TEST REPORT

Report Number. : 12875574-E3V1

Applicant	:	SONOS, INC. 614 CHAPALA STREET SANTA BARBARA, CA 93101, U.S.A
Model	:	S24
FCC ID	:	SBVRM024
IC	:	5373A-RM024
EUT Description	:	802.11 a/b/g/n 4x4 (HT20) Client Device
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E (EXCEPT DFS) ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue:
February 03, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2/3/2020	Initial Issue	

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UL VERIFICATION SERVICES INC.
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONOS, INC.
614 CHAPALA STREET
SANTA BARBARA, CA 93101, U.S.A.

EUT DESCRIPTION: 802.11 a/b/g/n 4x4 (HT20) Client Device

MODEL: S24

SERIAL NUMBER: D100 1909CP 34-7E-5C-D0-02-60-7 (Conducted Sample)
D100 1909CP 34-7E-5C-D0-02-5C-3 (Radiated Sample)
D100 1909CP 34-7E-5C-D0-02-7E-3(Radiated Sample)

DATE TESTED: November 11 – December 10, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E (Except DFS)	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	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.

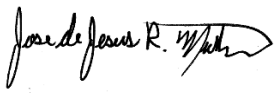
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. 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.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

DAN CORONIA
Operations Leader
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



JOSE MARTINEZ
Test Engineer
Consumer Technology Division
UL Verification Services Inc.

Reviewed By:

KIYA KEDIDA
Senior Project Engineer
Consumer Technology Division
UL Verification Services Inc.

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 662911 D02 v01, FCC KDB 905462 D06 v02, FCC KDB 789033 D02 v02r01, KDB 414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013, FCC 06-96, RSS-GEN Issue 5, and RSS-247 Issue 2.

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	

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: 2324A.

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

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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 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 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	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 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%.

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is an 802.11 a/b/g/n 4x4 (HT20) Client Device.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

FCC

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 4TX			
5180-5240	802.11a	19.11	81.47
5180-5240	802.11n HT20	19.09	81.10
5.3 GHz band, 4TX			
5260-5320	802.11a	18.19	65.92
5260-5320	802.11n HT20	18.69	73.96
5.6 GHz band, 4TX			
5500-5700	802.11a	18.34	68.23
5500-5700	802.11n HT20	18.33	68.08
5.8 GHz band, 4TX			
5725-5850	802.11a	22.33	171.00
5725-5850	802.11n HT20	22.40	173.78

IC

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 4TX			
5180-5240	802.11a	16.98	49.89
5180-5240	802.11n HT20	17.58	57.28

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5.3. DESCRIPTION OF AVAILABLE ANTENNAS

5GHz Antenna Identification / Max Antenna Gain dBi				
Frequency Range (MHz)	**Ant0 Wifi P/N 105-00152 Vertical Polarization**	**Ant1 Wifi Vertical Polarization**	**Ant2 Wifi P/N 105-00153 Horizontal Polarization**	**Ant3 Wifi Horizontal Polarization**
U-NII-1 (5180-5240)	Chain 0 / 3.7 dBi	Chain 1 / 4.7 dBi	Chain 2 / 4.8 dBi	Chain 3 / 3.5 dBi
U-NII-2 (5260-5320)	Chain 0 / 3.7 dBi	Chain 1 / 4.7 dBi	Chain 2 / 4.8 dBi	Chain 3 / 3.5 dBi
U-NII-3 (5500-5720)	Chain 0 / 3.7 dBi	Chain 1 / 4.7 dBi	Chain 2 / 4.8 dBi	Chain 3 / 3.5 dBi
U-NII-4 (5745-5825)	Chain 0 / 3.7 dBi	Chain 1 / 4.7 dBi	Chain 2 / 4.8 dBi	Chain 3 / 3.5 dBi

NOTE:
Antenna 1 = Chain 0
Antenna 2 = Chain 1
Antenna 3 = Chain 2
Antenna 4 = Chain 3

5.4. SOFTWARE

The test utility software used during testing was:
Sonos build 55.0-70090_mainline_integ_int_release

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y Left, Y Right, it was determined that Y Left orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y Left orientation.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps
802.11n HT20mode: MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T440p	SON-00008522	N/A
AC Adapter	Lenovo	ADLX90NDC2A	11S36200285ZZ3004758D2	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC Power	1	AC	Unshielded	2	AC Mains to EUT
2	Ethernet	1	RJ45	Unshielded	10	EUT to Laptop
3	DC Power	1	DC	Shielded	1.2	AC/DC Adapter to Laptop
4	AC Power	1	AC	Unshielded	1	AC Mains to AC/DC Adapter

TEST SETUP

The EUT connected to support laptop via the ethernet cable during testing.
The test utility software on support laptop exercised the radio card.
For radiated testing, the support laptop was set up outside the chamber.

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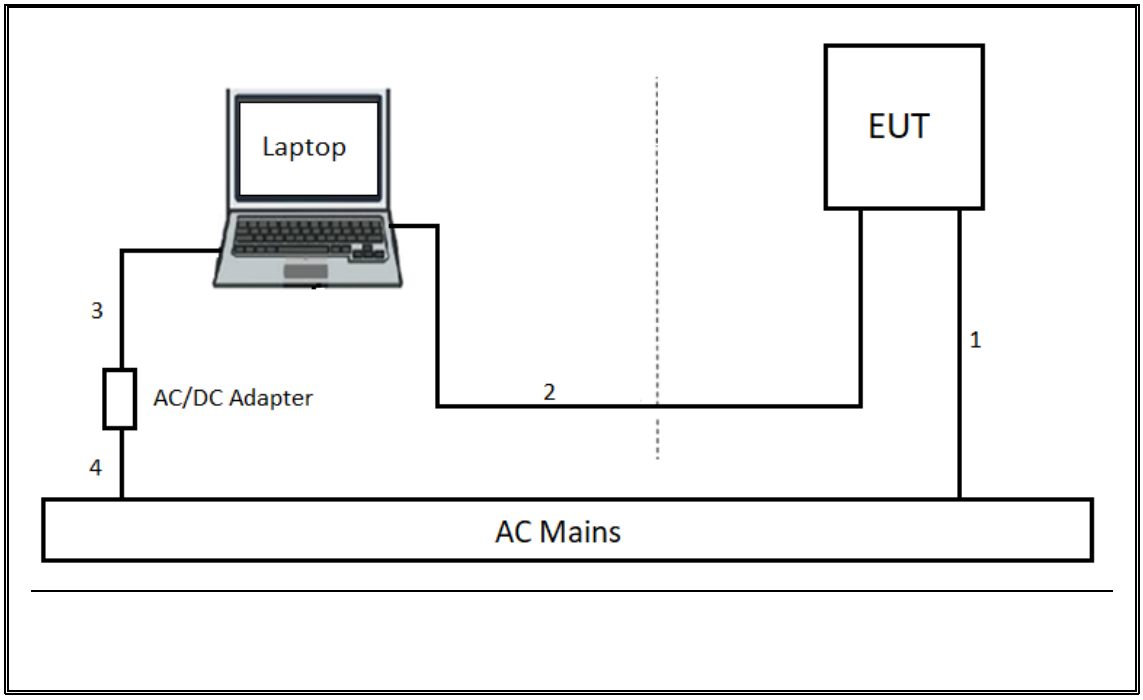
SETUP DIAGRAMS



6. MEASUREMENT METHOD

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

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

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

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

Conducted Output Power: KDB 789033 D02 v02r01, Sections II.E.2.b (Method SA-1) II.E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v02r01, Section II F.

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

Unwanted emissions: KDB 789033 D02 v02r01, Sections II.G.3 – II.G.6.

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

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7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies (Formerly Agilent)	N9030A	T908	01/23/2020	01/23/2019
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	11/06/2020	11/06/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	05/14/2020	05/14/2019
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179372	02/16/2020	02/16/2019
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	T1569	06/04/2020	06/04/2019
Antenna	ETS-Lindgren	3117	EMC4294	06/14/2020	06/14/2019
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179376	02/14/2020	02/14/2019
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180175	05/29/2020	06/29/2019
Antenna,Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	PRE0184052	11/12/2020	11/12/2019
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	PRE0181078	08/24/2020	08/24/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T862	06/05/2020	06/05/2019
Antenna, Active Loop 9KHz to 30MHz	COM-POWER	AL-130R	PRE0165308	04/11/2020	04/11/2019
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	08/13/2020	08/13/2019
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	Rf Amplifier, 18-26.5GHz, 60dB gain	PRE0181238	05/01/2020	05/01/2019
Antenna, Horn 26.5 to 40GHz	ARA	MWH-2640/B	T446	08/13/2020	08/13/2019
Amplifier, 26 - 40GHz	MITEQ	TTA2640-35-HG	T1864	03/23/2020	03/23/2019
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1265	01/29/2020	01/29/2019
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1227	02/05/2020	02/05/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies (Formerly Agilent)	N9030A	T917	01/24/2020	01/24/2019
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Keysight Technologies (Formerly Agilent)	E4440A	T200	01/28/2020	01/28/2019
AC Line Conducted					
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/14/2020	02/14/2019
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	01/24/2020	01/24/2019
Test Software List					
Radiated Software	UL	UL EMC		Ver 9.5, September 24, 2019	
Antenna Port Software	UL	UL RF		Ver 2019.10.18, October 18, 2019	
AC Line Conducted Software	UL	UL EMC		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)
802.11a	1.359	1.386	0.981	98.1%	0.00	0.010
802.11n HT20	1.269	1.297	0.978	97.8%	0.10	0.788

DUTY CYCLE 802.11a CDD MODE

DUTY CYCLE 802.11n CDD MODE

8.2. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

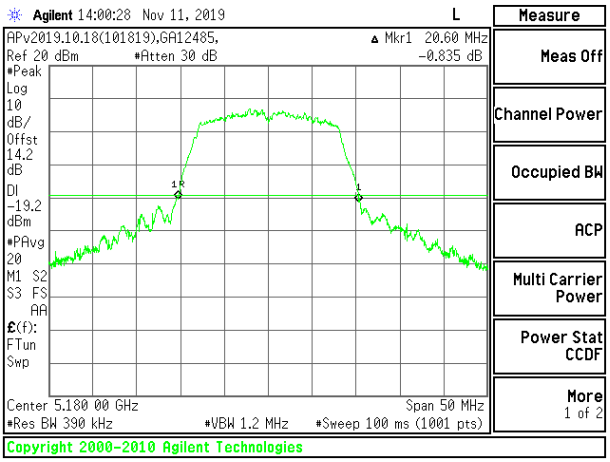
RESULTS

8.2.1. 802.11a MODE IN THE 5.2 GHz BAND

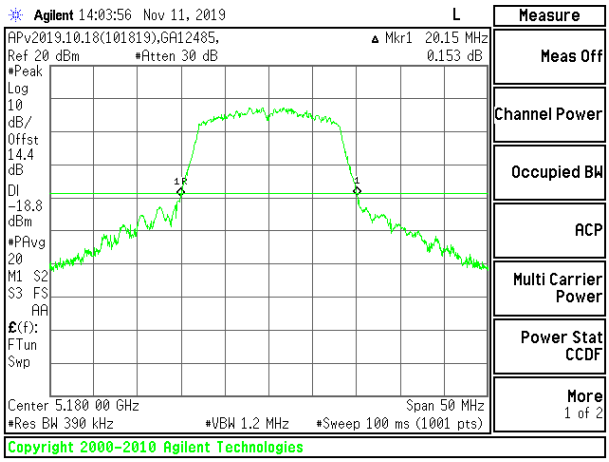
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5180	20.60	20.15	20.15	21.70
Mid	5200	23.10	23.10	21.50	20.50
High	5240	20.90	20.55	20.50	23.20

LOW CHANNEL



LOW CHANNEL CHAIN 0



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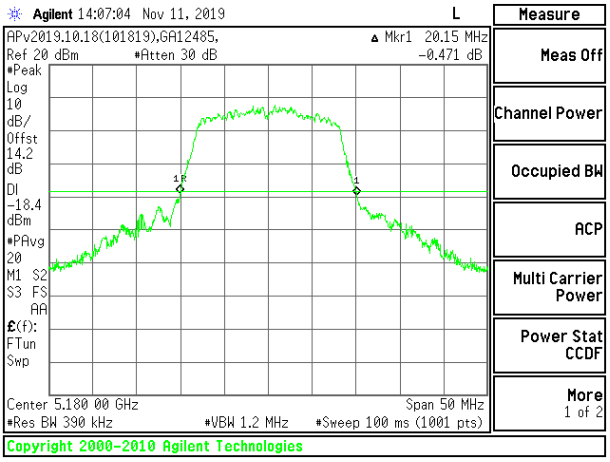
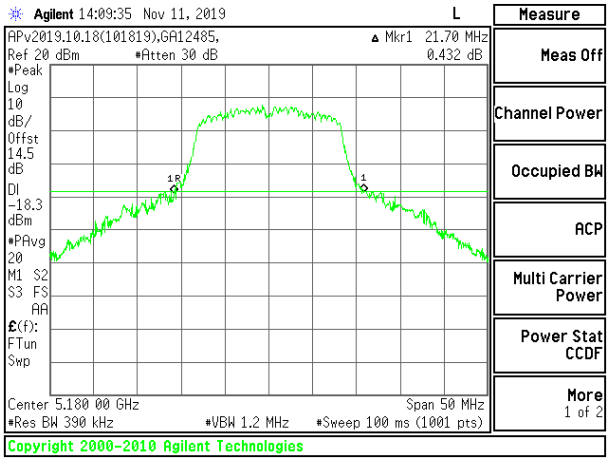
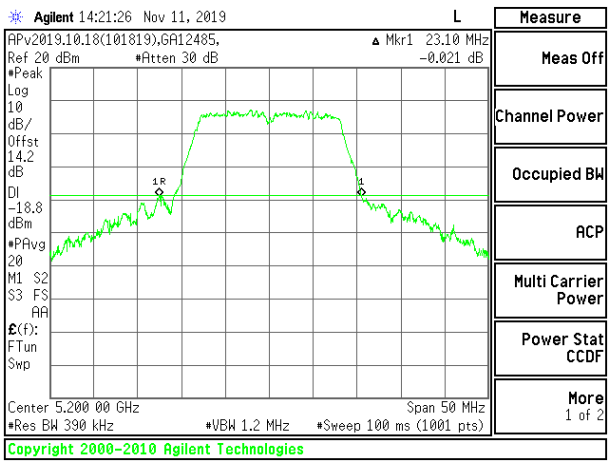


LOW CHANNEL CHAIN 2



LOW CHANNEL CHAIN 3

MID CHANNEL



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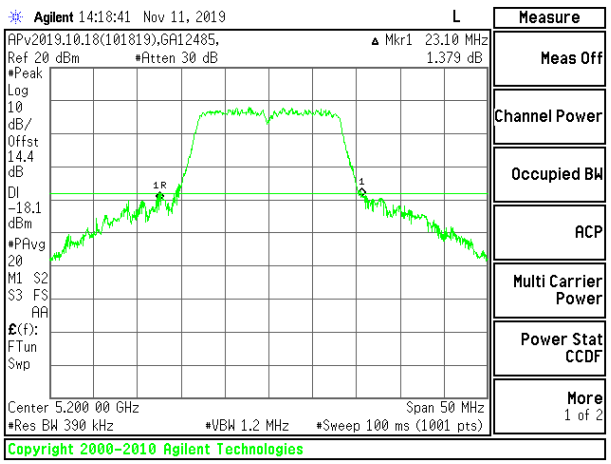

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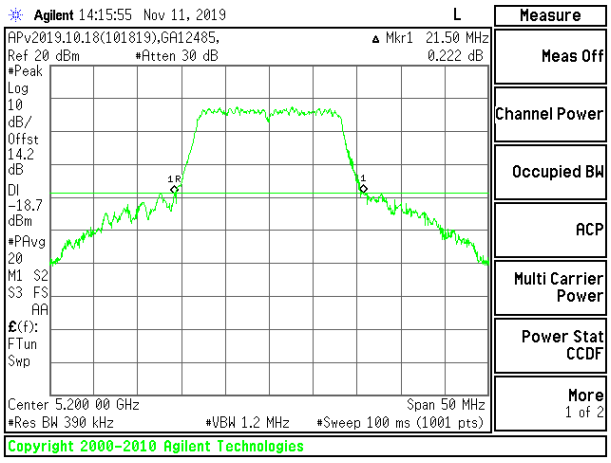

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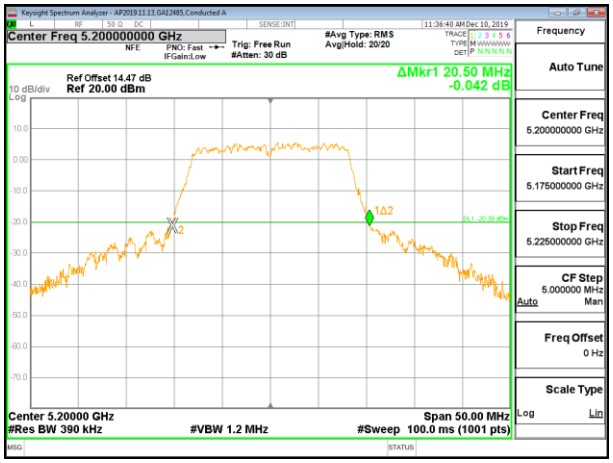
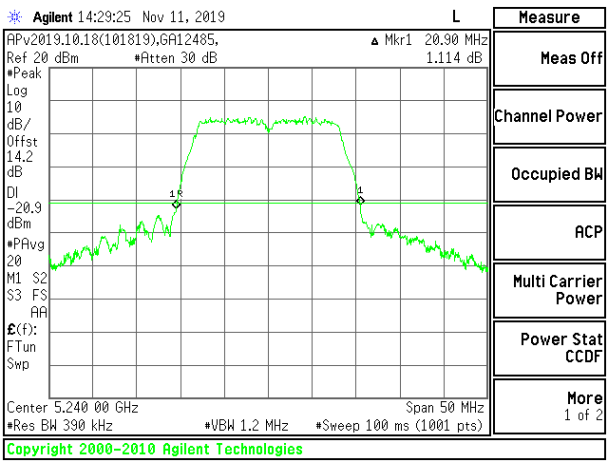


MID CHANNEL CHAIN 3

HIGH CHANNEL



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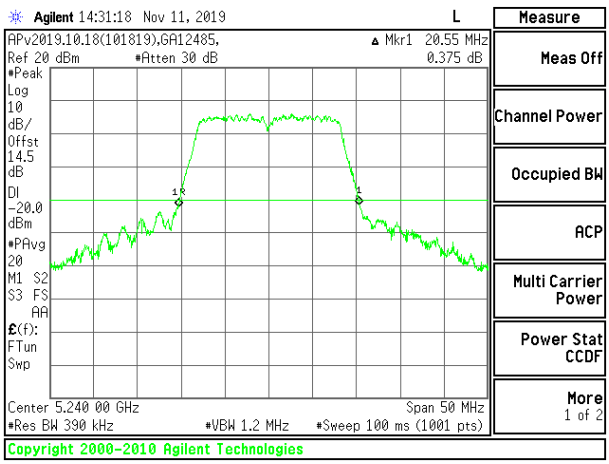

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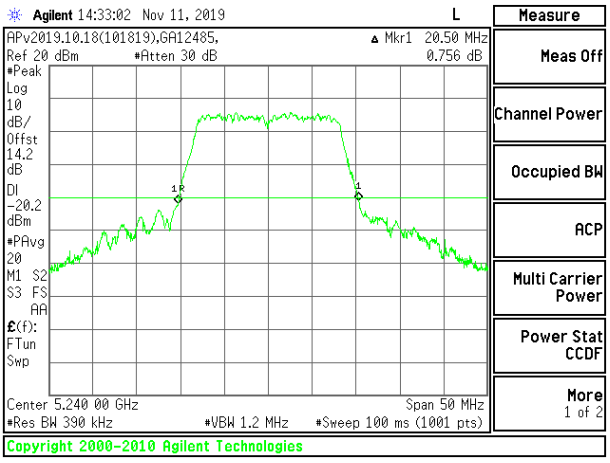

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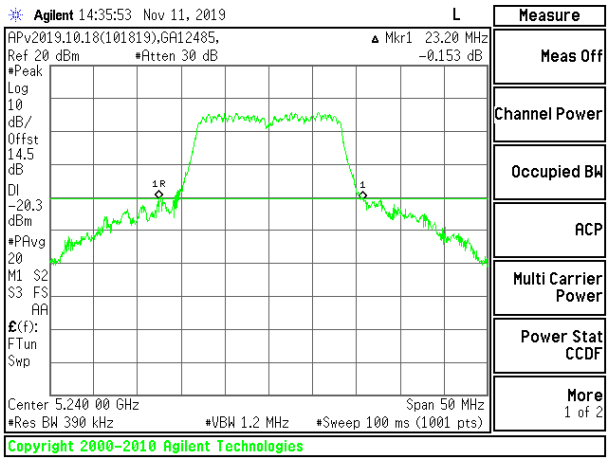


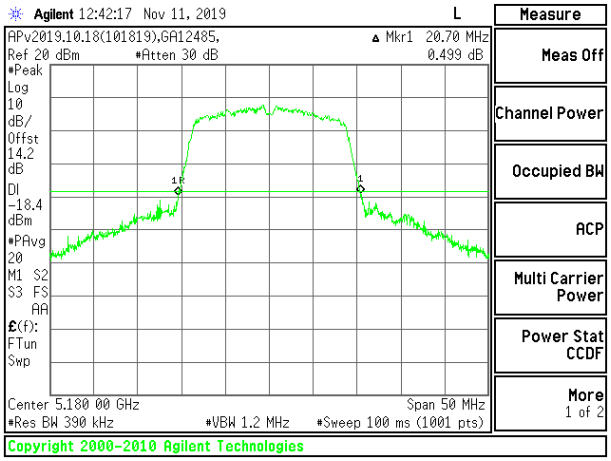
HIGH CHANNEL CHAIN 3

8.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5180	20.70	20.50	20.50	21.15
Mid	5200	21.05	20.70	20.95	23.70
High	5240	20.95	20.65	20.75	20.95

LOW CHANNEL



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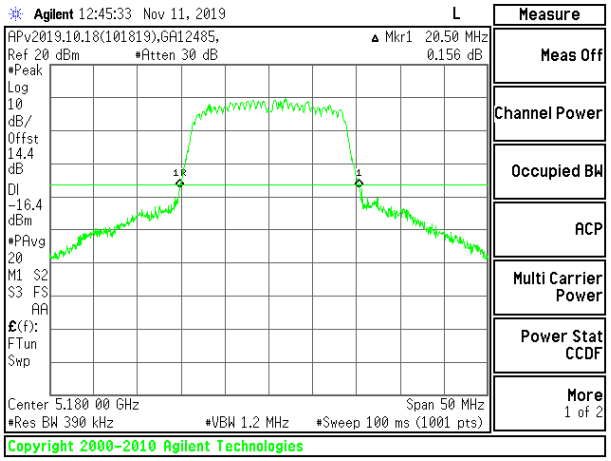

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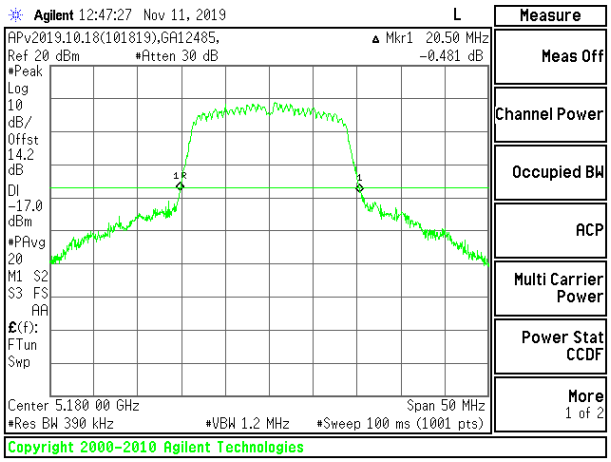

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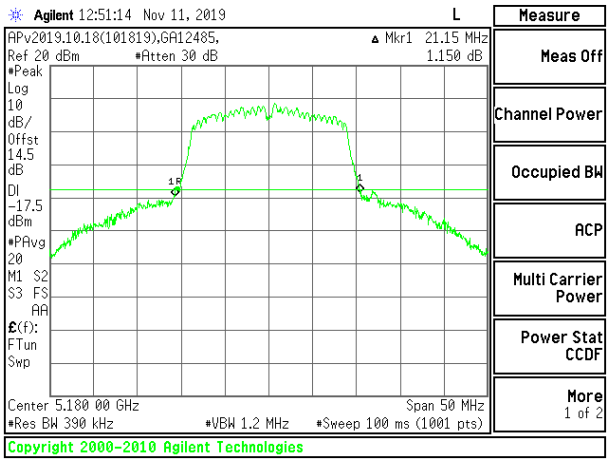
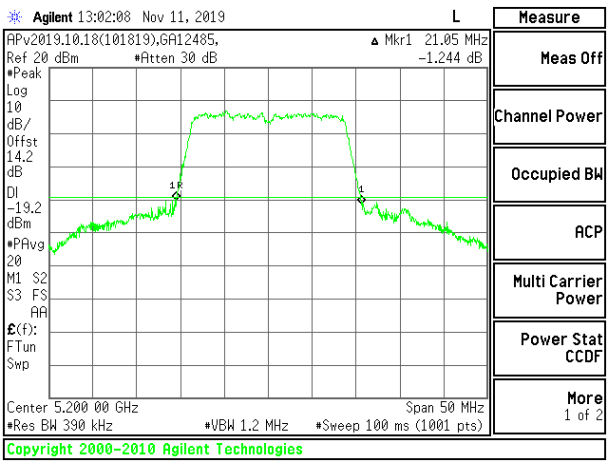


LOW CHANNEL CHAIN 3

MID CHANNEL



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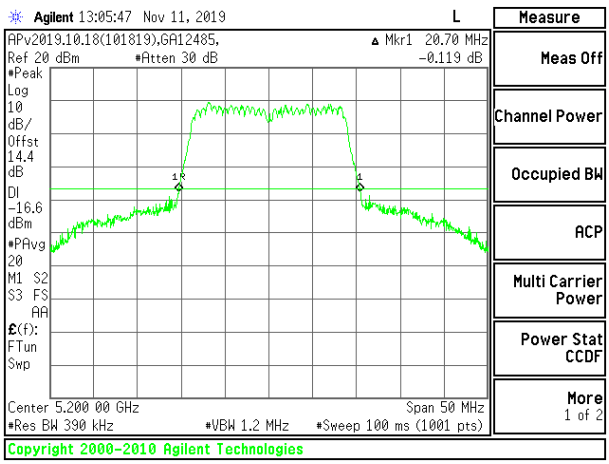
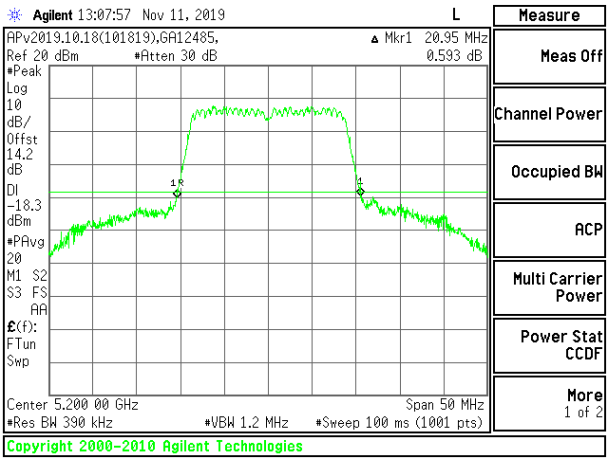
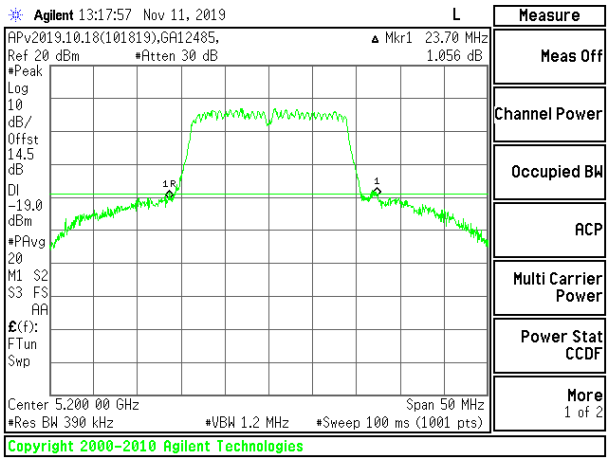


MID CHANNEL CHAIN 1

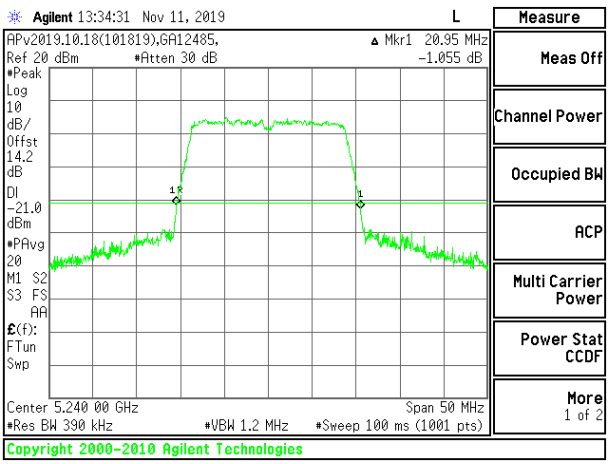


MID CHANNEL CHAIN 2

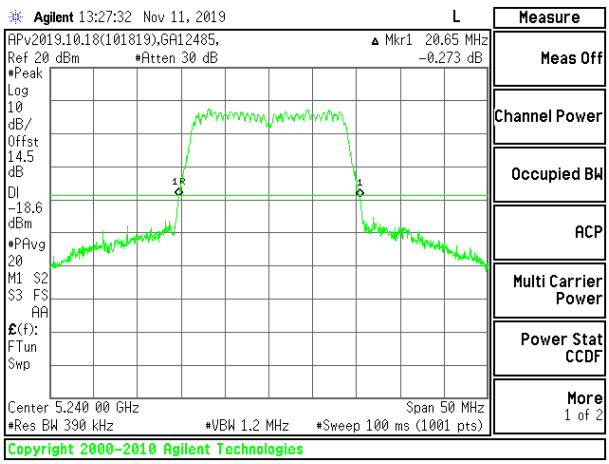


MID CHANNEL CHAIN 3

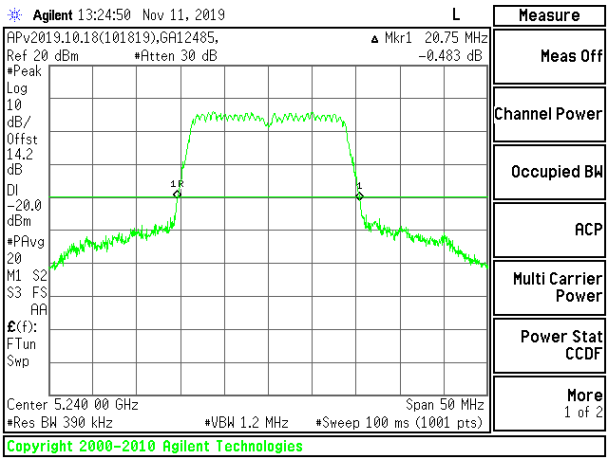
HIGH CHANNEL



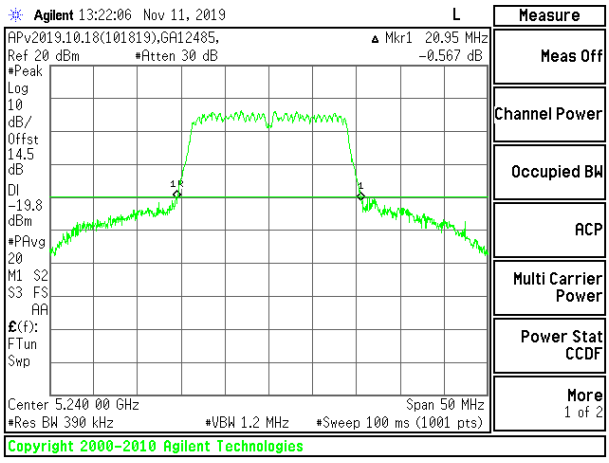
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



