

EMC Test Report

Project Number: 3878032

Report Number: 3878032EMC03

Revision Level: 0

Client: ADTRAN, Inc.

Equipment Under Test: Outdoor Wireless Access Point

Model Number: BSAP 2135

FCC ID: HDCBSAP2135

IC ID: 2250A-BSAP2135

Applicable Standards: FCC Part 15 Subpart C, § 15.247

RSS-247, Issue 1, May 2015

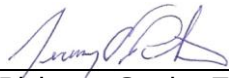
RSS-GEN, Issue 4, November 2014

ANSI C63.10: 2013

Report issued on: 30 October 2015

Test Result: Compliant

Tested by:



Jeremy O. Pickens, Senior EMC Engineer

Reviewed by:



David Schramm, EMC/RF/SAR/HAC Manager

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.

Table of Contents

1	SUMMARY OF TEST RESULTS	3
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	3
2	GENERAL INFORMATION	4
2.1	CLIENT INFORMATION	4
2.1	TEST LABORATORY	4
2.2	GENERAL INFORMATION OF EUT	4
2.3	EUT CONNECTION BLOCK DIAGRAM	5
2.4	SYSTEM CONFIGURATIONS	6
3	FIELD STRENGTH OF SPURIOUS RADIATION	7
3.1	TEST RESULT	7
3.2	TEST METHOD	7
3.3	TEST SITE	7
3.4	TEST EQUIPMENT	8
3.5	TEST DATA – ANTENNA P/N: M6060070MP13620 (1-3GHz)	9
3.6	TEST DATA – ANTENNA P/N: M6060070MP13620 (3-18GHz)	12
3.7	TEST DATA – ANTENNA P/N: M6060070MP13620 (18-26GHz)	15
3.8	TEST DATA – ANTENNA P/N: M6013070P30006I (1-3GHz)	18
3.9	TEST DATA – ANTENNA P/N: M6013070P30006I (3-18GHz)	21
3.10	TEST DATA – ANTENNA P/N: M6013070P30006I (18-26GHz)	24
4	RADIATED EMISSIONS AT BAND EDGE / RESTRICTED BAND	27
4.1	TEST RESULT	27
4.2	TEST METHOD	27
4.3	TEST SITE	27
4.4	TEST EQUIPMENT	27
4.5	TEST DATA	28
5	REVISION HISTORY	29

1 Summary of Test Results

Test Description	Test Specification		Test Result
6dB Bandwidth	15.247(d)	RSS-247 S5.2 (1)	NS(1)
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	NS(1)
Transmitter Output Power	15.247(b) (3)	RSS-247 S5.4 (4)	NS(1)
Radiated Spurious Emissions / Restricted Bands	15.247(d), 15.35(b),15.209	RSS-247 S5.5	Compliant

(1) This evaluation is to support a Class II Permissive Change. Refer to original filing for results.

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: ADTRAN, Inc.
Address: 901 Explorer Blvd.
City, State, Zip, Country: Huntsville, AL 35806

2.1 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

2.2 General Information of EUT

Type of Product: Outdoor Wireless Access Point
Model: BSAP-2135
Serial Number: 21352615050002

Frequency Range: 2400-2483.5MHz
Data Modes: 802.11b, 802.11g, 802.11n (HT20), 802.11n (HT40),
Antenna: TerraWave, 2.4/5 GHz, 6/7 dBi Dual Band MIMO Patch Antenna (P/N: M6060070MP13620)
TerraWave, 2.4/5 GHz, 13/7 dBi High Density MIMO Patch Array (P/N: M6013070P30006I)

Rated Voltage: 48Vdc (PoE)

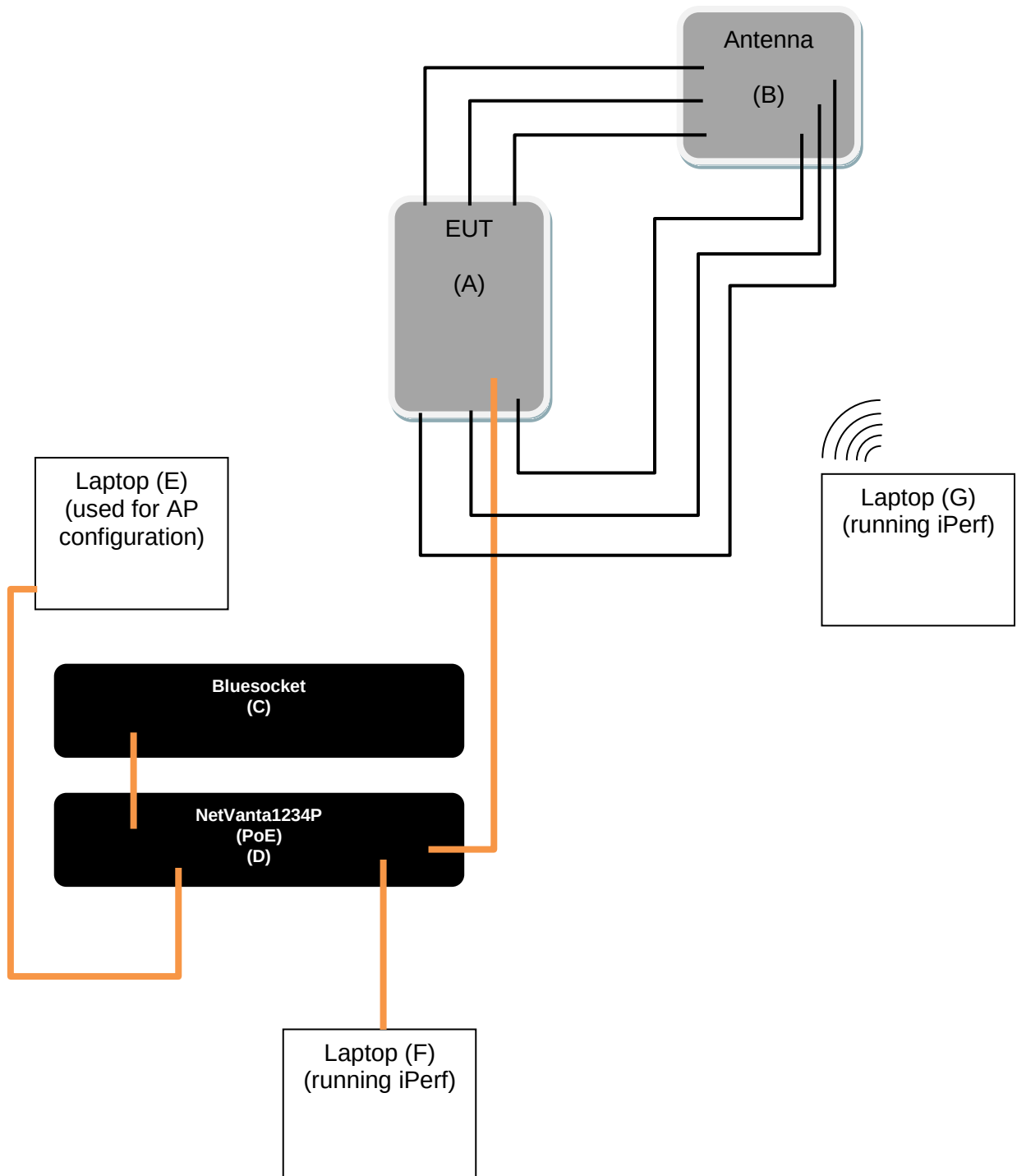
Sample Received Date: 16 September 2015
Dates of testing: 05 – 27 October 2015

Operating Modes and Conditions

For spurious emissions measurements, only the worst-case mode with respect to peak power from the original filing was investigated: 802.11b, 1Mbps. Two different antennas (described in Section 2.2) were used to evaluate the low, middle, and high channels in the 2400-2483.5MHz band.

Continuous traffic was generated using iPerf software which established communication between a laptop on the wired side of the access point and a second laptop connected wirelessly to the access point. Software was provided that allowed the access point to be fixed on each channel under investigation.

2.3 EUT Connection Block Diagram



2.4 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	ADTRAN, Inc.	Outdoor Access Point	BSAP-2135	21352615050002
B	TerraWave	Dual Band MIMO Patch	M6060070MP13620	Not Labeled
	TerraWave	High Density MIMO Patch Array	M6013070P30006I	Not Labeled
C	ADTRAN, Inc.	Bluesocket	1700900F2	80031315020001
D	ADTRAN, Inc.	NetVanta 1234P	1703595G1	Not Labeled
E	Dell	Laptop	Latitude D610	CN-0XD762-48643-629-0517
F	Lenovo	Laptop	T60	L3-PV518
G	Lenovo	Laptop	T420	R8-X9XFV

3 Field Strength of Spurious Radiation

3.1 Test Result

Test Description	Test Specification	Test Result
Spurious Emissions	15.247 (d) and 15.209 RSS-247 S5.5 ANSI C63.10: 2013	Compliant

3.2 Test Method

The preliminary scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector below 1GHz and a Peak detector above 1GHz. For harmonics of the fundamental, Average measurements were made by correcting the peak value with the duty cycle correction factor. For emissions other than harmonics of the fundamental, the Average measurements were made using the Average detector. The receivers resolution bandwidth was set to 120 kHz for measurements taken in the 30MHz to 1GHz frequency range and 1MHz for measurements for 1GHz and higher. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

There is a limit on spurious emissions produced by an intentional radiator in any 100 kHz Bandwidth outside the intentional emission band of -20dBc provided the radiator complies with the limits specified in 15.205© and 15.209(a).

Test distance:

1 to 18 GHz - The EUT to measurement antenna distance is 3 meters

18 to 40 GHz - The EUT to measurement antenna distance is 1 meter

Limits within restricted bands of operation:

Frequency	Limits ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 ⁽²⁾	--
88 - 216 MHz	150	43.5 ⁽²⁾	--
216 - 960 MHz	200	46 ⁽²⁾	--
960 - 1000 MHz	500	54 ⁽²⁾	--
1 - 40 GHz	500	54 ⁽³⁾	74

