

# EMC Test Report

**Project Number:** 4025145**Report Number:** 4025145EMC03**Revision Level:** 0**Client:** Deere & Company**Equipment Under Test:** John Deere 4640 Universal Display**Model:** GU6U**FCC ID:** OV5-GU6U**IC ID:** 11137A-GU6U**Applicable Standards:** FCC Part 15 Subpart C, § 15.407**ANSI C63.10: 2013****Report issued on:** 11 October 2016**Test Result:** Compliant

Tested by:

  
\_\_\_\_\_  
Fabian Nica, Senior Engineering Technician

Reviewed by:

  
\_\_\_\_\_  
Jeremy Pickens, Senior EMC Engineer**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

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## 1 Summary of Test Results

| Test Description                | Test Specification   | Test Result |
|---------------------------------|----------------------|-------------|
| Emission Bandwidth              | 15.407(a), 15.407(e) | Compliant   |
| Spectral Density                | 15.407(a)            | Compliant   |
| Peak Power Output               | 15.407(a)            | Compliant   |
| Unwanted Emissions              | 15.407(b)            | Compliant   |
| AC Powerline Conducted Emission | 15.107, 15.207       | N/A(1)      |

(1) Not Applicable – The host device for the module is battery-powered and has no facility for connection to the AC mains.

### 1.1 Modifications Required for Compliance

None

## 2 General Information

### 2.1 Client Information

Name: Deere & Company  
Address: One John Deere Place  
City, State, Zip, Country: Moline, IL 61265, USA

### 2.2 Test Laboratory

Name: SGS North America, Inc.  
Address: 620 Old Peachtree Road NW, Suite 100  
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA  
Type of lab: Testing Laboratory  
Certificate Number: 3212.01

### 2.3 General Information of EUT

Type of Product: John Deere 4640 Universal Display  
Model Number: GU6U  
Serial Number: PCGU6UA050575

FCC ID: OV5-GU6U  
IC ID: 11137A-GU6U

Frequency Range: 5150 to 5250 MHz and 5725 to 5825MHz  
Data Modes: 802.11a, 802.11n (HT20), 802.11n (HT40)  
Antenna: Taoglas, P/N: GW.05.0153 (Dual-Band WiFi 2.4~2.5GHz/5.15~5.85GHz)

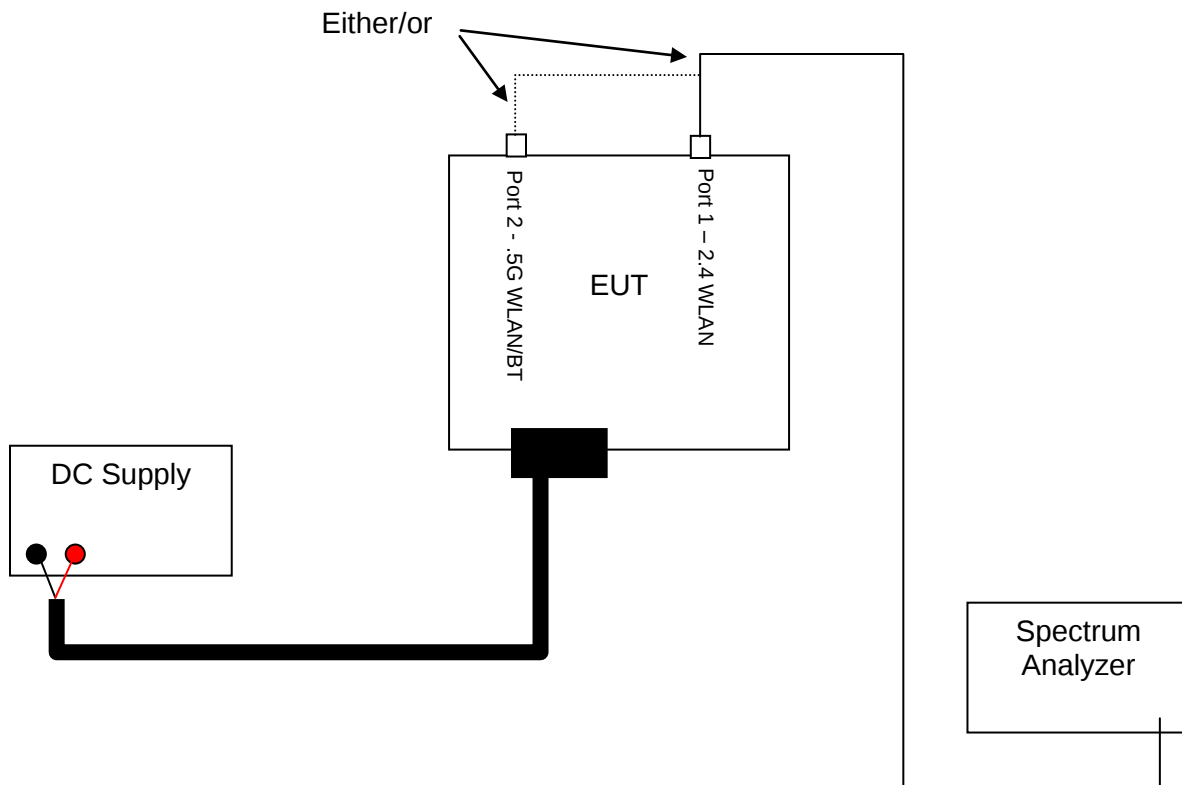
Rated Voltage: 9 – 32Vdc  
Test Voltage: 12Vdc

Sample Received Date: 15 August 2016  
Dates of testing: 06 - 20 September 2016

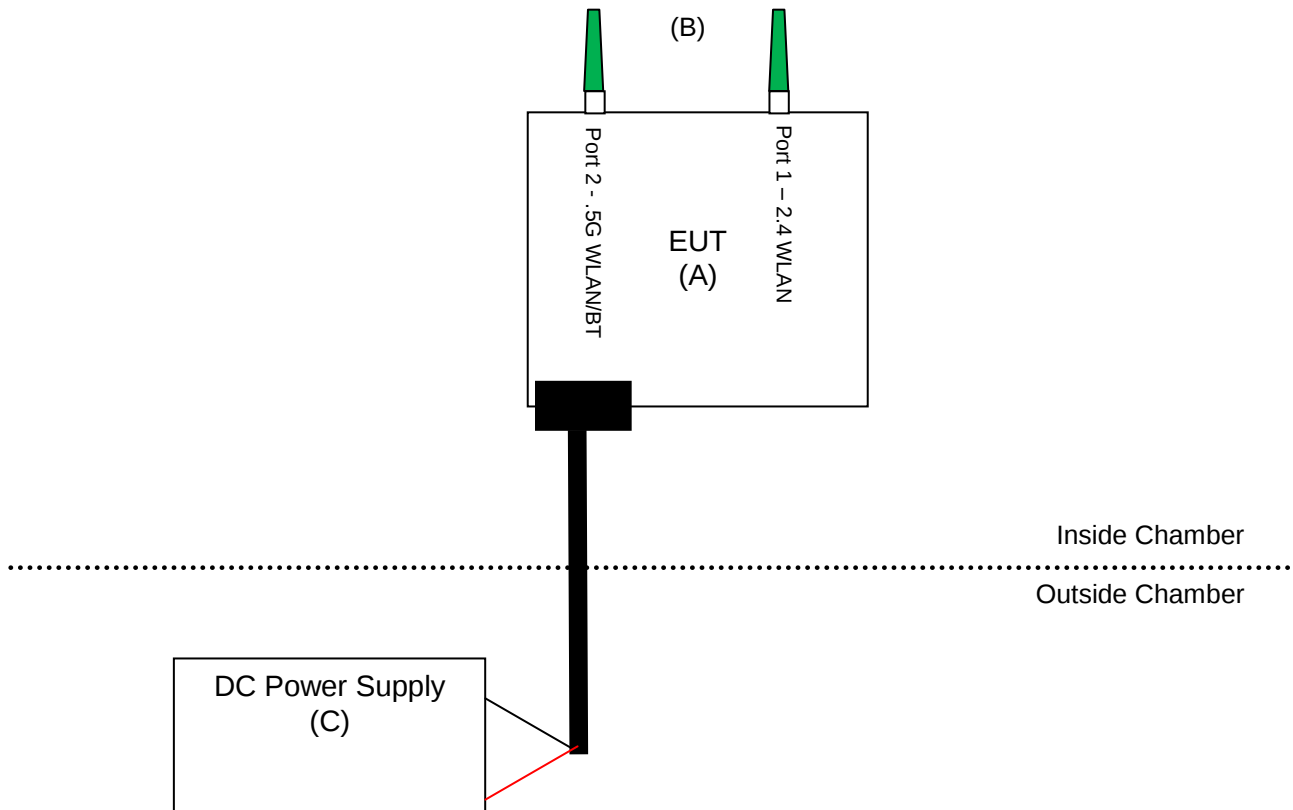
### 2.4 Operating Modes and Conditions

Using test commands, the EUT would transmit continuously on any of the UNII Band 1 or 3 channels at full power. All modulations and data rates were measured for power and worst-case were reported. For spurious emissions measurements, only the worst-case mode with respect to peak power was investigated: 802.11a, 6Mbps.

## 2.5 EUT Connection Block Diagram – Conducted Measurements



## 2.6 EUT Connection Block Diagram – Radiated Measurements



## 2.7 System Configurations

| Device reference | Manufacturer    | Description            | Model Number | Serial Number |
|------------------|-----------------|------------------------|--------------|---------------|
| A                | Deere & Company | 4640 Universal Display | GU6U         | PCGU6UA050575 |
| B                | Taoglas         | Dual-Band WiFi Antenna | GW.05.0153   | Not Labeled   |
| C                | Extech          | DC Power Supply        | 382280       | 12010471      |

### 3 Emission Bandwidth and Occupied Bandwidth

#### 3.1 Test Result

| Test Description             | Test Specification   | Test Result |
|------------------------------|----------------------|-------------|
| Emission bandwidth / 99% OBW | 15.407(a), 15.407(e) | Compliant   |

#### 3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 12.4 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r02 were used to determine the 6 dB bandwidth, the 26dB bandwidth, and 99% OBW.

#### 3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.3 °C

Relative Humidity: 49.3 %

#### 3.4 Test Equipment

Test Date: 12-Sep-2016

Tester: JC

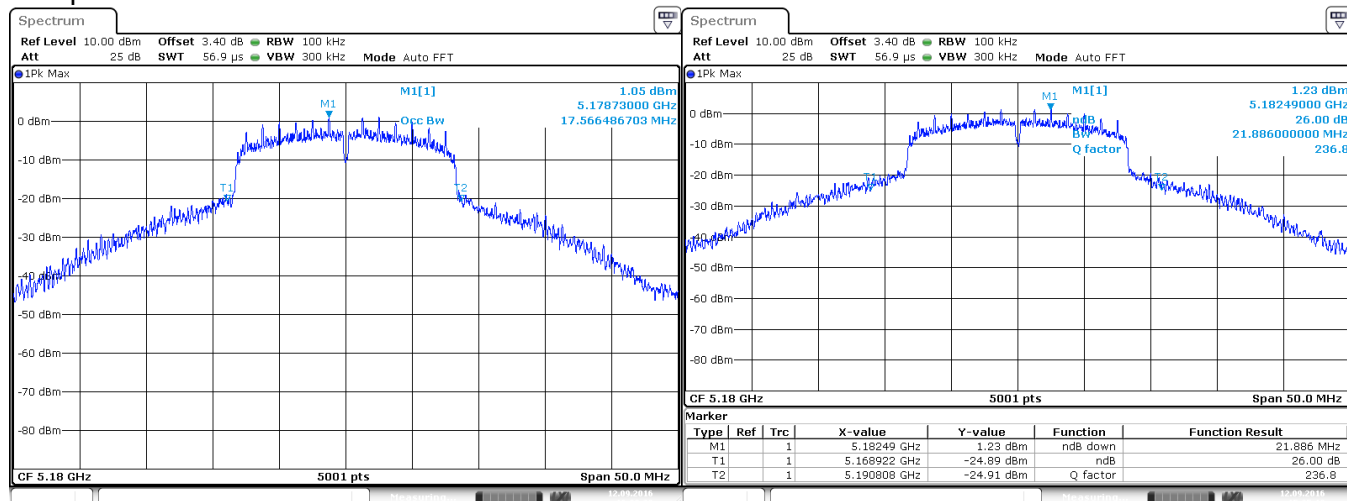
| Equipment       | Model | Manufacturer    | Asset Number | Cal Due Date |
|-----------------|-------|-----------------|--------------|--------------|
| SIGNAL ANALYZER | FSV30 | ROHDE & SCHWARZ | B085749      | 8-Oct-2017   |
| RF CABLE        | 1134  | GORE            | B094785      | 26-Jul-2017  |

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

#### 3.5 Test Data

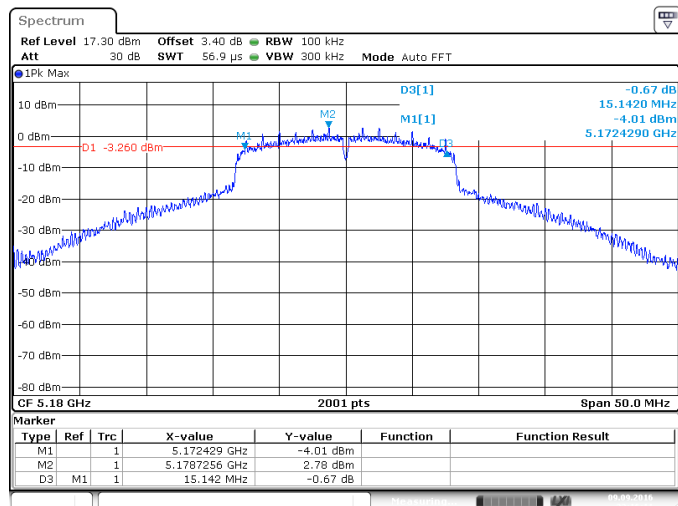
| Protocol       | Channel | Data Rate | 26dB Bandwidth (MHz) | 6dB Bandwidth (MHz) | OBW (99%) (MHz) |
|----------------|---------|-----------|----------------------|---------------------|-----------------|
| 802.11a        | 36      | 54Mbps    | 21.886               | 15.142              | 17.566          |
| 802.11a        | 44      | 54Mbps    | 22.106               | 15.126              | 17.836          |
| 802.11a        | 48      | 54Mbps    | 22.795               | 15.123              | 17.836          |
| 802.11a        | 149     | 54Mbps    | 21.836               | 15.127              | 17.047          |
| 802.11a        | 157     | 54Mbps    | 21.846               | 15.127              | 17.097          |
| 802.11a        | 165     | 54Mbps    | 20.986               | 15.127              | 17.047          |
| 802.11n (HT40) | 36+     | MCS7      | 37.696               | 30.726              | 35.705          |
| 802.11n (HT40) | 48-     | MCS7      | 37.516               | 32.094              | 35.741          |
| 802.11n (HT40) | 149+    | MCS7      | 37.768               | 30.954              | 35.729          |
| 802.11n (HT40) | 161-    | MCS7      | 37.768               | 31.396              | 35.825          |

## Sample Plots:



Date: 12 SEP 2016 16:08:30

Date: 12 SEP 2016 15:35:19



Date: 9 SEP 2016 22:16:12

## 4 Output Power

### 4.1 Test Result

| Test Description  | Test Specification | Test Result |
|-------------------|--------------------|-------------|
| Peak Output Power | 15.407(a)          | Compliant   |

### 4.2 Test Method

Fundamental power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 12.3 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r02.

#### Limit

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi

### 4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 24.0 °C

Relative Humidity: 48.2 %

### 4.4 Test Equipment

Test Date: 12-Sep-2016

Tester: JOP

| Equipment       | Model | Manufacturer    | Asset Number | Cal Due Date |
|-----------------|-------|-----------------|--------------|--------------|
| SIGNAL ANALYZER | FSV30 | ROHDE & SCHWARZ | B085749      | 8-Oct-2017   |
| RF CABLE        | 1134  | GORE            | B094785      | 26-Jul-2017  |

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

#### 4.5 Test Data

| Mode              | RateMbps | Channel | Target<br>dBm | Final<br>dBm |
|-------------------|----------|---------|---------------|--------------|
| 802.11a           | 6        | 36      | 20            | 11.84        |
|                   |          | 44      | 20            | 11.61        |
|                   |          | 48      | 20            | 11.86        |
|                   |          | 149     | 20            | 10.51        |
|                   |          | 157     | 20            | 10.88        |
|                   |          | 165     | 20            | 10.59        |
| 802.11n<br>(HT20) | MCS0     | 36      | 20            | 11.81        |
|                   |          | 44      | 20            | 11.49        |
|                   |          | 48      | 20            | 11.69        |
|                   |          | 149     | 20            | 10.64        |
|                   |          | 157     | 20            | 11.01        |
|                   |          | 161     | 20            | 10.71        |
| 802.11n<br>(HT40) | MCS0     | 36+     | 20            | 6.46         |
|                   |          | 48-     | 20            | 6.47         |
|                   |          | 149+    | 20            | 5.24         |
|                   |          | 161-    | 20            | 5.61         |

## 5 Power Spectral Density

### 5.1 Test Result

| Test Description       | Test Specification | Test Result |
|------------------------|--------------------|-------------|
| Power Spectral Density | 15.407(a)          | Compliant   |

### 5.2 Test Method

Fundamental power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 12.5 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r02. The lowest data rate for each modulation was determined to be the worst-case.

#### Limit

The limit is 17dBm in any 1MHz band for channels in the 5.15-5.25GHz band and 30dBm in any 500-kHz band for channels in the 5.725-5.85GHz band.

