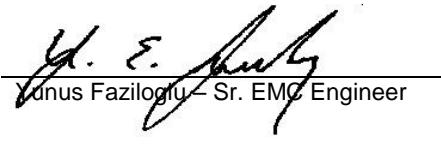




BUREAU  
VERITAS

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

# Test Report

|                     |   |
|---------------------|---|
| Report No           | ER2499-10   |
| Client              | Harman International Industries, Inc.<br>Mark Bowman  |
| Address             | 30001 Cabot Drive<br>Novi, MI 48377   |
| Phone               | 248-254-7751  |
| Items tested        | G31 MID   |
| FCC ID              | 2AHPN-BE2833  |
| IC                  | 6434C-BE2833  |
| FRN                 | 0026894154  |
| Equipment Type      | Digital Transmission System   |
| Equipment Code      | DTS   |
| FCC/IC Rule Parts   | CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2   |
| Test Dates          | September 22 - October 17, 2017   |
| Results             | As detailed within this report  |
| Prepared by         | <br>Zachary Johnson - Test Engineer        |
| Authorized by       | <br>Yunus Faziloglu - Sr. EMC Engineer     |
| Issue Date          | <u>10\26\2017</u>   |
| Conditions of Issue | This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 16 of this report. |

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Report REV Sep-08-2017 - YF



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## **Summary**

This test report supports an application for certification of a transmitter operating pursuant to:  
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

The product is the G31 MID. It is a direct sequence spread spectrum transmitter that operates in the 2412 – 2462MHz frequency range. This report covers the 2.4GHz Wifi portion of the device.

Antenna Type: Switching PCB trace antenna

Gain: 1.18dBi maximum in 2.4GHz – 2.5GHz range

We found that the product met the above requirements without modification.

Test samples were received in good condition.



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## Test Methodology

All testing was performed according to the following rules/procedures/documents:  
CFR 47 Part 15.247, RSS-247 Issue 2, RSS-Gen Issue 4, FCC KDB 558074 D01 DTS  
Measurement Guidance v04 and ANSI C63.10-2013.

Radiated emissions were maximized by measuring the device in normal operating position, as well as varying the test antenna's height and polarity.

EUT operating voltage is 11-16V DC

The following bandwidths were used during radiated spurious and AC line conducted emissions testing.

| Frequency  | RBW    | VBW   |
|------------|--------|-------|
| 0.15-30MHz | 9kHz   | 30kHz |
| 30-1000MHz | 120kHz | 1MHz  |
| 1-25GHz    | 1MHz   | 3MHz  |



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**Product Tested - Configuration Documentation**

| EUT Configuration  |   |                |                    |                   |                 |                 |                   |               |                   |                |
|--|---|----------------|--------------------|-------------------|-----------------|-----------------|-------------------|---------------|-------------------|----------------|
| <b>Work Order:</b>   | R2499   |                |                    |                   |                 |                 |                   |               |                   |                |
| <b>Company:</b>  | Harman International Industries, Incorporated |                |                    |                   |                 |                 |                   |               |                   |                |
| <b>Company Address:</b>  | 30001 Cabot Drive                             |                |                    |                   |                 |                 |                   |               |                   |                |
|  | Novi, MI, 48377                               |                |                    |                   |                 |                 |                   |               |                   |                |
| <b>Contact:</b>  | Mark Bowman                                   |                |                    |                   |                 |                 |                   |               |                   |                |
|  |   | <b>MN</b>      |                    |                   | <b>PN</b>       |                 |                   | <b>SN</b>     |                   |                |
| <b>EUT:</b>  |   | G31 MID        |                    |                   | --              |                 |                   | --            |                   |                |
| <b>EUT Description:</b>  | Car Stereo System                             |                |                    |                   |                 |                 |                   |               |                   |                |
| <b>EUT Components</b>  |   | <b>MN</b>      |                    |                   |                 |                 |                   | <b>SN</b>     |                   |                |
| Back up camera   |   | --             |                    |                   |                 |                 |                   | --            |                   |                |
| FM/AM antenna  |   | --             |                    |                   |                 |                 |                   | --            |                   |                |
| <b>Support Equipment</b>   |   | <b>MN</b>      |                    |                   |                 |                 |                   | <b>SN</b>     |                   |                |
| CS Supplied Laptop.  |   | --             |                    |                   |                 |                 |                   | --            |                   |                |
| USB to Ethernet Converter  |   | --             |                    |                   |                 |                 |                   | --            |                   |                |
| 13.5Vdc Power Supply   |   | --             |                    |                   |                 |                 |                   | --            |                   |                |
| <b>Port Label</b>  | <b>Port Type</b>                              | <b># ports</b> | <b># populated</b> | <b>cable type</b> | <b>shielded</b> | <b>ferrites</b> | <b>length (m)</b> | <b>in/out</b> | <b>under test</b> | <b>comment</b> |
| DC main  | Power DC                                      | 2              | 2                  | Power DC          | No              | No              | 1.2               | in            | yes               |                |
| Audio  |   | 1              | 1                  | -                 | Yes             | No              | 3                 | in            | yes               |                |
| USB  | USB   | 3              | 1                  | USB               | Yes             | No              | 1                 | in            | yes               |                |
| xm/Dab connector   |   | 1              | 1                  | Coaxial           | Yes             | No              | 1.2               | in            | yes               |                |
| FM/AM antenna  | -   | 1              | 1                  |                   | Yes             | No              | 0.4               | in            | yes               |                |
| Back up camera   |   | 1              | 1                  |                   | Yes             | No              | 0.3               | in            | yes               |                |
| Next Gen port  | -   | 1              | 0                  | -                 |                 |                 |                   | in            | no                |                |
| <b>Software Operating Mode Description:</b>  |   |                |                    |                   |                 |                 |                   |               |                   |                |
| EUT will be operating in a test mode for Immunity tests, RX for non intentional REMI, and Constant TX internal mode for Spurious.                                  |   |                |                    |                   |                 |                 |                   |               |                   |                |
| <b>Performance Criteria:</b>   |   |                |                    |                   |                 |                 |                   |               |                   |                |
| EUT will connect to CMW and preform less than 10% PER during test.BT- EUT will connect to tablet or CMW over bluetooth and stay connected at appropriate distance. |   |                |                    |                   |                 |                 |                   |               |                   |                |



### Statement of Conformity

| RSS-GEN | RSP-100 | RSS 247 | Part 15          | Comments   |
|---------|---------|---------|------------------|--|
| 6.3     |         |         | 15.15(b)         | There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.  |
|         | 3.1     |         | 15.19            | The label is shown in the label exhibit.   |
|         | 4       |         | 15.21            | Information to the user is shown in the instruction manual exhibit.  |
|         |         |         | 15.27            | No special accessories are required for compliance.  |
| 3, 6.1  |         |         | 15.31            | The EUT was tested in accordance with the measurement standards in this section.   |
| 6.13    |         |         | 15.33            | Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.  |
| 8.1     |         |         | 15.35            | The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.      |
| 8.3     |         |         | 15.203           | EUT employs single switching PCB trace antenna with 1.18dBi maximum gain.  |
| 8.10    |         |         | 15.205<br>15.209 | The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable |
| 8.8     |         |         | 15.207           | N/A. Unit is powered by a vehicle battery only.  |

Refer to Appendix A of this report for antenna port conducted measurements.



## Test Results

### Radiated Spurious Emissions

#### LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).  
[15.247(d)]

Device was measured in normal operating position.

### MEASUREMENTS / RESULTS

|   |                |                   |   |                |              |                    |                |                    |
|---|----------------|-------------------|---|----------------|--------------|--------------------|----------------|--------------------|
| Curtis Straus - a Bureau Veritas Company      |                |                   | Work Order - R2499                          |                |              |                    |                |                    |
| Radiated Emissions Electric Field 3m Distance |                |                   | EUT Power Input - 13.8V DC                  |                |              |                    |                |                    |
| 30-1000MHz Vertical Data                      |                |                   | Test Site - CH 2                            |                |              |                    |                |                    |
| Operator: CCH®                                |                |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                |              |                    |                |                    |
| 2.4GHz 802.11n ch6                            |                |                   |   |                |              |                    |                |                    |
|   |                |                   |   |                |              |                    |                |                    |
|   |                |                   |   |                |              |                    |                |                    |
| Frequency                                     | Raw QP Reading | Correction Factor | Adjusted QP                                 |                | Margin Req 1 | Test Results Req 1 | Antenna Height | Worst Margin Req 1 |
|   |                |                   | Amplitude                                   | Limit Req 1    |              |                    |                |                    |
| MHz   | (dB $\mu$ V)   | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m) | (dB)         | (Pass/Fail)        | (cm)           | (degrees)          |
| 31.077  | 39.5           | -15.4             | 24.2  | 40             | -15.8        | PASS               | 202            | 25                 |
| 479.558                                       | 44.8           | -15.9             | 28.9  | 46             | -17.1        | PASS               | 155            | 141                |
| 479.979                                       | 48             | -15.8             | 32.2  | 46             | -13.8        | PASS               | 125            | 160                |
| 480.967                                       | 46.5           | -15.8             | 30.7  | 46             | -15.4        | PASS               | 141            | 146                |
| 720.024                                       | 48.6           | -12.2             | 36.5  | 46             | -9.6         | PASS               | 139            | 328                |
| 960.041                                       | 44.6           | -9.2              | 35.4  | 54             | -18.6        | PASS               | 138            | -9.6               |
|   |                |                   |   |                |              |                    |                | 37                 |



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|---|--|--|--|---|--|--|--|--|--|--|--|
| Curtis Straus - a Bureau Veritas Company      |  |  |  | Work Order - R2499                          |  |  |  |  |  |  |  |
| Radiated Emissions Electric Field 3m Distance |  |  |  | EUT Power Input - 13.8V DC                  |  |  |  |  |  |  |  |
| 30-1000MHz Horizontal Data                    |  |  |  | Test Site - CH 2                            |  |  |  |  |  |  |  |
| Operator: CCH®                                |  |  |  | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |  |  |  |  |  |  |  |
| 2.4GHz 802.11n ch6                            |  |  |  |   |  |  |  |  |  |  |  |
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|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|--------------|----------------|------------|-------------|----------------|-------------|-------------------|------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |              |                |            |             |                |             |                   |                  |
| Radiated Emissions Electric Field 3m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |              |                |            |             |                |             |                   |                  |
| 1-6GHz Vertical Data                          |                  |                 |                   | Test Site - CH 2                            |                        |                |             |              |                |            |             |                |             |                   |                  |
| Operator: CCH                                 |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |              |                |            |             |                |             |                   |                  |
| 2.4GHz 802.11n ch6                            |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                  |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Results | Avg Limit      | Avg Margin | Avg Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Avg Margin |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)  | (dB $\mu$ V/m) | (dB)       | (Pass/Fail) | (cm)           | (degrees)   | (dB)              | (dB)             |
| 1037.9  | 42.4             | 33.6            | -6.8              | 35.6  | 26.8                   | 74             | -38.4       | PASS         | 54             | -27.1      | PASS        | 188            | 28          |                   |                  |
| 1064.9  | 55               | 41.4            | -6.4              | 48.6  | 35                     | 74             | -25.3       | PASS         | 54             | -19        | PASS        | 285            | 2           |                   |                  |
| 1176.8  | 41.4             | 33.2            | -5.5              | 35.9  | 27.7                   | 74             | -38         | PASS         | 54             | -26.3      | PASS        | 100            | 185         |                   |                  |
| 1329.8  | 42.7             | 33.3            | -3.9              | 38.8  | 29.4                   | 74             | -35.2       | PASS         | 54             | -24.6      | PASS        | 125            | 193         |                   |                  |
| 4874.3  | 44.7             | 41.2            | 3.2               | 47.9  | 44.4                   | 74             | -26.1       | PASS         | 54             | -9.6       | PASS        | 125            | 160         | -26.1             | -9.6             |

|   |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                      |
|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|--------------|----------------|------------|-------------|----------------|-------------|-------------------|----------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |              |                |            |             |                |             |                   |                      |
| Radiated Emissions Electric Field 3m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |              |                |            |             |                |             |                   |                      |
| 1-6GHz Horizontal Data                        |                  |                 |                   | Test Site - CH 2                            |                        |                |             |              |                |            |             |                |             |                   |                      |
| Operator: CCH                                 |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |              |                |            |             |                |             |                   |                      |
| 2.4GHz 802.11n ch6                            |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                      |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Results | Avg Limit      | Avg Margin | Avg Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Average Margin |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)  | (dB $\mu$ V/m) | (dB)       | (Pass/Fail) | (cm)           | (degrees)   | (dB)              | (dB)                 |
| 1063.9  | 46.9             | 33.6            | -6.4              | 40.5  | 27.2                   | 74             | -33.4       | PASS         | 54             | -26.7      | PASS        | 204            | 146         |                   |                      |
| 1331.4  | 42               | 32.4            | -3.9              | 38.1  | 28.6                   | 74             | -35.9       | PASS         | 54             | -25.4      | PASS        | 100            | 5           |                   |                      |
| 5759.6  | 39.5             | 30.5            | 5.6               | 45.1  | 36                     | 74             | -28.9       | PASS         | 54             | -17.9      | PASS        | 102            | 0           | -28.9             | -17.9                |

## 1-6GHz Mid Channel

|   |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                  |
|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|--------------|----------------|------------|-------------|----------------|-------------|-------------------|------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |              |                |            |             |                |             |                   |                  |
| Radiated Emissions Electric Field 3m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |              |                |            |             |                |             |                   |                  |
| 1-6GHz Vertical Data                          |                  |                 |                   | Test Site - CH 2                            |                        |                |             |              |                |            |             |                |             |                   |                  |
| Operator: CCH                                 |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |              |                |            |             |                |             |                   |                  |
| 2.4GHz 802.11b ch11                           |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                  |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Results | Avg Limit      | Avg Margin | Avg Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Avg Margin |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)  | (dB $\mu$ V/m) | (dB)       | (Pass/Fail) | (cm)           | (degrees)   | (dB)              | (dB)             |
| 1042  | 42.9             | 33.3            | -6.8              | 36.2  | 26.6                   | 74             | -37.8       | PASS         | 54             | -27.4      | PASS        | 175            | 69          |                   |                  |
| 1062.7  | 49.2             | 42.5            | -6.4              | 42.8  | 36.1                   | 74             | -31.2       | PASS         | 54             | -17.9      | PASS        | 287            | 0           |                   |                  |
| 1177.7  | 40.5             | 33.5            | -5.5              | 35  | 28                     | 74             | -39         | PASS         | 54             | -25.9      | PASS        | 110            | 149         |                   |                  |
| 1332.1  | 41.1             | 32.7            | -3.9              | 37.2  | 28.8                   | 74             | -36.7       | PASS         | 54             | -25.2      | PASS        | 125            | 172         |                   |                  |
| 4874.1  | 46.7             | 42.3            | 3.2               | 49.9  | 45.5                   | 74             | -24.1       | PASS         | 54             | -8.5       | PASS        | 100            | 176         | -24.1             | -8.5             |

|   |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                      |
|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|--------------|----------------|------------|-------------|----------------|-------------|-------------------|----------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |              |                |            |             |                |             |                   |                      |
| Radiated Emissions Electric Field 3m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |              |                |            |             |                |             |                   |                      |
| 1-6GHz Horizontal Data                        |                  |                 |                   | Test Site - CH 2                            |                        |                |             |              |                |            |             |                |             |                   |                      |
| Operator: CCH <sup>®</sup>                    |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |              |                |            |             |                |             |                   |                      |
| 2.4GHz 802.11b ch11                           |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                      |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Results | Avg Limit      | Avg Margin | Avg Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Average Margin |
|   |                  |                 |                   | (dB $\mu$ V)                                | (dB $\mu$ V)           |                |             |              |                |            |             |                |             |                   |                      |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)  | (dB $\mu$ V/m) | (dB)       | (Pass/Fail) | (cm)           | (degrees)   | (dB)              | (dB)                 |
| 1063.9  | 46.9             | 33.6            | -6.4              | 40.5  | 27.2                   | 74             | -33.4       | PASS         | 54             | -26.7      | PASS        | 204            | 146         |                   |                      |
| 1331.4  | 42               | 32.4            | -3.9              | 38.1  | 28.6                   | 74             | -35.9       | PASS         | 54             | -25.4      | PASS        | 100            | 5           |                   |                      |
| 5759.6  | 39.5             | 30.5            | 5.6               | 45.1  | 36                     | 74             | -28.9       | PASS         | 54             | -17.9      | PASS        | 102            | 0           | -28.9             | -17.9                |

## 1-6GHz High Channel

|   |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                  |
|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|--------------|----------------|------------|-------------|----------------|-------------|-------------------|------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |              |                |            |             |                |             |                   |                  |
| Radiated Emissions Electric Field 1m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |              |                |            |             |                |             |                   |                  |
| 6-18GHz Vertical Data                         |                  |                 |                   | Test Site - CH 2                            |                        |                |             |              |                |            |             |                |             |                   |                  |
| Operator: CCH <sup>®</sup>                    |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |              |                |            |             |                |             |                   |                  |
| 2.4GHz 802.11n ch6                            |                  |                 |                   |   |                        |                |             |              |                |            |             |                |             |                   |                  |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Results | Avg Limit      | Avg Margin | Avg Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Avg Margin |
|   |                  |                 |                   | (dB $\mu$ V)                                | (dB $\mu$ V)           |                |             |              |                |            |             |                |             |                   |                  |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)  | (dB $\mu$ V/m) | (dB)       | (Pass/Fail) | (cm)           | (degrees)   | (dB)              | (dB)             |
| 10534.4                                       | 39.5             | 28.8            | 11.1              | 50.7  | 39.9                   | 83.5           | -32.8       | PASS         | 63.5           | -23.6      | PASS        | 200            | 340         |                   |                  |
| 14480   | 39.1             | 30.7            | 14                | 53.1  | 44.7                   | 83.5           | -30.4       | PASS         | 63.5           | -18.8      | PASS        | 132            | 109         |                   |                  |
| 17045.4                                       | 36.9             | 27.5            | 18.8              | 55.8  | 46.4                   | 83.5           | -27.7       | PASS         | 63.5           | -17.1      | PASS        | 200            | 253         |                   |                  |
| 17925.8                                       | 35.7             | 26.6            | 20.9              | 56.6  | 47.5                   | 83.5           | -26.9       | PASS         | 63.5           | -16        | PASS        | 200            | 237         | -26.9             | -16              |

|   |                  |                 |                   |   |                        |                |             |                   |                |            |                  |                |             |                   |                  |
|---|------------------|-----------------|-------------------|---|------------------------|----------------|-------------|-------------------|----------------|------------|------------------|----------------|-------------|-------------------|------------------|
| Curtis Straus - a Bureau Veritas Company      |                  |                 |                   | Work Order - R2499                          |                        |                |             |                   |                |            |                  |                |             |                   |                  |
| Radiated Emissions Electric Field 1m Distance |                  |                 |                   | EUT Power Input - 13.8V DC                  |                        |                |             |                   |                |            |                  |                |             |                   |                  |
| 6-18GHz Horizontal Data                       |                  |                 |                   | Test Site - CH 2                            |                        |                |             |                   |                |            |                  |                |             |                   |                  |
| Operator: CCH <sup>®</sup>                    |                  |                 |                   | Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar |                        |                |             |                   |                |            |                  |                |             |                   |                  |
| 2.4GHz 802.11n ch6                            |                  |                 |                   |   |                        |                |             |                   |                |            |                  |                |             |                   |                  |
| Frequency                                     | Raw Peak Reading | Raw Avg Reading | Correction Factor | Adjusted Peak Amplitude                     | Adjusted Avg Amplitude | Peak Limit     | Peak Margin | Peak Test Results | Avg Limit      | Avg Margin | Avg Test Results | Antenna Height | EUT Azimuth | Worst Peak Margin | Worst Avg Margin |
|   |                  |                 |                   | (dB $\mu$ V)                                | (dB $\mu$ V)           |                |             |                   |                |            |                  |                |             |                   |                  |
| MHz   | (dB $\mu$ V)     | (dB $\mu$ V)    | (dB/m)            | (dB $\mu$ V/m)                              | (dB $\mu$ V/m)         | (dB $\mu$ V/m) | (dB)        | (Pass/Fail)       | (dB $\mu$ V/m) | (dB)       | (Pass/Fail)      | (cm)           | (degrees)   | (dB)              | (dB)             |
| 10534   | 36.6             | 28.7            | 11.1              | 47.7  | 39.8                   | 83.5           | -35.8       | PASS              | 63.5           | -23.7      | PASS             | 150            | 129         |                   |                  |
| 12500.6                                       | 38.8             | 30.3            | 14.1              | 52.9  | 44.4                   | 83.5           | -30.6       | PASS              | 63.5           | -19.1      | PASS             | 166            | 81          |                   |                  |
| 15574   | 38.4             | 29.7            | 15.5              | 53.9  | 45.2                   | 83.5           | -29.6       | PASS              | 63.5           | -18.3      | PASS             | 162            | 156         |                   |                  |
| 16810.3                                       | 38.6             | 29.1            | 17.7              | 56.2  | 46.8                   | 83.5           | -27.3       | PASS              | 63.5           | -16.7      | PASS             | 139            | 229         |                   |                  |
| 17957.7                                       | 35.9             | 26.7            | 20.9              | 56.8  | 47.6                   | 83.5           | -26.7       | PASS              | 63.5           | -15.9      | PASS             | 175            | 241         | -26.7             | -15.9            |



