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

CERTIFICATION TEST REPORT

FOR

Tv Box, 10/100 Ethernet, MoCA 1.1/2.0, WiFi AP, HDMI 1.4 w/ HDCP

MODEL NUMBER: GFHD200

FCC ID: A4RGFHD200

REPORT NUMBER: 14U17737-3 Revision A

ISSUE DATE: June 10, 2014

Prepared for
GOOGLE
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW
CA, 94043, US

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	6-2-14	Initial Issue	F. de Anda
A	6-10-14	Update- test range to 40GHz	F. de Anda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOOGLE
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW, CA, 94043, US

EUT DESCRIPTION: Tv Box, 10/100 Ethernet, MoCA 1.1/2.0, WiFi AP, HDMI 1.4 w/ HDCP

MODEL: GFHD200

SERIAL NUMBER: GTAFSJ1419D0016

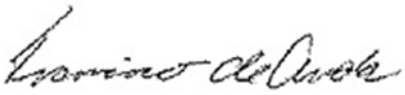
DATE TESTED: May 7, 2014 to May 16, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	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.

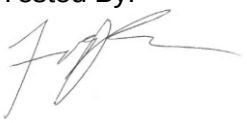
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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:



FRANCISCO DE ANDA
EMC SUPERVISOR
UL Verification Services Inc.

Tested By:



TRI PHAM
EMC ENGINEER
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.

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
☐ Chamber A	☐ Chamber D
☐ Chamber B	☒ Chamber E
☐ Chamber C	☒ 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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 a TV set top box that includes the following interfaces;
- 10/100 Ethernet
- MoCA 1.1/2.0
- 2.4/5.2/5.8 GHz WiFi AP
- HDMI1.4 w/HDCP
- BT 4.0 and BLE

The radio chipset is manufactured by Marvell and supports 5.2 GHz UNII band mode.

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)
5.2GHz Band			
5180 - 5240	802.11a	10.49	11.19
5180 - 5240	802.11n HT20	10.55	11.35
5190 - 5230	802.11n HT40	12.82	19.14
5210	802.11ac 80	8.75	7.50

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes stamped metal dipole antennas, with a maximum declared gain as follows;

	Antenna peak gain (dBi)	
Band	**Chain 0**	**Chain 1**
5150-5250	3	5

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was gftv200-37.11.

The EUT driver software installed in the HOST/SUPPORT equipment during testing was DUT LabTool Version 2.0.0.44.

The test utility software used during testing was WIFI Tool Version 2.0.0.44.

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.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

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

802.11a mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac mode: MCS0

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

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Sony	SVF143B1YL	54679497 0000931	DoC
AC Adaptor	Sony	ADP-45UD	149215611 1383206	N/A
Switch	Google	GFRG100	G20A32200367	DoC
AC Adaptor	Google	STD-12018U1	30303986	DoC
EUT AC Adapter	Liteon Tech. Corp.	PB-1180-29	N/A	N/A

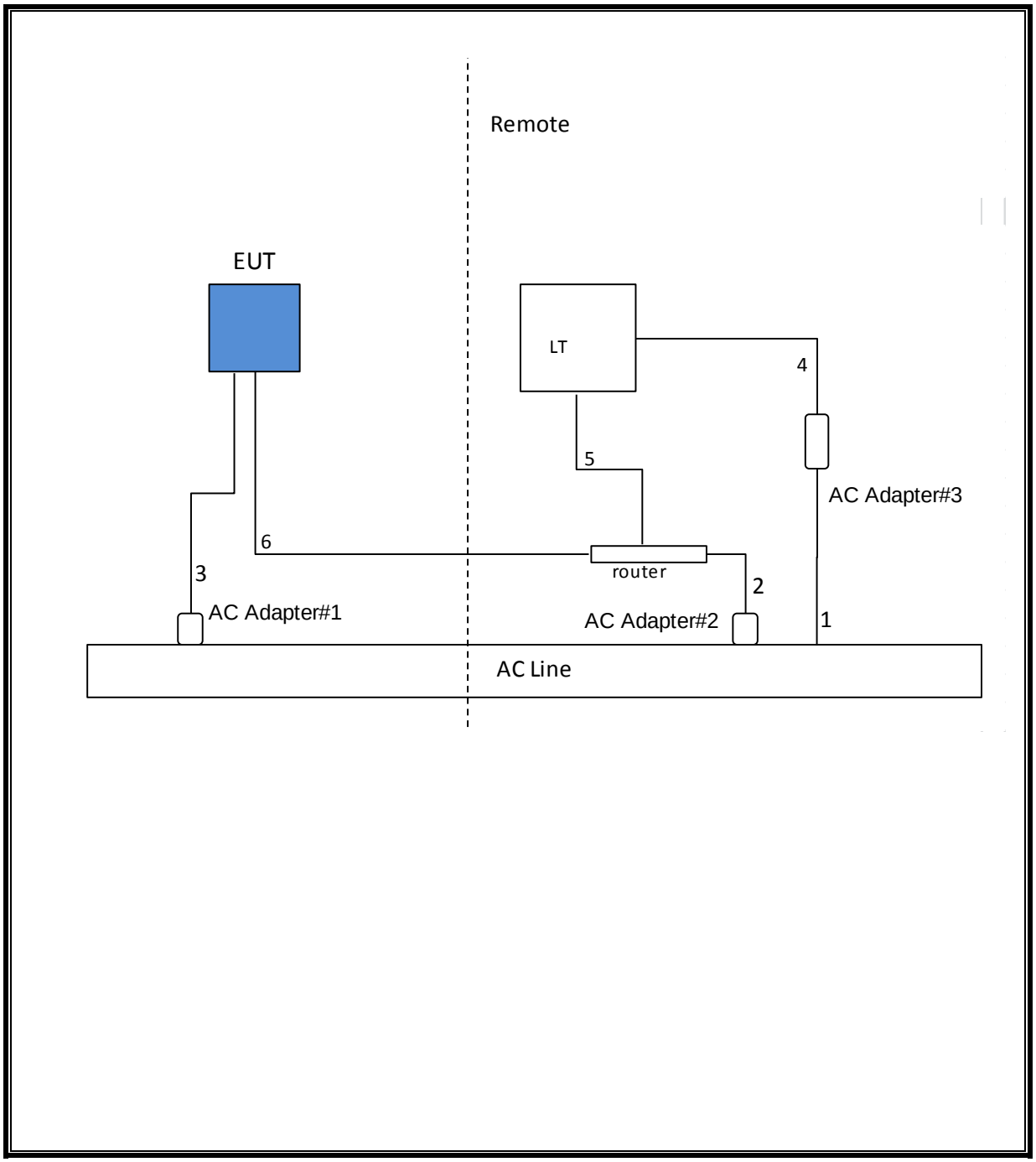
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	2-prong	Un-Shielded	1	N/A
2	DC	1	Barrel	Un-Shielded	1.8	N/A
3	DC	1	Barrel	Un-Shielded	1.8	EUT power
4	DC	1	Barrel	Un-Shielded	2.5	N/A
5	LAN	1	RJ45	Un-Shielded	1	N/A
6	LAN	1	RJ45	Un-Shielded	8.33	N/A

TEST SETUP

The EUT is connected to a host laptop computer via LAN switch during the tests. Test 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 Date**	**Cal Due**
Antenna, Horn, 40GHz	ARA	MWH-2640/B	C00981	06/28/13	11/26/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/26/13	11/26/14
Antenna, Horn, 18GHz	ETS Lindgren	3117	T711	06/24/13	06/24/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	F00027	05/05/14	05/05/15
High Pass Filter, fc: 3.0GHz, 50 Ohms	Micro-Tronics	HPM17543	F00182	08/30/13	08/30/14
Low Pass Filter, fc: 5GHz, 50 Ohms	Micro-Tronics	LPS17541	F00176	08/30/13	08/30/14
High Pass Filter, fc: 6GHz, 50 Ohms	Micro-Tronics	HPS17542	F00177	08/30/13	08/30/14
RF PreAmplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	F00352	08/30/13	08/30/14
Amplifier	Sonoma	310	F00009	04/23/14	04/23/15
PreAmplifier, 1-26.5GHz	Agilent	8449B	F00167	03/25/14	03/25/15
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/13	08/20/14
Spectrum Analyzer, 3Hz to 44GHz	Agilent	N9030A	F00127	03/11/14	03/11/15
Spectrum Analyzer 40 GHz	Agilent	8564E	C00951	07/29/13	07/29/14
Wideband Power Sensor, 30MHz BW	Agilent	N1921A	F00360	09/30/13	09/30/14
P-Series single channel Power Meter	Agilent	N1911A	F00050	10/04/13	10/04/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/17/14	01/17/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	F00092	09/09/13	09/09/14

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)
802.11a CDD	3.144	3.175	0.990	99.02%	0.00	0.010
802.11n HT20 CDD	2.923	2.952	0.990	99.02%	0.00	0.010
802.11n HT40 CDD	1.4280	1.4550	0.981	98.14%	0.00	0.010
802.11ac VHT80 CDD	0.6841	0.7047	0.971	97.08%	0.13	1.462

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.b (Method SA-1).

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

Peak Excursion: KDB 789033 D01 v01r03, Section G.

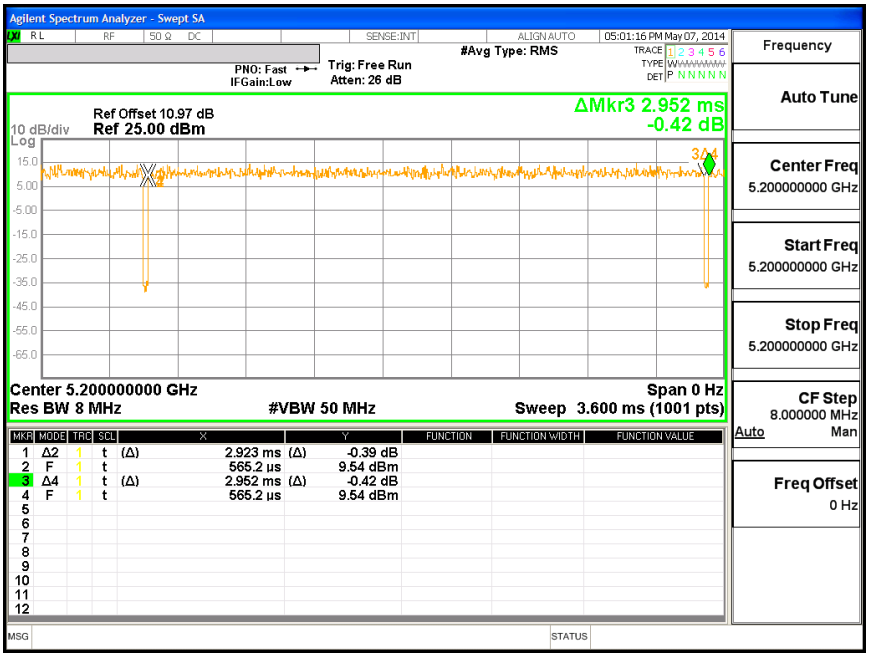
Unwanted emissions in restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, H.5, and H.6.

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

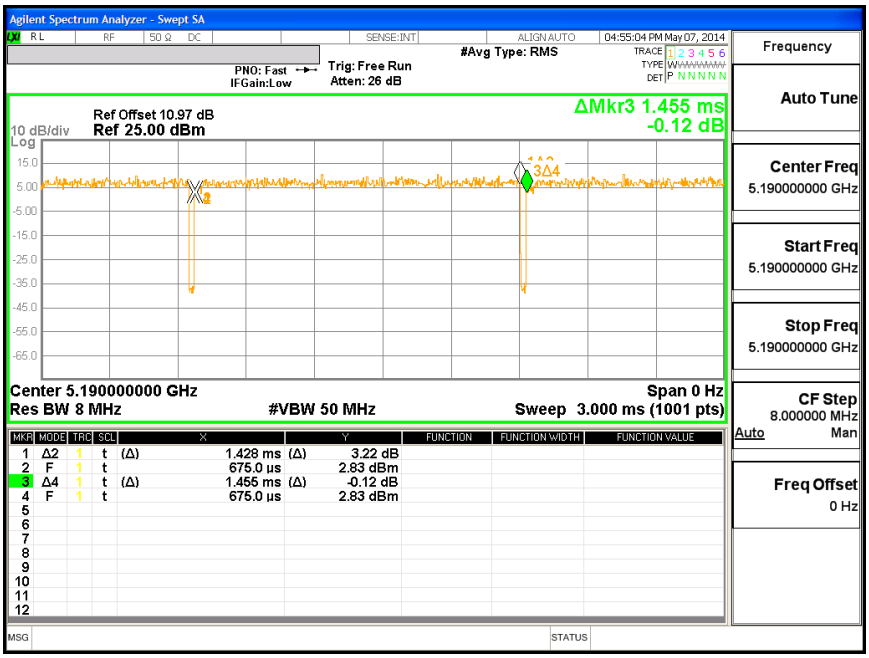
7.3. DUTY CYCLE PLOTS

DUTY CYCLE 802.11a CDD MODE

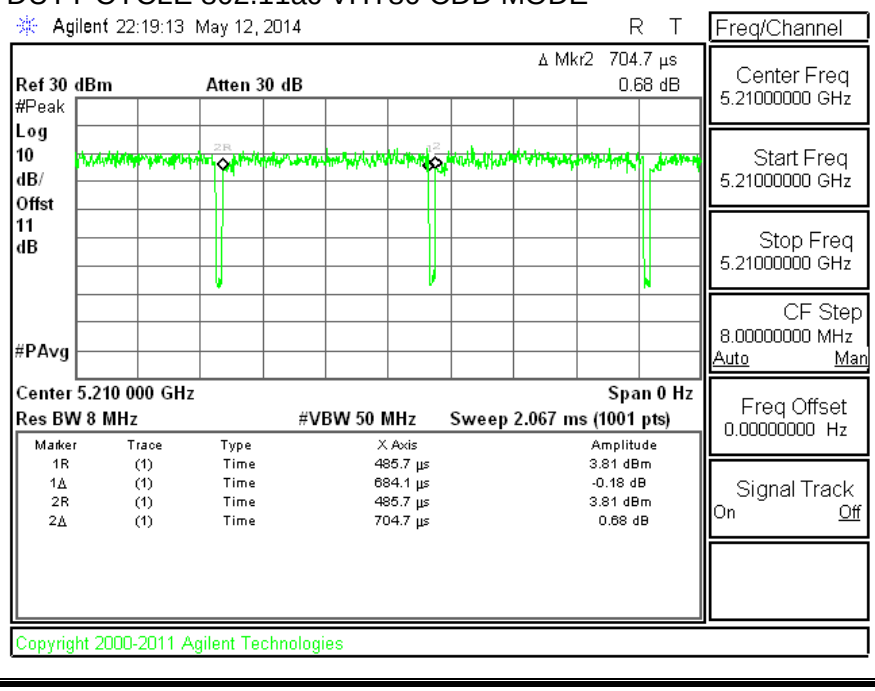
DUTY CYCLE 802.11n HT20 CDD MODE



DUTY CYCLE 802.11n HT40 CDD MODE



DUTY CYCLE 802.11ac VHT80 CDD MODE



8. ANTENNA PORT TEST RESULTS

8.1. 802.11a 2Tx CDD MODE IN THE 5.2 GHz BAND

8.1.1. 26 dB BANDWIDTH

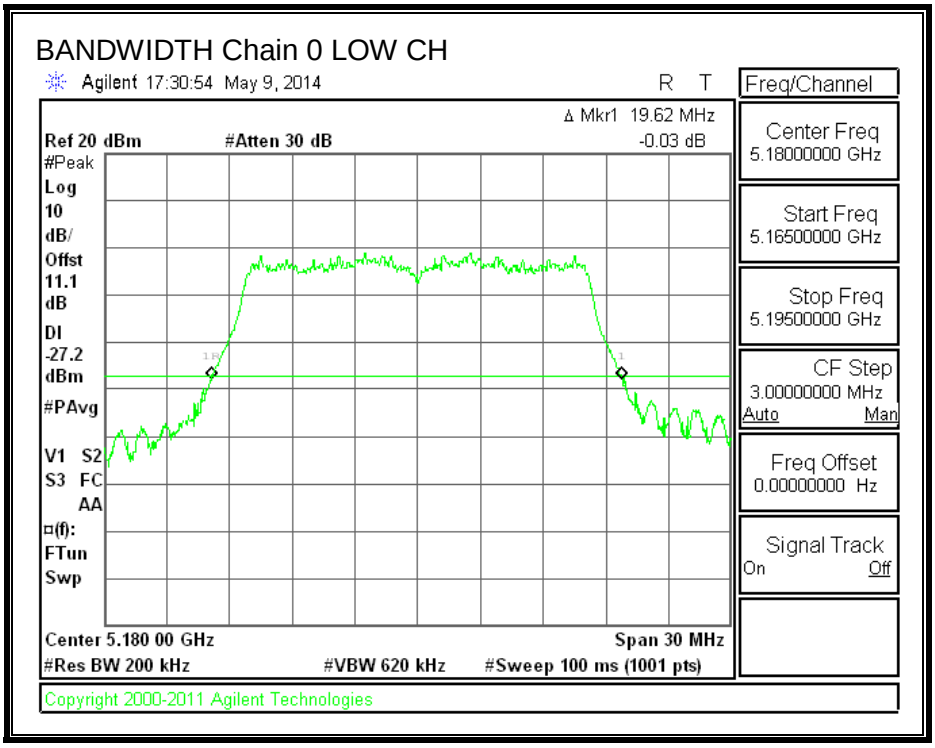
LIMITS

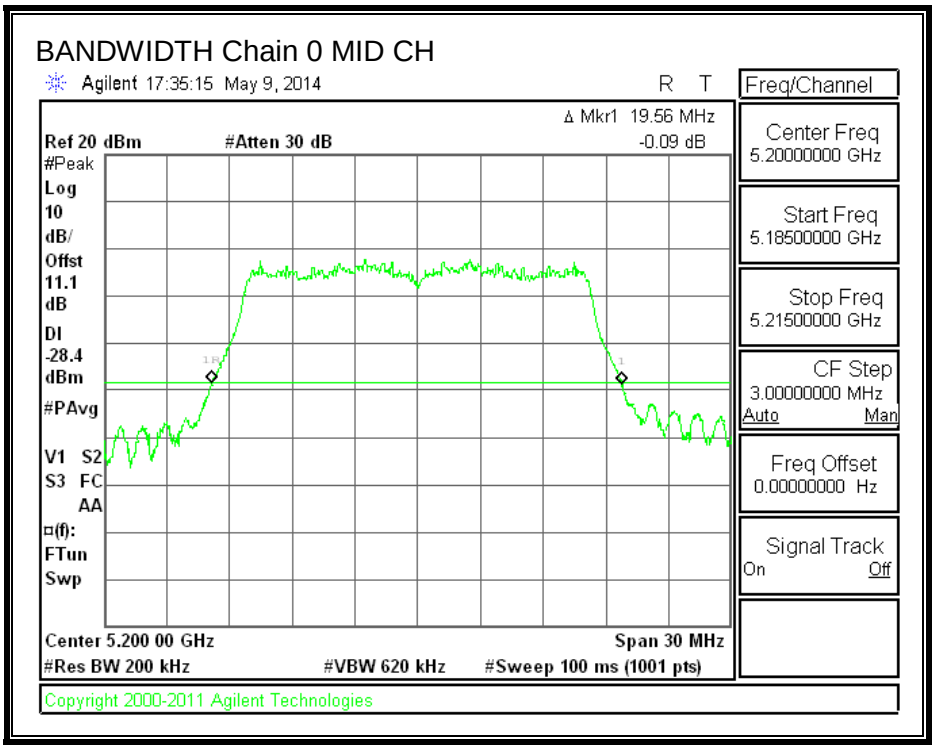
None; for reporting purposes only.

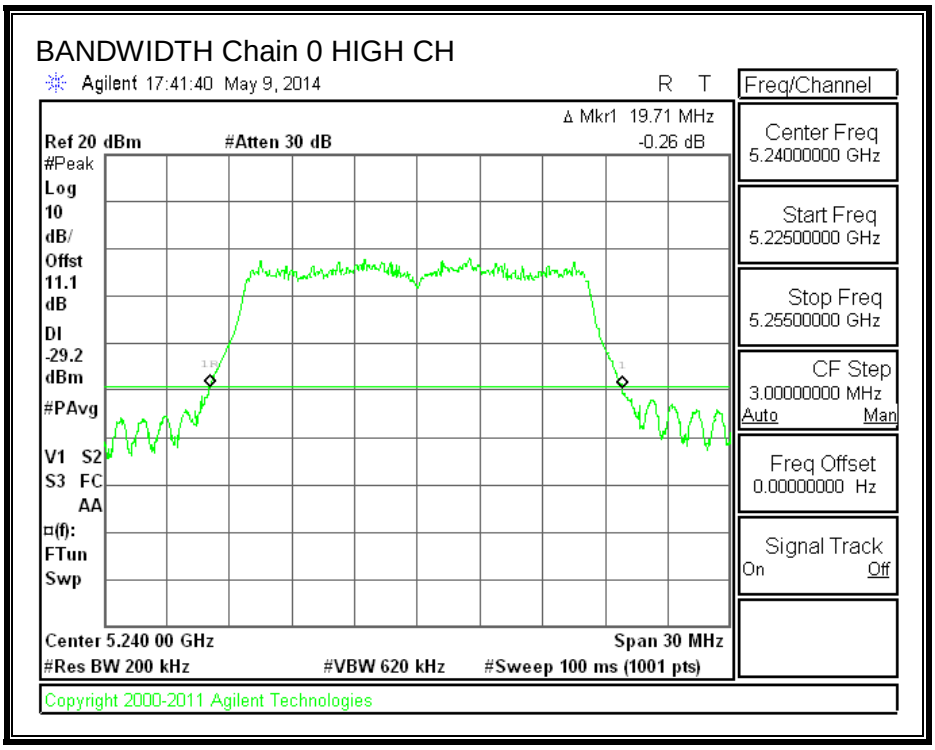
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	19.62	19.62
Mid	5200	19.56	19.50
High	5240	19.71	19.50

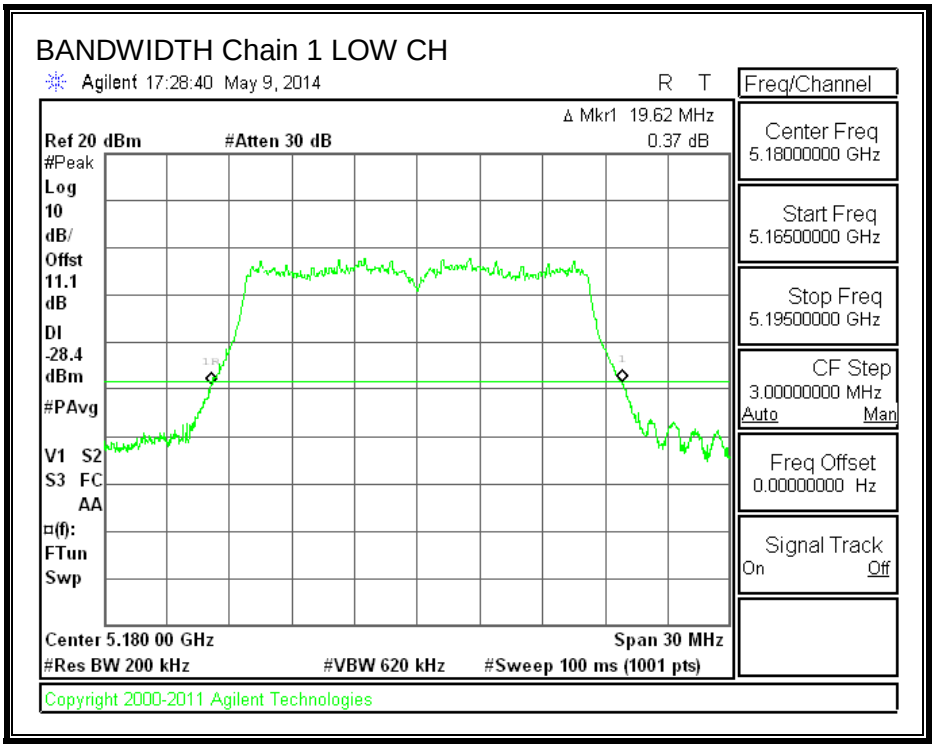
26 dB BANDWIDTH, Chain 0



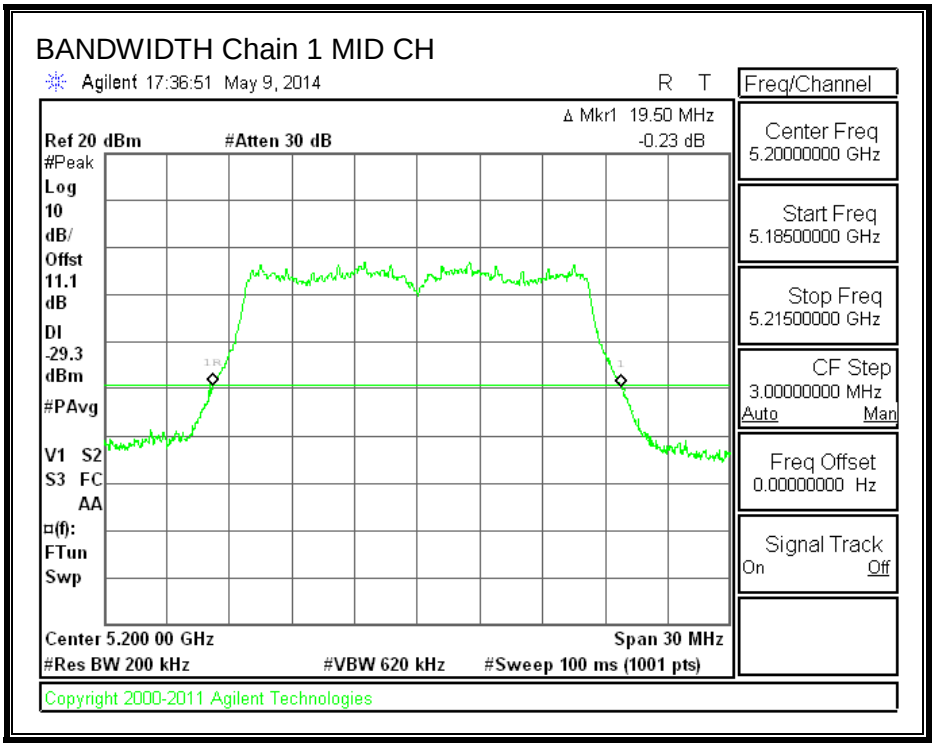




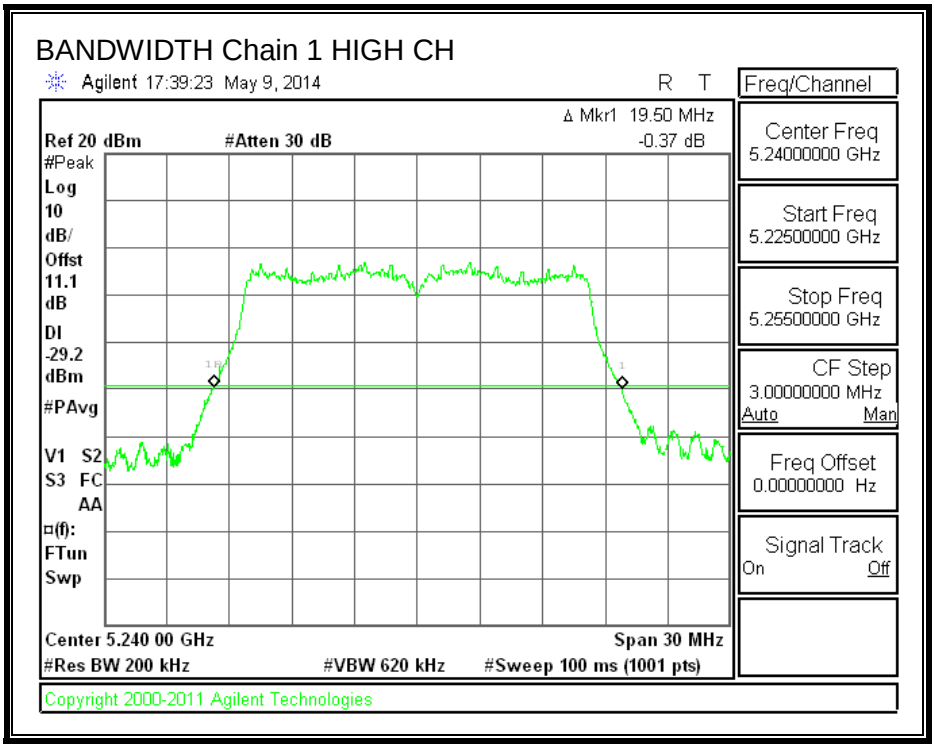
26 dB BANDWIDTH, Chain 1



BANDWIDTH Chain 1 MID CH



BANDWIDTH Chain 1 HIGH CH



8.1.2. 99% BANDWIDTH

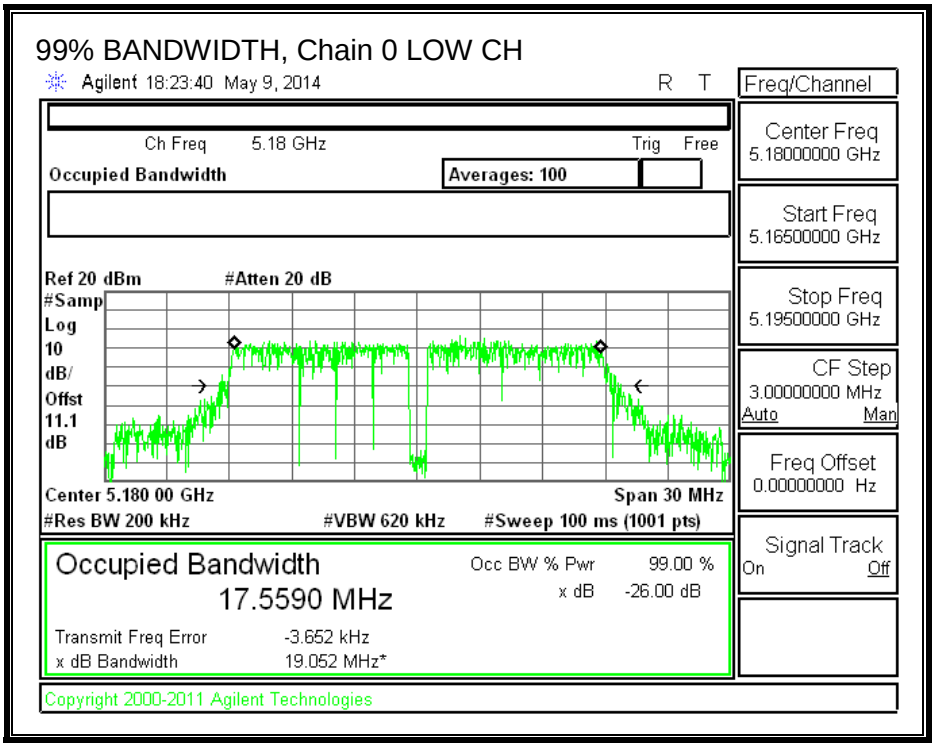
LIMITS

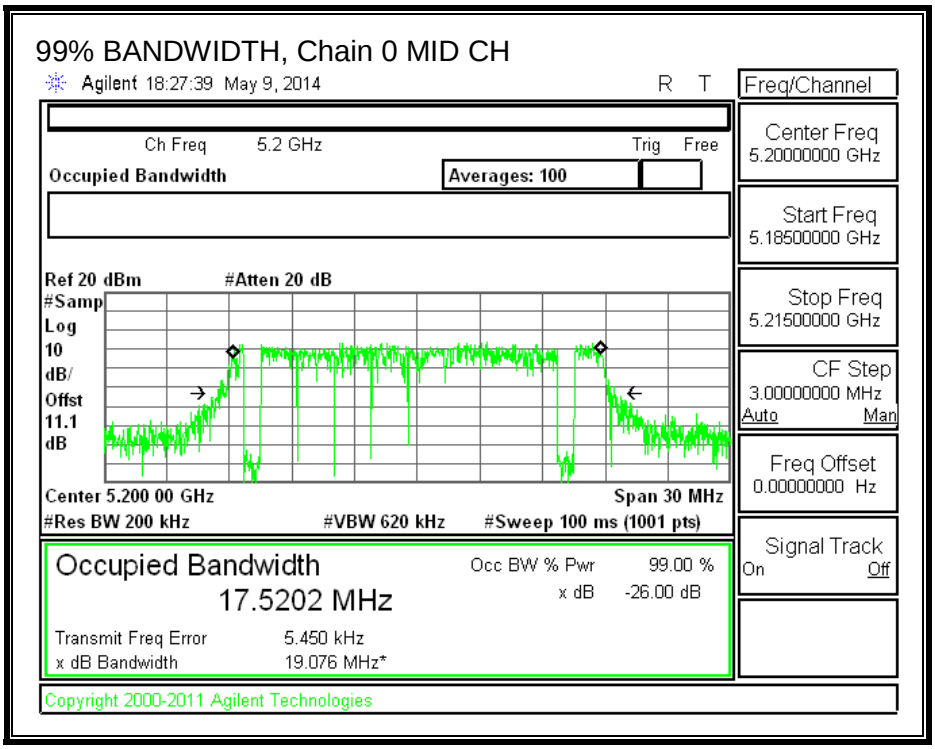
None; for reporting purposes only.