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.2 – 24.1 °C

Relative Humidity: 32.4 - 42.6 %

3.4 Test Equipment

Final Test Date: 22-Oct-2015

Tester: JOP

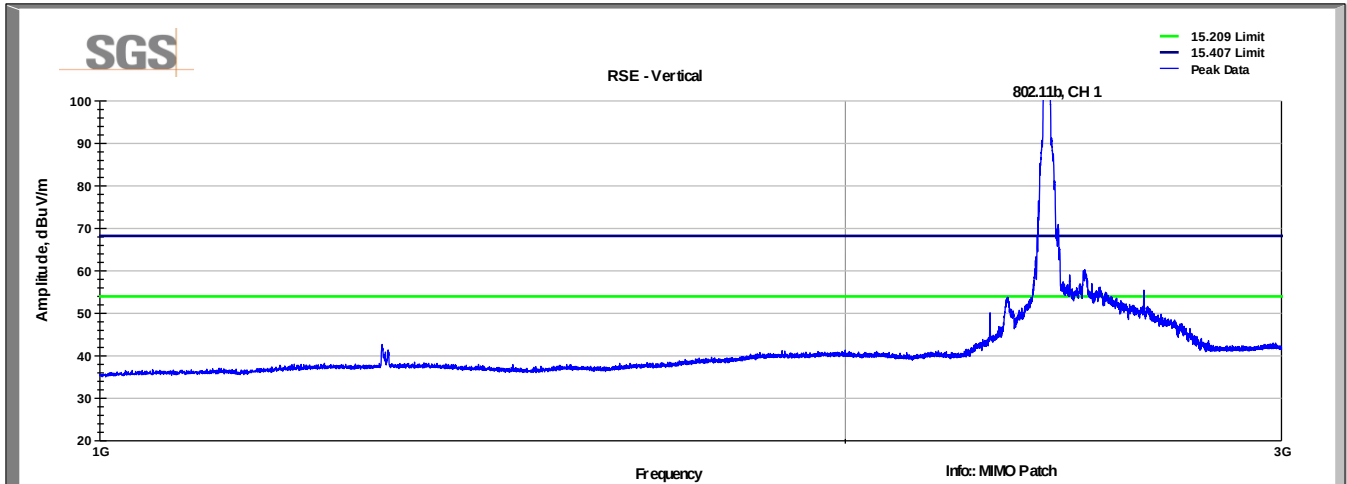
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	9-Jul-2016
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	4-Aug-2016
DRG HORN (MEDIUM)	3117	ETS-LINDGREN	B079691	9-Jul-2016
SMALL HORN ANTENNA	LB-180400-20-C-KF	A-INFOMW	15007	11-Mar-2016
DESKTOP AMPLIFIER 1-18 GHZ	NSP1800-25-HG	MITEQ	B085930	30-Mar-2016
PREAMPLIFIER-ANTENNA SYS	TS-PR18	ROHDE & SCHWARZ	B094463	13-Feb-2016
FIXED GAIN AMPLIFIER	NSP1840-HG	MITEQ	B087572	15-Oct-2016
RF CABLE - 7000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079712	3-Aug-2016
DRG HORN (MEDIUM)	3117	ETS-LINDGREN	B079691	9-Jul-2016
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079713	3-Aug-2016
10DB ATTENUATOR	10DB	ROHDE & SCHWARZ	B095594	5-Aug-2016
RF CABLE - 12000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079717	3-Aug-2016
COAXIAL CABLE	SUCOFLEX 102	HUBER&SUHNER	B079824	4-Aug-2016
COAXIAL CABLE	SUCOFLEX 102	HUBER&SUHNER	B079823	4-Aug-2016
FILTER	HPM50112	MICRO-TRONICS	B093647	5-Aug-2016
HIGH PASS FILTER	HPM50111	MICRO-TRONICS	B085747	5-Aug-2016

Note: The calibration period equipment is 1 year.

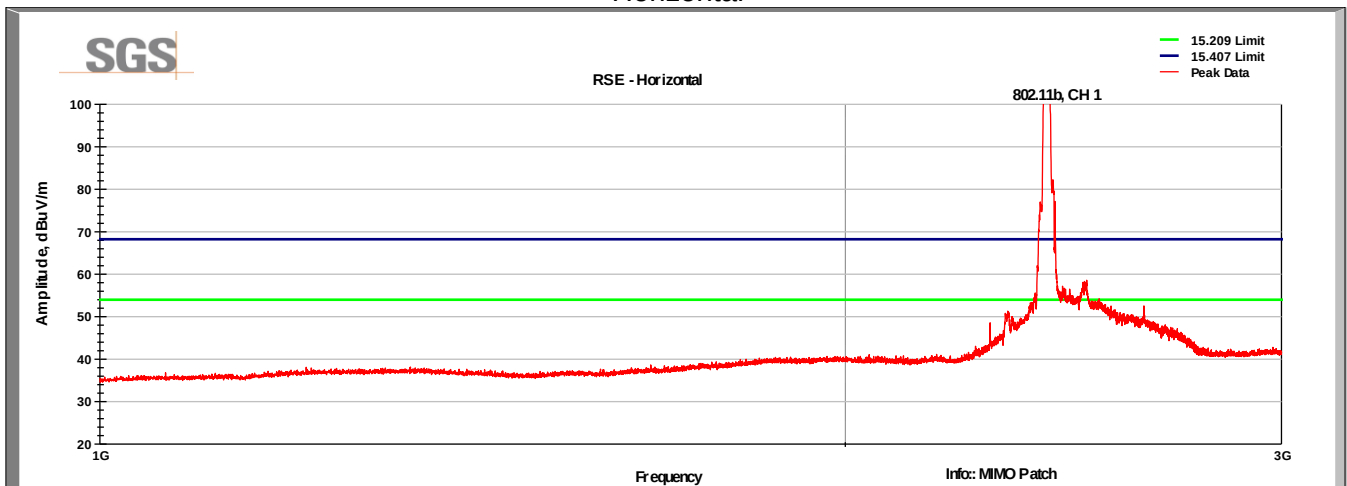
3.5 Test Data – Antenna P/N: M6060070MP13620 (1-3GHz)

CH 1 802.11b, 1Mbps

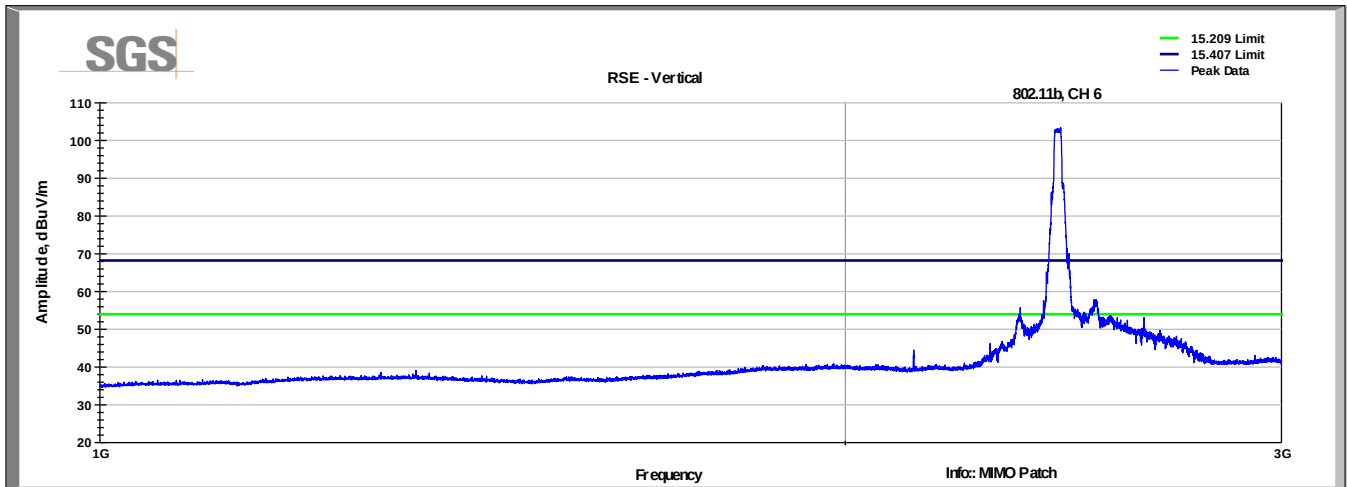
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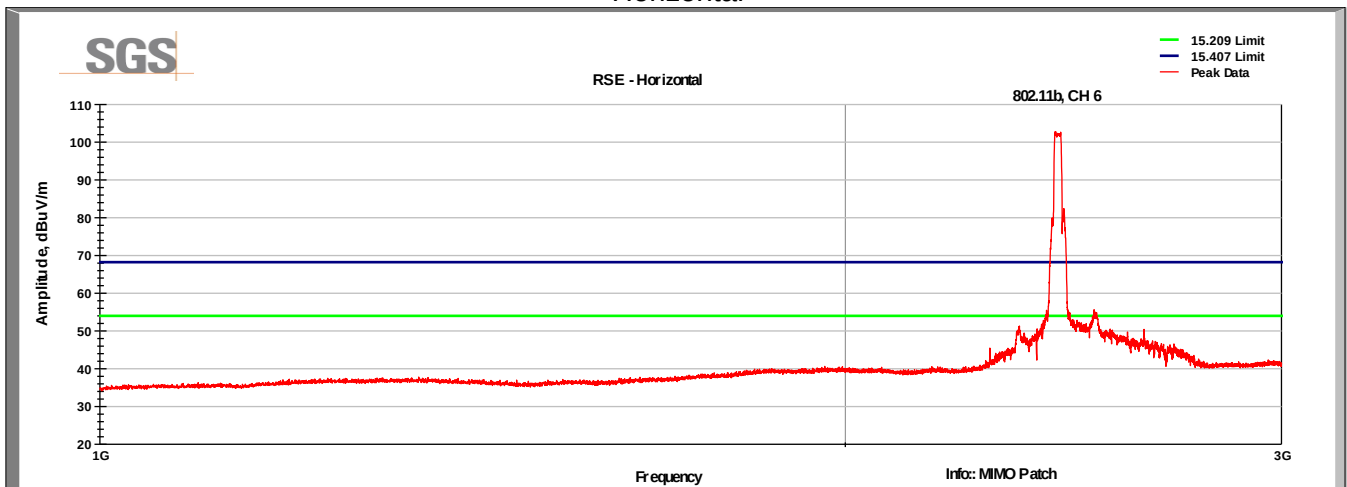
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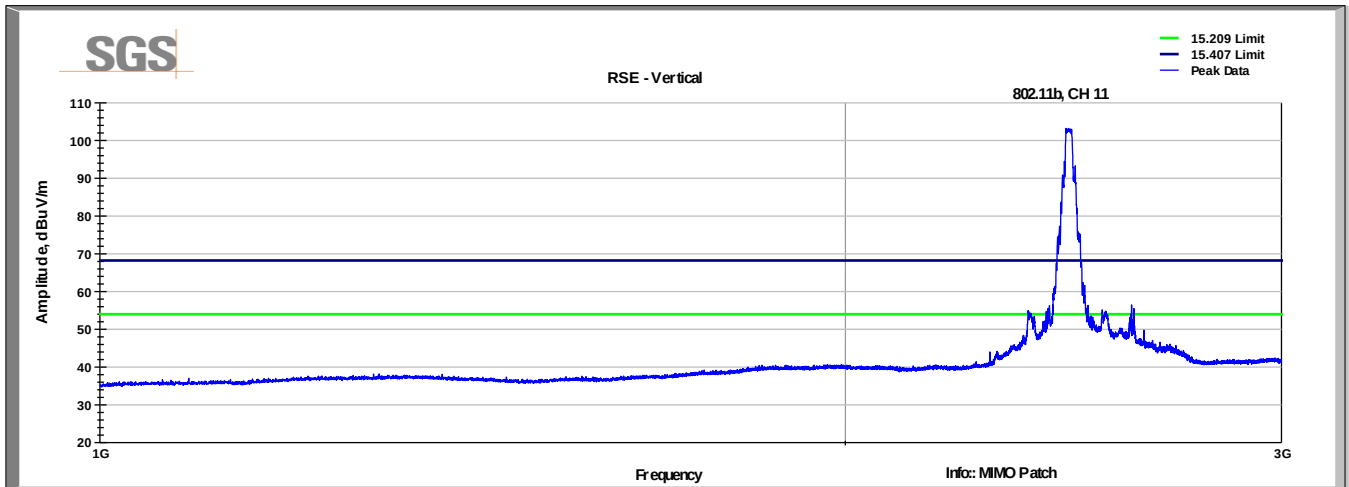
CH 6 802.11b, 1Mbps Vertical



