# FCC 47 CFR PART15 SUBPART E

## For

**Prepared by**

**Product Name: 4G LTE Mobile Router**

**Brand Name: macaroon**

**Model No.: macaroon M1**

**Series Model.:N/A**

**FCC ID: 2AMIWM1**

**Test Report Number:**

**C170614R01-RPW1**

**Issued for**

**Beijing ULINK Technology Co., Ltd.**

**East Area of 5F,No.16 Wangjing North Rd.,Chaoyang District,Beijing,China**

**Issued by**

**Compliance Certification Services Inc.**

**Kun shan Laboratory**

**No.10 Weiye Rd., Innovation park, Eco&Tec,
Development Zone, Kunshan City, Jiangsu, China**

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**FAX: 86-512-57370818**

TESTING CERT #2541.01

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# Revision History

| Rev. | Issue Date | Report NO. | Effect Page | Contents |
|---|---|---|---|---|
| 00 | July 26, 2017 | C170614R01-RPW1 | ALL | N/A |
| 01 | September 5, 2017 | C170614R01-RPW1 | P34 | Add data of Max EIRP |
| | | | | |

# 1 TEST RESULT CERTIFICATION

| | |
|---|---|
| **Product Name:** | 4G LTE Mobile Router |
| **Trade Name:** | macaroon |
| **Model Name.:** | macaroon M1 |
| **Series Model:** | N/A |
| **Applicant Discrepancy:** | Initial |
| **Device Category:** | portable unit |
| **Date of Test:** | June 23, 2017 ~ July 24, 2017 |
| **Applicant:** | **Beijing ULINK Technology Co., Ltd.**<br>East Area of 5F,No.16 Wangjing North Rd.,Chaoyang District,Beijing,China |
| **Manufacturer:** | **Beijing ULINK Technology Co., Ltd.**<br>East Area of 5F,No.16 Wangjing North Rd.,Chaoyang District,Beijing,China |
| **Application Type:** | Certification |

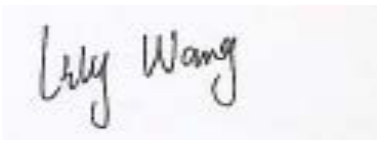
| **APPLICABLE STANDARDS** | |
|---|---|
| **STANDARD** | **TEST RESULT** |
| FCC 47 CFR Part 15 Subpart E | No non-compliance noted |

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.407and KDB 789033.
The test results of this report relate only to the tested sample EUT identified in this report.

***Approved by:***

Jeff.Fang
RF Manager
Compliance Certification Service Inc.

***Tested by:***



Lily.Wang
Test Engineer
Compliance Certification Service Inc.

# 2 EUT DESCRIPTION

| | | | | |
|---|---|---|---|---|
| **Product Name:** | 4G LTE Mobile Router | | | |
| **Brand Name:** | macaroon | | | |
| **Model Name:** | macaroon M1 | | | |
| **Series Model:** | N/A | | | |
| **Model Discrepancy:** | N/A | | | |
| **Power Adapter:** | Power Adapter：<br>Model :TUUS050100-K00<br>Input: 100-240V~50/60Hz, 0.2A<br>Output: 5V⎓1A<br>Battery（rating）：<br>capacity: 11.4WH 3.8V | | | |
| **Frequency Range :** | Band | Mode | Frequency Range(MHz) | Number of Channels |
| | Band I UNII-I | IEEE802.11a mode | 5150 MHz~5250 MHz | 4 |
| | | IEEE802.11an HT20 mode | | 4 |
| | | IEEE802.11an HT40 mode | | 2 |
| | | IEEE802.11ac VHT20 mode | | 4 |
| | | IEEE802.11ac VHT40 mode | | 2 |
| | | IEEE802.11ac VHT80 mode | | 1 |
| **Average Transmit Power :** | IEEE802.11a mode: 13.97dBm<br>IEEE802.11an HT20 mode: 12.92dBm<br>IEEE802.11an HT40 mode: 12.75dBm<br>IEEE802.11ac VHT20 mode: 11.85dBm<br>IEEE802.11ac VHT40 mode: 11.71dBm<br>IEEE802.11ac VHT80 mode: 11.99dBm | | | |
| **Modulation Technique :** | IEEE802.11a mode: OFDM (6,9,12,18,24,36,48 and 54 Mbps)<br>IEEE802.11an HT20 mode: OFDM (MCS0~MCS7)<br>IEEE802.11an HT40 mode: OFDM (MCS0~MCS7)<br>IEEE802.11ac VHT20 mode: OFDM (MCS0~MCS8)<br>IEEE802.11ac VHT40 mode: OFDM (MCS0~MCS9)<br>IEEE802.11ac VHT80 mode: OFDM (MCS0~MCS9) | | | |
| **Antenna Specification:** | Internal Antenna Antenna Gain: -1.01 dBi | | | |

**Remark:**

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for ***FCC ID: 2AMIWM1*** filing to comply with FCC Part 15, Subpart E Rules.

# 3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10:2013 and FCC CFR 47 15.207, 15.209 and 15.407.

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in Section 13.3 of ANSI C63.10:2013, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

**Radiated Emissions**

Under 1GHz

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.10:2013.

Above 1GHz

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.10:2013.

## 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.50 - 5.15 |
| 0.495 - 0.505 (1) | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960.0 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.50 - 25.67 | 1300 - 1427 | 8.025 - 8.500 |
| 4.17725 - 4.17775 | 37.50 - 38.25 | 1435.0 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73.00 - 74.60 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.80 - 75.20 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108.00 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.90 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 – 2500.0 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.70 - 156.90 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.1700 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.20 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358.0 | 36.43 - 36.5(2) |
| 12.57675 - 12.57725 | 322.0- 335.4 | 3600 - 4400 | |
| 13.36 - 13.41 | | | |

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

## 3.5 DESCRIPTION OF TEST MODES

| Description | Modulation Technology | Modulation Type |
|---|---|---|
| 26dB Bandwidth and 99% bandwidth | OFDM | BPSK |
| Maximum conducted output power | OFDM | BPSK |
| Band edges measurement | OFDM | BPSK |
| Peak Power Spectral Density | OFDM | BPSK |
| Radiated undesirable emission | OFDM | BPSK |
| Powerline conducted emission | OFDM | BPSK |

**IEEE 802.11a mode:**

Channel (5180MHz),Channel (5200MHz) and Channel (5240MHz) with 54Mbps data rate were chosen for full testing.

**IEEE 802.11an HT20 mode:**

Channel (5180MHz),Channel (5200MHz) and Channel (5240MHz) with MCS7 data rate were chosen for full testing.

**IEEE 802.11an HT40 mode:**

Channel (5190MHz) and Channel (5230MHz) with MCS7 data rate were chosen for full testing.

**IEEE 802.11ac VHT20 mode:**

Channel (5180MHz),Channel (5200MHz) and Channel (5240MHz) with MCS8 data rate were chosen for full testing.

**IEEE 802.11ac VHT40 mode:**

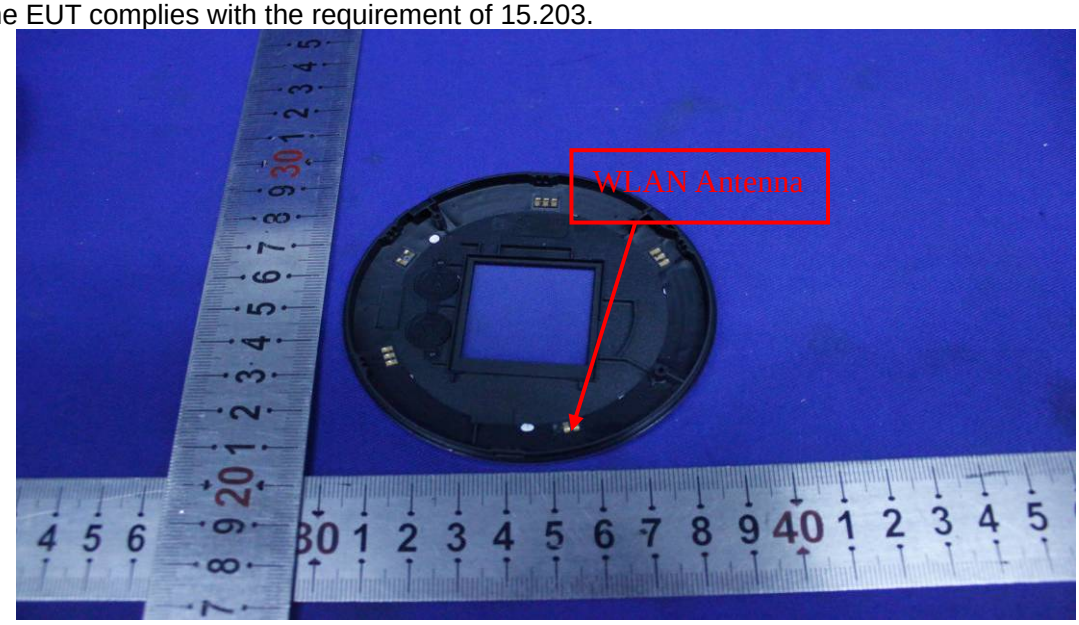
Channel (5190MHz) and Channel (5230MHz) with MCS9 data rate were chosen for full testing.

**IEEE 802.11ac VHT80 mode:**

Channel (5210MHz) with MCS9 data rate were chosen for full testing.

## 3.6 ANTENNA DESCRIPTION

an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section”
* the antenna of this EUT is a unique(Internal Antenna for WLAN).
* the EUT complies with the requirement of 15.203.




# 4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## 4.1 MEASUREMENT EQUIPMENT USED

| Conducted Emissions Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Data** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | MY44020154 | 2016-9-10 | 2017-9-9 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2016-7-21 | 2017-7-20 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2017-7-20 | 2018-7-19 |
| Power meter | Anritsu | ML2495A | 1445010 | 2017-4-26 | 2018-4-25 |
| Power sensor | Anritsu | MA2411B | 1339220 | 2017-4-26 | 2018-4-25 |
| Power SPLITTER | Mini-Circuits | ZN2PD-9G | SF078500430 | N.C.R | N.C.R |
| DC Power Supply | AGILENT | E3632A | MY50340053 | N.C.R | N.C.R |
| Temp. / Humidity Gauge | Anymetre | TH603 | CCS007 | 2016-11-1 | 2017-10-31 |
| Test Software | | | EZ-EMC | | |

| 977 Chamber | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Data** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | MY44020154 | 2016-9-10 | 2017-9-9 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2016-7-21 | 2017-7-20 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2017-7-20 | 2018-7-19 |
| EMI Test Receiver | R&S | ESCI | 101378 | 2017-1-5 | 2018-1-4 |
| Pre-Amplfier | MITEQ | AMF-6F-260400-40-8P | 1037496 | 2016-11-15 | 2017-11-14 |
| Amplifier | MITEQ | JS41-00101800-32-10P | 1675713 | 2017-7-20 | 2018-7-19 |
| Broad-Band Horn Antenna | SCHWARZBECK | BBHA 9170 | 9170-515 | 2017-3-6 | 2018-3-5 |
| Bilog Antenna | Sunol | JB1 | A062604 | 2017-5-27 | 2018-5-26 |
| Bilog Antenna | Sunol | JB1 | A110204-1 | 2017-5-27 | 2018-5-26 |
| Loop Antenna | Hengweiyi | 39501C | 2014012 | 2017-1-5 | 2018-1-4 |
| Horn-antenna | SCHWARZBECK | 9120D | D:266 | 2017-2-28 | 2018-2-27 |
| Horn-antenna | SCHWARZBECK | 9120D | D:267 | 2016-11-10 | 2017-11-9 |
| Turn Table | CT | CT123 | 4165 | N.C.R | N.C.R |
| Antenna Tower | CT | CTERG23 | 3256 | N.C.R | N.C.R |
| Controller | CT | CT1OO | 95637 | N.C.R | N.C.R |
| Test Software | | | EZ-EMC | | |

| Conducted Emission | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Data** | **Calibration Due** |
| EMI TEST RECEIVER | R&S | ESCI | 100781 | 2017-2-28 | 2018-2-27 |
| V (V-LISN) | SCHWARZBECK | NNLK 8129 | 8129-143 | 2016-11-1 | 2017-10-31 |
| TWO-LINE V-NETWORK | R&S | ENV216 | 101604 | 2016-11-1 | 2017-10-31 |
| Pulse LIMITER | R&S | ESH3-Z2 | 100524 | 2017-1-5 | 2018-1-4 |
| Test Software | | | EZ-EMC | | |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

## 4.2 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 6 is based on such expansion factors.

**Table 6: Maximum measurement uncertainty**

| Parameter | UNCERTAINTY |
|---|---|
| Radio frequency | ±0.8 × 10-7 |
| RF power, conducted | 0.2054 |
| Maximum frequency deviation:<br>-within 300 Hz and 6 kHz of audio frequency<br>-within 6 kHz and 25 kHz of audio frequency | <br>1.3%<br>0.65 dB |
| Adjacent channel power | 0.2054 |
| Conducted spurious emission of transmitter, valid up to 6 GHz | 0.2892 |
| Conducted emission of receivers | +1.2/-1.1 dB |
| Radiated emission of transmitter, valid up to 6 GHz | ±3.94 dB |
| Radiated emission of receiver, valid up to 6 GHz | ±3.94 dB |
| RF level uncertainty for a given BER | ±0.3 dB |
| Temperature | 0.1979 |
| Humidity | ±1 % |

# 5 FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at
☒ **No.10Weiye Rd., Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.**
The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

## 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

## 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

FCC –Designation Number: CN1172.

Compliance Certification Services Inc. Kun shan 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 our files and the Designation Number: CN1172.

## 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---|---|---|---|
| USA | A2LA | 47 CFR FCC Part 15/18 (using ANSI C63.10 :2013)；VCCI V3; CNS 13438; CNS 13439; CNS 13803; CISPR 11; EN 55011; CISPR 13; EN 55013; CISPR 22:2005; CISPR 22:1997 +A1 :2000+A2 :2002；EN 55022:2006; EN55022 :1998 +A1 :2001+A2 :2003；EN 61000-6-3 (excluding discontinuous interference);<br>EN 61000-6-4; AS/NZS CISPR 22；<br>CAN/CSA-CEI/IEC CISPR 22；EN 61000-3-2；EN 61000-3-3；EN550024； EN 61000-4-2；<br>EN 61000-4-3；EN61000-4-4；EN 61000-4-5；<br>EN 61000-4-6；IEC 61000-4-8；EN 61000-4-11；<br>IEC61000-3-2；IEC61000-3-3；IEC 61000-4-2； IEC 61000-4-3；IEC 61000-4-4； IEC 61000-4-5；IEC 61000-4-6；IEC 61000-4-8；IEC 61000-4-11；<br>EN 300 220-3; EN 300 328; EN 300 330-2; EN 300 440-1; EN 300-440-2; EN 300 893; EN 301 489-01; EN 301 489-3; EN 301 489-07; EN 301 489-17；47 CFR FCC Part 15, 22, 24 | A2LA ACCREDITED TESTING CERT #2541.01 |
| USA | FCC | 3/10 meter Sites to perform FCC Part 15/18 measurements | FC CN1172 |
| Japan | VCCI | 3/10 meter Sites and conducted test sites to perform radiated/conducted measurements | VCCI R-1600 C-1707 G-216 |

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

# 6 SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

## 6.2 SUPPORT EQUIPMENT

| No. | Equipment | Model No. | Serial No. |
|---|---|---|---|
| 1 | N/A | | |

**Remark:**

*1.* All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2.Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

# 7 FCC PART 15 REQUIREMENTS

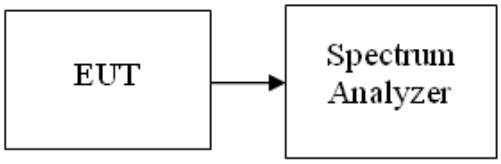
## 7.1 26 DB EMISSION BANDWIDTH

**LIMIT**

According to §15.403(i), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

**Test Configuration**

**TEST PROCEDURE**




1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1% of the emission bandwidth, VBW > RBW, Detector = Peak ,Span >26dB bandwidth, and Sweep = auto ,Trace mode = max hold.
4. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
5. Repeat until all the rest channels were investigated.

**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11a mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5180 | 22.452 |
| Mid | 5200 | 22.574 |
| High | 5240 | 22.596 |

**Test mode: IEEE 802.11n HT20MHz mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5180 | 22.776 |
| Mid | 5200 | 22.728 |
| High | 5240 | 22.676 |

**Test mode: IEEE 802.11n HT40MHz mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5190 | 43.942 |
| High | 5230 | 43.269 |

**Test mode: IEEE 802.11ac VHT20MHz mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5180 | 22.756 |
| Mid | 5200 | 22.949 |
| High | 5240 | 22.837 |

**Test mode: IEEE 802.11ac VHT40MHz mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5190 | 45.096 |
| High | 5230 | 44.231 |

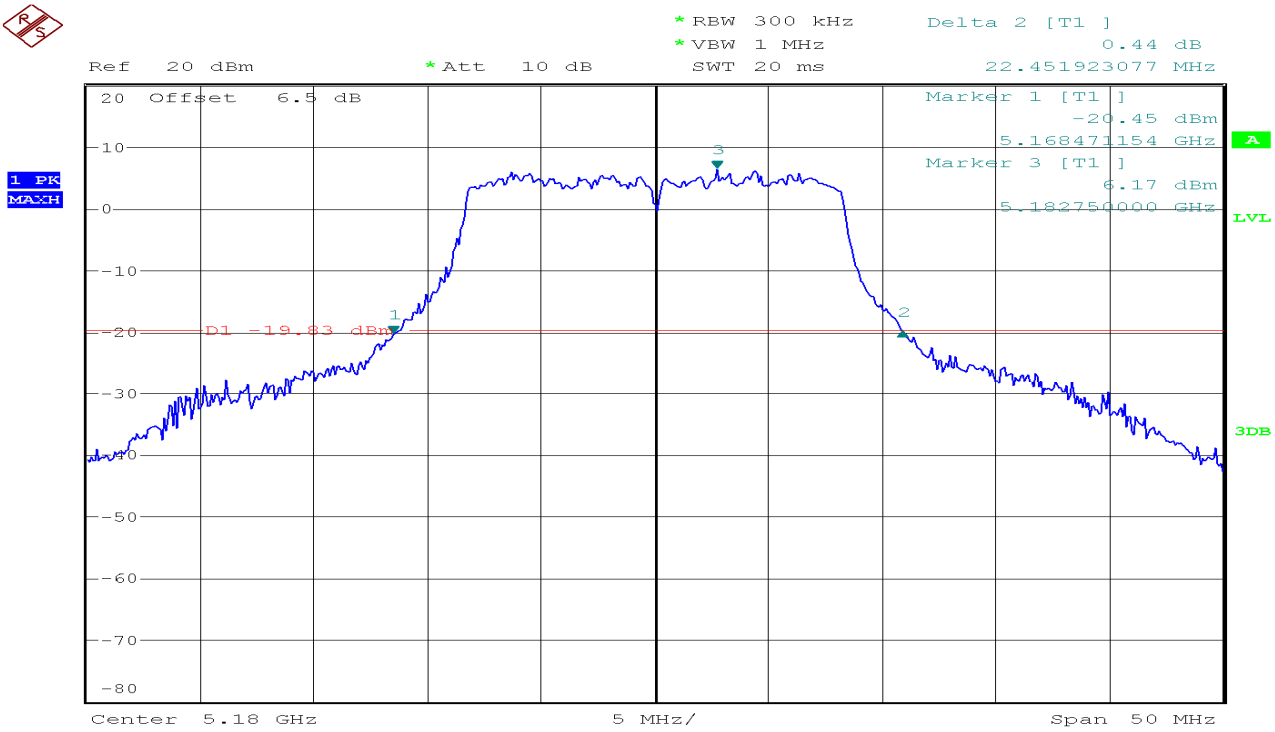
**Test mode: IEEE 802.11ac VHT80MHz mode**

| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Mid | 5210 | 91.346 |

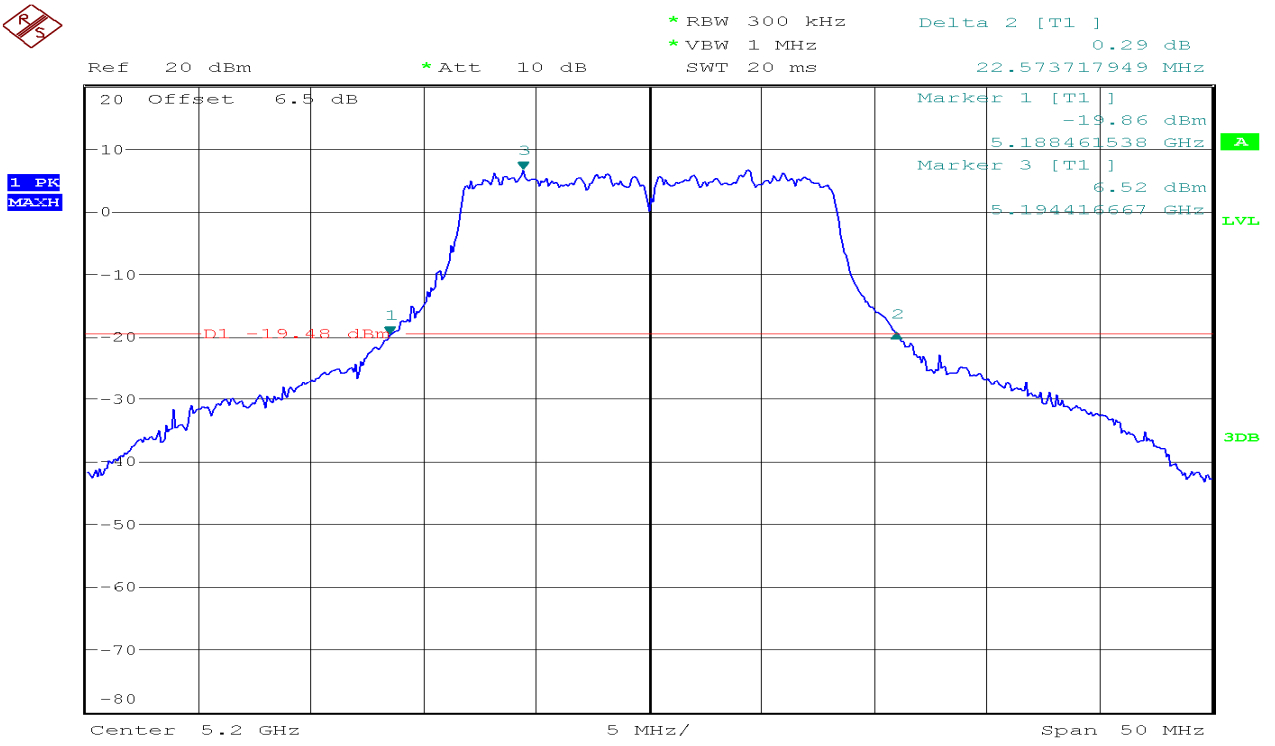
**Test Plot**

**IEEE 802.11a mode:**

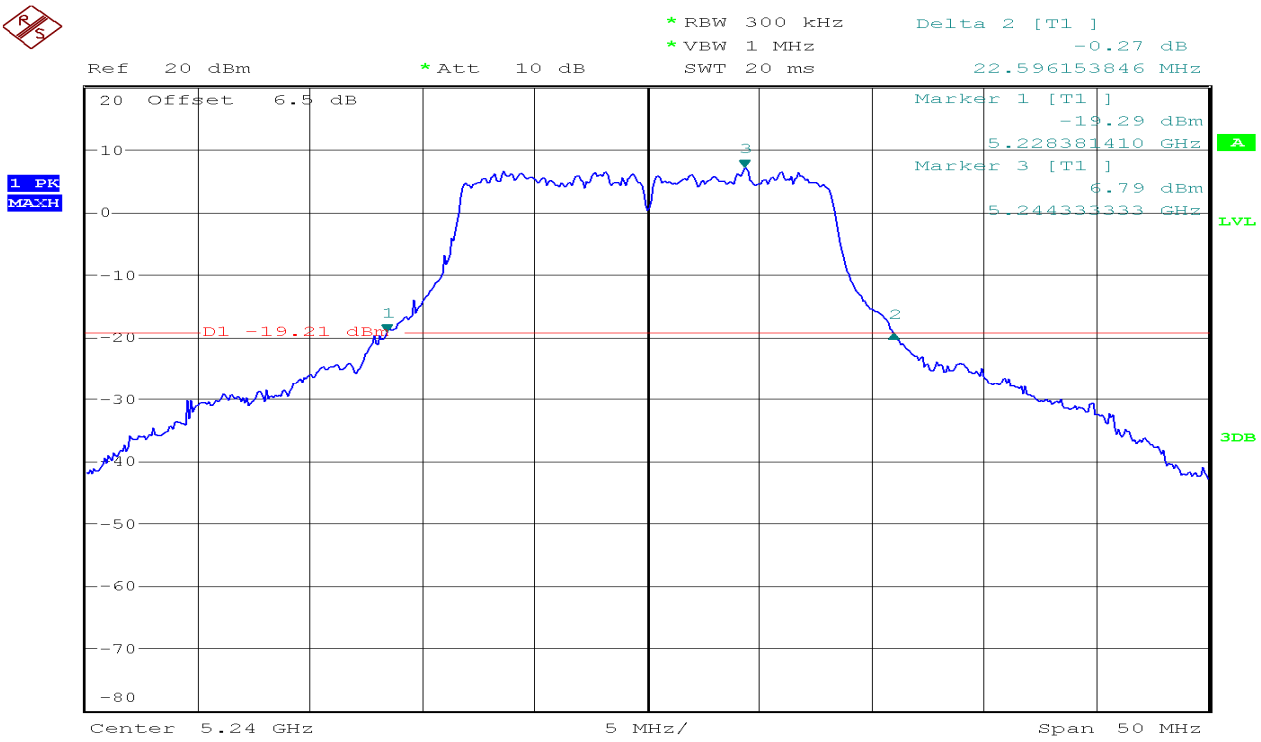
## CH Low




## CH Mid

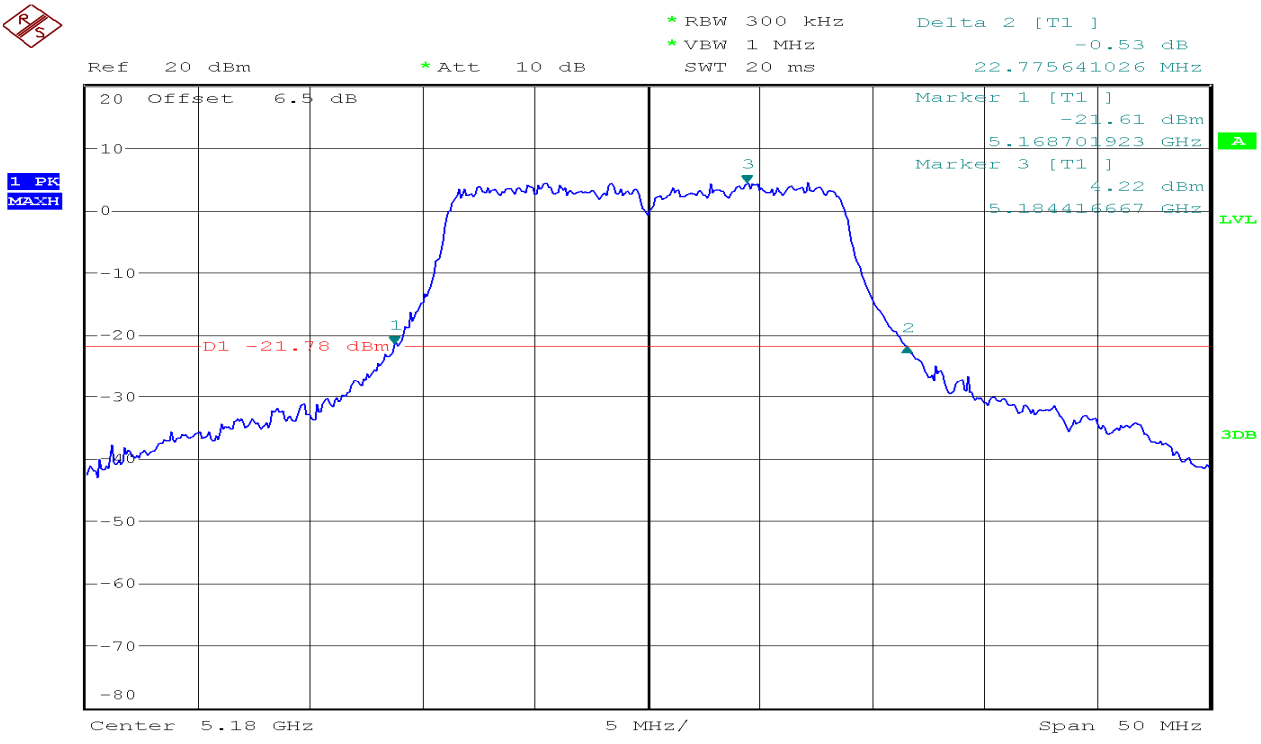


## CH High

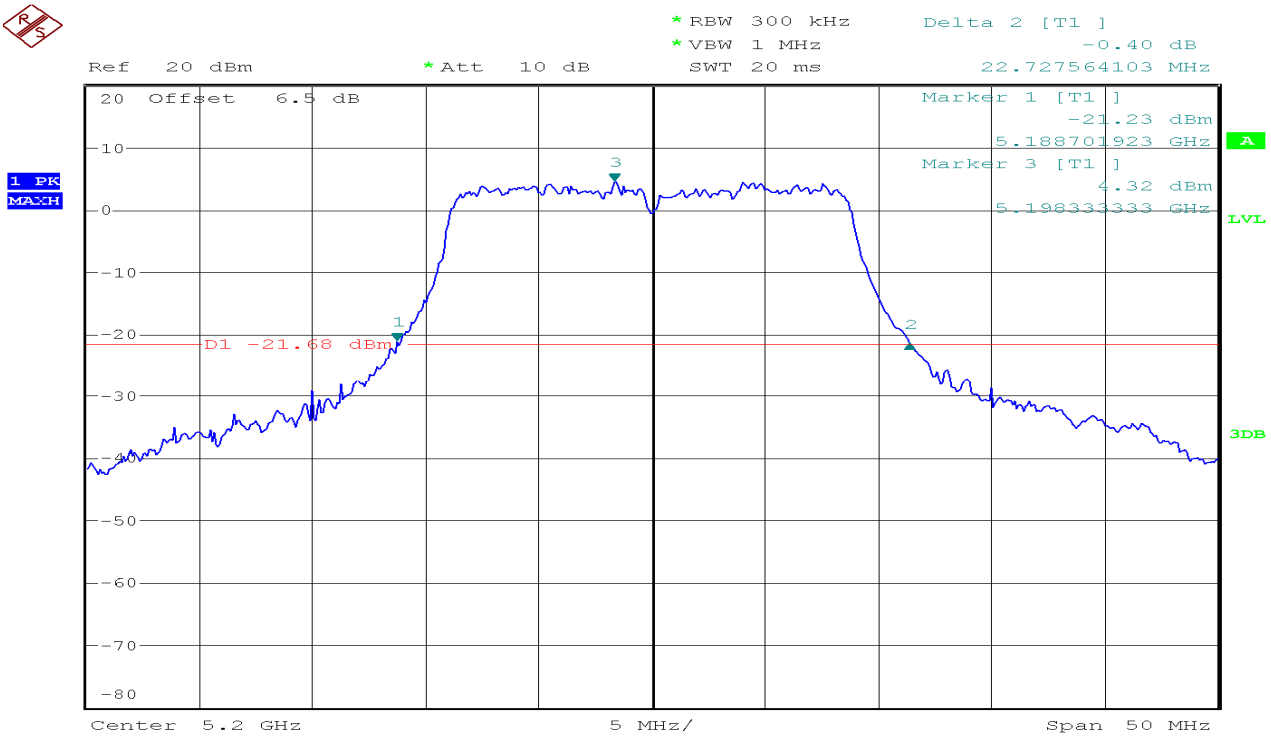



## IEEE 802.11n HT20 mode

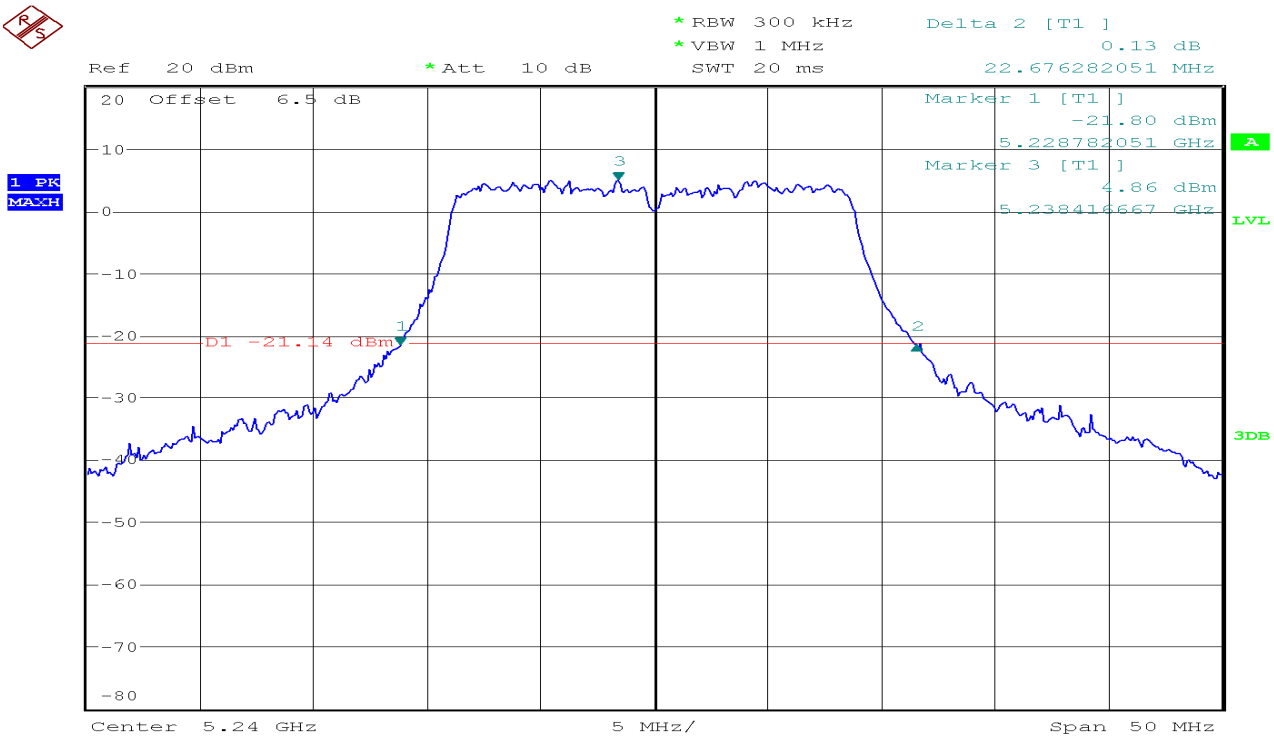
## CH Low



## CH Mid

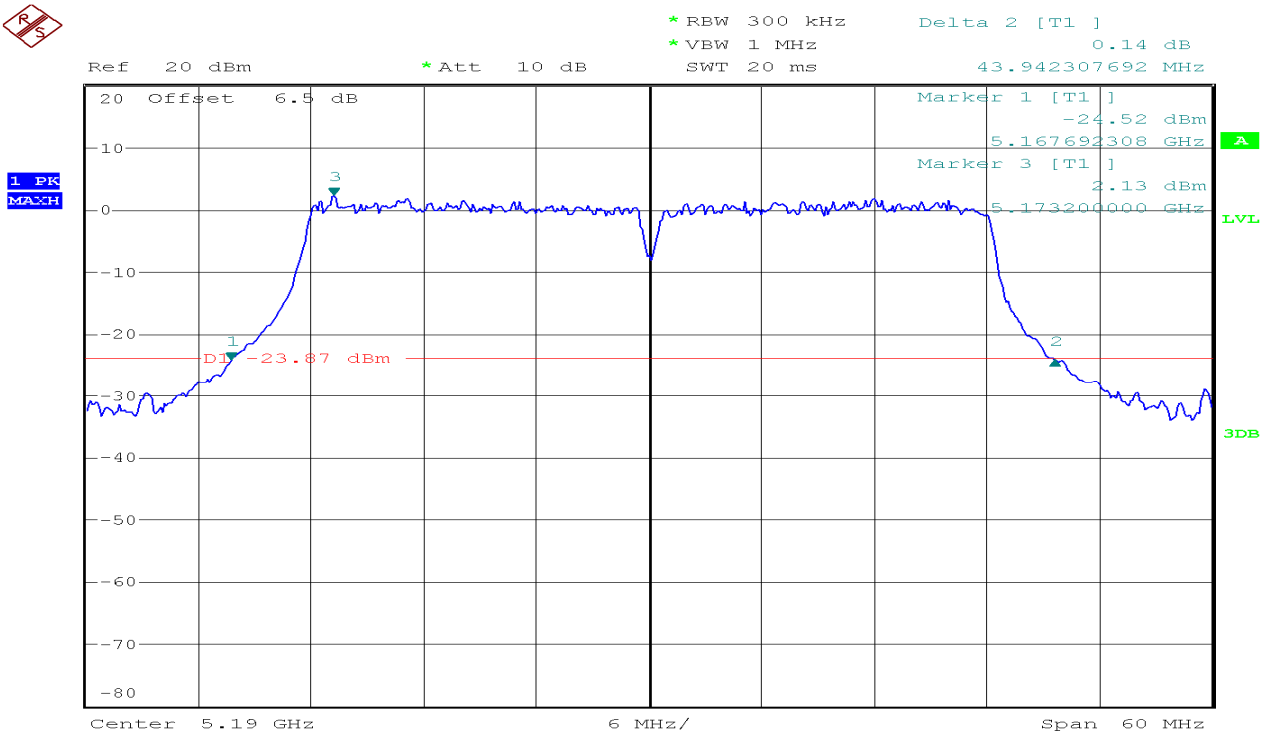



## CH High

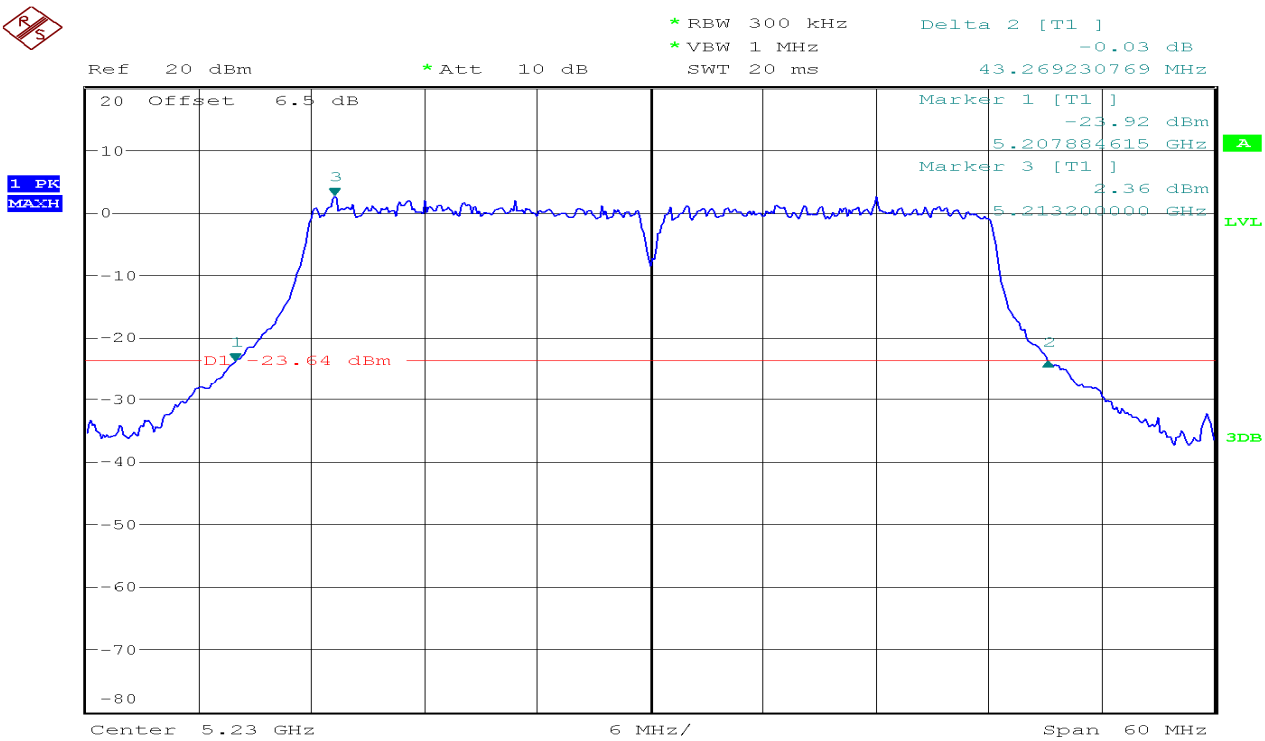


## IEEE 802.11n HT40 mode

### CH Low

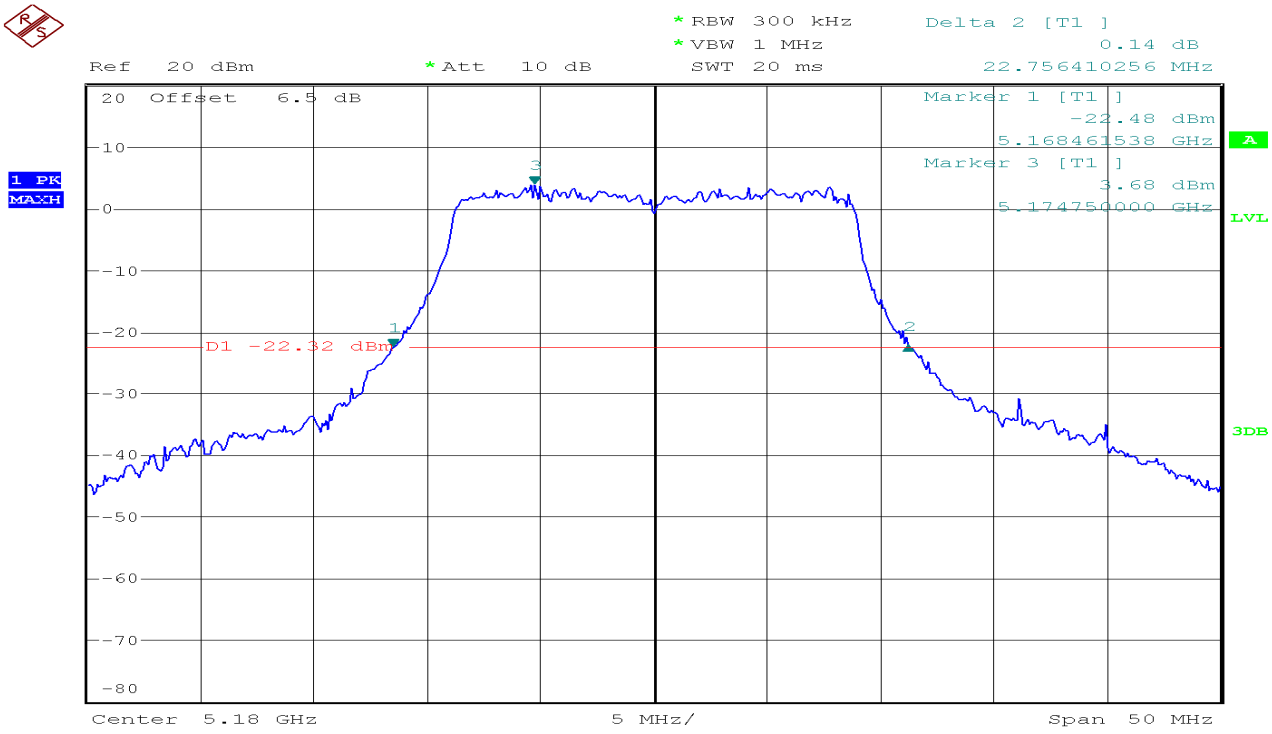



### CH High

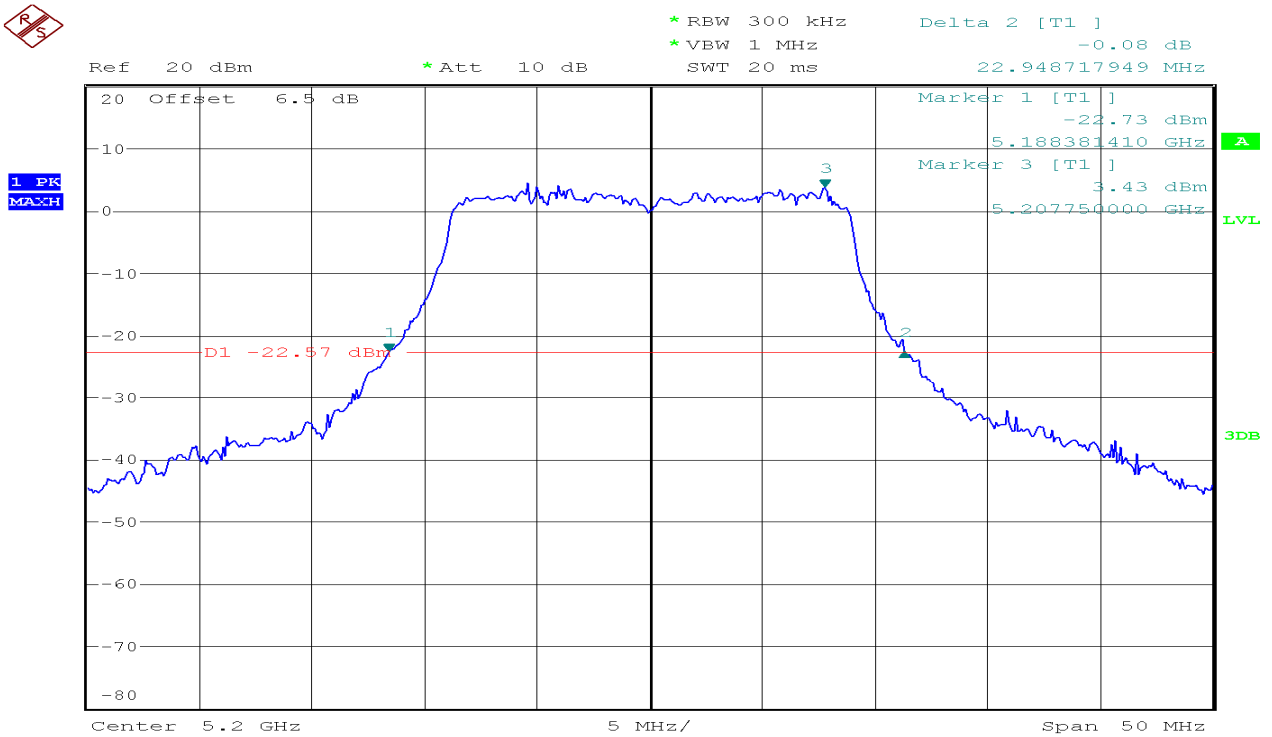


## IEEE 802.11ac VHT20 mode

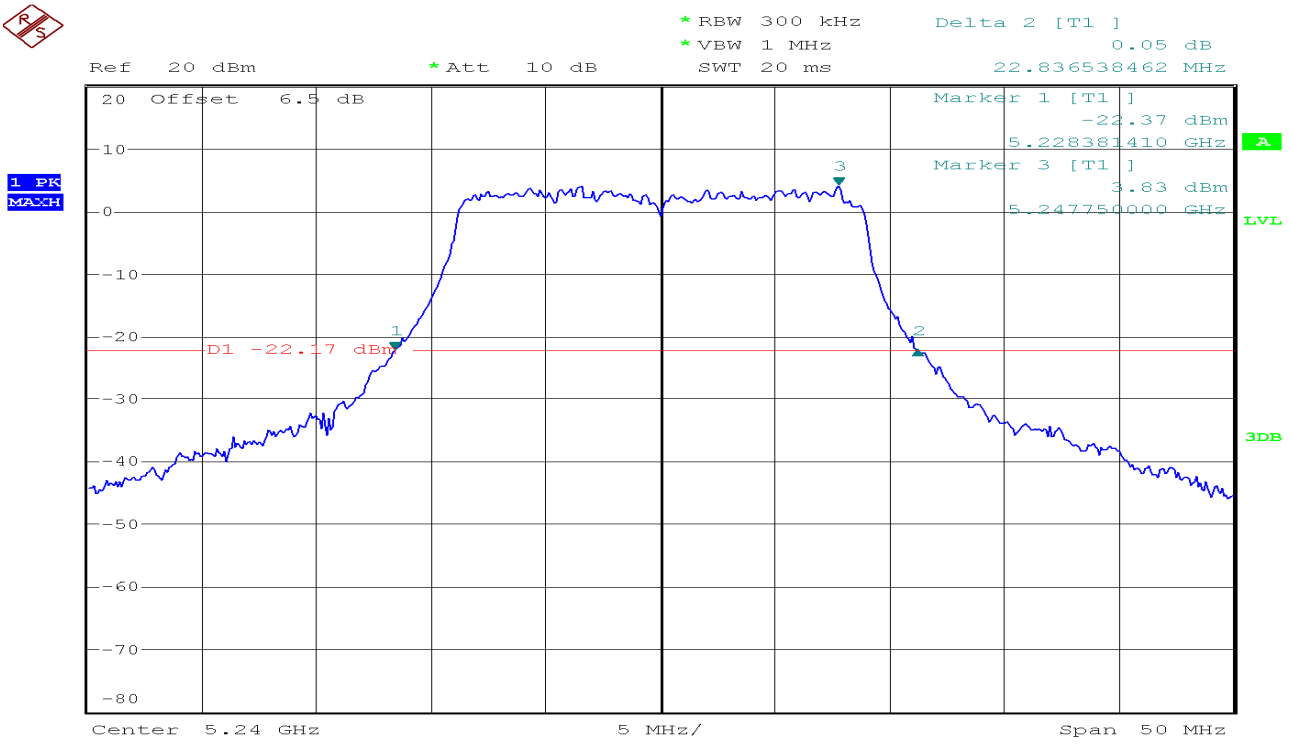
### CH Low




### CH Mid

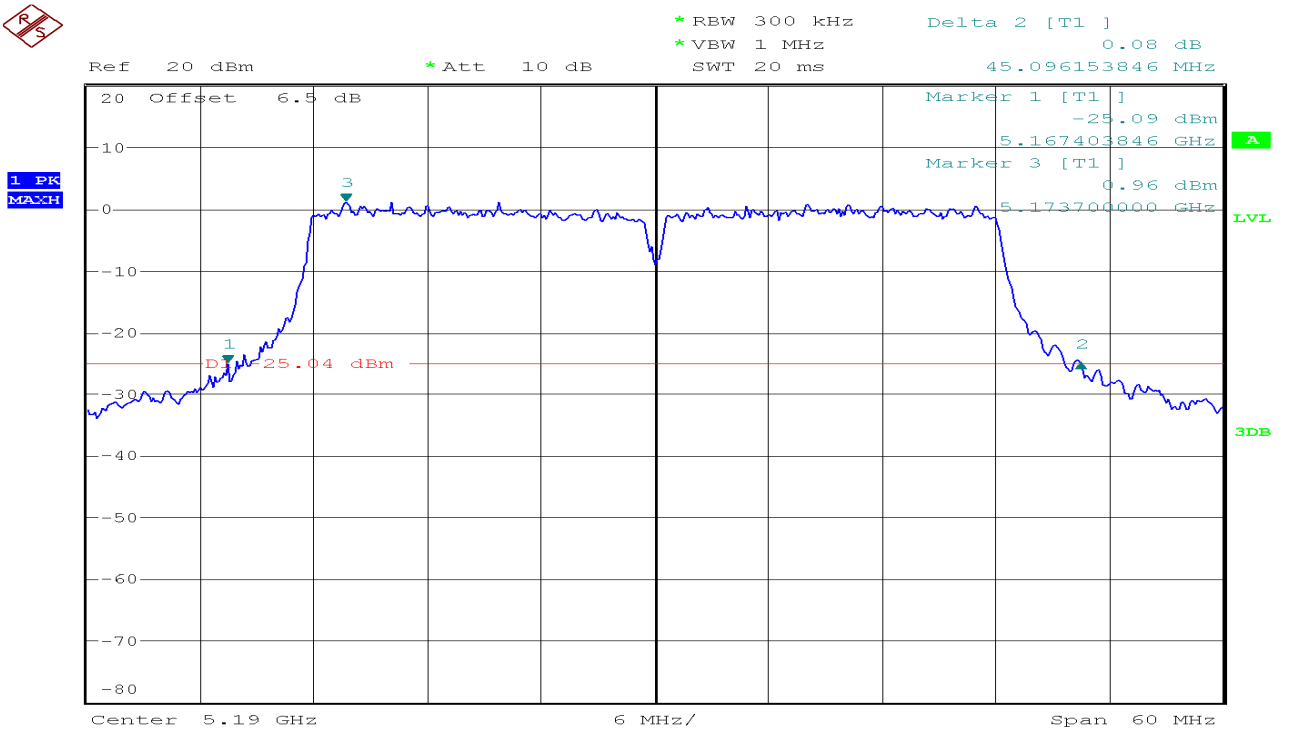


## CH High

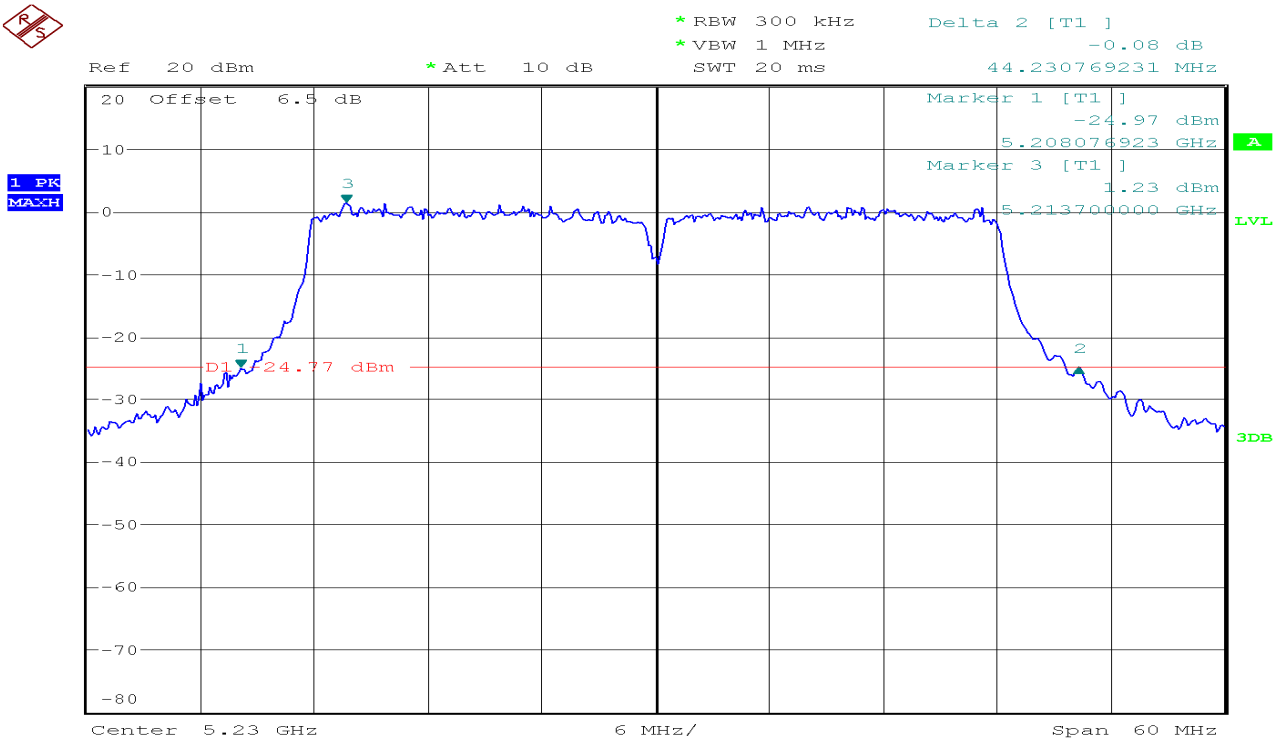



## IEEE 802.11ac VHT40 mode

## CH Low

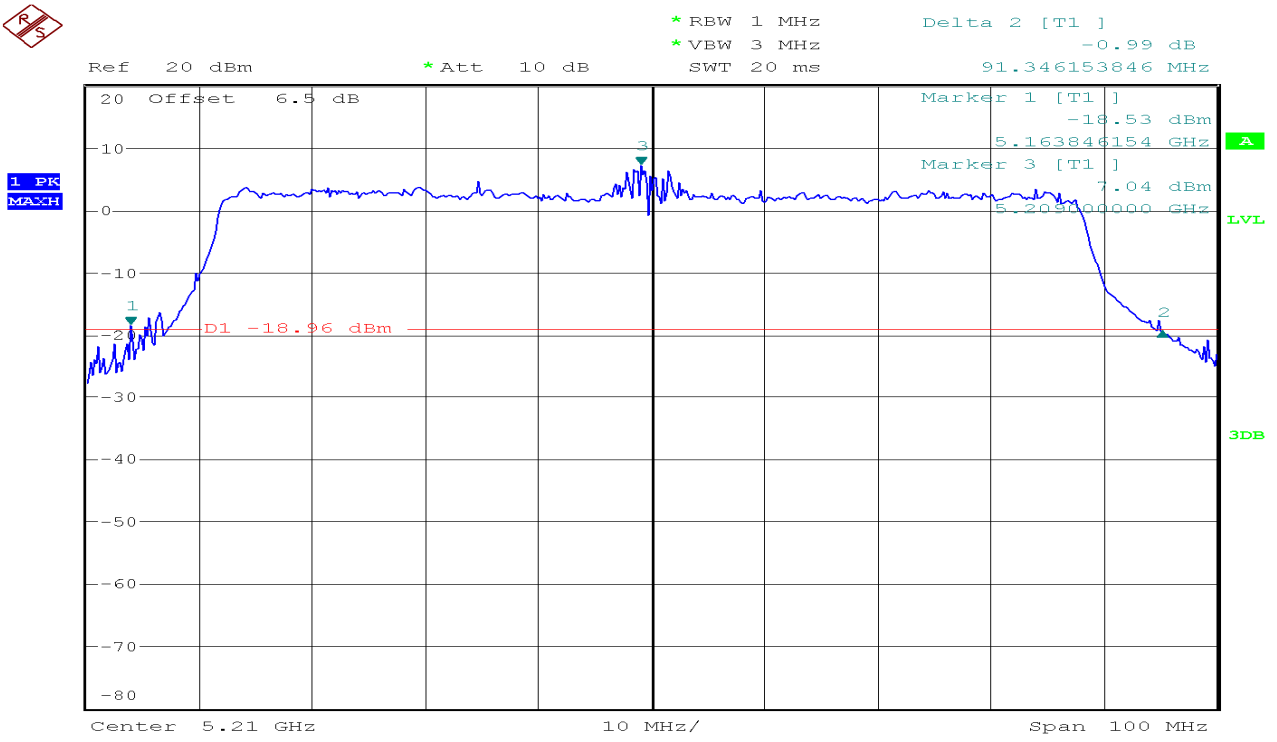


## CH High




## IEEE 802.11ac VHT80 mode

## CH Mid

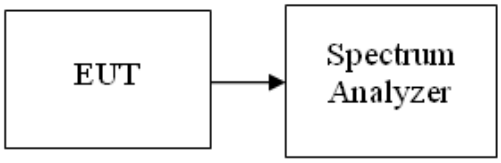


## 7.2 99% DB EMISSION BANDWIDTH

**LIMIT**

None; for reporting purposes only.

**Test Configuration**




### Test Procedure

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geqslant$ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).

**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11a mode**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 16.987 |
| Mid | 5200 | 16.907 |
| High | 5240 | 16.987 |

**Test mode: IEEE 802.11n HT20MHz mode**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 18.029 |
| Mid | 5200 | 18.029 |
| High | 5240 | 18.029 |

**Test mode: IEEE 802.11n HT40MHz mode**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 36.923 |
| High | 5230 | 36.827 |

**Test mode: IEEE 802.11ac VHT20MHz mode**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 18.109 |
| Mid | 5200 | 18.029 |
| High | 5240 | 18.029 |

**Test mode: IEEE 802.11ac VHT40MHz mode**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 36.731 |
| High | 5230 | 36.635 |

**Test mode: IEEE 802.11ac VHT80MHz mode**

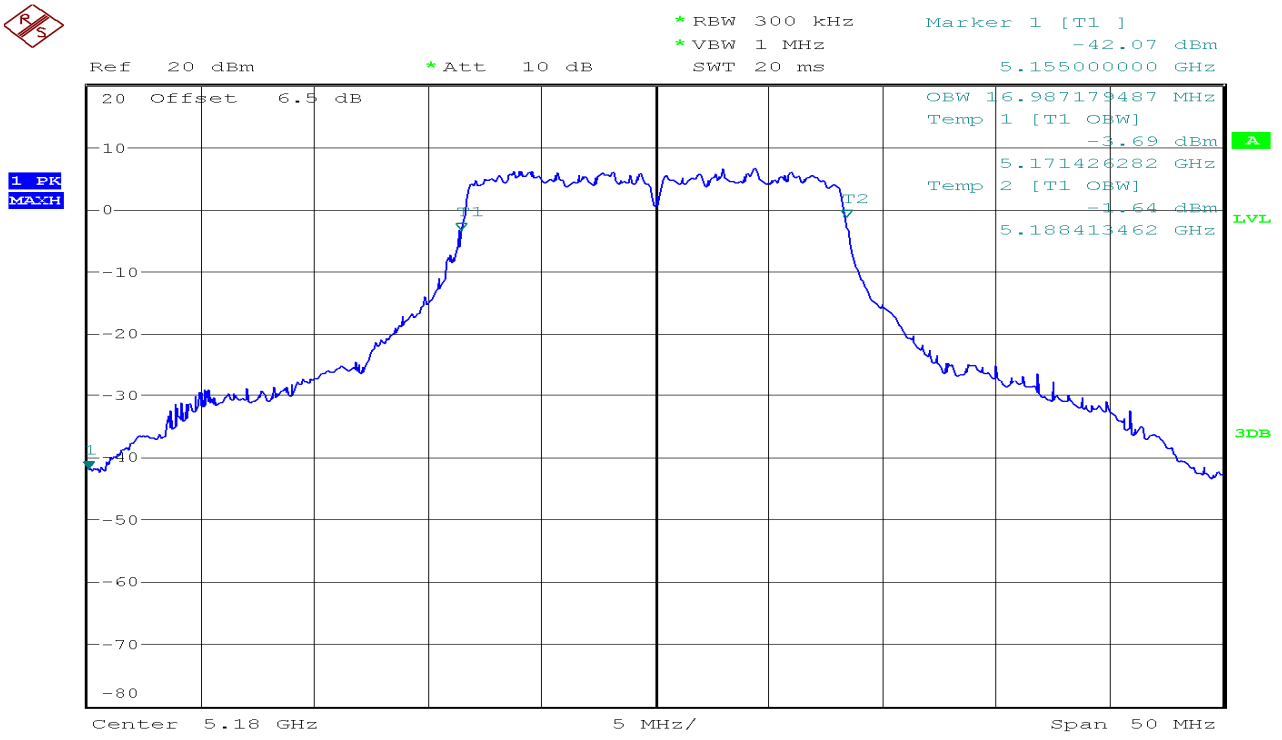
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Mid | 5210 | 76.538 |