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| Spectrum Analyzers / Receivers / Preselectors |  | Range                     | MN                | Mfr        | SN         | Asset   | Cat             | Calibration Due |  |
|---|--|---------------------------|-------------------|------------|------------|---------|-----------------|-----------------|--|
| Rental MXE EMI Receiver(1170725)              |  | 20Hz-26.5GHz              | N9038A            | Agilent    | MY51210151 | 1170725 | I               | 12/22/2017      |  |
| Radiated Emissions Sites                      |  | FCC Code                  | IC Code           | VCCI Code  | Range      | Asset   | Cat             | Calibration Due |  |
| EMI Chamber 2                                 |  | 719150                    | 2762A-7           | A-0015     | 30-1000MHz | 1686    | I               | 12/21/2018      |  |
| EMI Chamber 2                                 |  | 719150                    | 2762A-7           | A-0015     | 1-18GHz    | 1686    | I               | 12/21/2018      |  |
| Preamps / Couplers Attenuators / Filters      |  | Range                     | MN                | Mfr        | SN         | Asset   | Cat             | Calibration Due |  |
| Blue  |  | 0.009-2000MHz ZFL-1000-LN | CS                | N/A        | 759        | II      | 5/9/2018        |                 |  |
| 2311 PA                                       |  | 1-1000MHz                 | PAM-103           | COM-POWER  | 441174     | 2311    | II              | 2/4/2017        |  |
| 2444 PA                                       |  | 9kHz-6GHz                 | BBV9744           | SCWARZBECK | 67         | 2444    | I               | 10/2/2018       |  |
| Antennas                                      |  | Range                     | MN                | Mfr        | SN         | Asset   | Cat             | Calibration Due |  |
| Red-Black BiLog                               |  | 30-2000MHz                | JB1               | Sunol      | A091604-2  | 1106    | I               | 2/28/2019       |  |
| Meteorological Meters/Chambers                |  | MN                        | Mfr               | SN         | Asset      | Cat     | Calibration Due |                 |  |
| Weather Clock (Pressure Only)                 |  | BA928                     | Oregon Scientific | C3166-1    | 831        | I       | 4/28/2018       |                 |  |
| TH A#2082                                     |  | HTC-1                     | HDE               |            | 2082       | II      | 3/23/2018       |                 |  |
| Cables  |  | Range                     | Mfr               |            |            | Cat     | Calibration Due |                 |  |
| Asset #1509                                   |  | 9kHz - 18GHz              | Florida RF        |            |            | II      | 10/2/2018       |                 |  |
| Asset #1522                                   |  | 9kHz - 18GHz              | Florida RF        |            |            | II      | 2/11/2018       |                 |  |
| Asset #2052                                   |  | 9kHz - 18GHz              | Florida RF        |            |            | II      | 3/5/2018        |                 |  |
| Asset #2053                                   |  | 9kHz - 18GHz              | Florida RF        |            |            | II      | 10/30/2017      |                 |  |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## 6-18GHz Mid Channel

| Radiated Emissions Table   |                               |                           |                              |                    |                             |   |                                      |                                     |                                   |                                      |
|--|-------------------------------|---------------------------|------------------------------|--------------------|-----------------------------|---|--------------------------------------|-------------------------------------|-----------------------------------|--------------------------------------|
| Date: 17-Oct-17  | Company: Harman International |                           |                              |                    |                             | Work Order: R2499                         |                                      |                                     |                                   |                                      |
| Engineer: Chris Hamel  | EUT Desc: G31 MID             |                           |                              |                    |                             | EUT Operating Voltage/Frequency: 13.8V DC |                                      |                                     |                                   |                                      |
| Temp: 24.2°C   | Humidity: 42%                 |                           |                              |                    |                             | Pressure: 1010mbar                        |                                      |                                     |                                   |                                      |
| Frequency Range: 18-26.5GHz  |                               |                           |                              |                    | Measurement Distance: 0.1 m |   |                                      |                                     |                                   |                                      |
| Notes: No emissions Found  |                               |                           |                              |                    |                             |   |                                      |                                     | EUT Max Freq:                     |                                      |
| Antenna Polarization (H / V)   | Frequency (MHz)               | Peak Reading (dB $\mu$ V) | Average Reading (dB $\mu$ V) | Preamp Factor (dB) | Antenna Factor (dB/m)       | Cable Factor (dB)                         | Adjusted Peak Reading (dB $\mu$ V/m) | Adjusted Avg Reading (dB $\mu$ V/m) | FCC Class B High Frequency - Peak | FCC Class B High Frequency - Average |
| No Emissions Found   |                               |                           |                              |                    |                             |   |                                      |                                     |                                   |                                      |
| Table Result:  |                               | Pass                      | by                           | N/A dB             |                             | Worst Freq:                               |                                      |                                     |                                   |                                      |
| Test Site: EMI Chamber 2   | Cable 1: Asset #2324          |                           |                              |                    | Cable 2: ---                |   |                                      | Cable 3: ---                        |                                   |                                      |
| Analyzer: Gold   | Preamp: 18-26.5GHz            |                           |                              |                    | Antenna: 18-26.5GHz Horn    |   |                                      | Preselector: ---                    |                                   |                                      |
| CSsoft Radiated Emissions Calculator v 1.017.188                           |                               |                           |                              |                    |                             |   |                                      |                                     | Copyright Curtis-Straus LLC 2000  |                                      |
| Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor |                               |                           |                              |                    |                             |   |                                      |                                     |                                   |                                      |

| Rev. 9/20/2017                                |  |                |                       |           |              |       |                 |                   |               |
|---|--|----------------|-----------------------|-----------|--------------|-------|-----------------|-------------------|---------------|
| Spectrum Analyzers / Receivers / Preselectors |  | Range          | MN                    | Mfr       | SN           | Asset | Cat             | Calibration Due   | Calibrated on |
| Gold  |  | 100Hz-26.5 GHz | E4407B                | Agilent   | MY45113816   | 1284  | I               | 2/28/2018         | 2/28/2017     |
| Radiated Emissions Sites                      |  | FCC Code       | IC Code               | VCCI Code | Range        | Asset | Cat             | Calibration Due   | Calibrated on |
| EMI Chamber 2                                 |  | 719150         | 2762A-7               | A-0015    | 30-1000MHz   | 1686  | I               | 12/21/2018        | 12/21/2016    |
| EMI Chamber 2                                 |  | 719150         | 2762A-7               | A-0015    | 1-18GHz      | 1686  | I               | 12/21/2018        | 12/21/2016    |
| Preamps / Couplers Attenuators / Filters      |  | Range          | MN                    | Mfr       | SN           | Asset | Cat             | Calibration Due   | Calibrated on |
| HF (Yellow)                                   |  | 18-26.5GHz     | AFS4-18002650-60-8P-4 | CS        | 467559       | 1266  | II              | 10/16/2017        | 9/16/2016     |
| Antennas                                      |  | Range          | MN                    | Mfr       | SN           | Asset | Cat             | Calibration Due   | Calibrated on |
| HF (White) Horn                               |  | 18-26.5GHz     | 801-WLM               | Waveline  | 758          | 758   | III             | Verify before Use | date of test  |
| Meteorological Meters                         |  | MN             | Mfr                   | SN        | Asset        | Cat   | Calibration Due | Calibrated on     |               |
| Weather Clock (Pressure Only)                 |  | BA928          | Oregon Scientific     | C3166-1   | 831          | I     | 4/28/2018       | 4/28/2016         |               |
| TH A#2084                                     |  | HTC-1          | HDE                   |           | 2084         | II    | 3/23/2018       | 3/23/2017         |               |
| Cables  |  | Range          | MN                    | Mfr       | SN           | Asset | Cat             | Calibration Due   | Calibrated on |
| Asset 2324                                    |  | 1-26.5GHz      | TM26-S1S1-120         | MEGAPHASE | 17139101 001 | 2324  | II              | 8/19/2018         | 8/19/2017     |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## 18-26.5GHz Mid Channel



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**Radiated Emissions Table**

| Date: 17-Oct-17  | Company: Harman International | Work Order: R2499                         |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |
|--|-------------------------------|---|------------------------------------|--------------------------|-----------------------------|-------------------------|--|---|--------------------------------------|-------------------------|----------------|---|-------------------------|----------------|-----------------------|
| Engineer: Chris Hamel  | EUT Desc: G31 MID             | EUT Operating Voltage/Frequency: 13.8V DC |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |
| Temp: 24.2°C   | Humidity: 42%                 | Pressure: 1010mbar                        |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |
| Frequency Range: 26.5-40GHz  |                               | Measurement Distance: 0.1 m               |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |
| Notes: No emissions Found  |                               | EUT Max Freq:                             |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |
| Antenna<br>Polarization<br>(H / V)   | Frequency<br>(MHz)            | Peak<br>Reading<br>(dB $\mu$ V)           | Average<br>Reading<br>(dB $\mu$ V) | Preamp<br>Factor<br>(dB) | Antenna<br>Factor<br>(dB/m) | Cable<br>Factor<br>(dB) | Adjusted<br>Peak Reading<br>(dB $\mu$ V/m) | Adjusted<br>Avg Reading<br>(dB $\mu$ V/m) | FCC Class B High Frequency -<br>Peak |                         |                | FCC Class B High Frequency -<br>Average |                         |                |                       |
| o Emissions Found  |                               |   |                                    |                          |                             |                         |  |   |                                      | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB) | Result<br>(Pass/Fail)                   | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB) | Result<br>(Pass/Fail) |
|  |                               |   |                                    |                          |                             |                         |  |   |                                      | ---                     | ---            | ---                                     | ---                     | ---            | ---                   |
| <b>Table Result:</b>   |                               | Pass                                      |                                    | by                       |                             | N/A dB                  |  |   |                                      | <b>Worst Freq:</b>      |                | N/A MHz                                 |                         |                |                       |
| Test Site: EMI Chamber 1   |                               | Cable 1: Asset #2323                      |                                    | Cable 2: Asset #2324     |                             | Cable 3: ---            |  |   |                                      |                         |                |   |                         |                |                       |
| Analyzer: Gold   |                               | Preamp: 40GHz Mixer                       |                                    | Antenna: 40GHz Mixer     |                             | Preselector: ---        |  |   |                                      |                         |                |   |                         |                |                       |
| CSsoft Radiated Emissions Calculator                                       |                               | v 1.017.195                               |                                    |                          |                             |                         |  |   |                                      |                         |                | Copyright Curtis-Straus LLC 2000        |                         |                |                       |
| Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor |                               |   |                                    |                          |                             |                         |  |   |                                      |                         |                |   |                         |                |                       |

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| Spectrum Analyzers / Receivers /Preselectors | Range          | MN                | Mfr       | SN           | Asset | Cat             | Calibration Due | Calibrated on |
|--|----------------|-------------------|-----------|--------------|-------|-----------------|-----------------|---------------|
| Gold   | 100Hz-26.5 GHz | E4407B            | Agilent   | MY45113816   | 1284  | I               | 2/28/2018       | 2/28/2017     |
| <b>Radiated Emissions Sites</b>              |                |                   |           |              |       |                 |                 |               |
| EMI Chamber 1                                | FCC Code       | IC Code           | VCCI Code | Range        | Asset | Cat             | Calibration Due | Calibrated on |
|  | 719150         | 2762A-6           | A-0015    | 1-18GHz      | 1685  | I               | 12/21/2018      | 12/21/2016    |
| <b>Mixers/Diplexers</b>                      |                |                   |           |              |       |                 |                 |               |
| Mixer / Horn                                 | Range          | MN                | Mfr       | SN           | Asset | Cat             | Calibration Due | Calibrated on |
|  | 26.5-40 GHz    | 11970A            | Agilent   | 3003A10230   | 2154  | I               | 3/12/2019       | 3/12/2016     |
| <b>Meteorological Meters/Chambers</b>        |                |                   |           |              |       |                 |                 |               |
| Weather Clock (Pressure Only)                |                | MN                | Mfr       | SN           | Asset | Cat             | Calibration Due | Calibrated on |
| TH A#2084                                    | BA928          | Oregon Scientific | C3166-1   | 831          | I     |                 | 4/28/2018       | 4/28/2016     |
|  | HTC-1          | HDE               |           | 2084         | II    |                 | 3/23/2018       | 3/23/2017     |
| <b>Cables</b>                                | Range          | Mfr               |           |              | Cat   | Calibration Due | Calibrated on   |               |
| Asset 2323                                   | 1-26.5GHz      | TM26-S1S1-120     | MEGAPHASE | 17139101 002 | 2323  | II              | 8/19/2018       | 8/19/2017     |
| Asset 2324                                   | 1-26.5GHz      | TM26-S1S1-120     | MEGAPHASE | 17139101 001 | 2324  | II              | 8/19/2018       | 8/19/2017     |

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**26.5-40GHz Mid Channel**

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Testing Cert. No. 1627-01

**Radiated Band Edge****Radiated Emissions Table**

| Date: 21-Sep-17               |                 | Company: Harman International Industries, Inc. |                              |                    |                       |                   |                                      |                                     | Work Order: R2499                         |             |                    |                                      |             |                    |
|-------------------------------|-----------------|--|------------------------------|--------------------|-----------------------|-------------------|--------------------------------------|-------------------------------------|---|-------------|--------------------|--------------------------------------|-------------|--------------------|
| Engineer: Chris Hamel         |                 | EUT Desc: G31 MID                              |                              |                    | Humidity: 47%         |                   |                                      |                                     | EUT Operating Voltage/Frequency: 13.8V DC |             |                    |                                      |             |                    |
| Temp: 25.1°C                  |                 |  |                              |                    |                       |                   |                                      |                                     | Pressure: 1006 mbar                       |             |                    |                                      |             |                    |
| Frequency Range:              |                 |  |                              |                    |                       |                   | Measurement Distance: 3 m            |                                     |   |             |                    |                                      |             |                    |
| Notes: 802.11g Reduced power. |                 |  |                              |                    |                       |                   |                                      |                                     |   |             | EUT Max Freq:      |                                      |             |                    |
| Antenna Polarization (H / V)  | Frequency (MHz) | Peak Reading (dB $\mu$ V)                      | Average Reading (dB $\mu$ V) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Peak Reading (dB $\mu$ V/m) | Adjusted Avg Reading (dB $\mu$ V/m) | FCC Class B High Frequency - Peak         |             |                    | FCC Class B High Frequency - Average |             |                    |
|                               |                 |  |                              |                    |                       |                   |                                      |                                     | Limit (dB $\mu$ V/m)                      | Margin (dB) | Result (Pass/Fail) | Limit (dB $\mu$ V/m)                 | Margin (dB) | Result (Pass/Fail) |
| Low Max V                     | 2416.5          | 65.5   | 14.8                         | 0.0                | 32.3                  | 3.4               | ---                                  | ---                                 | 74.0                                      | ---         | ---                | 54.0                                 | ---         | ---                |
| Max H V                       | 2409.5          | 60.6   |                              | 0.0                | 32.3                  | 3.4               | ---                                  | ---                                 | 74.0                                      | ---         | ---                | 54.0                                 | ---         | ---                |
| High Max V                    | 2466.8          | 65.7   | 17.9                         | 0.0                | 32.4                  | 3.5               | ---                                  | ---                                 | 74.0                                      | ---         | ---                | 54.0                                 | ---         | ---                |
| Max H V                       | 2466.8          | 61.7   |                              | 0.0                | 32.4                  | 3.5               | ---                                  | ---                                 | 74.0                                      | ---         | ---                | 54.0                                 | ---         | ---                |
| V                             | 2483.5          | 28.1   | 15.4                         | 0.0                | 32.4                  | 3.5               | 64.0                                 | 53.8                                | 74.0                                      | -10.0       | Pass               | 54.0                                 | -0.2        | Pass               |
| V                             | 2483.8          | 29.2   |                              | 0.0                | 32.4                  | 3.5               | 65.1                                 | 53.5                                | 74.0                                      | -8.9        | Pass               | 54.0                                 | -0.5        | Pass               |
| V                             | 2485.8          | 26.6   |                              | 0.0                | 32.4                  | 3.5               | 62.5                                 | 51.3                                | 74.0                                      | -11.5       | Pass               | 54.0                                 | -2.7        | Pass               |

**Table Result:** Pass by -0.2 dB**Worst Freq:** 2483.5 MHz

| Test Site: EMI Chamber 2   | Cable 1: Asset #2052 | Cable 2: Asset #2053 | Cable 3: ...     |
|--|----------------------|----------------------|------------------|
| Analyzer: Rental SA#3  | Preamp: none         | Antenna: Blue Horn   | Preselector: ... |
| CSSoft Radiated Emissions Calculator v 1.017.188                           |                      |                      |                  |
| Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor |                      |                      |                  |

Rev. 10/22/2017

| Spectrum Analyzers / Receivers /Preselectors | Range        | MN                | Mfr        | SN          | Asset   | Cat        | Calibration Due |
|--|--------------|-------------------|------------|-------------|---------|------------|-----------------|
| Rental MXE EMI Receiver(1170725)             | 20Hz-26.5GHz | N9038A            | Agilent    | MY512010151 | 1170725 | I          | 12/22/2017      |
| <b>Radiated Emissions Sites</b>              |              |                   |            |             |         |            |                 |
| EMI Chamber 2                                | 719150       | 2762A-7           | A-0015     | 1-18GHz     | 1686    | I          | 12/21/2018      |
| <b>Antennas</b>                              |              |                   |            |             |         |            |                 |
| Orange Horn                                  | 1-18GHz      | 3115              | EMCO       | 0004-6123   | 390     | I          | 10/13/2018      |
| Blue Horn                                    | 1-18Ghz      | 3117              | ETS        | 157647      | 1861    | I          | 2/14/2019       |
| <b>Meteorological Meters/Chambers</b>        |              |                   |            |             |         |            |                 |
| Weather Clock (Pressure Only)                | BA928        | Oregon Scientific | C3166-1    | 831         | I       | 4/28/2018  |                 |
| TH A#2082                                    | HTC-1        | HDE               |            | 2082        | II      | 3/23/2018  |                 |
| <b>Cables</b>                                |              |                   |            |             |         |            |                 |
| Asset #2052                                  | 9kHz - 18GHz |                   | Florida RF |             | II      | 3/5/2018   |                 |
| Asset #2053                                  | 9kHz - 18GHz |                   | Florida RF |             | II      | 10/30/3017 |                 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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**AC Line Conducted Emissions****LIMITS**

| Frequency of emission (MHz) | Quasi-peak limit (dB $\mu$ V) | Average limit (dB $\mu$ V) |
|-----------------------------|-------------------------------|----------------------------|
| 0.15-0.5                    | 66 to 56*                     | 56 to 46*                  |
| 0.5-5                       | 56                            | 46                         |
| 5-30                        | 60                            | 50                         |

\*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

**MEASUREMENTS / RESULTS**

\*\*EUT is battery powered only



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## Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

| Measurement   | Expanded Uncertainty k=2 | Maximum allowable uncertainty |
|---|--------------------------|-------------------------------|
| Radiated Emissions (30-1000MHz)<br>NIST<br>CISPR                                      | 5.6dB<br>4.6dB           | N/A<br>5.2dB (Ucispr)         |
| Radiated Emissions (1-26.5GHz)  | 4.6dB                    | N/A                           |
| Radiated Emissions (above 26.5GHz)  | 4.9dB                    | N/A                           |
| Magnetic Radiated Emissions   | 5.6dB                    | N/A                           |
| Conducted Emissions<br>NIST<br>CISPR  | 3.9dB<br>3.6dB           | N/A<br>3.6dB (Ucispr)         |
| Telco Conducted Emissions (Current)   | 2.9dB                    | N/A                           |
| Telco Conducted Emissions (Voltage)   | 4.4dB                    | N/A                           |
| Electrostatic Discharge   | 11.5%                    | N/A                           |
| Radiated RF Immunity (Uniform Field)  | 1.6dB                    | N/A                           |
| Electrical Fast Transients  | 23.1%                    | N/A                           |
| Surge   | 23.1%                    | N/A                           |
| Conducted RF Immunity   | 3dB                      | N/A                           |
| Magnetic Immunity   | 12.8%                    | N/A                           |
| Dips and Interrupts   | 2.3V                     | N/A                           |
| Harmonics   | 3.5%                     | N/A                           |
| Flicker   | 3.5%                     | N/A                           |
| Radio frequency (@ 2.4GHz)  | $3.23 \times 10^{-8}$    | $1 \times 10^{-7}$            |
| RF power, conducted   | 0.40dB                   | 0.75dB                        |
| Maximum frequency deviation:  |                          |                               |
| • Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency | 3.4%<br>0.3dB            | 5%<br>3dB                     |
| Adjacent channel power  | 1.9dB                    | 3dB                           |
| Conducted spurious emission of transmitter, valid up to 12.75GHz                      | 2.39dB                   | 3dB                           |
| Conducted emission of receivers   | 1.3dB                    | 3dB                           |
| Radiated emission of transmitter, valid up to 26.5GHz                                 | 3.9dB                    | 6dB                           |
| Radiated emission of transmitter, valid up to 80GHz                                   | 3.3dB                    | 6dB                           |
| Radiated emission of receiver, valid up to 26.5GHz                                    | 3.9dB                    | 6dB                           |
| Radiated emission of receiver, valid up to 80GHz                                      | 3.3dB                    | 6dB                           |
| Humidity  | 2.37%                    | 5%                            |
| Temperature   | 0.7°C                    | 1.0°C                         |
| Time  | 4.1%                     | 10%                           |
| RF Power Density, Conducted   | 0.4dB                    | 3dB                           |
| DC and low frequency voltages   | 1.3%                     | 3%                            |
| Voltage (AC, <10kHz)  | 1.3%                     | 2%                            |
| Voltage (DC)  | 0.62%                    | 1%                            |
| The above reflects a 95% confidence level   |                          |                               |



## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPs**," "**MTL**," "**ACTS**," "**MTL-ACTS**" and **CURTIS-STRAUS** (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.



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15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND INrecognition of the relative risks and benefits to Client and the Company associated with the testing services contemplated hereby, the risks have been allocated such that under no circumstances whatsoever shall the liability of the Company to Client or any third party in respect of any claim for loss, damage or expense, of whatsoever nature or magnitude, and howsoever arising, exceed an amount equal to five (5) times the amount of the fees paid to the Company for the specific services which gave rise to such claim or U.S.\$10,000, whichever is the lesser amount.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request. Rev.160009121(2)\_#684340 v14CS



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**Appendix A:****CFR Title 47 FCC Part §15.247 and ISED Canada RSS-247 Issue 2****DUT Information**

Model: G31 MID  
 Manufacturer: Harman International Industries, Inc.  
 Serial Number: 047

| Mode              | Channel | Frequency |
|-------------------|---------|-----------|
| 802.11b/g/n(HT20) | 1       | 2412 MHz  |
| 802.11b/g/n(HT20) | 2       | 2417 MHz  |
| 802.11b/g/n(HT20) | 3       | 2422 MHz  |
| 802.11b/g/n(HT20) | 4       | 2427 MHz  |
| 802.11b/g/n(HT20) | 5       | 2432 MHz  |
| 802.11b/g/n(HT20) | 6       | 2437 MHz  |
| 802.11b/g/n(HT20) | 7       | 2442 MHz  |
| 802.11b/g/n(HT20) | 8       | 2447 MHz  |
| 802.11b/g/n(HT20) | 9       | 2452 MHz  |
| 802.11b/g/n(HT20) | 10      | 2457 MHz  |
| 802.11b/g/n(HT20) | 11      | 2462 MHz  |

Antenna Gain:

| Frequency (MHz) | Efficiency (dB) | Efficiency (%) | Gain (dBi) |
|-----------------|-----------------|----------------|------------|
| 2400            | -4.35           | 36.70          | 0.94       |
| 2410            | -4.40           | 36.33          | 0.93       |
| 2420            | -4.43           | 36.06          | 0.92       |
| 2430            | -4.46           | 35.78          | 1.18       |
| 2440            | -4.44           | 35.94          | 0.95       |
| 2450            | -4.50           | 35.47          | 0.87       |
| 2460            | -4.61           | 34.60          | 0.88       |
| 2470            | -4.80           | 33.13          | 0.71       |
| 2480            | -4.90           | 32.38          | 0.93       |
| 2490            | -5.06           | 31.18          | 0.85       |
| 2500            | -5.33           | 29.32          | 0.24       |

Number of transmission chains

1

Equipment Type

Digital Transmission System (DTS)



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## Test Equipment Used: R&amp;S TS8997 Test System

| Spectrum Analyzers / Receivers /Preselectors | Range        | MN       | Mfr             | SN     | Asset | Cat | Calibration Due | Calibrated on |
|--|--------------|----------|-----------------|--------|-------|-----|-----------------|---------------|
| FSV40 Signal Generator                       | 10Hz-40GHz   | FSV40    | ROHDE & SCHWARZ | 101551 | 2200  | I   | 6/30/2018       | 6/30/2017     |
| Signal Generators                            | Range        | MN       | Mfr             | SN     | Asset | Cat | Calibration Due | Calibrated on |
| SMBV100A Vector Signal Generator             | 9KHz-6GHz    | SMBV100A | ROHDE & SCHWARZ | 261919 | 2201  | I   | 6/26/2018       | 6/26/2017     |
| SMB100A Signal Generator                     | 100KHz-40GHz | SMB100A  | ROHDE & SCHWARZ | 179846 | 2434  | I   | 5/30/2018       | 5/30/2017     |
| R&S®OSP120 with R&S®OSP-B157                 | 30MHz-18GHz  | OSP120   | ROHDE & SCHWARZ | 101674 |       | I   | 6/1/2018        | 6/1/2017      |
| Cables                                       | Range        |          | Mfr             |        |       | Cat | Calibration Due | Calibrated on |
| Asset #2052                                  | 9KHz - 18GHz |          | Florida RF      |        |       | II  | 3/5/2018        | 3/5/2017      |
| DUT1   | 30MHz-26GHz  |          | Micro-Coax      |        |       | II  | 6/21/2018       | 6/21/2017     |
| Attenuators                                  | Range        | MN       | Mfr             | SN     | Asset | Cat | Calibration Due | Calibrated on |
| 10dB Attenuator-01 Brown                     | 30MHz-26GHz  |          | Mini Circuits   |        |       | II  | 7/13/2018       | 7/14/2017     |
| 10dB Attenuator-02 Yellow                    | 30MHz-26GHz  |          | Mini Circuits   |        |       | II  | 7/13/2018       | 7/14/2017     |
| Wideband Radio Communication Tester          | Range        | MN       | Mfr             | SN     | Asset | Cat | Calibration Due | Calibrated on |
| (Rental)CMW500                               | DC to 6GHz   | CMW500   | ROHDE & SCHWARZ | 155905 |       | I   | 6/2/2018        | 6/2/2017      |



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**Test Results Summary**

| Test                         | Frequency (MHz) | 802.11b | 802.11g | 802.11n (HT20) |
|------------------------------|-----------------|---------|---------|----------------|
| Average Output Power         | 2412.000        | PASS    | PASS    | PASS           |
| Peak Power Spectral Density  | 2412.000        | PASS    | PASS    | PASS           |
| DTS Bandwidth (6dB)          | 2412.000        | PASS    | PASS    | PASS           |
| Conducted Band Edges         | 2412.000        | PASS    | PASS    | PASS           |
| Conducted Spurious Emissions | 2412.000        | PASS    | PASS    | PASS           |
| Average Output Power         | 2437.000        | PASS    | PASS    | PASS           |
| Peak Power Spectral Density  | 2437.000        | PASS    | PASS    | PASS           |
| DTS Bandwidth (6dB)          | 2437.000        | PASS    | PASS    | PASS           |
| Conducted Band Edges         | 2437.000        | PASS    | PASS    | PASS           |
| Conducted Spurious Emissions | 2437.000        | PASS    | PASS    | PASS           |
| Average Output Power         | 2462.000        | PASS    | PASS    | PASS           |
| Peak Power Spectral Density  | 2462.000        | PASS    | PASS    | PASS           |
| DTS Bandwidth (6dB)          | 2462.000        | PASS    | PASS    | PASS           |
| Conducted Band Edges         | 2462.000        | PASS    | PASS    | PASS           |
| Conducted Spurious Emissions | 2462.000        | PASS    | PASS    | PASS           |



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## Average Output Power (Gated)

Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 9.2.3.2.