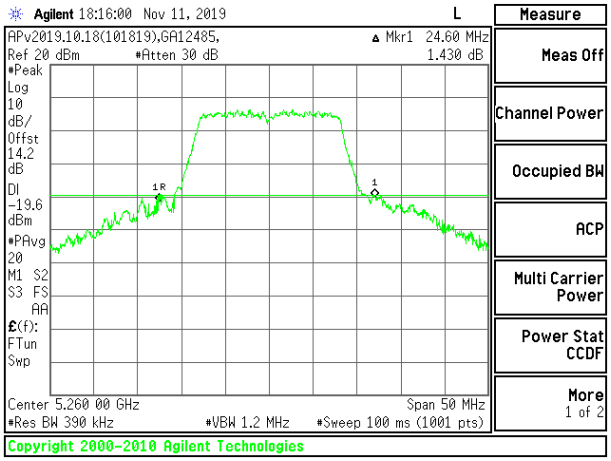
HIGH CHANNEL CHAIN 3

8.2.3. 802.11a MODE IN THE 5.3 GHz BAND

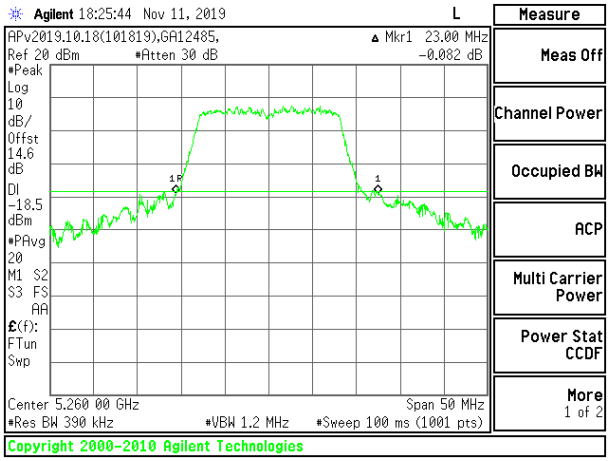
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5260	24.60	23.00	23.80	23.80
Mid	5300	23.15	24.70	21.40	21.35
High	5320	21.20	20.85	20.40	21.70

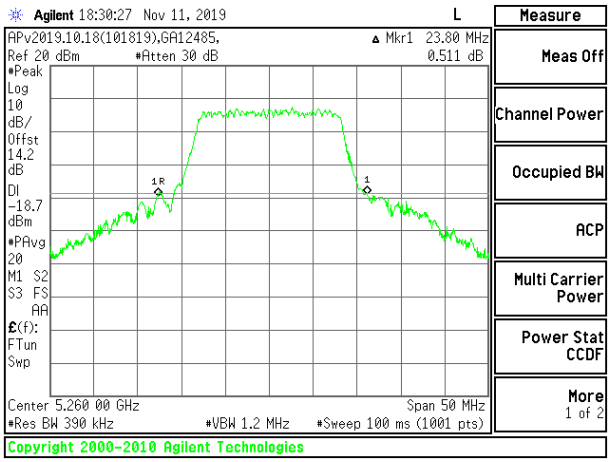
LOW CHANNEL



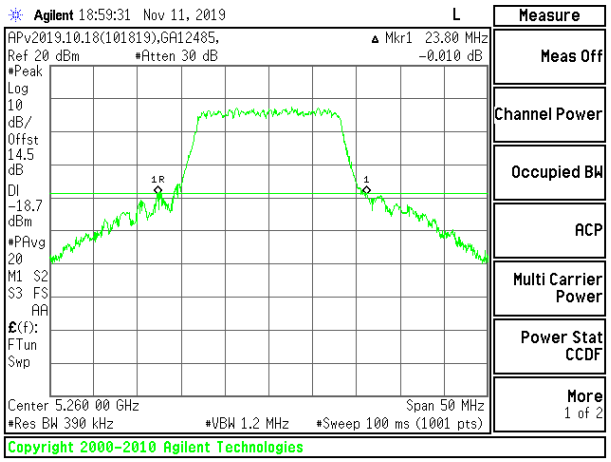
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

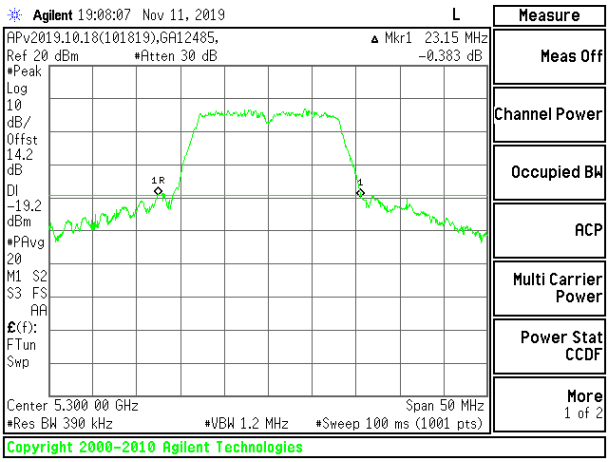


LOW CHANNEL CHAIN 2

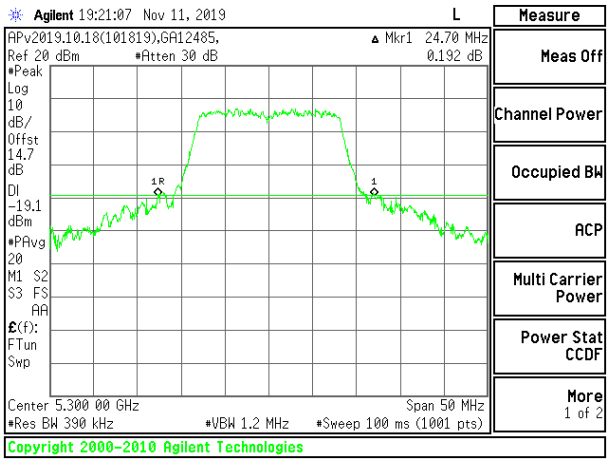


LOW CHANNEL CHAIN 3

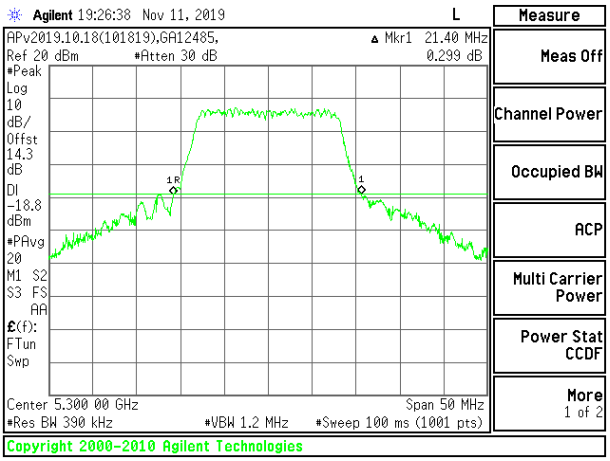
MID CHANNEL



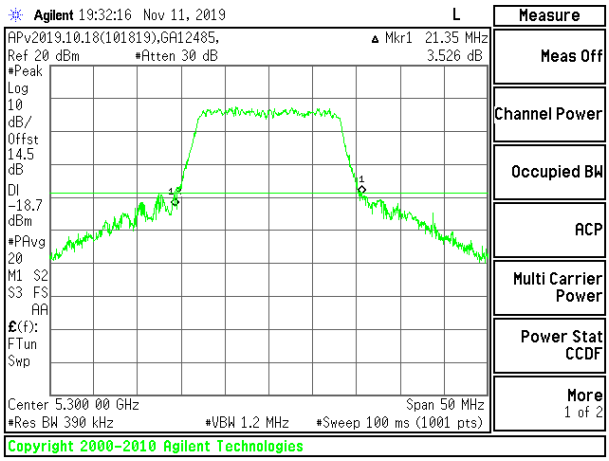
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

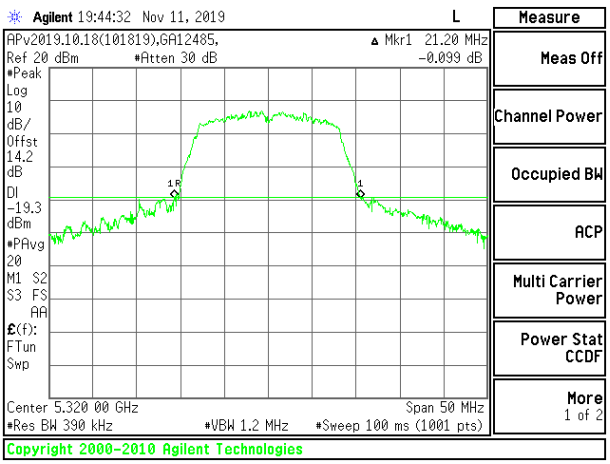


MID CHANNEL CHAIN 2

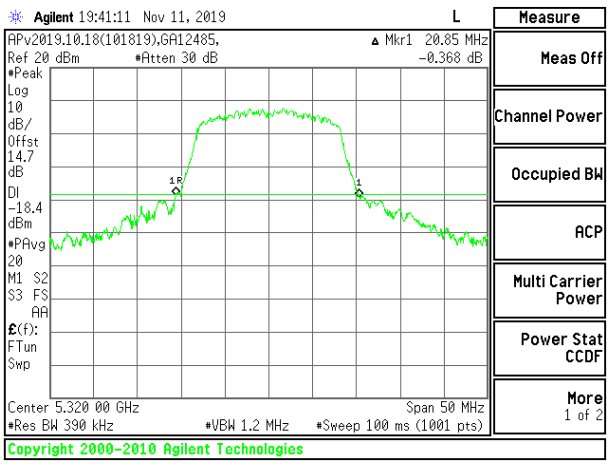


MID CHANNEL CHAIN 3

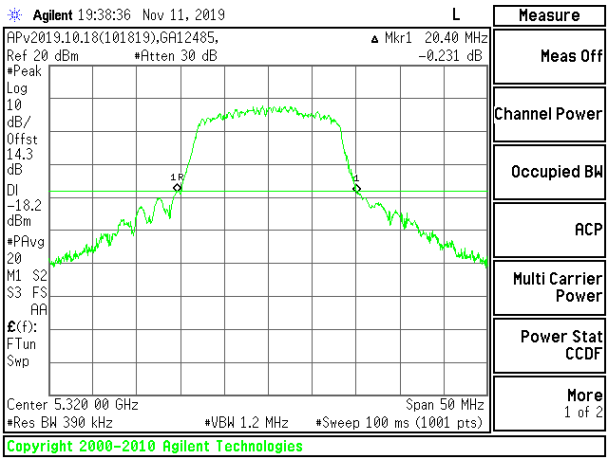
HIGH CHANNEL



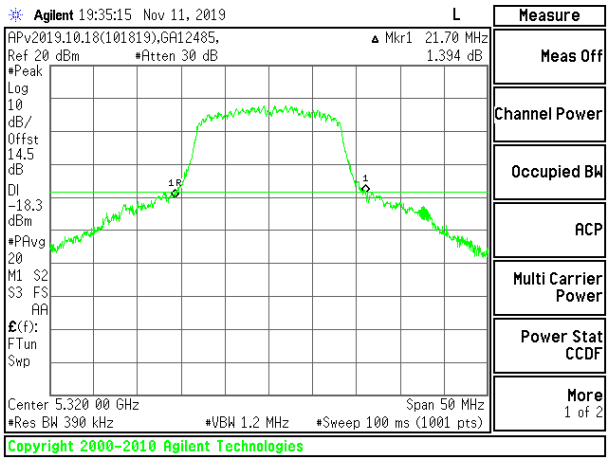
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



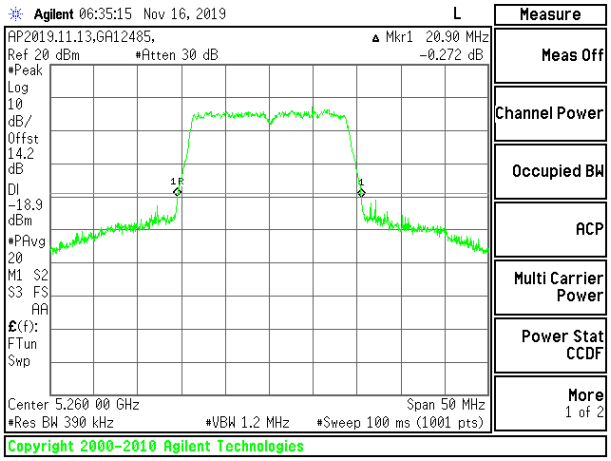
HIGH CHANNEL CHAIN 3

8.2.4. 802.11n HT20 MODE IN THE 5.3 GHz BAND

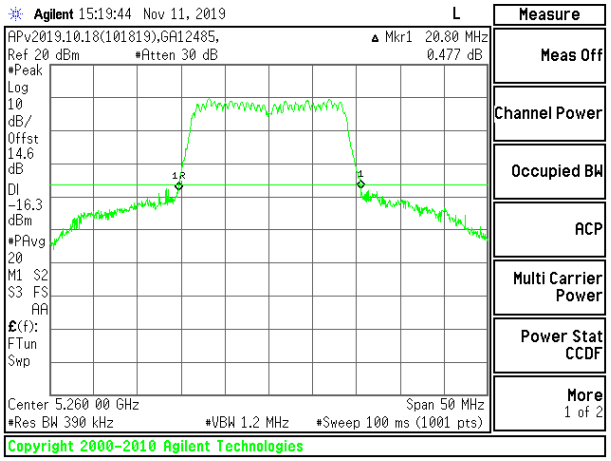
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5260	20.90	20.80	21.10	22.70
Mid	5300	21.15	21.55	21.20	24.00
High	5320	20.80	20.65	20.45	20.95

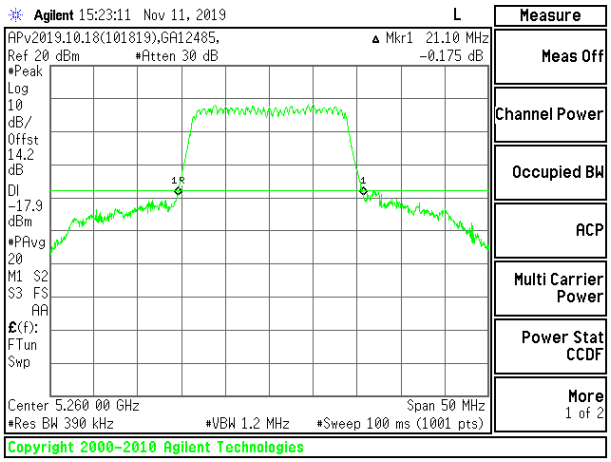
LOW CHANNEL



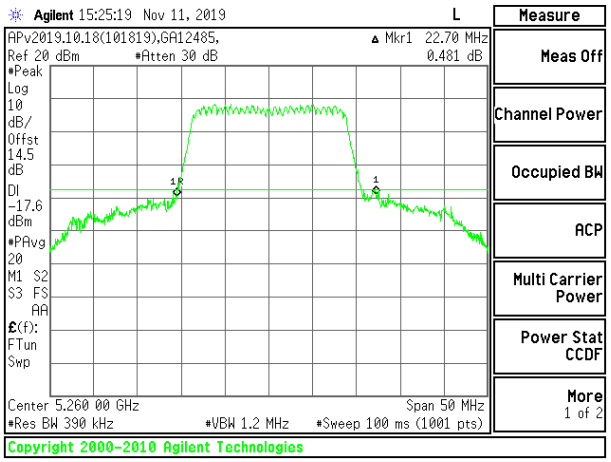
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

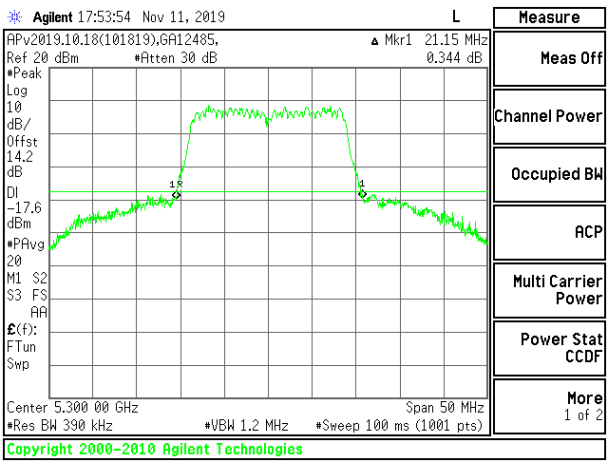


LOW CHANNEL CHAIN 2

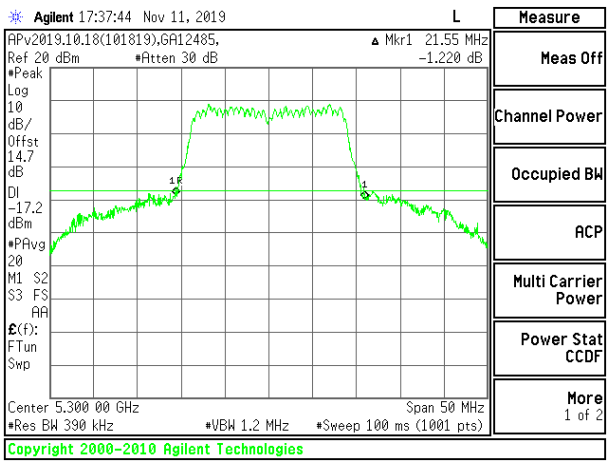


LOW CHANNEL CHAIN 3

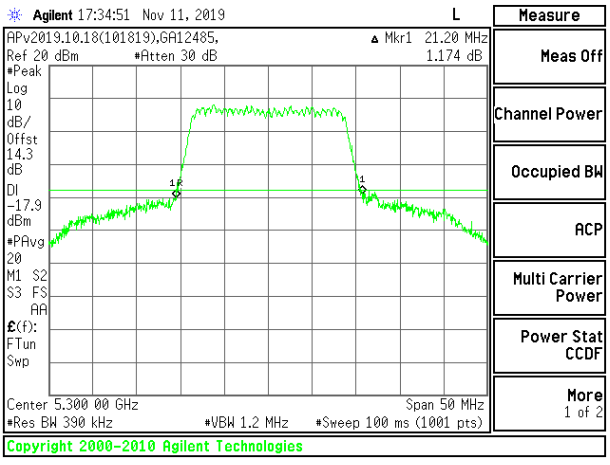
MID CHANNEL



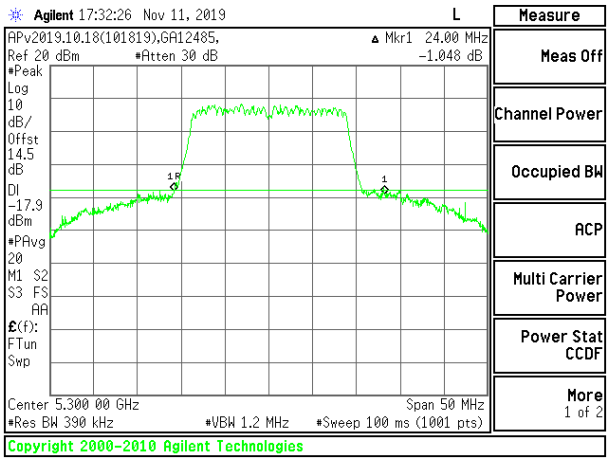
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

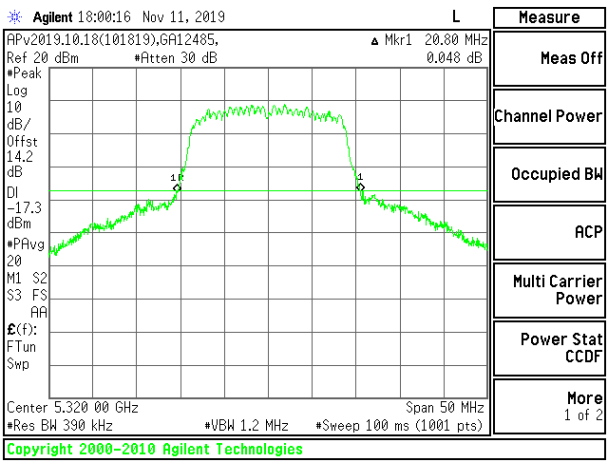


MID CHANNEL CHAIN 2

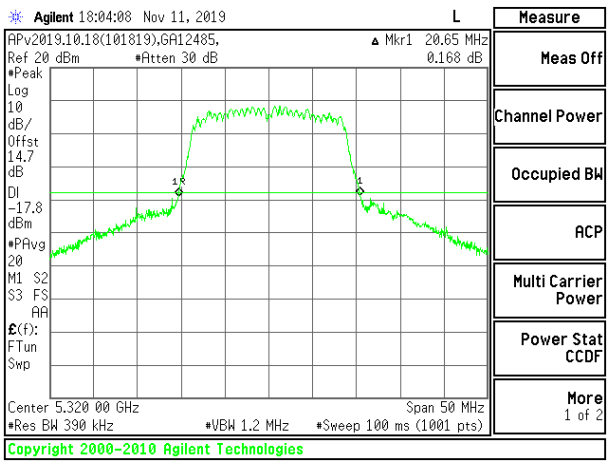


MID CHANNEL CHAIN 3

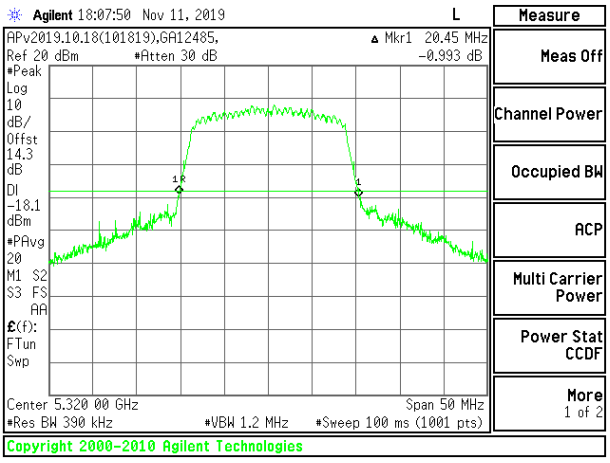
HIGH CHANNEL



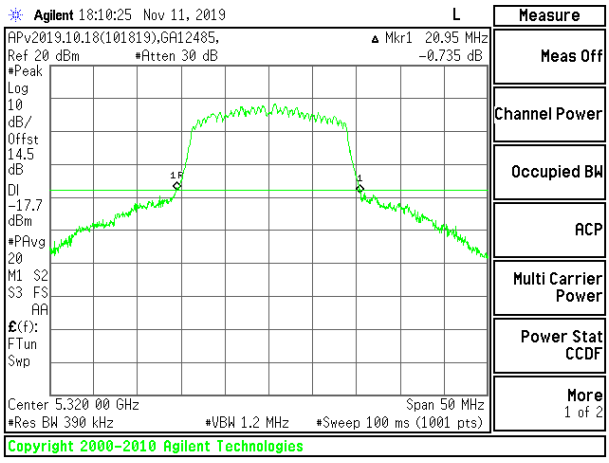
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



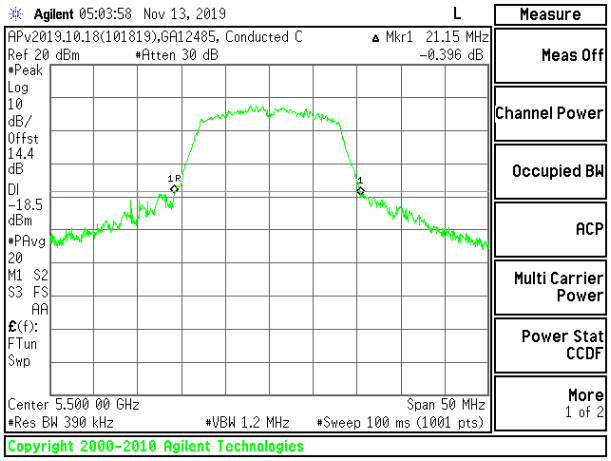
HIGH CHANNEL CHAIN 3

8.2.5. 802.11a MODE IN THE 5.6 GHz BAND

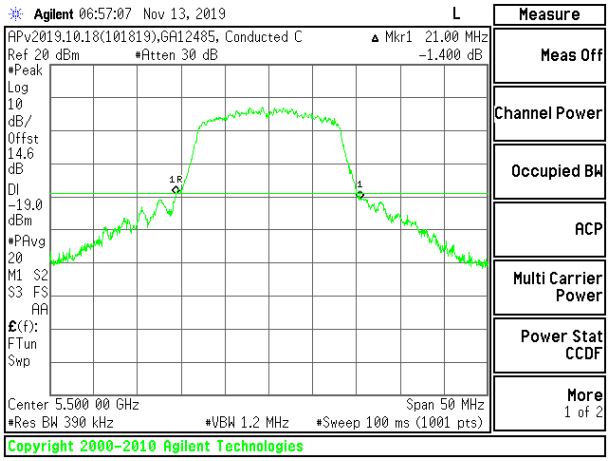
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5500	21.15	21.00	20.10	20.05
Mid	5580	23.60	23.65	21.35	20.45
High	5700	22.00	20.45	20.15	20.15

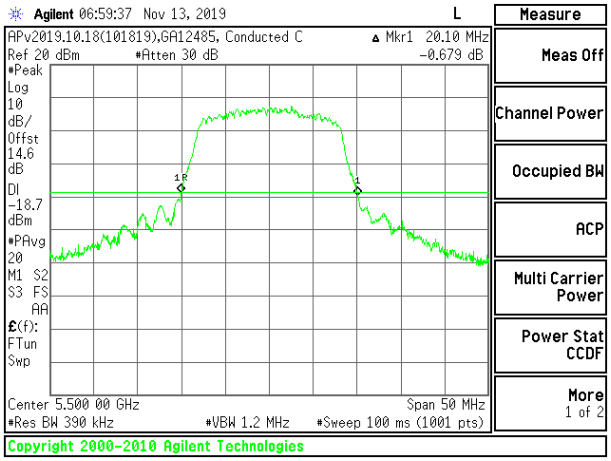
LOW CHANNEL



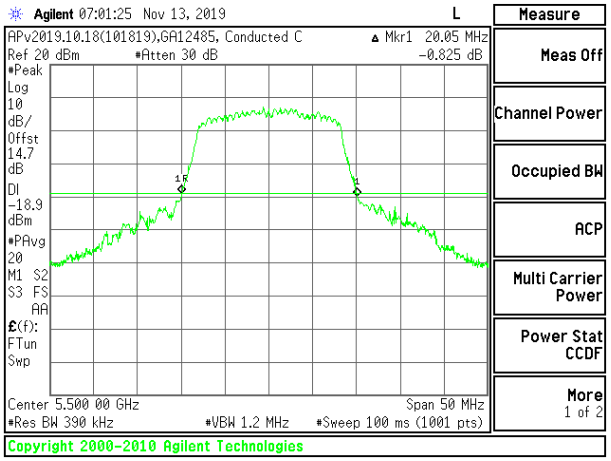
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

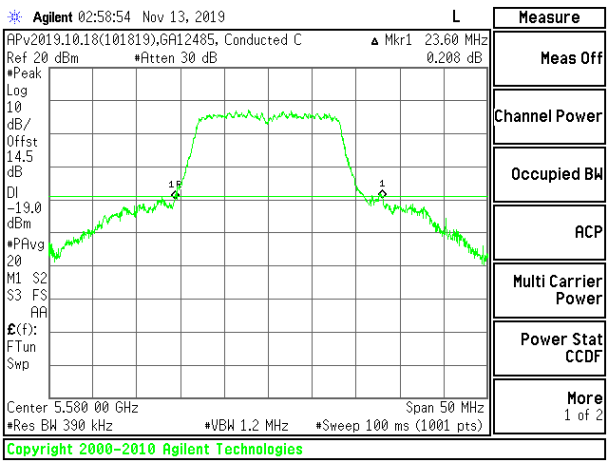


LOW CHANNEL CHAIN 2

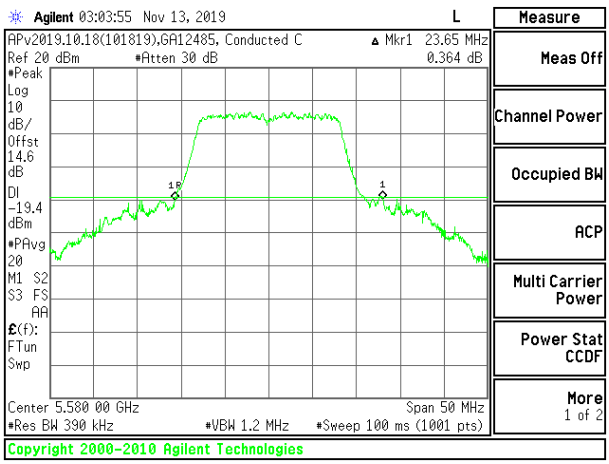


LOW CHANNEL CHAIN 3

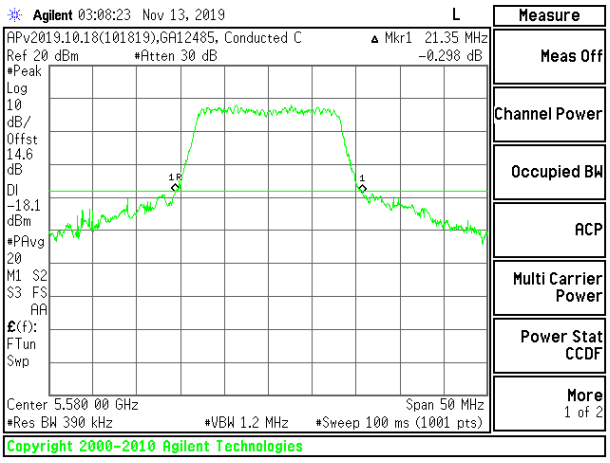
MID CHANNEL



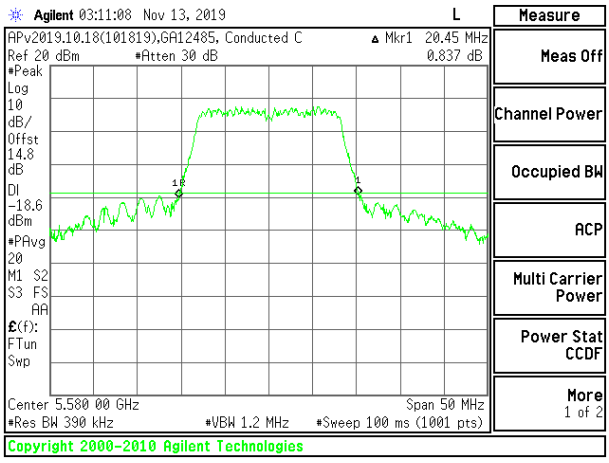
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