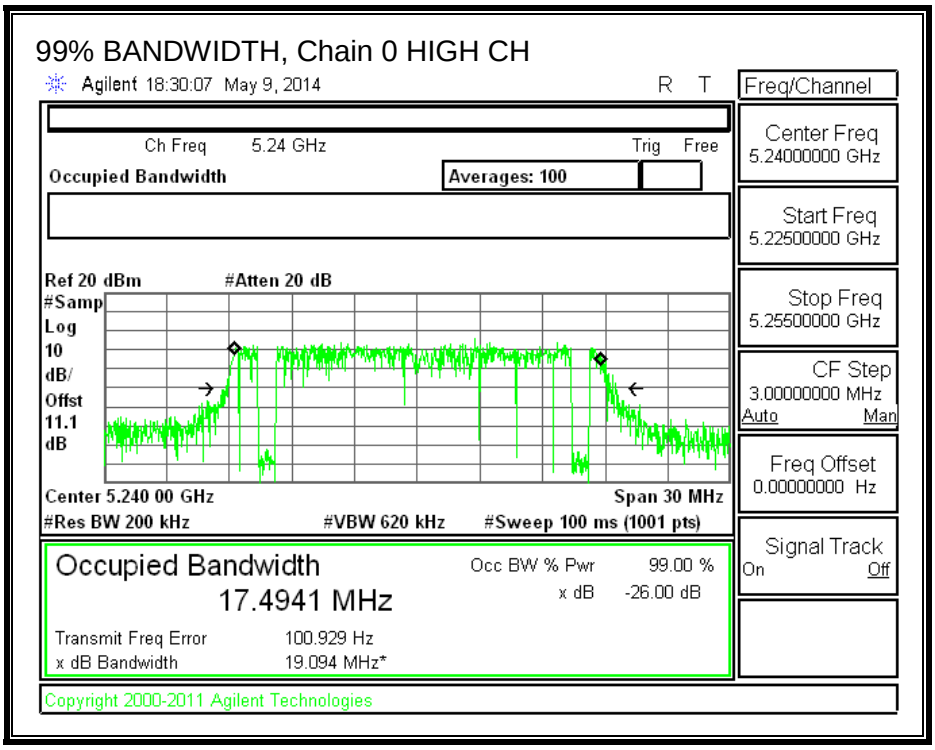
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.56	17.52
Mid	5200	17.52	17.56
High	5240	17.49	17.53

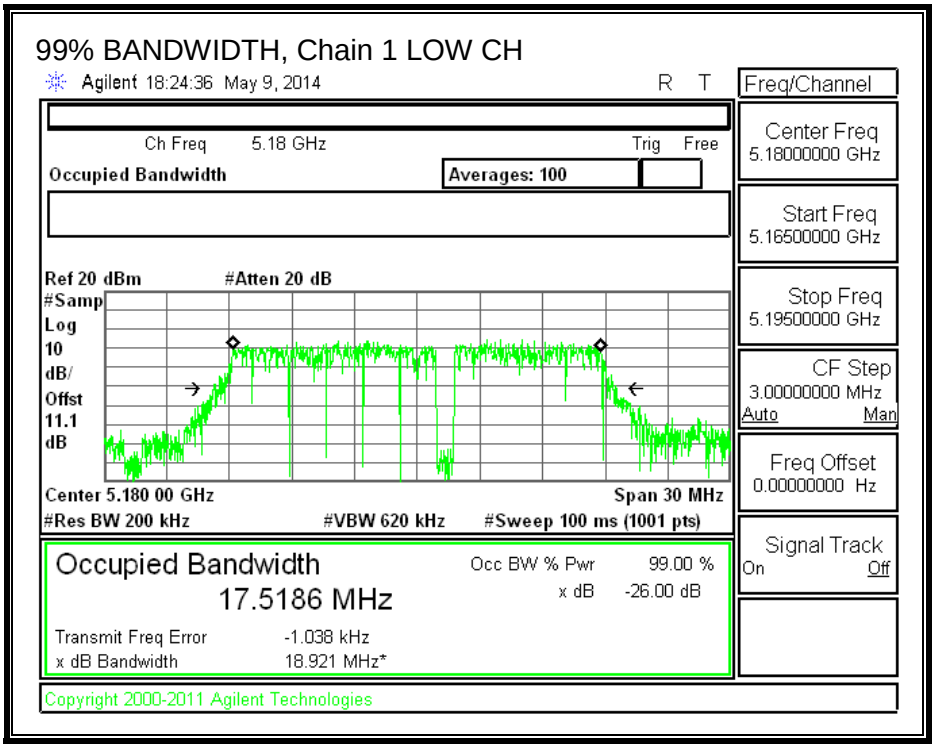
99% BANDWIDTH, Chain 0

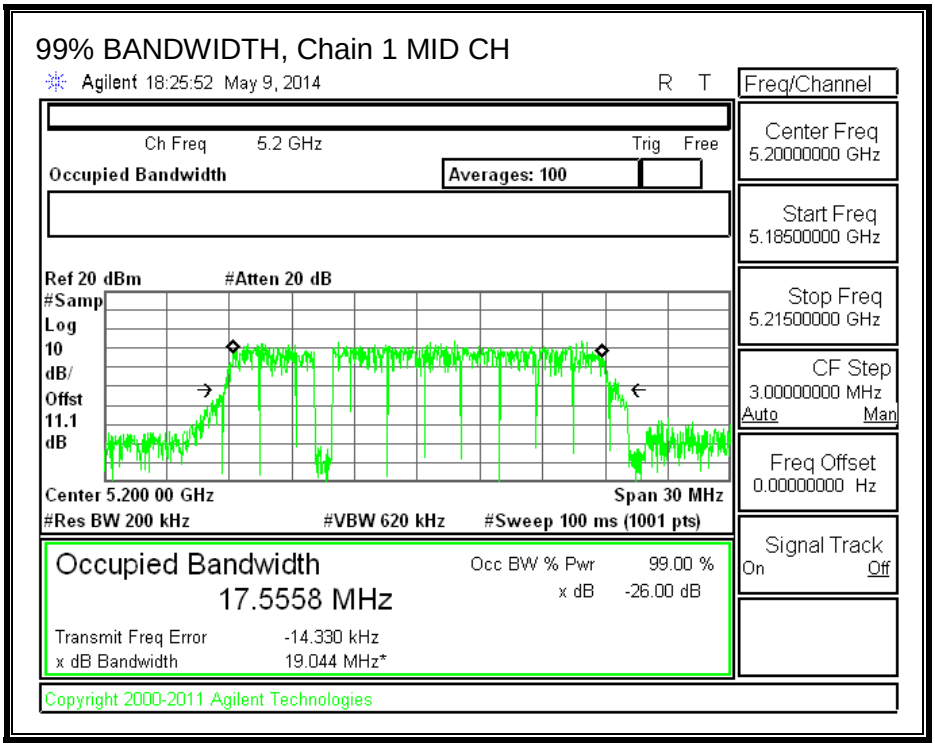


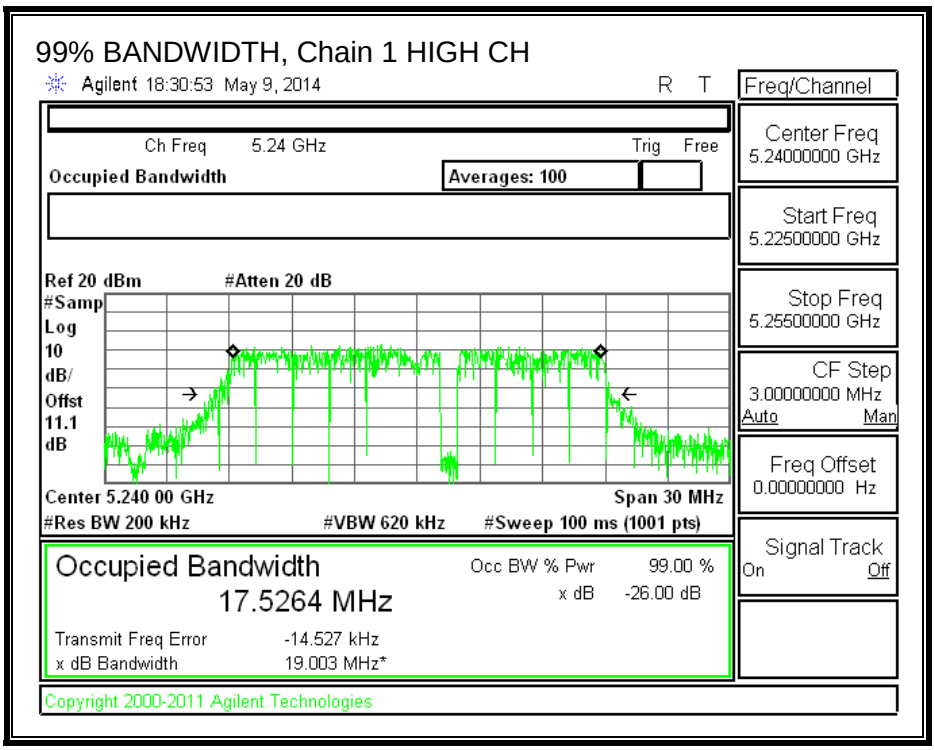




99% BANDWIDTH, Chain 1







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 11.26 dB (including 10 dB pad and 1.26 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	7.51	7.31	10.42
Mid	5200	6.78	6.12	9.47
High	5240	6.47	6.51	9.50

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 log10 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)
3.00	5.00	4.11

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)
3.00	5.00	7.07

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	19.56	17.5186	4.11	7.07
Mid	5200	19.50	17.5202	4.11	7.07
High	5240	19.50	17.4941	4.11	7.07

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	16.91	22.43	18.32	16.91	2.93	10.00	2.93
Mid	5200	16.90	22.44	18.33	16.90	2.93	10.00	2.93
High	5240	16.90	22.43	18.32	16.90	2.93	10.00	2.93

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

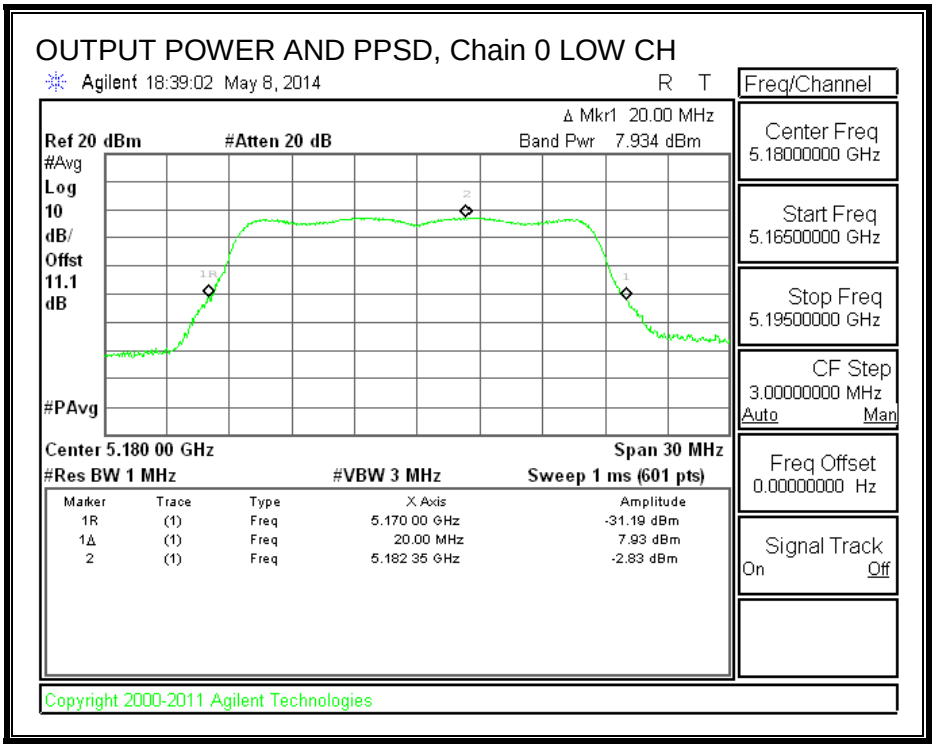
Output Power Results

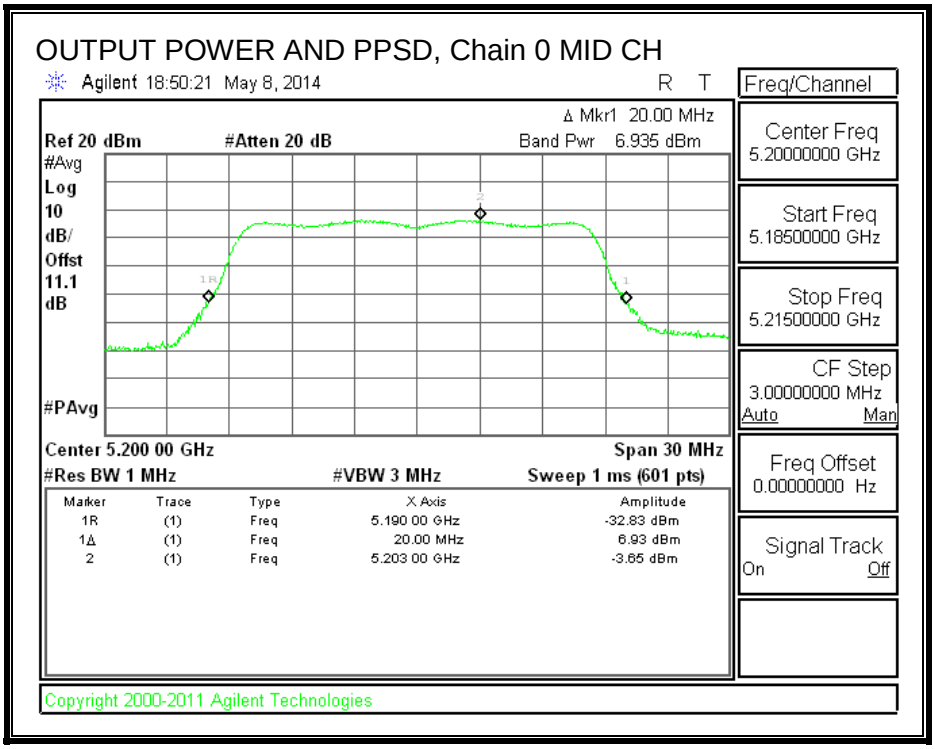
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	7.93	6.97	10.49	16.91	-6.43
Mid	5200	6.94	5.80	9.42	16.90	-7.48
High	5240	7.24	6.41	9.85	16.90	-7.05

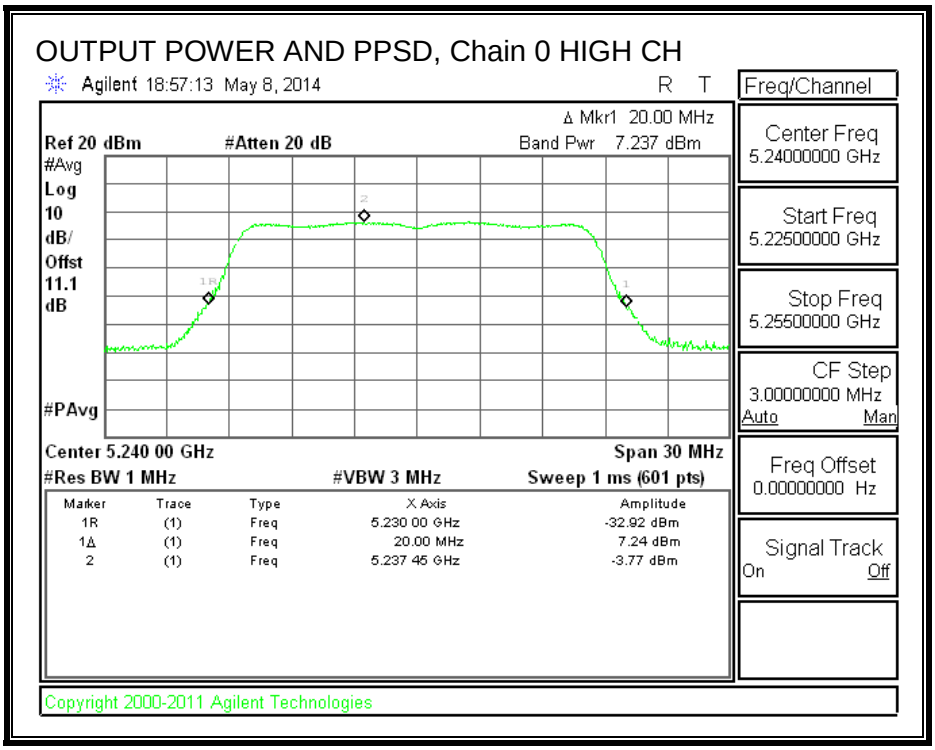
PPSD Results

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	-2.83	-3.96	-0.35	2.93	-3.28
Mid	5200	-3.65	-4.92	-1.23	2.93	-4.16
High	5240	-3.77	-4.33	-1.03	2.93	-3.96

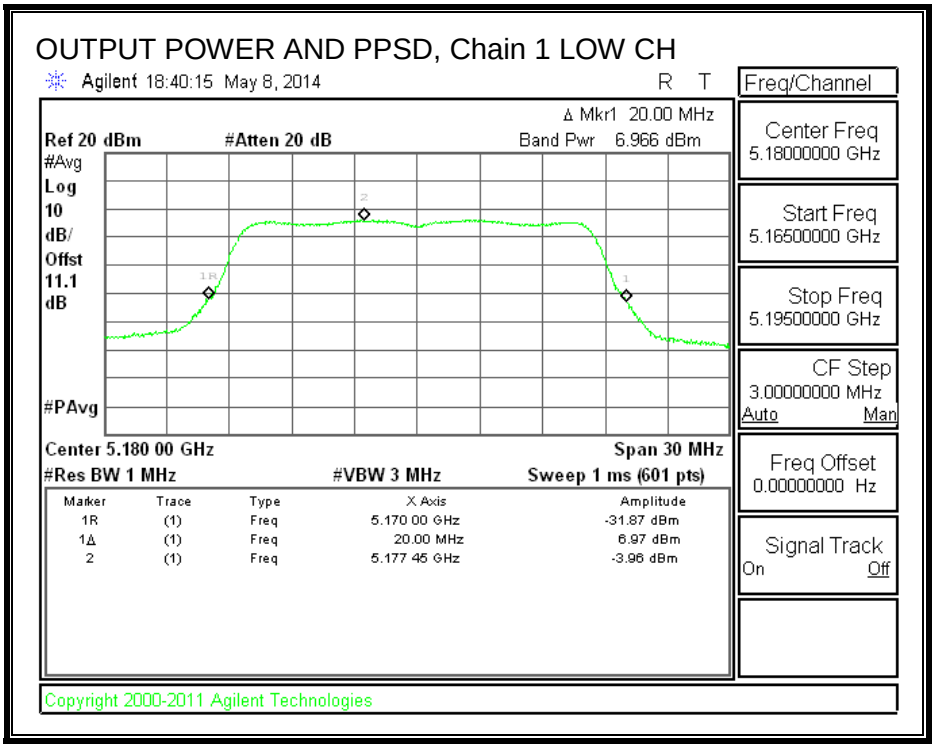
OUTPUT POWER AND PPSD, Chain 0



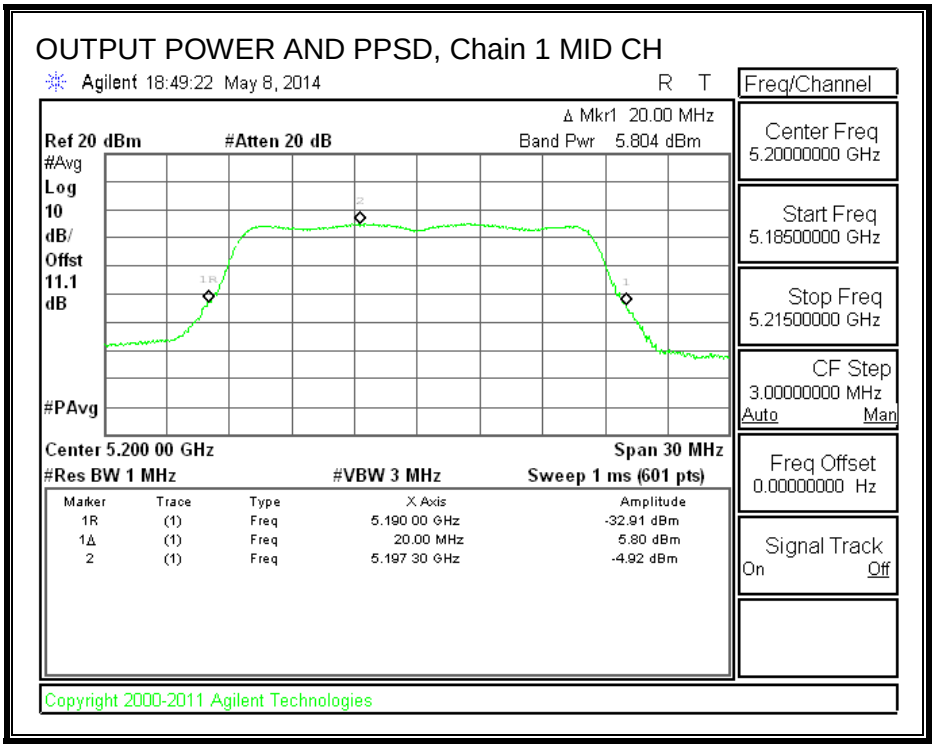




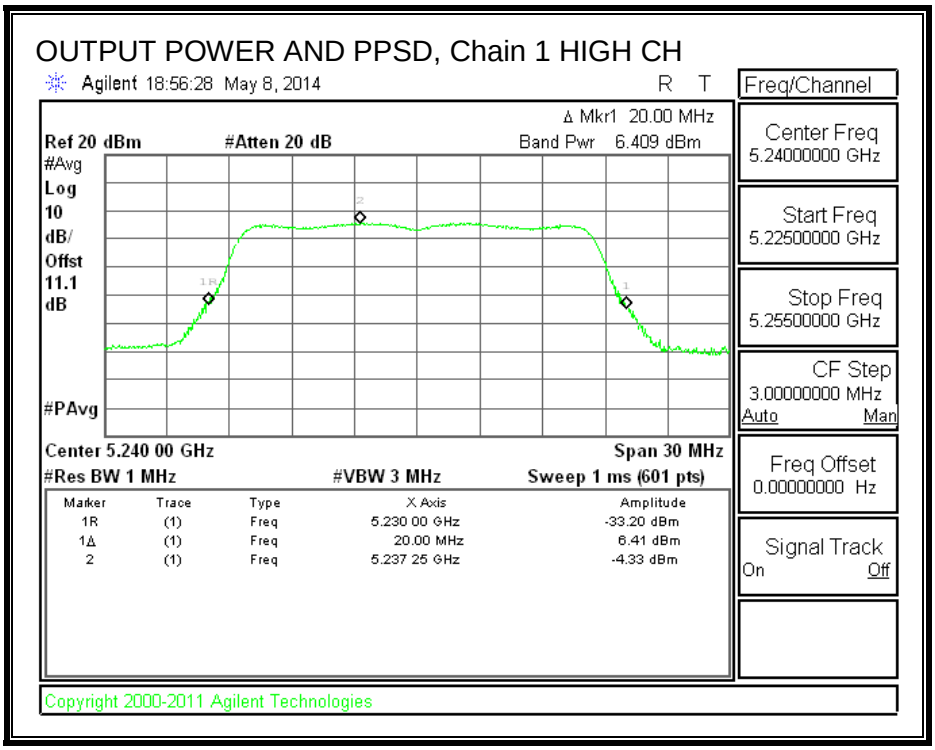
OUTPUT POWER AND PPSD, Chain 1



OUTPUT POWER AND PPSD, Chain 1 MID CH



OUTPUT POWER AND PPSD, Chain 1 HIGH CH



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

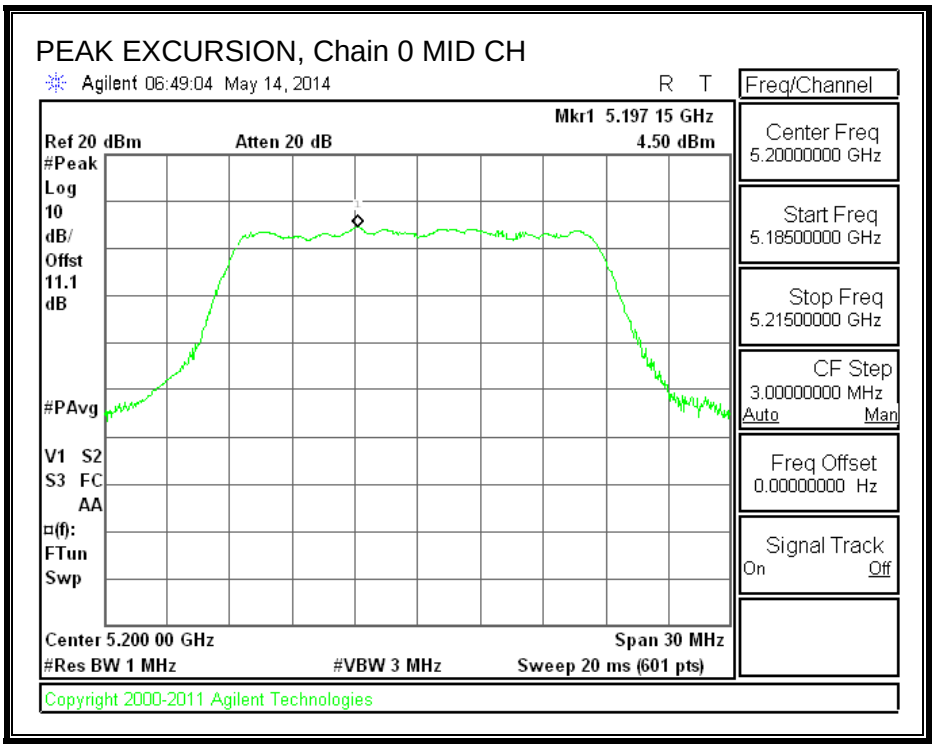
Chain 0

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	4.50	-3.65	0.00	8.15	13	-4.85

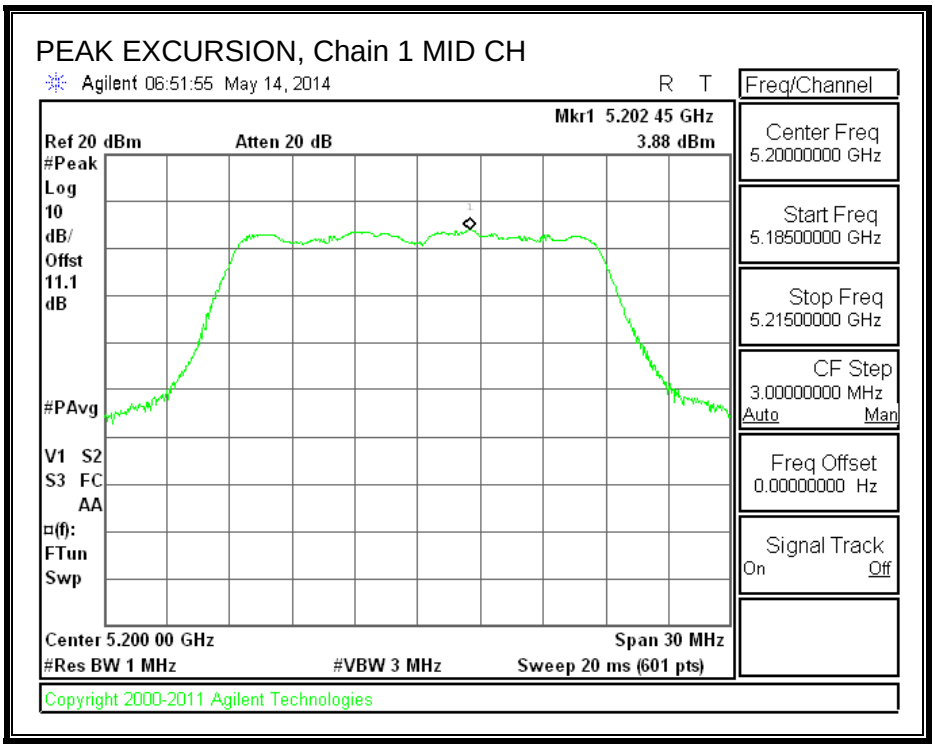
Chain 1

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	3.88	-4.92	0.00	8.80	13	-4.20

PEAK EXCURSION, Chain 0



PEAK EXCURSION, Chain 1



8.2. 802.11n HT20 2Tx CDD MODE IN THE 5.2 GHz BAND

8.2.1. 26 dB BANDWIDTH

LIMITS

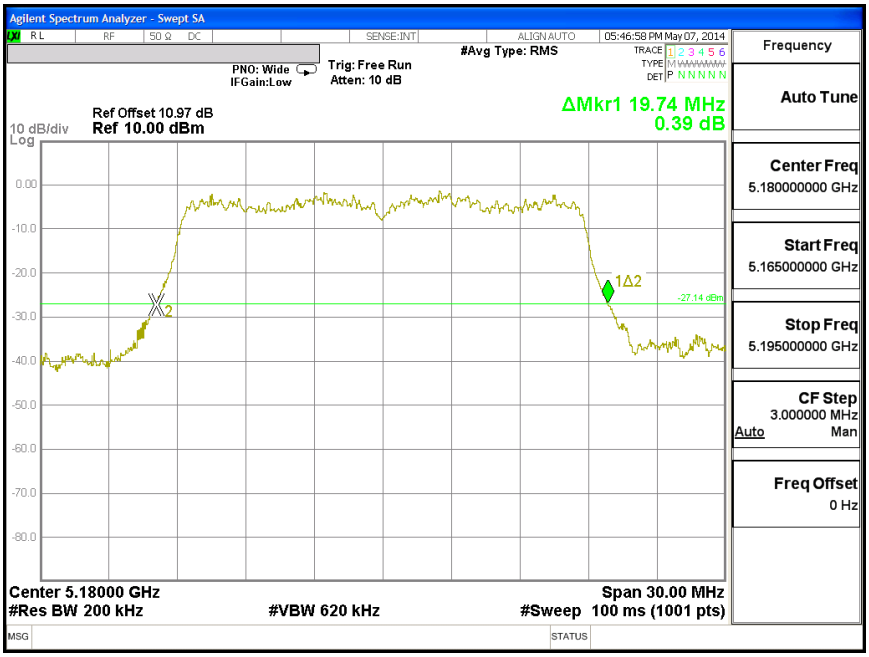
None; for reporting purposes only.