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.  
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

### 802.11b (Power Setting: Default)

| Data Rate | Gated RMS (dBm)<br>2412 MHz | Gated RMS (dBm)<br>2437 MHz | Gated RMS (dBm)<br>2462 MHz | Limit<br>(dBm) | Duty Cycle (%) |
|-----------|-----------------------------|-----------------------------|-----------------------------|----------------|----------------|
| 1 Mbps    | 16.691                      | 16.15                       | 15.45                       | 30.0           | 97.982         |
| 2 Mbps    | 17.098                      | 16.283                      | 15.598                      | 30.0           | 97.005         |
| 5.5 Mbps  | 17.198                      | 16.344                      | 15.62                       | 30.0           | 97.009         |
| 11 Mbps   | 17.04                       | 16.315                      | 15.6                        | 30.0           | 89.041         |

### 802.11g (Power Setting: 26)

| Data Rate | Gated RMS (dBm)<br>2412 MHz | Gated RMS (dBm)<br>2437 MHz | Gated RMS (dBm)<br>2462 MHz | Limit<br>(dBm) | Duty Cycle (%) |
|-----------|-----------------------------|-----------------------------|-----------------------------|----------------|----------------|
| 6 Mbps    | 13.527                      | 13.471                      | 13.935                      | 30.0           | 92.267         |
| 9 Mbps    | 13.075                      | 13.092                      | 13.523                      | 30.0           | 89.343         |
| 12 Mbps   | 12.972                      | 13.11                       | 13.542                      | 30.0           | 86.618         |
| 18 Mbps   | 13.02                       | 13.144                      | 13.488                      | 30.0           | 81.868         |
| 24 Mbps   | 13.146                      | 13.303                      | 13.628                      | 30.0           | 77.620         |
| 36 Mbps   | 13.212                      | 13.311                      | 13.686                      | 30.0           | 70.775         |
| 48 Mbps   | 13.304                      | 13.462                      | 13.803                      | 30.0           | 64.949         |
| 54 Mbps   | 13.25                       | 13.441                      | 13.705                      | 30.0           | 63.047         |

### 802.11n(HT20) (Power Setting: Default)

| Data Rate | Gated RMS (dBm)<br>2412 MHz | Gated RMS (dBm)<br>2437 MHz | Gated RMS (dBm)<br>2462 MHz | Limit<br>(dBm) | Duty Cycle (%) |
|-----------|-----------------------------|-----------------------------|-----------------------------|----------------|----------------|
| MCS0      | 14.12                       | 13.62                       | 12.948                      | 30.0           | 91.848         |
| MCS1      | 13.936                      | 13.666                      | 12.94                       | 30.0           | 85.993         |
| MCS2      | 13.948                      | 13.486                      | 12.969                      | 30.0           | 81.261         |
| MCS3      | 14.305                      | 13.827                      | 13.304                      | 30.0           | 77.168         |
| MCS4      | 13.133                      | 12.596                      | 11.952                      | 30.0           | 70.774         |
| MCS5      | 13.274                      | 12.678                      | 11.974                      | 30.0           | 65.531         |
| MCS6      | 13.132                      | 12.725                      | 11.987                      | 30.0           | 63.701         |
| MCS7      | 13.131                      | 12.691                      | 11.974                      | 30.0           | 61.631         |



## Peak Power Spectral Density

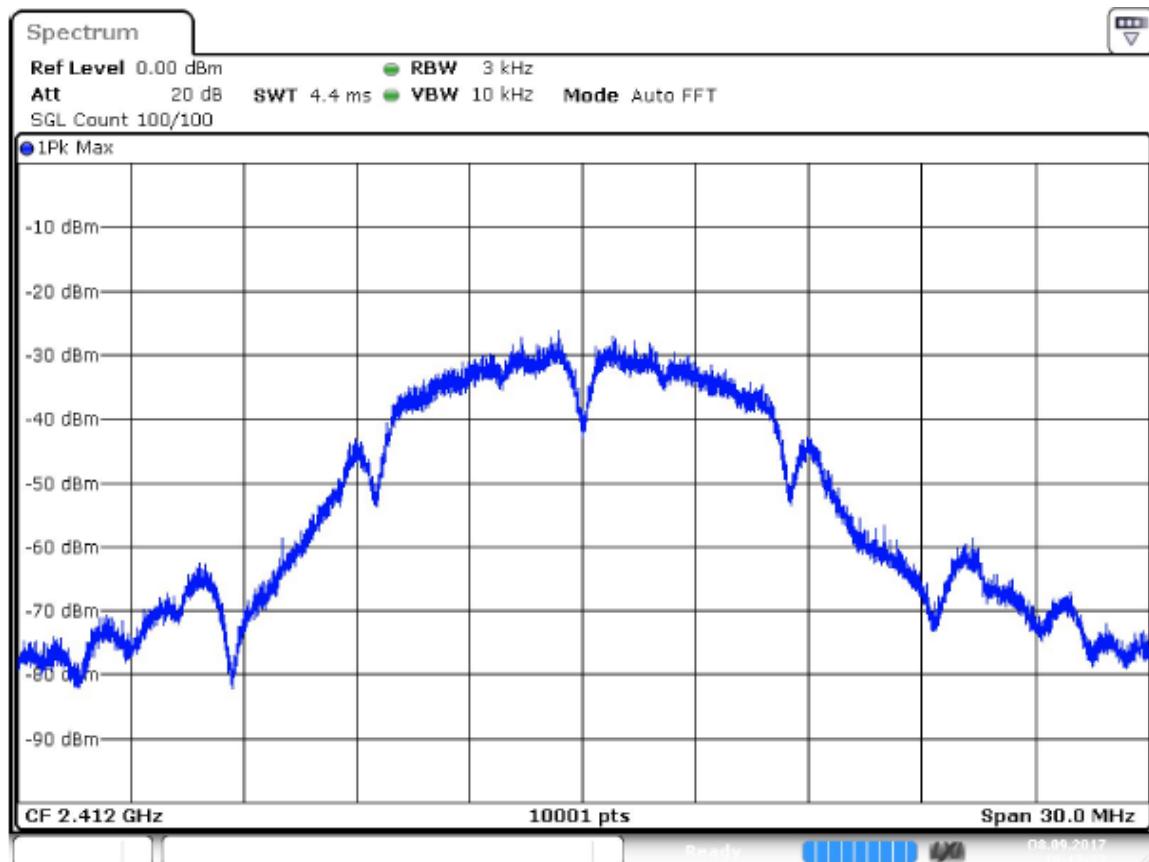
Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 10.2

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.3 dB

### 802.11b (Power Setting: Default)

| Data Rate | Peak PSD<br>(dBm)<br>2412 MHz | Peak PSD<br>(dBm)<br>2437 MHz | Peak PSD<br>(dBm)<br>2462 MHz | Limit<br>(dBm) |
|-----------|-------------------------------|-------------------------------|-------------------------------|----------------|
| 1 Mbps    | -4.506                        | -6.222                        | -7.470                        | 8              |
| 2 Mbps    | -5.240                        | -6.026                        | -6.540                        | 8              |
| 5.5 Mbps  | -4.231                        | -5.795                        | -6.669                        | 8              |
| 11 Mbps   | -5.944                        | -5.723                        | -7.450                        | 8              |

### 802.11b 5.5 Mbps 2412MHz



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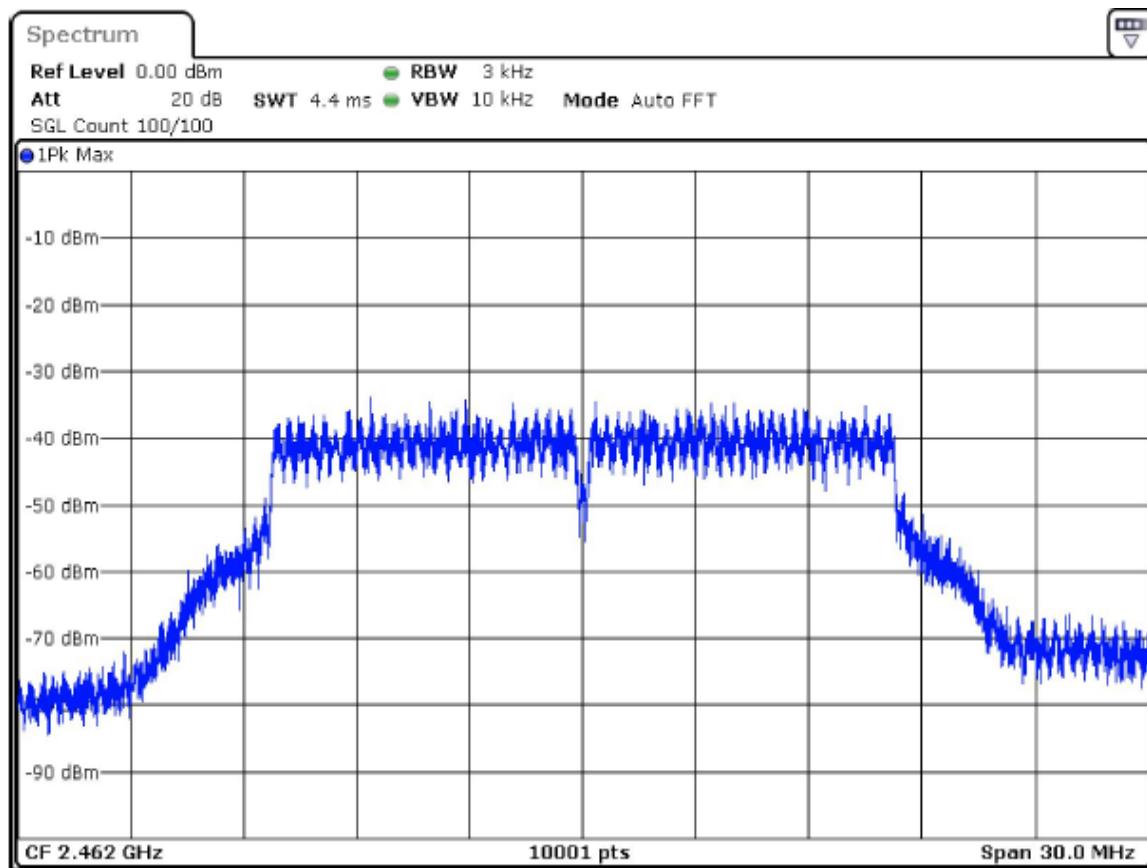


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## 802.11g (Power Setting: 26)

| Data Rate | Peak PSD (dBm)<br>2412 MHz | Peak PSD (dBm)<br>2437 MHz | Peak PSD (dBm)<br>2462 MHz | Limit (dBm) |
|-----------|----------------------------|----------------------------|----------------------------|-------------|
| 6 Mbps    | -12.253                    | -12.309                    | -11.956                    | 8           |
| 9 Mbps    | -13.789                    | -13.671                    | -13.223                    | 8           |
| 12 Mbps   | -12.664                    | -12.545                    | -12.272                    | 8           |
| 18 Mbps   | -14.146                    | -13.988                    | -13.492                    | 8           |
| 24 Mbps   | -13.227                    | -12.984                    | -12.737                    | 8           |
| 36 Mbps   | -14.086                    | -13.947                    | -13.497                    | 8           |
| 48 Mbps   | -14.724                    | -14.656                    | -14.289                    | 8           |
| 54 Mbps   | -15.173                    | -14.829                    | -14.596                    | 8           |

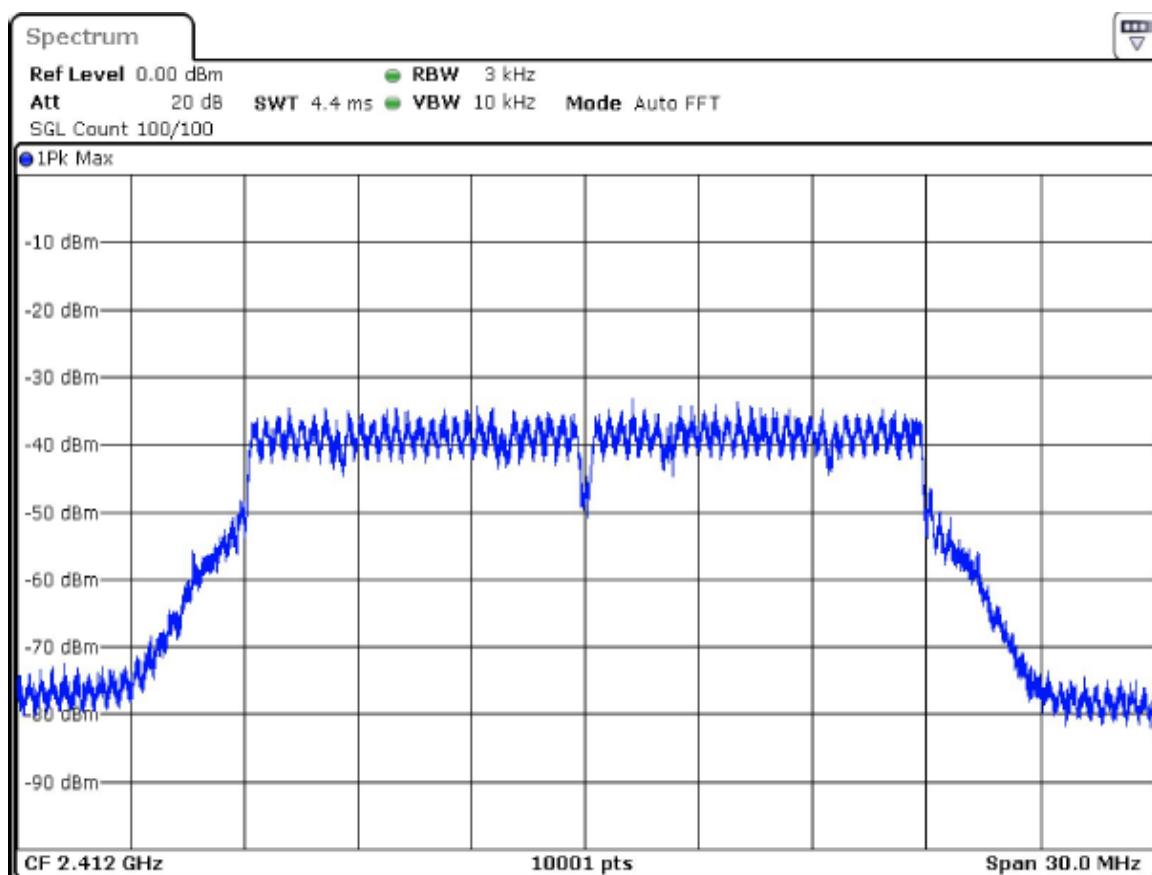
802.11g 6 Mbps 2462MHz

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## 802.11n(HT20) (Power Setting: Default)

| Data Rate | Peak PSD (dBm)<br>2412 MHz | Peak PSD (dBm)<br>2437 MHz | Peak PSD (dBm)<br>2462 MHz | Limit (dBm) |
|-----------|----------------------------|----------------------------|----------------------------|-------------|
| MCS0      | -11.238                    | -12.387                    | -12.712                    | 8           |
| MCS1      | -11.893                    | -12.460                    | -12.664                    | 8           |
| MCS2      | -12.294                    | -12.406                    | -13.332                    | 8           |
| MCS3      | -11.821                    | -12.383                    | -12.001                    | 8           |
| MCS4      | -12.628                    | -13.755                    | -14.283                    | 8           |
| MCS5      | -13.453                    | -13.540                    | -14.049                    | 8           |
| MCS6      | -13.404                    | -12.476                    | -14.777                    | 8           |
| MCS7      | -13.619                    | -13.326                    | -14.227                    | 8           |

802.11n(HT20) MCS0 2412MHz

## DTS Bandwidth (6dB)

Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 8.1

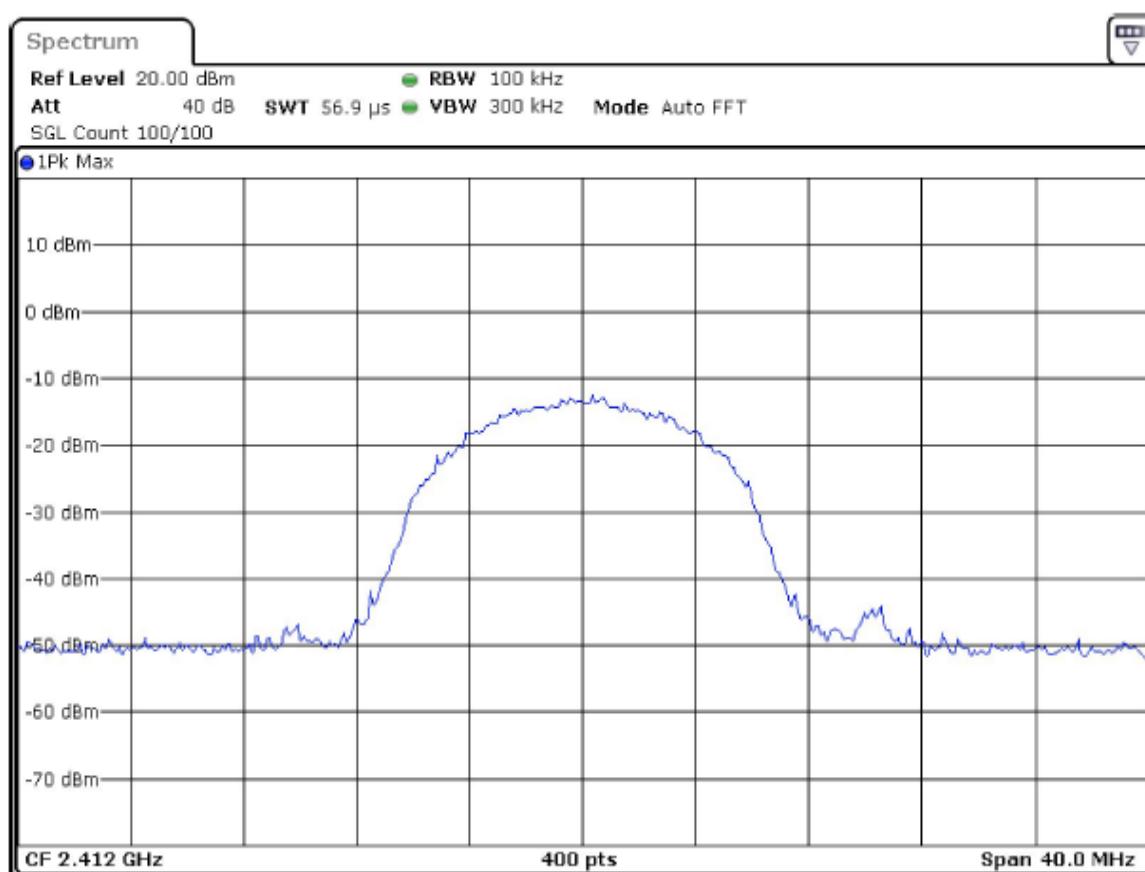
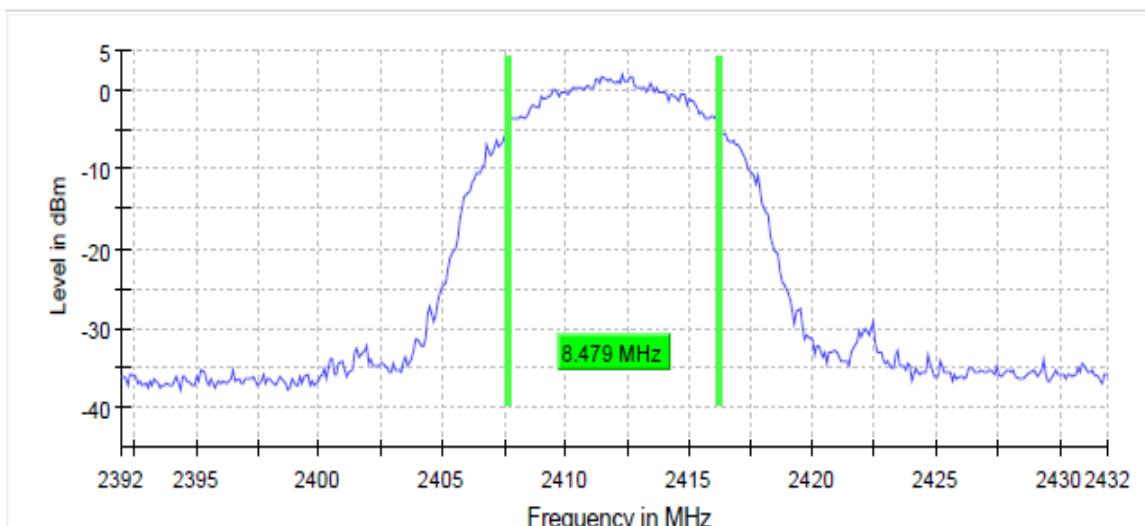
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

| Data Rate          | DUT Frequency (MHz) | Bandwidth (MHz) | Minimum Limit (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|--------------------|---------------------|-----------------|---------------------|----------------------|-----------------------|
| 802.11b 5.5 Mbps   | 2412.000            | 8.478803        | 0.5                 | 2403.022444          | 2420.877805           |
| 802.11g 6 Mbps     | 2412.000            | 16.458853       | 0.5                 | 2403.720698          | 2420.179551           |
| 802.11n(HT20) MCS3 | 2412.000            | 17.855361       | 0.5                 | 2403.022444          | 2420.877805           |
| 802.11b 5.5 Mbps   | 2437.000            | 8.179551        | 0.5                 | 2428.022444          | 2445.877805           |
| 802.11g 6 Mbps     | 2437.000            | 16.458853       | 0.5                 | 2428.720698          | 2445.179551           |
| 802.11n(HT20) MCS3 | 2437.000            | 17.855361       | 0.5                 | 2428.022444          | 2445.877805           |
| 802.11b 5.5 Mbps   | 2462.000            | 8.179551        | 0.5                 | 2453.022444          | 2470.877805           |
| 802.11g 6 Mbps     | 2462.000            | 16.458853       | 0.5                 | 2453.720698          | 2470.179551           |
| 802.11n(HT20) MCS3 | 2462.000            | 17.855361       | 0.5                 | 2453.022444          | 2470.877805           |