### 5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 24.3 °C  
Relative Humidity: 49.3 %

### 5.4 Test Equipment

Test Date: 12-Sep-2016

Tester: JC

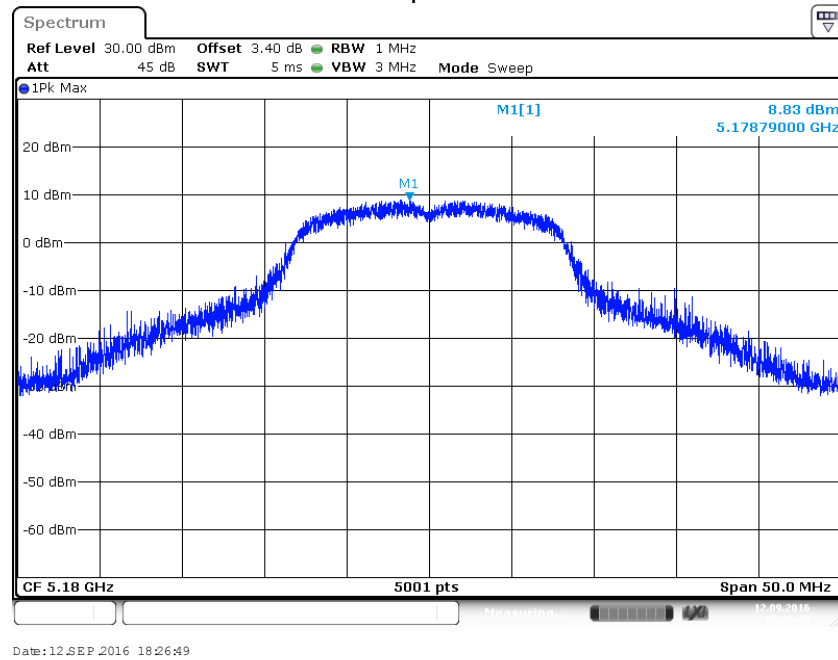
| Equipment       | Model | Manufacturer    | Asset Number | Cal Due Date |
|-----------------|-------|-----------------|--------------|--------------|
| SIGNAL ANALYZER | FSV30 | ROHDE & SCHWARZ | B085749      | 8-Oct-2017   |
| RF CABLE        | 1134  | GORE            | B094785      | 26-Jul-2017  |

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

### 5.5 Test Data (UNII Band 1)

| Protocol       | Channel | Data Rate | Meas PSD (dBm/MHz) | Limit (dBm) | Margin (dB) |
|----------------|---------|-----------|--------------------|-------------|-------------|
| 802.11a        | 36      | 6 Mbps    | 8.83               | 17          | -8.17       |
| 802.11a        | 44      | 6 Mbps    | 9.02               | 17          | -7.98       |
| 802.11a        | 48      | 6 Mbps    | 10.39              | 17          | -6.61       |
| 802.11n (HT40) | 36+     | MCS0      | 3.11               | 17          | -13.89      |
| 802.11n (HT40) | 48-     | MCS0      | 2.7                | 17          | -14.3       |

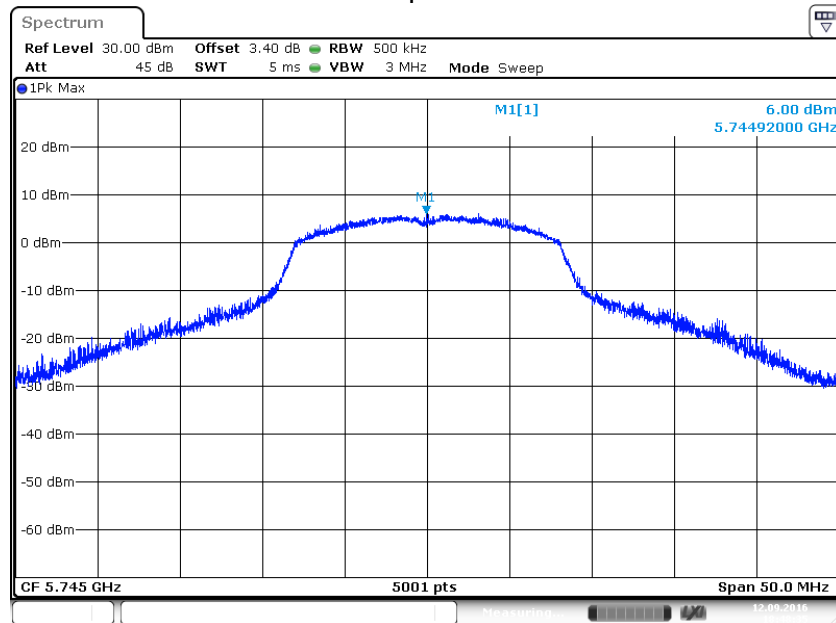
Sample Plot



## 5.6 Test Data (UNII Band 3)

| Protocol       | Channel | Data Rate | Meas PSD (dBm/500kHz) | Limit (dBm) | Margin (dB) |
|----------------|---------|-----------|-----------------------|-------------|-------------|
| 802.11a        | 149     | 6 Mbps    | 6                     | 30          | -24         |
| 802.11a        | 157     | 6 Mbps    | 6.39                  | 30          | -23.61      |
| 802.11a        | 165     | 6 Mbps    | 6.17                  | 30          | -23.83      |
| 802.11n (HT40) | 149+    | MCS0      | -0.2                  | 30          | -30.2       |
| 802.11n (HT40) | 161-    | MCS0      | -0.71                 | 30          | -30.71      |

## Sample Plot



Date: 12 SEP 2016 18:48:36

## 6 Unwanted Emissions – Antenna Port

### 6.1 Test Result

| Test Description   | Test Specification             | Test Result |
|--------------------|--------------------------------|-------------|
| Spurious Emissions | 15.407(b)<br>ANSI C63.10: 2013 | Compliant   |

### 6.2 Test Method

Testing was performed using the radiated and conducted methods defined in ANSI C63.10: 2013 clause 12.7 and KDB 789033 D02 General UNII Test Procedures New Rules v01r02. In lieu of the marker-delta or integration methods, band edge compliance was shown using a peak detector and a 1MHz resolution bandwidth. The correction factor for both the band edge measurements and the conducted spurious tests included cable loss and a 2dBi antenna gain (minimum that may be applied per the KDB for conducted methods).

Lowest, middle, and highest channels were investigated for each band. Only the worst-case (802.11a, 6Mbps) was reported except at the band edges where all three modulations were measured. The frequency range examined was 9kHz to 40GHz. A pre-scan was performed in the 9kHz-30MHz range and no emissions associated with the radio were observed.

#### Limit:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

### 6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 24.3 °C  
Relative Humidity: 49.3 %

### 6.4 Test Equipment

Test Date: 12-Sep-2016

Tester: JC

| Equipment       | Model | Manufacturer    | Asset Number | Cal Due Date |
|-----------------|-------|-----------------|--------------|--------------|
| SIGNAL ANALYZER | FSV30 | ROHDE & SCHWARZ | B085749      | 8-Oct-2017   |
| RF CABLE        | SF102 | HUBER & SUHNER  | B079822      | 27-Jul-2017  |

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

## 6.5 Test Equipment – Radiated Measurements

Test End Date: 20-Sep-2016

Tester: JOP/JC/FL

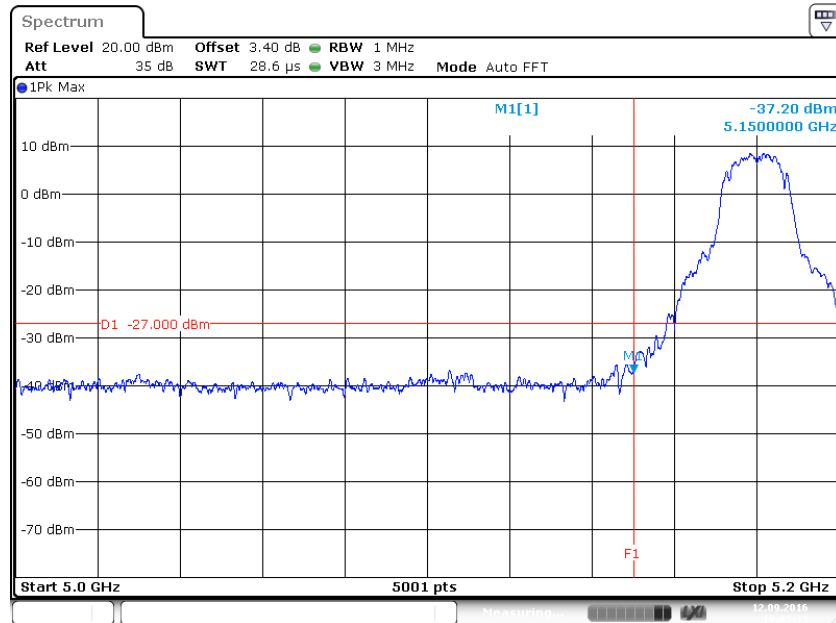
| Equipment           | Model        | Manufacturer    | Asset Number | Cal Due Date |
|---------------------|--------------|-----------------|--------------|--------------|
| EMI TEST RECEIVER   | ESU40        | ROHDE & SCHWARZ | B079629      | 20-Jun-2017  |
| DRG HORN (MEDIUM)   | 3117         | ETS LINDGREN    | B079691      | 27-Jul-2017  |
| RF CABLE            | SF106        | HUBER & SUHNER  | B079712      | 27-Jul-2017  |
| RF CABLE            | SF106        | HUBER & SUHNER  | B079713      | 27-Jul-2017  |
| RF CABLE            | SF106        | HUBER & SUHNER  | B085892      | 27-Jul-2017  |
| RF CABLE            | SUCOFLEX 100 | HUBER & SUHNER  | B108523      | 4-Aug-2017   |
| LOW NOISE AMPLIFIER | TS-PR18      | ROHDE & SCHWARZ | B094463      | 16-Feb-2017  |
| ANTENNA, BILOG      | CBL 6143A    | TESEQ           | B085931      | 1-Dec-2016   |
| RF CABLE            | SF106        | HUBER & SUHNER  | B079716      | 27-Jul-2017  |
| RF CABLE            | SF106        | HUBER & SUHNER  | B079713      | 27-Jul-2017  |
| FILTER, HIGH PASS   | HPM50112     | MICRO-TRONICS   | B093647      | 28-Jul-2017  |
| DRG HORN (SMALL)    | 3116B        | ETS LINDGREN    | B079697      | 29-Mar-2017  |
| RF CABLE            | SF102        | HUBER & SUHNER  | B079822      | 27-Jul-2017  |
| RF CABLE            | SF102        | HUBER & SUHNER  | B079823      | 27-Jul-2017  |
| LOW NOISE AMPLIFIER | NSP1840-HG   | MITEQ           | B087572      | 29-Jul-2017  |

Not

e: The calibration period for equipment is 1 year

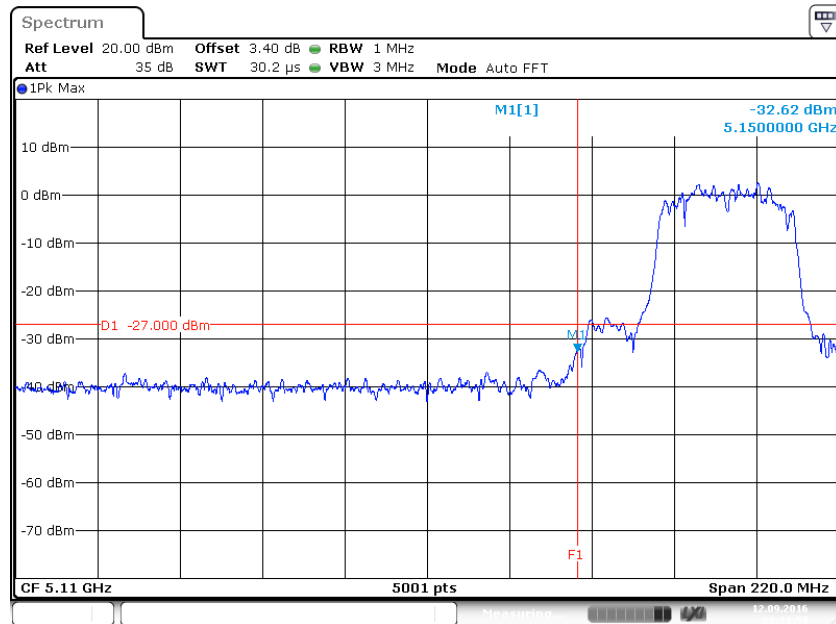
## 6.6 Test Data – Band Edge

802.11a  
Lower band edge  
Channel 36  
6Mbit/s

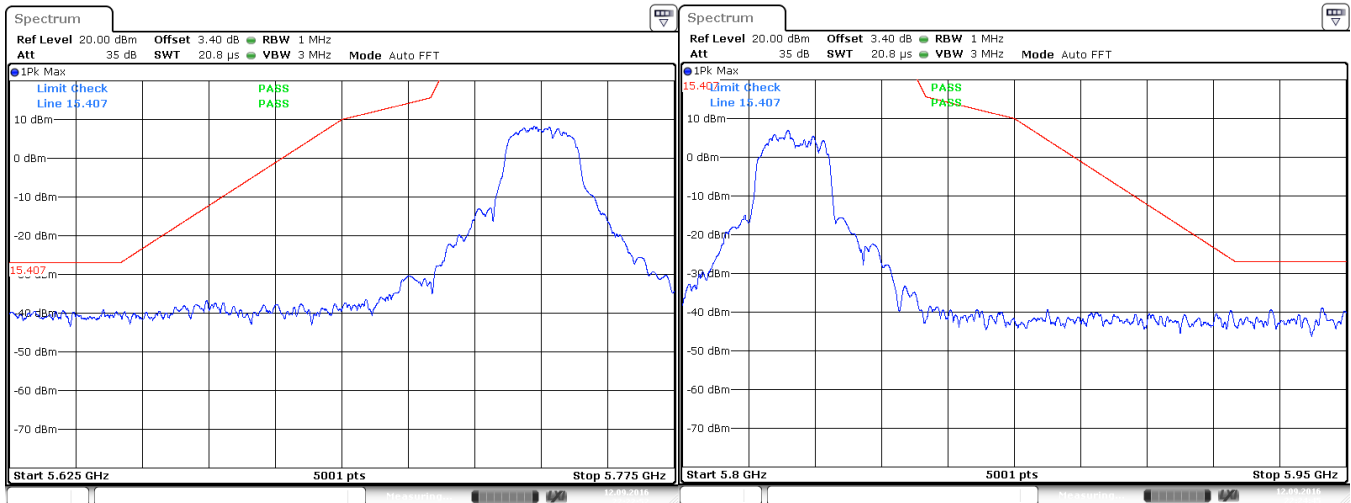


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802.11n (HT40)  
Lower band edge  
Channel 40  
MCS0

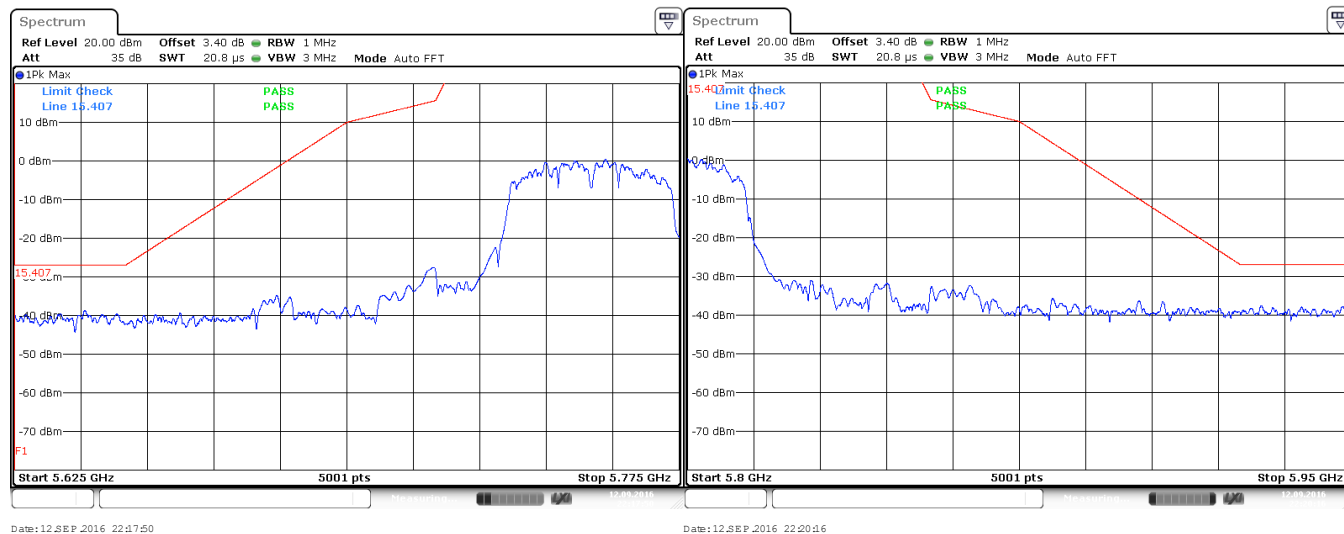


802.11a  
Lower band edge / Upper band edge  
Channel 149 / Channel 165  
6Mbit/s



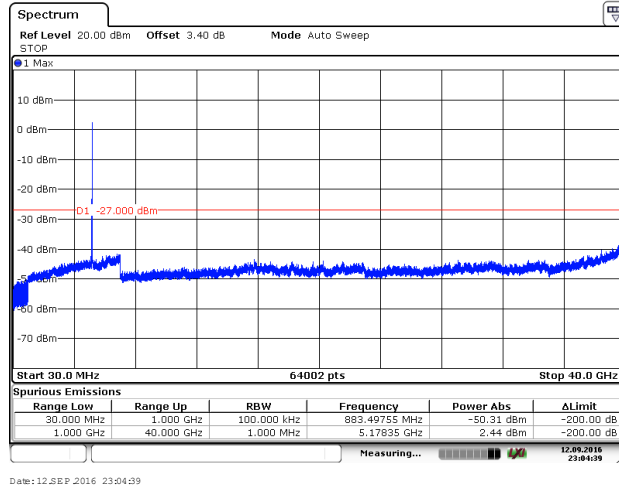
802.11n (HT40)  
Lower band edge / Upper band edge  
Channel 153 / Channel 161

MCS0

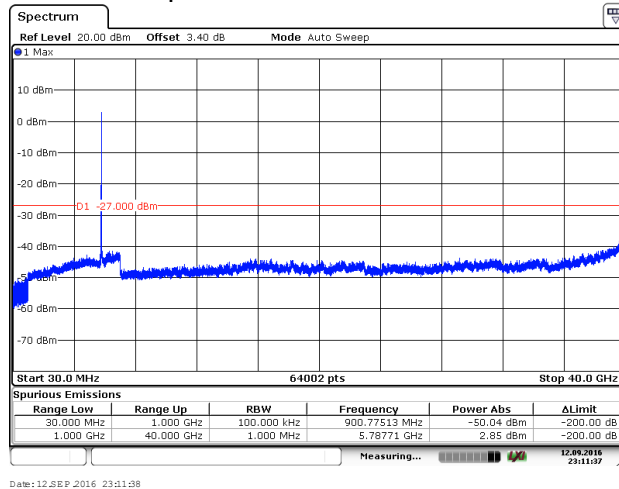


## 6.7 Test Data – Conducted Spurs

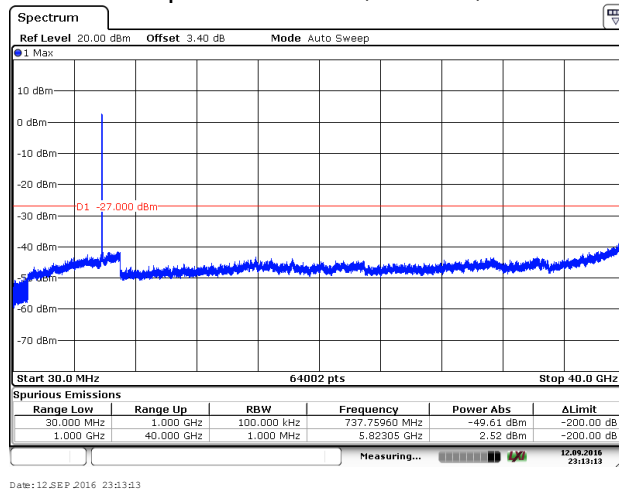
### Conducted Spurs – 802.11a, 6Mbit/s, Channel 36



