# TEST REPORT

**Product Name : Nio**
**Model Number : Nio 1**
**FCC ID : 2AWLO-NIO1**

Prepared for : KUNA SYSTEMS CORPORATION
Address : 883 Sneath Lane, Suite 222, San Bruno, California, U.S.A. 94066

Prepared by : EMTEK (SHENZHEN) CO., LTD.
Address : Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

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Report Number : ES200604032W03
Date(s) of Tests : Aug. 18, 2020 to Oct. 26, 2020
Date of issue : Oct. 26, 2020

# 1 TEST RESULT CERTIFICATION

| | | |
|---|---|---|
| Applicant | : | KUNA SYSTEMS CORPORATION |
| Address | : | 883 Sneath Lane, Suite 222, San Bruno, California, U.S.A. 94066 |
| Manufacturer | : | KUNA SYSTEMS CORPORATION |
| Address | : | 883 Sneath Lane, Suite 222, San Bruno, California, U.S.A. 94066 |
| EUT | : | Nio |
| Model Name | : | Nio 1 |
| Trademark | : | iDter |

Measurement Procedure Used:

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULT** |
| FCC 47 CFR Part 2, Subpart J<br>FCC 47 CFR Part 15, Subpart E | **PASS** |

The above equipment was tested by EMTEK (SHENZHEN) CO., LTD. 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 Part 15.407

The test results of this report relate only to the tested sample identified in this report.

Date of Test : Aug. 18, 2020 to Oct. 26, 2020

Prepared by: Qiang Wang /Editor

Reviewer: Joe Xia /Supervisor

Approve & Authorized Signer : Lisa Wang/Manager

EMTEK (SHENZHEN) CO., LTD. TESTING

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# 2 EUT TECHNICAL DESCRIPTION

| Characteristics | Description | |
|---|---|---|
| **Product:** | Nio | |
| **Model Number:** | Nio 1 | |
| **Sample number:** | 2# | |
| **Wifi Type:** | ☒UNII-1: 5150MHz-5250MHz Band<br>☒UNII-2A: with 5250MHz-5350MHz Band<br>☒UNII-2C: with 5470MHz-5725MHz Band<br>☒UNII-3 with 5725MHz-5850MHz Band | |
| **WLAN Supported:** | ☒802.11a<br>☒802.11n(20MHz channel bandwidth)<br>☒802.11n(40MHz channel bandwidth)<br>☒802.11ac(20MHz channel bandwidth)<br>☒802.11ac(40MHz channel bandwidth)<br>☒802.11ac(80MHz channel bandwidth) | |
| **Data Rate:** | 802.11a:54/48/36/24/18/12/9/6Mbps<br>802.11n:up to 300 Mbps<br>802.11ac:up to 867Mbps | |
| **Modulation:** | ☒OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n;<br>☒OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11ac; | |
| **Frequency Range:** | ☒UNII-1: 5150MHz-5250MHz Band | |
| | ☒5180-5240MHz for 802.11a;<br>☒5180-5240MHz for 802.11n(HT20);<br>☒5180-5240MHz for 802.11ac(HT20); | ☒5190-5230MHz for 802.11n(HT40);<br>☒5190-5230MHz for 802.11ac(HT40);<br>☒5210MHz for 802.11ac(HT80); |
| | ☒UNII-2A: with 5250MHz-5350MHz Band | |
| | ☒5260-5320MHz for 802.11a;<br>☒5260-5320MHz for 802.11n(HT20);<br>☒5260-5320MHz for 802.11ac(HT20); | ☒5270-5310MHz for 802.11n(HT40);<br>☒5270-5310MHz for 802.11ac(HT40);<br>☒5290MHz for 802.11ac(HT80); |
| | ☒UNII-2C: with 5470MHz-5725MHz Band | |
| | ☒5500-5700MHz for 802.11a;<br>☒5500-5700MHz for 802.11n(HT20);<br>☒5500-5700MHz for 802.11ac(HT20); | ☒5510-5670MHz for 802.11n(HT40);<br>☒5510-5670MHz for 802.11ac(HT40);<br>☒5530-5610MHz for 802.11ac(HT80) |
| | ☒UNII-3 with 5725MHz-5850MHz Band | |
| | ☒5745-5825MHz for 802.11a;<br>☒5745-5825MHz for 802.11n(HT20);<br>☒5745-5825MHz for 802.11ac(HT20); | ☒5755-5795MHz for 802.11n(HT40);<br>☒5755-5795MHz for 802.11ac(HT40);<br>☒5775MHz for 802.11ac(HT80); |
| **TPC Function:** | ☐ Applicable | ☒Not Applicable |
| **Antenna Port:** | ☒Antenna port 0 ☒Antenna port 1 | |
| **Antenna Type:** | ☒ANT 0: Internal Antenna<br>☒ANT 1: External Antenna | |

| | | |
|---|---|---|
| **Antenna Gain** | ☒ANT 0: 3.33 dBi<br>☒ANT 1: 2.15 dBi | |
| **Transmit Power:** | Output Power (Max.) for UNII-1(ANT0) | 16.77 dBm |
| | Output Power (Max.) for UNII-1(ANT1) | 16.42 dBm |
| | Output Power (Max.) for UNII-2A(ANT0) | 15.96 dBm |
| | Output Power (Max.) for UNII-2A(ANT1) | 15.36 dBm |
| | Output Power (Max.) for UNII-2C(ANT0) | 16.43 dBm |
| | Output Power (Max.) for UNII-2C(ANT1) | 15.73 dBm |
| | Output Power (Max.) for UNII-3(ANT0) | 15.98 dBm |
| | Output Power (Max.) for UNII-3(ANT1) | 16.09 dBm |
| **Rating:** | AC120-277V, 60Hz | |
| **Test voltage:** | AC120V, 60Hz | |
| **Temperature Range:** | -10°C ~ 55°C | |
| **Applicant:** | Kuna Systems Corporation | |
| **Address:** | 883 Sneath Lane, Suite 222, San Bruno, California, U.S.A. 94066 | |
| **Manufacturer:** | Kuna Systems Corporation | |
| **Address:** | 883 Sneath Lane, Suite 222, San Bruno, California, U.S.A. 94066 | |
| **Factory 1:** | Sky Light Electronic (ShenZhen) Limited | |
| **Address 1:** | No. 8 Building 1F-5F & 9 Building 1F-2F, AnTuoShan High-tech Industrial Park, XinSha Road, ShaJing, Bao'An, Shenzhen. | |
| **Factory 2:** | Sky Light Electronic Joint Stock Company | |
| **Address 2:** | Binh Xuyen Industrial Park, Dao Duc Town, Binh Xuyen District, Vinh Phuc province, Vietnam | |

***Note:*** *for more details, please refer to the User's manual of the EUT.*
*Equipment with 2 diversity antennas but only 1 antenna active at any moment in time.*

# 3 SUMMARY OF TEST RESULT

| FCC Part Clause | Test Parameter | Verdict | Remark |
|---|---|---|---|
| 15.407 (a)<br>15.407 (e) | 99% , 6dB and 26dB Bandwidth | PASS | |
| 15.407 (a) | Maximum Conducted Output Power | PASS | |
| 15.407 (a) | Peak Power Spectral Density | PASS | |
| 15.407 (b) | Radiated Spurious Emission | PASS | |
| 15.407(g) | Frequency Stability | PASS | |
| 15.407 (b)(6)<br>15.207 | Power Line Conducted Emission | PASS | |
| 15.407(a)<br>15.203 | Antenna Application | PASS | |
| NOTE1: N/A (Not Applicable)<br>NOTE2: According to FCC OET KDB 789033 D2 General UNII Test Procedures New Rules v02r01, In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits. | | | |

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AWLO-NIO1 filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules.

# 4 TEST METHODOLOGY

## 4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart E
FCC KDB 789033 D2 General UNII Test Procedures New Rules v02r01

## 4.2 MEASUREMENT EQUIPMENT USED

### 4.2.1 Conducted Emission Test Equipment

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LASTCAL. | DUE CAL. |
|---|---|---|---|---|---|
| Test Receiver | Rohde & Schwarz | ESCS30 | 828985/018 | 05/16/2020 | 05/15/2021 |
| L.I.S.N. | Schwarzbeck | NNLK8129 | 8129203 | 05/16/2020 | 05/15/2021 |
| 50Ω Coaxial Switch | Anritsu | MP59B | M20531 | 05/16/2020 | 05/15/2021 |
| Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100006 | 05/16/2020 | 05/15/2021 |
| Voltage Probe | Rohde & Schwarz | TK9416 | N/A | 05/16/2020 | 05/15/2021 |
| I.S.N | Rohde & Schwarz | ENY22 | 1109.9508.02 | 05/16/2020 | 05/15/2021 |

### 4.2.2 Radiated Emission Test Equipment

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | DUE CAL. |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESU | 1302.6005.26 | 05/16/2020 | 05/15/2021 |
| Pre-Amplifier | HP | 8447D | 2944A07999 | 05/16/2020 | 05/15/2021 |
| Bilog Antenna | Schwarzbeck | VULB9163 | 142 | 05/16/2020 | 05/15/2021 |
| Loop Antenna | ARA | PLA-1030/B | 1029 | 05/16/2020 | 05/15/2021 |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170399 | 05/16/2020 | 05/15/2021 |
| Horn Antenna | Schwarzbeck | BBHA 9120 | D143 | 05/16/2020 | 05/15/2021 |
| Cable | Schwarzbeck | AK9513 | ACRX1 | 05/16/2020 | 05/15/2021 |
| Cable | Rosenberger | N/A | FP2RX2 | 05/16/2020 | 05/15/2021 |
| Cable | Schwarzbeck | AK9513 | CRPX1 | 05/16/2020 | 05/15/2021 |
| Cable | Schwarzbeck | AK9513 | CRRX2 | 05/16/2020 | 05/15/2021 |

### 4.2.3 Radio Frequency Test Equipment

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LASTCAL. | DUE CAL. |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4407B | 88156318 | 05/16/2020 | 05/15/2021 |
| Signal Analyzer | Agilent | N9010A | My53470879 | 05/16/2020 | 05/15/2021 |
| Power meter | Anritsu | ML2495A | 0824006 | 05/16/2020 | 05/15/2021 |
| Power sensor | Anritsu | MA2411B | 0738172 | 05/16/2020 | 05/15/2021 |
| Temperature & Humidity Chamber | YINHE | SDH0525F | 2003003 | 05/16/2020 | 05/15/2021 |

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

## 4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.
The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

☒Wifi 5G with U-NII - 1
Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 36 | 5180 | 44 | 5220 | | |
| 40 | 5200 | 48 | 5240 | | |

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 38 | 5190 | | | | |
| 46 | 5230 | | | | |

Frequency and Channel list for 802.11ac Wave2 (HT80):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 42 | 5210 | | | | |
| | | | | | |

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 36 | 5180 | 40 | 5200 | 48 | 5240 |

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 38 | 5190 | N/A | N/A | 46 | 5230 |

Test Frequency and channel for 802.11ac Wave2 (HT80):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 42 | 5210 | N/A | N/A | N/A | N/A |

☒ Wifi 5G with U-NII -2A

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 52 | 5260 | 60 | 5300 | | |
| 56 | 5280 | 64 | 5320 | | |

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 54 | 5270 | | | | |
| 62 | 5310 | | | | |

Frequency and Channel list for 802.11ac (HT80):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 58 | 5290 | | | | |

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 52 | 5260 | 56 | 5280 | 64 | 5320 |

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 54 | 5270 | N/A | N/A | 62 | 5310 |

Test Frequency and channel for 802.11ac (HT80):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 58 | 5290 | | | | |

☒ Wifi 5G with U-NII -2C

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 100 | 5500 | 116 | 5580 | 132 | 5660 |
| 104 | 5520 | 120 | 5600 | 136 | 5680 |
| 108 | 5540 | 124 | 5620 | 140 | 5700 |
| 112 | 5560 | 128 | 5640 | | |

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 102 | 5510 | 118 | 5590 | 134 | 5670 |
| 110 | 5550 | 126 | 5630 | | |

Frequency and Channel list for 802.11ac (HT80):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 106 | 5530 | 122 | 5610 | | |
| | | | | | |

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 100 | 5500 | 120 | 5600 | 140 | 5700 |

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 102 | 5510 | | | 134 | 5670 |

Test Frequency and channel for 802.11ac (HT80):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 106 | 5530 | | | | |

☒ Wifi 5G with U-NII -3

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 149 | 5745 | 157 | 5785 | 165 | 5825 |
| 153 | 5765 | 161 | 5805 | | |

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 151 | 5755 | | | | |
| 159 | 5795 | | | | |

Frequency and Channel list for 802.11ac (HT80):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 155 | 5775 | | | | |

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 149 | 5745 | 157 | 5785 | 165 | 5825 |

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 151 | 5755 | N/A | N/A | 159 | 5795 |

Test Frequency and channel for 802.11ac (HT80):

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 155 | 5775 | | | | |

# 5 FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Building 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

## 5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

| | | |
|---|---|---|
| EMC Lab. | : | Accredited by CNAS, 2018.11.30<br>The certificate is valid until 2022.10.28<br>The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)<br>The Certificate Registration Number is L2291<br><br>Accredited by FCC,<br>Designation Number: CN1204<br>Test Firm Registration Number: 882943<br>Accredited by A2LA, August 25, 2020<br>The Certificate Registration Number is 4321.01<br><br>Accredited by Industry Canada, November 09, 2018<br>The Conformity Assessment Body Identifier is CN0008 |
| Name of Firm | : | EMTEK(SHENZHEN) CO., LTD. |
| Site Location | : | Building 69, Majialong Industry Zone,<br>Nanshan District, Shenzhen, Guangdong, China |

# 6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

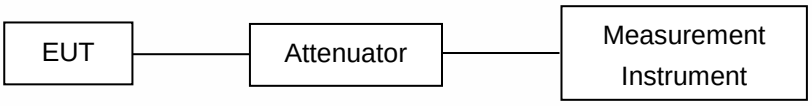
| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ±1x10^-5 |
| Maximum Peak Output Power Test | ±1.0dB |
| Conducted Emissions Test | ±2.0dB |
| Radiated Emission Test | ±2.0dB |
| Power Density | ±2.0dB |
| Occupied Bandwidth Test | ±1.0dB |
| Band Edge Test | ±3dB |
| All emission, radiated | ±3dB |
| Antenna Port Emission | ±3dB |
| Temperature | ±0.5℃ |
| Humidity | ±3% |

Measurement Uncertainty for a level of Confidence of 95%

# 7 SETUP OF EQUIPMENT UNDER TEST

## 7.1 RADIO FREQUENCY TEST SETUP

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.




