

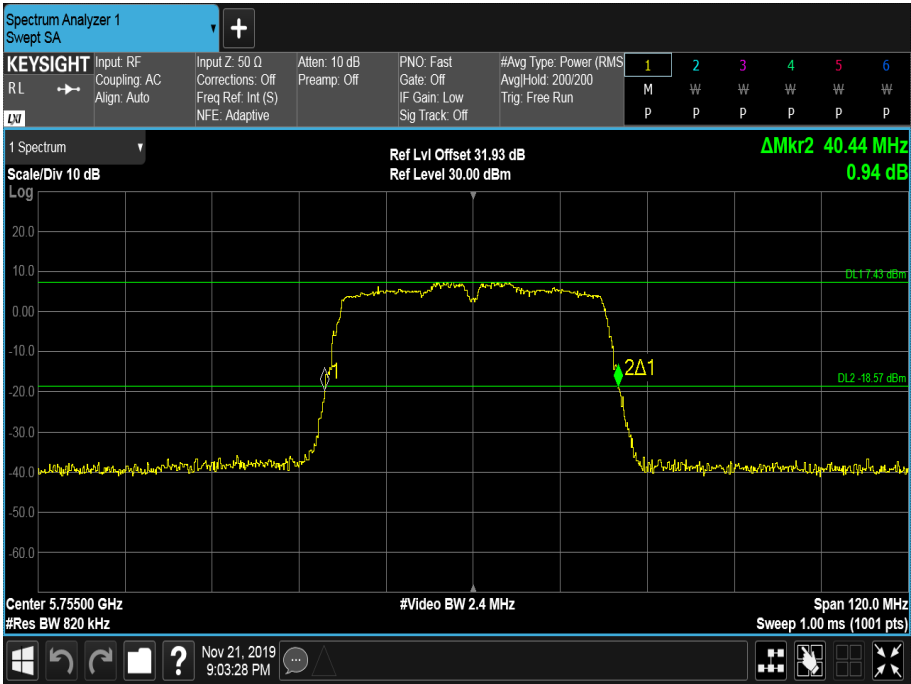


Figure 329 - 5755 MHz - 26 dB Emission Bandwidth

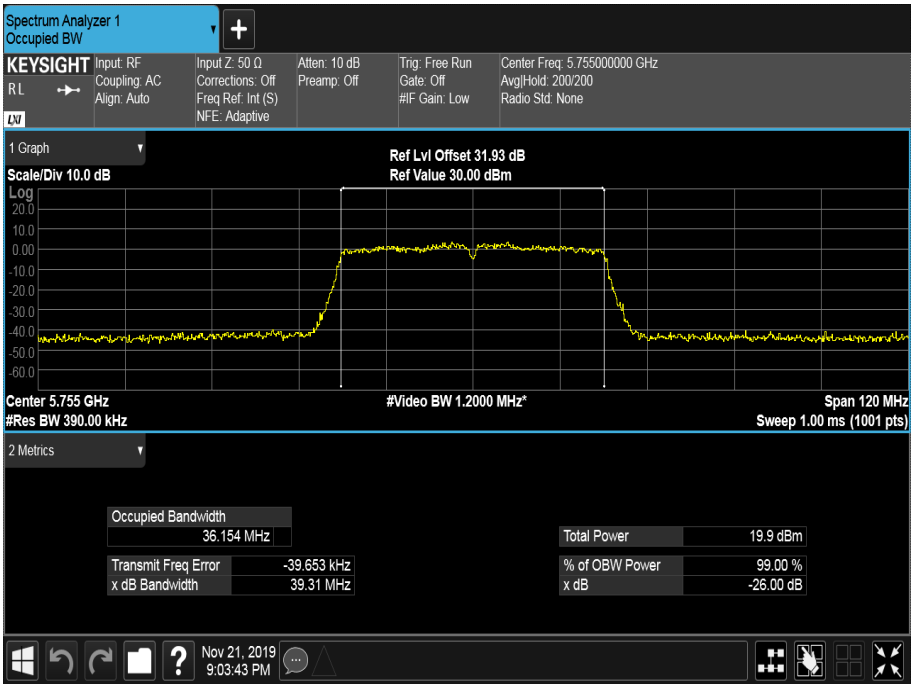


Figure 330 - 5755 MHz - 99% Occupied Bandwidth

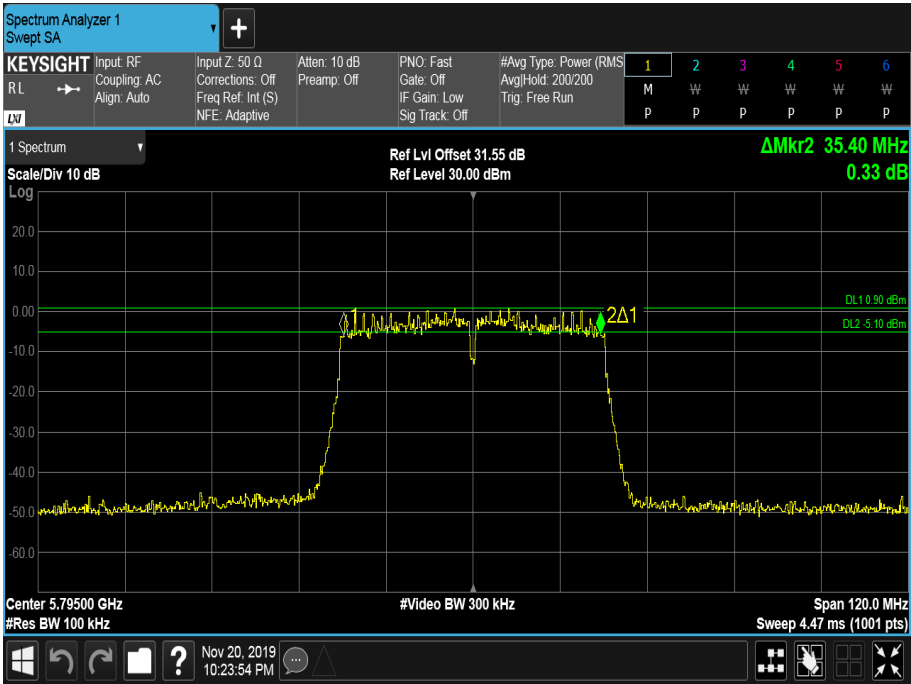


Figure 331 - 5795 MHz - 6 dB DTS Bandwidth

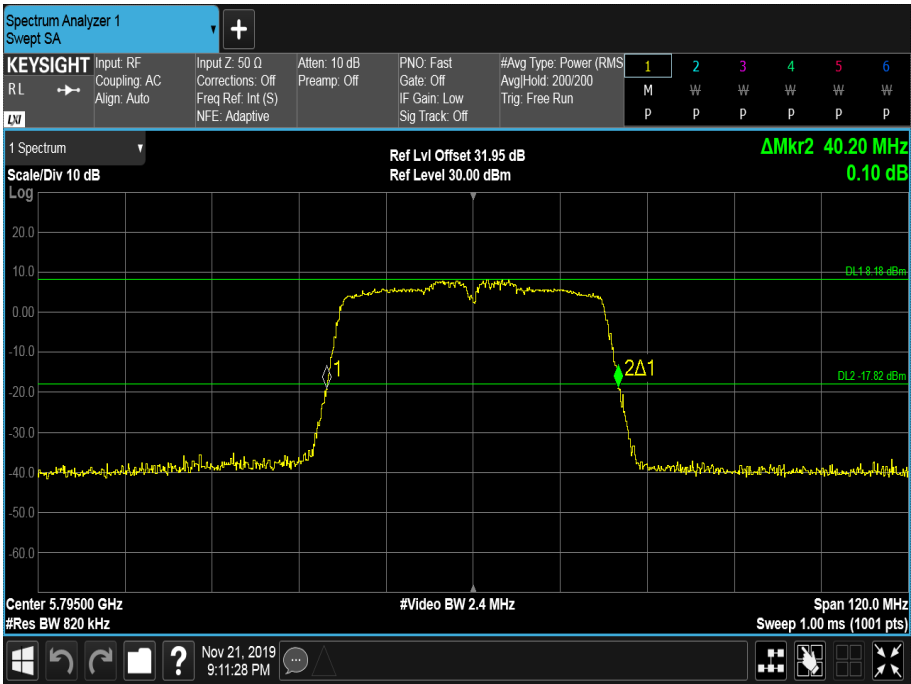


Figure 332 - 5795 MHz - 26 dB Emission Bandwidth

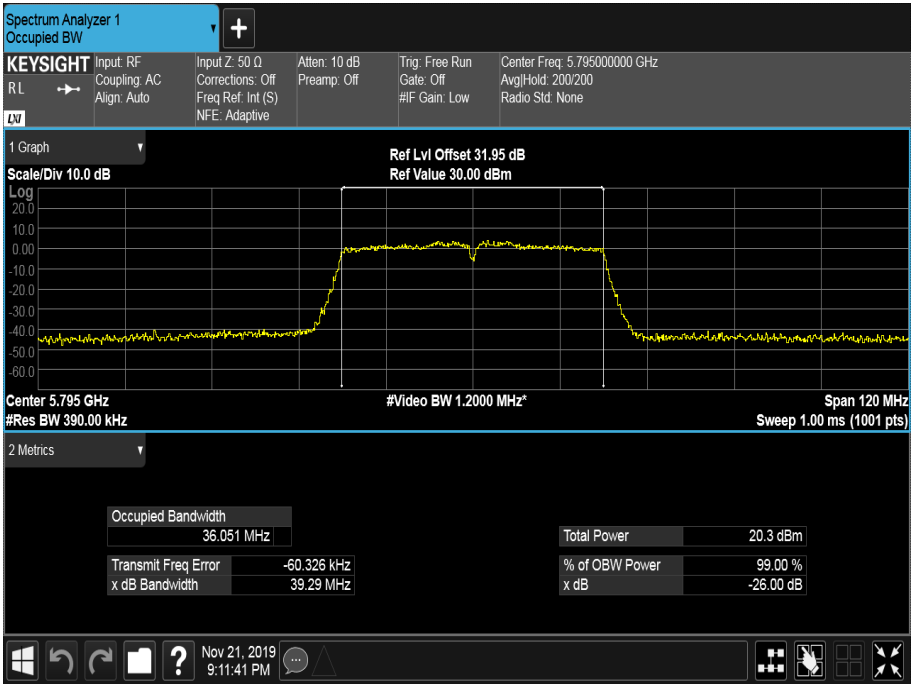


Figure 333 - 5795 MHz - 99% Occupied Bandwidth

Channel	Straddle	Bottom	Middle	Top
Frequency (MHz)	5720	5745	5785	5825
6 dB Bandwidth (MHz)	3.880	17.820	17.760	17.760
26 dB Bandwidth (MHz)	5.920	22.020	21.780	21.900
99% Bandwidth (MHz)	17.790	17.783	17.791	17.763

Table 202 - 802.11ac / VHT20 MCS0x1 / MIMO TxBF / Cores 0+1

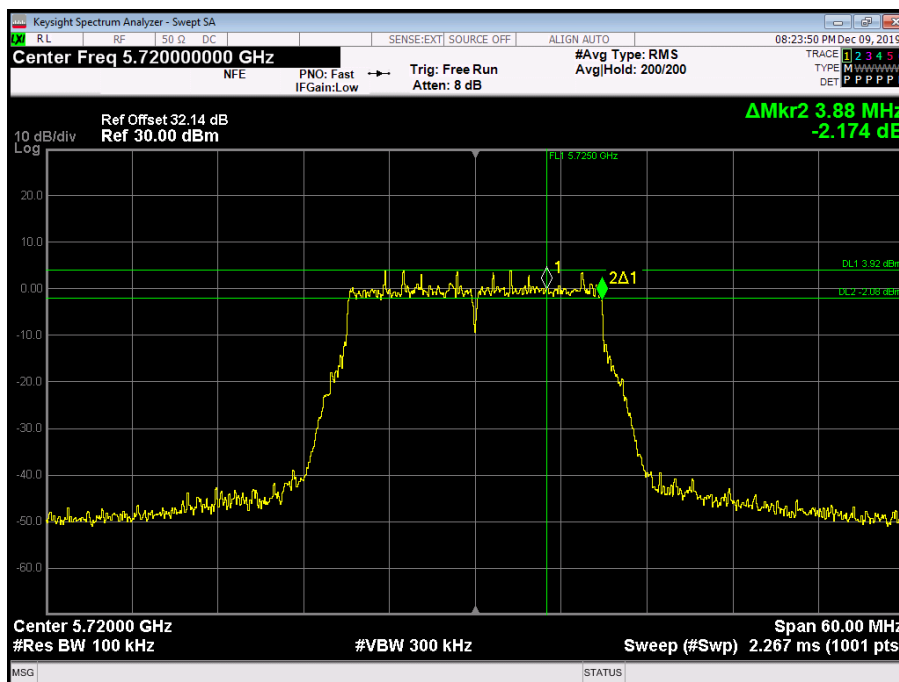


Figure 334 - 5720 MHz - 6 dB DTS Bandwidth

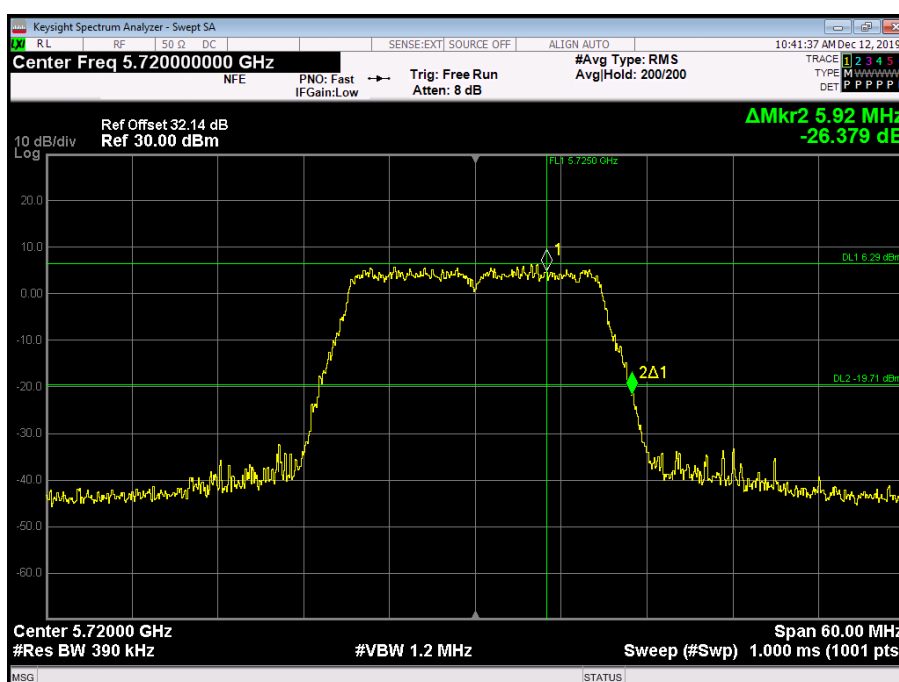


Figure 335 - 5720 MHz - 26 dB Emission Bandwidth

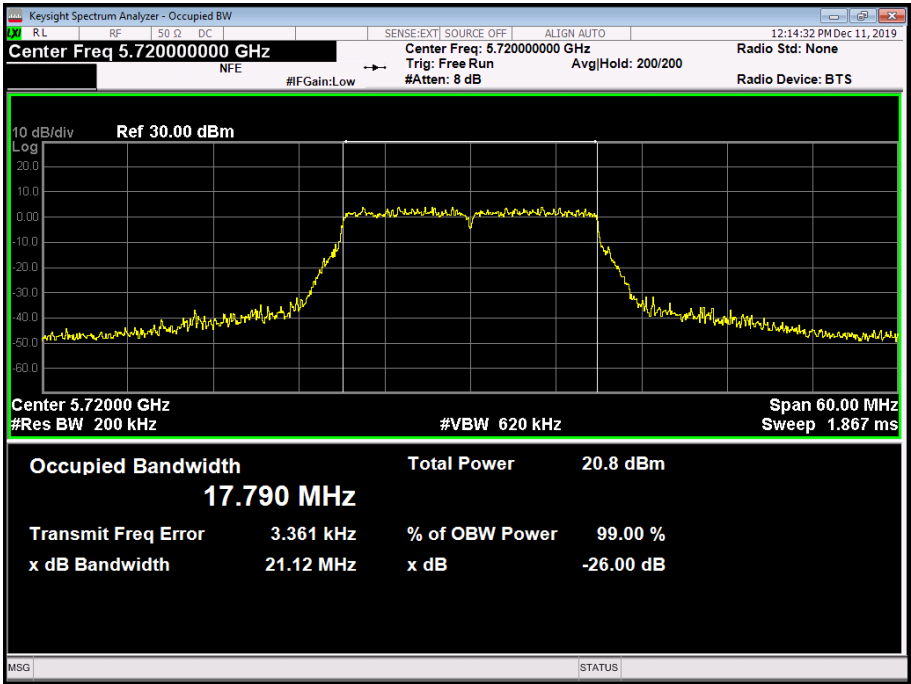


Figure 336 - 5720 MHz - 99% Occupied Bandwidth

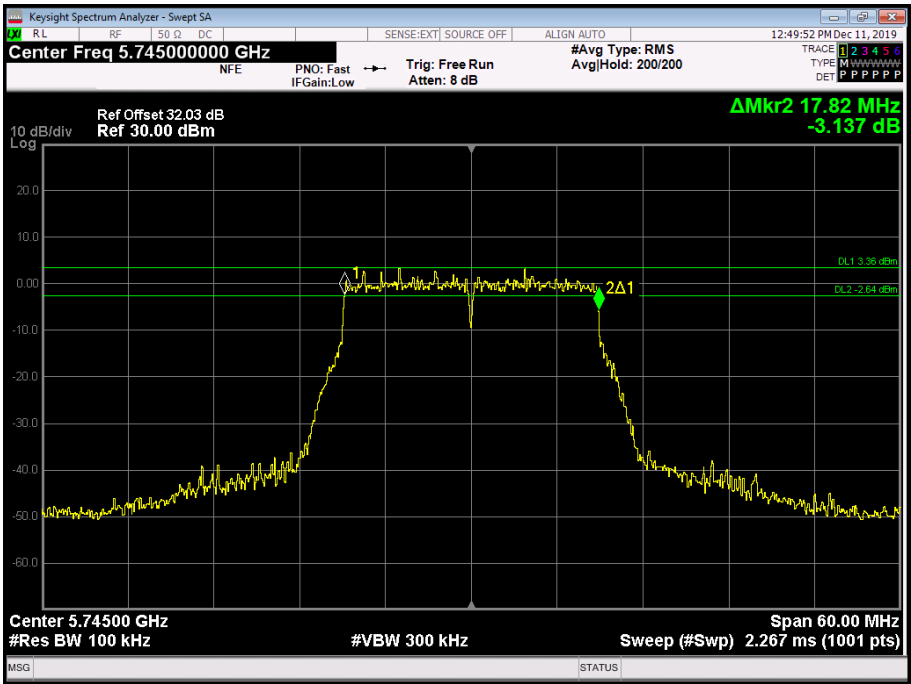


Figure 337 - 5745 MHz - 6 dB DTS Bandwidth

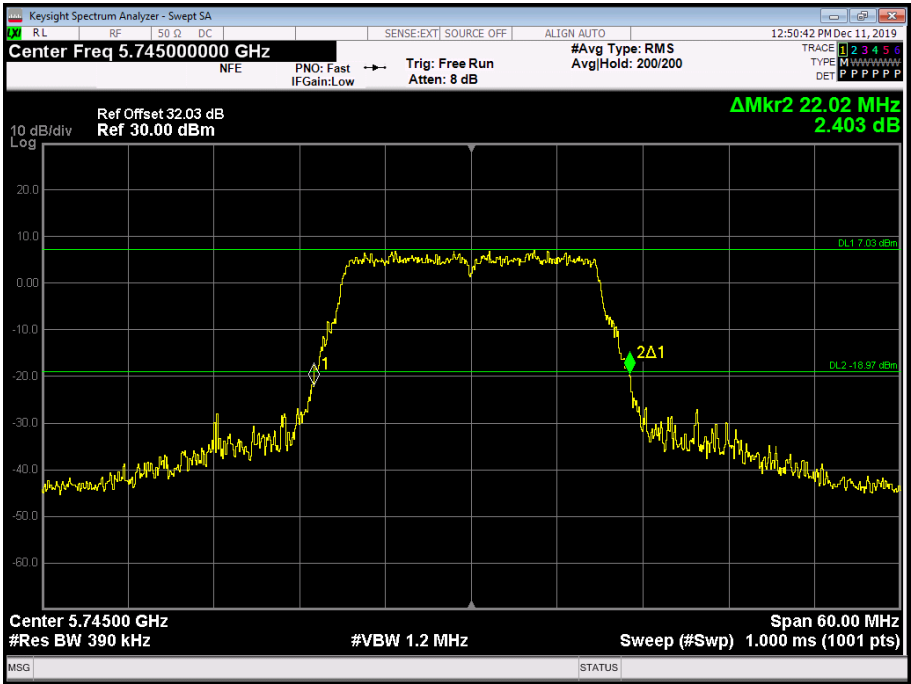


Figure 338 - 5745 MHz - 26 dB Emission Bandwidth

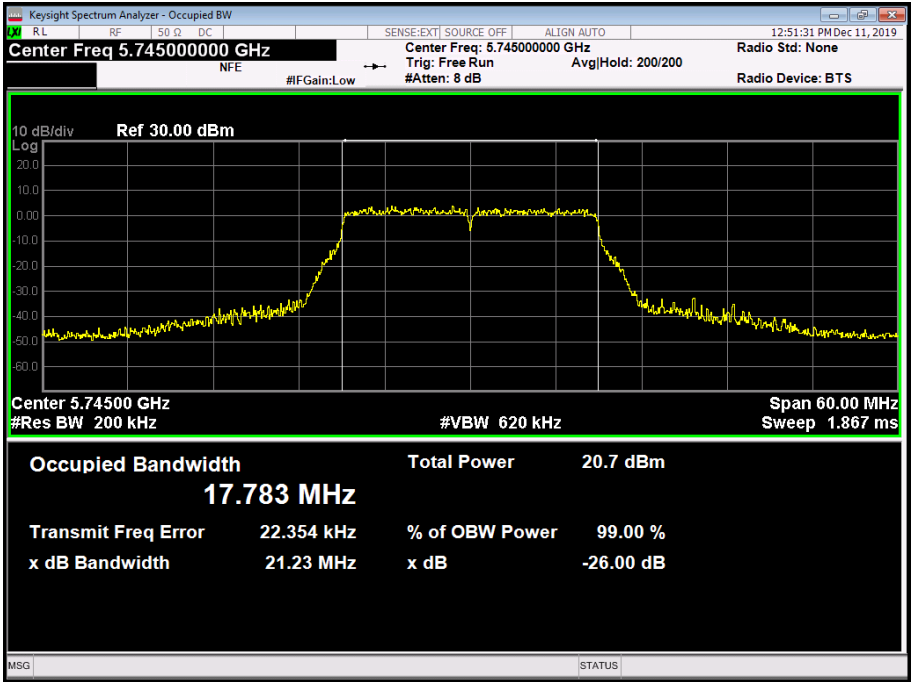


Figure 339 - 5745 MHz - 99% Occupied Bandwidth

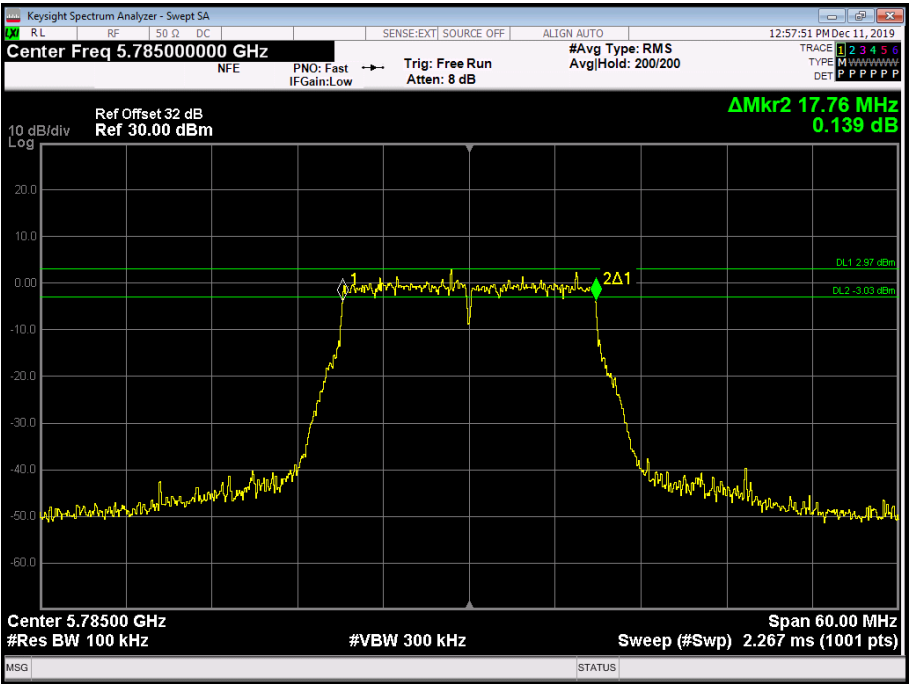


Figure 340 - 5785 MHz - 6 dB DTS Bandwidth

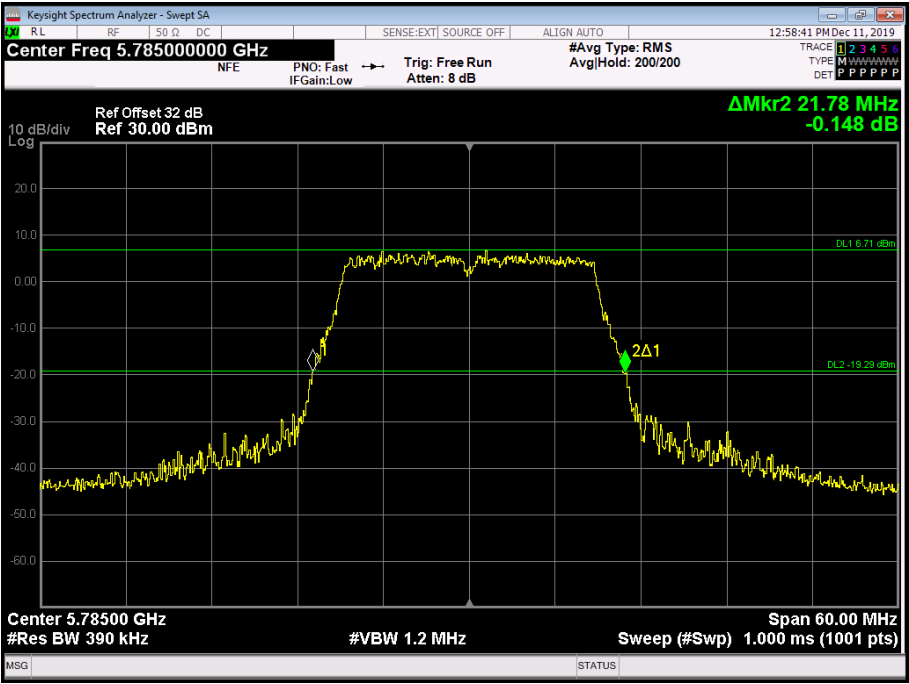


Figure 341 - 5785 MHz - 26 dB Emission Bandwidth

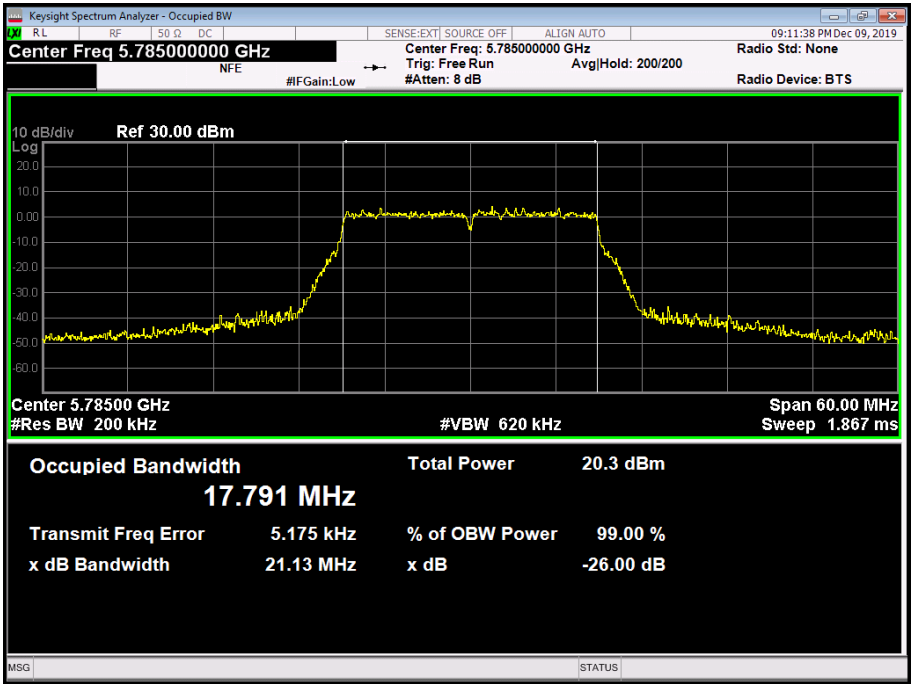


Figure 342 - 5785 MHz - 99% Occupied Bandwidth

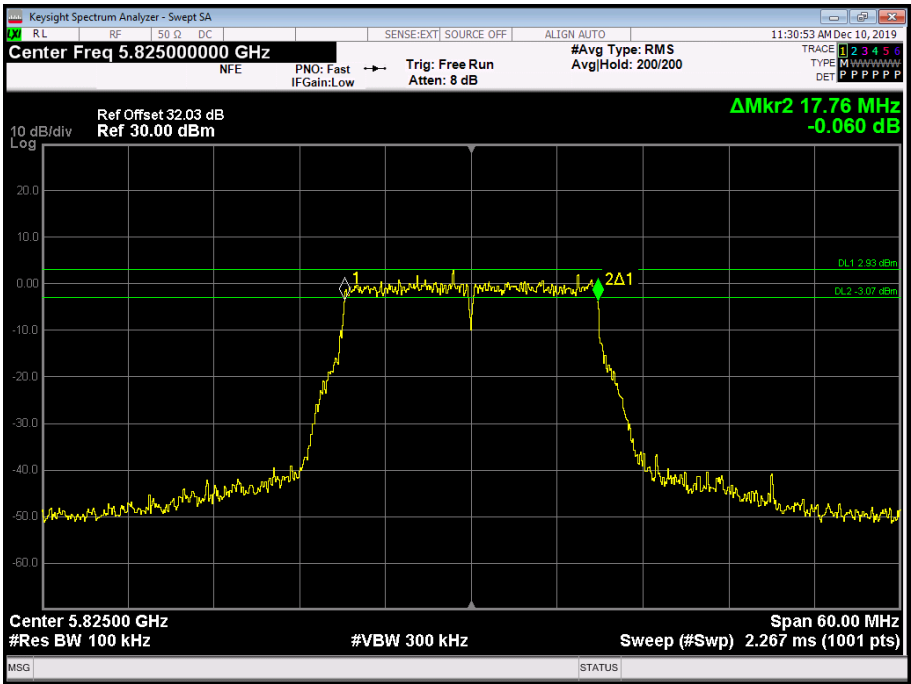


Figure 343 - 5825 MHz - 6 dB DTS Bandwidth

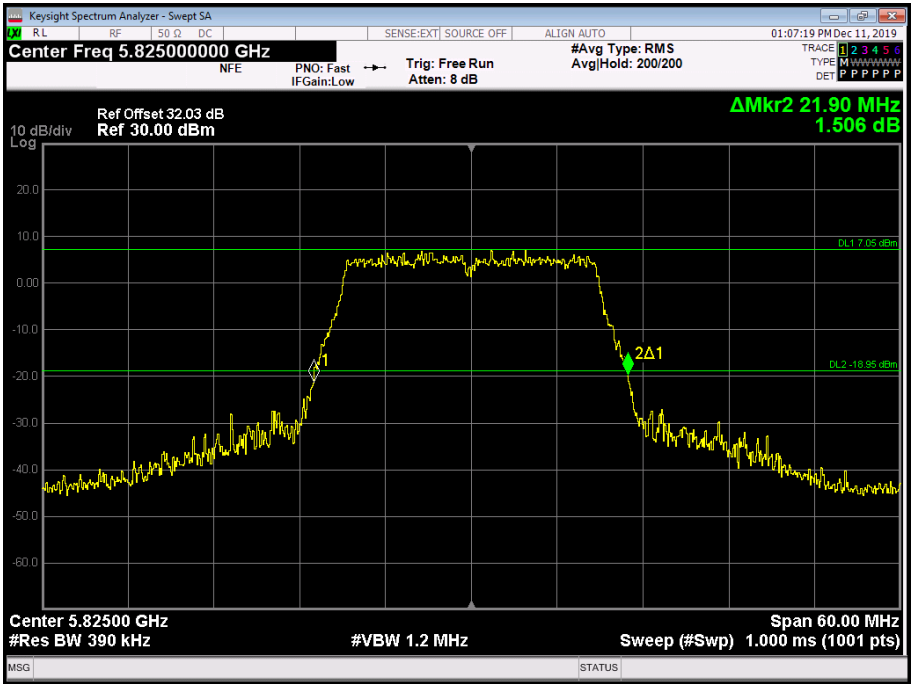


Figure 344 - 5825 MHz - 26 dB Emission Bandwidth

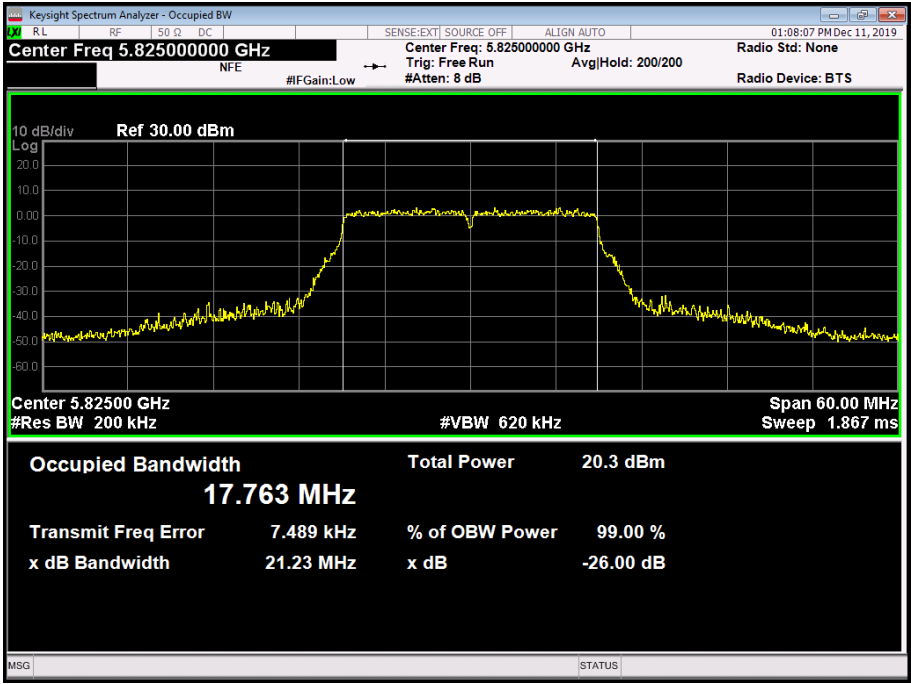


Figure 345 - 5825 MHz - 99% Occupied Bandwidth



Channel	Straddle	Bottom	Top
Frequency (MHz)	5710	5755	5795
6 dB Bandwidth (MHz)	2.640	36.480	31.560
26 dB Bandwidth (MHz)	5.280	40.440	39.600
99% Bandwidth (MHz)	36.263	36.289	36.223

Table 203 - 802.11ac / VHT40 MCS0x1 / MIMO Tx BF / Cores 0+1

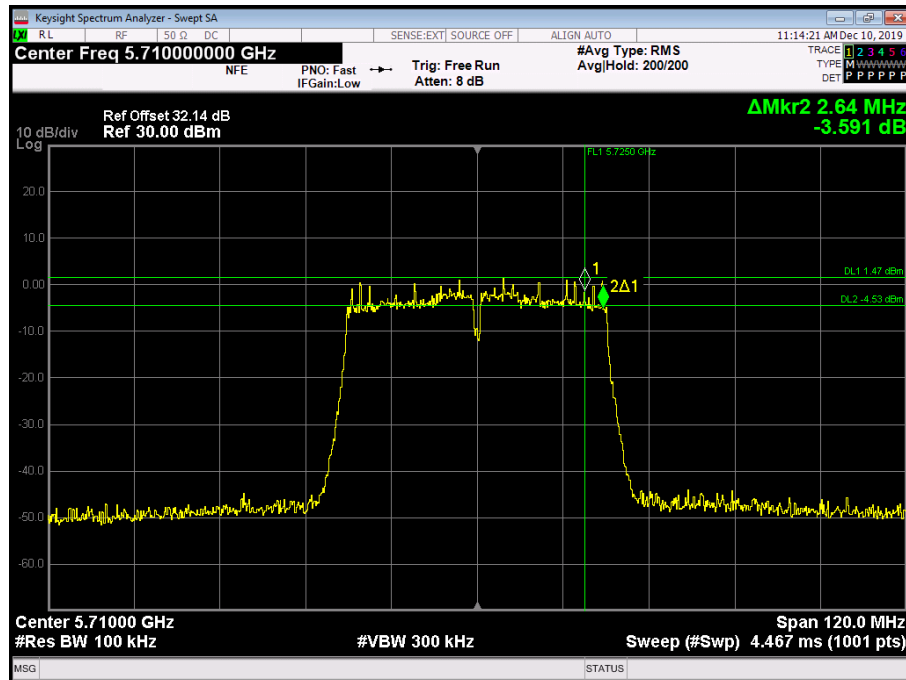


Figure 346 - 5710 MHz - 6 dB DTS Bandwidth

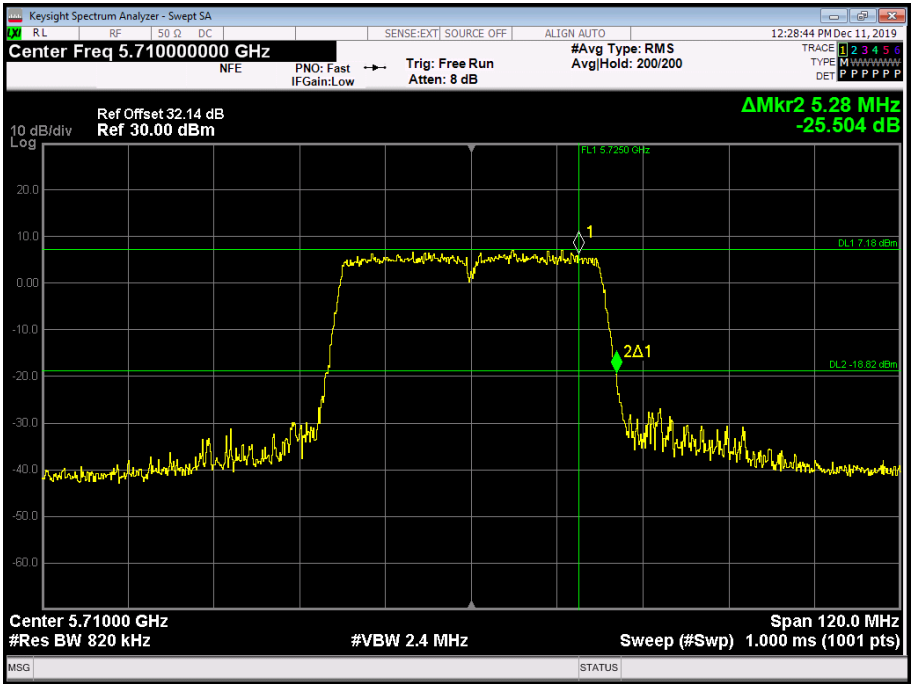


Figure 347 - 5710 MHz - 26 dB Emission Bandwidth

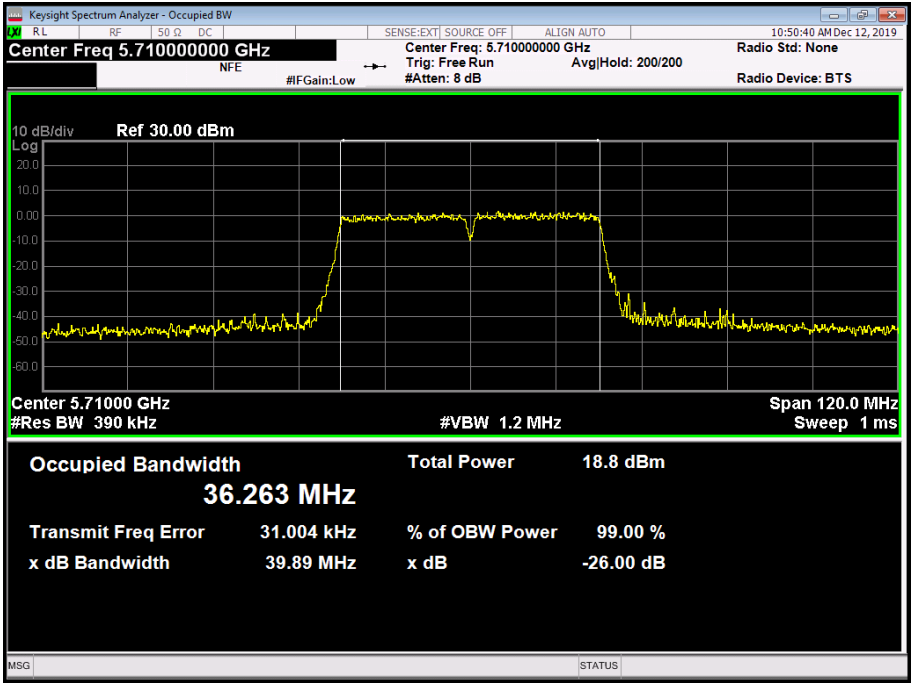


Figure 348 - 5710 MHz - 99% Occupied Bandwidth

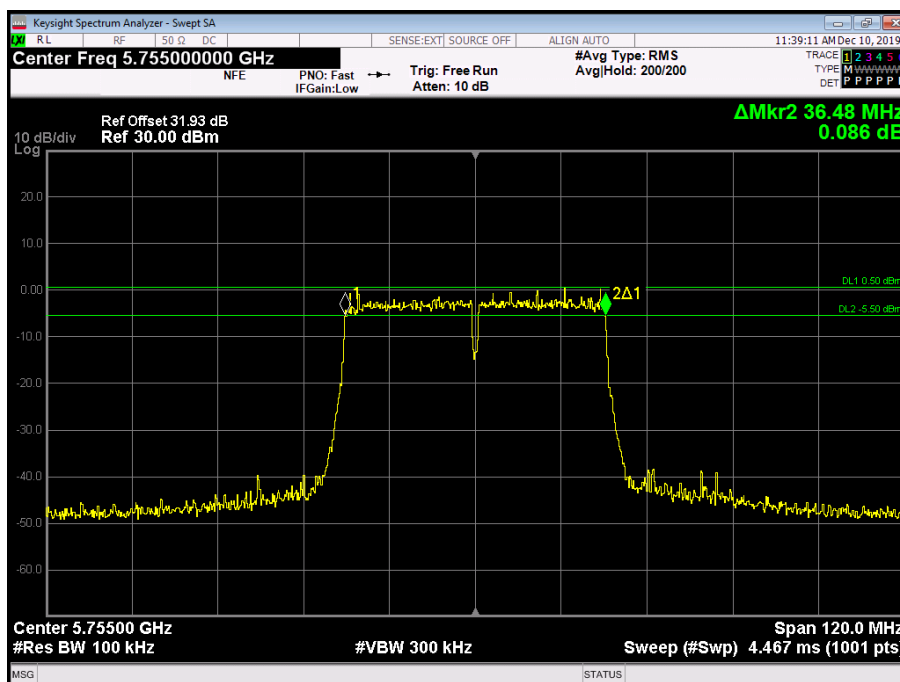


Figure 349 - 5755 MHz - 6 dB DTS Bandwidth

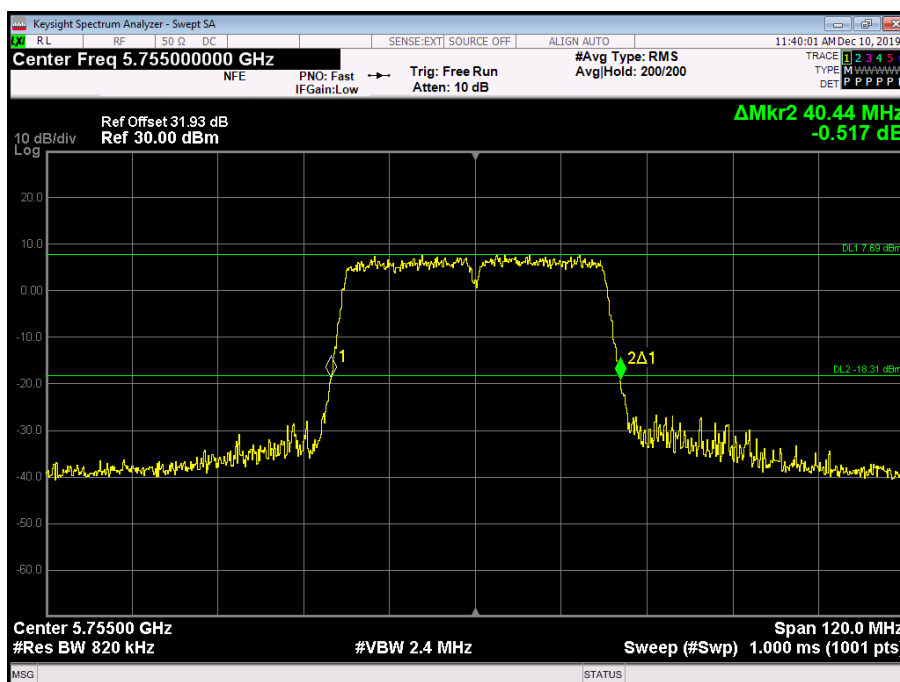


Figure 350 - 5755 MHz - 26 dB Emission Bandwidth

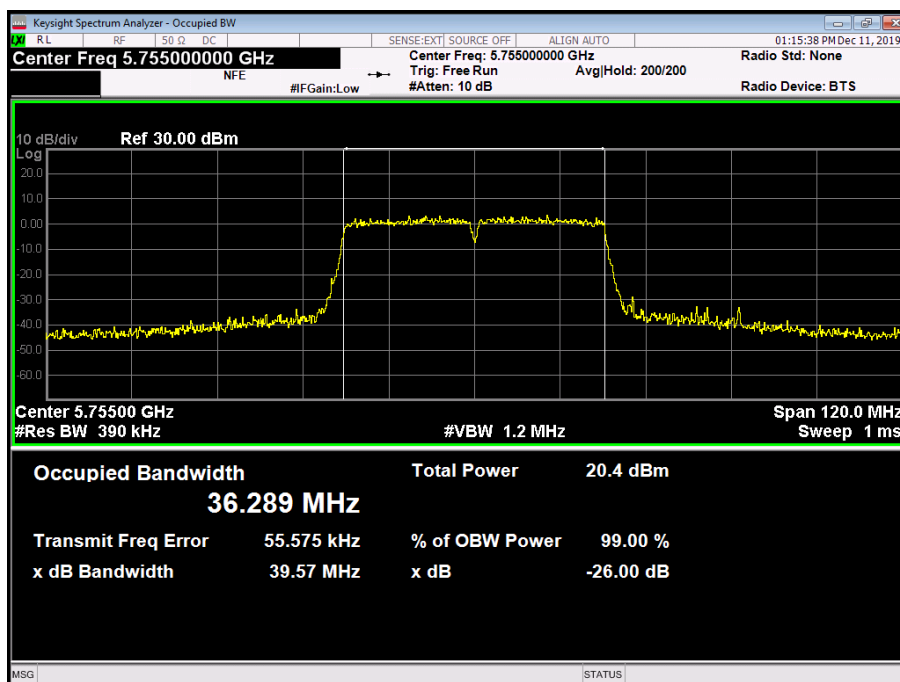


Figure 351 - 5755 MHz - 99% Occupied Bandwidth

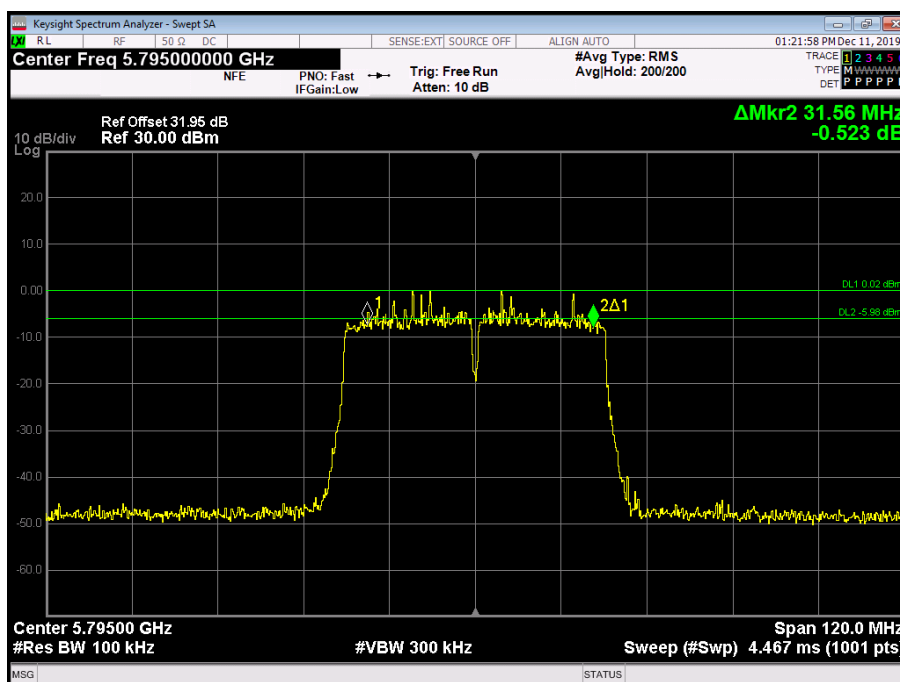


Figure 352 - 5795 MHz - 6 dB DTS Bandwidth

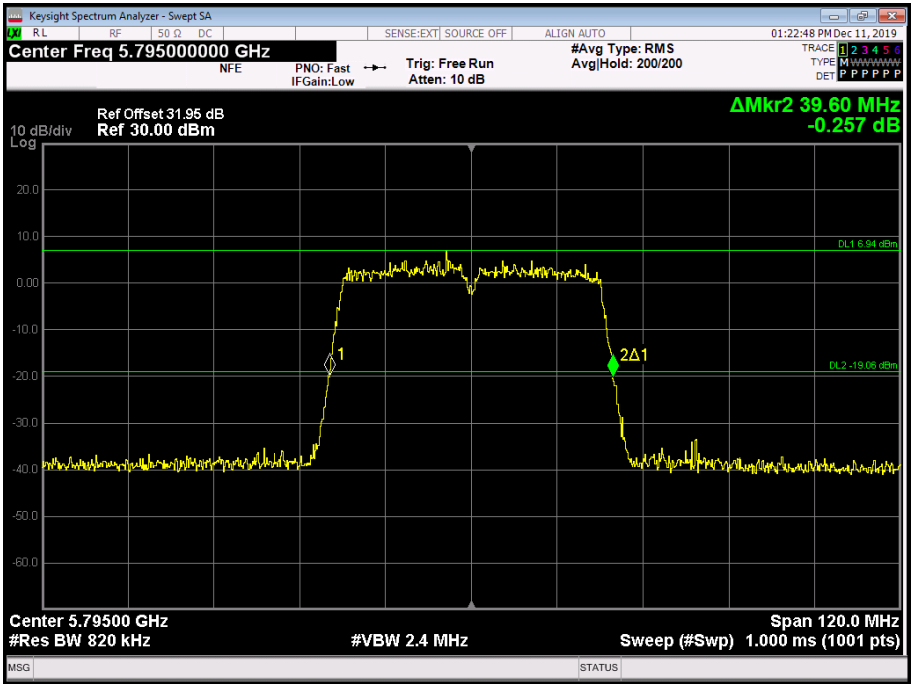


Figure 353 - 5795 MHz - 26 dB Emission Bandwidth

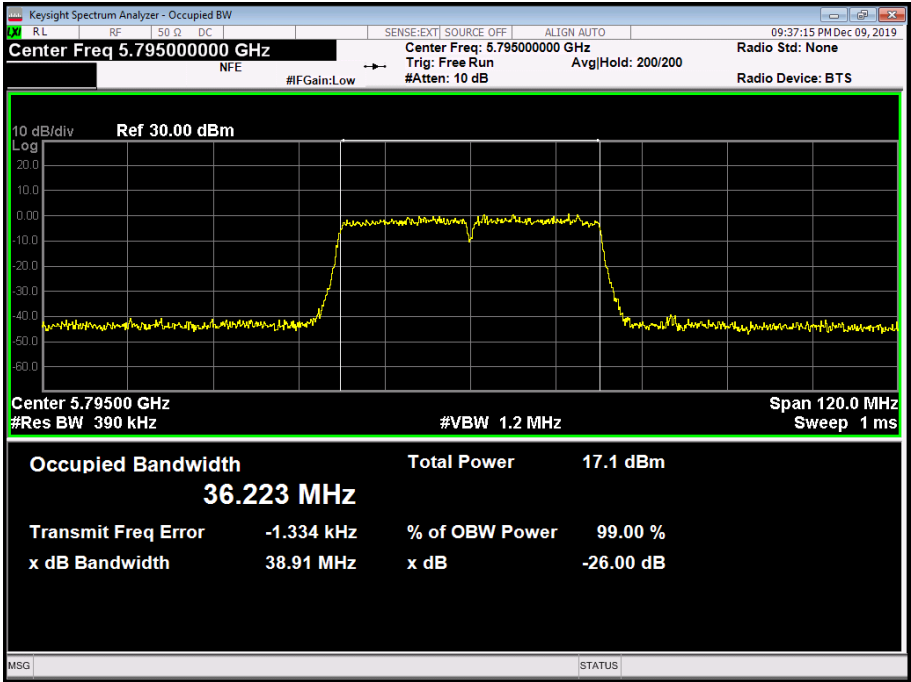


Figure 354 - 5795 MHz - 99% Occupied Bandwidth



Channel	Straddle	Middle
Frequency (MHz)	5690	5775
6 dB Bandwidth (MHz)	2.680	75.600
26 dB Bandwidth (MHz)	5.320	81.840
99% Bandwidth (MHz)	75.517	75.681

Table 204 - 802.11ac / VHT80 MCS0x1 / SISO / Core 1

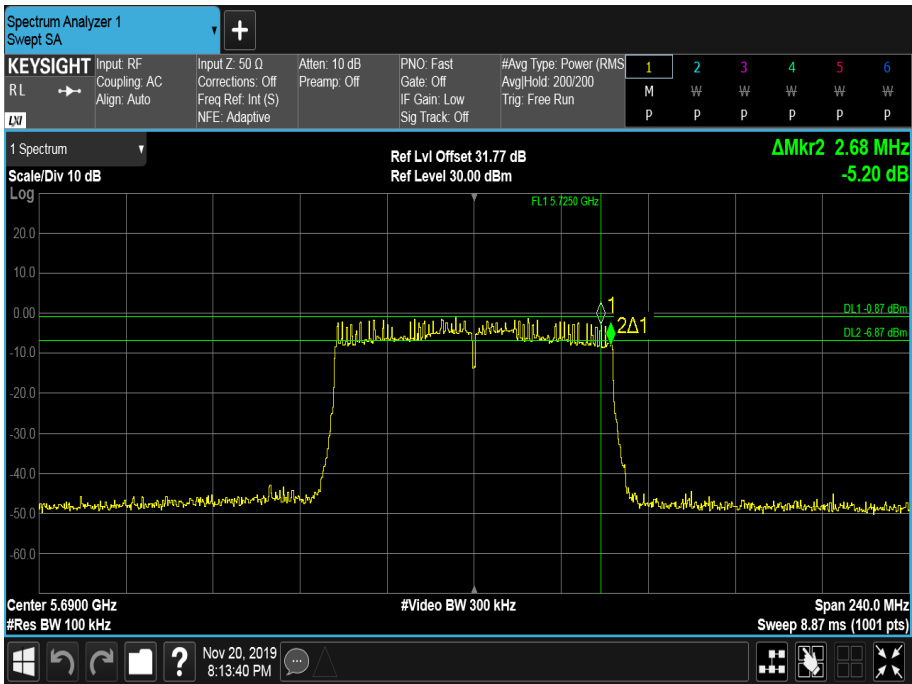


Figure 355 - 5690 MHz - 6 dB DTS Bandwidth

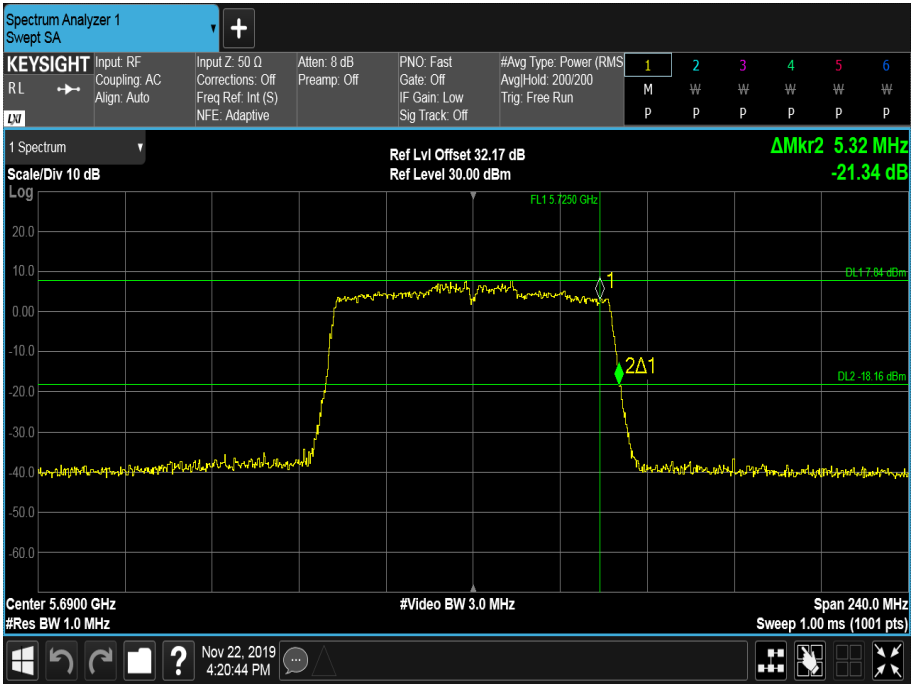


Figure 356 - 5690 MHz - 26 dB Emission Bandwidth

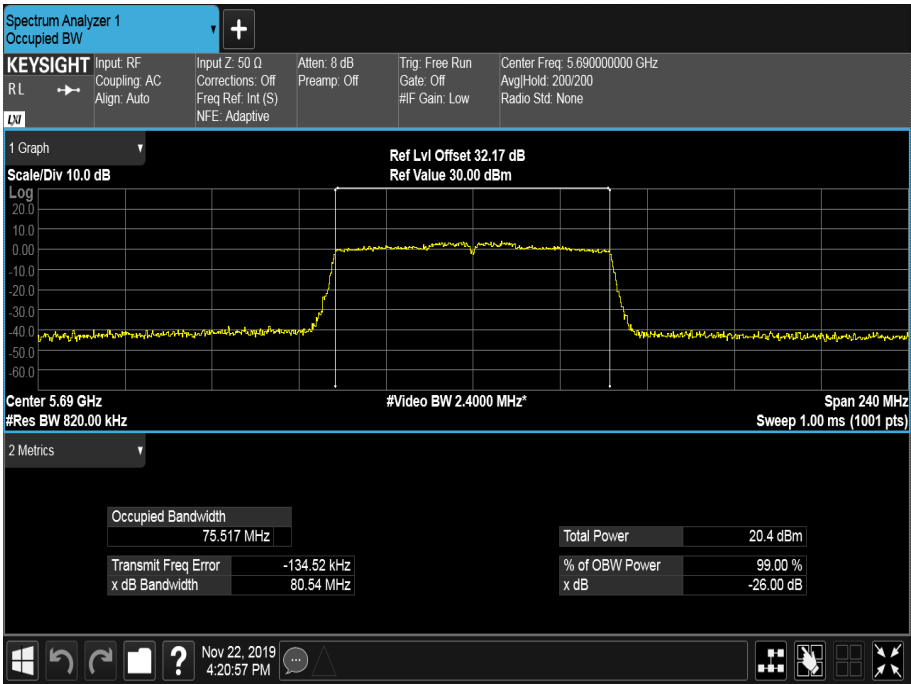


Figure 357 - 5690 MHz - 99% Occupied Bandwidth

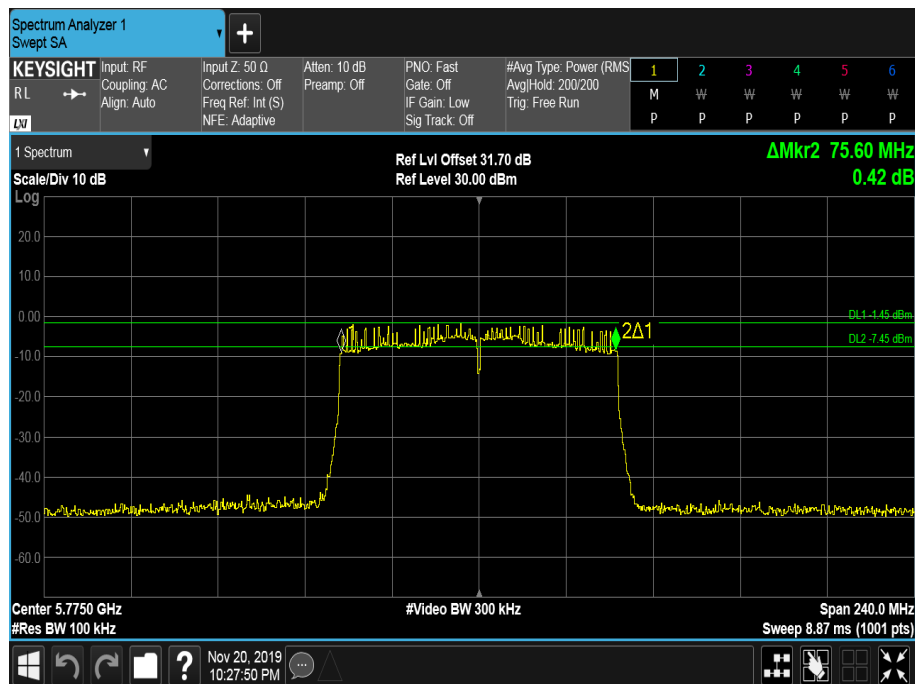


Figure 358 - 5775 MHz - 6 dB DTS Bandwidth

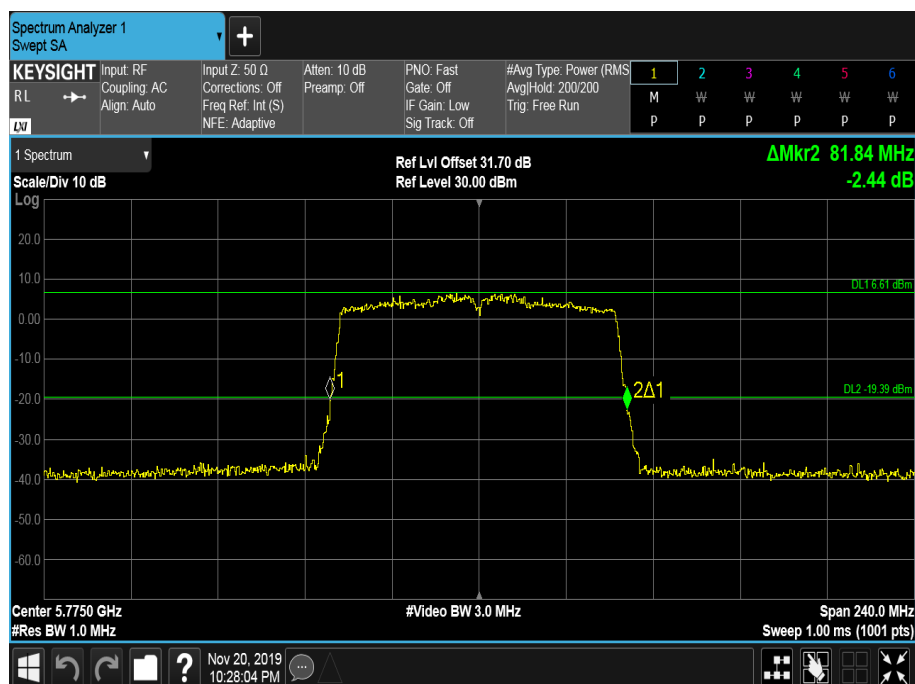


Figure 359 - 5775 MHz - 26 dB Emission Bandwidth

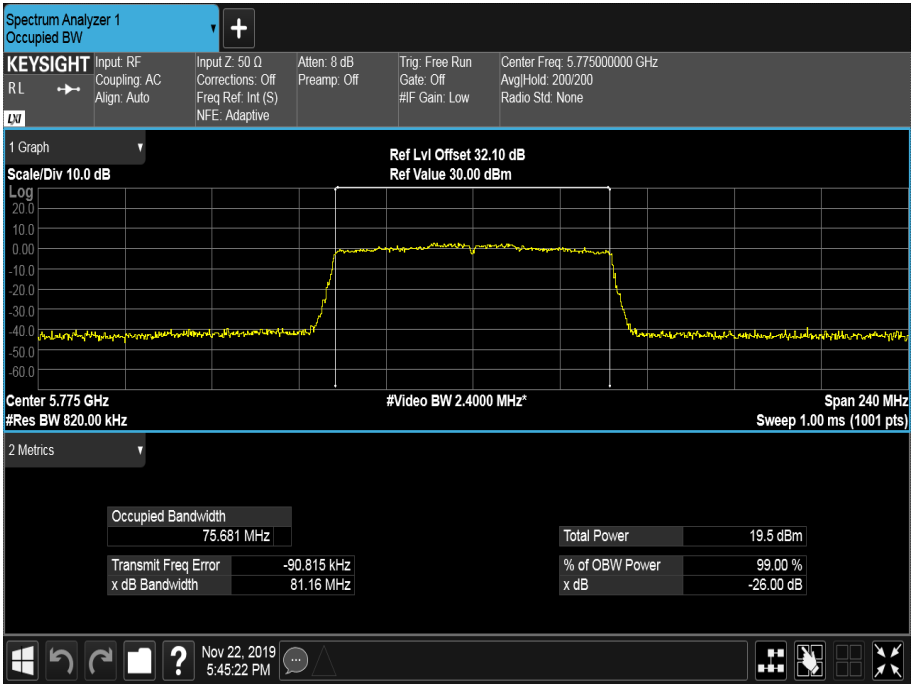


Figure 360 - 5775 MHz - 99% Occupied Bandwidth

Channel	Straddle	Middle
Frequency (MHz)	5690	5775
6 dB Bandwidth (MHz)	2.680	75.600
26 dB Bandwidth (MHz)	5.800	81.600
99% Bandwidth (MHz)	75.498	75.510

Table 205 - 802.11ac / VHT80 MCS0x1 / MIMO CDD / Cores 0+1

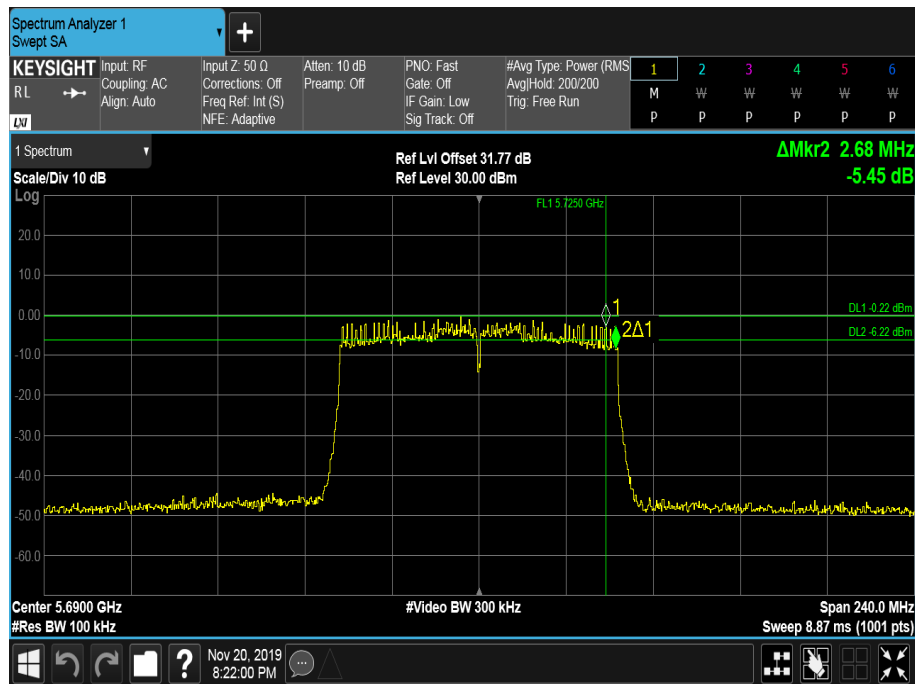


Figure 361 - 5690 MHz - 6 dB DTS Bandwidth

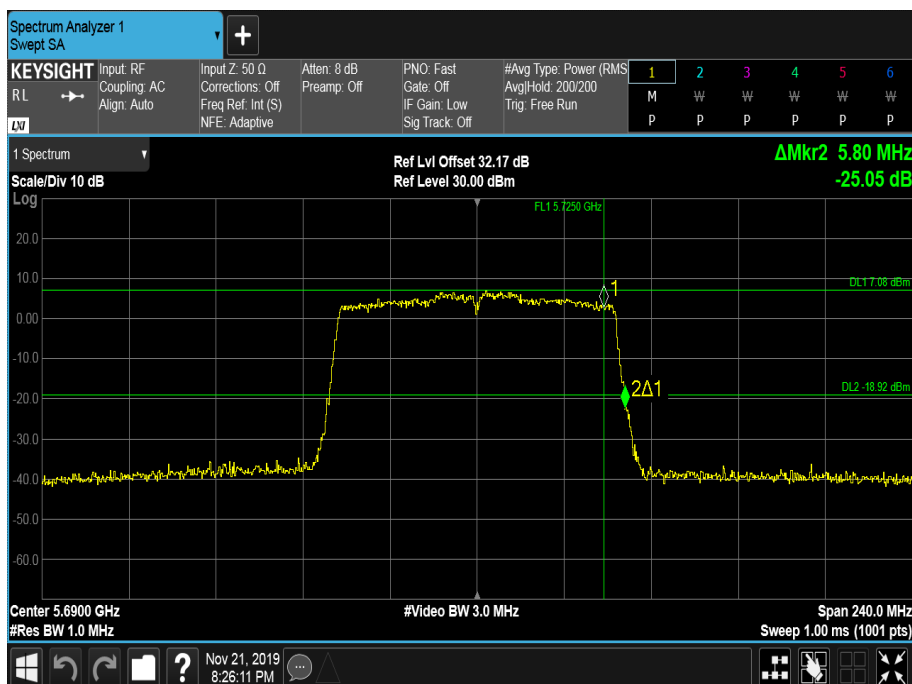


Figure 362 - 5690 MHz - 26 dB Emission Bandwidth

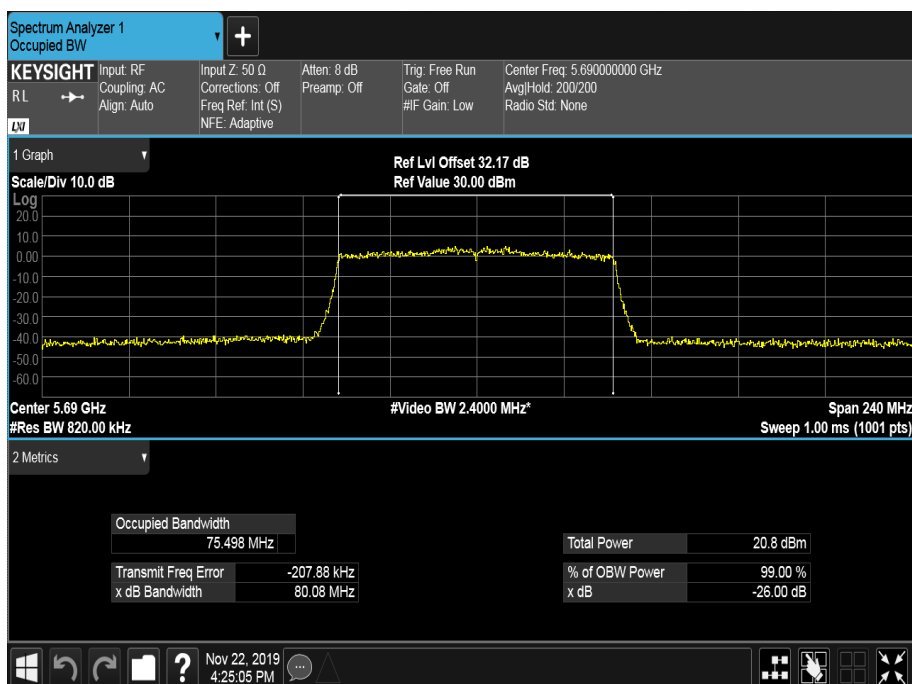


Figure 363 - 5690 MHz - 99% Occupied Bandwidth

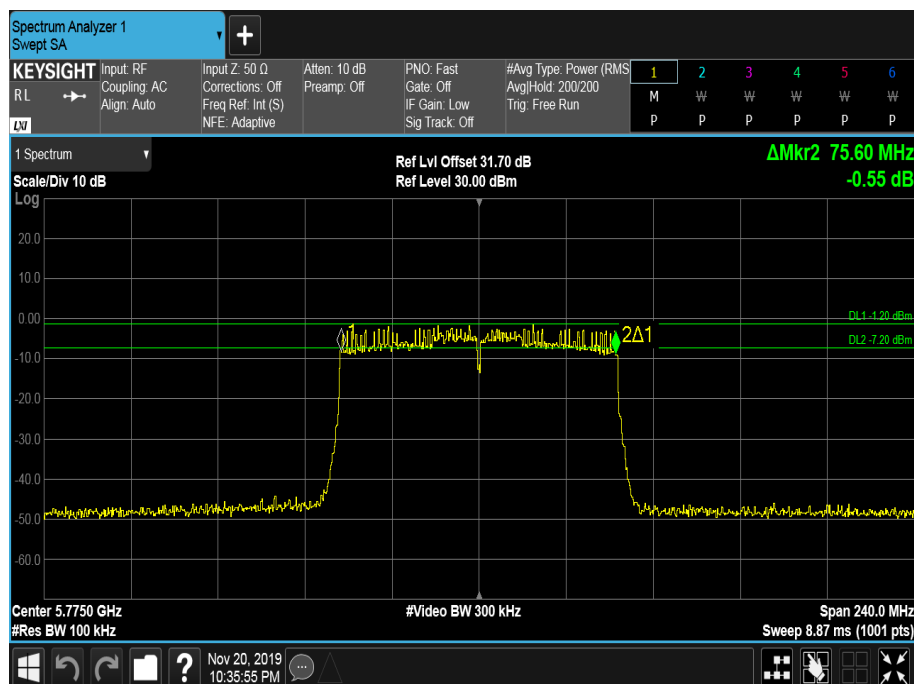


Figure 364 - 5775 MHz - 6 dB DTS Bandwidth

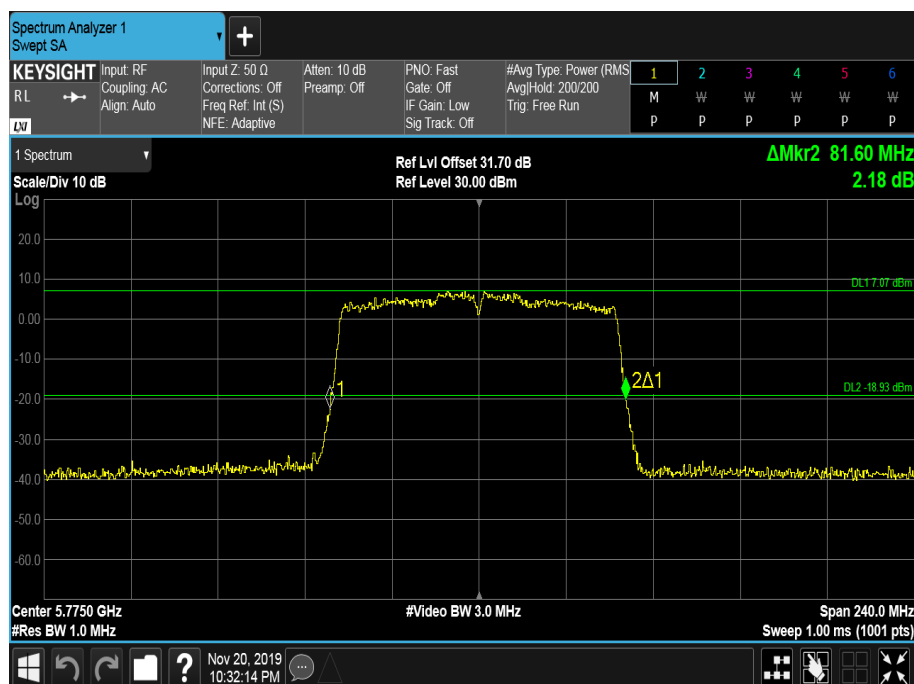


Figure 365 - 5775 MHz - 26 dB Emission Bandwidth

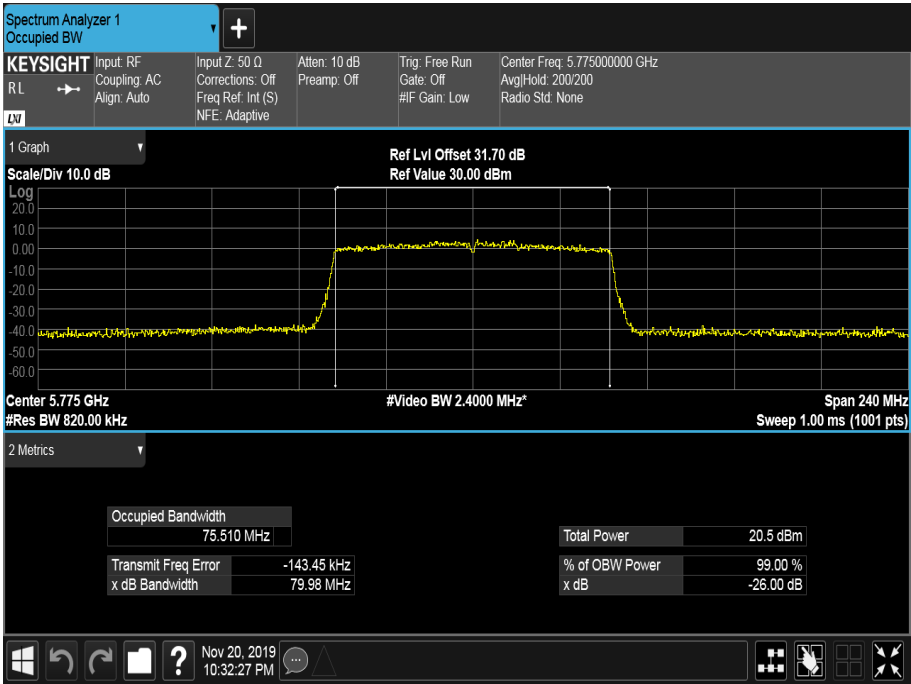


Figure 366 - 5775 MHz - 99% Occupied Bandwidth



Channel	Straddle	Middle
Frequency (MHz)	5690	5775
6 dB Bandwidth (MHz)	2.680	75.600
26 dB Bandwidth (MHz)	5.800	81.360
99% Bandwidth (MHz)	75.573	75.445

Table 206 - 802.11ac / VHT80 MCS0x2 / MIMO SDM / Cores 0+1

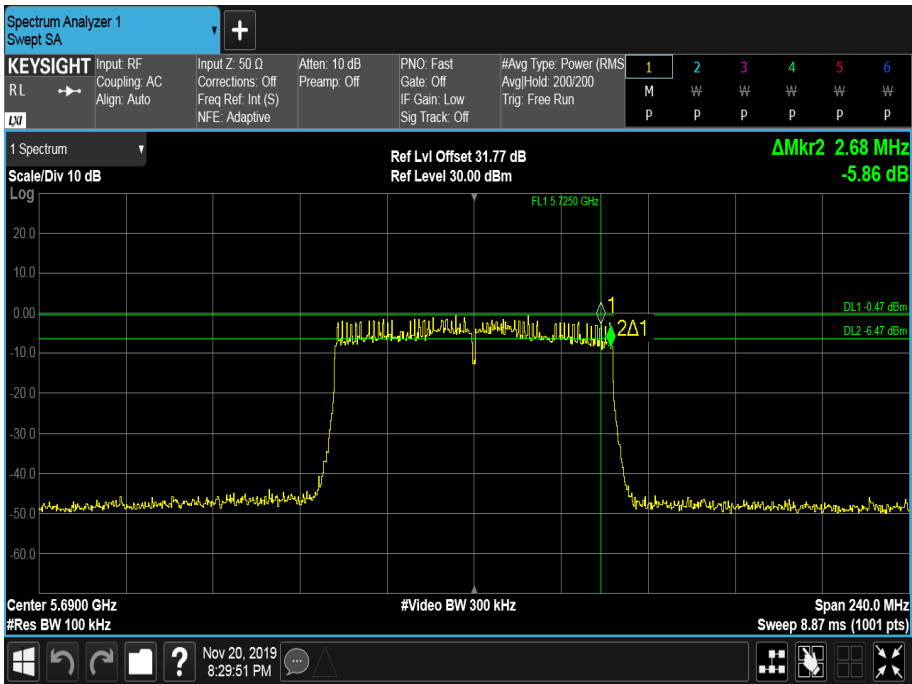


Figure 367 - 5690 MHz - 6 dB DTS Bandwidth

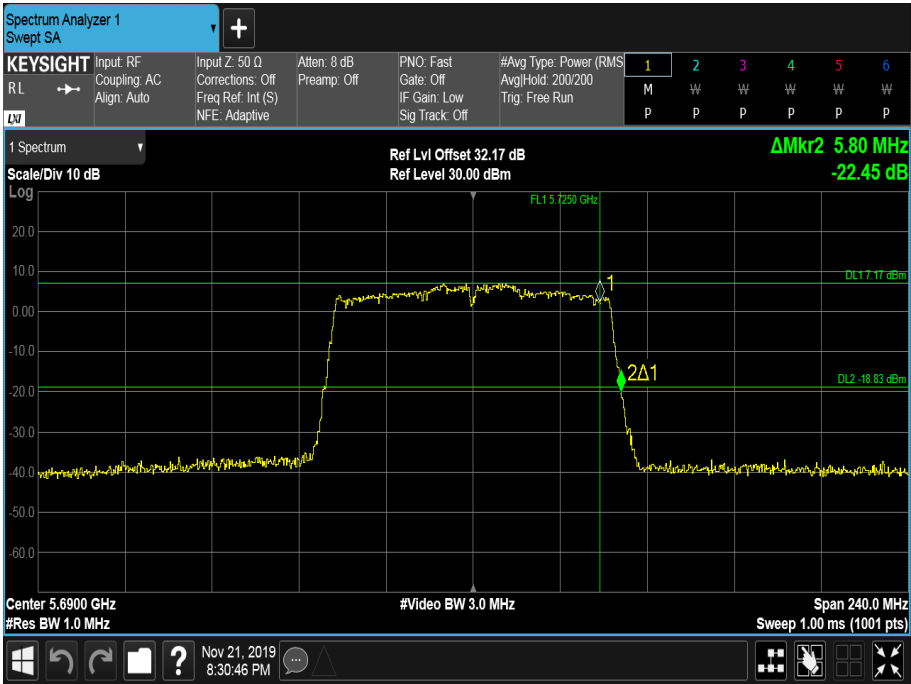


Figure 368 - 5690 MHz - 26 dB Emission Bandwidth

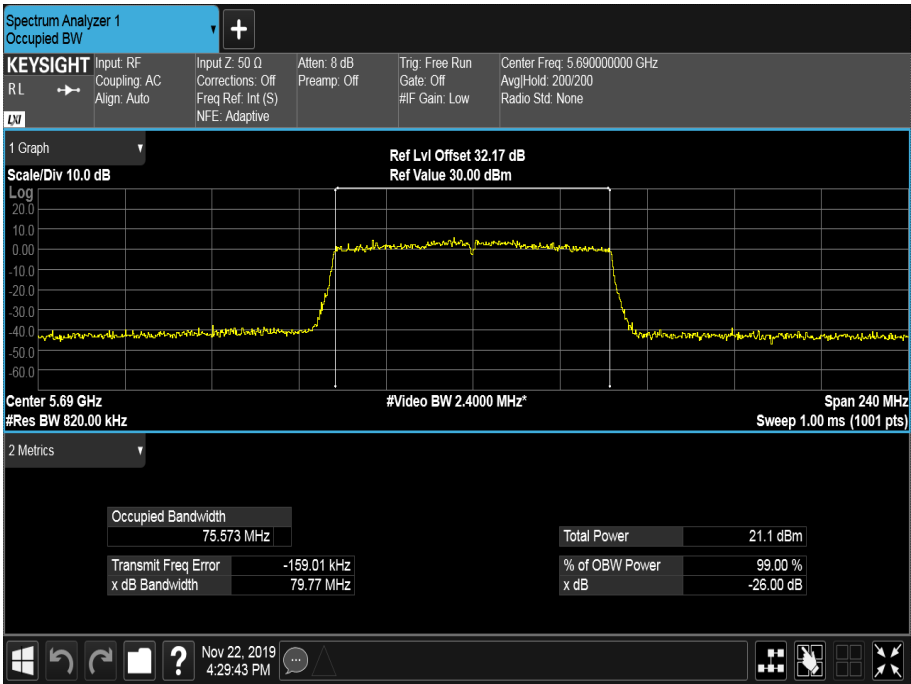


Figure 369 - 5690 MHz - 99% Occupied Bandwidth

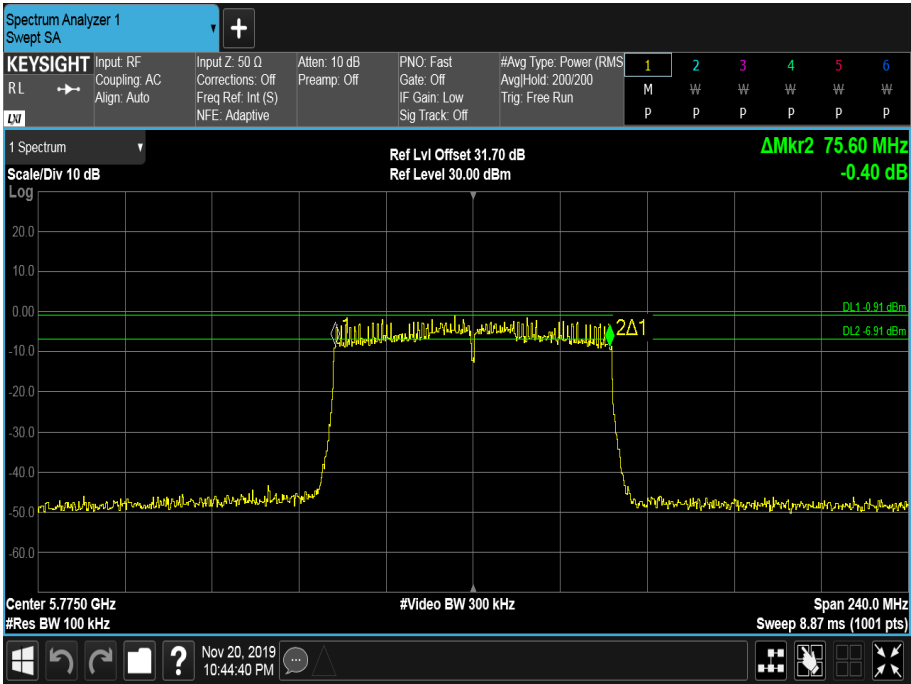


Figure 370 - 5775 MHz - 6 dB DTS Bandwidth

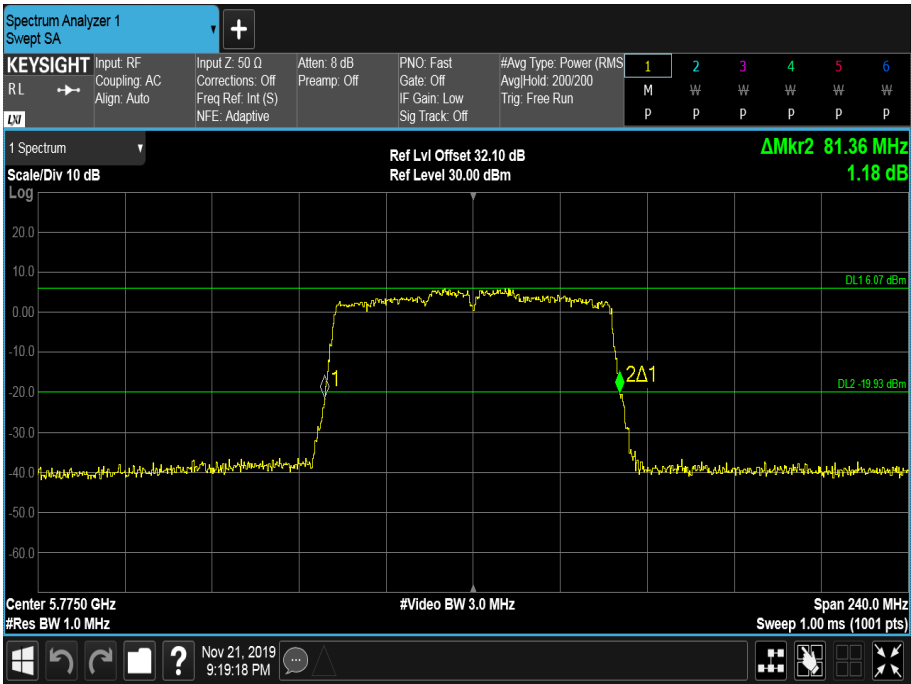


Figure 371 - 5775 MHz - 26 dB Emission Bandwidth

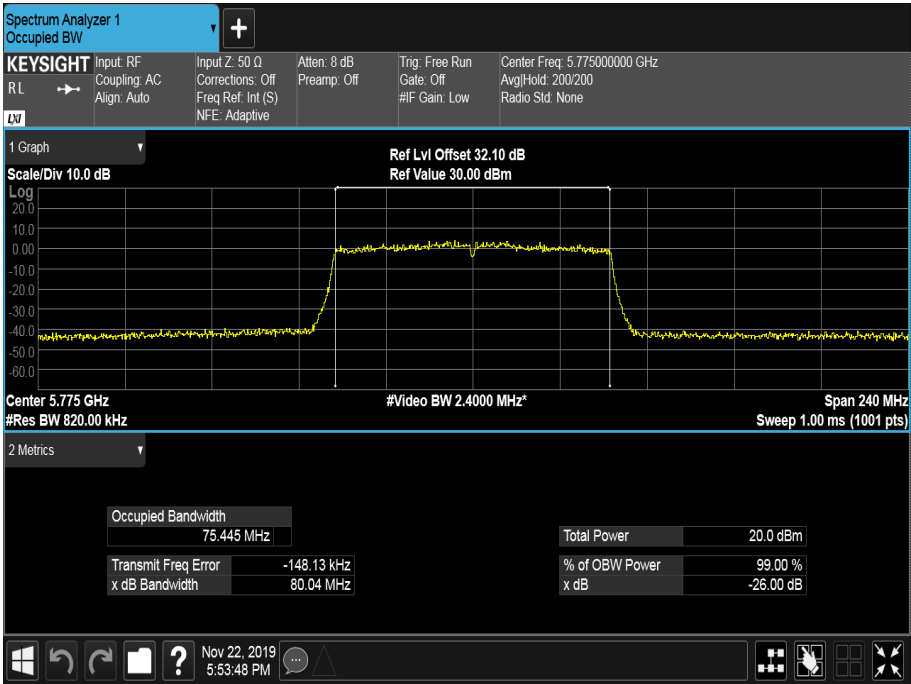


Figure 372 - 5775 MHz - 99% Occupied Bandwidth

Table 207 - 802.11ac / VHT80 MCS0x1 / MIMO TxBF / Cores 0+1

Figure 373 - 5690 MHz - 6 dB DTS Bandwidth

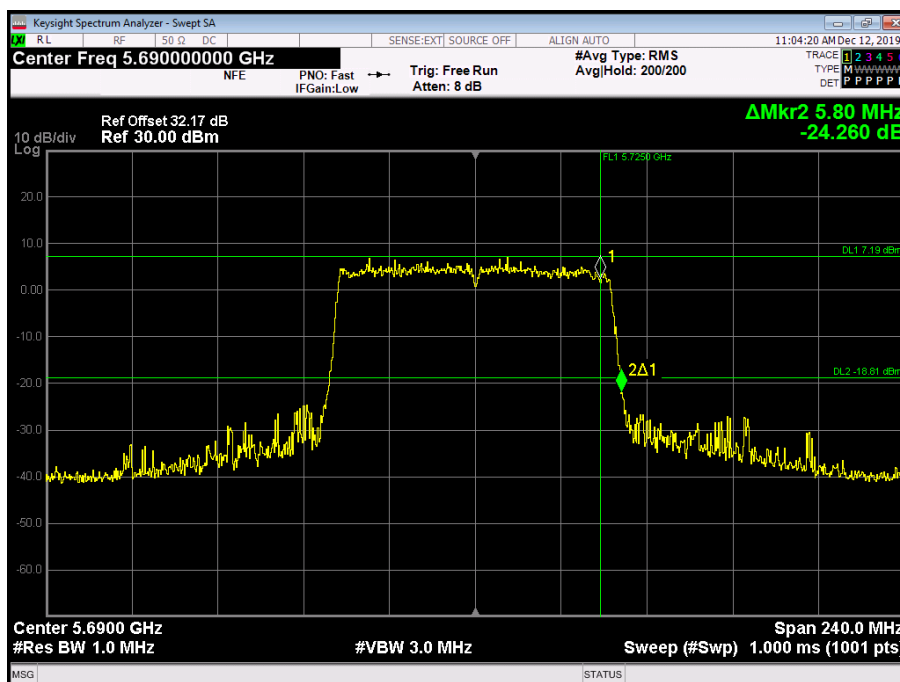


Figure 374 - 5690 MHz - 26 dB Emission Bandwidth

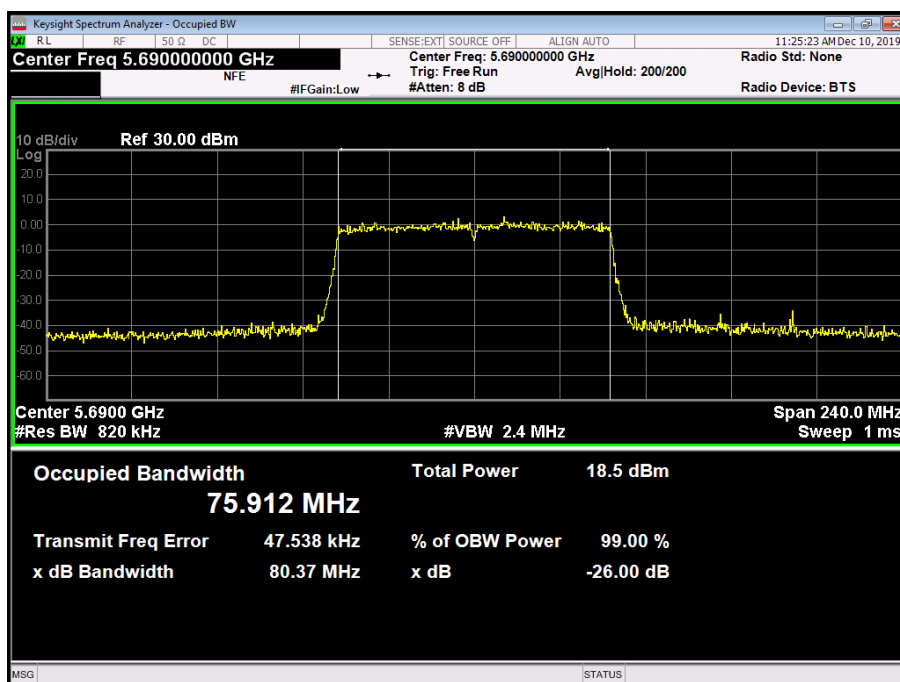


Figure 375 - 5690 MHz - 99% Occupied Bandwidth

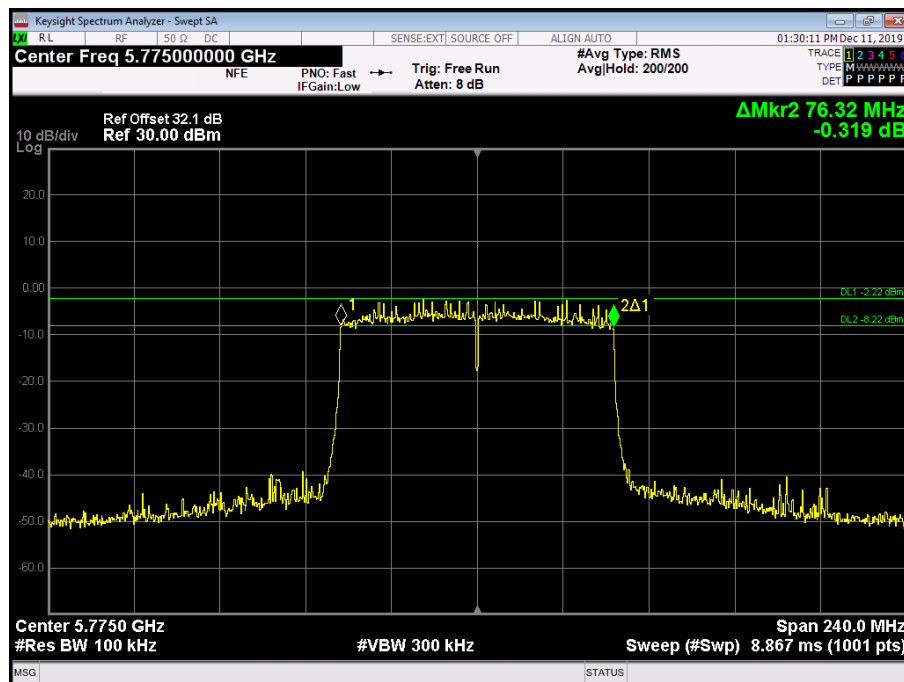


Figure 376 - 5775 MHz - 6 dB DTS Bandwidth

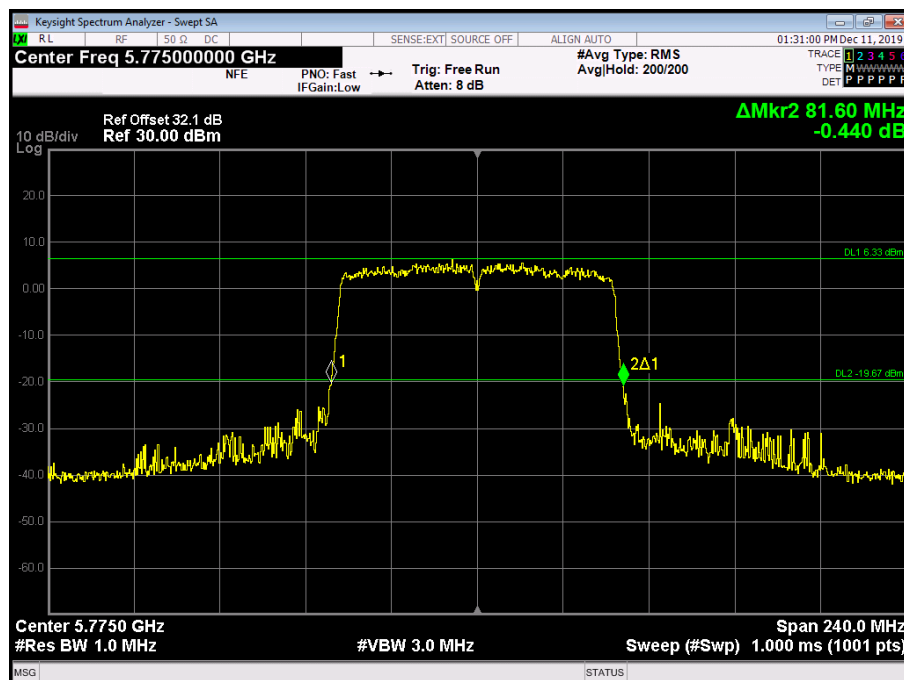


Figure 377 - 5775 MHz - 26 dB Emission Bandwidth

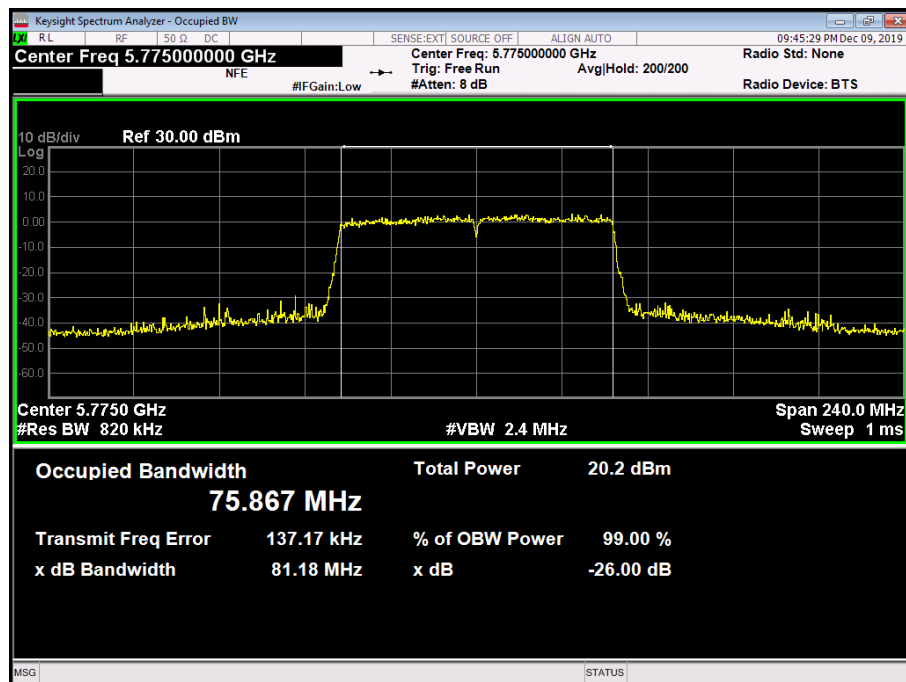


Figure 378 - 5775 MHz - 99% Occupied Bandwidth

FCC Part 15E, Limit Clause 15.407 and ISED RSS-247, Limit Clause 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1

5150 MHz to 5250 MHz: None specified.
5250 MHz to 5350 MHz: None specified.
5470 MHz to 5725 MHz: None specified.
5725 MHz to 5850 MHz: > 500 kHz.

ISED RSS-247, Limit Clause 6.2.1.1, 6.2.2.1, 6.2.3.1 and 6.2.4.1

5150 MHz to 5250 MHz: None specified.
5250 MHz to 5350 MHz: None specified.
5470 MHz to 5725 MHz: None specified.
5725 MHz to 5850 MHz: The minimum 6 dB bandwidth shall be at least 500 kHz.



2.3.9 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Attenuator (10 dB)	Weinschel	47-10-34	481	-	O/P Mon
Attenuator (20 dB, 2 W)	Pasternack	PE7004-20	489	-	O/P Mon
Multimeter	Fluke	79 Series III	611	12	11-Sep-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
1800-6000 MHz Power Splitter	Mini-Circuits	ZN2PD-63-S+	4055	-	O/P Mon
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
2 metre N-Type Cable	Florida Labs	NMS-235SP-78.8-NMS	4622	12	12-Jul-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-Feb-2020
Power splitter - 2 port	Mini-Circuits	ZN2PD-63-S+	4743	12	23-Sep-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Cable (18 GHz)	Rosenberger	LU7-071-1000	5098	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5108	12	06-Oct-2020
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
AC Programmable Power Supply	iTech	IT7324	5227	-	O/P Mon
Power Splitter, 4 way	Mini-Circuits	ZN4PD1-63-S+	5235	-	O/P Mon
Power Splitter, 4 way	Mini-Circuits	ZN4PD1-63-S+	5236	-	O/P Mon

Table 208

O/P Mon – Output Monitored using calibrated equipment



2.4 Authorised Band Edges

2.4.1 Specification Reference

FCC 47 CFR Part 15E, Clause 15.407 (b)
ISED RSS-247, Clause 6.2

2.4.2 Equipment Under Test and Modification State

A2179, S/N: C02ZC00WM8M5 - Modification State 0

2.4.3 Date of Test

19-November-2019 to 16-December-2019

2.4.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.6.

For U-NII-2C channels, the limit line on the following plots equates to -27 dBm/MHz. EIRP was converted to field strength at 3 m using the following formula:

Field Strength (dBμV/m at 3 m) = EIRP (dBm) + 95.2 dB

Authorised band edge measurements were performed, with the device operating in SISO and MIMO configurations, across the various modes supported by the device.

Further measurements are held on file by TÜV SÜD and are available if required.

2.4.5 Environmental Conditions

Ambient Temperature 21.0 to 23.2 °C
Relative Humidity 25.2 to 56.2 %

2.4.6 Test Results

5 GHz WLAN

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11a Core 1	6 Mbps	5500	5470	63.29
802.11n HT20 Core 1	MCS0	5500	5470	63.04
802.11a Core 1	6 Mbps	5700	5725	62.56
802.11n HT20 Core 1	MCS0	5700	5725	63.21
802.11a Core 1	6 Mbps	5745	5725	61.53
802.11n HT20 Core 1	MCS0	5745	5725	60.37
802.11a Core 1	6 Mbps	5825	5850	60.43
802.11n HT20 Core 1	MCS0	5825	5850	59.82

Table 209 - SISO

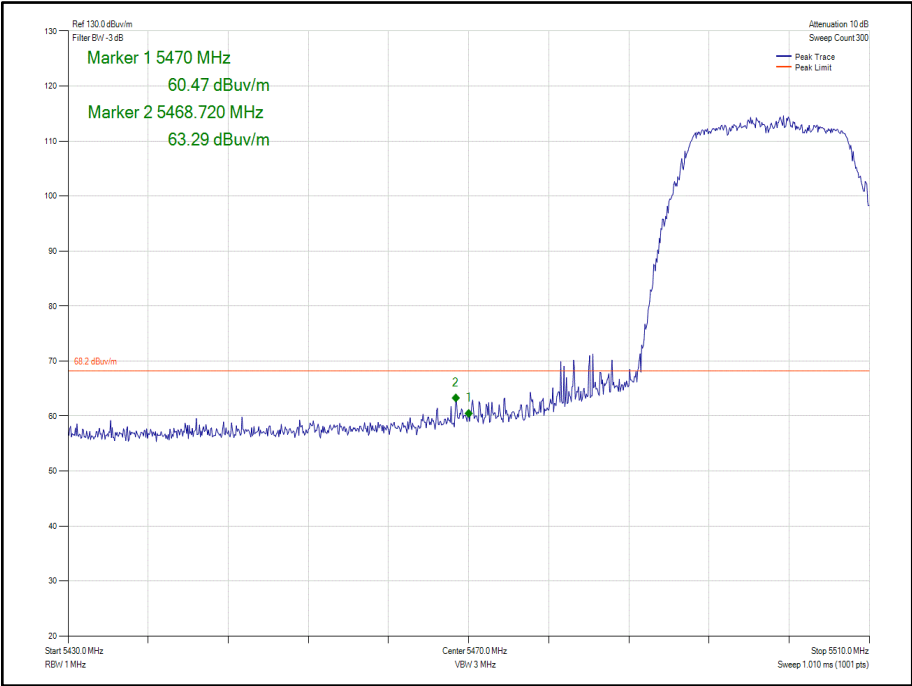


Figure 379 - 802.11a Core 1 - 5500 MHz
Band Edge Frequency 5470 MHz

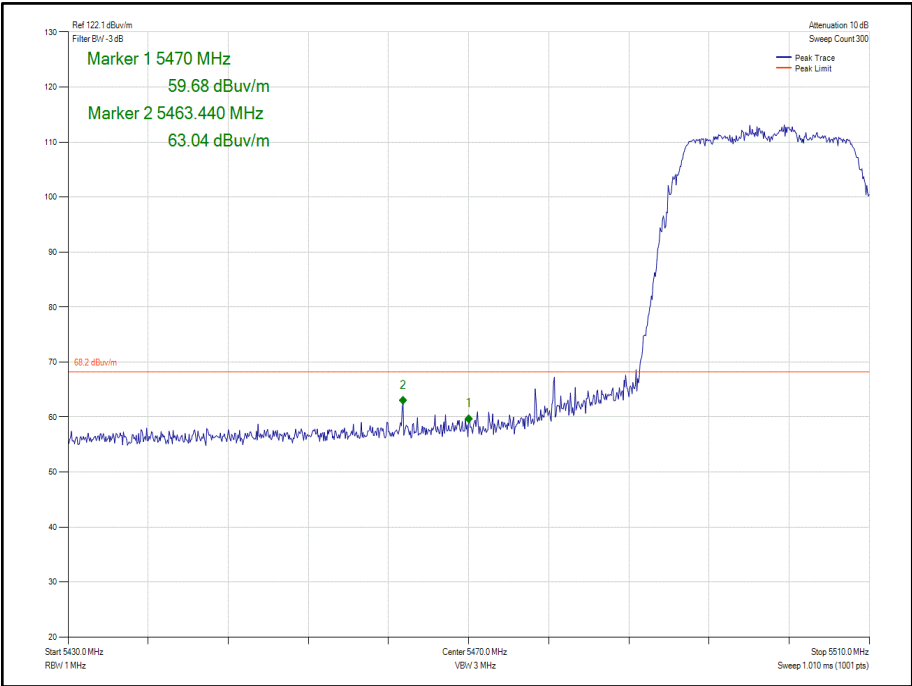


Figure 380 - 802.11n HT20 Core 1 - 5500 MHz
Band Edge Frequency 5470 MHz

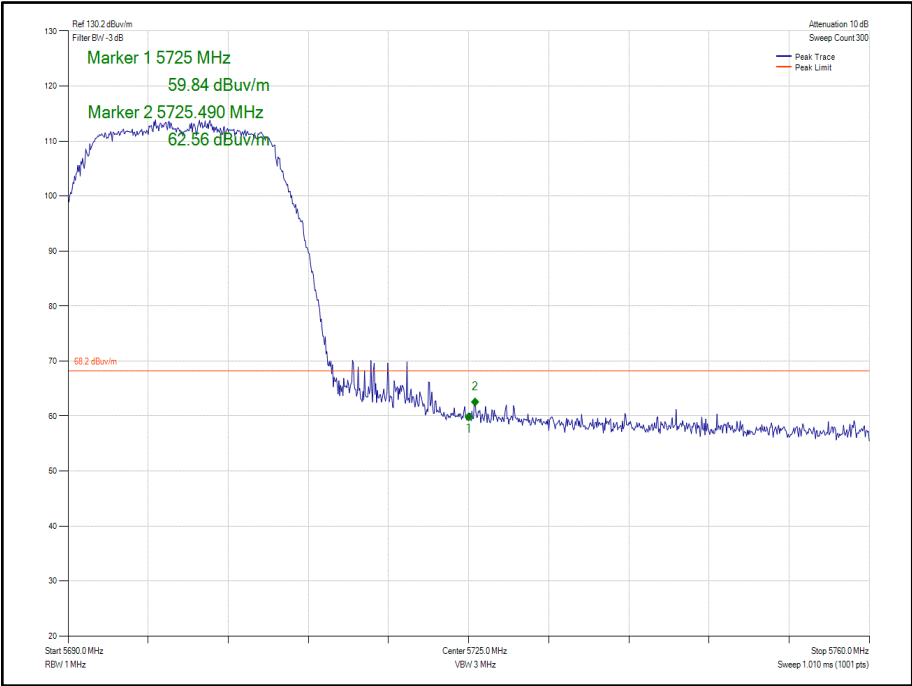


Figure 381 - 802.11a Core 1 - 5700 MHz
Band Edge Frequency 5725 MHz

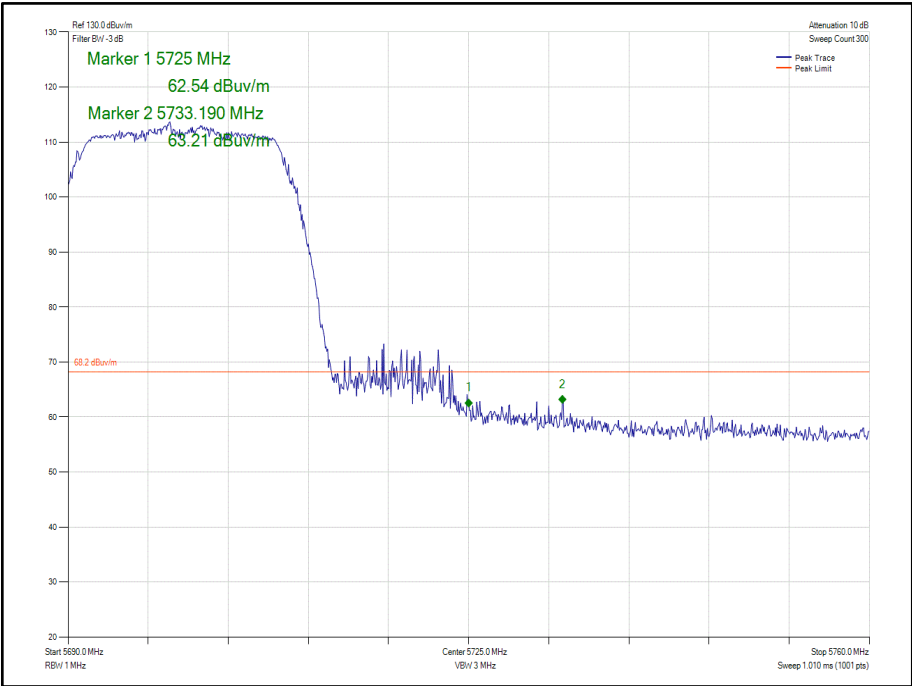


Figure 382 - 802.11n HT20 Core 1 - 5700 MHz
Band Edge Frequency 5725 MHz

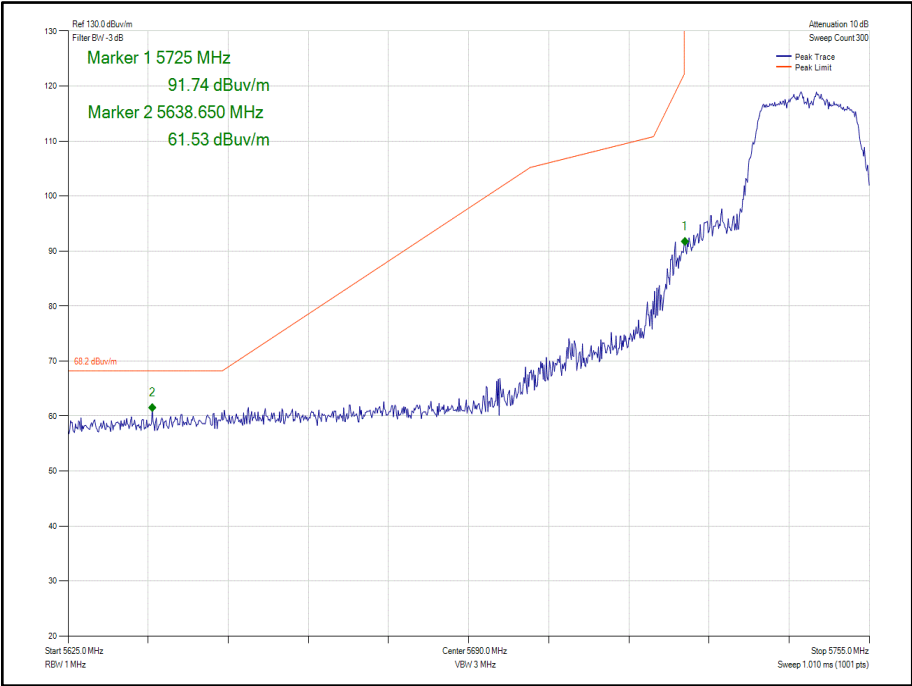


Figure 383 - 802.11a Core 1 - 5745 MHz
Band Edge Frequency 5725 MHz

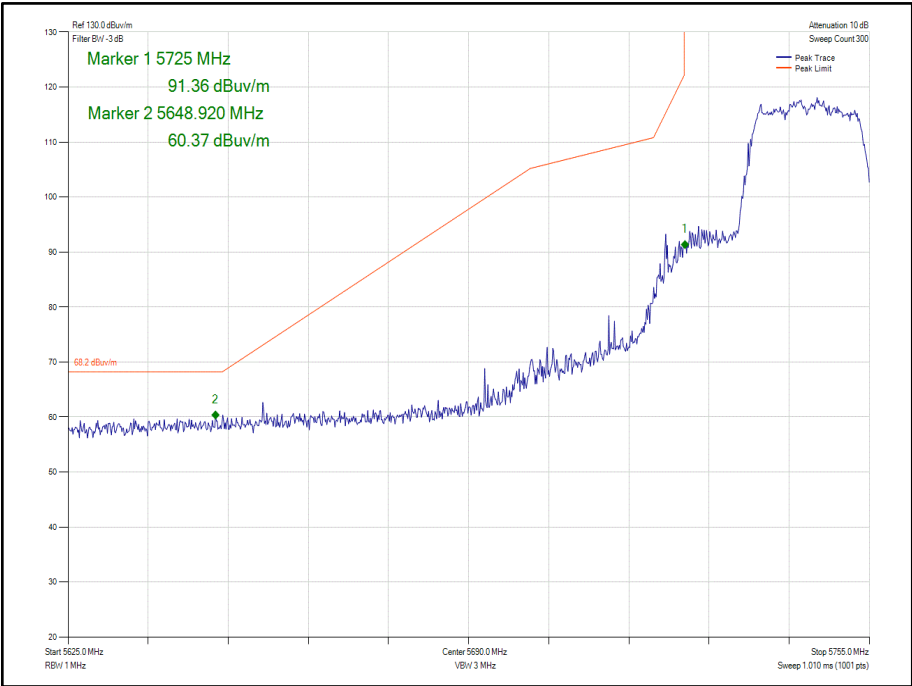


Figure 384 - 802.11n HT20 Core 1 - 5745 MHz
Band Edge Frequency 5725 MHz

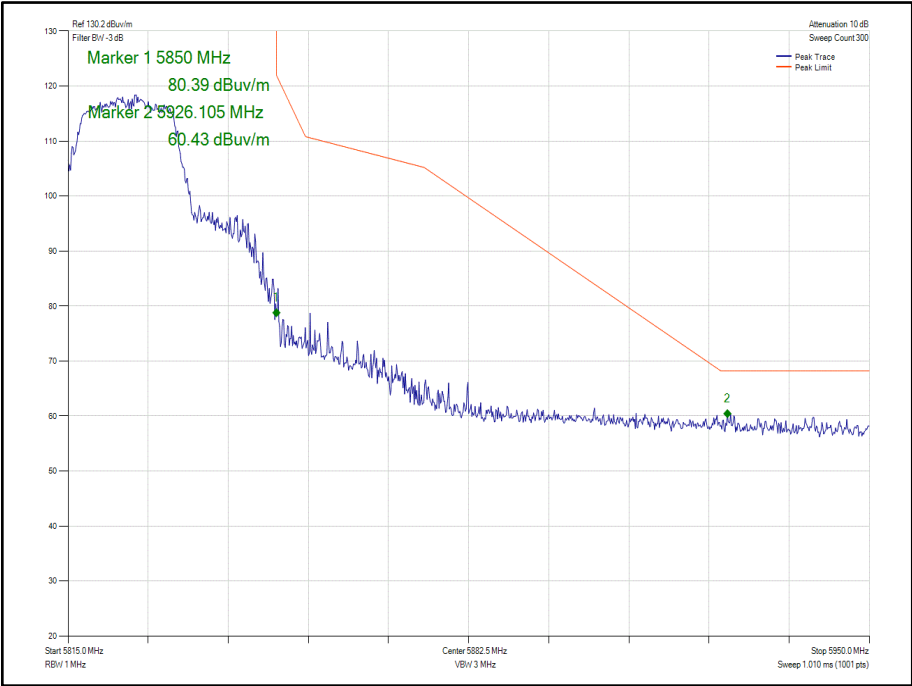


Figure 385 - 802.11a Core 1 - 5825 MHz
Band Edge Frequency 5850 MHz

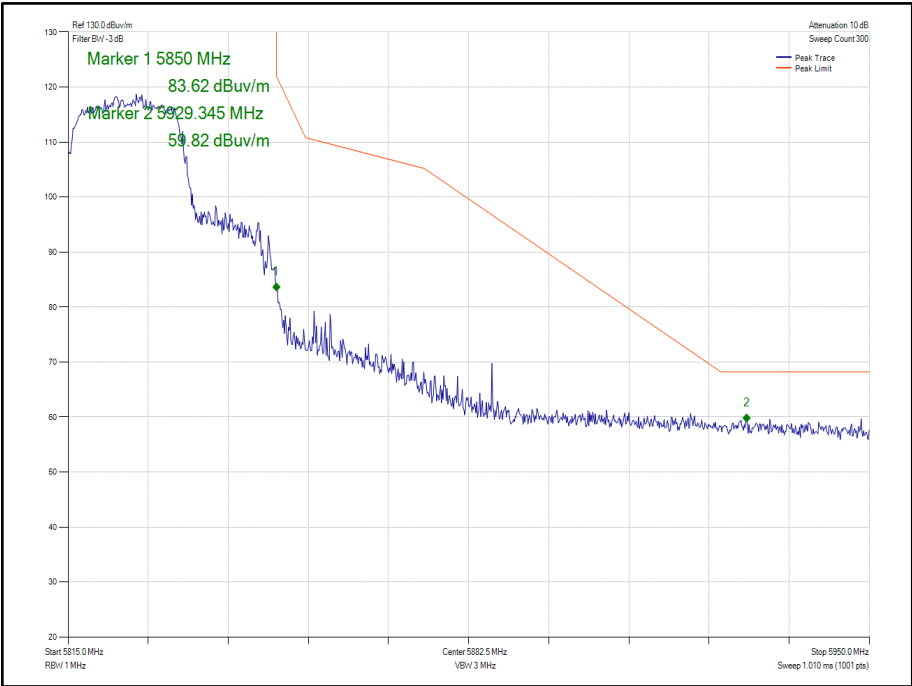
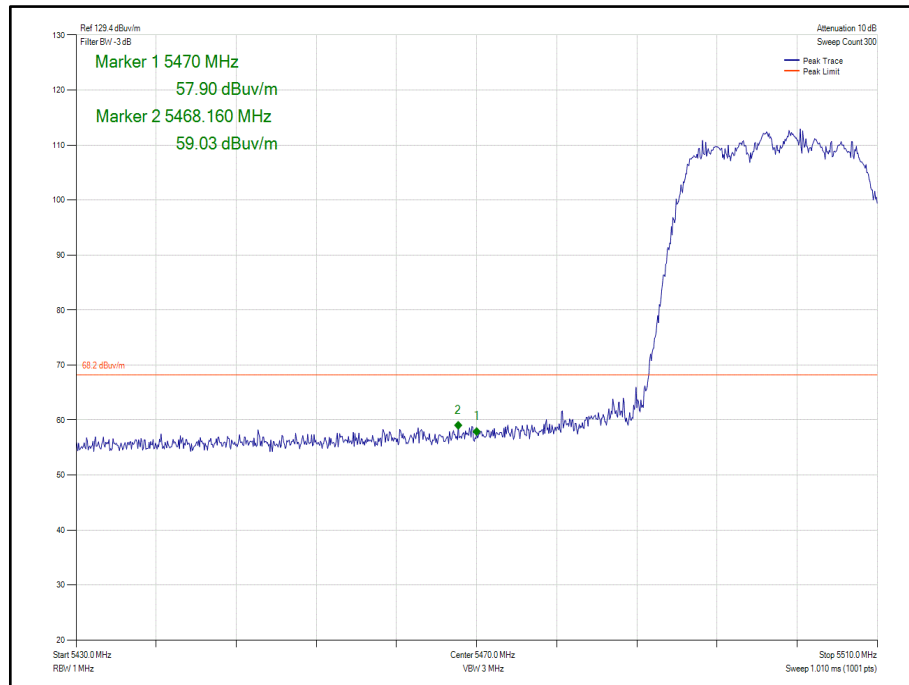


Figure 386 - 802.11n HT20 Core 1 - 5825 MHz
Band Edge Frequency 5850 MHz

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11n HT20 CDD Cores 0-1	MCS0	5500	5470	59.03
802.11n HT20 SDM Cores 0-1	MCS0	5500	5470	63.23
802.11n HT20 CDD Cores 0-1	MCS0	5700	5725	61.09
802.11n HT20 SDM Cores 0-1	MCS0	5700	5725	62.80
802.11n HT20 CDD Cores 0-1	MCS0	5745	5725	61.66
802.11n HT20 SDM Cores 0-1	MCS0	5745	5725	60.08
802.11n HT20 CDD Cores 0-1	MCS0	5825	5850	60.53
802.11n HT20 SDM Cores 0-1	MCS0	5825	5850	61.39

Table 210 – MIMO 2TX



**Figure 387 - 802.11n HT20 CDD Cores 0-1 - 5500 MHz
Band Edge Frequency 5470 MHz**

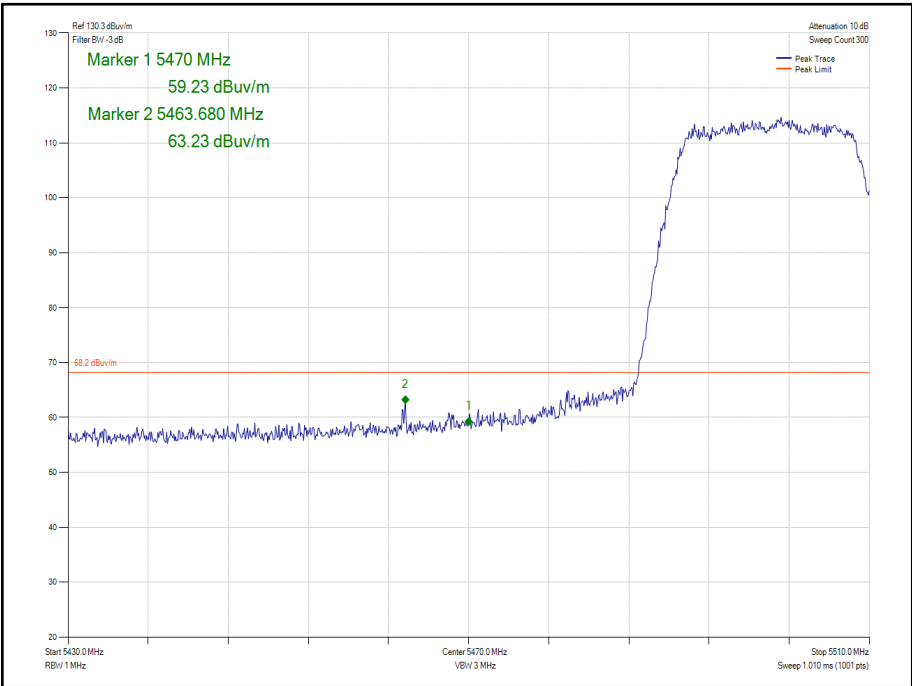


Figure 388 - 802.11n HT20 SDM Cores 0-1 - 5500 MHz
Band Edge Frequency 5470 MHz

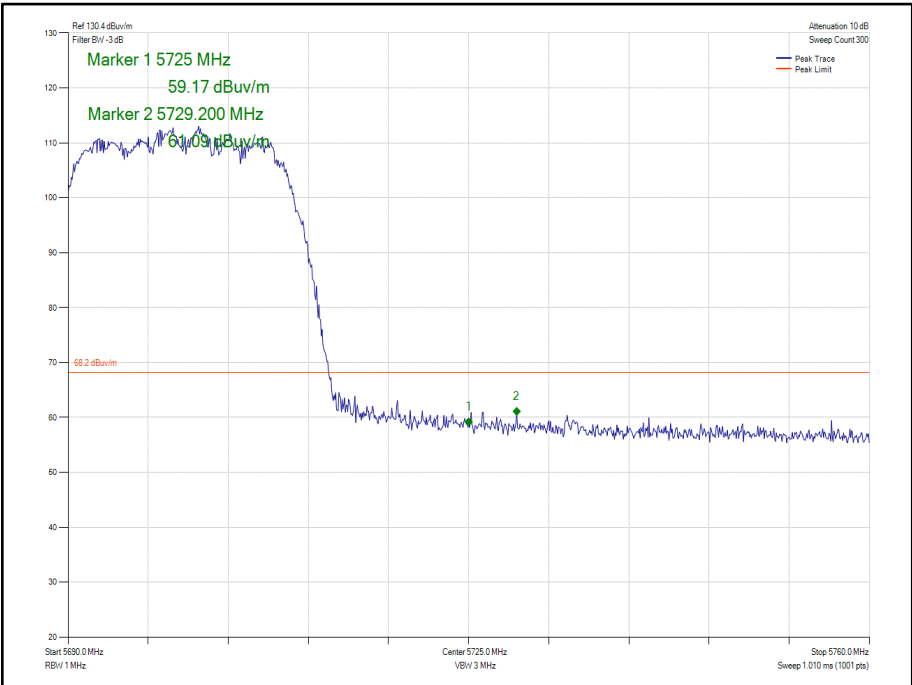
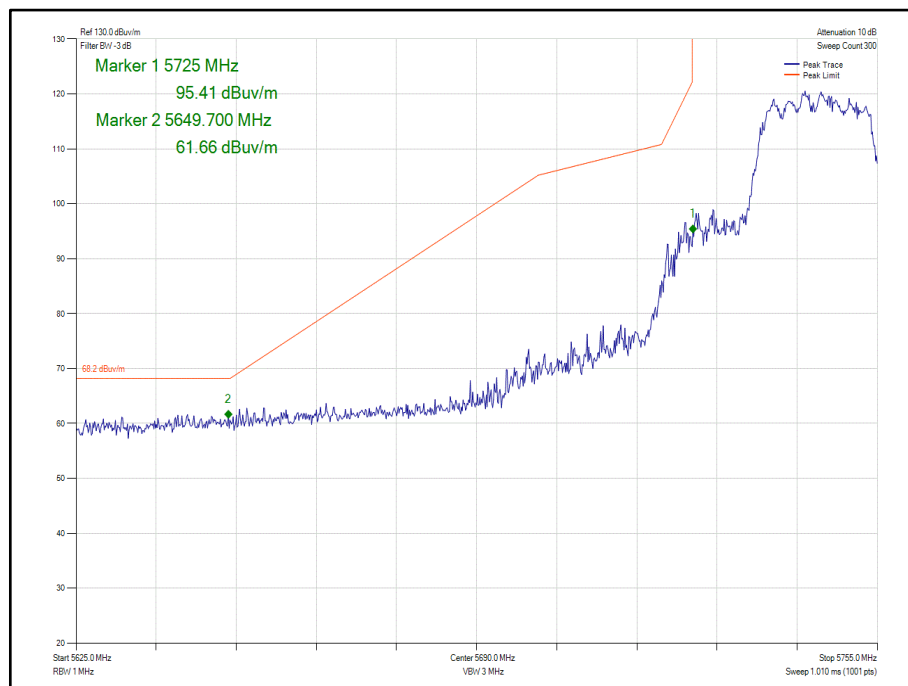
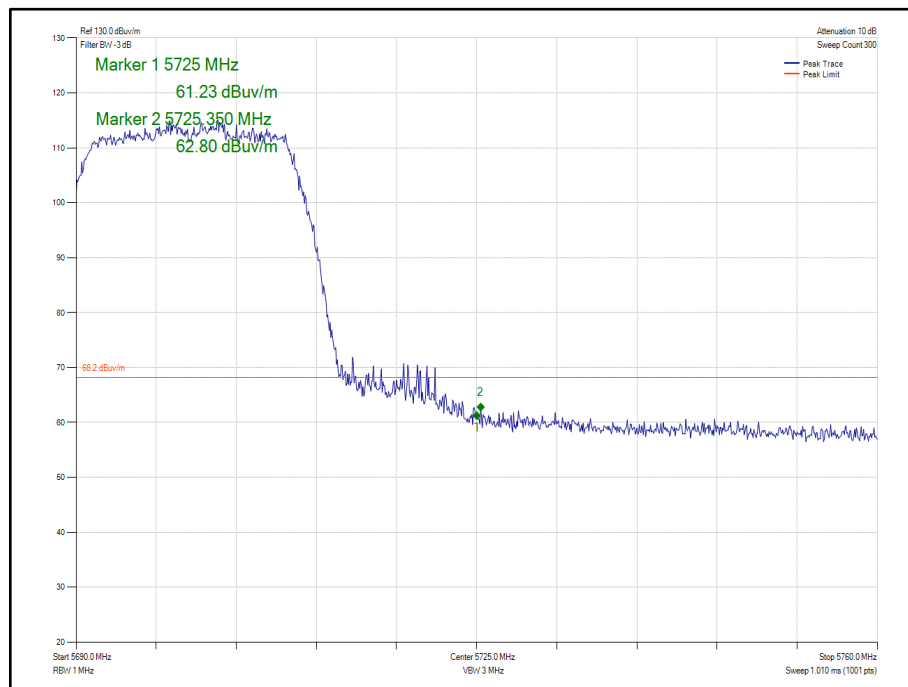


Figure 389 - 802.11n HT20 CDD Cores 0-1 - 5700 MHz
Band Edge Frequency 5725 MHz



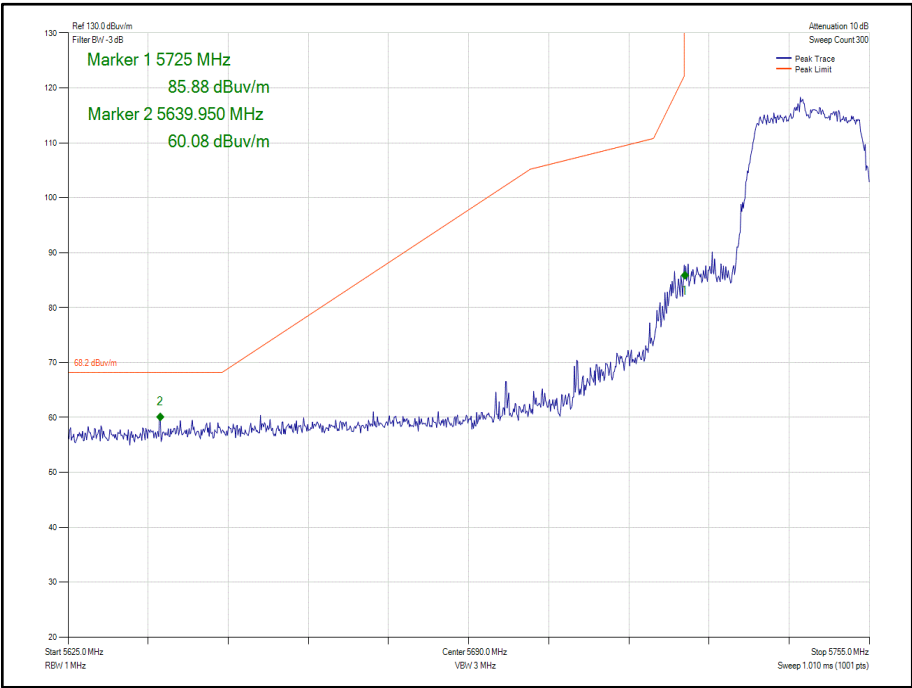


Figure 392 - 802.11n HT20 SDM Cores 0-1 - 5745 MHz
Band Edge Frequency 5725 MHz

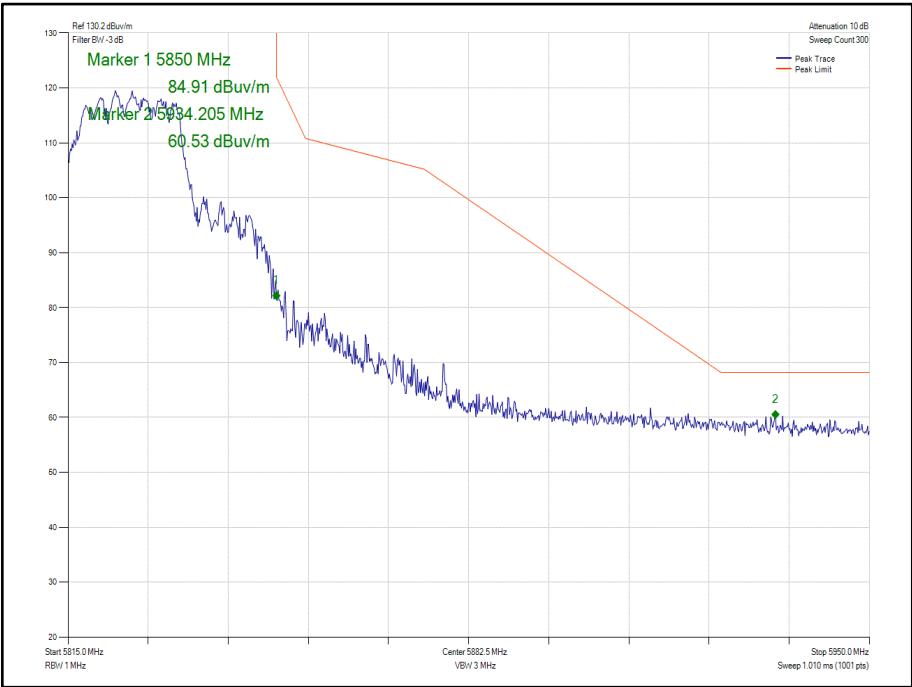
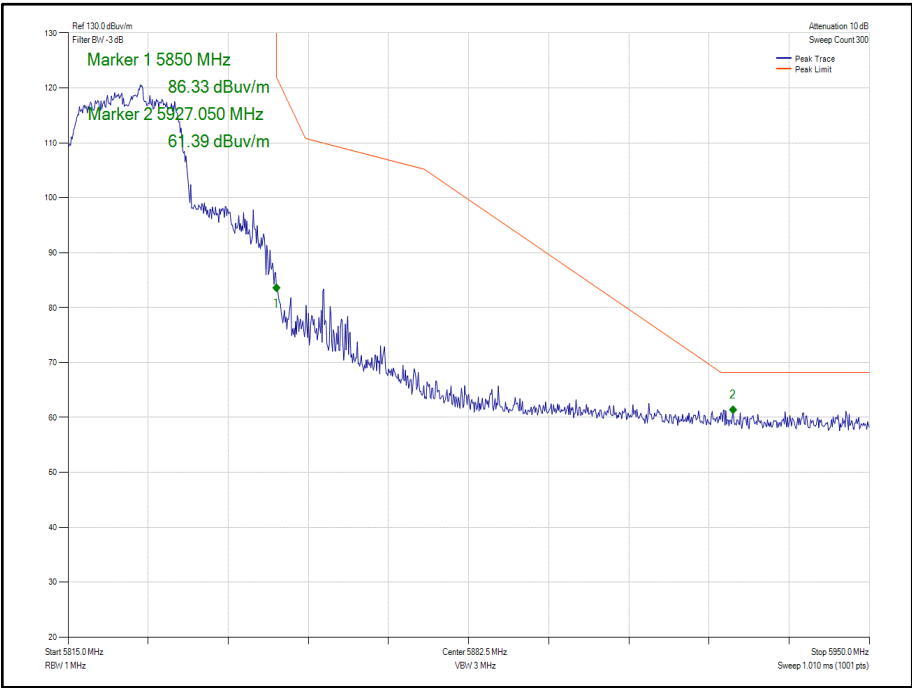


Figure 393 - 802.11n HT20 CDD Cores 0-1 - 5825 MHz
Band Edge Frequency 5850 MHz



**Figure 394 - 802.11n HT20 SDM Cores 0-1 - 5825 MHz
Band Edge Frequency 5850 MHz**



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11n HT40 Core 1	MCS0	5510	5470	61.16
802.11n HT40 Core 1	MCS0	5670	5725	62.86
802.11n HT40 Core 1	MCS0	5755	5725	62.23
802.11n HT40 Core 1	MCS0	5795	5850	61.21

Table 211 - SISO

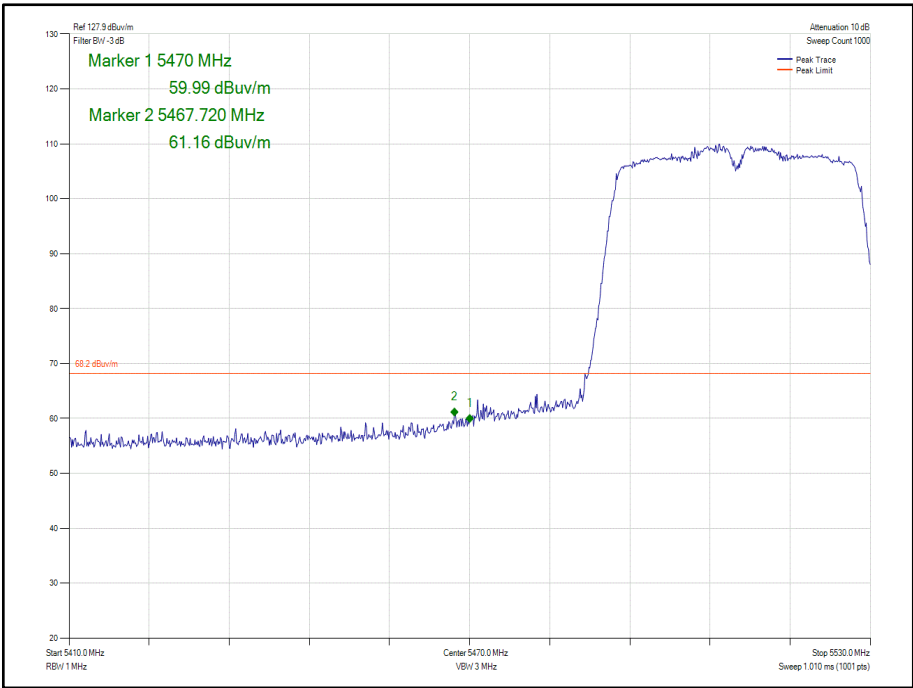


Figure 395 - 802.11n HT40 Core 1 - 5510 MHz
Band Edge Frequency 5470 MHz

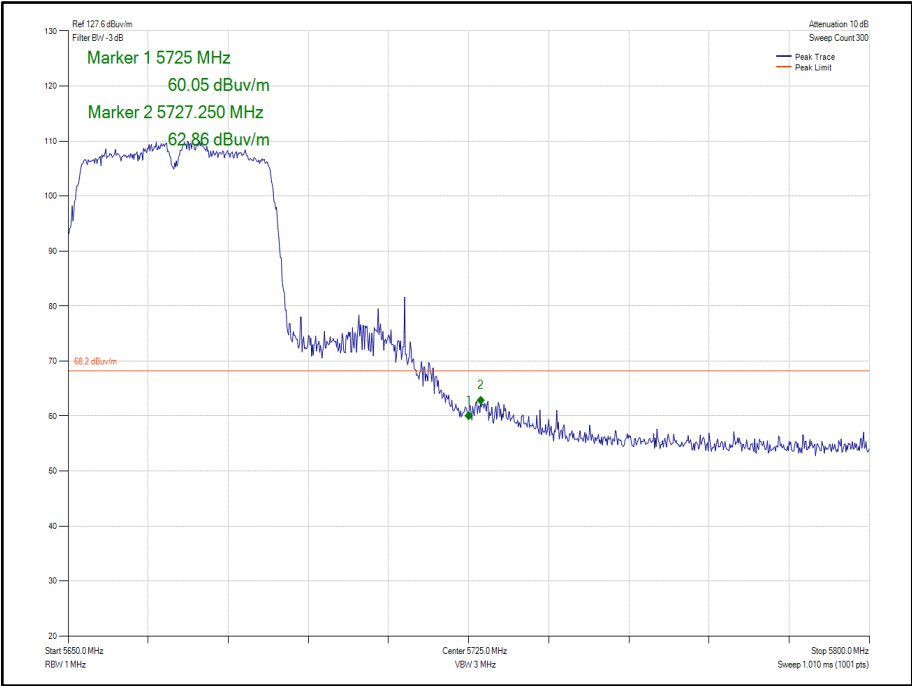


Figure 396 - 802.11n HT40 Core 1 - 5670 MHz
Band Edge Frequency 5725 MHz

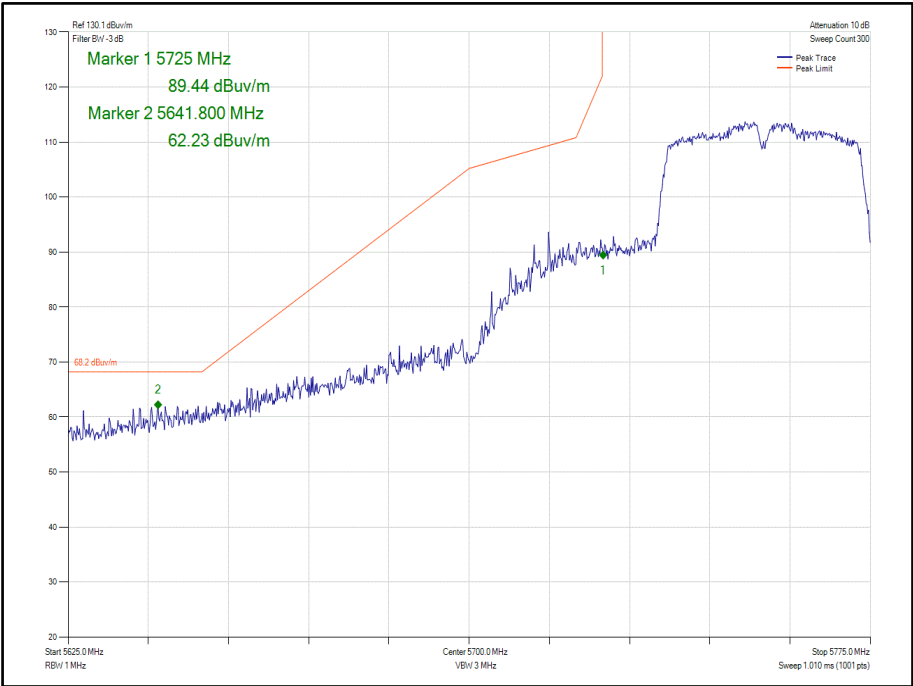


Figure 397 - 802.11n HT40 Core 1 - 5755 MHz
Band Edge Frequency 5725 MHz

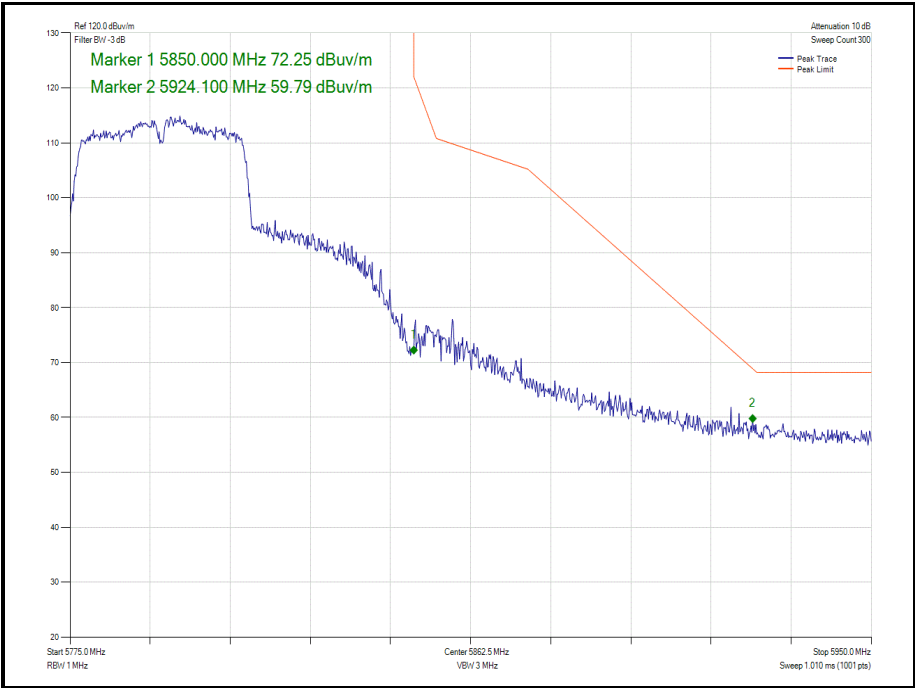


Figure 398 - 802.11n HT40 Core 1 - 5795 MHz
Band Edge Frequency 5850 MHz

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11n HT40 CDD Cores 0-1	MCS0	5510	5470	62.67
802.11n HT40 SDM Cores 0-1	MCS0	5510	5470	63.91
802.11n HT40 CDD Cores 0-1	MCS0	5670	5725	62.87
802.11n HT40 SDM Cores 0-1	MCS0	5670	5725	62.98
802.11n HT40 CDD Cores 0-1	MCS0	5755	5725	63.34
802.11n HT40 SDM Cores 0-1	MCS0	5755	5725	62.76
802.11n HT40 CDD Cores 0-1	MCS0	5795	5850	61.00
802.11n HT40 SDM Cores 0-1	MCS0	5795	5850	60.26

Table 212 – MIMO 2TX

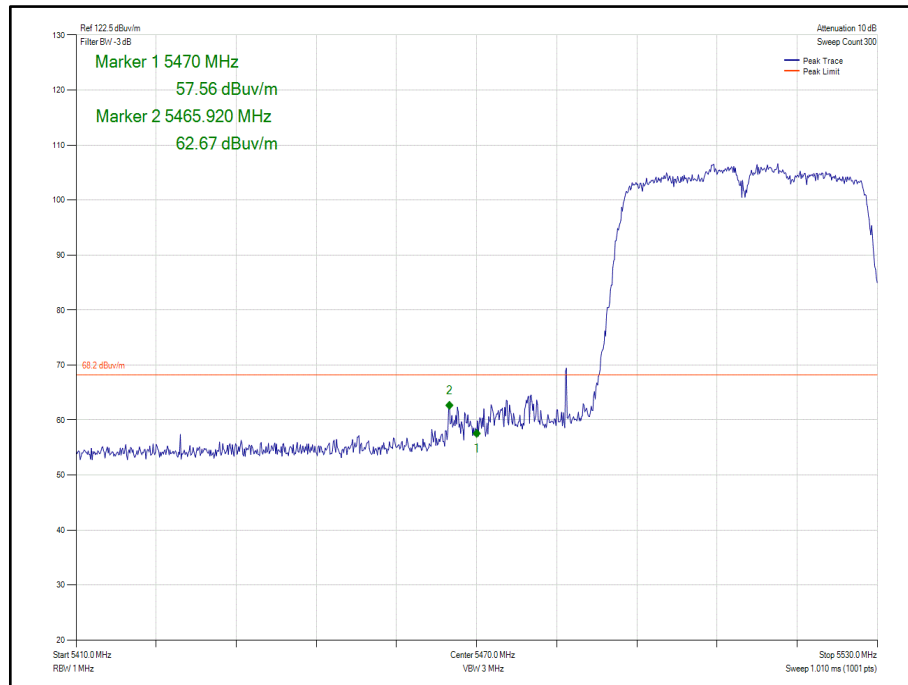


Figure 399 - 802.11n HT40 CDD Cores 0-1 - 5510 MHz
Band Edge Frequency 5470 MHz

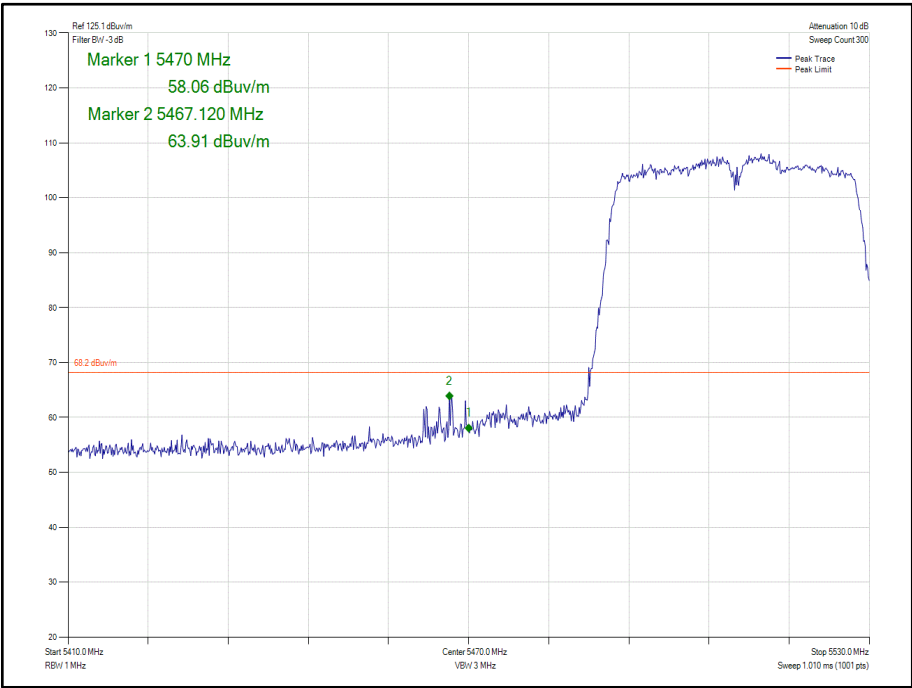


Figure 400 - 802.11n HT40 SDM Cores 0-1 - 5510 MHz
Band Edge Frequency 5470 MHz

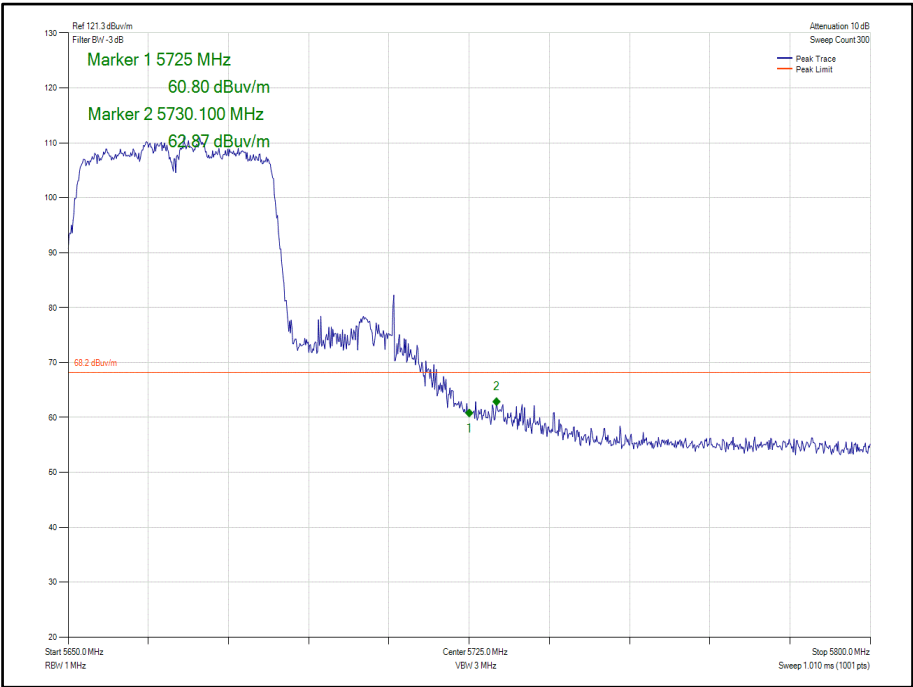


Figure 401 - 802.11n HT40 CDD Cores 0-1 - 5670 MHz
Band Edge Frequency 5725 MHz

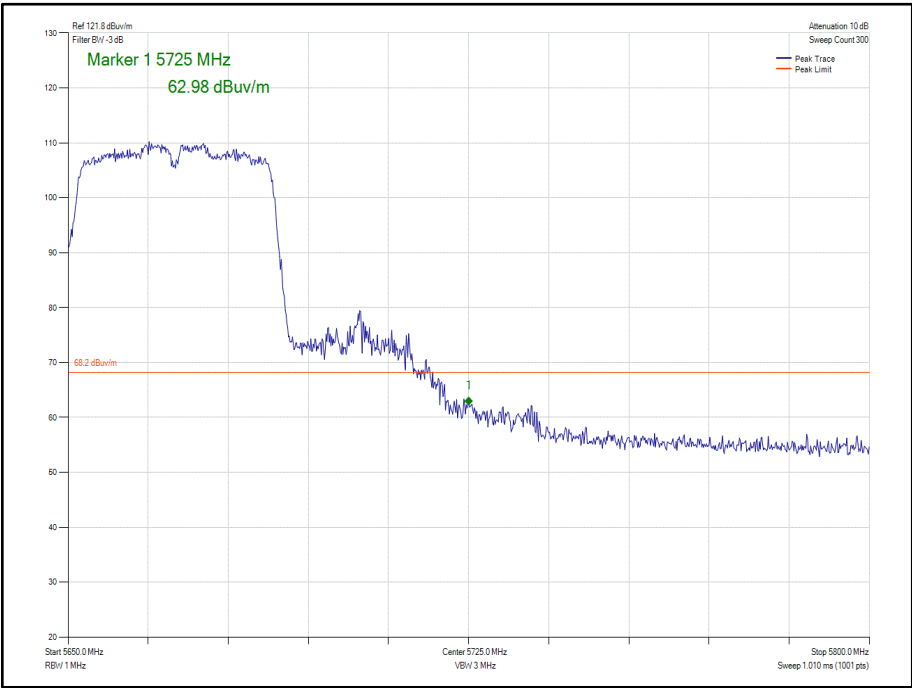


Figure 402 - 802.11n HT40 SDM Cores 0-1 - 5670 MHz
Band Edge Frequency 5725 MHz

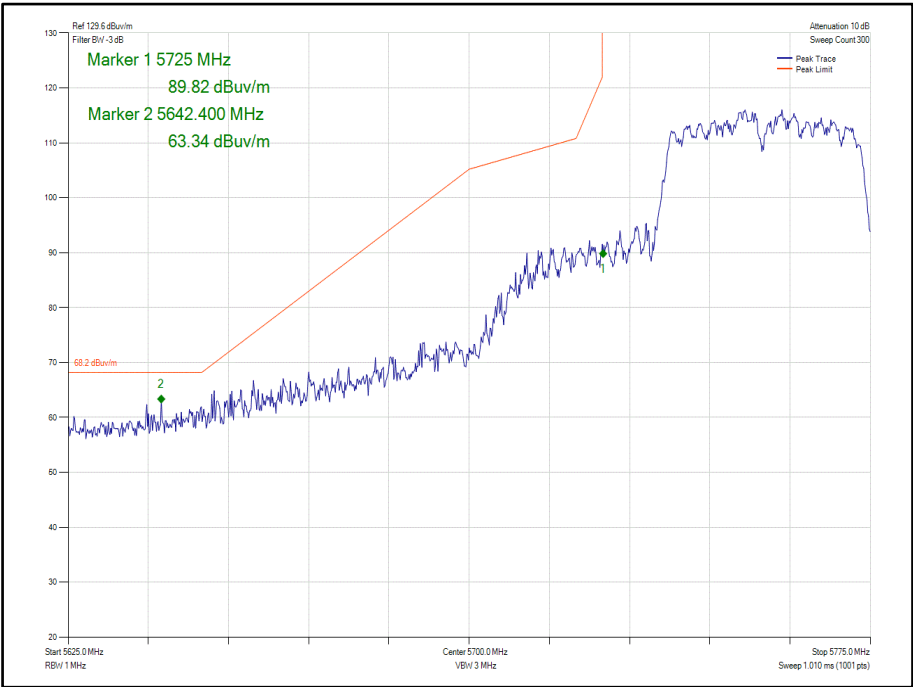


Figure 403 - 802.11n HT40 CDD Cores 0-1 - 5755 MHz
Band Edge Frequency 5725 MHz

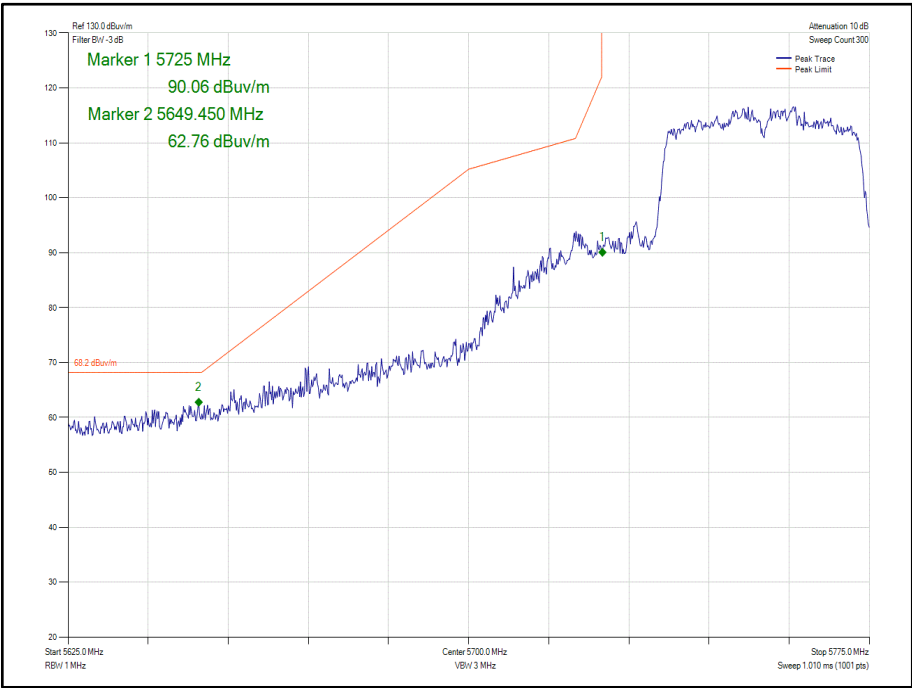


Figure 404 - 802.11n HT40 SDM Cores 0-1 - 5755 MHz
Band Edge Frequency 5725 MHz

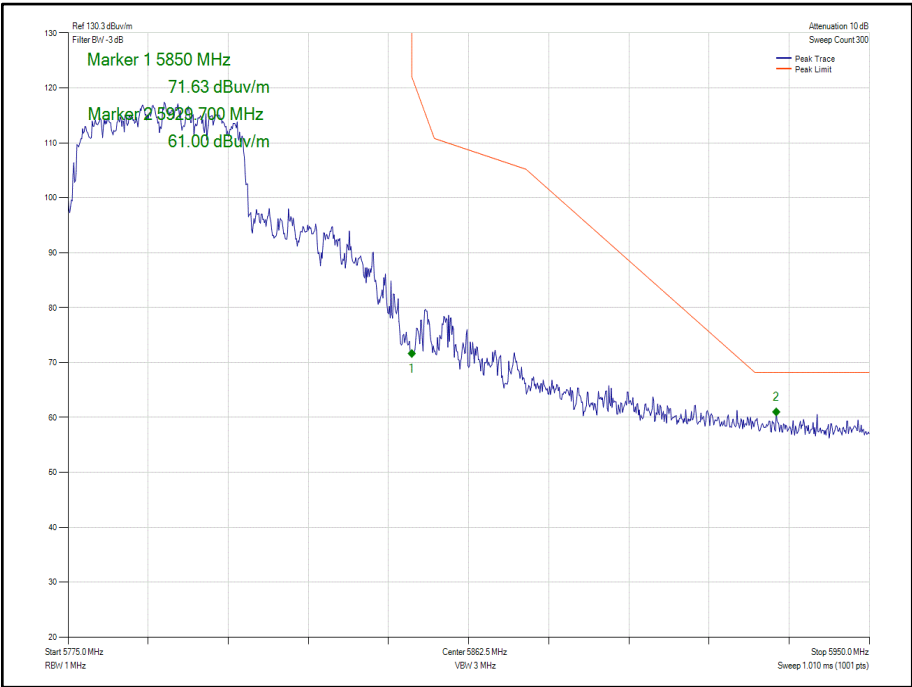
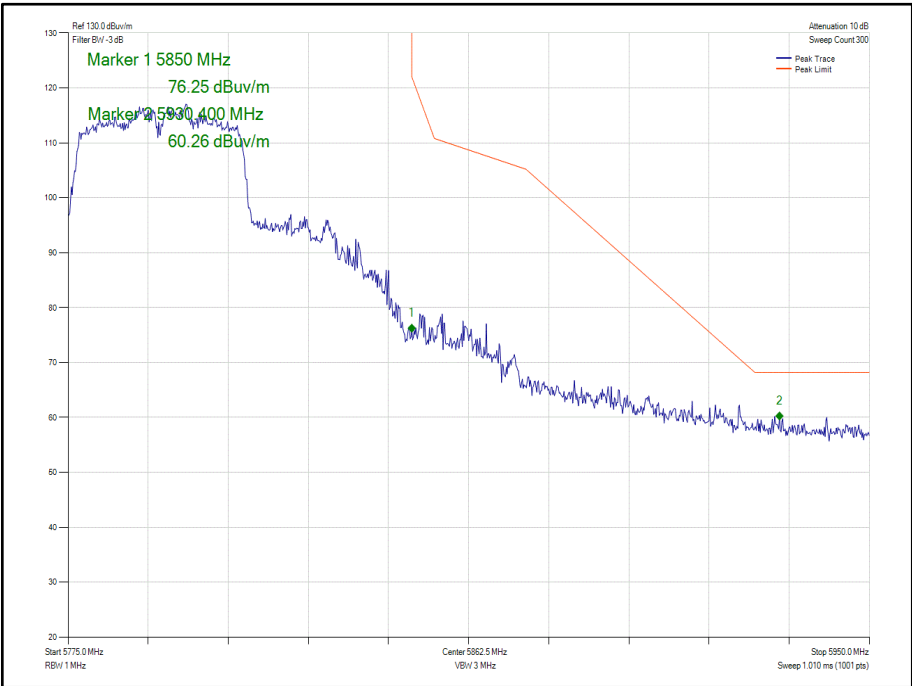


Figure 405 - 802.11n HT40 CDD Cores 0-1 - 5795 MHz
Band Edge Frequency 5850 MHz



**Figure 406 - 802.11n HT40 SDM Cores 0-1 - 5795 MHz
Band Edge Frequency 5850 MHz**



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11ac VHT80 Core 1	MCS0x1	5530	5470	63.44
802.11ac VHT80 Core 1	MCS0x1	5610	5725	63.54
802.11ac VHT80 Core 1	MCS0x1	5775	5725	63.18
802.11ac VHT80 Core 1	MCS0x1	5775	5850	55.71

Table 213 - SISO

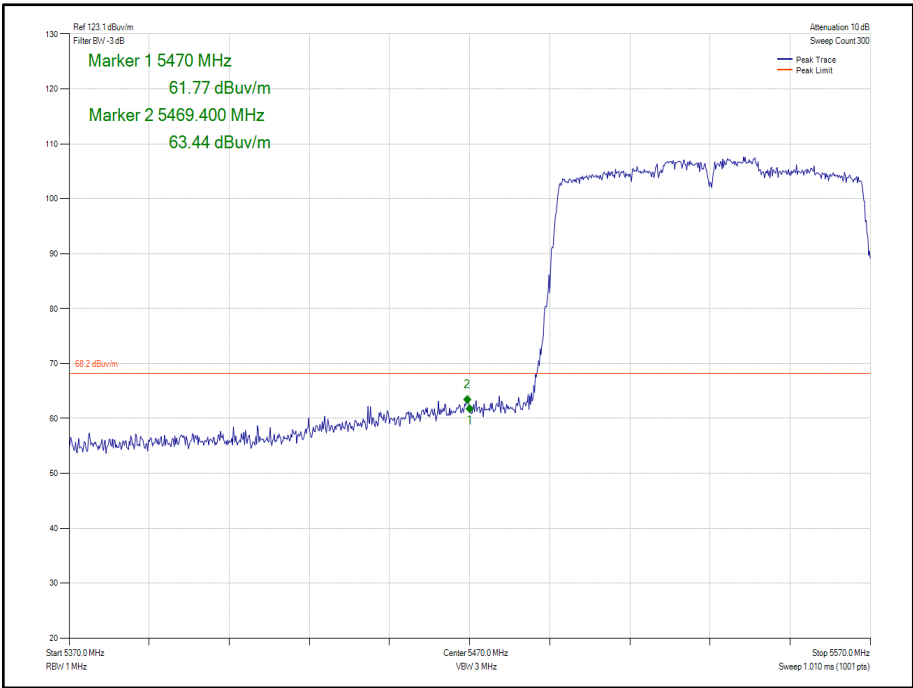


Figure 407 - 802.11ac Core 1 - 5530 MHz
Band Edge Frequency 5470 MHz

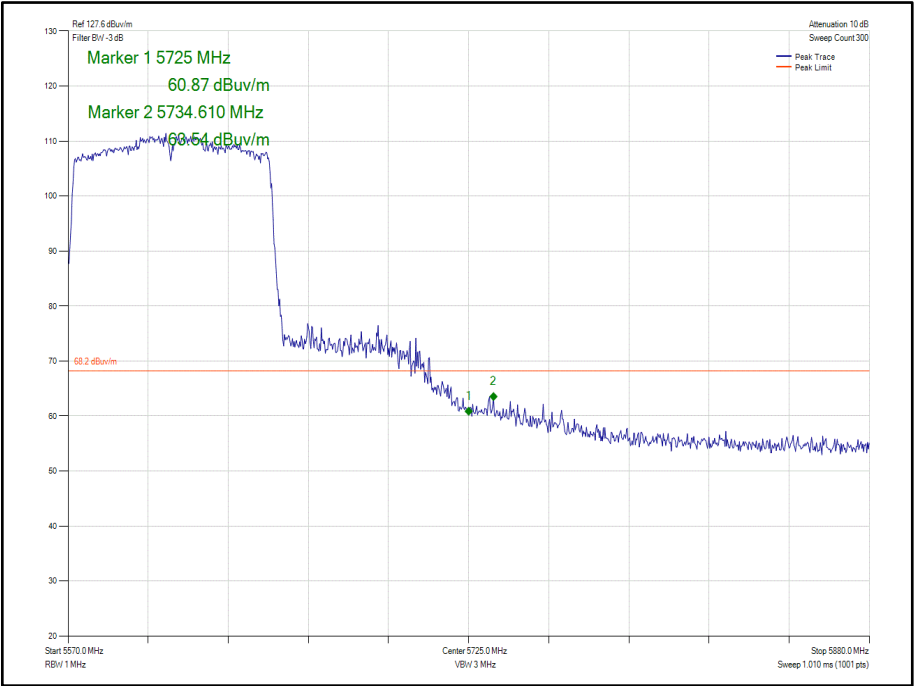


Figure 408 - 802.11ac VHT80 Core 1 - 5610 MHz
Band Edge Frequency 5725 MHz

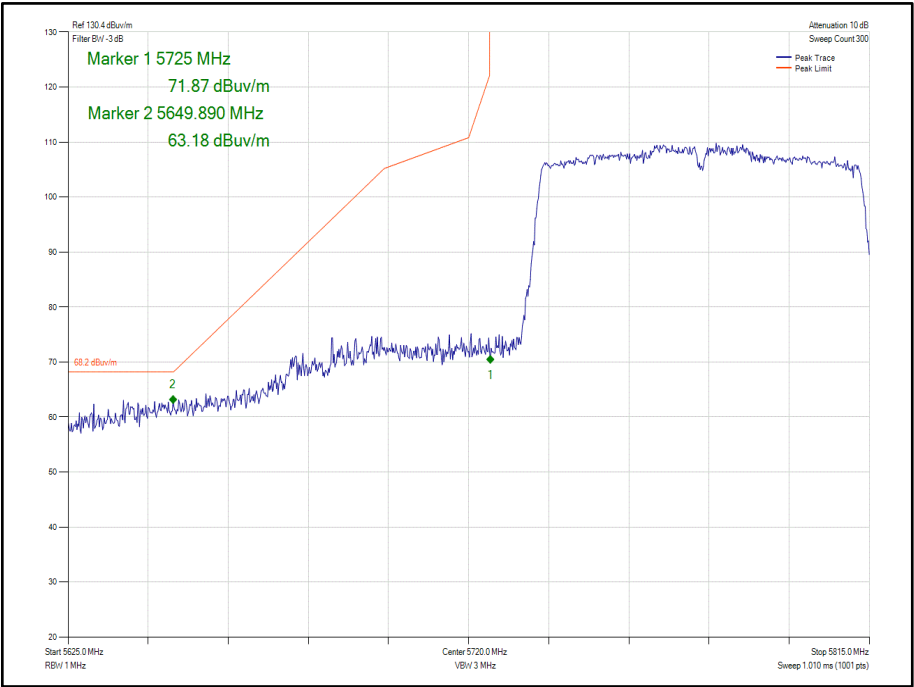


Figure 409 - 802.11ac VHT80 Core 1 - 5775 MHz
Band Edge Frequency 5725 MHz

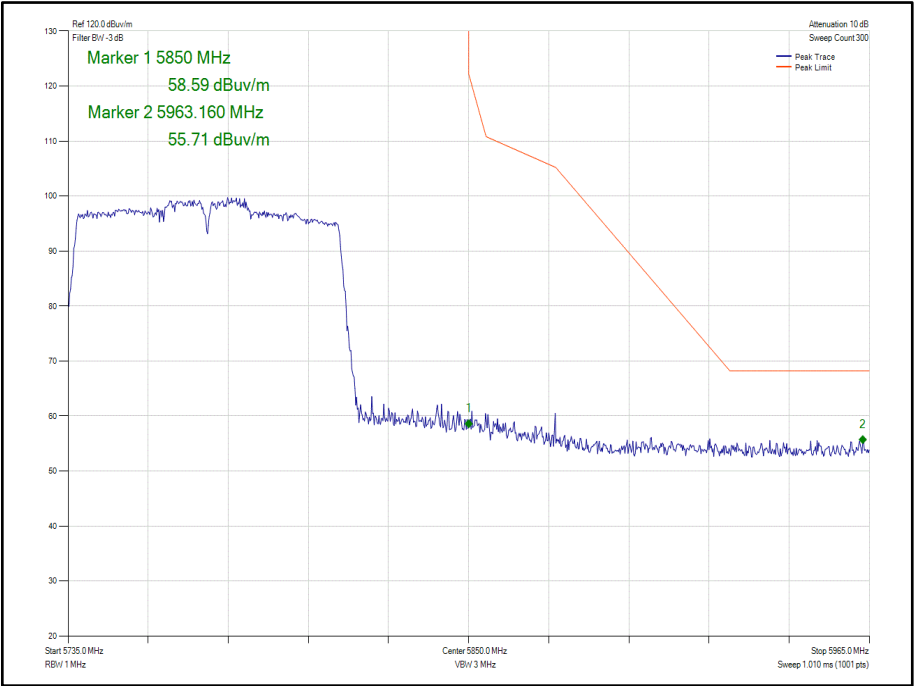


Figure 410 - 802.11ac VHT80 Core 1 - 5775 MHz
Band Edge Frequency 5850 MHz



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBuV/m)
802.11ac VHT80 CDD Cores 0-1	MCS0x1	5530	5470	63.35
802.11ac VHT80 SDM Cores 0-1	MCS0x1	5530	5470	63.64
802.11ac VHT80 CDD Cores 0-1	MCS0x1	5610	5725	62.54
802.11ac VHT80 SDM Cores 0-1	MCS0x1	5610	5725	63.54
802.11ac VHT80 CDD Cores 0-1	MCS0x1	5775	5725	62.40
802.11ac VHT80 SDM Cores 0-1	MCS0x1	5775	5725	64.14
802.11ac VHT80 CDD Cores 0-1	MCS0x1	5775	5850	58.21
802.11ac VHT80 SDM Cores 0-1	MCS0x1	5775	5850	58.36

Table 214 – MIMO 2TX

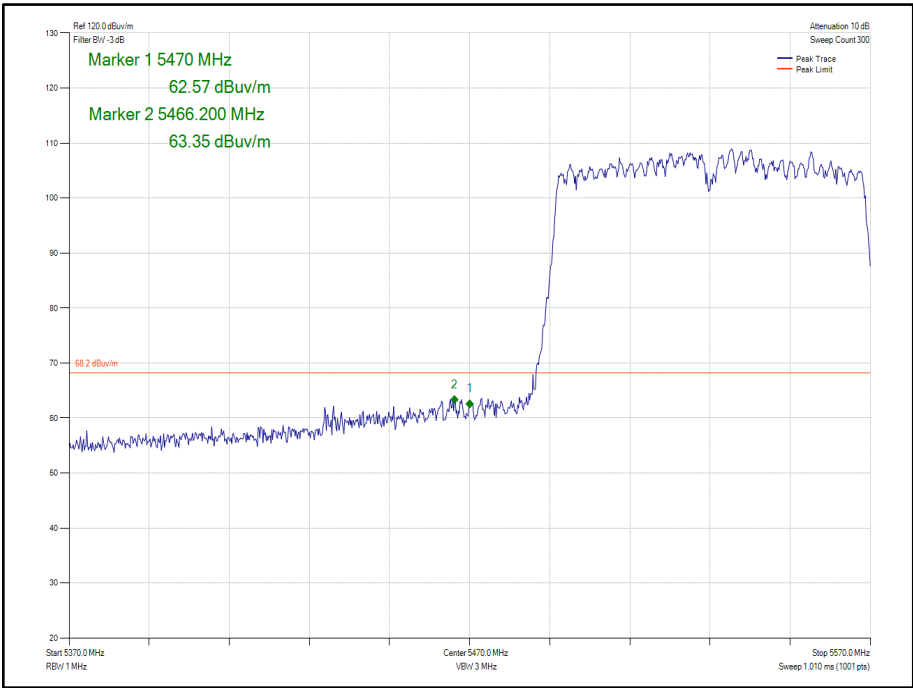


Figure 411 - 802.11ac VHT80 CDD Cores 0-1 - 5530 MHz
Band Edge Frequency 5470 MHz

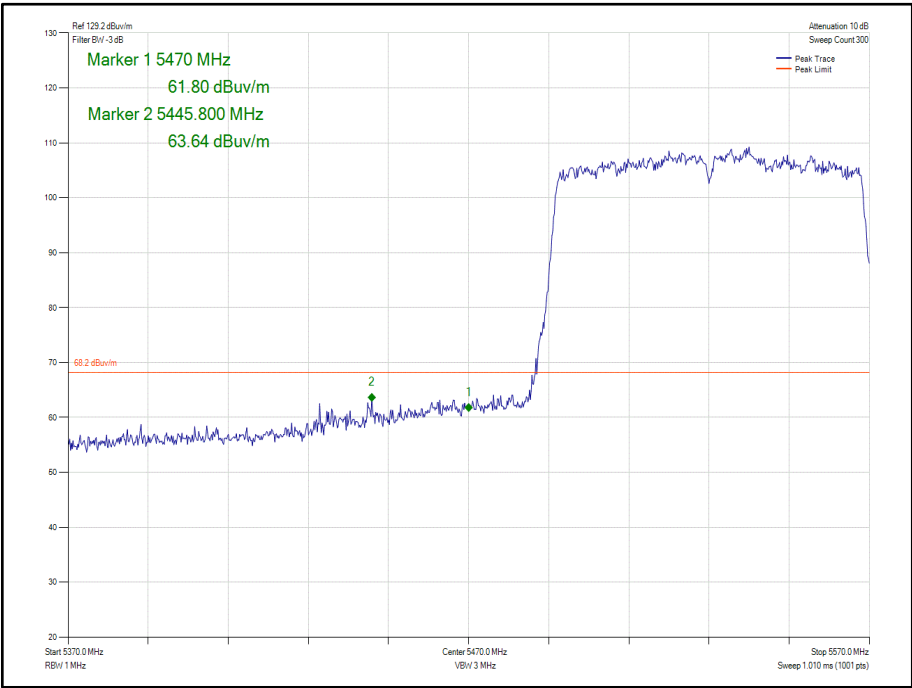


Figure 412 - 802.11ac VHT80 SDM Cores 0-1 - 5530 MHz
Band Edge Frequency 5470 MHz

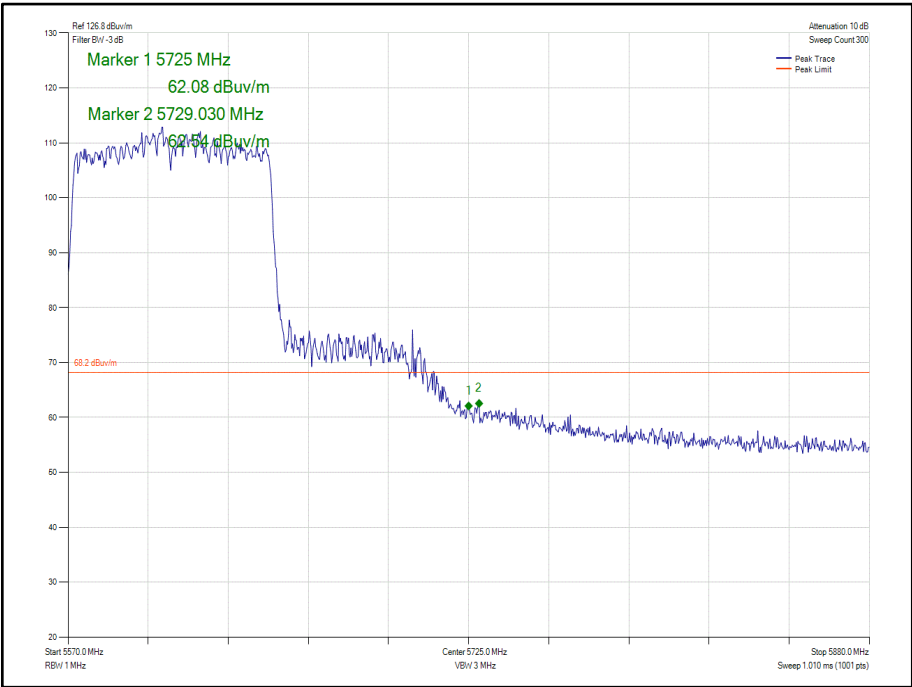


Figure 413 - 802.11ac VHT80 CDD Cores 0-1 - 5610 MHz
Band Edge Frequency 5725 MHz

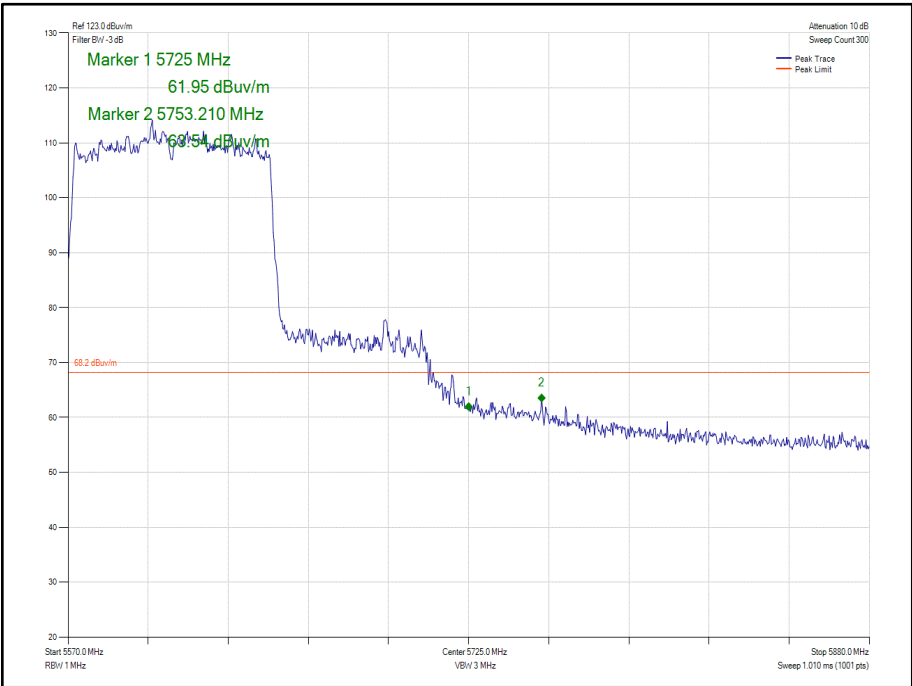


Figure 414 - 802.11ac VHT80 SDM Cores 0-1 - 5610 MHz
Band Edge Frequency 5725 MHz

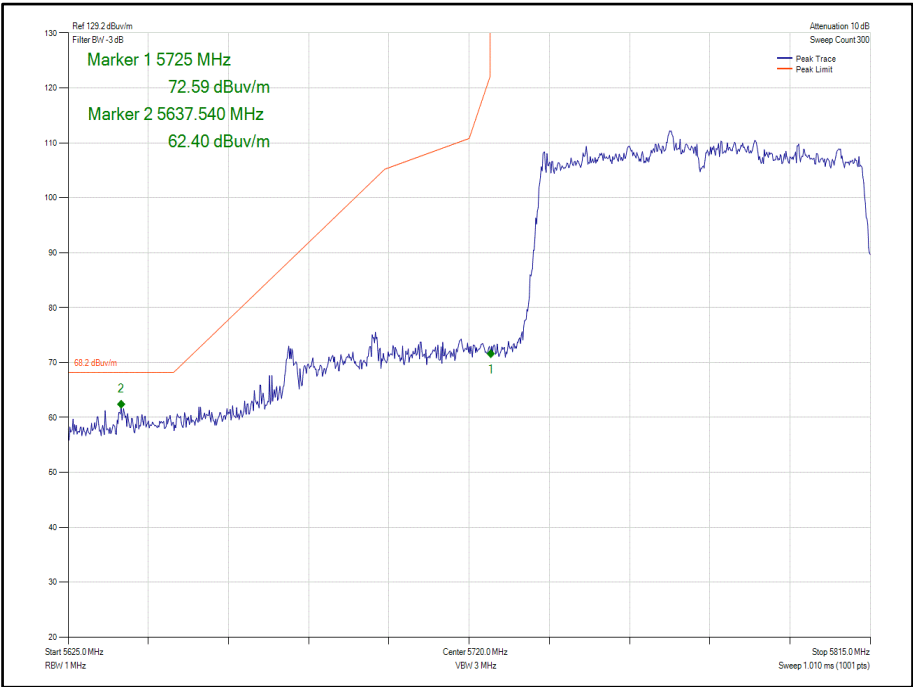


Figure 415 - 802.11ac VHT80 CDD Cores 0-1 - 5775 MHz
Band Edge Frequency 5725 MHz

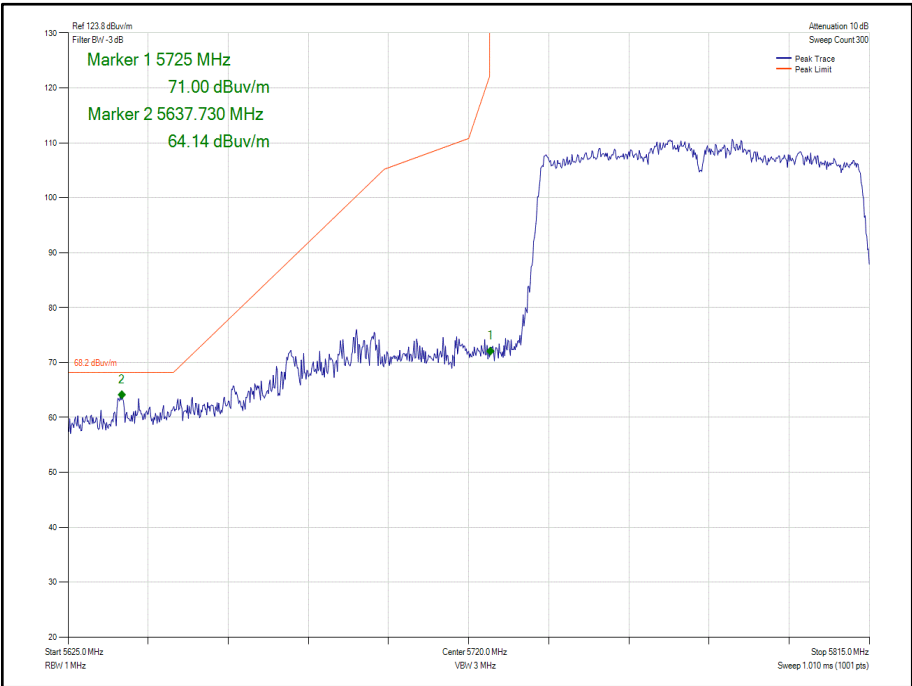


Figure 416 - 802.11ac VHT80 SDM Cores 0-1 - 5775 MHz
Band Edge Frequency 5725 MHz

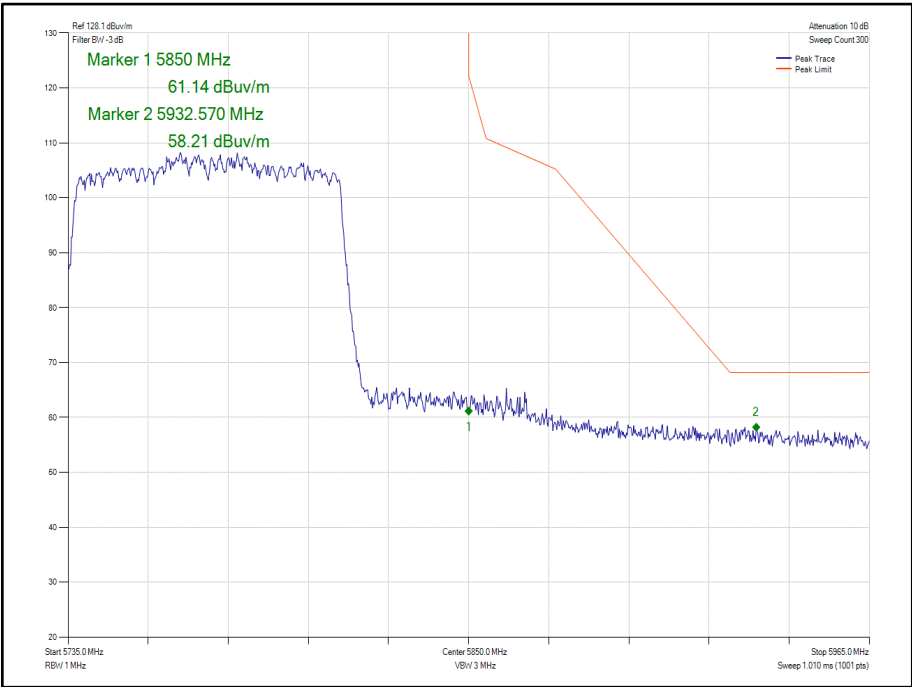


Figure 417 - 802.11ac VHT80 CDD Cores 0-1 - 5775 MHz
Band Edge Frequency 5850 MHz

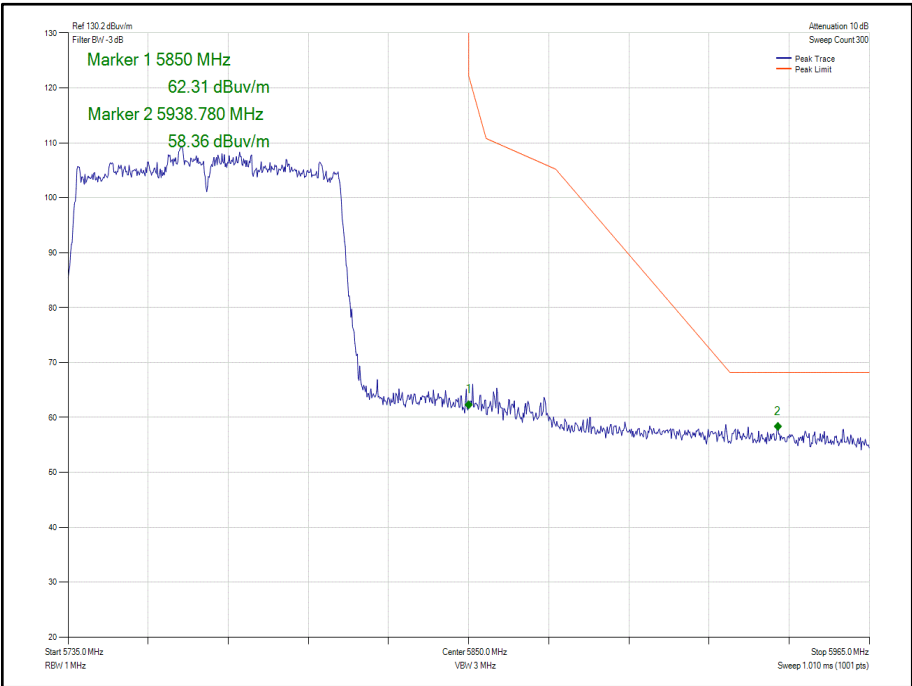


Figure 418 - 802.11ac VHT80 SDM Cores 0-1 - 5775 MHz
Band Edge Frequency 5850 MHz



FCC 47 CFR Part 15E, Limit Clause 15.407(b)(1)(2)(3)(4)

For transmitters operating in the 5.15-5.25 GHz band: ≤ -27 dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.25-5.35 GHz band: ≤ -27 dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.47-5.725 GHz band: ≤ -27 dBm/MHz outside 5470-5725 MHz

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

ISED RSS-247, Limit Clause 6.2.1.2, 6.2.2.2, 6.2.3.2 and 6.2.4.2

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB.

For transmitters with operating frequencies in the bands 5250-5350 MHz and 5470-5725 MHz, all emissions outside the band 5250-5350 MHz and 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
- d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.



2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
10dB/1W SMA Attenuator dc - 18GHz	Sealectro	60-674-1010-89	395	-	O/P Mon
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	14-Nov-2020
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	11-Dec-2019*
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
Hygrometer	Rotronic	HP21	4989	12	02-May-2020
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	28-Nov-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5095	12	04-Dec-2019*
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5104	12	09-Dec-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5105	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5107	12	06-Oct-2020
EmX Emissions Software	TUV SUD	EmX, V.V1.5.2	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	01-Nov-2021
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	30-Aug-2020
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	11-Mar-2020
Pre Amp 1 – 26.5 GHz	Agilent Technologies	8449B	5445	-	O/P Mon

Table 215

TU – Traceability Unscheduled

O/P Mon – Output monitored using calibrated equipment.

*As testing was performed over multiple days it may appear that some equipment was used outside of a valid calibration period, however, TUV SUD confirms that when equipment was used it held a valid calibration and has records of this.



2.5 Restricted Band Edges

2.5.1 Specification Reference

FCC 47 CFR Part 15E, Clause 15.205
ISED RSS-GEN, Clause 8.10

2.5.2 Equipment Under Test and Modification State

A2179, S/N: C02ZC00WM8M5 - Modification State 0

2.5.3 Date of Test

19-November-2019 to 16-December-2019

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.5.

Restricted band edge measurements were performed, with the device operating in SISO and MIMO, across the various modes supported by the device.

Where duty cycle corrections were required for average results, these are included in the result tables, but are not included in the plots.

Further measurements are held on file by TÜV SÜD and are available if required.

2.5.5 Environmental Conditions

Ambient Temperature 21.0 to 23.2 °C
Relative Humidity 25.2 to 56.2 %

2.5.6 Test Results

5 GHz WLAN

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11a Core 1	6 Mbps	5180	5150	59.08	49.24
802.11n HT20 Core 1	MCS0	5180	5150	60.01	48.46
802.11a Core 1	6 Mbps	5320	5350	60.34	49.91
802.11n HT20 Core 1	MCS0	5320	5350	60.29	49.78
802.11a Core 1	6 Mbps	5500	5460	58.20	47.29
802.11n HT20 Core 1	MCS0	5500	5460	57.87	46.98

Table 216 - SISO

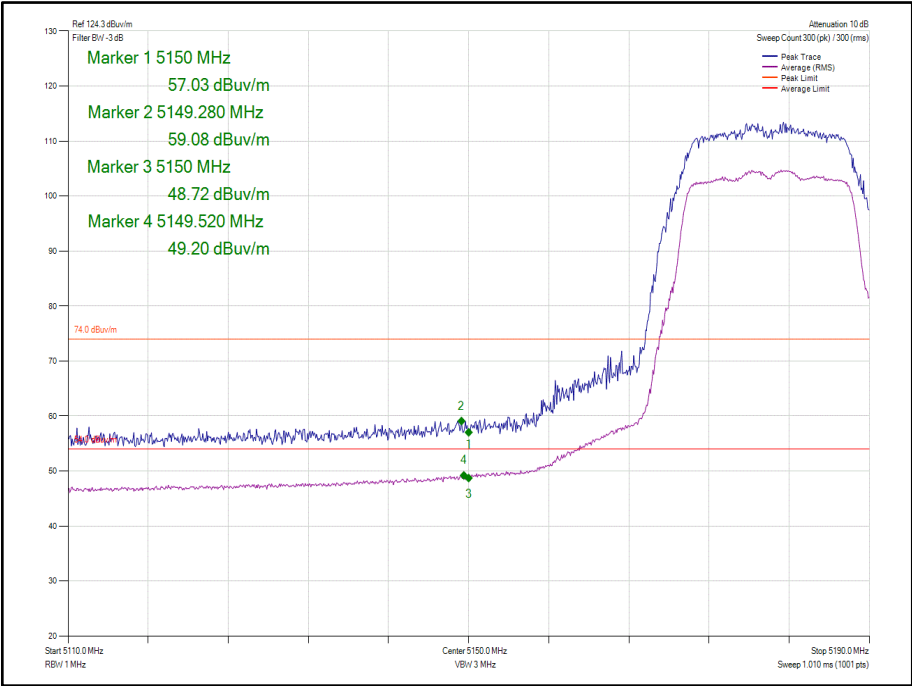


Figure 419 - 802.11a Core 1 - 5180 MHz
Band Edge Frequency 5150 MHz

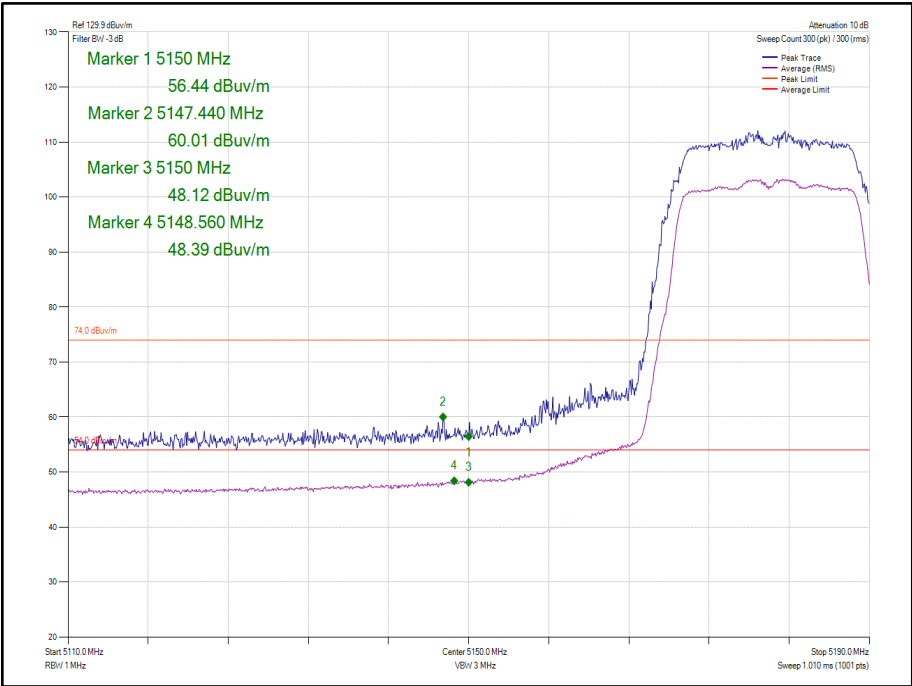


Figure 420 - 802.11n HT20 Core 1 - 5180 MHz
Band Edge Frequency 5150 MHz

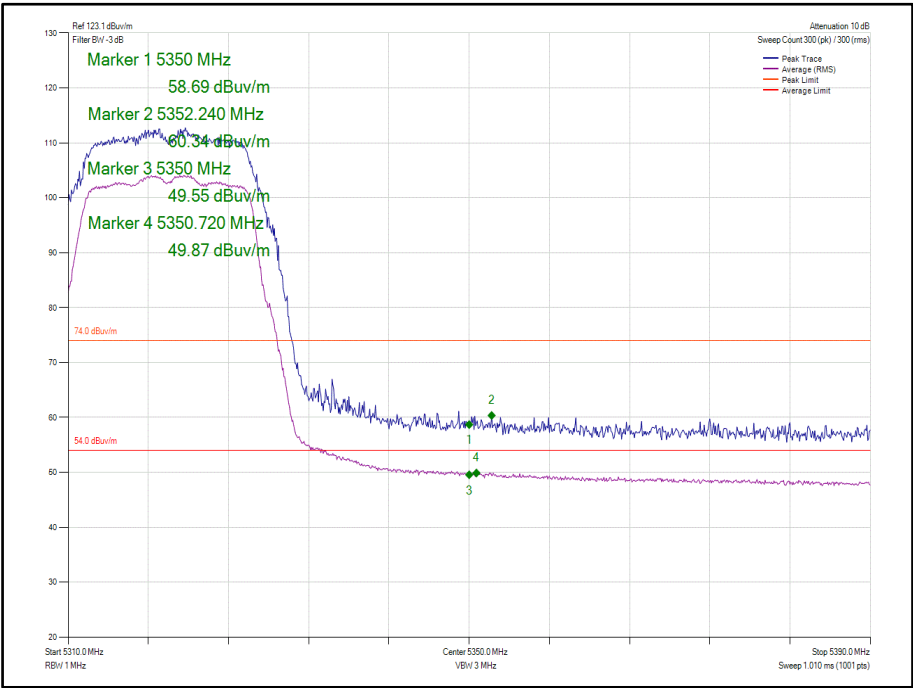


Figure 421 - 802.11a Core 1 - 5320 MHz
Band Edge Frequency 5350 MHz

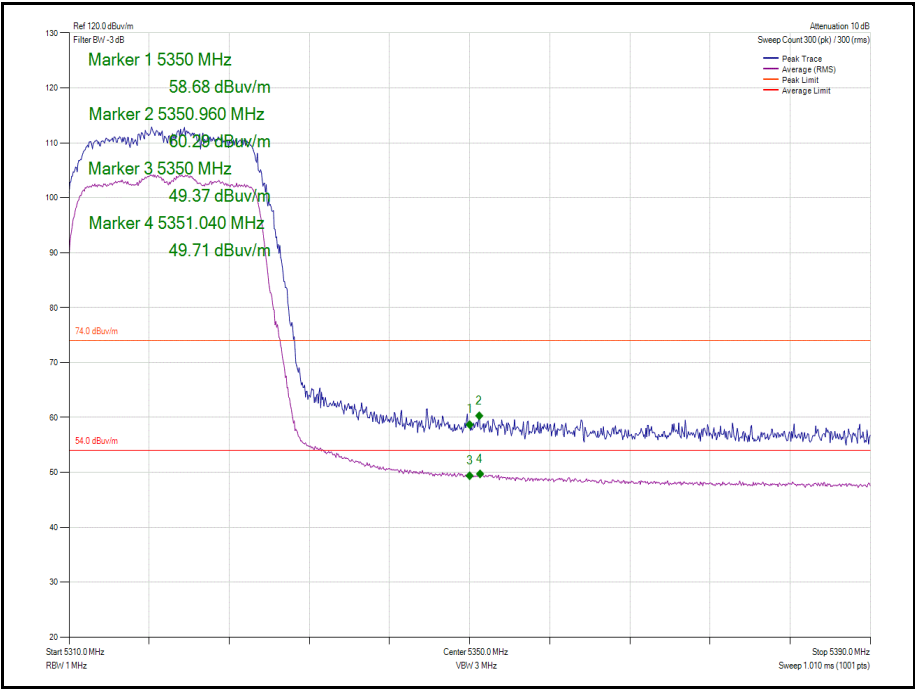


Figure 422 - 802.11n HT20 Core 1 - 5320 MHz
Band Edge Frequency 5350 MHz

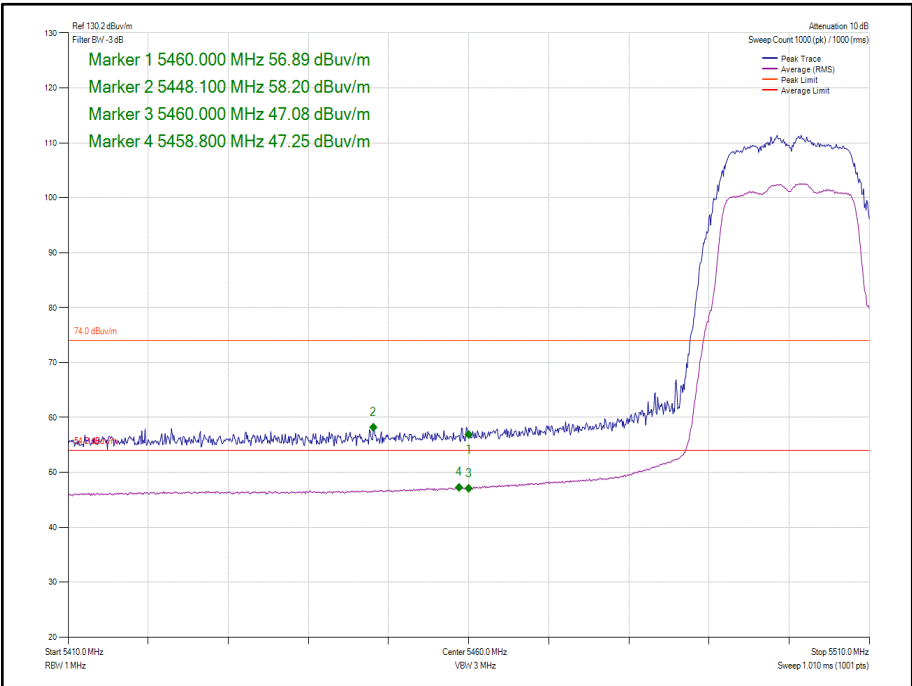


Figure 423 - 802.11a Core 1 - 5500 MHz
Band Edge Frequency 5460 MHz

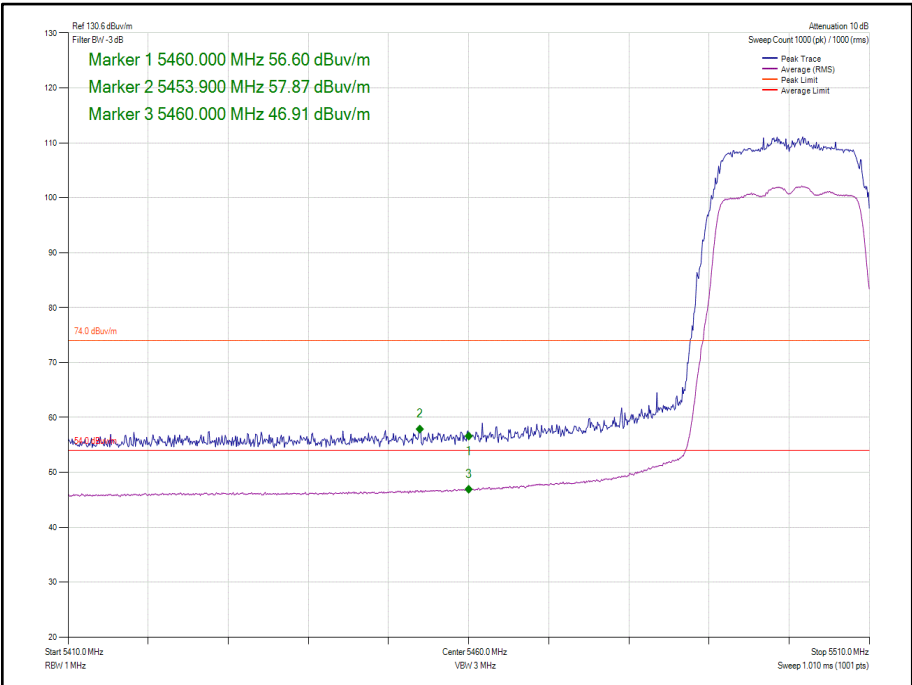


Figure 424 - 802.11n HT20 Core 1 - 5500 MHz
Band Edge Frequency 5460 MHz

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11n HT20 CDD Cores 0-1	MCS0	5180	5150	60.14	49.57
802.11n HT20 SDM Cores 0-1	MCS0	5180	5150	58.85	49.13
802.11n HT20 CDD Cores 0-1	MCS0	5320	5350	60.17	49.73
802.11n HT20 SDM Cores 0-1	MCS0	5320	5350	59.77	49.74
802.11n HT20 CDD Cores 0-1	MCS0	5500	5460	59.55	48.34
802.11n HT20 SDM Cores 0-1	MCS0	5500	5460	59.94	48.43

Table 217 – MIMO 2TX

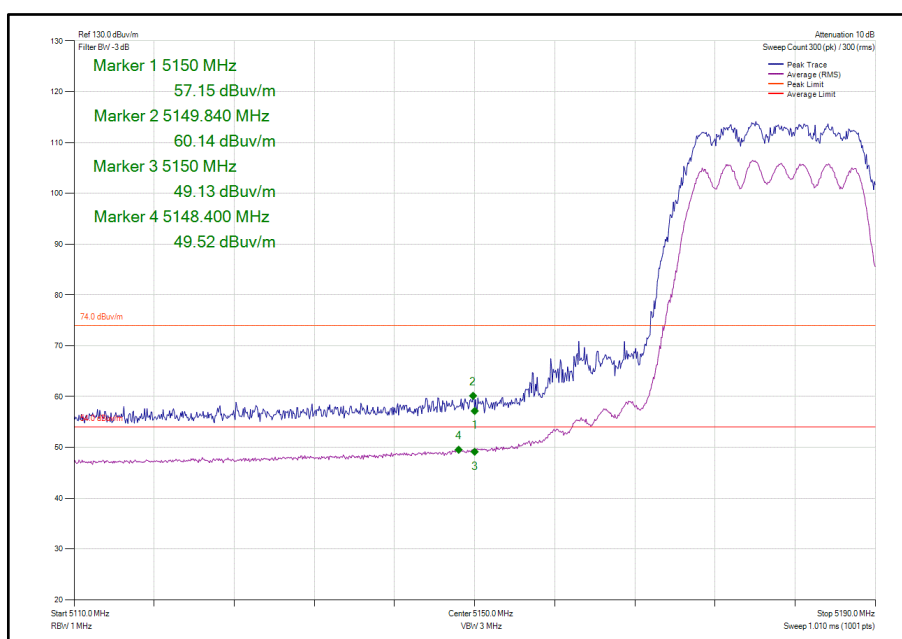
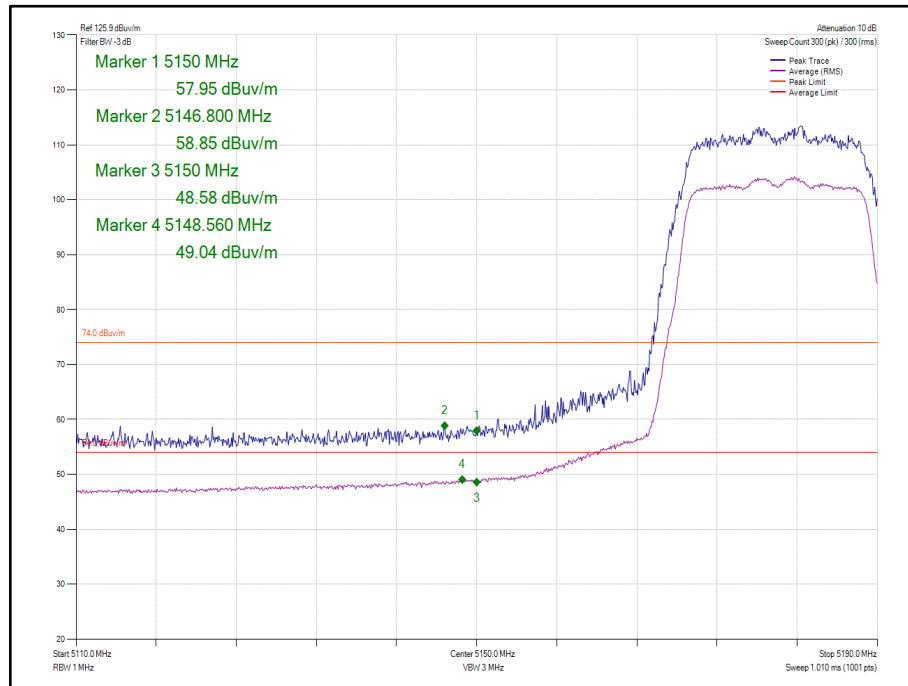
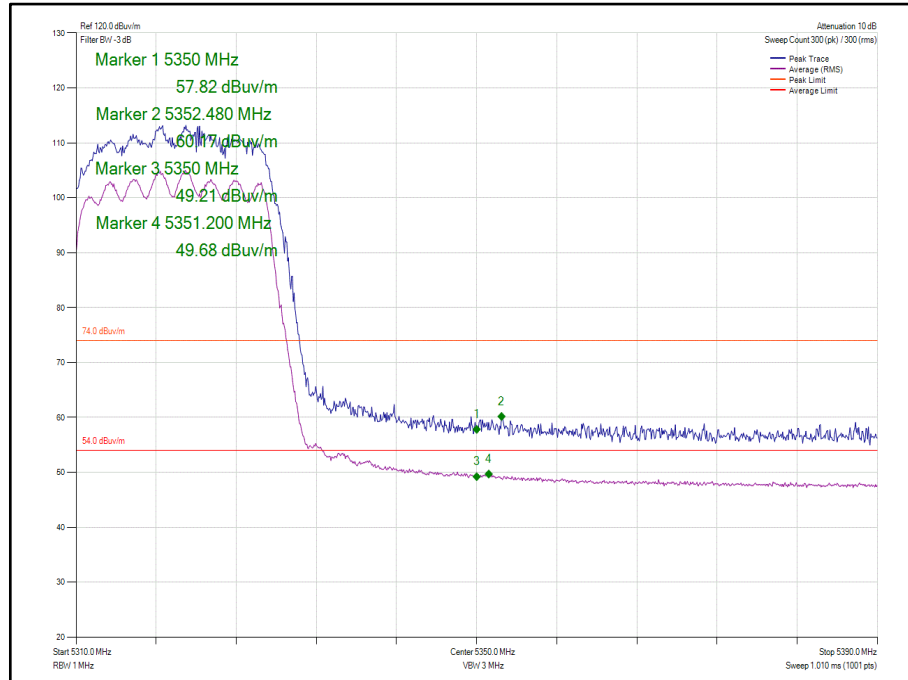


Figure 425 - 802.11n HT20 CDD Cores 0-1 - 5180 MHz
Band Edge Frequency 5150 MHz



**Figure 426 - 802.11n HT20 SDM Cores 0-1 - 5180 MHz
Band Edge Frequency 5150 MHz**



**Figure 427 - 802.11n HT20 CDD Cores 0-1 - 5320 MHz
Band Edge Frequency 5350 MHz**

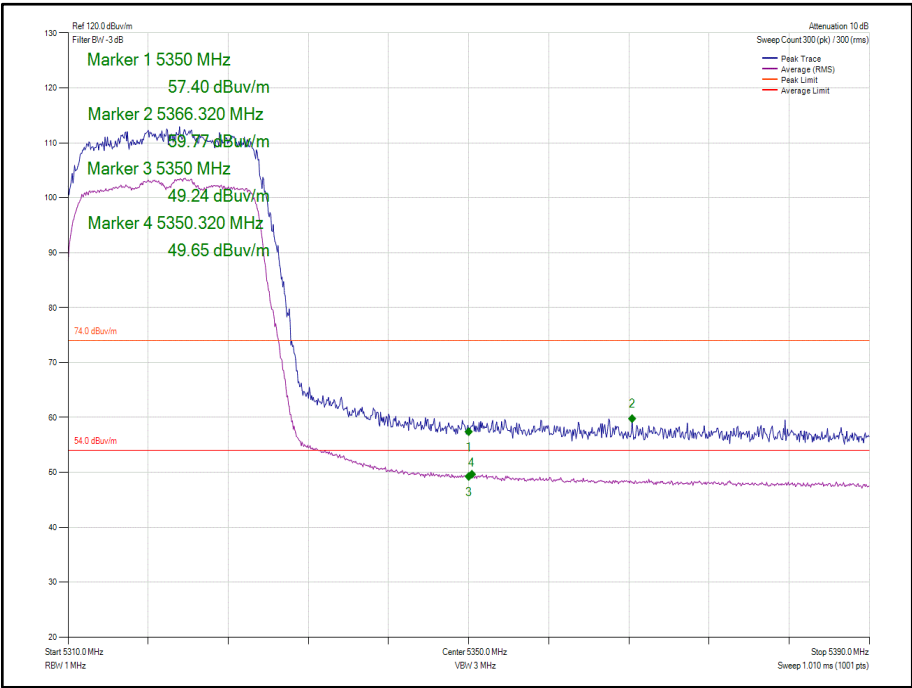


Figure 428 - 802.11n HT20 SDM Cores 0-1 - 5320 MHz
Band Edge Frequency 5350 MHz

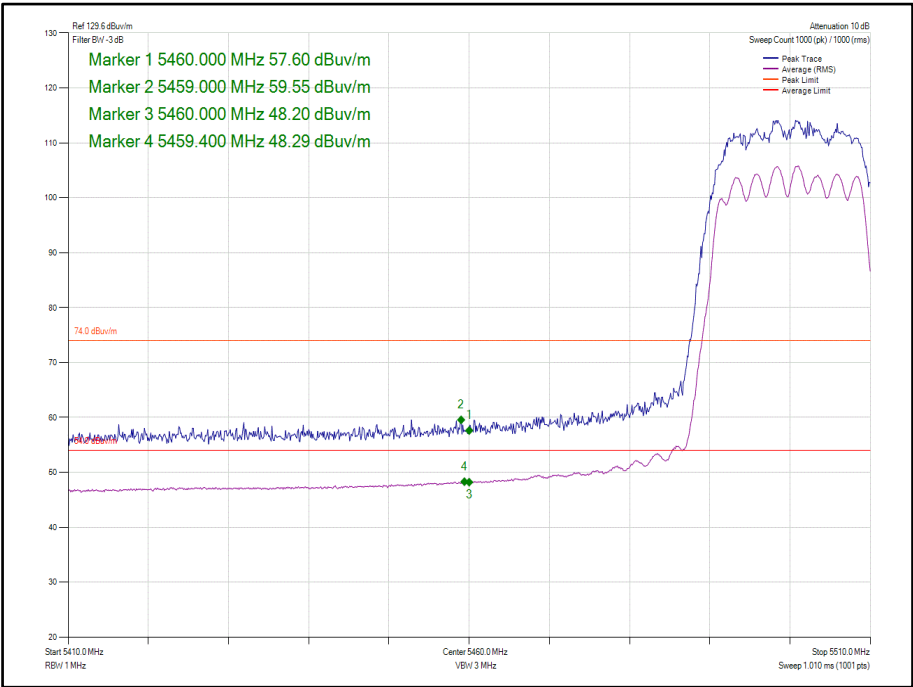


Figure 429 - 802.11n HT20 CDD Cores 0-1 - 5500 MHz
Band Edge Frequency 5460 MHz

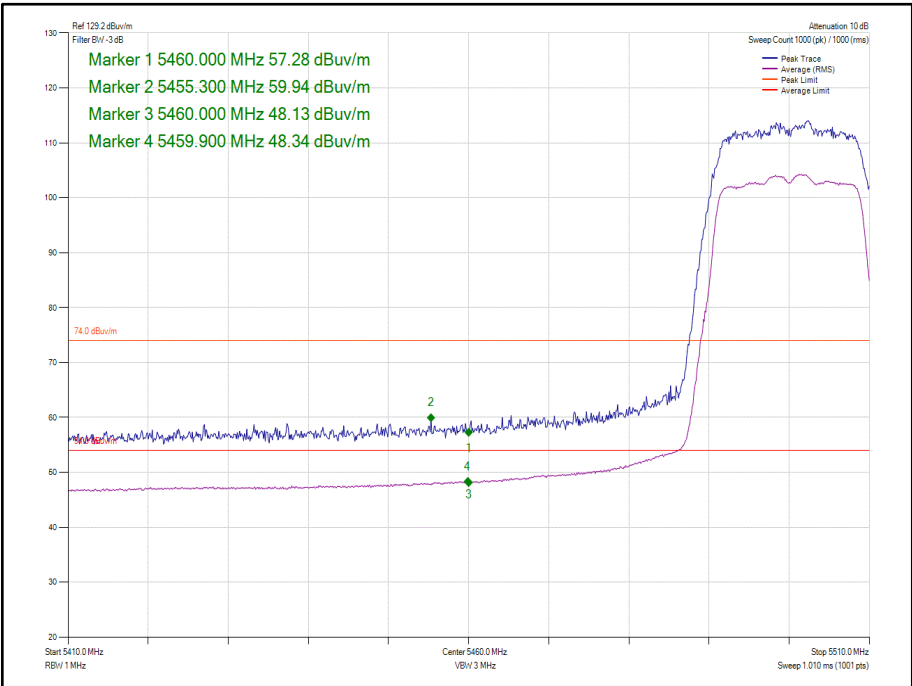


Figure 430 - 802.11n HT20 SDM Cores 0-1 - 5500 MHz
Band Edge Frequency 5460 MHz



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11n HT40 Core 1	MCS0	5190	5150	61.90	51.34
802.11n HT40 Core 1	MCS0	5310	5350	60.17	49.73
802.11n HT40 Core 1	MCS0	5510	5460	59.30	47.3

Table 218 - SISO

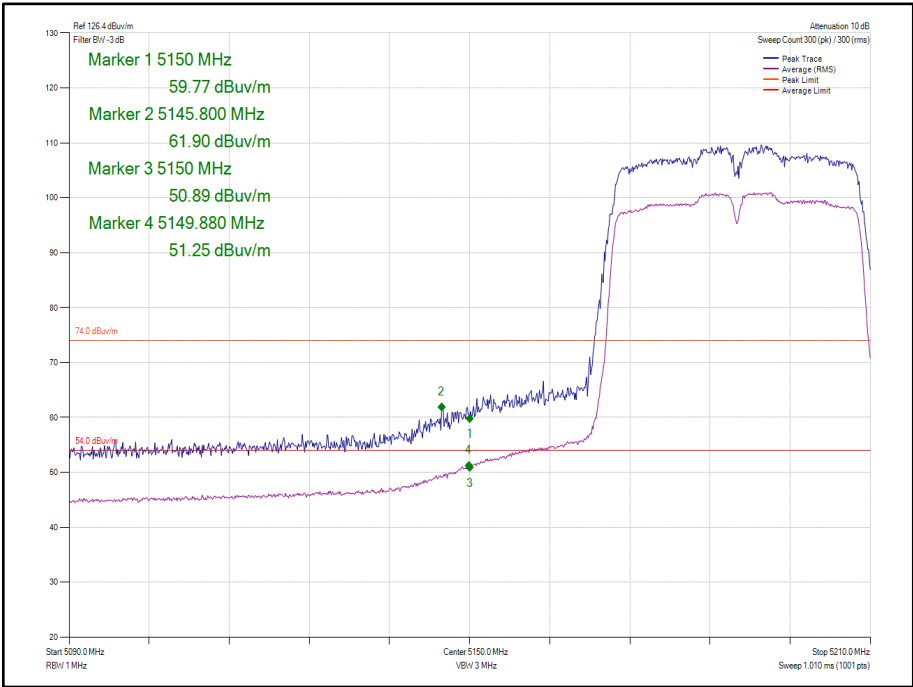


Figure 431 - 802.11n HT40 Core 1 - 5190 MHz
Band Edge Frequency 5150 MHz

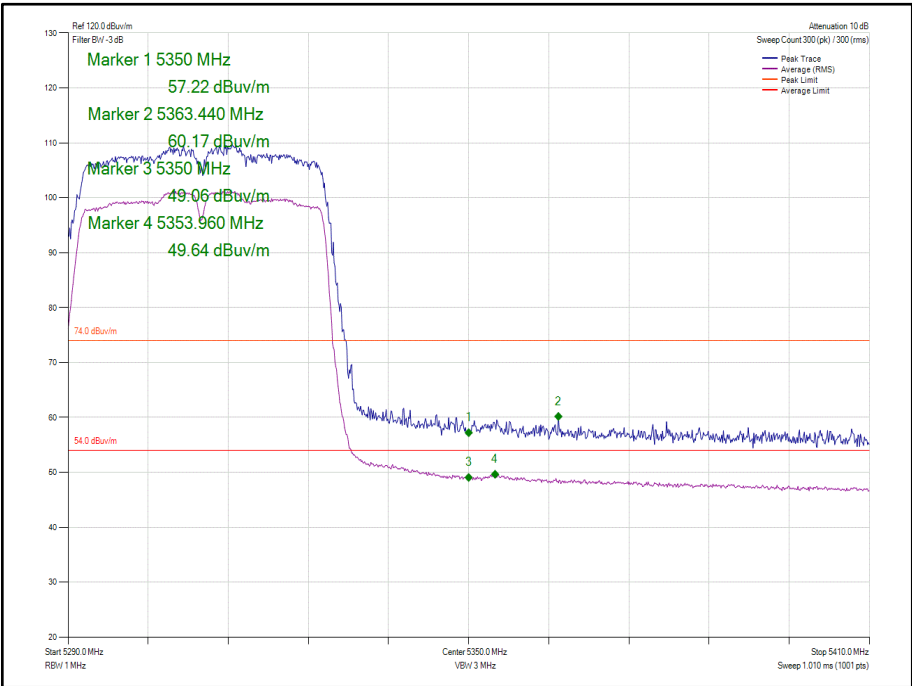


Figure 432 - 802.11n HT40 Core 1 - 5310 MHz
Band Edge Frequency 5350 MHz

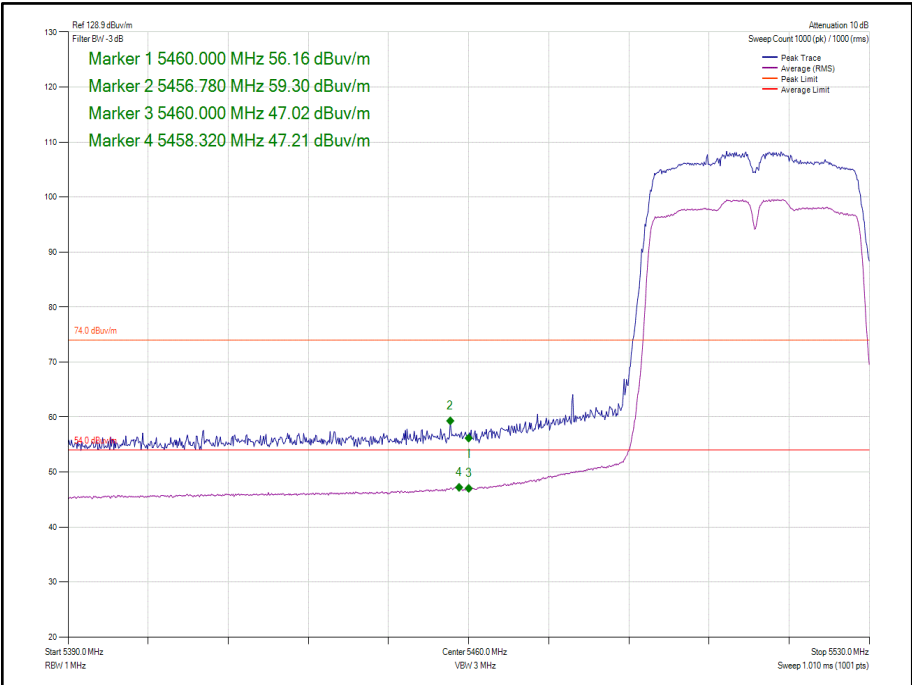


Figure 433 - 802.11n HT40 Core 1 - 5510 MHz
Band Edge Frequency 5460 MHz

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11n HT40 CDD Cores 0-1	MCS0	5190	5150	62.27	51.24
802.11n HT40 SDM Cores 0-1	MCS0	5190	5150	62.28	51.41
802.11n HT40 CDD Cores 0-1	MCS0	5310	5350	60.39	49.64
802.11n HT40 SDM Cores 0-1	MCS0	5310	5350	60.23	49.69
802.11n HT40 CDD Cores 0-1	MCS0	5510	5460	59.56	48.8
802.11n HT40 SDM Cores 0-1	MCS0	5510	5460	59.75	48.71

Table 219 – MIMO 2TX

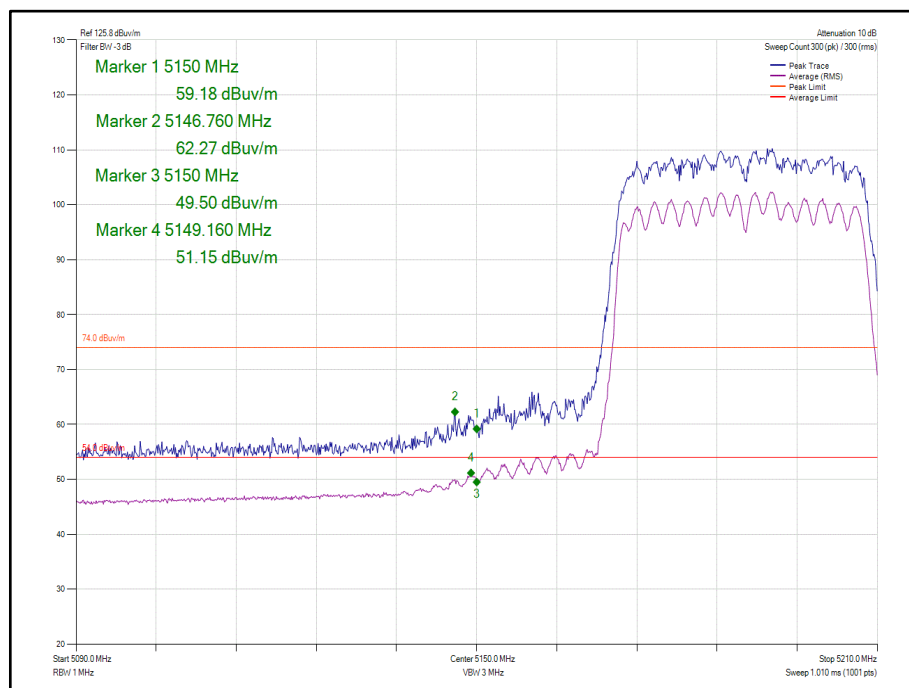
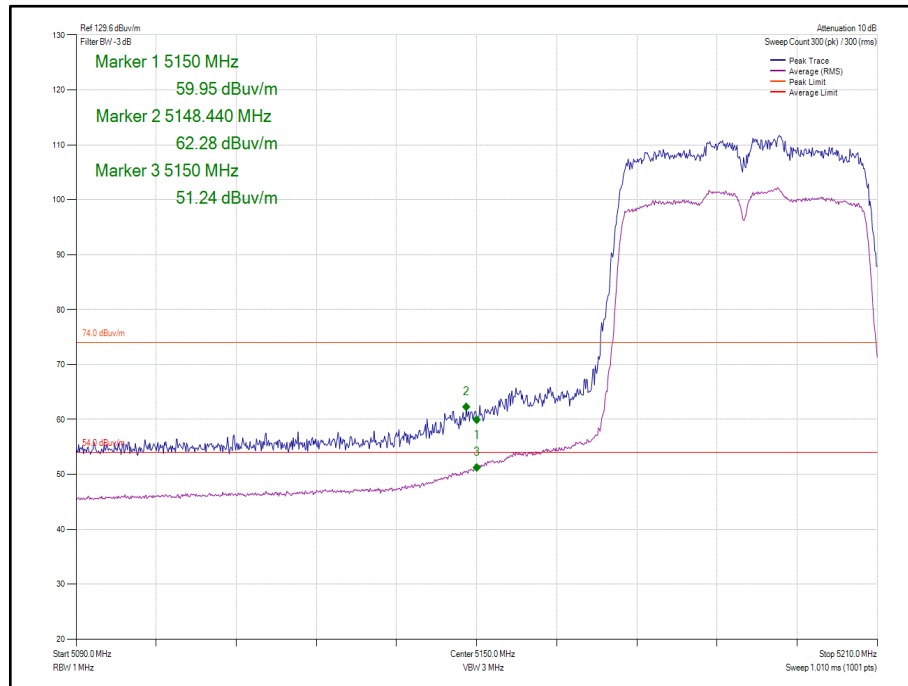
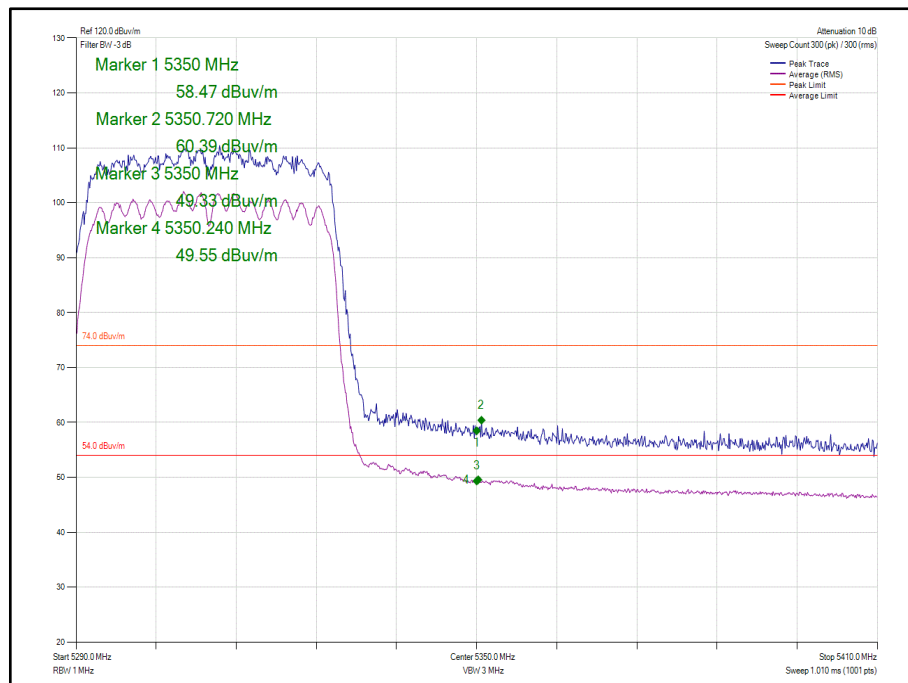


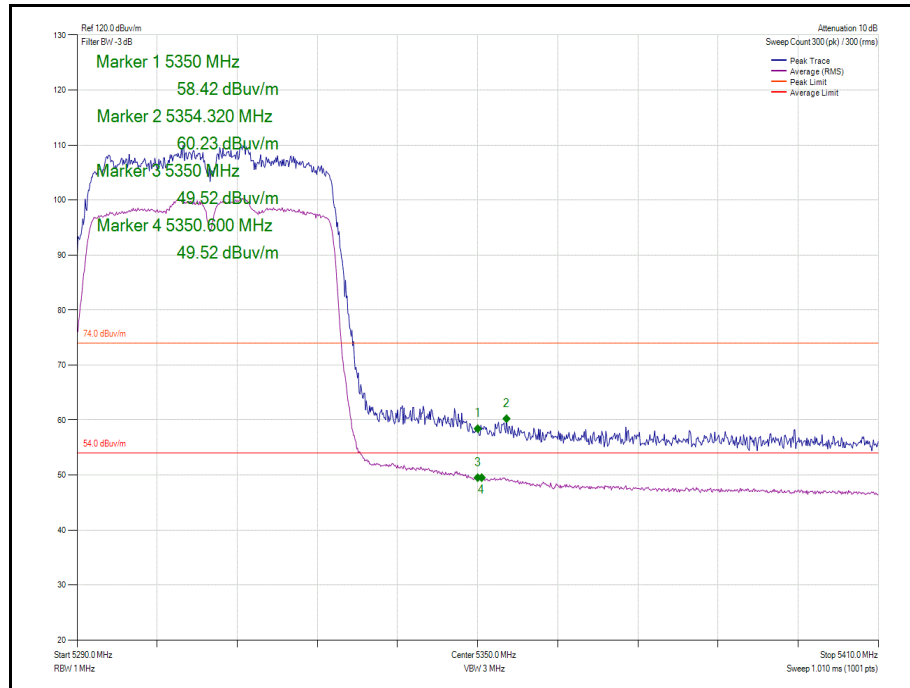
Figure 434 - 802.11n HT40 CDD Cores 0-1 - 5190 MHz
Band Edge Frequency 5150 MHz



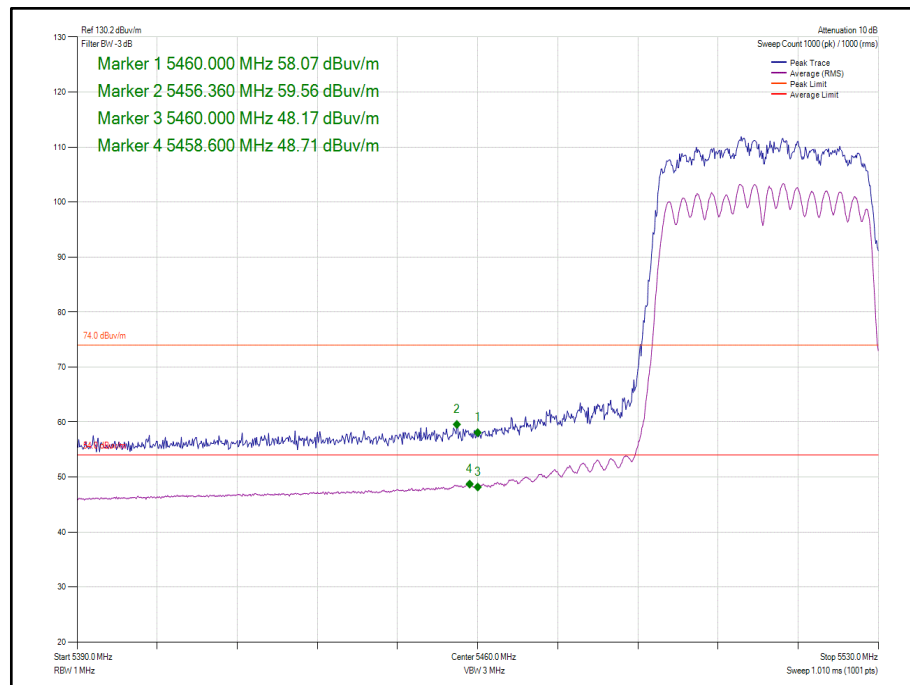
**Figure 435 - 802.11n HT40 SDM Cores 0-1 - 5190 MHz
Band Edge Frequency 5150 MHz**



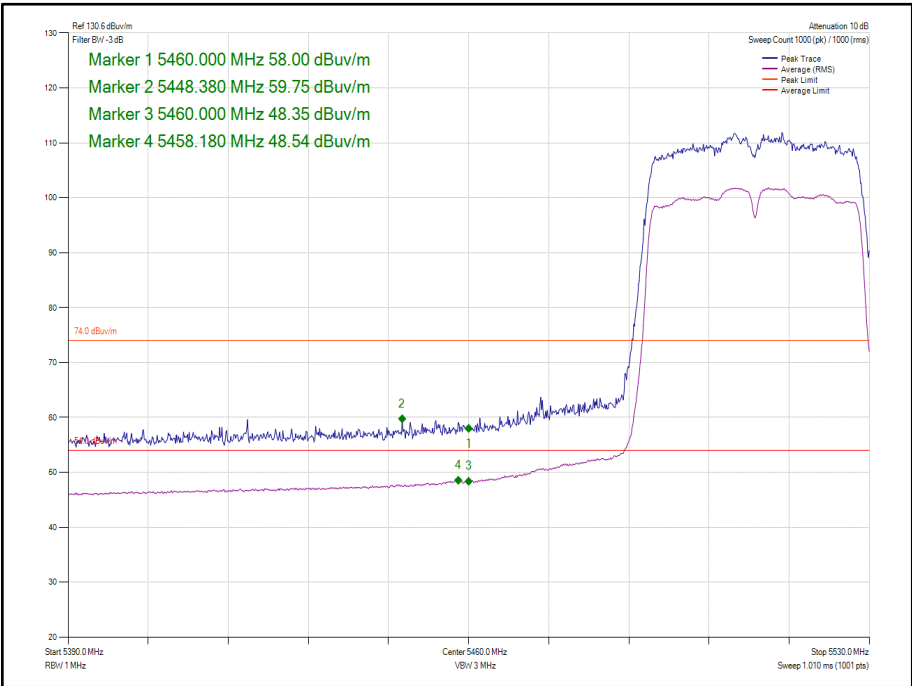
**Figure 436 - 802.11n HT40 CDD Cores 0-1 - 5310 MHz
Band Edge Frequency 5350 MHz**



**Figure 437 - 802.11n HT40 SDM Cores 0-1 - 5310 MHz
Band Edge Frequency 5350 MHz**



**Figure 438 - 802.11n HT40 CDD Cores 0-1 - 5510 MHz
Band Edge Frequency 5460 MHz**



**Figure 439 - 802.11n HT40 SDM Cores 0-1 - 5510 MHz
Band Edge Frequency 5460 MHz**



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11ac VHT80 Core 1	MCS0	5210	5150	58.77	48.05
802.11ac VHT80 Core 1	MCS0	5290	5350	61.07	51.02
802.11ac VHT80 Core 1	MCS0	5530	5460	58.08	48.29

Table 220 - SISO

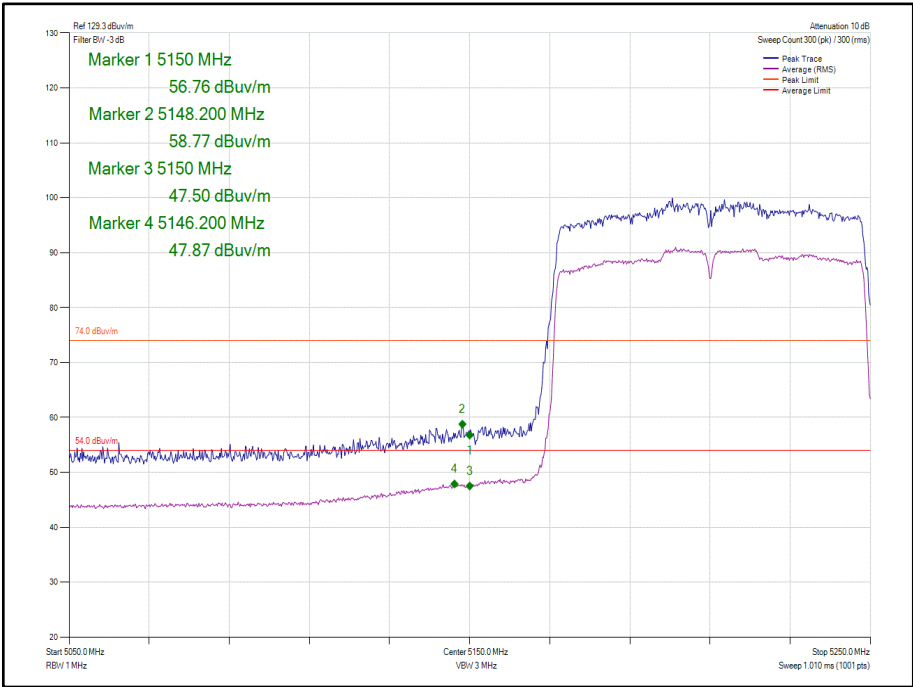
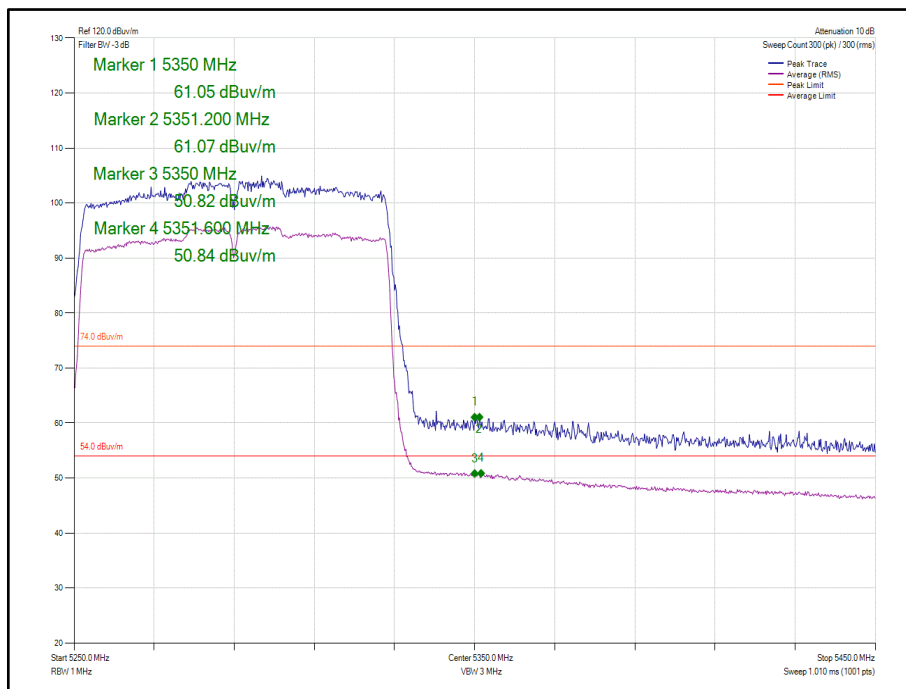
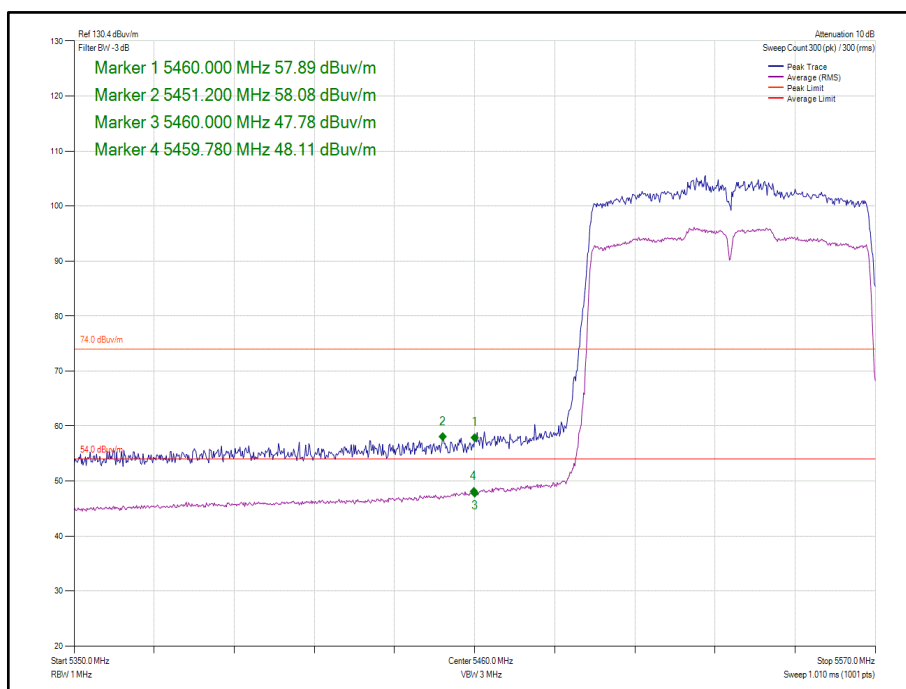


Figure 440 - 802.11ac VHT80 Core 1 - 5210 MHz
Band Edge Frequency 5150 MHz



**Figure 441 - 802.11ac VHT80 Core 1 - 5290 MHz
Band Edge Frequency 5350 MHz**



**Figure 442 - 802.11ac VHT80 Core 1 - 5530 MHz
Band Edge Frequency 5460 MHz**



Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11ac VHT80 CDD Cores 0-1	MCS0	5210	5150	59.76	48.98
802.11ac VHT80 SDM Cores 0-1	MCS0	5210	5150	59.41	48.57
802.11ac VHT80 CDD Cores 0-1	MCS0	5290	5350	61.13	51.29
802.11ac VHT80 SDM Cores 0-1	MCS0	5290	5350	60.93	50.82
802.11ac VHT80 CDD Cores 0-1	MCS0	5530	5460	60.23	50.26
802.11ac VHT80 SDM Cores 0-1	MCS0	5530	5460	60.08	50.25

Table 221 – MIMO 2TX

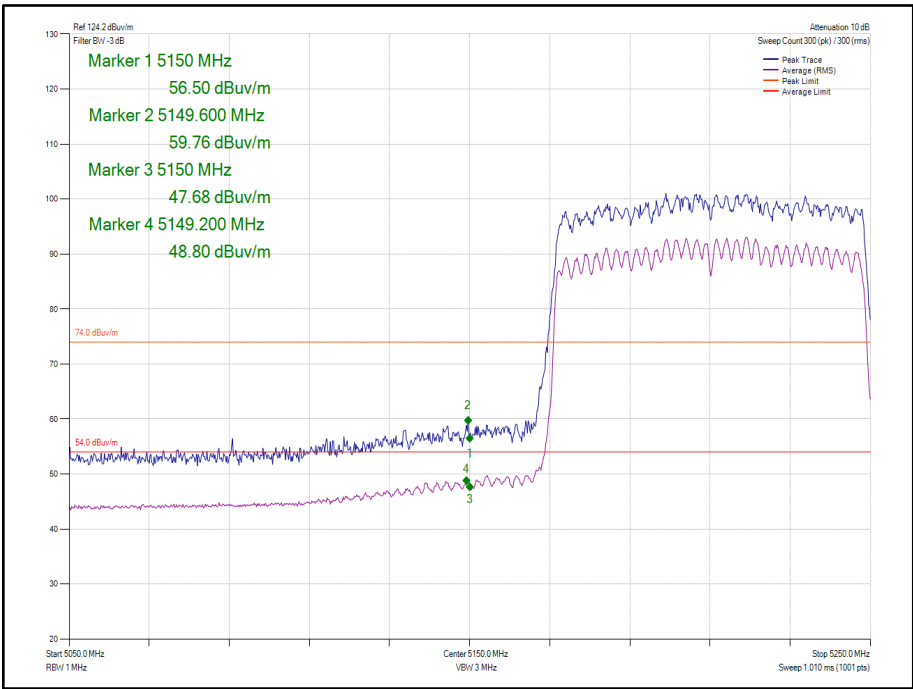


Figure 443 - 802.11ac VHT80 CDD Cores 0-1- 5210 MHz
Band Edge Frequency 5150 MHz

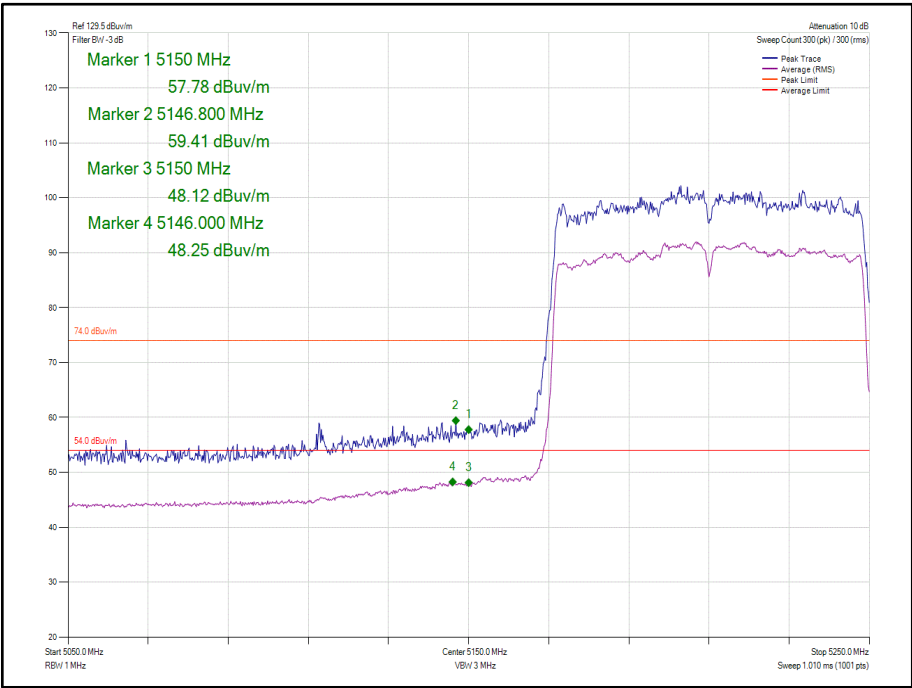


Figure 444 - 802.11ac VHT80 SDM Cores 0-1- 5210 MHz
Band Edge Frequency 5150 MHz

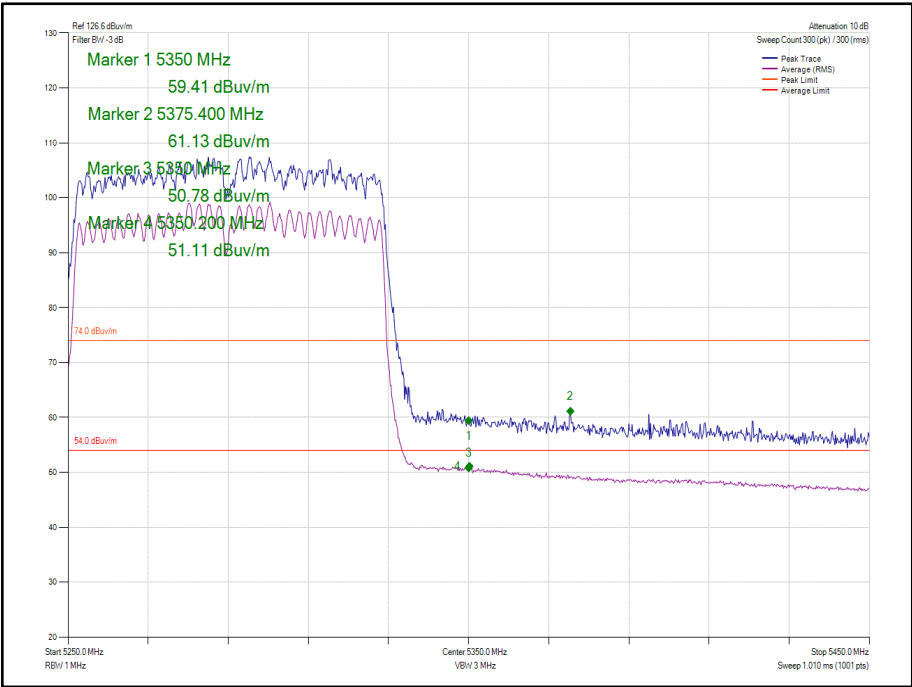
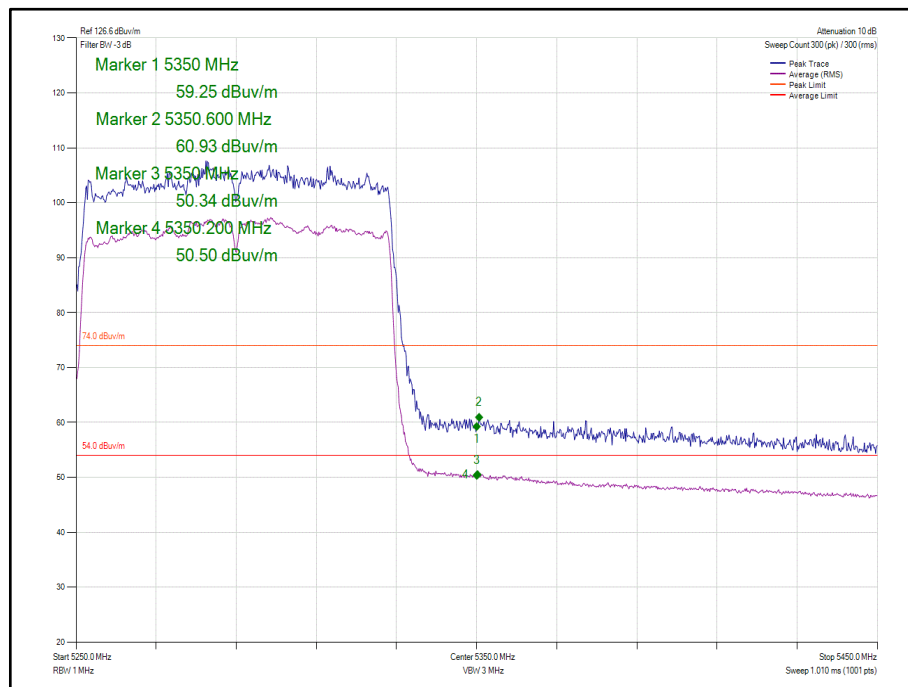
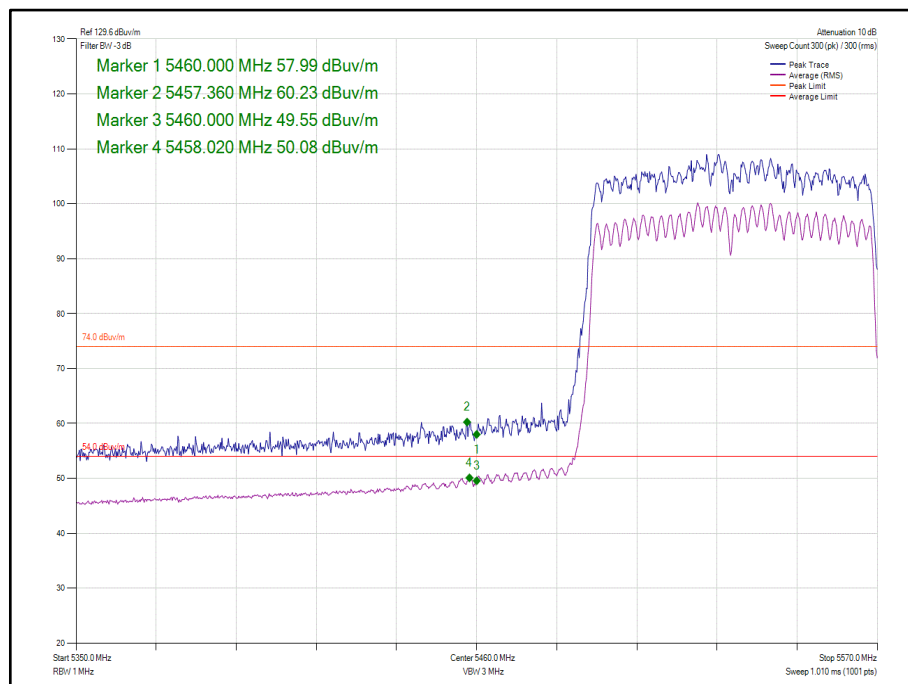


Figure 445 - 802.11ac VHT80 CDD Cores 0-1- 5290 MHz
Band Edge Frequency 5350 MHz



**Figure 446 - 802.11ac VHT80 SDM Cores 0-1- 5290 MHz
Band Edge Frequency 5350 MHz**



**Figure 447 - 802.11ac VHT80 CDD Cores 0-1- 5530 MHz
Band Edge Frequency 5460 MHz**

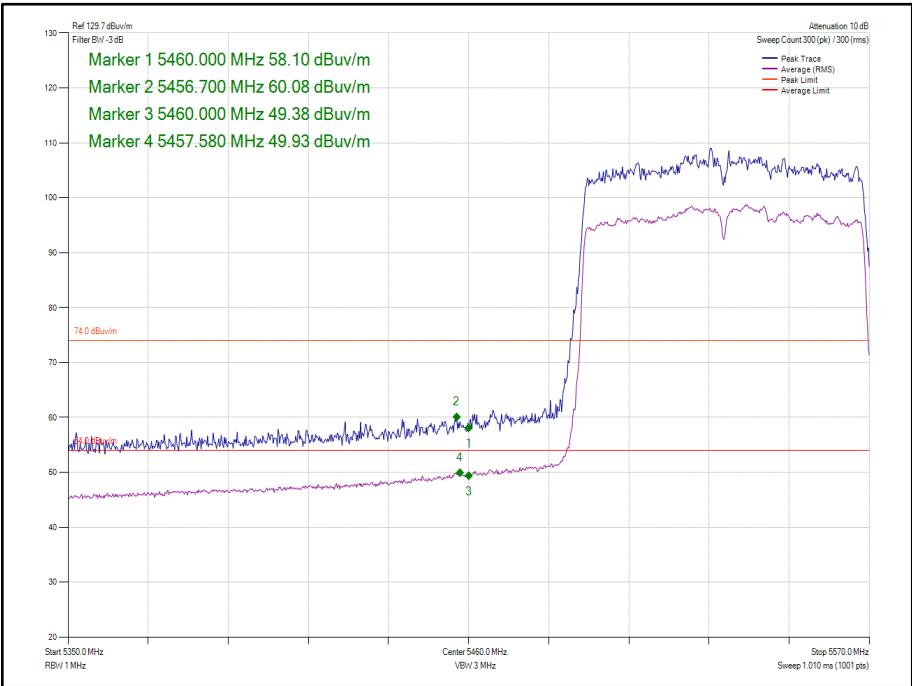


Figure 448 - 802.11ac VHT80 SDM Cores 0-1- 5530 MHz
Band Edge Frequency 5460 MHz

FCC 47 CFR Part 15, Limit Clause 15.205 and ISEDC RSS-GEN Limit Clause 8.10

	Peak (dBµV/m)	Average (dBµV/m)
Restricted Bands of Operation	73.98	53.98

Table 222 - Restricted Band Edge Limit Table



2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
10dB/1W SMA Attenuator dc - 18GHz	Sealectro	60-674-1010-89	395	-	O/P Mon
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	14-Nov-2020
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	11-Dec-2019*
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
Hygrometer	Rotronic	HP21	4989	12	02-May-2020
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	28-Nov-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5095	12	04-Dec-2019*
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5104	12	09-Dec-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5105	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5107	12	06-Oct-2020
EmX Emissions Software	TUV SUD	EmX, V.V1.5.2	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	01-Nov-2021
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	30-Aug-2020
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	11-Mar-2020
Pre Amp 1 – 26.5 GHz	Agilent Technologies	8449B	5445	-	O/P Mon

Table 223

TU – Traceability Unscheduled

O/P Mon – Output monitored using calibrated equipment.

*As testing was performed over multiple days it may appear that some equipment was used outside of a valid calibration period, however, TUV SUD confirms that when equipment was used it held a valid calibration and has records of this.



2.6 Spurious Radiated Emissions

2.6.1 Specification Reference

FCC 47 CFR Part 15E, Clause 15.407 (b), 15.205 and 15.209
ISED RSS-247, Clause 6.2

2.6.2 Equipment Under Test and Modification State

A2179, S/N: C02ZC00WM8M5 - Modification State 0
A2179, S/N: C02ZD00FM8MC - Modification State 0

2.6.3 Date of Test

19-November-2019 to 16-December-2019

2.6.4 Test Method

Testing was performed in accordance with ANSI C63.10 clause 6.3, 6.5 and 6.6.

Tests were performed in HT20 CDD in 2TX MIMO mode, with measurements undertaken from 30MHz to 40GHz, on channel 36 (5180MHz) and channel 165 (5825MHz). For the purpose of this testing, spurious emissions were limited to 1GHz to 40GHz on all other test channels.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 12.7.7.2 with max-hold trace to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (approx. 54/74 dBuV/m @ 3m and 64/84 dBuV/m @ 1m) when compared to -27 dBm/MHz EIRP outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBuV/m to uV/m:
 $10^{((\text{Field Strength in dBuV/m})/20)}$

EIRP was converted to field strength at 3m using the following formula:
 $\text{Field Strength (dBuV/m at 3m)} = \text{EIRP (dBm)} + 95.2 \text{ dB}$

2.6.5 Environmental Conditions

Ambient Temperature	21.0 to 23.2 °C
Relative Humidity	25.2 to 56.2 %



2.6.6 Test Results

5 GHz WLAN

Testing was performed with the device operating at maximum output power, HT20 CDD MIMO 2TX, as this was deemed to be worst case.

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
31.5	35.6	40.0	4.4	QP	192	324	Horizontal	-
32.1	32.2	40.0	7.8	QP	272	400	Vertical	-
33.4	30.5	40.0	9.5	QP	350	109	Vertical	-
66.7	31.3	40.0	8.7	QP	201	352	Horizontal	-
180.3	27.7	43.5	15.8	QP	345	172	Horizontal	-
184.6	19.6	43.5	23.9	QP	0	106	Vertical	-
199.1	23.6	43.5	19.9	QP	211	400	Horizontal	-
252.3	30.7	46.0	15.3	QP	15	107	Horizontal	-
270.3	29.0	46.0	17.0	QP	3	106	Horizontal	-
288.4	34.2	46.0	11.8	QP	30	110	Horizontal	-

Table 224 –30 MHz to 1 GHz – Radiated

No other emissions were detected within 10 dB of the limit.

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
*								

Table 225 – 1 GHz to 40 GHz - Emissions Results

*No emissions were detected within 10 dB of the limit.

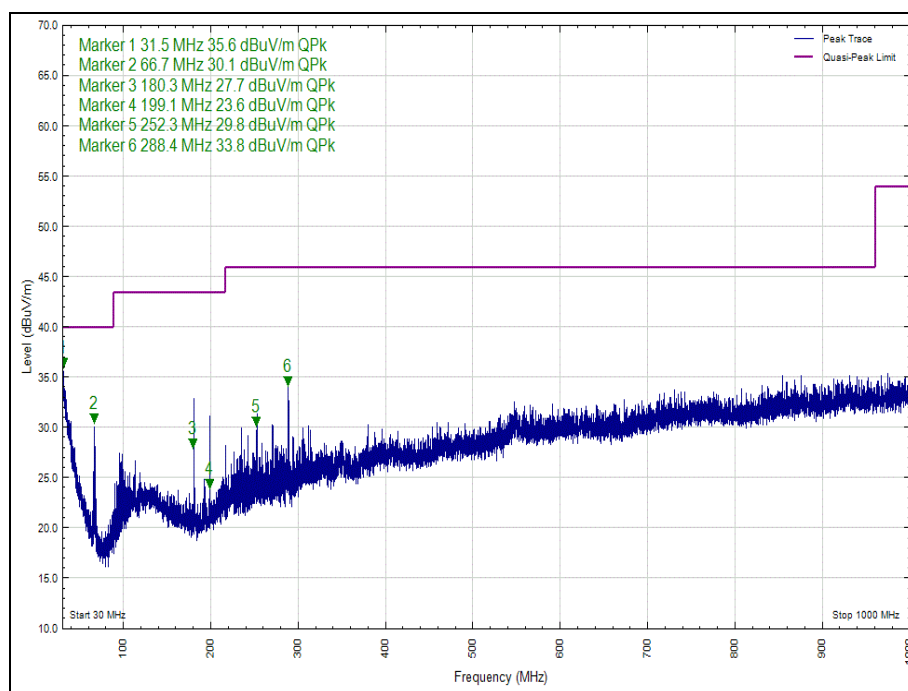


Figure 449 - U-NII 1 - 5180 MHz - 30 MHz to 1 GHz - Polarity: Horizontal (Peak)

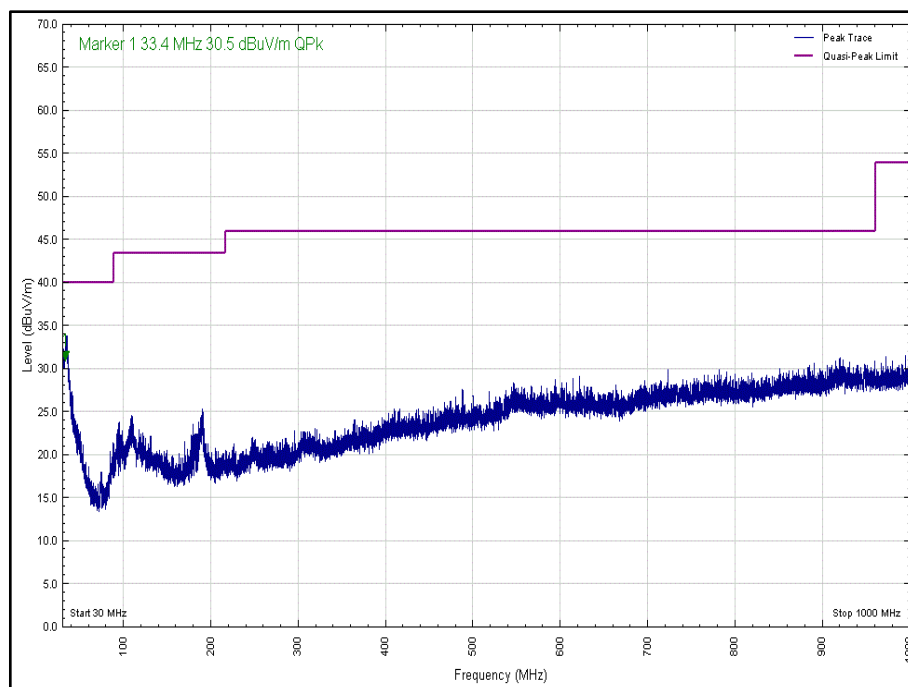


Figure 450 - U-NII 1 - 5180 MHz - 30 MHz to 1 GHz - Polarity: Vertical (Peak)

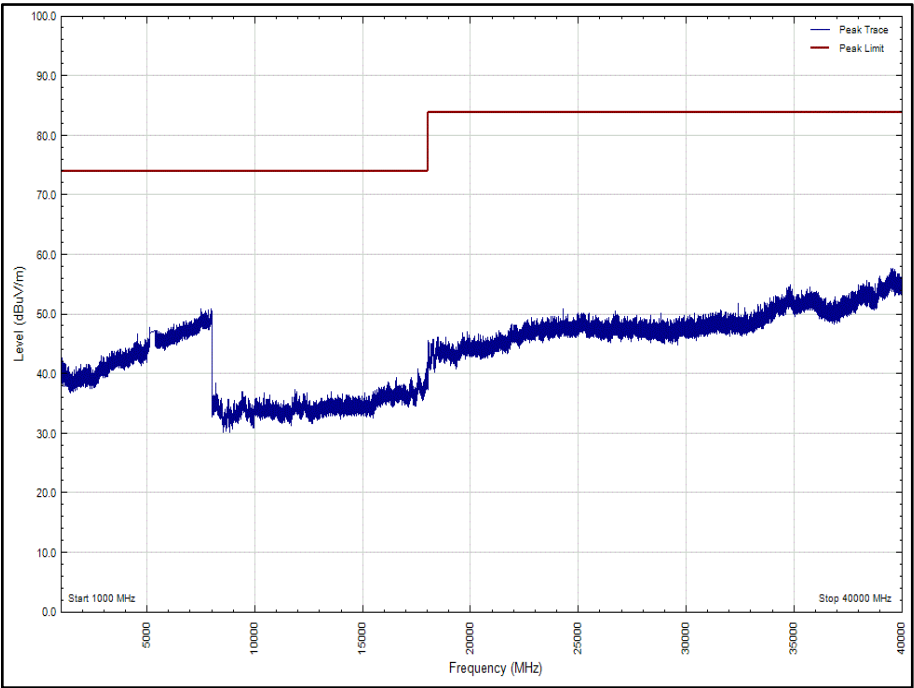


Figure 451 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

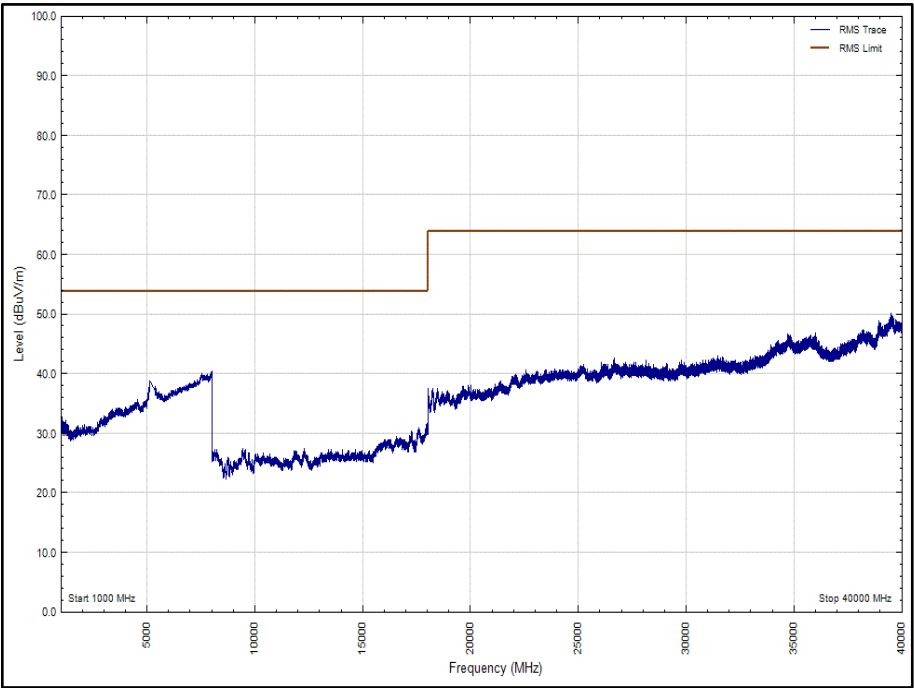


Figure 452 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

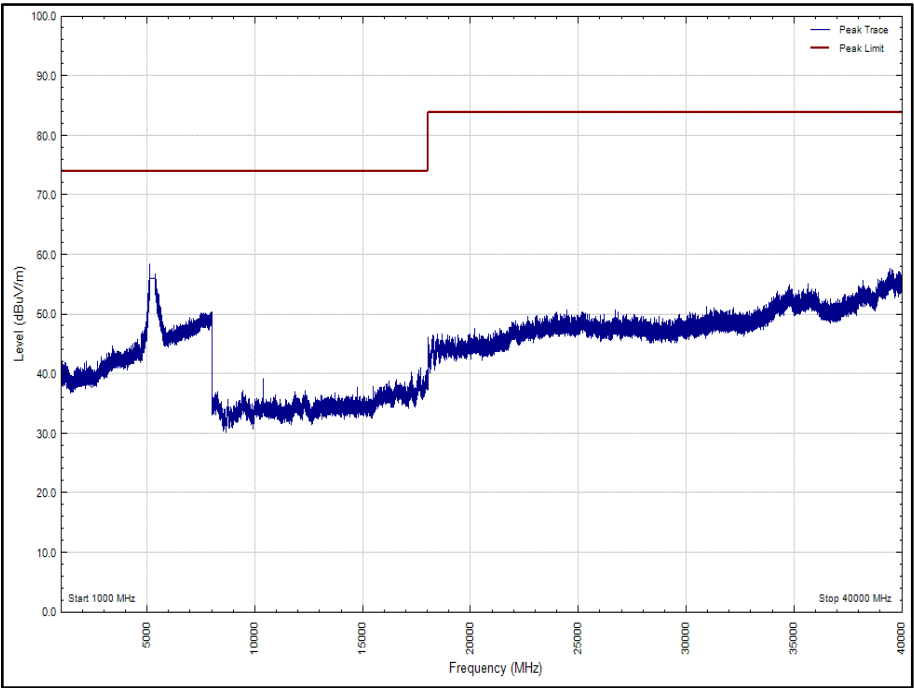


Figure 453 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

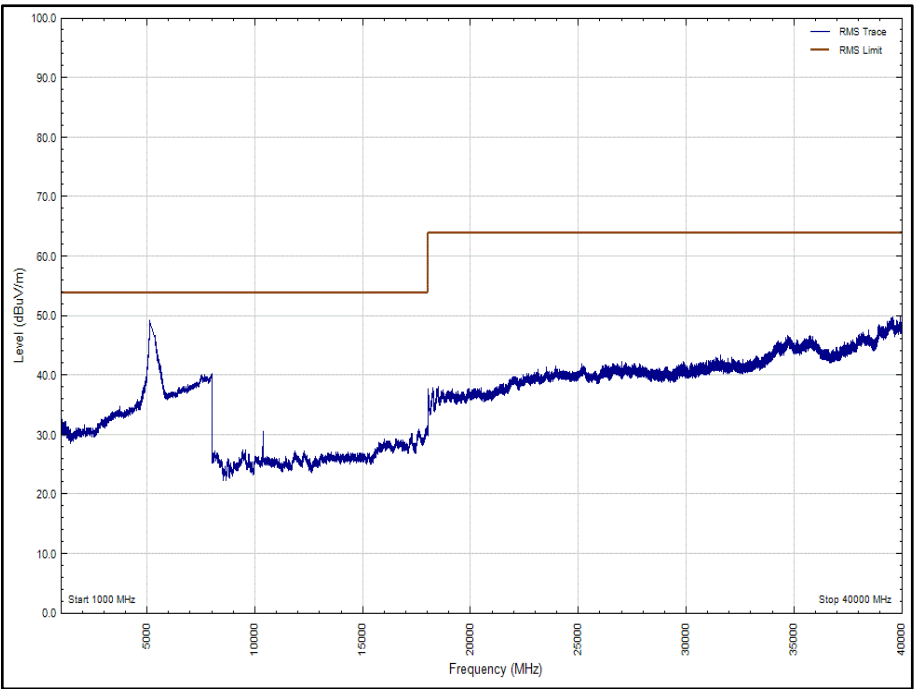


Figure 454 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)

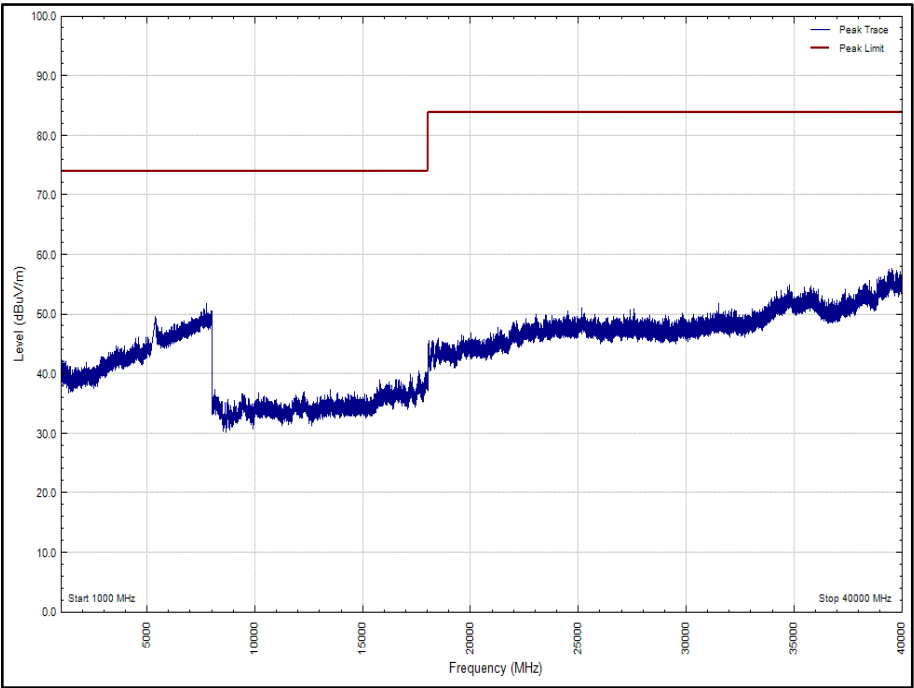


Figure 455 - U-NII 2a - 5320 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

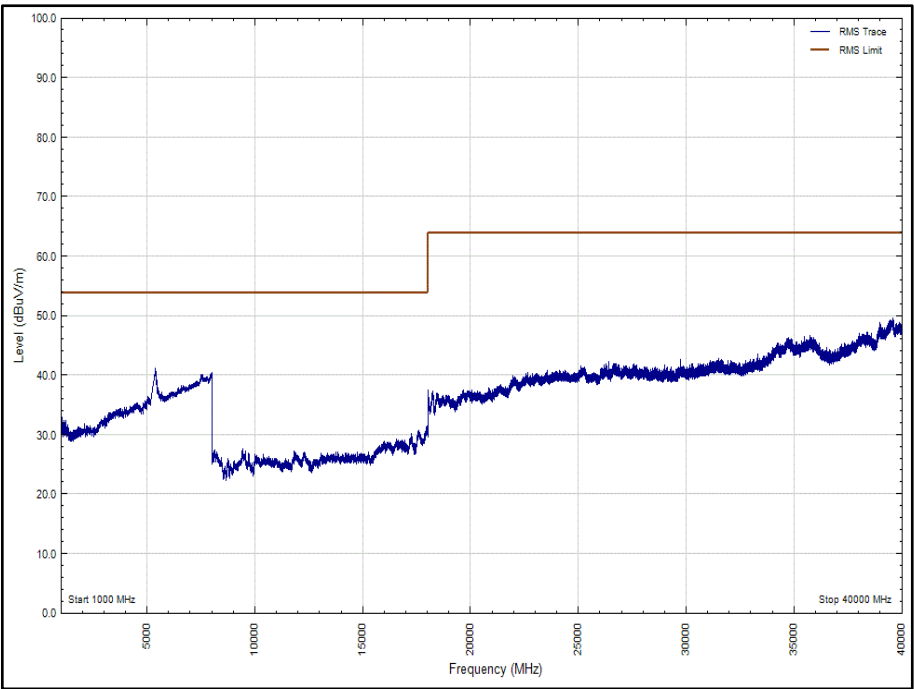


Figure 456 - U-NII 2a - 5320 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

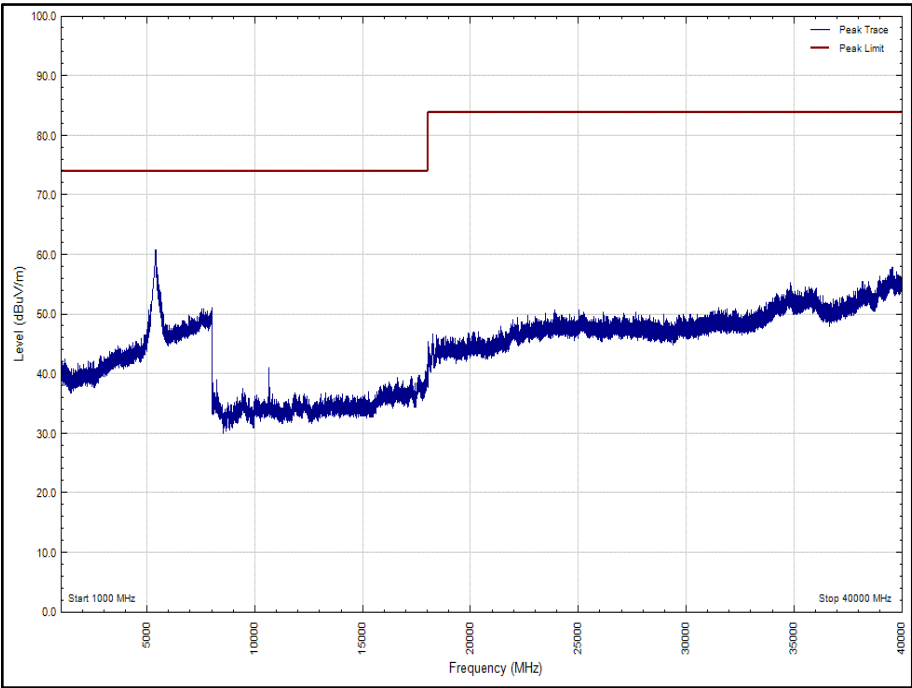


Figure 457 - U-NII 2a - 5320 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

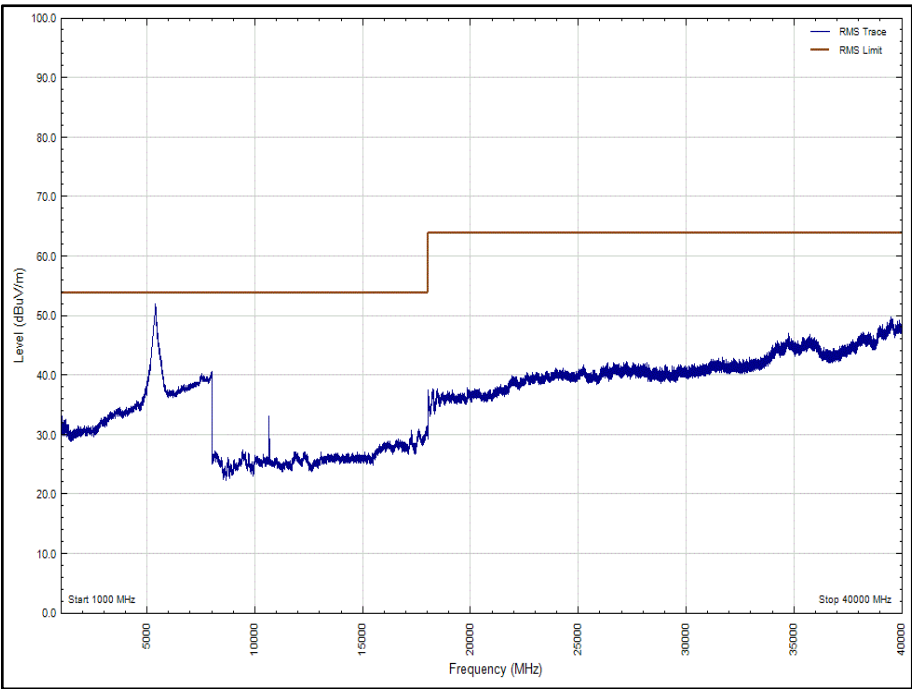


Figure 458 - U-NII 2a - 5320 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)

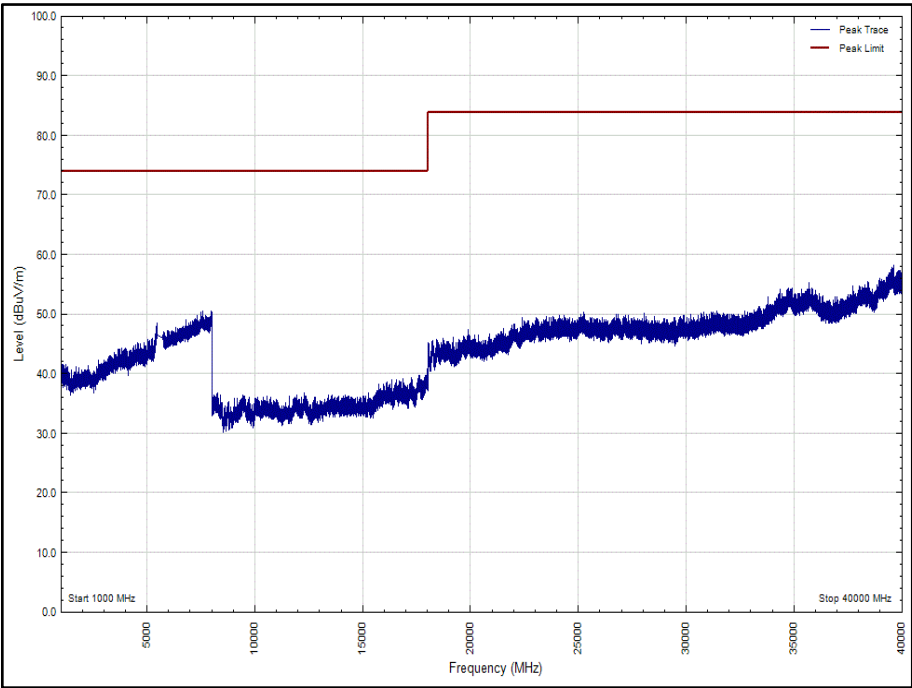


Figure 459 - U-NII 2c - 5500 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

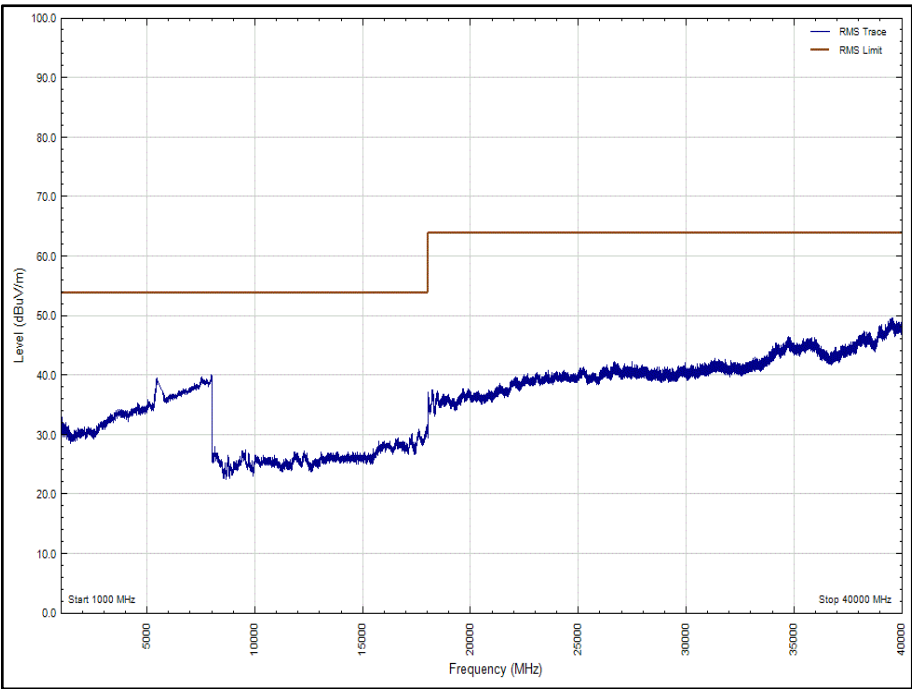


Figure 460 - U-NII 2c - 5500 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

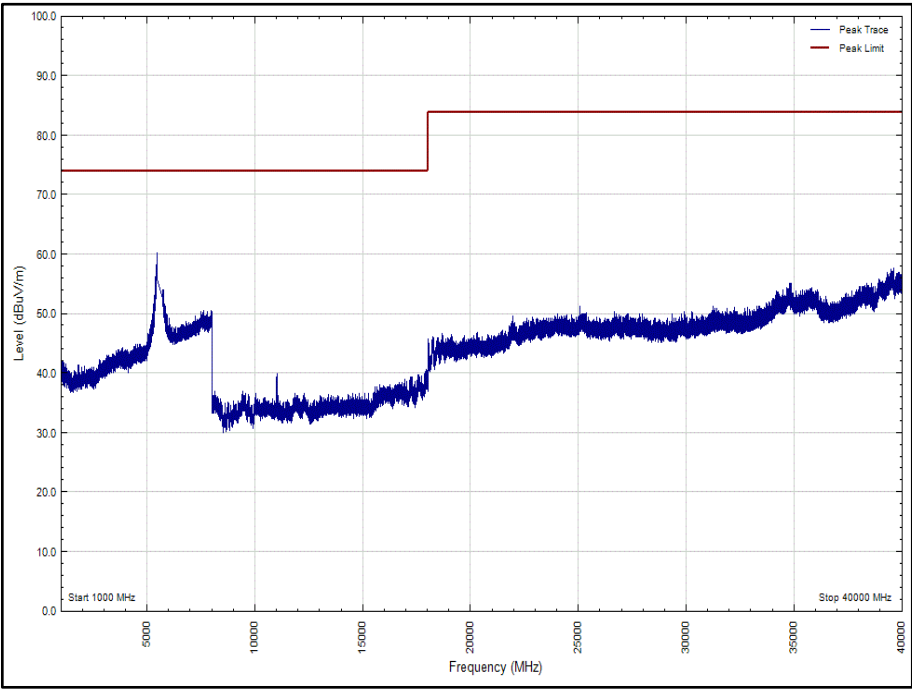


Figure 461 - U-NII 2c - 5500 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

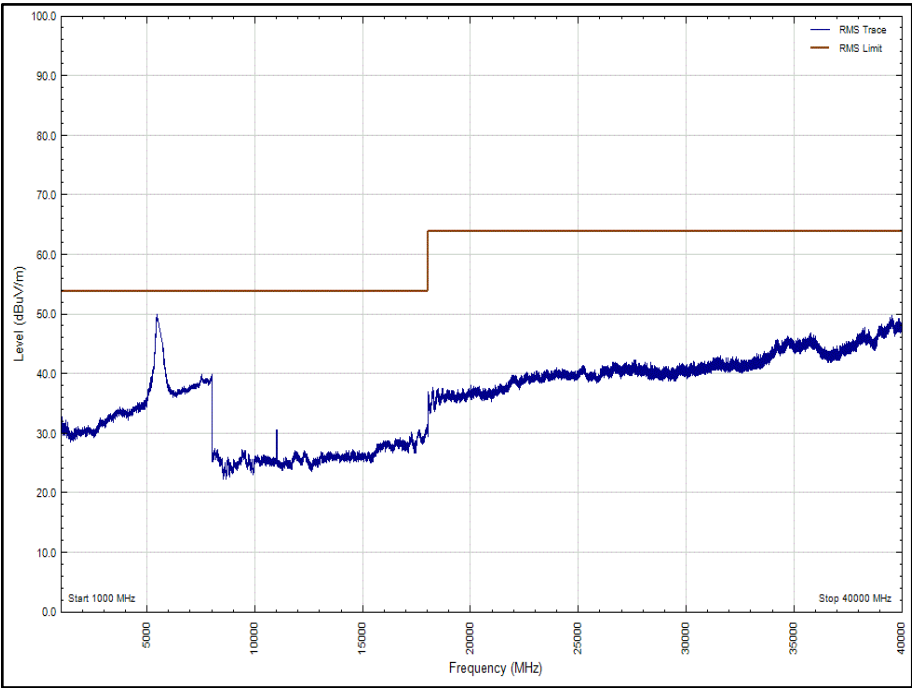


Figure 462 - U-NII 2c - 5500 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)

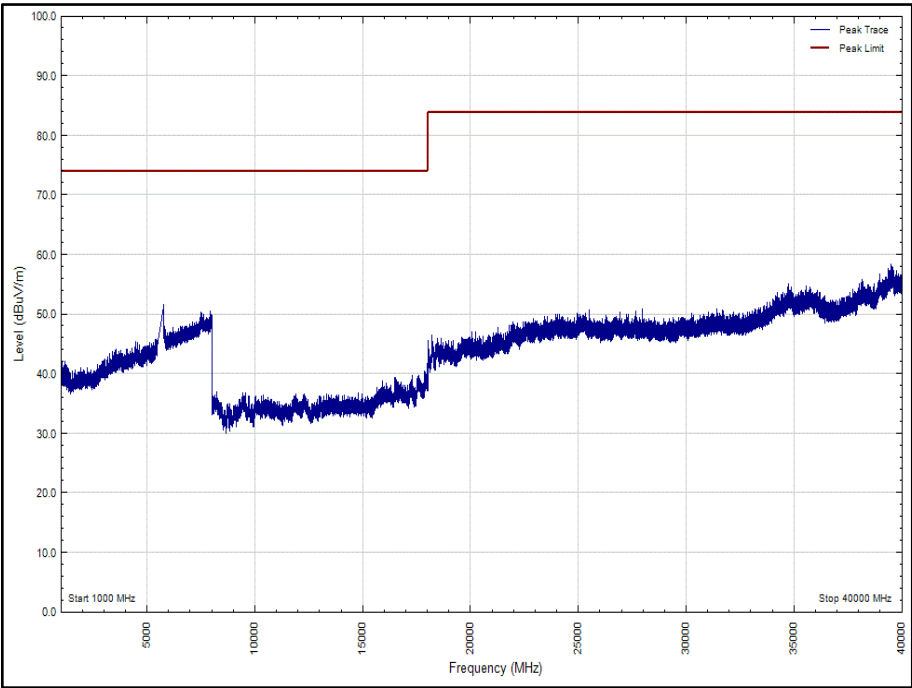


Figure 463 - U-NII 2c - 5700 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

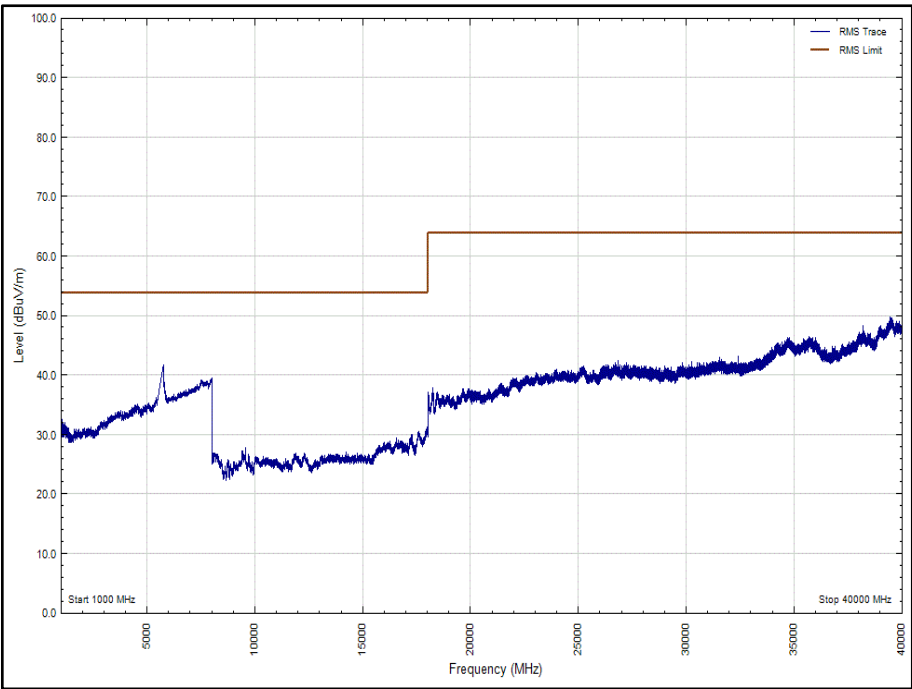


Figure 464 - U-NII 2c - 5700 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

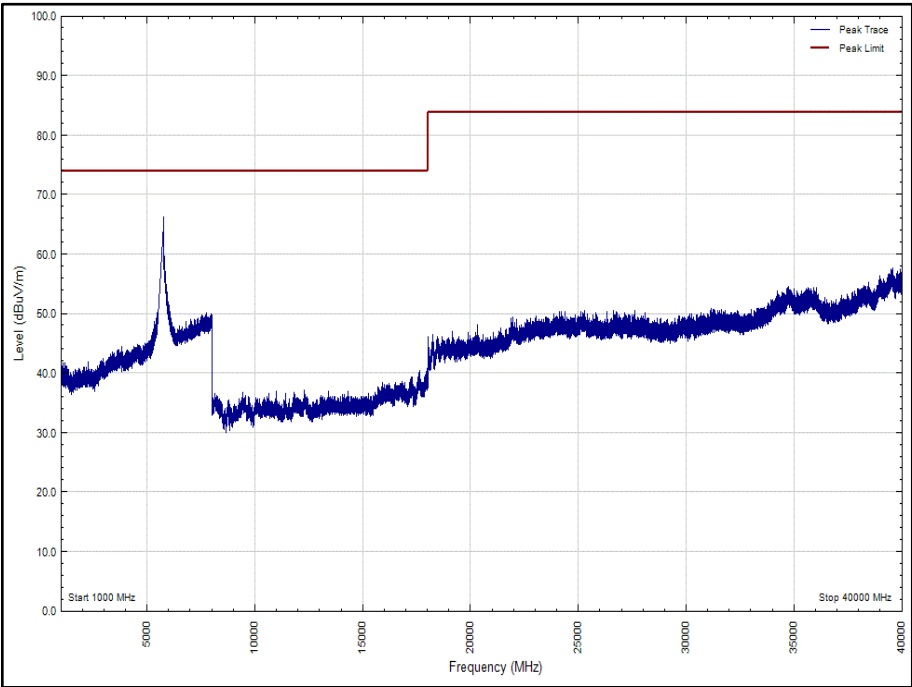


Figure 465 - U-NII 2c - 5700 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

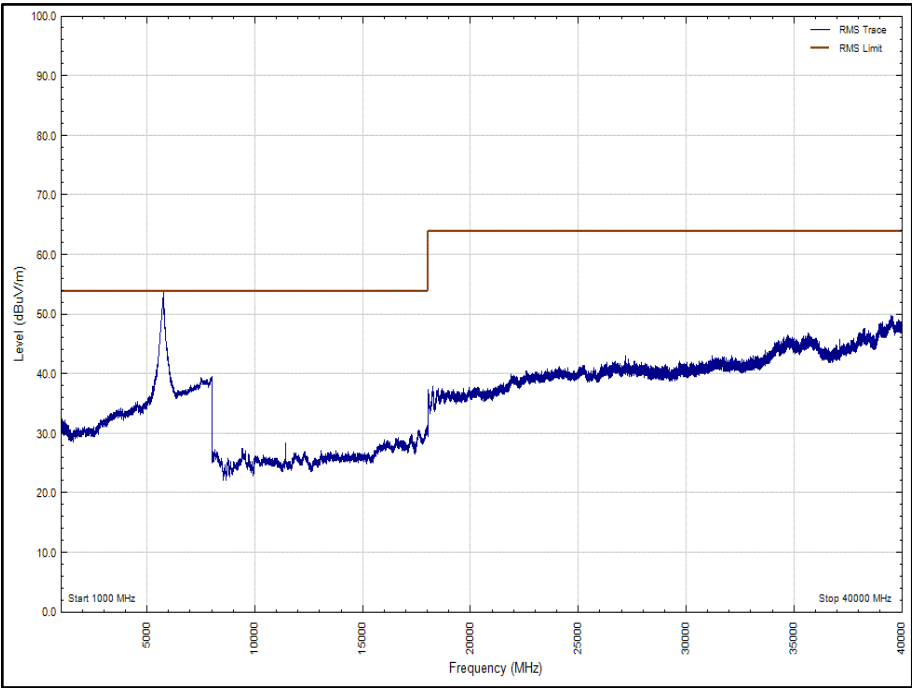


Figure 466 - U-NII 2c - 5700 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)

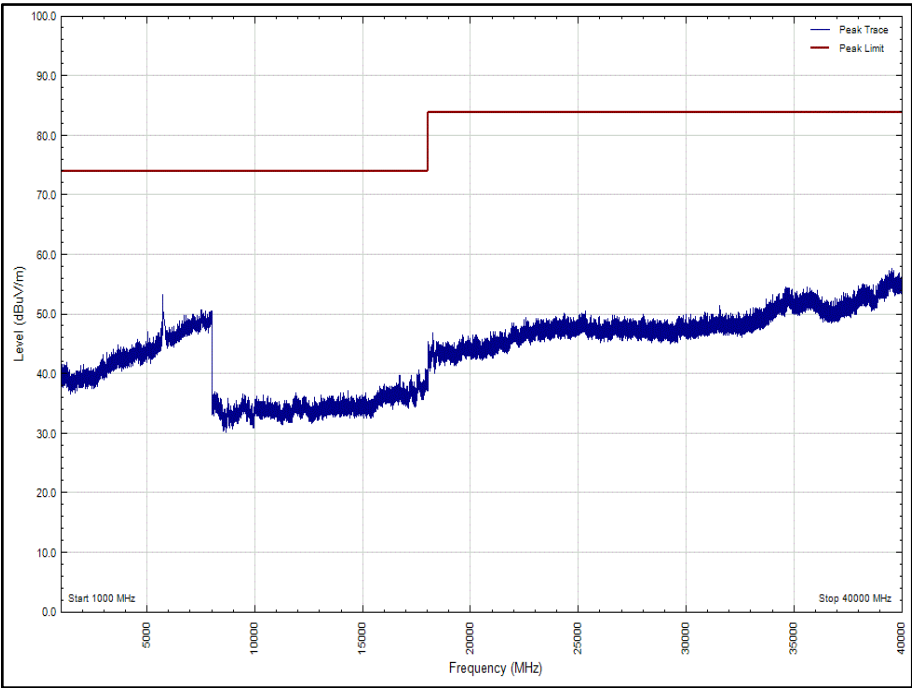


Figure 467 - U-NII 3 - 5745 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

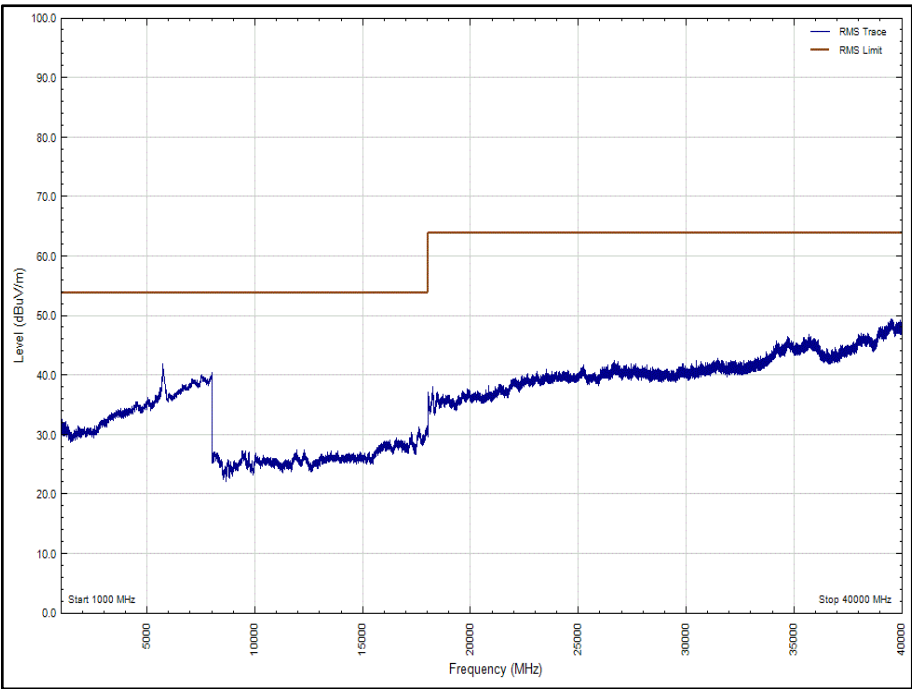


Figure 468 - U-NII 3- 5745 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

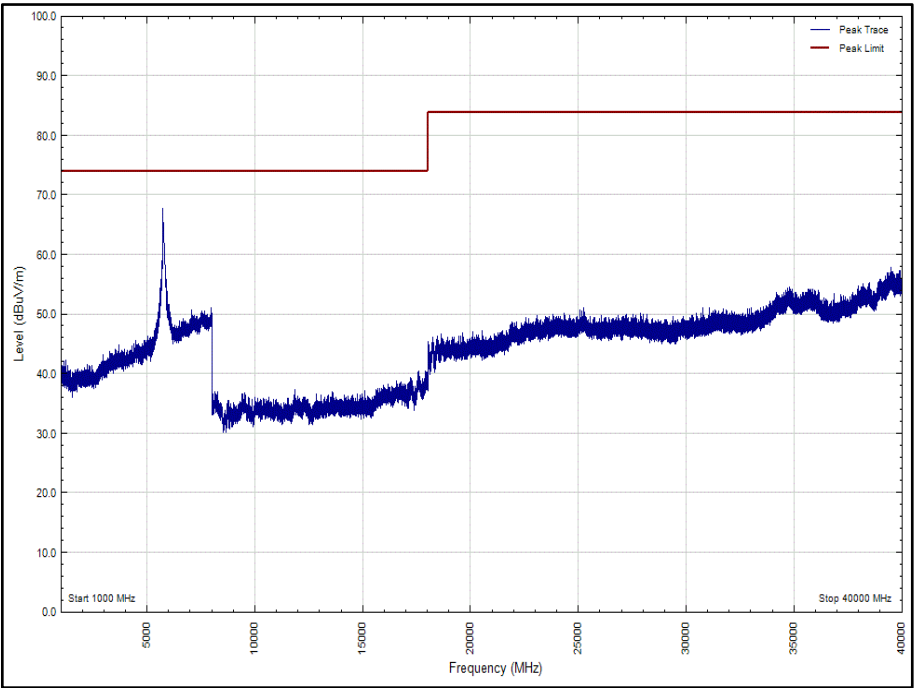


Figure 469 - U-NII 3 - 5745 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

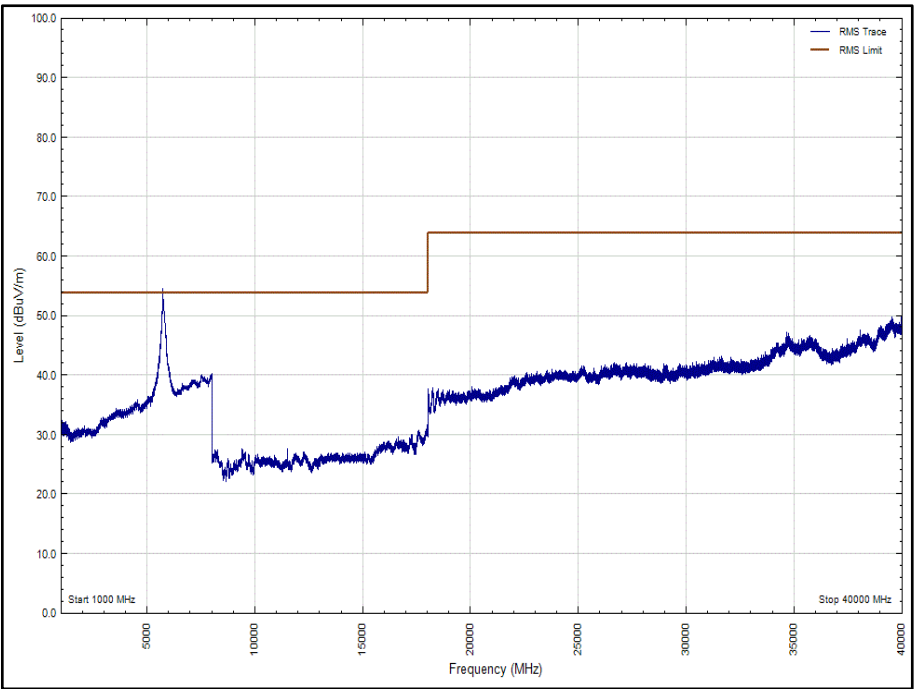


Figure 470 - U-NII 3 - 5745MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)