**Test Plot**

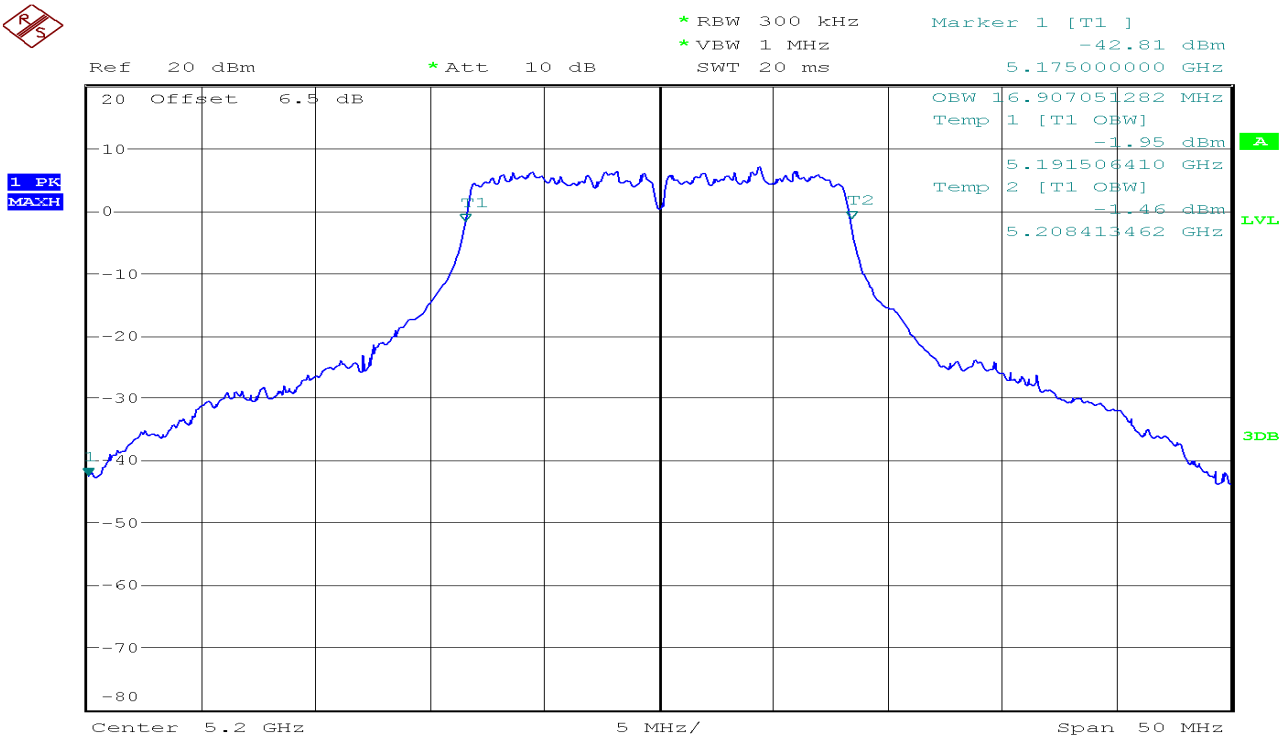
**IEEE 802.11a mode:**

**5150~5250MHz**

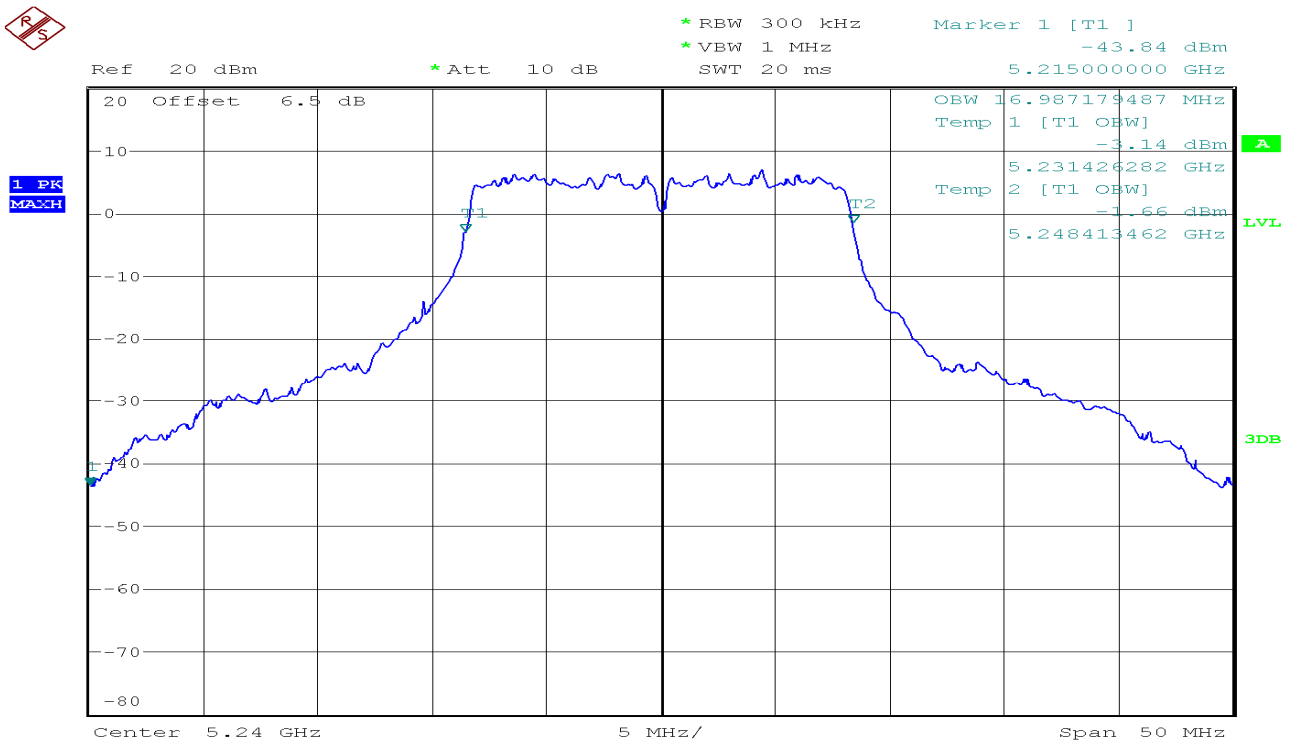
## CH Low




## CH Mid



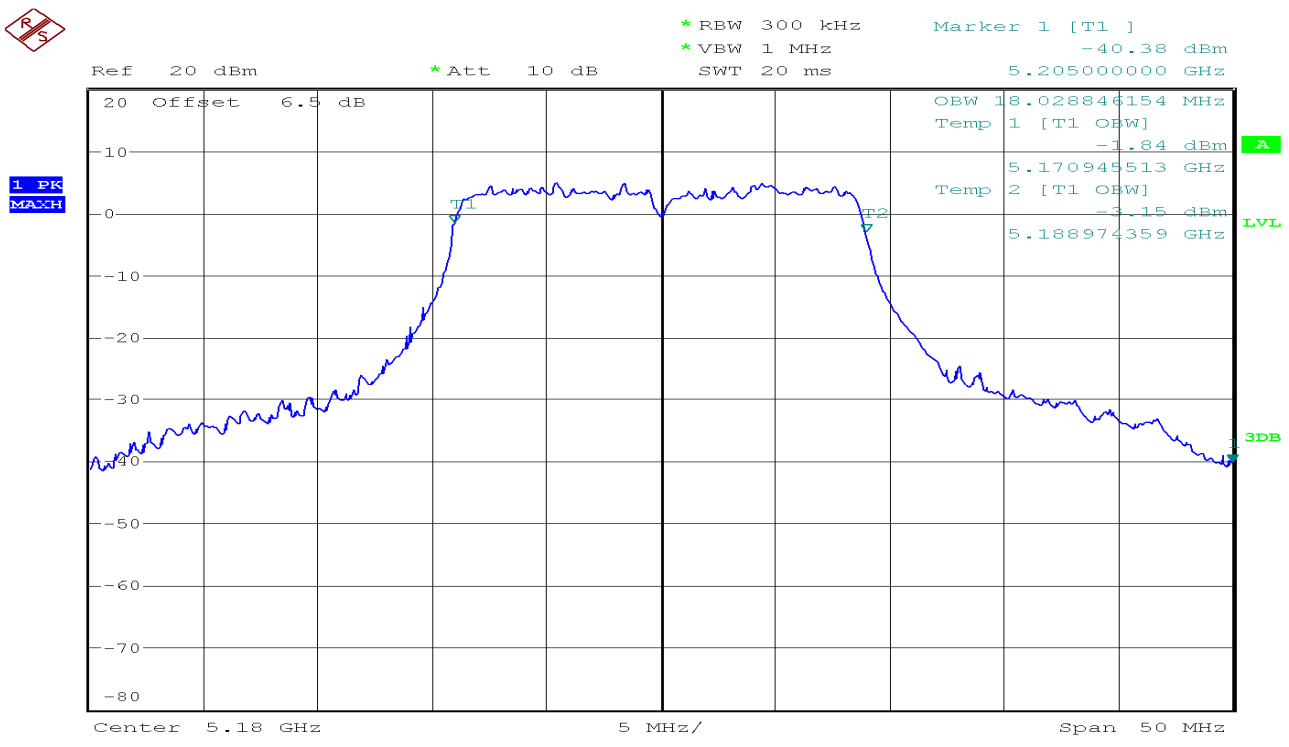
## CH High



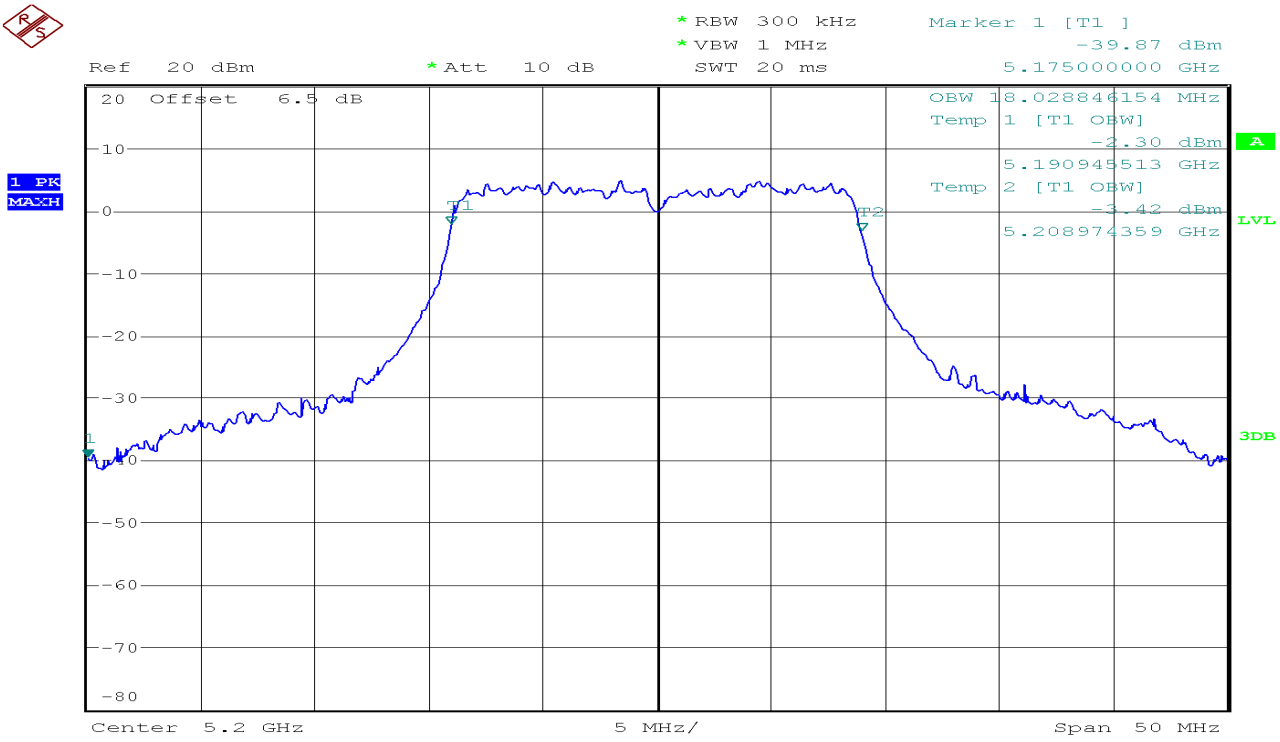

## IEEE 802.11n HT20 mode

**5150~5250MHz**

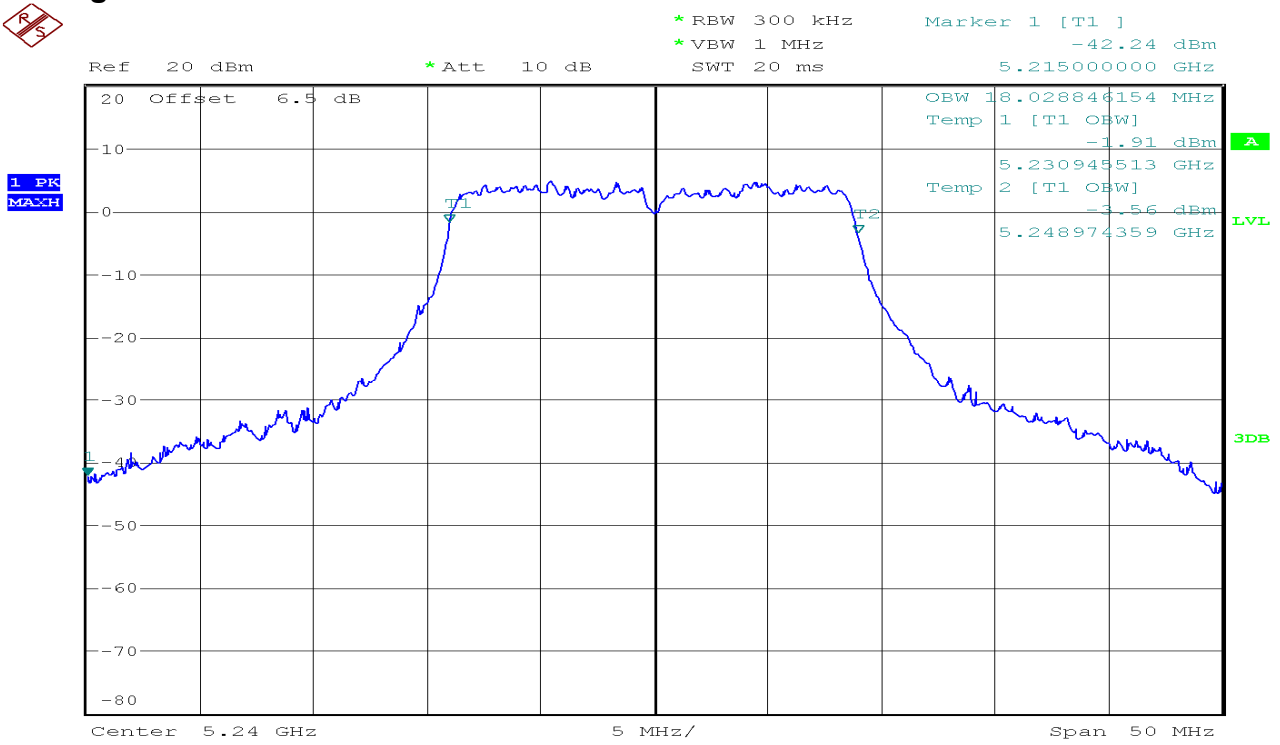
## CH Low



## CH Mid



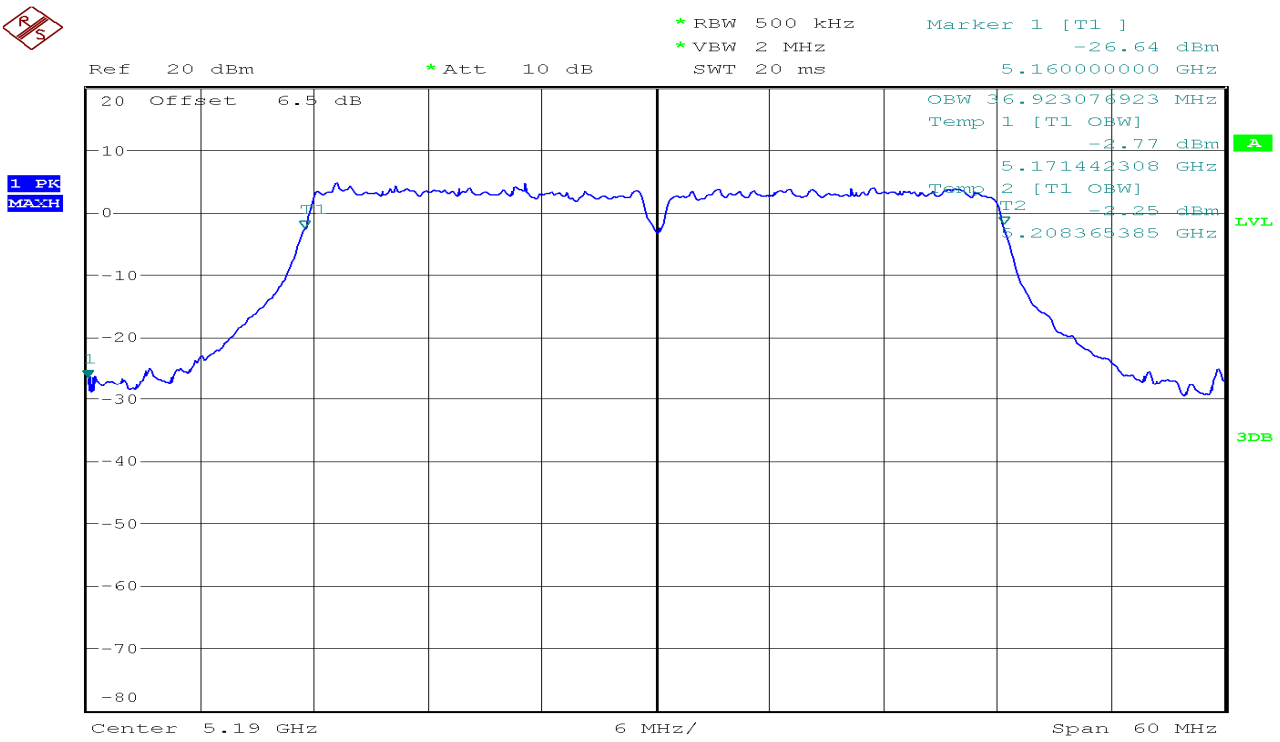

## CH High



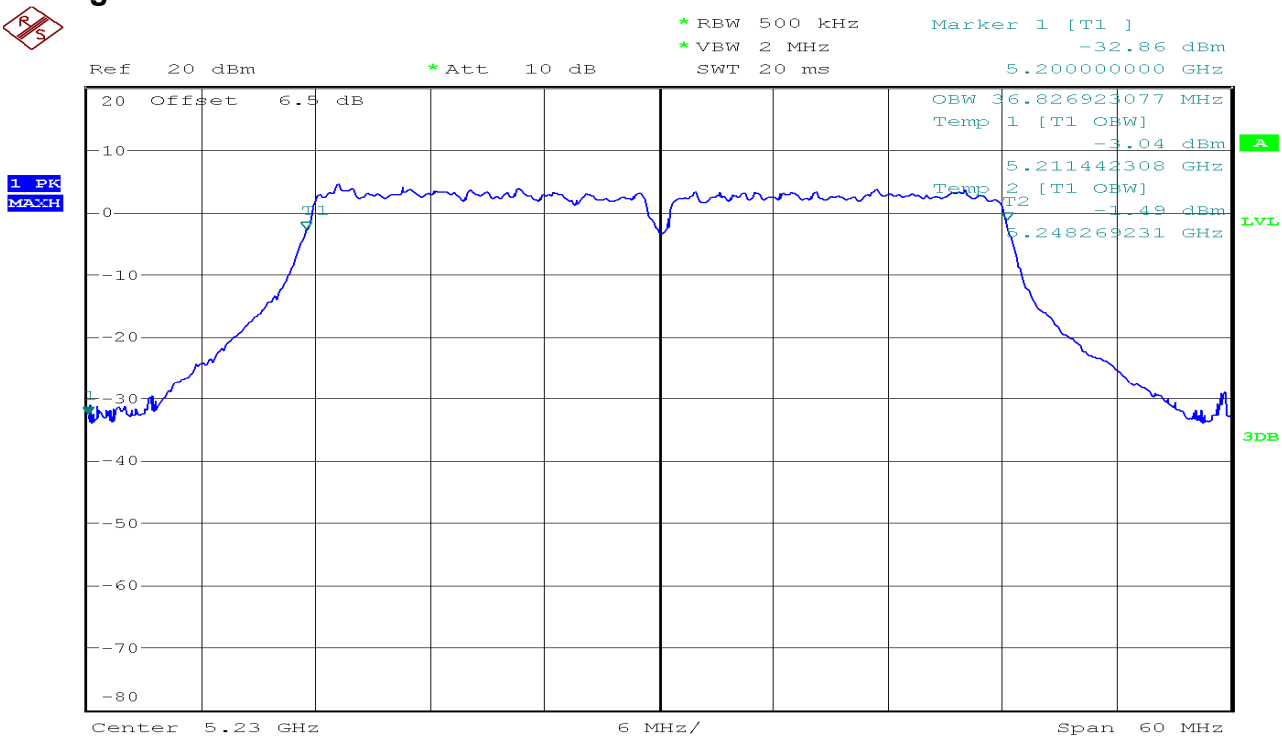
## IEEE 802.11n HT40 mode

**5150~5250MHz**

### CH Low



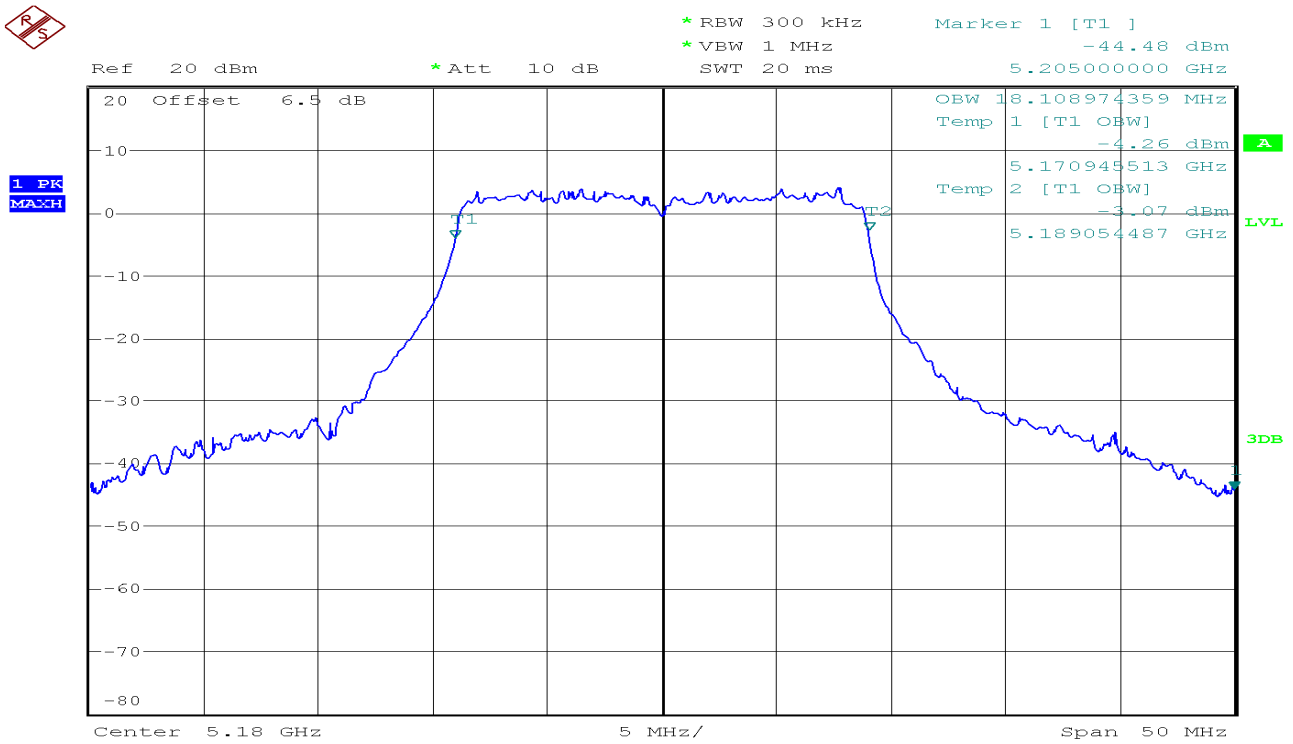

### CH High



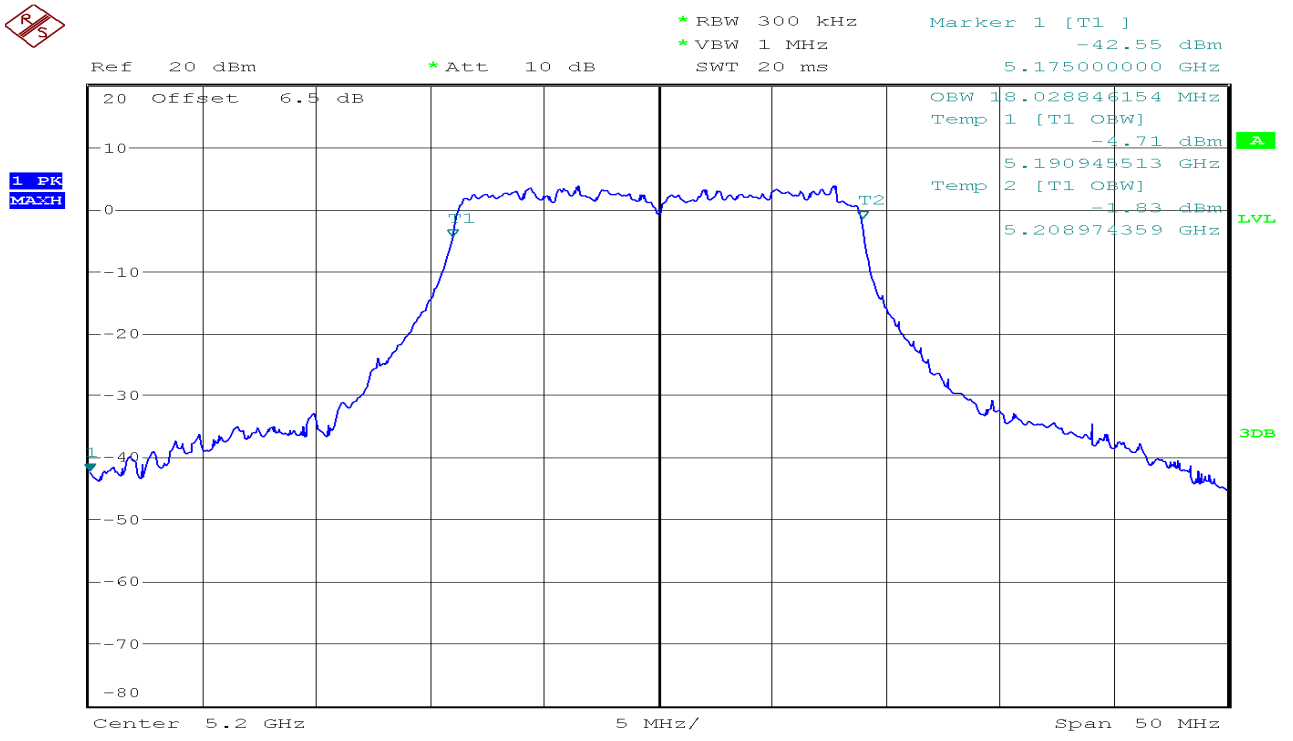
## IEEE 802.11ac HT20 mode

**5150~5250MHz**

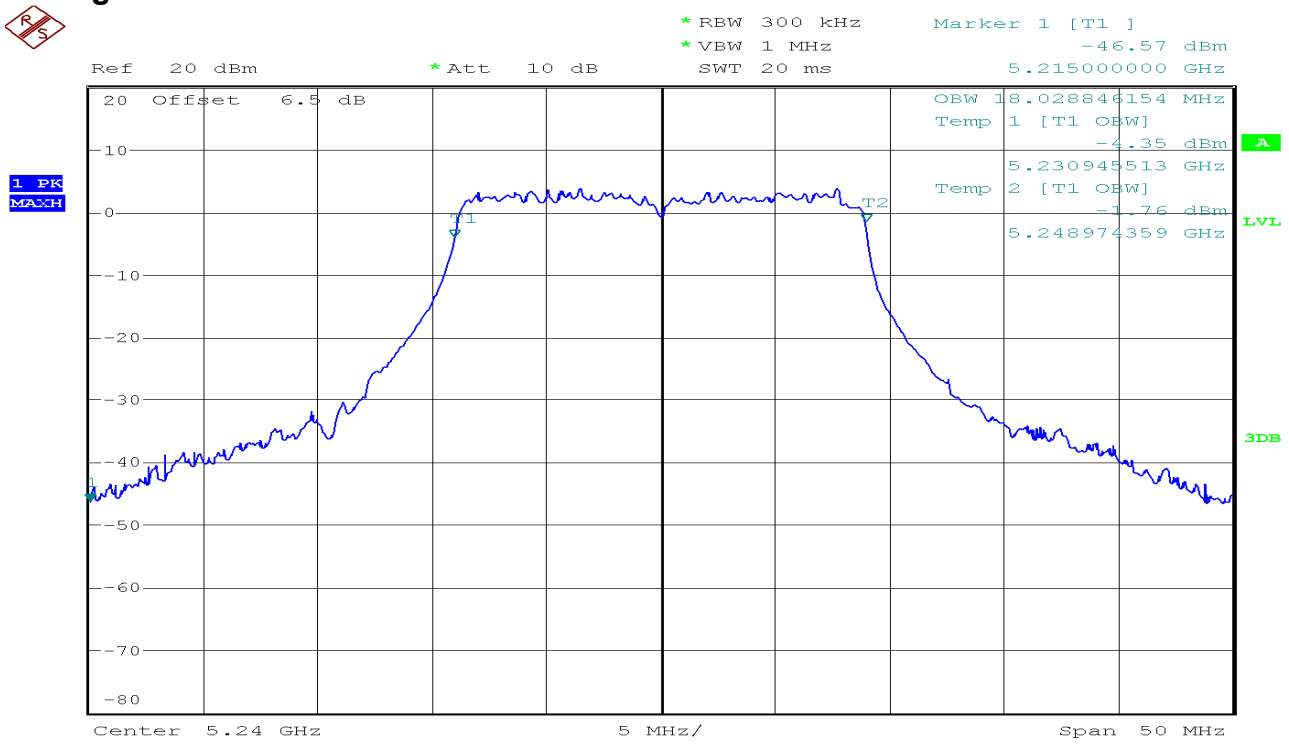
### CH Low




### CH Mid



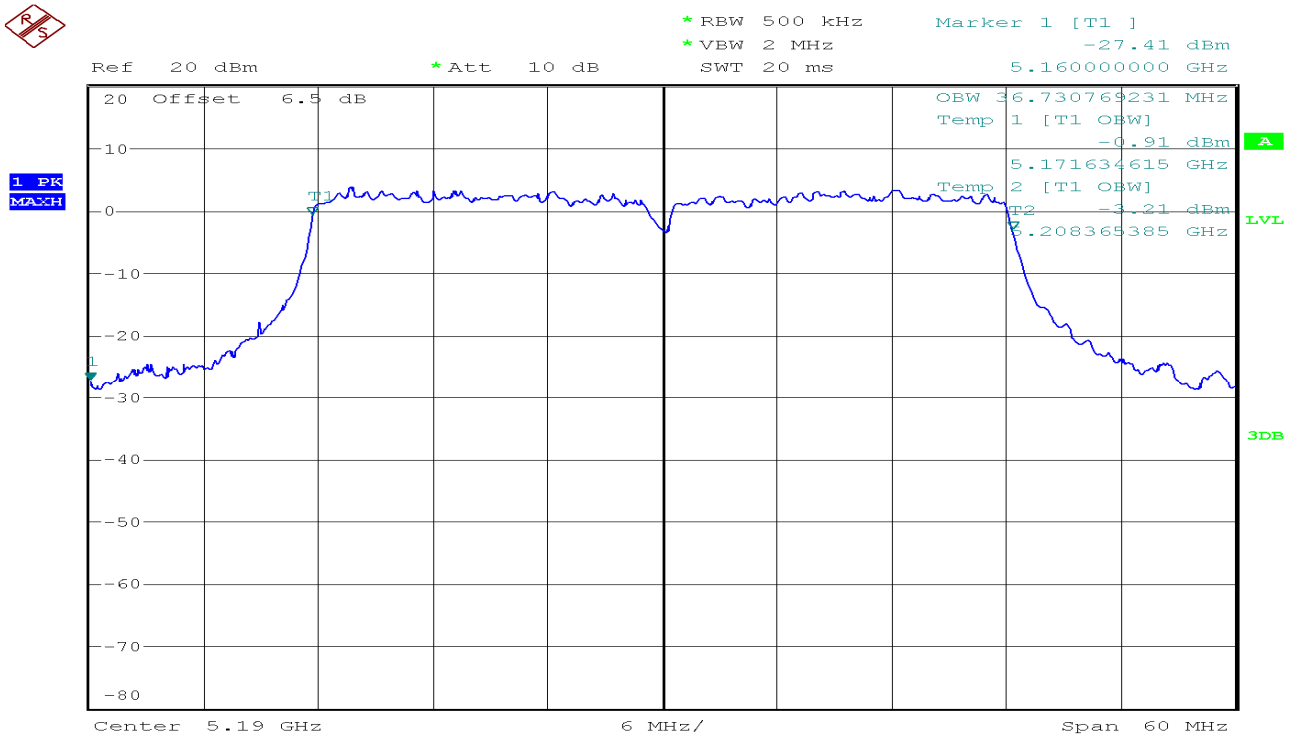
## CH High



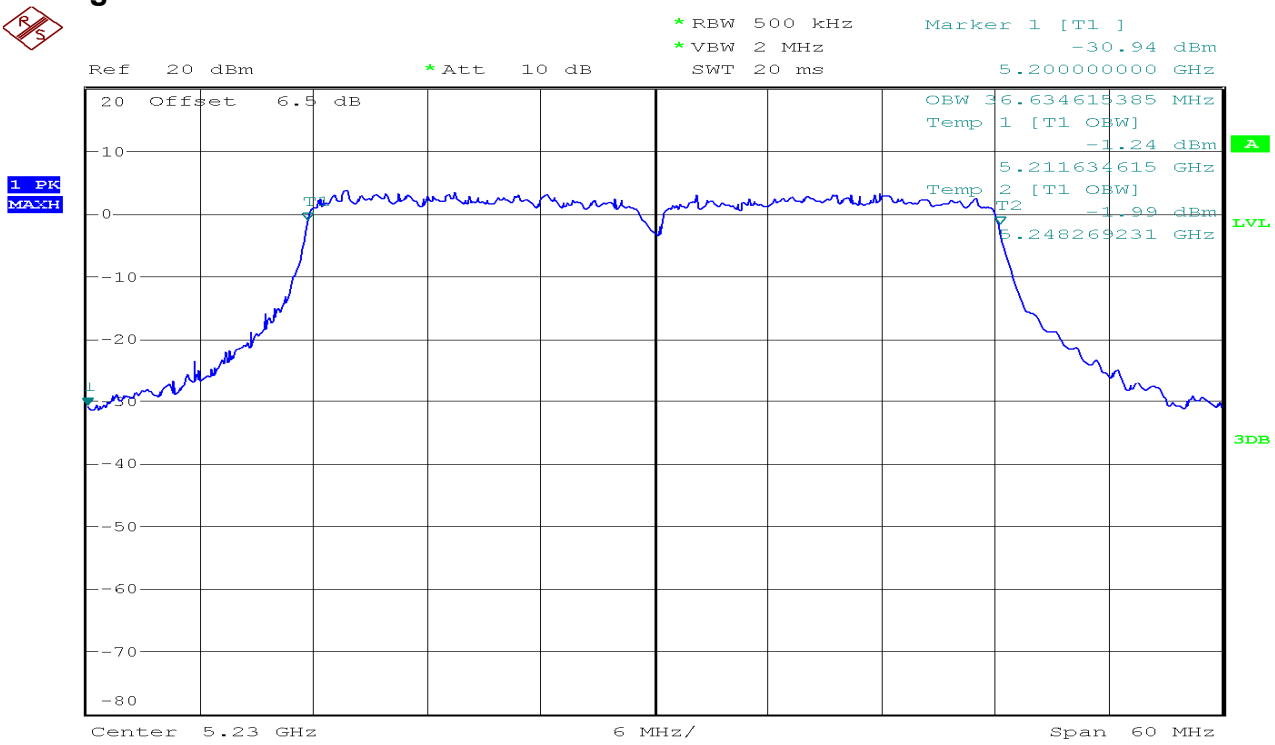

## IEEE 802.11ac HT40 mode

**5150~5250MHz**

## CH Low



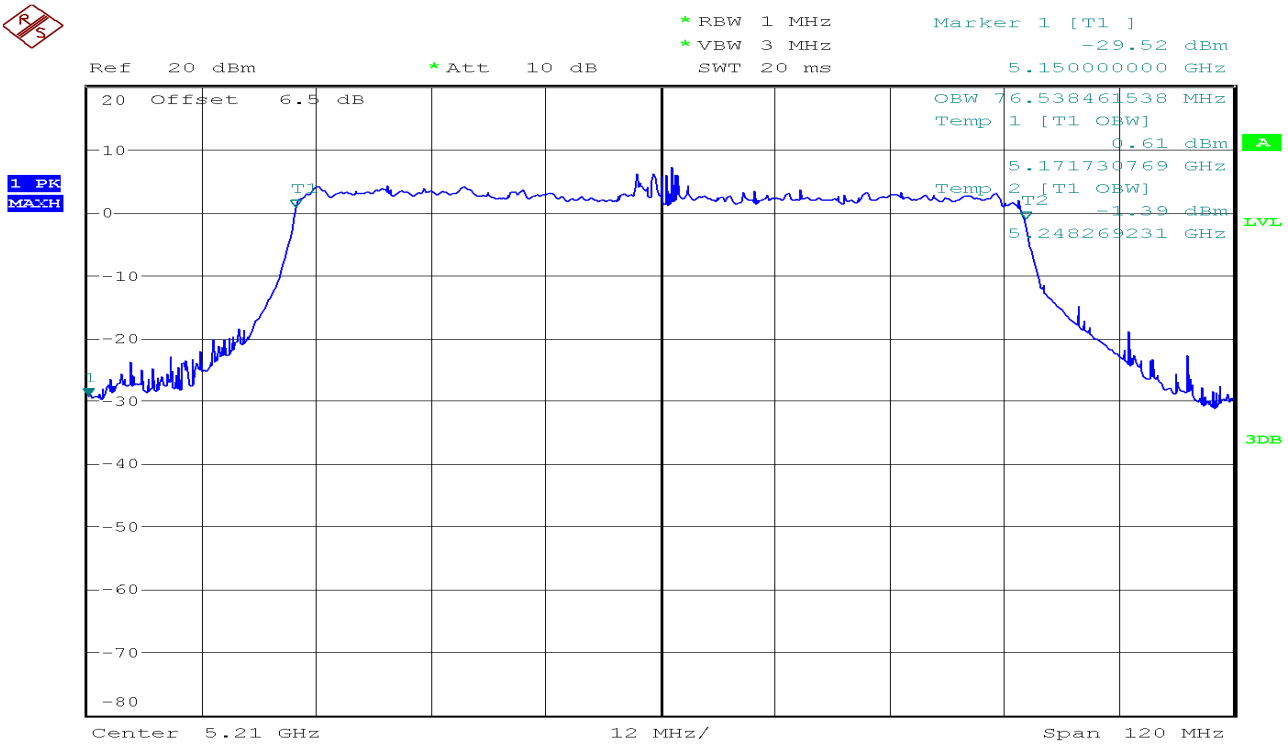
## CH High




## IEEE 802.11ac HT80 mode

**5150~5250MHz**

## CH Mid



## 7.3 MAXIMUM CONDUCTED OUTPUT POWER

**LIMIT**

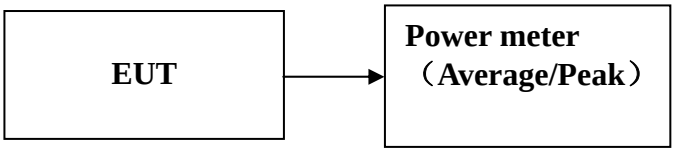
According to §15.407(a),

(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 6dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125mW (21dBm).

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

The peak power shall not exceed the limit as follow:

**Test Configuration**




*The EUT was connected to a spectrum analyzer through a 50Ω RF cable.*

**TEST PROCEDURE**

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

**TEST RESULTS**

*No non-compliance noted*

**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11a mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5180 | 13.68 | 30.00 | -1.01 | 12.67 | 21 |
| Mid | 5200 | 13.97 | 30.00 | -1.01 | 12.96 | 21 |
| High | 5240 | 13.95 | 30.00 | -1.01 | 12.94 | 21 |

**Test mode: IEEE 802.11n HT20MHz mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5180 | 12.72 | 30.00 | -1.01 | 11.71 | 21 |
| Mid | 5200 | 12.51 | 30.00 | -1.01 | 11.50 | 21 |
