



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

**CLASS II PERMISSIVE CHANGE
CERTIFICATION TEST REPORT**

FOR

**802.11 3X3 A/B/G/N MINI PCIE CARD. 20MHZ BW.PCB ANTENNA
DFS CLIENT DEVICE**

MODEL NUMBER: PLAY3

**FCC ID: SBVRM004
IC: 5373A-RM004**

REPORT NUMBER: 13U16719-1, REVISION B

ISSUE DATE: APRIL 28 2014

Prepared for

**SONOS, INC.
223 E. DE LA GUERRA
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

Rev.	Issue Date	Revisions	Revised By
--	02/13/2014	Initial Issue	G. Quizon
A	03/31/2014	Tx Power Settings added, page 116	M. Mekuria
B	04/28/2014	Added KDB 662911	M. Mekuria

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE	7
5.3. MAXIMUM OUTPUT POWER.....	7
5.4. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.5. SOFTWARE AND FIRMWARE.....	8
5.6. WORST-CASE CONFIGURATION AND MODE	8
5.7. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. ON TIME DUTY CYCLE MEASUREMENT METHODS	11
7.1.1. FOR POWER AND PPSD.....	11
7.1.2. FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz.....	11
7.1.3. ON TIME AND DUTY CYCLE RESULTS.....	12
7.1.4. MEASUREMENT METHODS	12
8. ANTENNA PORT TEST RESULTS	15
8.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND	15
8.1.1. 26 dB BANDWIDTH.....	15
8.1.2. 99% BANDWIDTH.....	21
8.1.3. AVERAGE POWER.....	27
8.1.4. OUTPUT POWER AND PPSD	28
8.1.5. PEAK EXCURSION.....	35
8.2. 802.11n HT20 MODE IN THE 5.3 GHz BAND	38
8.2.1. 26 dB BANDWIDTH.....	38
8.2.2. 99% BANDWIDTH.....	44
8.2.3. AVERAGE POWER.....	50
8.2.4. OUTPUT POWER AND PPSD	51
8.2.5. PEAK EXCURSION.....	58
8.3. 802.11n HT20 MODE IN THE 5.6 GHz BAND	61
8.3.1. 26 dB BANDWIDTH.....	61
8.3.2. 99% BANDWIDTH.....	67

8.3.3.	AVERAGE POWER	73
8.3.4.	OUTPUT POWER AND PPSD	74
8.3.5.	PEAK EXCURSION	81
9.	RADIATED TEST RESULTS.....	84
9.1.	LIMITS AND PROCEDURE	84
9.2.	TRANSMITTER ABOVE 1 GHz	85
9.2.1.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND.....	85
9.2.2.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND.....	93
9.2.3.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND.....	101
9.3.	WORST-CASE BELOW 1 GHz.....	110
10.	AC POWER LINE CONDUCTED EMISSIONS	112
11.	POWER SETTING	116
12.	SETUP PHOTOS	117

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONOS, INC.
223 E. DE LA GUERRA ST.
SANTA BARBARA, CA 93101, U.S.A

EUT DESCRIPTION: 802.11 3X3 A/B/G/N MINI PCIE CARD. 20MHZ BW.PCB
ANTENNA DFS CLIENT DEVICE

MODELNUMBER: PLAY3

SERIAL NUMBER: 1308000E58FD280E4 (Radiated), 1308000E58FD280A0
(Conducted)

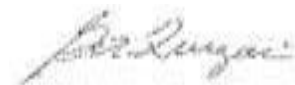
DATE TESTED: JANUARY 6 – FEBRUARY 6, 2014

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

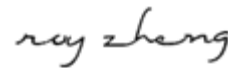
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section.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



GEORGE QUIZON
WiSE Project Lead
UL Verification Services Inc.

Tested By:



ROY ZHENG
WiSE 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, FCC KDB 662911 D01 v02r01 and 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
☐ 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:

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

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 802.11 3x3 abgn Mini PCIe Card. 20MHz BW.PCB antenna. DFS client device that is embedded inside the Sonos Play3 wireless sound system.

The radio module is manufactured by Sonos, Inc.

5.2. DESCRIPTION OF CLASS II PERMISSIVE Change

This is a Class II permissive change project. The change is to add a higher gain antennas on all 5GHz 802.11n (20 MHz) frequencies. The EUT tested did not support legacy mode. The original grant report was issued by Bureau Veritas Consumer Products Services (H.K.) Ltd, under RF110223E04-1 R1.

Note: Since the original report issued more than two years ago and some changes have made on FCC standards, this Class II permissive change report has a complete set of test data.

5.3. 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	14.28	26.79
5260 - 5320	802.11n HT20	20.79	119.95
5500 - 5700	802.11n HT20	20.63	115.61

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT is using 3 antennas as follow:

Antenna	Frequency	Peak Antenna Gain with Cable Loss (dBi)
Antenna (1)	5.2G (5180-5240)	1.6
	5.3G (5260-5320)	1.7
	5.5G (5500-5700)	1.7
Antenna (2)	5.2G (5180-5240)	1.9
	5.3G (5260-5320)	3.2
	5.5G (5500-5700)	5.8
Antenna (3)	5.2G (5180-5240)	1.2
	5.3G (5260-5320)	2.1
	5.5G (5500-5700)	2.4

5.5. SOFTWARE AND FIRMWARE

The Sonos software version is V3.6 17.1-48020

5.6. WORST-CASE CONFIGURATION AND MODE

The EUT supports only one orientation; therefore, X orientation (Lay down) was investigated and is considered the worst case.

Based on the baseline investigation, the worst-case were as followed:

802.11n HT20 3TX CDD mode: MCS0

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power.

For all modes with three chains, CDD was selected per the software provided by the client. Based on the testing of the three chains, chain 1 was found to be worst-case for the antenna port. The radiated emissions test was based on the port with the higher antenna gain.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	W510	R9-BK0RH 11/02	DOC
Laptop AC adapter	Lenovo	45N0058	11S45N0058Z1ZJA40C1GZXP	DOC
Router	Netgear	FS105	1D52163D0AADA	DOC
Router AC adapter	Netgear	MU08A9075100-A1	2411201651023902JT	N/A

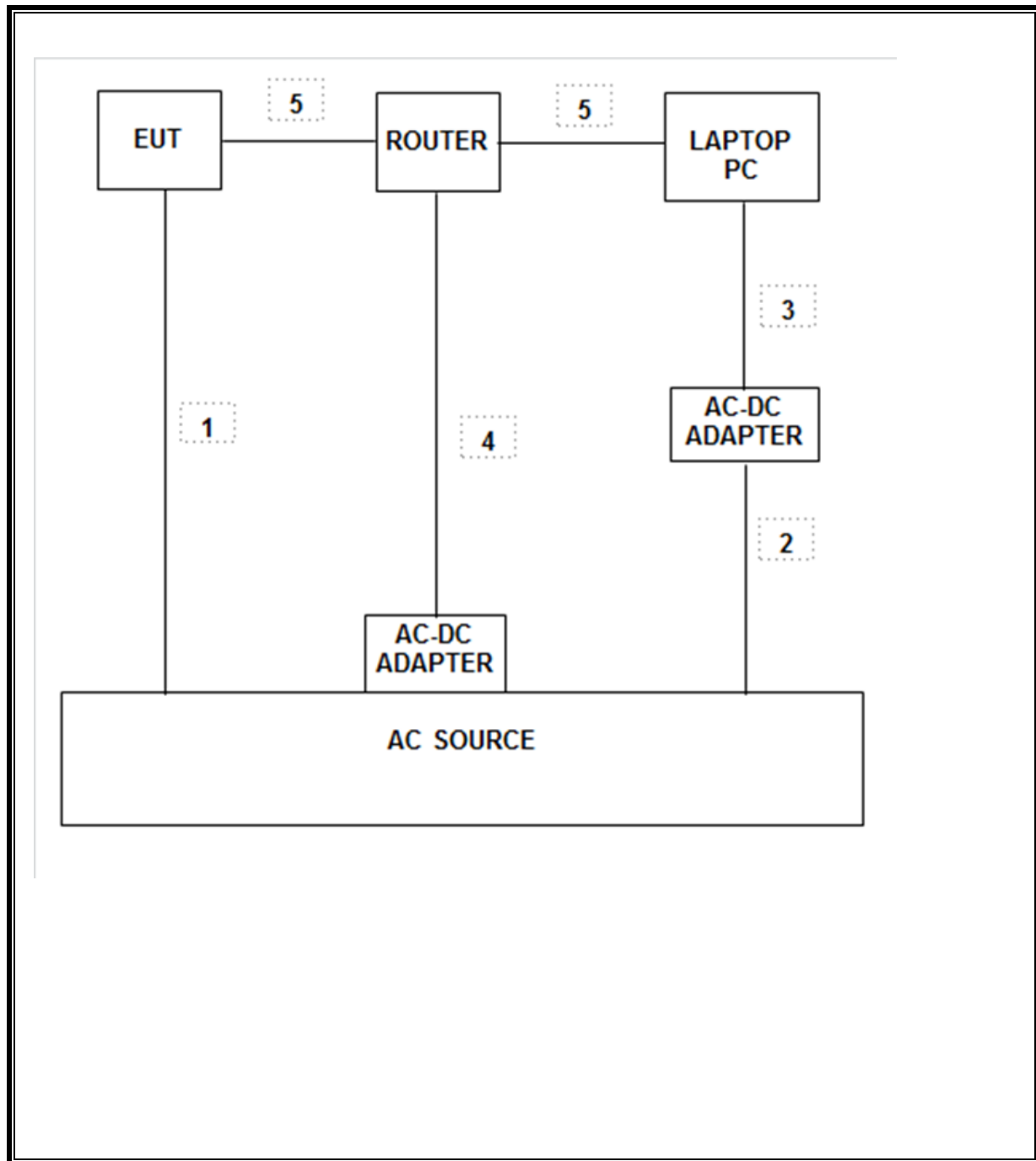
I/O CABLES

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

TEST SETUP

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 Due
Horn Antenna 1-18GHz	ETS Lindgren	3117	F00131	02/19/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	05/08/14
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	05/06/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	F00027	03/07/14
Peak / Average Power Sensor	Agilent / HP	E9323A	F00163	04/03/14
P-Series single channel Power Meter	Agilent / HP	N1911A	F00164	04/03/14
Spectrum Analyzer, 3Hz-44GHz	Agilent	N9030A	F00127	02/22/14
Spectrum Analyzer, 40 GHz	Agilent / HP	8564E	C00951	07/29/14
PreApmplifier, 1-26.5GHz	Agilent	8449B	F10067	03/23/14
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
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/14

7. ON TIME DUTY CYCLE MEASUREMENT METHODS

7.1.1. FOR POWER AND PPSD

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-2 is used.

7.1.2. FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz

The Duty Cycle is less than 98% and consistent, KDB 789033 Method AD with Power RMS Averaging and duty cycle correction is used.

7.1.3. ON TIME AND DUTY CYCLE RESULTS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
5.2GHz Band						
5180MHz HT20 CH 0	1.293	1.479	0.874	87.42%	0.58	0.773
5.3GHz Band						
5260MHz HT20 CH 0	1.297	1.478	0.878	87.75%	0.57	0.771
5.6GHz Band						
5500MHz HT20 CH 0	1.296	1.478	0.877	87.69%	0.57	0.772

7.1.4. 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.

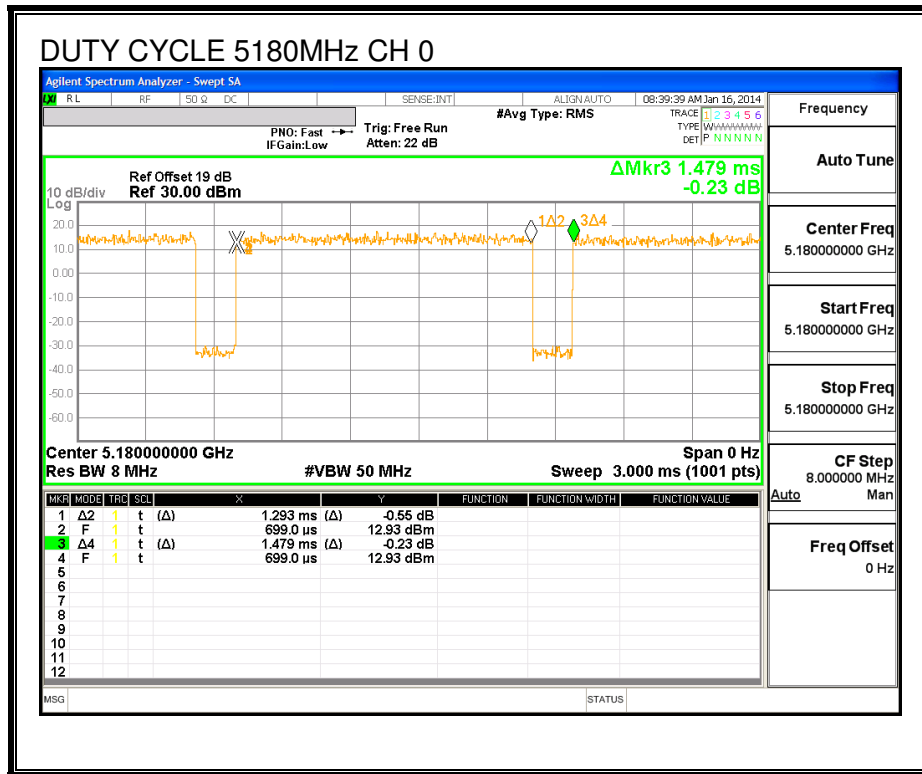
Unwanted emissions in restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, H.5, and H.6.

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

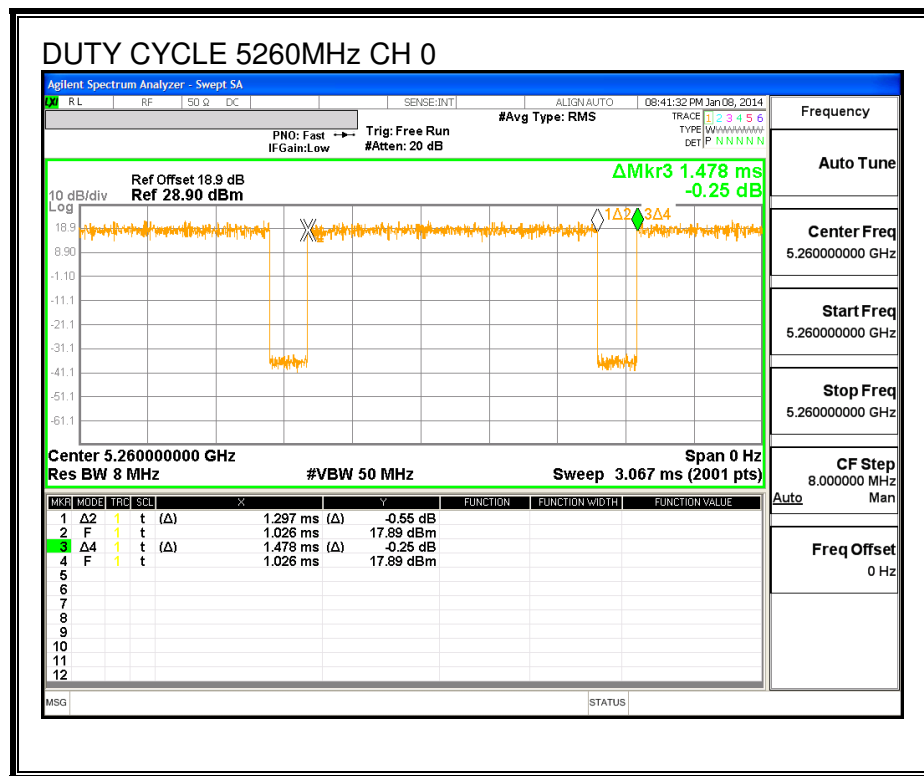
KDB 662911 D01 is referred for transmitters with Multiple Outputs in the Same Band.

DUTY CYCLE PLOTS

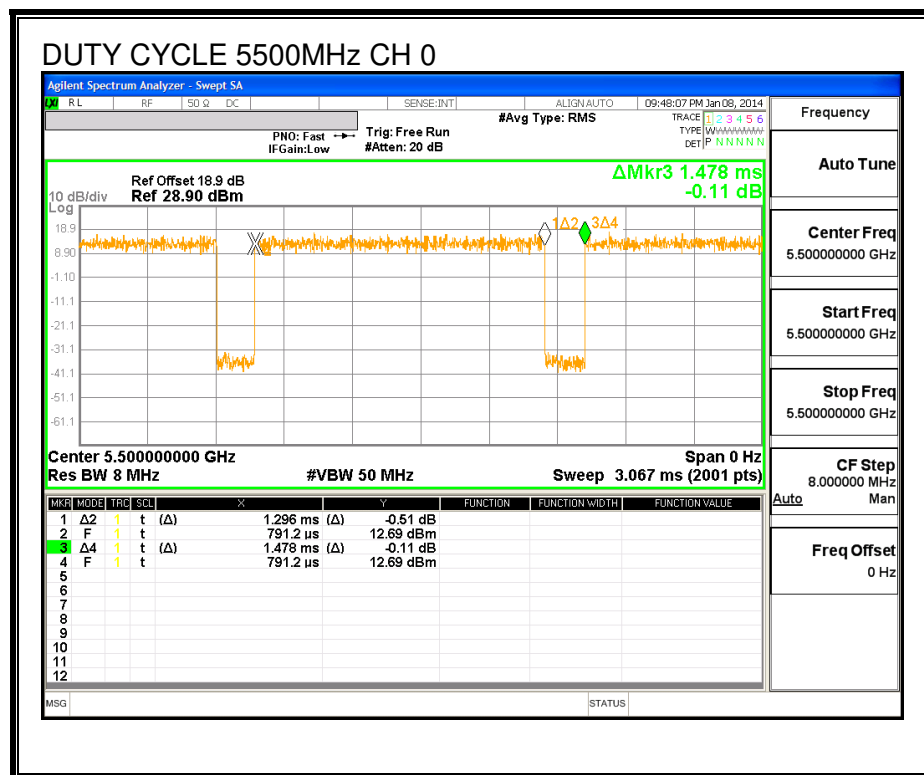
5.2GHz



5.3GHz



5.6GHz



8. ANTENNA PORT TEST RESULTS

8.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

8.1.1. 26 dB BANDWIDTH

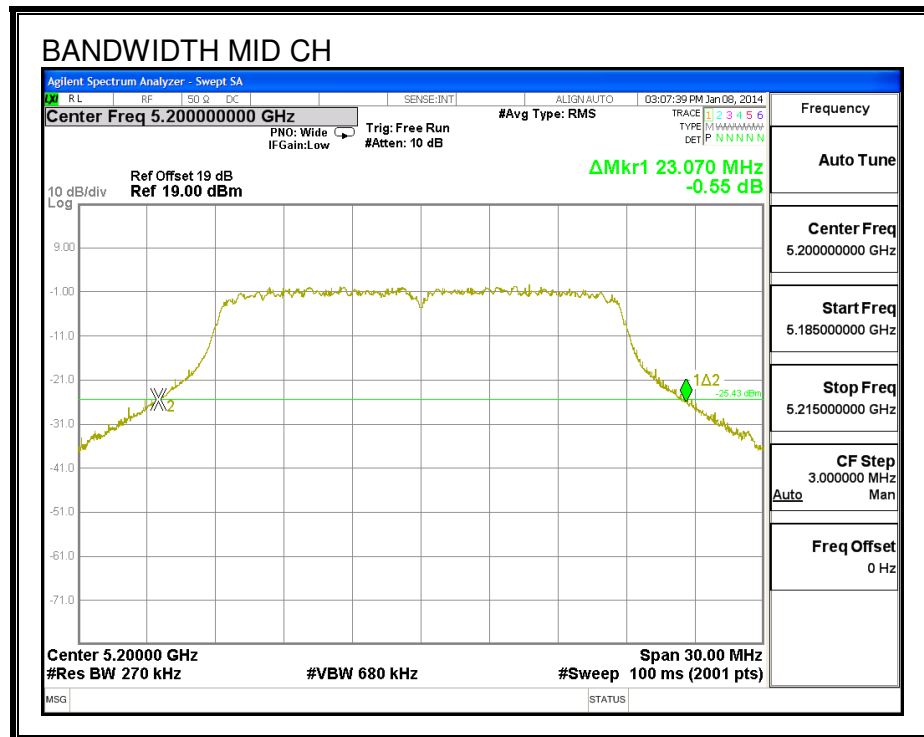
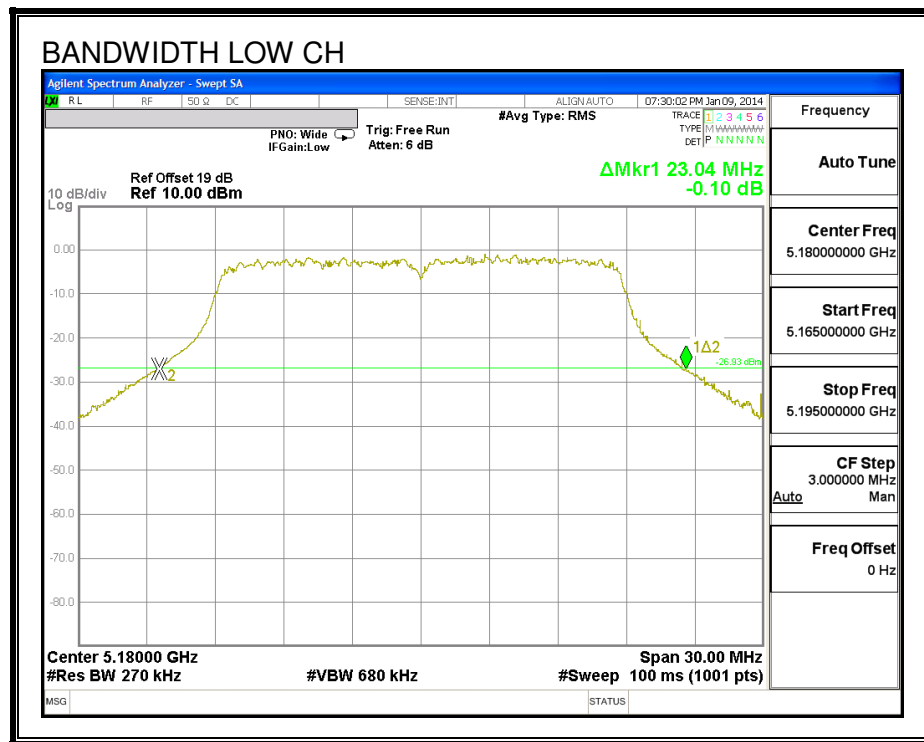
LIMITS

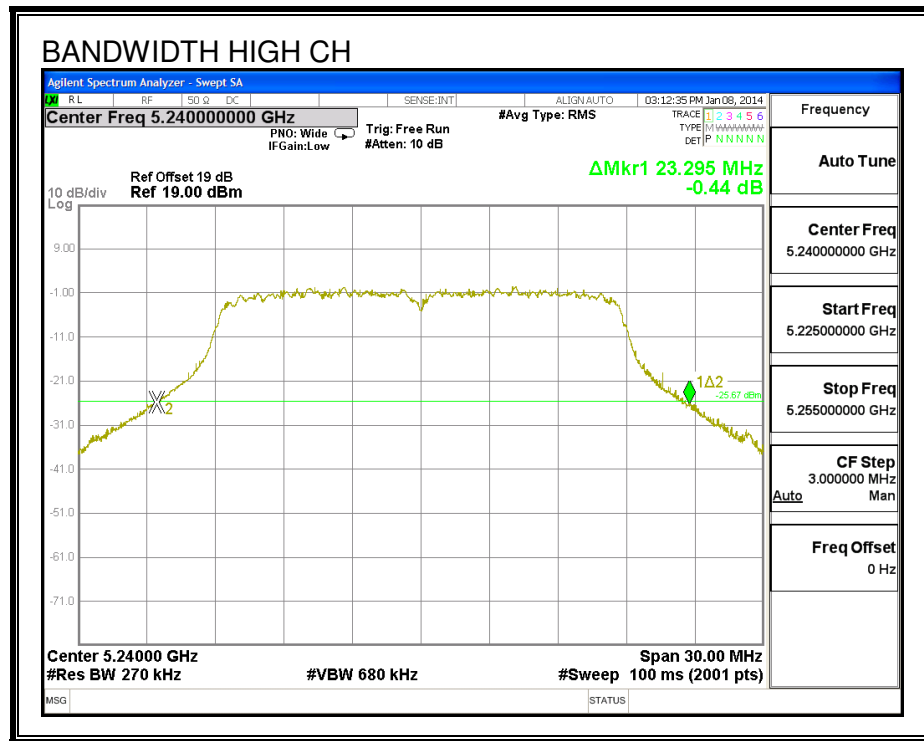
None; for reporting purposes only.

RESULTS

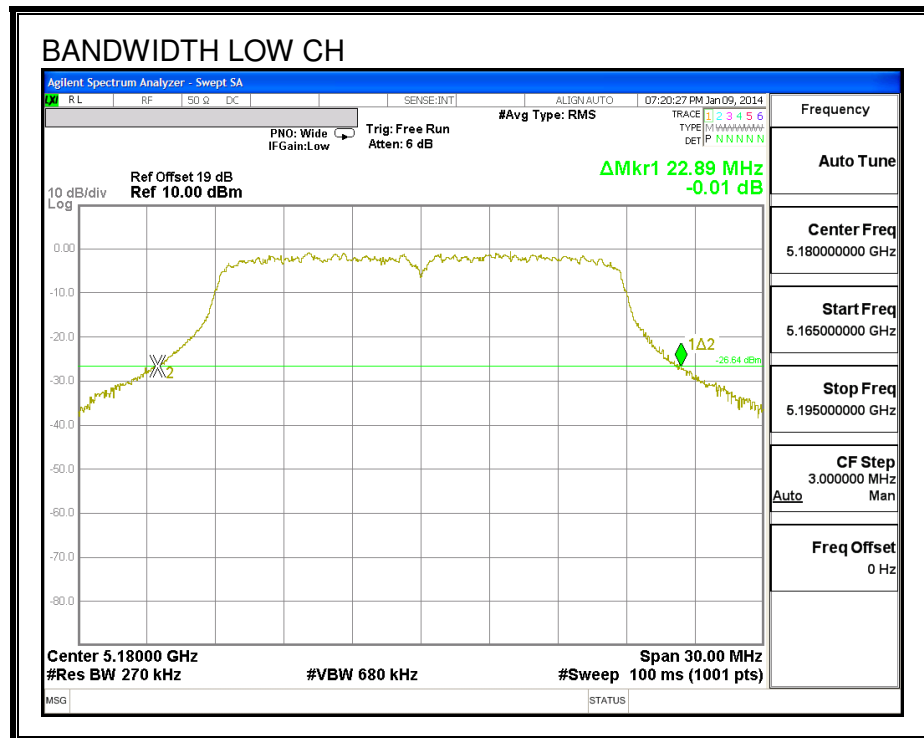
Channel	Frequency (MHz)	26 dB Bandwidth		
		CH0	CH1	CH2
Low	5180	23.040	22.890	23.280
Mid	5200	23.070	23.070	23.340
High	5240	23.295	23.085	23.265

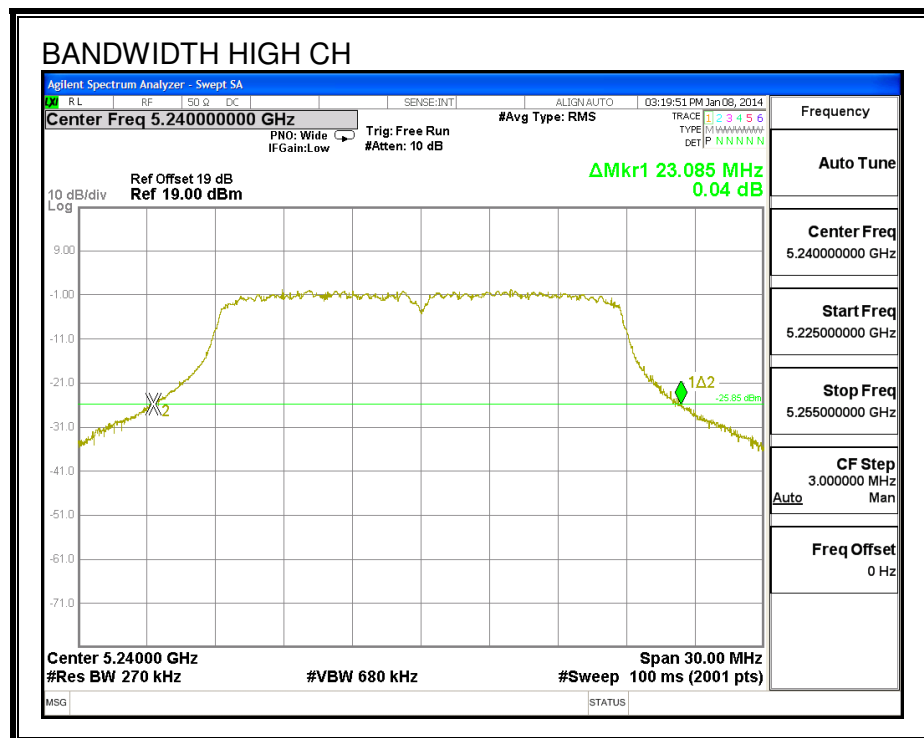
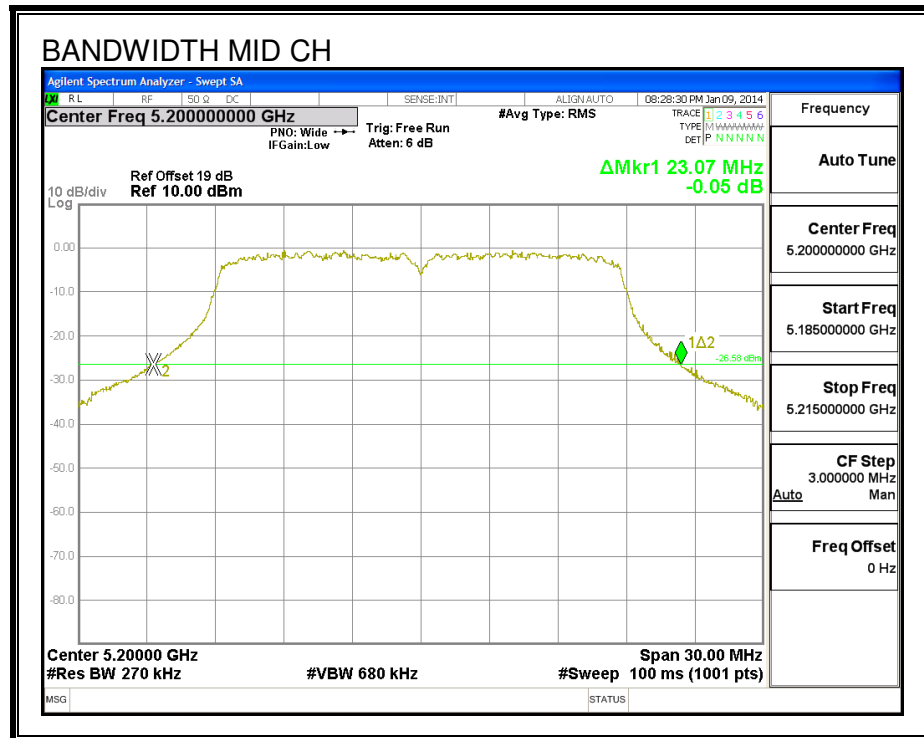
26 dB BANDWIDTH CH0