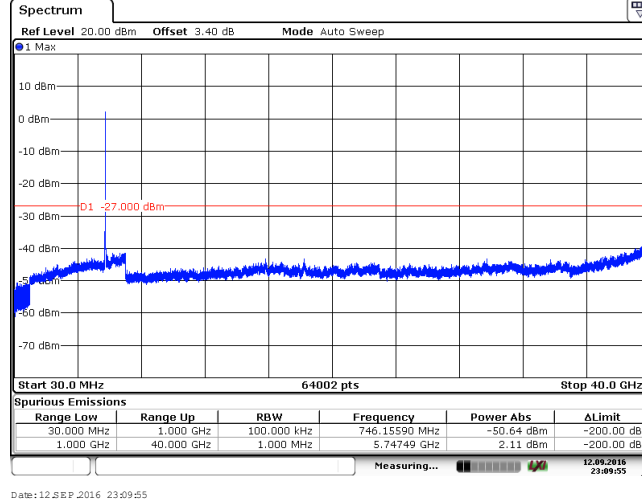
### Conducted Spurs – 802.11a, 6Mbit/s, Channel 44



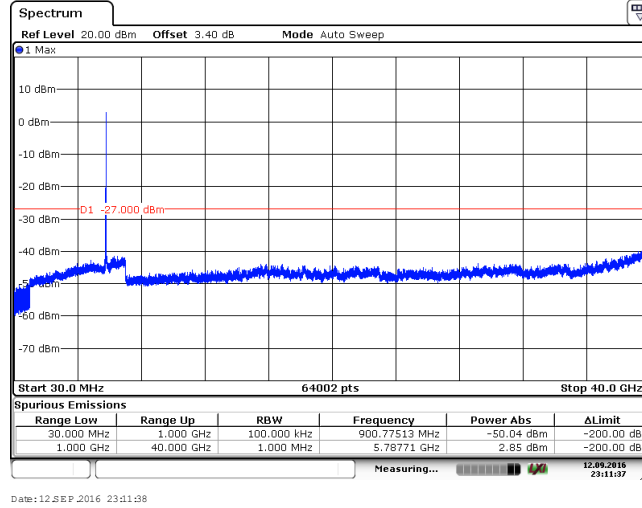
### Conducted Spurs – 802.11a, 6Mbit/s, Channel 48



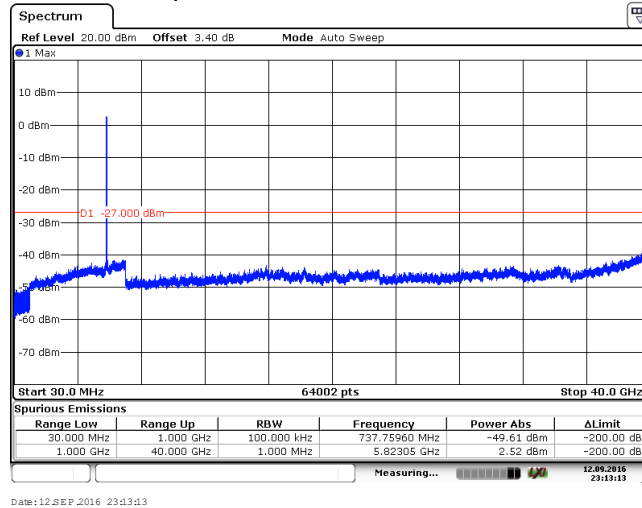
### Conducted Spurs – 802.11a, 6Mbit/s, Channel 149



### Conducted Spurs – 802.11a, 6Mbit/s, Channel 157



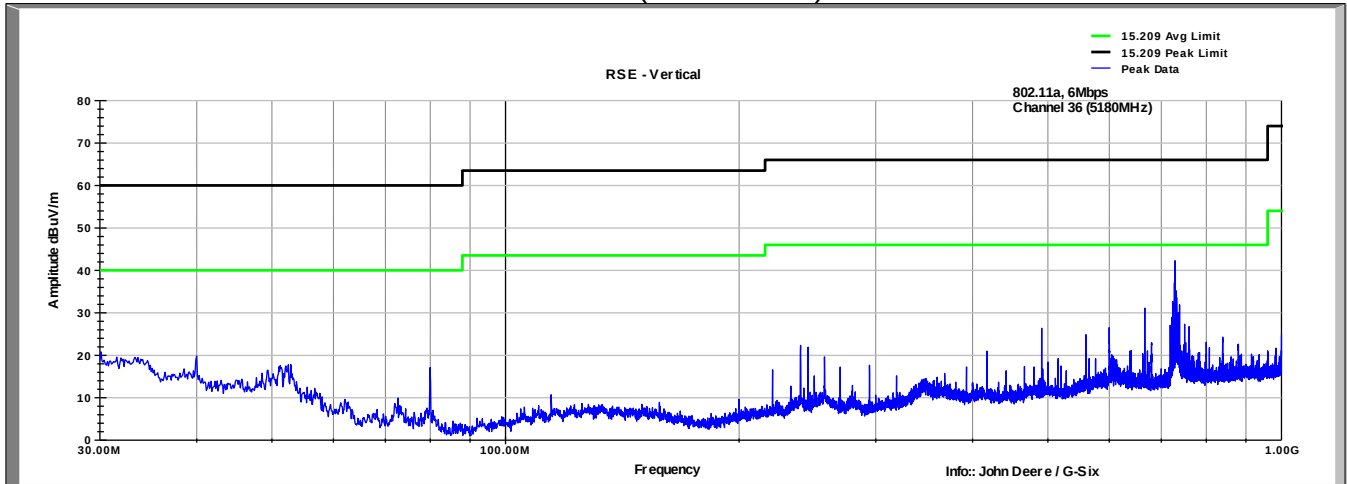
### Conducted Spurs – 802.11a, 6Mbit/s, Channel 165



## 6.8 Unwanted Emissions – Cabinet Radiation

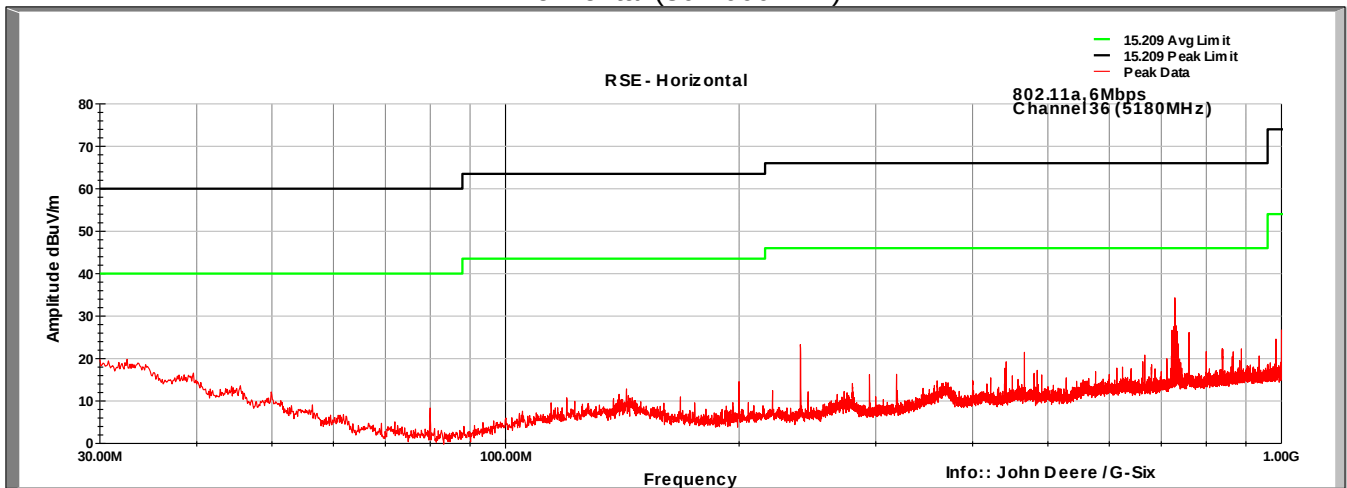
CH 36 802.11a, 6Mbps

Vertical (30-1000MHz)

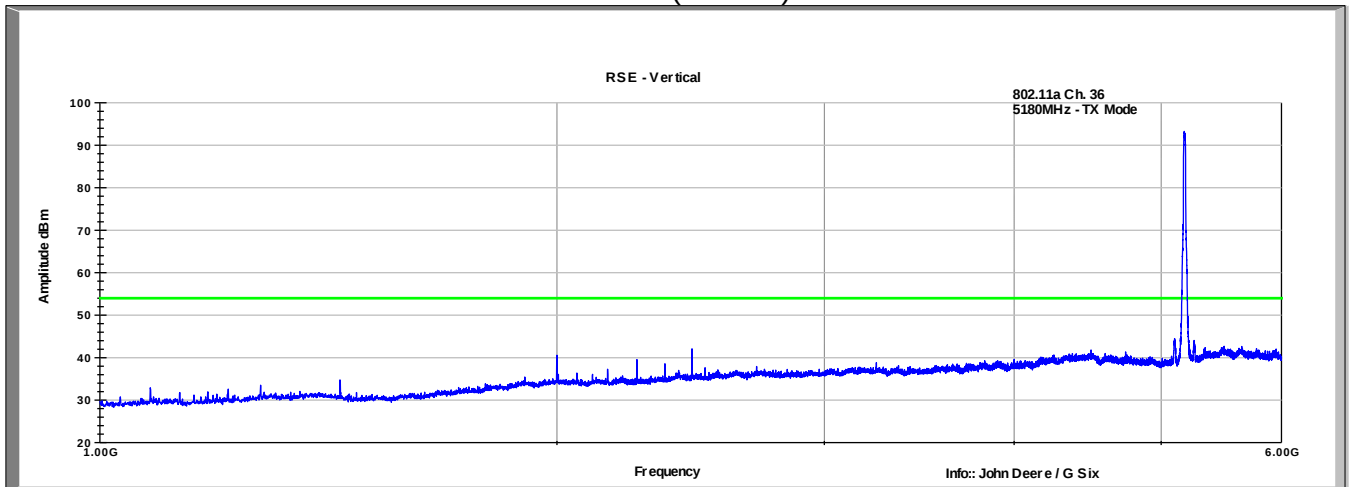


CH 36 802.11a, 6Mbps

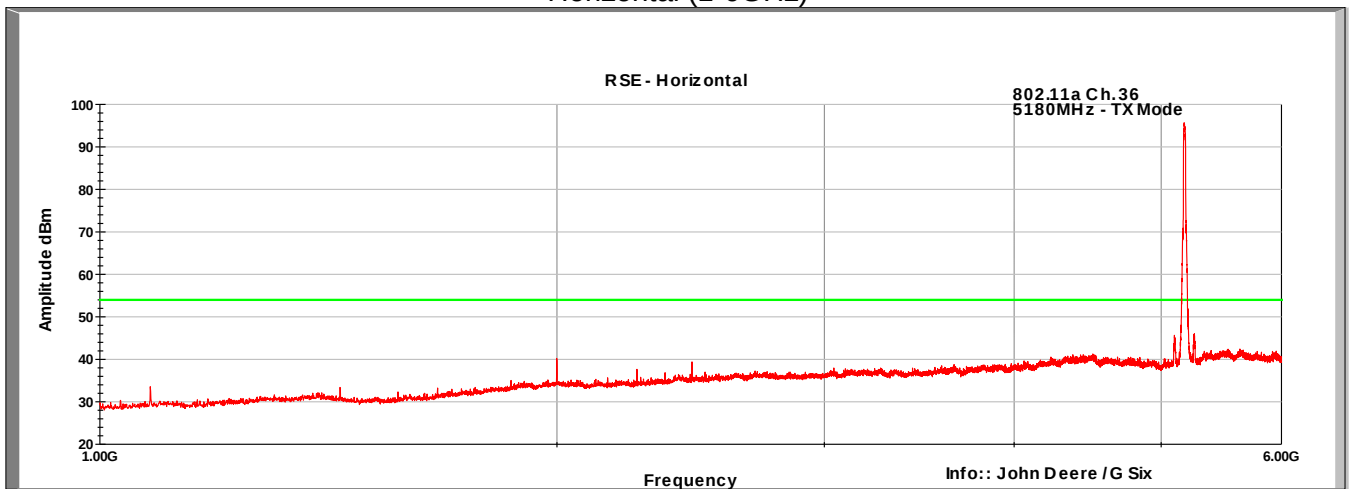
Horizontal (30-1000MHz)



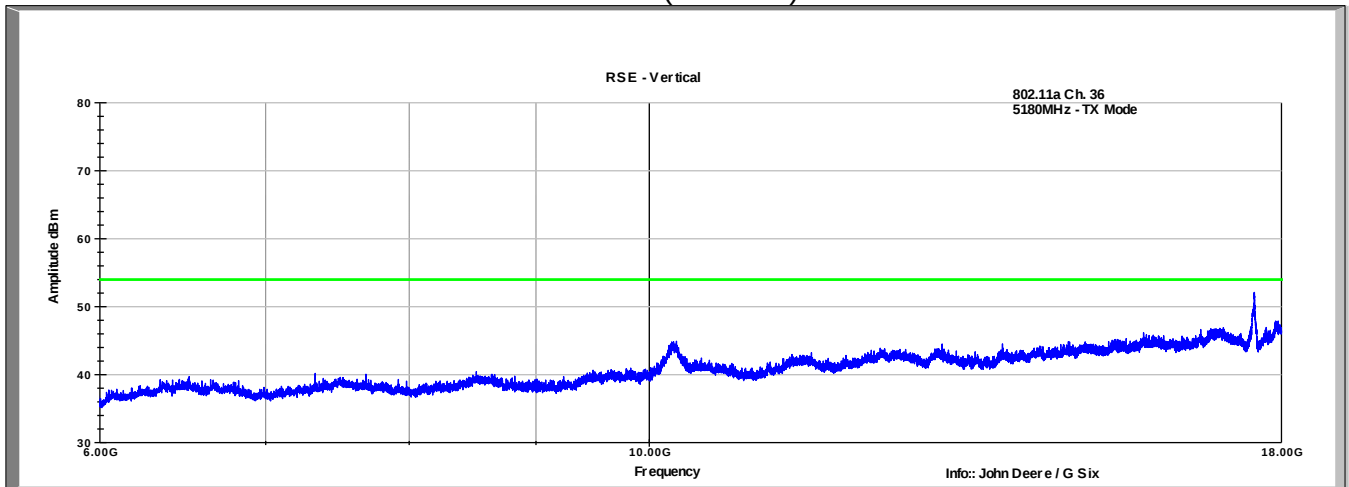
CH 36 802.11a, 6Mbps  
Vertical (1-6GHz)



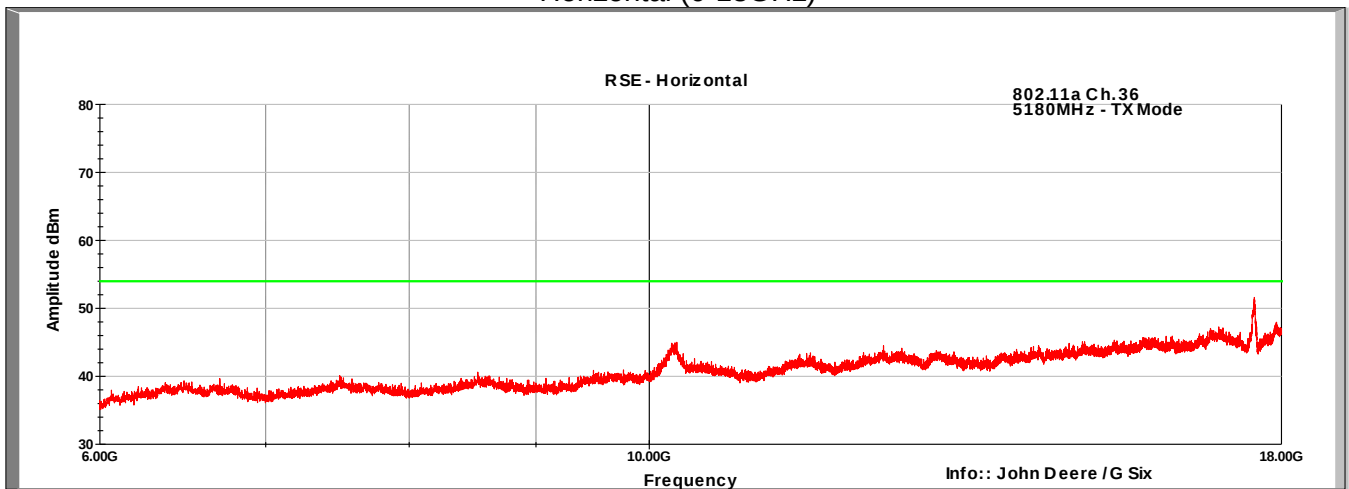
CH 36 802.11a, 6Mbps  
Horizontal (1-6GHz)



