

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

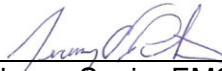
Test Result: Compliant

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.

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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)

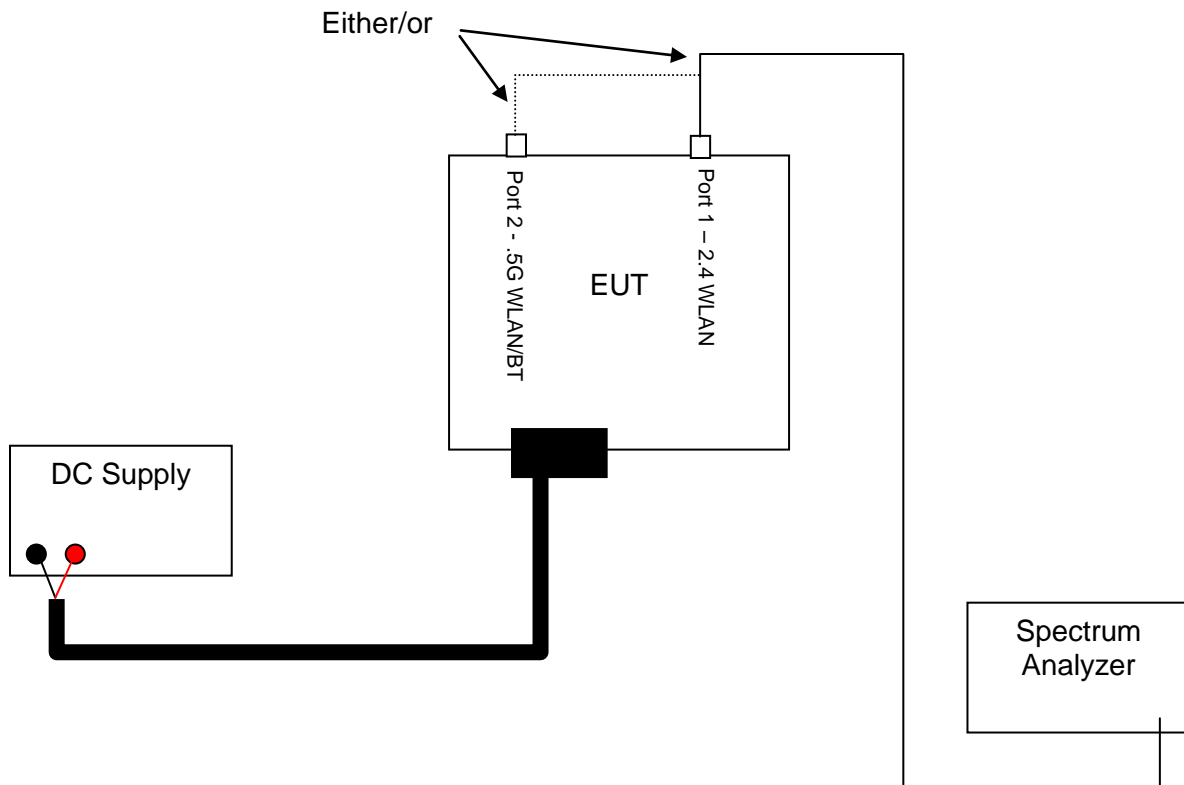
Rated Voltage: 9 – 32Vdc
Test Voltage: 12Vdc

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

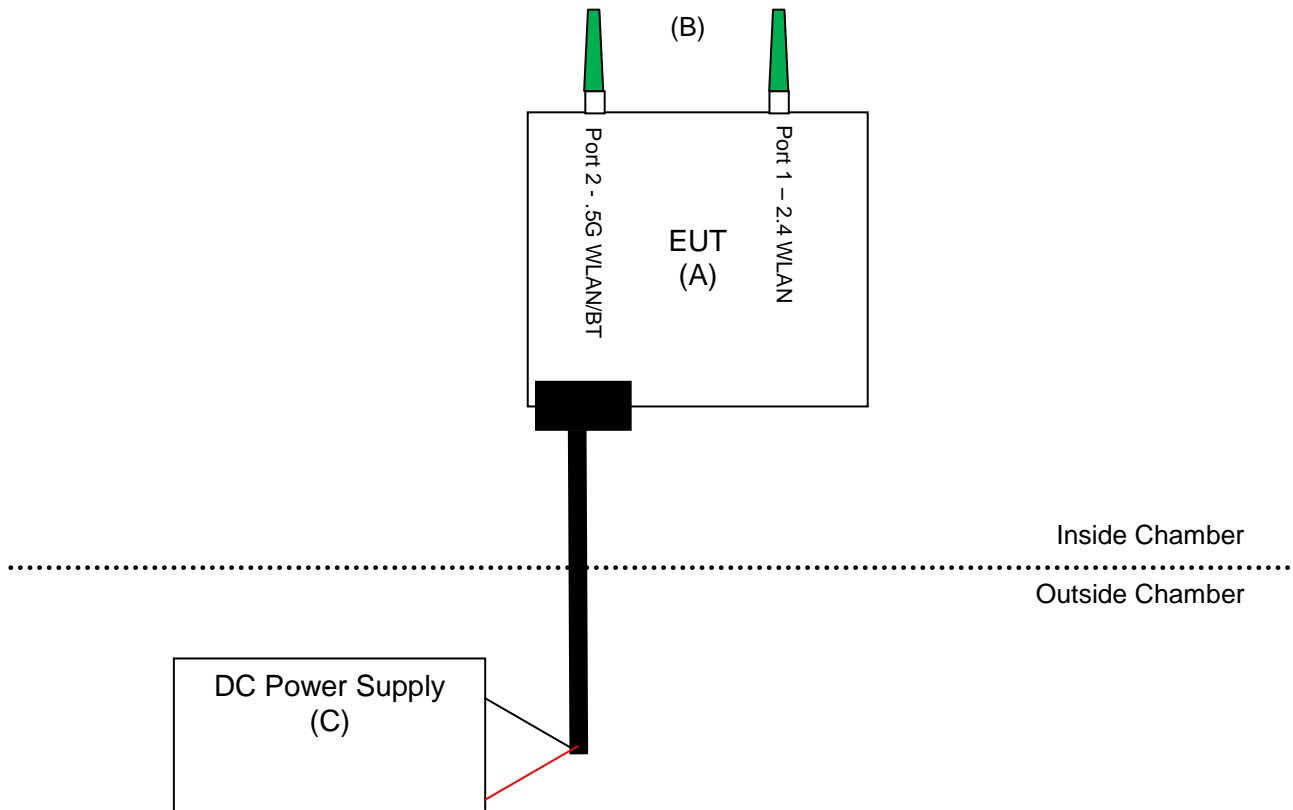
2.4 Operating Modes and Conditions

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

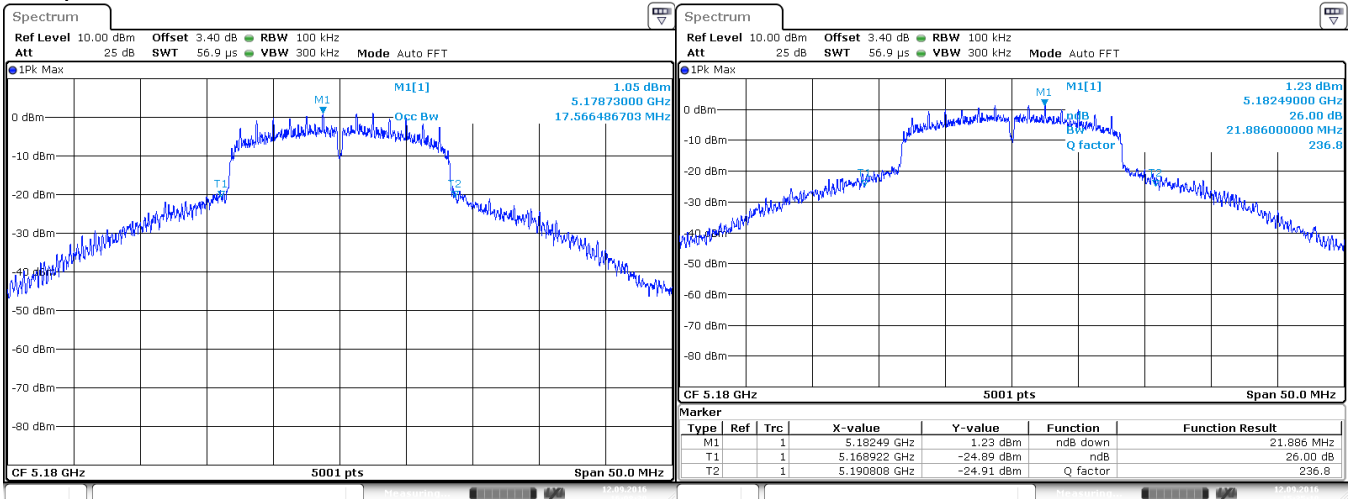
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

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

3.5 Test Data

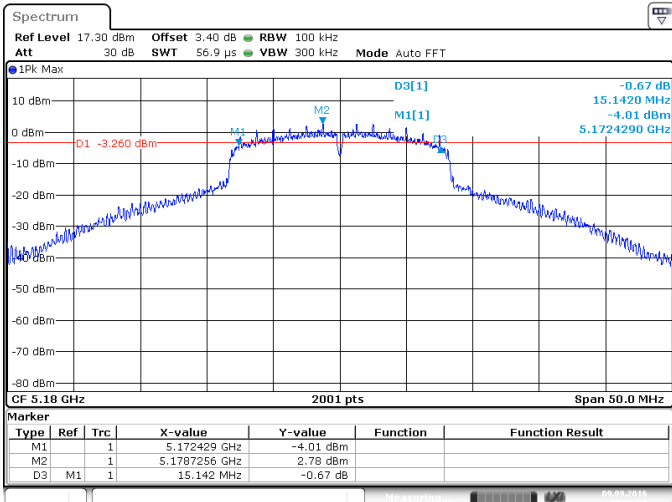
Protocol	Channel	Data Rate	26dB Bandwidth (MHz)	6dB Bandwidth (MHz)	OBW (99%) (MHz)
802.11a	36	54Mbps	21.886	15.142	17.566
802.11a	44	54Mbps	22.106	15.126	17.836
802.11a	48	54Mbps	22.795	15.123	17.836
802.11a	149	54Mbps	21.836	15.127	17.047
802.11a	157	54Mbps	21.846	15.127	17.097
802.11a	165	54Mbps	20.986	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 dBm	Final 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 (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 (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

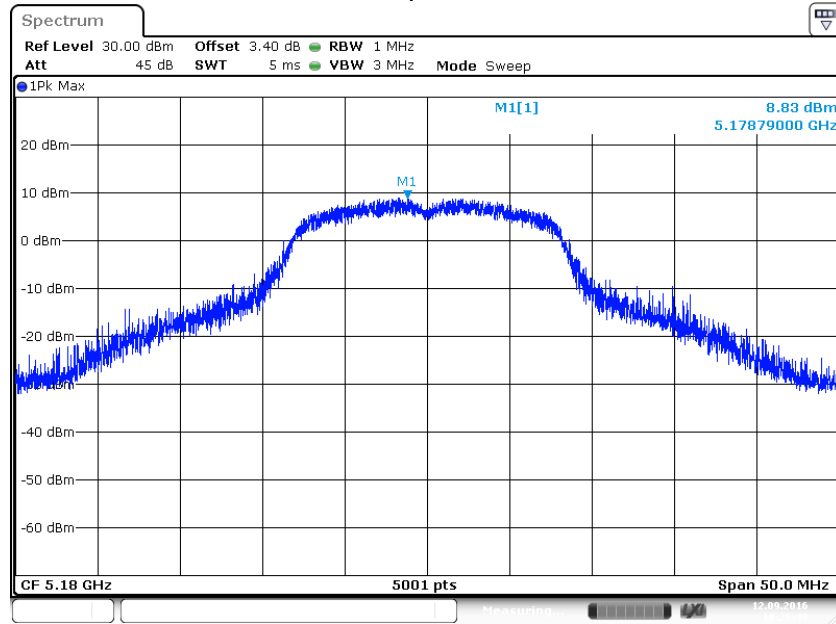
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

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

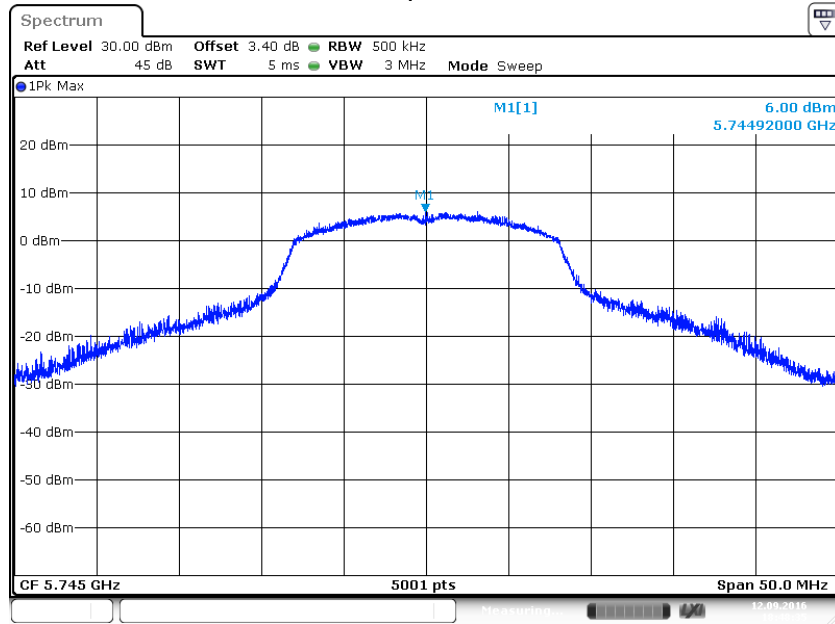


Date: 12_SEP 2016 18:26:49

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) 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

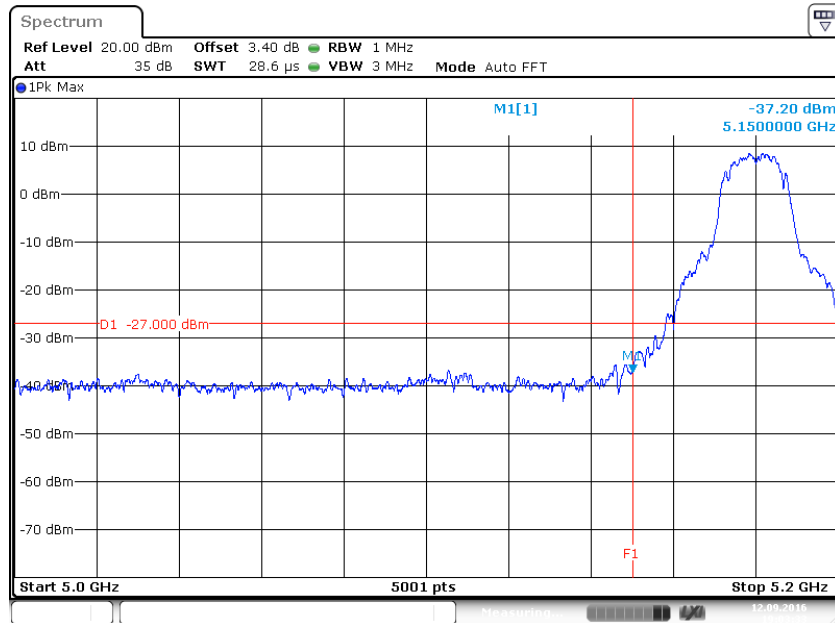
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079712	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	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

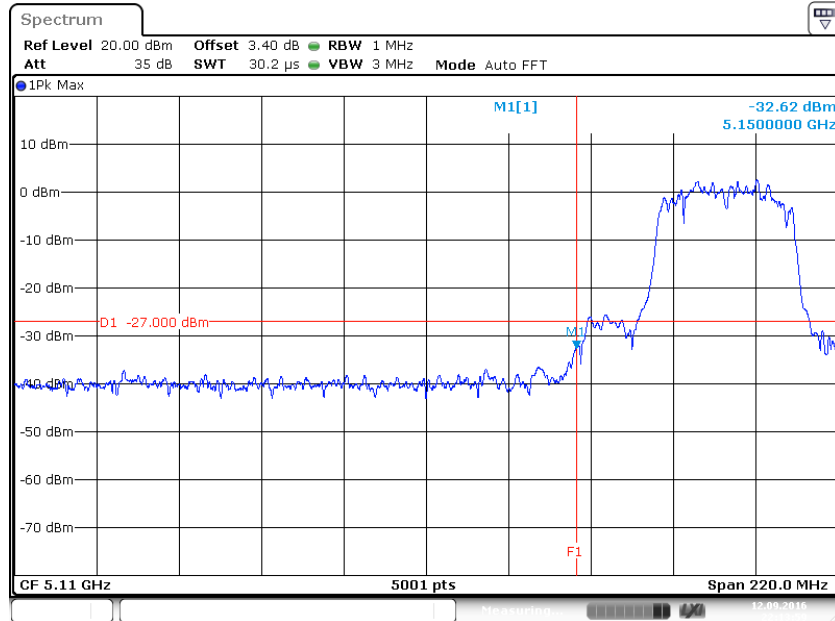
e: The calibration period for equipment is 1 year