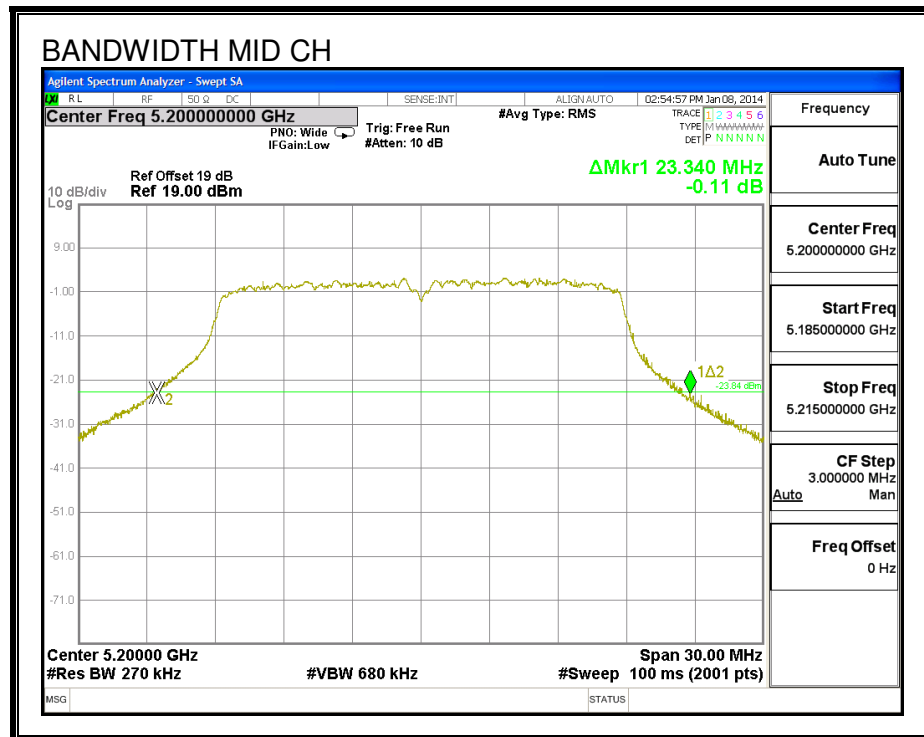
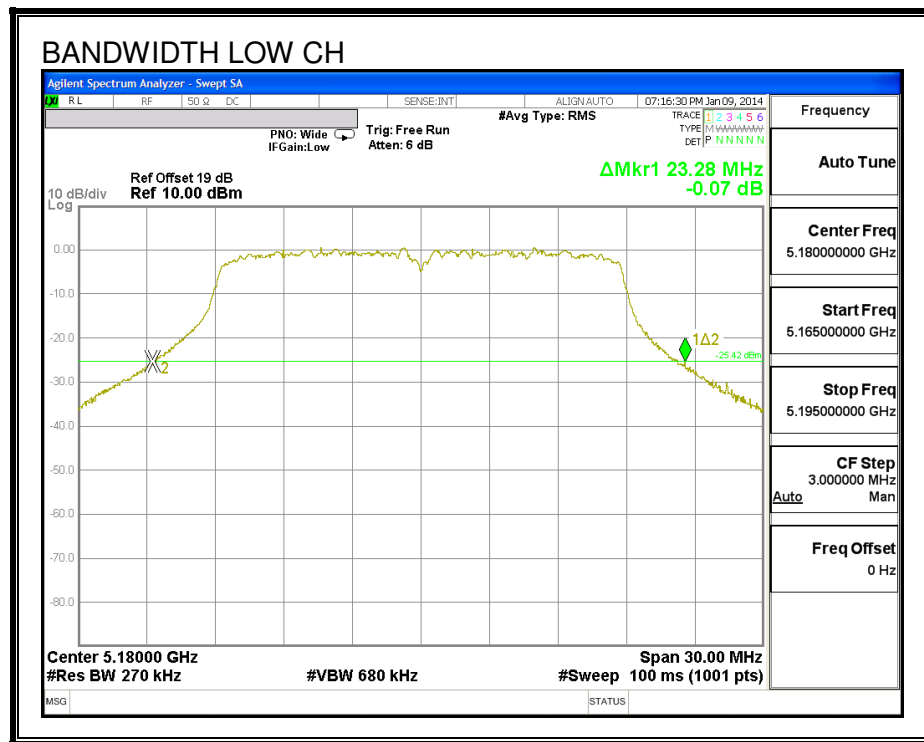


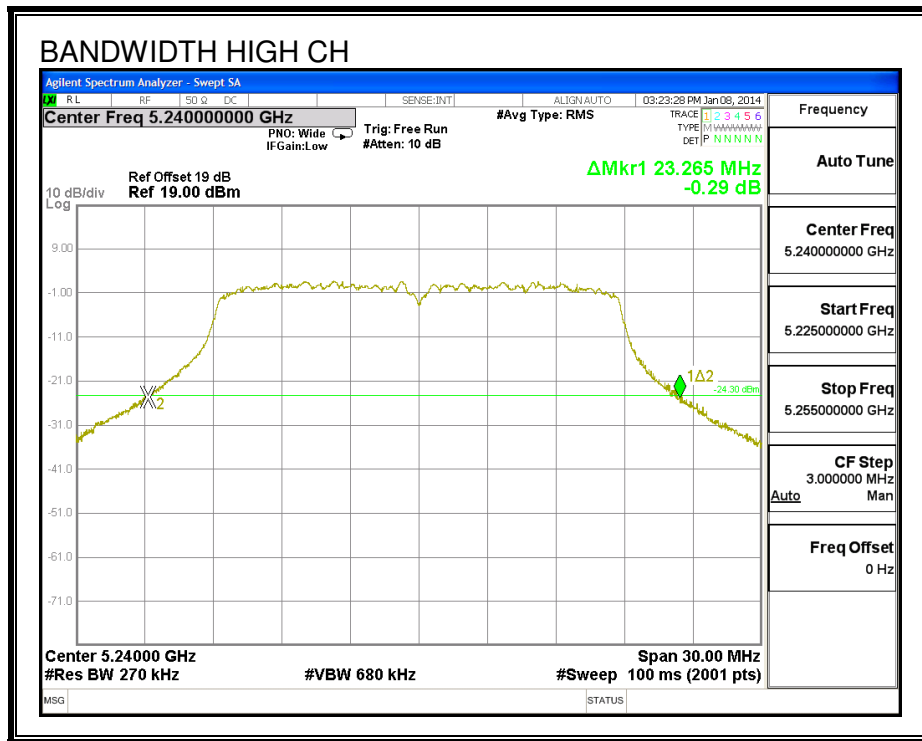
26 dB BANDWIDTH CH1





26 dB BANDWIDTH CH2





8.1.2. 99% BANDWIDTH

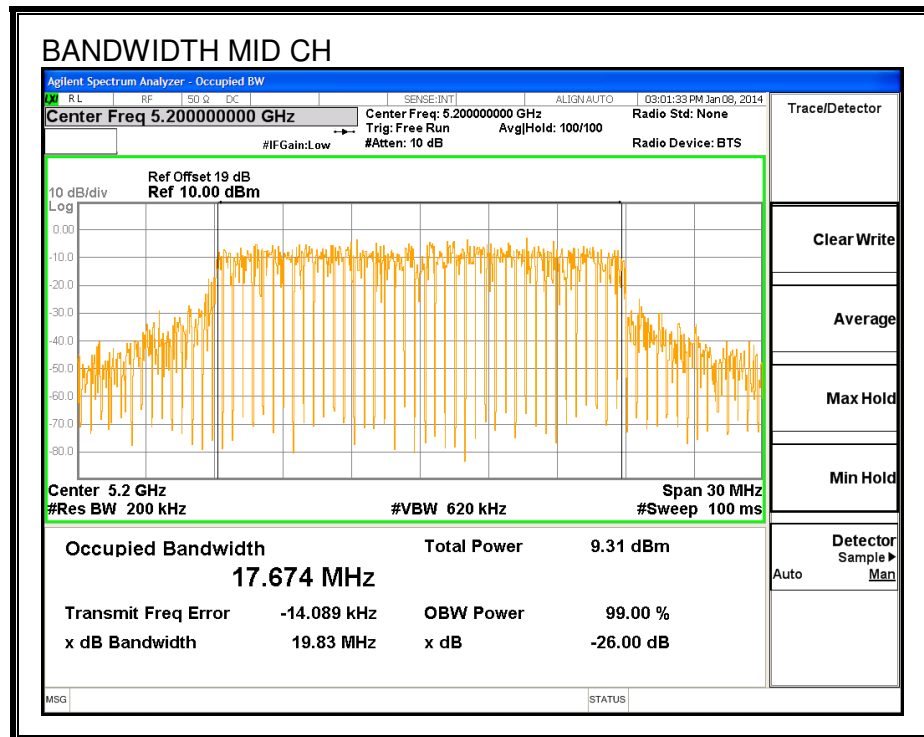
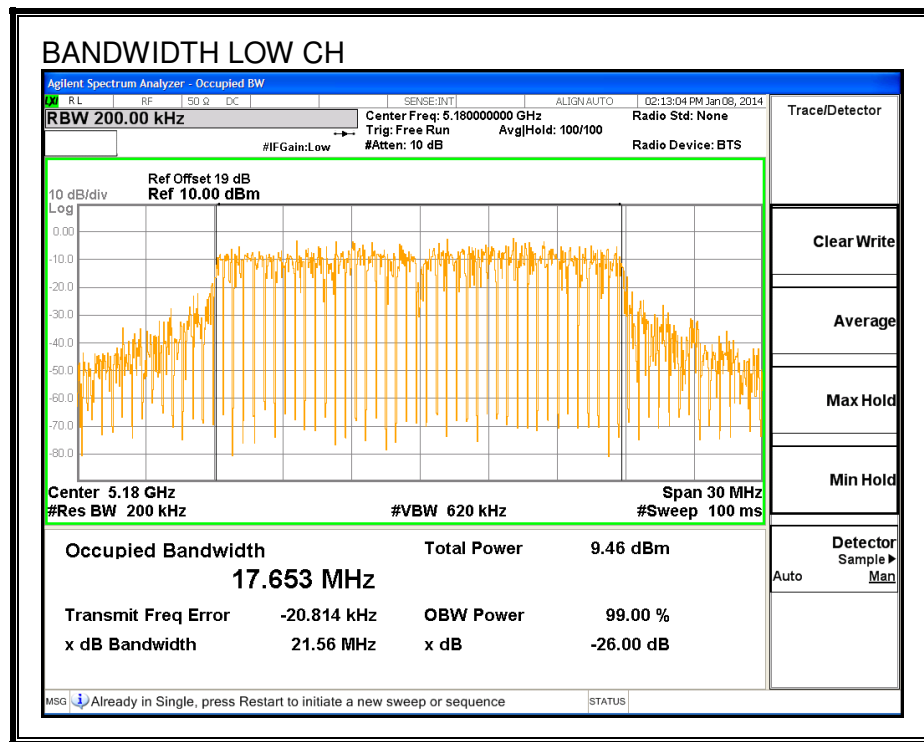
LIMITSs

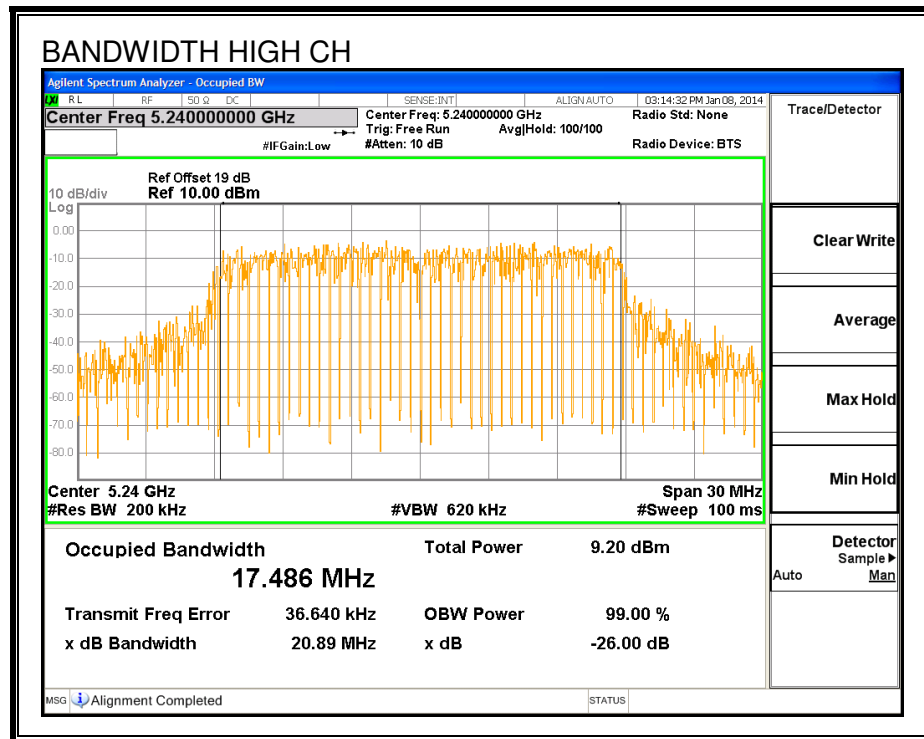
None; for reporting purposes only.

RESULTS

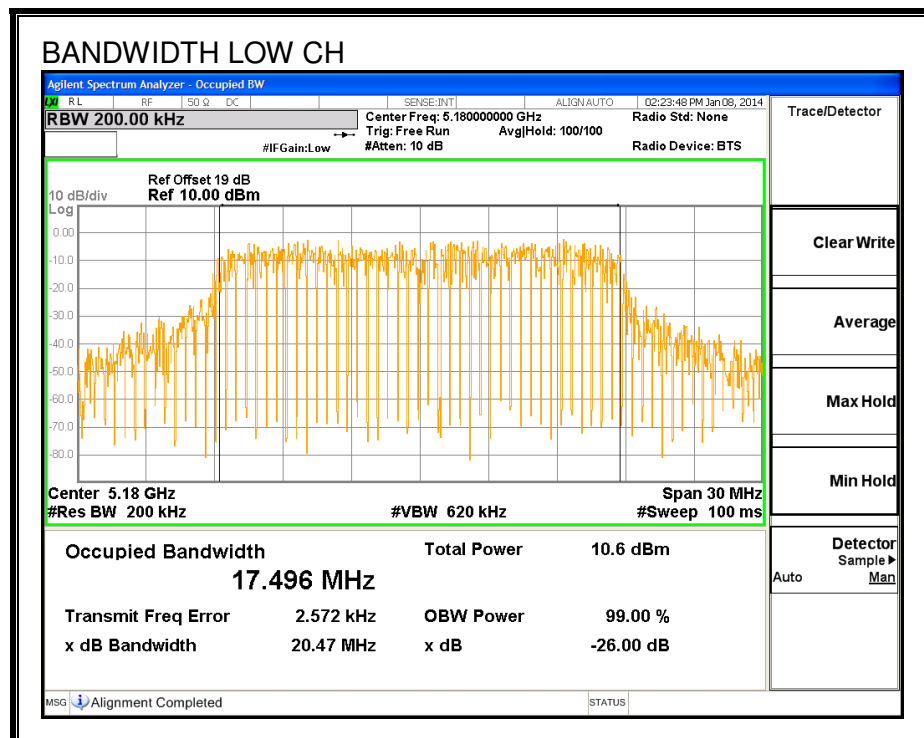
Channel	Frequency (MHz)	99% Bandwidth		
		CH0	CH1	CH2
Low	5180	17.653	17.496	17.566
Mid	5200	17.674	17.559	17.545
High	5240	17.486	17.559	17.666

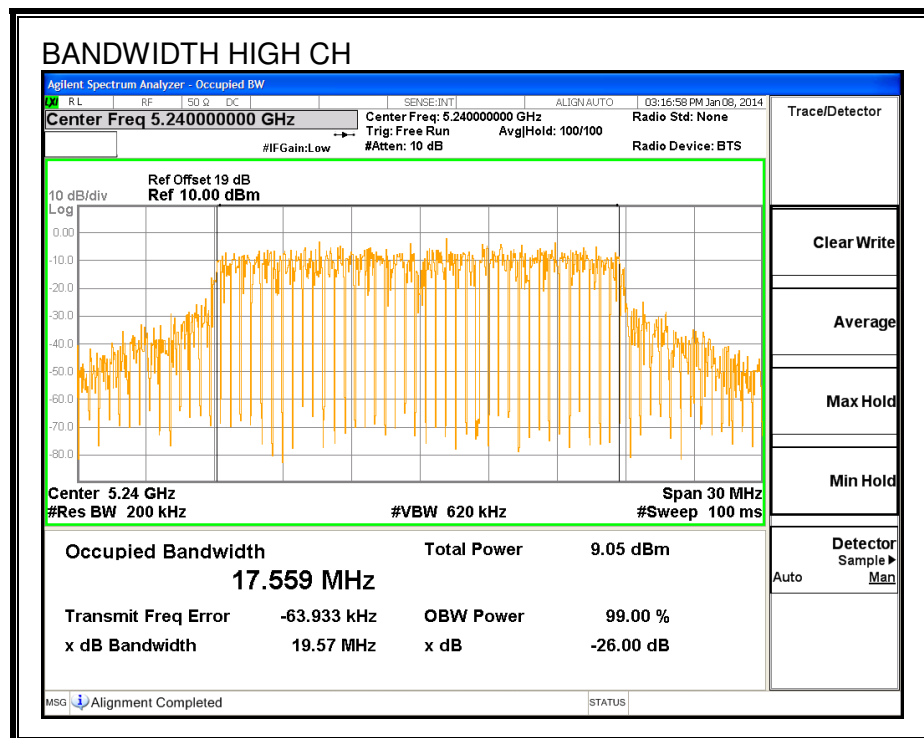
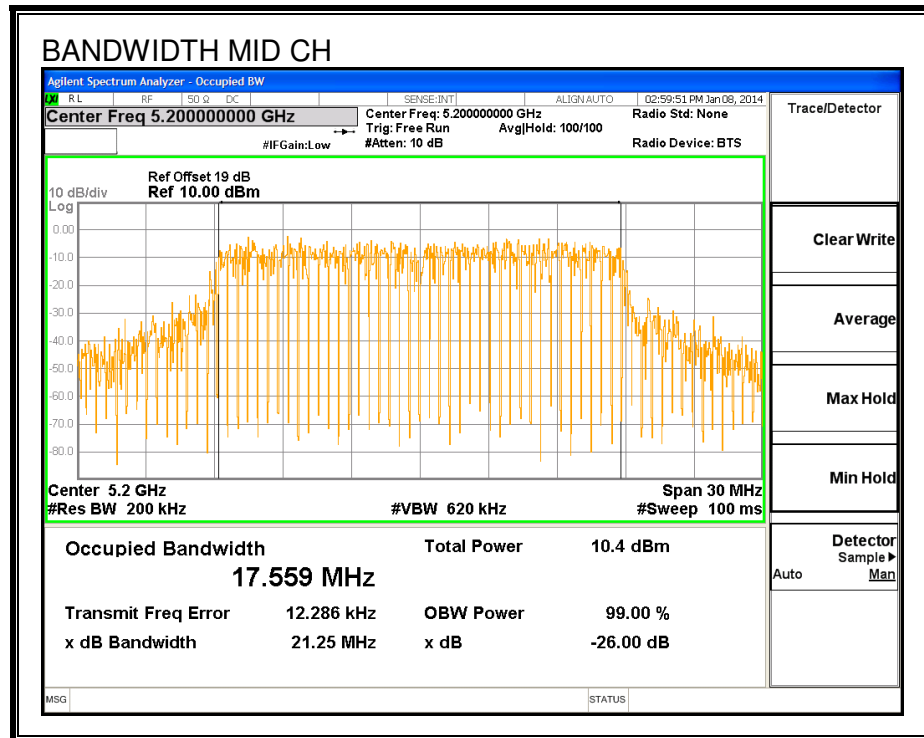
99% BANDWIDTH CHO



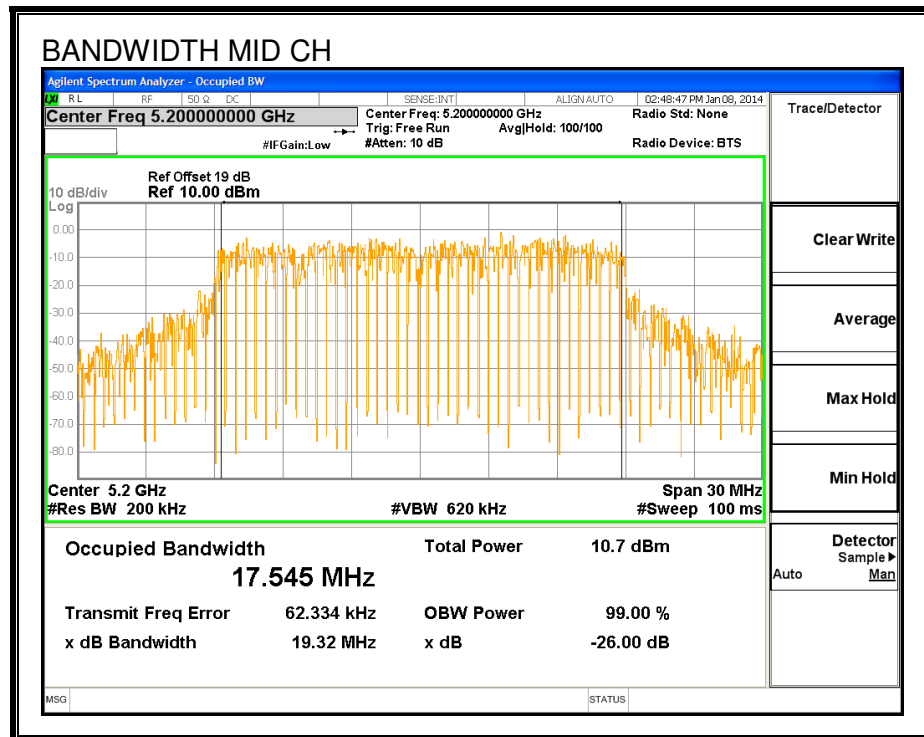
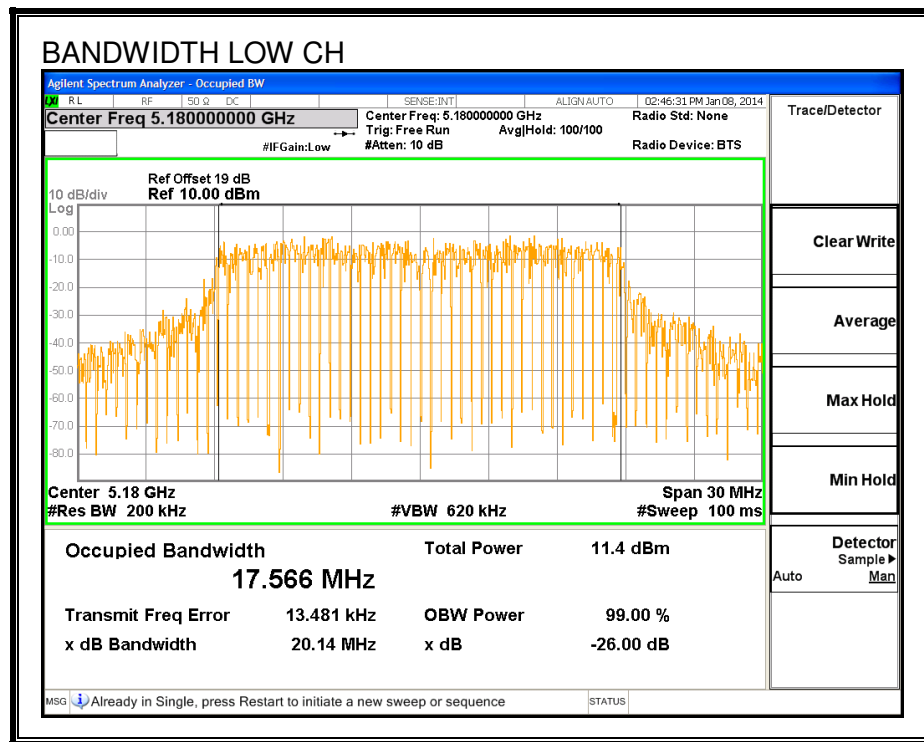


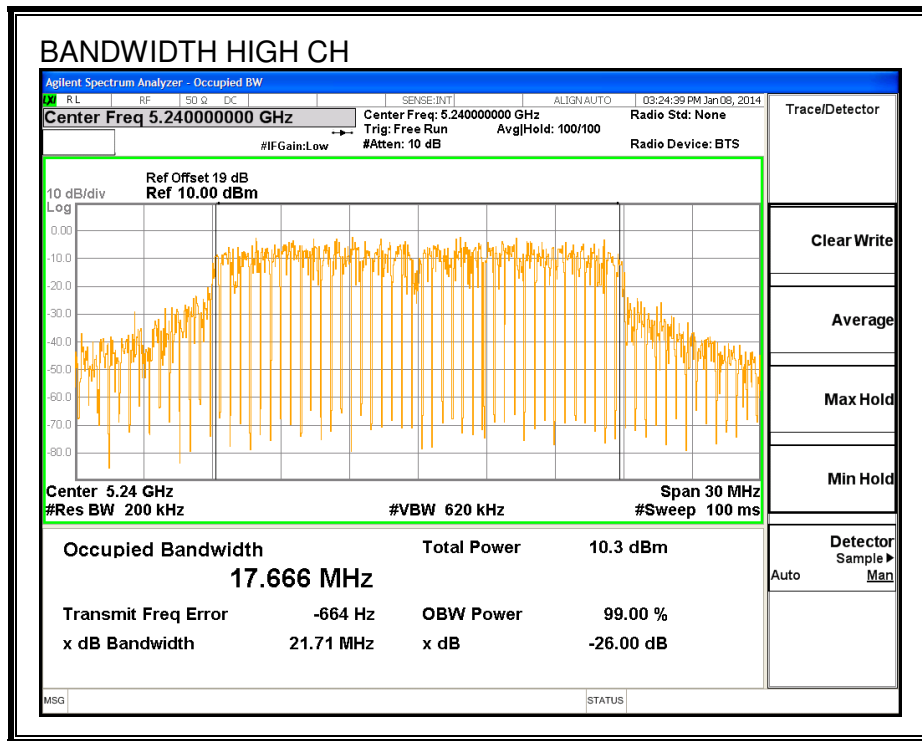
99% BANDWIDTH CH1





99% BANDWIDTH CH2





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 12.1 dB (including 10 dB pad and 2.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Power Settin	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5180	9	8.75	8.96	10.50	14.25
Mid	5200	9	9.04	8.84	10.42	14.26
High	5240	9	9.53	8.61	10.82	14.52

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 $4 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 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 $10 + 10 \log_{10} B$, 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. For output power, the directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
1.60	1.90	1.20	1.58

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
1.60	1.90	1.20	6.34

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	22.89	17.4960	1.58	6.34
Mid	5200	23.07	17.5450	1.58	6.34
High	5240	23.09	17.4860	1.58	6.34

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	22.43	20.85	17.00	3.66	10.00	3.66
Mid	5200	17.00	22.44	20.86	17.00	3.66	10.00	3.66
High	5240	17.00	22.43	20.85	17.00	3.66	10.00	3.66

Duty Cycle CF (dB)	0.55	Included in Calculations of Corr'd Power & PPSD
--------------------	------	---