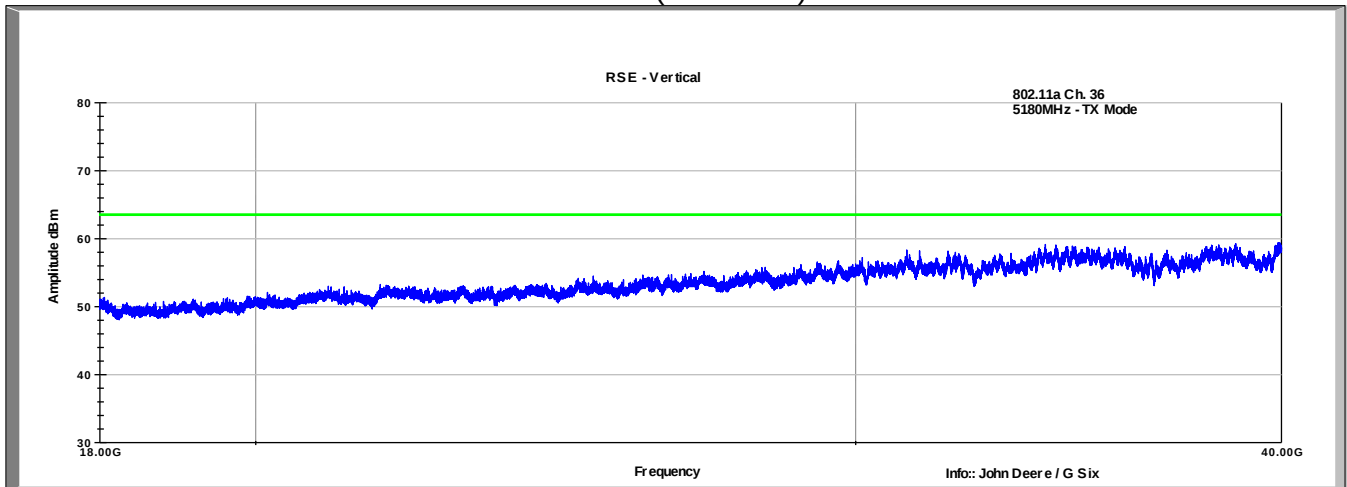
CH 36 802.11a, 6Mbps  
Vertical (6-18GHz)



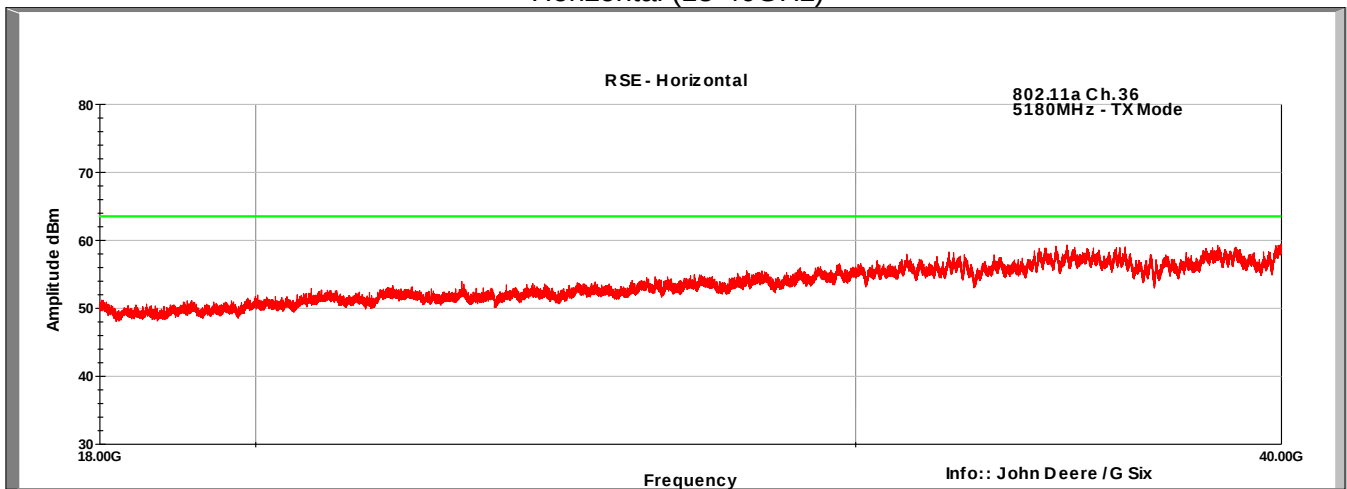
CH 36 802.11a, 6Mbps  
Horizontal (6-18GHz)



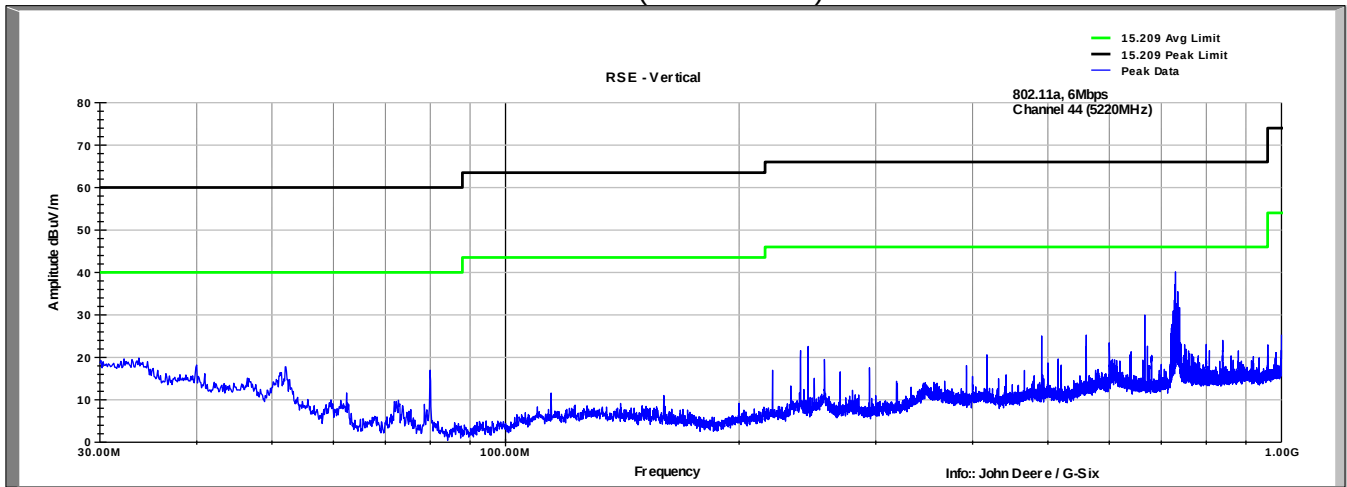
CH 36 802.11a, 6Mbps  
Vertical (18-40GHz)



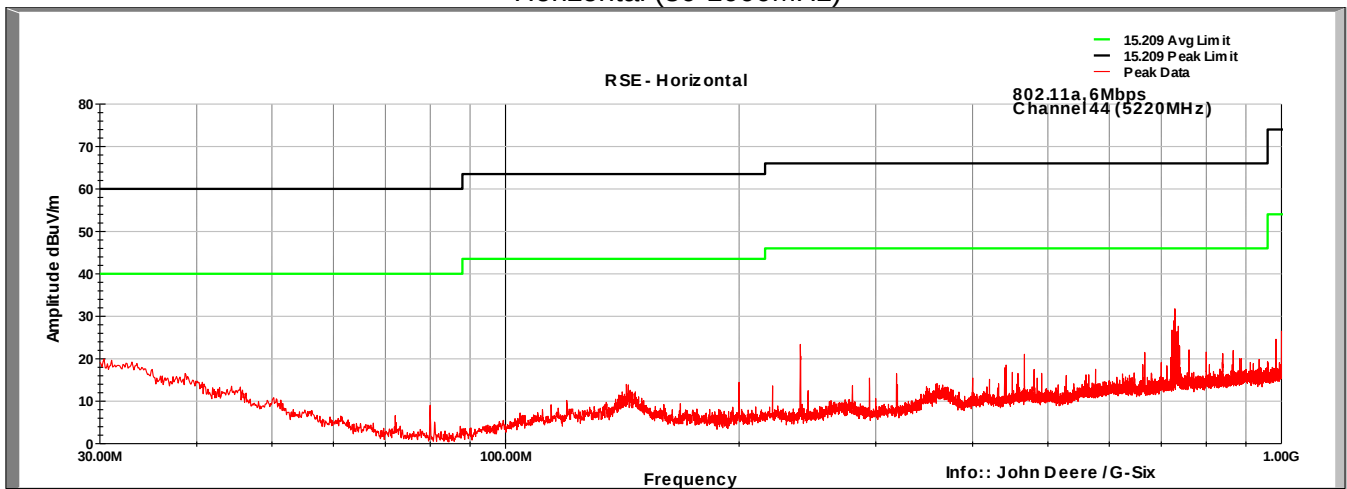
CH 36 802.11a, 6Mbps  
Horizontal (18-40GHz)



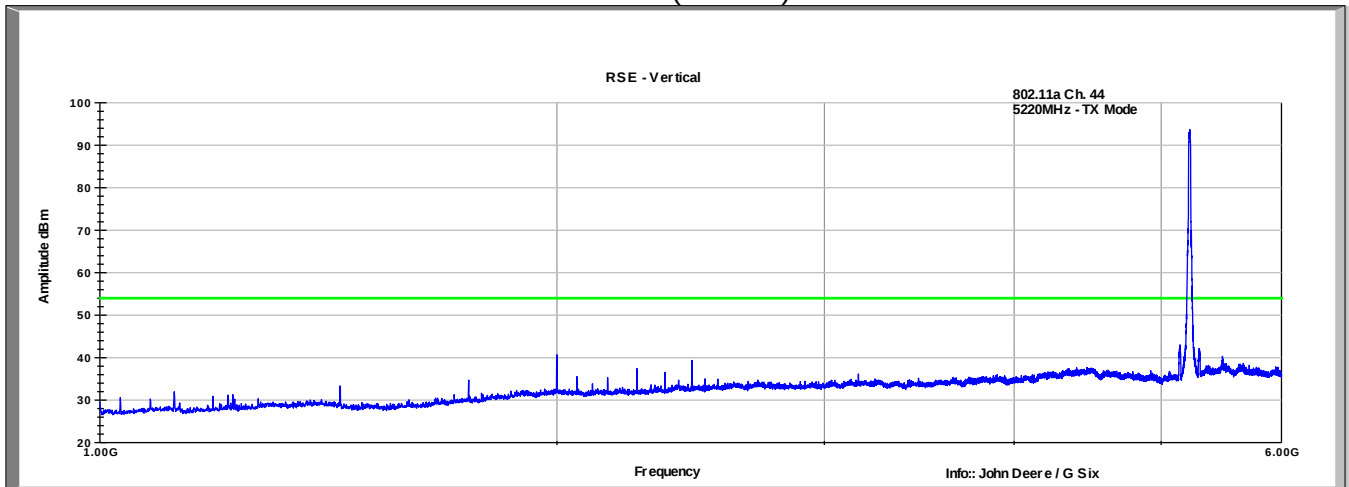
CH 44 802.11a, 6Mbps  
Vertical (30-1000MHz)



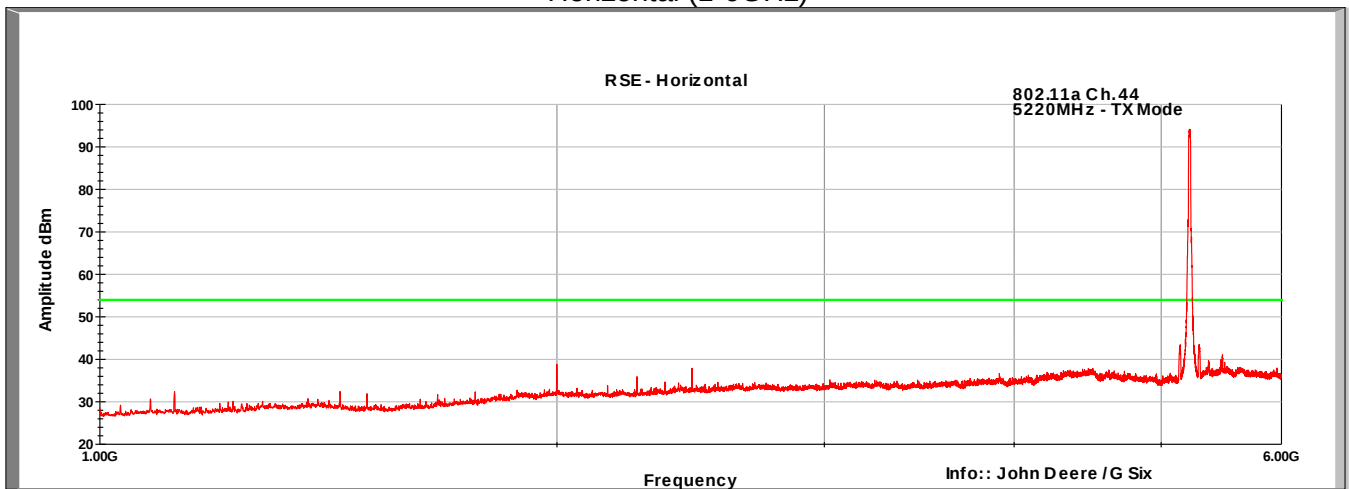
CH 44 802.11a, 6Mbps  
Horizontal (30-1000MHz)



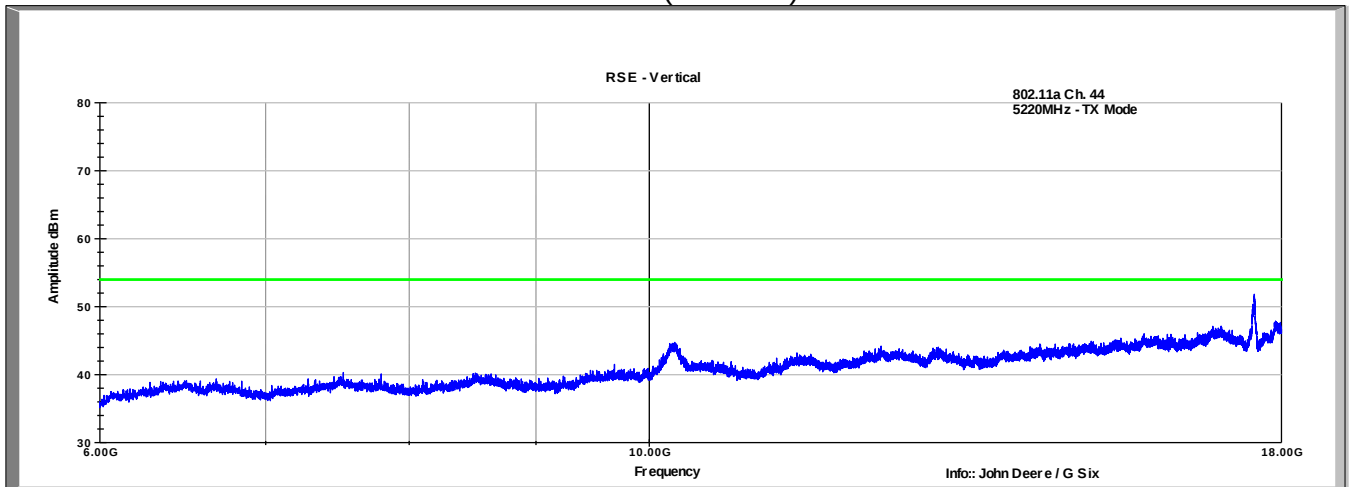
CH 44 802.11a, 6Mbps  
Vertical (1-6GHz)



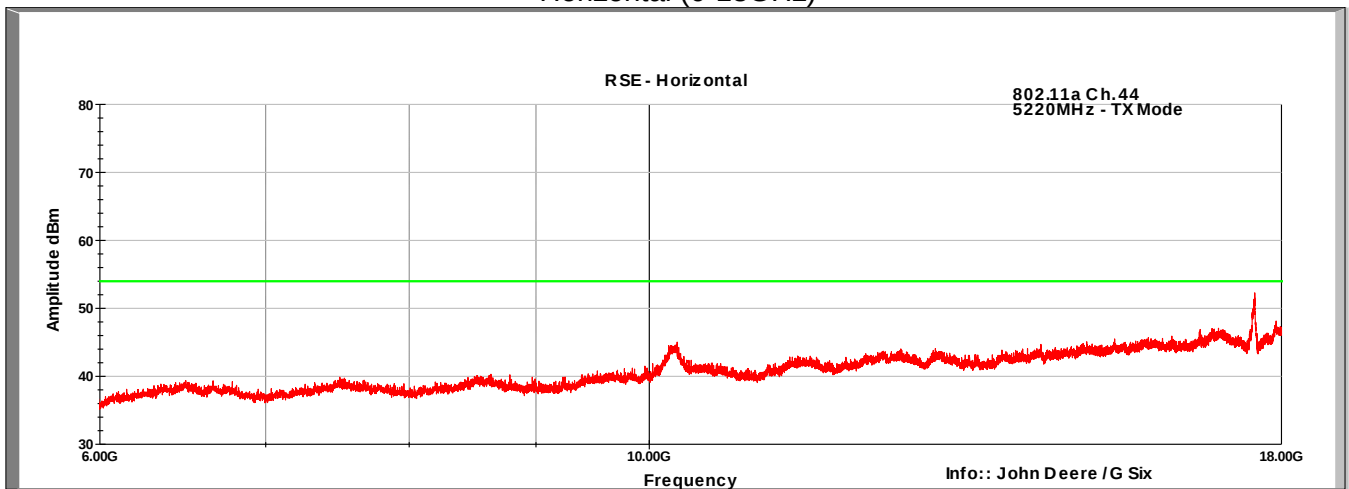
CH 44 802.11a, 6Mbps  
Horizontal (1-6GHz)



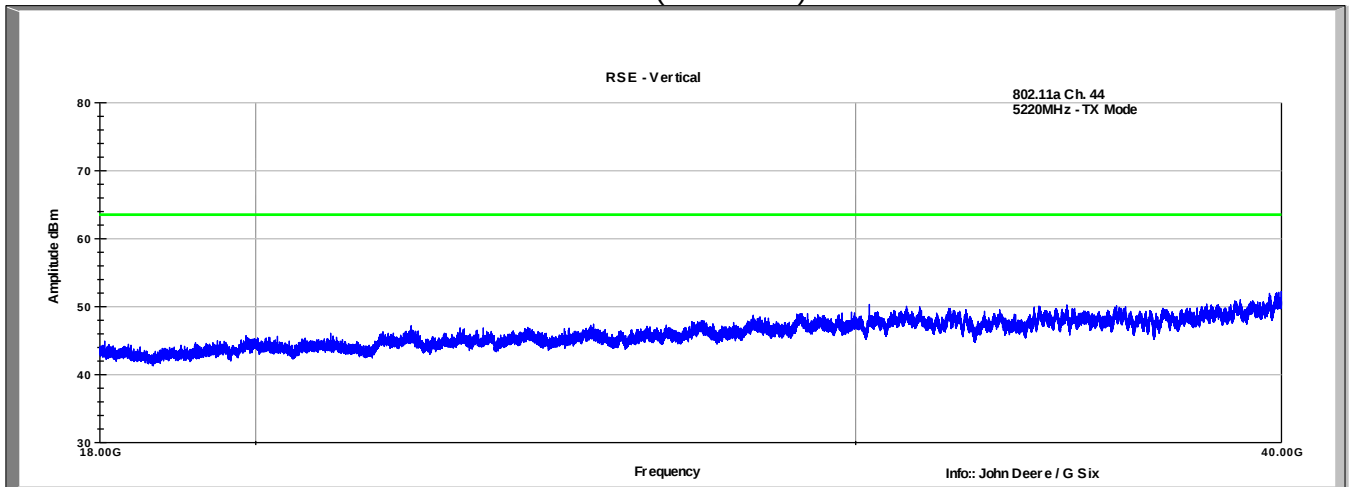
CH 44 802.11a, 6Mbps  
Vertical (6-18GHz)



