



CERTIFICATION TEST REPORT

Report Number. : 12081839-E5V3

Applicant : SONY MOBILE COMMUNICATIONS INC.
4-12-3 HIGASHI-SHINAGAWA, SHINAGAWA-KU
TOKYO, 140-0002, JAPAN

FCC ID : PY7-24118Q

EUT Description : GSM/WCDMA/LTE PHONE with BT, DTS/UNII a/b/g/n/ac & NFC

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

Date Of Issue:

January 24, 2018

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NVLAP LAB CODE 200065-0

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u> | <u>Revised By</u> |
|-------------|-------------------|---------------------------------------------|-------------------|
| V1 | 01/05/18 | Initial Issue | |
| V2 | 01/22/18 | Updated Section 5.3, 5.4 & 5.6 (added note) | Dan Corona |
| V3 | 01/24/18 | Updated Section 5.6 | Kiya Kedida |

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS INC.
4-12-3 HIGASHI-SHINAGAWA, SHINAGAWA-KU
TOKYO, 140-0002, JAPAN

EUT DESCRIPTION: GSM/WCDMA/LTE PHONE with BT, DTS/UNII a/b/g/n/ac, & NFC

SERIAL NUMBER: BH90003AAW & BH9000BQAW (CONDUCTED)
BH90006JAW & BH90005CAW (RADIATED)

DATE TESTED: DECEMBER 13 – 29 , 2017

| APPLICABLE STANDARDS | |
|---------------------------------------|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 Part 15 Subpart E (EXCEPT DFS) | Complies |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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 any government.

Approved & Released For
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Prepared By:



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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC KDB 662911 D01 v02r01, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, 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 |
|--------------------------------------------------------------|--------------------------------------------------------------|
| <input checked="" type="checkbox"/> Chamber A(ISED: 2324B-1) | <input type="checkbox"/> Chamber D(ISED: 22541-1) |
| <input checked="" type="checkbox"/> Chamber B(ISED: 2324B-2) | <input type="checkbox"/> Chamber E(ISED: 22541-2) |
| <input checked="" type="checkbox"/> Chamber C(ISED: 2324B-3) | <input type="checkbox"/> Chamber F(ISED: 22541-3) |
| | <input checked="" type="checkbox"/> Chamber G(ISED: 22541-4) |
| | <input type="checkbox"/> Chamber H(ISED: 22541-5) |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

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

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

| Parameter | Uncertainty |
|-----------------------------------------------------|-------------|
| Worst Case Conducted Disturbance, 9KHz to 0.15 MHz | 3.84 dB |
| Worst Case Conducted Disturbance, 0.15 to 30 MHz | 3.65 dB |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz | 3.15 dB |
| Worst Case Radiated Disturbance, 30 to 1000 MHz | 5.36 dB |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz | 4.32 dB |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.45 dB |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.24 dB |

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, & NFC.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2GHz Band

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|------------------------|--------------------|-------------------|
| 5180 - 5240 | 802.11a CDD 2TX | 14.65 | 29.17 |
| | 802.11n HT20 CDD 2TX | 14.85 | 30.55 |
| 5190 - 5230 | 802.11n HT40 CDD 2TX | 14.45 | 27.86 |
| 5210 | 802.11ac VHT80 CDD 2TX | 13.84 | 24.21 |

5.3GHz Band

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|------------------------|--------------------|-------------------|
| 5260 - 5320 | 802.11a CDD 2TX | 14.85 | 30.55 |
| | 802.11n HT20 CDD 2TX | 14.75 | 29.85 |
| 5270 - 5310 | 802.11n HT40 CDD 2TX | 14.50 | 28.18 |
| 5290 | 802.11ac VHT80 CDD 2TX | 13.91 | 24.60 |

5.6GHz Band

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|------------------------|--------------------|-------------------|
| 5500 - 5720 | 802.11a CDD 2TX | 14.64 | 29.11 |
| 5500 - 5720 | 802.11n HT20 CDD 2TX | 14.93 | 31.12 |
| 5510 - 5710 | 802.11n HT40 CDD 2TX | 14.70 | 29.51 |
| 5530-5710 | 802.11ac VHT80 CDD 2TX | 14.36 | 27.29 |

5.8GHz Band

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|------------------------|--------------------|-------------------|
| 5745 - 5825 | 802.11a CDD 2TX | 13.71 | 23.50 |
| 5745 - 5825 | 802.11n HT20 CDD 2TX | 13.81 | 24.04 |
| 5755 - 5795 | 802.11n HT40 CDD 2TX | 13.65 | 23.17 |
| 5775 | 802.11ac VHT80 CDD 2TX | 13.45 | 22.13 |

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Loop Type for Chain 0 and Monopole type for Chain 1 antennas, with the following maximum gains:

| Frequency (GHz) | Peak Antenna Gain (dBi) | |
|-----------------|-------------------------|---------------|
| | Main (Chain 0) | Sub (Chain 1) |
| 5180-5320 | -0.67 | -4.74 |
| 5500-5700 | 0.96 | -5.75 |
| 5725-5850 | 0.98 | -7.18 |

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SONY, s_atp_XXX_0_00333_A_11.
 The test utility software used during testing was Tera Term Ver 4.79.

5.5. LIST OF TEST REDUCTION AND MODES

| Antenna port & Radiated Testing | |
|---------------------------------|------------------------|
| Mode | Covered by |
| 802.11a Legacy | 802.11a 2TX CDD |
| 802.11HT20 2TX STBC | 802.11n HT20 2TX CDD |
| | 802.11n HT20 2TX CDD |
| 802.11ac VHT20 2TX STBC | 802.11n HT20 2TX CDD |
| | 802.11n HT20 2TX CDD |
| 802.11n HT40 2TX STBC | 802.11n HT40 2TX CDD |
| | 802.11n HT40 2TX CDD |
| 802.11ac VHT40 2TX STBC | 802.11n HT40 2TX CDD |
| | 802.11n HT40 2TX CDD |
| 802.11ac VHT80 2TX STBC | 802.11ac VHT80 2TX CDD |
| | 802.11ac VHT80 2TX CDD |

5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30MHz, 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.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, & Z, using the following two configurations, AC/DC Adapter and headphone. It was determined that Y-Axis with only AC/DC Adapter was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y-Axis with AC/DC Adapter orientation.

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

802.11a mode: 6 Mbps
802.11n HT20 mode: 13 Mbps (MCS8)
802.11n HT40 mode: 27 Mbps (MCS8)
802.11ac VHT80 mode: 58.5 Mbps (MCS0)

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings.

The simultaneous mode (SISO 2.4GHz Chain 0 and 5GHz chain 1) was checked and stand-alone (MIMO) 2.4 GHz / 5GHz remain worst case.

NOTE: SISO mode is covered by MIMO mode due to same maximum tune-up limit (power).

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| Support Equipment List | | | | |
|------------------------|--------------|-------------|---------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Laptop | Lenovo | 20B7S0A200 | PC015REW | NA |
| AC Adapter | SONY | 1309-8864.1 | VB17W46601037 | NA |

I/O CABLES (CONDUCTED TEST)

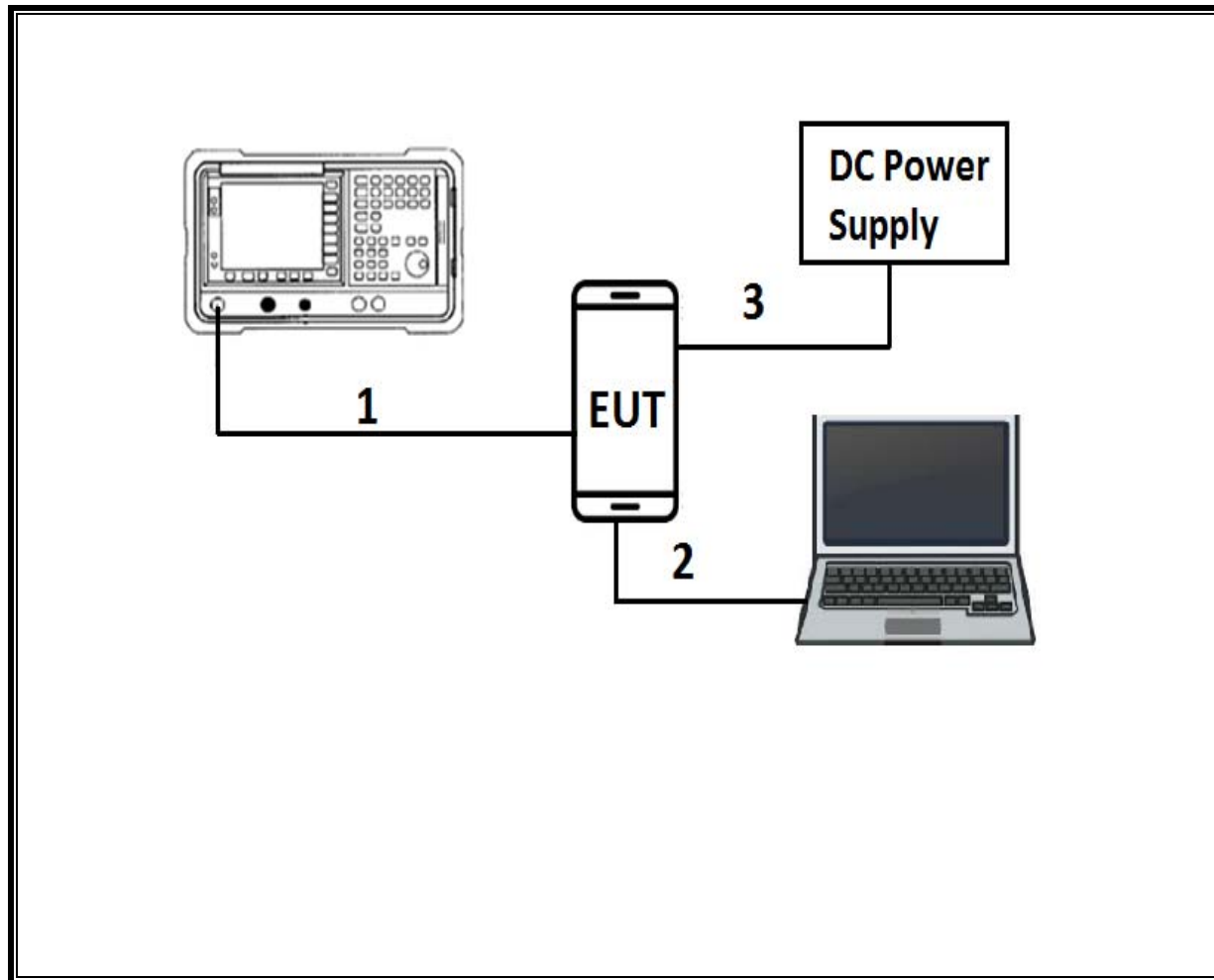
| I/O Cable List | | | | | | |
|----------------|---------|----------------------|----------------|------------|------------------|----------------------|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | Antenna | 1 | RF | Shielded | 0.2 | To spectrum Analyzer |
| 2 | USB | 1 | USB | Shielded | 1 | N/A |
| 3 | DC | 1 | DC | Shielded | 0.3 | N/A |

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

| I/O Cable List | | | | | | |
|----------------|------|----------------------|----------------|------------|------------------|---------|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | USB | 1 | USB | Shielded | 3 | N/A |

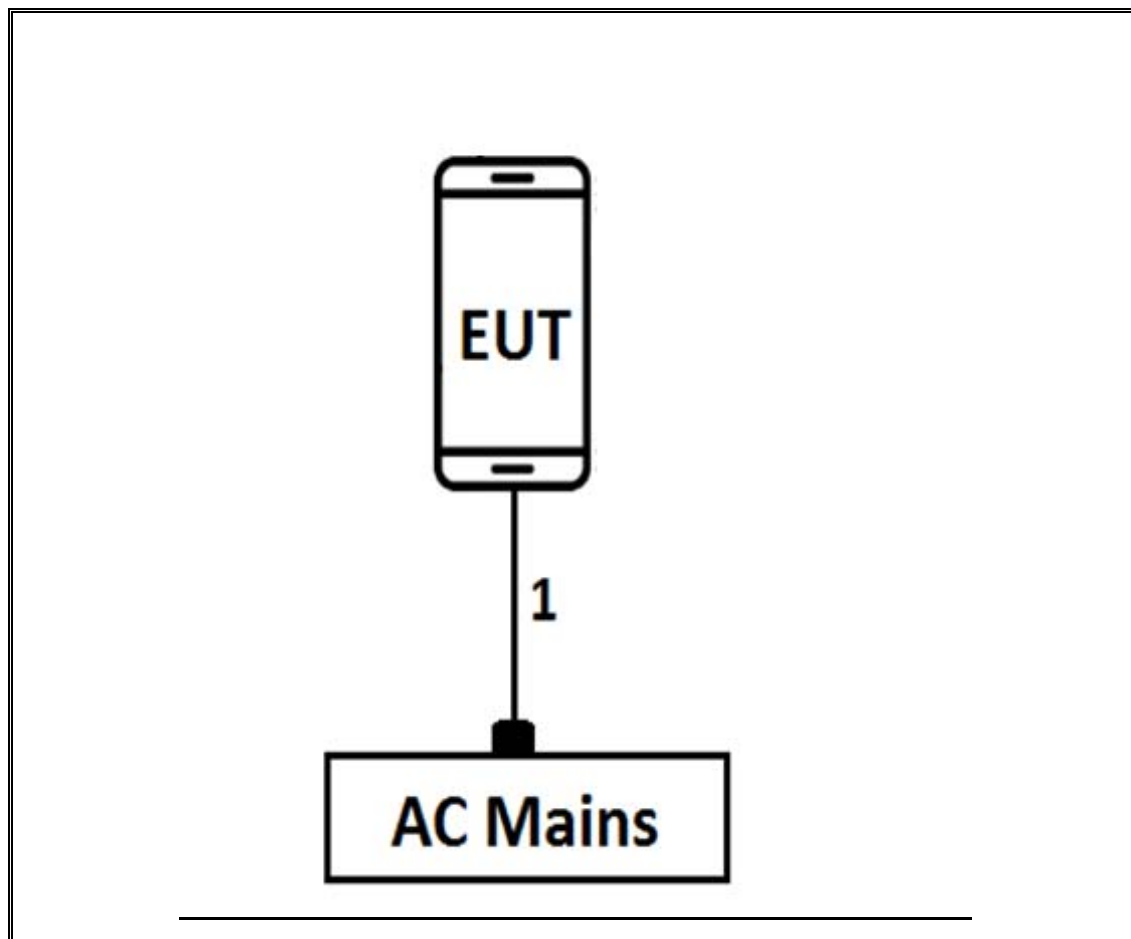
TEST SETUP

CONDCUTED TEST SETUP DIAGRAM



TEST SETUP

RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



6. 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 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad | Sunol Sciences Corp. | JB3 | T130 | 10/06/2018 |
| Antenna, Active Loop 9kHz-30MHz | Com-Power Corp. | AL-130R | T1866 | 10/10/2018 |
| Antenna, Horn 1-18GHz | ETS-Lindgren | 3117 | T862 | 06/09/2018 |
| Antenna, Horn 1-18GHz | ETS-Lindgren | 3117 | T346 | 03/28/2018 |
| Antenna, Horn 1-18GHz | ETS-Lindgren | 3117 | T345 | 04/14/2018 |
| Antenna, Horn 18-26.5GHz | ARA | MWH-1826 | T89 | 01/04/2018 |
| Antenna, Horn 26.5 - 40GHz | ARA | MWH-2640 | T90 | 08/25/2018 |
| Power Meter, P-series single channel | Agilent (Keysight) Technologies | N1911A | T1268 | 06/15/2018 |
| Power Sensor, P – series, 50MHz to 18GHz, Wideband | Agilent (Keysight) Technologies | N1921A | T1223 | 03/29/2018 |
| Amplifier, 1 - 18GHz | MITEQ | AFS42-00101800-25-S-42 | T1165 | 11/25/2018 |
| Amplifier, 1 - 18GHz | MITEQ | AFS42-00101800-25-S-42 | T491 | 06/01/2018 |
| Amplifier, 1 - 18GHz | MITEQ | AFS42-00101800-25-S-42 | T493 | 06/23/2018 |
| Pre Amplifier, 1-26.5GHz | Agilent | 8449B | T404 | 7/23/2018 |
| Pre-Amplifier, 26-40 GHz | MITEQ | TTA2640-35-HG | T1864 | 9/21/2018 |
| Amplifier, 10kHz-1GHz | Agilent (Keysight) Technologies | 8447D | T15 | 08/14/2018 |
| Amplifier, 1-8GHz | MITEQ | AMF-4D-01000800-30-29P | T1573 | 11/25/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T1210 | 07/17/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T339 | 09/13/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T905 | 01/11/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T1466 | 04/11/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T907 | 01/23/2018 |
| Test Receiver, EMI, 10Hz-7GHz | Rhode&Schwarz | ESR | T1436 | 01/06/2018 |
| LISN | FISCHER | FCC-LISN-50/250-25-2-01 | T1310 | 01/17/2018 |

| Test Software List | | | |
|-----------------------|--------------|--------|-----------------------|
| Description | Manufacturer | Model | Version |
| Radiated Software | UL | UL EMC | Ver 9.5, Dec 01, 2016 |
| Antenna Port Software | UL | UL RF | Ver 7.7, Dec 14, 2017 |

NOTE: *testing is completed before equipment calibration expiration date.

