

TEST REPORT

FCC ID: 2AATL-8223A-SR

Product: WIFI+BT Module

Model No.: 8223A-SR

Additional Model No.: N/A

Trade Mark: FN-LINK

Report No.: TCT171018E032

Issued Date: December 06, 2017

Issued for:

FN-LINK TECHNOLOGY LIMITED

No.8, Litong Road, Liuyang Economic Development Zone, Liuyang City,
Hunan Province, China

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

| | |
|------------------------------|--|
| Product: | WIFI+BT Module |
| Model No.: | 8223A-SR |
| Additional Model No.: | N/A |
| Trade Mark: | FN-LINK |
| Applicant: | FN-LINK TECHNOLOGY LIMITED |
| Address: | No.8, Litong Road, Liuyang Economic Development Zone, Liuyang City, Hunan Province, China |
| Manufacturer: | FN-LINK TECHNOLOGY LIMITED |
| Address: | No.8, Litong Road, Liuyang Economic Development Zone, Liuyang City, Hunan Province, China |
| Date of Test: | November 06, 2017 to December 05, 2017 |
| Applicable Standards: | FCC CFR Title 47 Part 15 Subpart E Section 15.407: 2016 KDB789033 D02 General U-NII Test Procedures New Rules v01r04 |

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Brews Xu

Date: December 05, 2017

Brews Xu

Reviewed By:

Joe Zhou

Date: December 06, 2017

Joe Zhou

Approved By:

Tomsin

Date: December 06, 2017

Tomsin



2. Test Result Summary

| Requirement | CFR 47 Section | Result |
|--|-----------------------|--------|
| Antenna requirement | §15.203 | PASS |
| AC Power Line Conducted Emission | §15.207 | PASS |
| Maximum Conducted Output Power | §15.407(a) §2.1046 | PASS |
| 6dB Emission Bandwidth | §15.407(a) §2.1049 | PASS |
| 26dB Emission Bandwidth & 99% Occupied Bandwidth | §15.407(a) §2.1049 | PASS |
| Power Spectral Density | §15.407(a) | PASS |
| Band edge | §15.407(a) | PASS |
| Radiated Emission | §15.407(a) §2.1053 | PASS |
| Frequency Stability | §15.407(g) §2.1055 | PASS |

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

| | |
|-------------------------------|--|
| Product: | WIFI+BT Module |
| Model No.: | 8223A-SR |
| Additional Model No.: | N/A |
| Trade Mark: | FN-LINK |
| Operation Frequency: | Band I: 5150~5250MHz Band IV: 5725~5850MHz |
| Channel Bandwidth: | 802.11a: 20MHz 802.11n: 40MHz 802.11ac: 80MHz |
| Modulation Technology: | OFDM |
| Modulation Type | CCK, DQPSK, DBPSK for 802.11a 64-QAM,16-QAM, QPSK, BPSK for 802.11n 256-QAM,64-QAM,16-QAM, QPSK BPSK for 802.11ac |
| Antenna Type: | Please refer to below antenna information. |
| Antenna Gain: | Please refer to below antenna information. |
| Power Supply: | DC 3.3V |
| Adapter: | N/A |
| Remark: | N/A |

Antenna Information

| Ant. | Brand | Model name | Antenna Type | Connector | Gain (dBi) | Application range |
|------|-------------------|-----------------------|--------------|-----------|------------|---------------------|
| 1 | XK | XKFPC-2D4-5D8 -150 | PIFA | I-PEX | 0.0 | 2.4G Band |
| | | | | | 2.95 | 5G Band |
| 2 | ZHONGTI AN XUN | 2.00001050 | PIFA | I-PEX | 0.38 | 2.4/5G Dual Band |

Note: The EUT has only one type antenna, so all tests were based on the maximum Gain antenna.

Operation Frequency each of channel

| 20MHz | | 40MHz | | 80MHz | |
|---------|-----------------|---------|-----------------|---------|-----------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 36 | 5180 | 38 | 5190 | 42 | 5210 |
| 40 | 5200 | 46 | 5230 | 155 | 5775 |
| 44 | 5220 | 151 | 5755 | | |
| 48 | 5240 | 159 | 5790 | | |
| 149 | 5745 | | | | |
| 153 | 5765 | | | | |
| 157 | 5785 | | | | |
| 161 | 5805 | | | | |
| 165 | 5825 | | | | |

Note:

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

For 802.11a/n (HT20)/ac(VHT20)

| Band I (5150 - 5250 MHz) | | | Band IV (5725 - 5850 MHz) | | |
|--------------------------|---------|-----------------|---------------------------|---------|-----------------|
| Channel Number | Channel | Frequency (MHz) | Channel Number | Channel | Frequency (MHz) |
| 36 | Low | 5180 | 149 | Low | 5745 |
| 40 | Mid | 5200 | 157 | Mid | 5785 |
| 48 | High | 5240 | 165 | High | 5825 |

For 802.11n (HT40)/ac(VHT40)

| Band I (5150 - 5250 MHz) | | | Band IV (5725 - 5850 MHz) | | |
|--------------------------|---------|-----------------|---------------------------|---------|-----------------|
| Channel Number | Channel | Frequency (MHz) | Channel Number | Channel | Frequency (MHz) |
| 38 | Low | 5190 | 151 | Low | 5755 |
| 46 | High | 5230 | 159 | High | 5795 |

For 802.11ac (VHT80)

| Band I (5150 - 5250 MHz) | | | Band IV (5725 - 5850 MHz) | | |
|--------------------------|---------|-----------------|---------------------------|---------|-----------------|
| Channel Number | Channel | Frequency (MHz) | Channel Number | Channel | Frequency (MHz) |
| 42 | / | 5210 | 155 | / | 5775 |

4. Genera Information

4.1. Test environment and mode

| Operating Environment: | |
|---|--|
| Temperature: | 25.0 °C |
| Humidity: | 56 % RH |
| Atmospheric Pressure: | 1010 mbar |
| Test Mode: | |
| Engineering mode: | Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%) |
| <p>The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p> | |

| <p>We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:</p> | |
|---|---|
| Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case. | |
| Mode | Data rate |
| 802.11a | 6 Mbps |
| 802.11n(HT20)/ac(VHT20) | MCS0 |
| 802.11n(HT40)/ac(VHT40) | MCS0 |
| 802.11ac(VHT80) | MCS0 |
| Final Test Mode: | |
| Operation mode: | Keep the EUT in continuous transmitting with modulation |

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|--------------|-----------|------------|--------|------------|
| Test Fixture | N/A | N/A | N/A | FN-LINK |
| Notebook PC | G485 | N/A | N/A | Lenovo |

Note:

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.
3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

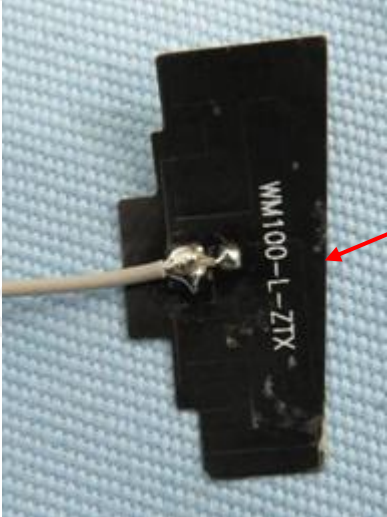
5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

| No. | Item | MU |
|-----|-------------------------------|-------------------------|
| 1 | Conducted Emission | $\pm 2.56\text{dB}$ |
| 2 | RF power, conducted | $\pm 0.12\text{dB}$ |
| 3 | Spurious emissions, conducted | $\pm 0.11\text{dB}$ |
| 4 | All emissions, radiated(<1G) | $\pm 3.92\text{dB}$ |
| 5 | All emissions, radiated(>1G) | $\pm 4.28\text{dB}$ |
| 6 | Temperature | $\pm 0.1^\circ\text{C}$ |
| 7 | Humidity | $\pm 1.0\%$ |

6. Test Results and Measurement Data

6.1. Antenna requirement

| | |
|---|-------------------------------------|
| Standard requirement: | FCC Part15 C Section 15.203 /247(c) |
| 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. | |
| E.U.T Antenna: | |
| The WIFI antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 1.83dBi . | |
|  | |

6.2. Conducted Emission

6.2.1. Test Specification

| Test Requirement: | FCC Part15 C Section 15.207 | | | | | | | | | | | | | | |
|--------------------------|---|-----------------------|--------------|--|------------|---------|----------|-----------|-----------|-------|----|----|------|----|----|
| Test Method: | ANSI C63.10:2013 | | | | | | | | | | | | | | |
| Frequency Range: | 150 kHz to 30 MHz | | | | | | | | | | | | | | |
| Receiver setup: | RBW=9 kHz, VBW=30 kHz, Sweep time=auto | | | | | | | | | | | | | | |
| Limits: | <table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> | Frequency range (MHz) | Limit (dBuV) | | Quasi-peak | Average | 0.15-0.5 | 66 to 56* | 56 to 46* | 0.5-5 | 56 | 46 | 5-30 | 60 | 50 |
| Frequency range (MHz) | Limit (dBuV) | | | | | | | | | | | | | | |
| | Quasi-peak | Average | | | | | | | | | | | | | |
| 0.15-0.5 | 66 to 56* | 56 to 46* | | | | | | | | | | | | | |
| 0.5-5 | 56 | 46 | | | | | | | | | | | | | |
| 5-30 | 60 | 50 | | | | | | | | | | | | | |
| Test Setup: | <p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p> | | | | | | | | | | | | | | |
| Test Mode: | Tx Mode | | | | | | | | | | | | | | |
| Test Procedure: | <ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. | | | | | | | | | | | | | | |
| Test Result: | PASS | | | | | | | | | | | | | | |

6.2.2. Test Instruments

| Conducted Emission Shielding Room Test Site (843) | | | | |
|---|-----------------------|-----------|---------------|-----------------|
| Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Test Receiver | R&S | ESPI | 101401 | Jun. 12, 2018 |
| LISN | Schwarzbeck | NSLK 8126 | 8126453 | Sep. 27, 2018 |
| Coax cable (9KHz-30MHz) | TCT | CE-05 | N/A | Sep. 27, 2018 |
| EMI Test Software | Shurple Technology | EZ-EMC | N/A | N/A |

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.2. Test Instruments

| RF Test Room | | | | |
|--------------------------|--------------|--------|---------------|-----------------|
| Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | Agilent | N9020A | MY49100060 | Sep. 27, 2018 |
| Power Meter | Agilent | N1911A | MY45101557 | Sep. 27, 2018 |
| Power Sensor | Agilent | N1922A | MY44124432 | Sep. 27, 2018 |
| RF Cable (9KHz-40GHz) | TCT | RE-03 | N/A | Sep. 27, 2018 |
| Antenna Connector | TCT | RFC-03 | N/A | Sep. 27, 2018 |

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

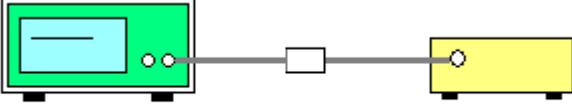
| Configuration Band I (5150 - 5250 MHz) | | | | |
|--|--------------|--------------------------------------|-----------------|--------|
| Mode | Test channel | Maximum Conducted Output Power (dBm) | FCC Limit (dBm) | Result |
| 11a | CH36 | 17.56 | 24 | PASS |
| 11a | CH40 | 17.39 | 24 | PASS |
| 11a | CH48 | 19.80 | 24 | PASS |
| 11n(HT20) | CH36 | 15.25 | 24 | PASS |
| 11n(HT20) | CH40 | 15.16 | 24 | PASS |
| 11n(HT20) | CH48 | 17.47 | 24 | PASS |
| 11n(HT40) | CH38 | 15.23 | 24 | PASS |
| 11n(HT40) | CH46 | 17.34 | 24 | PASS |
| 11ac(VHT20) | CH36 | 15.41 | 24 | PASS |
| 11ac(VHT20) | CH40 | 15.46 | 24 | PASS |
| 11ac(VHT20) | CH48 | 17.31 | 24 | PASS |
| 11ac(VHT40) | CH38 | 15.19 | 24 | PASS |
| 11ac(VHT40) | CH46 | 17.23 | 24 | PASS |
| 11ac(VHT80) | CH42 | 18.19 | 24 | PASS |

Configuration Band IV (5725 - 5850 MHz)

| Mode | Test channel | Maximum Conducted Output Power (dBm) | FCC Limit (dBm) | Result |
|-------------|--------------|--------------------------------------|-----------------|--------|
| 11a | CH149 | 17.56 | 30 | PASS |
| 11a | CH157 | 16.45 | 30 | PASS |
| 11a | CH165 | 16.89 | 30 | PASS |
| 11n (HT20) | CH149 | 19.40 | 30 | PASS |
| 11n (HT20) | CH157 | 18.45 | 30 | PASS |
| 11n (HT20) | CH165 | 18.91 | 30 | PASS |
| 11n (HT40) | CH151 | 17.51 | 30 | PASS |
| 11n (HT40) | CH159 | 16.81 | 30 | PASS |
| 11ac(VHT20) | CH149 | 17.48 | 30 | PASS |
| 11ac(VHT20) | CH157 | 16.30 | 30 | PASS |
| 11ac(VHT20) | CH165 | 16.90 | 30 | PASS |
| 11ac(VHT40) | CH151 | 17.45 | 30 | PASS |
| 11ac(VHT40) | CH159 | 16.48 | 30 | PASS |
| 11ac(VHT80) | CH155 | 18.22 | 30 | PASS |

6.4. 6dB Emission Bandwidth

6.4.1. Test Specification

| | |
|--------------------------|---|
| Test Requirement: | FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049 |
| Test Method: | KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C |
| Limit: | >500kHz |
| Test Setup: |  <p style="text-align: center;">Spectrum Analyzer EUT</p> |
| Test Mode: | Transmitting mode with modulation |
| Test Procedure: | <ol style="list-style-type: none"> 1. KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report. |
| Test Result: | PASS |

6.4.2. Test Instruments

| RF Test Room | | | | |
|--------------------------|-------------------|--------|---------------|-----------------|
| Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | ROHDE&SCH WARZ | FSQ | 200061 | Sep. 27, 2018 |
| RF Cable (9KHz-40GHz) | TCT | RE-03 | N/A | Sep. 27, 2018 |
| Antenna Connector | TCT | RFC-03 | N/A | Sep. 27, 2018 |

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

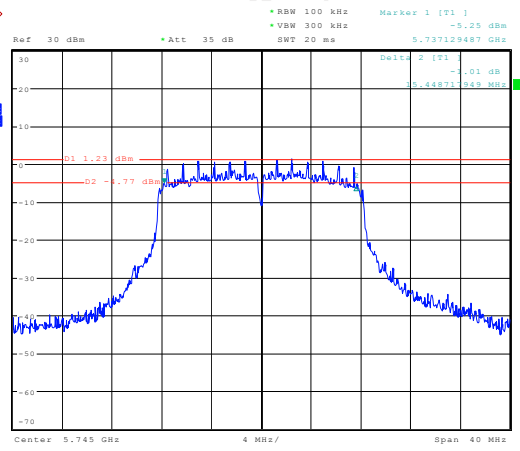
6.4.3. Test data

| Band IV (5725 - 5850 MHz) | | | | | |
|----------------------------|--------------|-----------------|----------------------|-------------|--------|
| Mode | Test channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
| 11a | CH149 | 5745 | 15.45 | 0.5 | PASS |
| 11a | CH157 | 5785 | 15.48 | 0.5 | PASS |
| 11a | CH161 | 5825 | 15.27 | 0.5 | PASS |
| 11n(HT20) | CH149 | 5745 | 15.24 | 0.5 | PASS |
| 11n(HT20) | CH157 | 5785 | 15.63 | 0.5 | PASS |
| 11n(HT20) | CH161 | 5825 | 15.19 | 0.5 | PASS |
| 11n(HT40) | CH151 | 5755 | 35.64 | 0.5 | PASS |
| 11n(HT40) | CH159 | 5795 | 35.26 | 0.5 | PASS |
| 11ac(VHT20) | CH149 | 5745 | 15.26 | 0.5 | PASS |
| 11ac(VHT20) | CH157 | 5785 | 15.31 | 0.5 | PASS |
| 11ac(VHT20) | CH165 | 5825 | 15.32 | 0.5 | PASS |
| 11ac(VHT40) | CH151 | 5755 | 35.13 | 0.5 | PASS |
| 11ac(VHT40) | CH159 | 5795 | 35.26 | 0.5 | PASS |
| 11ac(VHT80) | CH155 | 5775 | 76.07 | 0.5 | PASS |

Test plots as follows:

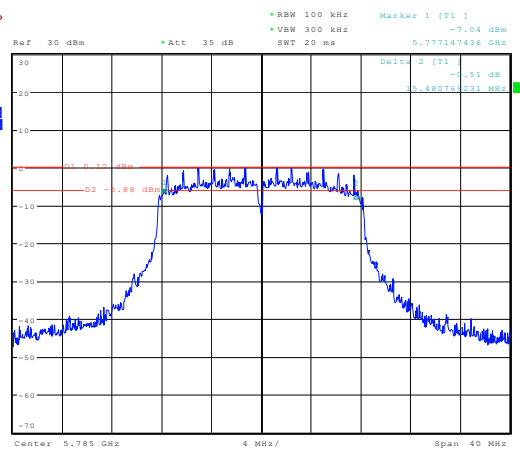
Band IV (5725 – 5850 MHz)

802.11a



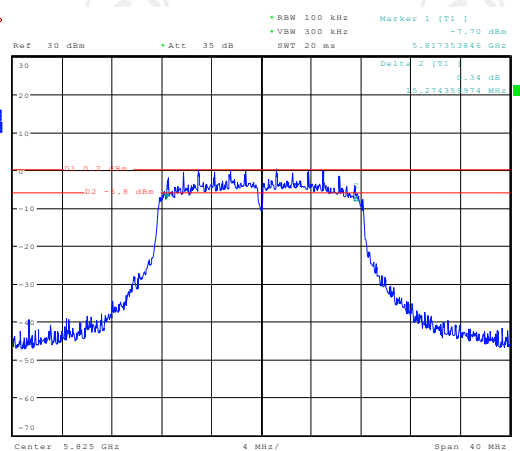
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Low



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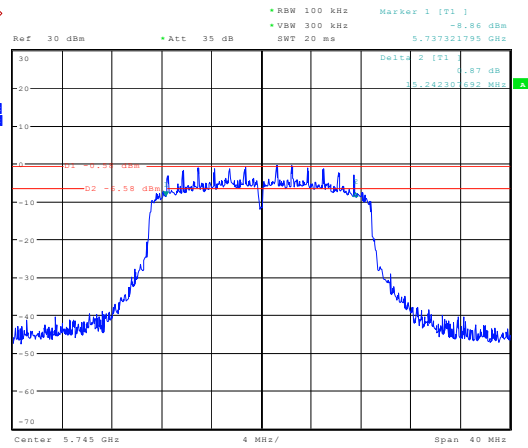
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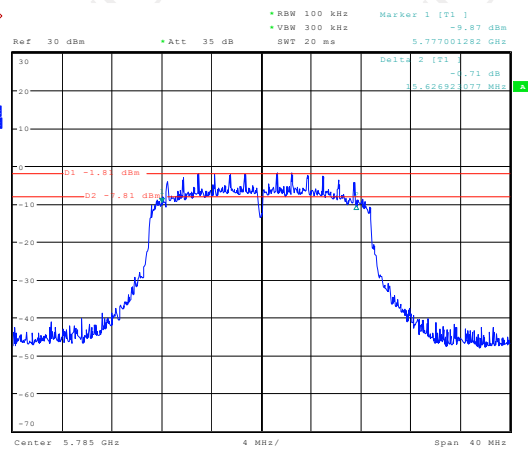
High