## 7.2 RADIO FREQUENCY TEST SETUP

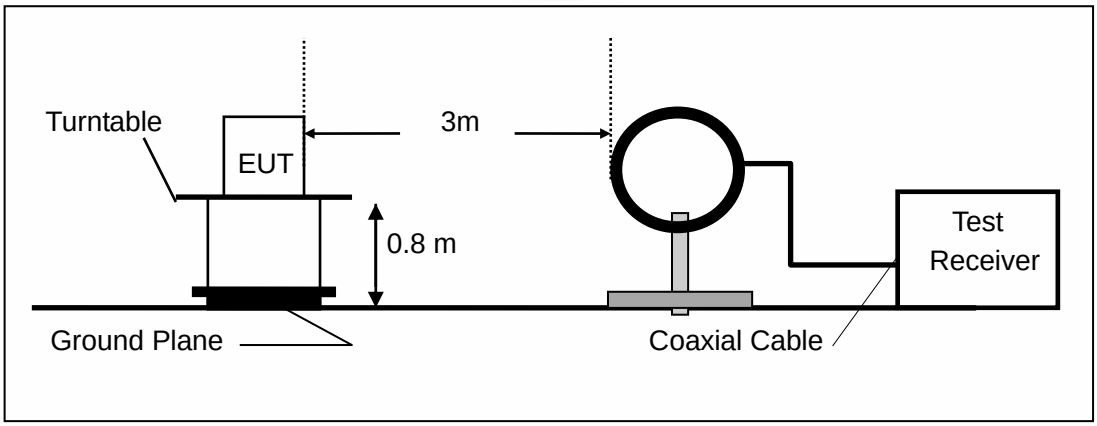
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

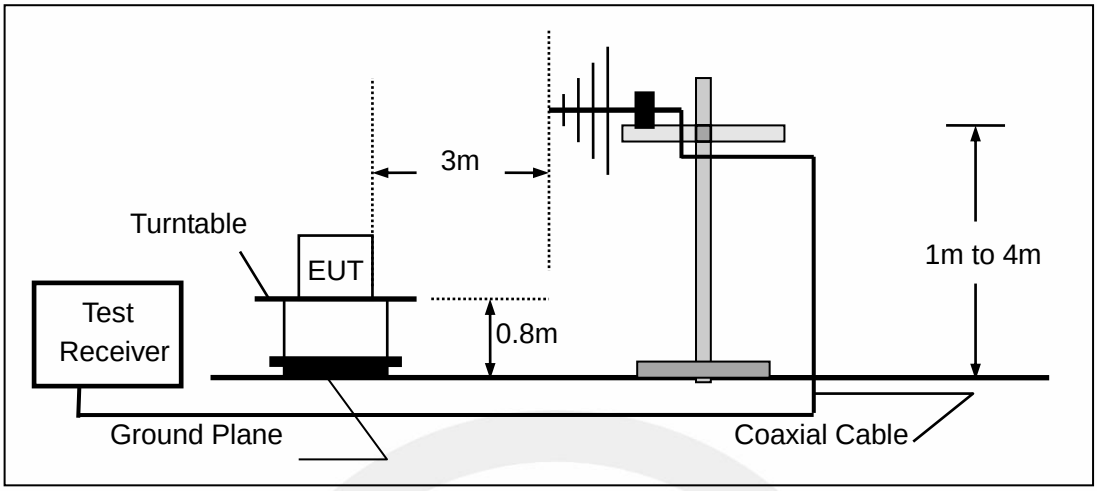
Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz：
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)
The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

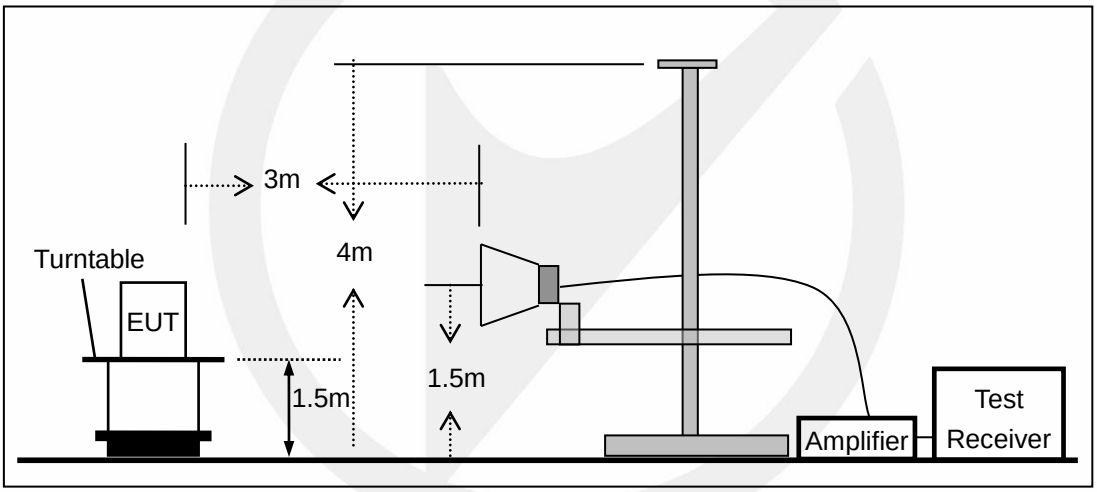
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz




(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

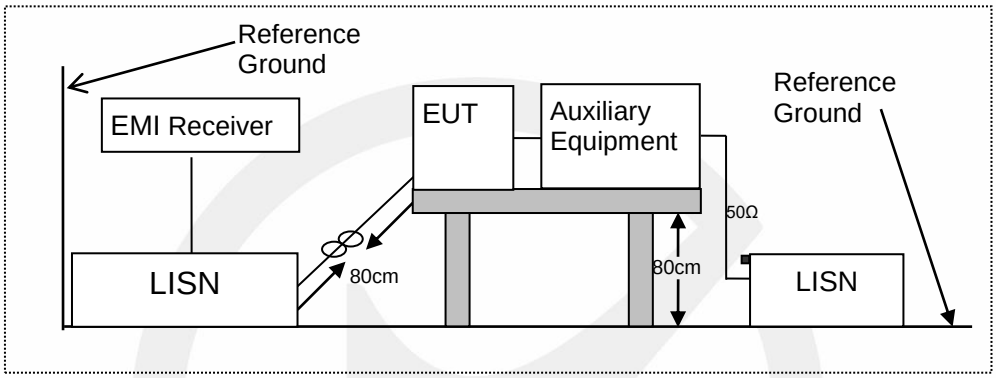


## 7.3 CONDUCTED EMISSION TEST SETUP

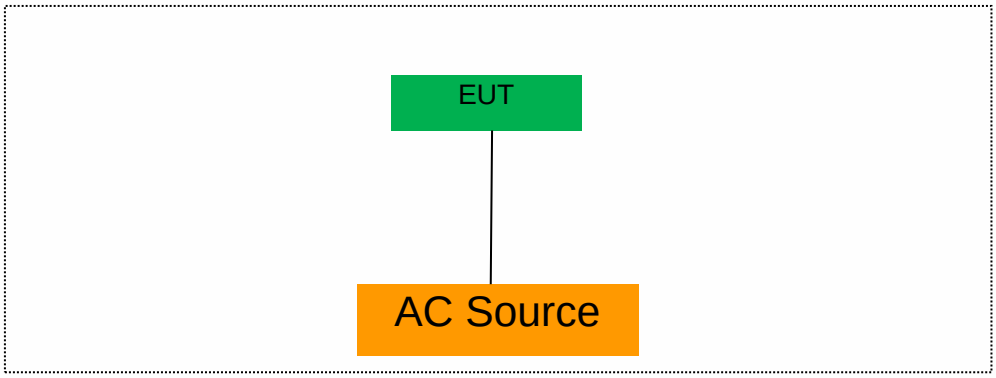
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



## 7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM




## 7.5 SUPPORT EQUIPMENT

| EUT Cable List and Details | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| Auxiliary Cable List and Details | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| Auxiliary Equipment List and Details | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Serial Number |
| Notebook | acer | ZR1 | LXTECOCO76643158372500 |
| External Antenna | / | / | / |

**Notes:**

*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.

# 8 TEST REQUIREMENTS

## 8.1 BANDWIDTH MEASUREMENT

### 8.1.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to FCC Part 15.407(e) for UNII Band III
According to 789033 D02 Section II(C)
According to 789033 D02 Section II(D)

### 8.1.2 Conformance Limit

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

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

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

### 8.1.4 Test Procedure

According to 789033 D02 v02r01 section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) 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%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth
The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v01r02 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

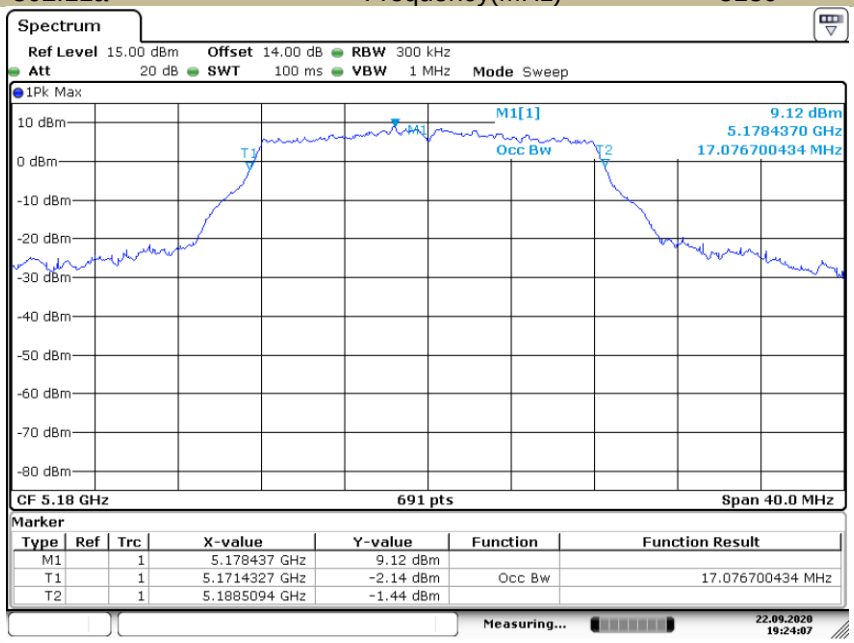
The following procedure shall be used for measuring (99 %) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 • RBW
5. Video averaging is not permitted. Where practical, 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).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

8.1.5 Test Results

*5150-5250MHz*

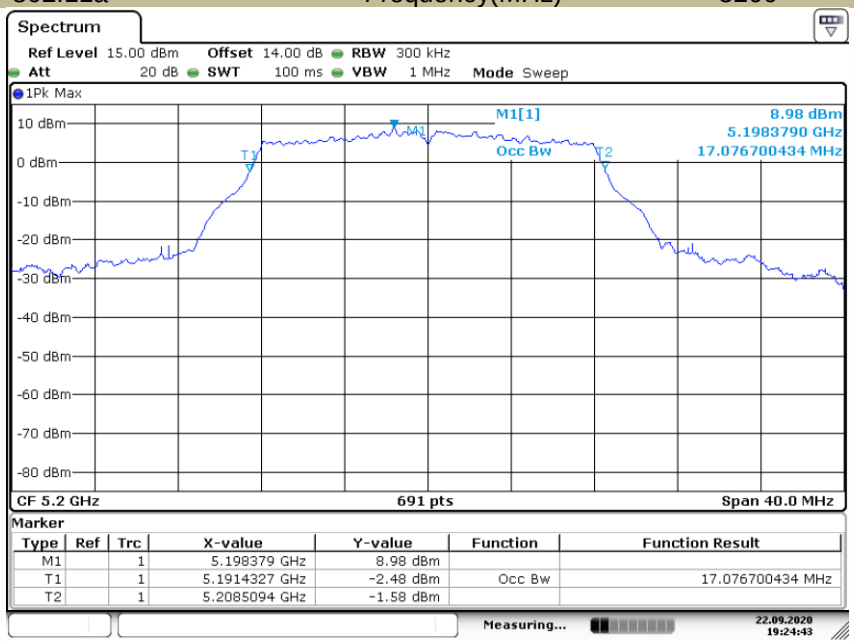
| Test Mode | Test Channel MHz | | 26 dB Bandwidth MHz | 99% Bandwidth MHz | Verdict |
|---|---|---|---|---|---|
| 802.11a | CH36 | 5180 | 21.592 | 17.077 | Pass |
| | CH40 | 5200 | 21.476 | 17.077 | Pass |
| | CH48 | 5240 | 21.418 | 17.077 | Pass |
| 802.11n-HT20 | CH36 | 5180 | 21.766 | 18.177 | Pass |
| | CH40 | 5200 | 21.881 | 18.119 | Pass |
| | CH48 | 5240 | 21.766 | 18.119 | Pass |
| 802.11ac(HT20) | CH36 | 5180 | 21.245 | 17.887 | Pass |
| | CH40 | 5200 | 21.245 | 17.887 | Pass |
| | CH48 | 5240 | 21.360 | 17.887 | Pass |
| 802.11n-HT40 | CH38 | 5190 | 39.830 | 36.237 | Pass |
| | CH46 | 5230 | 39.480 | 36.122 | Pass |
| 802.11ac(HT40) | CH38 | 5190 | 39.830 | 36.353 | Pass |
| | CH46 | 5230 | 39.830 | 36.469 | Pass |
| 802.11ac(HT80) | CH42 | 5210 | 80.810 | 75.485 | Pass |