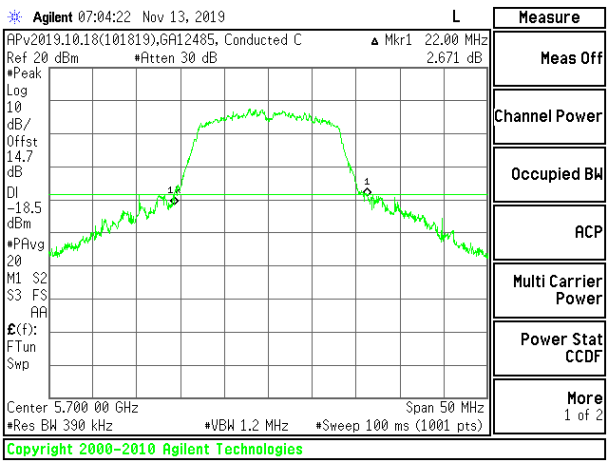


MID CHANNEL CHAIN 2

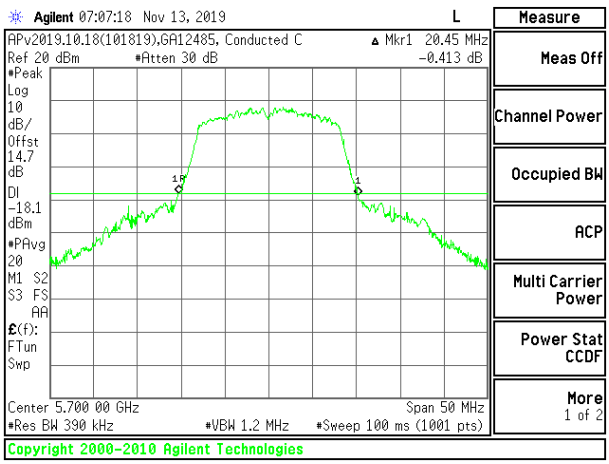


MID CHANNEL CHAIN 3

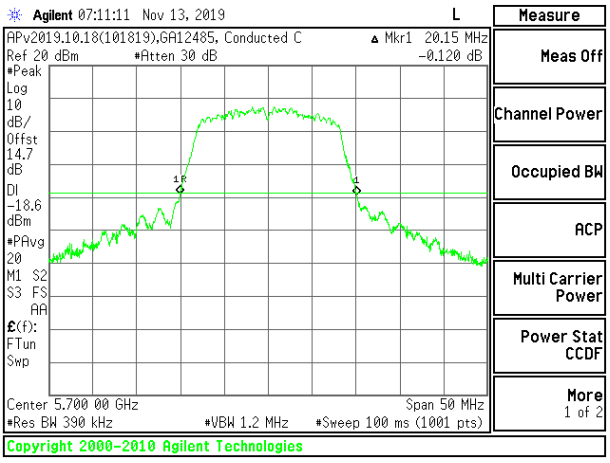
HIGH CHANNEL



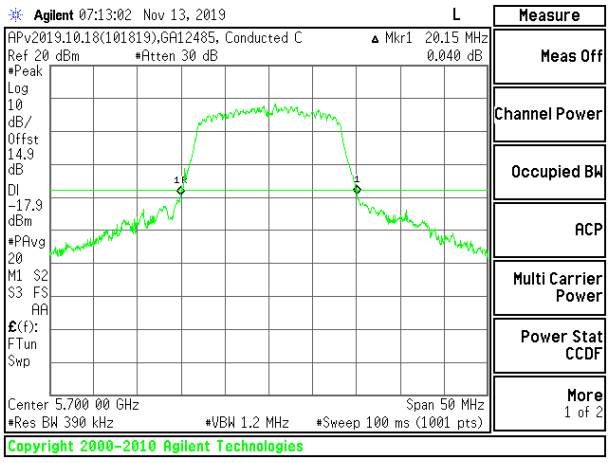
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



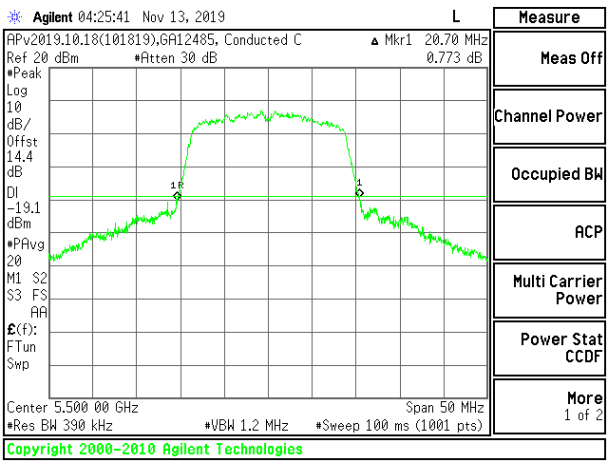
HIGH CHANNEL CHAIN 3

8.2.6. 802.11n HT20 MODE IN THE 5.6 GHz BAND

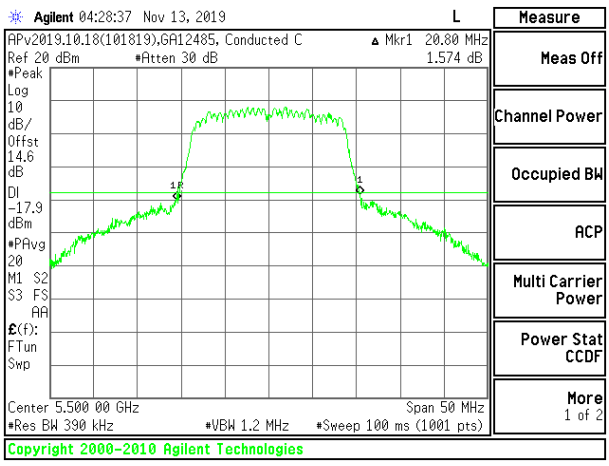
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5500	20.70	20.80	20.40	20.70
Mid	5580	21.10	20.90	20.85	20.85
High	5700	21.05	20.50	20.40	20.50

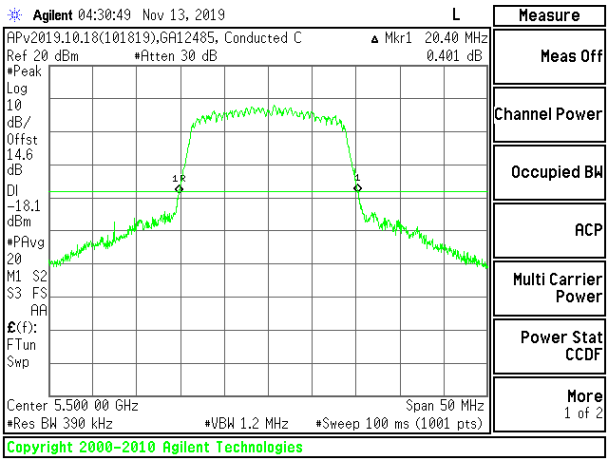
LOW CHANNEL



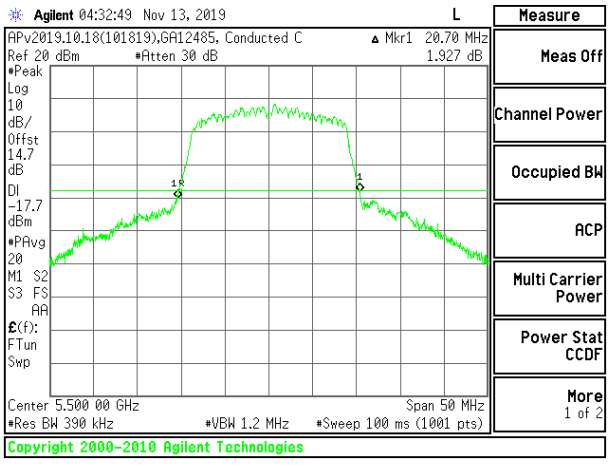
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

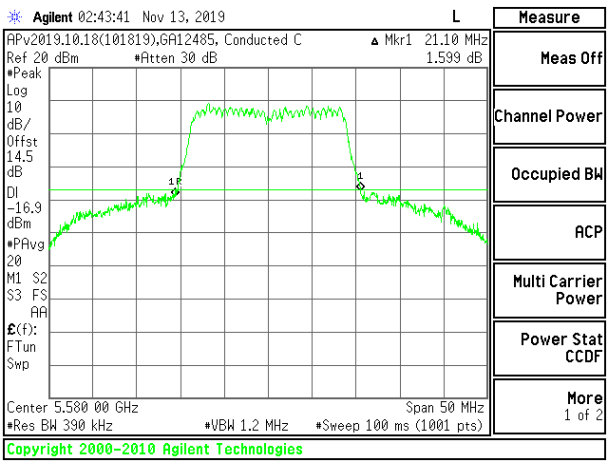


LOW CHANNEL CHAIN 2

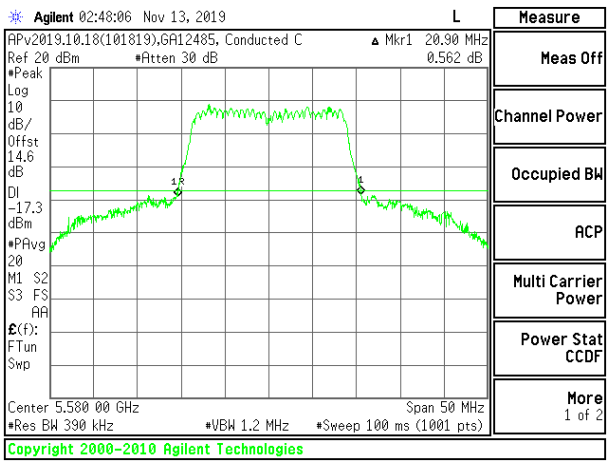


LOW CHANNEL CHAIN 3

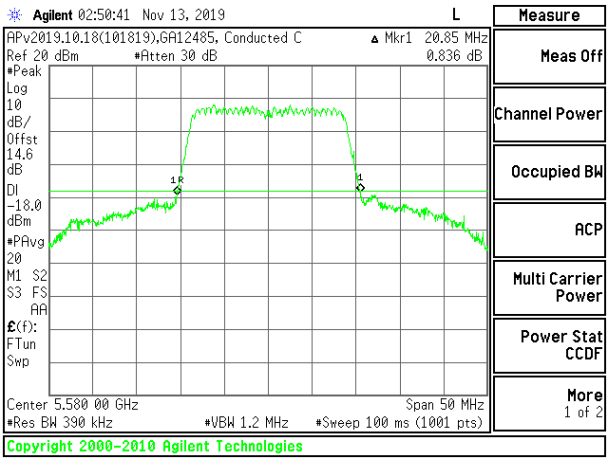
MID CHANNEL



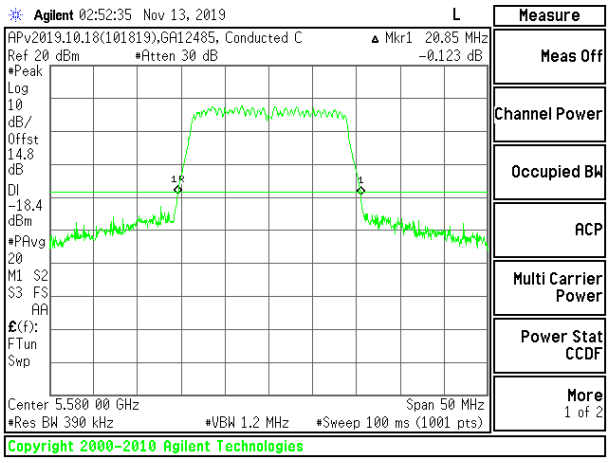
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

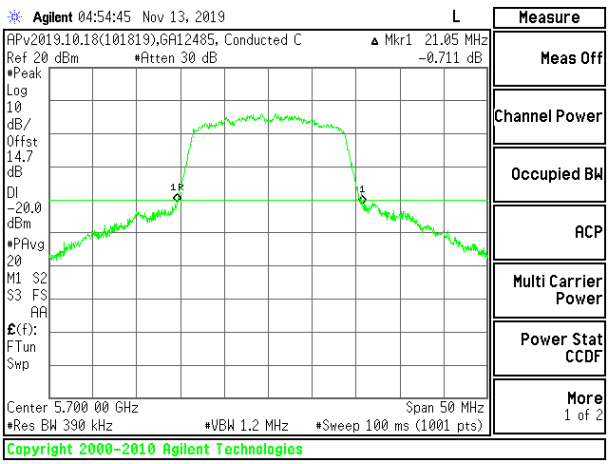


MID CHANNEL CHAIN 2

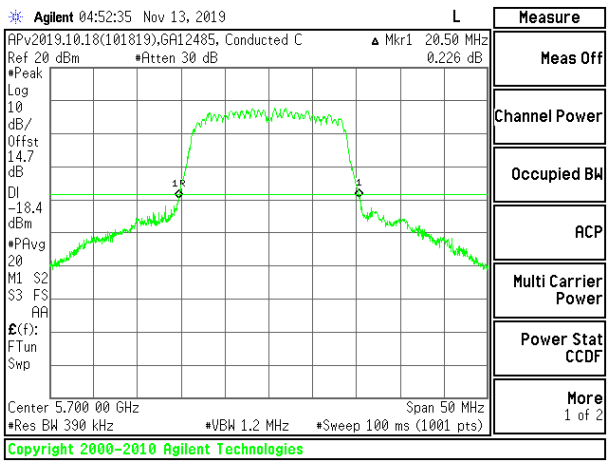


MID CHANNEL CHAIN 3

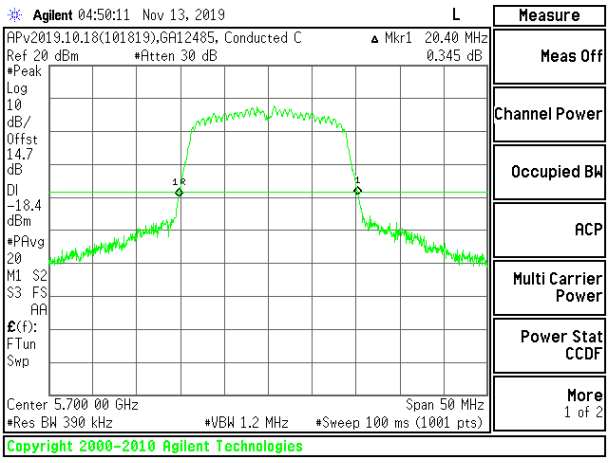
HIGH CHANNEL



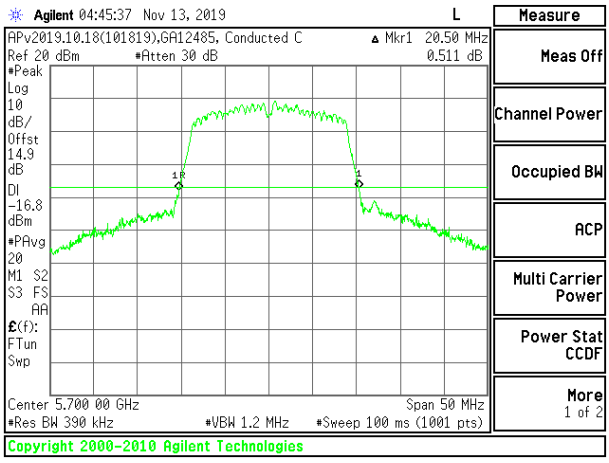
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



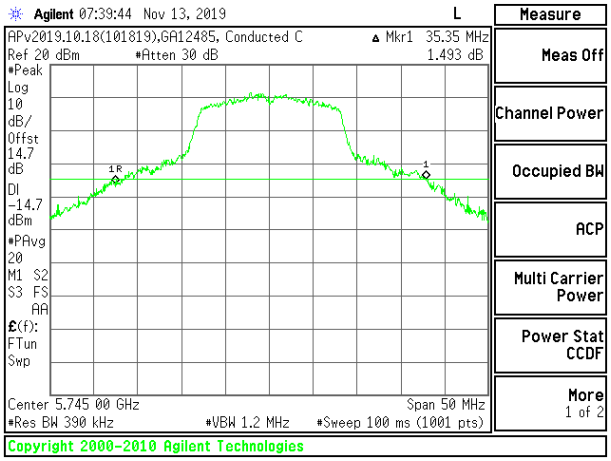
HIGH CHANNEL CHAIN 3

8.2.7. 802.11a MODE IN THE 5.8 GHz BAND

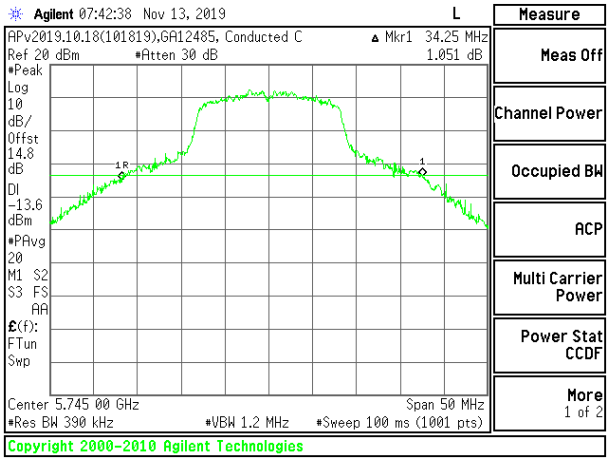
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5745	35.35	34.25	31.40	33.45
Mid	5785	42.90	42.05	36.70	38.55
High	5825	37.60	34.90	30.95	34.60

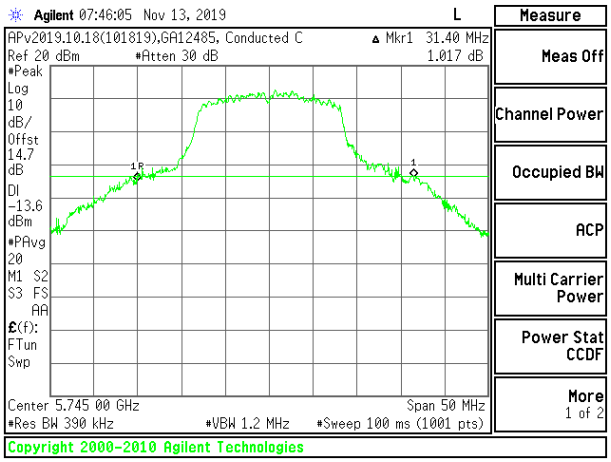
LOW CHANNEL



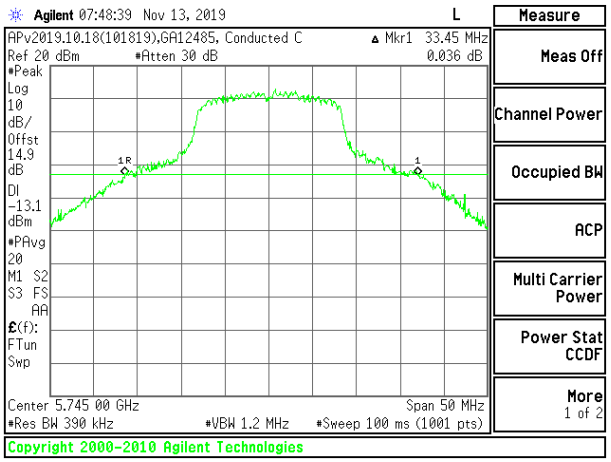
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

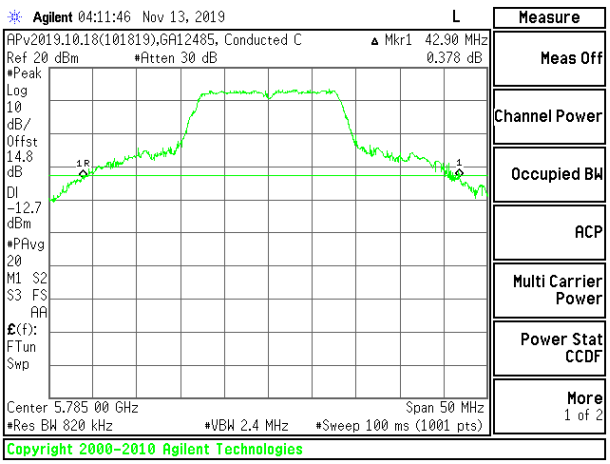


LOW CHANNEL CHAIN 2

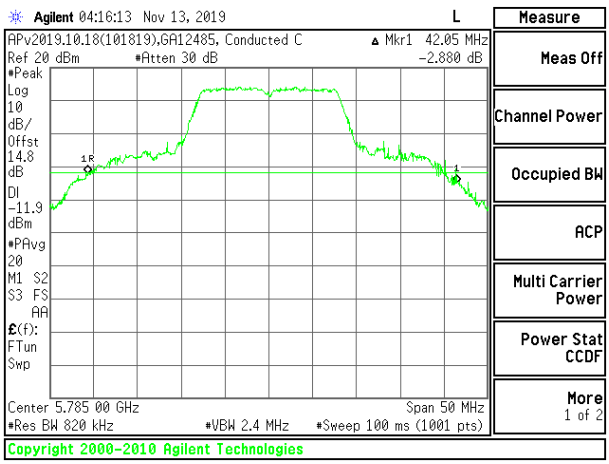


LOW CHANNEL CHAIN 3

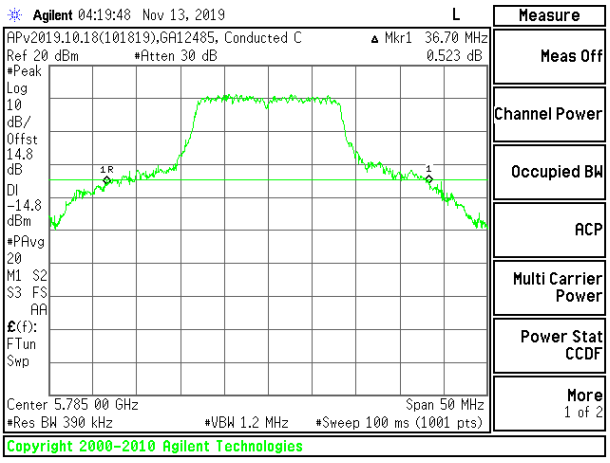
MID CHANNEL



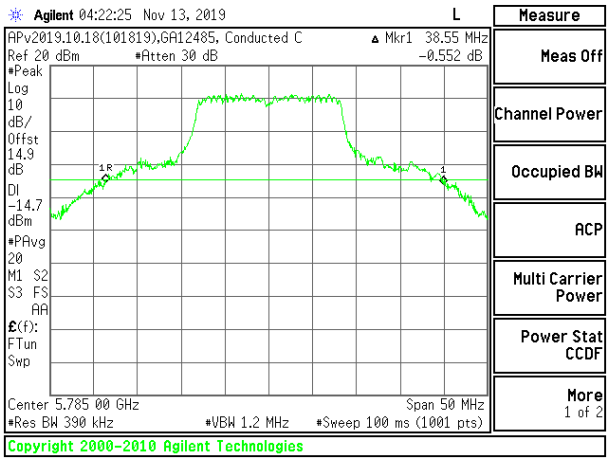
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

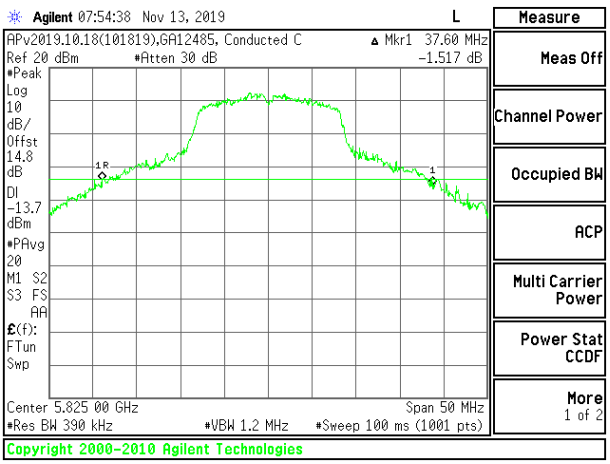


MID CHANNEL CHAIN 2

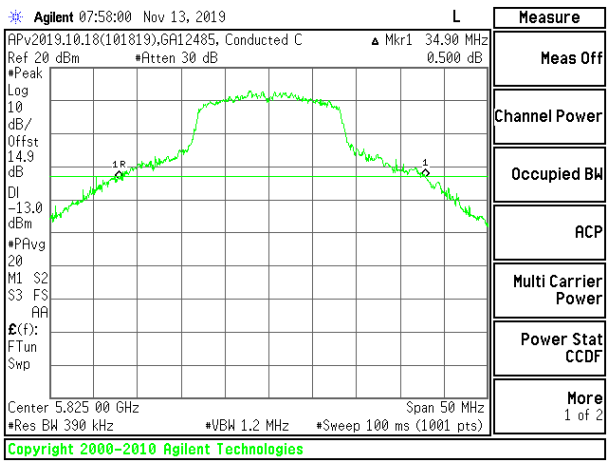


MID CHANNEL CHAIN 3

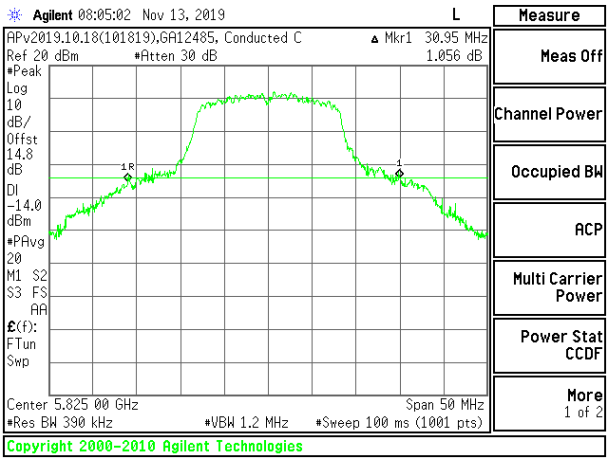
HIGH CHANNEL



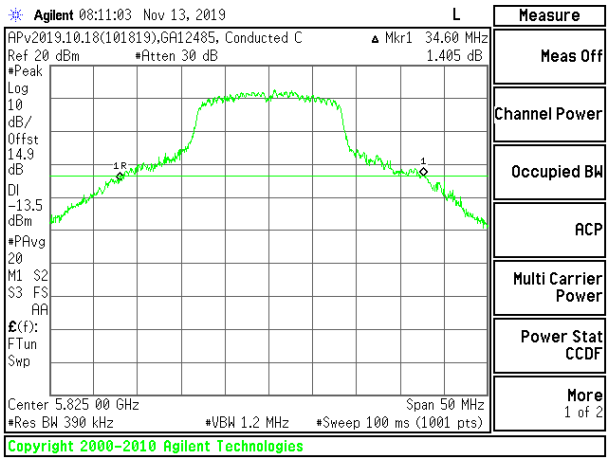
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



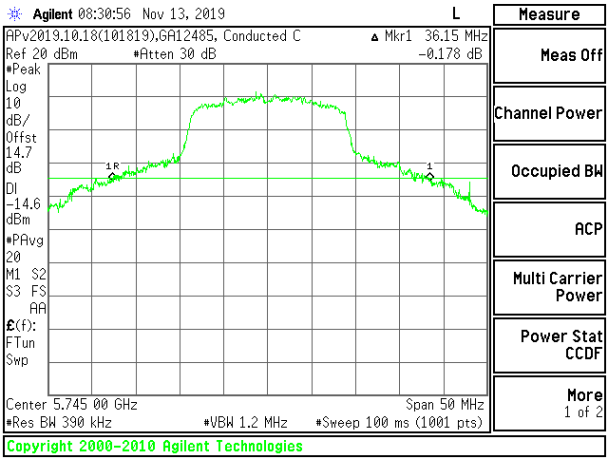
HIGH CHANNEL CHAIN 3

8.2.8. 802.11n HT20 MODE IN THE 5.8 GHz BAND

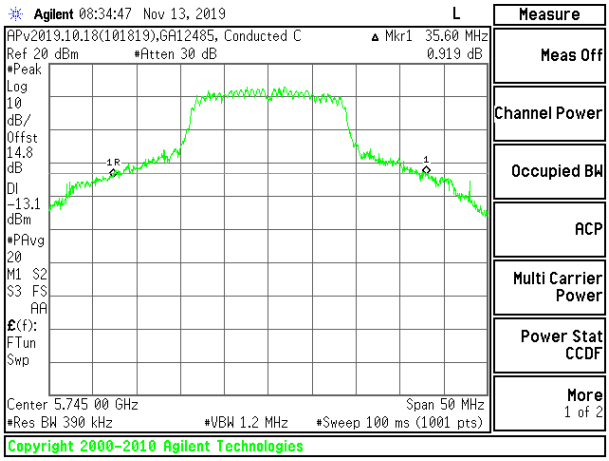
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)	26 dB Bandwidth Chain 3 (MHz)
Low	5745	36.15	35.60	32.35	35.15
Mid	5785	46.25	43.55	43.40	45.95
High	5825	43.95	37.45	29.95	33.80

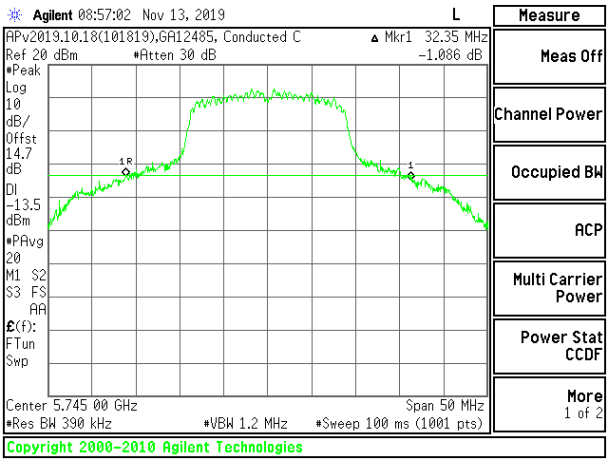
LOW CHANNEL



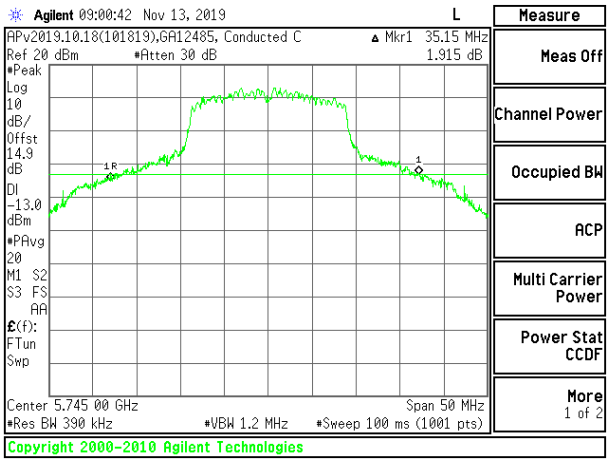
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

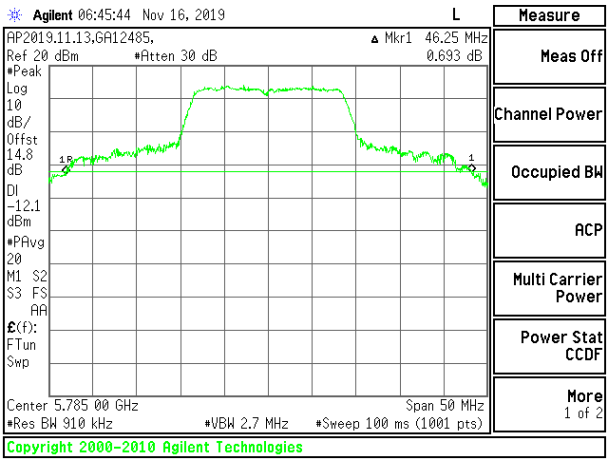


LOW CHANNEL CHAIN 2

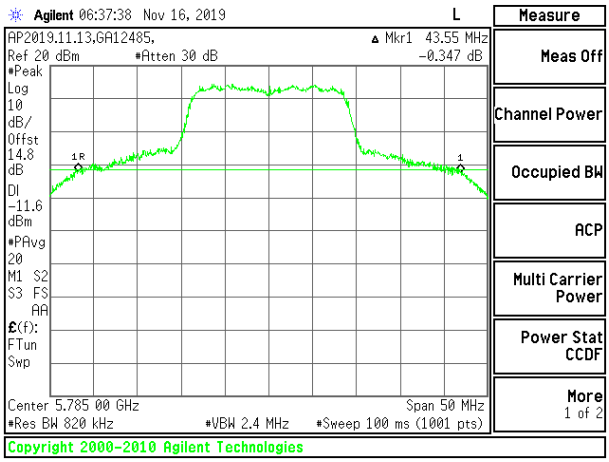


LOW CHANNEL CHAIN 3

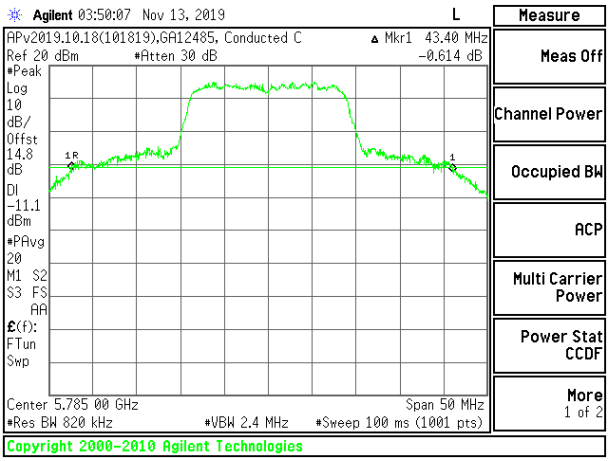
MID CHANNEL



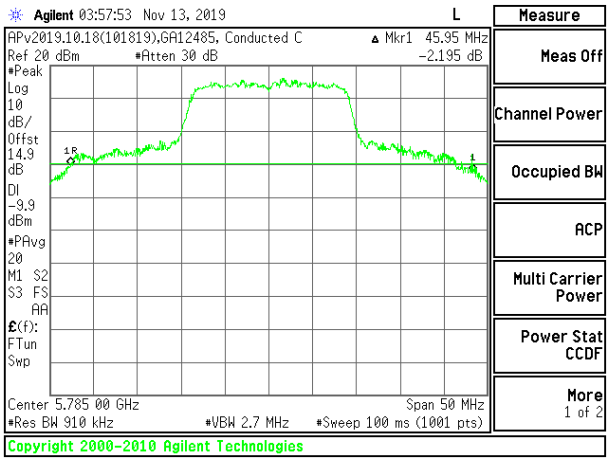
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