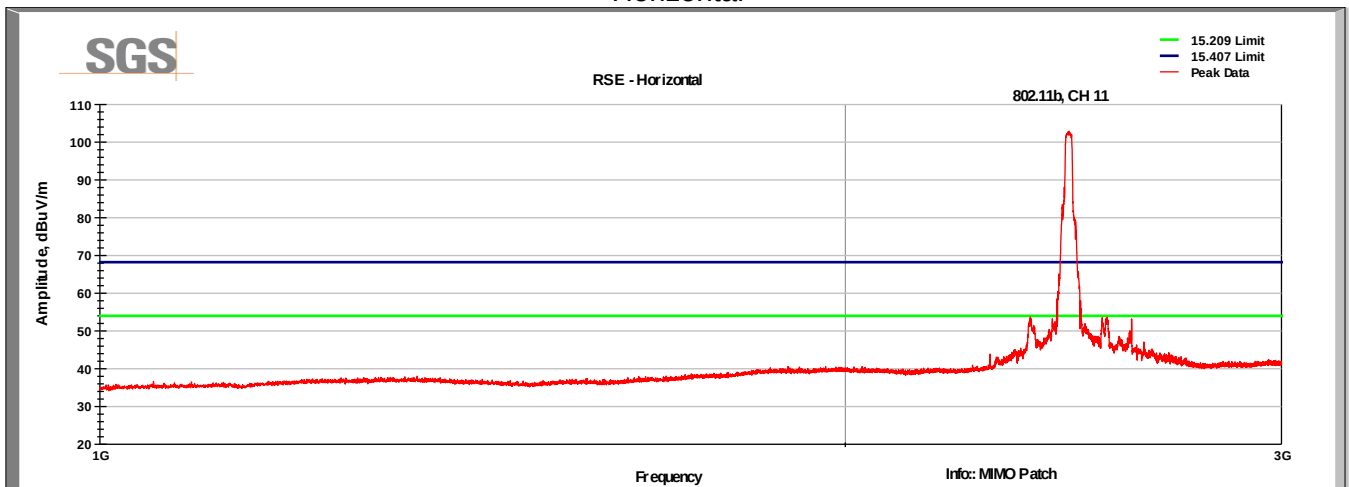
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CH 11 802.11b, 1Mbps Vertical



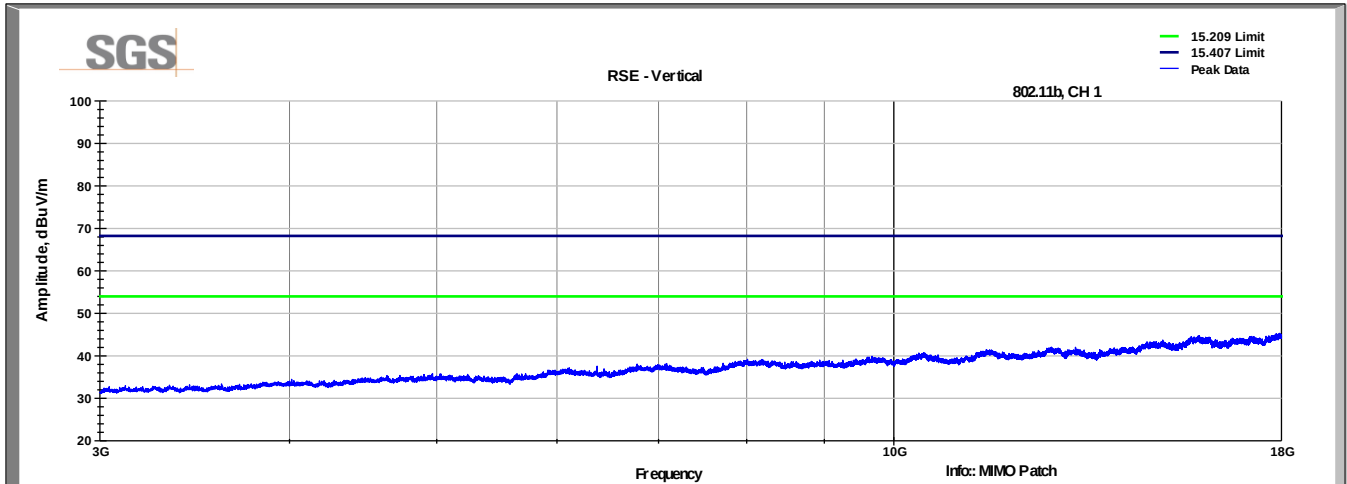
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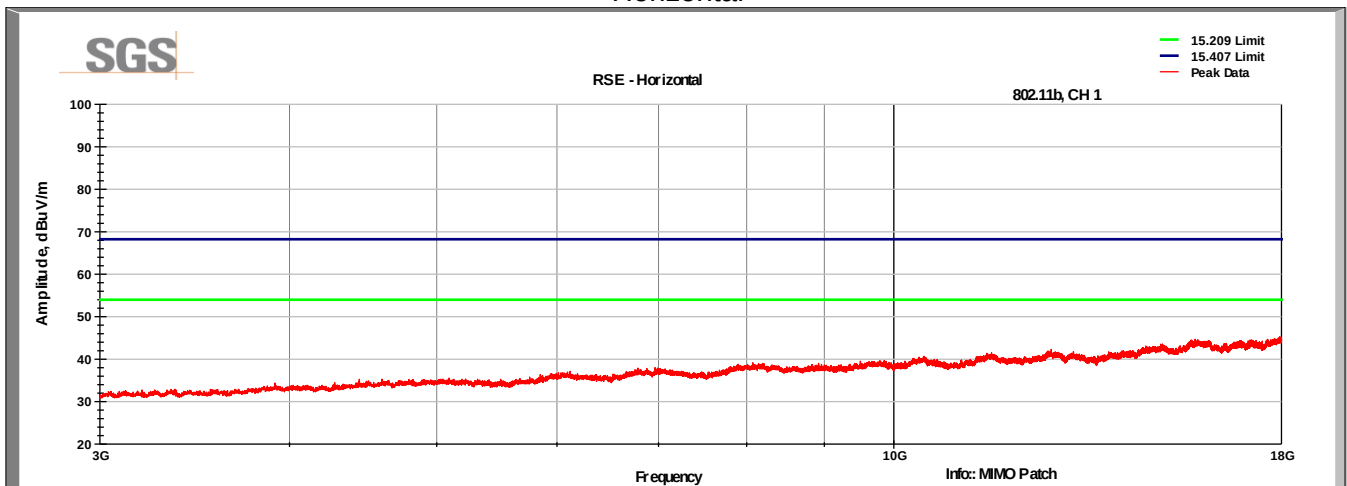
3.6 Test Data – Antenna P/N: M6060070MP13620 (3-18GHz)

CH 1 802.11b, 1Mbps

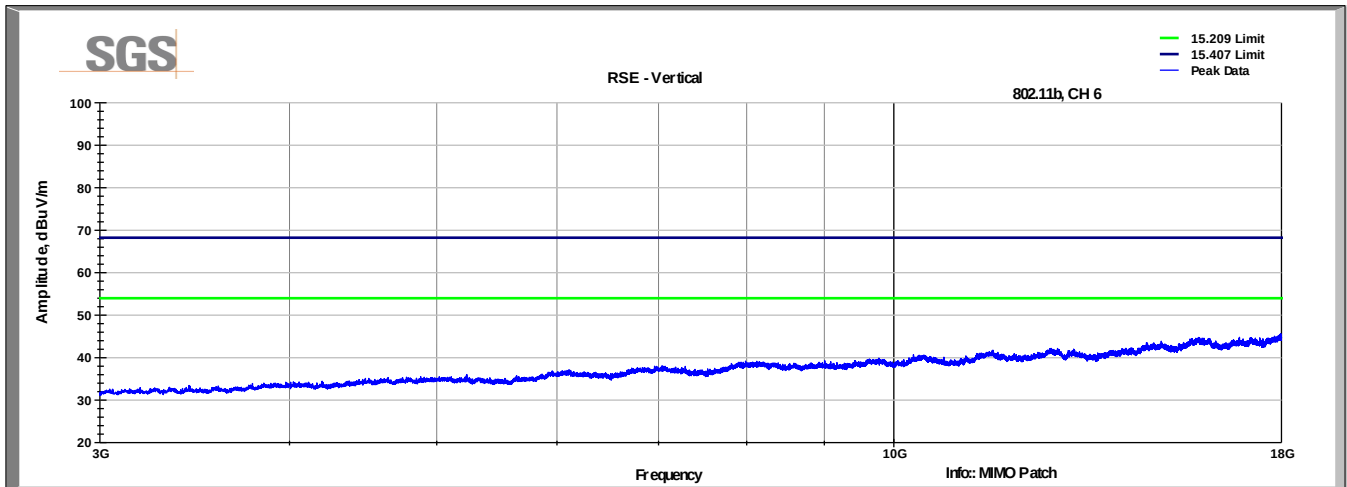
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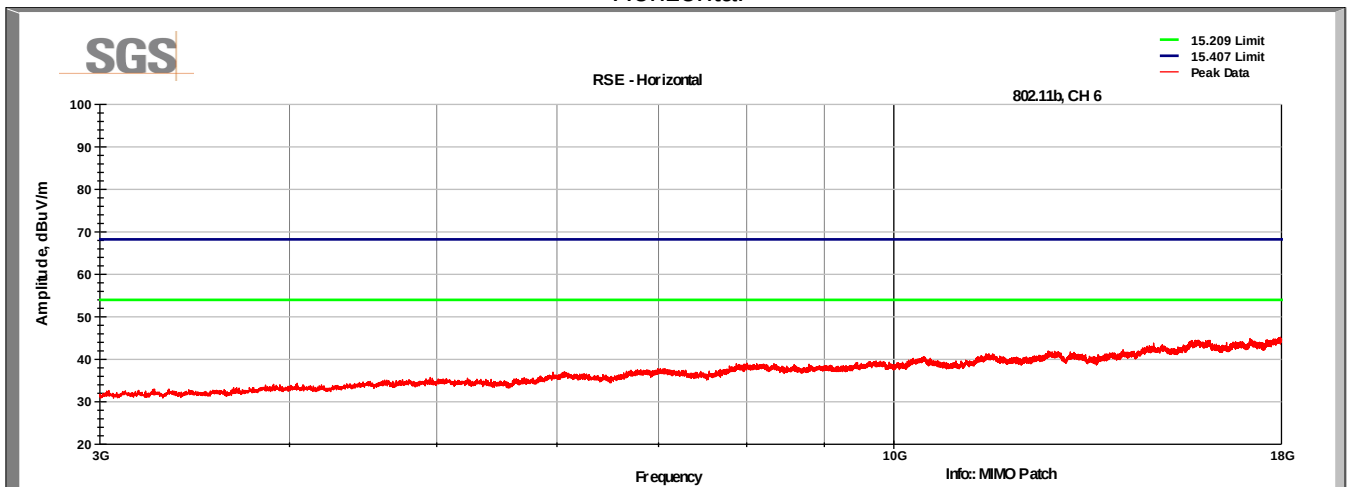
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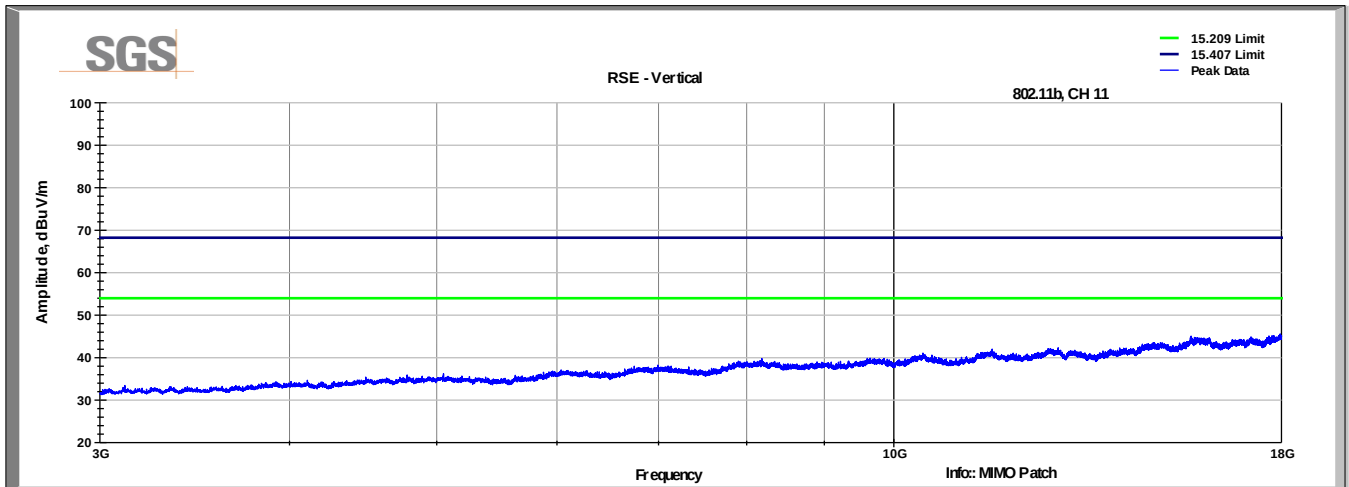
CH 6 802.11b, 1Mbps Vertical