802.11n(HT20)



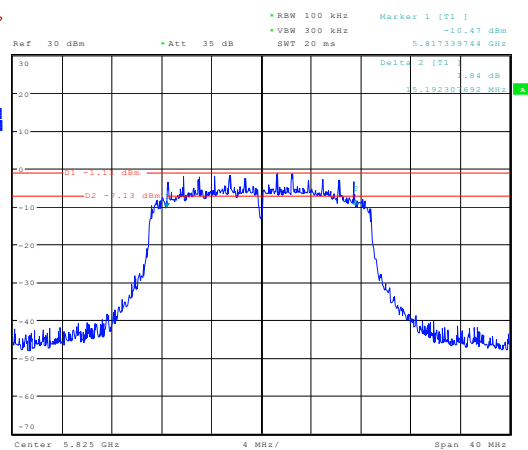
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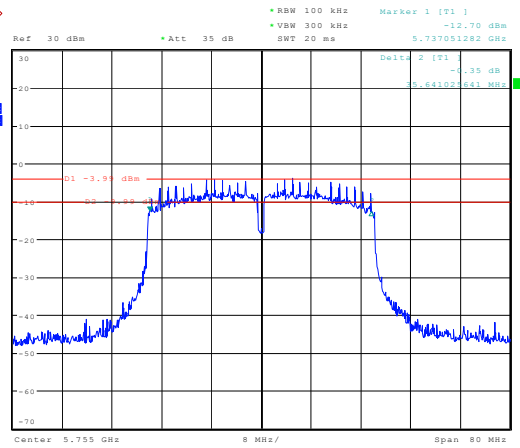
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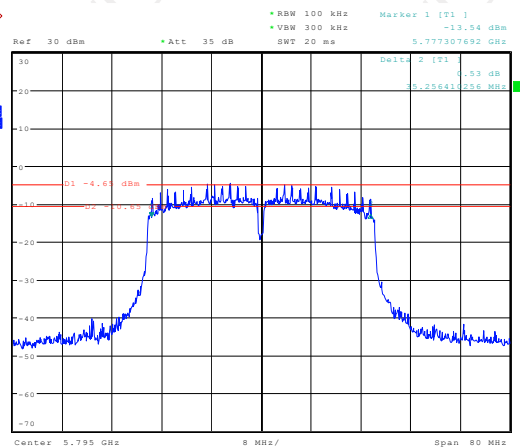
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802.11n(HT40)



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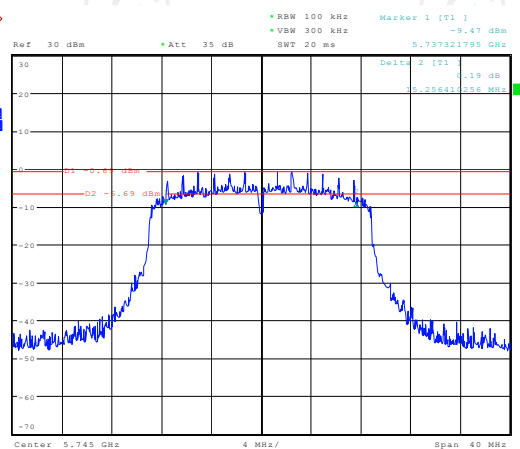
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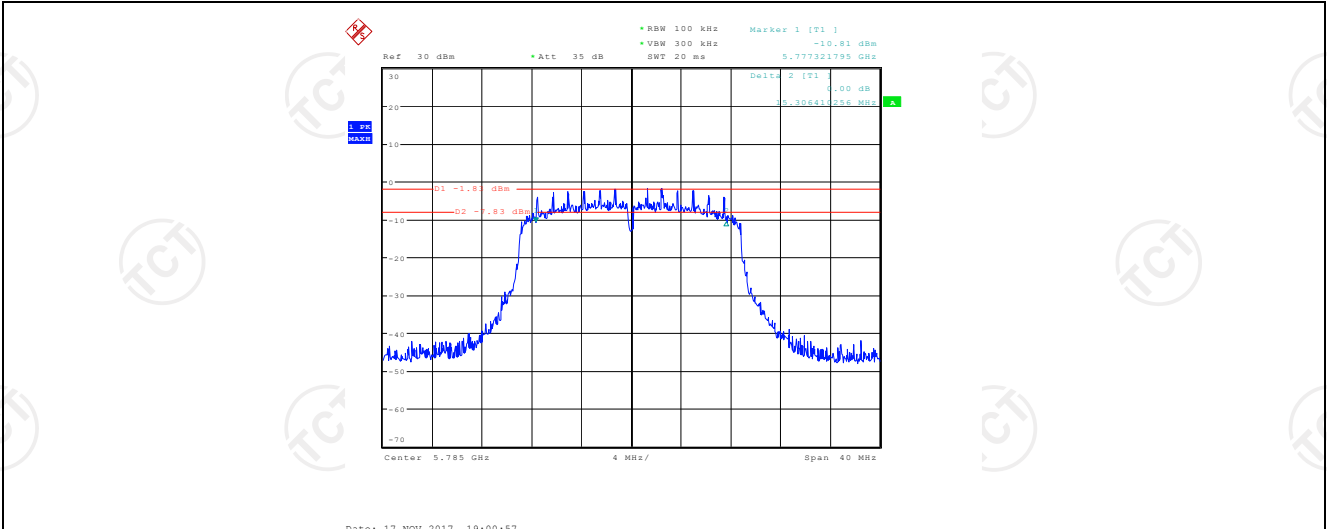
High

802.11ac(VHT20)

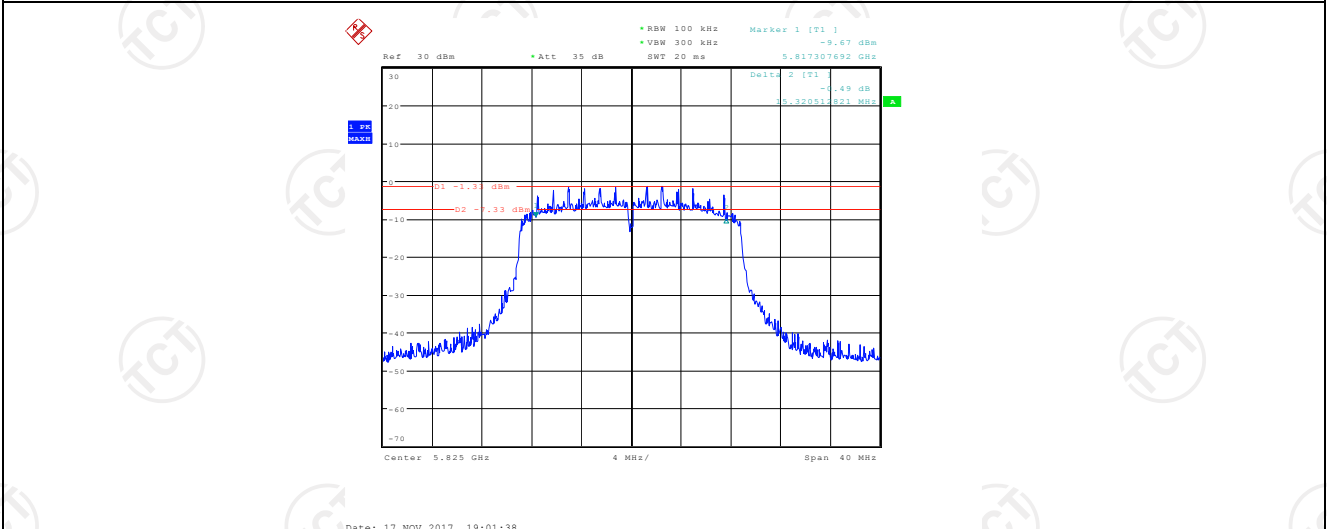


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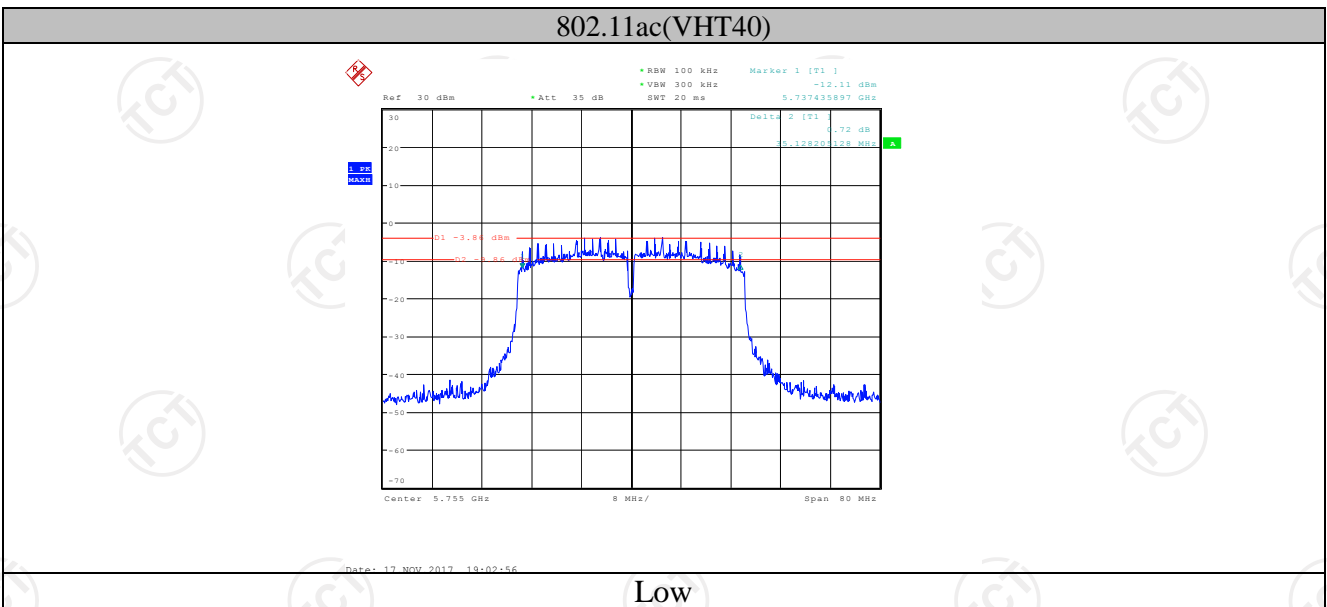
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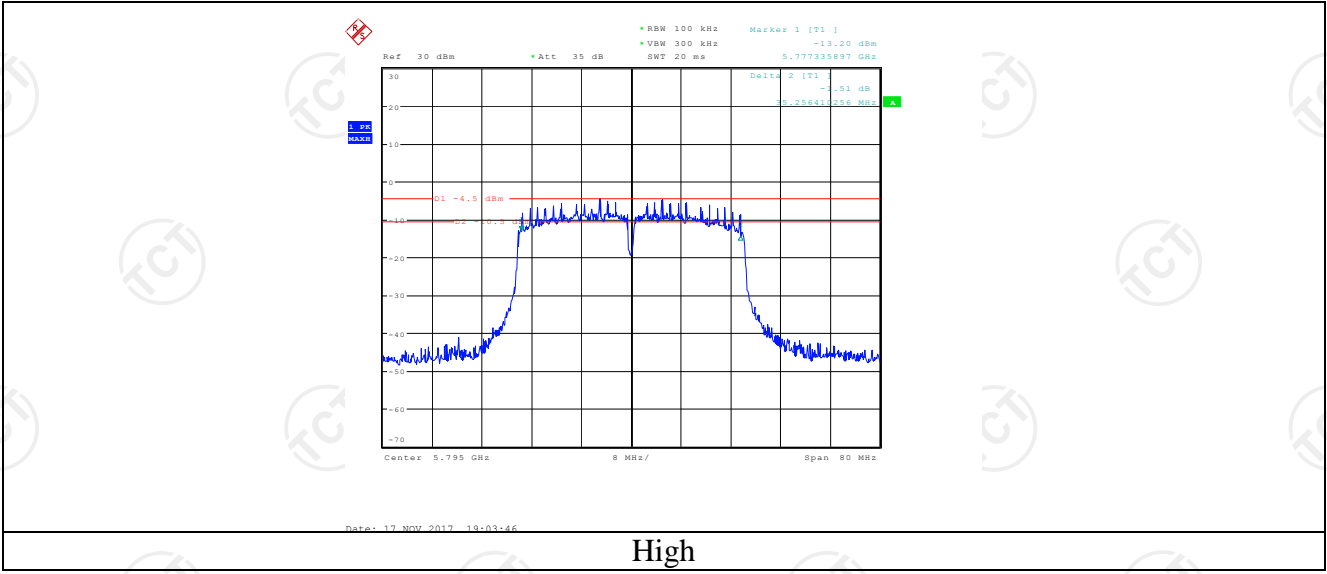


Mid

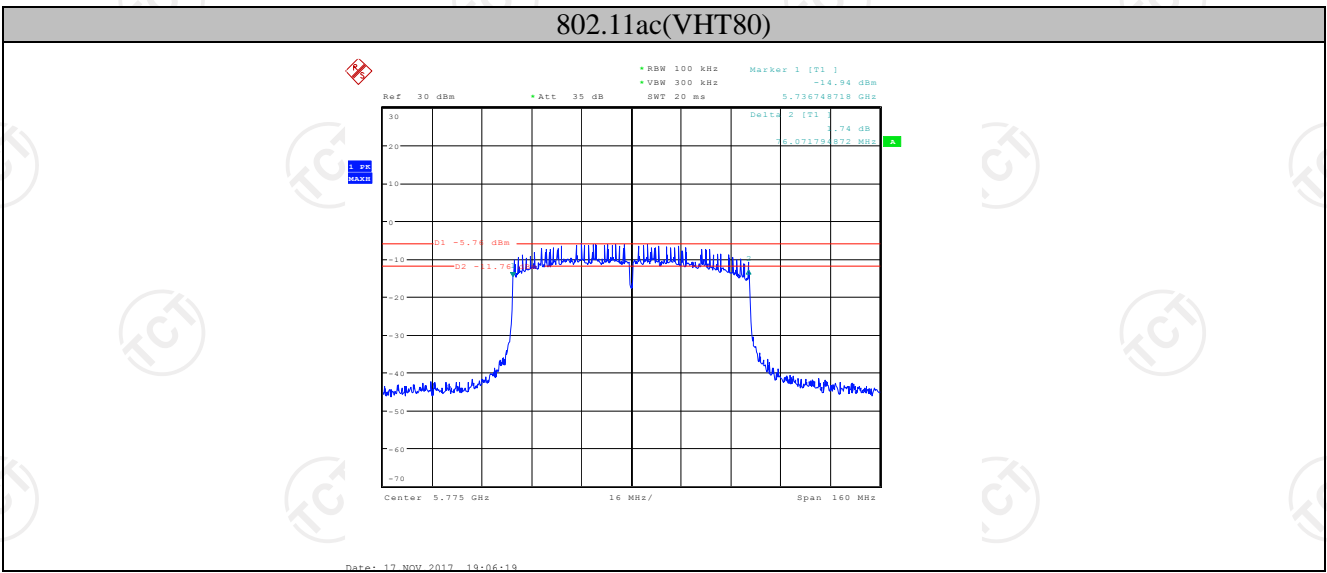


High





High



6.5.3. Test data

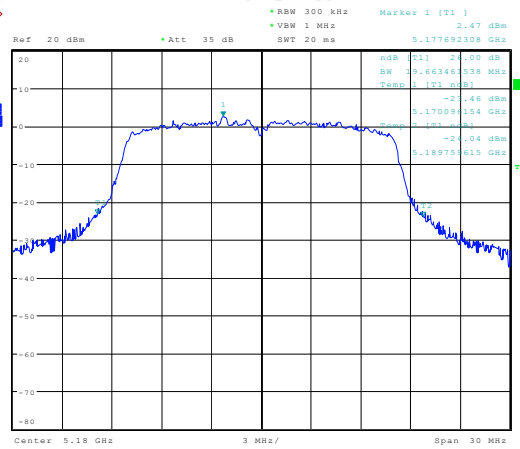
Band I

| Mode | Test channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|-------------|--------------|-----------------|-----------------------|---------------------|
| 11a | CH36 | 5180 | 19.66 | 16.39 |
| 11a | CH40 | 5200 | 19.57 | 16.39 |
| 11a | CH48 | 5240 | 19.42 | 16.39 |
| 11n(HT20) | CH36 | 5180 | 20.72 | 17.50 |
| 11n(HT20) | CH40 | 5200 | 20.87 | 17.50 |
| 11n(HT20) | CH48 | 5240 | 20.77 | 17.45 |
| 11n(HT40) | CH38 | 5190 | 45.87 | 36.44 |
| 11n(HT40) | CH46 | 5230 | 45.29 | 36.35 |
| 11ac(VHT20) | CH36 | 5180 | 20.77 | 17.50 |
| 11ac(VHT20) | CH40 | 5200 | 20.82 | 17.50 |
| 11ac(VHT20) | CH48 | 5240 | 20.82 | 17.45 |
| 11ac(VHT40) | CH38 | 5190 | 45.19 | 36.34 |
| 11ac(VHT40) | CH46 | 5230 | 43.27 | 36.25 |
| 11ac(VHT80) | CH42 | 5210 | 82.12 | 75.19 |

Test plots as follows:

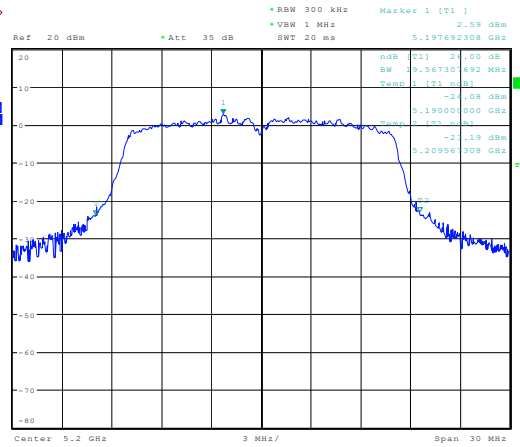
Band I (5150 – 5250 MHz) 26dB Bandwidth

802.11a



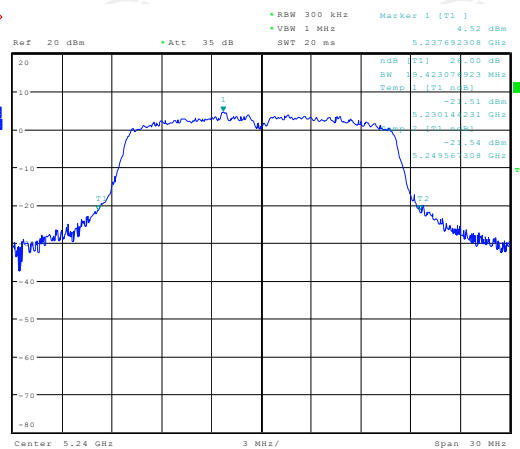
Date: 10 NOV 2017 17:35:12

Low



Date: 10 NOV 2017 17:36:07

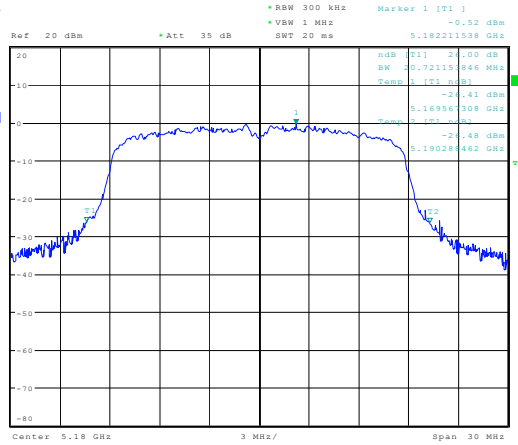
Mid



Date: 10 NOV 2017 17:37:06

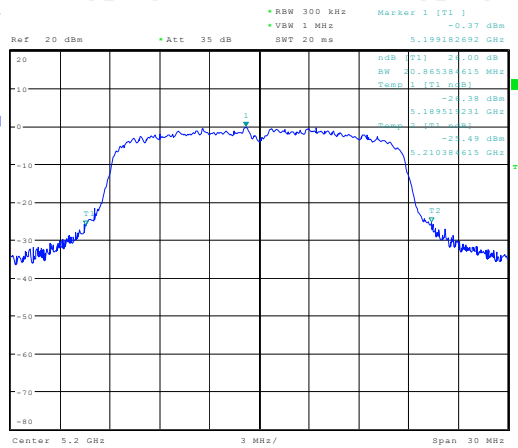
High

802.11n(HT20)



