

Test Report

Product	Electronic Control Unit for Vehicle Integration		
Name and address of the applicant	CPAC Systems AB Bergskroken 3 431 37 Mölndal, Sweden		
Name and address of the manufacturer	CPAC Systems AB Bergskroken 3 431 37 Mölndal, Sweden		
Model	SID 2.0		
Rating	24V _{DC}		
Trademark	CPAC Systems AB		
Additional information	WiFi, Bluetooth, LTE		
Tested according to	FCC Part 15.407 Unlicensed National Information Infrastructure Devices (U-NII) Industry Canada RSS-247, Issue 3 Licence-Exempt Local Area Network (LE-LAN) Devices		
Order number	PRJ0043386		
Tested in period	2023-03-03 to 2023-09-14		
Issue date	2023-11-22		
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number FCC: NO0001 ISED: NO0470   An accredited technical test executed under the Norwegian accreditation scheme		
 Prepared by [Frode Sveinsen]  Approved by [Jan G Eriksen]			
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Revision history

Revision	Date	Comment	Sign
A	2023-11-22	First edition	FS

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

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2 INFORMATION

2.1 Test Item

Name	CPAC Systems AB
Model	SID 2.0
FCC ID	AHV-SID2B
ISED ID	10111A-SID2B
Serial number	HYD-3891
Hardware identity and/or version	P-01
Software identity and/or version	Hydra-WLANSW_1.0
Frequency Ranges	U-NII 1 : 5180 – 5240 MHz U-NII 2A : 5260 – 5320 MHz U-NII 2C : 5500 – 5720 MHz U-NII 3 : 5745 – 5825 MHz
Operating Modes	802.11a 802.11n (20/40 MHz BW) 802.11ac (20/40/80 MHz BW)
Type of Modulation	Digital (OFDM - Orthogonal frequency-division multiplexing)
Conducted Output Power	5180 – 5240 MHz: 35 mW 5260 – 5320 MHz: 34 mW 5500 – 5720 MHz: 34 mW 5745 – 5825 MHz: 36 mW
Antenna Connector	Fakra
Number of Antennas	2
Antenna Diversity Supported	YES
Smart Antennas Supported	YES
DFS Supported	Client Device without Radar Detection
Ad-hoc Mode	EUT does not support Ad-hoc Mode*
Hotspot Mode	EUT does not support Hotspot Mode*
Power Supply	External Power Supply, 8-32 V _{DC}

*If the EUT supports Ad-hoc or Hotspot mode in the DFS Bands, it is to be considered a Master Device

Description of Test Item

The EUT is an electronic control unit for vehicle integration. The EUT contains WiFi, Bluetooth, and LTE modules.

Model Overview						
Model Name	U-NII	Marine	LTE	FCC ID	IC ID	Description
SID 2.0	☐	☐	☒	AHV-SID2	10111A-SID2	Model without 5GHz WiFi
SID 2.0	☒	☐	☒	AHV-SID2B	10111A-SID2B	Model with 5GHz WiFi
SID 2.0M	☒	☒	☐	AHV-SID2M	10111A-SID2M	Marine Model without LTE
SID 2.0MLTE	☒	☒	☒	AHV-SID2MLTE	10111A-SID2MLTE	Marine Model with LTE

All models are electrically identical, except SID 2.0M does not have the LTE module installed.

2.2 Antenna Types

Name	P/N	Function	Number of inputs	Description
2J 2× 4G/3G/2G MIMO, +2× 2.4/5.0 GHz MIMO and GNSS	2J #2J4A50PCFa	2.4GHz Wifi+BT	2	COMBI ANT
		2G+3G+4G	2	
TE ANTENNA BASE FULL FEAT	Volvo #23311779	2.4GHz Wifi+BT	1	WHIP ANT
		2G+3G+4G	1	
TE ANTENNA INTERIOR WLAN	Volvo #23311706	2.4GHz Wifi+BT	1	PATCH ANT

2.3 Normal test condition

Temperature	20 - 24 °C
Relative humidity	20 - 50 %
Normal test voltage	24 V DC

The values are the limit registered during the test period.

The EUT was powered from a regulated power supply during all tests.

2.4 Test Engineer

Frode Sveinsen

2.5 Antenna Requirement

Is the antenna detachable?	☒ Yes	☐ No
If detachable, is the antenna connector non-standard?	☒ Yes	☐ No
Type of antenna connector: Fakra		

2.6 EUT Operating Modes

Description of operating modes	Continuous TX, 5 GHz 20/40/80 MHz Mode. Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.
Additional information	The worst-case data rates were: 802.11a mode: 6 Mbps 802.11n/ac HT20 mode: MCS0 802.11n/ac HT40 mode : MCS0 802.11ac HT80 mode : MCS0

2.7 Comments

The measurements were done with the EUT powered by 24 V DC. It was checked that power variations between 8V and 32V did not have any influence on the measured output power.

2.8 EUT Power Levels

Channel	Freq (MHz)	11a	11n/ac HT20 SISO	11n/ac HT20 MIMO	11n/ac HT40 SISO	11n/ac HT40 MIMO	11ac HT80 SISO	11ac HT80 MIMO
36	5180	PL8	PL9	PL6				
40	5200	PL16	PL14	PL13				
44	5220	PL16	PL16	PL13				
48	5240	PL16	PL16	PL13				
52	5260	PL16	PL16	PL13				
56	5280	PL16	PL16	PL13				
60	5300	PL16	PL14	PL13				
64	5320	PL9	PL9	PL6				
100	5500	PL9	PL9	PL6				
104	5520	PL16	PL11	PL9				
108	5540	PL16	PL16	PL13				
112	5560	PL16	PL16	PL13				
116	5580	PL16	PL16	PL13				
120	5600	PL16/D	PL16/D	PL13/D				
124	5620	PL16/D	PL16/D	PL13/D				
128	5640	PL16/D	PL16/D	PL13/D				
132	5660	PL16	PL16	PL13				
136	5680	PL16	PL12	PL12				
140	5700	PL6	PL6	PL4				
144	5720	PL16	PL16	PL13				
149	5745	PL16	PL16	PL13				
153	5765	PL16	PL16	PL13				
157	5785	PL16	PL16	PL13				
161	5805	PL16	PL16	PL13				
165	5825	PL16	PL16	PL13				
38	5190				PL9	PL2		
46	5230				PL15	PL12		
54	5270				PL15	PL12		
62	5310				PL9	PL6		
102	5510				PL4	PL3		
110	5550				PL16	PL13		
118	5590				PL16/D	PL13/D		
126	5630				PL16/D	PL13/D		
134	5670				PL9	PL6		
142	5710				PL16	PL13		
151	5755				PL16	PL13		
159	5795				PL16	PL13		
42	5210						PL6	PL6
58	5290						PL9	PL6
106	5530						PL6	PL6
122	5610						PL16/D	PL13/D
138	5690						PL16	PL13
155	5775						PL12	PL12

Levels in red text are reduced from the default level.

D = Disabled/ Not Used in Canada.

ISED Canada require that all channels in the TDWR Band (5.60-5.65 GHz) are disabled, also on client devices

3 TEST REPORT SUMMARY

3.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.407 and ISSED RSS-247 Issue 3.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were performed in a semi-anechoic chamber at measuring distances of 1m and 3m.

☒ New Submission	☒ Production Unit
☐ Class II Permissive Change	☐ Pre-production Unit
NII Equipment Code	☐ Family Listing

3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 3 RSS-GEN Issue 5 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	N/A
Maximum Output Power	15.407(a)	6.2	Complies
Power Spectral Density	15.407(a)	6.2	Complies
Emission Bandwidth	15.407(a)(2)	6.2	Complies
Unwanted Emissions	15.407(b)	6.2	Complies
Discontinuation of Transmission	15.407(c)	6.4	N/T ¹
6 dB Bandwidth	15.407(e)	6.2.4	Complies
Transmit Power Control	15.407(h)	6.2.3	N/A ²
Dynamic Frequency Selection	15.407(h)	6.3	Complies ³
Radiated Emissions	15.205 15.209	7.3 (RSS-GEN) 8.9 (RSS-GEN)	Complies

¹ See manufacturers declaration

² Transmit Power Control is not required when Max EIRP is below 500 mW

³ The EUT is a Client Device without Radar Detection.

4 TEST RESULTS

4.1 Maximum Output Power, EIRP

FCC 15.407 (a)

ISED RSS-247, Issue 3, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.3, method SA-2

Test Results: Complies

Measurement Data:

Maximum Conducted Output Power							
Ch. No.	Nominal Frequency (MHz)	dBm			mW		
		802.11a	802.11n HT20 SISO	802.11n HT20 MIMO	802.11a	802.11n HT20 SISO	802.11n HT20 MIMO
36	5180	6.9	6.1	8.2	4.9	4.1	6.6
40	5200	14.7	14.5	15.4	29.5	28.2	34.7
48	5240	14.3	14.1	15.2	26.9	25.7	33.1
52	5260	14.8	14.6	15.3	30.2	28.8	33.9
60	5300	15.1	14.9	15.3	32.4	30.9	33.9
64	5320	7.4	7.1	7.9	5.5	5.1	6.2
100	5500	7.2	7.1	7.8	5.2	5.1	6.0
104	5520	15.3	15.2	15.2	33.9	33.1	33.1
116	5580	15.1	15.0	15.2	32.4	31.6	33.1
136	5680	15.2	15.0	15.1	33.1	31.6	32.4
140	5700	6.3	6.2	6.7	4.3	4.2	4.7
144	5720	14.6	14.5	14.7	28.8	28.2	29.5
149	5745	15.2	15.0	15.1	33.1	31.6	32.4
157	5785	15.4	15.3	15.3	34.7	33.9	33.9
165	5825	15.3	15.2	14.9	33.9	33.1	30.9

Maximum Conducted Output Power									
Ch. No.	Nominal Frequency (MHz)	dBm				mW			
		802.11ac HT40 SISO	802.11ac HT40 MIMO	802.11ac HT80 SISO	802.11ac HT80 MIMO	802.11ac HT40 SISO	802.11ac HT40 MIMO	802.11ac HT80 SISO	802.11ac HT80 MIMO
38	5190	6.0	8.5			4.0	7.1		
46	5230	14.0	15.3			25.1	33.9		
54	5270	14.8	15.3			30.2	33.9		
62	5310	6.7	7.8			4.7	6.0		
102	5510	6.9	5.9			4.9	3.9		
110	5550	14.8	15.2			30.2	33.1		
134	5670	14.6	15.0			28.8	31.6		
142	5710	14.3	14.5			26.9	28.2		
151	5755	14.5	15.1			28.2	32.4		
159	5795	15.4	15.5			34.7	35.5		
42	5210			5.3	8.4			3.4	6.9
58	5290			6.1	8.1			4.1	6.5
106	5530			6.0	7.7			4.0	5.9
138	5690			14.6	15.1			28.8	32.4
138	5690			14.7	14.9			29.5	30.9
155	5775			15.0	15.3			31.6	33.9

The EUT operates with a constant duty cycle, method SA-2 of ANSI C63.10-2013 clause 12.3 was used.

Output Power reported is Average Power measured with a wideband power meter.

Output Power on P0 and P1 in SISO mode is identical. All SISO measurements in conducted mode were performed on P0.

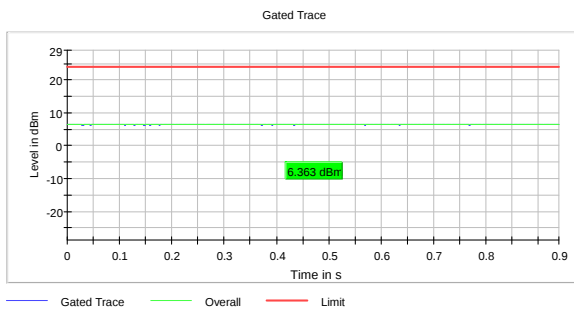
Output in MIMO mode is the sum power of P0+P1. The measurement was performed simultaneously with two power meters and the sum power was calculated. The R&S TS8997 Test System contains 8 identical power meters, however for this EUT only two of them were used.

Maximum Antenna Gain in MIMO mode is more than 6 dBi, Maximum Allowed Output Power in MIMO Mode is therefore reduced by the amount exceeding 6 dBi.

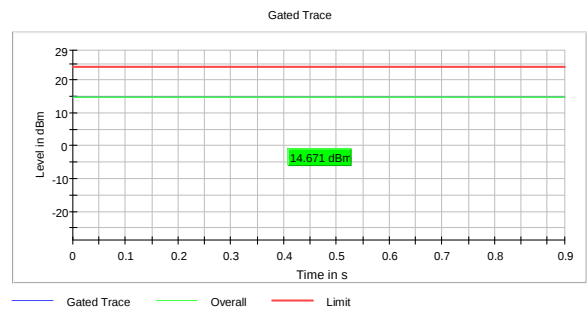
This is a device for mounting in motor vehicles.

Limits:

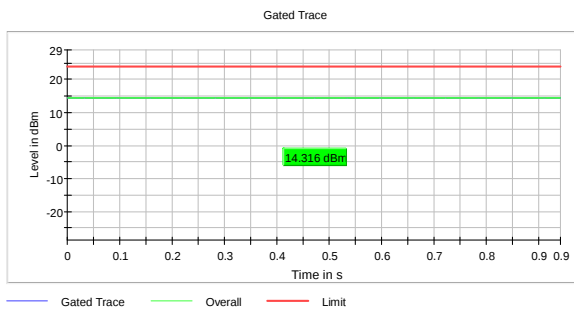
Frequency Band	FCC 15.407(a)	ISED RSS-247 Issue 3
5150 – 5250 MHz	Less than 250 mW (24 dBm) for client device Less than 1 W (30 dBm) for master device	Less than the lesser of 200 mW e.i.r.p. or $10 + 10 \log_{10} B$ dBm e.i.r.p. Only indoor operation, except OEM devices installed in vehicles by vehicle manufacturers. For OEM devices installed in vehicles: Less than the lesser of 30 mW or $1.76 + 10 \log_{10} B$ dBm e.i.r.p. TPC must be implemented and must be able to operate at least 3 dB below maximum permitted level of 30 dBm.
5250 – 5350 MHz 5470 – 5725 MHz	Less than the lesser of 250 mW (24 dBm) or $11 + 10 \log_{10} B$ dBm	Less than the lesser of 250 mW or $11 + 10 \log_{10} B$ dBm, and Less than the lesser of 1 W e.i.r.p. or $17 + 10 \log_{10} B$ dBm e.i.r.p. Devices with 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 Until further notice, not allowed to operate in the band 5600-5650 MHz. For OEM devices installed in vehicles (only 5250-5350 MHz): Less than the lesser of 30 mW or $1.76 + 10 \log_{10} B$ dBm e.i.r.p. TPC must be implemented and must be able to operate at least 3 dB below maximum permitted level of 30 dBm.
5725 – 5850 MHz	Less than 1 Watt	Less than 1 Watt
	If Antenna Gain is more than 6 dBi the Power Limit is reduced by the amount exceeding 6 dBi	If Antenna Gain is more than 6 dBi the Power Limit is reduced by the amount exceeding 6 dBi
	<i>B</i> is the 26dB emission bandwidth in MHz	<i>B</i> is the 99% emission bandwidth in MHz



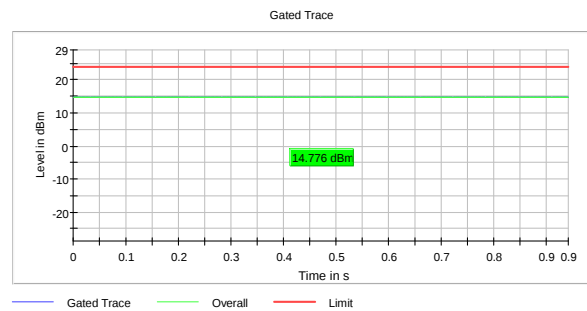
RMS Conducted Power, 5180 MHz, 802.11a, 6Mb



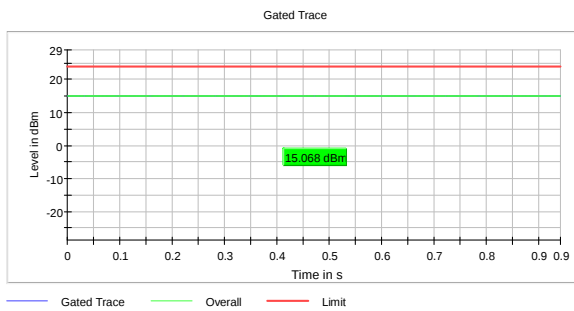
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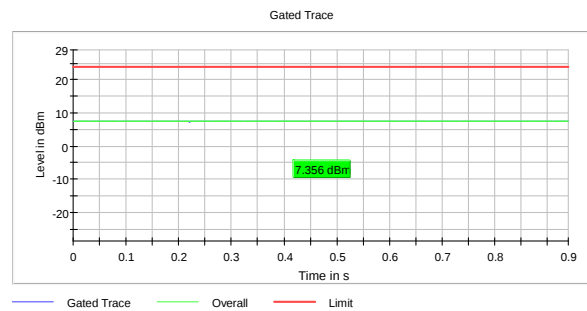
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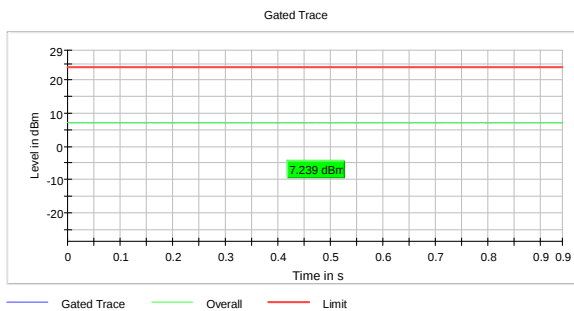
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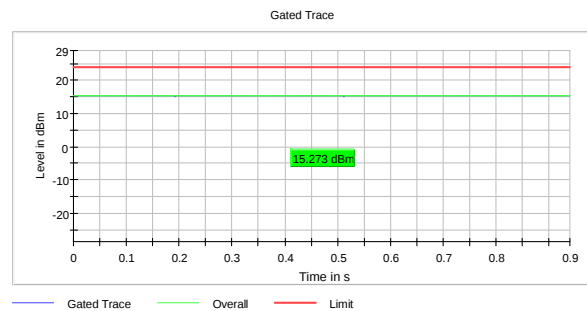
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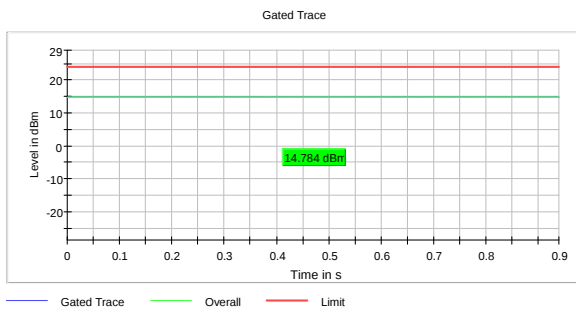
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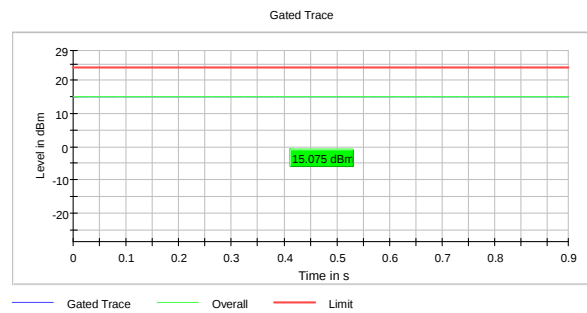
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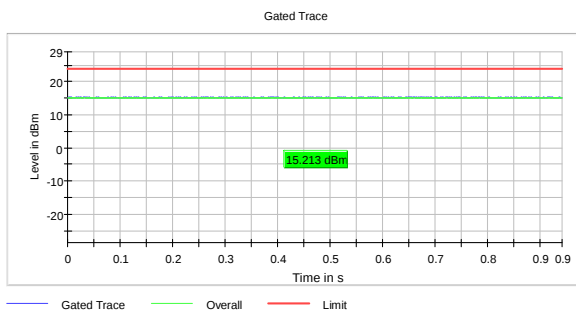
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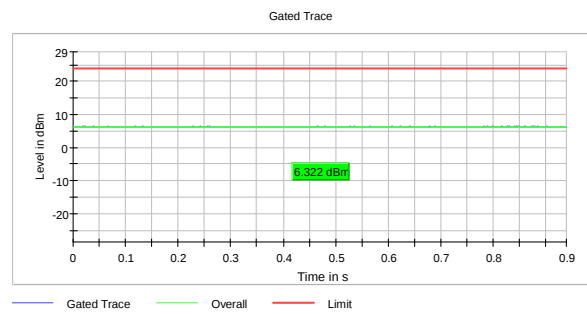
RMS Conducted Power, 5540 MHz, 802.11a, 6Mb



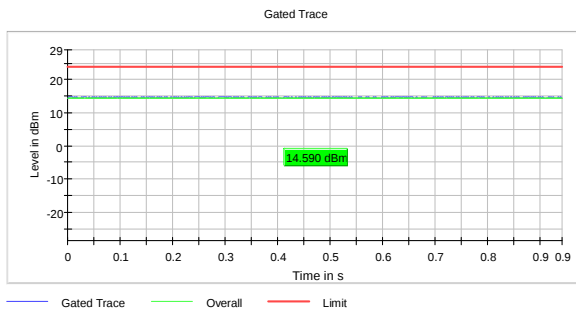
RMS Conducted Power, 5580 MHz, 802.11a, 6Mb



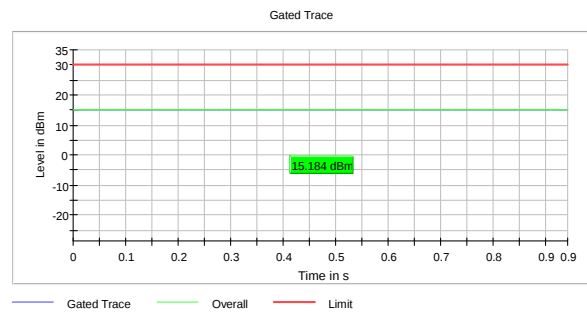
RMS Conducted Power, 5680 MHz, 802.11a, 6Mb



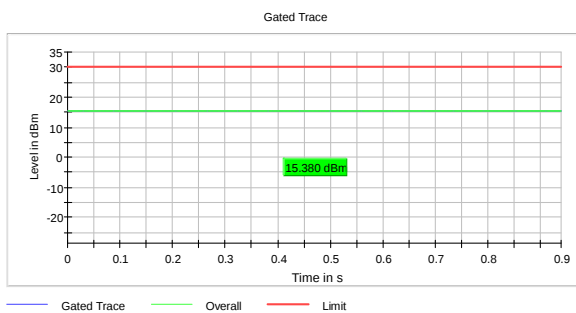
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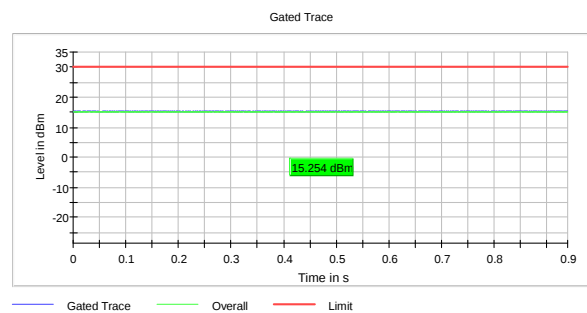
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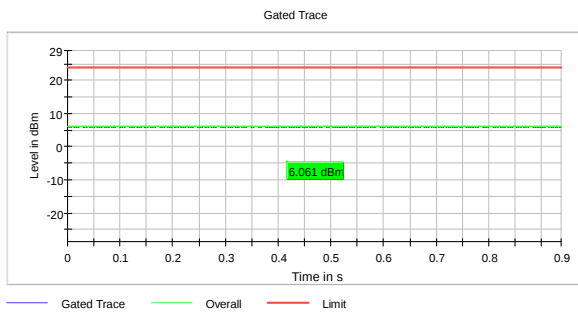
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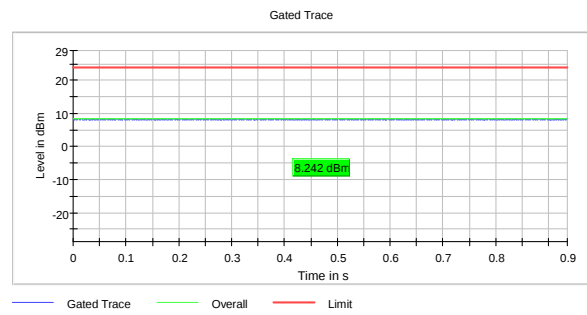
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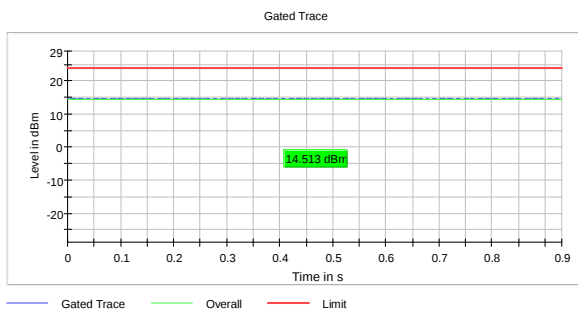
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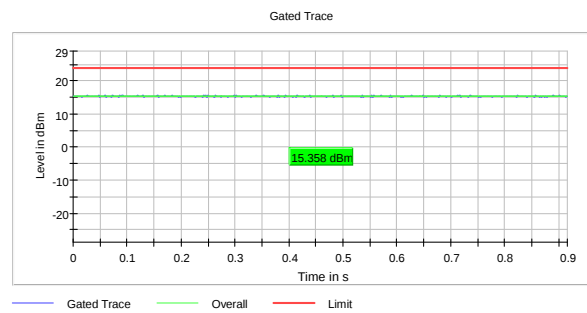
RMS Conducted Power, 5180 MHz, 802.11n, HT20, MCS0, Ant1



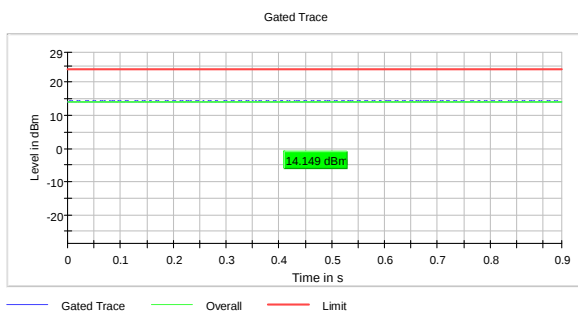
MIMO



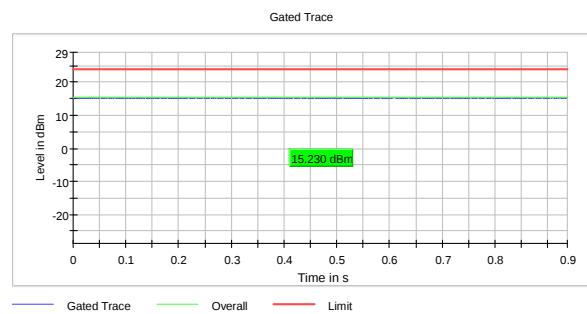
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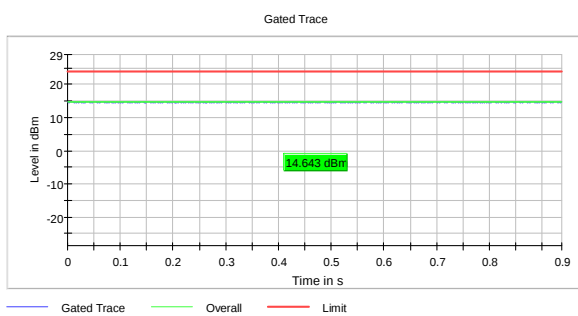
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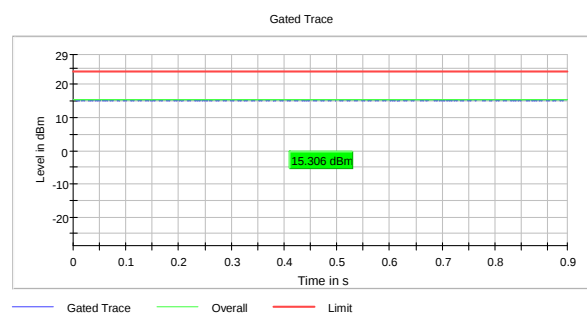
RMS Conducted Power, 5240 MHz, 802.11n, HT20, MCS0, Ant1



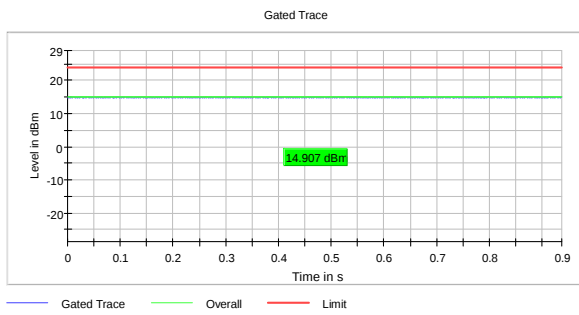
MIMO



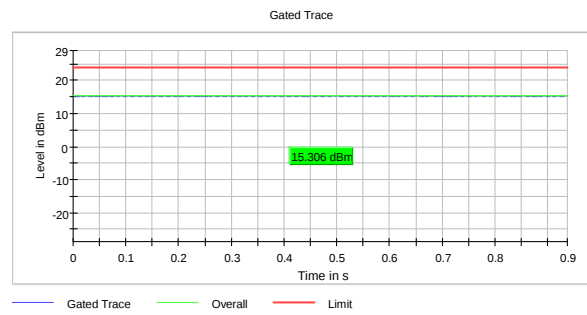
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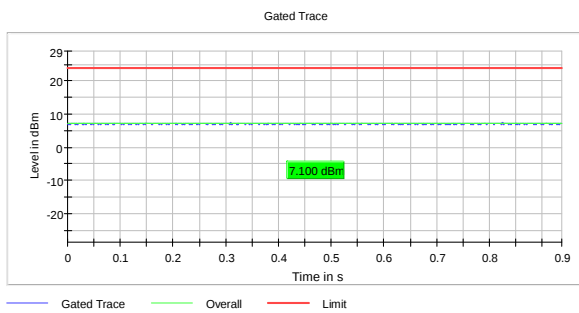
MIMO



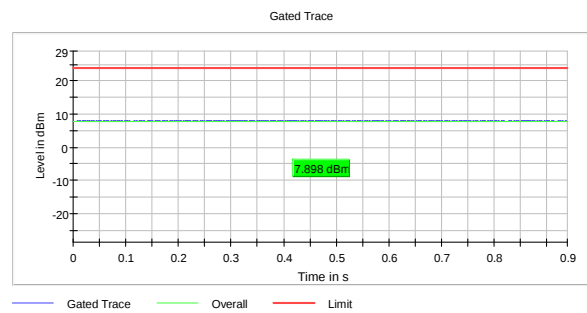
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MIMO



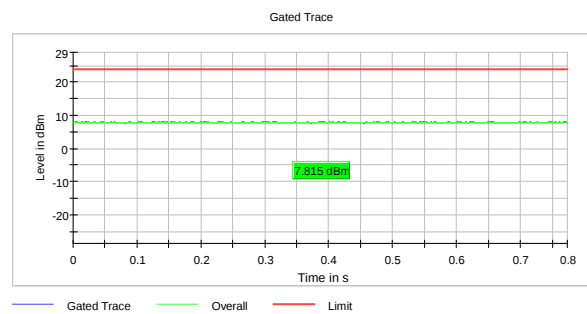
RMS Conducted Power, 5320 MHz, 802.11n, HT20, MCS0, Ant1



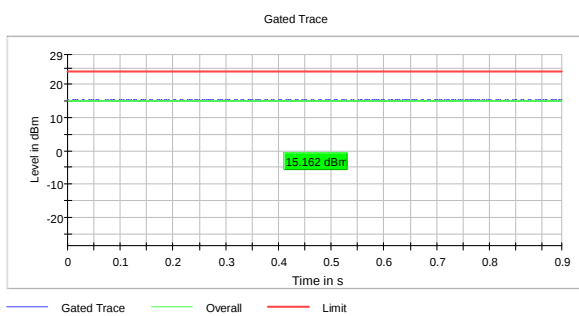
MIMO



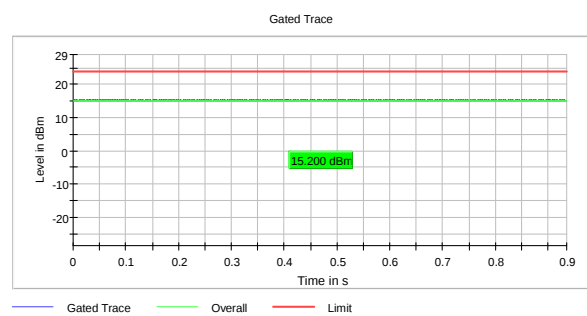
RMS Conducted Power, 5500 MHz, 802.11n, HT20, MCS0, Ant1



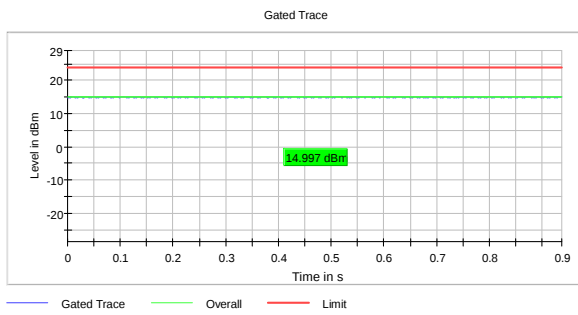
MIMO



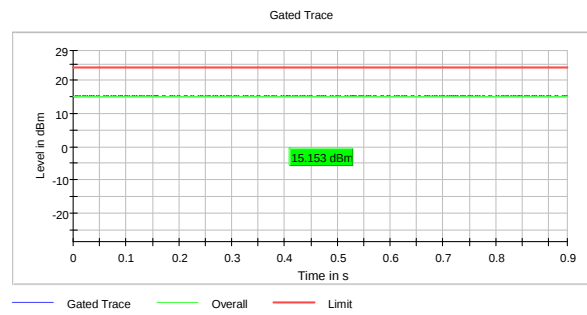
RMS Conducted Power, 5520 MHz, 802.11n, HT20, MCS0, Ant1



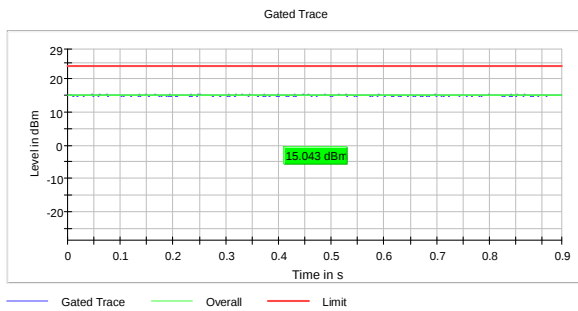
MIMO



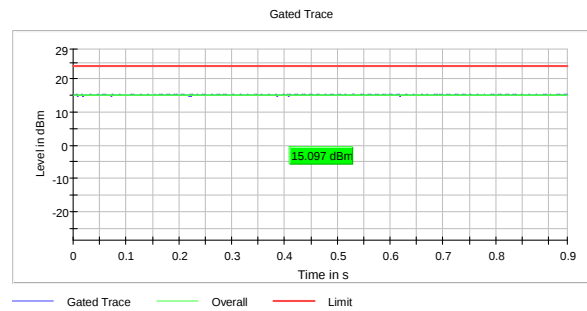
RMS Conducted Power, 5580 MHz, 802.11n, HT20, MCS0, Ant1



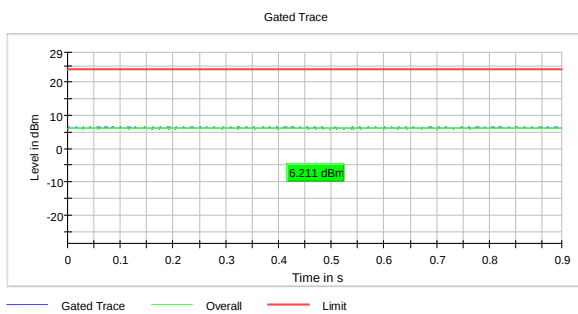
MIMO



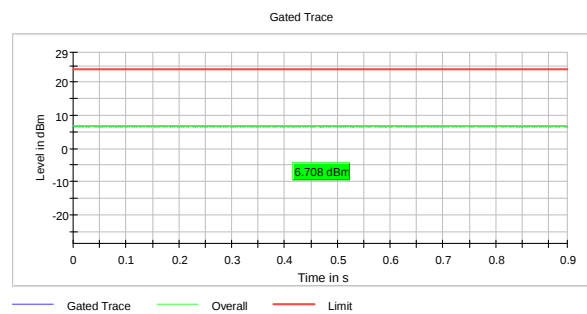
RMS Conducted Power, 5680 MHz, 802.11n, HT20, MCS0, Ant1



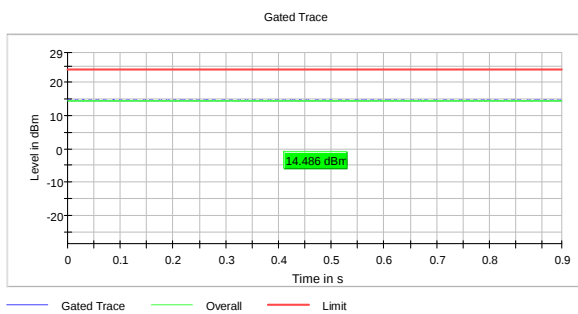
MIMO



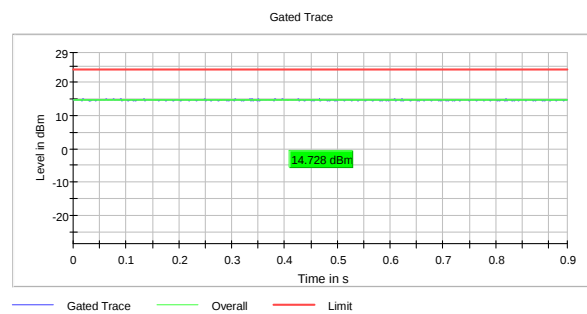
RMS Conducted Power, 5700 MHz, 802.11n, HT20, MCS0, Ant1



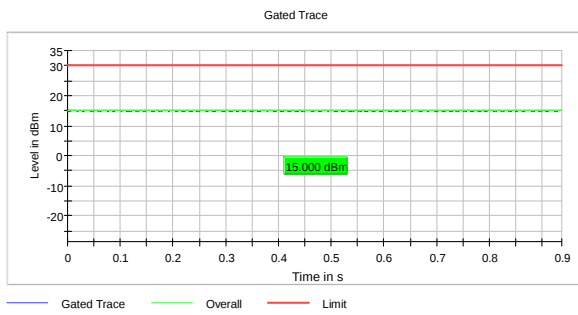
MIMO



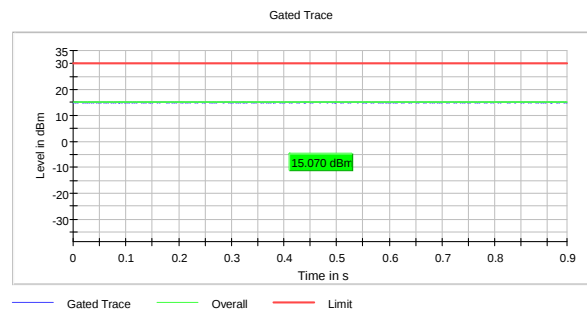
RMS Conducted Power, 5720 MHz, 802.11n, HT20, MCS0, Ant1



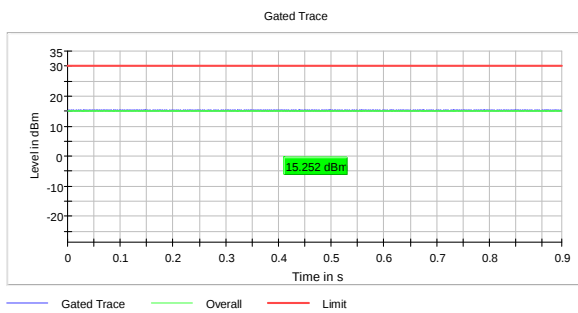
MIMO



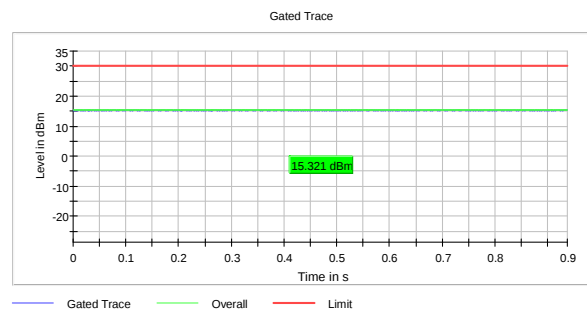
RMS Conducted Power, 5745 MHz, 802.11n, HT20, MCS0, Ant1