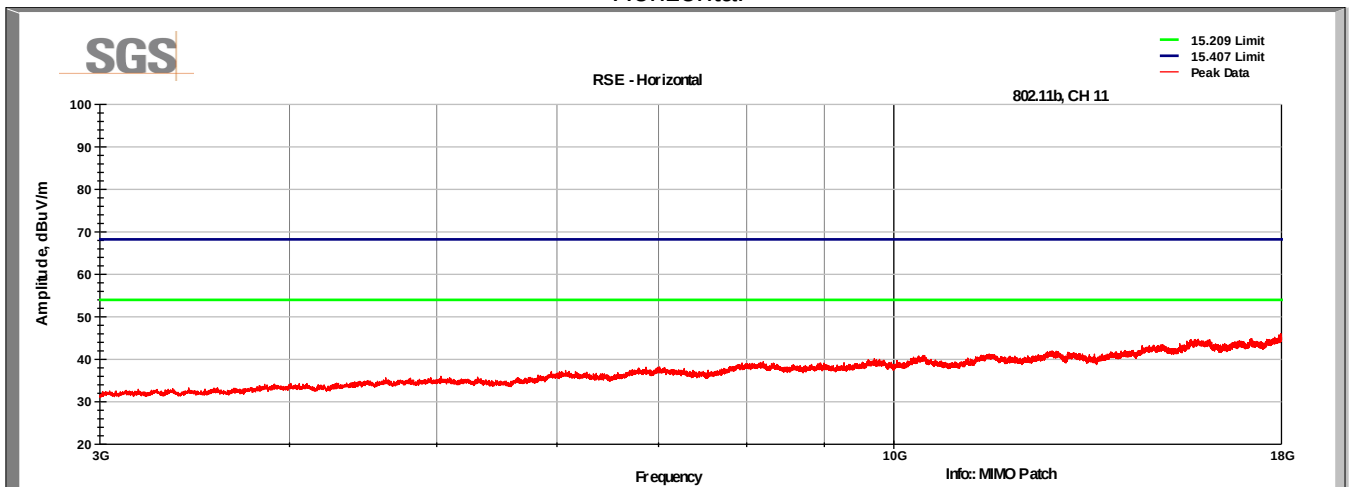
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CH 11 802.11b, 1Mbps Vertical



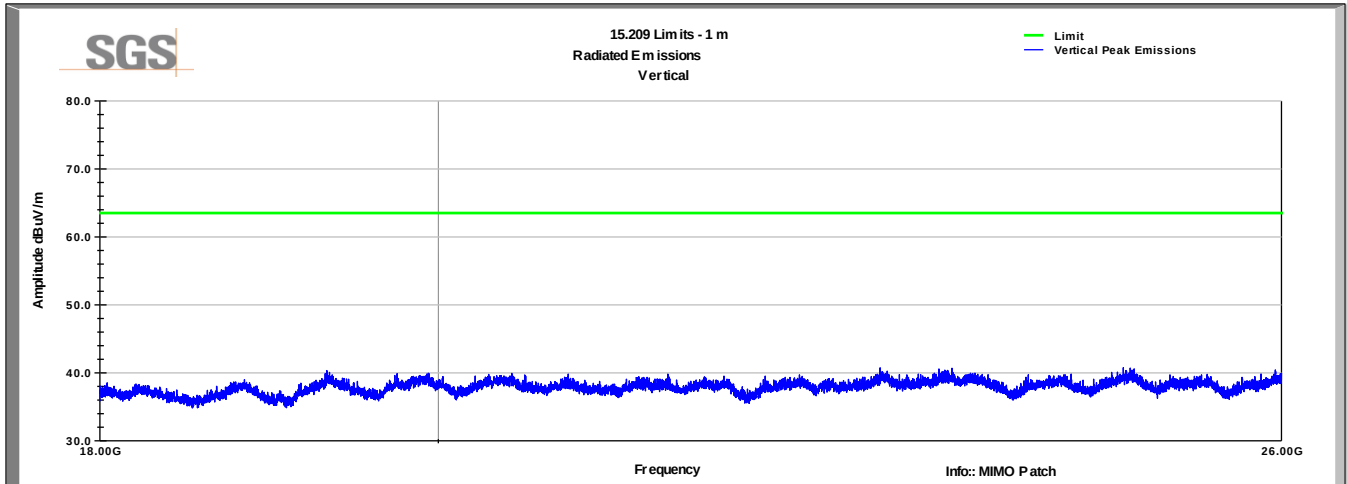
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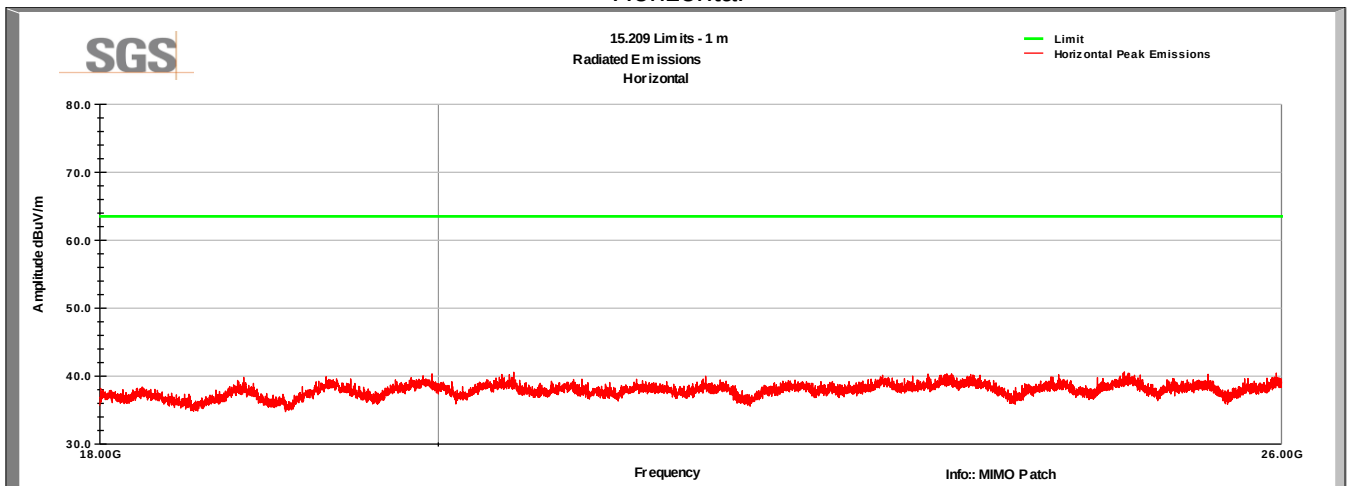
3.7 Test Data – Antenna P/N: M6060070MP13620 (18-26GHz)

CH 1 802.11b, 1Mbps

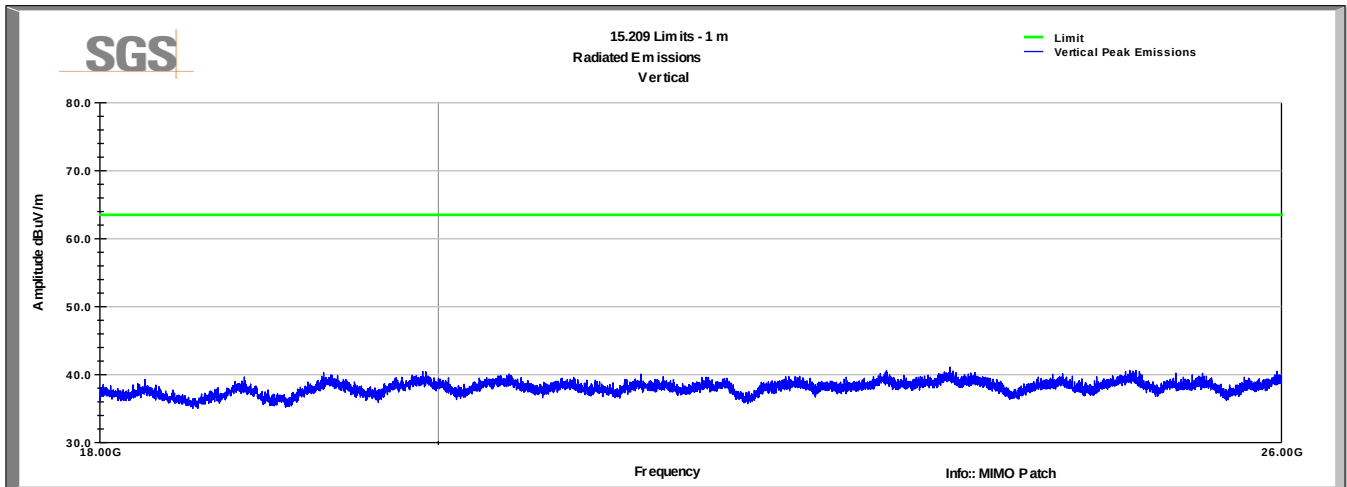
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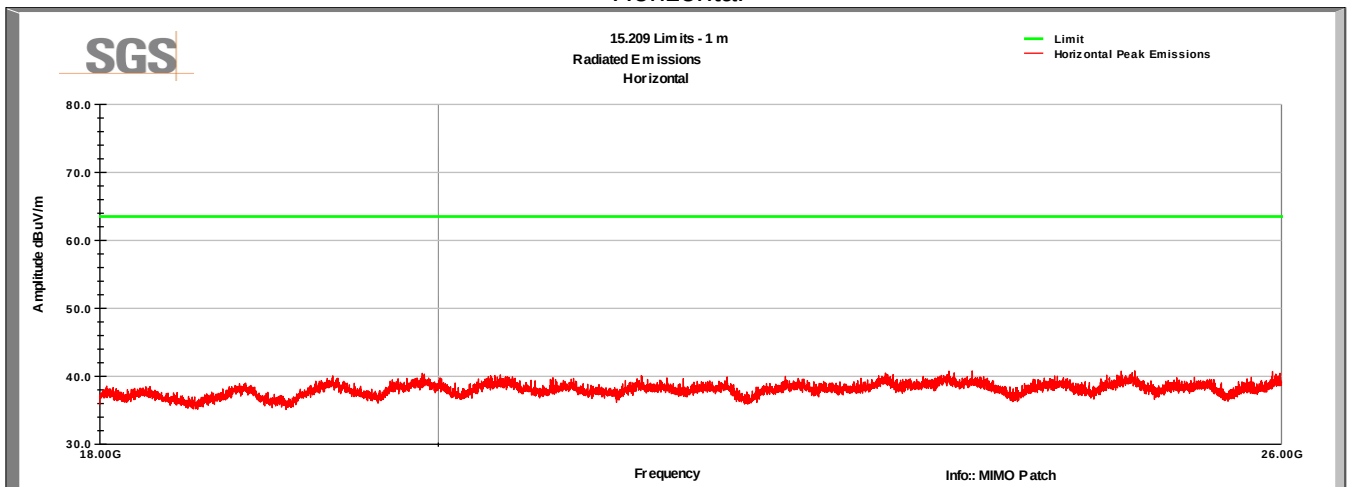
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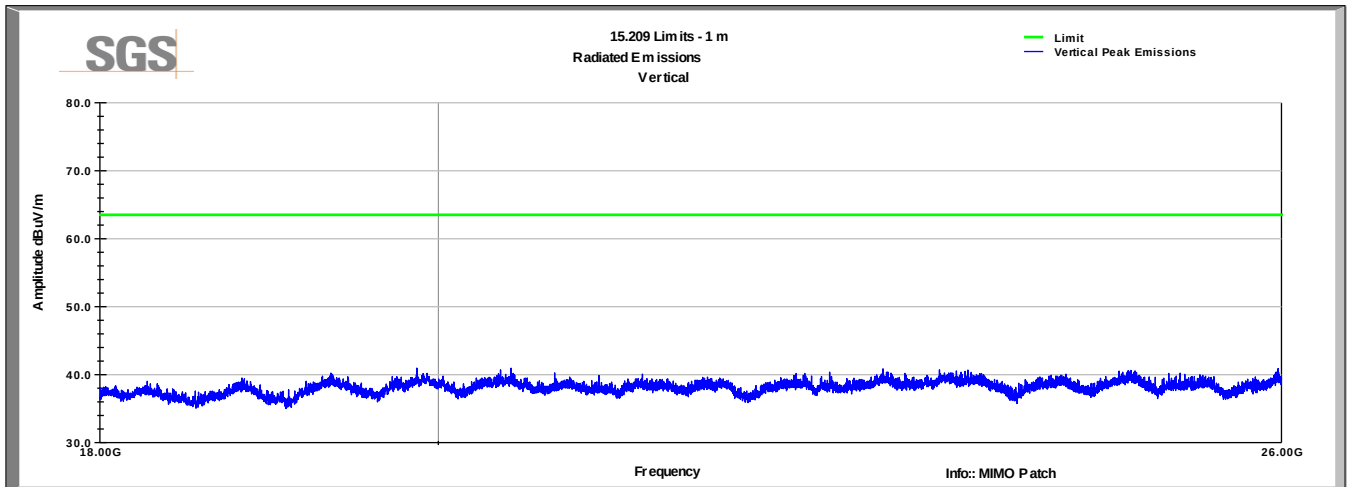
CH 6 802.11b, 1Mbps Vertical