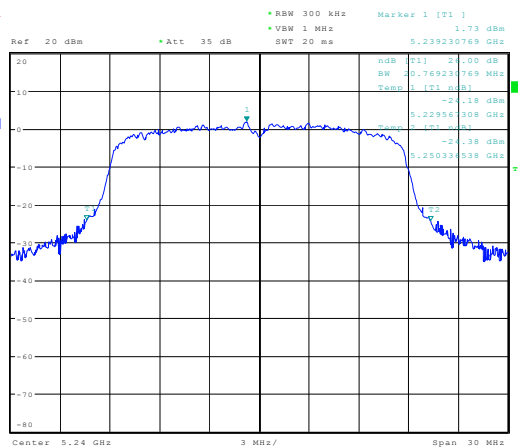
Date: 10 NOV 2017 17:38:04

Low



Date: 10 NOV 2017 17:38:03

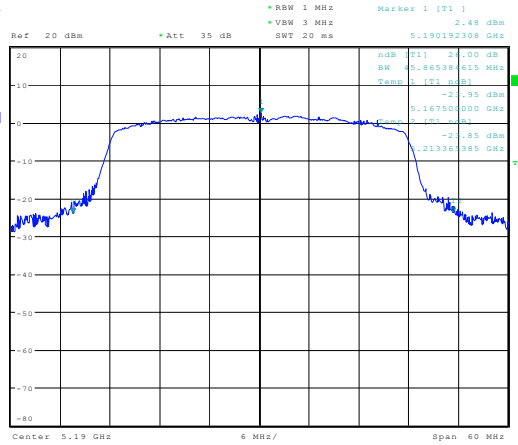
Mid



Date: 10 NOV 2017 17:40:09

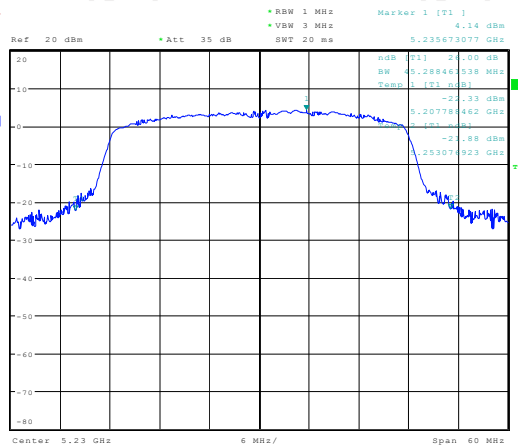
High

802.11n(HT40)



Date: 10 NOV 2017 17:44:44

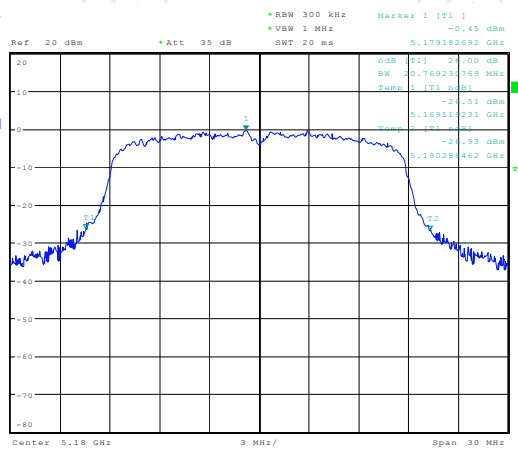
Low



Date: 10 NOV 2017 17:45:54

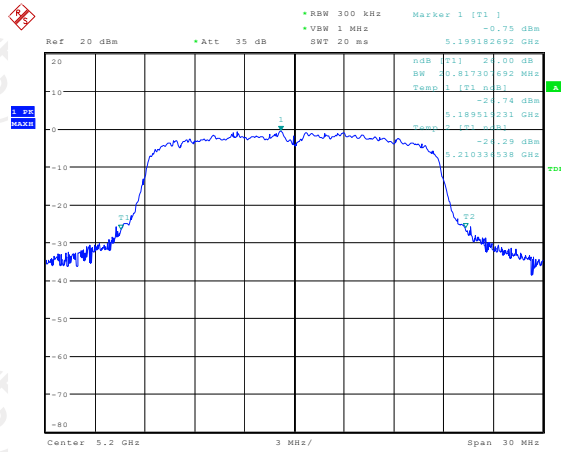
High

802.11ac(VHT20)



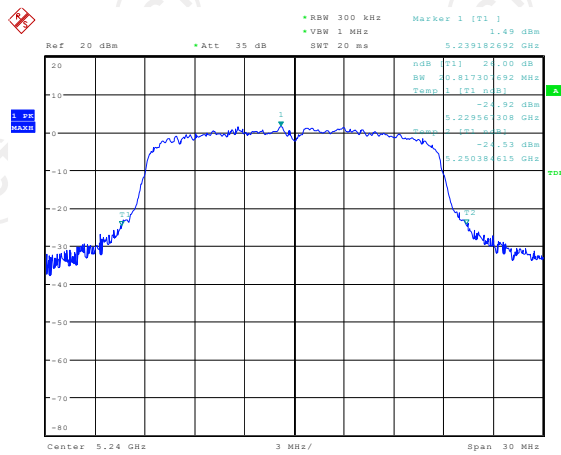
Date: 10 NOV 2017 17:41:20

Low



Date: 10 NOV 2017 17:42:14

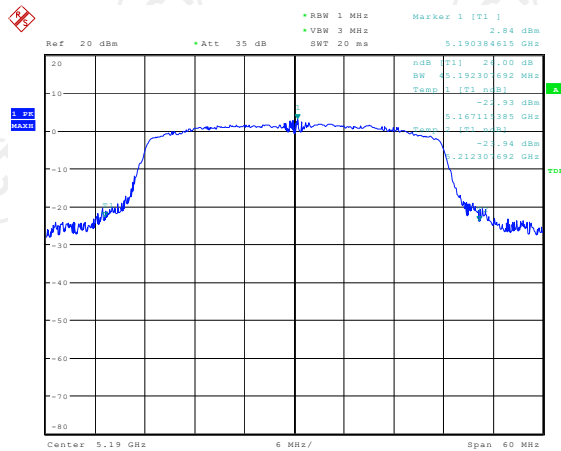
Mid



Date: 10 NOV 2017 17:43:21

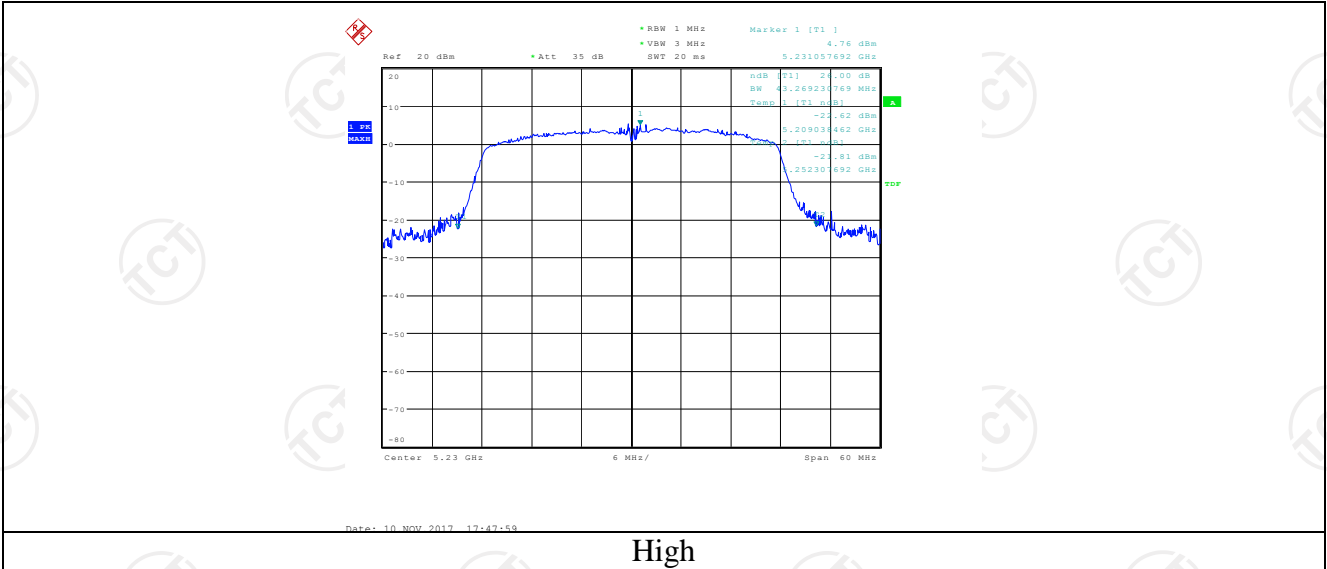
High

802.11ac(VHT40)

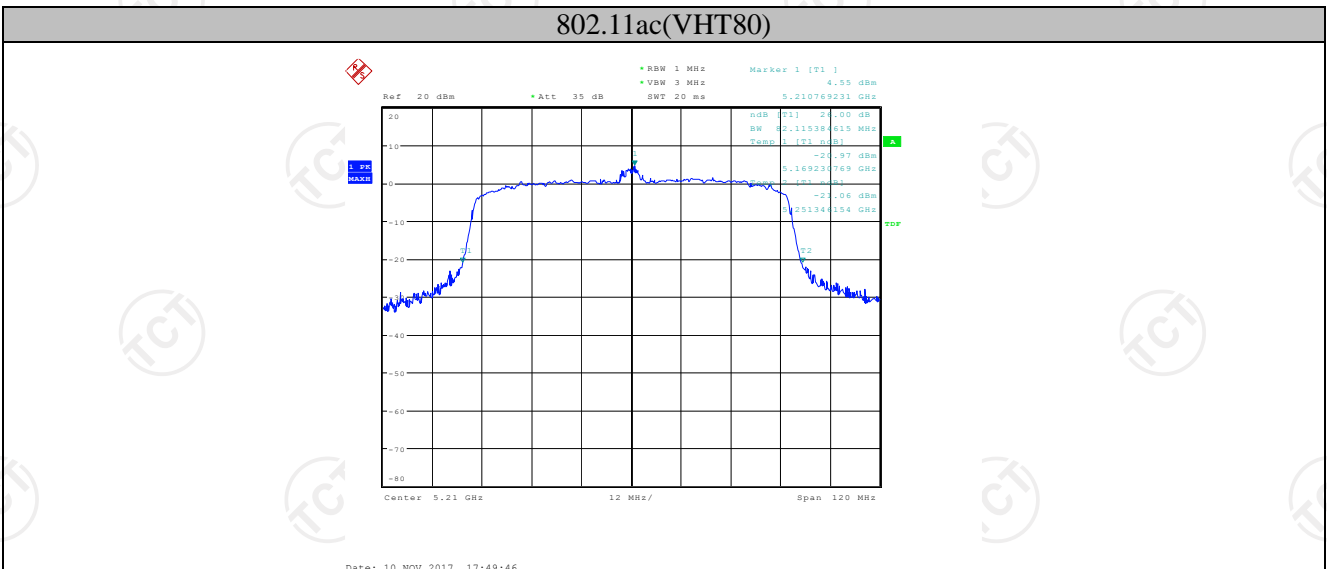


Date: 10 NOV 2017 17:47:01

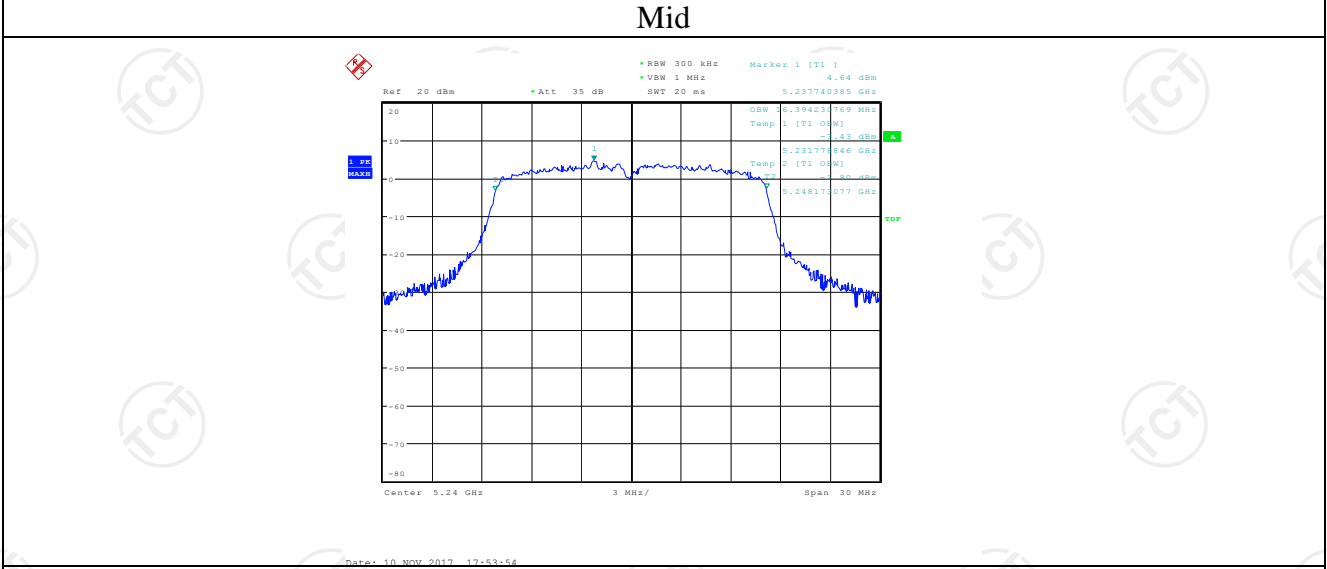
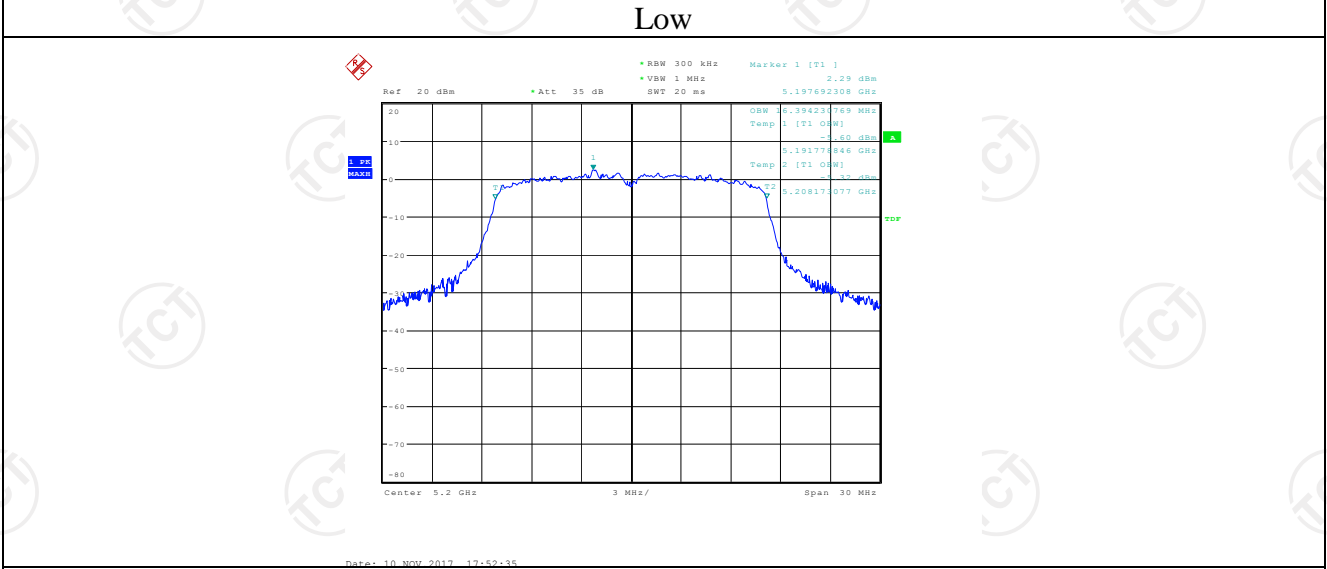
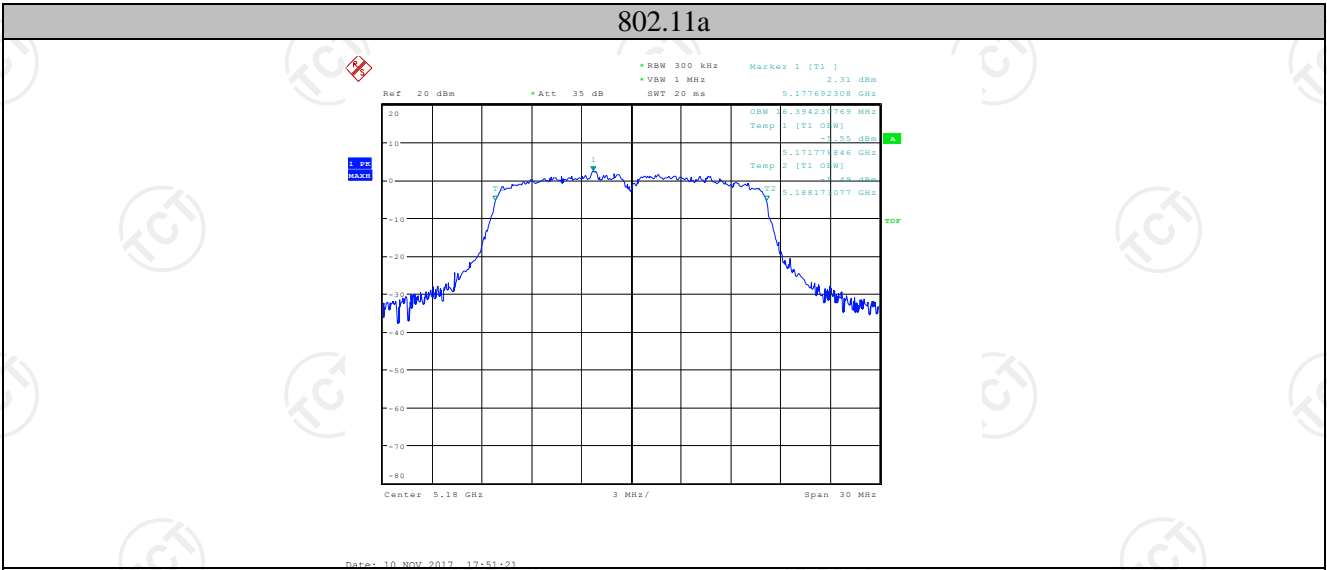
Low