RESULTS

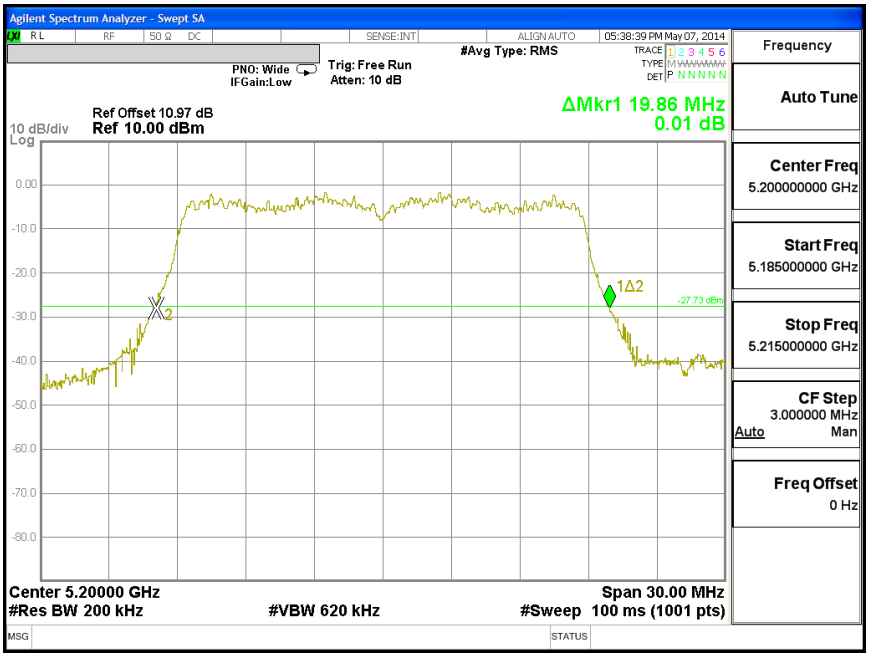
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	19.74	19.80
Mid	5200	19.86	19.95
High	5240	19.92	19.83

26 dB BANDWIDTH, Chain 0

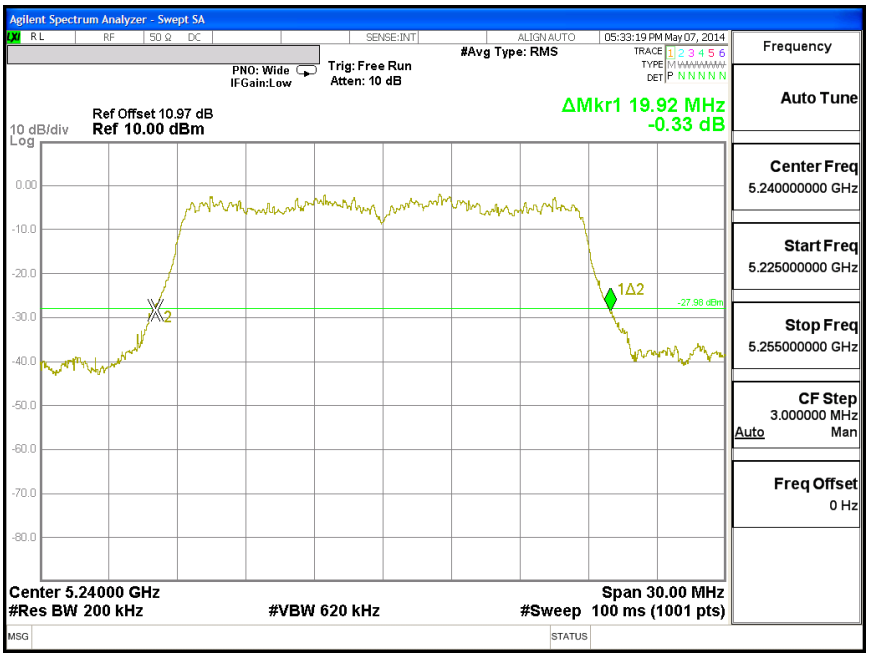
BANDWIDTH Chain 0 LOW CH



BANDWIDTH Chain 0 MID CH

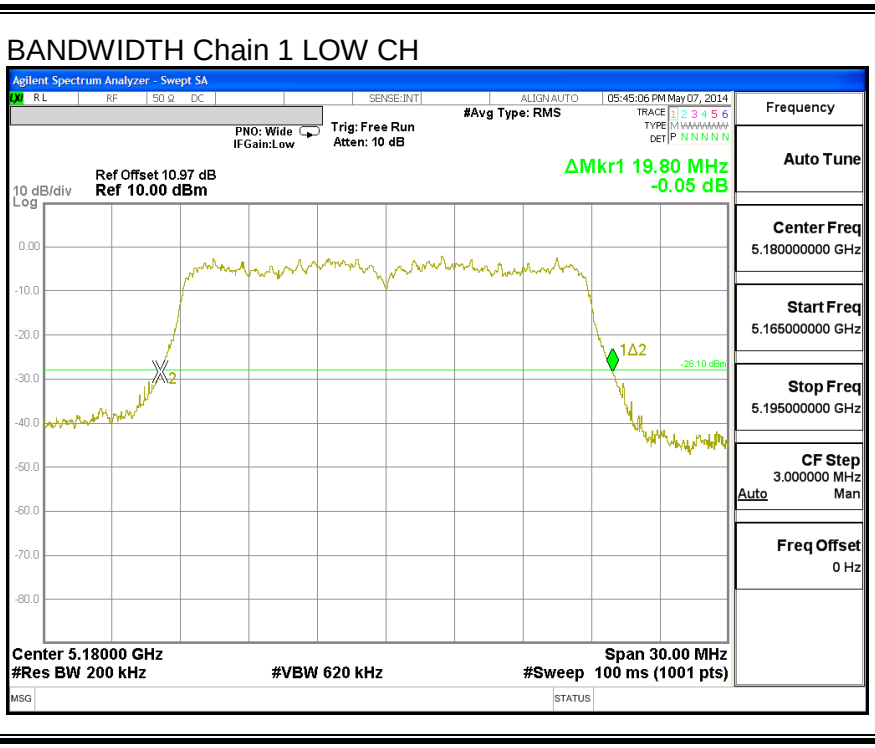


BANDWIDTH Chain 0 HIGH CH

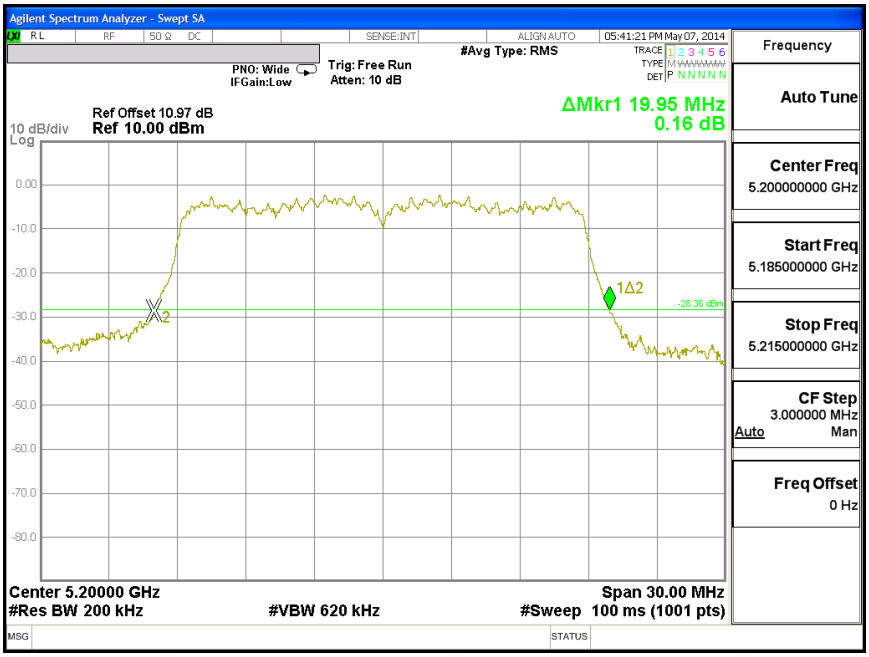


26 dB BANDWIDTH, Chain 1

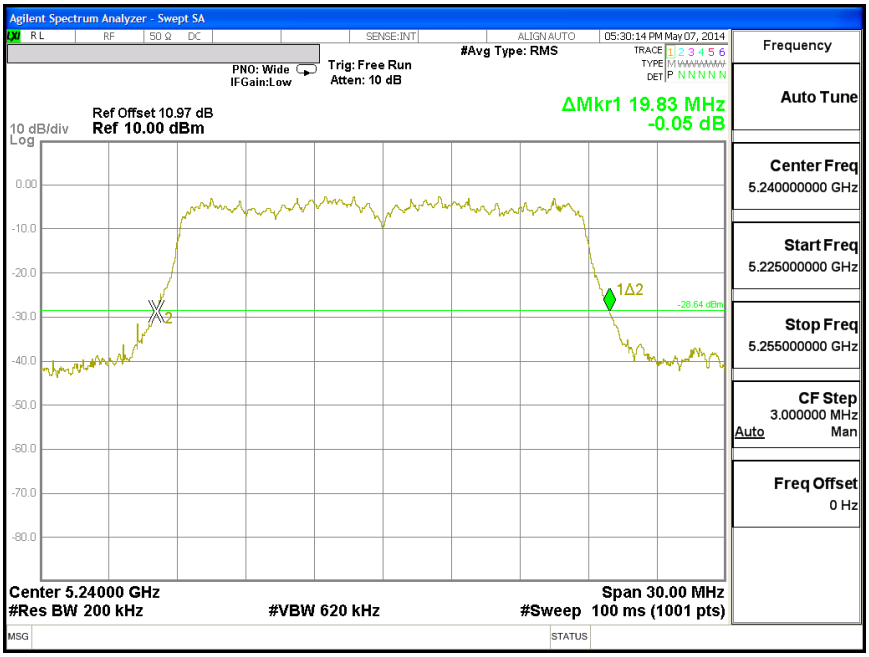
BANDWIDTH Chain 1 LOW CH



BANDWIDTH Chain 1 MID CH



BANDWIDTH Chain 1 HIGH CH



8.2.2. 99% BANDWIDTH

LIMITS

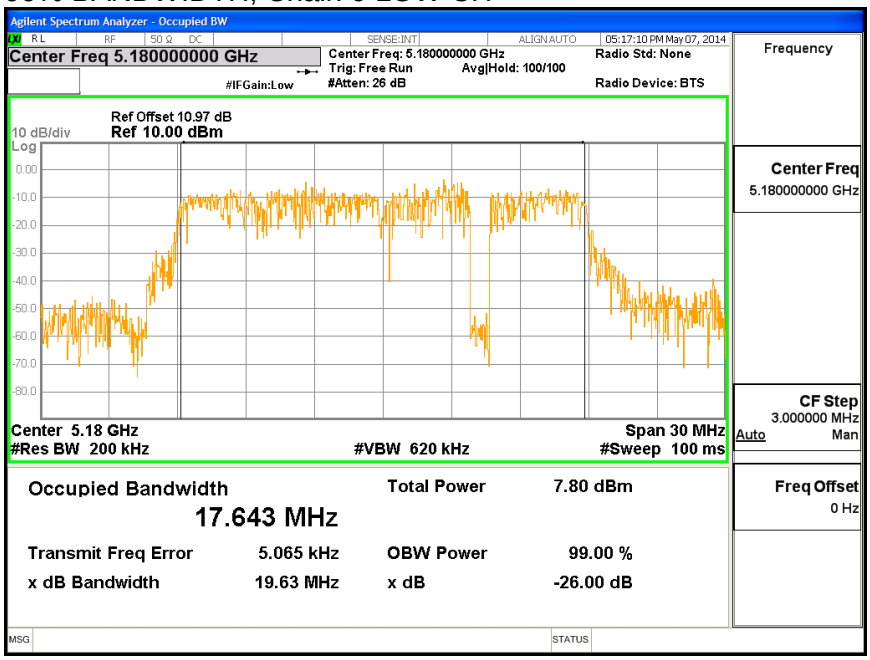
None; for reporting purposes only.

RESULTS

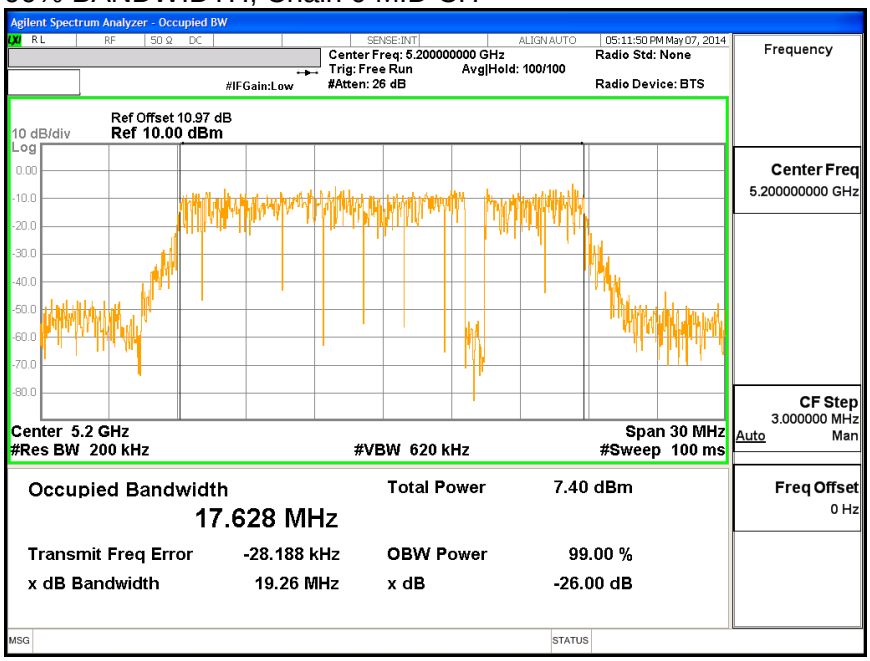
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.64	17.62
Mid	5200	17.63	17.66
High	5240	17.66	17.59

99% BANDWIDTH, Chain 0

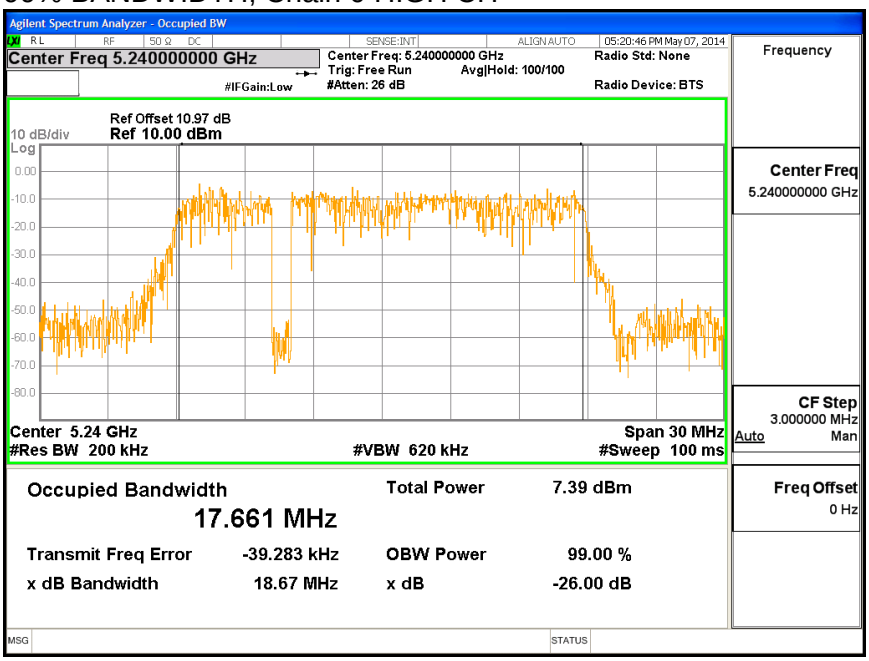
99% BANDWIDTH, Chain 0 LOW CH



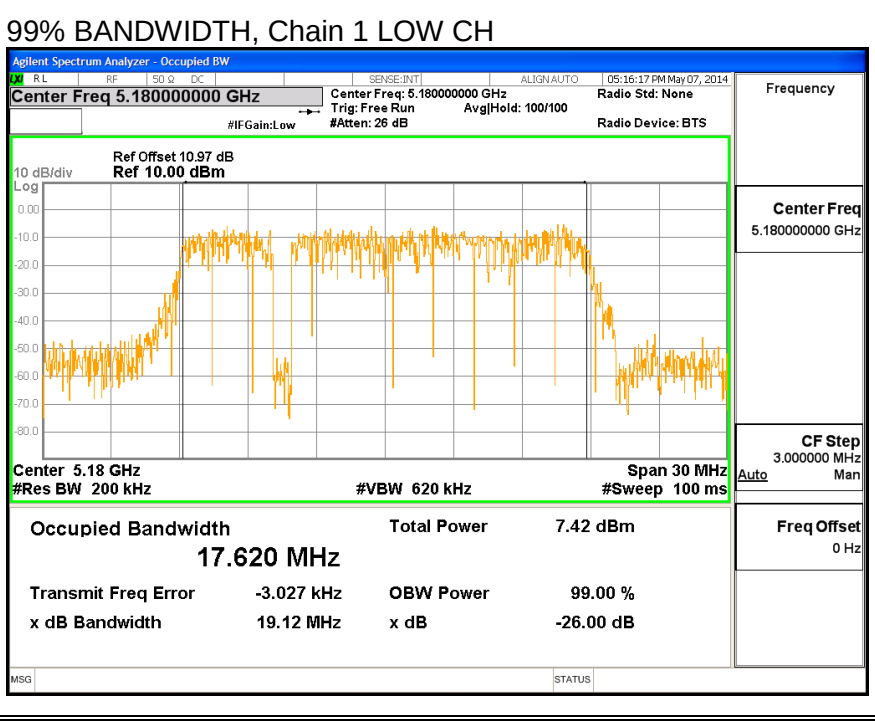
99% BANDWIDTH, Chain 0 MID CH



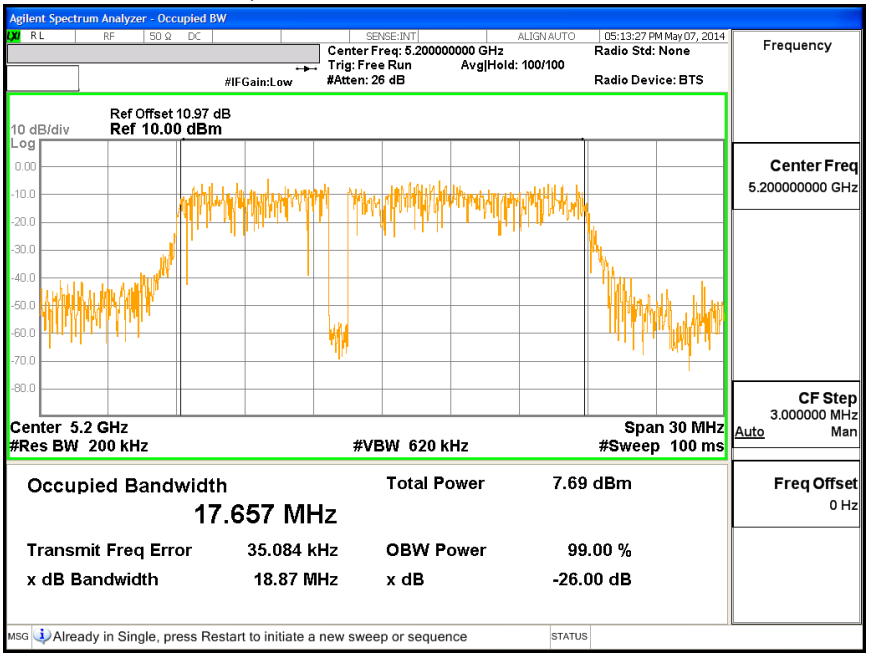
99% BANDWIDTH, Chain 0 HIGH CH



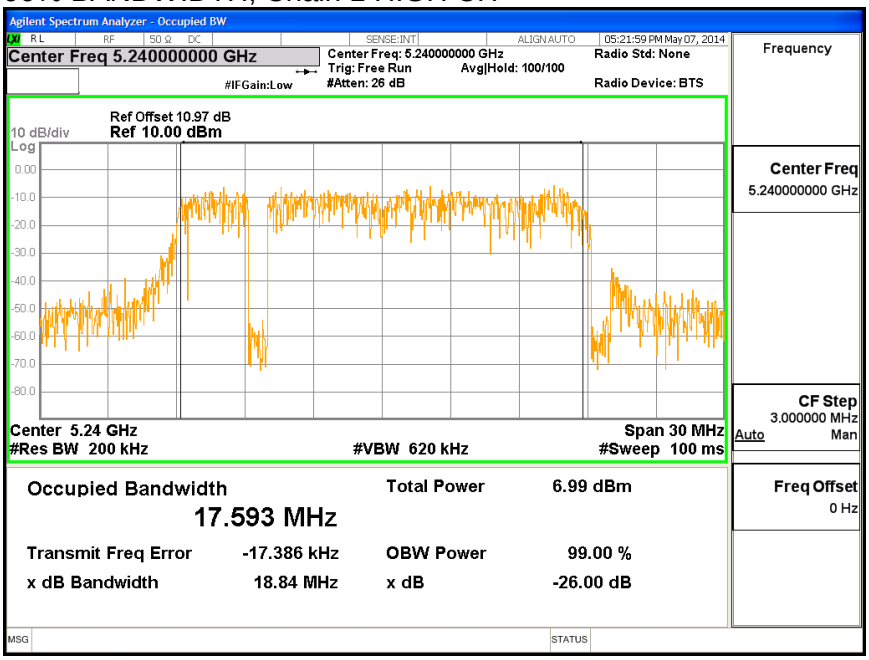
99% BANDWIDTH, Chain 1



99% BANDWIDTH, Chain 1 MID CH



99% BANDWIDTH, Chain 1 HIGH CH



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 11.26 dB (including 10 dB pad and 1.26 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	7.55	6.79	10.20
Mid	5200	7.39	6.77	10.10
High	5240	7.34	6.95	10.16

8.2.4. 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.