| High | 5240 | 12.72 | 30.00 | -1.01 | 11.71 | 21 |

**Test mode: IEEE 802.11n HT40MHz mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5190 | 12.75 | 30.00 | -1.01 | 11.74 | 21 |
| High | 5230 | 12.37 | 30.00 | -1.01 | 11.36 | 21 |

**Test mode: IEEE 802.11ac VHT20MHz mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5180 | 11.69 | 30.00 | -1.01 | 10.68 | 21 |
| Mid | 5200 | 11.46 | 30.00 | -1.01 | 10.45 | 21 |
| High | 5240 | 11.66 | 30.00 | -1.01 | 10.65 | 21 |

**Test mode: IEEE 802.11ac VHT40MHz mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5190 | 11.71 | 30.00 | -1.01 | 10.70 | 21 |
| High | 5230 | 11.47 | 30.00 | -1.01 | 10.46 | 21 |

**Test mode: IEEE 802.11ac VHT80MHz mode**

| Channel | Frequency (MHz) | AV Output Power (dBm) | Power Limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) |
|---|---|---|---|---|---|---|
| Mid | 5210 | 11.81 | 30.00 | -1.01 | 10.80 | 21 |

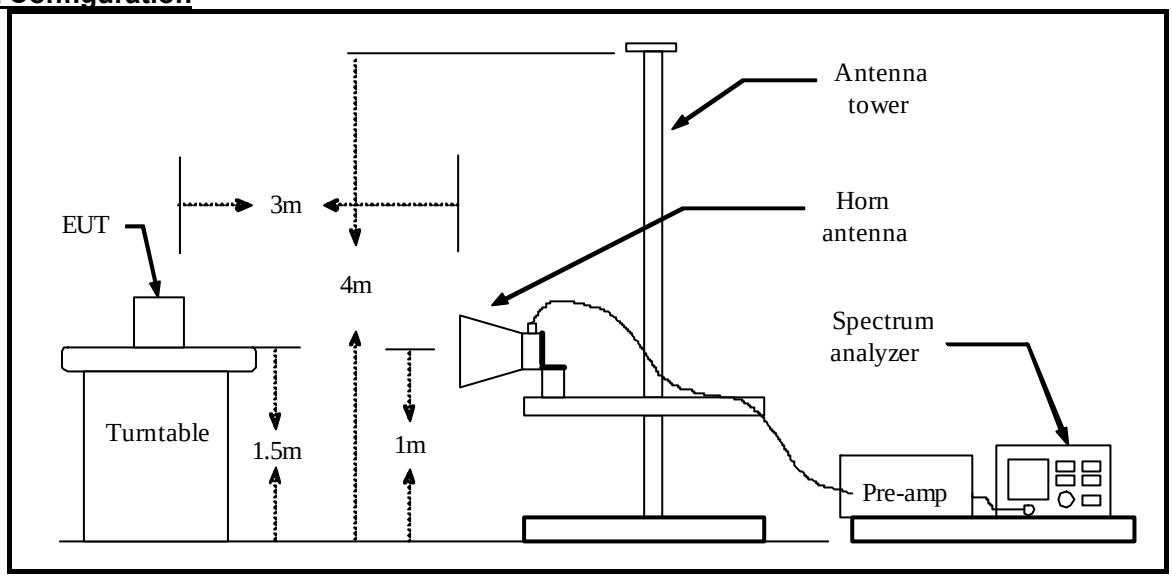
**Note:Duty factor has been offseted with cableloss**

## 7.4 BAND EDGES MEASUREMENT

**LIMIT**

According to §15.407(b),
(1) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

**Test Configuration**




**TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / Sweep=AUTO

   VBW=10Hz,when duty cycle is no less than 98 percent.

   VBW≧1/T,when duty cycle is less than 98 percent,where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximun power control level for the tested mode of operation.

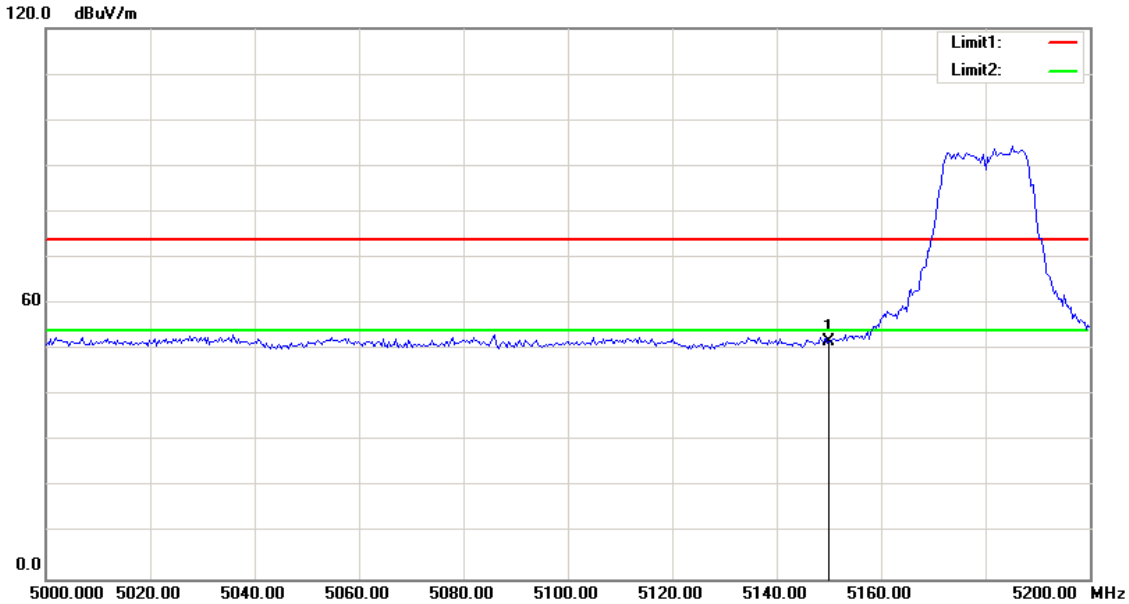
| Band | Duty Cycle(%) | T(ms) | 1/T(kHz) | VBW Setting |
|---|---|---|---|---|
| IEEE 802.11 a | 96 | 2.267 | 0.44 | 0.5KHz |
| IEEE 802.11n HT20 | 96.8 | 3.750 | 0.27 | 0.3KHz |
| IEEE 802.11n HT40 | 96.9 | 3.617 | 0.28 | 0.3KHz |
| IEEE 802.11ac HT20 | 96.5 | 3.167 | 0.32 | 0.5KHz |
| IEEE 802.11ac HT40 | 97 | 3.750 | 0.27 | 0.3KHz |
| IEEE 802.11ac HT80 | 93.1 | 3.167 | 0.32 | 0.5KHz |

**TEST RESULTS**

Refer to attach spectrum analyzer data chart.