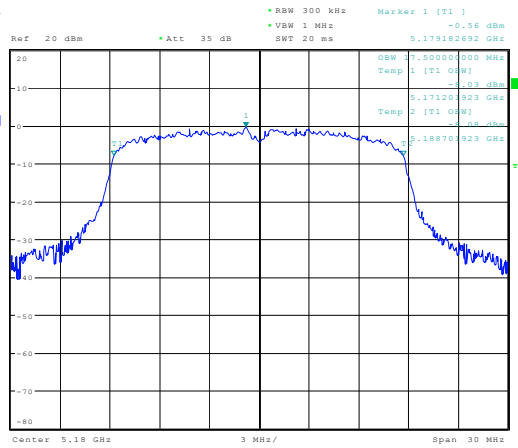
High



Band I (5150 – 5250 MHz) 99% Bandwidth

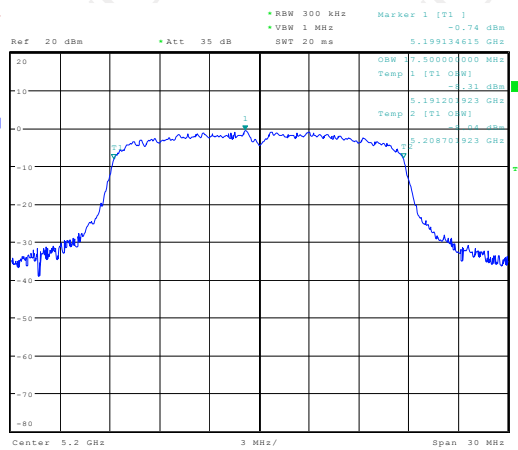


802.11n(HT20)



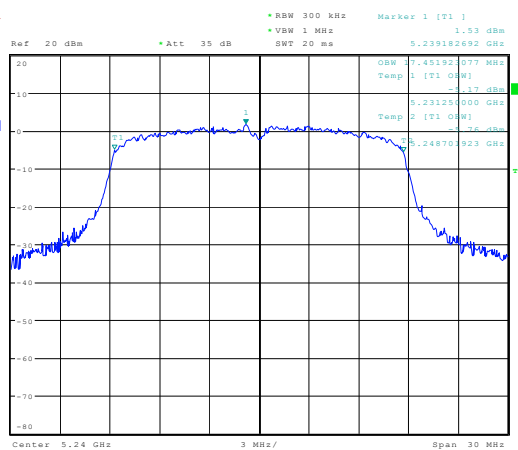
Date: 10 NOV 2017 17:54:44

Low



Date: 10 NOV 2017 17:55:38

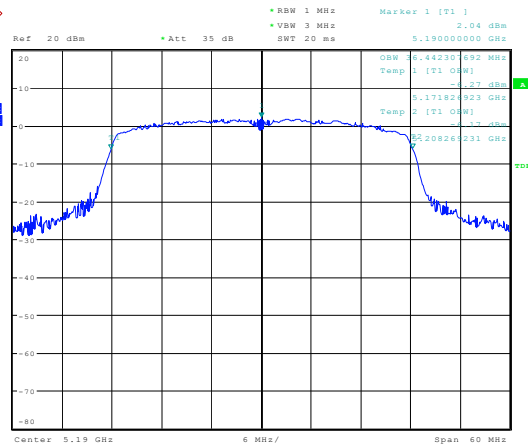
Mid



Date: 10 NOV 2017 17:56:57

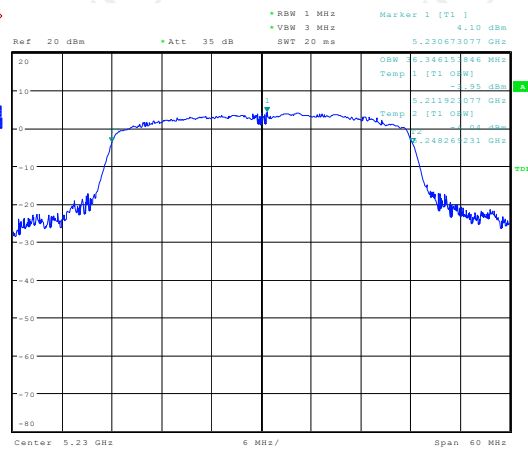
High

802.11n(HT40)



Date: 10 NOV 2017 18:02:05

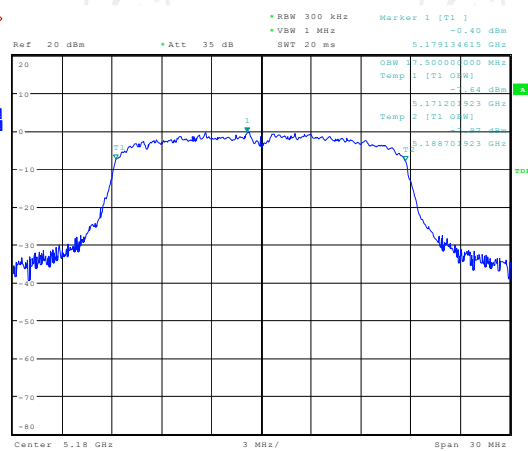
Low



Date: 10 NOV 2017 18:03:14

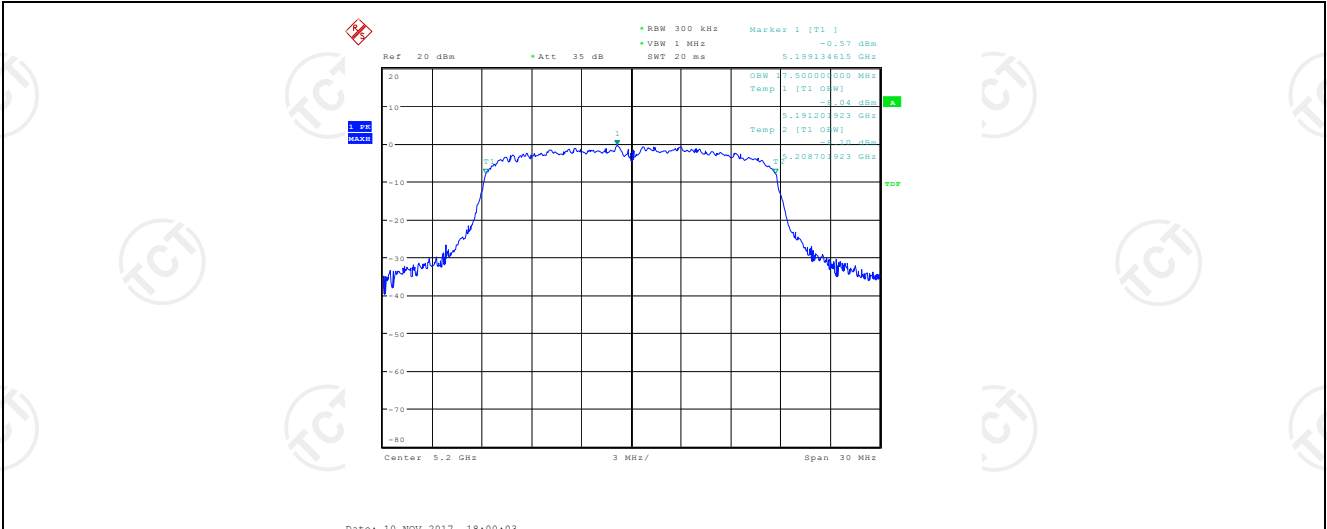
High

802.11ac(VHT20)

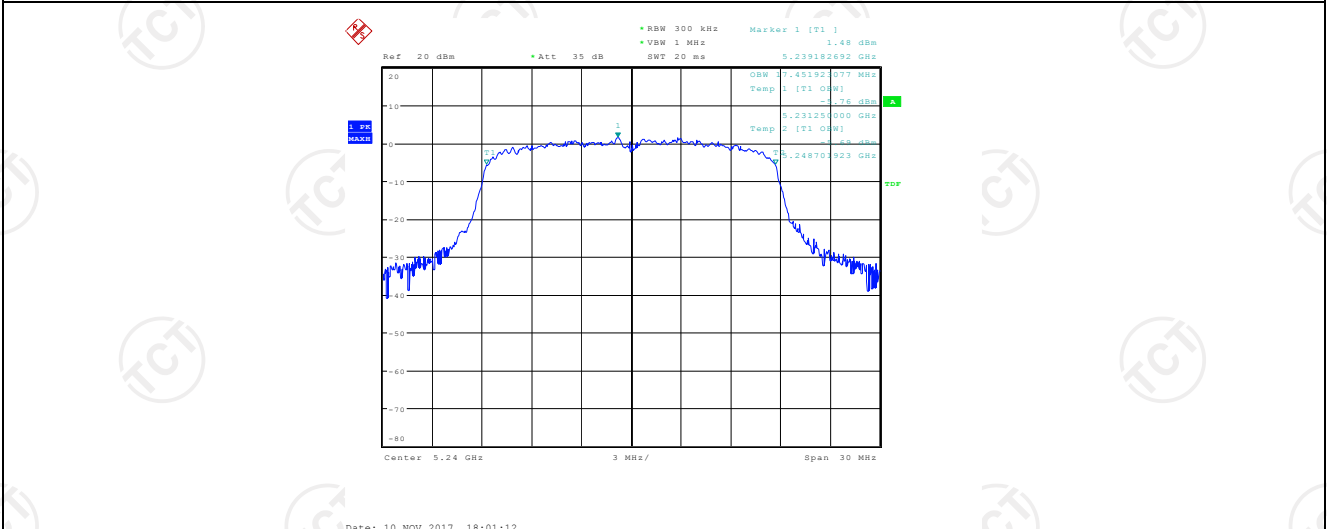


Date: 10 NOV 2017 17:59:00

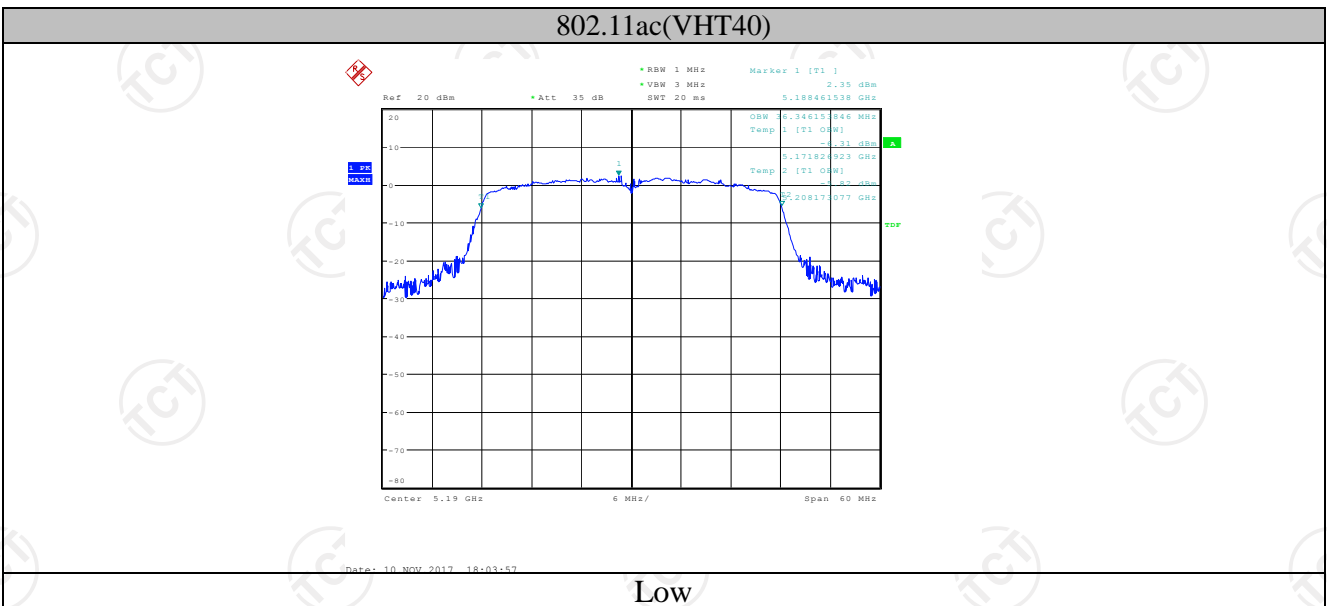
Low



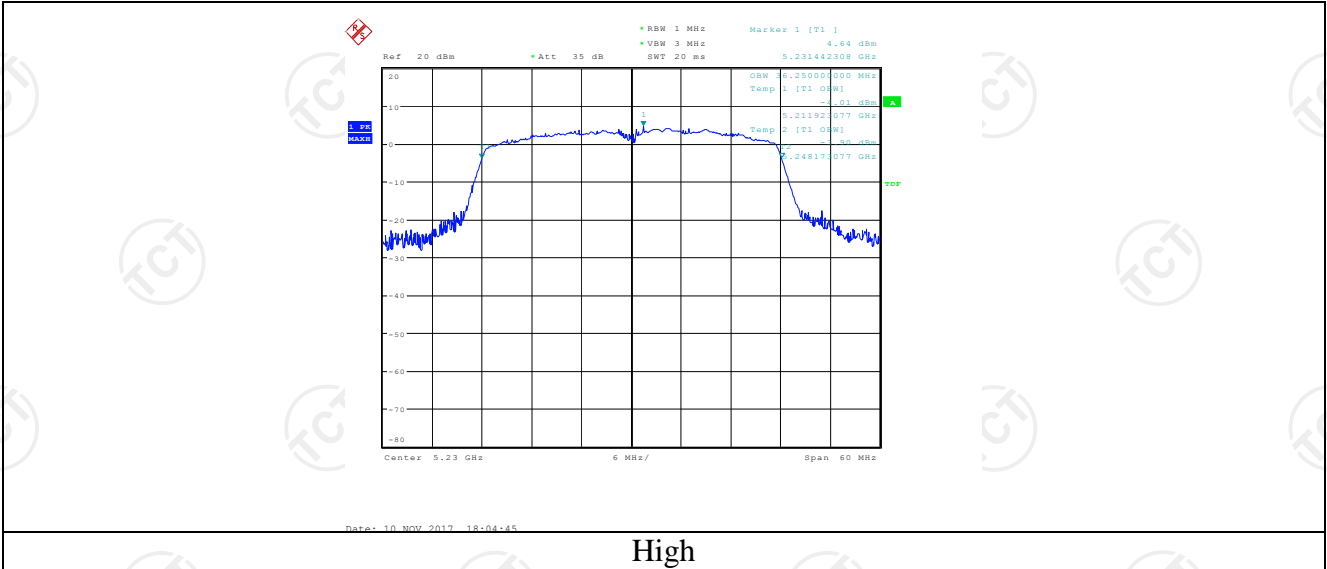
Mid



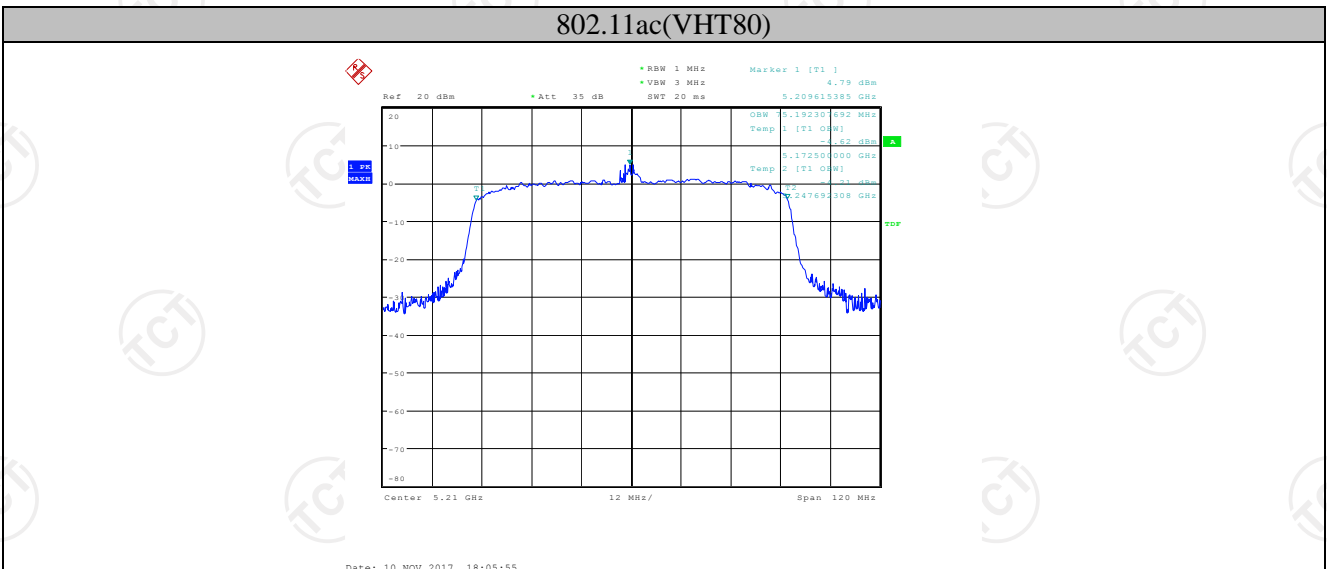
High



Low




High



6.6. Power Spectral Density

6.6.1. Test Specification

| | |
|--------------------------|---|
| Test Requirement: | FCC Part15 E Section 15.407 (a) |
| Test Method: | KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section F |
| Limit: | $\leq 11.00\text{dBm/MHz}$ for Band I 5150MHz-5250MHz $\leq 30.00\text{dBm/500KHz}$ for Band IV 5725MHz-5850MHz The e.i,r,p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz |
| Test Setup: |  <p style="text-align: center;">Spectrum Analyzer EUT</p> |
| Test Mode: | Transmitting mode with modulation |
| Test Procedure: | 1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 1. Set RBW = 510 kHz/1 MHz, VBW $\geq 3 \times$ RBW, Sweep time = Auto, Detector = RMS. 2. Allow the sweeps to continue until the trace stabilizes. 3. Use the peak marker function to determine the maximum amplitude level. 4. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment. |
| Test Result: | PASS |

6.6.2. Test Instruments

| RF Test Room | | | | |
|-----------------------|----------------|--------|---------------|-----------------|
| Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | ROHDE&SCH WARZ | FSQ | 200061 | Sep. 27, 2018 |
| RF Cable (9KHz-40GHz) | TCT | RE-03 | N/A | Sep. 27, 2018 |
| Antenna Connector | TCT | RFC-03 | N/A | Sep. 27, 2018 |