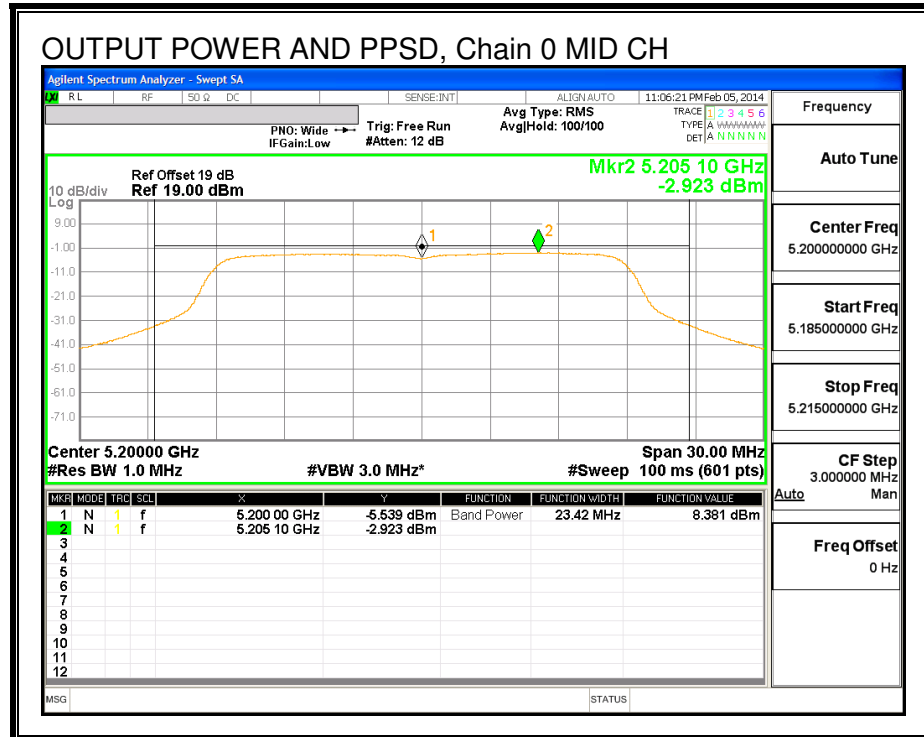
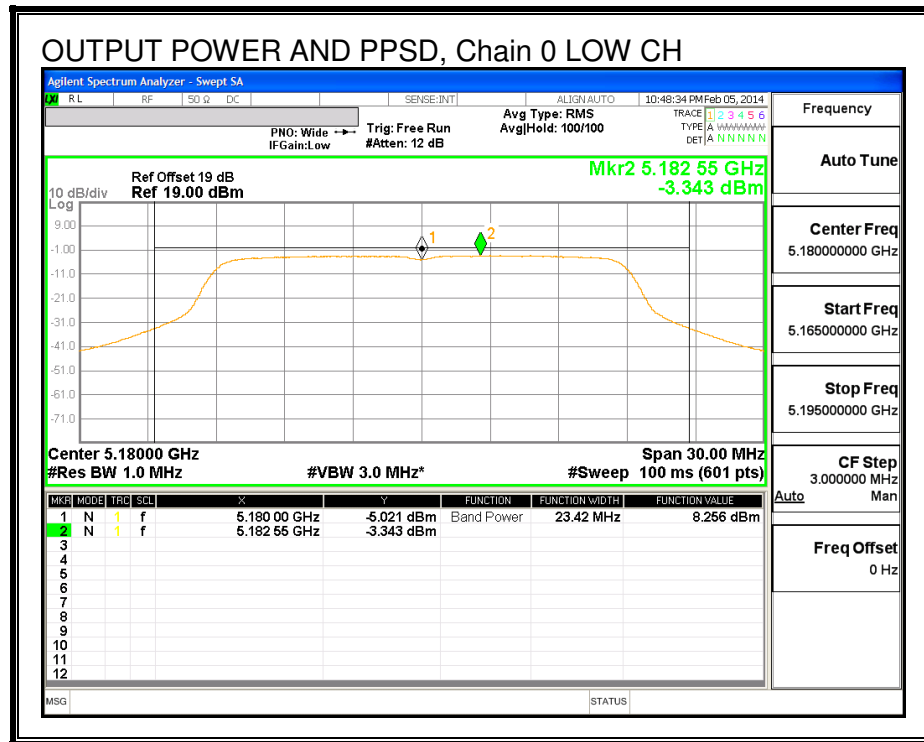
Output Power Results

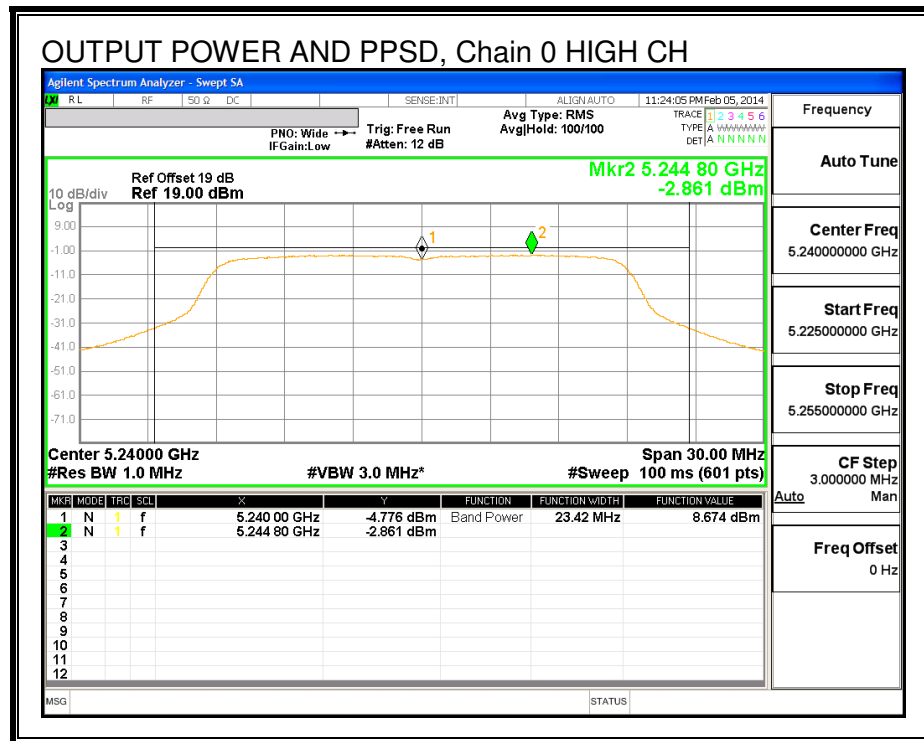
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	8.26	8.42	9.97	14.28	17.00	-2.72
Mid	5200	8.38	8.22	9.84	14.20	17.00	-2.80
High	5240	8.67	7.80	9.79	14.15	17.00	-2.85

PPSD Results

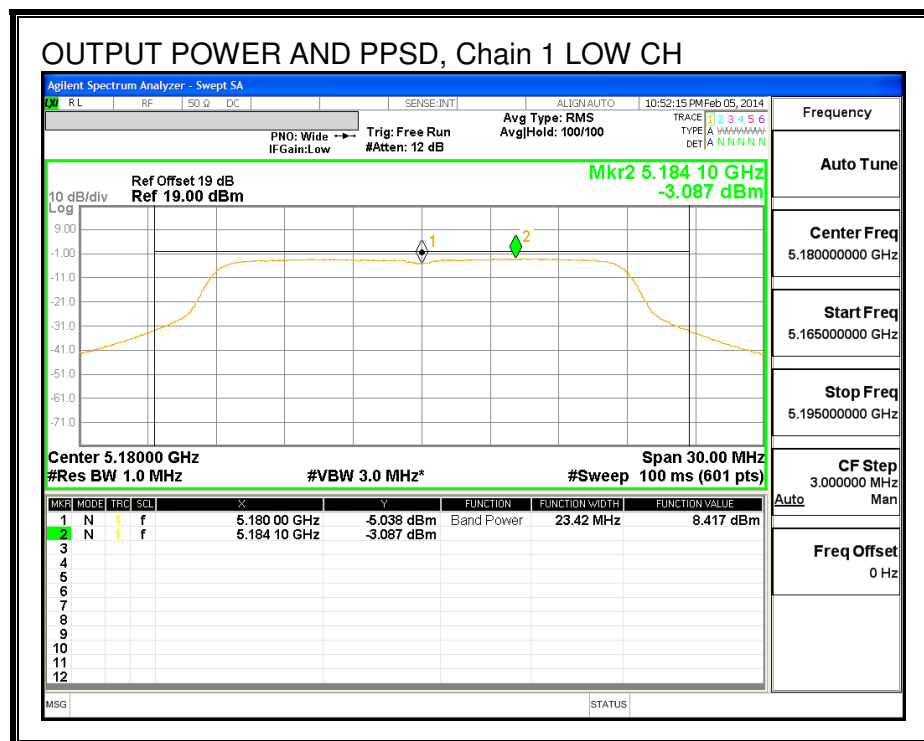
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-3.34	-3.09	-1.28	2.85	3.66	-0.81
Mid	5200	-2.92	-3.44	-1.32	2.86	3.66	-0.80
High	5240	-2.86	-3.65	-1.57	2.71	3.66	-0.95

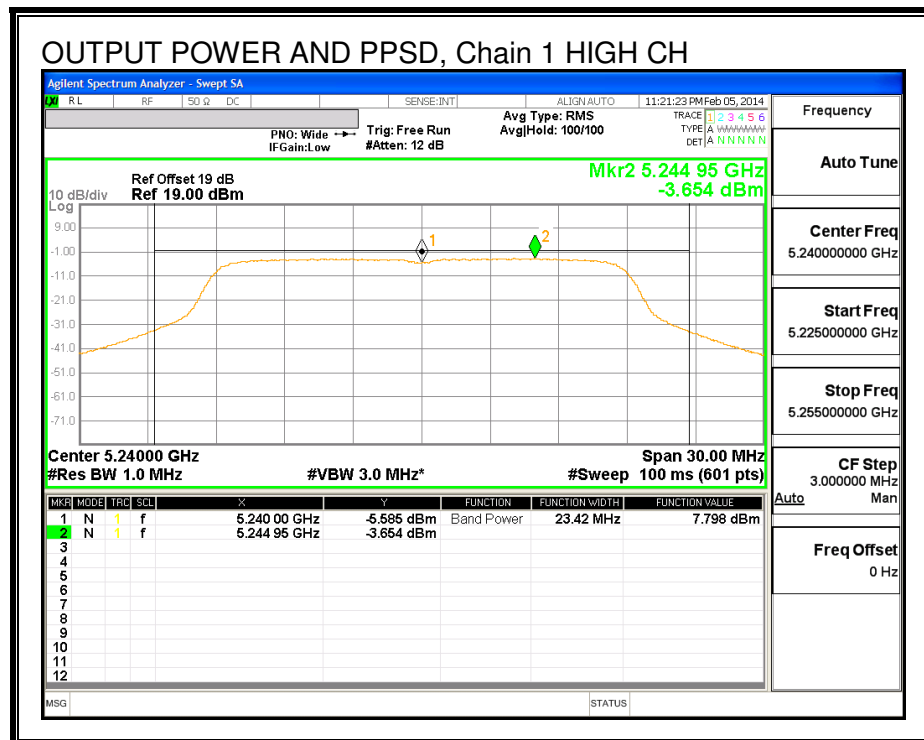
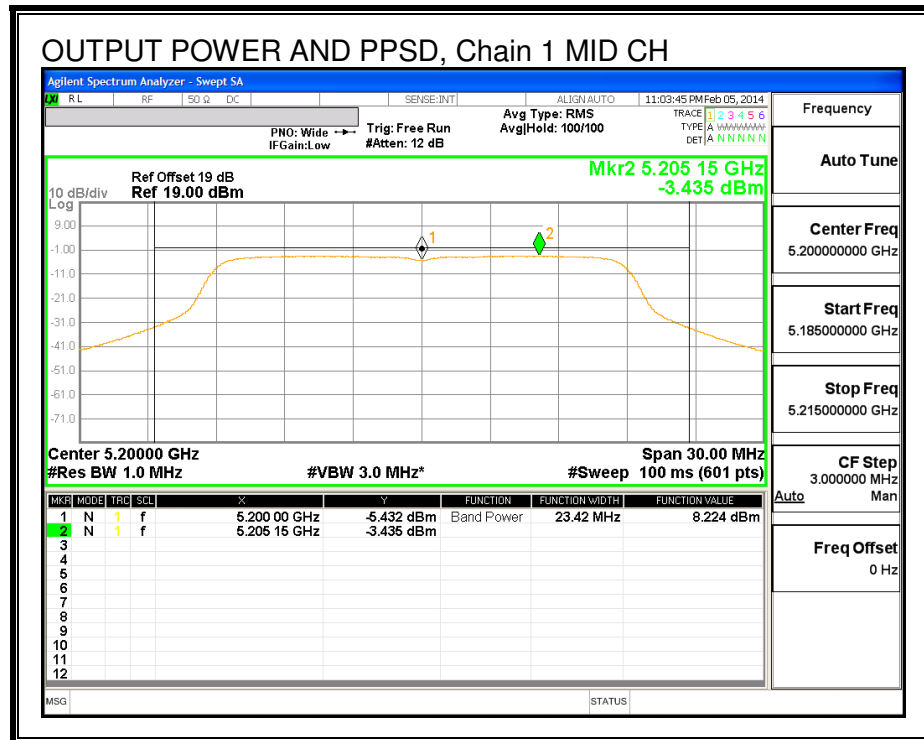
OUTPUT POWER AND PPSD, Chain 0



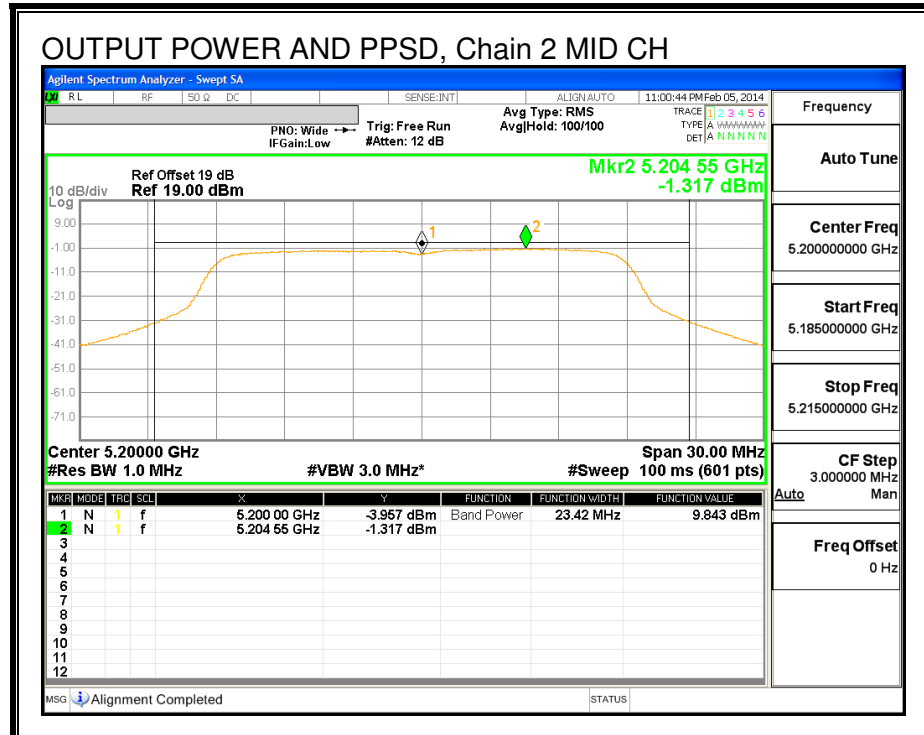
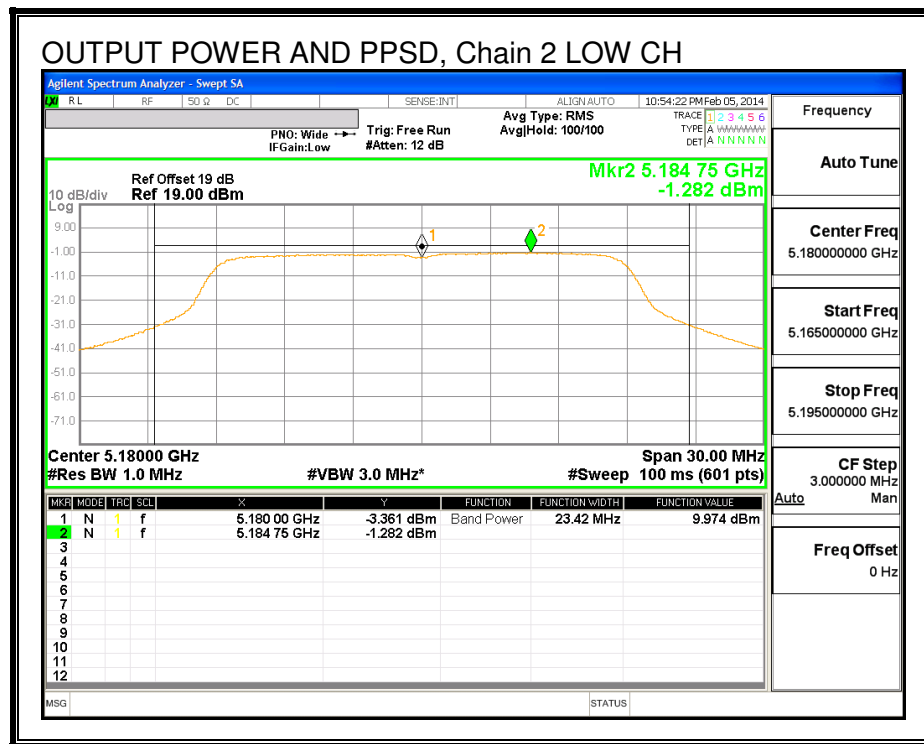


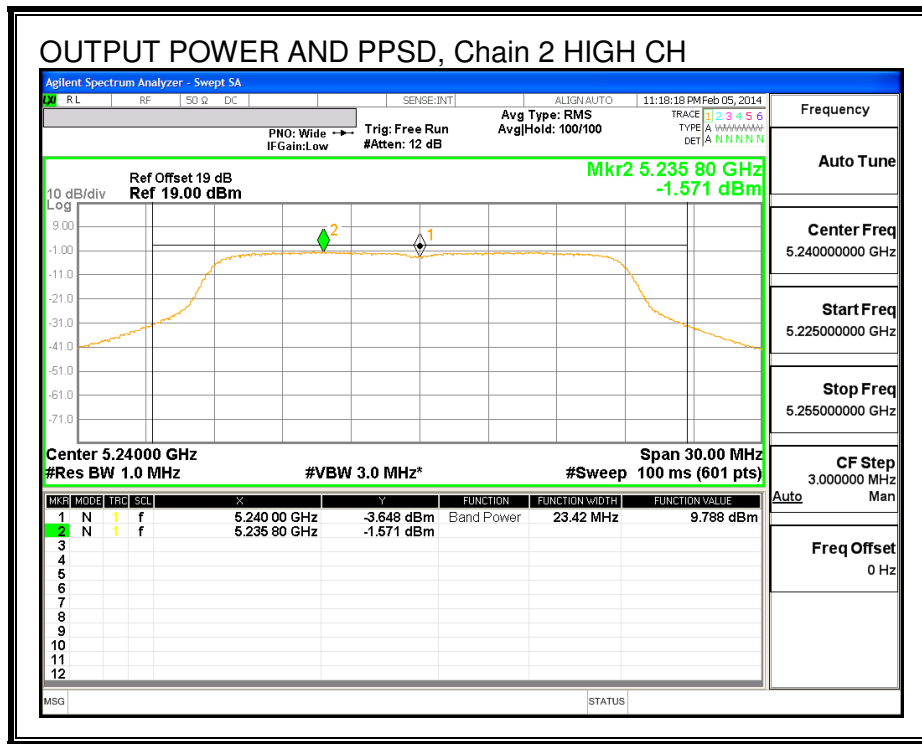
OUTPUT POWER AND PSD, Chain 1





OUTPUT POWER AND PPSD, Chain 2





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	6.56	-2.92	0.58	8.90	13	-4.10

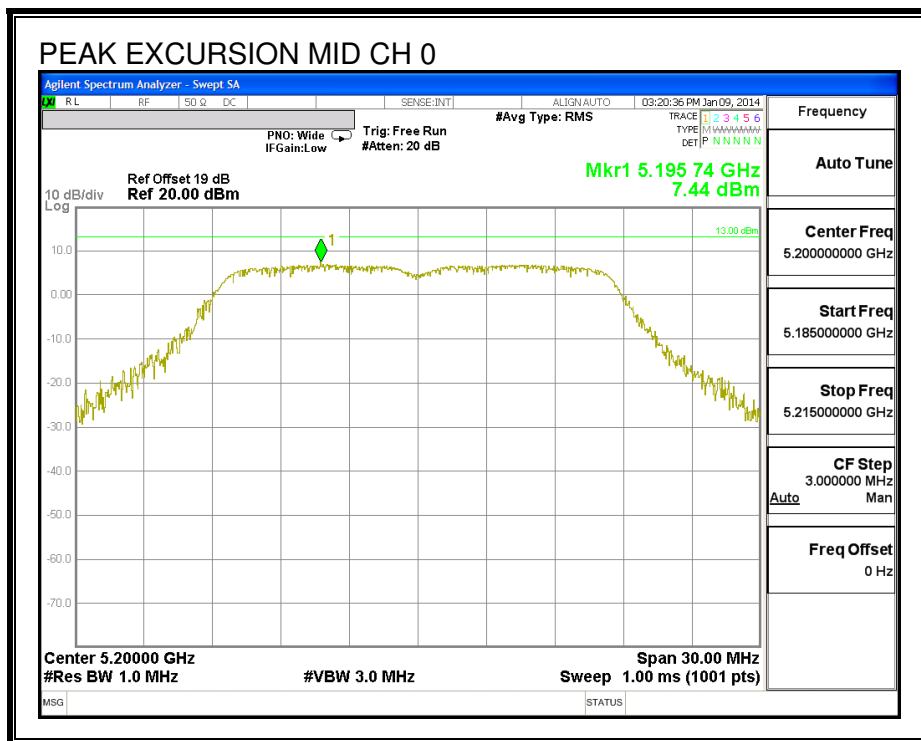
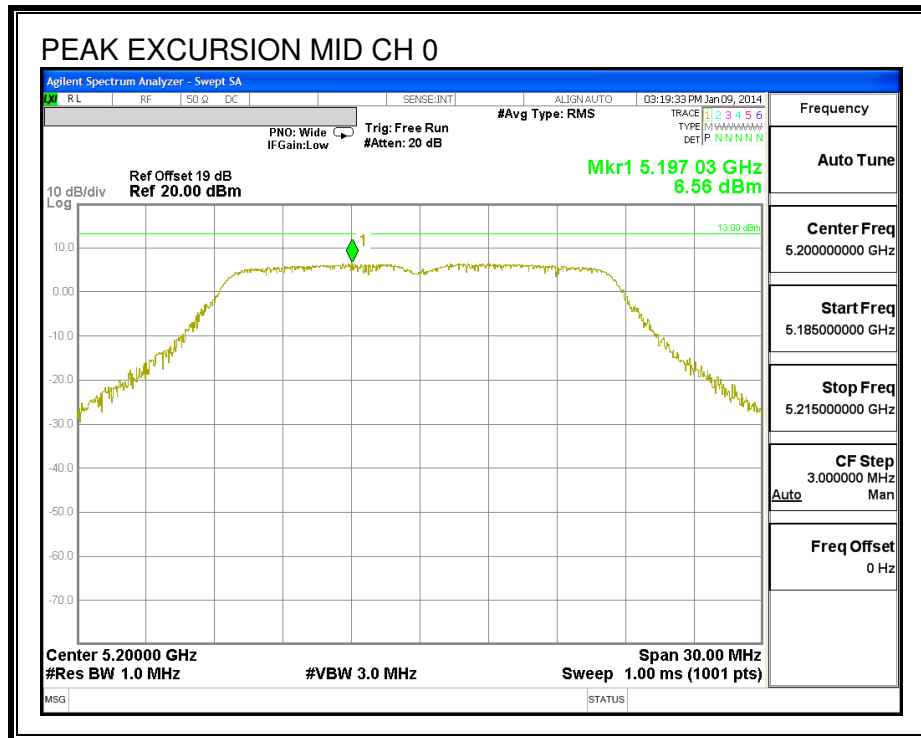
Chain 1

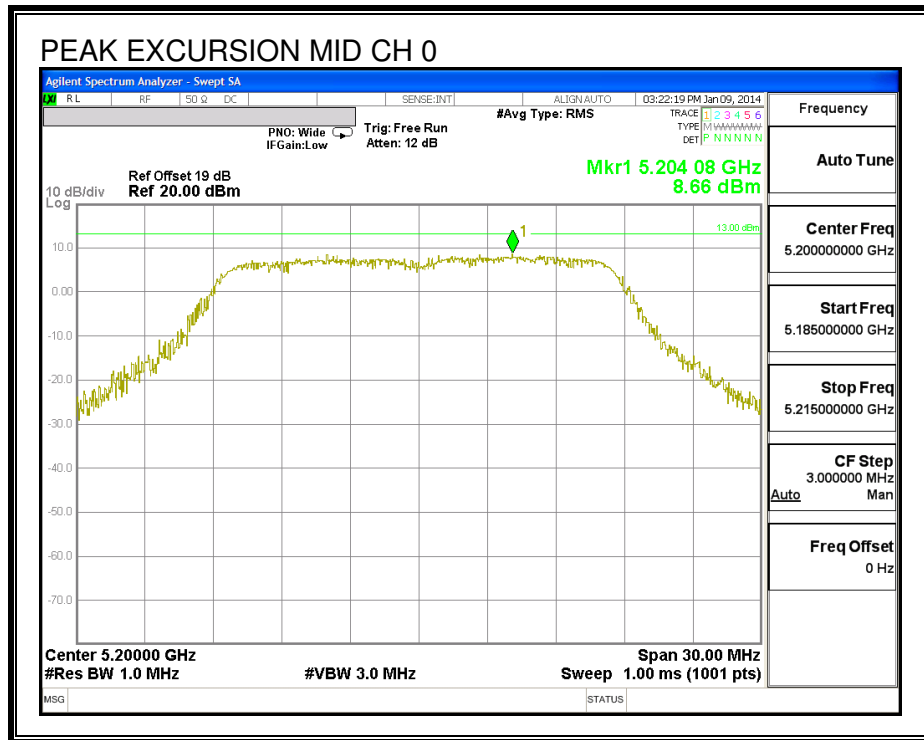
Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	7.44	-3.44	0.58	10.30	13	-2.70

Chain 2

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	8.66	-2.92	0.58	11.00	13	-2.00

PEAK EXCURSION





8.2. 802.11n HT20 MODE IN THE 5.3 GHz BAND

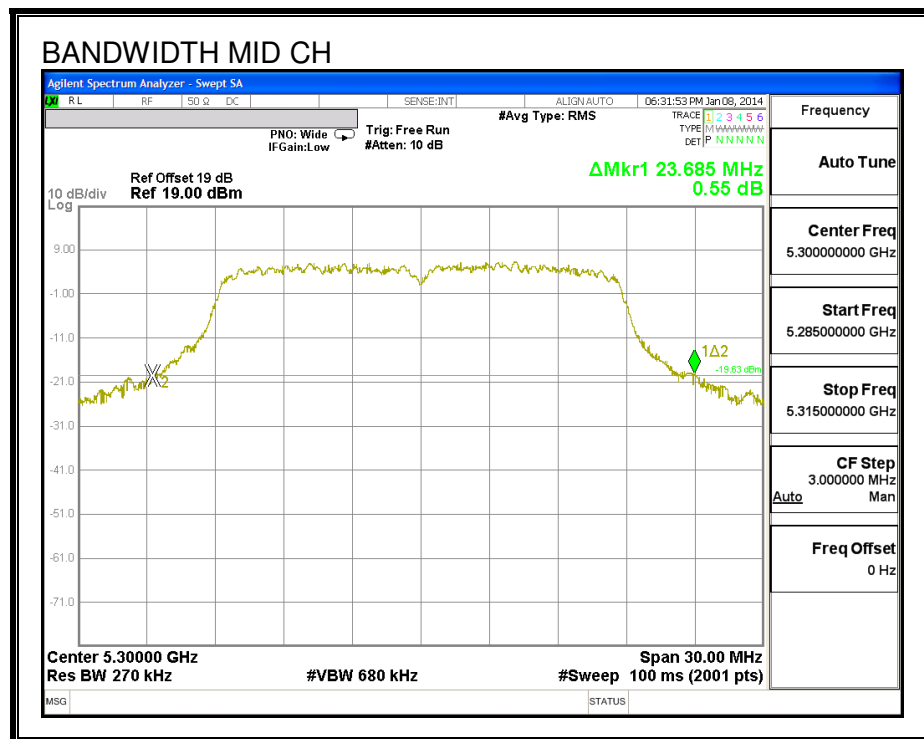
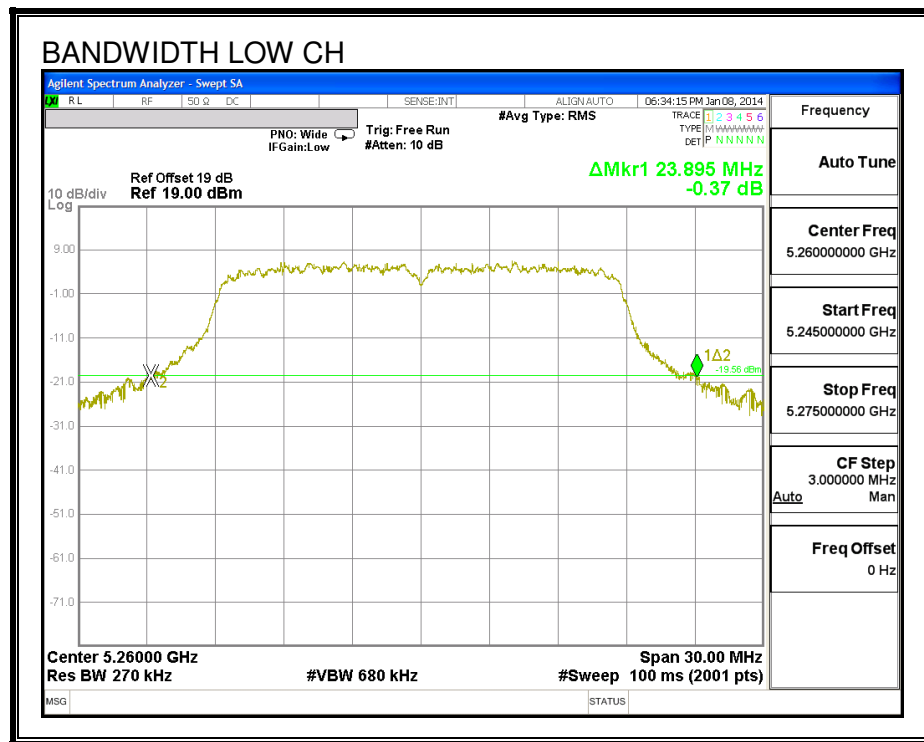
8.2.1. 26 dB BANDWIDTH

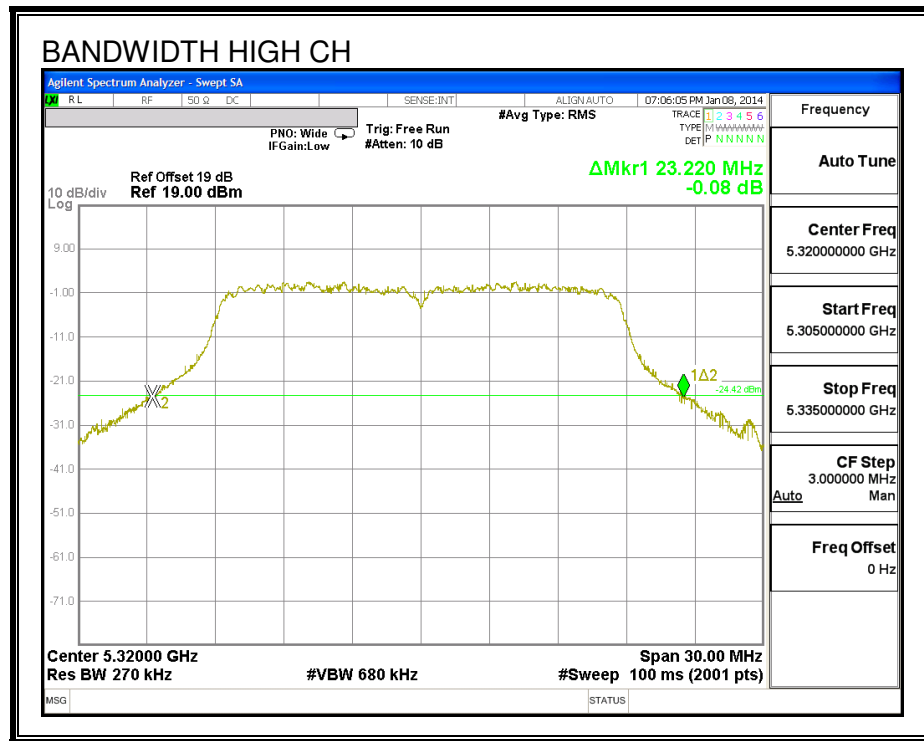
LIMITS

None; for reporting purposes only.