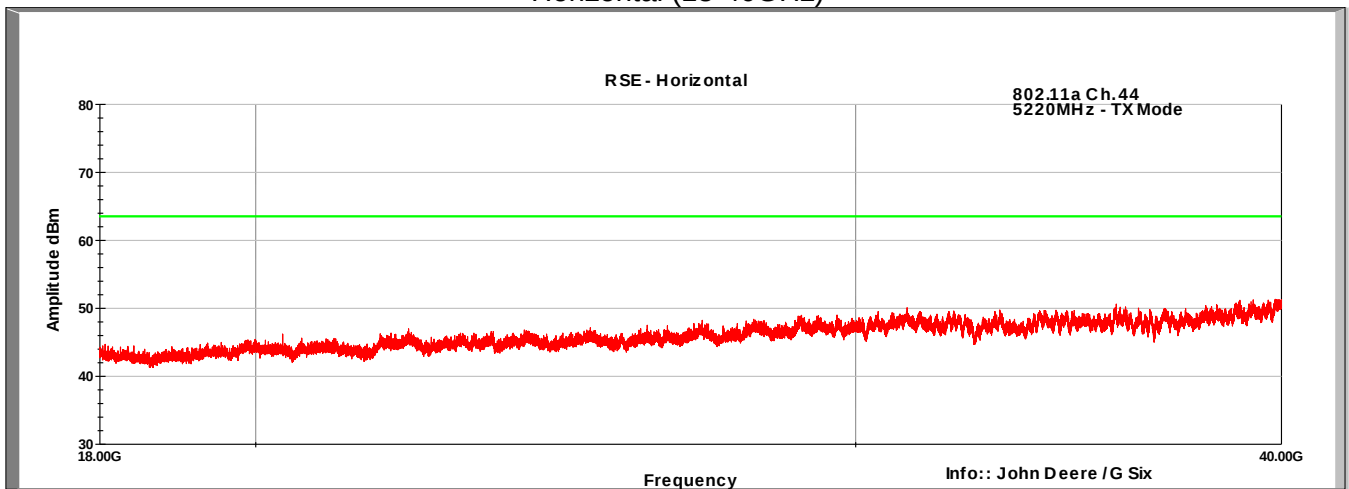
CH 44 802.11a, 6Mbps  
Horizontal (6-18GHz)



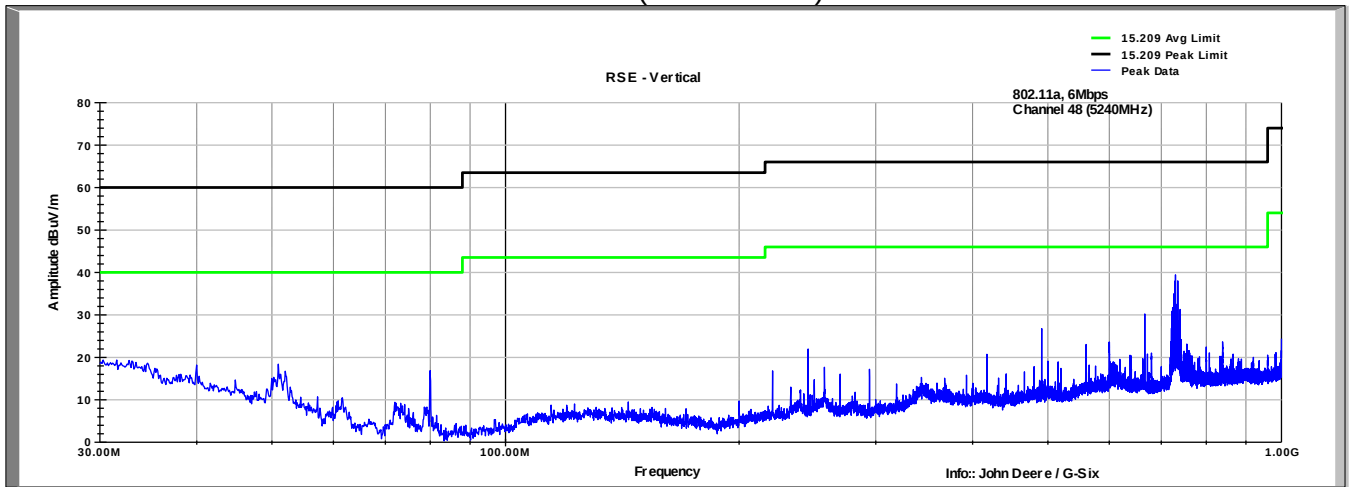
CH 44 802.11a, 6Mbps  
Vertical (18-40GHz)



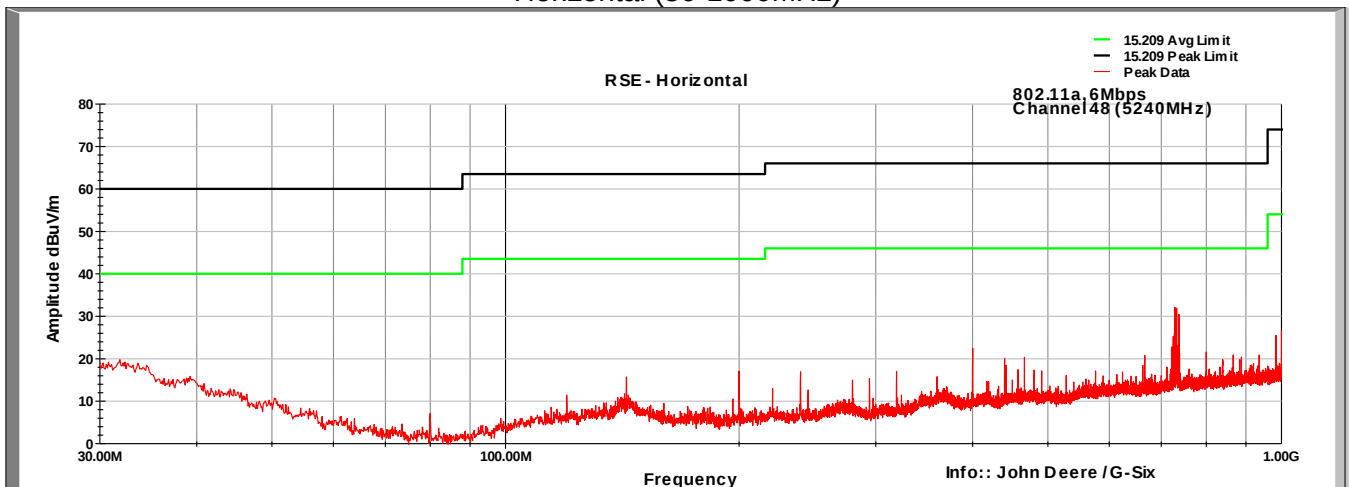
CH 44 802.11a, 6Mbps  
Horizontal (18-40GHz)



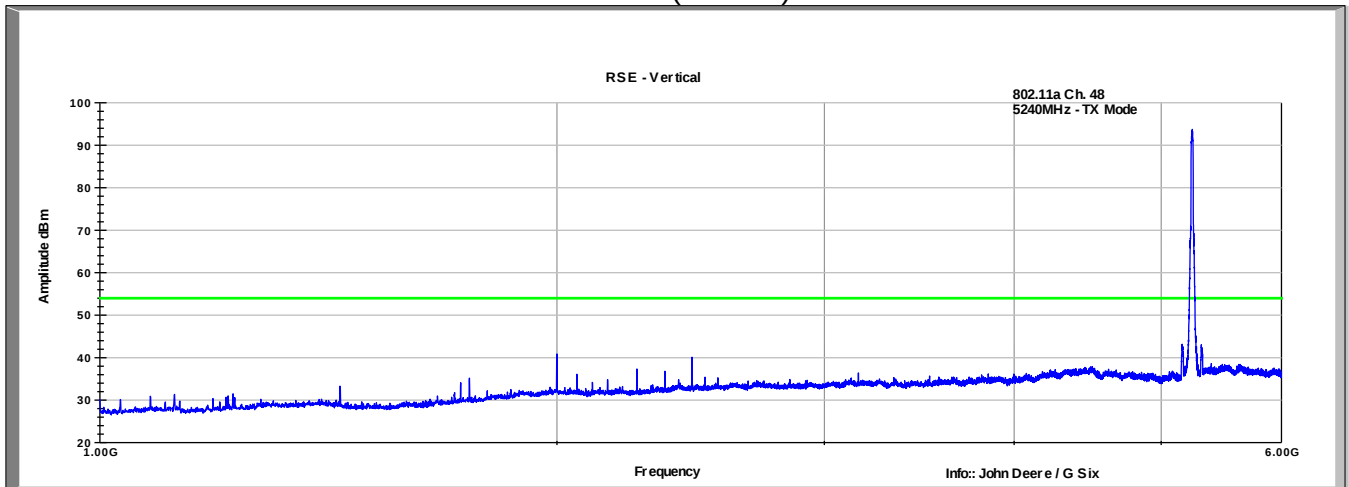
CH 48 802.11a, 6Mbps  
Vertical (30-1000MHz)



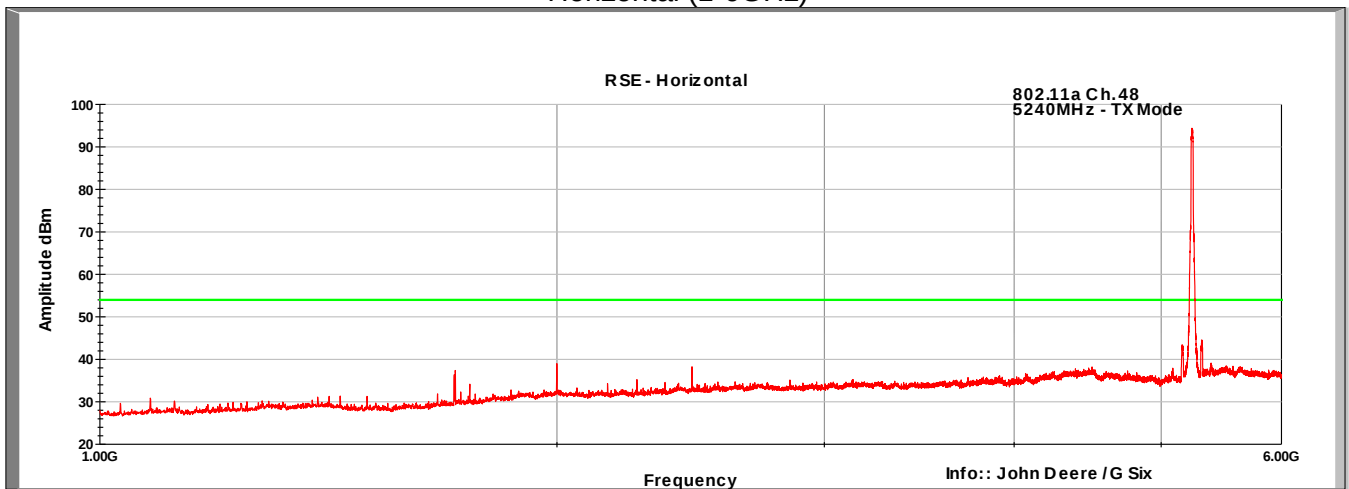
CH 48 802.11a, 6Mbps  
Horizontal (30-1000MHz)



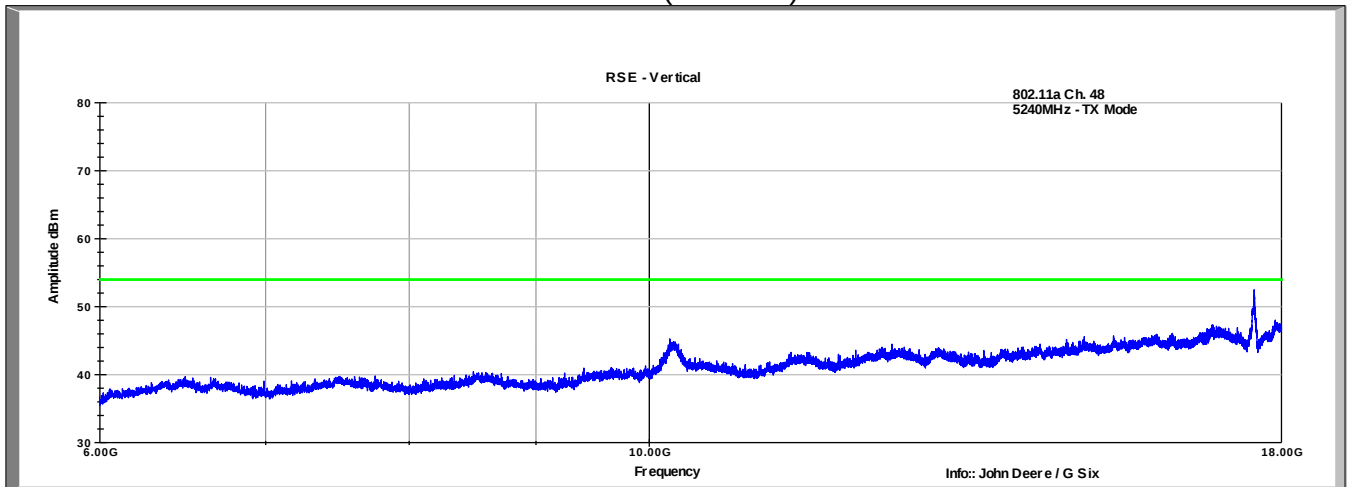
CH 48 802.11a, 6Mbps  
Vertical (1-6GHz)



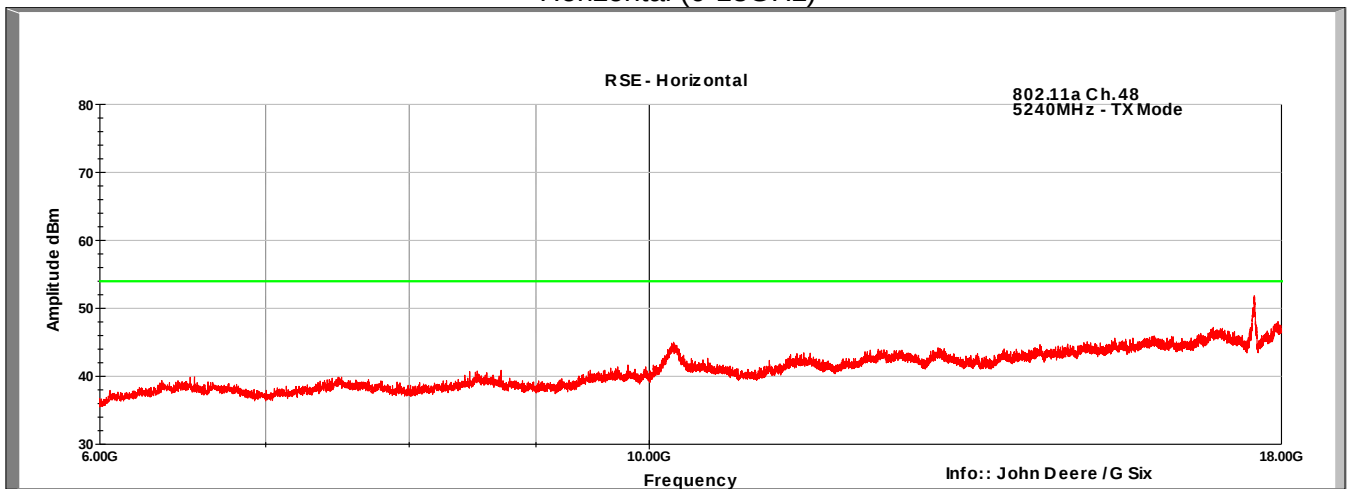
CH 48 802.11a, 6Mbps  
Horizontal (1-6GHz)



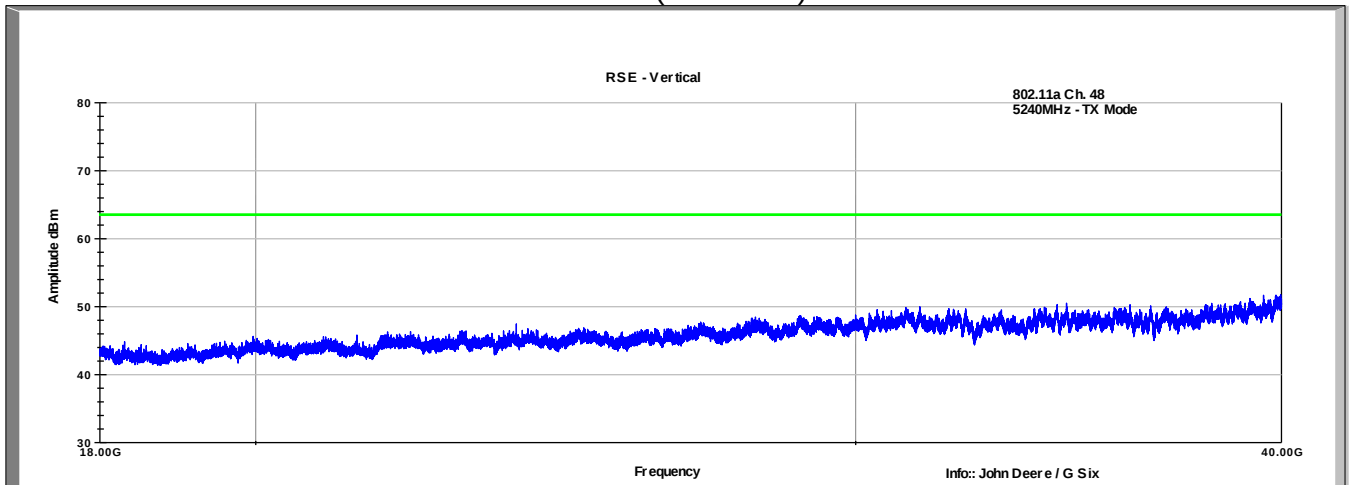
CH 48 802.11a, 6Mbps  
Vertical (6-18GHz)