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.6.3. Test data

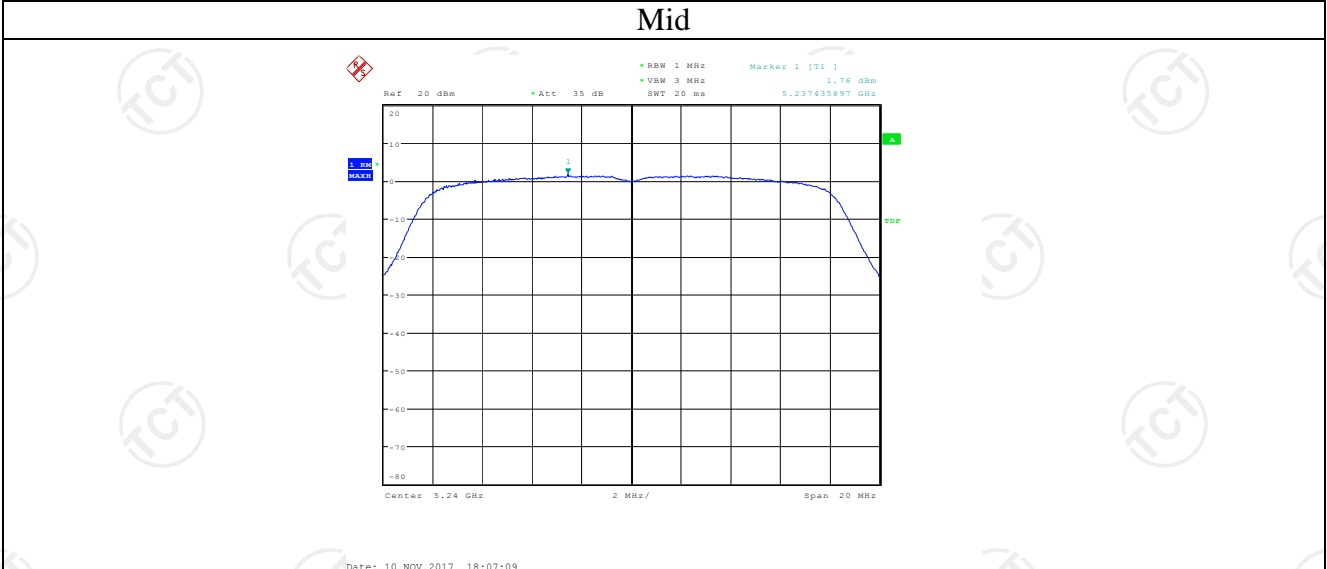
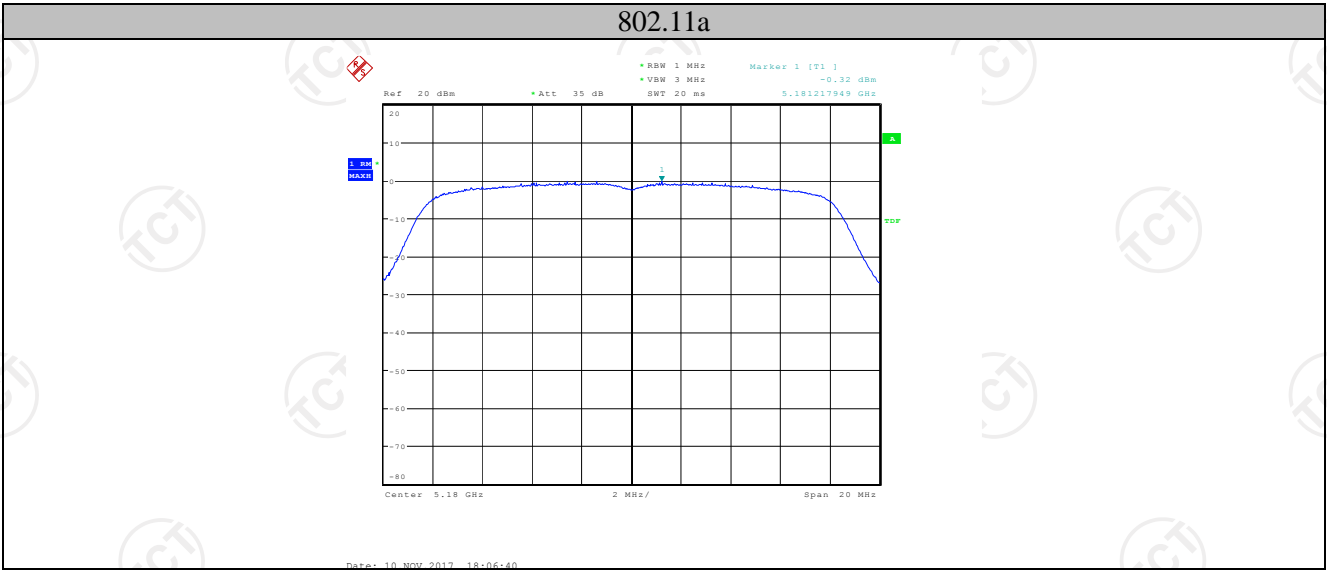
| Configuration Band I (5150 - 5250 MHz) | | | | |
|---|--------------|------------------------|-----------------|--------|
| Mode | Test channel | Power Spectral Density | Limit (dBm/MHz) | Result |
| 11a | CH36 | -0.32 | 11 | PASS |
| 11a | CH40 | -0.32 | 11 | PASS |
| 11a | CH48 | 1.76 | 11 | PASS |
| 11n(HT20) | CH36 | -2.64 | 11 | PASS |
| 11n(HT20) | CH40 | -2.65 | 11 | PASS |
| 11n(HT20) | CH48 | -0.55 | 11 | PASS |
| 11n(HT40) | CH38 | -6.62 | 11 | PASS |
| 11n(HT40) | CH46 | -4.21 | 11 | PASS |
| 11ac(VHT20) | CH36 | -2.56 | 11 | PASS |
| 11ac(VHT20) | CH40 | -2.52 | 11 | PASS |
| 11ac(VHT20) | CH48 | -0.57 | 11 | PASS |
| 11ac(VHT40) | CH38 | -6.45 | 11 | PASS |
| 11ac(VHT40) | CH46 | -4.20 | 11 | PASS |
| 11ac(VHT80) | CH42 | -6.30 | 11 | PASS |

| Configuration Band IV (5725 - 5850 MHz) | | | | | | |
|--|--------------|---|--|---|---------------------------|--------|
| Mode | Test channel | RBW =1MHz | Correction Factor 10log(500k Hz/RBW) | Power Spectral Density (dBm/500k Hz) | Limit (dBm/500 kHz) | Result |
| | | Measurement Power Spectral Density (dBm/MHz) | | | | |
| 11a | CH149 | 1.84 | -3.01 | -1.17 | 30 | PASS |
| 11a | CH157 | 0.51 | -3.01 | -2.50 | 30 | PASS |
| 11a | CH161 | 0.87 | -3.01 | -2.14 | 30 | PASS |
| 11n(HT20) | CH149 | -0.33 | -3.01 | -3.34 | 30 | PASS |
| 11n(HT20) | CH157 | -1.32 | -3.01 | -4.33 | 30 | PASS |
| 11n(HT20) | CH161 | -1.03 | -3.01 | -4.04 | 30 | PASS |
| 11n(HT40) | CH151 | -4.08 | -3.01 | -7.09 | 30 | PASS |
| 11n(HT40) | CH159 | -4.44 | -3.01 | -7.45 | 30 | PASS |
| 11ac(VHT20) | CH149 | -0.61 | -3.01 | -3.62 | 30 | PASS |
| 11ac(VHT20) | CH157 | -1.56 | -3.01 | -4.57 | 30 | PASS |
| 11ac(VHT20) | CH161 | -1.04 | -3.01 | -4.05 | 30 | PASS |
| 11ac(VHT40) | CH151 | -4.00 | -3.01 | -7.01 | 30 | PASS |
| 11ac(VHT40) | CH159 | -4.94 | -3.01 | -7.95 | 30 | PASS |
| 11ac(VHT80) | CH155 | -5.51 | -3.01 | -8.52 | 30 | PASS |

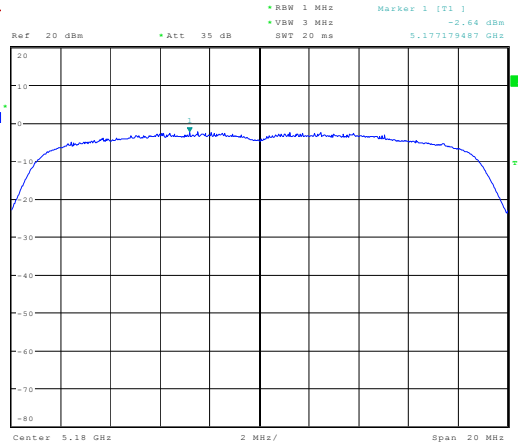
Remark: Power Spectral Density (dBm/500kHz) = Measurement Power Spectral Density /1MHz(dBm/MHz) + Correction Factor
where, Correction Factor = 10log(500kHz/RBW) = -3.01dB

Test plots as follows:

Band I (5150 – 5250 MHz)

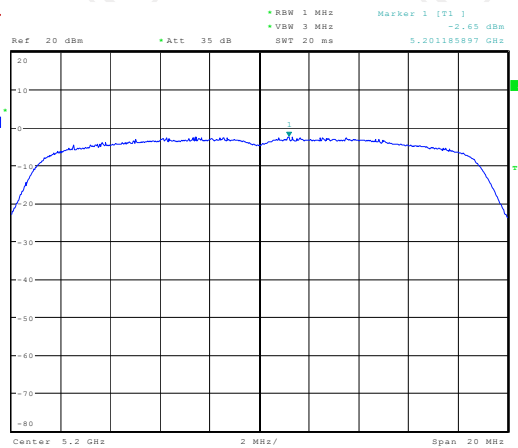


802.11n(HT20)



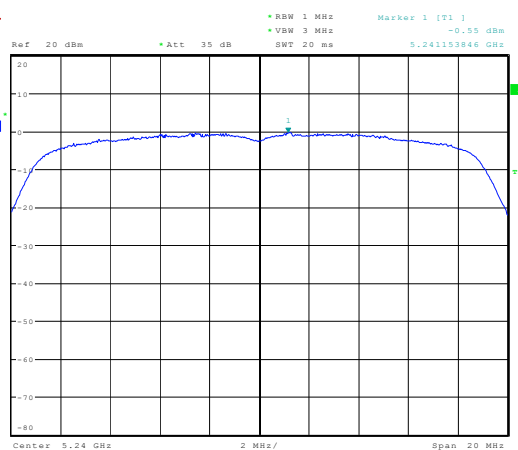
Date: 10 NOV 2017 18:07:34

Low



Date: 10 NOV 2017 18:07:46

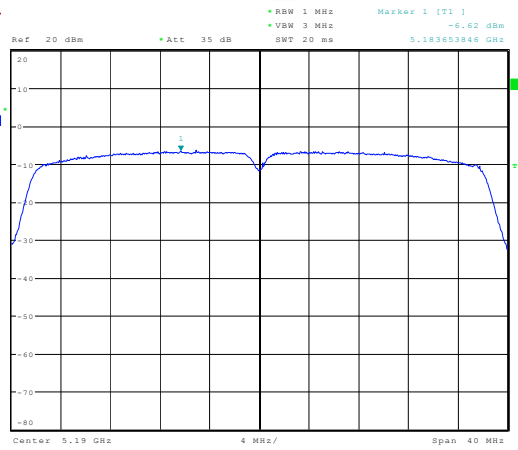
Mid



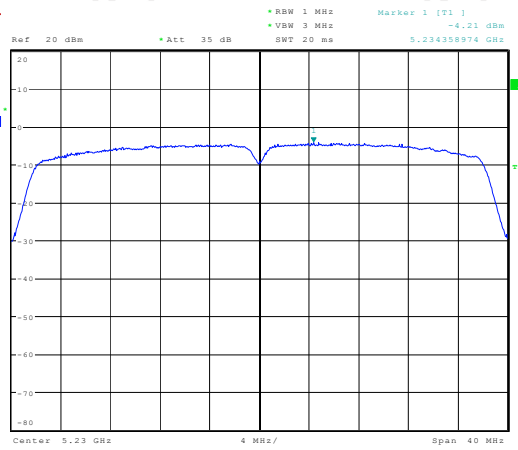
Date: 10 NOV 2017 18:08:01

High

802.11n(HT40)

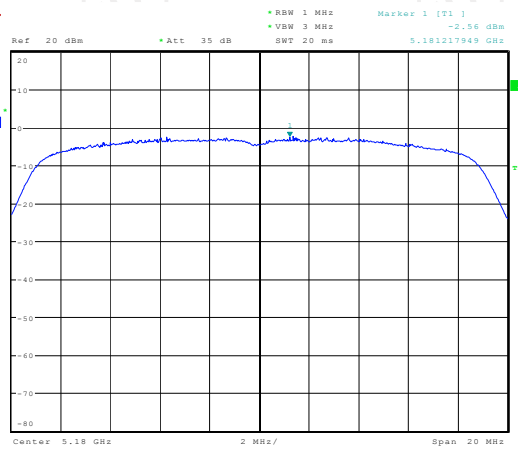


Low

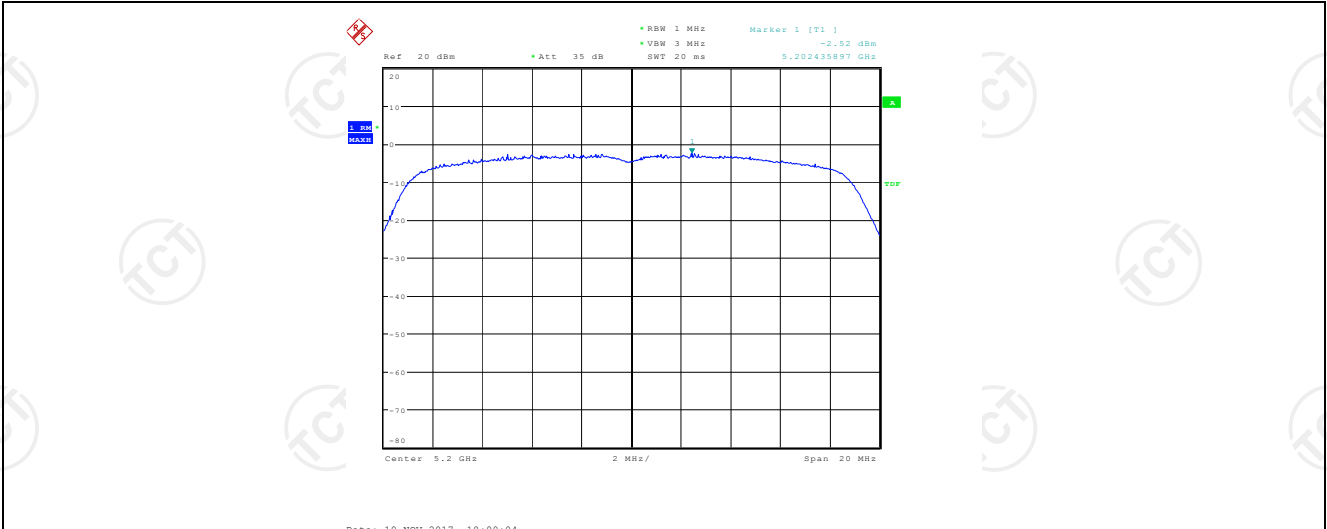


High

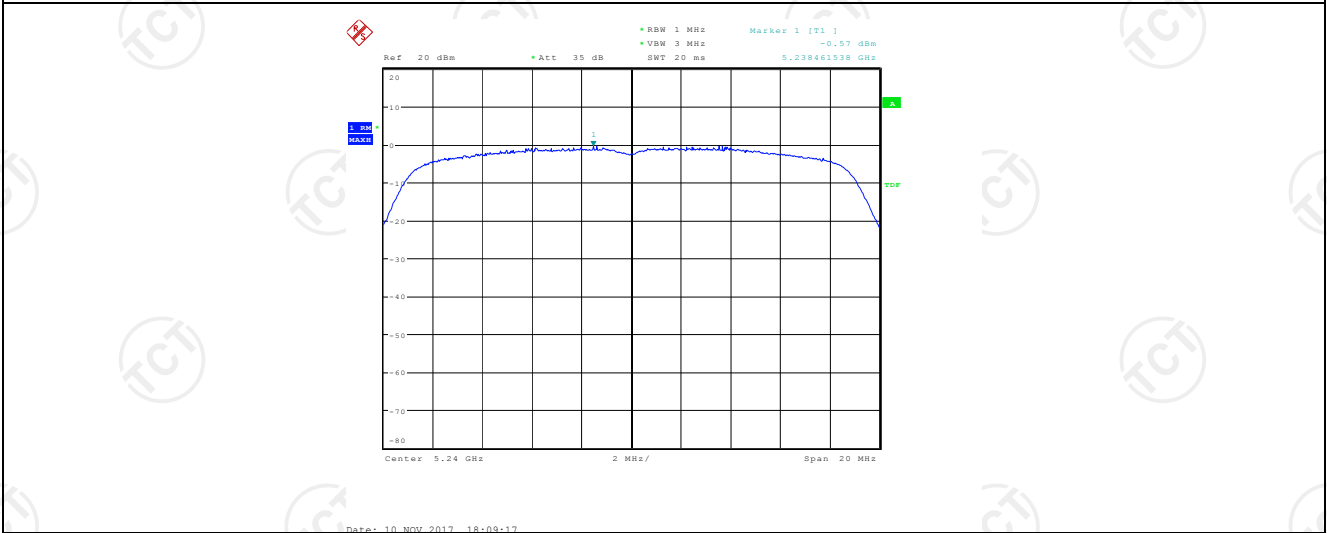
802.11ac(VHT20)