6.6 Test Data – Band Edge

802.11a
 Lower band edge
 Channel 36
 6Mbit/s

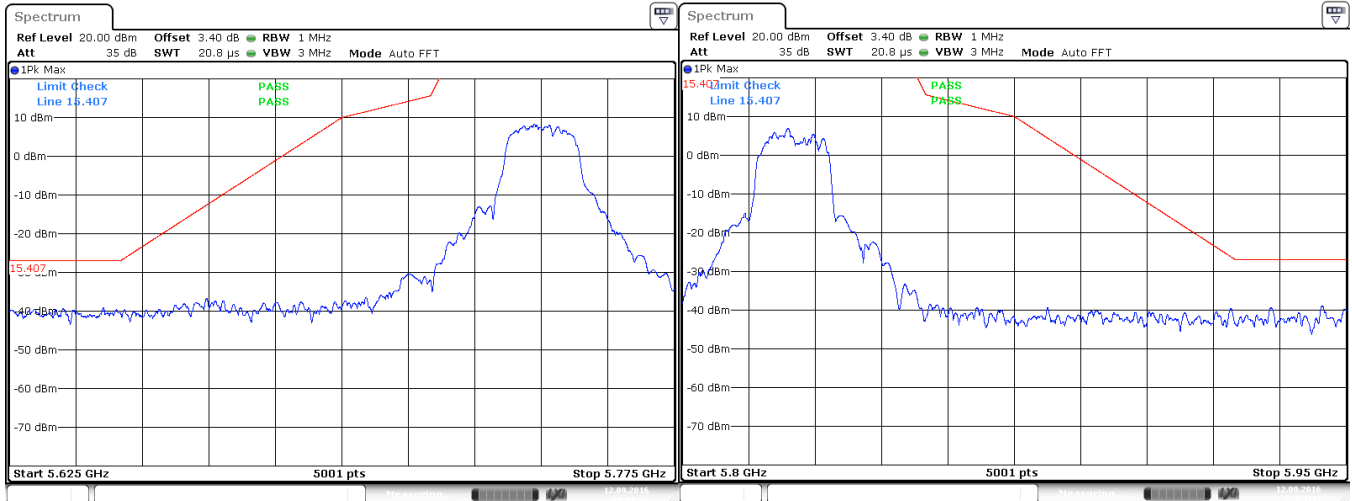


802.11n (HT40)
Lower band edge
Channel 40
MCS0



Date: 12.SEP.2016 22:13:59

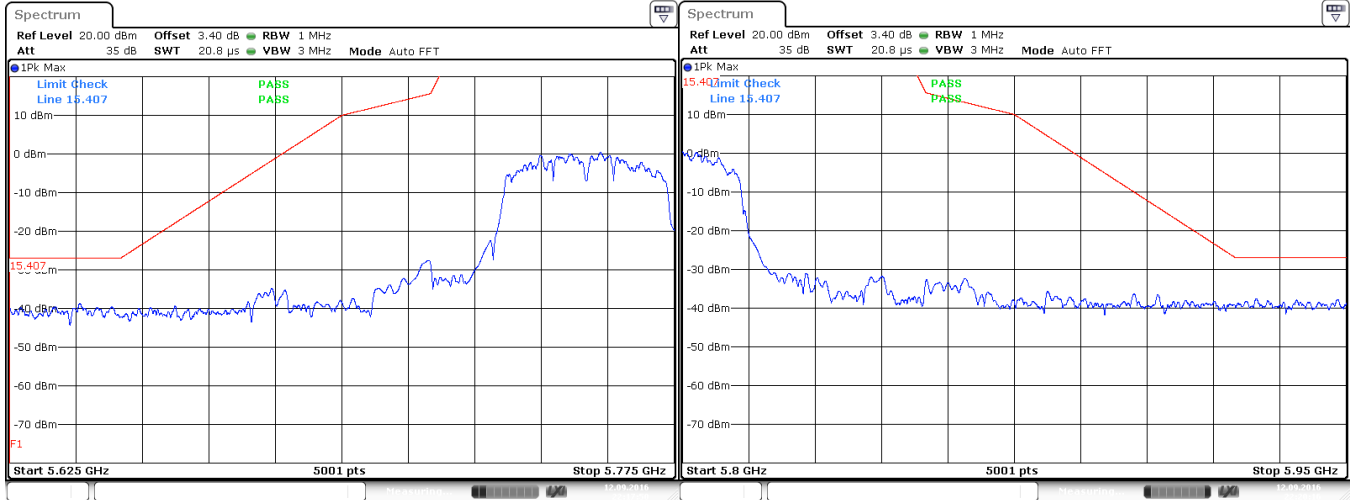
802.11a
Lower band edge / Upper band edge
Channel 149 / Channel 165
6Mbit/s



Date: 12.SEP.2016 22:22:52

Date: 12.SEP.2016 22:24:45

802.11n (HT40)
 Lower band edge / Upper band edge
 Channel 153 / Channel 161
 MCS0

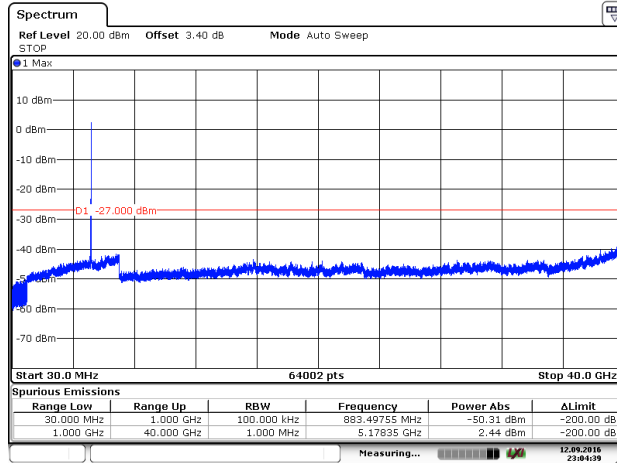


Date: 12 SEP 2016 22:17:50

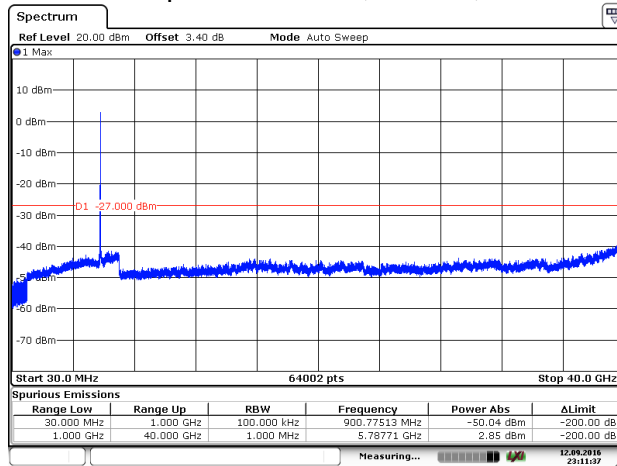
Date: 12 SEP 2016 22:20:16

6.7 Test Data – Conducted Spurs

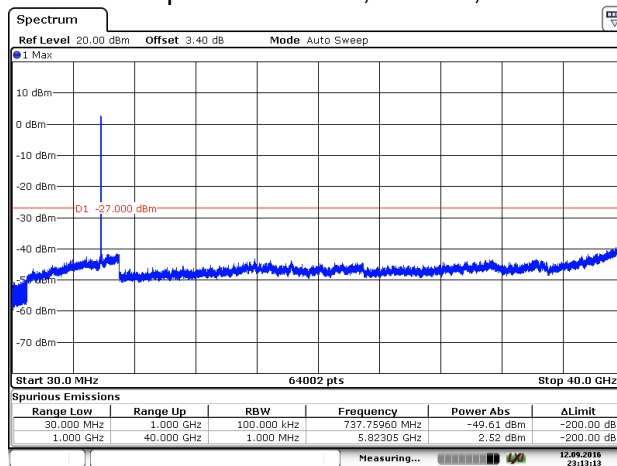
Conducted Spurs – 802.11a, 6Mbit/s, Channel 36



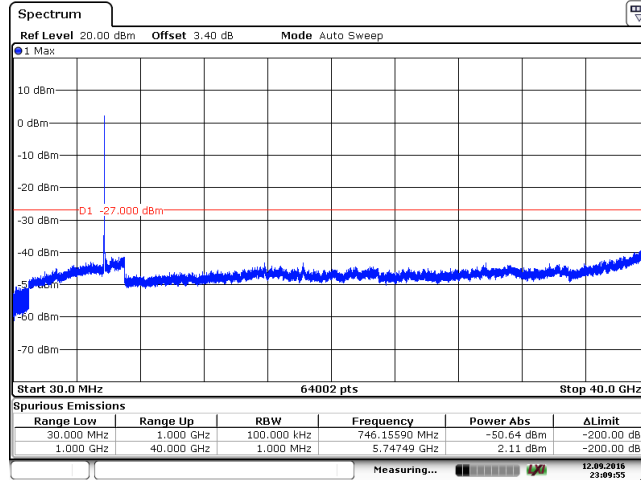
Conducted Spurs – 802.11a, 6Mbit/s, Channel 44



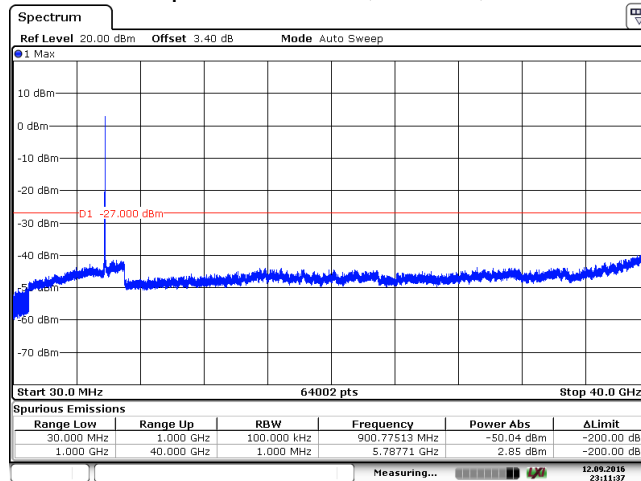
Conducted Spurs – 802.11a, 6Mbit/s, Channel 48



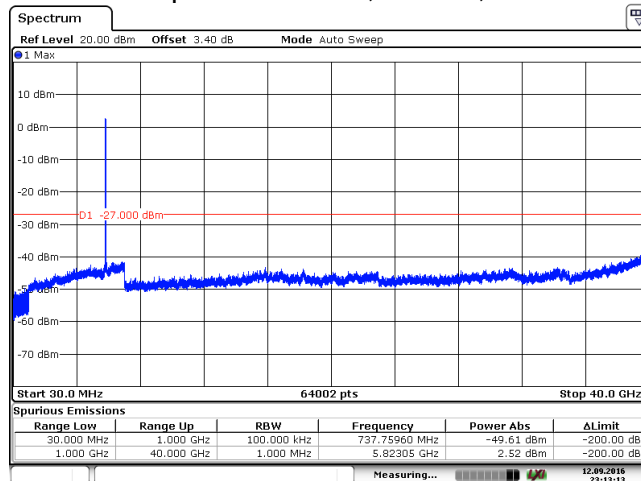
Conducted Spurs – 802.11a, 6Mbit/s, Channel 149



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

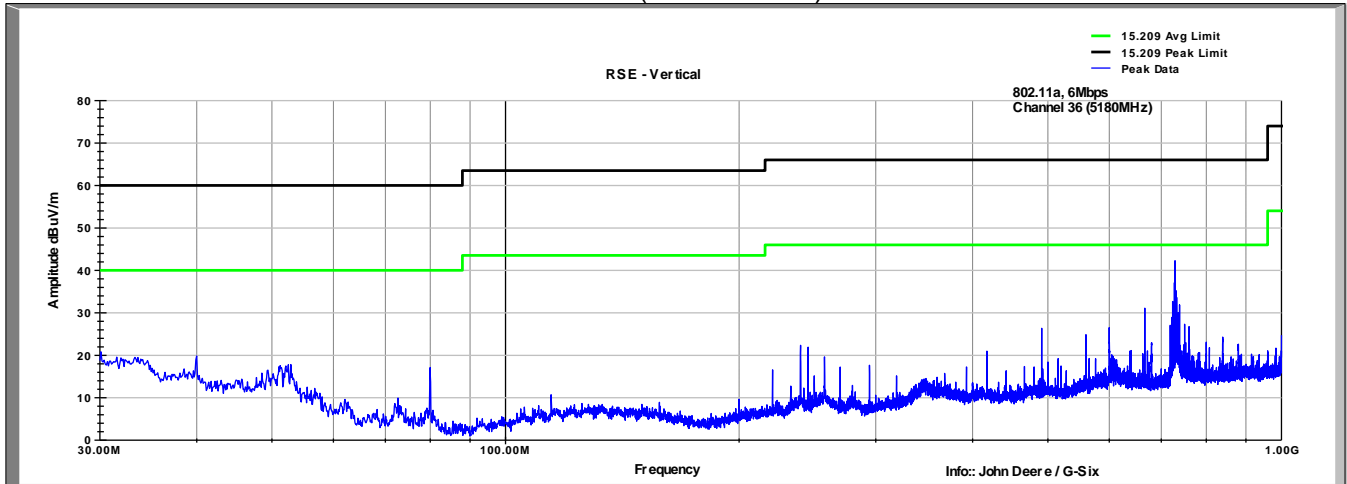


Conducted Spurs – 802.11a, 6Mbit/s, Channel 165

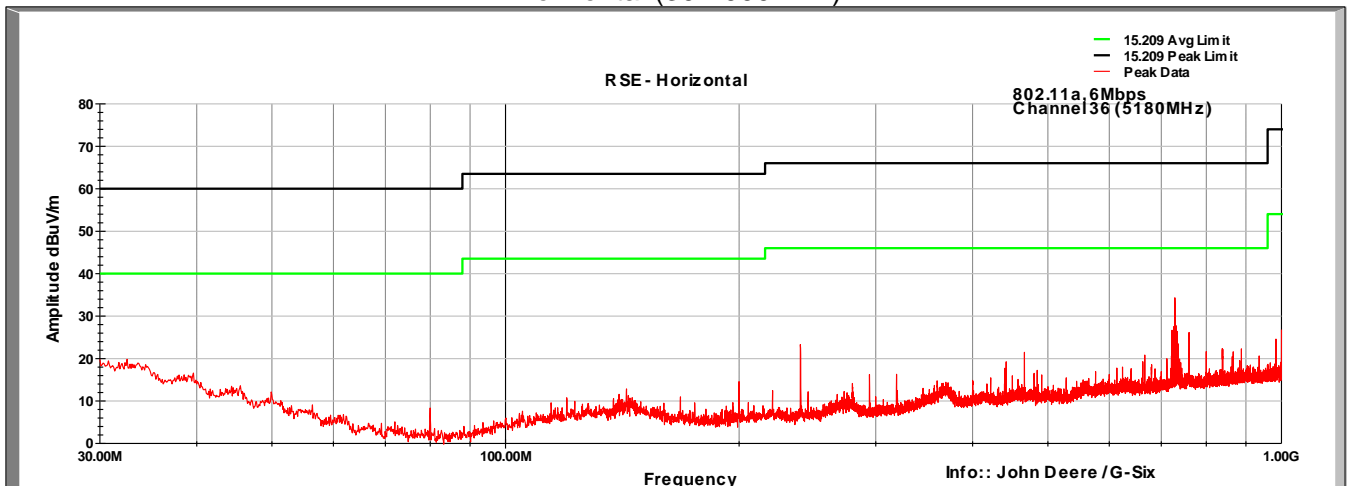


6.8 Unwanted Emissions – Cabinet Radiation

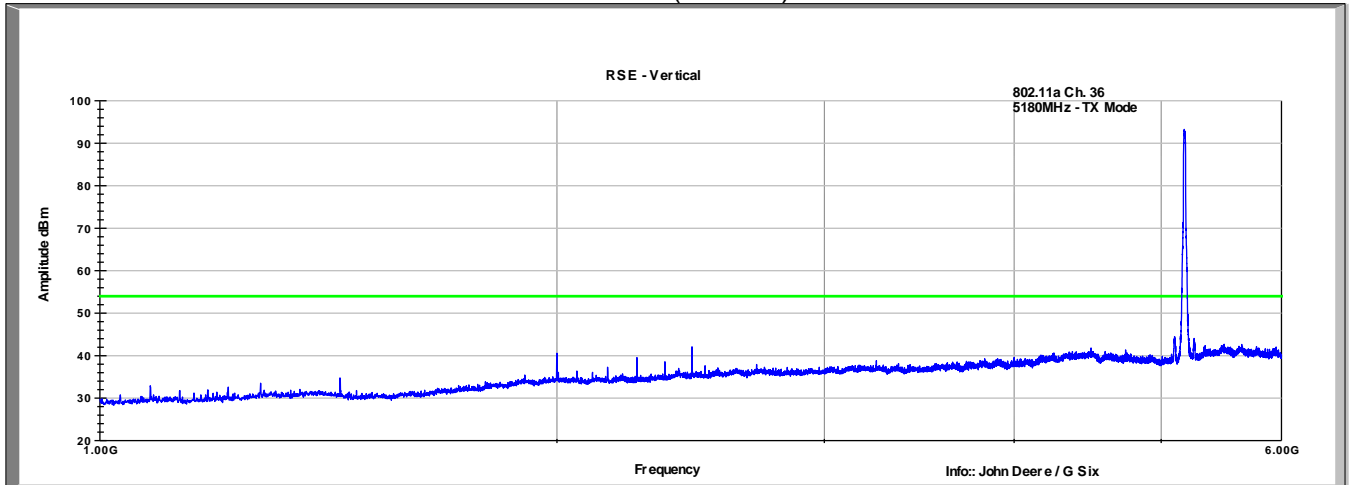
CH 36 802.11a, 6Mbps
Vertical (30-1000MHz)