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5180 |



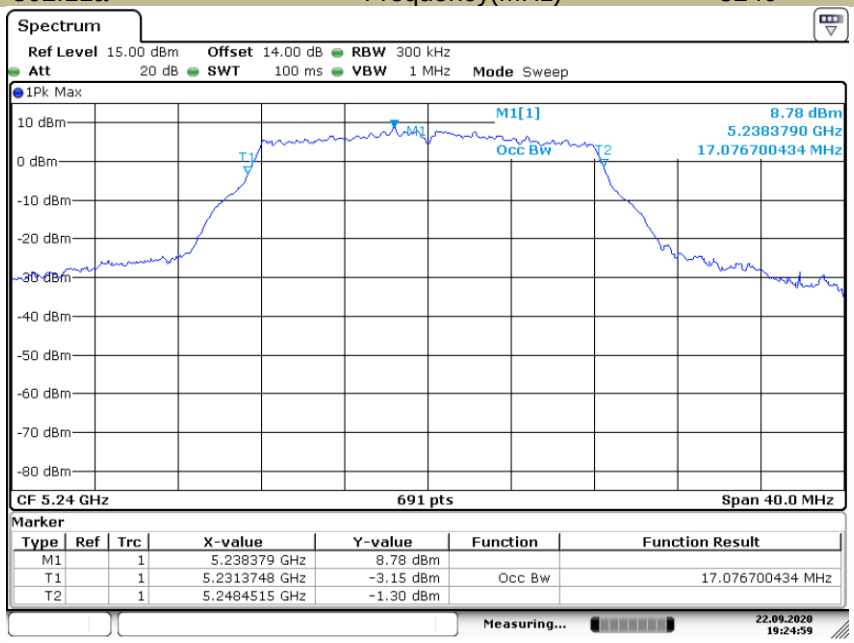

Date: 22.SEP.2020 19:24:08

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5200 |



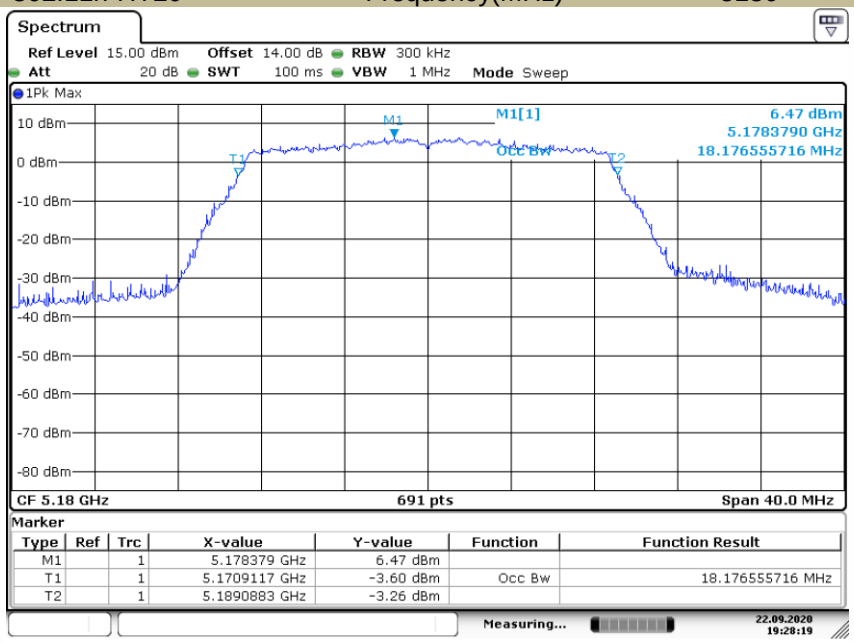

Date: 22.SEP.2020 19:24:42

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5240 |



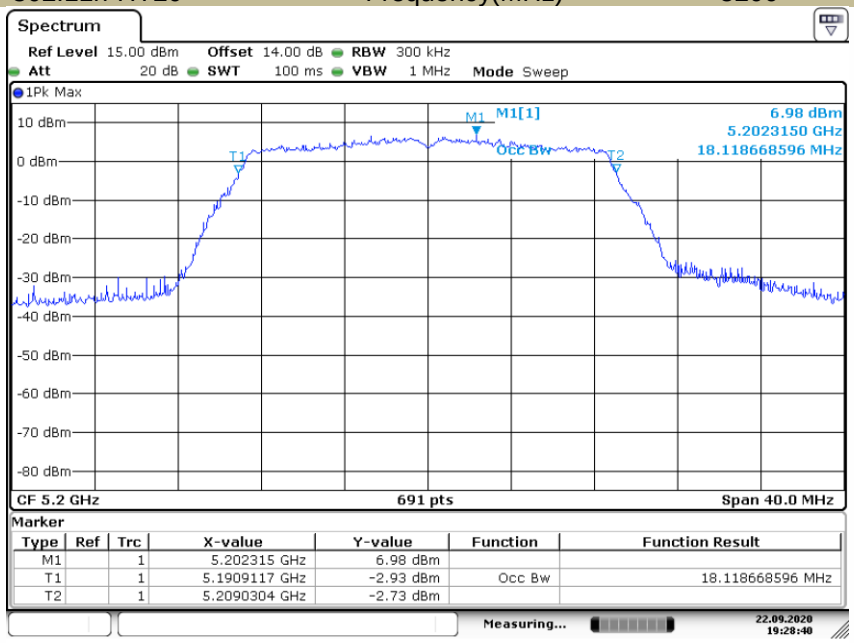

Date: 22.SEP.2020 19:24:59

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5180 |



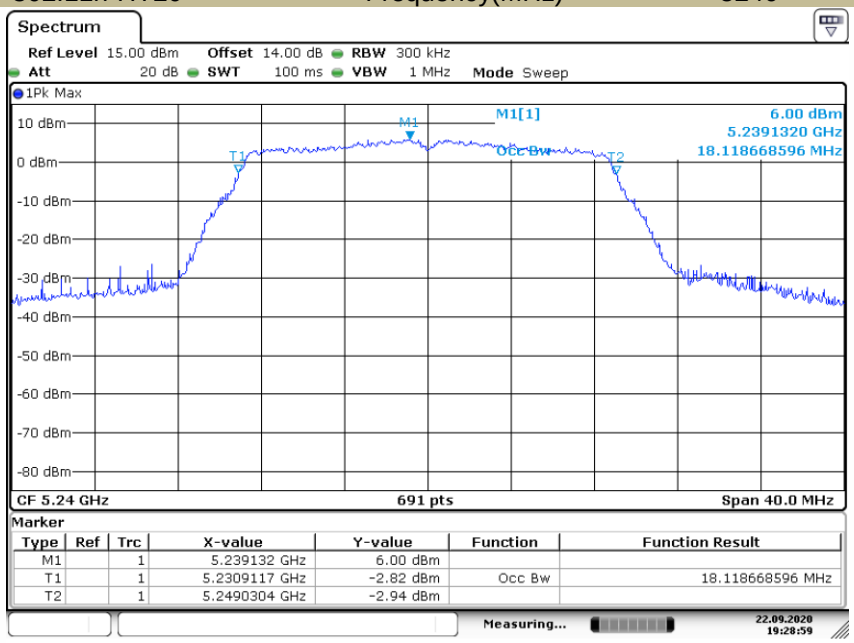

Date: 22.SEP.2020 19:28:19

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5200 |



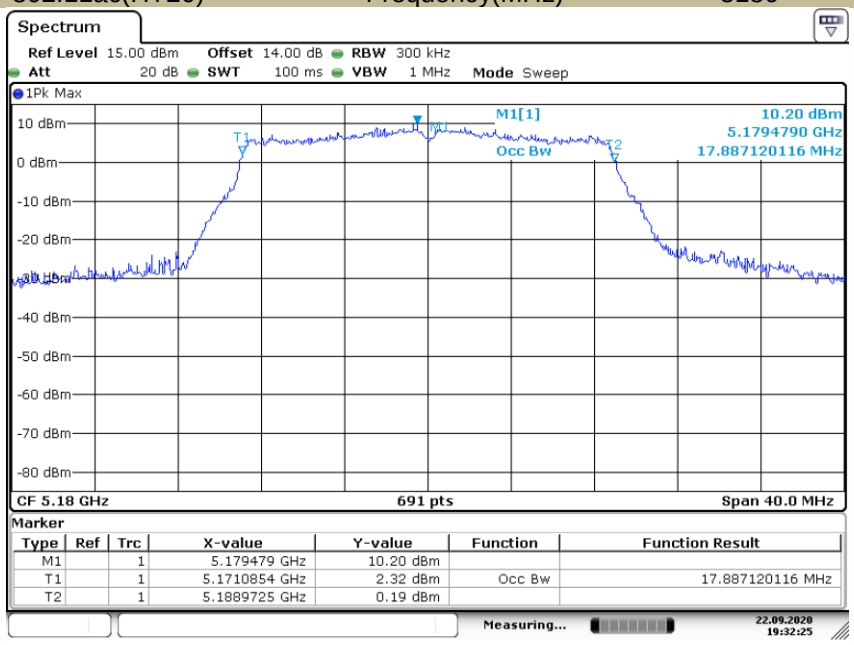

Date: 22.SEP.2020 19:28:40

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5240 |



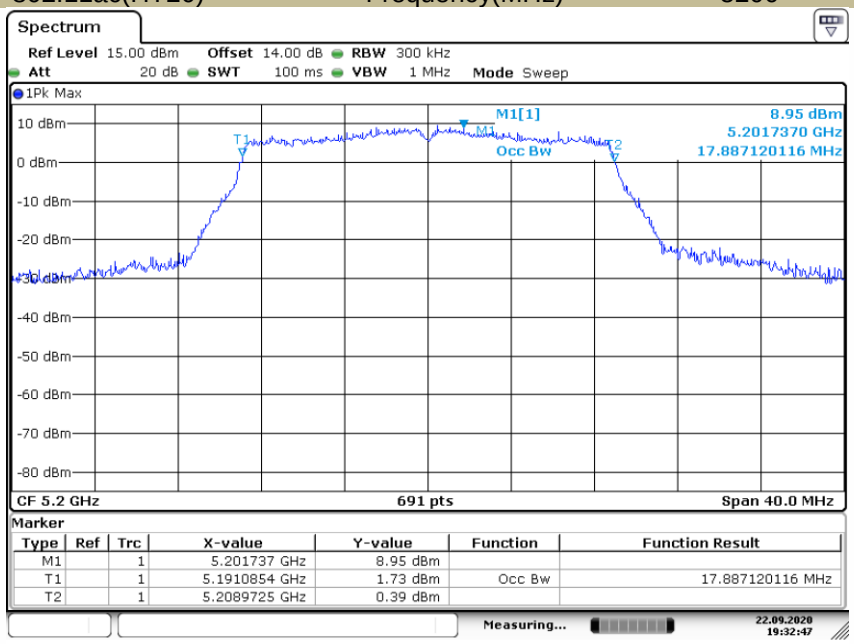

Date: 22.SEP.2020 19:28:59

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5180 |



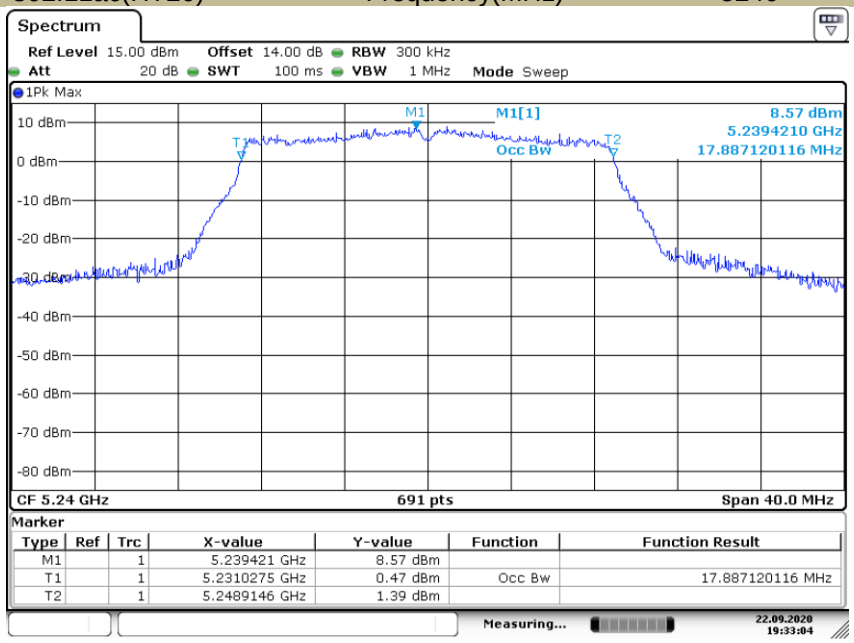

Date: 22.SEP.2020 19:32:25

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5200 |



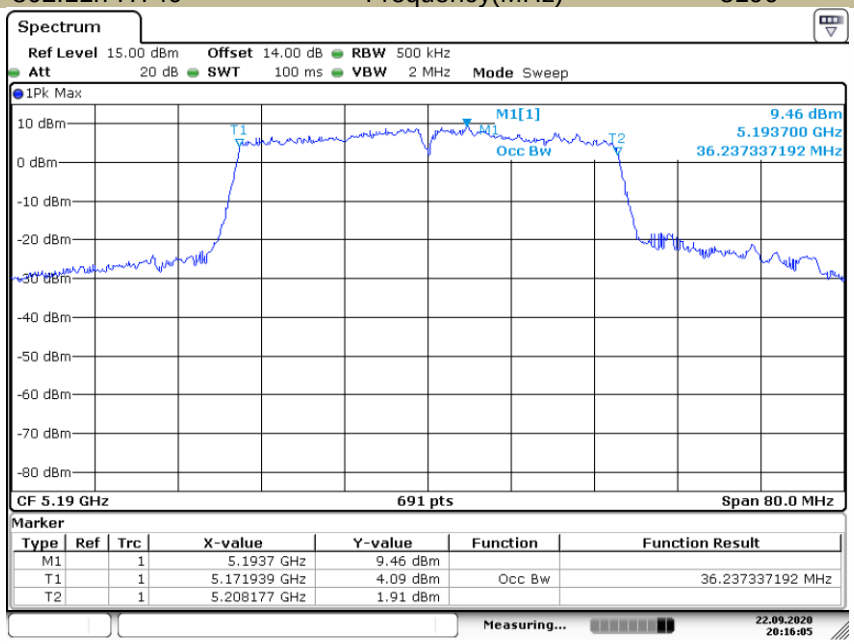

Date: 22.SEP.2020 19:32:47

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5240 |



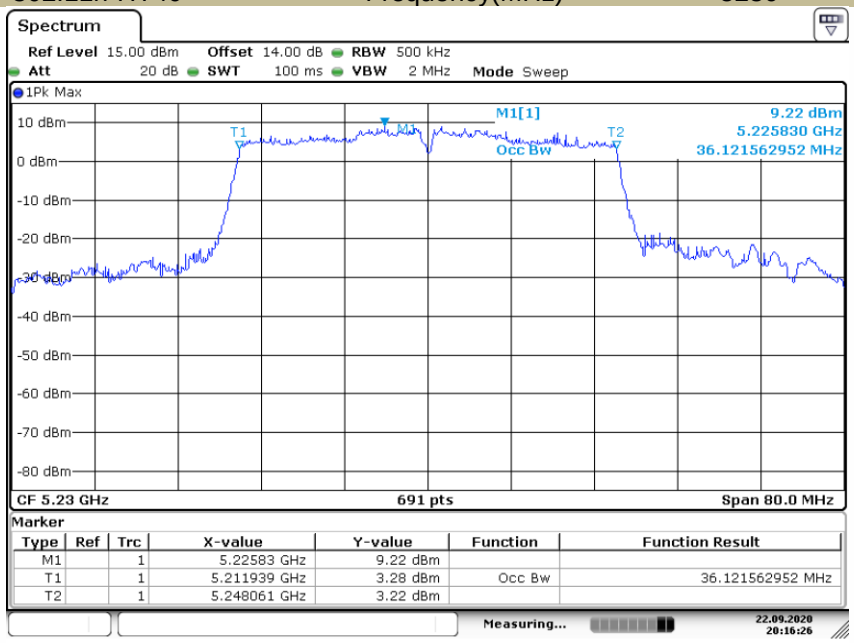

Date: 22.SEP.2020 19:33:03

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5190 |



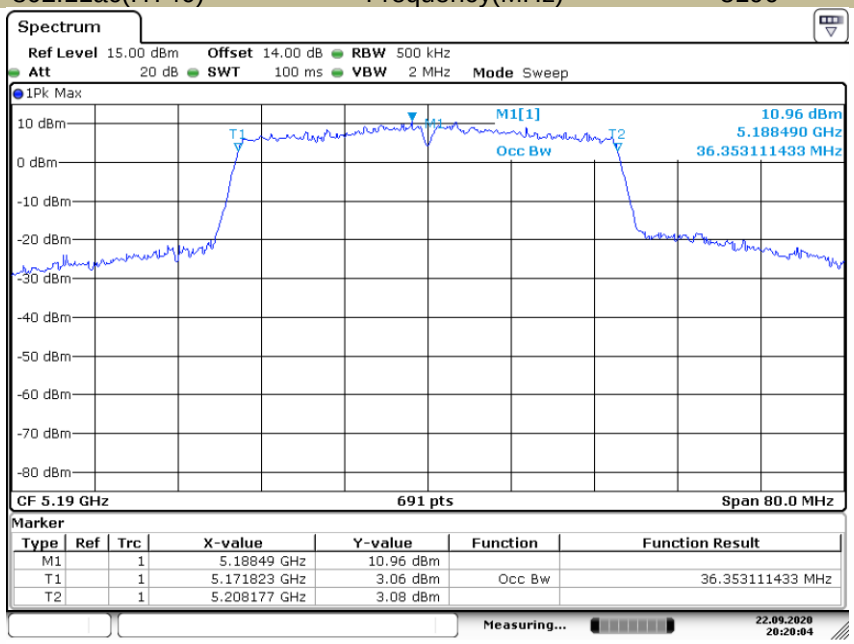

Date: 22.SEP.2020 20:16:06

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5230 |



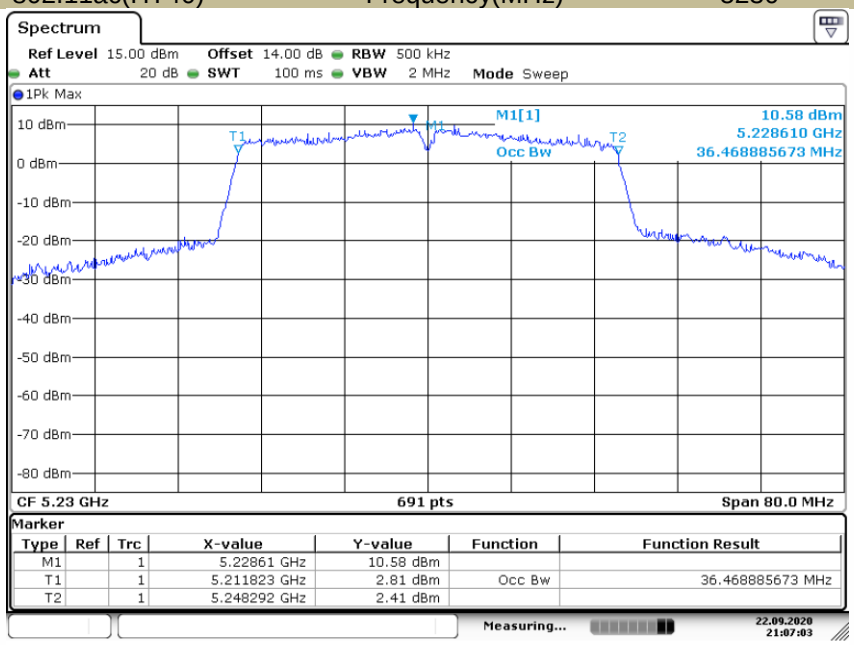

Date: 22.SEP.2020 20:16:26

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5190 |



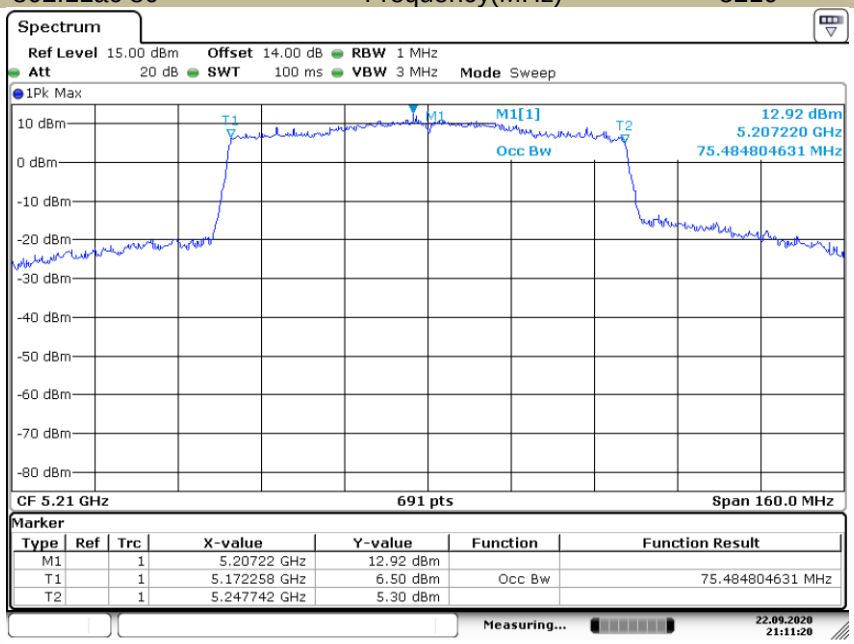

Date: 22.SEP.2020 20:20:04

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5230 |



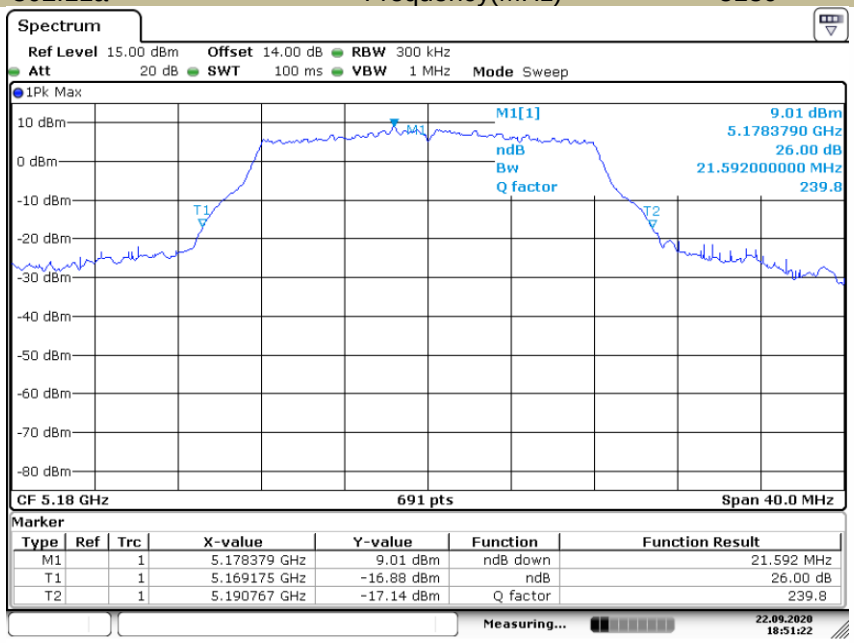

Date: 22.SEP.2020 21:07:03

| 99% Occupied Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac 80 | Frequency(MHz) | 5210 |



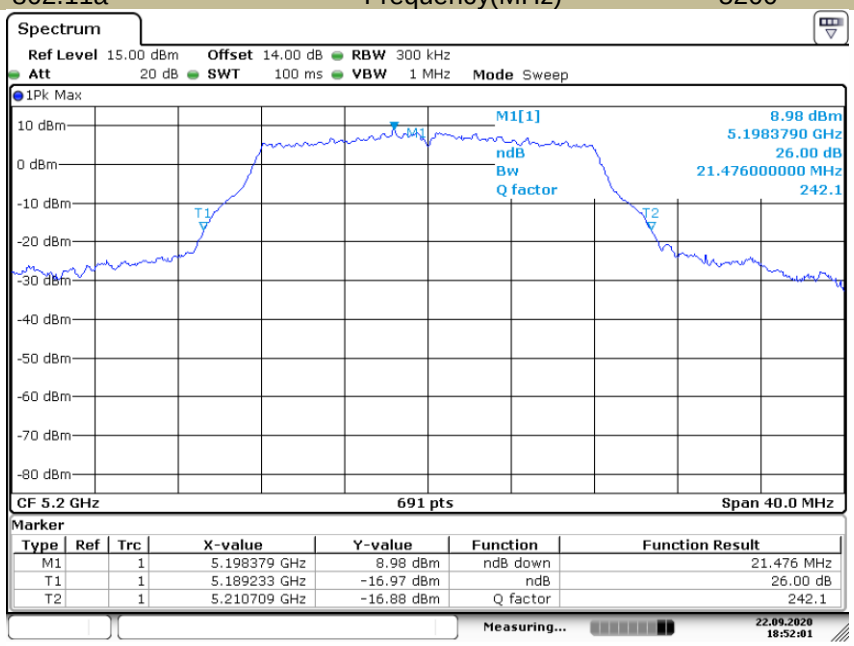

Date: 22.SEP.2020 21:11:20

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5180 |



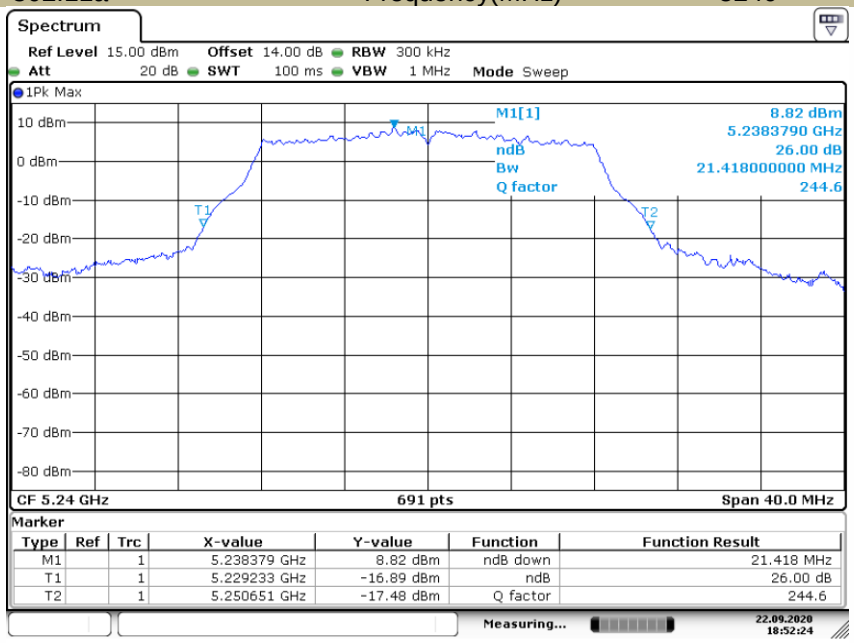

Date: 22.SEP.2020 18:51:22

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5200 |



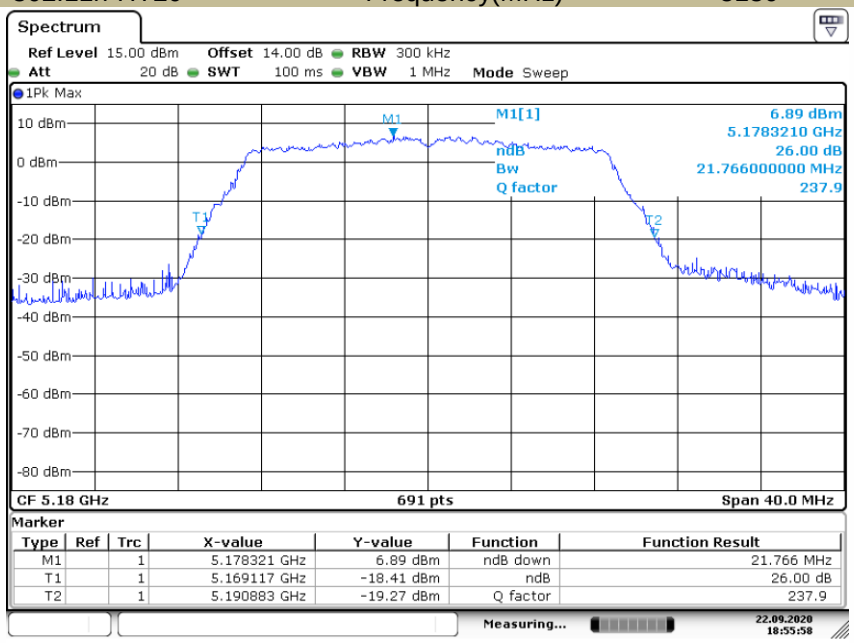

Date: 22.SEP.2020 18:52:01

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5240 |



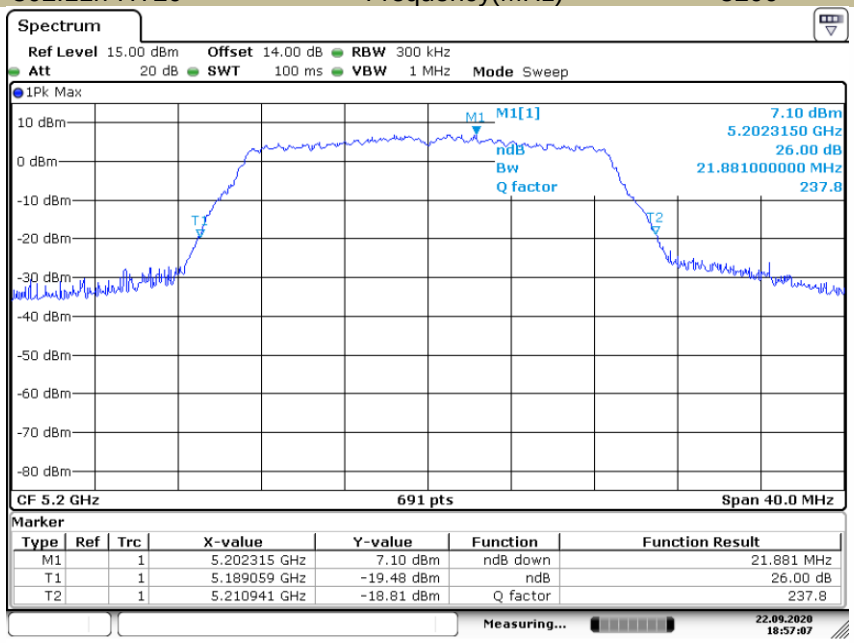

Date: 22.SEP.2020 18:52:24

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5180 |



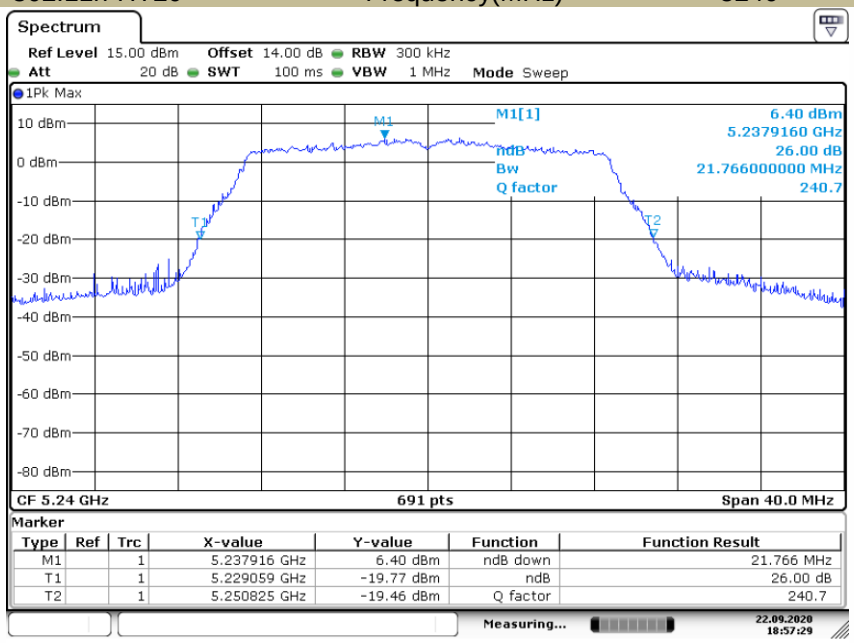

Date: 22.SEP.2020 18:55:58

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5200 |



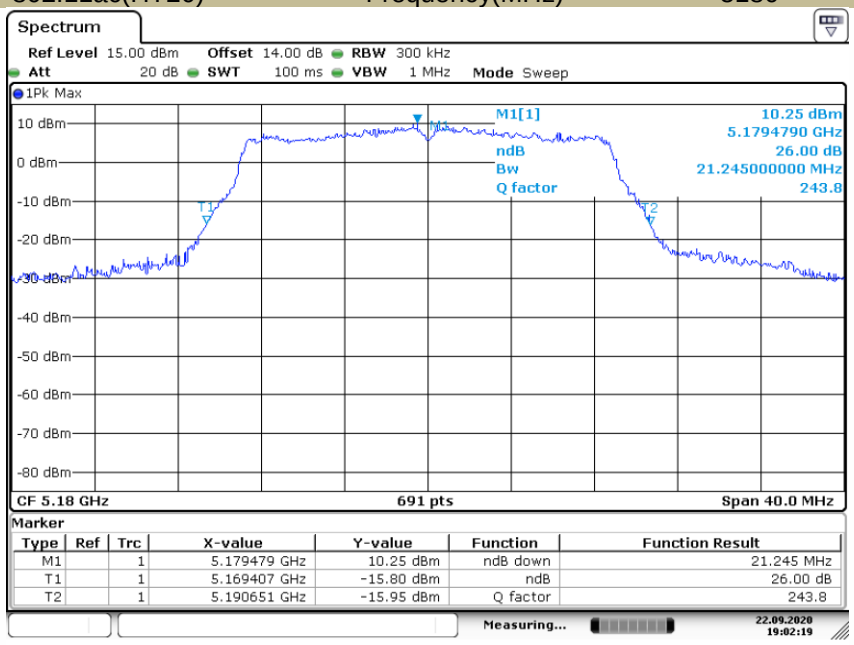

Date: 22.SEP.2020 18:57:07

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5240 |



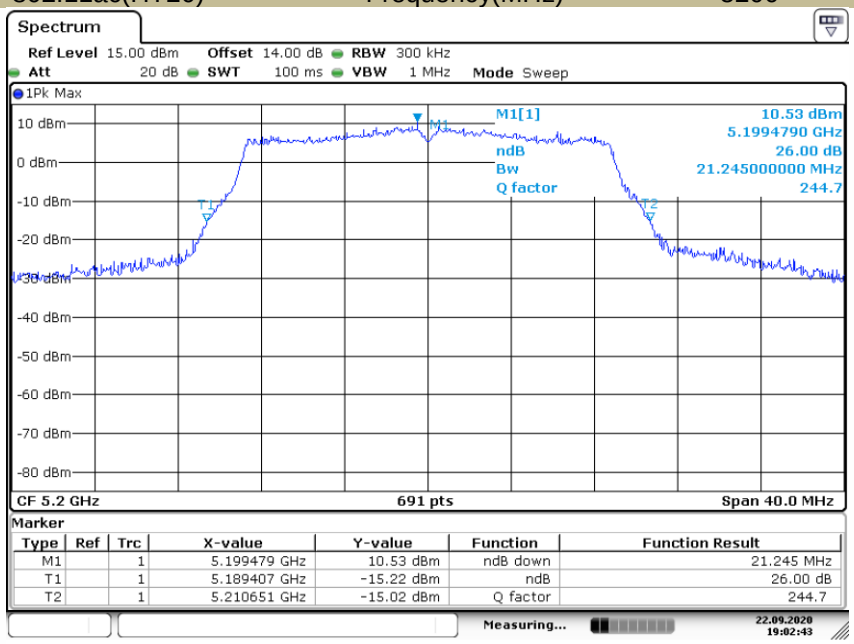

Date: 22.SEP.2020 18:57:29

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5180 |



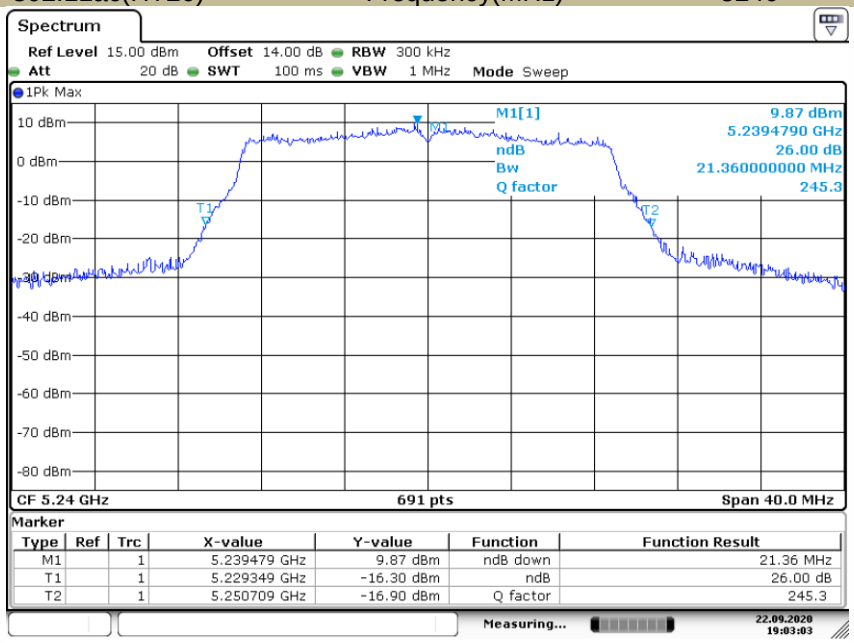

Date: 22.SEP.2020 19:02:19

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5200 |



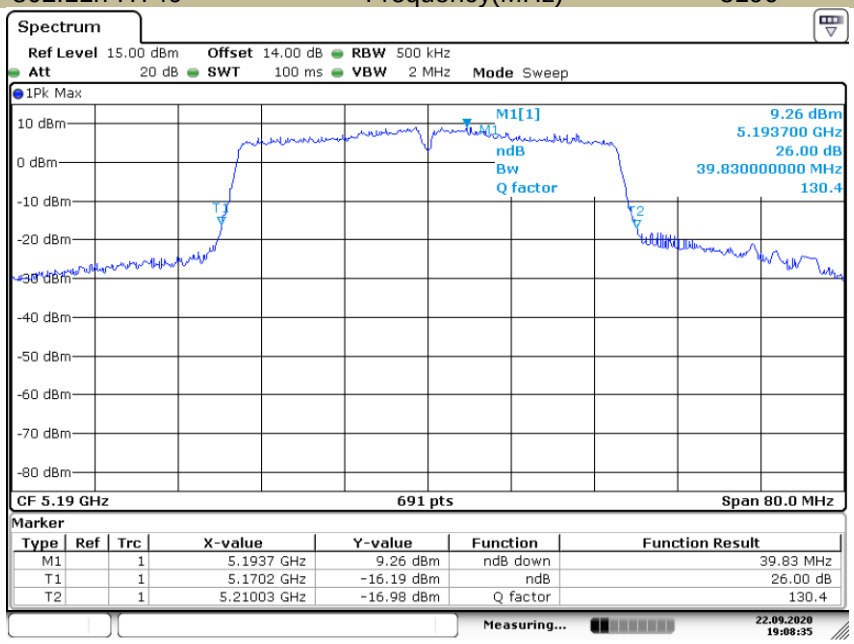

Date: 22.SEP.2020 19:02:43

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5240 |



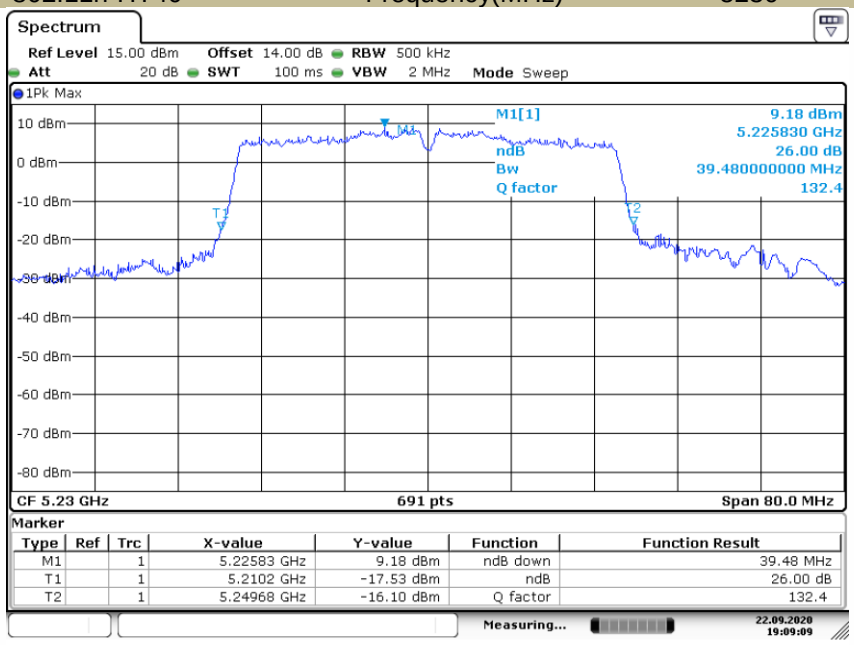

Date: 22.SEP.2020 19:03:03

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5190 |



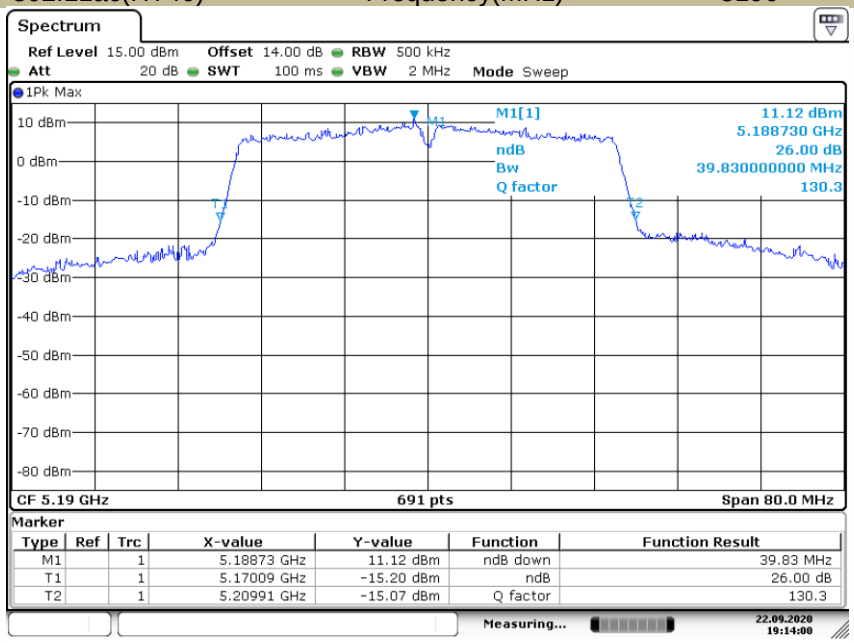

Date: 22.SEP.2020 19:08:35

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5230 |



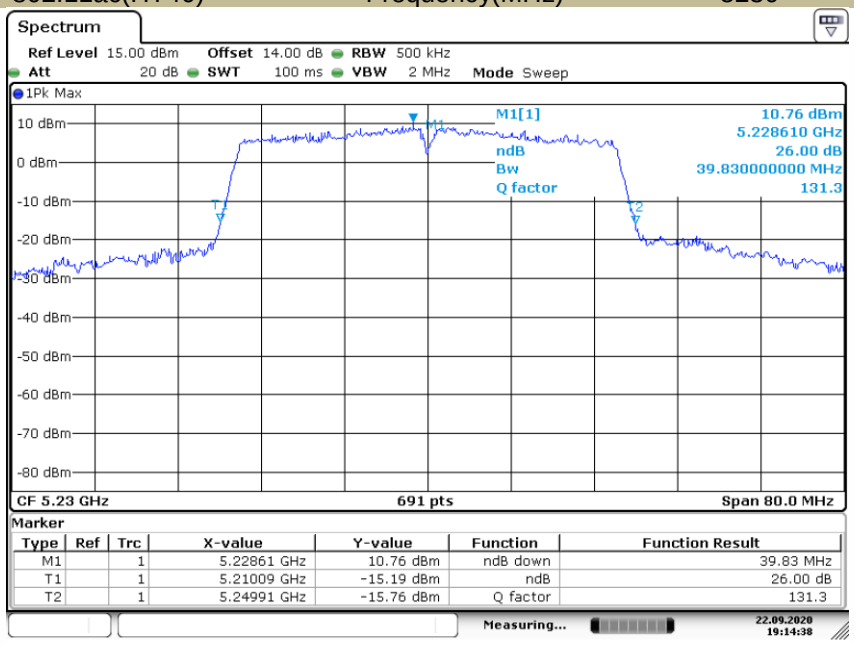

Date: 22.SEP.2020 19:09:09

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5190 |



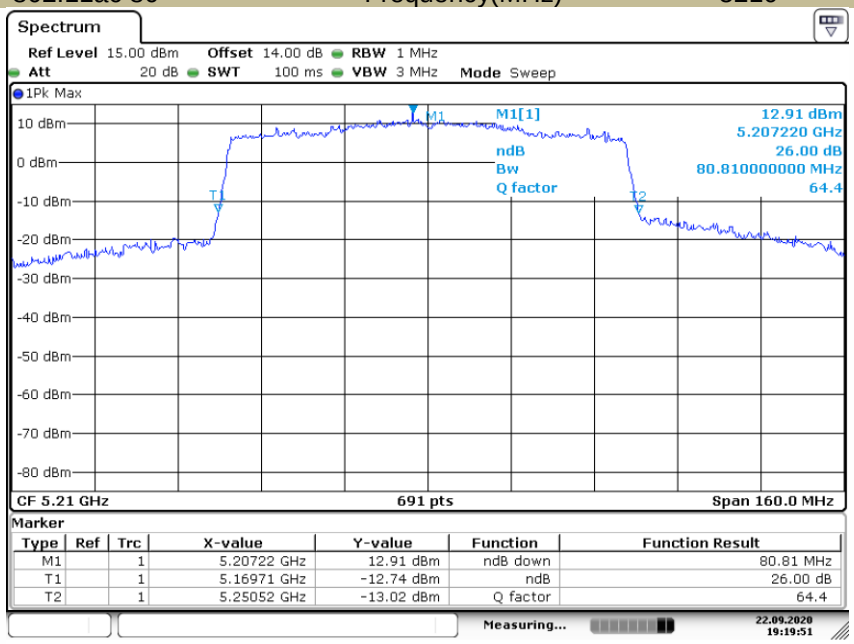

Date: 22.SEP.2020 19:14:00

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5230 |




Date: 22.SEP.2020 19:14:39

| 26dB Emission Bandwidth | | U-NII - 1 | |
|---|---|---|---|
| Test Model | 802.11ac 80 | Frequency(MHz) | 5210 |

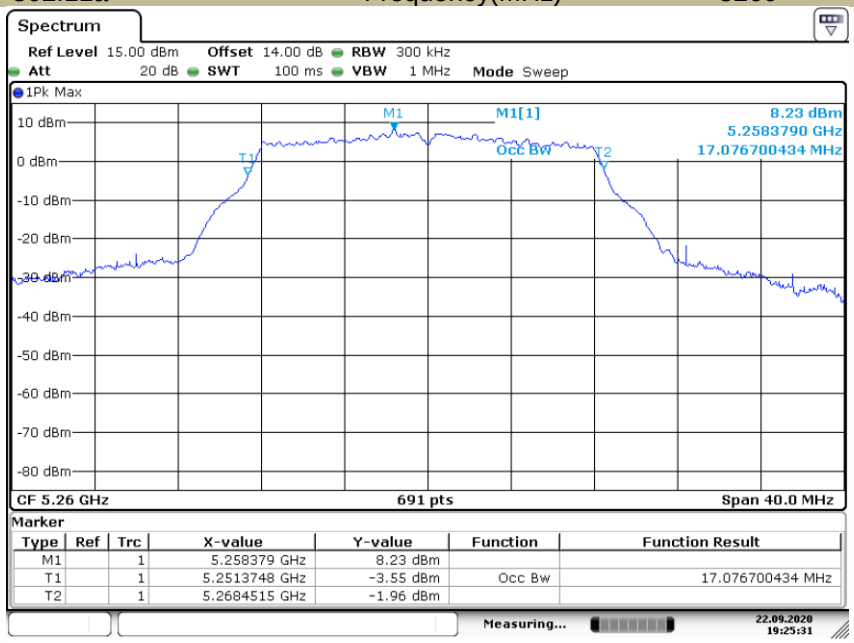



Date: 22.SEP.2020 19:19:51

*5250-5350MHz*

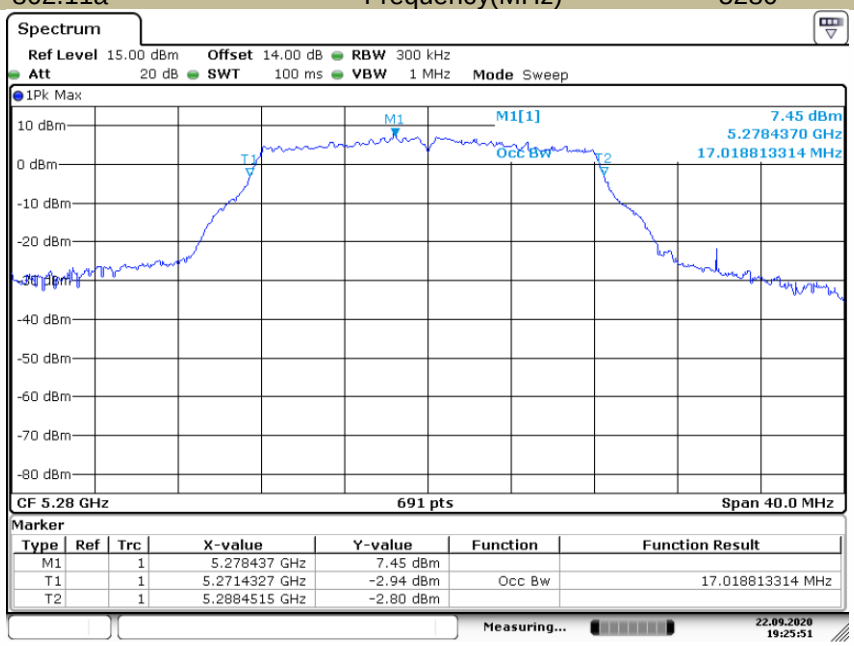
| Test Mode | Test Channel MHz | | 26 dB Bandwidth MHz | 99% Bandwidth MHz | Verdict |
|---|---|---|---|---|---|
| 802.11a | CH52 | 5260 | 21.418 | 17.077 | Pass |
| | CH56 | 5280 | 21.534 | 17.019 | Pass |
| | CH64 | 5320 | 21.534 | 17.136 | Pass |
| 802.11n-HT20 | CH52 | 5260 | 21.766 | 18.061 | Pass |
| | CH56 | 5280 | 21.939 | 18.119 | Pass |
| | CH64 | 5320 | 21.708 | 18.061 | Pass |
| 802.11ac(HT20) | CH52 | 5260 | 21.245 | 17.829 | Pass |
| | CH56 | 5280 | 21.476 | 17.945 | Pass |
| | CH64 | 5320 | 21.418 | 17.945 | Pass |
| 802.11n-HT40 | CH54 | 5270 | 39.710 | 36.237 | Pass |
| | CH62 | 5310 | 39.940 | 36.353 | Pass |
| 802.11ac(HT40) | CH54 | 5270 | 39.940 | 36.469 | Pass |
| | CH62 | 5310 | 39.830 | 36.469 | Pass |
| 802.11ac(HT80) | CH58 | 5290 | 81.270 | 75.948 | Pass |

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5260 |



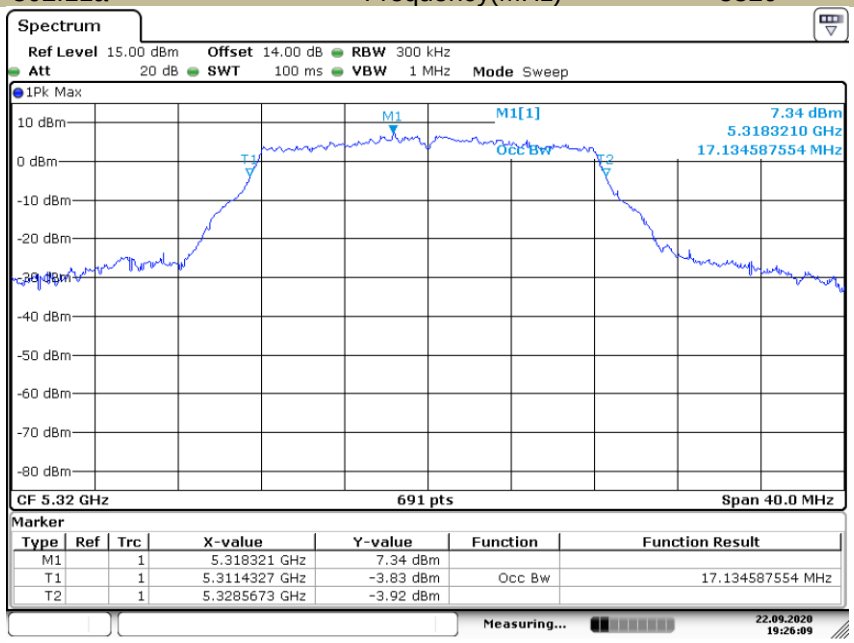

Date: 22.SEP.2020 19:25:31

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5280 |



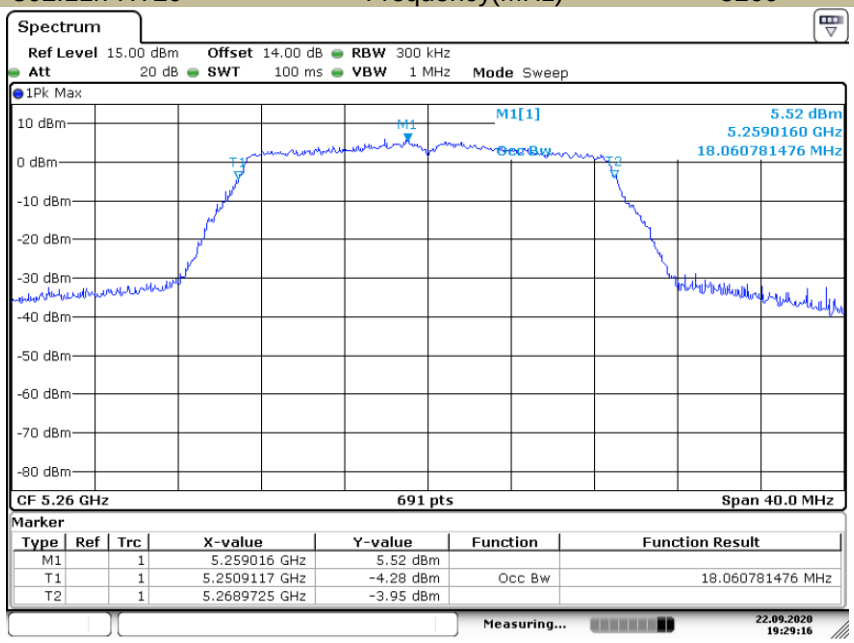

Date: 22.SEP.2020 19:25:50

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5320 |



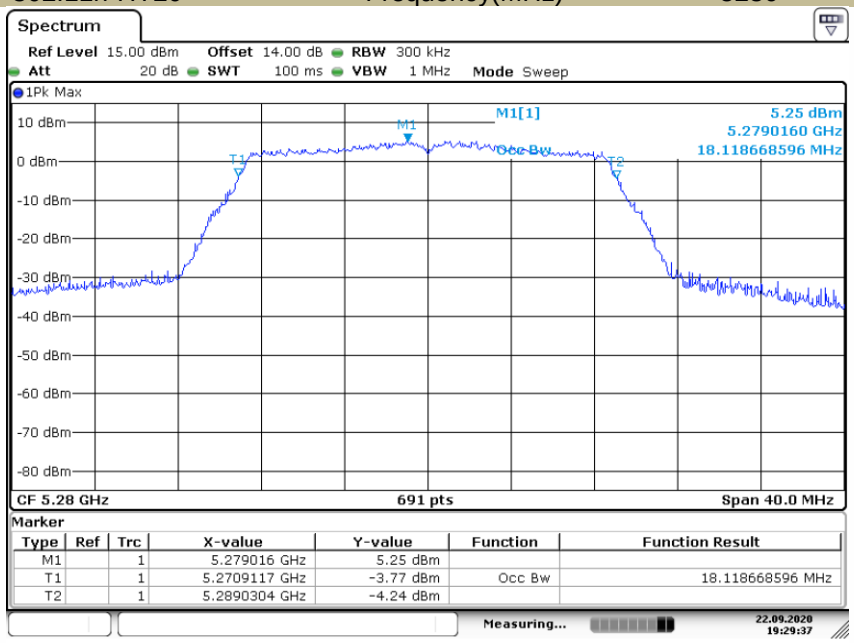

Date: 22.SEP.2020 19:26:09

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5260 |



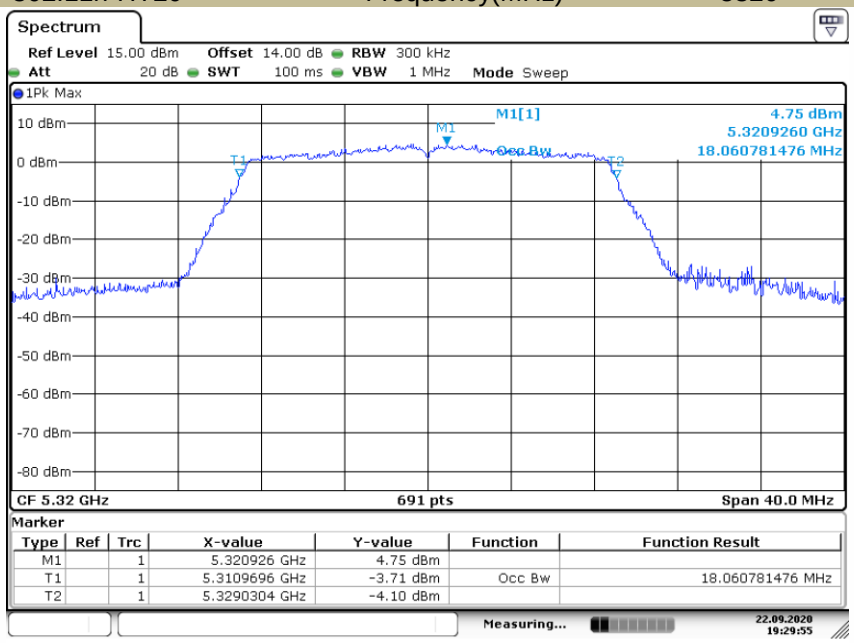

Date: 22.SEP.2020 19:29:16

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5280 |



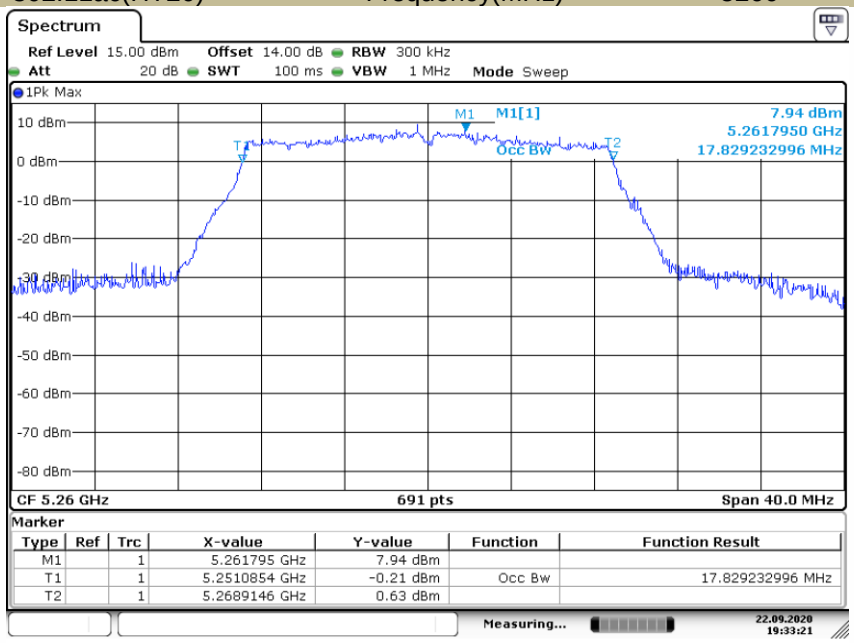

Date: 22.SEP.2020 19:29:36

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5320 |



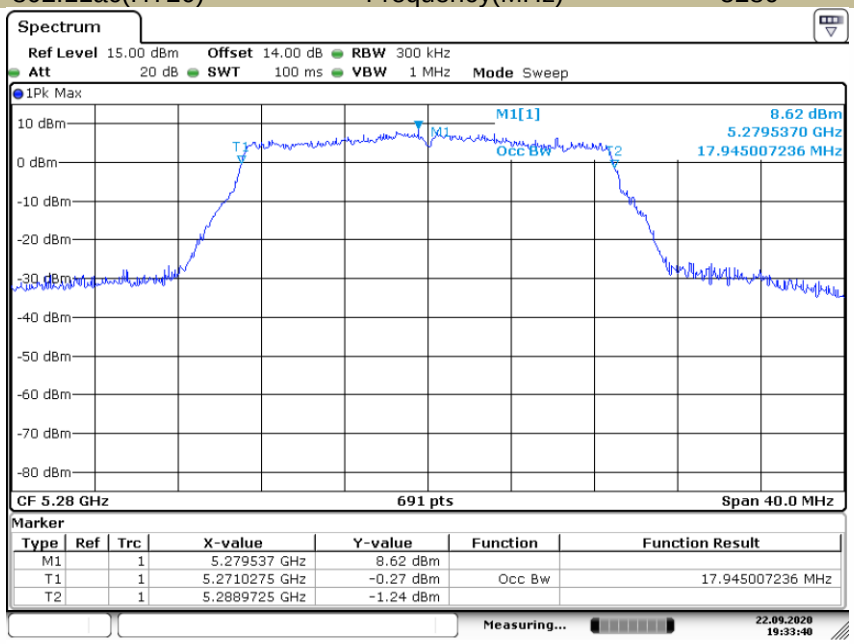

Date: 22.SEP.2020 19:29:55

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5260 |



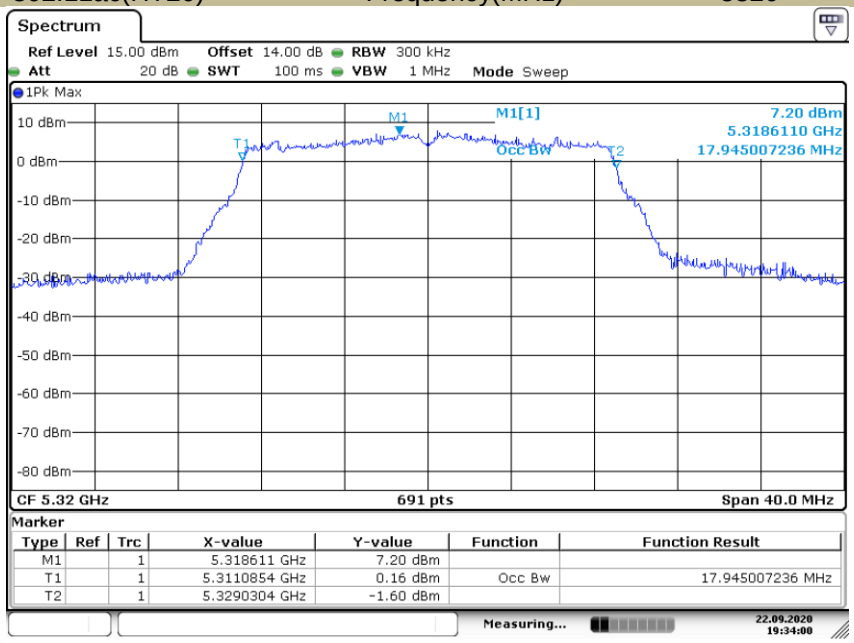

Date: 22.SEP.2020 19:33:21

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5280 |



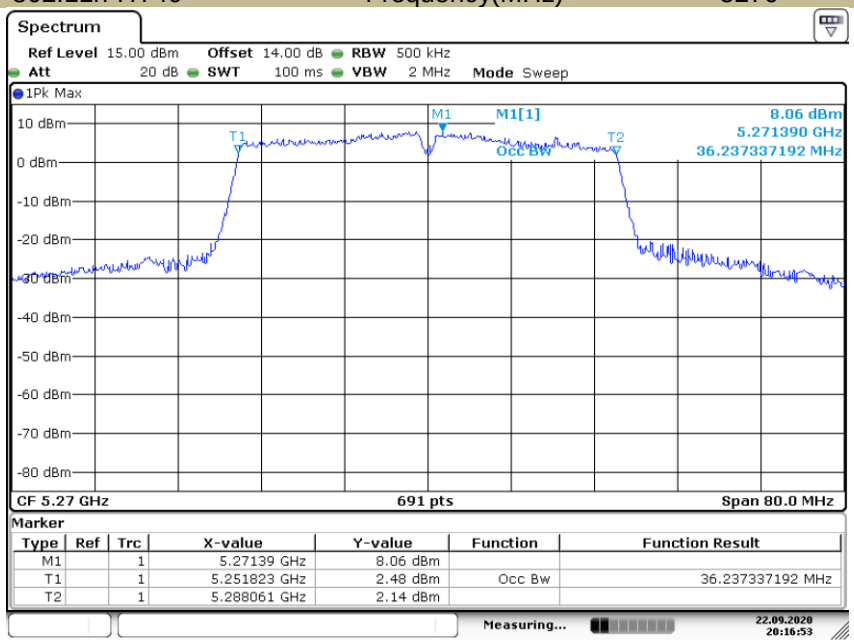

Date: 22.SEP.2020 19:33:40

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5320 |



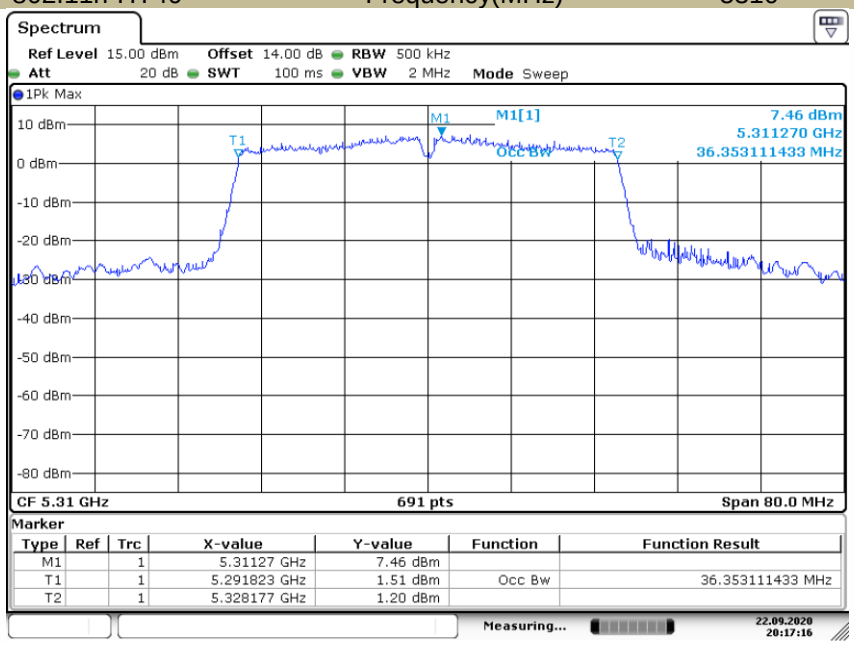

Date: 22.SEP.2020 19:34:00

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5270 |



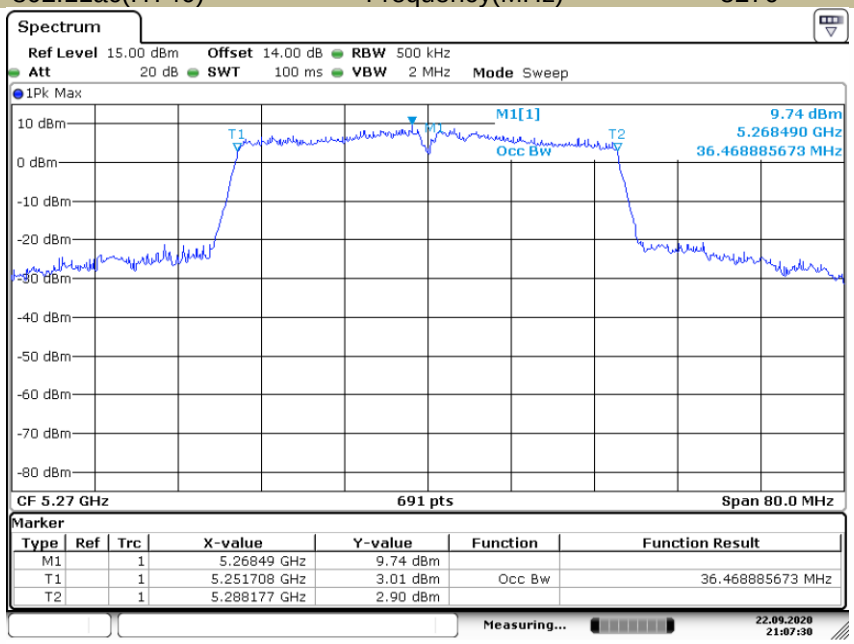

Date: 22.SEP.2020 20:16:53

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5310 |



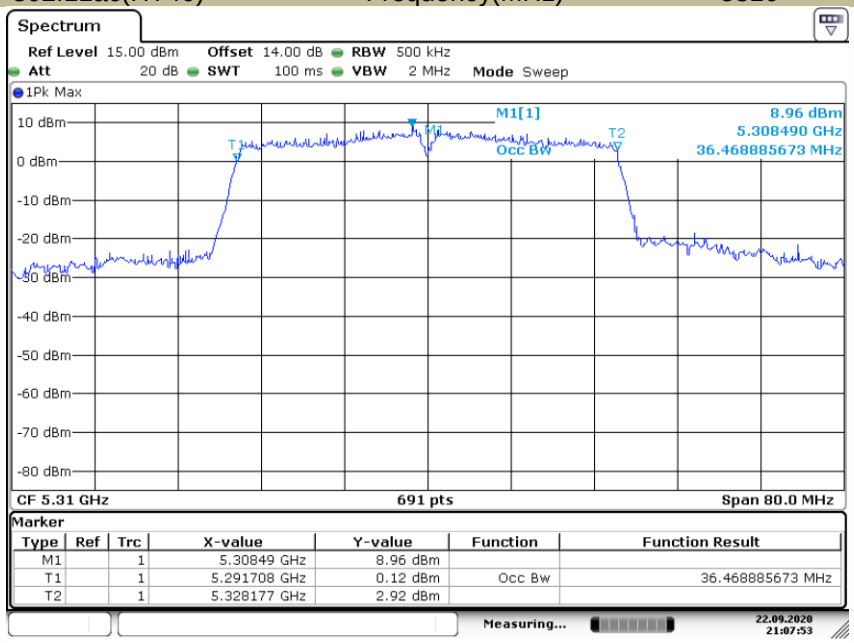

Date: 22.SEP.2020 20:17:16

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5270 |



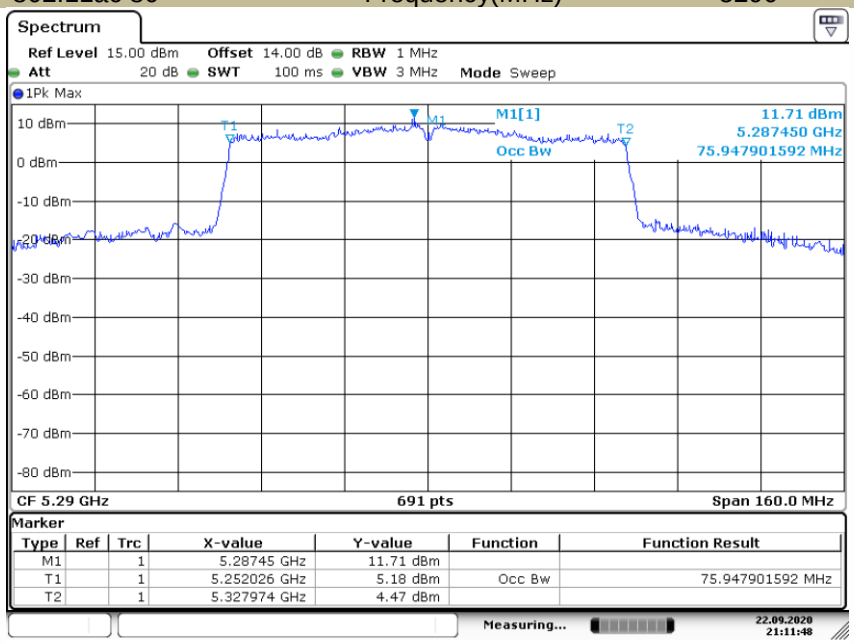

Date: 22.SEP.2020 21:07:29

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5310 |



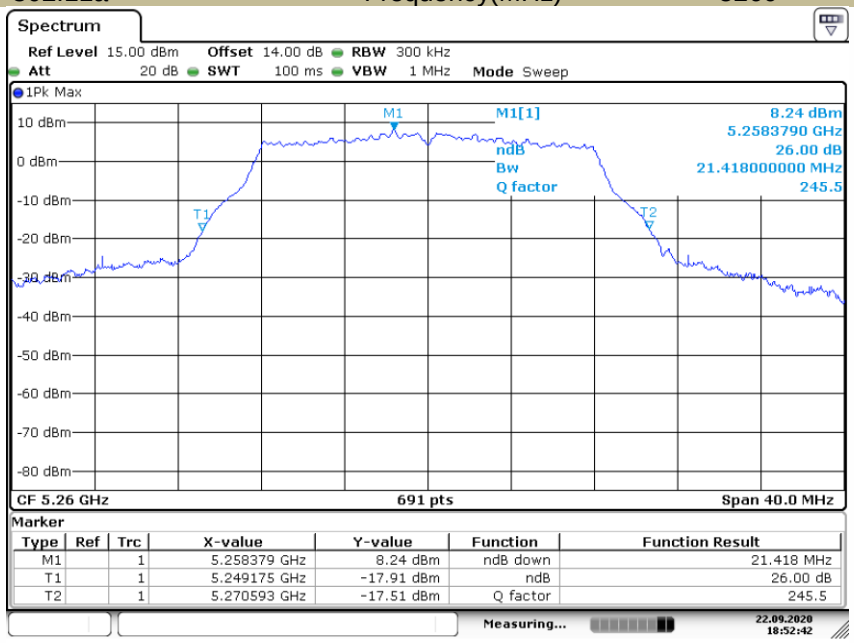

Date: 22.SEP.2020 21:07:53

| 99% Occupied Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac 80 | Frequency(MHz) | 5290 |



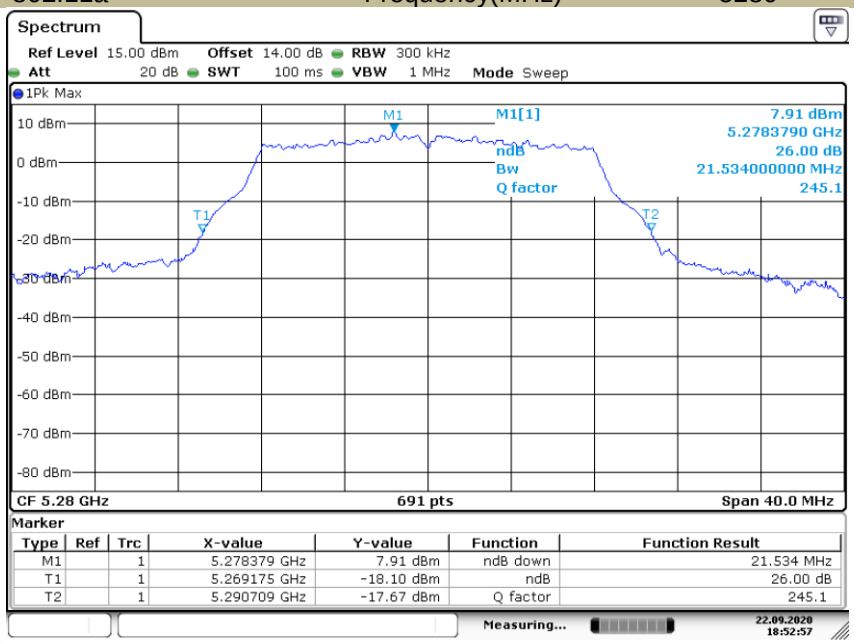

Date: 22.SEP.2020 21:11:48

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5260 |



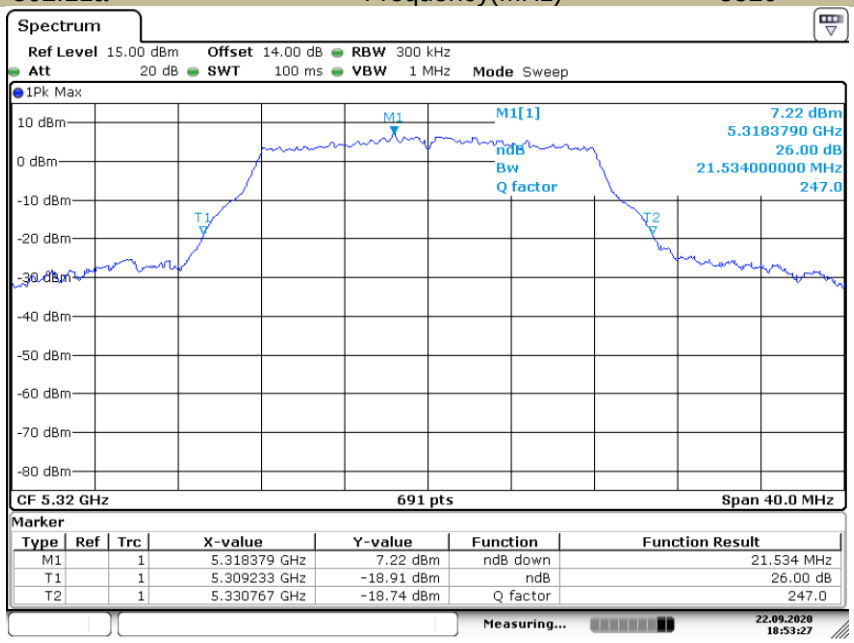

Date: 22.SEP.2020 18:52:42

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5280 |



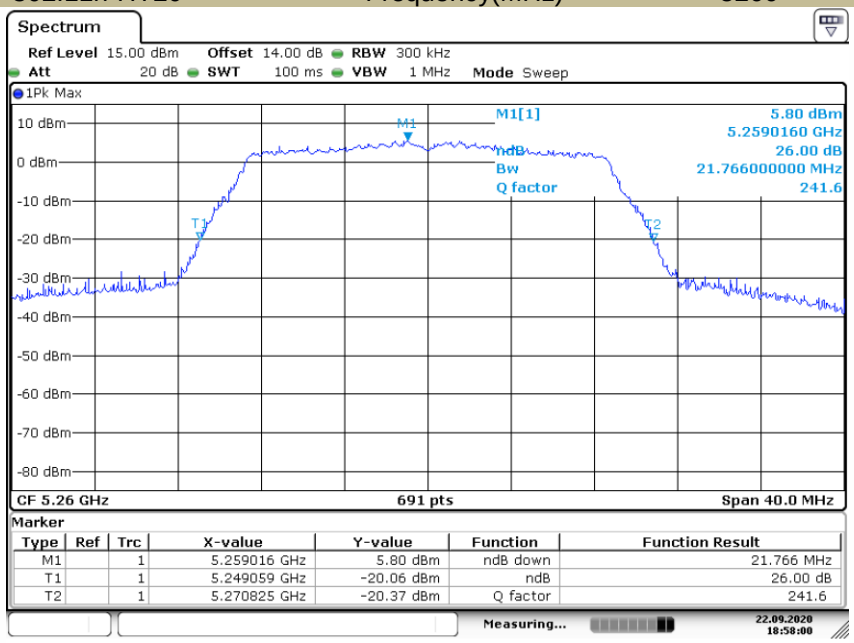

Date: 22.SEP.2020 18:52:57

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11a | Frequency(MHz) | 5320 |



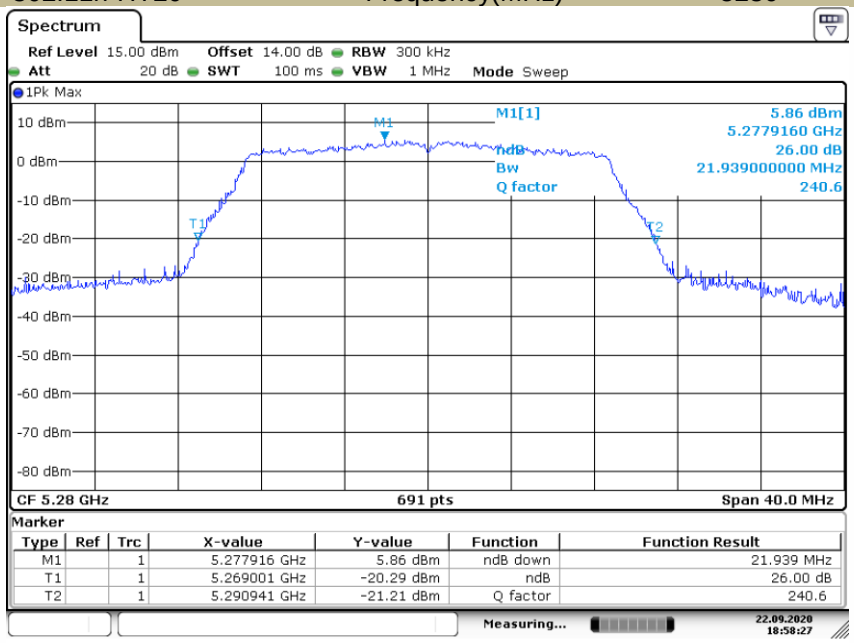

Date: 22.SEP.2020 18:53:27

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5260 |



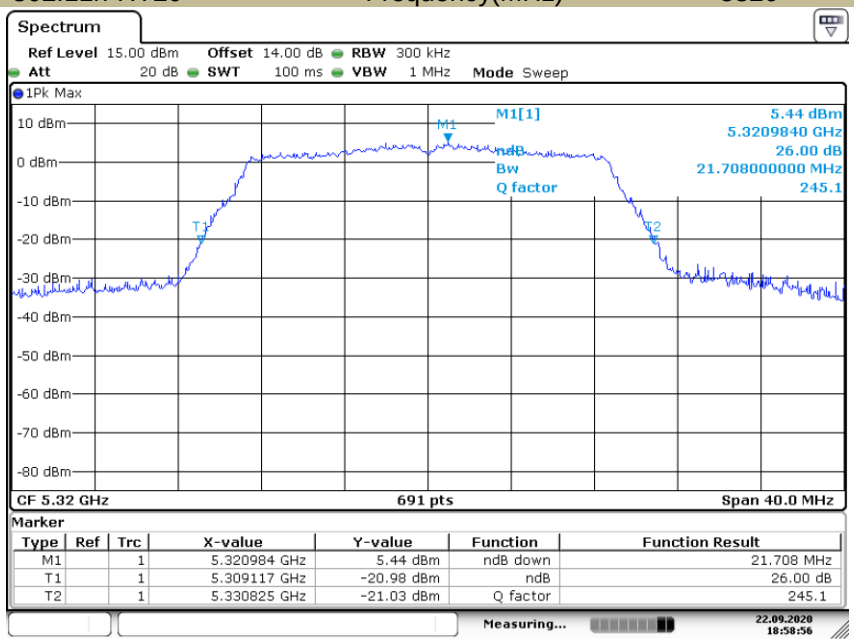

Date: 22.SEP.2020 18:57:59

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5280 |



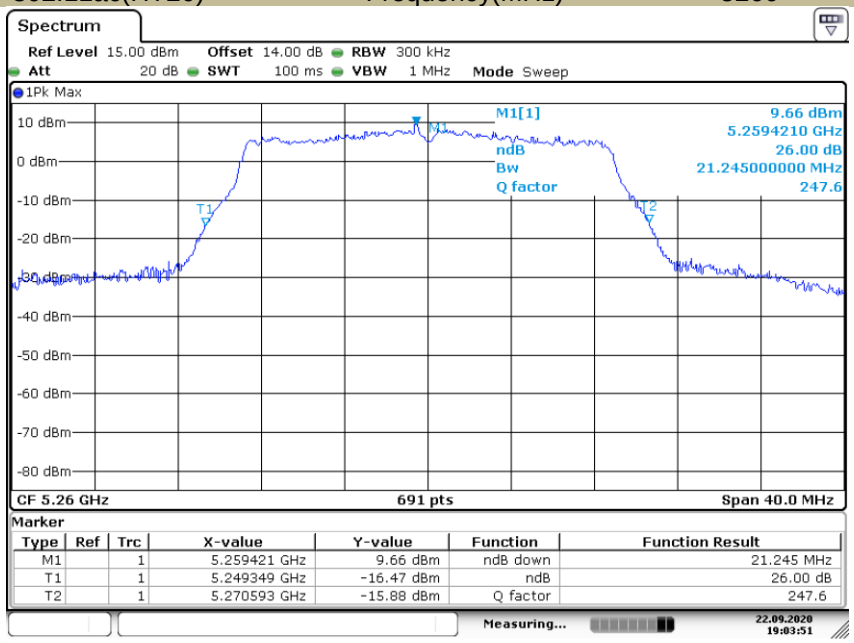

Date: 22.SEP.2020 18:58:27

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT20 | Frequency(MHz) | 5320 |



