# TEST REPORT

| | |
|---|---|
| **Applicant:** | Elo Touch Solutions, Inc. |
| **Address of Applicant:** | 670 N McCarthy Blvd, Suite 100 Milpitas CA 95035, USA |
| **Manufacturer/Factory:** | Elo Touch Solutions, Inc. |
| **Address of Manufacturer/Factory:** | 670 N McCarthy Blvd, Suite 100 Milpitas CA 95035, USA |
| **Equipment Under Test (EUT)** | |
| Product Name: | Touch All-in-One Computer |
| Model No.: | ESY15I1D |
| Trade Mark: | Elo |
| **FCC ID:** | RBWESY15I1D |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart E Section 15.407 |
| **Date of sample receipt:** | Mar. 28, 2020 |
| **Date of Test:** | Mar. 28, 2020~Apr. 01, 2021 |
| **Date of report issued:** | Apr. 01, 2021 |
| **Test Result :** | PASS * |

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:


**Robinson Lo**
**Laboratory Manager**

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *Apr. 01, 2021* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Prepared By:***  ***Date:*** Apr. 01, 2021

***Tested/Project Engineer***

***Check By:***  ***Date:*** Apr. 01, 2021

***Reviewer***

# 3 Contents

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# 4 Test Summary

| Test Item | Section in CFR 47 | Result |
|---|---|---|
| Antenna requirement | 15.203 | Pass |
| AC Power Line Conducted Emission | 15.207 | Pass |
| Conducted Peak Output Power | 15.407(a)(3) | Pass |
| Channel Bandwidth | 15.407(e) | Pass |
| Power Spectral Density | 15.407(a)(3) | Pass |
| Band Edge | 15.407(b)(4) | Pass |
| Spurious Emission | 15.205/15.209/15.407(b)(4) | Pass |
| Frequency Stability | 15.407(g) | Pass |

*Remarks：*

*1. Pass: The EUT complies with the essential requirements in the standard.*

*2. Test according to ANSI C63.10:2013.*

## 4.1 Measurement Uncertainty

| Test Item | Frequency Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30MHz-200MHz | 3.8039dB | (1) |
| Radiated Emission | 200MHz-1GHz | 3.9679dB | (1) |
| Radiated Emission | 1GHz-18GHz | 4.29dB | (1) |
| Radiated Emission | 18GHz-40GHz | 3.30dB | (1) |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | 3.44dB | (1) |
| Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%. | | | |

# 5 General Information

## 5.1 General Description of EUT

| | |
|---|---|
| Product Name: | Touch All-in-One Computer |
| Model No.: | ESY15I1D |
| Serial No.: | N/A |
| Hardware Version: | N/A |
| Software Version: | N/A |
| Test sample(s) ID: | GTSL202103000292-1(Engineer sample)<br>GTSL202103000292-2(Normal sample) |
| Operation Frequency: | 802.11a/802.11n(HT20)/802.11ac(HT20): 5745MHz ~ 5825MHz<br>802.11n(HT40)/ 802.11ac(HT40): 5755MHz ~ 5795MHz<br>802.11ac(HT80): 5775MHz |
| Channel numbers: | 802.11a/802.11n(HT20)/802.11ac(HT20): 5<br>802.11n(HT40)/ 802.11ac(HT40): 2<br>802.11ac(HT80): 1 |
| Channel bandwidth: | 802.11a/802.11n(HT20)/802.11ac(HT20) : 20MHz<br>802.11n(HT40)/802.11ac(HT40) : 40MHz<br>802.11ac(HT80): 80MHz |
| Modulation technology: | 802.11a/802.11n(H20)/802.11n(H40)/802.11ac(HT20)/802.11ac(HT40)<br>/802.11ac(HT80):<br>Orthogonal Frequency Division Multiplexing (OFDM) |
| Antenna Type: | FPCB antenna |
| Antenna gain: | Antenna 1:1dBi<br>Antenna 2:1dBi<br>MIMO: 4.01dBi |
| Power supply: | DC 19V 3.0A |

| Operation Frequency each of channel | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 149 | 5745MHz | 151 | 5755MHz | 153 | 5765MHz | 155 | 5775MHz |
| 157 | 5785MHz | 159 | 5795MHz | 161 | 5805MHz | 163 | 5815MHz |
| 165 | 5825MHz | | | | | | |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Test channel | Frequency (MHz) | | |
|---|---|---|---|
| | 802.11 a/n/ac(HT20/VHT20) | 802.11 n/ac(HT40/VHT40) | 802.11ac(VHT80) |
| Lowest channel | 5745 | 5755 | |
| Middle channel | 5785 | | 5775 |
| Highest channel | 5825 | 5795 | |

## 5.2 Test mode

| | |
|---|---|
| Transmitting mode | Keep the EUT in continuously transmitting mode |

*Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.*

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

| Mode | Data rate |
|---|---|
| 802.11a | 6Mbps |
| 802.11n(HT20) | 6.5Mbps |
| 802.11n(HT40) | 13Mbps |
| 802.11ac(VHT20) | 6.5Mbps |
| 802.11ac(VHT40) | 13.5Mbps |
| 802.11ac(VHT80) | 29.3Mbps |

## 5.3 Description of Support Units

None.

## 5.4 Deviation from Standards

None.

## 5.5 Abnormalities from Standard Conditions

None.

## 5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

● **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

## 5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,

Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

# 6 Test Instruments list

| Radiated Emission: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | GTS250 | July. 02 2020 | July. 01 2025 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS251 | N/A | N/A |
| 3 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | June. 25 2020 | June. 24 2021 |
| 4 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | GTS214 | June. 25 2020 | June. 24 2021 |
| 5 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120 D | GTS208 | June. 25 2020 | June. 24 2021 |
| 6 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | June. 25 2020 | June. 24 2021 |
| 7 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 8 | Coaxial Cable | GTS | N/A | GTS213 | June. 25 2020 | June. 24 2021 |
| 9 | Coaxial Cable | GTS | N/A | GTS211 | June. 25 2020 | June. 24 2021 |
| 10 | Coaxial cable | GTS | N/A | GTS210 | June. 25 2020 | June. 24 2021 |
| 11 | Coaxial Cable | GTS | N/A | GTS212 | June. 25 2020 | June. 24 2021 |
| 12 | Amplifier(100kHz-3GHz) | HP | 8347A | GTS204 | June. 25 2020 | June. 24 2021 |
| 13 | Amplifier(2GHz-20GHz) | HP | 84722A | GTS206 | June. 25 2020 | June. 24 2021 |
| 14 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | June. 25 2020 | June. 24 2021 |
| 15 | Band filter | Amindeon | 82346 | GTS219 | June. 25 2020 | June. 24 2021 |
| 16 | Power Meter | Anritsu | ML2495A | GTS540 | June. 25 2020 | June. 24 2021 |
| 17 | Power Sensor | Anritsu | MA2411B | GTS541 | June. 25 2020 | June. 24 2021 |
| 18 | Wideband Radio Communication Tester | Rohde & Schwarz | CMW500 | GTS575 | June. 25 2020 | June. 24 2021 |
| 19 | Splitter | Agilent | 11636B | GTS237 | June. 25 2020 | June. 24 2021 |
| 20 | Loop Antenna | ZHINAN | ZN30900A | GTS534 | June. 25 2020 | June. 24 2021 |
| 21 | Breitband hornantenne | SCHWARZBECK | BBHA 9170 | GTS579 | Oct. 19 2020 | Oct. 18 2021 |
| 22 | Amplifier | TDK | PA-02-02 | GTS574 | Oct. 19 2020 | Oct. 18 2021 |
| 23 | Amplifier | TDK | PA-02-03 | GTS576 | Oct. 19 2020 | Oct. 18 2021 |
| 24 | PSA Series Spectrum Analyzer | Rohde & Schwarz | FSP | GTS578 | June. 25 2020 | June. 24 2021 |

| Conducted Emission | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | Shielding Room | ZhongYu Electron | 7.3(L)x3.1(W)x2.9(H) | GTS252 | May.15 2019 | May.14 2022 |
| 2 | EMI Test Receiver | R&S | ESCI 7 | GTS552 | June. 25 2020 | June. 24 2021 |
| 3 | Coaxial Switch | ANRITSU CORP | MP59B | GTS225 | June. 25 2020 | June. 24 2021 |
| 4 | ENV216 2-L-V-NETZNACHB.DE | ROHDE&SCHWARZ | ENV216 | GTS226 | June. 25 2020 | June. 24 2021 |
| 5 | Coaxial Cable | GTS | N/A | GTS227 | N/A | N/A |
| 6 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 7 | Thermo meter | KTJ | TA328 | GTS233 | June. 25 2020 | June. 24 2021 |
| 8 | Absorbing clamp | Elektronik-Feinmechanik | MDS21 | GTS229 | June. 25 2020 | June. 24 2021 |
| 9 | ISN | SCHWARZBECK | NTFM 8158 | GTD565 | June. 25 2020 | June. 24 2021 |

| RF Conducted Test: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | MXA Signal Analyzer | Agilent | N9020A | GTS566 | June. 25 2020 | June. 24 2021 |
| 2 | EMI Test Receiver | R&S | ESCI 7 | GTS552 | June. 25 2020 | June. 24 2021 |
| 3 | Spectrum Analyzer | Agilent | E4440A | GTS533 | June. 25 2020 | June. 24 2021 |
| 4 | MXG vector Signal Generator | Agilent | N5182A | GTS567 | June. 25 2020 | June. 24 2021 |
| 5 | ESG Analog Signal Generator | Agilent | E4428C | GTS568 | June. 25 2020 | June. 24 2021 |
| 6 | USB RF Power Sensor | DARE | RPR3006W | GTS569 | June. 25 2020 | June. 24 2021 |
| 7 | RF Switch Box | Shongyi | RFSW3003328 | GTS571 | June. 25 2020 | June. 24 2021 |
| 8 | Programmable Constant Temp & Humi Test Chamber | WEWON | WHTH-150L-40-880 | GTS572 | June. 25 2020 | June. 24 2021 |
| 9 | Spectrum Analyzer | R&S | FSV40 | GTS559 | June. 25 2020 | June. 24 2021 |

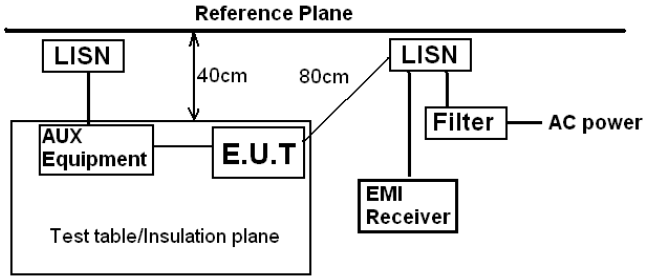
| General used equipment: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | Humidity/ Temperature Indicator | KTJ | TA328 | GTS243 | June. 25 2020 | June. 24 2021 |
| 2 | Barometer | ChangChun | DYM3 | GTS255 | June. 25 2020 | June. 24 2021 |

# 7 Test results and Measurement Data

## 7.1 Antenna requirement

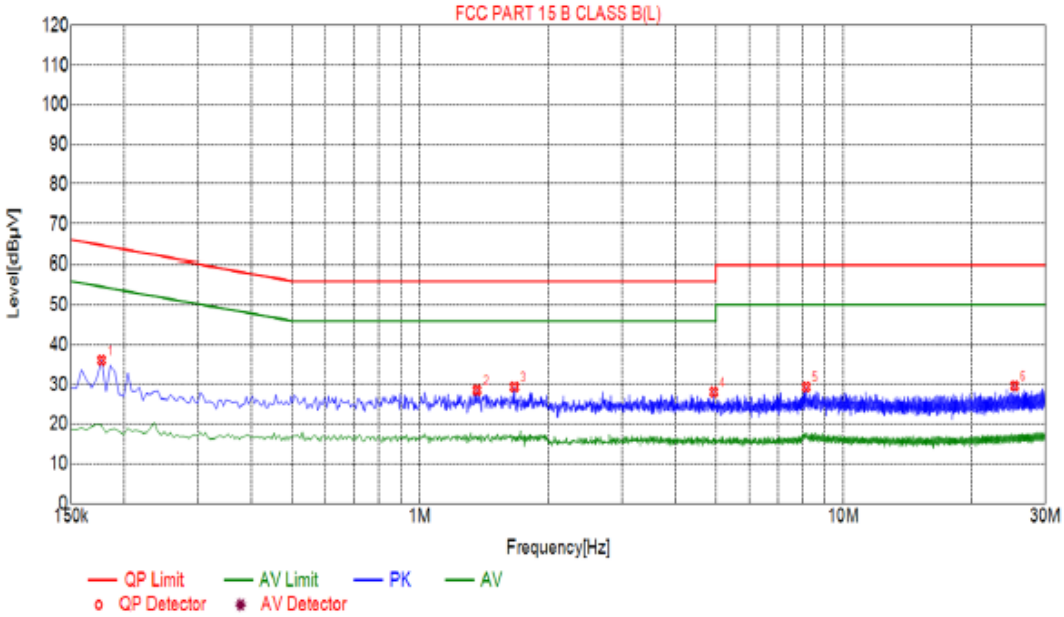
| **Standard requirement:** | FCC Part15 C Section 15.203 |
|---|---|
| *15.203 requirement:*<br>*An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.* | |
| **E.U.T Antenna:** | |
| *The antennas are FPCB antenna, the best case gain of the antennas are 1 dBi, reference to the appendix II for details* | |

## 7.2 Conducted Emissions

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.207 |
| Test Method: | ANSI C63.10:2013 |
| Test Frequency Range: | 150KHz to 30MHz |
| Class / Severity: | Class B |
| Receiver setup: | RBW=9KHz, VBW=30KHz, Sweep time=auto |
| Limit: | Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average<br>0.15-0.5: 66 to 56* / 56 to 46*<br>0.5-5: 56 / 46<br>5-30: 60 / 50<br>* Decreases with the logarithm of the frequency. |
| Test setup: |  <br>*Remark:*<br>*E.U.T: Equipment Under Test*<br>*LISN: Line Impedence Stabilization Network*<br>*Test table height=0.8m* |
| Test procedure: | 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test environment: | Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar |
| Test voltage: | AC 120V, 60Hz |
| Test results: | Pass |

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

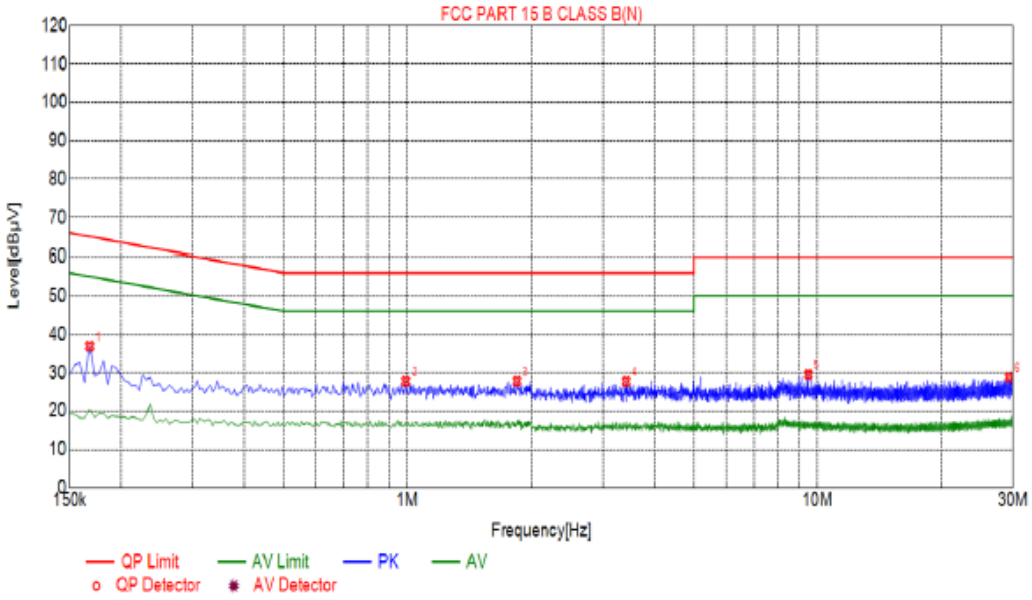
**Measurement data**
**Line:**




| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Level [dBµV] | Factor [dB] | Limit [dBµV] | Margin [dB] | Reading [dBµV] | Detector | Type |
| 1 | 0.1770 | 36.10 | 10.05 | 64.63 | 28.53 | 26.05 | PK | L |
| 2 | 1.3650 | 28.55 | 10.11 | 56.00 | 27.45 | 18.44 | PK | L |
| 3 | 1.6710 | 29.36 | 10.12 | 56.00 | 26.64 | 19.24 | PK | L |
| 4 | 4.9425 | 28.10 | 10.26 | 56.00 | 27.90 | 17.84 | PK | L |
| 5 | 8.1735 | 29.35 | 10.14 | 60.00 | 30.65 | 19.21 | PK | L |
| 6 | 25.3500 | 29.65 | 10.25 | 60.00 | 30.35 | 19.40 | PK | L |

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

**Neutral:**




Suspected List

| NO. | Freq. [MHz] | Level [dBµV] | Factor [dB] | Limit [dBµV] | Margin [dB] | Reading [dBµV] | Detector | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1680 | 36.90 | 10.01 | 65.06 | 28.16 | 26.89 | PK | N |
| 2 | 0.9915 | 27.81 | 10.06 | 56.00 | 28.19 | 17.75 | PK | N |
| 3 | 1.8510 | 27.82 | 10.14 | 56.00 | 28.18 | 17.68 | PK | N |
| 4 | 3.4125 | 27.74 | 10.24 | 56.00 | 28.26 | 17.50 | PK | N |
| 5 | 9.5055 | 29.54 | 10.09 | 60.00 | 30.46 | 19.45 | PK | N |
| 6 | 29.2965 | 28.84 | 10.26 | 60.00 | 31.16 | 18.58 | PK | N |

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

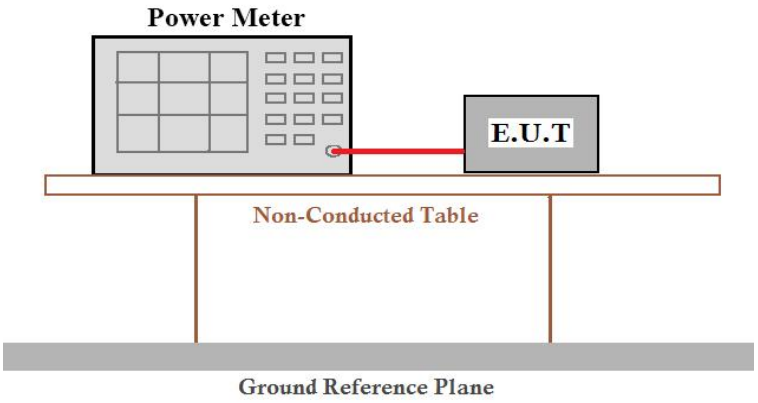
Level=Test receiver reading + correction factor

*Notes:*

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both *limits and measurement with the average detector receiver is unnecessary.*

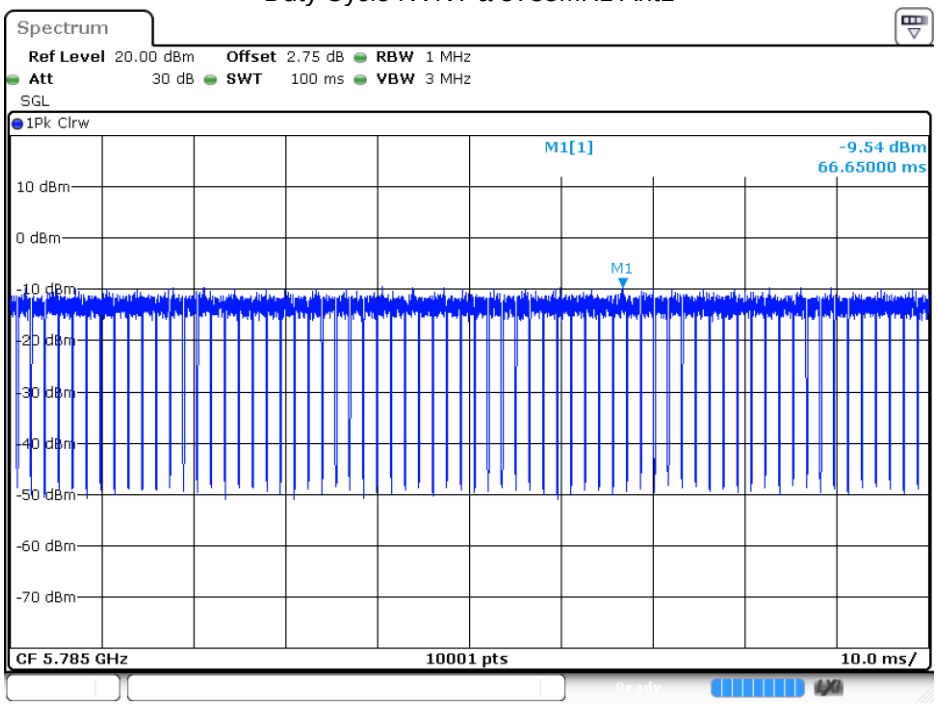
## 7.3 Conducted Peak Output Power

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Requirement: | FCC Part15 E Section 15.407(a)(3) | | | | | |
| Test Method: | ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 | | | | | |
| Limit: | 30dBm | | | | | |
| Test setup: |  | | | | | |
| Test Instruments: | Refer to section 6.0 for details | | | | | |
| Test mode: | Refer to section 5.2 for details | | | | | |
| Test environment: | Temp.: | 24 °C | Humid.: | 53% | Press.: | 1012mbar |
| Test voltage: | AC 120V, 60Hz | | | | | |
| Test results: | Pass | | | | | |

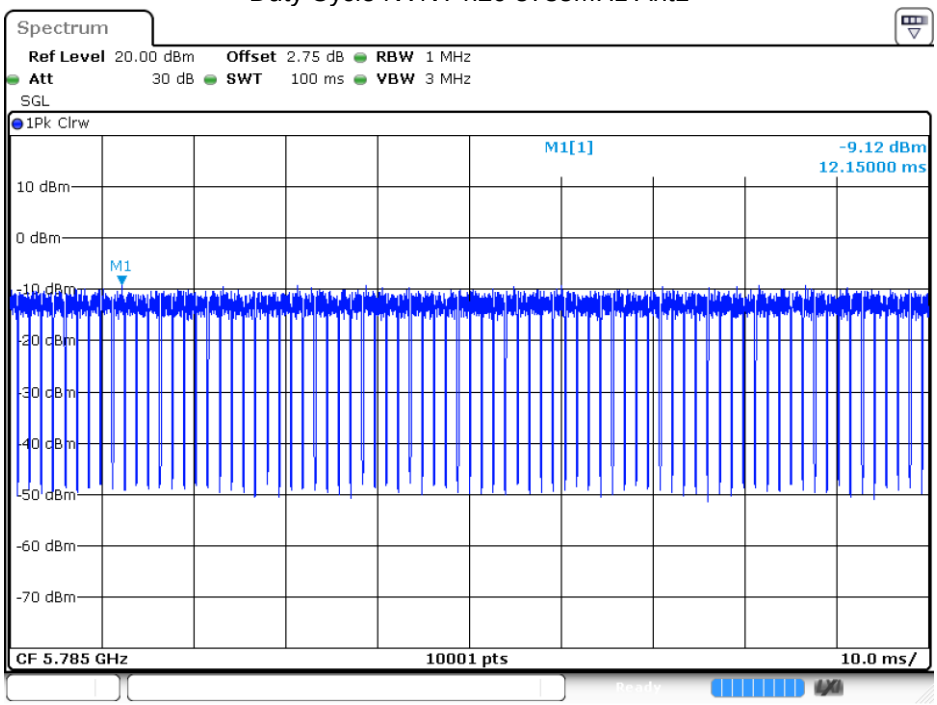
**Measurement Data**

| Modulation | Duty cycle Ant1 | Duty cycle Ant2 | Duty Factor Ant1 | Duty Factor Ant2 |
|---|---|---|---|---|
| 802.11a | 91.22 | 91.2 | 0.4 | 0.4 |
| 802.11n(HT20) | 89.82 | 89.44 | 0.47 | 0.48 |
| 802.11n(HT40) | 81.77 | 81.35 | 0.87 | 0.9 |
| 802.11ac(HT20) | 89.75 | 89.61 | 0.47 | 0.48 |
| 802.11ac(HT40) | 81.41 | 81.51 | 0.89 | 0.89 |
| 802.11ac(HT80) | 66.4 | 67.23 | 1.78 | 1.72 |