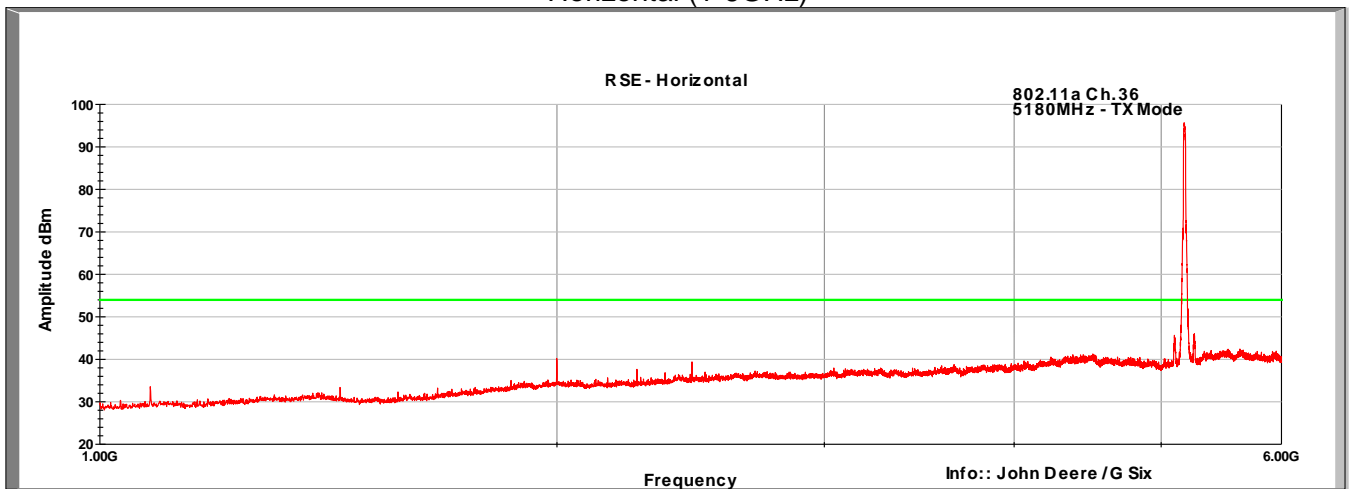
CH 36 802.11a, 6Mbps
Horizontal (30-1000MHz)



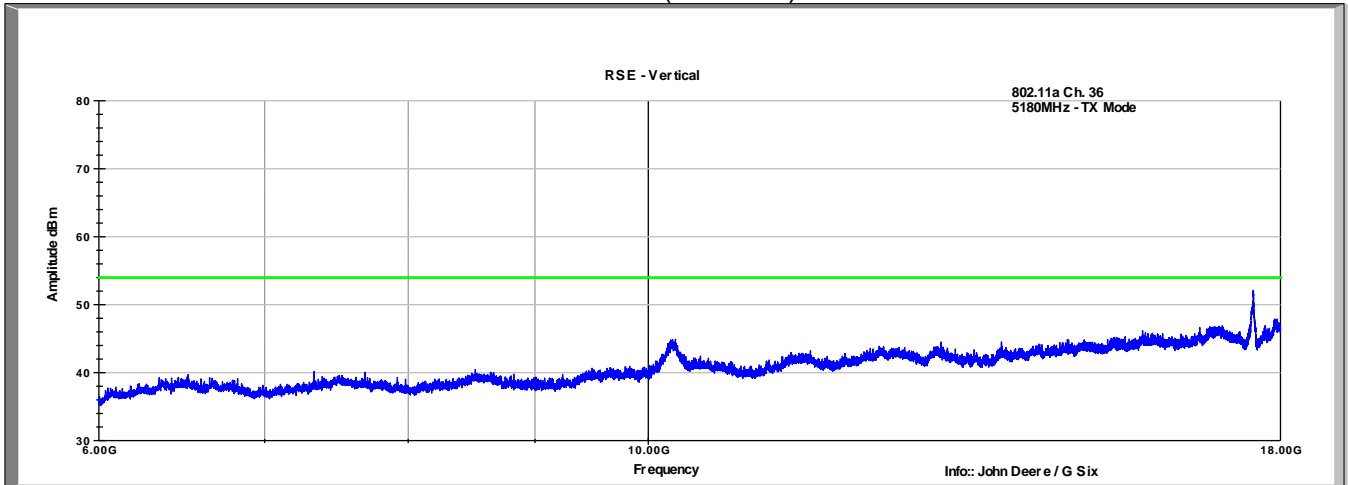
CH 36 802.11a, 6Mbps
Vertical (1-6GHz)



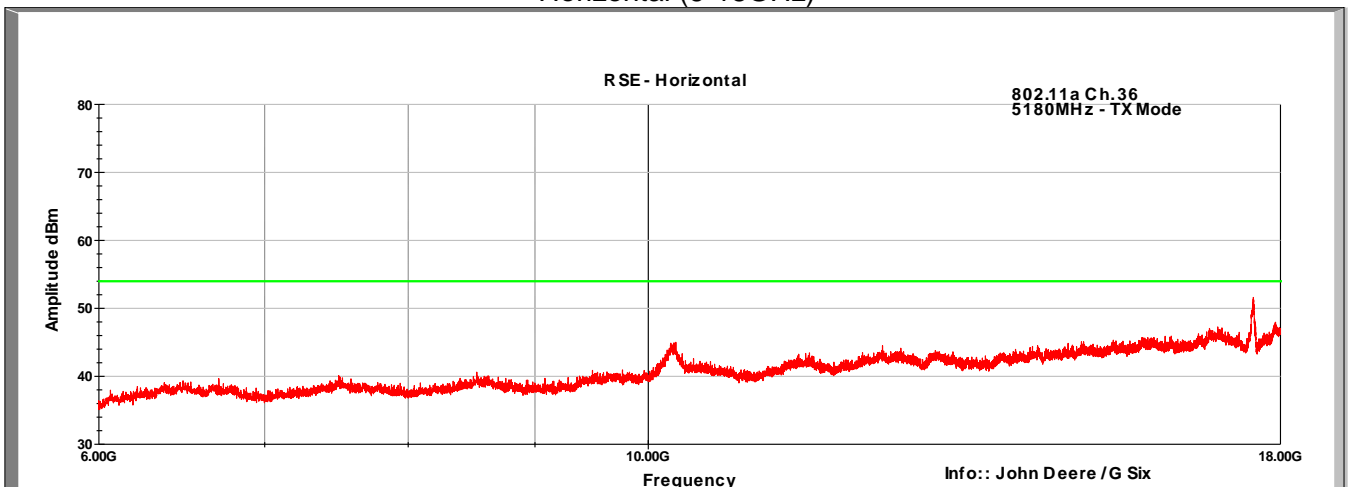
CH 36 802.11a, 6Mbps
Horizontal (1-6GHz)



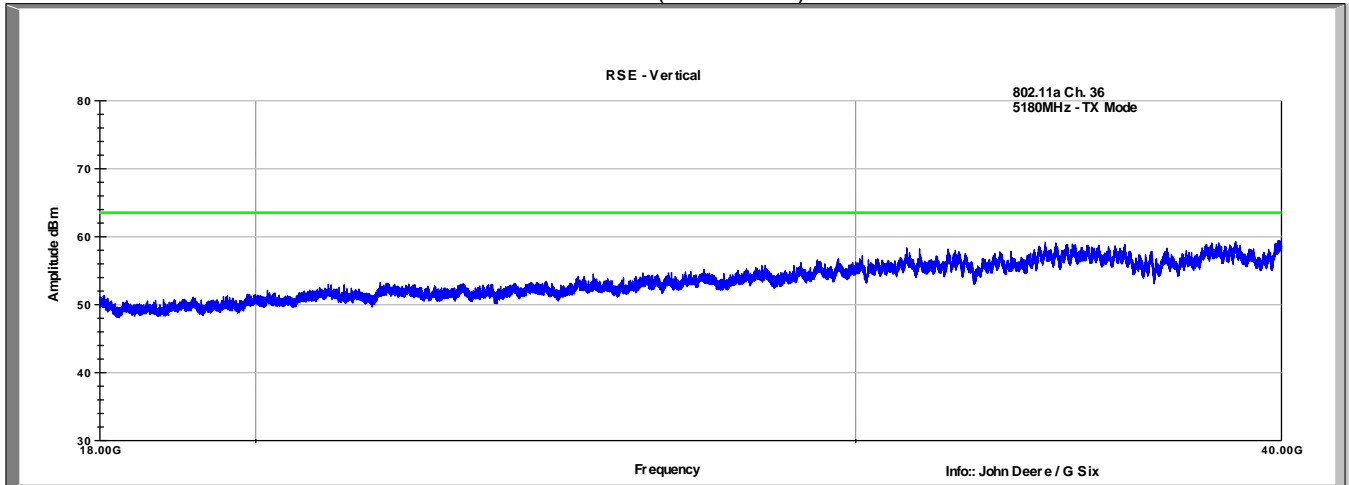
CH 36 802.11a, 6Mbps
Vertical (6-18GHz)



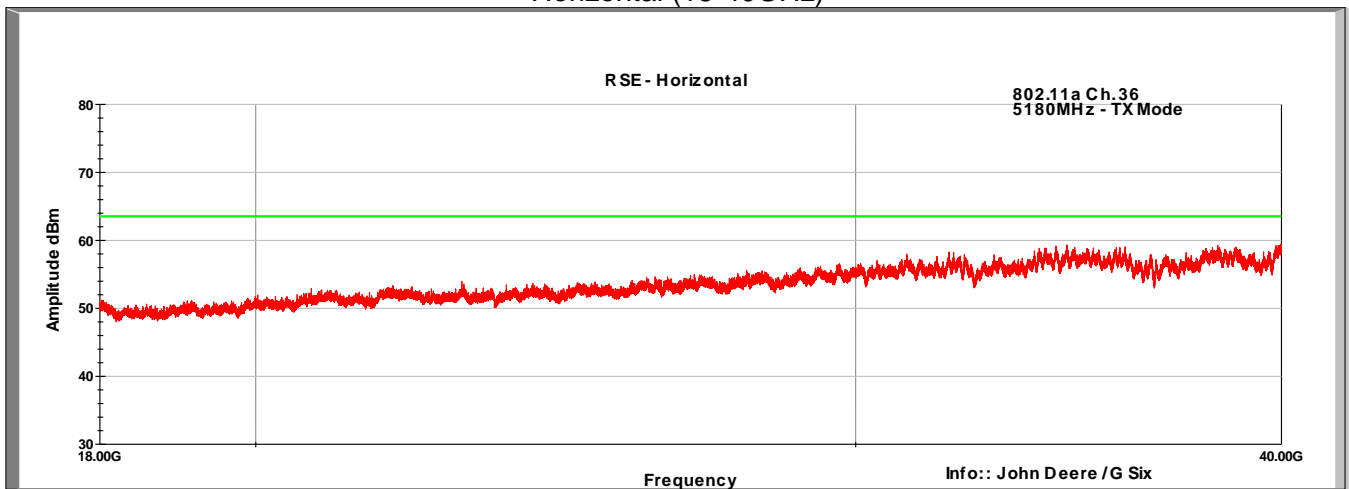
CH 36 802.11a, 6Mbps
Horizontal (6-18GHz)



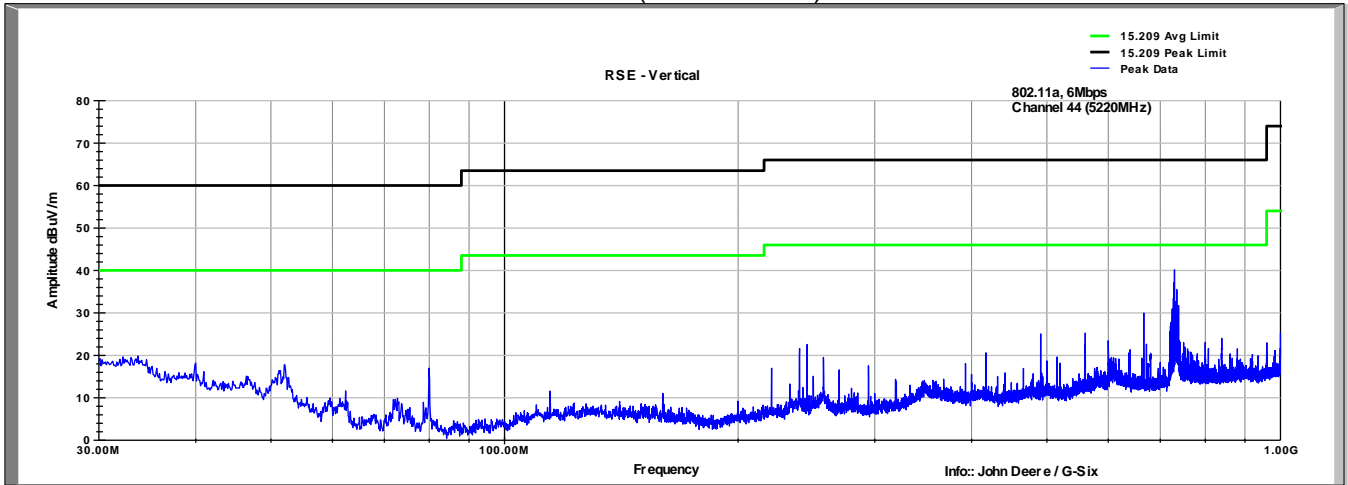
CH 36 802.11a, 6Mbps
Vertical (18-40GHz)



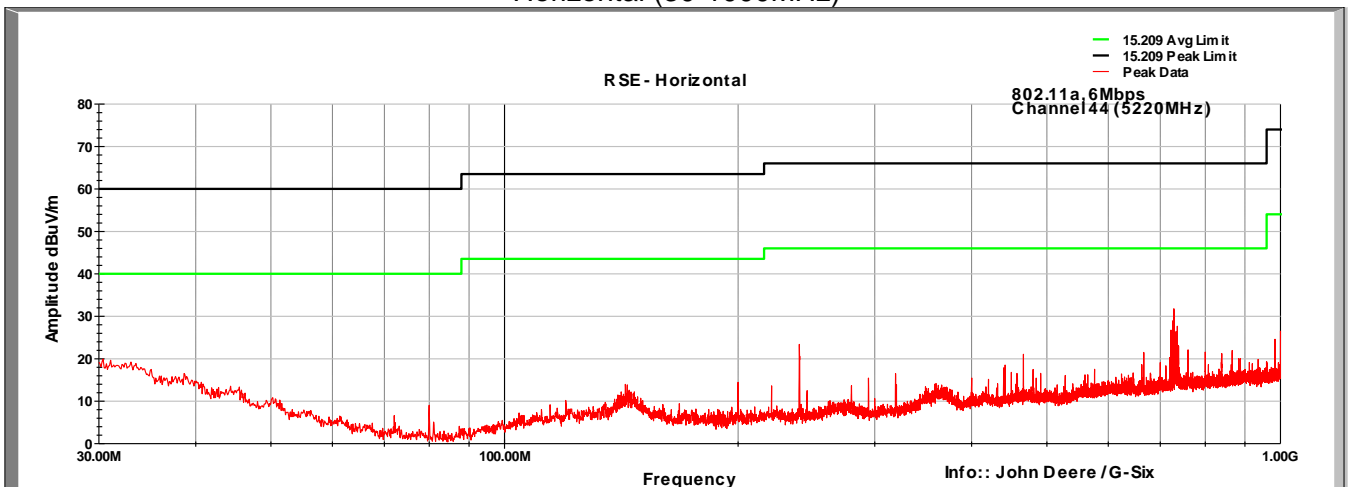
CH 36 802.11a, 6Mbps
Horizontal (18-40GHz)