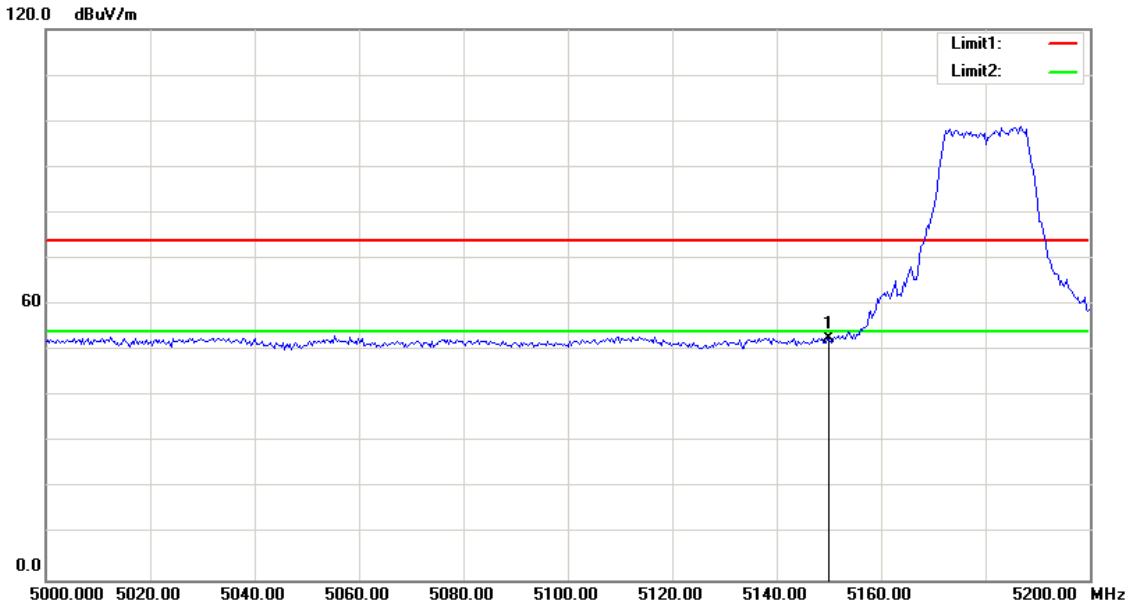
**Band Edges (IEEE 802.11a mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.22 | -4.40 | 51.82 | 74.00 | -22.18 | 100 | 209 | peak |

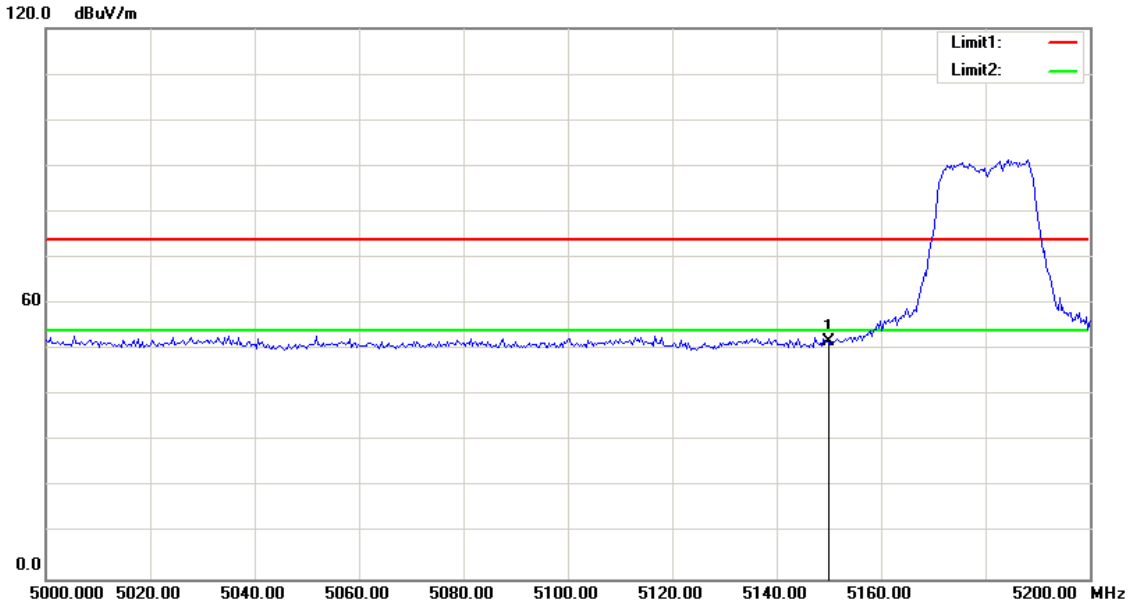
**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.92 | -4.40 | 52.52 | 74.00 | -21.48 | 100 | 160 | peak |

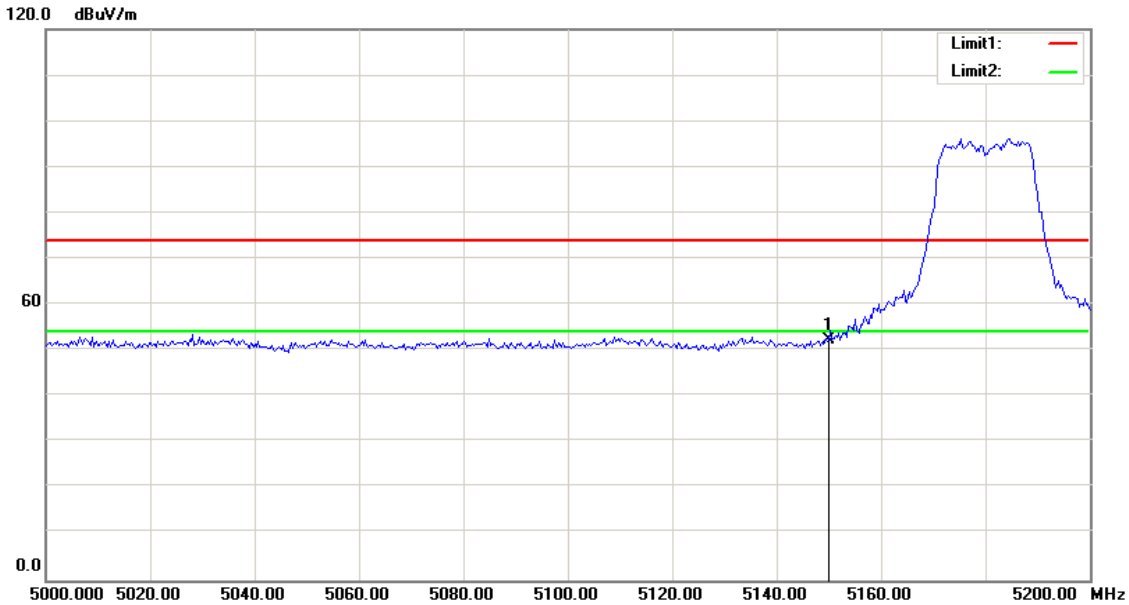
**Band Edges (IEEE 802.11n HT20 mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.16 | -4.40 | 51.76 | 74.00 | -22.24 | 100 | 145 | peak |

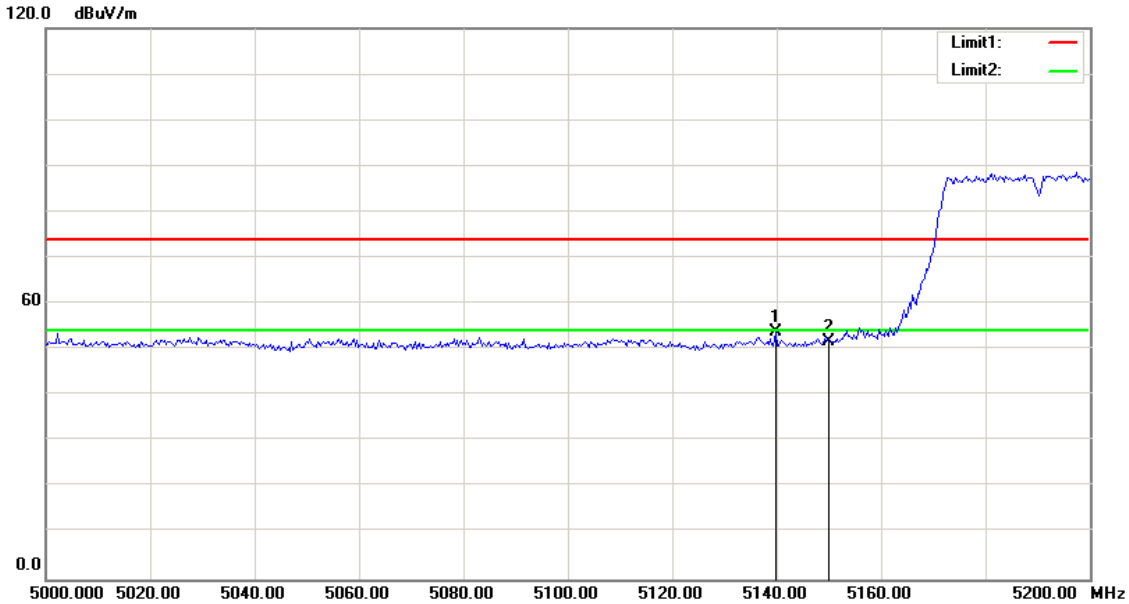
**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.70 | -4.40 | 52.30 | 74.00 | -21.70 | 100 | 244 | peak |

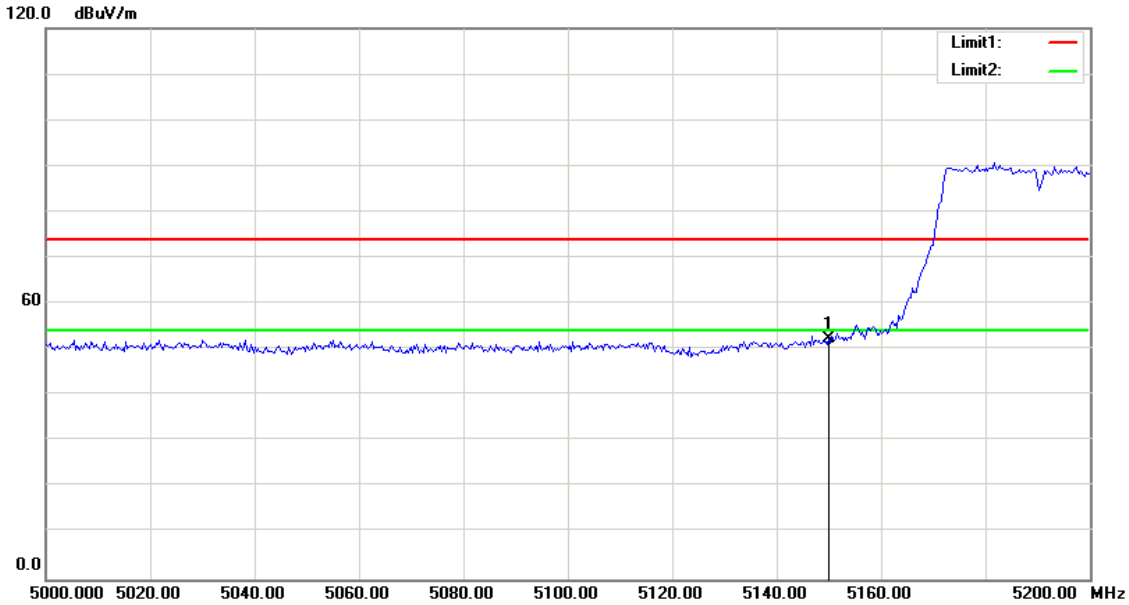
**Band Edges (IEEE 802.11n HT40 mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5139.744 | 58.16 | -4.44 | 53.72 | 74.00 | -20.28 | 200 | 17 | peak |
| 2 | 5150.000 | 56.28 | -4.40 | 51.88 | 74.00 | -22.12 | 100 | 147 | peak |

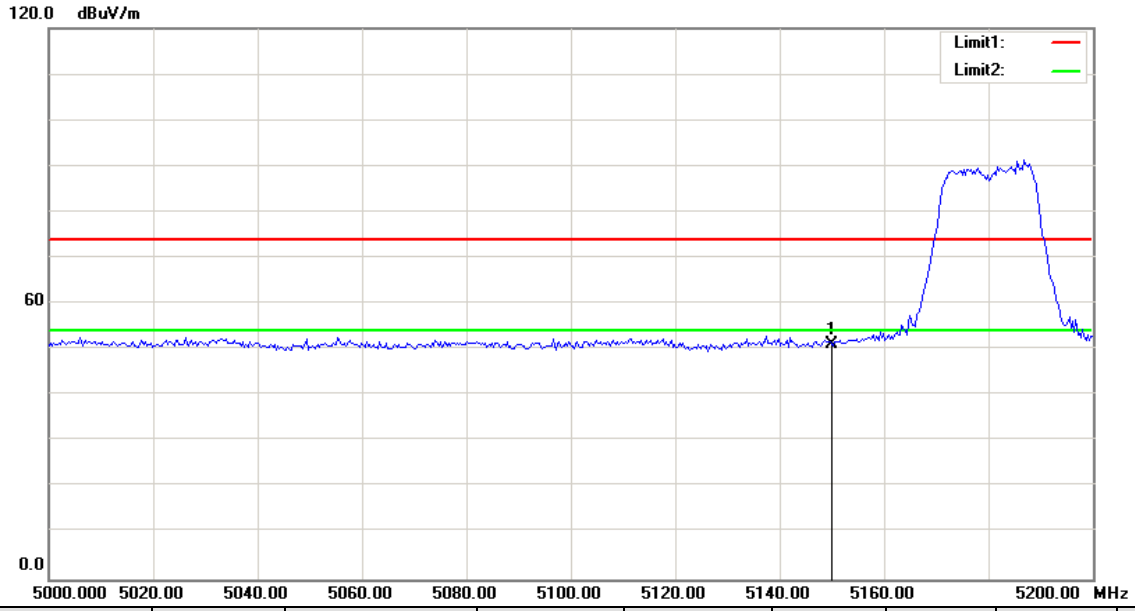
**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.80 | -4.40 | 52.40 | 74.00 | -21.60 | 100 | 212 | peak |

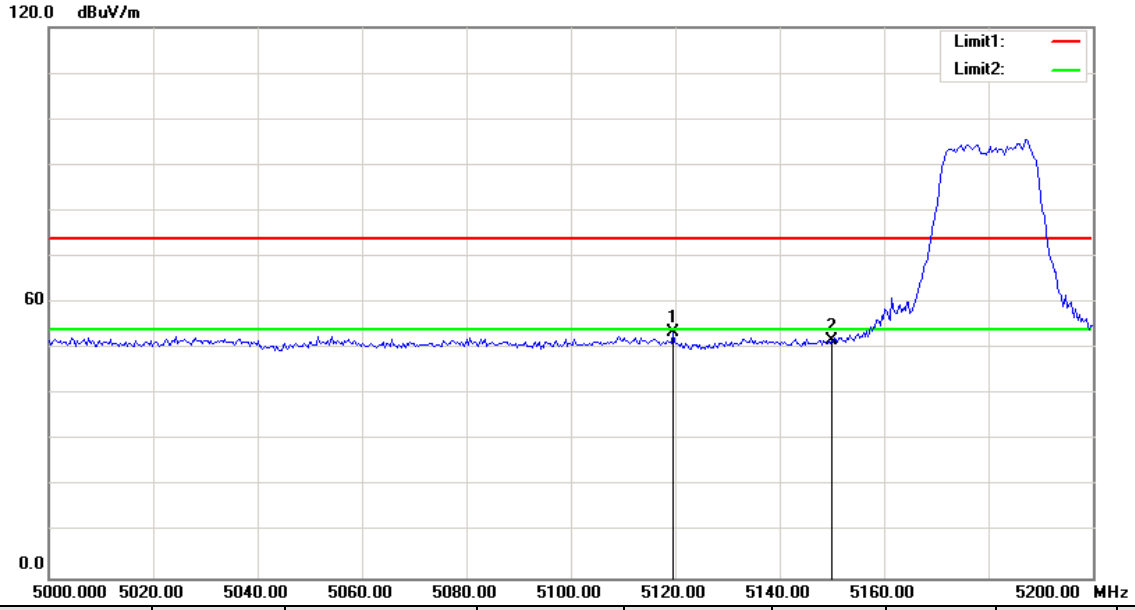
**Band Edges (IEEE 802.11ac VHT20 mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 55.70 | -4.40 | 51.30 | 74.00 | -22.70 | 100 | 315 | peak |

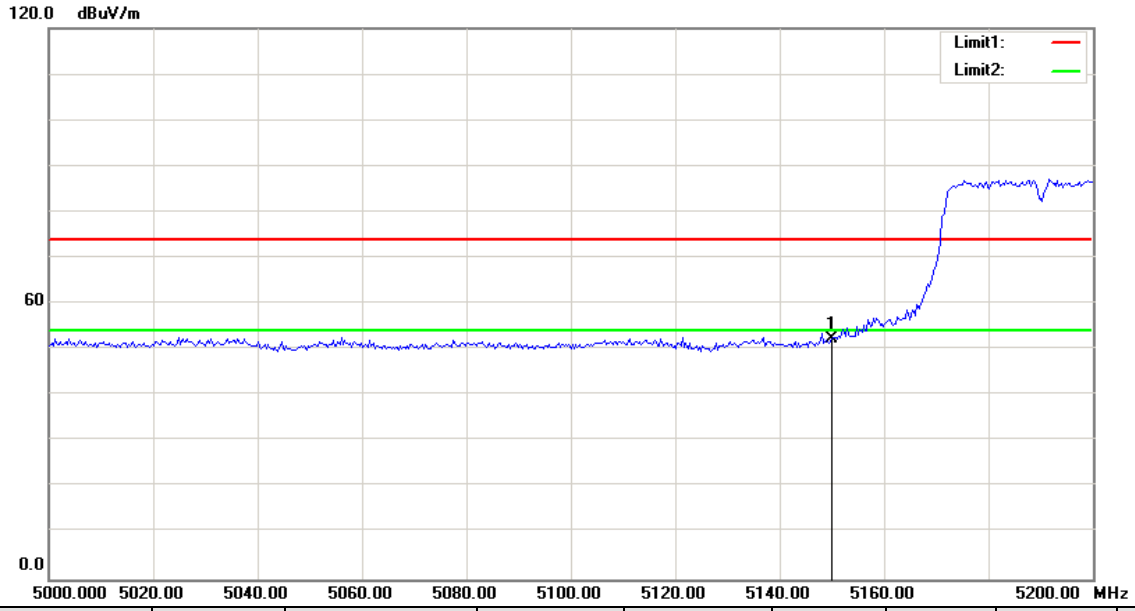
**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5119.551 | 58.00 | -4.54 | 53.46 | 74.00 | -20.54 | 200 | 31 | peak |
| 2 | 5150.000 | 56.24 | -4.40 | 51.84 | 74.00 | -22.16 | 100 | 225 | peak |

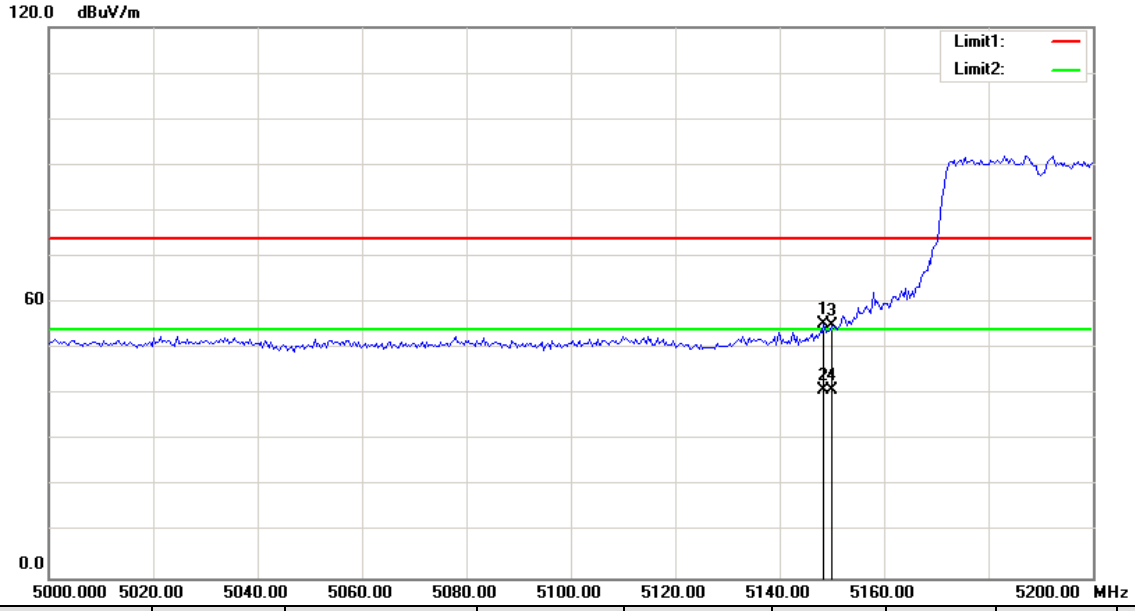
**Band Edges (IEEE 802.11ac VHT40 mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 56.78 | -4.40 | 52.38 | 74.00 | -21.62 | 100 | 139 | peak |

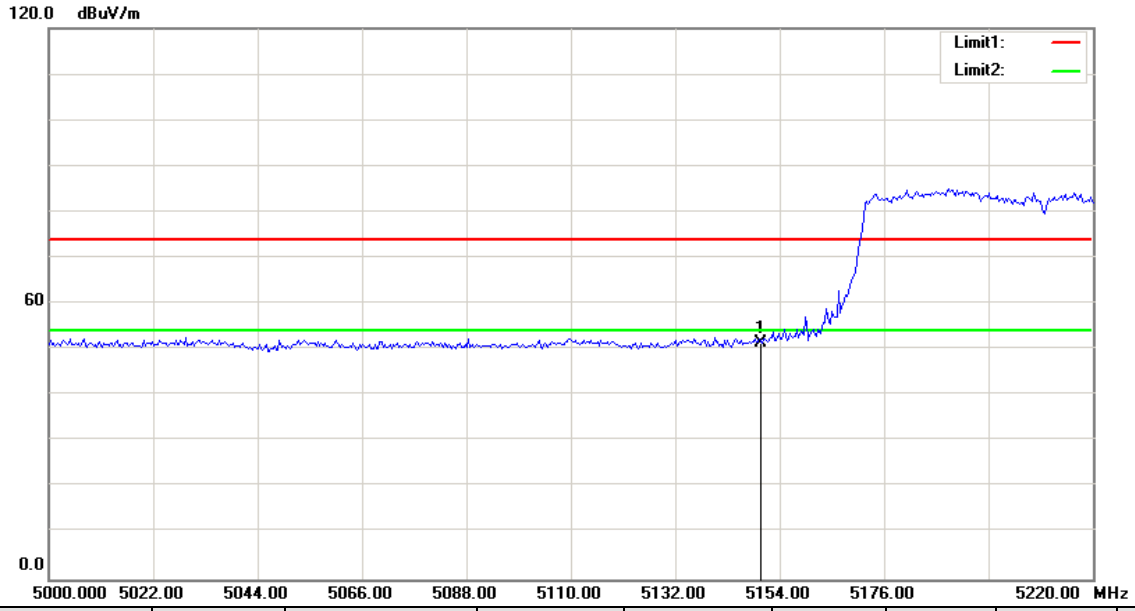
**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5148.397 | 59.64 | -4.40 | 55.24 | 74.00 | -18.76 | 100 | 225 | peak |
| 2 | 5148.397 | 45.25 | -4.40 | 40.85 | 54.00 | -13.15 | 100 | 232 | AVG |
| 3 | 5150.000 | 59.52 | -4.40 | 55.12 | 74.00 | -18.88 | 100 | 216 | peak |
| 4 | 5150.000 | 45.43 | -4.40 | 41.03 | 54.00 | -12.97 | 100 | 204 | AVG |

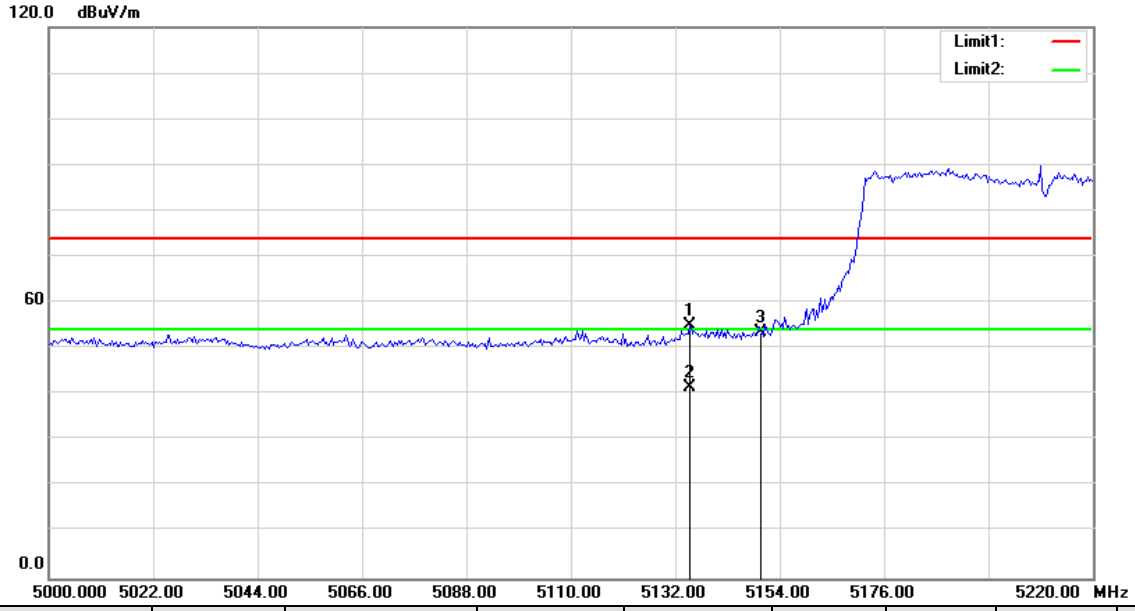
**Band Edges (IEEE 802.11ac VHT80 mode)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5150.000 | 55.88 | -4.40 | 51.48 | 74.00 | -22.52 | 100 | 127 | peak |

**Polarity: Horizontal**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 5135.032 | 59.45 | -4.47 | 54.98 | 74.00 | -19.02 | 100 | 224 | peak |
| 2 | 5135.032 | 46.09 | -4.47 | 41.62 | 54.00 | -12.38 | 100 | 216 | AVG |
| 3 | 5150.000 | 57.95 | -4.40 | 53.55 | 74.00 | -20.45 | 100 | 149 | peak |

## 7.5 MAXIMUM POWER SPECTRAL DENSITY

**LIMIT**

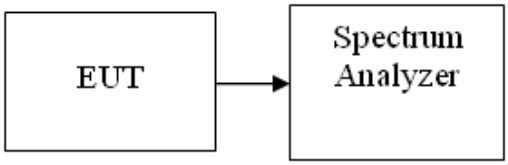
According to §15.407(a),

(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.