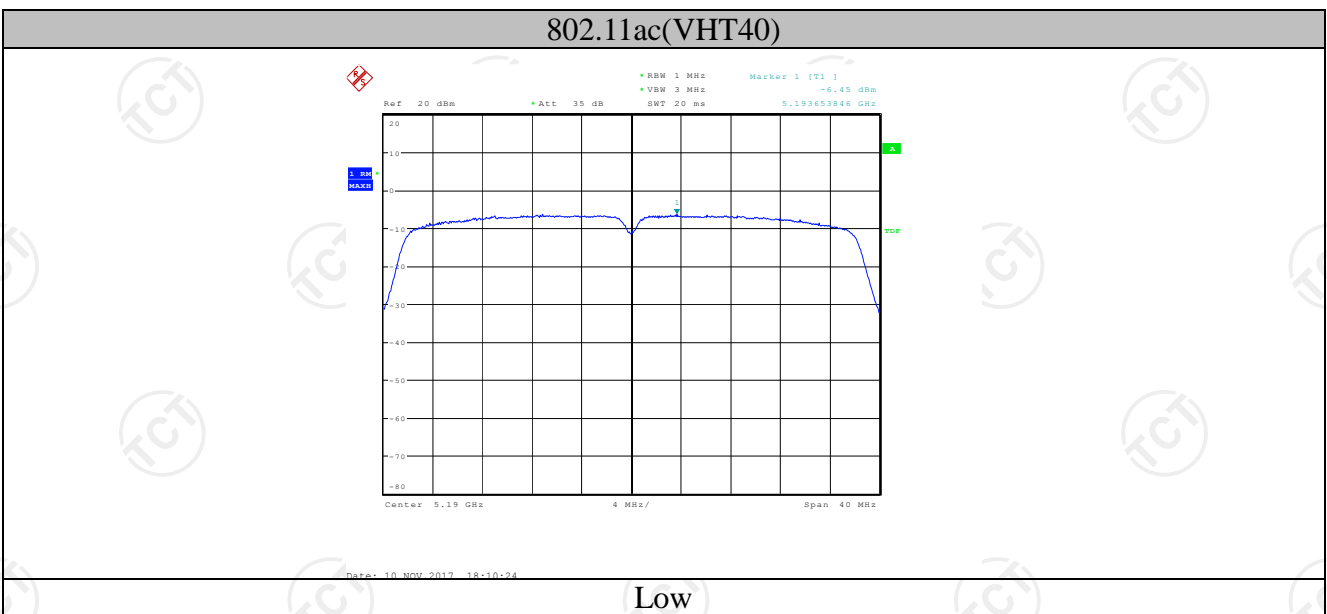
Low



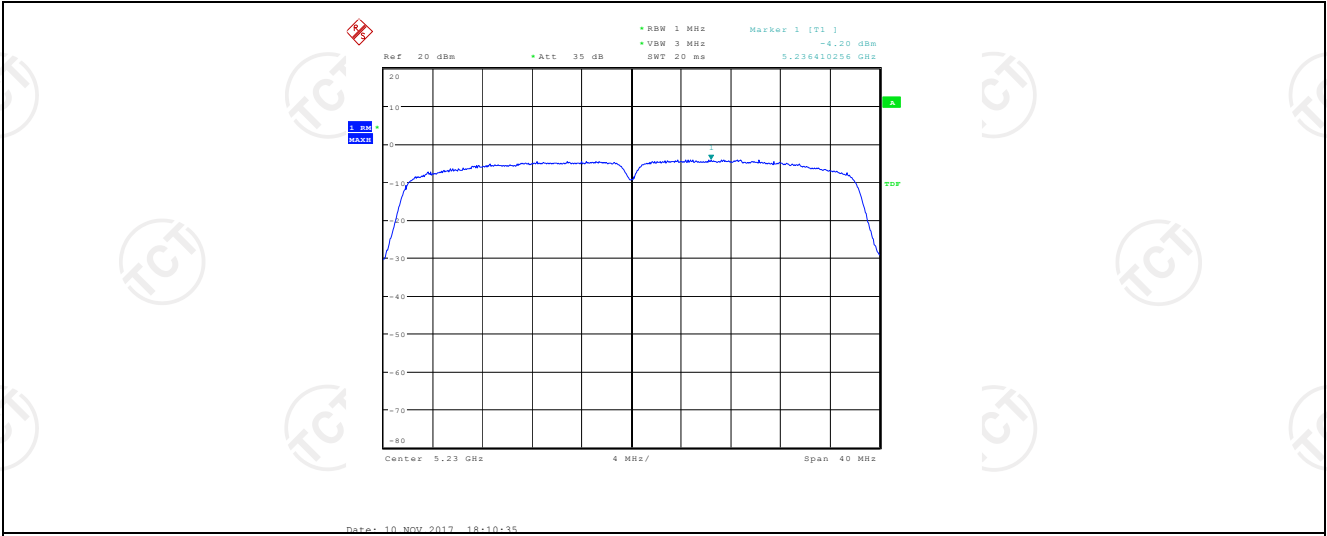
Mid



High

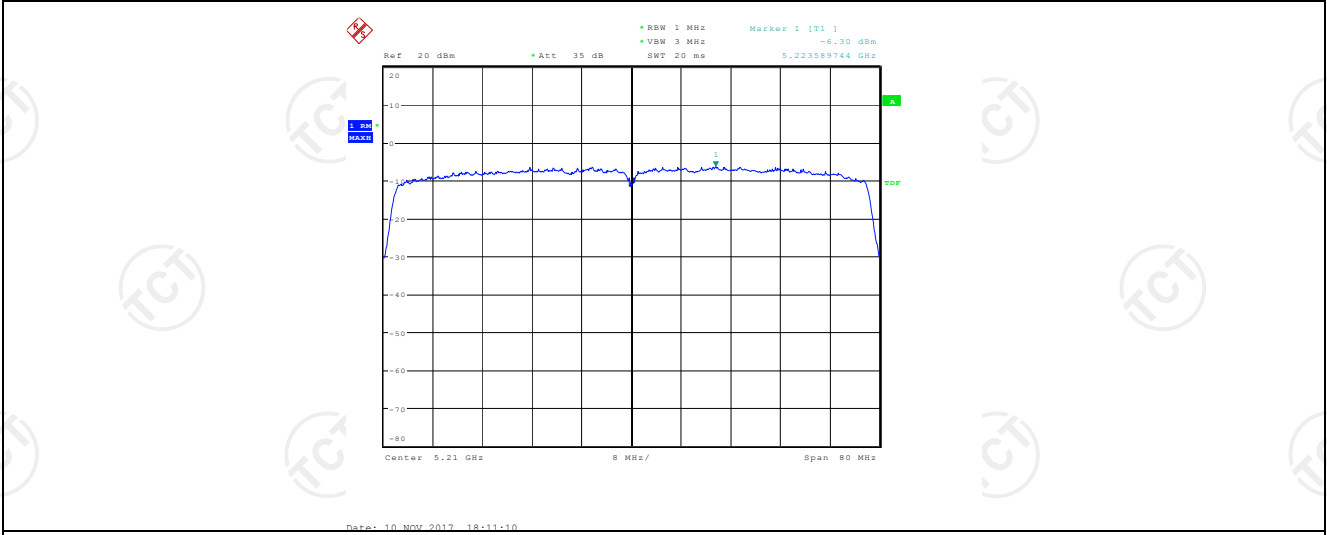


Low



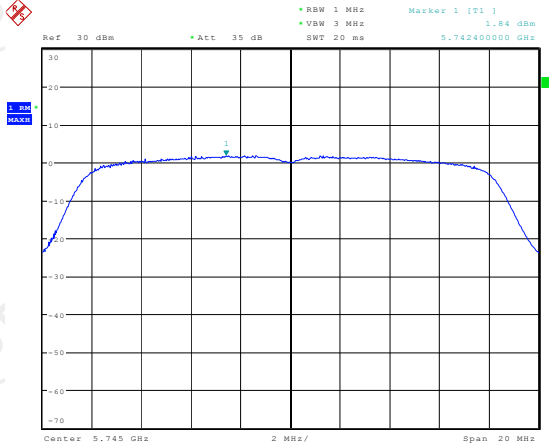
High

802.11ac(VHT80)



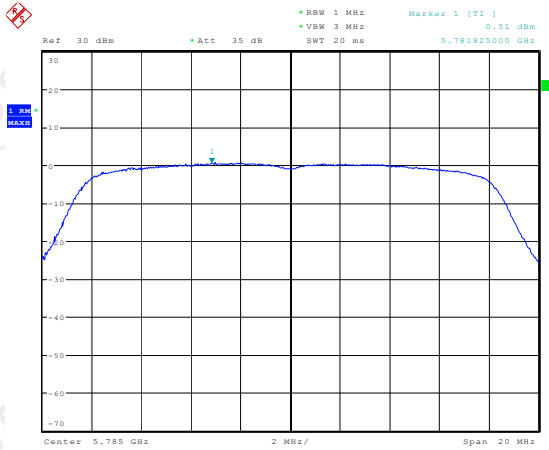
Band IV (5725 – 5850 MHz)

802.11a



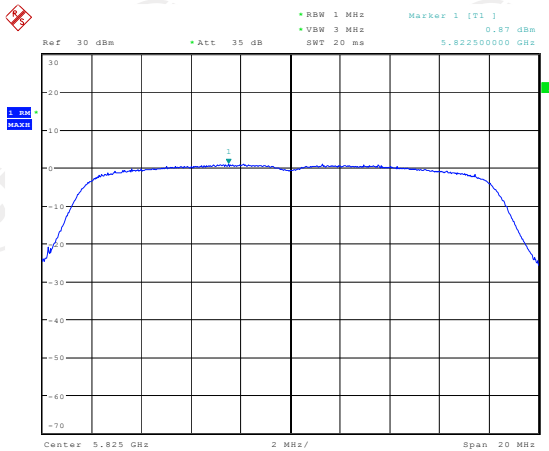
Date: 17 NOV 2017 19:19:44

Low



Date: 17 NOV 2017 19:19:53

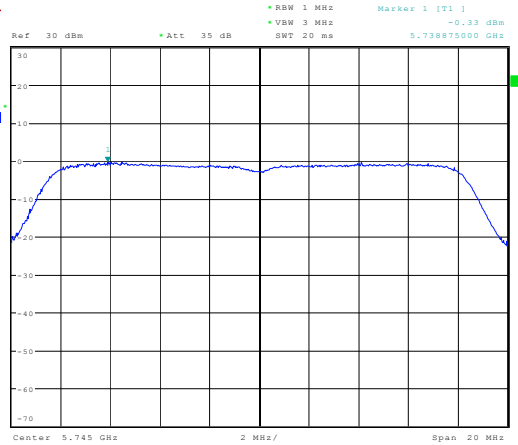
Mid



Date: 17 NOV 2017 19:20:12

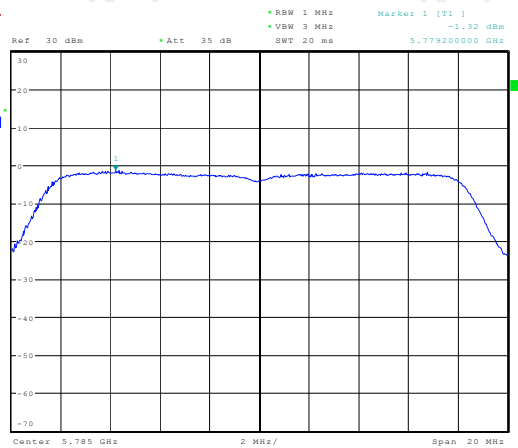
High

802.11n(HT20)



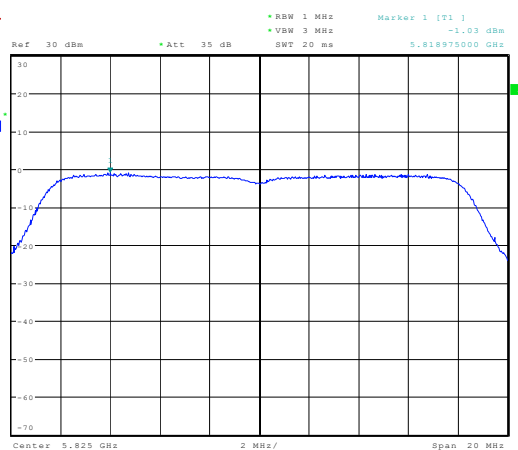
Date: 17 NOV 2017 18:20:38

Low



Date: 17 NOV 2017 18:20:39

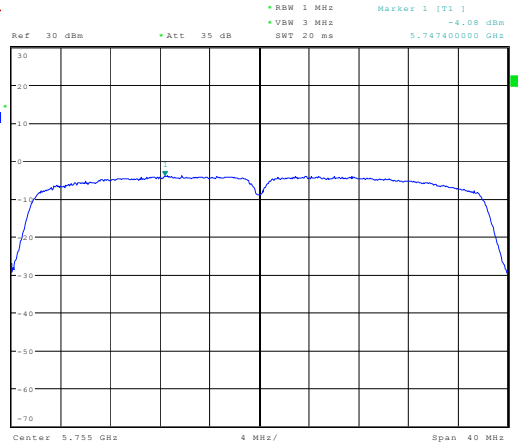
Mid



Date: 17 NOV 2017 18:20:50

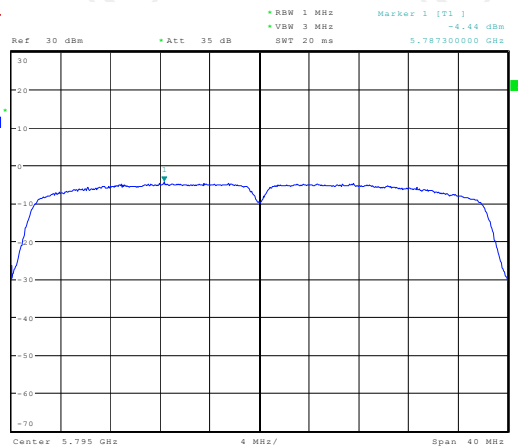
High

802.11n(HT40)



Date: 17 NOV 2017 18:24:08

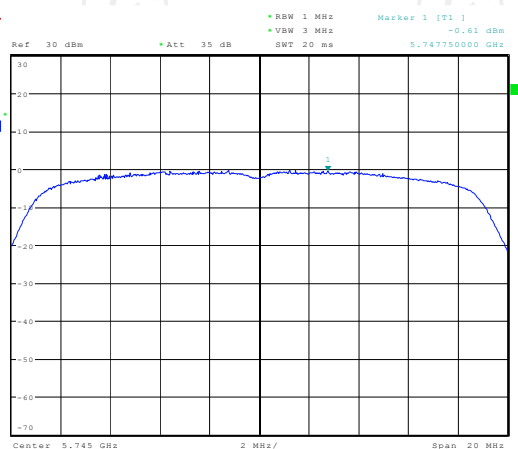
Low



Date: 17 NOV 2017 18:24:22

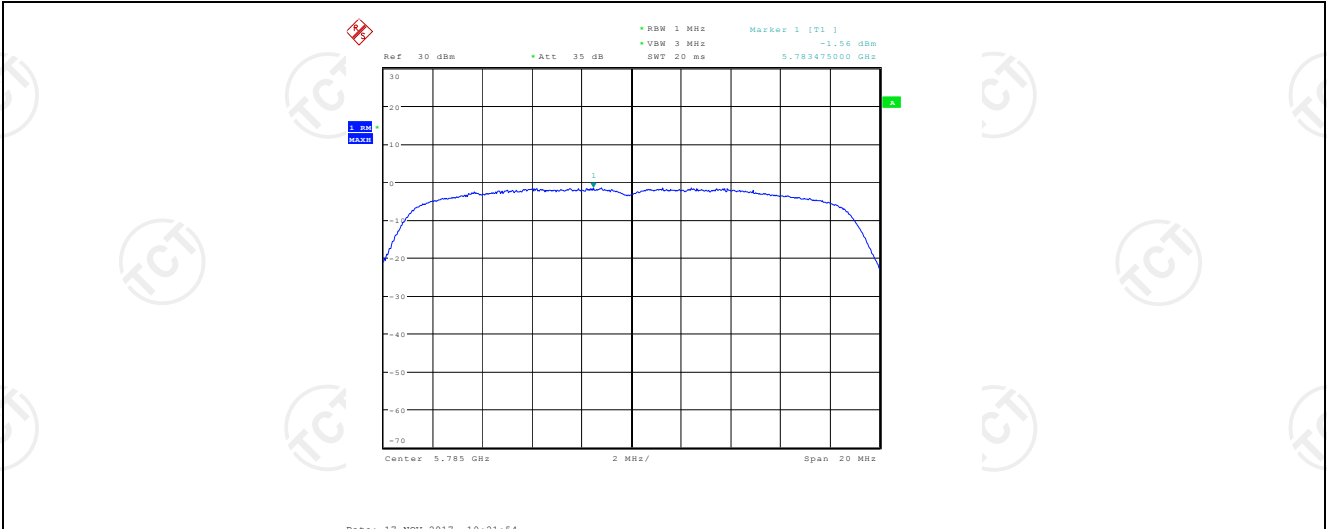
High

802.11ac(VHT20)



Date: 17 NOV 2017 18:21:36

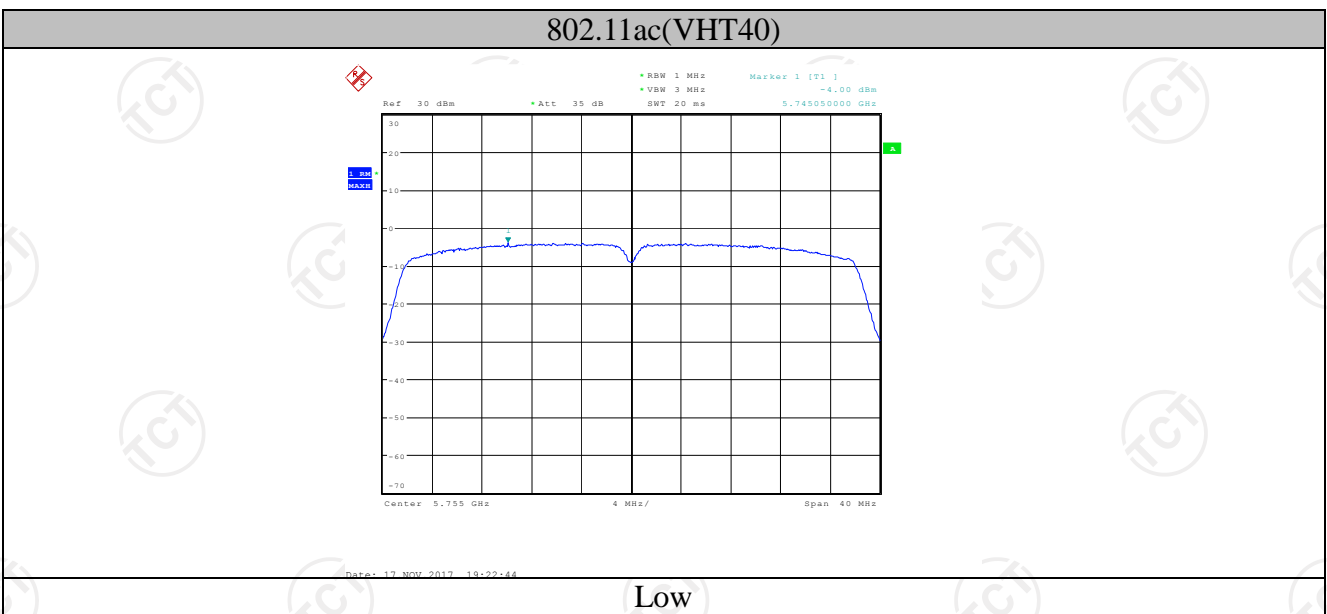
Low



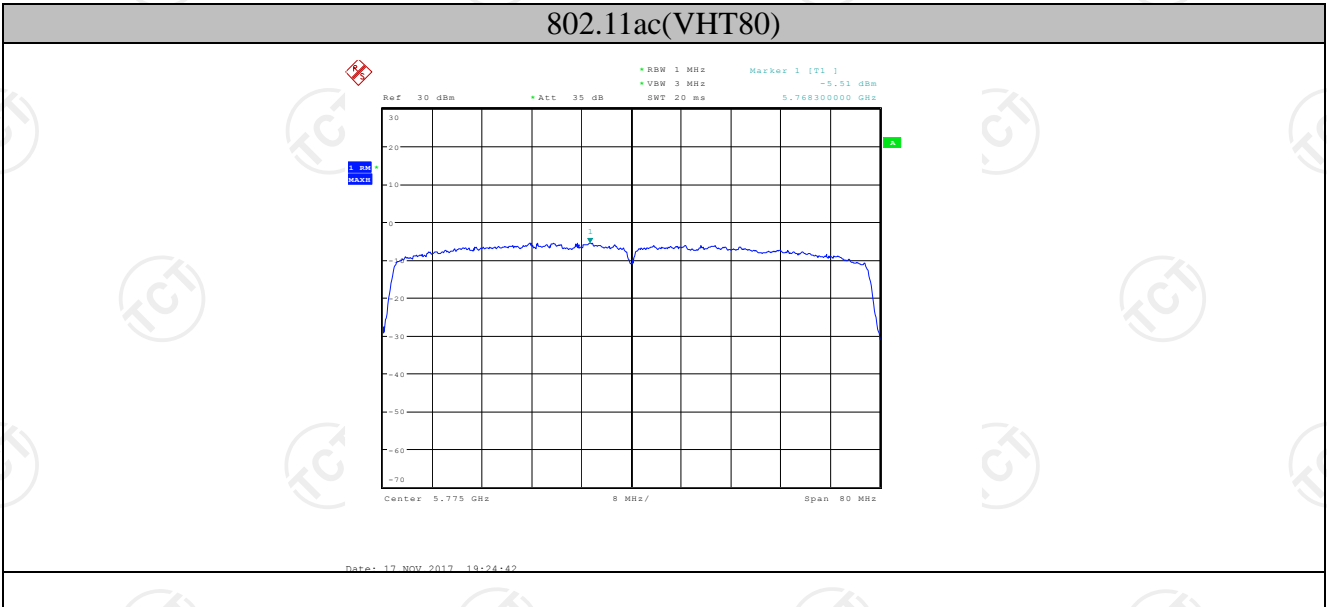
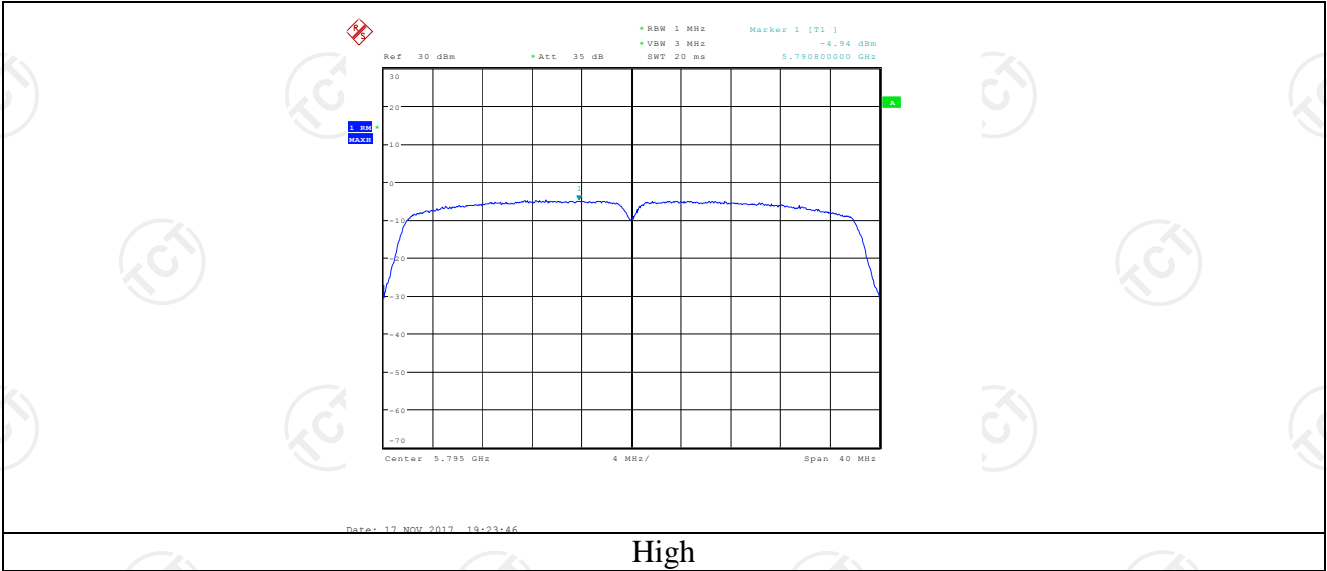
Mid



High

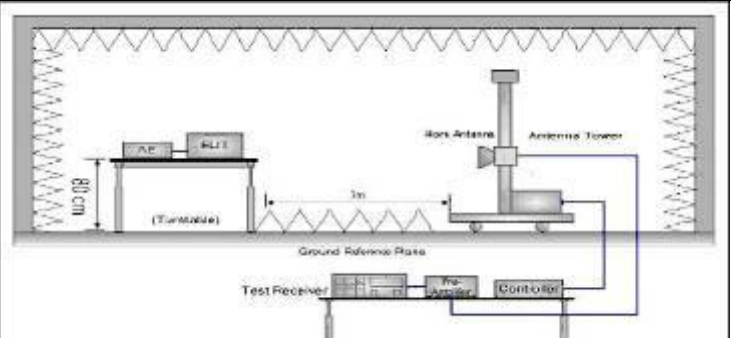


Low



6.7. Band edge

6.7.1. Test Specification

| | |
|--------------------------|--|
| Test Requirement: | FCC CFR47 Part 15E Section 15.407 |
| Test Method: | ANSI C63.10 2013 |
| Limit: | For band I&II&III: $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB μ V/m, for EIRP(dBm)= -27dBm For band IV(5715-5725MHz&5850-5860MHz): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 78.2$ dB μ V/m, for EIRP(dBm)= -17dBm ; For band IV(other un-restricted band): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB μ V/m, for EIRP(dBm)= -27dBm |
| Test Setup: |  <p>The diagram illustrates the test setup. A rotating table (labeled 'Turntable') is positioned 0.8 meters above a 'Ground Reference Plane'. On the table, an 'EUT' (Equipment Under Test) is placed. A 'Work Antenna' is mounted on an 'Antenna Tower' at a distance of 3 meters from the EUT. The antenna tower is connected to a 'Test Receiver' system, which includes a 'Pre-Amplifier' and a 'Controller'.</p> |
| Test Mode: | Transmitting mode with modulation |
| Test Procedure: | <ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have |

| | |
|---------------------|---|
| | 10dB margin would be re-tested one by one using peak, quasipeak or average method as specified and then reported in a data sheet. |
| Test Result: | PASS |

6.7.2. Test Instruments

| Radiated Emission Test Site (966) | | | | |
|-----------------------------------|--|------------|---------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Test Receiver | ROHDE&SCHW ARZ | ESVD | 100008 | Sep. 27, 2018 |
| Spectrum Analyzer | ROHDE&SCHW ARZ | FSQ | 200061 | Sep. 27, 2018 |
| Spectrum Analyzer | ROHDE&SCHW ARZ | FSP40 | 100056 | Sep. 27, 2018 |
| Spectrum Analyzer | Agilent | N9020A | MY49100060 | Sep. 27, 2018 |
| Pre-amplifier | EM Electronics Corporation CO.,LTD | EM30265 | 07032613 | Sep. 27, 2018 |
| Pre-amplifier | HP | 8447D | 2727A05017 | Sep. 27, 2018 |
| Loop antenna | ZHINAN | ZN30900A | 12024 | Sep. 27, 2018 |
| Broadband Antenna | Schwarzbeck | VULB9163 | 340 | Sep. 27, 2018 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 631 | Sep. 27, 2018 |
| Horn Antenna | Schwarzbeck | BBH 9170 | 582 | Jun. 07, 2018 |
| Coax cable (9KHz-1GHz) | TCT | RE-low-01 | N/A | Sep. 27, 2018 |
| Coax cable (9KHz-40GHz) | TCT | RE-high-02 | N/A | Sep. 27, 2018 |
| Coax cable (9KHz-1GHz) | TCT | RE-low-03 | N/A | Sep. 27, 2018 |
| Coax cable (9KHz-40GHz) | TCT | RE-high-04 | N/A | Sep. 27, 2018 |
| Antenna Mast | Keleto | CC-A-4M | N/A | N/A |
| EMI Test Software | Shurple Technology | EZ-EMC | N/A | N/A |

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.7.3. Test Data

| Band edge emission | | | | | | | | | | |
|--------------------|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 5150 | V | 52.83 | 38.83 | 6.89 | 59.72 | 45.72 | 68.20 | 54.00 | -8.48 | -8.28 |
| 5150 | H | 51.45 | 38.14 | 6.89 | 58.34 | 45.03 | 68.20 | 54.00 | -9.86 | -8.97 |
| --- | | | | | | | | | | |
| 5350 | V | 53.06 | 39.24 | 6.95 | 60.01 | 46.19 | 68.20 | 54.00 | -8.19 | -7.81 |
| 5350 | H | 51.64 | 37.83 | 6.95 | 58.59 | 44.78 | 68.20 | 54.00 | -9.61 | -9.22 |
| --- | | | | | | | | | | |

| Band edge emission | | | | | | | | | | |
|--------------------|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 5725 | V | 47.44 | 35.2 | 7.63 | 58.44 | 44.92 | 78.20 | 54.00 | -19.76 | -9.08 |
| 5725 | H | 47.85 | 36.03 | 7.63 | 57.16 | 44.17 | 78.20 | 54.00 | -21.04 | -9.83 |
| --- | | | | | | | | | | |
| 5850 | V | 48.43 | 36.01 | 7.82 | 59.95 | 45.61 | 78.20 | 54.00 | -18.25 | -8.39 |
| 5850 | H | 49.11 | 36.40 | 7.82 | 57.28 | 44.29 | 78.20 | 54.00 | -20.92 | -9.71 |
| --- | | | | | | | | | | |

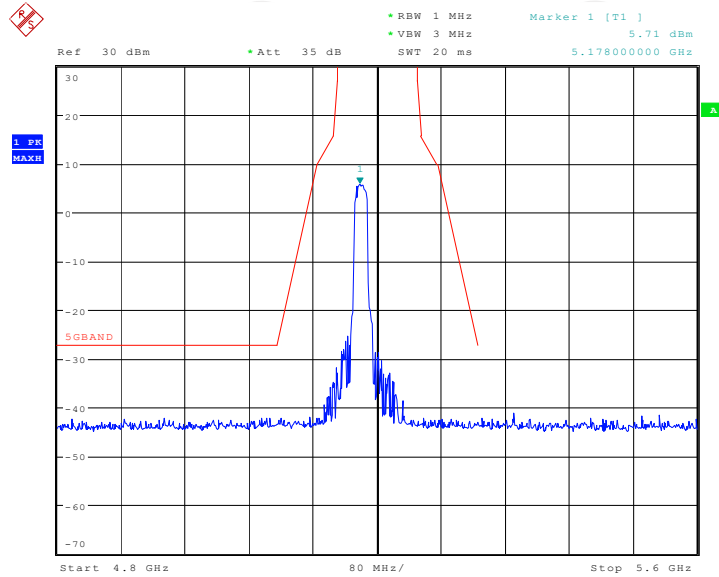
Remark:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor=Antenna Factor + Cable loss - Pre-amplifier.
2. Margin (dB)= Emission Level - Peak Limit / AV Limit
3. Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Conducted: The worst case (802.11a)

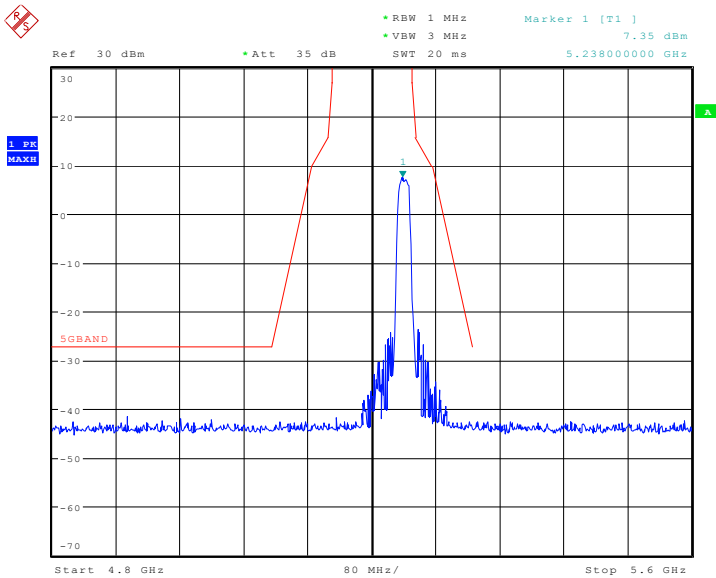
Band I: 5150-5250MHz

Low channel



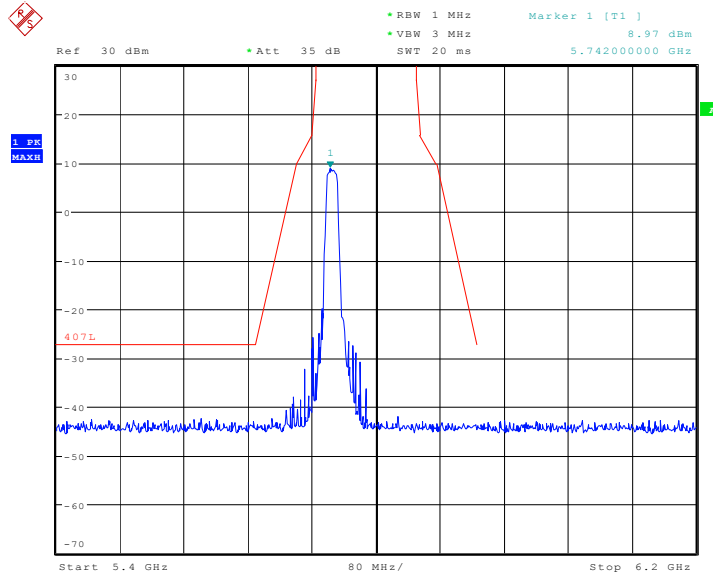
Date: 17.NOV.2017 17:39:47

High channel



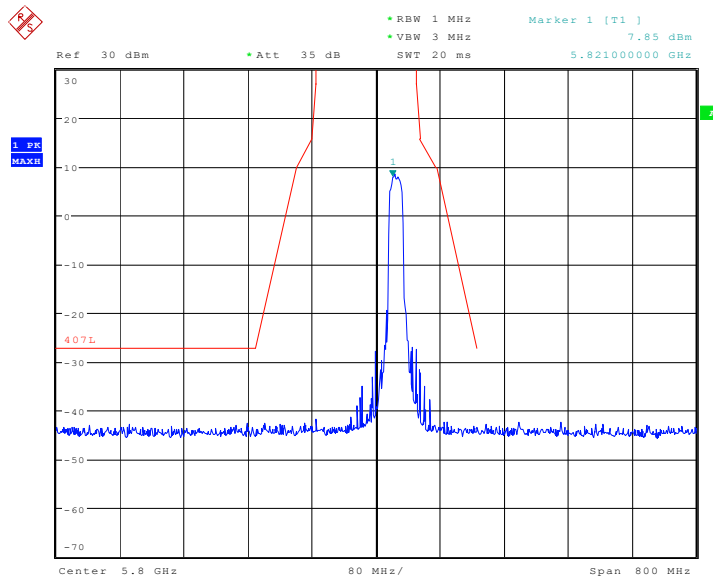
Date: 17.NOV.2017 17:40:06

Band IV: 5725-5850MHz
Low channel



Date: 17.NOV.2017 19:25:37

High channel

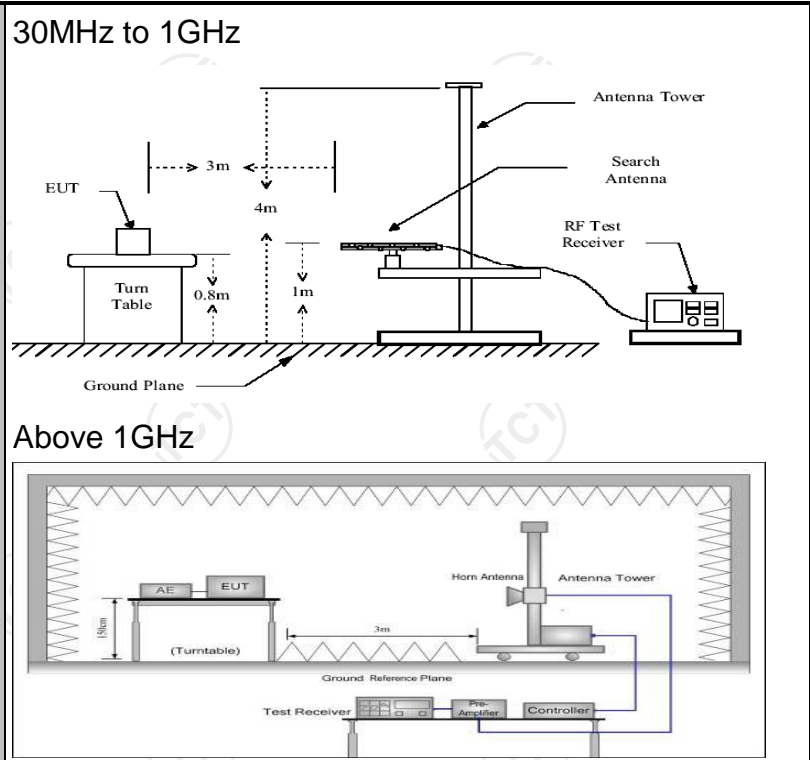


Date: 17.NOV.2017 19:26:00

6.8. Spurious Emission

6.8.1.1. Test Specification

| | | | | | |
|------------------------------|---|-----------------------------------|-------------------------------|----------|------------------|
| Test Requirement: | FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205 | | | | |
| Test Method: | KDB 789033 D02 v01r04 | | | | |
| Frequency Range: | 9kHz to 40GHz | | | | |
| Measurement Distance: | 3 m | | | | |
| Antenna Polarization: | Horizontal & Vertical | | | | |
| Operation mode: | Transmitting mode with modulation | | | | |
| Receiver Setup: | Frequency | Detector | RBW | VBW | Remark |
| | 9kHz- 150kHz | Quasi-peak | 200Hz | 1kHz | Quasi-peak Value |
| | 150kHz- 30MHz | Quasi-peak | 9kHz | 30kHz | Quasi-peak Value |
| | 30MHz-1GHz | Quasi-peak | 100KHz | 300KHz | Quasi-peak Value |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | | Peak | 1MHz | 10Hz | Average Value |
| Limit: | Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table, | | | | |
| | Frequency | 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 | 30 | 30 | | |
| | 30-88 | 100 | 3 | | |
| | 88-216 | 150 | 3 | | |
| | 216-960 | 200 | 3 | | |
| | Above 960 | 500 | 3 | | |
| | | Frequency | Limit (dBuV/m @3m) | Detector | |
| | Above 1G | 74.0 | Peak | | |
| | | 54.0 | Average | | |
| Test setup: | For radiated emissions below 30MHz | | | | |
| | <p>The diagram illustrates the test setup for radiated emissions below 30MHz. It shows an EUT (Equipment Under Test) on a turn table, positioned 3m from a circular antenna. The antenna is mounted on a ground plane. The antenna is connected to a Pre-Amplifier, which is connected to a Receiver, which is connected to a Computer.</p> | | | | |



Test Procedure:

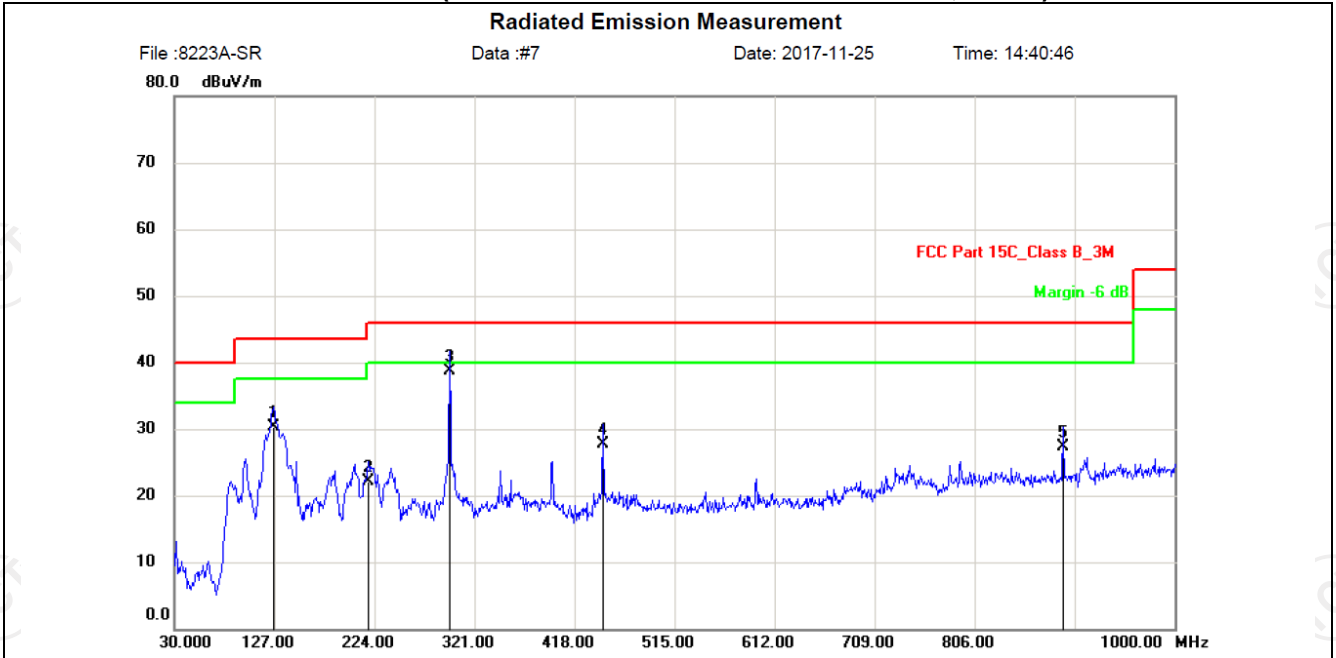
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter center. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height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

