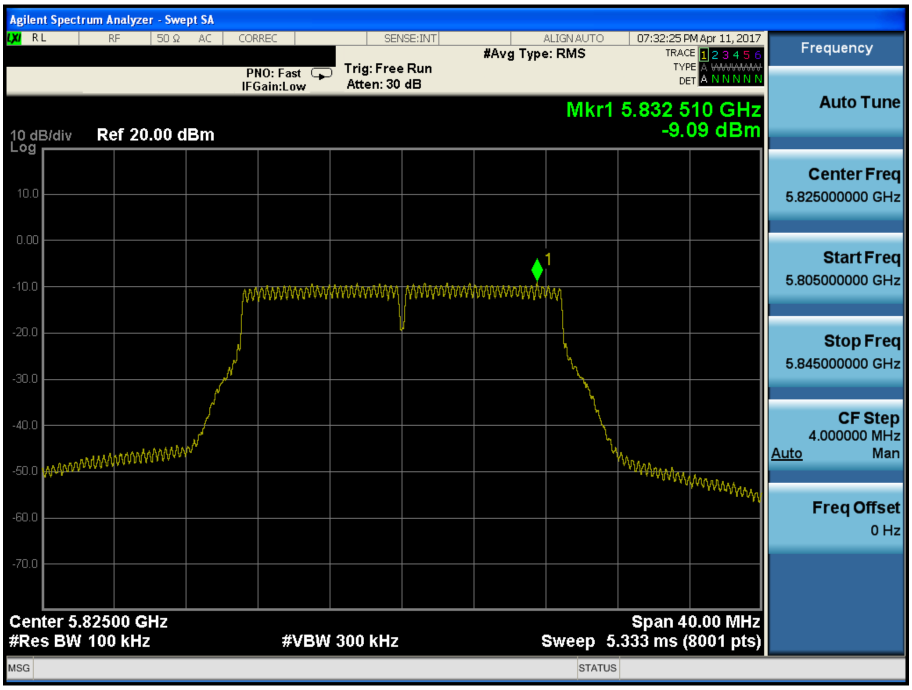
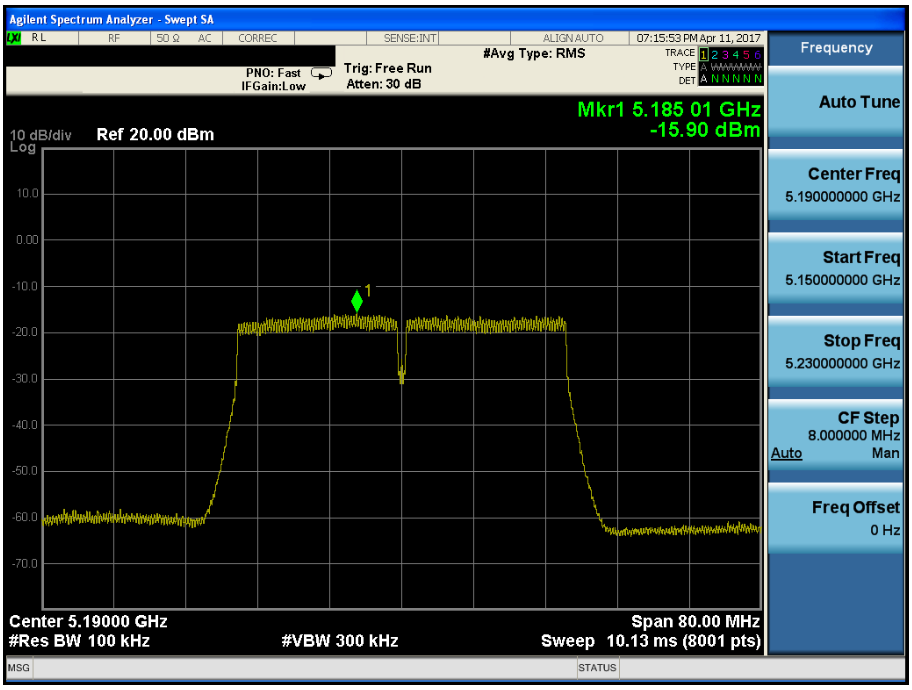
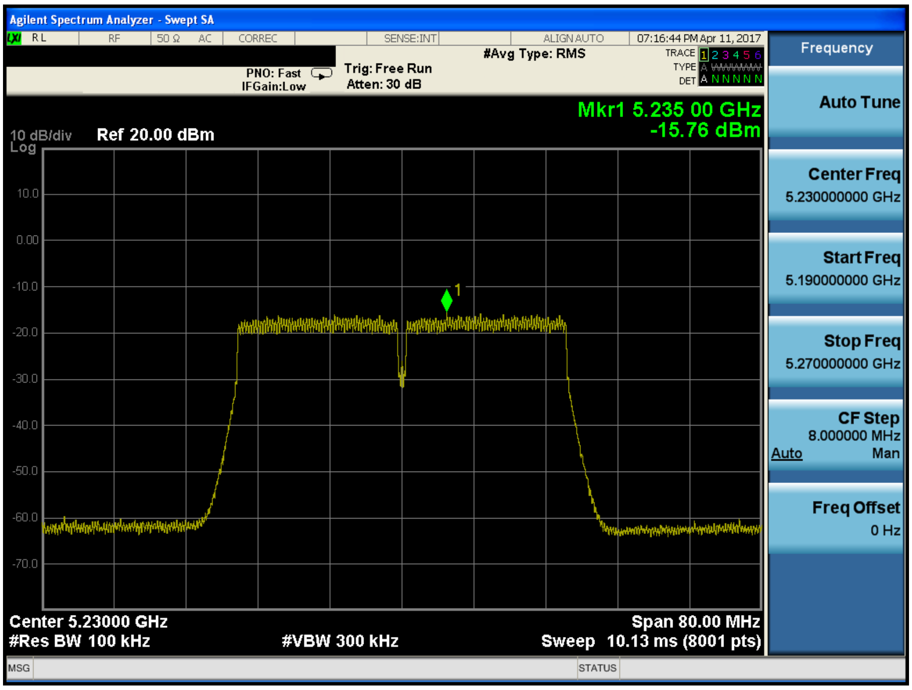
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.165



Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.38



Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.46



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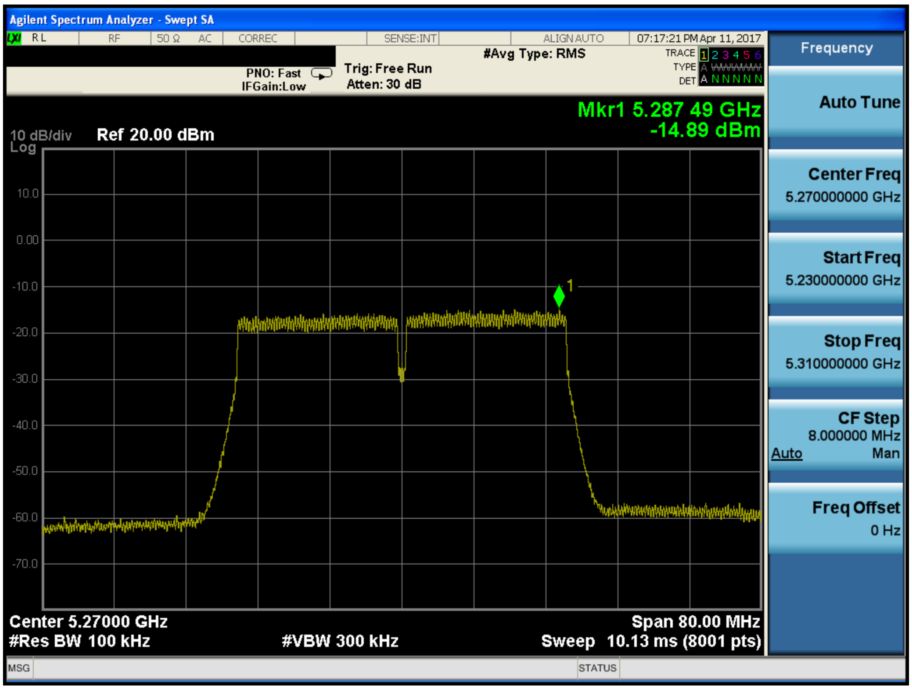

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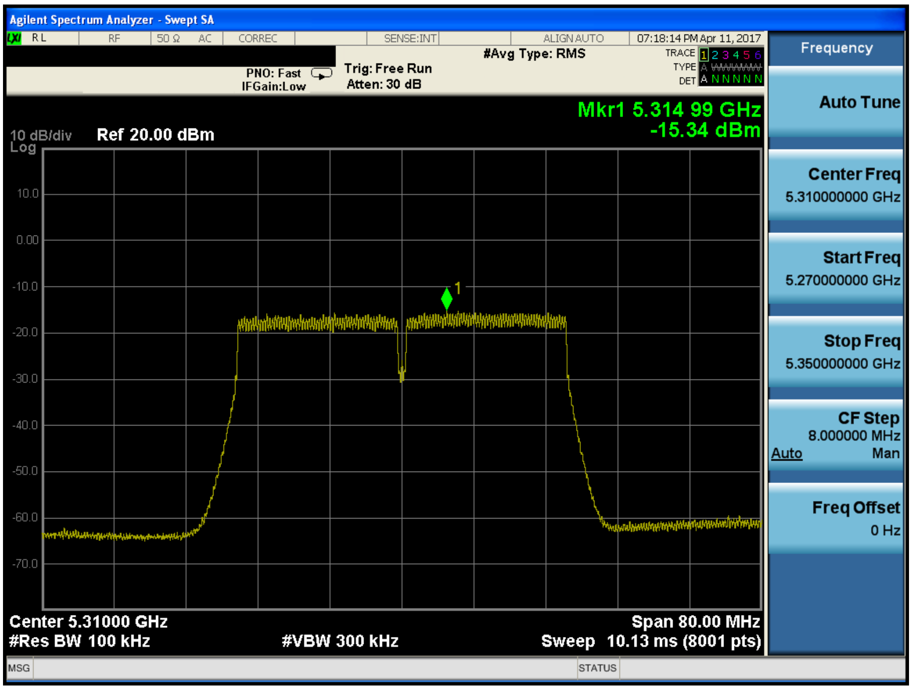
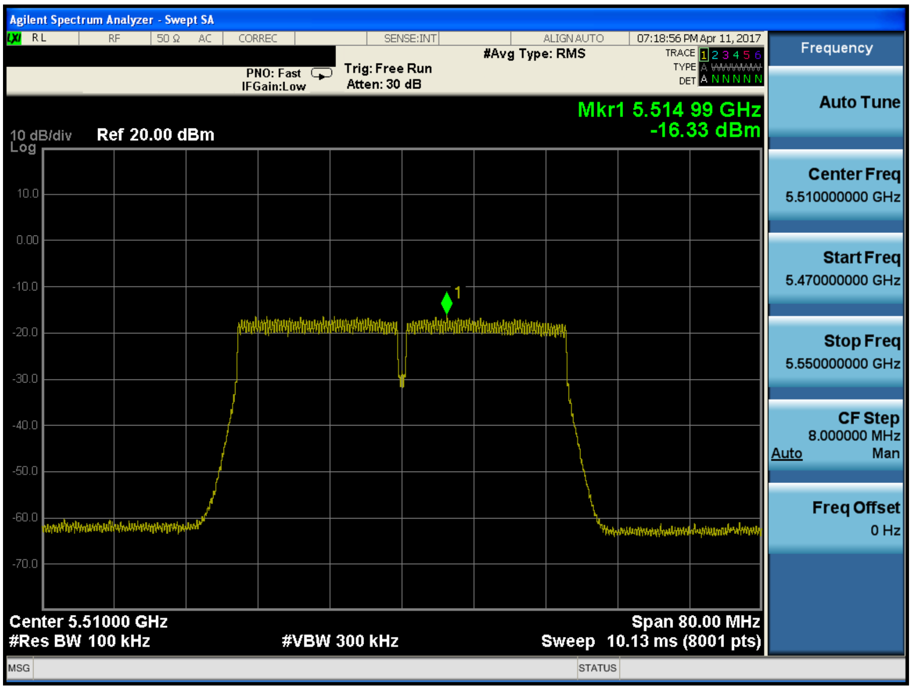
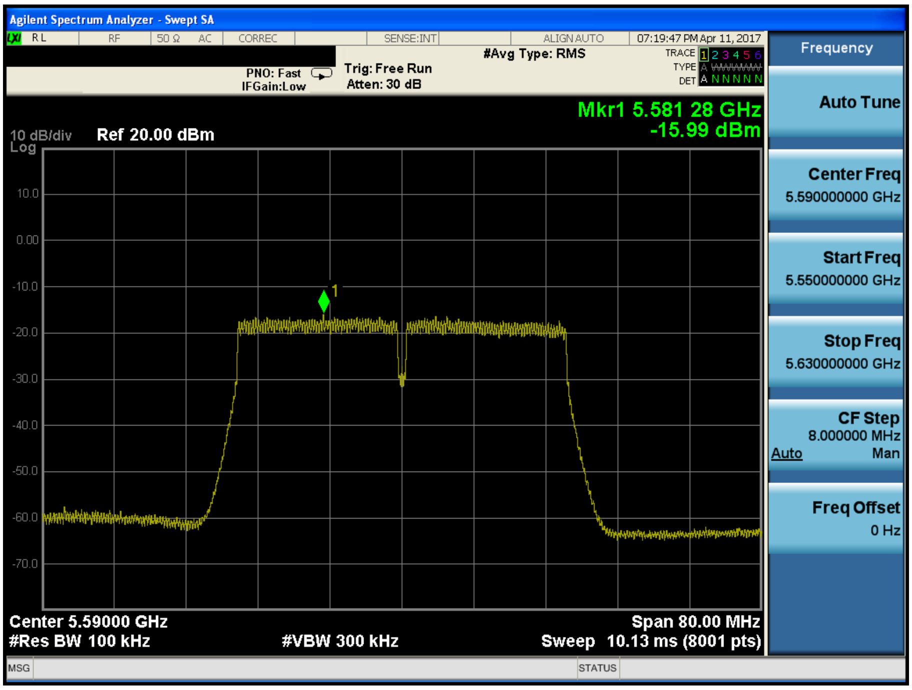


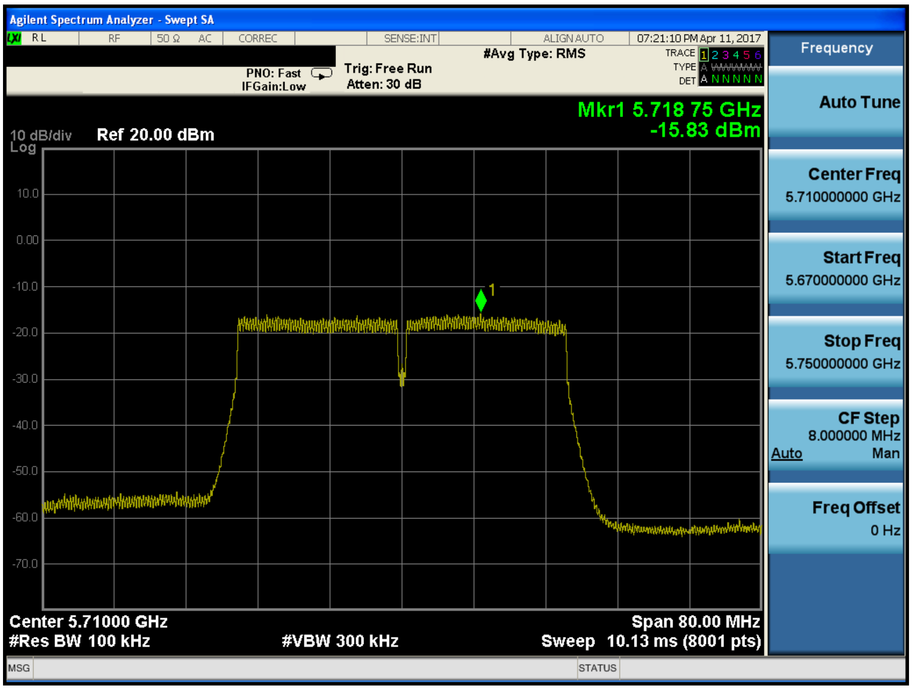
Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.102



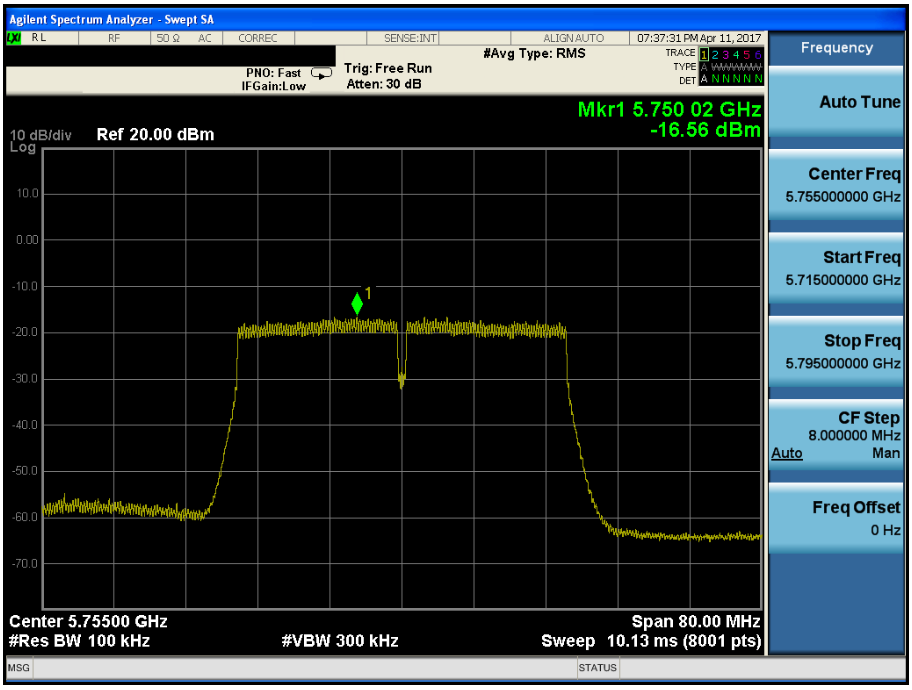
Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.118



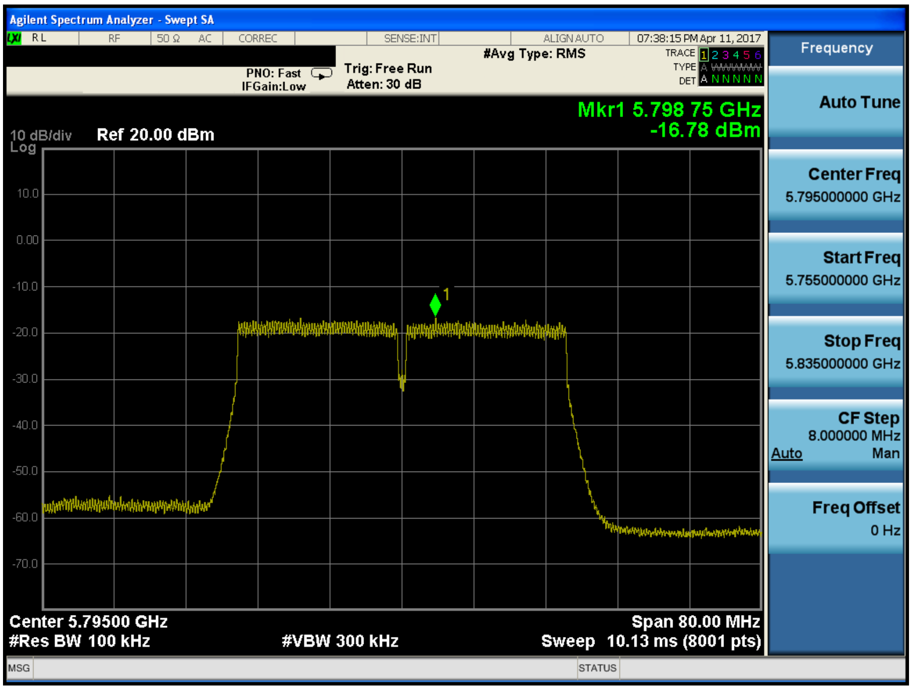
Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.142



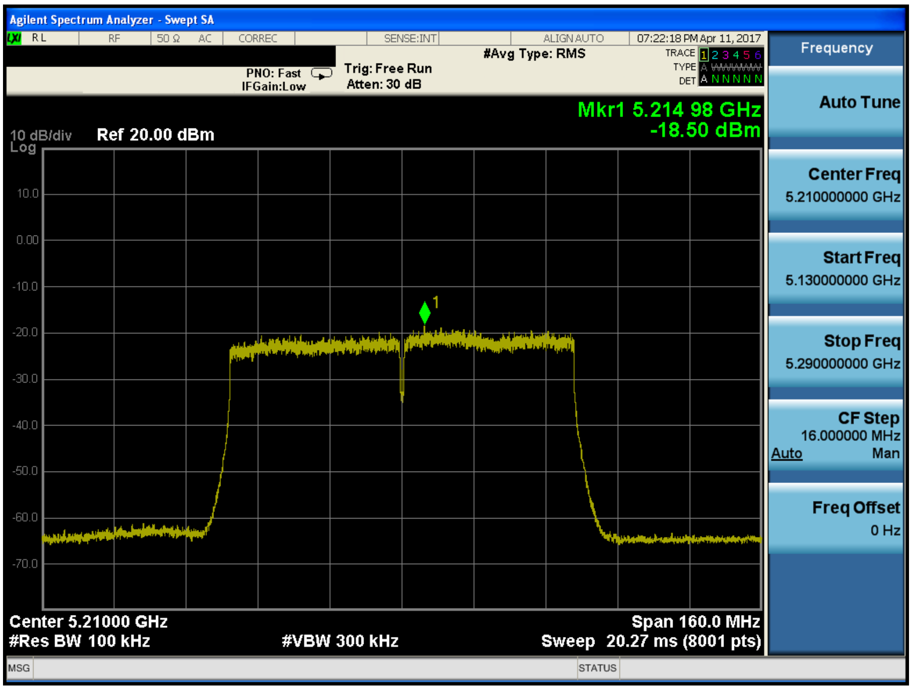
Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.151



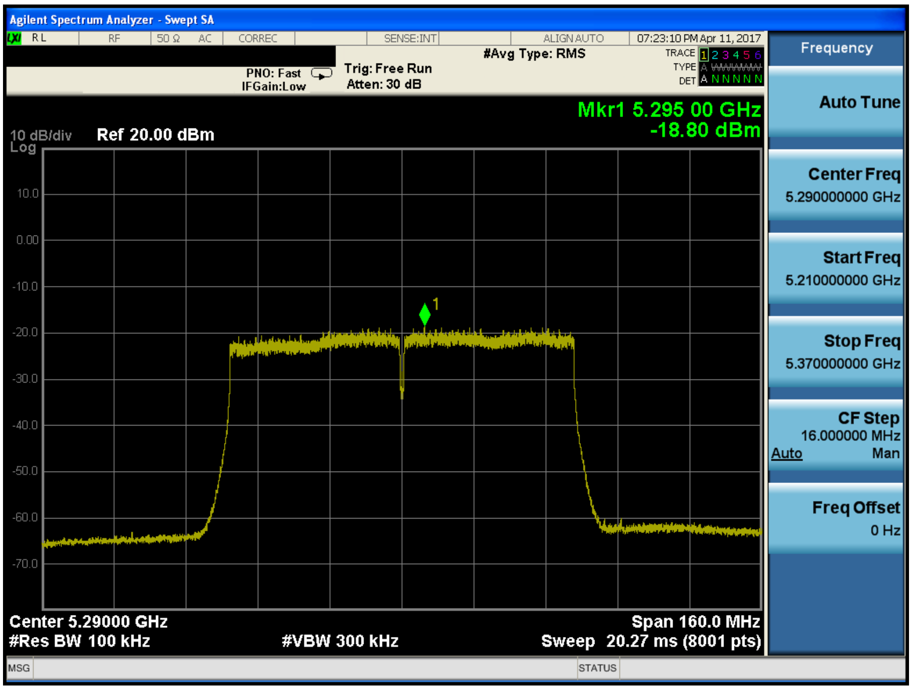
Maximum Power Spectral Density Test Mode: 802.11ac(VHT40) & Ch.159



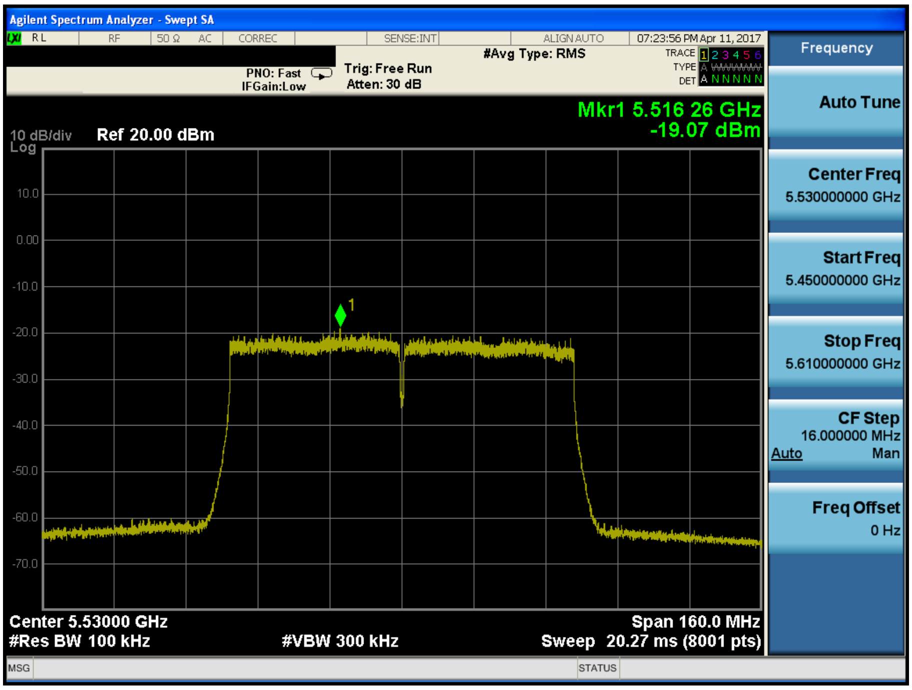
Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.42



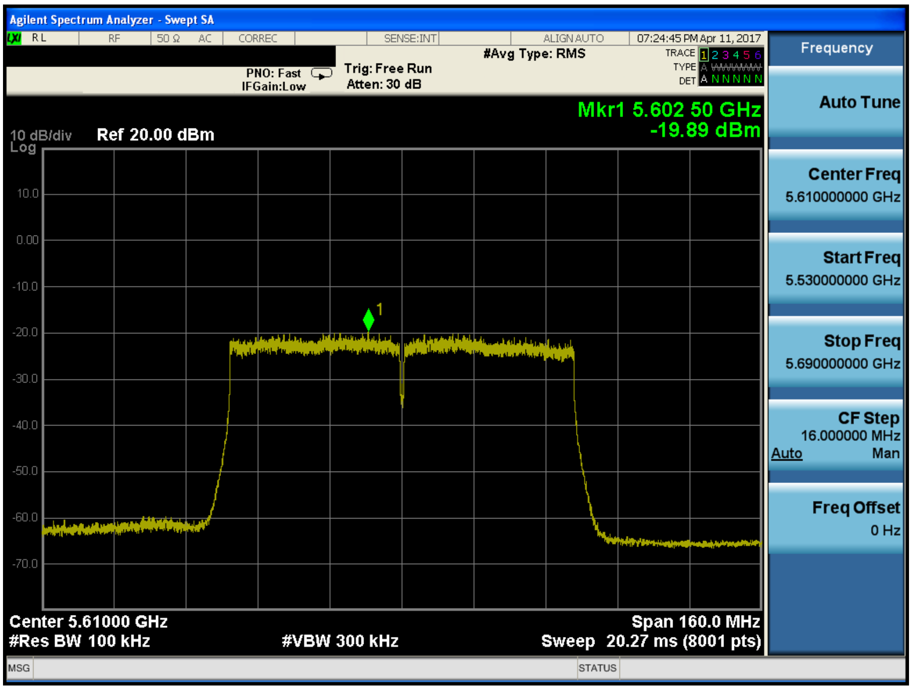
Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.58



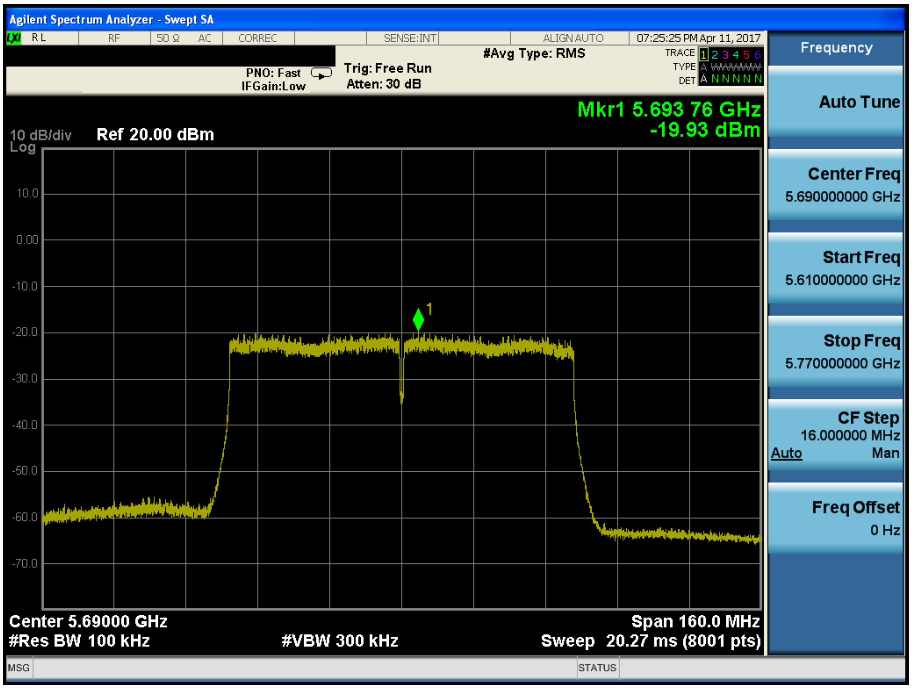
Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.106



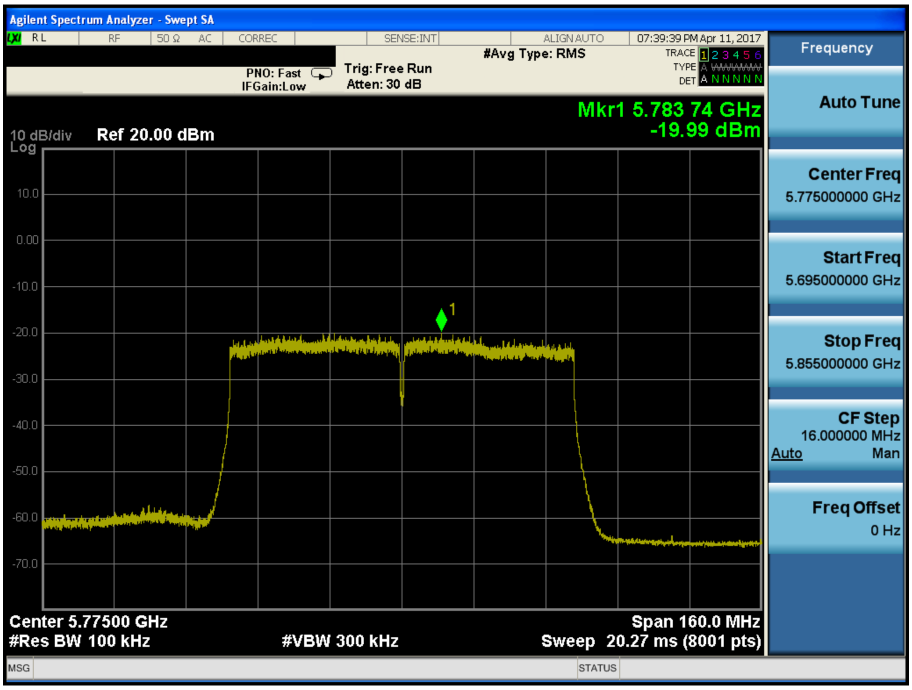
Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.122



Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.138



Maximum Power Spectral Density Test Mode: 802.11ac(VHT80) & Ch.155



7.5 Frequency Stability

▣ Test requirements

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

▣ Test Procedure

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -20℃ and +50℃. The temperature was incremented by 10℃ intervals and the unit was allowed to stabilize at each measurement. And the edge point of EBW(26dB or 6dB bandwidth) was reported.

▣ Test Result : Comply

U-NII 1 & U-NII 2A : (5150 MHz ~ 5350 MHz)

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency	
		5180 MHz	5320 MHz
		26dBc low edge (Hz)	**26dBc High edge**(Hz)
14.400	+20(Ref)	5,169,031,250	5,330,868,750
	+50	5,169,168,750	5,330,637,500
	+40	5,169,431,250	5,330,793,750
	+30	5,169,293,750	5,330,818,750
	+20	5,169,031,250	5,330,868,750
	+10	5,169,212,500	5,330,762,500
	0	5,169,156,250	5,330,800,000
	-10	5,169,362,500	5,330,750,000
	-20	5,169,425,000	5,330,875,000
14.000	+20	5,169,318,750	5,330,812,500
16.560	+20	5,169,206,250	5,330,875,000

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

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency	
		5500 MHz	5720 MHz Note1
		26dBc low edge (Hz)	26dBc High edge(Hz)
14.400	+20(Ref)	5,489,200,000	-
	+50	5,489,250,000	-
	+40	5,489,025,000	-
	+30	5,489,200,000	-
	+20	5,489,200,000	-
	+10	5,489,287,500	-
	0	5,489,206,250	-
	-10	5,489,131,250	-
	-20	5,489,287,500	-
14.000	+20	5,489,125,000	-
16.560	+20	5,489,131,250	-

Note 1: This channel was not performed because operate in cross-band(U-NII 2C & 3).

U-NII 3 : (5725 MHz ~ 5850 MHz)

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency	
		5745 MHz	5825 MHz
		6dBc low edge (Hz)	6dBc High edge(Hz)
14.400	+20(Ref)	5,736,237,500	5,833,918,750
	+50	5,736,250,000	5,833,837,500
	+40	5,736,128,750	5,833,856,250
	+30	5,736,206,250	5,833,856,250
	+20	5,736,237,500	5,833,918,750
	+10	5,736,231,250	5,833,868,750
	0	5,736,218,750	5,833,856,250
	-10	5,736,250,000	5,833,856,250
	-20	5,736,225,000	5,833,856,250
14.000	+20	5,736,262,500	5,833,918,750
16.560	+20	5,736,218,750	5,833,856,250

7.6 Radiated Spurious Emission Measurements

▣ Test Procedure

▪ **FCC Part 15.209 (a)**

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.209 (b):** In the emission table above the tighter limit applies at the band edge.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110 0.495 ~ 0.505 2.1735 ~ 2.1905 4.125 ~ 4.128 4.17725 ~ 4.17775 4.20725 ~ 4.20775 6.215 ~ 6.218 6.26775 ~ 6.26825 6.31175 ~ 6.31225 8.291 ~ 8.294 8.362 ~ 8.366 8.37625 ~ 8.38675	8.41425 ~ 8.41475 12.29 ~ 12.293 12.51975 ~ 12.52025 12.57675 ~ 12.57725 13.36 ~ 13.41 16.42 ~ 16.423 16.69475 ~ 16.69525 16.80425 ~ 16.80475 25.5 ~ 25.67 37.5 ~ 38.25 73 ~ 74.6 74.8 ~ 75.2	108 ~ 121.94 123 ~ 138 149.9 ~ 150.05 160.52475 ~ 160.52525 160.7 ~ 160.9 162.0125 ~ 167.17 167.72 ~ 173.2 240 ~ 285 322 ~ 335.4 399.90 ~ 410 608 ~ 614 960 ~ 1240	1300 ~ 1427 1435 ~ 1626.5 1645.5 ~ 1646.5 1660 ~ 1710 1718.8 ~ 1722.2 2200 ~ 2300 2310 ~ 2390 2483.5 ~ 2500 2655 ~ 2900 3260 ~ 3267 3332 ~ 3339 3345.8 ~ 3358 3600 ~ 4000	4.5 ~ 5.15 5.35 ~ 5.46 7.25 ~ 7.75 8.025 ~ 8.5 9.0 ~ 9.2 9.3 ~ 9.5 10.6 ~ 12.7 13.25 ~ 13.4	14.47 ~ 14.5 15.35 ~ 16.2 17.7 ~ 21.4 22.01 ~ 23.12 23.6 ~ 24.0 31.2 ~ 31.8 36.43 ~ 36.5 Above 38.6

▪ **FCC Part 15.205 (b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ **FCC Part 15.407 (b):** Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the **5.15-5.25 GHz band**: all emissions outside of the **5.15-5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
(2) For transmitters operating in the **5.25-5.35 GHz band**: all emissions outside of the **5.15-5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
(3) For transmitters operating in the **5.47-5.725 GHz band**: all emissions outside of the **5.47-5.725 GHz band** shall not exceed an **EIRP of -27 dBm/MHz.**
(4) For transmitters operating in the **5.725-5.85 GHz band**: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(6) Unwanted emissions **below 1 GHz** must comply with the general field strength limits set forth in **Section 15.209**. Further, any U-NII devices using an **AC power line** are required to comply also with the conducted limits set forth in **Section 15.207**.
(7) The provisions of §15.205 apply to intentional radiators operating under this section
(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 1 or 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

Radiated spurious emission measured using following Measurement Procedure **of KDB789033 D02 V01**

► General Requirements for Unwanted Emissions Measurements

The following requirements apply to all unwanted emissions measurements, both in and outside of the restricted bands:

▪ EUT Duty Cycle

(1) The EUT shall be configured or modified to **transmit continuously** except as stated in (ii), below. The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle(**to no lower than 98 percent**) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

(2) If **continuous transmission (or at least 98 percent duty cycle) cannot be achieved** due to hardware limitations of the EUT (e.g., overheating), the following additions to the measurement and reporting procedures are required:

- The EUT shall be configured to operate at the maximum achievable duty cycle.
- Measure the duty cycle, x, of the transmitter output signal.
- Adjustments to measurement procedures (e.g., increasing test time and number of traces averaged) shall be performed as described in the procedures below.
- The test report shall include the following additional information:
  - The reason for the duty cycle limitation.
  - The duty cycle achieved for testing and the associated transmit duration and interval between transmissions.
  - The sweep time and the amount of time used for trace stabilization during max-hold measurements for peak emission measurements.

(3) **Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.**

► Measurements below 1000 MHz

a) Follow the requirements in section II.G.3, “General Requirements for Unwanted Emissions Measurements”.
b) Compliance shall be demonstrated using **CISPR quasi-peak detection**; however, **peak detection** is permitted as an alternative to quasi-peak detection.

► **Measurements Above 1000 MHz (Peak)**

a) Follow the requirements in section II.G.3, "General Requirements for Unwanted Emissions Measurements".
b) Maximum emission levels are measured by setting the analyzer as follows:
(i) **RBW = 1 MHz.**
(ii) **VBW ≥ 3 MHz.**
(iii) **Detector = Peak.**
(iv) Sweep time = auto.
(v) Trace mode = max hold.
(vi) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

► **Measurements Above 1000 MHz(Method AD)**

(i) **RBW = 1 MHz.**
(ii) **VBW ≥ 3 MHz.**
(iii) **Detector = RMS**, if span/(# of points in sweep) ≤ RBW/2. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
(iv) Averaging type = power (i.e., RMS)
• As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
(v) Sweep time = auto.
(vi) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces shall be averaged.
(vii) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

- **If power averaging (RMS) mode was used in step (iv) above, the correction factor is 10 log(1/x), where x is the duty cycle.** For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
- If linear voltage averaging mode was used in step (iv) above, the correction factor is 20 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.
- If a specific emission is demonstrated to be continuous (100 percent duty cycle) rather than turning on and off with the transmit cycle, no duty cycle correction is required for that emission.

Please refer to Appendix II for the duty cycle correction factor

▣ Measurement Data:

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : *802.11a*

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	36 (5180 MHz)	5149.24	H	X	PK	46.99	7.81	N/A	N/A	54.80	74.00	19.20
		5149.40	H	X	AV	36.21	7.82	0.30	N/A	44.33	54.00	9.67
		10363.05	V	X	PK	43.15	11.80	N/A	-9.54	45.41	68.20	22.79
	40 (5200 MHz)	10406.93	H	X	PK	43.68	11.95	N/A	-9.54	46.09	68.20	22.11
	48 (5240 MHz)	10489.48	V	X	PK	42.67	12.24	N/A	-9.54	45.37	68.20	22.83
U-NII 2A	52 (5260 MHz)	10529.17	V	X	PK	42.71	12.34	N/A	-9.54	45.51	68.20	22.69
	60 (5300 MHz)	10598.49	V	X	PK	42.93	12.49	N/A	-9.54	45.88	68.20	22.32
	64 (5320 MHz)	5350.36	H	X	PK	49.86	7.99	N/A	N/A	57.85	74.00	16.15
		5350.42	H	X	AV	39.59	7.99	0.30	N/A	47.88	54.00	6.12
		10637.90	V	X	PK	42.93	12.58	N/A	-9.54	45.97	74.00	28.03
		10637.71	V	X	AV	32.03	12.58	0.30	-9.54	35.37	54.00	18.63
U-NII 2C	100 (5500 MHz)	5459.48	H	X	PK	48.57	7.74	N/A	N/A	56.31	74.00	17.69
		5459.54	H	X	AV	38.19	7.74	0.30	N/A	46.23	54.00	7.77
		5469.68	H	X	PK	48.00	7.71	N/A	N/A	55.71	68.20	12.49
		11008.51	H	X	PK	42.50	13.38	N/A	-9.54	46.34	74.00	27.66
		11008.26	H	X	AV	31.39	13.38	0.30	-9.54	35.53	54.00	18.47
	120 (5600 MHz)	11199.83	H	X	PK	44.24	13.60	N/A	-9.54	48.30	74.00	25.70
		11200.95	H	X	AV	33.56	13.61	0.30	-9.54	37.93	54.00	16.07
	144 (5720 MHz)	11440.43	H	X	PK	44.18	13.98	N/A	-9.54	48.62	74.00	25.38
		11440.52	H	X	AV	33.19	13.98	0.30	-9.54	37.93	54.00	16.07
U-NII 3	149 (5745 MHz)	5713.37	H	X	PK	46.78	8.98	N/A	N/A	55.76	68.20	12.44
		5724.58	H	X	PK	55.78	8.98	N/A	N/A	64.76	78.20	13.44
		11488.90	H	X	PK	43.62	14.04	N/A	-9.54	48.12	74.00	25.88
		11488.86	H	X	AV	32.46	14.04	0.30	-9.54	37.26	54.00	16.74
	157 (5785 MHz)	11570.99	H	X	PK	43.82	14.17	N/A	-9.54	48.45	74.00	25.55
		11570.16	H	X	AV	32.85	14.17	0.30	-9.54	37.78	54.00	16.22
	165 (5825 MHz)	5850.81	H	X	PK	45.25	9.42	N/A	N/A	54.67	78.20	23.53
		5861.07	H	X	PK	45.32	9.52	N/A	N/A	54.84	68.20	13.36
		11651.09	H	X	PK	42.80	14.29	N/A	-9.54	47.55	74.00	26.45
		11652.60	H	X	AV	32.71	14.29	0.30	-9.54	37.76	54.00	16.24

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

■ Measurement Data:

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : *802.11n(HT20)*

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	36 (5180 MHz)	5148.72	H	X	PK	47.56	7.81	N/A	N/A	55.37	74.00	18.63
		5148.80	H	X	AV	36.14	7.81	0.32	N/A	44.27	54.00	9.73
		10364.83	H	X	PK	43.00	11.81	N/A	-9.54	45.27	68.20	22.93
	40 (5200 MHz)	10398.57	H	X	PK	44.00	11.92	N/A	-9.54	46.38	68.20	21.82
	48 (5240 MHz)	10477.57	H	X	PK	43.01	12.20	N/A	-9.54	45.67	68.20	22.53
U-NII 2A	52 (5260 MHz)	10522.07	H	X	PK	43.10	12.33	N/A	-9.54	45.89	68.20	22.31
	60 (5300 MHz)	10598.48	H	X	PK	42.46	12.49	N/A	-9.54	45.41	68.20	22.79
	64 (5320 MHz)	5350.88	H	X	PK	49.31	7.99	N/A	N/A	57.30	74.00	16.70
		5350.82	H	X	AV	39.76	7.99	0.32	N/A	48.07	54.00	5.93
		10637.20	H	X	PK	43.22	12.58	N/A	-9.54	46.26	74.00	27.74
		10637.19	H	X	AV	31.77	12.58	0.32	-9.54	35.13	54.00	18.87
U-NII 2C	100 (5500 MHz)	5458.20	H	X	PK	48.41	7.74	N/A	N/A	56.15	74.00	17.85
		5458.68	H	X	AV	38.53	7.74	0.32	N/A	46.59	54.00	7.41
		5468.90	H	X	PK	49.44	7.71	N/A	N/A	57.15	68.20	11.05
		10999.82	H	X	PK	41.75	13.37	N/A	-9.54	45.58	74.00	28.42
		11000.19	H	X	AV	30.83	13.37	0.32	-9.54	34.98	54.00	19.02
	120 (5600 MHz)	11201.64	H	X	PK	43.59	13.65	N/A	-9.54	47.70	74.00	26.30
		11200.64	H	X	AV	33.62	13.65	0.32	-9.54	38.05	54.00	15.95
	144 (5720 MHz)	11441.30	H	X	PK	43.06	13.98	N/A	-9.54	47.50	74.00	26.50
		11441.18	H	X	AV	32.85	13.98	0.32	-9.54	37.61	54.00	16.39
U-NII 3	149 (5745 MHz)	5714.66	H	X	PK	48.64	8.98	N/A	N/A	57.62	68.20	10.58
		5724.82	H	X	PK	61.19	8.98	N/A	N/A	70.17	78.20	8.03
		11490.21	V	X	PK	42.78	14.05	N/A	-9.54	47.29	74.00	26.71
		11490.15	V	X	AV	32.75	14.05	0.32	-9.54	37.58	54.00	16.42
	157 (5785 MHz)	11570.02	V	X	PK	42.60	14.17	N/A	-9.54	47.23	74.00	26.77
		11569.02	V	X	AV	32.42	14.16	0.32	-9.54	37.36	54.00	16.64
	165 (5825 MHz)	5850.55	H	X	PK	45.37	9.42	N/A	N/A	54.79	78.20	23.41
		5860.50	H	X	PK	45.76	9.42	N/A	N/A	55.18	68.20	13.02
		11651.17	V	X	PK	43.11	14.29	N/A	-9.54	47.86	74.00	26.14
		11650.32	V	X	AV	32.24	14.29	0.32	-9.54	37.31	54.00	16.69

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

▣ Measurement Data:

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : *802.11ac(VHT40)*

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	38 (5190 MHz)	5147.76	H	X	PK	45.36	7.81	N/A	N/A	53.17	74.00	20.83
		5147.97	H	X	AV	35.13	7.81	0.62	N/A	43.56	54.00	10.44
		10383.68	H	X	PK	43.02	11.87	N/A	-9.54	45.35	68.20	22.85
	46 (5230 MHz)	10457.28	H	X	PK	43.10	12.13	N/A	-9.54	45.69	68.20	22.51
U-NII 2A	54 (5270 MHz)	10534.64	H	X	PK	43.12	12.36	N/A	-9.54	45.94	68.20	22.26
	62 (5310 MHz)	5351.56	H	X	PK	51.93	7.99	N/A	N/A	59.92	74.00	14.08
		5350.85	H	X	AV	39.39	7.99	0.62	N/A	48.00	54.00	6.00
		10624.74	H	X	PK	44.13	12.55	N/A	-9.54	47.14	74.00	26.86
		10624.74	H	X	AV	32.27	12.55	0.62	-9.54	35.90	54.00	18.10
U-NII 2C	102 (5510 MHz)	5458.94	H	X	PK	44.30	7.74	N/A	N/A	52.04	74.00	21.96
		5458.98	H	X	AV	34.76	7.74	0.62	N/A	43.12	54.00	10.88
		5468.91	H	X	PK	46.82	7.71	N/A	N/A	54.53	68.20	13.67
		11026.84	H	X	PK	42.07	13.41	N/A	-9.54	45.94	74.00	28.06
		11026.72	H	X	AV	31.65	13.41	0.62	-9.54	36.14	54.00	17.86
	118 (5590 MHz)	11172.82	H	X	PK	42.18	13.56	N/A	-9.54	46.20	74.00	27.80
		11173.18	H	X	AV	31.56	13.56	0.62	-9.54	36.20	54.00	17.80
	142 (5710 MHz)	11417.00	H	X	PK	43.04	13.95	N/A	-9.54	47.45	74.00	26.55
		11417.10	H	X	AV	31.72	13.95	0.62	-9.54	36.75	54.00	17.25
U-NII 3	151 (5755 MHz)	5709.88	H	X	PK	51.81	8.96	N/A	N/A	60.77	68.20	7.43
		5722.22	H	X	PK	50.76	8.98	N/A	N/A	59.74	78.20	18.46
		11517.82	H	X	PK	42.04	14.09	N/A	-9.54	46.59	74.00	27.41
		11518.52	H	X	AV	31.75	14.09	0.62	-9.54	36.92	54.00	17.08
	159 (5795 MHz)	5852.45	H	X	PK	44.93	9.43	N/A	N/A	54.36	78.20	23.84
		5861.43	H	X	PK	44.23	9.54	N/A	N/A	53.77	68.20	14.43
		11583.74	H	X	PK	42.85	14.19	N/A	-9.54	47.50	74.00	26.50
		11583.66	H	X	AV	31.72	14.19	0.62	-9.54	36.99	54.00	17.01

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

▣ Measurement Data:

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : *802.11ac(VHT80)*

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	42 (5210 MHz)	5147.30	H	X	PK	45.08	7.80	N/A	N/A	52.88	74.00	21.12
		5147.35	H	X	AV	33.92	7.80	1.17	N/A	42.89	54.00	11.11
		10405.92	V	X	PK	43.33	11.95	N/A	-9.54	45.74	68.20	22.46
U-NII 2A	58 (5290 MHz)	5352.45	H	X	PK	48.06	7.99	N/A	N/A	56.05	74.00	17.95
		5352.24	H	X	AV	36.70	7.99	1.17	N/A	45.86	54.00	8.14
		10545.92	V	X	PK	43.01	12.38	N/A	-9.54	45.85	68.20	22.35
U-NII 2C	106 (5530 MHz)	5457.62	H	X	PK	46.47	7.74	N/A	N/A	54.21	74.00	19.79
		5458.68	H	X	AV	35.11	7.74	1.17	N/A	44.02	54.00	9.98
		11051.84	H	X	PK	42.70	13.44	N/A	-9.54	46.60	74.00	27.40
		11052.40	H	X	AV	31.84	13.44	1.17	-9.54	36.91	54.00	17.09
	122 (5610 MHz)	11227.84	H	X	PK	42.07	13.68	N/A	-9.54	46.21	74.00	27.79
		11227.36	H	X	AV	30.72	13.68	1.17	-9.54	36.03	54.00	17.97
	138 (5690 MHz)	11402.40	H	X	PK	41.74	13.93	N/A	-9.54	46.13	74.00	27.87
		11402.44	H	X	AV	31.04	13.93	1.17	-9.54	36.60	54.00	17.40
U-NII 3	155 (5775 MHz)	5710.11	H	X	PK	49.97	8.96	N/A	N/A	58.93	68.20	9.27
		5720.39	H	X	PK	50.90	8.98	N/A	N/A	59.88	78.20	18.32
		5850.53	H	X	PK	44.11	9.42	N/A	N/A	53.53	78.20	24.67
		5862.08	H	X	PK	45.68	9.56	N/A	N/A	55.24	68.20	12.96
		11578.84	V	X	PK	42.08	14.18	N/A	-9.54	46.72	74.00	27.28
		11579.00	V	X	AV	31.12	14.18	1.17	-9.54	36.93	54.00	17.07

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

7.7 AC Conducted Emissions

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies,
within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ Test Configuration

NA

▣ Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

▣ Measurement Data:

NA

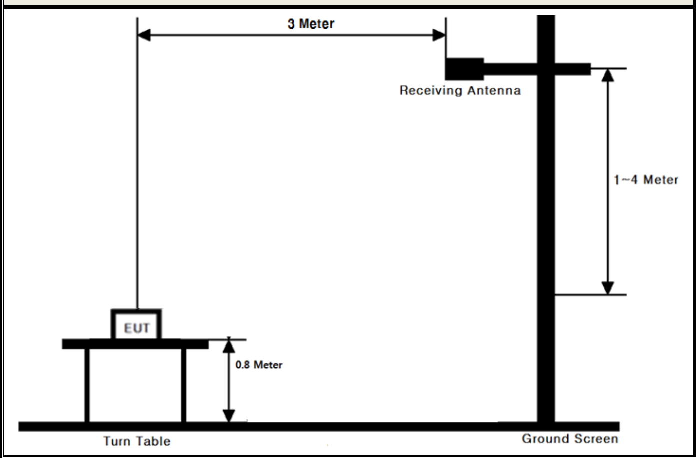
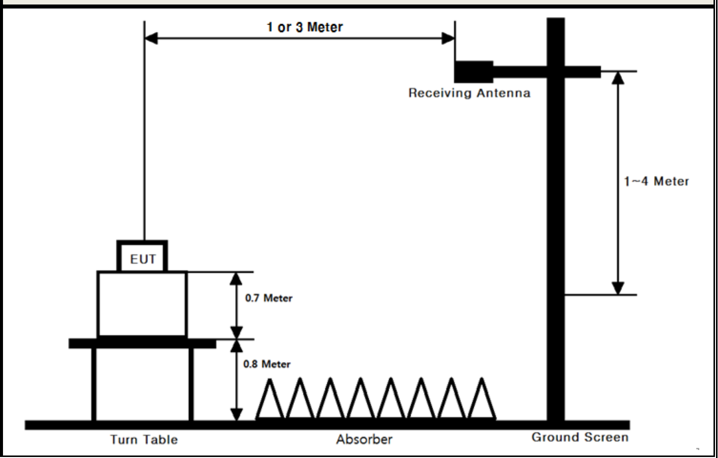
8. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	17/01/11	18/01/11	MY50200828
Spectrum Analyzer	Agilent Technologies	N9020A	16/10/11	17/10/11	MY46471251
Spectrum Analyzer	Agilent Technologies	N9030A	16/10/18	17/10/18	MY53310140
DC Power Supply	Agilent Technologies	66332A	16/09/08	17/09/08	GB42110550
Thermohygrometer	HCT	HCT-1	16/09/09	17/09/09	NONE
Signal Generator	Rohde Schwarz	SMF100A	16/06/23	17/06/23	102341
Signal Generator	Rohde Schwarz	SMBV100A	17/01/04	18/01/04	255571
Multimeter	FLUKE	17B	17/04/12	18/04/12	26030065WS
Temp & Humi Test Chamber	SJ Science	TEMI850-10	17/01/25	18/01/25	SJ-TH-S50-120203
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	16/05/13	18/05/13	3358
Horn Antenna	ETS-LINDGREN	3117	16/05/03	18/05/03	00140394
Horn Antenna	A.H.Systems Inc.	SAS-574	15/09/03	17/09/03	155
Highpass Filter	Wainwright Instruments	WHKX12-2580-3000-18000-80SS	16/09/09	17/09/09	3
Highpass Filter	Wainwright Instruments	WHNX6-6320-8000-26500-40CC	16/09/13	17/09/13	1
PreAmplifier	TSJ	MLA-010K01-B01-27	17/02/16	18/02/16	1844539
PreAmplifier	Agilent	8449B	17/01/11	18/01/11	3008A00370
PreAmplifier	A.H.Systems Inc.	PAM-1840VH	16/12/04	17/12/04	163
EMI Test Receiver	Rohde Schwarz	ESR7	17/02/16	18/02/16	101061
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A, MA2490A	16/10/19	17/10/19	1338003, 1249304
DC Power Supply	SM techno	SDP30-5D	16/09/08	17/09/08	305DMG304
Attenuator	SMAJK	SMAJK-50-30	16/09/08	17/09/08	15081906

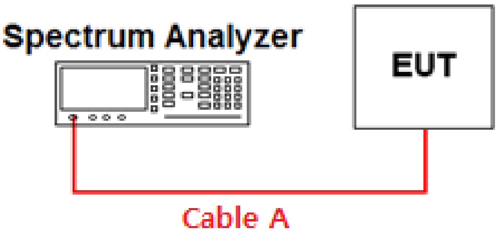
APPENDIX I

Test set up diagrams

- **Radiated Measurement**

Below 1GHz	Above 1GHz
	

- **Conducted Measurement**



APPENDIX II

Duty Cycle Information

▣ Test Procedure

Duty Cycle [X = On Time / (On + Off time)] is measured using Measurement Procedure **of KDB789033 D02 V01**

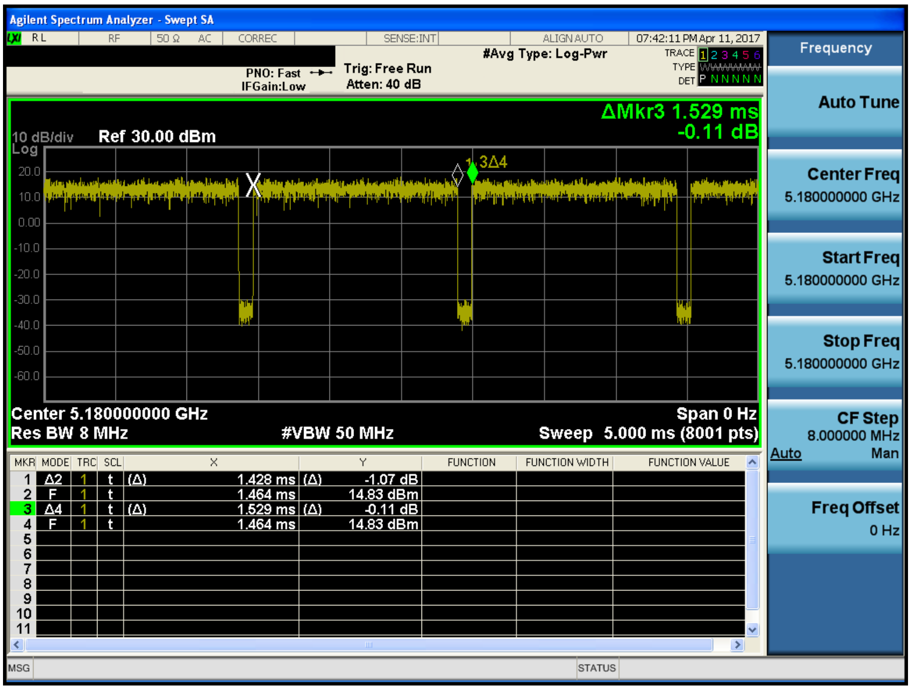
1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW ≥ RBW. Set detector = peak.
4. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are> 50/*T***, where *T* is defined in section II.B.1.a), and **the number of sweep points across duration *T* exceeds 100**. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if *T* ≤ 16.7 microseconds.)

T : The minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
(***T* = On time** of the above table since the EUT operates with above fixed Duty Cycle and it is the minimum On time)

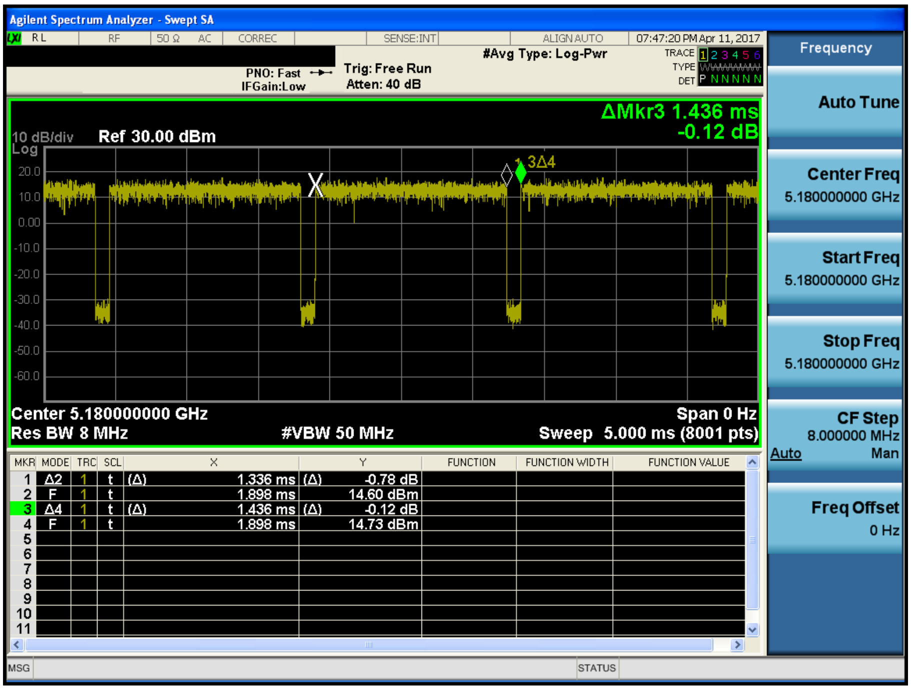
▣ Test Results:

Mode	Channel	Tested Frequency [MHz]	Maximum Achievable Duty Cycle (*x*) = On / (On+Off)			Duty Cycle Correction Factor [dB]
			On Time [ms]	On+OffTime [ms]	*x*	
802.11a	100	5500	1.428	1.529	93.39	0.30
802.11n (HT20)	100	5500	1.336	1.436	93.04	0.32
802.11ac (VHT40)	102	5510	0.668	0.769	86.87	0.62
802.11ac (VHT80)	106	5530	0.331	0.433	76.44	1.17

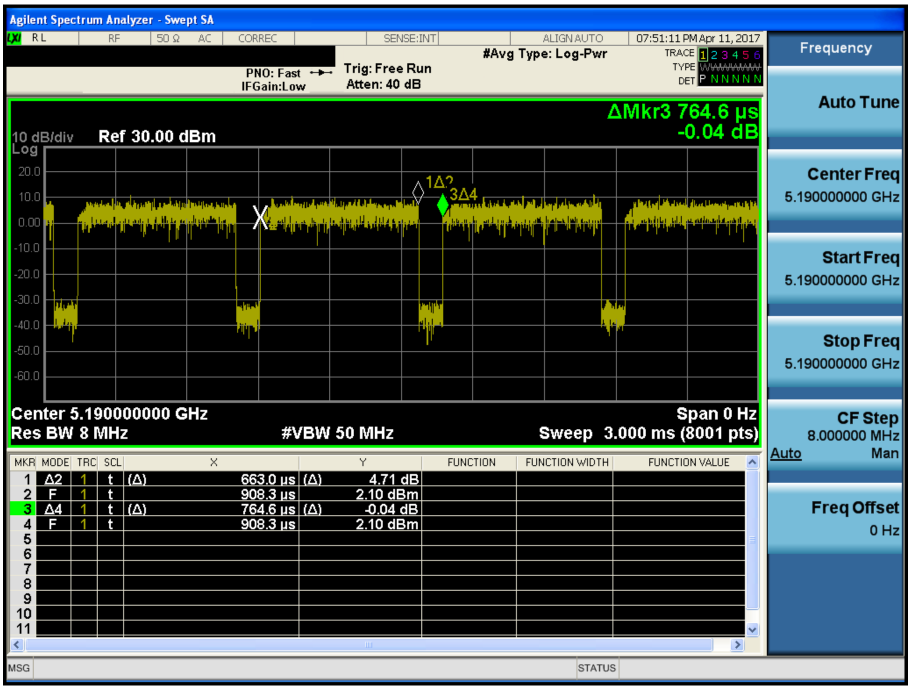
Duty Cycle Test Mode: 802.11a & Ch.100



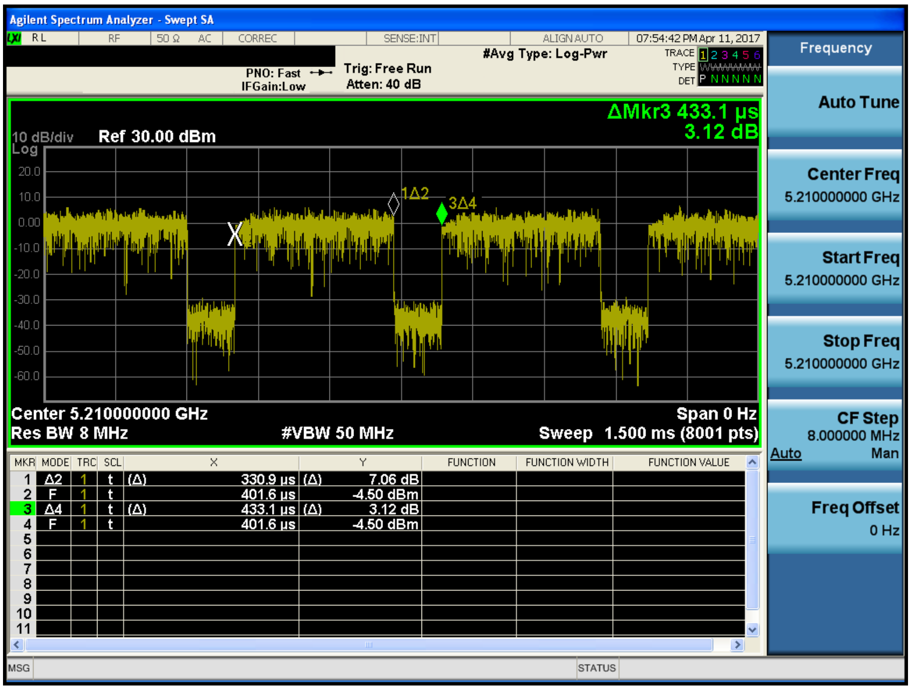
Duty Cycle Test Mode: 802.11n(HT20) & Ch.100



Duty Cycle Test Mode: 802.11ac(VHT40) & Ch.102



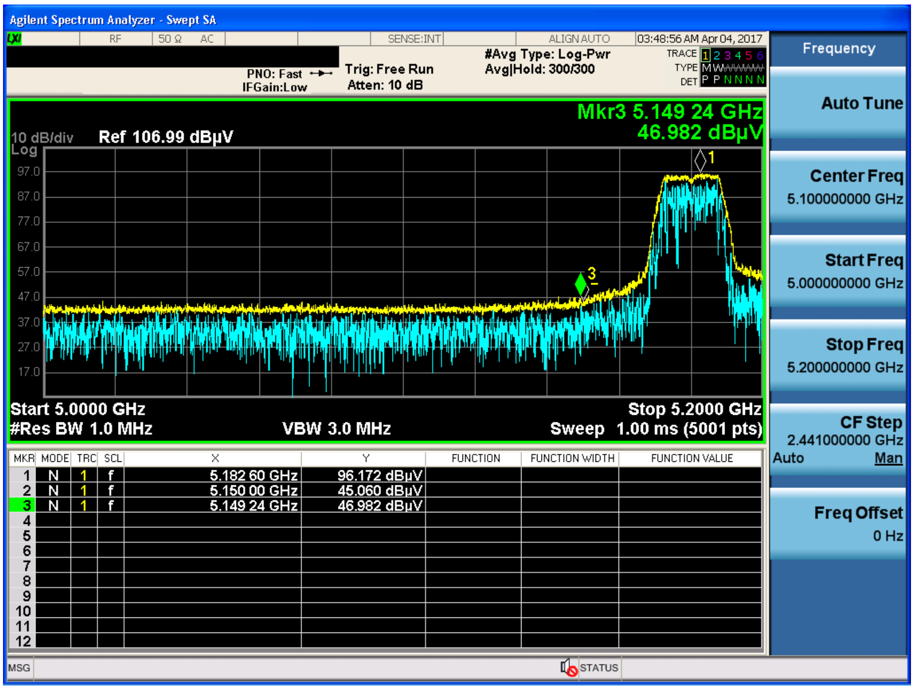
Duty Cycle Test Mode: 802.11ac(VHT80) & Ch.106



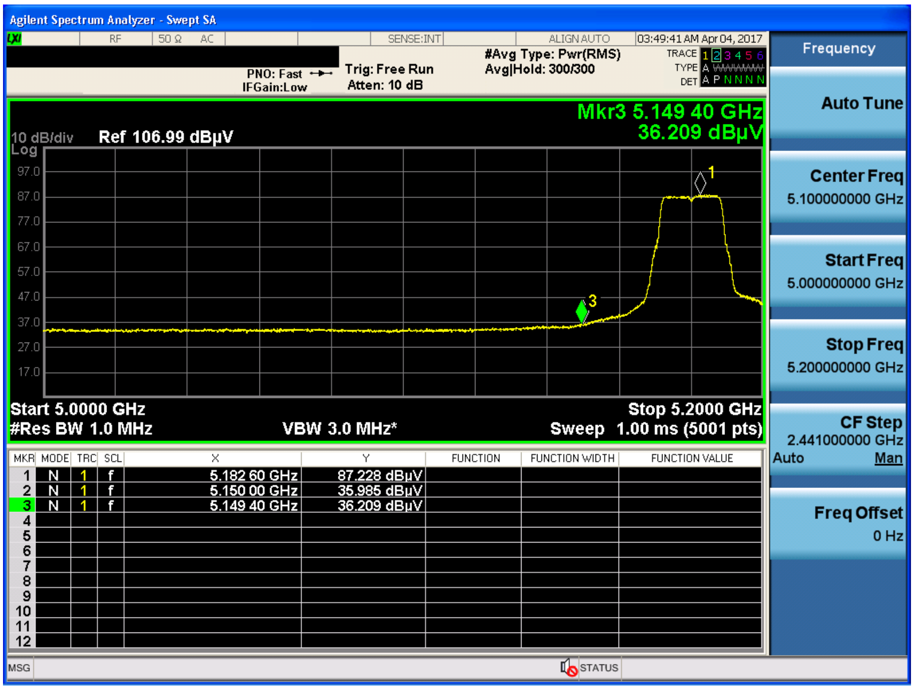
APPENDIX III

Unwanted Emissions (Radiated) Test Plot

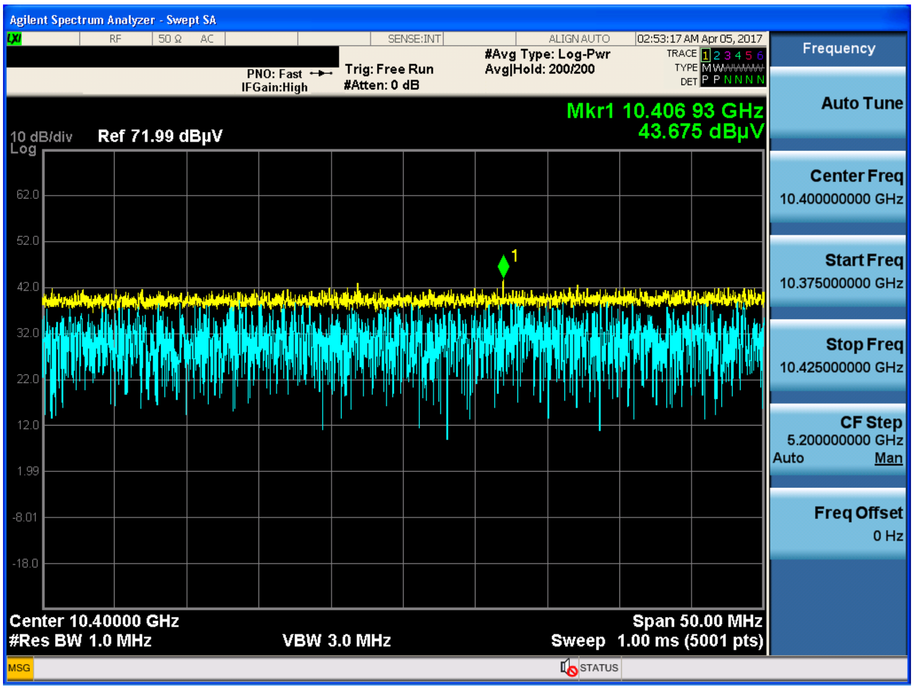
802.11a & U-NII 1 & Ch.36 & X axis & Hor **Detector Mode : PK**



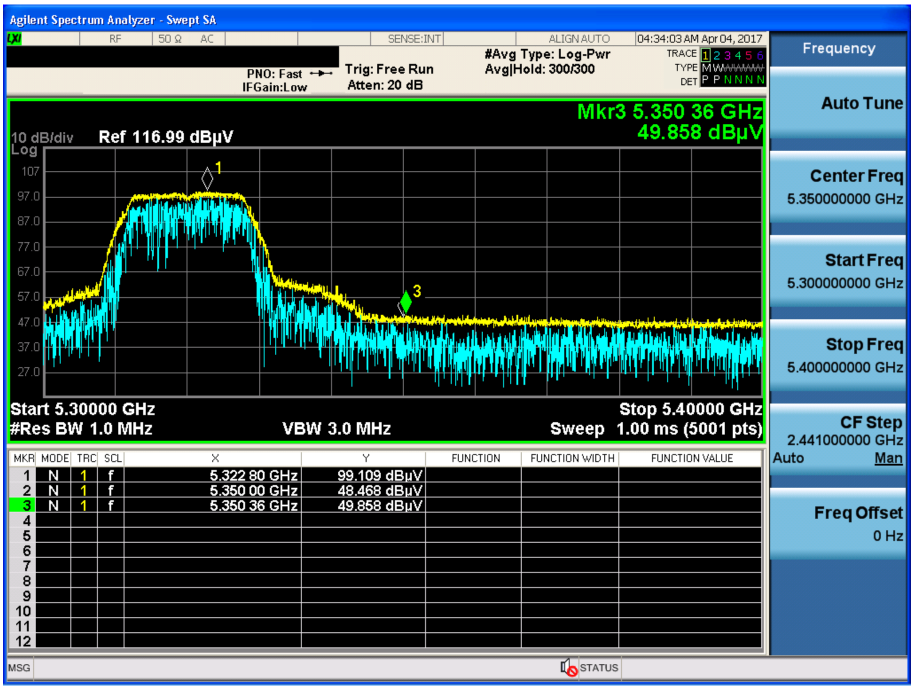
802.11a & U-NII 1 & Ch.36 & X axis & Hor **Detector Mode : AV**



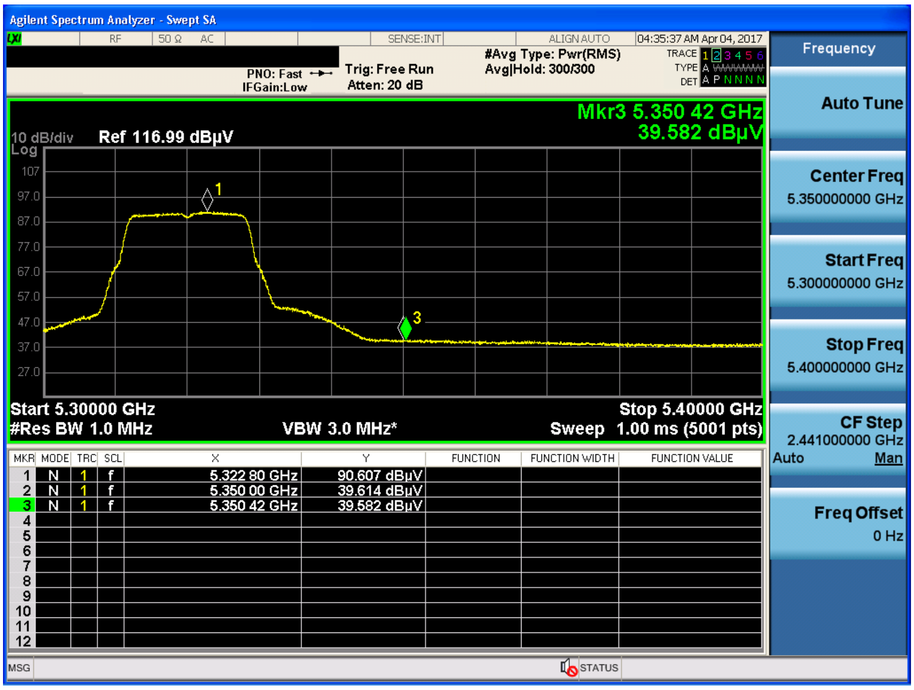
802.11a & U-NII 1 & Ch.40 & X axis & Hor **Detector Mode : PK**



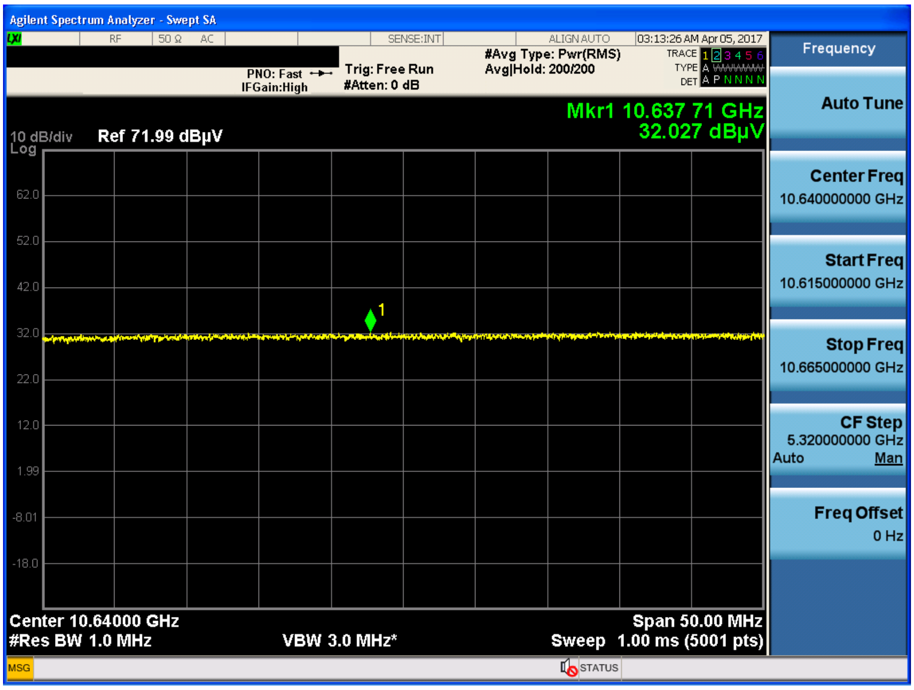
802.11a & U-NII 2A & Ch.64 & X axis & Hor Detector Mode : PK



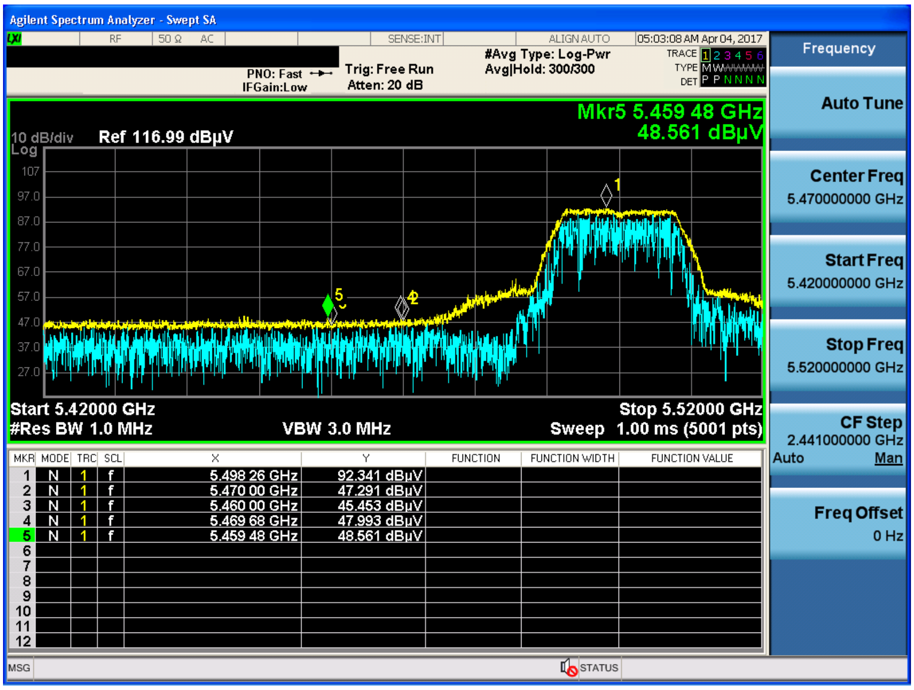
802.11a & U-NII 2A & Ch.64 & X axis & Hor Detector Mode : AV



802.11a & U-NII 2A & Ch.64 & X axis & Ver **Detector Mode : AV**

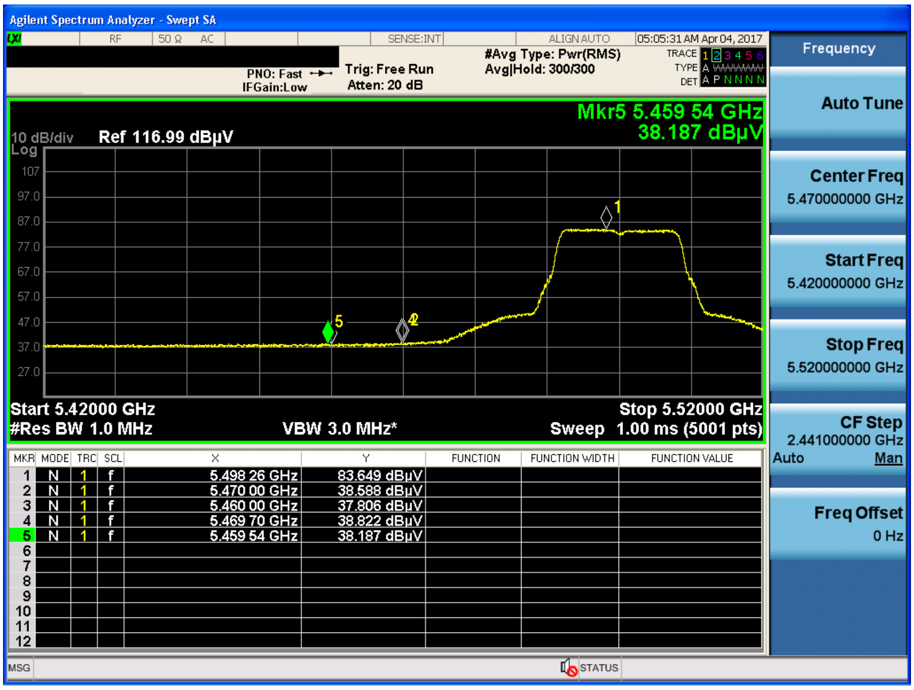


802.11a & U-NII 2C & Ch.100 & X axis & Hor Detector Mode : PK



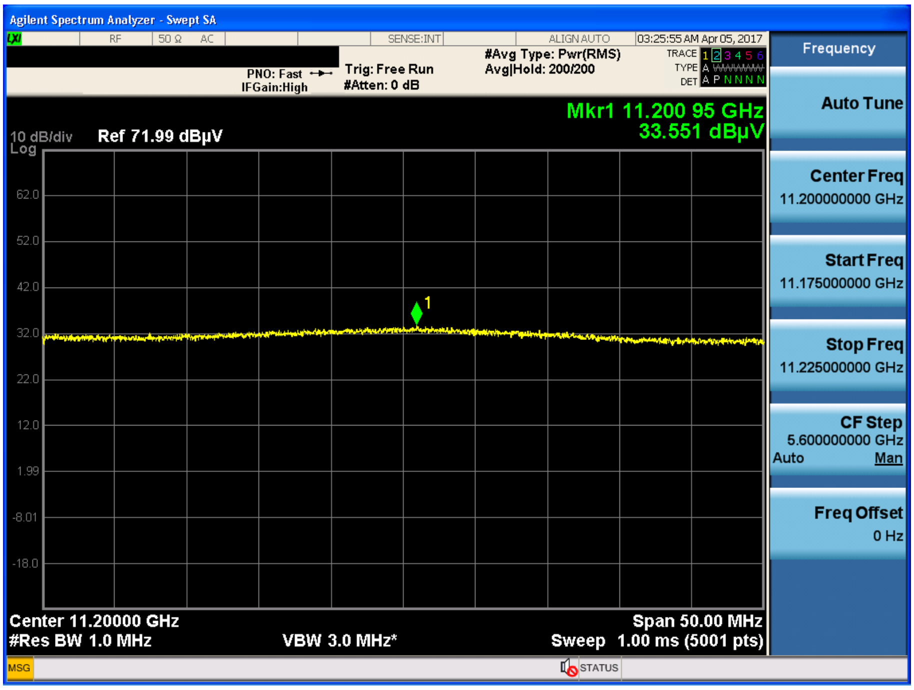
MKR	MODE	TRC	SCL	X	Y
1	N	1	f	5.498 26 GHz	92.341 dBµV
2	N	1	f	5.470 00 GHz	47.291 dBµV
3	N	1	f	5.460 00 GHz	45.453 dBµV
4	N	1	f	5.469 68 GHz	47.993 dBµV
5	N	1	f	5.459 48 GHz	48.561 dBµV

802.11a & U-NII 2C & Ch.100 & X axis & Hor Detector Mode : AV

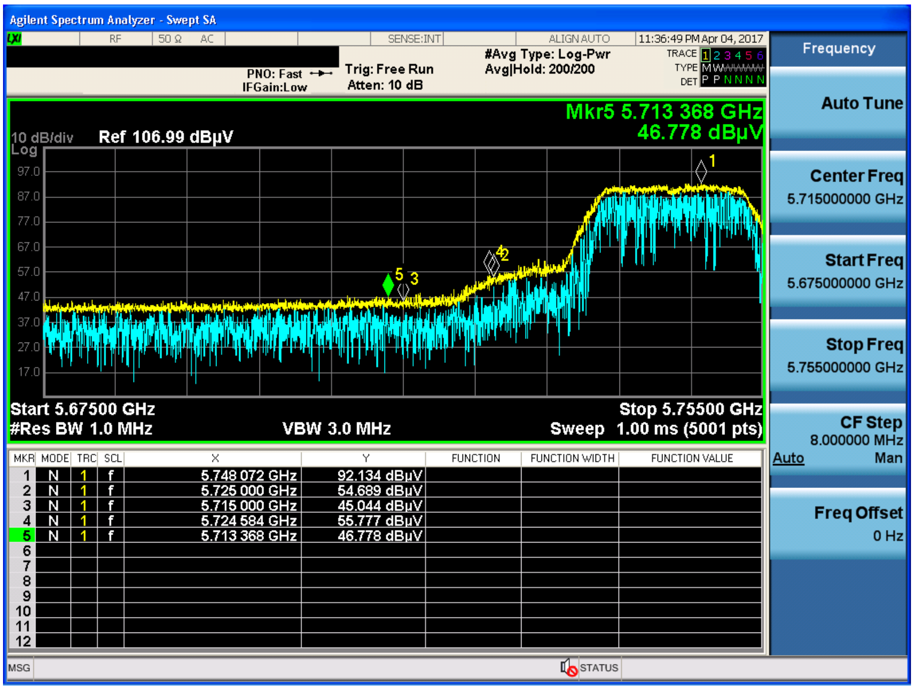


MKR	MODE	TRC	SCL	X	Y
1	N	1	f	5.498 26 GHz	83.649 dBµV
2	N	1	f	5.470 00 GHz	38.588 dBµV
3	N	1	f	5.460 00 GHz	37.806 dBµV
4	N	1	f	5.469 70 GHz	38.822 dBµV
5	N	1	f	5.459 54 GHz	38.187 dBµV

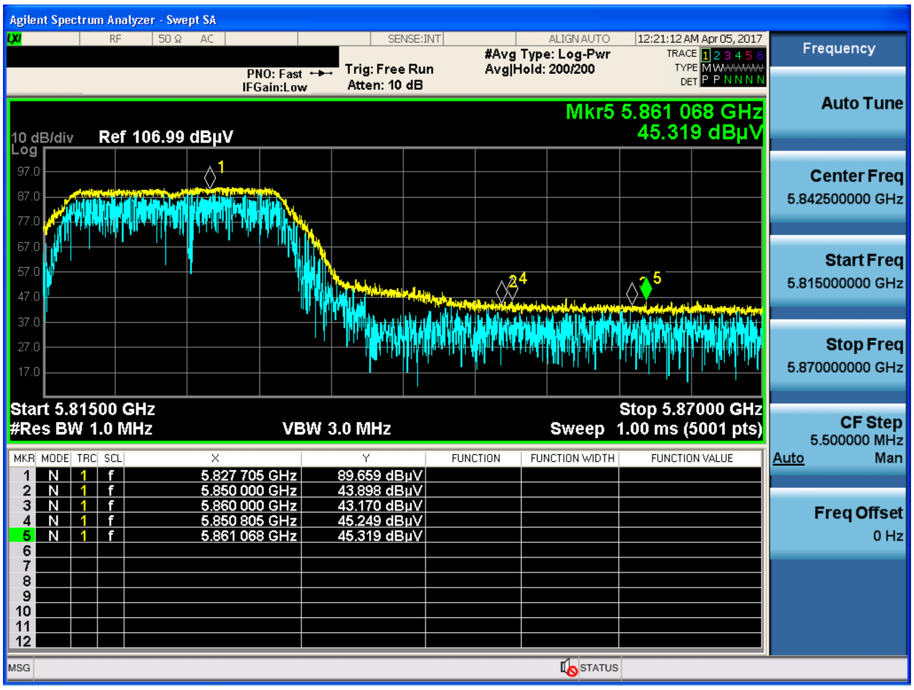
802.11a & U-NII 2C & Ch.120 & X axis & Hor Detector Mode : AV



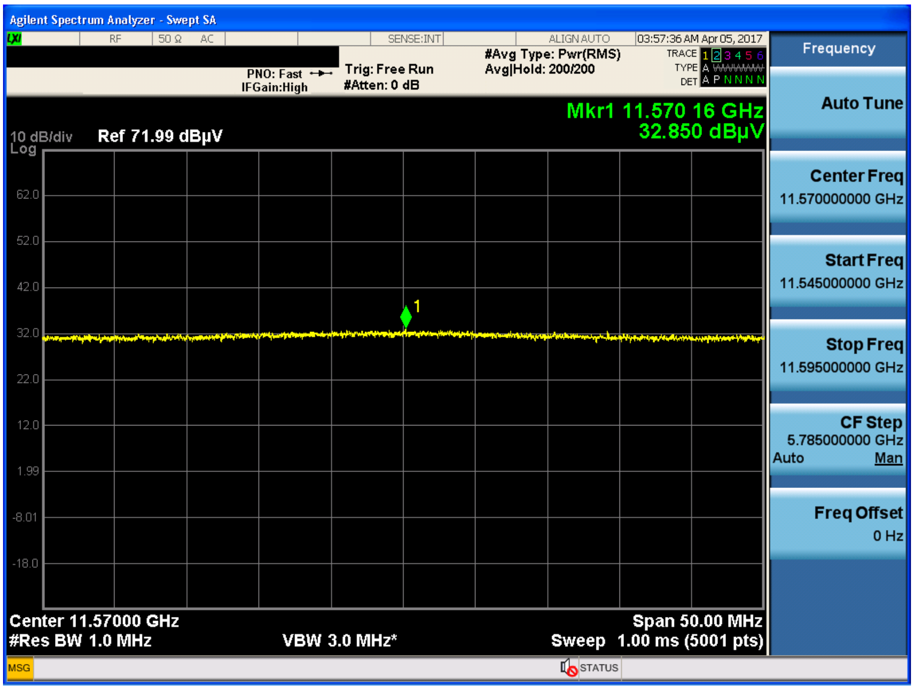
802.11a & U-NII 3 & Ch.149 & X axis & Hor Detector Mode : PK



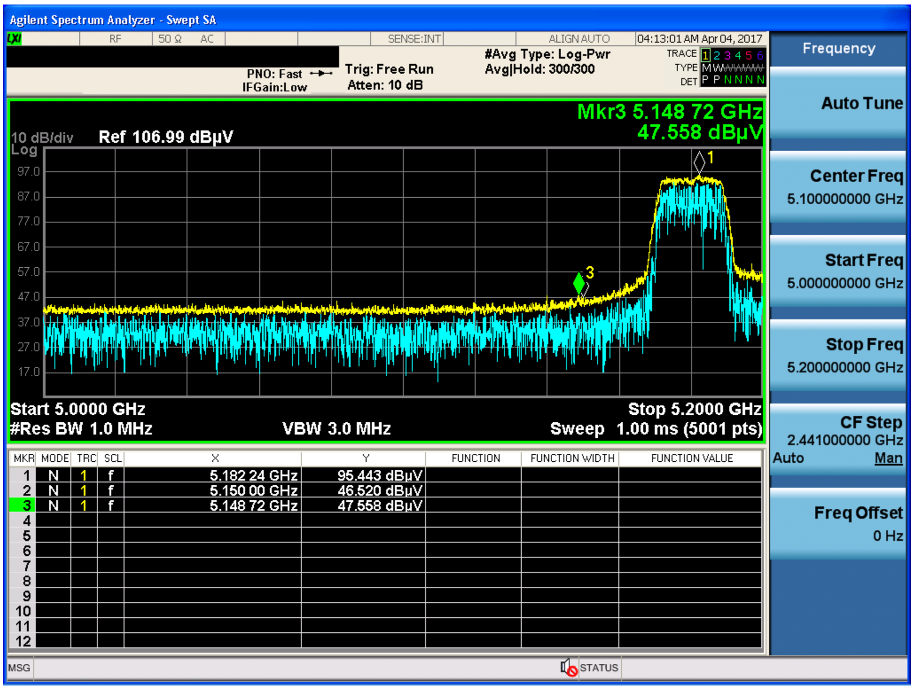
802.11a & U-NII 3 & Ch.165 & X axis & Hor Detector Mode : PK



802.11a & U-NII 3 & Ch.157 & X axis & Hor Detector Mode : AV



802.11n(HT20) & U-NII 1 & Ch.36 & X axis & Hor Detector Mode : PK



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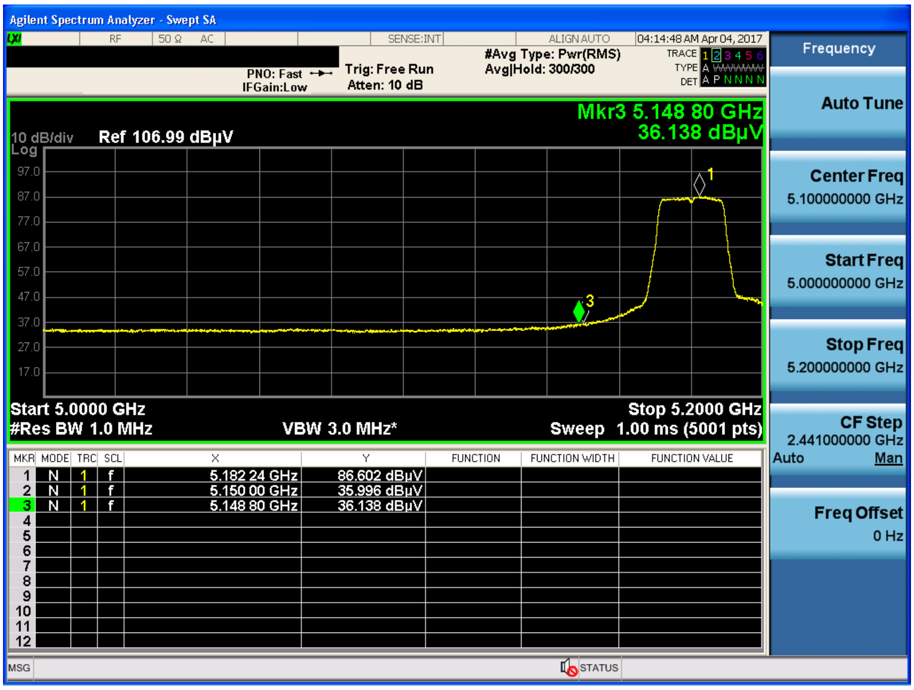
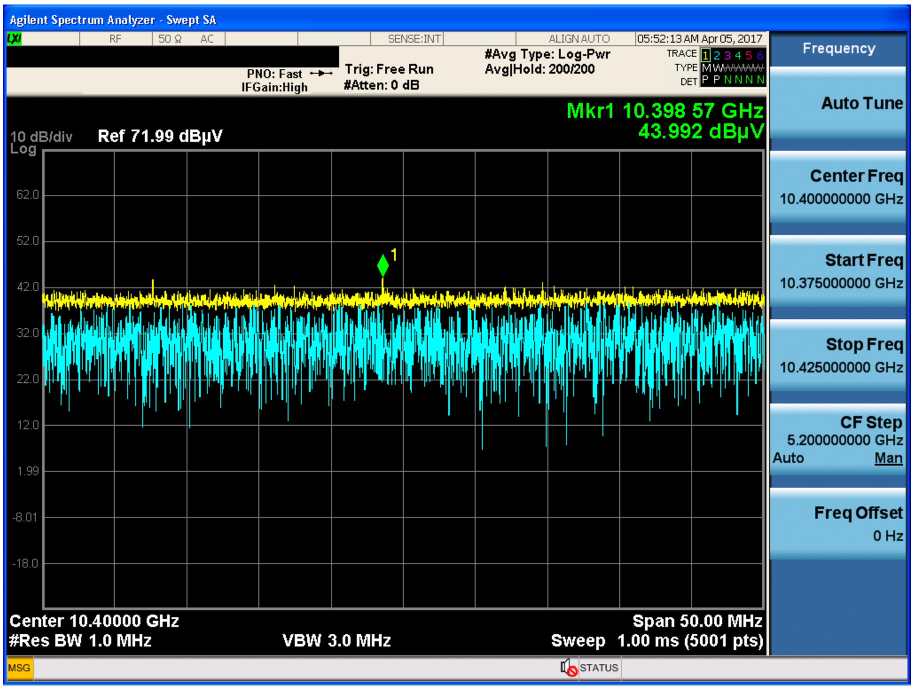
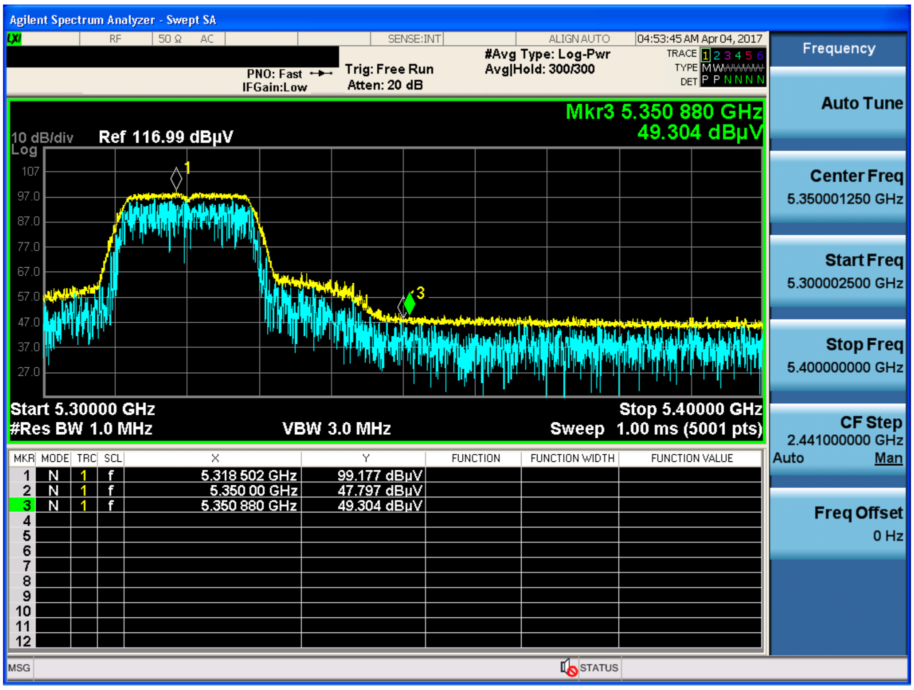


802.11n(HT20) & U-NII 1 & Ch.40 & X axis & Hor Detector Mode : PK



802.11n(HT20) & U-NII 2A & Ch.64 & X axis & Hor Detector Mode : PK



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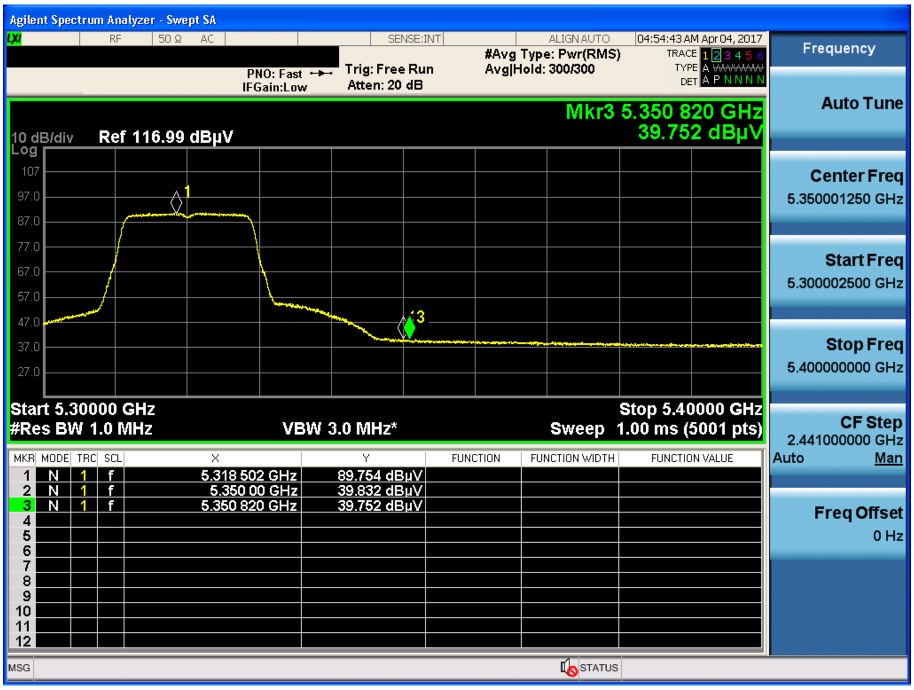

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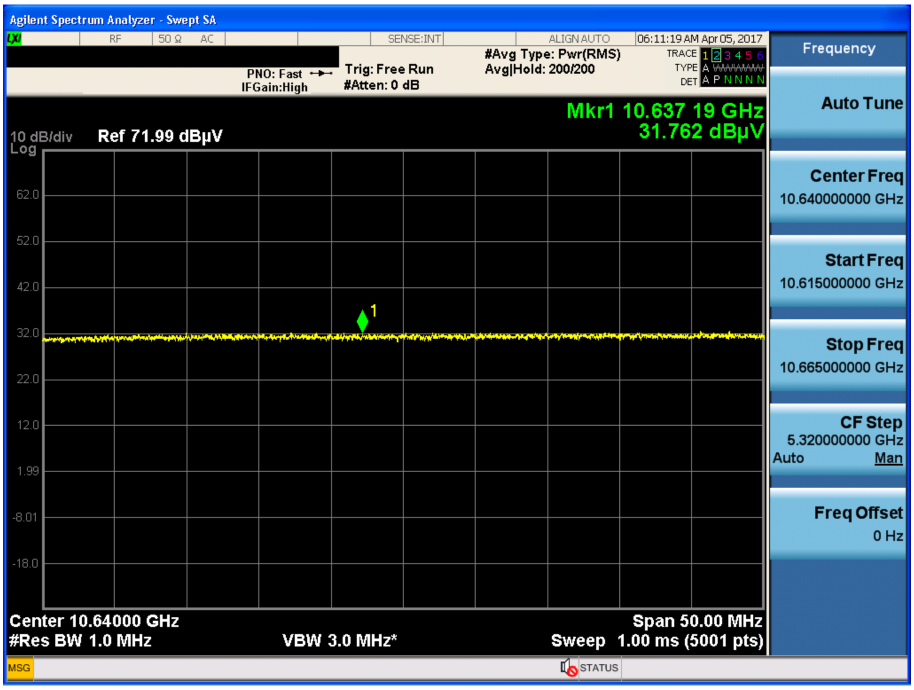
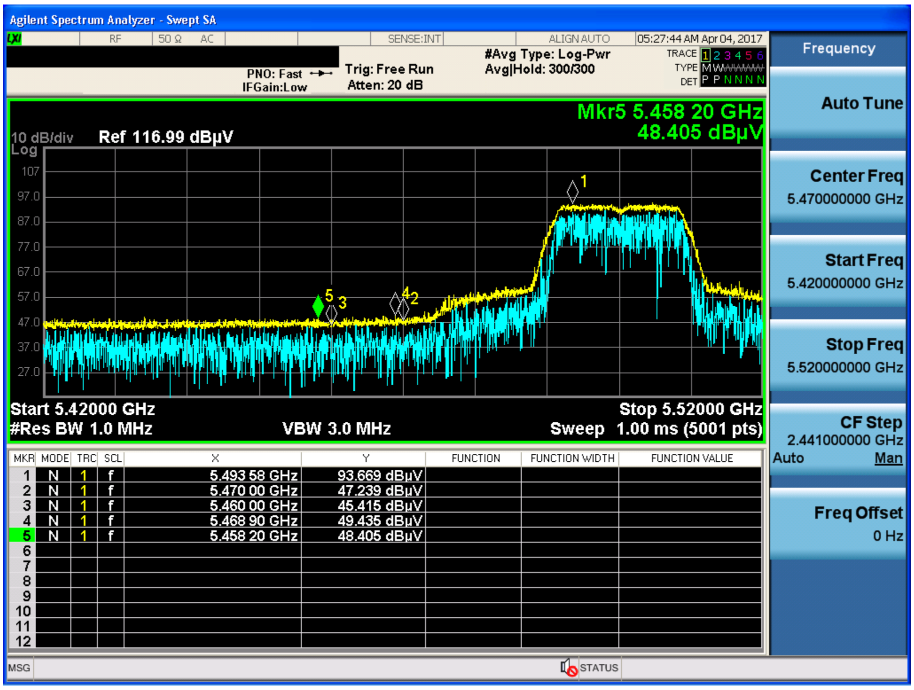


802.11n(HT20) & U-NII 2C & Ch.100 & X axis & Hor Detector Mode : PK



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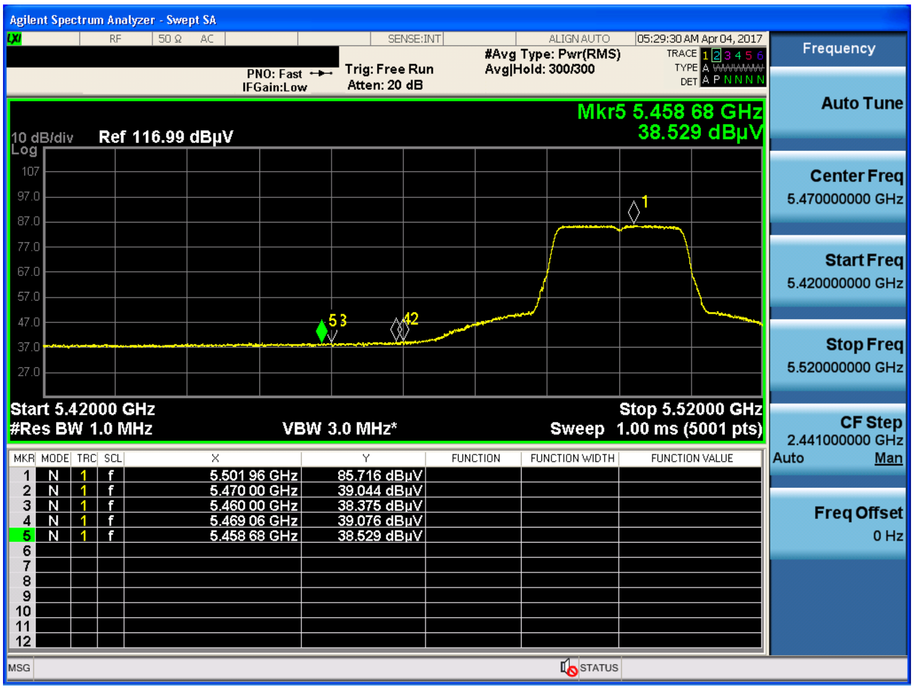
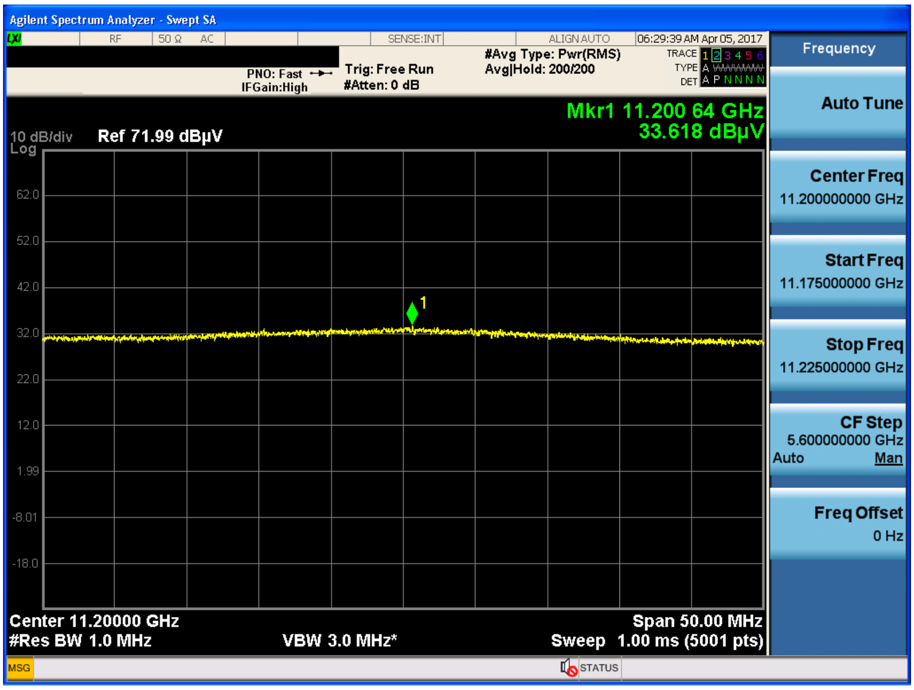
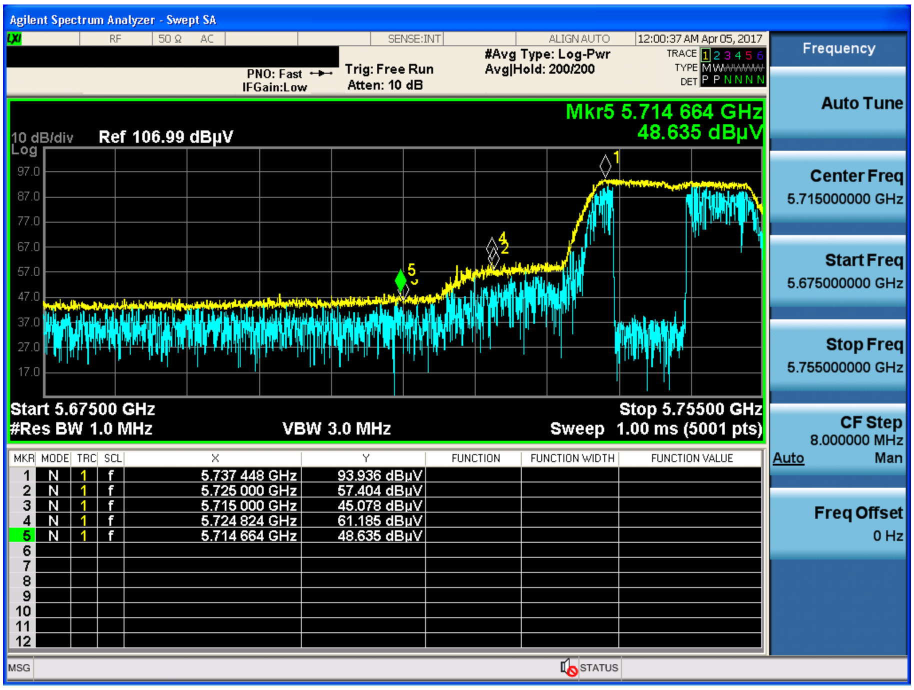


802.11n(HT20) & U-NII 2C & Ch.120 & X axis & Hor Detector Mode : AV



802.11n(HT20) & U-NII 3 & Ch.149 & X axis & Hor Detector Mode : PK



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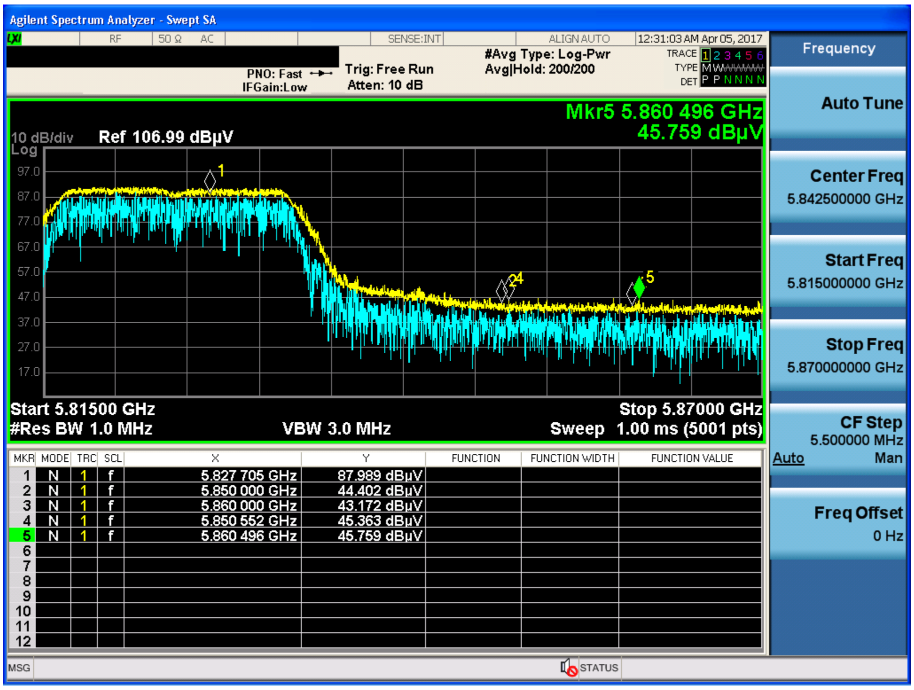
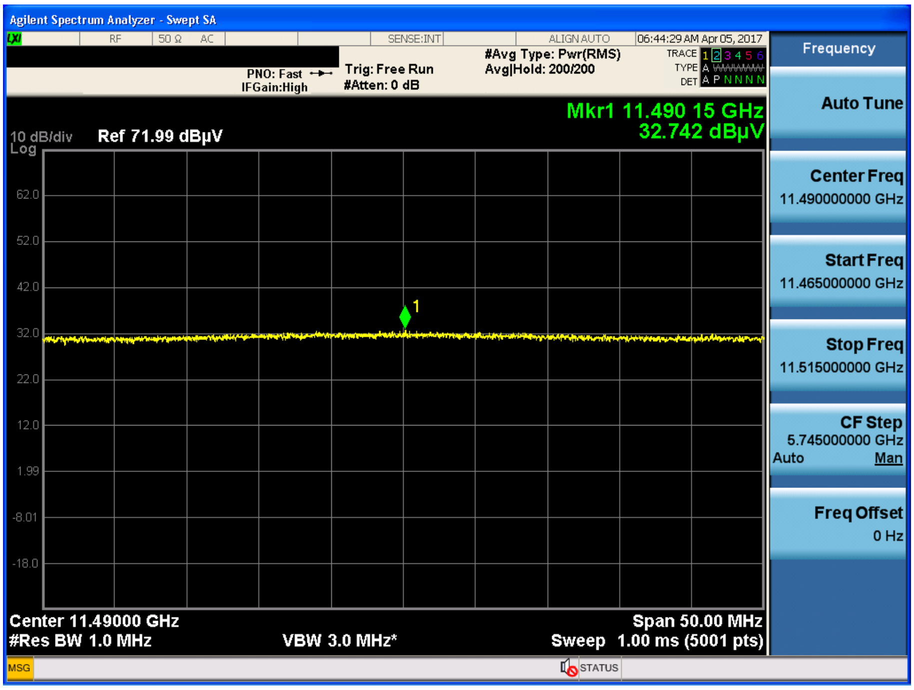
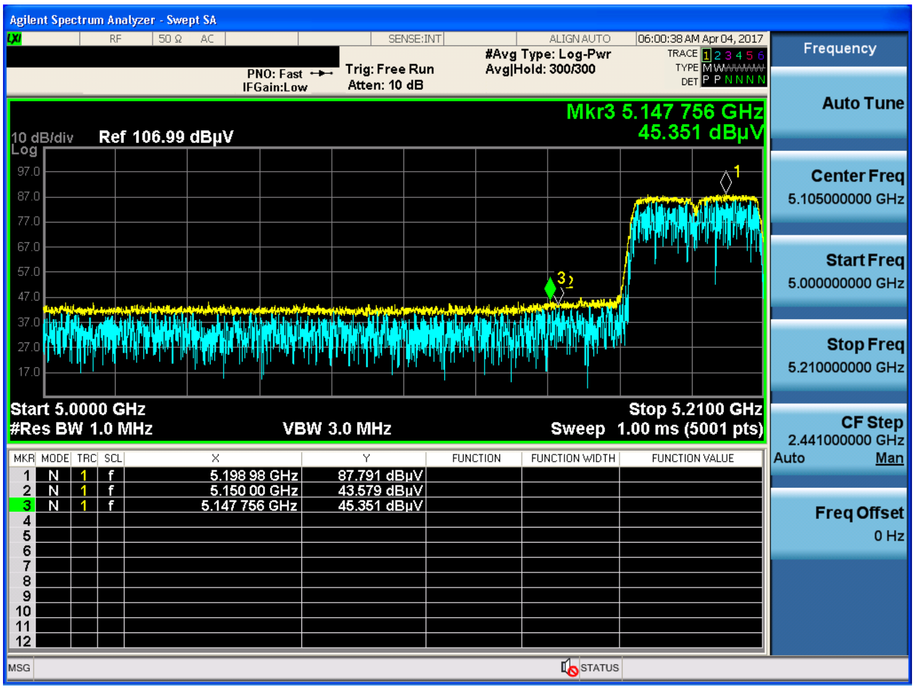


802.11n(HT20) & U-NII 3 & Ch.149 & X axis & Ver Detector Mode : AV



802.11ac(VHT40) & U-NII 1 & Ch.38 & X axis & Hor Detector Mode : PK



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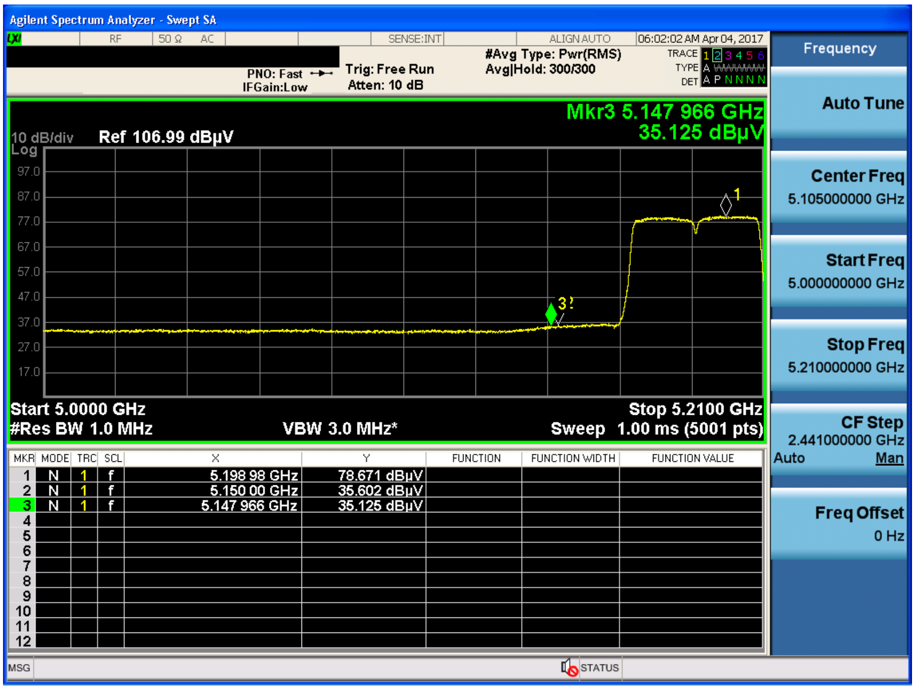
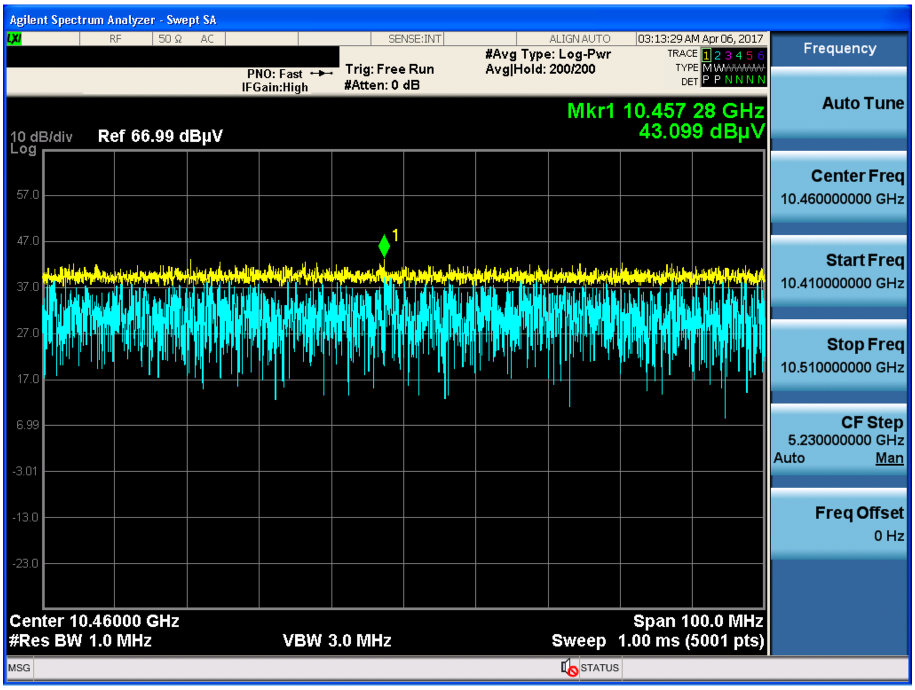
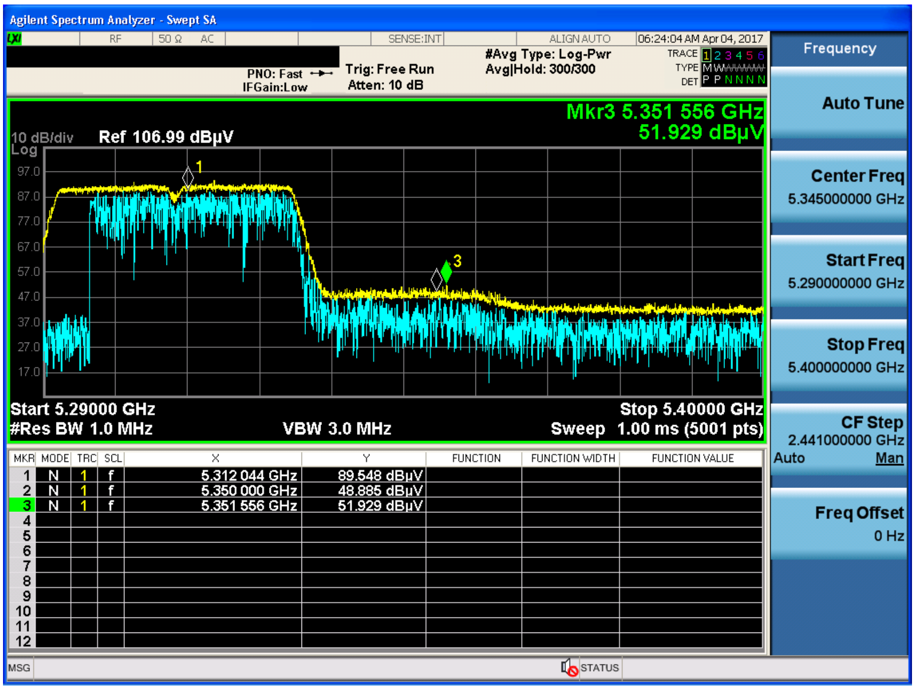


802.11ac(VHT40) & U-NII 1 & Ch.46 & X axis & Ver Detector Mode : PK



802.11n(VHT40) & U-NII 2A & Ch.62 & X axis & Hor Detector Mode : PK



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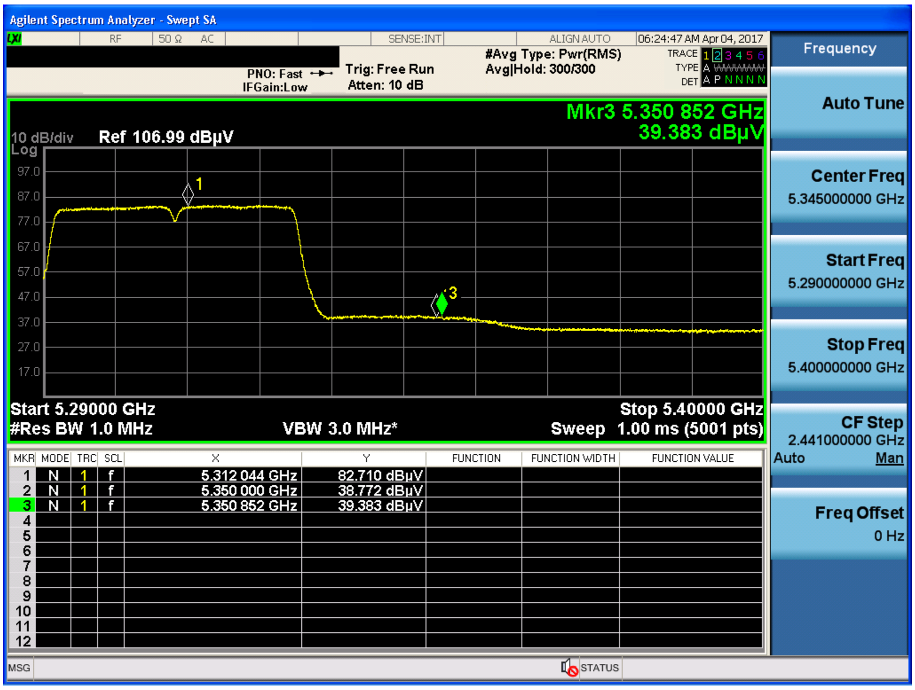

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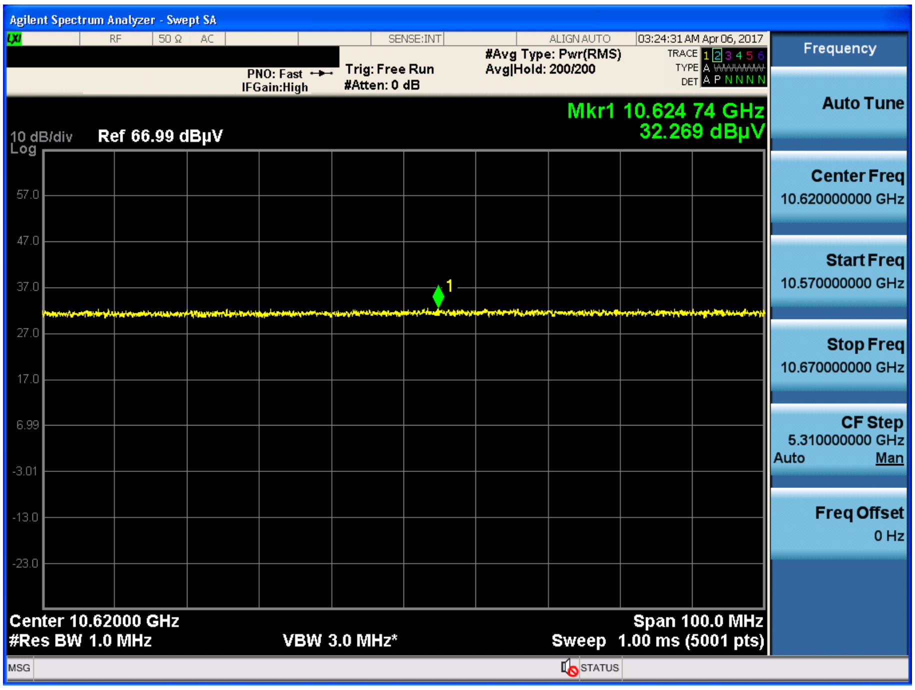
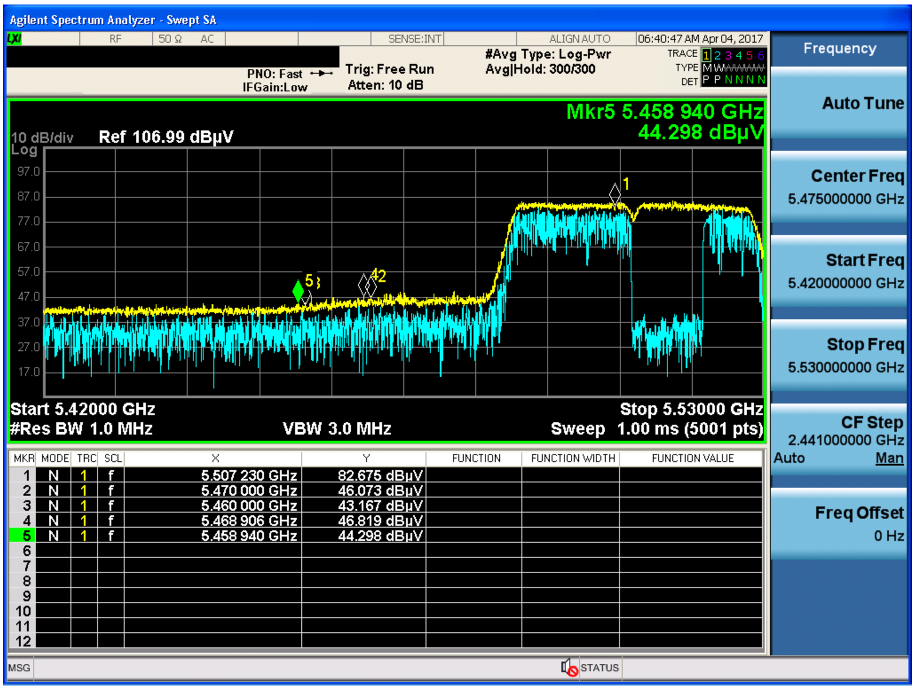


802.11n(VHT40) & U-NII 2C & Ch.102 & X axis & Hor Detector Mode : PK



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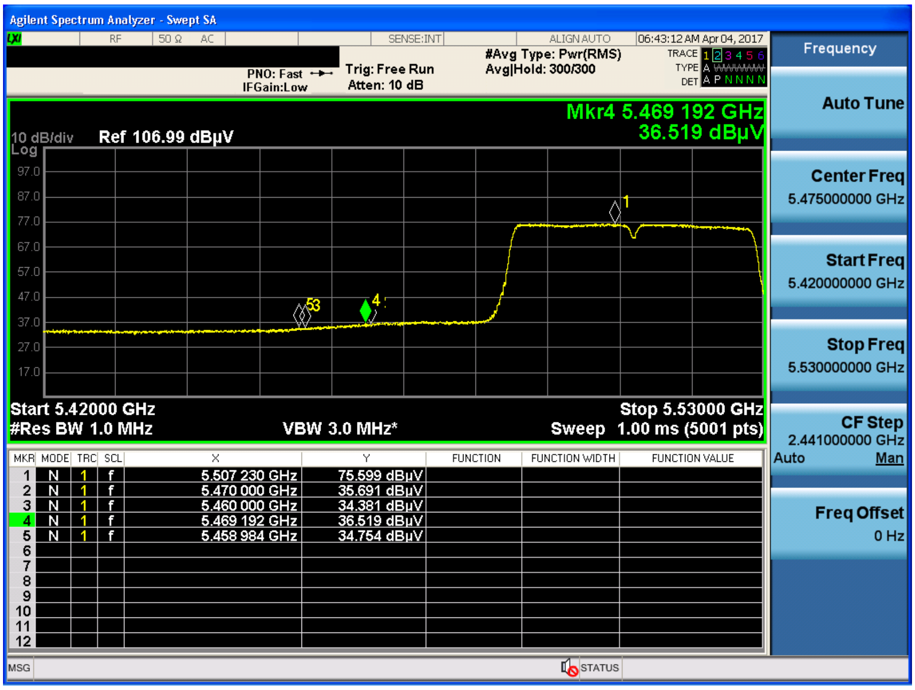

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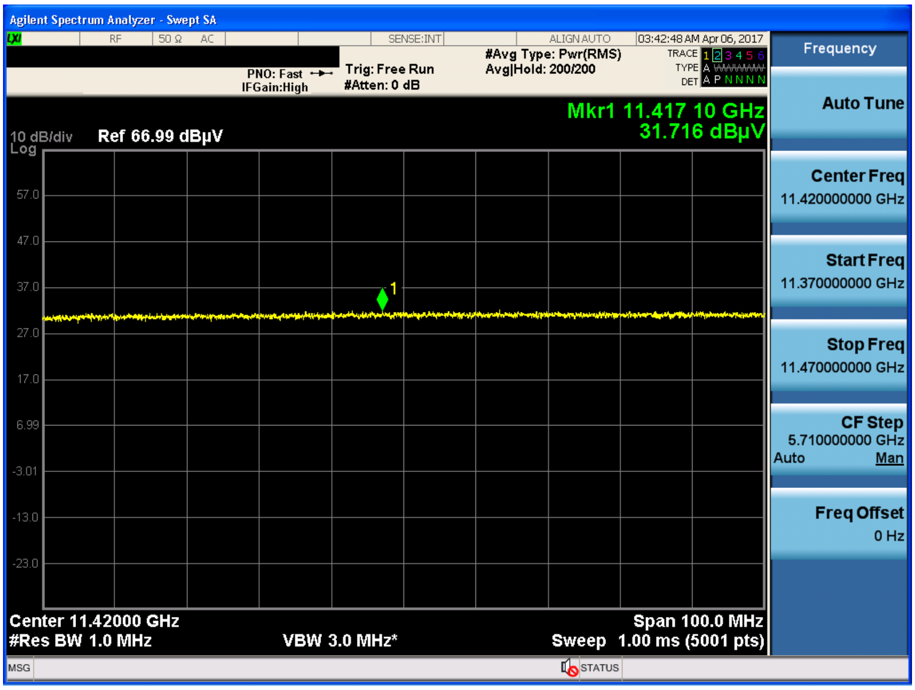
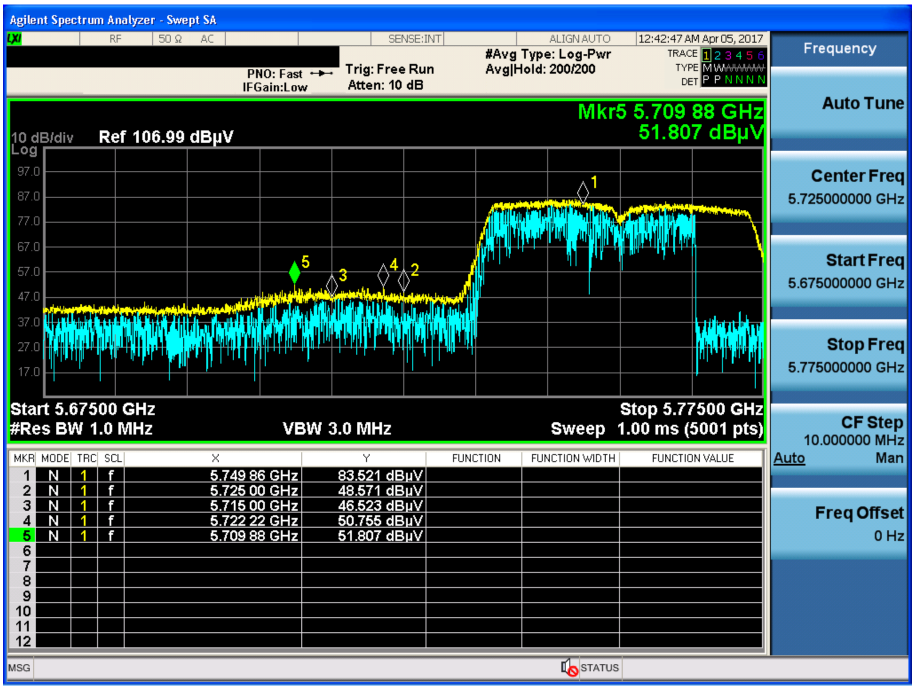


802.11n(VHT40) & U-NII 3 & Ch.151 & X axis & Hor Detector Mode : PK



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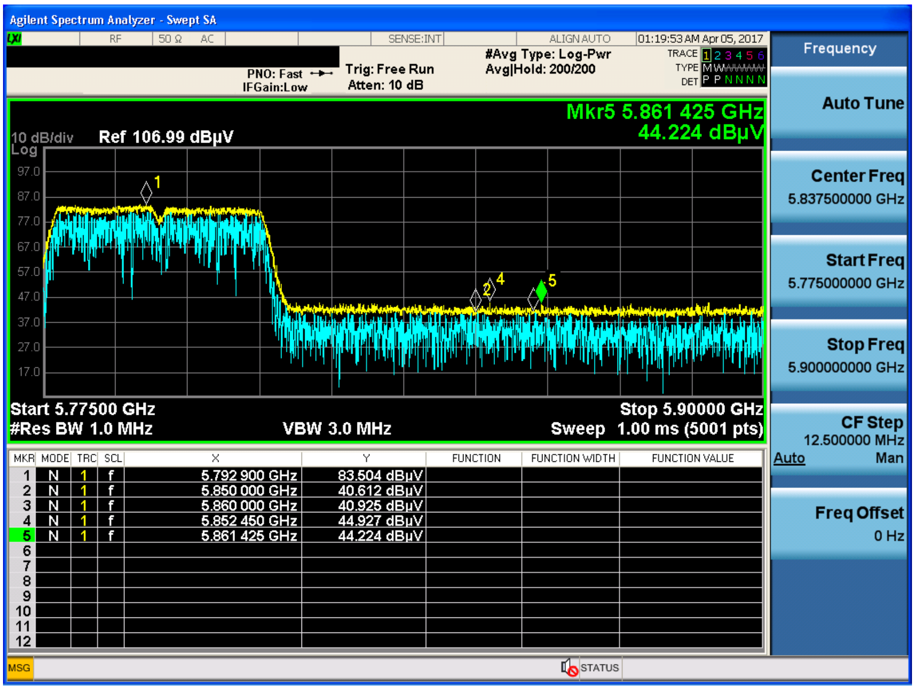

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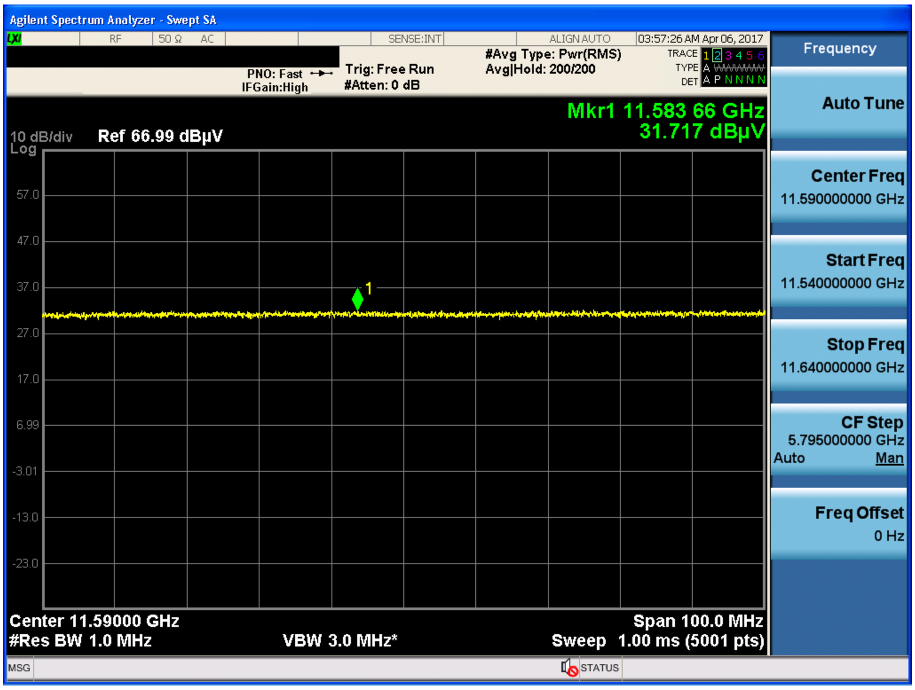
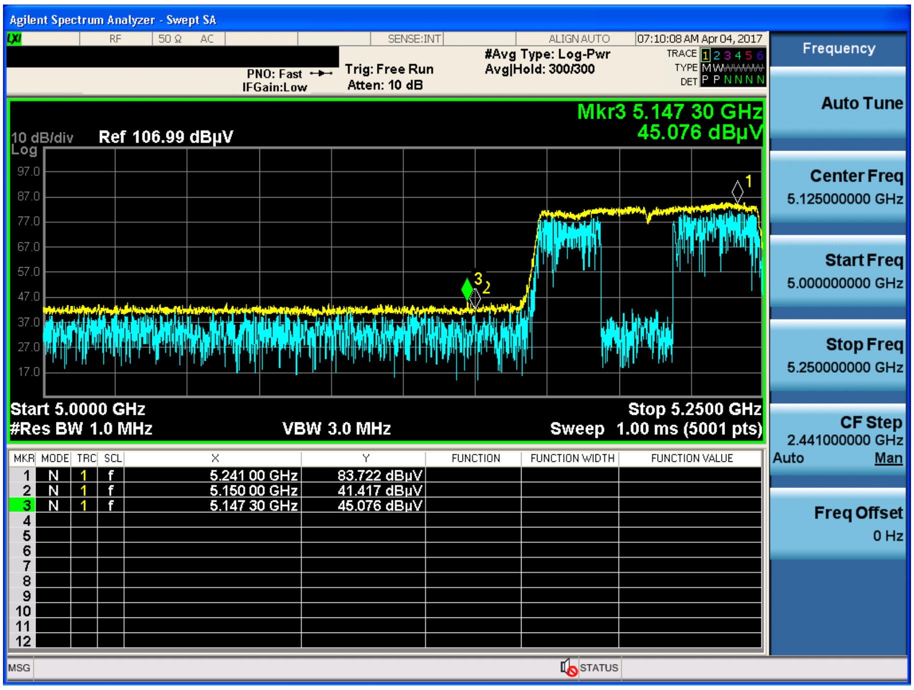


802.11ac(VHT80) & U-NII 1 & Ch.42 & X axis & Hor   Detector Mode : PK



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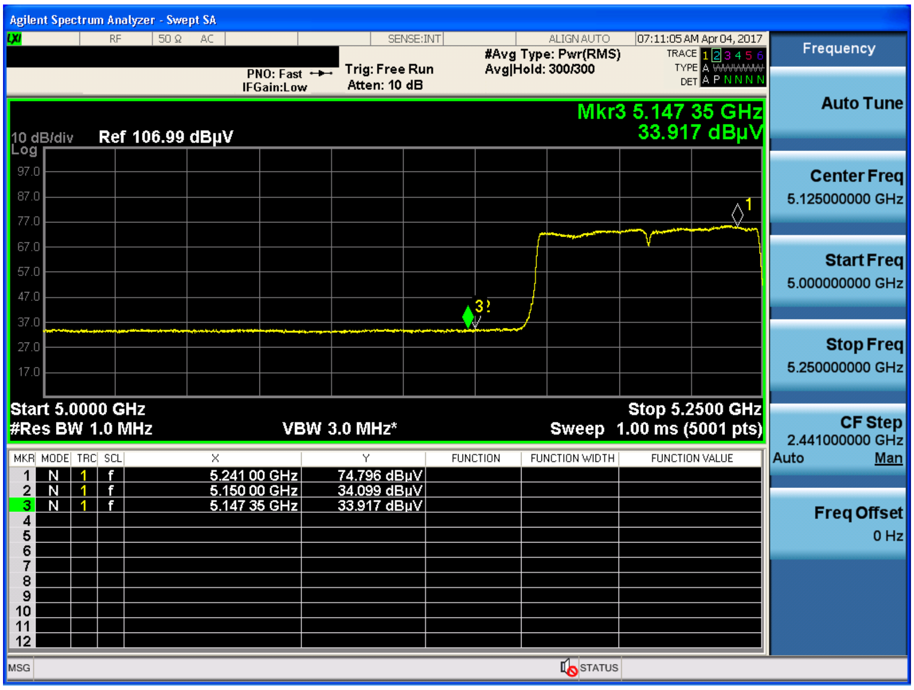
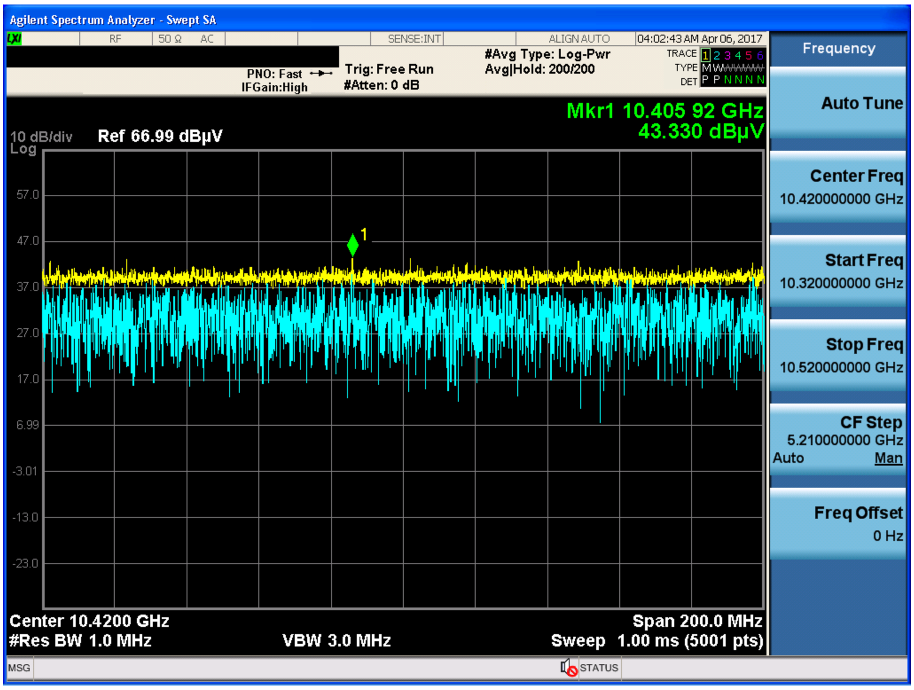
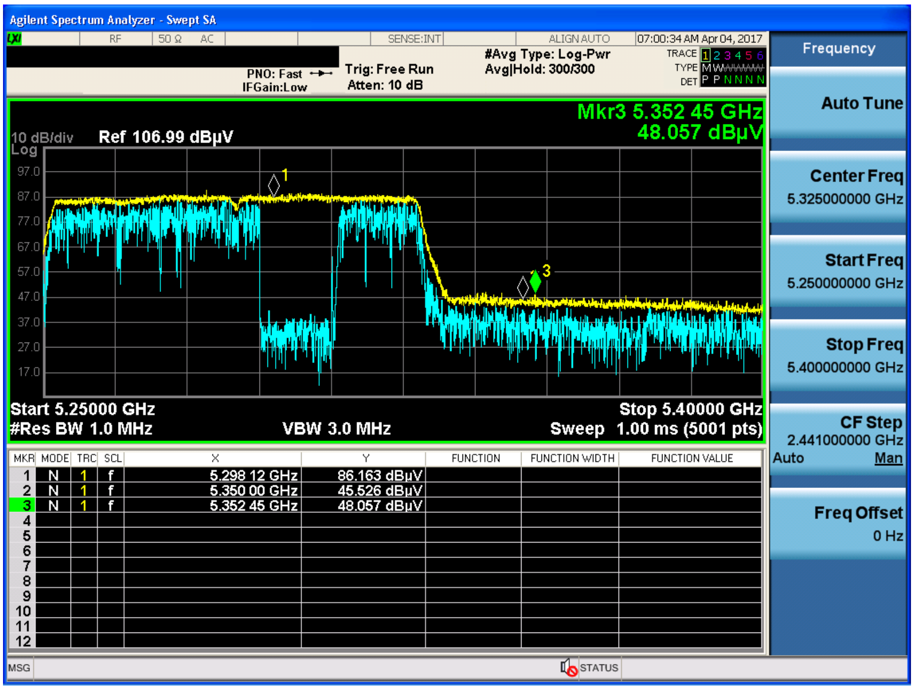


802.11ac(VHT80) & U-NII 1 & Ch.42 & X axis & Ver Detector Mode : PK



802.11ac(VHT80) & U-NII 2A & Ch.58 & X axis & Hor Detector Mode : PK



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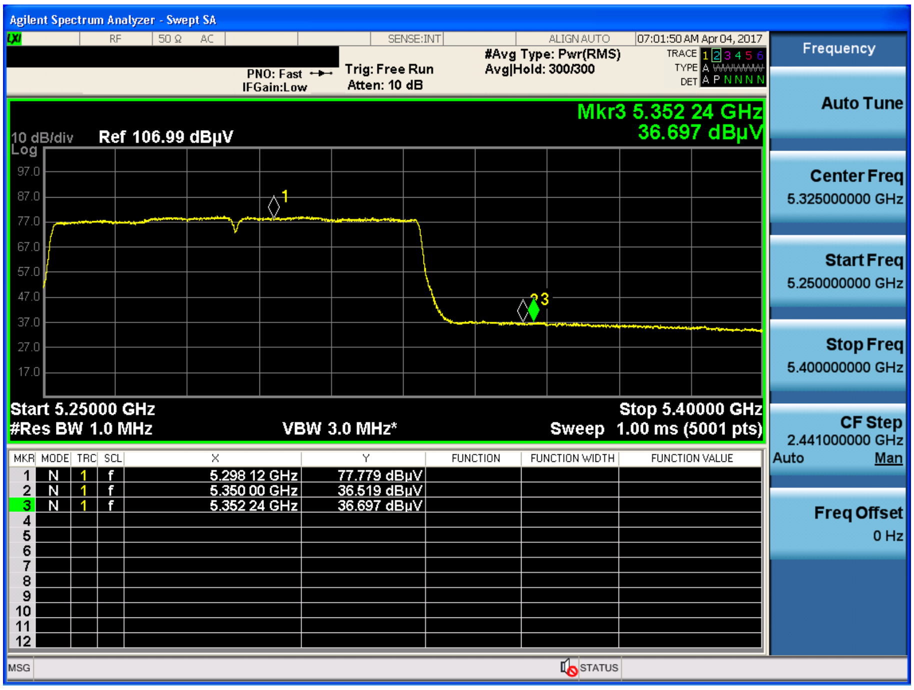

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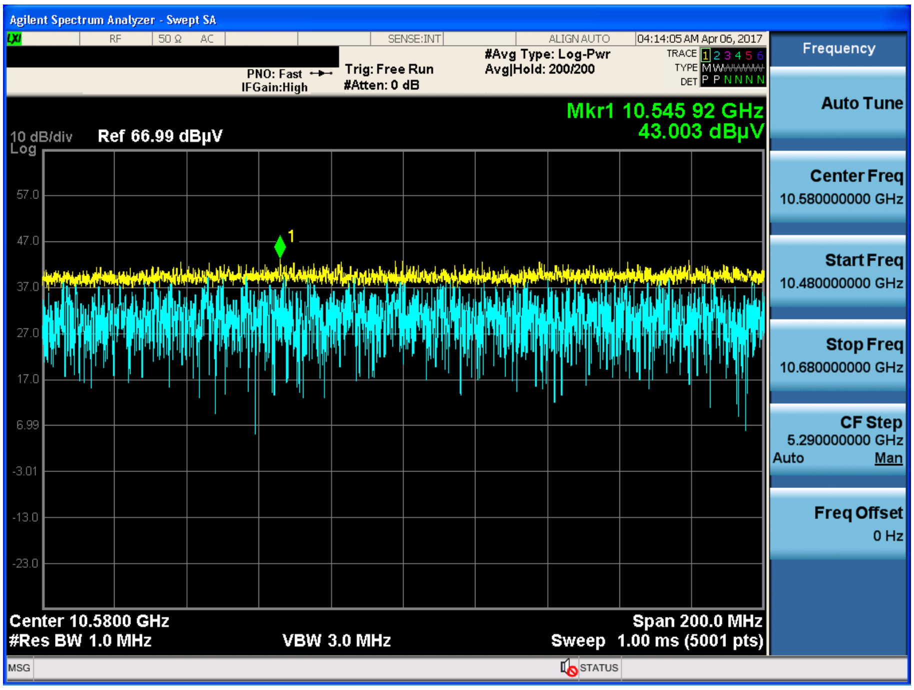
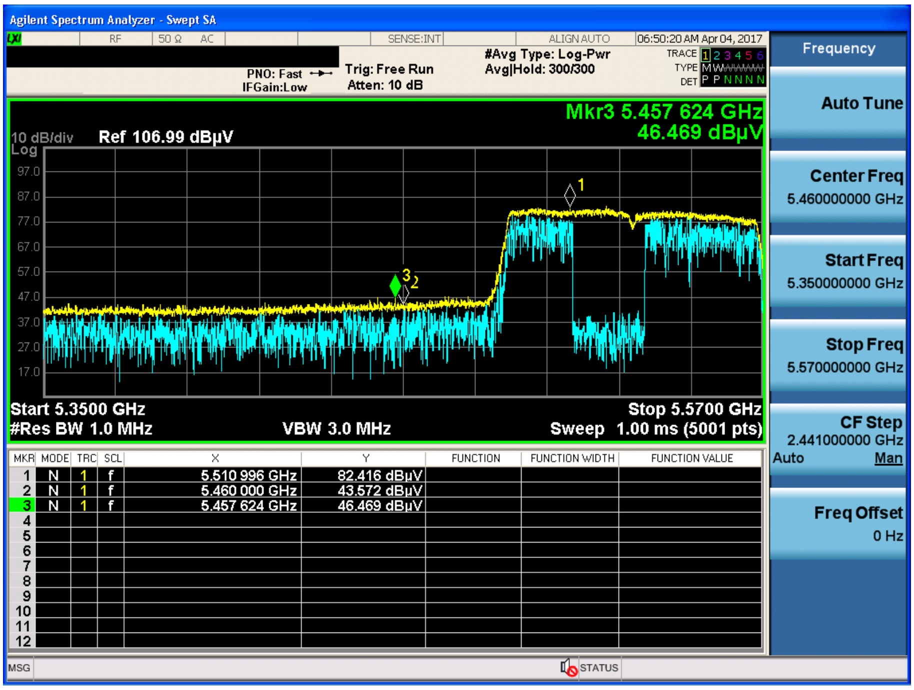


802.11ac(VHT80) & U-NII 2C & Ch.106 & X axis & Hor Detector Mode : PK



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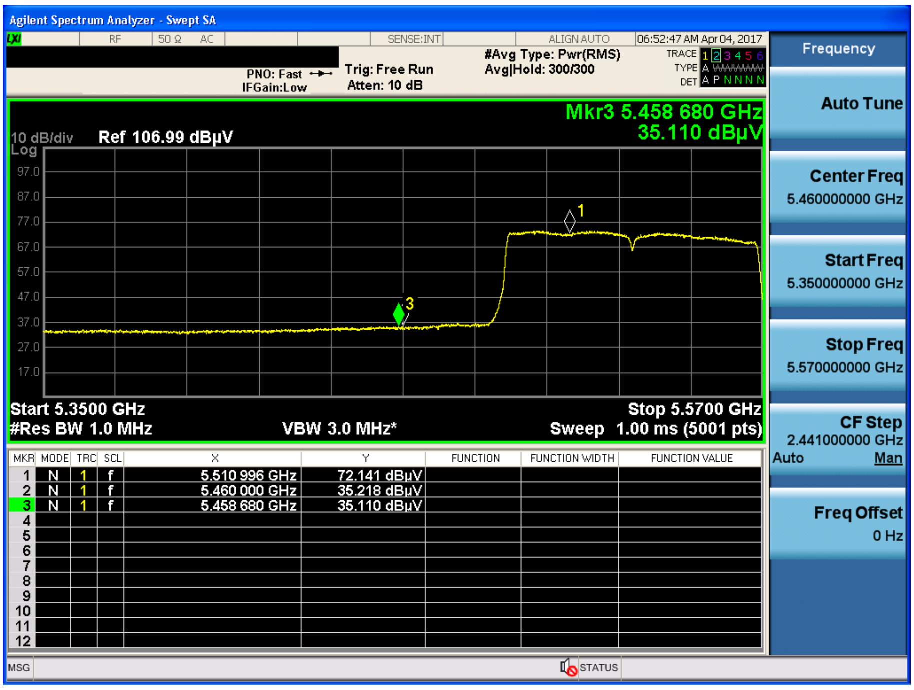

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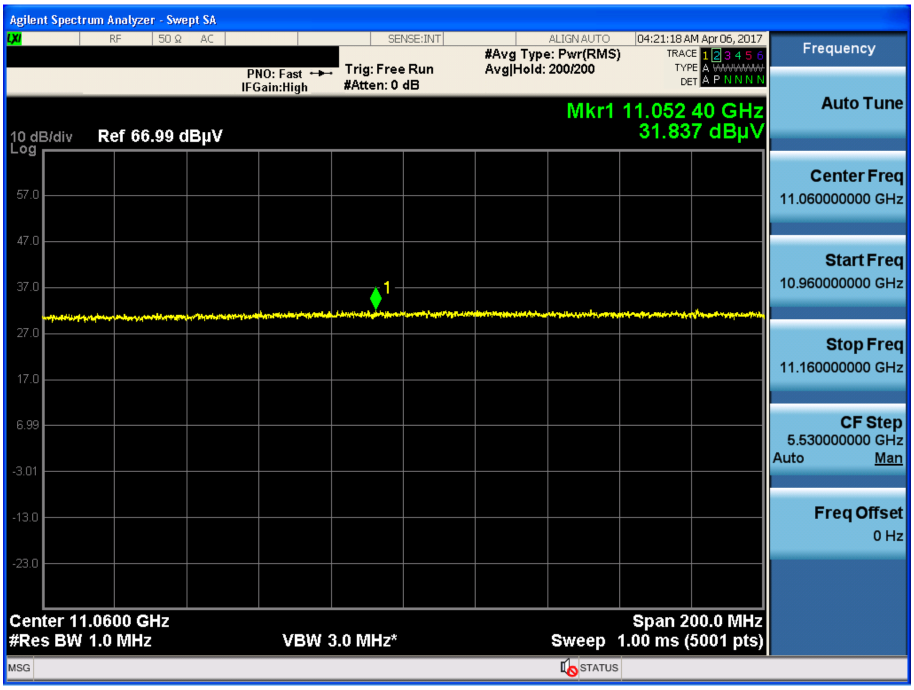

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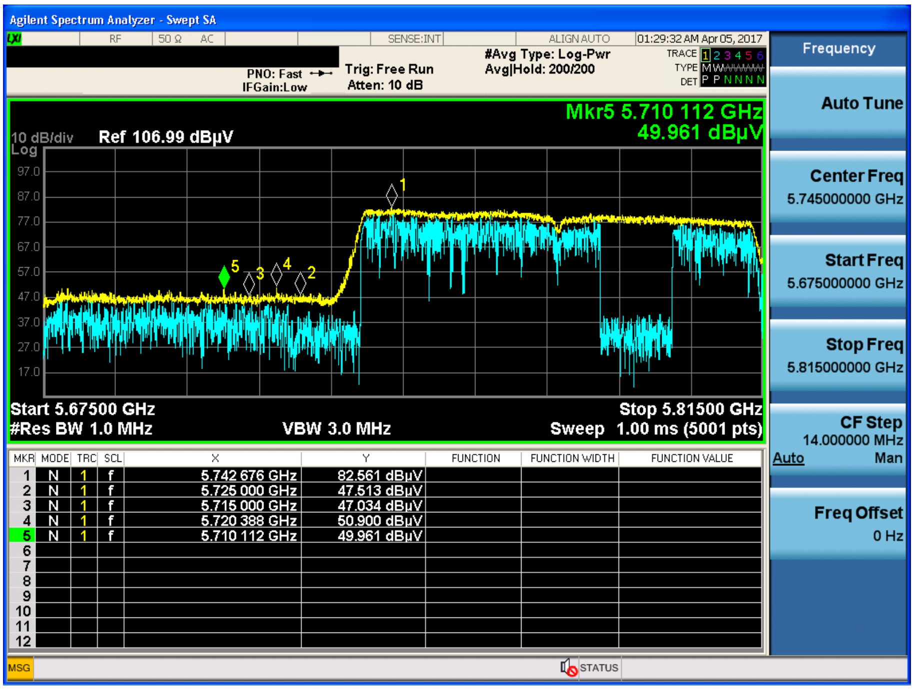

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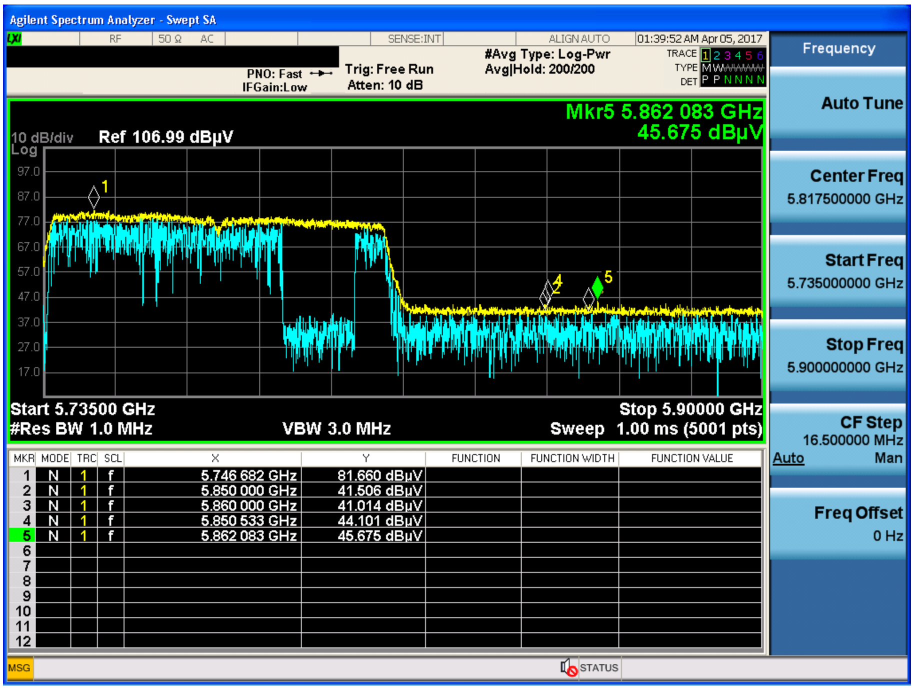

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