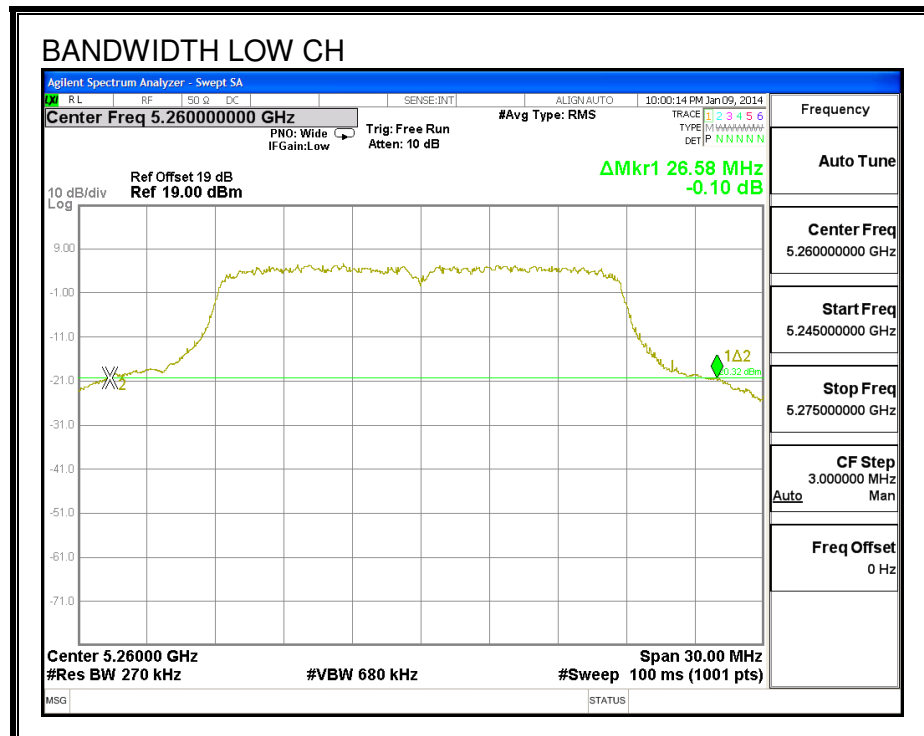
RESULTS

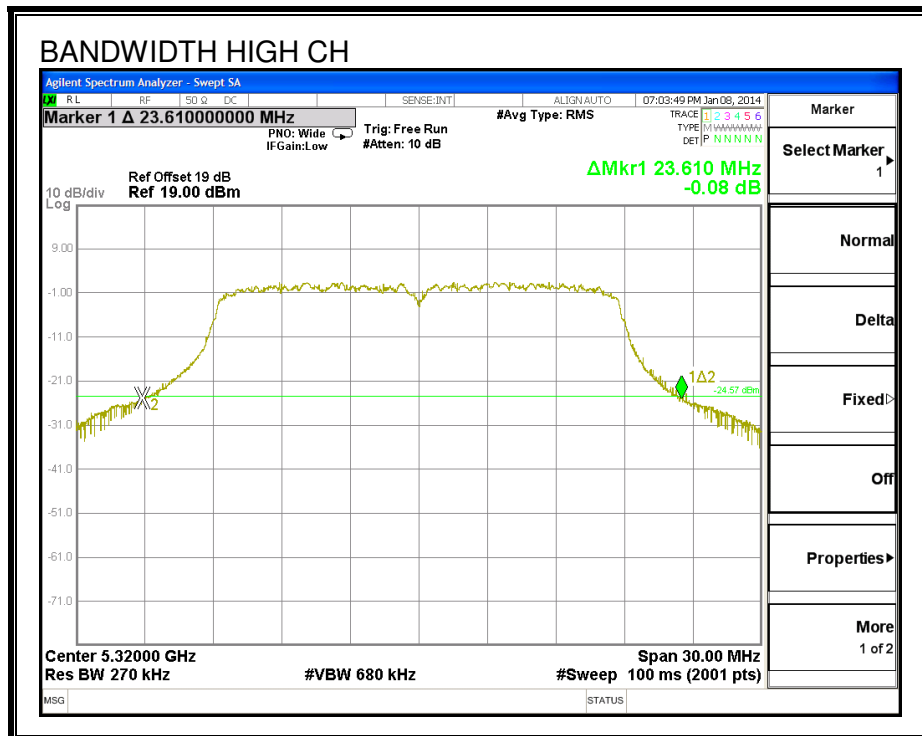
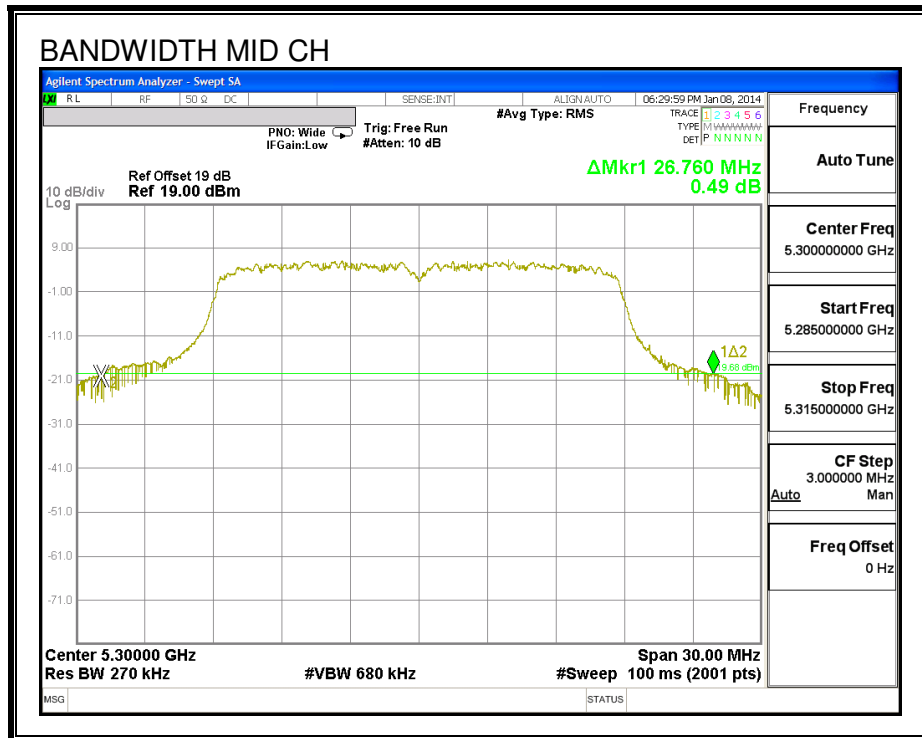
Channel	Frequency (MHz)	26 dB Bandwidth		
		CH0	CH1	CH2
Low	5260	23.895	26.580	23.370
Mid	5300	23.685	26.760	23.475
High	5320	23.220	23.610	23.475



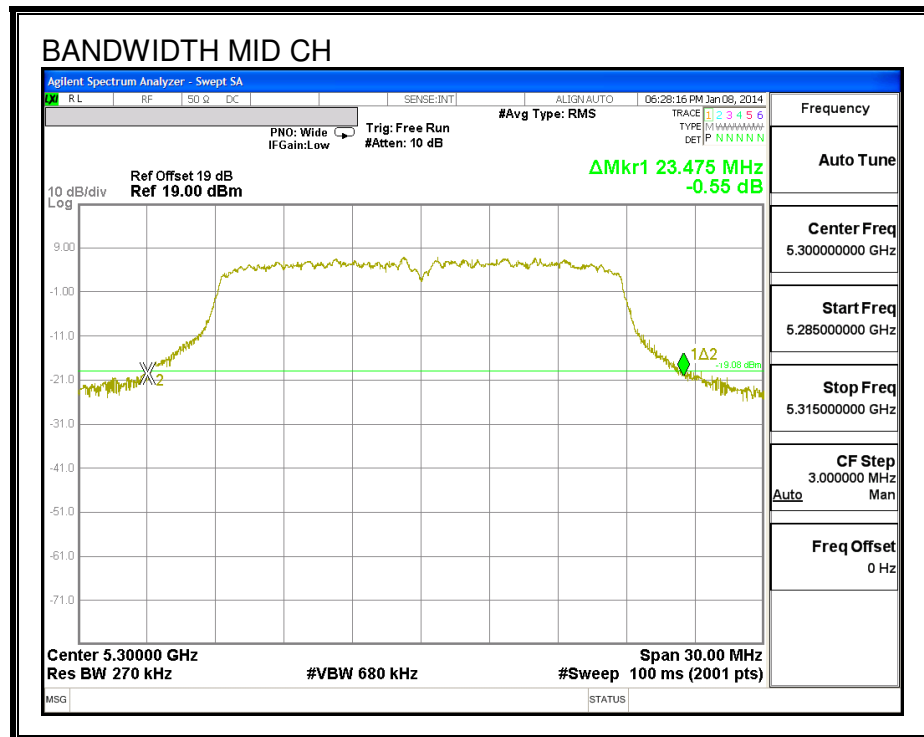
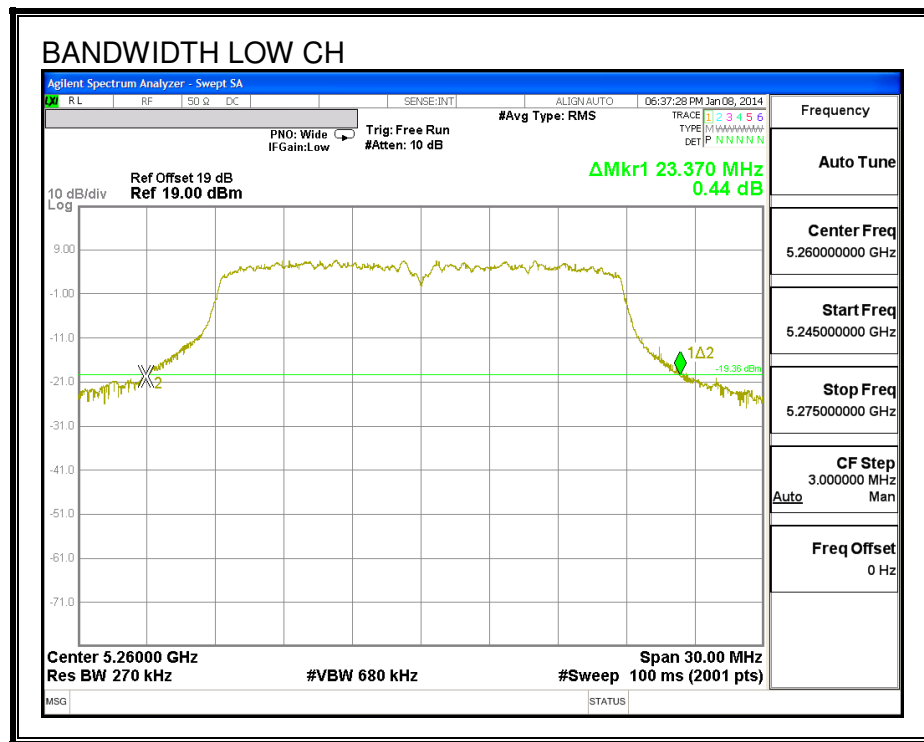


26 dB BANDWIDTH CH1





26 dB BANDWIDTH CH2





8.2.2. 99% BANDWIDTH

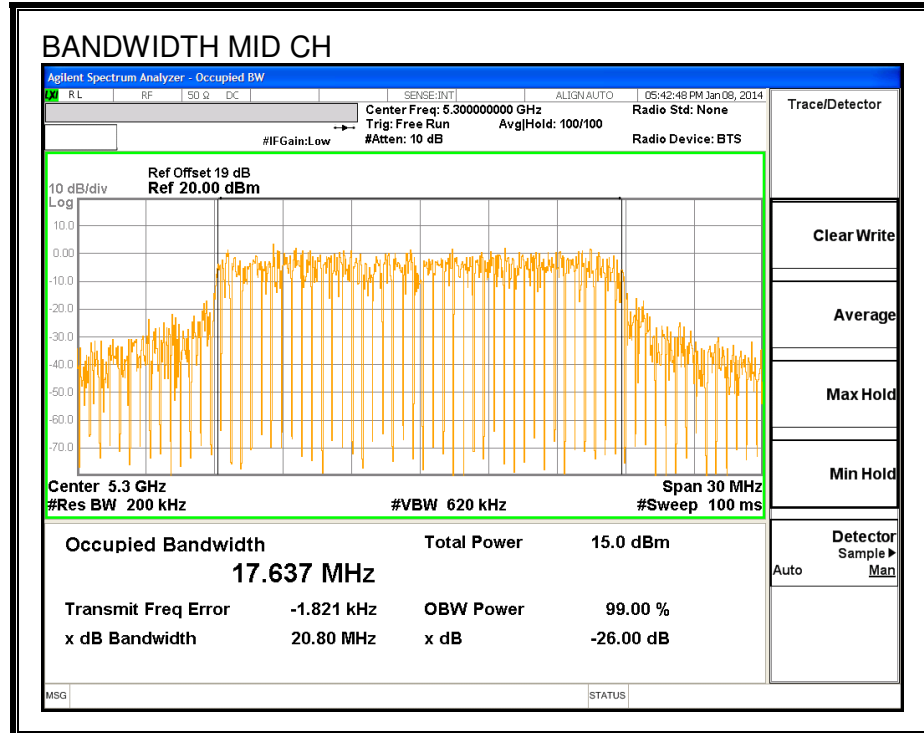
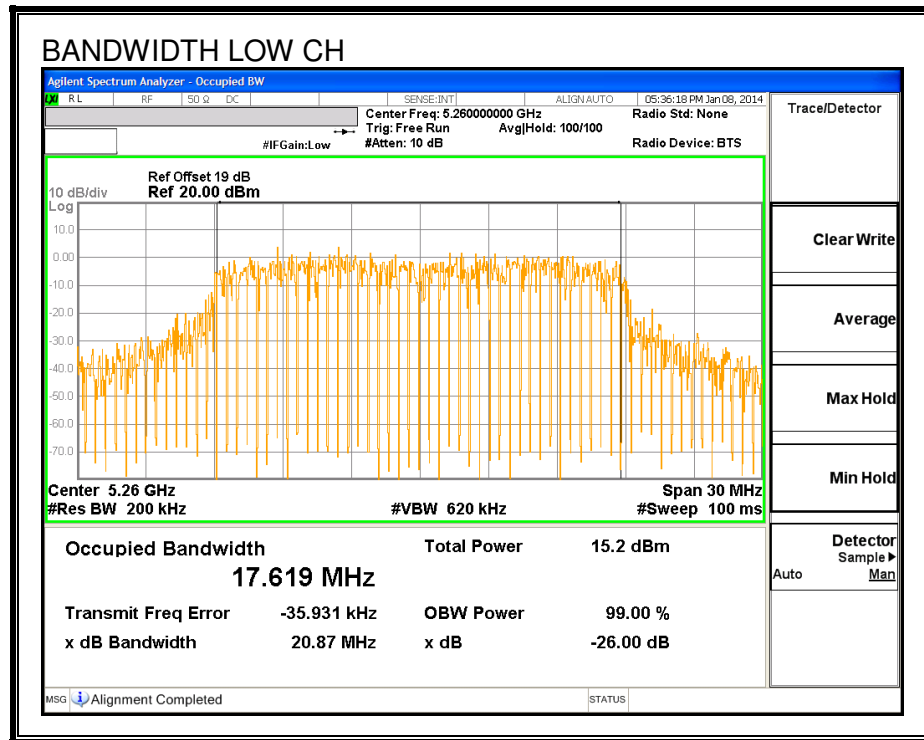
LIMITSs

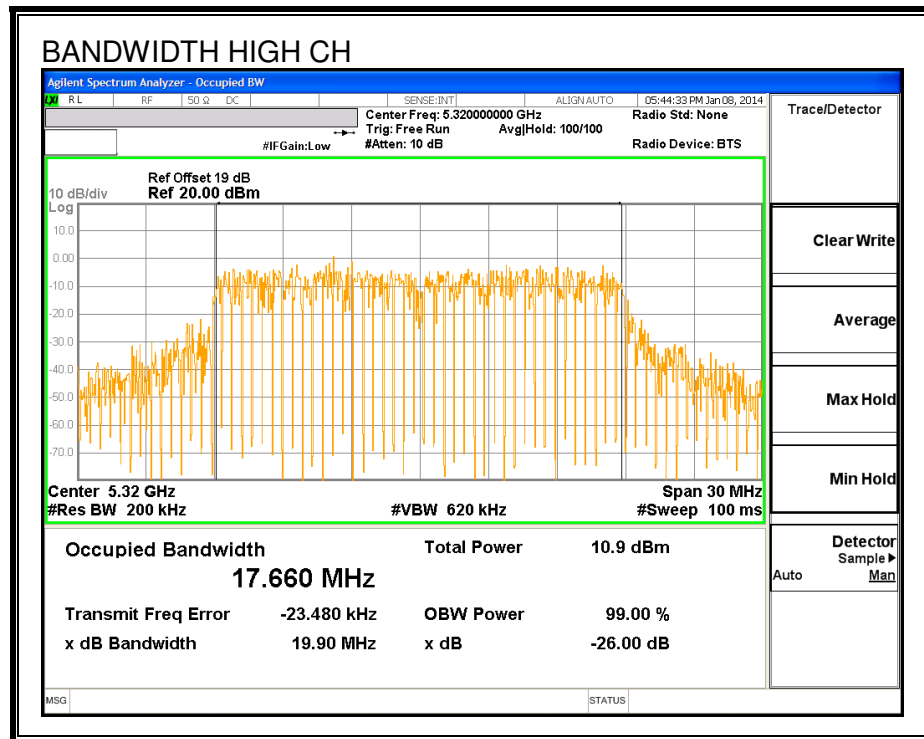
None; for reporting purposes only.

RESULTS

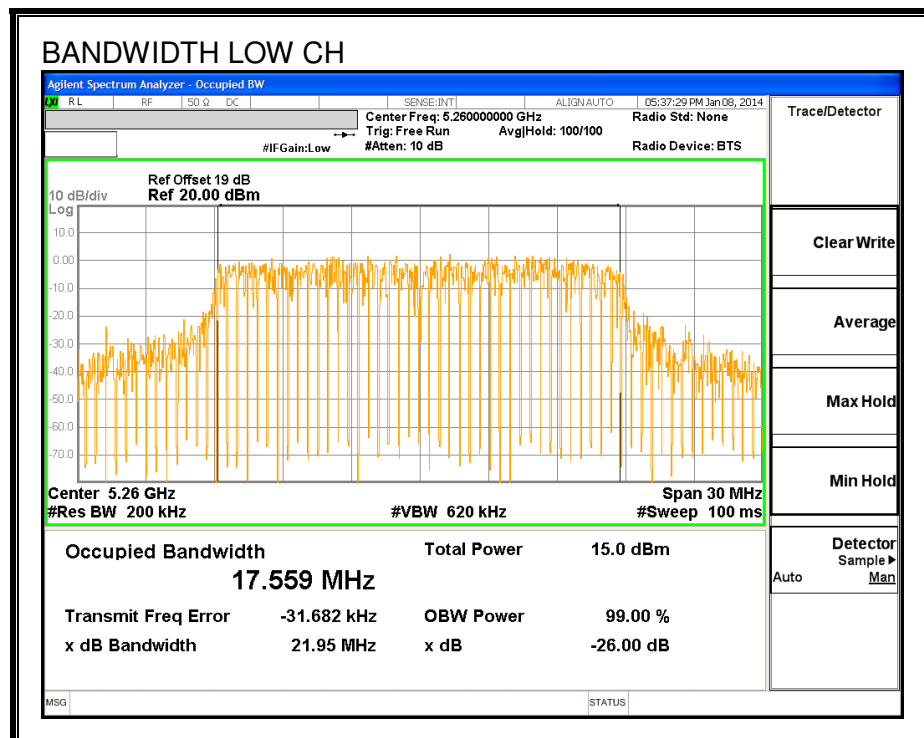
Channel	Frequency (MHz)	99% Bandwidth		
		CH0	CH1	CH2
Low	5260	17.619	17.559	17.527
Mid	5300	17.637	17.666	17.630
High	5320	17.660	17.562	17.641

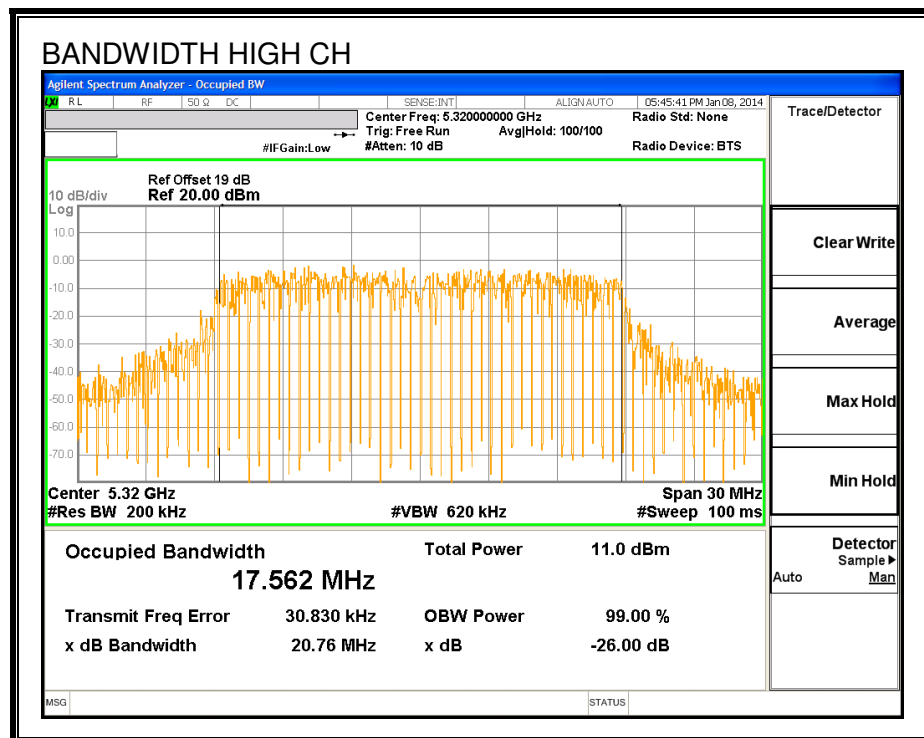
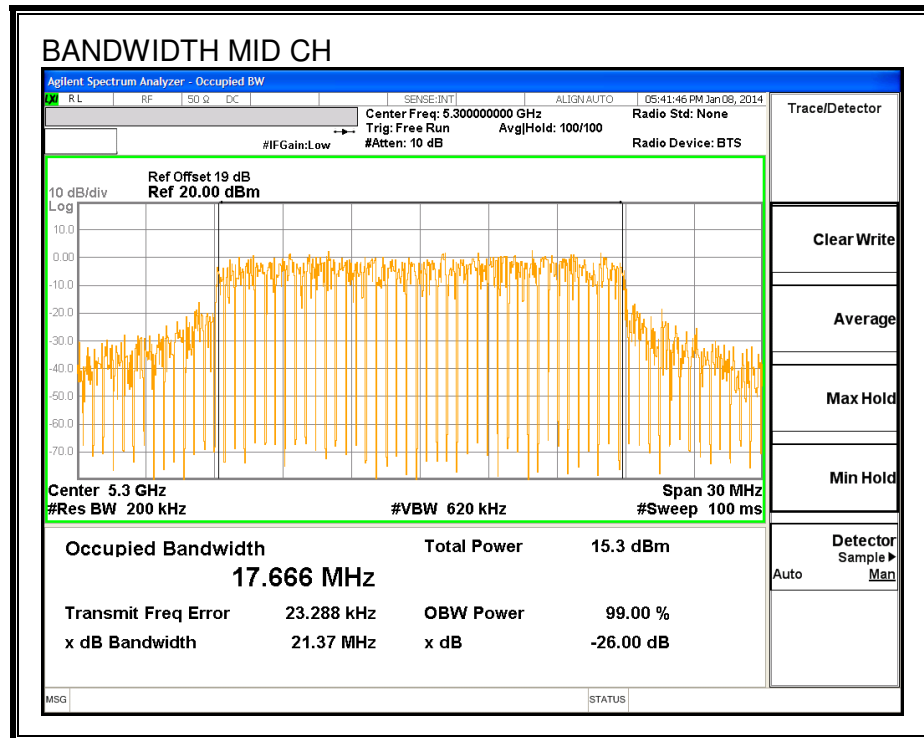
99% BANDWIDTH CHO



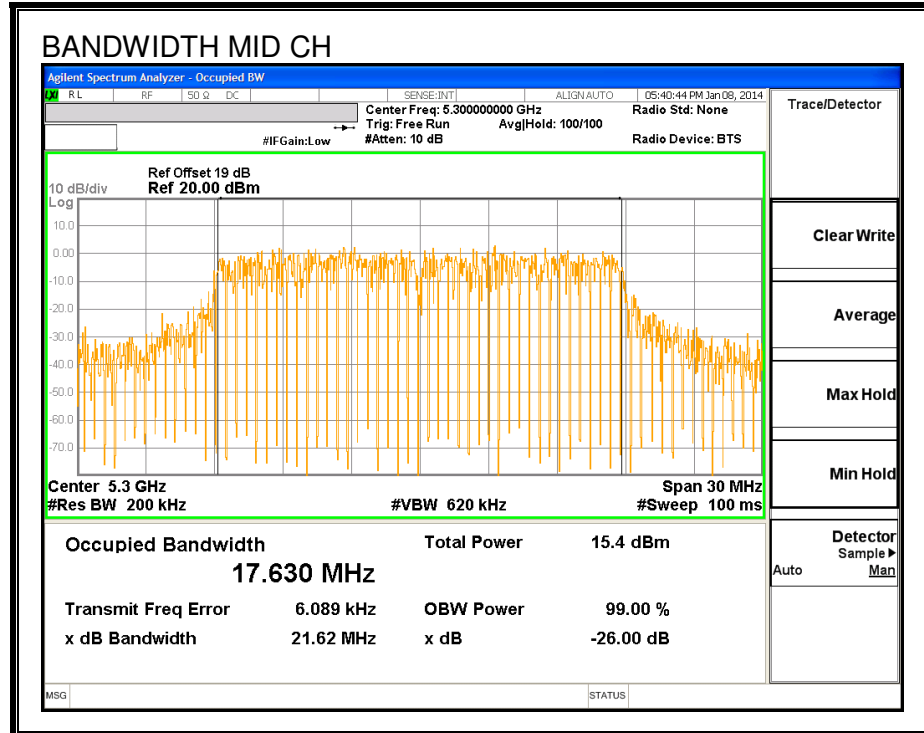
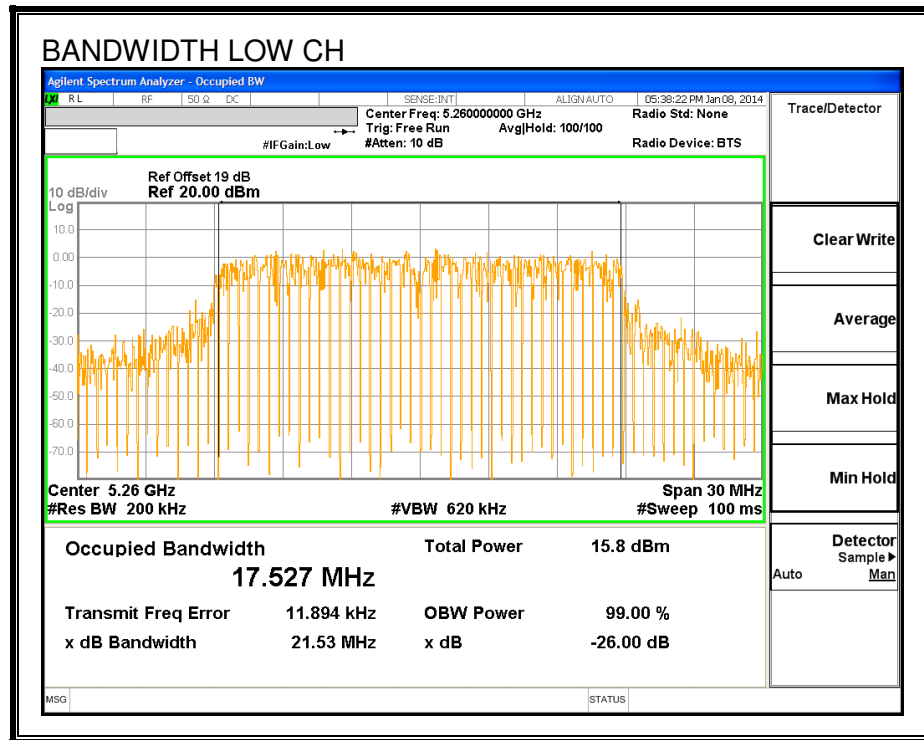