7. MEASUREMENT METHODS

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

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

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

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

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

Power Spectral Density: KDB 789033 D02 v02r01, Section F

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

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

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

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

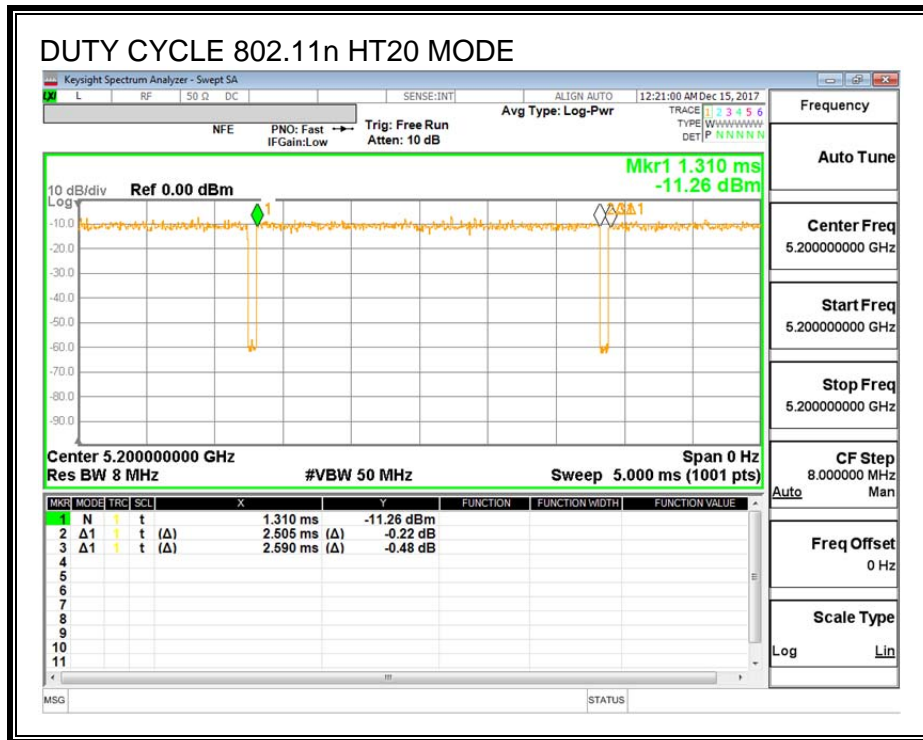
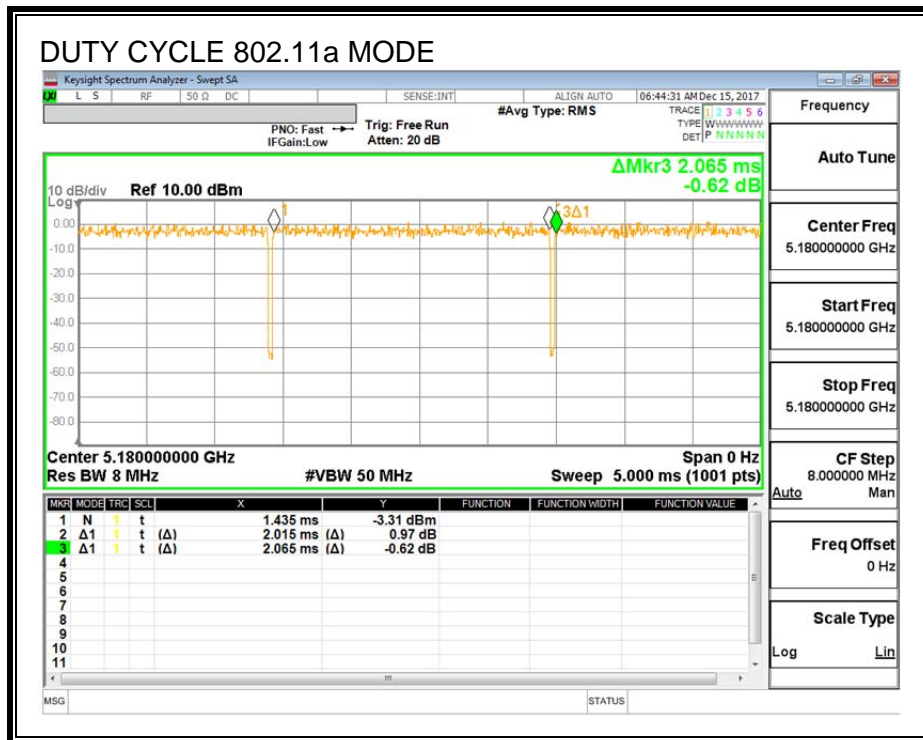
PROCEDURE

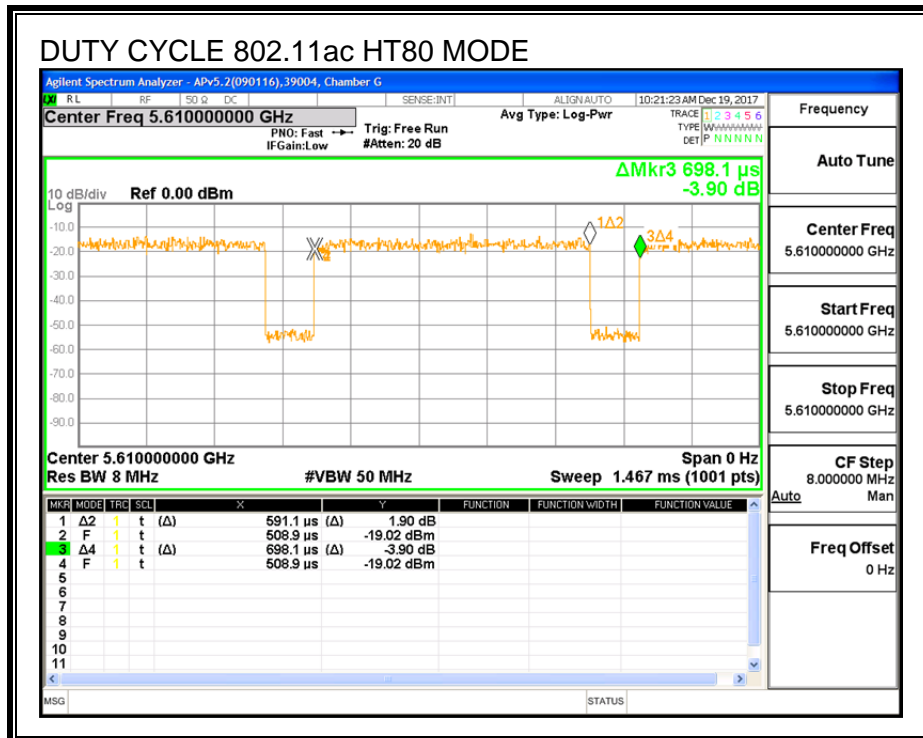
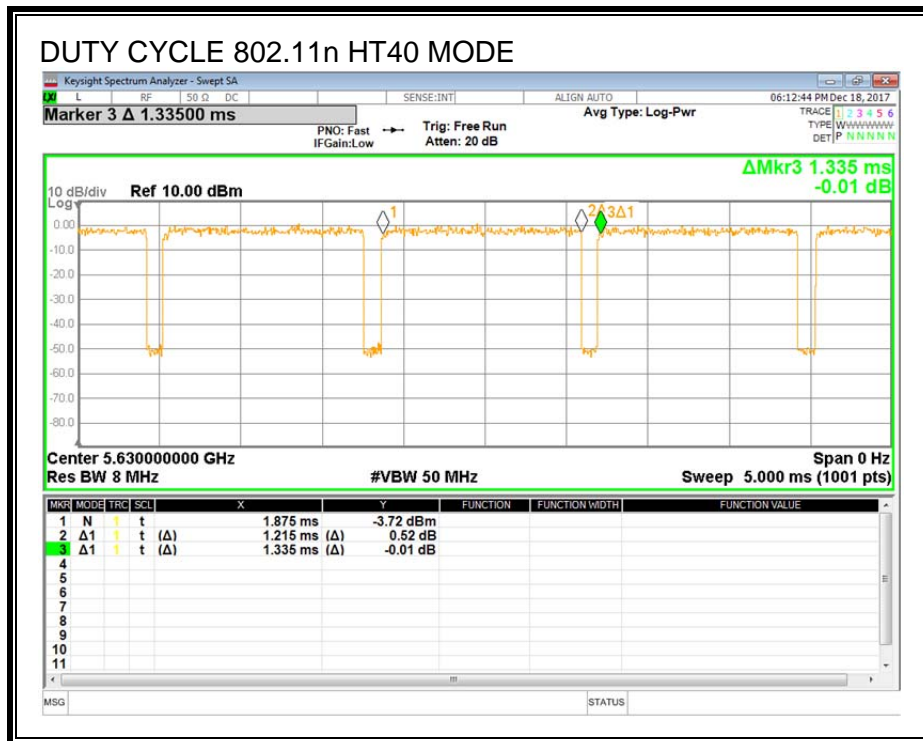
KDB 789033 Zero-Span Spectrum Analyzer Method.

RESULTS

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/T Minimum VBW (kHz) |
|----------------|------------------------|------------------|-----------------------------|----------------------|-----------------------------------------|-----------------------------|
| 802.11a | 2.015 | 2.065 | 0.976 | 97.6% | 0.11 | 0.496 |
| 802.11n HT20 | 2.505 | 2.590 | 0.967 | 96.7% | 0.14 | 0.399 |
| 802.11n HT40 | 1.215 | 1.335 | 0.910 | 91.0% | 0.41 | 0.823 |
| 802.11ac VHT80 | 0.591 | 0.698 | 0.847 | 84.7% | 0.72 | 1.692 |

DUTY CYCLE PLOTS





9. ANTENNA PORT TEST RESULTS

9.1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND

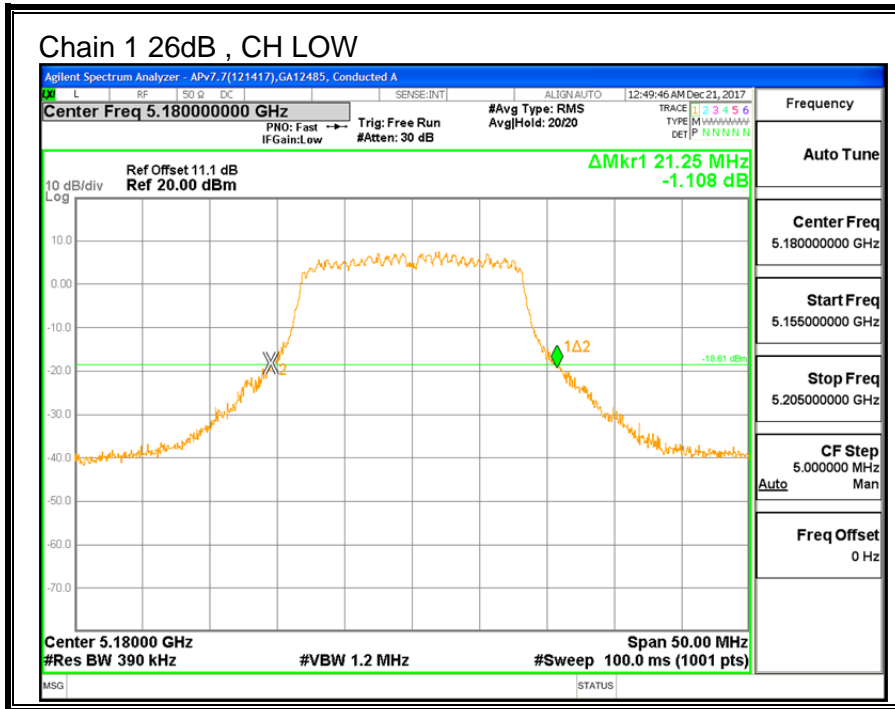
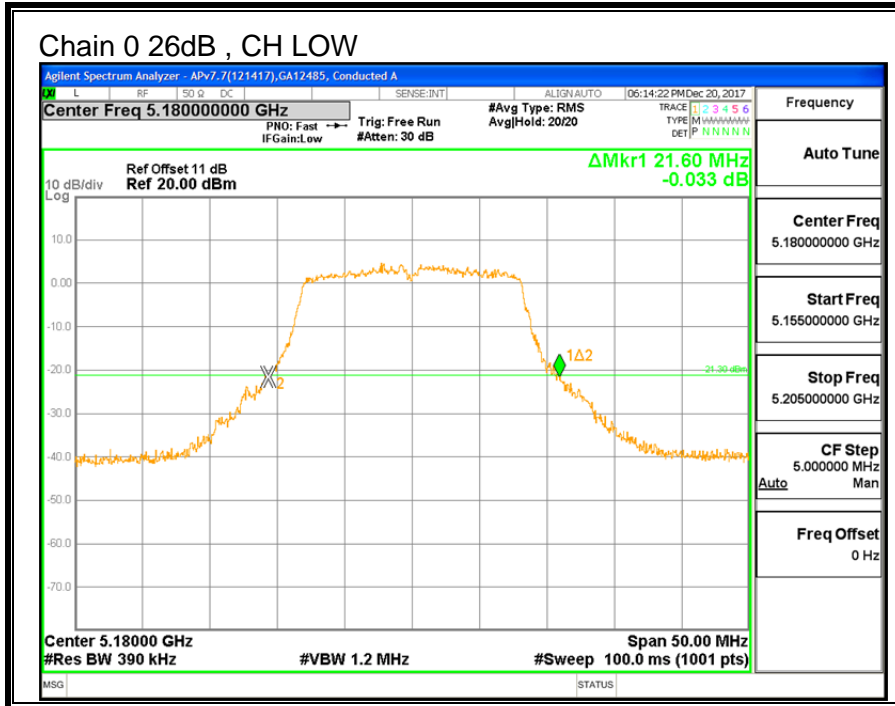
9.1.1. 26 dB BANDWIDTH

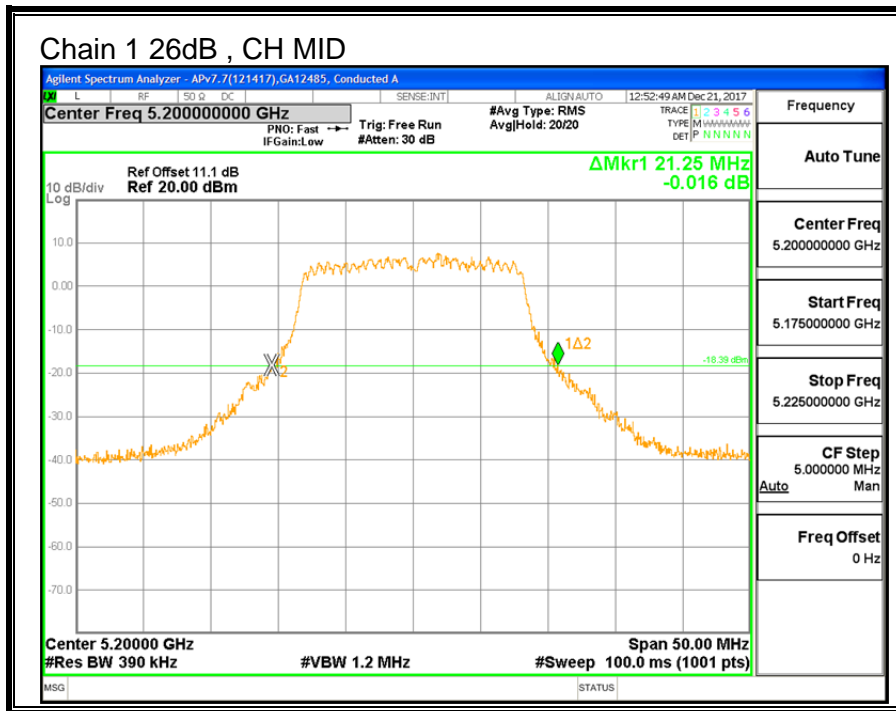
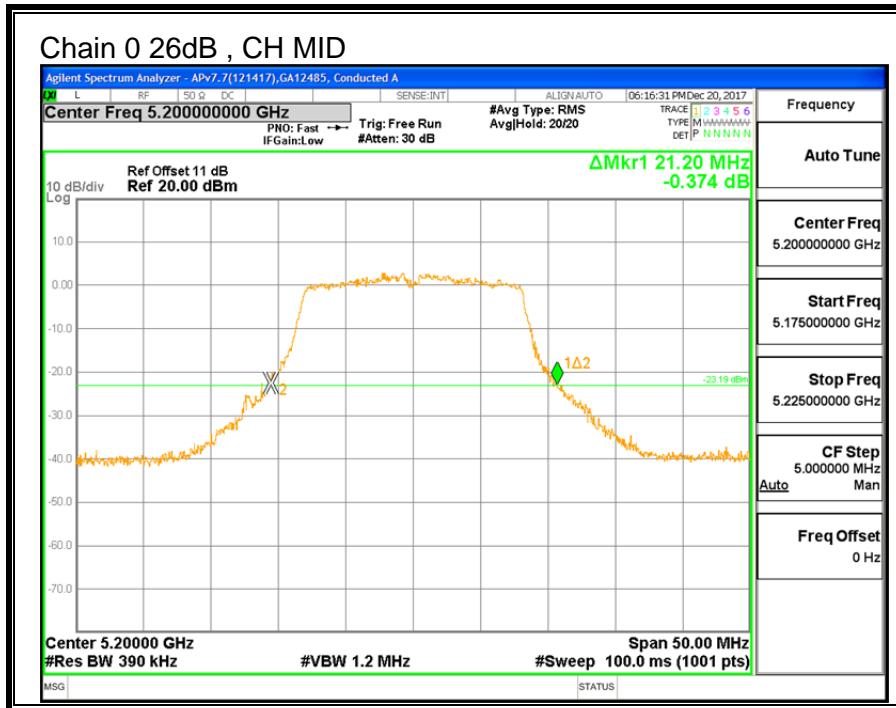
LIMITS