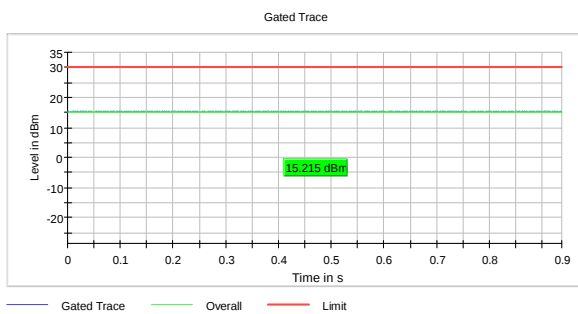
MIMO



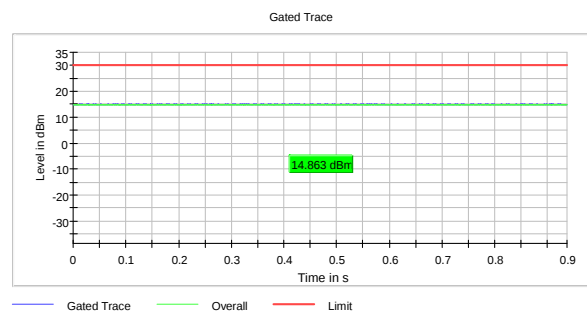
RMS Conducted Power, 5785 MHz, 802.11n, HT20, MCS0, Ant1



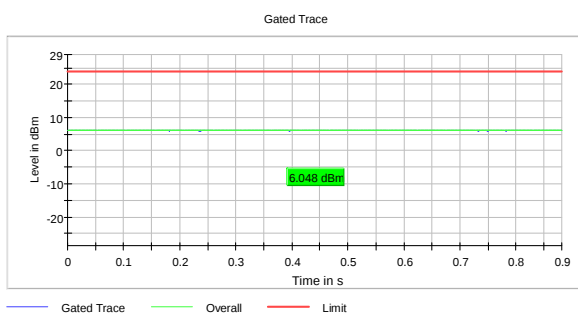
MIMO



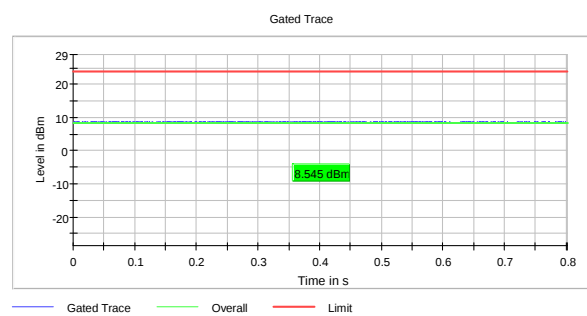
RMS Conducted Power, 5825 MHz, 802.11n, HT20, MCS0, Ant1



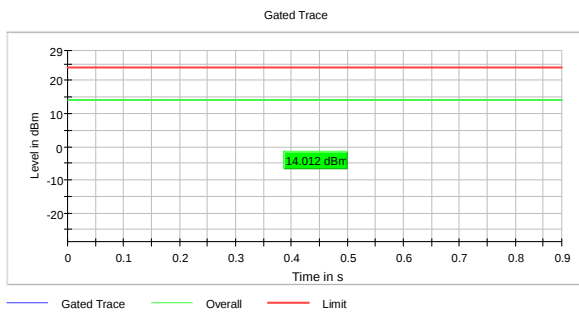
MIMO



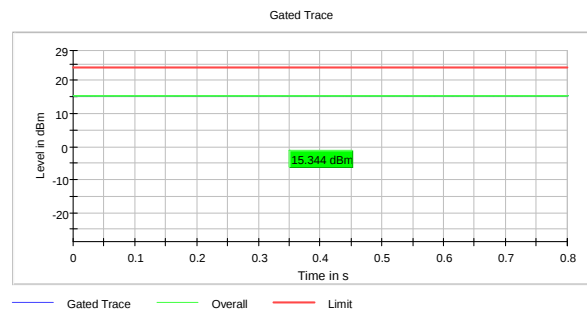
RMS Conducted Power, 5190 MHz, 802.11n, HT40, MCS0, Ant1



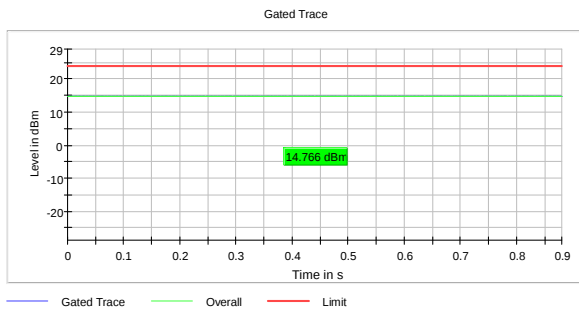
MIMO



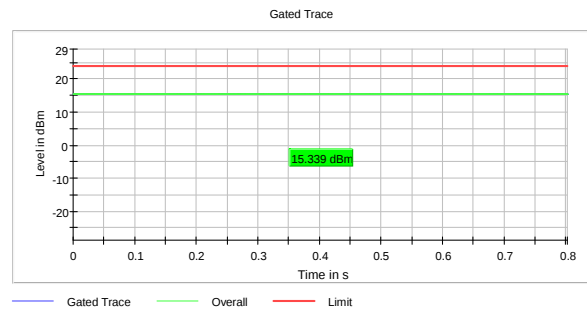
RMS Conducted Power, 5230 MHz, 802.11n, HT40, MCS0, Ant1



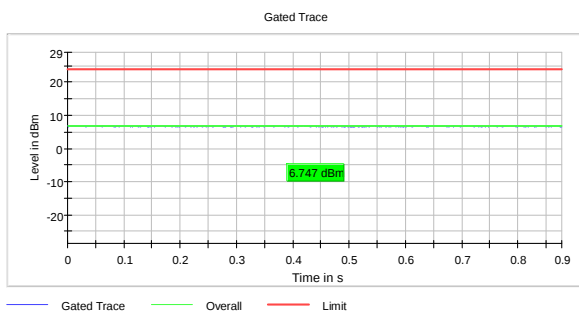
MIMO



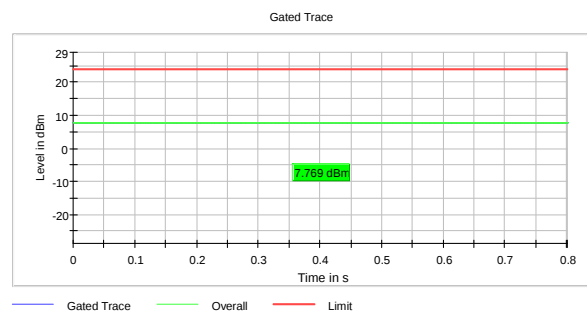
RMS Conducted Power, 5270 MHz, 802.11n, HT40, MCS0, Ant1



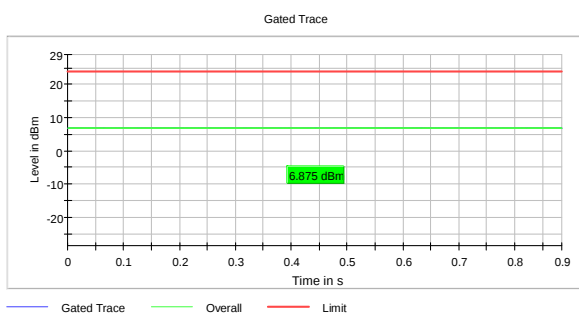
MIMO



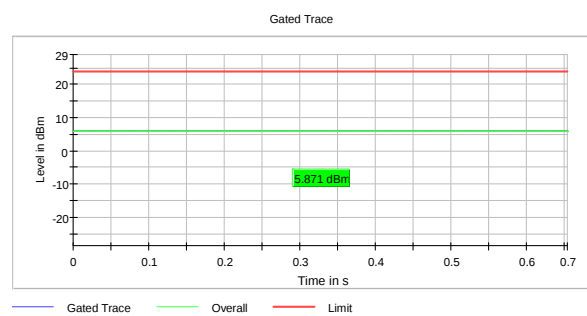
RMS Conducted Power, 5310 MHz, 802.11n, HT40, MCS0, Ant1



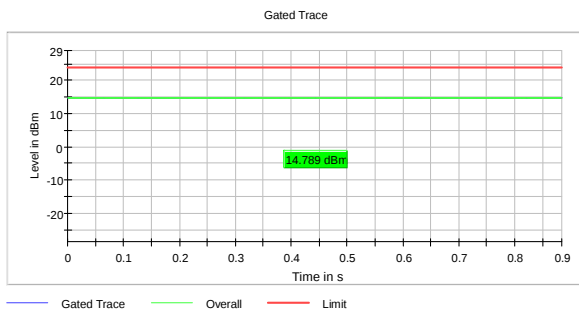
MIMO



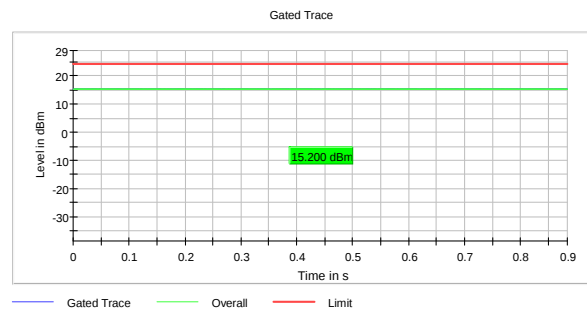
RMS Conducted Power, 5510 MHz, 802.11n, HT40, MCS0, Ant1



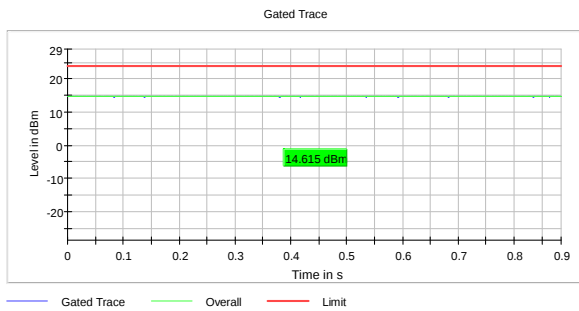
MIMO



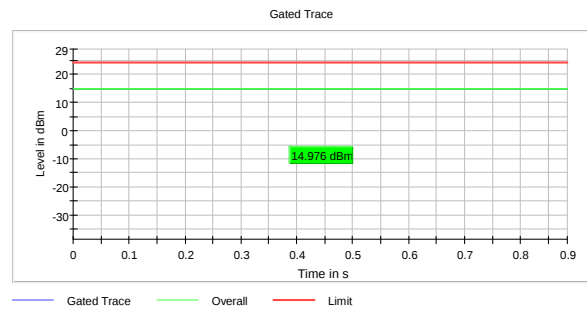
RMS Conducted Power, 5550 MHz, 802.11n, HT40, MCS0, Ant1



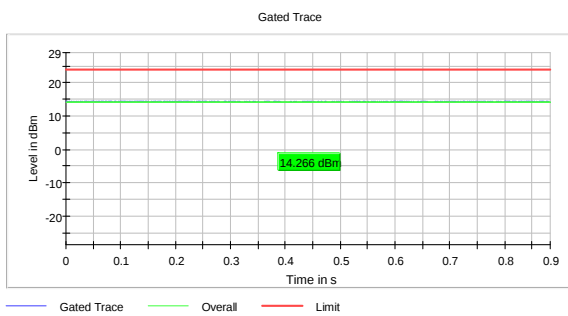
MIMO



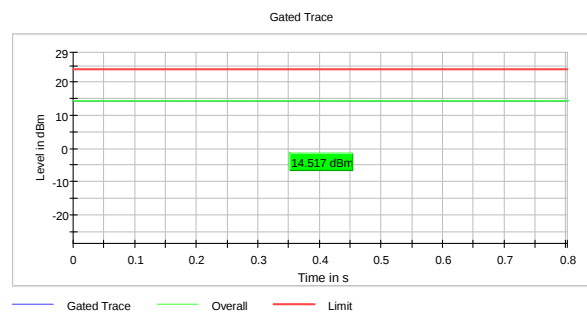
RMS Conducted Power, 5670 MHz, 802.11n, HT40, MCS0, Ant1



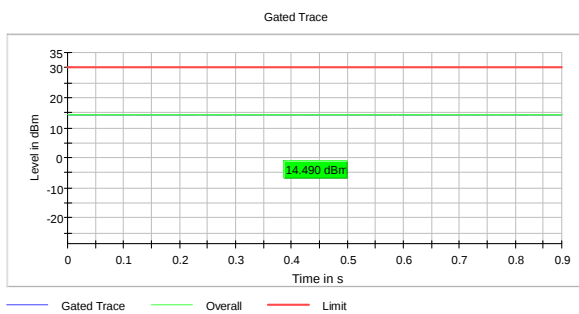
MIMO



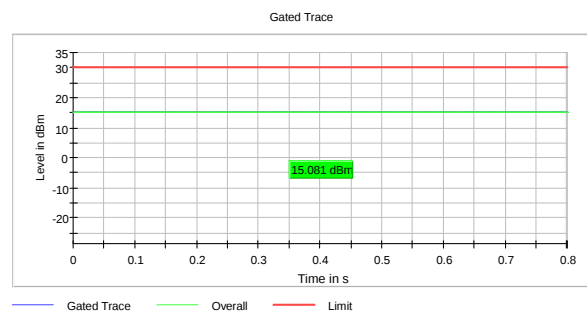
RMS Conducted Power, 5710 MHz, 802.11n, HT40, MCS0, Ant1



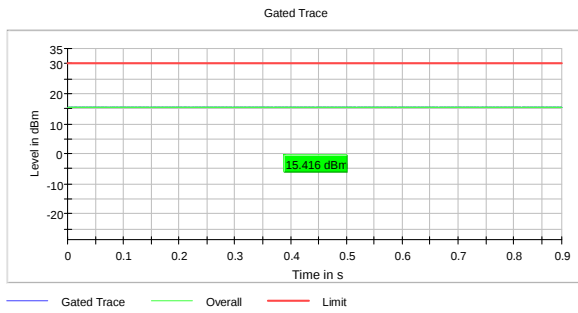
MIMO



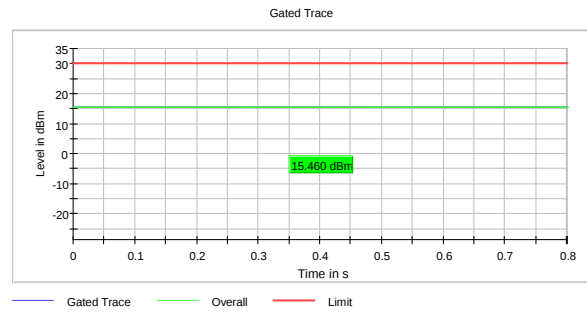
RMS Conducted Power, 5755 MHz, 802.11n, HT40, MCS0, Ant1



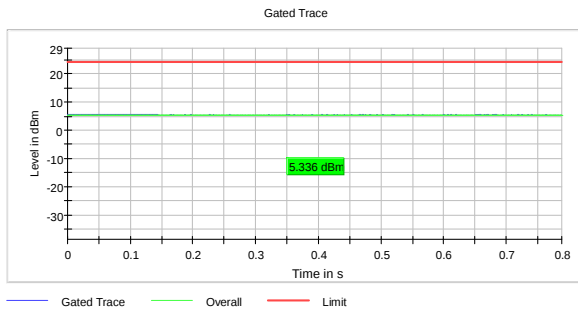
MIMO



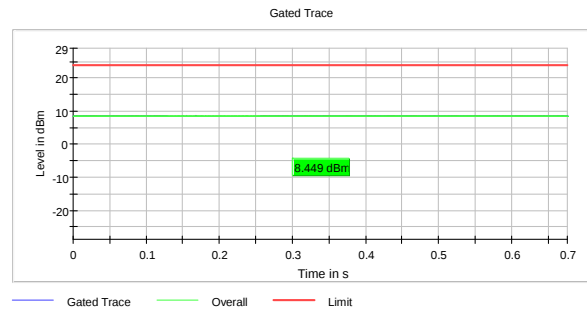
RMS Conducted Power, 5795 MHz, 802.11n, HT40, MCS0, Ant1



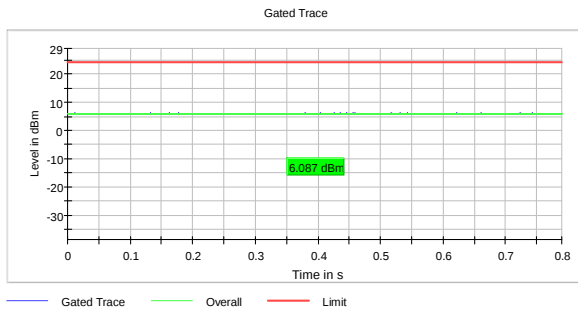
MIMO



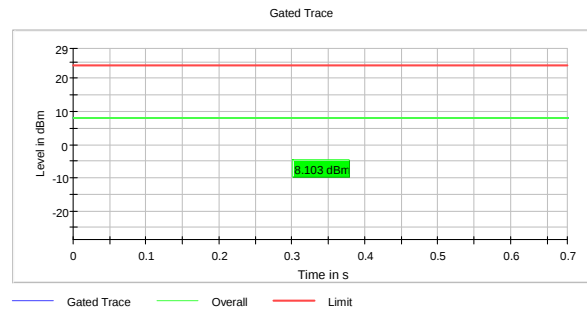
RMS Conducted Power, 5210 MHz, 802.11ac, HT80, MCS0, Ant1



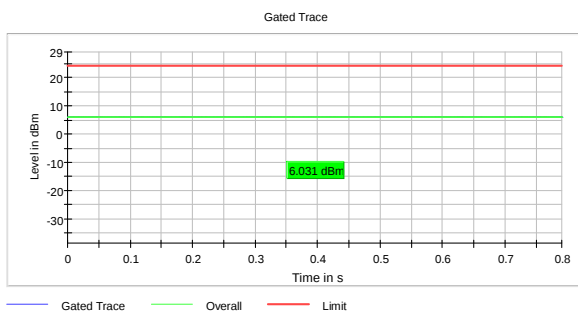
MIMO



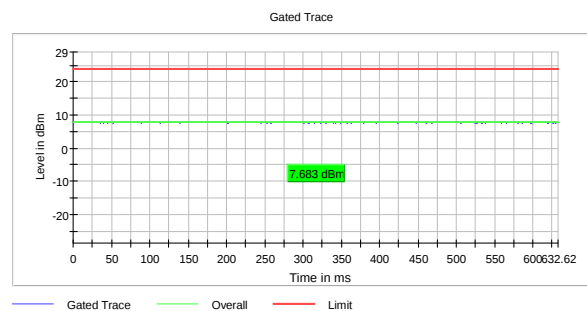
RMS Conducted Power, 5290 MHz, 802.11ac, HT80, MCS0, Ant1



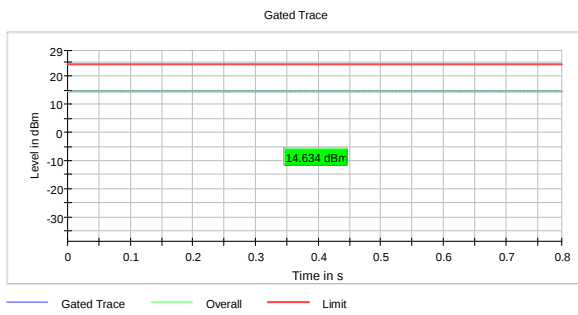
MIMO



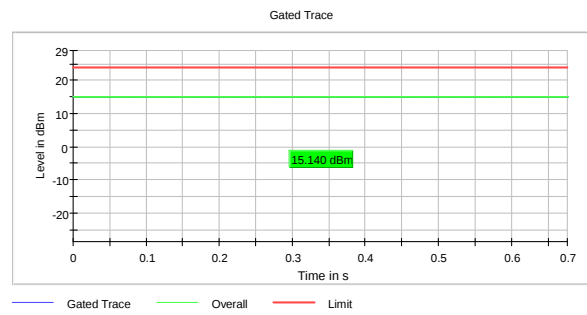
RMS Conducted Power, 5530 MHz, 802.11ac, HT80, MCS0, Ant1



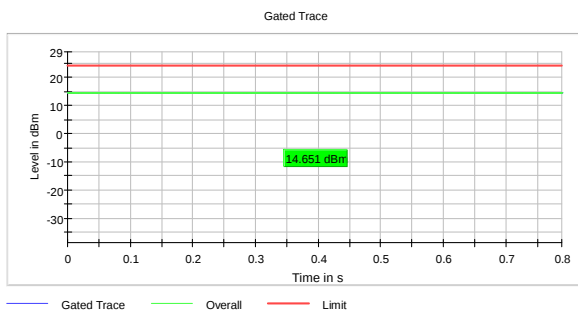
MIMO



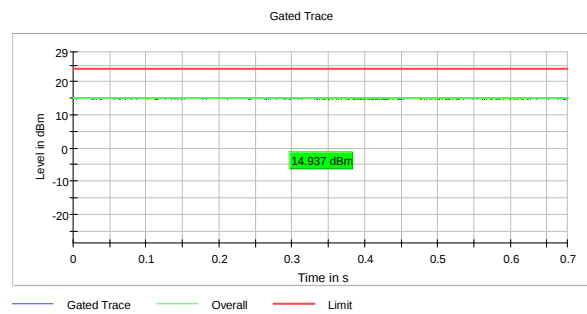
RMS Conducted Power, 5610 MHz, 802.11ac, HT80, MCS0, Ant1



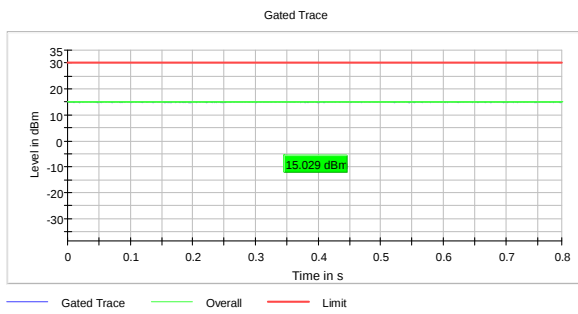
MIMO



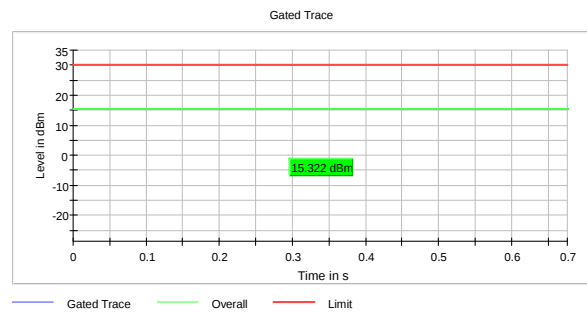
RMS Conducted Power, 5690 MHz, 802.11ac, HT80, MCS0, Ant1



MIMO



RMS Conducted Power, 5775 MHz, 802.11ac, HT80, MCS0, Ant1



MIMO

4.2 Emission Bandwidth

Para. No.: 15.407(a)(2)

ISED RSS-247, Issue 3, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 and 12.4.1

Test Results: Complies

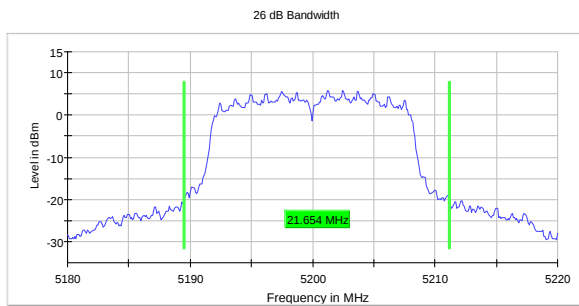
Measurement Data:

Ch. No.	Nominal Frequency (MHz)	FCC Emission Bandwidth (26dB BW), Measured Values (MHz)			
		802.11a 6M	802.11n HT20	802.11n HT40	802.11ac HT80
36	5180		20.4		
40	5200	21.6	21.7		
52	5260	28.1	23.6		
64	5320		19.9		
100	5500		20.0		
116	5580	31.9	29.3		
140	5700		19.9		
46	5230			40.6	
54	5270			41.5	
62	5310			43.9	
110	5550			40.8	
142	5710			44.2	
42	5210				83.8
58	5290				82.8
106	5530				82.8
138	5690				81.8

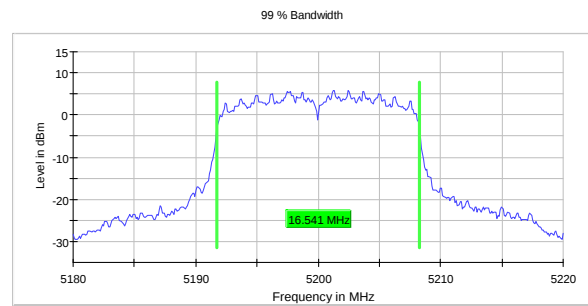
Ch. No.	Nominal Frequency (MHz)	ISED Canada 99% Occupied Bandwidth, Measured Values (MHz)			
		802.11a 6M	802.11n HT20	802.11n HT40	802.11ac HT80
36	5180		17.4		
40	5200	16.5	17.5		
52	5260	16.5	17.6		
56	5280	16.5	17.4		
64	5320		17.4		
100	5500		17.4		
116	5580	16.7	17.8		
136	5680	16.6			
140	5700		17.4		
157	5785	17.4	17.5		
46	5230			36.4	
54	5270			36.4	
62	5310			36.4	
110	5550			36.4	
142	5710			36.4	
149	5755			36.6	
42	5210				74.7
58	5290				75.2
106	5530				75.7
138	5690				75.7
155	5775				75.7

Limit:

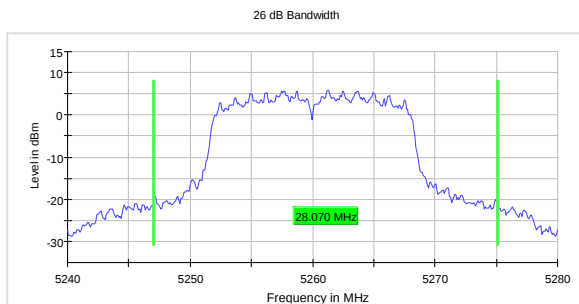
No requirements as long as the emissions are within the band-edges.



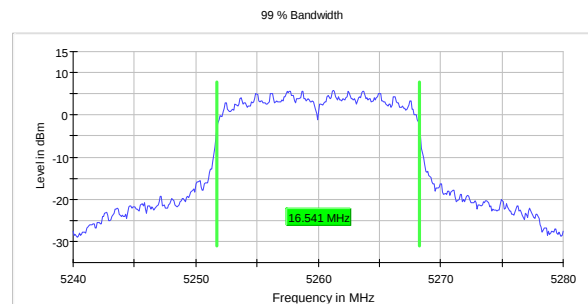
Emission Bandwidth, 5200 MHz, 802.11a, 6Mb



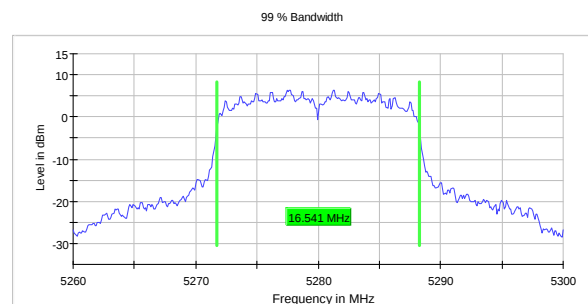
99% Occupied Bandwidth, 5200 MHz, 802.11a, 6Mb



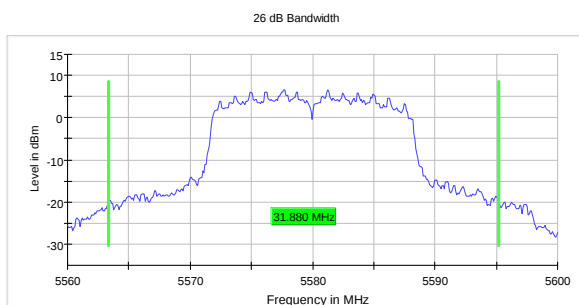
Emission Bandwidth, 5260 MHz, 802.11a, 6Mb



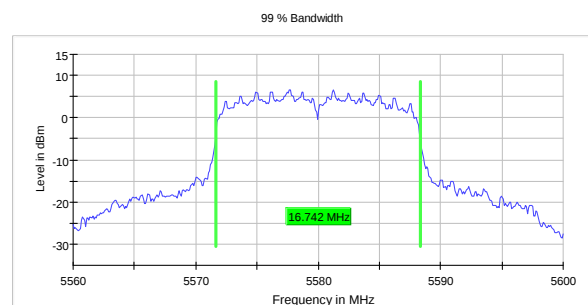
99% Occupied Bandwidth, 5260 MHz, 802.11a, 6Mb



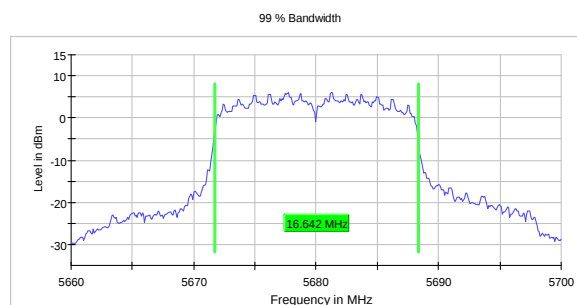
99% Occupied Bandwidth, 5280 MHz, 802.11a, 6Mb



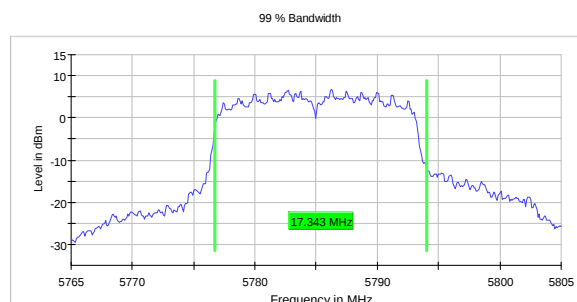
Emission Bandwidth, 5580 MHz, 802.11a, 6Mb



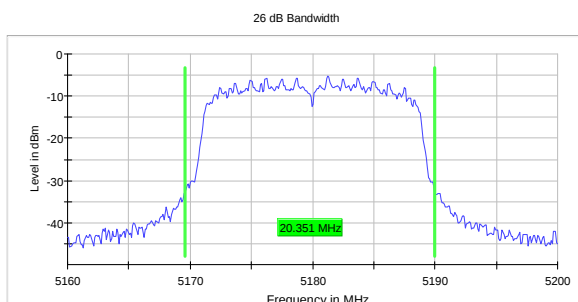
99% Occupied Bandwidth, 5580 MHz, 802.11a, 6Mb



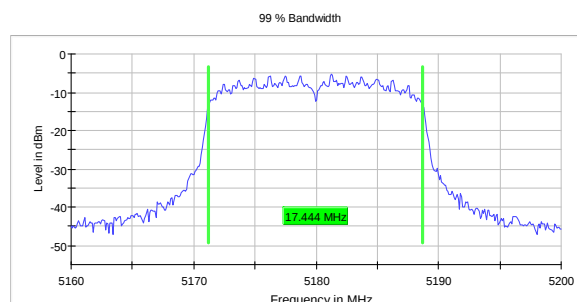
99% Occupied Bandwidth, 5680 MHz, 802.11a, 6Mb



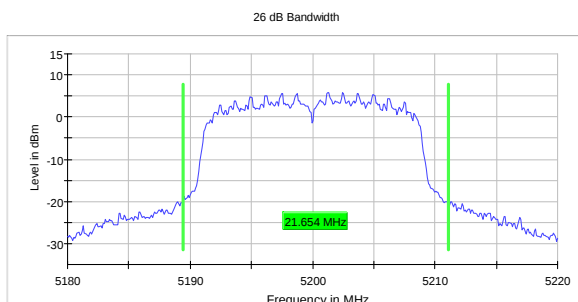
99% Occupied Bandwidth, 5785 MHz, 802.11a, 6Mb



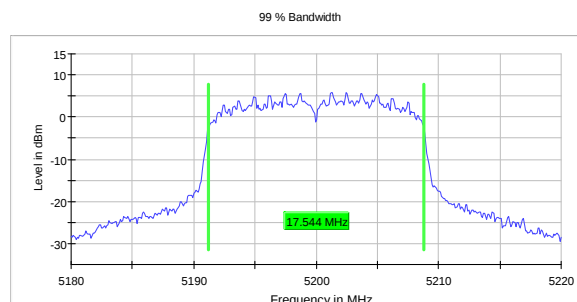
Emission Bandwidth, 5180 MHz, 802.11n, HT20



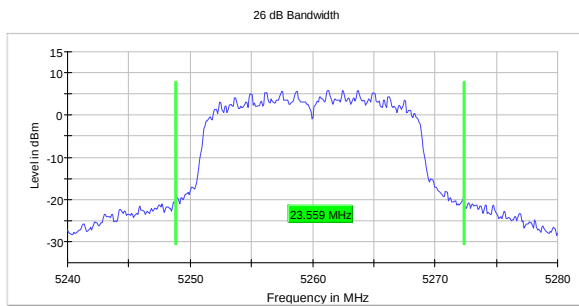
99% Occupied Bandwidth, 5180 MHz, 802.11n, HT20



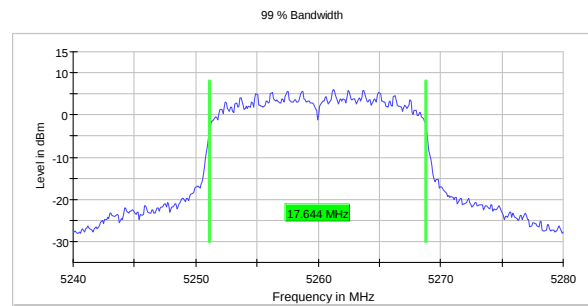
Emission Bandwidth, 5200 MHz, 802.11n, HT20



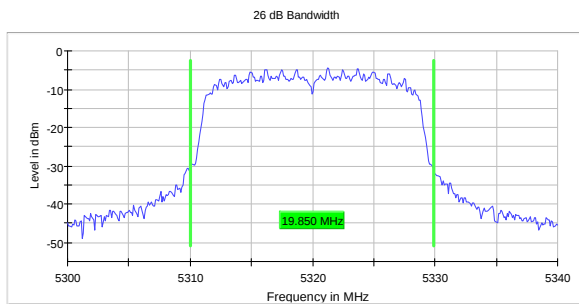
99% Occupied Bandwidth, 5200 MHz, 802.11n, HT20



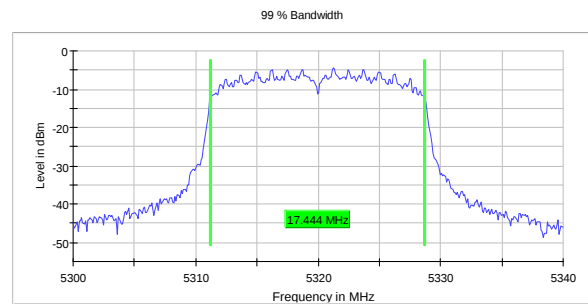
Emission Bandwidth, 5260 MHz, 802.11n, HT20



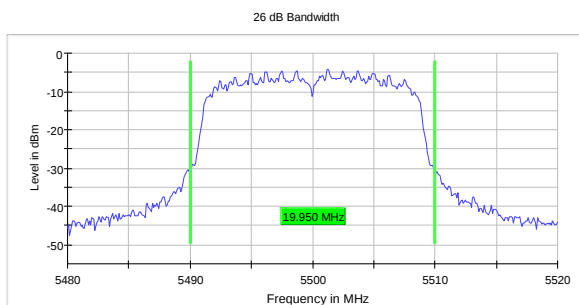
99% Occupied Bandwidth, 5260 MHz, 802.11n, HT20



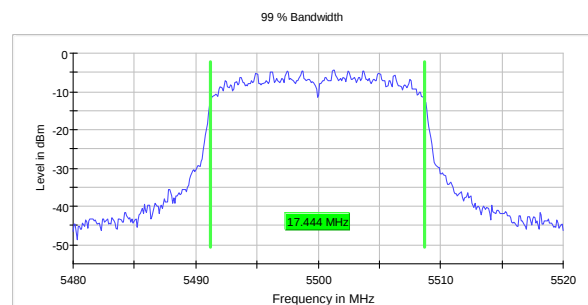
Emission Bandwidth, 5320 MHz, 802.11n, HT20



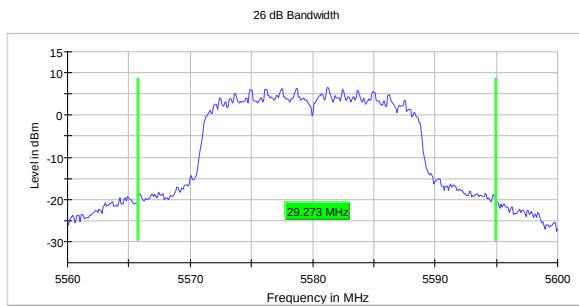
99% Occupied Bandwidth, 5320 MHz, 802.11n, HT20



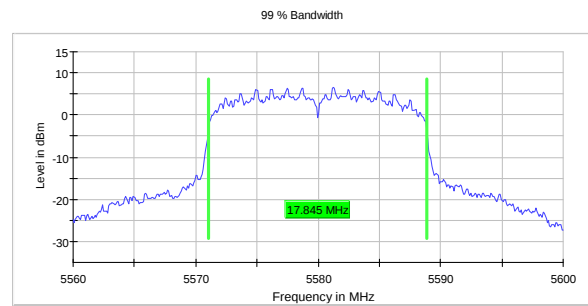
Emission Bandwidth, 5500 MHz, 802.11n, HT20



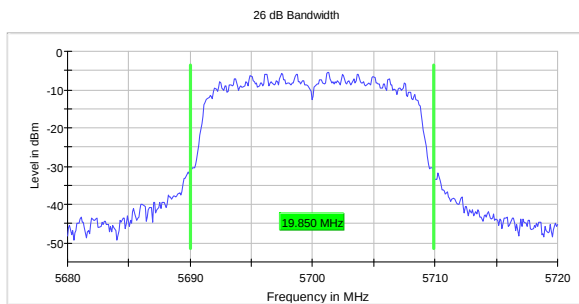
99% Occupied Bandwidth, 5500 MHz, 802.11n, HT20



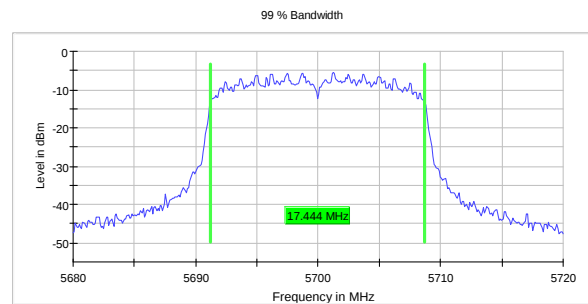
Emission Bandwidth, 5580 MHz, 802.11n, HT20



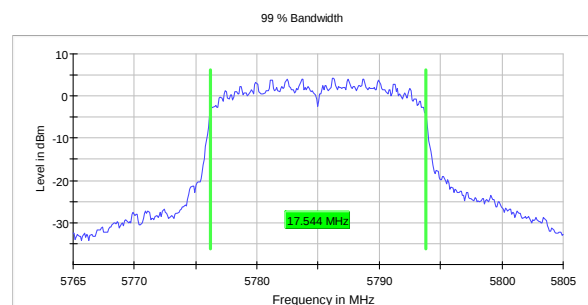
99% Occupied Bandwidth, 5580 MHz, 802.11n, HT20



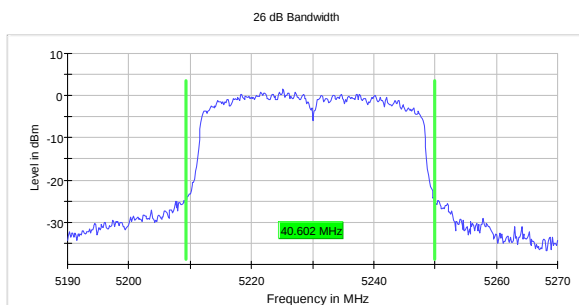
Emission Bandwidth, 5700 MHz, 802.11n, HT20



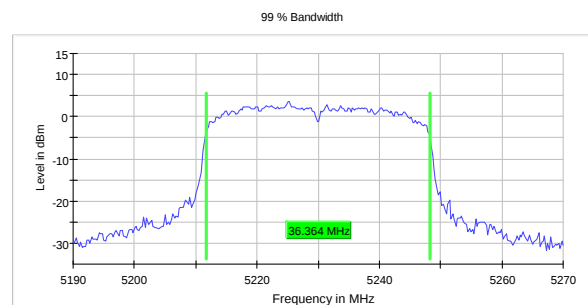
99% Occupied Bandwidth, 5700 MHz, 802.11n, HT20



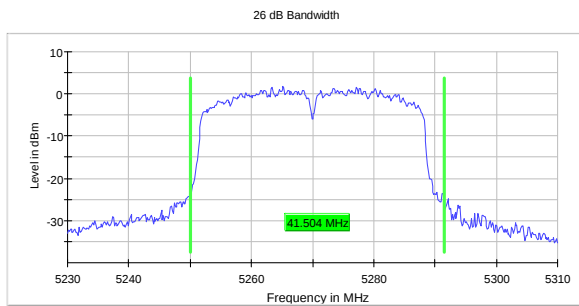
99% Occupied Bandwidth, 5785 MHz, 802.11n, HT20



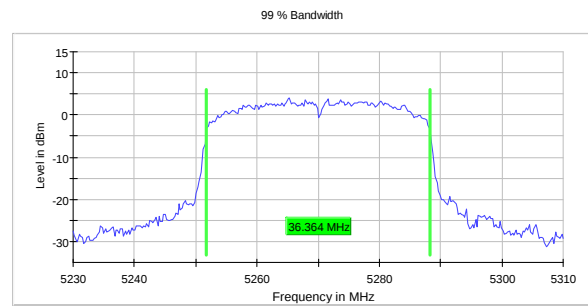
Emission Bandwidth, 5230 MHz, 802.11n, HT40



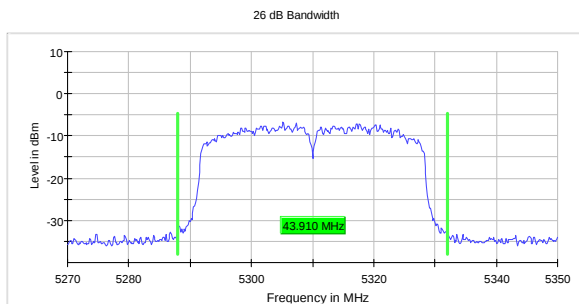
99% Occupied Bandwidth, 5230 MHz, 802.11n, HT40



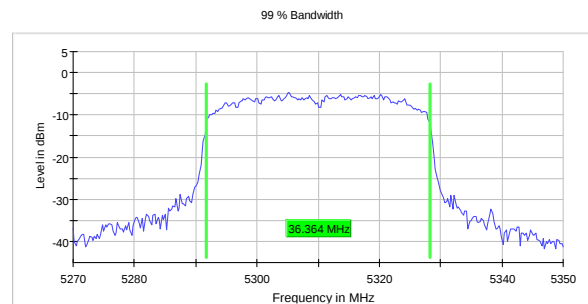
Emission Bandwidth, 5270 MHz, 802.11n, HT40



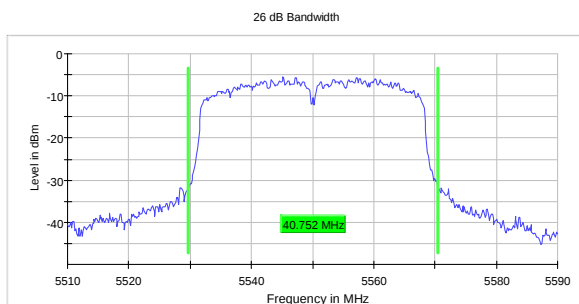
99% Occupied Bandwidth, 5270 MHz, 802.11n, HT40



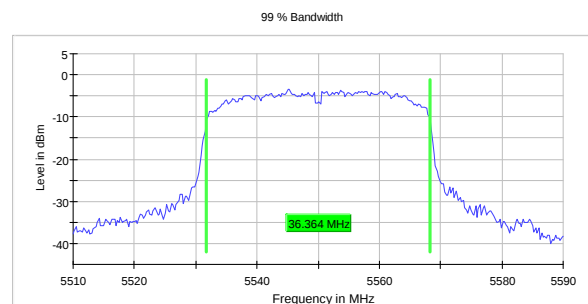
Emission Bandwidth, 5310 MHz, 802.11n, HT40



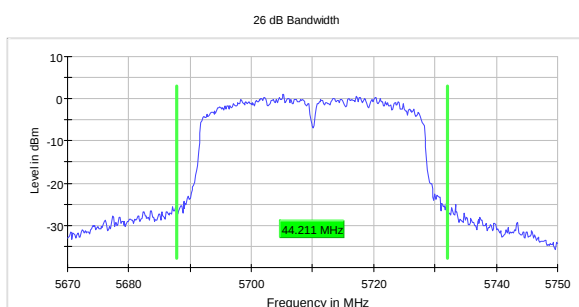
99% Occupied Bandwidth, 5310 MHz, 802.11n, HT40



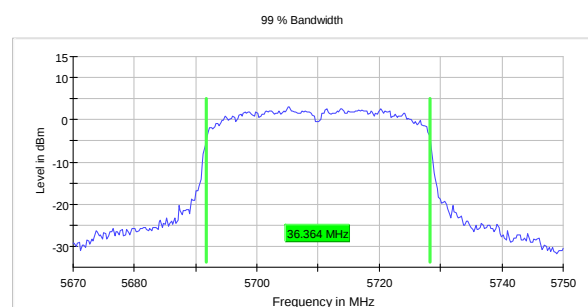
Emission Bandwidth, 5550 MHz, 802.11n, HT40



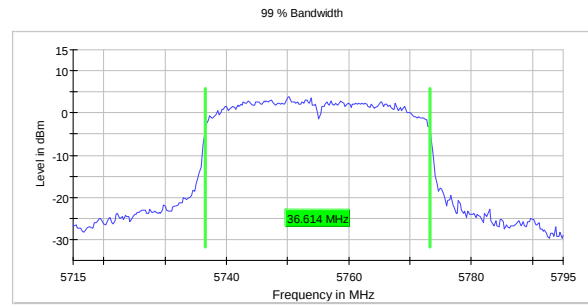
99% Occupied Bandwidth, 5550 MHz, 802.11n, HT40



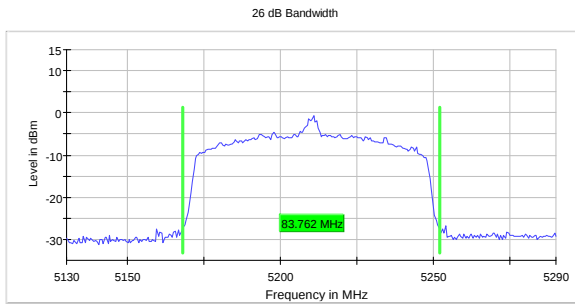
Emission Bandwidth, 5710 MHz, 802.11n, HT40



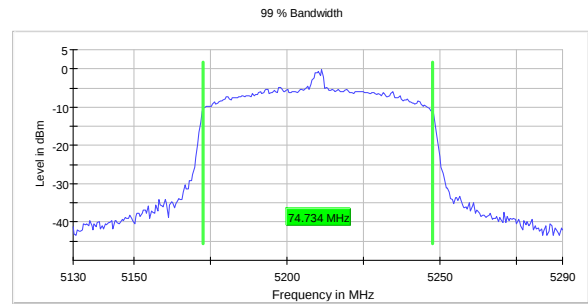
99% Occupied Bandwidth, 5710 MHz, 802.11n, HT40



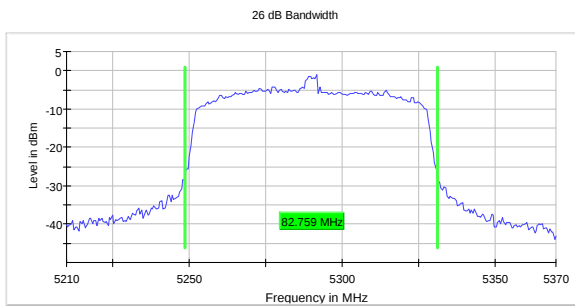
99% Occupied Bandwidth, 5755 MHz, 802.11n, HT40



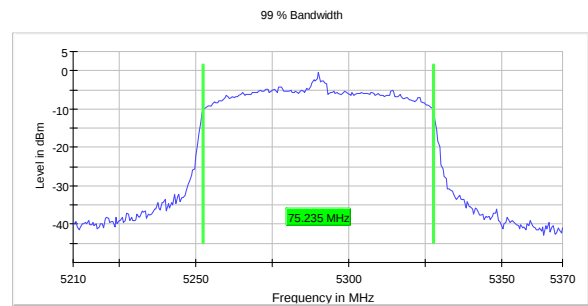
Emission Bandwidth, 5210 MHz, 802.11ac, HT80



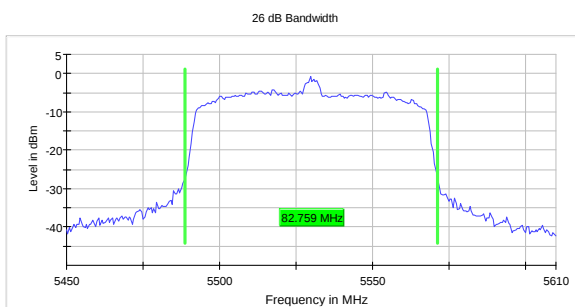
99% Occupied Bandwidth, 5210 MHz, 802.11ac, HT80



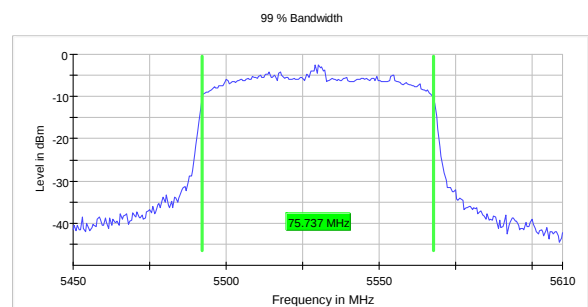
Emission Bandwidth, 5290 MHz, 802.11ac, HT80



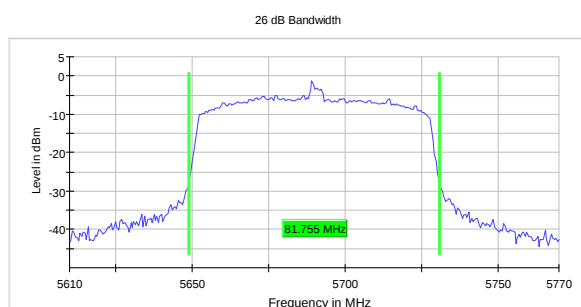
99% Occupied Bandwidth, 5290 MHz, 802.11ac, HT80



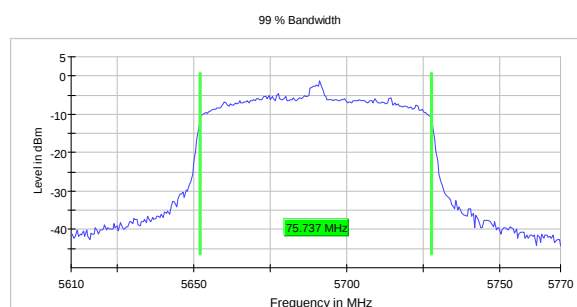
Emission Bandwidth, 5530 MHz, 802.11ac, HT80



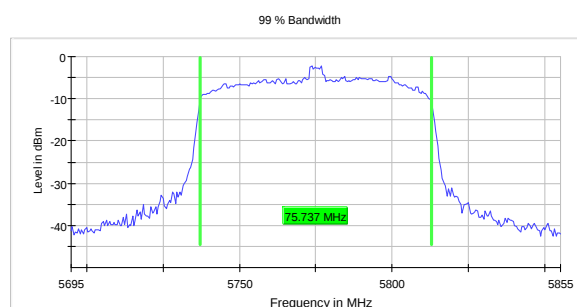
99% Occupied Bandwidth, 5530 MHz, 802.11ac, HT80



Emission Bandwidth, 5690 MHz, 802.11ac, HT80



99% Occupied Bandwidth, 5690 MHz, 802.11ac, HT80



99% Occupied Bandwidth, 5775 MHz, 802.11ac, HT80

4.3 DTS Bandwidth

Para. No.: 15.407(e)

ISED RSS-247, Issue 3, Clause 6.2.4

Measurement procedure: ANSI C63.10-2013 Clause 11.8, Option 1

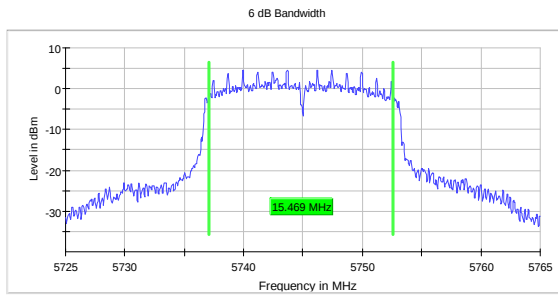
Test Results: Complies

Measurement Data:

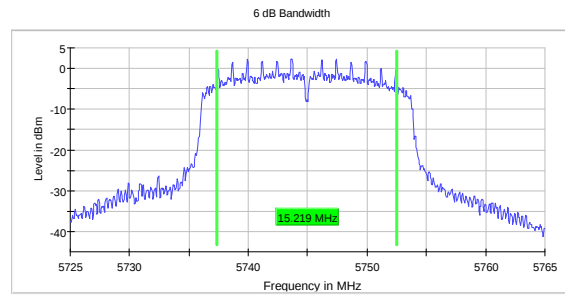
Ch. No.	Nominal Frequency (MHz)	DTS Bandwidth, Measured Values (MHz)			
		802.11a 6Mb	802.11n HT20	802.11n HT40	802.11ac HT80
149	5745	15.5	15.2		
157	5785	15.3	15.2		
165	5825	15.5	15.2		
151	5755			35.2	
159	5795			35.2	
155	5775				75.2

Limit:

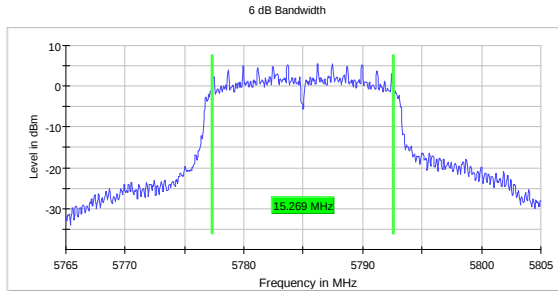
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.



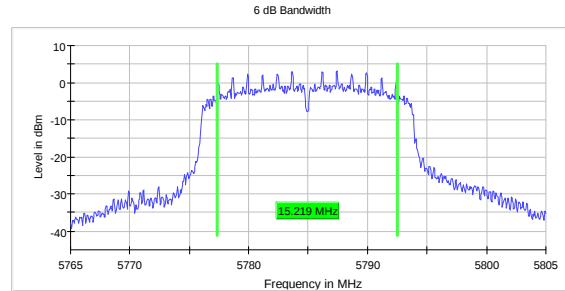
DTS BW, 5745 MHz, 802.11a, 6Mb



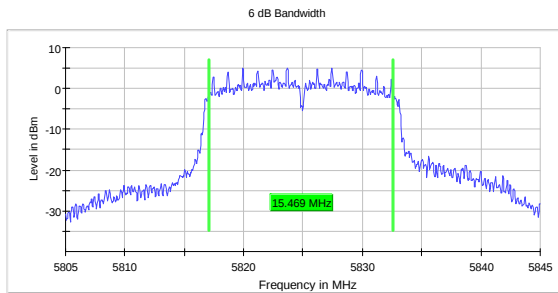
DTS BW, 5745 MHz, 802.11n, HT20



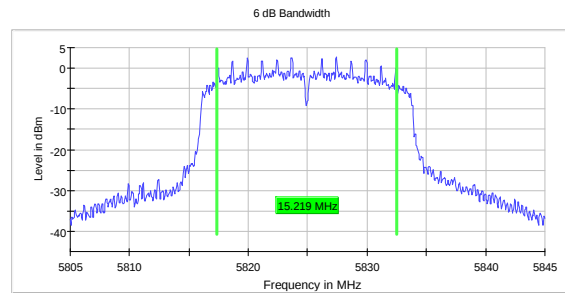
DTS BW, 5785 MHz, 802.11a, 6Mb



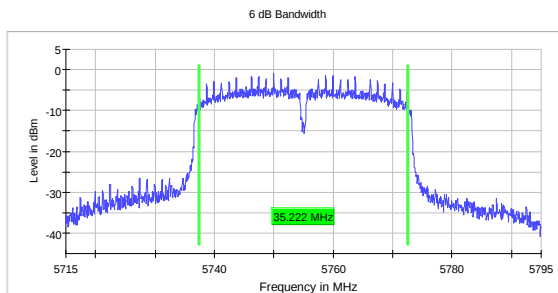
DTS BW, 5785 MHz, 802.11n, HT20



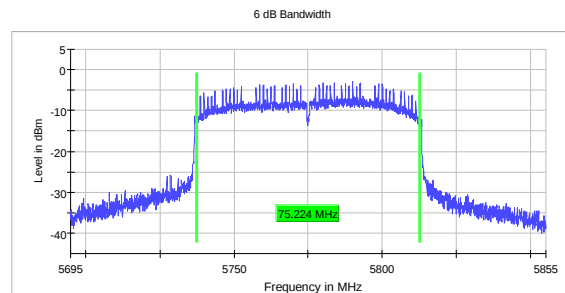
DTS BW, 5825 MHz, 802.11a, 6Mb



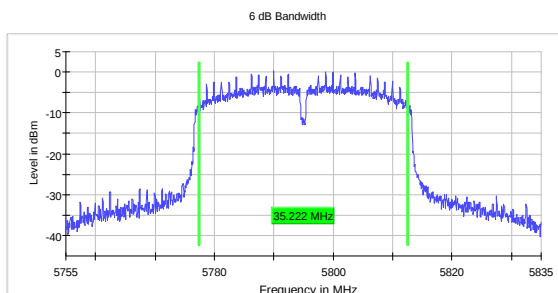
DTS BW, 5825 MHz, 802.11n, HT20



DTS BW, 5755 MHz, 802.11n, HT40



DTS BW, 5775 MHz, 802.11ac, HT80



DTS BW, 5795 MHz, 802.11n, HT40

4.4 Peak Power Spectral Density

FCC 15.407(a)

ISED RSS-247, Issue 3, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.5

Test Results: Complies

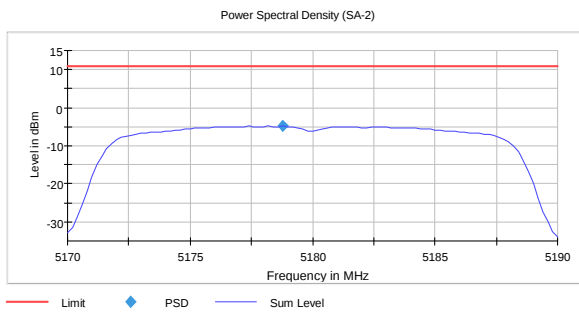
Measurement Data:

Ch. No.	Nominal Frequency (MHz)	Peak Power Spectral Density, Measured Values (dBm/MHz)			
		802.11a 6M	802.11n HT20	802.11n HT40	802.11ac HT80
36	5180	-4.8	-3.0		
40	5200	3.4	4.0		
48	5240	2.9	3.7		
52	5260	3.4	3.8		
60	5300	3.8	3.7		
64	5320	-3.9	-3.4		
100	5500	-3.8	-3.4		
104	5520	4.2	4.0		
116	5580	4.1	3.9		
136	5680	4.0	3.6		
140	5700	-5.0	-4.6		
144	5720	3.3	3.2		
38	5190			-6.7	
46	5230			0.0	
54	5270			0.2	
62	5310			-7.2	
102	5510			-7.5	
110	5550			0.9	
134	5670			0.5	
142	5710			-0.5	
42	5210				-11.0
58	5290				-11.0
106	5530				-11.1
122	5610				-3.1
138	5690				-3.5

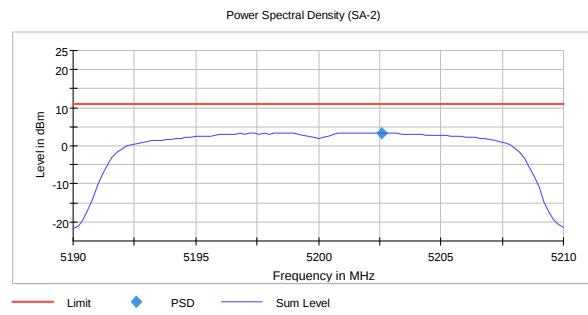
Ch. No.	Nominal Frequency (MHz)	Peak Power Spectral Density, Measured Values (dBm/500kHz)			
		802.11a 6M	802.11n HT20	802.11n HT40	802.11ac HT80
149	5745	1.0	0.8		
157	5785	1.3	1.2		
165	5825	1.4	1.0		
149	5755			-3.1	
159	5795			-2.0	
155	5775				-5.8

Limits:

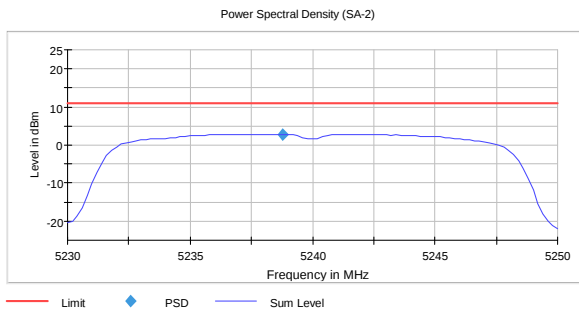
Frequency Band	FCC 15.407(a)	RSS-247, Issue 3
5150 – 5250 MHz	Less than 17 dBm/MHz for master device Less than 11 dBm/MHz for client device	Less than 10 dBm/MHz e.i.r.p. (only indoor allowed)
5250 – 5350 MHz	Less than 11 dBm/MHz	Less than 11 dBm/MHz
5470 – 5725 MHz	Less than 11 dBm/MHz	Less than 11 dBm/MHz
5725 – 5825 MHz	Less than 30 dBm/500kHz	Less than 30 dBm/500kHz
	If Antenna Gain is more than 6 dBi the limit above is reduced by the amount exceeding 6 dBi	



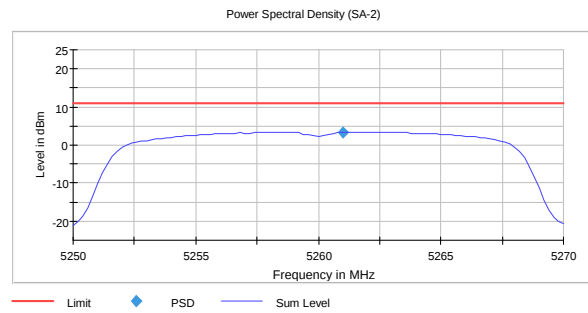
PSD, 5180 MHz, 802.11a, 6Mb -4.8



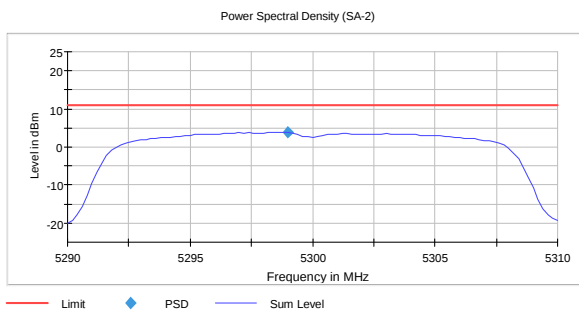
PSD, 5200 MHz, 802.11a, 6Mb 3.4



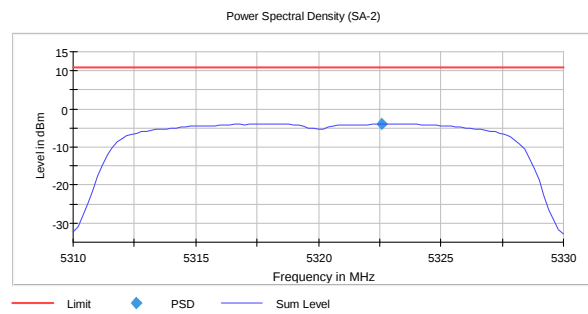
PSD, 5240 MHz, 802.11a, 6Mb 2.9



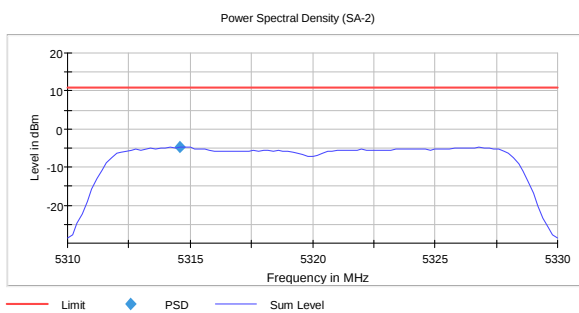
PSD, 5260 MHz, 802.11a, 6Mb 3.4



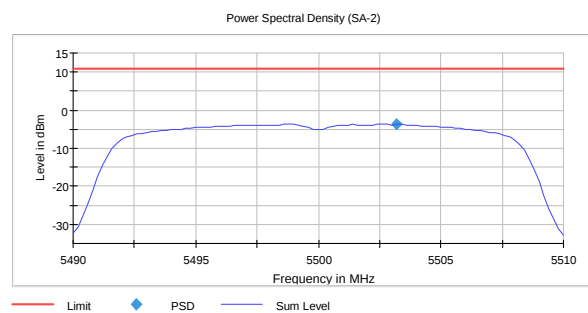
PSD, 5300 MHz, 802.11a, 6Mb 3.8



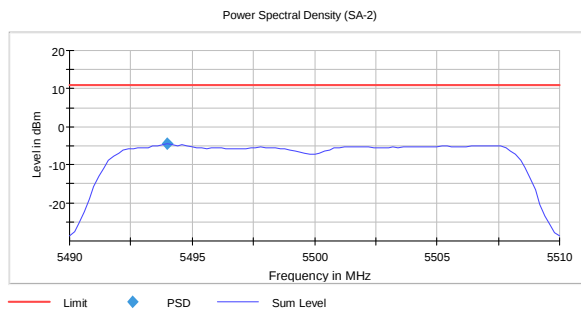
PSD, 5320 MHz, 802.11a, 6Mb -3.9



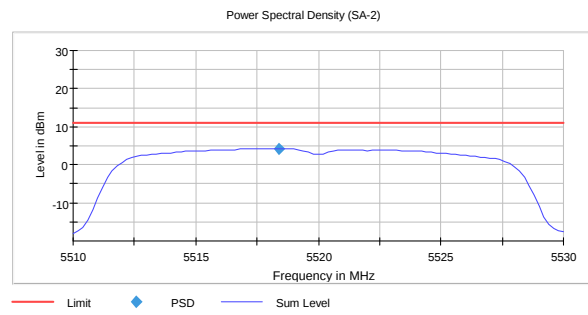
54Mb -4.8



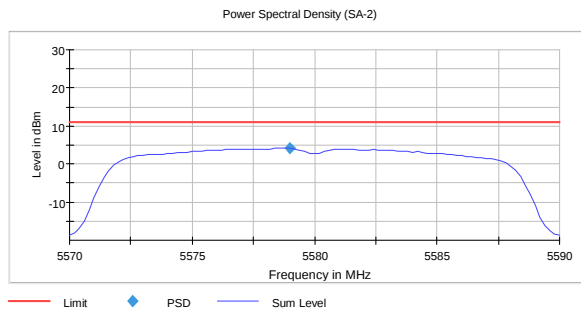
PSD, 5500 MHz, 802.11a, 6Mb -3.8



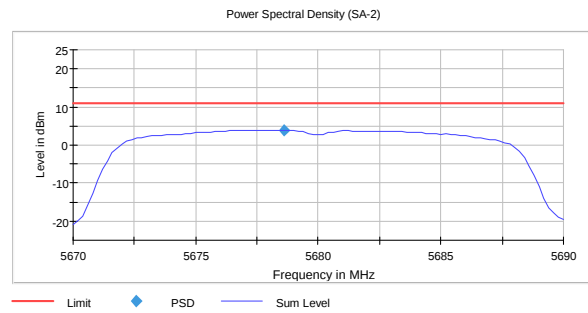
54Mb -4.5



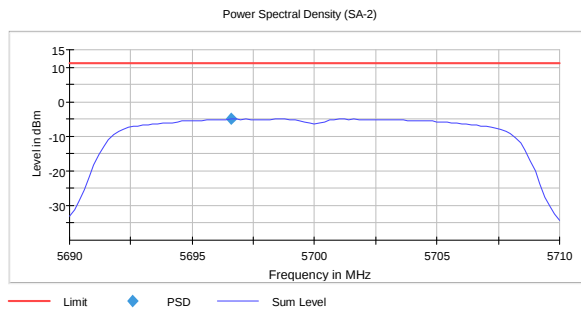
PSD, 5520 MHz, 802.11a, 6Mb 4.2



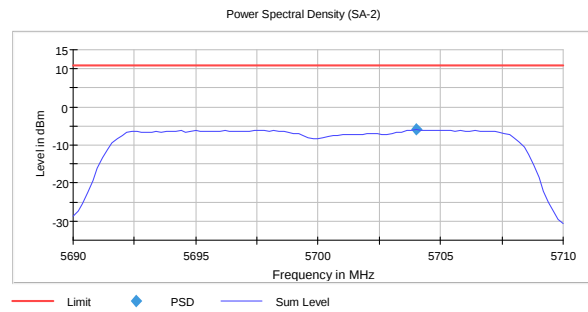
PSD, 5580 MHz, 802.11a, 6Mb 4.1



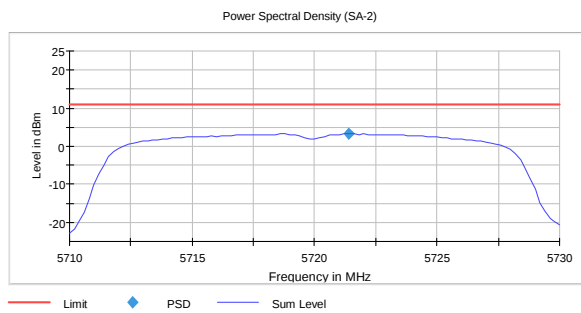
PSD, 5680 MHz, 802.11a, 6Mb 4.0



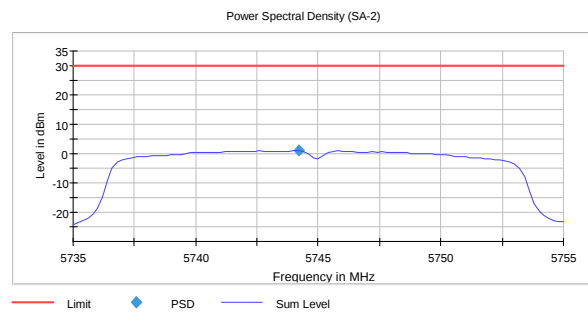
PSD, 5700 MHz, 802.11a, 6Mb -5.0



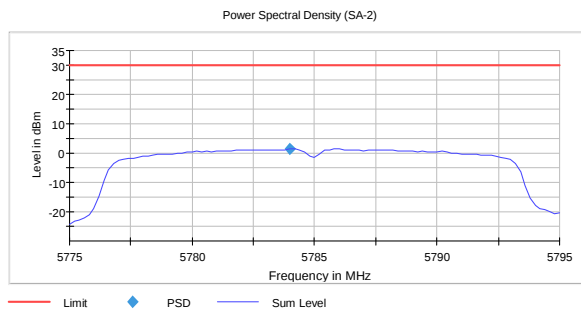
54Mb -6.0



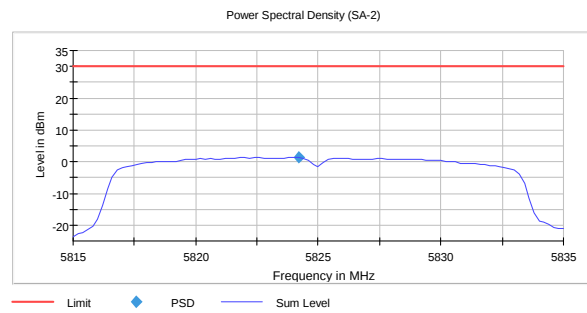
PSD, 5720 MHz, 802.11a, 6Mb 3.3



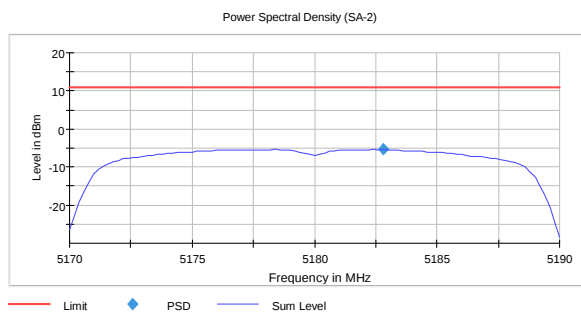
PSD, 5745 MHz, 802.11a, 6Mb 1.0



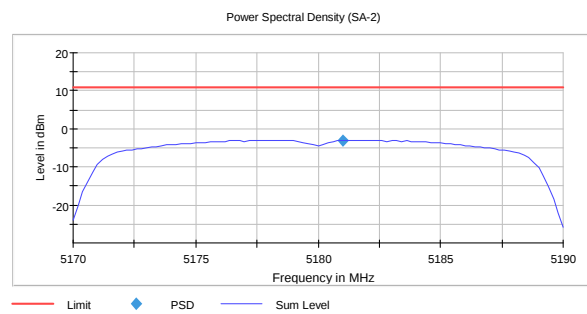
PSD, 5785 MHz, 802.11a, 6Mb 1.3



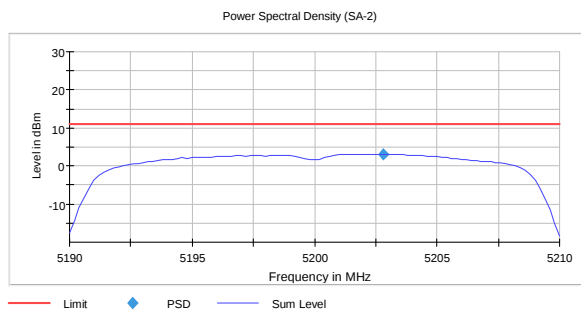
PSD, 5825 MHz, 802.11a, 6Mb 1.4



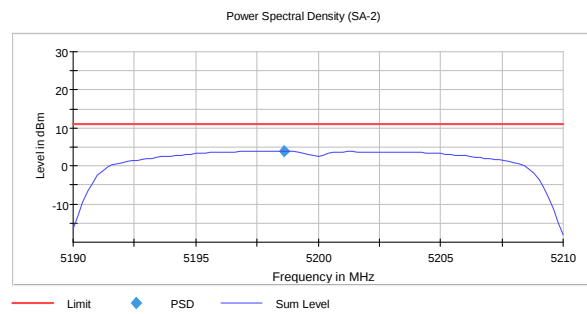
PSD, 5180 MHz, 802.11n, HT20, MCS0, Ant1 -5.4



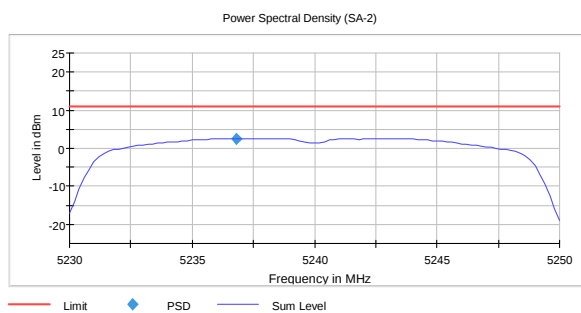
MIMO -3.0



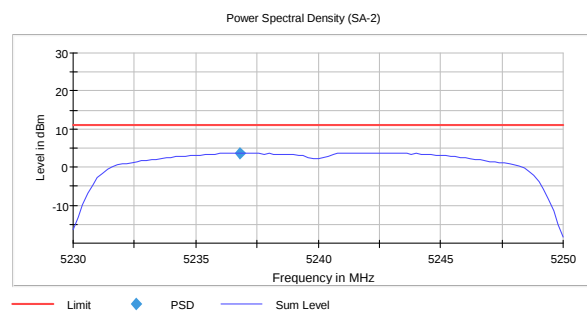
PSD, 5200 MHz, 802.11n, HT20, MCS0, Ant1 3.2



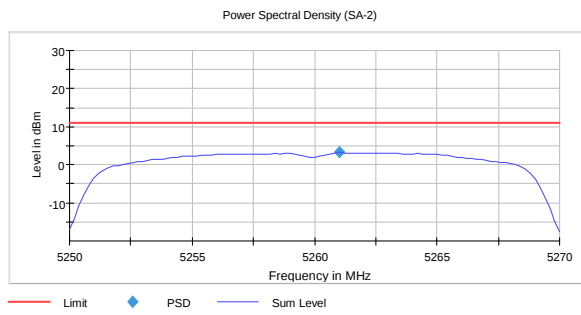
MIMO 4.0



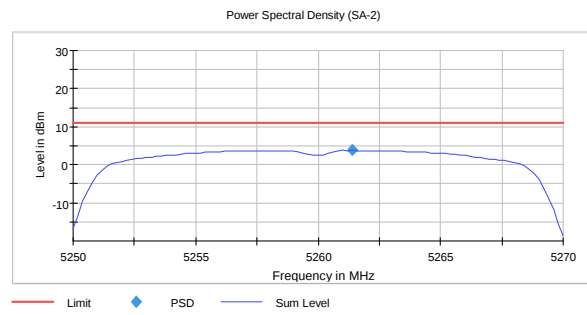
PSD, 5240 MHz, 802.11n, HT20, MCS0, Ant1 2.6



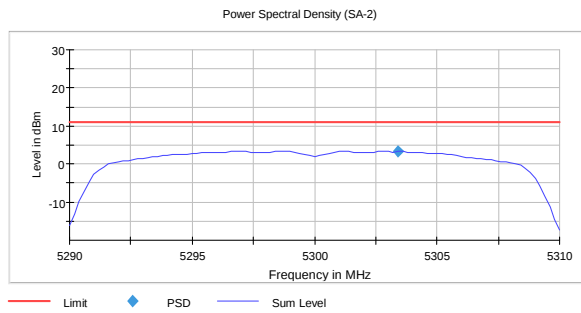
MIMO 3.7



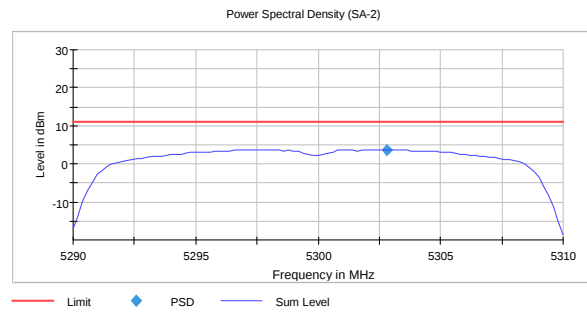
PSD, 5260 MHz, 802.11n, HT20, MCS0, Ant1 3.2



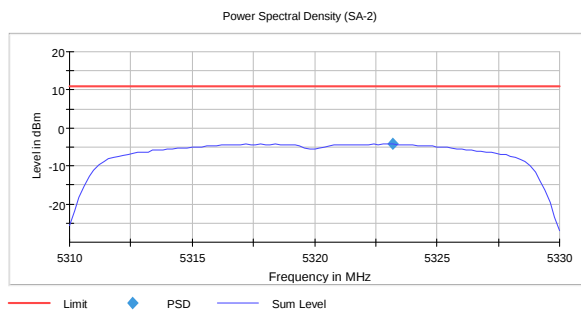
MIMO 3.8



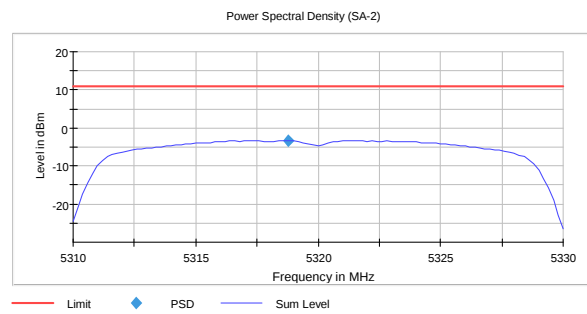
PSD, 5300 MHz, 802.11n, HT20, MCS0, Ant1 3.4



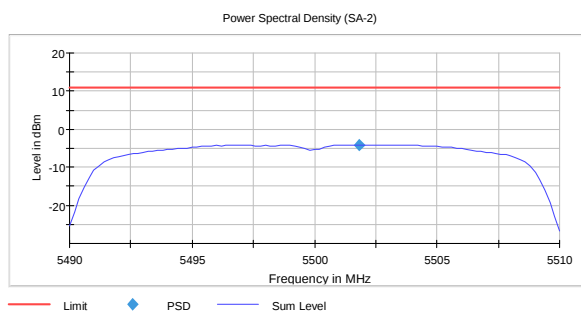
MIMO 3.7



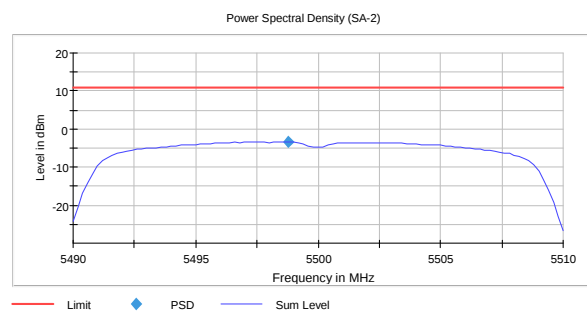
PSD, 5320 MHz, 802.11n, HT20, MCS0, Ant1 -4.2



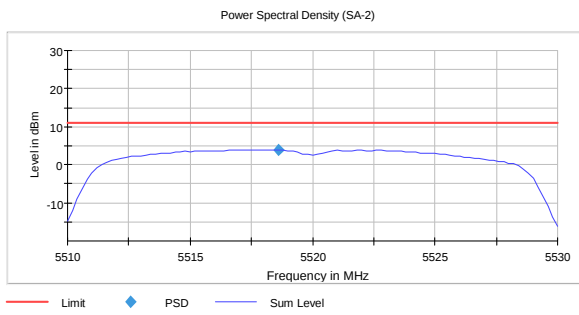
MIMO -3.4



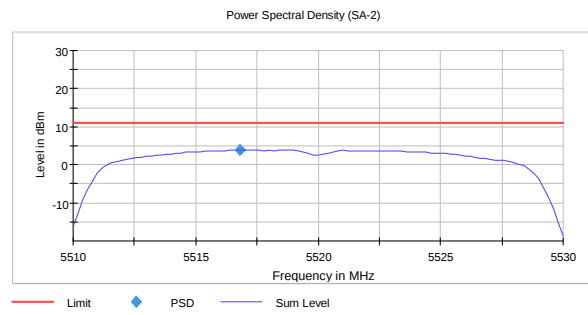
PSD, 5500 MHz, 802.11n, HT20, MCS0, Ant1 -4.0



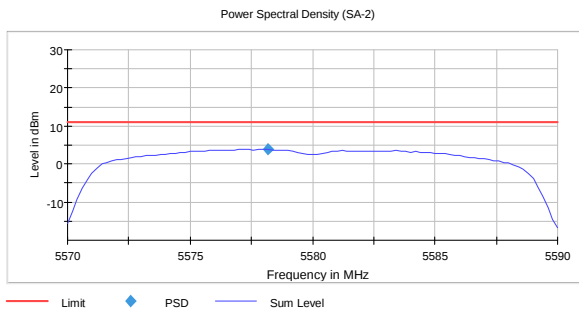
MIMO -3.4



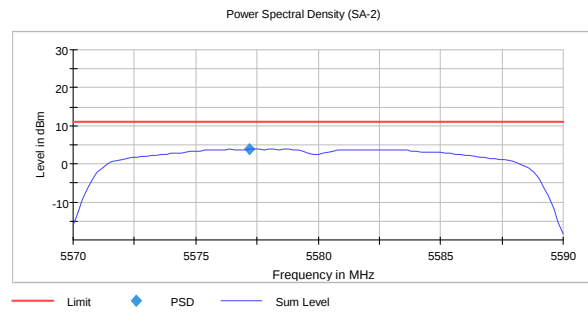
PSD, 5520 MHz, 802.11n, HT20, MCS0, Ant1 4.0



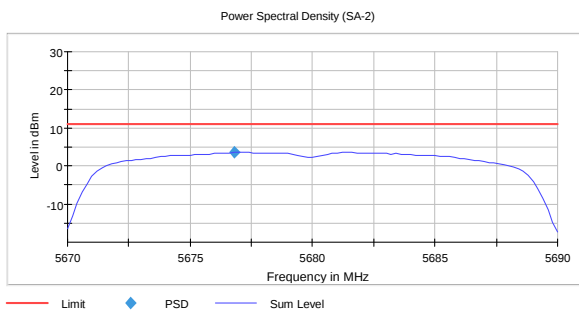
MIMO 3.9



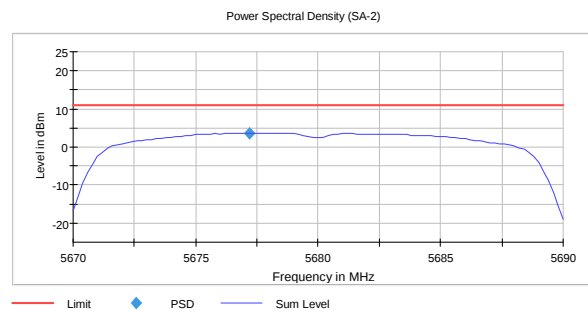
PSD, 5580 MHz, 802.11n, HT20, MCS0, Ant1 3.9



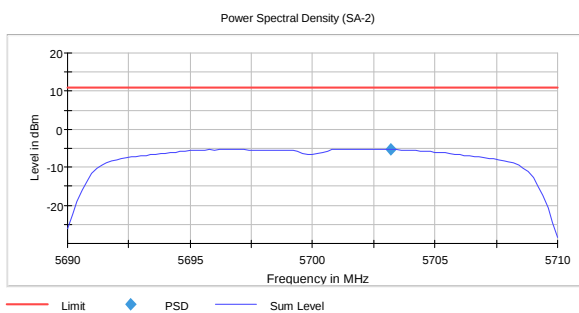
MIMO 3.8



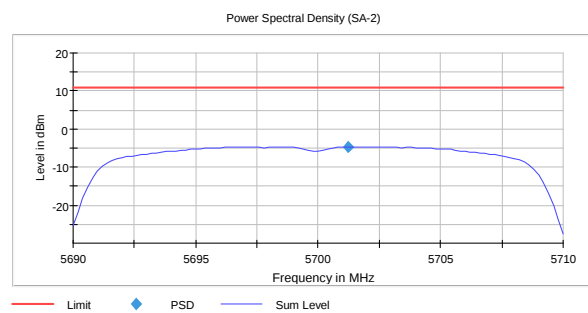
PSD, 5680 MHz, 802.11n, HT20, MCS0, Ant1 3.6



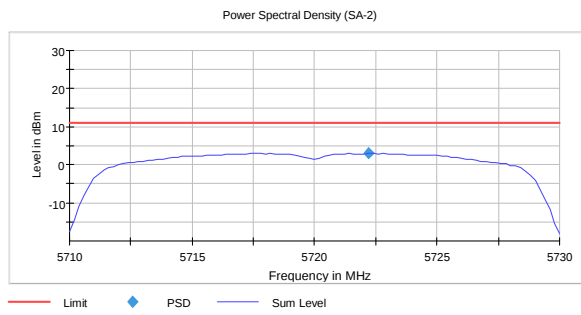
MIMO 3.6



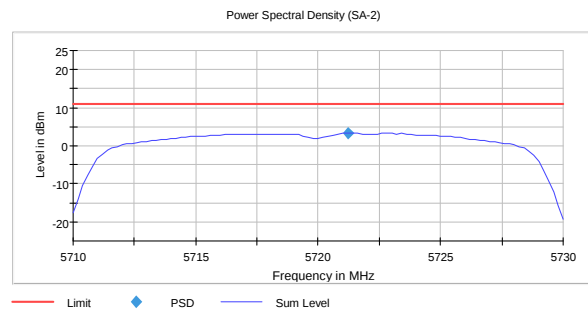
PSD, 5700 MHz, 802.11n, HT20, MCS0, Ant1 -5.3



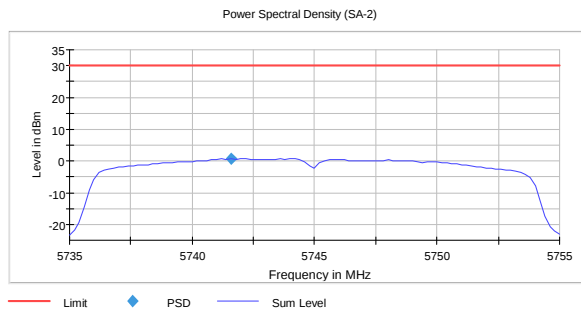
MIMO -4.6



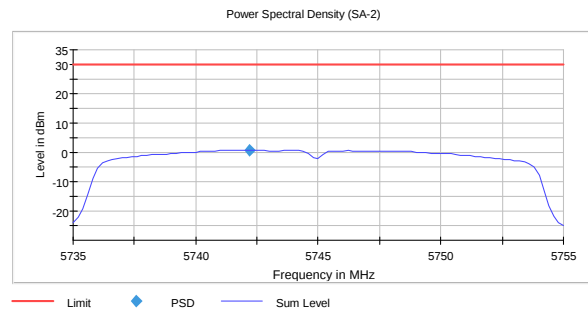
PSD, 5720 MHz, 802.11n, HT20, MCS0, Ant1 3.0



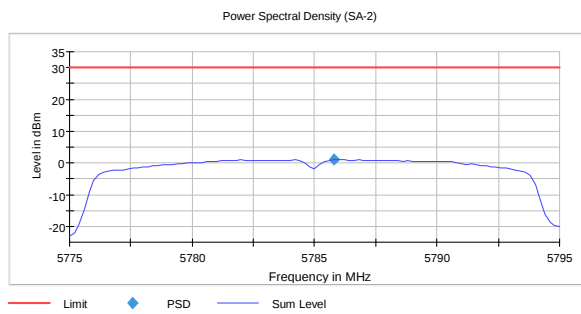
MIMO 3.2



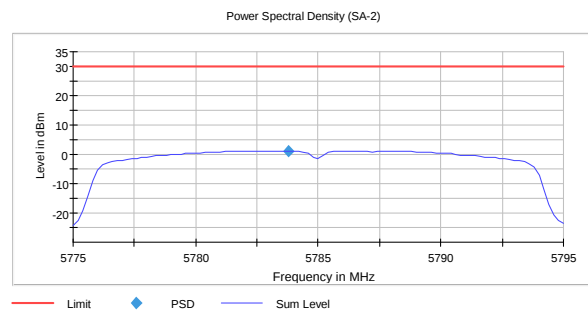
PSD, 5745 MHz, 802.11n, HT20, MCS0, Ant1 0.6



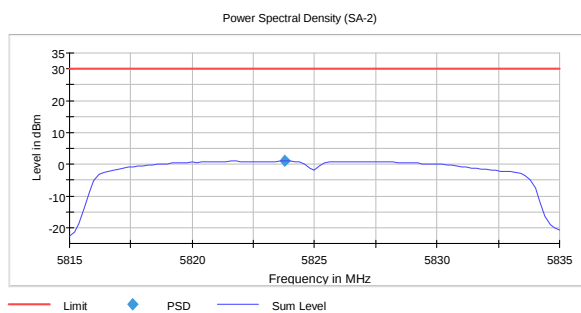
MIMO 0.8



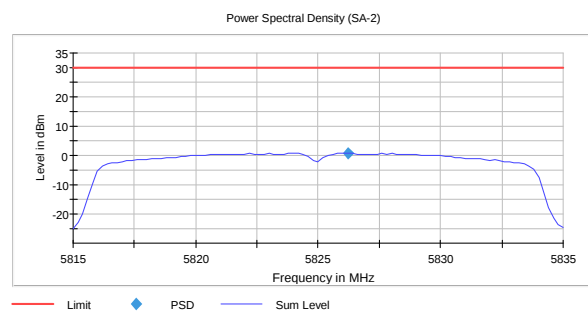
PSD, 5785 MHz, 802.11n, HT20, MCS0, Ant1 1.0



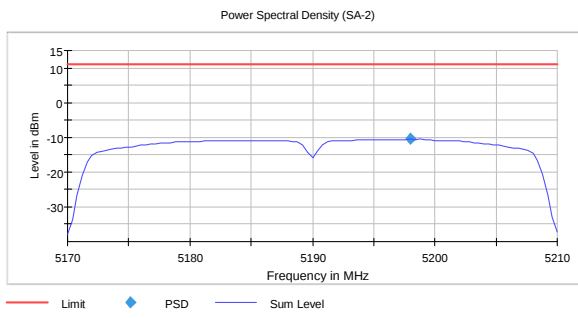
MIMO 1.2



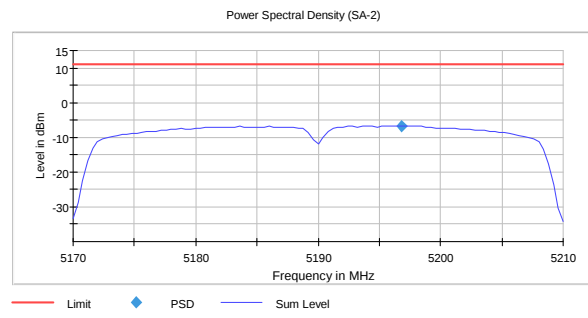
PSD, 5825 MHz, 802.11n, HT20, MCS0, Ant1 1.0



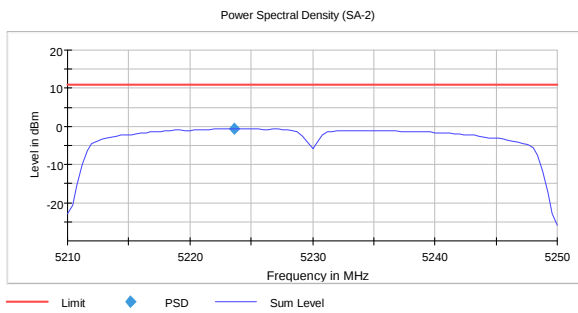
MIMO 0.7



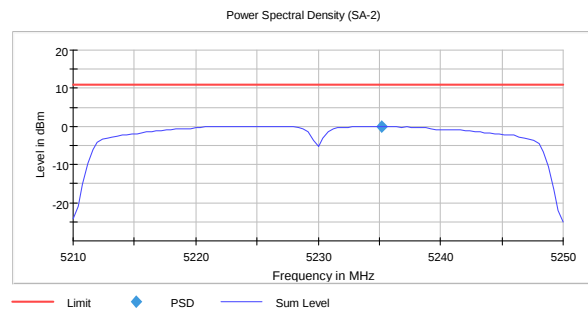
PSD, 5190 MHz, 802.11n, HT40, MCS0, Ant1 -10.5



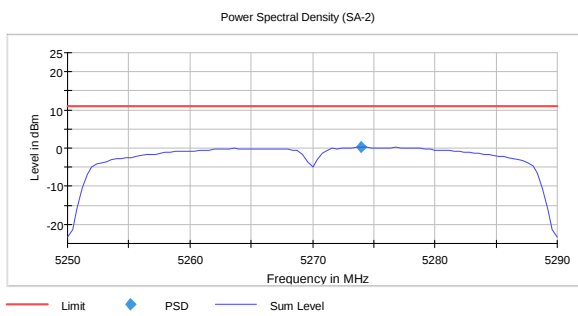
MIMO -6.7



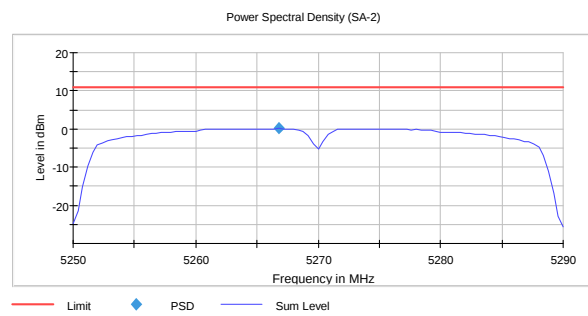
PSD, 5230 MHz, 802.11n, HT40, MCS0, Ant1 -0.6



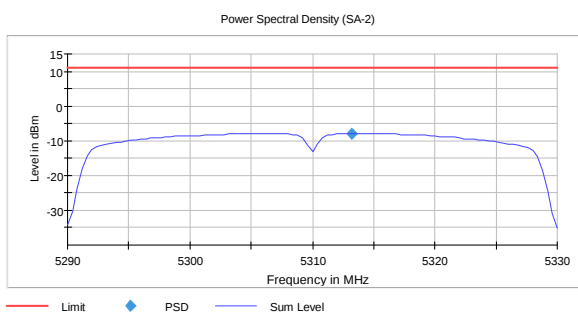
MIMO 0.0



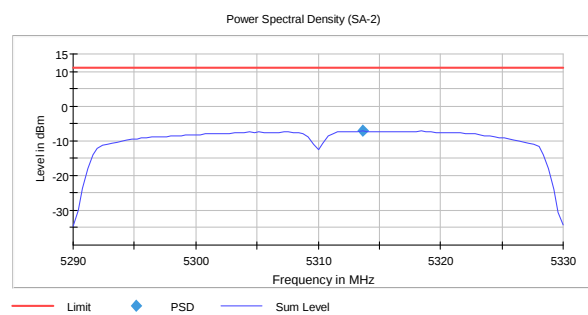
PSD, 5270 MHz, 802.11n, HT40, MCS0, Ant1 0.2



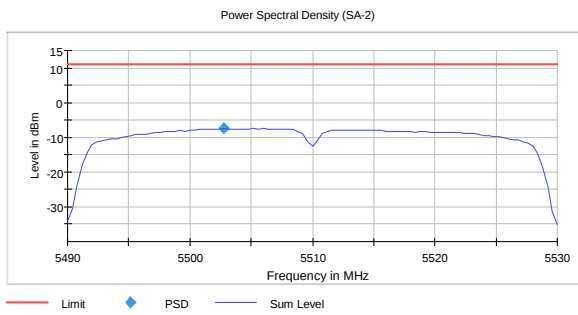
MIMO 0.1



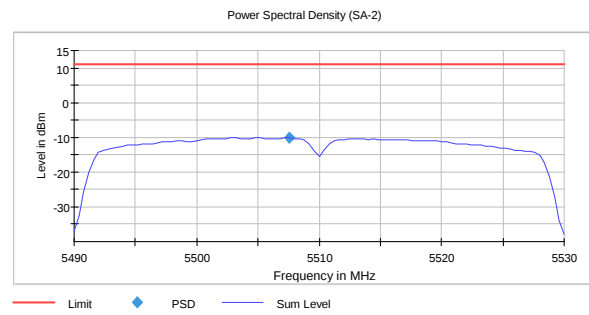
PSD, 5310 MHz, 802.11n, HT40, MCS0, Ant1 -7.9



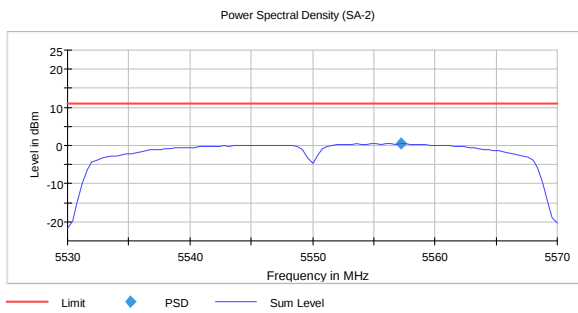
MIMO -7.2



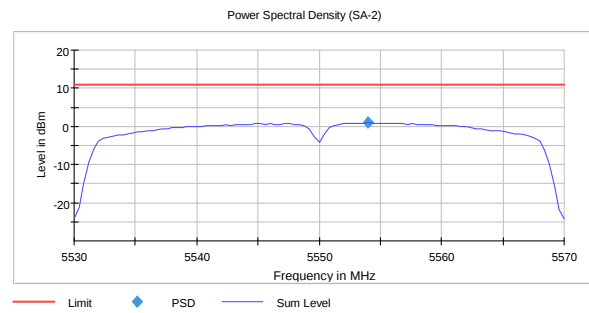
PSD, 5510 MHz, 802.11n, HT40, MCS0, Ant1 -7.5



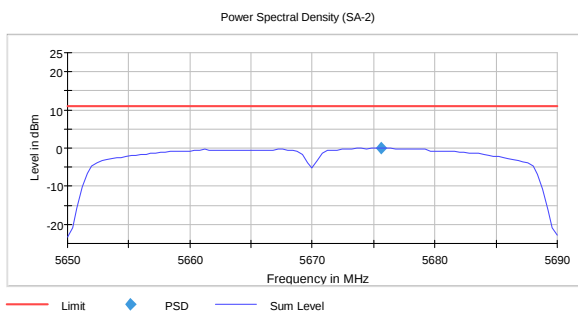
MIMO -10.2



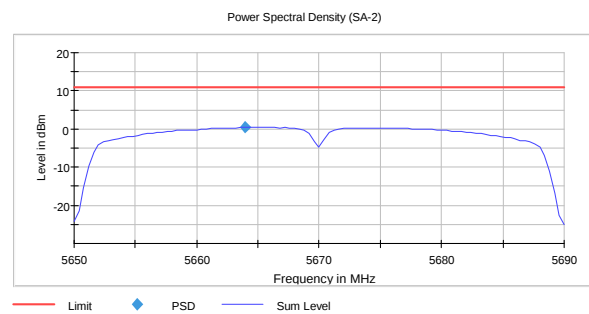
PSD, 5550 MHz, 802.11n, HT40, MCS0, Ant1 0.5



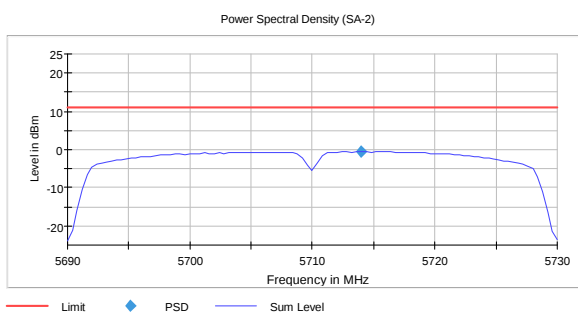
MIMO 0.9



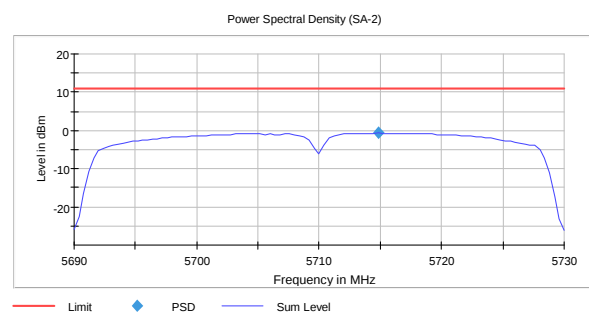
PSD, 5670 MHz, 802.11n, HT40, MCS0, Ant1 0.0



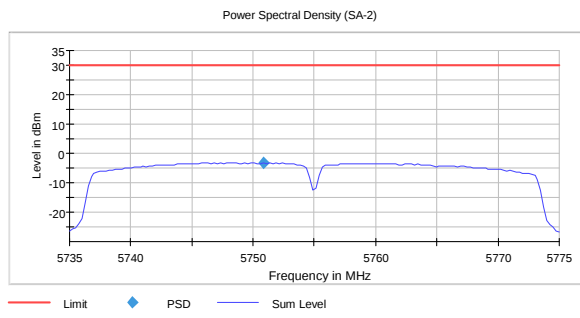
MIMO 0.5



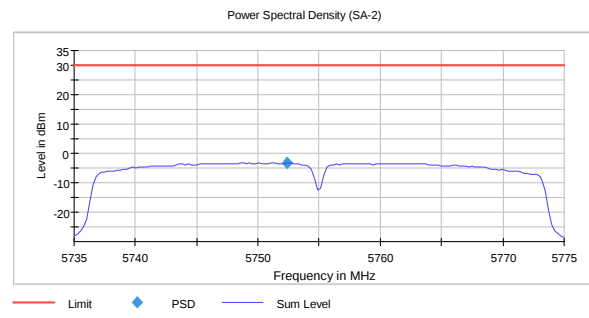
PSD, 5710 MHz, 802.11n, HT40, MCS0, Ant1 -0.5



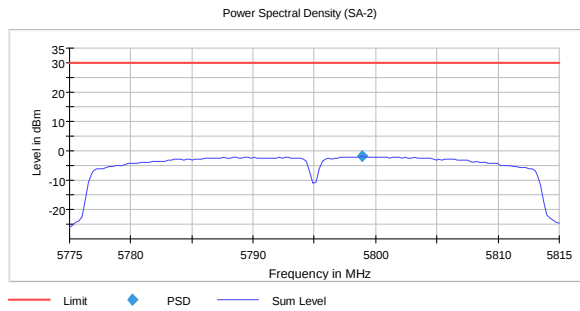
MIMO -0.7



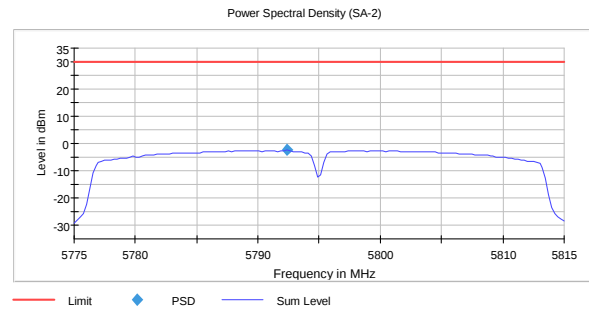
PSD, 5755 MHz, 802.11n, HT40, MCS0, Ant1 -3.1



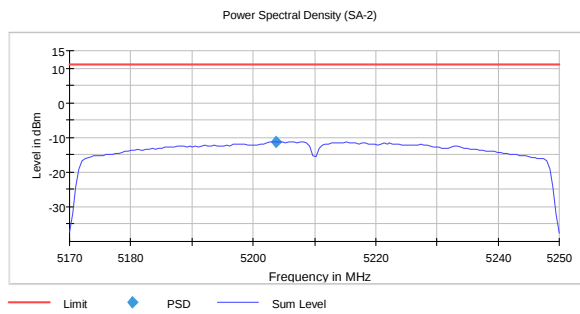
MIMO -3.2



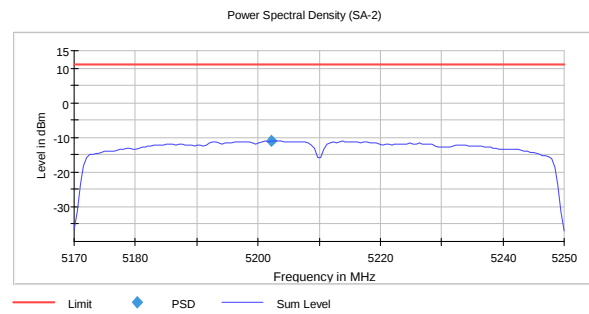
PSD, 5795 MHz, 802.11n, HT40, MCS0, Ant1 -2.0



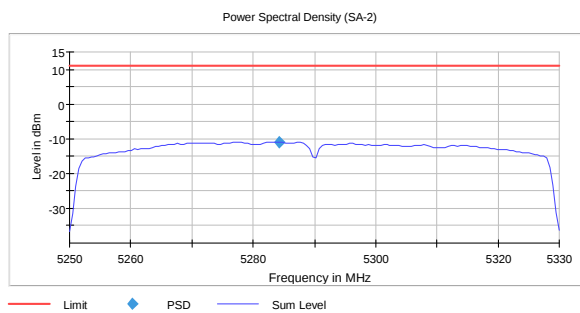
MIMO -2.5



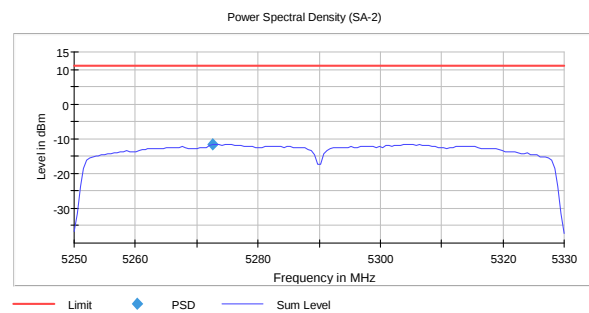
PSD, 5210 MHz, 802.11ac, HT80, Ant1, -11.2



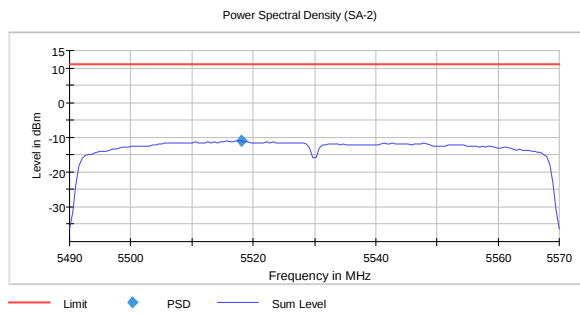
MIMO -11.0



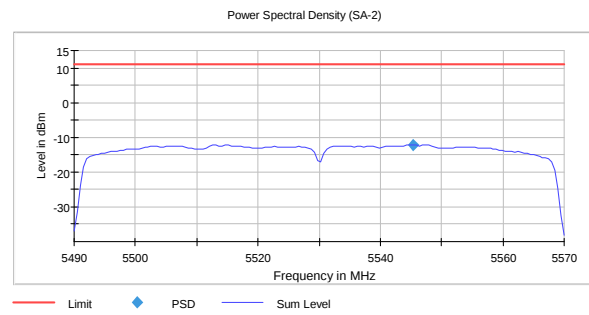
PSD, 5290 MHz, 802.11ac, HT80, Ant1, -11.0



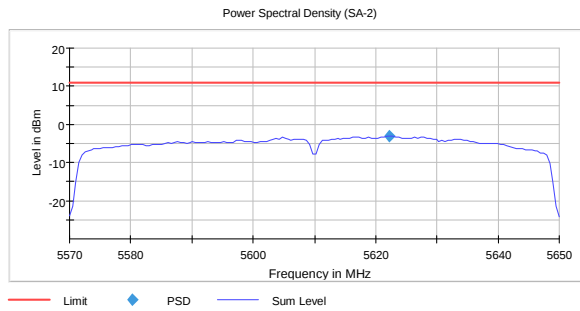
MIMO -11.6



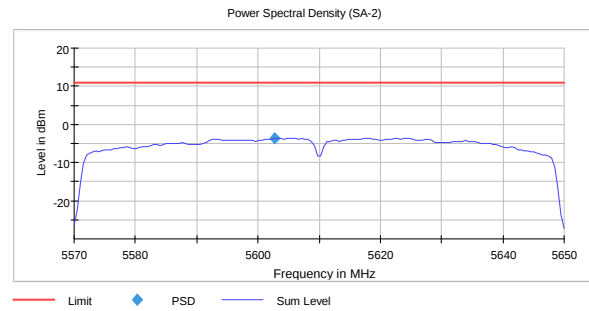
PSD, 5530 MHz, 802.11ac, HT80, Ant1, -11.1



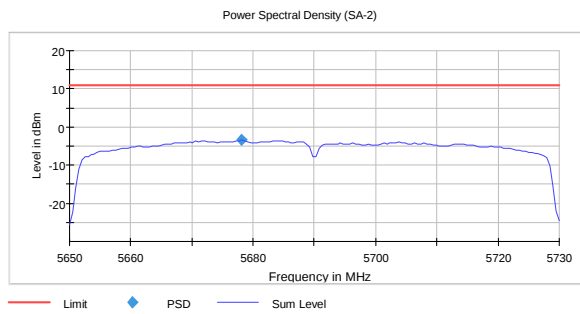
MIMO -12.1



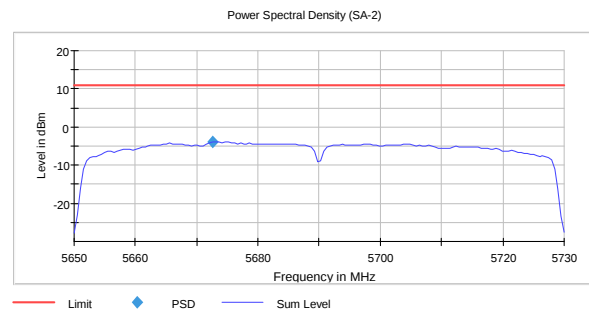
PSD, 5610 MHz, 802.11ac, HT80, Ant1, -3.1



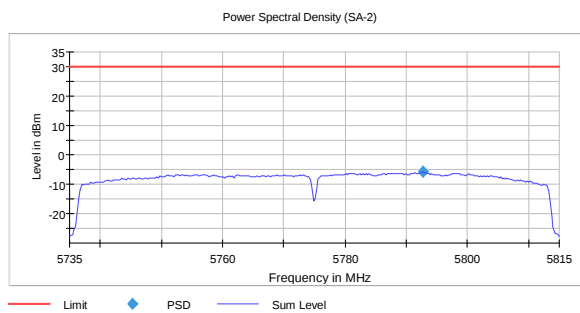
MIMO -3.5



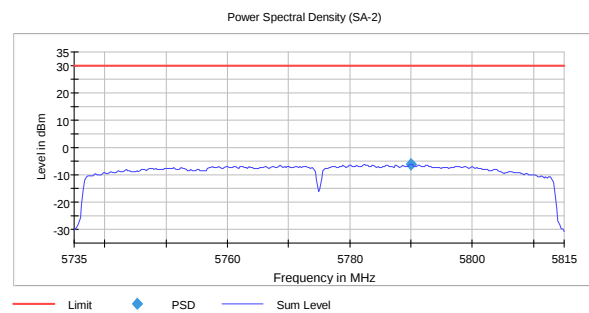
PSD, 5690 MHz, 802.11ac, HT80, Ant1, -3.5



MIMO -3.8



PSD, 5775 MHz, 802.11ac, HT80, Ant1, -5.8



MIMO -6.1

4.5 Unwanted Emissions

FCC 15.407 (b)

ISED RSS-247, Issue 3, clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Band Edge Emissions:

Ch. No.	Carrier Frequency (MHz)	Band Edge Frequency (MHz)	Measured Values (dBm/MHz e.i.r.p.)						
			11a 6Mb	11n SISO HT20	11n MIMO HT20	11n SISO HT40	11n MIMO HT40	11ac SISO HT80	11ac MIMO HT80
36	5180	5150	-27.1	-28.8	-27.1				
64	5320	5350	-30.8	-28.6	-28.2				
100	5500	5470	-27.0	-27.2	-28.1				
140	5700	5725	-29.4	-27.7	-27.5				
149	5745	5650	< -40	< -40	< -40				
149	5745	5700	< -45	< -45	< -45				
165	5825	5875	< -45	< -45	< -45				
165	5825	5925	< -40	< -40	< -40				
38	5190	5150				-27.4	-28.2		
62	5310	5350				-28.1	-27.8		
102	5510	5470				-27.2	-27.2		
134	5670	5725				-27.6	-27.0		
151	5755	5650				< -40	< -40		
151	5755	5700				< -45	< -45		
159	5795	5875				< -45	< -45		
159	5795	5925				< -40	< -40		
42	5210	5150						-28.7	-29.1
58	5290	5350						-30.9	-31.9
106	5530	5470						-28.0	-30.2
155	5775	5650						< -40	< -40
155	5775	5700						< -45	< -45
155	5775	5875						< -45	< -45
155	5775	5925						< -40	< -40

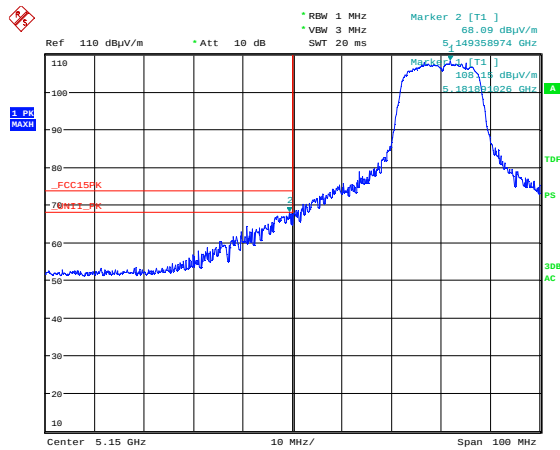
The measurement was performed radiated.

EIRP values were calculated from field strength using the method in KDB 412172 D01.

Limits:

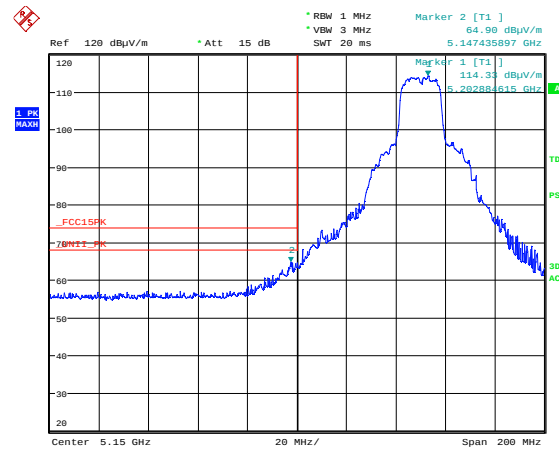
Operating Frequency band	Limit for Emissions Outside Operating Frequency Band
5150 – 5250 MHz	-27 dBm/MHz e.i.r.p.
5250 – 5350 MHz	-27 dBm/MHz e.i.r.p.
5470 – 5725 MHz	-27 dBm/MHz e.i.r.p.
5725 – 5825 MHz	See FCC 15.407(b)(4)(i) or 15.407(b)(4)(ii)

Combi Antenna



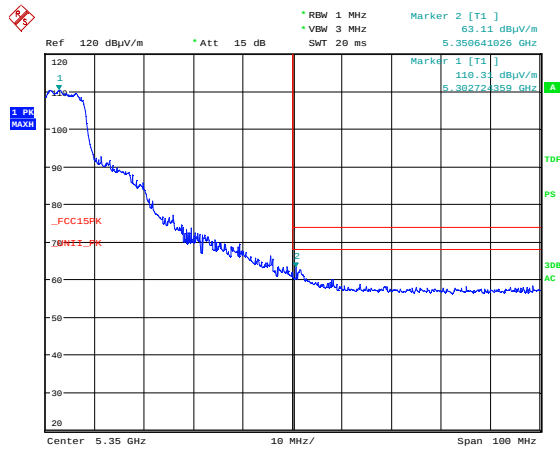
Date: 12.JUL.2023 12:43:14

Band Edge 5150 MHz, ch036, 802.11a 6Mb, Radiated, Max, Pk, PL8



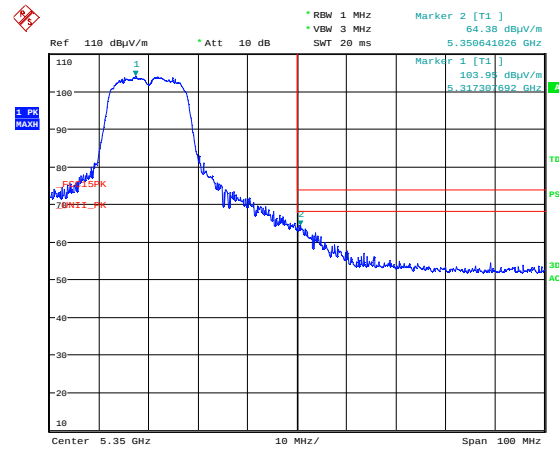
Date: 12.JUL.2023 12:39:38

Band Edge 5150 MHz, ch040, 802.11a 6Mb, Radiated, Max, Pk



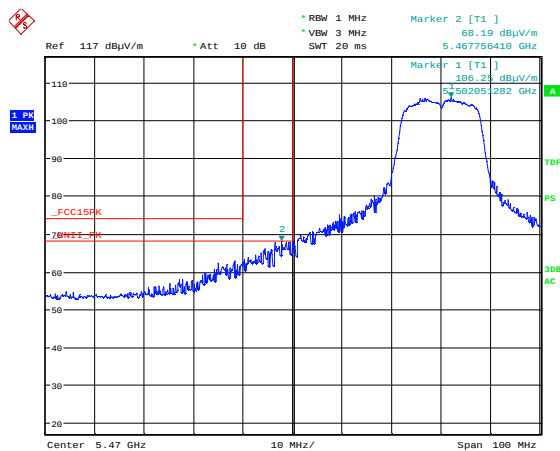
Date: 12.JUL.2023 12:59:10

Band Edge 5350 MHz, ch060, 802.11a 6Mb, Radiated, Max, Pk



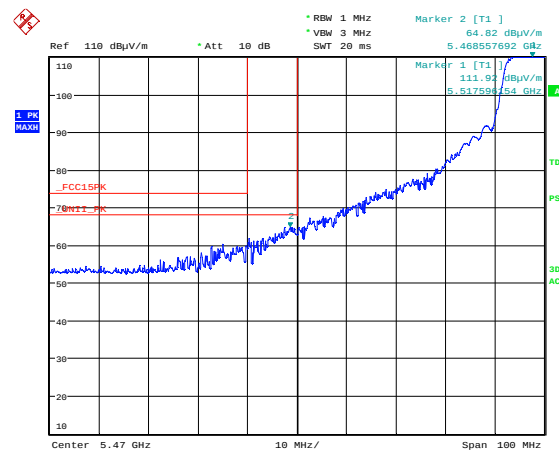
Date: 12.JUL.2023 13:01:36

Band Edge 5350 MHz, ch064, 802.11a 6Mb, Radiated, Max, Pk



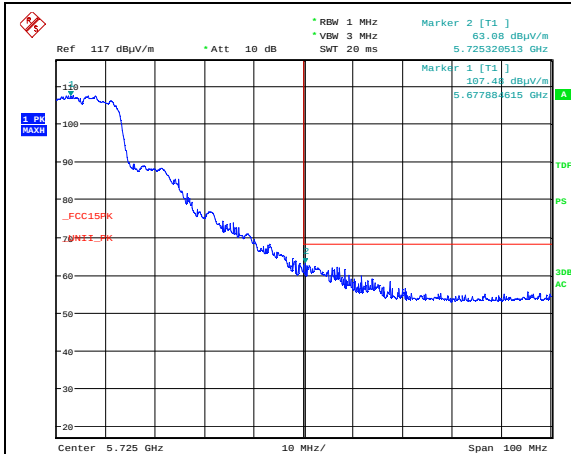
Date: 12.JUL.2023 13:15:18

Band Edge 5470 MHz, ch100, 802.11a 6Mb, Radiated, Max, Pk



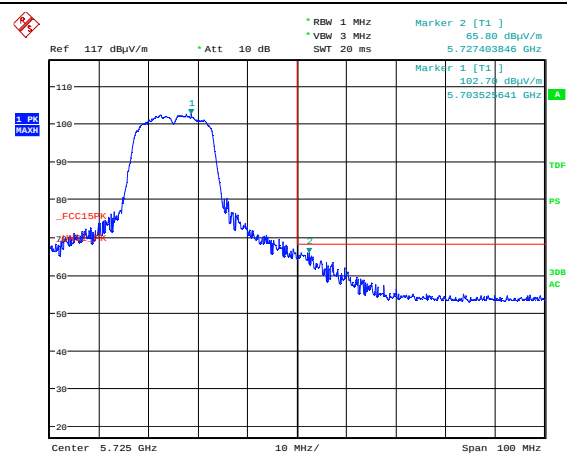
Date: 12.JUL.2023 13:09:20

Band Edge 5470 MHz, ch104, 802.11a 6Mb, Radiated, Max, Pk



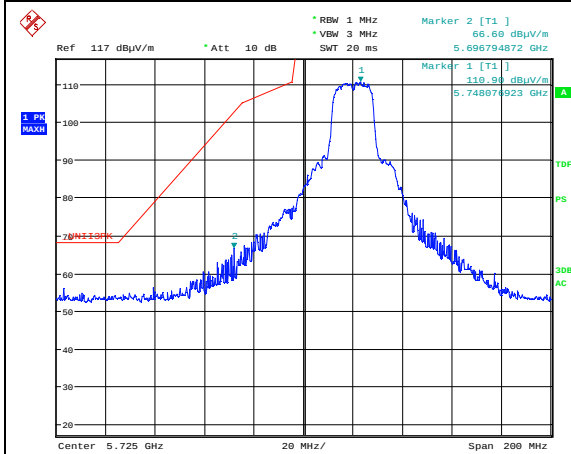
Date: 12.JUL.2023 13:20:17

Band Edge 5725 MHz, ch136, 802.11a 6Mb, Radiated, Max, Pk



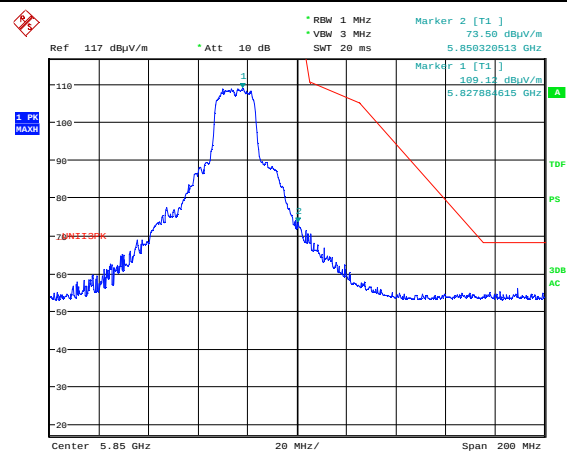
Date: 12.JUL.2023 13:22:56

Band Edge 5725 MHz, ch140, 802.11a 6Mb, Radiated, Max, Pk



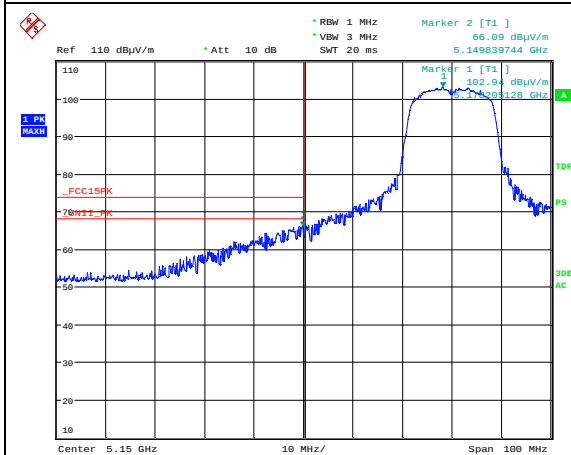
Date: 12.JUL.2023 13:28:56

Band Edge 5725 MHz, ch149, 802.11a 6Mb, Radiated, Max, Pk



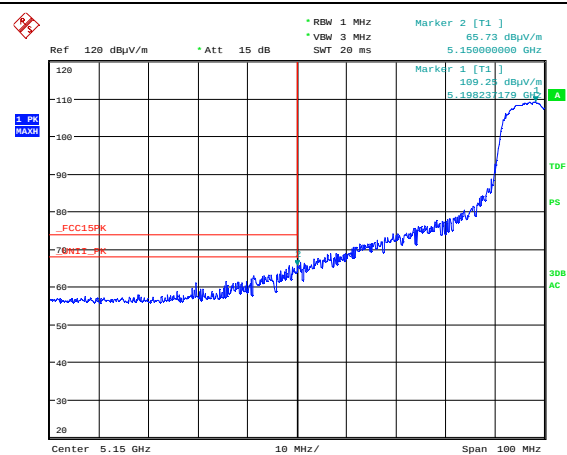
Date: 12.JUL.2023 13:39:11

Band Edge 5850 MHz, ch165, 802.11a 6Mb, Radiated, Max, Pk



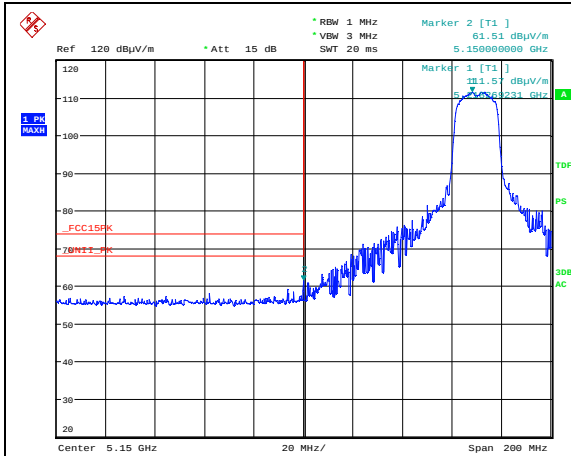
Date: 12.JUL.2023 10:54:18

Band Edge 5150 MHz, ch036, 802.11n HT20 SISO, Radiated, Max, Pk



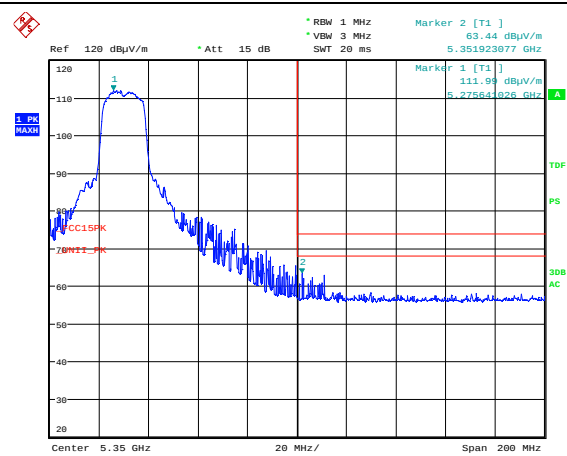
Date: 12.JUL.2023 10:59:59

Band Edge 5150MHz, ch040, 802.11n HT20 SISO, Radiated, Max, Pk PL14



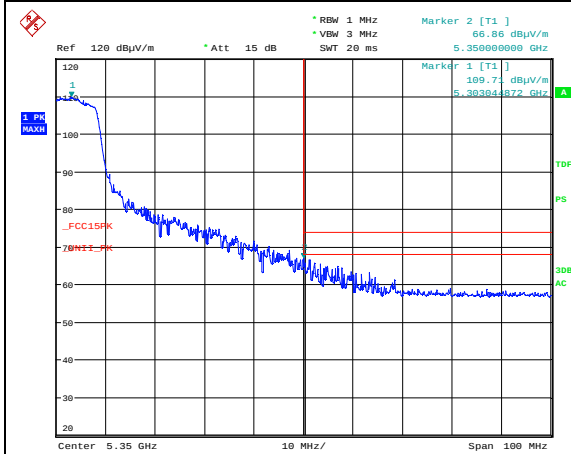
Date: 12.JUL.2023 11:04:08

Band Edge 5150MHz, ch044, 802.11n HT20 SISO, Radiated, Max, Pk



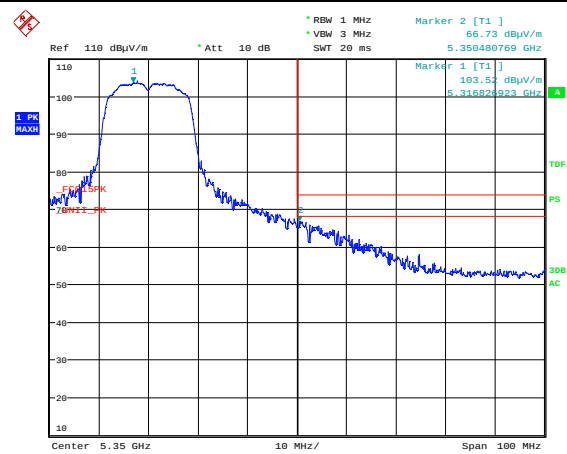
Date: 12.JUL.2023 10:41:42

Band Edge 5350 MHz, ch056, 802.11n HT20 SISO, Radiated, Max, Pk



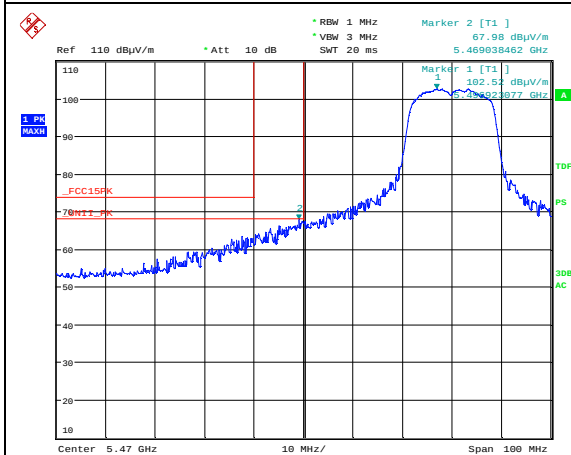
Date: 12.JUL.2023 10:39:08

Band Edge 5350 MHz, ch060, 802.11n HT20 SISO, Radiated, Max, Pk PL14



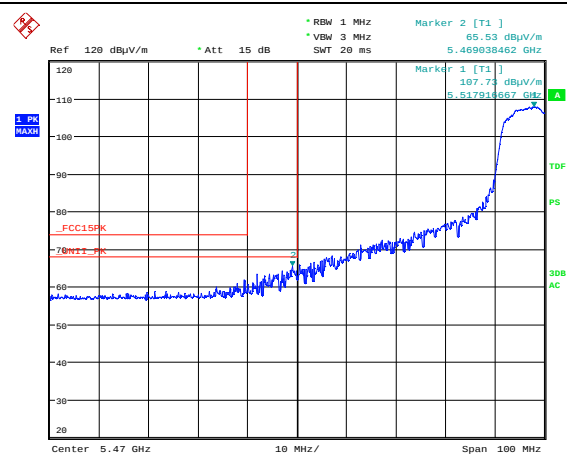
Date: 12.JUL.2023 10:31:55

Band Edge 5350 MHz, ch064, 802.11n HT20 SISO, Radiated, Max, Pk



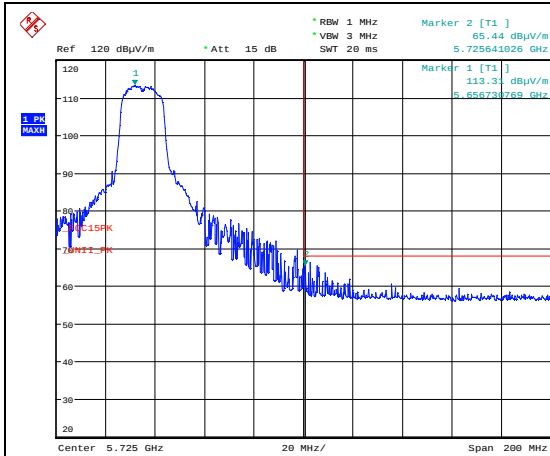
Date: 12.JUL.2023 10:28:02

Band Edge 5470 MHz, ch100, 802.11n HT20 SISO, Radiated, Max, Pk



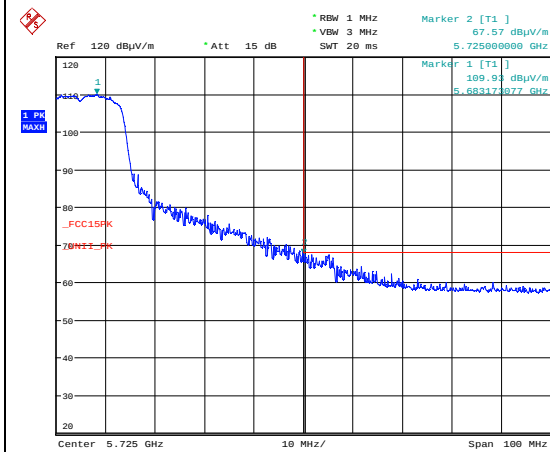
Date: 11.JUL.2023 16:41:25

Band Edge 5470 MHz, ch104, 802.11n HT20 SISO, Radiated, Max, Pk PL11



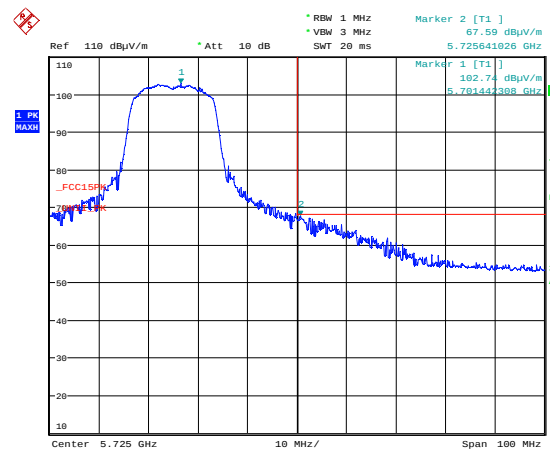
Date: 12.JUL.2023 10:21:59

Band Edge 5725 MHz, ch132, 802.11n HT20 SISO, Radiated, Max, Pk



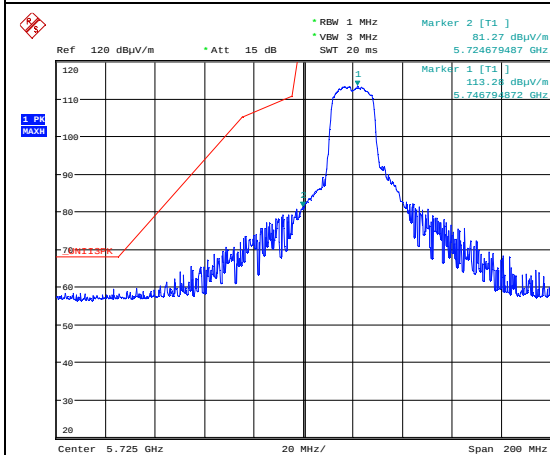
Date: 12.JUL.2023 10:19:52

Band Edge 5725 MHz, ch136, 802.11n HT20 SISO, Radiated, Max, Pk PL12



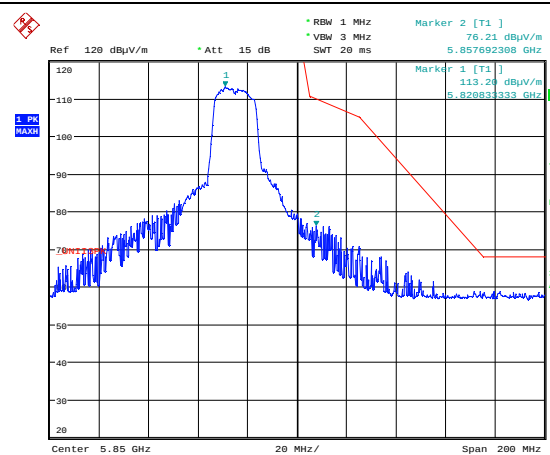
Date: 12.JUL.2023 10:15:33

Band Edge 5725 MHz, ch140, 802.11n HT20 SISO, Radiated, Max, Pk PL6



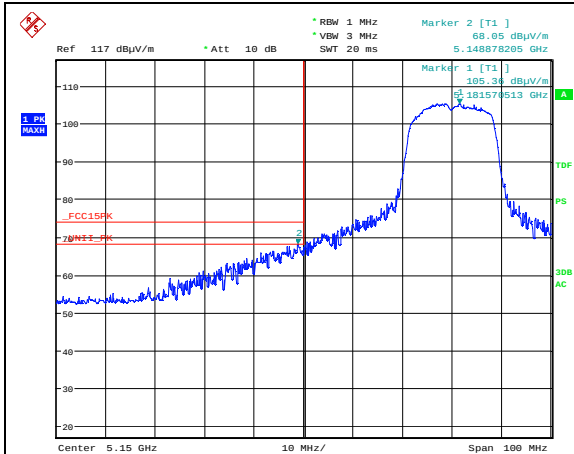
Date: 12.JUL.2023 09:58:17

Band Edge 5725 MHz, ch149, 802.11n HT20 SISO, Radiated, Max, Pk



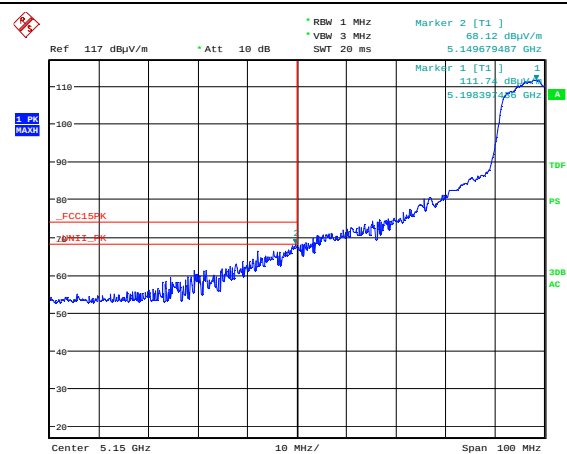
Date: 12.JUL.2023 10:04:43

Band Edge 5850 MHz, ch165, 802.11n HT20 SISO, Radiated, Max, Pk



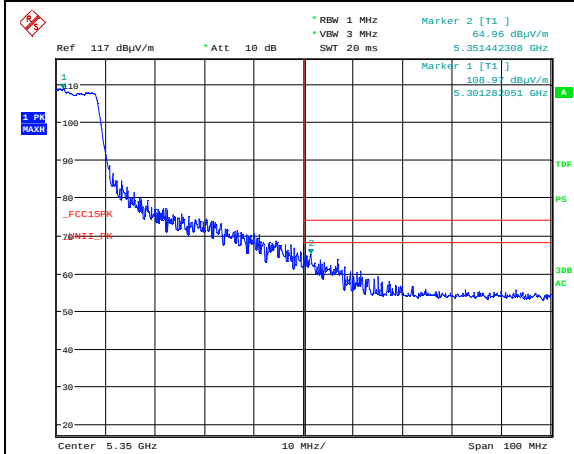
Date: 12.JUL.2023 15:26:33

Band Edge 5150 MHz, ch036, 802.11n HT20 MIMO, Radiated, Max, Pk



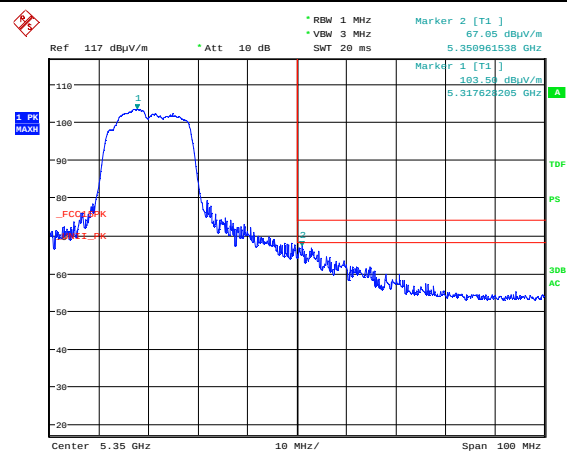
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Band Edge 5150 MHz, ch040, 802.11n HT20 MIMO, Radiated, Max, Pk



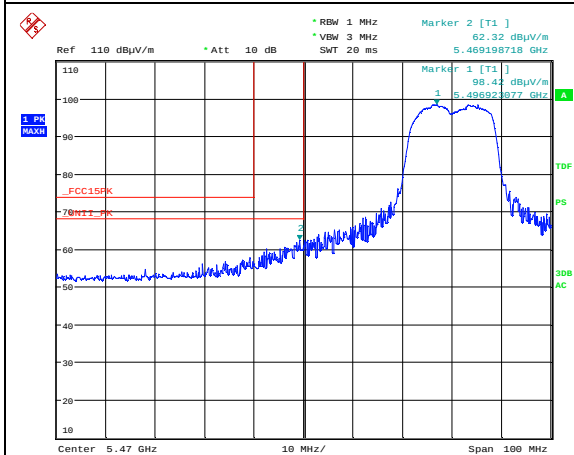
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Band Edge 5350 MHz, ch060, 802.11n HT20 MIMO, Radiated, Max, Pk



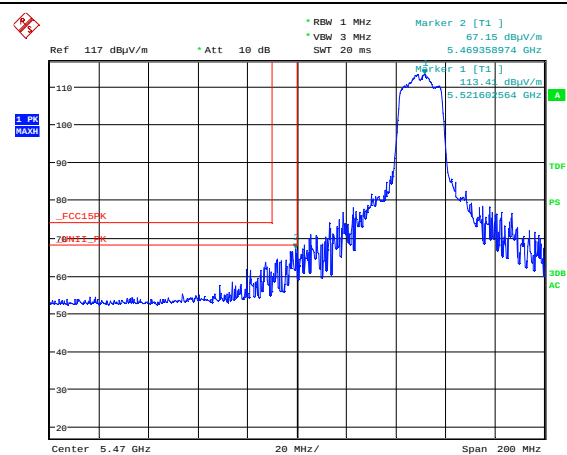
Date: 12.JUL.2023 15:14:17

Band Edge 5350 MHz, ch064, 802.11n HT20 MIMO, Radiated, Max, Pk



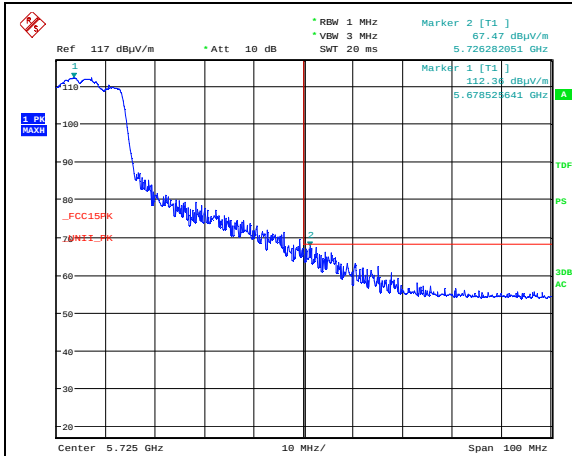
Date: 12.JUL.2023 14:02:36

Band Edge 5470 MHz, ch100, 802.11n HT20 MIMO, Radiated, Max, Pk



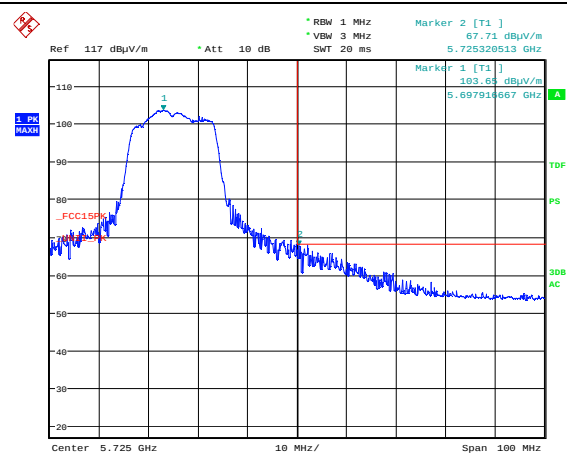
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Band Edge 5470 MHz, ch104, 802.11n HT20 MIMO, Radiated, Max, Pk



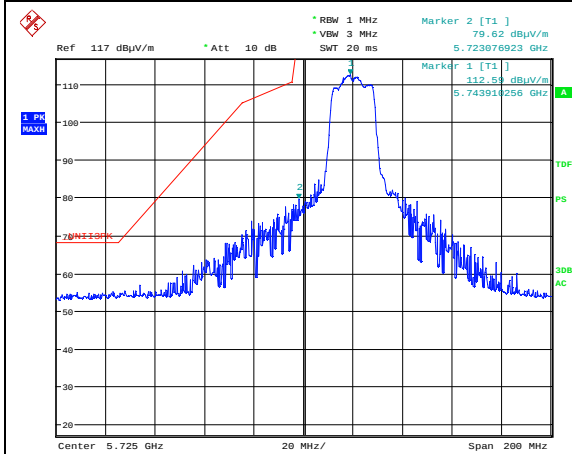
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Band Edge 5725 MHz, ch136, 802.11n HT20 MIMO, Radiated, Max, Pk PL12



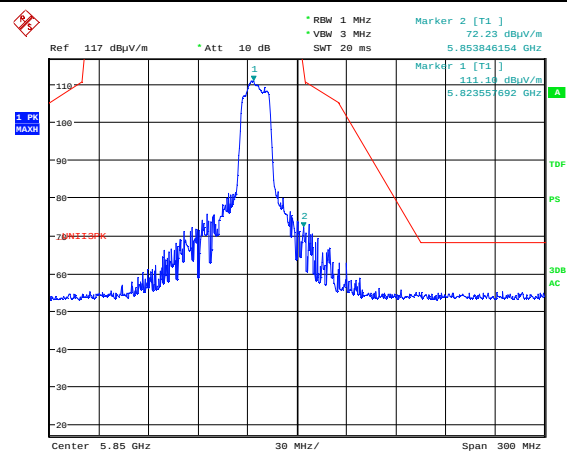
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Band Edge 5725 MHz, ch140, 802.11n HT20 MIMO, Radiated, Max, Pk PL4



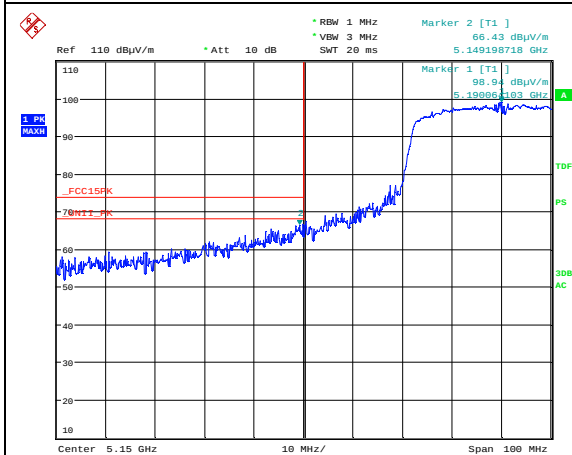
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Band Edge 5725 MHz, ch149, 802.11n HT20 MIMO, Radiated, Max, Pk



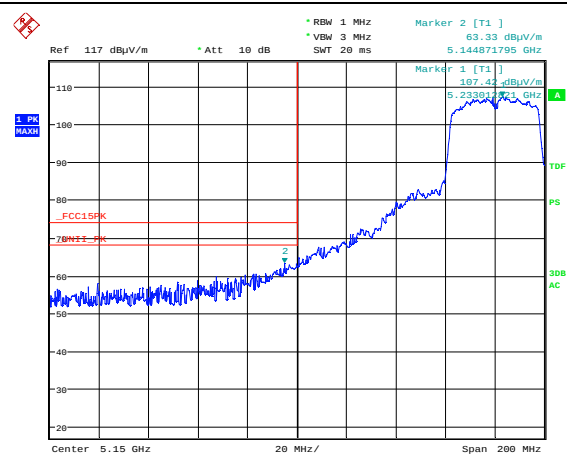
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Band Edge 5850 MHz, ch165, 802.11n HT20 MIMO, Radiated, Max, Pk



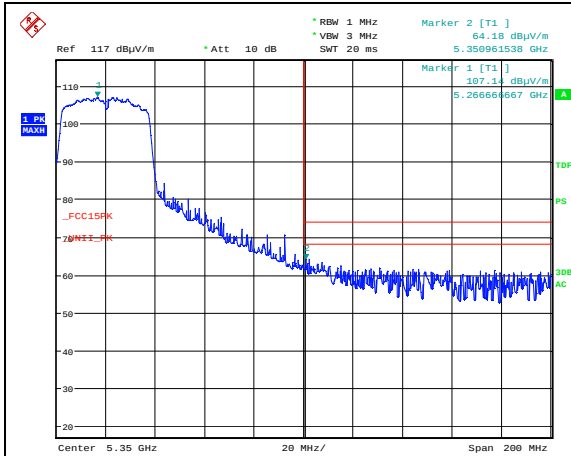
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Band Edge 5150 MHz, ch038, 802.11n HT40 SISO, Radiated, Max, Pk



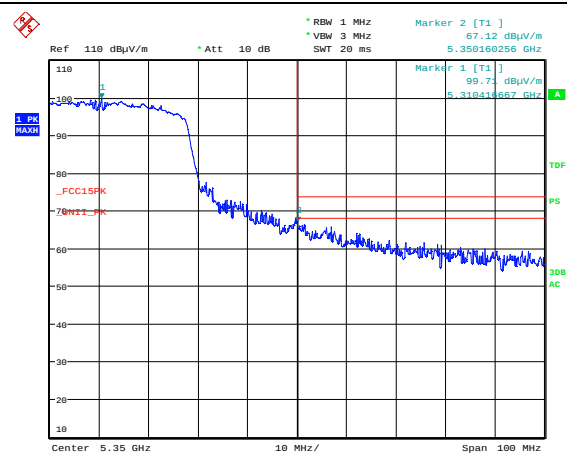
Date: 13.JUL.2023 12:31:33

Band Edge 5150 MHz, ch046, 802.11n HT40 SISO, Radiated, Max, Pk



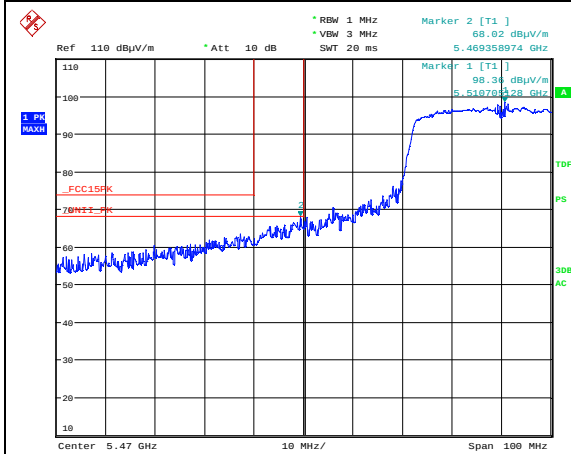
Date: 13.JUL.2023 12:26:24

Band Edge 5350 MHz, ch054, 802.11n HT40 SISO, Radiated, Max, Pk PL15



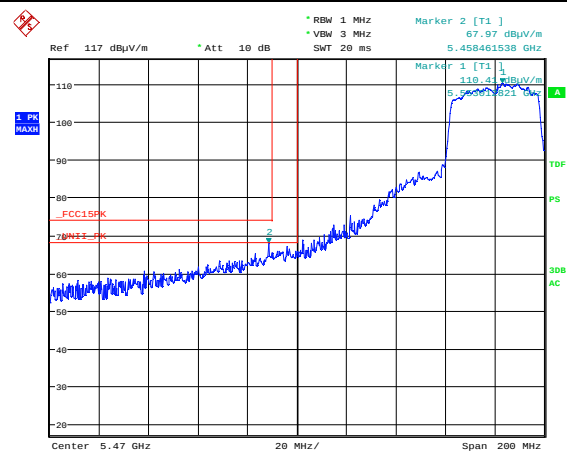
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Band Edge 5350 MHz, ch062, 802.11n HT40 SISO, Radiated, Max, Pk PL9



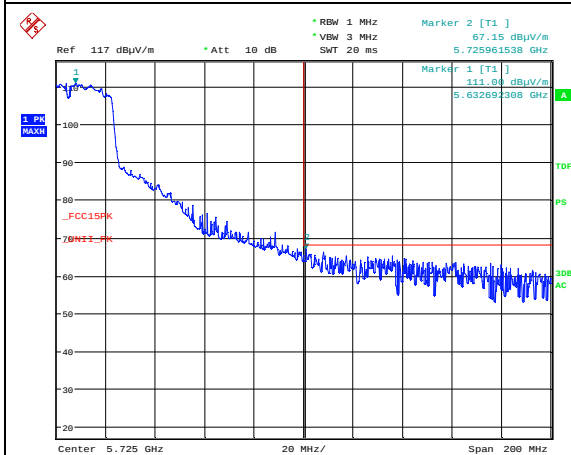
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Band Edge 5470 MHz, ch102, 802.11n HT40 SISO, Radiated, Max, Pk PL4



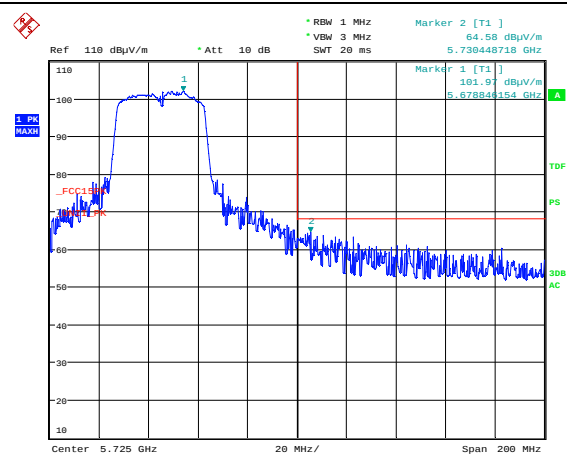
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Band Edge 5470 MHz, ch110, 802.11n HT40 SISO, Radiated, Max, Pk



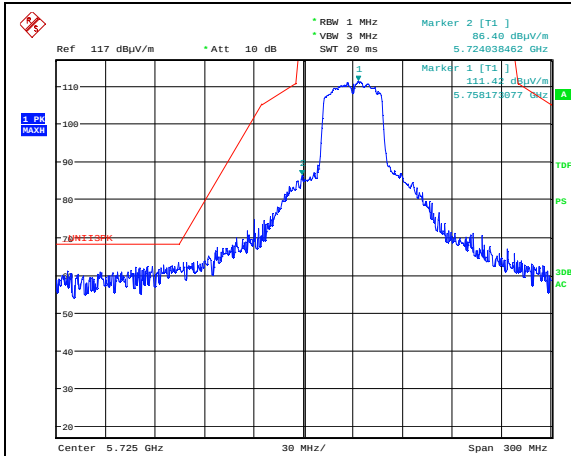
Date: 13.JUL.2023 12:39:01

Band Edge 5725 MHz, ch126, 802.11n HT40 SISO, Radiated, Max, Pk



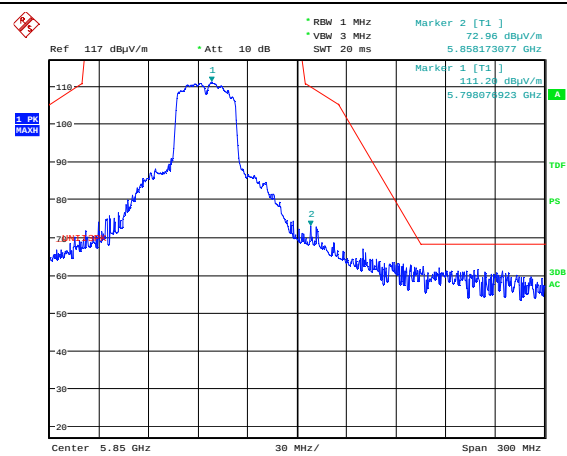
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Band Edge 5725 MHz, ch134, 802.11n HT40 SISO, Radiated, Max, Pk PL9



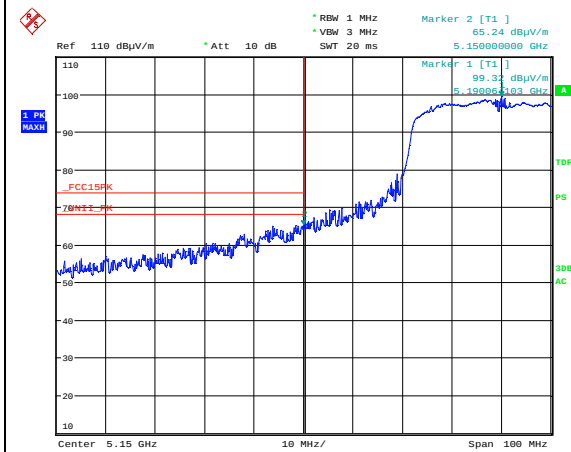
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Band Edge 5725 MHz, ch151, 802.11n HT40 SISO, Radiated, Max, Pk



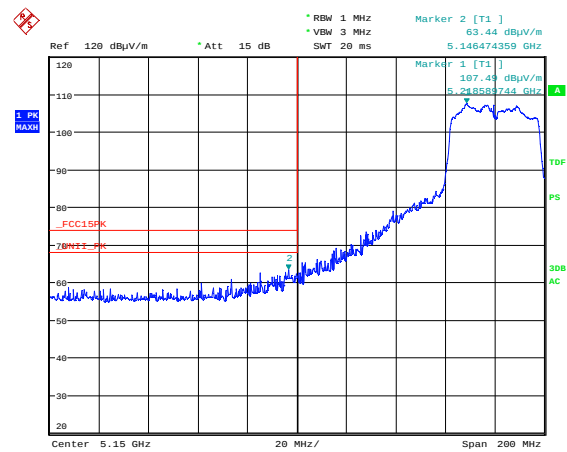
Date: 13.JUL.2023 12:48:38

Band Edge 5850 MHz, ch159, 802.11n HT40 SISO, Radiated, Max, Pk



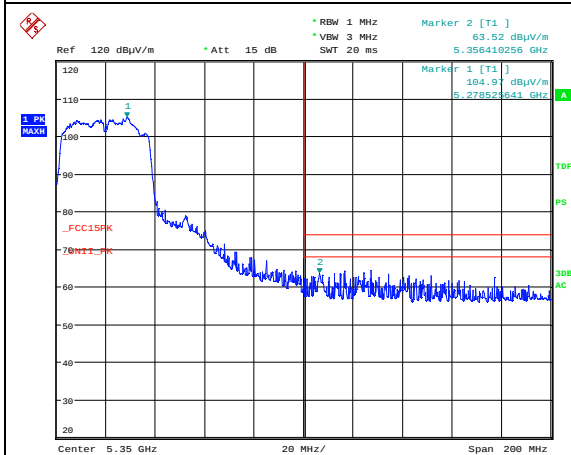
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Band Edge 5150 MHz, ch038, 802.11n HT40 MIMO, Radiated, Max, Pk PL2



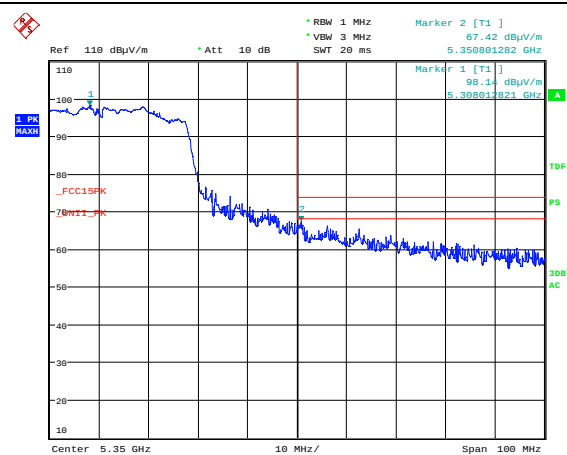
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Band Edge 5150 MHz, ch046, 802.11n HT40 MIMO, Radiated, Max, Pk



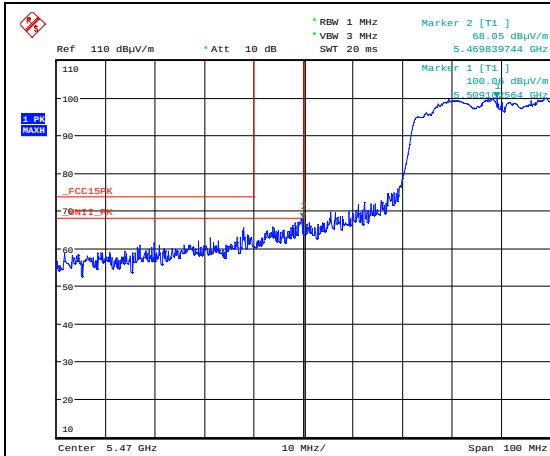
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Band Edge 5350 MHz, ch054, 802.11n HT40 MIMO, Radiated, Max, Pk



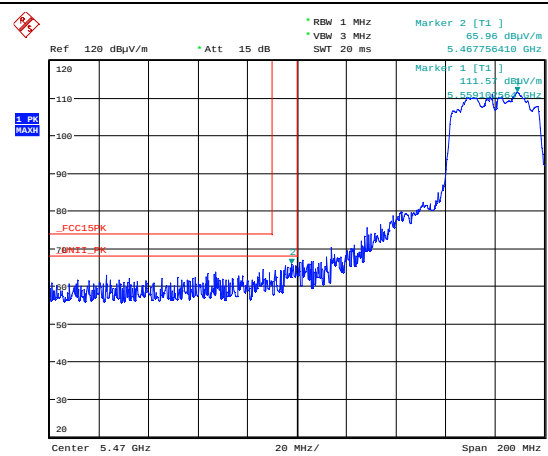
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Band Edge 5350 MHz, ch062, 802.11n HT40 MIMO, Radiated, Max, Pk



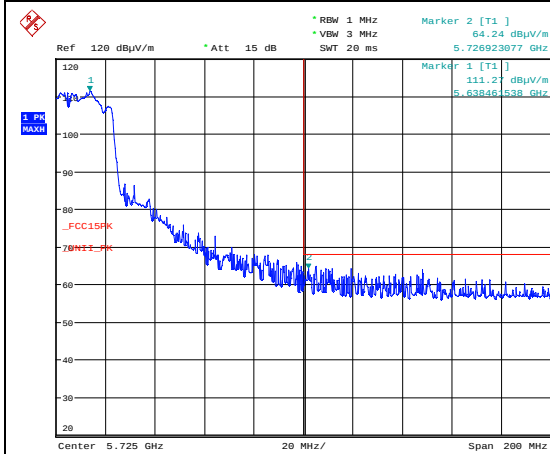
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Band Edge 5470 MHz, ch102, 802.11n HT40 MIMO, Radiated, Max, Pk PL3



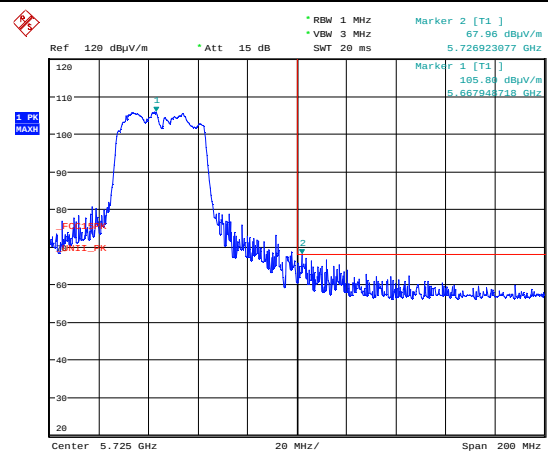
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Band Edge 5470 MHz, ch110, 802.11n HT40 MIMO, Radiated, Max, Pk



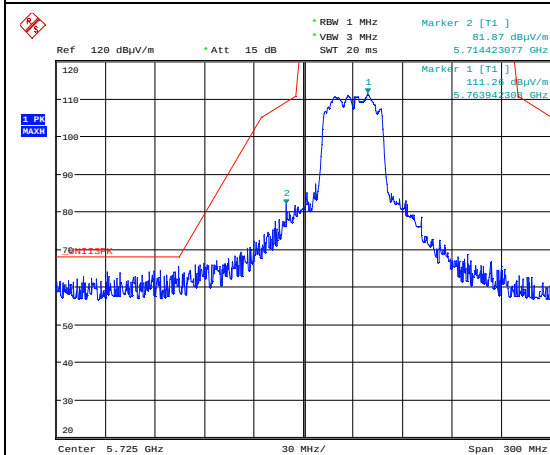
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Band Edge 5725 MHz, ch126, 802.11n HT40 MIMO, Radiated, Max, Pk



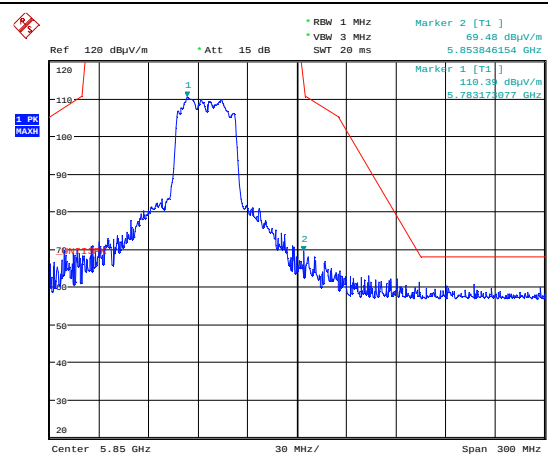
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Band Edge 5725 MHz, ch134, 802.11n HT40 MIMO, Radiated, Max, Pk PL10



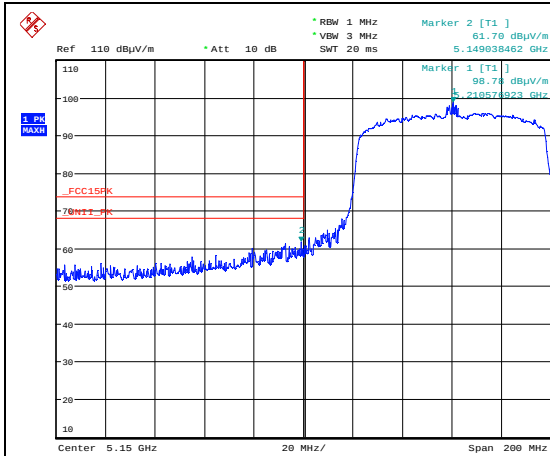
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Band Edge 5725 MHz, ch151, 802.11n HT40 MIMO, Radiated, Max, Pk



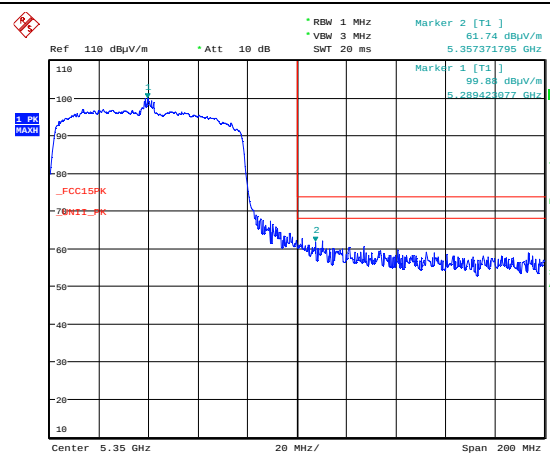
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Band Edge 5850 MHz, ch159, 802.11n HT40 MIMO, Radiated, Max, Pk



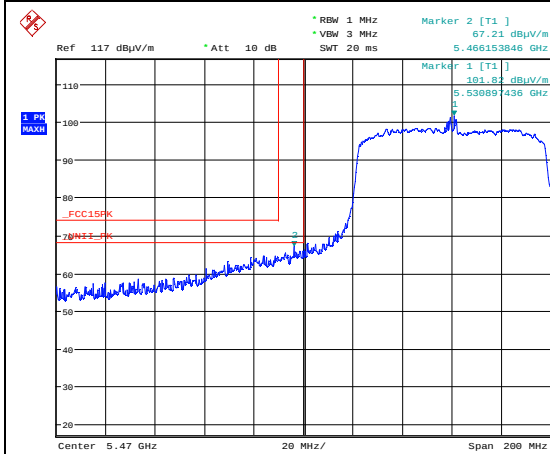
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Band Edge 5150 MHz, ch042, 802.11ac HT80 SISO, Radiated, Max, Pk PL9



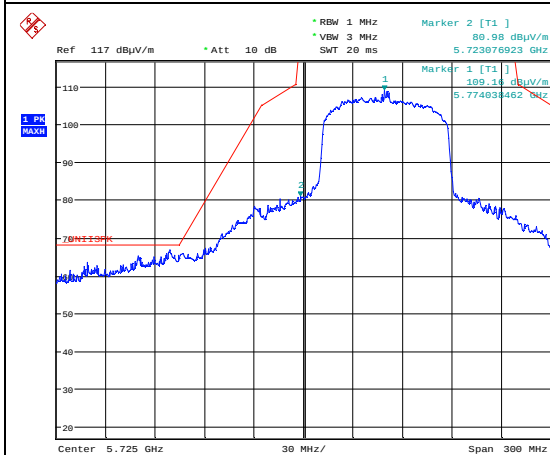
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Band Edge 5350 MHz, ch058, 802.11ac HT80 SISO, Radiated, Max, Pk PL9



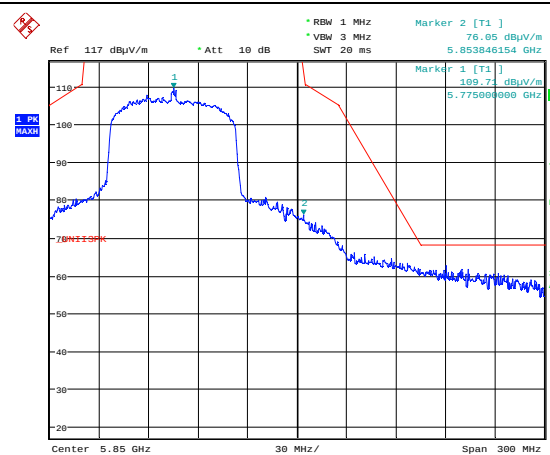
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Band Edge 5470 MHz, ch106, 802.11ac HT80 SISO, Radiated, Max, Pk PL9



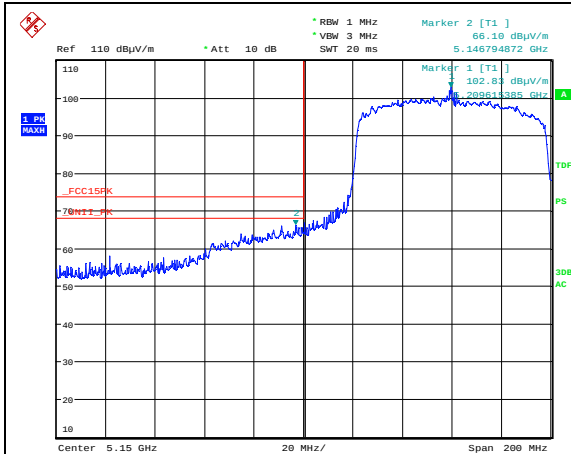
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Band Edge 5725 MHz, ch155, 802.11ac HT80 SISO, Radiated, Max, Pk PL14



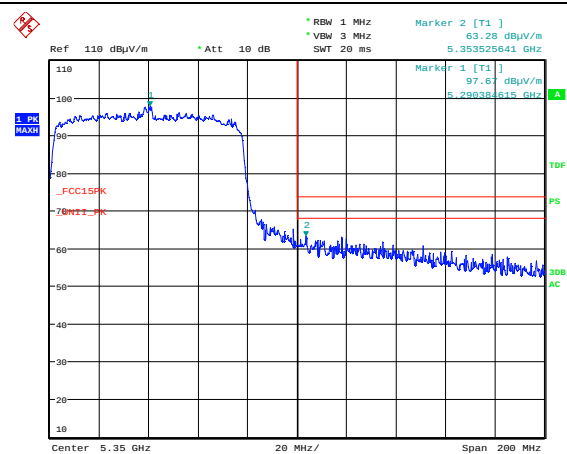
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Band Edge 5850 MHz, ch155, 802.11ac HT80 SISO, Radiated, Max, Pk PL14



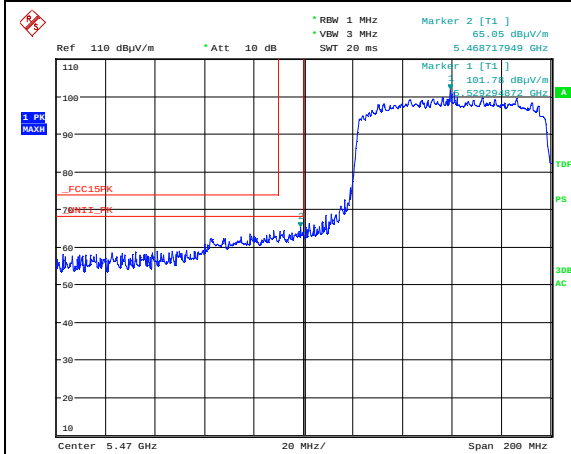
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Band Edge 5150 MHz, ch042, 802.11ac HT80 MIMO, Radiated, Max, Pk



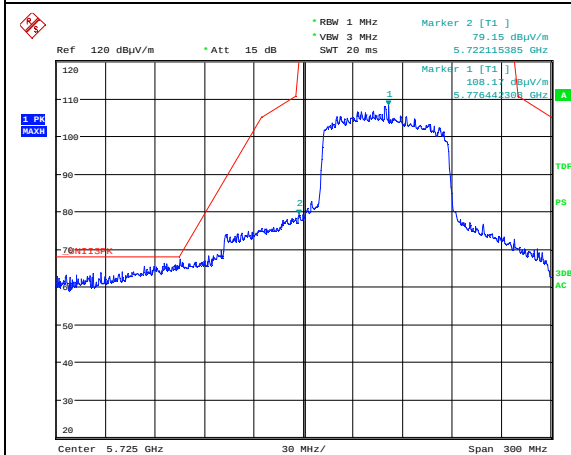
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Band Edge 5350 MHz, ch058, 802.11ac HT80 MIMO, Radiated, Max, Pk



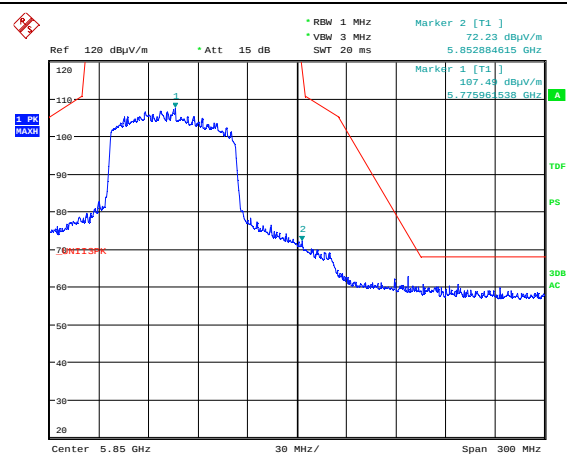
Date: 12.JUL.2023 16:30:33

Band Edge 5470 MHz, ch106, 802.11ac HT80 MIMO, Radiated, Max, Pk



Date: 12.JUL.2023 16:44:21

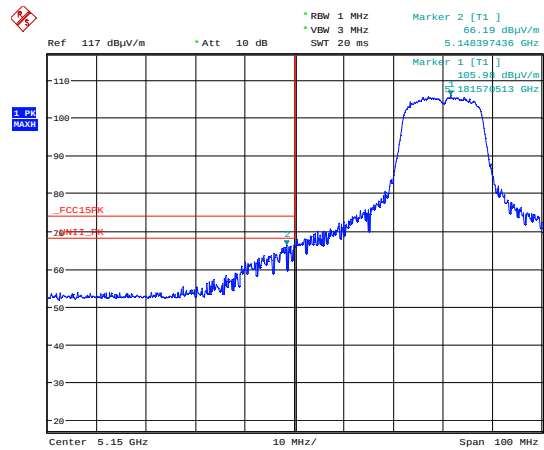
Band Edge 5725 MHz, ch155, 802.11ac HT80 MIMO, Radiated, Max, Pk



Date: 12.JUL.2023 16:45:31

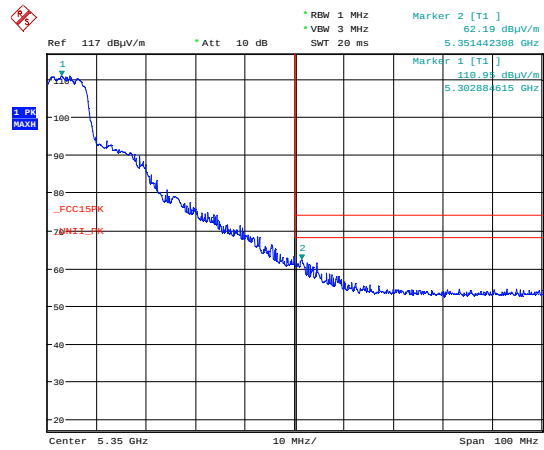
Band Edge 5850 MHz, ch155, 802.11ac HT80 MIMO, Radiated, Max, Pk

Whip+Patch Antenna



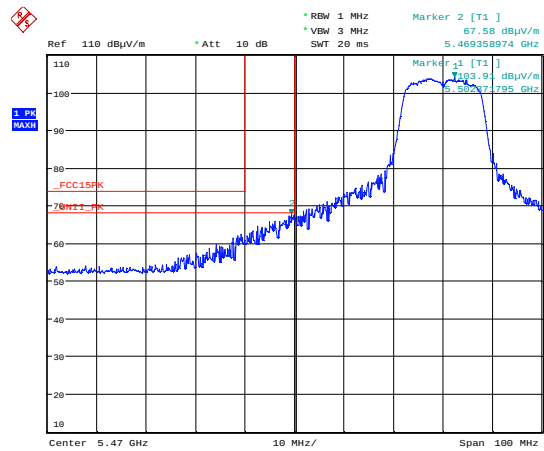
Date: 11.JUL.2023 14:52:06

Band Edge 5150 MHz, ch036, 802.11a 6Mb, Radiated, Max, Pk



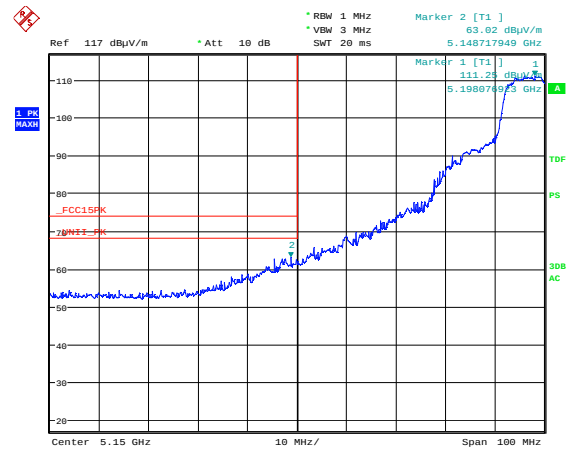
Date: 11.JUL.2023 14:37:35

Band Edge 5350 MHz, ch060, 802.11a 6Mb, Radiated, Max, Pk



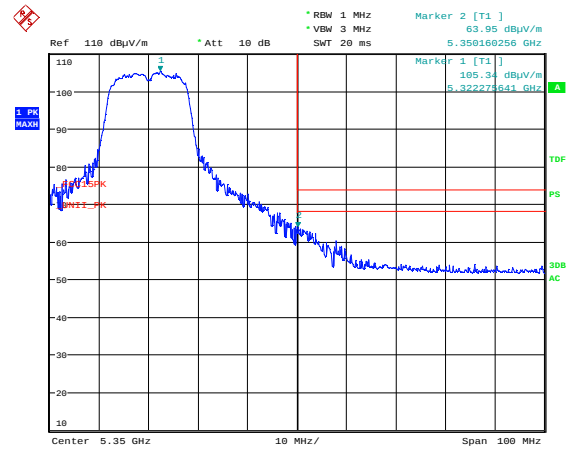
Date: 11.JUL.2023 14:59:26

Band Edge 5470 MHz, ch100, 802.11a 6Mb, Radiated, Max, Pk



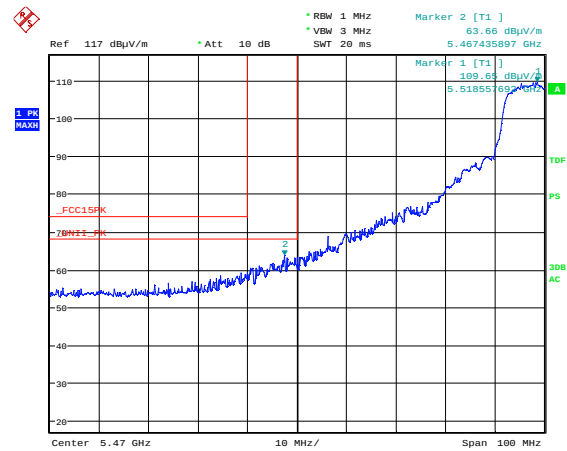
Date: 11.JUL.2023 14:46:58

Band Edge 5150 MHz, ch040, 802.11a 6Mb, Radiated, Max, Pk



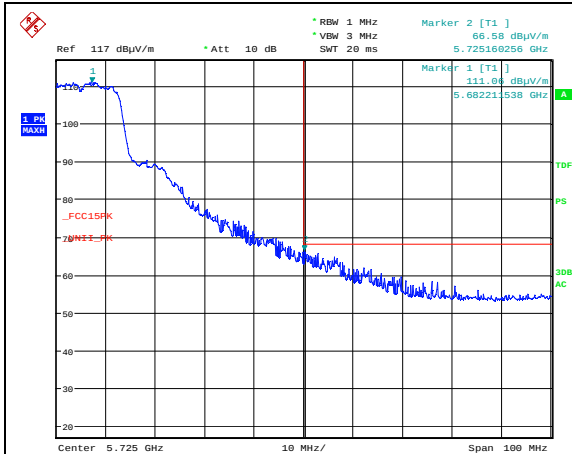
Date: 11.JUL.2023 14:54:26

Band Edge 5350 MHz, ch064, 802.11a 6Mb, Radiated, Max, Pk



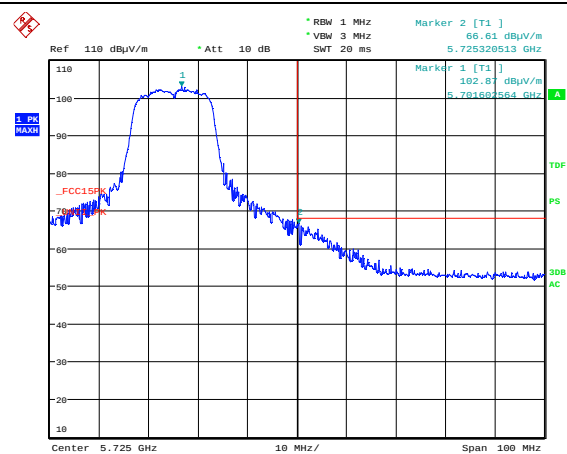
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Band Edge 5470 MHz, ch104, 802.11a 6Mb, Radiated, Max, Pk



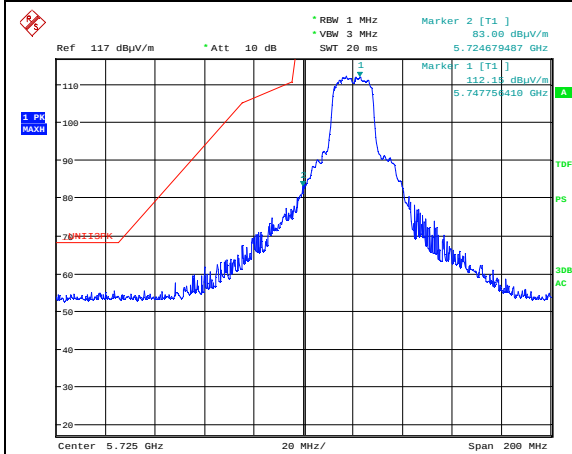
Date: 11.JUL.2023 13:51:30

Band Edge 5725 MHz, ch136, 802.11a 6Mb, Radiated, Max, Pk



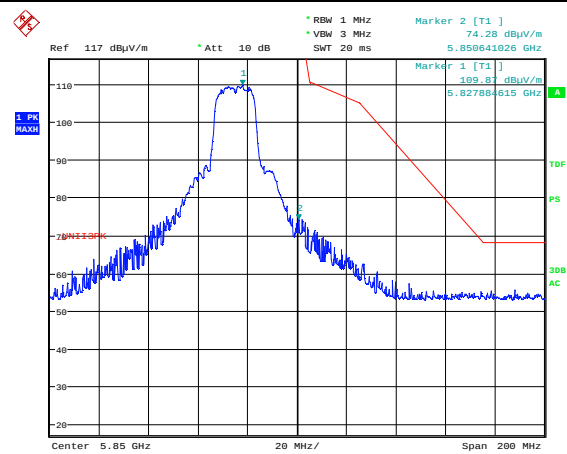
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Band Edge 5725 MHz, ch140, 802.11a 6Mb, Radiated, Max, Pk PL6



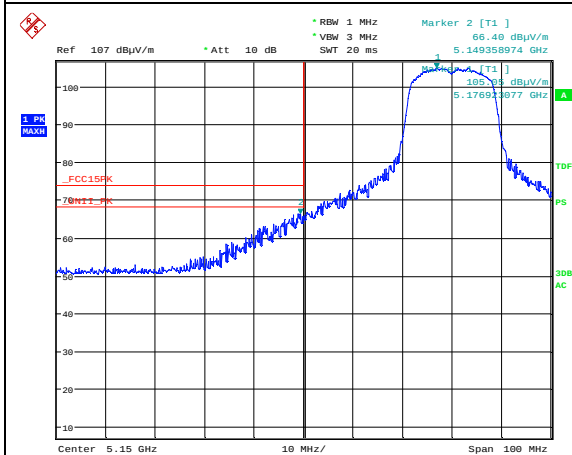
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Band Edge 5725 MHz, ch149, 802.11a 6Mb, Radiated, Max, Pk



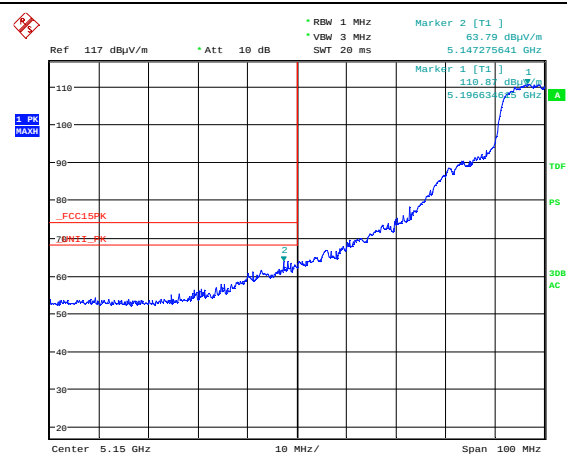
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Band Edge 5850 MHz, ch165, 802.11a 6Mb, Radiated, Max, Pk



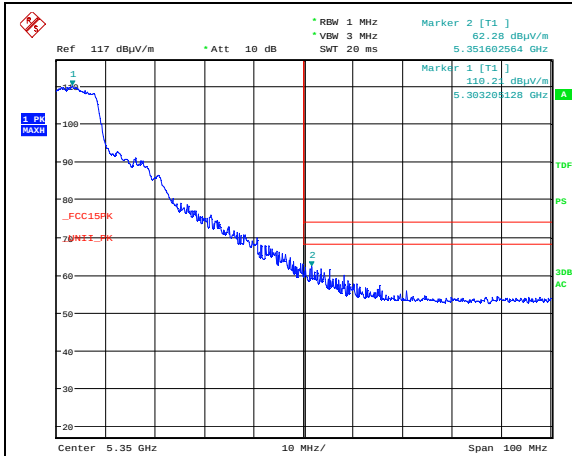
Date: 11.JUL.2023 12:55:13

Band Edge 5150 MHz, ch036, 802.11n HT20 SISO, Radiated, Max, Pk



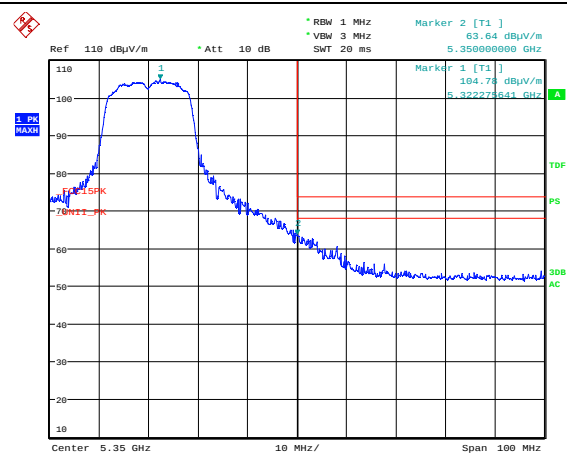
Date: 11.JUL.2023 12:52:54

Band Edge 5150MHz, ch040, 802.11n HT20 SISO, Radiated, Max, Pk



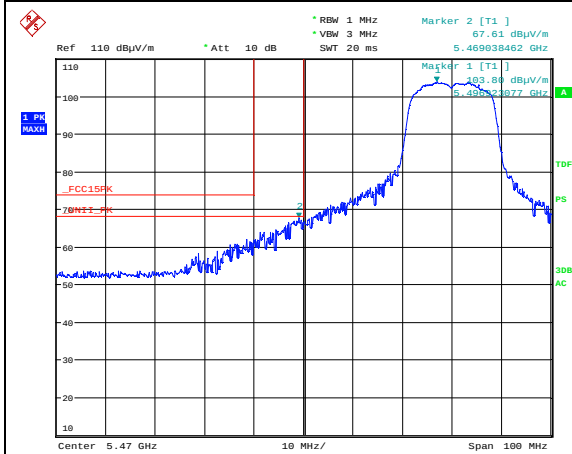
Date: 11.JUL.2023 12:49:00

Band Edge 5350 MHz, ch060, 802.11n HT20 SISO, Radiated, Max, Pk



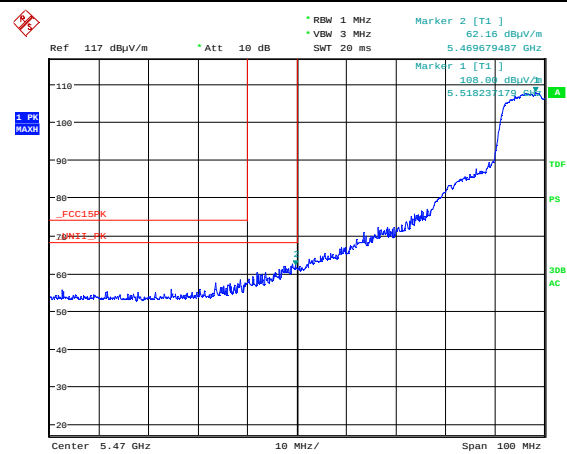
Date: 11.JUL.2023 12:57:02

Band Edge 5350 MHz, ch064, 802.11n HT20 SISO, Radiated, Max, Pk



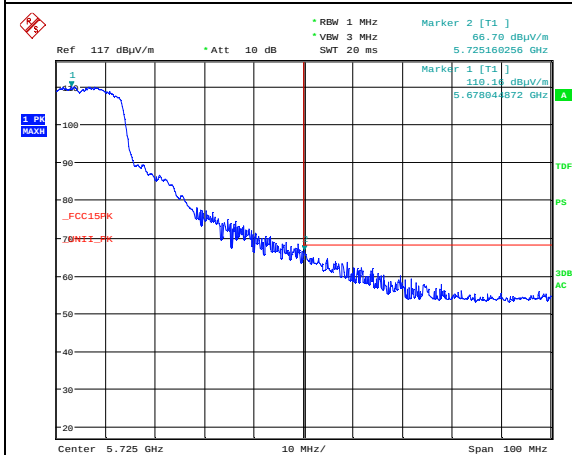
Date: 11.JUL.2023 13:01:53

Band Edge 5470 MHz, ch100, 802.11n HT20 SISO, Radiated, Max, Pk



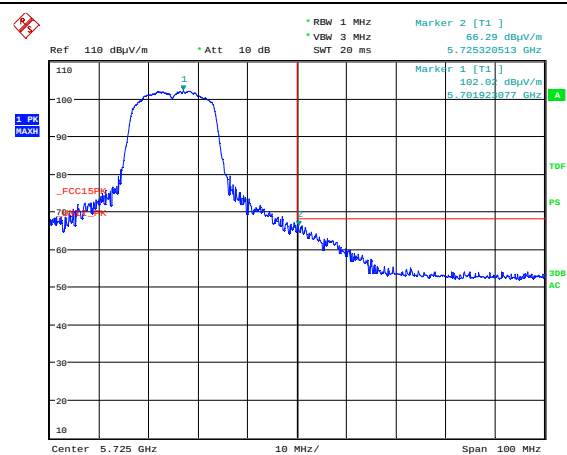
Date: 11.JUL.2023 12:44:21

Band Edge 5470 MHz, ch104, 802.11n HT20 SISO, Radiated, Max, Pk



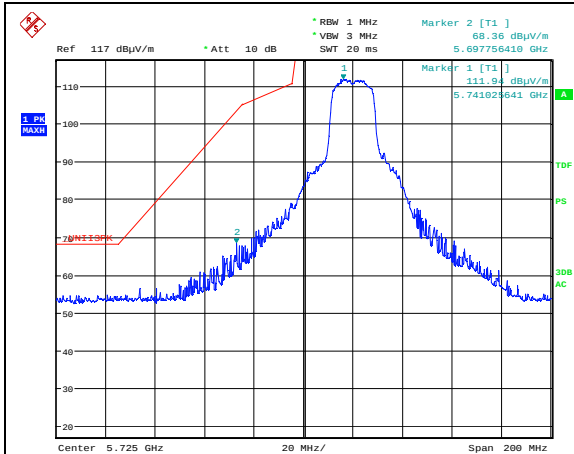
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Band Edge 5725 MHz, ch136, 802.11n HT20 SISO, Radiated, Max, Pk



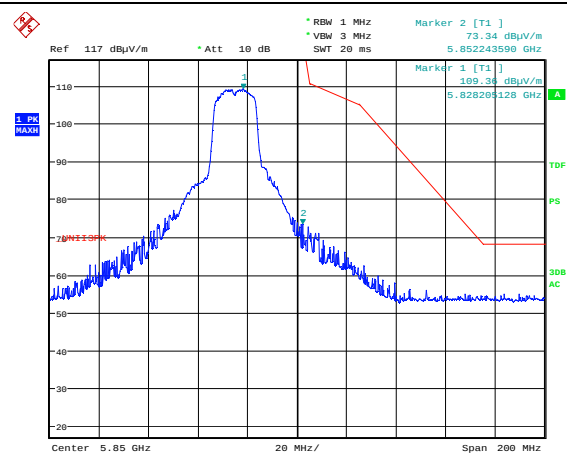
Date: 11.JUL.2023 13:09:59

Band Edge 5725 MHz, ch140, 802.11n HT20 SISO, Radiated, Max, Pk PL6



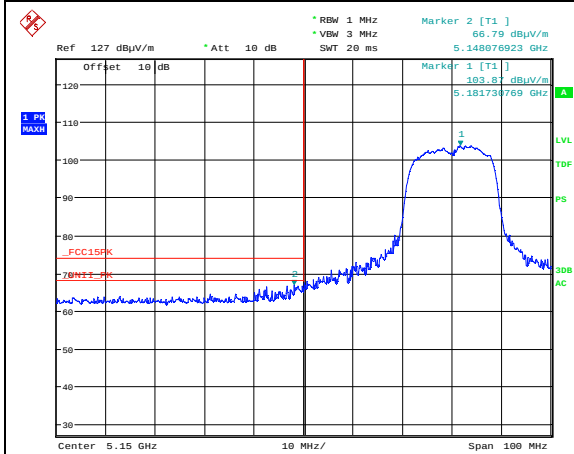
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Band Edge 5725 MHz, ch149, 802.11n HT20 SISO, Radiated, Max, Pk



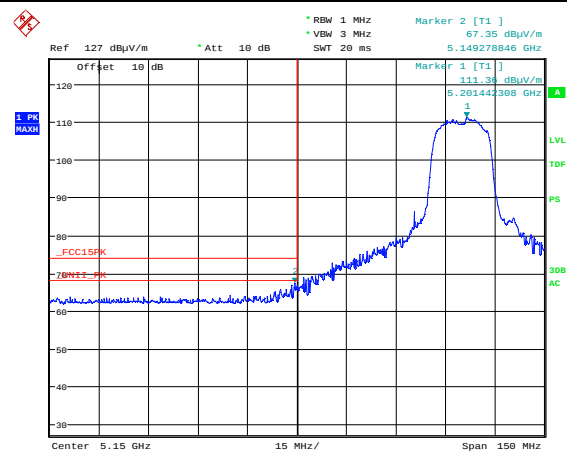
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Band Edge 5850 MHz, ch165, 802.11n HT20 SISO, Radiated, Max, Pk



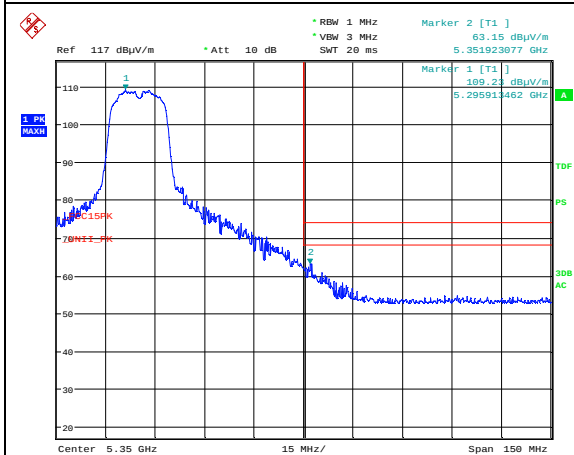
Date: 6.MAR.2023 15:01:21

Band Edge 5150 MHz, ch036, 802.11n HT20 MIMO, Radiated, Max, Pk



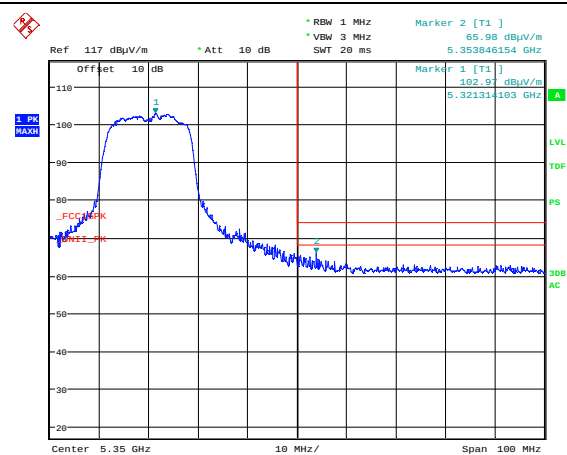
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Band Edge 5150 MHz, ch040, 802.11n HT20 MIMO, Radiated, Max, Pk



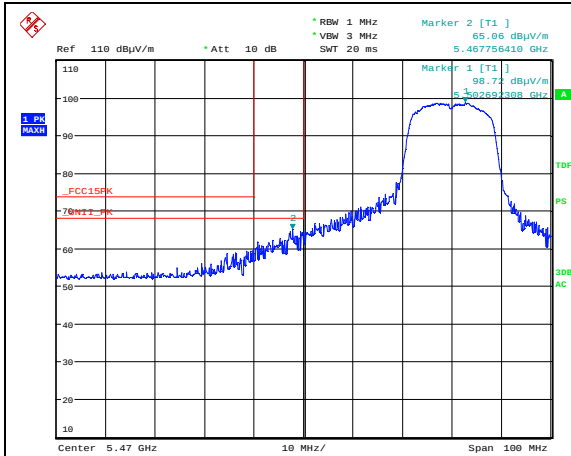
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Band Edge 5350 MHz, ch060, 802.11n HT20 MIMO, Radiated, Max, Pk



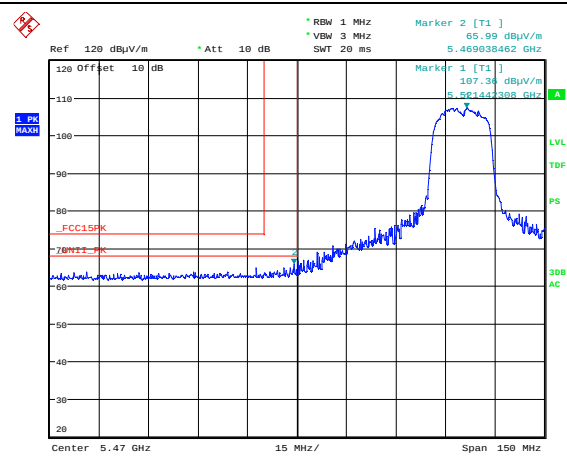
Date: 6.MAR.2023 15:12:35

Band Edge 5350 MHz, ch064, 802.11n HT20 MIMO, Radiated, Max, Pk



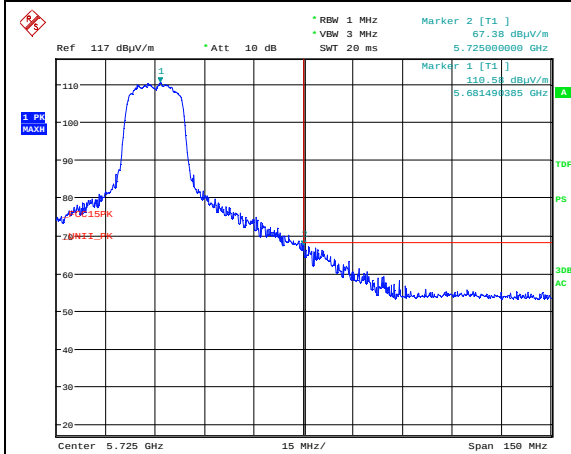
Date: 7.MAR.2023 13:18:26

Band Edge 5470 MHz, ch100, 802.11n HT20 MIMO, Radiated, Max, Pk



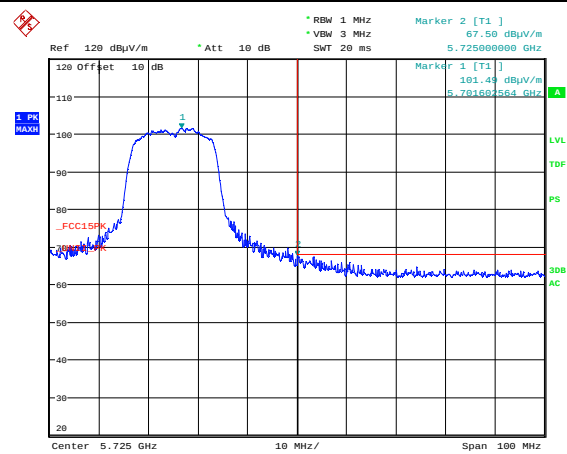
Date: 6.MAR.2023 15:27:43

Band Edge 5470 MHz, ch104, 802.11n HT20 MIMO, Radiated, Max, Pk PL9



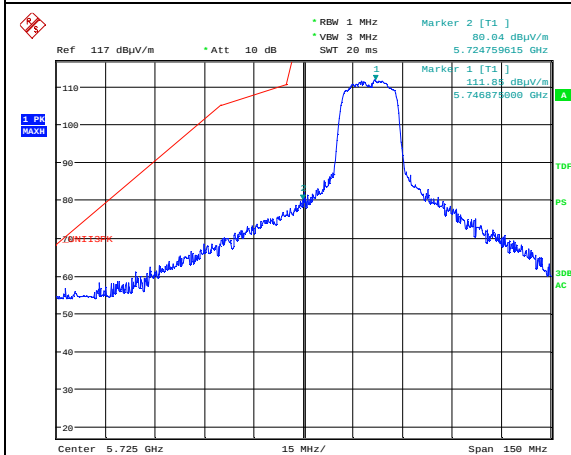
Date: 6.MAR.2023 16:24:58

Band Edge 5725 MHz, ch136, 802.11n HT20 MIMO, Radiated, Max, Pk



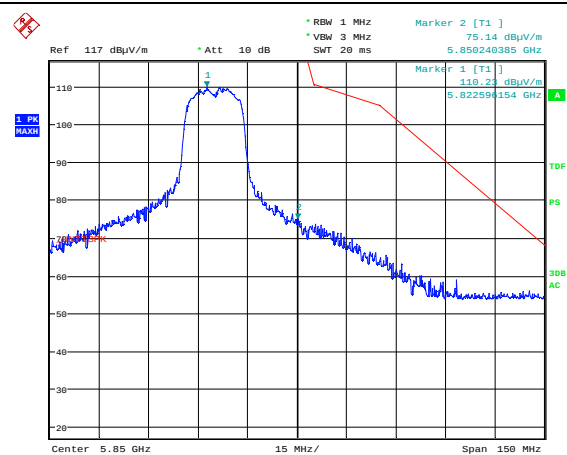
Date: 6.MAR.2023 16:01:18

Band Edge 5725 MHz, ch140, 802.11n HT20 MIMO, Radiated, Max, Pk PL9



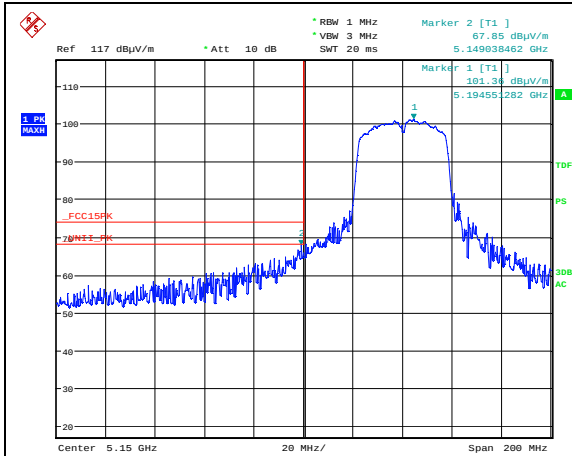
Date: 6.MAR.2023 16:32:04

Band Edge 5725 MHz, ch149, 802.11n HT20 MIMO, Radiated, Max, Pk



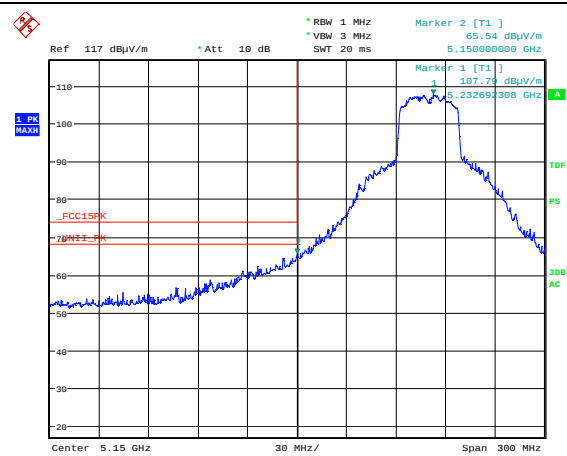
Date: 6.MAR.2023 16:36:49

Band Edge 5850 MHz, ch165, 802.11n HT20 MIMO, Radiated, Max, Pk



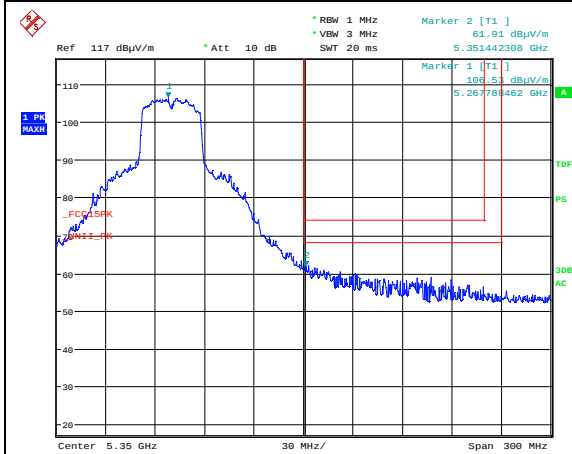
Date: 11.JUL.2023 11:05:10

Band Edge 5150 MHz, ch038, 802.11n HT40 SISO, Radiated, Max



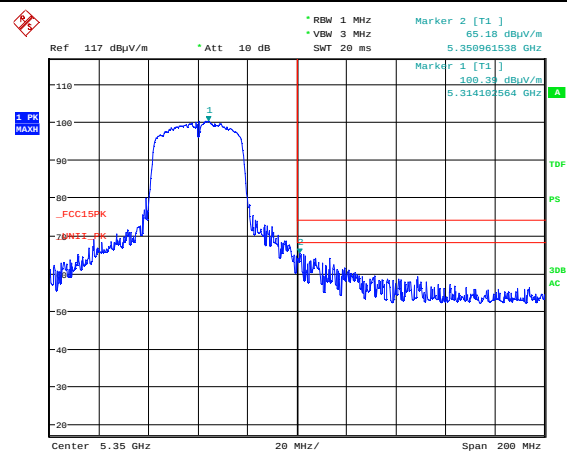
Date: 11.JUL.2023 11:00:25

Band Edge 5150 MHz, ch046, 802.11n HT40 SISO, Radiated, Max, Pk



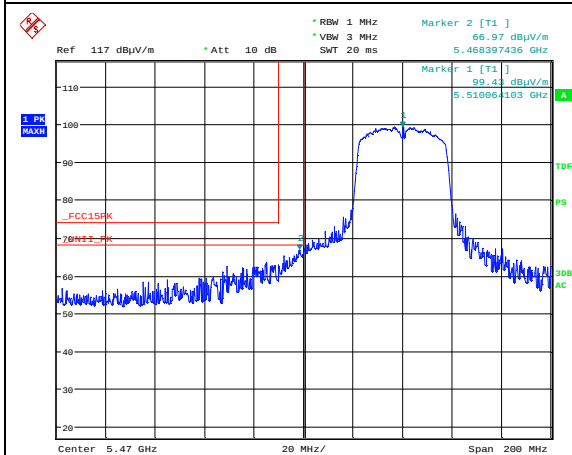
Date: 11.JUL.2023 10:53:34

Band Edge 5350 MHz, ch054, 802.11n HT40 SISO, Radiated, Max, Pk



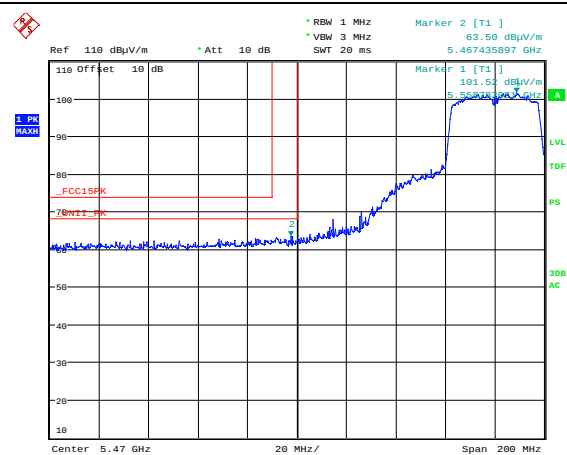
Date: 11.JUL.2023 10:49:35

Band Edge 5350 MHz, ch062, 802.11n HT40 SISO, Radiated, Max, Pk



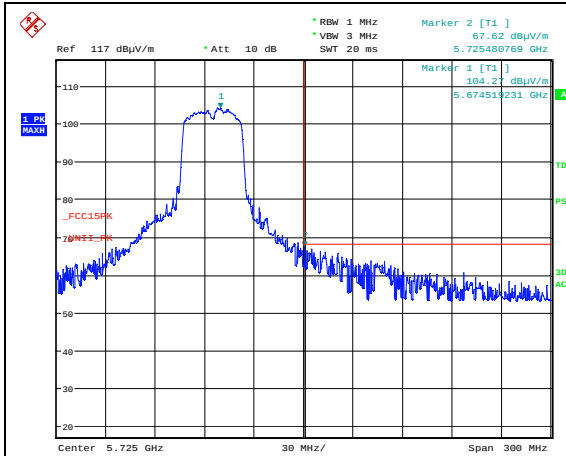
Date: 11.JUL.2023 10:44:11

Band Edge 5470 MHz, ch102, 802.11n HT40 SISO, Radiated, Max, Pk



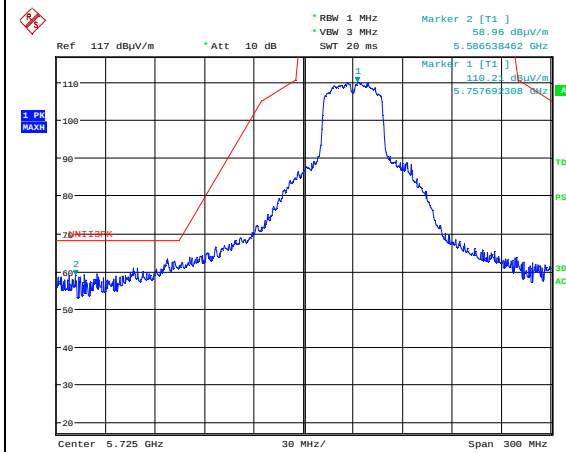
Date: 10.JUL.2023 13:41:18

Band Edge 5470 MHz, ch110, 802.11n HT40 SISO, Radiated, Max, Pk



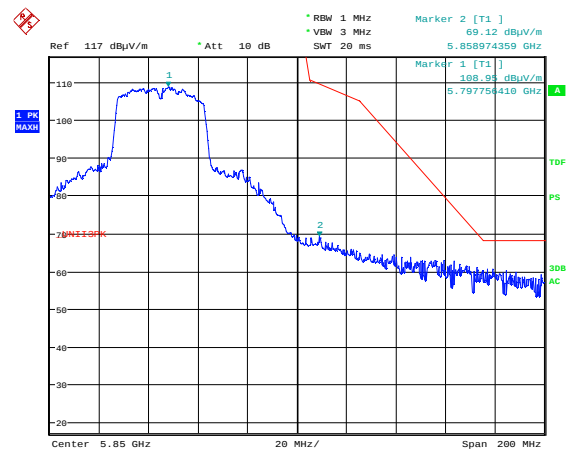
Date: 11.JUL.2023 10:36:10

Band Edge 5725 MHz, ch134, 802.11n HT40 SISO, Radiated, Max, Pk PL12



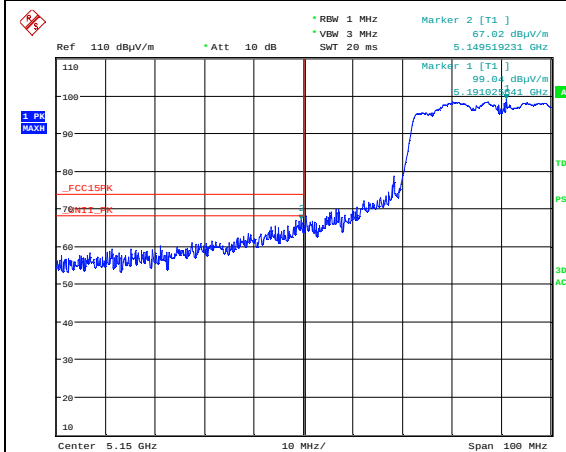
Date: 11.JUL.2023 10:20:42

Band Edge 5725 MHz, ch151, 802.11n HT40 SISO, Radiated, Max, Pk



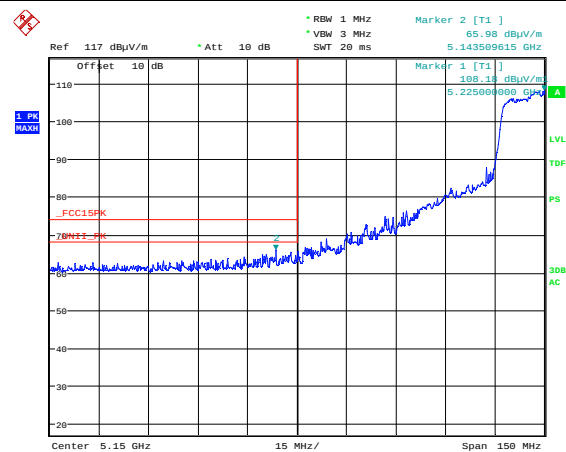
Date: 11.JUL.2023 10:18:33

Band Edge 5850 MHz, ch159, 802.11n HT40 SISO, Radiated, Max, Pk



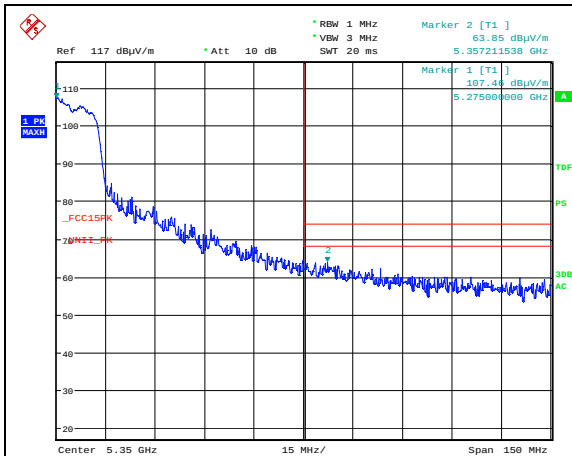
Date: 10.JUL.2023 15:15:55

Band Edge 5150 MHz, ch038, 802.11n HT40 MIMO, Radiated, Max, Pk PL2



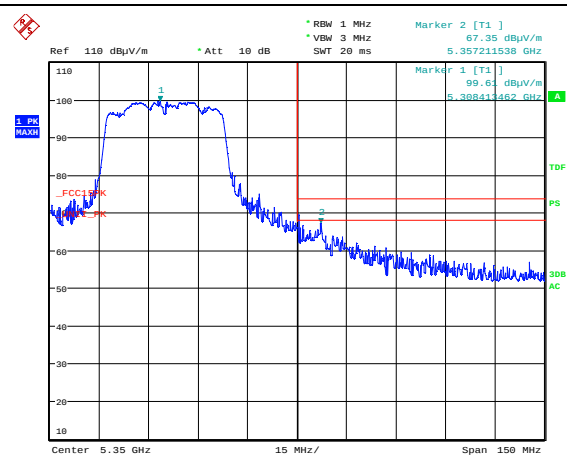
Date: 10.JUL.2023 14:59:44

Band Edge 5150 MHz, ch046, 802.11n HT40 MIMO, Radiated, Max, Pk



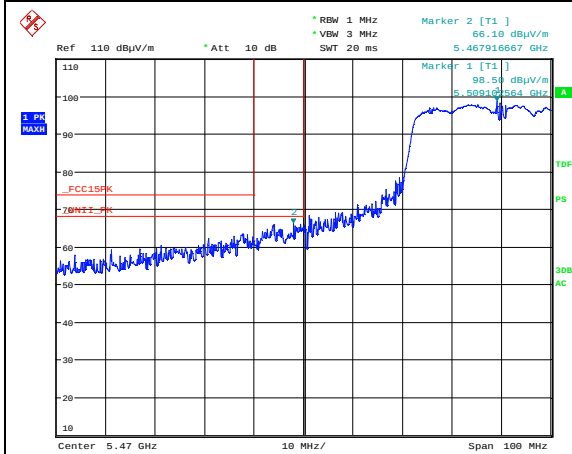
Date: 10.JUL.2023 15:26:45

Band Edge 5350 MHz, ch054, 802. 11n HT40 MIMO, Radiated, Max, Pk



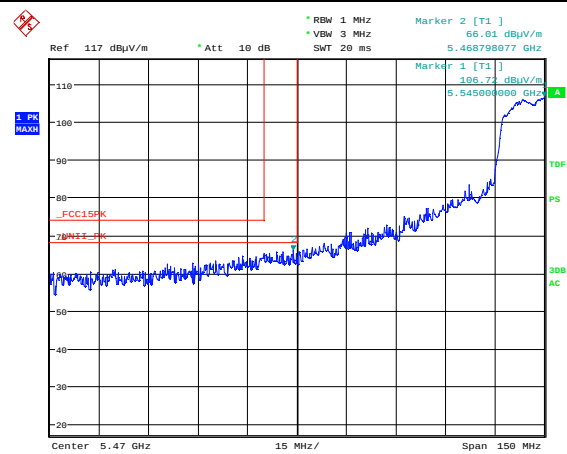
Date: 10.JUL.2023 15:37:09

Band Edge 5350 MHz, ch062, 802. 11n HT40 MIMO, Radiated, Max, Pk



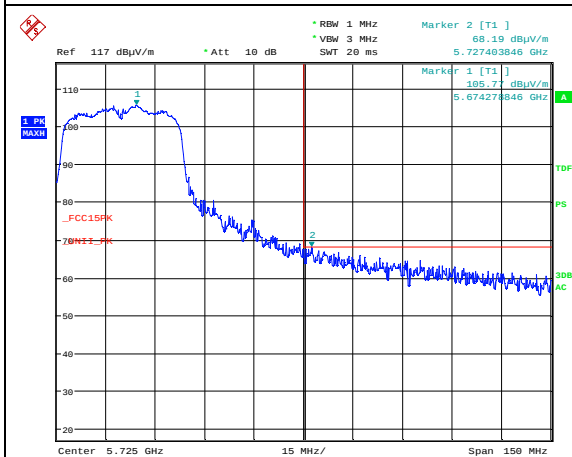
Date: 10.JUL.2023 15:46:28

Band Edge 5470 MHz, ch102, 802. 11n HT40 MIMO, Radiated, Max, Pk PL3



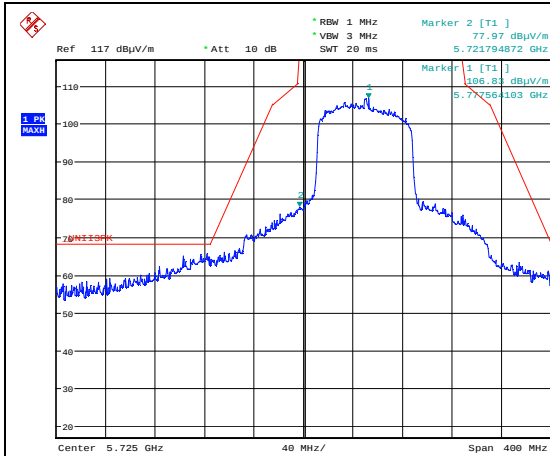
Date: 10.JUL.2023 15:52:07

Band Edge 5470 MHz, ch110, 802. 11n HT40 MIMO, Radiated, Max, Pk



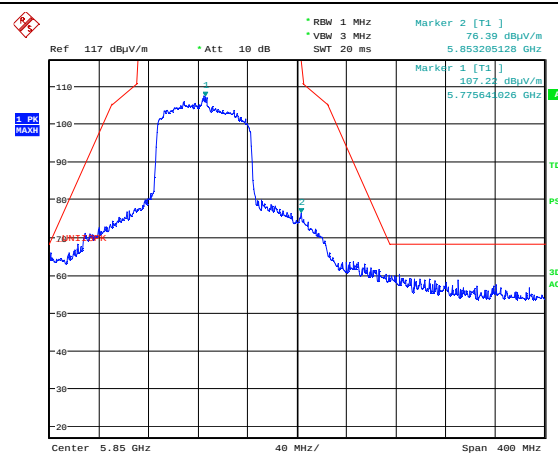
Date: 10.JUL.2023 16:00:57

Band Edge 5725 MHz, ch134, 802. 11n HT40 MIMO, Radiated, Max, Pk PL11



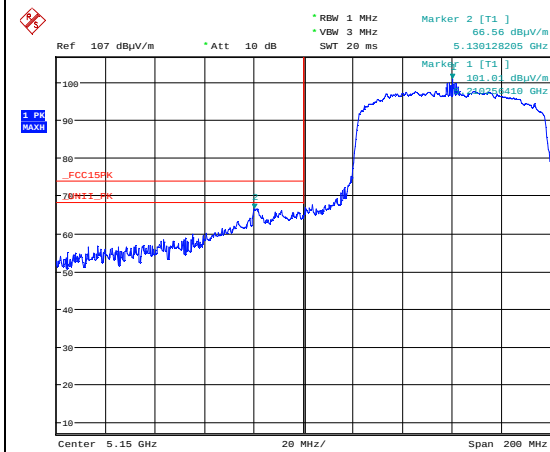
Date: 11.JUL.2023 09:16:07

Band Edge 5725 MHz, ch151, 802.11n HT40 MIMO, Radiated, Max, Pk



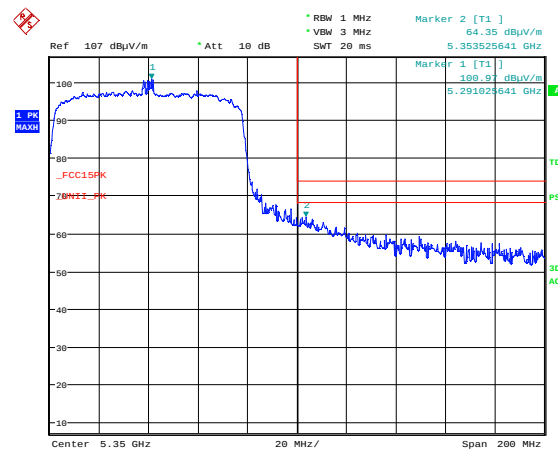
Date: 11.JUL.2023 09:16:59

Band Edge 5850 MHz, ch159, 802.11n HT40 MIMO, Radiated, Max, Pk



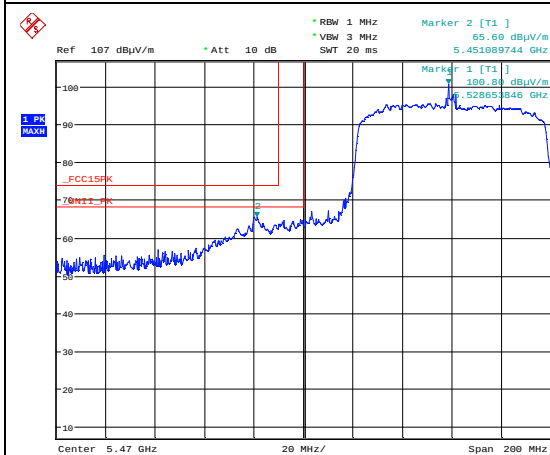
Date: 11.JUL.2023 09:53:41

Band Edge 5150 MHz, ch042, 802.11ac HT80 SISO, Radiated, Max, Pk PL6



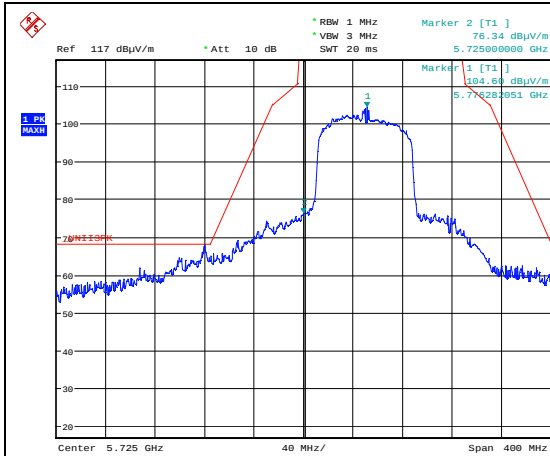
Date: 11.JUL.2023 09:44:48

Band Edge 5350 MHz, ch058, 802.11ac HT80 SISO, Radiated, Max, Pk



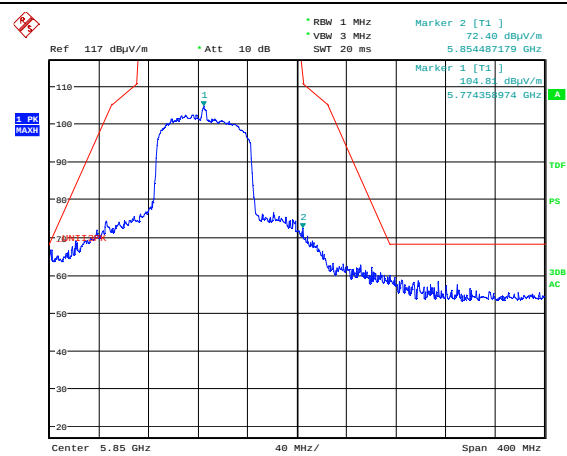
Date: 11.JUL.2023 09:48:55

Band Edge 5470 MHz, ch106, 802.11ac HT80 SISO, Radiated, Max, Pk PL6



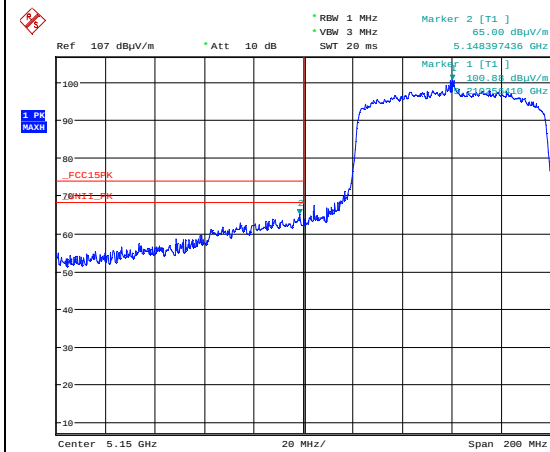
Date: 11.JUL.2023 10:08:29

Band Edge 5725 MHz, ch155, 802.11ac HT80 SISO, Radiated, Max, Pk PL12



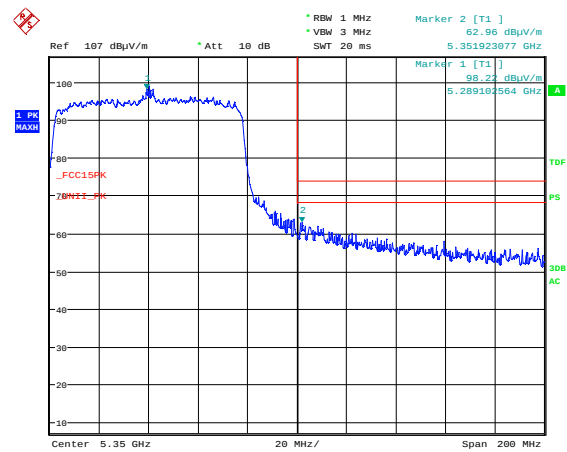
Date: 11.JUL.2023 10:11:17

Band Edge 5850 MHz, ch155, 802.11ac HT80 SISO, Radiated, Max, Pk PL12



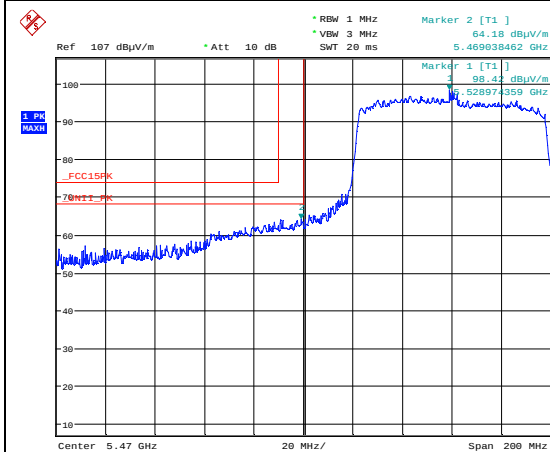
Date: 11.JUL.2023 08:59:36

Band Edge 5150 MHz, ch042, 802.11ac HT80 MIMO, Radiated, Max, Pk



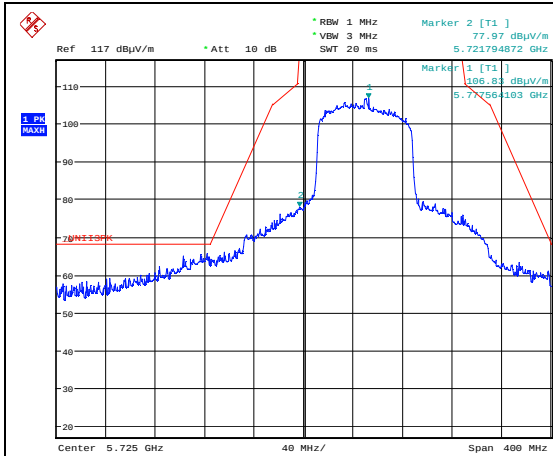
Date: 11.JUL.2023 08:57:25

Band Edge 5350 MHz, ch058, 802.11ac HT80 MIMO, Radiated, Max, Pk



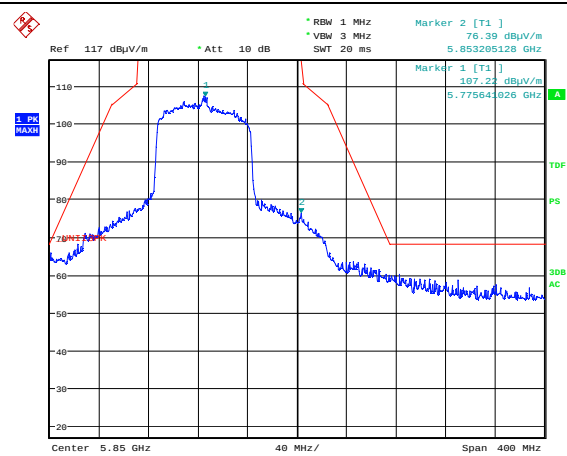
Date: 11.JUL.2023 08:54:20

Band Edge 5470 MHz, ch106, 802.11ac HT80 MIMO, Radiated, Max, Pk



Date: 11.JUL.2023 09:16:07

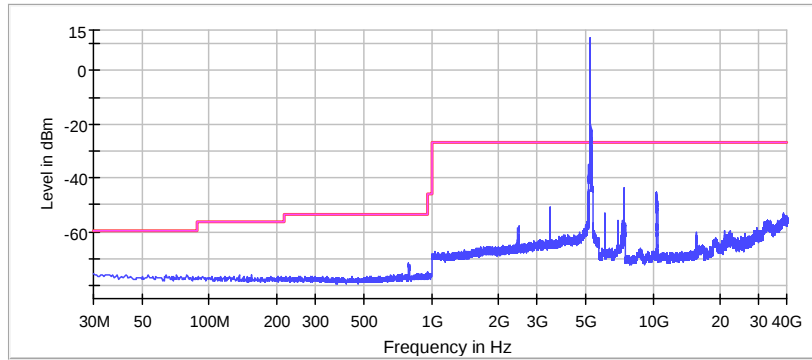
Band Edge 5725 MHz, ch155, 802. 11ac HT80 MIMO, Radiated, Max, Pk



Date: 11.JUL.2023 09:16:59

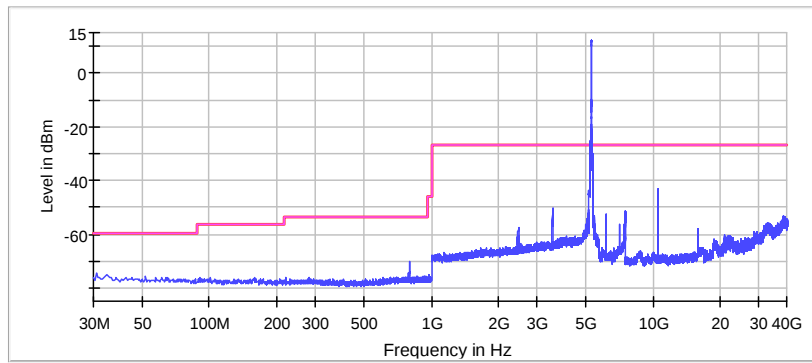
Band Edge 5850 MHz, ch155, 802. 11ac HT80 MIMO, Radiated, Max, Pk

Spurious



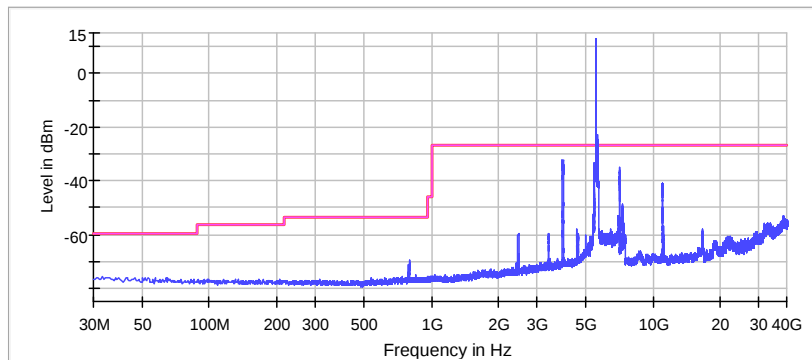
Unwanted Emissions 30M-40GHz, ch044, 802.11a 6M, Ant1, Conducted

Spurious

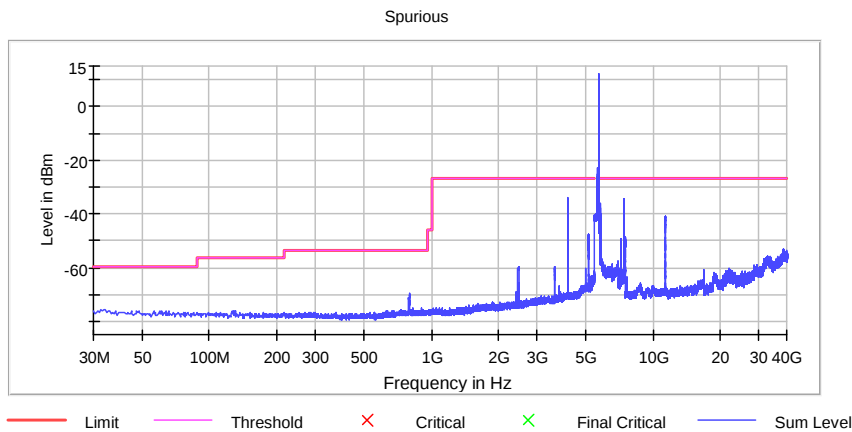


Unwanted Emissions 30M-40GHz, ch056, 802.11a 6M, Ant1, Conducted

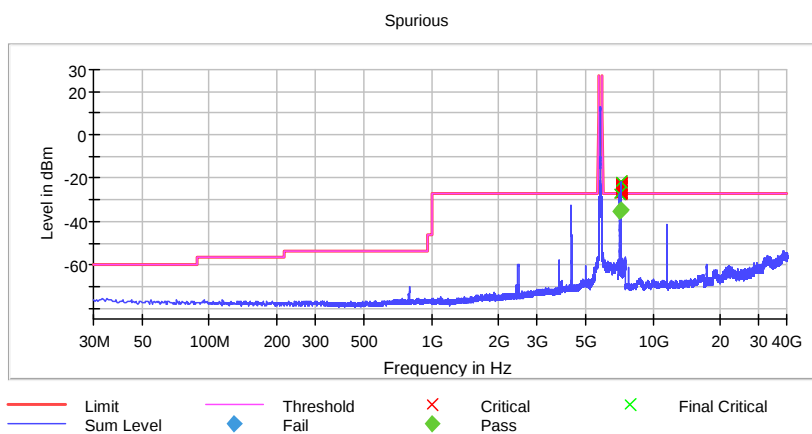
Spurious



Unwanted Emissions 30M-40GHz, ch108, 802.11a 6M, Ant1, Conducted

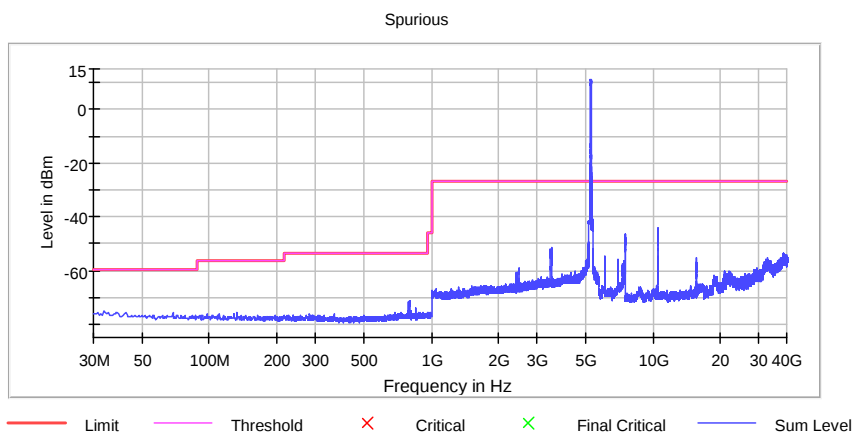


Unwanted Emissions 30M-40GHz, ch136, 802.11a 6M, Ant1, Conducted

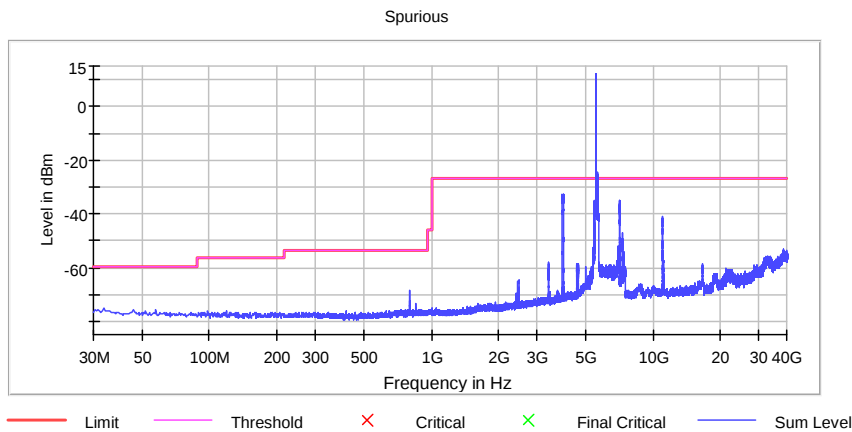


Unwanted Emissions 30M-40GHz, ch157, 802.11a 6M, Ant1, Conducted

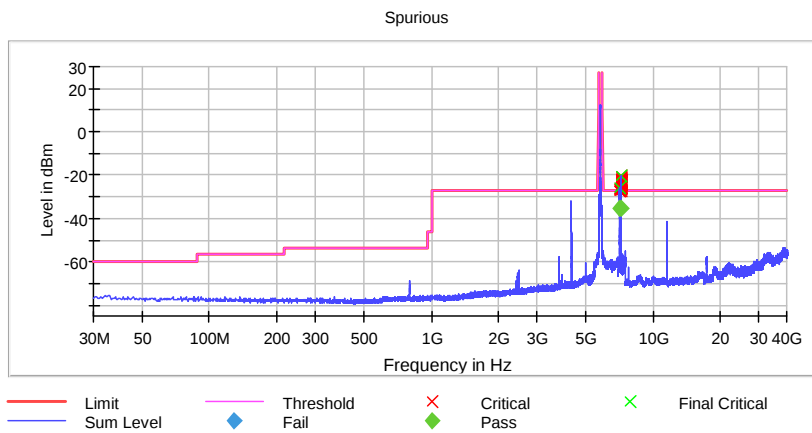
Measured: 7053.5 MHz, Level: -35.5 dBm, Limit: -27.0 dBm, Margin: 8.5 dB
Measured: 7173.0 MHz, Level: -34.7 dBm, Limit: -27.0 dBm, Margin: 7.7 dB



Unwanted Emissions 30M-40GHz, ch048, 802.11n HT20, Ant1, Conducted

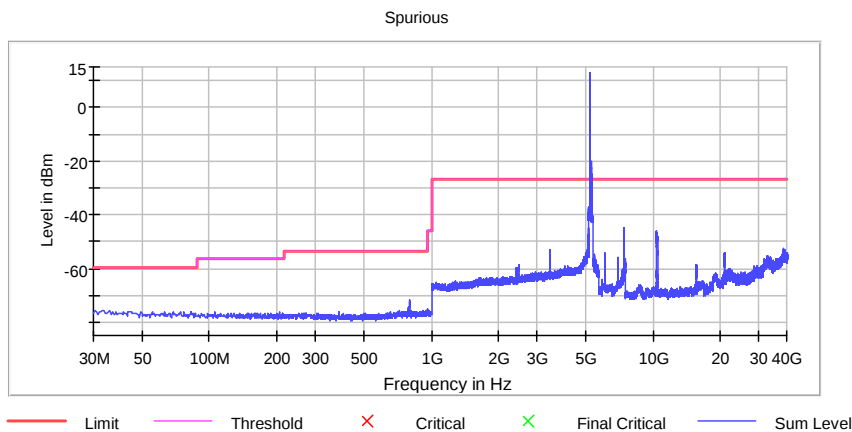


Unwanted Emissions 30M-40GHz, ch108, 802.11n HT20, Ant1, Conducted



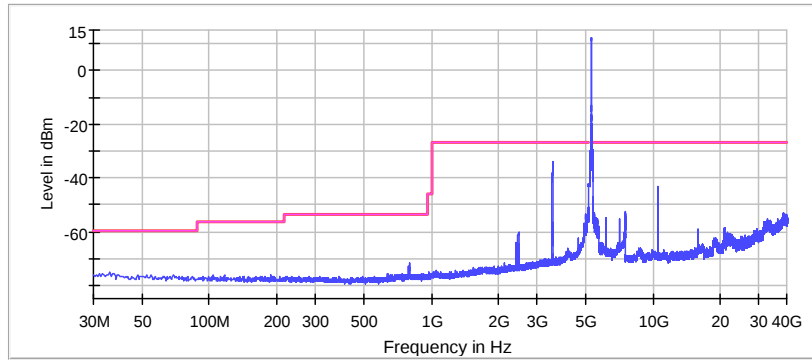
Unwanted Emissions 30M-40GHz, ch157, 802.11n HT20, Ant1, Conducted

Measured: 7049.5 MHz, Level: -35.4 dBm, Limit: -27.0 dBm, Margin: 8.4 dB
Measured: 7169.5 MHz, Level: -35.1 dBm, Limit: -27.0 dBm, Margin: 8.1 dB



Unwanted Emissions 30M-40GHz, ch044, 802.11n HT20, MIMO, Conducted

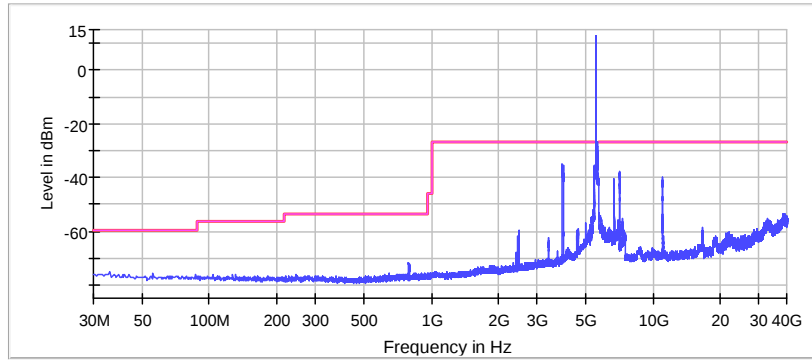
Spurious



— Limit — Threshold × Critical × Final Critical — Sum Level

Unwanted Emissions 30M-40GHz, ch056, 802.11n HT20, MIMO, Conducted

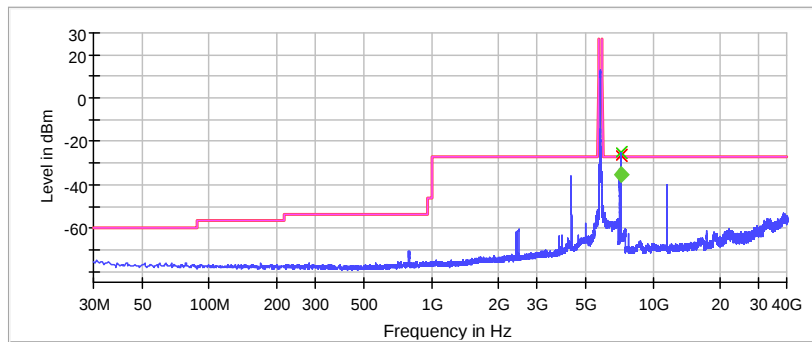
Spurious



— Limit — Threshold × Critical × Final Critical — Sum Level

Unwanted Emissions 30M-40GHz, ch108, 802.11n HT20, MIMO, Conducted

Spurious

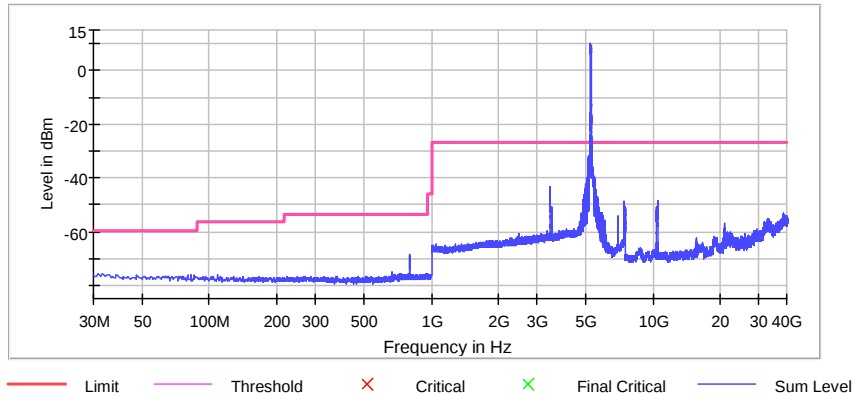


— Limit — Threshold × Critical × Final Critical
— Sum Level ◆ Threshold Fail ◆ Critical Pass

Unwanted Emissions 30M-40GHz, ch157, 802.11n HT20, MIMO, Conducted

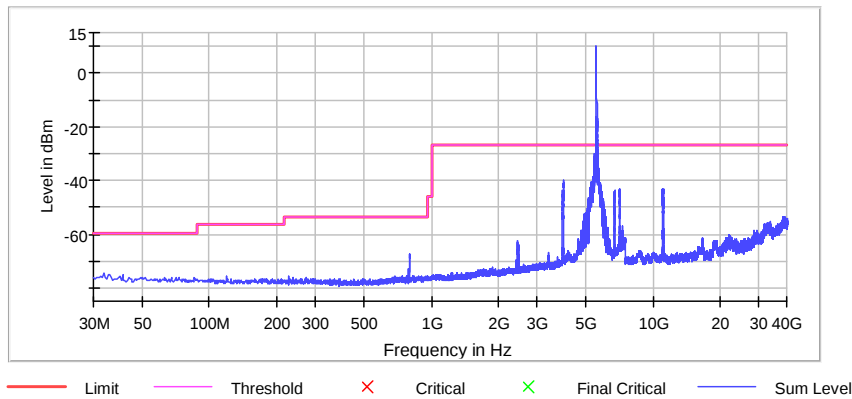
Measured: 7169.5 MHz, Level: -35.1 dBm, Limit: -27.0 dBm, Margin: 8.1 dB

Spurious



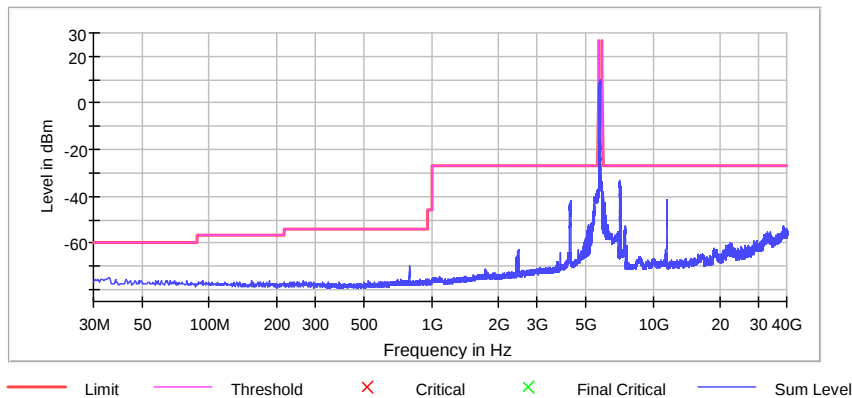
Unwanted Emissions 30M-40GHz, ch046, 802.11ac HT40, MIMO, Conducted

Spurious



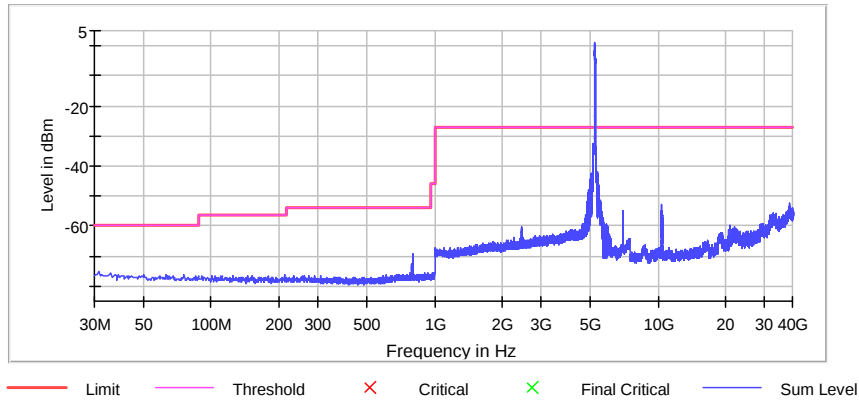
Unwanted Emissions 30M-40GHz, ch110, 802.11ac HT40, MIMO, Conducted

Spurious



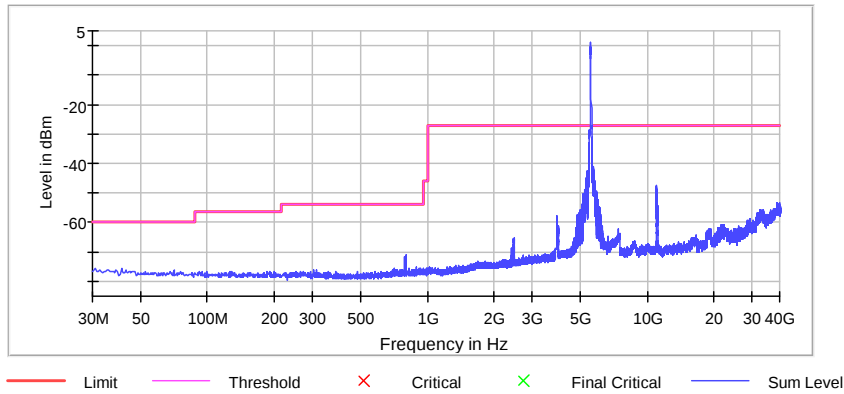
Unwanted Emissions 30M-40GHz, ch151, 802.11ac HT40, MIMO, Conducted

Spurious



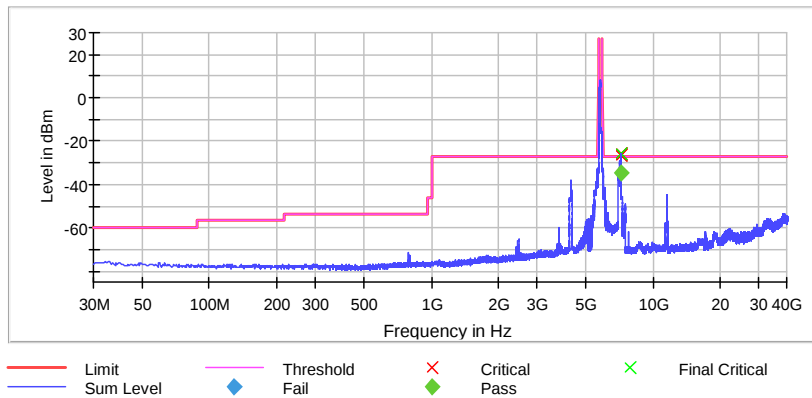
Unwanted Emissions 30M-40GHz, ch042, 802.11ac HT80, Ant1, Conducted

Spurious



Unwanted Emissions 30M-40GHz, ch106, 802.11ac HT80, Ant1, Conducted

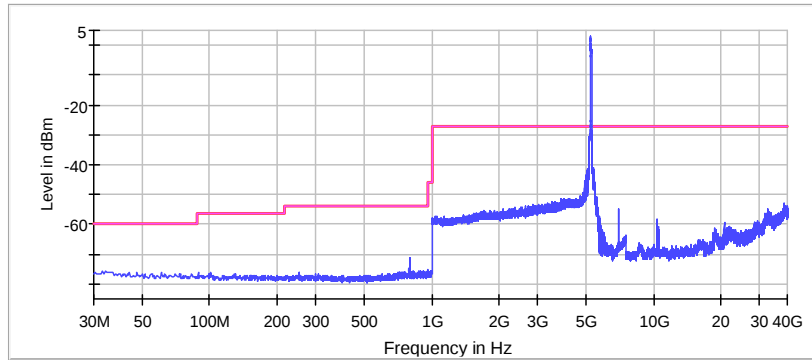
Spurious



Unwanted Emissions 30M-40GHz, ch155, 802.11ac HT80, Ant1, Conducted

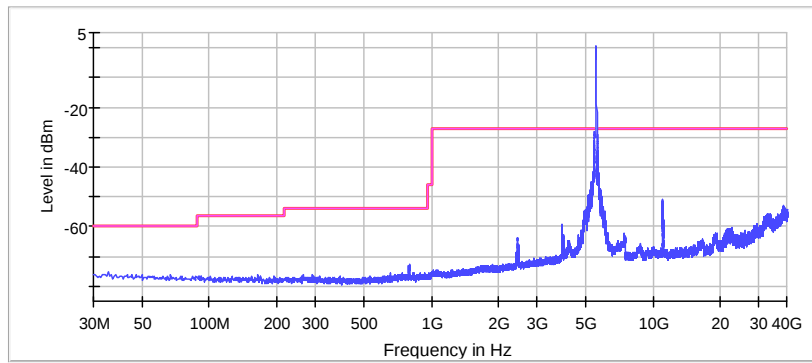
Measured: 7152.5 MHz, Level: -34.8 dBm, Limit: -27.0 dBm, Margin: 7.8 dB

Spurious



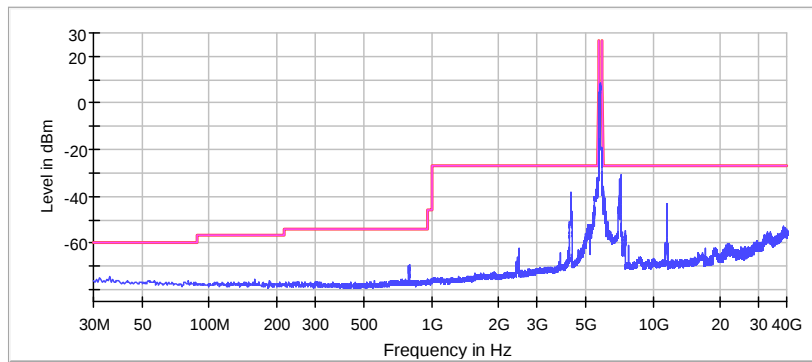
Unwanted Emissions 30M-40GHz, ch042, 802.11ac HT80, MIMO, Conducted

Spurious



Unwanted Emissions 30M-40GHz, ch106, 802.11ac HT80, MIMO, Conducted

Spurious



Unwanted Emissions 30M-40GHz, ch155, 802.11ac HT80, MIMO, Conducted

4.6 Restricted Bands of operation

Restricted Bands of operation for FCC and ISSED are defined in FCC Part 15.205 and ISSED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISSED (MHz)	FCC (GHz)	ISSED (GHz)
0.090-0.110		0.96-1.24 1.3-1.427	0.96-1.427
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		2.69-2.9	2.655-2.9
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		3.6-4.4	3.5-4.4
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 123-138	108-138	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISSED, all other frequencies are common.

4.7 Radiated Emissions, 30 – 1000 MHz

FCC 15.205, 15.209, 15.407

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Detector: Peak

Measuring distance 3 m

Tested in test mode with EUT transmitting on ch 048/116/157.

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30 – 88	2440	GFSK	< 30	40.0	> 10
88 – 216	2440	GFSK	40.0	43.5	3.5
216 – 960	2440	GFSK	< 36	46.0	> 10
960 – 1000	2440	GFSK	< 35	54.0	> 19
120.010	2440	GFSK	40.0	43.5	3.5

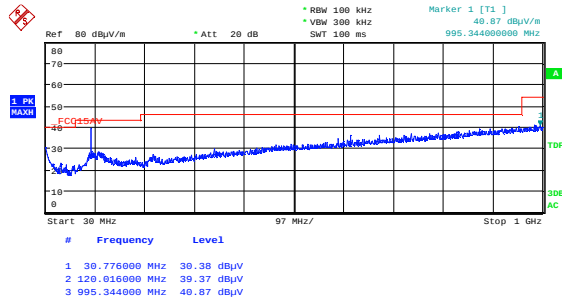
The spurious at 120.010 MHz is independent of RF signal or antenna type.

See attached plots.

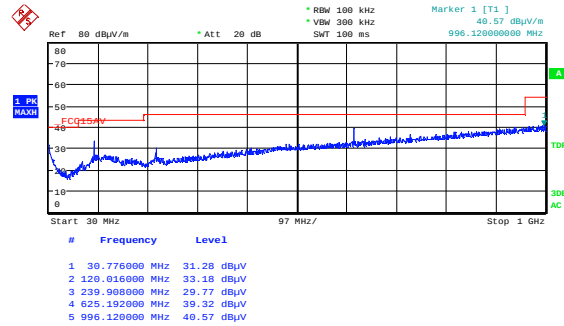
Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 μ V/m	40.0 dB μ V/m
88 – 216 MHz	150 μ V/m	43.5 dB μ V/m
216 – 960 MHz	200 μ V/m	46.0 dB μ V/m
960 – 1000 MHz	500 μ V/m	54.0 dB μ V/m
	Limits above are with Quasi Peak Detector	

Combi Antenna

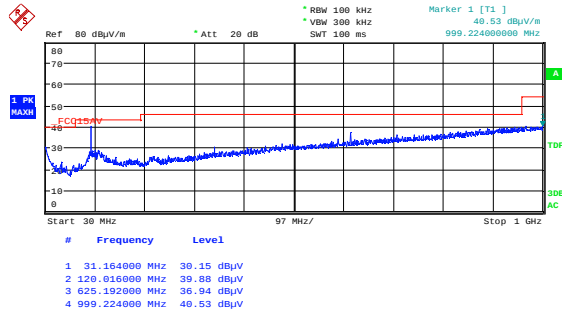


Date: 10.MAR.2023 14:42:28

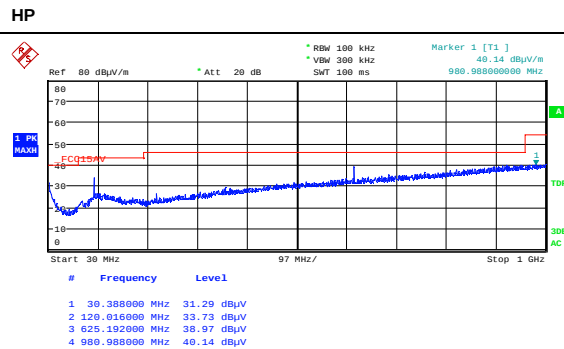


Date: 10.MAR.2023 14:44:24

Radiated Emissions 30-1000 MHz, Ch048, 802.11n HT20, MIMO, VP

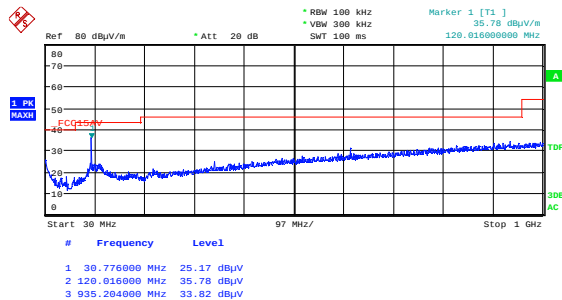


Date: 10.MAR.2023 14:54:44

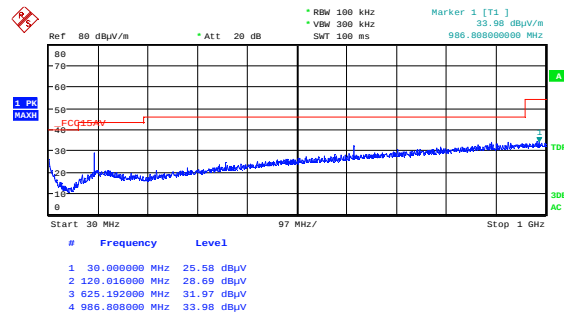


Date: 10.MAR.2023 15:04:53

Radiated Emissions 30-1000 MHz, Ch116, 802.11n HT20, MIMO, VP



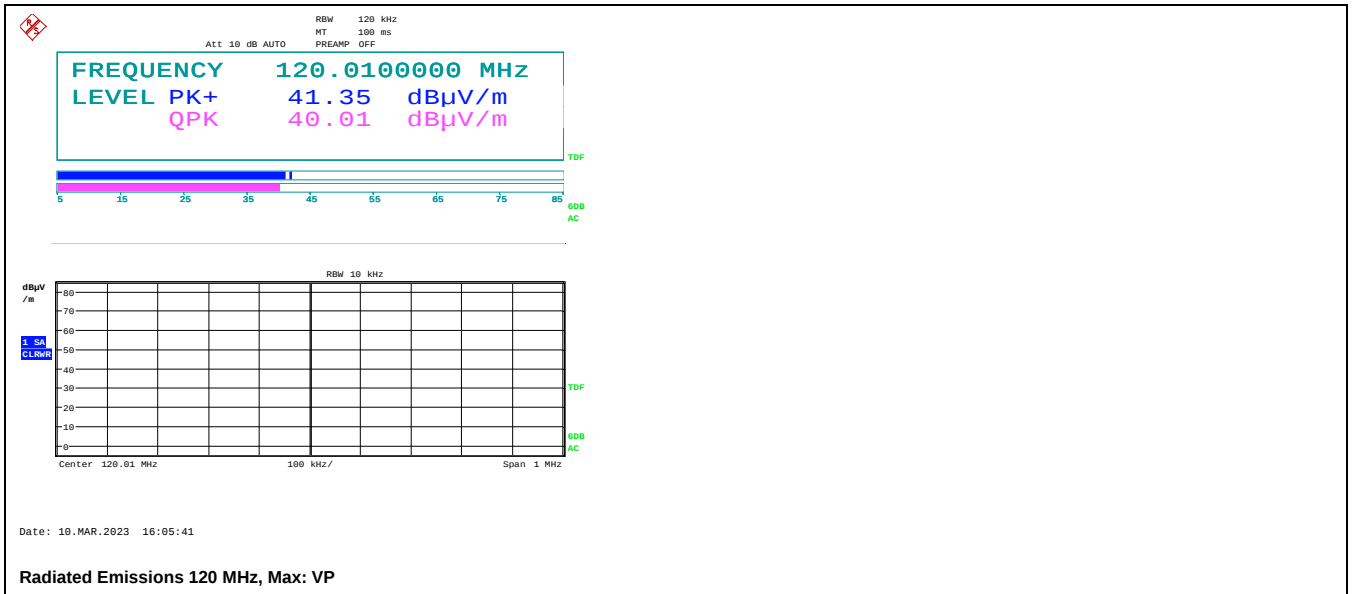
Date: 10.MAR.2023 15:19:30



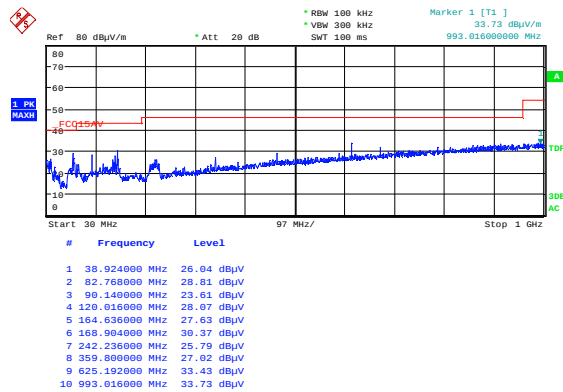
Date: 10.MAR.2023 15:25:57

Radiated Emissions 30-1000 MHz, Ch157, 802.11n HT20, MIMO, VP

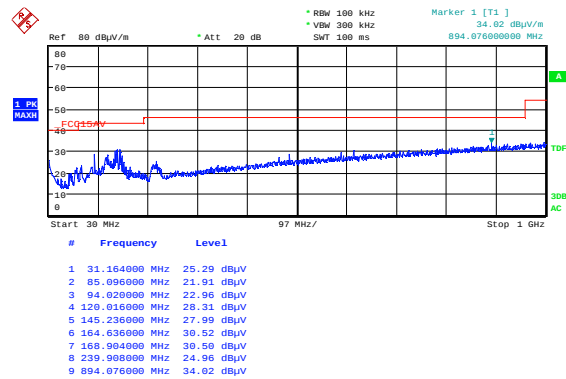
HP



Whip+Patch Antenna

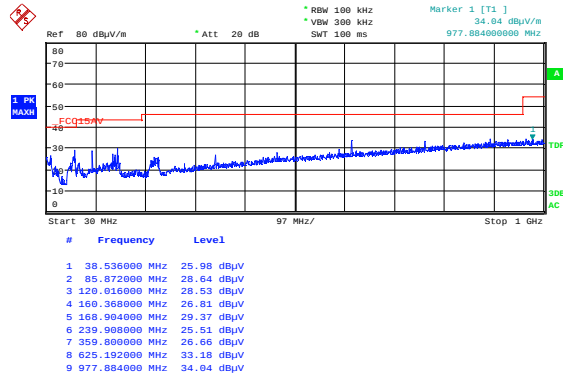


Date: 13.MAR.2023 11:04:17

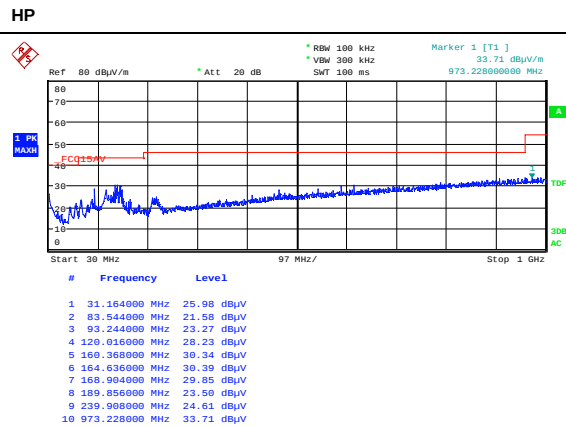


Date: 13.MAR.2023 11:06:14

Radiated Emissions 30-1000 MHz, Ch048, 802.11n HT20, MIMO, VP

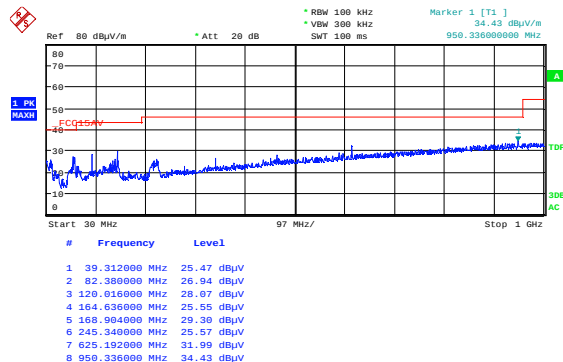


Date: 13.MAR.2023 11:11:41

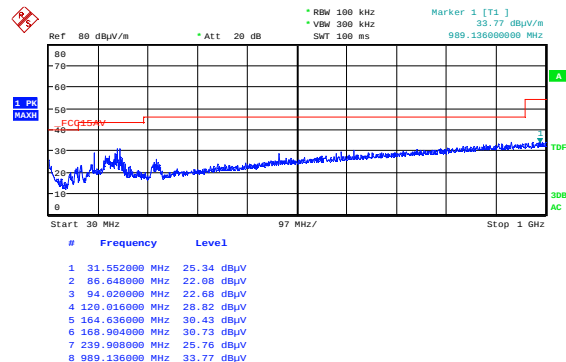


Date: 13.MAR.2023 11:13:38

Radiated Emissions 30-1000 MHz, Ch116, 802.11n HT20, MIMO, VP



Date: 13.MAR.2023 11:55:42



Date: 13.MAR.2023 11:57:38

Radiated Emissions 30-1000 MHz, Ch157, 802.11n HT20, MIMO, VP

HP

4.8 Radiated Emissions, 1 – 40 GHz

FCC 15.205, 15.209, 15.407

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Measuring distance 3m up to 18 GHz, 1m above 18 GHz.

A prescan at approx. 1m was performed from 18 – 40 GHz.

Peak Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5180	5150	Any	68.1	74	5.9
5320	5350	Any	67.4	74	6.6
5500	5460	Any	68.2	74	5.8
5220	10440	802.11a	57.5	74	16.5
5580	11160	802.11a	54.5	74	19.5

Band Edge values with Peak Detector are reported in clause 2.8

Average Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5180	5150	Any	53.5	54	0.5
5320	5350	Any	50.6	54	3.4
5500	5460	Any	53.1	54	0.9
5220	10440*	802.11a	45.3	54	8.7
5580	11160	802.11a	44.9	54	10.1

*Not in a Restricted Band

Measured results are for 802.11a 6Mbps and 802.11n MCS0, it was checked that other modulations and/or bitrates did not produce higher emissions.

BandStop Filters were used for measurements from 1 to 18 GHz.

Only harmonics that fall in the restricted bands (ref. §15.205) have been measured.

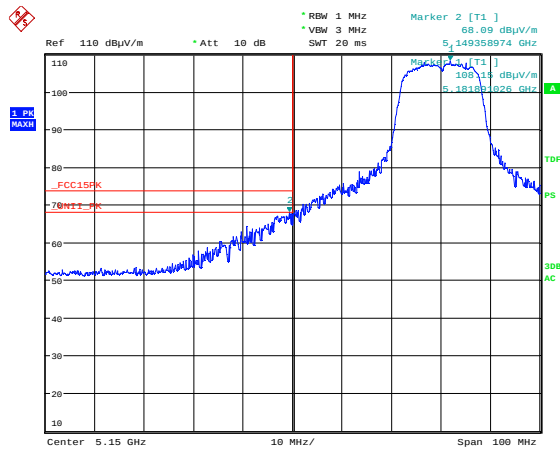
Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

See attached plots.

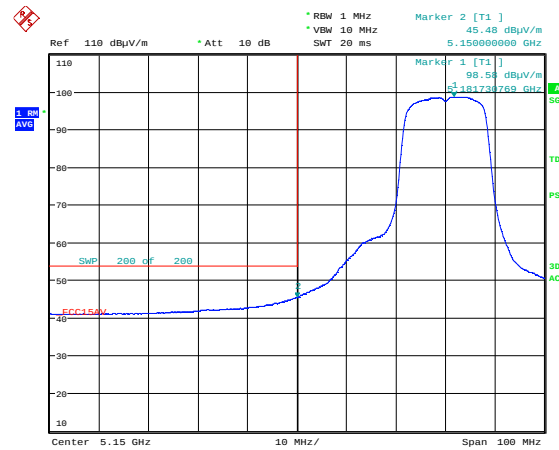
Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector (dBμV/m)	Peak Detector (dBμV/m)
1 – 40 GHz	54.0	74.0

Combi Antenna



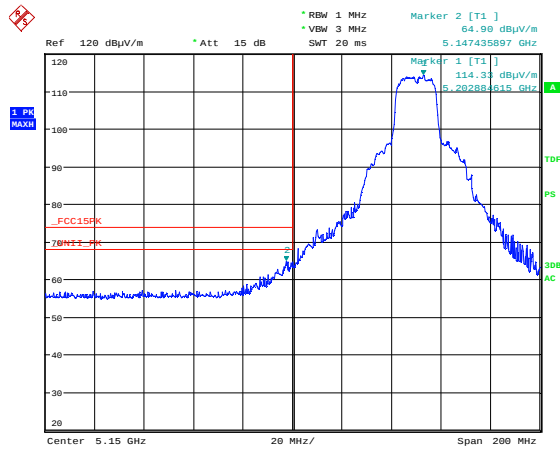
Date: 12.JUL.2023 12:43:14



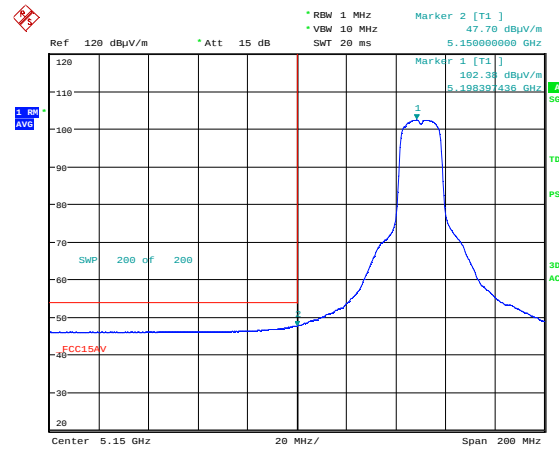
Date: 12.JUL.2023 12:44:38

Band Edge 5150 MHz, ch036, 802.11a 6Mb, Radiated, Max, Pk, PL8

Av



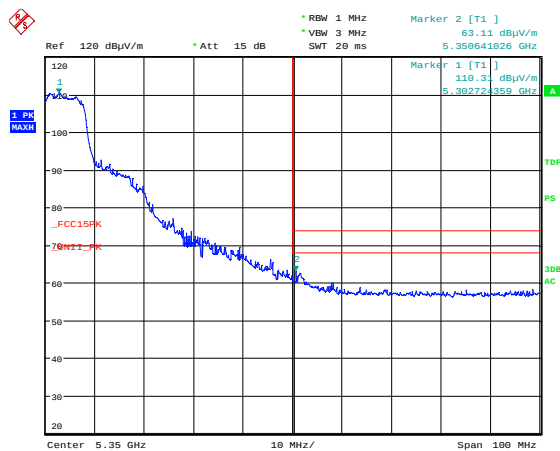
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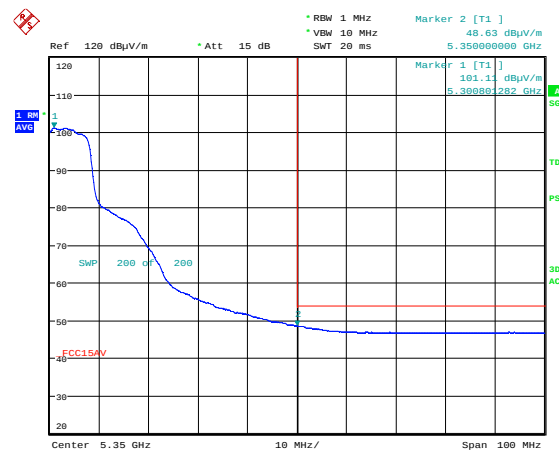
Date: 12.JUL.2023 11:17:12

Band Edge 5150 MHz, ch040, 802.11a 6Mb, Radiated, Max, Pk

Av



Date: 12.JUL.2023 12:59:10



Date: 12.JUL.2023 12:59:52

Band Edge 5350 MHz, ch060, 802.11a 6Mb, Radiated, Max, Pk

Av