(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 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.*

**Test Configuration**




**TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 1MHz, VBW = 3MHz, Span must be greater than 26dB bandwidth, adjust as necessary, Sweep= auto, Detector RMS
3. Record the max. reading.

**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11a mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Low | 5180 | 3.23 | 17.00 | PASS |
| Mid | 5200 | 3.73 | 17.00 | PASS |
| High | 5240 | 4.09 | 17.00 | PASS |

**Test mode: IEEE 802.11n HT20MHz mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Low | 5180 | 2.15 | 17.00 | PASS |
| Mid | 5200 | 2.03 | 17.00 | PASS |
| High | 5240 | 4.19 | 17.00 | PASS |

**Test mode: IEEE 802.11n HT40MHz mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Low | 5190 | -0.78 | 17.00 | PASS |
| High | 5230 | -0.66 | 17.00 | PASS |

**Test mode: IEEE 802.11ac VHT20MHz mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Low | 5180 | 1.08 | 17.00 | PASS |
| Mid | 5200 | 1.26 | 17.00 | PASS |
| High | 5240 | 1.66 | 17.00 | PASS |

**Test mode: IEEE 802.11ac VHT40MHz mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Low | 5190 | -1.90 | 17.00 | PASS |
| High | 5230 | -1.66 | 17.00 | PASS |

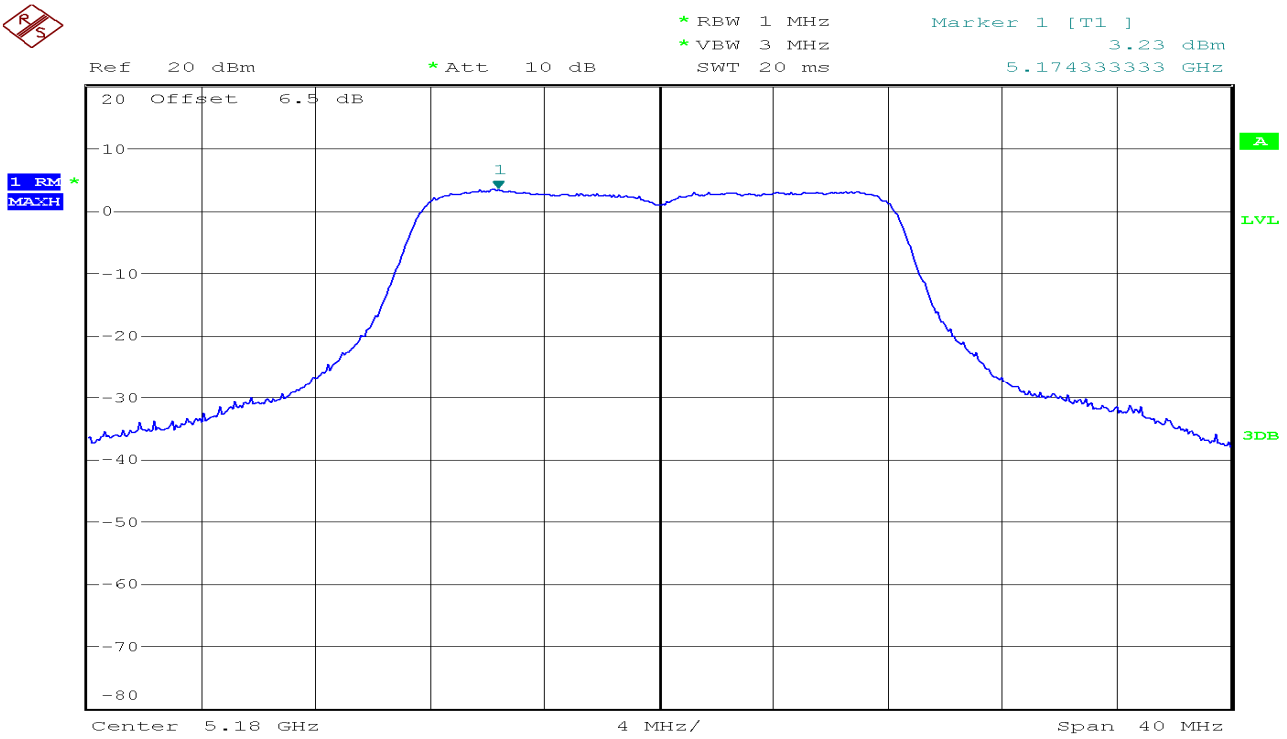
**Test mode: IEEE 802.11ac VHT80MHz mode**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| Mid | 5210 | -4.16 | 17.00 | PASS |

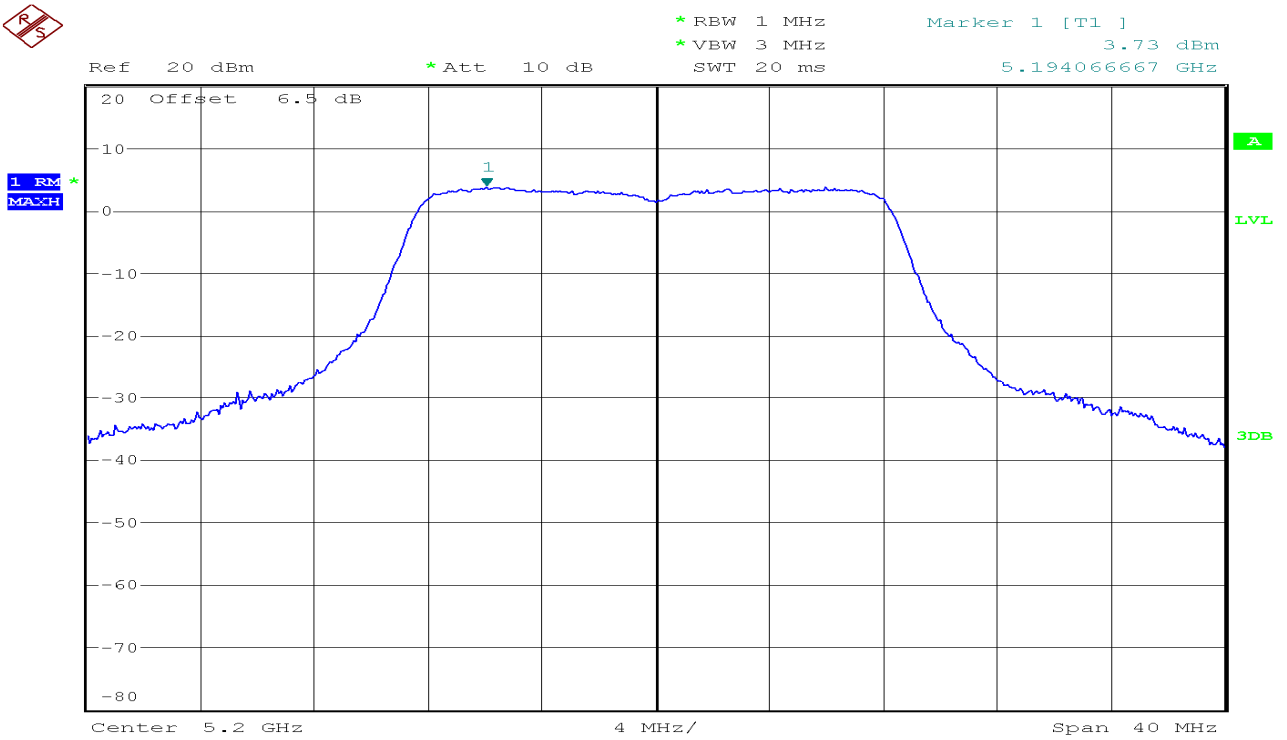
**Note:Duty factor has been offseted with cableloss**

