-NII-2C (5250-5350 MHz)

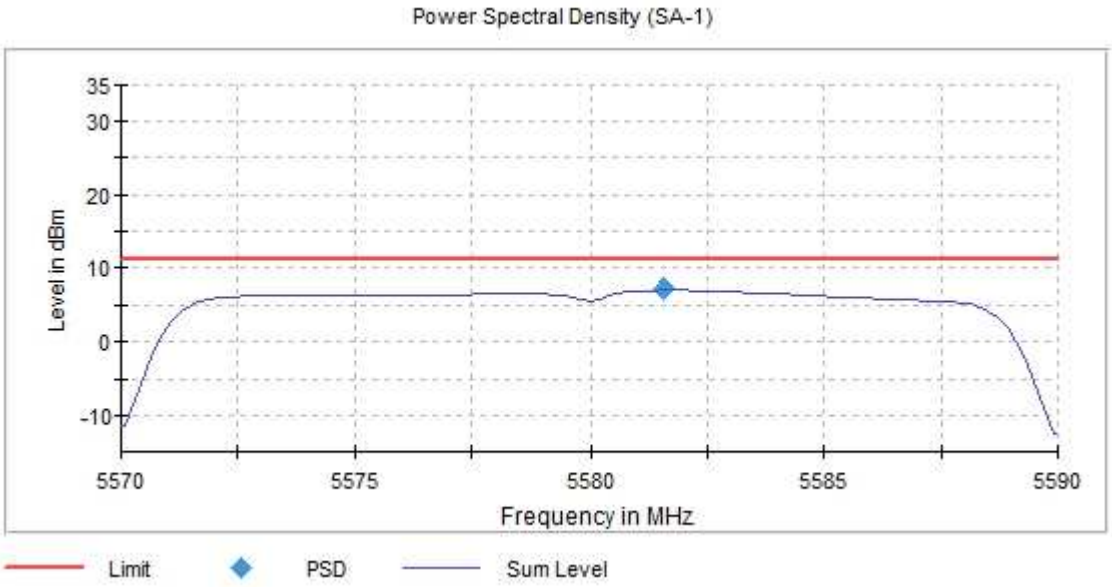
- Low Channel 100 (5500 MHz):



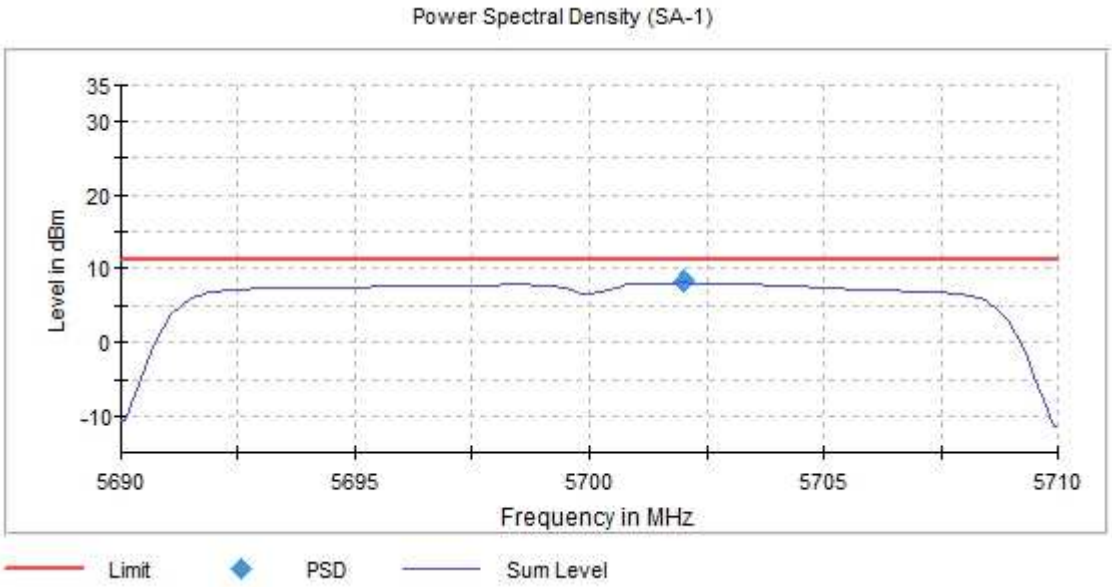
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

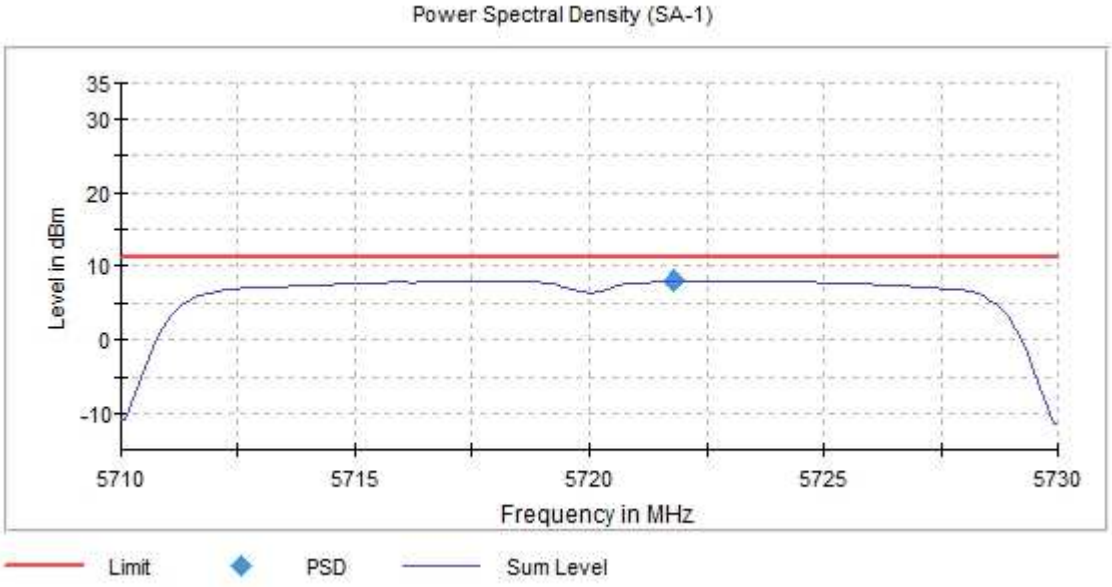


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

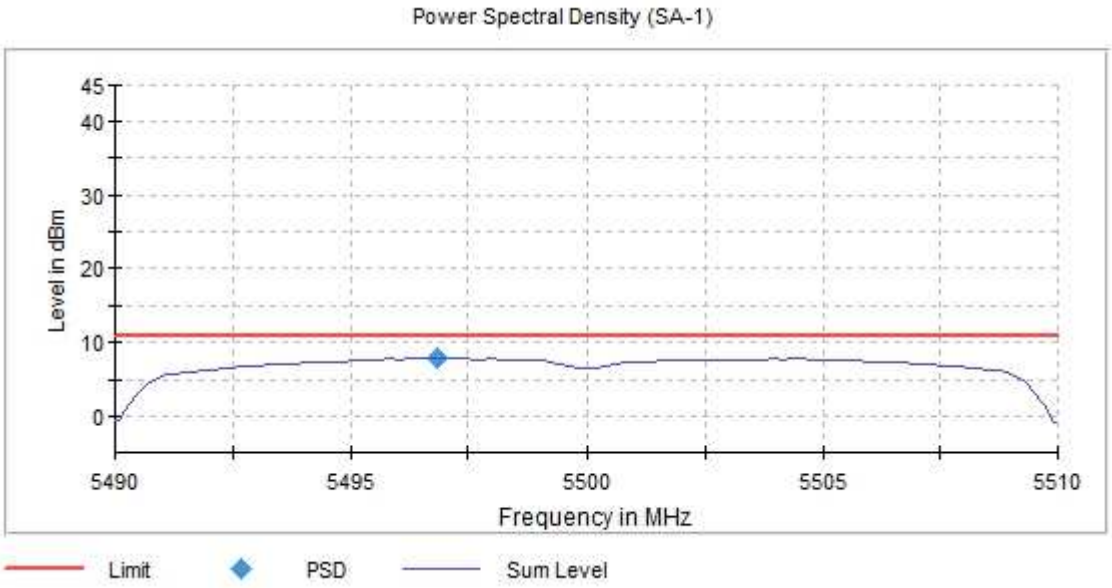
- Straddle Channel 144 (5720 MHz):



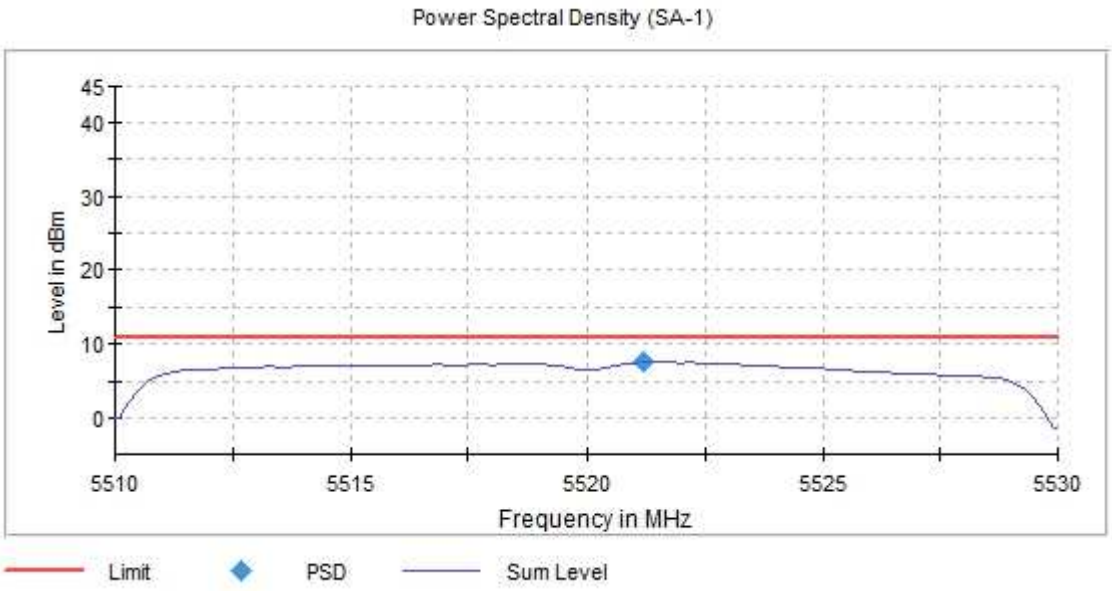
MIMO 802.11 ax20 (HE20):

U-NII-2C (5250-5350 MHz)

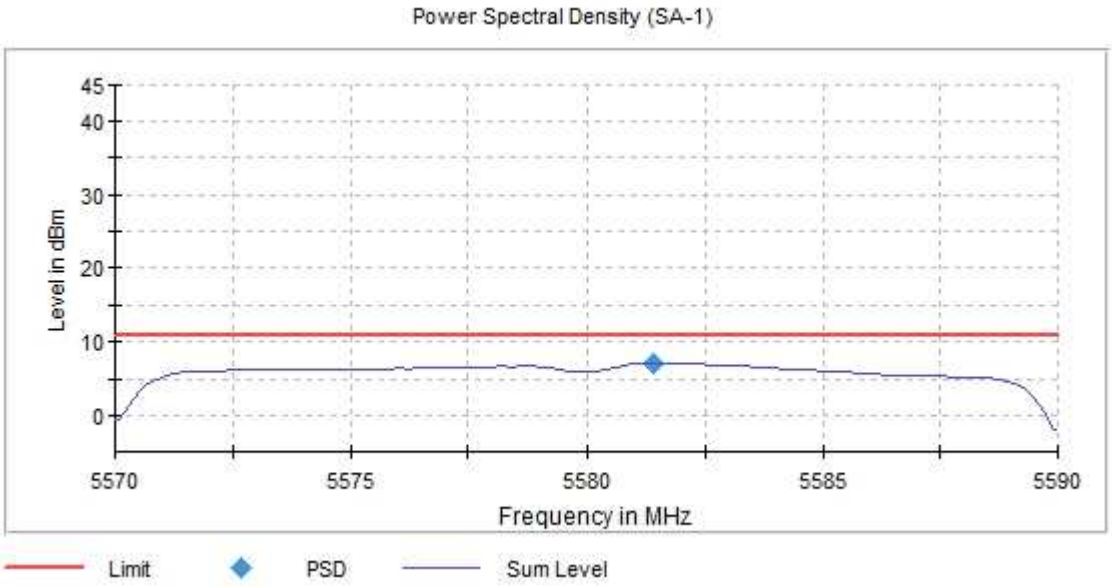
- Low Channel 100 (5500 MHz):