802.11b 5.5Mbps 2412MHz

6 dB Bandwidth

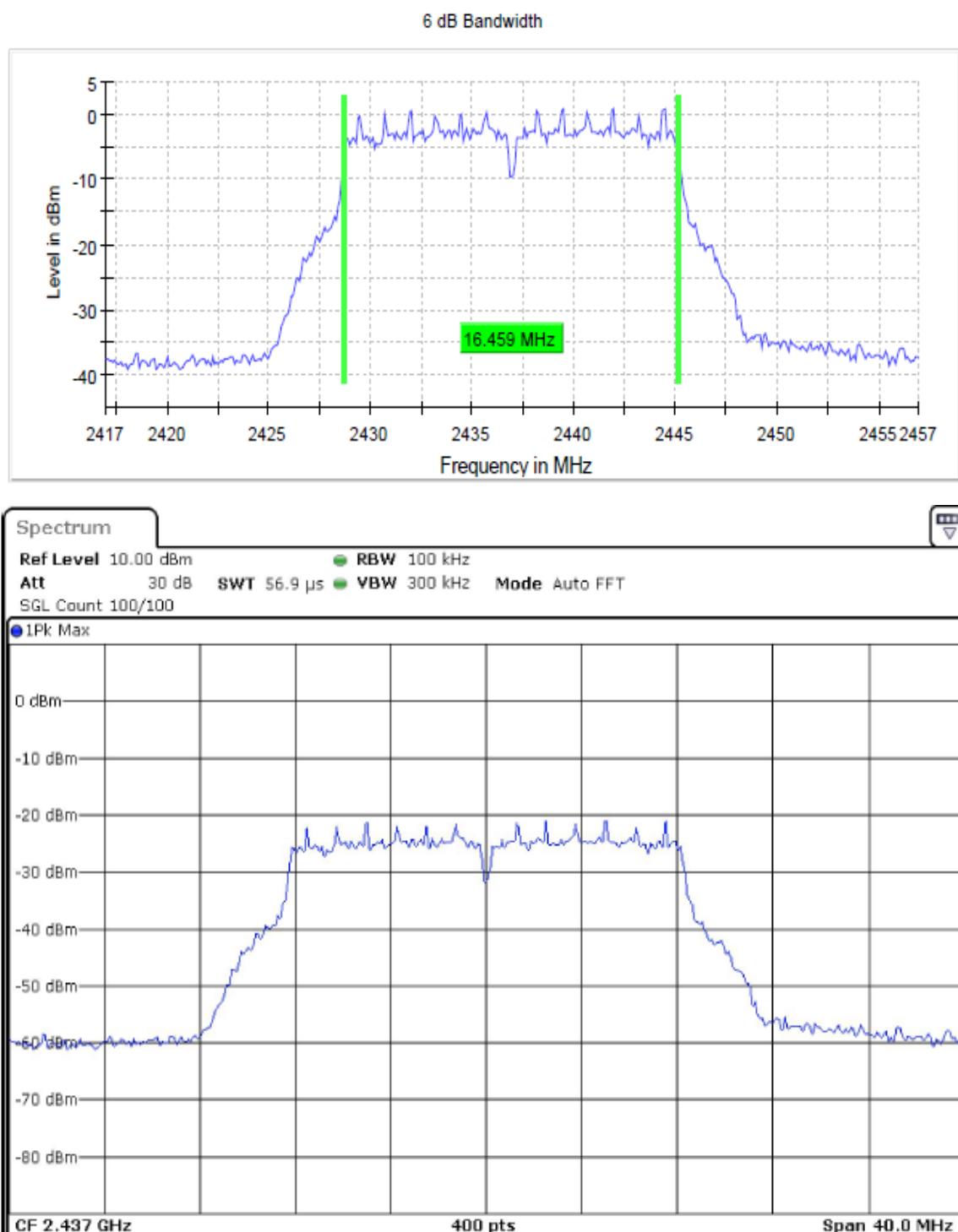


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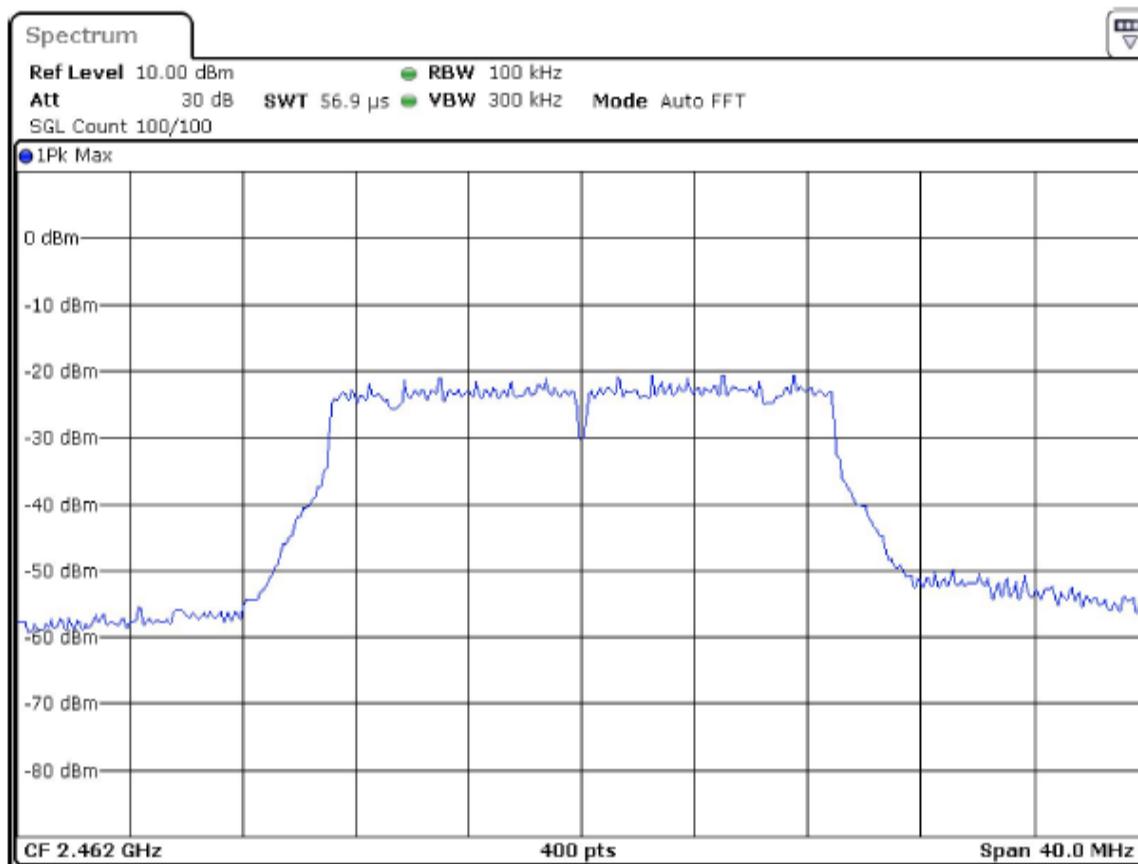
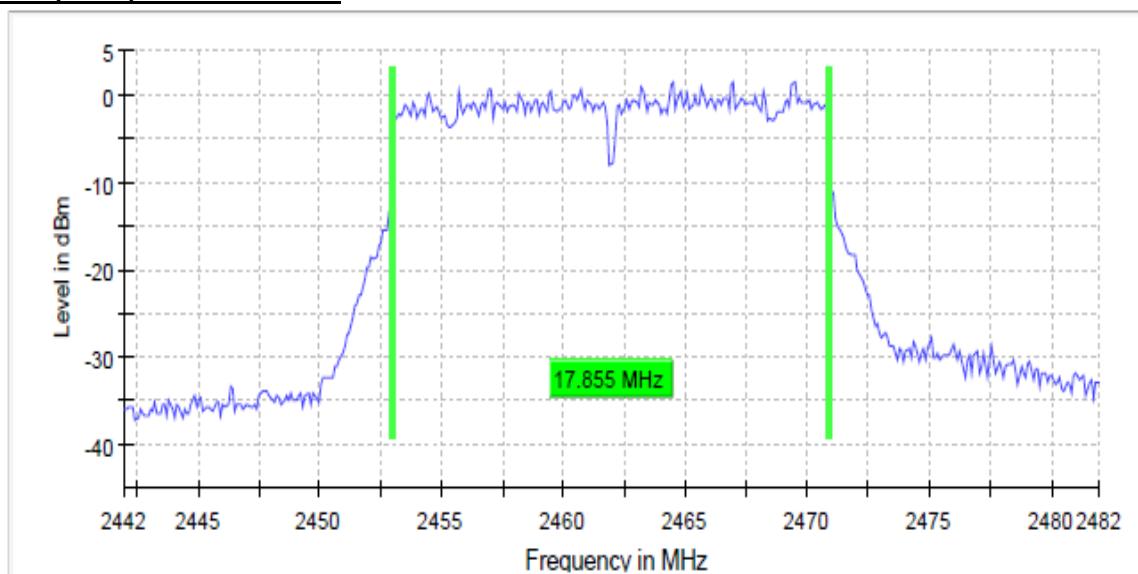
802.11g 6 Mbps 2437MHz

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**802.11n(HT20) MCS3 2462MHz**

## Conducted Band Edge

Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 11.

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

### 802.11b 5.5Mbps 2412MHz

#### Band Edge Low

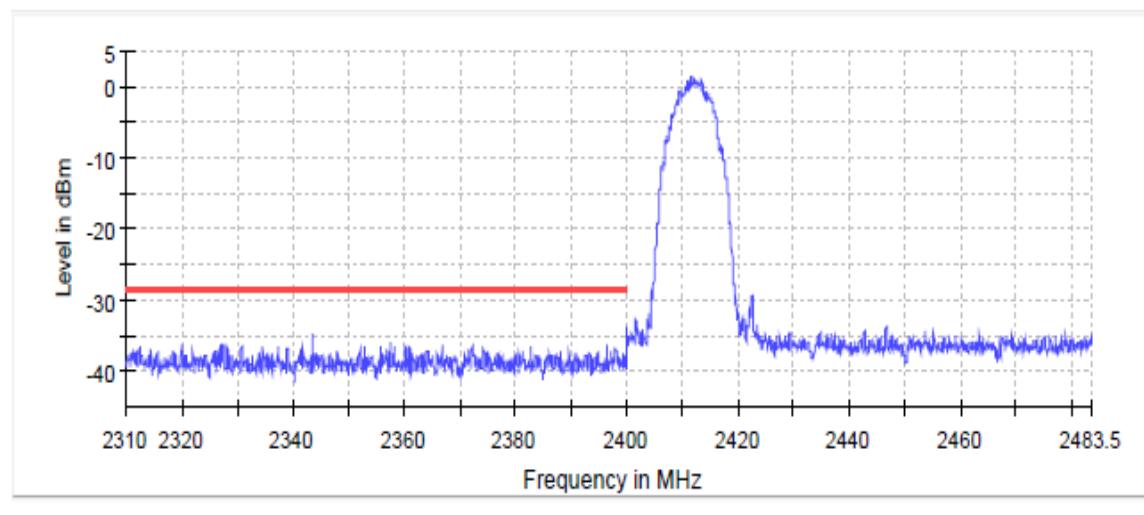
##### Inband Peak

| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2414.516308     | 2.5         |

## Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2396.926707     | -31.1       | 3.6         | -27.5       | PASS   |
| 2396.976680     | -31.1       | 3.6         | -27.5       | PASS   |
| 2399.475292     | -31.4       | 3.9         | -27.5       | PASS   |
| 2399.525264     | -31.7       | 4.1         | -27.5       | PASS   |
| 2397.626319     | -31.7       | 4.2         | -27.5       | PASS   |
| 2398.825652     | -31.8       | 4.3         | -27.5       | PASS   |
| 2398.875625     | -31.9       | 4.3         | -27.5       | PASS   |
| 2398.775680     | -32.1       | 4.6         | -27.5       | PASS   |
| 2397.576346     | -32.2       | 4.6         | -27.5       | PASS   |
| 2399.425319     | -32.2       | 4.6         | -27.5       | PASS   |
| 2399.825097     | -32.2       | 4.6         | -27.5       | PASS   |
| 2399.775125     | -32.3       | 4.7         | -27.5       | PASS   |
| 2399.575236     | -32.6       | 5.0         | -27.5       | PASS   |
| 2395.727374     | -32.9       | 5.4         | -27.5       | PASS   |
| 2399.125486     | -33.1       | 5.6         | -27.5       | PASS   |

Band Edge

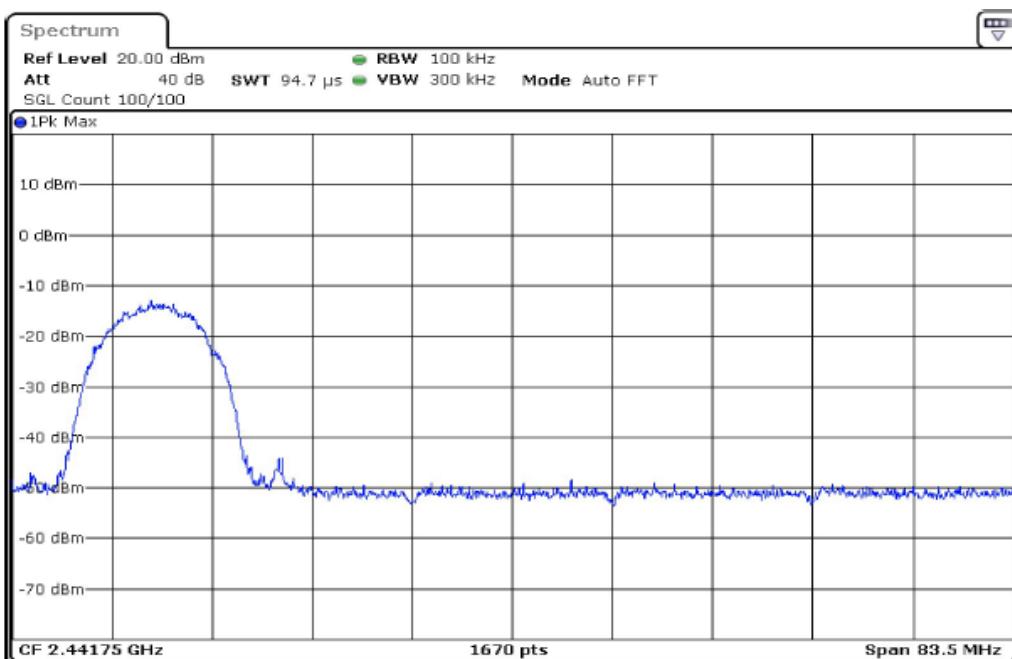
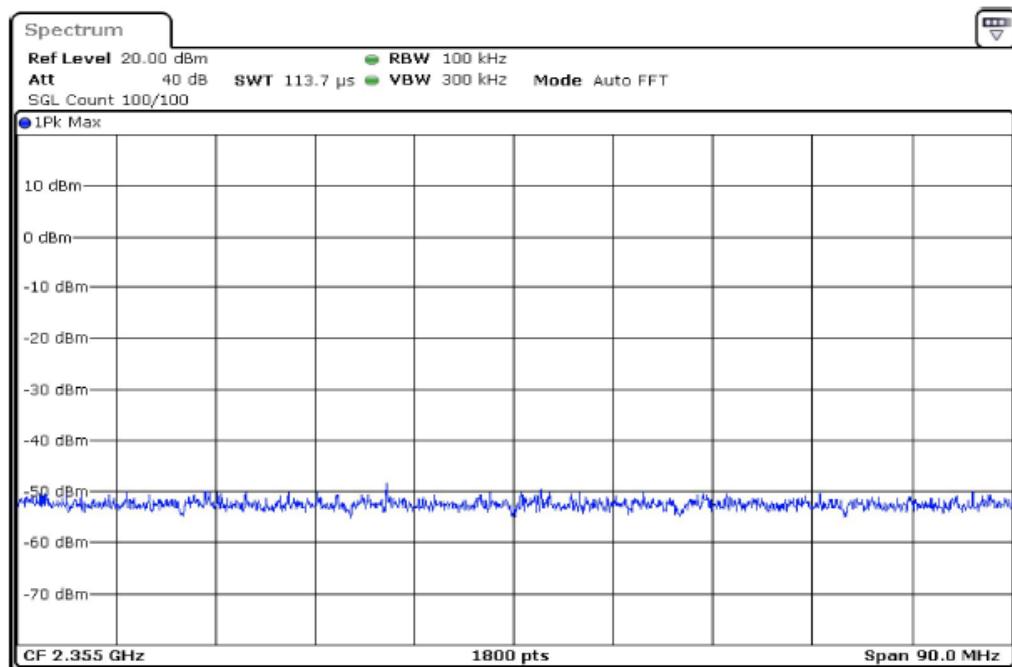


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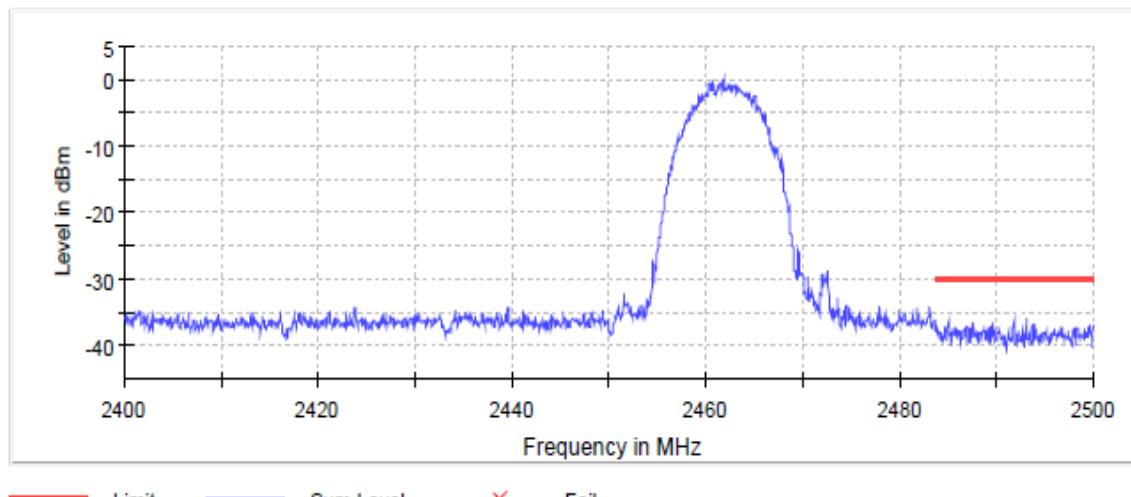
**802.11b 5.5Mbps 2462MHz****Band Edge High****Inband Peak**

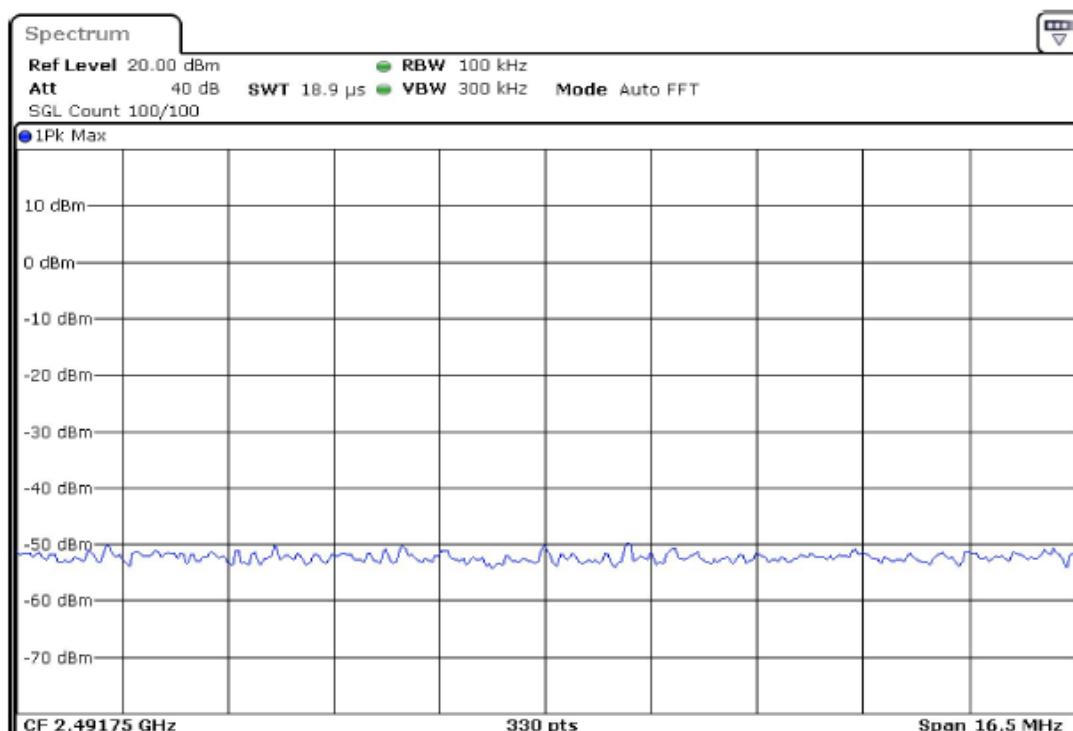
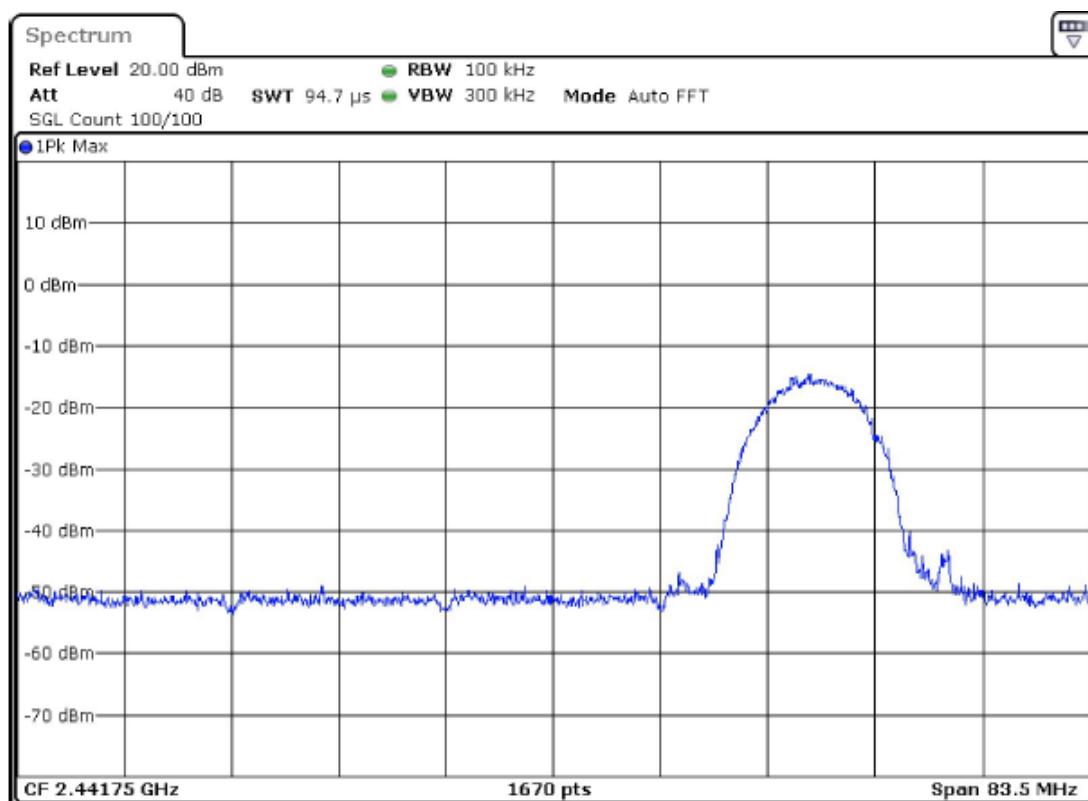
| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2464.486385     | 1.4         |

**Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2483.524924     | -35.0       | 6.4         | -28.6       | PASS   |
| 2486.366314     | -35.9       | 7.3         | -28.6       | PASS   |
| 2484.771148     | -36.0       | 7.5         | -28.6       | PASS   |
| 2484.721299     | -36.1       | 7.6         | -28.6       | PASS   |
| 2483.574773     | -36.3       | 7.7         | -28.6       | PASS   |
| 2486.416163     | -36.3       | 7.7         | -28.6       | PASS   |
| 2485.668429     | -36.3       | 7.7         | -28.6       | PASS   |
| 2483.824018     | -36.5       | 7.9         | -28.6       | PASS   |
| 2485.618580     | -36.5       | 7.9         | -28.6       | PASS   |
| 2486.316465     | -36.5       | 8.0         | -28.6       | PASS   |
| 2483.873867     | -36.5       | 8.0         | -28.6       | PASS   |
| 2483.774169     | -36.6       | 8.1         | -28.6       | PASS   |
| 2483.923716     | -36.7       | 8.2         | -28.6       | PASS   |
| 2484.222810     | -36.9       | 8.4         | -28.6       | PASS   |
| 2484.571752     | -36.9       | 8.4         | -28.6       | PASS   |

Band Edge





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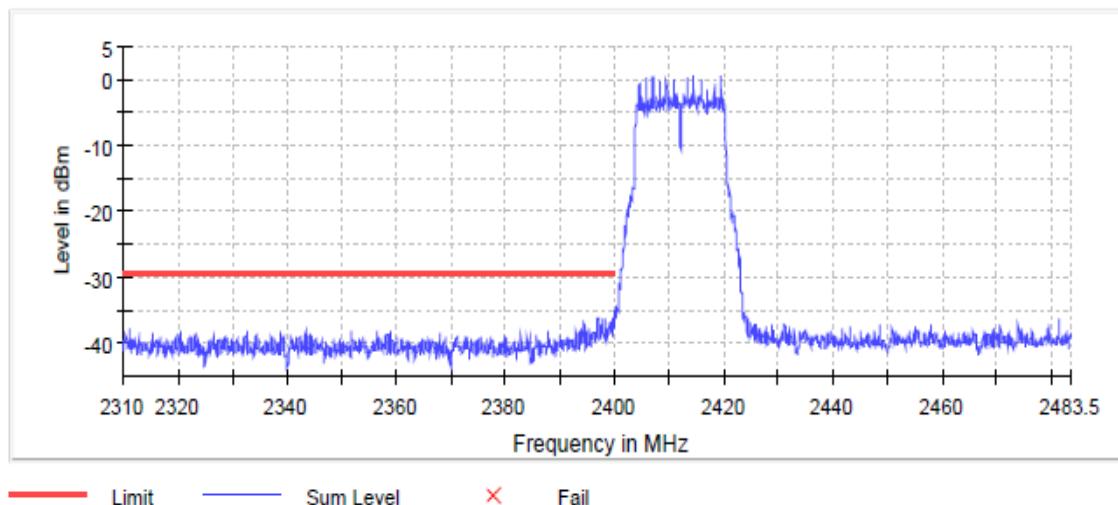
**802.11g 6 Mbps 2412MHz****Band Edge Low****Inband Peak**

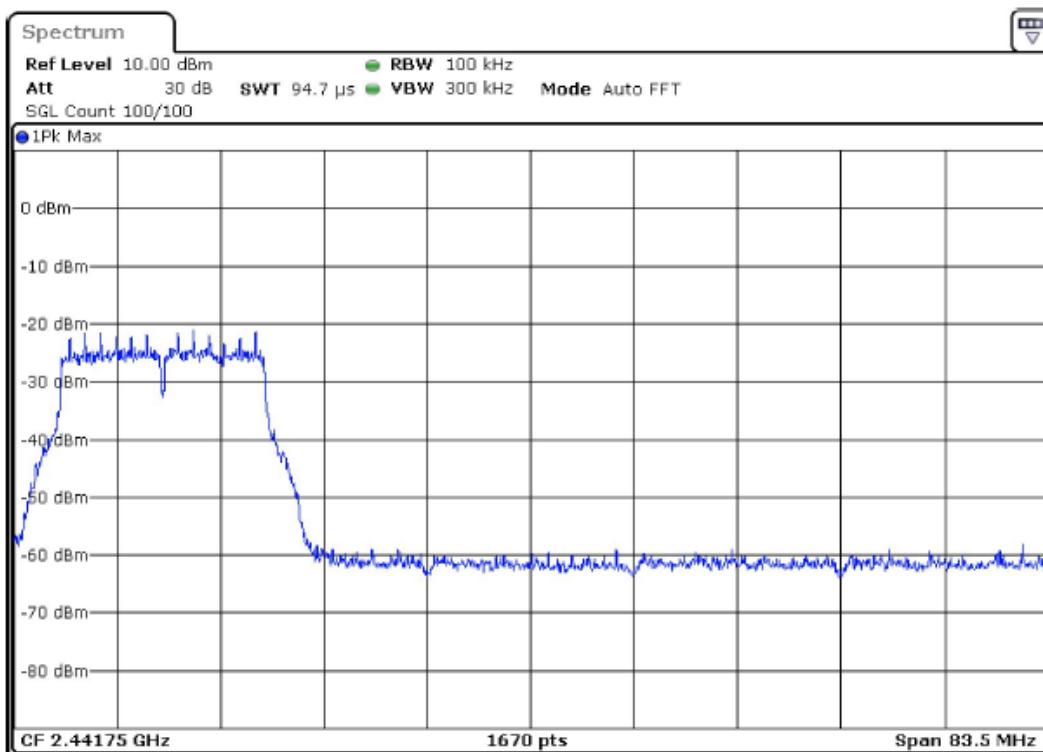
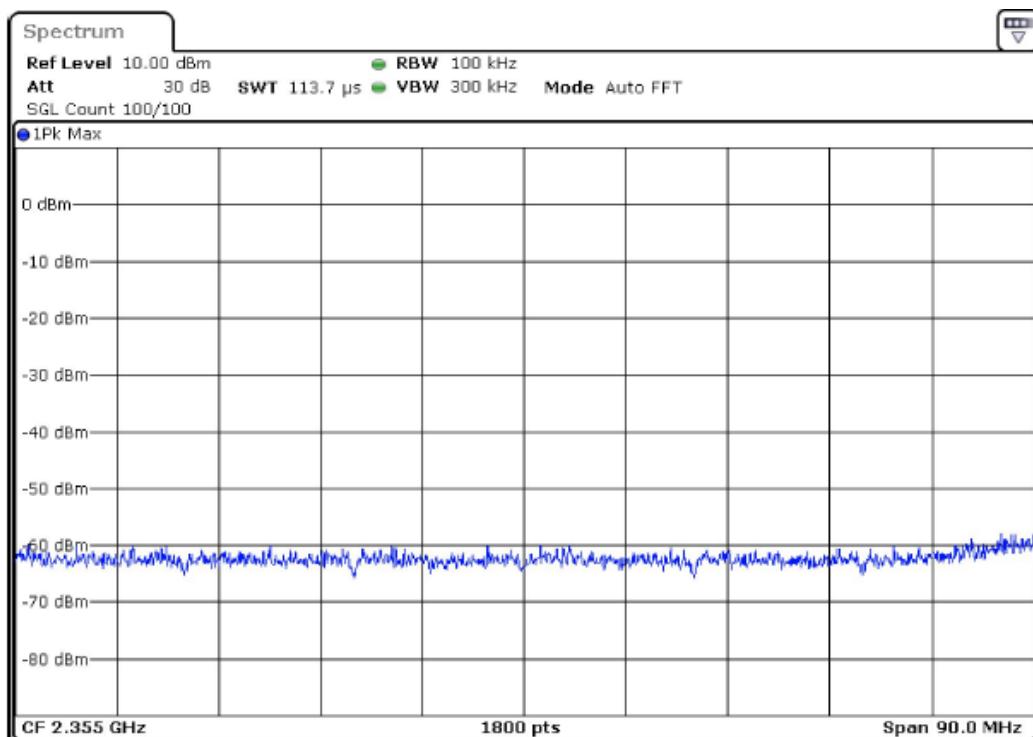
| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2414.516308     | 0.7         |

**Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2396.926707     | -36.1       | 6.9         | -29.3       | PASS   |
| 2399.825097     | -36.3       | 7.0         | -29.3       | PASS   |
| 2399.775125     | -36.3       | 7.0         | -29.3       | PASS   |
| 2398.176013     | -36.3       | 7.0         | -29.3       | PASS   |
| 2397.926152     | -36.4       | 7.1         | -29.3       | PASS   |
| 2396.976680     | -36.4       | 7.1         | -29.3       | PASS   |
| 2397.876180     | -36.6       | 7.3         | -29.3       | PASS   |
| 2398.225986     | -36.6       | 7.4         | -29.3       | PASS   |
| 2398.825652     | -36.8       | 7.6         | -29.3       | PASS   |
| 2398.875625     | -36.9       | 7.6         | -29.3       | PASS   |
| 2399.375347     | -36.9       | 7.6         | -29.3       | PASS   |
| 2394.378123     | -36.9       | 7.6         | -29.3       | PASS   |
| 2399.425319     | -36.9       | 7.6         | -29.3       | PASS   |
| 2397.276513     | -37.0       | 7.7         | -29.3       | PASS   |
| 2397.226541     | -37.1       | 7.8         | -29.3       | PASS   |

## Band Edge





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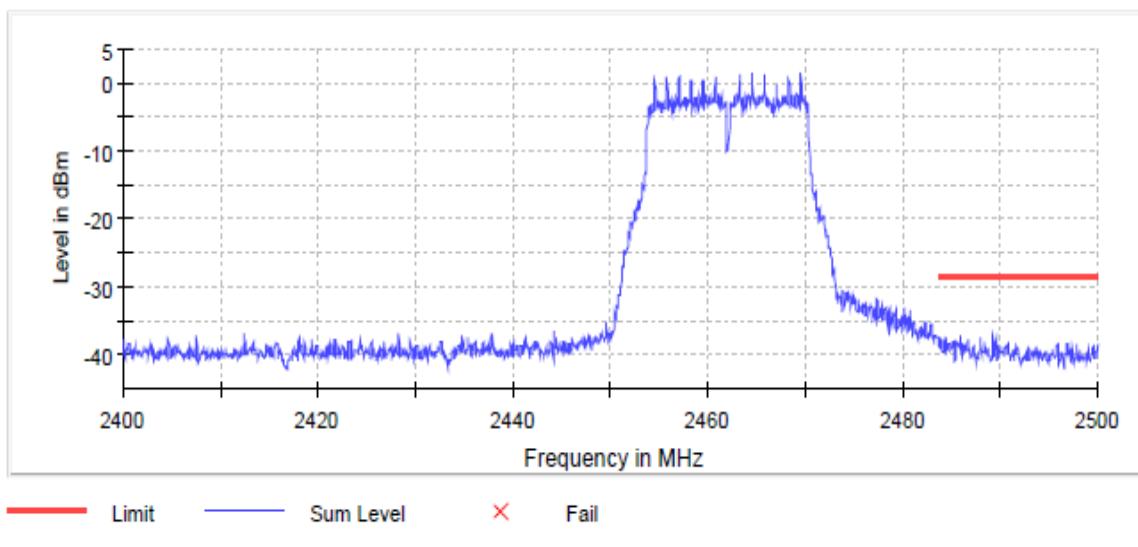
**802.11g 6 Mbps 2462MHz****Band Edge High****Inband Peak**

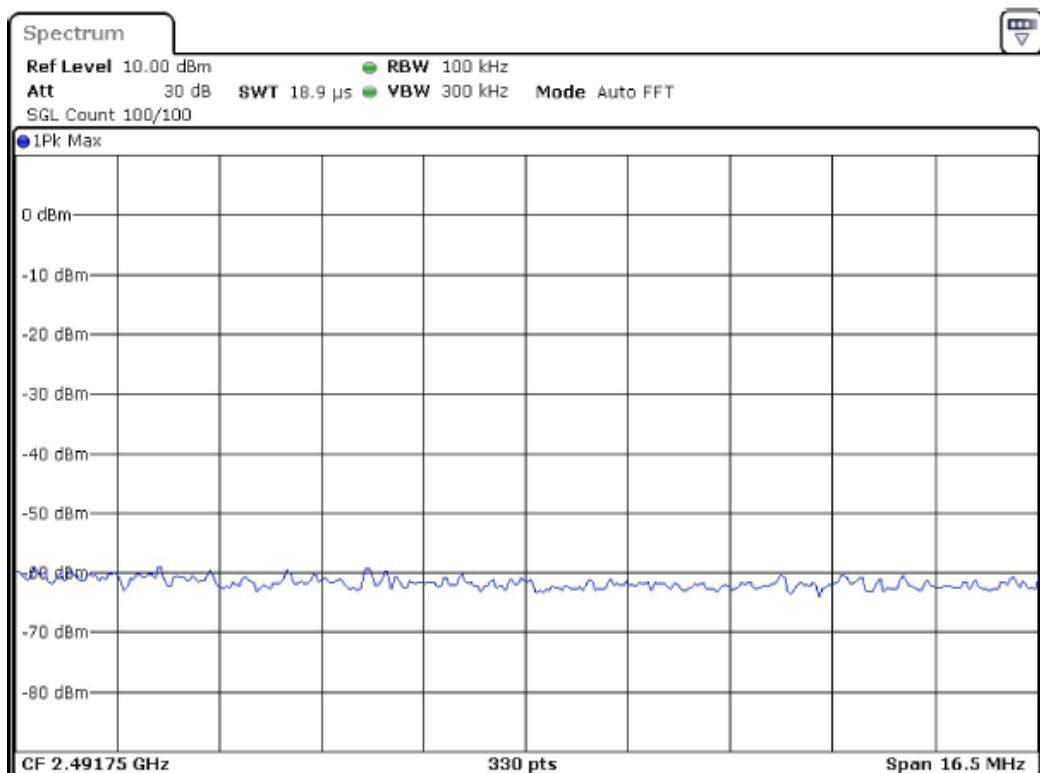
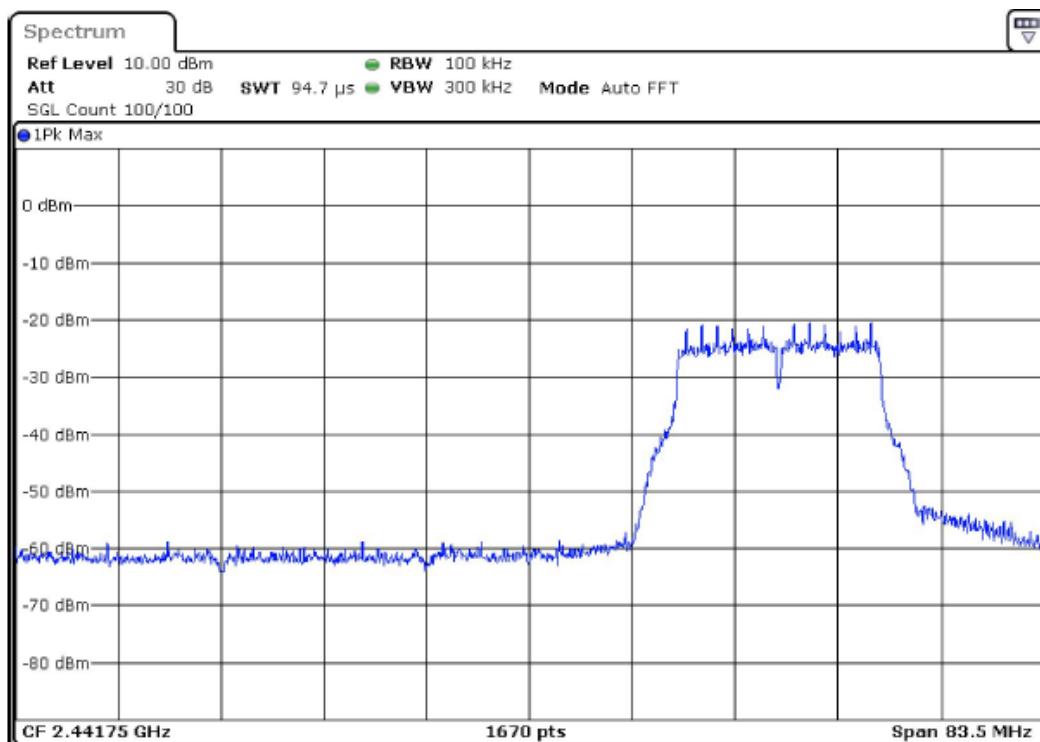
| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2464.486385     | 1.5         |

**Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2485.817976     | -37.1       | 8.6         | -28.5       | PASS   |
| 2485.867825     | -37.2       | 8.7         | -28.5       | PASS   |
| 2489.157855     | -37.3       | 8.8         | -28.5       | PASS   |
| 2489.207704     | -37.3       | 8.8         | -28.5       | PASS   |
| 2483.824018     | -37.4       | 8.9         | -28.5       | PASS   |
| 2487.911631     | -37.5       | 9.0         | -28.5       | PASS   |
| 2484.422205     | -37.5       | 9.0         | -28.5       | PASS   |
| 2486.665408     | -37.7       | 9.1         | -28.5       | PASS   |
| 2483.873867     | -37.7       | 9.1         | -28.5       | PASS   |
| 2487.861782     | -37.7       | 9.2         | -28.5       | PASS   |
| 2484.372356     | -37.7       | 9.2         | -28.5       | PASS   |
| 2489.456949     | -37.8       | 9.2         | -28.5       | PASS   |
| 2483.574773     | -37.8       | 9.2         | -28.5       | PASS   |
| 2489.506798     | -37.8       | 9.3         | -28.5       | PASS   |
| 2483.973565     | -37.9       | 9.4         | -28.5       | PASS   |

Band Edge





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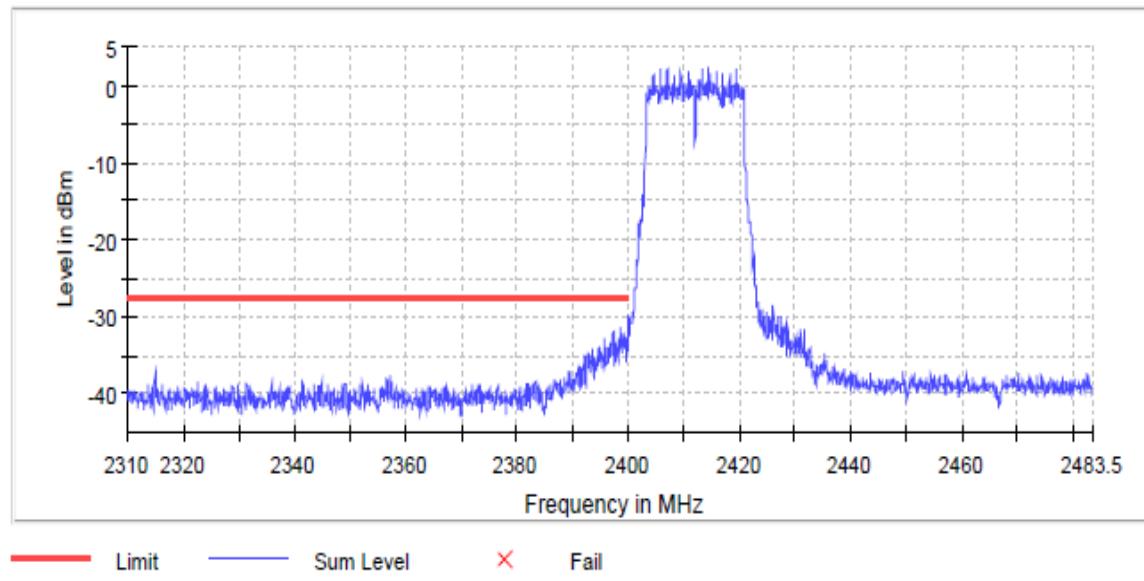
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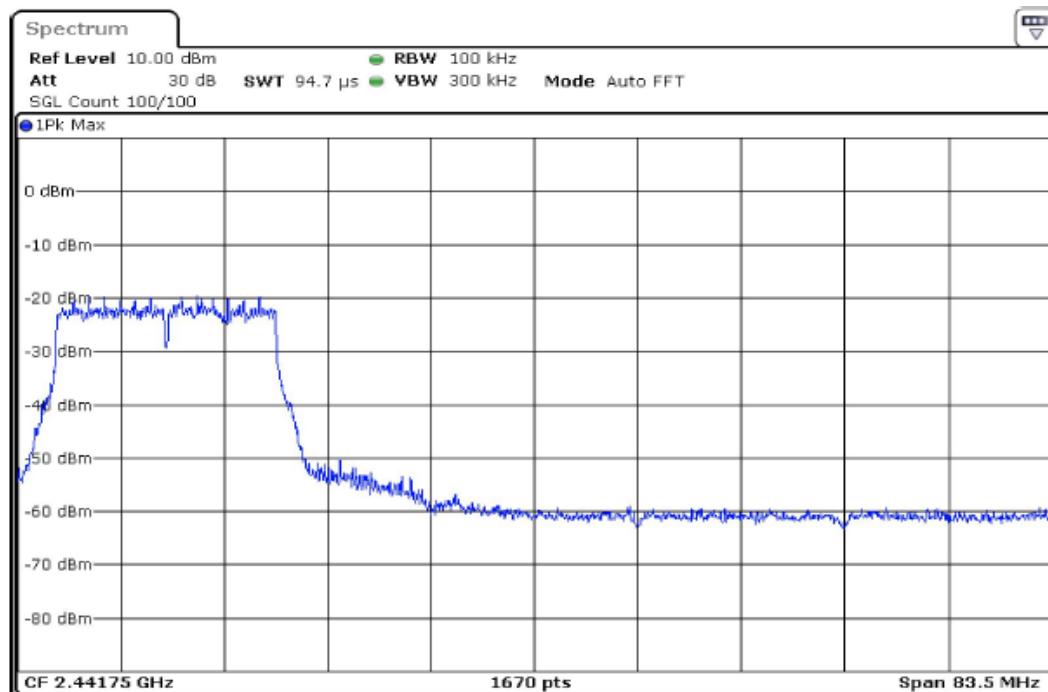
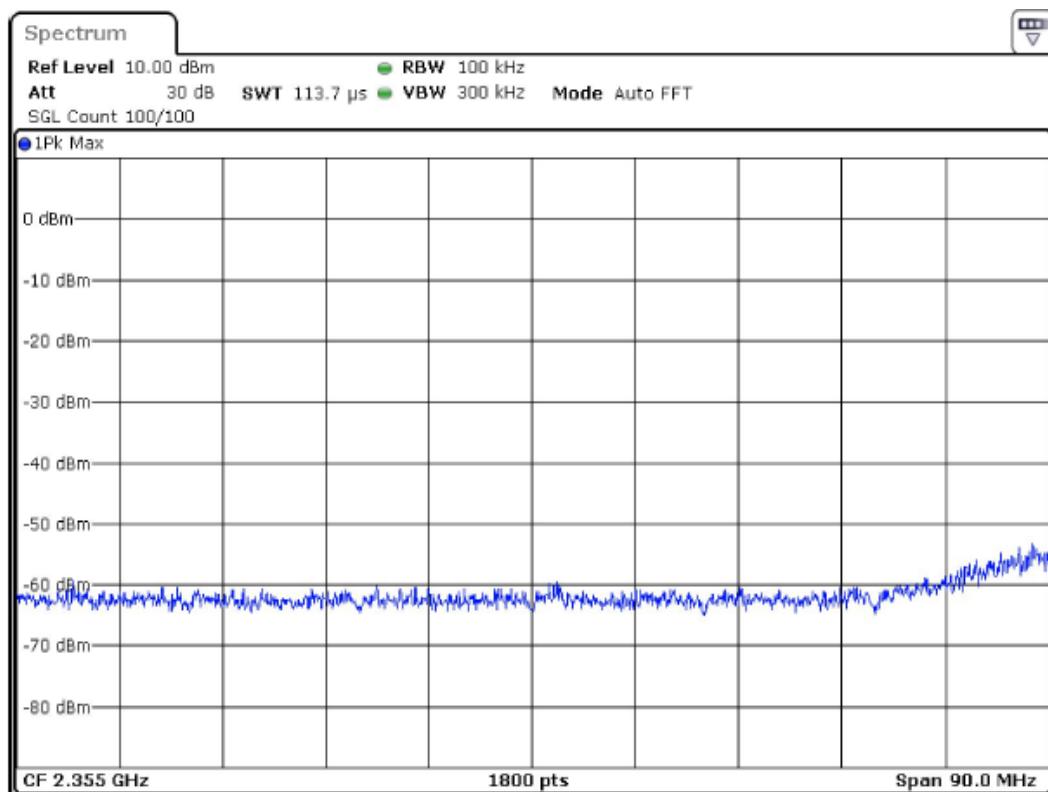
**802.11n(HT20) MCS3 2412MHz****Band Edge Low****Inband Peak**

| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2414.516308     | 2.4         |

**Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2398.475847     | -31.4       | 3.8         | -27.6       | PASS   |
| 2398.525819     | -31.7       | 4.1         | -27.6       | PASS   |
| 2398.425875     | -31.7       | 4.1         | -27.6       | PASS   |
| 2397.326485     | -32.1       | 4.5         | -27.6       | PASS   |
| 2397.276513     | -32.2       | 4.6         | -27.6       | PASS   |
| 2398.825652     | -32.3       | 4.7         | -27.6       | PASS   |
| 2398.176013     | -32.8       | 5.2         | -27.6       | PASS   |
| 2399.125486     | -32.8       | 5.2         | -27.6       | PASS   |
| 2398.225986     | -32.8       | 5.2         | -27.6       | PASS   |
| 2399.175458     | -32.8       | 5.2         | -27.6       | PASS   |
| 2399.725153     | -32.8       | 5.2         | -27.6       | PASS   |
| 2395.727374     | -32.8       | 5.3         | -27.6       | PASS   |
| 2395.677401     | -33.0       | 5.4         | -27.6       | PASS   |
| 2399.475292     | -33.0       | 5.4         | -27.6       | PASS   |
| 2399.775125     | -33.0       | 5.4         | -27.6       | PASS   |





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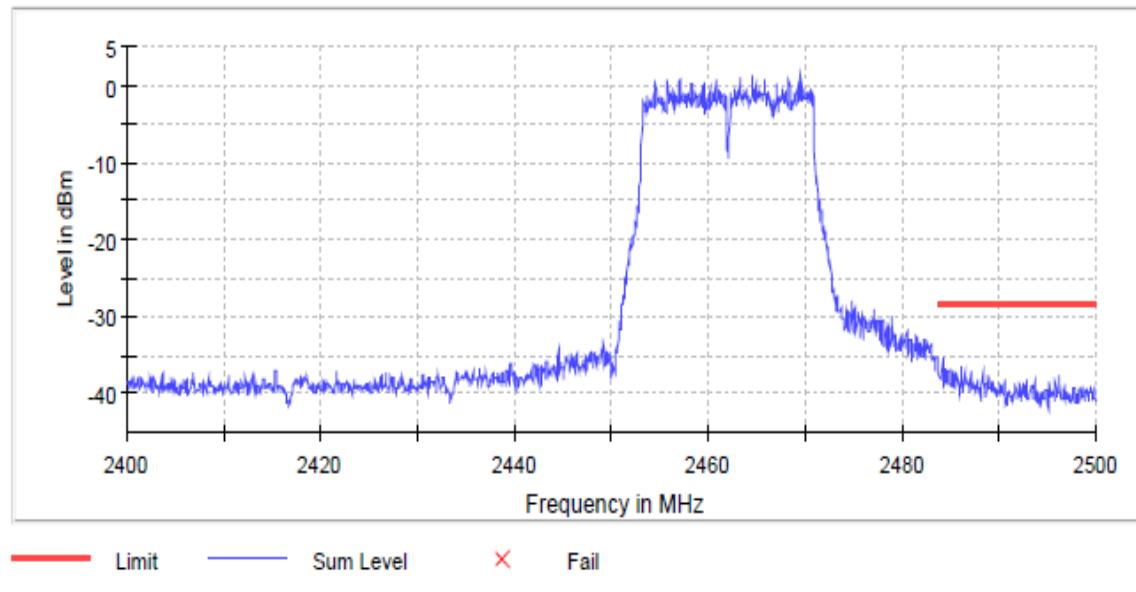
Testing Cert. No. 1627-01

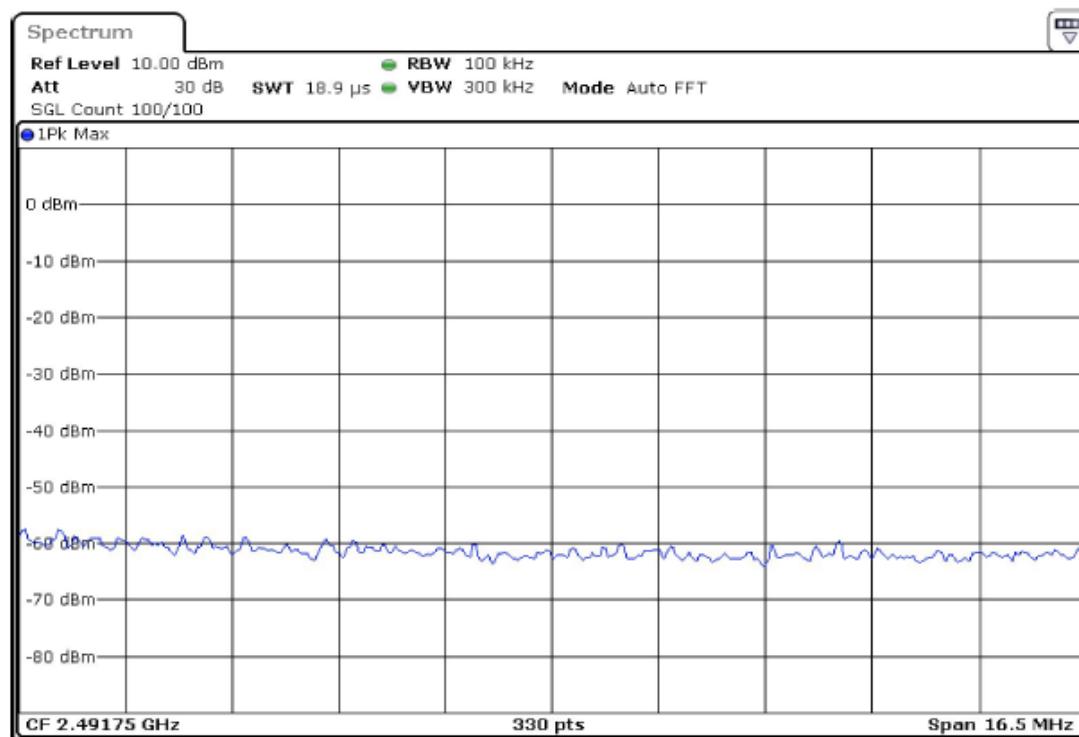
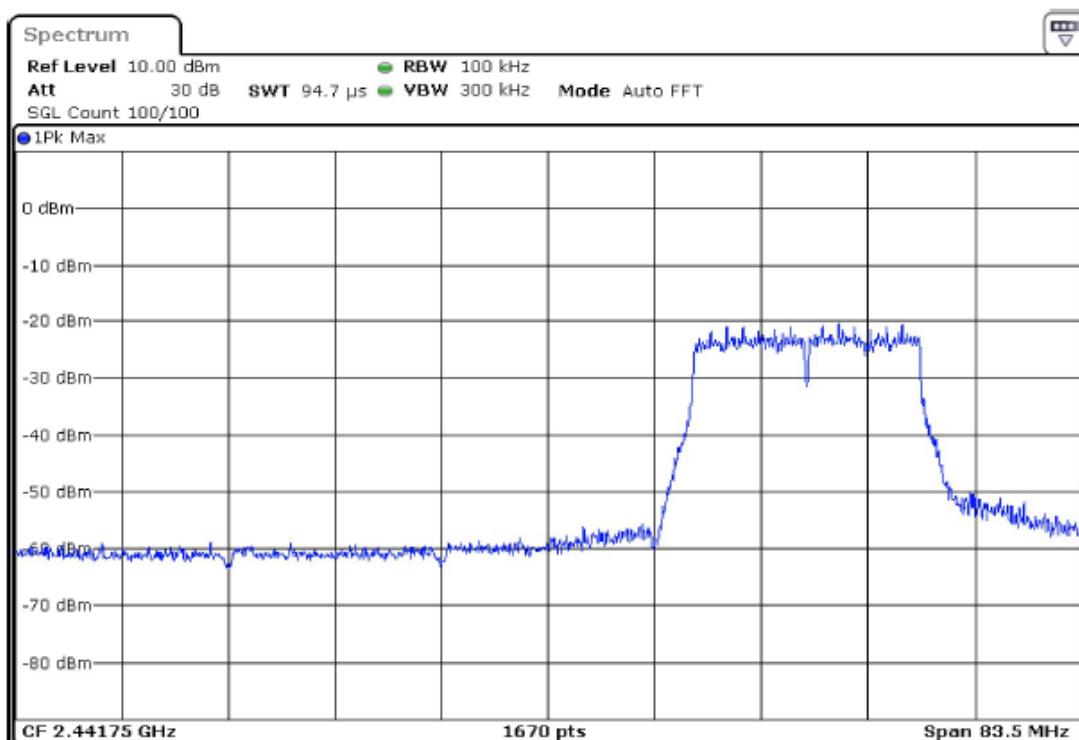
**802.11n(HT20) MCS3 2462MHz****Band Edge High****Inband Peak**

| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 2464.486385     | 1.4         |

**Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2484.123112     | -35.5       | 6.8         | -28.6       | PASS   |
| 2483.624622     | -35.6       | 7.0         | -28.6       | PASS   |
| 2484.172961     | -35.7       | 7.0         | -28.6       | PASS   |
| 2483.574773     | -35.9       | 7.2         | -28.6       | PASS   |
| 2486.067221     | -36.6       | 7.9         | -28.6       | PASS   |
| 2483.524924     | -36.7       | 8.1         | -28.6       | PASS   |
| 2484.372356     | -36.7       | 8.1         | -28.6       | PASS   |
| 2484.222810     | -36.8       | 8.1         | -28.6       | PASS   |
| 2486.017372     | -36.8       | 8.2         | -28.6       | PASS   |
| 2487.014350     | -36.9       | 8.3         | -28.6       | PASS   |
| 2486.416163     | -36.9       | 8.3         | -28.6       | PASS   |
| 2484.422205     | -36.9       | 8.3         | -28.6       | PASS   |
| 2484.721299     | -37.0       | 8.4         | -28.6       | PASS   |
| 2486.366314     | -37.0       | 8.4         | -28.6       | PASS   |
| 2486.964502     | -37.1       | 8.4         | -28.6       | PASS   |





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## Conducted Spurious Emissions

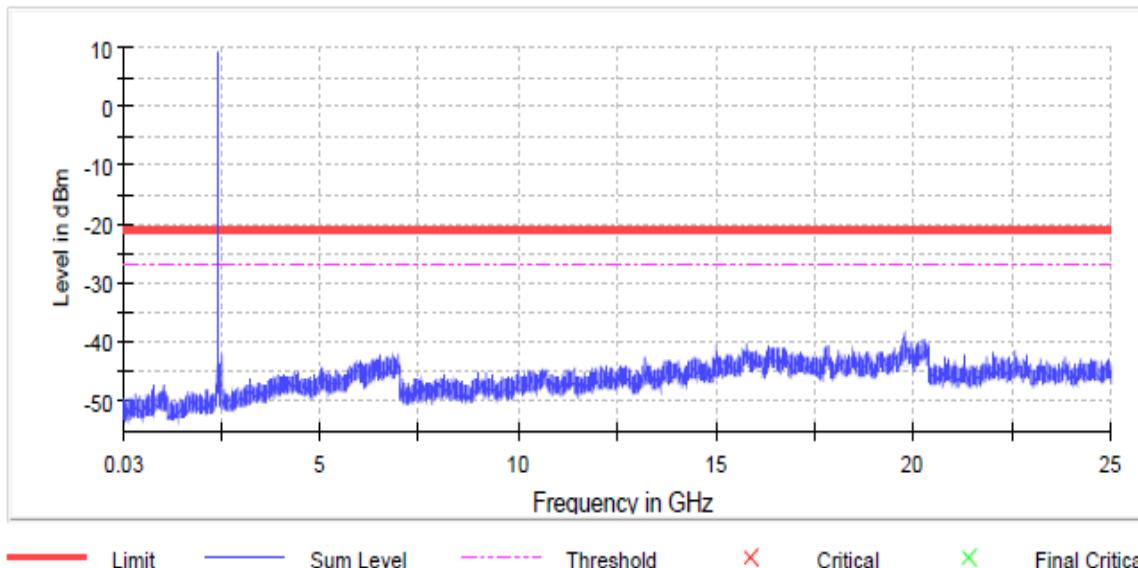
Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 11.

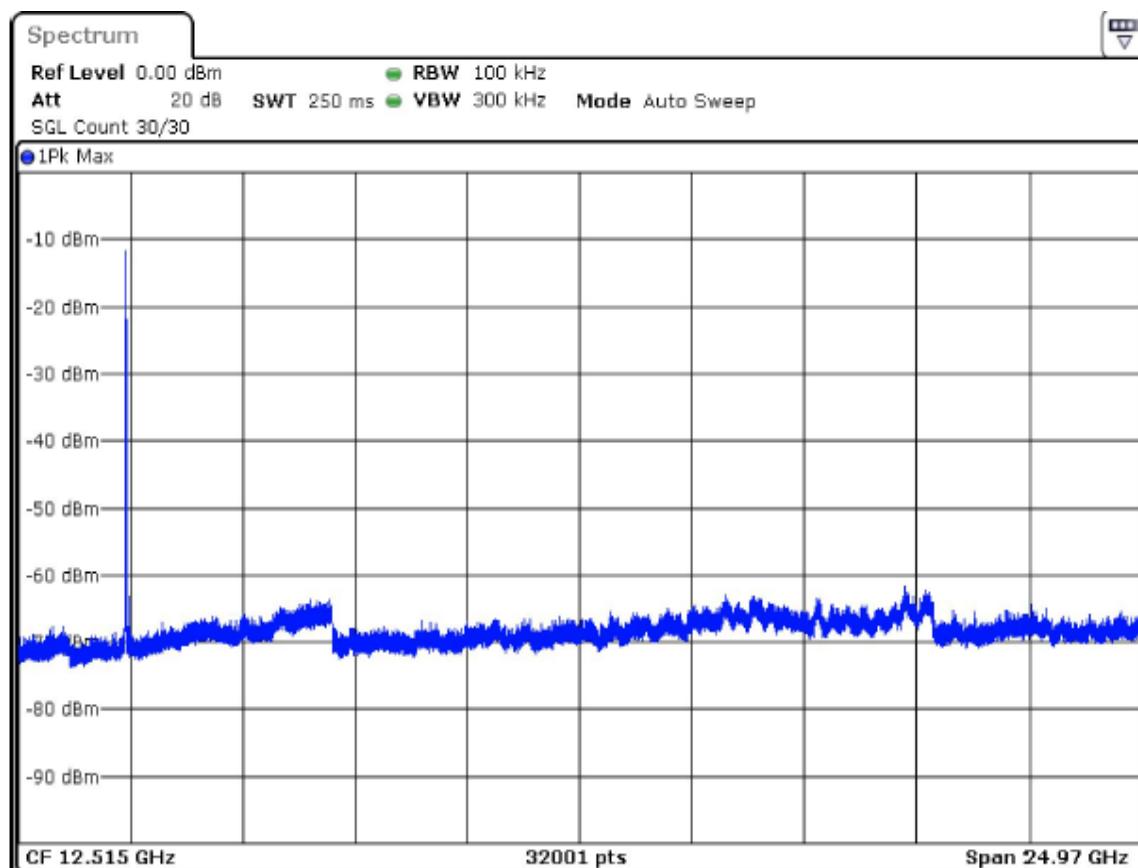
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.8 dB

### 802.11b 5.5 Mbps 2412MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2399.270827     | -35.4       | 14.5        | -20.9       |
| 2396.149772     | -36.2       | 15.3        | -20.9       |
| 2394.589244     | -38.1       | 17.2        | -20.9       |
| 19767.941535    | -38.4       | 17.5        | -20.9       |
| 19758.578370    | -38.6       | 17.7        | -20.9       |
| 19766.381007    | -39.1       | 18.2        | -20.9       |
| 19777.304700    | -39.2       | 18.3        | -20.9       |
| 2396.930036     | -39.3       | 18.4        | -20.9       |
| 20217.373445    | -39.4       | 18.5        | -20.9       |
| 19761.699425    | -39.5       | 18.6        | -20.9       |
| 19753.896788    | -39.5       | 18.6        | -20.9       |
| 20282.135335    | -39.6       | 18.7        | -20.9       |
| 19741.412568    | -39.6       | 18.7        | -20.9       |
| 19837.385007    | -39.7       | 18.8        | -20.9       |
| 20279.014280    | -39.8       | 18.9        | -20.9       |





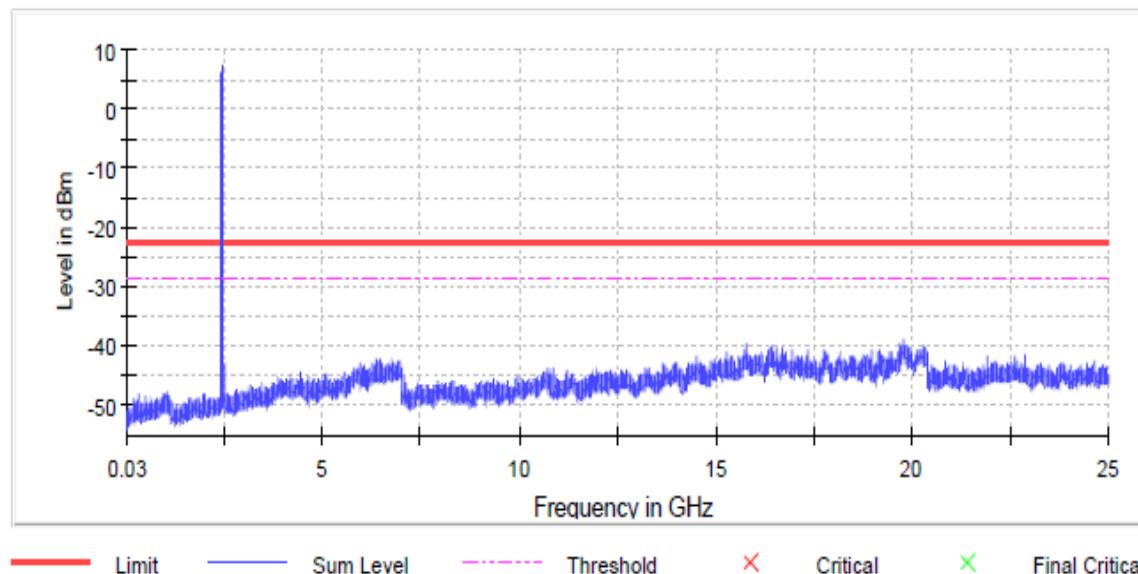
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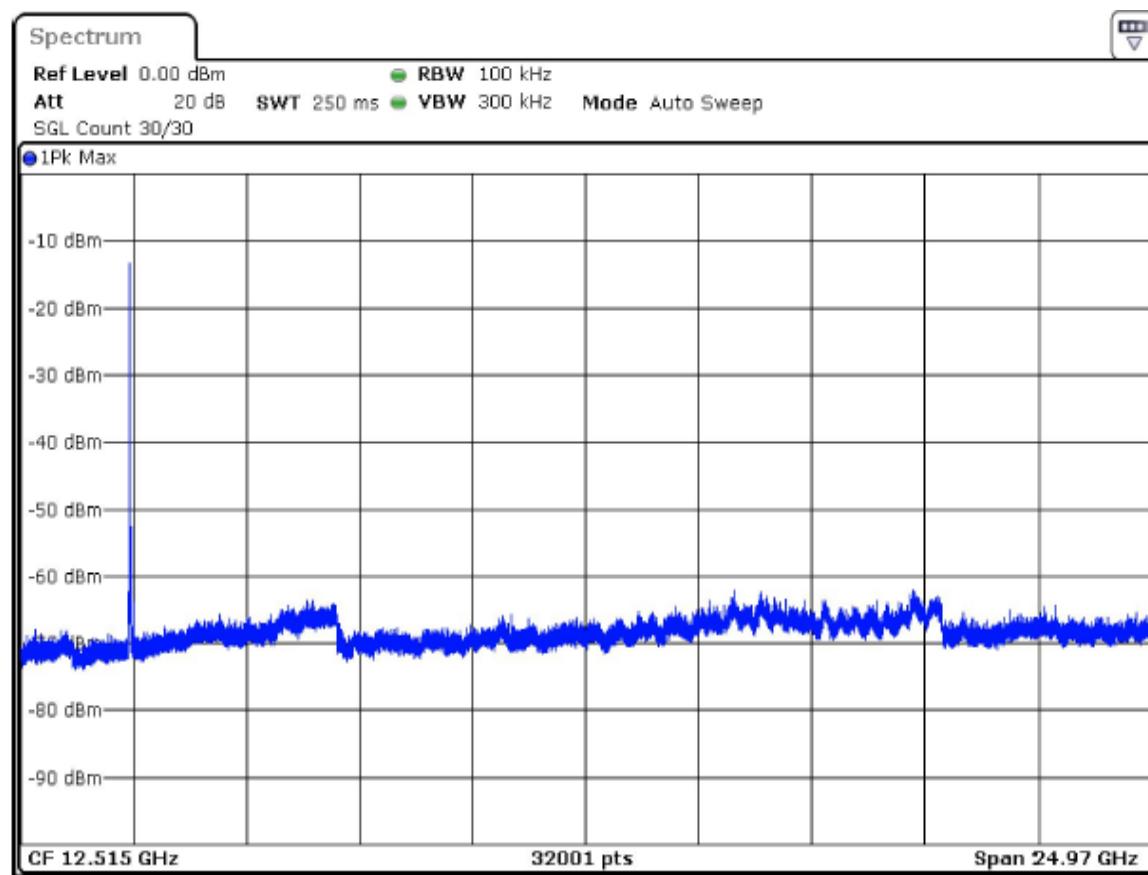