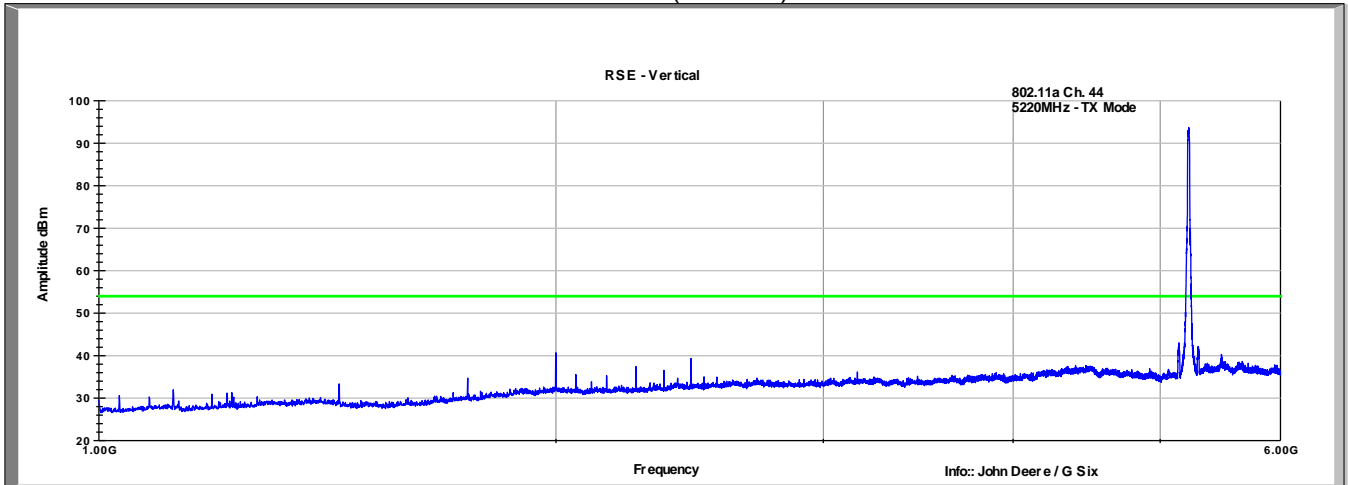
CH 44 802.11a, 6Mbps
Vertical (30-1000MHz)



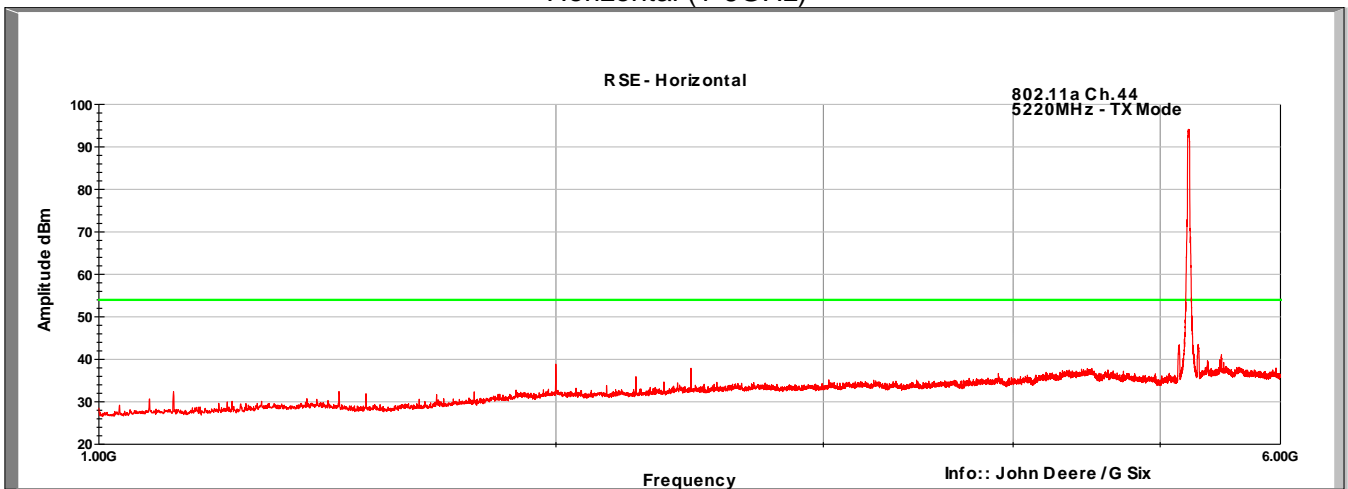
CH 44 802.11a, 6Mbps
Horizontal (30-1000MHz)



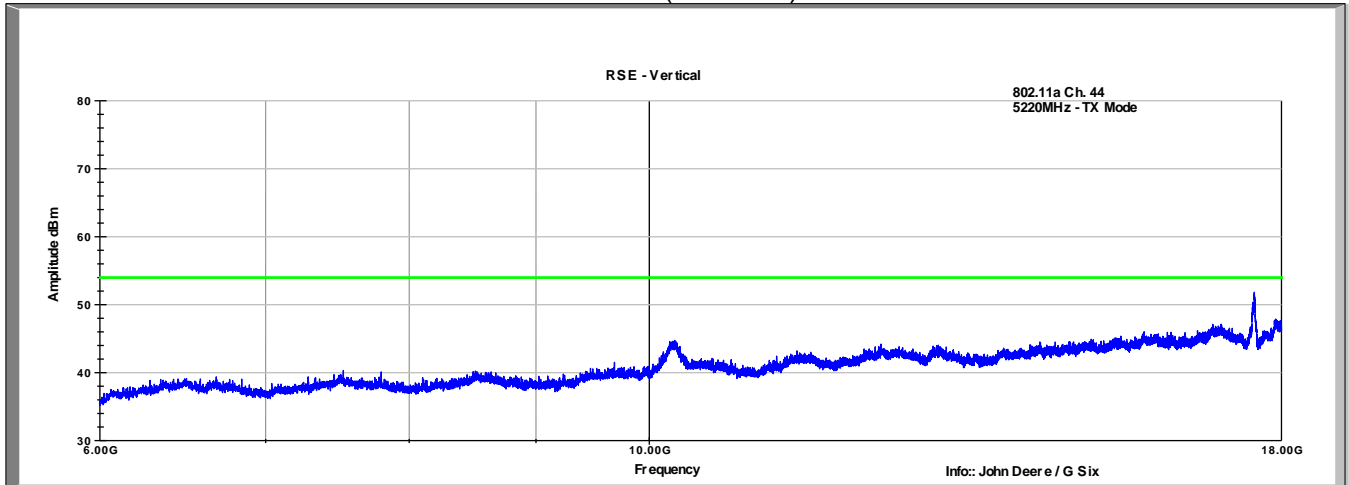
CH 44 802.11a, 6Mbps
Vertical (1-6GHz)



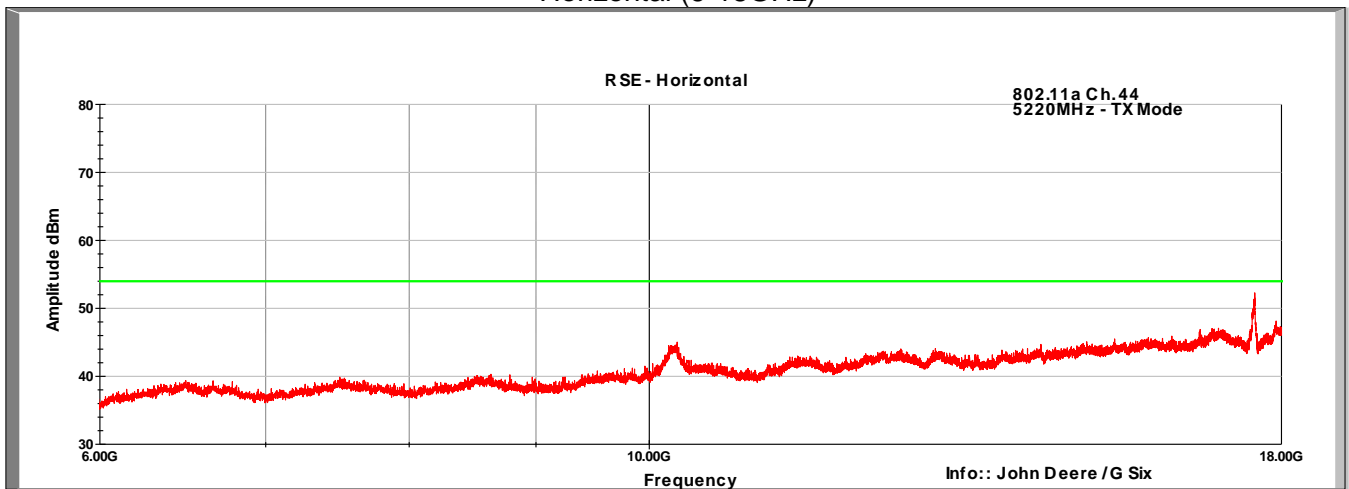
CH 44 802.11a, 6Mbps
Horizontal (1-6GHz)



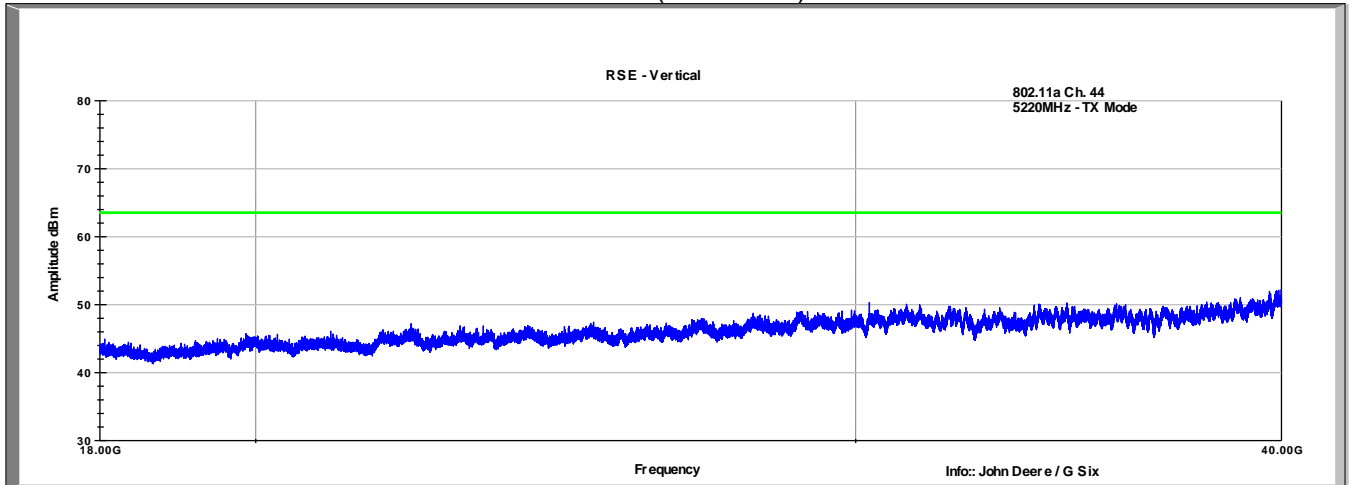
CH 44 802.11a, 6Mbps
Vertical (6-18GHz)



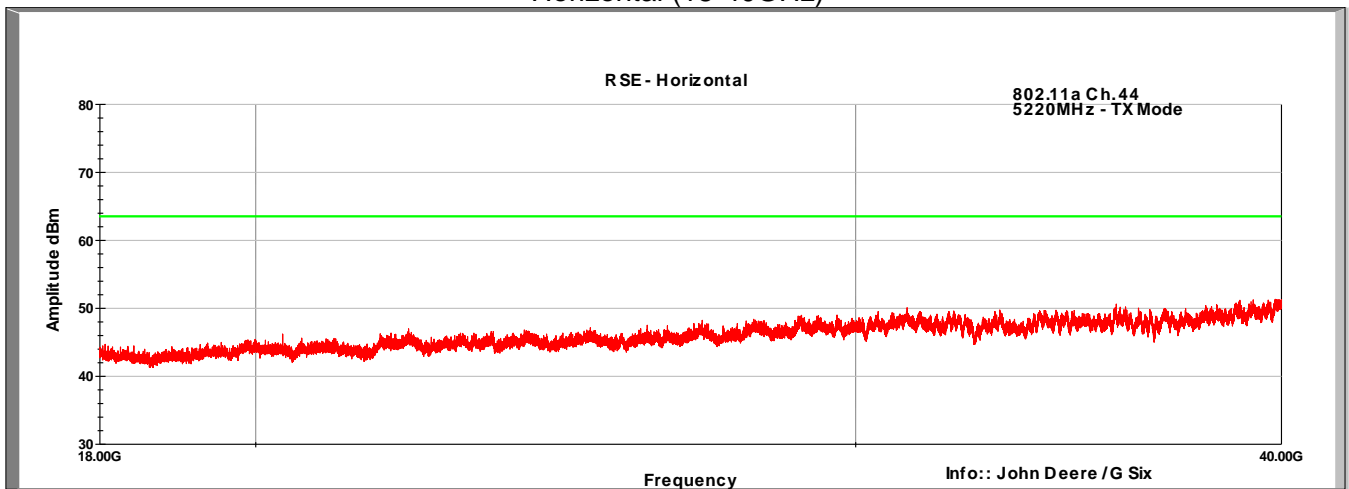
CH 44 802.11a, 6Mbps
Horizontal (6-18GHz)



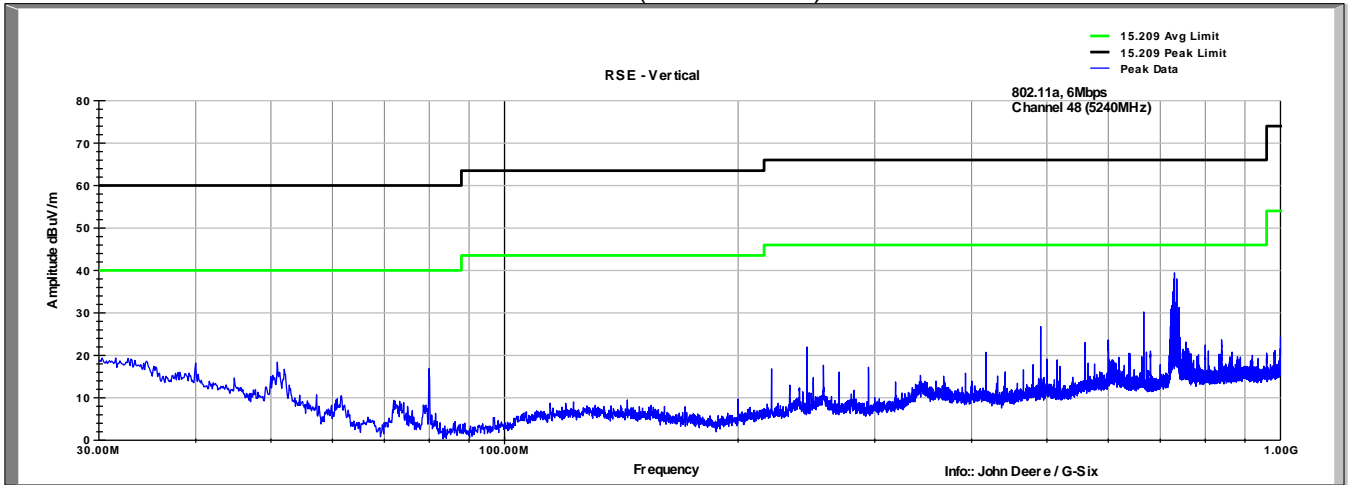
CH 44 802.11a, 6Mbps
Vertical (18-40GHz)



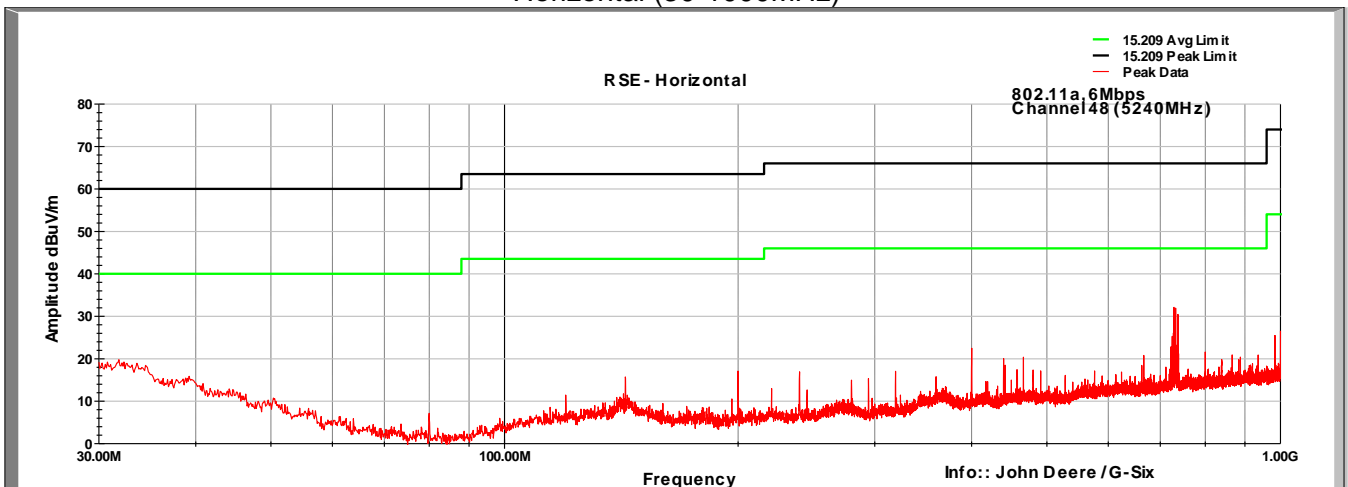
CH 44 802.11a, 6Mbps
Horizontal (18-40GHz)