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The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 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)
3.00	5.00	4.11

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)
3.00	5.00	7.07

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	19.74	17.6200	4.11	7.07
Mid	5200	19.86	17.6280	4.11	7.07
High	5240	19.92	17.5930	4.11	7.07

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	16.95	22.46	18.35	16.95	2.93	10.00	2.93
Mid	5200	16.98	22.46	18.35	16.98	2.93	10.00	2.93
High	5240	16.99	22.45	18.34	16.99	2.93	10.00	2.93

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

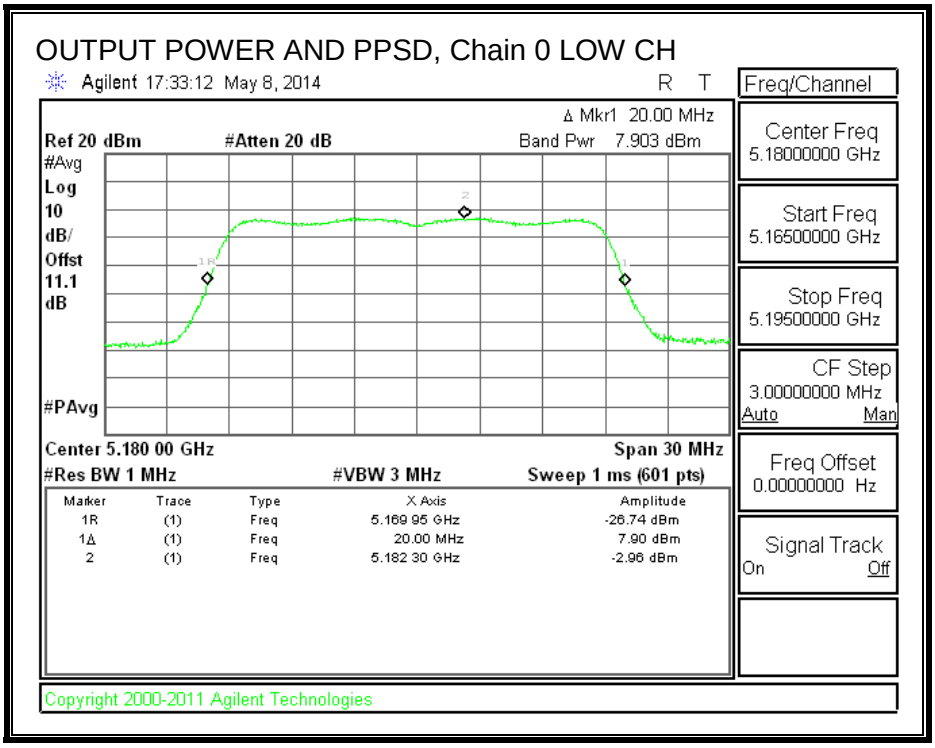
Output Power Results

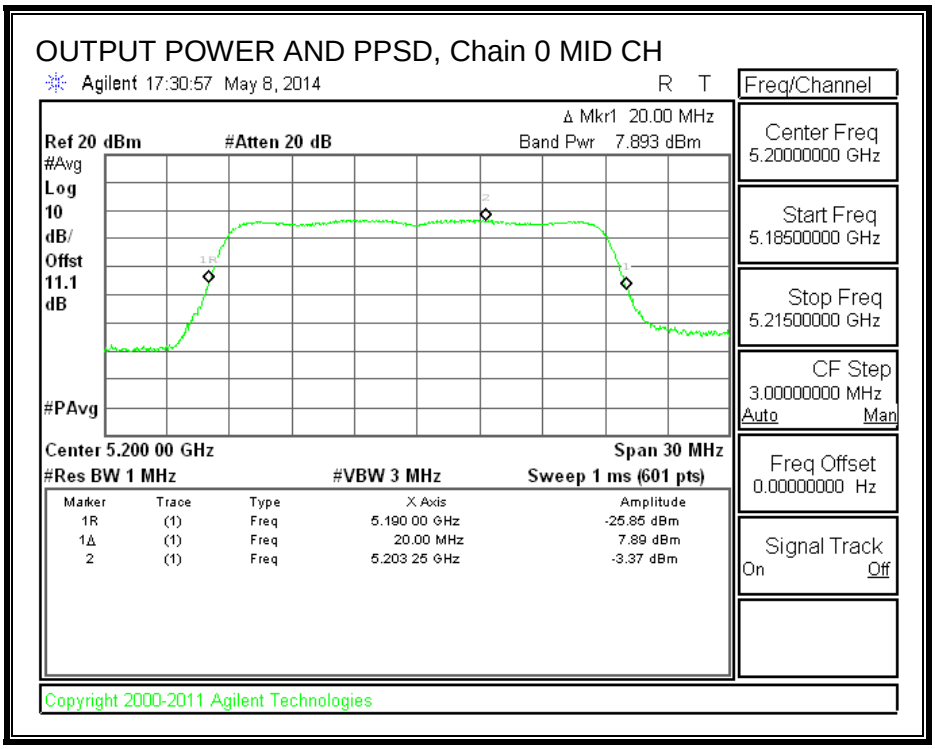
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	7.90	6.90	10.44	16.95	-6.51
Mid	5200	7.89	7.13	10.54	16.98	-6.44
High	5240	8.09	6.92	10.55	16.99	-6.44

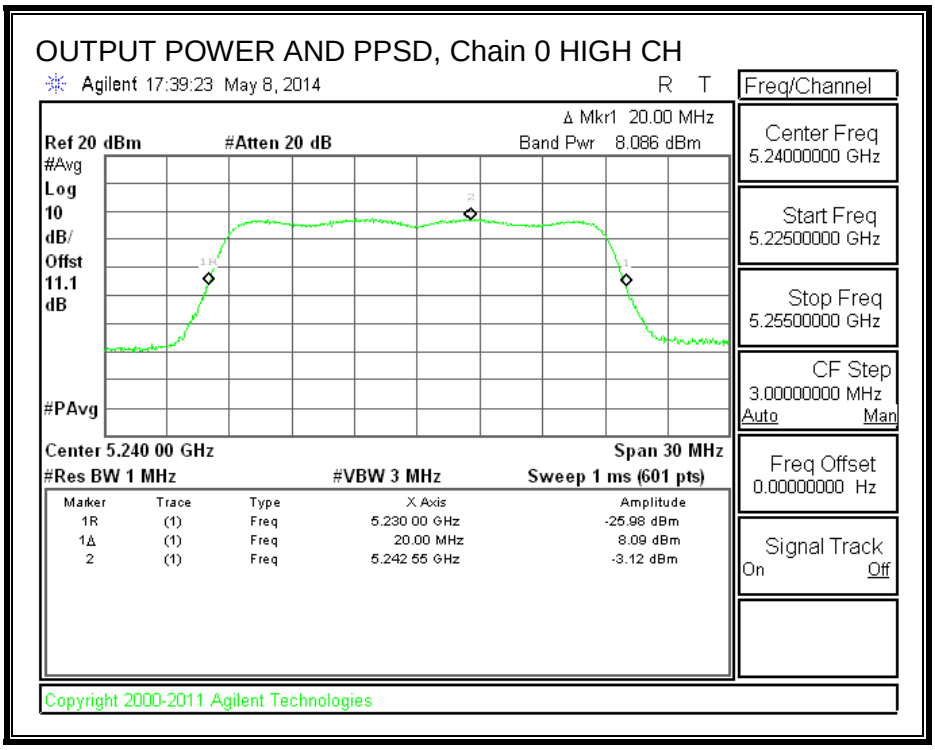
PPSD Results

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	-2.96	-4.11	-0.49	2.93	-3.42
Mid	5200	-3.37	-4.12	-0.72	2.93	-3.65
High	5240	-3.12	-4.31	-0.66	2.93	-3.59

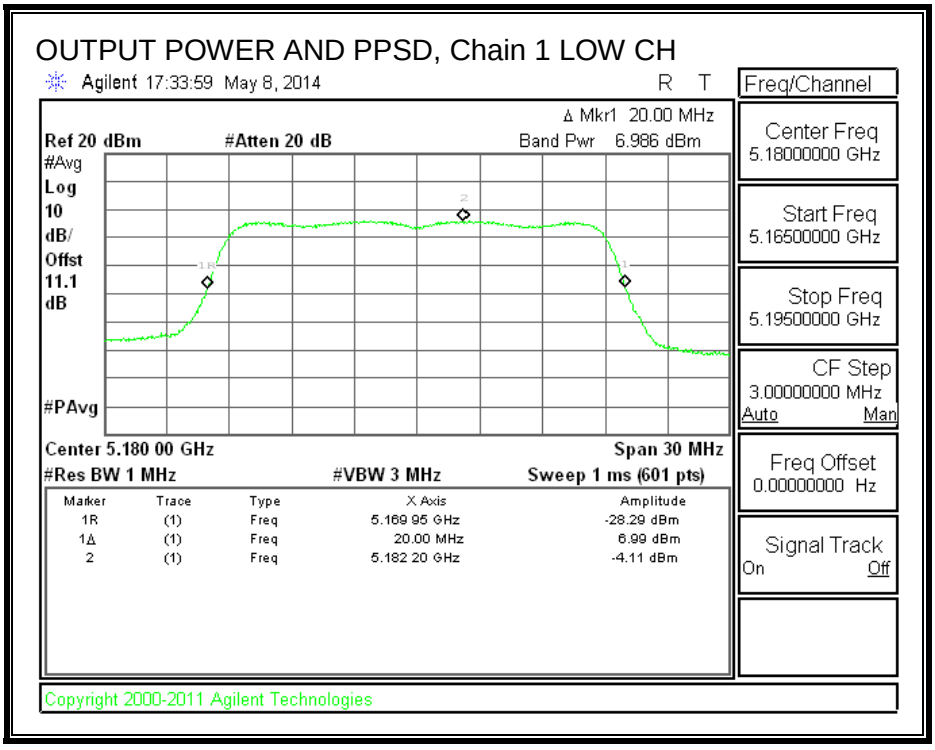
OUTPUT POWER AND PPSD, Chain 0



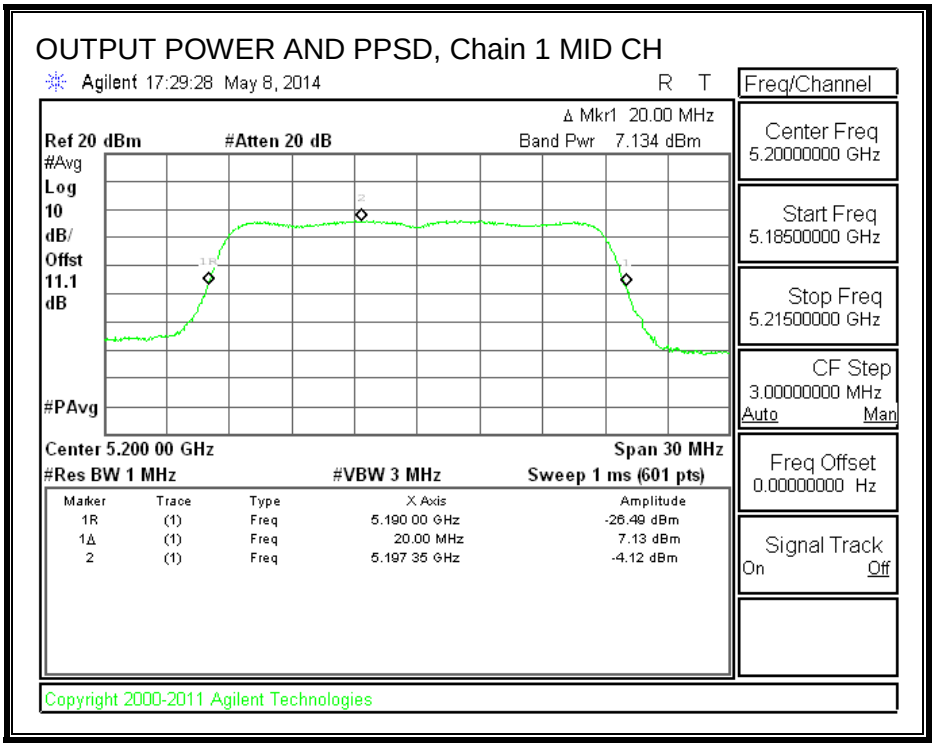




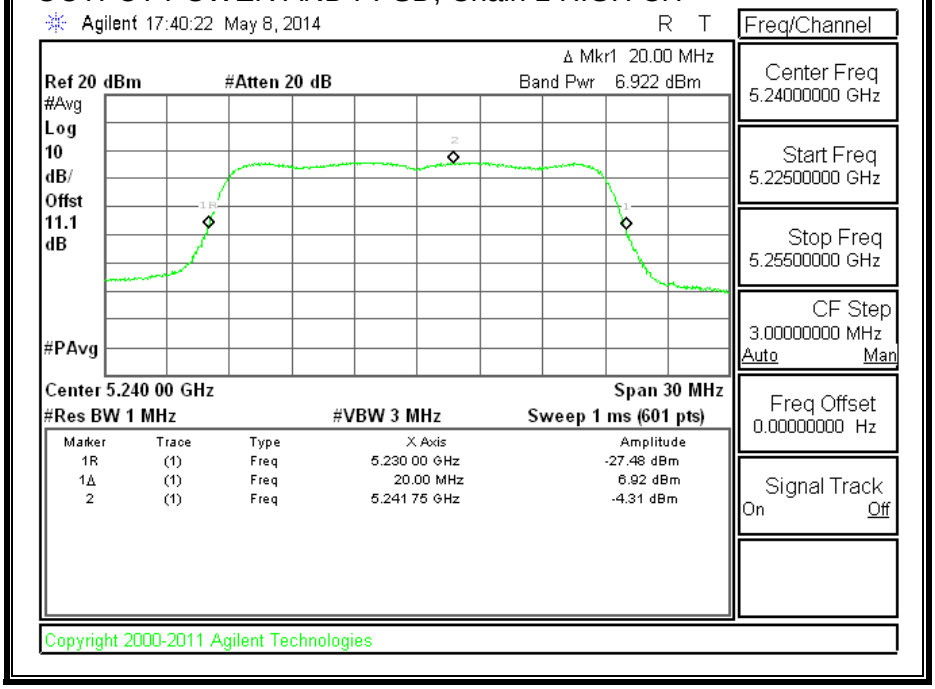
OUTPUT POWER AND PPSD, Chain 1



OUTPUT POWER AND PPSD, Chain 1 MID CH



OUTPUT POWER AND PPSD, Chain 1 HIGH CH



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

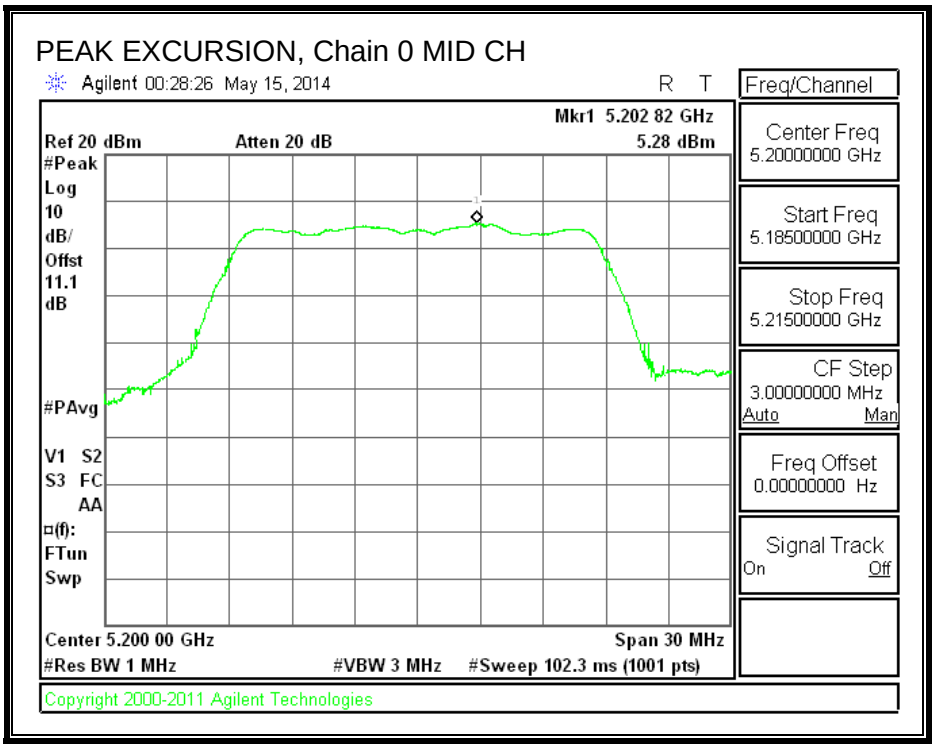
Chain 0

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	5.28	-3.37	0.00	8.65	13	-4.35

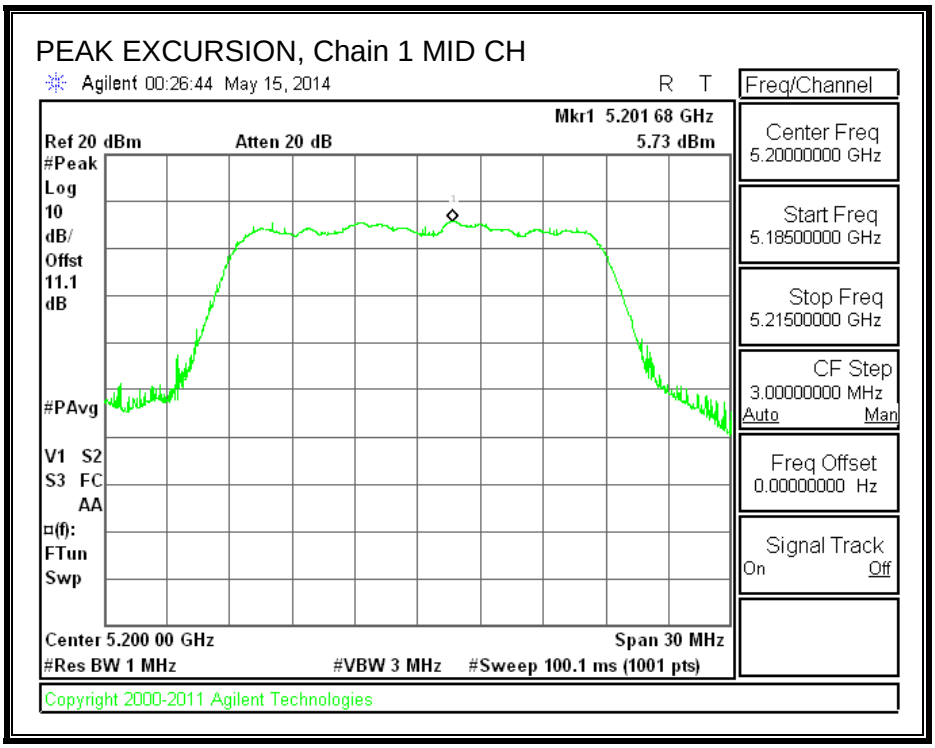
Chain 1

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	5.73	-4.12	0.00	9.85	13	-3.15

PEAK EXCURSION, Chain 0



PEAK EXCURSION, Chain 1



8.3. 802.11n HT40 2Tx CDD MODE IN THE 5.2 GHz BAND

8.3.1. 26 dB BANDWIDTH

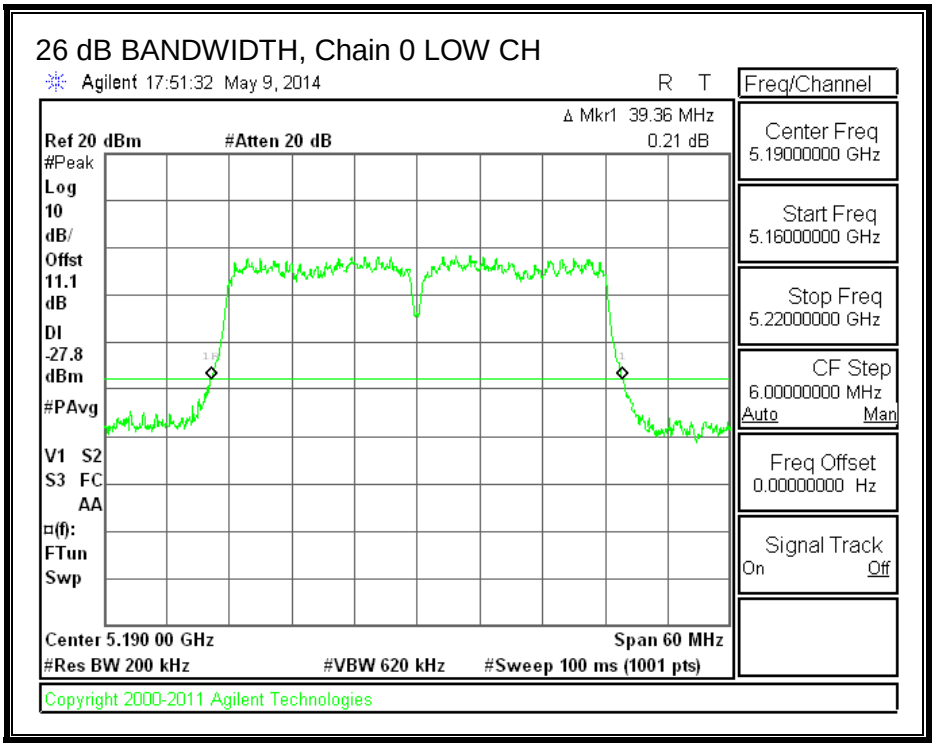
LIMITS

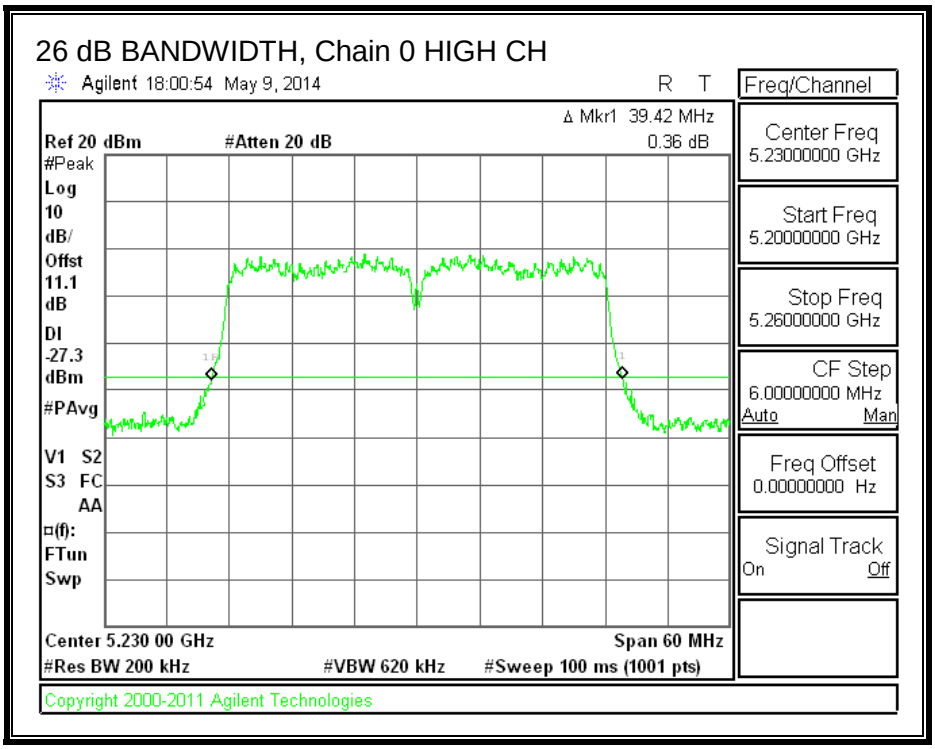
None; for reporting purposes only.

RESULTS

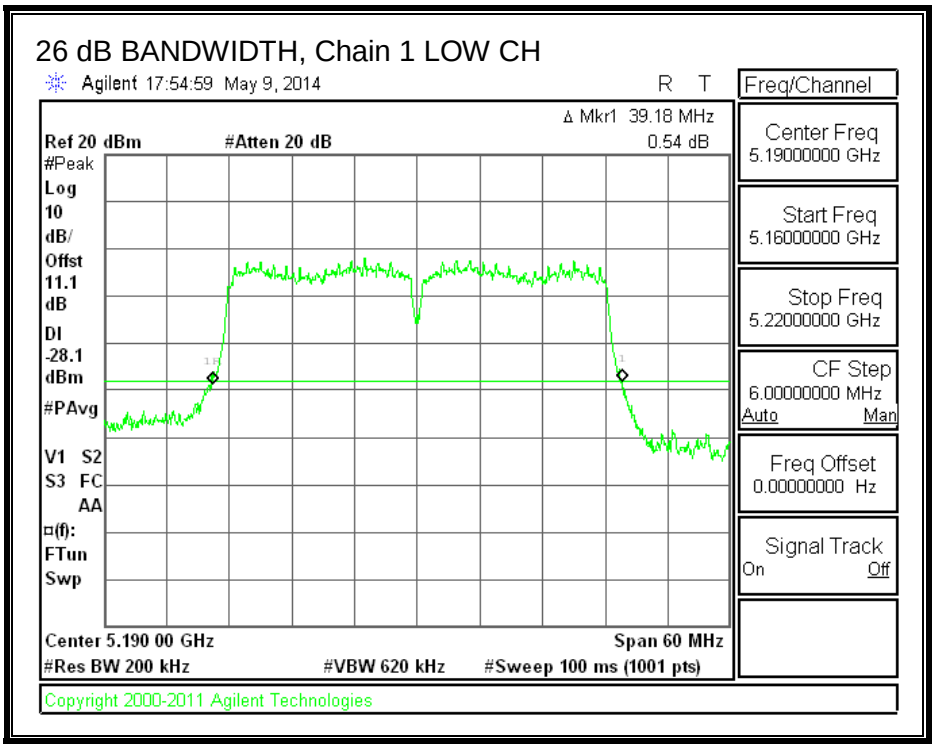
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5190	39.36	39.18
High	5230	39.42	39.94

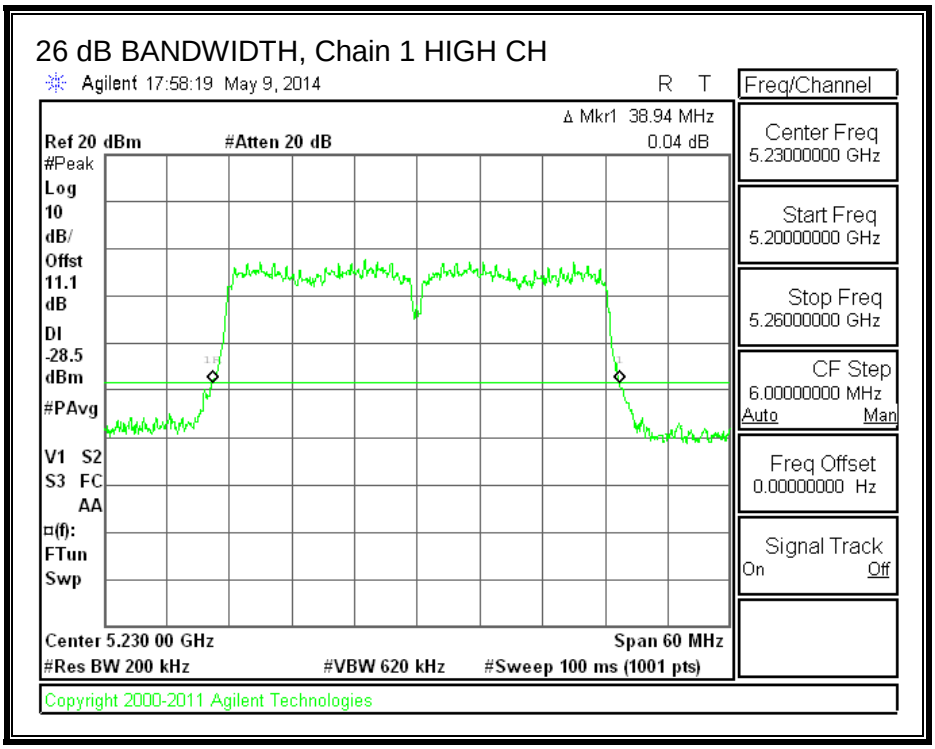
26 dB BANDWIDTH, Chain 0





26 dB BANDWIDTH, Chain 1





8.3.2. 99% BANDWIDTH

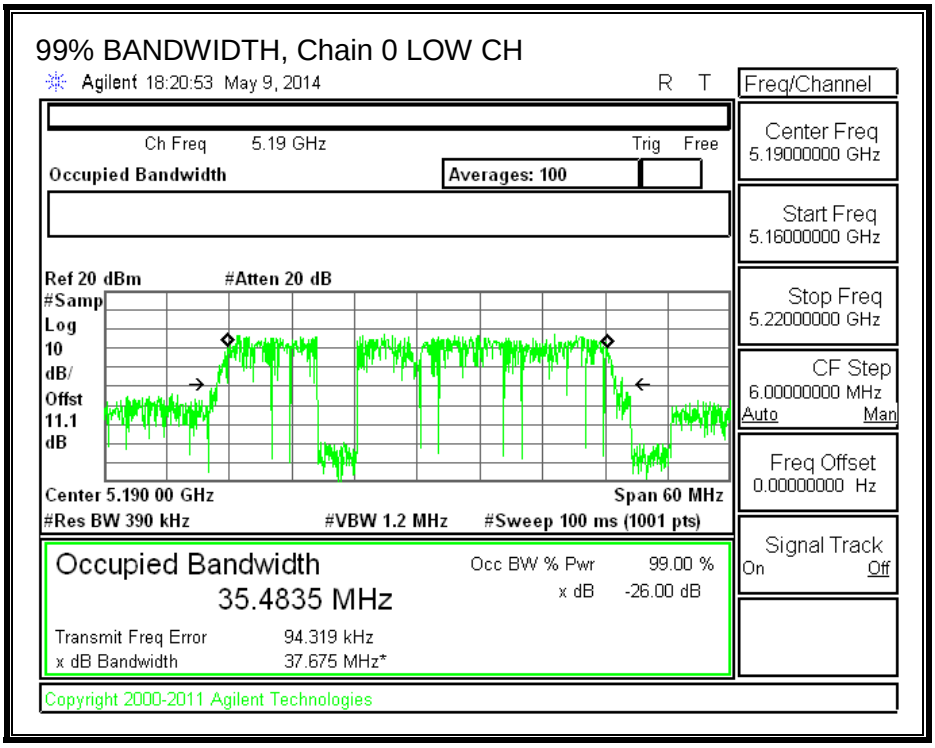
LIMITS

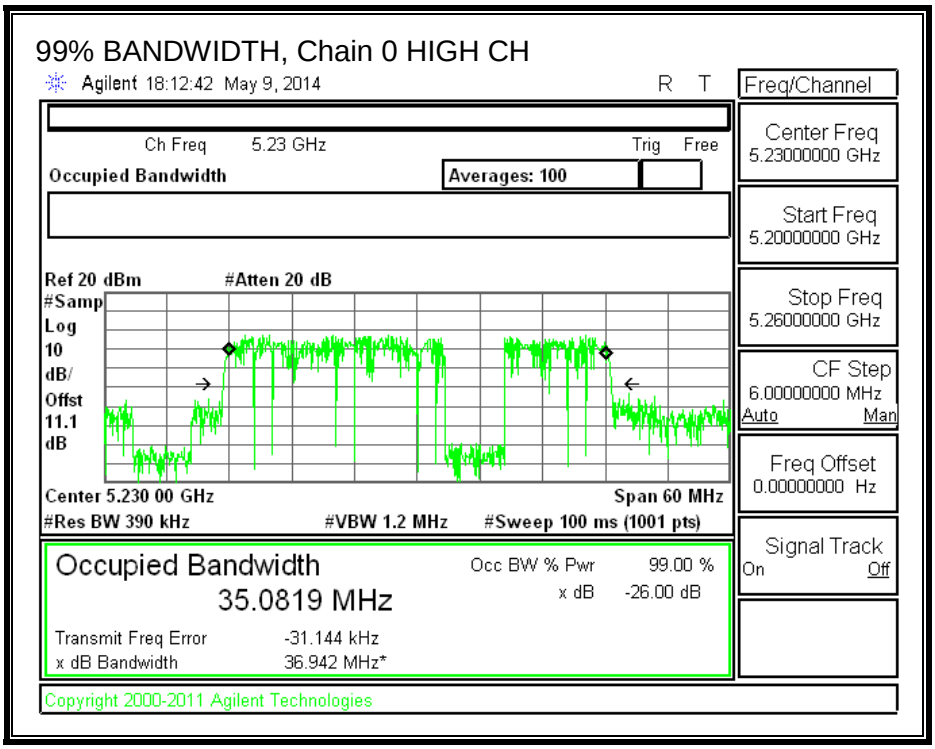
None; for reporting purposes only.