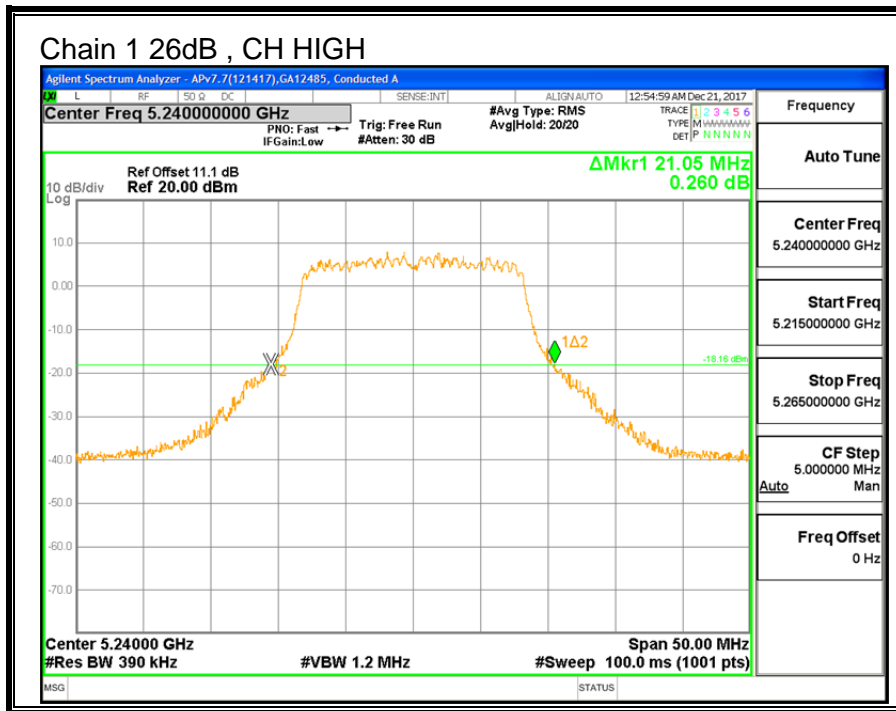
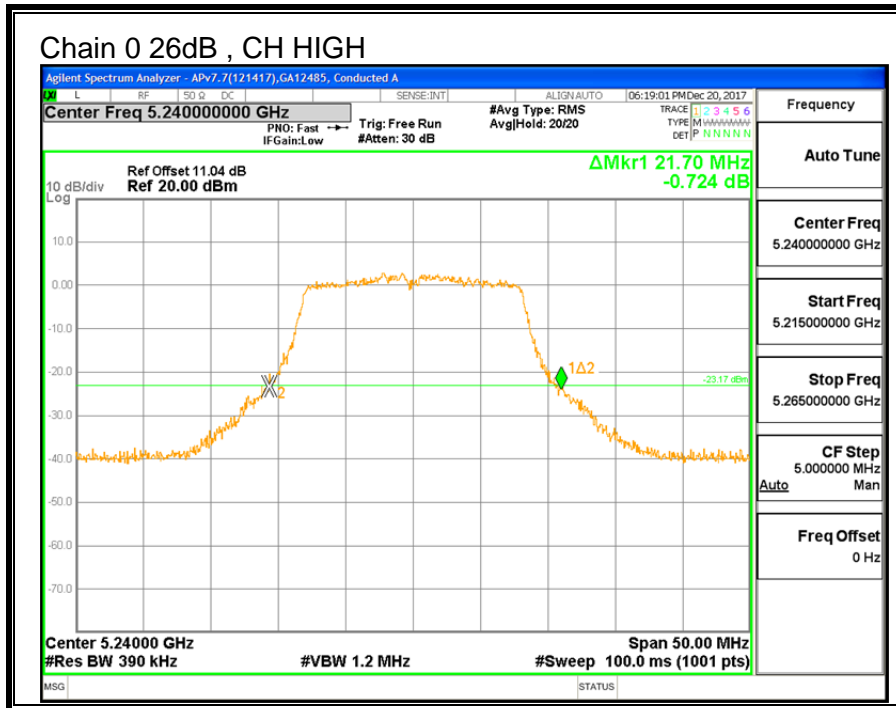
None; for reporting purposes only.

RESULTS

| Channel | Frequency | 26 dB BW Chain 0 (MHz) | 26 dB BW Chain 1 (MHz) |
|---------|-----------|------------------------------|------------------------------|
| Low | 5180 | 21.60 | 21.25 |
| Mid | 5200 | 21.20 | 21.25 |
| High | 5240 | 21.70 | 21.05 |







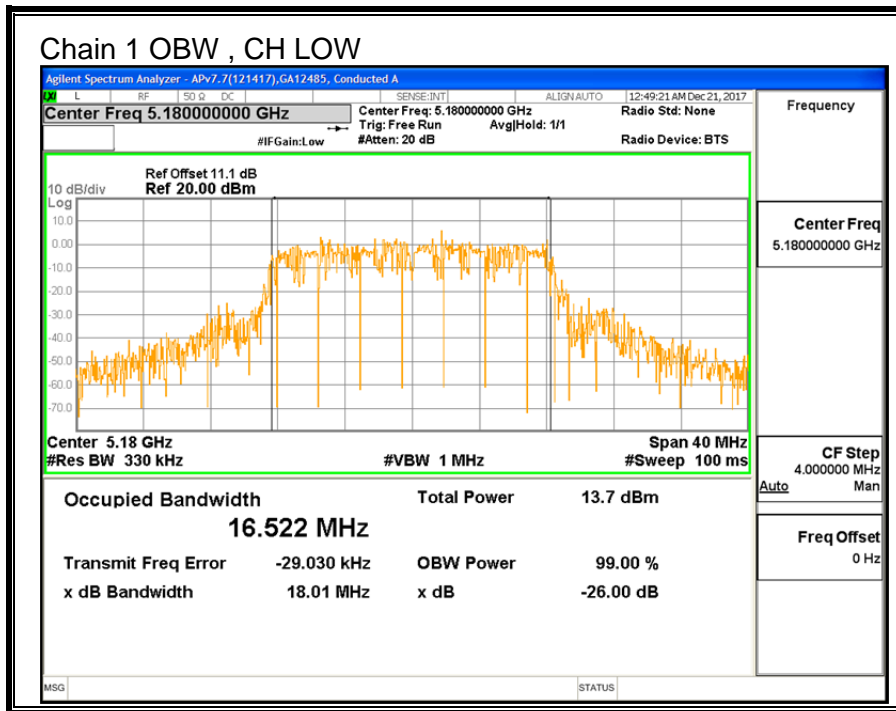
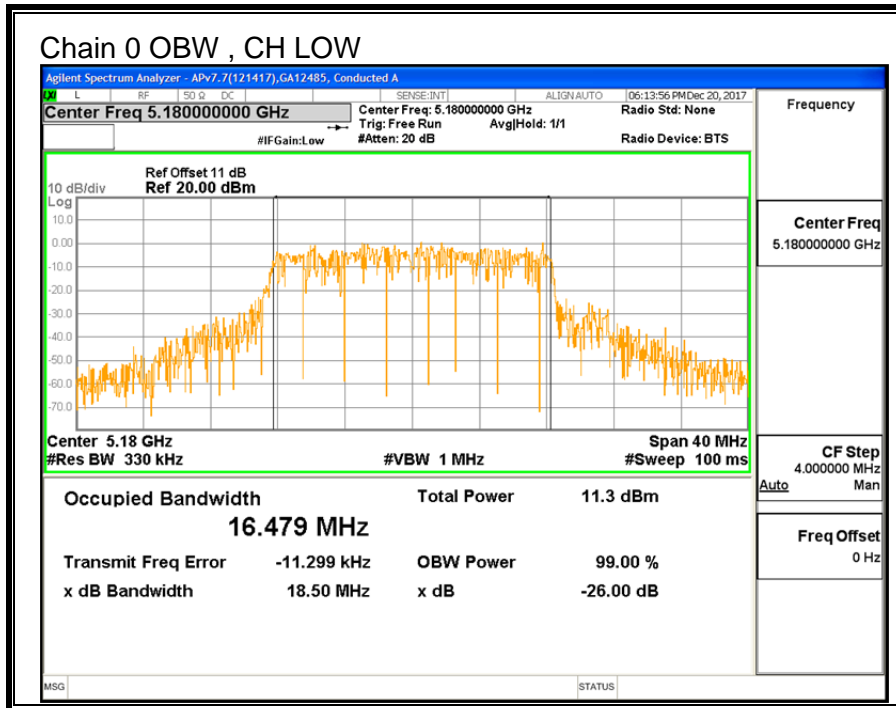
9.1.2. 99% BANDWIDTH

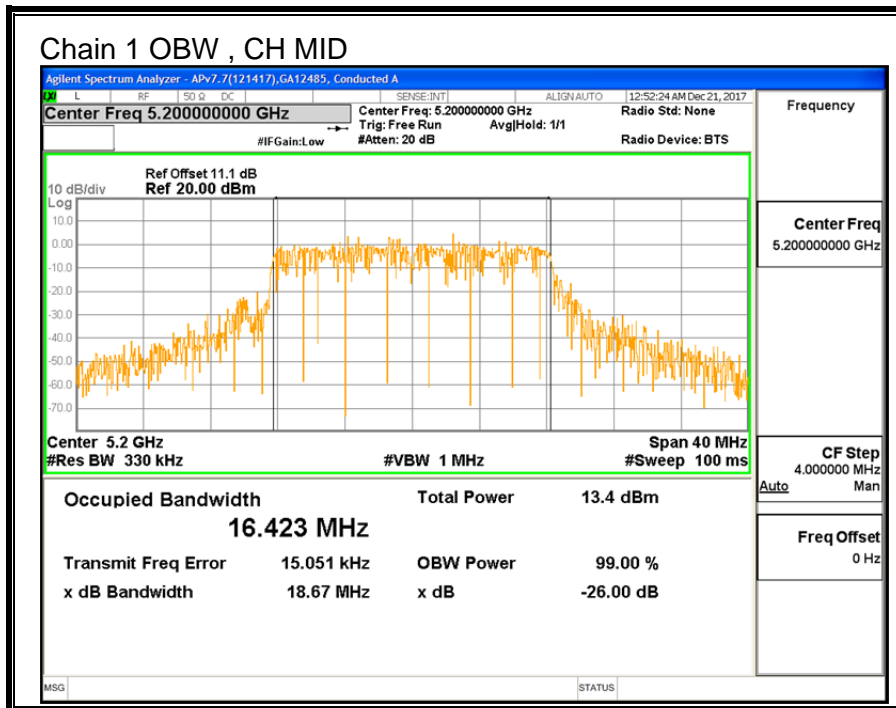
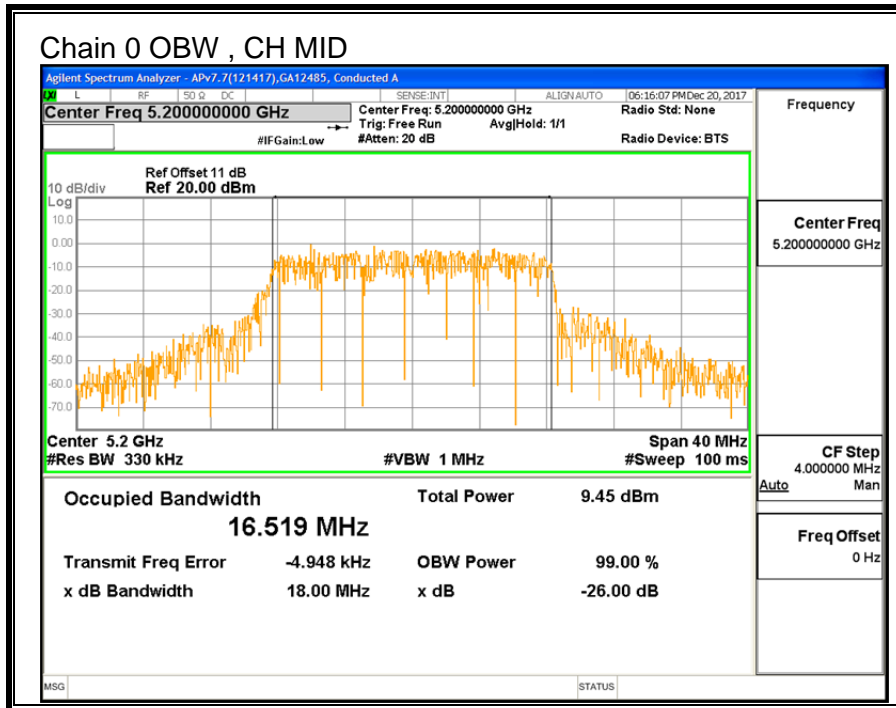
LIMITS

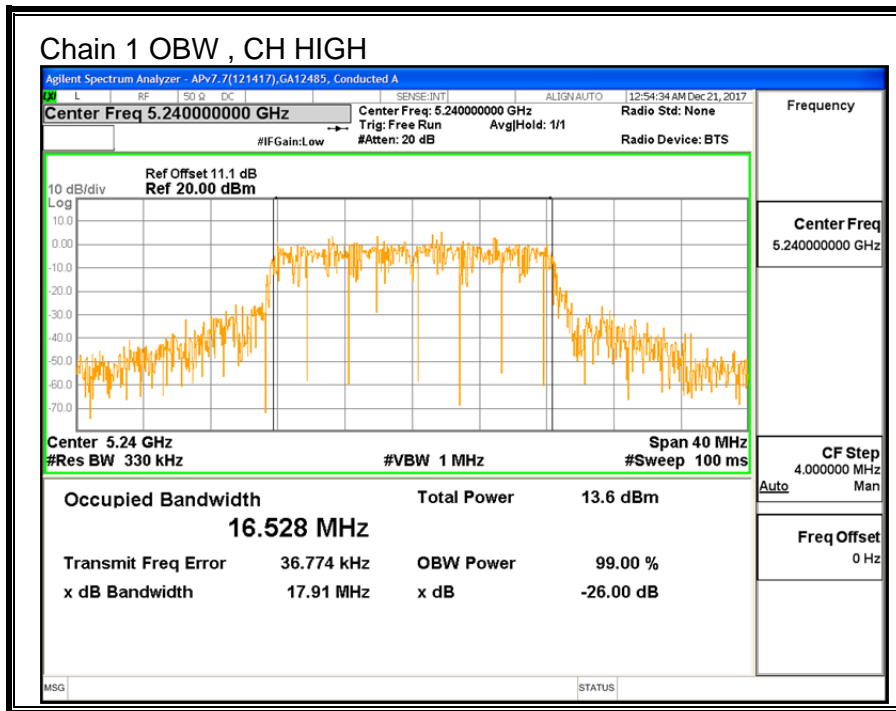
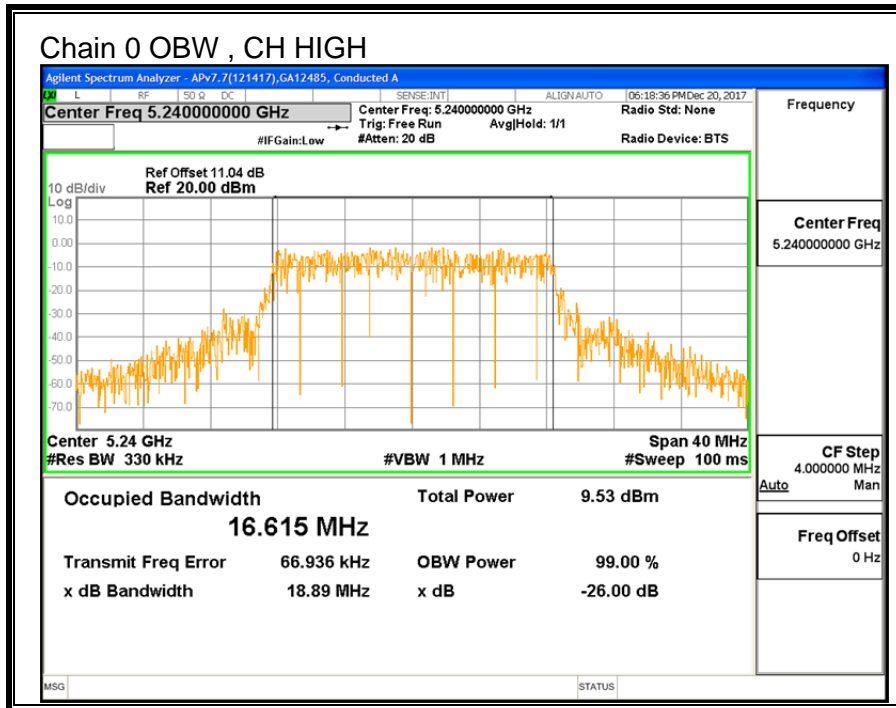
None; for reporting purposes only.

RESULTS

| Channel | Frequency | 99% BW Chain 0 (MHz) | 99% BW Chain 1 (MHz) |
|---------|-----------|----------------------|----------------------|
| Low | 5180 | 16.479 | 16.522 |
| Mid | 5200 | 16.519 | 16.423 |
| High | 5240 | 16.615 | 16.528 |







9.1.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(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.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|---------------------------------------------------------------|
| -0.67 | -4.74 | -2.24 |

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Correlated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|
| -0.67 | -4.74 | 0.54 |

RESULTS

| | | | |
|------------|---------|--------------|----------|
| ID: | GA12485 | Date: | 12/21/17 |
|------------|---------|--------------|----------|

Bandwidth and Antenna Gain

| Channel | Frequency (MHz) | Min 26 dB BW (MHz) | Min 99% BW (MHz) | Directional Gain for Power (dBi) | Directional Gain for PPSD (dBi) |
|---------|--------------------|-----------------------------|---------------------------|-------------------------------------------|------------------------------------------|
| Low | 5180 | 21.25 | 16.479 | -2.24 | 0.54 |
| Mid | 5200 | 21.20 | 16.423 | -2.24 | 0.54 |
| High | 5240 | 21.05 | 16.528 | -2.24 | 0.54 |

Limits

| Channel | Frequency (MHz) | FCC Power Limit (dBm) | IC EIRP Limit (dBm) | Max IC Power (dBm) | Power Limit (dBm) | FCC PPSD Limit (dBm) | IC eirp PSD Limit (dBm) | PPSD Limit (dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|-------------------------------|-------------------------------------|------------------------|
| Low | 5180 | 24.00 | 22.17 | 24.41 | 24.00 | 11.00 | 10.00 | 9.46 |
| Mid | 5200 | 24.00 | 22.15 | 24.39 | 24.00 | 11.00 | 10.00 | 9.46 |
| High | 5240 | 24.00 | 22.18 | 24.42 | 24.00 | 11.00 | 10.00 | 9.46 |

| | | |
|---------------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.11 | Included in Calculations of Corr'd PPSD |
|---------------------------|------|------------------------------------------------|

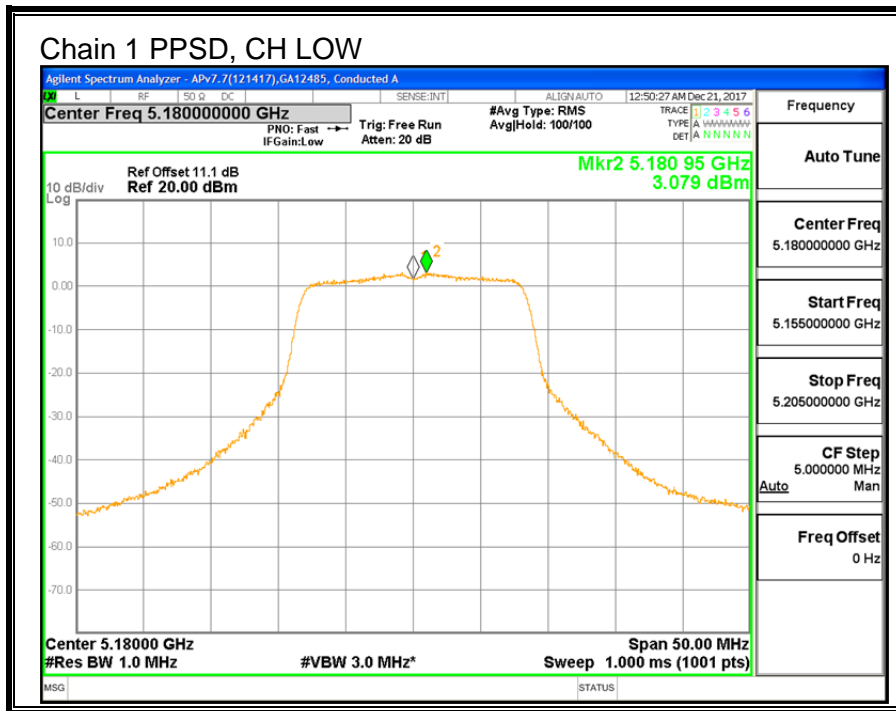
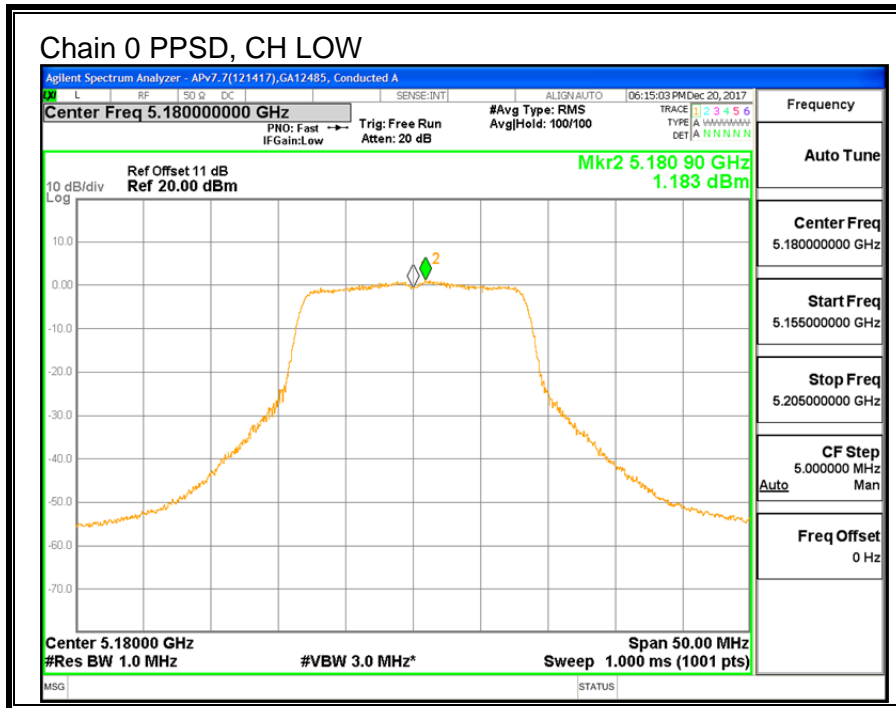
Output Power Results

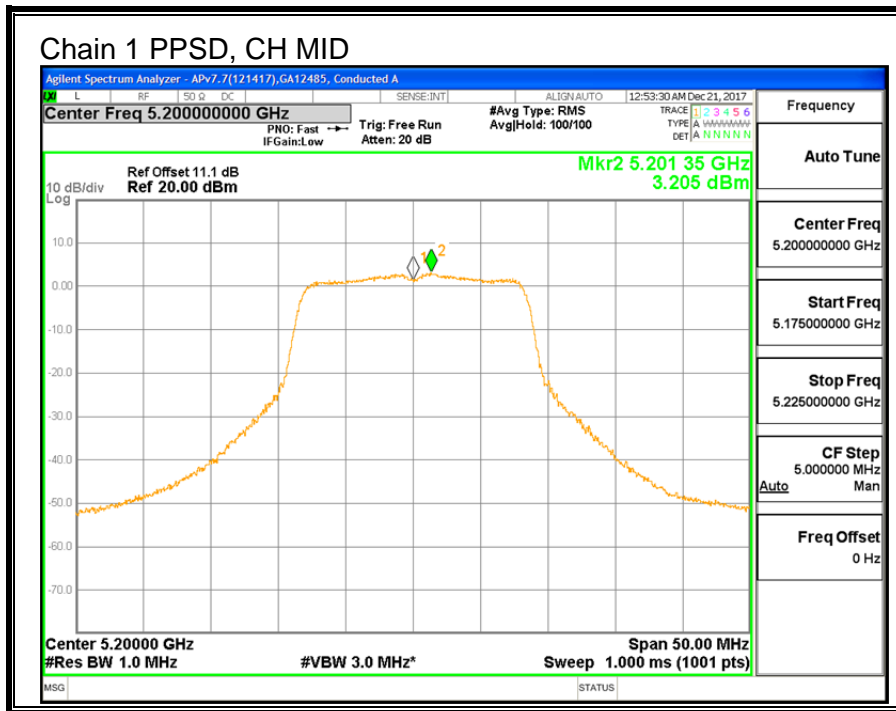
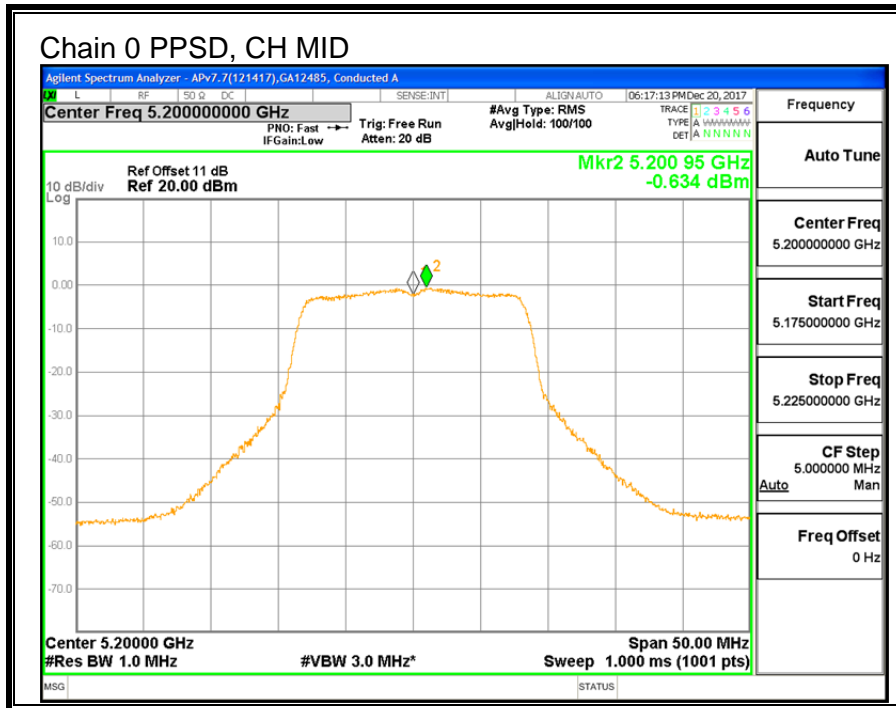
| Channel | Frequency (MHz) | Chain 0 Meas Power (dBm) | Chain 1 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low | 5180 | 8.73 | 13.36 | 14.65 | 24.00 | -9.35 |
| Mid | 5200 | 8.76 | 13.16 | 14.51 | 24.00 | -9.49 |
| High | 5240 | 8.76 | 13.35 | 14.65 | 24.00 | -9.35 |

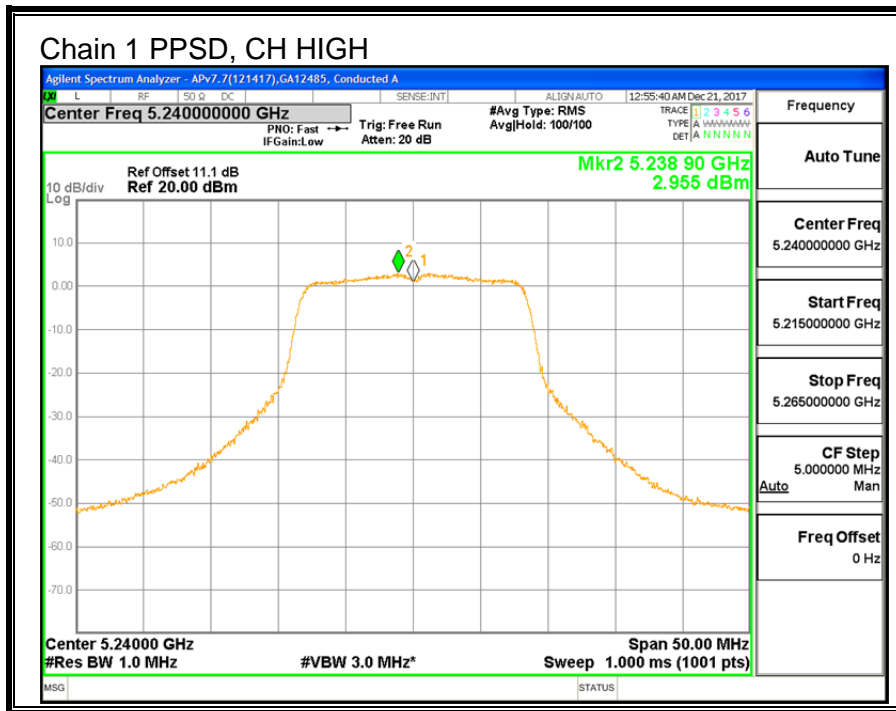
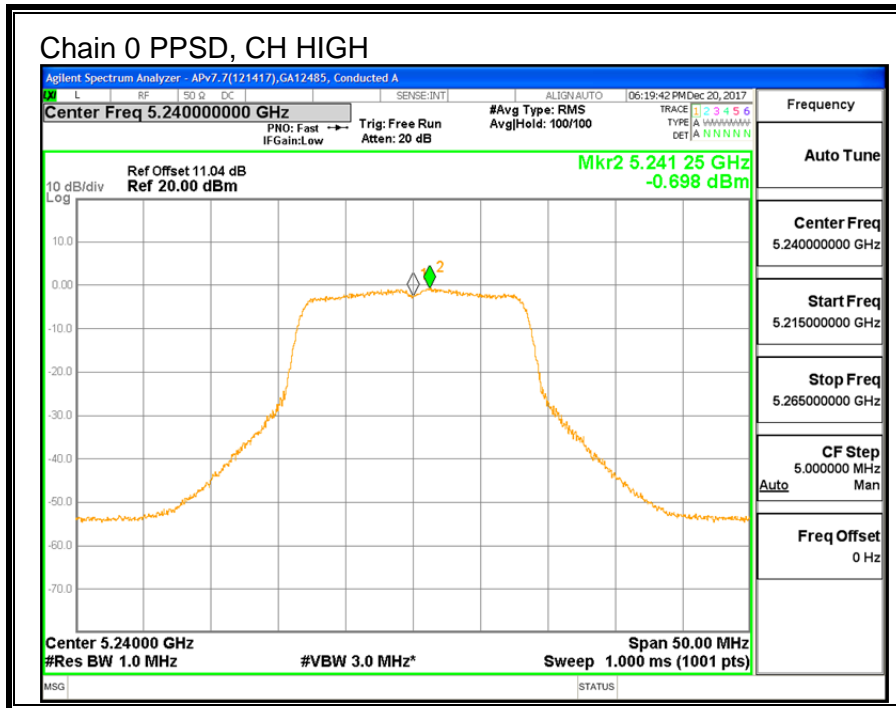
PPSD Results

| Channel | Frequency (MHz) | Chain 0 Meas PPSD (dBm) | Chain 1 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---------|--------------------|----------------------------------|----------------------------------|----------------------------------|------------------------|------------------------|
| Low | 5180 | 1.183 | 3.079 | 5.35 | 9.46 | -4.11 |
| Mid | 5200 | -0.634 | 3.205 | 4.82 | 9.46 | -4.64 |
| High | 5240 | -0.698 | 2.955 | 4.62 | 9.46 | -4.84 |

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.







9.2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND

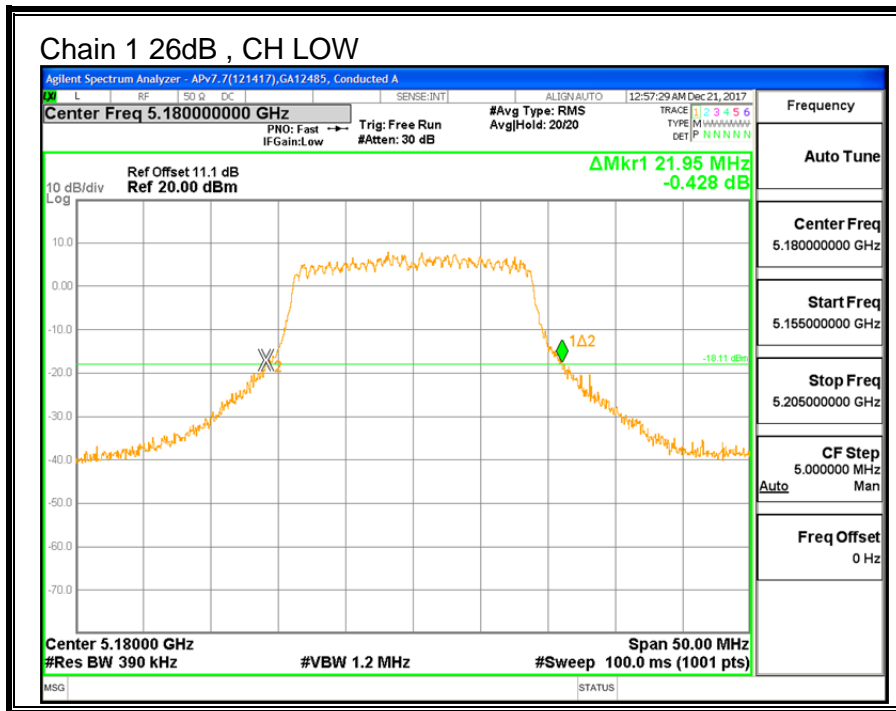
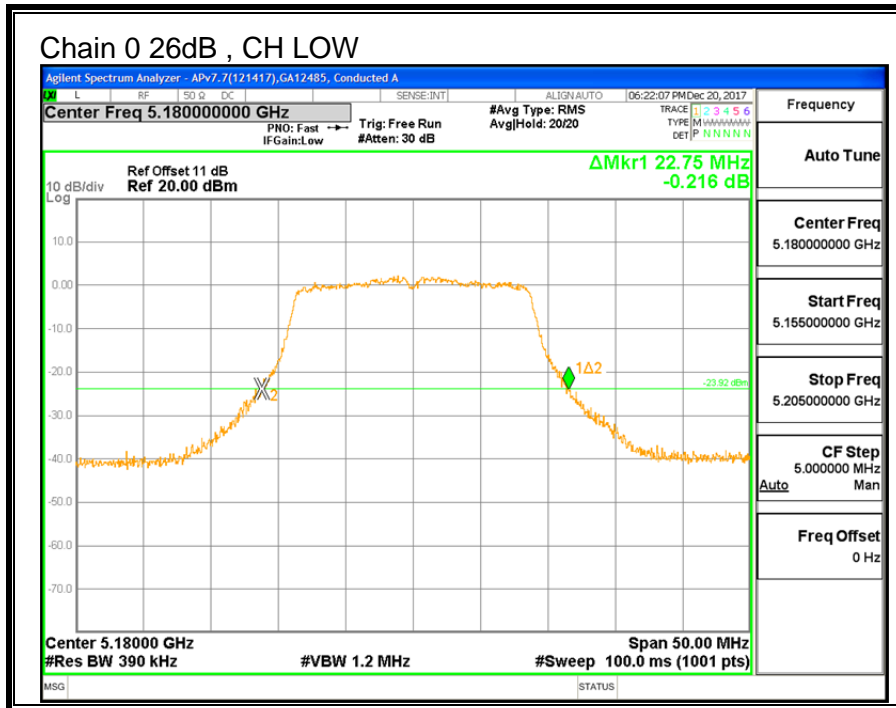
9.2.1. 26 dB BANDWIDTH

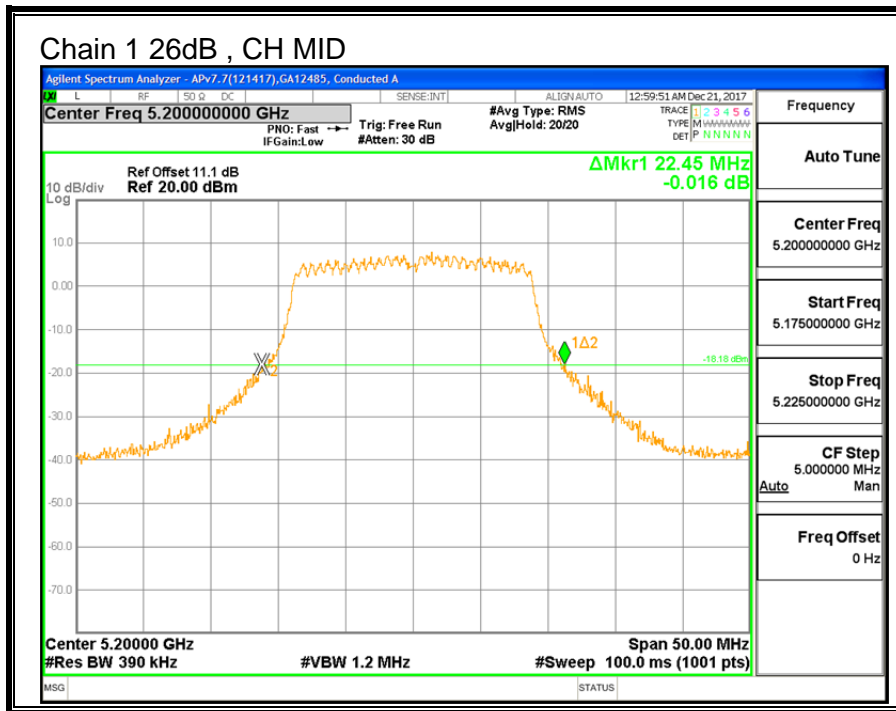
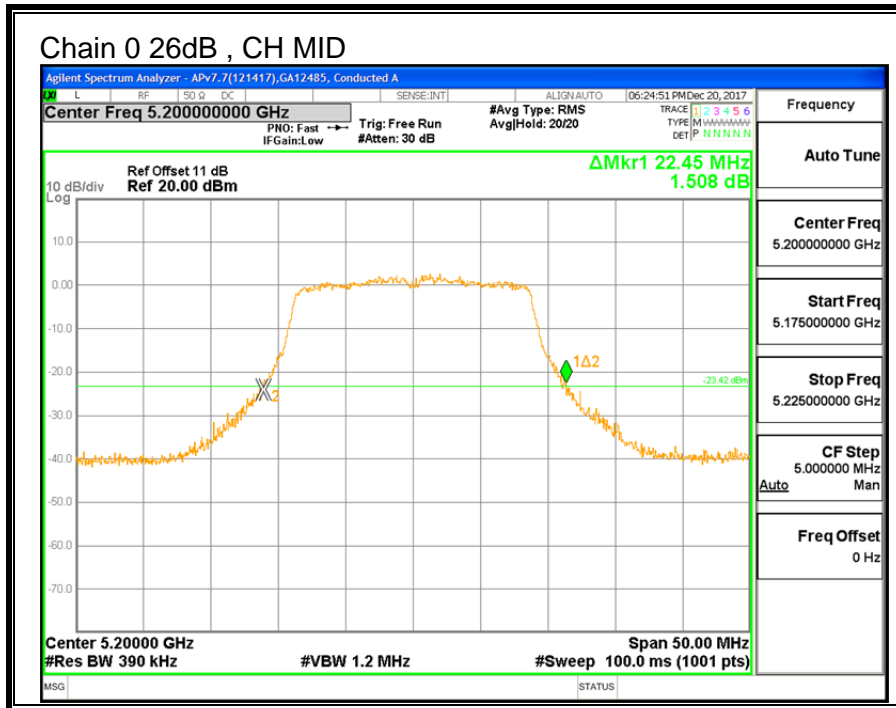
LIMITS

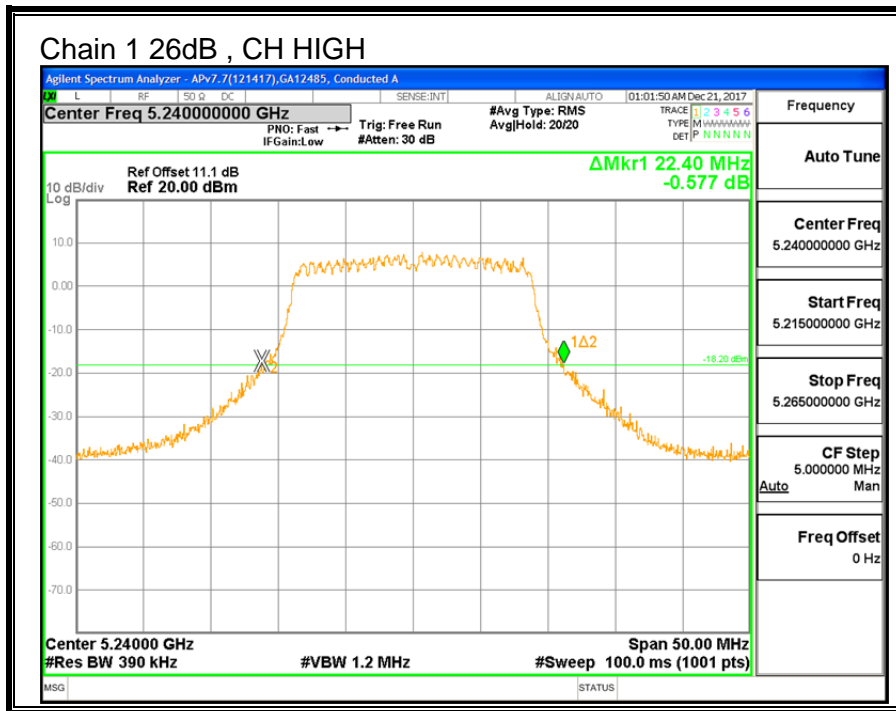
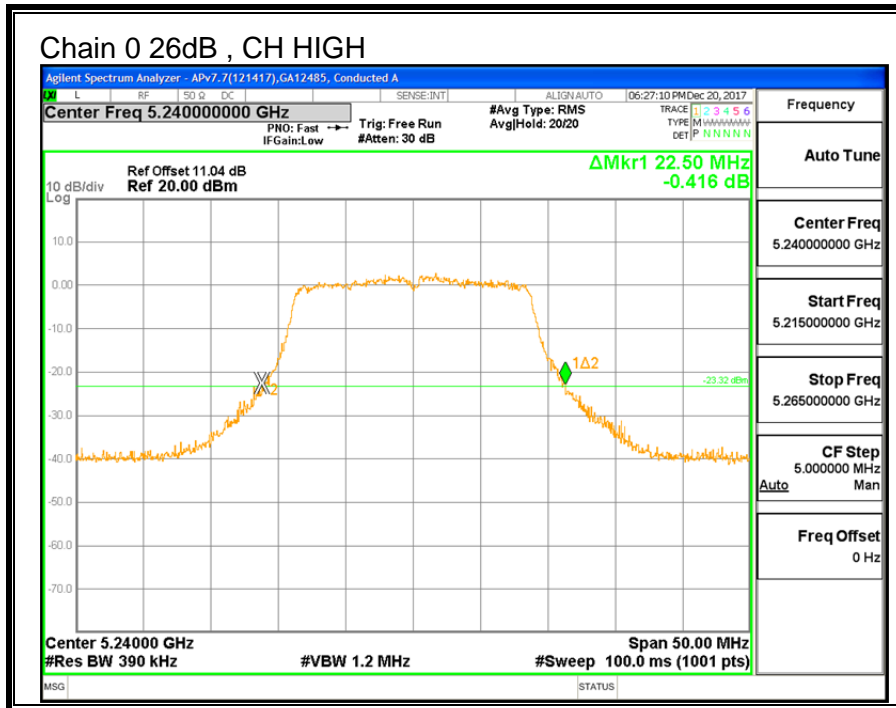
None; for reporting purposes only.

RESULTS

| Channel | Frequency | 26 dB BW Chain 0 (MHz) | 26 dB BW Chain 1 (MHz) |
|---------|-----------|------------------------------|------------------------------|
| Low | 5180 | 22.75 | 21.95 |
| Mid | 5200 | 22.45 | 22.45 |
| High | 5240 | 22.50 | 22.40 |







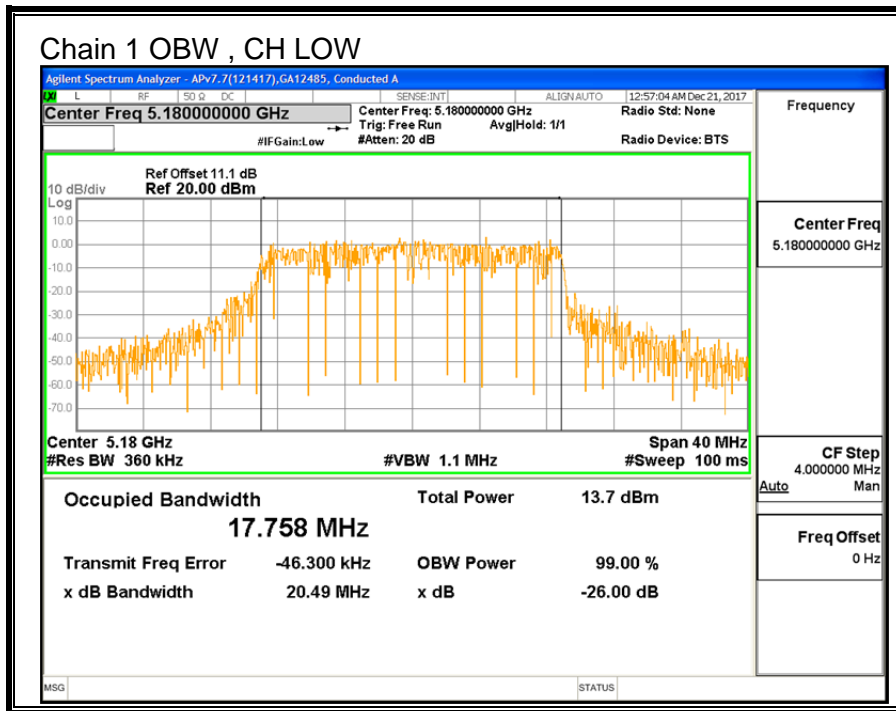
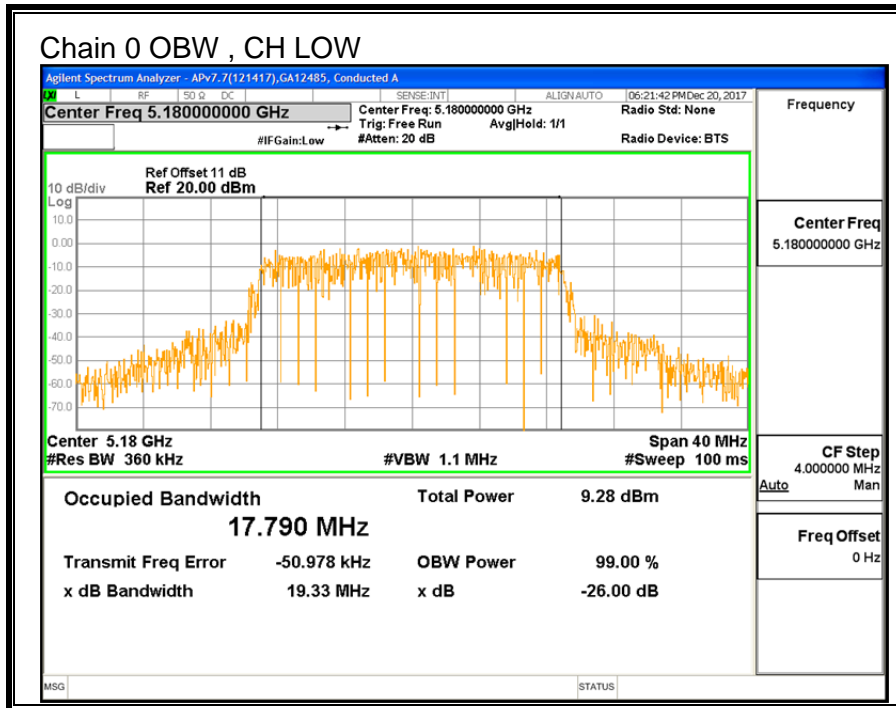
9.2.2. 99% BANDWIDTH

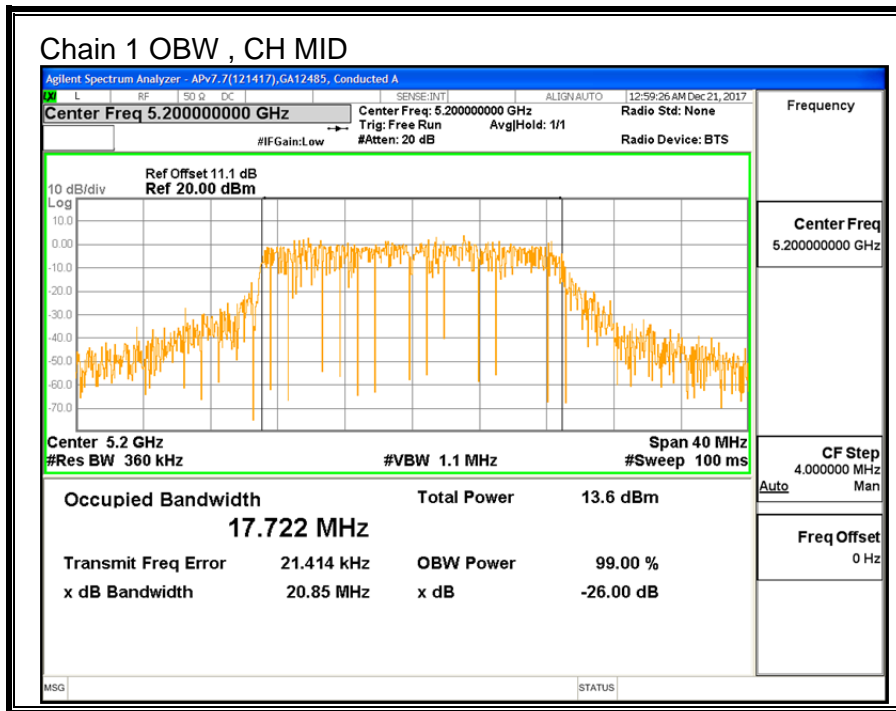
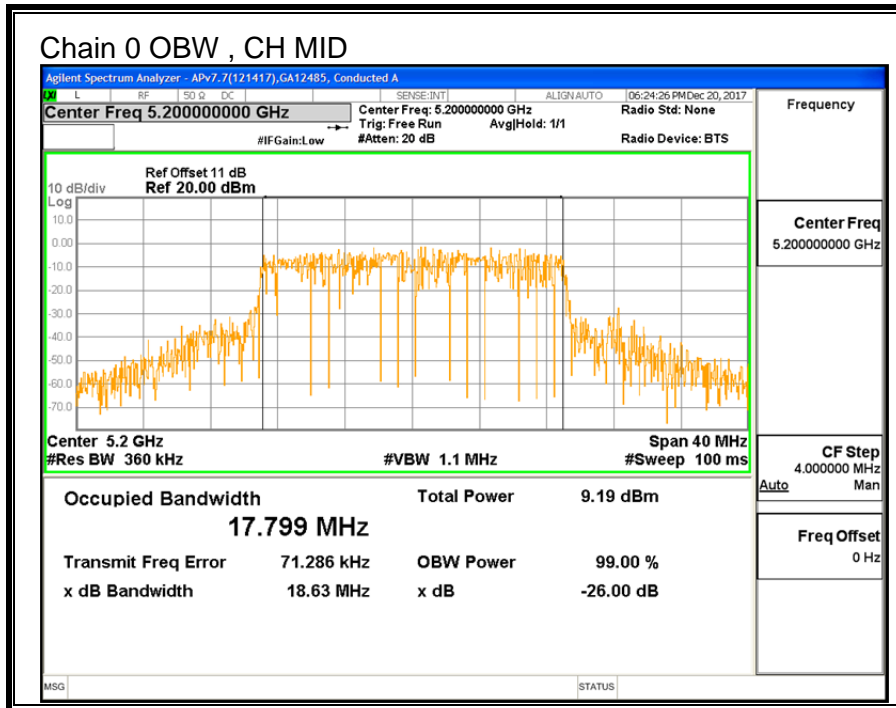
LIMITS

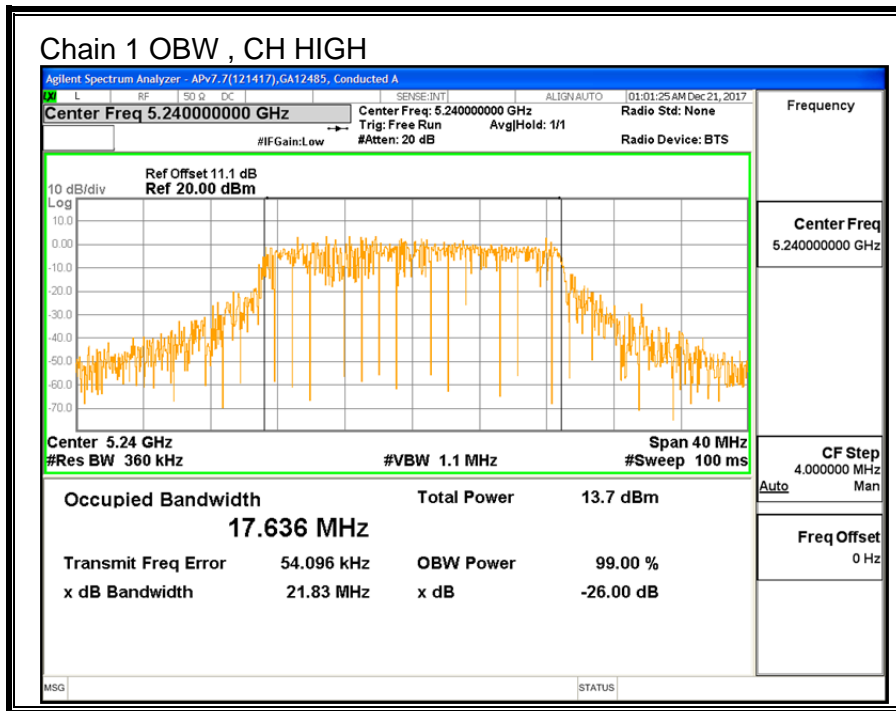
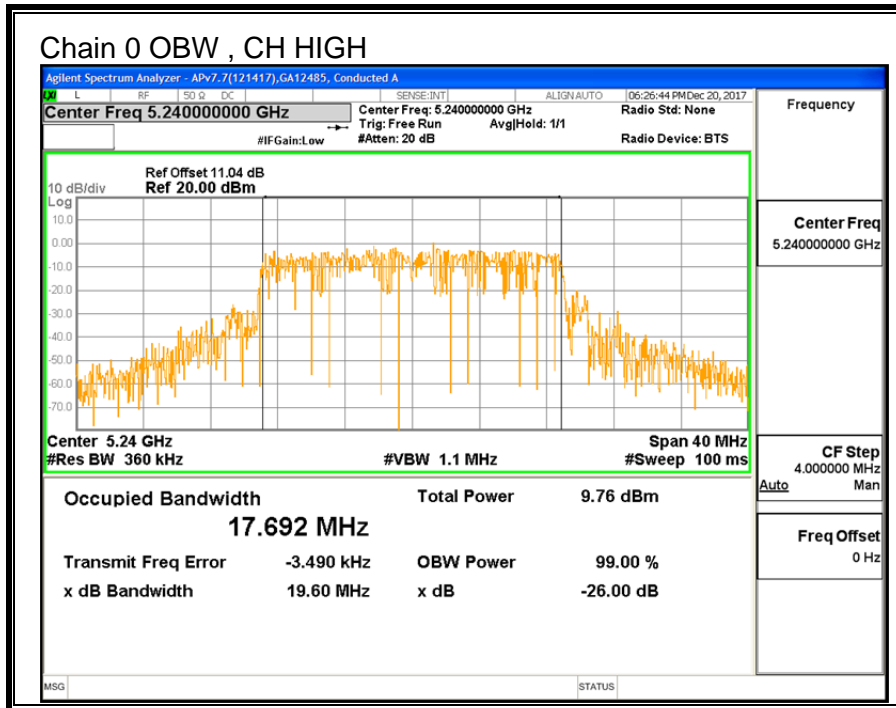
None; for reporting purposes only.

RESULTS

| Channel | Frequency | 99% BW Chain 0 (MHz) | 99% BW Chain 1 (MHz) |
|---------|-----------|----------------------|----------------------|
| Low | 5180 | 17.790 | 17.758 |
| Mid | 5200 | 17.799 | 17.722 |
| High | 5240 | 17.692 | 17.636 |







9.2.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(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.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|---------------------------------------------------------------|
| -0.67 | -4.74 | -2.24 |

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Correlated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|
| -0.67 | -4.74 | 0.54 |

RESULTS

| | | | |
|------------|---------|--------------|----------|
| ID: | GA12485 | Date: | 12/21/17 |
|------------|---------|--------------|----------|

Bandwidth and Antenna Gain

| Channel | Frequency (MHz) | Min 26 dB BW (MHz) | Min 99% BW (MHz) | Directional Gain for Power (dBi) | Directional Gain for PPSD (dBi) |
|---------|--------------------|-----------------------------|---------------------------|-------------------------------------------|------------------------------------------|
| Low | 5180 | 21.95 | 17.758 | -2.24 | 0.54 |
| Mid | 5200 | 22.45 | 17.722 | -2.24 | 0.54 |
| High | 5240 | 22.40 | 17.636 | -2.24 | 0.54 |

Limits

| Channel | Frequency (MHz) | FCC Power Limit (dBm) | IC EIRP Limit (dBm) | Max IC Power (dBm) | Power Limit (dBm) | FCC PPSD Limit (dBm) | IC eirp PSD Limit (dBm) | PPSD Limit (dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|-------------------------------|-------------------------------------|------------------------|
| Low | 5180 | 24.00 | 22.49 | 24.73 | 24.00 | 11.00 | 10.00 | 9.46 |
| Mid | 5200 | 24.00 | 22.49 | 24.73 | 24.00 | 11.00 | 10.00 | 9.46 |
| High | 5240 | 24.00 | 22.46 | 24.70 | 24.00 | 11.00 | 10.00 | 9.46 |

| | | |
|---------------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.14 | Included in Calculations of Corr'd PPSD |
|---------------------------|------|------------------------------------------------|

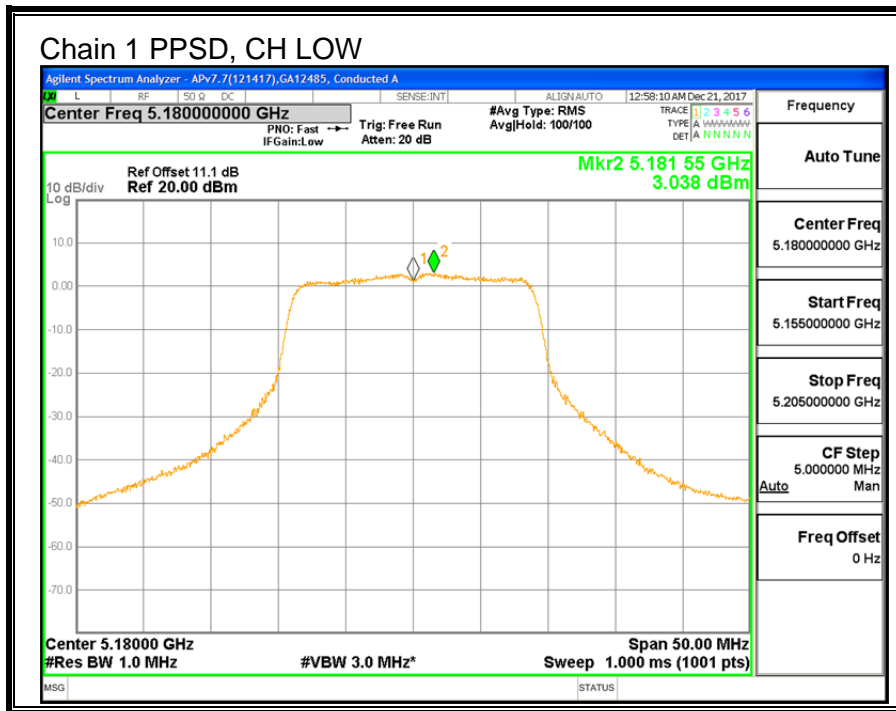
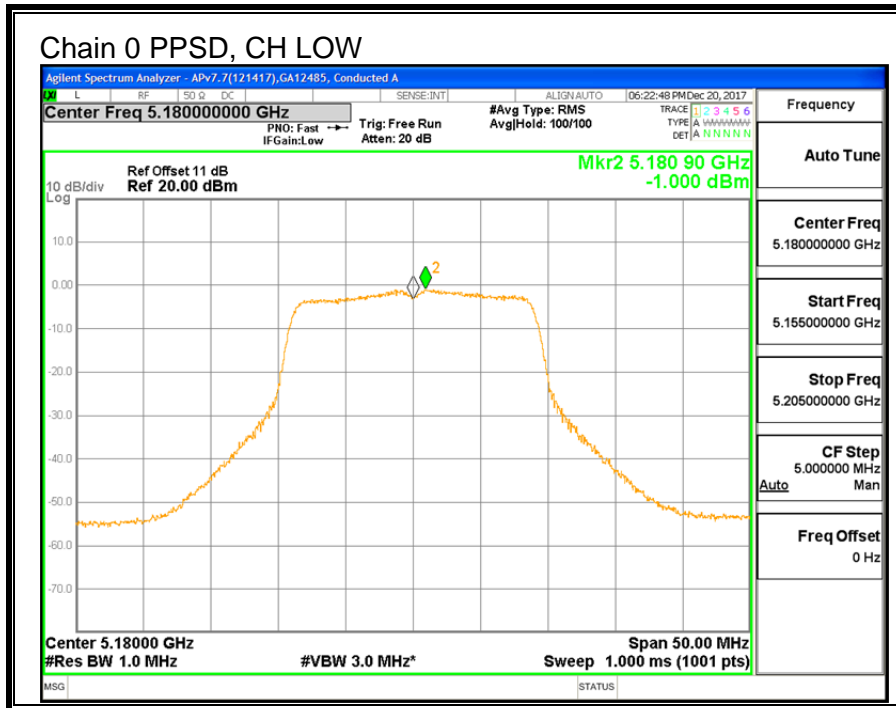
Output Power Results

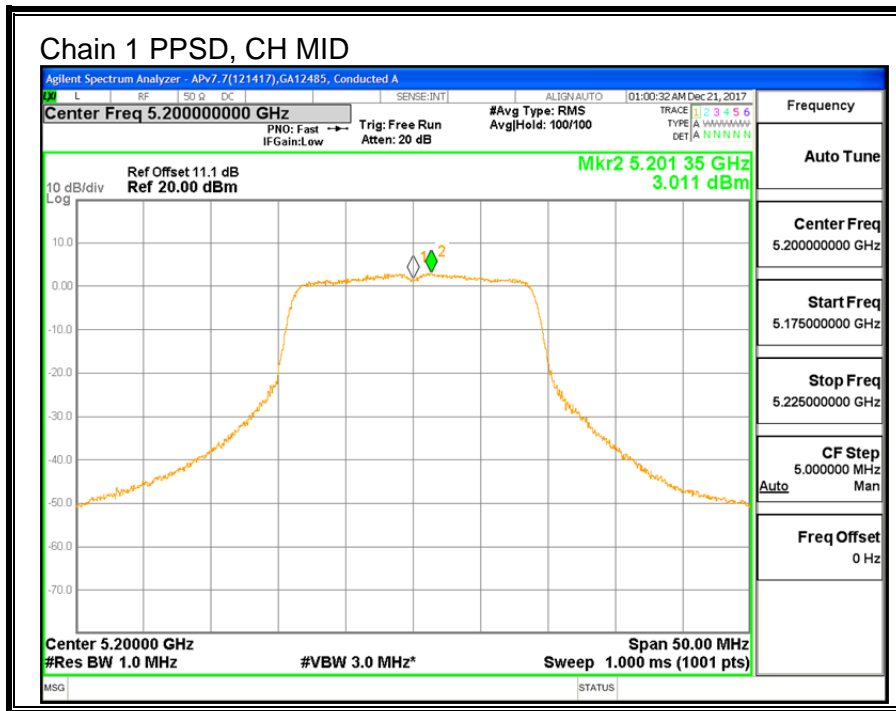
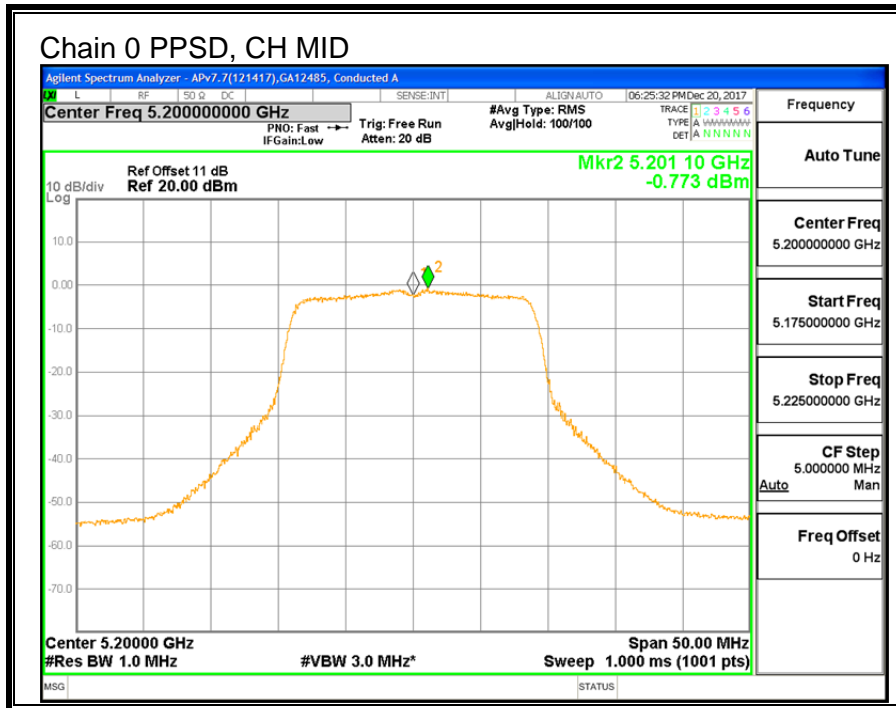
| Channel | Frequency (MHz) | Chain 0 Meas Power (dBm) | Chain 1 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low | 5180 | 8.63 | 13.66 | 14.85 | 24.00 | -9.15 |
| Mid | 5200 | 8.58 | 13.51 | 14.72 | 24.00 | -9.28 |
| High | 5240 | 8.64 | 13.60 | 14.80 | 24.00 | -9.20 |

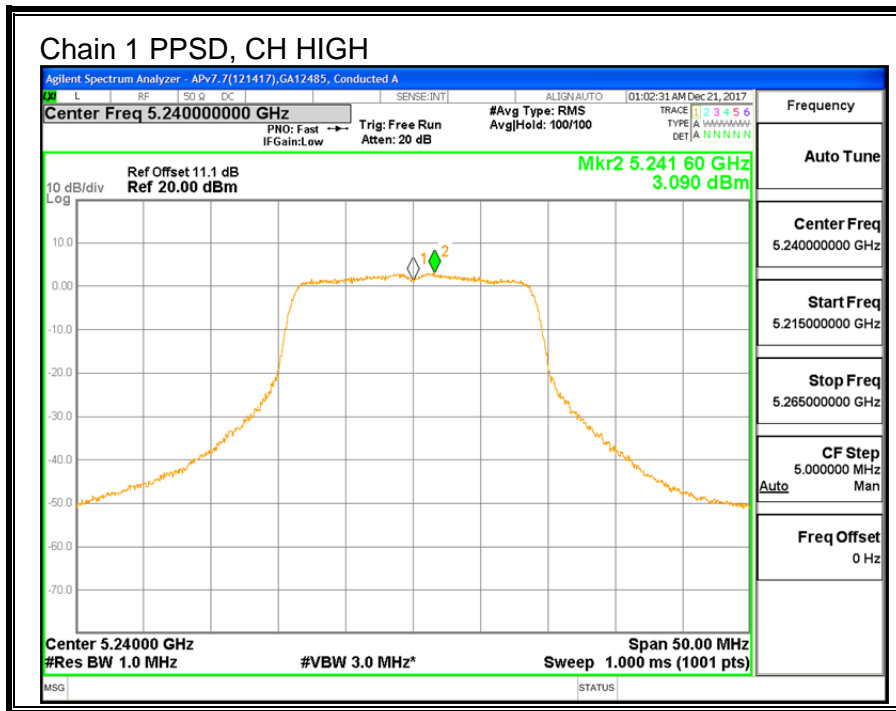
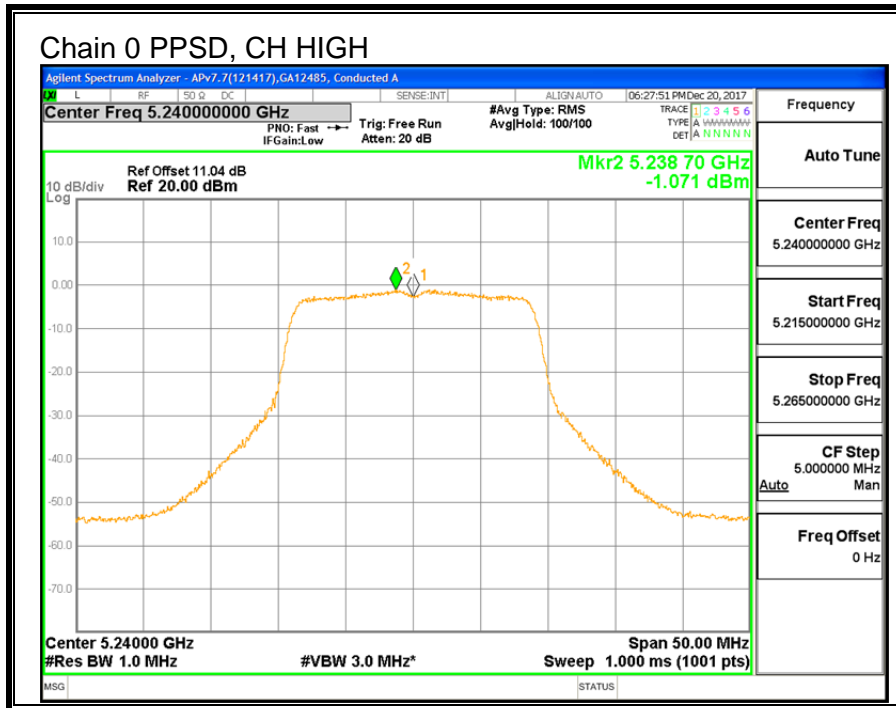
PPSD Results

| Channel | Frequency (MHz) | Chain 0 Meas PPSD (dBm) | Chain 1 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---------|--------------------|----------------------------------|----------------------------------|----------------------------------|------------------------|------------------------|
| Low | 5180 | -1.000 | 3.038 | 4.62 | 9.46 | -4.84 |
| Mid | 5200 | -0.773 | 3.011 | 4.67 | 9.46 | -4.79 |
| High | 5240 | -1.071 | 3.090 | 4.64 | 9.46 | -4.82 |

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.







9.3. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND

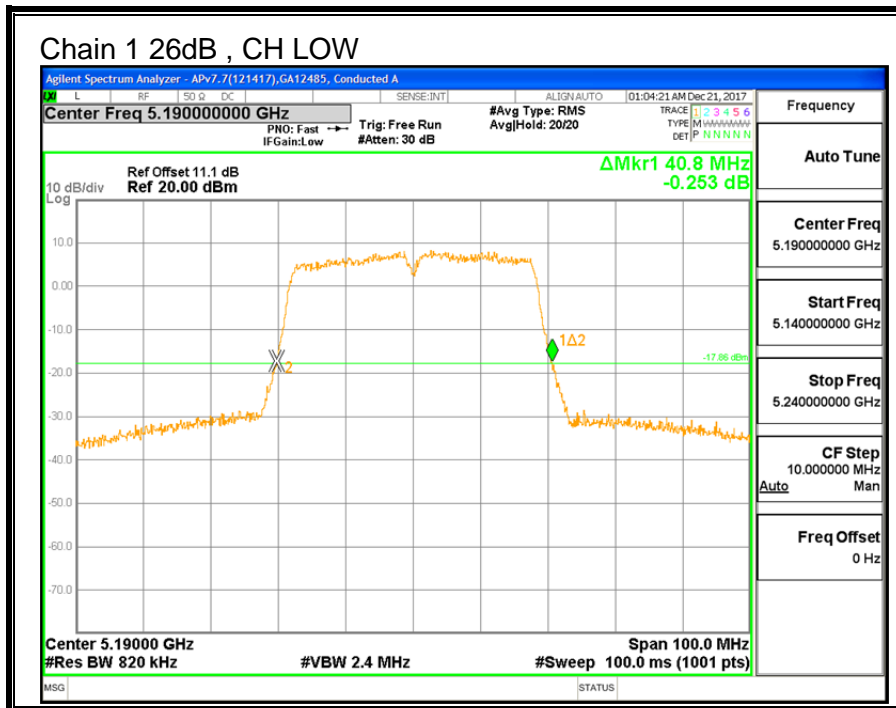
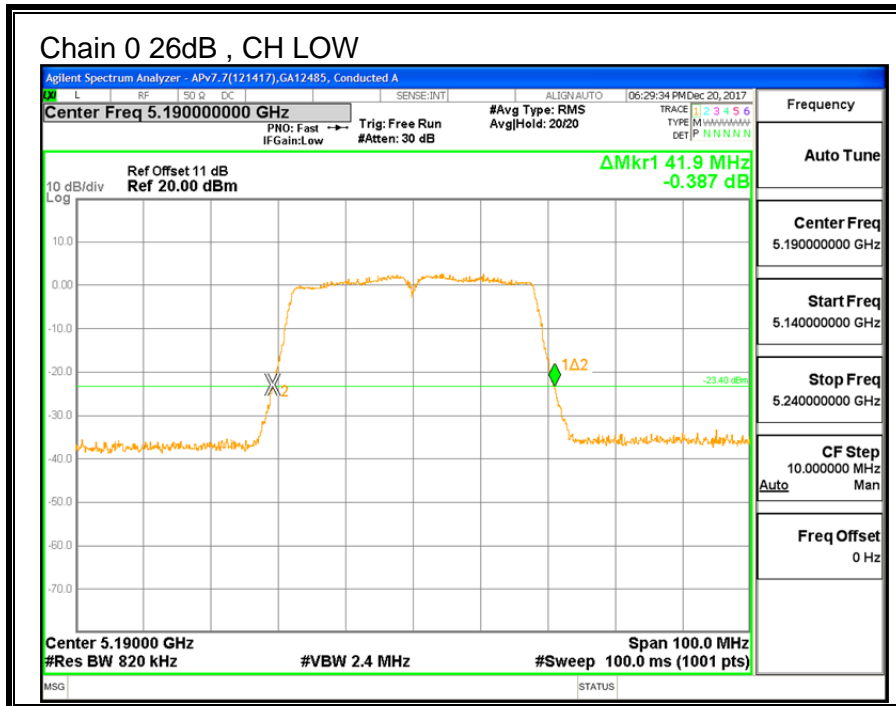
9.3.1. 26 dB BANDWIDTH

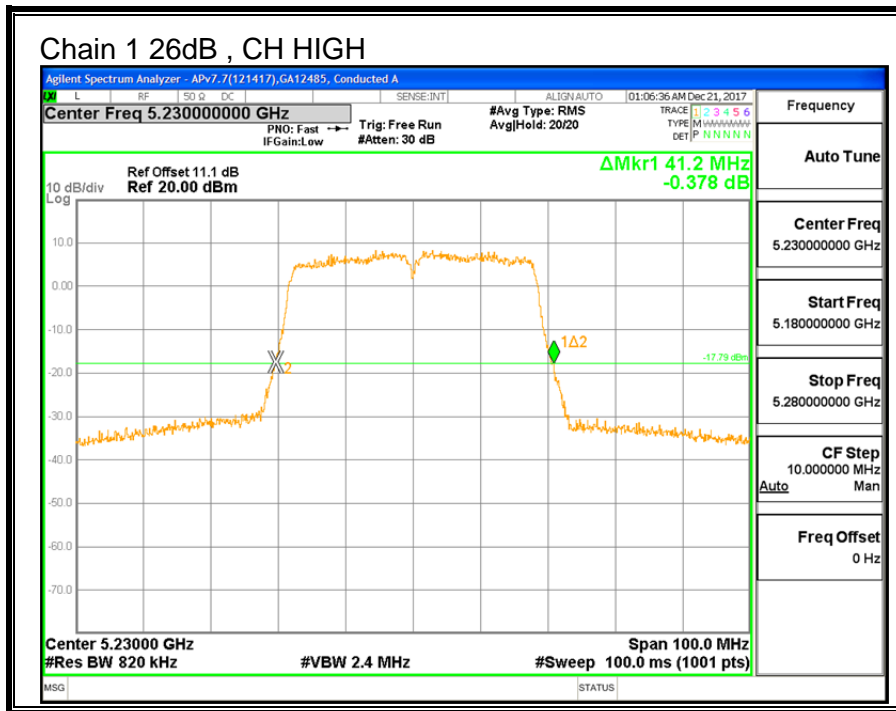
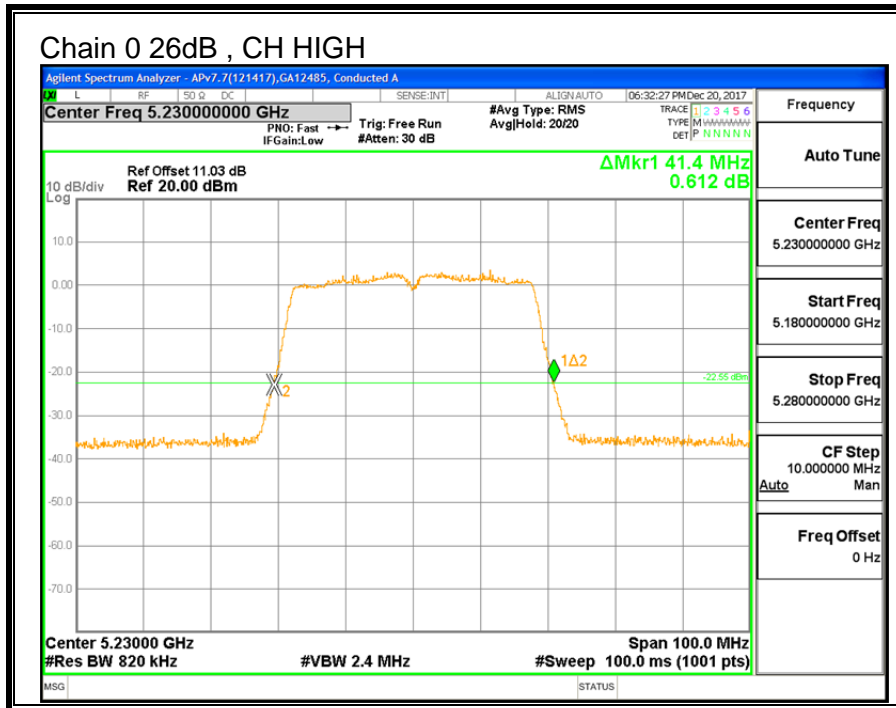
LIMITS

None; for reporting purposes only.

RESULTS

| Channel | Frequency | 26 dB BW Chain 0 (MHz) | 26 dB BW Chain 1 (MHz) |
|---------|-----------|------------------------------|------------------------------|
| Low | 5190 | 41.9 | 40.8 |
| High | 5230 | 41.4 | 41.2 |





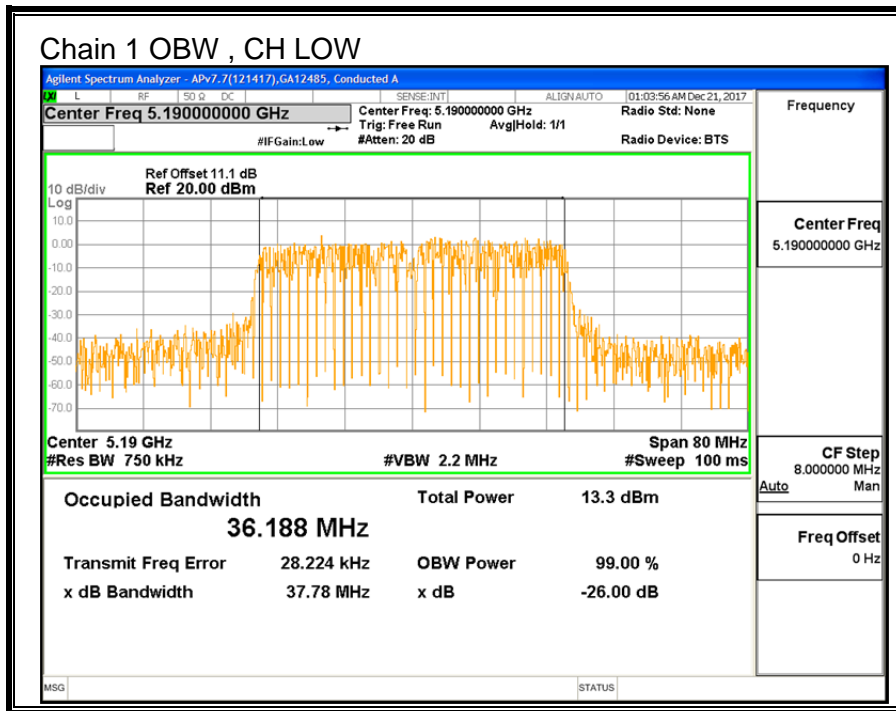
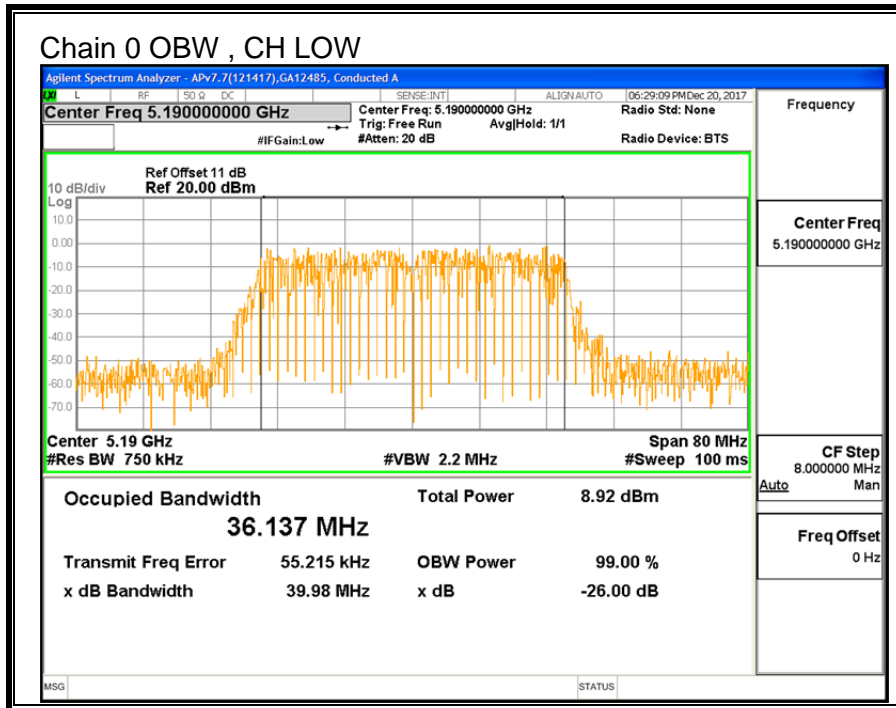
9.3.2. 99% BANDWIDTH

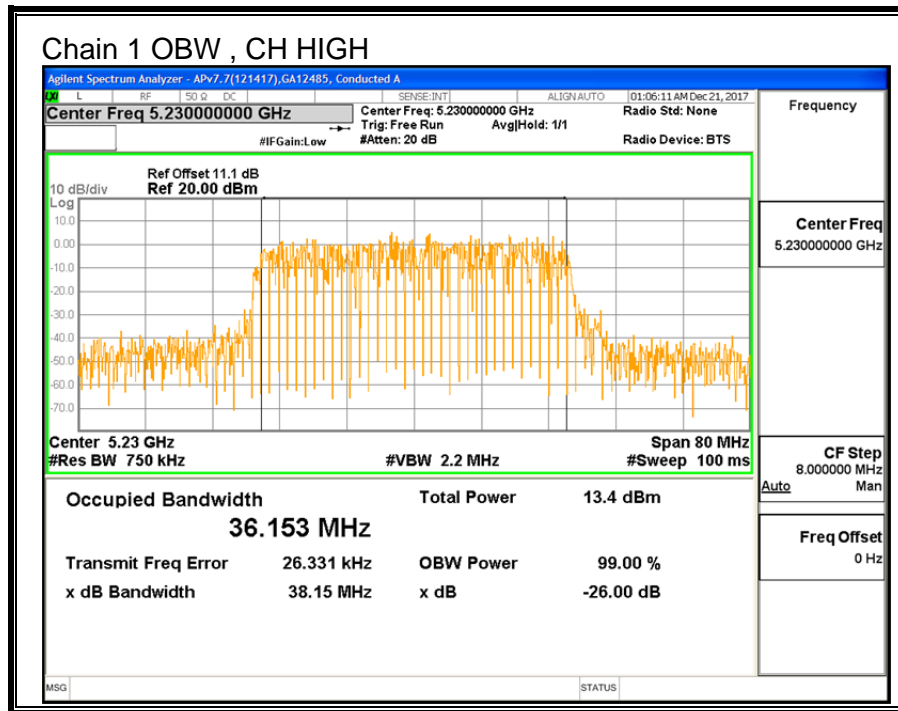
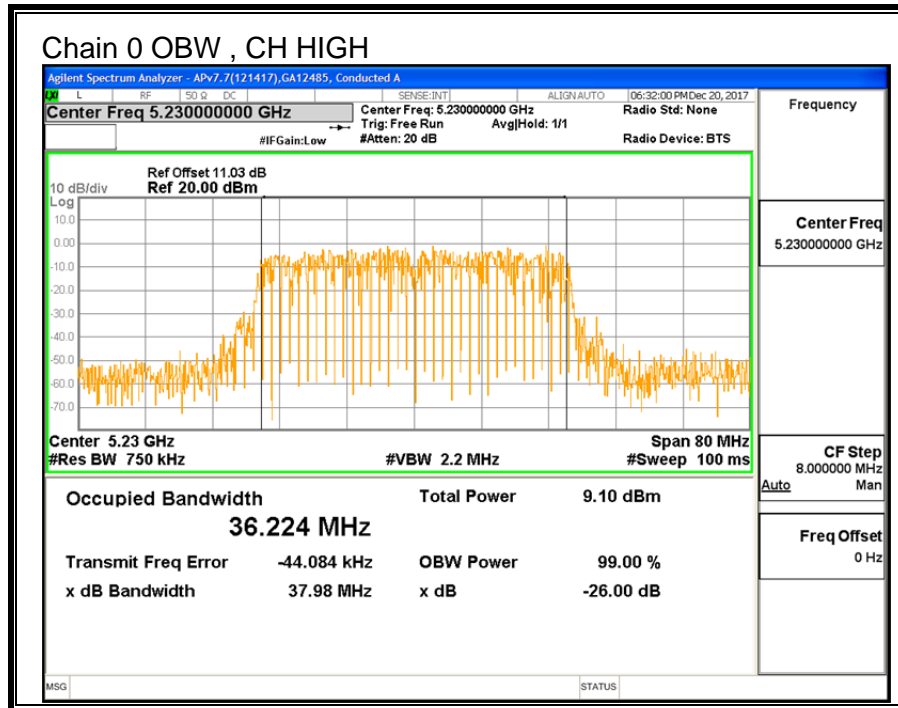
LIMITS

None; for reporting purposes only.

RESULTS

| Channel | Frequency | 99% BW Chain 0 (MHz) | 99% BW Chain 1 (MHz) |
|----------------|------------------|-------------------------------------|-------------------------------------|
| Low | 5190 | 36.137 | 36.188 |
| High | 5230 | 36.224 | 36.153 |





9.3.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(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.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|---------------------------------------------------------------|
| -0.67 | -4.74 | -2.24 |

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

| Chain 0 Antenna Gain (dBi) | Chain 1 Antenna Gain (dBi) | Correlated Chains Directional Gain (dBi) |
|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|
| -0.67 | -4.74 | 0.54 |

RESULTS

| | | | |
|------------|---------|--------------|----------|
| ID: | GA12485 | Date: | 12/21/17 |
|------------|---------|--------------|----------|

Bandwidth and Antenna Gain

| Channel | Frequency (MHz) | Min 26 dB BW (MHz) | Min 99% BW (MHz) | Directional Gain for Power (dBi) | Directional Gain for PPSD (dBi) |
|---------|--------------------|-----------------------------|---------------------------|-------------------------------------------|------------------------------------------|
| Low | 5190 | 40.80 | 36.137 | -2.24 | 0.54 |
| High | 5230 | 41.20 | 36.153 | -2.24 | 0.54 |

Limits

| Channel | Frequency (MHz) | FCC Power Limit (dBm) | IC EIRP Limit (dBm) | Max IC Power (dBm) | Power Limit (dBm) | FCC PPSD Limit (dBm) | IC eirp PSD Limit (dBm) | PPSD Limit (dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|-------------------------------|-------------------------------------|------------------------|
| Low | 5190 | 24.00 | 23.00 | 25.24 | 24.00 | 11.00 | 10.00 | 9.46 |
| High | 5230 | 24.00 | 23.00 | 25.24 | 24.00 | 11.00 | 10.00 | 9.46 |

| | | |
|---------------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.41 | Included in Calculations of Corr'd PPSD |
|---------------------------|------|------------------------------------------------|

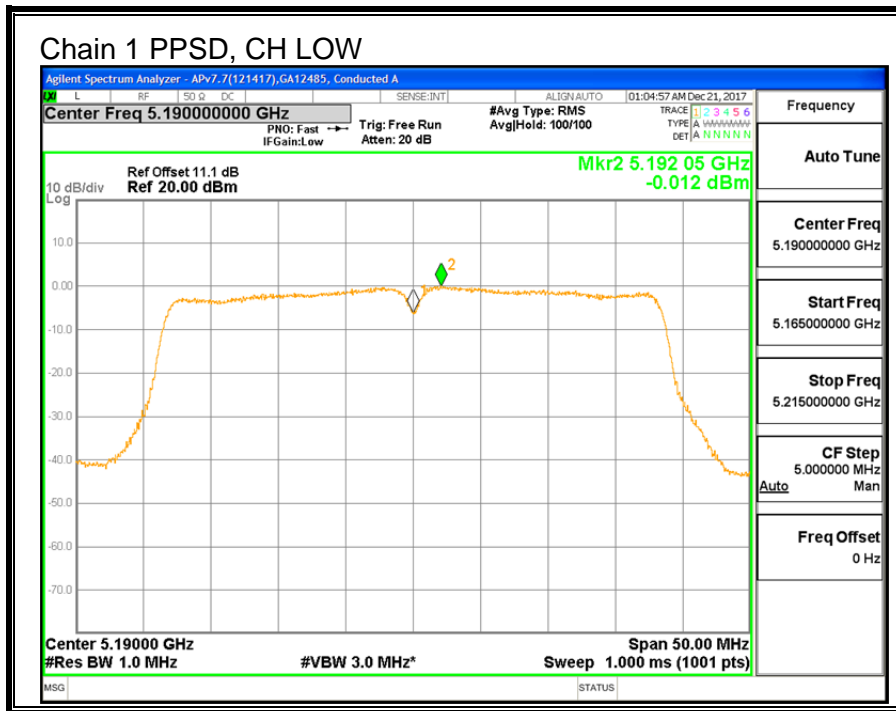
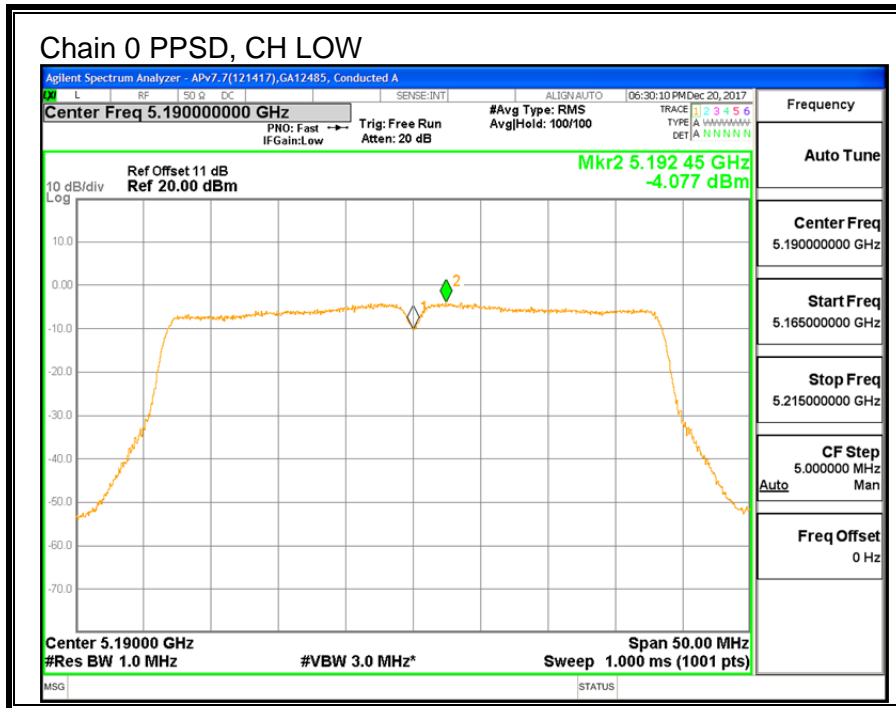
Output Power Results

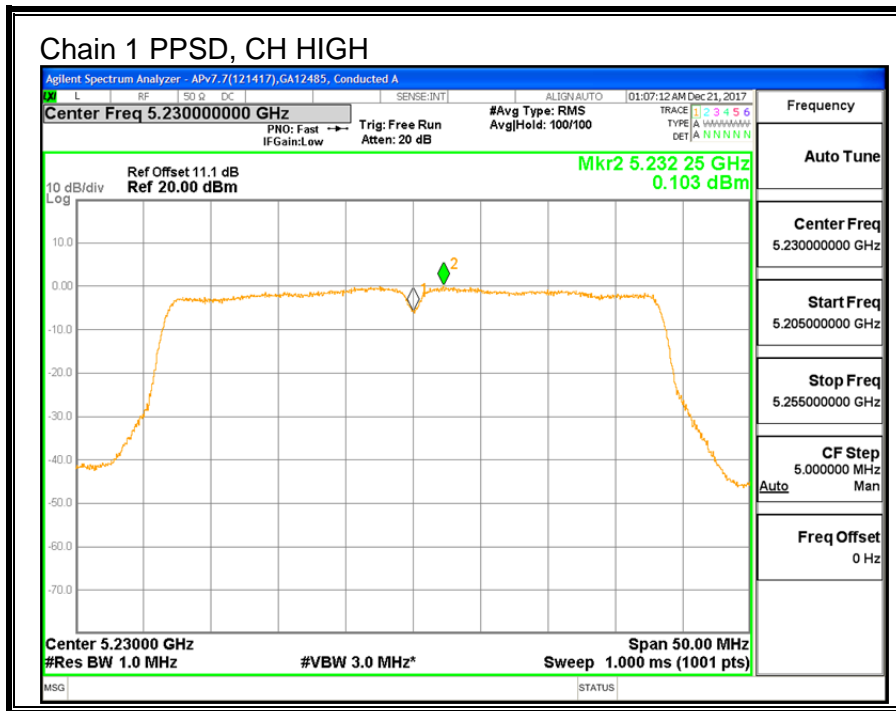
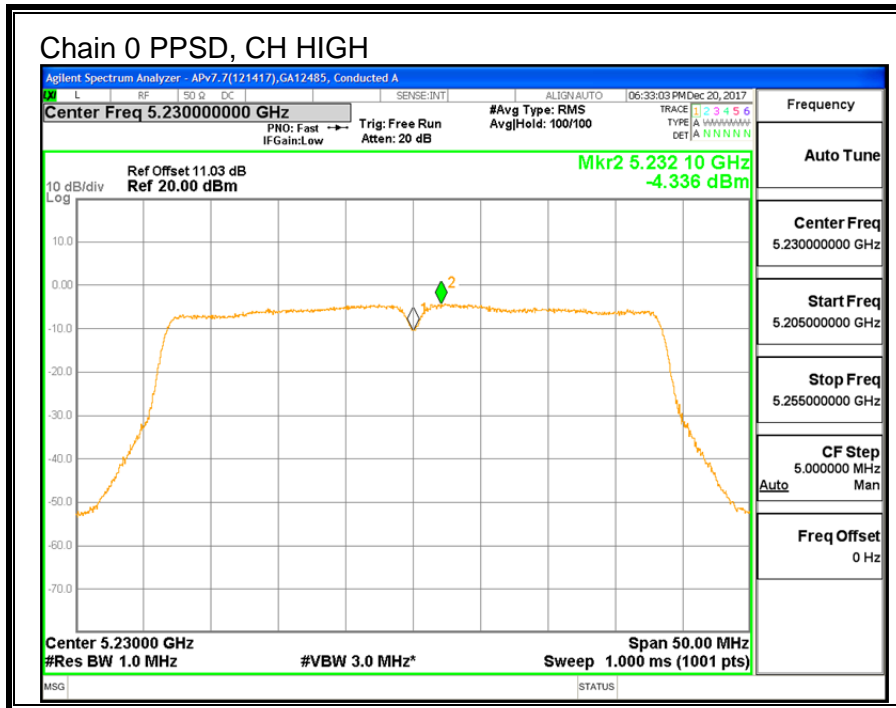
| Channel | Frequency (MHz) | Chain 0 Meas Power (dBm) | Chain 1 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low | 5190 | 8.58 | 12.94 | 14.30 | 24.00 | -9.70 |
| High | 5230 | 8.59 | 13.14 | 14.45 | 24.00 | -9.55 |

PPSD Results

| Channel | Frequency (MHz) | Chain 0 Meas PPSD (dBm) | Chain 1 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---------|--------------------|----------------------------------|----------------------------------|----------------------------------|------------------------|------------------------|
| Low | 5190 | -4.077 | -0.012 | 1.83 | 9.46 | -7.63 |
| High | 5230 | -4.336 | 0.103 | 1.85 | 9.46 | -7.61 |

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.





9.4. 11ac HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND

9.4.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

| Channel | Frequency | 26 dB BW Chain 0 (MHz) | 26 dB BW Chain 1 (MHz) |
|----------------|------------------|---------------------------------------|---------------------------------------|
| Mid | 5210 | 83.8 | 86.4 |