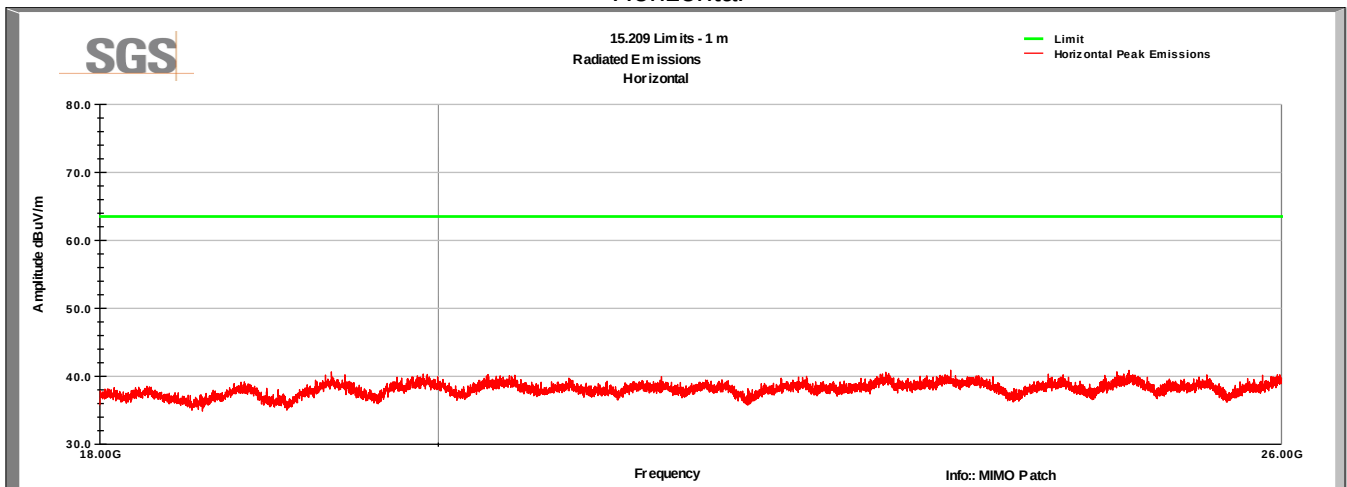
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CH 11 802.11b, 1Mbps Vertical



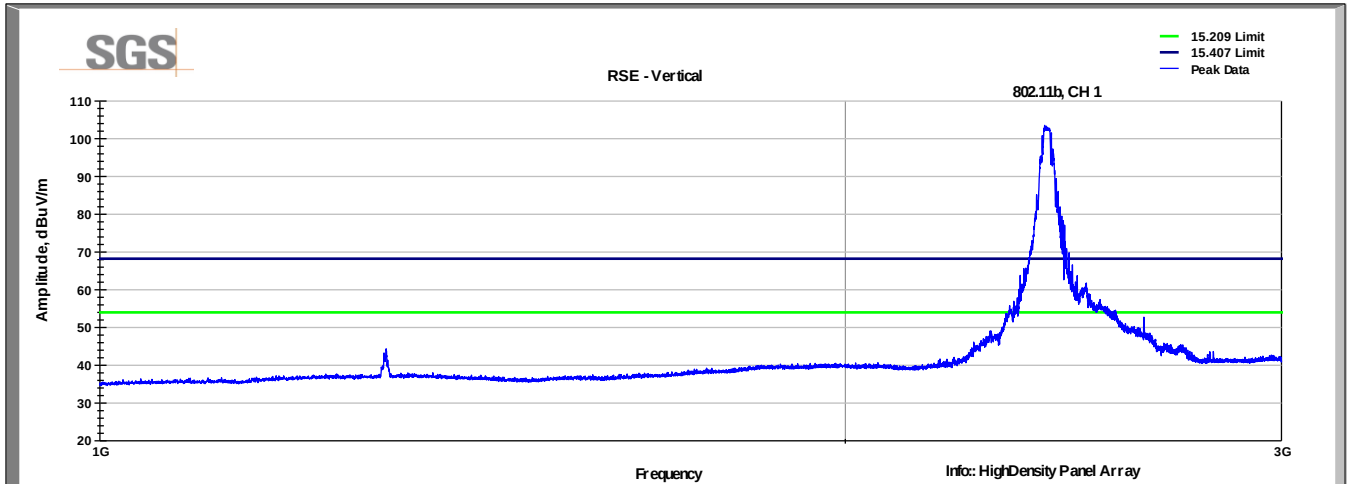
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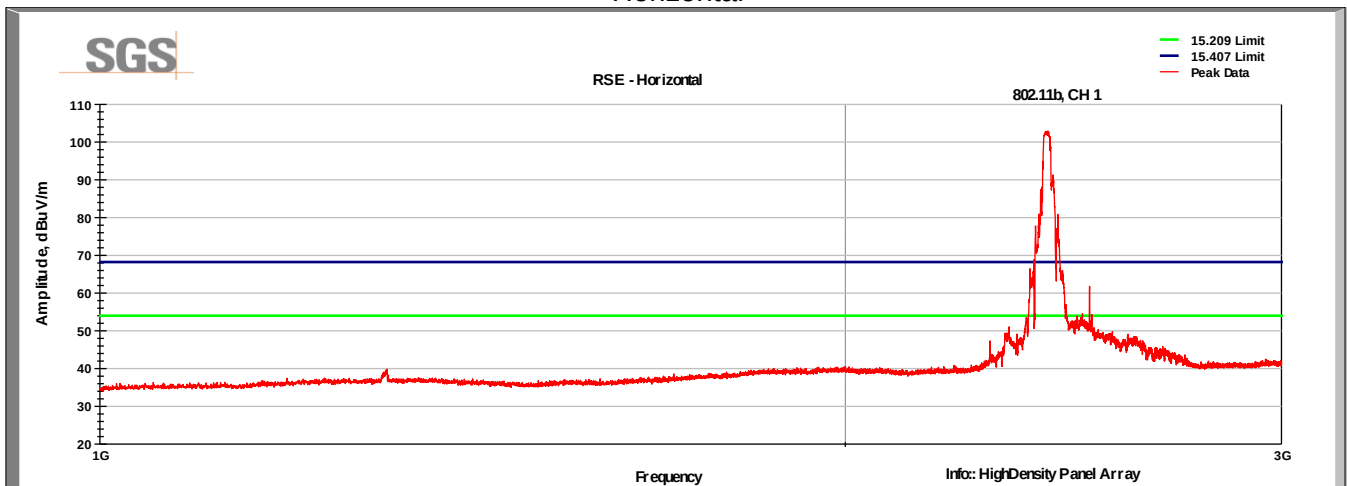
3.8 Test Data – Antenna P/N: M6013070P30006I (1-3GHz)

CH 1 802.11b, 1Mbps

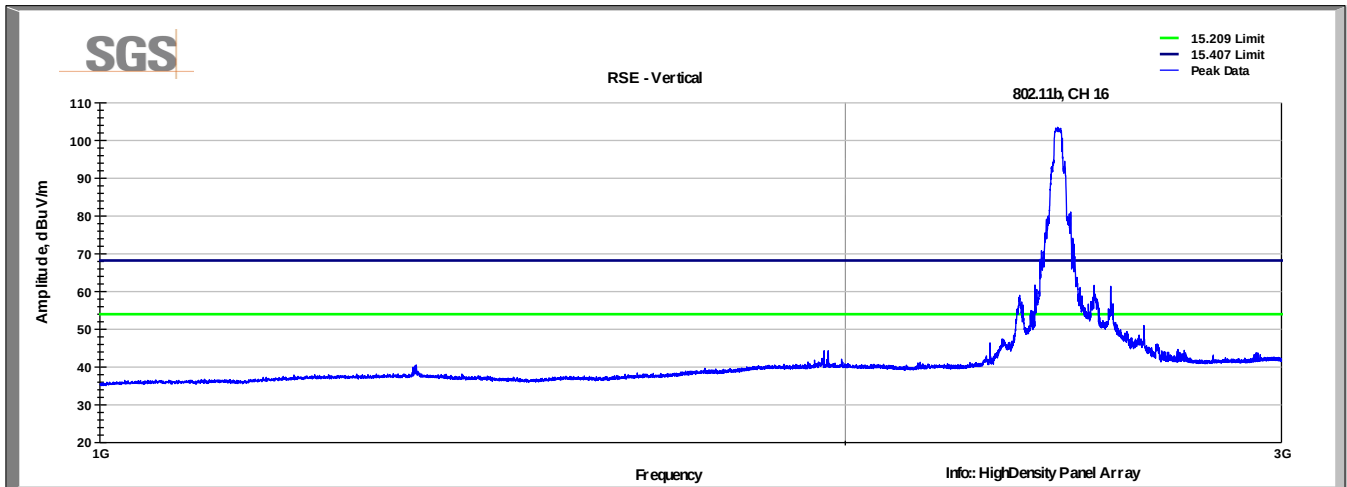
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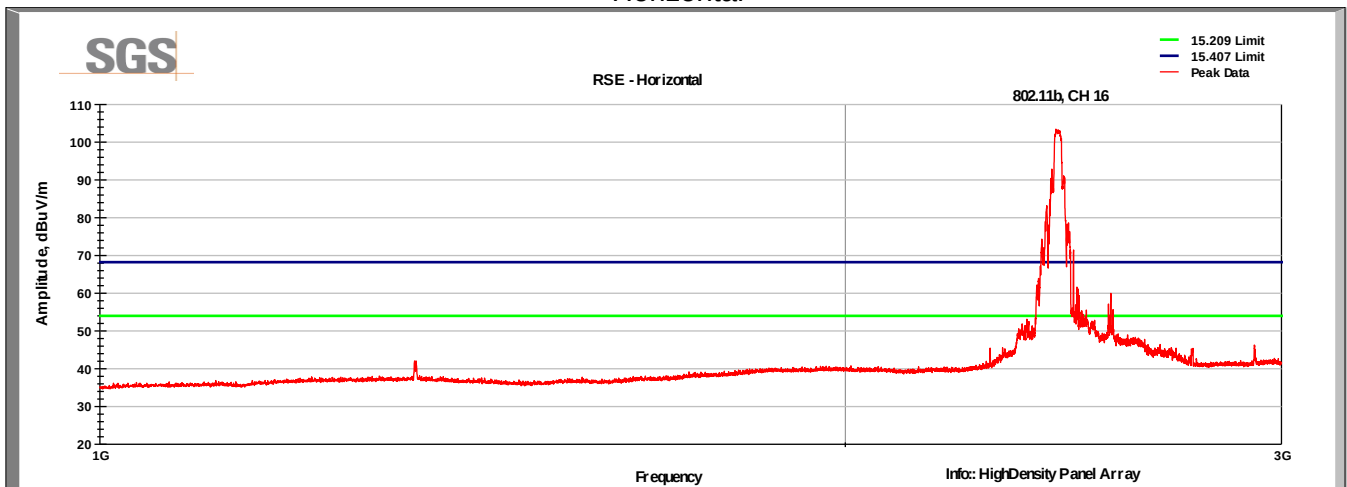
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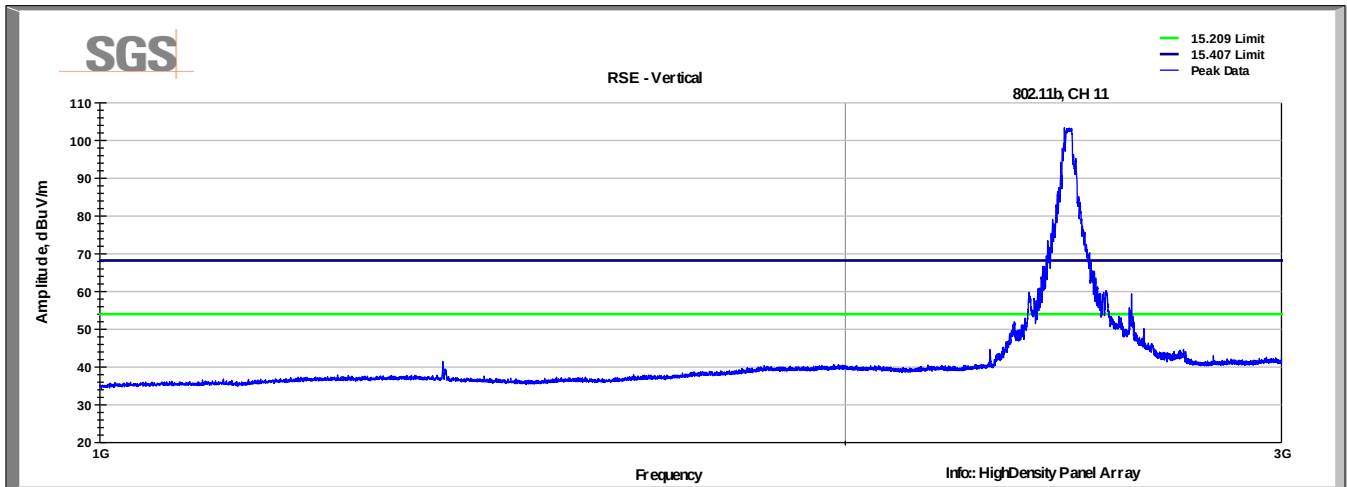
CH 6 802.11b, 1Mbps Vertical



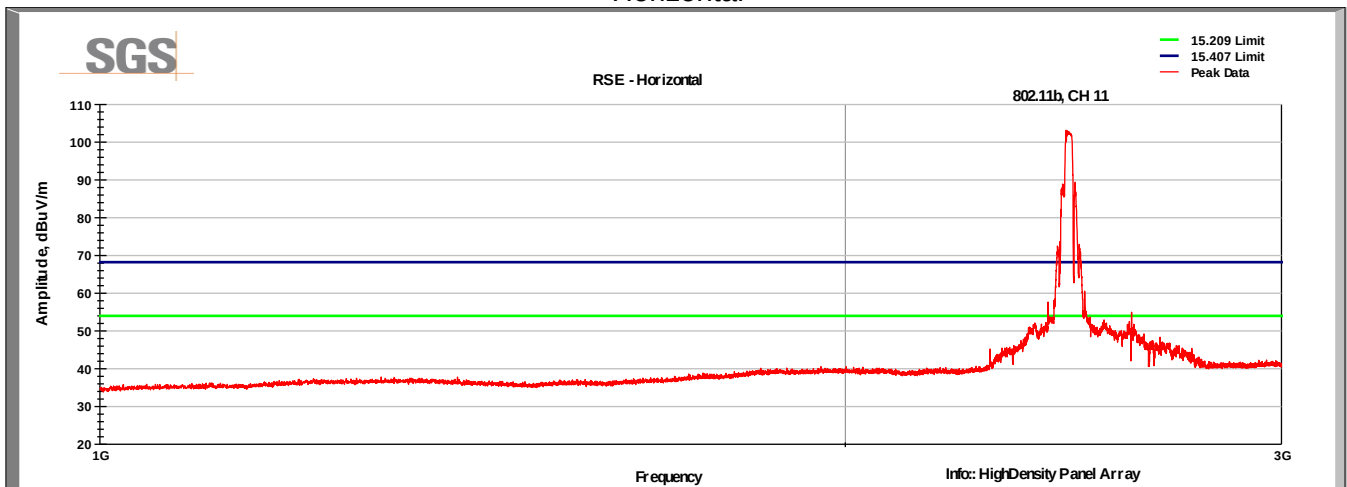
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CH 11 802.11b, 1Mbps Vertical



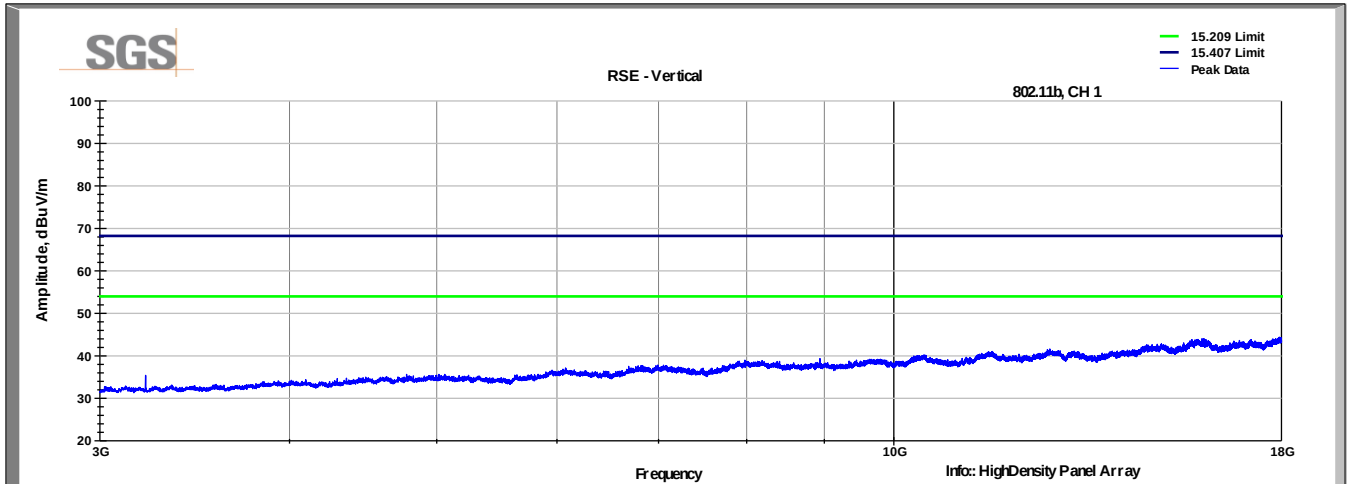
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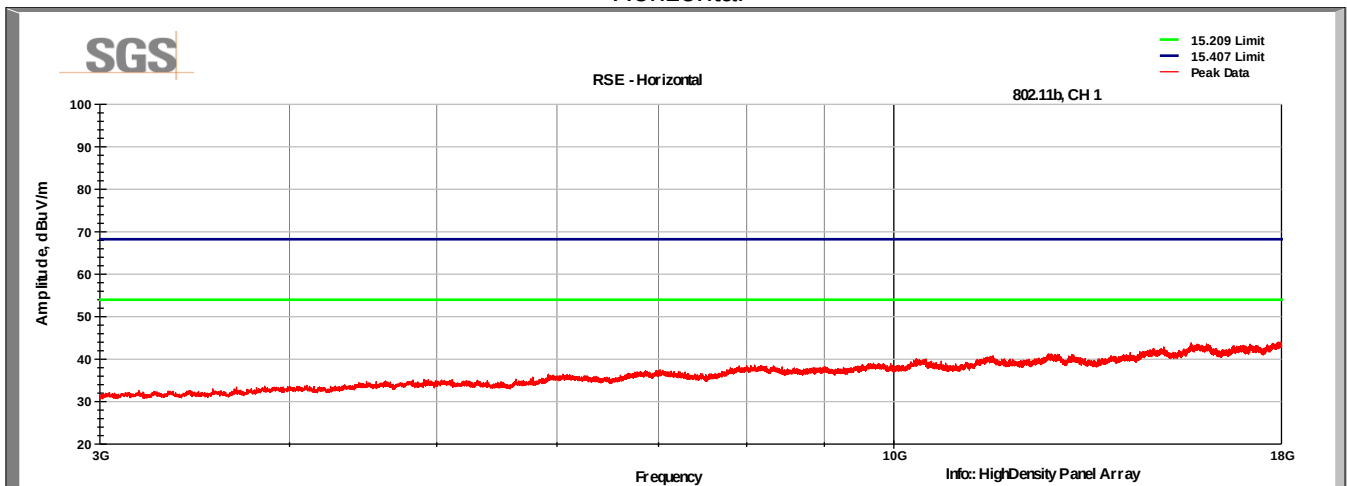
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CH 1 802.11b, 1Mbps