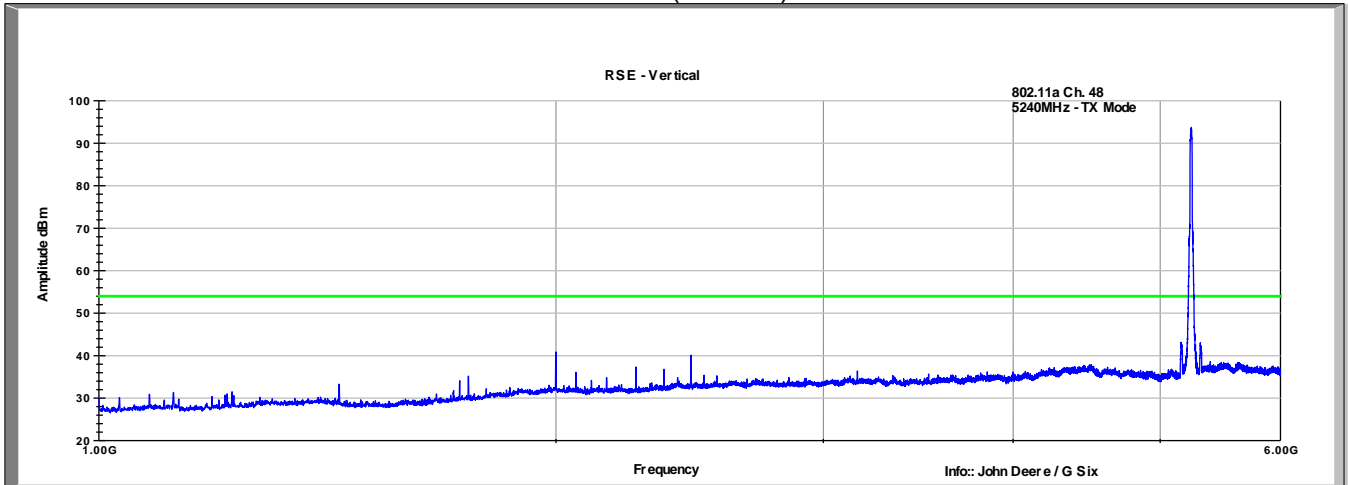
CH 48 802.11a, 6Mbps
Vertical (30-1000MHz)



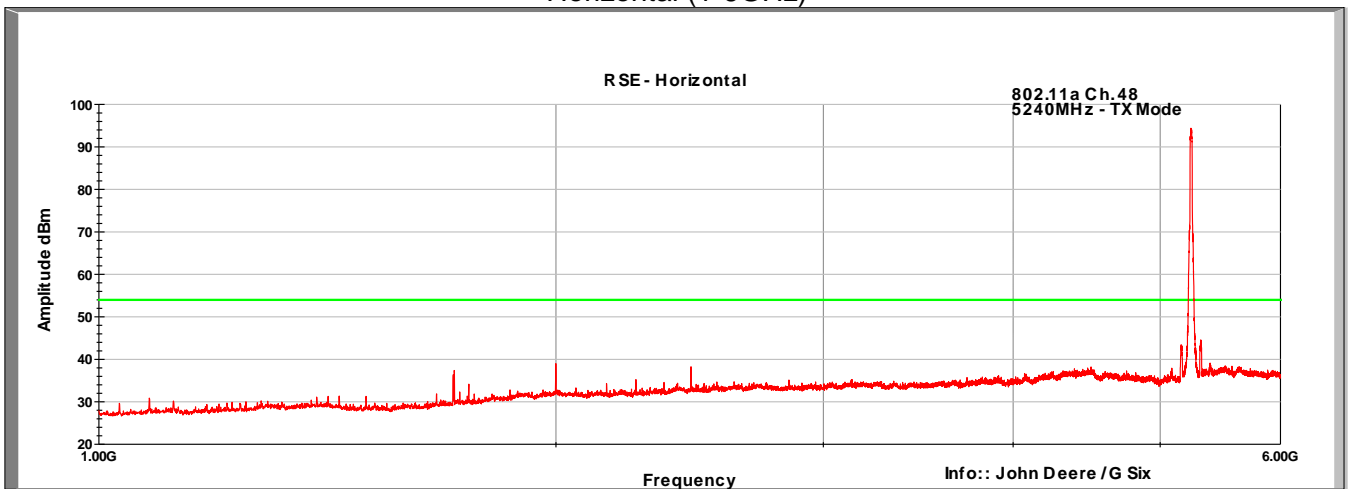
CH 48 802.11a, 6Mbps
Horizontal (30-1000MHz)



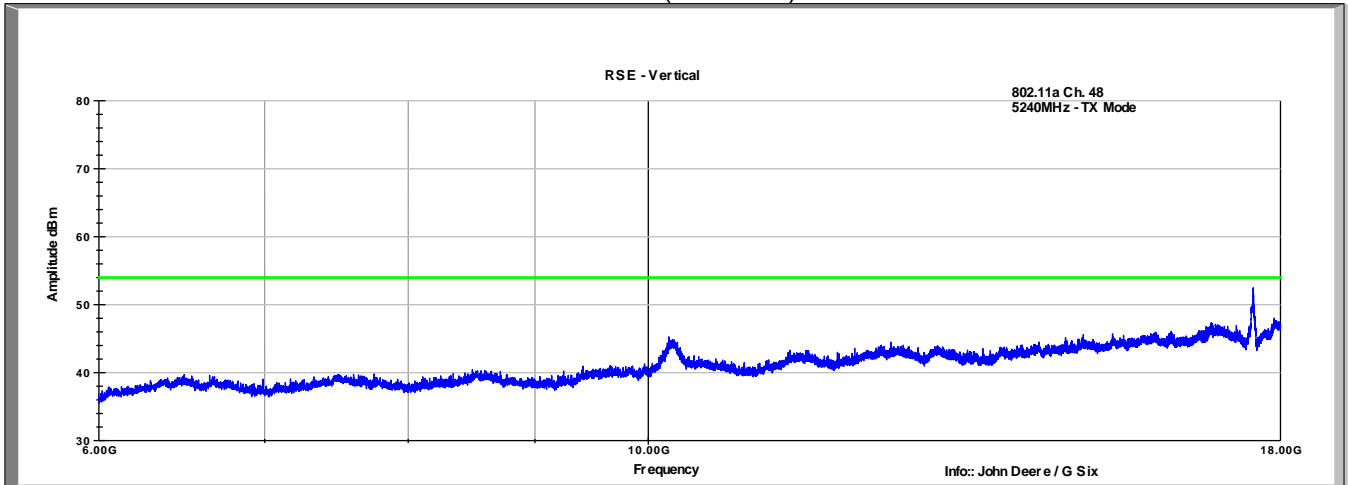
CH 48 802.11a, 6Mbps
Vertical (1-6GHz)



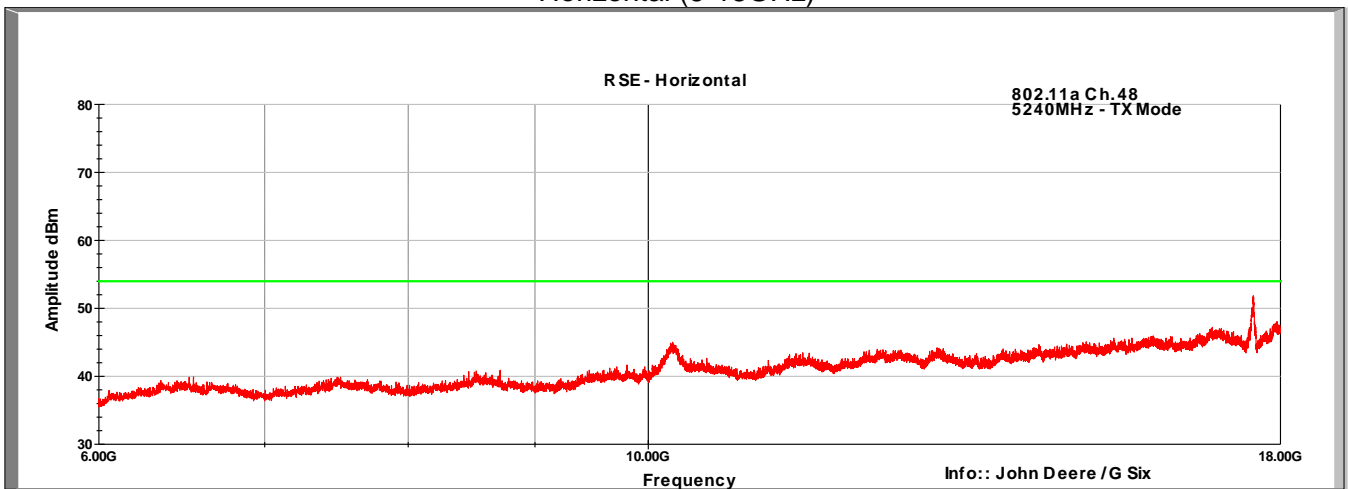
CH 48 802.11a, 6Mbps
Horizontal (1-6GHz)



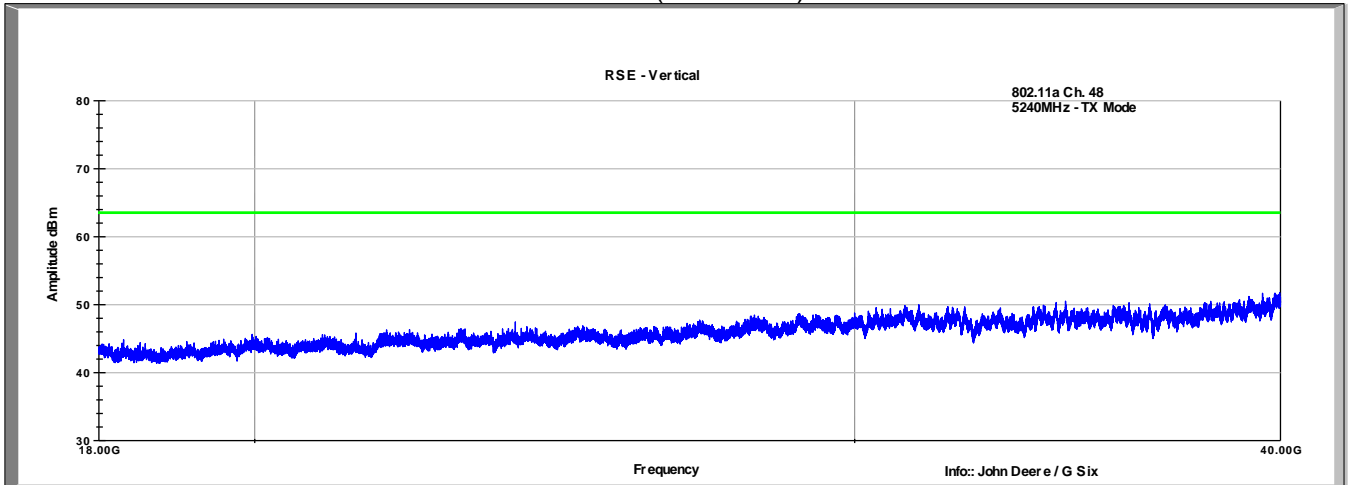
CH 48 802.11a, 6Mbps
Vertical (6-18GHz)



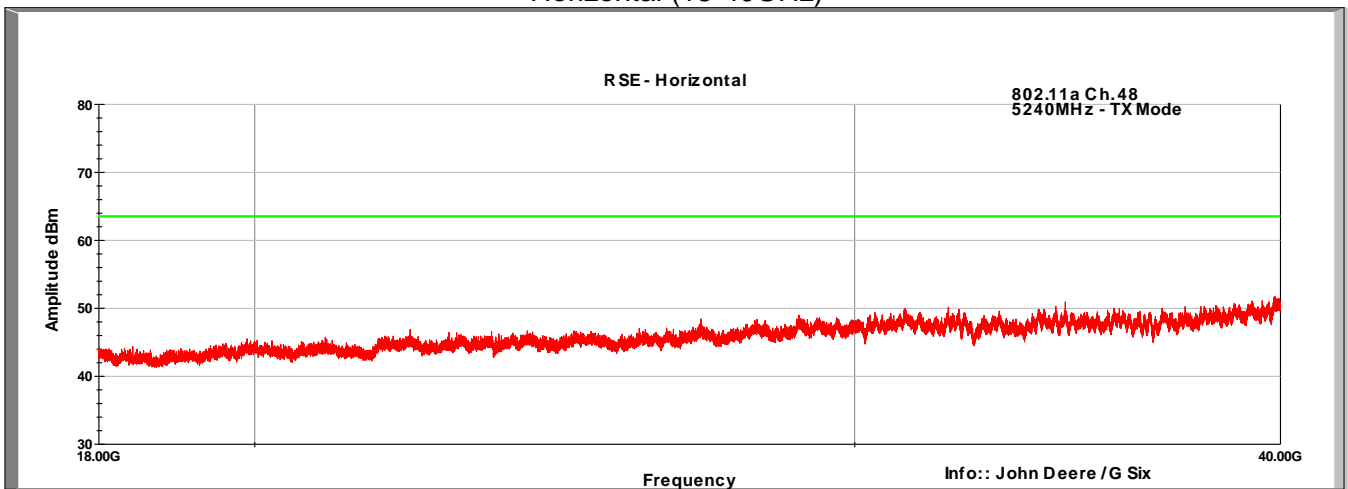
CH 48 802.11a, 6Mbps
Horizontal (6-18GHz)



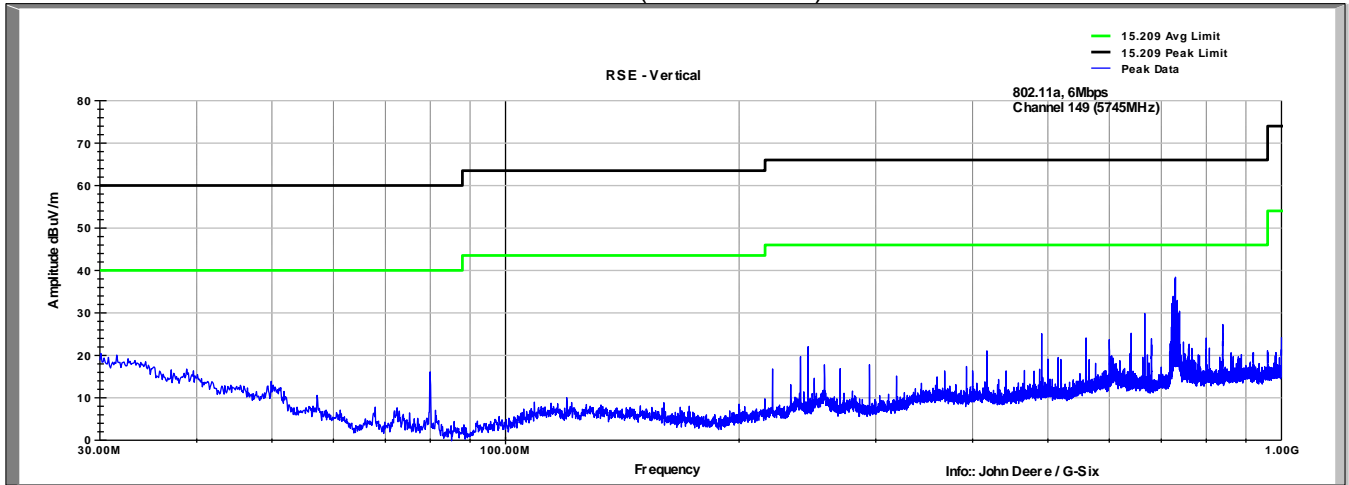
CH 48 802.11a, 6Mbps
Vertical (18-40GHz)