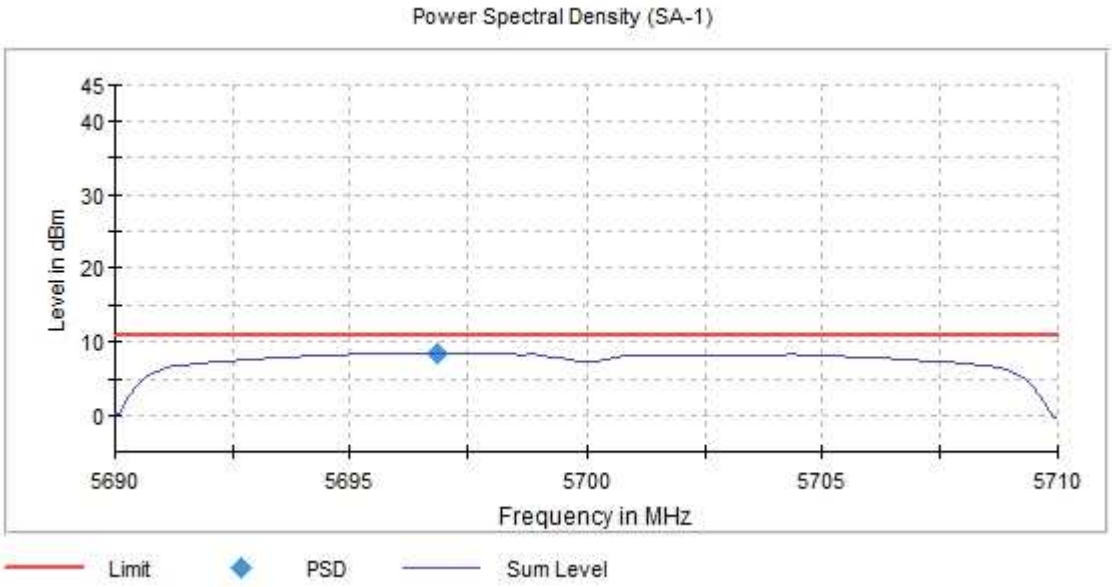
- Low+1 Channel 104 (5520 MHz):



- Middle-1 Channel 116 (5580 MHz):

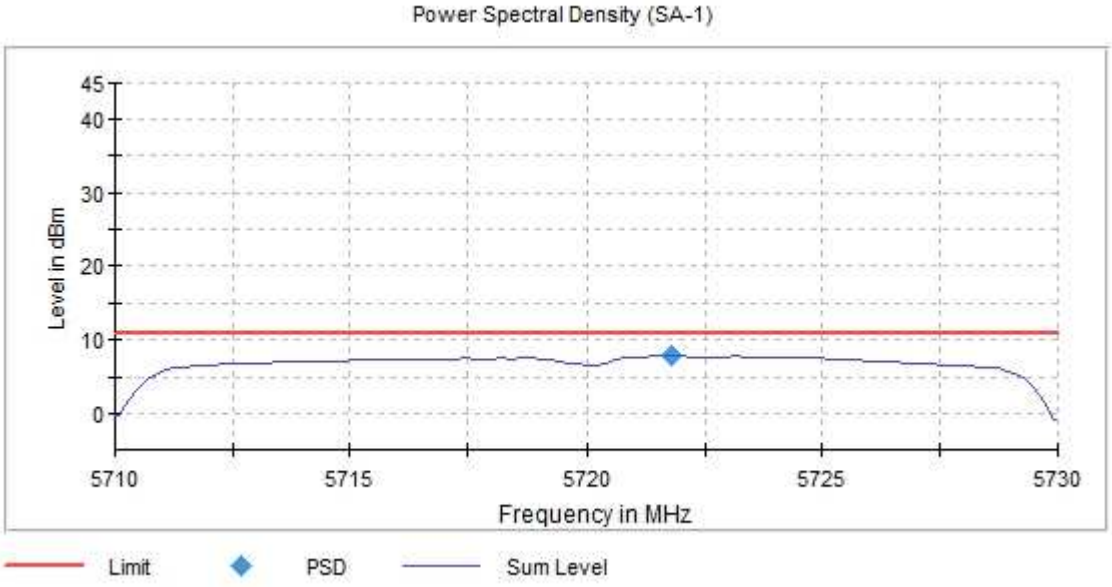


- High Channel 140 (5700 MHz):



STRADDLE CHANNEL

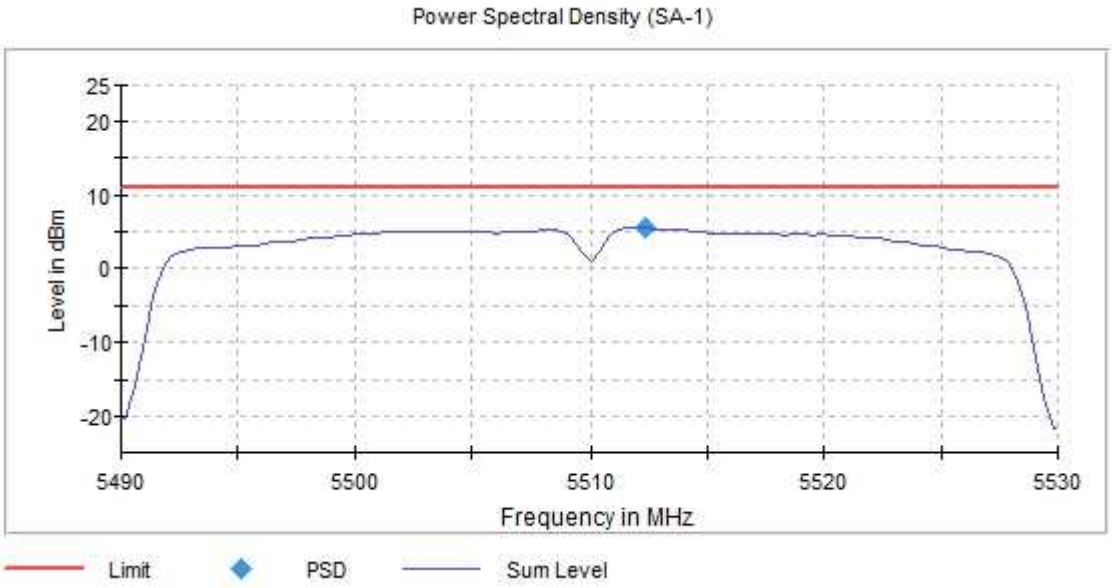
- Straddle Channel 144 (5720 MHz):



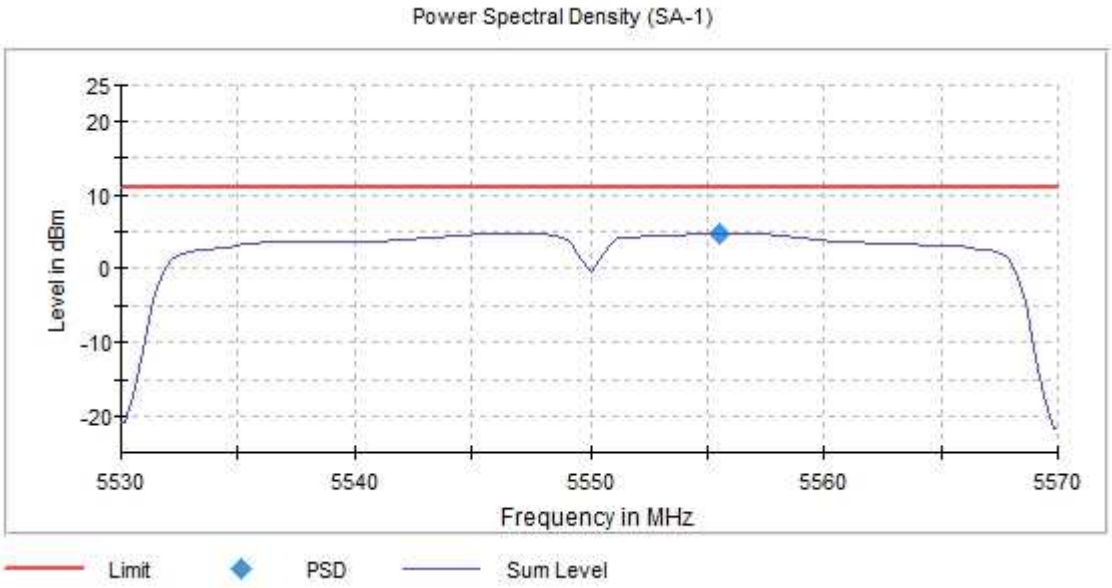
MIMO 802.11 n40 (HT40):

U-NII-2C (5470-5725 MHz)

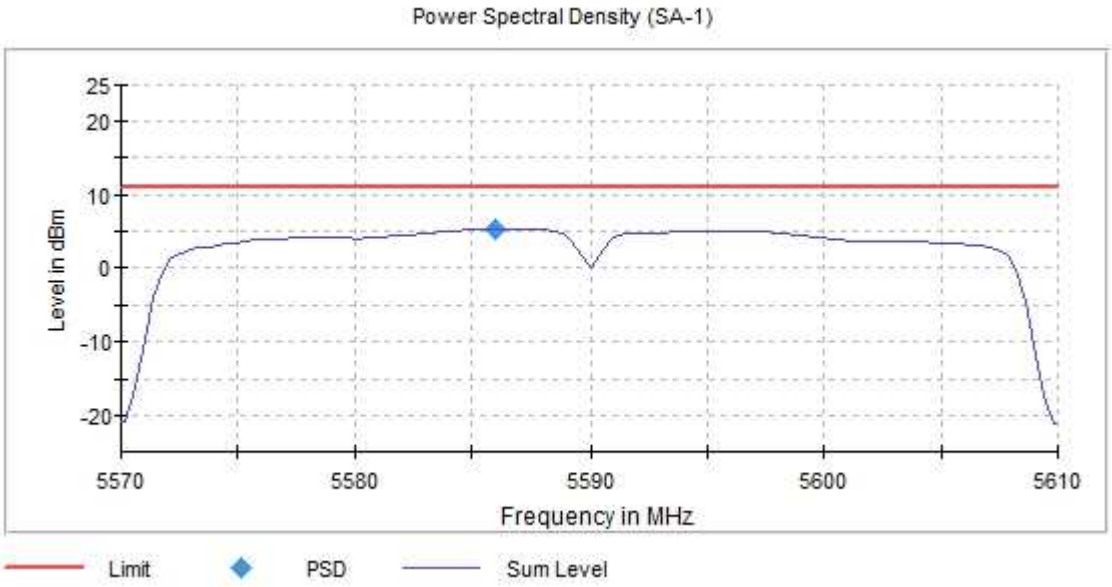
- Low Channel 102 (5510 MHz):



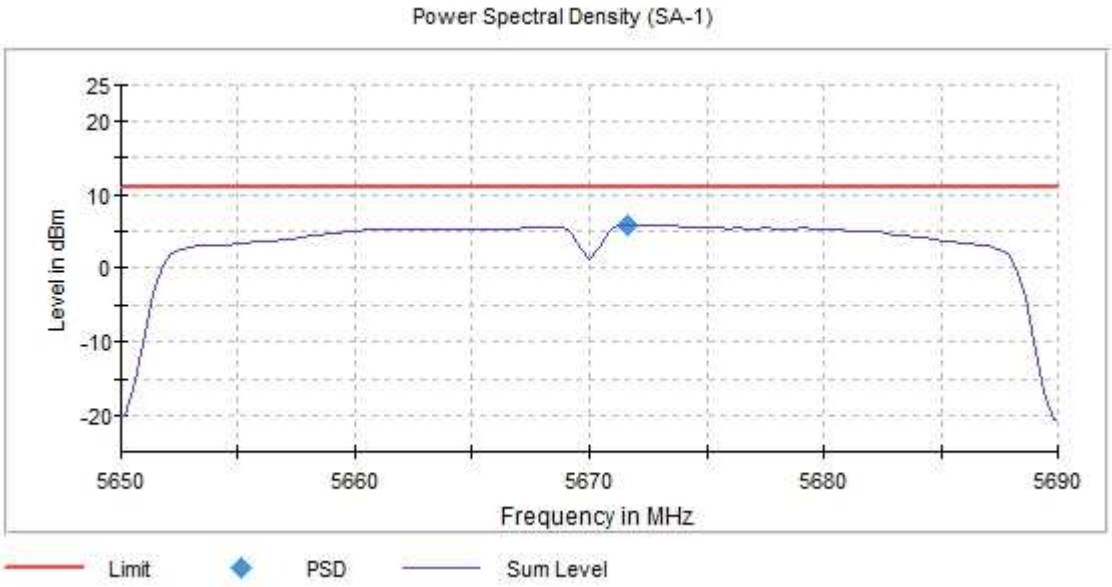
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