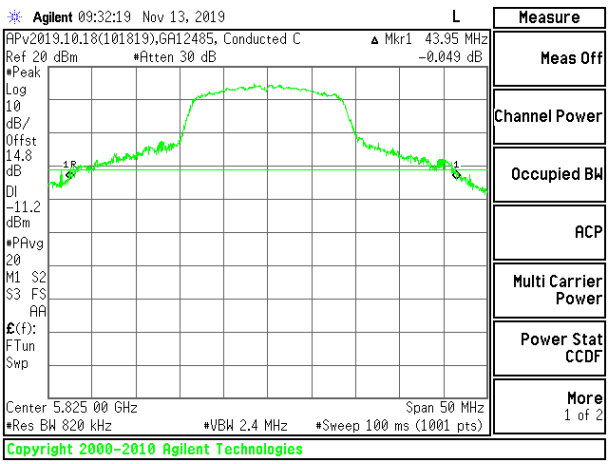


MID CHANNEL CHAIN 2

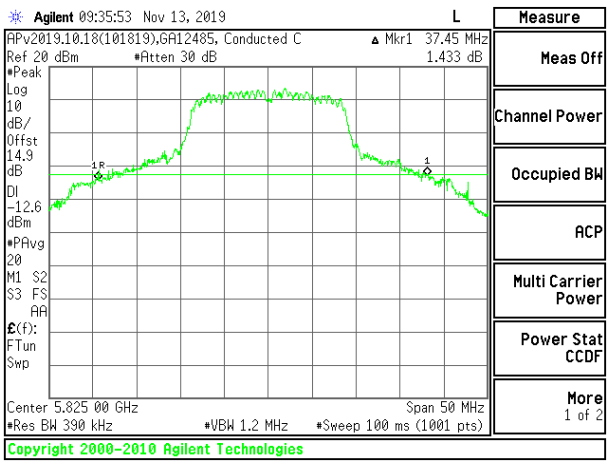


MID CHANNEL CHAIN 3

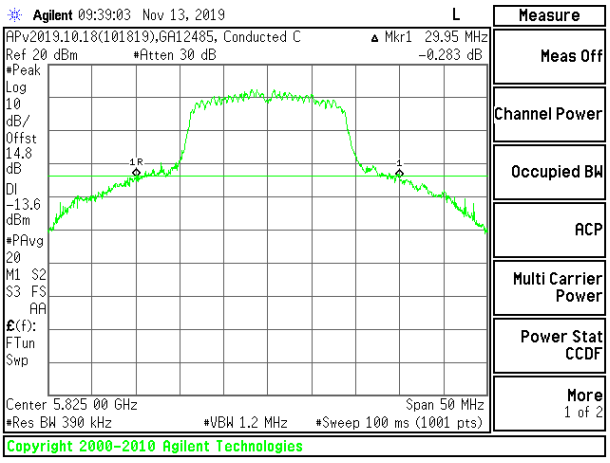
HIGH CHANNEL



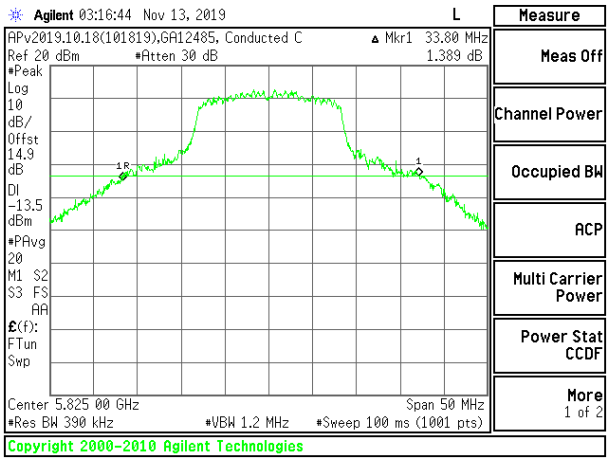
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



HIGH CHANNEL CHAIN 3

8.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

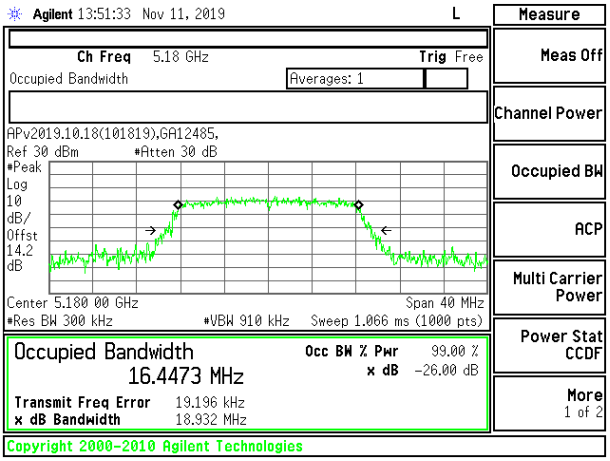
RESULTS

8.3.1. 802.11a MODE IN THE 5.2 GHz BAND

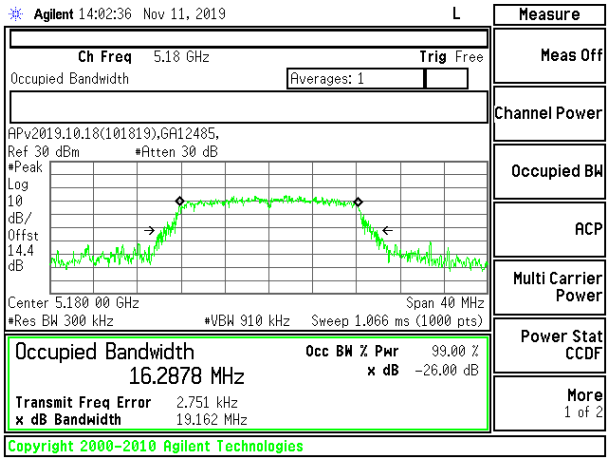
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5180	16.447	16.288	16.365	16.477
Mid	5200	16.624	16.549	16.582	16.691
High	5240	16.680	16.545	16.502	16.633

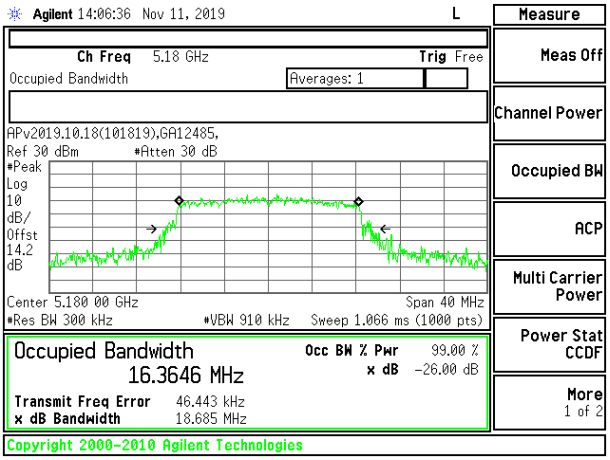
LOW CHANNEL



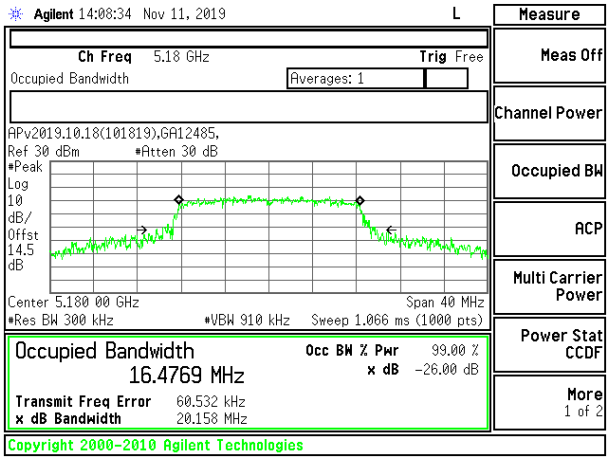
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

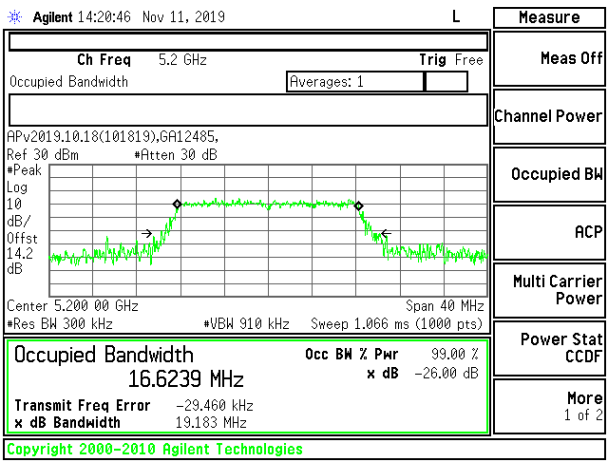


LOW CHANNEL CHAIN 2

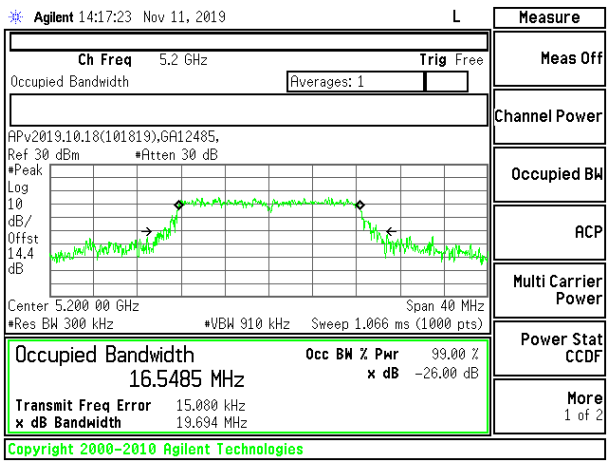


LOW CHANNEL CHAIN 3

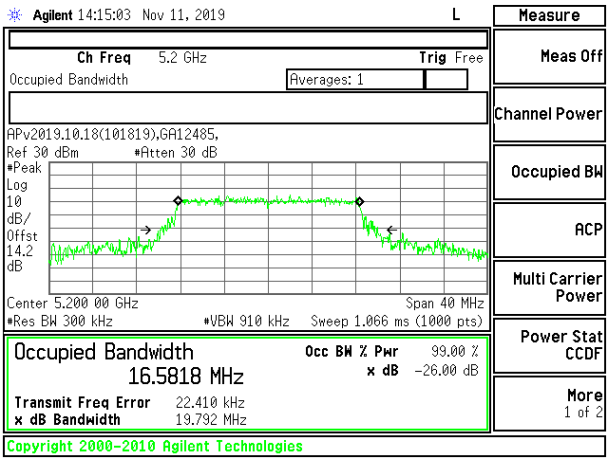
MID CHANNEL



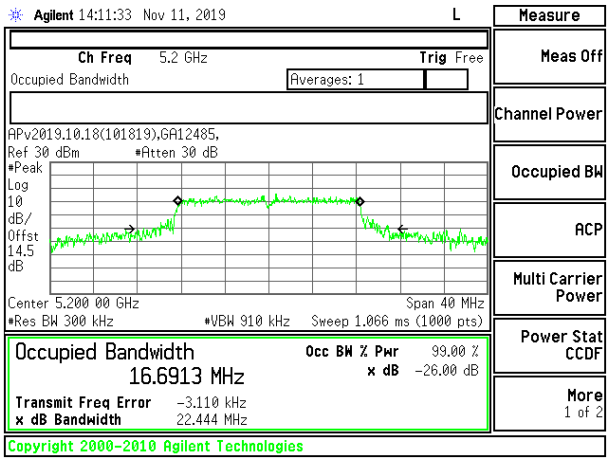
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

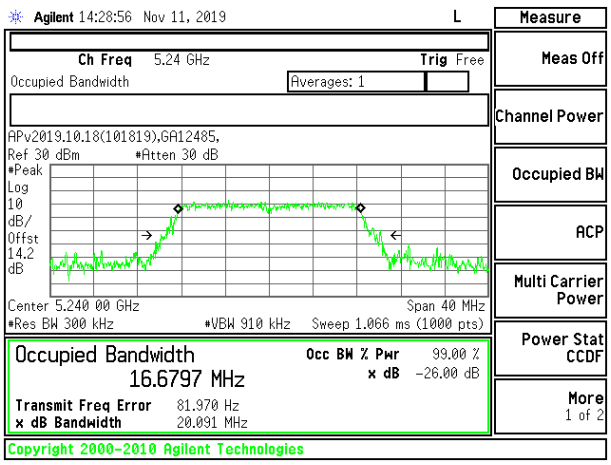


MID CHANNEL CHAIN 2

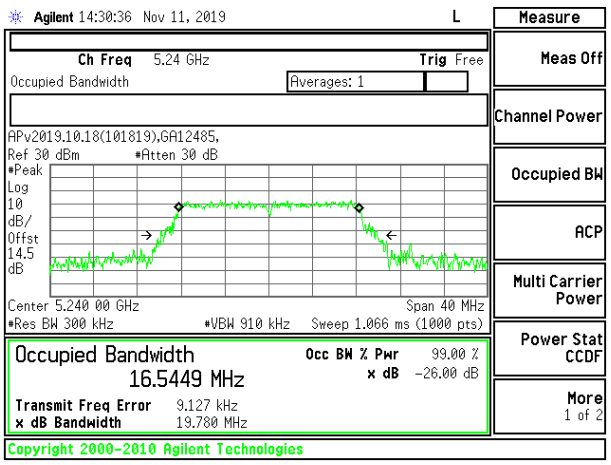


MID CHANNEL CHAIN 3

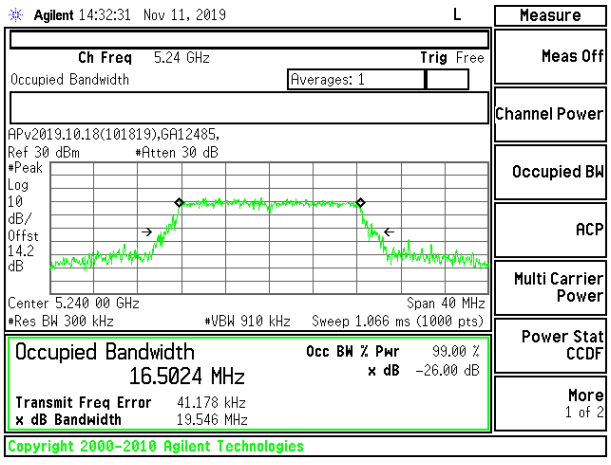
HIGH CHANNEL



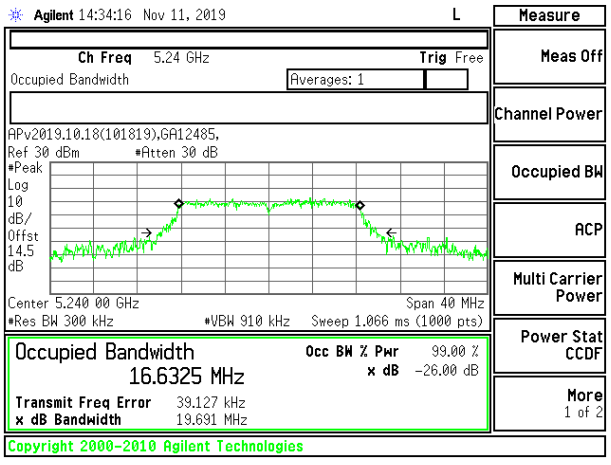
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



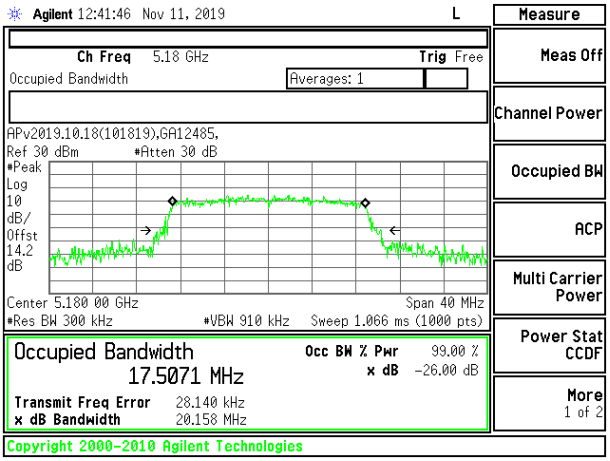
HIGH CHANNEL CHAIN 3

8.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

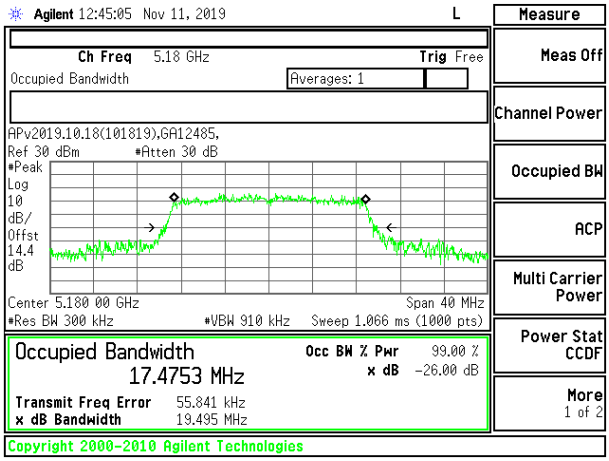
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5180	17.507	17.475	17.518	17.615
Mid	5200	17.794	17.759	17.728	17.982
High	5240	17.744	17.739	17.711	17.724

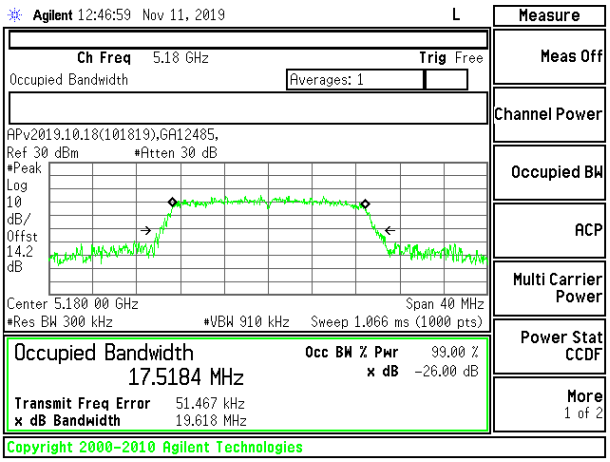
LOW CHANNEL



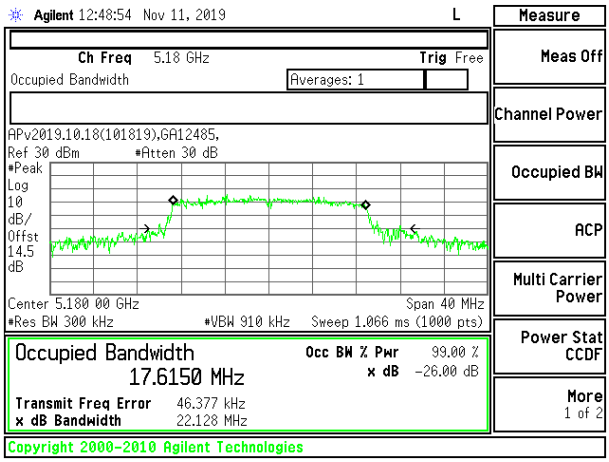
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

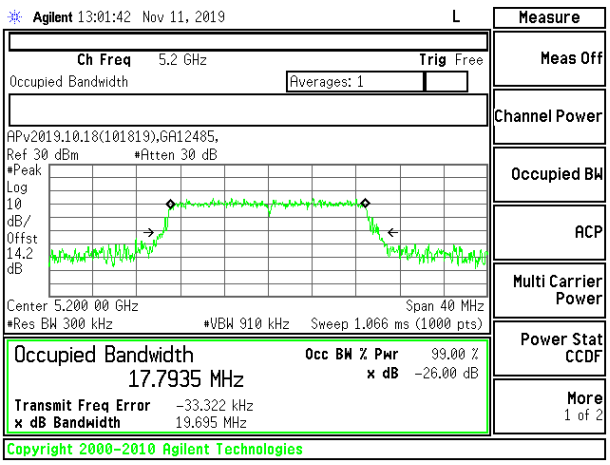


LOW CHANNEL CHAIN 2

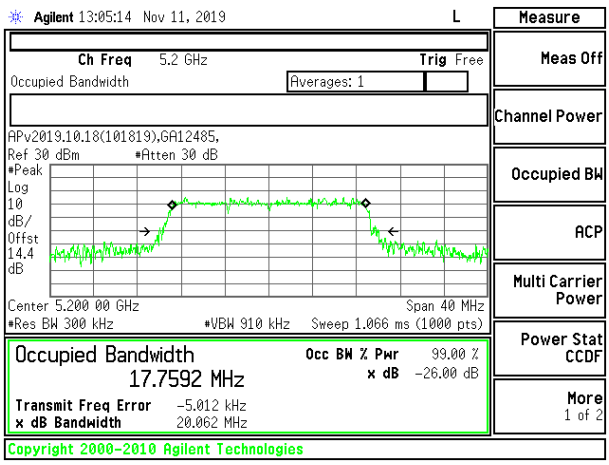


LOW CHANNEL CHAIN 3

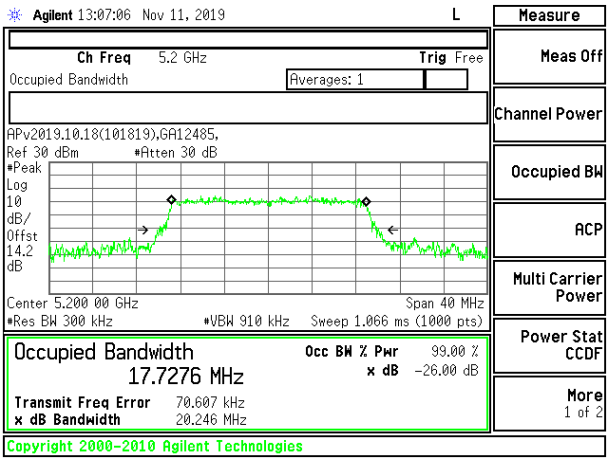
MID CHANNEL



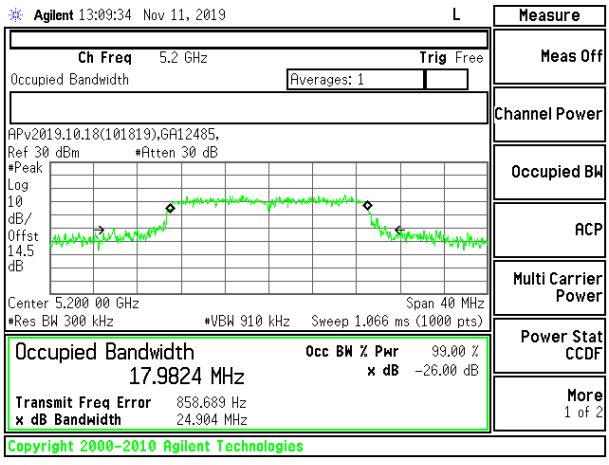
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

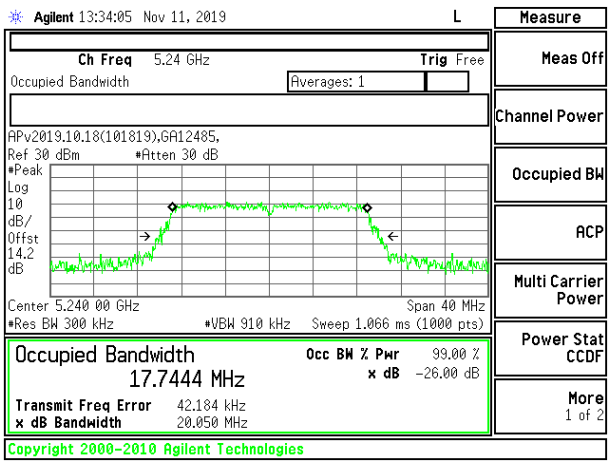


MID CHANNEL CHAIN 2

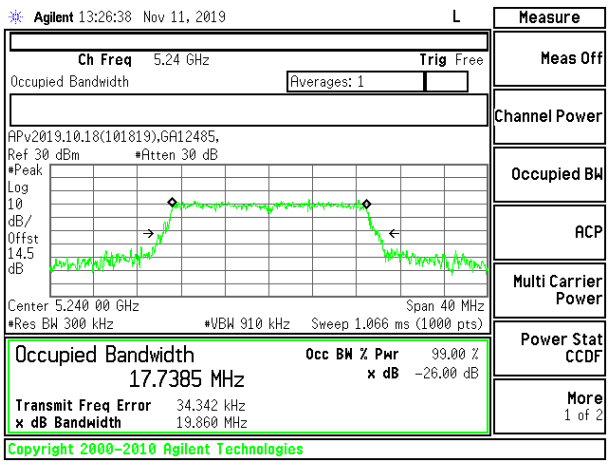


MID CHANNEL CHAIN 3

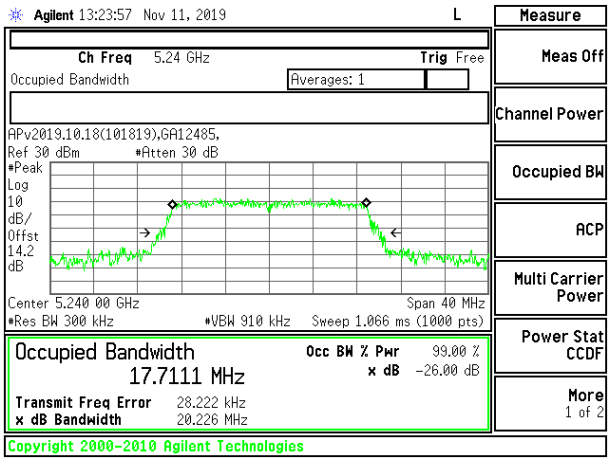
HIGH CHANNEL



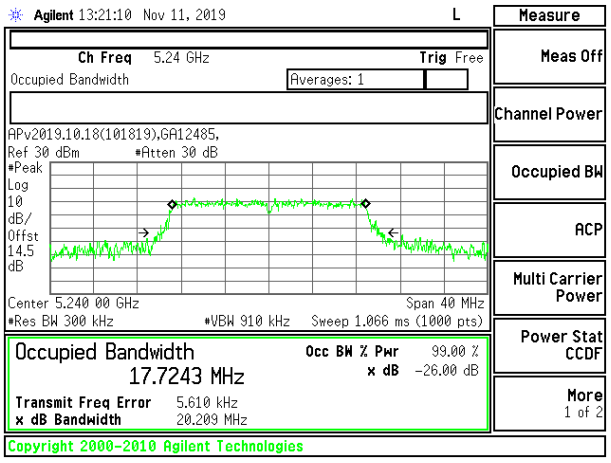
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



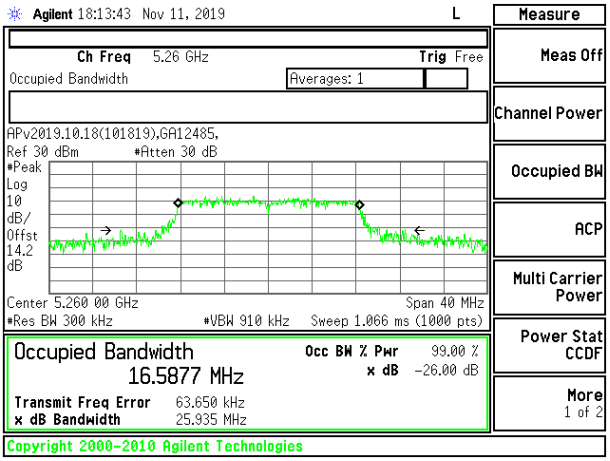
HIGH CHANNEL CHAIN 3

8.3.3. 802.11a MODE IN THE 5.3 GHz BAND

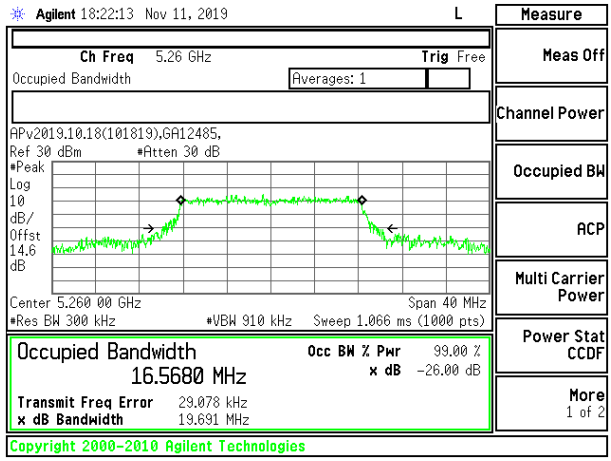
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5260	16.588	16.568	16.616	16.604
Mid	5300	16.650	16.737	16.558	16.643
High	5320	16.421	16.246	16.397	16.524

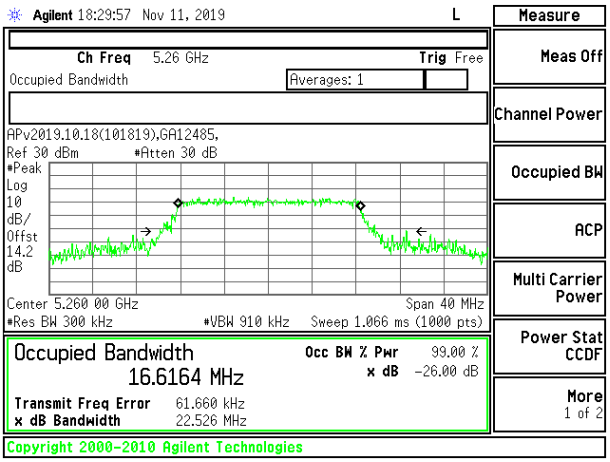
LOW CHANNEL



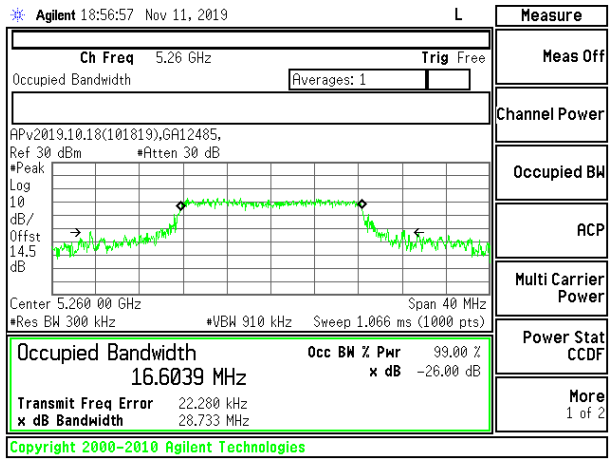
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