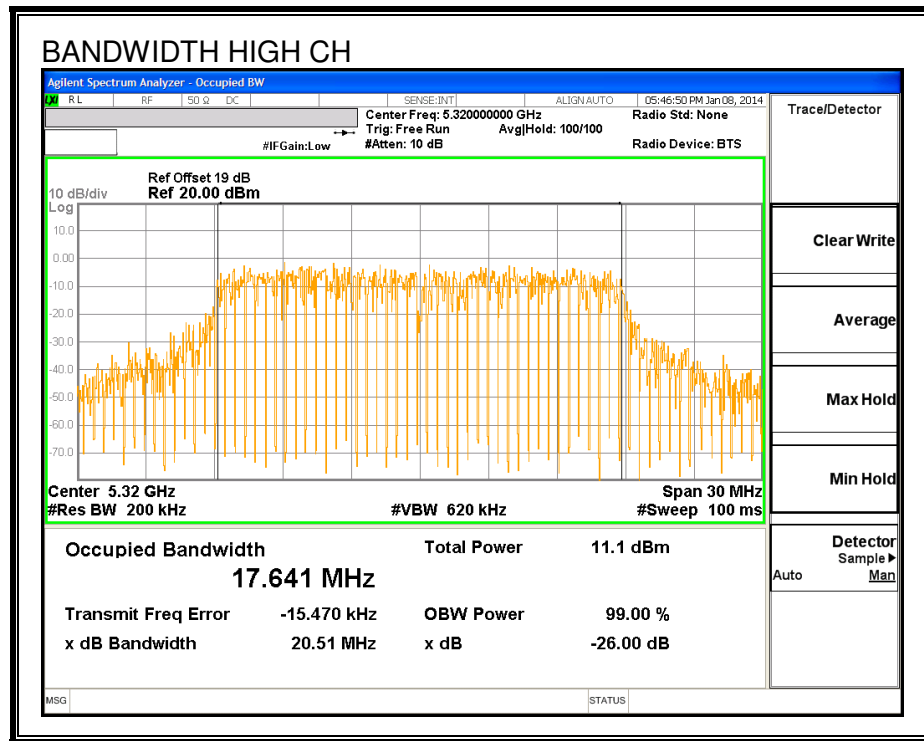
99% BANDWIDTH CH1





99% BANDWIDTH CH2





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 12.1 dB (including 10 dB pad and 2.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Power Setting	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5260	16.5	15.68	15.06	16.10	20.41
Mid	5300	16.5	15.82	15.86	16.35	20.79
High	5320	16.5	15.76	15.70	16.50	20.77

8.2.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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 $11 \text{ dBm} + 10 \log B$, 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:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
1.70	3.20	2.10	2.38

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
1.70	3.20	2.10	7.13

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	23.37	17.56	2.38	7.13
Mid	5300	23.48	17.63	2.38	7.13
High	5320	23.22	17.56	2.38	7.13

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	23.44	29.44	23.44	9.87	11.00	9.87
Mid	5300	24.00	23.46	29.46	23.46	9.87	11.00	9.87
High	5320	24.00	23.45	29.45	23.45	9.87	11.00	9.87

Duty Cycle CF (dB)	0.57	Included in Calculations of Corr'd Power & PPSD
--------------------	------	---

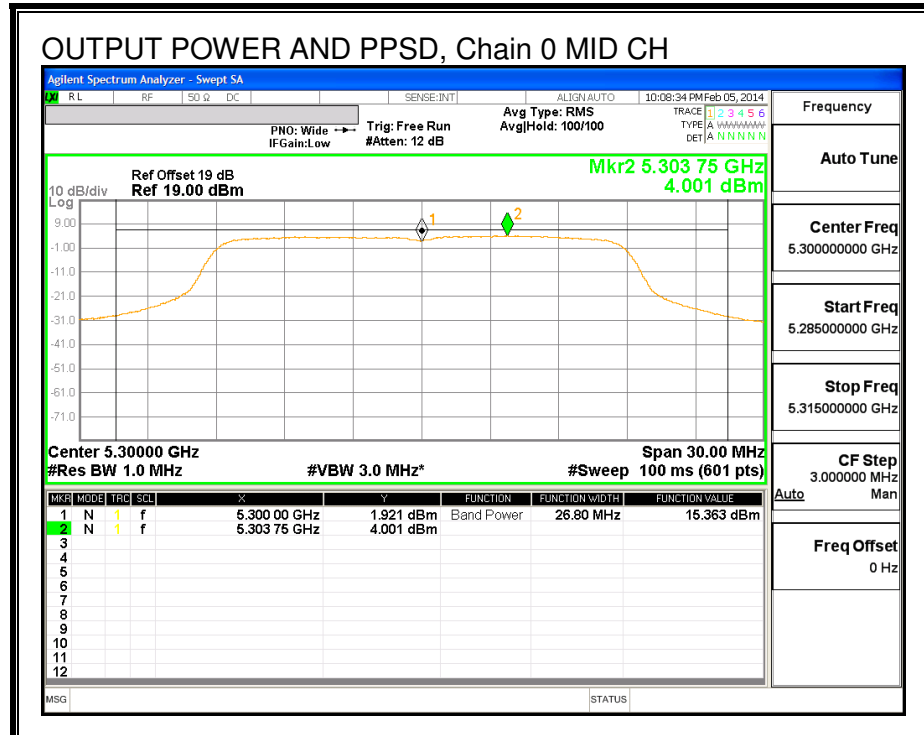
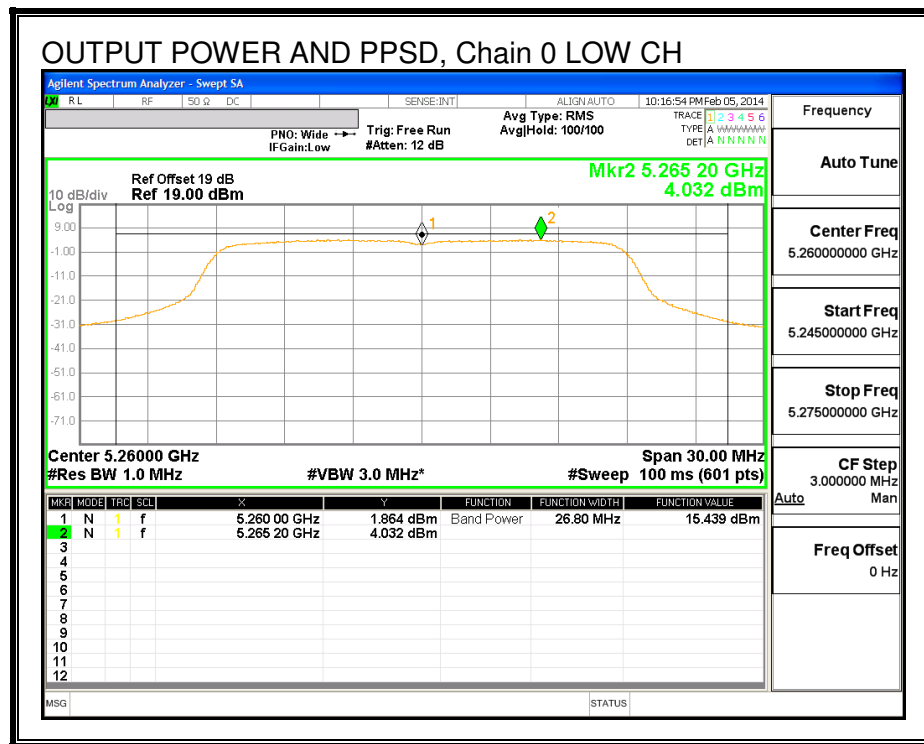
Output Power Results

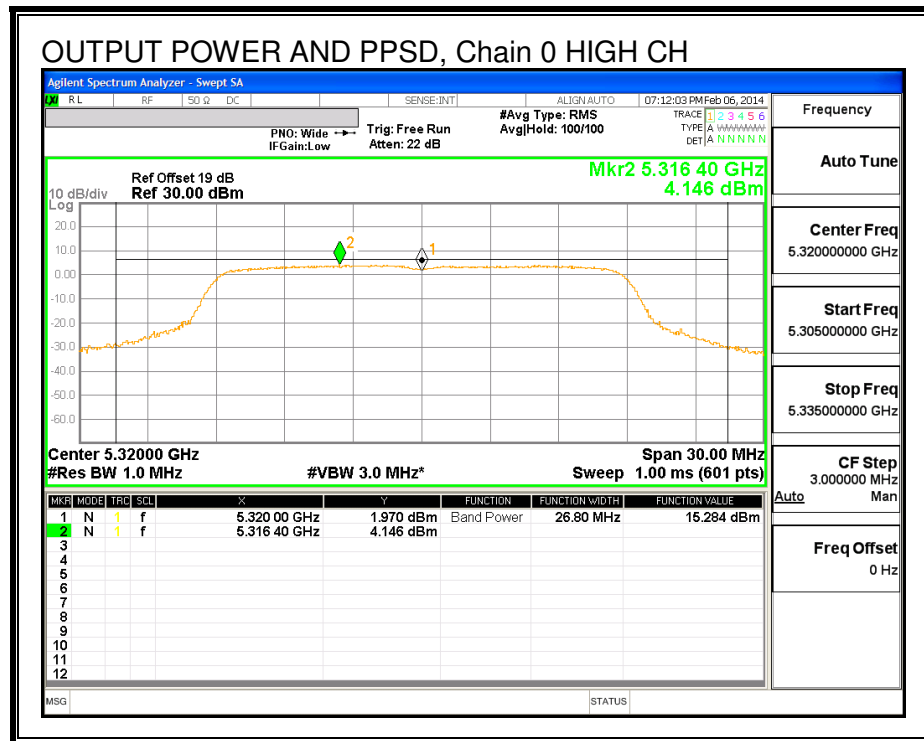
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	15.44	14.61	15.77	20.64	23.44	-2.81
Mid	5300	15.36	14.74	15.88	20.69	23.46	-2.77
High	5320	15.28	15.21	15.82	20.79	23.45	-2.66

PPSD Results

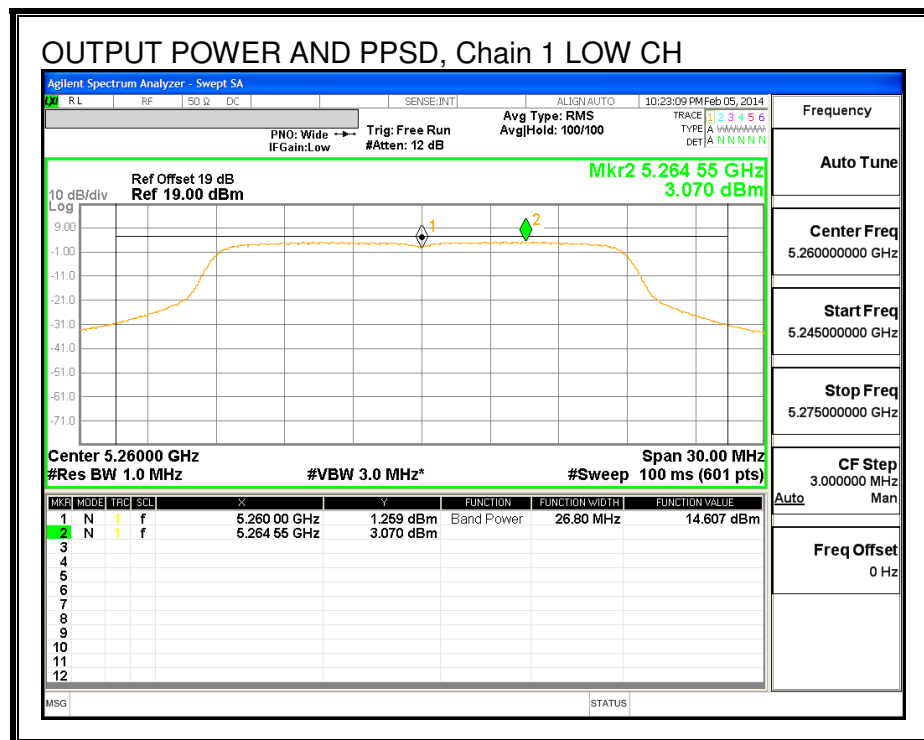
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	4.03	3.07	4.50	9.25	9.87	-0.62
Mid	5300	4.00	3.23	4.41	9.25	9.87	-0.62
High	5320	4.15	3.92	4.30	9.46	9.87	-0.41

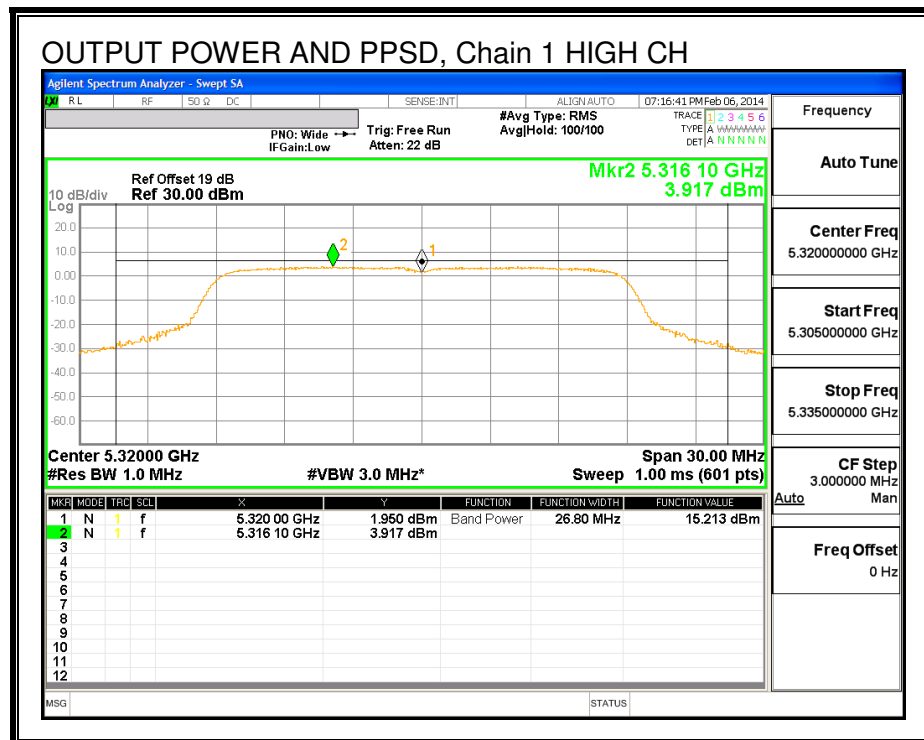
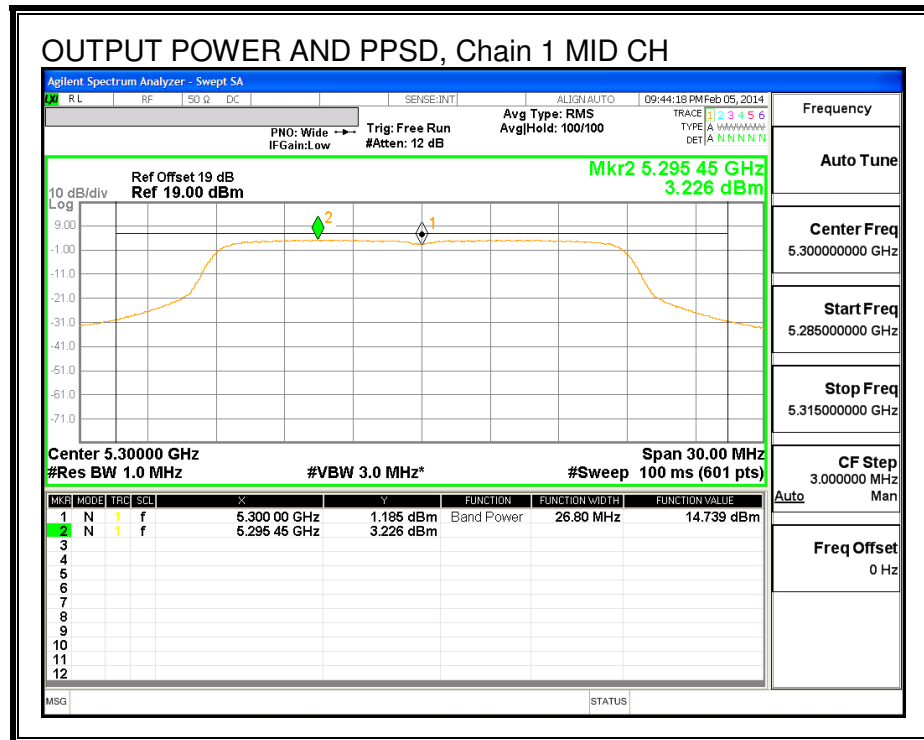
OUTPUT POWER AND PPSD, Chain 0



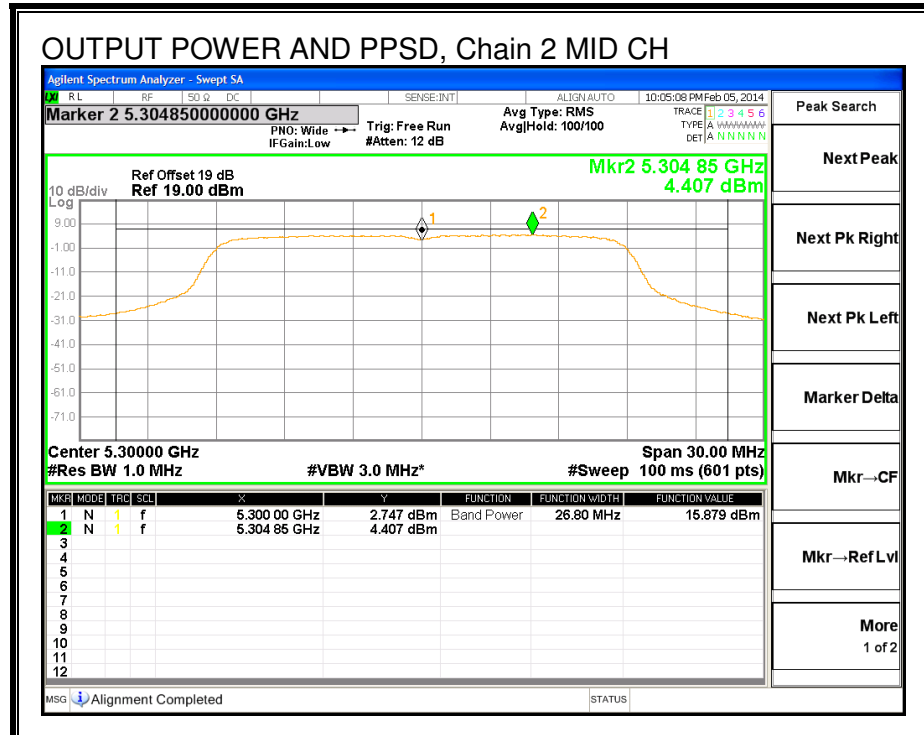
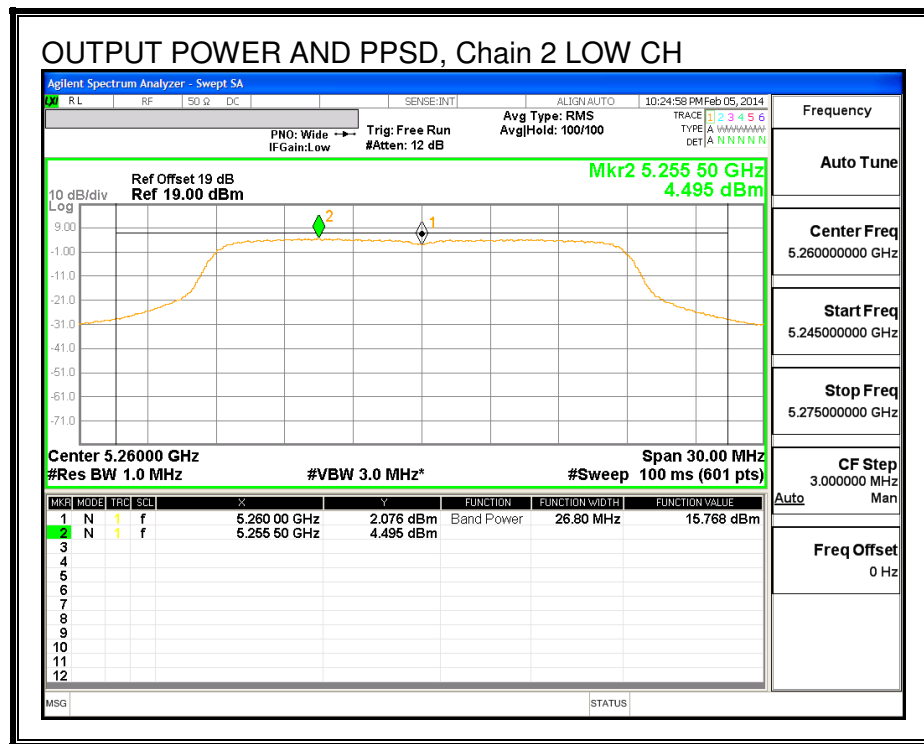


OUTPUT POWER AND PSD, Chain 1





OUTPUT POWER AND PPSP, Chain 2





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

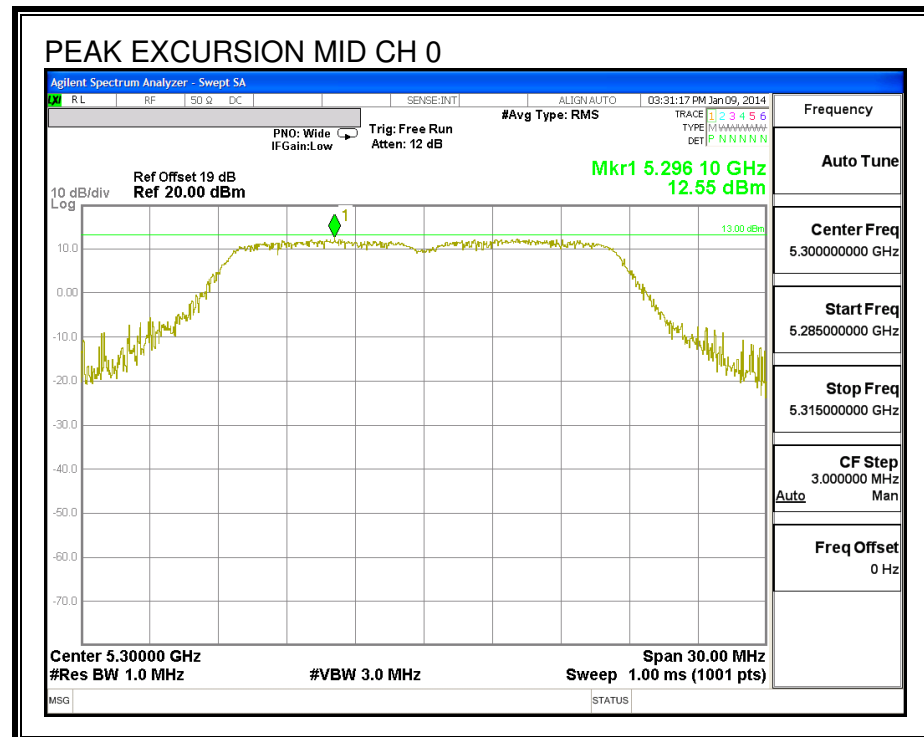
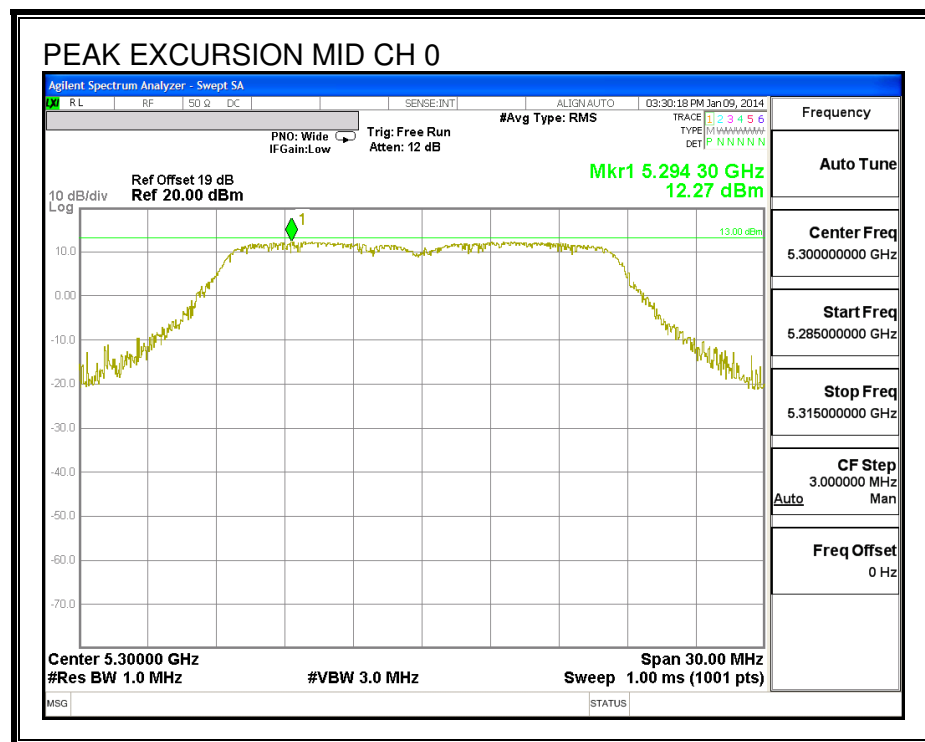
Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5300	12.27	3.07	0.58	8.62	13	-4.38

Chain 1

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5300	12.55	3.23	0.58	8.74	13	-4.26

Chain 2

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5300	12.61	3.92	0.58	8.11	13	-4.89





8.3. 802.11n HT20 MODE IN THE 5.6 GHz BAND

8.3.1. 26 dB BANDWIDTH

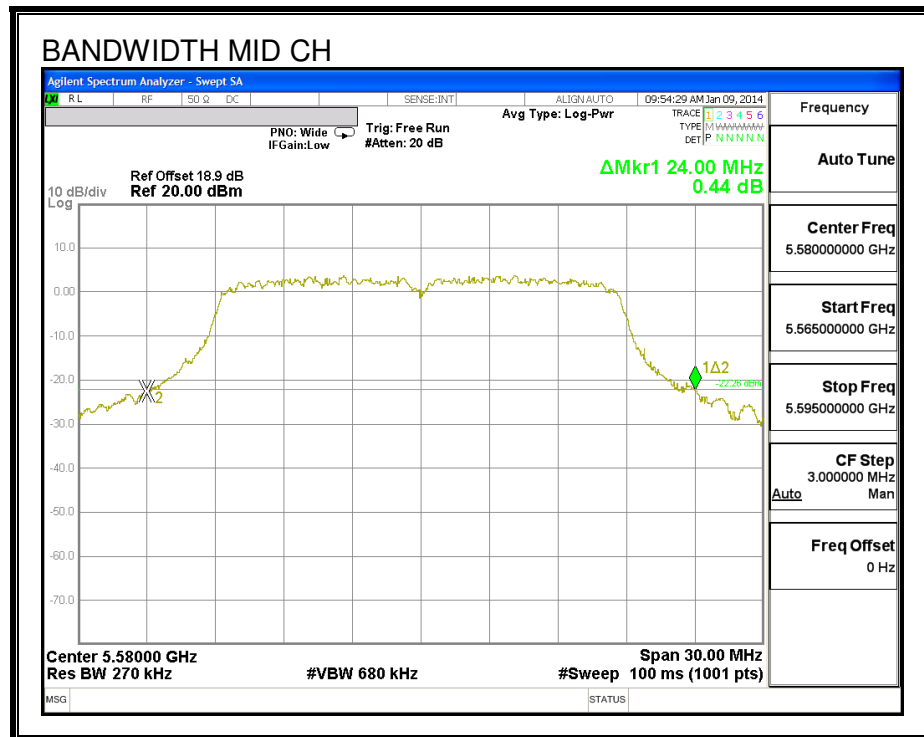
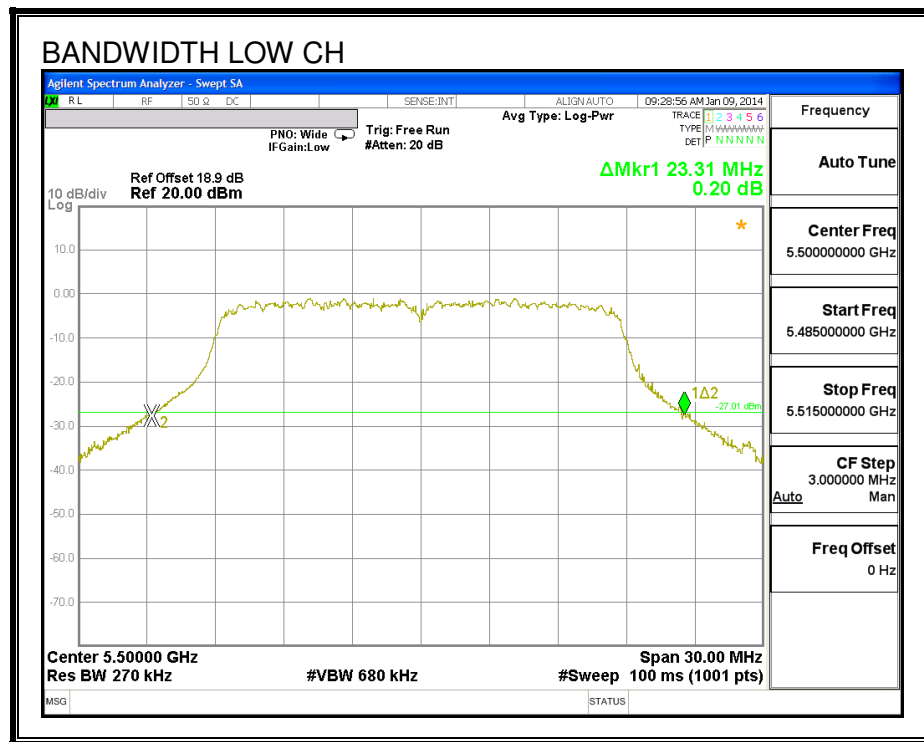
LIMITS

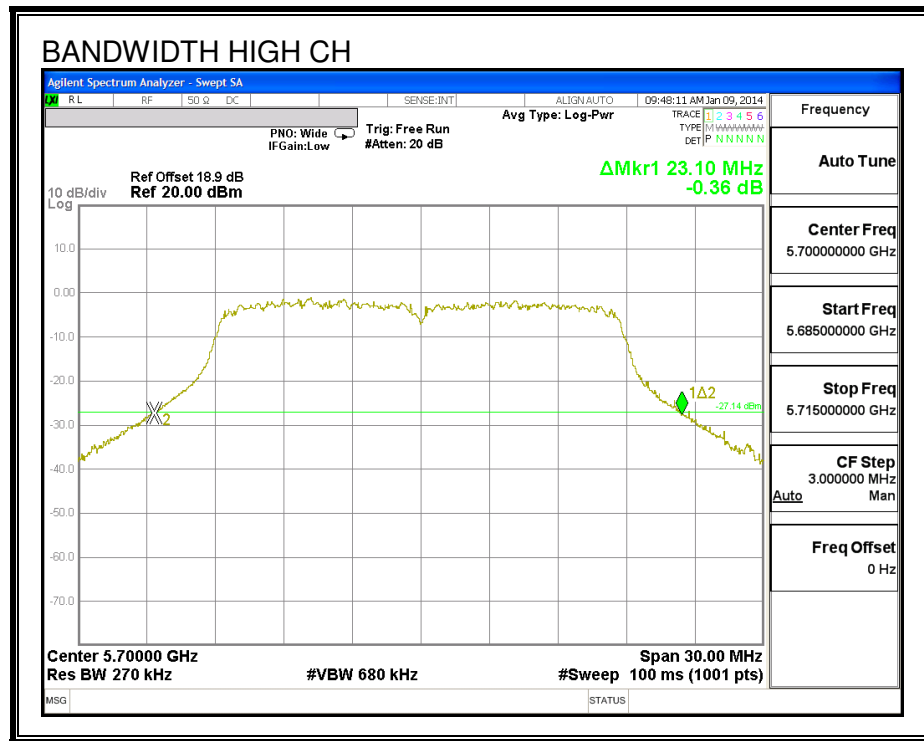
None; for reporting purposes only.

RESULTS

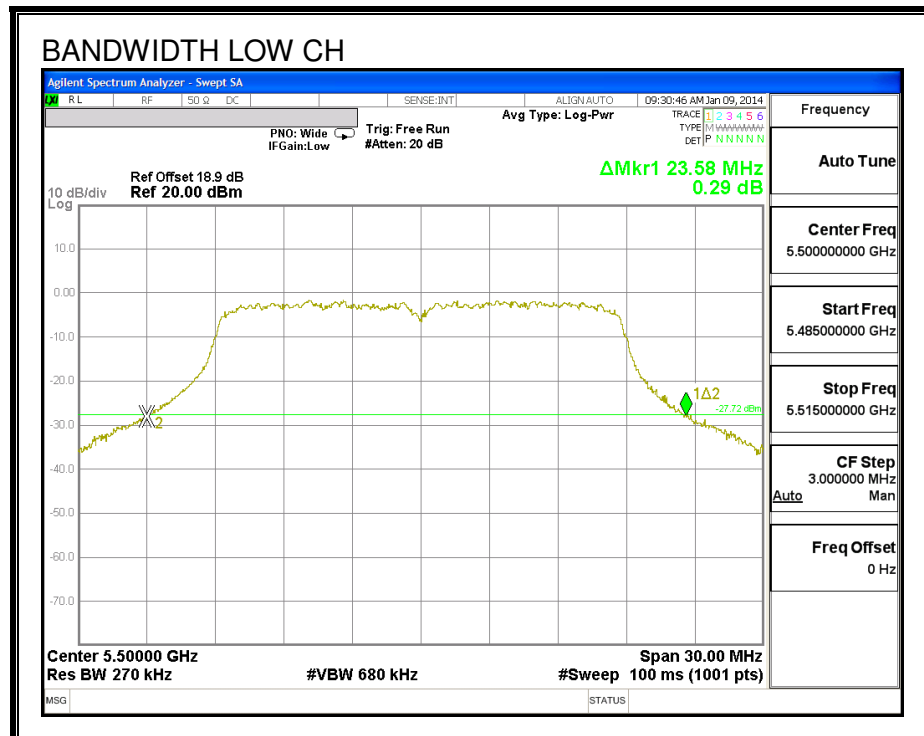
Channel	Frequency (MHz)	26 dB Bandwidth		
		CH0	CH1	CH2
Low	5500	23.310	23.580	23.760
Mid	5580	24.000	24.120	23.370
High	5700	23.100	23.610	23.250

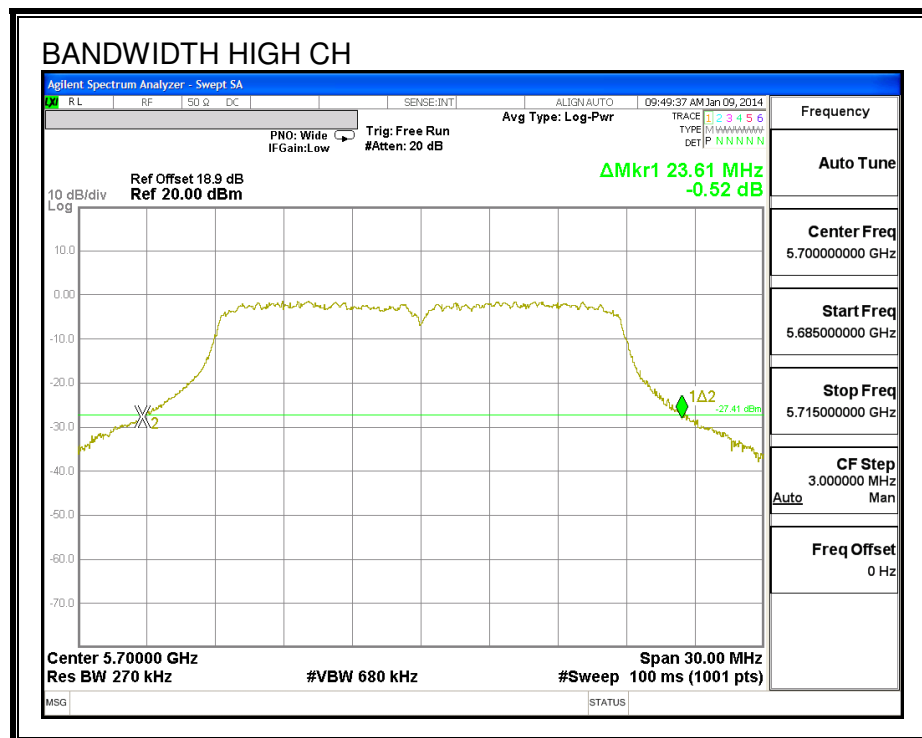
26 dB BANDWIDTH CH0



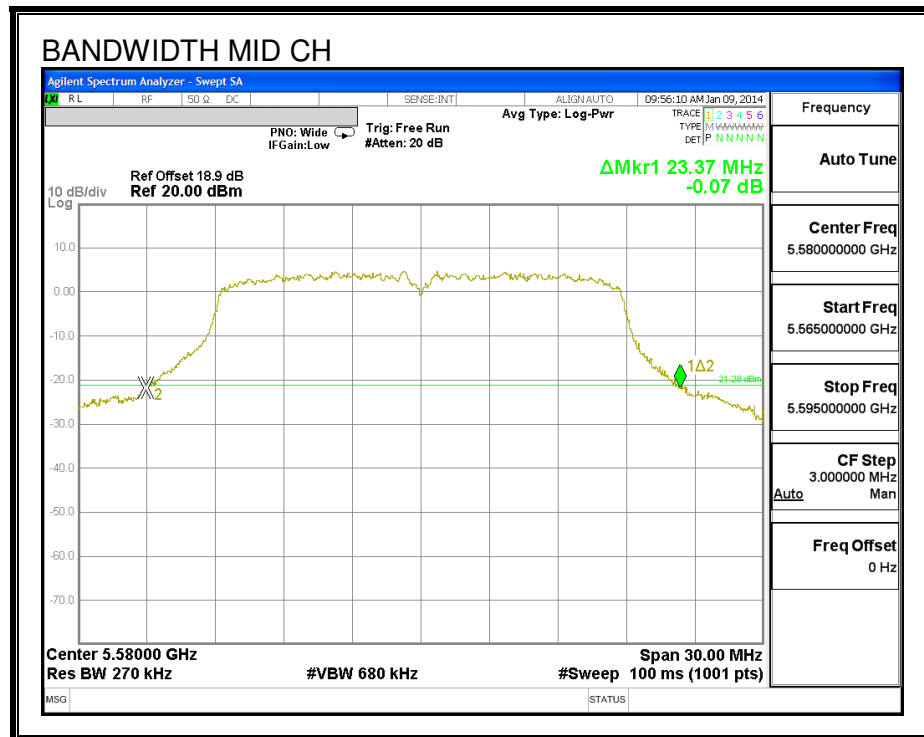
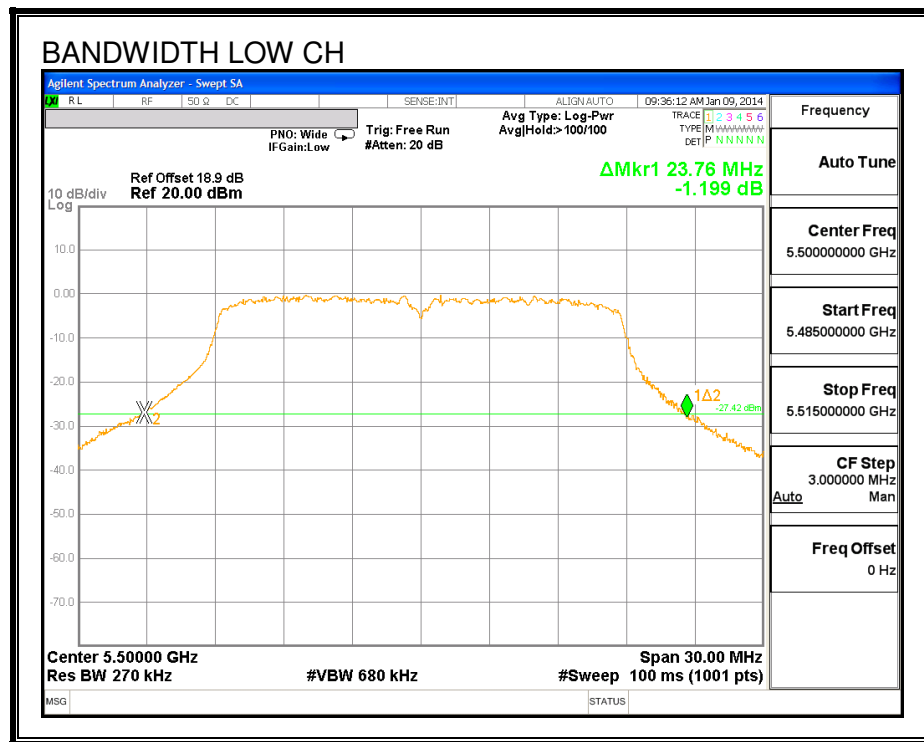


26 dB BANDWIDTH CH1





26 dB BANDWIDTH CH2





8.3.2. 99% BANDWIDTH

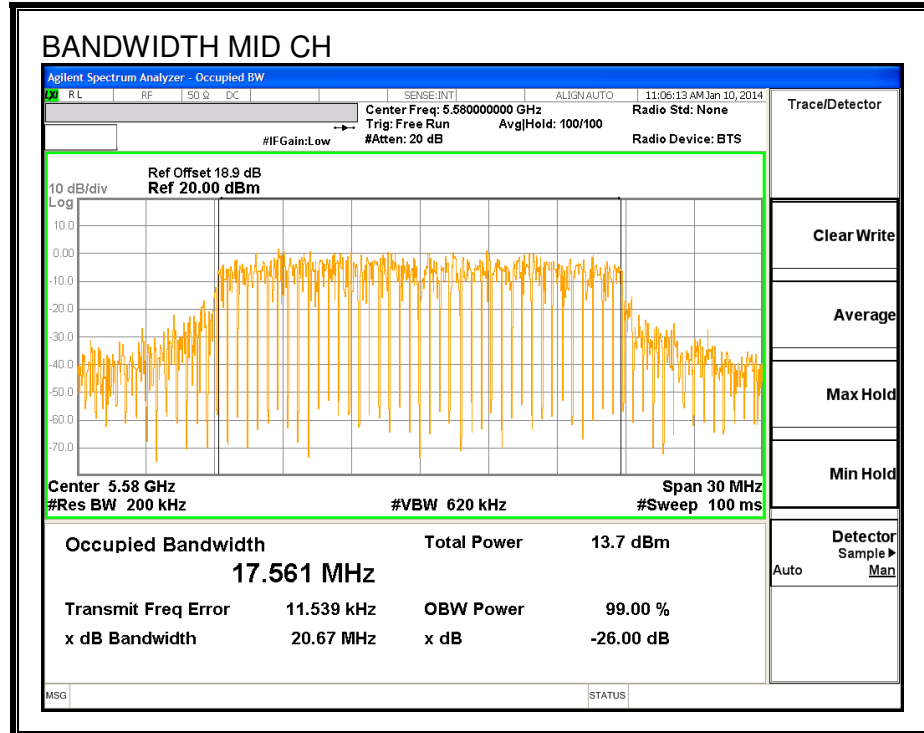
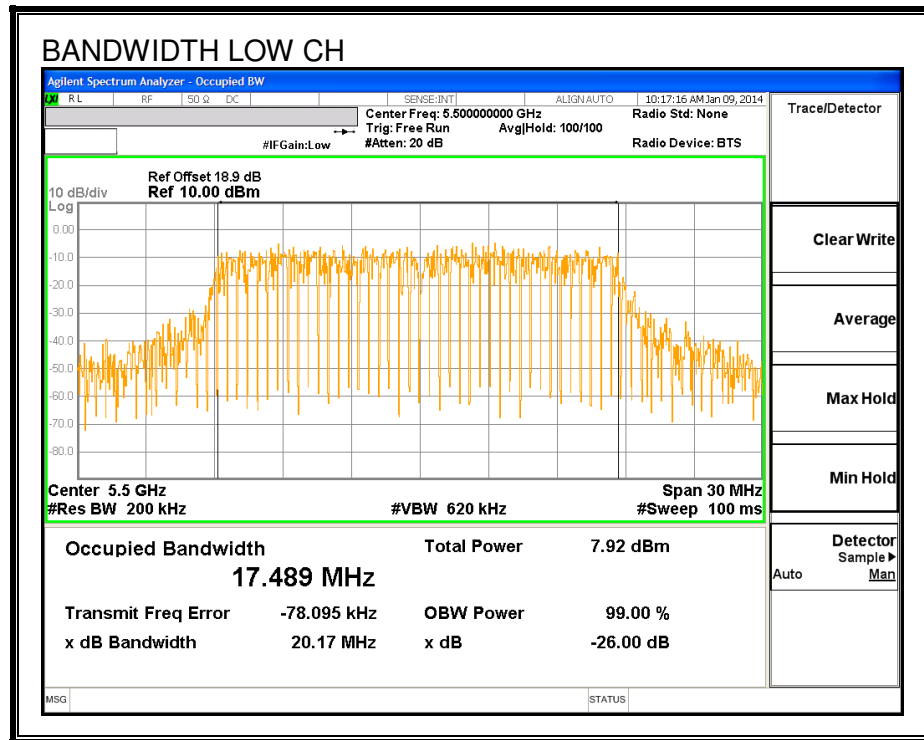
LIMITSs

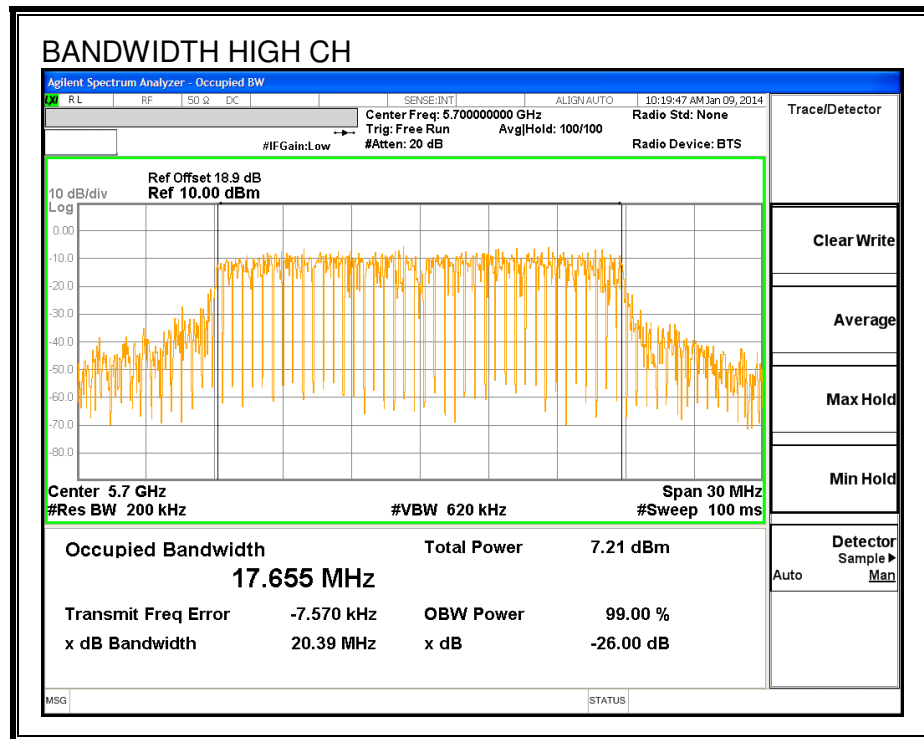
None; for reporting purposes only.

RESULTS

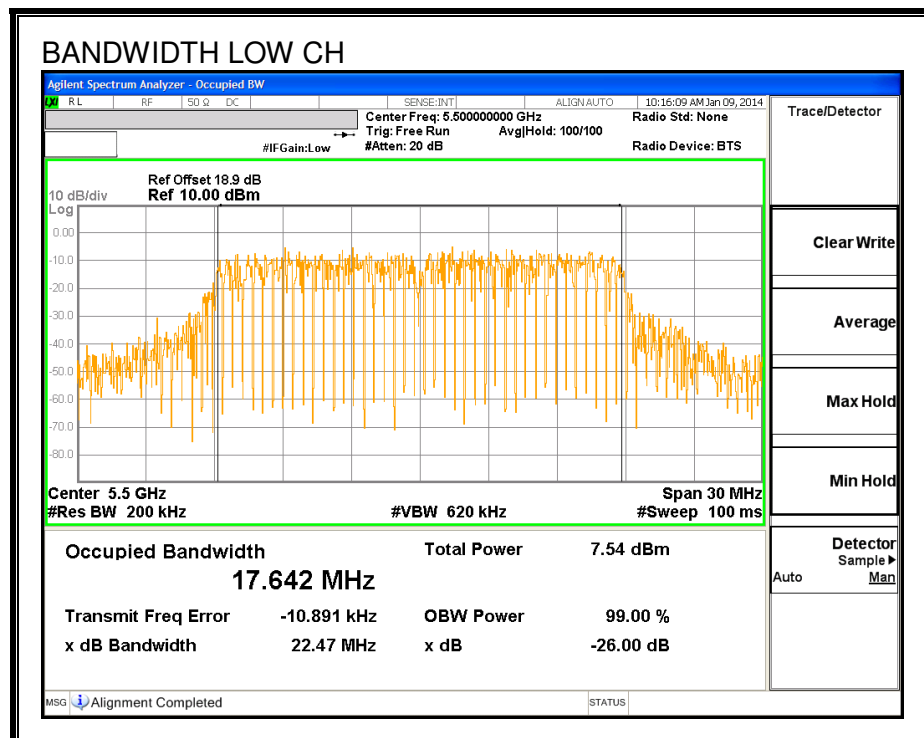
Channel	Frequency (MHz)	99% Bandwidth		
		CH0	CH1	CH2
Low	5500	17.489	17.642	17.576
Mid	5580	17.561	17.404	17.695
High	5700	17.655	17.579	17.553

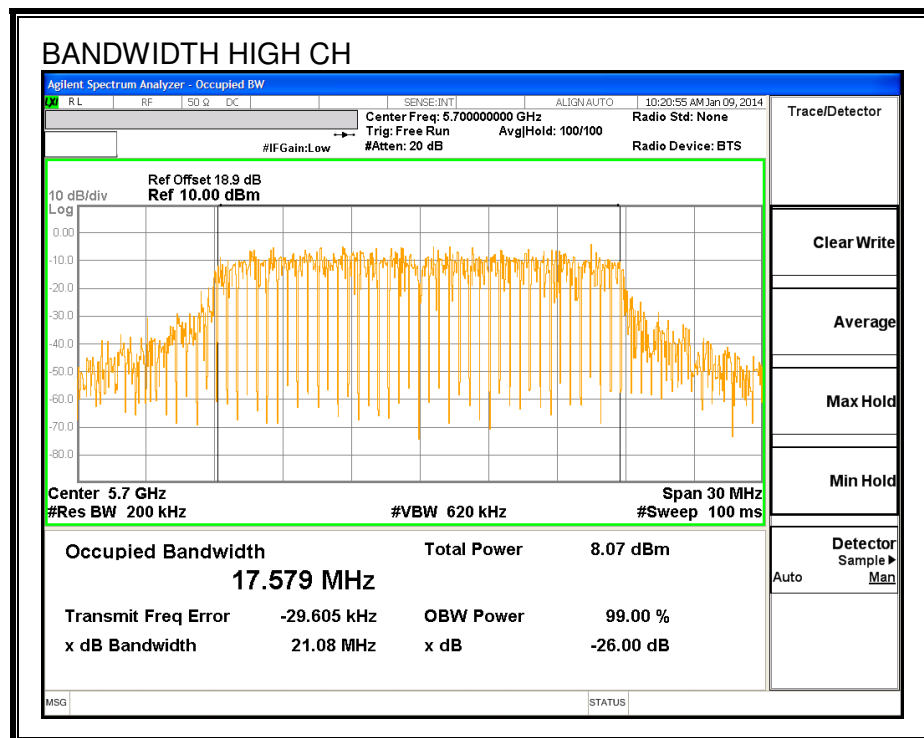
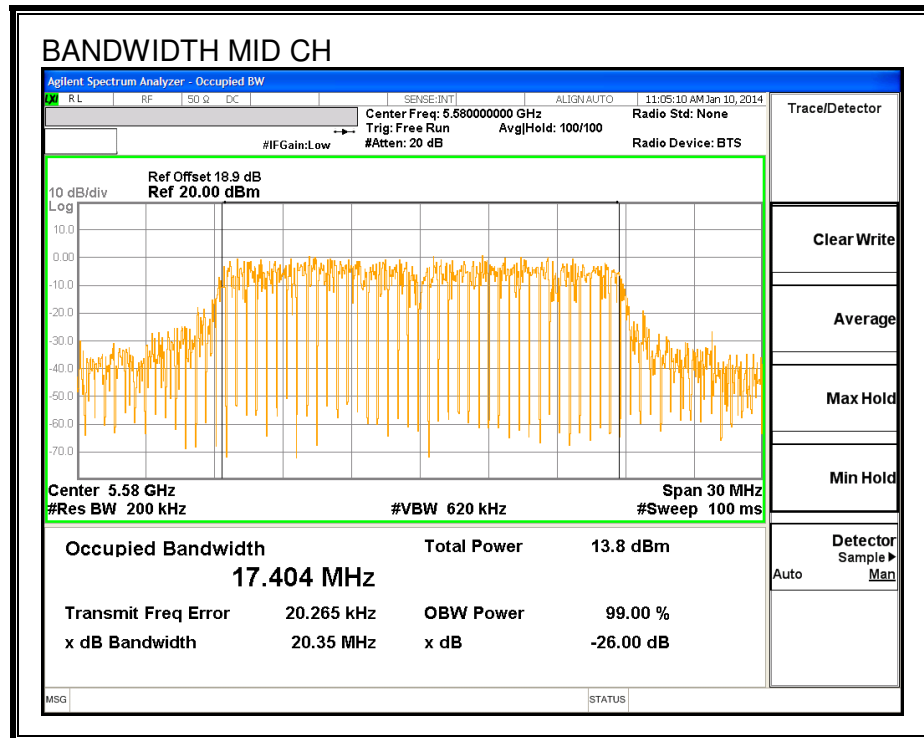
99% BANDWIDTH CHO



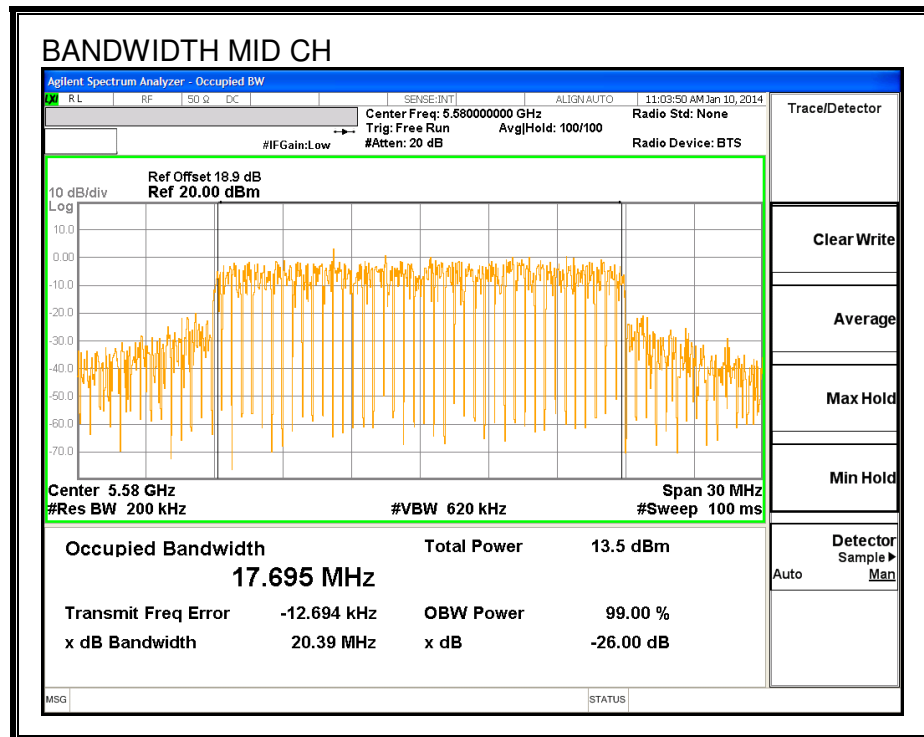
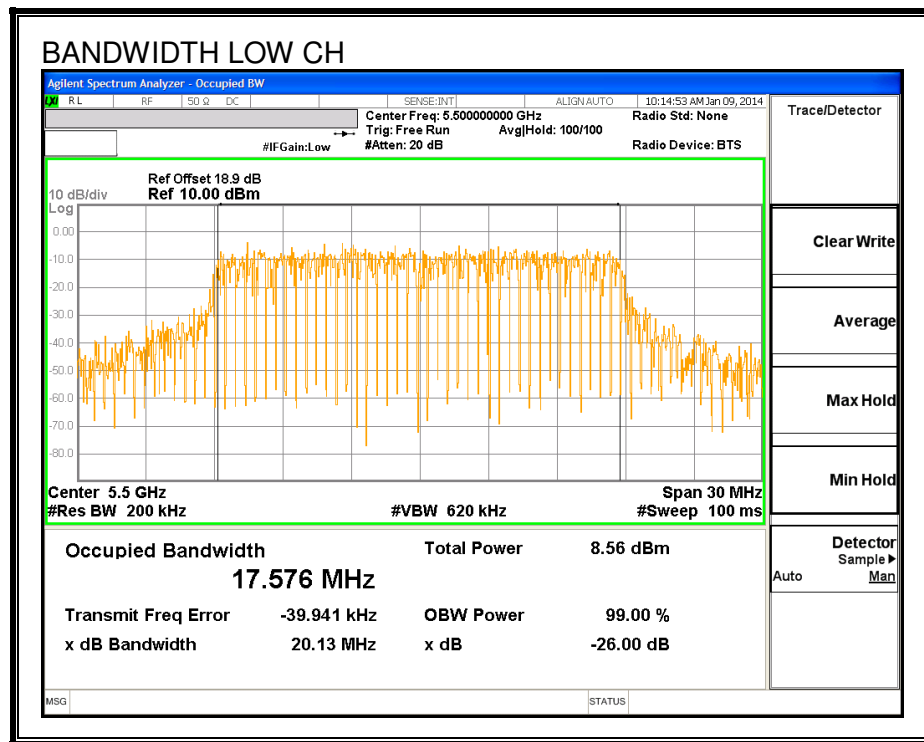


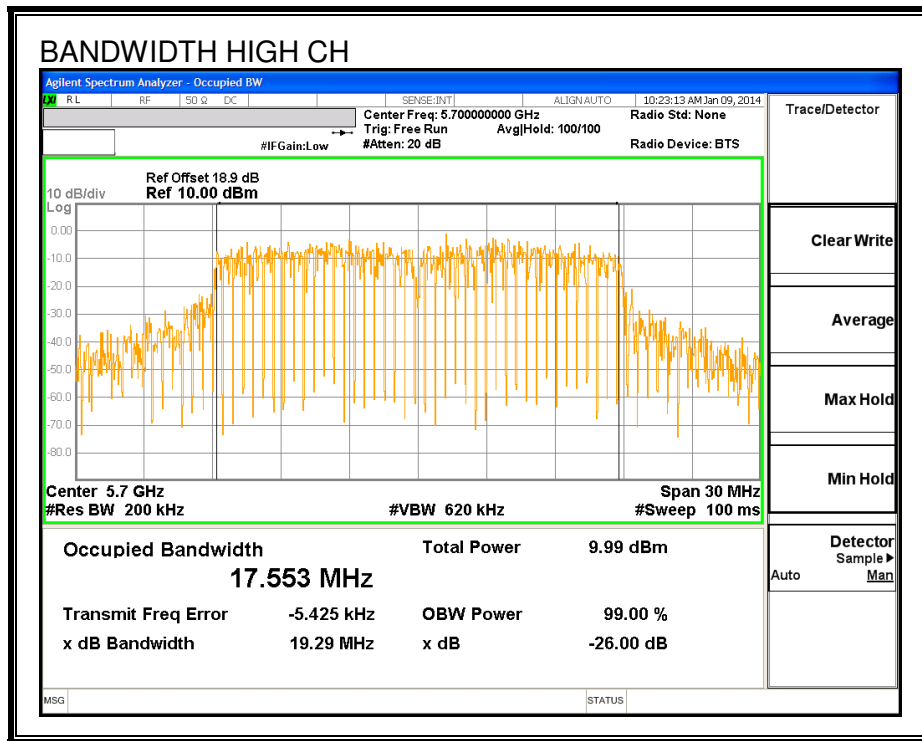
99% BANDWIDTH CH1





99% BANDWIDTH CH2





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 12.1 dB (including 10 dB pad and 2.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency (MHz)	Power Setting	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5500	17	15.82	15.01	16.57	20.62
Mid	5580	16	15.11	13.78	15.45	19.61
High	5700	15.5	13.99	13.68	16.11	19.50