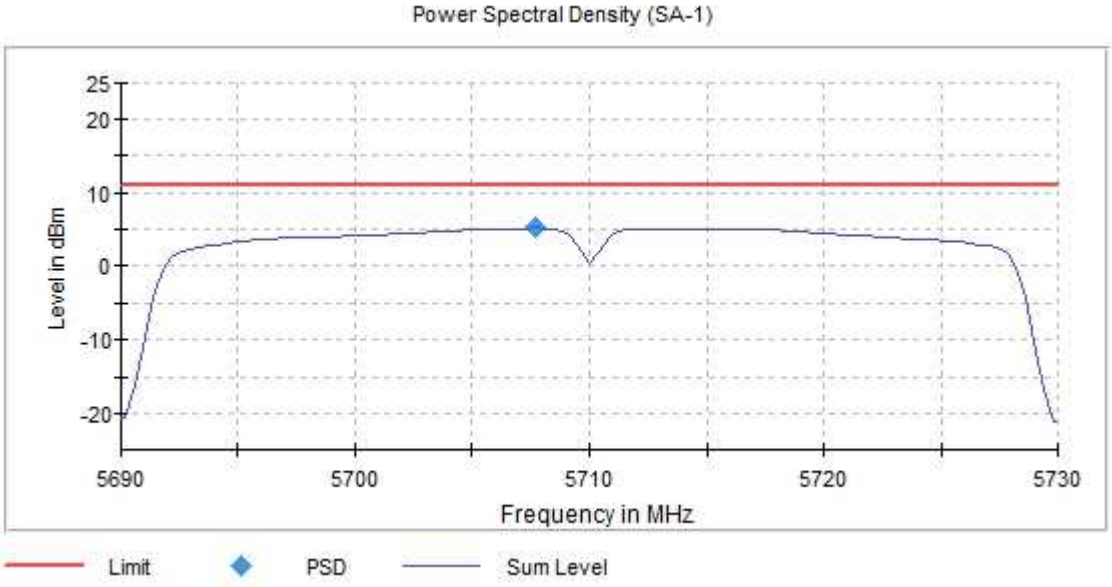


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

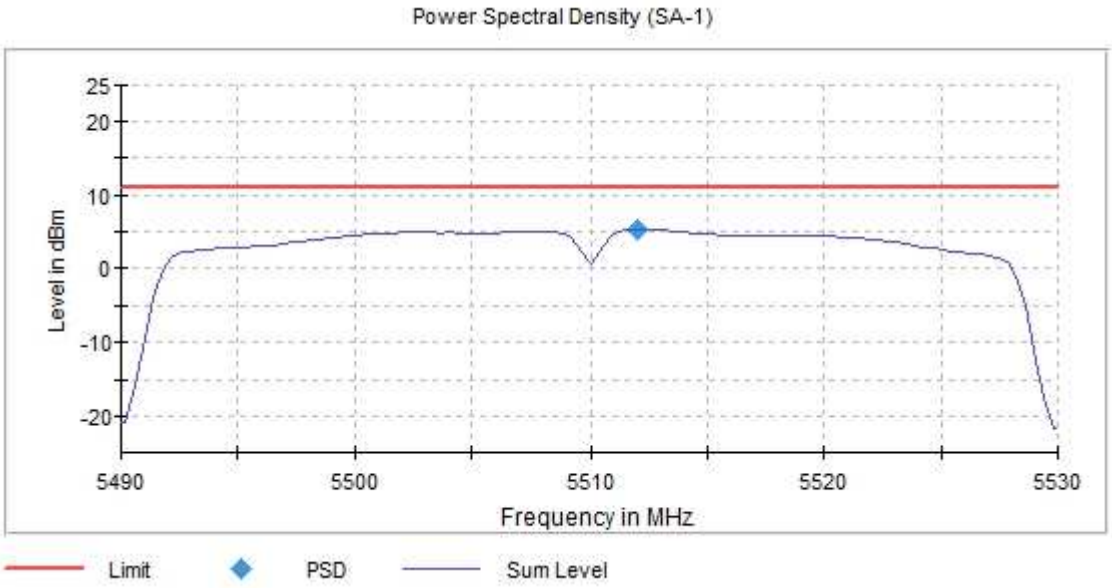
- Straddle Channel 142 (5710 MHz):



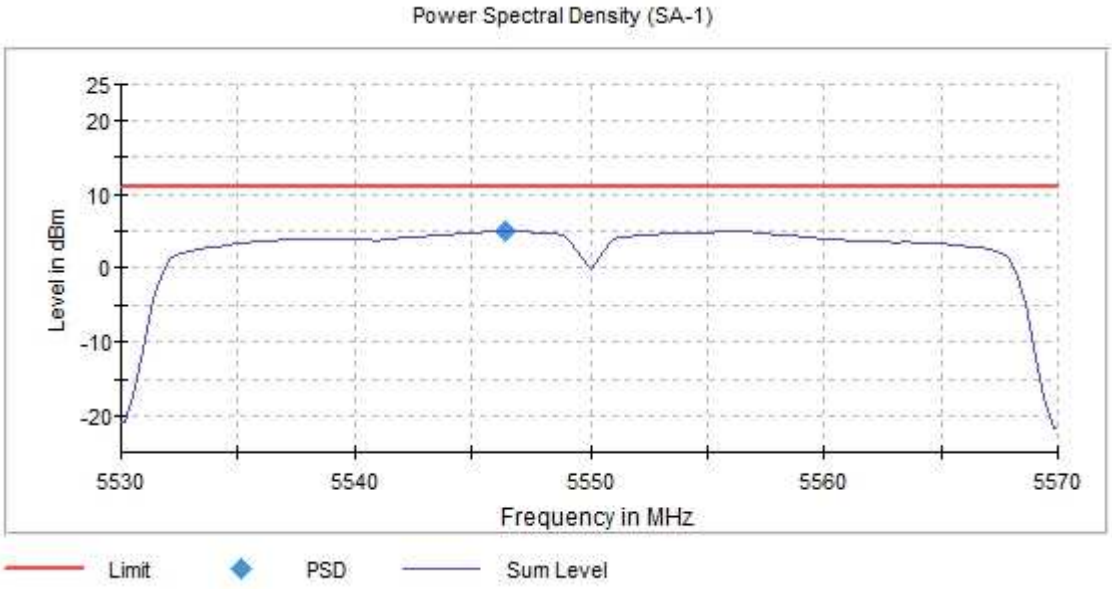
MIMO 802.11 ac40 (VHT40):

U-NII-2C (5470-5725 MHz)

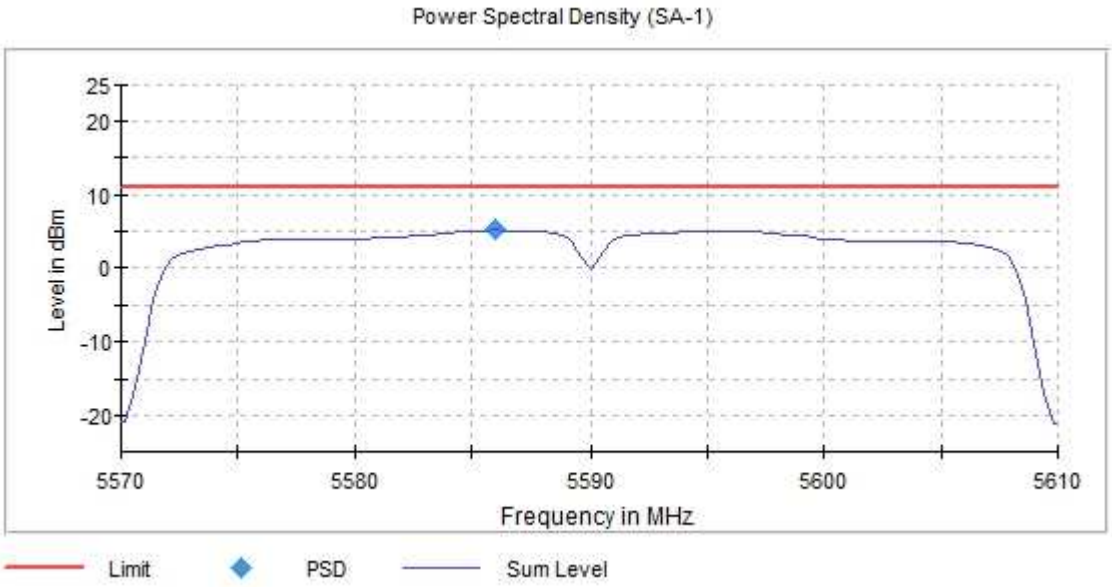
- Low Channel 102 (5510 MHz):



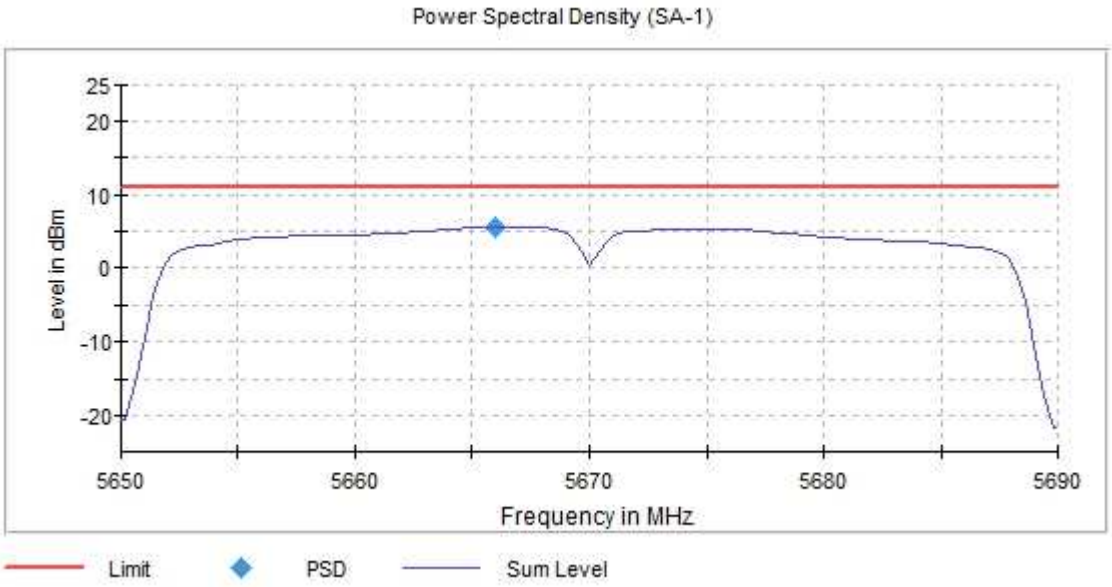
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

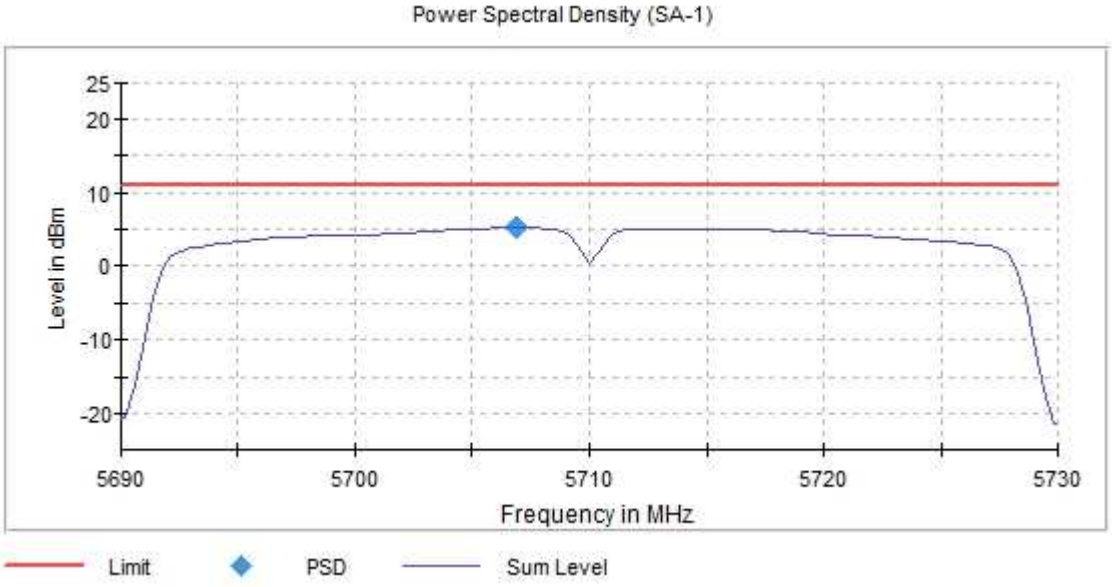


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

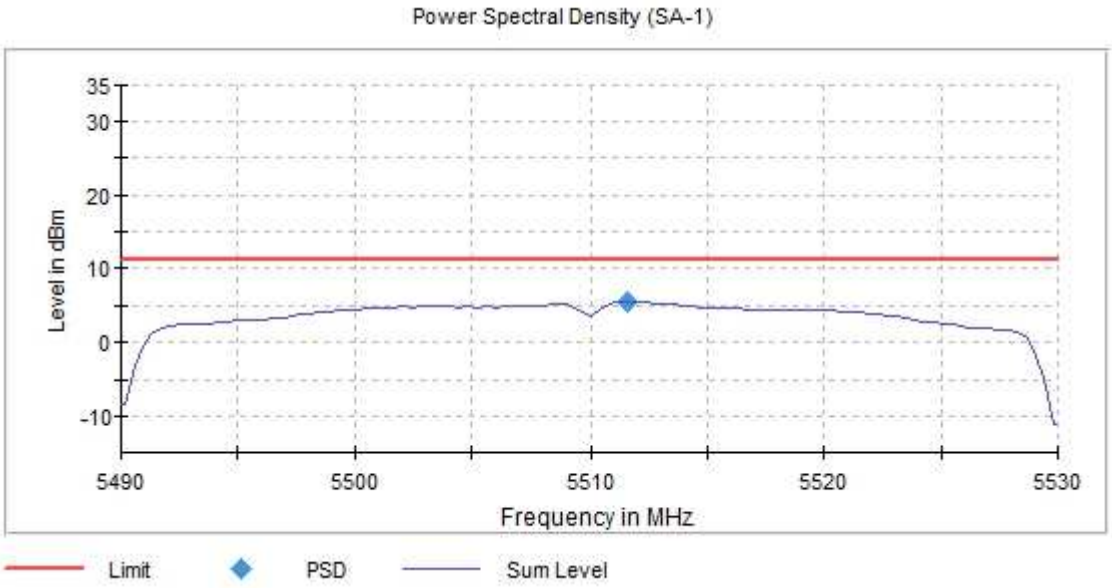
- Straddle Channel 142 (5710 MHz):