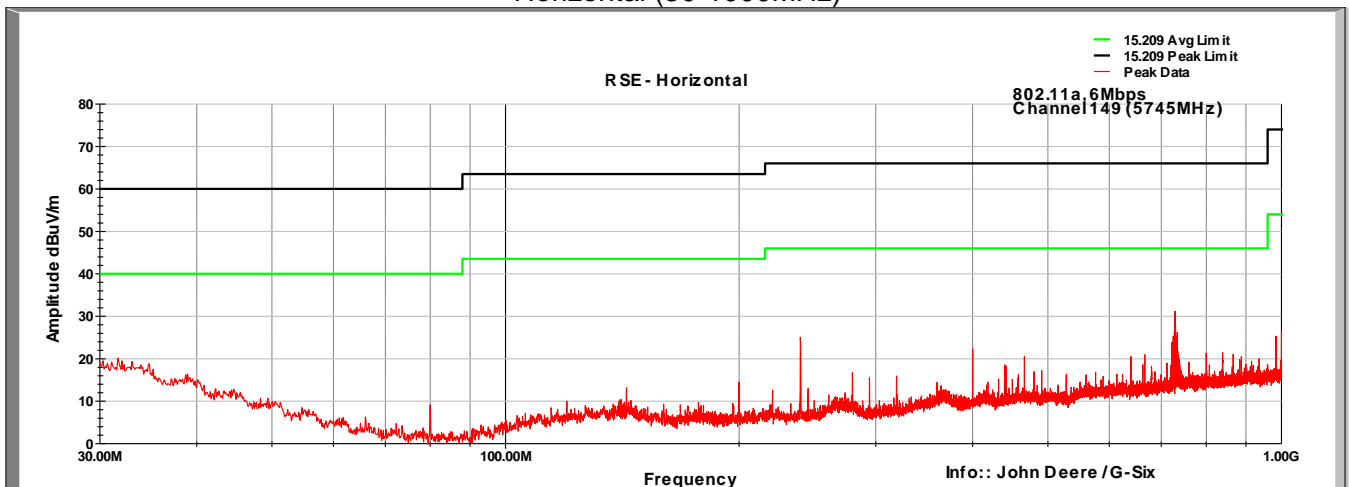
CH 48 802.11a, 6Mbps
Horizontal (18-40GHz)



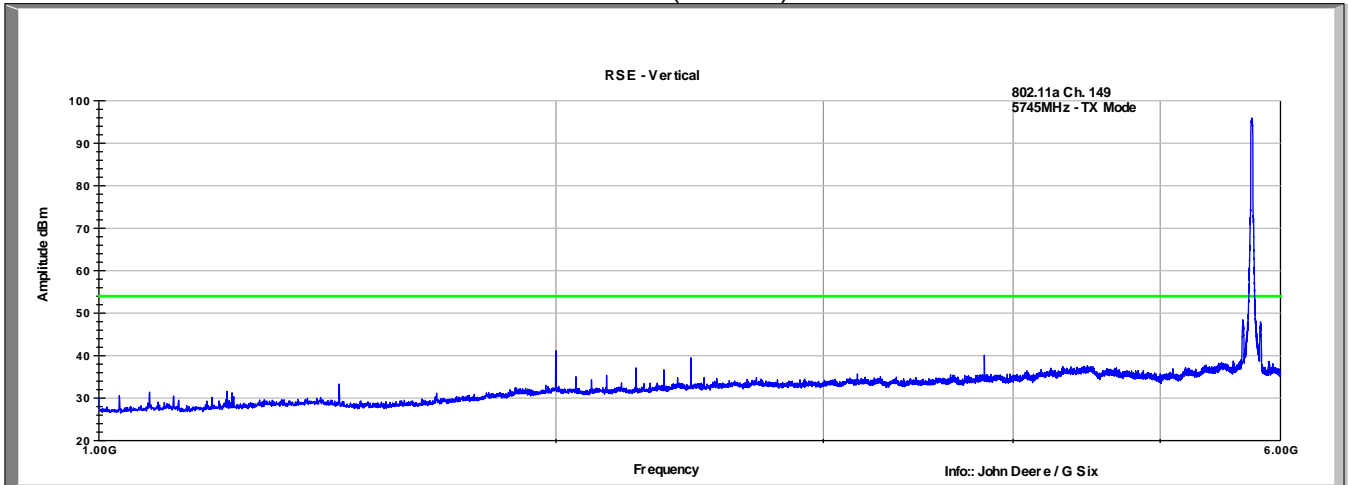
CH 149 802.11a, 6Mbps
Vertical (30-1000MHz)



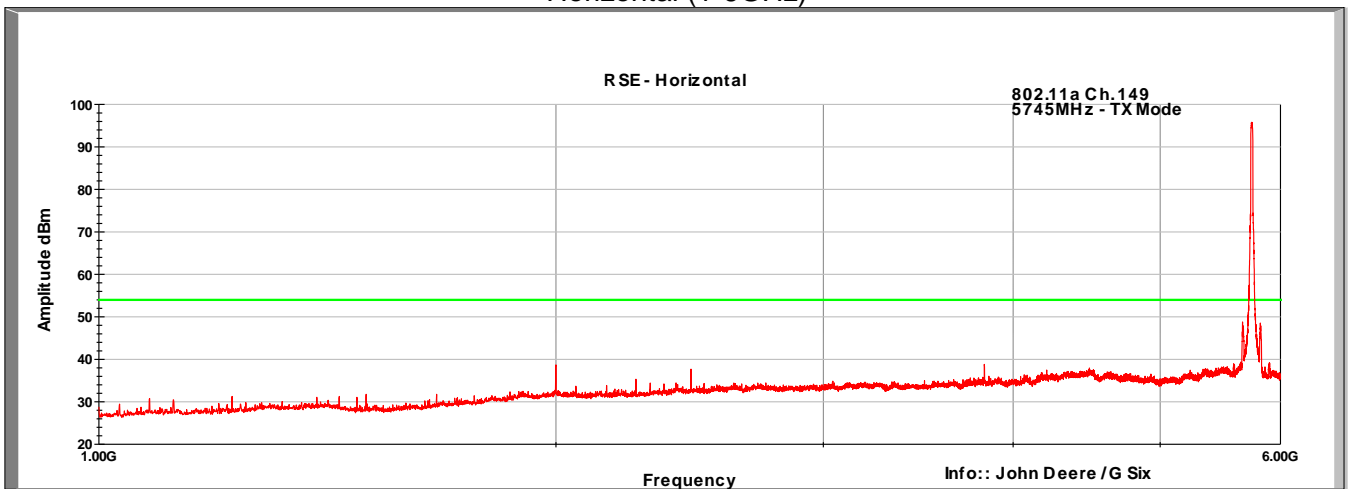
CH 149 802.11a, 6Mbps
Horizontal (30-1000MHz)



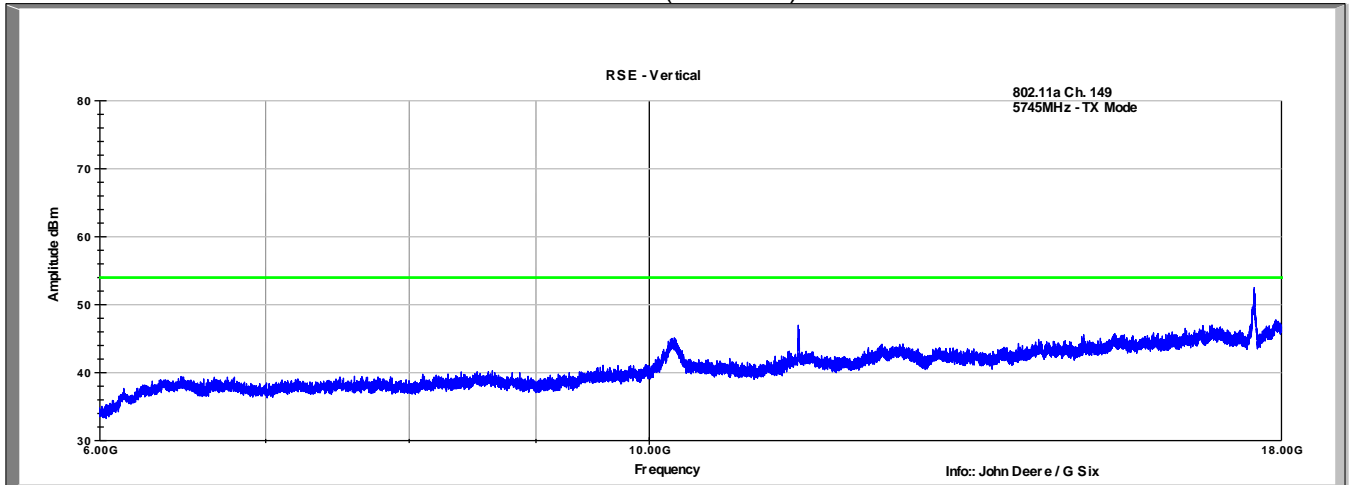
CH 149 802.11a, 6Mbps
Vertical (1-6GHz)



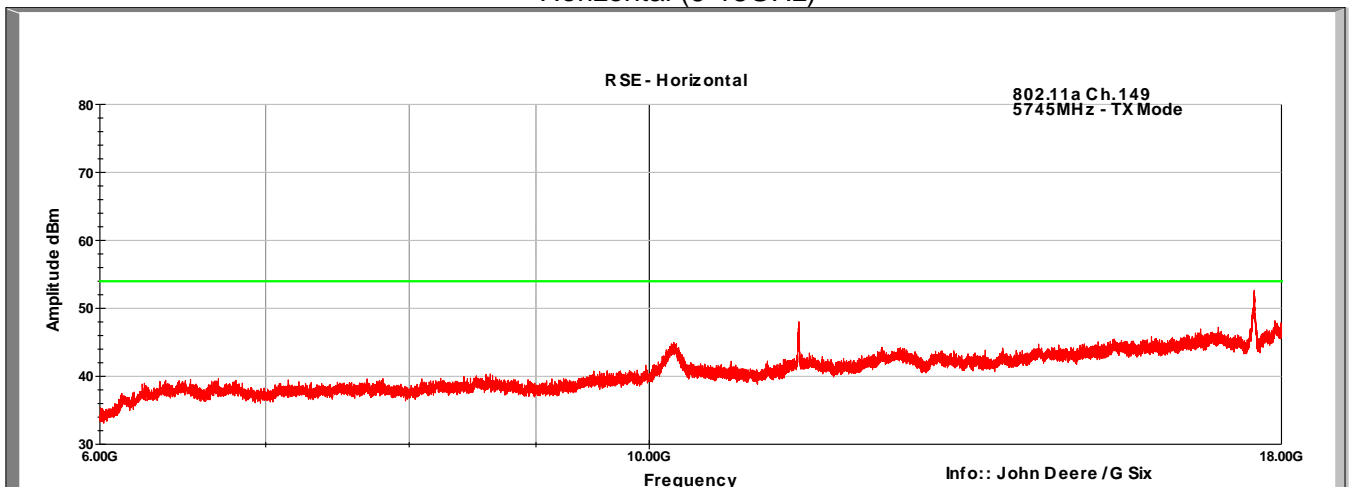
CH 149 802.11a, 6Mbps
Horizontal (1-6GHz)



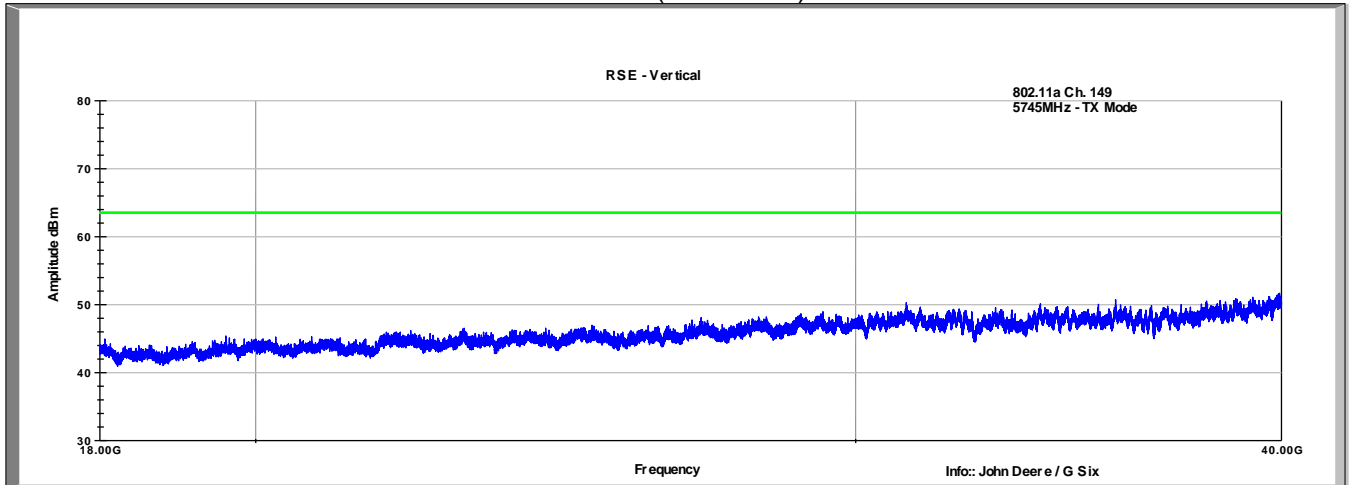
CH 149 802.11a, 6Mbps
Vertical (6-18GHz)



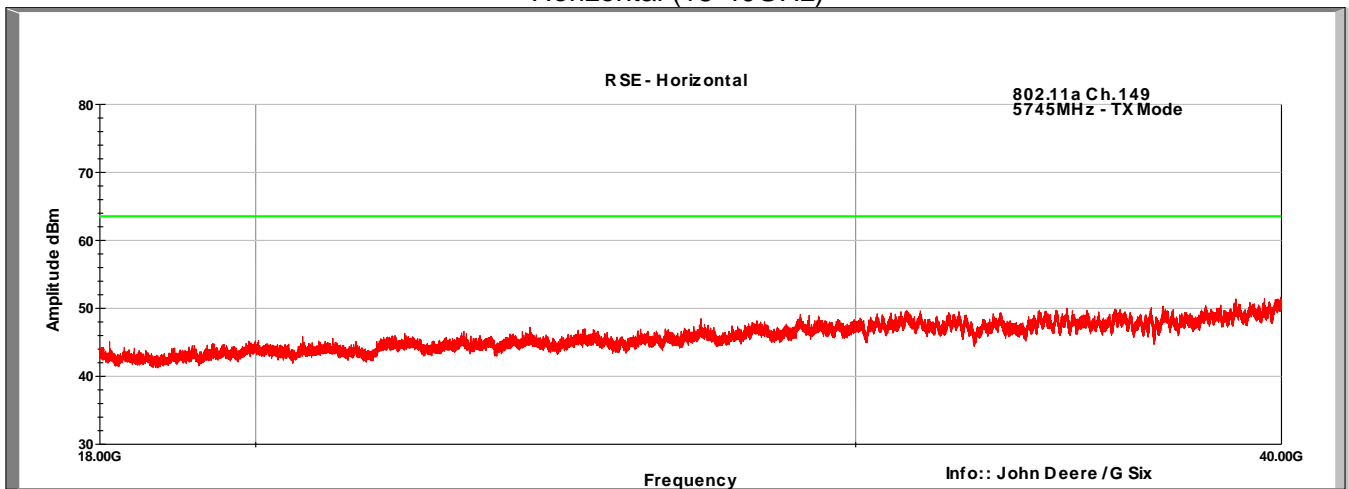
CH 149 802.11a, 6Mbps
Horizontal (6-18GHz)



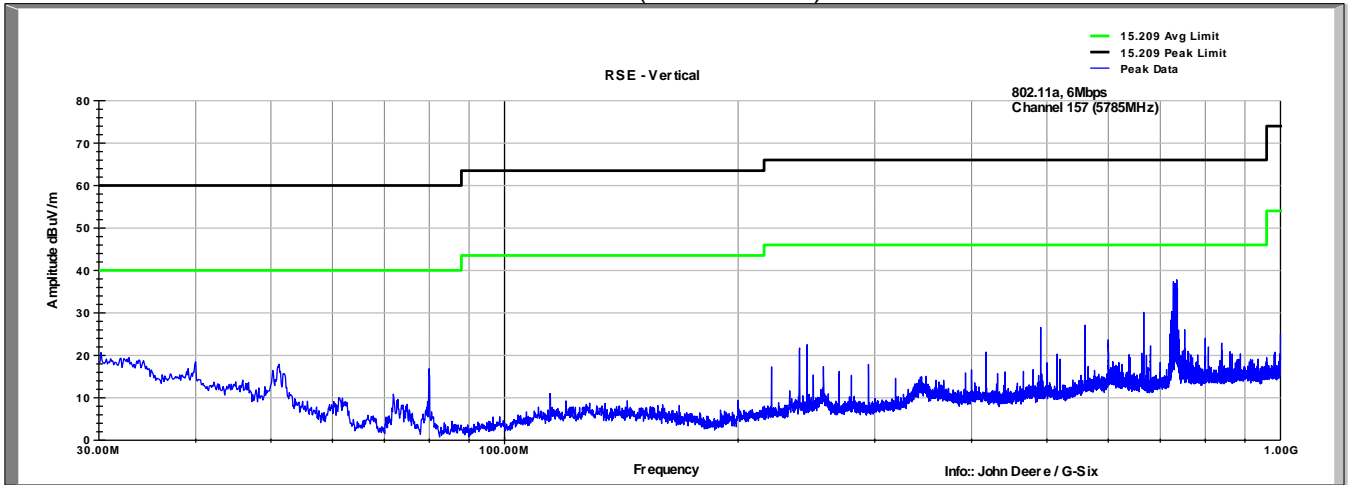
CH 149 802.11a, 6Mbps
Vertical (18-40GHz)



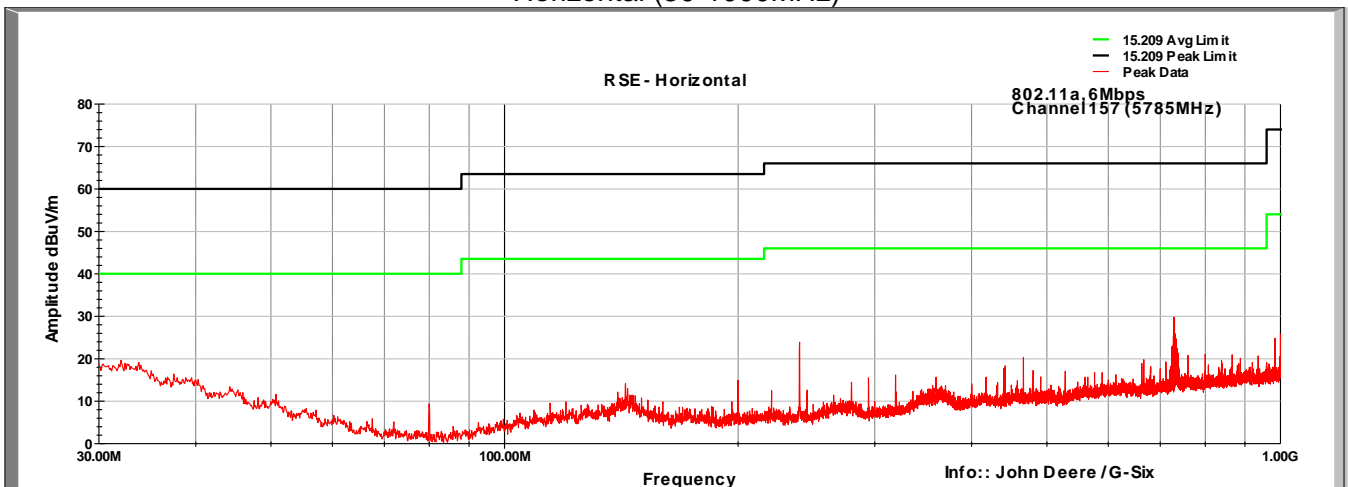
CH 149 802.11a, 6Mbps
Horizontal (18-40GHz)



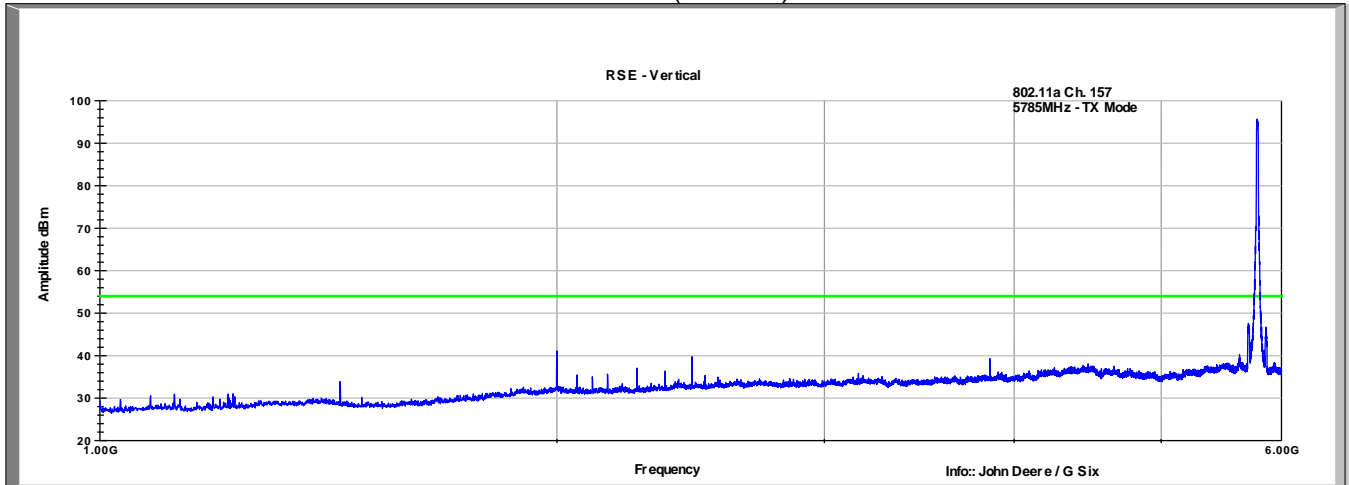
CH 157 802.11a, 6Mbps
Vertical (30-1000MHz)



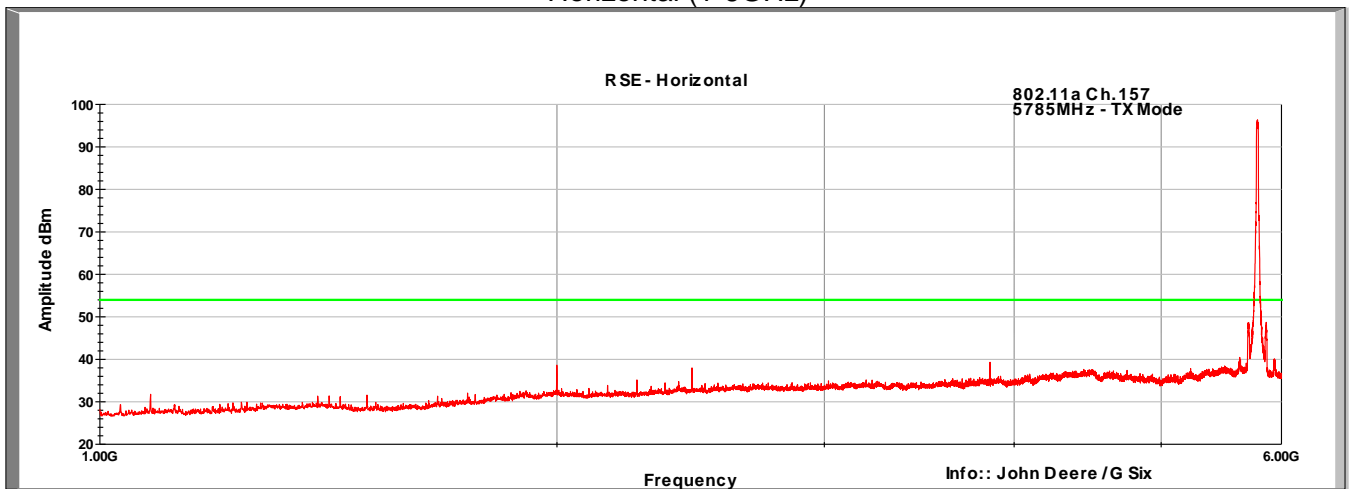
CH 157 802.11a, 6Mbps
Horizontal (30-1000MHz)



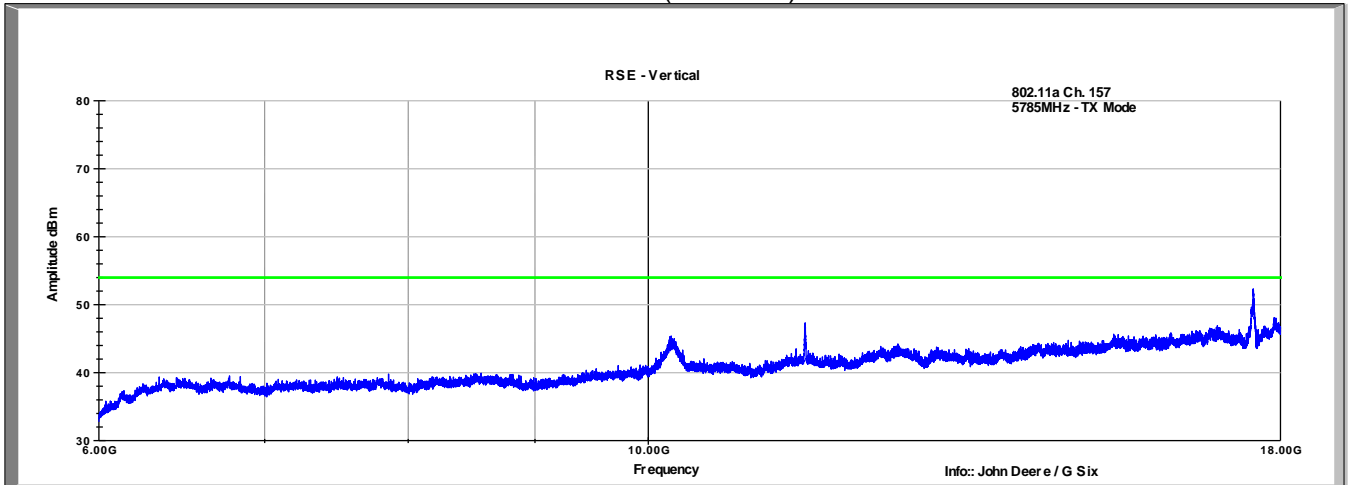
CH 157 802.11a, 6Mbps
Vertical (1-6GHz)



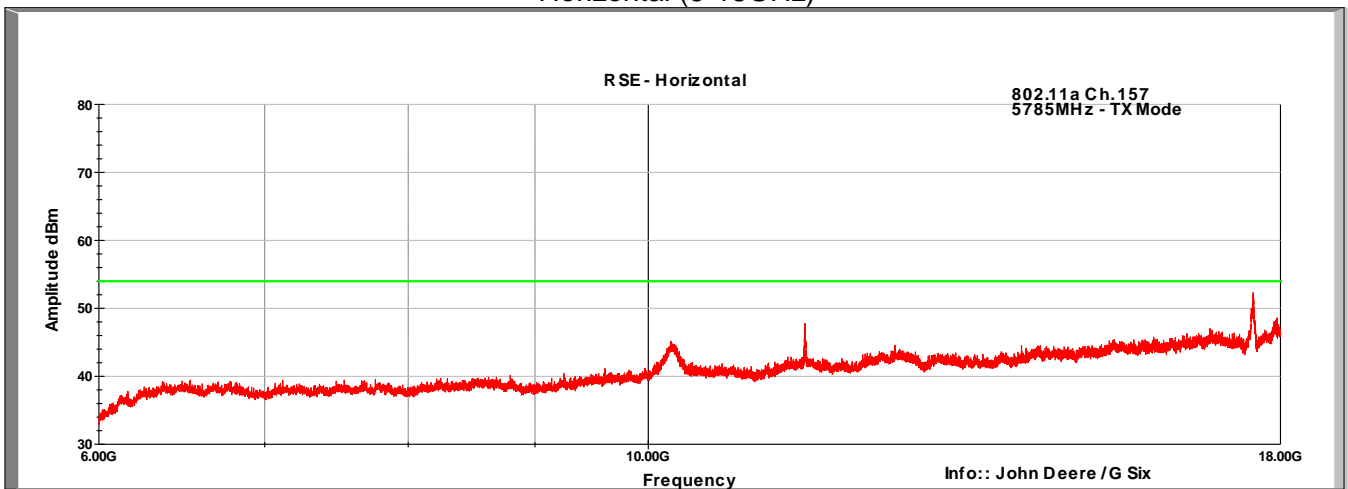
CH 157 802.11a, 6Mbps
Horizontal (1-6GHz)



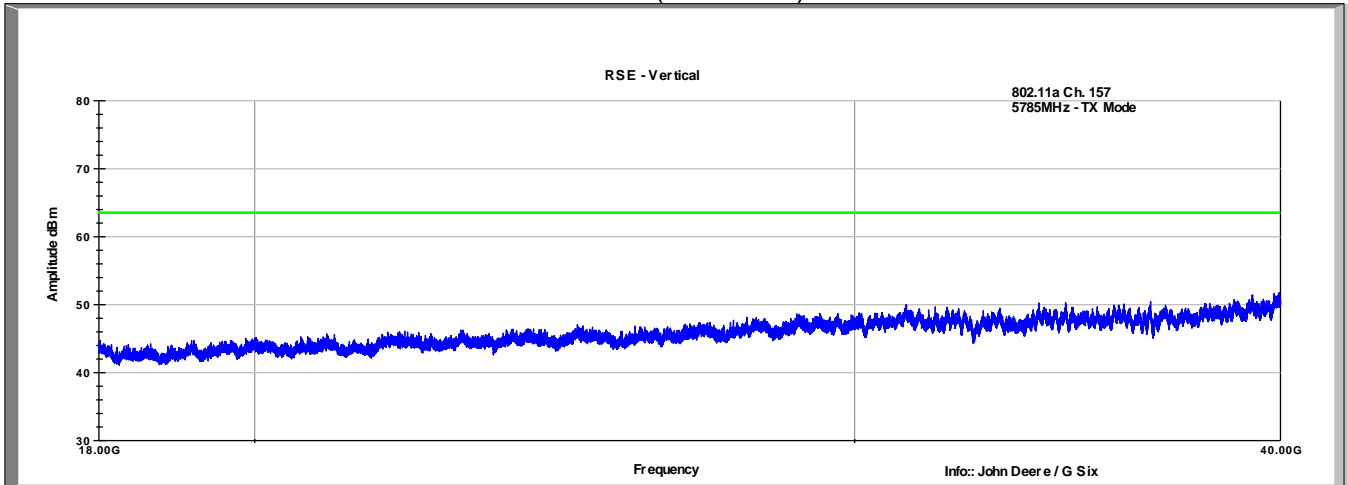
CH 157 802.11a, 6Mbps
Vertical (6-18GHz)



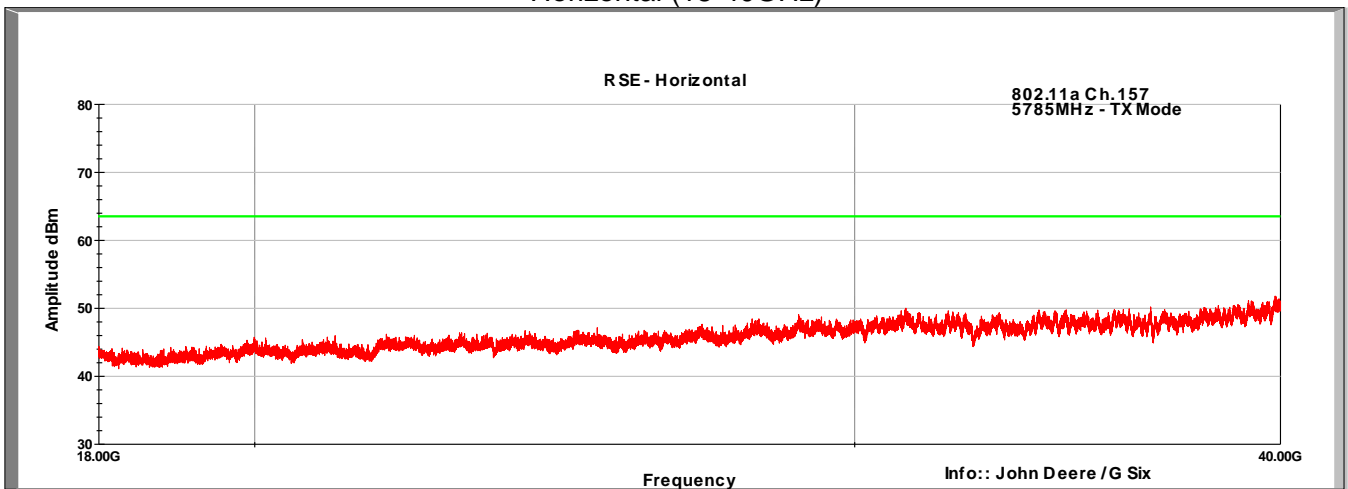
CH 157 802.11a, 6Mbps
Horizontal (6-18GHz)