8.3.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
1.70	5.80	2.40	3.69

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
1.70	5.80	2.40	8.26

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	23.31	17.49	3.69	8.26
Mid	5580	23.37	17.40	3.69	8.26
High	5700	23.10	17.55	3.69	8.26

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	23.43	29.43	23.43	8.74	11.00	8.74
Mid	5580	24.00	23.41	29.41	23.41	8.74	11.00	8.74
High	5700	24.00	23.44	29.44	23.44	8.74	11.00	8.74

Duty Cycle CF (dB)	0.58	Included in Calculations of Corr'd Power & PPSD
--------------------	------	---

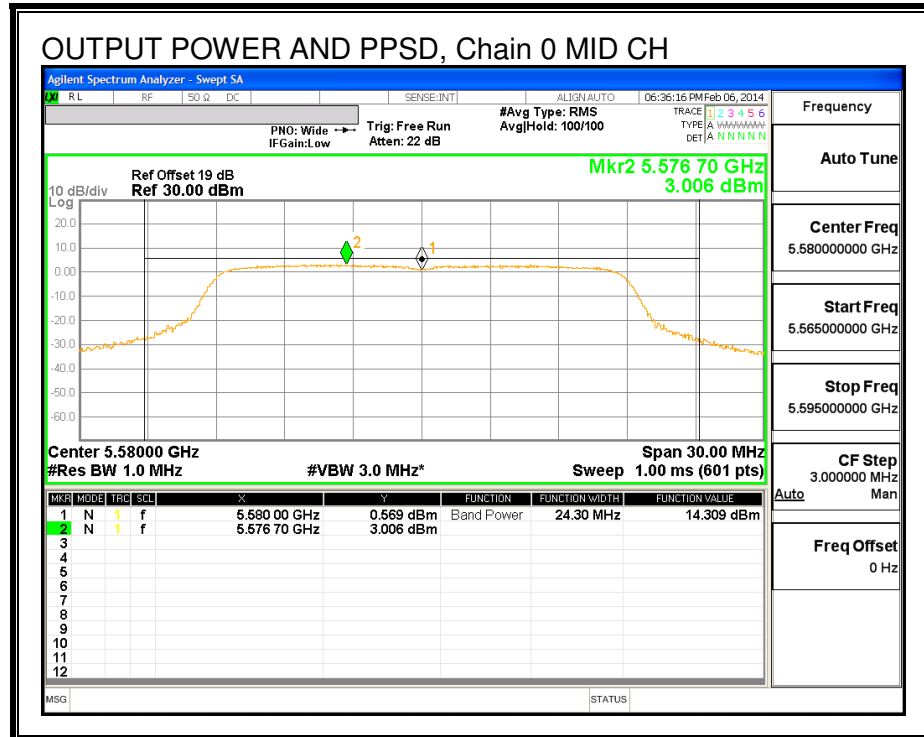
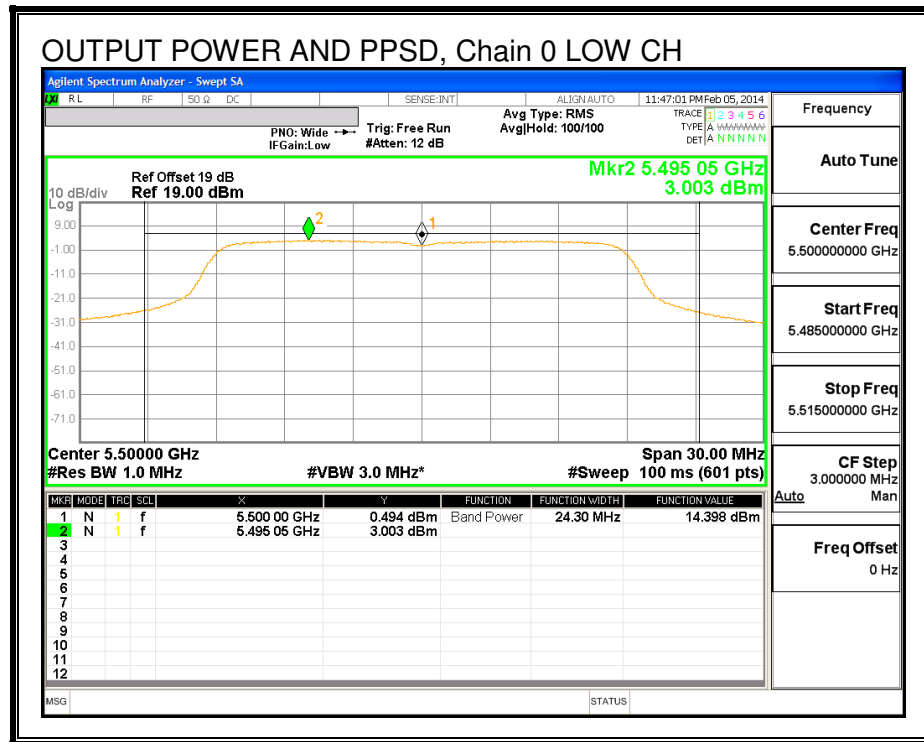
Output Power Results

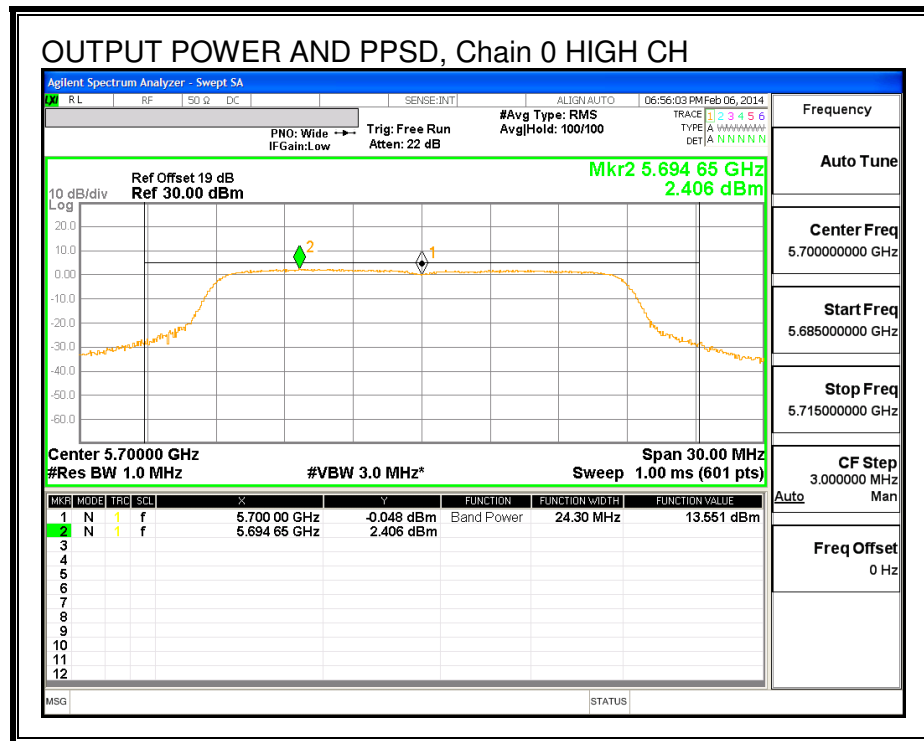
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	14.40	13.65	15.28	19.85	23.43	-3.58
Mid	5580	14.31	12.99	14.81	19.45	23.41	-3.95
High	5700	13.55	13.08	15.76	19.65	23.44	-3.80

PPSD Results

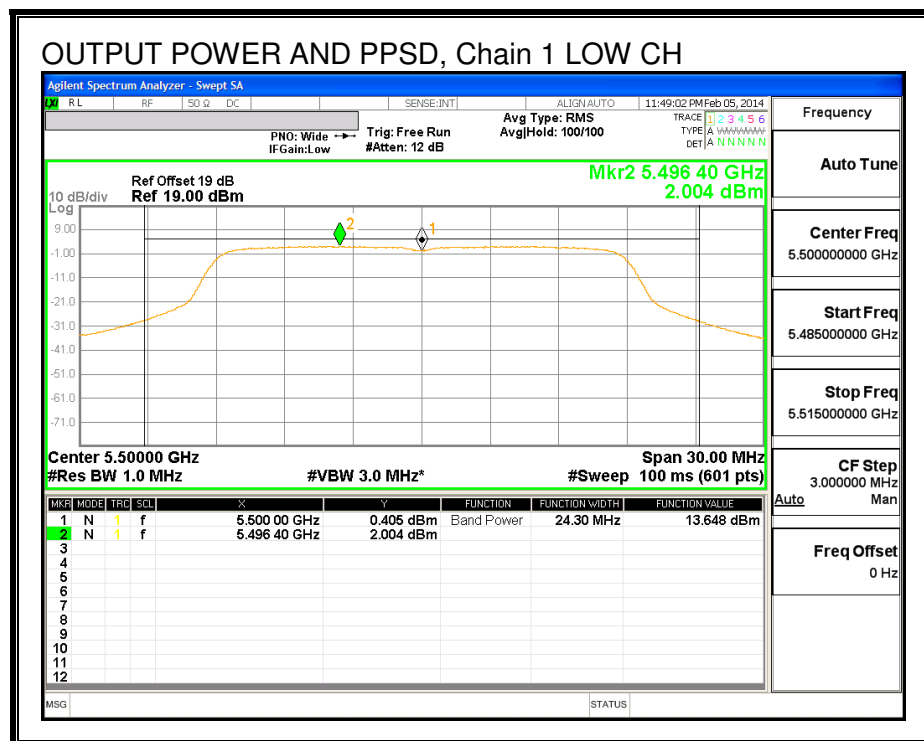
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	3.00	2.00	3.92	8.40	8.74	-0.34
Mid	5580	3.01	1.61	3.77	8.23	8.74	-0.51
High	5700	2.41	1.87	4.67	8.51	8.74	-0.23

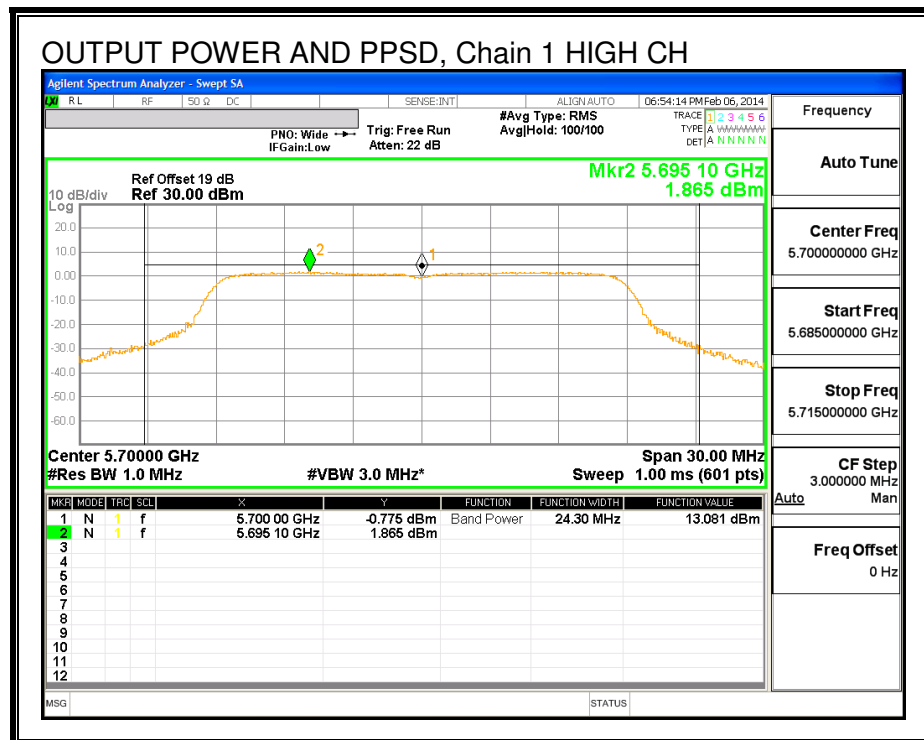
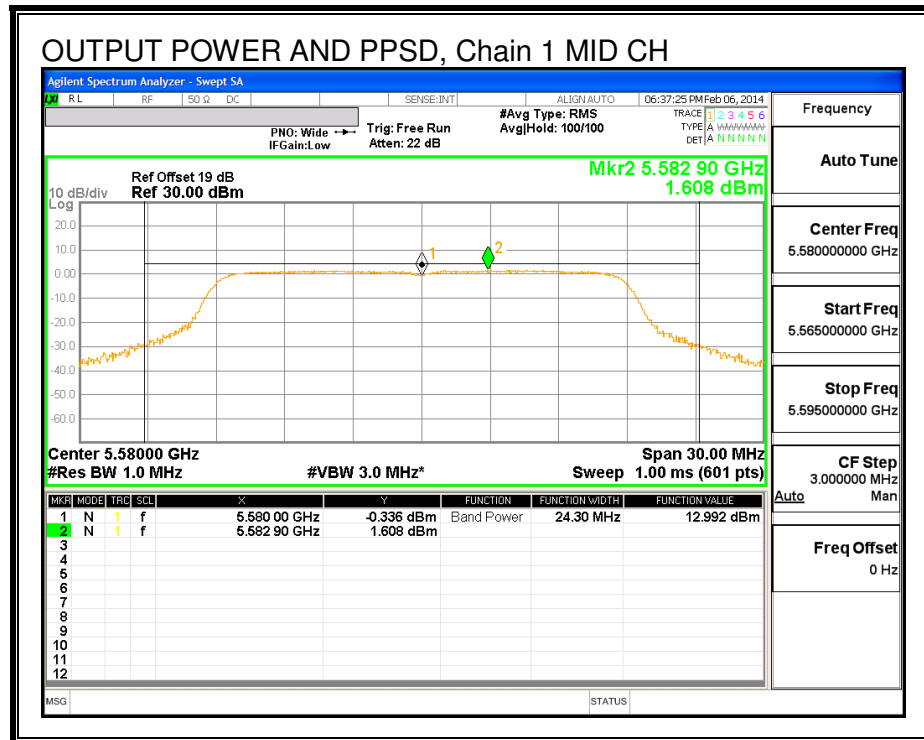
OUTPUT POWER AND PPSD, Chain 0



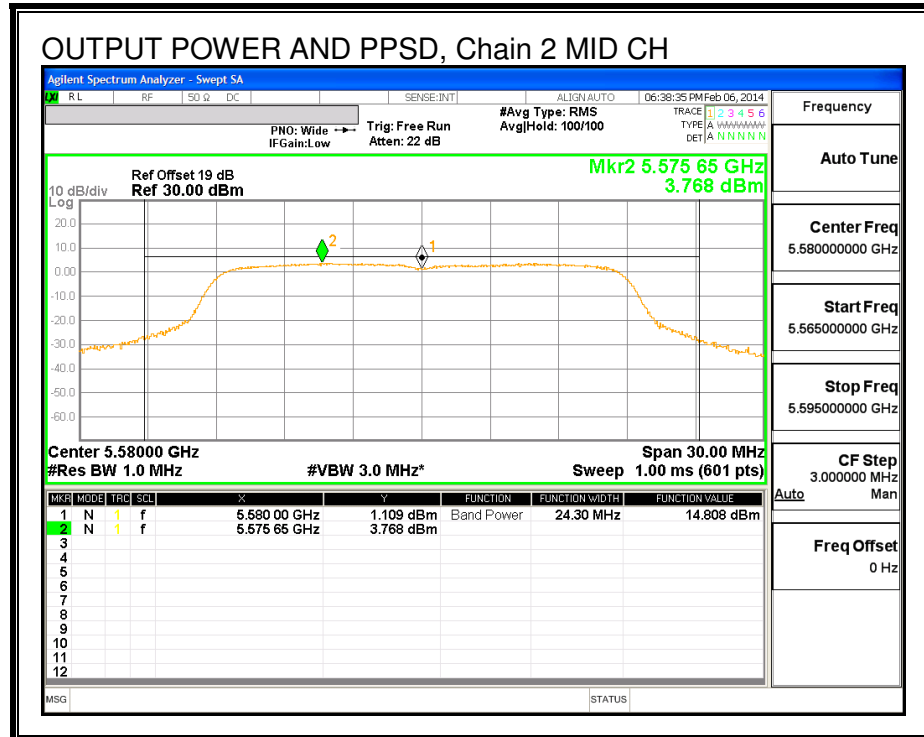
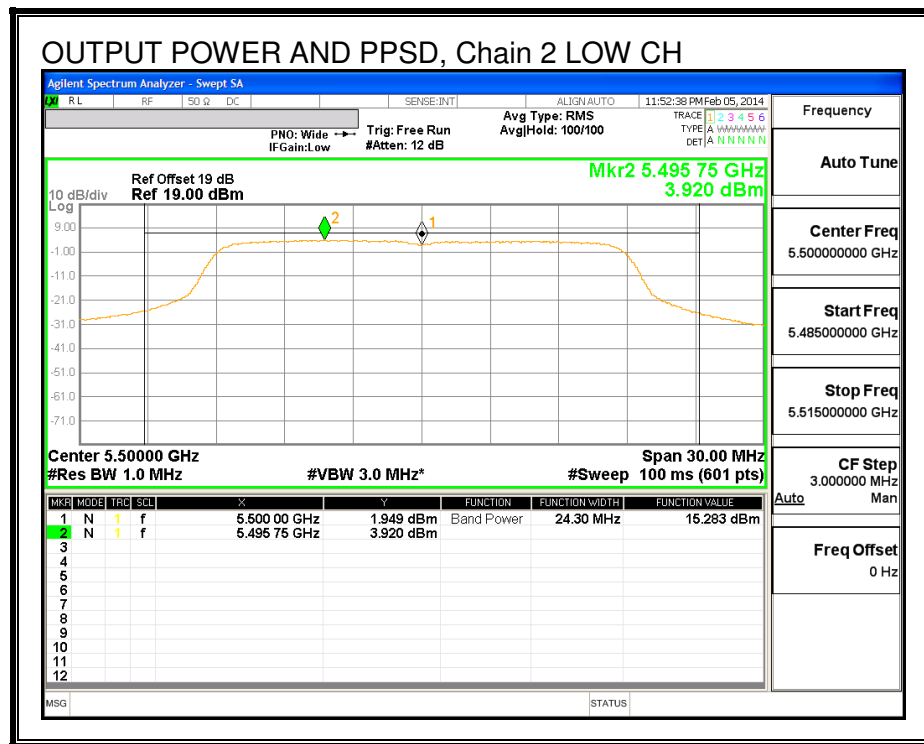


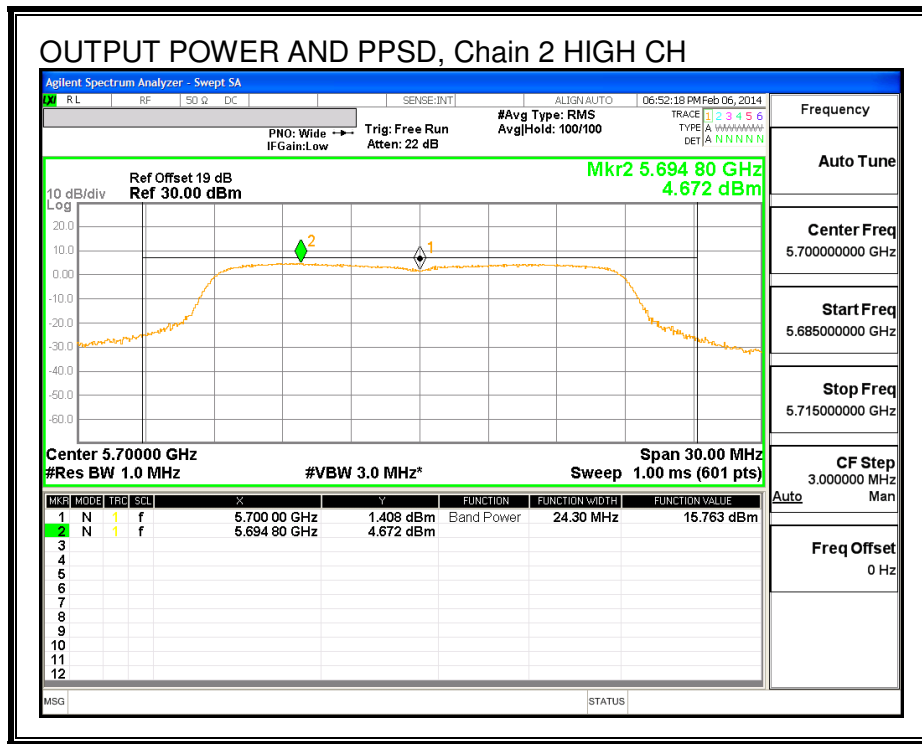
OUTPUT POWER AND PSD, Chain 1





OUTPUT POWER AND PPSD, Chain 2





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

Chain 0

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5580	11.67	3.01	0.58	8.08	13	-4.92

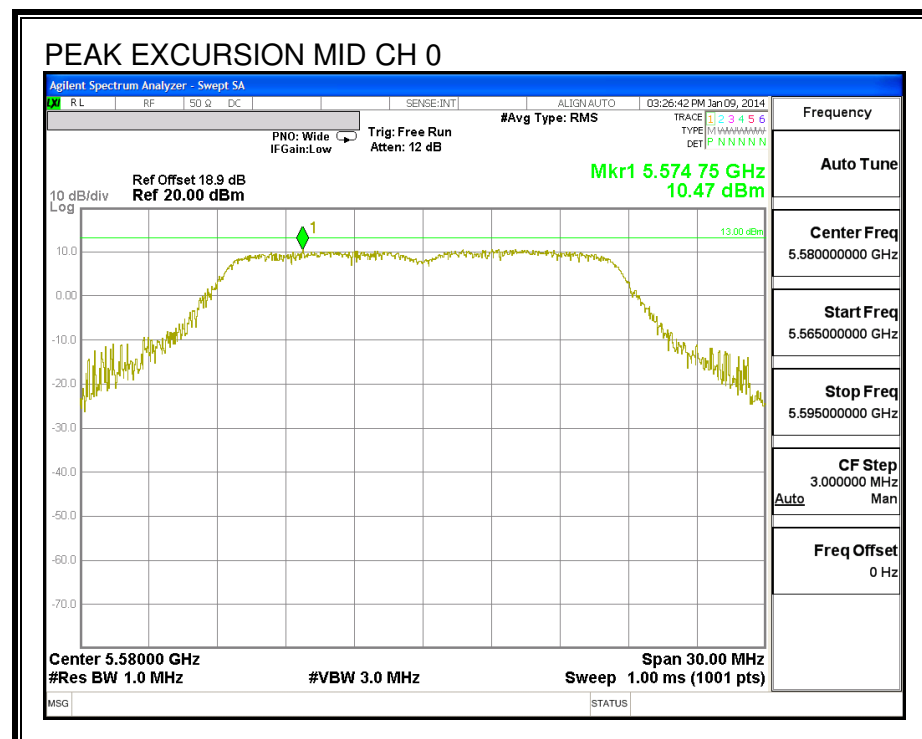
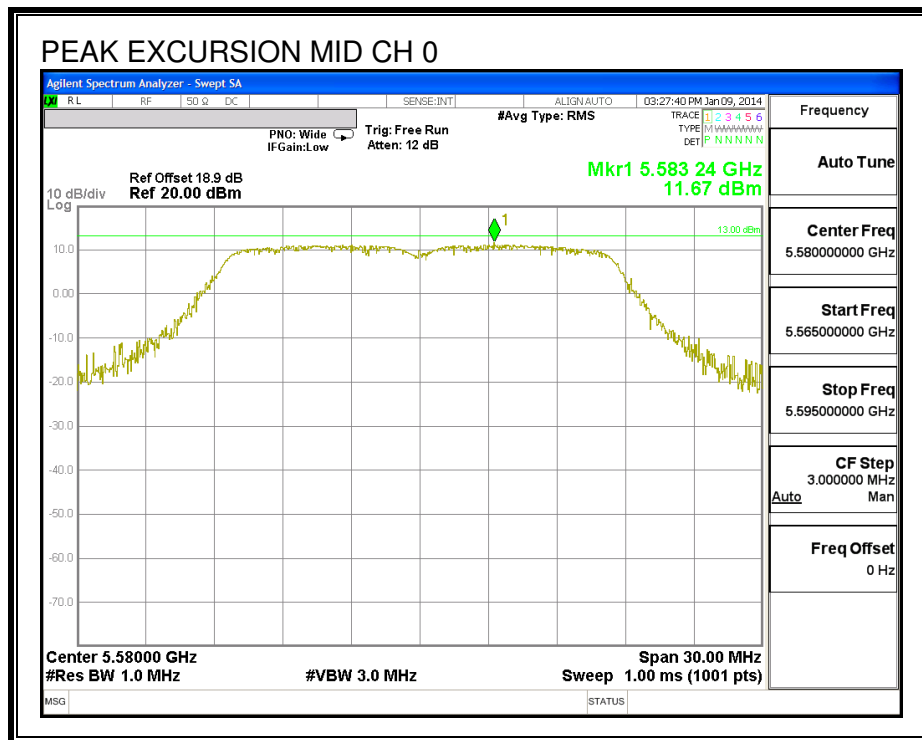
Chain 1

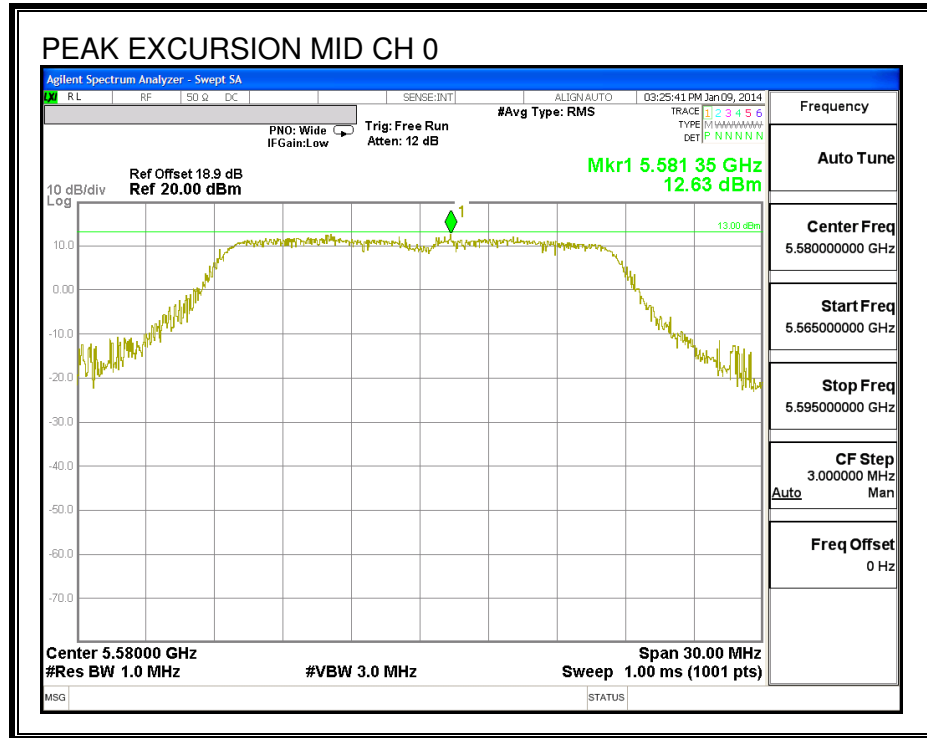
Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5580	10.47	1.61	0.58	8.28	13	-4.72

Chain 2

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5580	12.63	3.77	0.58	8.28	13	-4.72

PEAK EXCURSION





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.