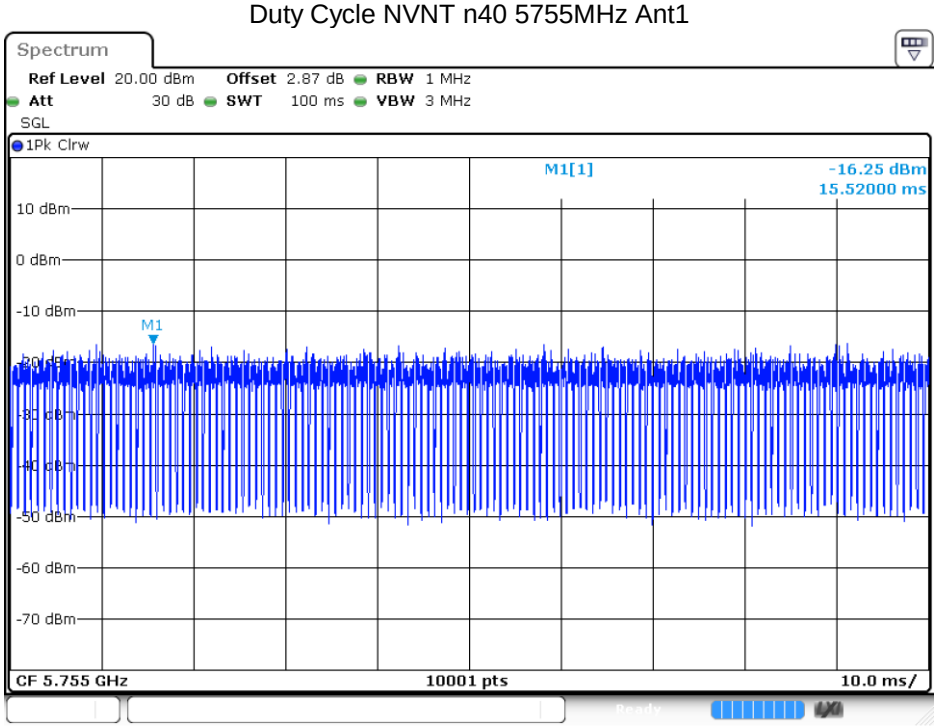
Duty Cycle NVNT a 5785MHz Ant1



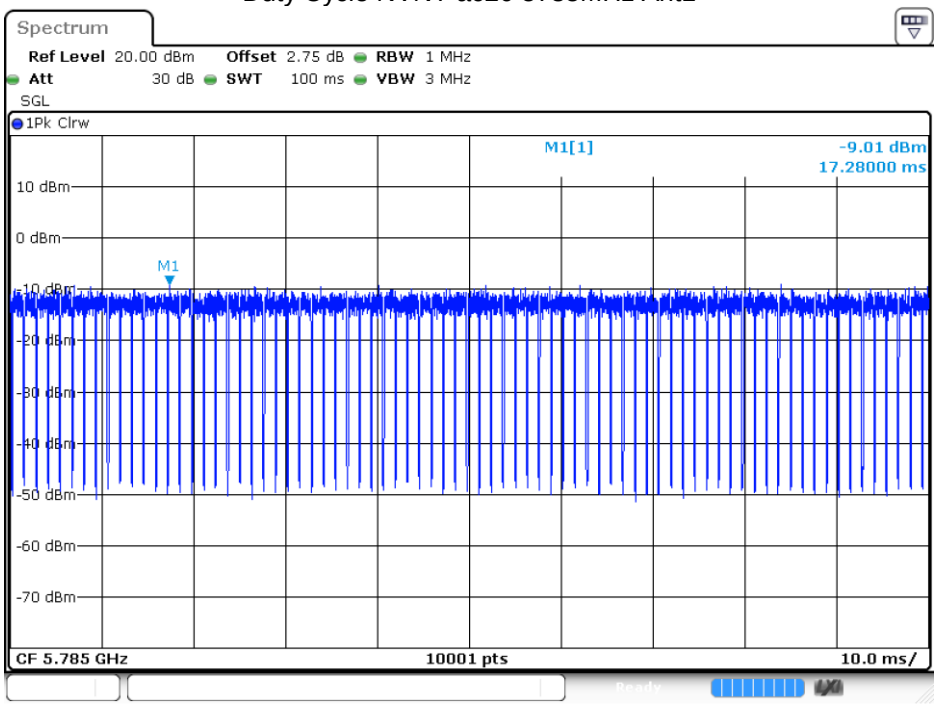
Duty Cycle NVNT n20 5785MHz Ant1



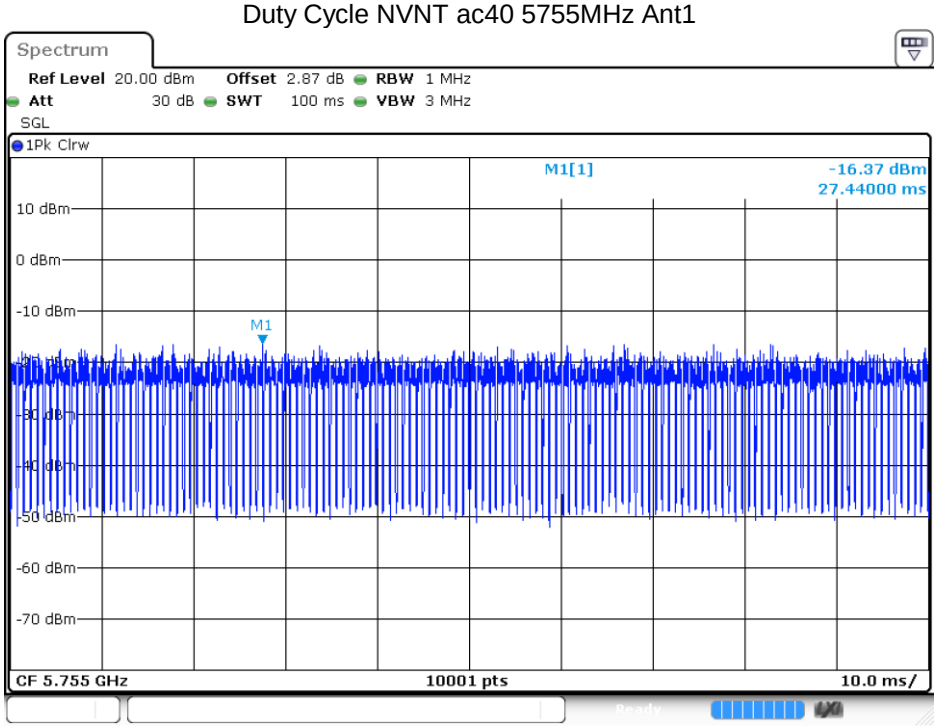

Duty Cycle NVNT n40 5755MHz Ant1



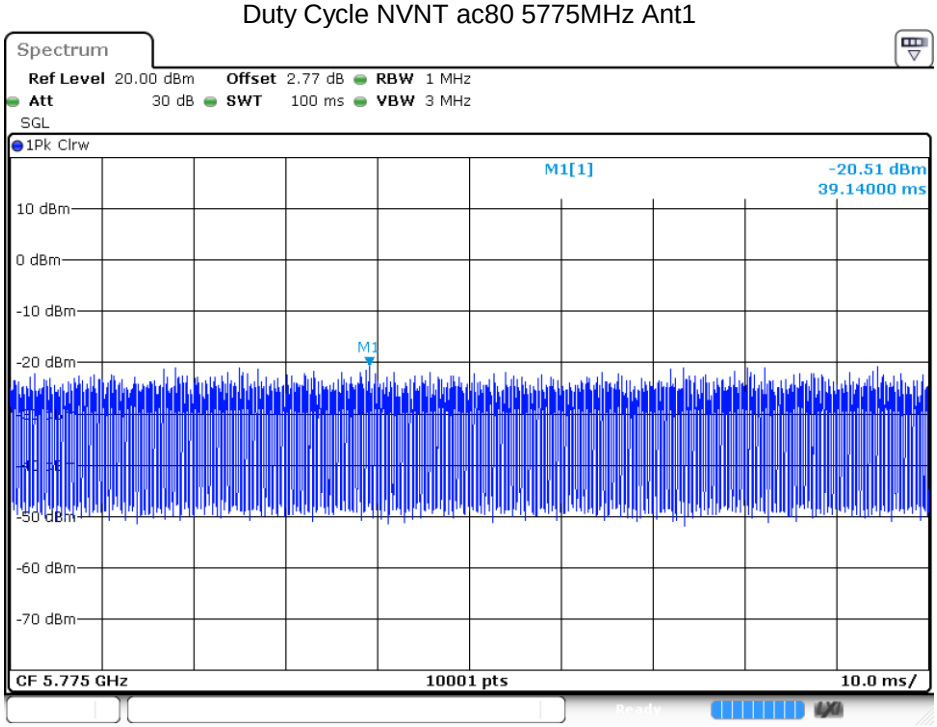
Duty Cycle NVNT ac20 5785MHz Ant1



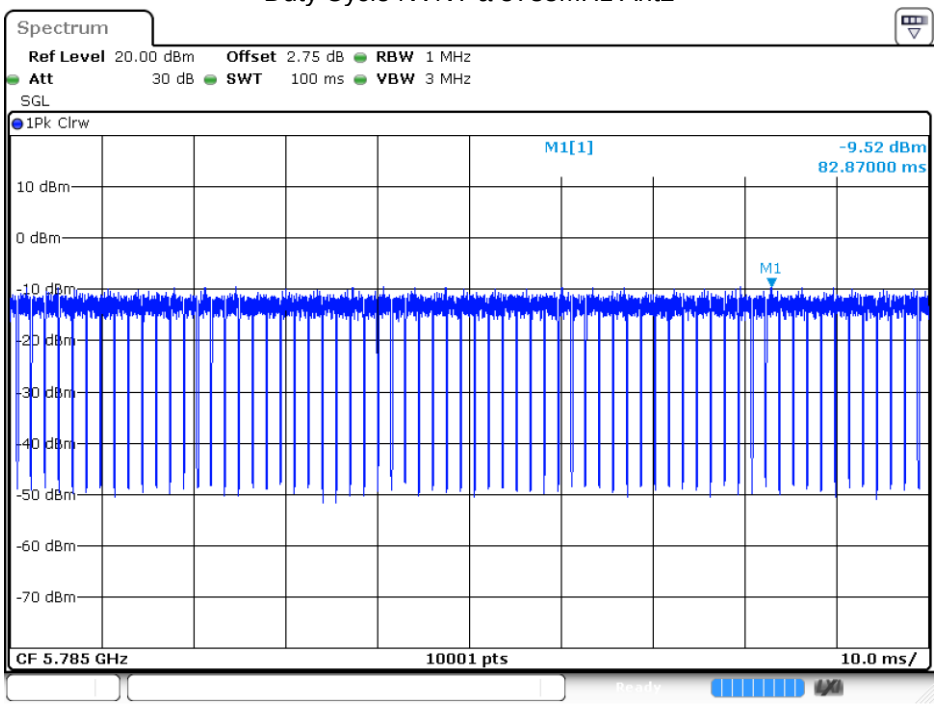

Duty Cycle NVNT ac40 5755MHz Ant1



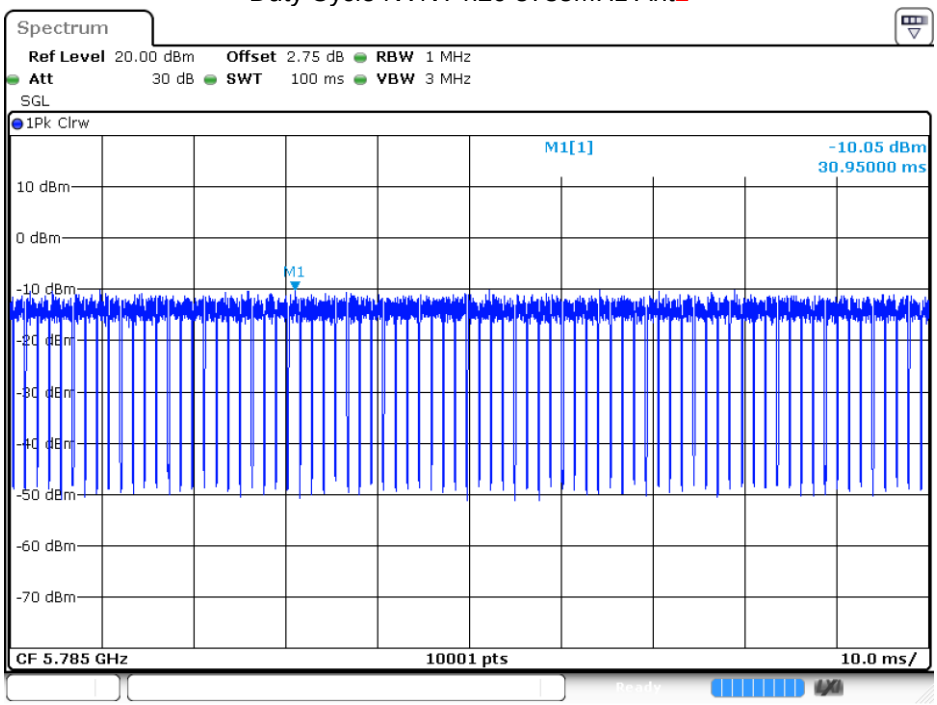
Duty Cycle NVNT ac80 5775MHz Ant1



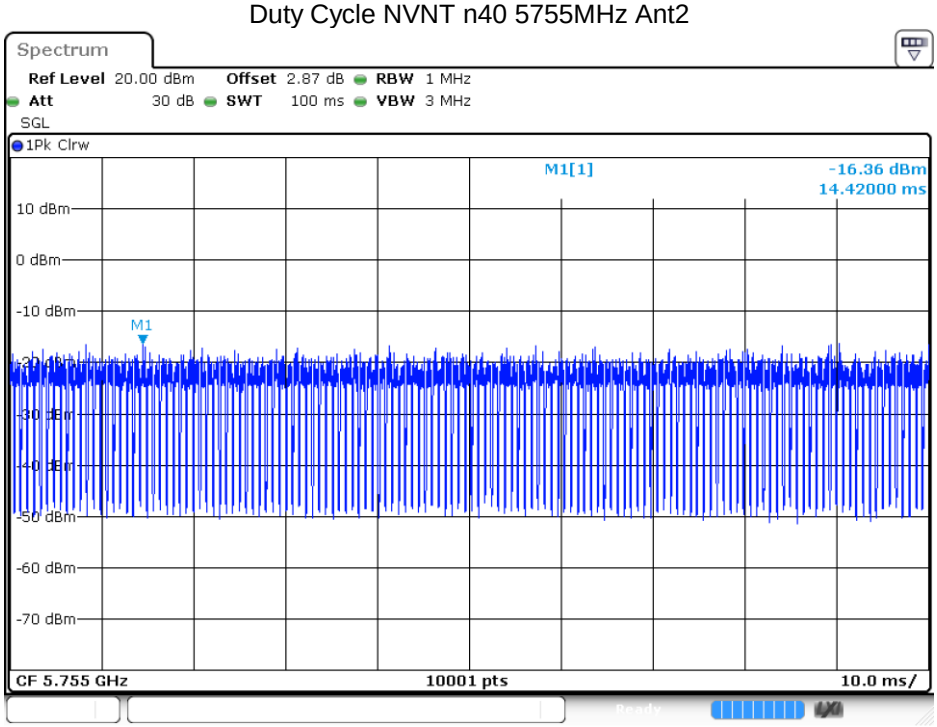

Duty Cycle NVNT a 5785MHz Ant2



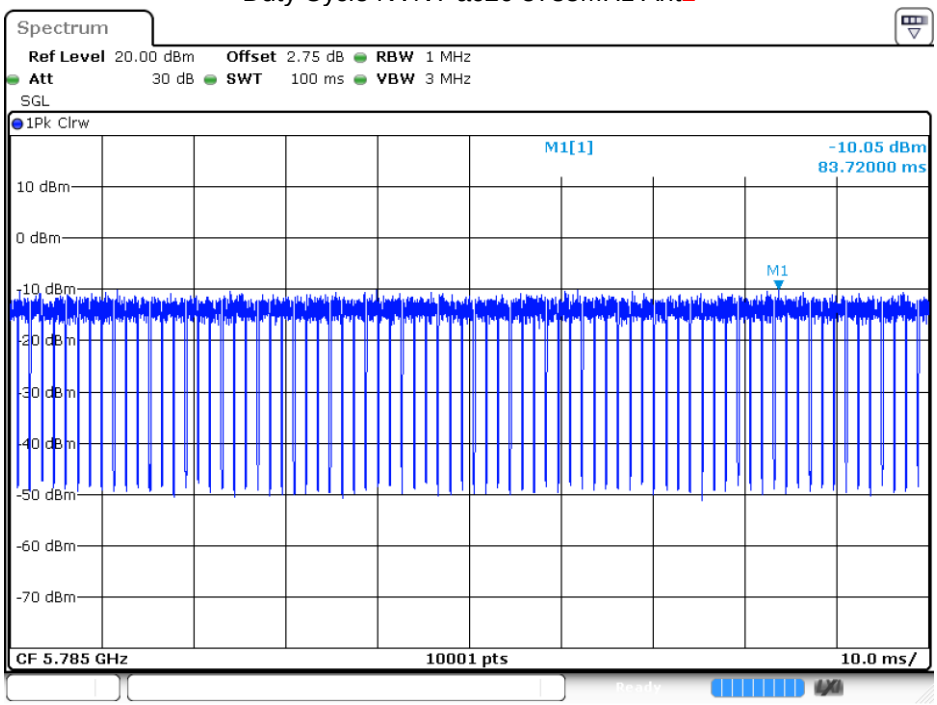
Duty Cycle NVNT n20 5785MHz Ant2



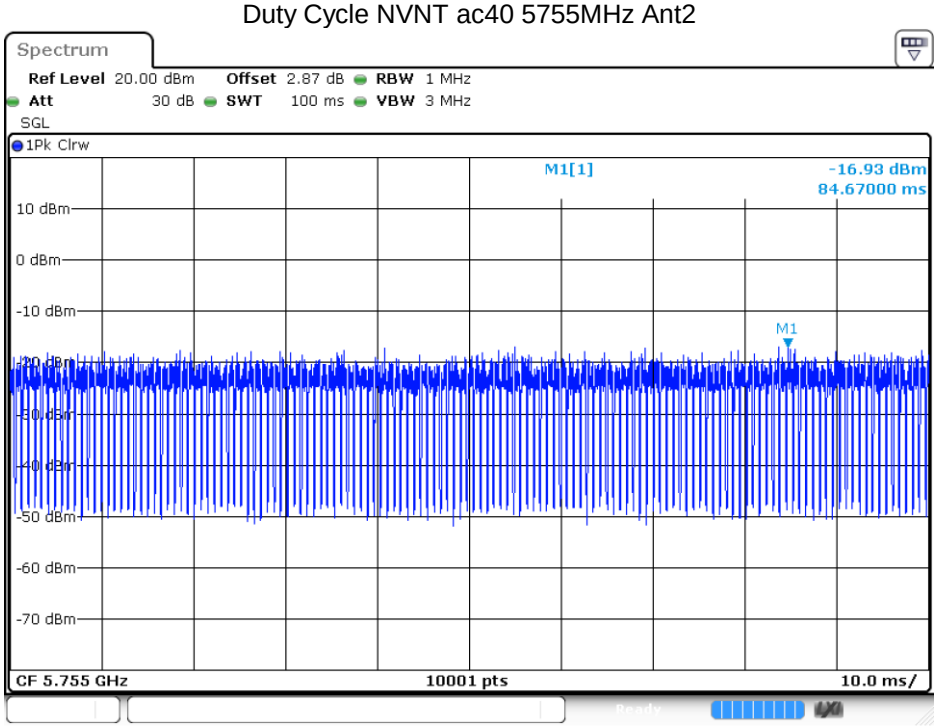

Duty Cycle NVNT n40 5755MHz Ant2



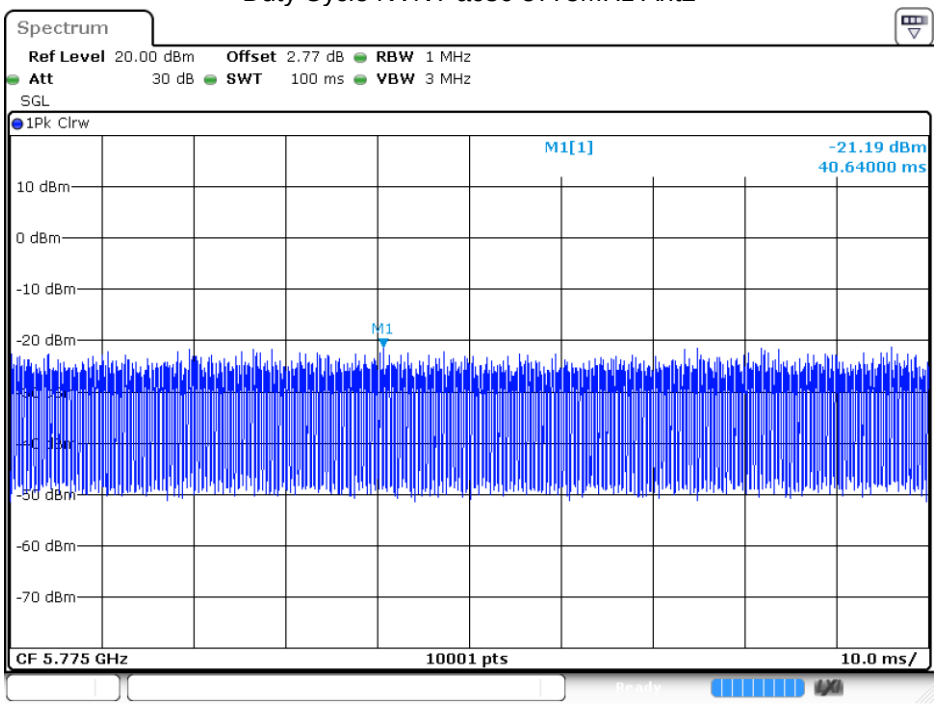
Duty Cycle NVNT ac20 5785MHz Ant2




Duty Cycle NVNT ac40 5755MHz Ant2



Duty Cycle NVNT ac80 5775MHz Ant2



| 802.11a mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1 (dBm) | Duty Factor | Total Output Power Ant2 (dBm) | Mimo | Limit (dBm) | Result |
| 149 | 5745 | 0.4 | 0.08 | 0.4 | 0.03 | / | 30 | Pass |
| 157 | 5785 | 0.4 | -0.03 | 0.4 | -0.09 | / | 30 | Pass |
| 165 | 5825 | 0.4 | -0.07 | 0.4 | -0.1 | / | 30 | Pass |

| 802.11n(HT20) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1 (dBm) | Duty Factor | Total Output Power Ant2 (dBm) | Mimo | Limit (dBm) | Result |
| 149 | 5745 | 0.47 | 0.04 | 0.47 | -0.04 | 3.01 | 30 | Pass |
| 157 | 5785 | 0.47 | 0.03 | 0.47 | 0.04 | 3.05 | 30 | Pass |
| 165 | 5825 | 0.47 | 0.08 | 0.47 | -0.08 | 3.01 | 30 | Pass |

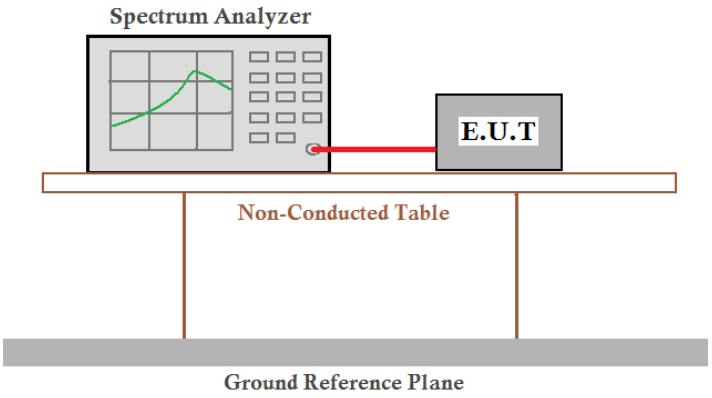
| 802.11ac(HT20) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1 (dBm) | Duty Factor | Total Output Power Ant2 (dBm) | Mimo | Limit (dBm) | Result |
| 149 | 5745 | 0.47 | -0.02 | 0.48 | -0.14 | 2.93 | 30 | Pass |
| 157 | 5785 | 0.47 | -0.2 | 0.48 | -0.23 | 2.80 | 30 | Pass |
| 165 | 5825 | 0.47 | -0.14 | 0.48 | -0.2 | 2.84 | 30 | Pass |

| 802.11n(HT40) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1 (dBm) | Duty Factor | Total Output Power Ant2 (dBm) | Mimo | Limit (dBm) | Result |
| 151 | 5755 | 0.87 | -2.1 | 0.9 | -2.24 | 0.84 | 30 | Pass |
| 159 | 5795 | 0.87 | -2.03 | 0.9 | -2.19 | 0.90 | 30 | Pass |

| 802.11ac(HT40) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1 (dBm) | Duty Factor | Total Output Power Ant2 (dBm) | Mimo | Limit (dBm) | Result |
| 151 | 5755 | 0.89 | -2.03 | 0.89 | -2.08 | 0.96 | 30 | Pass |
| 159 | 5795 | 0.89 | -1.95 | 0.89 | -2.13 | 0.97 | 30 | Pass |

| 802.11 ac(HT80) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total Output Power Ant1(dBm) | Duty Factor | Total Output Power Ant2(dBm) | Mimo | Limit (dBm) | Result |
| 155 | 5775 | 1.78 | -3.03 | 1.72 | -3.28 | -0.14 | 30 | Pass |