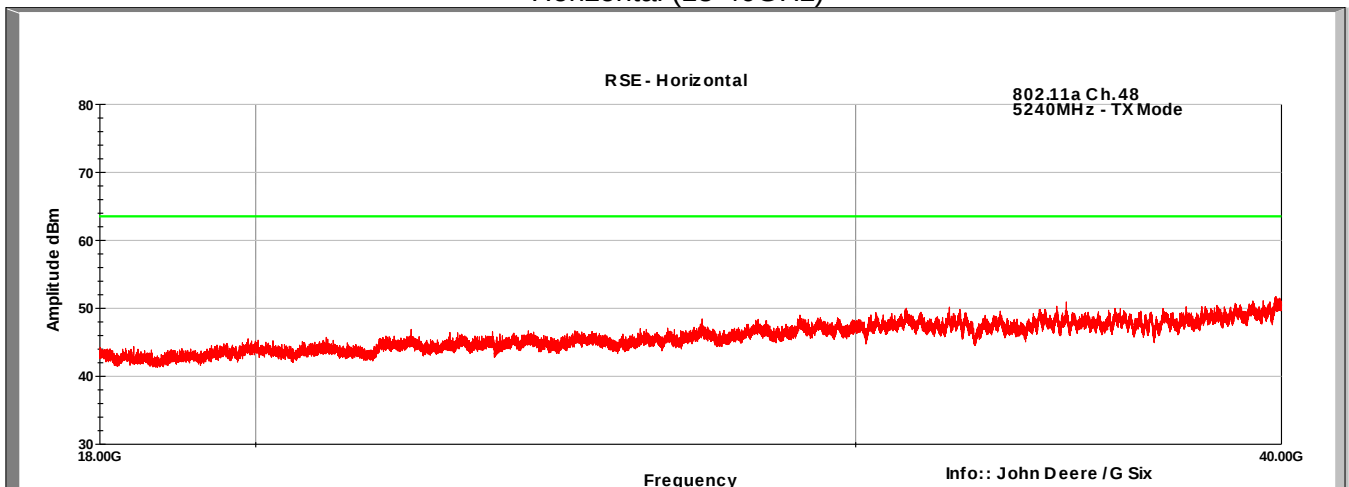
CH 48 802.11a, 6Mbps  
Horizontal (6-18GHz)



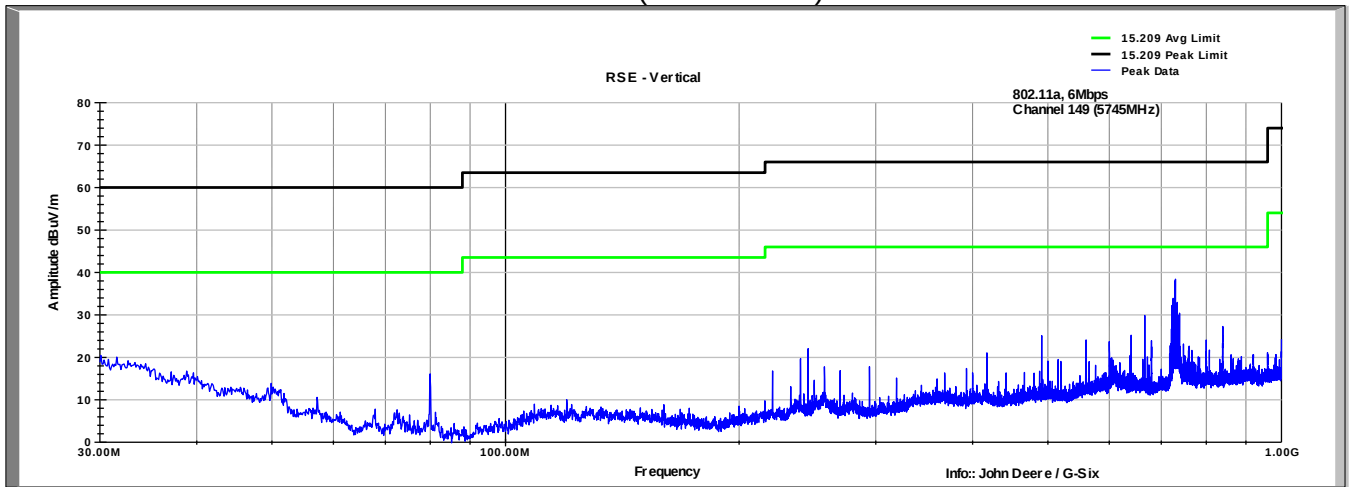
CH 48 802.11a, 6Mbps  
Vertical (18-40GHz)



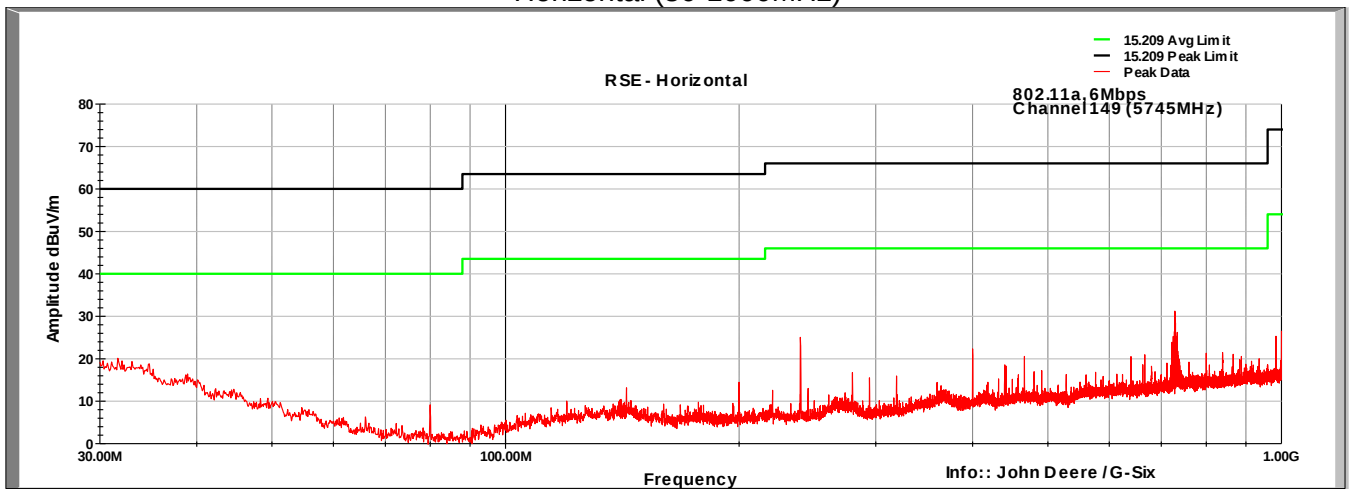
CH 48 802.11a, 6Mbps  
Horizontal (18-40GHz)



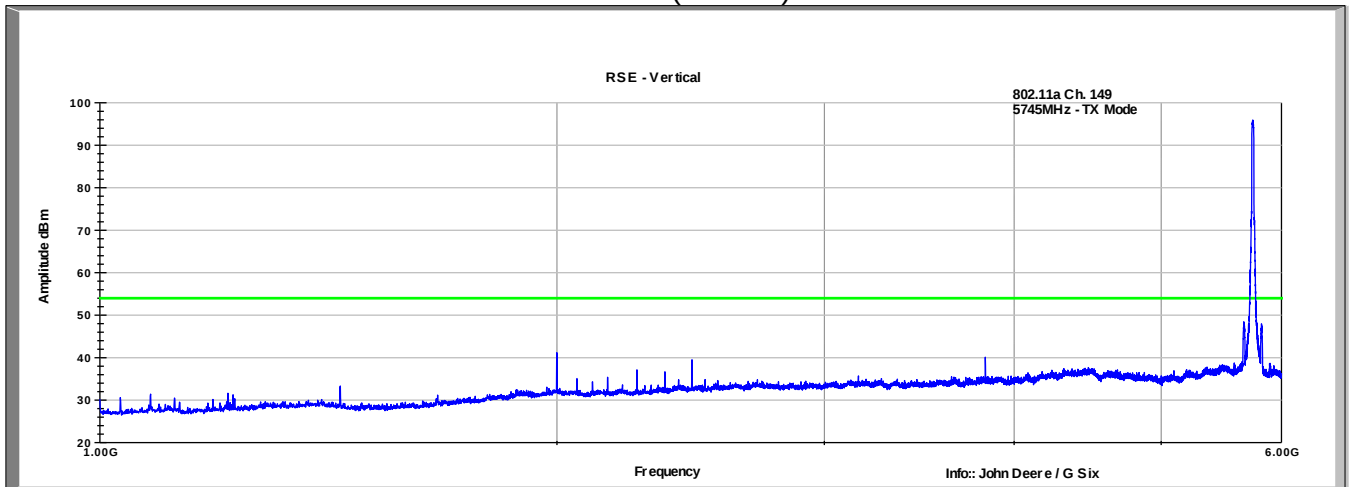
CH 149 802.11a, 6Mbps  
Vertical (30-1000MHz)



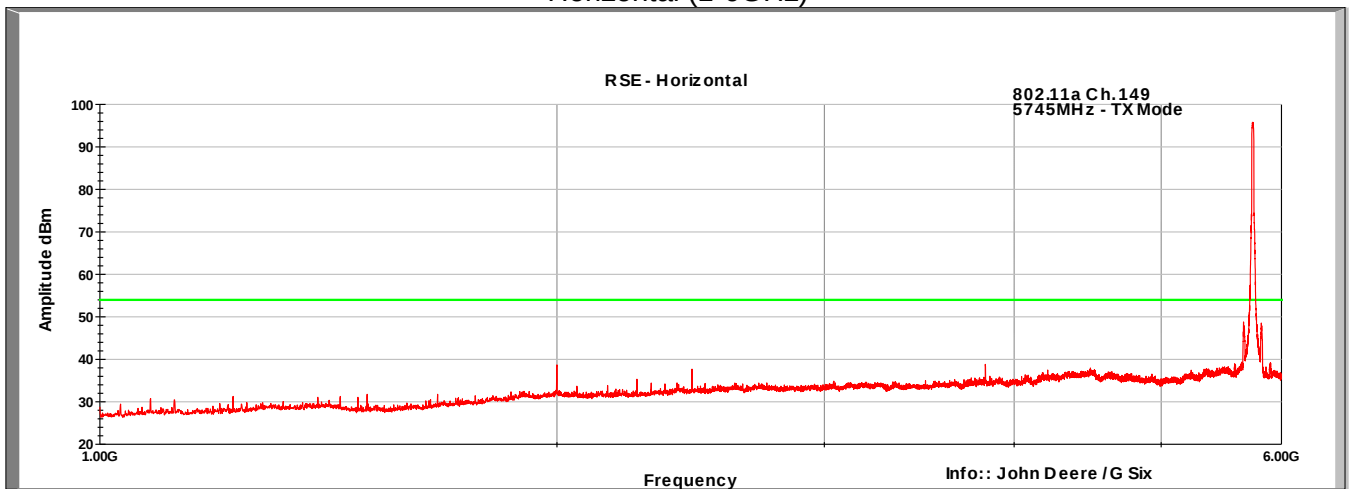
CH 149 802.11a, 6Mbps  
Horizontal (30-1000MHz)



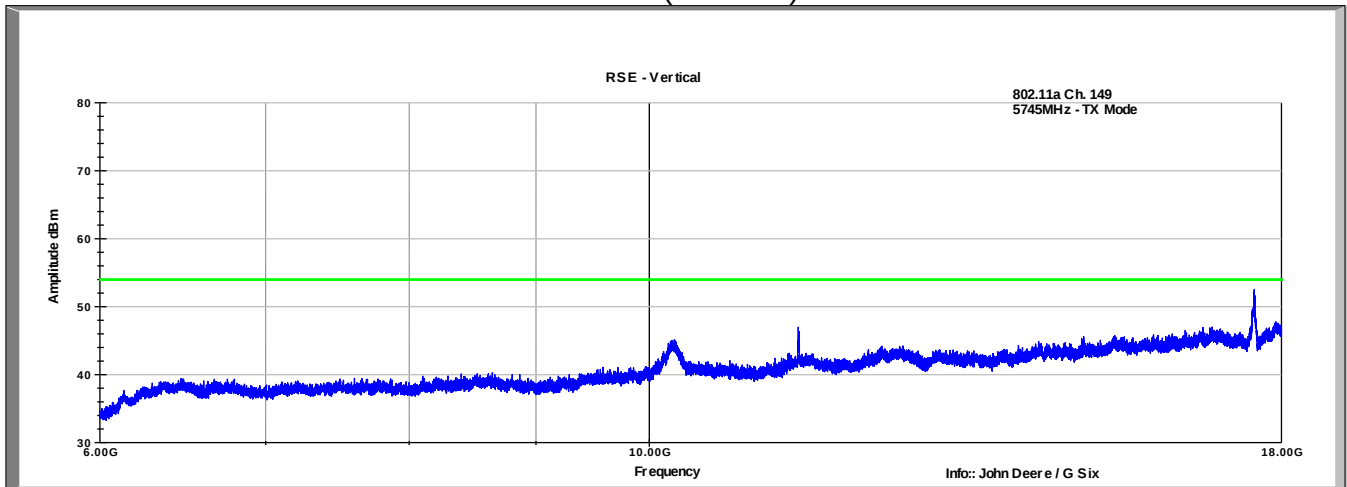
CH 149 802.11a, 6Mbps  
Vertical (1-6GHz)



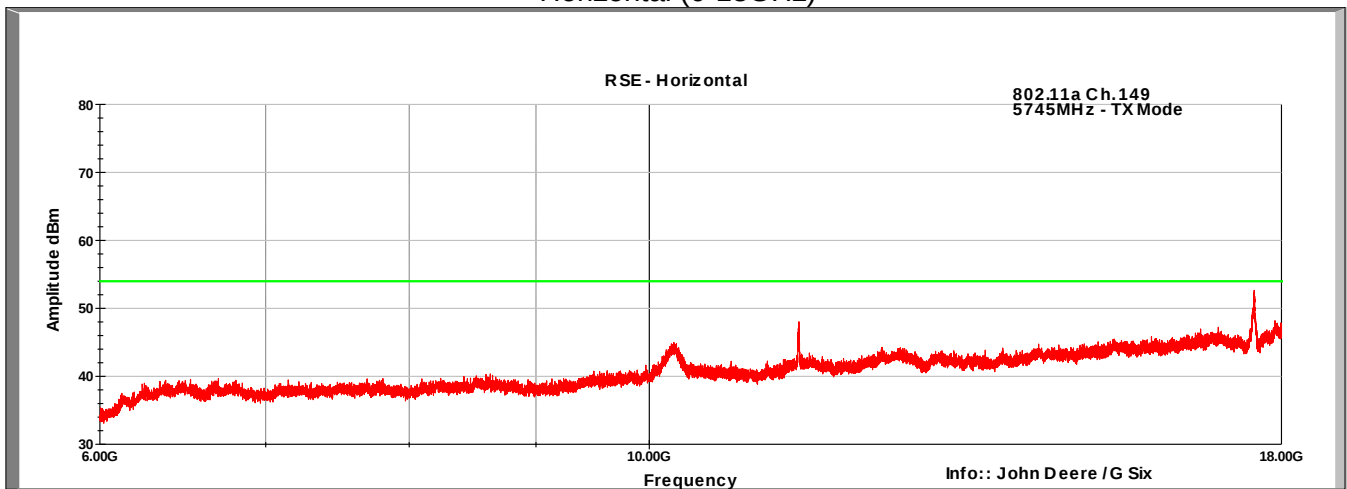
CH 149 802.11a, 6Mbps  
Horizontal (1-6GHz)



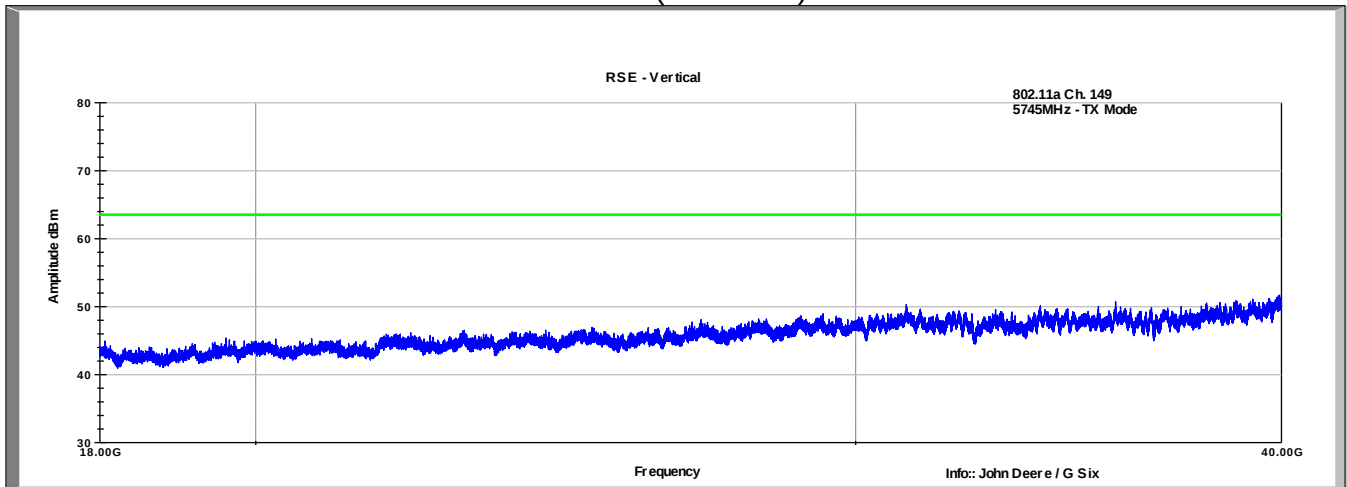
CH 149 802.11a, 6Mbps  
Vertical (6-18GHz)