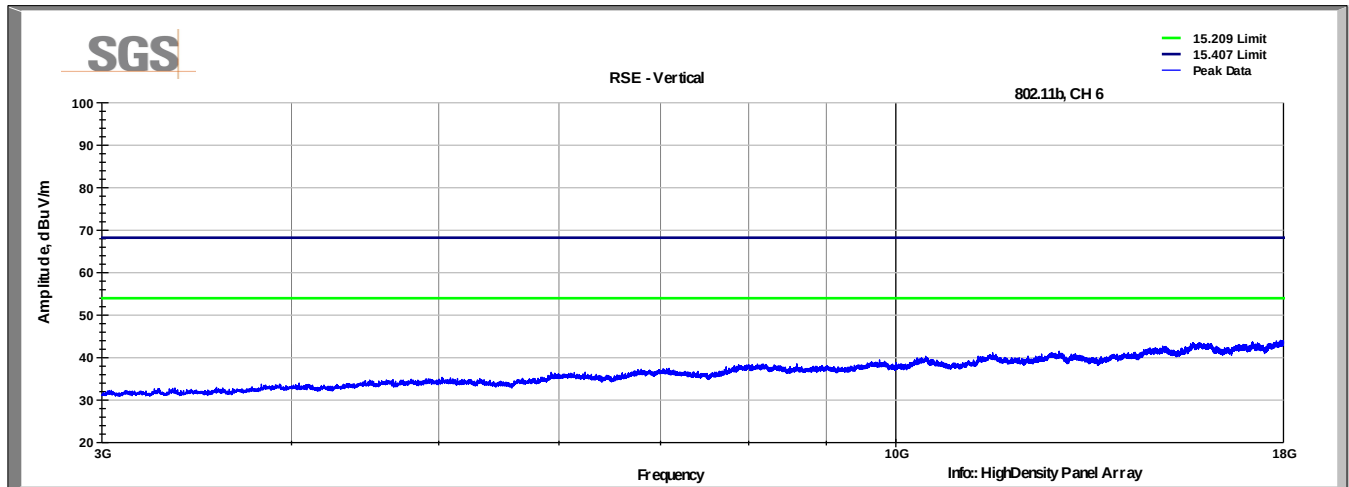
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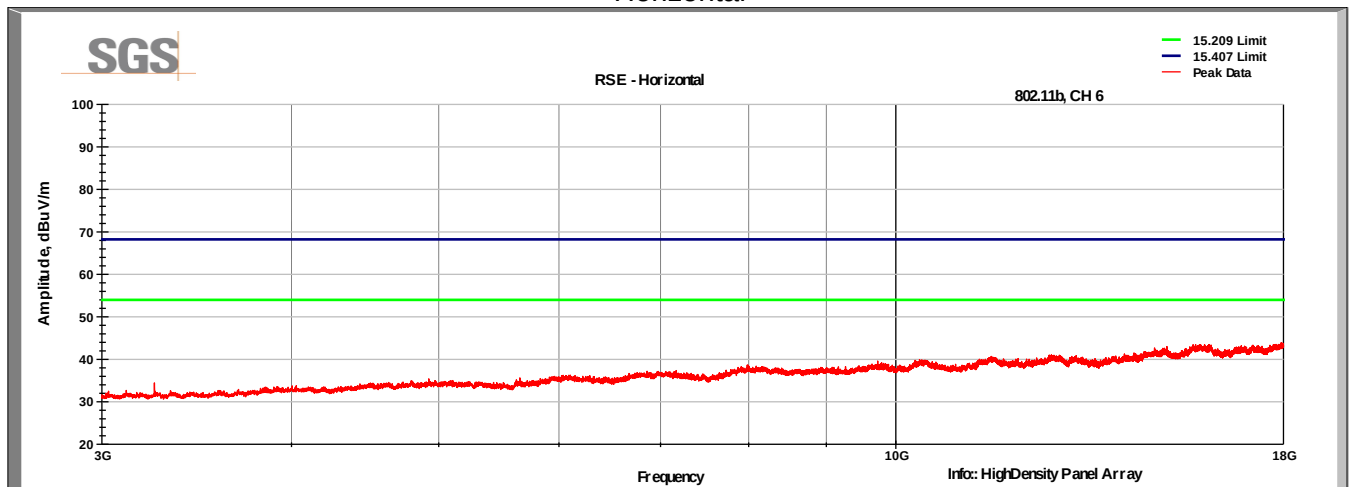
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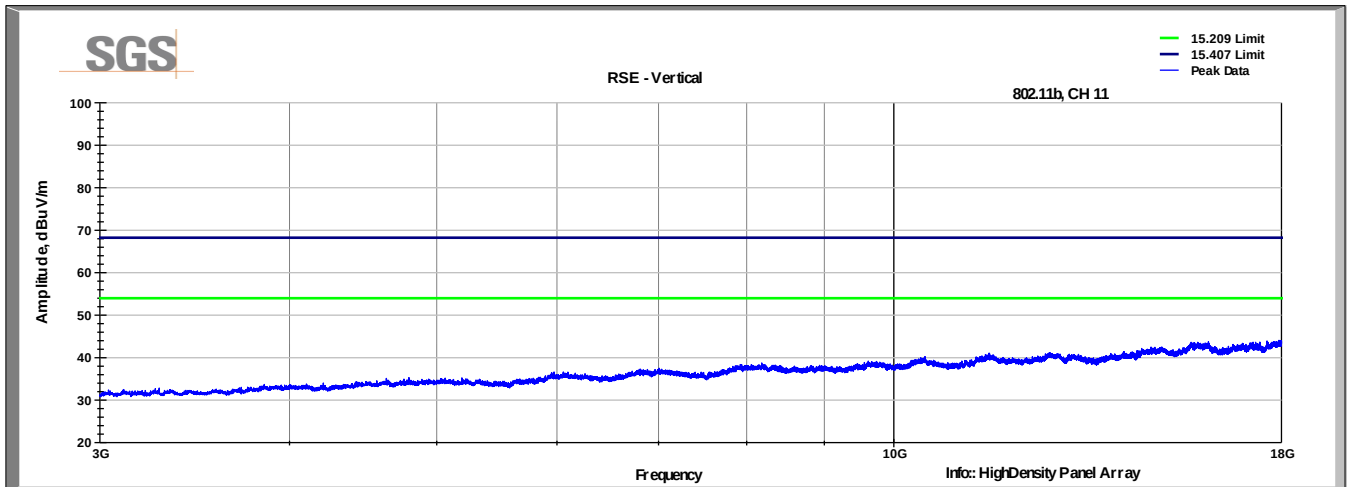
CH 6 802.11b, 1Mbps Vertical



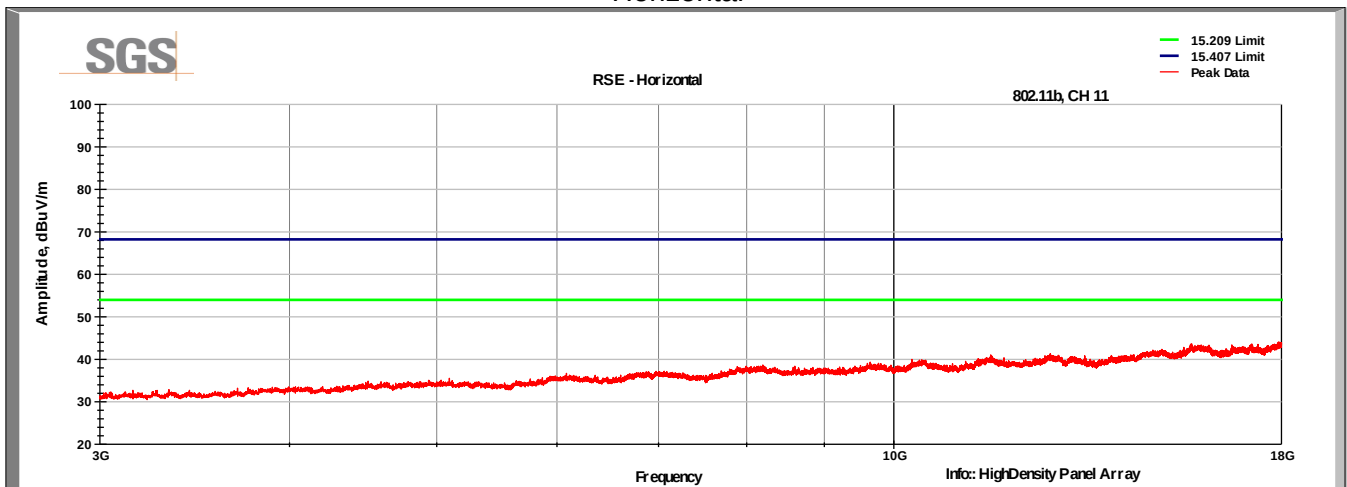
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CH 11 802.11b, 1Mbps Vertical



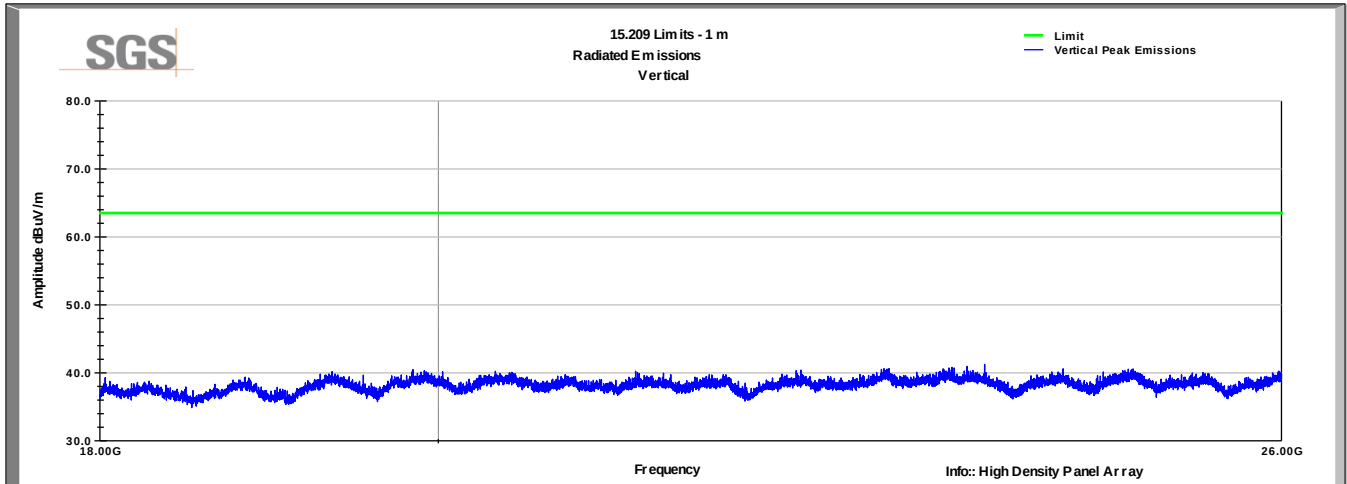
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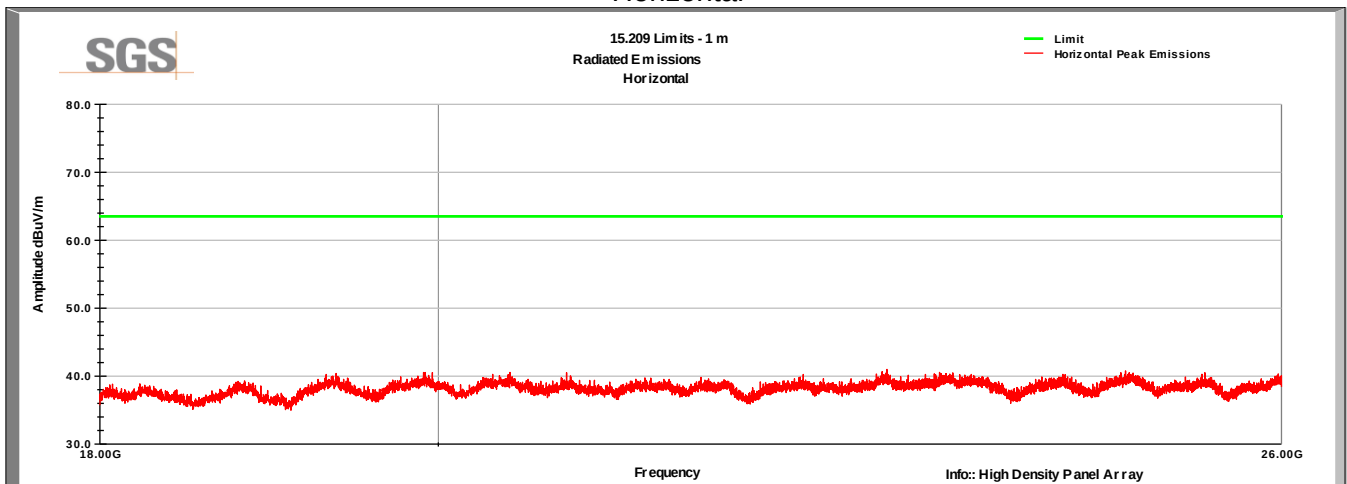
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CH 1 802.11b, 1Mbps