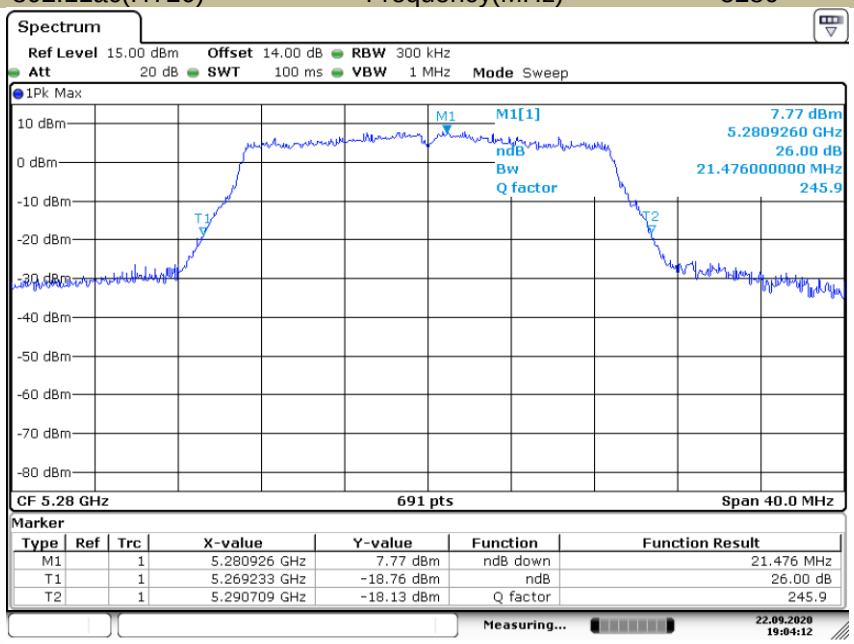

Date: 22.SEP.2020 18:58:57

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5260 |



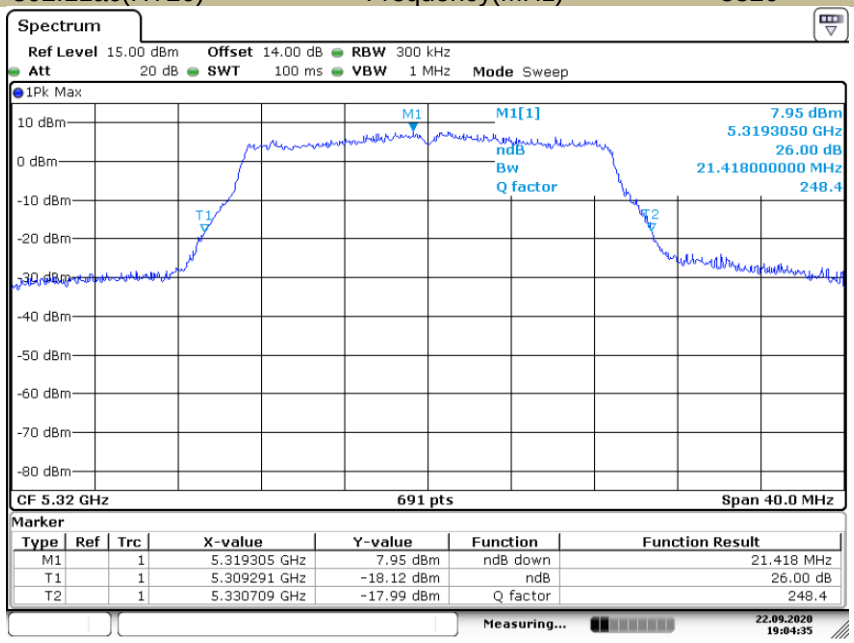

Date: 22.SEP.2020 19:03:52

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5280 |



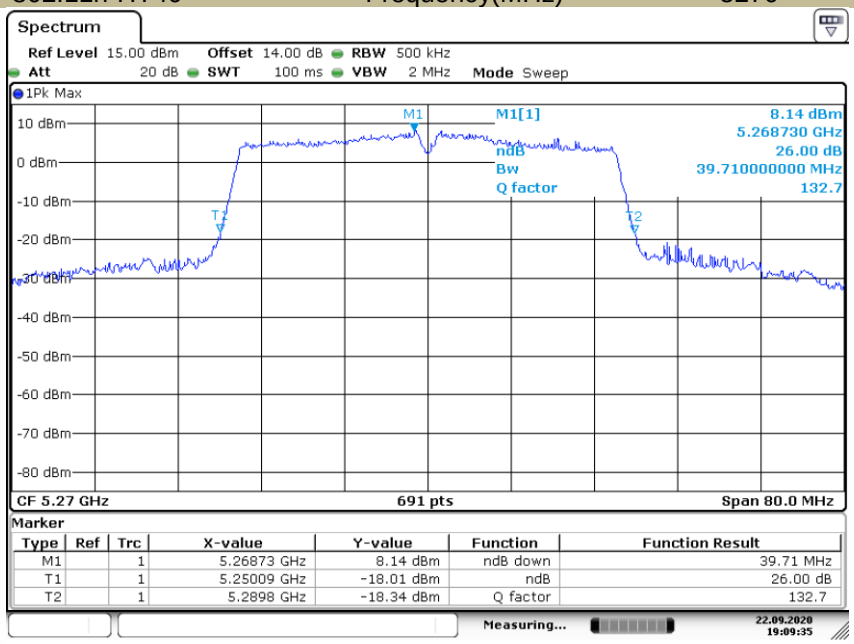

Date: 22.SEP.2020 19:04:12

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT20) | Frequency(MHz) | 5320 |



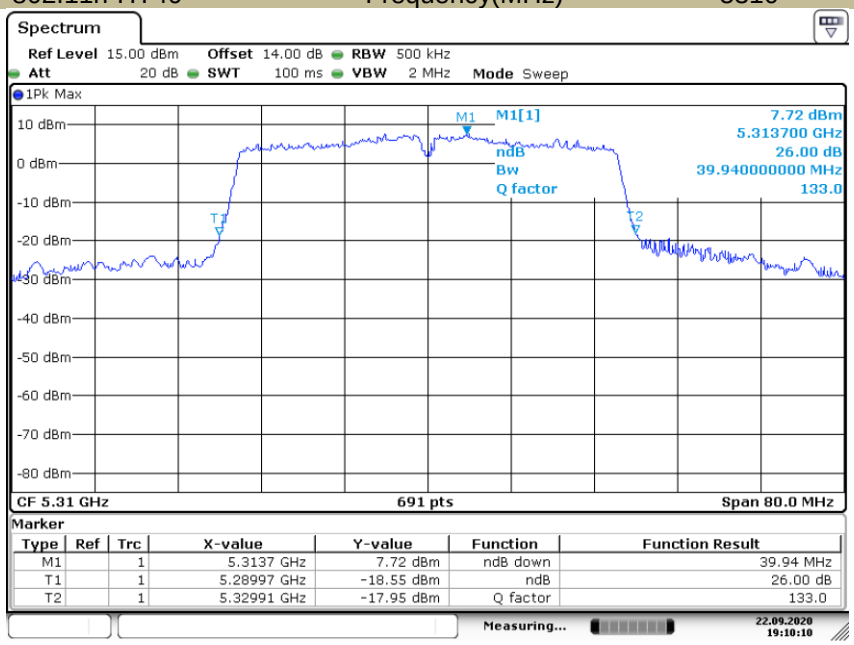

Date: 22.SEP.2020 19:04:35

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5270 |



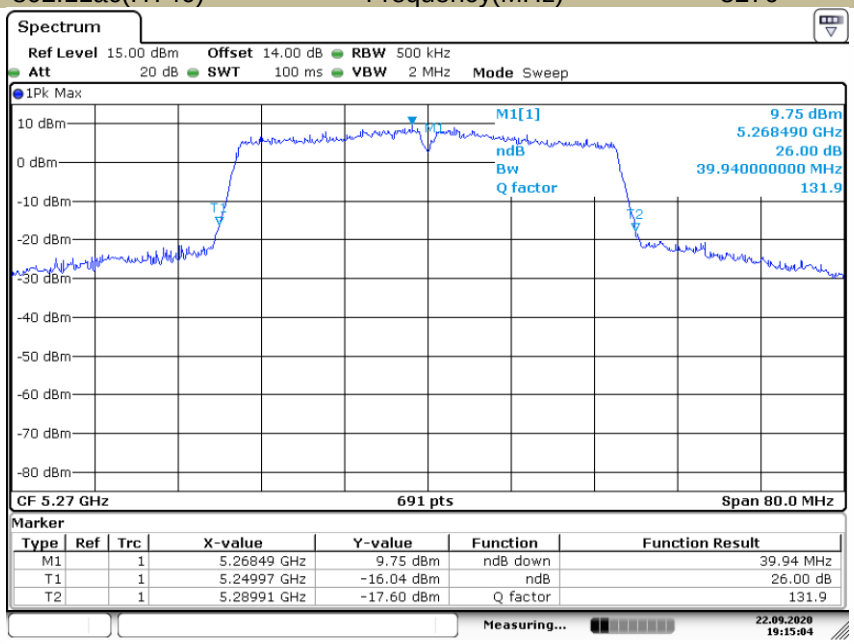

Date: 22.SEP.2020 19:09:35

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11n-HT40 | Frequency(MHz) | 5310 |



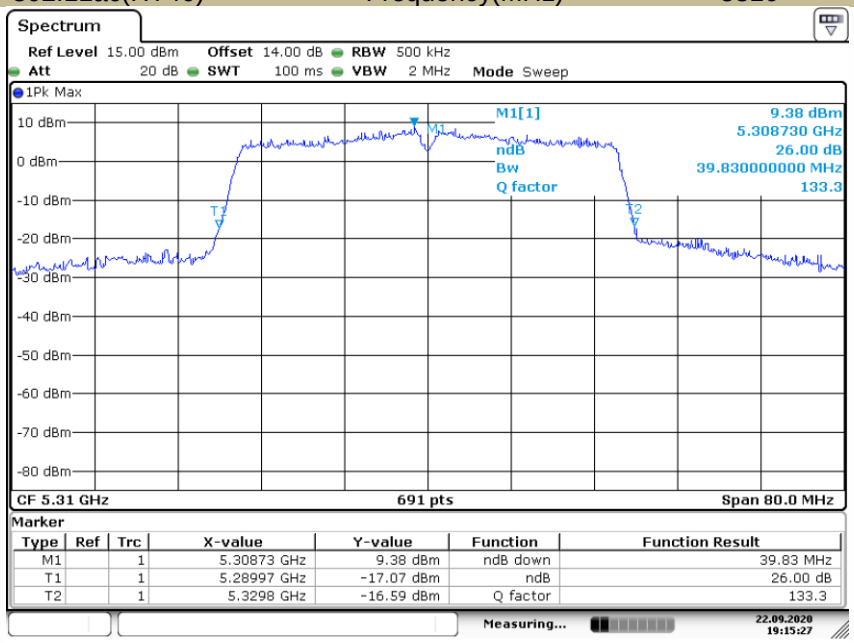

Date: 22.SEP.2020 19:10:10

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5270 |



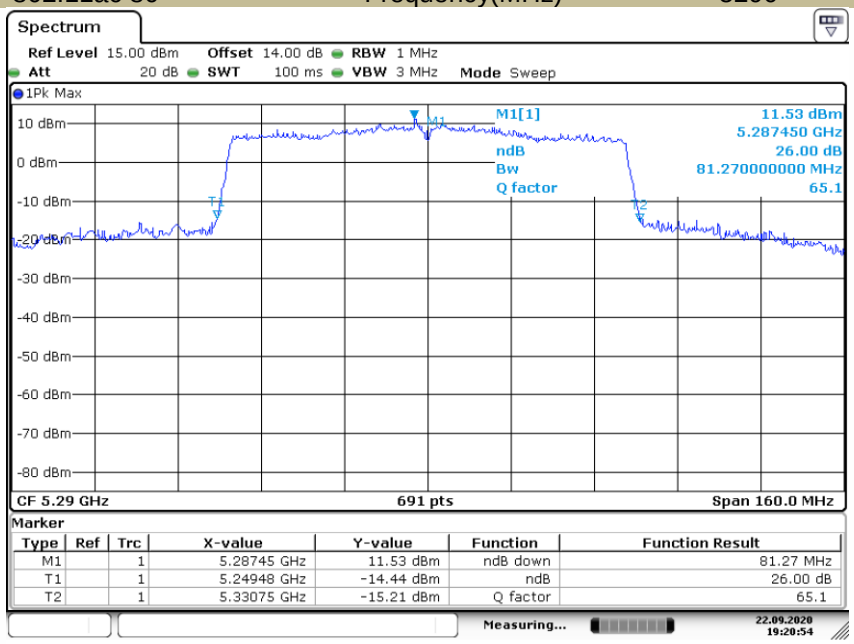

Date: 22.SEP.2020 19:15:03

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac(HT40) | Frequency(MHz) | 5310 |




Date: 22.SEP.2020 19:15:27

| 26dB Emission Bandwidth | | U-NII – 2A | |
|---|---|---|---|
| Test Model | 802.11ac 80 | Frequency(MHz) | 5290 |




Date: 22.SEP.2020 19:20:54

*5470-5725MHz*

| Test Mode | Test Channel MHz | | 26dB Bandwidth MHz | 99% Bandwidth MHz | Verdict |
|---|---|---|---|---|---|
| 802.11a | CH100 | 5500 | 21.360 | 17.077 | Pass |
| | CH116 | 5600 | 21.418 | 17.077 | Pass |
| | CH140 | 5700 | 21.592 | 17.077 | Pass |
| 802.11n-HT20 | CH100 | 5500 | 21.881 | 18.234 | Pass |
| | CH116 | 5600 | 21.881 | 18.119 | Pass |
| | CH140 | 5700 | 21.708 | 18.119 | Pass |
| 802.11ac(HT20) | CH100 | 5500 | 21.418 | 17.887 | Pass |
| | CH116 | 5600 | 21.071 | 17.887 | Pass |
| | CH140 | 5700 | 21.476 | 17.945 | Pass |
| 802.11n-HT40 | CH102 | 5510 | 39.710 | 36.353 | Pass |
| | CH134 | 5670 | 40.060 | 36.353 | Pass |
| 802.11ac(HT40) | CH102 | 5510 | 39.830 | 36.469 | Pass |
| | CH134 | 5670 | 40.060 | 36.469 | Pass |
| 802.11ac(HT80) | CH106 | 5530 | 81.270 | 75.716 | Pass |