



**FCC 47 CFR PART 15 SUBPART E  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**802.11a/b/g/n 2x2 (HT20) CLIENT DEVICE**

**MODEL NUMBER: PLAY:1(Type 2)**

**FCC ID: SBVRM009**

**IC: 5373A-RM009**

**REPORT NUMBER: 14U17203-2, Revision A**

**ISSUE DATE: May 14, 2014**

*Prepared for*

**SONOS, INC.**

**223 E. DE LA GUERRA STREET**

**SANTA BARBARA**

**CA 93101, U.S.A.**

*Prepared by*

**UL VERIFICATION SERVICES INC.**

**47173 BENICIA STREET**

**FREMONT, CA 94538, U.S.A.**

**TEL: (510) 771-1000**

**FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

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--	04/28/14	Initial Issue	C. Pang
A	05/14/14	Correction of IC Number and add Section 10, LC Data.	C. Pang

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION .....</i>	<i>6</i>
4.2. <i>SAMPLE CALCULATION .....</i>	<i>6</i>
4.3. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>7</i>
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>8</b>
5.1. <i>DESCRIPTION OF EUT .....</i>	<i>8</i>
5.2. <i>MAXIMUM OUTPUT POWER.....</i>	<i>8</i>
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS .....</i>	<i>8</i>
5.4. <i>SOFTWARE AND FIRMWARE.....</i>	<i>8</i>
5.5. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	<i>8</i>
5.6. <i>DESCRIPTION OF TEST SETUP.....</i>	<i>10</i>
<b>7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS .....</b>	<b>13</b>
<b>8. ANTENNA PORT TEST RESULTS .....</b>	<b>17</b>
8.1. <i>802.11n HT20 MODE IN THE 5.2 GHz BAND .....</i>	<i>17</i>
8.1.1. <i>26 dB BANDWIDTH.....</i>	<i>17</i>
8.1.2. <i>99% BANDWIDTH.....</i>	<i>21</i>
8.1.3. <i>AVERAGE POWER .....</i>	<i>25</i>
8.1.4. <i>OUTPUT POWER AND PPSD .....</i>	<i>26</i>
8.1.5. <i>PEAK EXCURSION.....</i>	<i>31</i>
8.2. <i>802.11n HT20 MODE IN THE 5.3 GHz BAND .....</i>	<i>33</i>
8.2.1. <i>26 dB BANDWIDTH.....</i>	<i>33</i>
8.2.2. <i>99% BANDWIDTH.....</i>	<i>37</i>
8.2.3. <i>AVERAGE POWER.....</i>	<i>41</i>
8.2.4. <i>OUTPUT POWER AND PPSD .....</i>	<i>42</i>
8.2.5. <i>PEAK EXCURSION.....</i>	<i>47</i>
8.3. <i>802.11n HT20 MODE IN THE 5.6 GHz BAND .....</i>	<i>48</i>
8.3.1. <i>26 dB BANDWIDTH.....</i>	<i>48</i>
8.3.2. <i>99% BANDWIDTH.....</i>	<i>52</i>
8.3.3. <i>AVERAGE POWER.....</i>	<i>56</i>
8.3.4. <i>OUTPUT POWER AND PPSD .....</i>	<i>57</i>
8.3.5. <i>PEAK EXCURSION.....</i>	<i>62</i>
<b>9. RADIATED TEST RESULTS.....</b>	<b>63</b>
9.1. <i>LIMITS AND PROCEDURE.....</i>	<i>63</i>
9.2. <i>TRANSMITTER ABOVE 1 GHz.....</i>	<i>64</i>

9.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND.....64  
9.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND.....72  
9.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND.....80  
9.4. WORST-CASE BELOW 1 GHz.....90  
**10. AC POWER LINE CONDUCTED EMISSIONS .....92**  
**11. DYNAMIC FREQUENCY SELECTION .....96**  
11.1. OVERVIEW.....96  
11.1.1. LIMITS .....96  
11.1.2. TEST AND MEASUREMENT SYSTEM .....99  
11.1.3. SETUP OF EUT .....102  
11.1.4. DESCRIPTION OF EUT.....103  
11.2. RESULTS FOR 20 MHz BANDWIDTH.....105  
11.2.1. TEST CHANNEL.....105  
11.2.2. RADAR WAVEFORM AND TRAFFIC .....105  
11.2.3. OVERLAPPING CHANNEL TESTS .....107  
11.2.4. MOVE AND CLOSING TIME.....107  
11.2.5. NON-OCCUPANCY PERIOD.....111  
**12. SETUP PHOTOS .....112**

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SONOS, INC.  
223 E. DE LA GUERRA STREET  
SANTA BARBARA, CA, 93101, USA

**EUT DESCRIPTION:** 802.11a/b/g/n 2x2 (HT20) CLIENT DEVICE

**MODEL:** PLAY:1(TYPE 2)

**SERIAL NUMBER:** 1823314(RF) and B8-E9-37-58-33-4C-F (DFS)

**DATE TESTED:** FEBRUARY 26 to MARCH 10 and APRIL 09 to 10, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:

Tested By:



Chin Pang  
Senior Engineer  
UL Verification Services Inc.

Francisco Gerner  
Lab Technician  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input type="checkbox"/> Chamber A	<input checked="" type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	±3.52 dB
Radiated Disturbance, 30 to 1000 MHz	±4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n 2x2 (HT20) Client Device.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11n HT20	14.22	26.42
5260 - 5320	802.11n HT20	21.54	142.56
5500 - 5700	802.11n HT20	21.25	133.35

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes left and right dipole PCB construction antennas with a maximum gain as follow:

Antenna	Ant. Gain (dBi)
Chain 0	3.59
Chain 1	3.29

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Atheros Radio Test 2 (ART2-GUI)

### 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Worst-case data rates as provided by the client were:

802.11n HT20mode: MCS9 26Mbps

The EUT was placed on normal orientation, standing position and all radiated emissions were performed with the EUT as shown on the setup photo



Radiated emissions for EUT with antenna was performed and passed; therefore, antenna port spurious was not performed.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	X201	R9-3V9YR 10/05	DOC
AC-DC Adapter	Lenovo	ADLX65NCT2A	11S45N0323ZLZH34A5EG	DOC
AC-DC Adapter	Sonos	112-00135	N/A	DOC

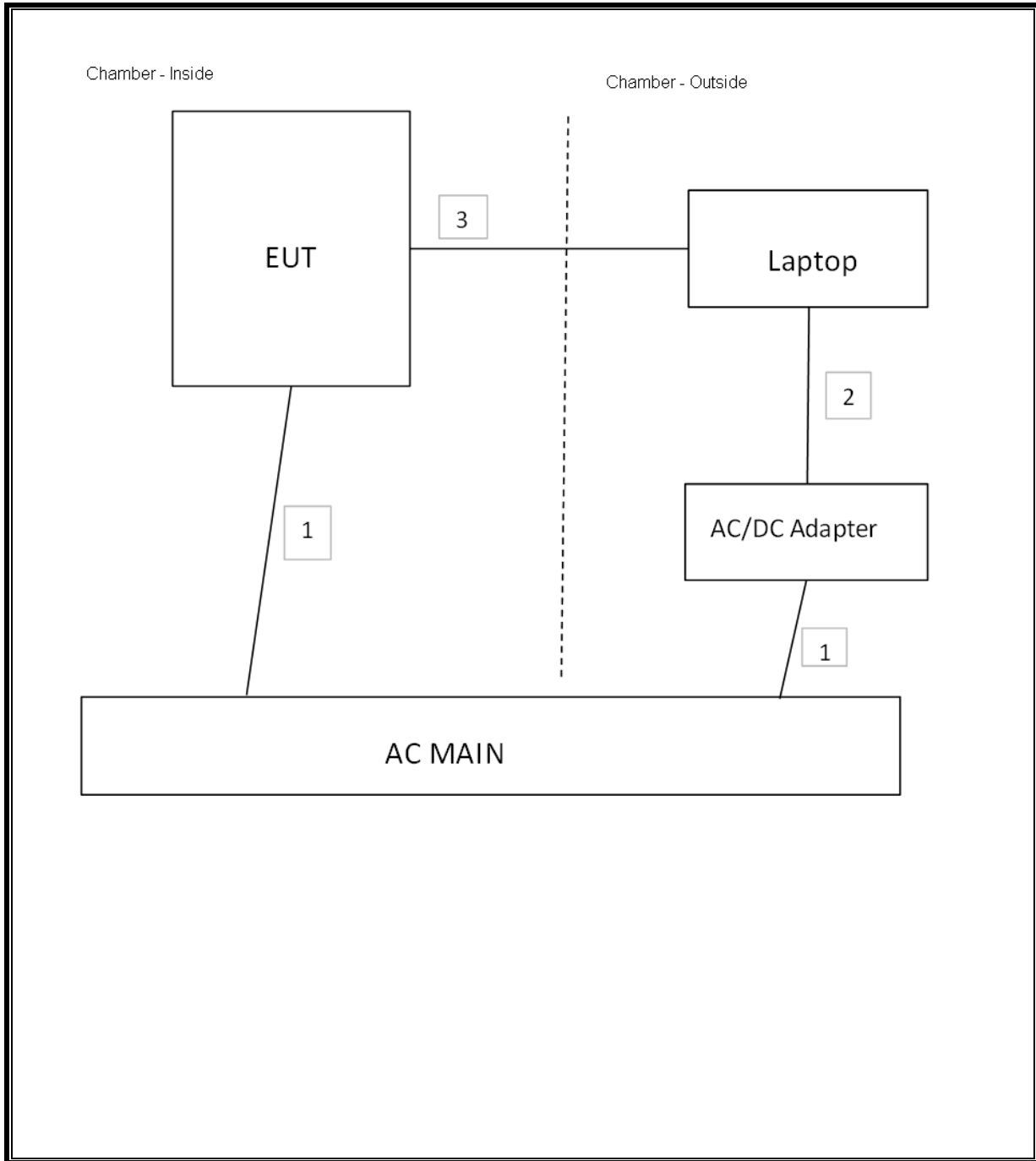
### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	US 115V	Un-shielded	1.8m	N/A
2	DC	2	DC	Un-shielded	1.8m	N/A
3	Ethernet	1	RJ45	Un-shielded	1.5m	N/A

### TEST SETUP

The EUT is connected to a laptop via an Ethernet cable during the tests and software exercised the radio card

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Horn, 18 GHz	ETS Lindgren	3117	C01006	1/6/2015
Preamplifier, 1000 MHz	Sonoma	310N	N02891	12/30/14
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	05/06/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	F00168	03/28/15
Peak / Average Power Sensor	Agilent / HP	E9323A	F00158	03/06/15
P-Series single channel Power Meter	Agilent / HP	N1911A	F00026	04/03/15
Spectrum Analyzer, PXA, 3Hz to 50GHz	Agilent	N9030A	F00121	01/21/15
Spectrum Analyzer, 40 GHz	Agilent / HP	8564E	C00951	07/29/14
RF PreAmplifier, 1-18GHz	Miteq	AFS42-00101800 -25-S-42	F00353	08/24/14
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	F00194	05/14/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/15/14
LISN 30MHz	FCC	50/250-25-2	C00626	01/17/15
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/14

## 7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

### LIMITS

None; for reporting purposes only.

### PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

#### 7.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
<b>5.2GHz Band</b>						
5200MHz HT20 CH 0	0.345	0.392	0.880	88.01%	0.55	2.899
<b>5.3GHz Band</b>						
5300MHz HT20 CH 0	0.347	0.393	0.883	88.30%	0.54	2.882
<b>5.6GHz Band</b>						
5580MHz HT20 CH 0	0.348	0.392	0.888	88.78%	0.52	2.874

## 7.2. MEASUREMENT METHODS

26 dB Emission BW: KDB 789033 D01 v01r03, Section C.

99% Occupied BW: KDB 789033 D01 v01r03, Section D.

Conducted Output Power: KDB 789033 D01 v01r03, Section E.2.d (Method SA-2).

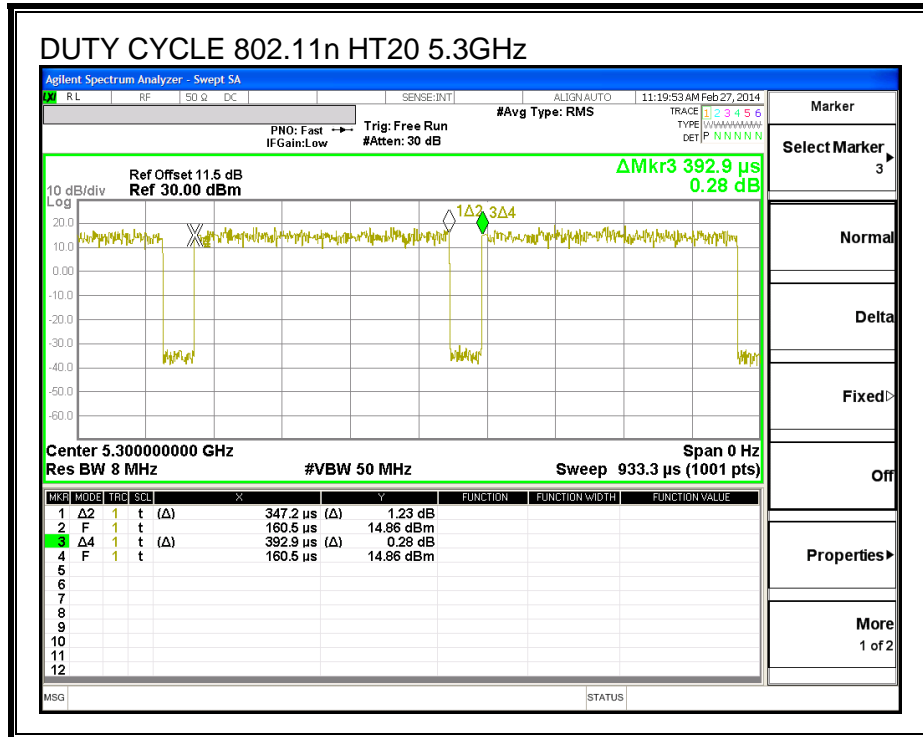
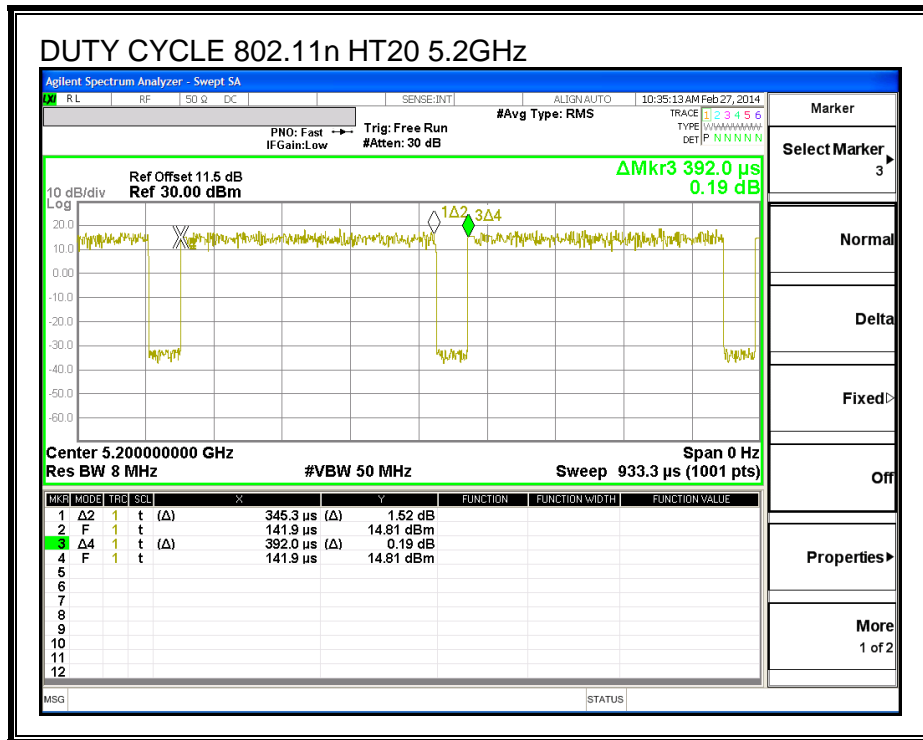
Power Spectral Density: KDB 789033 D01 v01r03, Section F.

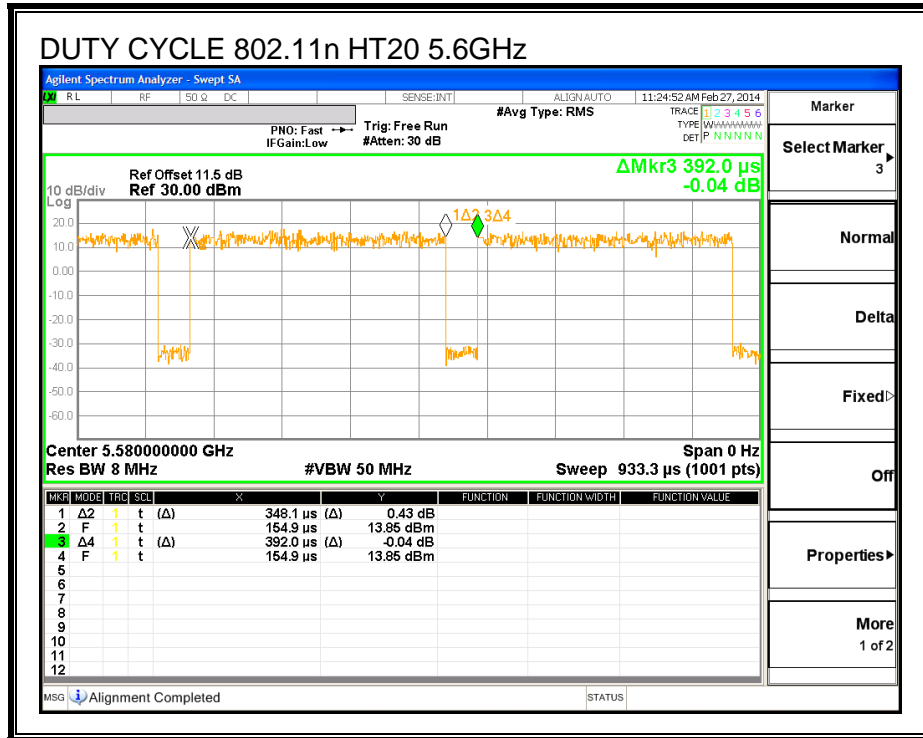
Peak Excursion: KDB 789033 D01 v01r03, Section G.

Unwanted emissions in restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, H.5, and H.6.

Unwanted emissions in non-restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, and H.5.

### 7.3. DUTY CYCLE PLOTS







## 8. ANTENNA PORT TEST RESULTS

### 8.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

#### 8.1.1. 26 dB BANDWIDTH

##### LIMITS

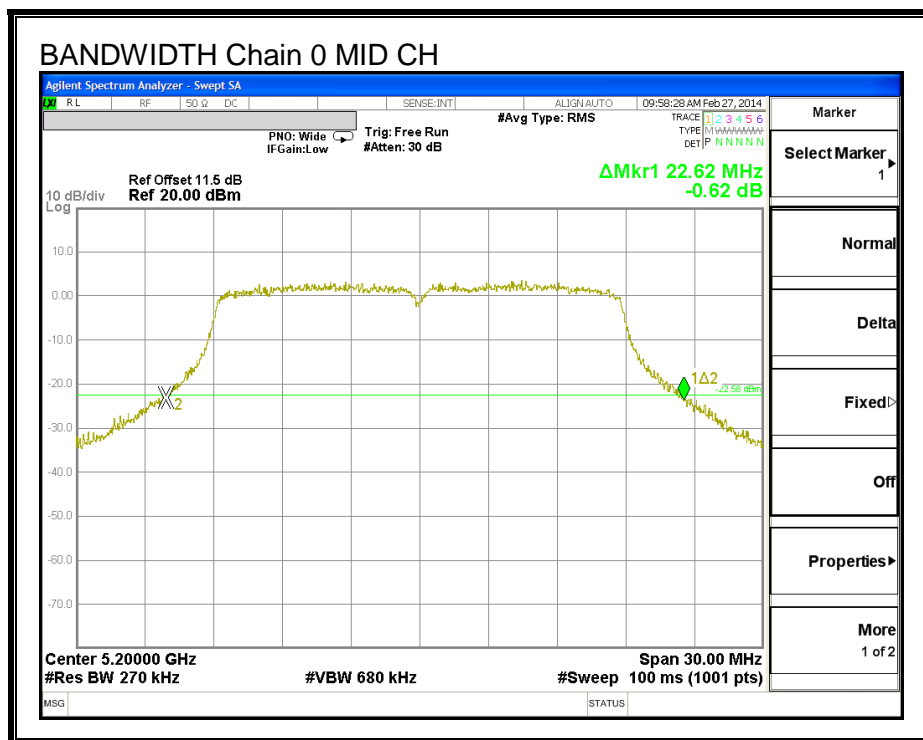
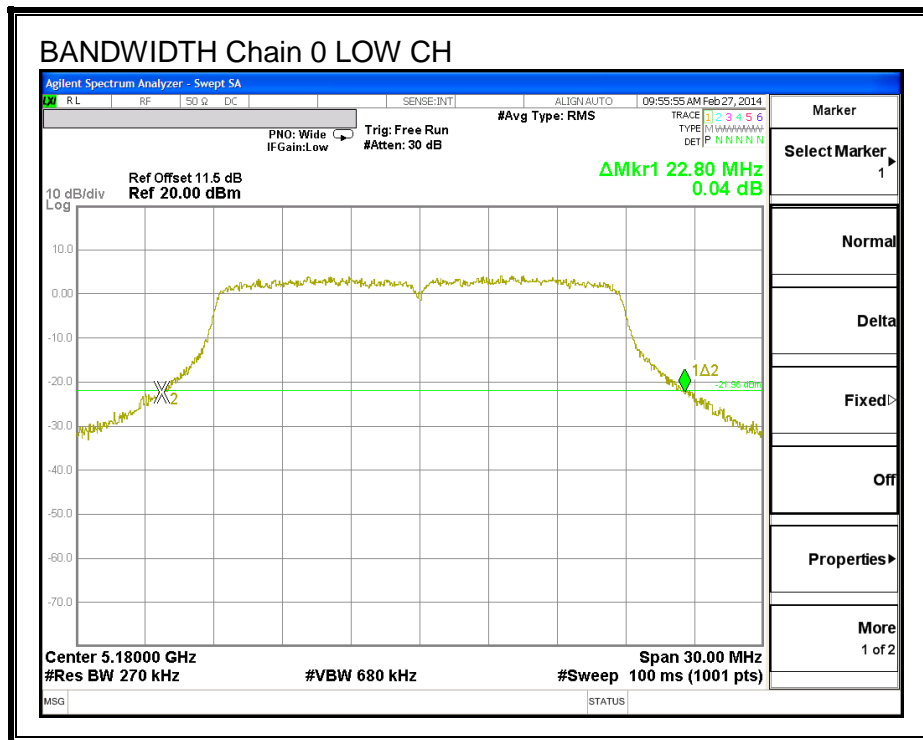
None; for reporting purposes only.

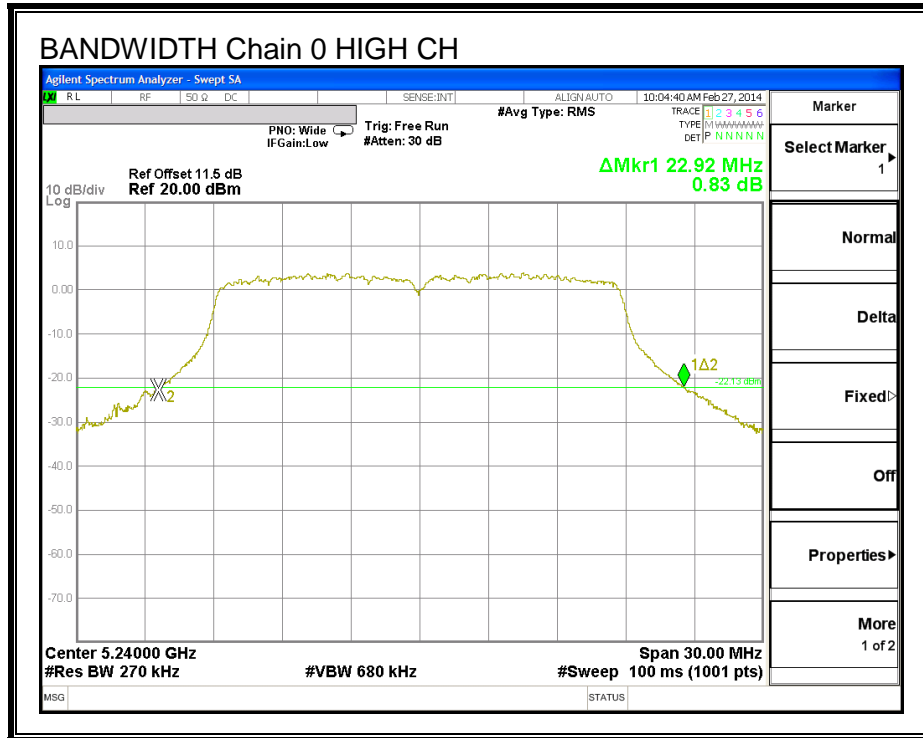
##### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	22.8	22.7
Mid	5200	22.6	22.7
High	5240	22.9	22.7

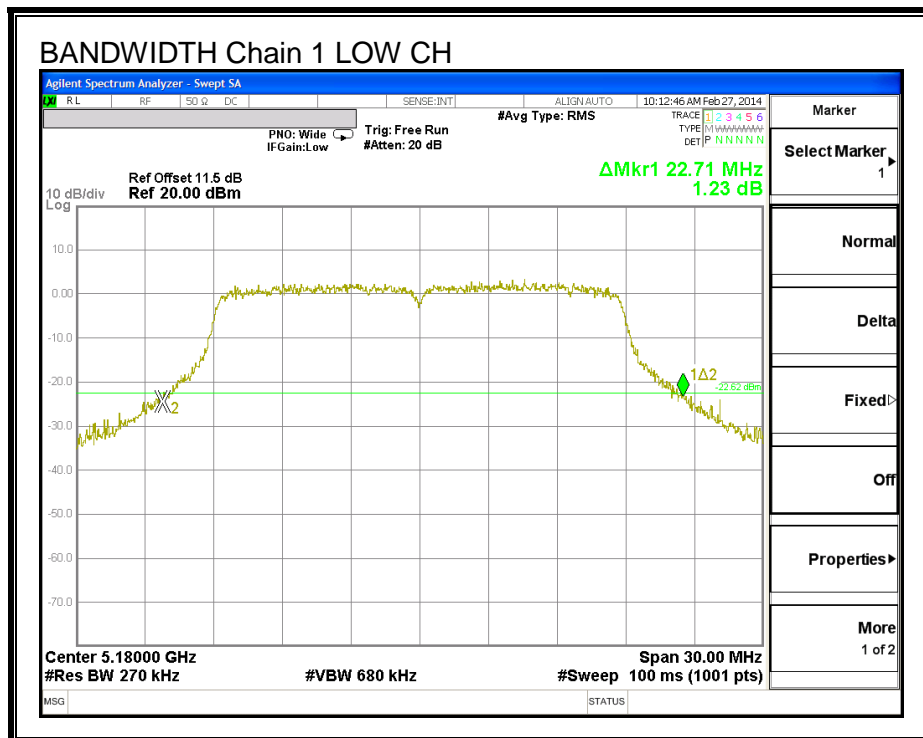
**26 dB BANDWIDTH**

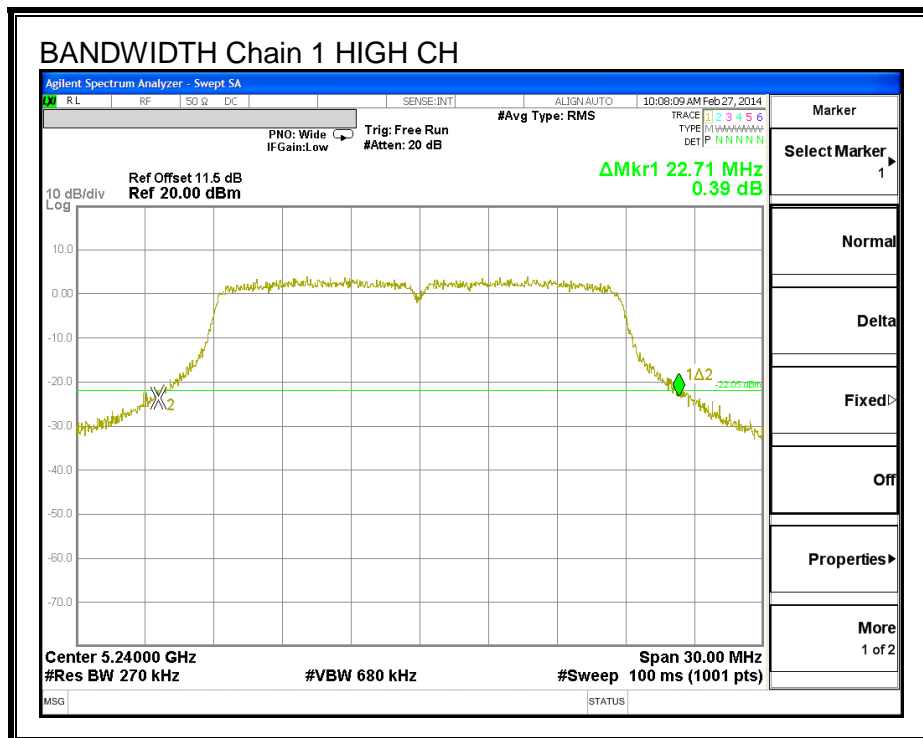
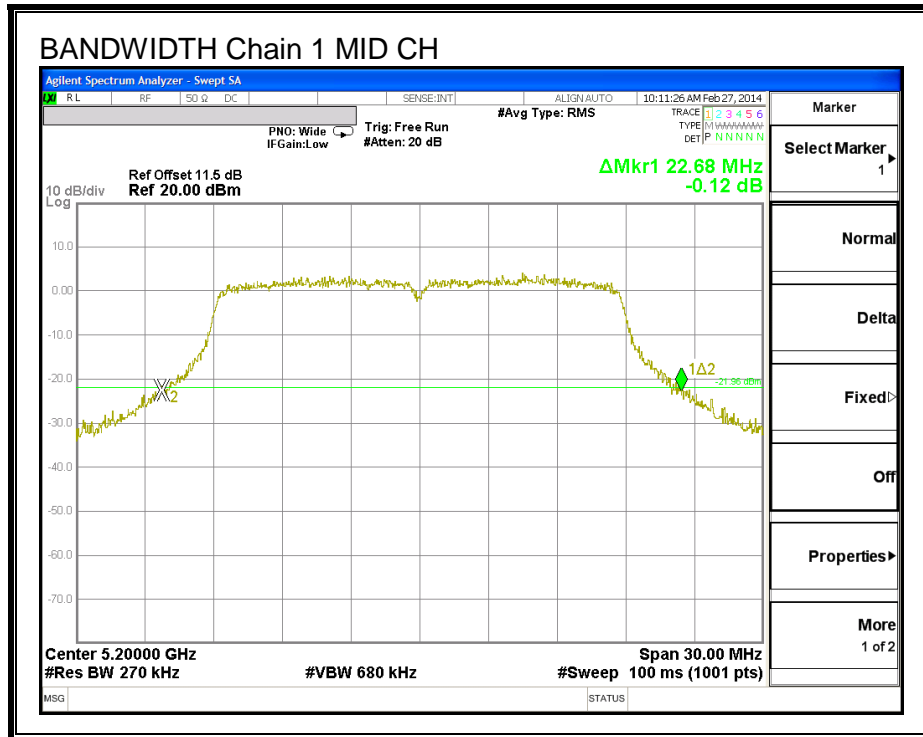
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





### 8.1.2. 99% BANDWIDTH

#### LIMITS

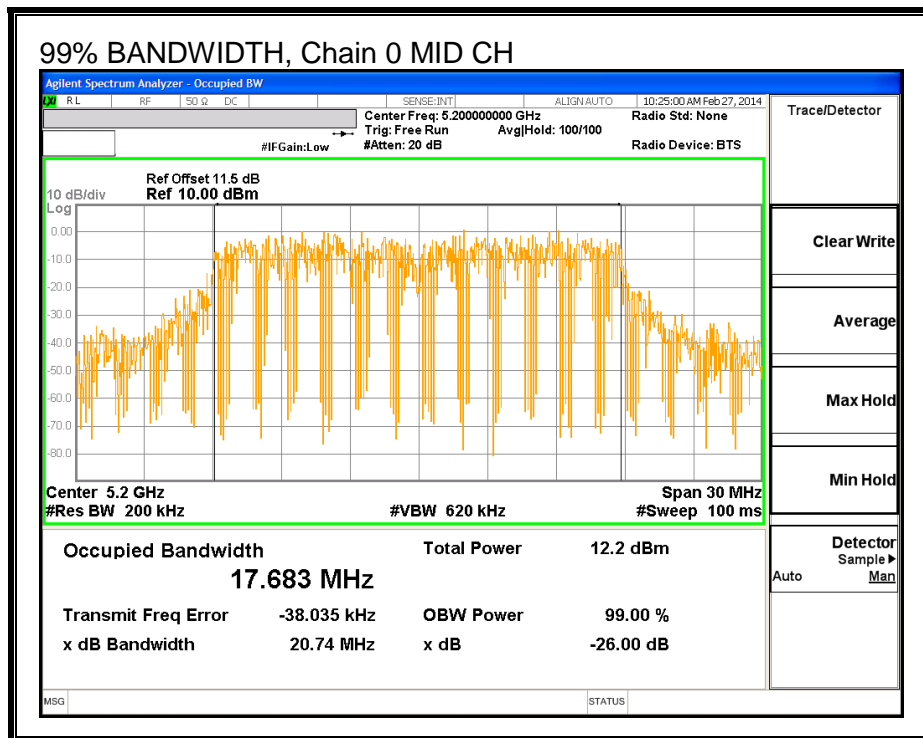
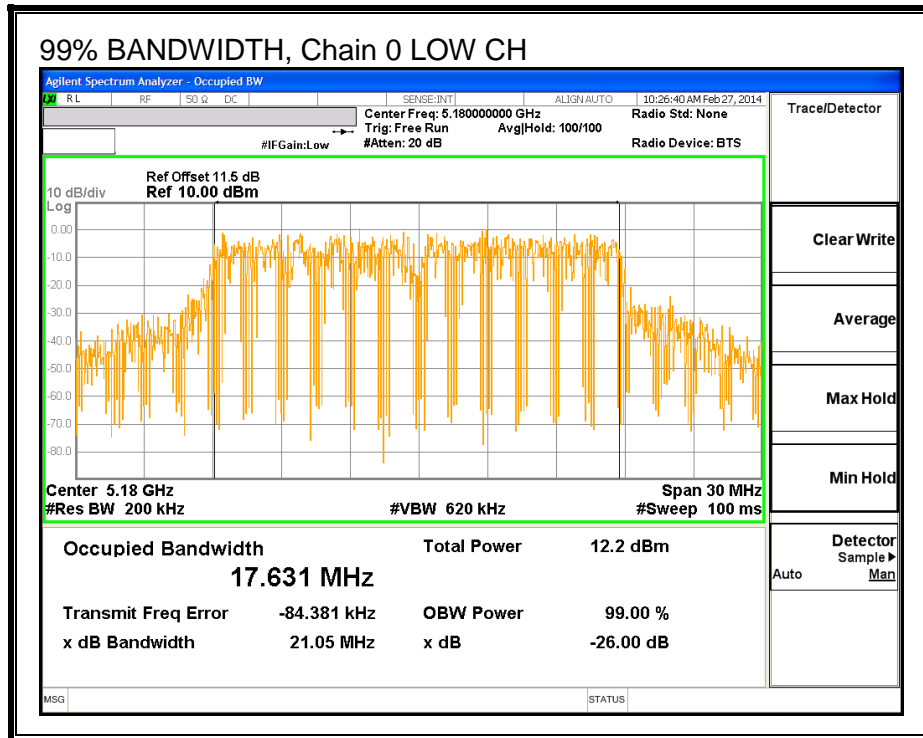
None; for reporting purposes only.