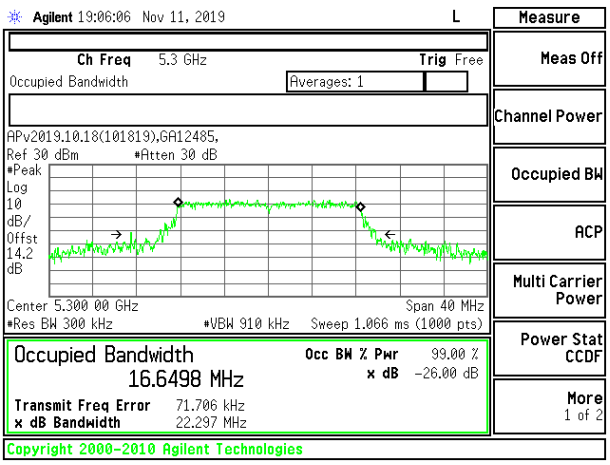


LOW CHANNEL CHAIN 2

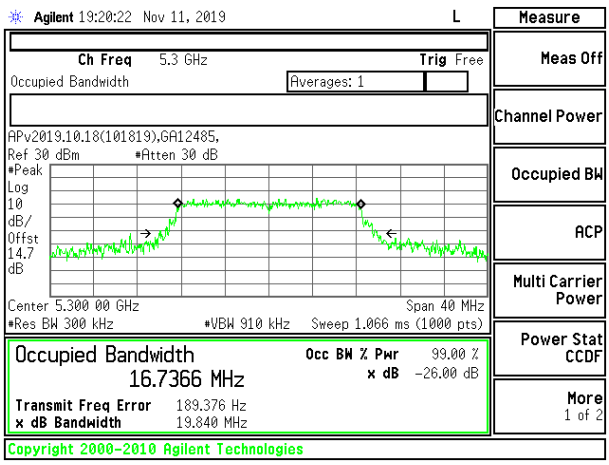


LOW CHANNEL CHAIN 3

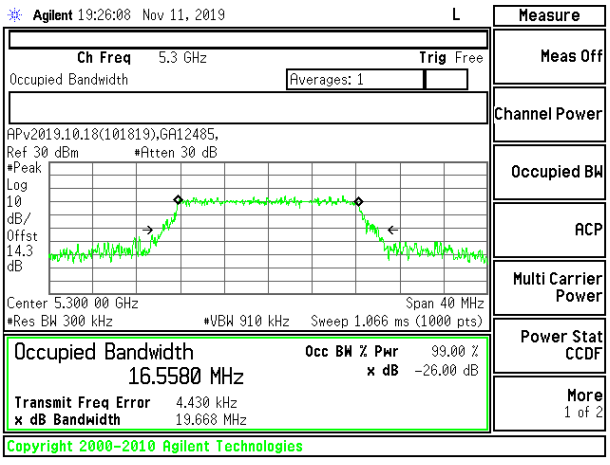
MID CHANNEL



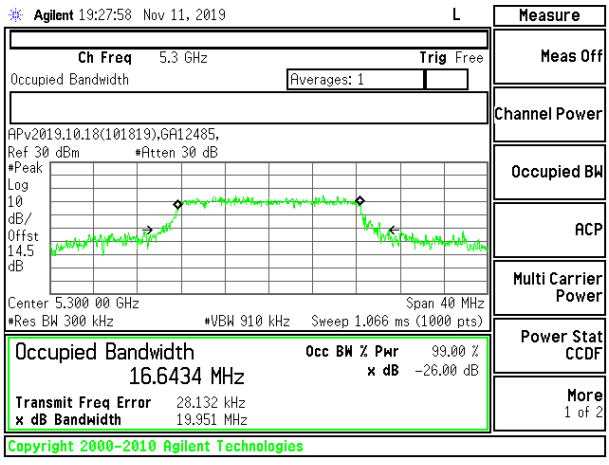
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

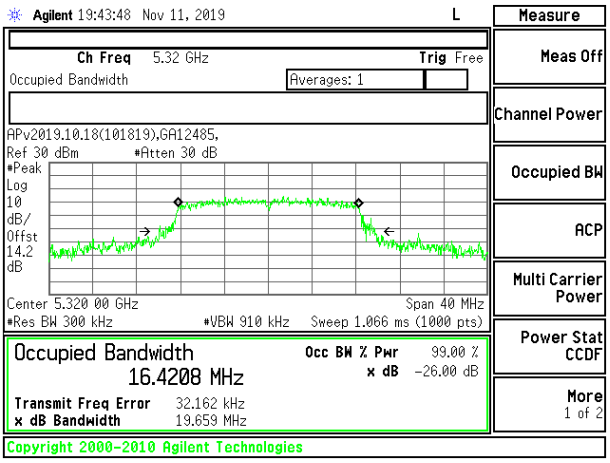


MID CHANNEL CHAIN 2

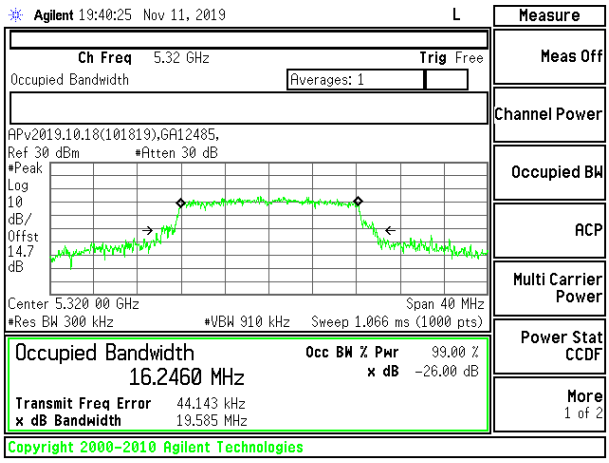


MID CHANNEL CHAIN 3

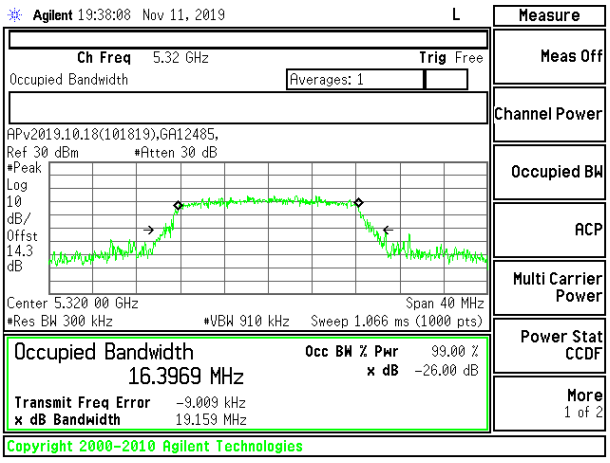
HIGH CHANNEL



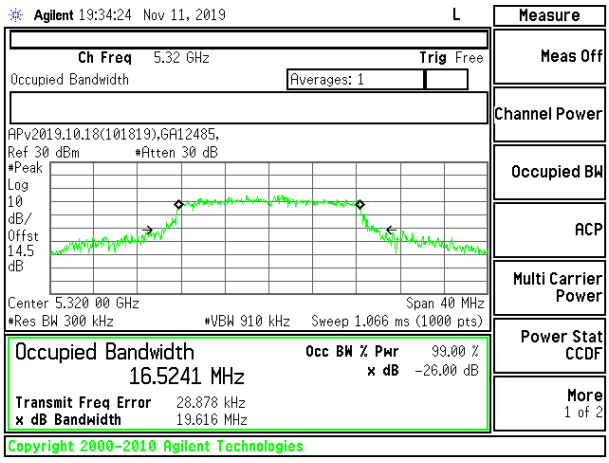
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



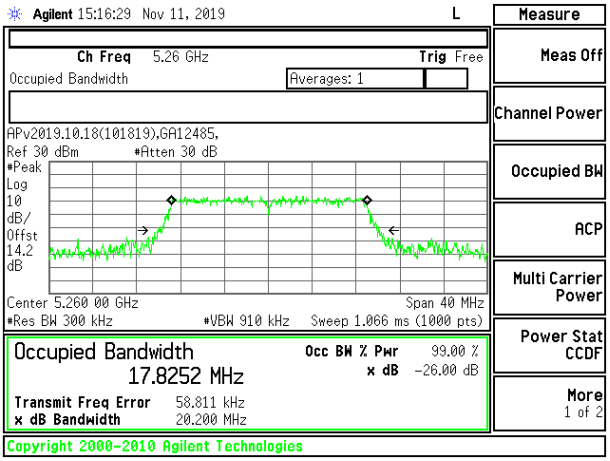
HIGH CHANNEL CHAIN 3

8.3.4. 802.11n HT20 MODE IN THE 5.3 GHz BAND

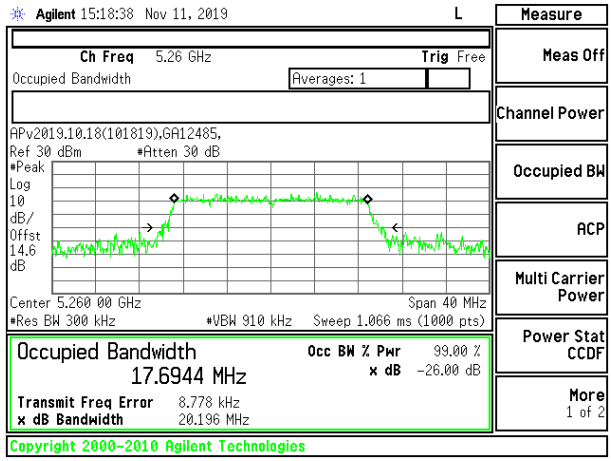
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5260	17.825	17.694	17.686	17.737
Mid	5300	17.769	17.812	17.768	17.817
High	5320	17.677	17.514	17.516	17.489

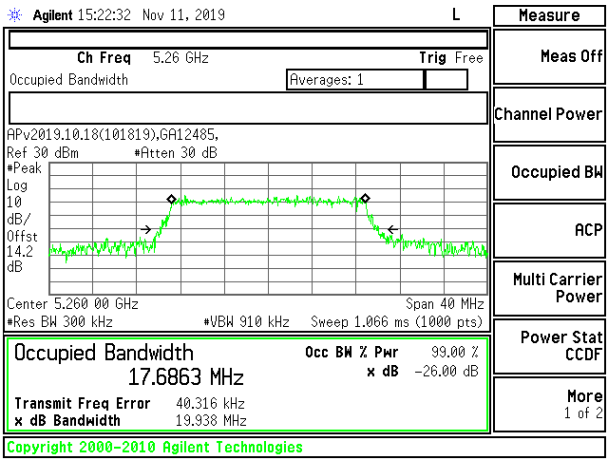
LOW CHANNEL



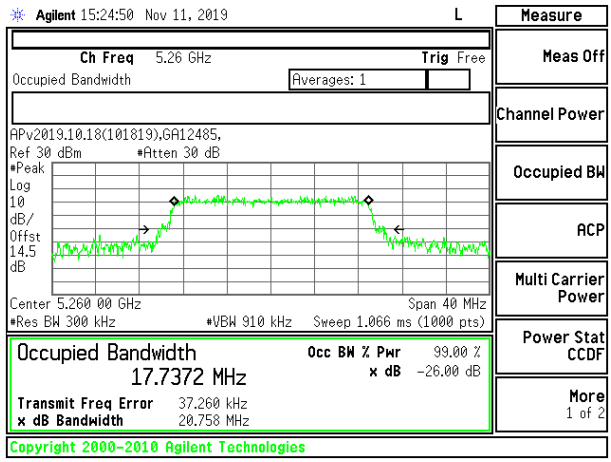
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

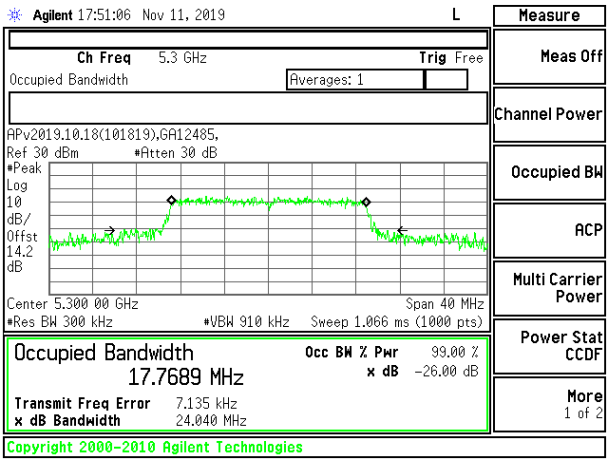


LOW CHANNEL CHAIN 2

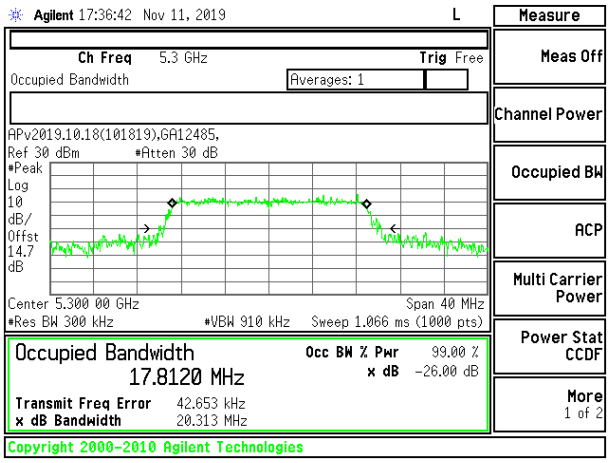


LOW CHANNEL CHAIN 3

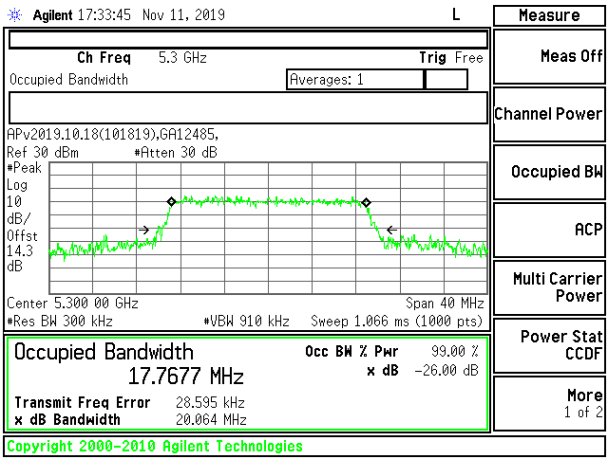
MID CHANNEL



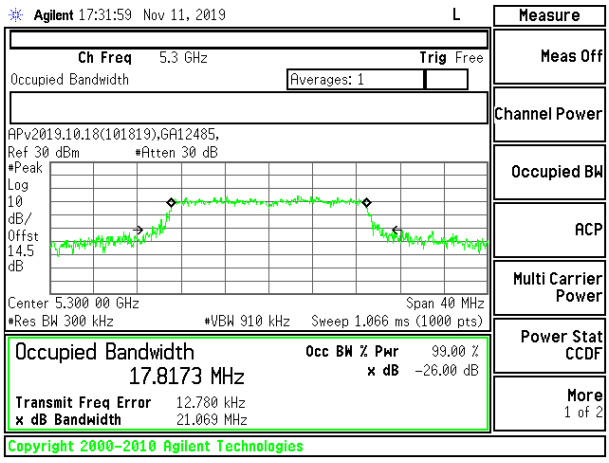
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

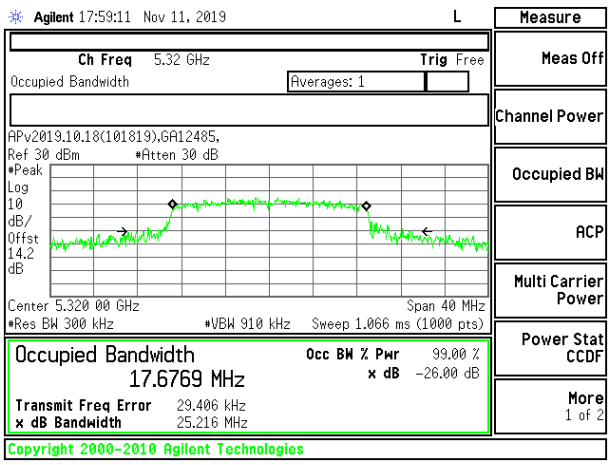


MID CHANNEL CHAIN 2

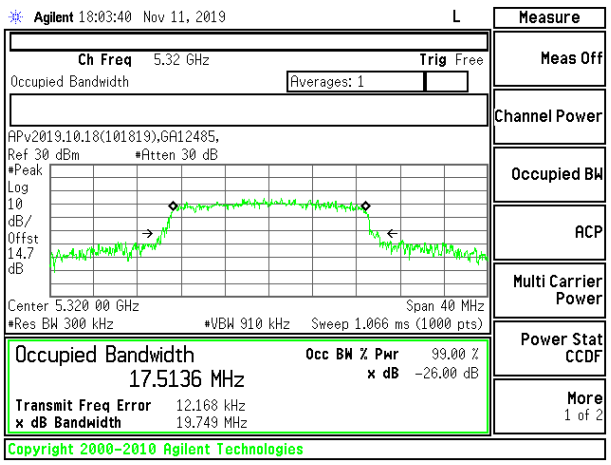


MID CHANNEL CHAIN 3

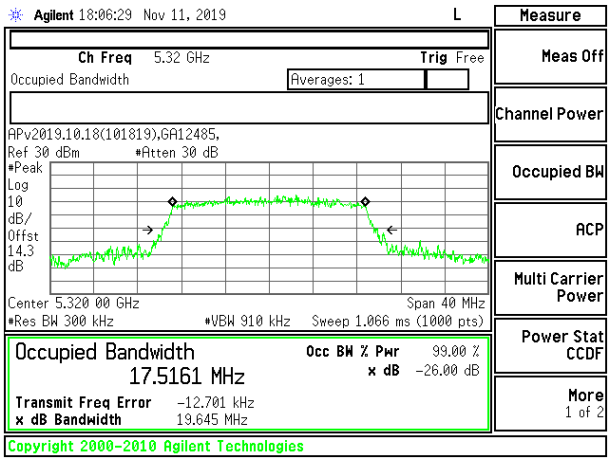
HIGH CHANNEL



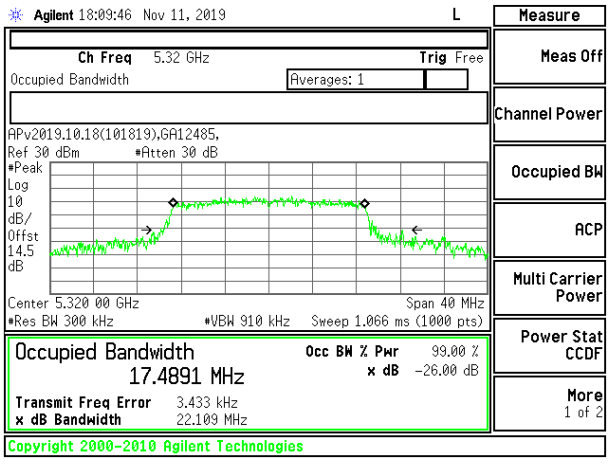
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



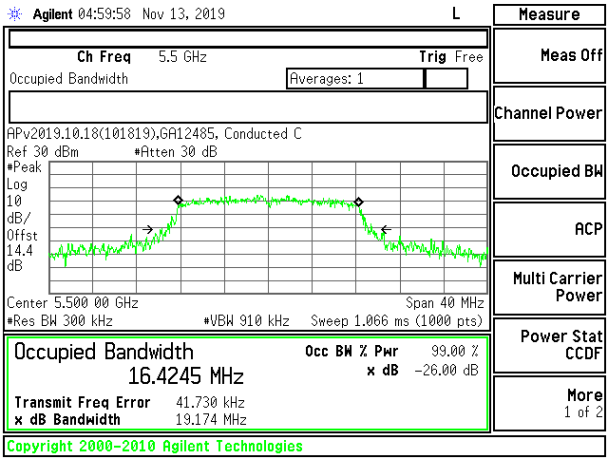
HIGH CHANNEL CHAIN 3

8.3.5. 802.11a MODE IN THE 5.6 GHz BAND

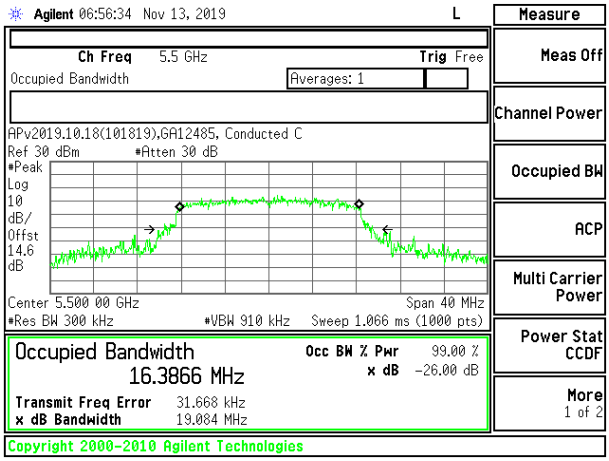
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5500	16.425	16.387	16.371	16.402
Mid	5580	16.589	16.627	16.523	16.648
High	5700	16.383	16.394	16.417	16.334

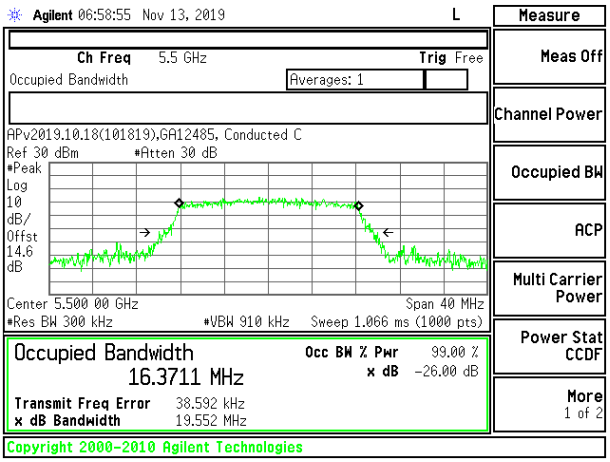
LOW CHANNEL



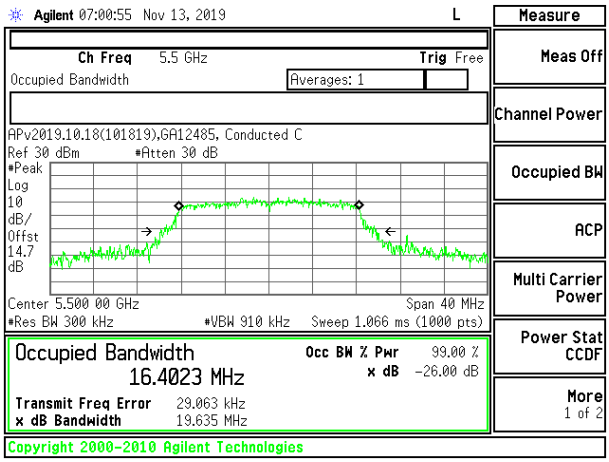
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

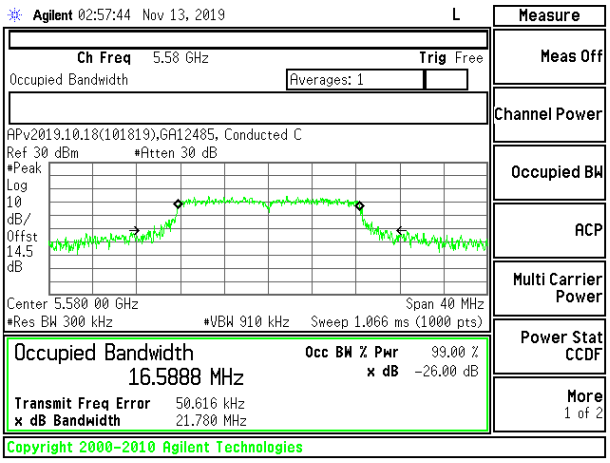


LOW CHANNEL CHAIN 2

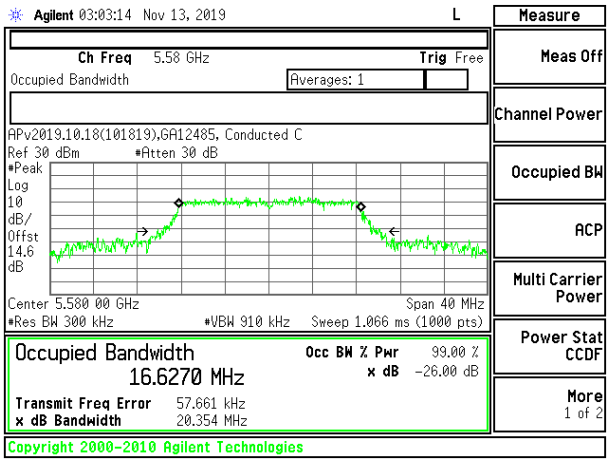


LOW CHANNEL CHAIN 3

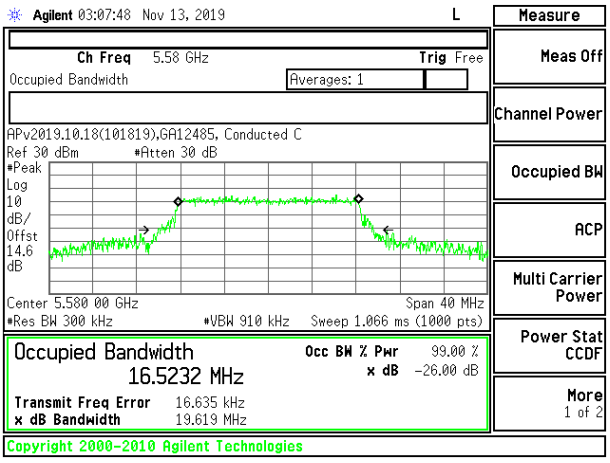
MID CHANNEL



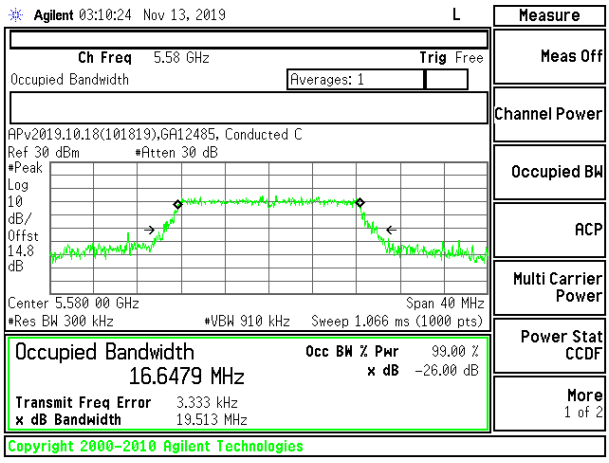
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

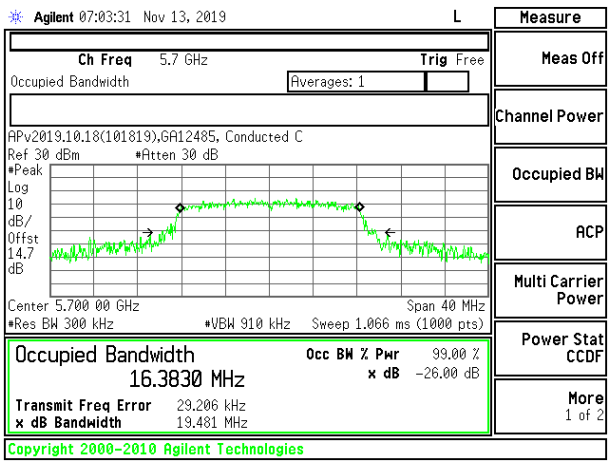


MID CHANNEL CHAIN 2

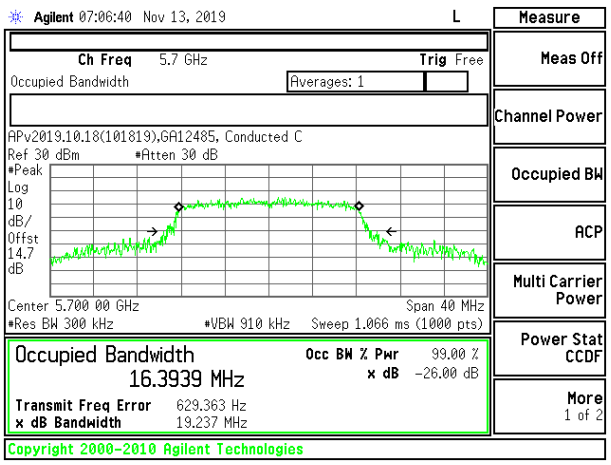


MID CHANNEL CHAIN 3

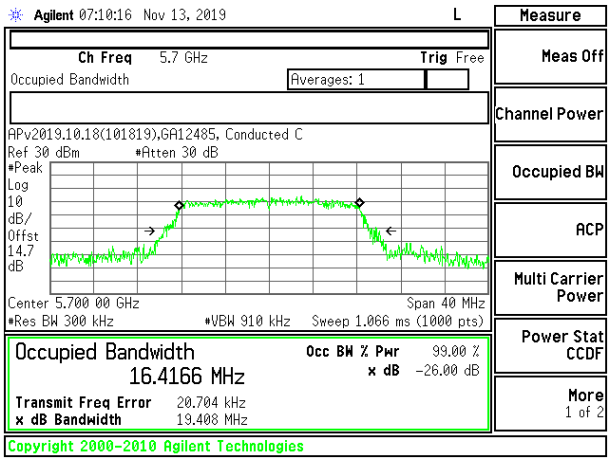
HIGH CHANNEL



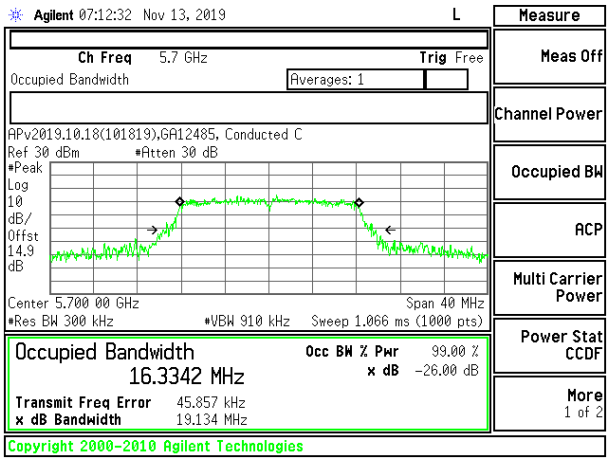
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



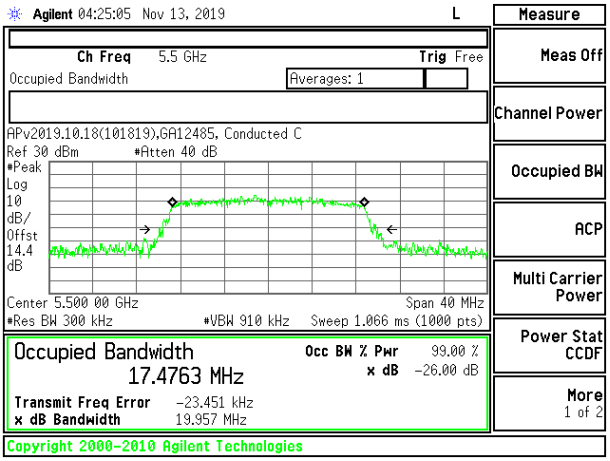
HIGH CHANNEL CHAIN 3

8.3.6. 802.11n HT20 MODE IN THE 5.6 GHz BAND

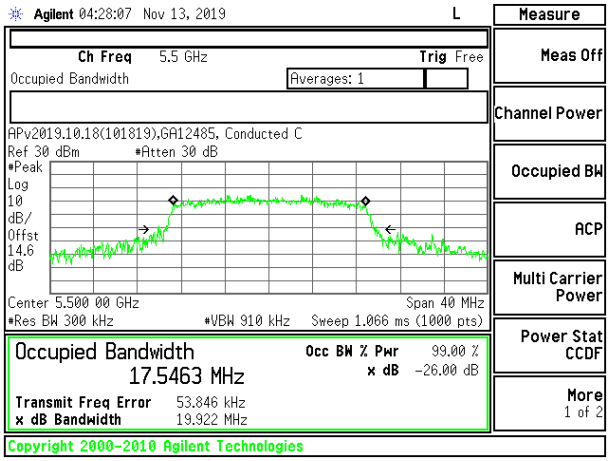
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5500	17.476	17.546	17.519	17.584
Mid	5580	17.762	17.829	17.741	17.797
High	5700	17.646	17.513	17.558	17.538

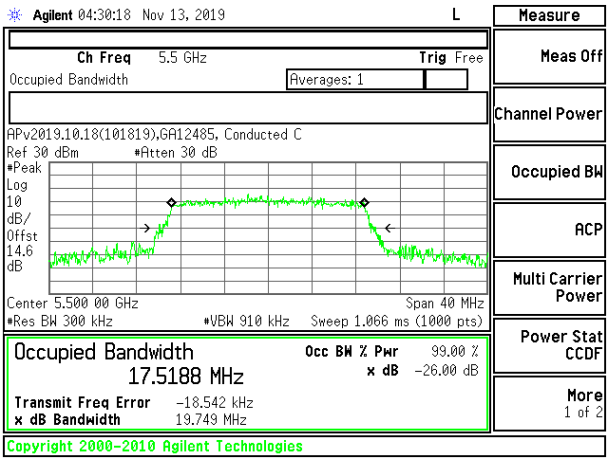
LOW CHANNEL



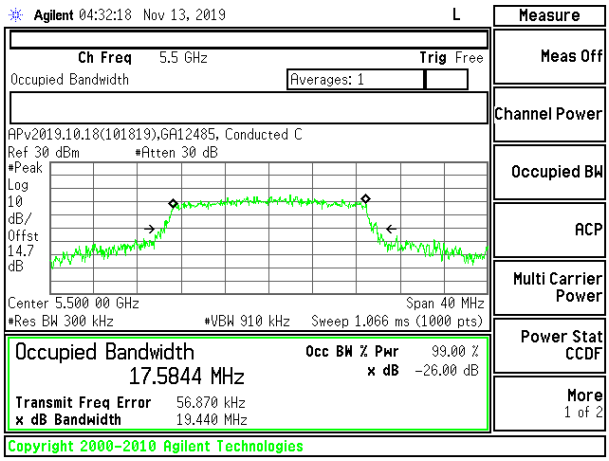
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