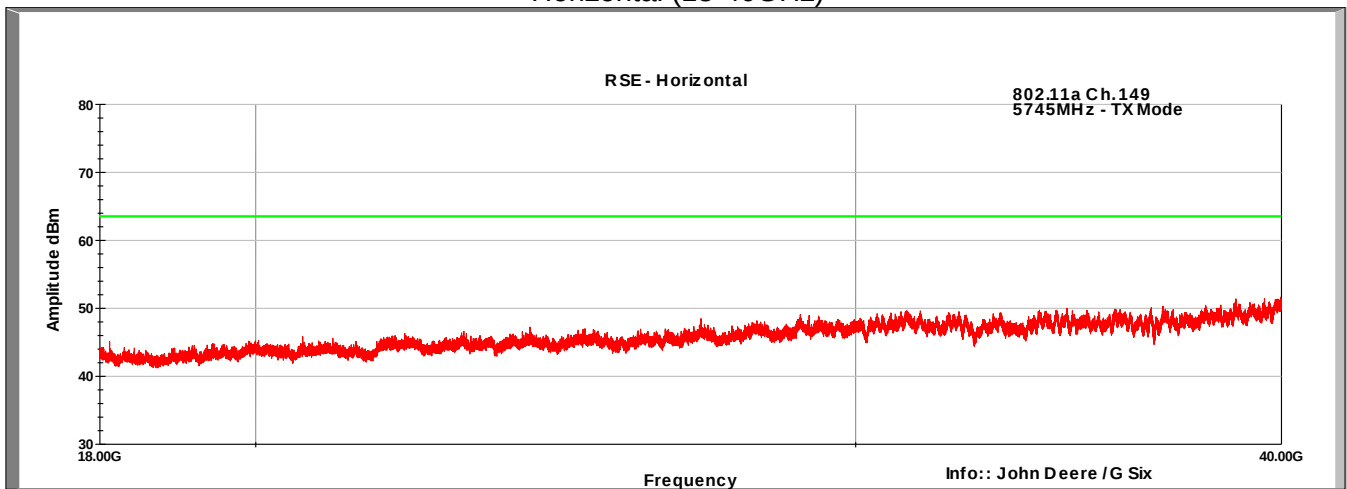
CH 149 802.11a, 6Mbps  
Horizontal (6-18GHz)



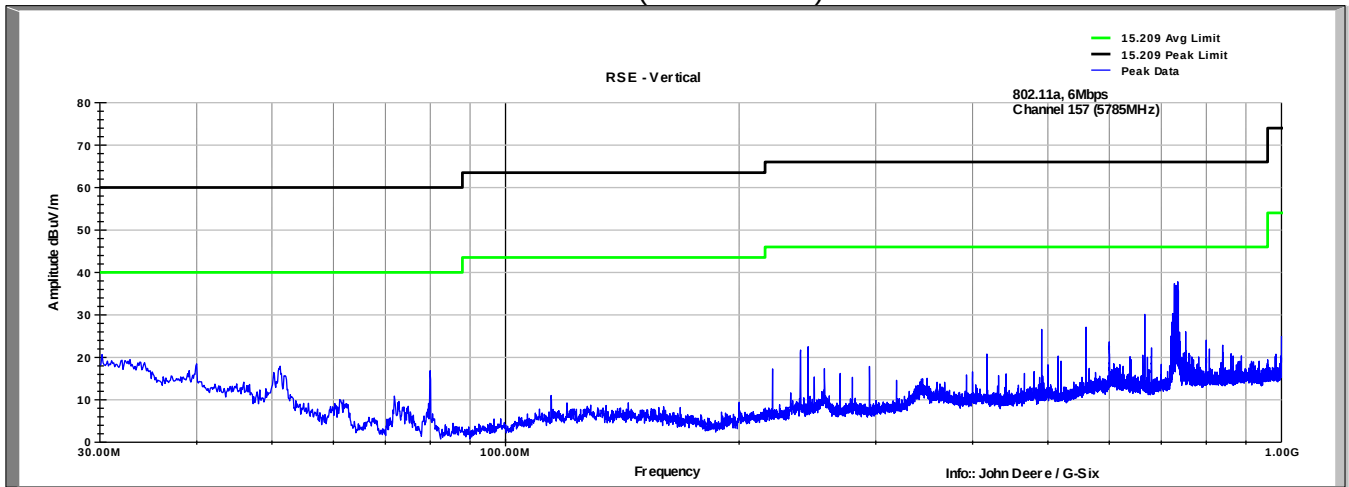
CH 149 802.11a, 6Mbps  
Vertical (18-40GHz)



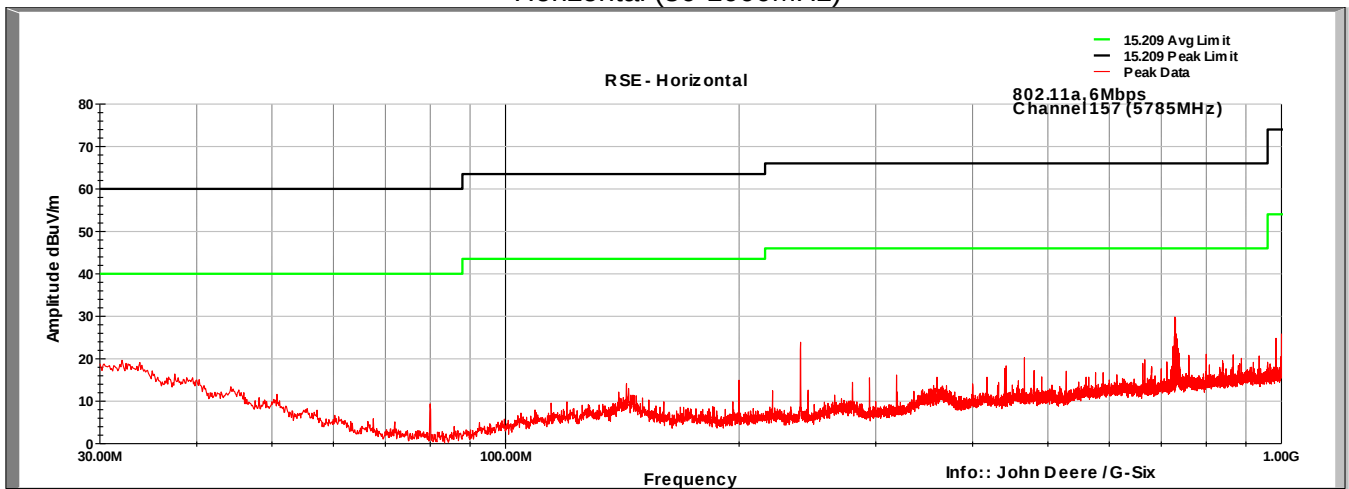
CH 149 802.11a, 6Mbps  
Horizontal (18-40GHz)



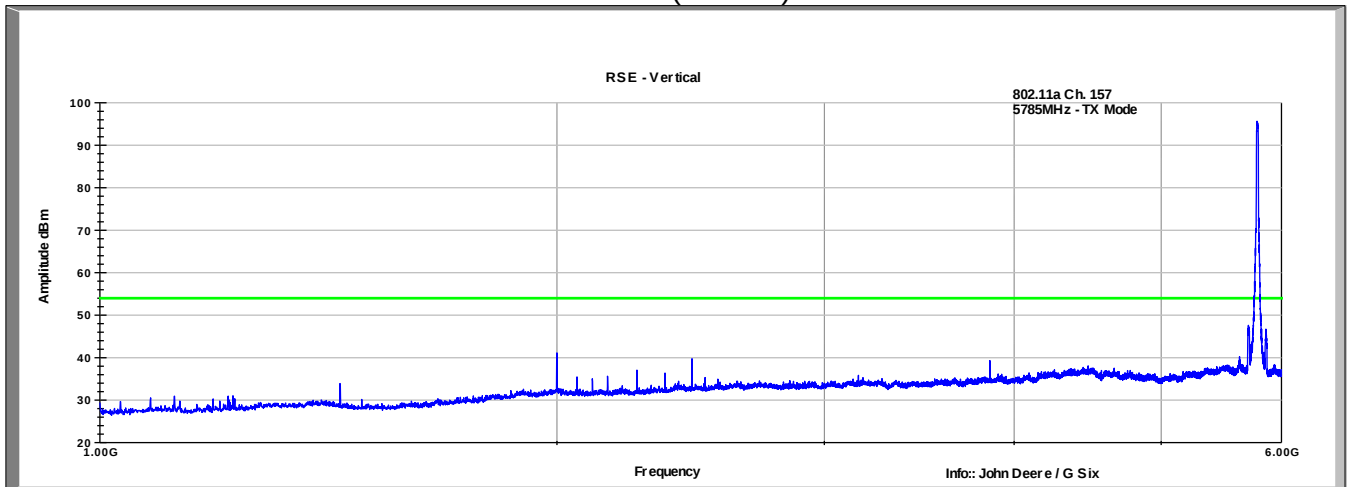
CH 157 802.11a, 6Mbps  
Vertical (30-1000MHz)



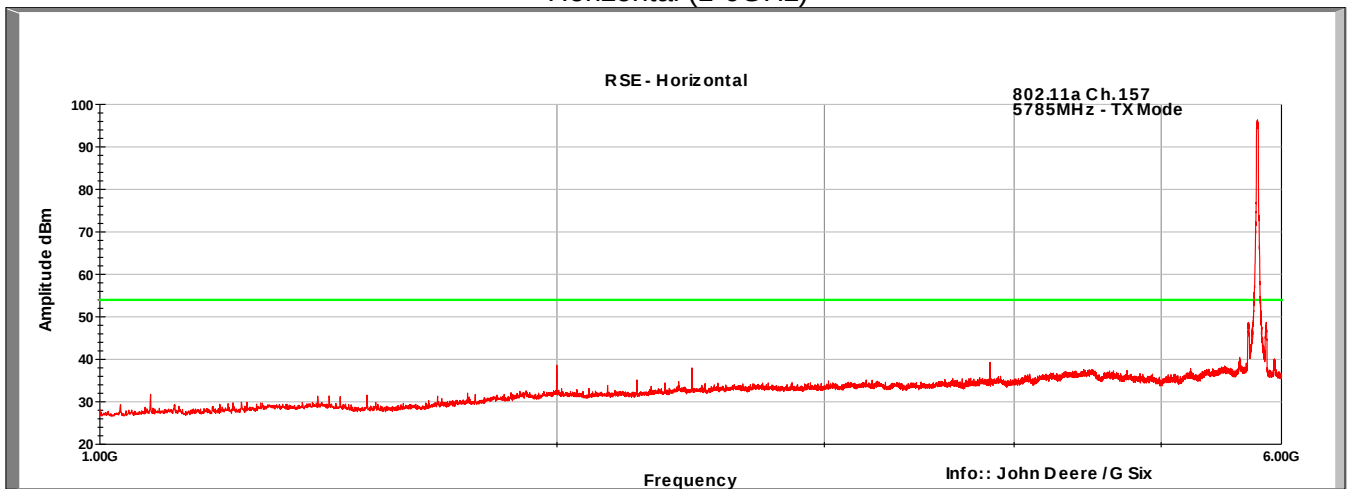
CH 157 802.11a, 6Mbps  
Horizontal (30-1000MHz)



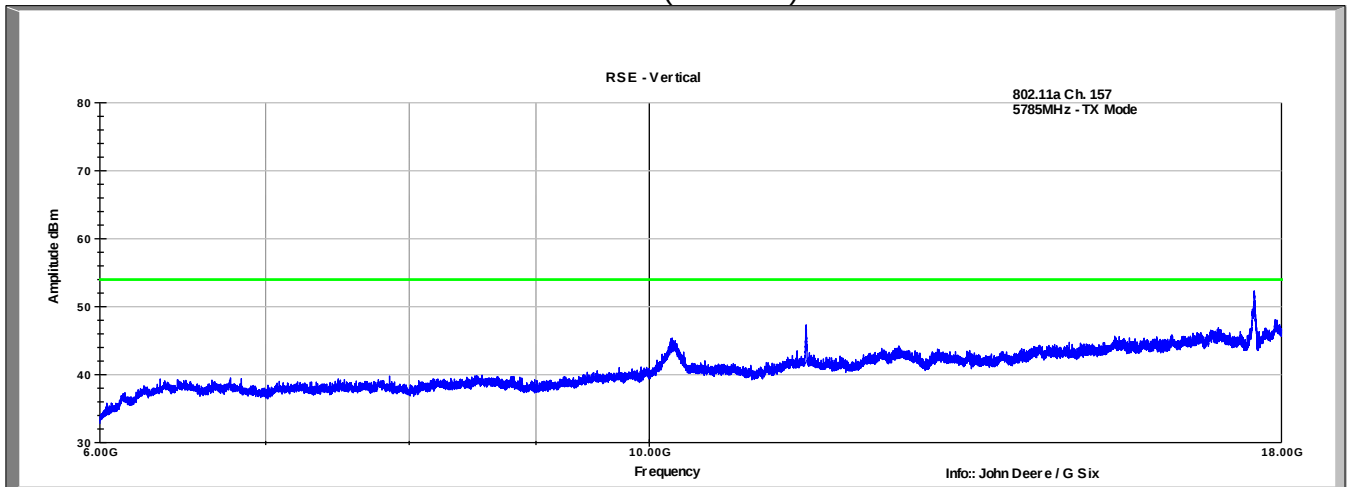
CH 157 802.11a, 6Mbps  
Vertical (1-6GHz)



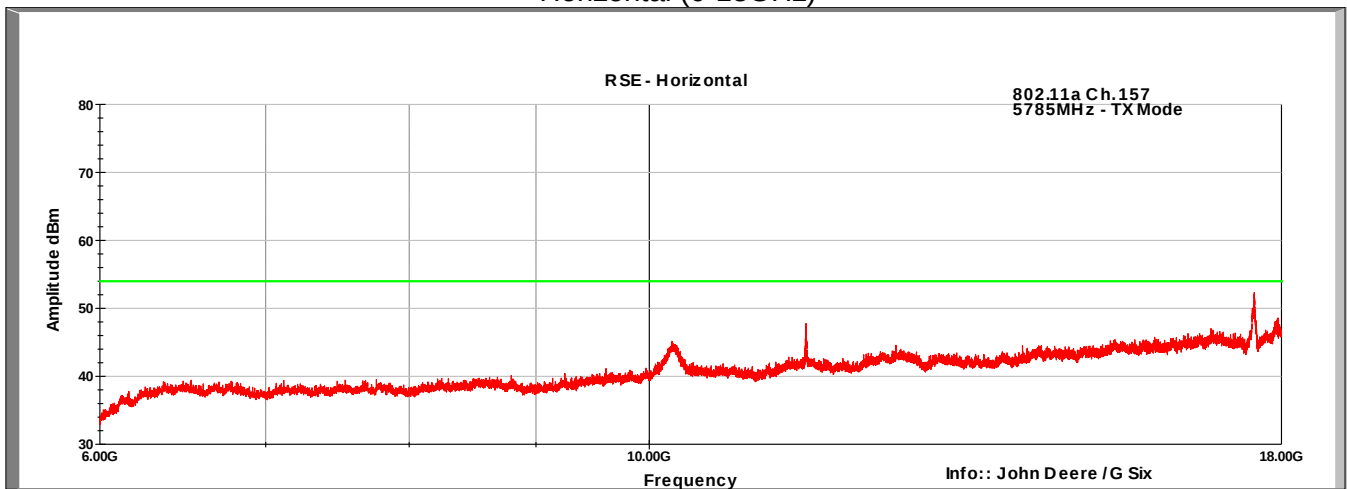
CH 157 802.11a, 6Mbps  
Horizontal (1-6GHz)



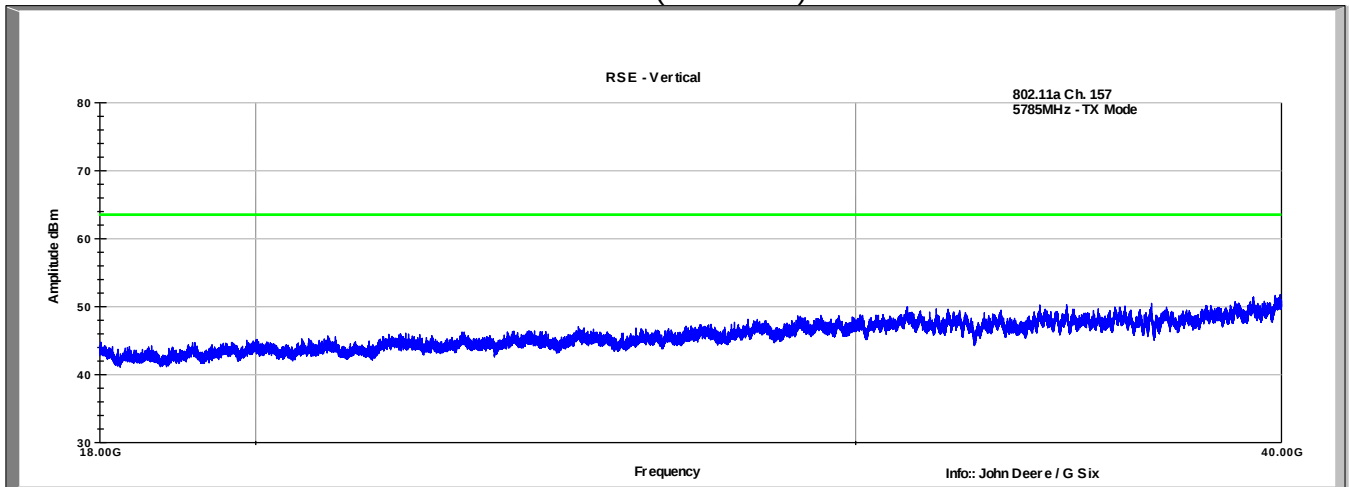
CH 157 802.11a, 6Mbps  
Vertical (6-18GHz)



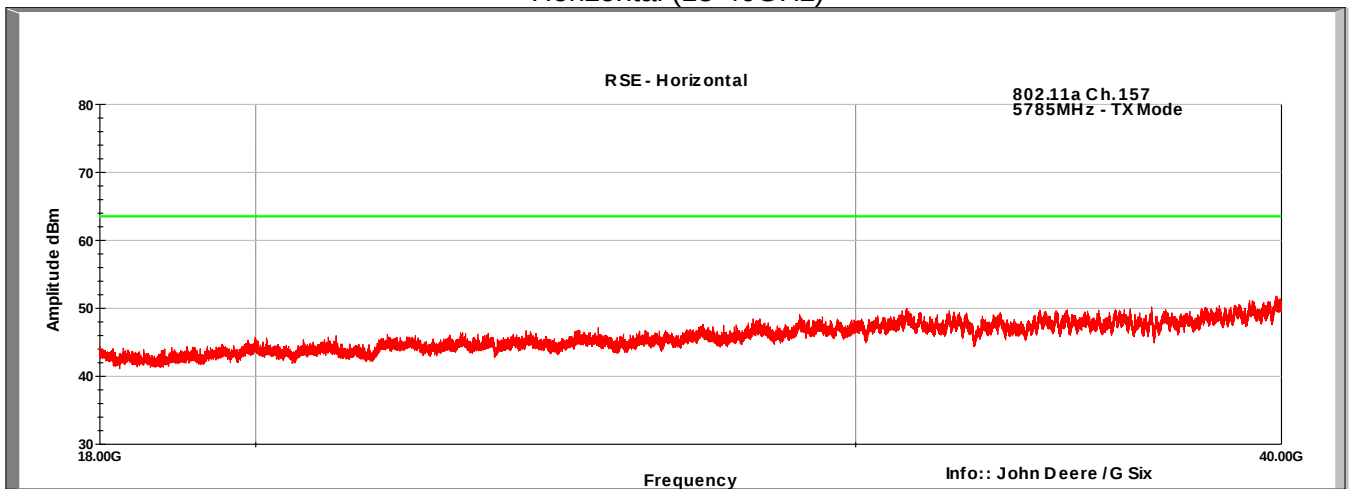
CH 157 802.11a, 6Mbps  
Horizontal (6-18GHz)