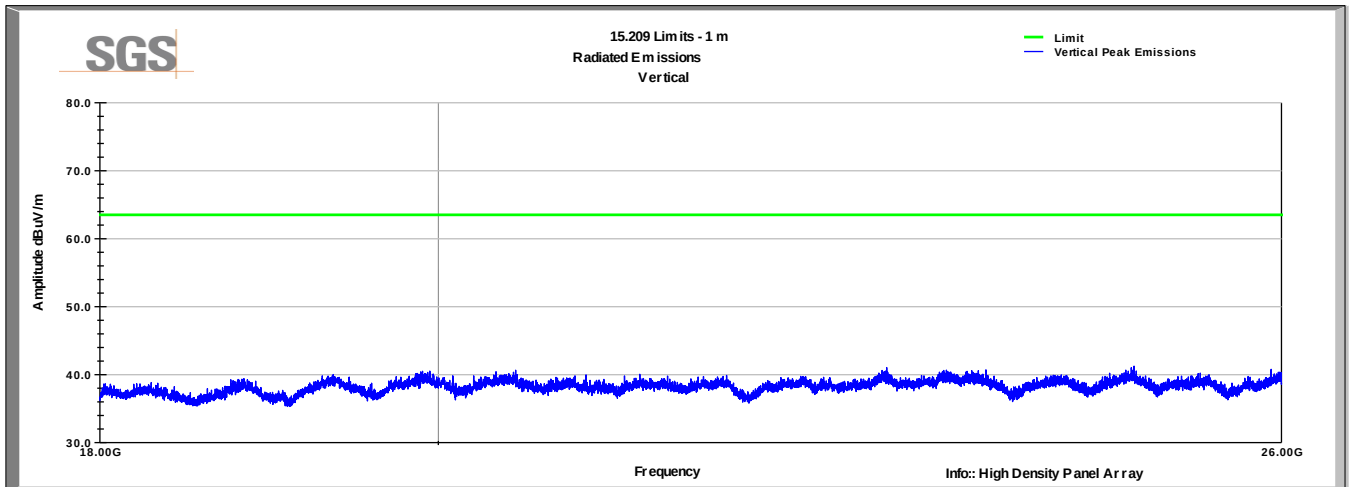
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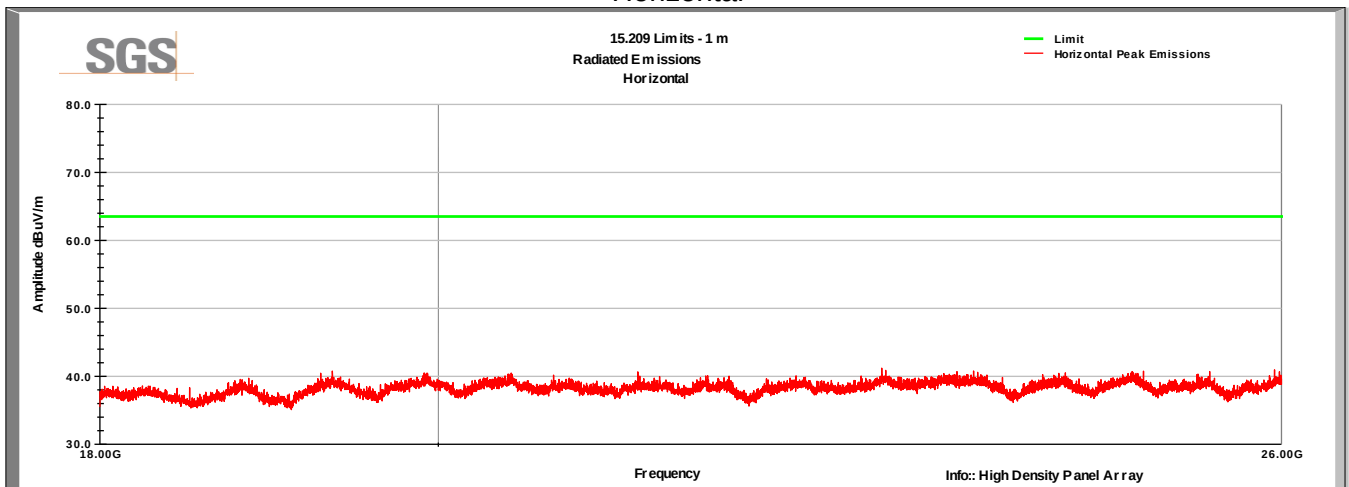
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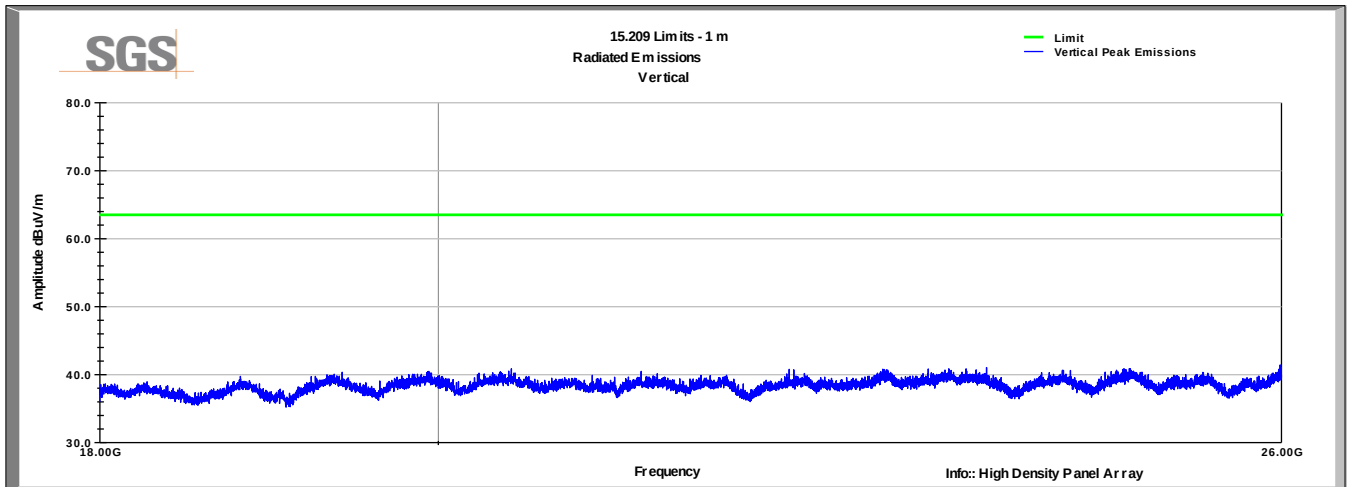
CH 6 802.11b, 1Mbps Vertical



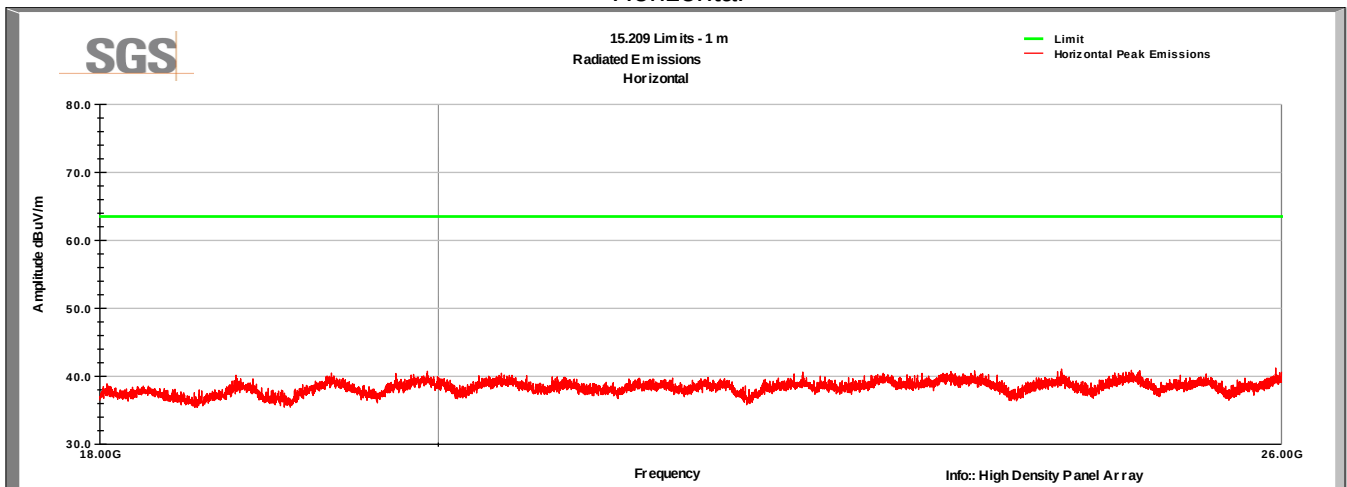
Horizontal



CH 11 802.11b, 1Mbps Vertical



Horizontal



4 Radiated Emissions at Band Edge / Restricted Band

4.1 Test Result

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247 (d) and 15.209	Compliant

4.2 Test Method

Peak and average field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz. Measurements were made using the radiated methods defined in Sections 12 and 13 of FCC publication D01 DTS Meas Guidance v03r02.

4.3 Test Site

3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

Temperature: 22.2 – 24.1 °C

Relative Humidity: 32.4 - 42.6 %

4.4 Test Equipment

Final Test Date: 22-Oct-2015

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	9-Jul-2016
DRG HORN (MEDIUM)	3117	ETS-LINDGREN	B079691	9-Jul-2016
DESKTOP AMPLIFIER 1-18 GHZ	NSP1800-25-HG	MITEQ	B085930	30-Mar-2016
PREAMPLIFIER-ANTENNA SYS	TS-PR18	ROHDE & SCHWARZ	B094463	13-Feb-2016
FIXED GAIN AMPLIFIER	NSP1840-HG	MITEQ	B087572	15-Oct-2016
RF CABLE - 7000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079712	3-Aug-2016
RF CABLE - 12000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079717	3-Aug-2016
10DB ATTENUATOR	10DB	ROHDE & SCHWARZ	B095594	5-Aug-2016

Note: The calibration period equipment is 1 year.

4.5 Test Data

802.11g, 6Mbps

Frequency MHz	Raw Meas (dBuV)	Polarity (V/H)	Correction (dB/m)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)	Detector
Antenna P/N: M6060070MP13620 (MIMO Patch)							
Channel 1							
2390.00	60.6	V	11.6	72.2	74.0	-1.8	Peak
2390.00	29.5	V	14.0	43.5	54.0	-10.5	Average
Channel 11							
2483.50	60.9	V	11.6	72.5	74.0	-1.5	Peak
2483.50	30.0	V	14.0	44.0	54.0	-10.0	Average
Antenna P/N: M6013070P30006I (High Density Panel)							
Channel 1							
2390.00	58.9	V	11.6	70.5	74.0	-3.5	Peak
2390.00	37.0	V	14.0	51.0	54.0	-3.0	Average
Channel 11							
2483.50	61.5	V	11.6	73.1	74.0	-0.9	Peak
2483.50	38.5	V	14.0	52.5	54.0	-1.5	Average

802.11b, 1Mbps

Frequency MHz	Raw Meas (dBuV)	Polarity (V/H)	Correction (dB/m)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)	Detector
Antenna P/N: M6060070MP13620 (MIMO Patch)							
Channel 1							
2390.00	60.0	V	11.6	71.6	74.0	-2.4	Peak
2390.00	30.4	V	13.8	44.2	54.0	-9.8	Average
Channel 11							
2483.50	61.1	V	11.6	72.7	74.0	-1.3	Peak
2483.50	32.1	V	13.8	45.9	54.0	-8.1	Average
Antenna P/N: M6013070P30006I (High Density Panel)							
Channel 1							
2390.00	59.2	V	11.6	70.8	74.0	-3.2	Peak
2390.00	35.1	V	13.8	48.9	54.0	-5.1	Average
Channel 11							
2483.50	60.1	V	11.6	71.7	74.0	-2.3	Peak
2483.50	39.8	V	13.8	53.6	54.0	-0.4	Average

To comply with the band edge requirements, the target power levels had to be adjusted as follows:

Antenna	Modulation	Channel	Target Power
M6060070MP13620	802.11g	1	14
M6060070MP13620	802.11g	11	14
M6060070MP13620	802.11b	1	17
M6060070MP13620	802.11b	11	17
M6060070MP13620	802.11g	1	15
M6060070MP13620	802.11g	11	15
M6060070MP13620	802.11b	1	18
M6060070MP13620	802.11b	11	17

5 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	30 October 2015