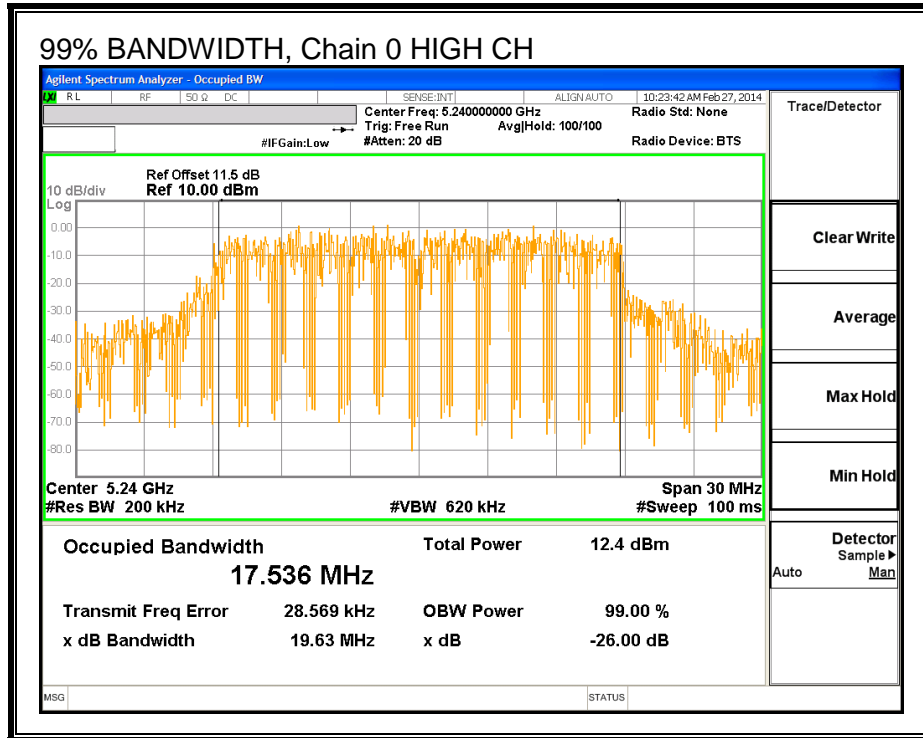
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.6310	17.5950
Mid	5200	17.6830	17.5220
High	5240	17.5360	17.5120

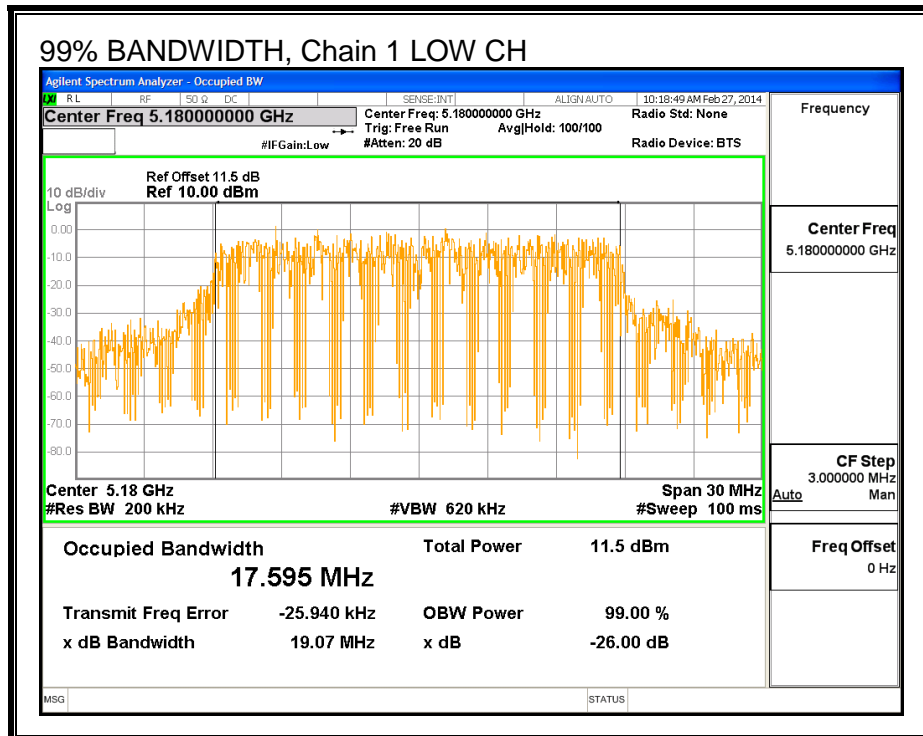
**99% BANDWIDTH**

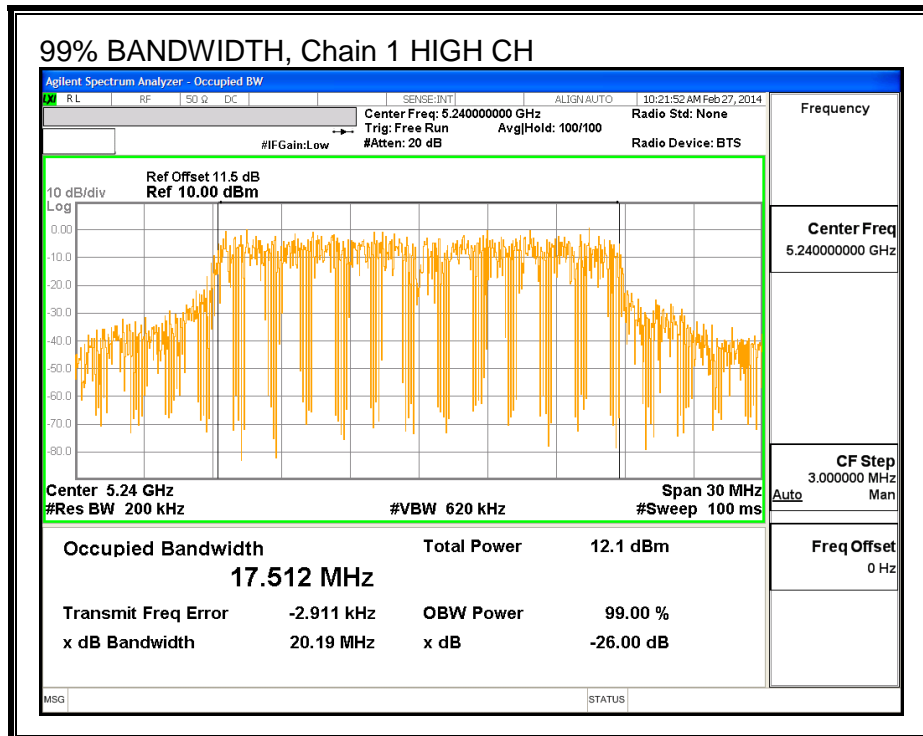
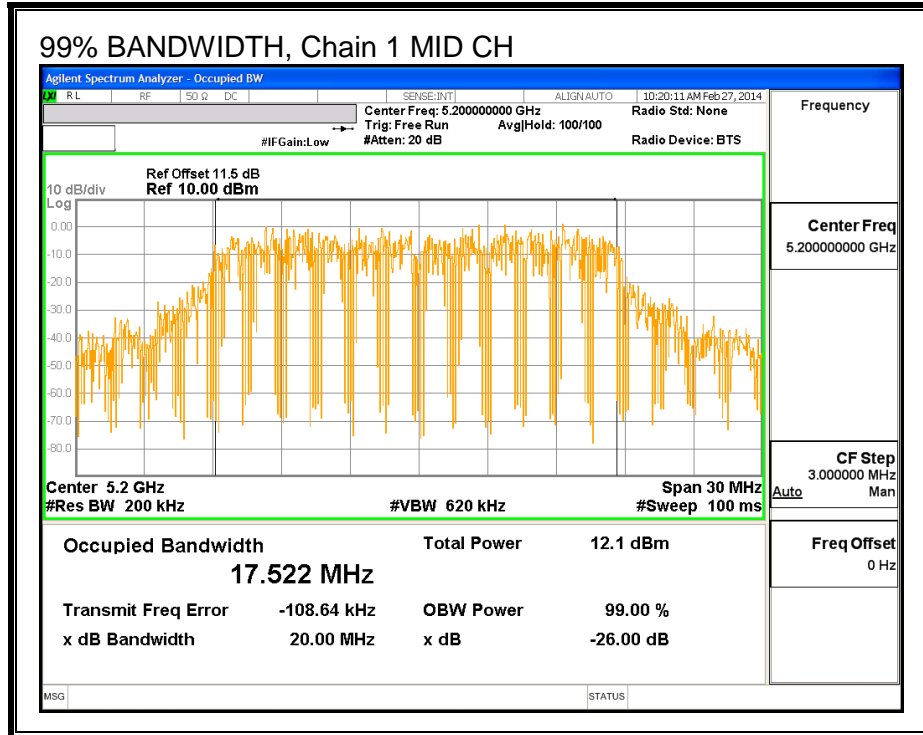
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**







### 8.1.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 0 Power Setting	Chain 1 Power Setting
Low	5180	12.50	12.50
Mid	5200	12.50	12.50
High	5240	12.50	12.50

#### RESULTS

##### Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	9.90	10.40	13.17
Mid	5200	9.70	11.15	13.50
High	5240	9.60	11.45	13.63

### 8.1.4. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log<sub>10</sub> B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.59	3.29	3.44

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for correlated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.59	3.29	6.45

**RESULTS**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	22.80	17.63	3.44	6.45
Mid	5200	22.68	17.68	3.44	6.45
High	5240	22.92	17.54	3.44	6.45

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	17.00	22.46	19.02	17.00	3.55	10.00	3.55
Mid	5200	17.00	22.47	19.03	17.00	3.55	10.00	3.55
High	5240	17.00	22.44	19.00	17.00	3.55	10.00	3.55

<b>Duty Cycle CF (dB)</b>	0.55	<b>Included in Calculations of Corr'd Power &amp; PPSD</b>
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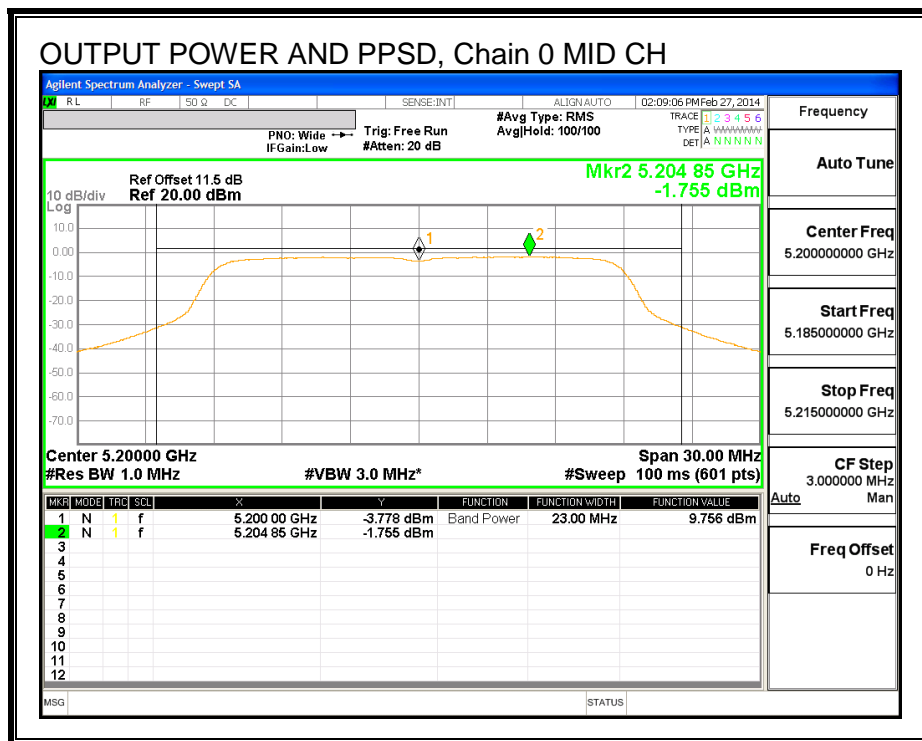
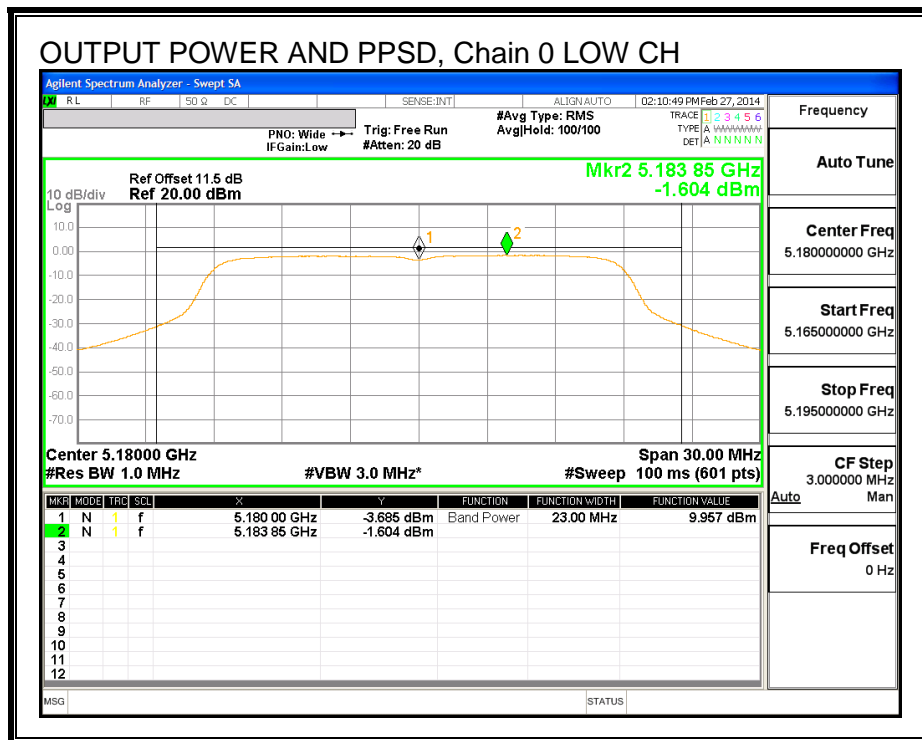
**Output Power Results**

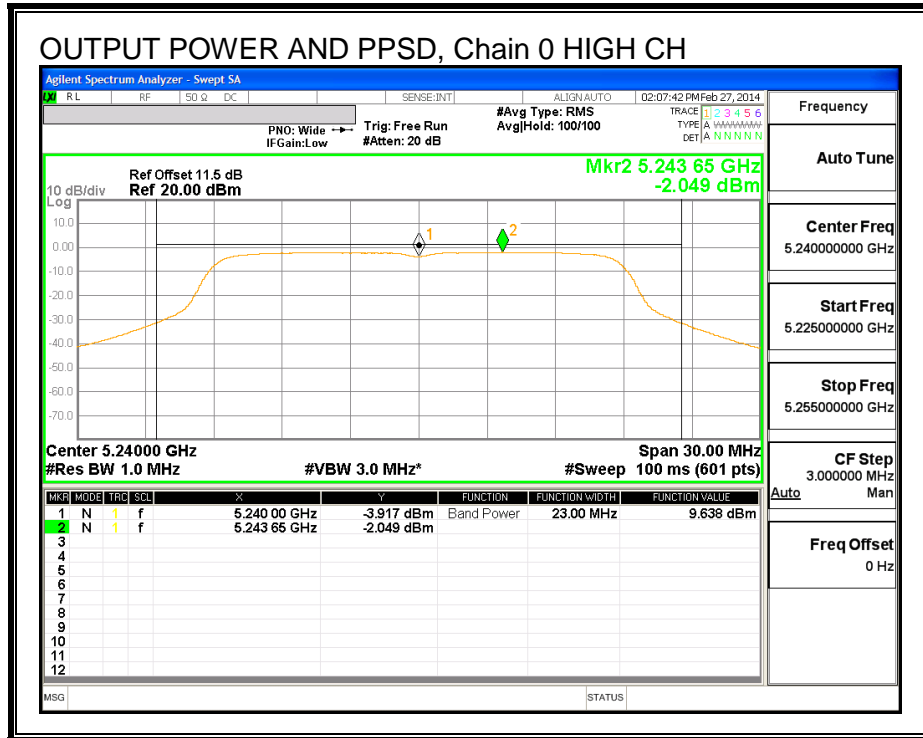
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	9.96	10.44	13.77	17.00	-3.23
Mid	5200	9.76	11.17	14.08	17.00	-2.92
High	5240	9.64	11.49	14.22	17.00	-2.78

**PPSD Results**

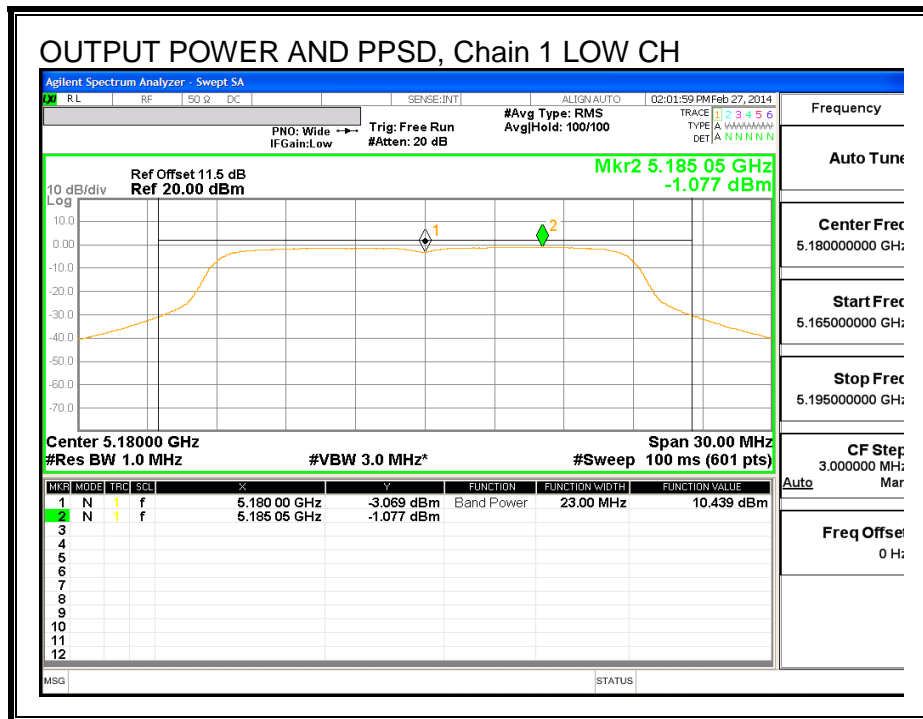
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-1.61	-1.08	2.22	3.55	-1.33
Mid	5200	-1.76	-0.35	2.56	3.55	-0.99
High	5240	-2.05	-0.16	2.56	3.55	-0.99

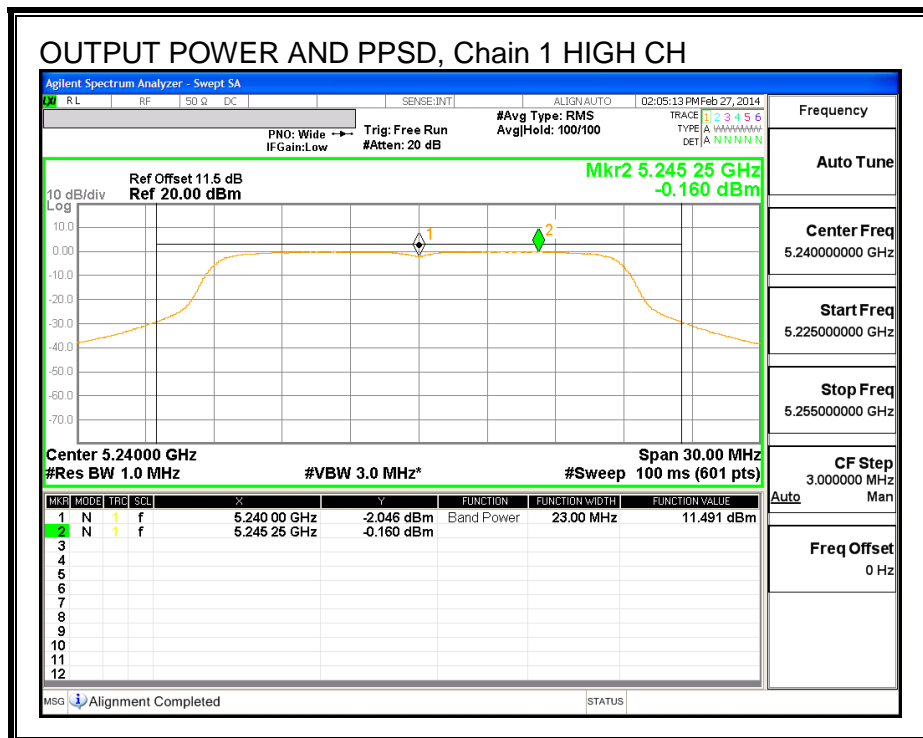
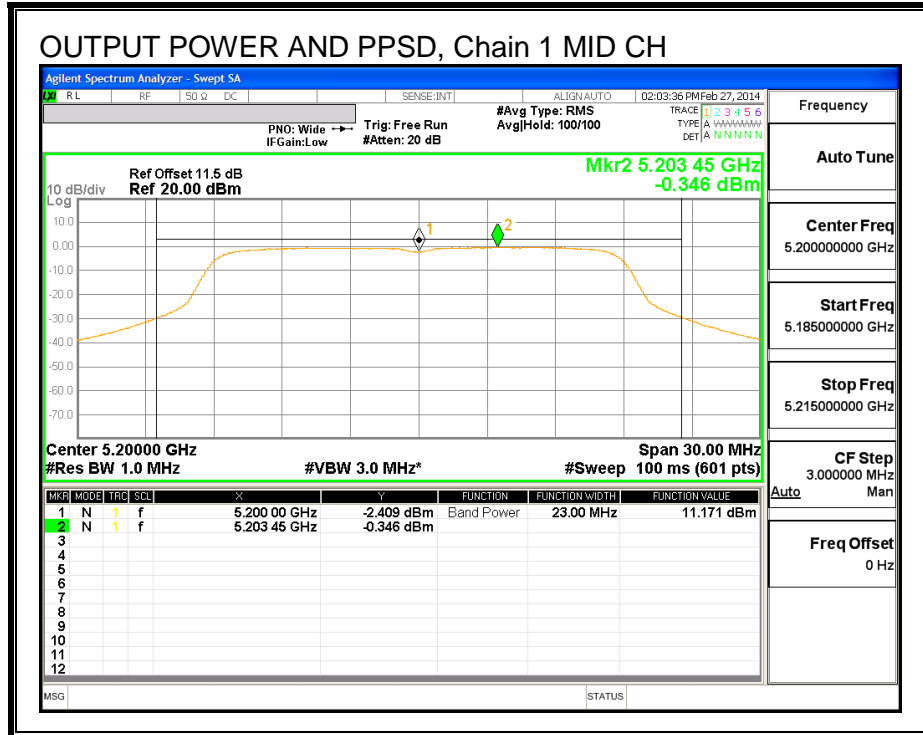
**OUTPUT POWER AND PPSD, Chain 0**





### OUTPUT POWER AND PPSD, Chain 1





### 8.1.5. PEAK EXCURSION

#### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

#### RESULTS

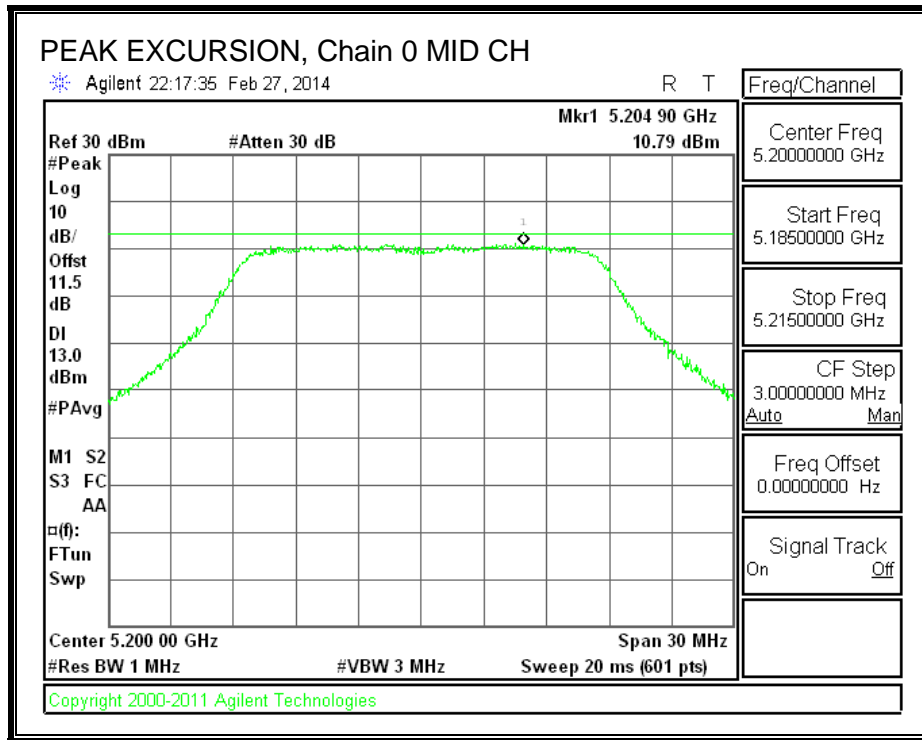
Chain 0

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	10.79	-1.76	0.55	12.00	13	-1.01

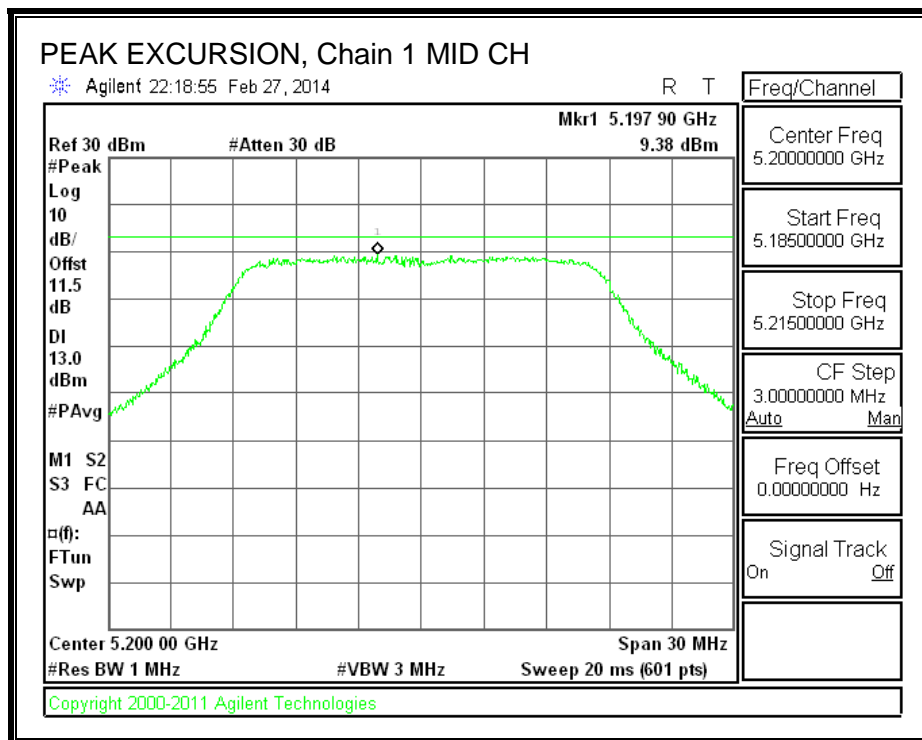
Chain 1

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	9.38	-0.35	0.55	9.18	13	-3.82

**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**





## 8.2. 802.11n HT20 MODE IN THE 5.3 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

#### LIMITS

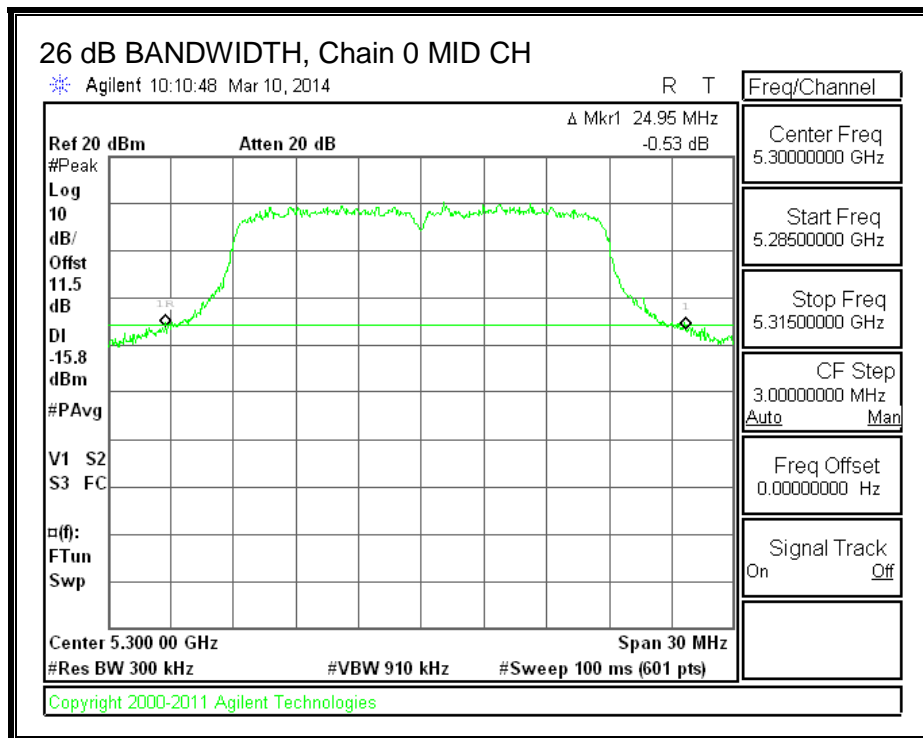
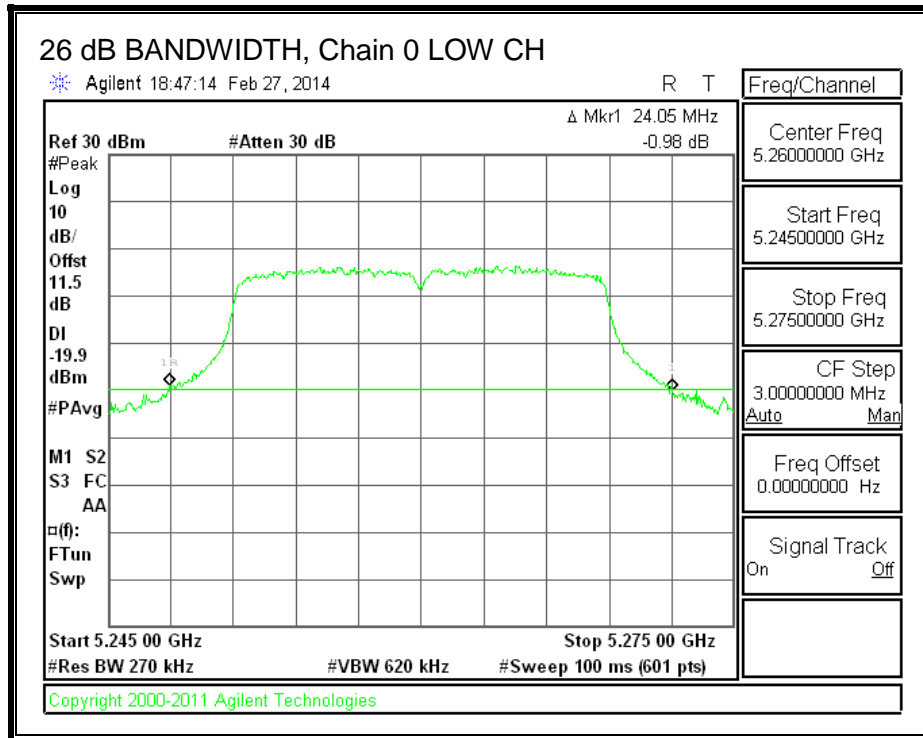
None; for reporting purposes only.