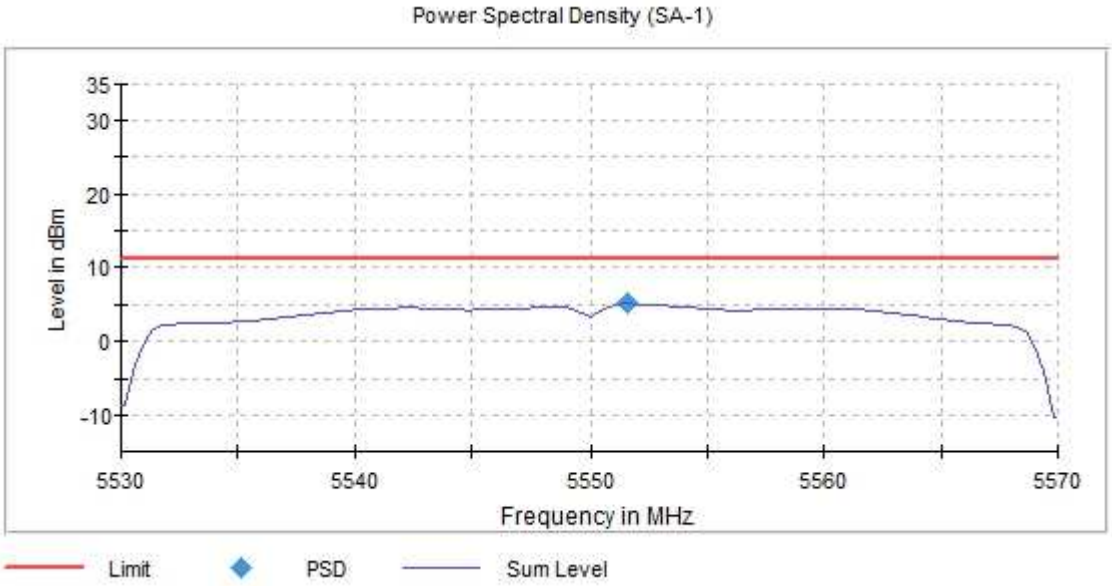
MIMO 802.11 ax40 (HE40):

U-NII-2C (5470-5725 MHz)

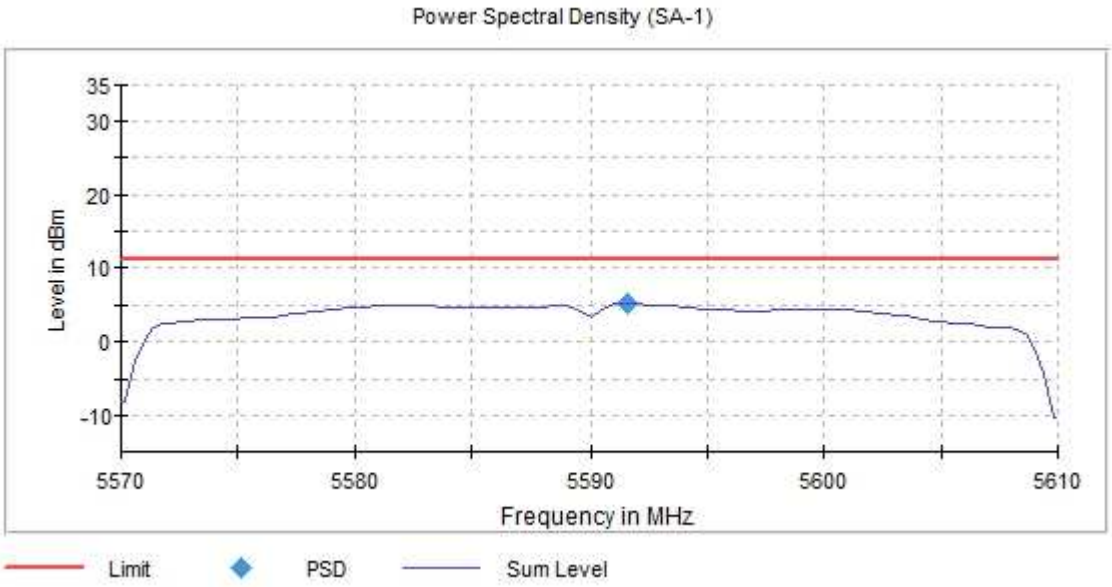
- Low Channel 102 (5510 MHz):



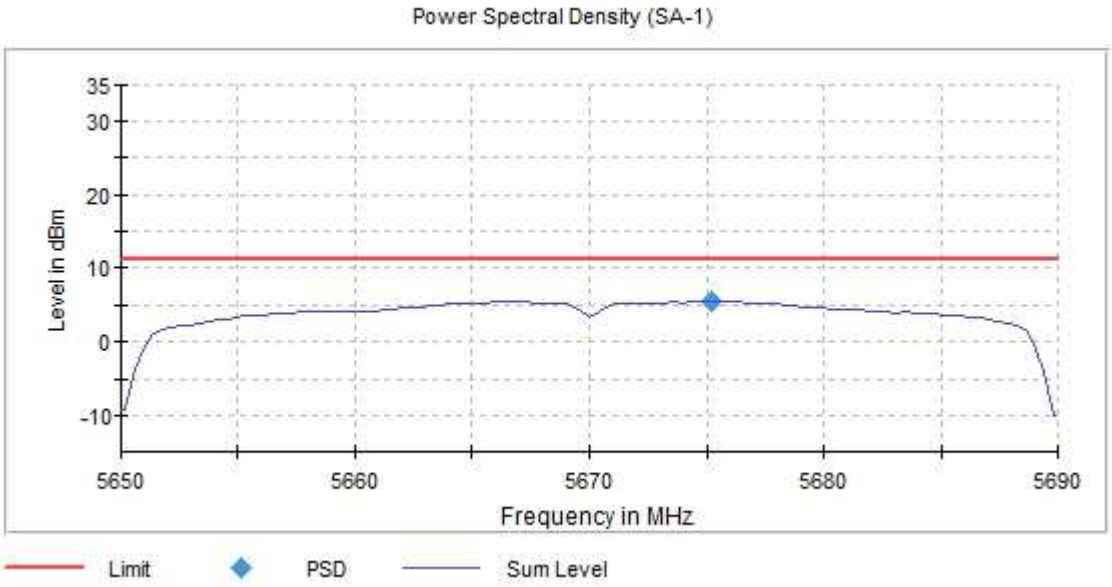
- Low+1 Channel 110 (5550 MHz):



- Middle Channel 118 (5590 MHz):

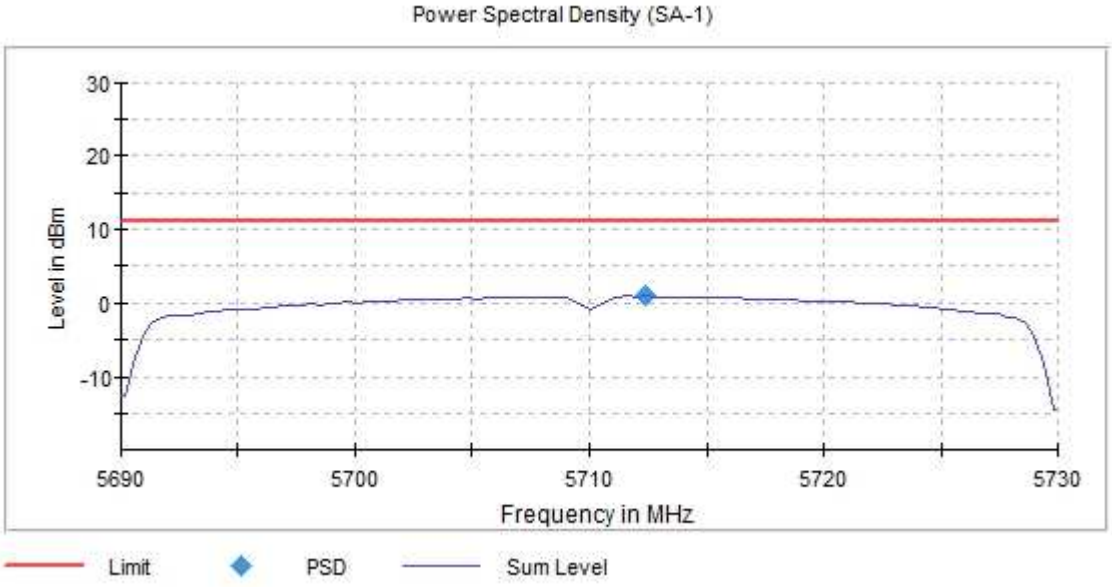


- High Channel 134 (5670 MHz):



STRADDLE CHANNEL

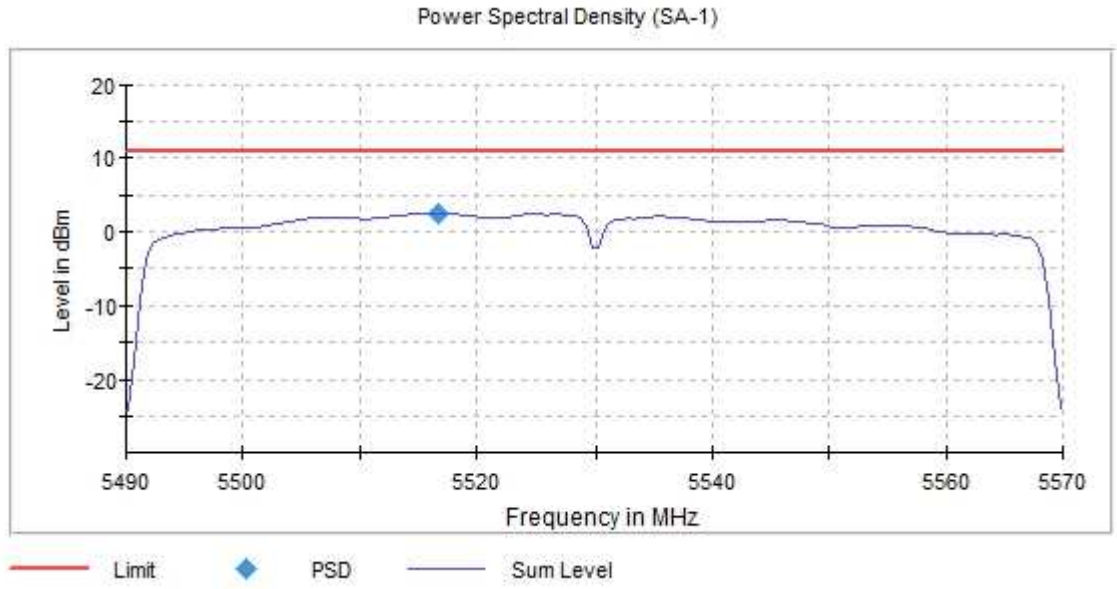
- Straddle Channel 142 (5710 MHz):



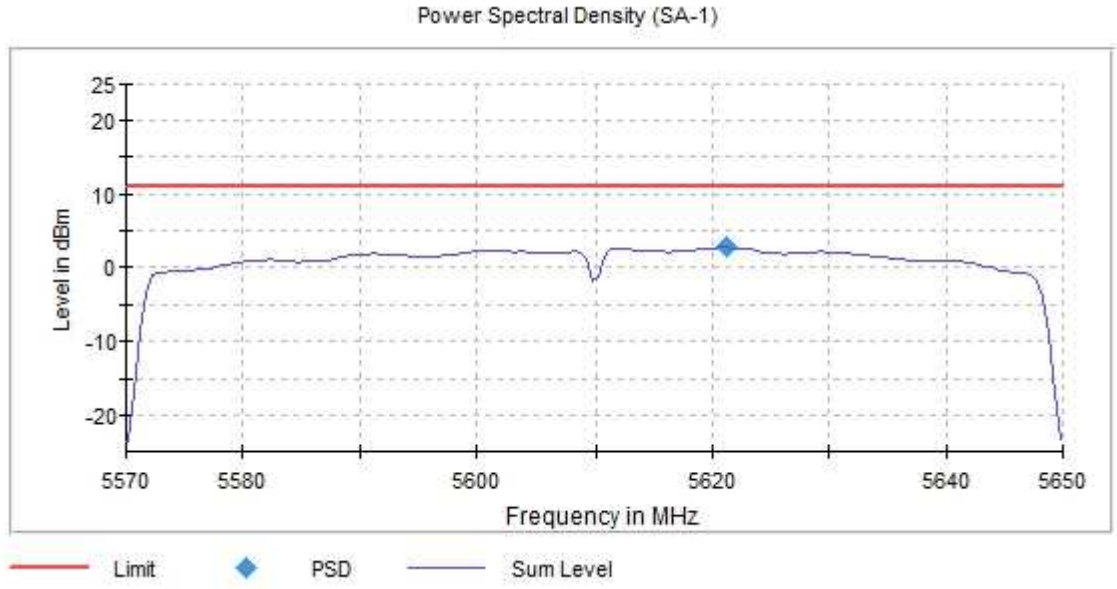
MIMO 802.11 ac80 (VHT80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