RESULTS

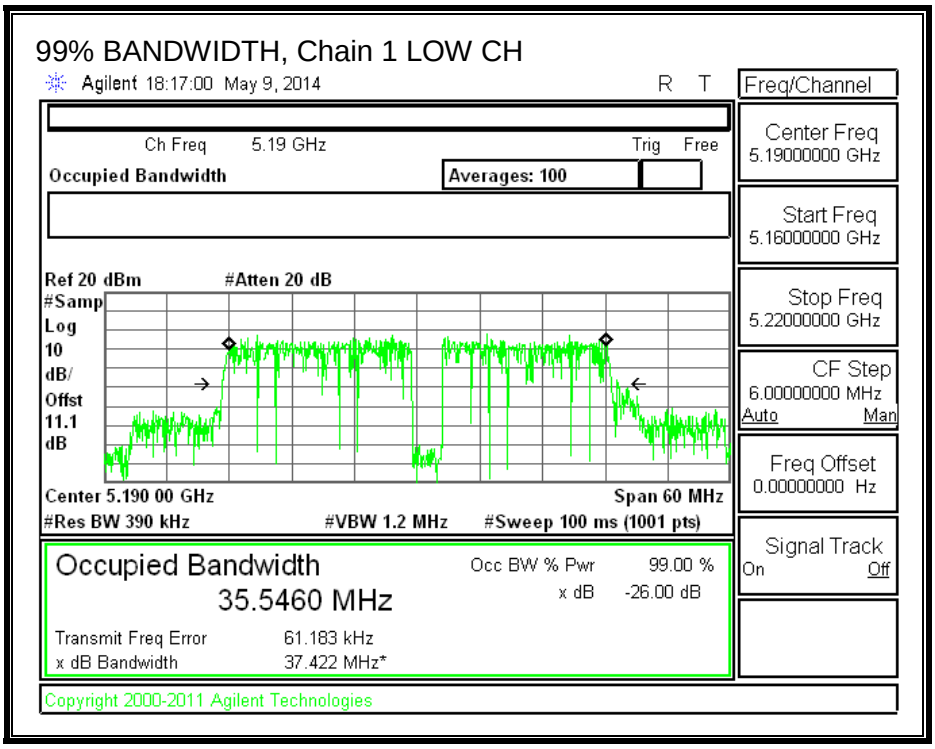
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5190	35.48	35.55
High	5230	35.08	35.23

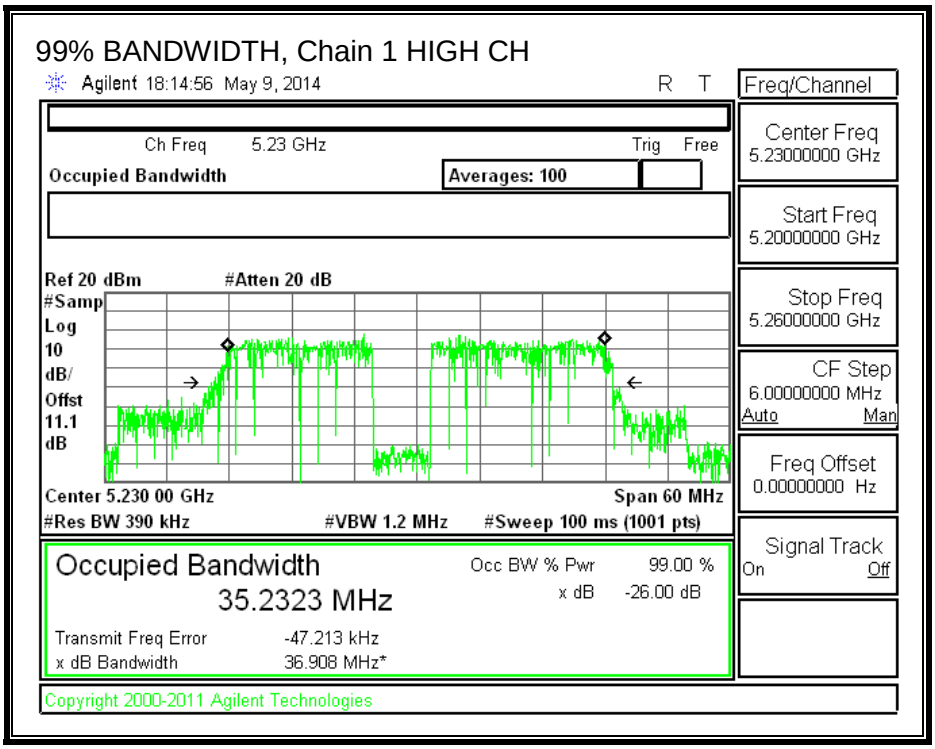
99% BANDWIDTH, Chain 0





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 11.26 dB (including 10 dB pad and 1.26 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5190	10.07	10.06	13.08
High	5230	10.00	9.80	12.91

8.3.4. 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 log10 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)
3.00	5.00	4.11

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)
3.00	5.00	7.07

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	5190	39.18	35.0819	4.11	7.07
High	5230	39.42	35.2323	4.11	7.07

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	5190	17.00	23.00	18.89	17.00	2.93	10.00	2.93
High	5230	17.00	23.00	18.89	17.00	2.93	10.00	2.93

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

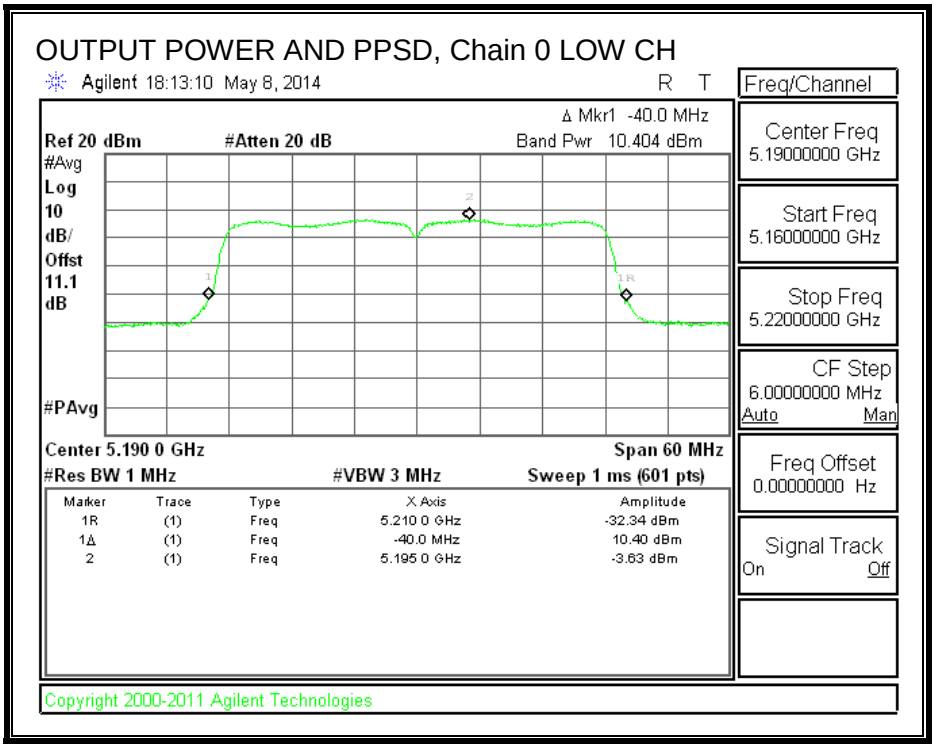
Output Power Results

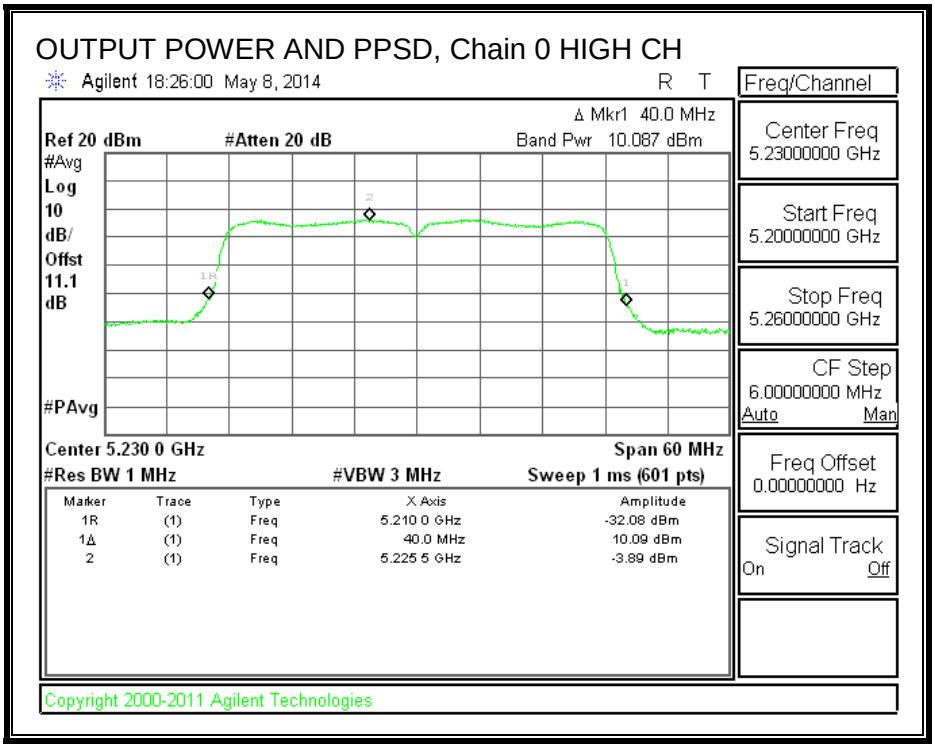
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	10.40	9.08	12.80	17.00	-4.20
High	5230	10.09	9.52	12.82	17.00	-4.18

PPSD Results

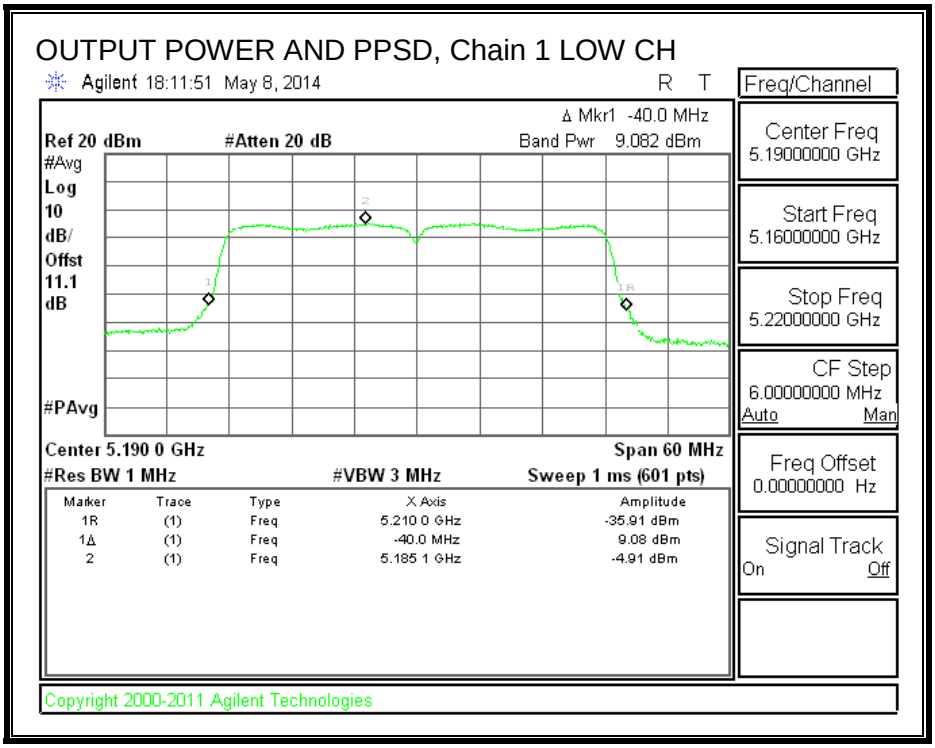
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5190	-3.53	-4.91	-1.16	2.93	-4.09
High	5230	-3.89	-4.46	-1.16	2.93	-4.09

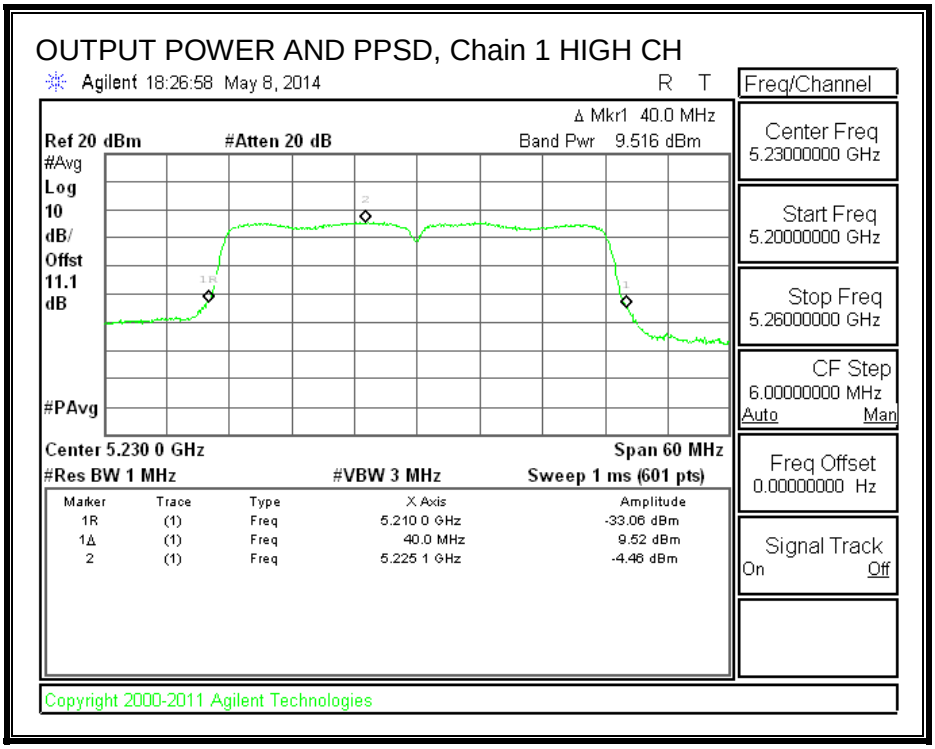
OUTPUT POWER AND PPSD, Chain 0





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.

8.4. 802.11ac 80MHz 2TX CDD MODE IN THE 5.2 GHz BAND

8.4.1. 26 dB BANDWIDTH

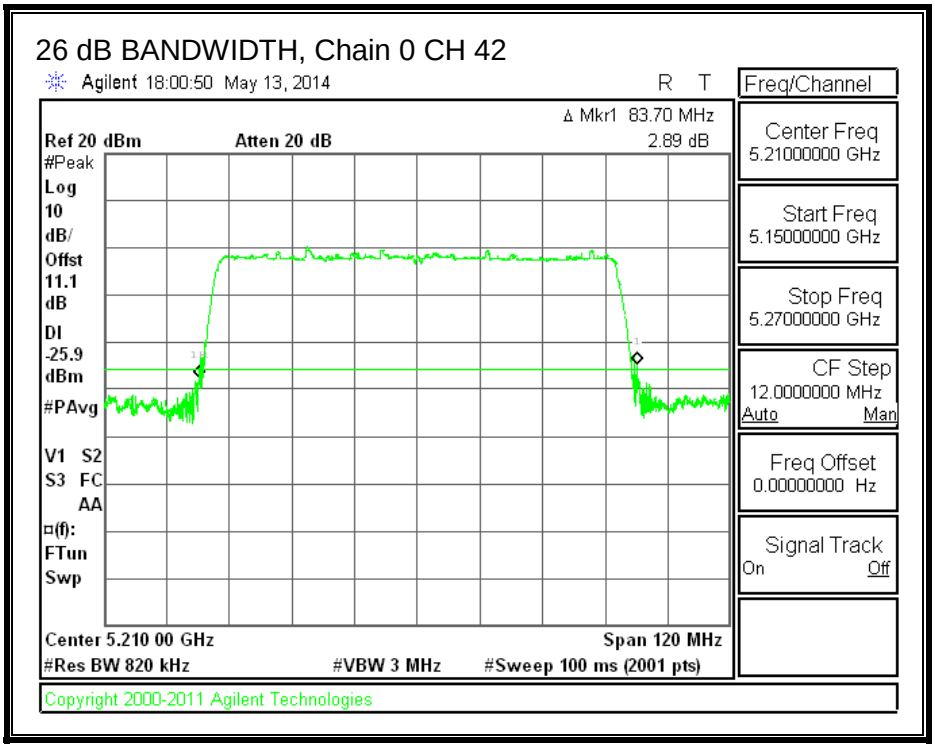
LIMITS

None; for reporting purposes only.

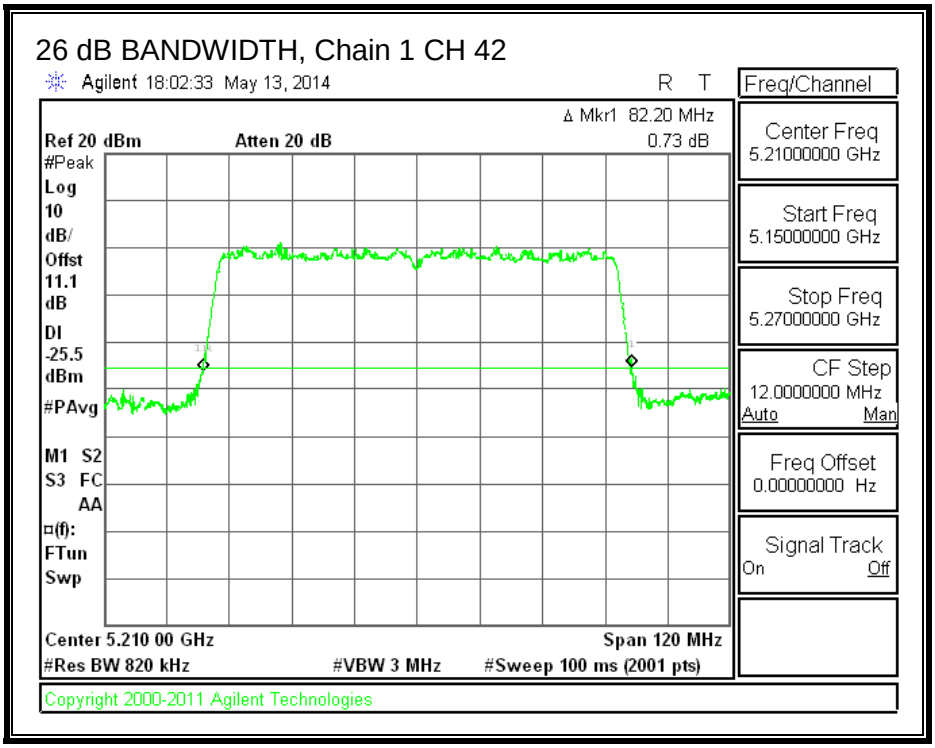
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
42	5210	83.700	82.200

26 dB BANDWIDTH, Chain 0



26 dB BANDWIDTH, Chain 1



8.4.2. 99% BANDWIDTH

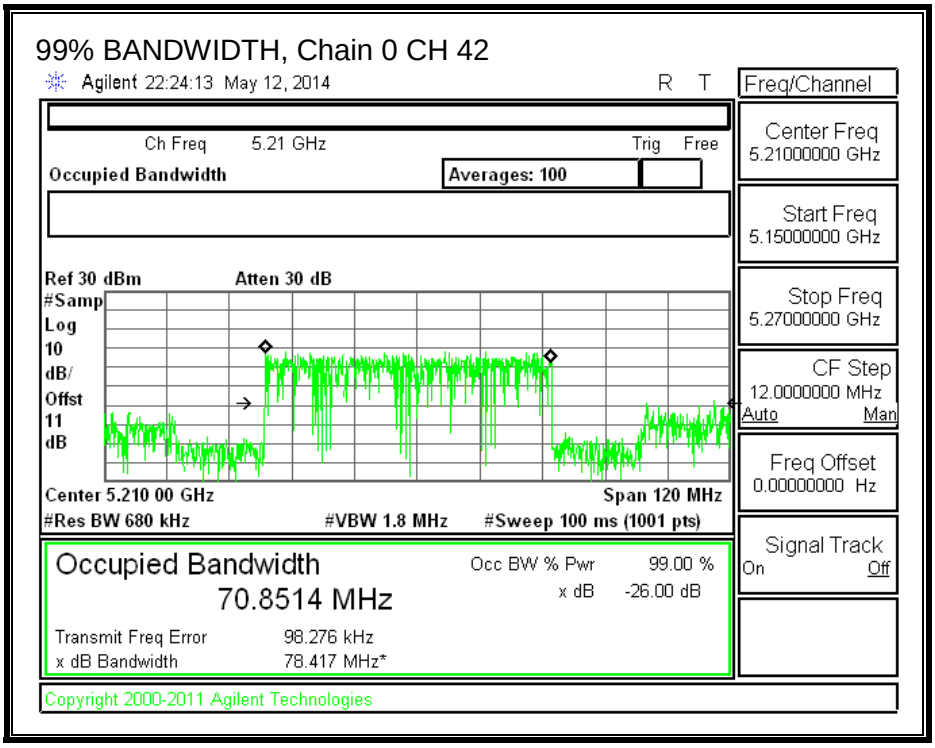
LIMITS

None; for reporting purposes only.

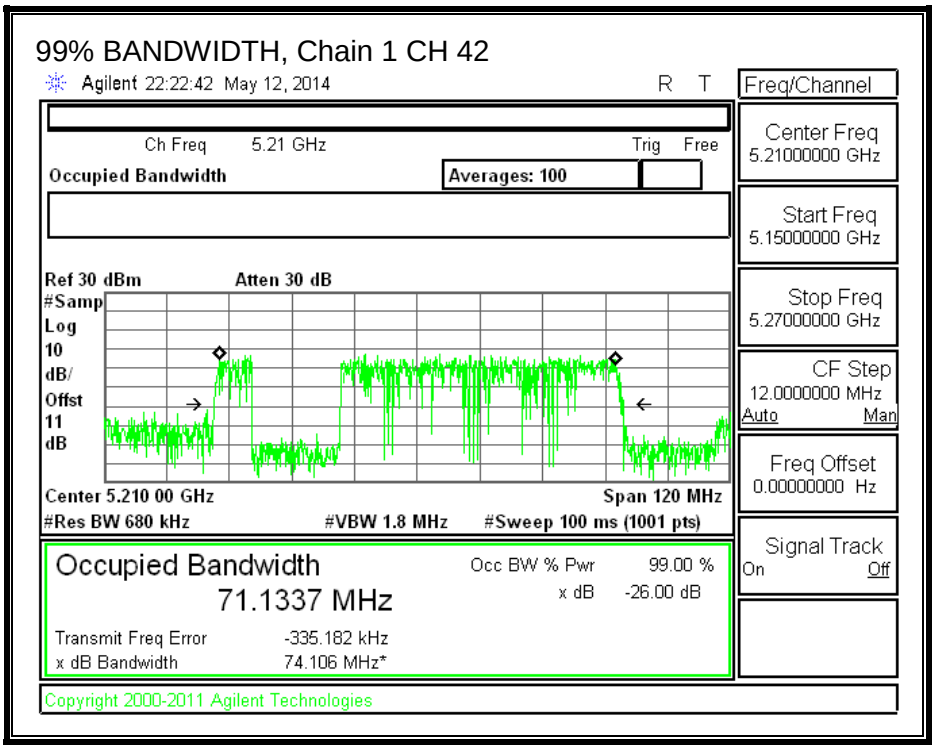
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
42	5210	70.851	71.134

99% BANDWIDTH, Chain 0



99% BANDWIDTH, Chain 1



8.4.3. 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 11.26 dB (including 10 dB pad and 1.26 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
42	5210	5.62	4.88	8.28

8.4.4. 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 log10 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)
3.00	5.00	4.11

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)
3.00	5.00	7.07

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)
42	5210	82.20	70.8510	4.11	7.07

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)
42	5210	24.00	24.00	30.00	24.00	9.93	11.00	9.93

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

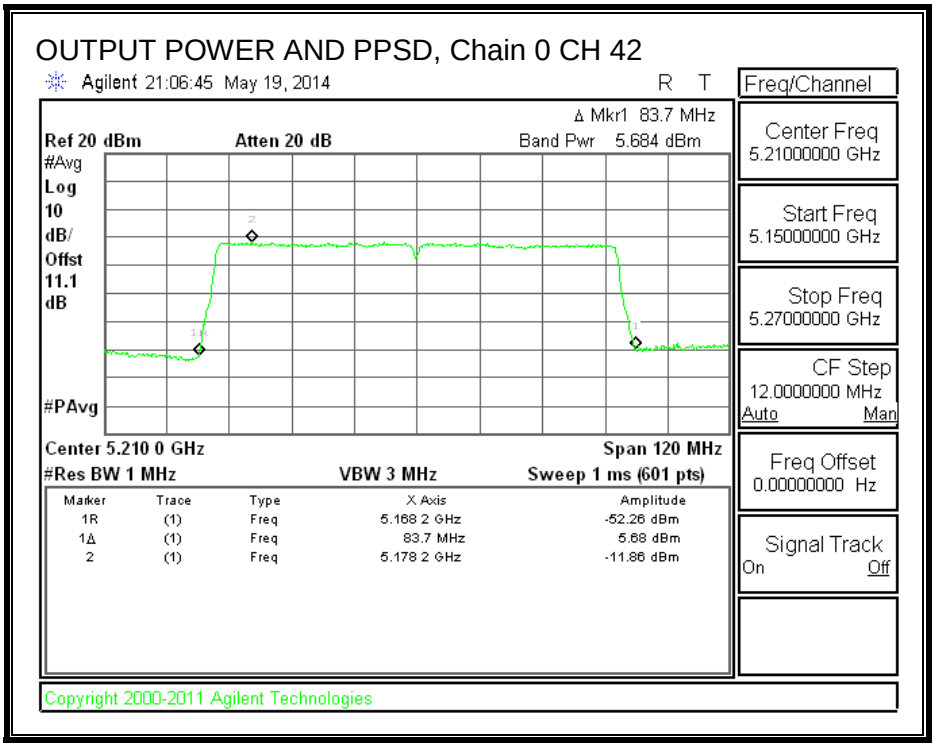
Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margi (dB)
42	5210	5.68	4.92	8.33	24.00	-15.67

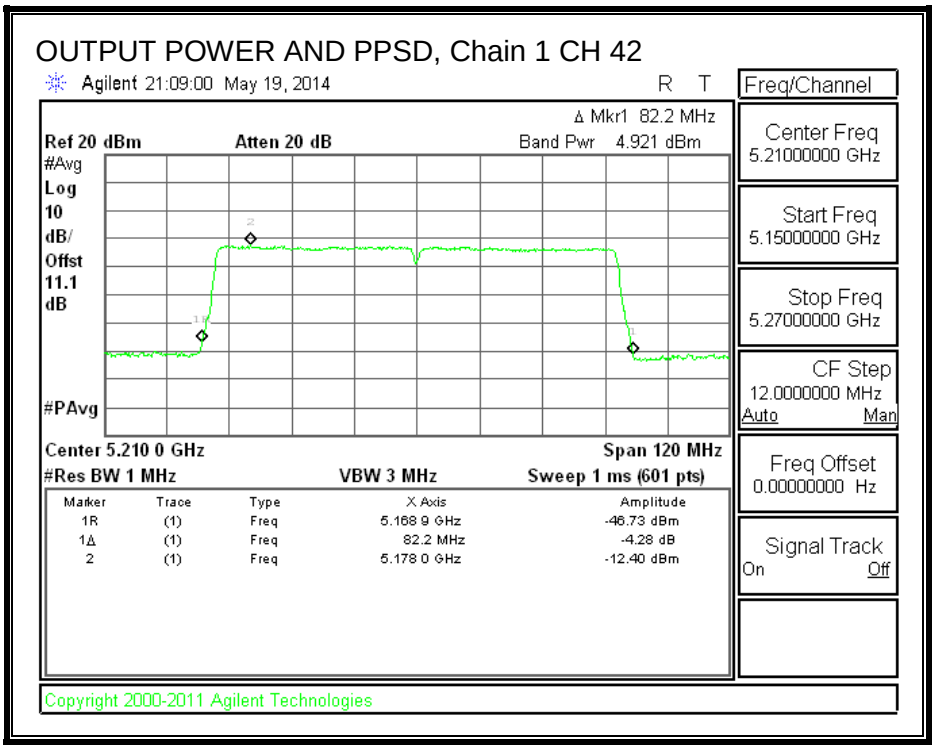
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margi (dB)
42	5210	-11.86	-12.40	-9.11	9.93	-19.04

OUTPUT POWER AND PPSD, Chain 0



OUTPUT POWER AND PPSD, Chain 1



8.4.5. 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.