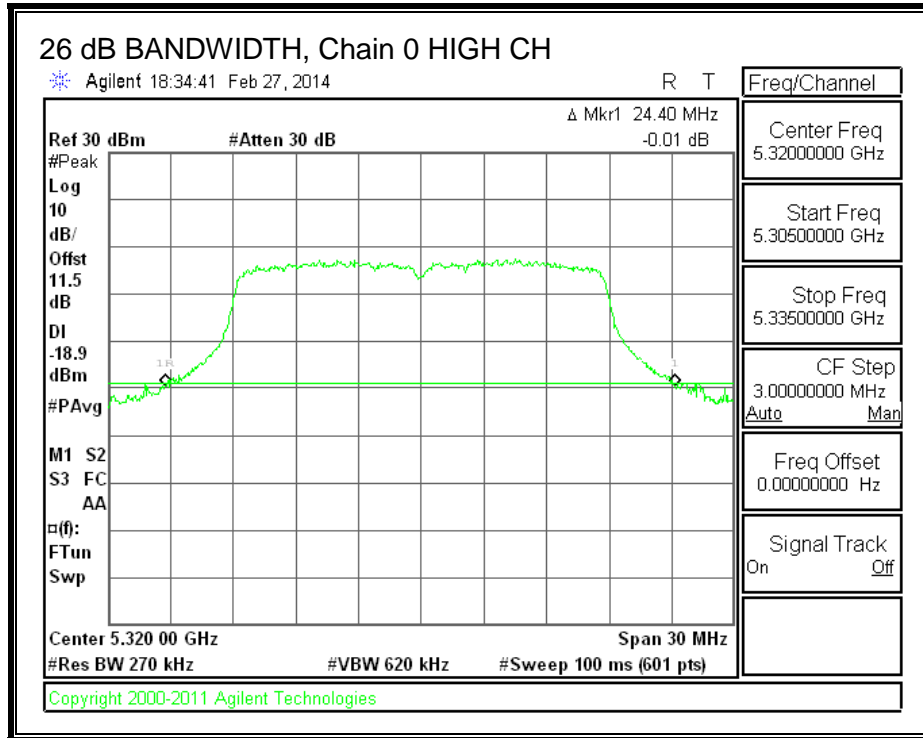
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5260	24.05	26.05
Mid	5300	24.95	26.05
High	5320	24.40	25.96

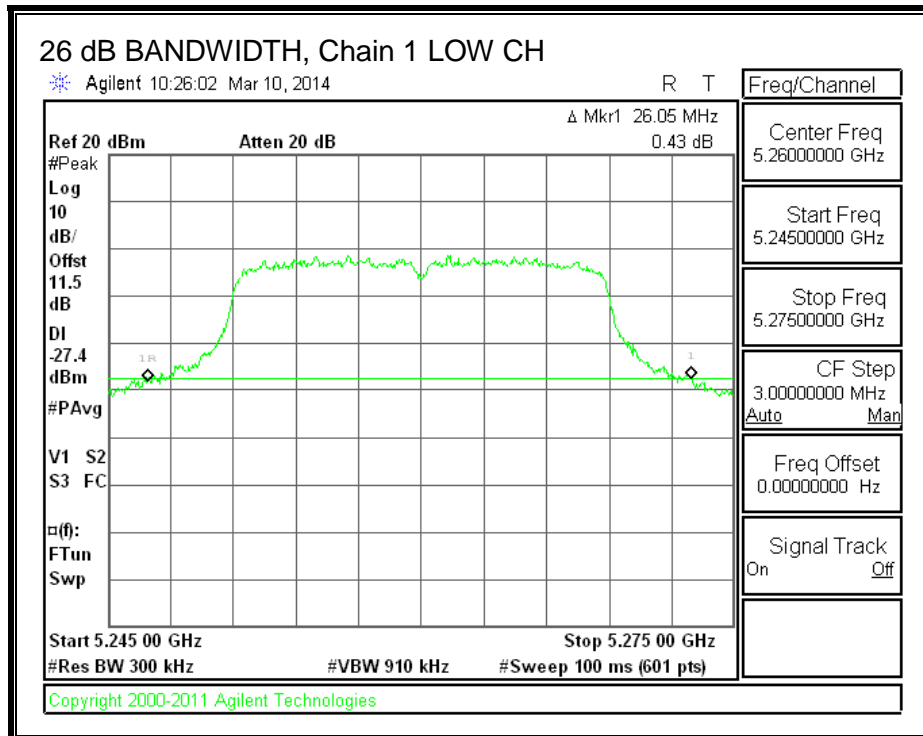
**26 dB BANDWIDTH**

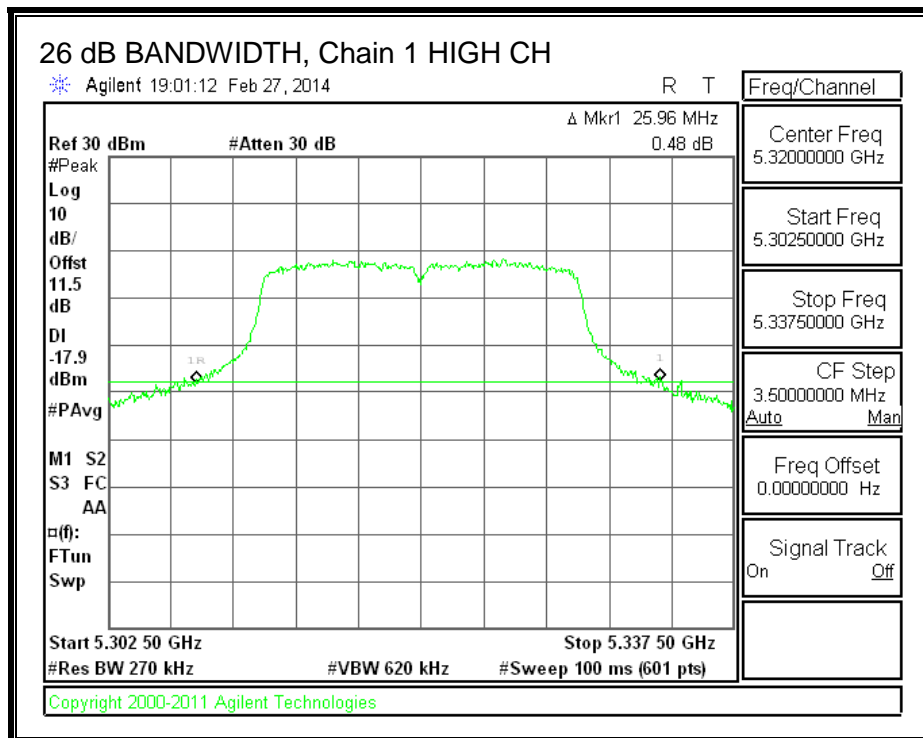
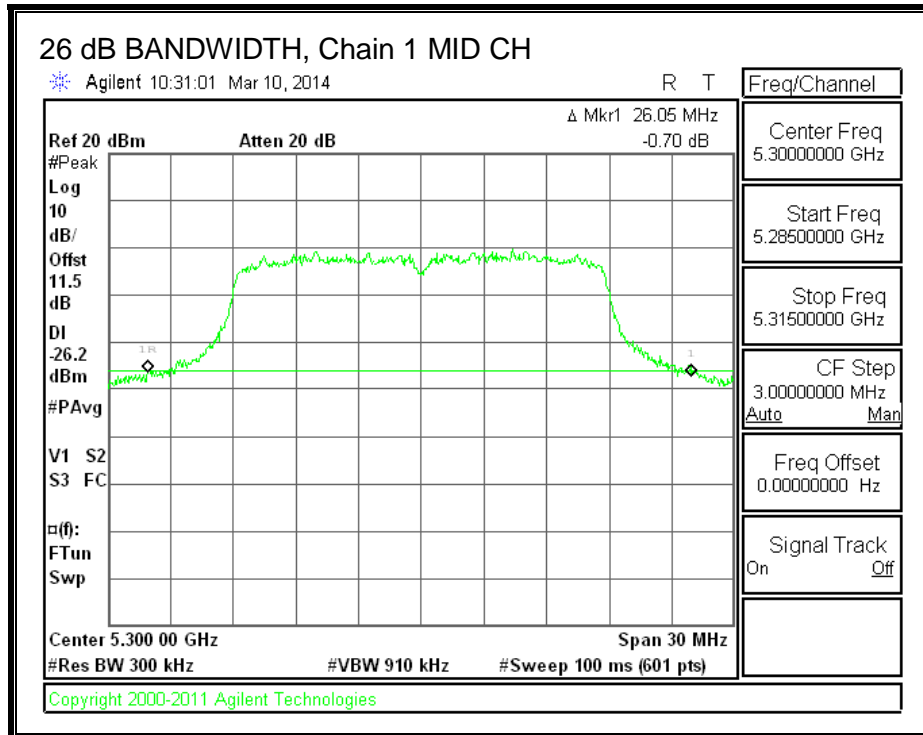
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





### 8.2.2. 99% BANDWIDTH

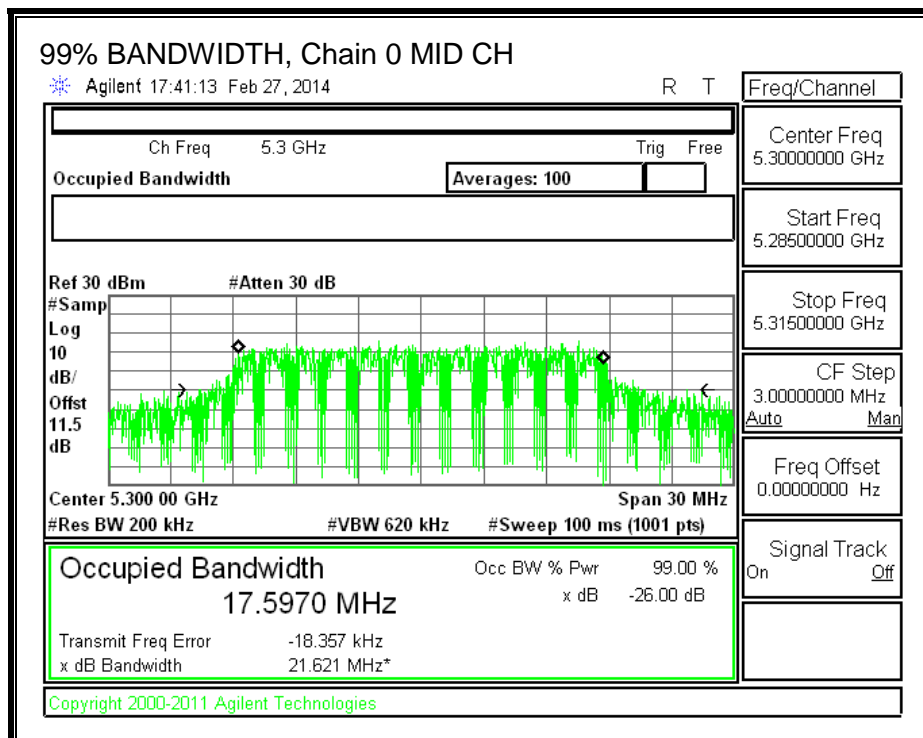
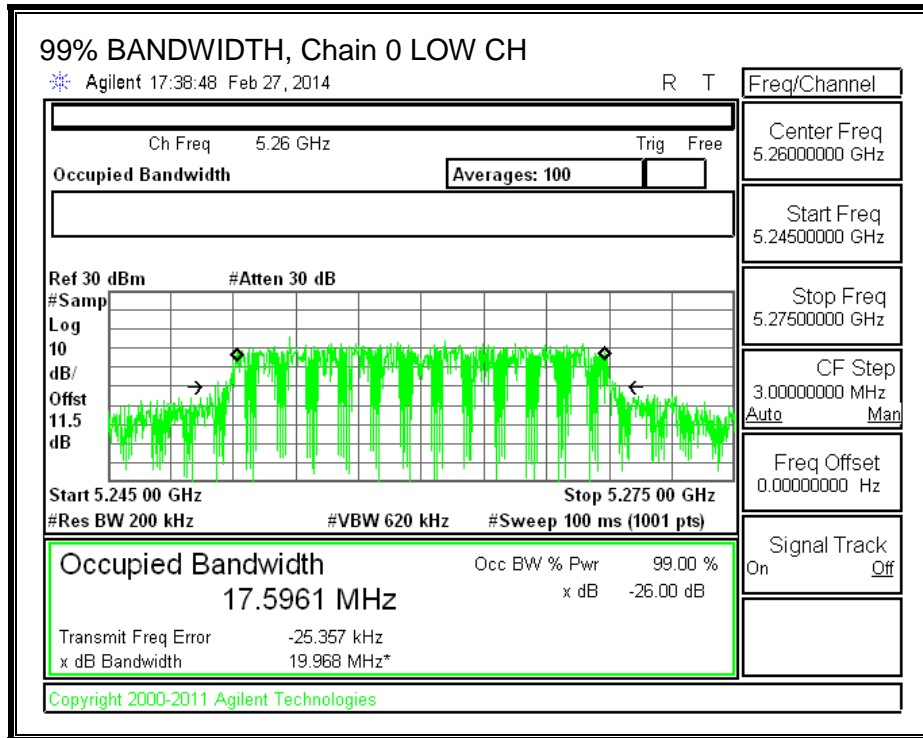
#### LIMITS

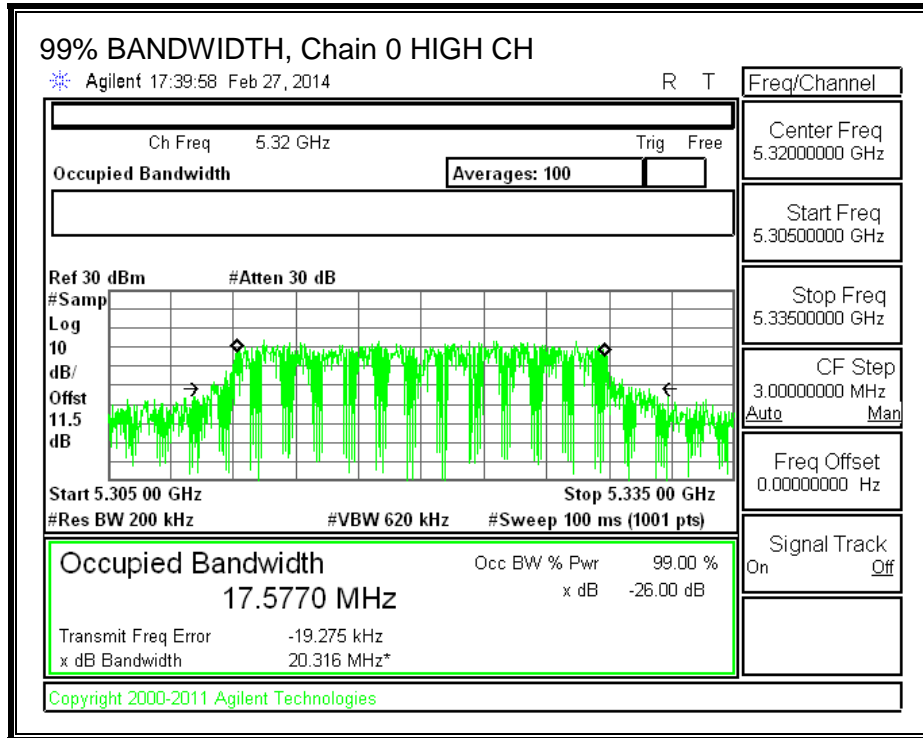
None; for reporting purposes only.

#### RESULTS

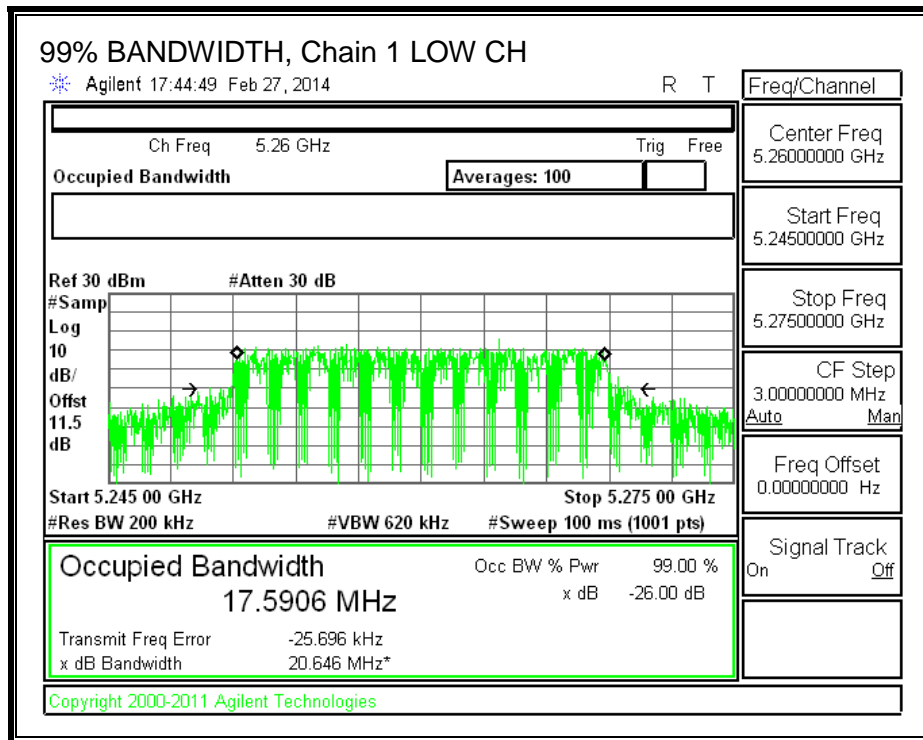
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5260	17.5961	17.5906
Mid	5300	17.5970	17.6308
High	5320	17.5770	17.5901

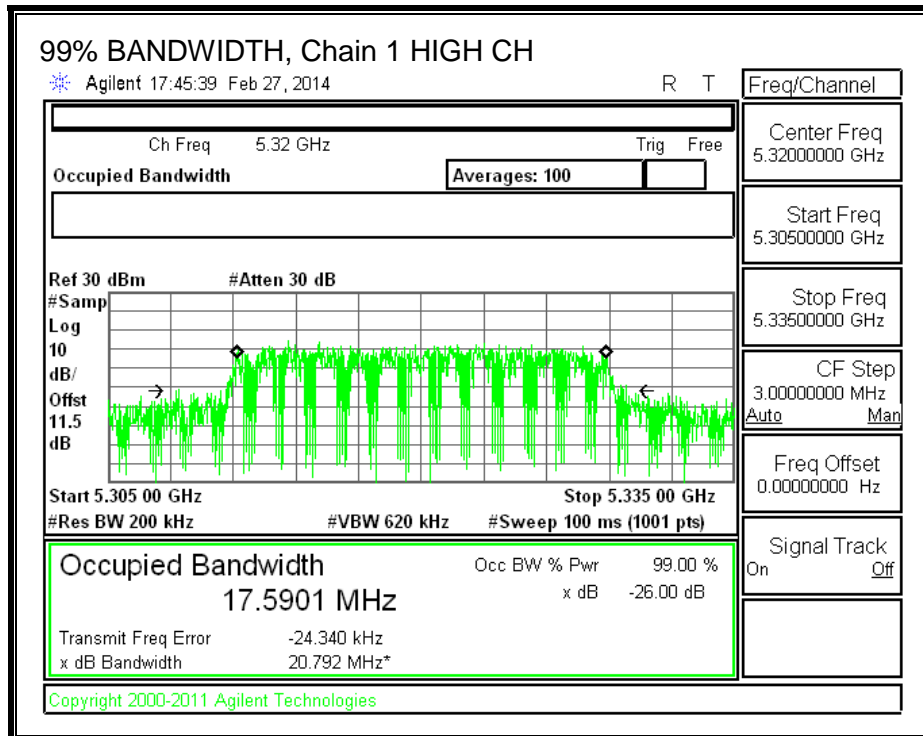
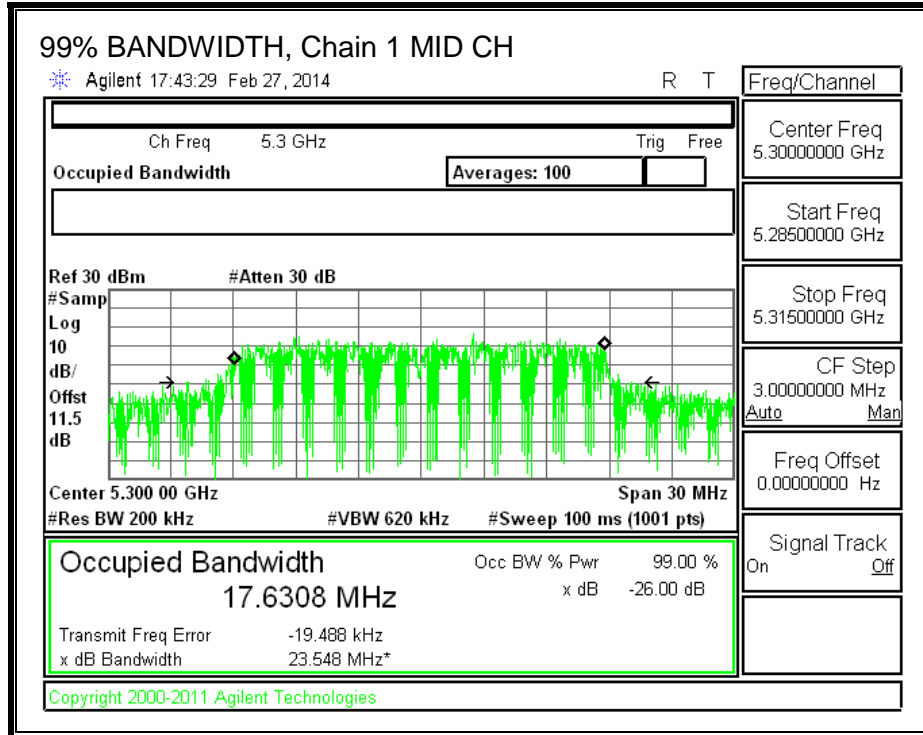
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**







### 8.2.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 0 PowerSetting	Chain 1 PowerSetting
Low	5260	17.50	17.50
Mid	5300	18.00	18.00
High	5320	17.00	17.00

#### RESULTS

##### Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5260	17.74	17.00	20.40
Mid	5300	18.31	17.59	20.98
High	5320	17.50	16.88	20.21

### 8.2.4. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log<sub>10</sub> B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.59	3.29	3.44

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for correlated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.59	3.29	6.45

**RESULTS**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5260	24.05	17.5906	3.44	6.45
Mid	5300	28.18	17.5970	3.44	6.45
High	5320	24.40	17.5770	3.44	6.45

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.45	29.45	23.45	10.55	11.00	10.55
Mid	5300	24.00	23.45	29.45	23.45	10.55	11.00	10.55
High	5320	24.00	23.45	29.45	23.45	10.55	11.00	10.55

<b>Duty Cycle CF (dB)</b>	0.54	<b>Included in Calculations of Corr'd Power &amp; PPSD</b>
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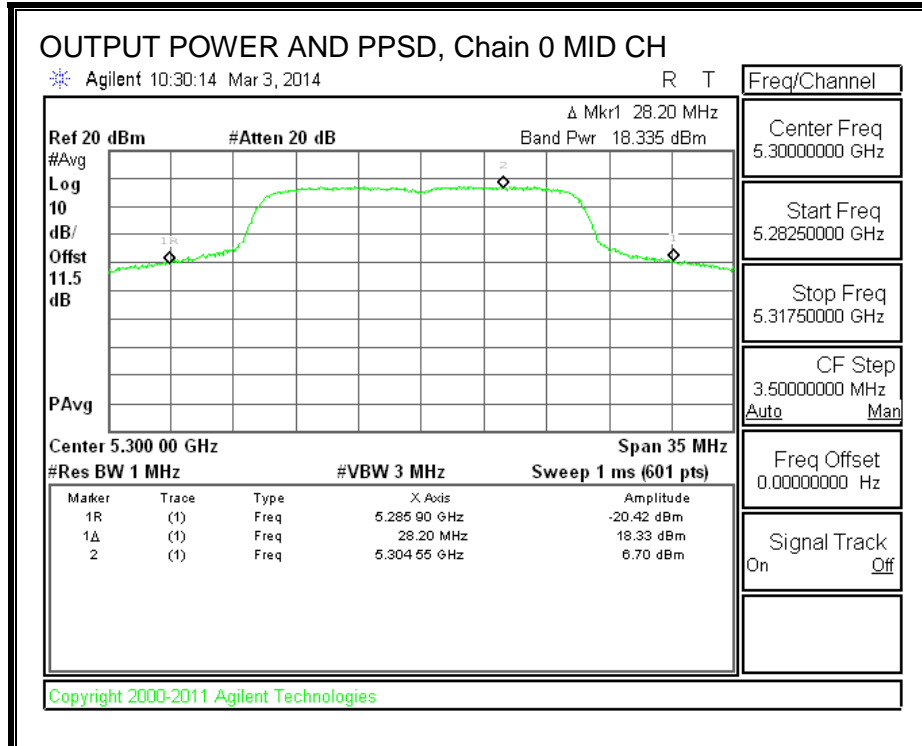
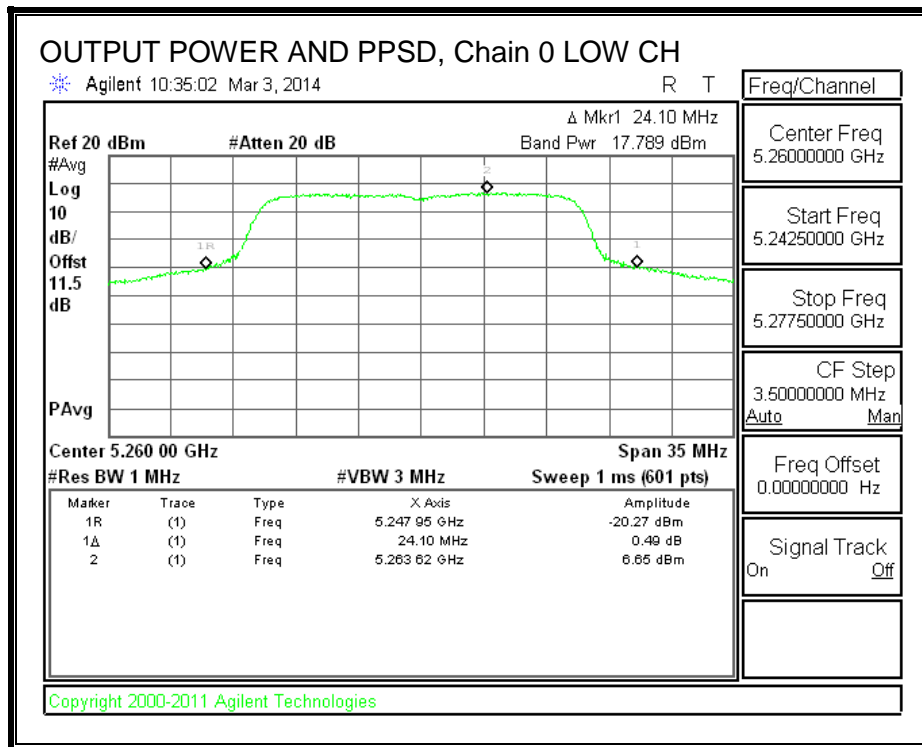
**Output Power Results**

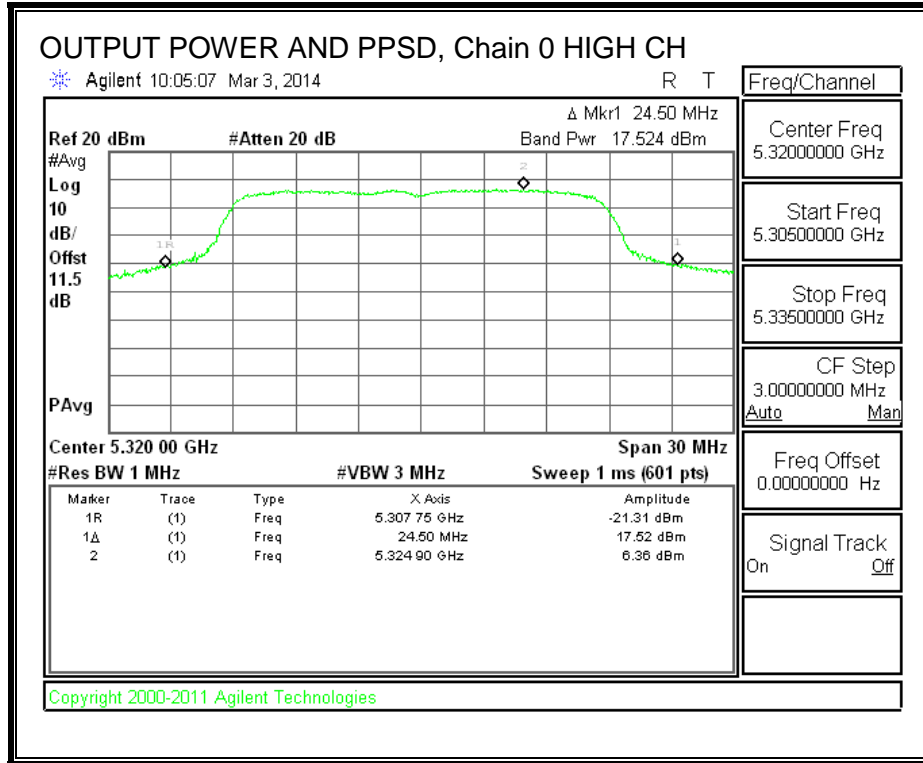
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	17.79	17.05	20.98	23.45	-2.47
Mid	5300	18.34	17.62	21.54	23.45	-1.91
High	5320	17.52	16.91	20.78	23.45	-2.67

**PPSD Results**

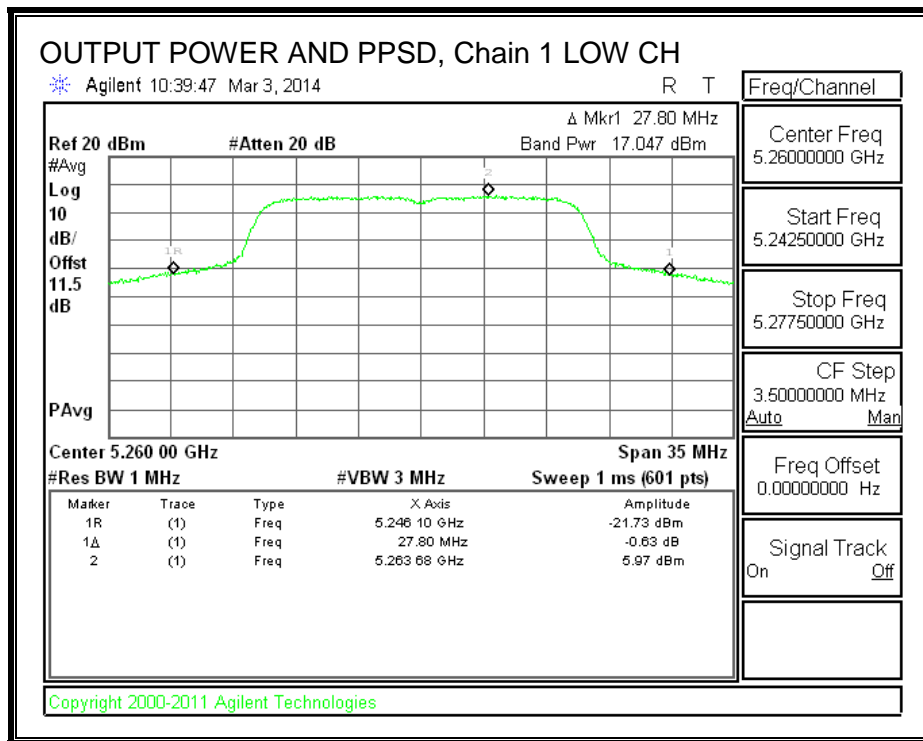
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	6.65	5.97	9.87	10.55	-0.68
Mid	5300	6.70	6.46	10.13	10.55	-0.42
High	5320	6.36	6.05	9.76	10.55	-0.79

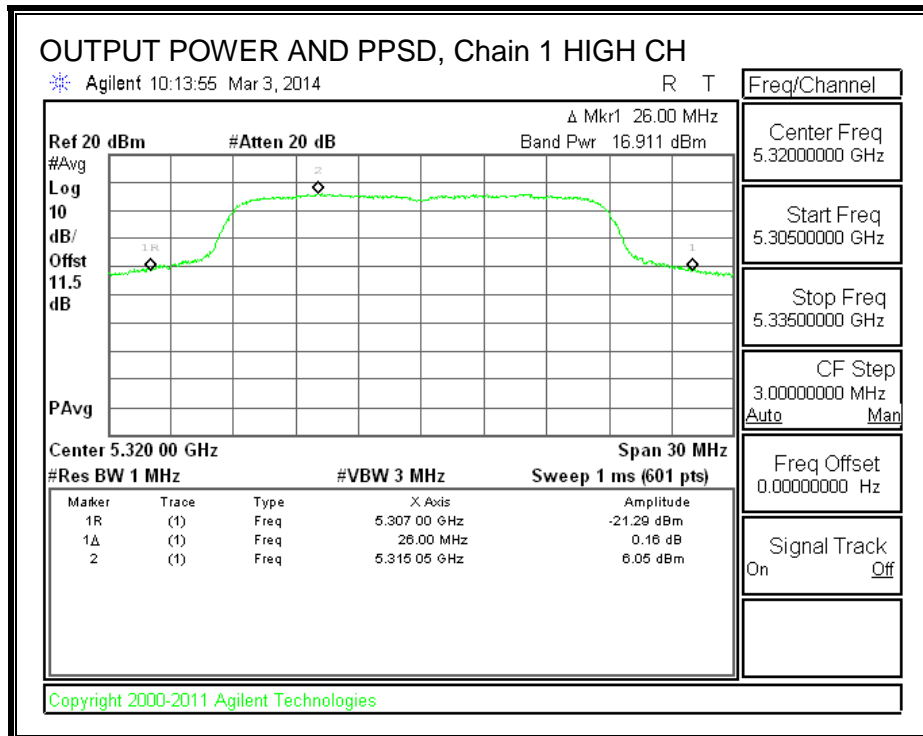
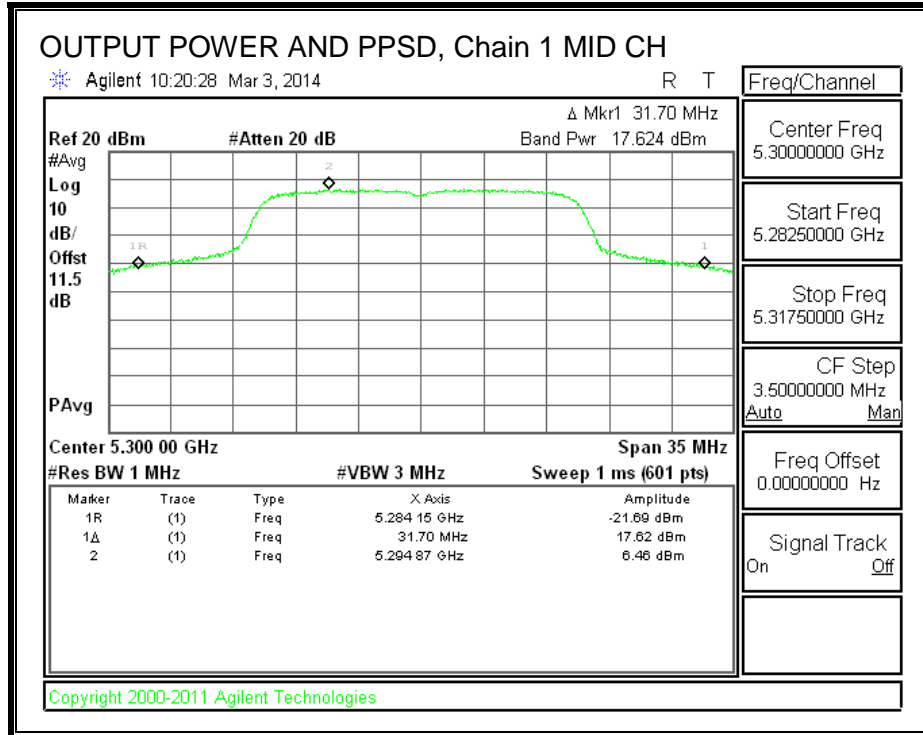
**OUTPUT POWER AND PPSD, Chain 0**





**OUTPUT POWER AND PPSD, Chain 1**





## 8.2.5. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

### 8.3. 802.11n HT20 MODE IN THE 5.6 GHz BAND

#### 8.3.1. 26 dB BANDWIDTH

##### LIMITS

None; for reporting purposes only.

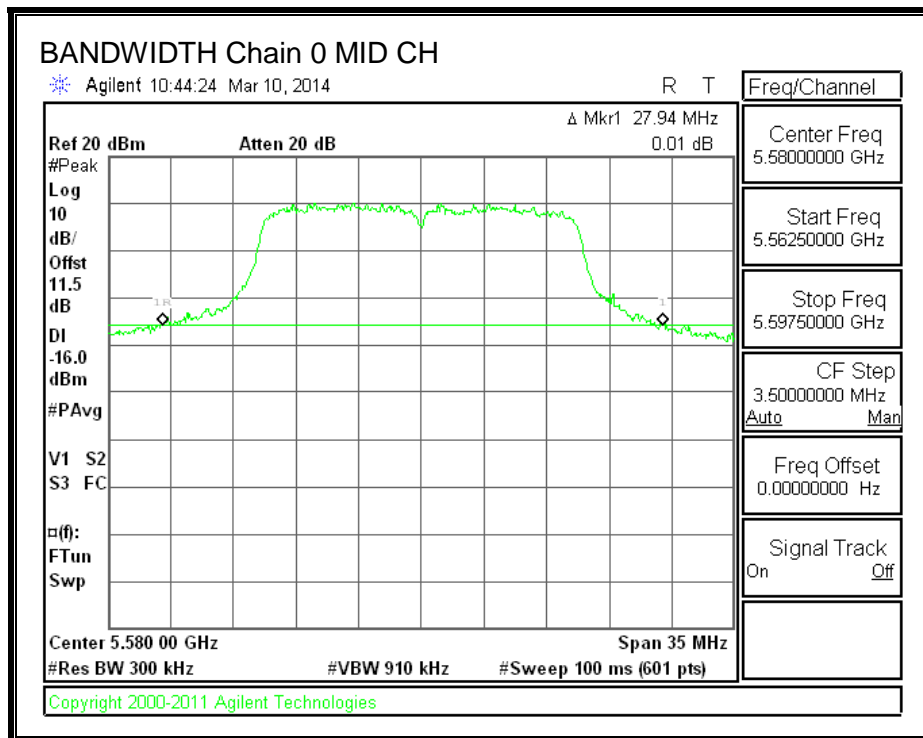
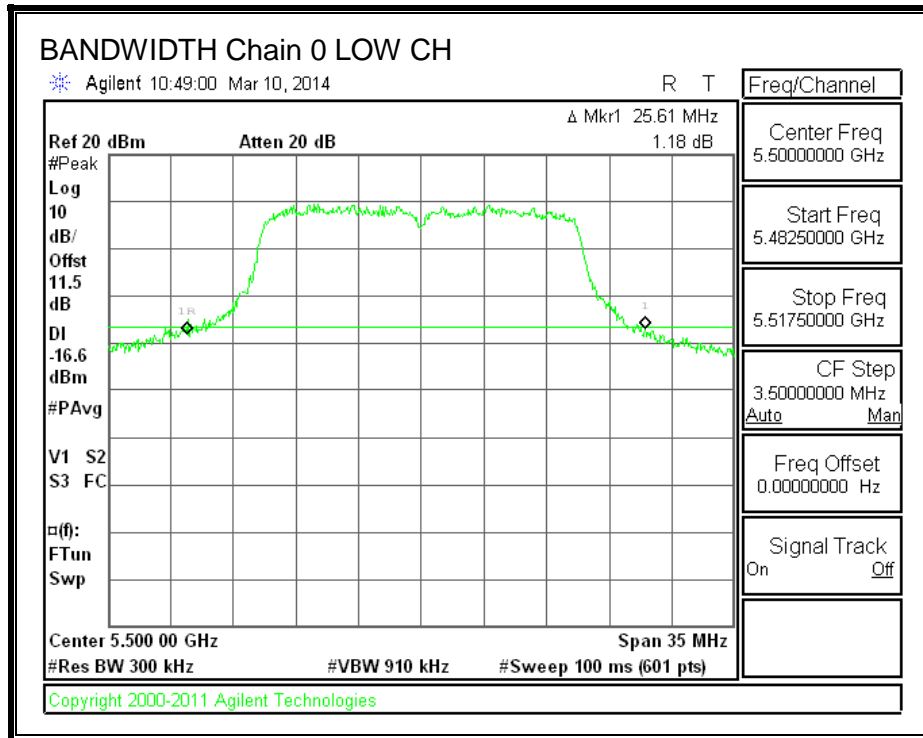
##### RESULTS

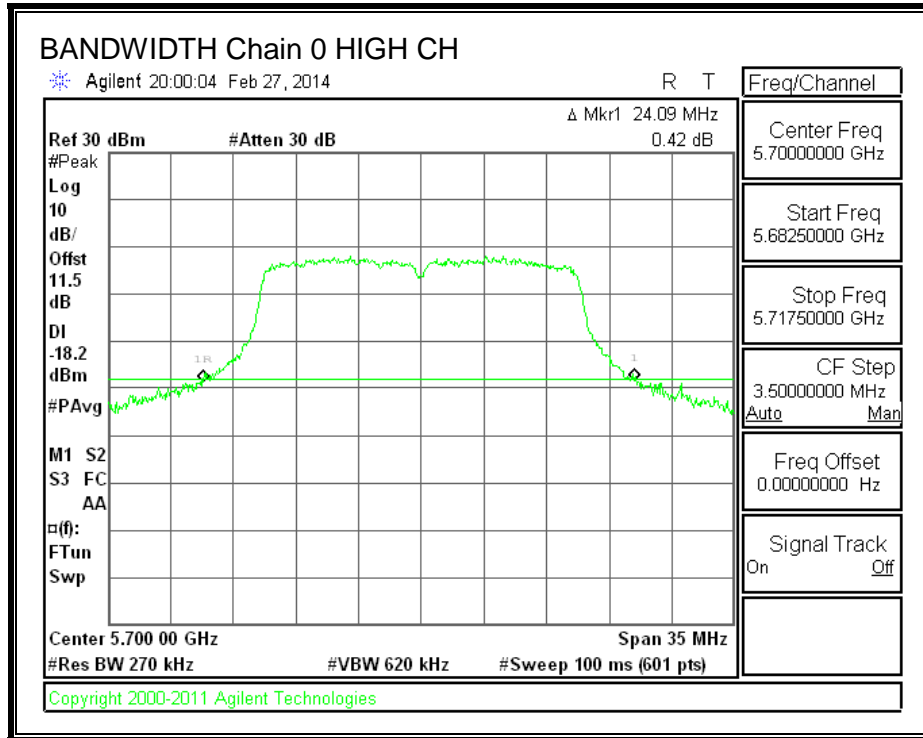
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5500	25.61	25.43
Mid	5580	27.94	29.05
High	5700	24.09	26.08



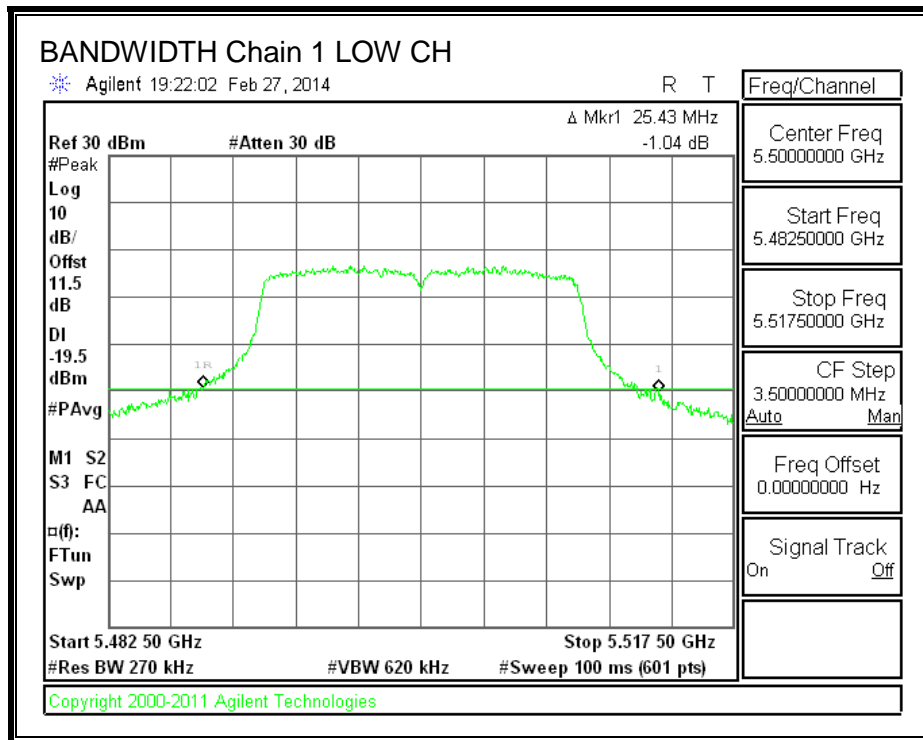
**26 dB BANDWIDTH**

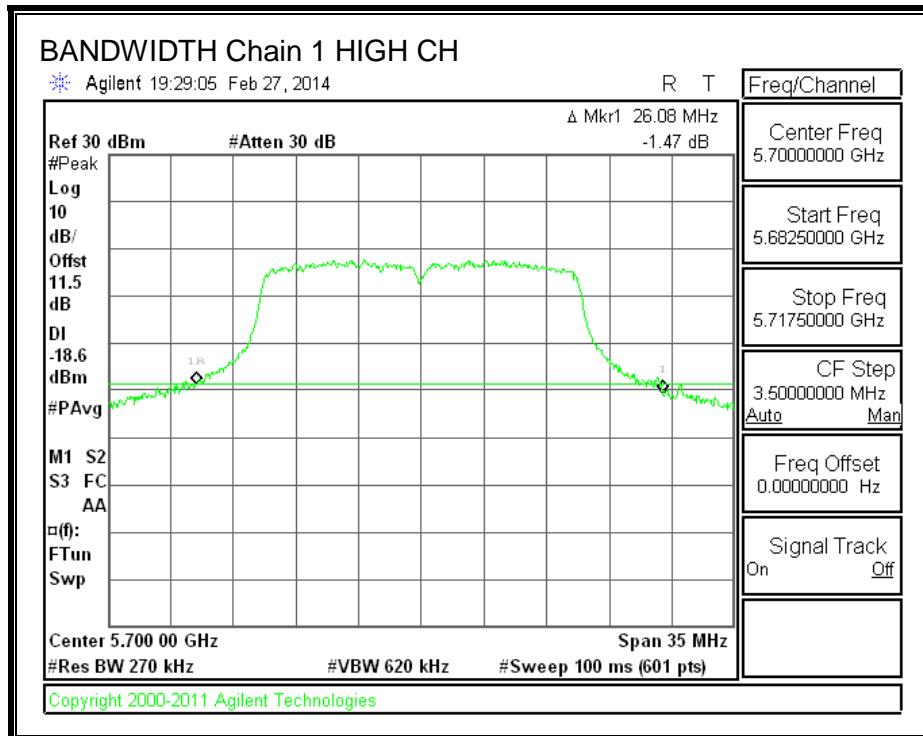
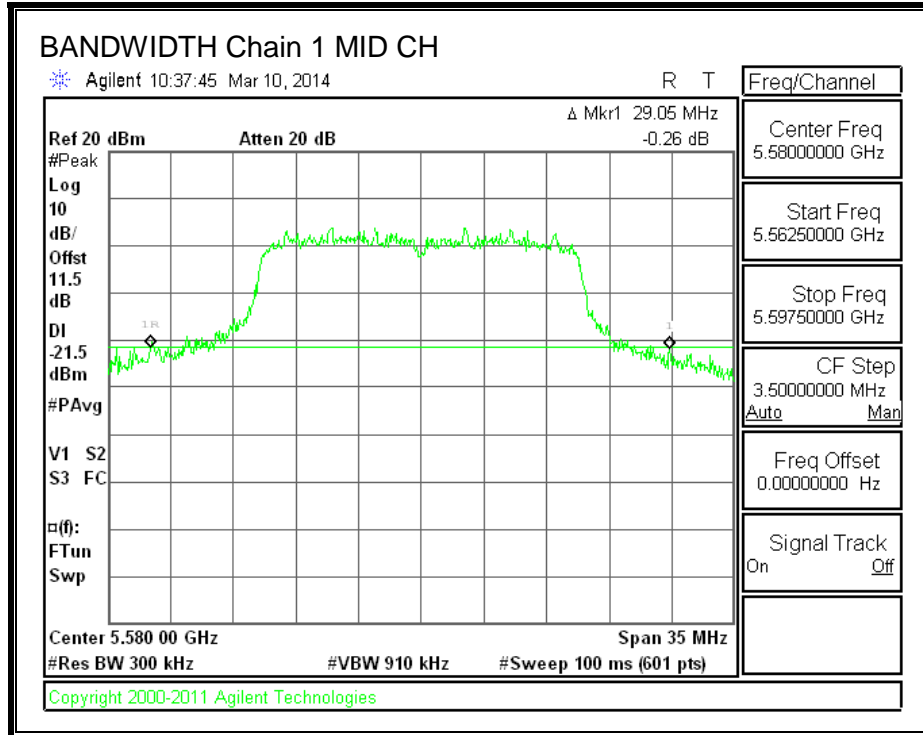
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





### 8.3.2. 99% BANDWIDTH

#### LIMITS

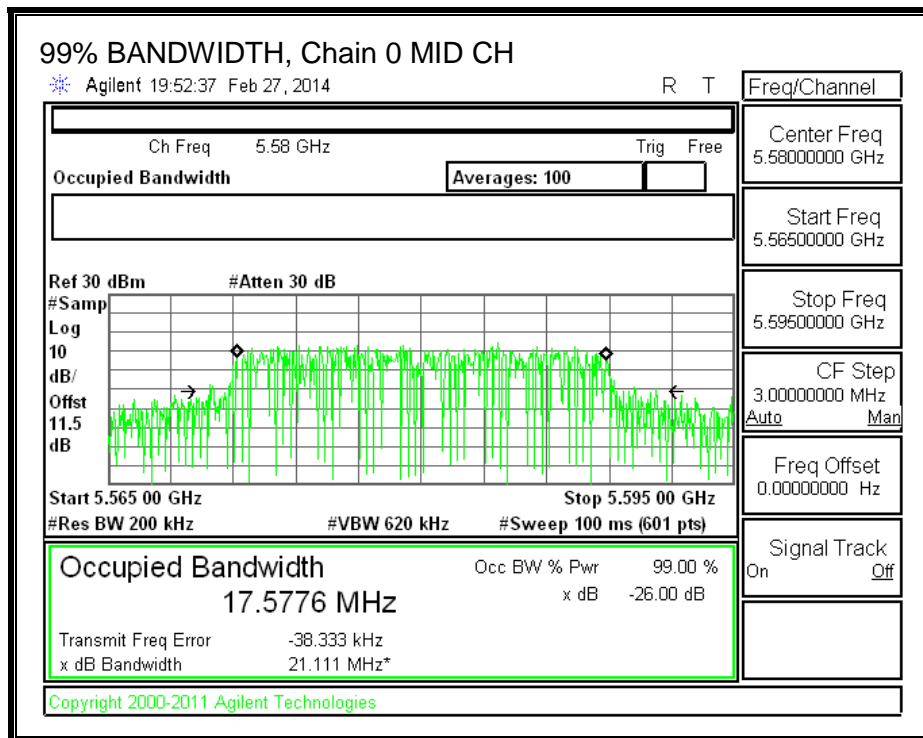
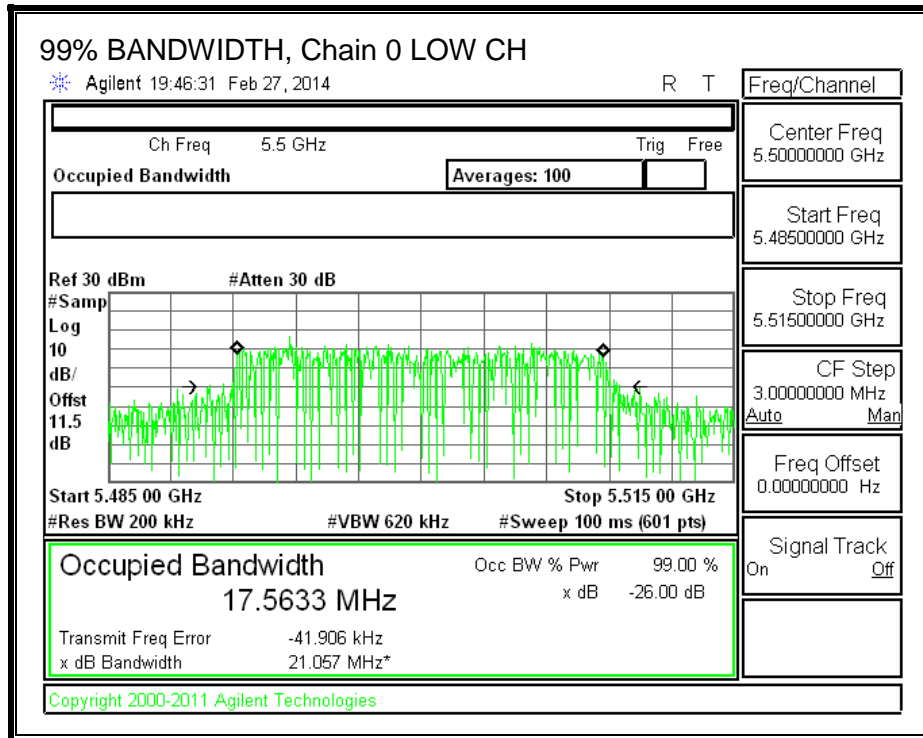
None; for reporting purposes only.

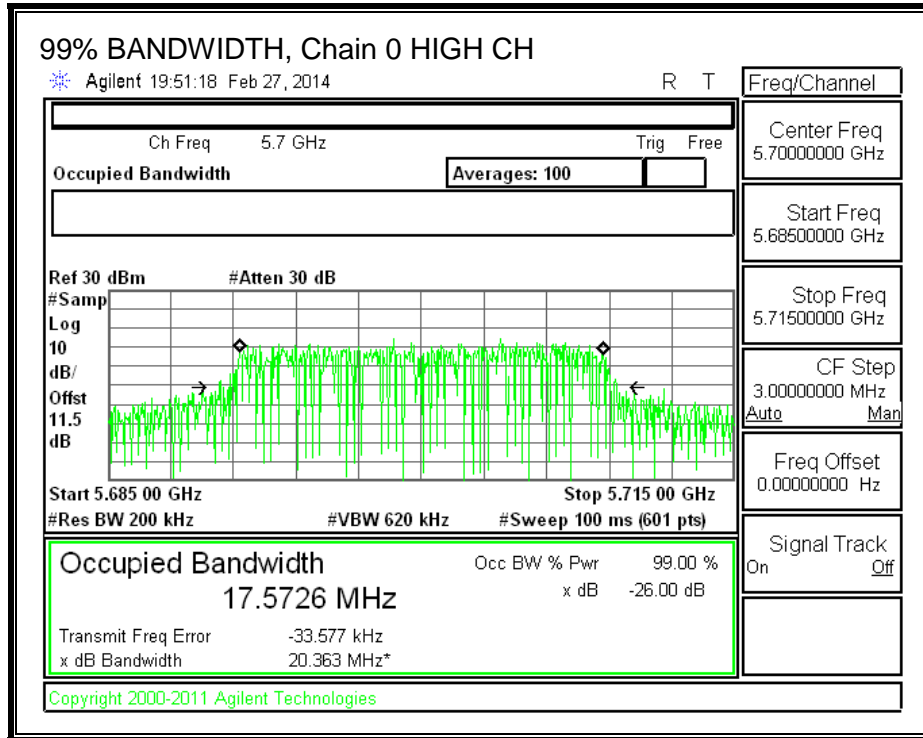
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5500	17.5633	17.5668
Mid	5580	17.5776	17.5983
High	5700	17.5726	17.5745

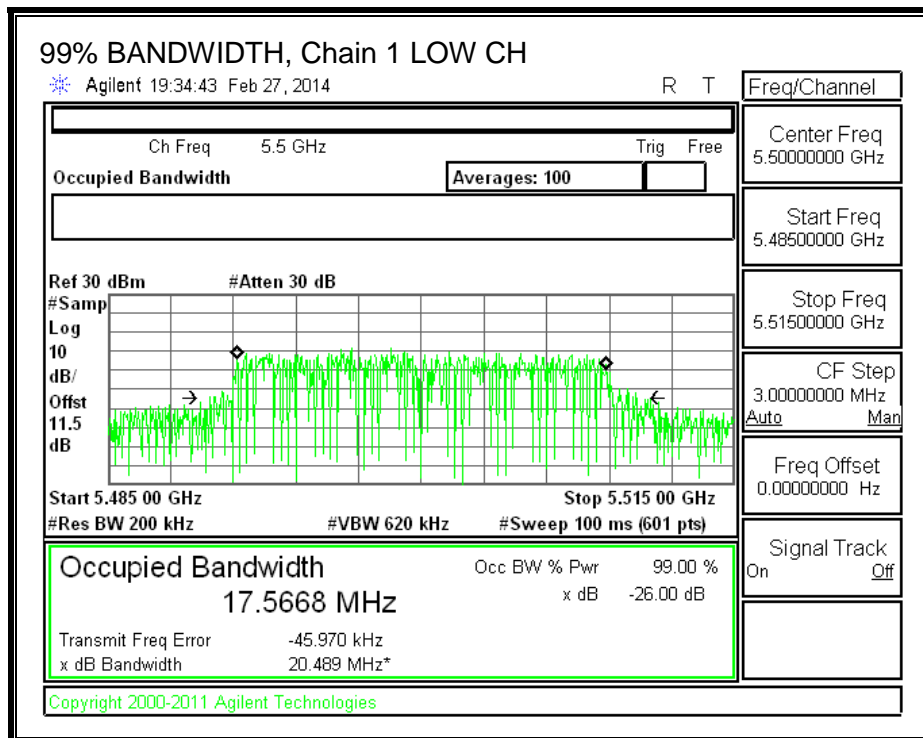
**99% BANDWIDTH**

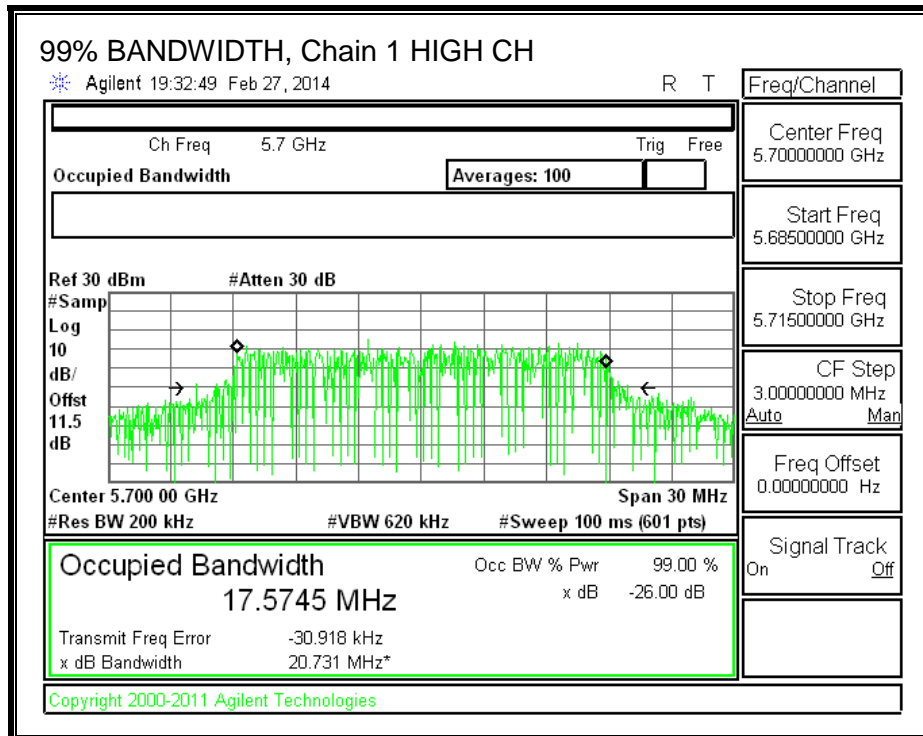
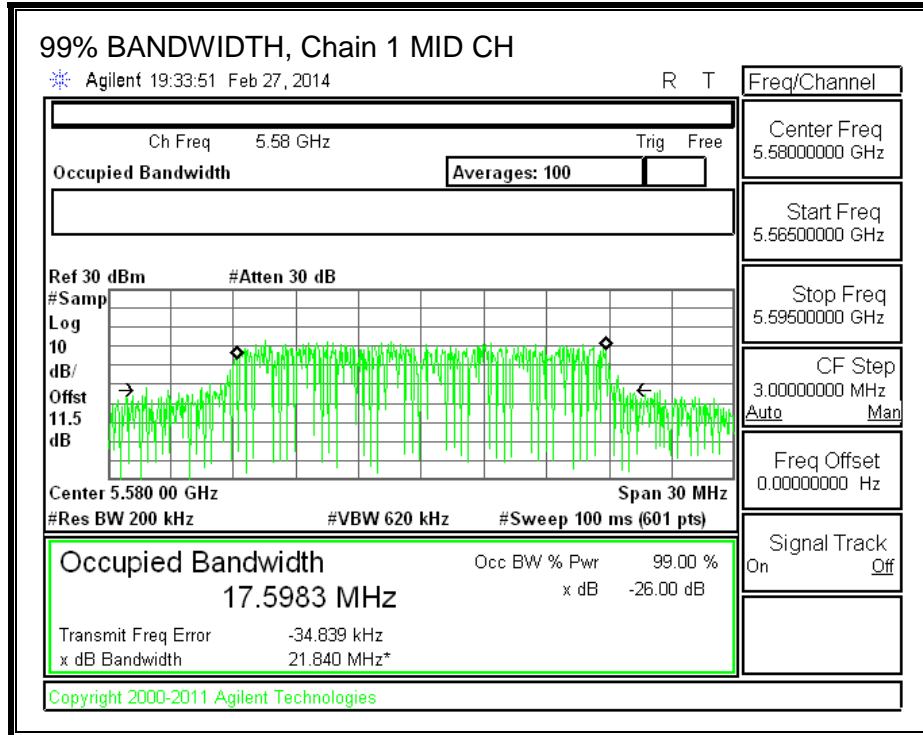
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 8.3.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 0 Power Setting	Chain 1 Power Setting
Low	5500	19.00	19.00
Mid	5580	19.50	19.50
High	5700	18.50	18.50

#### RESULTS

##### Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5500	17.81	16.77	20.33
Mid	5580	18.07	17.00	20.58
High	5700	17.80	17.51	20.67



### 8.3.4. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.5–5.7 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.59	3.29	3.44

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Use this table for correlated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.59	3.29	6.45

**RESULTS**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5500	25.43	17.5633	3.44	6.45
Mid	5580	27.36	17.5776	3.44	6.45
High	5700	24.09	17.5726	3.44	6.45

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5500	24.00	23.45	29.45	23.45	10.55	11.00	10.55
Mid	5580	24.00	23.45	29.45	23.45	10.55	11.00	10.55
High	5700	24.00	23.45	29.45	23.45	10.55	11.00	10.55

<b>Duty Cycle CF (dB)</b>	0.52	<b>Included in Calculations of Corr'd Power &amp; PPSD</b>
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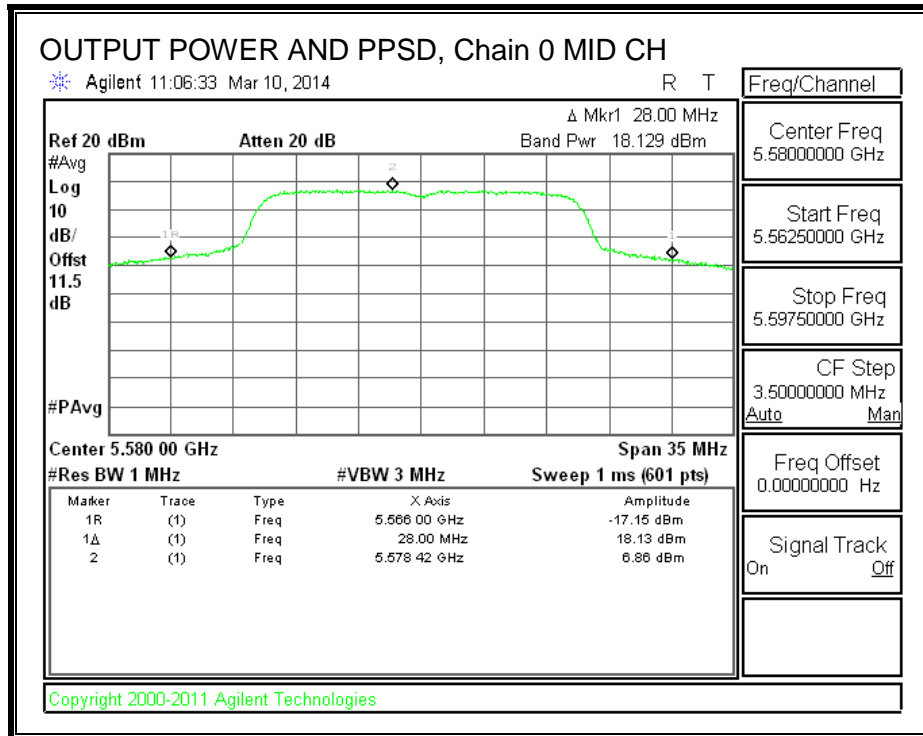
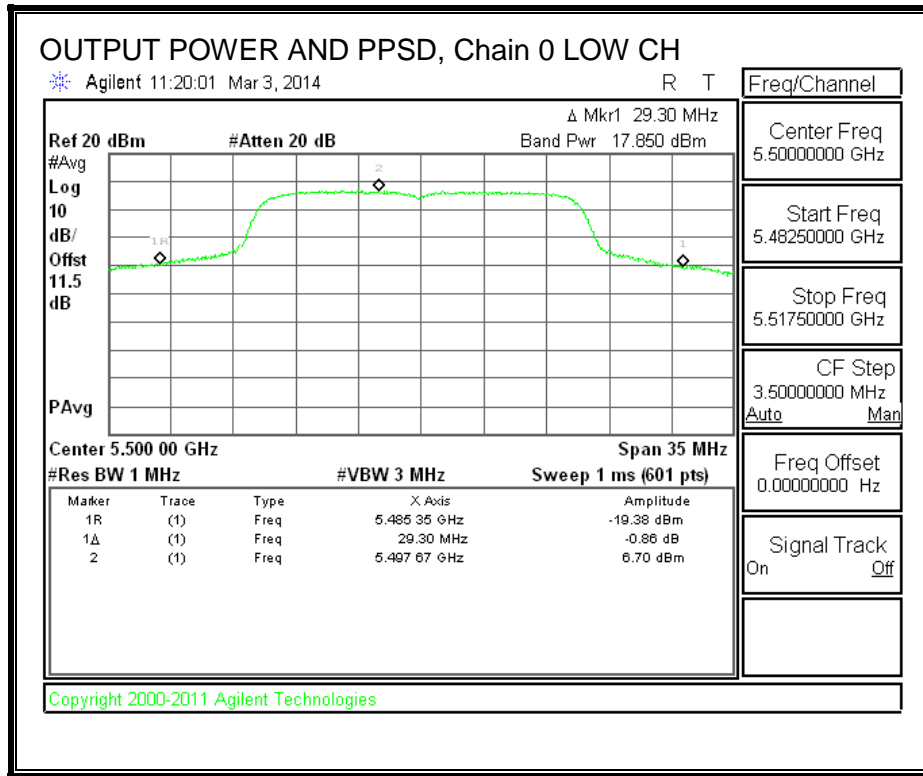
**Output Power Results**

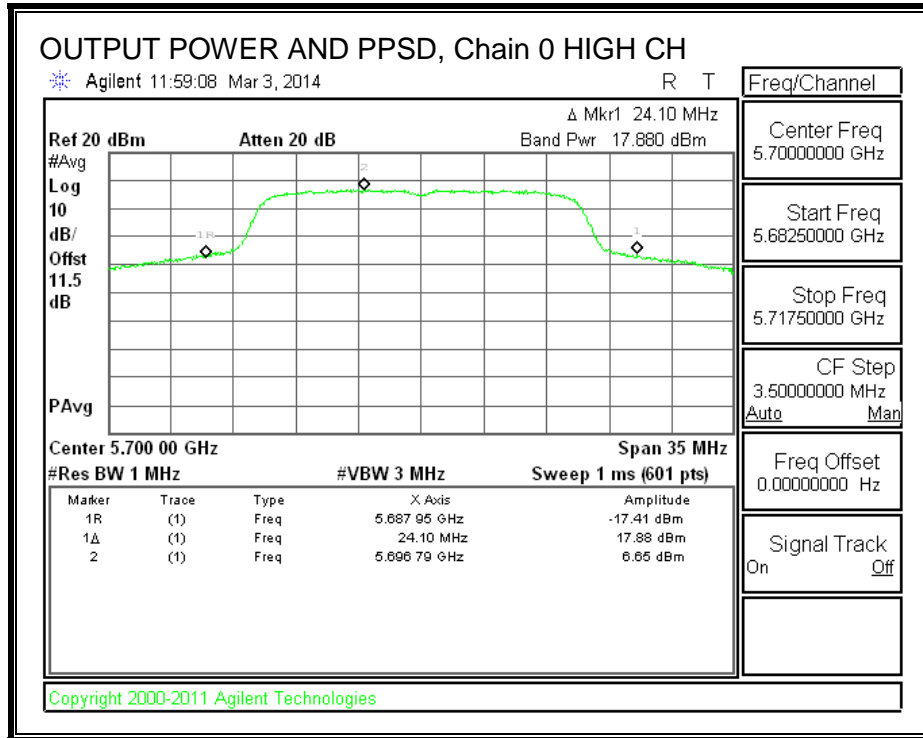
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	17.85	16.80	20.89	23.45	-2.56
Mid	5580	18.13	17.02	21.14	23.45	-2.31
High	5700	17.88	17.56	21.25	23.45	-2.19

**PPSD Results**

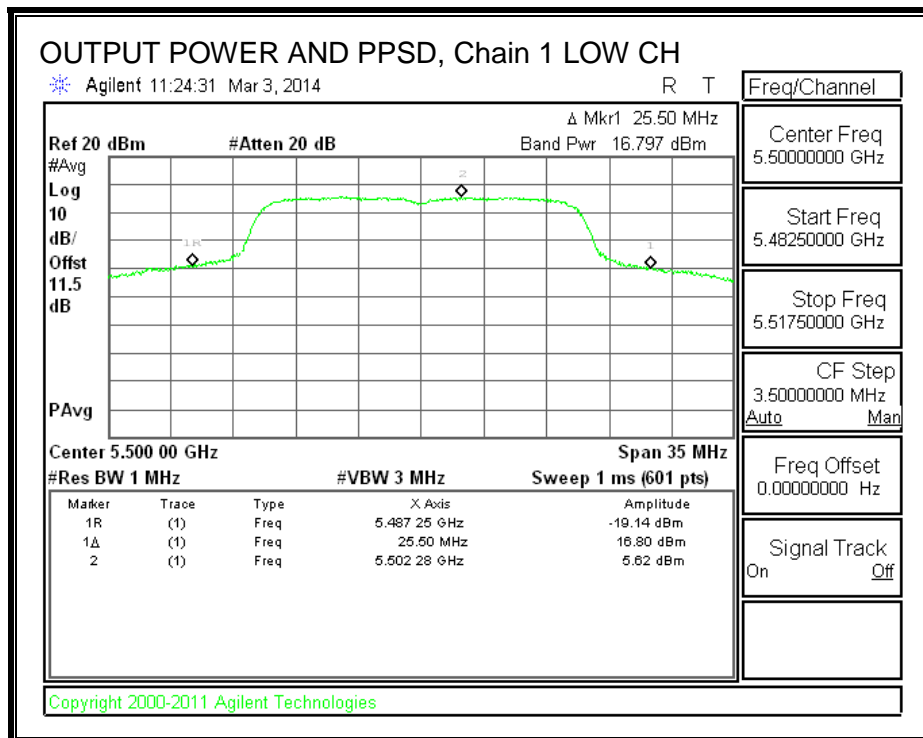
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	6.70	5.62	9.72	10.55	-0.83
Mid	5580	6.86	6.04	10.00	10.55	-0.55
High	5700	6.65	6.34	10.03	10.55	-0.52

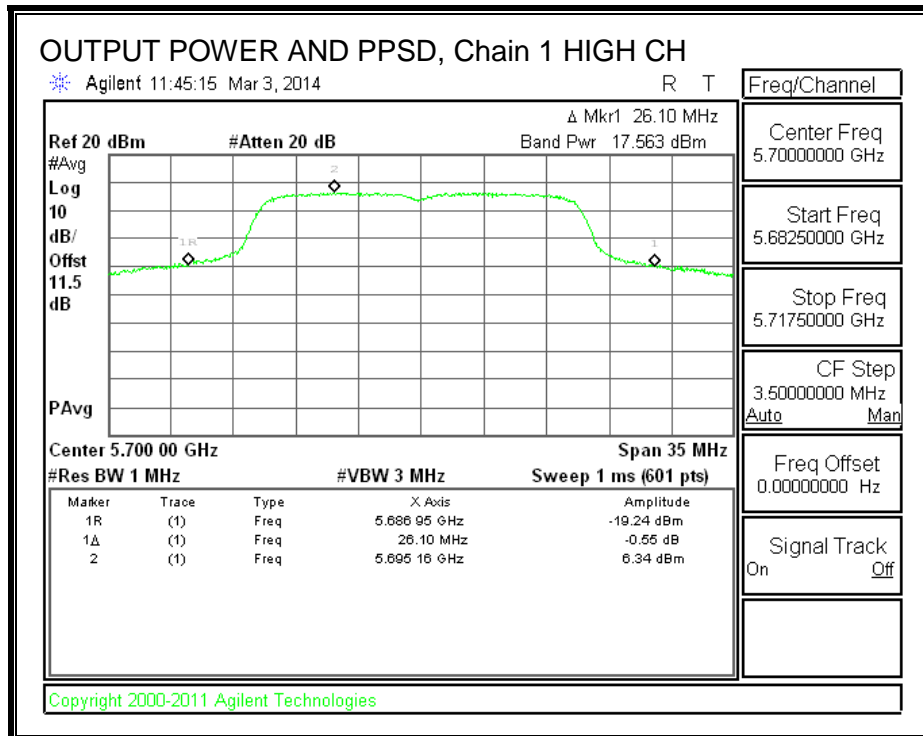
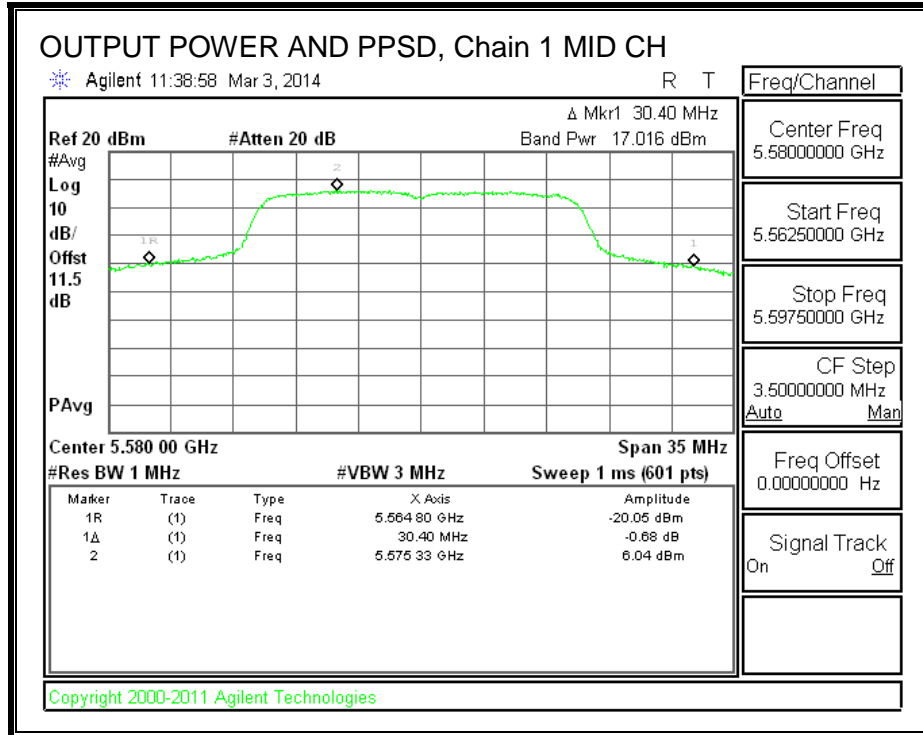
**OUTPUT POWER AND PPSD, Chain 0**





### OUTPUT POWER AND PPSD, Chain 1





### **8.3.5. PEAK EXCURSION**

#### **LIMITS**

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

#### **RESULTS**

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

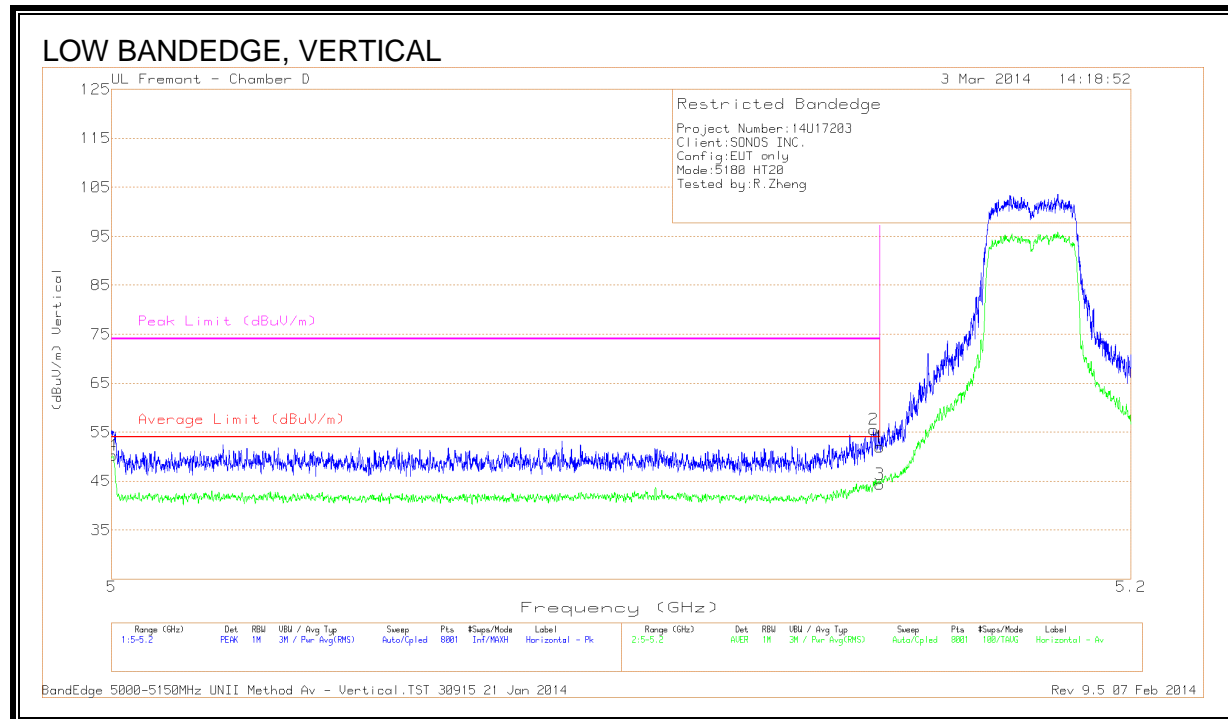
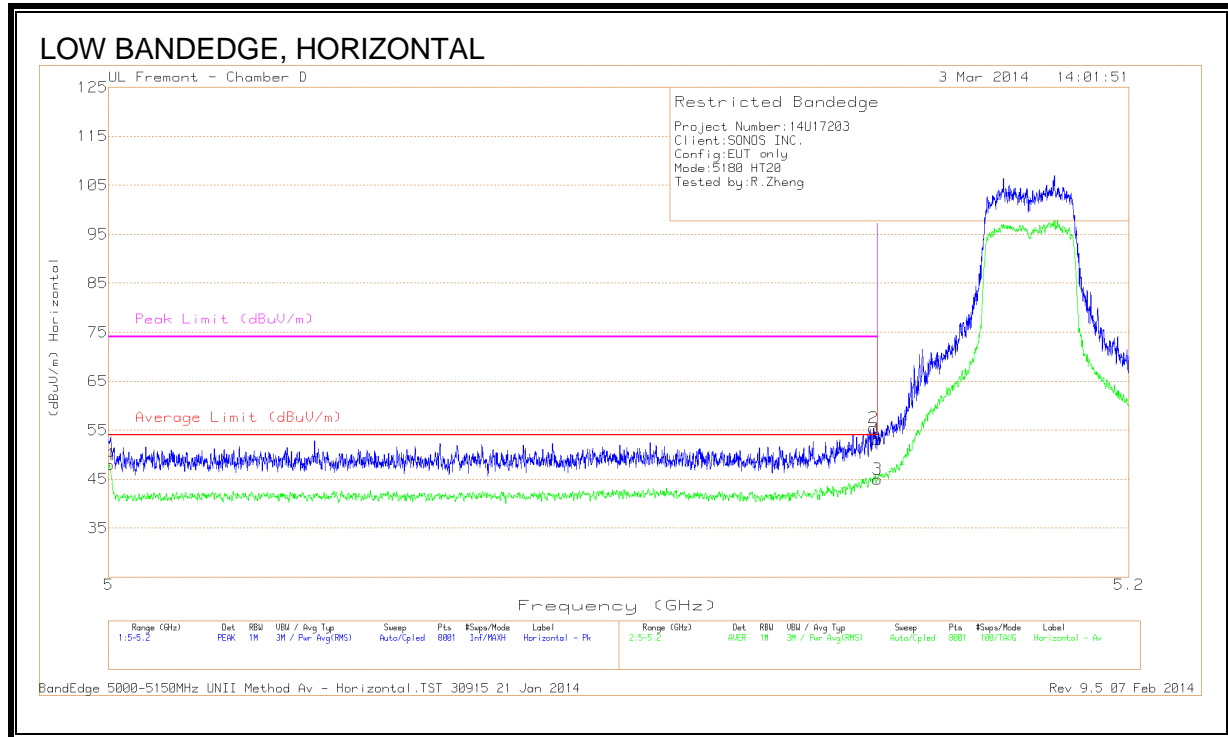
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 9.2. TRANSMITTER ABOVE 1 GHz

### 9.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND





**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.150	37.61	PK	33.7	-18.3	53.01	-	-	74	-20.99	187	165	H
2	* 5.149	40.04	PK	33.7	-18.3	55.44	-	-	74	-18.56	187	165	H
3	* 5.150	29.58	RMS	33.7	-18.3	44.98	54	-9.02	-	-	187	165	H
4	* 5.000	32.62	RMS	33.5	-18.2	47.92	54	-6.08	-	-	187	165	H

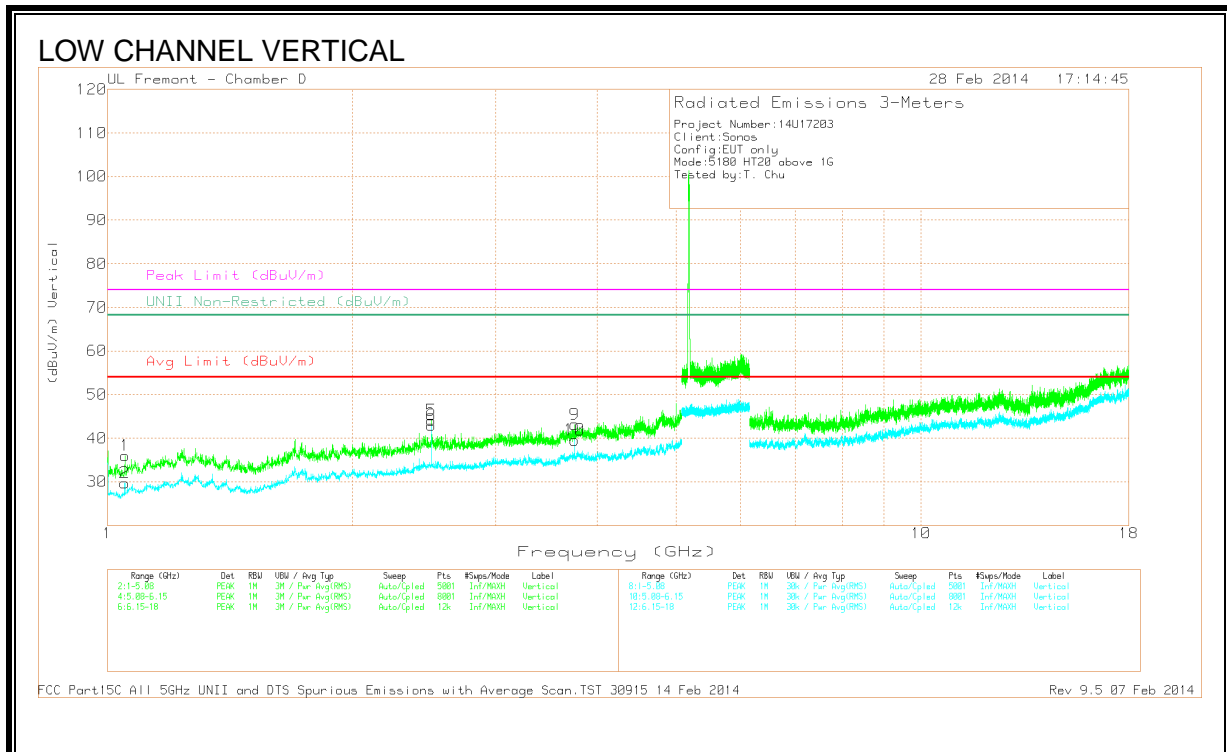
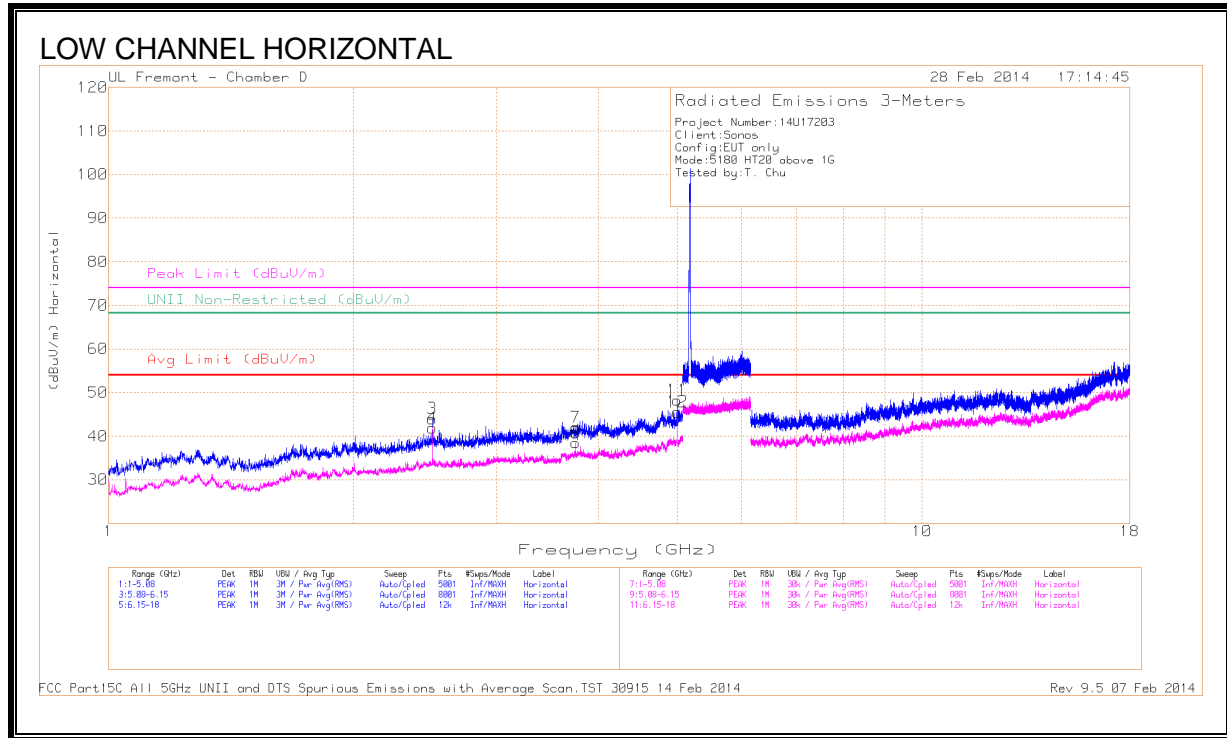
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.150	36.59	PK	33.7	-18.3	51.99	-	-	74	-22.01	233	106	V
2	* 5.149	40.15	PK	33.7	-18.3	55.55	-	-	74	-18.45	233	106	V
3	* 5.150	28.95	RMS	33.7	-18.3	44.35	54	-9.65	-	-	233	106	V
4	* 5.000	34.93	RMS	33.5	-18.2	50.23	54	-3.77	-	-	233	106	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	41.22	PK	26.8	-32.0	36.02	-	-	74	-37.98	-	-	0-360	201	V
2	* 1.050	34.95	Avg	26.8	-32.0	29.75	54	-24.25	-	-	-	-	0-360	201	V
3	*2.500	42.10	PK	32.2	-30.3	44.00	-	-	74	-30.00	-	-	0-360	201	H
4	* 2.500	40.00	Avg	32.2	-30.3	41.90	54	-12.10	-	-	-	-	0-360	201	H
5	*2.500	42.16	PK	32.2	-30.3	44.06	-	-	74	-29.94	-	-	0-360	100	V
6	* 2.500	41.09	Avg	32.2	-30.3	42.99	54	-11.01	-	-	-	-	0-360	100	V
7	* 3.751	38.03	PK	32.7	-28.7	42.03	-	-	74	-31.97	-	-	0-360	201	H
8	* 3.751	34.47	Avg	32.7	-28.7	38.47	54	-15.53	-	-	-	-	0-360	100	H
9	* 3.751	39.15	PK	32.7	-28.7	43.15	-	-	74	-30.85	-	-	0-360	100	V
10	* 3.751	35.57	Avg	32.7	-28.7	39.57	54	-14.43	-	-	-	-	0-360	100	V
11	* 5.007	37.11	PK1	33.5	-26.4	44.21	-	-	74	-29.79	-	-	191	228	H
12	* 5.007	27.63	AD1	33.5	-26.7	34.43	54	-19.57	-	-	-	-	191	228	H

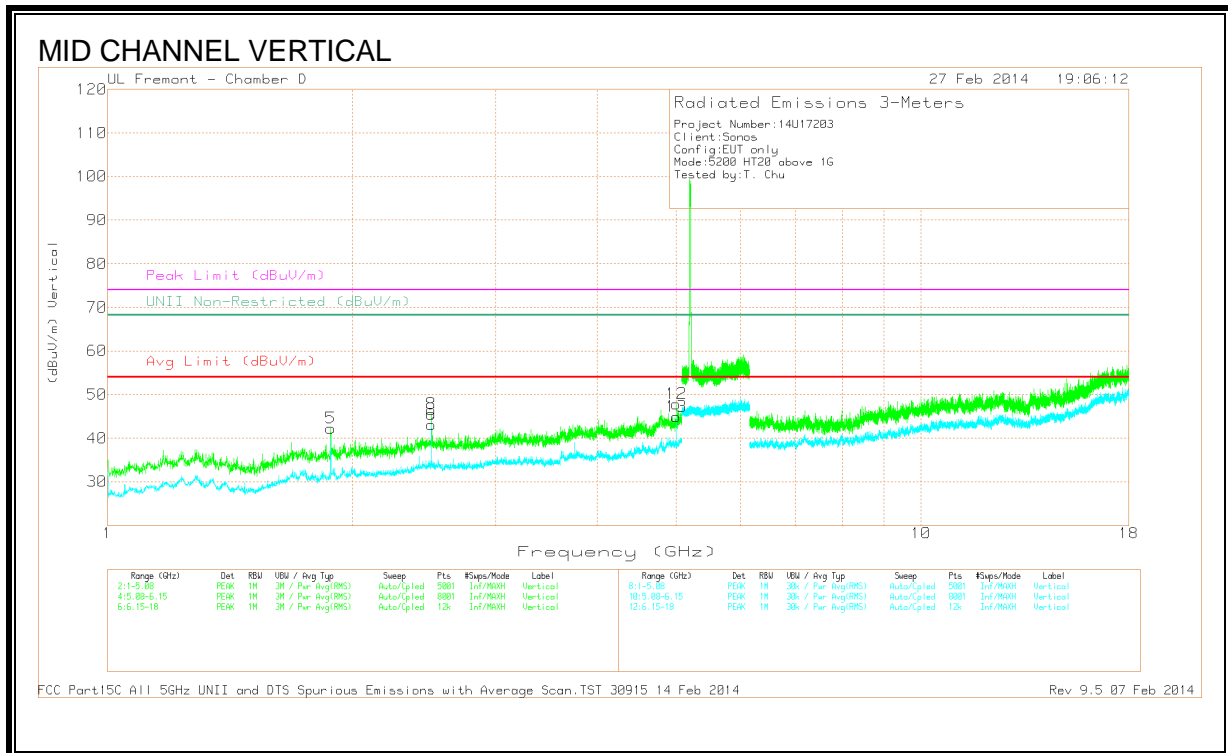
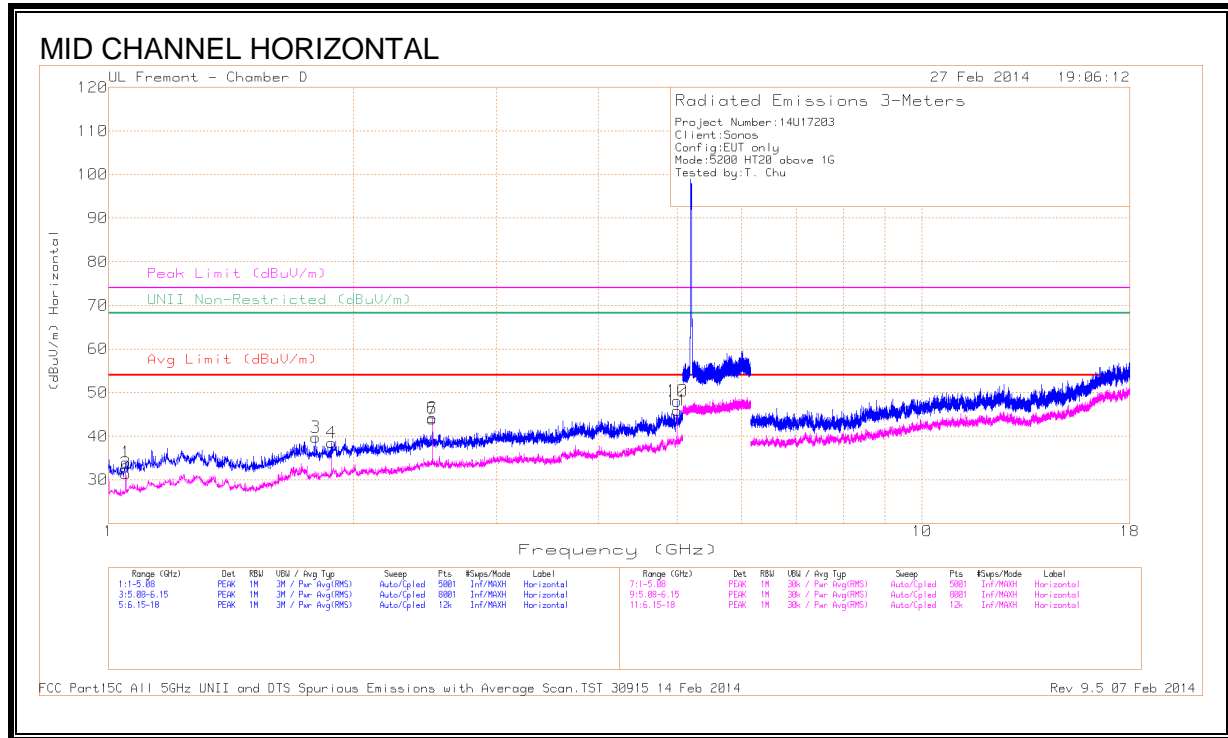
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	39.28	PK	26.8	-32.0	34.08	-	-	74	-39.92	-	-	0-360	100	H
2	* 1.051	36.66	Avg	26.8	-32.0	31.46	54	-22.54	-	-	-	-	0-360	100	H
3	1.797	41.44	PK	29.6	-31.3	39.74	-	-	-	-	68.2	-28.46	0-360	100	H
4	1.880	38.99	PK	30.1	-30.6	38.49	-	-	-	-	68.2	-29.71	0-360	201	H
5	1.880	42.78	PK	30.1	-30.6	42.28	-	-	-	-	68.2	-25.92	0-360	201	V
6	*2.500	42.28	PK	32.2	-30.3	44.18	-	-	74	-29.82	-	-	0-360	201	H
7	* 2.500	42.03	Avg	32.2	-30.3	43.93	54	-10.07	-	-	-	-	0-360	201	H
8	*2.500	43.65	PK	32.2	-30.3	45.55	-	-	74	-28.45	-	-	0-360	100	V
9	* 2.500	41.23	Avg	32.2	-30.3	43.13	54	-10.87	-	-	-	-	0-360	100	V
10	* 5.011	36.97	PK1	33.5	-26.5	43.97	-	-	74	-30.03	-	-	213	236	H
11	* 5.011	27.82	AD1	33.5	-26.6	34.72	54	-19.28	-	-	-	-	213	236	H
12	* 5.001	40.86	PK	33.5	-26.5	47.86	-	-	74	-26.14	-	-	0-360	100	V
13	* 5.001	37.95	Avg	33.5	-26.5	44.95	54	-9.05	-	-	-	-	0-360	201	V

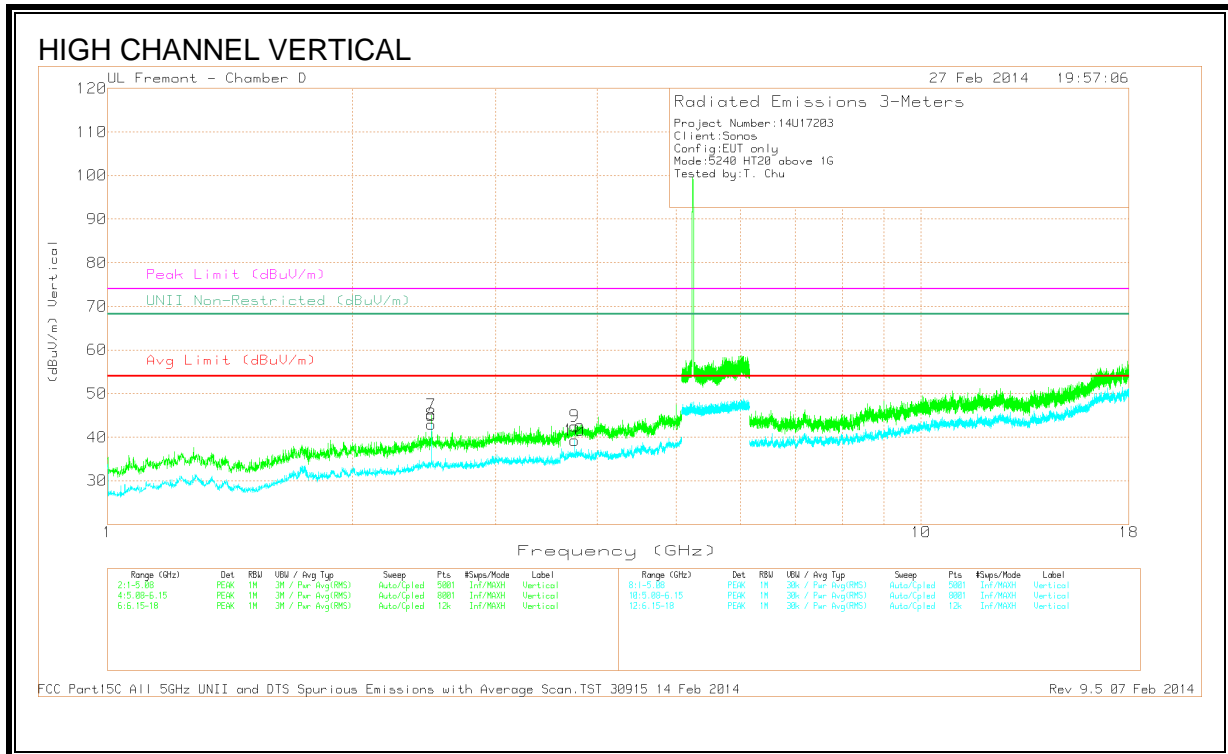
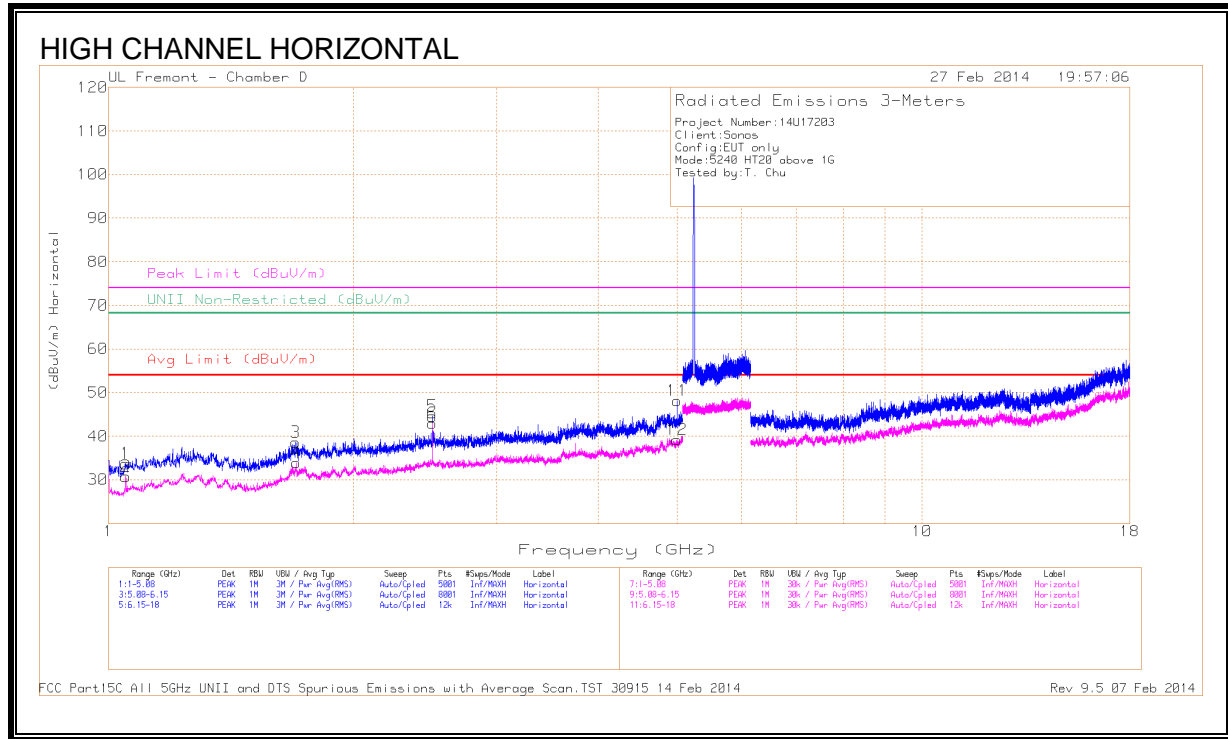
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.050	38.90	PK	26.8	-32	33.70	-	-	74	-40.30	-	-	0-360	100	H
2	* 1.050	35.97	Avg	26.8	-32	30.77	54	-23.23	-	-	-	-	0-360	100	H
3	* 1.702	40.58	PK	28.9	-30.9	38.58	-	-	74	-35.42	-	-	0-360	100	H
4	* 1.702	35.99	Avg	28.9	-31	33.89	54	-20.11	-	-	-	-	0-360	100	H
5	* 2.500	42.67	PK	32.2	-30.3	44.57	-	-	74	-29.43	-	-	0-360	201	H
6	* 2.500	41.09	Avg	32.2	-30.3	42.99	54	-11.01	-	-	-	-	0-360	201	H
7	* 2.500	43.10	PK	32.2	-30.3	45.00	-	-	74	-29.00	-	-	0-360	201	V
8	* 2.500	41.05	Avg	32.2	-30.3	42.95	54	-11.05	-	-	-	-	0-360	100	V
9	* 3.751	38.55	PK	32.7	-28.7	42.55	-	-	74	-31.45	-	-	0-360	100	V
10	* 3.751	35.26	Avg	32.7	-28.7	39.26	54	-14.74	-	-	-	-	0-360	100	V
11	* 5.005	38.69	PK1	33.5	-26.7	45.49	-	-	74	-28.51	-	-	162	168	H
12	* 5.005	27.78	AD1	33.5	-26.6	34.68	54	-19.32	-	-	-	-	162	168	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

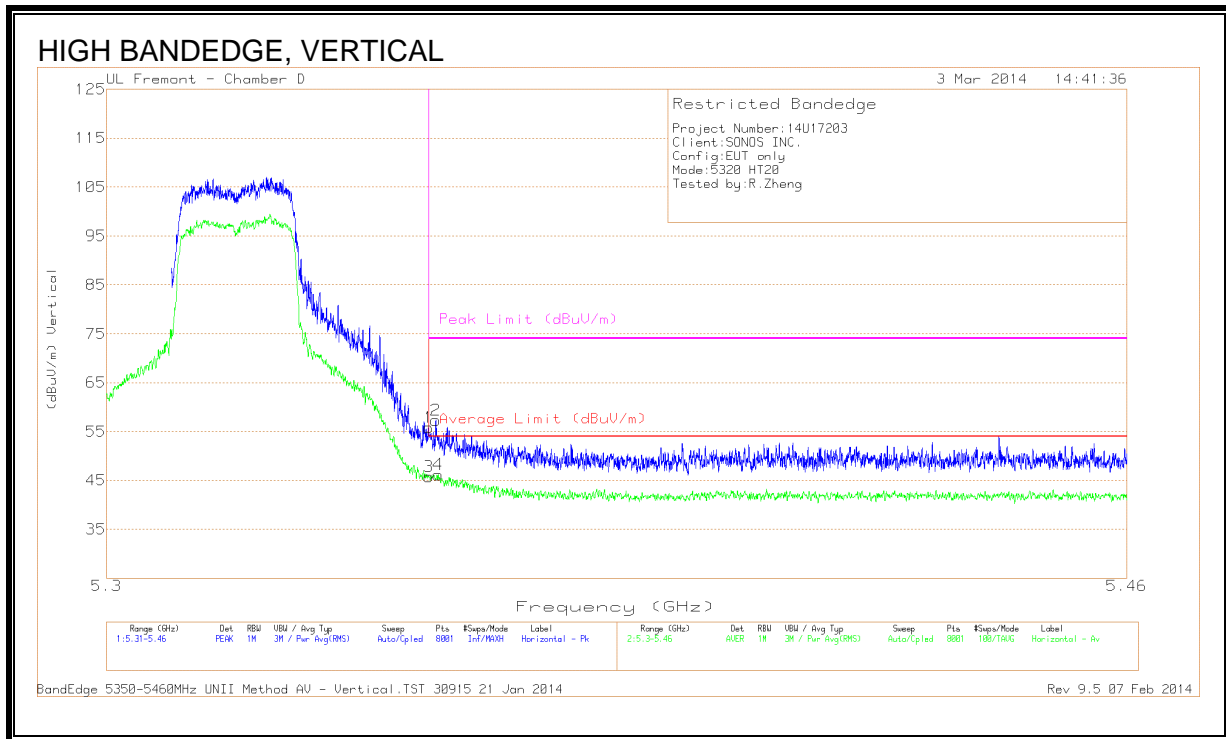
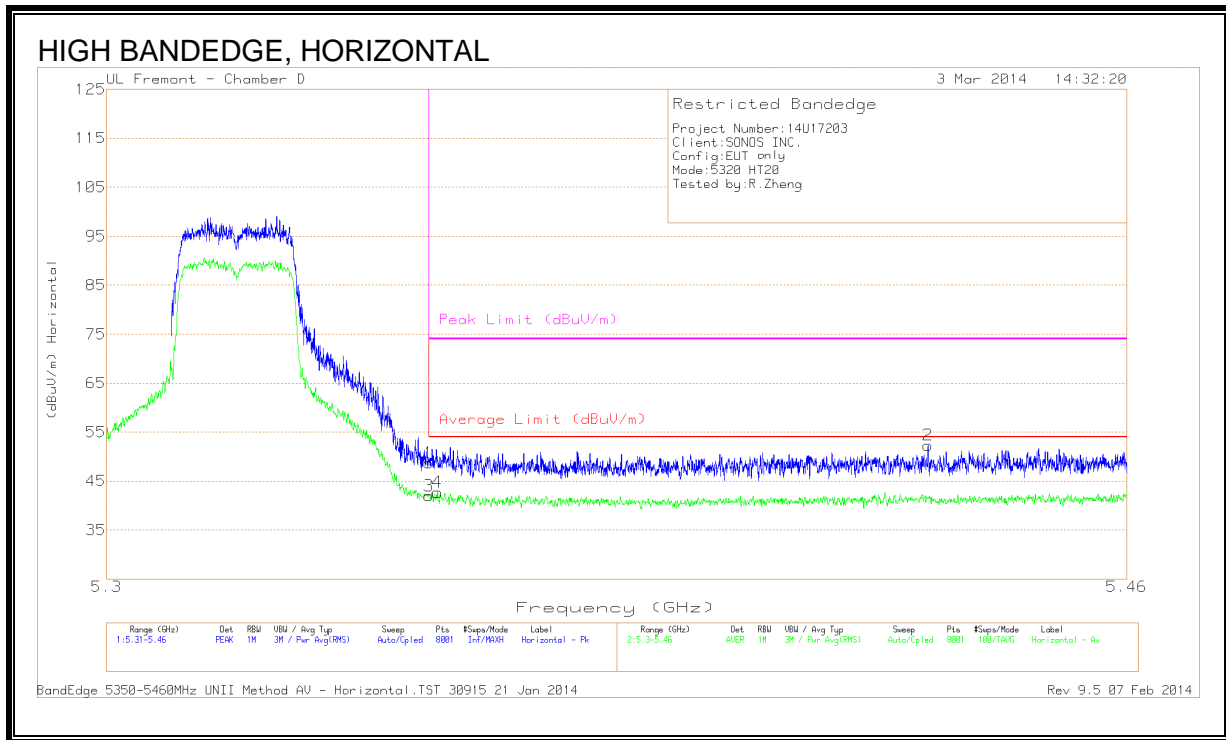
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average

### 9.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND





**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.350	32.98	PK	33.8	-18.1	48.68	-	-	74	-25.32	158	215	H
2	* 5.428	36.41	PK	33.9	-18.0	52.31	-	-	74	-21.69	158	215	H
3	* 5.350	26.29	RMS	33.8	-18.1	41.99	54	-12.01	-	-	158	215	H
4	* 5.351	26.97	RMS	33.8	-18.1	42.67	54	-11.33	-	-	158	215	H

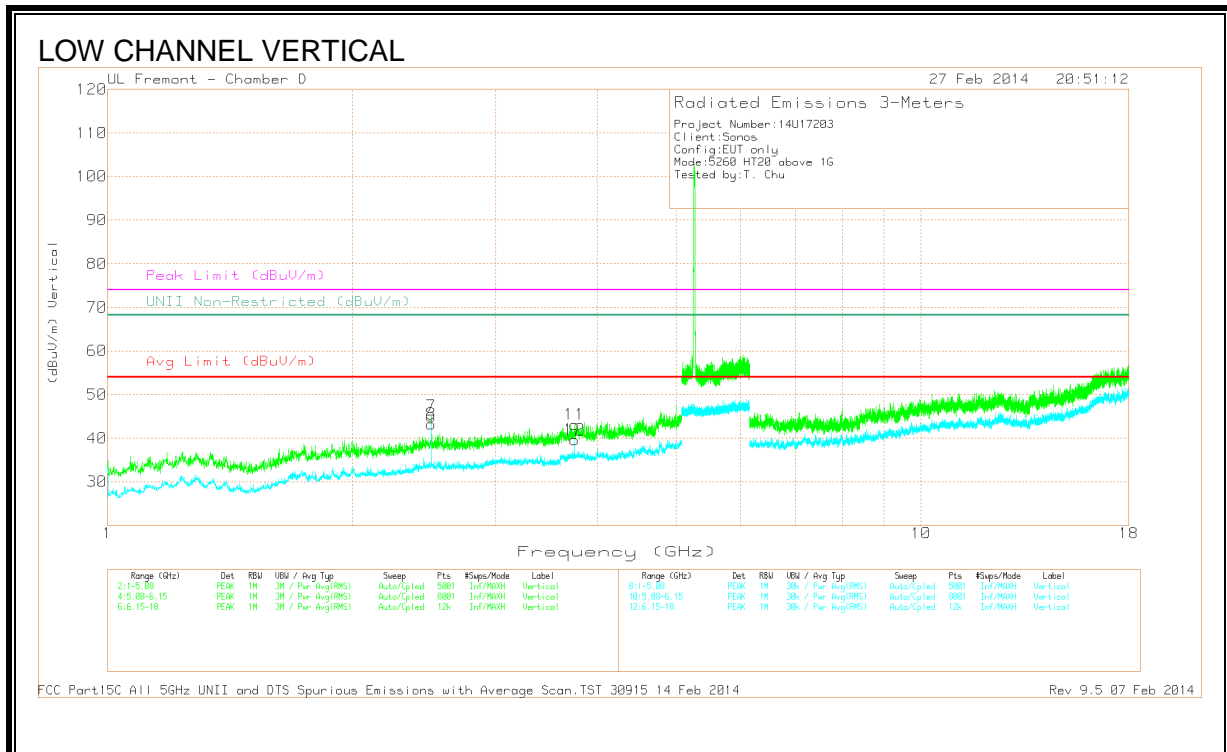
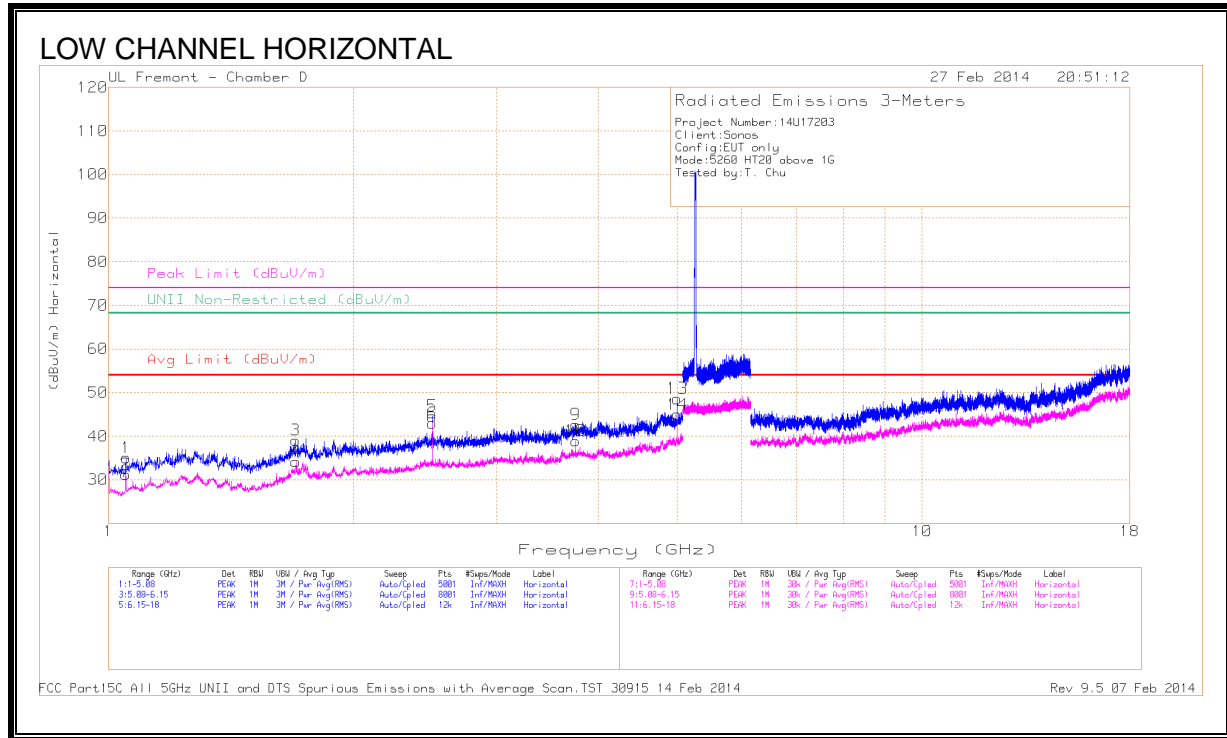
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.350	40.11	PK	33.8	-18.1	55.81	-	-	74	-18.19	95	215	V
2	* 5.351	41.61	PK	33.8	-18.1	57.31	-	-	74	-16.69	95	215	V
3	* 5.350	30.06	RMS	33.8	-18.1	45.76	54	-8.24	-	-	95	215	V
4	* 5.352	30.46	RMS	33.8	-18.1	46.16	54	-7.84	-	-	95	215	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	40.26	PK	26.8	-32.0	35.06	-	-	74	-38.94	-	-	0-360	100	H
2	* 1.051	36.43	Avg	26.8	-32.0	31.23	54	-22.77	-	-	-	-	0-360	100	H
3	* 1.700	41.18	PK	28.9	-31.0	39.08	-	-	74	-34.92	-	-	0-360	100	H
4	* 1.700	36.24	Avg	28.9	-31.0	34.14	54	-19.86	-	-	-	-	0-360	100	H
5	*2.500	42.67	PK	32.2	-30.3	44.57	-	-	74	-29.43	-	-	0-360	201	H
6	* 2.500	41.11	Avg	32.2	-30.3	43.01	54	-10.99	-	-	-	-	0-360	201	H
7	*2.500	43.17	PK	32.2	-30.3	45.07	-	-	74	-28.93	-	-	0-360	100	V
8	* 2.500	41.32	Avg	32.2	-30.3	43.22	54	-10.78	-	-	-	-	0-360	100	V
9	* 3.752	38.62	PK	32.7	-28.7	42.62	-	-	74	-31.38	-	-	0-360	100	H
10	* 3.752	34.95	Avg	32.7	-28.7	38.95	54	-15.05	-	-	-	-	0-360	100	H
11	* 3.751	39.14	PK	32.7	-28.7	43.14	-	-	74	-30.86	-	-	0-360	100	V
12	* 3.751	35.62	Avg	32.7	-28.7	39.62	54	-14.38	-	-	-	-	0-360	100	V
13	* 5.007	38.13	PK1	33.5	-26.5	45.13	-	-	74	-28.87	-	-	48	339	H
14	* 5.007	27.75	AD1	33.5	-26.7	34.55	54	-19.45	-	-	-	-	48	339	H

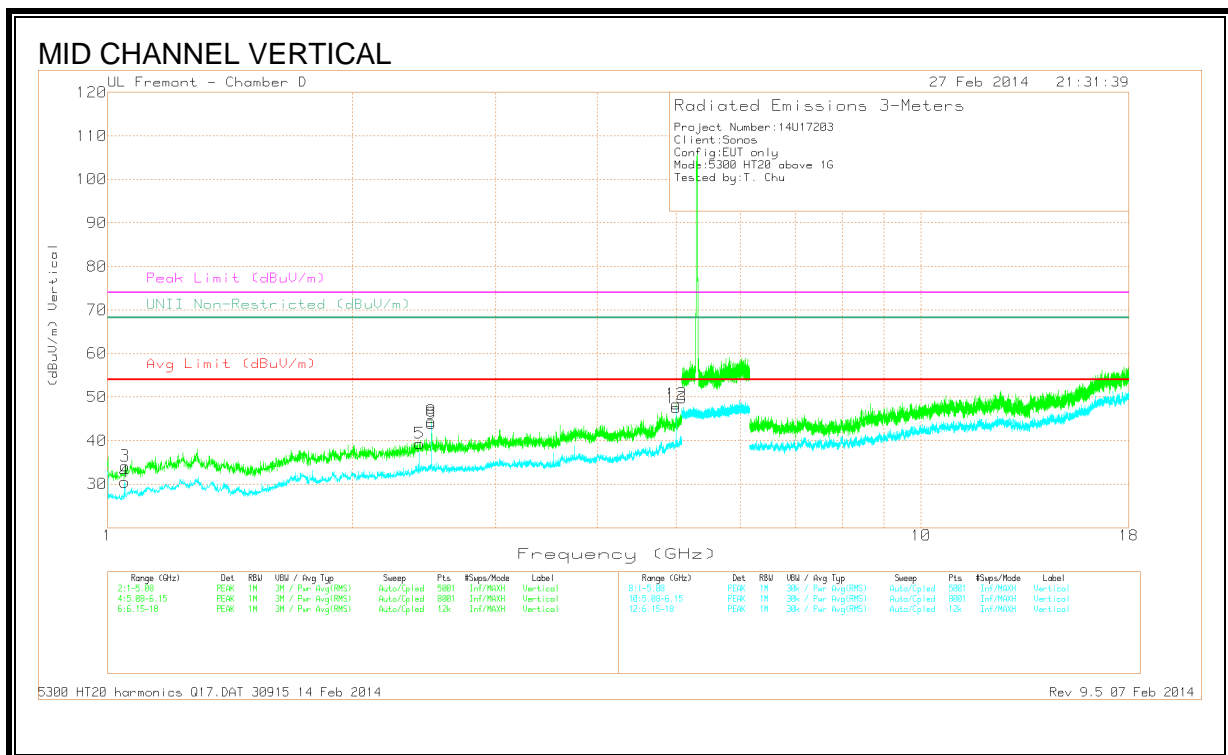
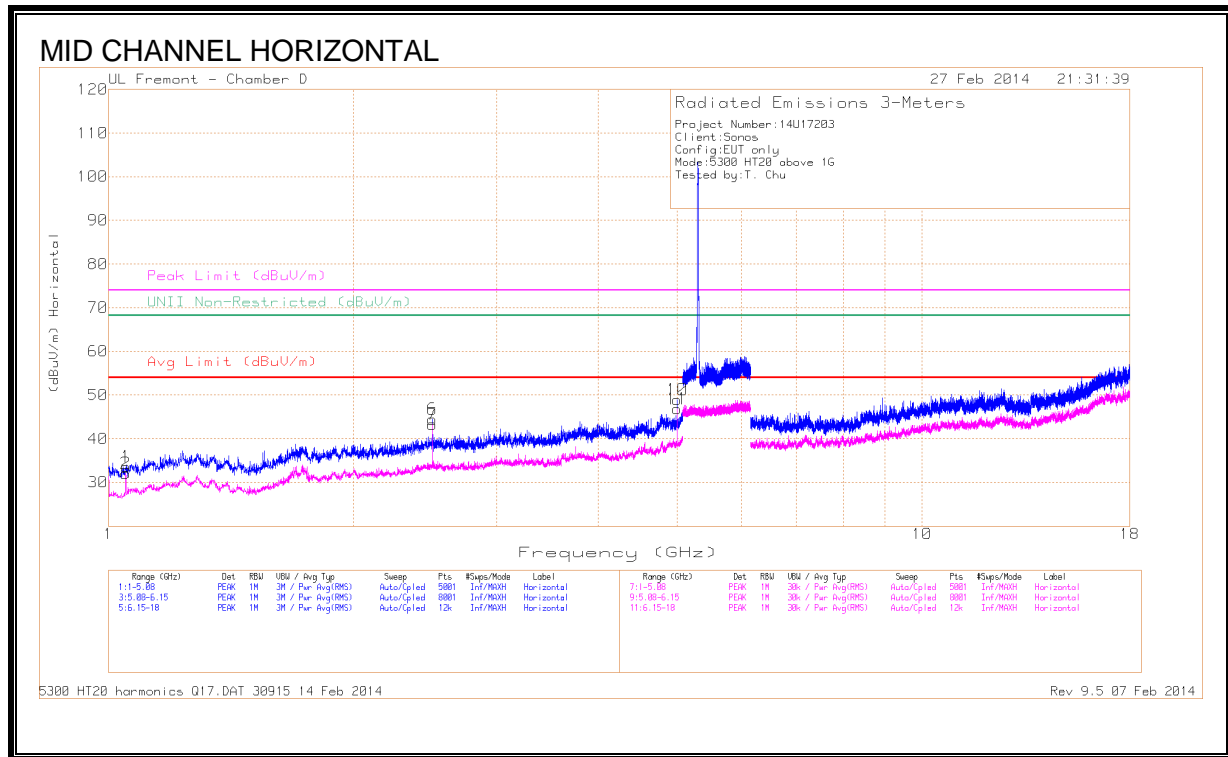
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	38.78	PK	26.8	-32.0	33.58	-	-	74	-40.42	-	-	0-360	100	H
2	* 1.051	37.25	Avg	26.8	-32.0	32.05	54	-21.95	-	-	-	-	0-360	100	H
3	* 1.051	39.38	PK	26.8	-32.0	34.18	-	-	74	-39.82	-	-	0-360	201	V
4	* 1.051	35.70	Avg	26.8	-32.0	30.5	54	-23.50	-	-	-	-	0-360	201	V
5	2.417	37.97	PK	31.7	-30.3	39.37	-	-	-	-	68.2	-28.83	0-360	100	V
6	*2.500	42.55	PK	32.2	-30.3	44.45	-	-	74	-29.55	-	-	0-360	201	H
7	* 2.500	41.42	Avg	32.2	-30.3	43.32	54	-10.68	-	-	-	-	0-360	201	H
8	*2.500	42.53	PK	32.2	-30.3	44.43	-	-	74	-29.57	-	-	0-360	100	V
9	* 2.500	42.01	Avg	32.2	-30.3	43.91	54	-10.09	-	-	-	-	0-360	100	V
10	* 5.003	39.00	PK1	33.5	-26.6	45.90	-	-	74	-28.10	-	-	64	117	H
11	* 5.003	27.80	AD1	33.5	-26.3	35.00	54	-19.00	-	-	-	-	64	117	H
12	* 4.997	38.01	PK1	33.5	-26.3	45.21	-	-	74	-28.79	-	-	94	162	V
13	* 4.997	27.82	AD1	33.5	-26.4	34.92	54	-19.08	-	-	-	-	94	162	V

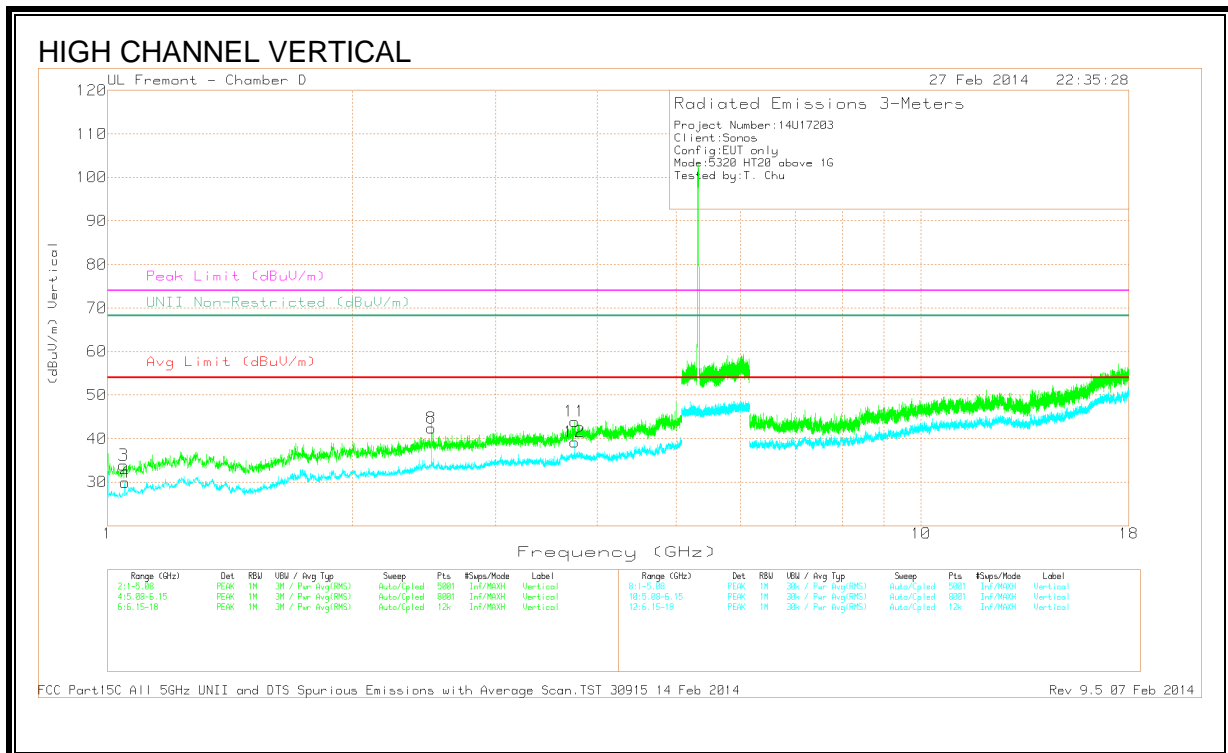
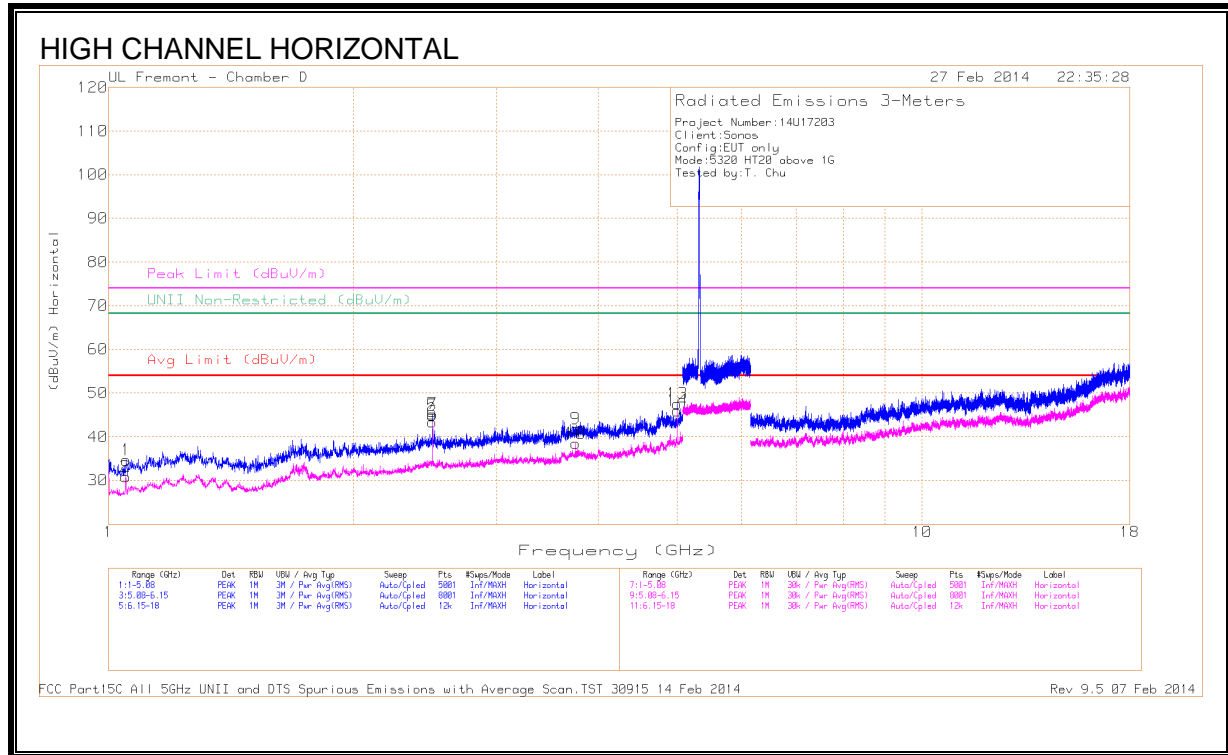
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	39.87	PK	26.8	-32	34.67	-	-	74	-39.33	-	-	0-360	100	H
2	* 1.051	36.05	Avg	26.8	-32	30.85	54	-23.15	-	-	-	-	0-360	100	H
3	* 1.047	38.99	PK	26.8	-31.9	33.89	-	-	74	-40.11	-	-	0-360	100	V
4	* 1.047	35.14	Avg	26.8	-32	29.94	54	-24.06	-	-	-	-	0-360	201	V
5	* 2.500	42.97	PK	32.2	-30.3	44.87	-	-	74	-29.13	-	-	0-360	201	H
6	* 2.500	41.50	Avg	32.2	-30.3	43.4	54	-10.60	-	-	-	-	0-360	201	H
7	* 2.500	43.31	PK	32.2	-30.3	45.21	-	-	74	-28.79	-	-	0-360	201	H
8	* 2.500	40.51	Avg	32.2	-30.3	42.41	54	-11.59	-	-	-	-	0-360	100	V
9	* 3.750	37.83	PK	32.7	-28.7	41.83	-	-	74	-32.17	-	-	0-360	100	H
10	* 3.750	34.48	Avg	32.7	-28.7	38.48	54	-15.52	-	-	-	-	0-360	100	H
11	* 3.751	39.97	PK	32.7	-28.7	43.97	-	-	74	-30.03	-	-	0-360	100	V
12	* 3.751	35.21	Avg	32.7	-28.7	39.21	54	-14.79	-	-	-	-	0-360	100	V
13	* 5.001	40.60	PK	33.5	-26.5	47.6	-	-	74	-26.40	-	-	0-360	201	H
14	* 5.001	38.98	Avg	33.5	-26.5	45.98	54	-8.02	-	-	-	-	0-360	201	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

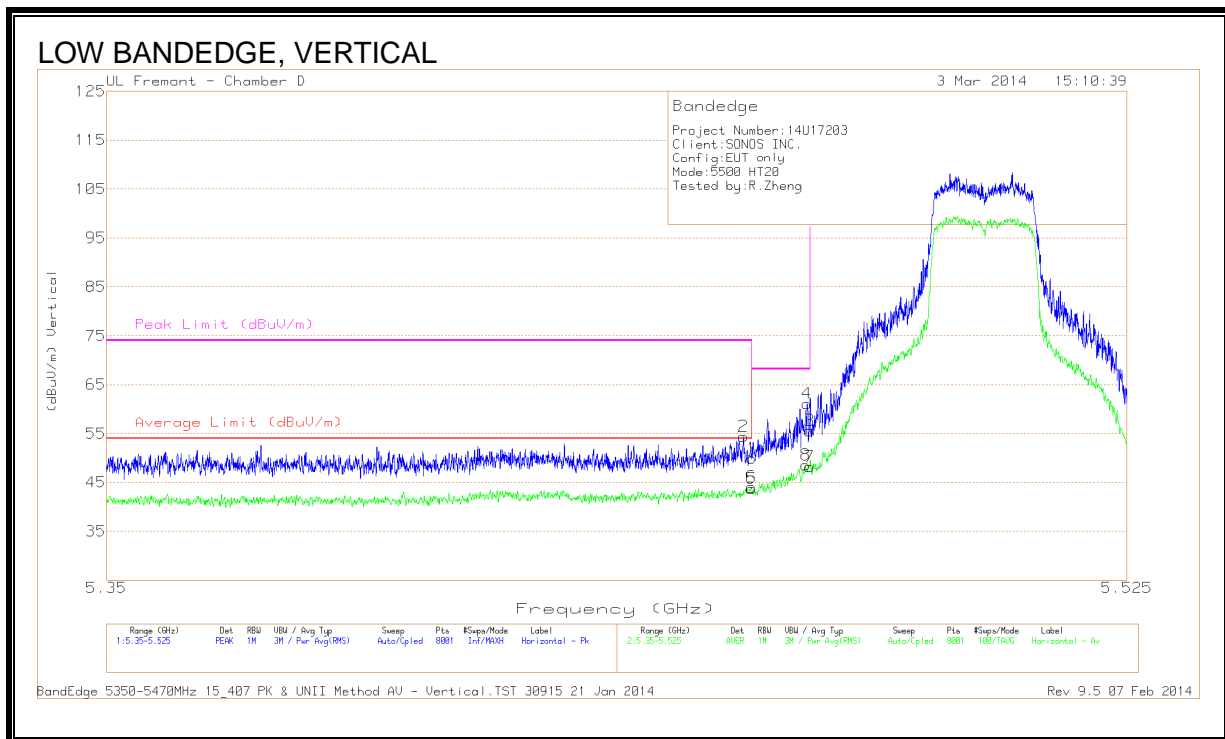
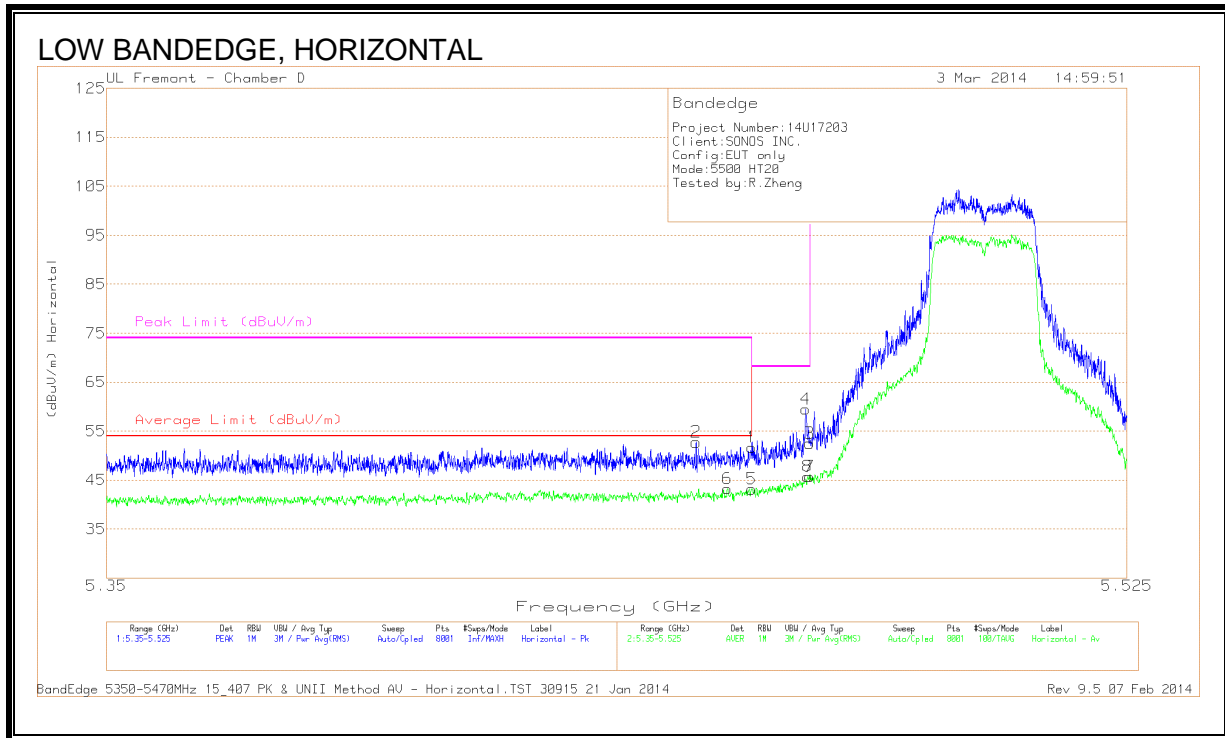
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average