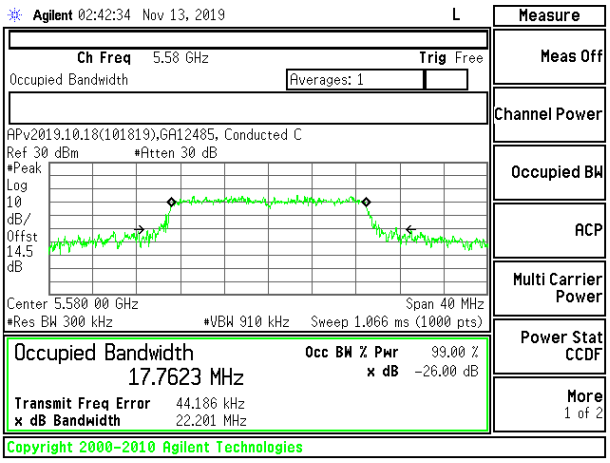


LOW CHANNEL CHAIN 2

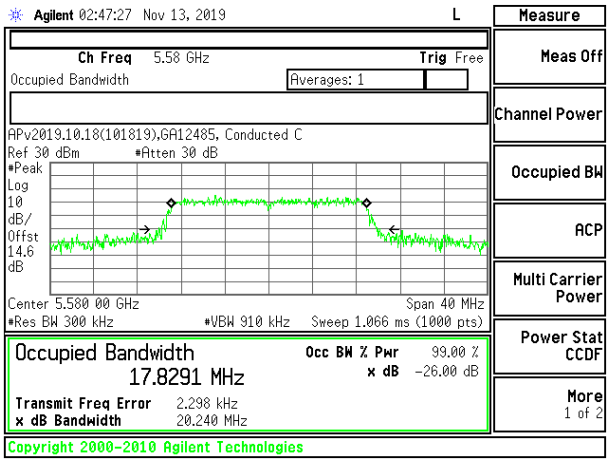


LOW CHANNEL CHAIN 3

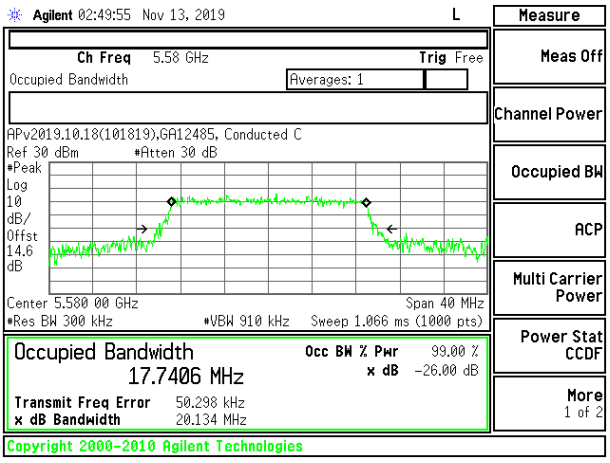
MID CHANNEL



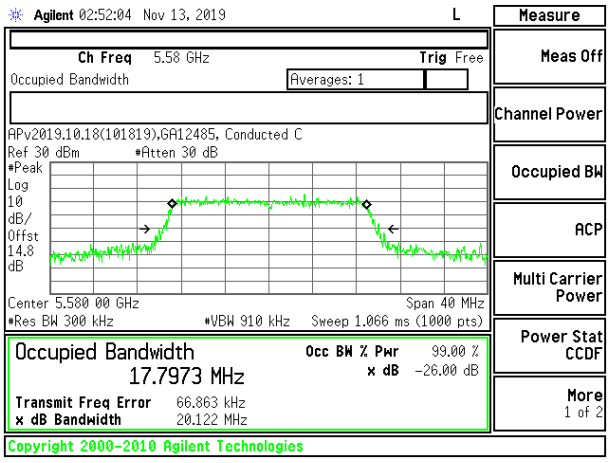
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

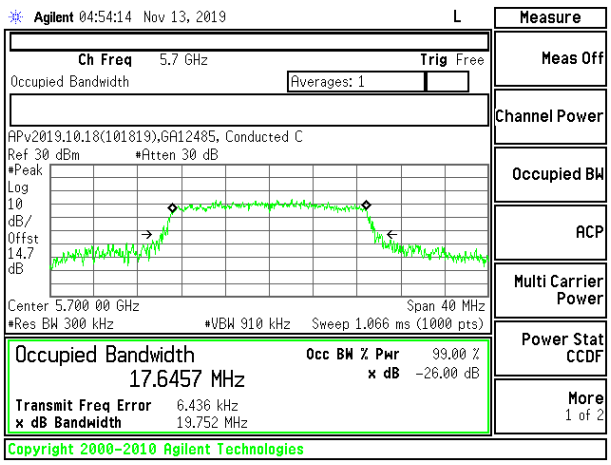


MID CHANNEL CHAIN 2

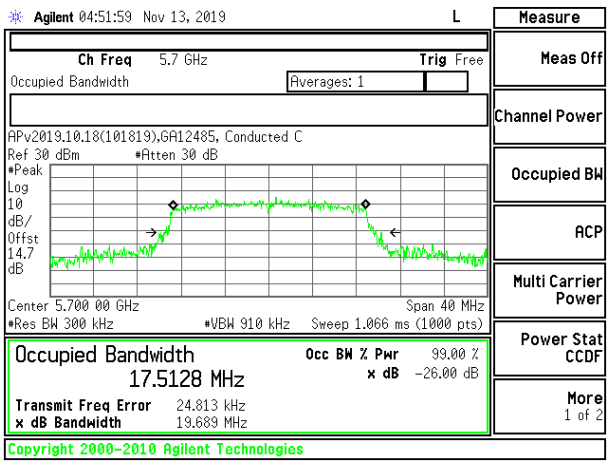


MID CHANNEL CHAIN 3

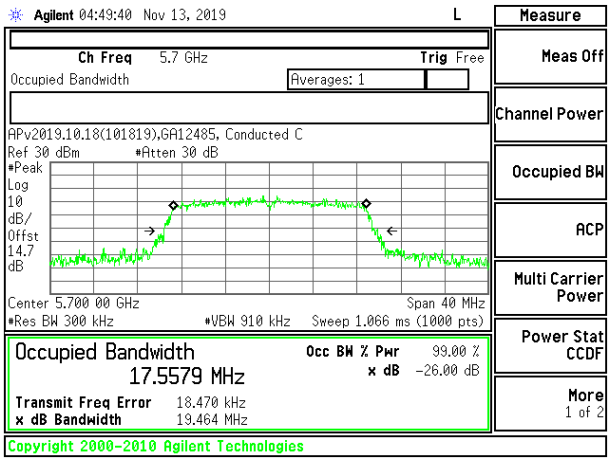
HIGH CHANNEL



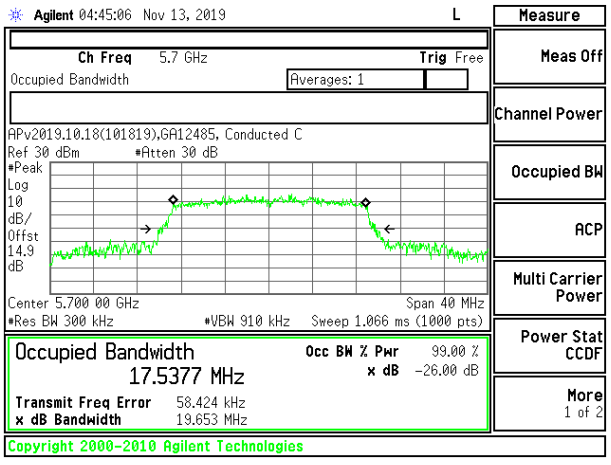
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



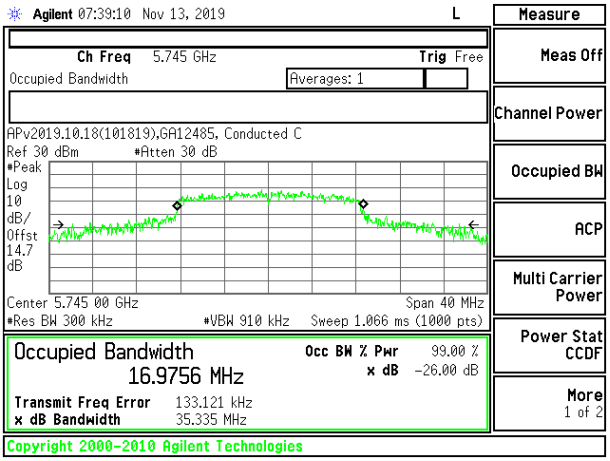
HIGH CHANNEL CHAIN 3

8.3.7. 802.11a MODE IN THE 5.8 GHz BAND

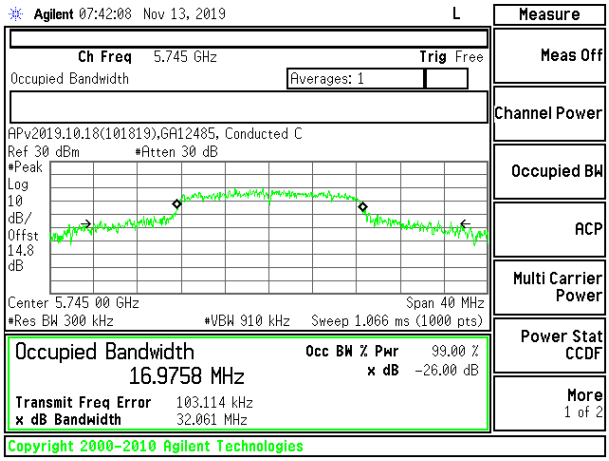
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5745	16.976	16.976	16.684	17.313
Mid	5785	18.425	17.675	16.975	17.315
High	5825	18.018	17.764	16.583	17.654

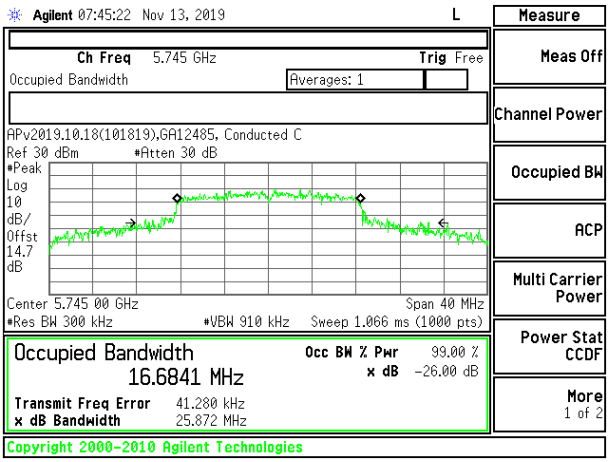
LOW CHANNEL



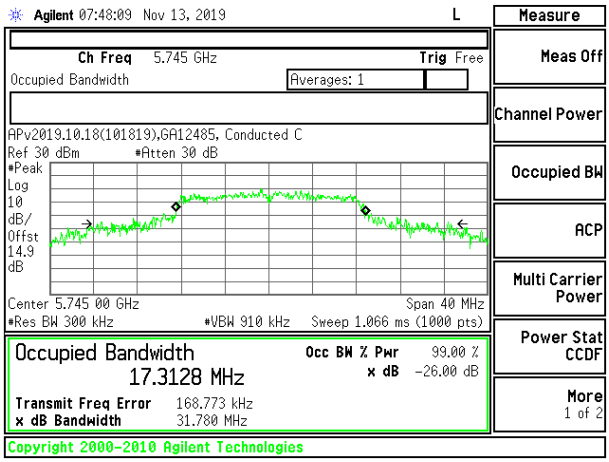
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

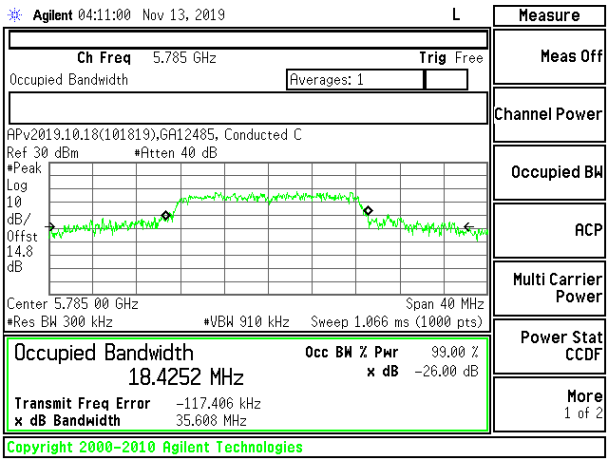


LOW CHANNEL CHAIN 2

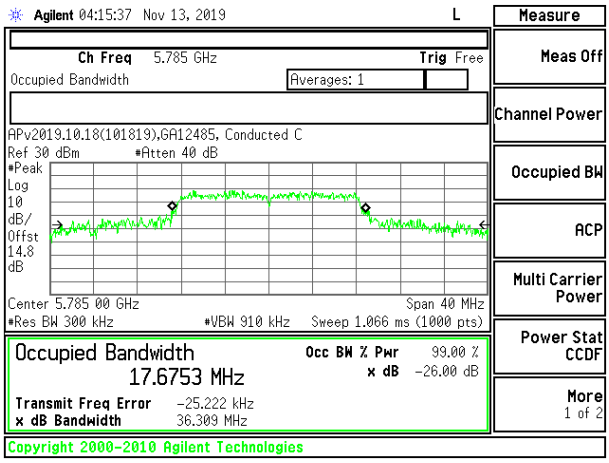


LOW CHANNEL CHAIN 3

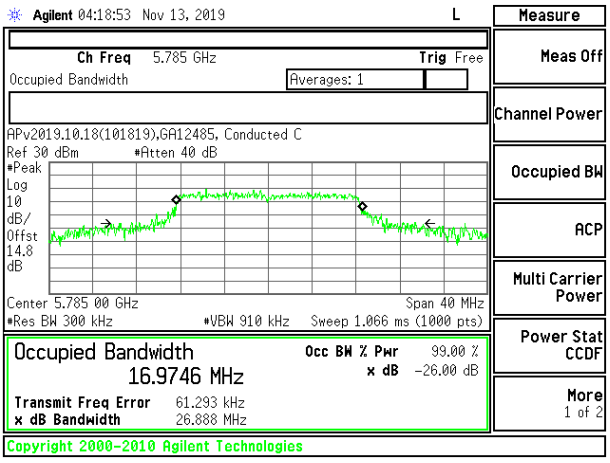
MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1



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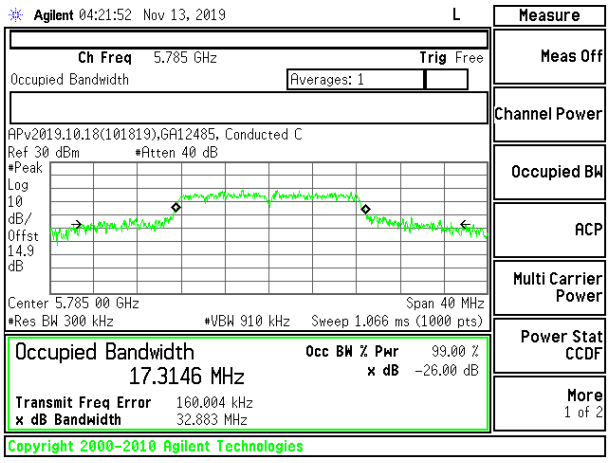
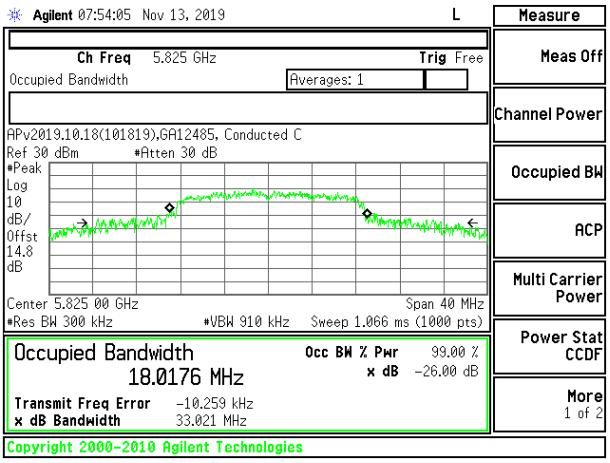
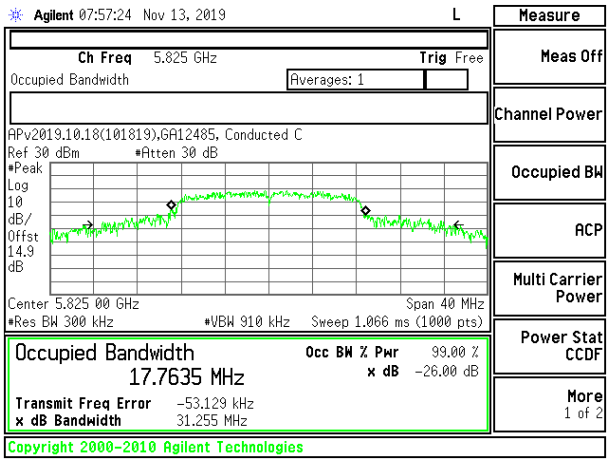


MID CHANNEL CHAIN 3

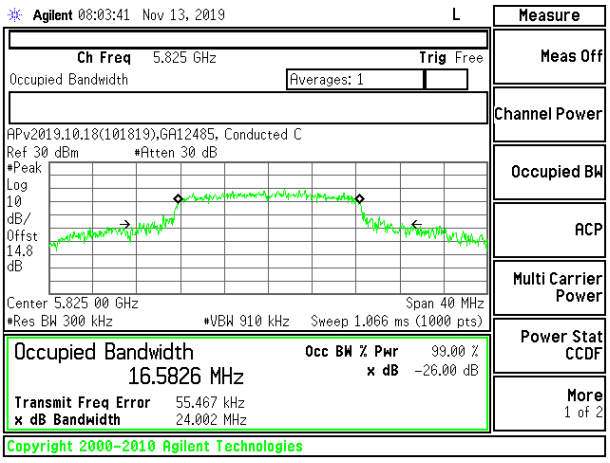
HIGH CHANNEL



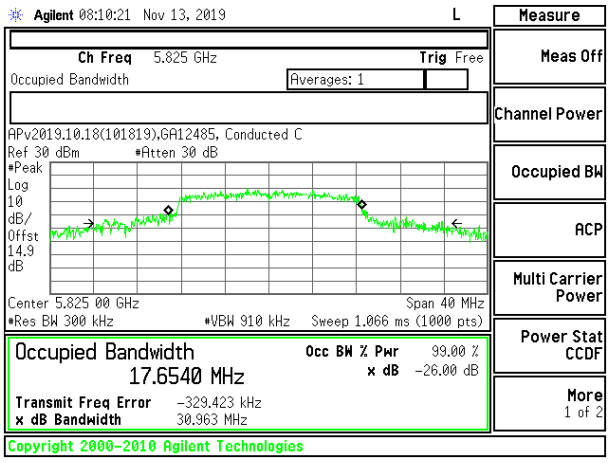
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



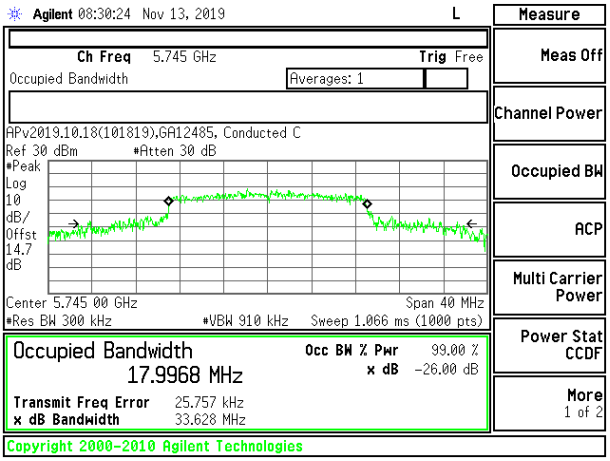
HIGH CHANNEL CHAIN 3

8.3.8. 802.11n HT20 MODE IN THE 5.8 GHz BAND

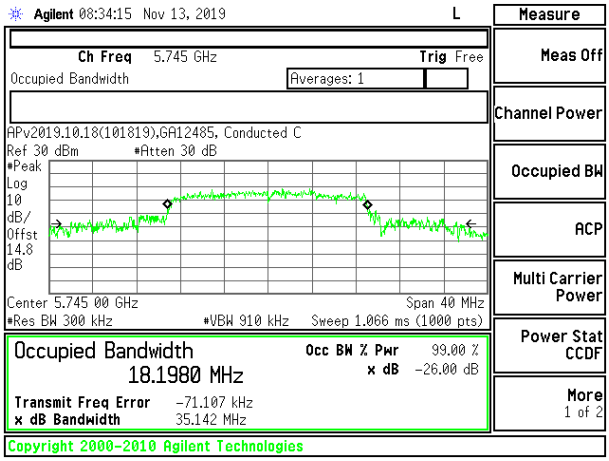
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)	99% Bandwidth Chain 2 (MHz)	99% Bandwidth Chain 3 (MHz)
Low	5745	17.997	18.198	17.723	17.871
Mid	5785	19.113	18.248	17.945	18.284
High	5825	18.340	17.952	17.698	17.324

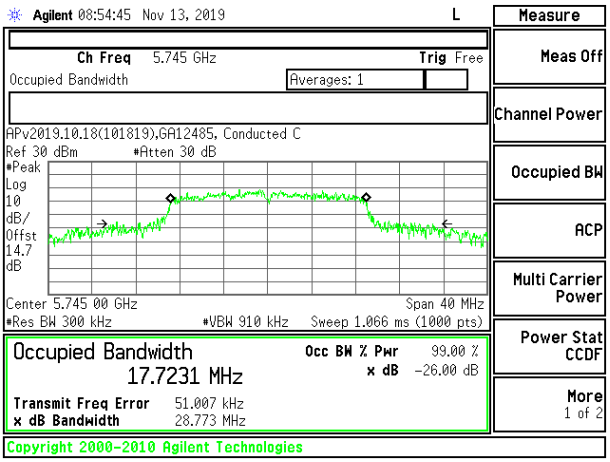
LOW CHANNEL



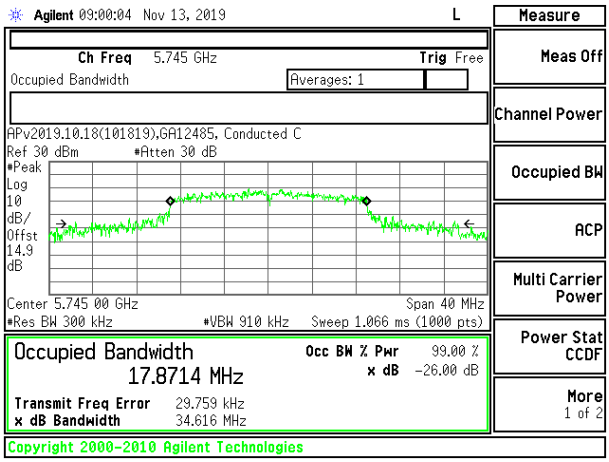
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

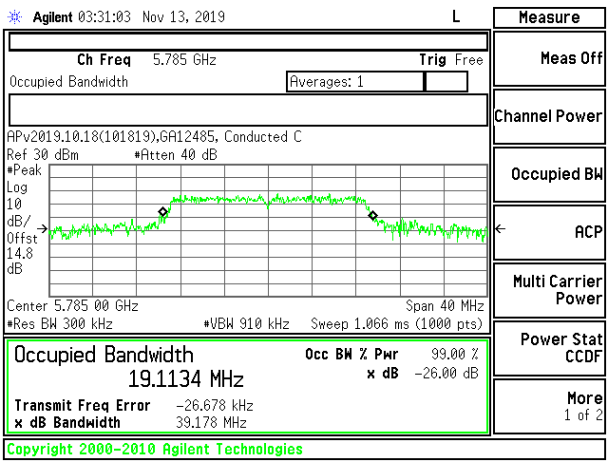


LOW CHANNEL CHAIN 2

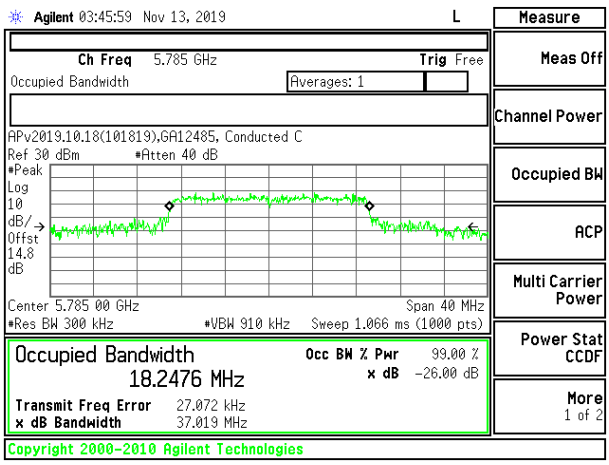


LOW CHANNEL CHAIN 3

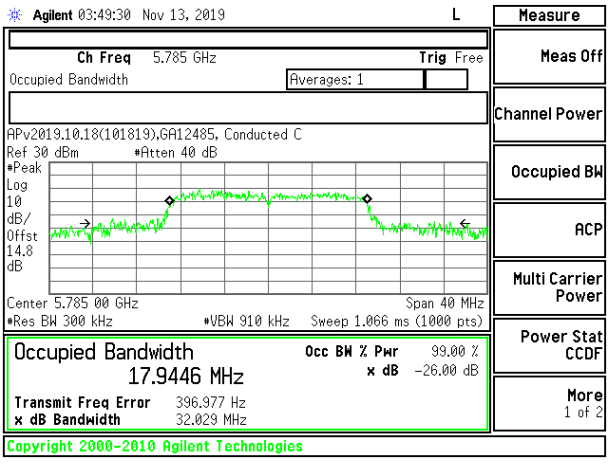
MID CHANNEL



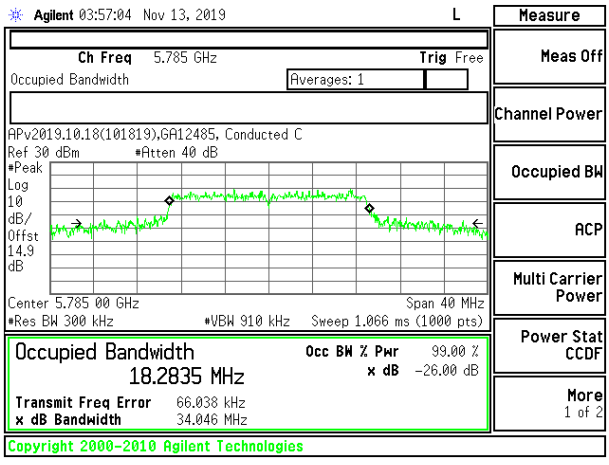
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

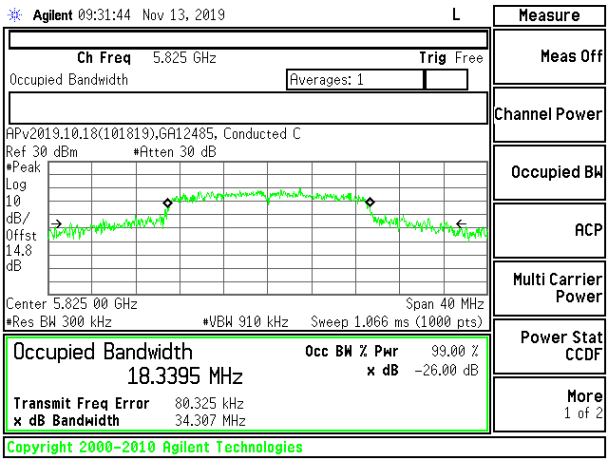


MID CHANNEL CHAIN 2

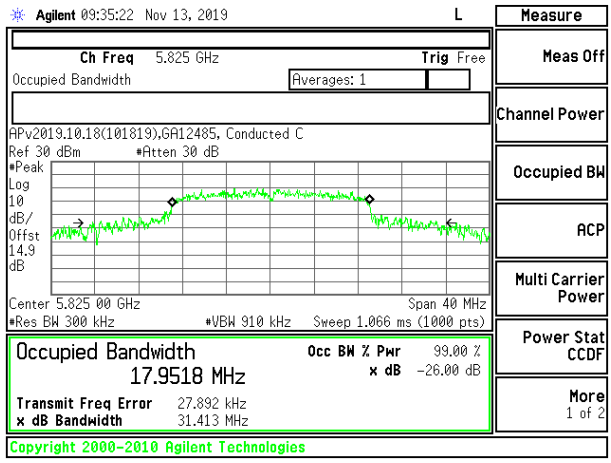


MID CHANNEL CHAIN 3

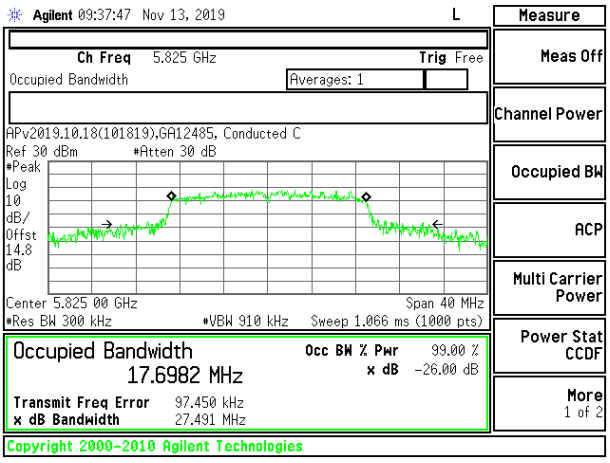
HIGH CHANNEL



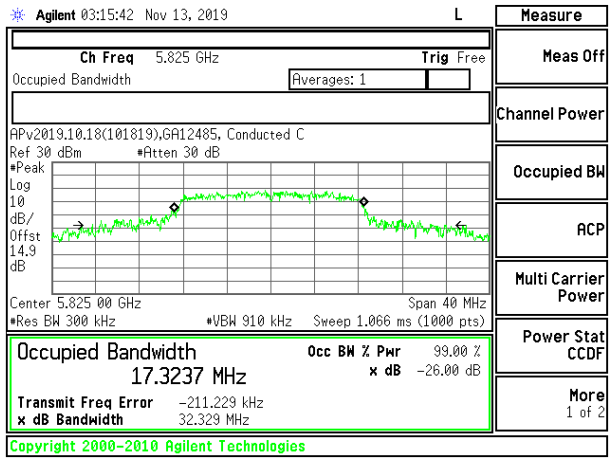
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



HIGH CHANNEL CHAIN 3

8.4. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

RSS-247 6.2.4.1

The minimum 6 dB bandwidth shall be at least 500 kHz.