802.11b 5.5Mbps 2437MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 19760.138898    | -38.8       | 16.2        | -22.6       |
| 19772.623117    | -39.0       | 16.4        | -22.6       |
| 19791.349447    | -39.2       | 16.6        | -22.6       |
| 19681.332260    | -39.4       | 16.8        | -22.6       |
| 15799.520186    | -39.5       | 16.9        | -22.6       |
| 19759.358634    | -39.5       | 16.9        | -22.6       |
| 19770.282326    | -39.7       | 17.2        | -22.6       |
| 16417.489063    | -39.9       | 17.3        | -22.6       |
| 19849.869227    | -39.9       | 17.3        | -22.6       |
| 19807.734985    | -39.9       | 17.3        | -22.6       |
| 20302.422192    | -39.9       | 17.3        | -22.6       |
| 19892.003469    | -40.0       | 17.4        | -22.6       |
| 19792.129711    | -40.0       | 17.4        | -22.6       |
| 19826.461315    | -40.0       | 17.4        | -22.6       |
| 19746.874414    | -40.0       | 17.4        | -22.6       |





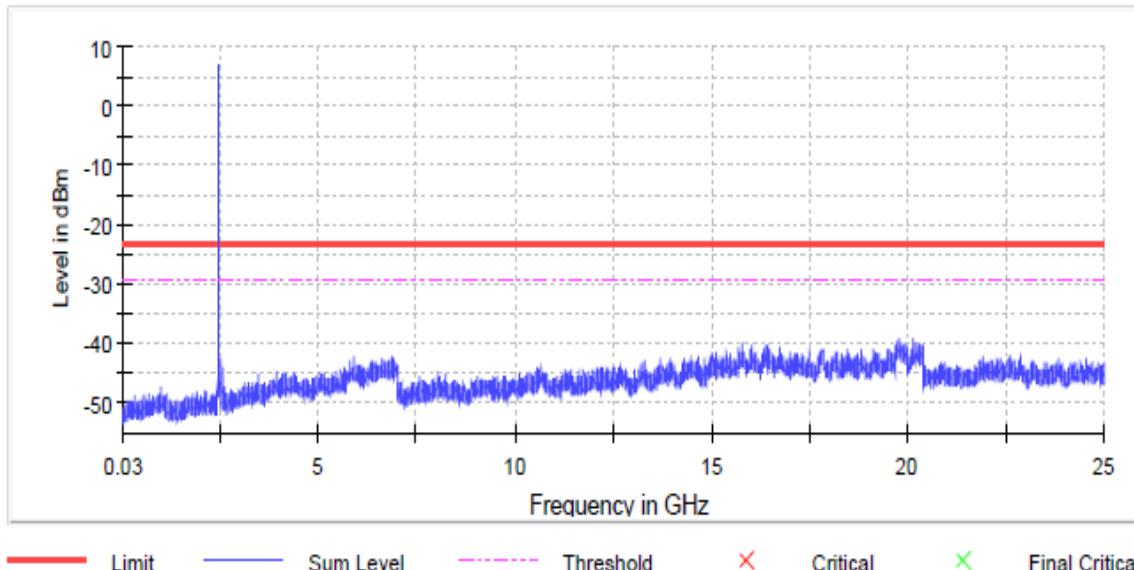
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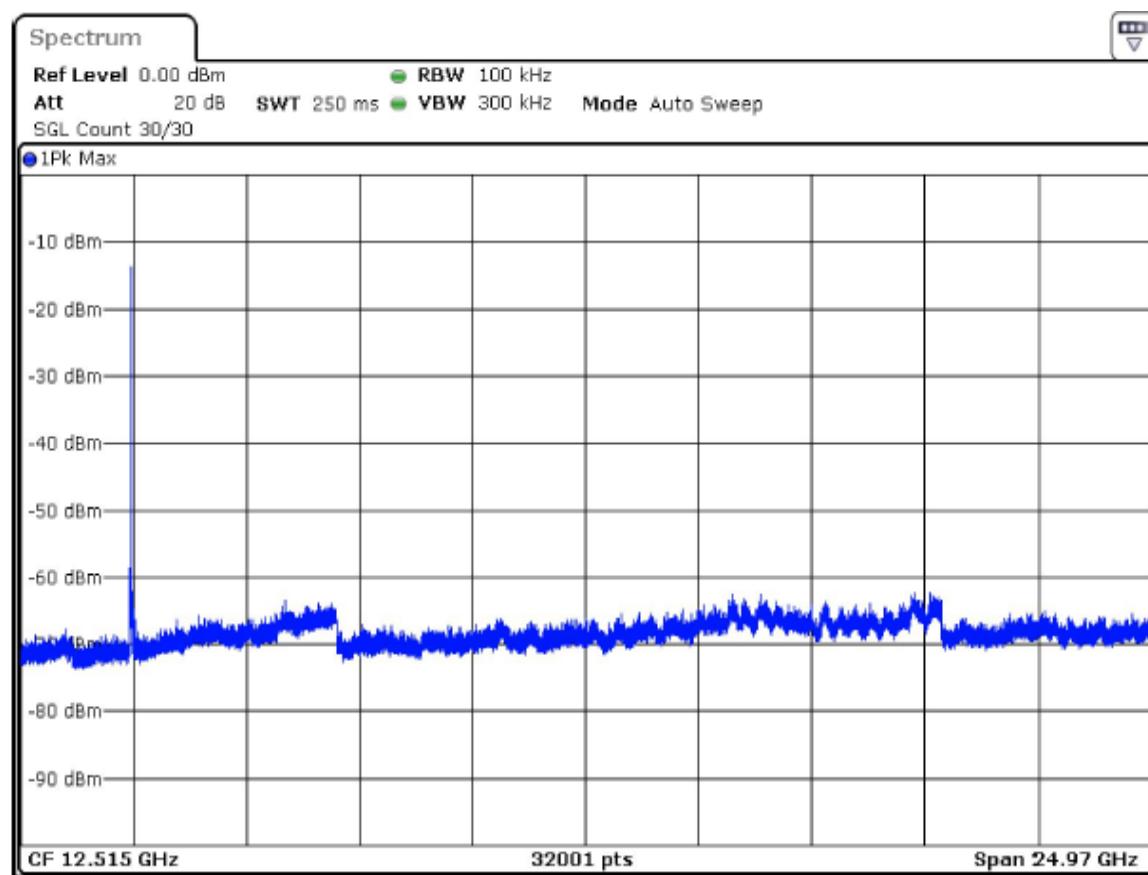


802.11b 5.5Mbps 2462MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 19774.963909    | -39.0       | 15.9        | -23.1       |
| 19768.721799    | -39.1       | 16.1        | -23.1       |
| 19771.842854    | -39.2       | 16.1        | -23.1       |
| 20118.279951    | -39.2       | 16.1        | -23.1       |
| 19775.744172    | -39.2       | 16.2        | -23.1       |
| 19774.183645    | -39.3       | 16.3        | -23.1       |
| 19718.784920    | -39.4       | 16.4        | -23.1       |
| 19771.062590    | -39.6       | 16.5        | -23.1       |
| 20140.127336    | -39.7       | 16.6        | -23.1       |
| 15779.233329    | -39.8       | 16.7        | -23.1       |
| 19764.820480    | -40.0       | 16.9        | -23.1       |
| 20307.884038    | -40.0       | 16.9        | -23.1       |
| 19753.896788    | -40.0       | 17.0        | -23.1       |
| 19935.698238    | -40.0       | 17.0        | -23.1       |
| 20200.987907    | -40.0       | 17.0        | -23.1       |





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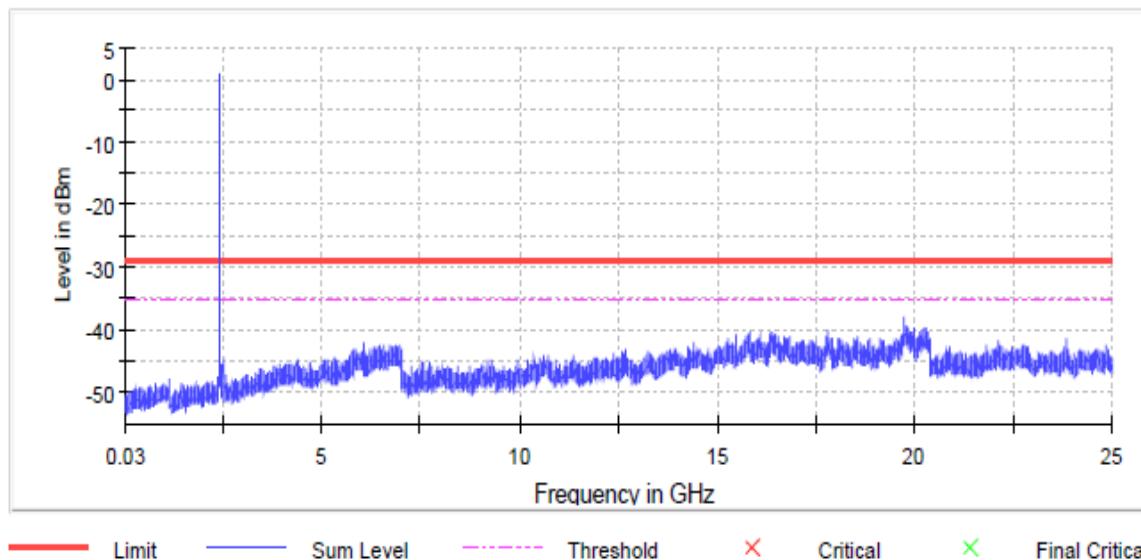
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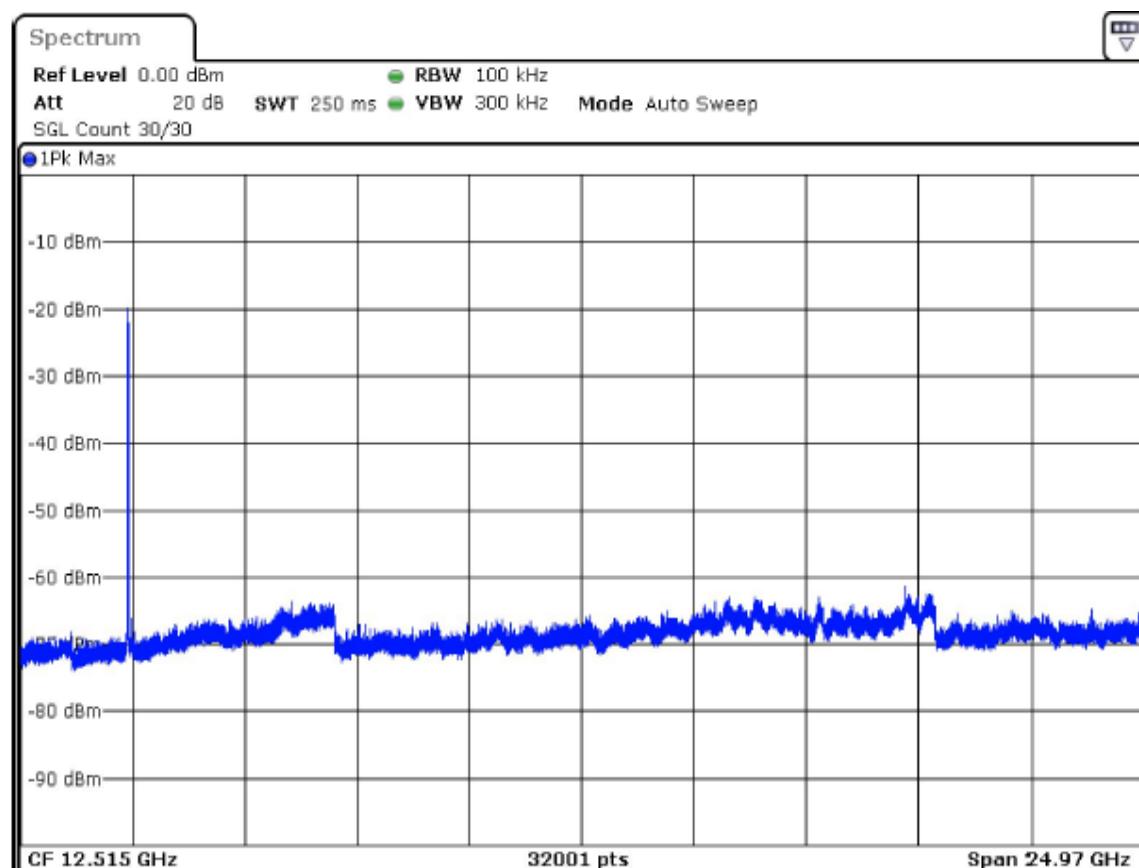
Testing Cert. No. 1627-01

802.11g 6 Mbps 2412MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2396.930036     | -37.8       | 8.7         | -29.2       |
| 19730.488876    | -38.0       | 8.8         | -29.2       |
| 2398.490563     | -38.8       | 9.6         | -29.2       |
| 19778.084963    | -39.4       | 10.3        | -29.2       |
| 19807.734985    | -39.5       | 10.4        | -29.2       |
| 19773.403381    | -39.6       | 10.4        | -29.2       |
| 2399.270827     | -39.6       | 10.5        | -29.2       |
| 19787.448128    | -39.7       | 10.5        | -29.2       |
| 20310.224830    | -39.7       | 10.5        | -29.2       |
| 19996.558809    | -39.7       | 10.5        | -29.2       |
| 19808.515249    | -39.7       | 10.5        | -29.2       |
| 2397.710299     | -39.7       | 10.6        | -29.2       |
| 20293.059028    | -39.7       | 10.6        | -29.2       |
| 19740.632304    | -39.8       | 10.6        | -29.2       |
| 20255.606368    | -39.8       | 10.6        | -29.2       |





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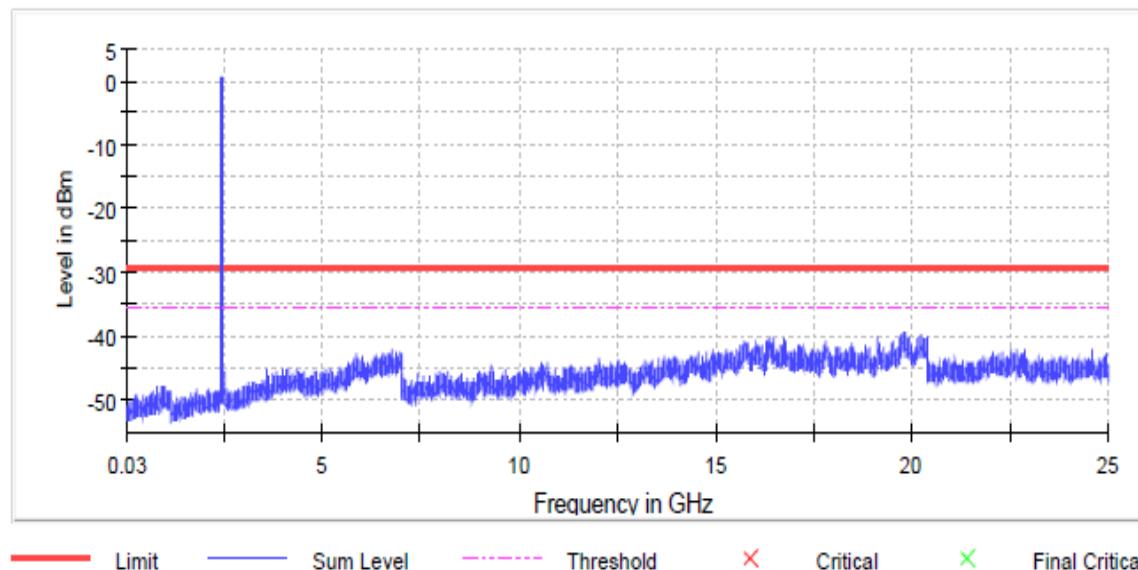
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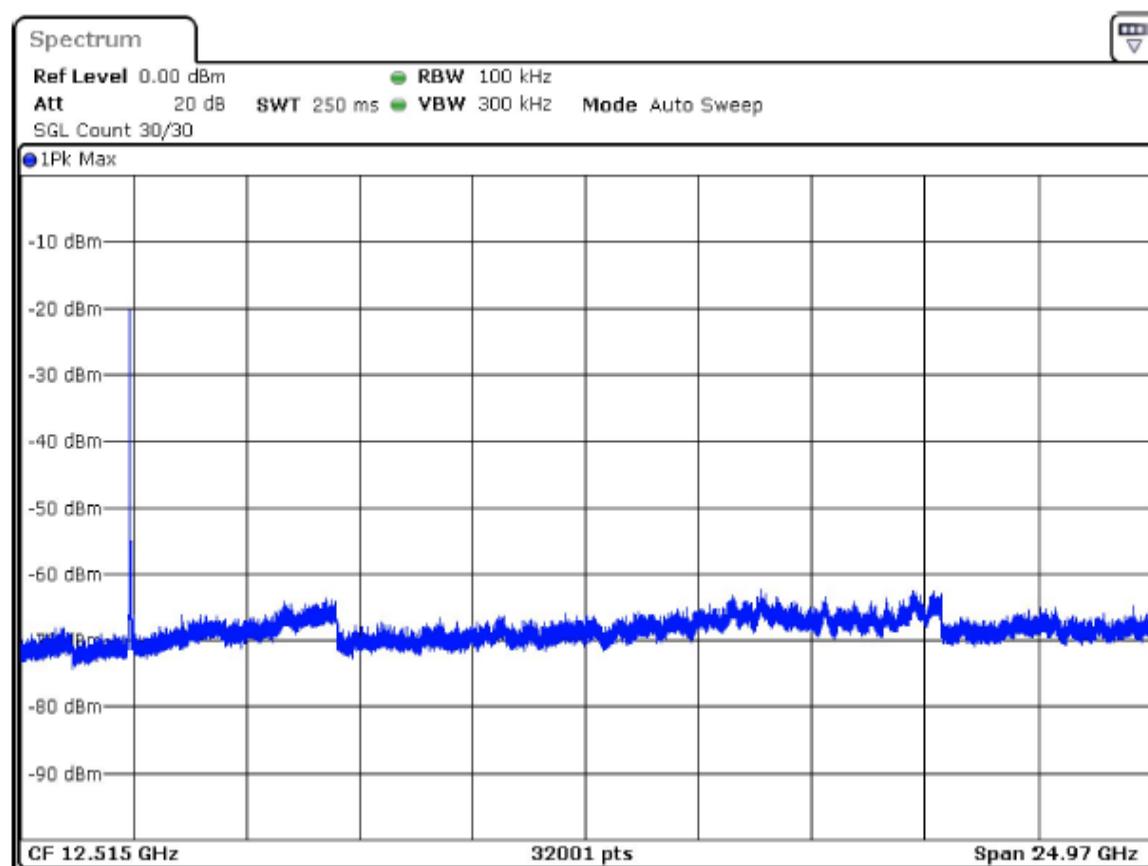
Testing Cert. No. 1627-01

802.11g 6 Mbps 2437MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 19763.259953    | -39.2       | 9.7         | -29.4       |
| 19808.515249    | -39.5       | 10.0        | -29.4       |
| 19747.654678    | -39.5       | 10.1        | -29.4       |
| 19760.138898    | -39.6       | 10.1        | -29.4       |
| 19765.600744    | -39.7       | 10.2        | -29.4       |
| 20239.220830    | -39.8       | 10.4        | -29.4       |
| 19714.103337    | -39.8       | 10.4        | -29.4       |
| 20371.085401    | -39.9       | 10.4        | -29.4       |
| 19729.708612    | -39.9       | 10.4        | -29.4       |
| 19768.721799    | -39.9       | 10.4        | -29.4       |
| 19767.941535    | -39.9       | 10.5        | -29.4       |
| 19781.986282    | -39.9       | 10.5        | -29.4       |
| 19764.820480    | -39.9       | 10.5        | -29.4       |
| 19734.390194    | -40.0       | 10.5        | -29.4       |
| 16397.982470    | -40.0       | 10.5        | -29.4       |