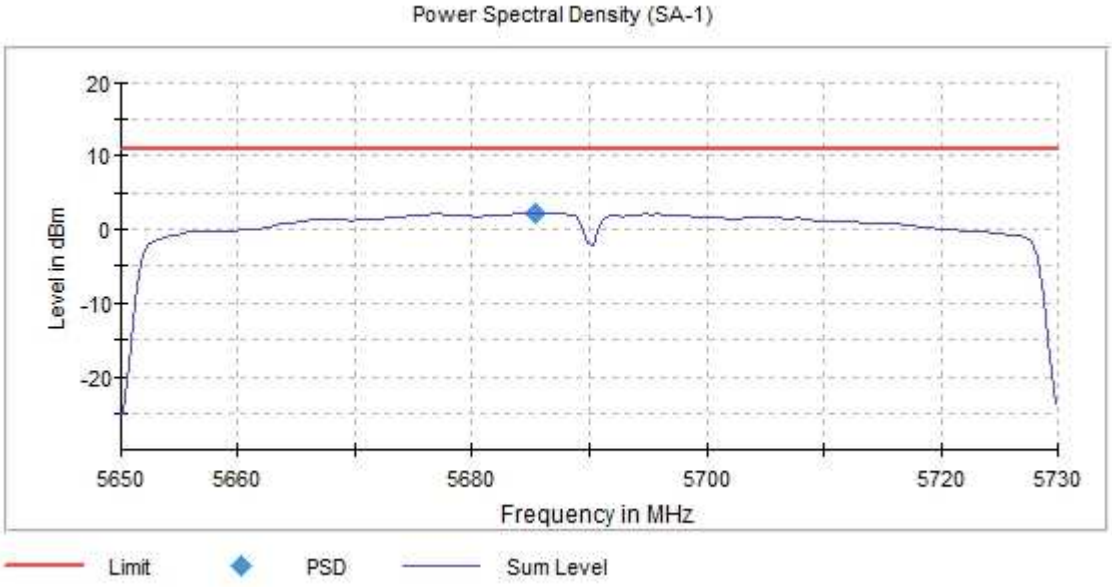


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

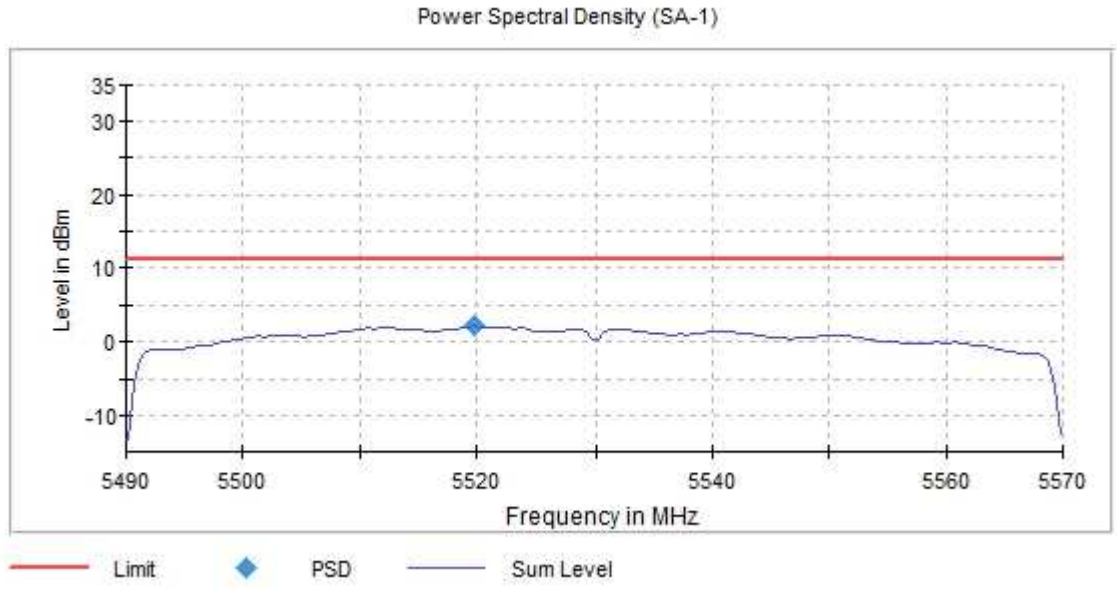
- Straddle Channel 138 (5690 MHz):



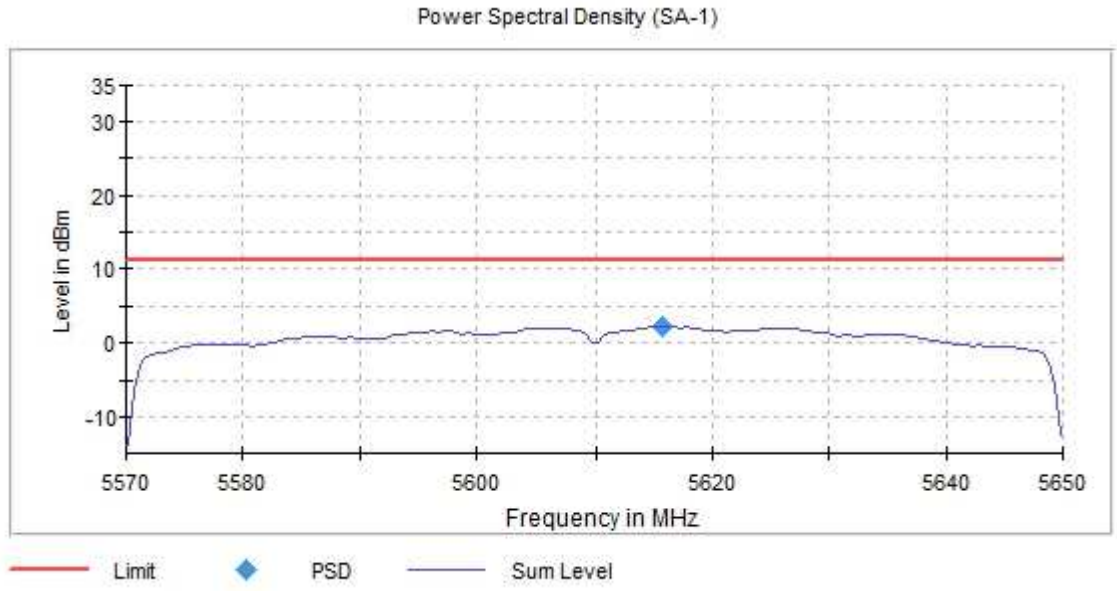
MIMO 802.11 ax80 (HE80):

U-NII-2C (5470-5725 MHz)

- Low Channel 106 (5530 MHz):

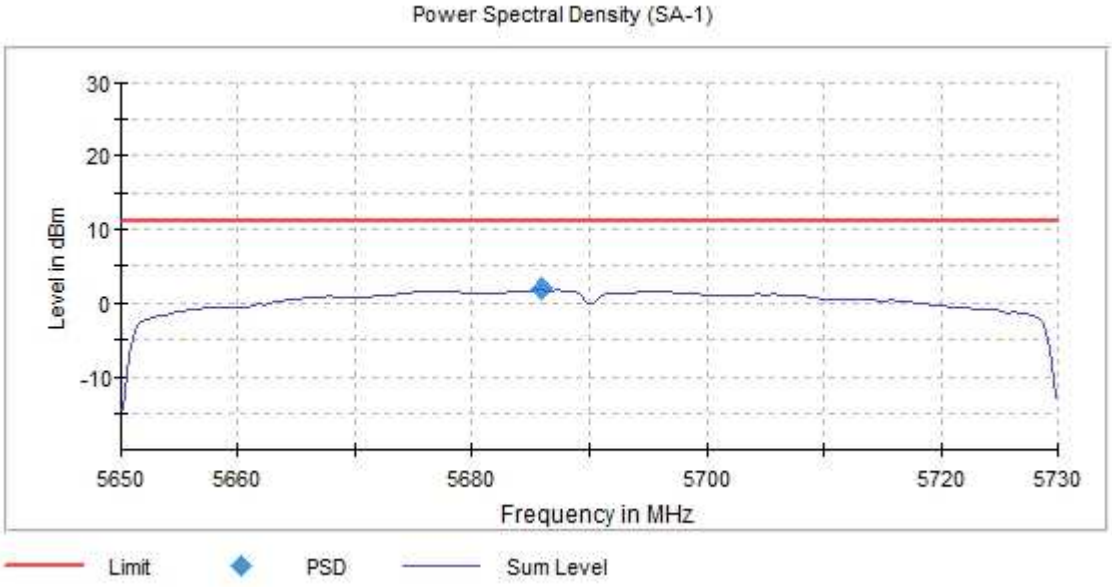


- High Channel 122 (5610 MHz):



STRADDLE CHANNEL

- Straddle Channel 138 (5690 MHz):



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

SPECIFICATION:

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.20 dBµV/m at 3 m distance).

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

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

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

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

RESULTS:

The 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 1m for the frequency range 1 GHz-40 GHz and a distance of 3m for frequency range 30MHz-1GHz.

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 worst-case was determined by measuring the eirp density (radiated). Test performed on the worst-case:

SISO worst-case:

- Preliminary tests determined the SISO worst-case: WLAN1.

  Worst-case: **802.11 a20** (bit rate of 6 Mbps).

Frequency range 30 MHz - 1 GHz (SISO worst-case):

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

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
48.963500	22.18	V	Quasi Peak
120.113000	27.81	V	Quasi Peak
127.194000	28.08	V	Quasi Peak

Measurement Uncertainty (dB) <± 5.1

Frequency range 1 - 40 GHz (SISO worst-case):

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

The Low, Middle and High Channels were measured for out-of-band emissions for the worst mode.

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

- **SISO 802.11 a20 (SISO worst-case):**

** Duty Cycle: 0.26 dB*

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	51.99	51.99	H	Peak
5088.000000	56.99	56.99	H	Peak
	46.87	47.13		Average
5088.500000	56.91	56.91	H	Peak
	45.20	45.46		Average
5855.500000	54.11	54.11	H	Peak
	41.89	42.15		Average
8750.000000	49.94	49.94	V	Peak
11000.000000	52.78	52.78	V	Peak
13629.500000	55.92	55.92	V	Peak
	42.62	42.88		Average
14472.000000	53.51	53.51	V	Peak

- LOW+1 CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	51.50	51.50	H	Peak
4992.000000	55.80	55.80	H	Peak
	44.89	45.15		Average
5088.000000	57.37	57.37	H	Peak
	47.19	47.45		Average
5376.000000	57.43	57.43	H	Peak
	46.81	47.07		Average
6437.500000	54.30	54.30	V	Peak

	41.31	41.57		Average
7360.000000	47.48	47.48	V	Peak
8750.000000	49.75	49.75	V	Peak
11040.000000	52.16	52.16	V	Peak
14472.000000	53.71	53.71	V	Peak

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	52.22	52.22	H	Peak
4992.000000	57.22	57.22	H	Peak
	46.79	47.05		Average
5088.000000	58.22	58.22	H	Peak
	47.38	47.64		Average
5391.000000	57.55	57.55	H	Peak
	44.09	44.35		Average
7961.000000	47.55	47.55	V	Peak
8750.000000	49.97	49.97	V	Peak
11160.000000	52.35	52.35	V	Peak
14472.000000	53.52	53.52	V	Peak
22319.900000	42.74	42.74	V	Peak
39264.000000	51.69	51.69	H	Peak

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	52.18	52.18	H	Peak
3812.500000	49.69	49.69	H	Peak
4992.000000	57.22	57.22	H	Peak
	46.99	47.25		Average
5088.000000	58.40	58.40	H	Peak
	47.75	48.01		Average
5280.500000	57.99	57.99	H	Peak
5376.000000	57.85	57.85	H	Peak
	47.11	47.37		Average
8750.000000	50.15	50.15	V	Peak
11400.000000	52.98	52.98	V	Peak
13977.500000	54.20	54.20	H	Peak
	41.38	41.64		Average
14472.000000	54.12	54.12	V	Peak
	43.05	43.31		Average

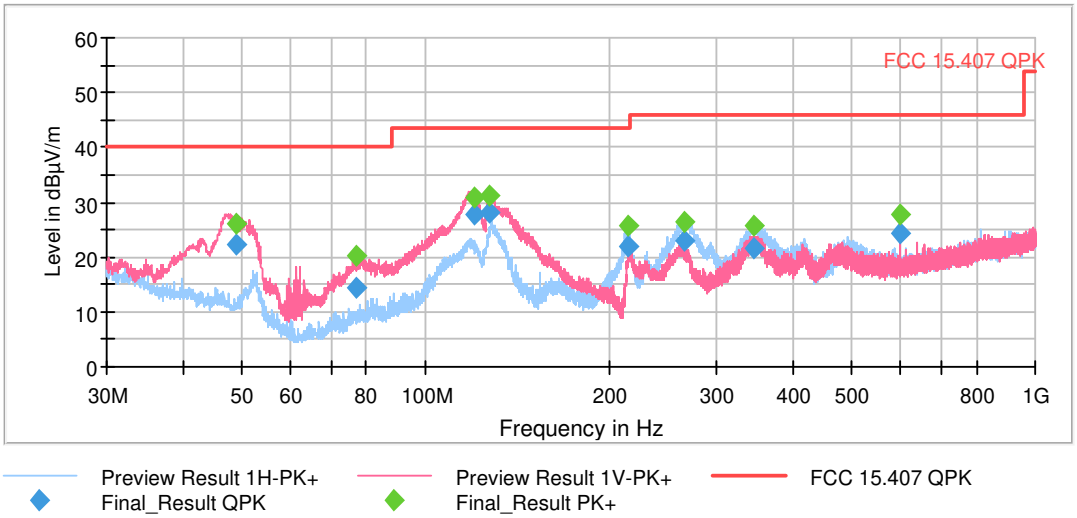
Measurement Uncertainty (dB): 1 GHz <± f < 17 GHz: <± 4.6
17 GHz <± f <± 26.5 GHz: <± 4.89
26.5 GHz <± f <± 40 GHz: <± 5.14

Verdict: PASS

SISO worst-case:

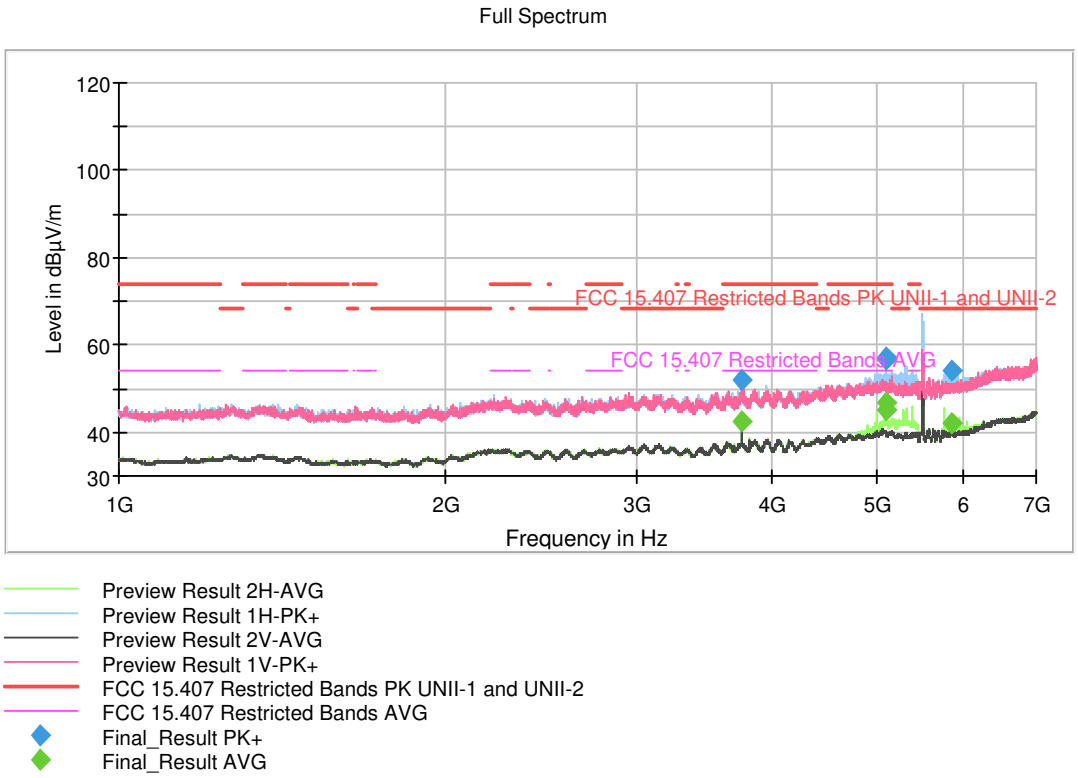
FREQUENCY RANGE 30 MHz - 1 GHz (SISO worst-case):

This plot is valid for all the Channels and all the modulation modes and bandwidths.



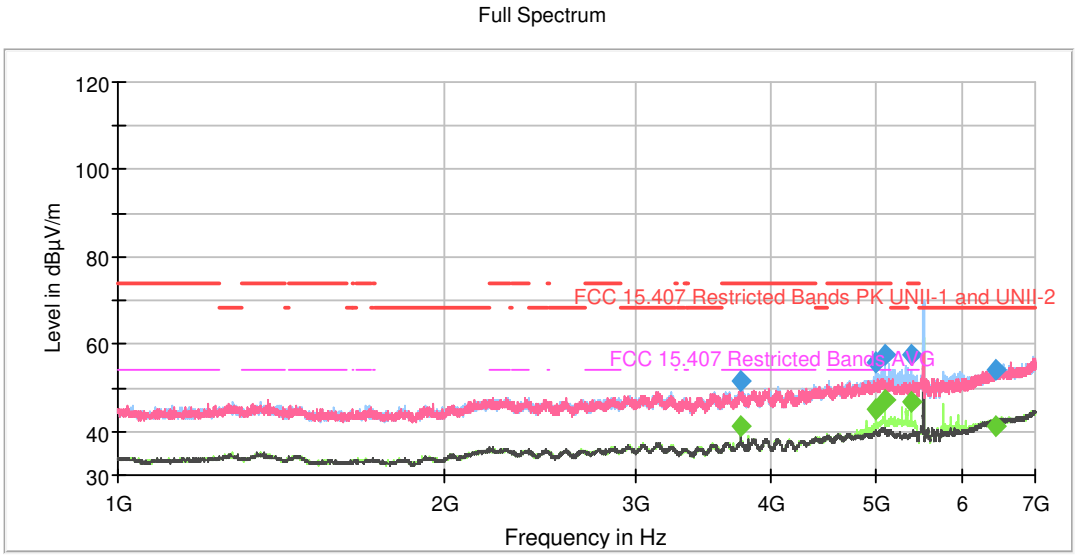
FREQUENCY RANGE 1 - 7 GHz (SISO worst-case):

- Low Channel:



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

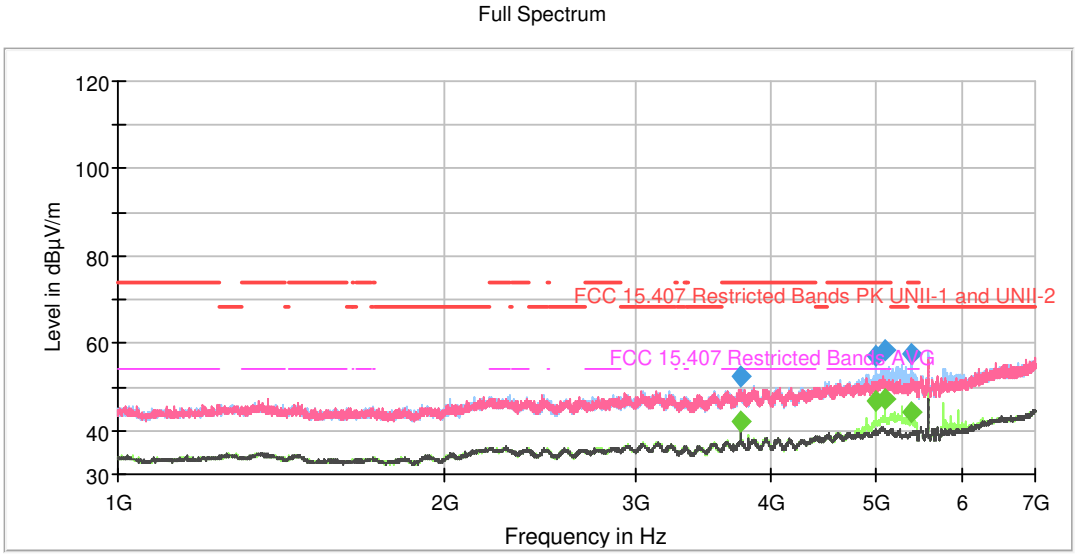
- Low+1 Channel:



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

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

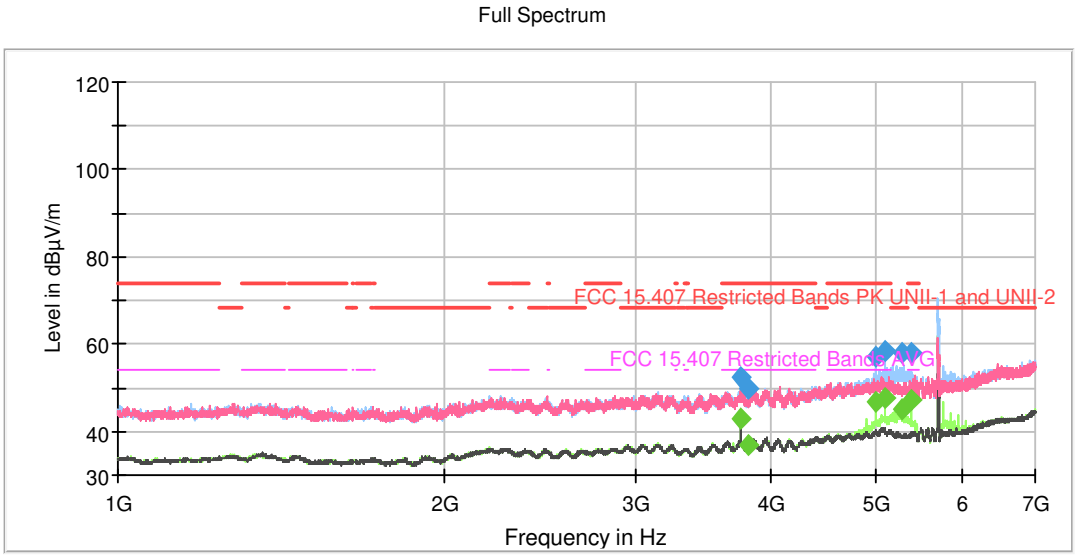
- Middle Channel:



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

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

- High Channel:

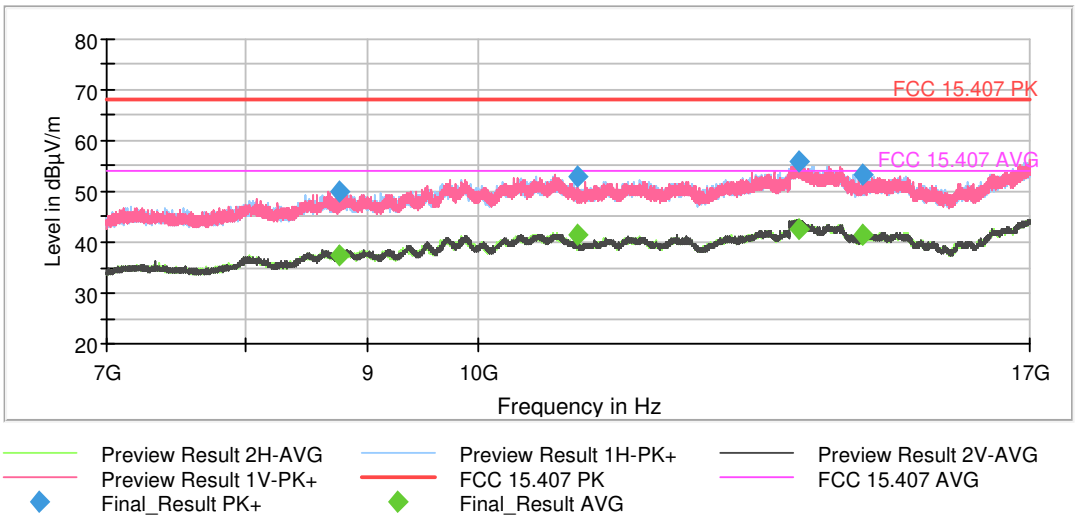


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

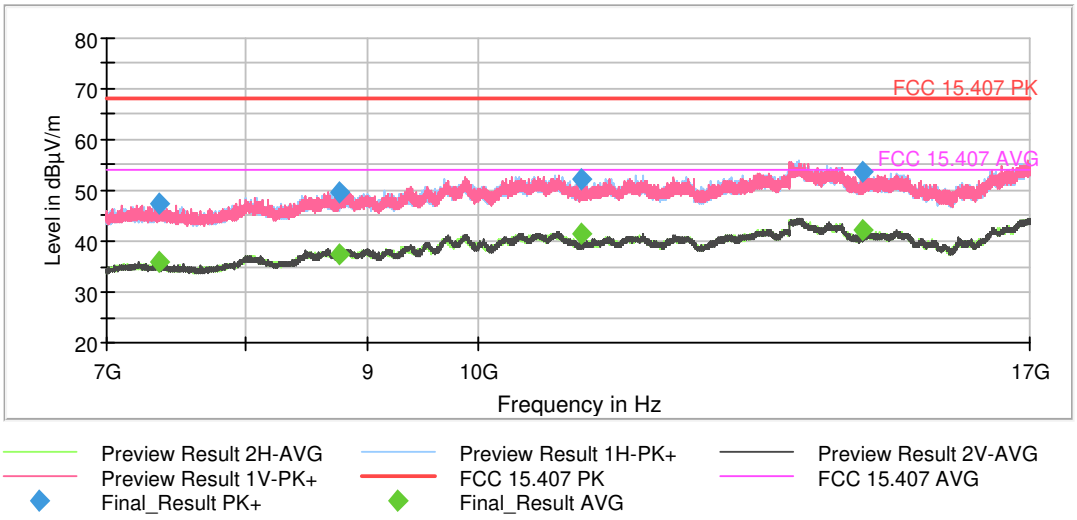
Note: The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 7 - 17 GHz (SISO worst-case):

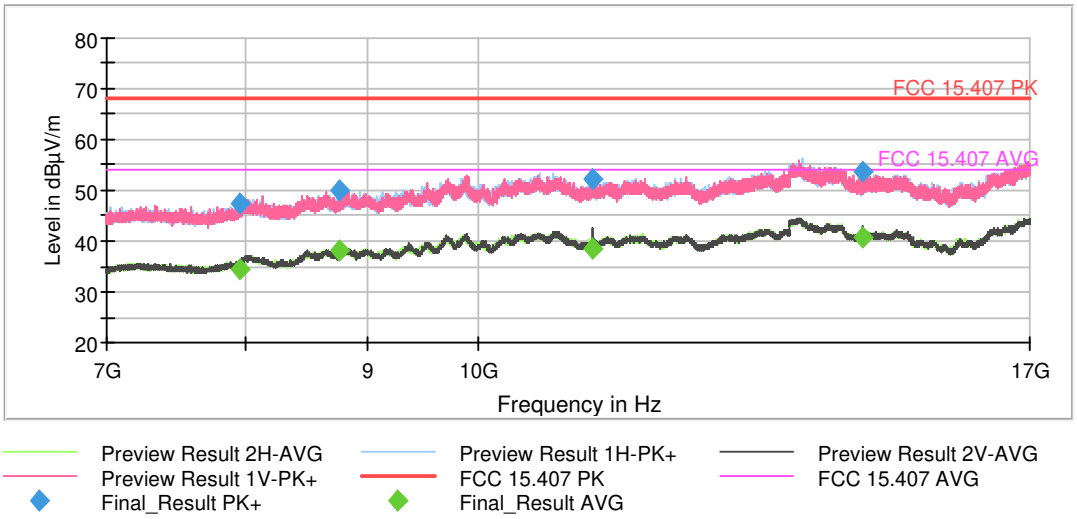
- Low Channel:



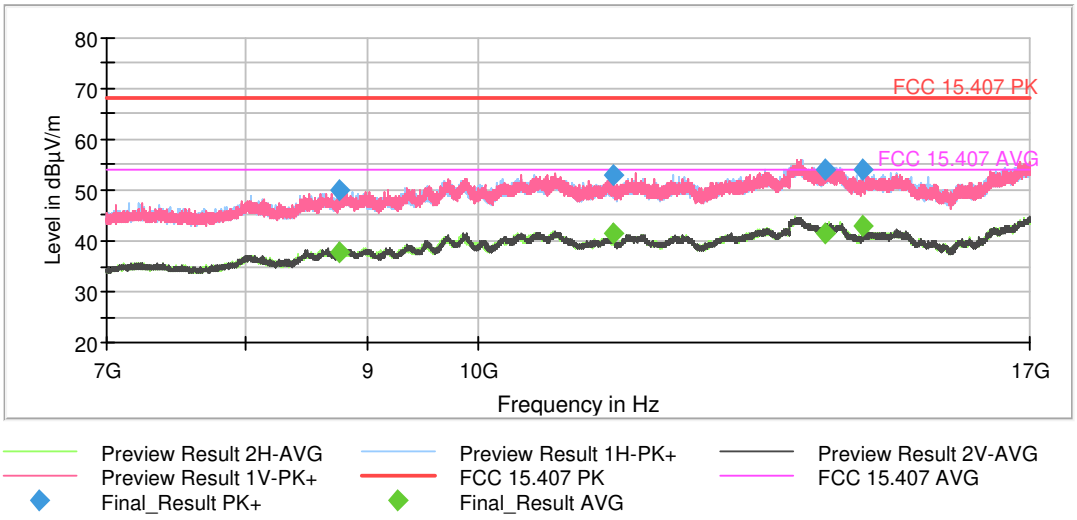
- Low +1 Channel:



- Middle Channel:

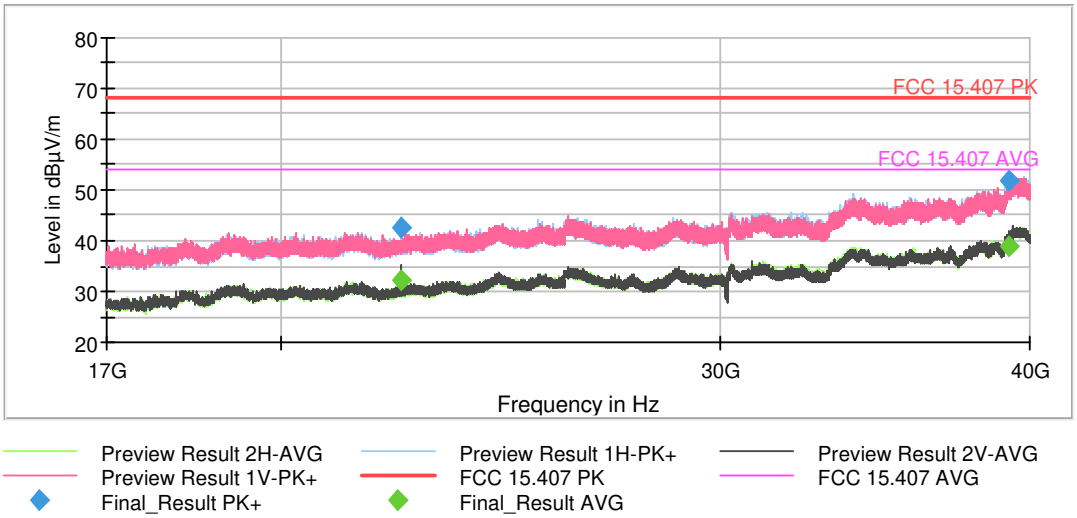


- High Channel:



FREQUENCY RANGE 17 - 40 GHz (SISO worst-case):

This plot is valid for all the Channels and all the modulation modes and bandwidths.



MIMO worst-case:

- Preliminary tests determined the MIMO worst-case: WLAN12.

Worst-case: **802.11 a20** (bit rate of 6 Mbps).

Frequency range 30 MHz - 1 GHz (MIMO worst-case):

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

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
47.072000	24.01	V	Quasi Peak
117.833500	28.43	V	Quasi Peak
128.697500	28.71	V	Quasi Peak

Measurement Uncertainty (dB) <± 5.1

Frequency range 1 - 40 GHz (MIMO worst-case):

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

The Low, Middle and High Channels were measured for out-of-band emissions for the worst mode.

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

- **MIMO 802.11 a20 (MIMO worst-case):**

** Duty Cycle: 0.27 dB*

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	52.11	52.11	H	Peak
4992.000000	57.38	57.38	H	Peak
	46.85	47.12		Average
5088.000000	57.57	57.57	H	Peak
	48.53	48.8		Average
5376.000000	57.33	57.33	H	Peak
	46.36	46.63		Average
5760.000000	56.54	56.54	H	Peak
	46.79	47.06		Average
8750.000000	50.17	50.17	V	Peak
11000.000000	52.85	52.85	V	Peak
14472.000000	53.49	53.49	V	Peak
14609.000000	52.20	52.20	V	Peak
21999.740000	42.91	42.91	V	Peak
39680.300000	52.90	52.90	H	Peak

- LOW+1 CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	50.58	50.58	H	Peak
4992.000000	56.44	56.44	H	Peak
	46.29	46.56		Average
5088.000000	57.95	57.95	H	Peak
	48.74	49.01		Average
5376.000000	58.53	58.53	H	Peak
	46.69	46.96		Average
5760.000000	55.93	55.93	H	Peak
	45.16	45.43		Average
7363.000000	46.81	46.81	H	Peak
8750.000000	49.98	49.98	V	Peak
11040.000000	52.56	52.56	V	Peak
13614.000000	55.19	55.19	H	Peak
	42.50	42.77		Average
14314.500000	52.80	52.80	V	Peak
14472.000000	52.91	52.91	V	Peak

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	51.43	51.43	H	Peak
5065.500000	57.79	57.79	H	Peak
	44.24	44.51		Average
5381.500000	61.26	61.26	H	Peak
	48.58	48.85		Average
5952.500000	57.83	57.83	H	Peak
	47.70	47.97		Average
8750.000000	50.46	50.46	V	Peak
9647.500000	52.36	52.36	V	Peak
11160.000000	52.48	52.48	V	Peak
22319.900000	43.85	43.85	V	Peak
33989.640000	47.85	47.85	V	Peak
39708.820000	52.15	52.15	V	Peak

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector
3750.000000	51.16	51.16	H	Peak
4992.000000	57.37	57.37	H	Peak
	47.28	47.55		Average
5088.000000	58.51	58.51	H	Peak
	48.98	49.25		Average
5376.000000	55.22	55.22	H	Peak
	43.46	43.73		Average
5760.000000	56.88	56.88	H	Peak
	47.30	47.57		Average
8750.000000	49.67	49.67	V	Peak
11400.000000	53.04	53.04	V	Peak
14472.000000	53.51	53.51	V	Peak

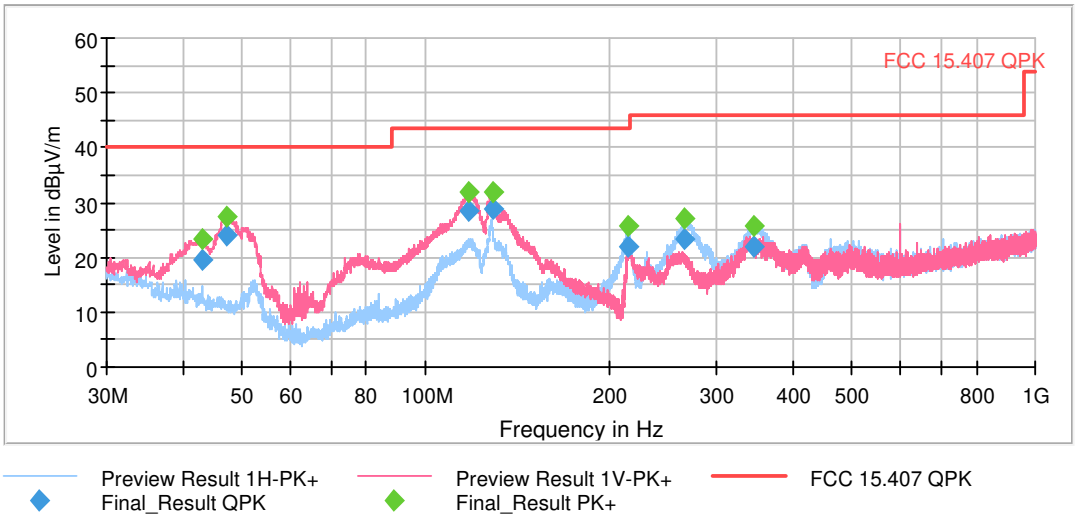
Measurement Uncertainty (dB): 1 GHz <± f < 17 GHz: <± 4.6
17 GHz <± f <± 26.5 GHz: <± 4.89
26.5 GHz <± f <± 40 GHz: <± 5.14

Verdict: PASS

MIMO worst-case:

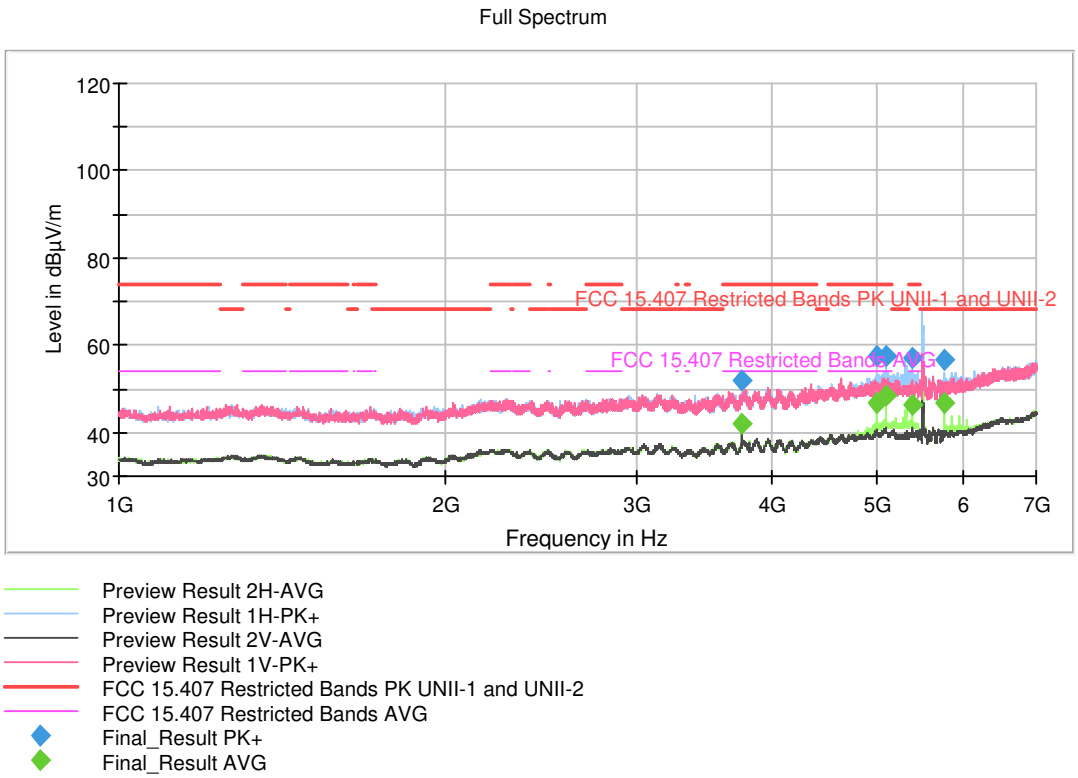
FREQUENCY RANGE 30 MHz - 1 GHz (SISO worst-case):

This plot is valid for all the Channels and all the modulation modes and bandwidths.