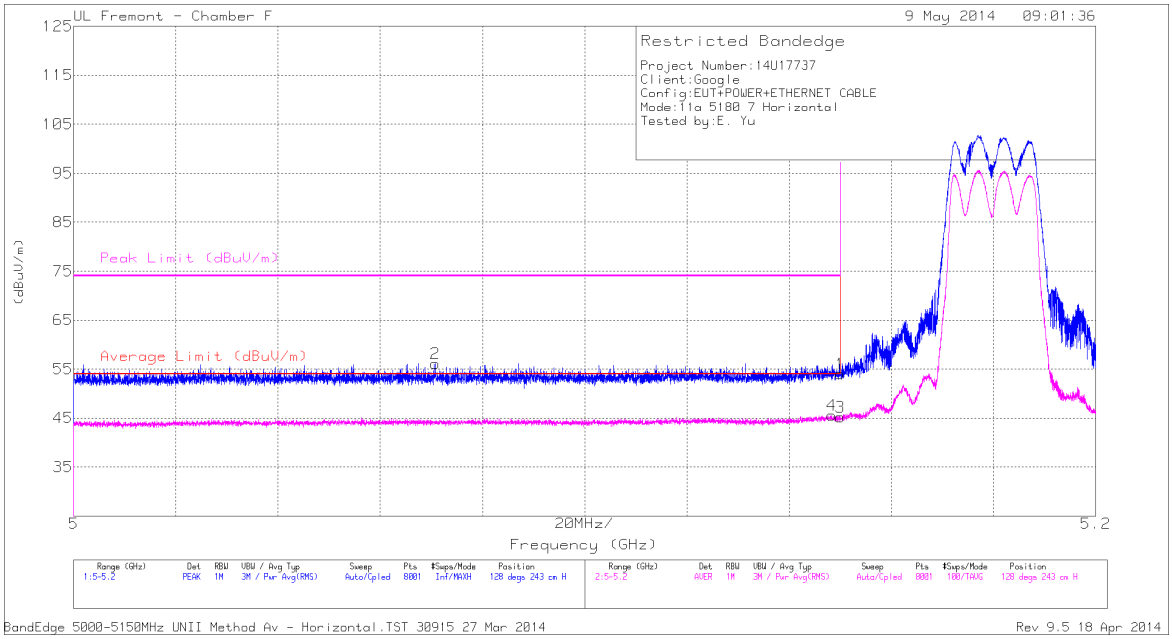
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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. TX ABOVE 1 GHz 802.11a 2Tx CDD MODE IN THE 5.2 GHz BAND

9.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT



DATA

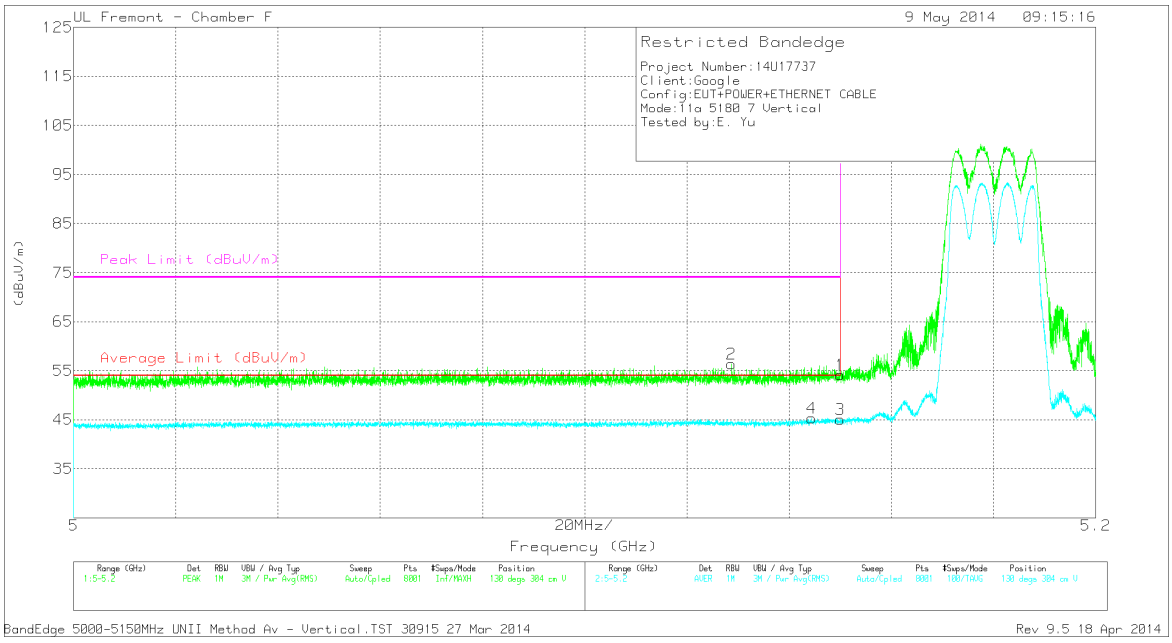
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	38.9	PK	34.4	-19.3	54	-	-	74	-20	128	243	H
2	* 5.071	41.68	PK	34.3	-19.8	56.18	-	-	74	-17.82	128	243	H
3	* 5.15	30.05	RMS	34.4	-19.3	45.15	54	-8.85	-	-	128	243	H
4	* 5.148	30.42	RMS	34.4	-19.3	45.52	54	-8.48	-	-	128	243	H

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

PK - Peak detector

RMS - RMS detection

LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 5.15	39.01	PK	34.4	-19.3	54.11	-	-	74	-19.89	130	304	V
2	* 5.129	41.42	PK	34.4	-19.4	56.42	-	-	74	-17.58	130	304	V
3	* 5.15	29.97	RMS	34.4	-19.3	45.07	54	-8.93	-	-	130	304	V
4	* 5.144	30.26	RMS	34.4	-19.3	45.36	54	-8.64	-	-	130	304	V

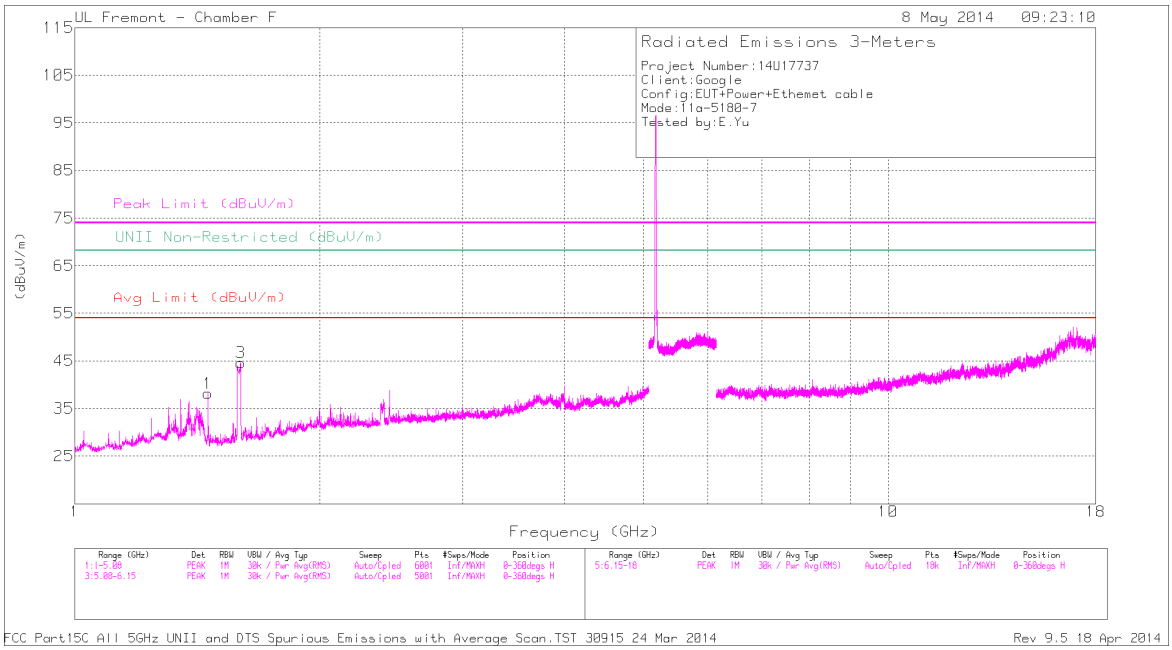
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

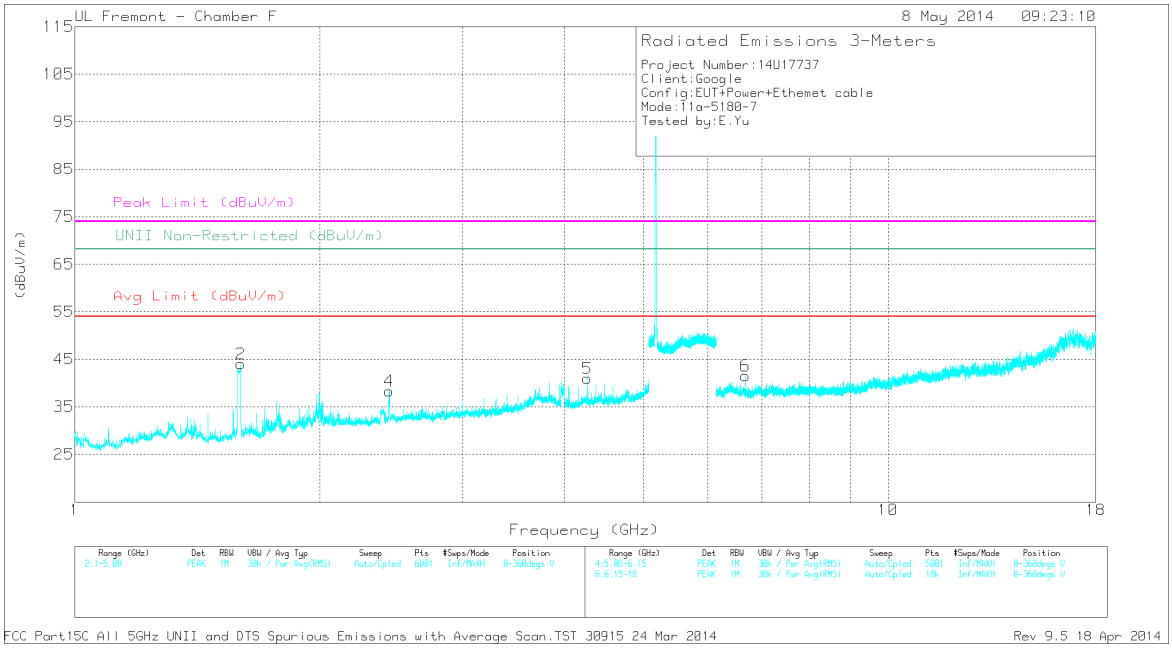
RMS - RMS detection

9.2.2. LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.459	48.32	PK1	28.7	-32.1	44.92	-	-	74	-29.08	-	-	339	195	H
* 1.458	42.24	AD1	28.7	-32.1	38.84	54	-15.16	-	-	-	-	339	195	H
* 1.6	56.11	PK1	28.5	-31.7	52.91	-	-	74	-21.09	-	-	75	256	H
* 1.598	43.18	AD1	28.5	-31.6	40.08	54	-13.92	-	-	-	-	75	256	H
* 1.591	50.61	PK1	28.5	-31.6	47.51	-	-	74	-26.49	-	-	170	129	V
* 1.591	37.18	AD1	28.5	-31.6	34.08	54	-19.92	-	-	-	-	170	129	V
* 4.266	40.24	PK1	33.7	-27.7	46.24	-	-	74	-27.76	-	-	100	328	V
* 4.266	31.31	AD1	33.7	-27.7	37.31	54	-16.69	-	-	-	-	100	328	V
2.437	44.48	PK1	32.4	-30.9	45.98	-	-	-	-	68.2	-22.22	223	227	V
2.436	44.63	PK1	32.4	-30.9	46.13	-	-	-	-	68.2	-22.07	223	227	V
6.676	39.49	PK1	35.6	-26.9	48.19	-	-	-	-	68.2	-20.01	75	161	V

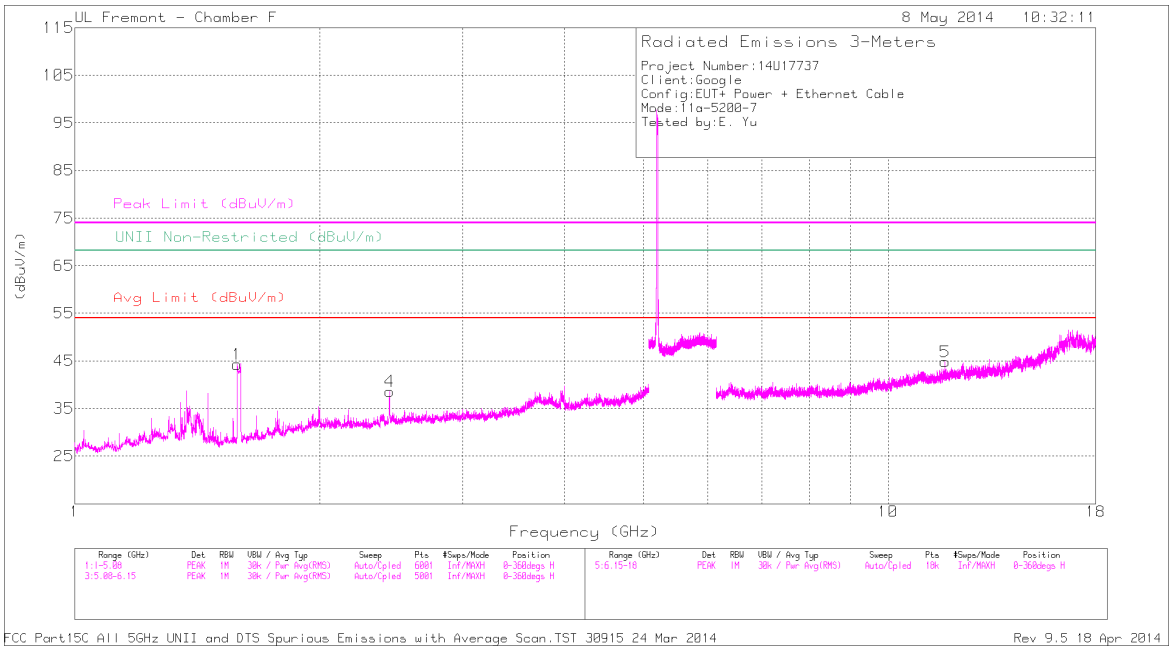
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK1 - KDB789033 Method: Peak

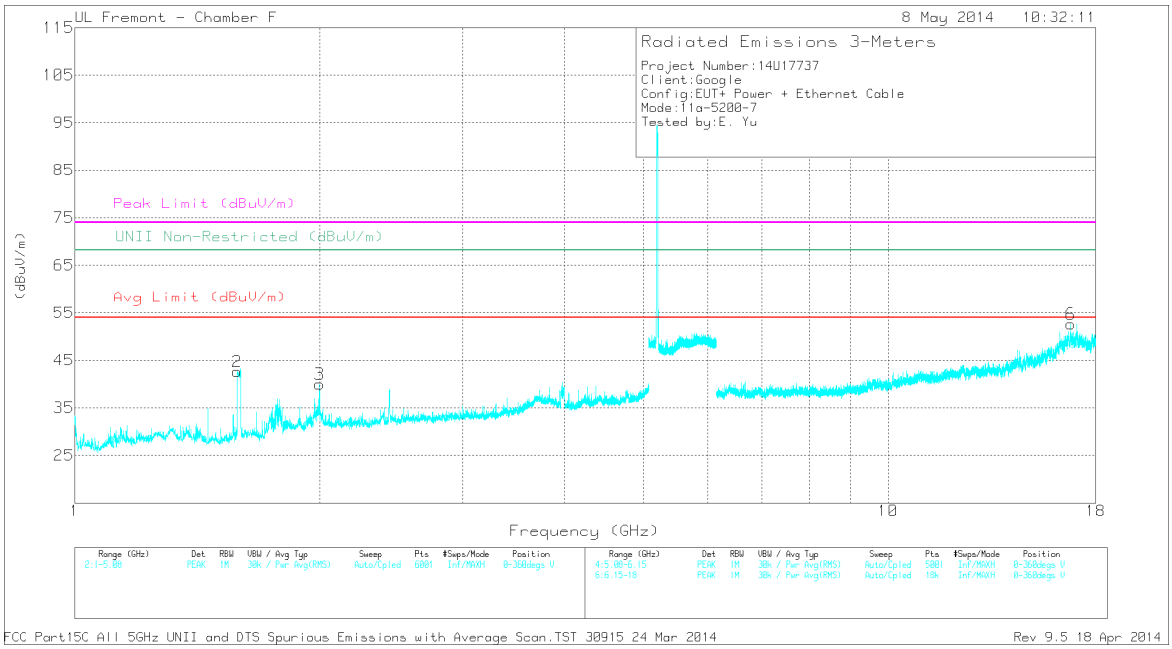
AD1 - KDB789033 Method: AD Primary Power Average

9.2.3. MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.586	55.75	PK1	28.5	-31.5	52.75	-	-	74	-21.25	-	-	79	398	H
* 1.586	43.33	AD1	28.5	-31.5	40.33	54	-13.67	-	-	-	-	79	398	H
2.438	44.63	PK1	32.4	-30.9	46.13	-	-	-	-	68.2	-22.07	298	364	H
* 1.599	54.88	PK1	28.5	-31.6	51.78	-	-	74	-22.22	-	-	232	139	V
* 1.598	42.38	AD1	28.5	-31.6	39.28	54	-14.72	-	-	-	-	232	139	V
1.999	48.4	PK1	31.7	-31.2	48.9	-	-	-	-	68.2	-19.3	30	320	V
* 11.753	34.32	PK1	38.7	-22.6	50.42	-	-	74	-23.58	-	-	97	235	H
* 11.754	23.2	AD1	38.7	-22.6	39.3	54	-14.7	-	-	-	-	97	235	H
16.767	34.09	PK1	41.5	-16.5	59.09	-	-	-	-	68.2	-9.11	337	169	V

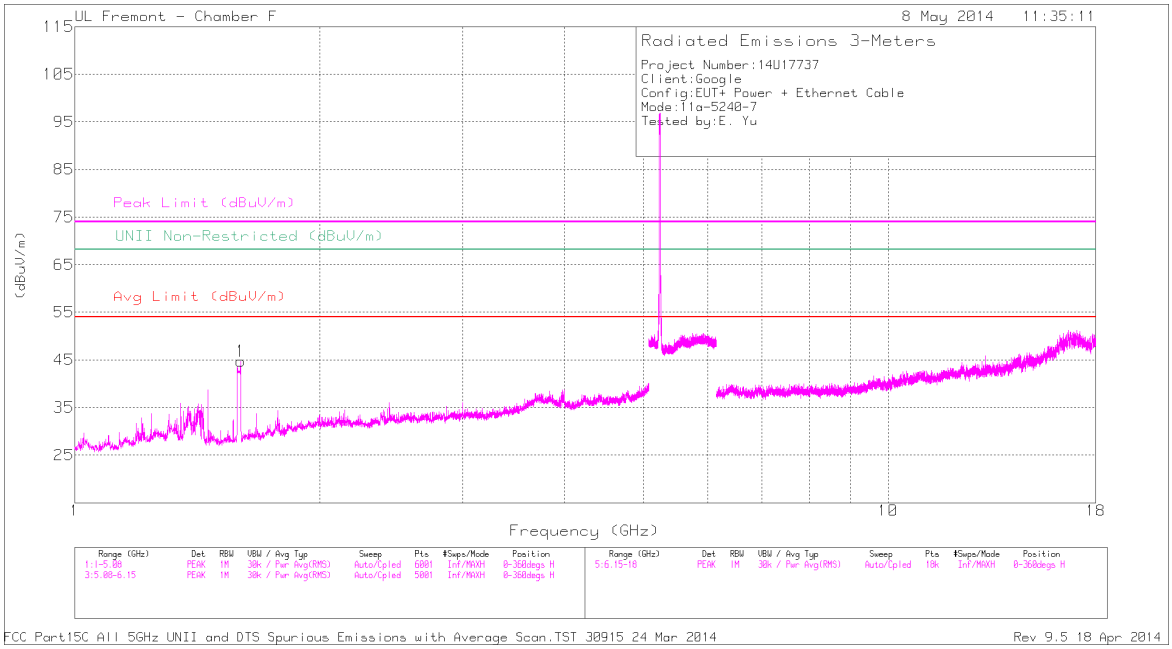
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK1 - KDB789033 Method: Peak

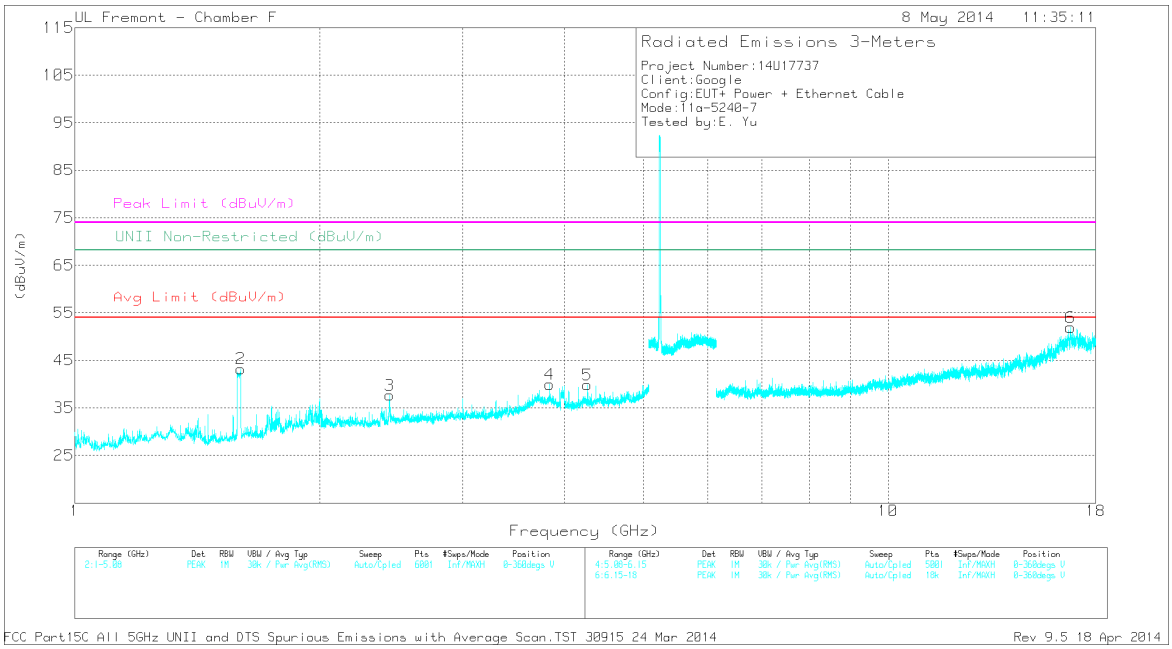
AD1 - KDB789033 Method: AD Primary Power Average

9.2.4. HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.594	56.37	PK1	28.5	-31.6	53.27	-	-	74	-20.73	-	-	81	323	H
* 1.59	43.92	AD1	28.5	-31.6	40.82	54	-13.18	-	-	-	-	81	323	H
* 1.6	55.08	PK1	28.5	-31.7	51.88	-	-	74	-22.12	-	-	208	139	V
* 1.6	41.55	AD1	28.5	-31.6	38.45	54	-15.55	-	-	-	-	208	139	V
* 4.266	39.71	PK1	33.7	-27.7	45.71	-	-	74	-28.29	-	-	97	228	V
* 4.266	32.01	AD1	33.7	-27.7	38.01	54	-15.99	-	-	-	-	97	228	V
2.438	46.29	PK1	32.4	-30.9	47.79	-	-	-	-	68.2	-20.41	152	288	V
* 3.834	40.06	PK1	34.3	-29.2	45.16	-	-	74	-28.84	-	-	55	238	V
* 3.834	31.7	AD1	34.3	-29.2	36.8	54	-17.2	-	-	-	-	55	238	V
16.753	34.5	PK1	41.4	-17.2	58.7	-	-	-	-	68.2	-9.5	27	359	V

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

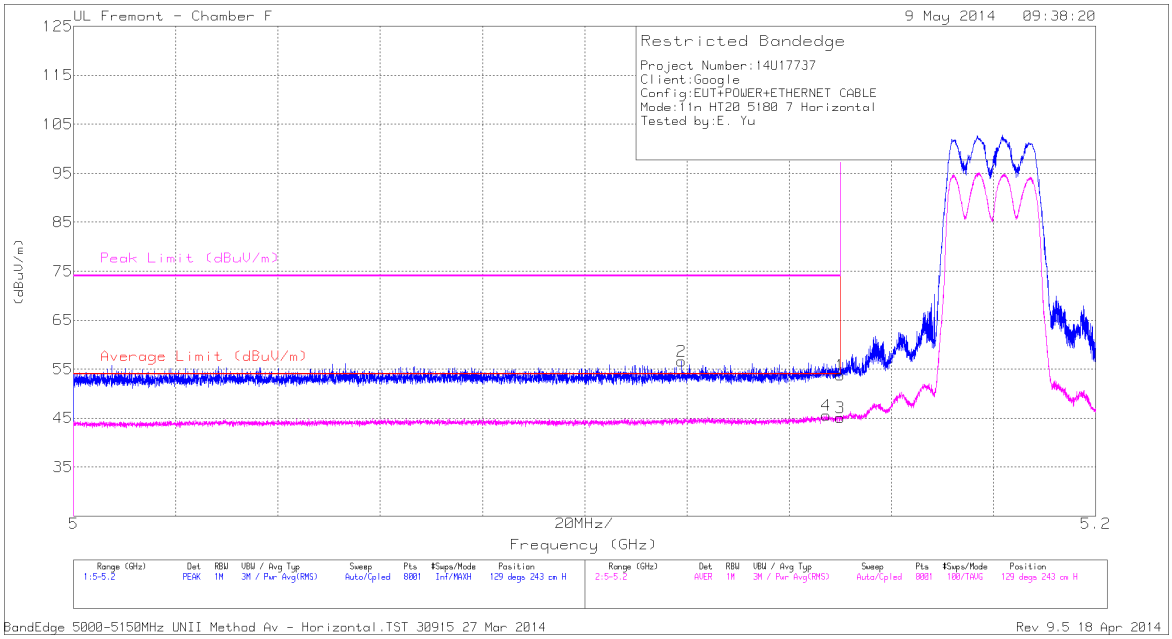
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

9.3. TX ABOVE 1 GHz 802.11n HT20 2Tx CDD MODE IN THE 5.2 GHz BAND

9.3.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT



DATA

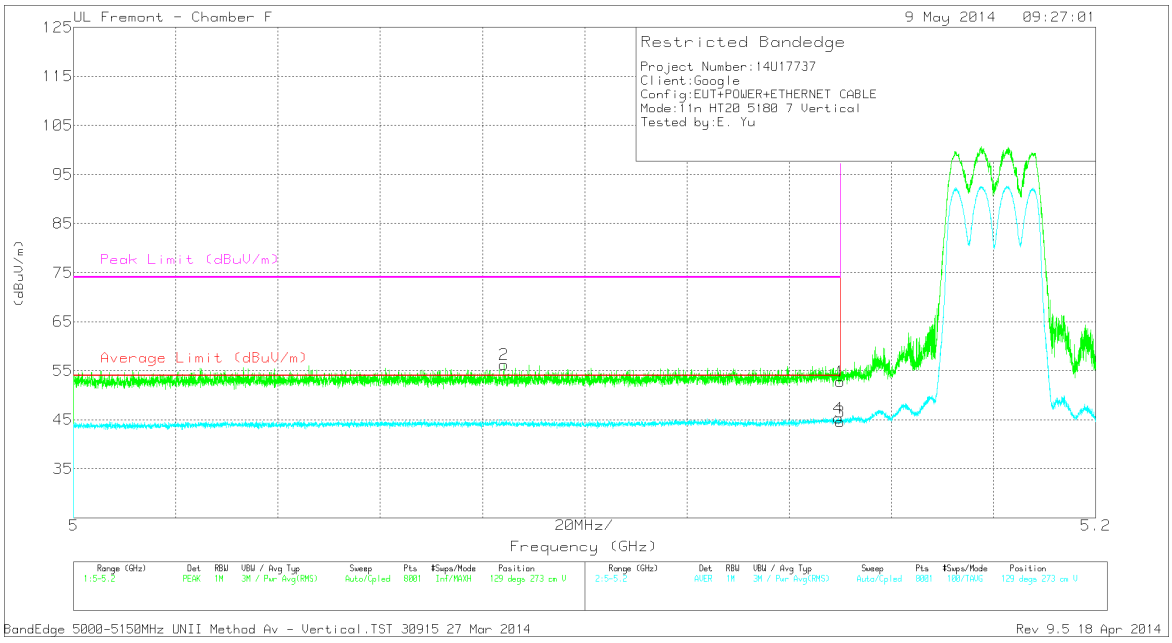
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	38.72	PK	34.4	-19.3	53.82	-	-	74	-20.18	129	243	H
2	* 5.119	41.68	PK	34.4	-19.4	56.68	-	-	74	-17.32	129	243	H
3	* 5.15	29.92	RMS	34.4	-19.3	45.02	54	-8.98	-	-	129	243	H
4	* 5.147	30.52	RMS	34.4	-19.3	45.62	54	-8.38	-	-	129	243	H

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

PK - Peak detector

RMS - RMS detection

LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 5.15	37.7	PK	34.4	-19.3	52.8	-	-	74	-21.2	129	273	V
2	* 5.084	41.67	PK	34.3	-19.7	56.27	-	-	74	-17.73	129	273	V
3	* 5.15	29.46	RMS	34.4	-19.3	44.56	54	-9.44	-	-	129	273	V
4	* 5.15	30.28	RMS	34.4	-19.3	45.38	54	-8.62	-	-	129	273	V

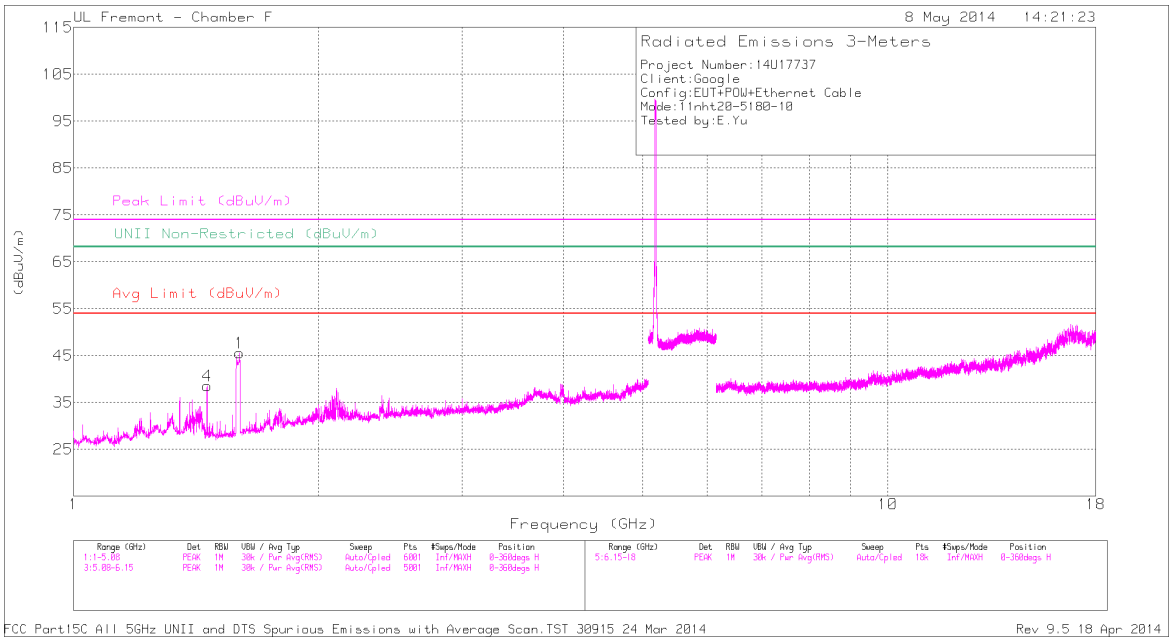
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