### 9.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND





**DATA**

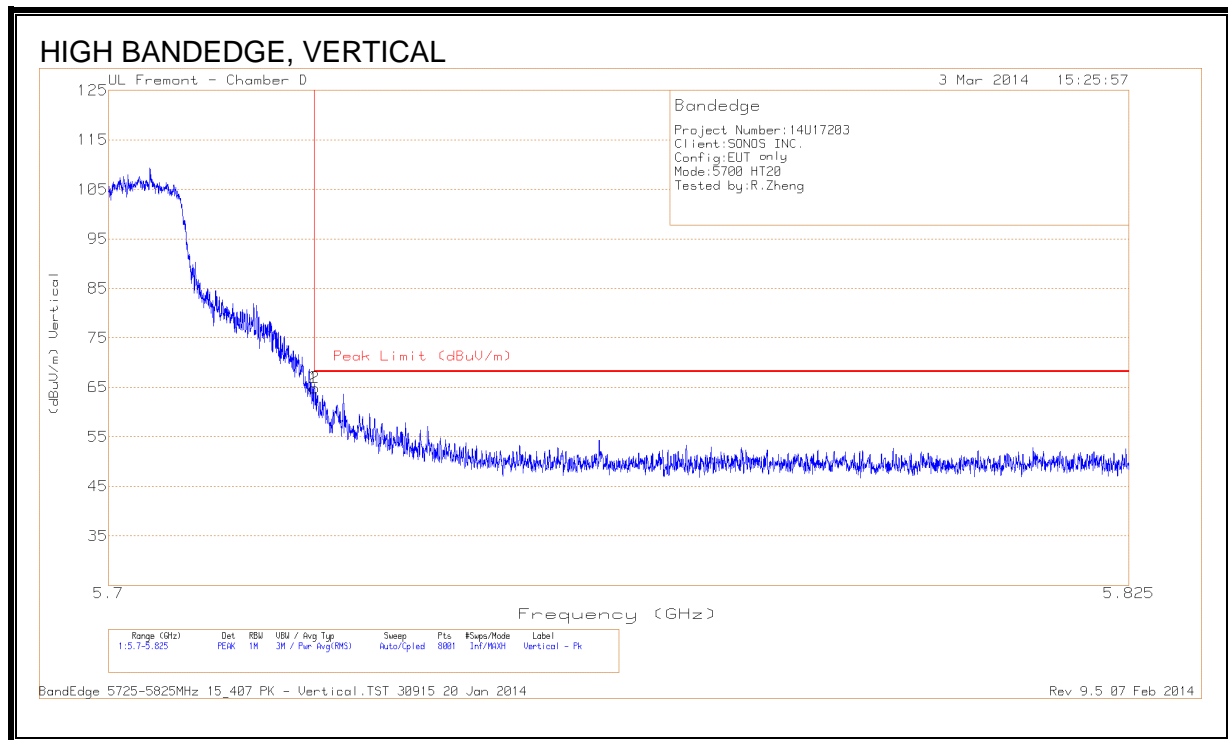
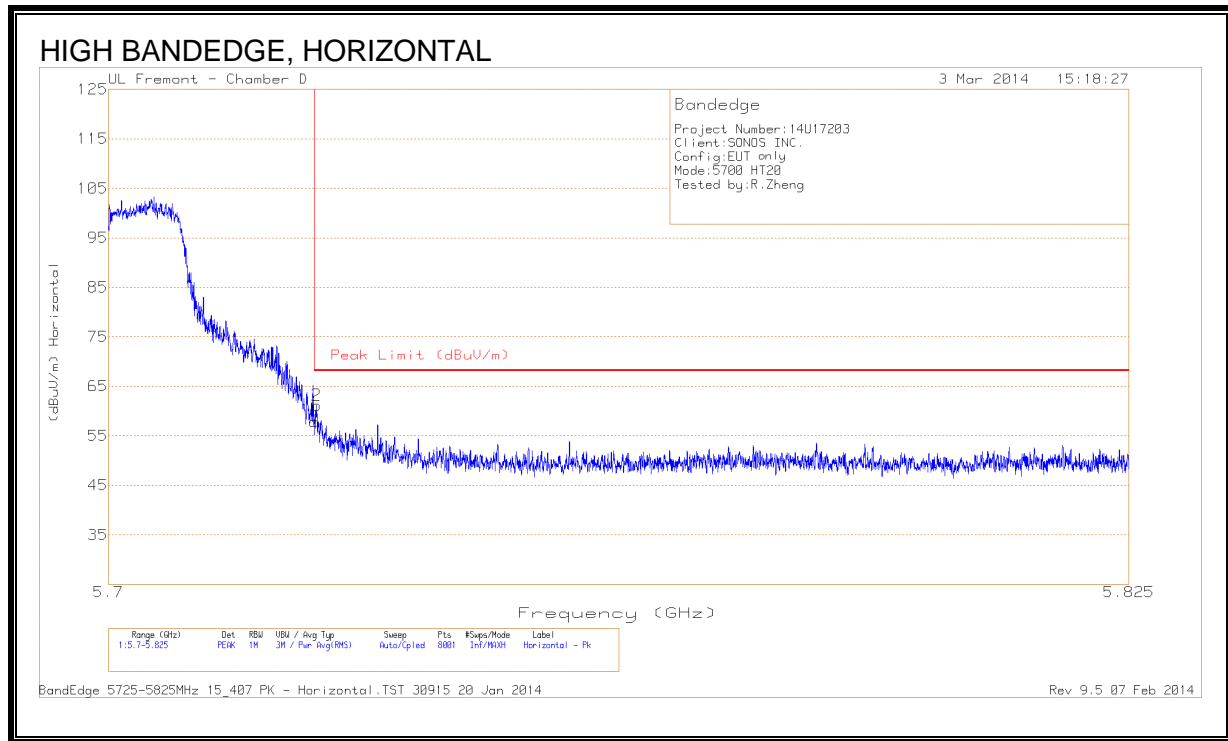
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.460	35.60	PK	33.9	-17.8	51.70	-	-	74	-22.3	223	215	H
2	* 5.450	36.83	PK	33.9	-18.0	52.73	-	-	74	-21.27	223	215	H
3	5.470	36.50	PK	33.9	-17.9	52.50	-	-	68.2	-15.70	223	215	H
4	5.469	43.50	PK	33.9	-17.9	59.50	-	-	68.2	-8.70	223	215	H
5	* 5.460	27.08	RMS	33.9	-17.8	43.18	54	-10.82	-	-	223	215	H
6	* 5.456	27.26	RMS	33.9	-17.9	43.26	54	-10.74	-	-	223	215	H
7	5.470	29.72	RMS	33.9	-17.9	45.72	-	-	-	-	223	215	H
8	5.470	29.73	RMS	33.9	-17.9	45.73	-	-	-	-	223	215	H

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.460	33.83	PK	33.9	-17.8	49.93	-	-	74	-24.07	359	177	V
2	* 5.459	38.28	PK	33.9	-17.8	54.38	-	-	74	-19.62	359	177	V
3	5.470	39.59	PK	33.9	-17.9	55.59	-	-	68.2	-12.61	359	177	V
4	5.470	45.13	PK	33.9	-17.9	61.13	-	-	68.2	-7.07	359	177	V
5	* 5.460	27.65	RMS	33.9	-17.8	43.75	54	-10.25	-	-	359	177	V
6	* 5.460	27.95	RMS	33.9	-17.8	44.05	54	-9.95	-	-	359	177	V
7	5.470	32.20	RMS	33.9	-17.9	48.20	-	-	-	-	359	177	V
8	5.469	32.58	RMS	33.9	-17.9	48.58	-	-	-	-	359	177	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection



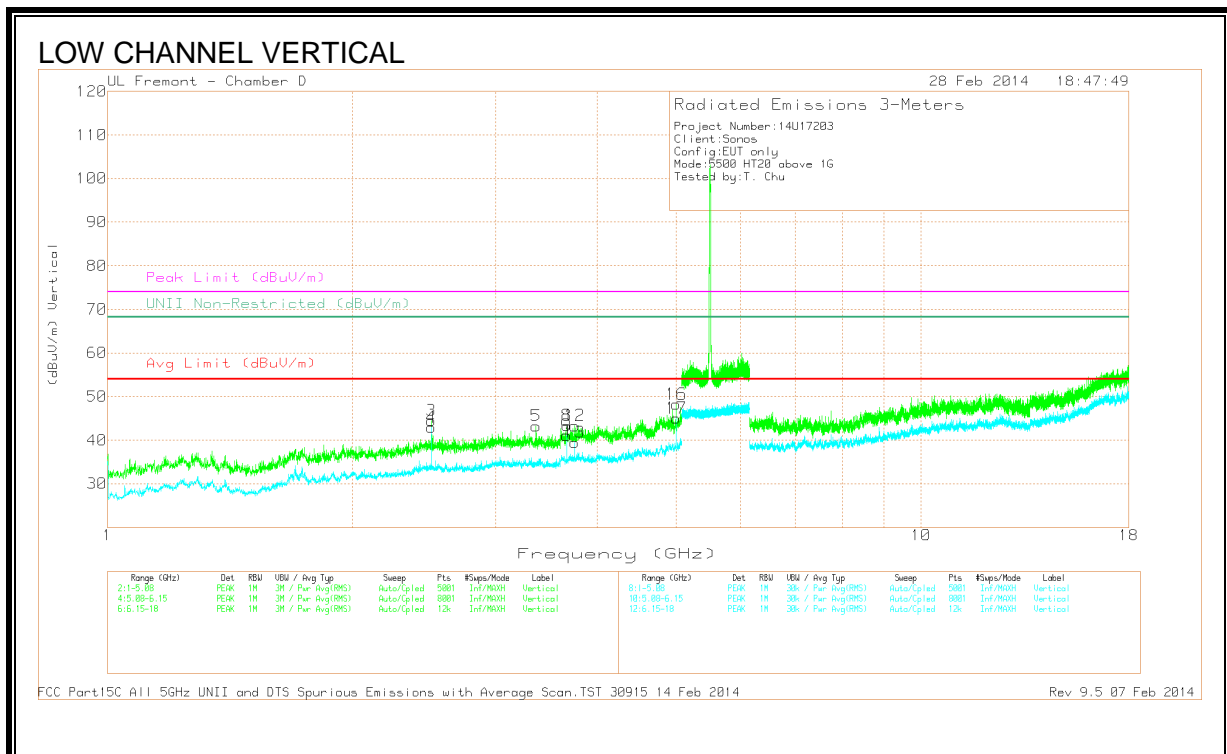
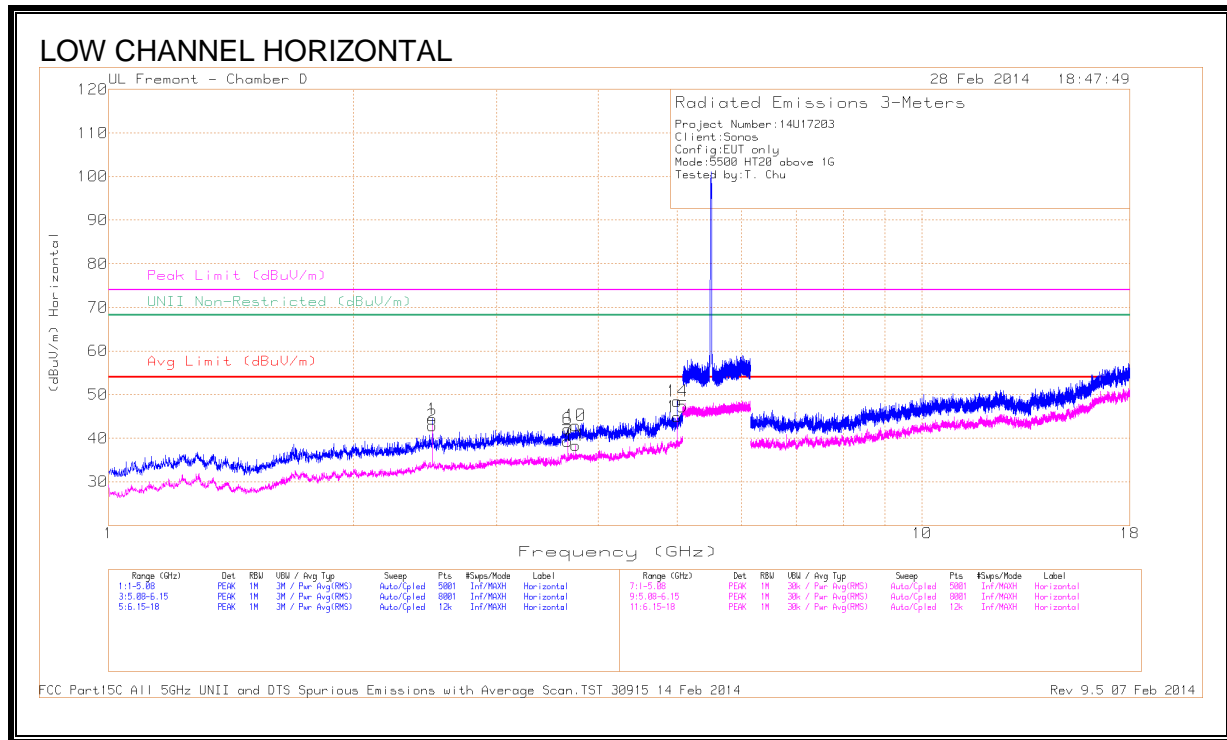
**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	41.30	PK	34.2	-17.6	57.90	68.2	-10.30	242	215	H
2	5.725	44.54	PK	34.2	-17.6	61.14	68.2	-7.06	242	215	H

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	48.30	PK	34.2	-17.6	64.90	68.2	-3.30	257	215	V
2	5.725	48.30	PK	34.2	-17.6	64.90	68.2	-3.30	257	215	V

PK - Peak detector

**HARMONICS AND SPURIOUS EMISSIONS**



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.500	42.51	PK	32.2	-30.3	44.41	-	-	74	-29.59	-	-	0-360	201	H
2	* 2.500	41.01	Avg	32.2	-30.3	42.91	54	-11.09	-	-	-	-	0-360	201	H
3	* 2.500	42.61	PK	32.2	-30.3	44.51	-	-	74	-29.49	-	-	0-360	201	V
4	* 2.500	41.02	Avg	32.2	-30.3	42.92	54	-11.08	-	-	-	-	0-360	100	V
5	3.362	39.96	PK	32.4	-29.1	43.26	-	-	-	-	68.2	-24.94	0-360	201	V
6	* 3.668	37.96	PK	32.6	-28.4	42.16	-	-	74	-31.84	-	-	0-360	100	H
7	* 3.668	35.09	Avg	32.6	-28.4	39.29	54	-14.71	-	-	-	-	0-360	201	H
8	* 3.668	39.17	PK	32.6	-28.4	43.37	-	-	74	-30.63	-	-	0-360	201	V
9	* 3.668	36.87	Avg	32.6	-28.4	41.07	54	-12.93	-	-	-	-	0-360	201	V
10	* 3.751	38.90	PK	32.7	-28.7	42.9	-	-	74	-31.10	-	-	0-360	201	H
11	* 3.751	34.34	Avg	32.7	-28.7	38.34	54	-15.66	-	-	-	-	0-360	100	H
12	* 3.751	39.32	PK	32.7	-28.7	43.32	-	-	74	-30.68	-	-	0-360	100	V
13	* 3.751	35.49	Avg	32.7	-28.7	39.49	54	-14.51	-	-	-	-	0-360	100	V
14	* 5.004	38.26	PK1	33.5	-26.6	45.16	-	-	74	-28.84	-	-	304	150	H
15	* 5.004	27.56	AD1	33.5	-26.7	34.36	54	-19.64	-	-	-	-	304	150	H
16	* 5.005	37.39	PK1	33.5	-26.7	44.19	-	-	74	-29.81	-	-	231	188	V
17	* 5.005	27.84	AD1	33.5	-26.4	34.94	54	-19.06	-	-	-	-	231	188	V

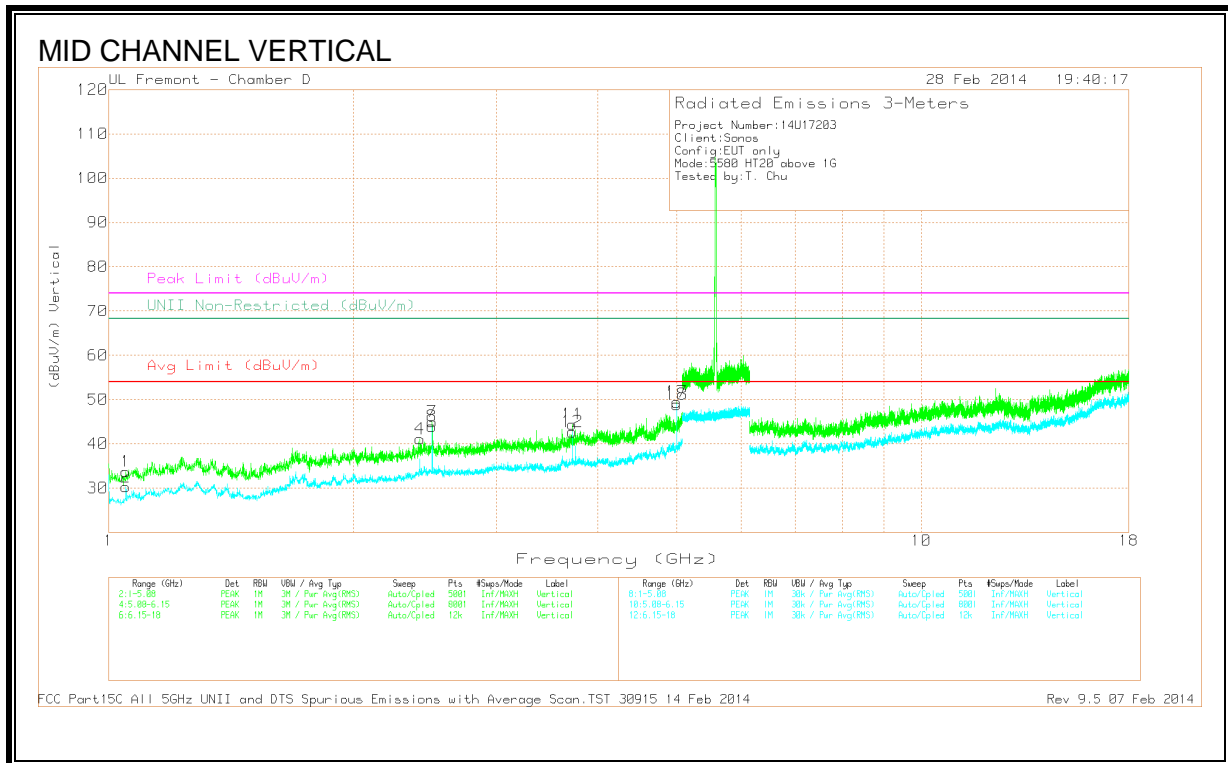
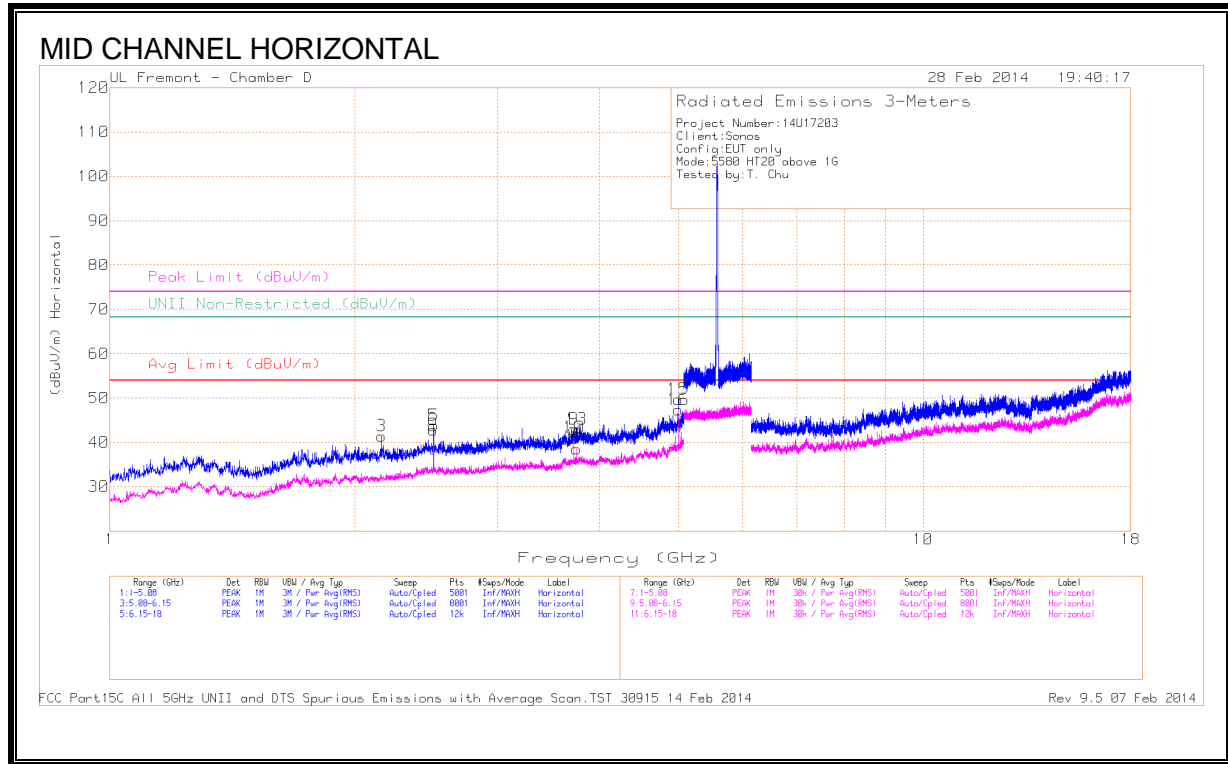
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.050	38.91	PK	26.8	-32.0	33.71	-	-	74	-40.29	-	-	0-360	201	V
2	* 1.050	35.46	Avg	26.8	-32.0	30.26	54	-23.74	-	-	-	-	0-360	201	V
3	2.159	41.42	PK	30.6	-30.6	41.42	-	-	-	-	68.2	-26.78	0-360	201	H
4	2.416	39.71	PK	31.7	-30.3	41.11	-	-	-	-	68.2	-27.09	0-360	201	V
5	* 2.500	41.93	PK	32.2	-30.3	43.83	-	-	74	-30.17	-	-	0-360	201	H
6	* 2.500	40.97	Avg	32.2	-30.3	42.87	54	-11.13	-	-	-	-	0-360	201	H
7	* 2.500	43.06	PK	32.2	-30.3	44.96	-	-	74	-29.04	-	-	0-360	100	V
8	* 2.500	42.04	Avg	32.2	-30.3	43.94	54	-10.06	-	-	-	-	0-360	100	V
9	* 3.721	38.99	PK	32.7	-28.7	42.99	-	-	74	-31.01	-	-	0-360	100	H
10	* 3.721	37.02	Avg	32.7	-28.7	41.02	54	-12.98	-	-	-	-	0-360	201	H
11	* 3.721	40.41	PK	32.7	-28.7	44.41	-	-	74	-29.59	-	-	0-360	201	V
12	* 3.721	38.7	Avg	32.7	-28.7	42.70	54	-11.30	-	-	-	-	0-360	201	V
13	* 3.749	39.02	PK	32.7	-28.7	43.02	-	-	74	-30.98	-	-	0-360	100	H
14	* 3.749	34.51	Avg	32.7	-28.7	38.51	54	-15.49	-	-	-	-	0-360	201	H
15	* 5.001	38.65	PK1	33.5	-26.5	45.65	-	-	74	-28.35	-	-	82	213	H
16	* 5.001	27.57	AD1	33.5	-26.5	34.57	54	-19.43	-	-	-	-	82	213	H
17	* 5.006	37.57	PK1	33.5	-26.7	44.37	-	-	74	-29.63	-	-	284	304	V
18	* 5.006	27.69	AD1	33.5	-26.7	34.49	54	-19.51	-	-	-	-	284	304	V

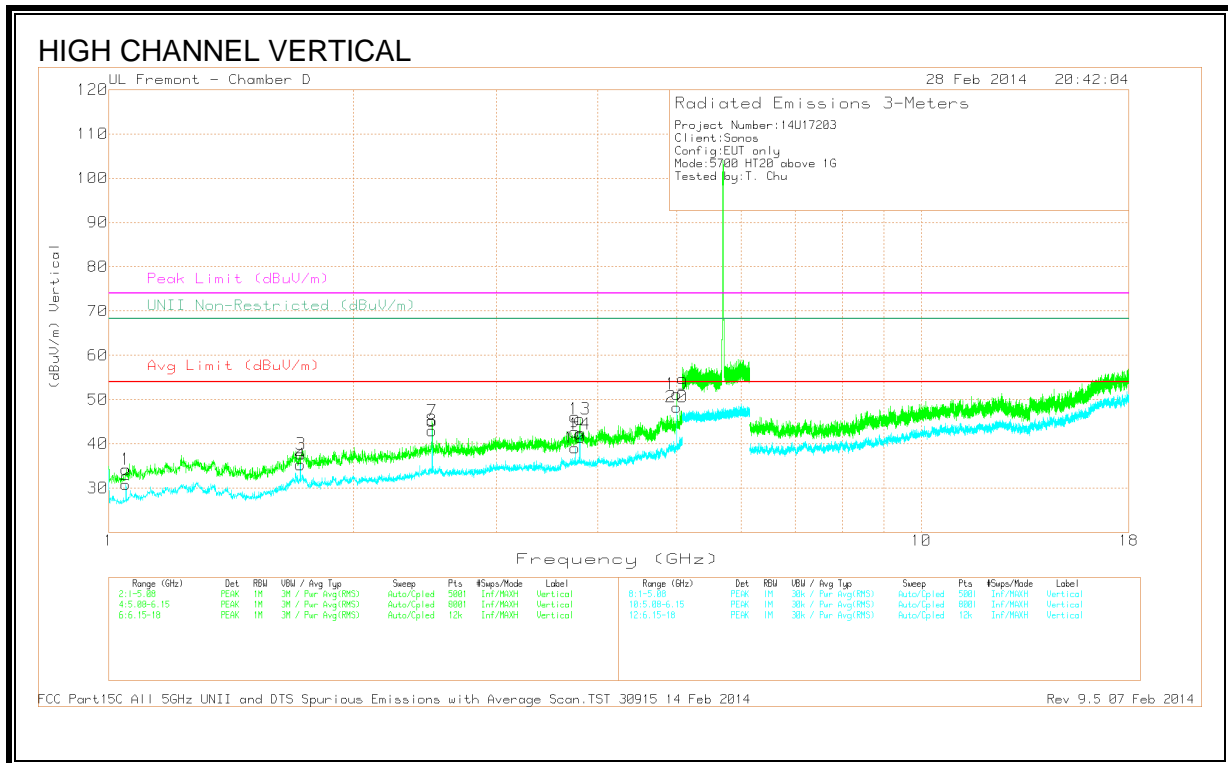
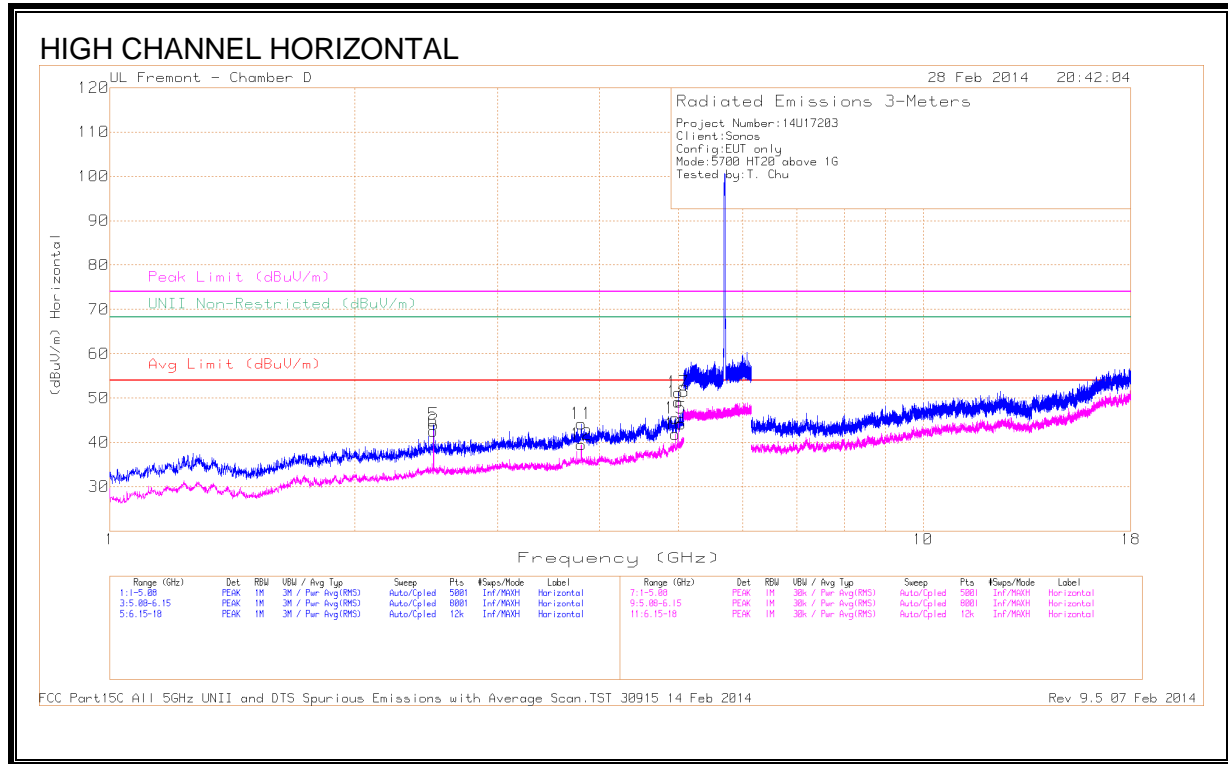
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average





**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.051	39.43	PK	26.8	-32	34.23	-	-	74	-39.77	-	-	0-360	201	V
2	* 1.051	36.02	Avg	26.8	-32	30.82	54	-23.18	-	-	-	-	0-360	201	V
3	* 1.722	39.47	PK	29.1	-30.9	37.67	-	-	74	-36.33	-	-	0-360	201	V
4	* 1.722	37.13	Avg	29.1	-30.9	35.33	54	-18.67	-	-	-	-	0-360	100	V
5	* 2.500	42.14	PK	32.2	-30.3	44.04	-	-	74	-29.96	-	-	0-360	201	H
6	* 2.500	40.70	Avg	32.2	-30.3	42.60	54	-11.40	-	-	-	-	0-360	201	H
7	* 2.500	43.28	PK	32.2	-30.3	45.18	-	-	74	-28.82	-	-	0-360	100	V
8	* 2.500	41.09	Avg	32.2	-30.3	42.99	54	-11.01	-	-	-	-	0-360	100	V
9	* 3.750	38.69	PK	32.7	-28.7	42.69	-	-	74	-31.31	-	-	0-360	100	V
10	* 3.750	35.06	Avg	32.7	-28.7	39.06	54	-14.94	-	-	-	-	0-360	100	V
11	* 3.801	40.38	PK	32.7	-28.9	44.18	-	-	74	-29.82	-	-	0-360	201	H
12	* 3.801	35.71	Avg	32.7	-28.9	39.51	54	-14.49	-	-	-	-	0-360	201	H
13	* 3.801	41.78	PK	32.7	-28.9	45.58	-	-	74	-28.42	-	-	0-360	201	V
14	* 3.801	38.41	Avg	32.7	-28.9	42.21	54	-11.79	-	-	-	-	0-360	201	V
15	* 4.961	38.05	PK	33.5	-26.1	45.45	-	-	74	-28.55	-	-	0-360	201	H
16	* 4.961	34.49	Avg	33.5	-26.1	41.89	54	-12.11	-	-	-	-	0-360	201	H
17	* 4.998	37.27	PK1	33.5	-26.4	44.37	-	-	74	-29.63	-	-	235	142	H
18	* 4.998	27.52	AD1	33.5	-26.7	34.32	54	-19.68	-	-	-	-	235	142	H
19	* 4.998	37.20	PK1	33.5	-26.4	44.30	-	-	74	-29.7	-	-	286	161	V
20	* 4.998	27.59	AD1	33.5	-26.4	34.69	54	-19.31	-	-	-	-	286	161	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