Test results:

PASS

6.8.2. Test Data

Please refer to following diagram for individual
Below 1GHz (The worst case 802.11a band 5150-5250, CH 48)



File :8223A-SR Data :#7 Date: 2017-11-25 Time: 14:40:46
80.0 dBuV/m

Site Polarization: *Horizontal* Temperature: 26
Limit: FCC Part 15C_Class B_3M Power: DC 3.3V Humidity: 60 %
EUT: WIFI+BT Module Distance: 3m
M/N: 8223A-SR
Mode: TX(5.8G WLAN)
Note: 802.11a CH48

| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Over dB | Detector | Antenna Height cm | Table Degree degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|-------------------------|---------------------------|---------|
| 1 | | 126.0300 | 45.03 | -14.73 | 30.30 | 43.50 | -13.20 | QP | | | |
| 2 | | 218.1800 | 35.12 | -13.02 | 22.10 | 46.00 | -23.90 | QP | | | |
| 3 | * | 296.7500 | 49.26 | -10.56 | 38.70 | 46.00 | -7.30 | QP | | | |
| 4 | | 445.1600 | 35.78 | -8.08 | 27.70 | 46.00 | -18.30 | QP | | | |
| 5 | | 891.3600 | 28.50 | -1.20 | 27.30 | 46.00 | -18.70 | QP | | | |

*:Maximum data x:Over limit !:over margin

(Reference Only)

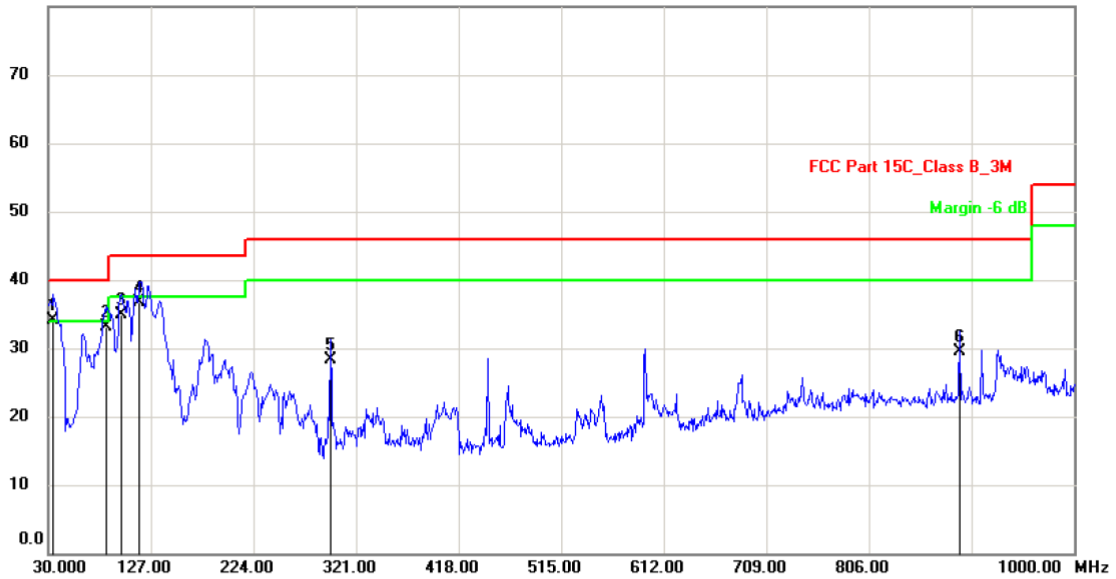
Radiated Emission Measurement

File :8223A-SR
80.0 dBuV/m

Data :#8

Date: 2017-11-25

Time: 14:46:06



Site Polarization: **Vertical** Temperature: 26
 Limit: FCC Part 15C_Class B_3M Power: DC 3.3V Humidity: 60 %
 EUT: WIFI+BT Module Distance: 3m
 M/N: 8223A-SR
 Mode: TX(5.8G WLAN)
 Note: 802.11a CH48

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 34.8500 | 50.27 | -16.17 | 34.10 | 40.00 | -5.90 | QP | | |
| 2 | | 84.3200 | 51.51 | -18.31 | 33.20 | 40.00 | -6.80 | QP | | |
| 3 | | 98.8700 | 50.95 | -16.05 | 34.90 | 43.50 | -8.60 | QP | | |
| 4 | | 116.3300 | 53.05 | -16.25 | 36.80 | 43.50 | -6.70 | QP | | |
| 5 | | 296.7500 | 40.86 | -12.56 | 28.30 | 46.00 | -17.70 | QP | | |
| 6 | | 891.3600 | 30.70 | -1.20 | 29.50 | 46.00 | -16.50 | QP | | |

*:Maximum data x:Over limit !:over margin

◁Reference Only

Remark: 1. Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

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

Above 1GHz

| Band I | | | | | | | | | | |
|--|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH36, 5180MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 10360 | V | 44.27 | 32.48 | 14.04 | 58.31 | 46.52 | 74.00 | 54.00 | -15.69 | -7.48 |
| 15540 | V | 43.98 | 31.12 | 19.00 | 62.98 | 50.12 | 74.00 | 54.00 | -11.02 | -3.88 |
| --- | | | | | | | | | | |
| 10360 | H | 43.85 | 31.52 | 14.04 | 57.89 | 45.56 | 74.00 | 54.00 | -16.11 | -8.44 |
| 15540 | H | 42.78 | 30.53 | 19.00 | 61.78 | 49.53 | 74.00 | 54.00 | -12.22 | -4.47 |
| --- | | | | | | | | | | |

| Band I | | | | | | | | | | |
|--|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH40, 5200MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 10400 | V | 43.77 | 31.44 | 14.12 | 57.89 | 45.56 | 74.00 | 54.00 | -16.11 | -8.44 |
| 15600 | V | 41.58 | 29.33 | 20.20 | 61.78 | 49.53 | 74.00 | 54.00 | -12.22 | -4.47 |
| --- | | | | | | | | | | |
| 10400 | H | 44.19 | 32.4 | 14.12 | 58.31 | 46.52 | 74.00 | 54.00 | -15.69 | -7.48 |
| 15600 | H | 42.78 | 29.92 | 20.20 | 62.98 | 50.12 | 74.00 | 54.00 | -11.02 | -3.88 |
| --- | | | | | | | | | | |

| Band I | | | | | | | | | | |
|--|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH48, 5240MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 10480 | V | 44.67 | 32.78 | 14.29 | 58.96 | 47.07 | 74.00 | 54.00 | -15.04 | -6.93 |
| 15720 | V | 40.76 | 28.4 | 20.82 | 61.58 | 49.22 | 74.00 | 54.00 | -12.42 | -4.78 |
| --- | | | | | | | | | | |
| 10480 | H | 43.49 | 30.94 | 14.29 | 57.78 | 45.23 | 74.00 | 54.00 | -16.22 | -8.77 |
| 15720 | H | 39.86 | 27.67 | 20.82 | 60.68 | 48.49 | 74.00 | 54.00 | -13.32 | -5.51 |
| --- | | | | | | | | | | |

| Band IV | | | | | | | | | | |
|---|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH149, 5745MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 11490 | V | 40.63 | 28.5 | 16.86 | 57.49 | 45.36 | 74.00 | 54.00 | -16.51 | -8.64 |
| 17235 | V | 38.05 | 26.34 | 22.23 | 60.28 | 48.57 | 74.00 | 54.00 | -13.72 | -5.43 |
| --- | | | | | | | | | | |
| 11490 | H | 41.43 | 29.26 | 16.86 | 58.29 | 46.12 | 74.00 | 54.00 | -15.71 | -7.88 |
| 17235 | H | 38.04 | 26.15 | 22.23 | 60.27 | 48.38 | 74.00 | 54.00 | -13.73 | -5.62 |
| --- | | | | | | | | | | |

| Band IV | | | | | | | | | | |
|---|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH157, 5785MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 11570 | V | 40.78 | 28.35 | 17.01 | 57.79 | 45.36 | 74.00 | 54.00 | -16.21 | -8.64 |
| 17355 | V | 37.86 | 25.73 | 22.62 | 60.48 | 48.35 | 74.00 | 54.00 | -13.52 | -5.65 |
| --- | | | | | | | | | | |
| 11570 | H | 40.78 | 28.44 | 17.01 | 57.79 | 45.45 | 74.00 | 54.00 | -16.21 | -8.55 |
| 17355 | H | 37.96 | 25.67 | 22.62 | 60.58 | 48.29 | 74.00 | 54.00 | -13.42 | -5.71 |
| --- | | | | | | | | | | |

| Band IV | | | | | | | | | | |
|---|--------------|---------------------|-------------------|------------------------|----------------|-------------|---------------------|-------------------|-------------|-------|
| The worst case: 802.11a, CH165, 5825MHz | | | | | | | | | | |
| Frequency (MHz) | Ant.Pol. H/V | Peak reading (dBuV) | AV reading (dBuV) | Correction Factor (dB) | Emission Level | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | Peak | AV |
| 11650 | V | 40.47 | 28.33 | 17.16 | 57.63 | 45.49 | 74.00 | 54.00 | -16.37 | -8.51 |
| 17475 | V | 37.25 | 25.23 | 23.01 | 60.26 | 48.24 | 74.00 | 54.00 | -13.74 | -5.76 |
| --- | | | | | | | | | | |
| 11650 | H | 40.31 | 28.22 | 17.16 | 57.47 | 45.38 | 74.00 | 54.00 | -16.53 | -8.62 |
| 17475 | H | 37.8 | 25.75 | 23.01 | 60.81 | 48.76 | 74.00 | 54.00 | -13.19 | -5.24 |
| --- | | | | | | | | | | |

Remark:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor=Antenna Factor + Cable loss - Pre-amplifier.
2. Margin (dB)= Emission Level - Limit
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.
5. Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

6.9. Frequency Stability Measurement

6.9.1. Test Specification

| | |
|--------------------------|--|
| Test Requirement: | FCC Part15 Section 15.407(g) &Part2 J Section 2.1055 |
| Test Method: | ANSI C63.10: 2013 |
| Limit: | The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. |
| Test Setup: | <pre> graph LR SA[Spectrum Analyzer] --- EUT[EUT] subgraph TC [Temperature Chamber] EUT end P[AC/DC Power supply] --- EUT </pre> |
| Test Procedure: | The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record. |
| Test Result: | PASS |
| Remark: | N/A |

Test plots as follows:

| Band I for 802.11a Low (5180MHz) | | | | |
|----------------------------------|--------------|----------------------------|----------------------|--------|
| Temperature(°C) | Voltage (DC) | Measurement Frequency(MHz) | Delta Frequency(KHz) | Result |
| -40 | 3.3 | 5179.9352 | 64.8 | PASS |
| -20 | | 5179.9377 | 62.3 | PASS |
| 0 | | 5179.9284 | 71.6 | PASS |
| 25 | | 5179.9374 | 62.6 | PASS |
| 45 | | 5179.9360 | 64.0 | PASS |
| 65 | | 5179.9227 | 77.3 | PASS |
| 85 | | 5179.9236 | 76.4 | PASS |
| 20 | 2.97 | 5179.9318 | 68.2 | PASS |
| | 3.63 | 5179.9322 | 67.8 | PASS |

| Band I for 802.11a High (5240MHz) | | | | |
|-----------------------------------|--------------|----------------------------|----------------------|--------|
| Temperature(°C) | Voltage (DC) | Measurement Frequency(MHz) | Delta Frequency(KHz) | Result |
| -40 | 3.3 | 5239.9377 | 62.3 | PASS |
| -20 | | 5239.9328 | 67.2 | PASS |
| 0 | | 5239.9335 | 66.5 | PASS |
| 25 | | 5239.9347 | 65.3 | PASS |
| 45 | | 5239.9342 | 65.8 | PASS |
| 65 | | 5239.9258 | 74.2 | PASS |
| 85 | | 5239.9233 | 76.7 | PASS |
| 20 | 2.97 | 5239.9365 | 63.5 | PASS |
| | 3.63 | 5239.9343 | 65.7 | PASS |

Remark:

1. EUT temperature working range is -40 to 85.

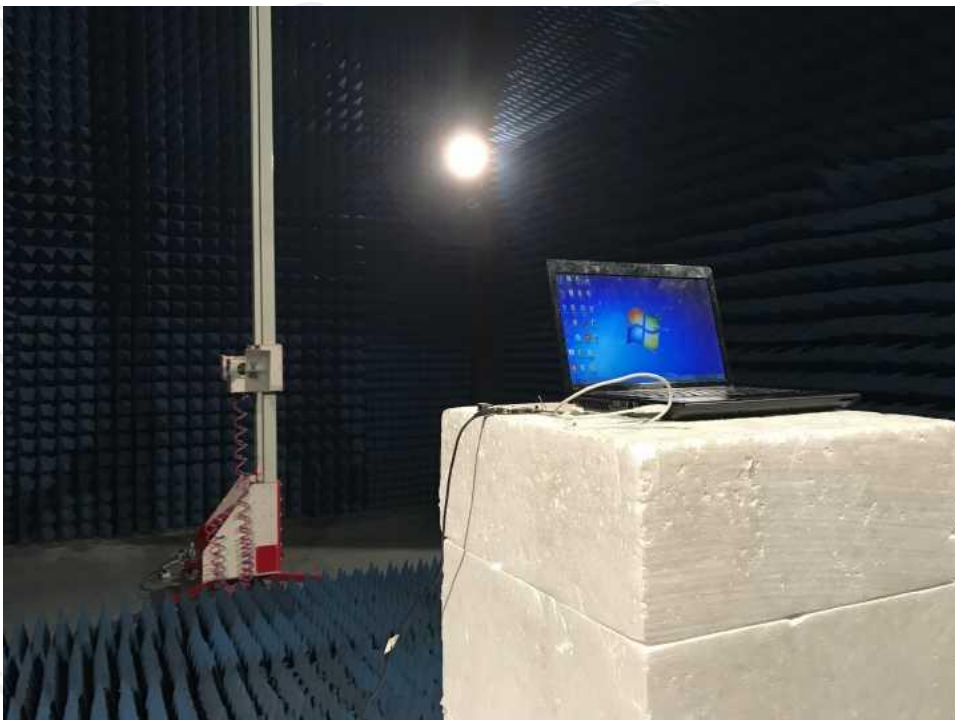
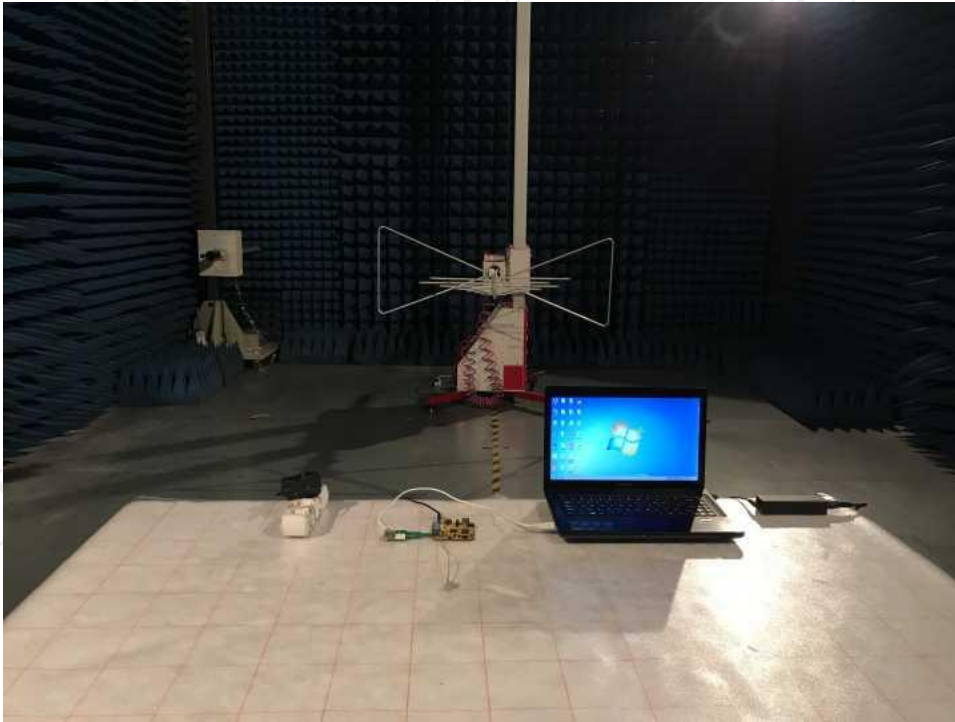
| Band IV for 802.11a Low (5745MHz) | | | | |
|-----------------------------------|--------------|----------------------------|----------------------|--------|
| Temperature(°C) | Voltage (DC) | Measurement Frequency(MHz) | Delta Frequency(KHz) | Result |
| -40 | 3.3 | 5744.9325 | 67.5 | PASS |
| -20 | | 5744.9324 | 67.6 | PASS |
| 0 | | 5744.9347 | 65.3 | PASS |
| 25 | | 5744.9331 | 66.9 | PASS |
| 45 | | 5744.9352 | 64.8 | PASS |
| 65 | | 5744.9223 | 67.7 | PASS |
| 85 | | 5744.9292 | 70.8 | PASS |
| 20 | | 2.97 | 5744.9367 | 63.3 |
| | 3.63 | 5744.9344 | 65.6 | PASS |

| Band IV for 802.11a High (5825MHz) | | | | |
|------------------------------------|--------------|----------------------------|----------------------|--------|
| Temperature(°C) | Voltage (DC) | Measurement Frequency(MHz) | Delta Frequency(KHz) | Result |
| -40 | 3.3 | 5824.9367 | 63.3 | PASS |
| -20 | | 5824.9339 | 66.1 | PASS |
| 0 | | 5824.9357 | 64.3 | PASS |
| 25 | | 5824.9340 | 66.0 | PASS |
| 45 | | 5824.9243 | 75.7 | PASS |
| 65 | | 5824.9235 | 76.5 | PASS |
| 85 | | 5824.9249 | 75.1 | PASS |
| 20 | | 2.97 | 5824.9352 | 65.8 |
| | 3.63 | 5824.9361 | 63.9 | PASS |

Remark:

1. EUT temperature working range is -40 to 85.

Appendix A: Photographs of Test Setup
Radiated Emission



CE



Appendix B: Photographs of EUT

Refer to the External Photo.

*******END OF REPORT*******