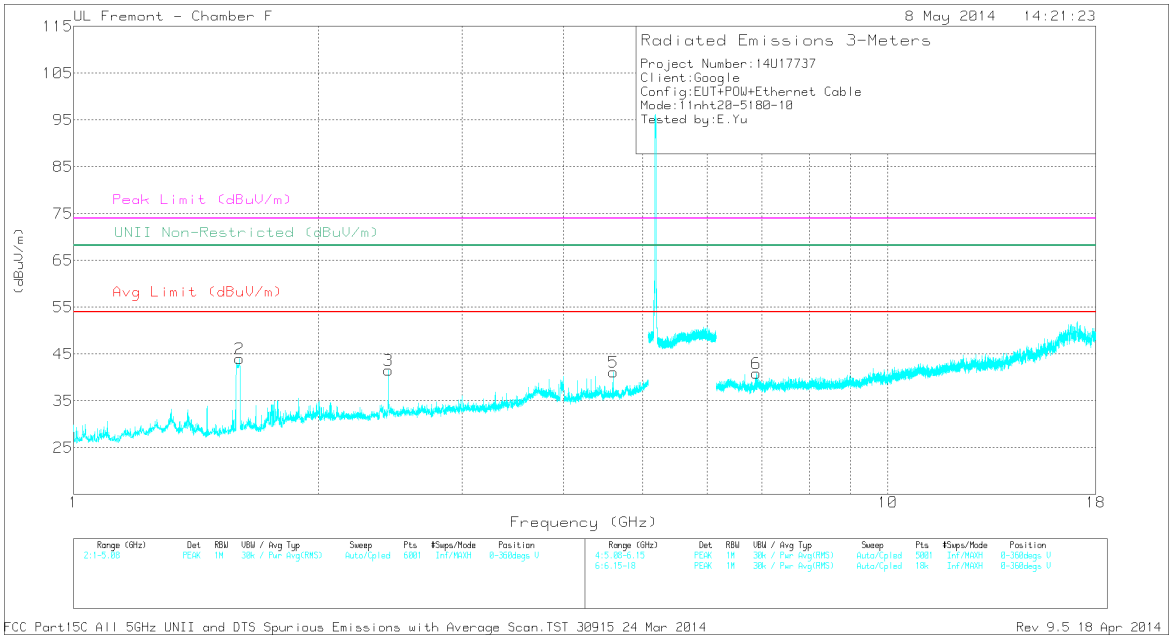
RMS - RMS detection

9.3.2. LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.6	57.57	PK1	28.5	-31.6	54.47	-	-	74	-19.53	-	-	83	342	H
* 1.597	44.9	AD1	28.5	-31.6	41.8	54	-12.2	-	-	-	-	83	342	H
* 1.458	47.85	PK1	28.7	-32.1	44.45	-	-	74	-29.55	-	-	339	195	H
* 1.458	42.25	AD1	28.7	-32.1	38.85	54	-15.15	-	-	-	-	339	195	H
* 1.6	55.67	PK1	28.5	-31.7	52.47	-	-	74	-21.53	-	-	212	154	V
* 1.598	43.47	AD1	28.5	-31.6	40.37	54	-13.63	-	-	-	-	212	154	V
* 4.6	42.06	PK1	34.1	-28	48.16	-	-	74	-25.84	-	-	264	284	V
* 4.6	27.5	AD1	34.1	-28	33.6	54	-20.4	-	-	-	-	264	284	V
2.439	44.68	PK1	32.4	-30.9	46.18	-	-	-	-	68.2	-22.02	333	255	V
6.9	39.69	PK1	35.5	-26.5	48.69	-	-	-	-	68.2	-19.51	66	221	V

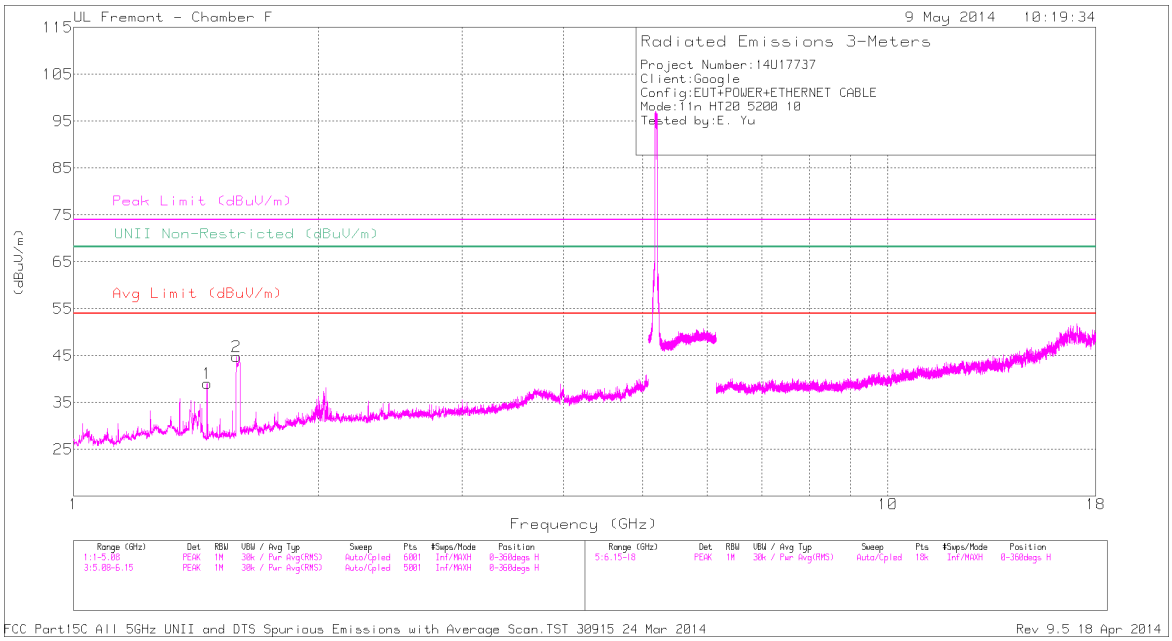
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK1 - KDB789033 Method: Peak

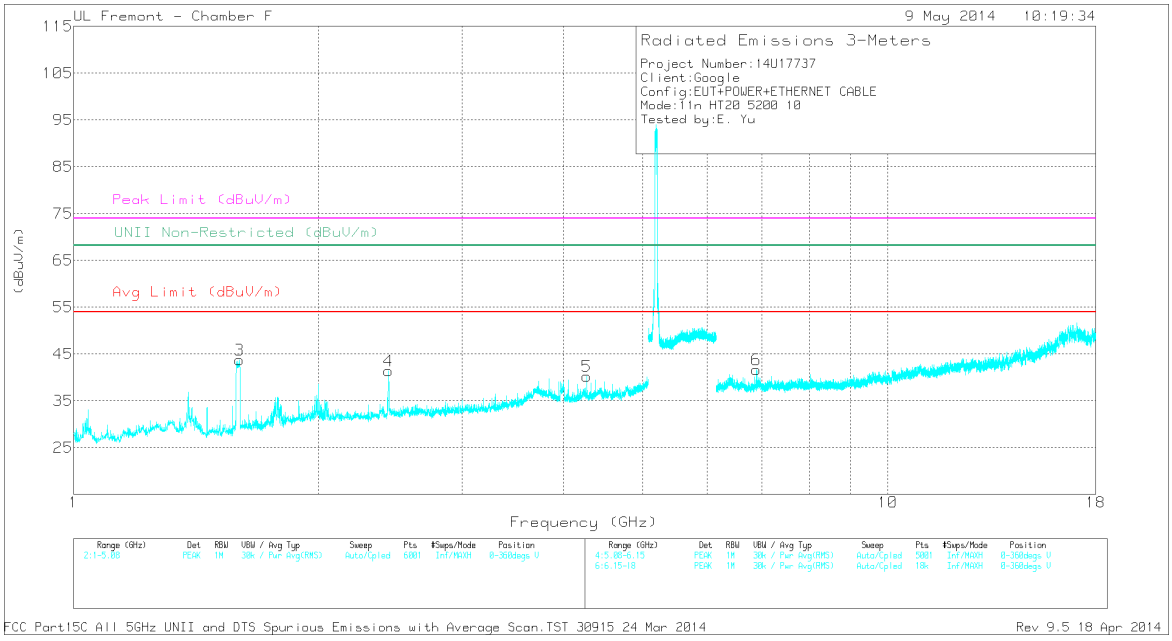
AD1 - KDB789033 Method: AD Primary Power Average

9.3.3. MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.458	48.63	PK1	28.7	-32.1	45.23	-	-	74	-28.77	-	-	335	200	H
* 1.458	42.4	AD1	28.7	-32.1	39	54	-15	-	-	-	-	335	200	H
* 1.6	57.63	PK1	28.5	-31.7	54.43	-	-	74	-19.57	-	-	84	284	H
* 1.597	44.87	AD1	28.5	-31.6	41.77	54	-12.23	-	-	-	-	84	284	H
* 1.6	53.86	PK1	28.5	-31.6	50.76	-	-	74	-23.24	-	-	171	103	V
* 1.594	41.44	AD1	28.5	-31.6	38.34	54	-15.66	-	-	-	-	171	103	V
* 4.266	39.79	PK1	33.7	-27.7	45.79	-	-	74	-28.21	-	-	96	227	V
* 4.266	31.83	AD1	33.7	-27.7	37.83	54	-16.17	-	-	-	-	96	227	V
2.439	47.51	PK1	32.4	-30.9	49.01	-	-	-	-	68.2	-19.19	4	339	V
6.9	38.71	PK1	35.5	-26.5	47.71	-	-	-	-	68.2	-20.49	258	159	V

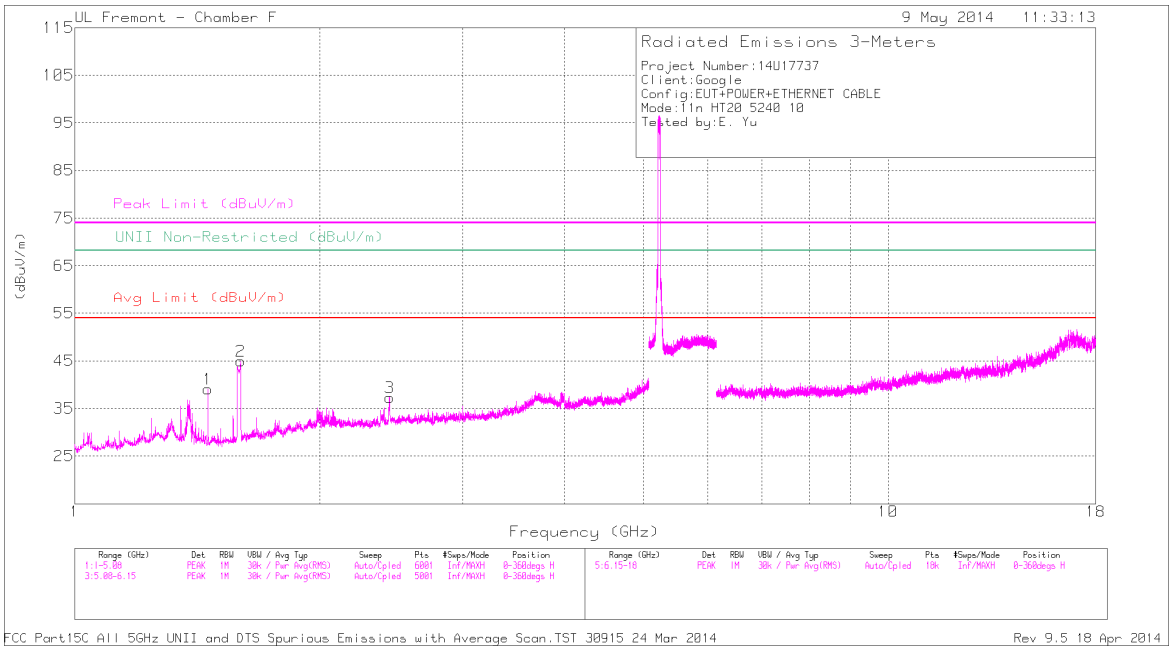
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK1 - KDB789033 Method: Peak

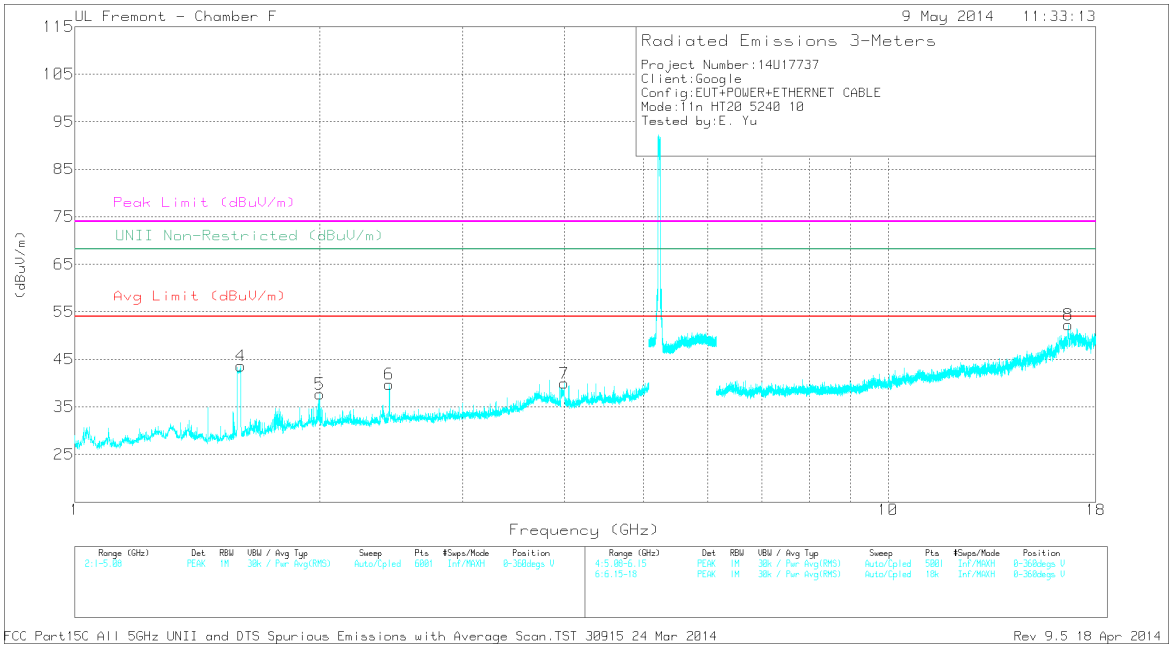
AD1 - KDB789033 Method: AD Primary Power Average

9.3.4. HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.458	48.58	PK1	28.7	-32.1	45.18	-	-	74	-28.82	-	-	338	194	H
* 1.458	42.87	AD1	28.7	-32.1	39.47	54	-14.53	-	-	-	-	338	194	H
* 1.6	57.32	PK1	28.5	-31.7	54.12	-	-	74	-19.88	-	-	84	233	H
* 1.596	44.33	AD1	28.5	-31.6	41.23	54	-12.77	-	-	-	-	84	233	H
* 1.6	52.48	PK1	28.5	-31.7	49.28	-	-	74	-24.72	-	-	169	119	V
* 1.598	39.23	AD1	28.5	-31.6	36.13	54	-17.87	-	-	-	-	169	119	V
* 3.996	41.82	PK1	33.7	-29	46.52	-	-	74	-27.48	-	-	202	168	V
* 3.996	28.76	AD1	33.7	-29	33.46	54	-20.54	-	-	-	-	202	168	V
1.995	48.72	PK1	31.7	-31.2	49.22	-	-	-	-	68.2	-18.98	9	343	V
2.437	44.09	PK1	32.4	-30.9	45.59	-	-	-	-	68.2	-22.61	336	155	V
16.648	34.66	PK1	41.3	-16.9	59.06	-	-	-	-	68.2	-9.14	278	284	V

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

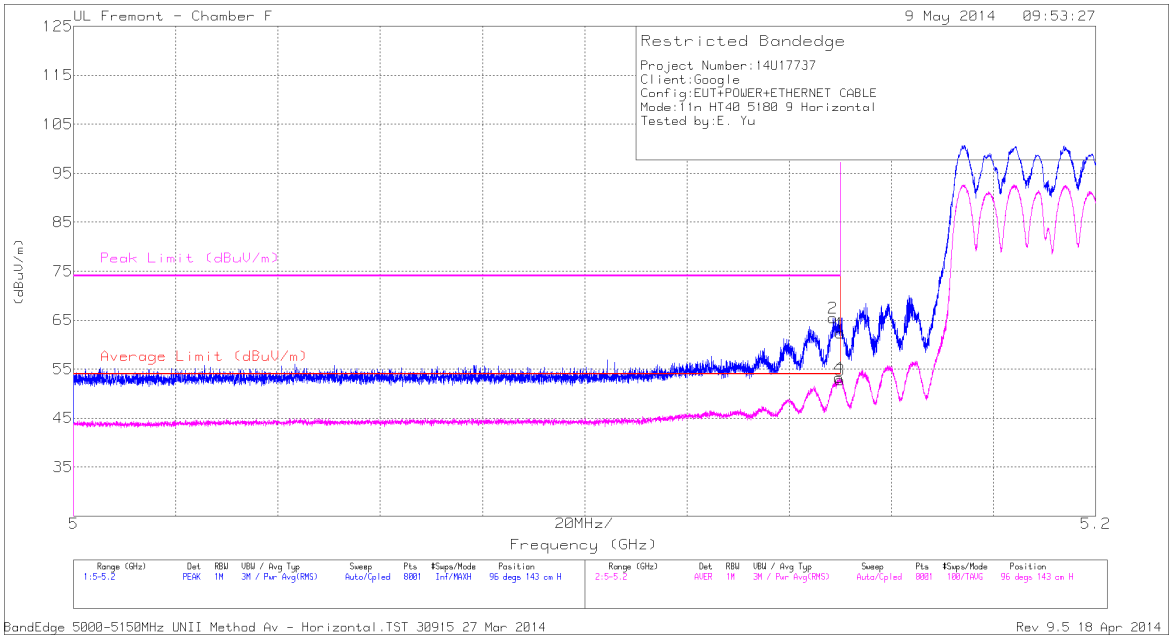
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

9.4. TX ABOVE 1 GHz 802.11n HT40 2Tx CDD MODE IN THE 5.2 GHz BAND

9.4.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT



DATA

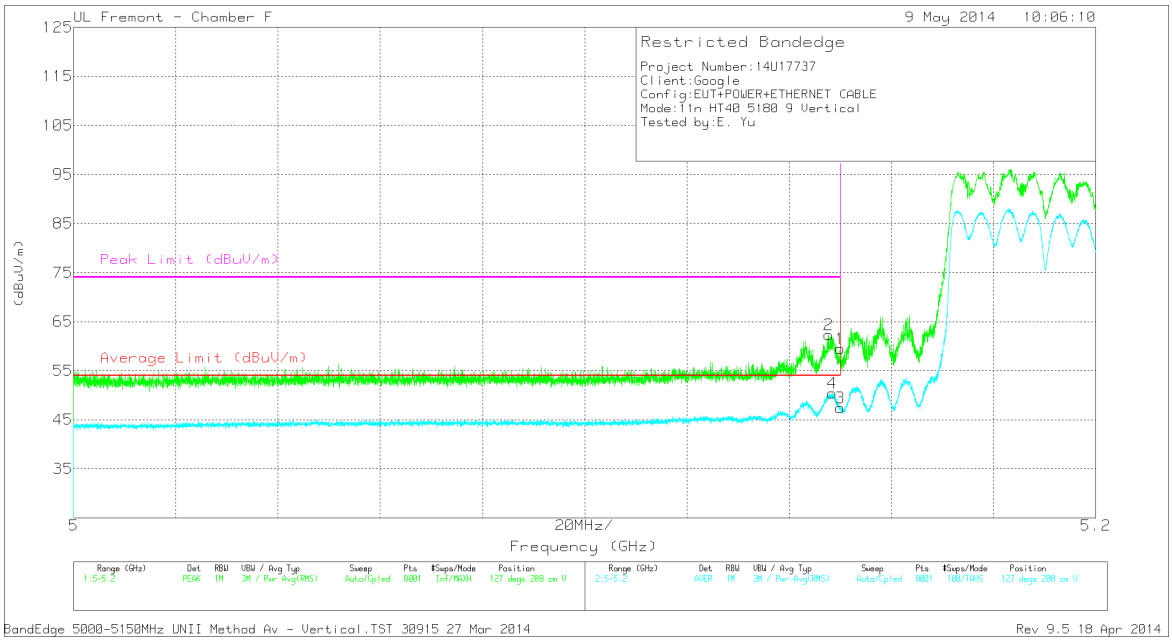
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	47.27	PK	34.4	-19.3	62.37	-	-	74	-11.63	96	143	H
2	* 5.149	50.39	PK	34.4	-19.3	65.49	-	-	74	-8.51	96	143	H
3	* 5.15	37.65	RMS	34.4	-19.3	52.75	54	-1.25	-	-	96	143	H
4	* 5.15	38.17	RMS	34.4	-19.3	53.27	54	-.73	-	-	96	143	H

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

PK - Peak detector

RMS - RMS detection

LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 5.15	44.4	PK	34.4	-19.3	59.5	-	-	74	-14.5	127	208	V
2	* 5.148	47.2	PK	34.4	-19.3	62.3	-	-	74	-11.7	127	208	V
3	* 5.15	32.37	RMS	34.4	-19.3	47.47	54	-6.53	-	-	127	208	V
4	* 5.148	35.26	RMS	34.4	-19.3	50.36	54	-3.64	-	-	127	208	V

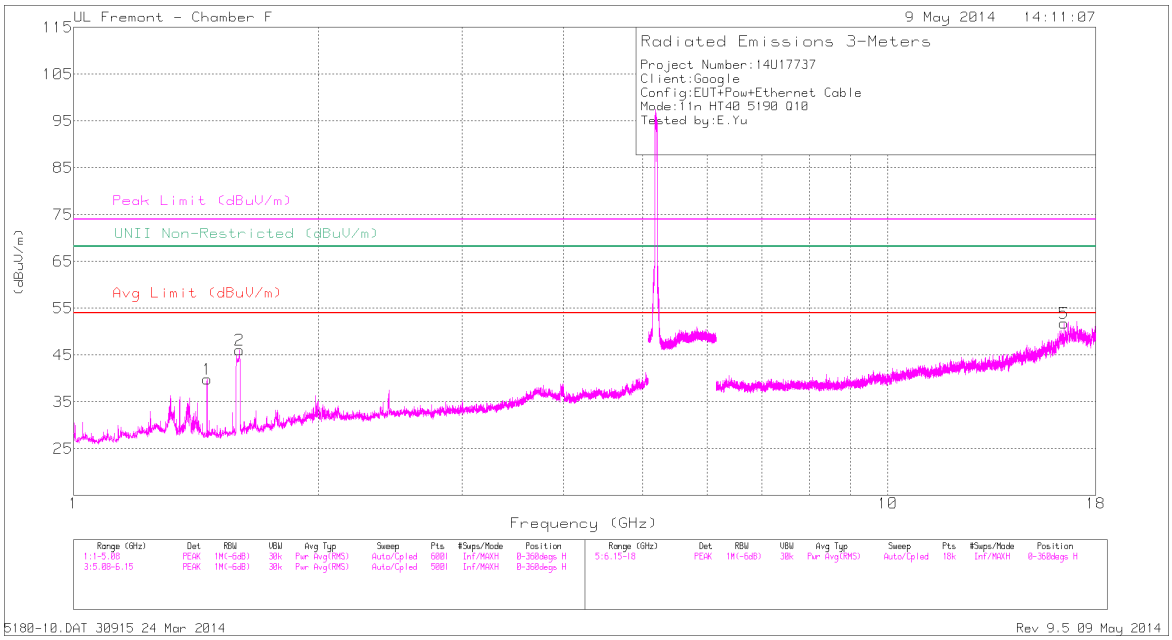
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

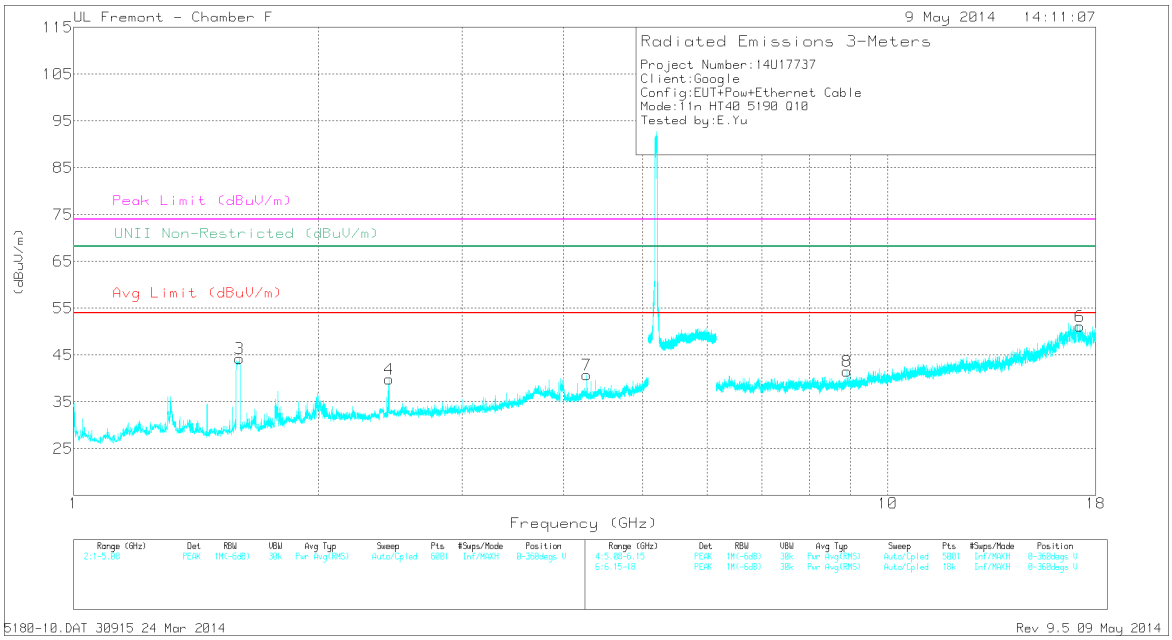
RMS - RMS detection

9.4.2. LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.458	48.85	PK1	28.7	-32.1	45.45	-	-	74	-28.55	-	-	340	209	H
* 1.458	42.61	AD1	28.7	-32.1	39.21	54	-14.79	-	-	-	-	340	209	H
* 1.6	58.13	PK1	28.5	-31.7	54.93	-	-	74	-19.07	-	-	83	284	H
* 1.598	45.61	AD1	28.5	-31.6	42.51	54	-11.49	-	-	-	-	83	284	H
* 1.599	55.59	PK1	28.5	-31.6	52.49	-	-	74	-21.51	-	-	346	136	V
* 1.598	43.32	AD1	28.5	-31.6	40.22	54	-13.78	-	-	-	-	346	136	V
2.44	46	PK1	32.4	-30.9	47.5	-	-	-	-	68.2	-20.7	32	266	V
2.44	29.84	AD1	32.4	-30.9	31.34	-	-	-	-	-	-	32	266	V
* 4.228	37.6	PK1	33.6	-27.1	44.1	-	-	74	-29.9	-	-	40	272	V
* 4.228	26.25	AD1	33.6	-27.1	32.75	54	-21.25	-	-	-	-	40	272	V
16.454	34.99	PK1	41.1	-19.5	56.59	-	-	-	-	68.2	-11.61	331	129	H
17.123	35.8	PK1	41.1	-19.8	57.1	-	-	-	-	68.2	-11.1	177	182	V
8.905	34.94	PK1	36.1	-23.6	47.44	-	-	-	-	68.2	-20.76	111	304	V

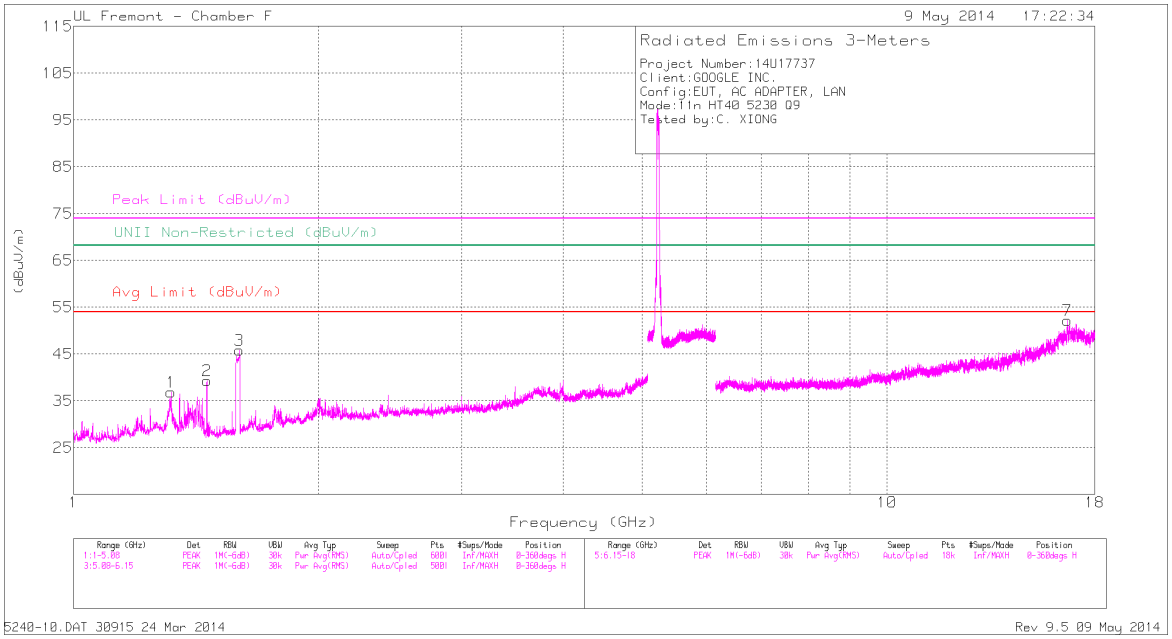
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK1 - KDB789033 Method: Peak