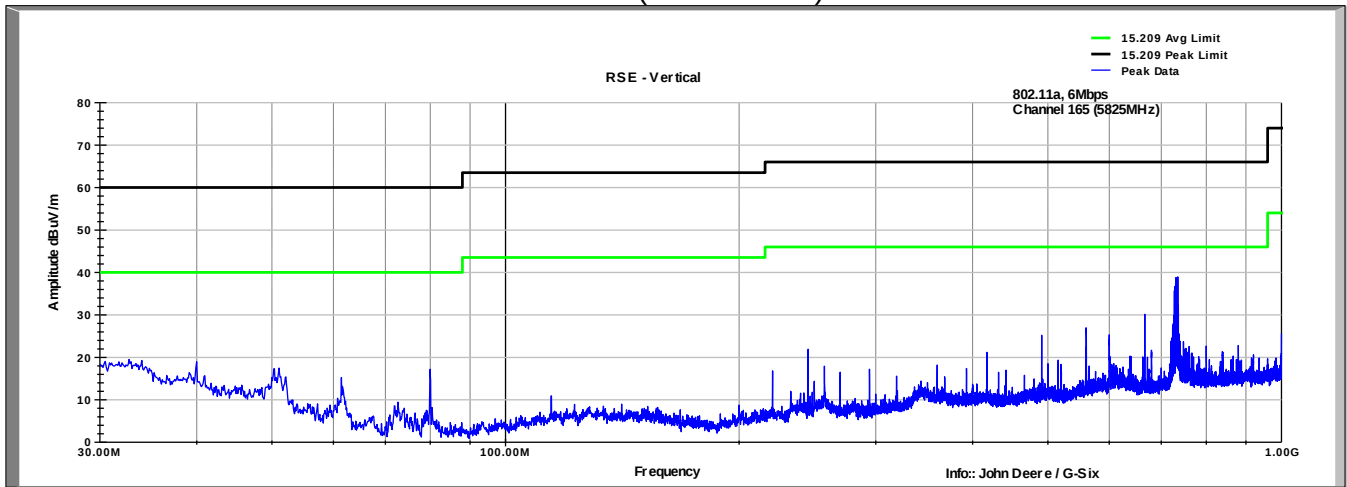
CH 157 802.11a, 6Mbps  
Vertical (18-40GHz)



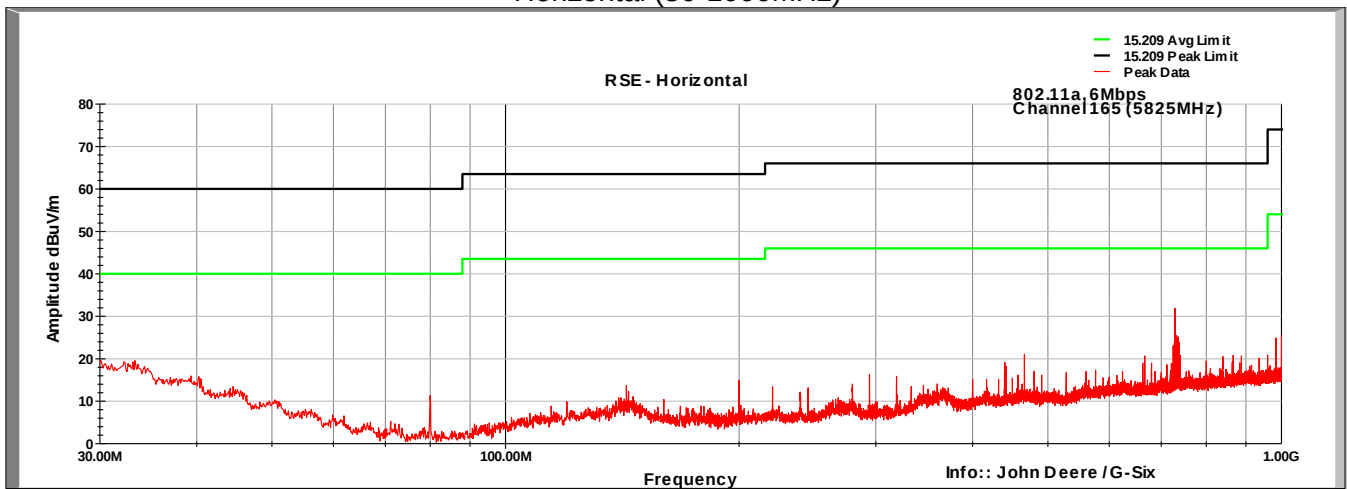
CH 157 802.11a, 6Mbps  
Horizontal (18-40GHz)



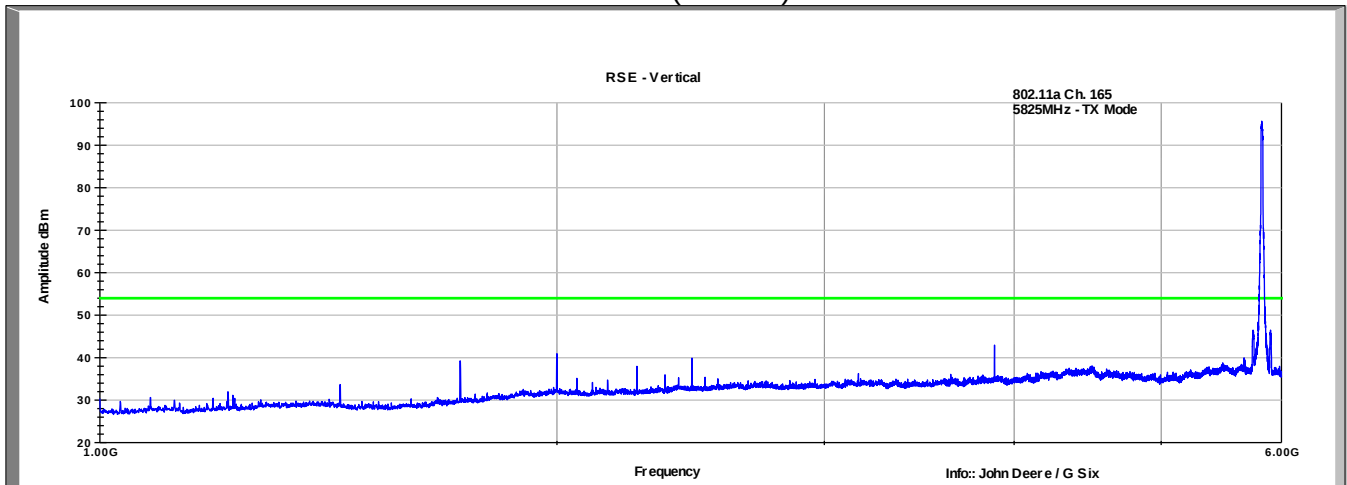
CH 165 802.11a, 6Mbps  
Vertical (30-1000MHz)



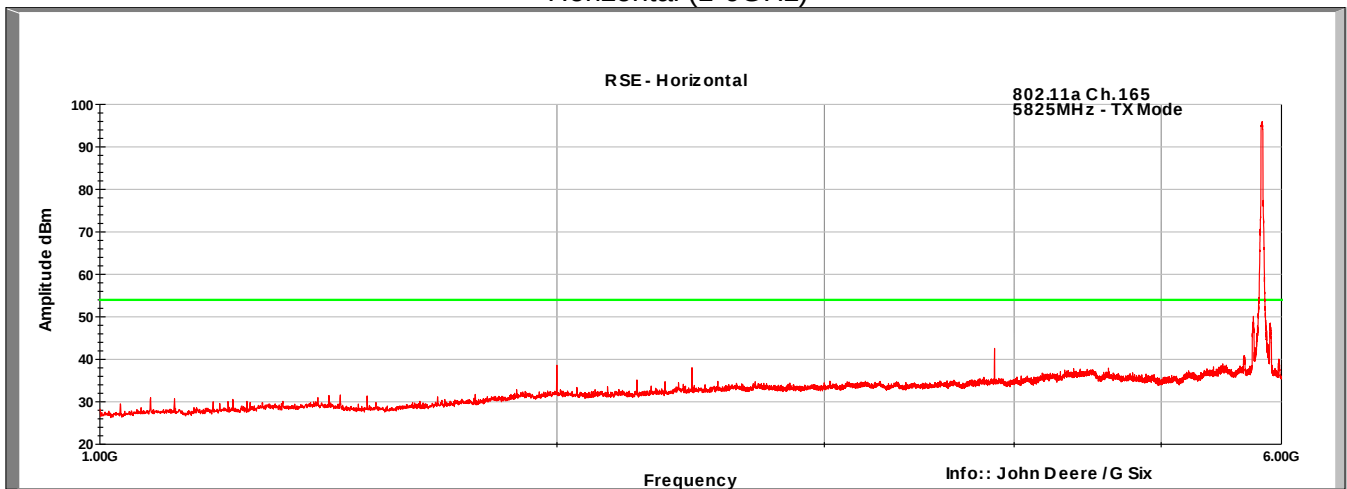
CH 165 802.11a, 6Mbps  
Horizontal (30-1000MHz)



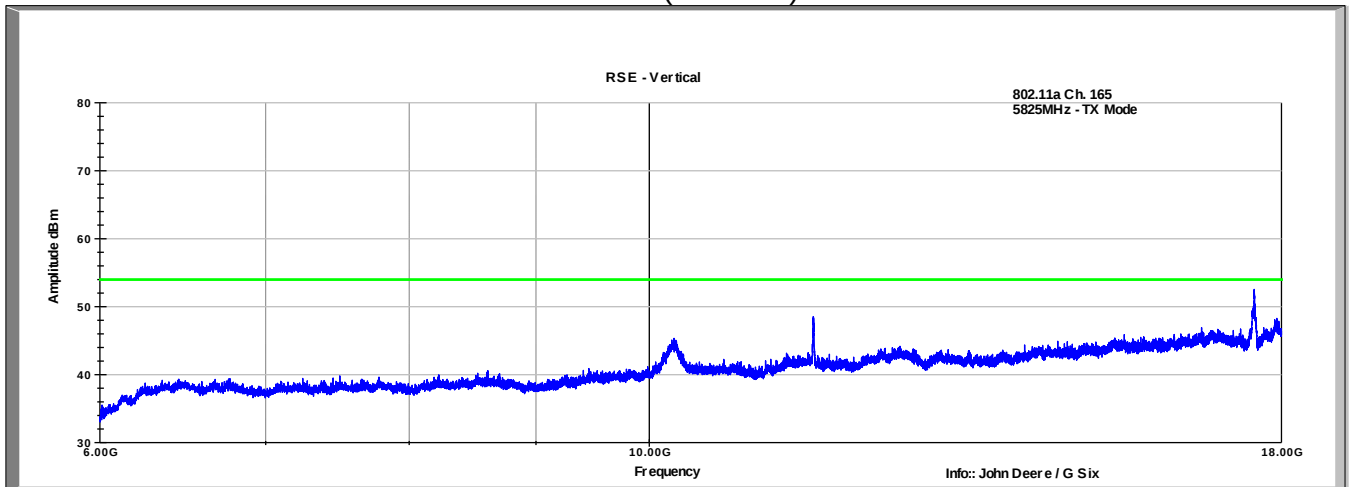
CH 165 802.11a, 6Mbps  
Vertical (1-6GHz)



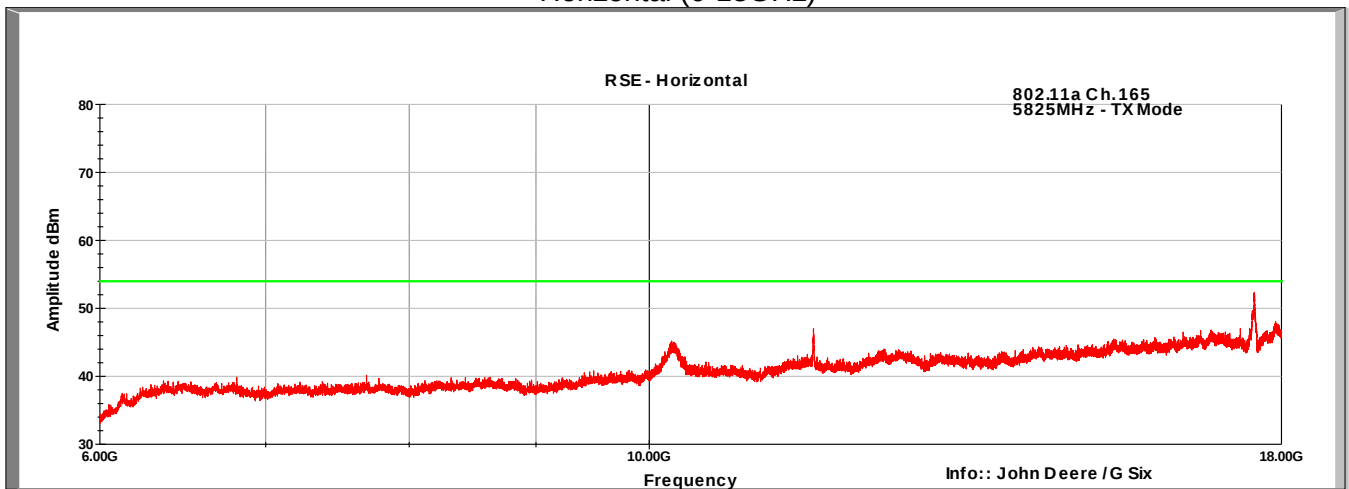
CH 165 802.11a, 6Mbps  
Horizontal (1-6GHz)



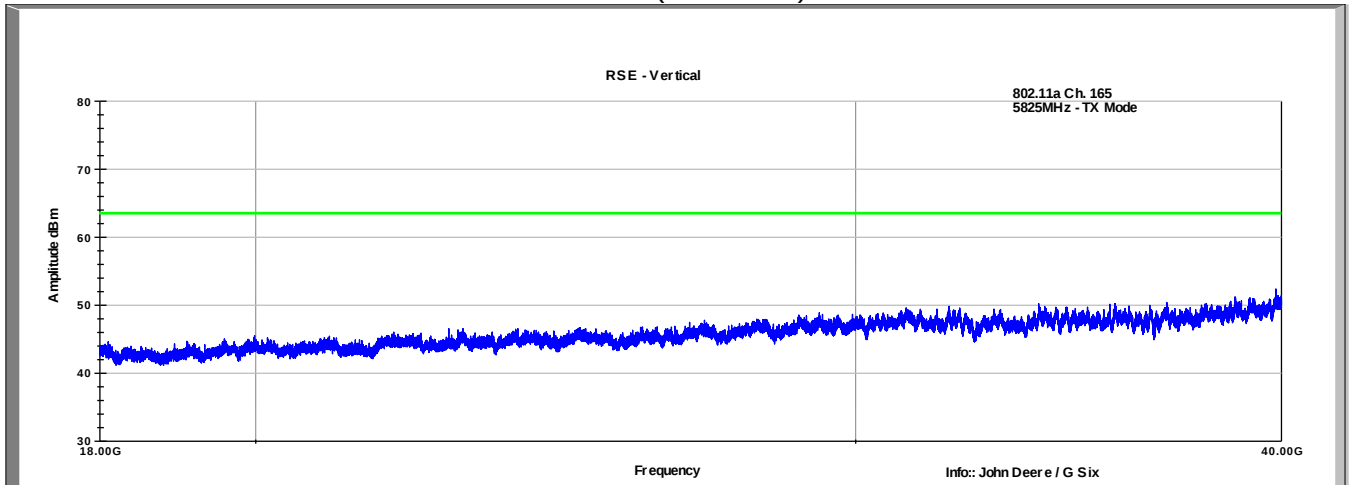
CH 165 802.11a, 6Mbps  
Vertical (6-18GHz)



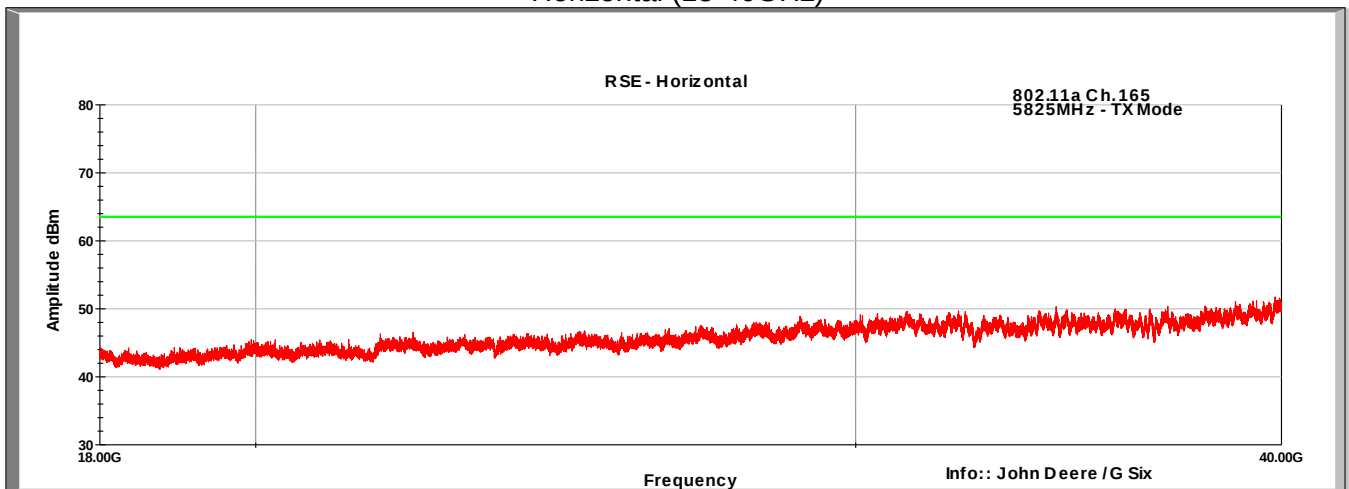
CH 165 802.11a, 6Mbps  
Horizontal (6-18GHz)



CH 165 802.11a, 6Mbps  
Vertical (18-40GHz)



CH 165 802.11a, 6Mbps  
Horizontal (18-40GHz)



## 7 Revision History

| Revision Level | Description of changes | Revision Date     |
|----------------|------------------------|-------------------|
| --             | Draft release          | 20 September 2016 |
| 0              | Initial release        | 11 October 2016   |
|                |                        |                   |
|                |                        |                   |
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