**Test Plot**
**IEEE 802.11a mode:**

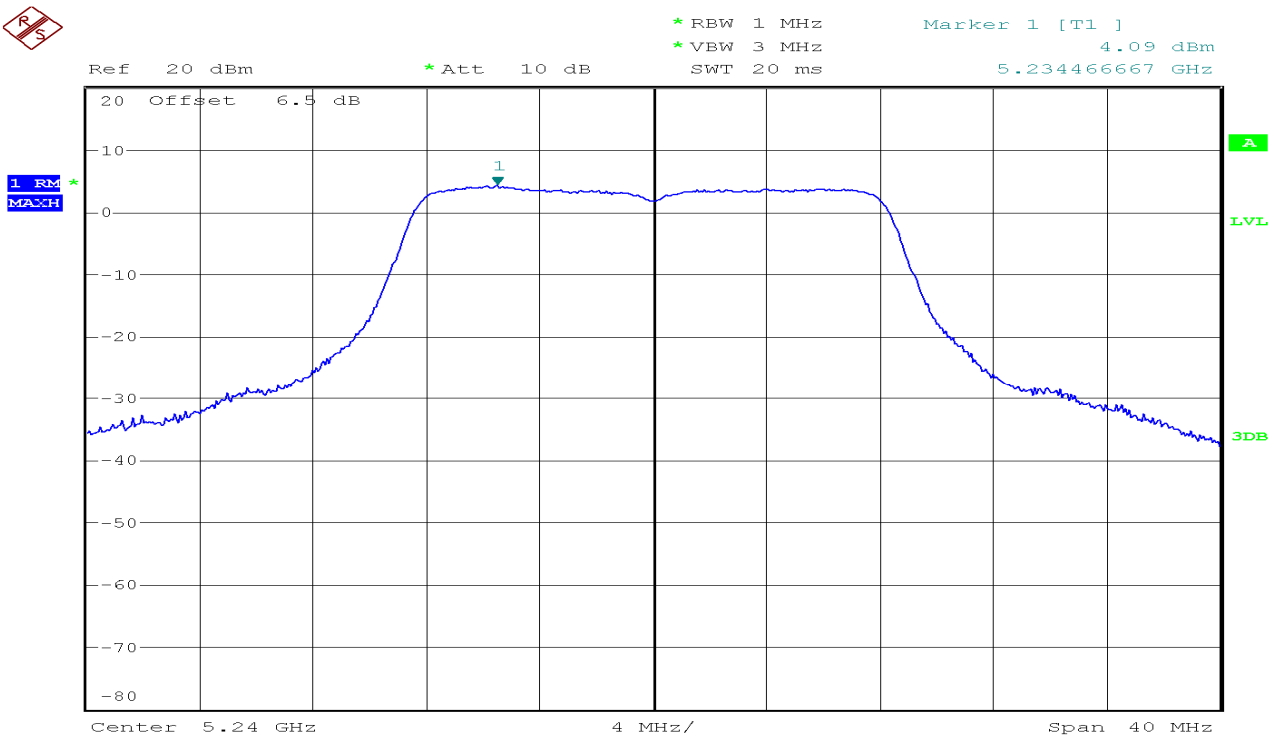
## CH Low




## CH Mid

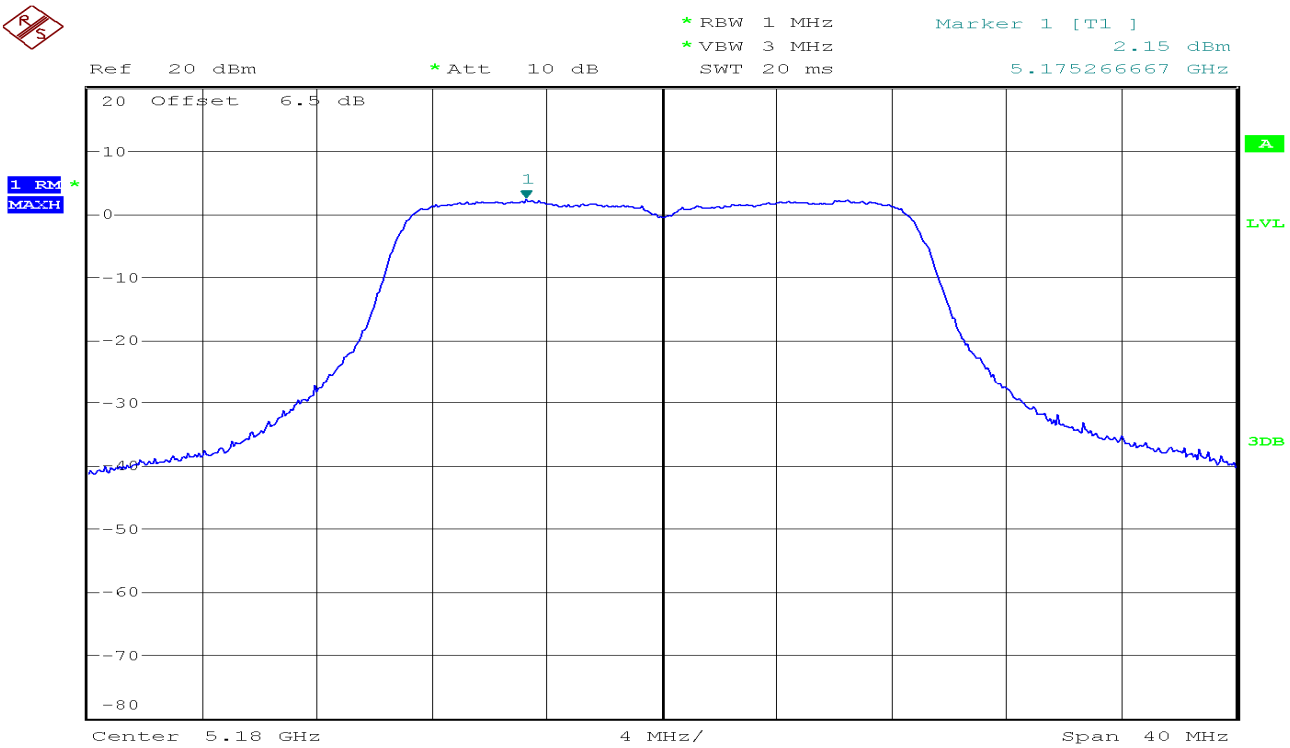


## CH High

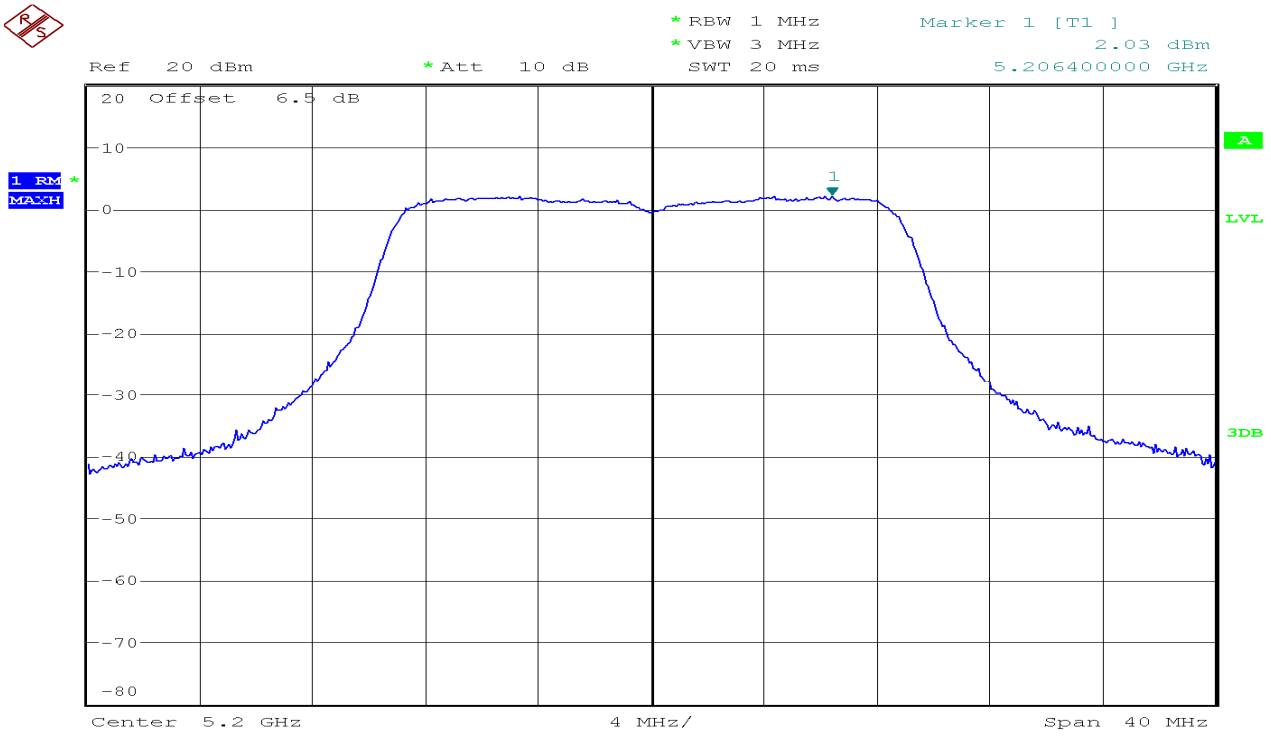



## IEEE 802.11n HT20 mode

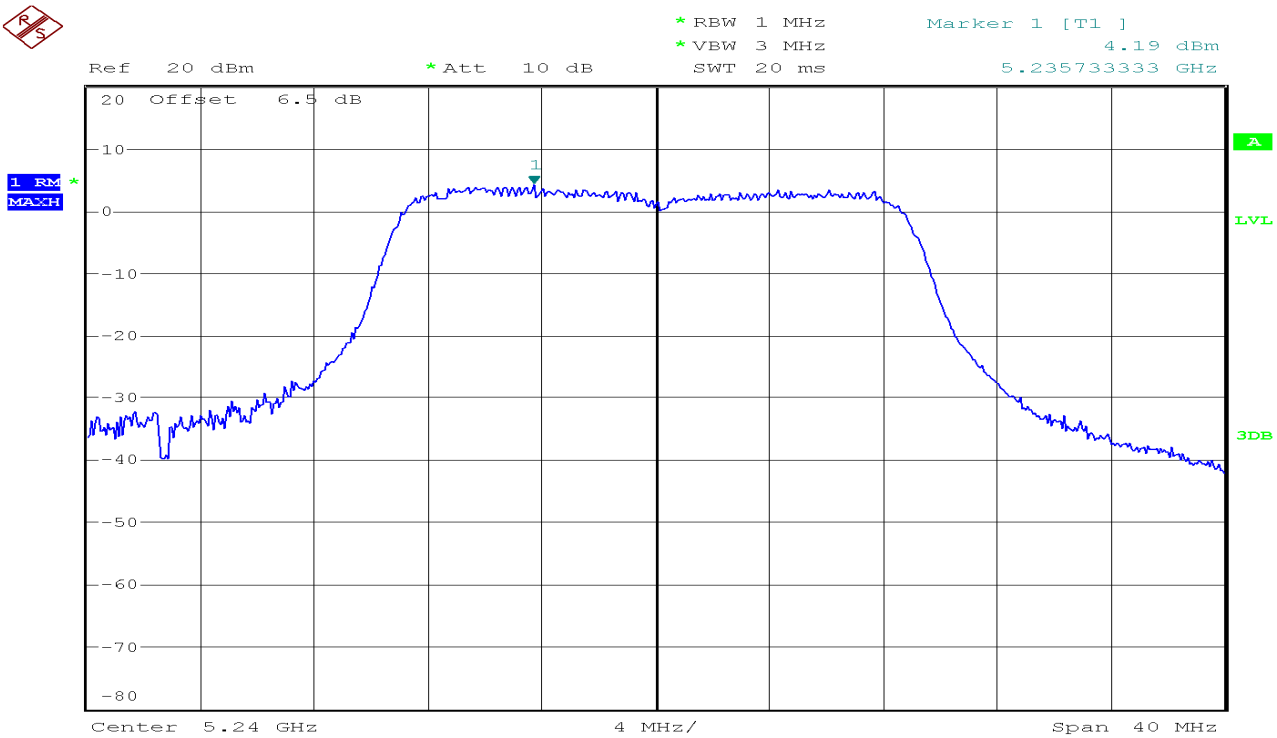
## CH Low



## CH Mid

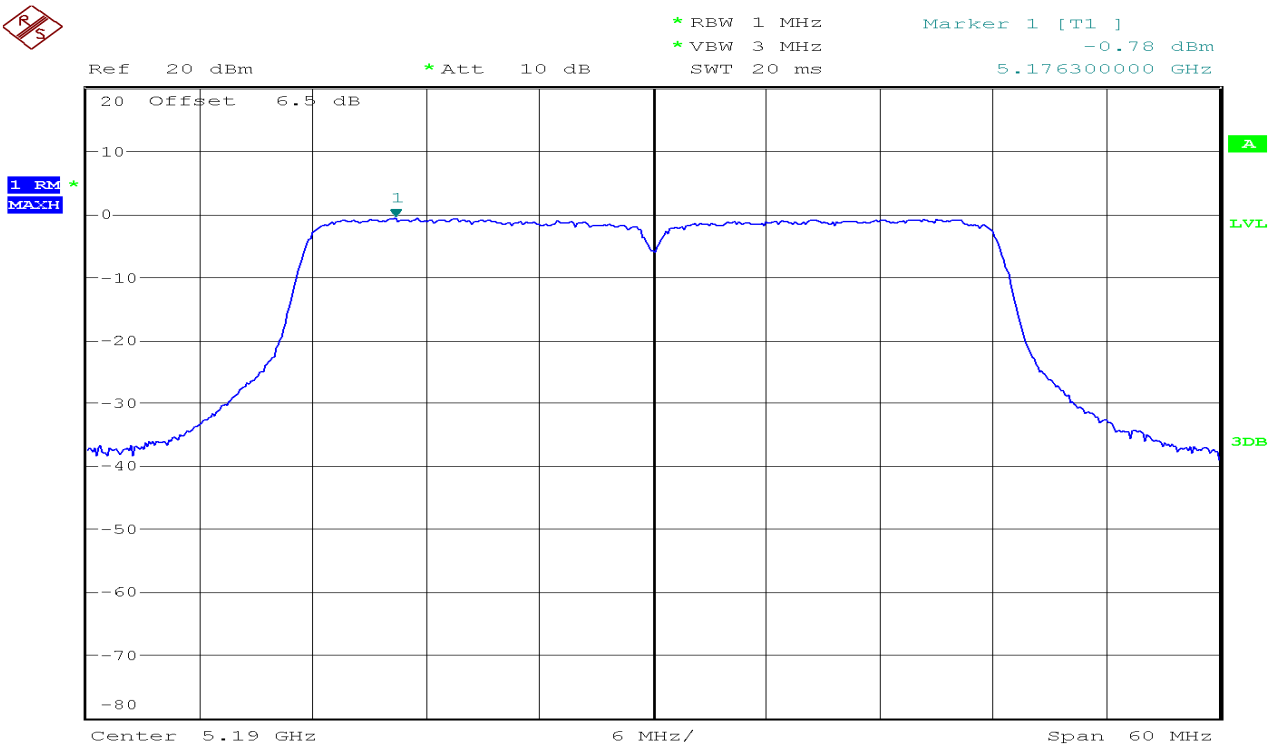



## CH High

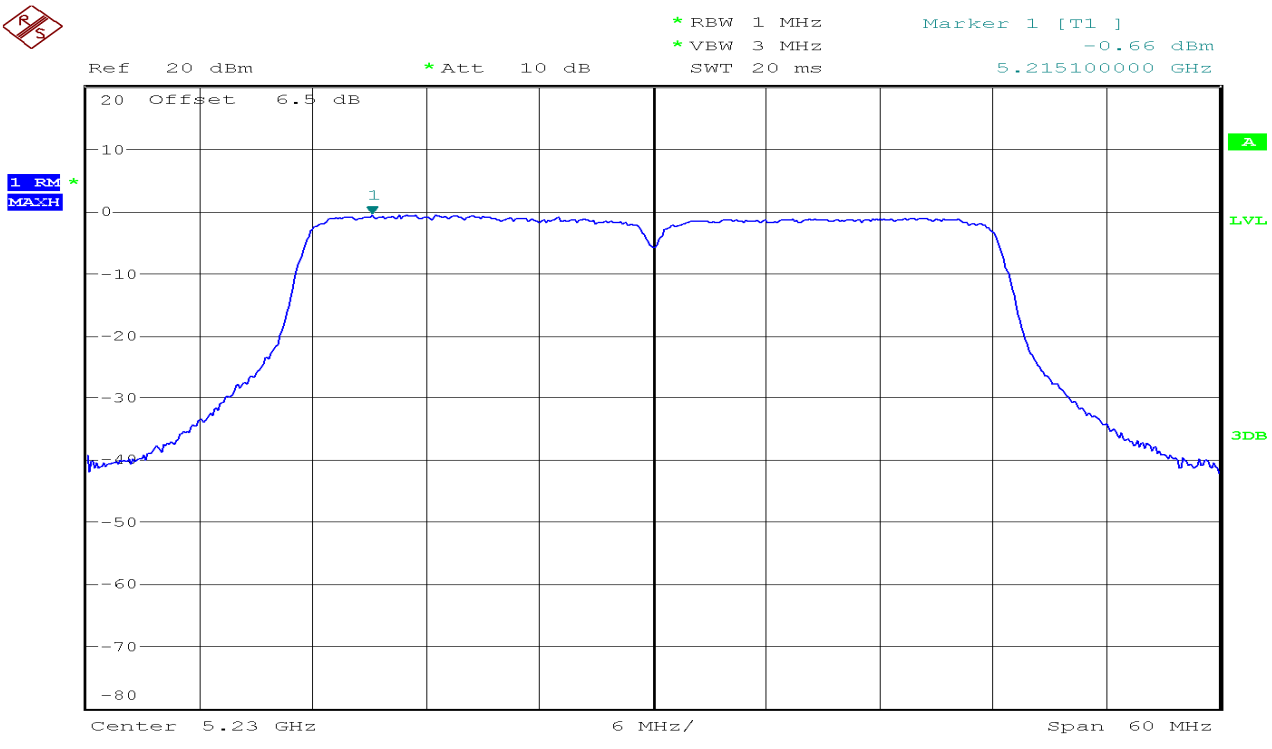


## IEEE 802.11n HT40 mode

### CH Low

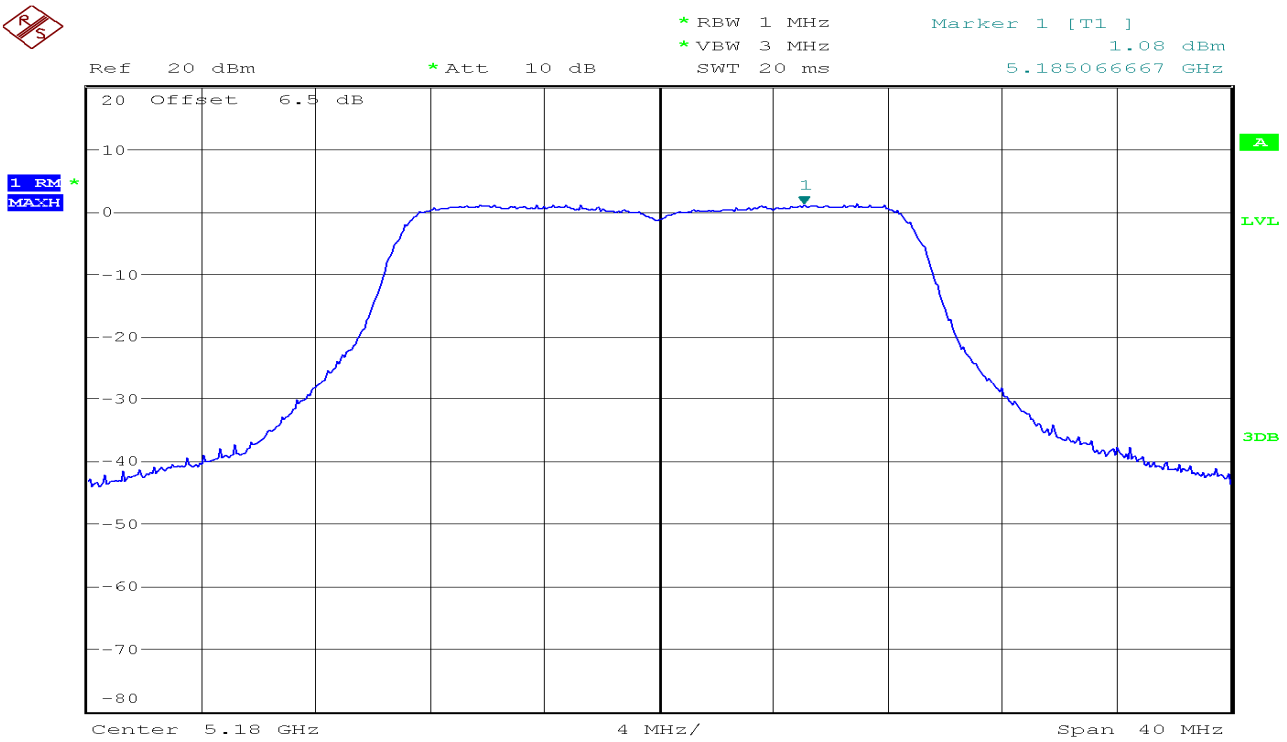



### CH High

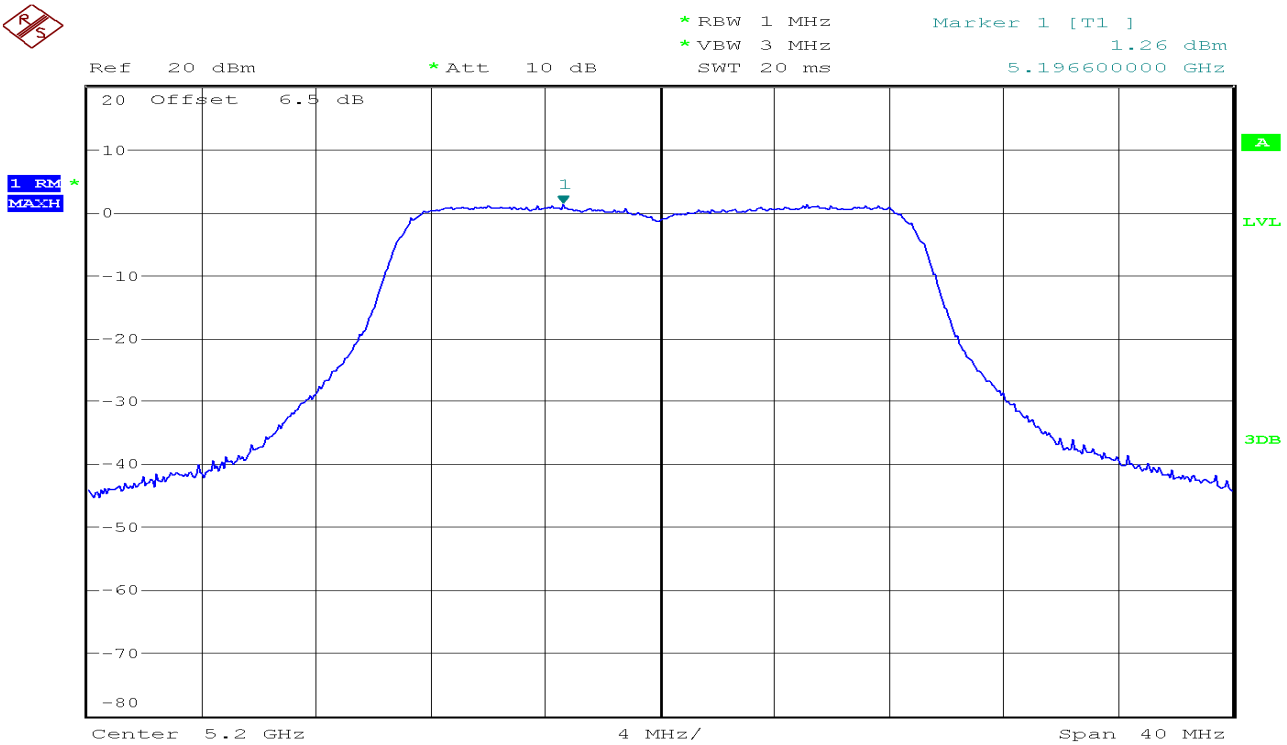


## IEEE 802.11ac VHT20 mode

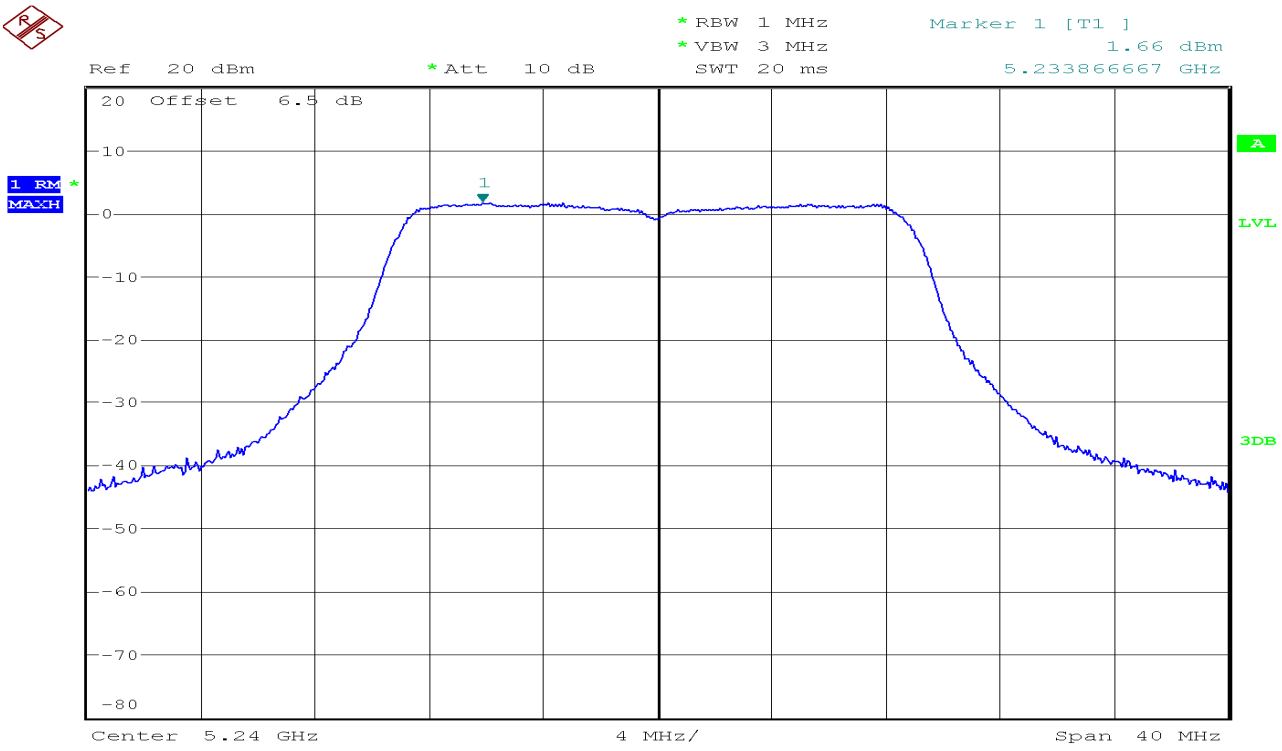
### CH Low




### CH Mid

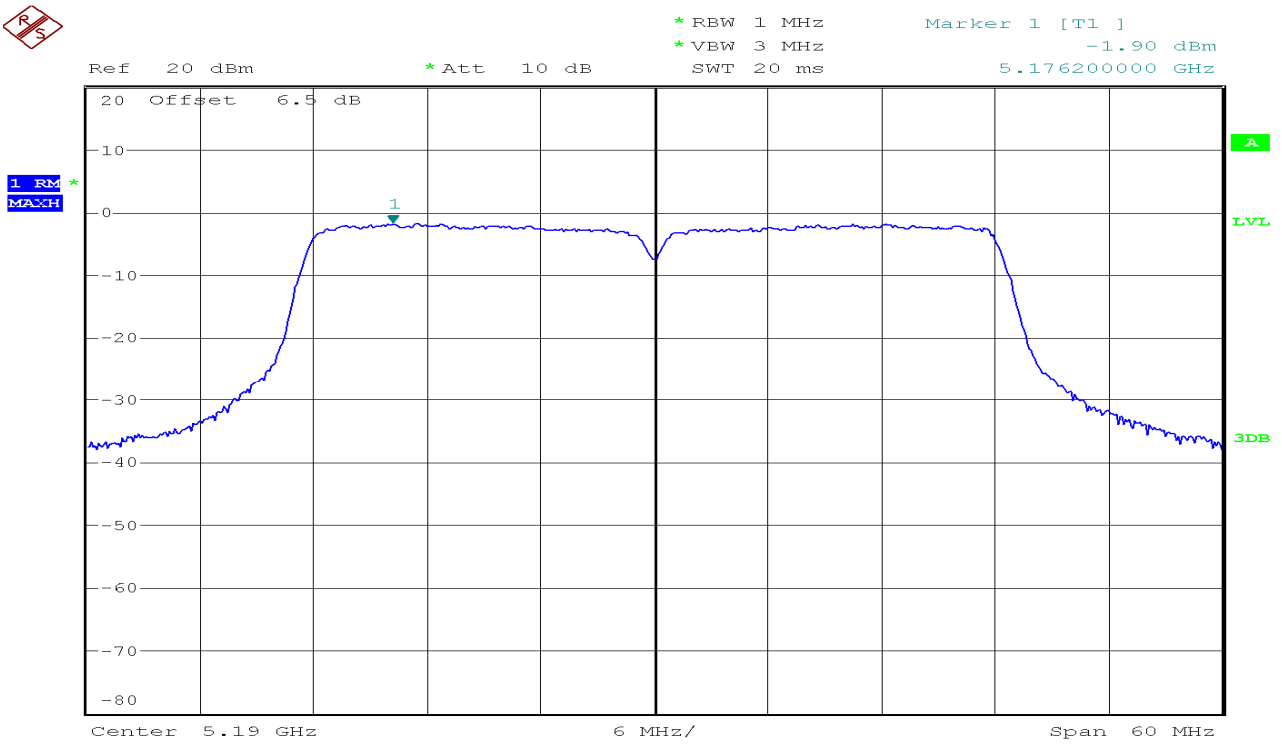


## CH High

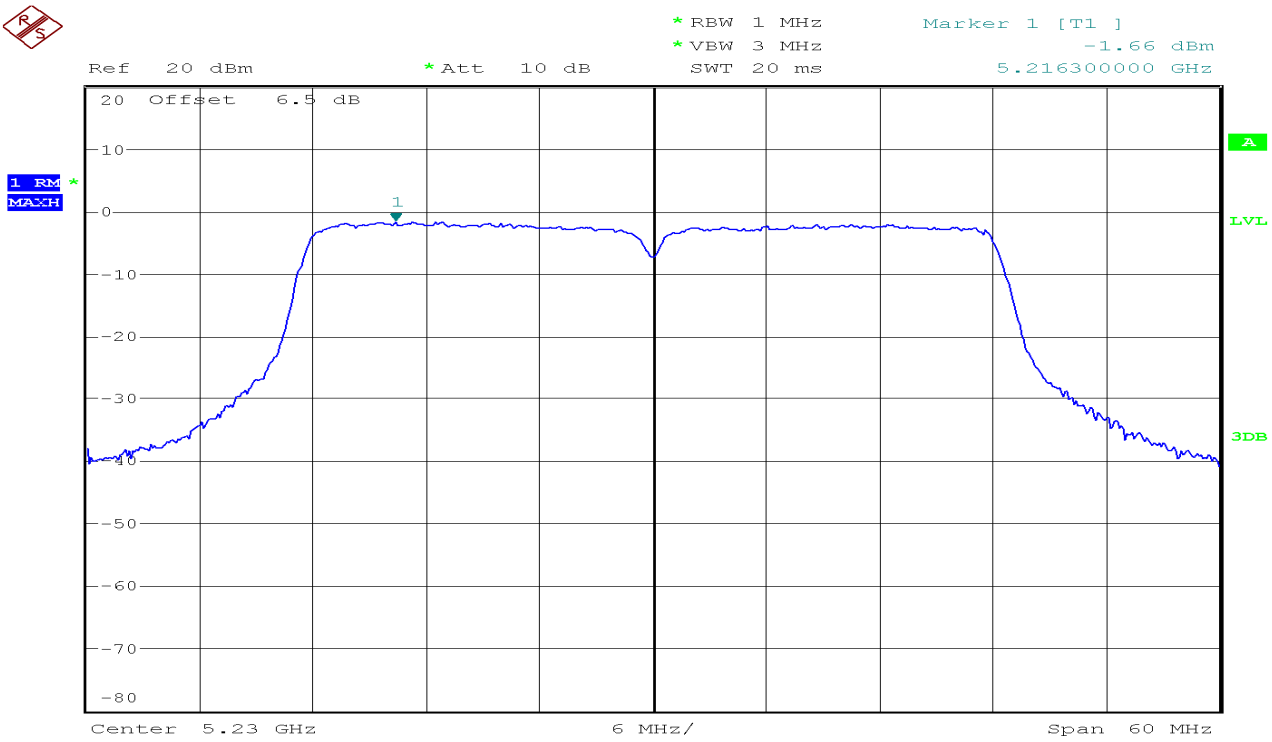



## IEEE 802.11ac VHT40 mode

## CH Low

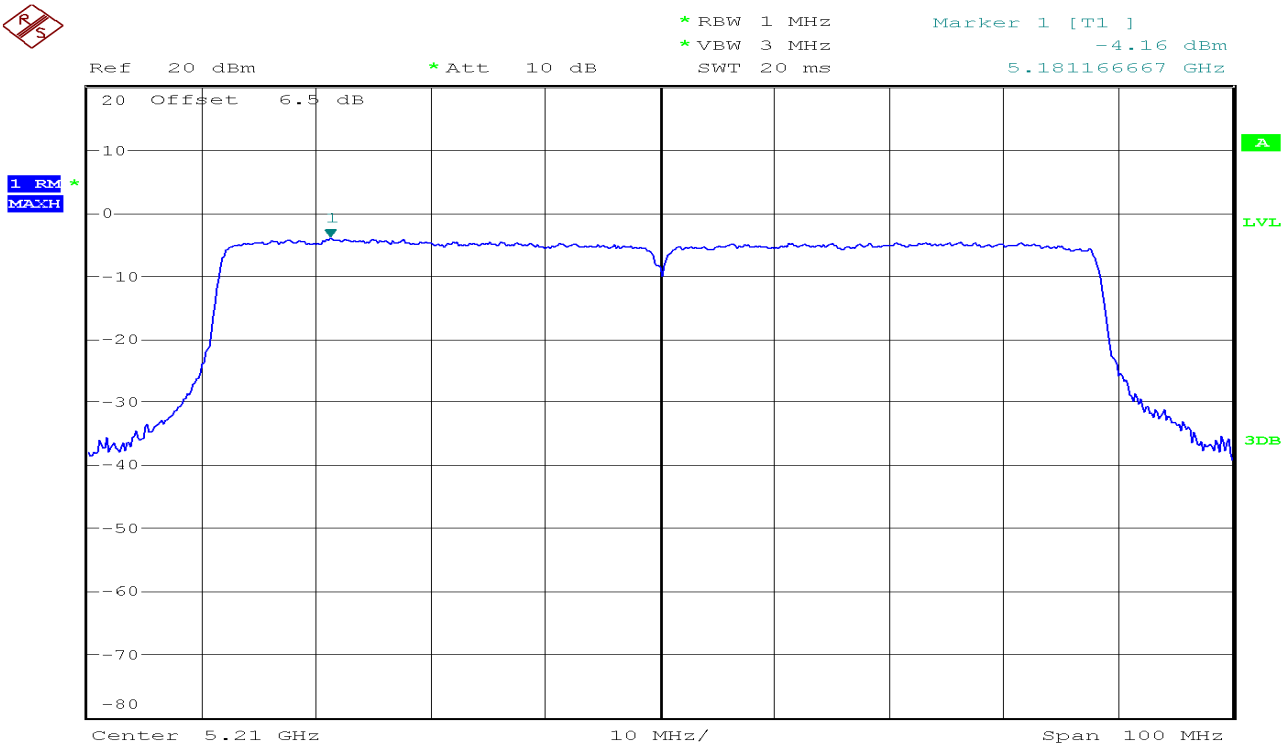


## CH High




## IEEE 802.11ac VHT80 mode

## CH Mid

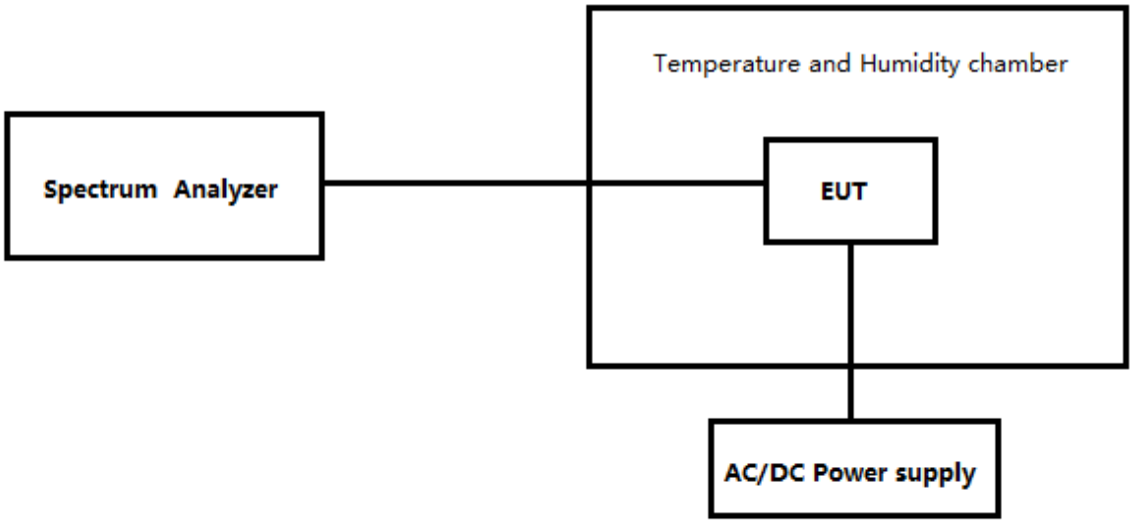


## 7.6 FREQUENCY STABILITY MEASUREMENT

**LIMIT**

According to §15.407(g),Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

# TEST RESULTS

| U-NII-1-(5150MHz-5250MHz) | | | | | |
|---|---|---|---|---|---|
| Freq.(MHz) | Center Frequency (MHz) | Frequency Deviation (MHz) | Frequency Stability (ppm) | Temperature (°C) | Voltage (V) |
| 5180 | 5179.915 | 0.085 | 16.41 | 25 | $V_{min}$ |
| 5180 | 5179.919 | 0.081 | 15.64 | 25 | $V_{max}$ |
| 5180 | 5179.916 | 0.084 | 16.22 | 25 | $V_{nor}$ |
| 5180 | 5179.915 | 0.085 | 16.41 | -10 | $V_{nor}$ |
| 5180 | 5179.920 | 0.080 | 13.93 | 55 | $V_{nor}$ |

## 7.7 RADIATED UNDESIRABLE EMISSION

**LIMIT**

Radiated emissions from 9 kHz to 25 GHz were measured according to the methods defines in ANSI C63.10-2013. The EUT was placed above the ground plane, 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

1. For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.
   For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.
   For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.
2. KDB789033 v01 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.
3. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| FREQUENCIES(MHz) | FIELD STRENGTH (microvolts/meter) | MEASUREMENT DISTANCE(meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(kHz) | 300 |
| 0.490~1.705 | 24000/F(kHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

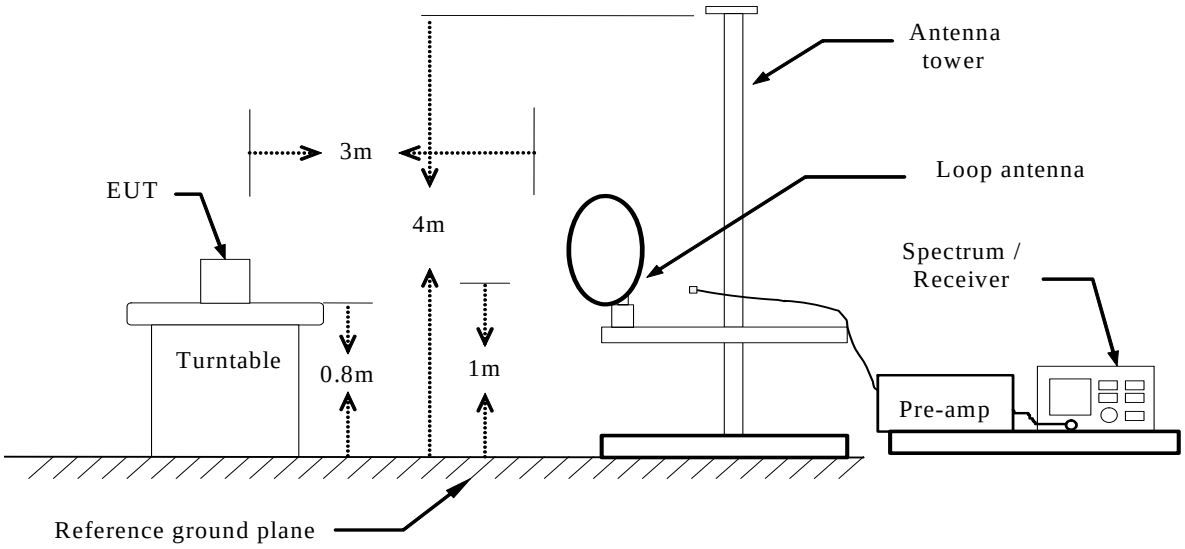
***Remark:*** *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections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

4. In the emission table above, the tighter limit applies at the band edges.

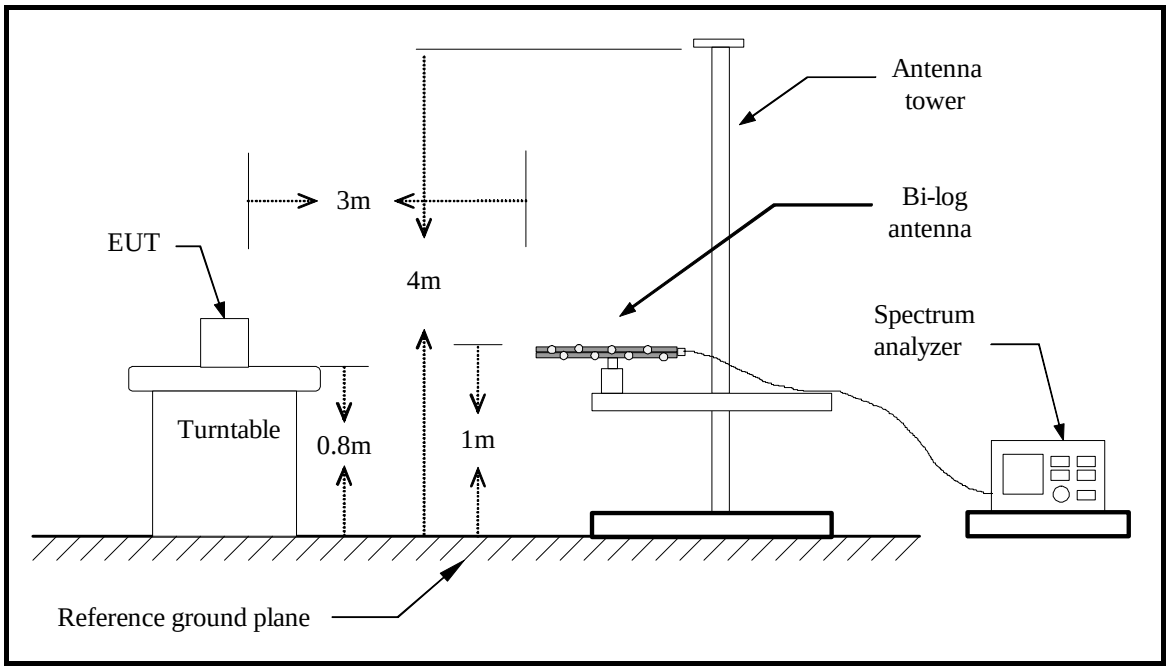
| Frequency (MHz) | Field Strength (μV/m at 3-meter) | Field Strength (dBμV/m at 3-meter) |
|---|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

**Test Configuration**

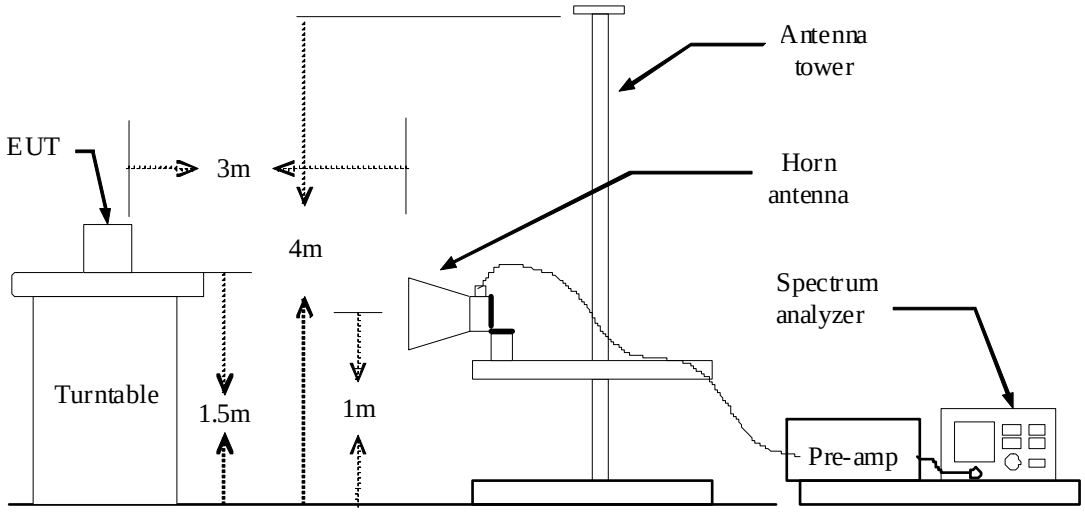
## Below 30MHz




## Below 1 GHz



**Above 1 GHz**




## TEST PROCEDURE

1. The EUT is placed on a turntable above ground plane, which is 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / Sweep=AUTO

VBW=10Hz,when duty cycle is no less than 98 percent.