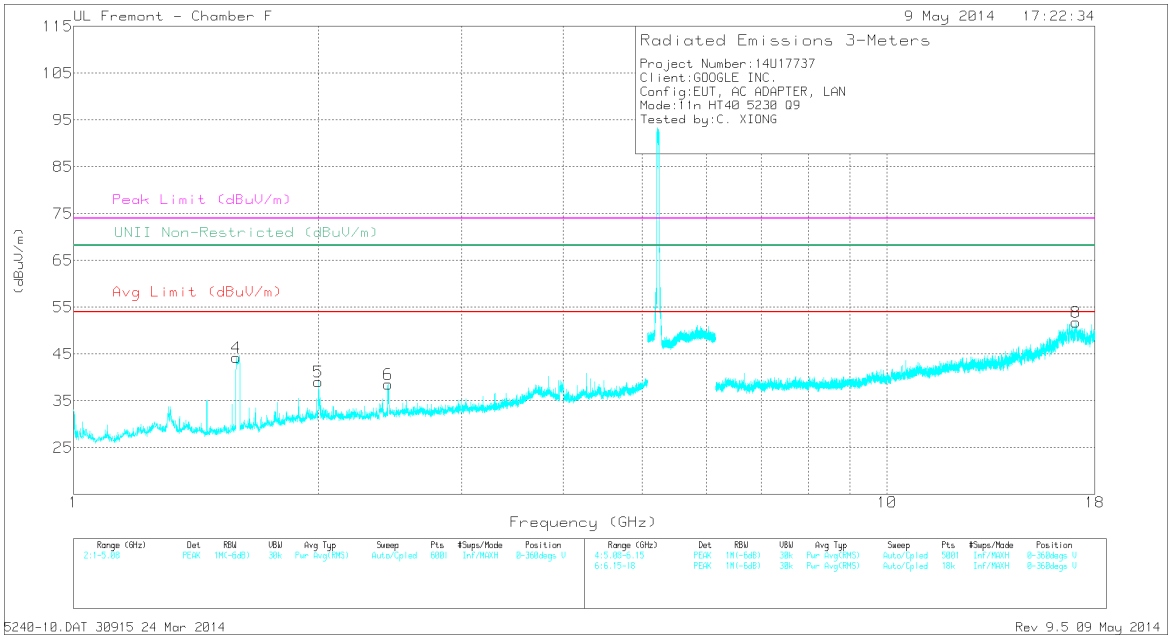
AD1 - KDB789033 Method: AD Primary Power Average

9.4.3. HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.325	49.93	PK1	29.9	-31.4	48.43	-	-	74	-25.57	-	-	214	101	H
* 1.318	29.69	AD1	29.9	-31.4	28.19	54	-25.81	-	-	-	-	214	101	H
* 1.458	46.97	PK1	28.7	-32.1	43.57	-	-	74	-30.43	-	-	340	277	H
* 1.458	42.34	AD1	28.7	-32.1	38.94	54	-15.06	-	-	-	-	340	277	H
1.997	46.91	PK1	31.7	-31.2	47.41	-	-	-	-	68.2	-20.79	49	337	V
2.439	44.66	PK1	32.4	-30.9	46.16	-	-	-	-	68.2	-22.04	29	250	V
16.645	34.84	PK1	41.3	-17.1	59.04	-	-	-	-	68.2	-9.16	134	380	H
17.075	34.52	PK1	41.2	-16.3	59.42	-	-	-	-	68.2	-8.78	179	308	V

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

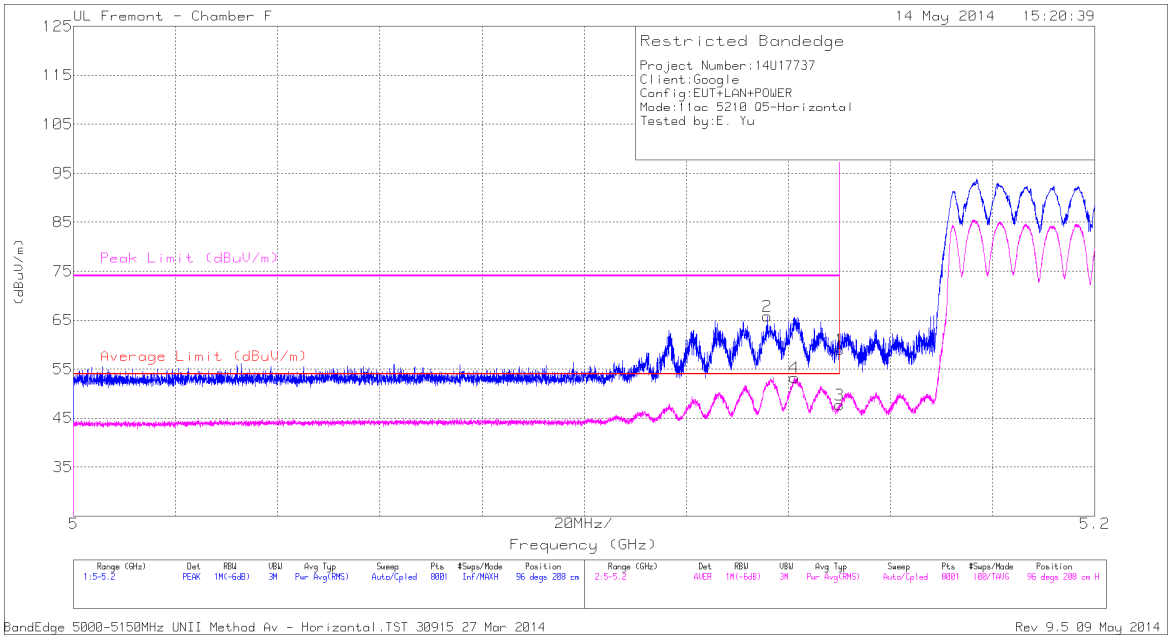
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

9.5. TX ABOVE 1 GHz 802.11ac 80MHz 2TX CDD MODE IN THE 5.2 GHz BAND

9.5.1. RESTRICTED BANDEDGE (LOW CHANNEL, CH 42)

LOW CHANNEL HORIZONTAL PLOT



DATA

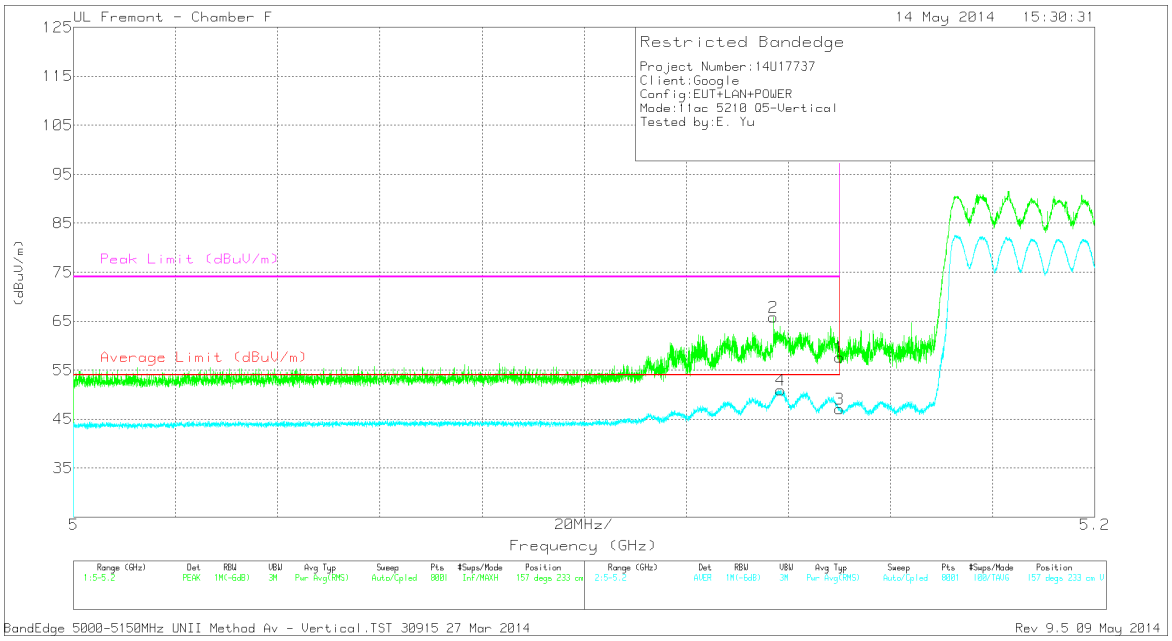
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	43.84	PK	34.4	-19.3	58.94	-	-	74	-15.06	96	208	H
2	* 5.136	50.77	PK	34.4	-19.4	65.77	-	-	74	-8.23	96	208	H
3	* 5.15	32.56	RMS	34.4	-19.3	47.66	54	-6.34	-	-	96	208	H
4	* 5.141	38.18	RMS	34.4	-19.3	53.28	54	-.72	-	-	96	208	H

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

PK - Peak detector

RMS - RMS detection

LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 5.15	42.52	PK	34.4	-19.3	57.62	-	-	74	-16.38	157	233	V
2	* 5.137	50.86	PK	34.4	-19.4	65.86	-	-	74	-8.14	157	233	V
3	* 5.15	32	RMS	34.4	-19.3	47.1	54	-6.9	-	-	157	233	V
4	* 5.138	35.86	RMS	34.4	-19.4	50.86	54	-3.14	-	-	157	233	V

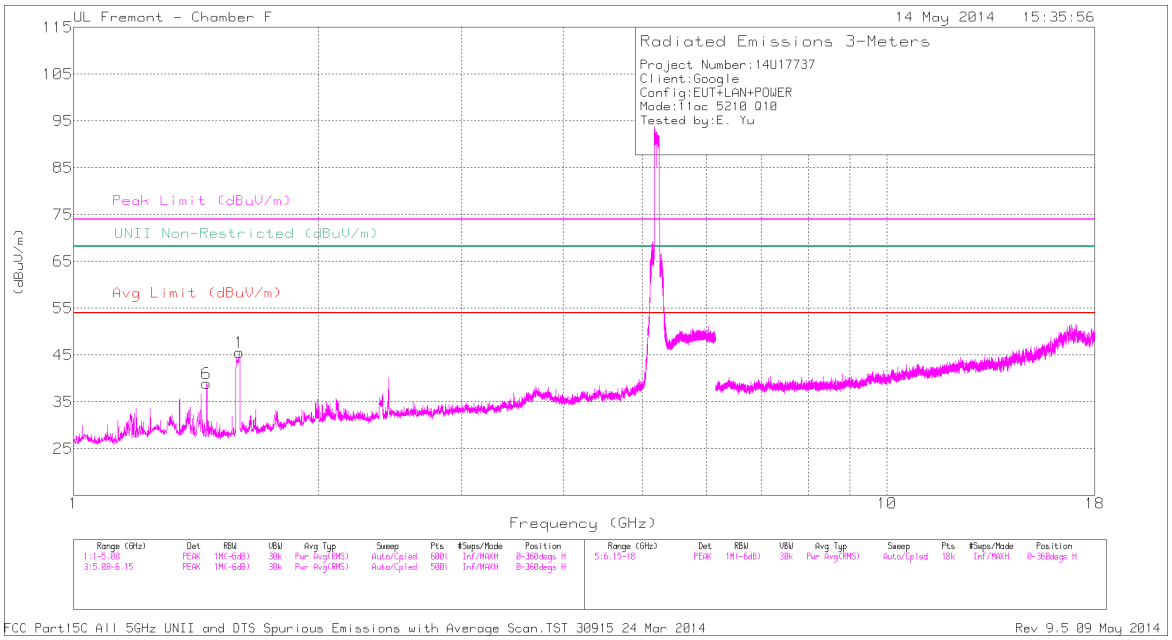
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

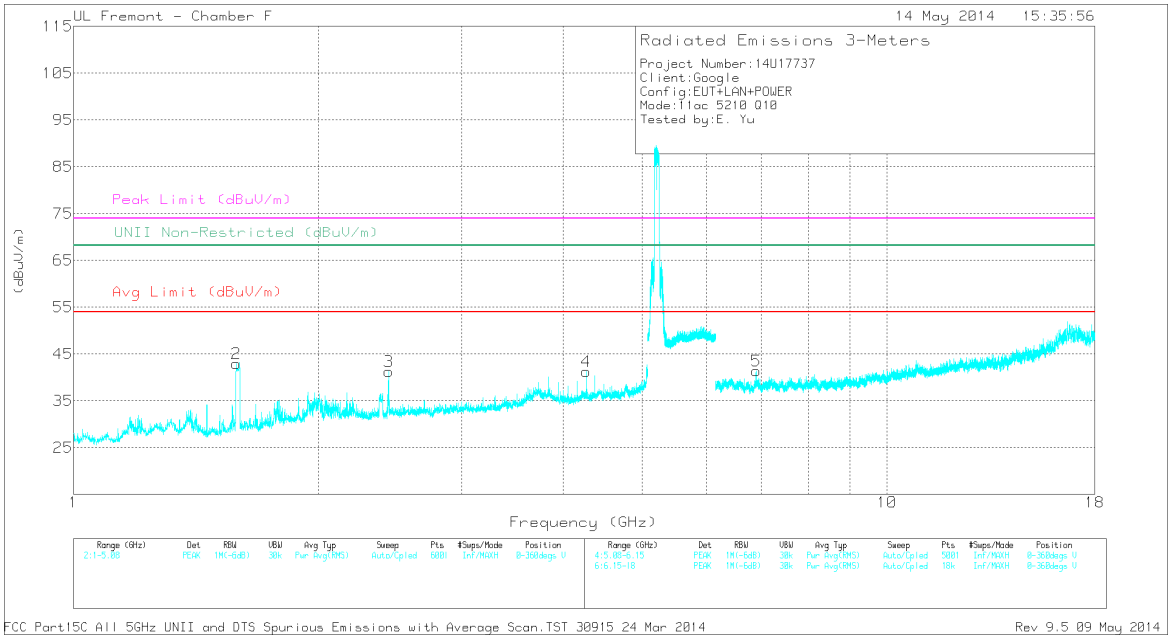
RMS - RMS detection

9.5.2. LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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
* 1.6	54.33	PK1	28.5	-31.6	51.23	-	-	74	-22.77	-	-	107	290	H
* 1.599	41.04	AD1	28.5	-31.6	37.94	54	-16.06	-	-	-	-	107	290	H
* 1.458	48.27	PK1	28.7	-32.1	44.87	-	-	74	-29.13	-	-	342	278	H
* 1.458	42.84	AD1	28.7	-32.1	39.44	54	-14.56	-	-	-	-	342	278	H
* 1.597	53.69	PK1	28.5	-31.6	50.59	-	-	74	-23.41	-	-	320	139	V
* 1.597	41.46	AD1	28.5	-31.6	38.36	54	-15.64	-	-	-	-	320	139	V
* 4.266	39.85	PK1	33.7	-27.7	45.85	-	-	74	-28.15	-	-	90	226	V
* 4.266	32.09	AD1	33.7	-27.7	38.09	54	-15.91	-	-	-	-	90	226	V
2.439	46.35	PK1	32.4	-30.9	47.85	-	-	-	-	68.2	-20.35	207	241	V
6.9	38.86	PK1	35.5	-26.5	47.86	-	-	-	-	68.2	-20.34	72	254	V

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

RMS - RMS detection

PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

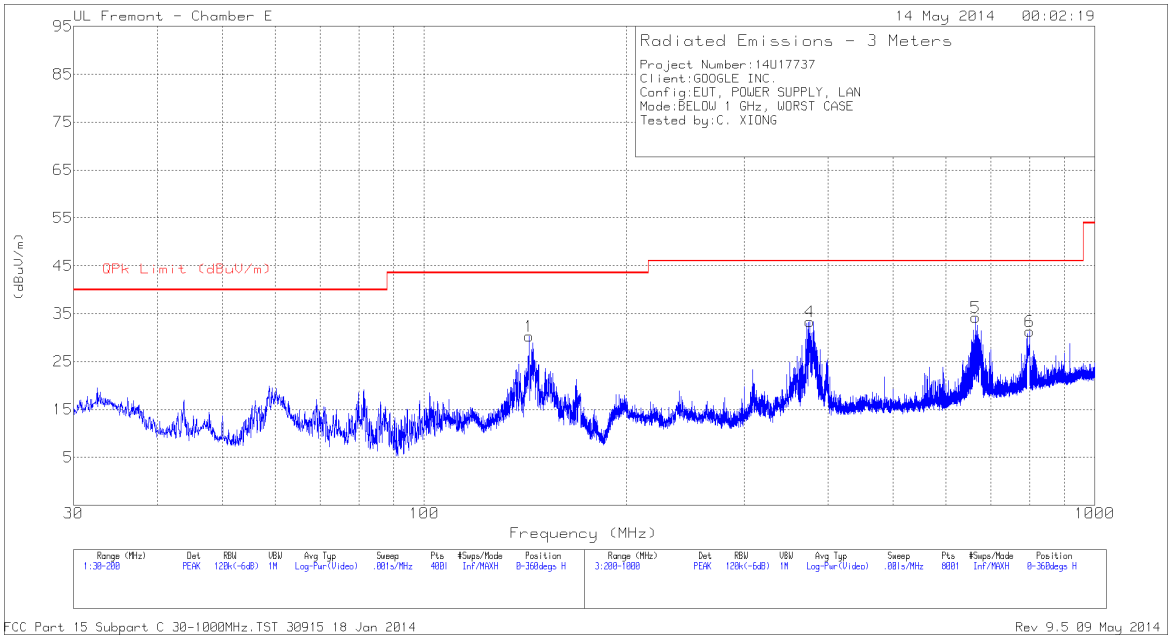
9.6. TX ABOVE 18 GHz

Note: Emissions were scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

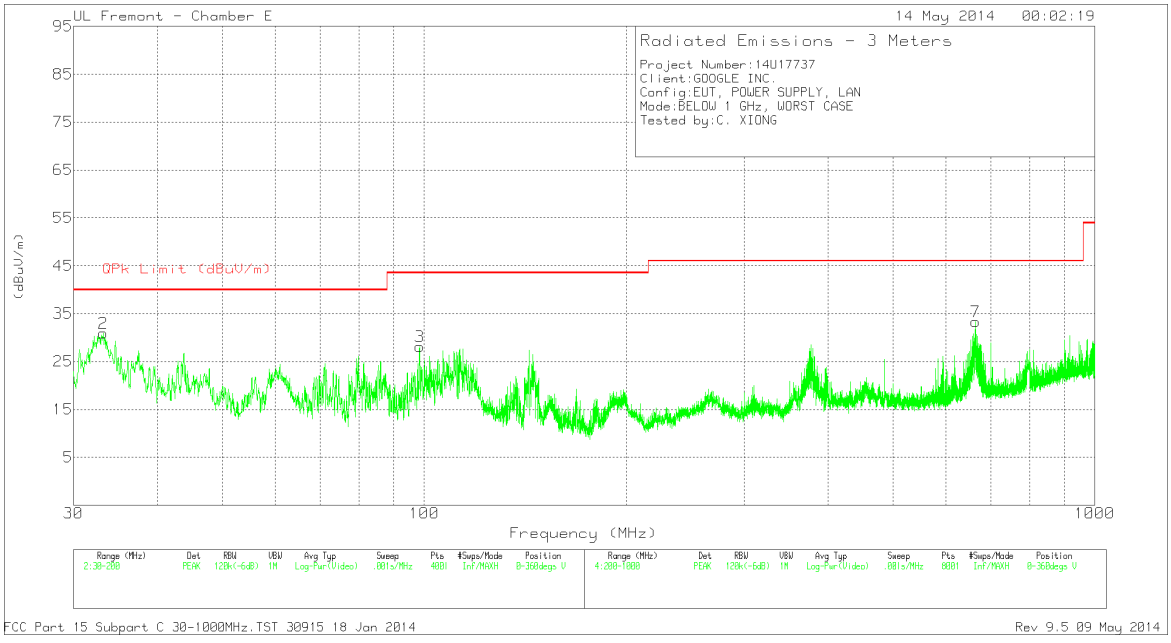
9.7. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	33.23	43.66	PK	19.1	-31.8	30.96	40	-9.04	0-360	100	V
3	98.425	49.72	PK	9.7	-31.3	28.12	43.52	-15.4	0-360	100	V
1	143.305	48.54	PK	12.8	-31.1	30.24	43.52	-13.28	0-360	201	H
4	375.9	48.46	PK	14.9	-30	33.36	46.02	-12.66	0-360	100	H
7	663.6	42.88	PK	19.6	-29.1	33.38	46.02	-12.64	0-360	100	V
5	664	43.72	PK	19.6	-29.1	34.22	46.02	-11.8	0-360	200	H
6	800	38.86	PK	21.2	-28.7	31.36	46.02	-14.66	0-360	100	H

PK - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

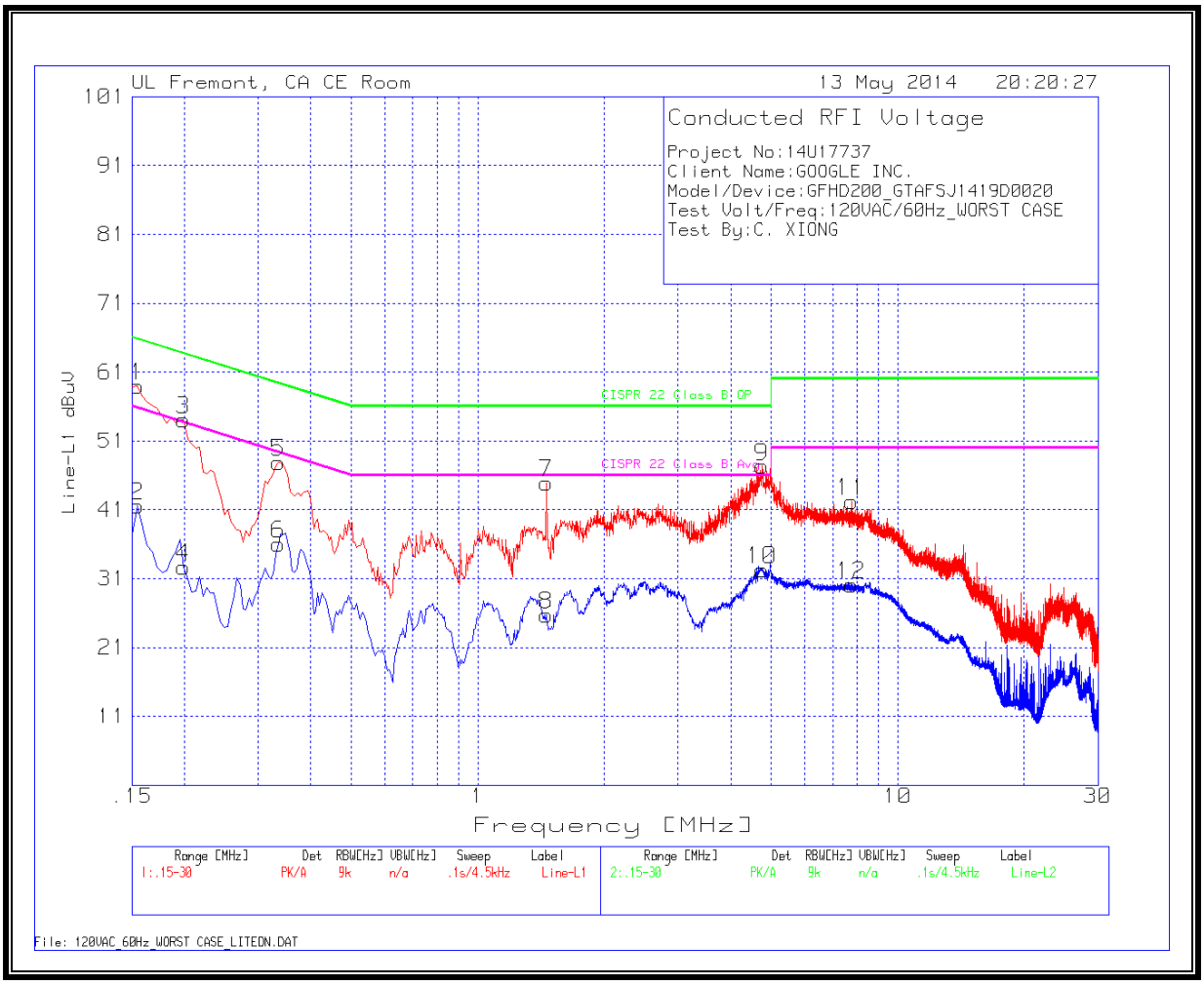
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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

LINE 1 RESULTS



WORST EMISSIONS

Line-L1 .15 - 30MHz

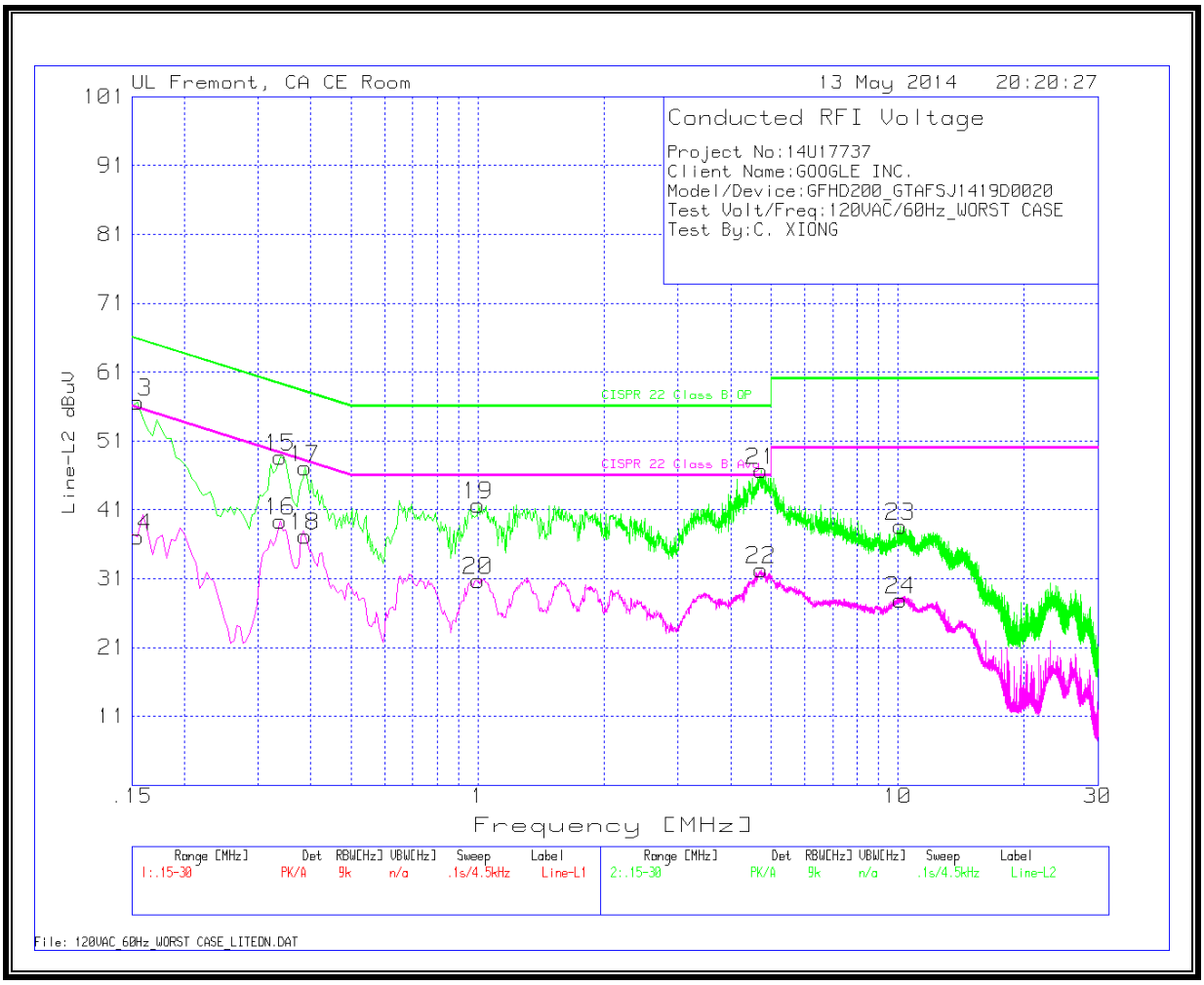
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.1545	57.71	PK	1.3	0	59.01	65.8	-6.79	-	-
2	.1545	40.26	Av	1.3	0	41.56	-	-	55.8	-14.24
3	.1995	53.13	PK	.9	0	54.03	63.6	-9.57	-	-
4	.1995	31.78	Av	.9	0	32.68	-	-	53.6	-20.92
5	.3345	47.42	PK	.5	0	47.92	59.3	-11.38	-	-
6	.3345	35.49	Av	.5	0	35.99	-	-	49.3	-13.31
7	1.455	44.56	PK	.2	.1	44.86	56	-11.14	-	-
8	1.455	25.46	Av	.2	.1	25.76	-	-	46	-20.24
9	4.7625	47	PK	.2	.1	47.3	56	-8.7	-	-
10	4.7625	31.94	Av	.2	.1	32.24	-	-	46	-13.76
11	7.7505	41.93	PK	.2	.1	42.23	60	-17.77	-	-
12	7.7505	29.78	Av	.2	.1	30.08	-	-	50	-19.92

PK - Peak detector

Av - average detection

LINE 2 RESULTS



WORST EMISSIONS

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
13	.1545	55.27	PK	1.4	0	56.67	65.8	-9.13	-	-
14	.1545	35.66	Av	1.4	0	37.06	-	-	55.8	-18.74
15	.339	48.21	PK	.5	0	48.71	59.2	-10.49	-	-
16	.339	38.82	Av	.5	0	39.32	-	-	49.2	-9.88
17	.3885	46.55	PK	.5	0	47.05	58.1	-11.05	-	-
18	.3885	36.68	Av	.5	0	37.18	-	-	48.1	-10.92
19	1.0005	41.36	PK	.3	0	41.66	56	-14.34	-	-
20	1.0005	30.46	Av	.3	0	30.76	-	-	46	-15.24
21	4.722	46.36	PK	.2	.1	46.66	56	-9.34	-	-
22	4.722	31.99	Av	.2	.1	32.29	-	-	46	-13.71
23	10.158	38.22	PK	.2	.2	38.62	60	-21.38	-	-
24	10.158	27.45	Av	.2	.2	27.85	-	-	50	-22.15

PK - Peak detector

Av - average detection