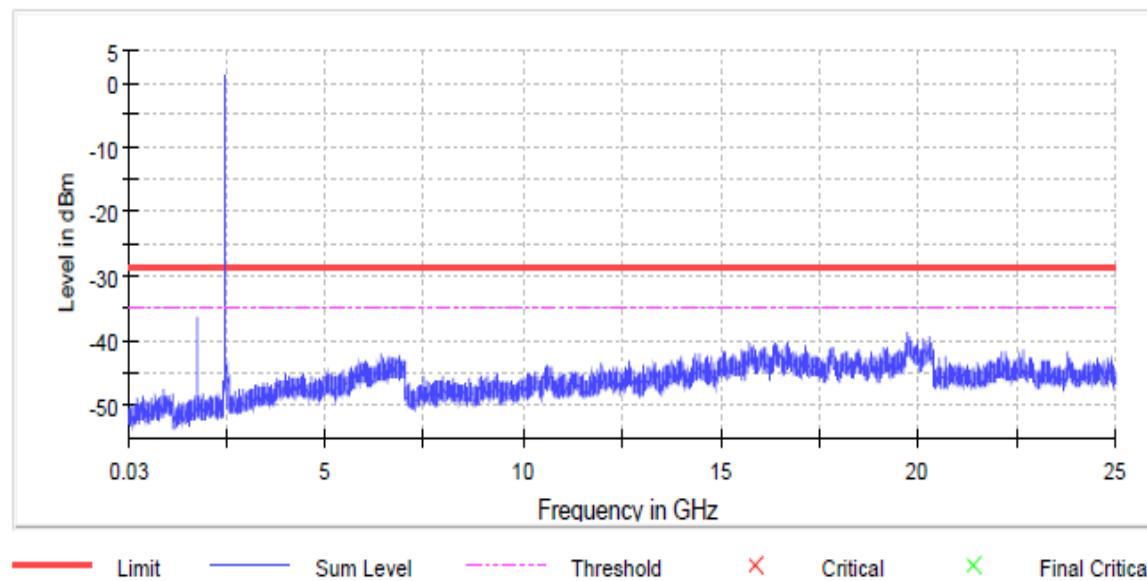
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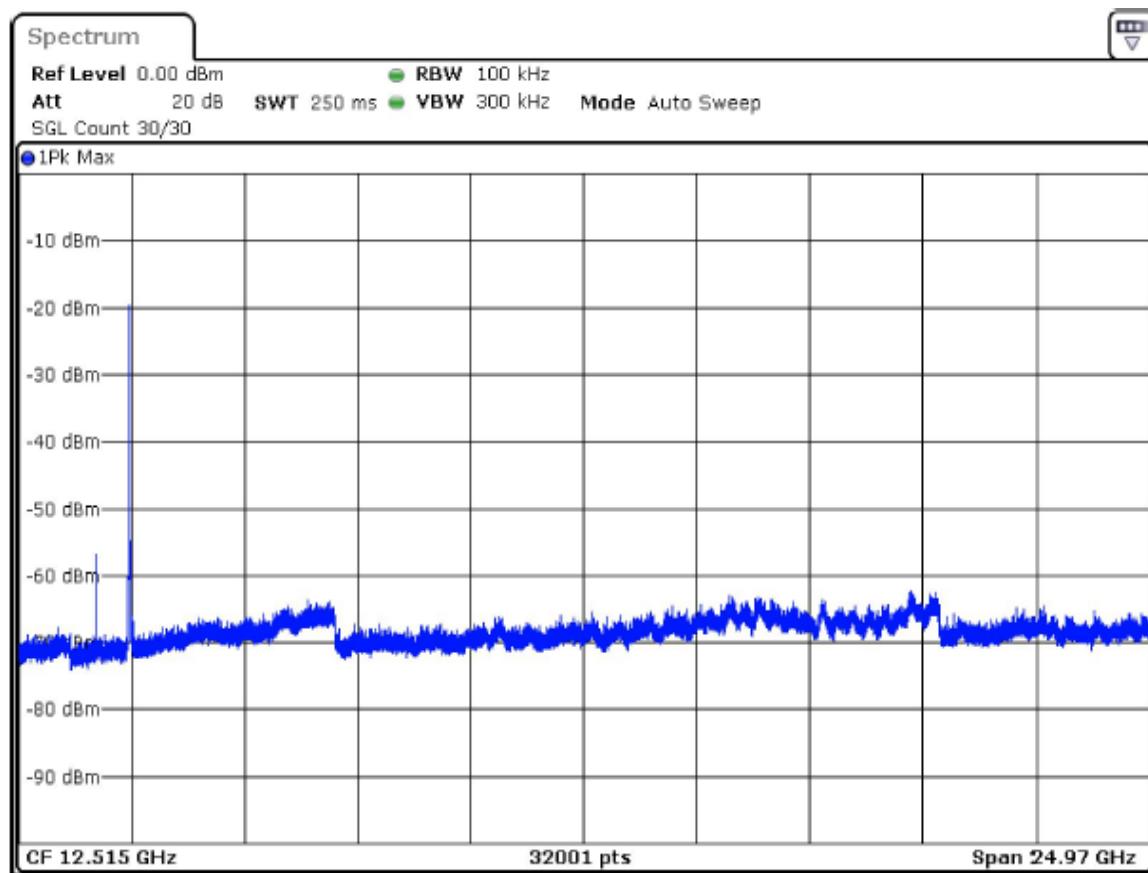


802.11g 6 Mbps 2462MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 1731.365071     | -36.2       | 7.4         | -28.8       |
| 19742.192832    | -38.8       | 9.9         | -28.8       |
| 19725.807293    | -39.0       | 10.1        | -28.8       |
| 19721.905975    | -39.0       | 10.2        | -28.8       |
| 20302.422192    | -39.4       | 10.5        | -28.8       |
| 19772.623117    | -39.5       | 10.6        | -28.8       |
| 20151.831292    | -39.7       | 10.8        | -28.8       |
| 19762.479689    | -39.7       | 10.8        | -28.8       |
| 19800.712612    | -39.7       | 10.8        | -28.8       |
| 19747.654678    | -39.7       | 10.9        | -28.8       |
| 19775.744172    | -39.9       | 11.0        | -28.8       |
| 19754.677051    | -39.9       | 11.0        | -28.8       |
| 19753.116524    | -40.0       | 11.2        | -28.8       |
| 19757.798106    | -40.0       | 11.2        | -28.8       |
| 19811.636304    | -40.0       | 11.2        | -28.8       |





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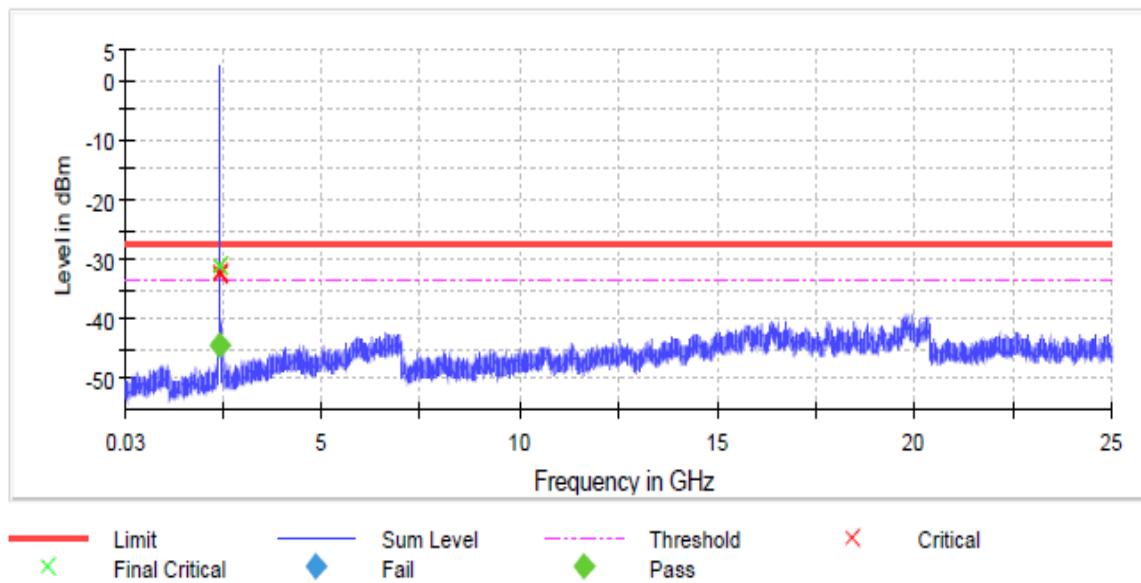
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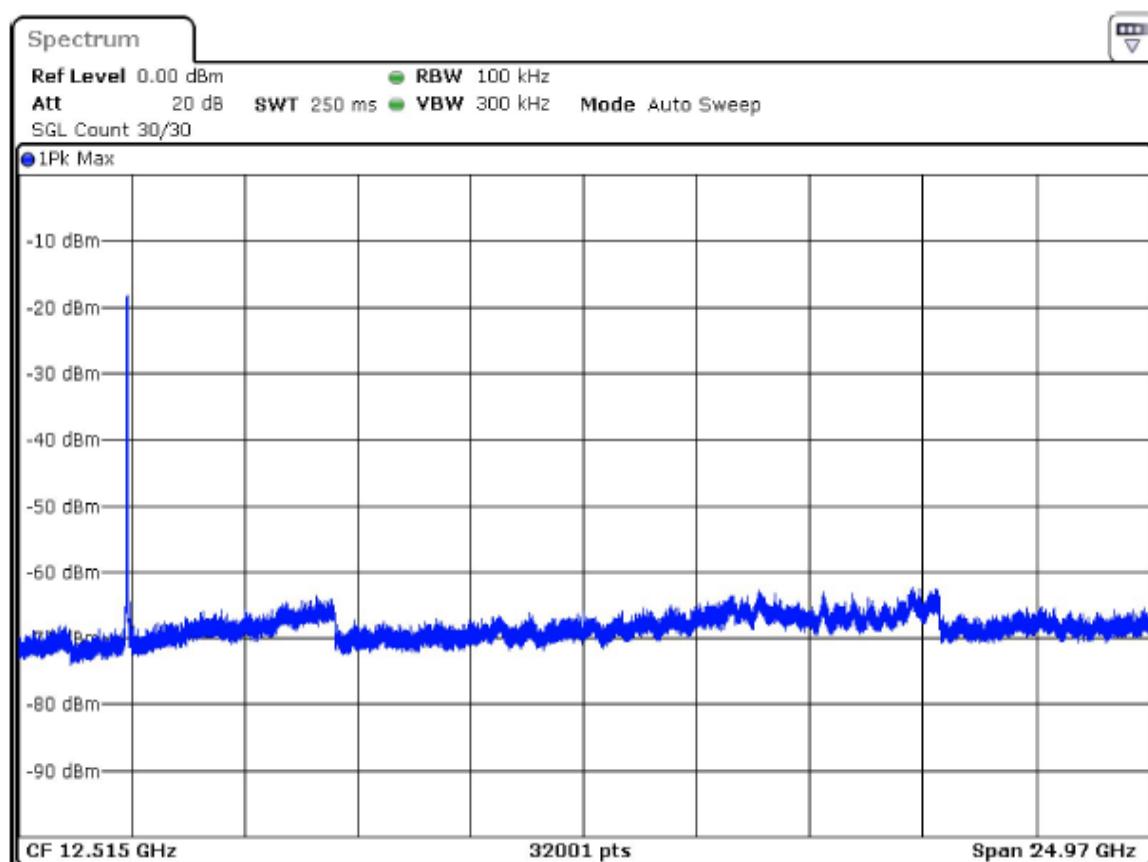
Testing Cert. No. 1627-01

802.11n(HT20) MCS3 2412MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2399.270827     | -31.1       | 3.5         | -27.6       |
| 2396.930036     | -32.0       | 4.5         | -27.6       |
| 2398.490563     | -32.1       | 4.5         | -27.6       |
| 2397.710299     | -32.7       | 5.2         | -27.6       |
| 2396.149772     | -34.1       | 6.5         | -27.6       |
| 2393.028717     | -35.0       | 7.5         | -27.6       |
| 2395.369508     | -35.4       | 7.9         | -27.6       |
| 2394.589244     | -35.5       | 8.0         | -27.6       |
| 2393.808981     | -35.8       | 8.3         | -27.6       |
| 2392.248453     | -35.9       | 8.3         | -27.6       |
| 2391.468189     | -37.1       | 9.5         | -27.6       |
| 2390.687926     | -37.4       | 9.9         | -27.6       |
| 2389.907662     | -38.1       | 10.5        | -27.6       |
| 19794.470502    | -39.0       | 11.5        | -27.6       |
| 19935.698238    | -39.2       | 11.6        | -27.6       |





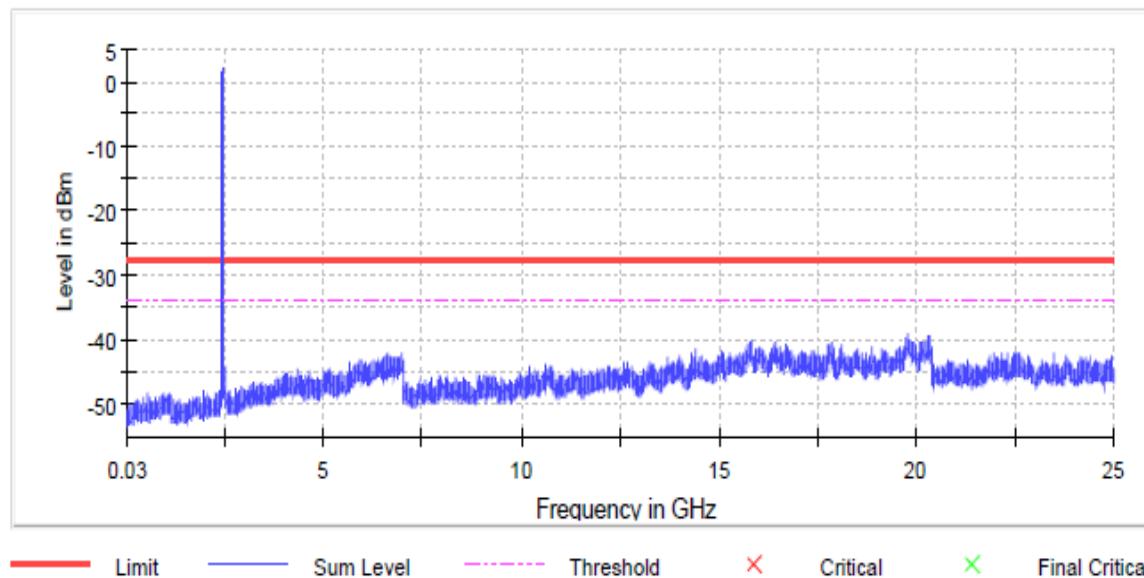
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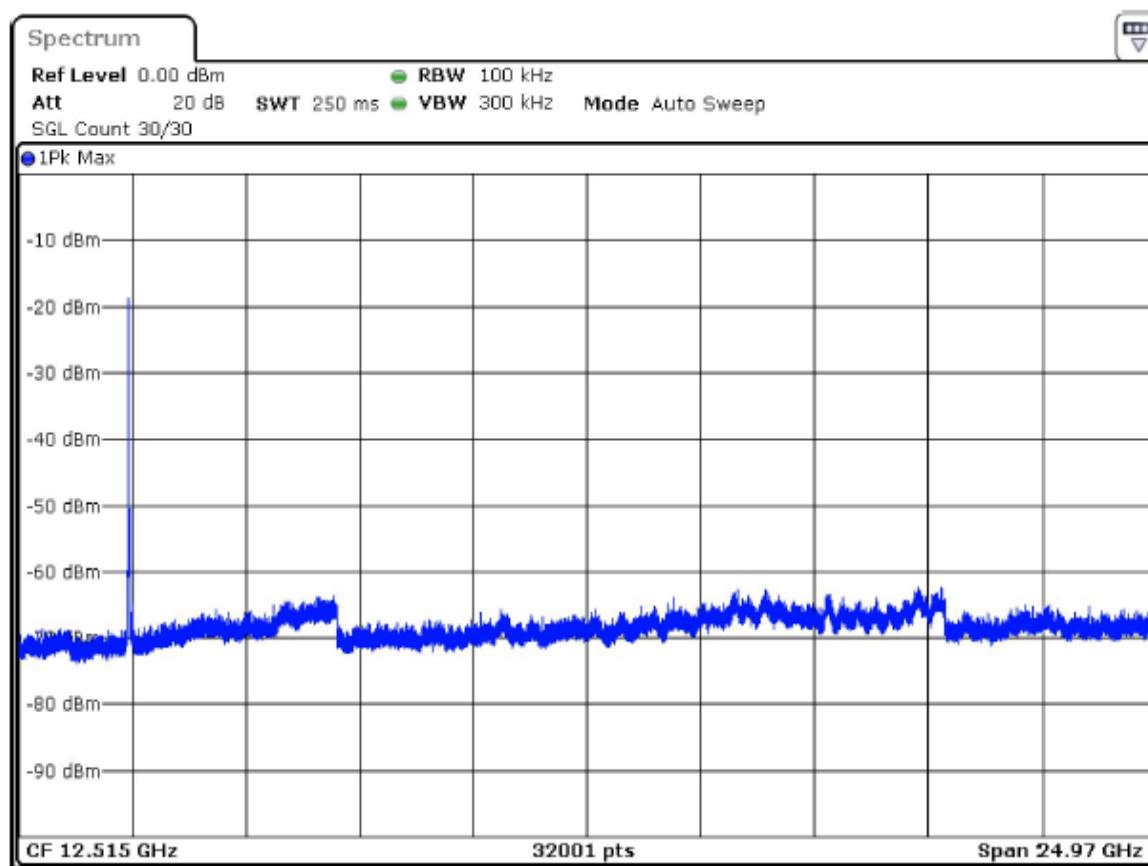


802.11n(HT20) MCS3 2437MHz

## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 19770.282326    | -39.0       | 11.1        | -27.9       |
| 20303.202456    | -39.2       | 11.4        | -27.9       |
| 20328.170896    | -39.4       | 11.6        | -27.9       |
| 19717.224392    | -39.6       | 11.7        | -27.9       |
| 19799.932348    | -39.6       | 11.7        | -27.9       |
| 19778.865227    | -39.8       | 11.9        | -27.9       |
| 19739.071777    | -39.8       | 11.9        | -27.9       |
| 19750.775733    | -39.8       | 11.9        | -27.9       |
| 19772.623117    | -39.8       | 12.0        | -27.9       |
| 19761.699425    | -39.9       | 12.0        | -27.9       |
| 19757.017843    | -39.9       | 12.0        | -27.9       |
| 19779.645491    | -39.9       | 12.0        | -27.9       |
| 19832.703425    | -39.9       | 12.0        | -27.9       |
| 19774.963909    | -39.9       | 12.0        | -27.9       |
| 19849.869227    | -39.9       | 12.1        | -27.9       |





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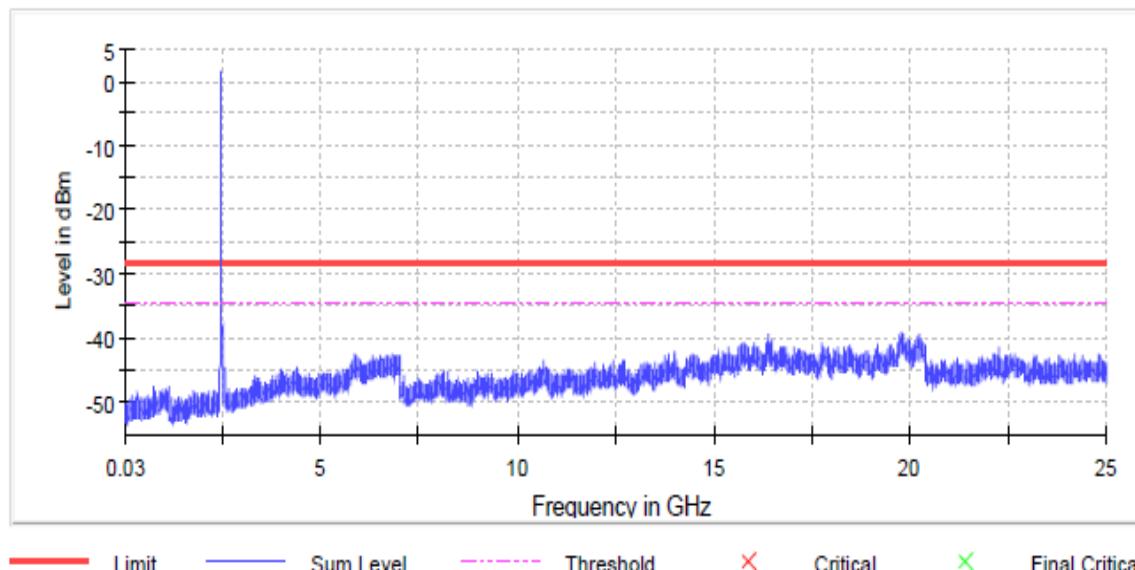


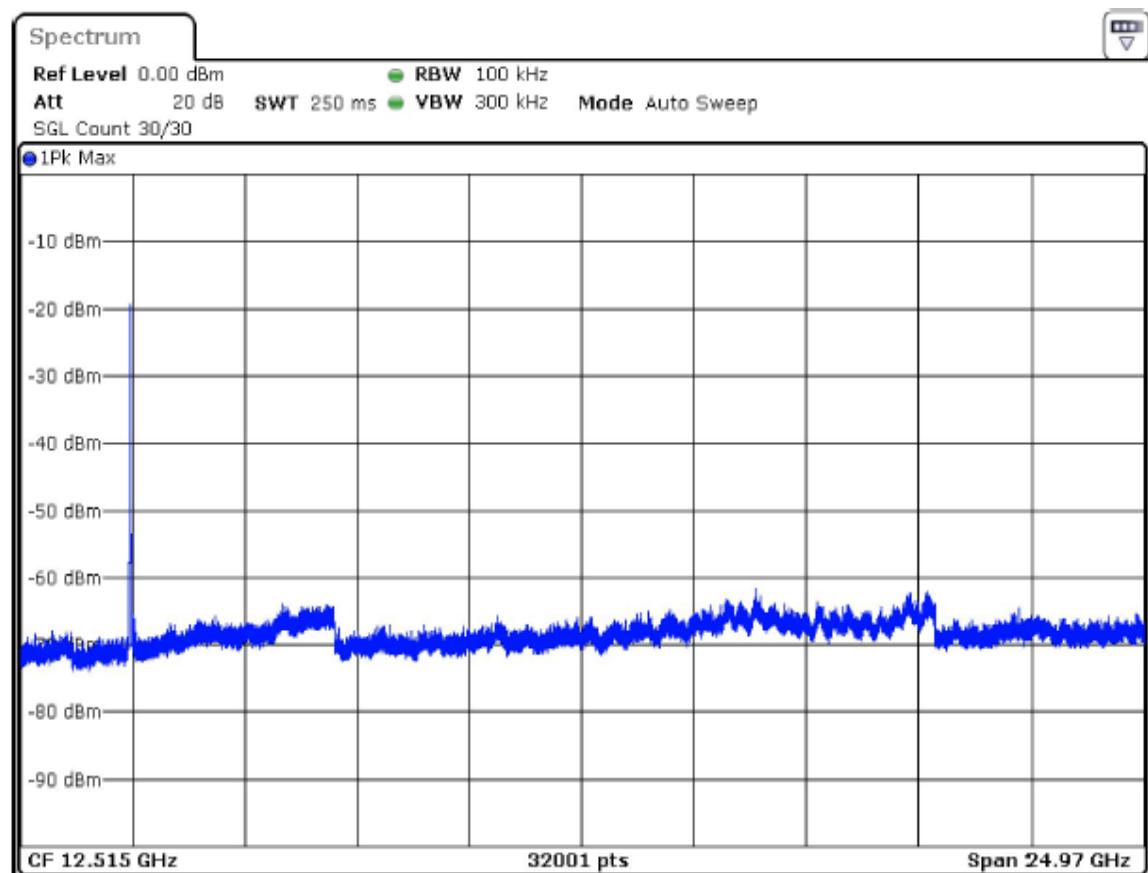
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**802.11n(HT20) MCS3 2462MHz****Pre Measurements**

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2483.539310     | -37.3       | 8.9         | -28.5       |
| 2486.660365     | -38.4       | 9.9         | -28.5       |
| 2484.319574     | -38.9       | 10.4        | -28.5       |
| 2487.440629     | -39.0       | 10.5        | -28.5       |
| 19800.712612    | -39.1       | 10.6        | -28.5       |
| 19845.967908    | -39.2       | 10.7        | -28.5       |
| 16393.300887    | -39.3       | 10.8        | -28.5       |
| 20224.395819    | -39.4       | 10.9        | -28.5       |
| 19842.066590    | -39.4       | 10.9        | -28.5       |
| 19762.479689    | -39.5       | 11.0        | -28.5       |
| 20171.337885    | -39.5       | 11.0        | -28.5       |
| 19738.291513    | -39.6       | 11.1        | -28.5       |
| 2485.099838     | -39.7       | 11.3        | -28.5       |
| 2485.880101     | -39.8       | 11.3        | -28.5       |
| 19788.228392    | -39.8       | 11.3        | -28.5       |





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