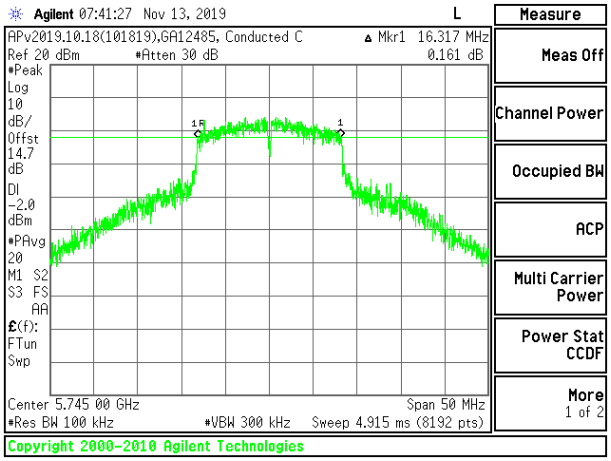
RESULTS

8.4.1. 802.11a MODE IN THE 5.8 GHz BAND

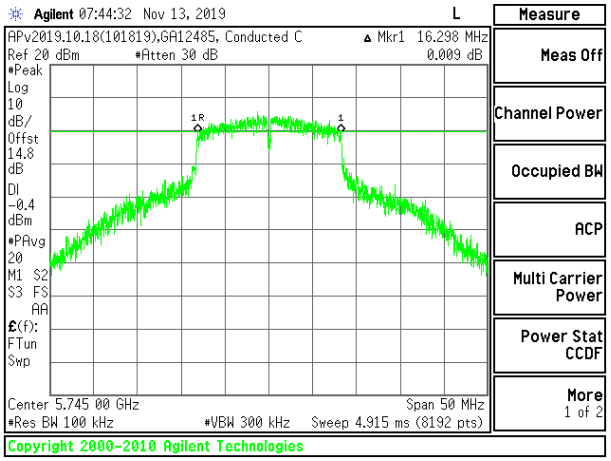
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	6 dB BW Chain 3 (MHz)	Minimum Limit (MHz)
Low	5745	16.317	16.298	16.304	16.292	0.5
Mid	5785	16.274	16.402	16.353	16.335	0.5
High	5825	16.317	16.366	16.329	16.323	0.5

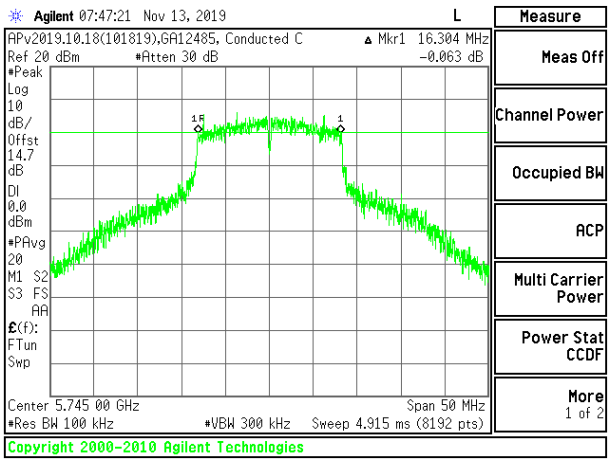
LOW CHANNEL



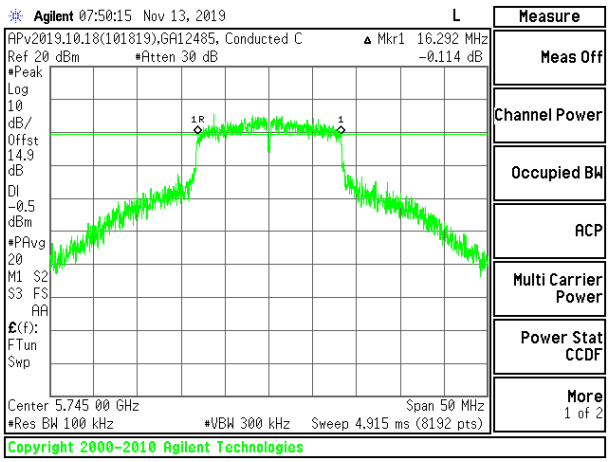
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

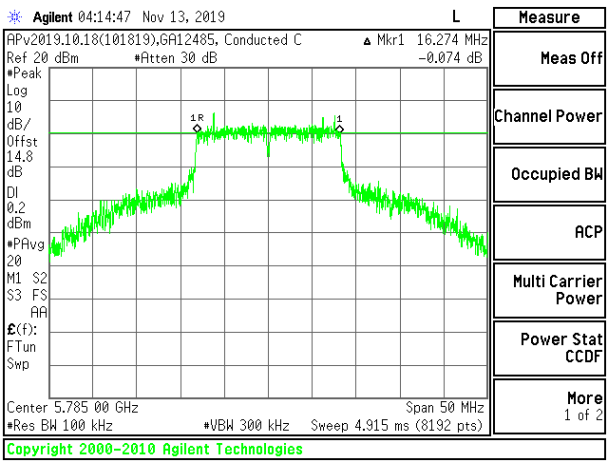


LOW CHANNEL CHAIN 2

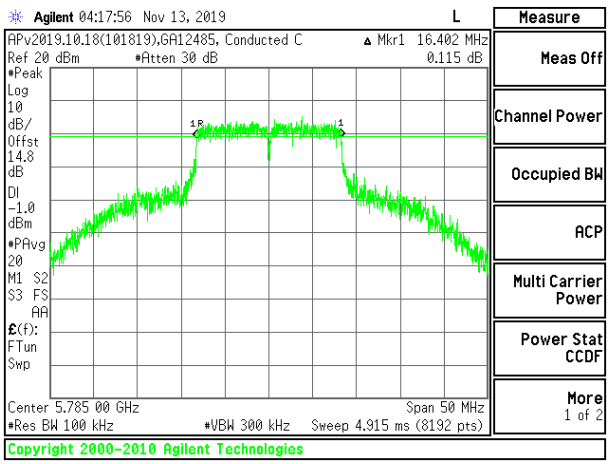


LOW CHANNEL CHAIN 3

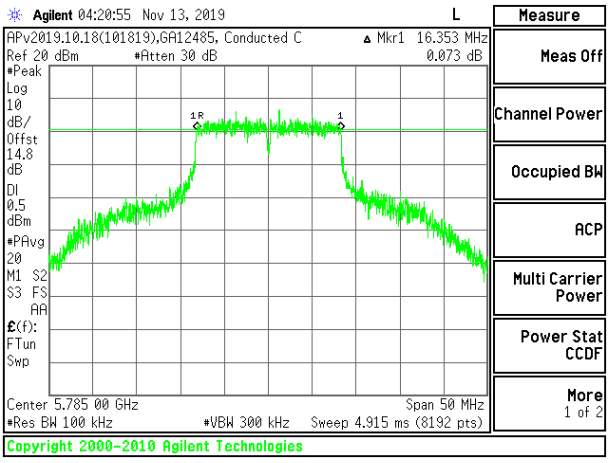
MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1



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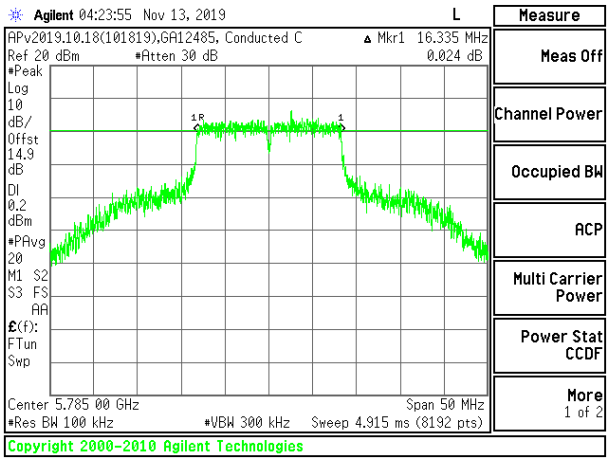
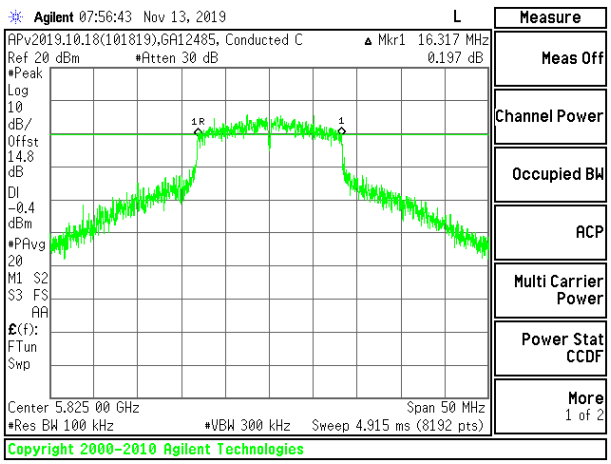
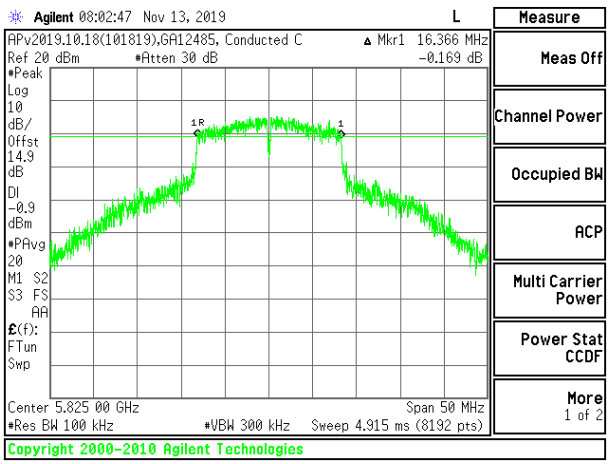


MID CHANNEL CHAIN 3

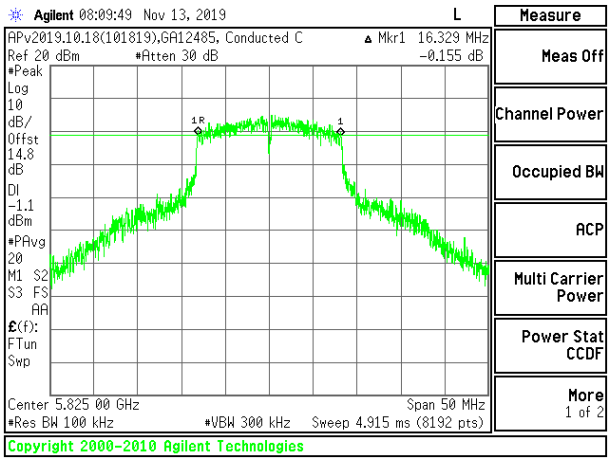
HIGH CHANNEL



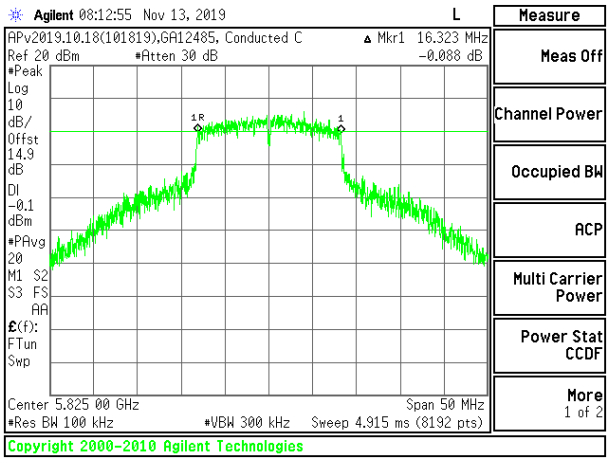
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



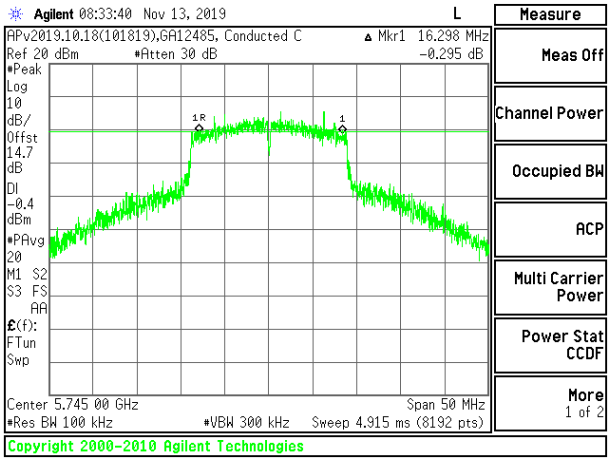
HIGH CHANNEL CHAIN 3

8.4.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

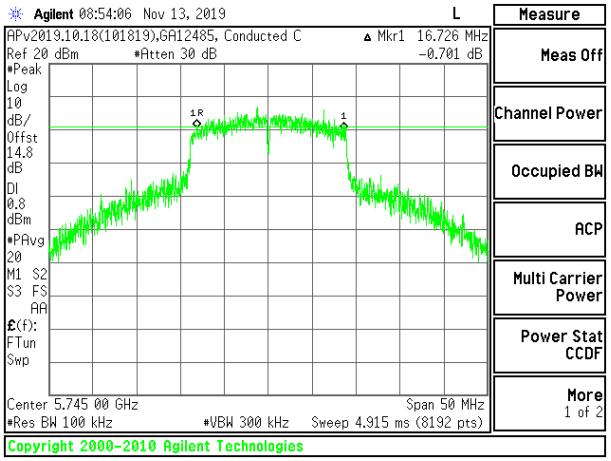
4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	6 dB BW Chain 3 (MHz)	Minimum Limit (MHz)
Low	5745	16.298	16.726	16.915	16.713	0.5
Mid	5785	17.531	17.373	17.586	17.580	0.5
High	5825	16.280	16.915	16.890	16.690	0.5

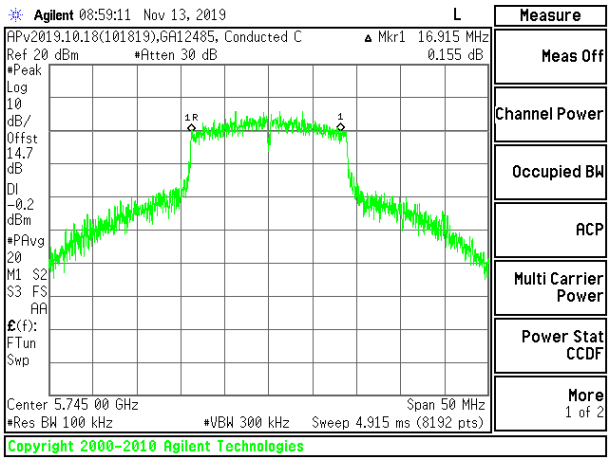
LOW CHANNEL



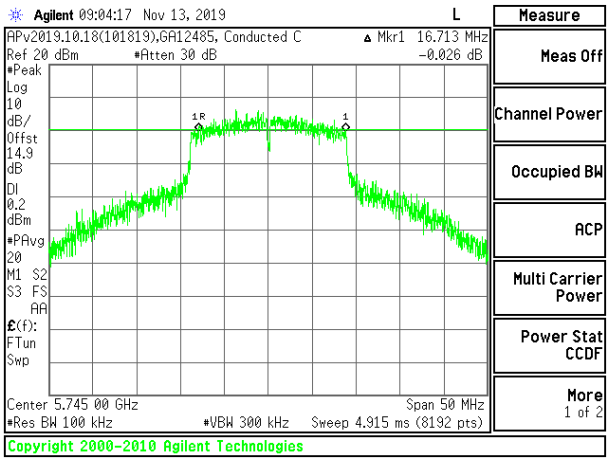
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

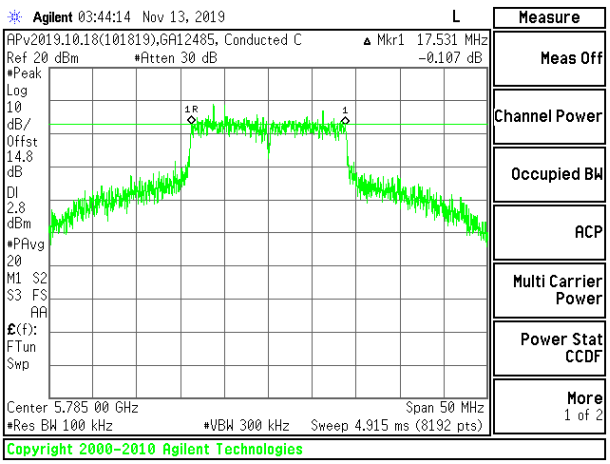


LOW CHANNEL CHAIN 2

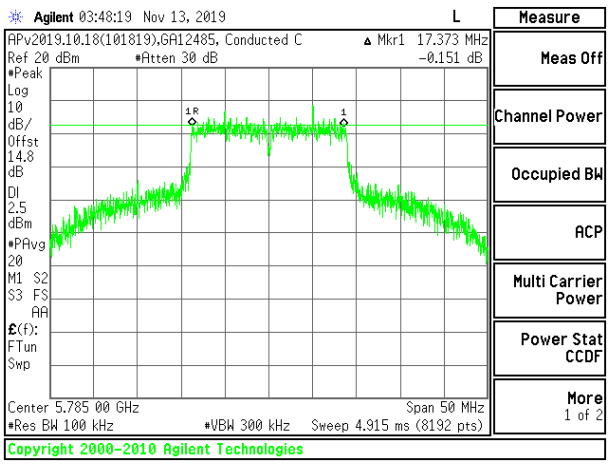


LOW CHANNEL CHAIN 3

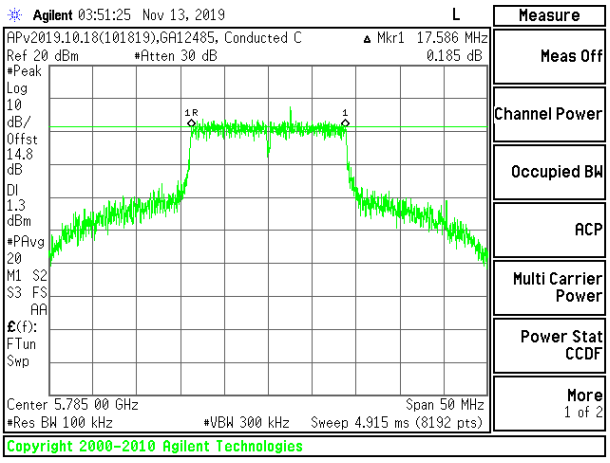
MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1



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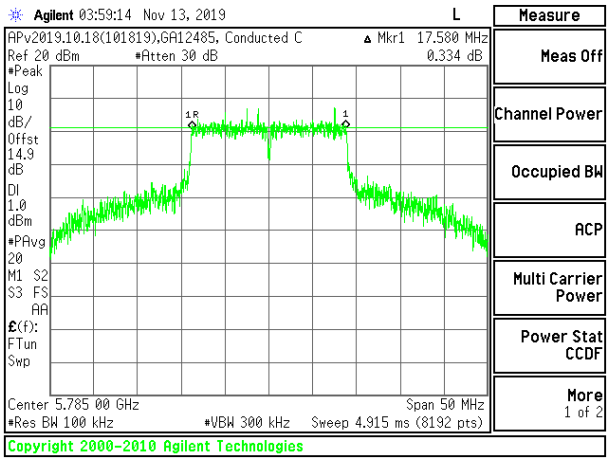
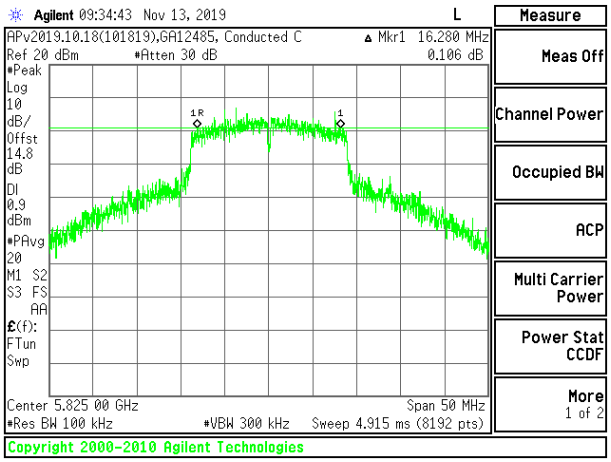
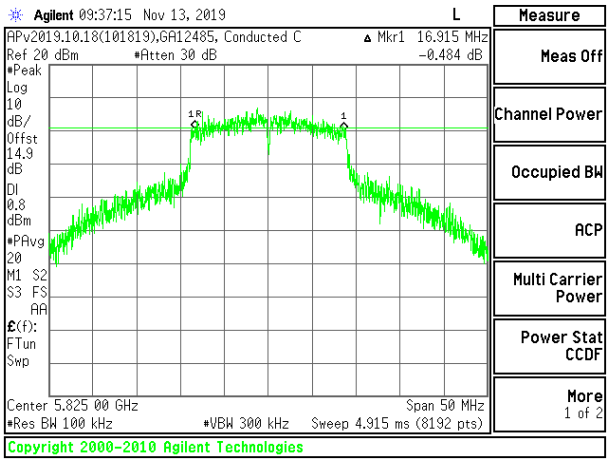


MID CHANNEL CHAIN 3

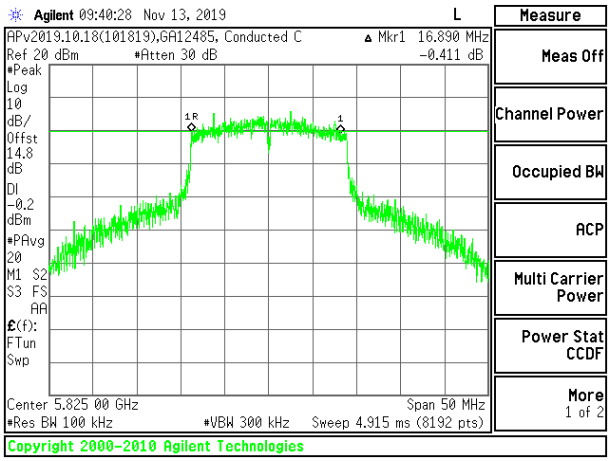
HIGH CHANNEL



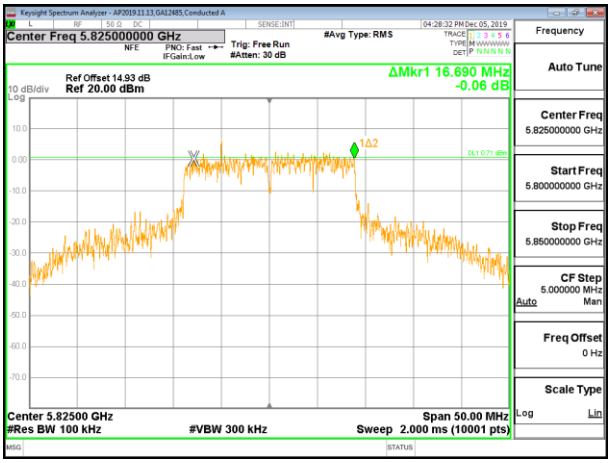
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



HIGH CHANNEL CHAIN 3

8.5. OUTPUT POWER AND PSD

LIMITS

FCC §15.407

Band 5.15–5.25 GHz
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Bands 5.25-5.35 GHz and 5.47-5.725 GHz
The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Band 5.725-5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

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RSS-247

Band 5.15-5.25 GHz
The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Band 5.25-5.35 GHz
The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Bands 5.47-5.6 GHz and 5.65-5.725 GHz
The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Band 5.725-5.85 GHz
The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v02r01, Section E.3.b (Method PM-G) and for straddles channels KDB 789033 D02 v02r01, Section E.2.b (Method SA-1) was used.

The measurement method used for power spectral density is KDB 789033 D02 v02r01, Section F

DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Vertical Polarity (***Worst Case***)

Band (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.2	3.70	4.70	4.23	7.22
5.3	3.70	4.70	4.23	7.22
5.6	3.70	4.70	4.23	7.22
5.8	3.70	4.70	4.23	7.22

Horizontal Polarity

Band (GHz)	Chain 2 Antenna Gain (dBi)	Chain 3 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.2	4.80	3.50	4.20	7.18
5.3	4.80	3.50	4.20	7.18
5.6	4.80	3.50	4.20	7.18
5.8	4.80	3.50	4.20	7.18

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

RESULTS

8.5.1. 802.11a MODE IN THE 5.2 GHz BAND

FCC

4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 1MHz)
Low	5180	4.23	7.22	24.00	9.78
Mid	5200	4.23	7.22	24.00	9.78
High	5240	4.23	7.22	24.00	9.78

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

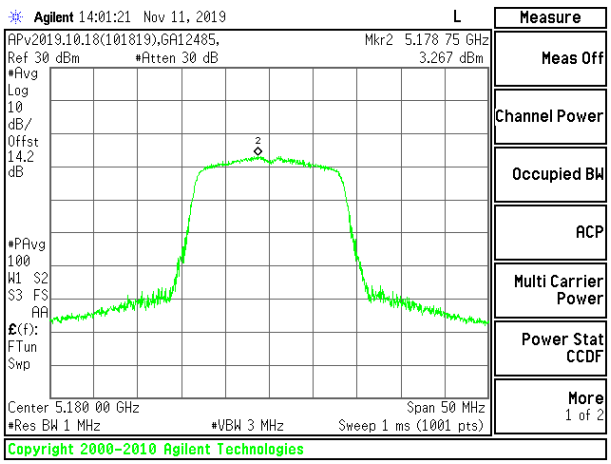
Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Chain 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	11.74	11.89	11.80	11.78	17.82	24.00	-6.18
Mid	5200	13.05	13.31	12.99	13.02	19.11	24.00	-4.89
High	5240	11.19	11.14	11.06	10.95	17.11	24.00	-6.89

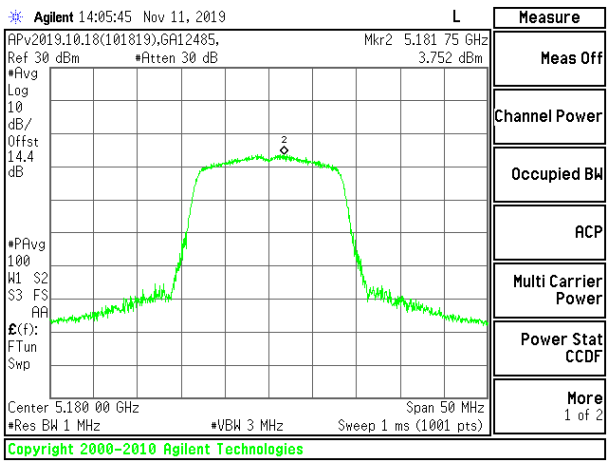
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm/ 1MHz)	Chain 1 Meas PSD (dBm/ 1MHz)	Chain 2 Meas PSD (dBm/ 1MHz)	Chain 3 Meas PSD (dBm/ 1MHz)	Total Corr'd PSD (dBm/ 1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5180	3.27	3.75	3.23	3.46	9.45	9.78	-0.33
Mid	5200	3.50	4.07	3.40	3.40	9.62	9.78	-0.16
High	5240	1.59	2.41	1.72	1.84	7.92	9.78	-1.86

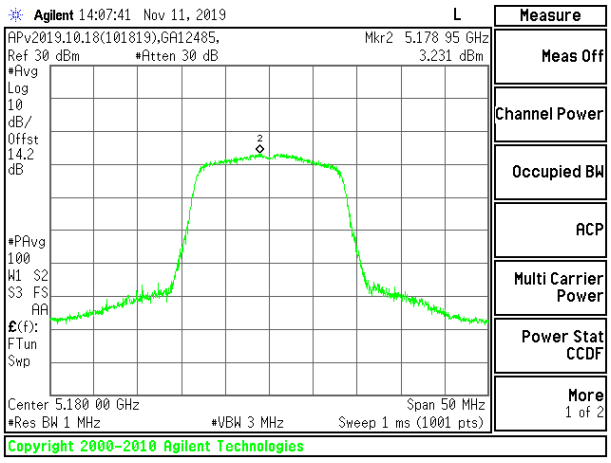
LOW CHANNEL



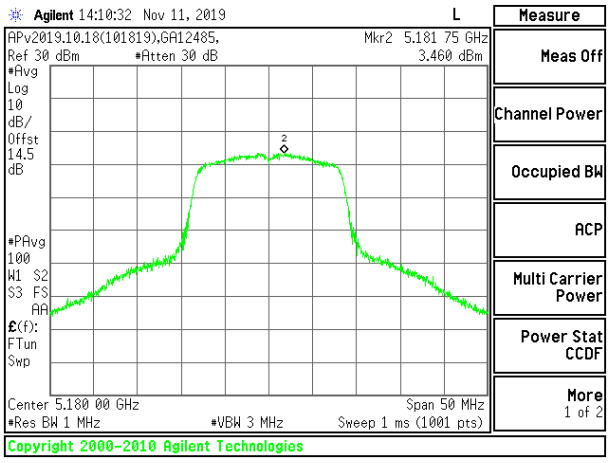
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

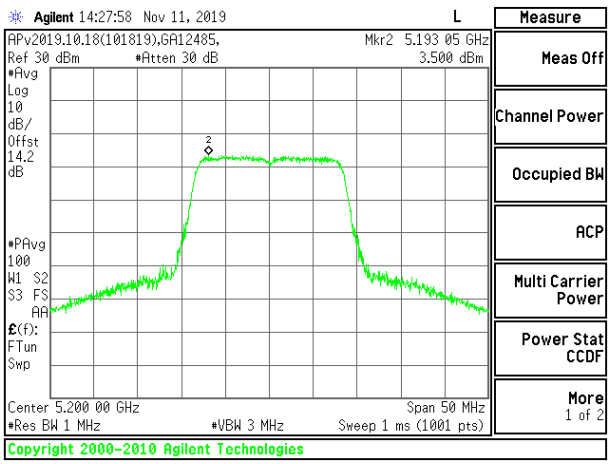


LOW CHANNEL CHAIN 2

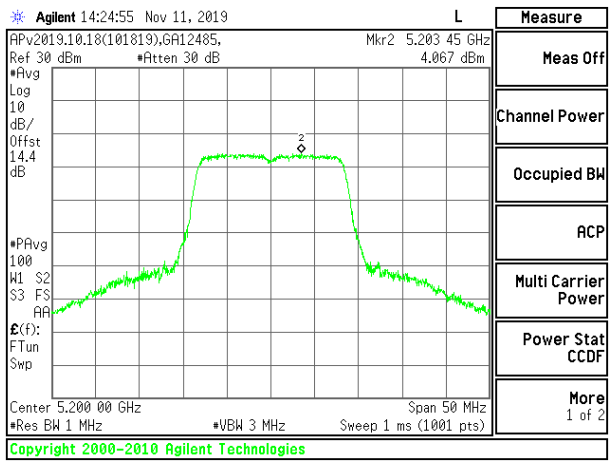


LOW CHANNEL CHAIN 3

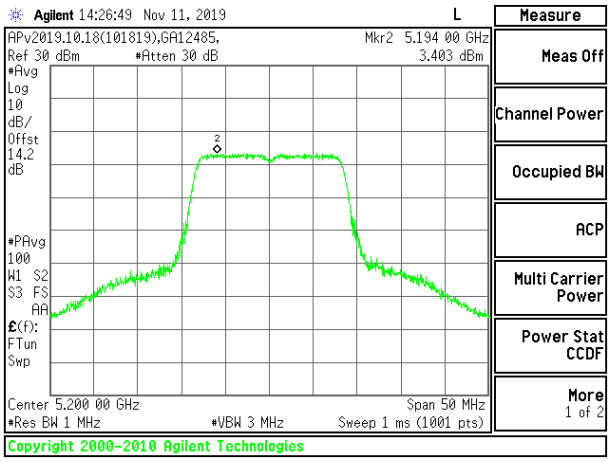
MID CHANNEL



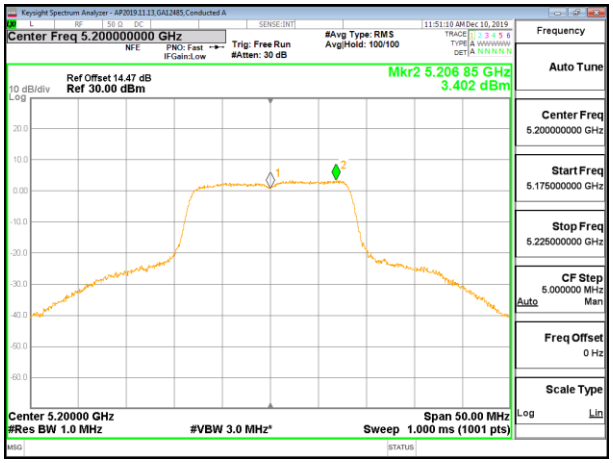
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