VBW≧1/T, when duty cycle is less than 98 percent, where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximun power control level for the tested mode of operation.

| Band | Duty Cycle(%) | T(ms) | 1/T(kHz) | VBW Setting |
|---|---|---|---|---|
| IEEE 802.11 a | 96 | 2.267 | 0.44 | 0.5KHz |
| IEEE 802.11n HT20 | 96.8 | 3.750 | 0.27 | 0.3KHz |
| IEEE 802.11n HT40 | 96.9 | 3.617 | 0.28 | 0.3KHz |
| IEEE 802.11ac HT20 | 96.5 | 3.167 | 0.32 | 0.5KHz |
| IEEE 802.11ac HT40 | 97 | 3.750 | 0.27 | 0.3KHz |
| IEEE 802.11ac HT80 | 93.1 | 3.167 | 0.32 | 0.5KHz |

7. Repeat above procedures until the measurements for all frequencies are complete.

# TEST RESULTS

**Test Result of Radiated Emission**

**Below 30MHz**

The interference of the frequency value is lower than the limit below 20 db, measured as the background noise values and will not be recorded.

**30MHz-1GHz**

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal Link | **Test Date:** | 2017-7-22 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 48% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Ant. Pol. (H/V) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 45.3300 | V | 16.46 | 13.37 | 29.83 | 40.00 | -10.17 | QP |
| 171.6200 | V | 8.70 | 15.12 | 23.82 | 43.50 | -19.68 | peak |
| 650.8000 | V | 6.19 | 24.45 | 30.64 | 46.00 | -15.36 | peak |
| 763.3200 | V | 6.40 | 25.96 | 32.36 | 46.00 | -13.64 | peak |
| 851.5900 | V | 5.42 | 26.14 | 31.56 | 46.00 | -14.44 | peak |
| 993.2100 | V | 4.76 | 27.47 | 32.23 | 54.00 | -21.77 | peak |
| | | | | | | | |
| 168.7100 | H | 9.54 | 15.05 | 24.59 | 43.50 | -18.91 | peak |
| 673.1100 | H | 5.47 | 24.62 | 30.09 | 46.00 | -15.91 | peak |
| 748.7700 | H | 5.31 | 26.42 | 31.73 | 46.00 | -14.27 | peak |
| 870.9900 | H | 5.27 | 26.06 | 31.33 | 46.00 | -14.67 | peak |
| 929.1900 | H | 5.53 | 26.43 | 31.96 | 46.00 | -14.04 | peak |
| 998.0600 | H | 5.30 | 27.55 | 32.85 | 54.00 | -21.15 | peak |

**Remark:**

1. Measuring frequencies from 30 MHz to the 1GHz.(no emission found from the lowest internal used/generated frequency to 30MHz)
2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

**Above 1 GHz**

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode CH Low | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10644.231 | 41.07 | 11.53 | 52.60 | 74.00 | -21.40 | 100 | 24 | peak |
| 2 | 16365.385 | 37.51 | 15.22 | 52.73 | 74.00 | -21.27 | 100 | 257 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10671.474 | 41.25 | 11.64 | 52.89 | 74.00 | -21.11 | 100 | 5 | peak |
| 2 | 16365.385 | 38.37 | 15.22 | 53.59 | 74.00 | -20.41 | 100 | 357 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode CH Mid | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10644.231 | 42.17 | 11.53 | 53.70 | 74.00 | -20.30 | 100 | 220 | peak |
| 2 | 16038.461 | 36.44 | 13.60 | 50.04 | 74.00 | -23.96 | 100 | 194 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10671.474 | 41.25 | 11.64 | 52.89 | 74.00 | -21.11 | 100 | 263 | peak |
| 2 | 15248.397 | 36.52 | 13.65 | 50.17 | 74.00 | -23.83 | 100 | 91 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode CH High | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10535.256 | 40.85 | 11.11 | 51.96 | 74.00 | -22.04 | 100 | 60 | peak |
| 2 | 14567.308 | 37.41 | 15.56 | 52.97 | 74.00 | -21.03 | 100 | 101 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10453.526 | 41.93 | 10.71 | 52.64 | 74.00 | -21.36 | 100 | 321 | peak |
| 2 | 16338.141 | 37.63 | 15.08 | 52.71 | 74.00 | -21.29 | 100 | 293 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Operation Mode:** | TX / IEEE 802.11n HT20 mode /CH Low | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10889.423 | 40.04 | 12.49 | 52.53 | 74.00 | -21.47 | 100 | 73 | peak |
| 2 | 15357.372 | 36.43 | 12.87 | 49.30 | 74.00 | -24.70 | 100 | 193 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10862.180 | 40.89 | 12.38 | 53.27 | 74.00 | -20.73 | 100 | 1 | peak |
| 2 | 15330.128 | 35.85 | 13.07 | 48.92 | 74.00 | -25.08 | 100 | 1 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11n HT20 mode /CH Mid | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10508.013 | 42.24 | 11.00 | 53.24 | 74.00 | -20.76 | 100 | 72 | peak |
| 2 | 16201.923 | 35.85 | 14.41 | 50.26 | 74.00 | -23.74 | 100 | 316 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 11080.128 | 40.60 | 12.69 | 53.29 | 74.00 | -20.71 | 100 | 360 | peak |
| 2 | 15248.397 | 36.99 | 13.65 | 50.64 | 74.00 | -23.36 | 100 | 141 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11n HT20 mode /CH High | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10671.474 | 41.59 | 11.64 | 53.23 | 74.00 | -20.77 | 100 | 21 | peak |
| 2 | 16283.654 | 36.03 | 14.81 | 50.84 | 74.00 | -23.16 | 100 | 333 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10889.423 | 41.45 | 12.49 | 53.94 | 74.00 | -20.06 | 100 | 335 | peak |
| 2 | 16038.461 | 37.64 | 13.60 | 51.24 | 74.00 | -22.76 | 100 | 120 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11n HT40 mode /CH Low | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10453.526 | 41.30 | 10.71 | 52.01 | 74.00 | -21.99 | 100 | 274 | peak |
| 2 | 15983.974 | 37.15 | 13.36 | 50.51 | 74.00 | -23.49 | 100 | 263 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10317.308 | 41.24 | 9.96 | 51.20 | 74.00 | -22.80 | 100 | 165 | peak |
| 2 | 15112.180 | 35.16 | 14.61 | 49.77 | 74.00 | -24.23 | 100 | 334 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11n HT40 mode /CH High | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10562.500 | 40.98 | 11.21 | 52.19 | 74.00 | -21.81 | 100 | 336 | peak |
| 2 | 16092.949 | 36.14 | 13.87 | 50.01 | 74.00 | -23.99 | 100 | 83 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10181.090 | 41.23 | 9.21 | 50.44 | 74.00 | -23.56 | 100 | 49 | peak |
| 2 | 15493.590 | 37.36 | 11.91 | 49.27 | 74.00 | -24.73 | 100 | 67 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11ac VHT20 mode /CH Low | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10453.526 | 41.27 | 10.71 | 51.98 | 74.00 | -22.02 | 100 | 302 | peak |
| 2 | 15929.487 | 37.18 | 13.19 | 50.37 | 74.00 | -23.63 | 100 | 93 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10644.231 | 41.66 | 11.53 | 53.19 | 74.00 | -20.81 | 100 | 333 | peak |
| 2 | 15983.974 | 36.86 | 13.36 | 50.22 | 74.00 | -23.78 | 100 | 202 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11ac VHT20 mode /CH Mid | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10508.013 | 40.92 | 11.00 | 51.92 | 74.00 | -22.08 | 100 | 122 | peak |
| 2 | 15112.180 | 35.06 | 14.61 | 49.67 | 74.00 | -24.33 | 100 | 89 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10453.526 | 40.81 | 10.71 | 51.52 | 74.00 | -22.48 | 100 | 15 | peak |
| 2 | 15956.731 | 37.17 | 13.28 | 50.45 | 74.00 | -23.55 | 100 | 182 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11ac VHT20 mode /CH High | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10453.526 | 41.69 | 10.71 | 52.40 | 74.00 | -21.60 | 100 | 283 | peak |
| 2 | 16365.385 | 37.79 | 15.22 | 53.01 | 74.00 | -20.99 | 100 | 246 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10371.795 | 40.82 | 10.26 | 51.08 | 74.00 | -22.92 | 100 | 209 | peak |
| 2 | 15956.731 | 37.14 | 13.28 | 50.42 | 74.00 | -23.58 | 100 | 166 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Operation Mode: | TX / IEEE 802.11ac VHT40 mode /CH Low | Test Date: | 2017-7-23 |
|---|---|---|---|
| Temperature: | 25°C | Tested by: | Lily.Wang |
| Humidity: | 55% RH | Polarity: | Ver. / Hor. |

**Horizontal**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10508.013 | 40.94 | 11.00 | 51.94 | 74.00 | -22.06 | 100 | 203 | peak |
| 2 | 16120.192 | 36.26 | 14.00 | 50.26 | 74.00 | -23.74 | 100 | 93 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10916.667 | 40.47 | 12.60 | 53.07 | 74.00 | -20.93 | 100 | 290 | peak |
| 2 | 16147.436 | 36.03 | 14.14 | 50.17 | 74.00 | -23.83 | 100 | 128 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Operation Mode:** | TX / IEEE 802.11ac VHT40 mode /CH High | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10508.013 | 41.12 | 11.00 | 52.12 | 74.00 | -21.88 | 100 | 67 | peak |
| 2 | 16365.385 | 37.77 | 15.22 | 52.99 | 74.00 | -21.01 | 100 | 344 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10725.961 | 41.35 | 11.85 | 53.20 | 74.00 | -20.80 | 100 | 192 | peak |
| 2 | 15575.320 | 37.35 | 12.09 | 49.44 | 74.00 | -24.56 | 100 | 272 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Operation Mode:** | TX / IEEE 802.11ac VHT80 mode /CH Mid | **Test Date:** | 2017-7-23 |
| **Temperature:** | 25°C | **Tested by:** | Lily.Wang |
| **Humidity:** | 55% RH | **Polarity:** | Ver. / Hor. |

**Horizontal**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10616.987 | 41.39 | 11.43 | 52.82 | 74.00 | -21.18 | 100 | 351 | peak |
| 2 | 15575.320 | 37.39 | 12.09 | 49.48 | 74.00 | -24.52 | 100 | 241 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Vertical**

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | |
| 1 | 10562.500 | 42.25 | 11.21 | 53.46 | 74.00 | -20.54 | 100 | 126 | peak |
| 2 | 15466.346 | 38.35 | 12.10 | 50.45 | 74.00 | -23.55 | 100 | 126 | peak |
| N/A | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

## 7.8 POWERLINE CONDUCTED EMISSIONS

**LIMIT**

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range (MHz) | Limits (dBµV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

** Decreases with the logarithm of the frequency.*

**TEST CONFIGURATION**

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

**TEST PROCEDURE**

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

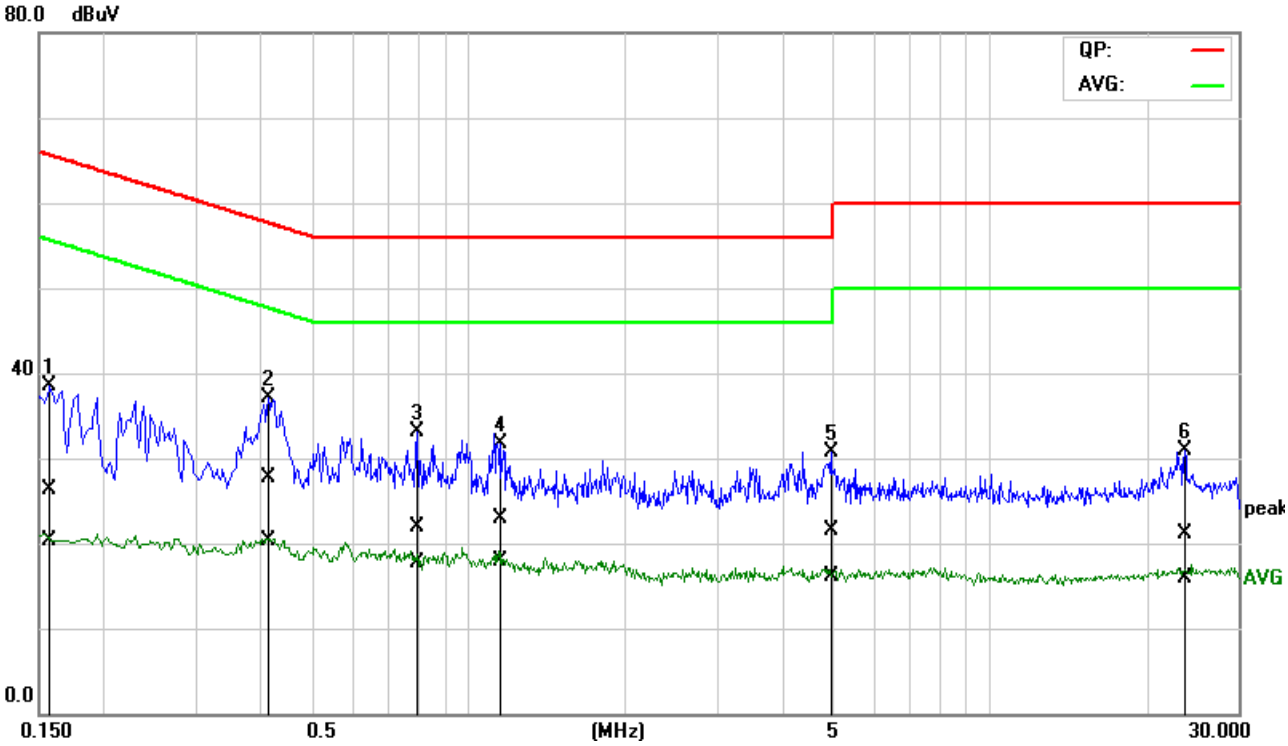
**TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

## Test Data

| | | | |
|---|---|---|---|
| Job No.: | C170614R01 | Date: | 2017/7/1 |
| Model No.: | macaroon M1 | Time: | AM 10:12:25 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L1 | Test Voltage: | AC 120V/60Hz |
| Model: | | Description: | |

***L1***

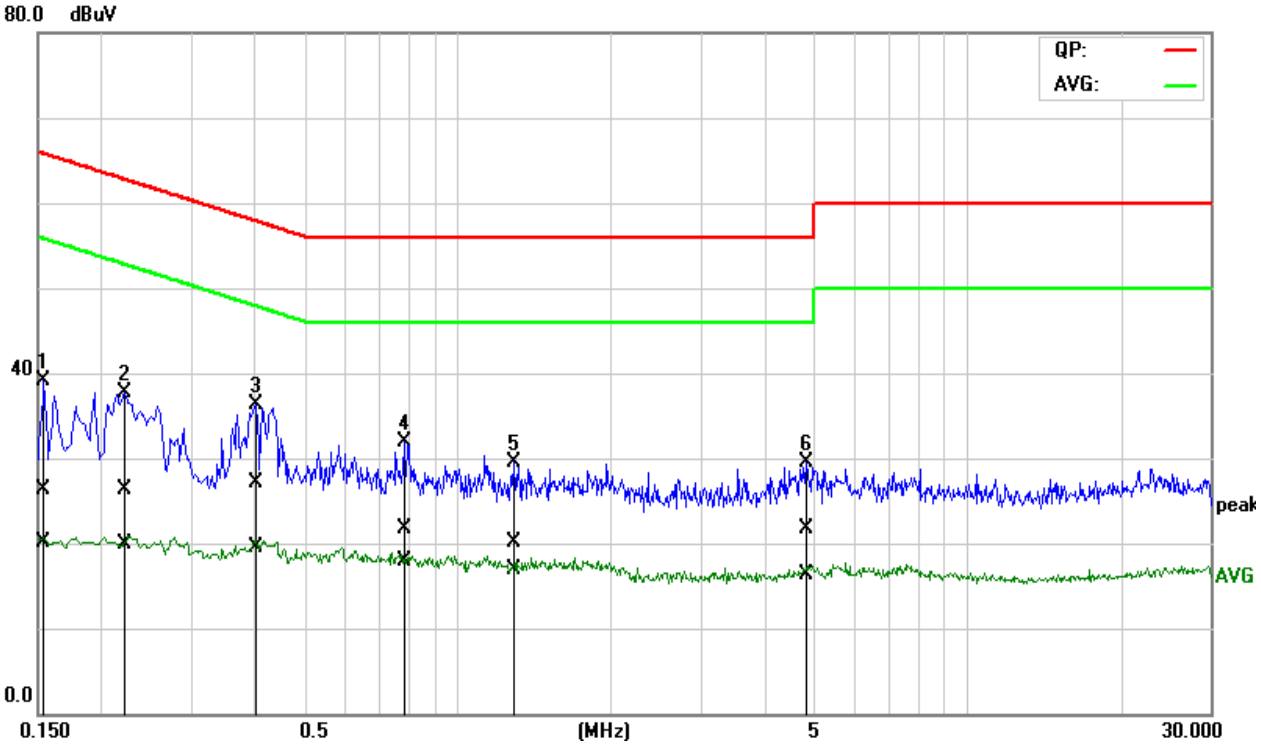



| No. | Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) | |
| 1 | 0.1581 | 5.68 | -0.33 | 20.58 | 26.26 | 20.25 | 65.56 | 55.56 | -39.30 | -35.31 | Pass |
| 2* | 0.4145 | 7.14 | -0.26 | 20.53 | 27.67 | 20.27 | 57.56 | 47.56 | -29.89 | -27.29 | Pass |
| 3 | 0.7927 | 1.34 | -2.74 | 20.50 | 21.84 | 17.76 | 56.00 | 46.00 | -34.16 | -28.24 | Pass |
| 4 | 1.1601 | 2.52 | -2.49 | 20.44 | 22.96 | 17.95 | 56.00 | 46.00 | -33.04 | -28.05 | Pass |
| 5 | 4.9717 | 0.93 | -4.57 | 20.61 | 21.54 | 16.04 | 56.00 | 46.00 | -34.46 | -29.96 | Pass |
| 6 | 23.6432 | 0.33 | -4.88 | 20.86 | 21.19 | 15.98 | 60.00 | 50.00 | -38.81 | -34.02 | Pass |

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

| | | | |
|---|---|---|---|
| Job No.: | C170614R01 | Date: | 2017/7/1 |
| Model No.: | macaroon M1 | Time: | AM 10:17:44 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L2 | Test Voltage: | AC 120V/60Hz |
| Model: | | Description: | |

***L2***

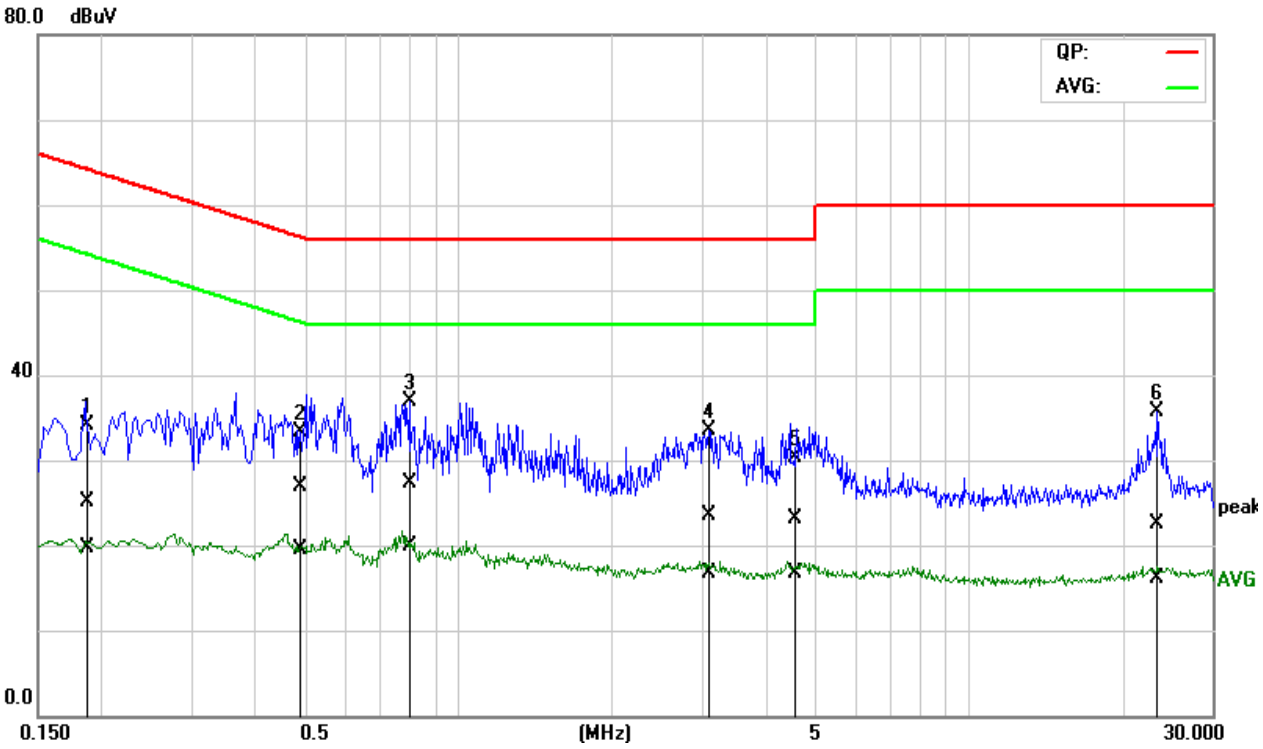



| No. | Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) | |
| 1 | 0.1547 | 5.86 | -0.26 | 20.36 | 26.22 | 20.10 | 65.74 | 55.74 | -39.52 | -35.64 | Pass |
| 2 | 0.2236 | 5.83 | -0.49 | 20.42 | 26.25 | 19.93 | 62.68 | 52.68 | -36.43 | -32.75 | Pass |
| 3 | 0.4052 | 6.61 | -1.05 | 20.46 | 27.07 | 19.41 | 57.75 | 47.75 | -30.68 | -28.34 | Pass |
| 4* | 0.7867 | 1.30 | -2.53 | 20.46 | 21.76 | 17.93 | 56.00 | 46.00 | -34.24 | -28.07 | Pass |
| 5 | 1.2947 | -0.31 | -3.50 | 20.47 | 20.16 | 16.97 | 56.00 | 46.00 | -35.84 | -29.03 | Pass |
| 6 | 4.8494 | 0.99 | -4.36 | 20.74 | 21.73 | 16.38 | 56.00 | 46.00 | -34.27 | -29.62 | Pass |

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

| | | | |
|---|---|---|---|
| Job No.: | C170614R01 | Date: | 2017/7/1 |
| Model No.: | macaroon M1 | Time: | AM 10:02:30 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L1 | Test Voltage: | AC 240V/60Hz |
| Model: | | Description: | |

***L1***

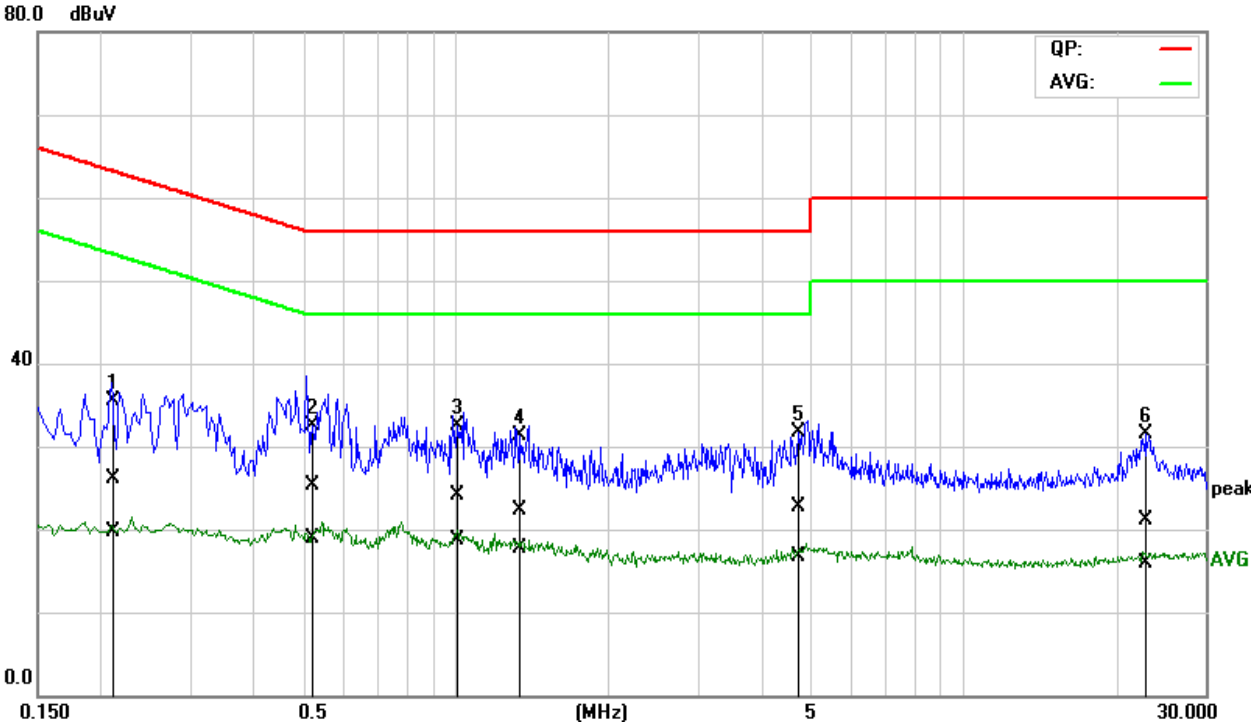



| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1882 | 4.58 | -0.76 | 20.53 | 25.11 | 19.77 | 64.12 | 54.12 | -39.01 | -34.35 | Pass |
| 2 | 0.4904 | 6.41 | -1.07 | 20.49 | 26.90 | 19.42 | 56.16 | 46.16 | -29.26 | -26.74 | Pass |
| 3* | 0.7947 | 6.74 | -0.52 | 20.50 | 27.24 | 19.98 | 56.00 | 46.00 | -28.76 | -26.02 | Pass |
| 4 | 3.0876 | 2.93 | -3.89 | 20.52 | 23.45 | 16.63 | 56.00 | 46.00 | -32.55 | -29.37 | Pass |
| 5 | 4.5040 | 2.44 | -3.95 | 20.59 | 23.03 | 16.64 | 56.00 | 46.00 | -32.97 | -29.36 | Pass |
| 6 | 23.4295 | 1.72 | -4.83 | 20.86 | 22.58 | 16.03 | 60.00 | 50.00 | -37.42 | -33.97 | Pass |

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

| | | | |
|---|---|---|---|
| Job No.: | C170614R01 | Date: | 2017/7/1 |
| Model No.: | macaroon M1 | Time: | AM 10:07:28 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L2 | Test Voltage: | AC 240V/60Hz |
| Model: | | Description: | |

***L2***




| No. | Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) | |
| 1 | 0.2121 | 5.79 | -0.76 | 20.41 | 26.20 | 19.65 | 63.12 | 53.12 | -36.92 | -33.47 | Pass |
| 2* | 0.5159 | 4.91 | -1.63 | 20.45 | 25.36 | 18.82 | 56.00 | 46.00 | -30.64 | -27.18 | Pass |
| 3 | 1.0129 | 3.56 | -1.80 | 20.45 | 24.01 | 18.65 | 56.00 | 46.00 | -31.99 | -27.35 | Pass |
| 4 | 1.3487 | 1.84 | -2.81 | 20.48 | 22.32 | 17.67 | 56.00 | 46.00 | -33.68 | -28.33 | Pass |
| 5 | 4.7531 | 1.92 | -3.99 | 20.73 | 22.65 | 16.74 | 56.00 | 46.00 | -33.35 | -29.26 | Pass |
| 6 | 22.9604 | 0.30 | -5.06 | 20.87 | 21.17 | 15.81 | 60.00 | 50.00 | -38.83 | -34.19 | Pass |

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

*R*emark:

1.The measuring frequencies range between 0.15 MHz and 30 MHz.

2.The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.

3."---" denotes the emission level was or more than 2dB below the Average limit, and no re-check was made.

4.The IF bandwidth of SPA between 0.15MHz and 30MHz was 10KHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.

**END OF REPORT**