## 7.4 Channel Bandwidth and 99% Occupied Bandwidth

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Requirement: | FCC Part15 E Section 15.407(e) | | | | | |
| Test Method: | ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 | | | | | |
| Limit: | >500KHz | | | | | |
| Test setup: |  | | | | | |
| Test Instruments: | Refer to section 6.0 for details | | | | | |
| Test mode: | Refer to section 5.2 for details | | | | | |
| Test environment: | Temp.: | 24 °C | Humid.: | 53% | Press.: | 1012mbar |
| Test voltage: | AC 120V, 60Hz | | | | | |
| Test results: | Pass | | | | | |

**t Data**

**Ant1:**

| Test CH | Channel Bandwidth (MHz) | | | | | | Limit (KHz) | Result |
|---|---|---|---|---|---|---|---|---|
| | 802.11a | 802.11n (HT20) | 802.11ac (VHT20) | 802.11n (HT40) | 802.11ac (VHT40) | 802.11ac (VHT80) | | |
| Lowest | 16.32 | 17.56 | 17.56 | 36.32 | 36.32 | 75.06 | >500 | Pass |
| Middle | 16.33 | 17.57 | 17.57 | -- | -- | -- | | |
| Highest | 16.33 | 17.56 | 17.56 | 36.33 | 36.26 | -- | | |

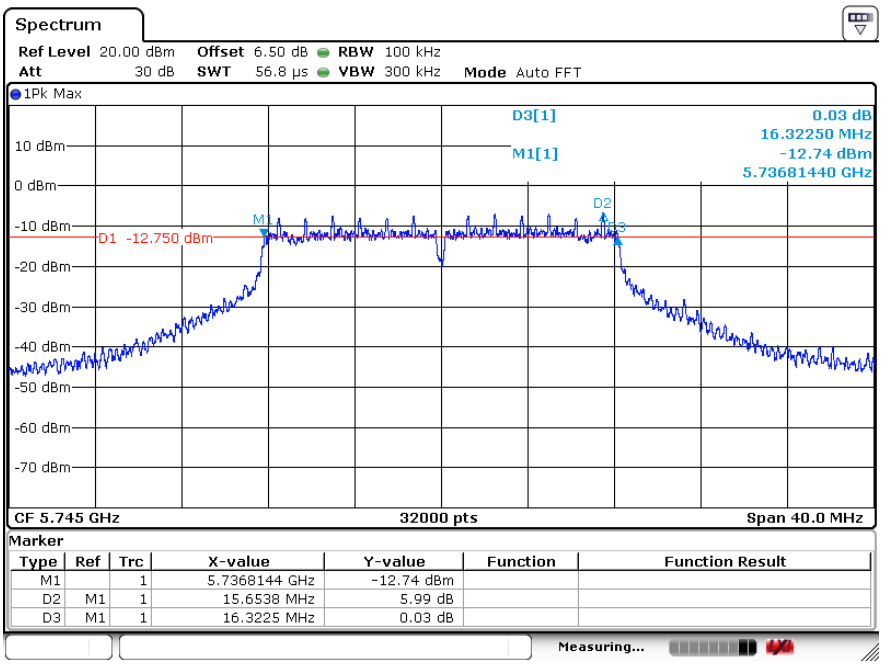
| Test CH | 99%Channel Bandwidth (MHz) | | | | | | Limit (KHz) | Result |
|---|---|---|---|---|---|---|---|---|
| | 802.11a | 802.11n (HT20) | 802.11ac (VHT20) | 802.11n (HT40) | 802.11ac (VHT40) | 802.11ac (VHT80) | | |
| Lowest | 16.95 | 17.79 | 17.76 | 36.27 | 36.26 | 75.08 | >500 | Pass |
| Middle | 16.72 | 17.76 | 17.74 | -- | -- | -- | | |
| Highest | 16.71 | 17.76 | 17.75 | 36.25 | 36.24 | -- | | |

Remark: “---“is not applicable

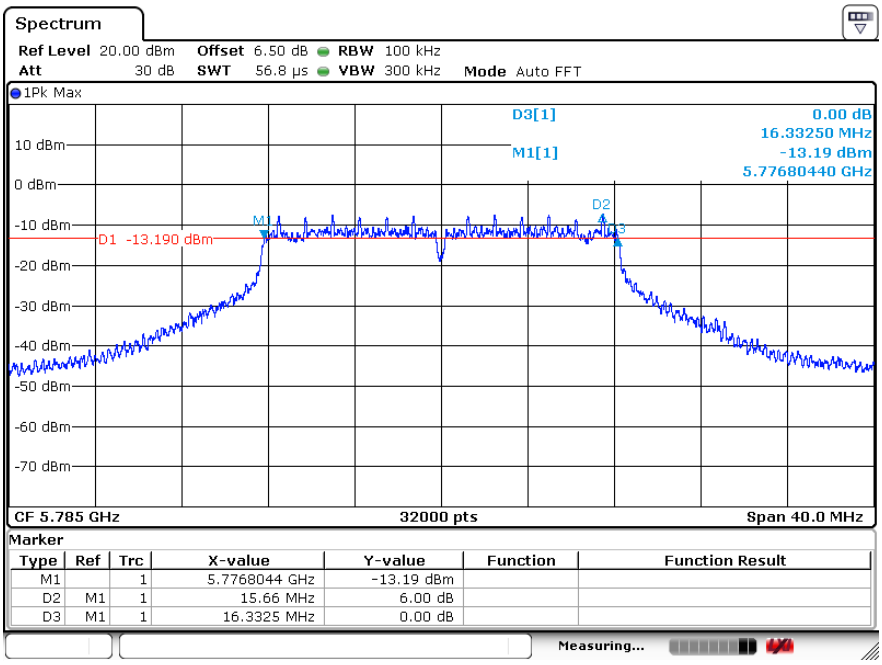
Note: The worst data is Antenna 1, only shown Antenna 1 Plot

**Test plot as follows:**

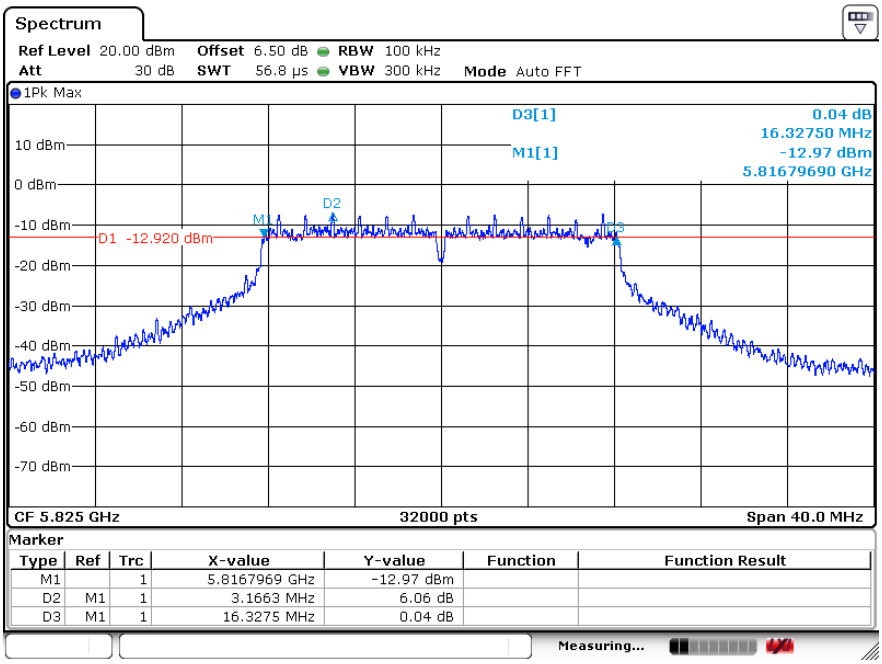
6dB Occupied Bandwidth
Ant1:
Test mode: 802.11a




Lowest channel

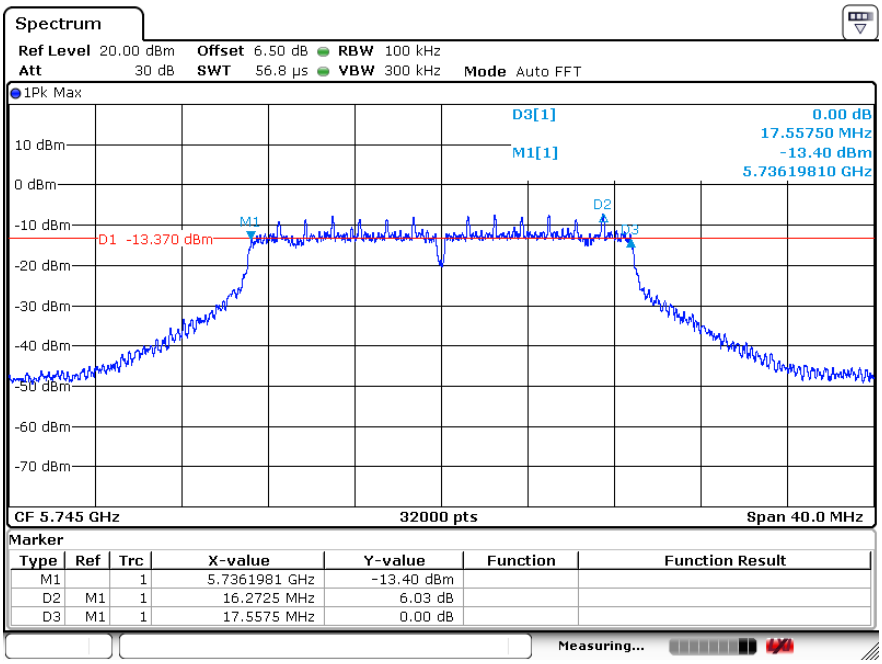



Middle channel

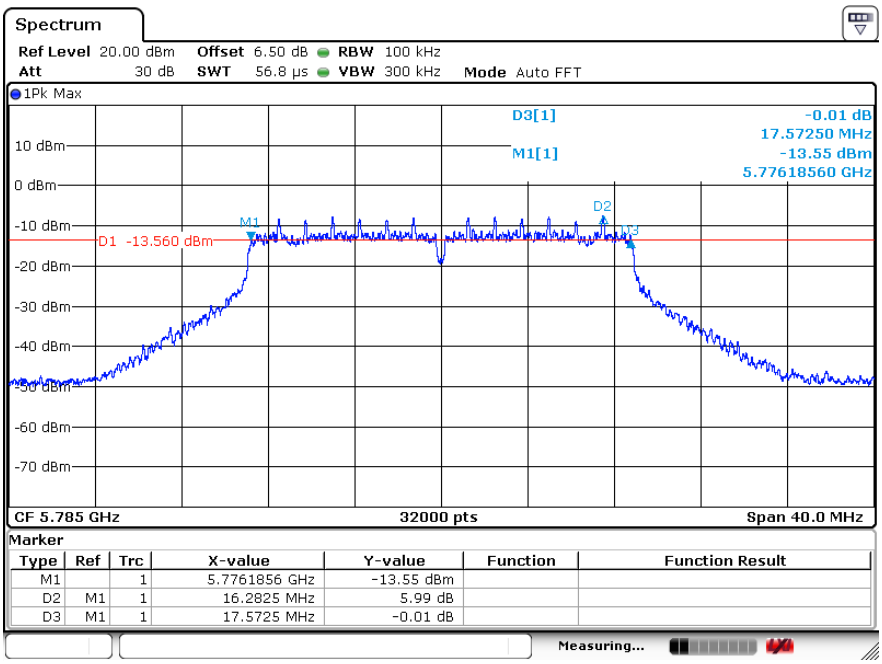



Highest channel

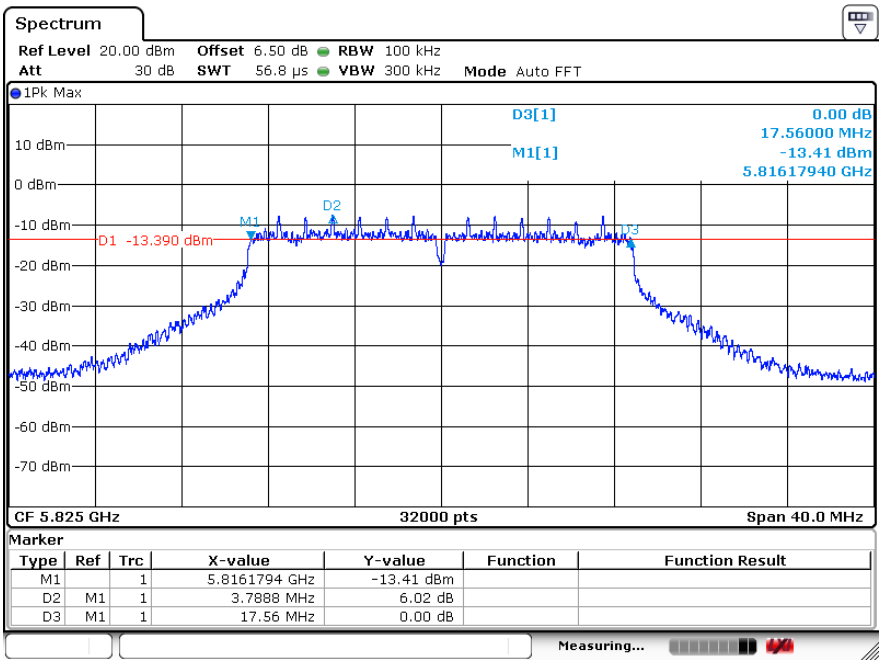
Test mode: 802.11n(HT20)




Lowest channel

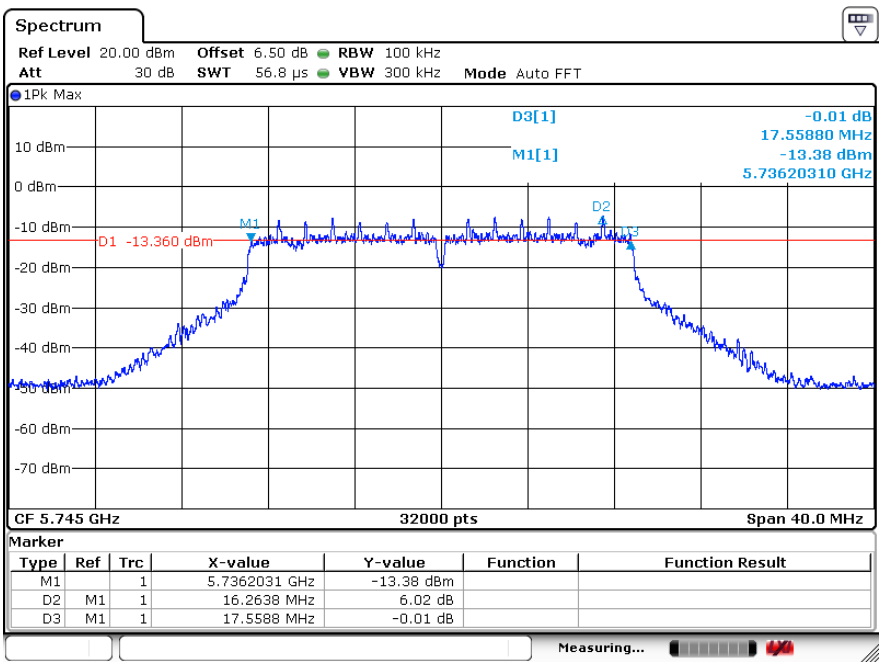



Middle channel

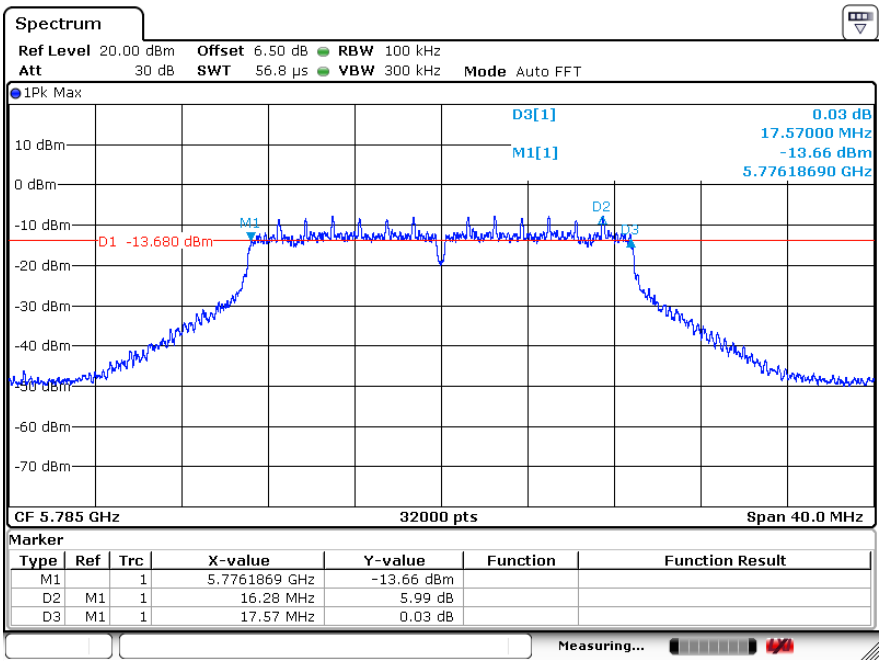



Highest channel

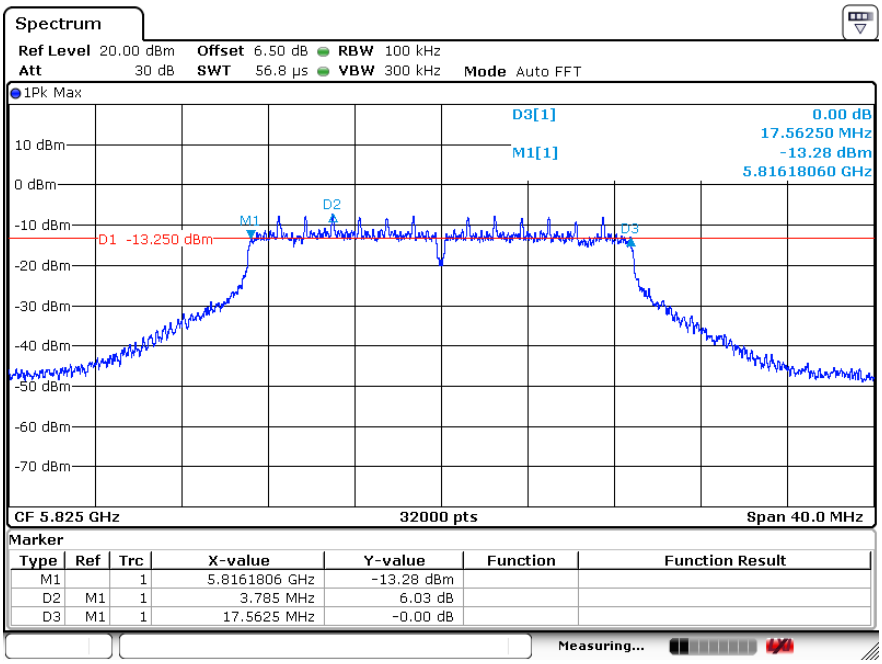
Test mode: 802.11ac(VHT20)




Lowest channel

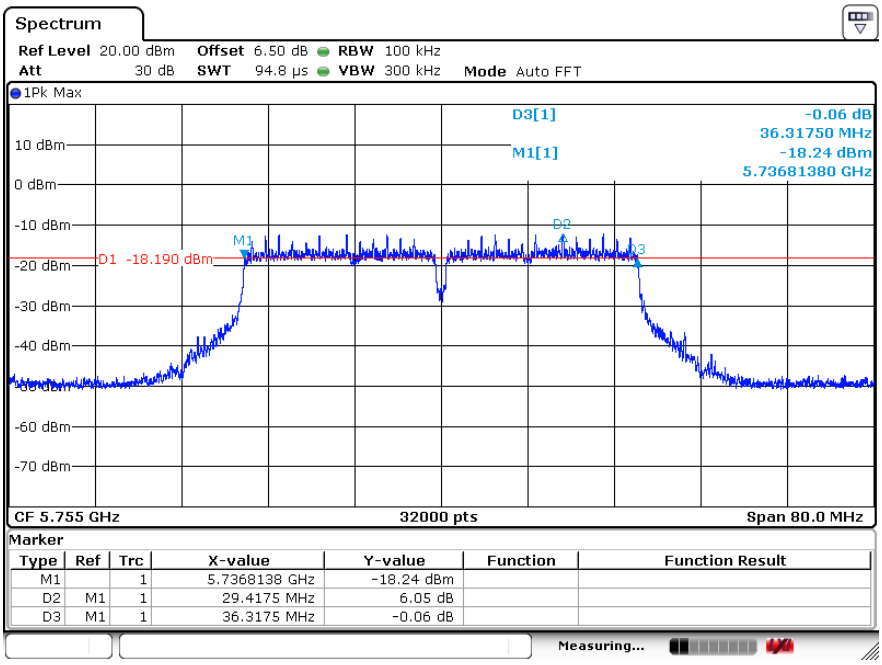



Middle channel

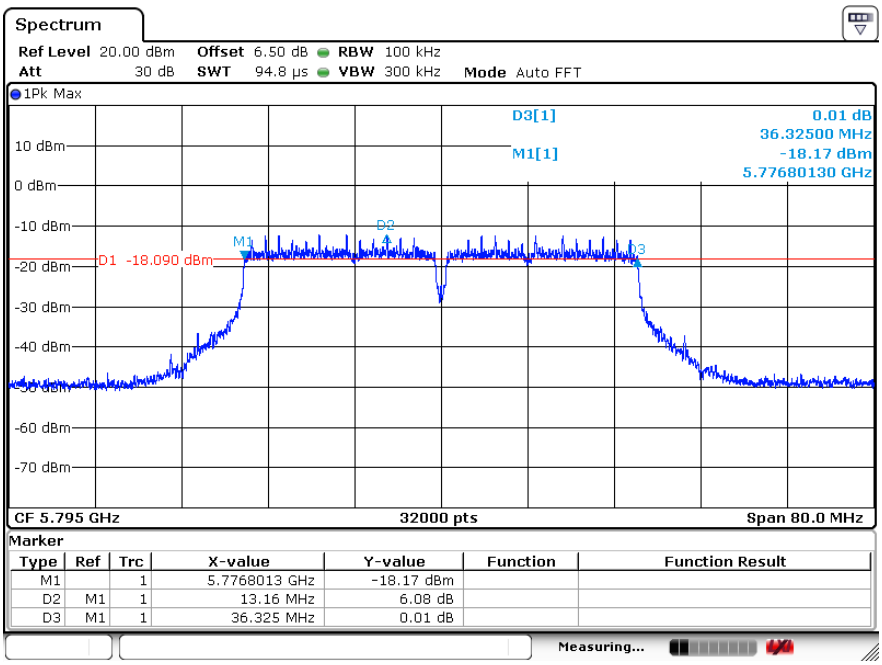



Highest channel

Test mode: 802.11n(HT40)

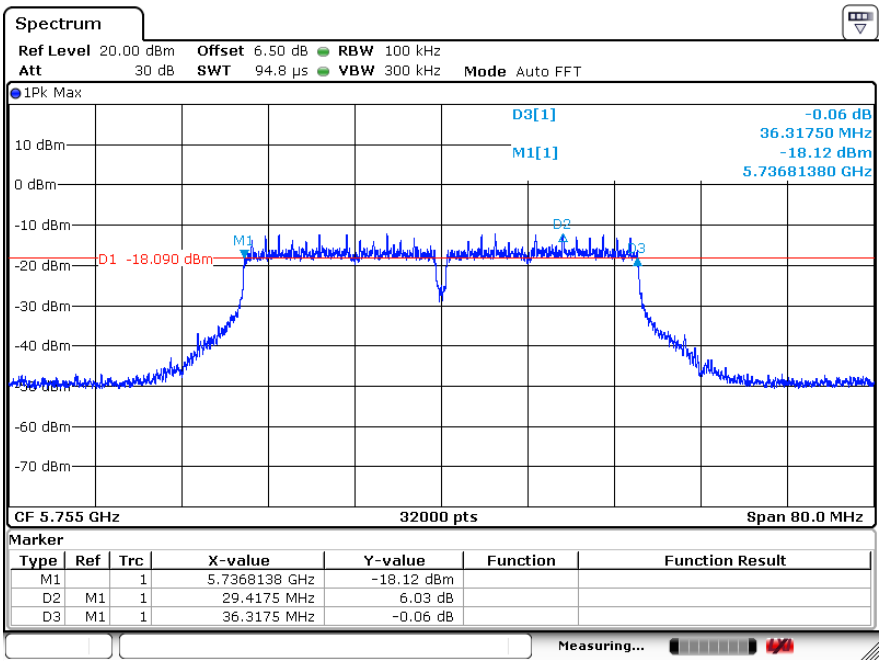



Lowest channel

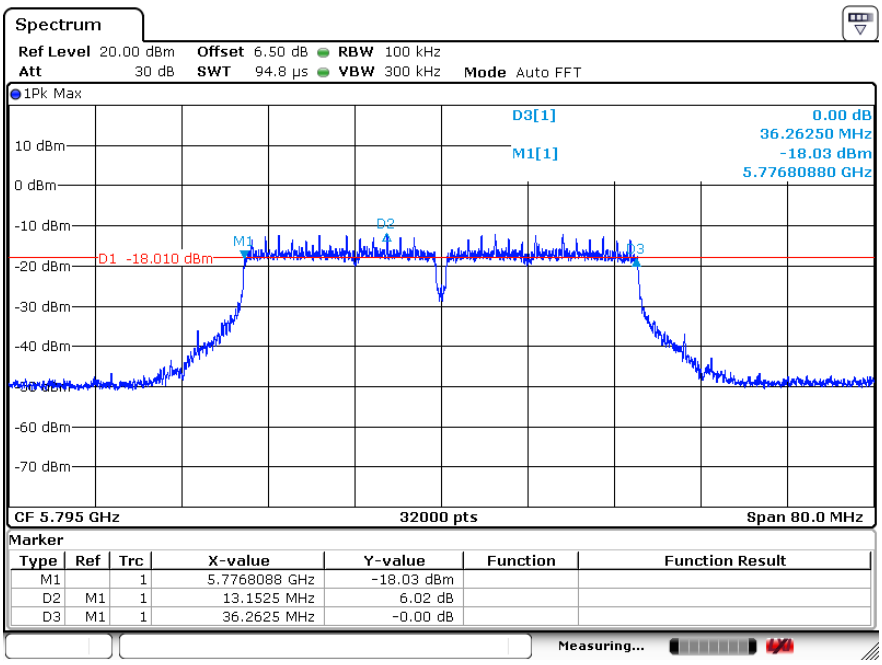



Highest channel

Test mode: 802.11ac(VHT40)

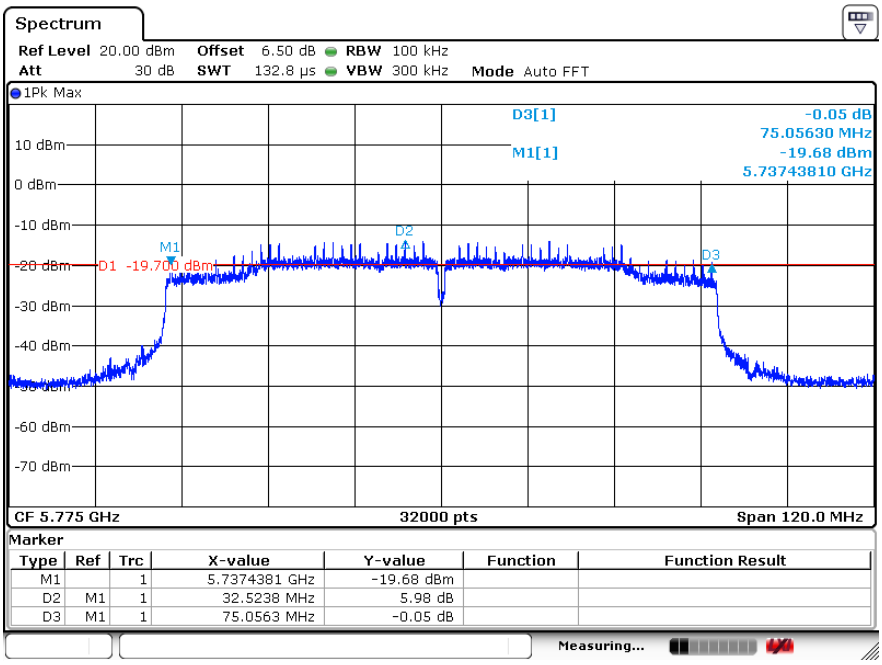



Lowest channel

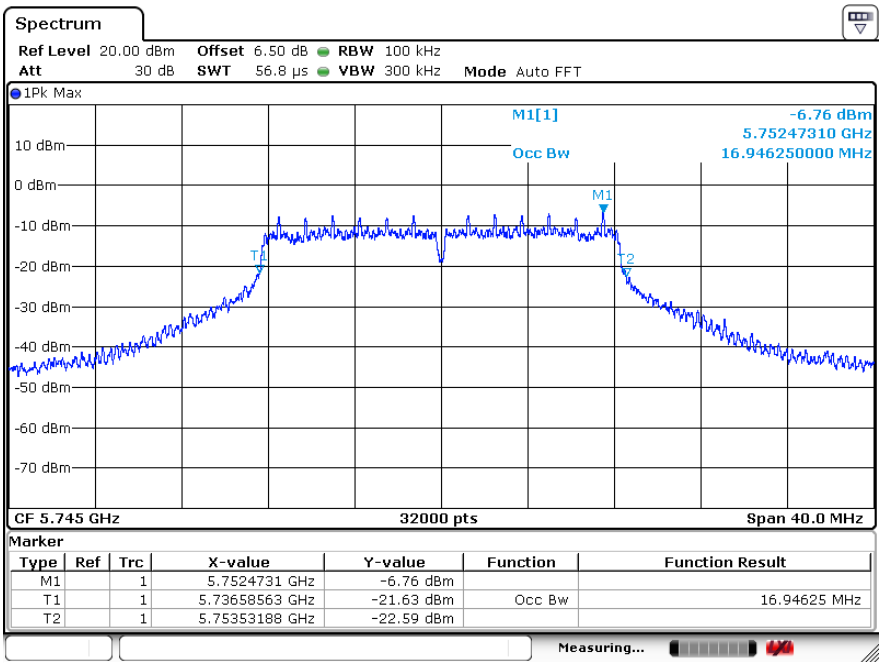



Highest channel

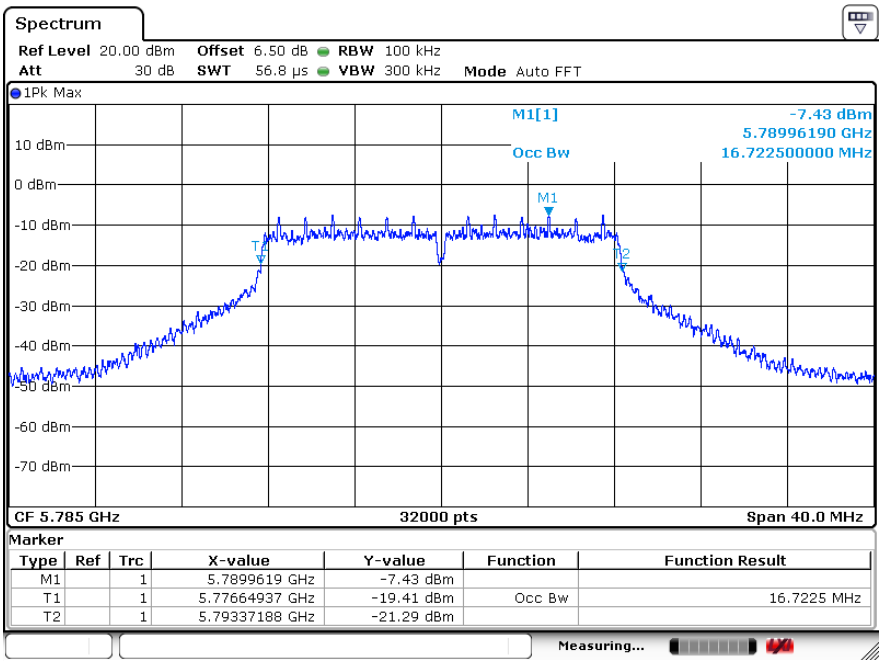
Test mode: 802.11ac(VHT80)



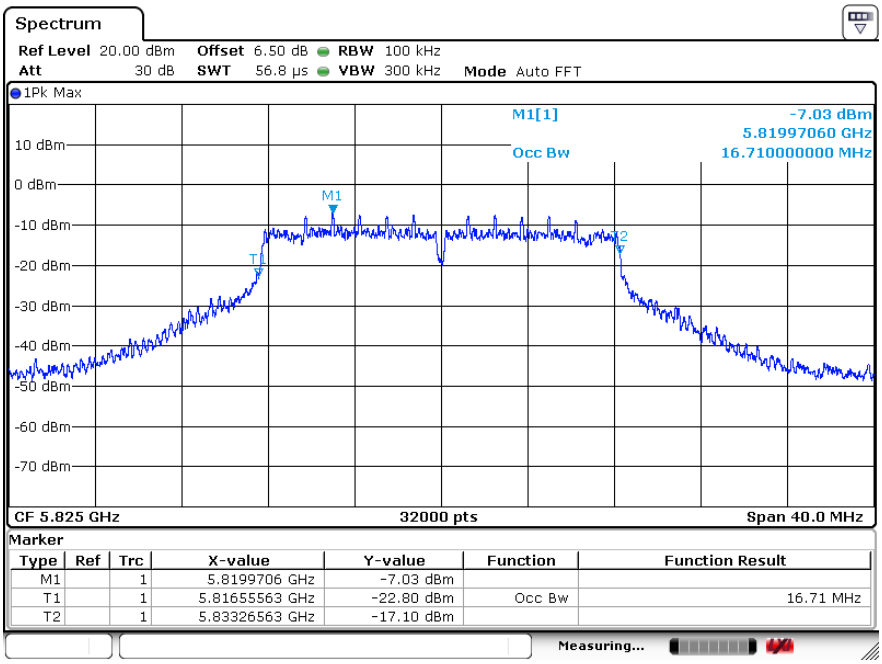
99% Occupied Bandwidth
Ant1:
Test mode: 802.11a




Lowest channel

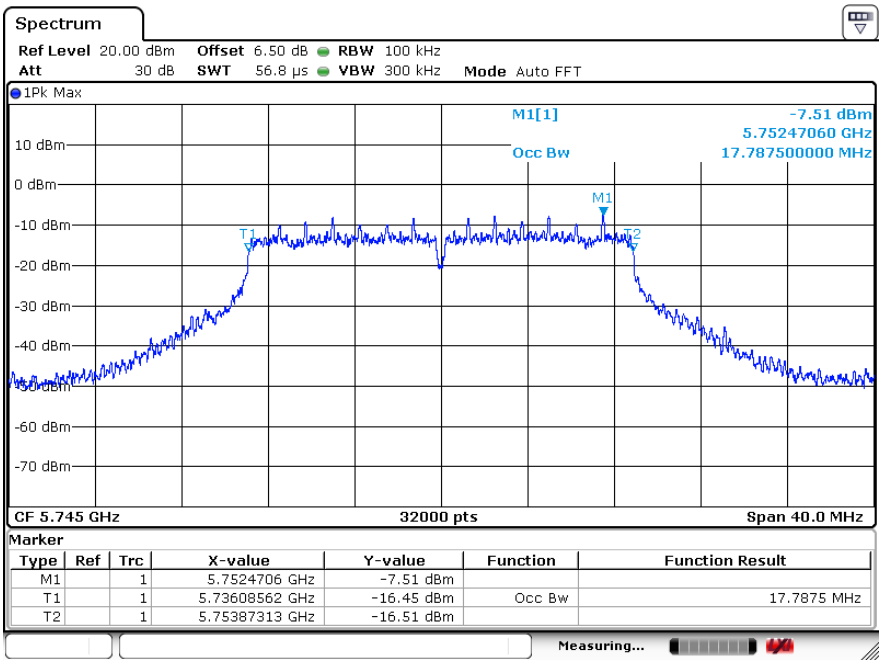



Middle channel

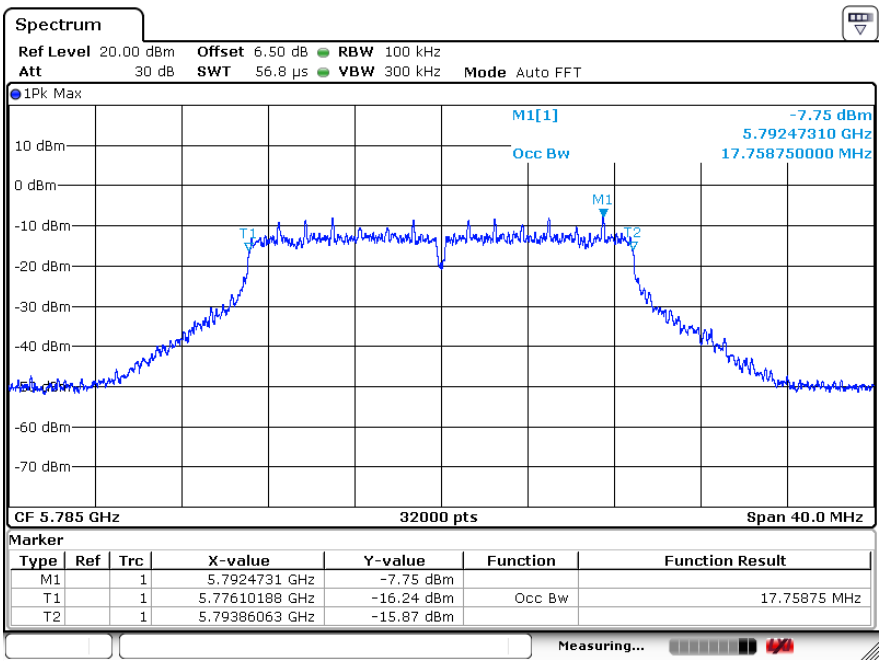



Highest channel

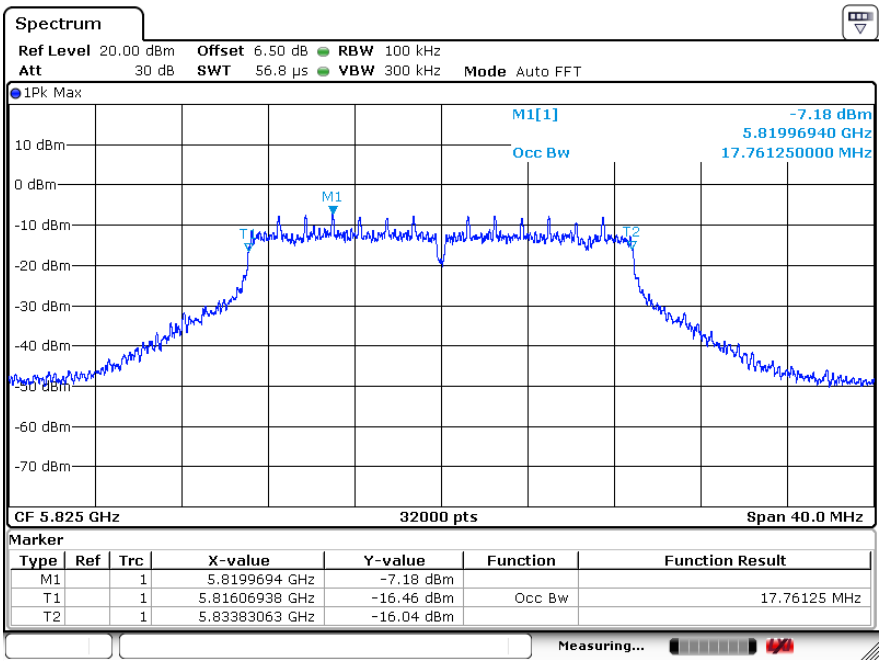
Test mode: 802.11n(HT20)




Lowest channel

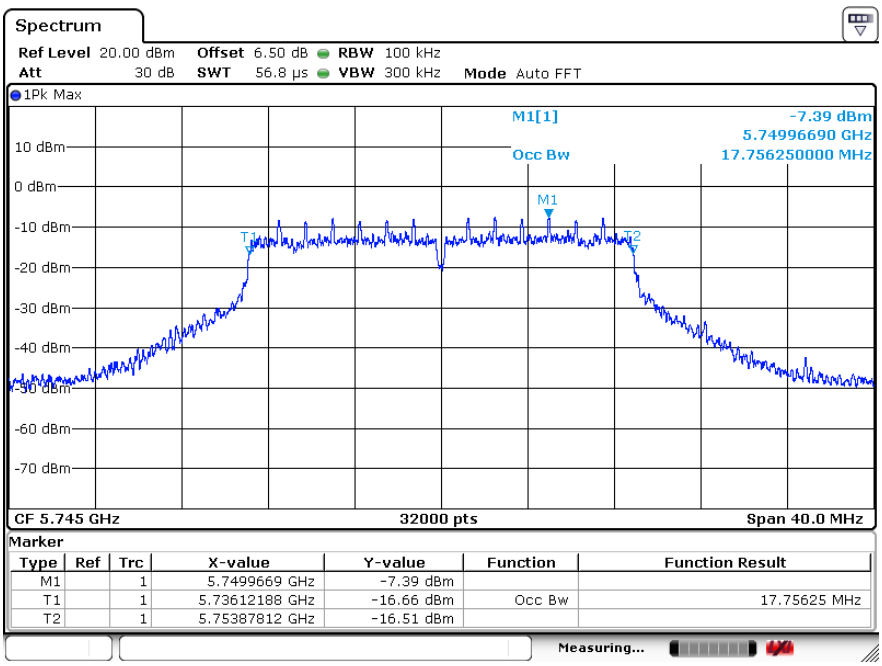



Middle channel

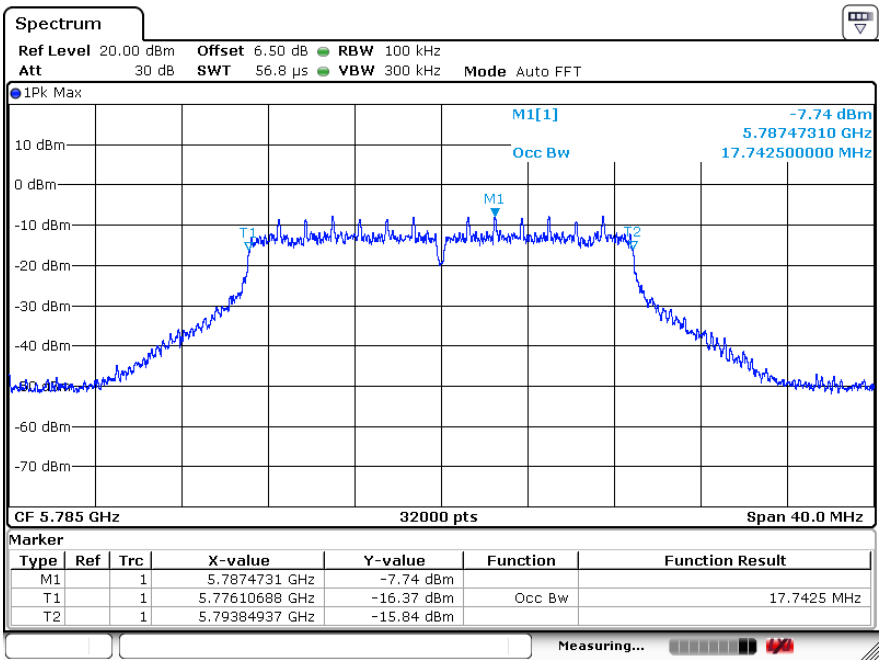



Highest channel

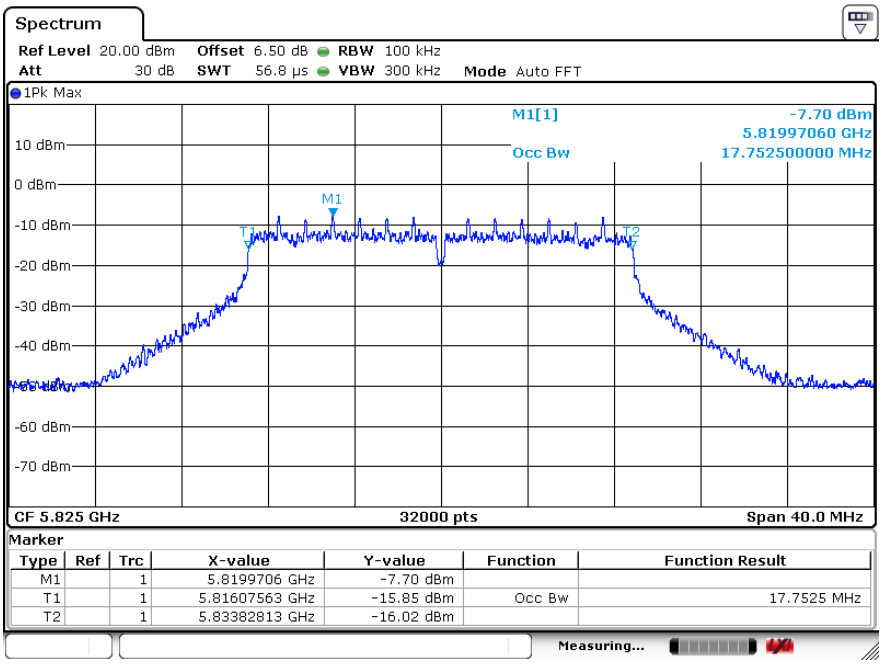
Test mode: 802.11ac(VHT20)




Lowest channel

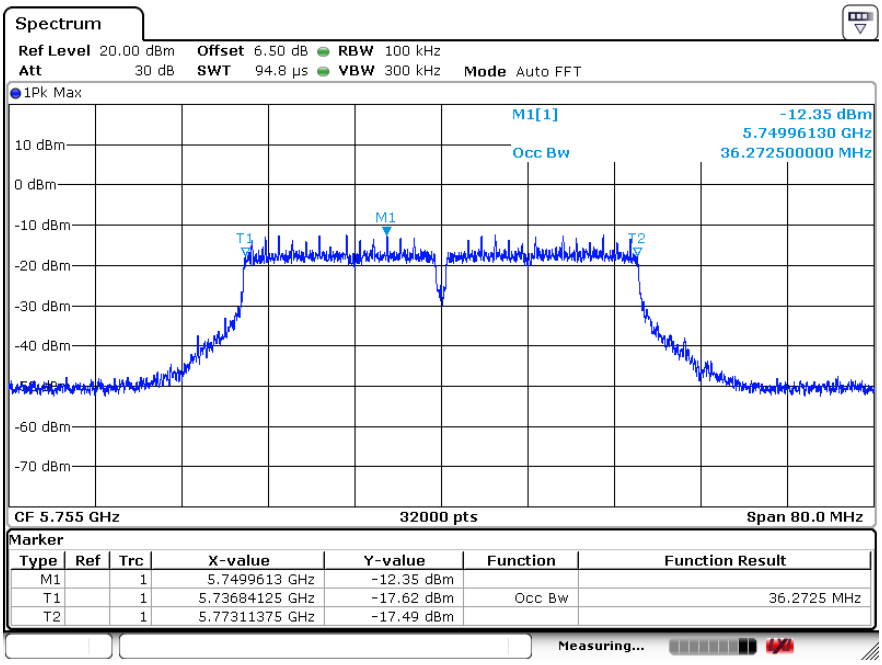



Middle channel

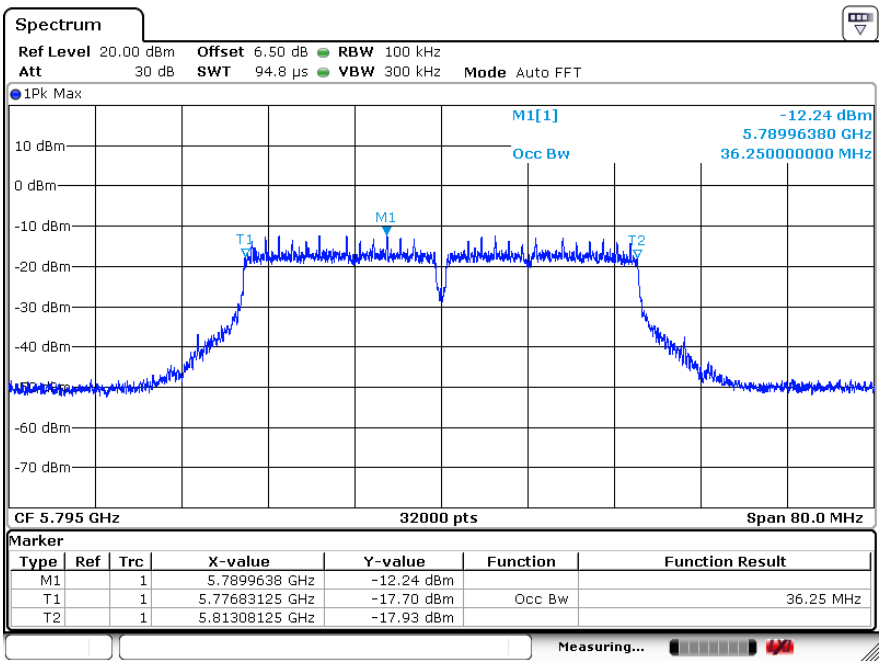



Highest channel

Test mode: 802.11n(VHT40)

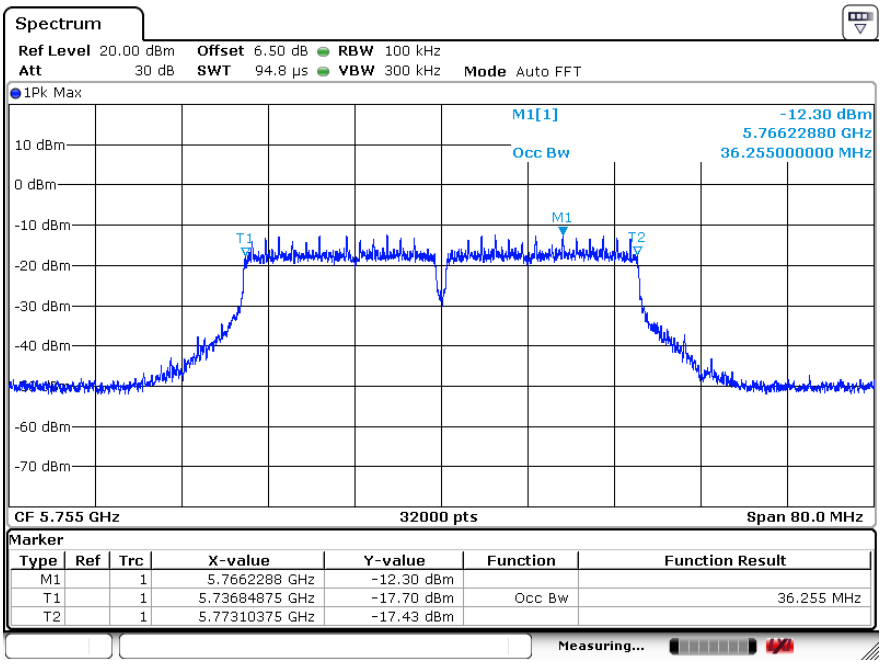



Lowest channel

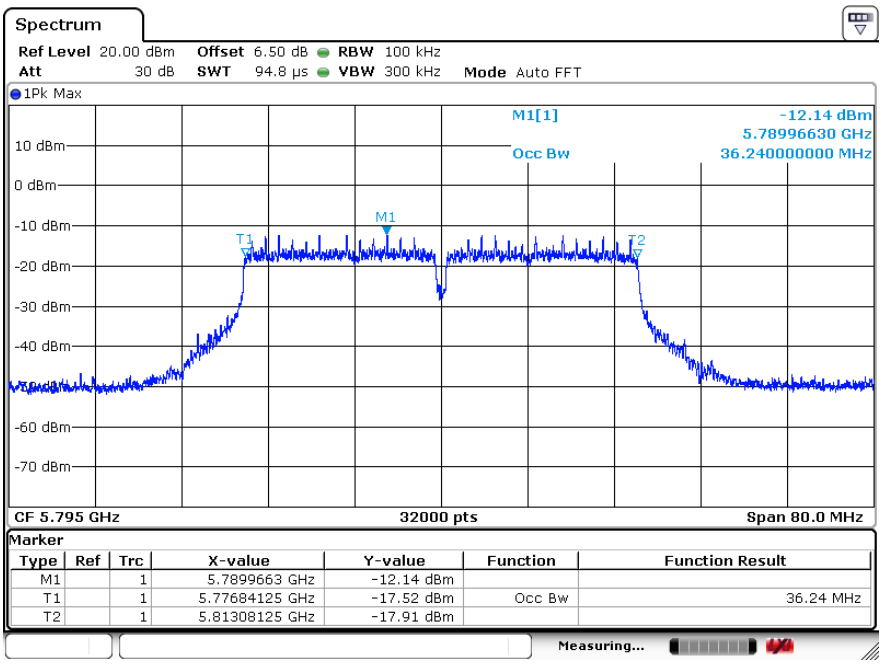



Highest channel

Test mode: 802.11ac(VHT40)

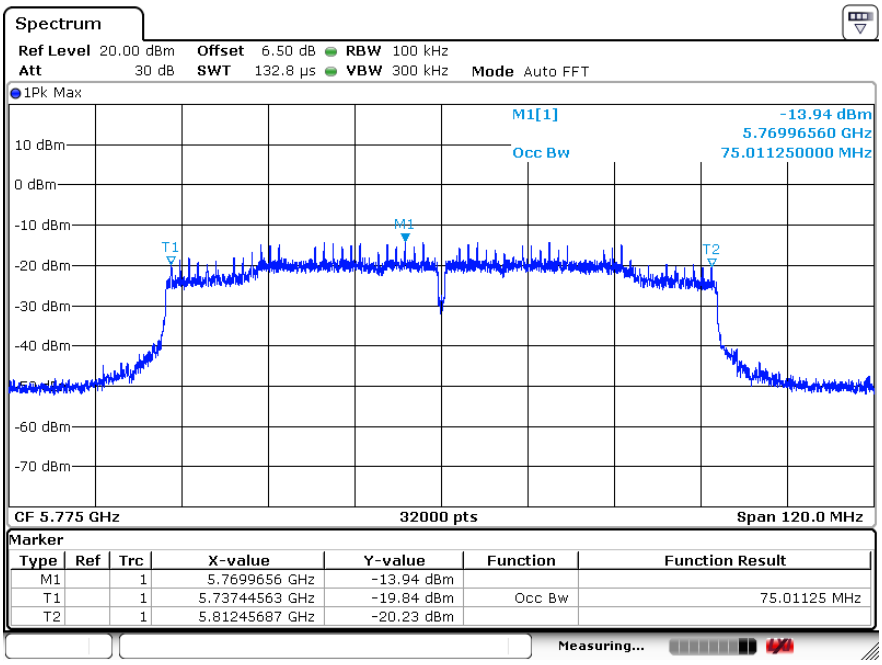



Lowest channel

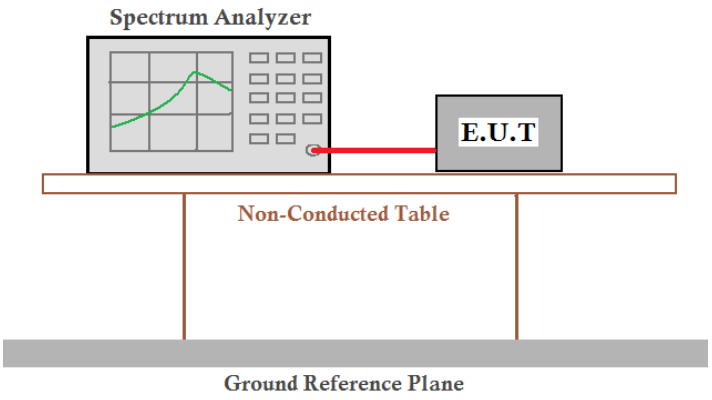



Highest channel

Test mode: 802.11ac(VHT80)



Power Spectral Density

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Requirement: | FCC Part15 E Section 15.407(a)(3) | | | | | |
| Test Method: | ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 | | | | | |
| Limit: | 30dBm/500kHz | | | | | |
| Test setup: |  | | | | | |
| Test Instruments: | Refer to section 6.0 for details | | | | | |
| Test mode: | Refer to section 5.2 for details | | | | | |
| Test environment: | Temp.: | 24 °C | Humid.: | 53% | Press.: | 1012mbar |
| Test voltage: | AC 120V, 60Hz | | | | | |
| Test results: | Pass | | | | | |

**Measurement Data**

| Modulation | Duty cycle Ant1 | Duty cycle Ant2 | Duty Factor Ant1 | Duty Factor Ant2 |
|---|---|---|---|---|
| 802.11a | 91.22 | 91.2 | 0.4 | 0.4 |
| 802.11n(HT20) | 89.82 | 89.44 | 0.47 | 0.48 |
| 802.11n(HT40) | 81.77 | 81.35 | 0.87 | 0.9 |
| 802.11ac(HT20) | 89.75 | 89.61 | 0.47 | 0.48 |
| 802.11ac(HT40) | 81.41 | 81.51 | 0.89 | 0.89 |
| 802.11ac(HT80) | 66.4 | 67.23 | 1.78 | 1.72 |

| 802.11a mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Result |
| 149 | 5745 | 0.4 | -12.92 | 0.4 | -12.24 | / | 30 | Pass |
| 157 | 5785 | 0.4 | -12.23 | 0.4 | -12.77 | / | 30 | Pass |
| 165 | 5825 | 0.4 | -13.21 | 0.4 | -12.91 | / | 30 | Pass |

| 802.11n(HT20) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Result |
| 149 | 5745 | 0.47 | -12.23 | 0.47 | -13.81 | -9.94 | 30 | Pass |
| 157 | 5785 | 0.47 | -11.07 | 0.47 | -12.79 | -8.84 | 30 | Pass |
| 165 | 5825 | 0.47 | -10.93 | 0.47 | -13.09 | -8.87 | 30 | Pass |

| 802.11ac(HT20) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Result |
| 149 | 5745 | 0.47 | -11.27 | 0.48 | -13.64 | -9.28 | 30 | Pass |
| 157 | 5785 | 0.47 | -12.01 | 0.48 | -12.4 | -9.19 | 30 | Pass |
| 165 | 5825 | 0.47 | -12.49 | 0.48 | -13.46 | -9.94 | 30 | Pass |

| 802.11n(HT40) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Result |
| 151 | 5755 | 0.87 | -18.01 | 0.9 | -17.86 | -14.92 | 30 | Pass |
| 159 | 5795 | 0.87 | -18.62 | 0.9 | -18.46 | -15.53 | 30 | Pass |

| 802.11ac(HT40) mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Result |
| 151 | 5755 | 0.89 | -17.54 | 0.89 | -17.95 | -14.73 | 30 | Pass |
| 159 | 5795 | 0.89 | -18.54 | 0.89 | -17.94 | -15.22 | 30 | Pass |

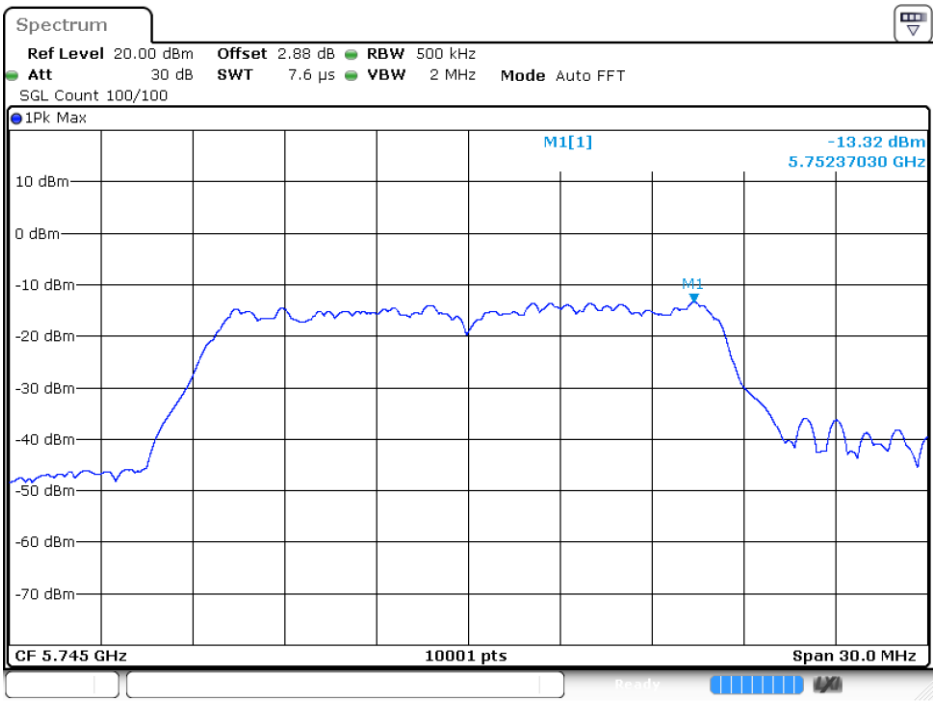
| 802.11 ac(HT80) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CH No. | Frequency (MHz) | Duty Factor | Total PSD Power Ant1(dBm/MHz) | Duty Factor | Total PSD Power Ant2(dBm/MHz) | Mimo | Limit (dBm/MHz) | Limit (dBm/MHz) |
| 155 | 5775 | 1.78 | -21.34 | 1.72 | -21.59 | -18.45 | 30 | Pass |

Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n/ac for MIMO mode,not support 802.11 a for MIMO mode.

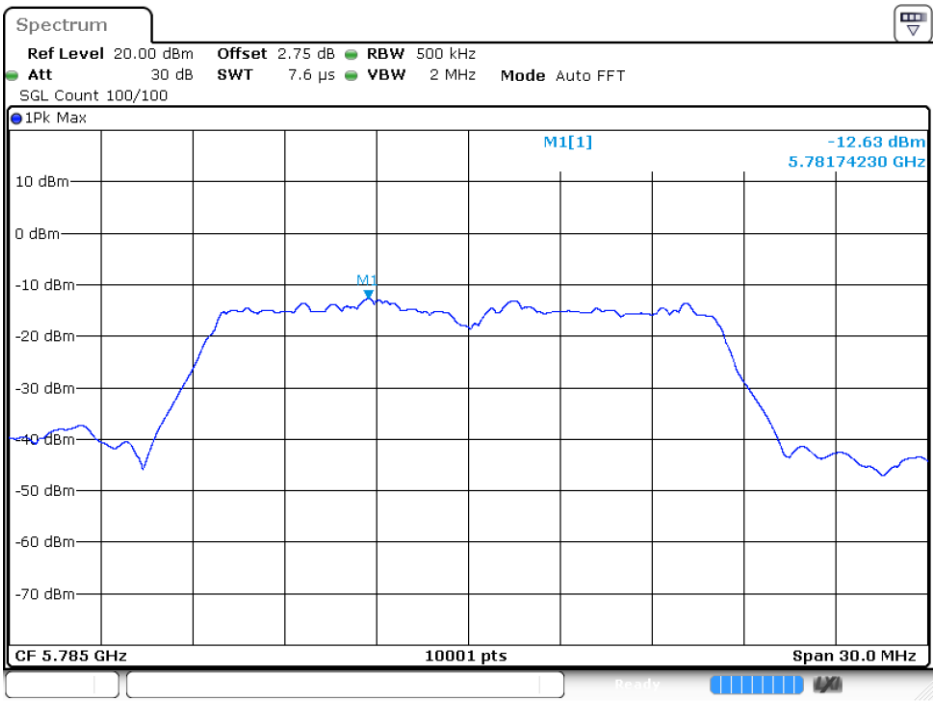
**Test plot as follows:**

**Ant1:**

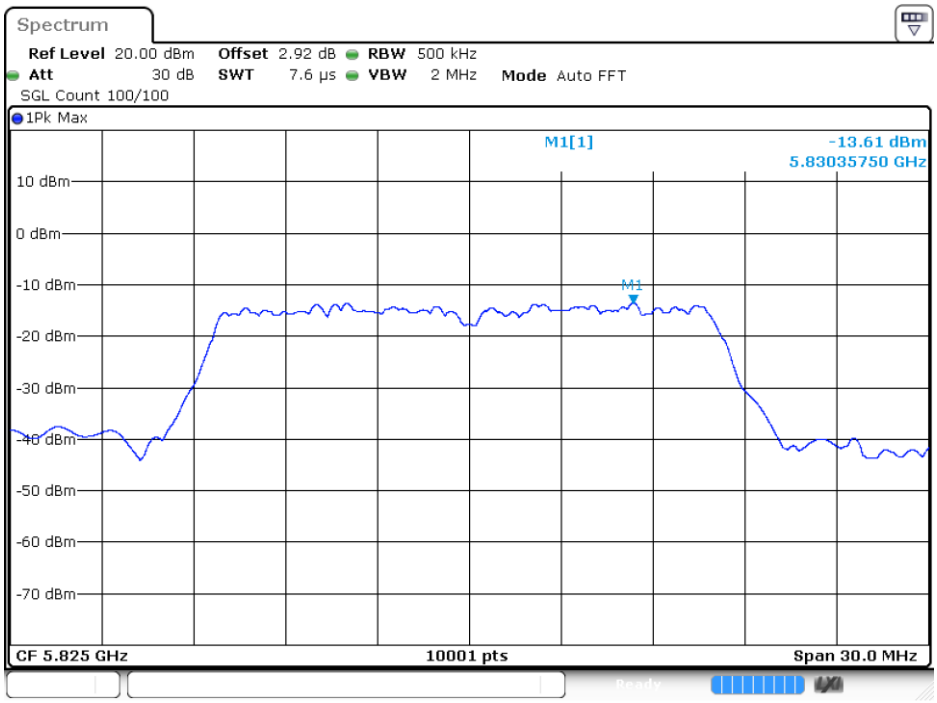
Test mode: 802.11a




Lowest channel

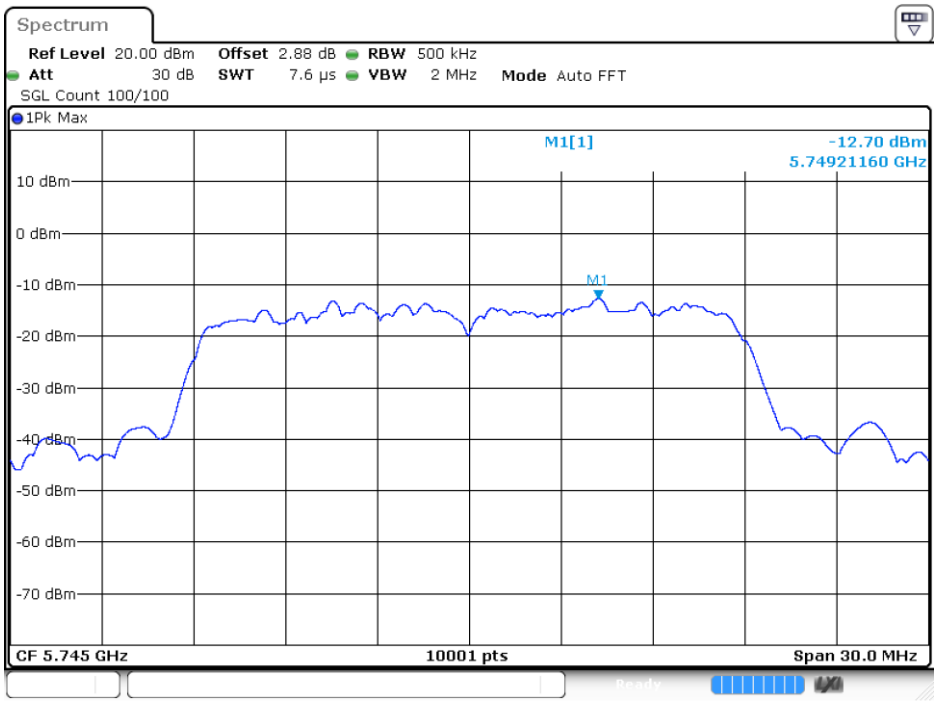



Middle channel

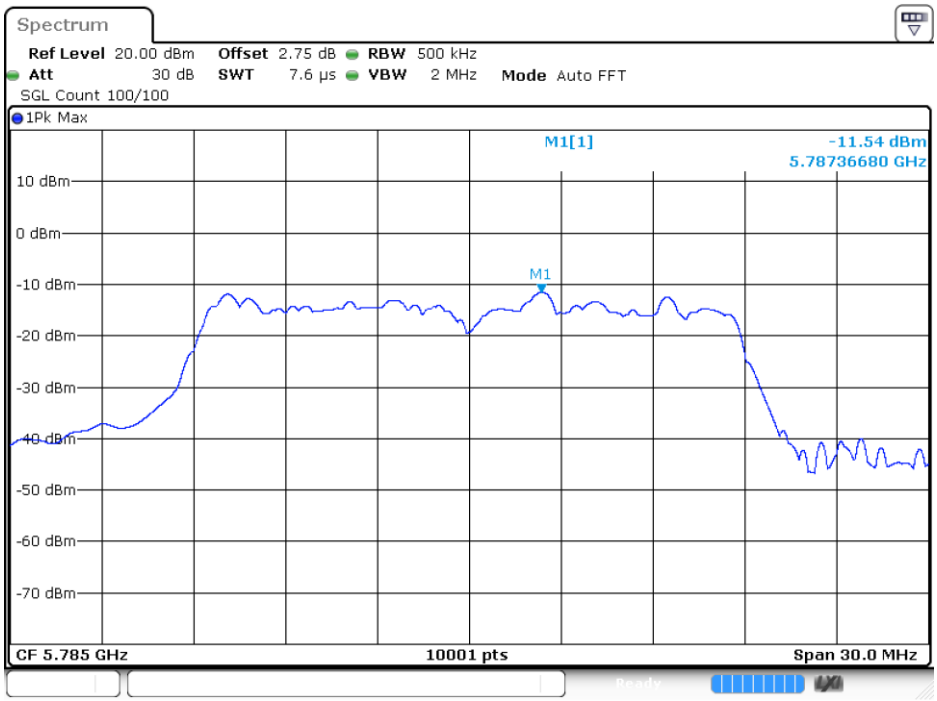



Highest channel

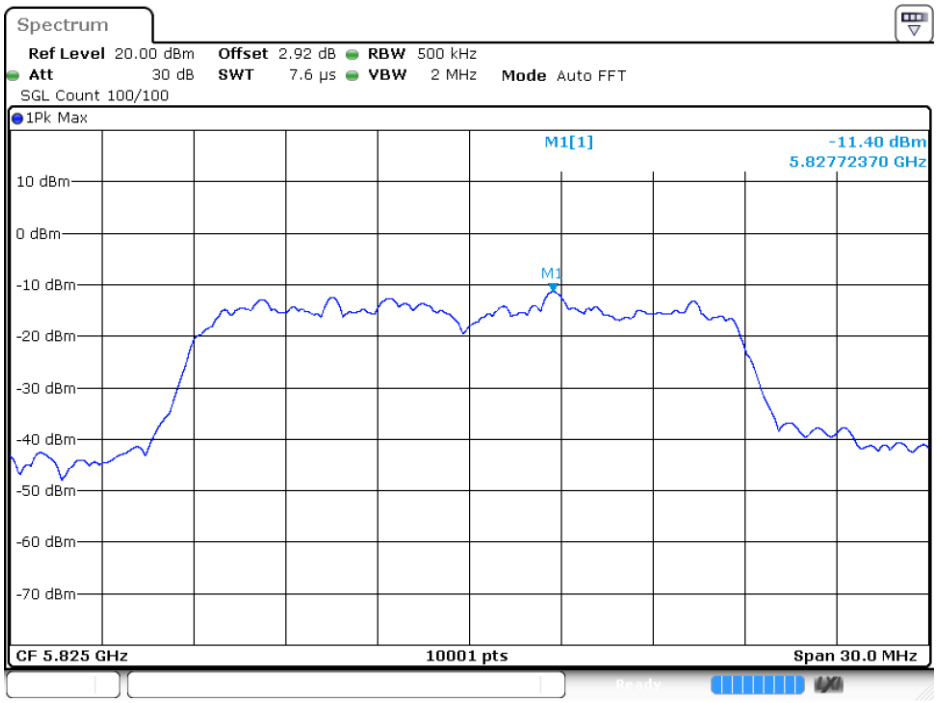
Test mode: 802.11n(HT20)




Lowest channel

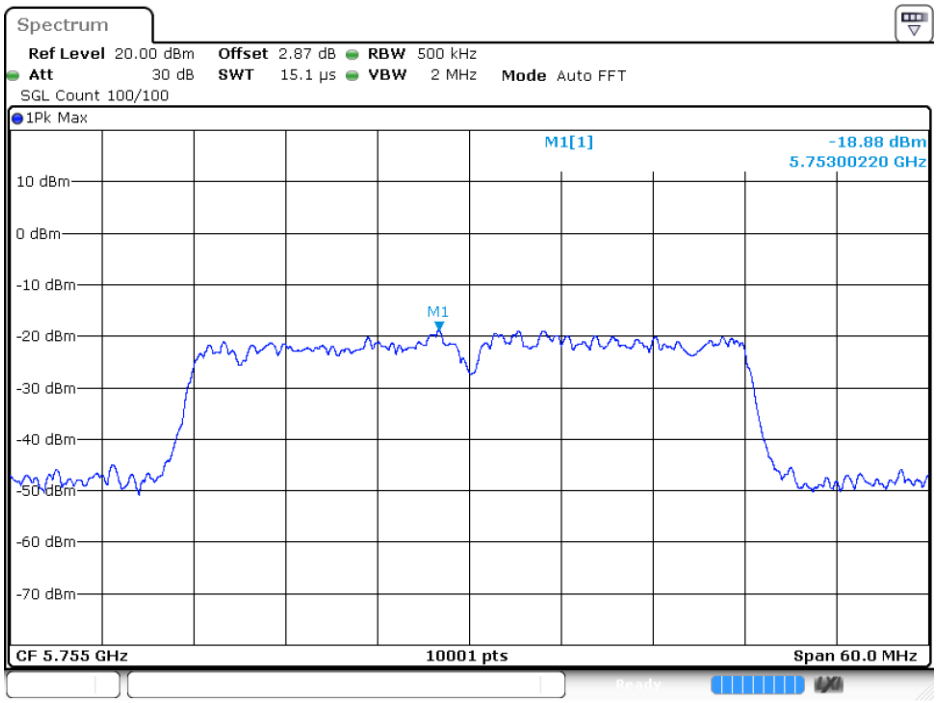



Middle channel

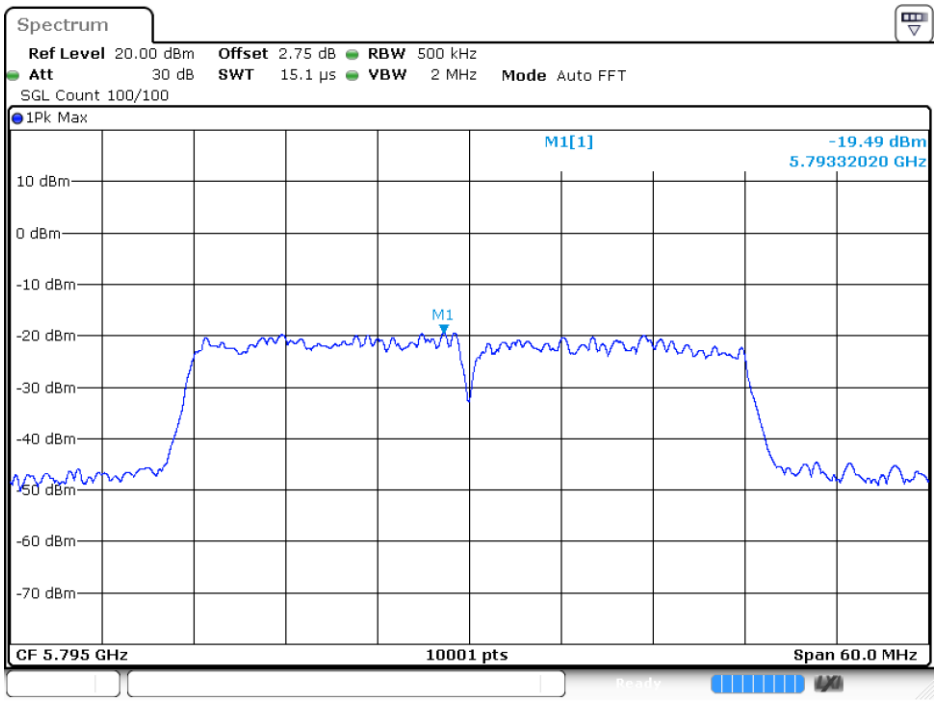



Highest channel

Test mode: 802.11n(HT40)

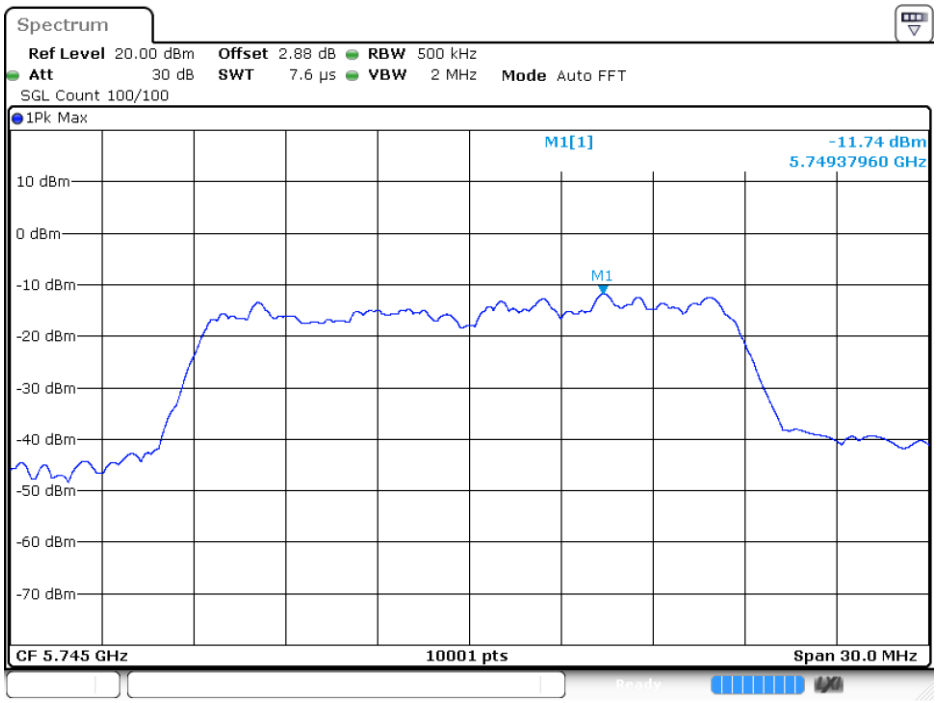



Lowest channel

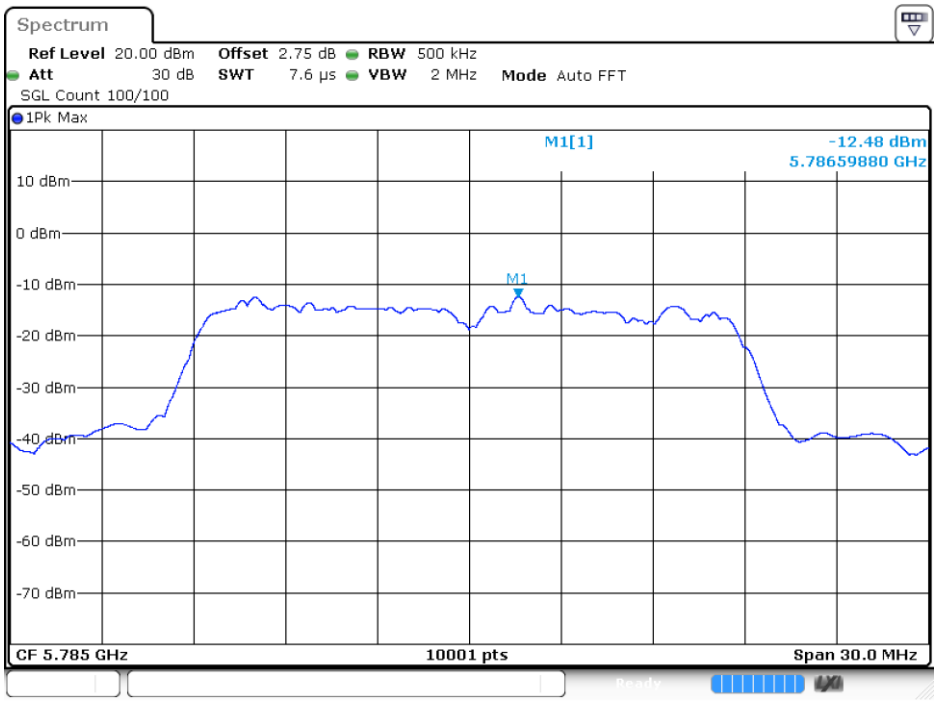



Highest channel

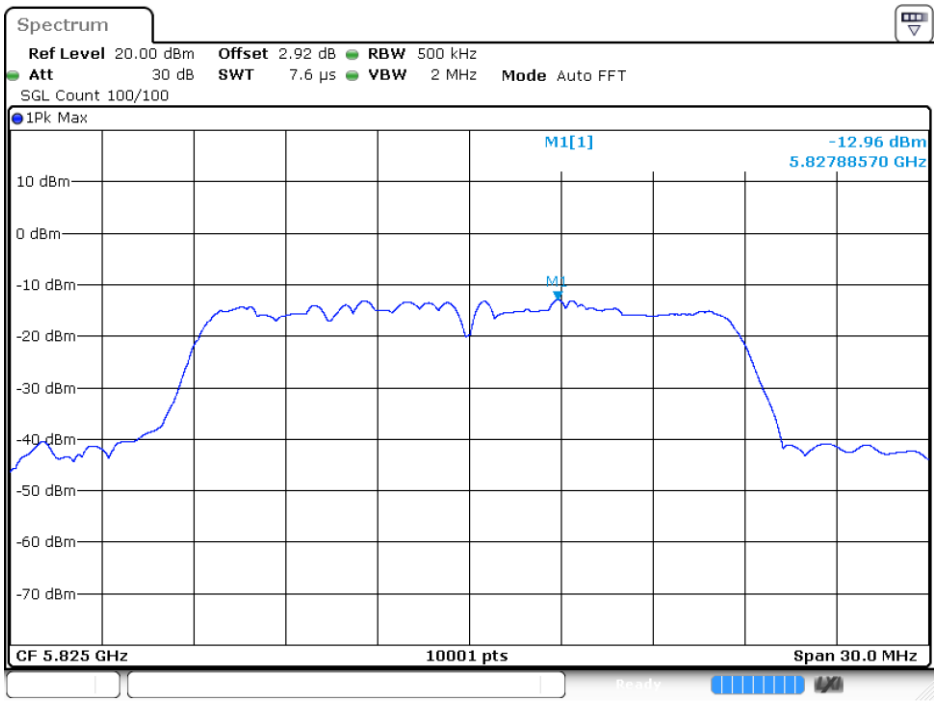
Test mode: 802.11ac(HT20)




Lowest channel

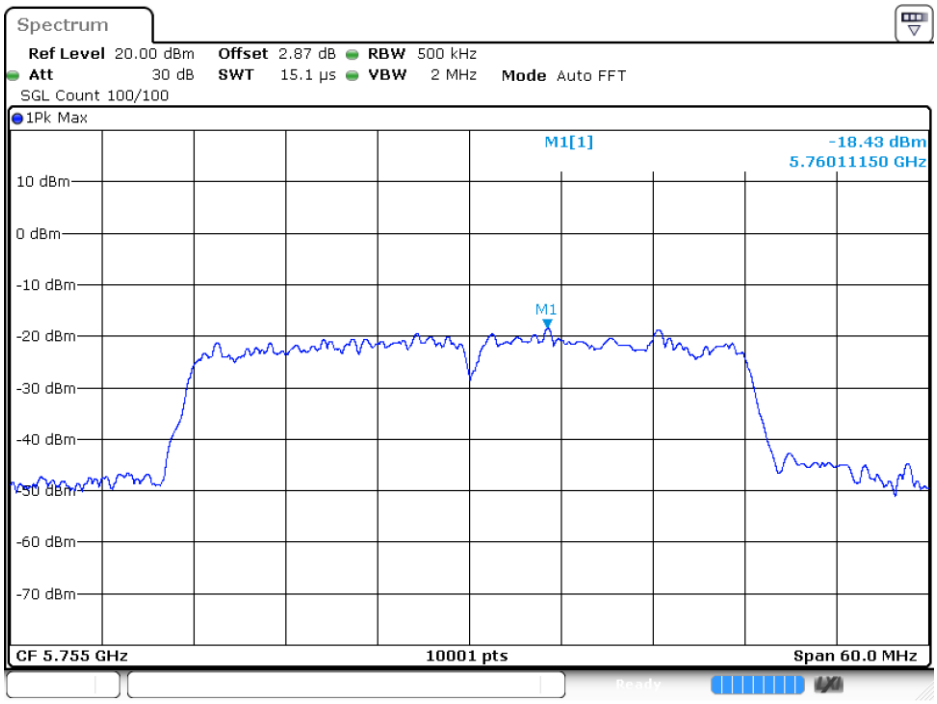



Middle channel

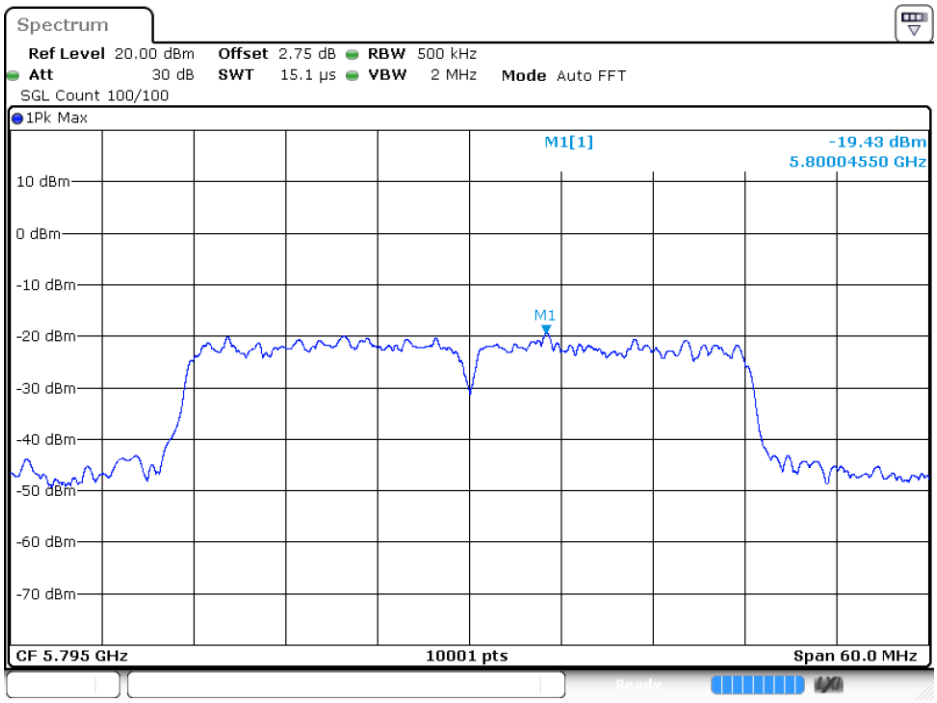



Highest channel

Test mode: 802.11ac(HT40)

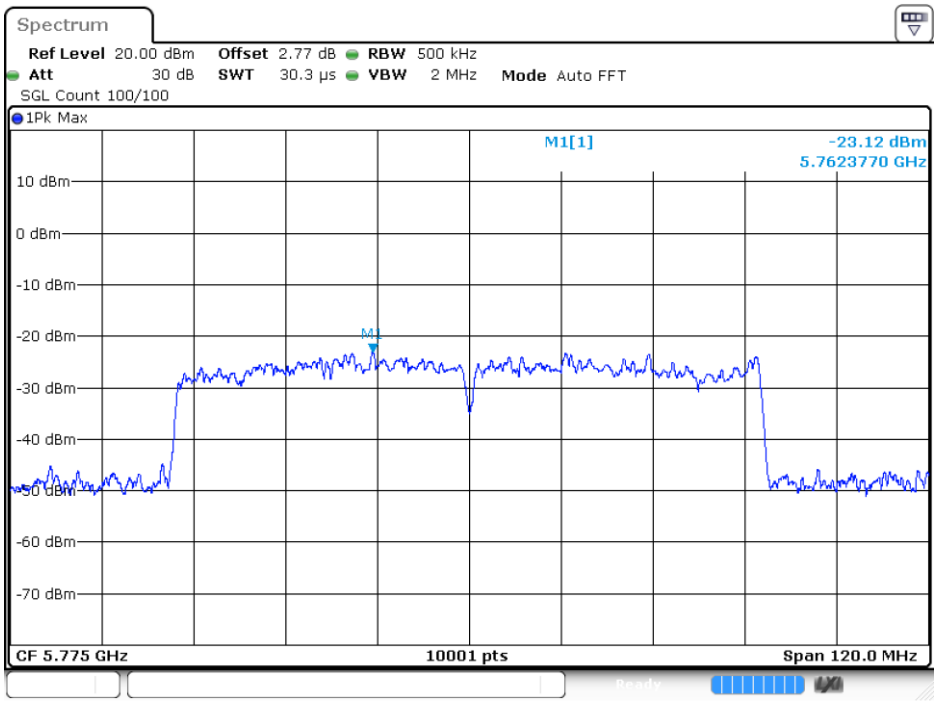



Lowest channel




Highest channel

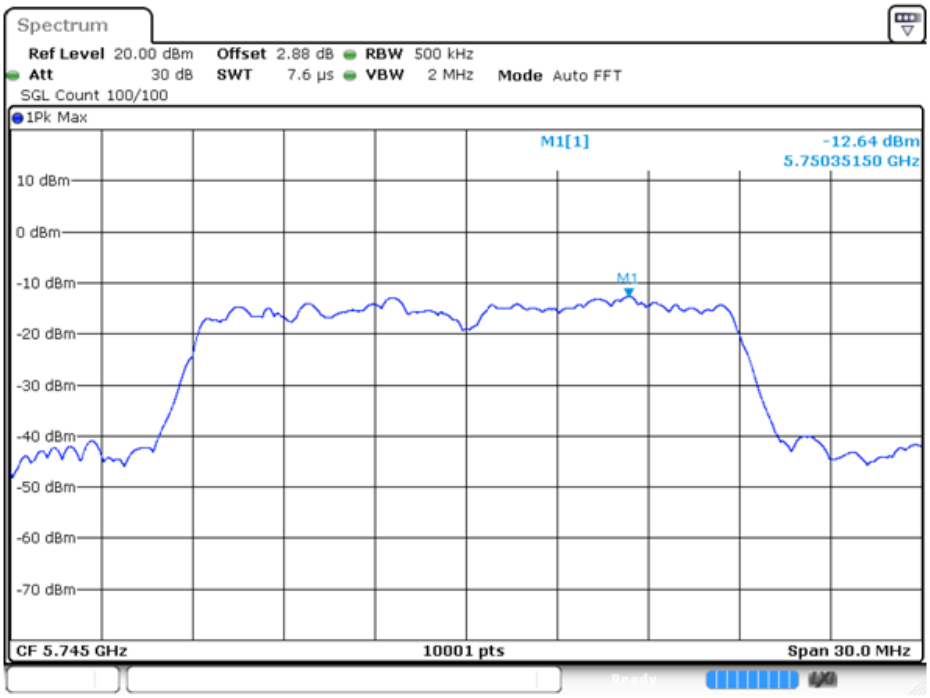
Test mode: 802.11ac(HT80)



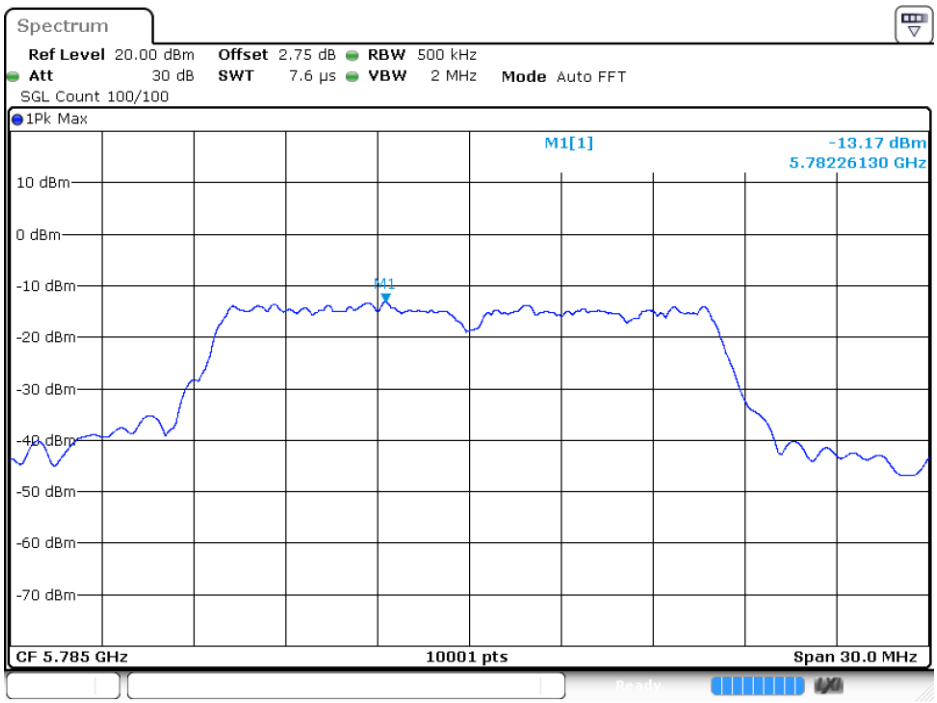

Middle channel

**Ant2:**

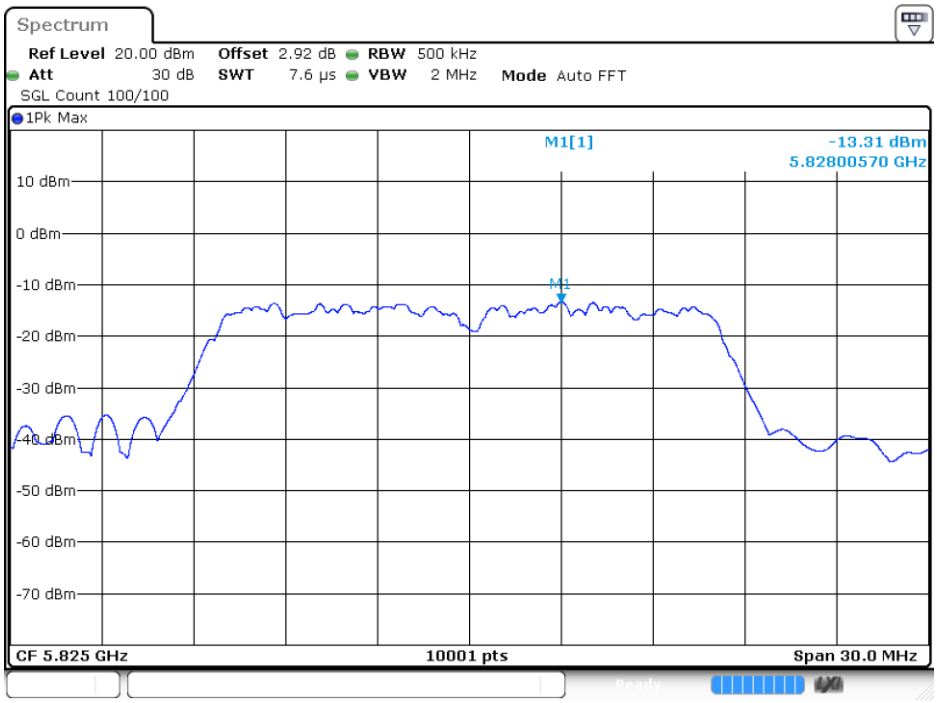
Test mode: 802.11a




Lowest channel

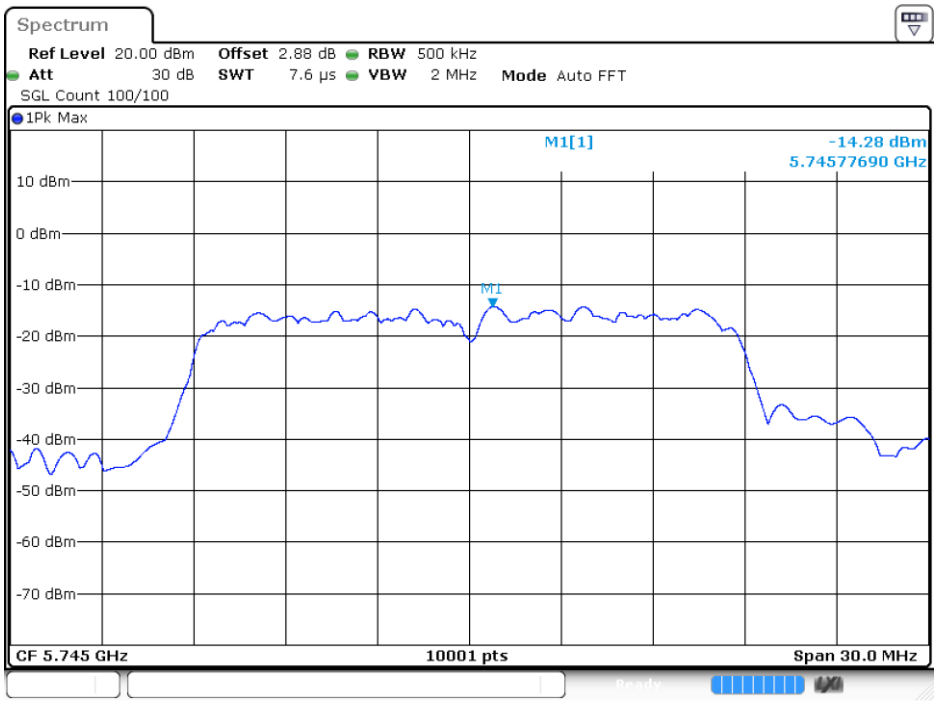



Middle channel

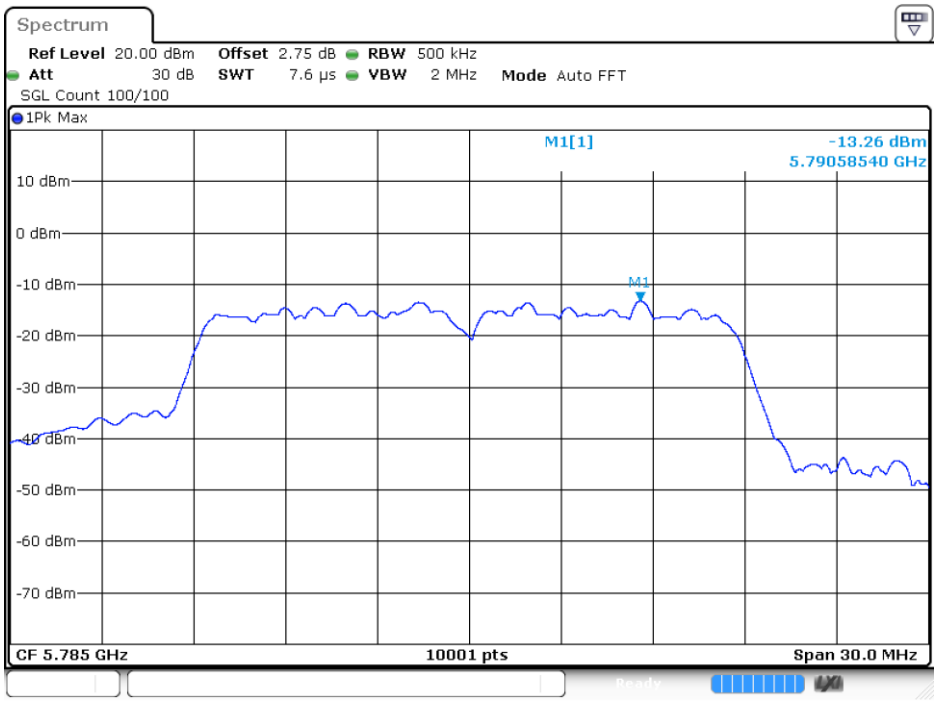



Highest channel

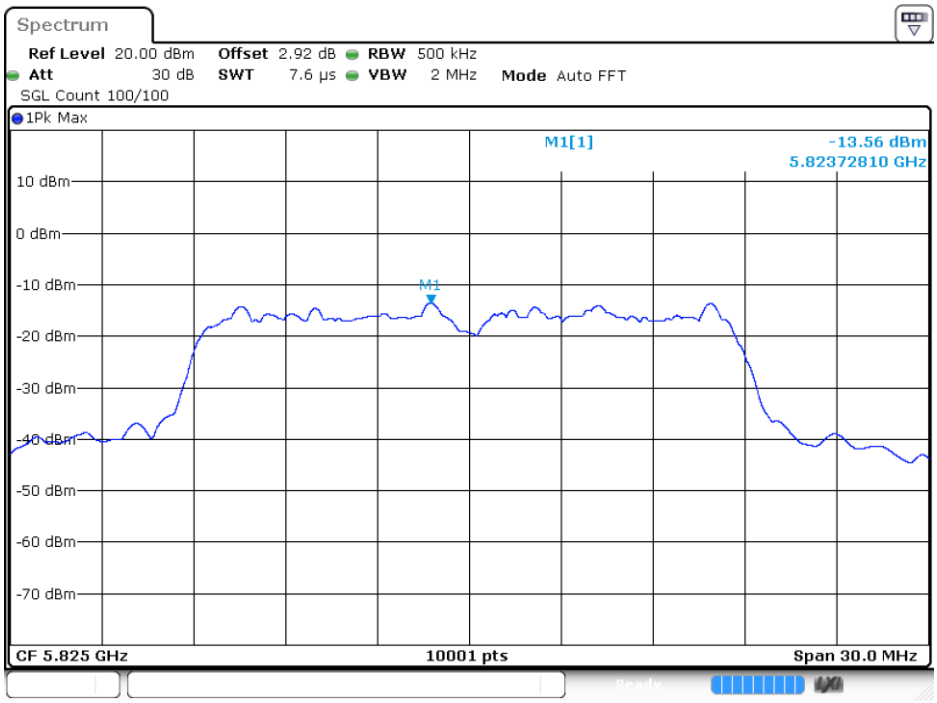
Test mode: 802.11n(HT20)




Lowest channel

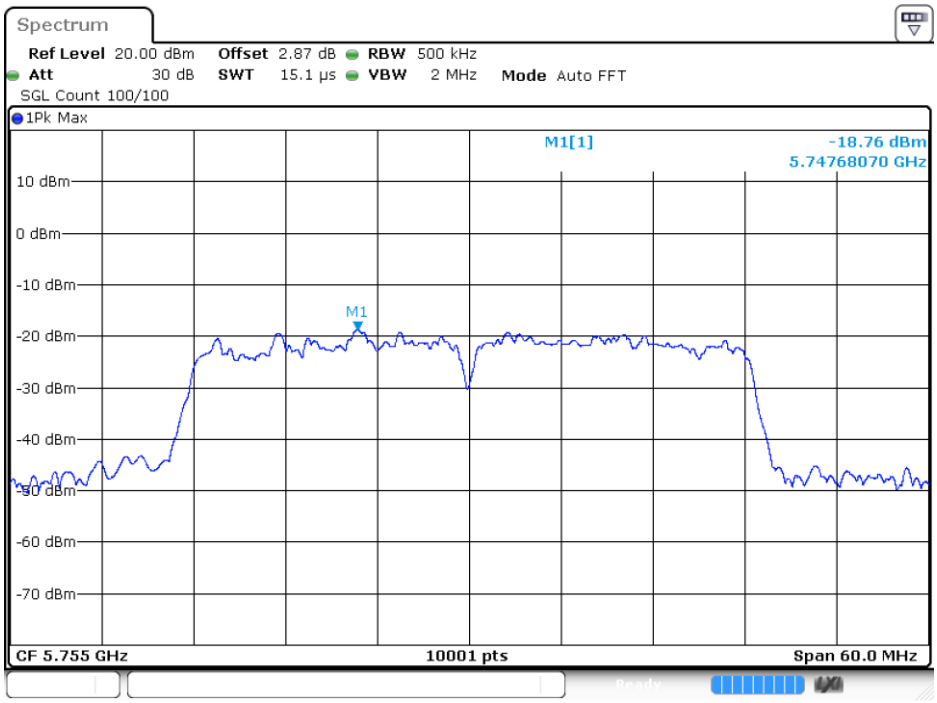



Middle channel

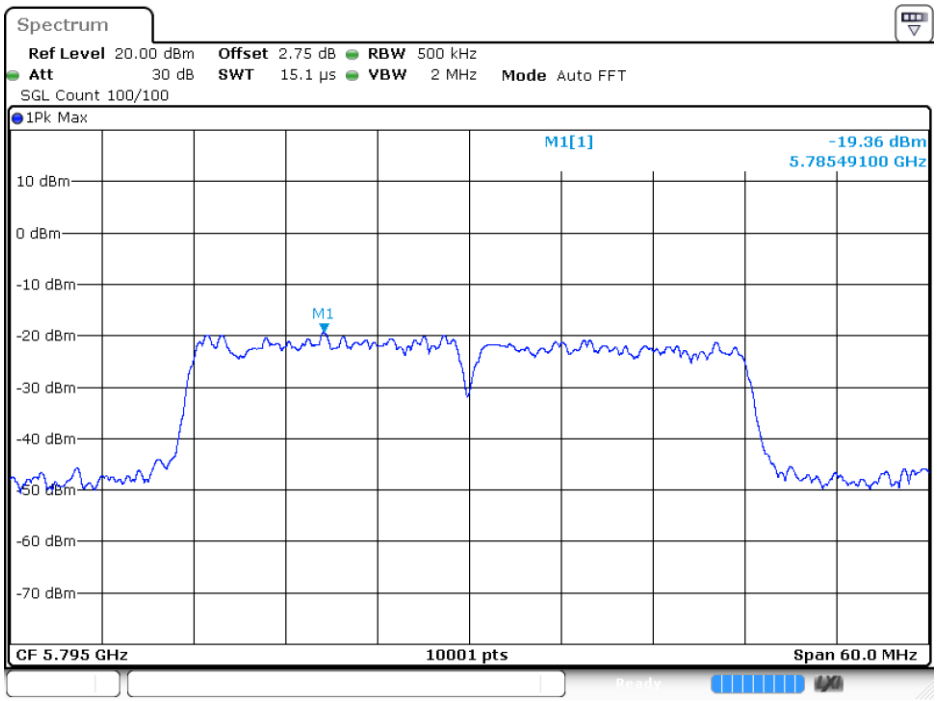



Highest channel

Test mode: 802.11n(HT40)

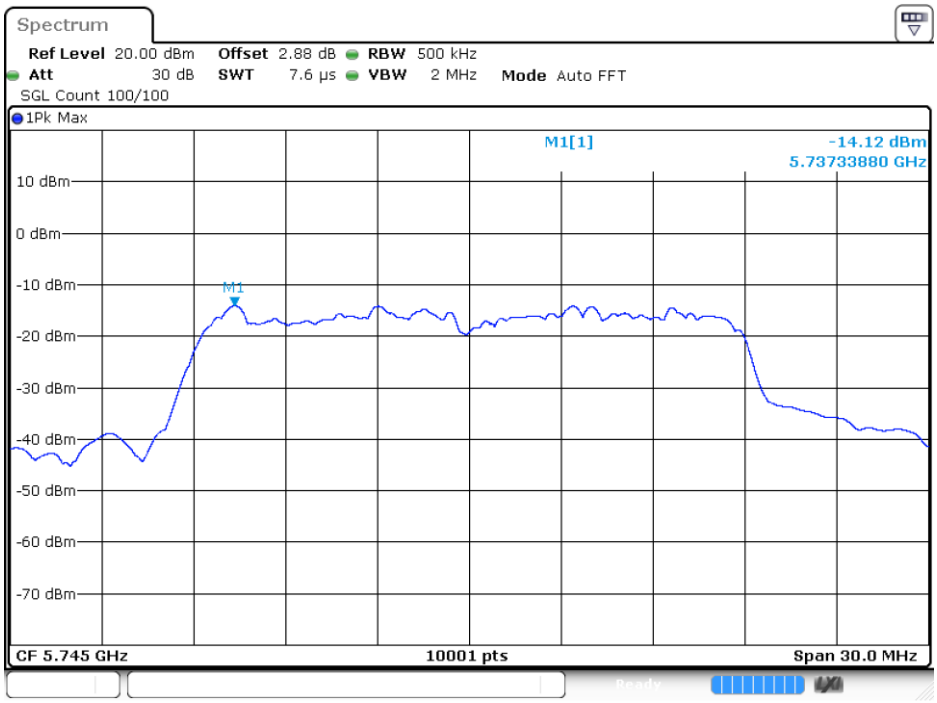



Lowest channel

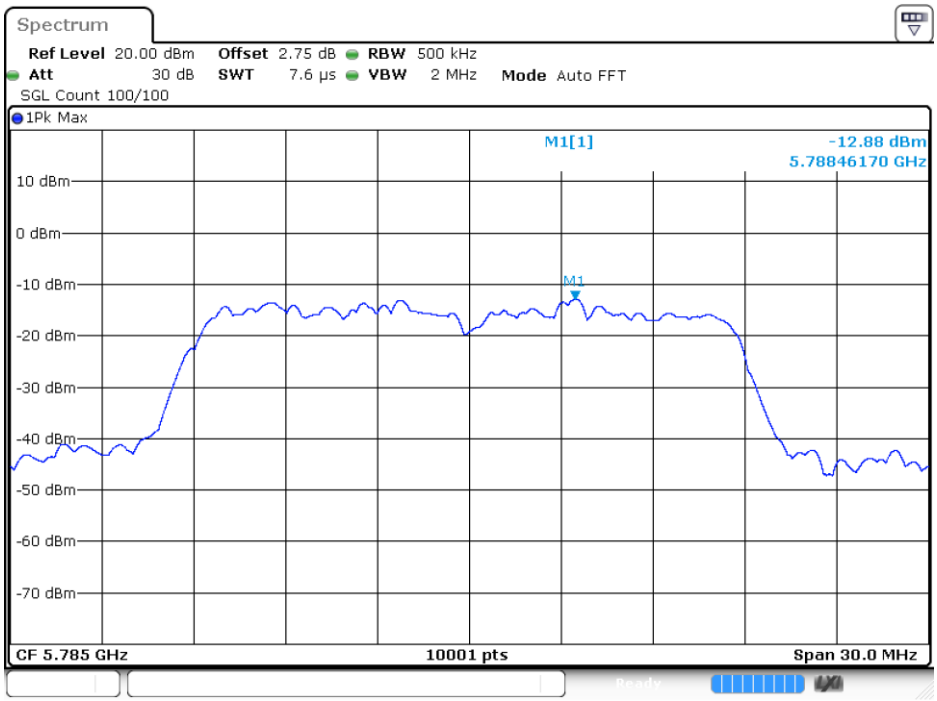



Highest channel

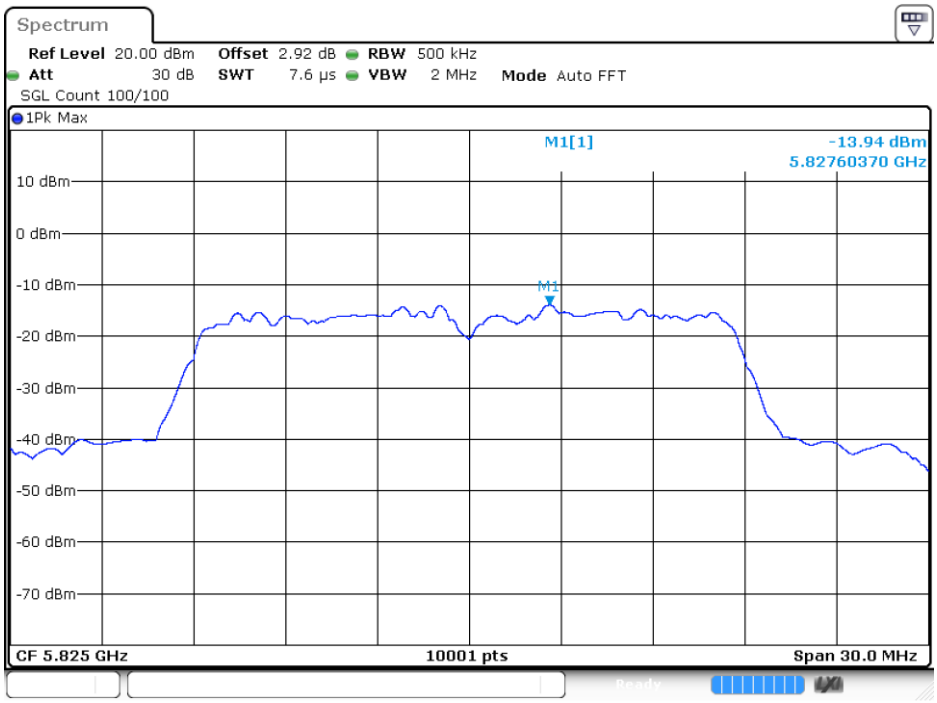
Test mode: 802.11ac(HT20)




Lowest channel

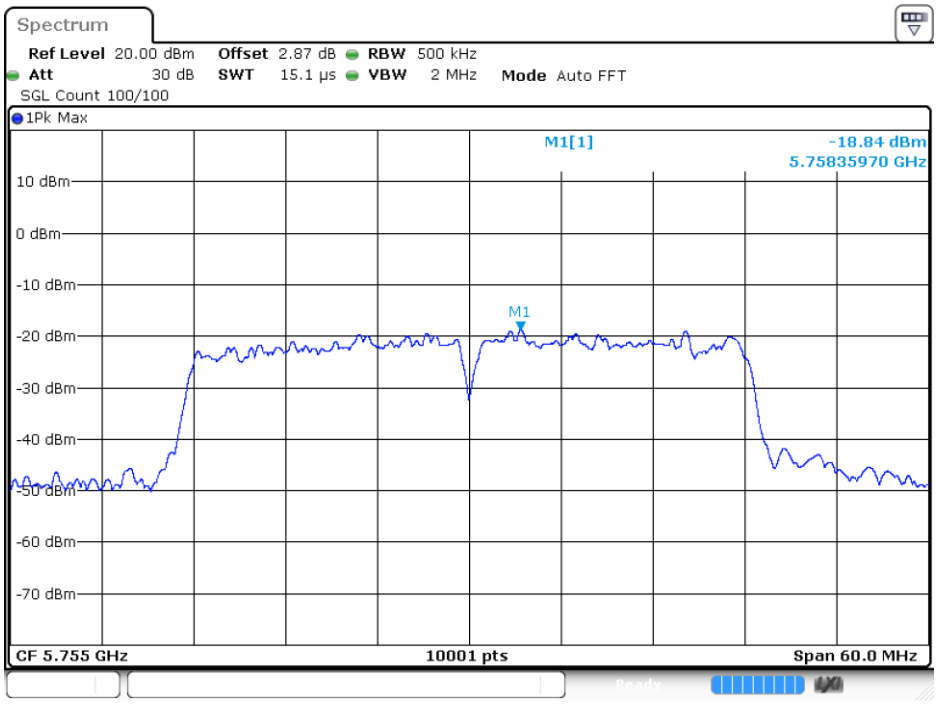



Middle channel

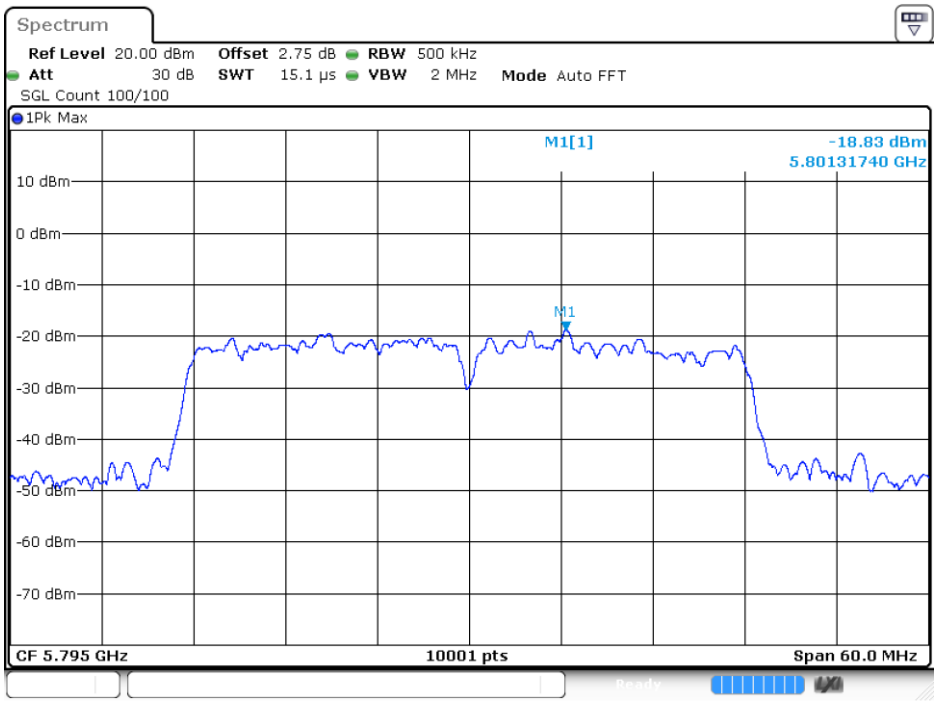



Highest channel

Test mode: 802.11ac(HT40)

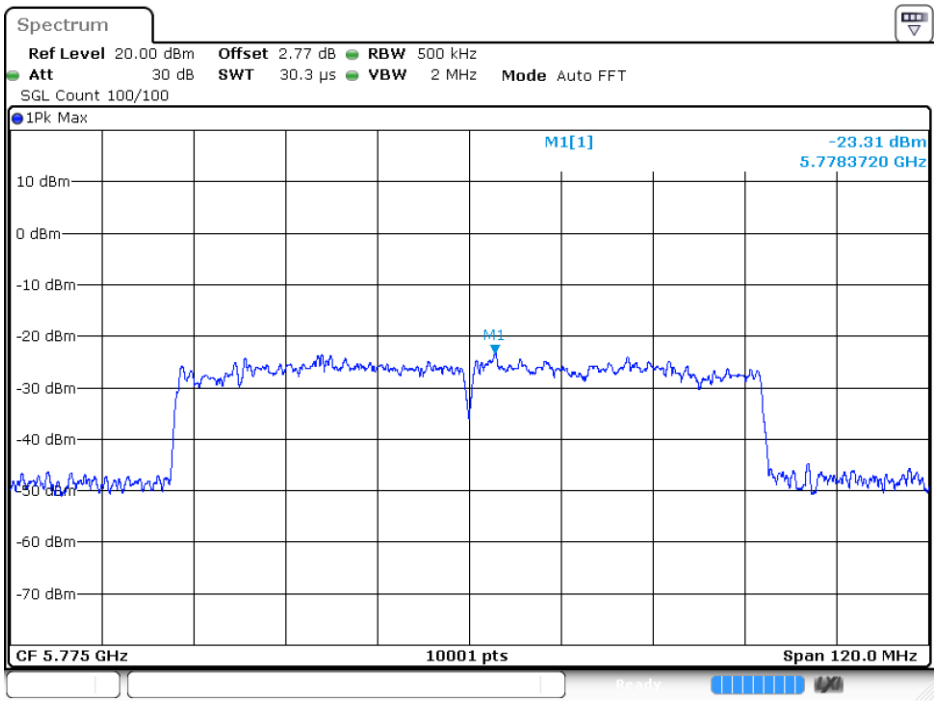



Lowest channel




Highest channel

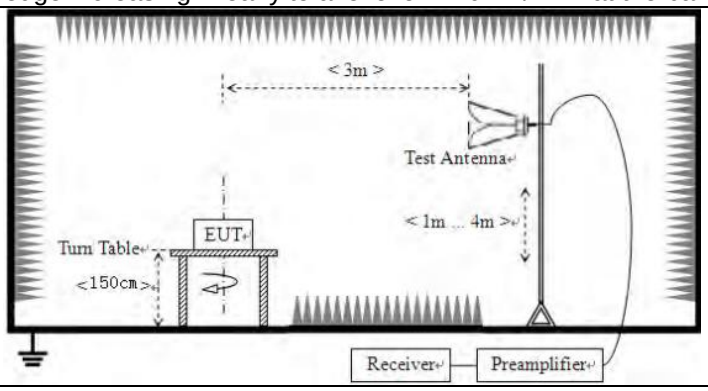
Test mode: 802.11ac(HT80)




Middle channel

## 7.5 Band edge

### 7.5.1 Radiated Emission Method

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.209 and 15.205 |
| Test Method: | ANSI C63.10: 2013 |
| Test Frequency Range: | 9kHz to 40GHz, only worse case is reported |
| Test site: | Measurement Distance: 3m |
| Receiver setup: | <table><tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr><tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>RMS</td></tr></table> |
| Limit: | All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. |
| Test setup: |  |
| Test Procedure: | 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.<br>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. |

| | |
|---|---|
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

*Remarks:*

1. *Only the worst case Main Antenna test data..*
2. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
5. *According to KDB 789033 D02v02r01 section G) 1) d),for measurements above 1000 MHz @3m distance, the limit of field strength is computed as follows:*

   *E[dBuV/m] = EIRP[dBm] + 95.2;*

   *E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.*

   *E[dBuV/m] = 10 + 95.2 = 105.2dBuV/m.*

   *E[dBuV/m] = 15.6 + 95.2 = 110.8dBuV/m.*

   *E[dBuV/m] = 27 + 95.2 = 122.2dBuV/m*

**Measurement data:**

***IEEE 802.11a***

| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 57.74 | 3.95 | 61.69 | 122.2 | CH 149 |
| 5725.000 | H | 58.36 | 3.95 | 62.31 | 122.2 | CH 149 |
| 5850.000 | V | 50.28 | 3.96 | 54.24 | 122.2 | CH 165 |
| 5850.000 | H | 50.16 | 3.96 | 54.12 | 122.2 | CH 165 |

***IEEE 802.11n HT20***

| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 56.49 | 3.95 | 60.44 | 122.2 | CH 149 |
| 5725.000 | H | 57.74 | 3.95 | 61.69 | 122.2 | CH 149 |
| 5850.000 | V | 53.68 | 3.96 | 57.64 | 122.2 | CH 165 |
| 5850.000 | H | 53.49 | 3.96 | 57.45 | 122.2 | CH 165 |

***IEEE 802.11ac HT20***

| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 55.46 | 3.95 | 59.41 | 122.2 | CH 149 |
| 5725.000 | H | 57.13 | 3.95 | 61.08 | 122.2 | CH 149 |
| 5850.000 | V | 52.21 | 3.96 | 56.17 | 122.2 | CH 165 |
| 5850.000 | H | 51.49 | 3.96 | 55.45 | 122.2 | CH 165 |

***IEEE 802.11n HT40***

| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 55.17 | 3.95 | 59.12 | 122.2 | CH 151 |
| 5725.000 | H | 58.35 | 3.95 | 62.3 | 122.2 | CH 151 |
| 5850.000 | V | 48.66 | 3.96 | 52.62 | 122.2 | CH 159 |
| 5850.000 | H | 47.59 | 3.96 | 51.55 | 122.2 | CH 159 |

***IEEE 802.11ac HT40***

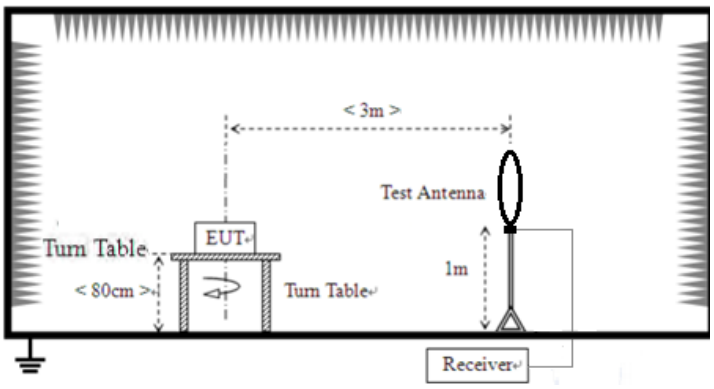
| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 56.39 | 3.95 | 60.34 | 122.2 | CH 151 |
| 5725.000 | H | 56.87 | 3.95 | 60.82 | 122.2 | CH 151 |
| 5850.000 | V | 45.36 | 3.96 | 49.32 | 122.2 | CH 159 |
| 5850.000 | H | 48.42 | 3.96 | 52.38 | 122.2 | CH 159 |

***IEEE 802.11ac HT80***

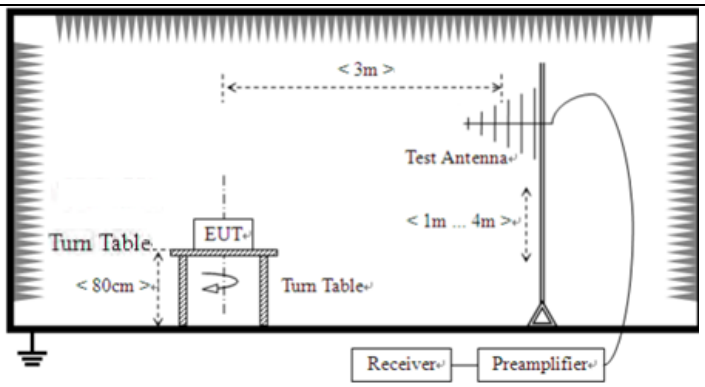
| Freq. (MHz) | Ant.Pol. H/V | Reading (dBuv) | Ant/CF (dB) | Act (dBuv/m) | Limit (dBuv/m) | Note |
|---|---|---|---|---|---|---|
| 5725.000 | V | 58.69 | 3.95 | 62.64 | 122.2 | CH 155 |
| 5850.000 | V | 55.28 | 3.96 | 59.24 | 122.2 | CH 155 |
| 5725.000 | H | 59.46 | 3.95 | 63.41 | 122.2 | CH 155 |
| 5850.000 | H | 53.49 | 3.96 | 57.45 | 122.2 | CH 155 |

## 7.6 Spurious Emission

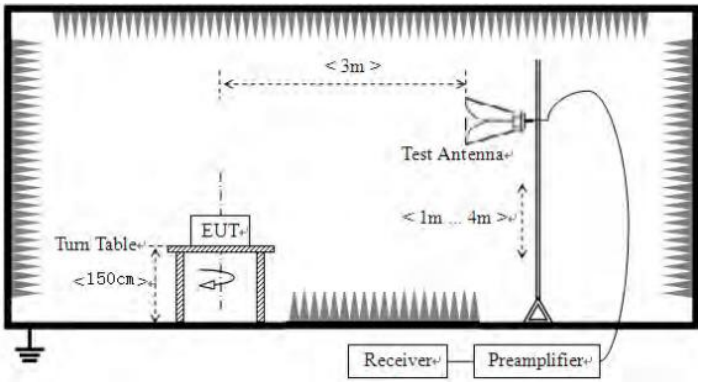
### 7.6.1 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209, Part 15E Section 15.407(b)(4)</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 40GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>9kHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>AV</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="4">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
</table>
<table>
<tr><th>Frequency</th><th>Limit (dBm/MHz)</th><th>Remark</th></tr>
<tr><td>Above 1GHz</td><td>-27.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz<br> 

<br>For radiated emissions from 30MHz to1GHz</td></tr>
</table>




For radiated emissions above 1GHz




| | |
|---|---|
| Test Procedure: | 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.<br>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test |

| | | | | | | |
|---|---|---|---|---|---|---|
| | worst case mode is recorded in the report. | | | | | |
| Test Instruments: | Refer to section 6.0 for details | | | | | |
| Test mode: | Refer to section 5.2 for details | | | | | |
| Test environment: | Temp.: | 25 °C | Humid.: | 52% | Press.: | 1012mbar |
| Test voltage: | AC 120V, 60Hz | | | | | |
| Test results: | Pass | | | | | |

*Remarks:*

1. *Only the worst case Main Antenna test data.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

**Measurement Data:**

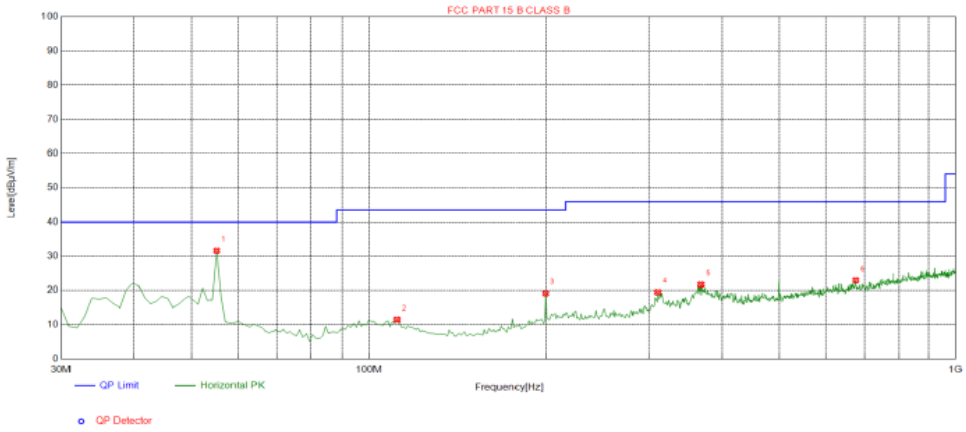
**9 kHz ~ 30 MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

**Below 1GHz**

Pre-scan all test modes, found worst case at 802.11ac(HT80), and so only show the test result of 802.11ac(HT80)

**Horizontal:**

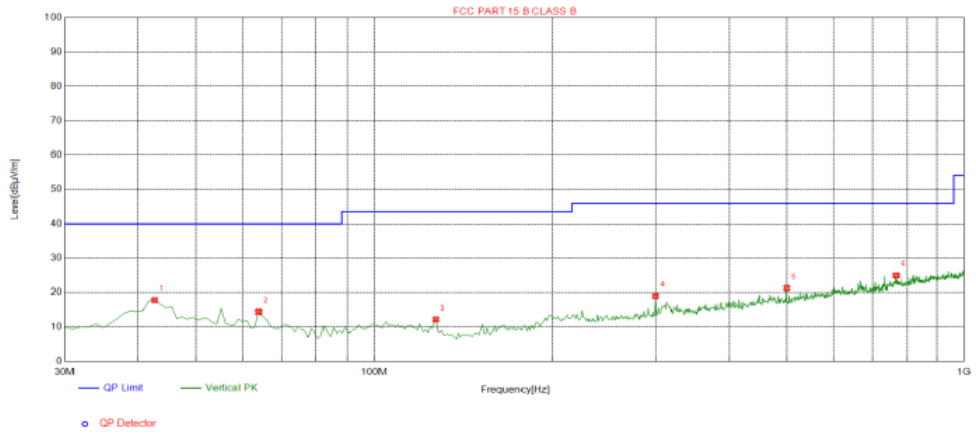



| Suspected List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 55.2452 | -14.44 | 46.07 | 31.63 | 40.00 | 8.37 | 100 | 124 | Horizontal |
| 2 | 111.5616 | -15.69 | 27.10 | 11.41 | 43.50 | 32.09 | 100 | 296 | Horizontal |
| 3 | 199.9199 | -15.07 | 34.20 | 19.13 | 43.50 | 24.37 | 100 | 34 | Horizontal |
| 4 | 310.6106 | -12.58 | 32.05 | 19.47 | 46.00 | 26.53 | 100 | 147 | Horizontal |
| 5 | 367.8979 | -11.07 | 32.76 | 21.69 | 46.00 | 24.31 | 100 | 112 | Horizontal |
| 6 | 675.6957 | -4.75 | 27.67 | 22.92 | 46.00 | 23.08 | 100 | 157 | Horizontal |

**Final Data List**

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level;

**Vertical:**




| Suspected List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 42.6226 | -14.07 | 31.83 | 17.76 | 40.00 | 22.24 | 100 | 57 | Vertical |
| 2 | 63.9840 | -16.16 | 30.52 | 14.36 | 40.00 | 25.64 | 100 | 322 | Vertical |
| 3 | 127.0971 | -18.14 | 30.31 | 12.17 | 43.50 | 31.33 | 100 | 296 | Vertical |
| 4 | 299.9299 | -12.74 | 31.71 | 18.97 | 46.00 | 27.03 | 100 | 96 | Vertical |
| 5 | 499.9500 | -8.30 | 29.58 | 21.28 | 46.00 | 24.72 | 100 | 0 | Vertical |
| 6 | 766.9670 | -3.32 | 28.29 | 24.97 | 46.00 | 21.03 | 100 | 242 | Vertical |

**Final Data List**

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level;

## Above 1GHz:

802.11a,11n(HT20),11ac(HT20),11n(HT40),11ac(HT40),11ac(HT80) all have been tested,
Only the data of worst case at each channel plan (nominal bandwidth =20MHz, 40MHz, 80MHz) is reported.

| Test mode: | | 802.11a | | Test channel: | | lowest | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11490 | 32.73 | 16.82 | 49.55 | 68.2 | -18.65 | PK |
| V | 17235 | 29.82 | 22.93 | 52.75 | 68.2 | -15.45 | PK |
| H | 11490 | 31.04 | 16.82 | 47.86 | 68.2 | -20.34 | PK |
| H | 17235 | 29.72 | 22.93 | 52.65 | 68.2 | -15.55 | PK |

| Test mode: | | 802.11a | | Test channel: | | Middle | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11570 | 31.77 | 16.71 | 48.48 | 68.2 | -19.72 | PK |
| V | 17355 | 27.39 | 24.37 | 51.76 | 68.2 | -16.44 | PK |
| H | 11570 | 30.36 | 16.71 | 47.07 | 68.2 | -21.13 | PK |
| H | 17355 | 28.09 | 24.37 | 52.46 | 68.2 | -15.74 | PK |

| Test mode: | | 802.11a | | Test channel: | | Highest | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11650 | 33.74 | 16.61 | 50.35 | 68.2 | -17.85 | PK |
| V | 17475 | 27.15 | 25.01 | 52.16 | 68.2 | -16.04 | PK |
| H | 11650 | 32.14 | 16.61 | 48.75 | 68.2 | -19.45 | PK |
| H | 17475 | 28.26 | 25.01 | 53.27 | 68.2 | -14.93 | PK |

| Test mode: | | 802.11ac(HT40) | | Test channel: | | Lowest | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11510 | 32.15 | 16.78 | 48.93 | 68.2 | -19.27 | PK |
| V | 17265 | 28.03 | 23.29 | 51.32 | 68.2 | -16.88 | PK |
| H | 11510 | 33.83 | 16.78 | 50.61 | 68.2 | -17.59 | PK |
| H | 17265 | 29.09 | 23.29 | 52.38 | 68.2 | -15.82 | PK |

| Test mode: | | 802.11ac(HT40) | | Test channel: | | Highest | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11590 | 30.85 | 16.69 | 47.54 | 68.2 | -20.66 | PK |
| V | 17385 | 26.57 | 24.73 | 51.3 | 68.2 | -16.9 | PK |
| H | 11590 | 32.71 | 16.69 | 49.4 | 68.2 | -18.8 | PK |
| H | 17385 | 27.73 | 24.73 | 52.46 | 68.2 | -15.74 | PK |

| Test mode: | | 802.11ac(HT80) | | Test channel: | | Middle | |
|---|---|---|---|---|---|---|---|
| Antenna Pol. | Frequency (MHz) | Reading Level (dBuV/m) | Factor (dBuV/m) | Measure Level (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | Detector |
| V | 11550 | 31.64 | 16.73 | 48.37 | 68.2 | -19.83 | PK |
| V | 17325 | 26.40 | 24.01 | 50.41 | 68.2 | -17.79 | PK |
| H | 11550 | 29.45 | 16.73 | 46.18 | 68.2 | -22.02 | PK |
| H | 17325 | 24.96 | 24.01 | 48.97 | 68.2 | -19.23 | PK |

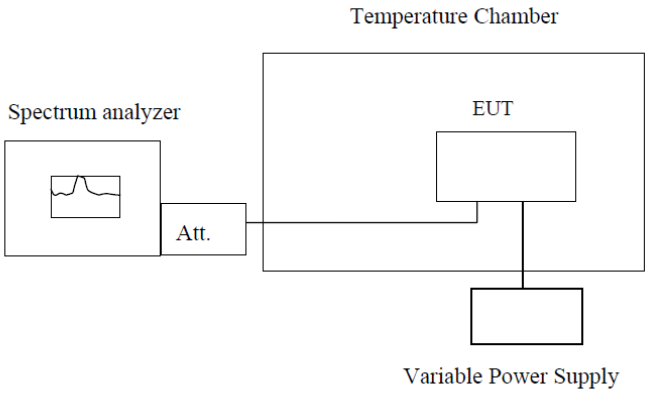
Notes:

1. Measure Level = Reading Level + Factor.

2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

## 7.7 Frequency stability

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Requirement: | FCC Part15 C Section 15.407(g) | | | | | |
| Test Method: | ANSI C63.10:2013, FCC Part 2.1055 | | | | | |
| Limit: | Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified | | | | | |
| Test Procedure: | The EUT was setup to ANSI C63.4, 2003; tested to 2.1055 for compliance to FCC Part 15.407(g) requirements. | | | | | |
| Test setup: |  **Note :** Measurement setup for testing on Antenna connector | | | | | |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.2 for details | | | | | |
| Test environment: | Temp.: | 24 °C | Humid.: | 53% | Press.: | 1012mbar |
| Test voltage: | AC 120V, 60Hz | | | | | |
| Test results: | Pass | | | | | |

**Measurement data:**

| HT 20MHz | | | | | |
|---|---|---|---|---|---|
| **Frequency stability versus Temp.** | | | | | |
| **Power Supply: AC 120V** | | | | | |
| Temp. (°C) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| -30 | 5745 | 5744.9675 | 5745.0625 | 5745.0923 | 5745.1162 |
| | 5785 | 5785.1029 | 5784.8679 | 5785.2028 | 5785.0065 |
| | 5825 | 5825.1755 | 5825.1670 | 5824.9471 | 5824.9172 |
| -20 | 5745 | 5744.9747 | 5745.1710 | 5744.9880 | 5745.0855 |
| | 5785 | 5785.1076 | 5785.0849 | 5784.8992 | 5785.0155 |
| | 5825 | 5824.9888 | 5824.8356 | 5825.0931 | 5824.9632 |
| -10 | 5745 | 5745.0995 | 5745.0967 | 5745.2143 | 5745.1031 |
| | 5785 | 5785.2236 | 5785.1202 | 5785.0115 | 5785.1225 |
| | 5825 | 5825.0664 | 5824.9249 | 5825.0737 | 5824.9576 |
| 0 | 5745 | 5745.0427 | 5745.0079 | 5745.0153 | 5744.8745 |
| | 5785 | 5785.0309 | 5785.0792 | 5784.9053 | 5784.9288 |
| | 5825 | 5825.0177 | 5825.0672 | 5824.8510 | 5824.9803 |
| 10 | 5745 | 5744.9746 | 5745.0868 | 5744.8405 | 5745.1439 |
| | 5785 | 5784.9922 | 5785.1594 | 5784.7937 | 5785.0051 |
| | 5825 | 5824.9220 | 5824.8456 | 5824.8630 | 5824.9575 |
| 20 | 5745 | 5744.8451 | 5745.0426 | 5744.9910 | 5745.1077 |
| | 5785 | 5784.8676 | 5785.1501 | 5785.0575 | 5785.2205 |
| | 5825 | 5824.9755 | 5824.9694 | 5824.9192 | 5824.9123 |
| 30 | 5745 | 5745.1004 | 5745.0074 | 5745.0688 | 5744.9511 |
| | 5785 | 5785.0414 | 5785.0191 | 5784.9678 | 5784.8738 |
| | 5825 | 5825.0114 | 5824.8783 | 5825.1281 | 5824.9701 |
| 40 | 5745 | 5744.9484 | 5744.9920 | 5745.0203 | 5745.0759 |
| | 5785 | 5785.0684 | 5785.0656 | 5785.1347 | 5785.1516 |
| | 5825 | 5825.1660 | 5825.2552 | 5825.1017 | 5824.9633 |
| 50 | 5745 | 5745.1150 | 5744.9182 | 5745.0178 | 5744.9387 |
| | 5785 | 5785.2018 | 5785.0803 | 5785.0802 | 5784.9381 |
| | 5825 | 5824.9359 | 5824.8975 | 5824.8984 | 5825.0461 |

| **Frequency stability versus Voltage** | | | | | |
|---|---|---|---|---|---|
| **Temperature: 25°C** | | | | | |
| Power Supply (VAC) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| 108 | 5745 | 5745.1212 | 5745.0037 | 5745.1943 | 5745.2282 |
| | 5785 | 5785.0187 | 5784.8933 | 5784.9709 | 5785.0485 |
| | 5825 | 5825.1846 | 5825.2482 | 5824.9788 | 5825.0764 |
| 120 | 5745 | 5744.9026 | 5745.0017 | 5744.9738 | 5744.9932 |
| | 5785 | 5785.1692 | 5785.0199 | 5785.1471 | 5785.0748 |
| | 5825 | 5825.0093 | 5825.0873 | 5825.1215 | 5824.8264 |
| 132 | 5745 | 5745.0572 | 5745.1632 | 5745.0740 | 5744.8976 |
| | 5785 | 5785.1387 | 5784.9816 | 5785.1266 | 5785.0317 |
| | 5825 | 5825.1248 | 5825.0436 | 5825.0424 | 5825.0992 |

| HT40 MHz | | | | | |
|---|---|---|---|---|---|
| **Frequency stability versus Temp.** | | | | | |
| **Power Supply: AC 120V** | | | | | |
| Temp. (°C) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| -30 | 5745 | 5745.2827 | 5745.0939 | 5745.1304 | 5745.0399 |
| | 5785 | 5784.9750 | 5785.1311 | 5785.1304 | 5784.8439 |
| -20 | 5825 | 5825.0234 | 5825.3097 | 5825.2245 | 5825.1075 |
| | 5745 | 5745.1107 | 5744.9985 | 5744.9258 | 5745.0986 |
| -10 | 5785 | 5784.9707 | 5785.1818 | 5785.2216 | 5784.9744 |
| | 5825 | 5824.9640 | 5824.9358 | 5825.0511 | 5825.0961 |
| 0 | 5745 | 5744.9526 | 5744.9160 | 5745.0849 | 5744.9470 |
| | 5785 | 5785.0671 | 5785.1719 | 5784.8035 | 5784.8220 |
| 10 | 5825 | 5824.8965 | 5825.0287 | 5825.0173 | 5825.2509 |
| | 5745 | 5745.0072 | 5745.1091 | 5744.9729 | 5744.9467 |
| 20 | 5785 | 5785.0686 | 5784.8072 | 5784.9218 | 5784.9128 |
| | 5825 | 5824.8565 | 5824.8640 | 5825.0178 | 5824.9329 |
| 30 | 5745 | 5744.8159 | 5744.9086 | 5744.8466 | 5744.7881 |
| | 5785 | 5784.9055 | 5784.9841 | 5784.9397 | 5784.8521 |
| 40 | 5825 | 5744.9657 | 5744.9882 | 5744.9286 | 5745.1633 |
| | 5745 | 5785.0833 | 5785.0506 | 5785.1121 | 5785.1171 |
| 50 | 5785 | 5825.2115 | 5825.0210 | 5825.0238 | 5825.0232 |
| | 5825 | 5744.8490 | 5745.0757 | 5745.0560 | 5744.9843 |

| **Frequency stability versus Voltage** | | | | | |
|---|---|---|---|---|---|
| **Temperature: 25°C** | | | | | |
| Power Supply (VAC) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| 108 | 5745 | 5745.1294 | 5745.0582 | 5745.0168 | 5744.9927 |
| | 5785 | 5785.0926 | 5784.9584 | 5785.0897 | 5785.0477 |
| 120 | 5825 | 5825.1310 | 5825.0068 | 5824.9317 | 5824.8209 |
| | 5745 | 5745.0109 | 5744.9704 | 5744.8911 | 5745.0012 |
| 132 | 5785 | 5785.1940 | 5785.1609 | 5785.1183 | 5785.2773 |
| | 5825 | 5825.2168 | 5824.7484 | 5825.0859 | 5824.9113 |

| HT80 MHz | | | | | |
|---|---|---|---|---|---|
| **Frequency stability versus Temp.** | | | | | |
| **Power Supply: AC 120V** | | | | | |
| Temp. (°C) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| -30 | 5745 | 5744.9403 | 5745.1353 | 5744.9952 | 5745.1017 |
| -20 | 5785 | 5785.0272 | 5785.0186 | 5785.1780 | 5784.9640 |
| -10 | 5825 | 5825.1581 | 5825.0446 | 5825.0387 | 5824.9984 |
| 0 | 5745 | 5745.0926 | 5744.8888 | 5745.1701 | 5744.8768 |
| 10 | 5785 | 5784.8794 | 5785.0373 | 5785.0919 | 5784.9261 |
| 20 | 5825 | 5824.9983 | 5824.9409 | 5824.8002 | 5825.0322 |
| 30 | 5745 | 5745.0970 | 5744.9985 | 5744.9038 | 5745.0193 |
| 40 | 5785 | 5784.8999 | 5784.9761 | 5785.0207 | 5784.9503 |
| 50 | 5825 | 5825.0412 | 5825.1961 | 5824.9593 | 5825.0189 |

| **Frequency stability versus Voltage** | | | | | |
|---|---|---|---|---|---|
| **Temperature: 25°C** | | | | | |
| Power Supply (VAC) | Operating Frequency (MHz) | 0 minute | 2 minute | 5 minute | 10 minute |
| | | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) | Measured Frequency (MHz) |
| 108 | 5745 | 5745.2518 | 5745.0541 | 5744.9459 | 5745.0561 |
| 120 | 5785 | 5785.1572 | 5785.0162 | 5785.0423 | 5784.9266 |
| 132 | 5825 | 5825.1079 | 5824.9671 | 5825.1200 | 5824.8870 |

# 8 Test Setup Photo

Reference to the **appendix I** for details.

# 9 EUT Constructional Details

Reference to the **appendix II** for details.

------END------