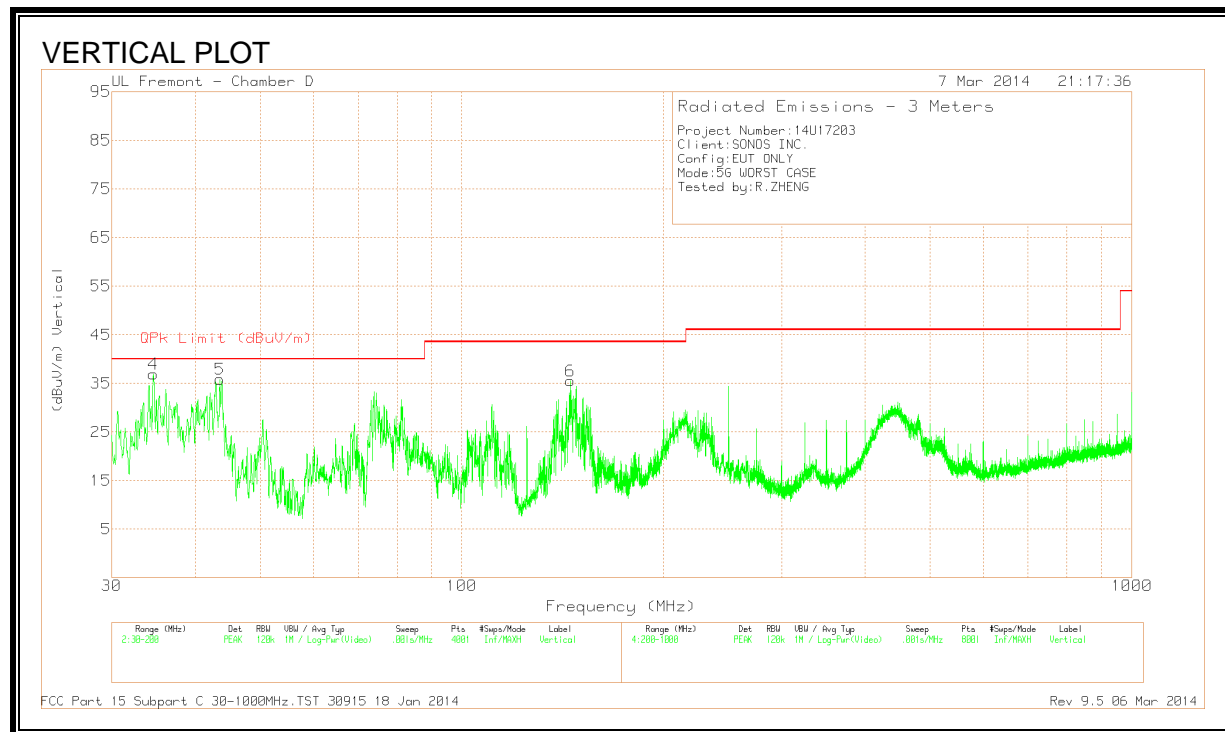
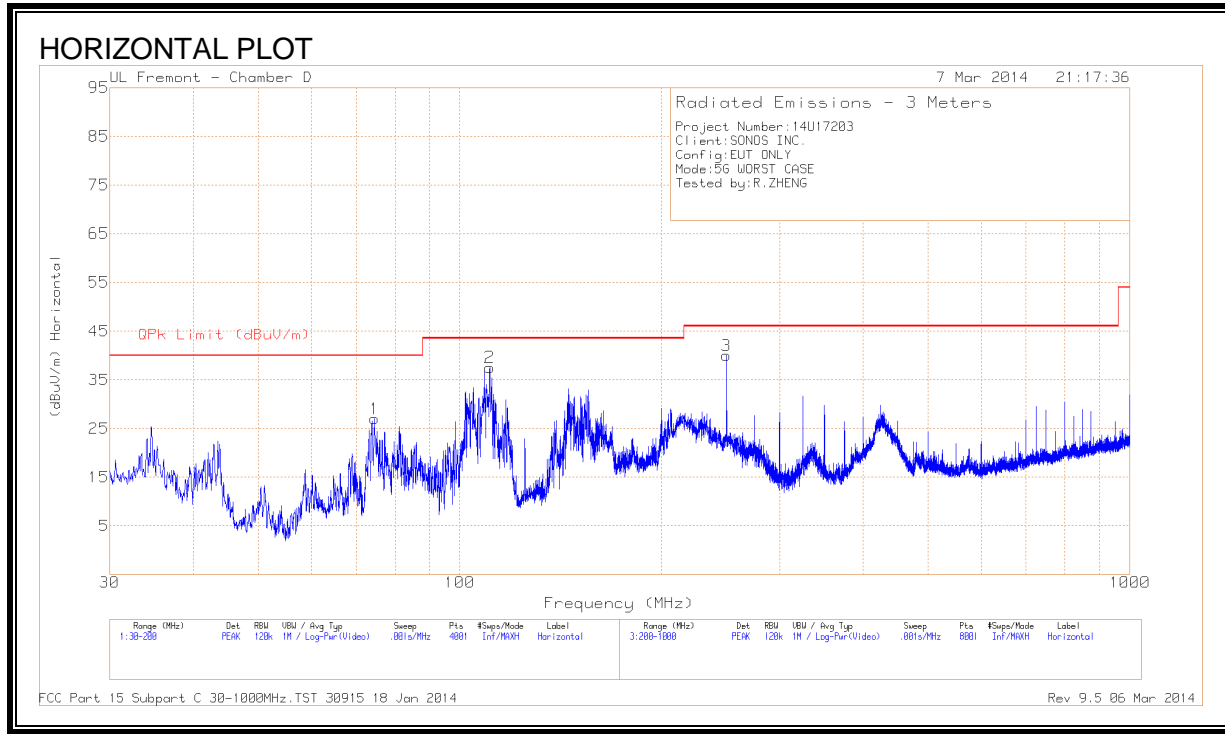
Avg - Video bandwidth < Resolution bandwidth

PK1 - KDB 789033 Method: Peak

AD1 - KDB 789033 Method: AD Primary Power Average

### 9.4. WORST-CASE BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



**DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 dB/m	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 74.54	50.5	PK	8.2	-31.7	27	40	-13	0-360	301	H
2	* 110.7925	56.17	PK	12.7	-31.3	37.57	43.52	-5.95	0-360	301	H
3	* 250	58.92	PK	11.5	-30.4	40.02	46.02	-6	0-360	100	H
4	34.6325	50.82	PK	17.9	-31.8	36.92	40	-3.08	0-360	100	V
5	43.515	56.14	PK	11.4	-31.7	35.84	40	-4.16	0-360	100	V
6	145.26	54.19	PK	12.6	-31.3	35.49	43.52	-8.03	0-360	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

QP - Quasi-Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
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.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10-2009.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS**

**6 WORST EMISSIONS**

**Line-L1 .15 - 30MHz**

**Trace Markers**

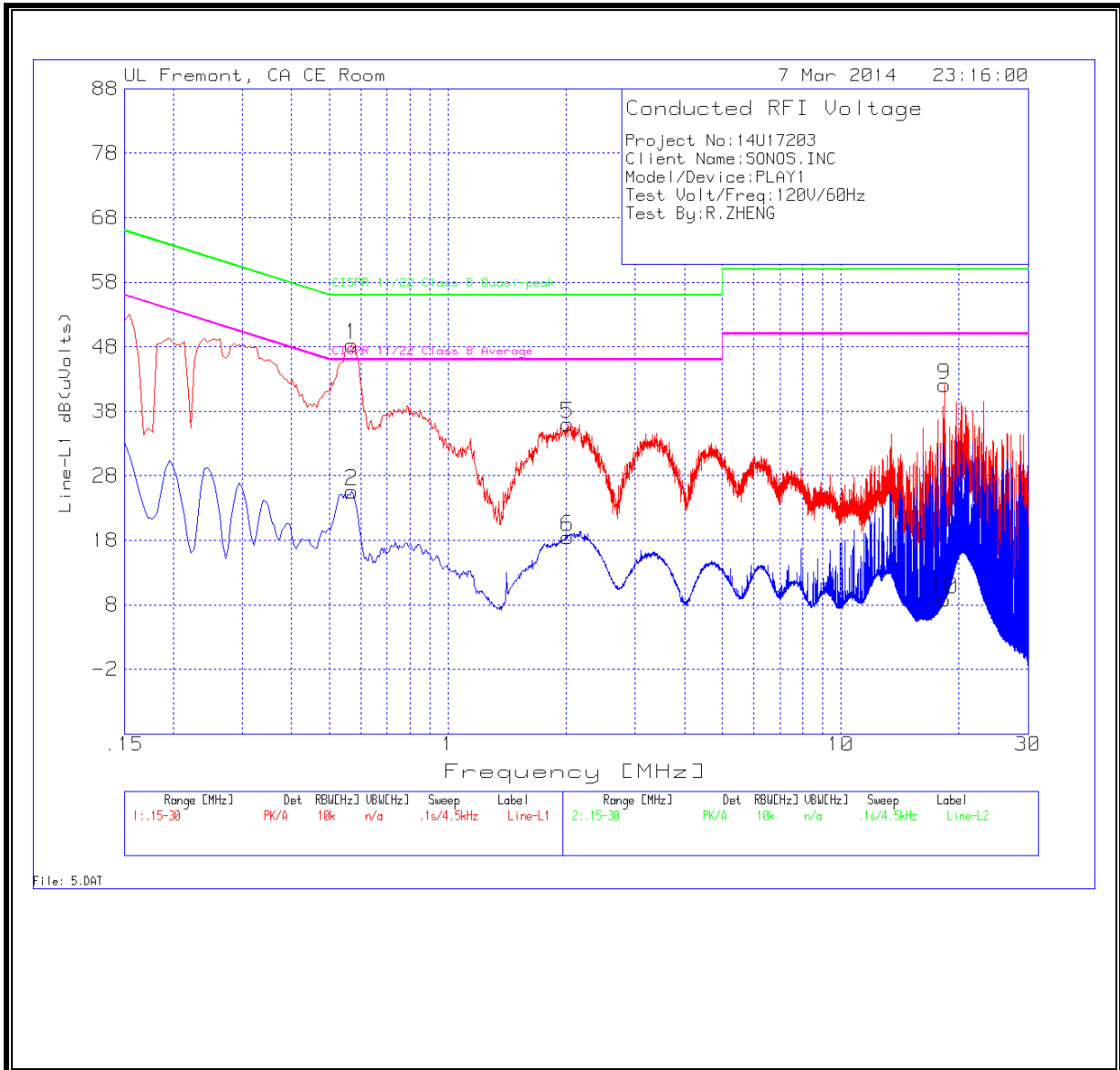
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
1	.5685	47.97	PK	.3	0	48.27	56	-7.73	-	-
2	.5685	25.33	Av	.3	0	25.63	-	-	46	-20.37
5	2.022	35.73	PK	.2	.1	36.03	56	-19.97	-	-
6	2.022	18.23	Av	.2	.1	18.53	-	-	46	-27.47
9	18.3435	41.54	PK	.3	.2	42.04	60	-17.96	-	-
10	18.3435	8.39	Av	.3	.2	8.89	-	-	50	-41.11

**Line-L2 .15 - 30MHz**

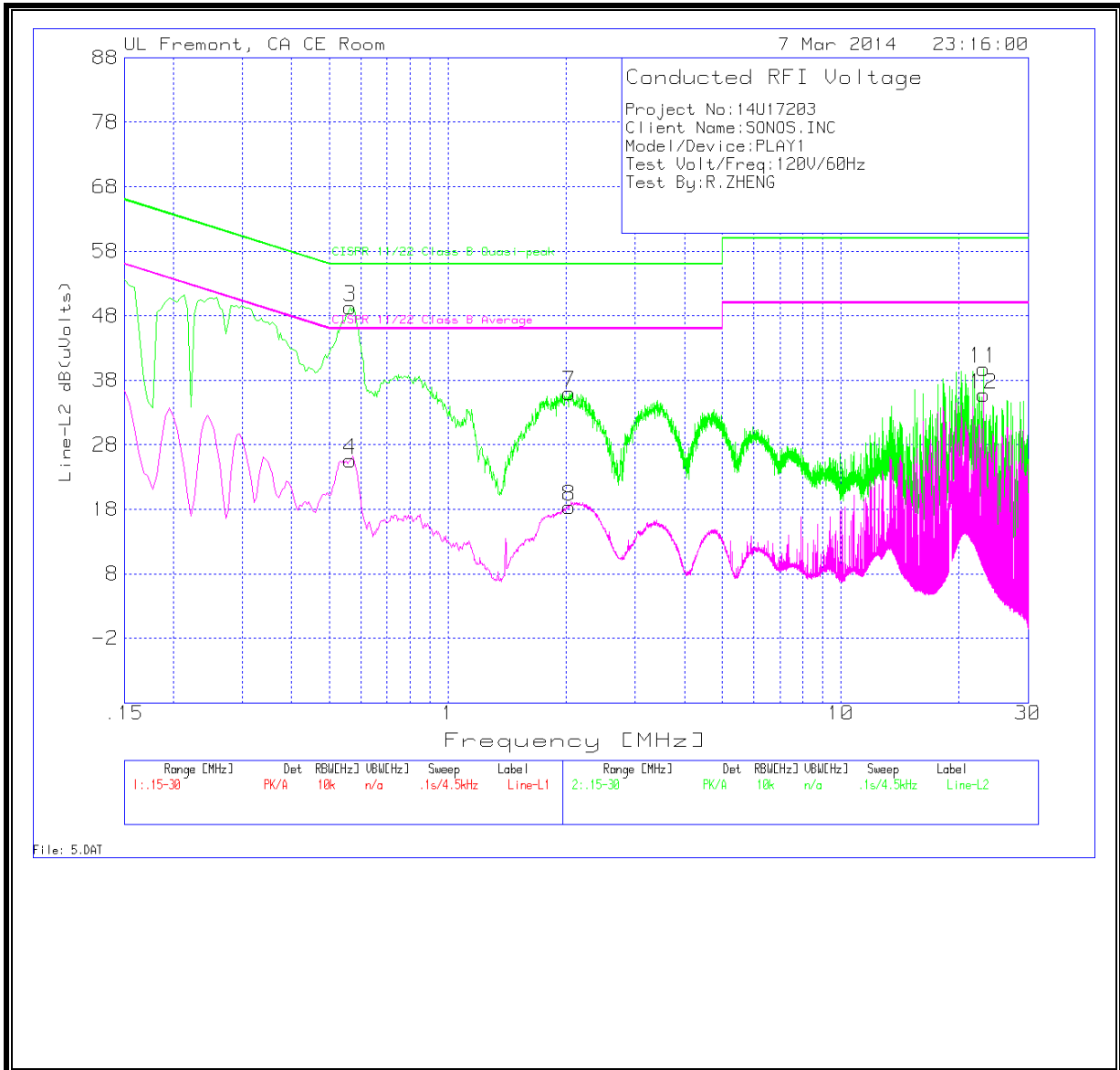
**Trace Markers**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
3	.564	49.03	PK	.3	0	49.33	56	-6.67	-	-
4	.564	25.35	Av	.3	0	25.65	-	-	46	-20.35
7	2.0355	35.78	PK	.2	.1	36.08	56	-19.92	-	-
8	2.0355	18.1	Av	.2	.1	18.4	-	-	46	-27.6
11	23.127	39.24	PK	.3	.2	39.74	60	-20.26	-	-
12	23.127	35.22	Av	.3	.2	35.72	-	-	50	-14.28

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 11. DYNAMIC FREQUENCY SELECTION

### 11.1. OVERVIEW

#### 11.1.1. LIMITS

##### INDUSTRY CANADA

IC RSS-210 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-210 Issue 7 A9.4 (b) (ii) **Channel Availability Check Time:** ...

**Additional requirements for the band 5600-5650 MHz:** Until further notice, devices subject to this Section shall not be capable of transmitting in the band 5600-5650 MHz, so that Environment Canada weather radars operating in this band are protected.

##### FCC

§15.407 (h) and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".



**Table 1: Applicability of DFS requirements prior to use of a channel**

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required

**Table 2: Applicability of DFS requirements during normal operation**

Requirement	Operational Mode		
	Master	Client (without DFS)	Client (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes

**Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring**

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna  
 Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

**Table 4: DFS Response requirement values**

Parameter	Value
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period

The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:  
 For the Short pulse radar Test Signals this instant is the end of the *Burst*.  
 For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.  
 For the Long Pulse radar Test Signal this instant is the end of the 12-second period defining the radar transmission.  
 The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10-second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

**Table 5 – Short Pulse Radar Test Waveforms**

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

**Table 6 – Long Pulse Radar Test Signal**

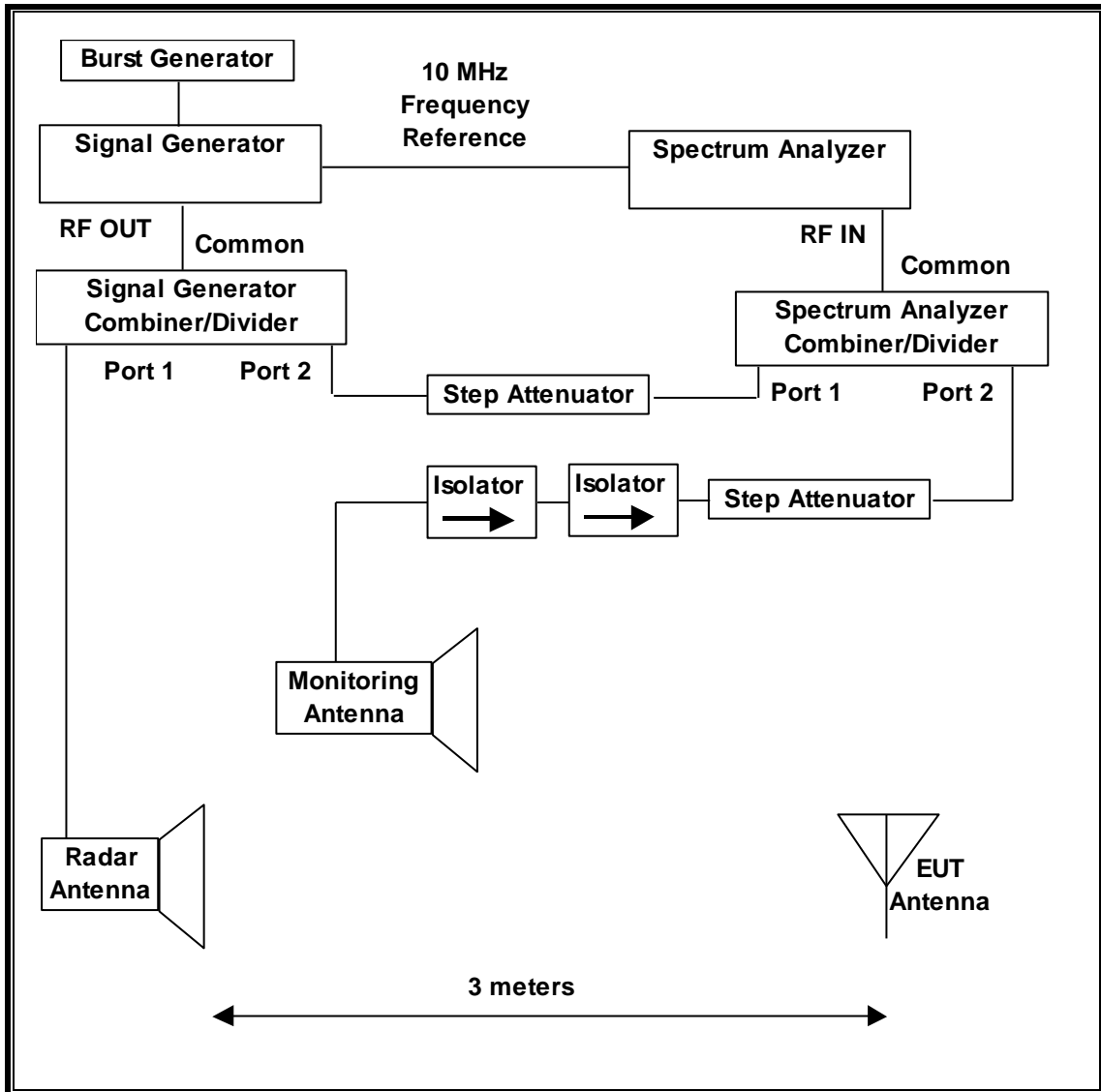
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

**Table 7 – Frequency Hopping Radar Test Signal**

Radar Waveform	Pulse Width (µsec)	PRI (µsec)	Burst Length (ms)	Pulses per Hop	Hopping Rate (kHz)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	300	9	.333	70%	30

### 11.1.2. TEST AND MEASUREMENT SYSTEM

#### RADIATED METHOD SYSTEM BLOCK DIAGRAM



## **SYSTEM OVERVIEW**

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from  $F_L$  to  $F_H$  for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

## **SYSTEM CALIBRATION**

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

**ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL**

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

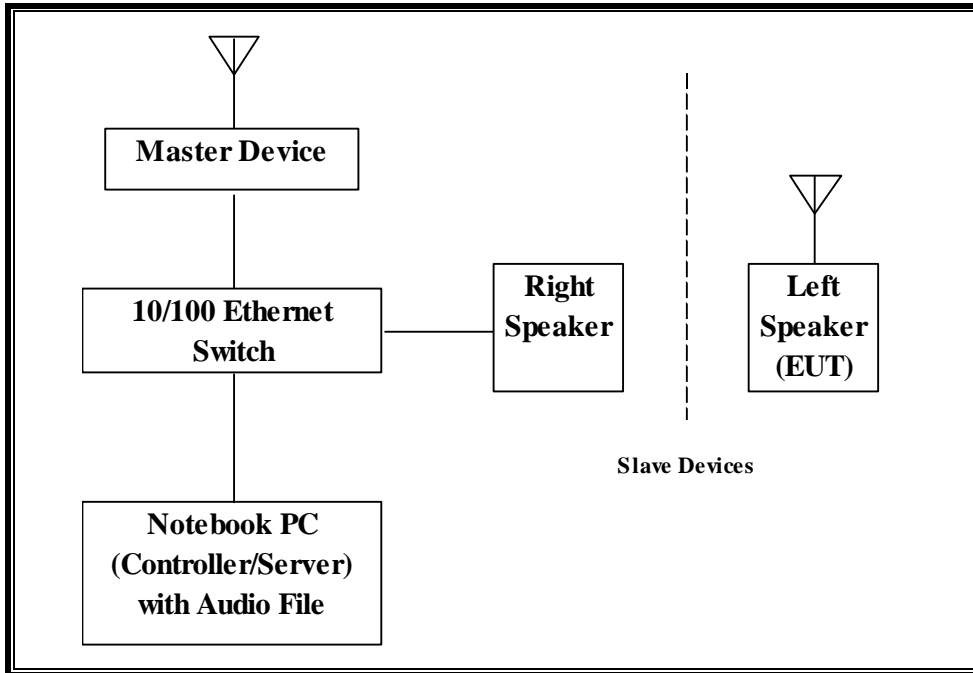
**TEST AND MEASUREMENT EQUIPMENT**

The following test and measurement equipment was utilized for the DFS tests documented in this report:

<b>TEST EQUIPMENT LIST</b>				
<b>Description</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Asset Number</b>	<b>Cal Due</b>
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	09/10/14
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/12/14

### 11.1.3. SETUP OF EUT

#### RADIATED METHOD EUT TEST SETUP



#### SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Wireless Sound Bar (Master Device)	Sonos, Inc.	Playbar	00-0E-58-B3-E1-13-1	SBVRM006
Notebook PC (Console/Server)	Dell	P05G	9NGRWN1	DoC
AC Adapter (Console/Server PC)	Lite On Technology	PA-1650-02DD	CN-0928G4-72538-07F-16F1-A00	DoC
5-Port 10/100 Switch	Netgear	FS105 v2	1D52163D0AADA	DoC
AC Adapter (Router)	Netgear	MU08A9075100-A1	2411201651023902JT	DoC
Speaker (Right / Hardwired)	Sonos, Inc.	Play: 1	B8-E9-37-58-33-74-4	SBVRM009

#### 11.1.4. DESCRIPTION OF EUT

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges excluding the 5600-5650 MHz range.

The EUT is a Slave Device without Radar Detection.

The highest power level within these bands is 24.98 dBm EIRP in the 5250-5350 MHz band and 24.69 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly consists of 2 antennas with individual gains of 3.59 dBi and 3.29 dBi.

Two antennas are utilized to meet the diversity and MIMO operational requirements.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-62 + 1 = -61$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses two transmitter/receiver chains, each connected to an antenna to perform radiated tests.

WLAN Traffic was generated by streaming the audio file "5\_GHz\_Audio\_Test\_file.WAV" from the Master to the Slave using Sonos Controller for PC version 5.0 (Beta) media player.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11a/n architecture. One nominal channel bandwidth, 20 MHz, is implemented.

The software installed in the Master Device is 26.1-76080.

### **UNIFORM CHANNEL SPREADING**

This requirement is not applicable to Slave radio devices.

### **OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS**

The Master Device is a Sonos Playbar, FCC ID: SBVRM006. The minimum antenna gain for the Master Device is 4.1 dBi.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-62 + 1 = -61$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.



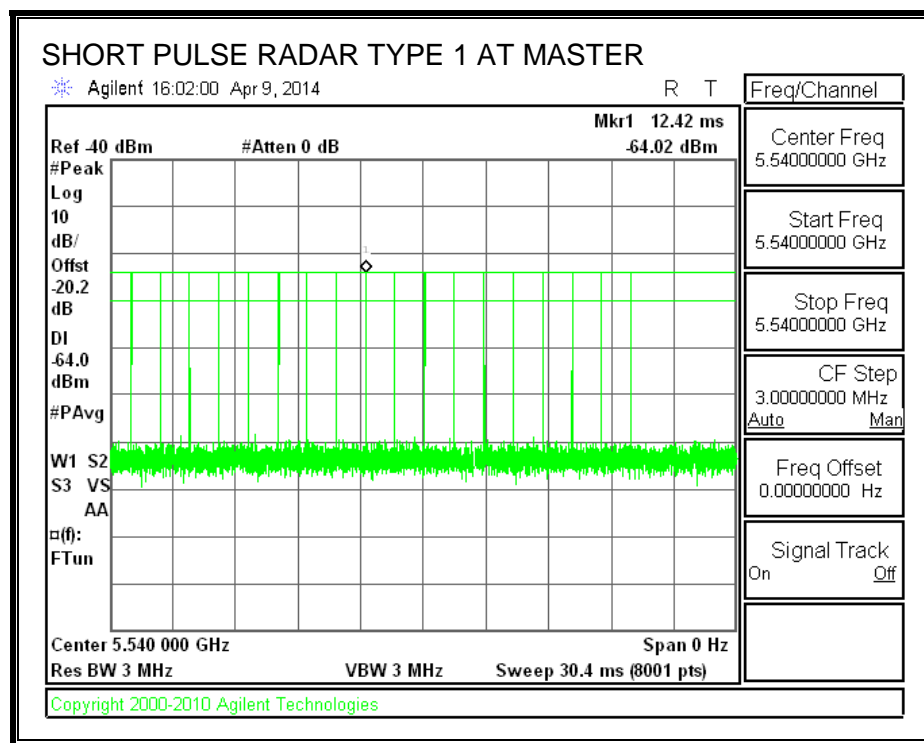
## 11.2. RESULTS FOR 20 MHz BANDWIDTH

### 11.2.1. TEST CHANNEL

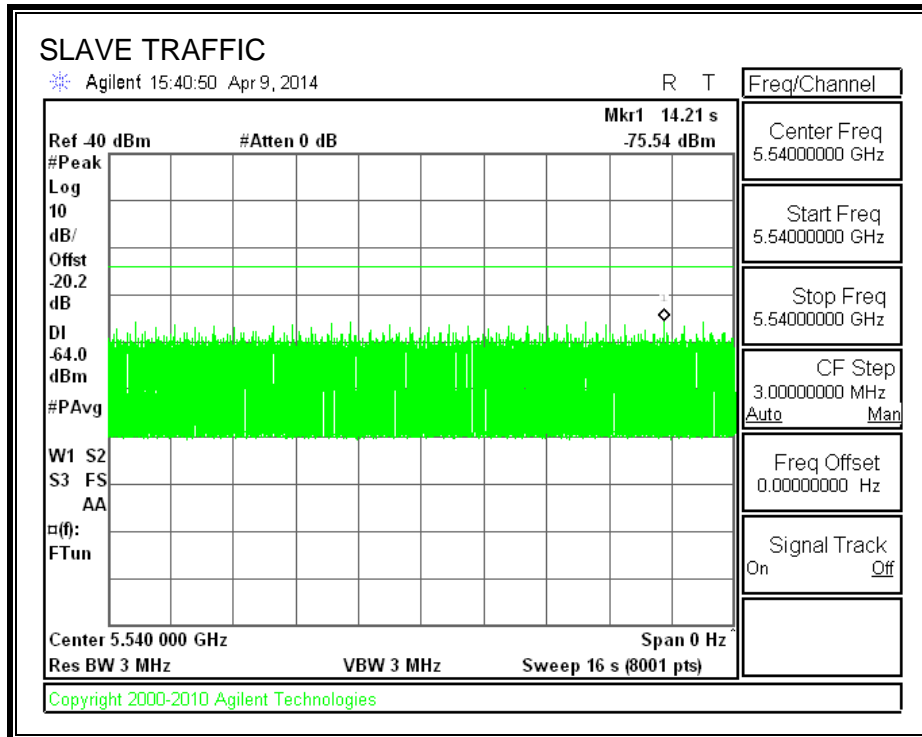
All tests were performed at a channel center frequency of 5540 MHz.

### 11.2.2. RADAR WAVEFORM AND TRAFFIC

#### RADAR WAVEFORM



**TRAFFIC**



### 11.2.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 11.2.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

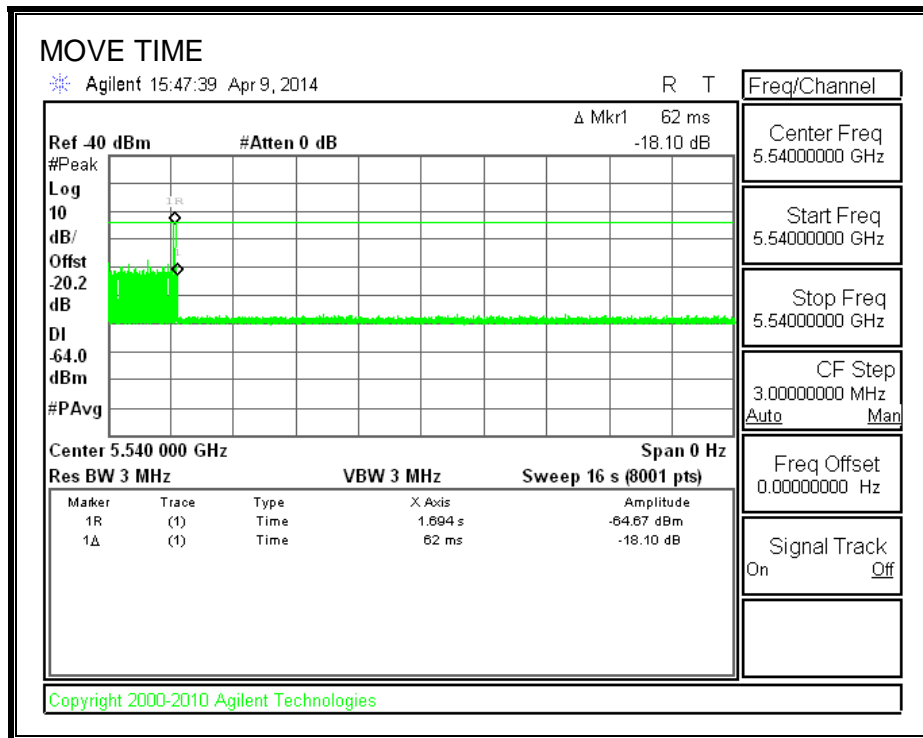
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

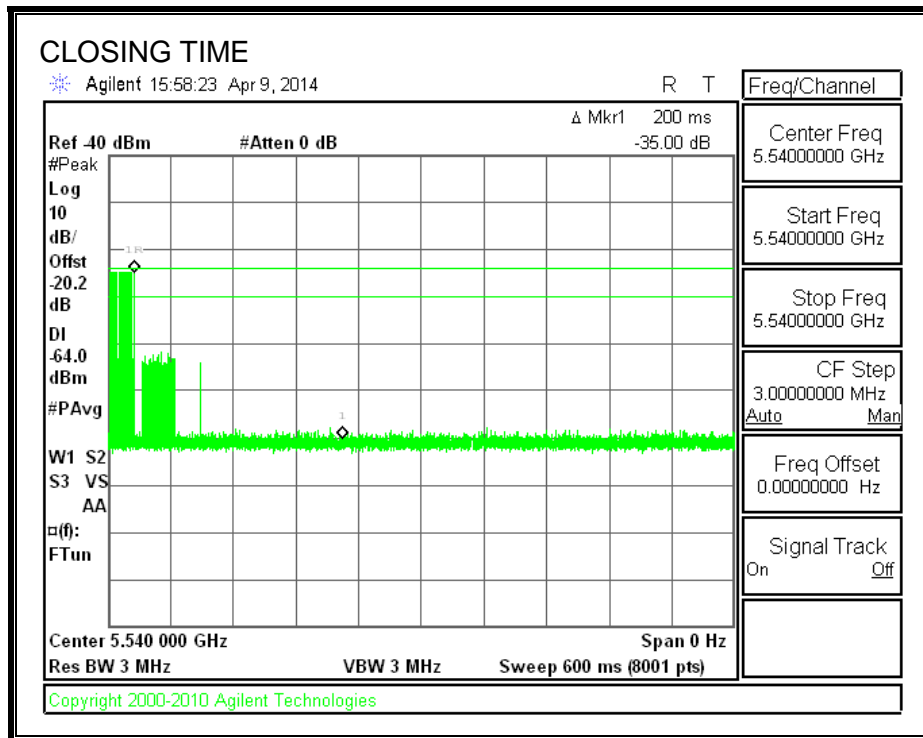
Channel Move Time (sec)	Limit (sec)
0.062	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

**MOVE TIME**

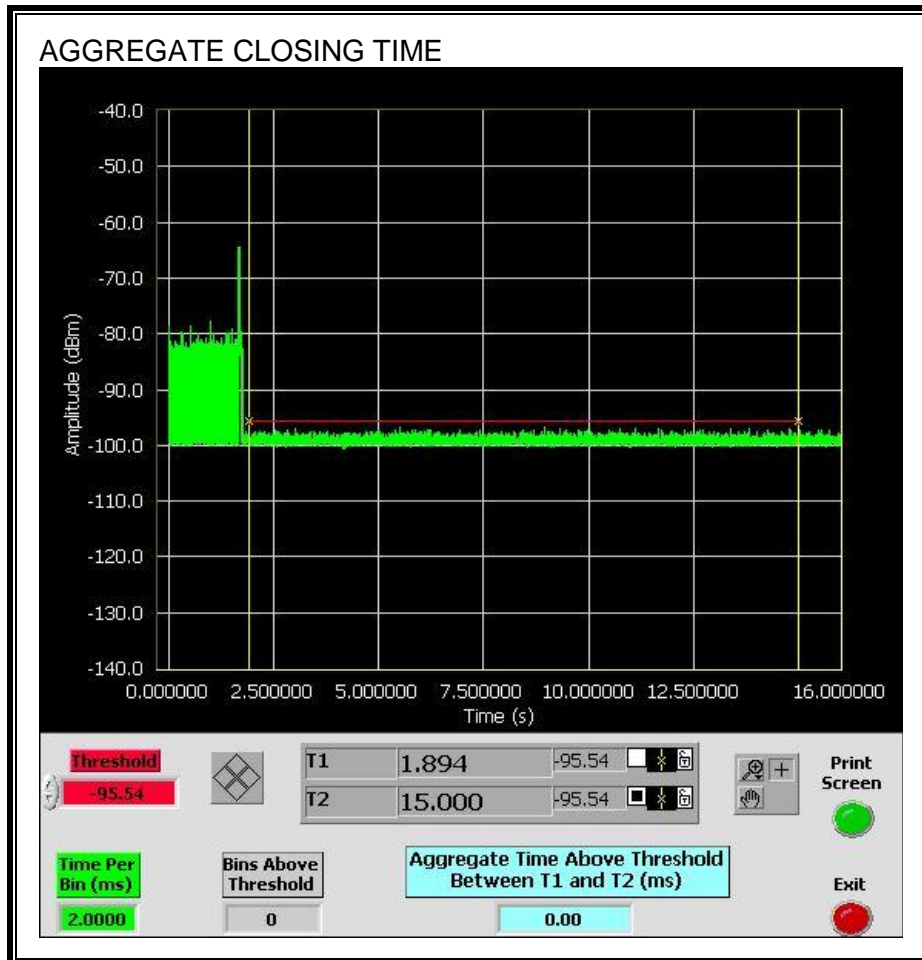


**CHANNEL CLOSING TIME**



**AGGREGATE CHANNEL CLOSING TRANSMISSION TIME**

Only intermittent transmissions are observed during the aggregate monitoring period.



### 11.2.5. NON-OCCUPANCY PERIOD

#### RESULTS

No EUT transmissions were observed on the test channel during the 30-minute observation time.