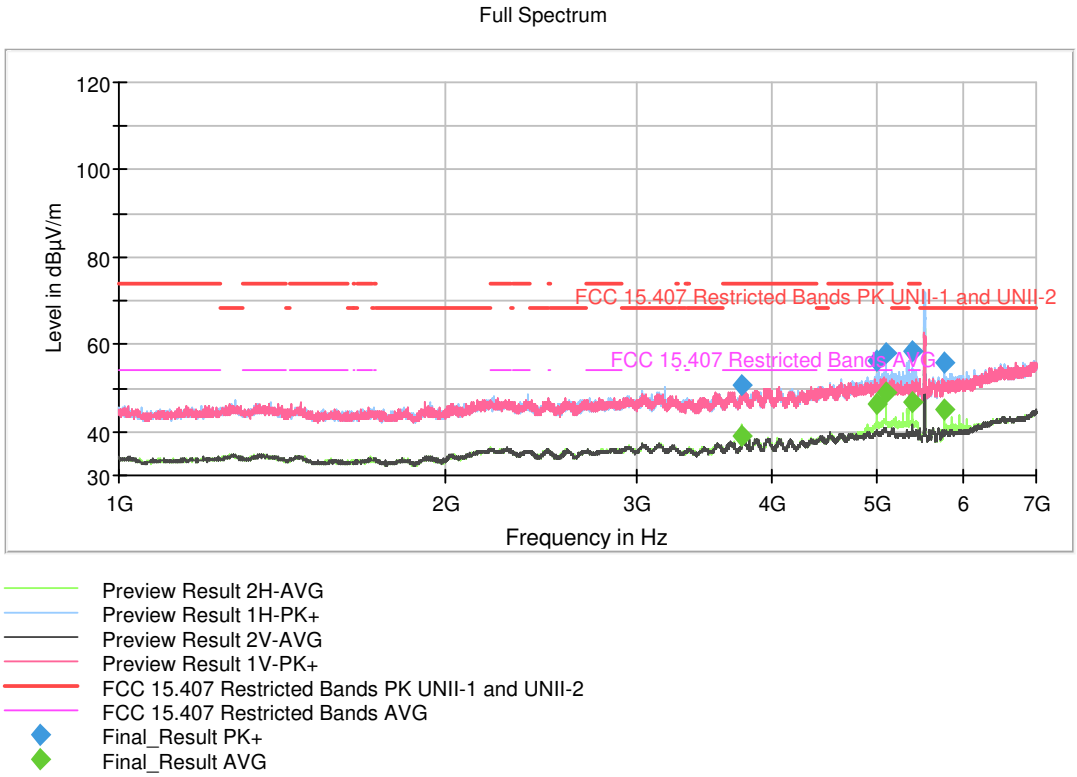
FREQUENCY RANGE 1 - 7 GHz (SISO worst-case):

- Low Channel:



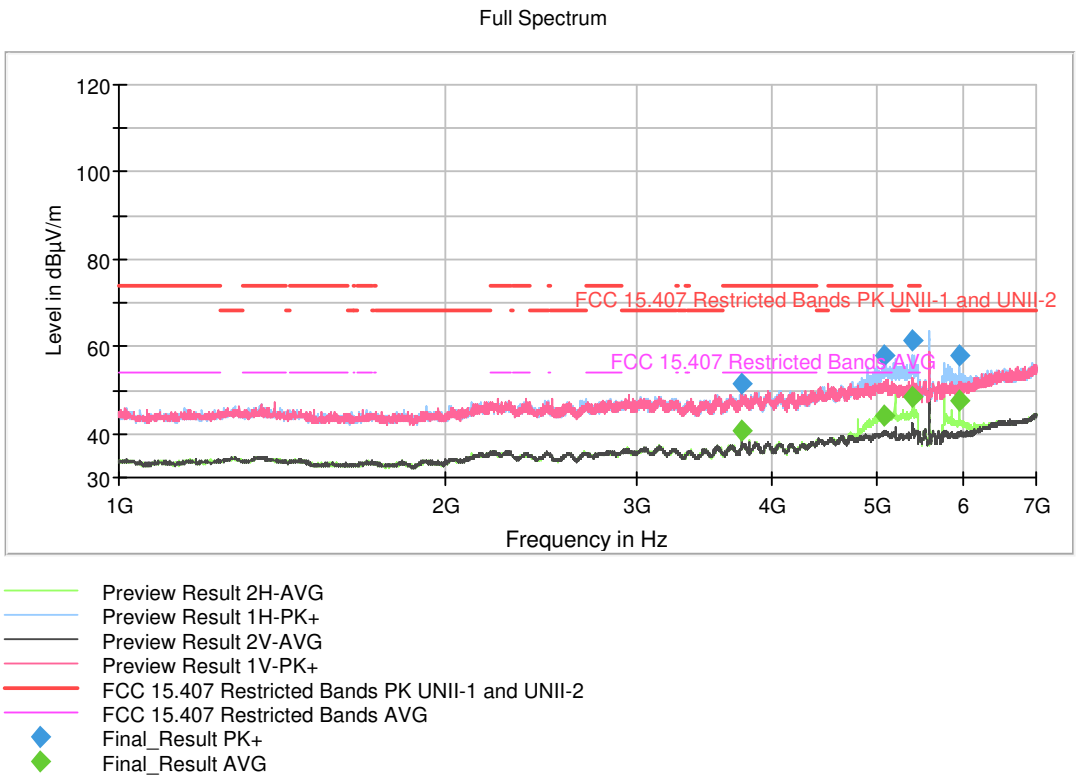
Note: The peak shown in the plot above the limit is the carrier frequency.

- Low+1 Channel:



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

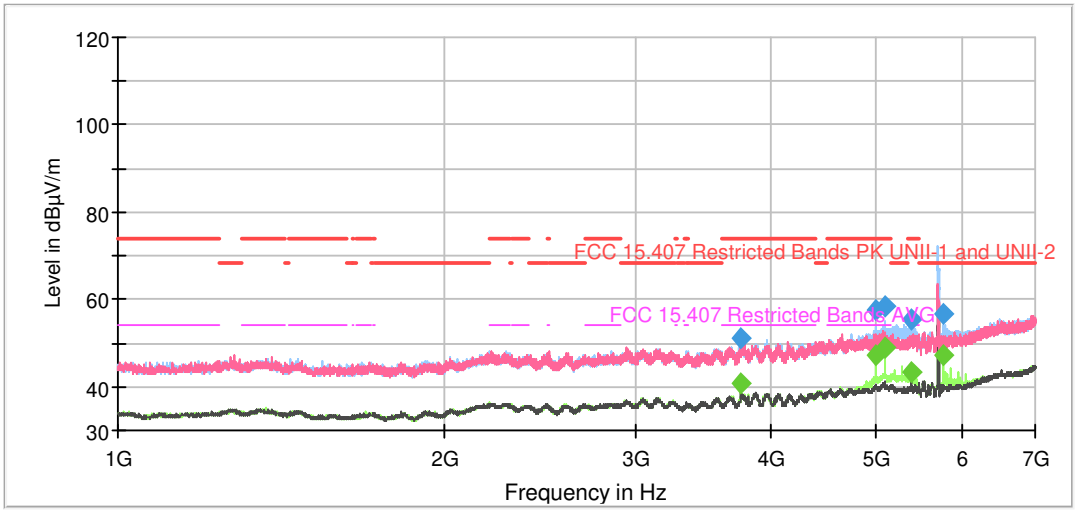
- Middle Channel:



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

- High Channel:

Full Spectrum

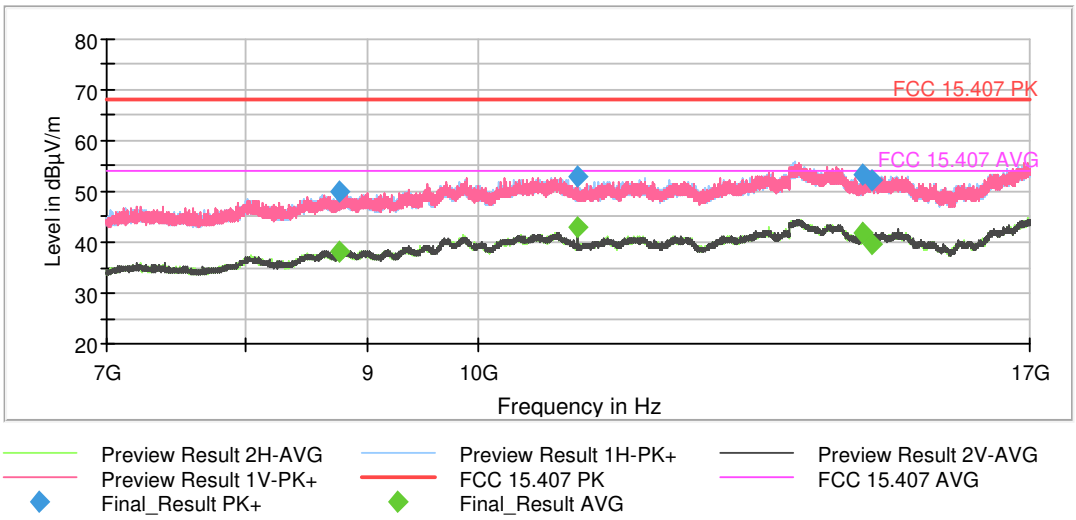


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

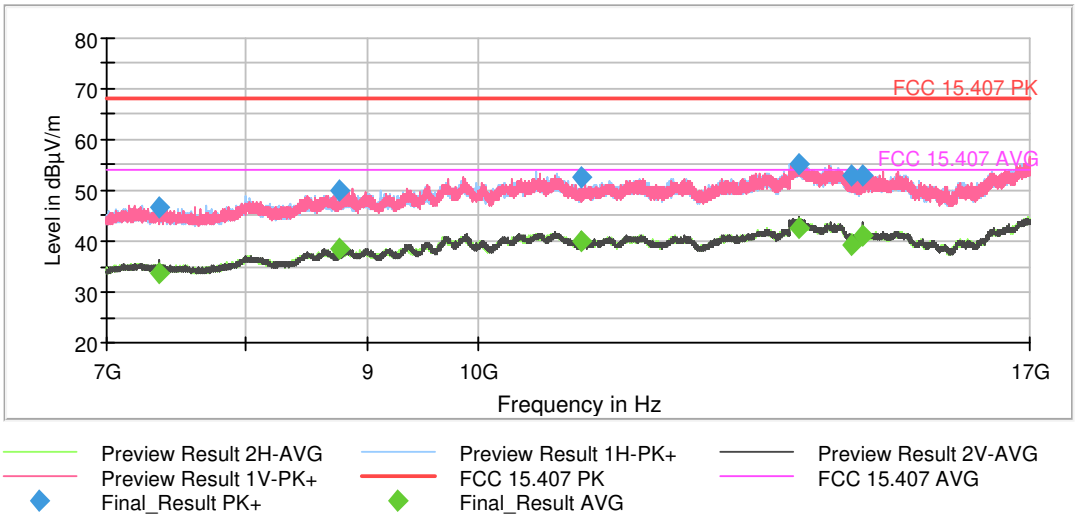
Note: The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 7 - 17 GHz (SISO worst-case):

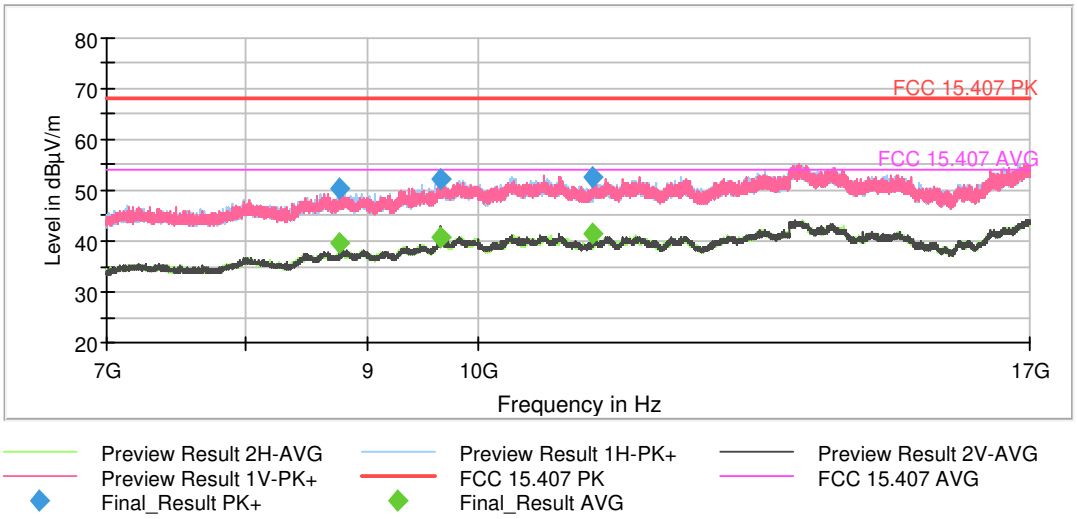
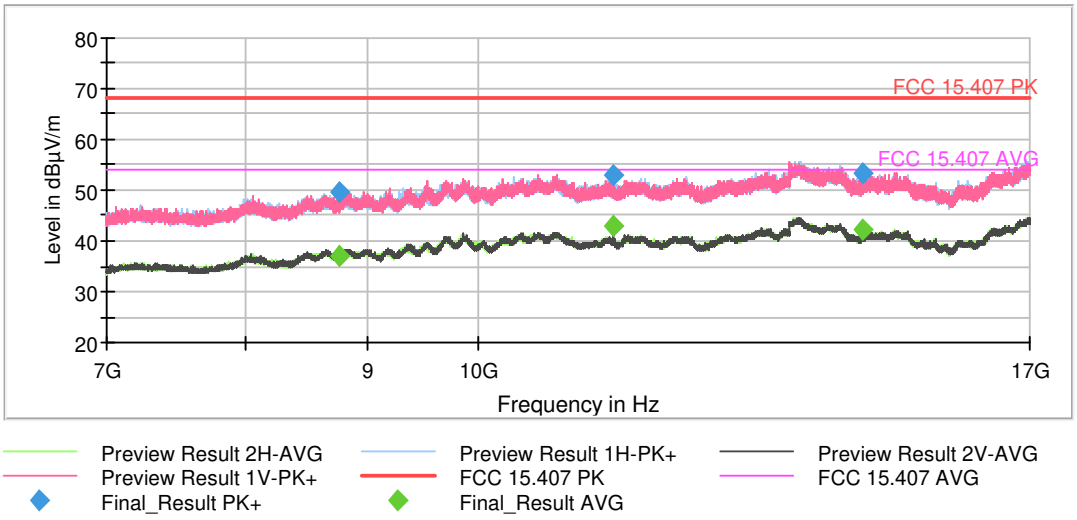
- Low Channel:



- Low +1 Channel:



- Middle Channel:



- High Channel: