



CERTIFICATION TEST REPORT

Report Number. : 12901678-E5V2

Applicant : APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

Model : A2161, A2219, AND A2220

FCC ID : BCG-E3306A

EUT Description : SMARTPHONE

Test Standard(s) : FCC 47 CFR PART 15 SUBPART E

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REPORT REVISION HISTORY

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V1	8/17/2019	Initial Issue	Chris Xiong
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: SMARTPHONE

MODEL: A2161, A2219, AND A2220

SERIAL NUMBER: G6TYW007N397 (Conducted), G6TYW009N395 (Radiated)

DATE TESTED: JUNE 6TH, 2019 - AUGUST 16TH, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Complies

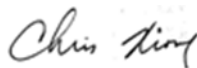
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 905462 D02 v02/D03 v01r02/D06 v02, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013, FCC 06-96.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
☒ Chamber A	☒ Chamber D	☐ Chamber I
☐ Chamber B	☒ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☐ Chamber K
	☒ Chamber G	☐ Chamber L
	☒ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wide band, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also not user accessible.

5.2. DIFFERENCE IN MODEL NUMBER

Model A2161, A2219, AND A2220 is electrically identical to Model A2161. Three model numbers are allocated for marketing and logistic purposes only. A2161 was used to perform all final tests.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND (FCC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 1TX			
5180-5240	802.11a	Covered by 802.11n HT20 1TX	
5180-5240	802.11n HT20	20.69	117.22
5190-5230	802.11n HT40	21.24	133.05
5180-5240	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5190-5230	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5210	802.11ac VHT80	16.74	47.21
5180-5240	802.11ax HE20	20.71	117.76
5190-5230	802.11ax HE40	21.22	132.43
5210	802.11ax HE80	15.24	33.42
5.2 GHz band, 2TX			
5180-5240	802.11n HT20 CDD	20.74	118.58
5180-5240	802.11n HT20 SDM/STBC	Covered by 802.11n HT20 2TX CDD	
5190-5230	802.11n HT40 CDD	22.73	187.50
5190-5230	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5180-5240	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5190-5230	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5210	802.11ac VHT80 CDD	18.74	74.82
5210	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5180-5240	802.11ax HE20 OFDMA	20.68	116.95
5190-5230	802.11ax HE40 OFDMA	22.73	187.50
5210	802.11ax HE80 OFDMA	17.17	52.12

5.3 GHz BAND (FCC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3 GHz band, 1TX			
5260 - 5320	802.11a	Covered by 802.11n HT20 1TX	
5260 - 5320	802.11n HT20	20.74	118.58
5270 - 5310	802.11n HT40	21.24	133.05
5260 - 5320	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5270 - 5310	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5290	802.11ac VHT80	17.24	52.97
5260 - 5320	802.11ax HE20	20.72	118.03
5270 - 5310	802.11ax HE40	21.24	133.05
5290	802.11ax HE80	15.73	37.41
5.3 GHz band, 2TX			
5260 - 5320	802.11n HT20 CDD	20.73	118.30
5260 - 5320	802.11n HT20 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5270 - 5310	802.11n HT40 CDD	22.74	187.93
5270 - 5310	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5260 - 5320	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5270 - 5310	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5290	802.11ac VHT80 CDD	19.24	83.95
5290	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5260 - 5320	802.11ax HE20 OFDMA	20.71	117.76
5270 - 5310	802.11ax HE40 OFDMA	22.72	187.07
5290	802.11ax HE80 OFDMA	17.71	59.02

5.6 GHz BAND (FCC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6 GHz band, 1TX			
5500-5720	802.11a	Covered by 802.11n HT20 1TX	
5500-5720	802.11n HT20	20.74	118.58
5510-5710	802.11n HT40	21.24	133.05
5500-5720	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5510-5710	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5530-5690	802.11ac VHT80	21.25	133.35
5500-5720	802.11ax HE20	20.63	115.61
5510-5710	802.11ax HE40	21.21	132.13
5530-5690	802.11ax HE80	21.23	132.74
5.6 GHz band, 2TX			
5500-5720	802.11n HT20 CDD	20.74	118.58
5500-5720	802.11n HT20 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5510-5710	802.11n HT40 CDD	22.73	187.50
5510-5710	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5500-5720	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5510-5710	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5530-5690	802.11ac VHT80 CDD	22.93	196.34
5530-5690	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5500-5720	802.11ax HE20 OFDMA	20.72	118.03
5510-5710	802.11ax HE40 OFDMA	22.75	188.36
5530-5690	802.11ax HE80 OFDMA	22.74	187.93

5.8 GHz BAND (FCC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8 GHz band, 1TX			
5745-5825	802.11a	Covered by 802.11n HT20 1TX	
5745-5825	802.11n HT20	21.22	132.43
5755-5795	802.11n HT40	21.20	131.83
5745-5825	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5755-5795	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5775	802.11ac VHT80	21.21	132.13
5745-5825	802.11ax HE20	21.24	133.05
5755-5795	802.11ax HE40	21.25	133.35
5775	802.11ax HE80	21.22	132.43
5.8 GHz band, 2TX			
5745-5825	802.11n HT20 CDD	24.26	266.69
5745-5825	802.11n HT20 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5755-5795	802.11n HT40 CDD	24.22	264.24
5755-5795	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5745-5825	802.11ac VHT20 STM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5755-5795	802.11ac VHT40 STM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5775	802.11ac VHT80 CDD	24.26	266.69
5775	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5745-5825	802.11ax HE20 OFDMA	24.26	266.69
5755-5795	802.11ax HE40 OFDMA	24.24	265.46
5775	802.11ax HE80 OFDMA	22.71	186.64

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range	Antenna 6 (Core 0)	Antenna 5 (Core 1)
5180 – 5240	-1.3	-5.8
5260 – 5320	-2.3	-7.1
5500 – 5720	-3.1	-5.6
5745 – 5825	-5.2	-9.4

5.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was WiFi FW Version: 18_20_56_1.

5.6. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations; X (Flatbed), Y (Landscape) and Z (Portrait) on Ant 6 (Core 0), Ant 5 (Core 1) and 2TX (Ant 6 + Ant 5). It was determined that Y (Landscape) orientation was the worst-case orientation for Ant 6, Ant 5 and 2TX.

For radiated harmonics spurious below 1GHz, 1-18GHz L/M/H channels, 18-40GHz, and power line conducted emissions, tests were performed with the EUT set at the 2TX CDD mode among the CDD/SDM modes with power setting equal or higher than SISO modes as worst-case scenario.

Radiated band edge, harmonic and spurious emissions from 1GHz to 18GHz were performed with the EUT set to transmit at highest power on Low/Middle/High channels. Radiated harmonic and spurious emissions for 11ax were tested with power setting equal to or higher than 11n legacy mode.

Below 1GHz tests were performed with EUT connected to AC power adapter as the worst case. For above 1GHz, the worst-case configuration reported was tested with EUT only. For AC line conducted emission, test was investigated with AC power adapter and with laptop.

There were no emissions found below 30MHz within 20dB of the limit.

The output power and PSD for the 802.11 ax mode were investigated between all different tones. The highest tone had the highest output power and lowest tone had the highest PSD readings. Therefore, full testing was performed on both the highest and lowest tones.

Simultaneous transmission with Bluetooth was investigated, and no noticeable emission was found.

Investigated worst-case data rates as listed below were:

802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac VHT80 mode: MCS0
802.11ax HE20/HE40/HE80 FULL RU & RU26

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
laptop	Apple	Macbook Pro	C02P41RZG086	FCC DoC
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
EUT AC Adapter	Apple	A1385	D292365CDYADHLHC3	NA

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADIATED ABOVE 1 GHz)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
NA						

I/O CABLES (BELOW 1GHz AND AC POWER LINE TEST WITH ADAPTER AND LAPTOP)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	2	N/A
2	USB	1	USB	Shielded	1	N/A

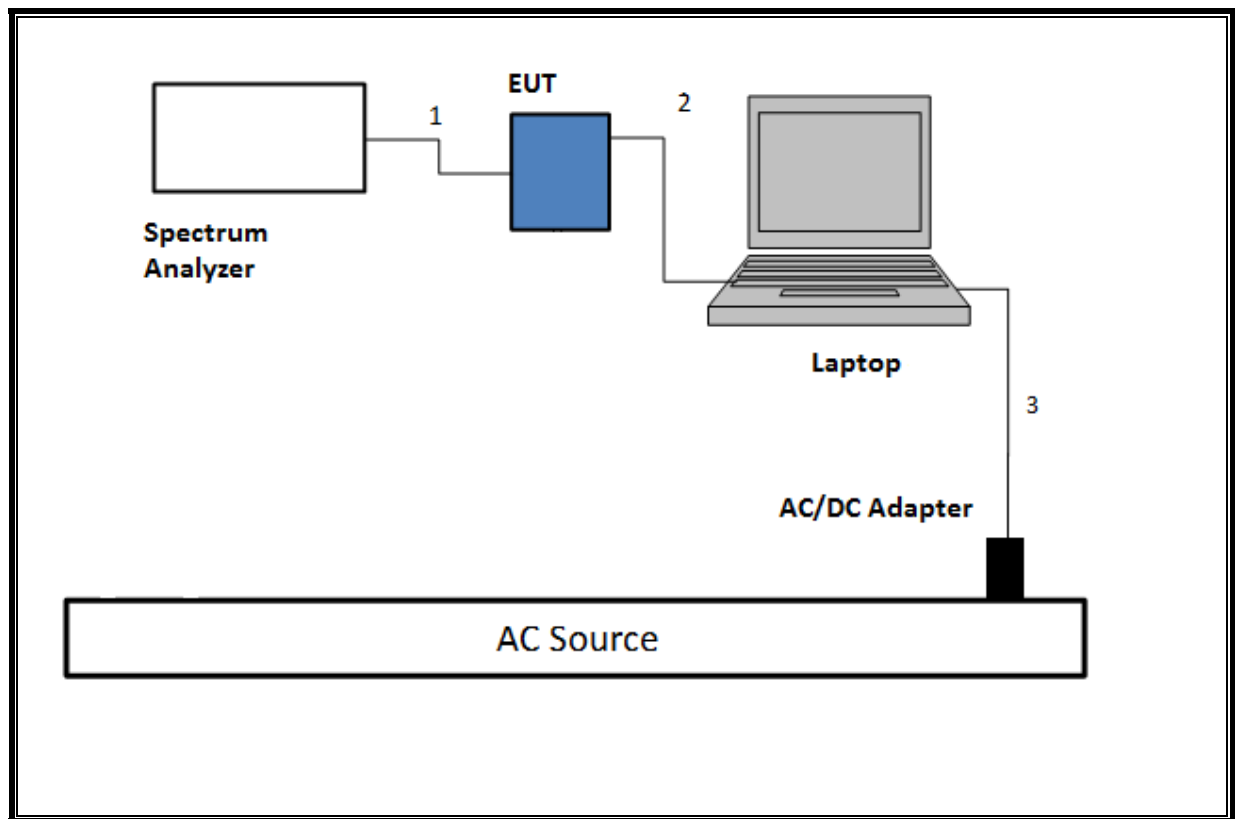
TEST SETUP - CONDUCTED TESTS

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

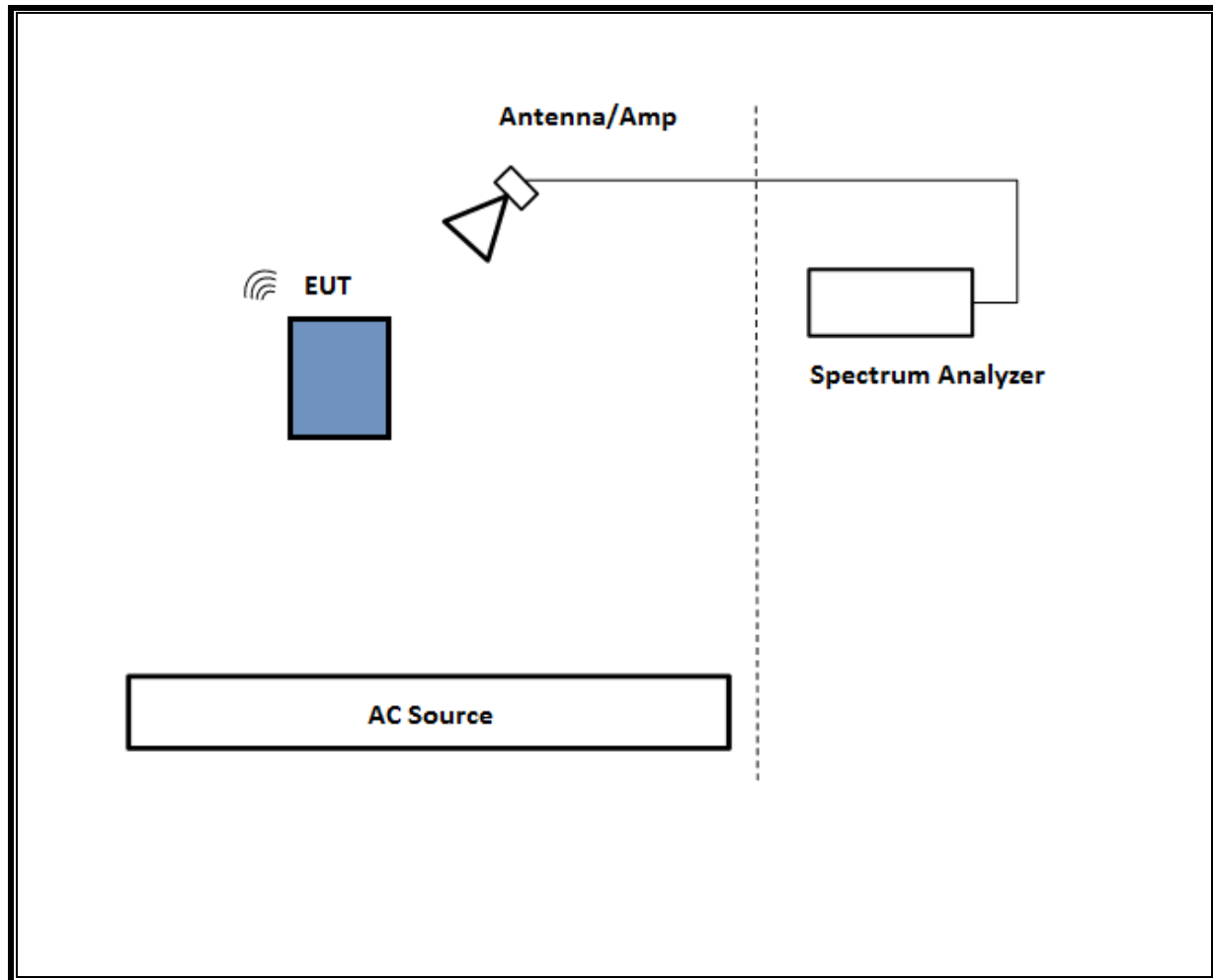
TEST SETUP - RADIATED TESTS

The EUT was powered by battery. Test software exercised the EUT.

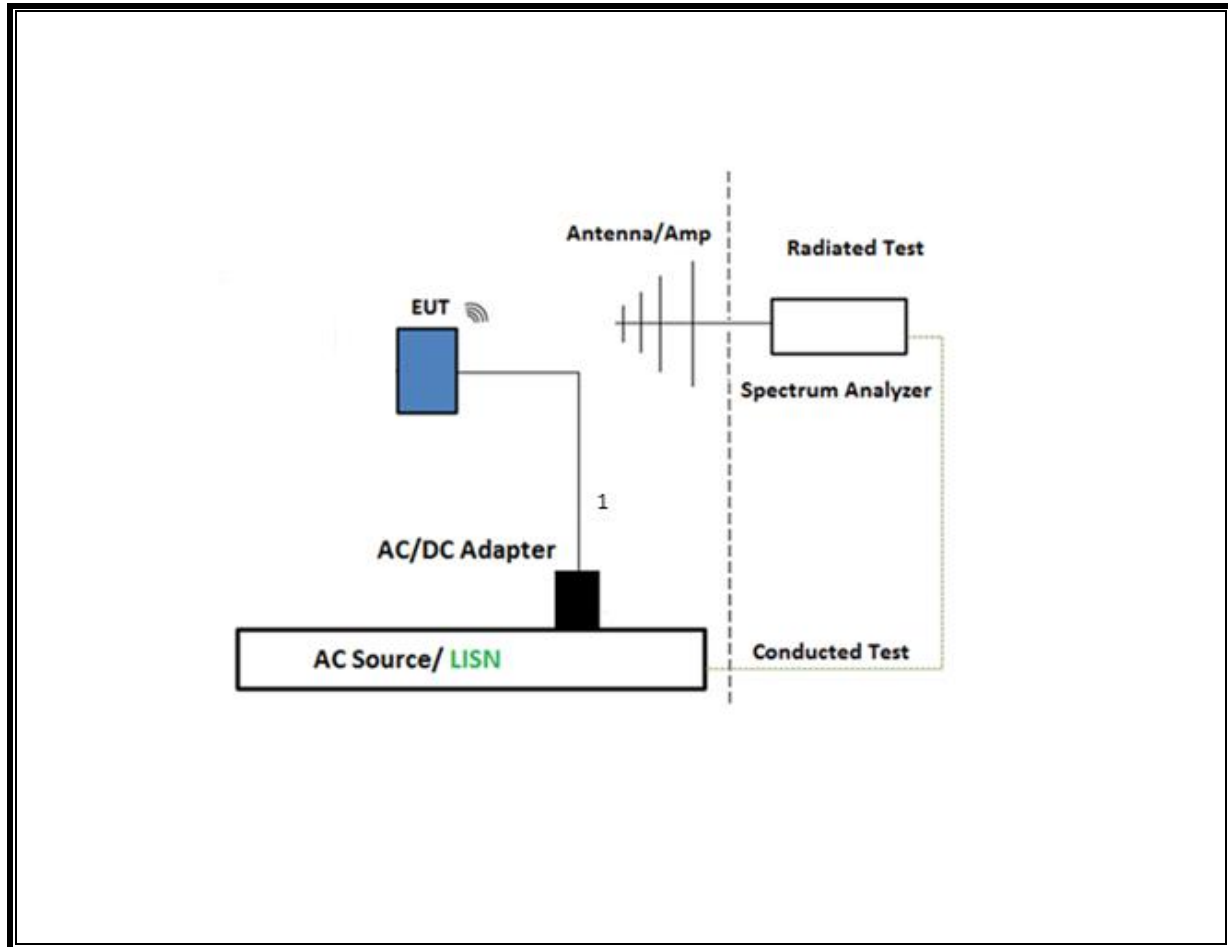
SETUP DIAGRAM FOR CONDUCTED TESTS



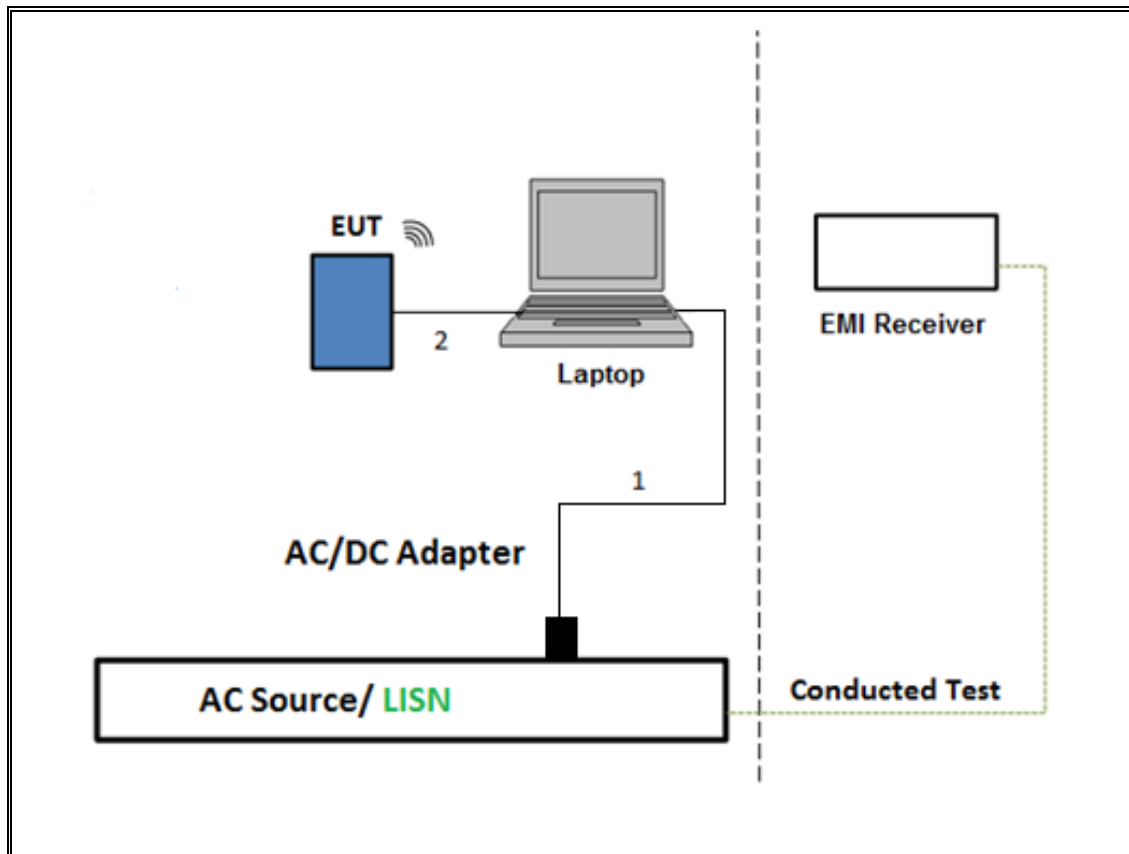
SETUP DIAGRAM FOR RADIATED TESTS ABOVE 1GHz



SETUP DIAGRAM FOR BELOW 1GHz AND AC LINE CONDUCTED TEST



SETUP DIAGRAM FOR AC LINE CONDUCTED TEST VIA LAPTOP CONFIGURATION



6. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section B

6 dB Emission BW: KDB 789033 D02 v02r01, Section C.2

26 dB Emission BW: KDB 789033 D02 v02r01, Section C.1

99% Occupied BW: KDB 789033 D02 v02r01, Section D

Conducted Output Power: KDB 789033 D02 v02r01, Section E.3.b (Method PM-G)

Power Spectral Density: KDB 789033 D02 v02r01, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipments were utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	ID Num	Last Cal	Cal Due
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T908	1/23/2019	1/23/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	5/14/19	5/14/20
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	2/2/2019	2/2/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T906	1/22/2019	1/22/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T712	2/26/2019	2/26/2020
Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T740	10/6/2018	10/6/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1466	1/23/2019	1/23/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T119	3/22/2019	3/22/2020
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	PRE0141166	9/15/2018	9/15/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A-544	T1113	1/22/2019	1/22/2020
*Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T136	7/2/2018	7/2/2019
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25-S-42	T491	5/30/2019	5/30/2020
*Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad	Sunol Sciences Corp.	JB3	T477	7/24/2018	7/24/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma Instrument	310N	T834	6/1/2019	6/1/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	1/22/2019	1/22/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	5/30/2019	5/30/2020
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25-S-42	T1567	1/26/2019	1/26/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T905	1/24/2019	1/24/2020
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T448	3/26/2019	3/26/2020
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent (Keysight) Technologies	8449B	T404	3/23/2019	3/23/2020
Antenna, Horn 26 to 40GHz	ARA	MWH-2640/B	T445	3/26/2019	3/26/2020
Amplifier, 26 - 40GHz	MITEQ	TTA2640-35-HG	T1864	3/23/2019	3/23/2020
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent (Keysight) Technologies	E4446A	T99	1/28/2019	1/28/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A-526	PRE0189715	3/18/2019	3/18/2020
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1268	1/31/2019	1/31/2020
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1228	3/1/2019	3/1/2020

*Tests were completed prior to equipment calibration due date

AC Line Conducted					
Description	Manufacturer	Model	ID Num	Last Cal	Cal Due
EMI Test Receiver 9KHz - 7GHz	Rohde & Schwarz	ESR	T1436	2/14/2019	2/14/2020
Conducted Emissions	UL	PR1	T861	10/19/2018	10/19/2019
LISN	Fischer Custom Communications	FCC-LISN-50/250-25-2-01	T1310	1/24/2019	1/24/2020

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016
Conducted Software	UL	UL EMC	Ver 9.9, June 4, 2019
Antenna Port Software	UL	UL RF	Ver 9.5, May 26, 2015

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

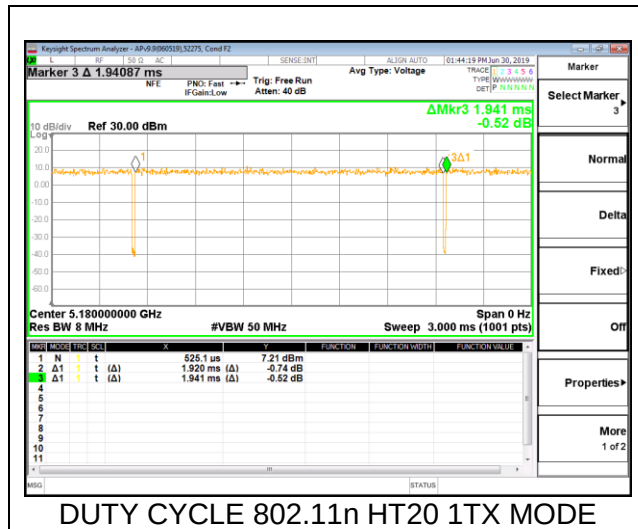
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

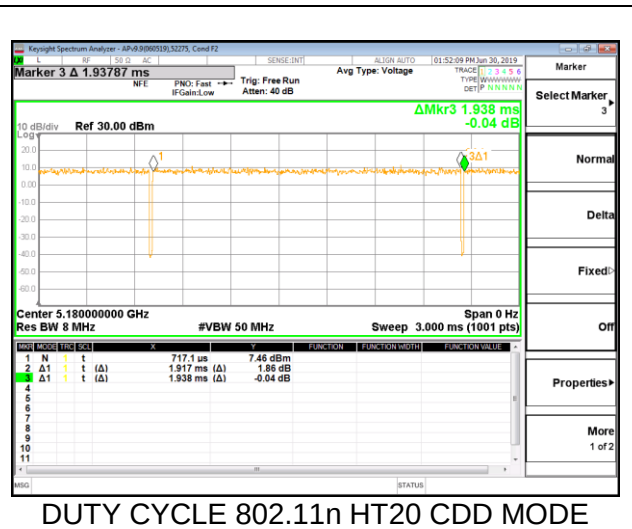
ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
5GHz Band						
802.11n HT20 1Tx	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT20 CDD	1.917	1.938	0.989	98.92%	0.00	0.010
802.11n HT40 1Tx	0.943	0.965	0.977	97.73%	0.10	1.060
802.11n HT40 CDD	0.945	0.965	0.979	97.93%	0.09	1.058
802.11ac VHT80 1Tx	0.459	0.480	0.956	95.59%	0.20	2.179
802.11ac VHT80 CDD	0.459	0.480	0.956	95.56%	0.20	2.179
802.11ax HE20 1Tx, 242-Tones	1.593	1.614	0.987	98.70%	0.00	0.010
802.11ax HE20 1Tx, 26-Tones	4.155	4.186	0.993	99.26%	0.00	0.010
802.11ax HE20 OFDMA, 242-Tones	1.575	1.595	0.987	98.75%	0.00	0.010
802.11ax HE20 OFDMA, 26-Tones	4.155	4.186	0.993	99.26%	0.00	0.010
802.11ax HE40 1Tx, 484-Tones	1.581	1.602	0.987	98.69%	0.00	0.010
802.11ax HE40 1Tx, 26-Tones	4.152	4.188	0.991	99.14%	0.00	0.010
802.11ax HE40 OFDMA, 484-Tones	1.581	1.602	0.987	98.69%	0.00	0.010
802.11ax HE40 OFDMA, 26-Tones	4.152	4.188	0.991	99.14%	0.00	0.010
802.11ax HE80 1Tx, 996-Tones	1.496	1.516	0.987	98.68%	0.00	0.010
802.11ax HE80 1Tx, 26-Tones	4.152	4.188	0.991	99.14%	0.00	0.010
802.11ax HE80 OFDMA, 996-Tones	1.494	1.516	0.985	98.55%	0.00	0.010
802.11ax HE80 OFDMA, 26-Tones	4.158	4.188	0.993	99.28%	0.00	0.010

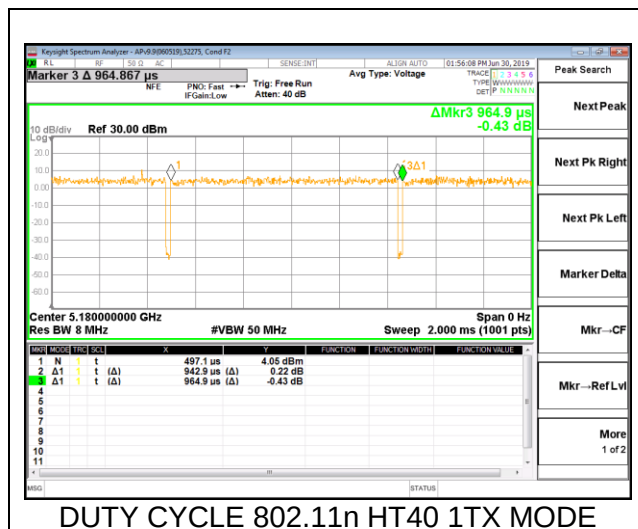
DUTY CYCLE PLOTS



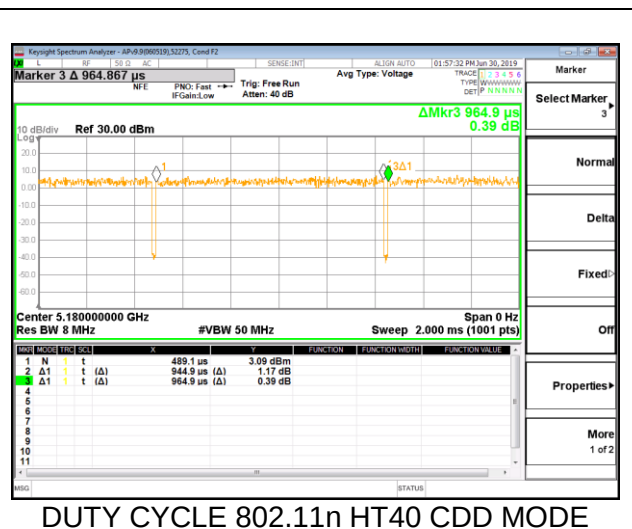
DUTY CYCLE 802.11n HT20 1TX MODE



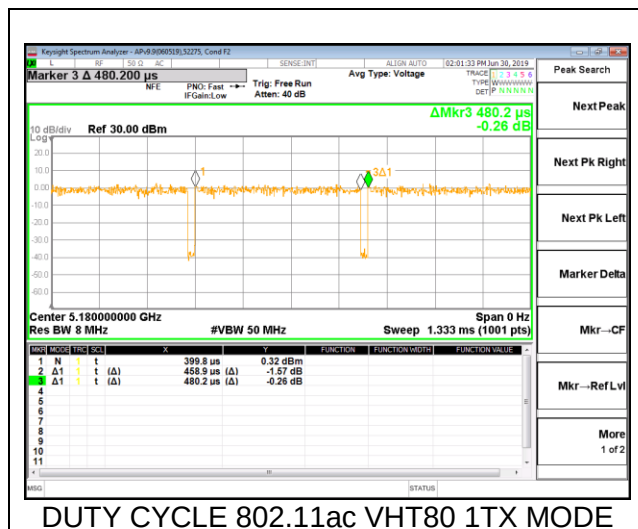
DUTY CYCLE 802.11n HT20 CDD MODE



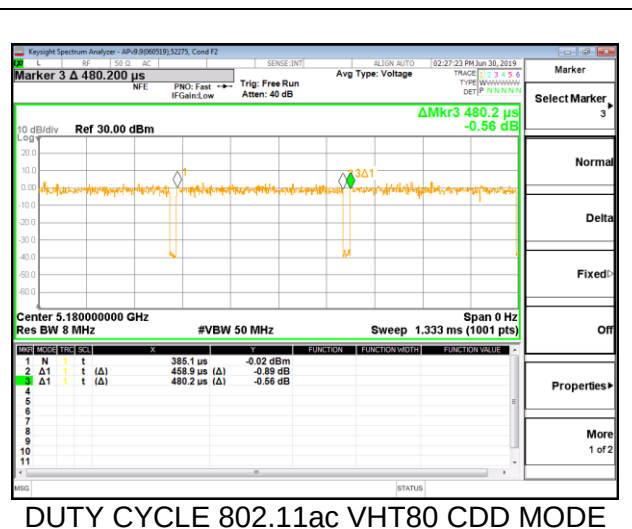
DUTY CYCLE 802.11n HT40 1TX MODE



DUTY CYCLE 802.11n HT40 CDD MODE

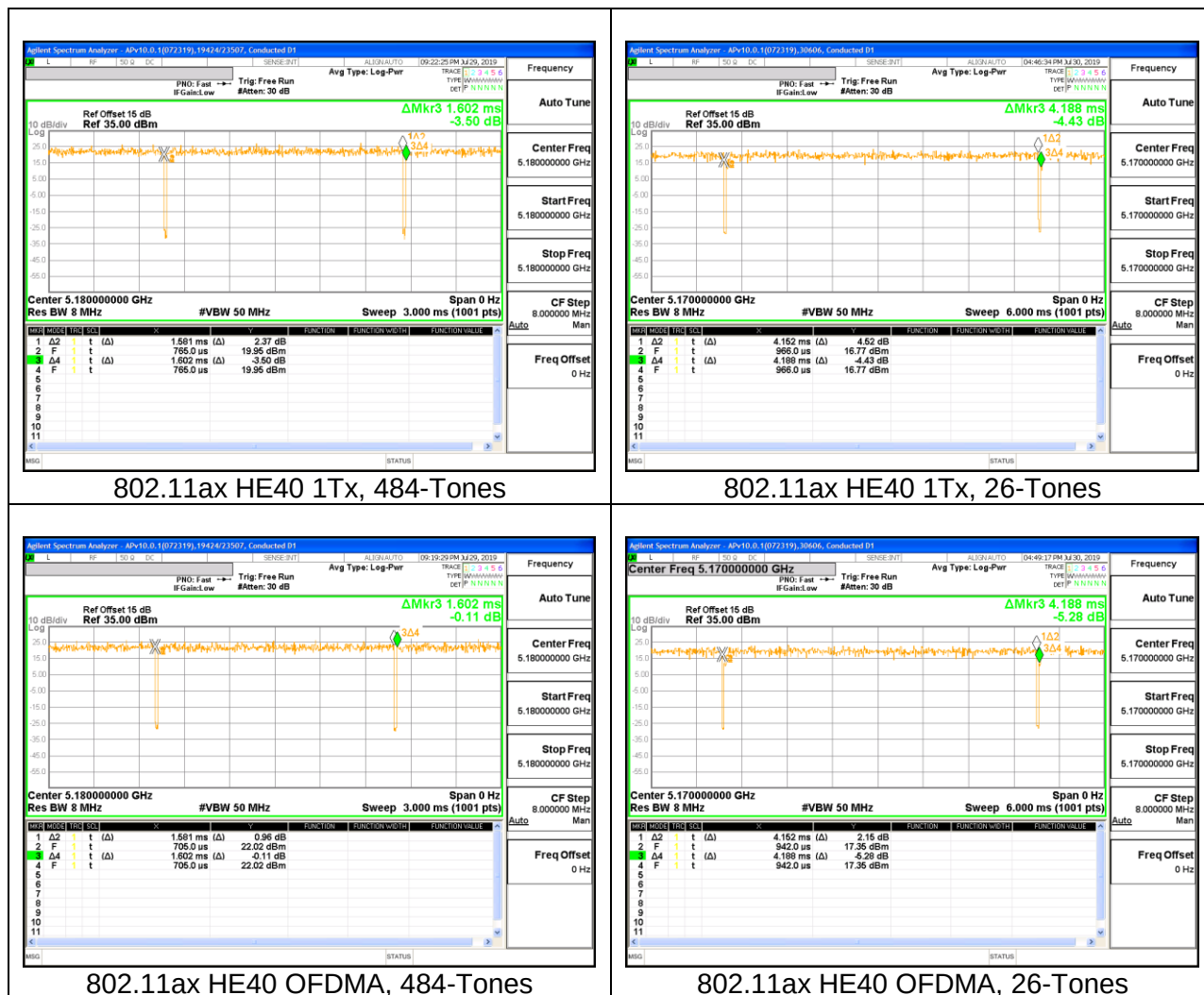


DUTY CYCLE 802.11ac VHT80 1TX MODE



DUTY CYCLE 802.11ac VHT80 CDD MODE







8.2. 26 dB BANDWIDTH

LIMITS

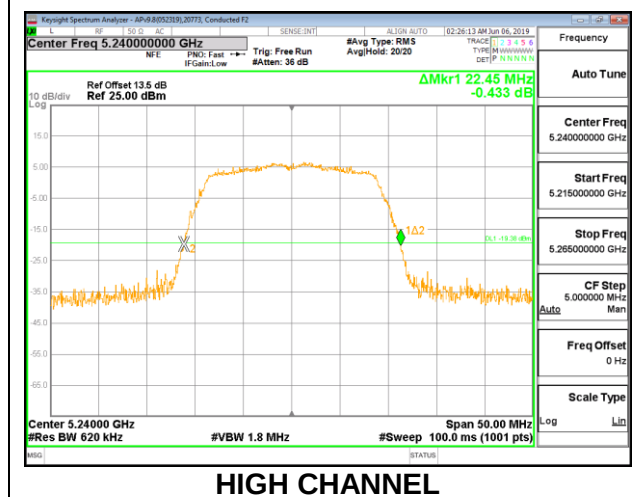
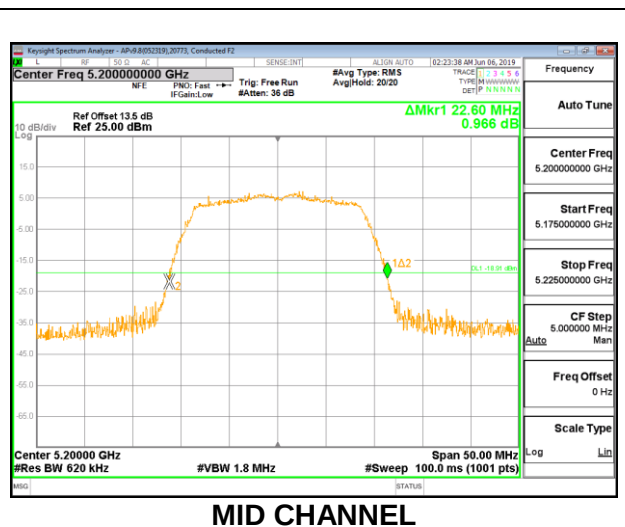
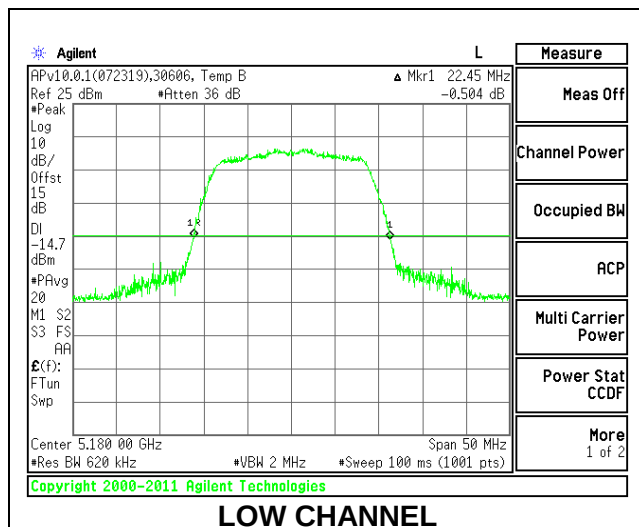
None; for reporting purposes only.

RESULTS

8.2.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

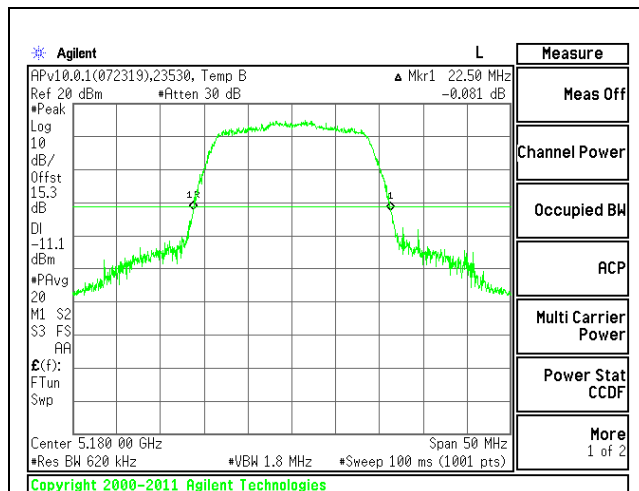
1TX Antenna 6 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	22.45
Mid	5200	22.60
High	5240	22.45

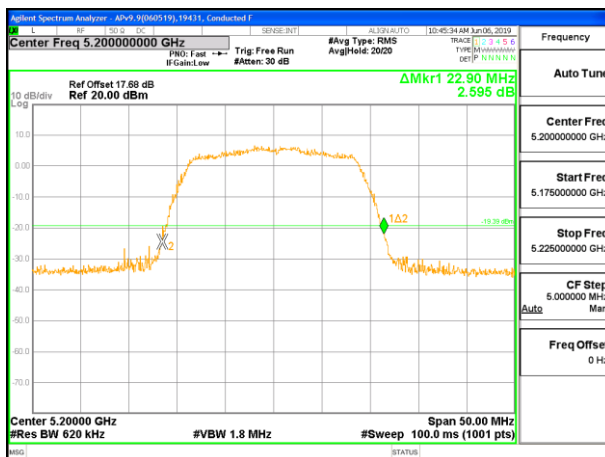


1TX Antenna 5 MODE

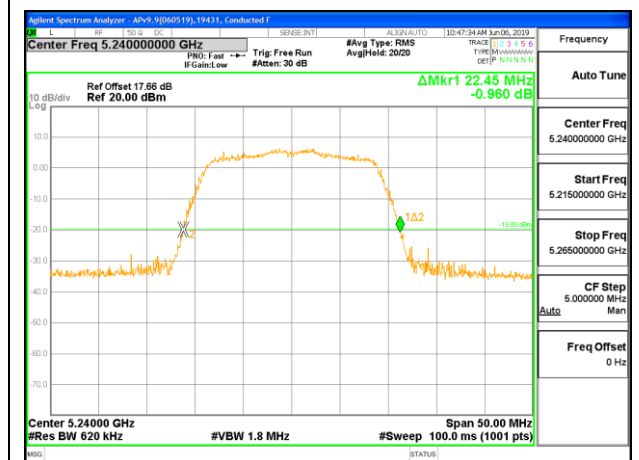
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	22.50
Mid	5200	22.90
High	5240	22.45



LOW CHANNEL

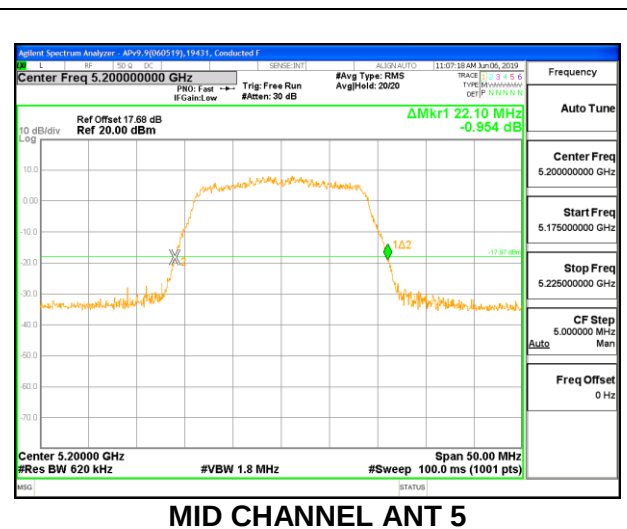
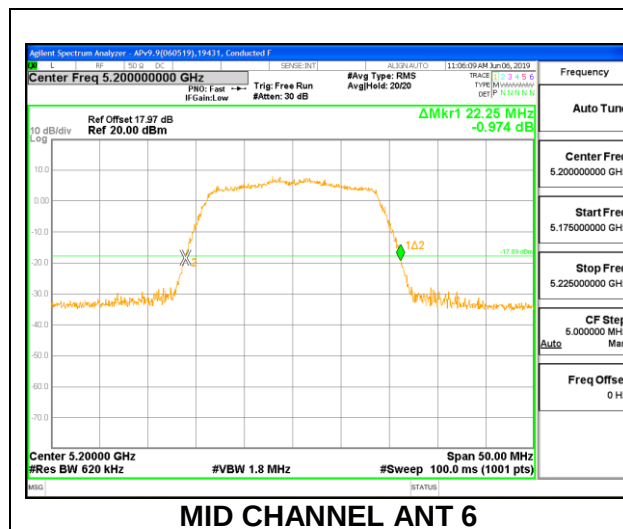
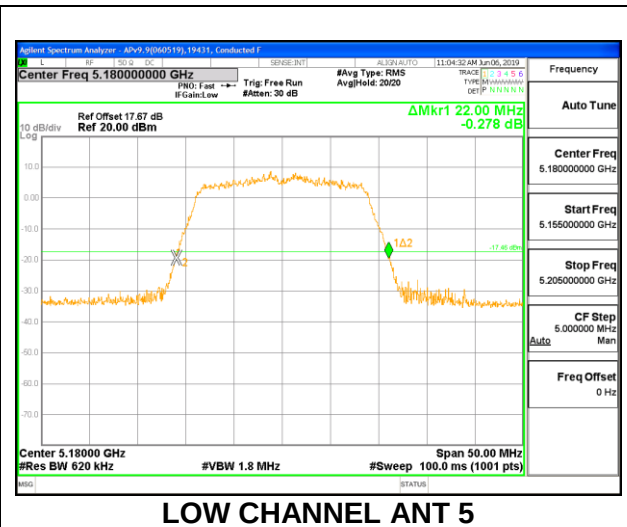
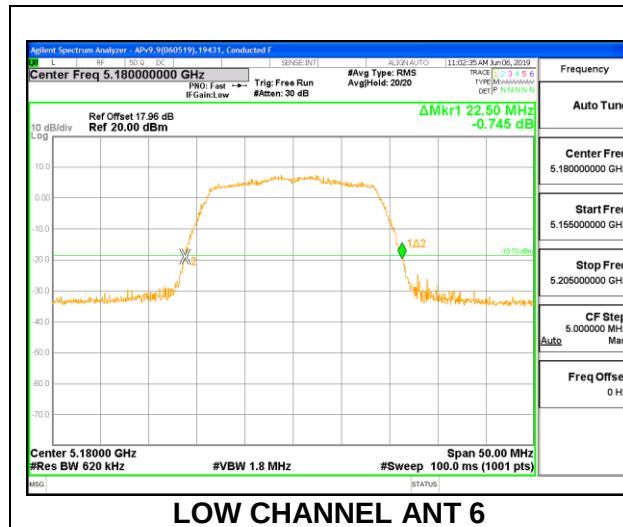


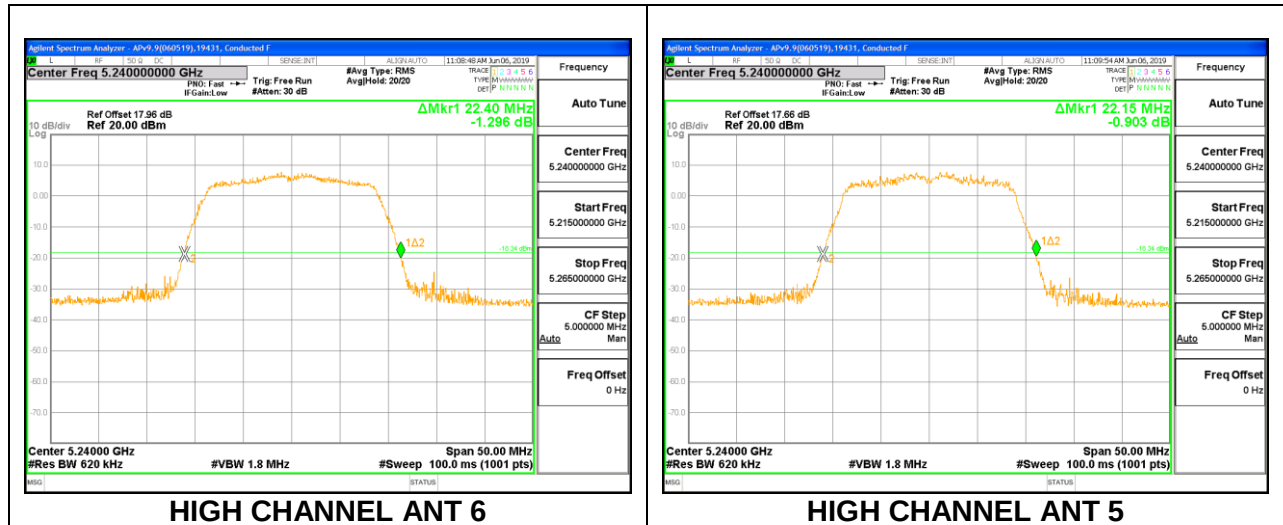
MID CHANNEL



HIGH CHANNEL

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5180	22.50	22.00
Mid	5200	22.25	22.10
High	5240	22.40	22.15

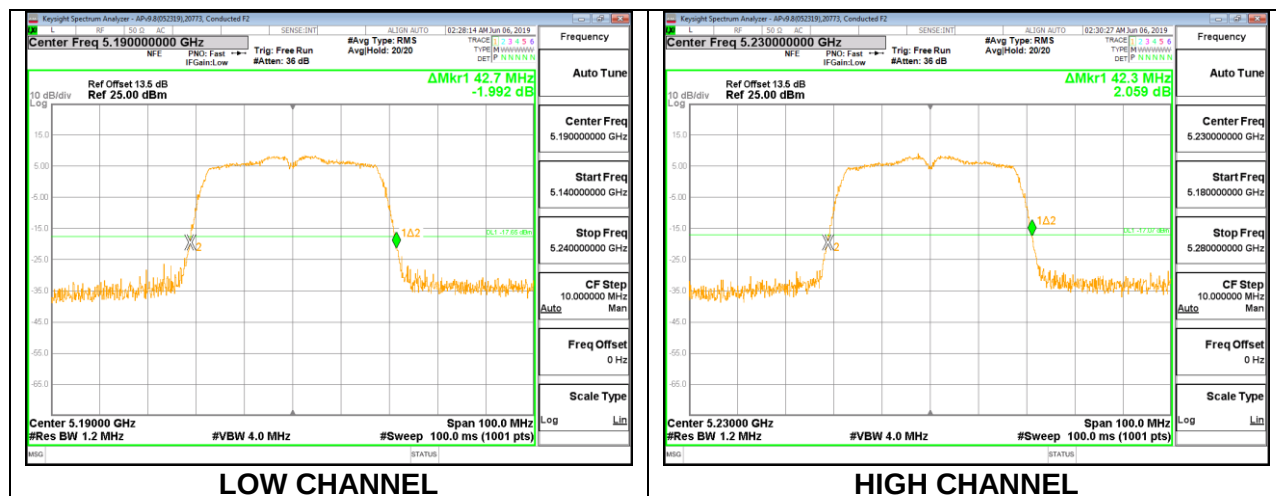




8.2.2. 802.11n HT40 MODE IN THE 5.2 GHz BAND

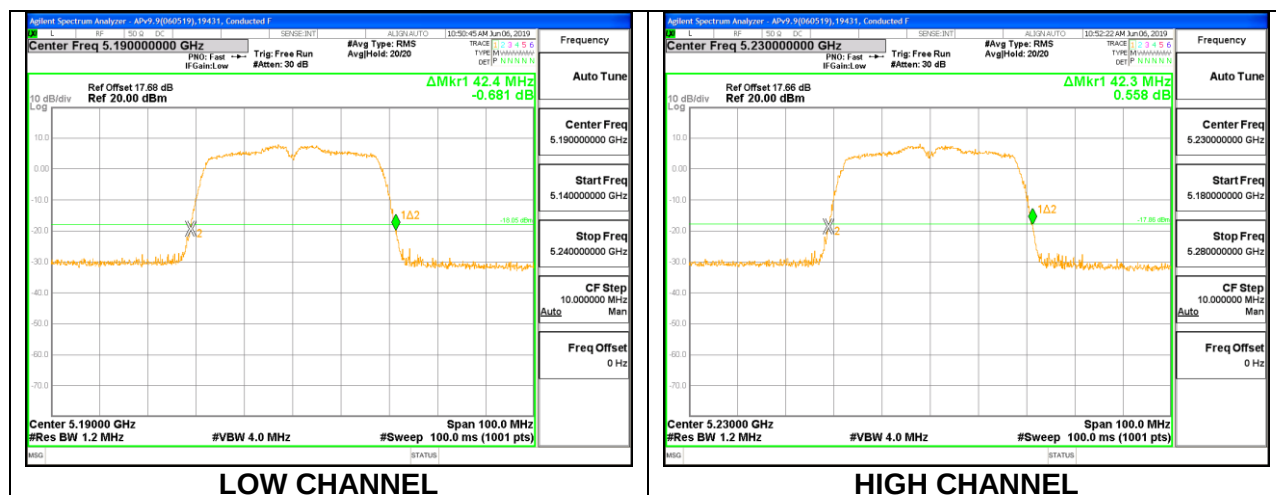
1TX Antenna 6 MODE

Channel	Frequency	26dB Bandwidth
	(MHz)	(MHz)
Low	5190	42.70
High	5230	42.30



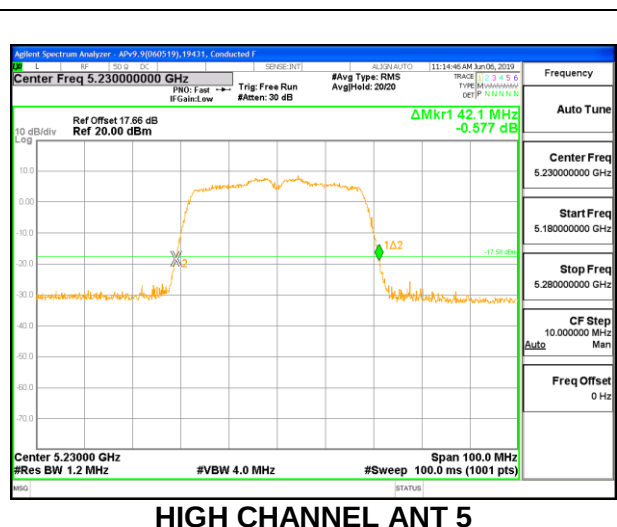
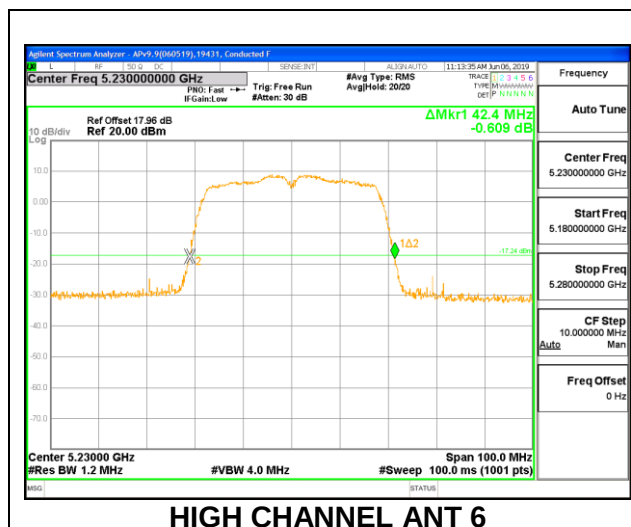
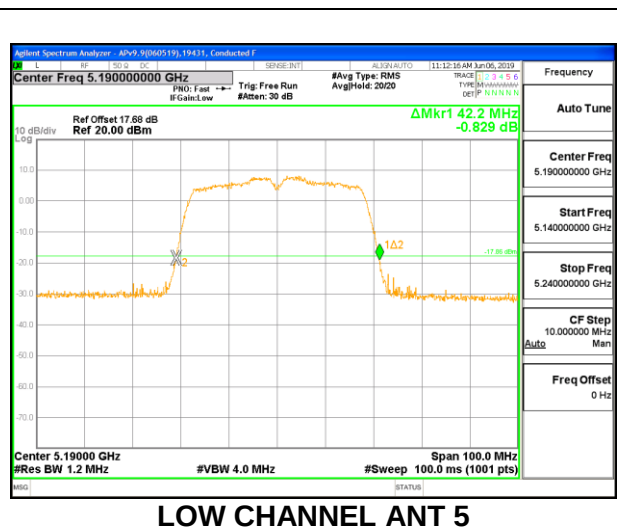
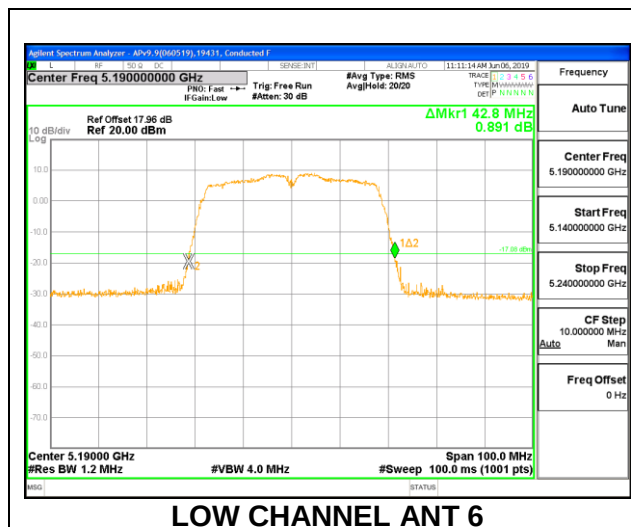
1TX Antenna 5 MODE

Channel	Frequency	26dB Bandwidth
	(MHz)	(MHz)
Low	5190	42.40
High	5230	42.30



2TX Antenna 6 + Antenna 5 CDD MODE

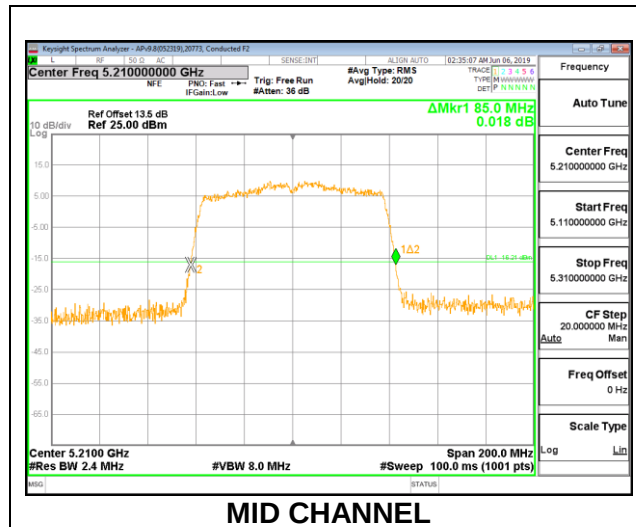
Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5190	42.80	42.20
High	5230	42.40	42.10



8.2.3. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

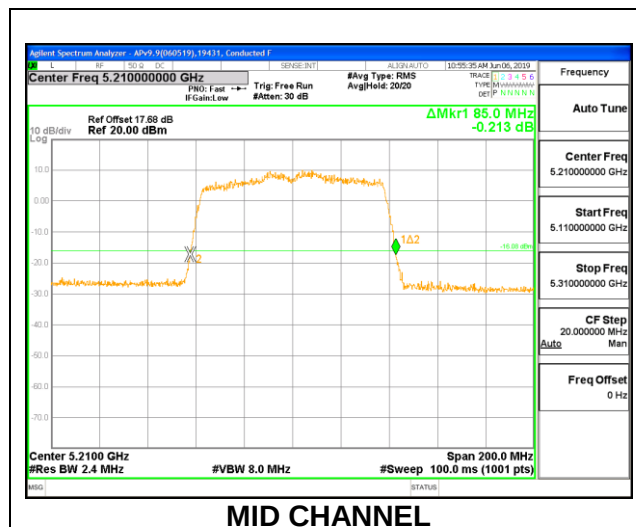
1TX Antenna 6 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	85.00



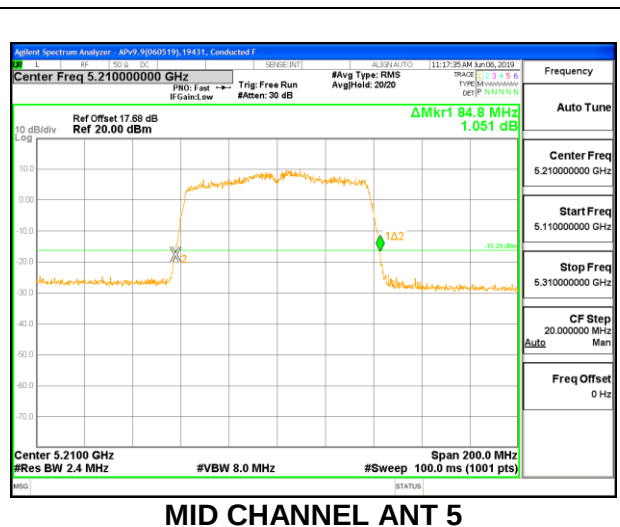
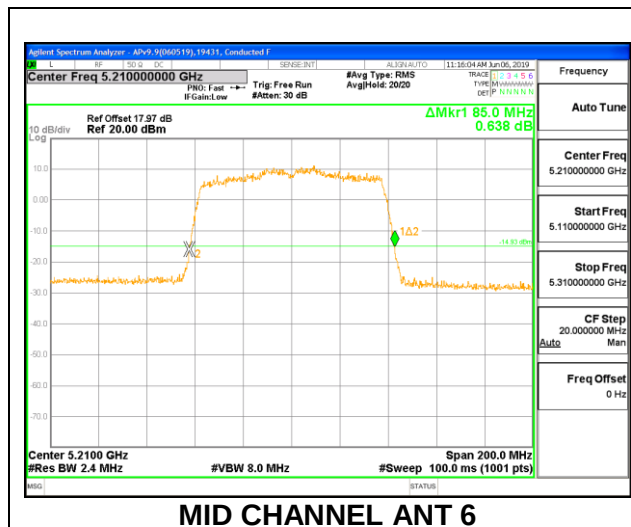
1TX Antenna 5 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	85.00



2TX Antenna 6 + Antenna 5 CDD MODE

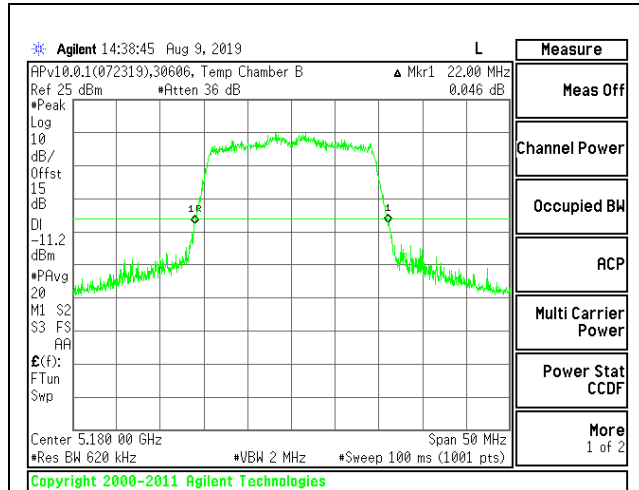
Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Mid	5210	85.00	84.80



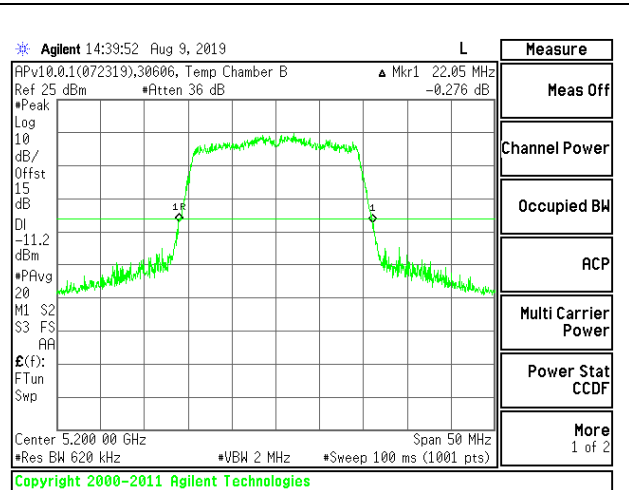
8.2.4. 802.11ax HE20 MODE IN THE 5.2 GHz BAND

1TX Antenna 6 MODE – 242-Tones, RU Index 61

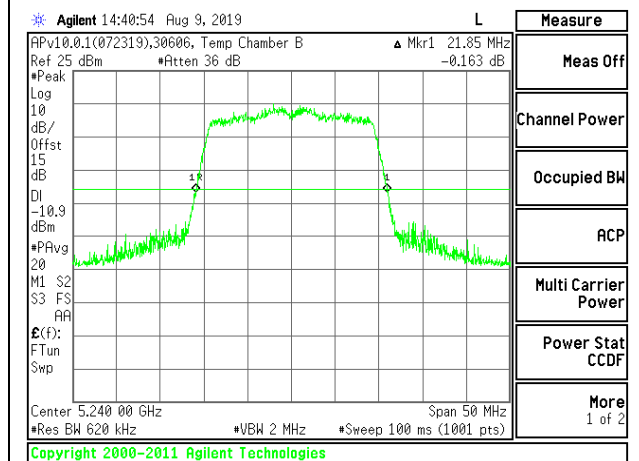
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	22.00
Mid	5200	22.05
High	5240	21.85



LOW CHANNEL



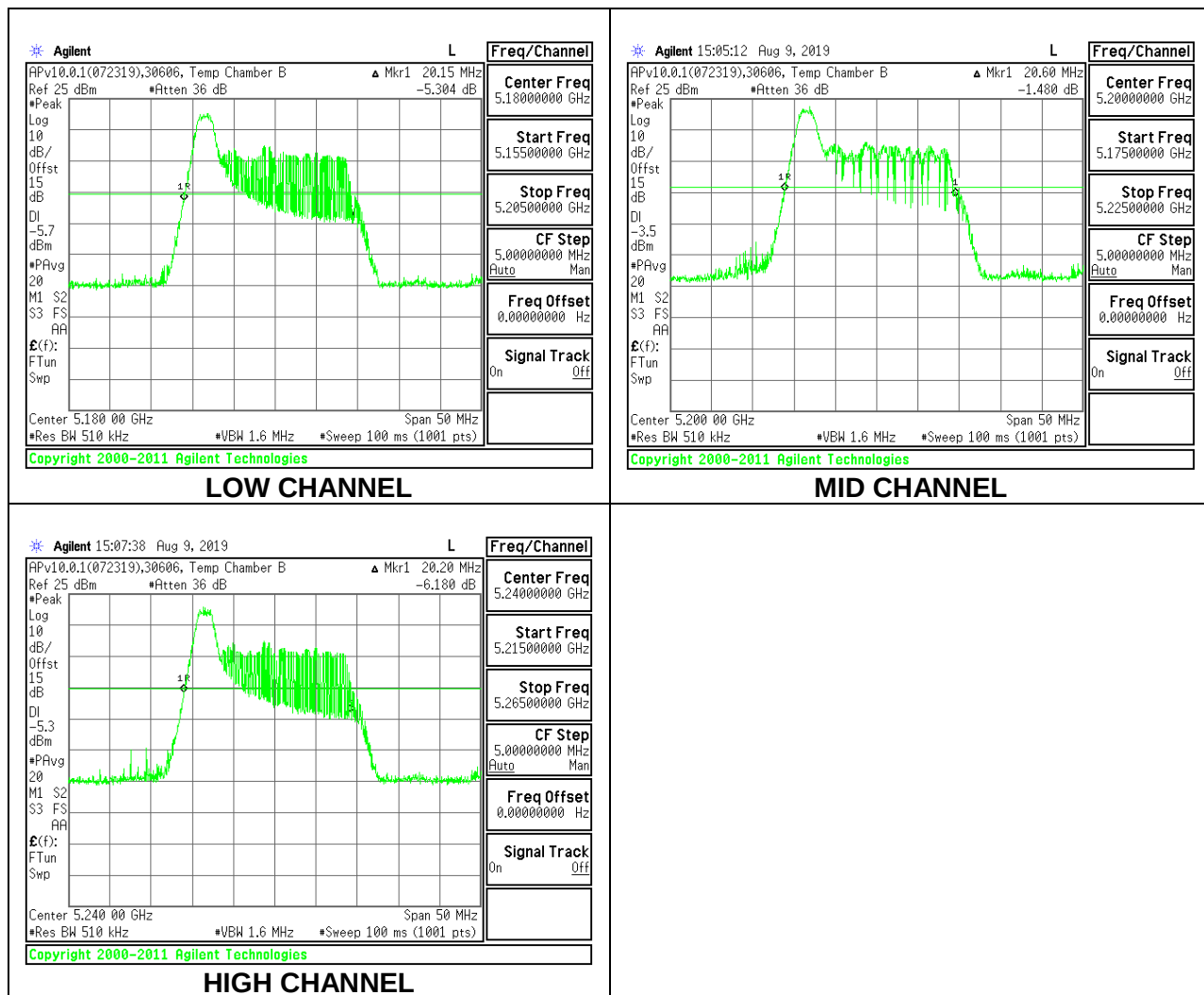
MID CHANNEL



HIGH CHANNEL

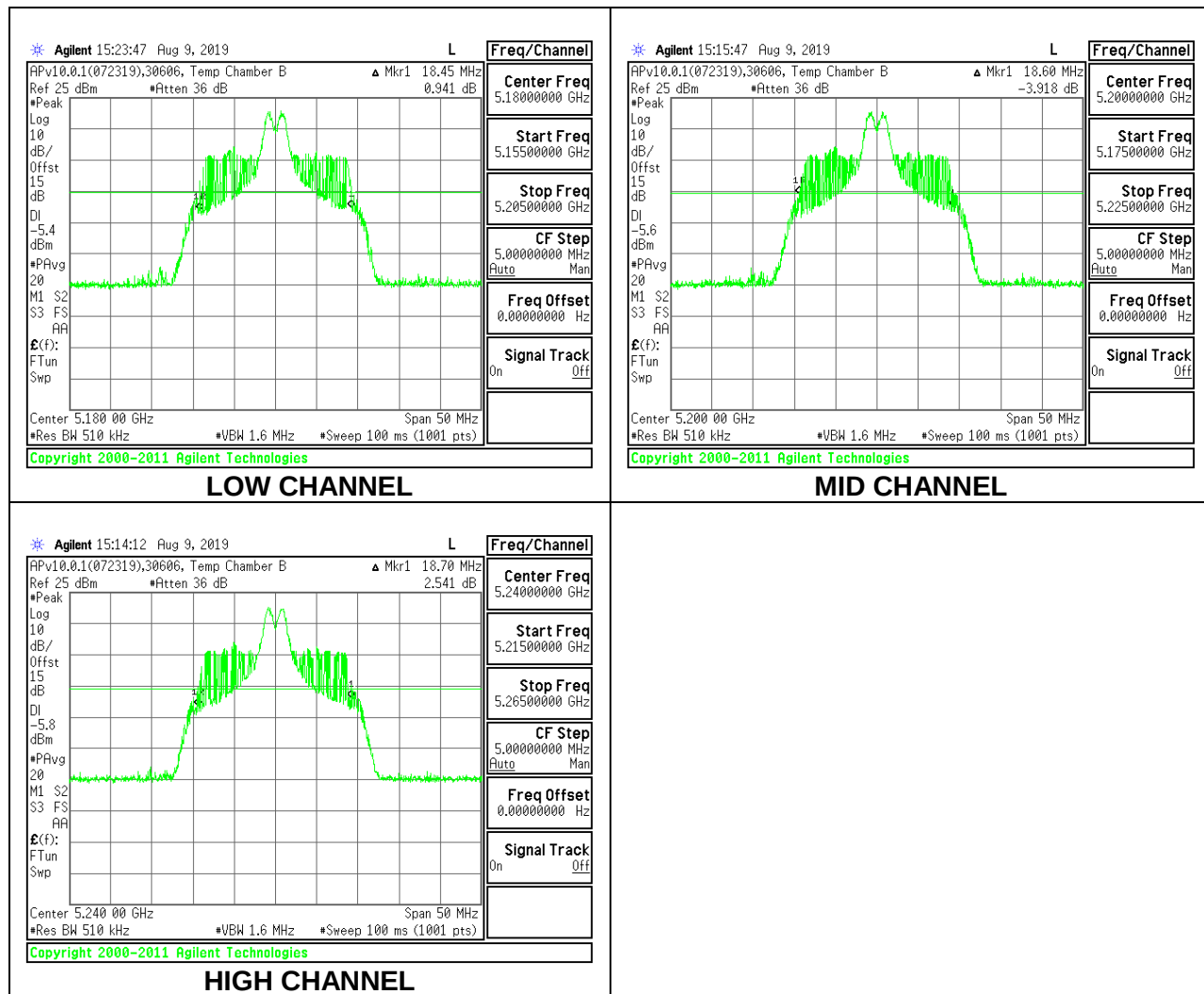
1TX Antenna 6 MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.15
Mid	5200	20.60
High	5240	20.20



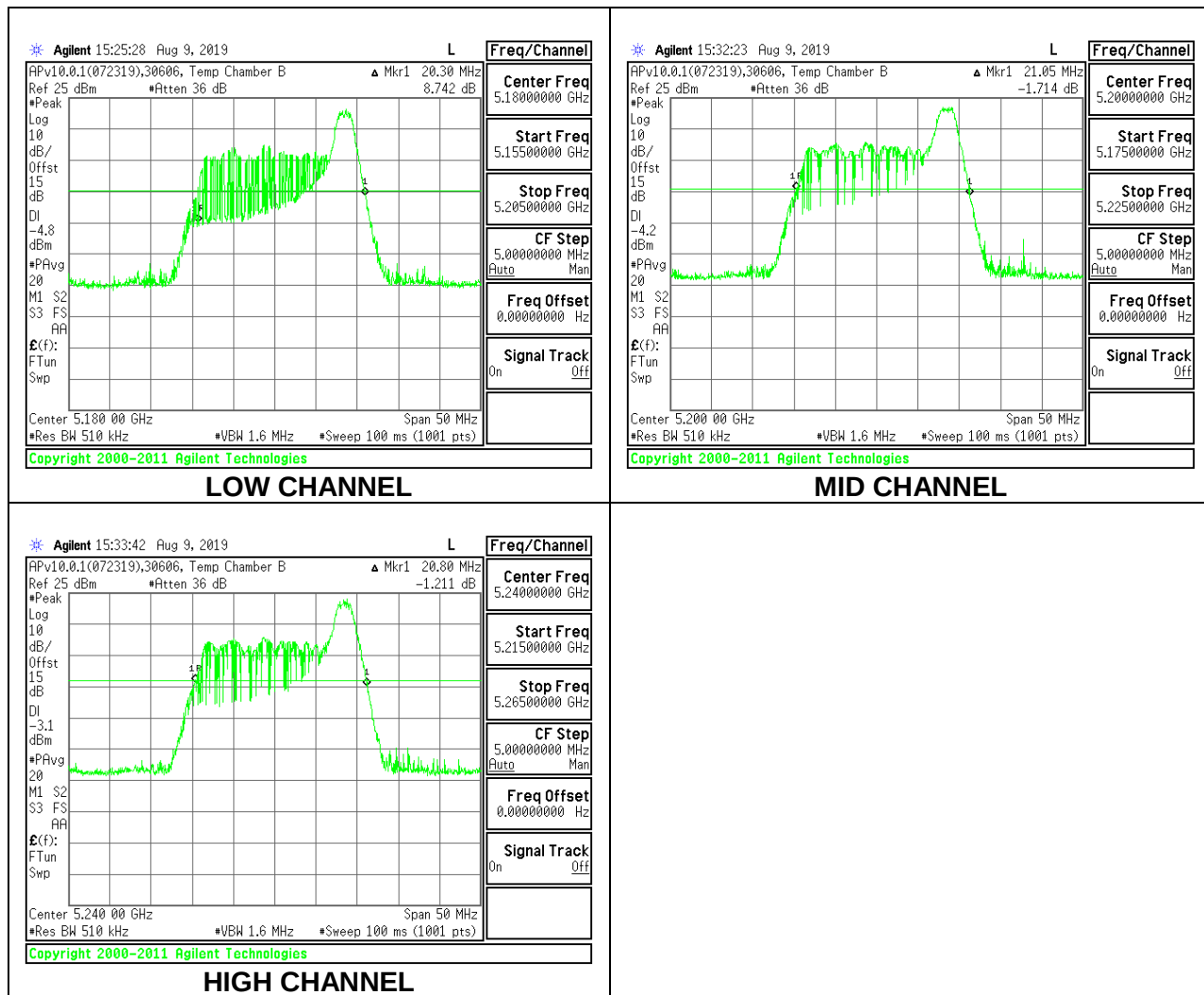
1TX Antenna 6 MODE – 26-Tones, RU Index 4

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	18.45
Mid	5200	18.60
High	5240	18.70



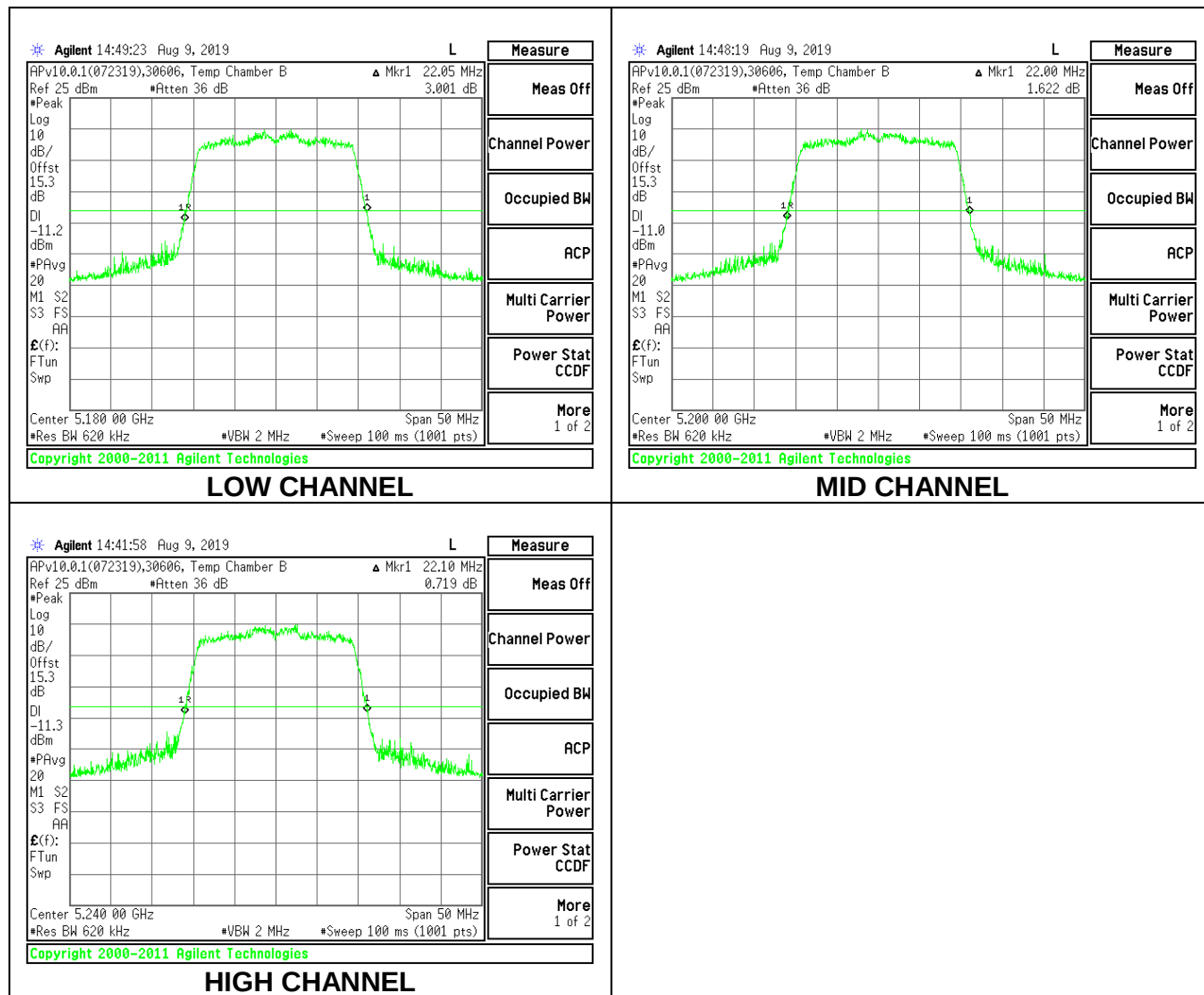
1TX Antenna 6 MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.30
Mid	5200	21.05
High	5240	20.80



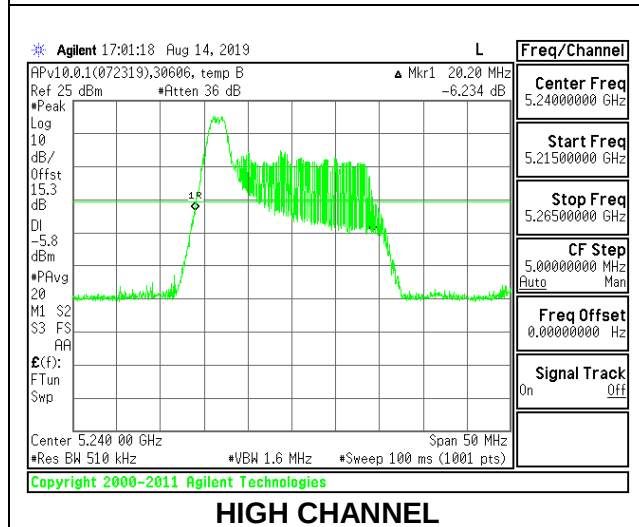
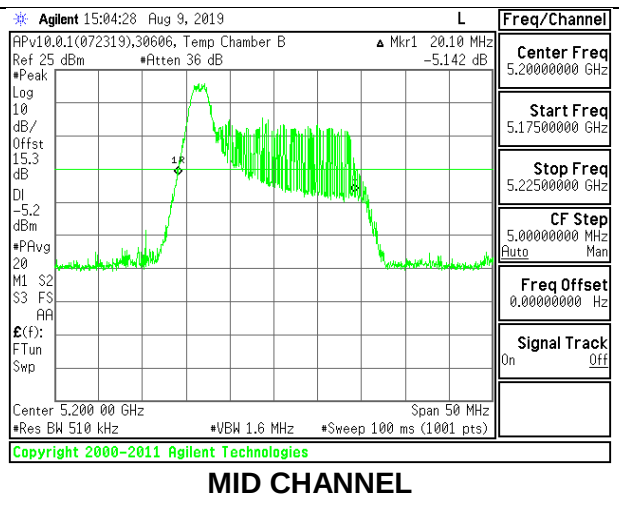
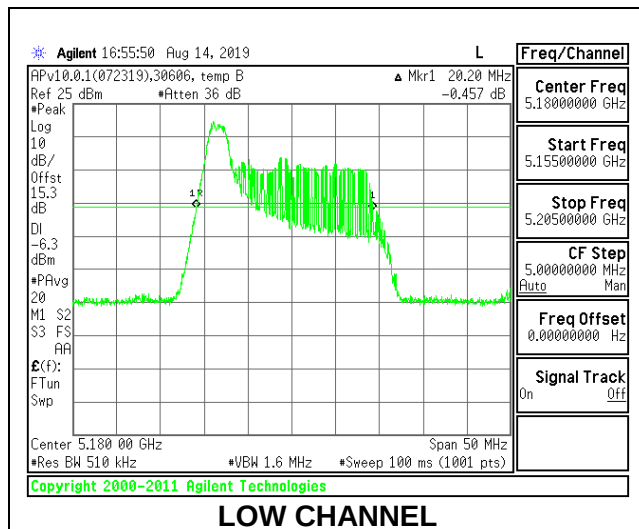
1TX Antenna 5 MODE – 242-Tones, RU Index 61

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	22.05
Mid	5200	22.00
High	5240	22.10



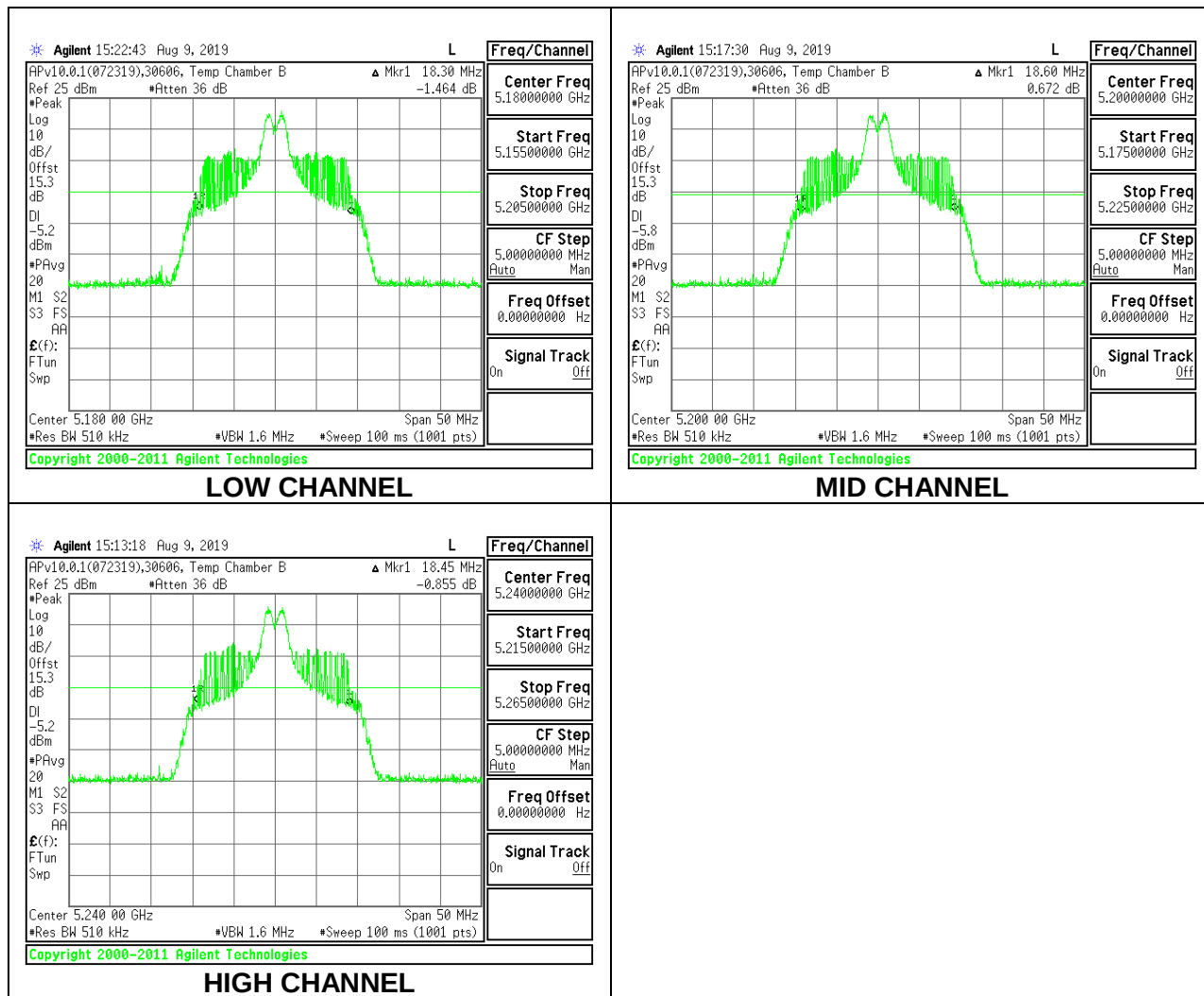
1TX Antenna 5 MODE – 26-Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.20
Mid	5200	20.10
High	5240	20.20



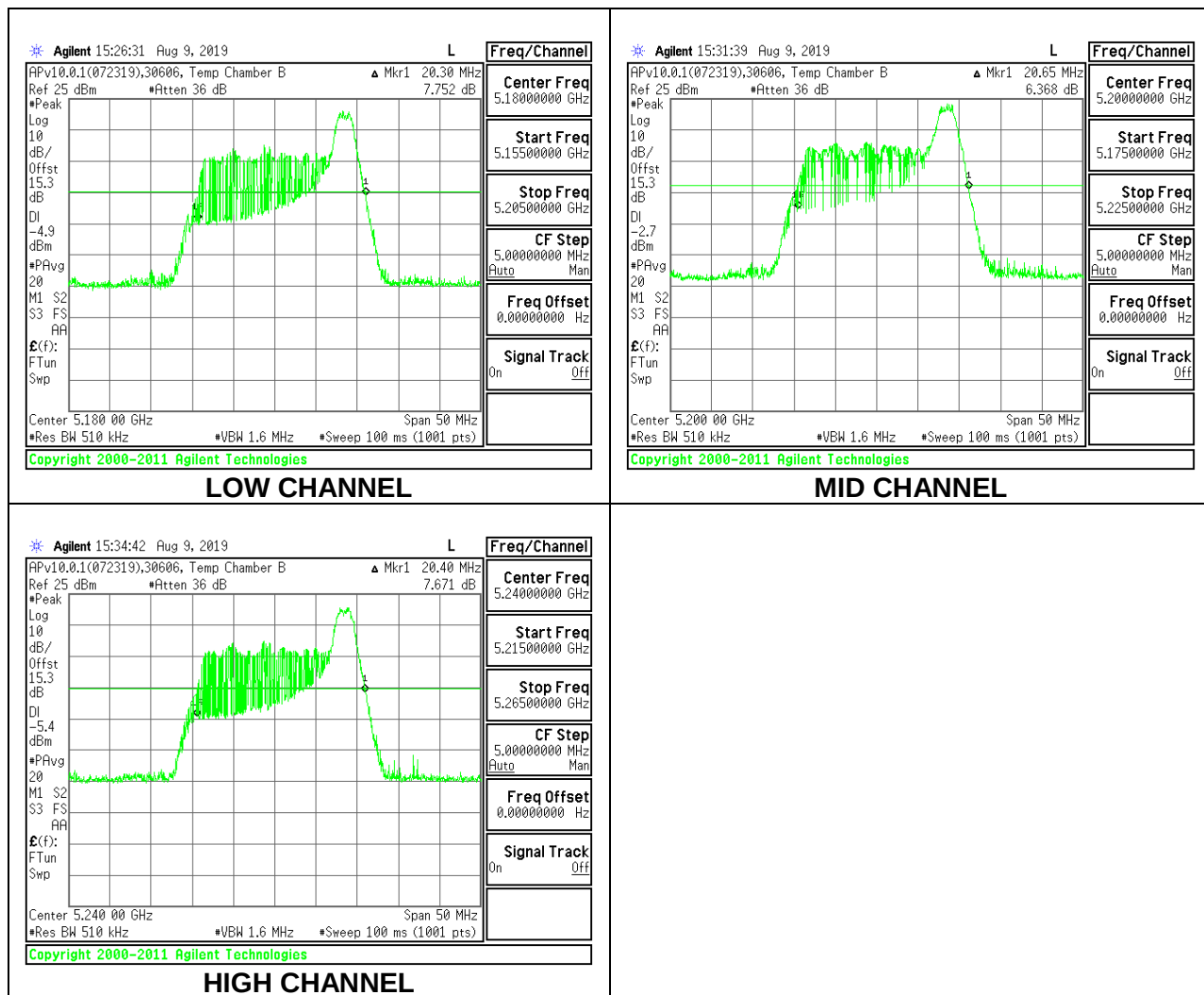
1TX Antenna 5 MODE – 26-Tones, RU Index 4

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	18.30
Mid	5200	18.60
High	5240	18.45



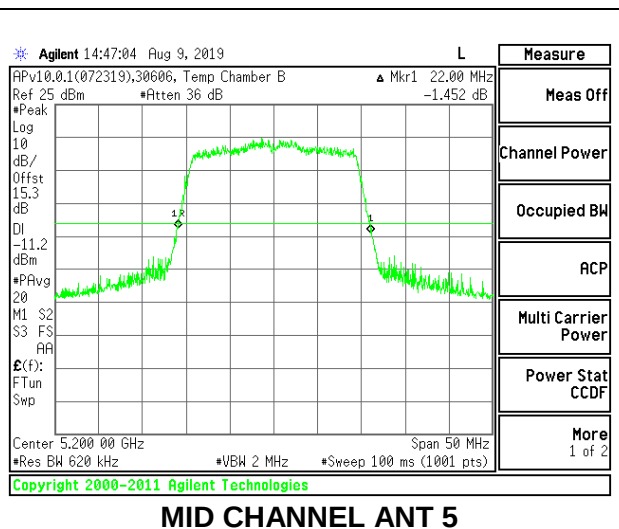
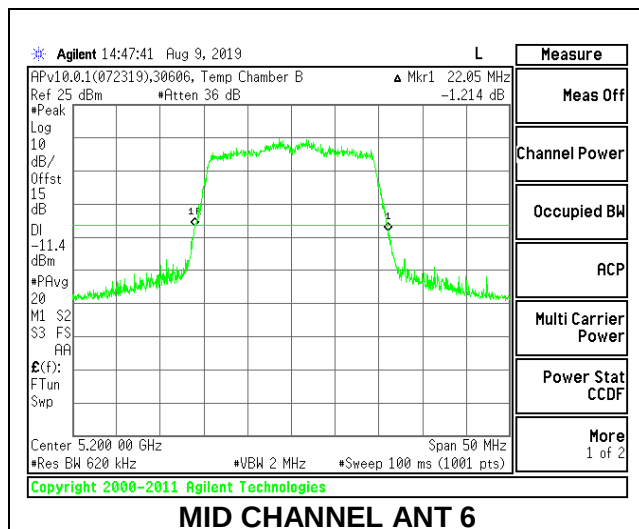
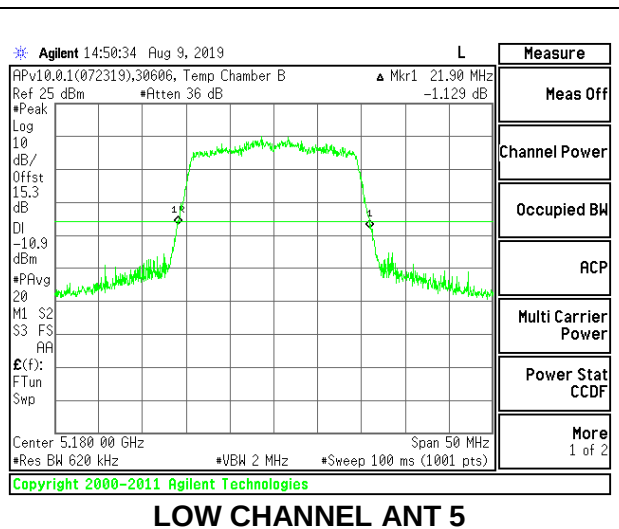
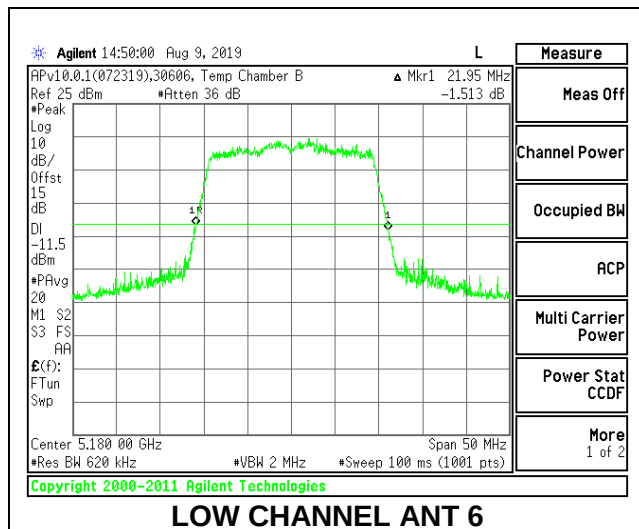
1TX Antenna 5 MODE – 26-Tones, RU Index 8

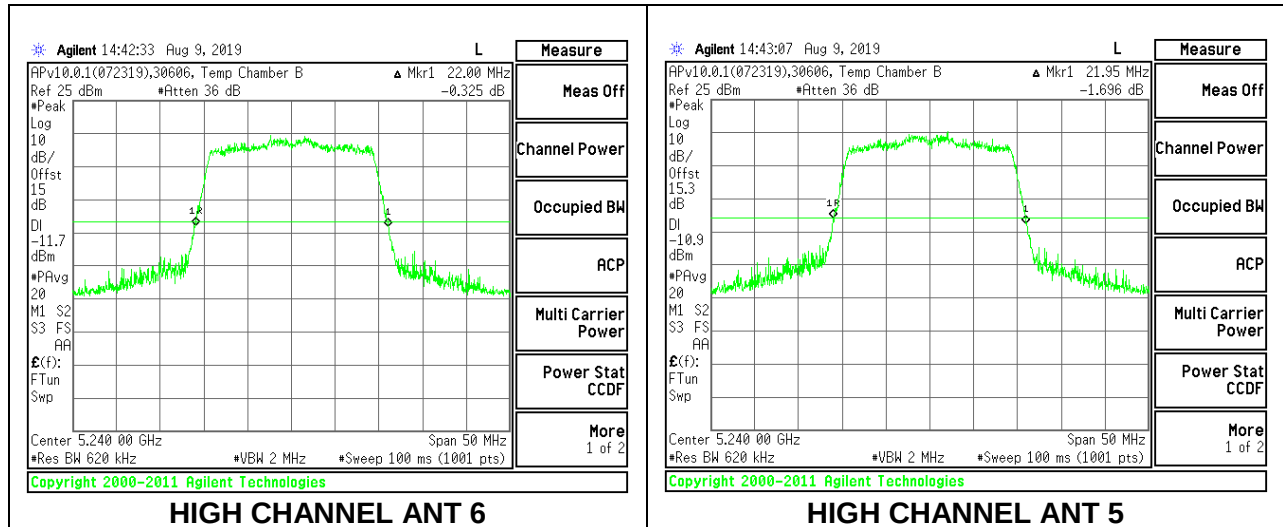
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.30
Mid	5200	20.65
High	5240	20.40



2TX Antenna 6 + Antenna 5 OFDMA MODE – 242-Tones, RU Index 61

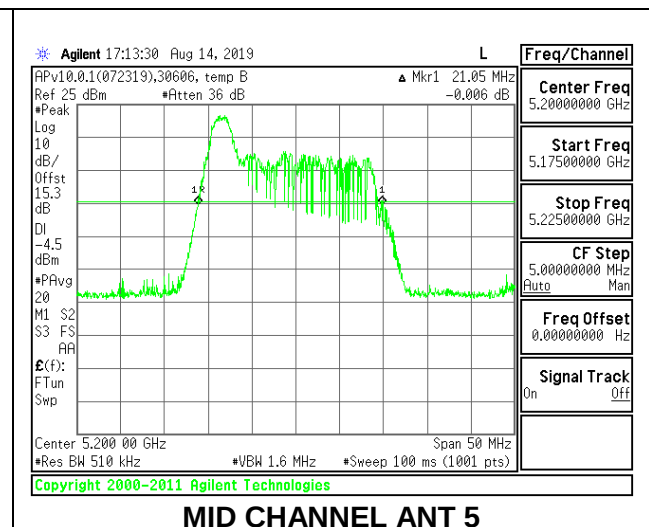
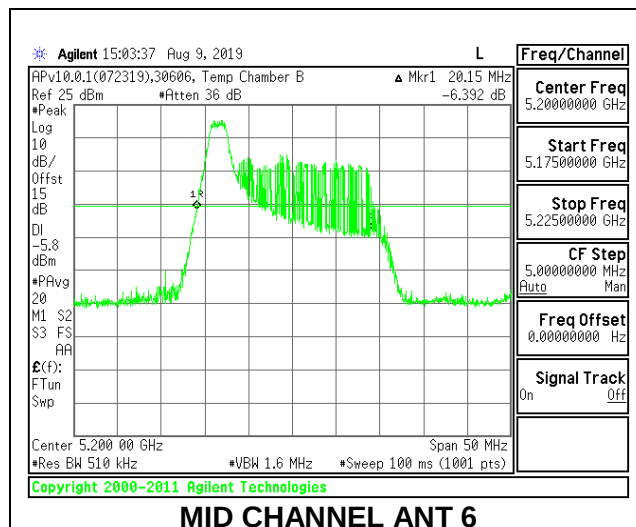
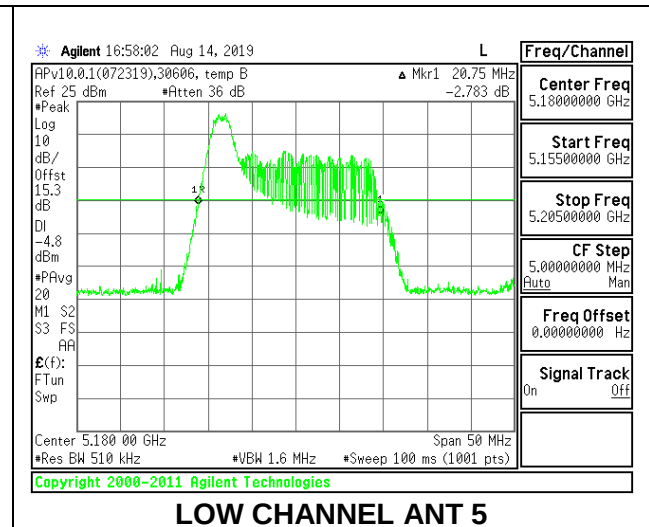
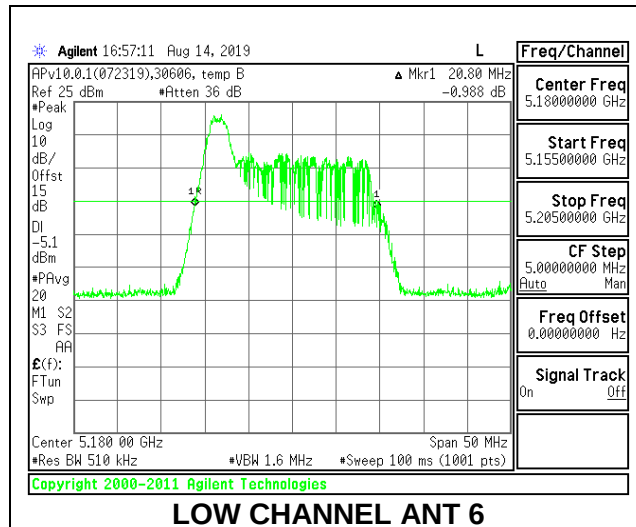
Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5180	21.95	21.90
Mid	5200	22.05	22.00
High	5240	22.00	21.95

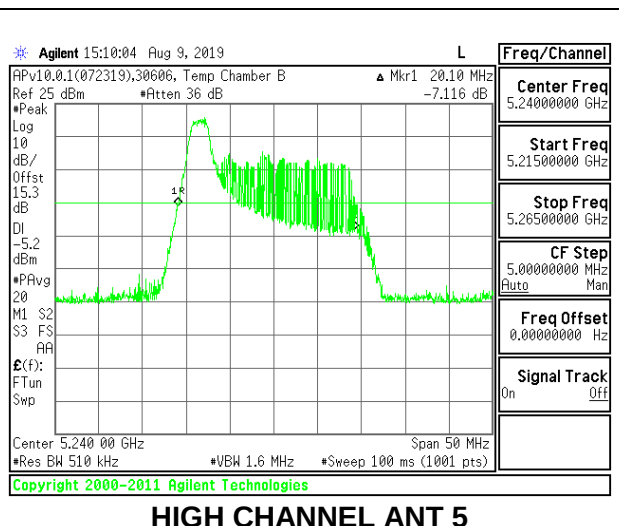
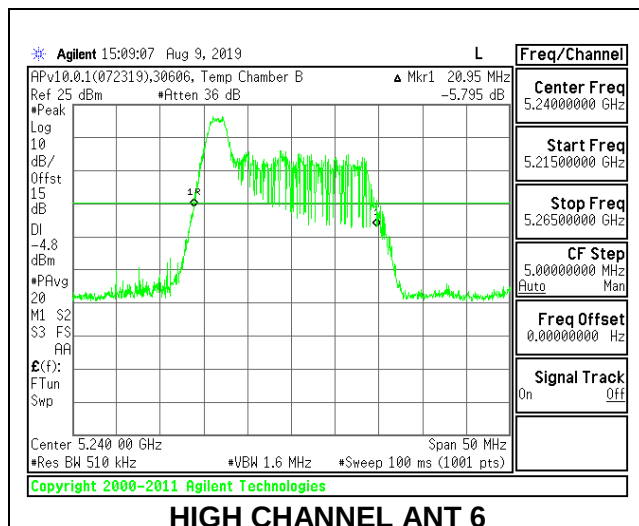




2TX Antenna 6 + Antenna 5 OFDMA MODE – 26-Tones, RU Index 0

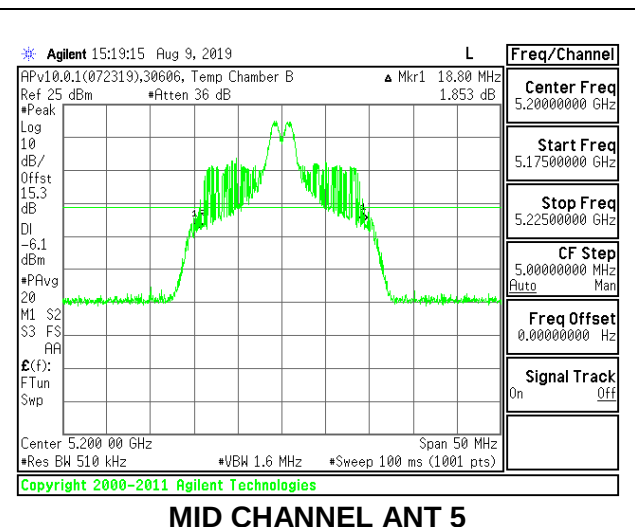
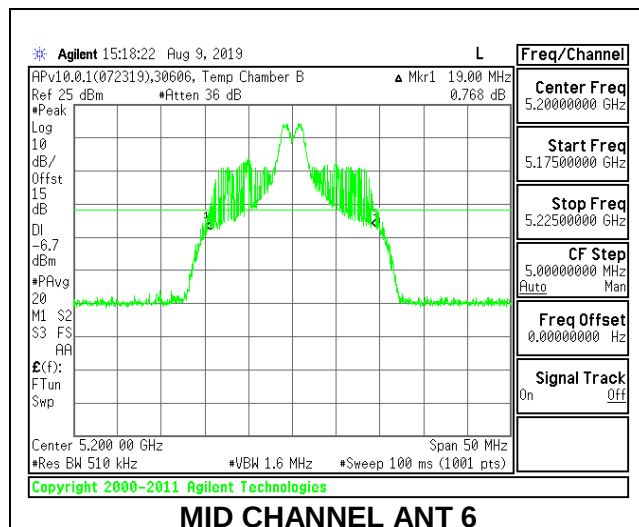
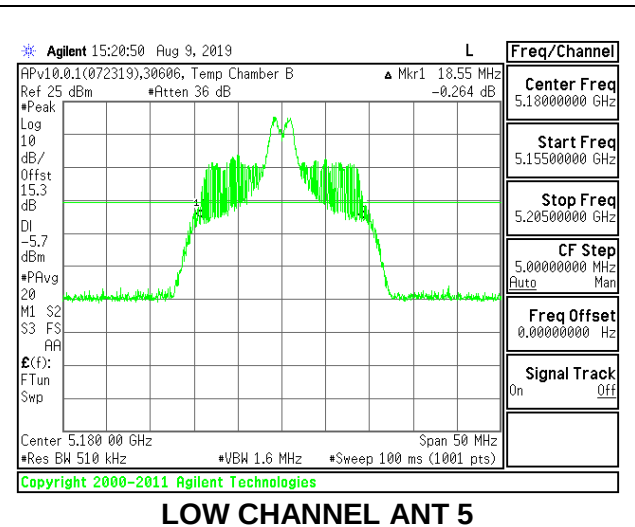
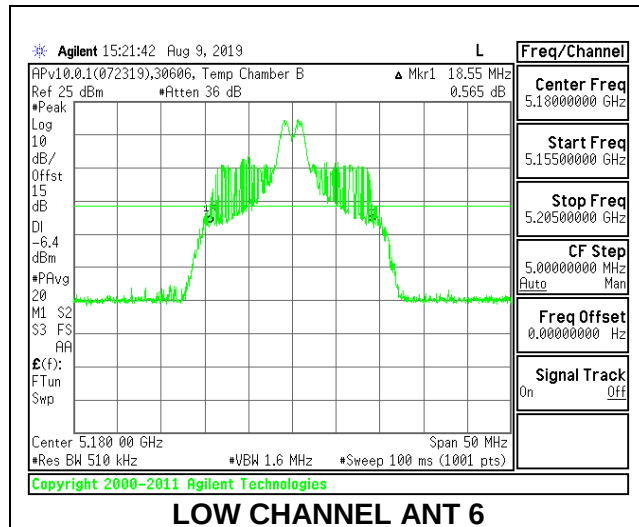
Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5180	20.80	20.75
Mid	5200	20.15	21.05
High	5240	20.95	20.10

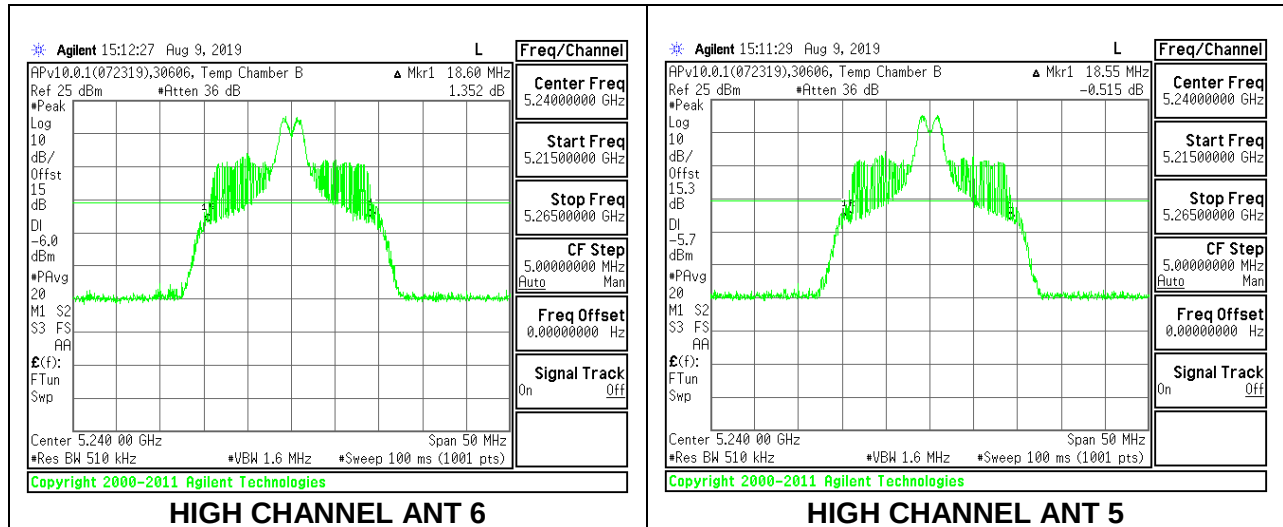




2TX Antenna 6 + Antenna 5 OFDMA MODE – 26-Tones, RU Index 4

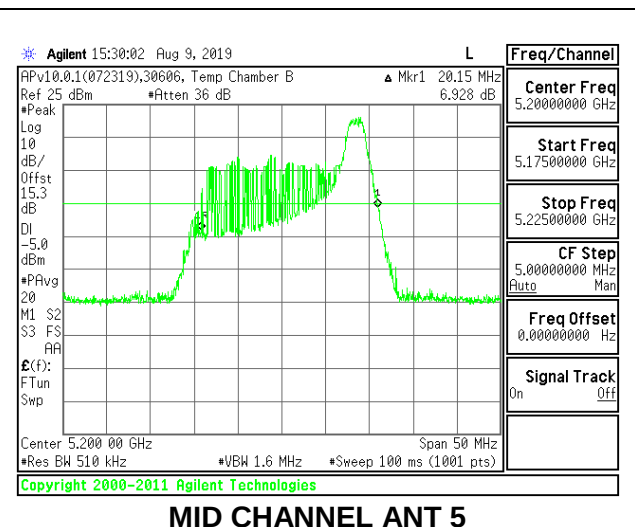
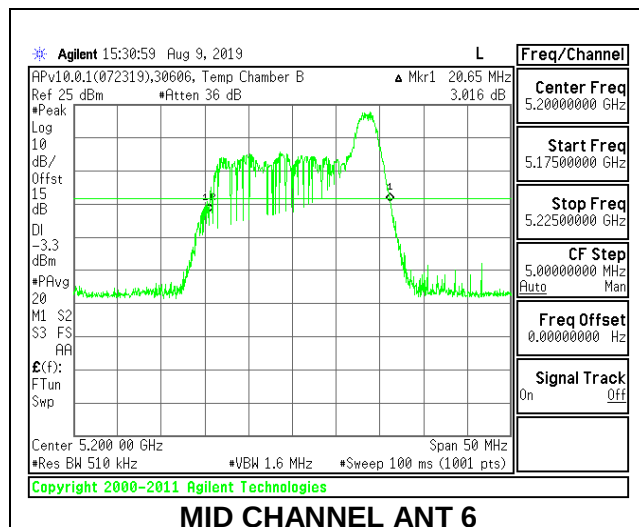
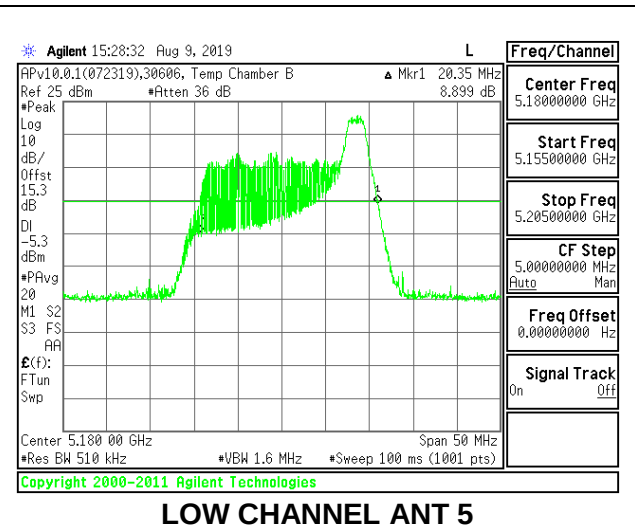
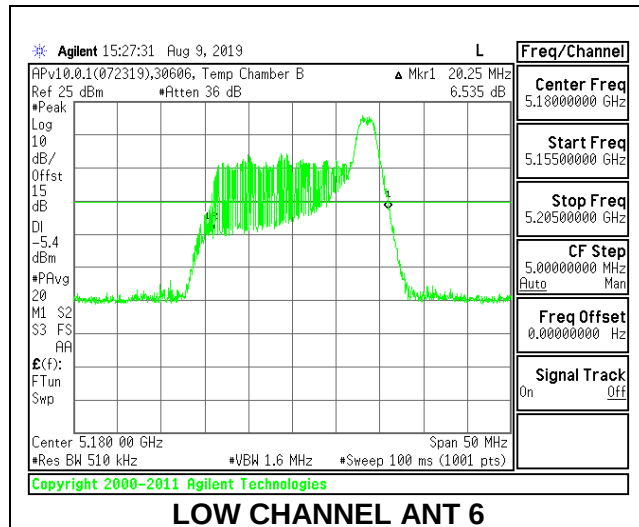
Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5180	18.55	18.55
Mid	5200	19.00	18.80
High	5240	18.60	18.55

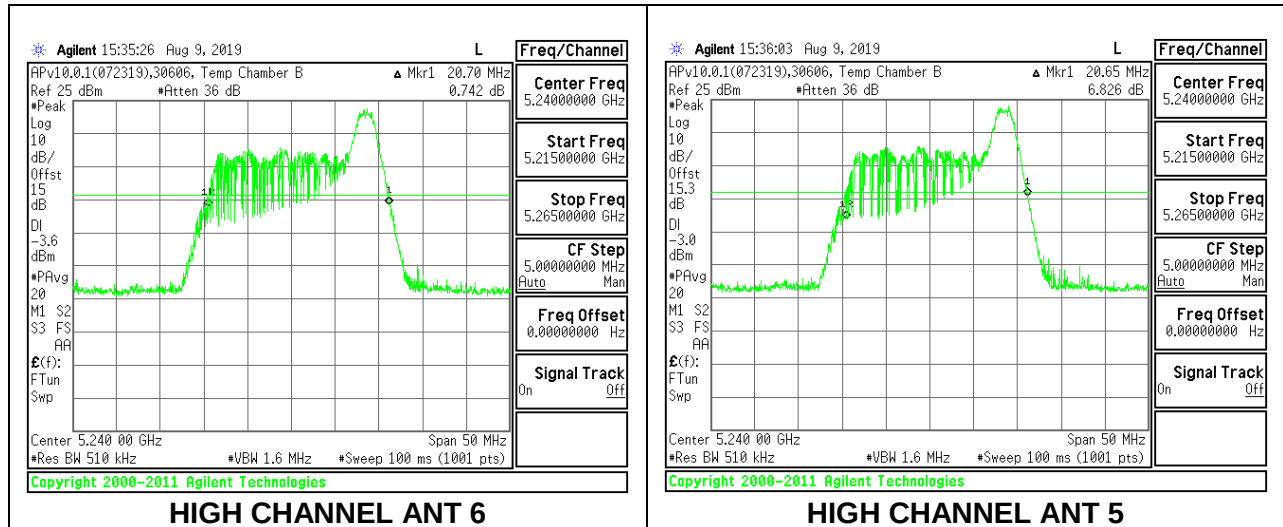




2TX Antenna 6 + Antenna 5 OFDMA MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5180	20.25	20.35
Mid	5200	20.65	20.15
High	5240	20.70	20.65

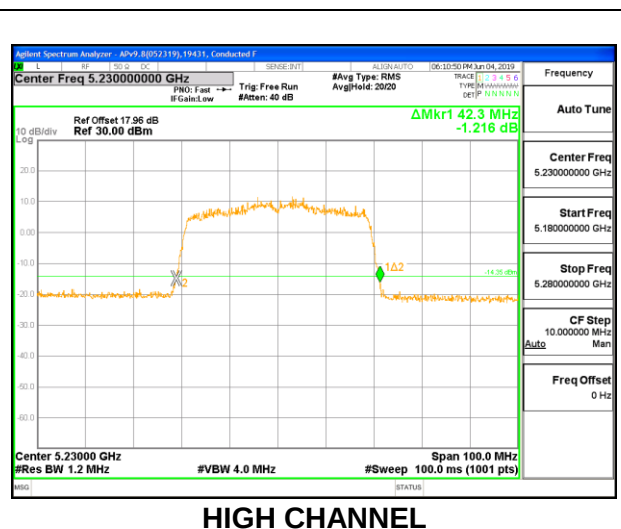
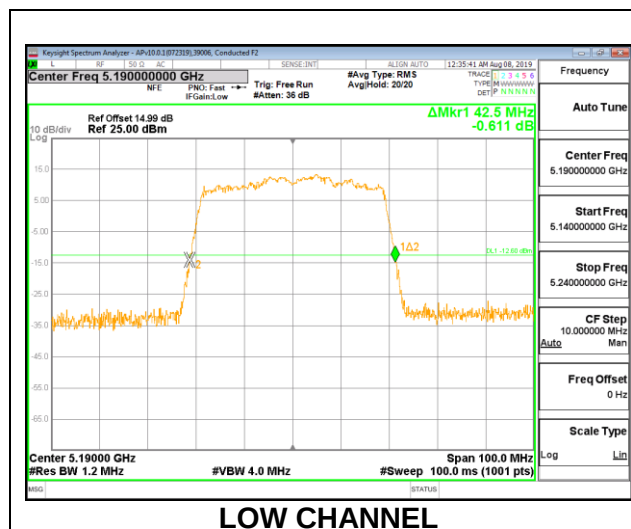




8.2.5. 802.11ax HE40 MODE IN THE 5.2 GHz BAND

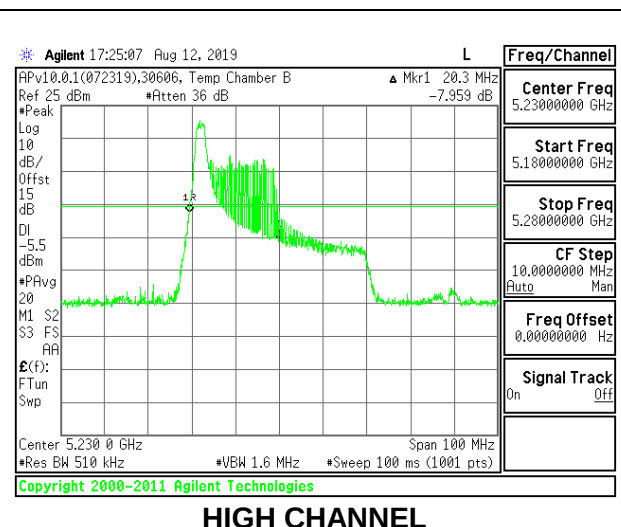
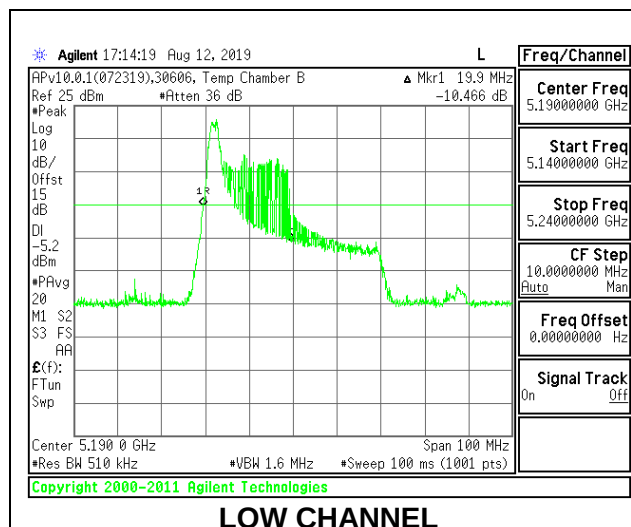
1TX Antenna 6 MODE – 484-Tones, RU Index 65

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	42.50
High	5230	42.30



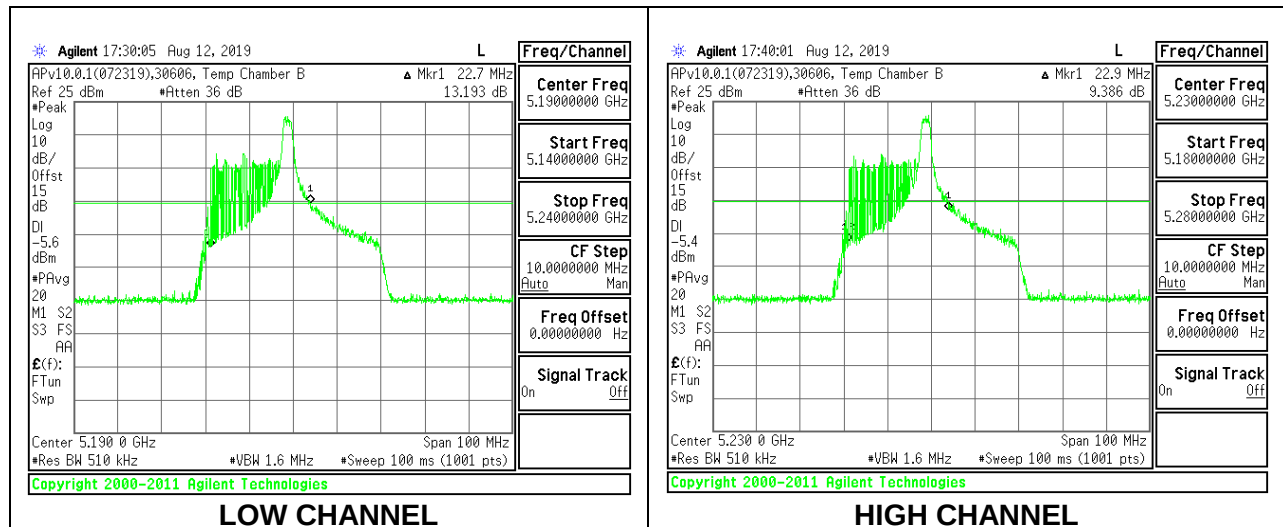
1TX Antenna 6 MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	19.90
High	5230	20.30



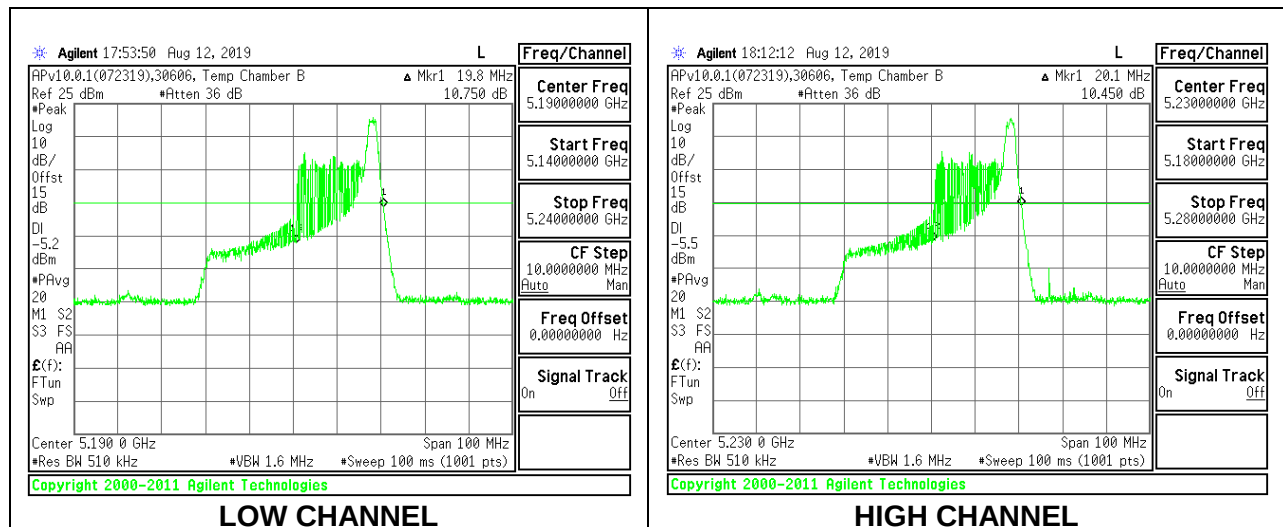
1TX Antenna 6 MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	22.70
High	5230	22.90



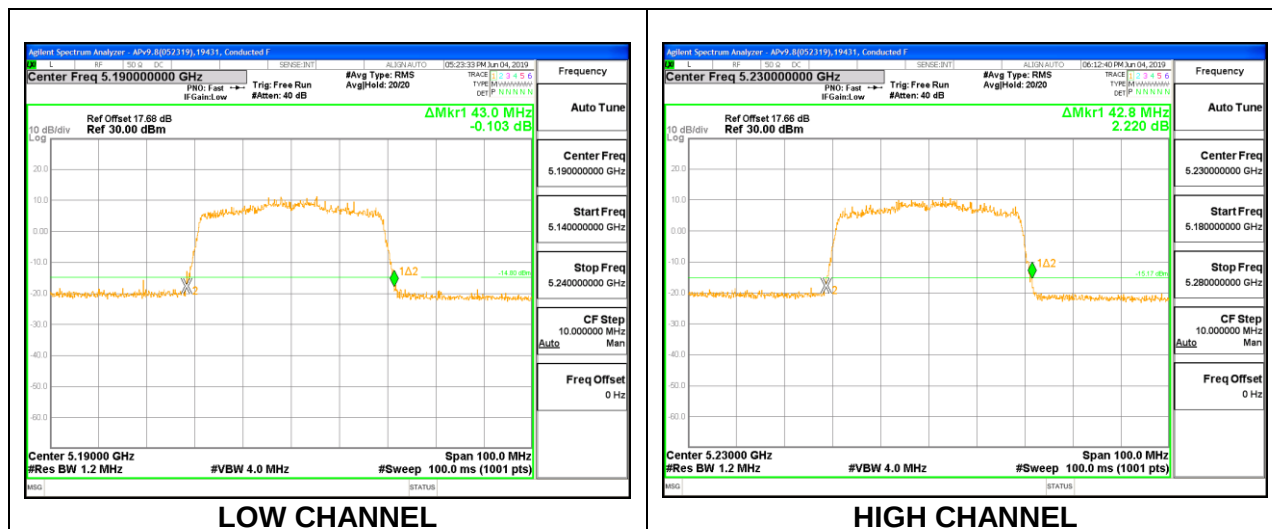
1TX Antenna 6 MODE – 26-Tones, RU Index 17

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	19.80
High	5230	20.10



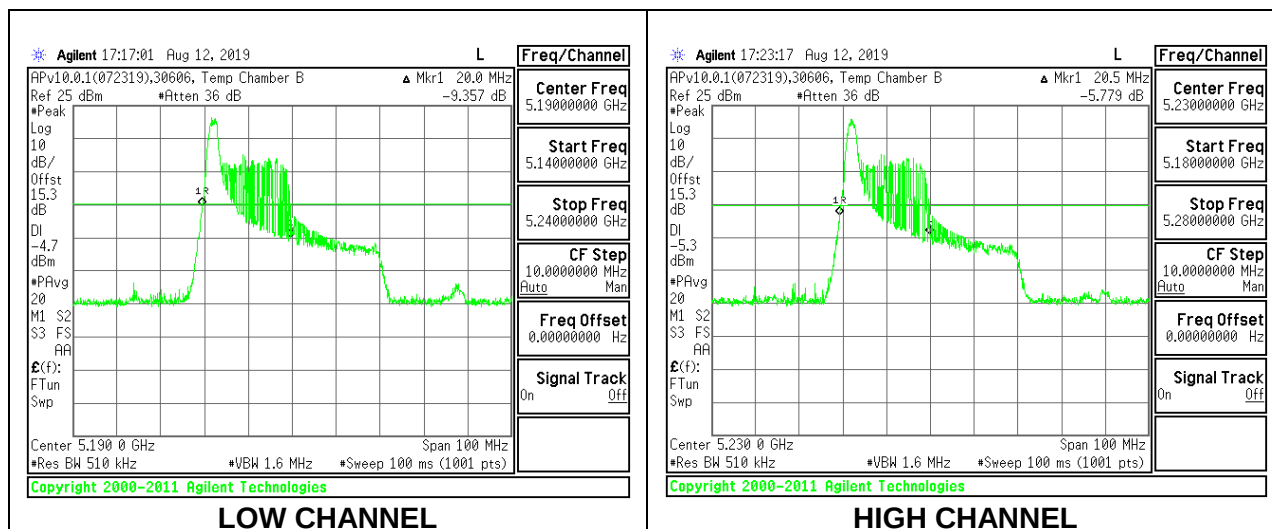
1TX Antenna 5 MODE – 484-Tones, RU Index 65

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	43.00
High	5230	42.80



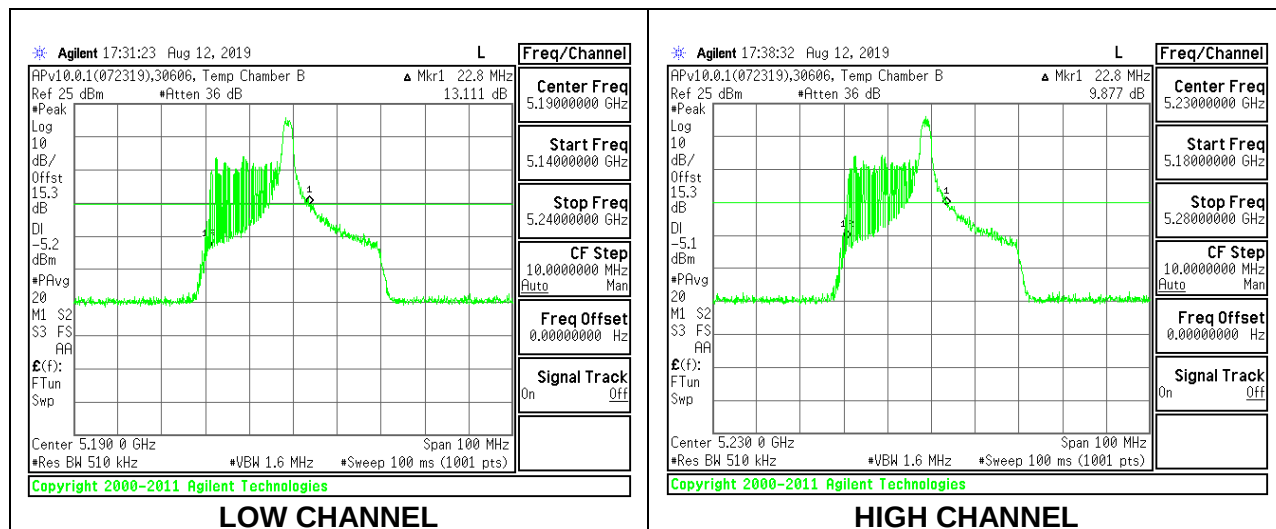
1TX Antenna 5 MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	20.00
High	5230	20.50



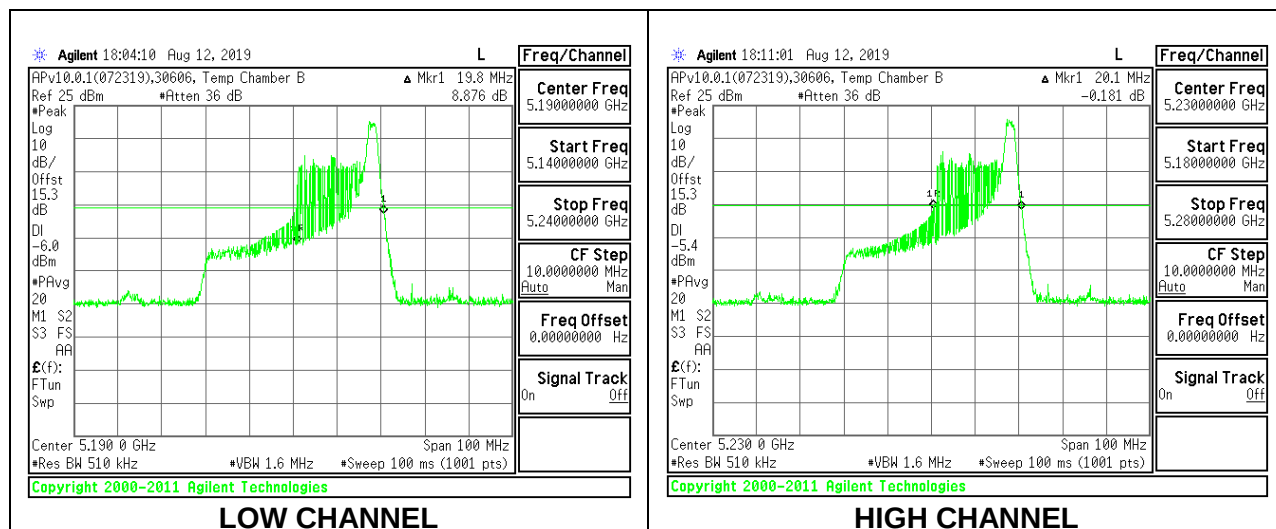
1TX Antenna 5 MODE – 26-Tones, RU Index 8

Channel	Frequency	26dB Bandwidth
	(MHz)	(MHz)
Low	5190	22.80
High	5230	22.80



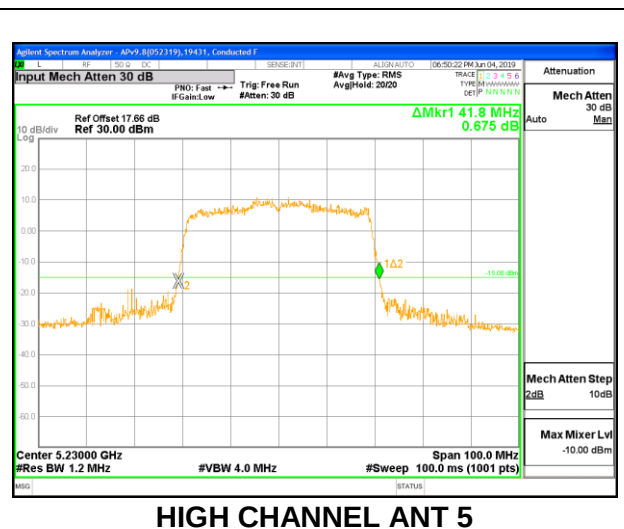
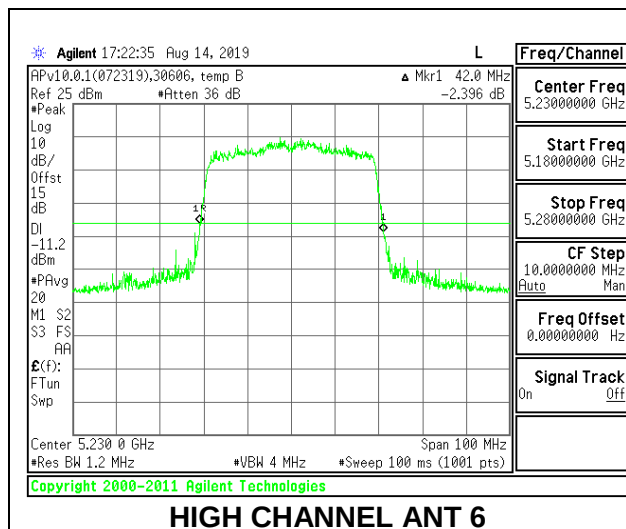
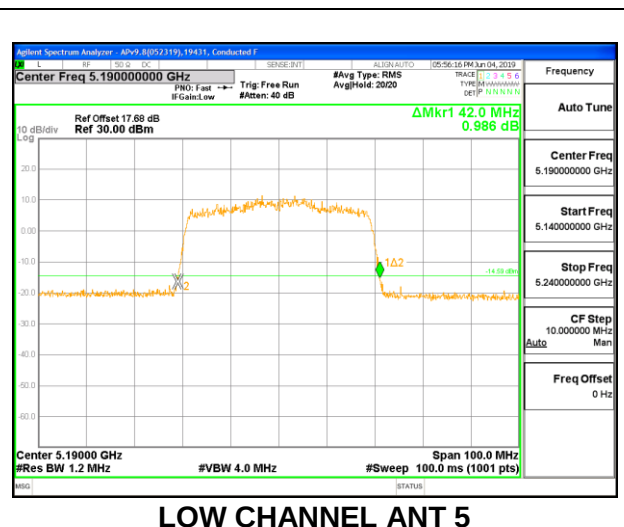
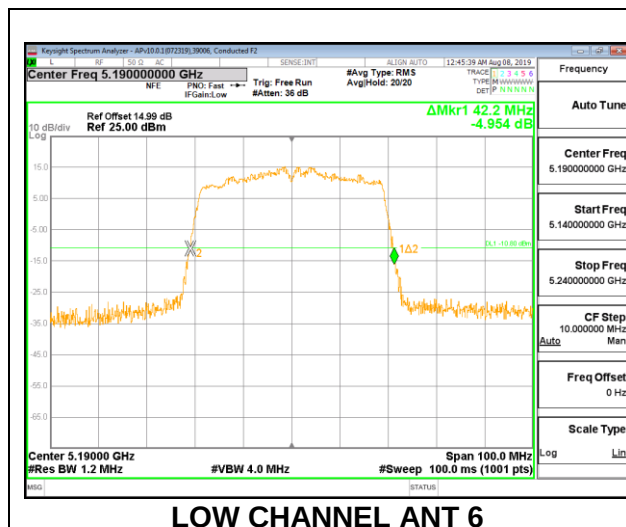
1TX Antenna 5 MODE – 26-Tones, RU Index 17

Channel	Frequency	26dB Bandwidth
	(MHz)	(MHz)
Low	5190	19.80
High	5230	20.10



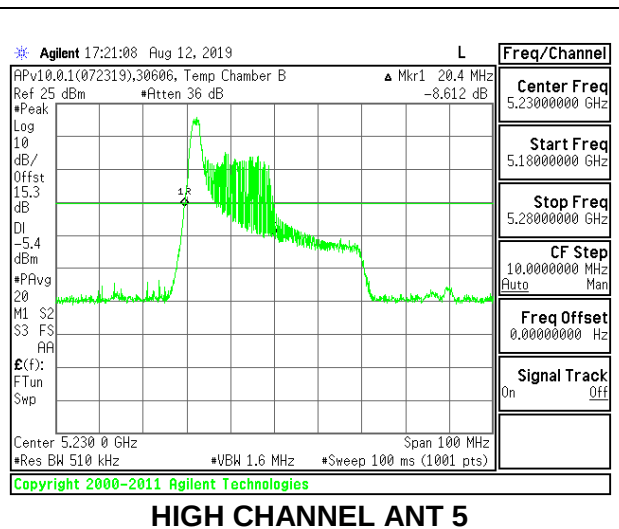
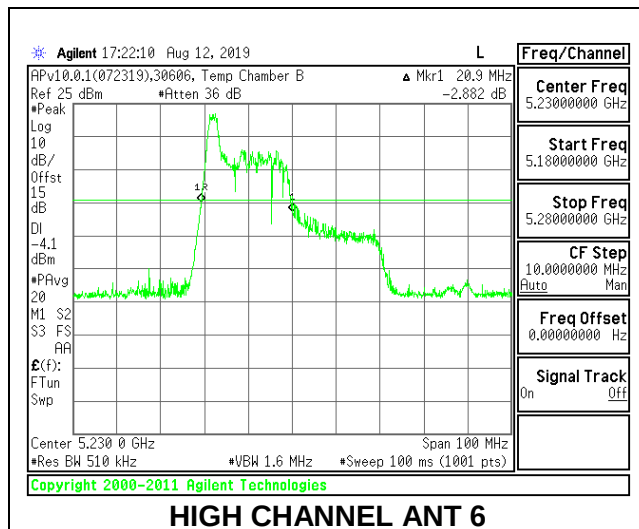
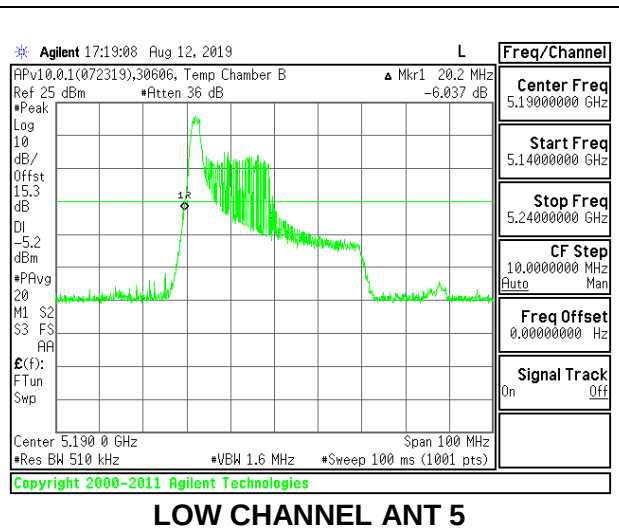
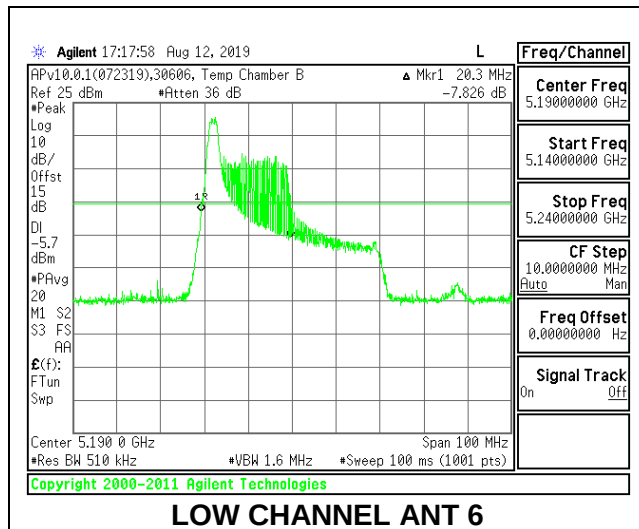
2TX Antenna 6 + Antenna 5 OFDMA MODE – 484-Tones, RU Index 65

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5190	42.20	42.00
High	5230	42.00	41.80



2TX Antenna 6 + Antenna 5 OFDMA MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5190	20.30	20.20
High	5230	20.90	20.40



2TX Antenna 6 + Antenna 5 OFDMA MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 6 (MHz)	26 dB Bandwidth Antenna 5 (MHz)
Low	5190	23.10	23.70
High	5230	24.50	23.20