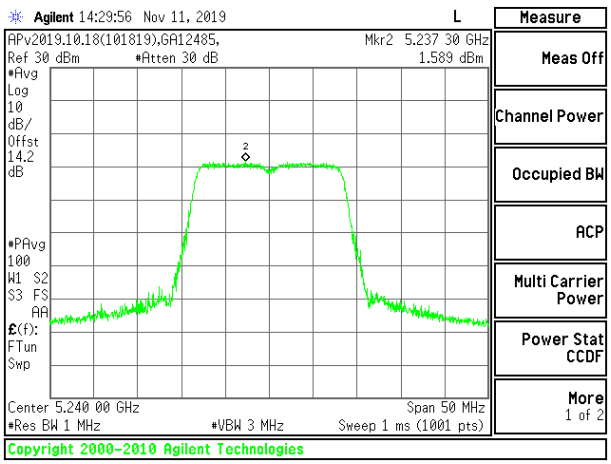


MID CHANNEL CHAIN 2

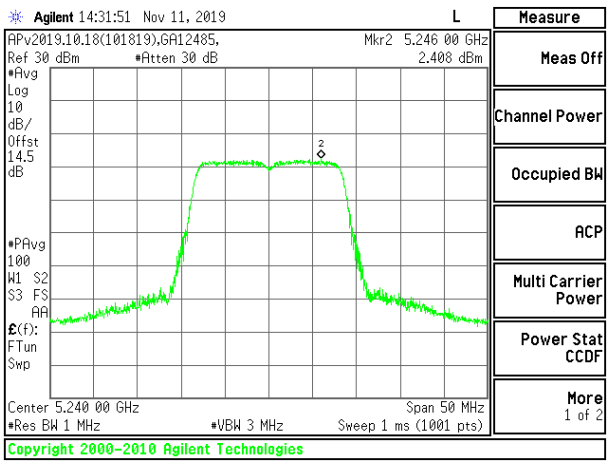


MID CHANNEL CHAIN 3

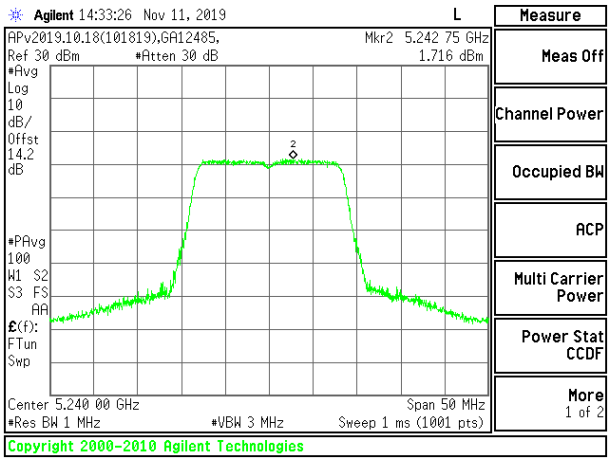
HIGH CHANNEL



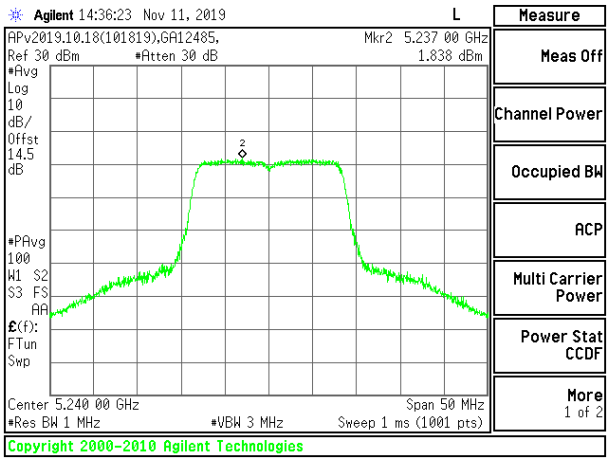
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



HIGH CHANNEL CHAIN 3

IC

Test Engineer ID:	20756	Date:	11/18/2019

(Note: **IC PSD was tested by radiated method)**

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 99% BW (MHz)
Low	5180	16.288
Mid	5200	16.549
High	5240	16.502

Limits

Channel	Frequency (MHz)	ISED EIRP Limit (dBm)	ISED eirp PSD Limit (dBm/ 1MHz)
Low	5180	22.12	10.00
Mid	5200	22.19	10.00
High	5240	22.18	10.00

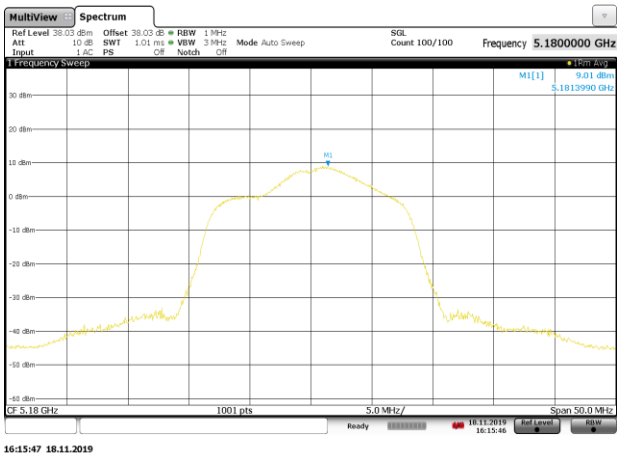
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

Output Power Results

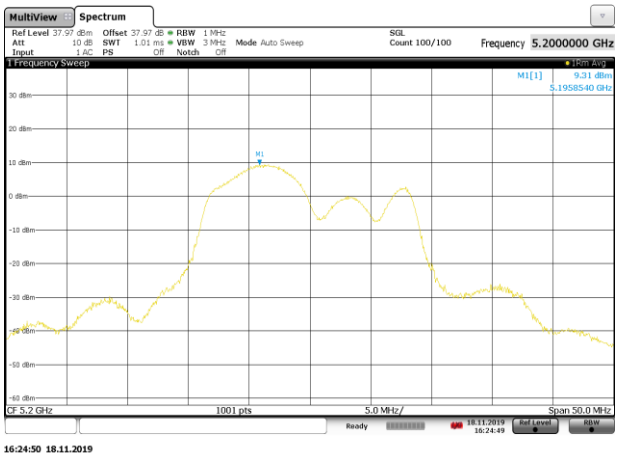
Channel	Frequency (MHz)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	16.07	22.12	-6.05
Mid	5200	16.98	22.19	-5.21
High	5240	16.43	22.18	-5.75

PSD Results

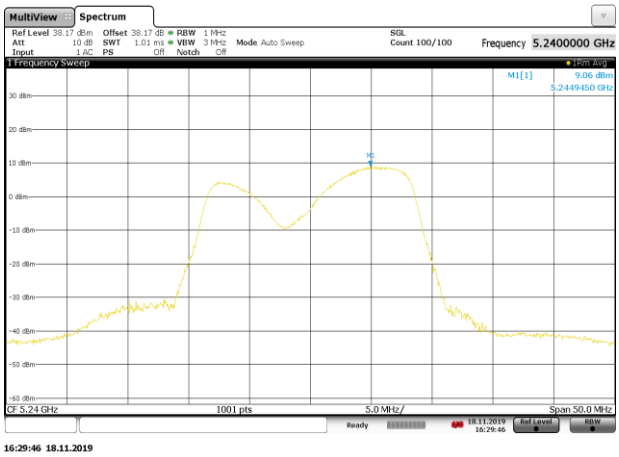
Channel	Frequency (MHz)	Total Corr'd PSD (dBm/ 1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5180	5.181	10.00	-4.82
Mid	5200	5.196	10.00	-4.80
High	5240	5.245	10.00	-4.76



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.5.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

FCC

4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 1MHz)
Low	5180	4.23	7.22	24.00	9.78
Mid	5200	4.23	7.22	24.00	9.78
High	5240	4.23	7.22	24.00	9.78

Duty Cycle CF (dB)	0.10	Included in Calculations of Corr'd PSD

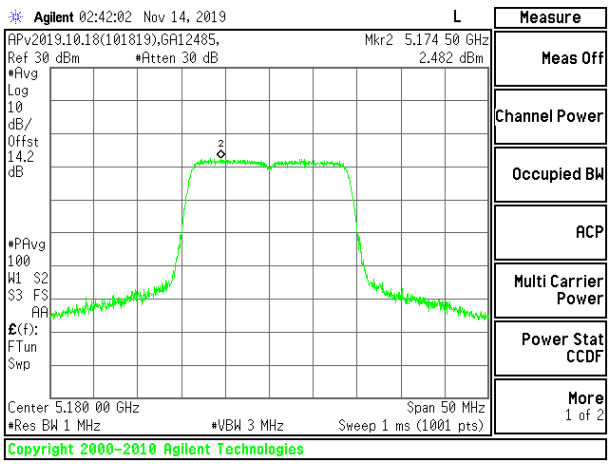
Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Chain 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	11.61	11.77	11.81	11.61	17.72	24.00	-6.28
Mid	5200	12.94	13.12	13.09	13.14	19.09	24.00	-4.91
High	5240	11.04	11.12	11.21	11.06	17.13	24.00	-6.87

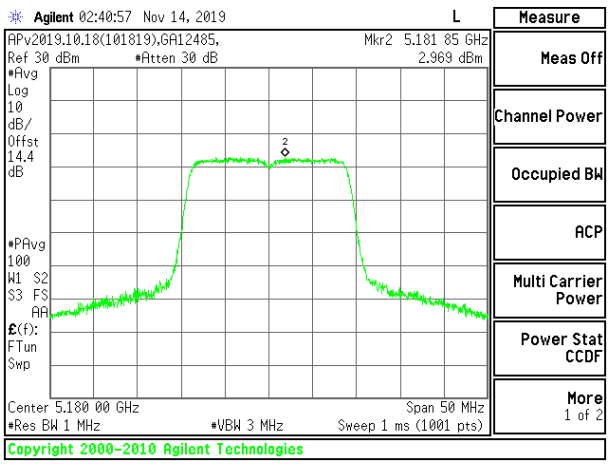
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm/ 1MHz)	Chain 1 Meas PSD (dBm/ 1MHz)	Chain 2 Meas PSD (dBm/ 1MHz)	Chain 3 Meas PSD (dBm/ 1MHz)	Total Corr'd PSD (dBm/ 1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5180	2.48	2.97	2.72	2.73	8.85	9.78	-0.93
Mid	5200	3.24	3.87	3.64	3.80	9.76	9.78	-0.02
High	5240	1.34	2.28	1.88	1.62	7.91	9.78	-1.87

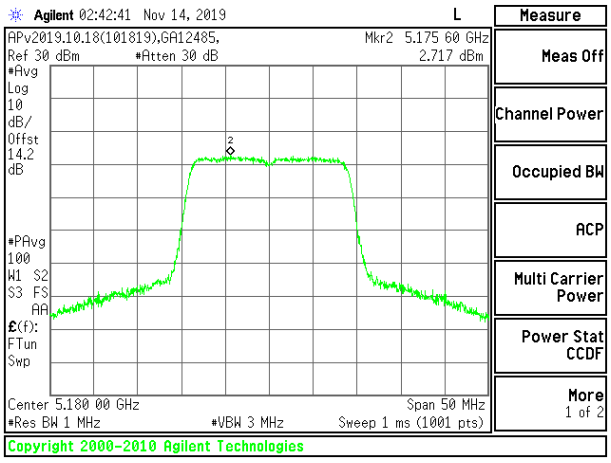
LOW CHANNEL



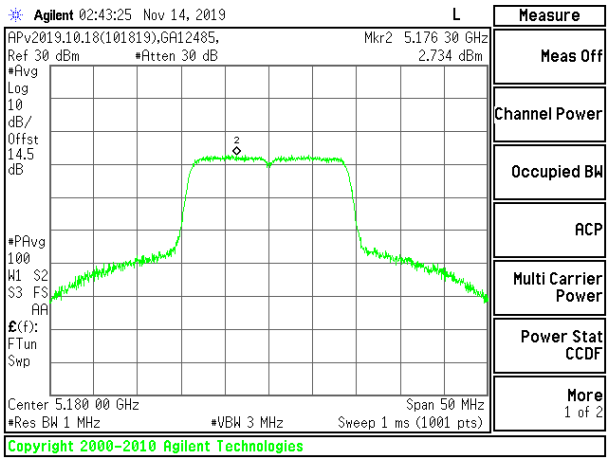
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

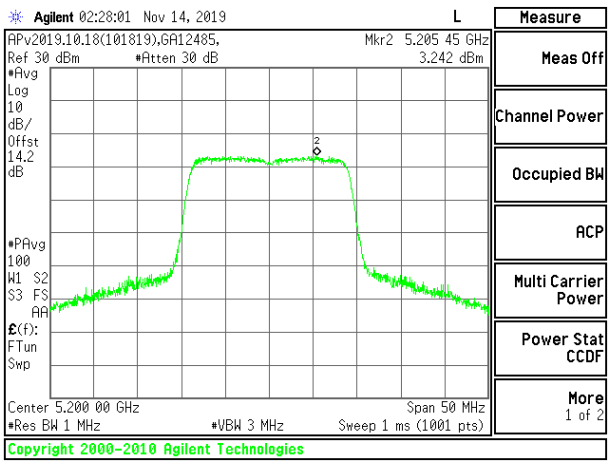


LOW CHANNEL CHAIN 2

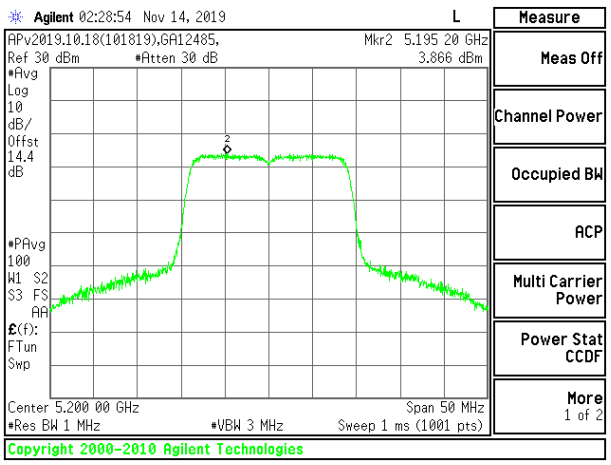


LOW CHANNEL CHAIN 3

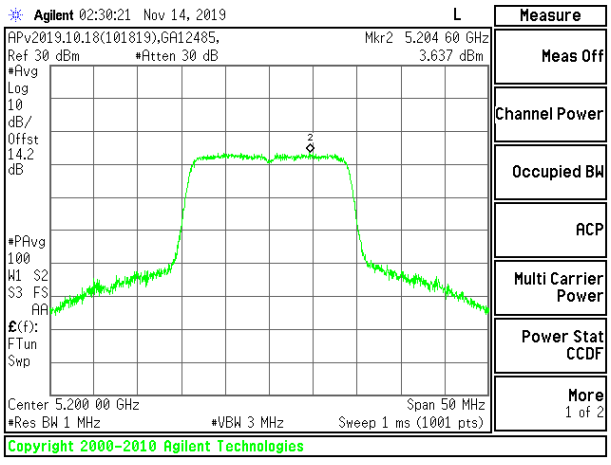
MID CHANNEL



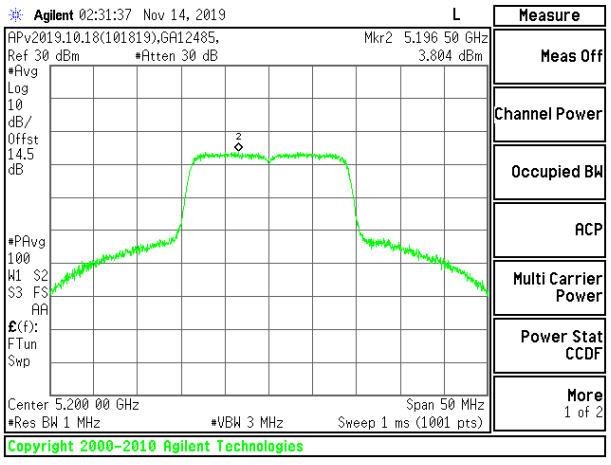
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

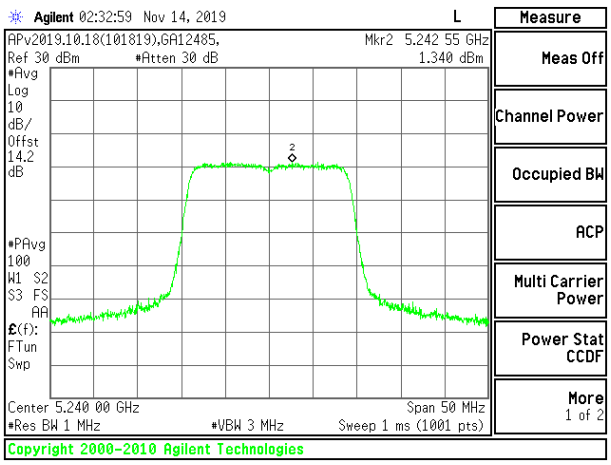


MID CHANNEL CHAIN 2

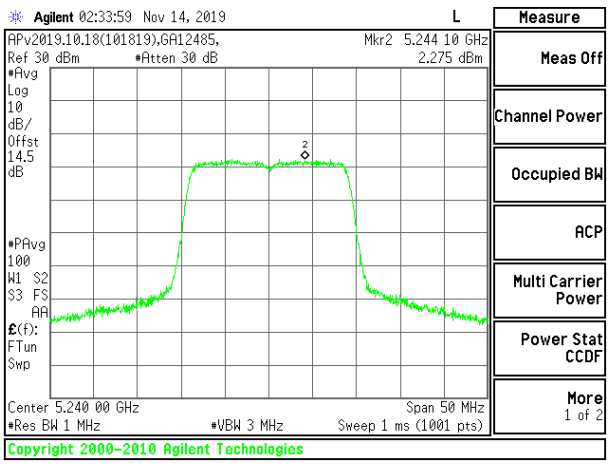


MID CHANNEL CHAIN 3

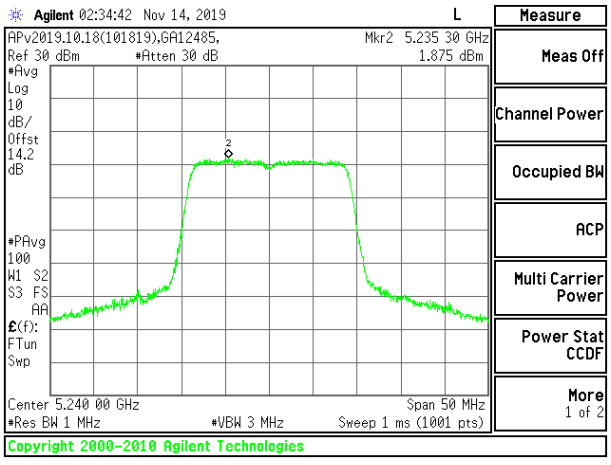
HIGH CHANNEL



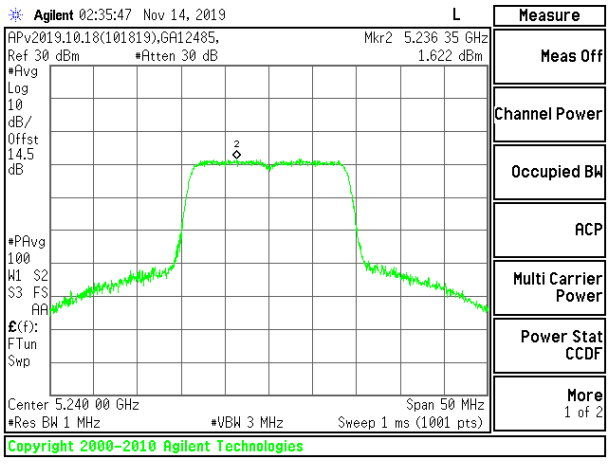
HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1



HIGH CHANNEL CHAIN 2



HIGH CHANNEL CHAIN 3

IC

Test Engineer ID:	20756	Date:	11/18/2019

(**Note:** IC PSD was tested by radiated method)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 99% BW (MHz)
Low	5180	17.475
Mid	5200	17.728
High	5240	17.711

Limits

Channel	Frequency (MHz)	ISED EIRP Limit (dBm)	ISED eirp PSD Limit (dBm/ 1MHz)
Low	5180	22.42	10.00
Mid	5200	22.49	10.00
High	5240	22.48	10.00

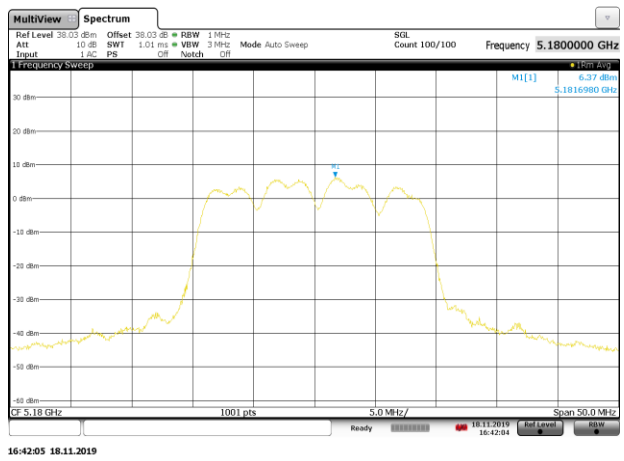
Duty Cycle CF (dB)	0.10	Included in Calculations of Corr'd PSD

Output Power Results

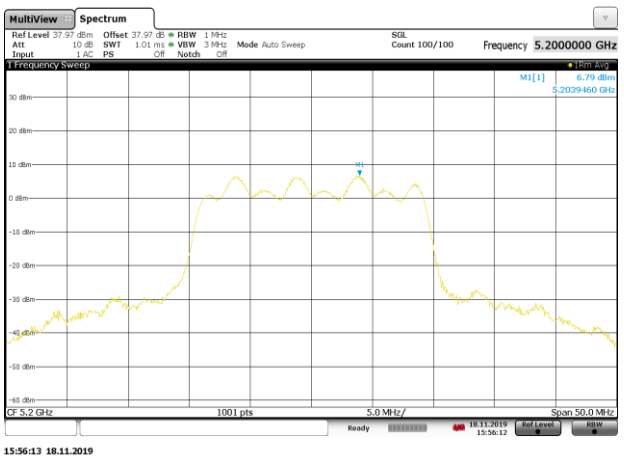
Channel	Frequency (MHz)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.65	22.42	-7.77
Mid	5200	17.58	22.49	-4.91
High	5240	17.14	22.48	-5.34

PSD Results

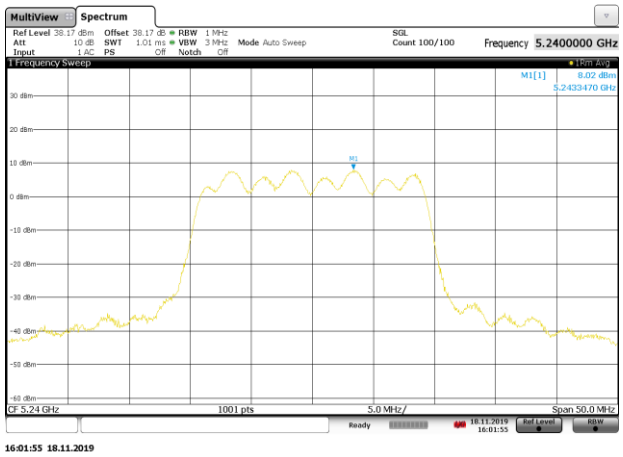
Channel	Frequency (MHz)	Total Corr'd PSD (dBm/ 1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5180	5.282	10.00	-4.72
Mid	5200	5.304	10.00	-4.70
High	5240	5.343	10.00	-4.66



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.5.3. 802.11a MODE IN THE 5.3 GHz BAND

4TX Antenna 1 + Antenna 2 + Antenna 3 + Antenna 4 CDD MODE (FCC+IC)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Direction Gain for PPSD (dBi)
Low	5260	23.00	16.568	4.23	7.22
Mid	5300	21.35	16.558	4.23	7.22
High	5320	20.40	16.246	4.23	7.22

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.19	29.19	23.19	9.78	11.00	9.78
Mid	5300	24.00	23.19	29.19	23.19	9.78	11.00	9.78
High	5320	24.00	23.11	29.11	23.11	9.78	11.00	9.78

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PPSD

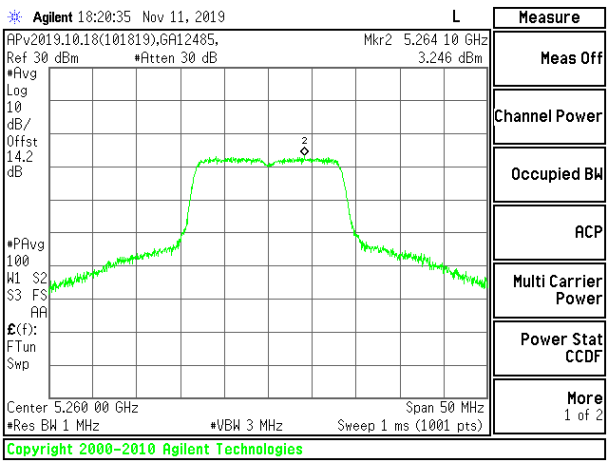
Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Chain 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	12.08	12.24	12.29	12.05	18.19	23.19	-5.01
Mid	5300	12.11	12.06	12.23	12.04	18.13	23.19	-5.06
High	5320	11.02	10.98	11.04	11.12	17.06	23.11	-6.05

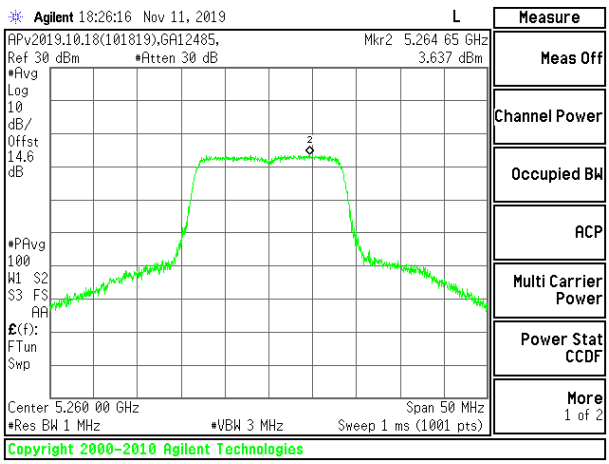
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm/ 1MHz)	Chain 1 Meas PPSD (dBm/ 1MHz)	Chain 2 Meas PPSD (dBm/ 1MHz)	Chain 3 Meas PPSD (dBm/ 1MHz)	Total Corr'd PPSD (dBm/ 1MHz)	PPSD Limit (dBm/ 1MHz)	PPSD Margin (dB)
Low	5260	3.25	3.64	3.22	3.13	9.34	9.78	-0.44
Mid	5300	3.00	3.25	3.12	3.26	9.18	9.78	-0.60
High	5320	3.08	3.50	3.35	3.41	9.36	9.78	-0.42

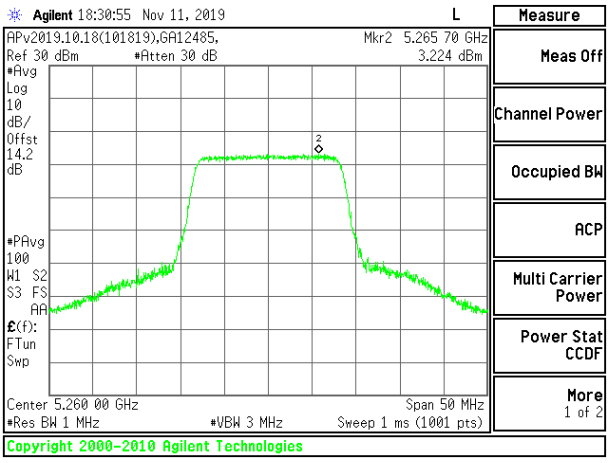
LOW CHANNEL



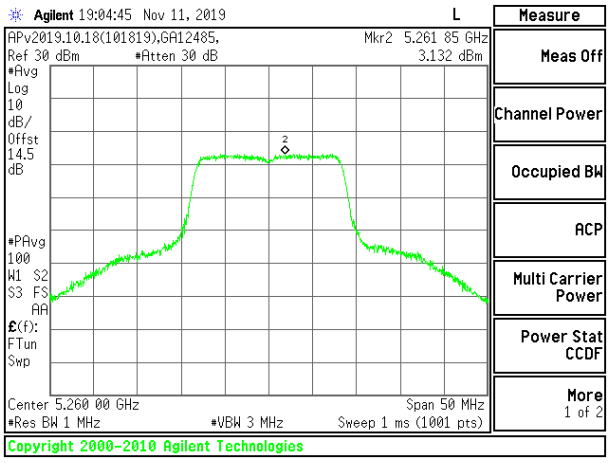
LOW CHANNEL CHAIN 0



LOW CHANNEL CHAIN 1

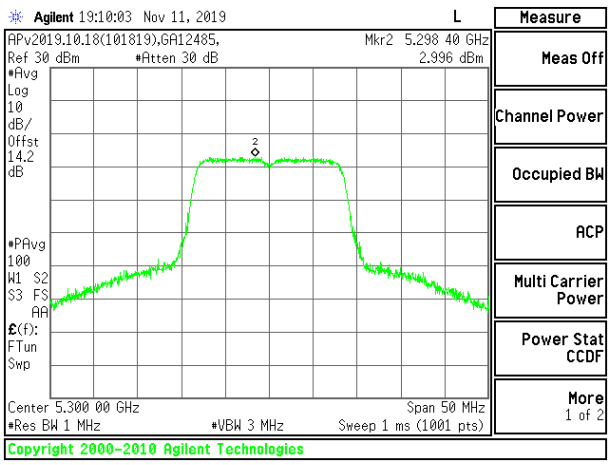


LOW CHANNEL CHAIN 2

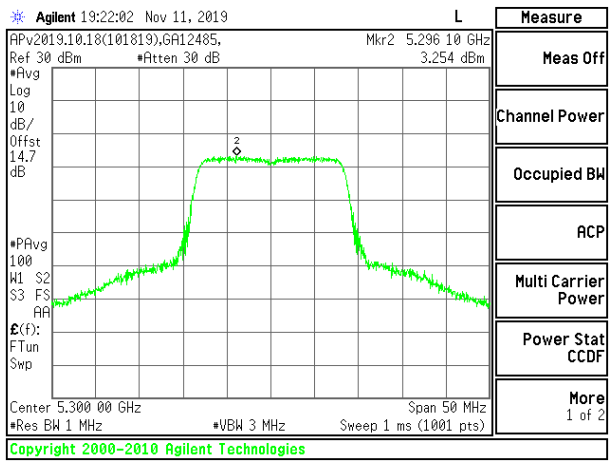


LOW CHANNEL CHAIN 3

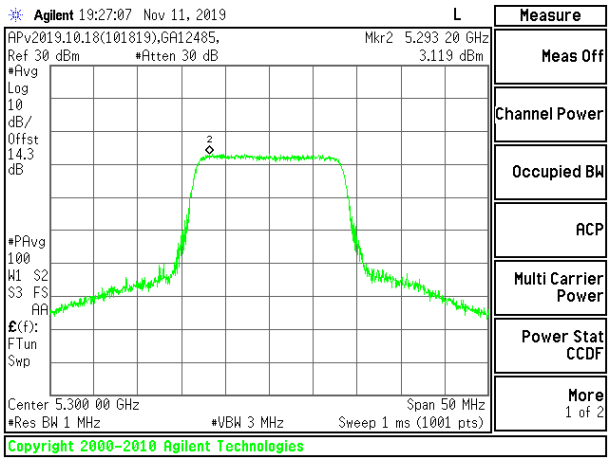
MID CHANNEL



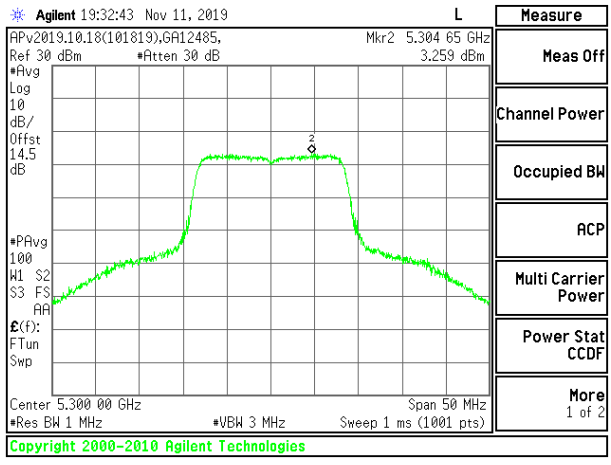
MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1



MID CHANNEL CHAIN 2



MID CHANNEL CHAIN 3