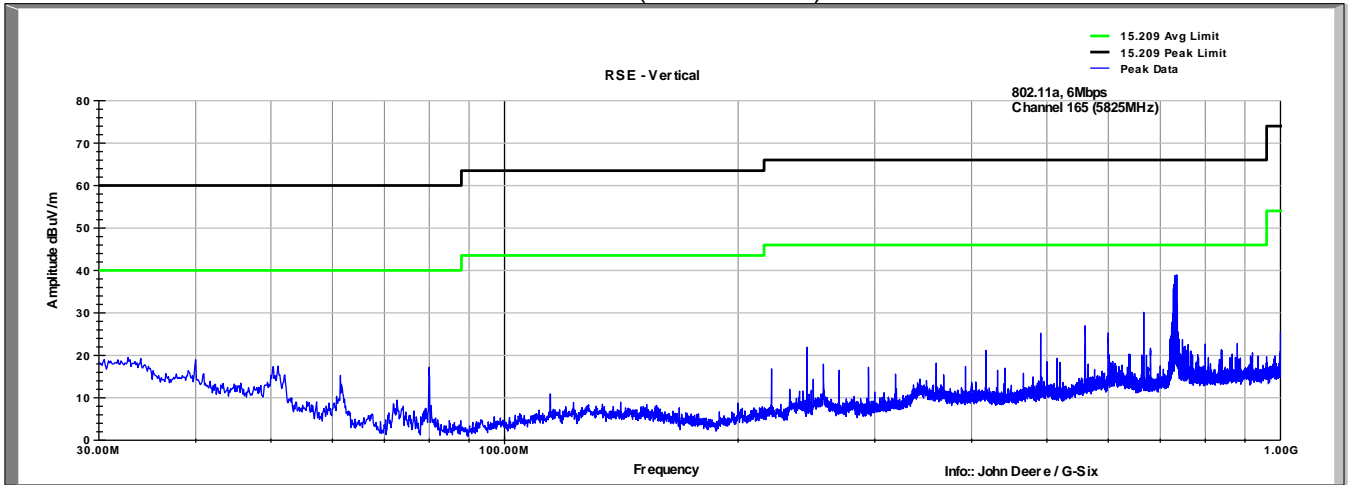
CH 157 802.11a, 6Mbps
Vertical (18-40GHz)



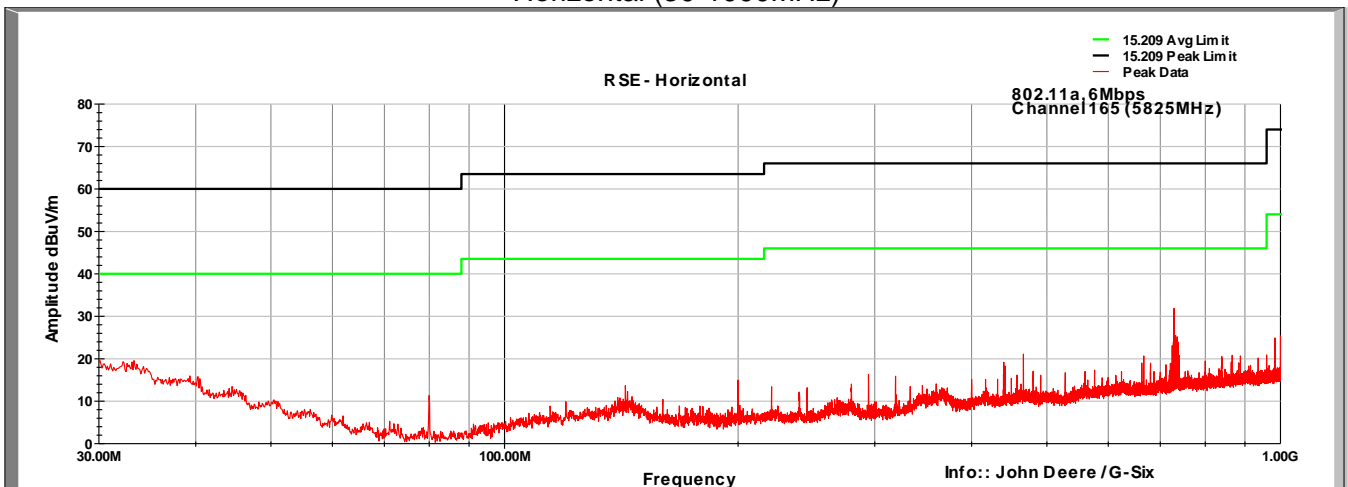
CH 157 802.11a, 6Mbps
Horizontal (18-40GHz)



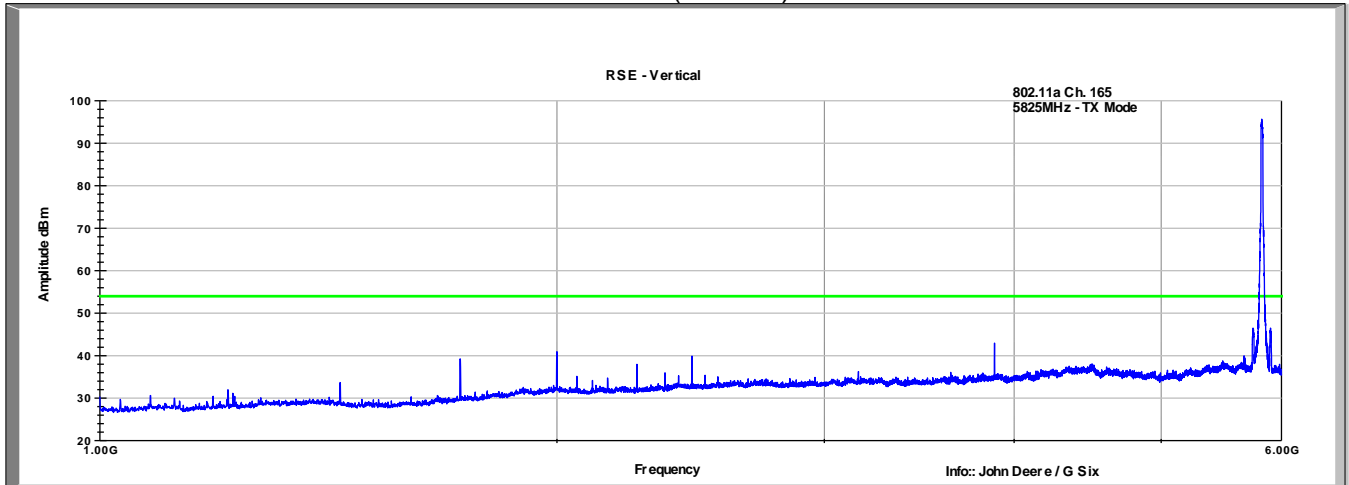
CH 165 802.11a, 6Mbps
Vertical (30-1000MHz)



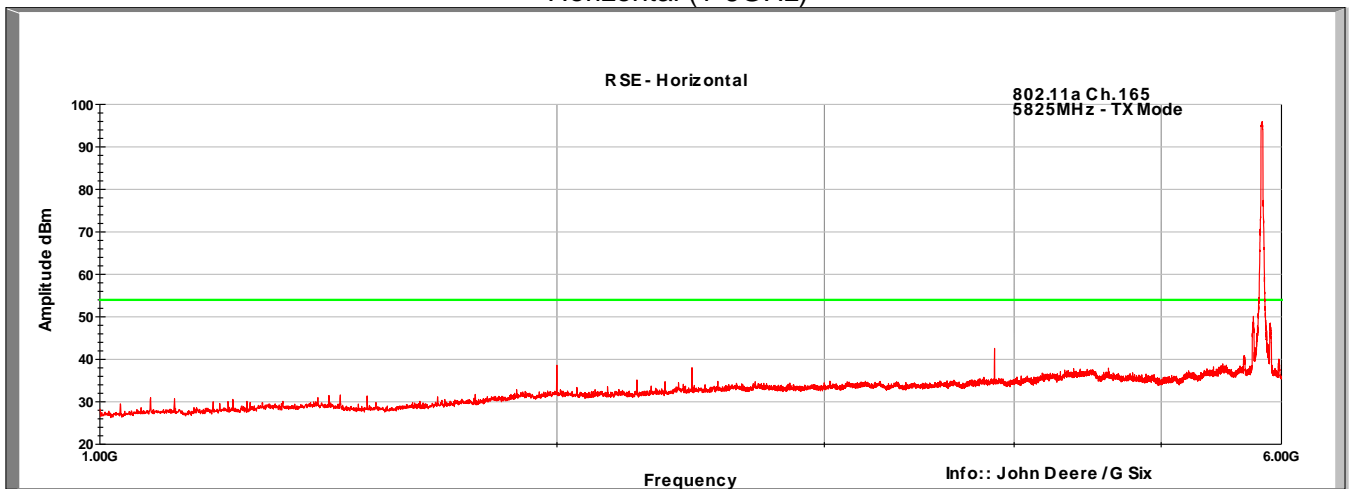
CH 165 802.11a, 6Mbps
Horizontal (30-1000MHz)



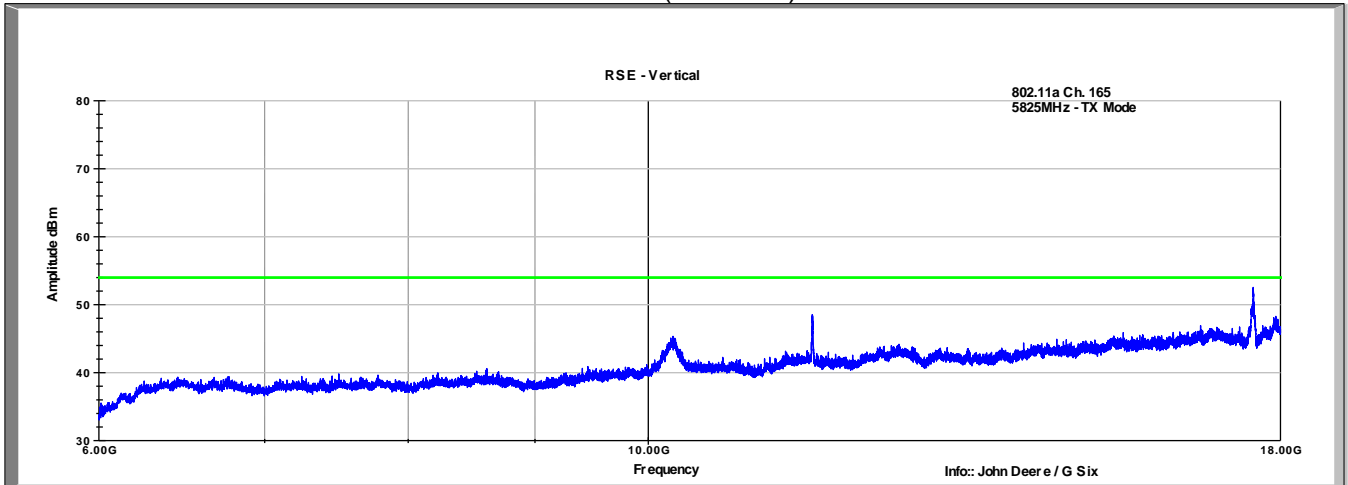
CH 165 802.11a, 6Mbps
Vertical (1-6GHz)



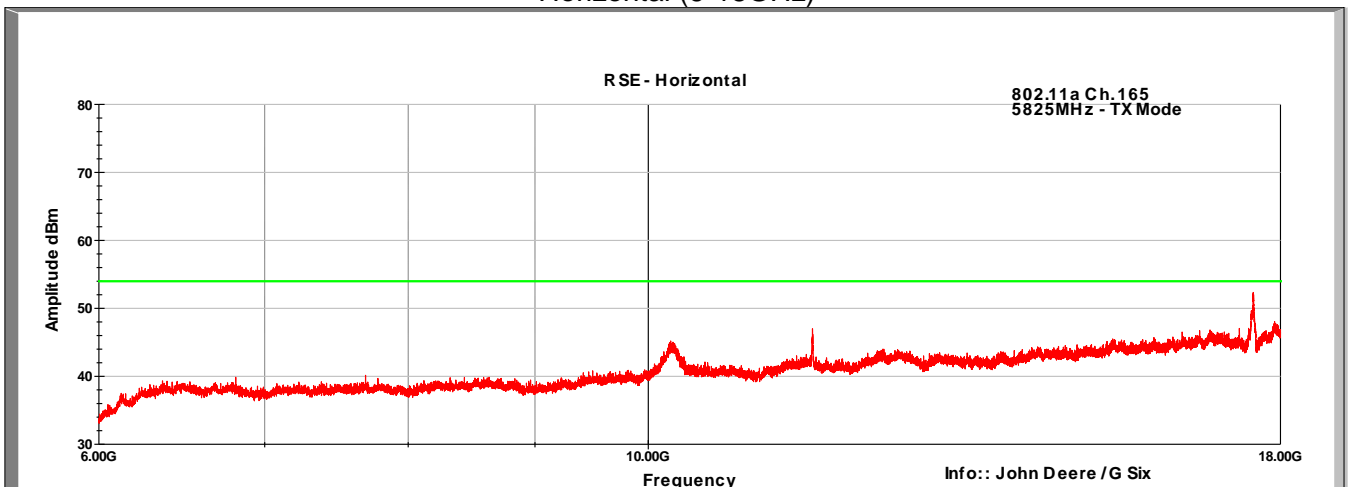
CH 165 802.11a, 6Mbps
Horizontal (1-6GHz)



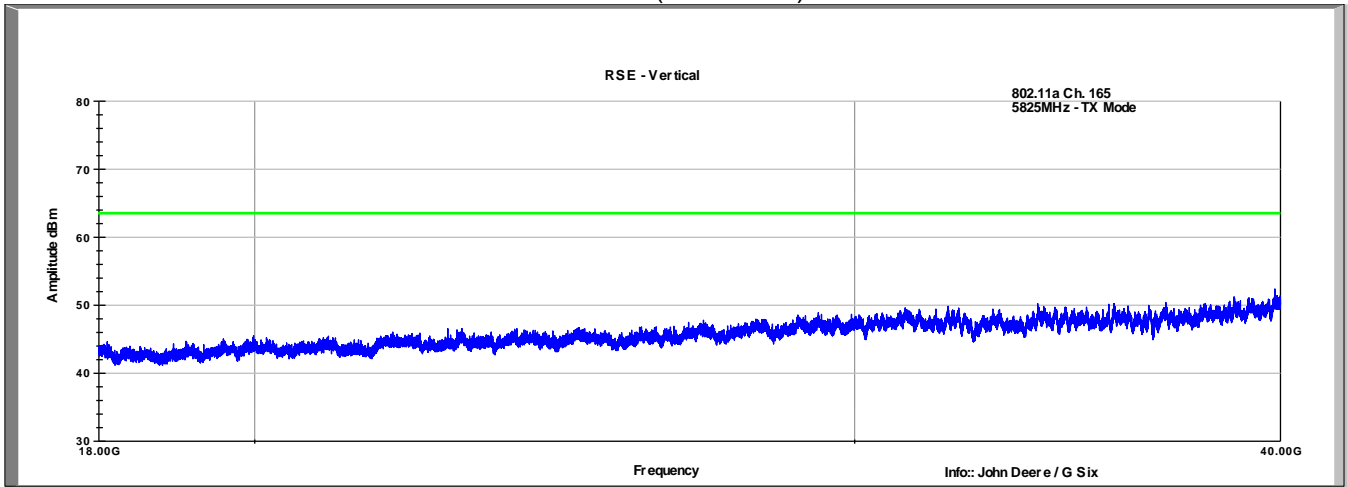
CH 165 802.11a, 6Mbps
Vertical (6-18GHz)



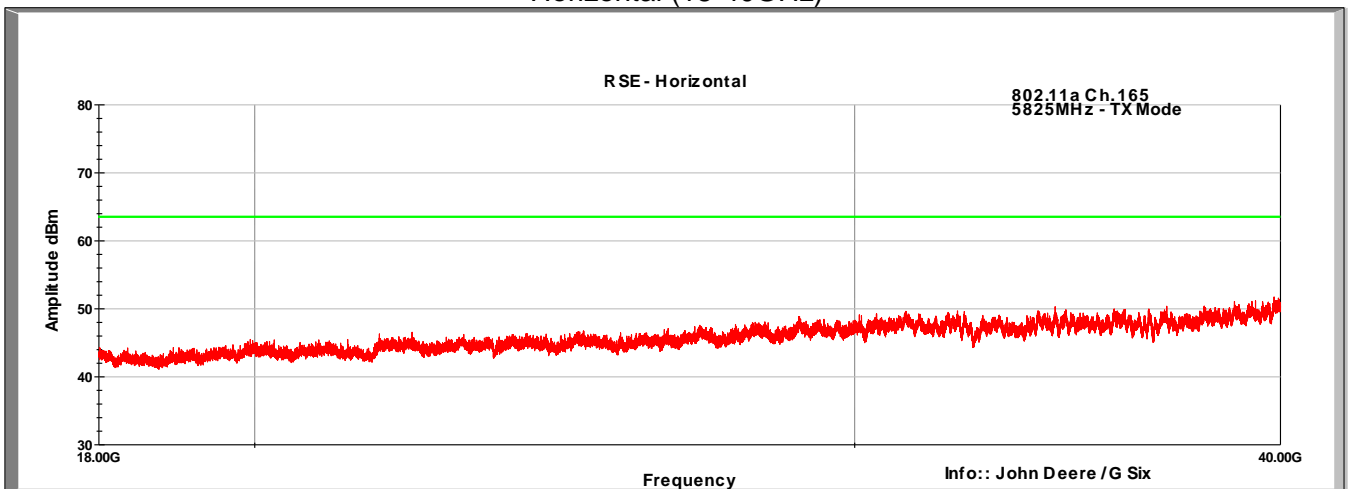
CH 165 802.11a, 6Mbps
Horizontal (6-18GHz)



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