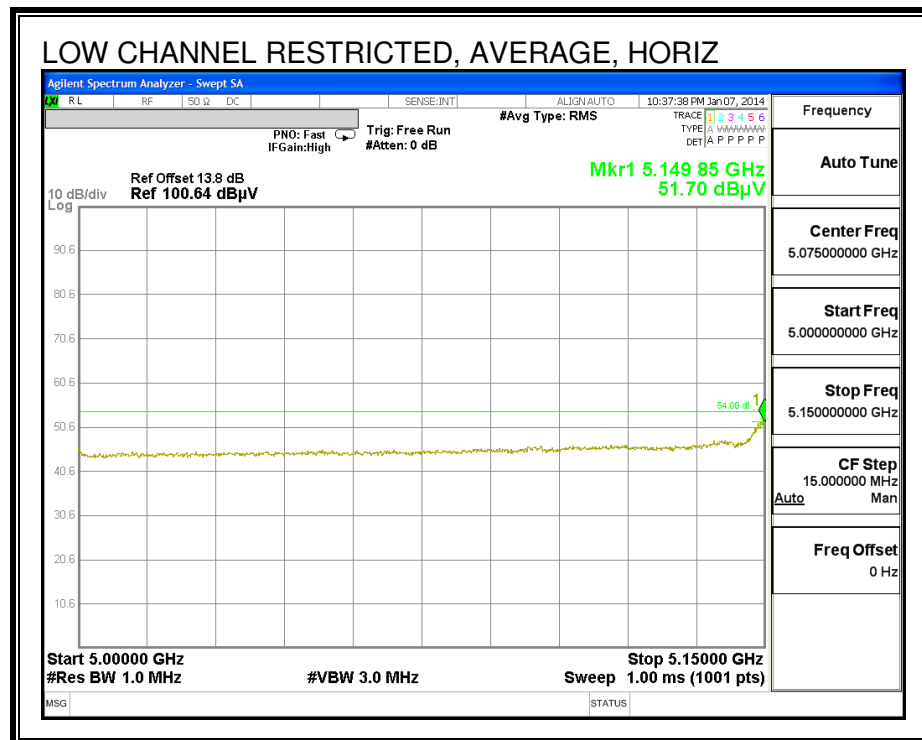
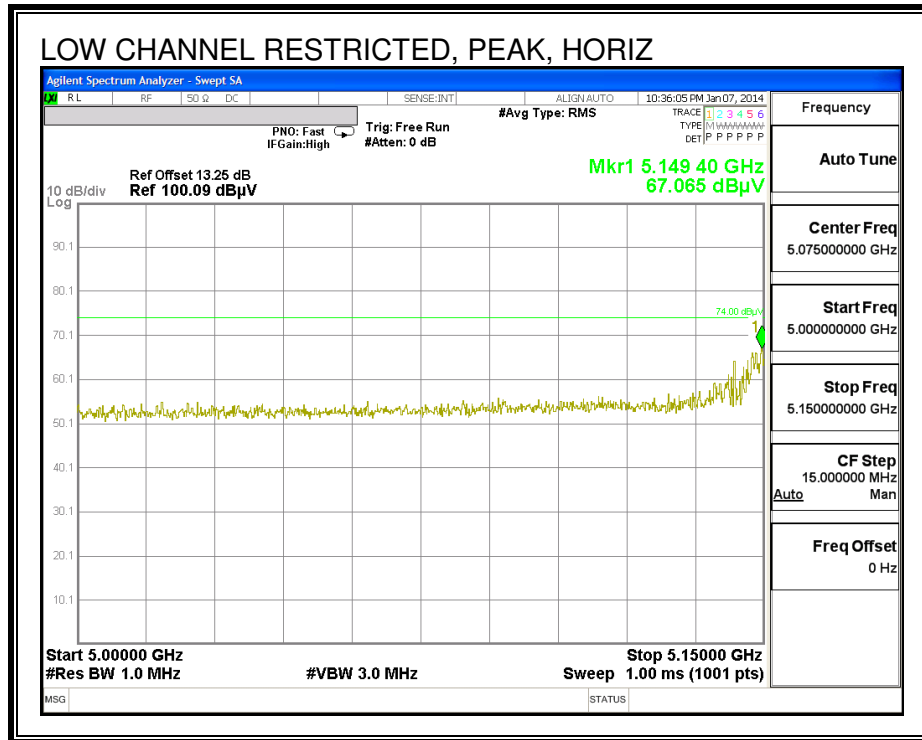
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

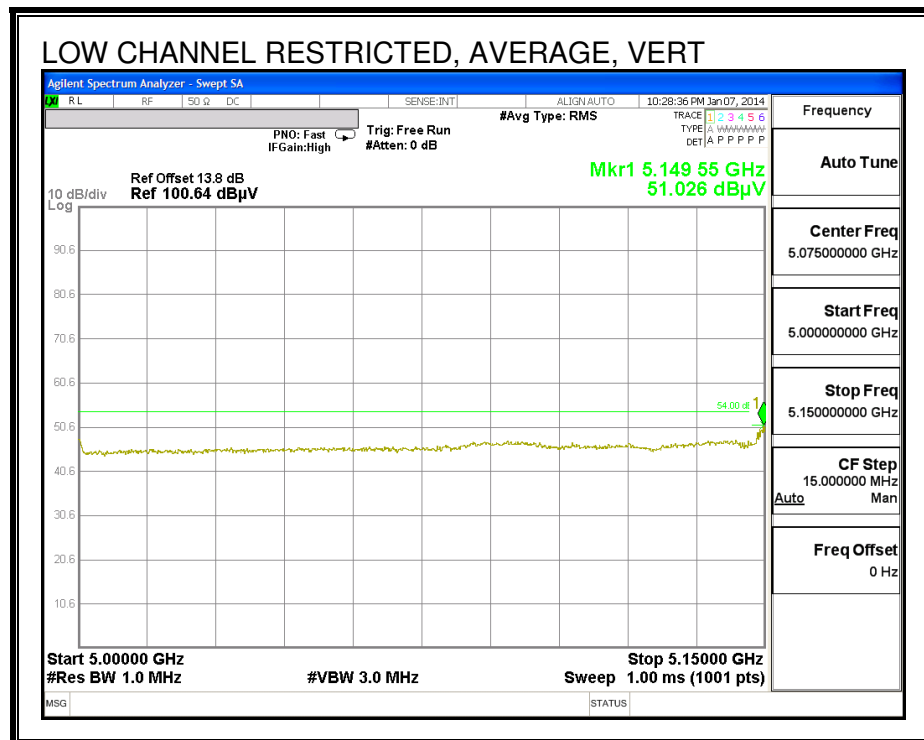
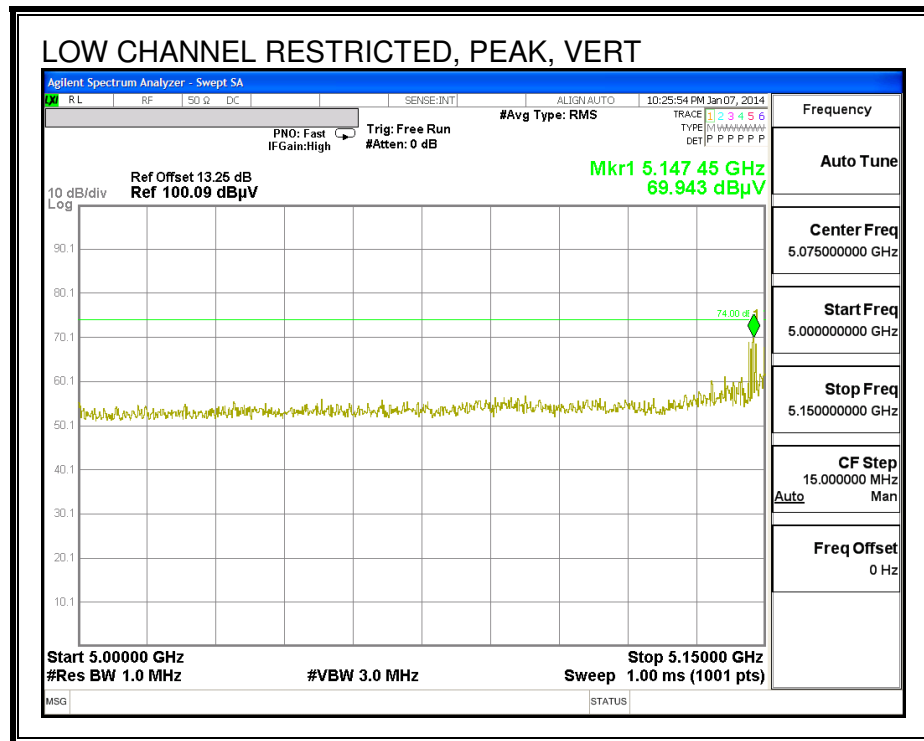
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

9.2. TRANSMITTER ABOVE 1 GHz

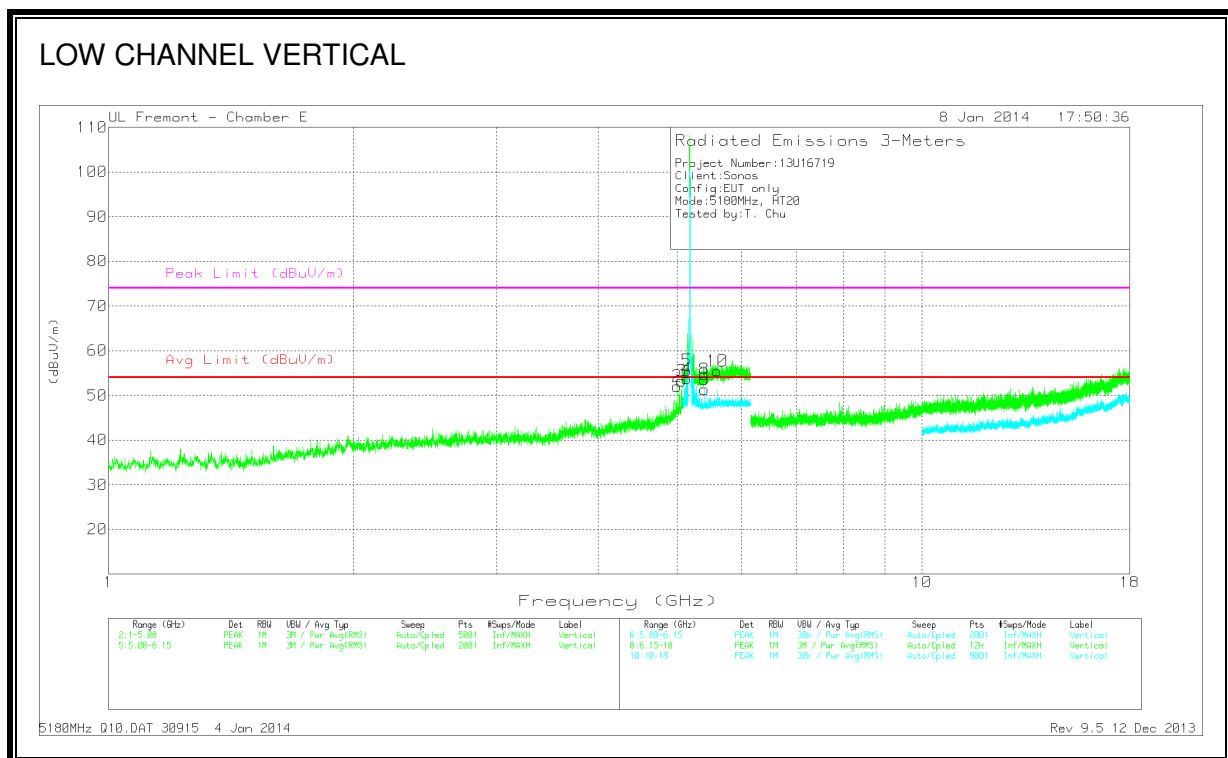
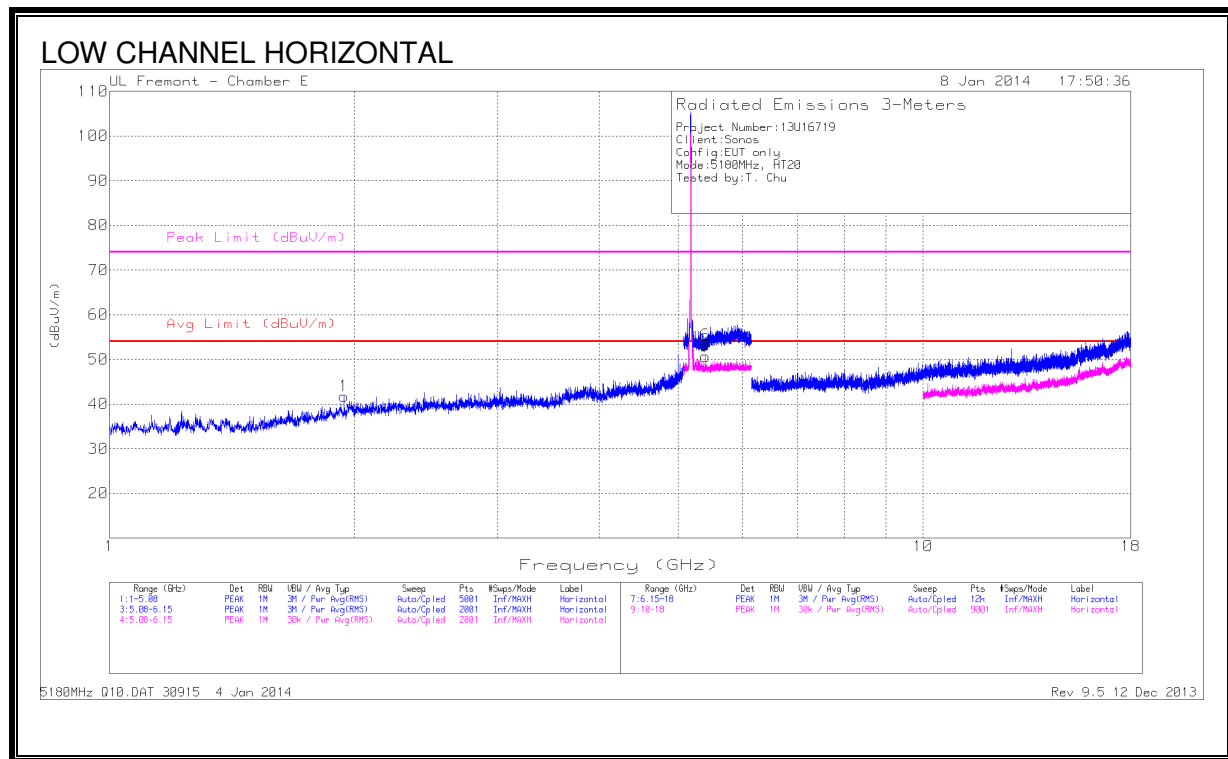
9.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)





HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

Marker	Freq. (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl /5GHz LPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.942	42.99	PK	31.7	-32.9	41.79	-	-	68.2	-26.41	0-360	199	H
2	* 5.001	46.74	PK	34.4	-29.1	52.04	-	-	74	-21.96	0-360	101	V
	* 5.001	34.13	AD1	34.4	-29.1	39.43	54	-14.57	-	-	115	309	V
3	* 5.064	46.67	PK	34.5	-27.9	53.27	-	-	74	-20.73	0-360	200	V
	* 5.064	32.93	AD1	34.5	-27.8	39.63	54	-14.37	-	-	173	158	V
4	* 5.138	40.6	PK	34.6	-21.5	53.7	-	-	74	-20.3	0-360	101	V
5	* 5.138	35.01	AD1	34.6	-21.5	48.11	54	-5.89	-	-	79	140	V
6	* 5.4	39.97	PK	34.8	-21.6	53.17	-	-	74	-20.83	0-360	101	H
7	* 5.4	31.51	AD1	34.8	-21.6	44.71	54	-9.29	-	-	260	241	H
8	* 5.399	40.38	PK	34.8	-21.6	53.58	-	-	74	-20.42	0-360	101	V
9	* 5.399	33.18	AD1	34.8	-21.6	46.38	54	-7.62	-	-	104	266	V
10	5.6	41.02	PK	35	-21	55.02	-	-	68.2	-13.18	0-360	101	V

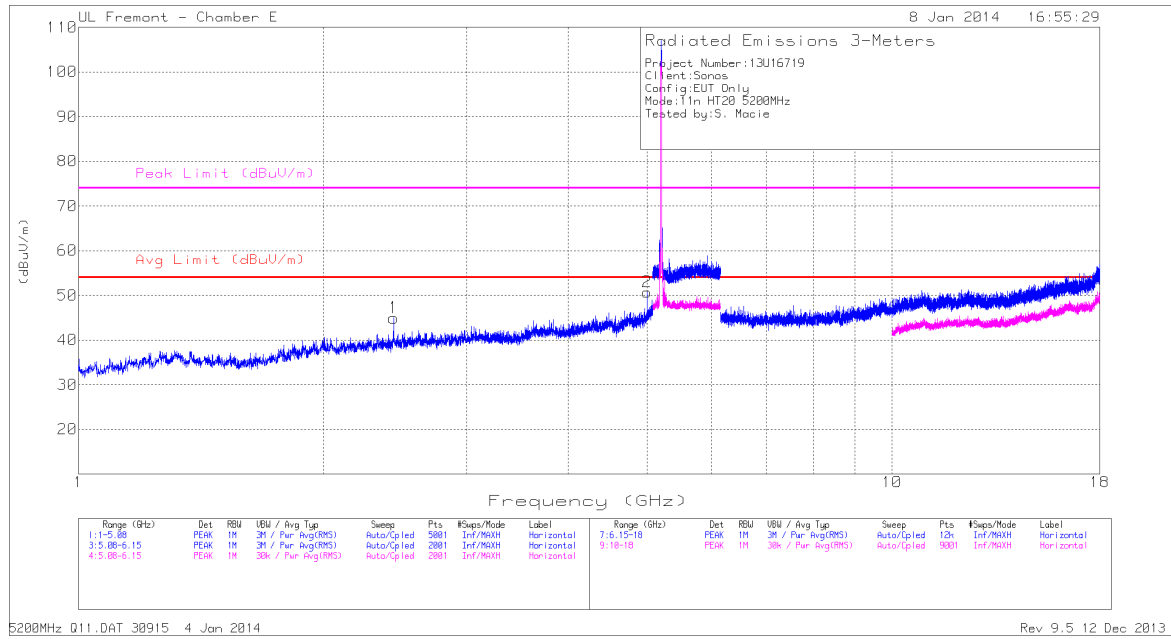
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

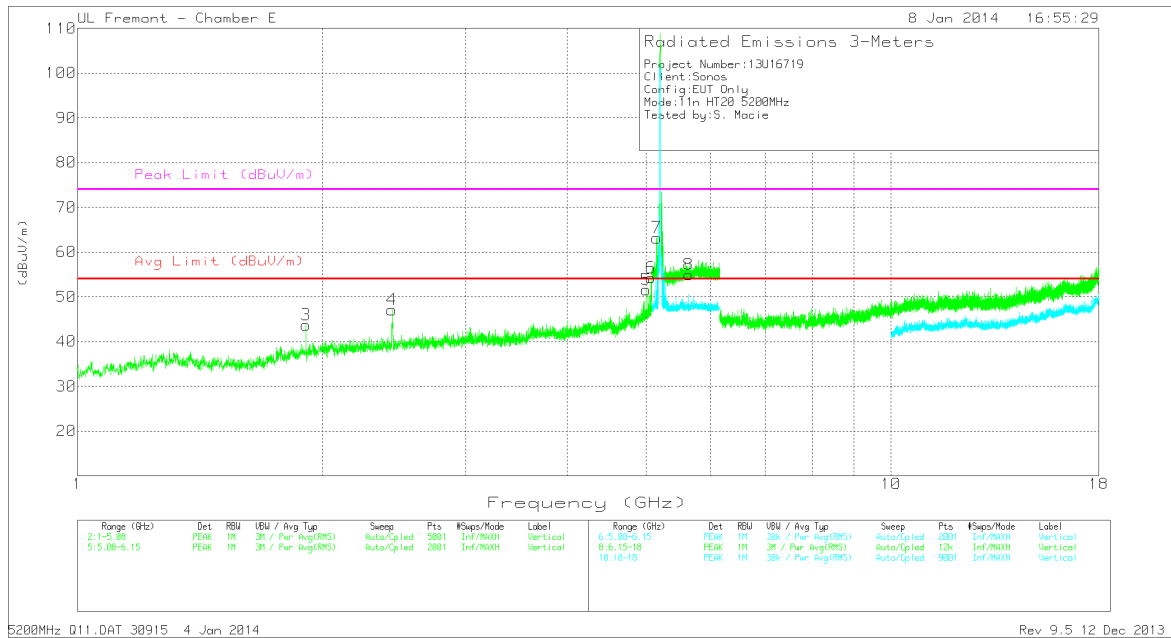
Avg - Video bandwidth < Resolution bandwidth

FCC Part15C All 5GHz UNII and DTS Spurious Emissions with Average Scan.TST 30915 4 Jan 2014 Rev 9.5 12 Dec 2013

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ 5GHz LPF	Correcte d Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.439	43.36	PK	32.3	-30.7	44.96	-	-	68.2	-23.24	0-360	200	H
2	* 5.001	43.75	PK	34	-27	50.75	-	-	74	-23.25	0-360	200	H
	* 5.001	37.45	AD1	34	-27	44.45	54	-9.55	-	-	129	145	H
3	1.908	43.73	PK	31.2	-31.2	43.73	-	-	68.2	-24.74	0-360	101	V
4	2.435	45.52	PK	32.3	-30.7	47.12	-	-	68.2	-21.08	0-360	201	V
5	* 5	44.6	PK	34	-27	51.6	-	-	74	-22.4	0-360	101	V
	* 5	39.77	AD1	34	-27	46.77	54	-7.23	-	-	284	114	V
6	* 5.069	46.16	PK	34.1	-26	54.26	-	-	74	-19.74	0-360	101	V
	* 5.069	33.16	AD1	34.1	-25.9	41.36	54	-12.64	-	-	168	145	V
7	5.151	47.88	PK	34.2	-18.9	63.18	-	-	68.2	-5.02	0-360	101	V
9	5.64	39.81	PK	34.8	-18.9	55.71	-	-	68.2	-12.49	0-360	101	V

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

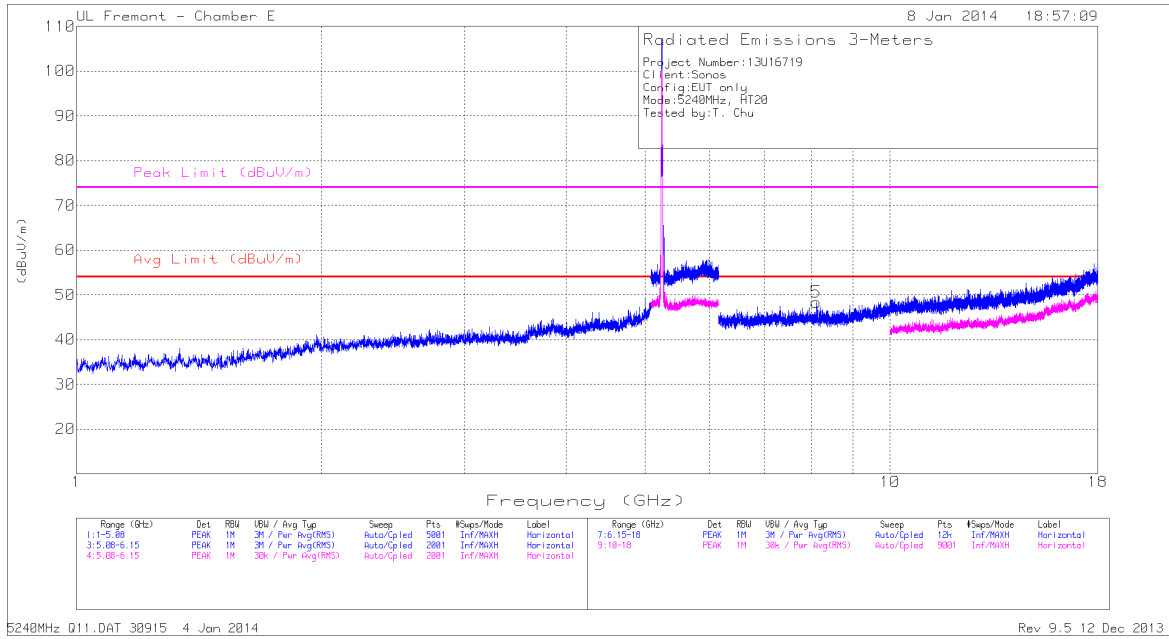
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

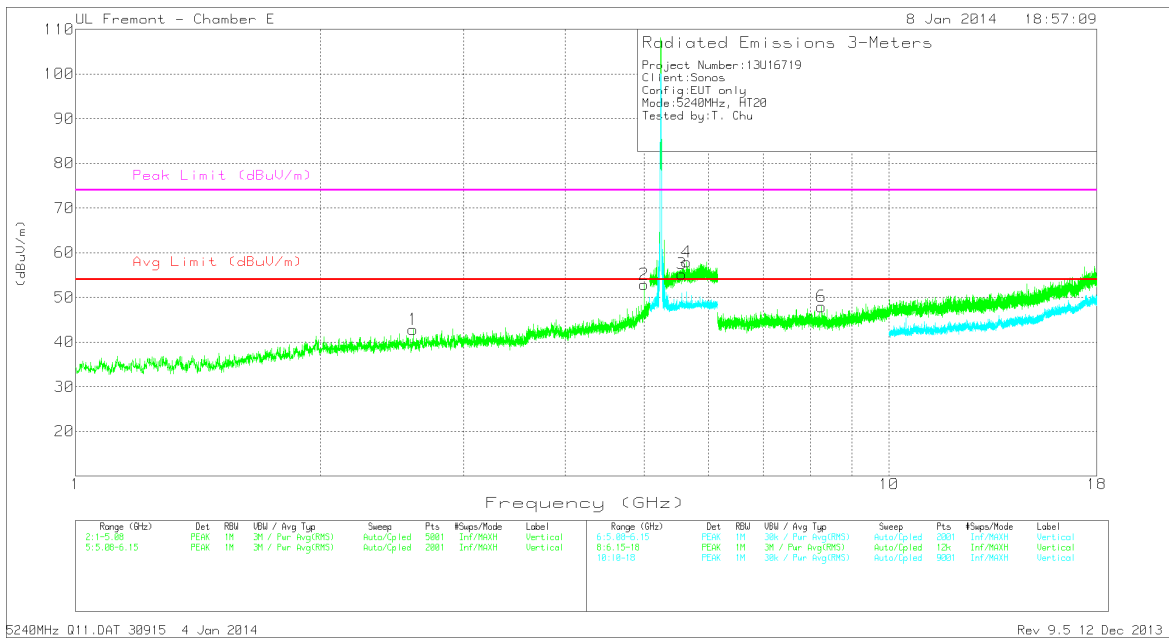
AD1 - KDB 789033 Method: AD Primary Power Average

5200MHz Q11.DAT 30915 4 Jan 2014 Rev 9.5 12 Dec 2013

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/ 5GHz LPF	Correcte d Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.599	43.24	PK	32.9	-33.3	42.84	-	-	68.2	-25.36	0-360	200	V
2	* 5.001	47.57	PK	34.4	-29.1	52.87	54	-1.13	74	-21.13	0-360	101	V
	* 5.001	42.76	AD1	34.4	-29.1	48.06	54	-5.94	-	-	135	147	V
3	5.56	41.16	PK	34.9	-20.8	55.26	-	-	68.2	-12.94	0-360	101	V
4	5.64	43.91	PK	35.1	-21.1	57.91	-	-	68.2	-10.29	0-360	101	V
5	* 8.114	40.05	PK	36.2	-27.9	48.35	-	-	74	-25.65	0-360	200	H
	* 8.114	28.86	AD1	36.2	-27.9	37.16	54	-16.84	-	-	115	253	H
6	* 8.261	39.14	PK	36.2	-27.4	47.94	-	-	74	-26.06	0-360	101	V

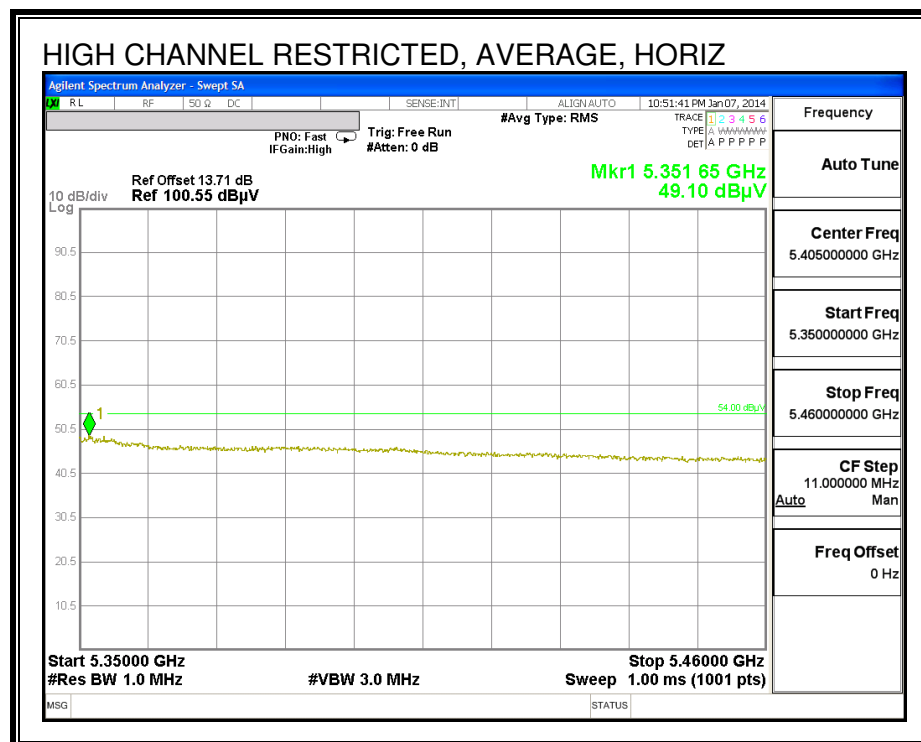
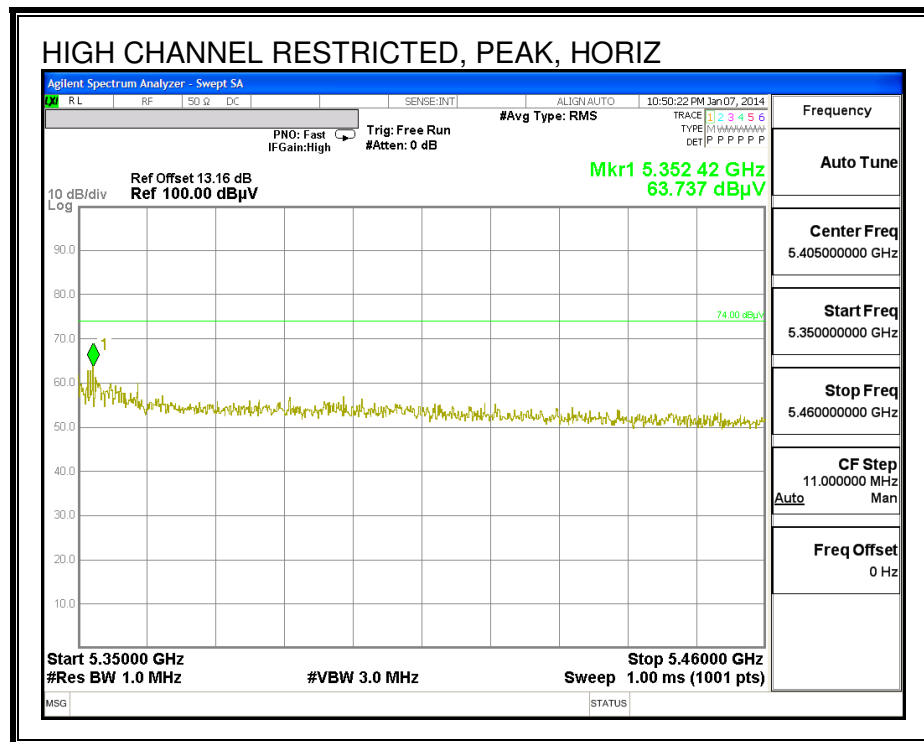
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

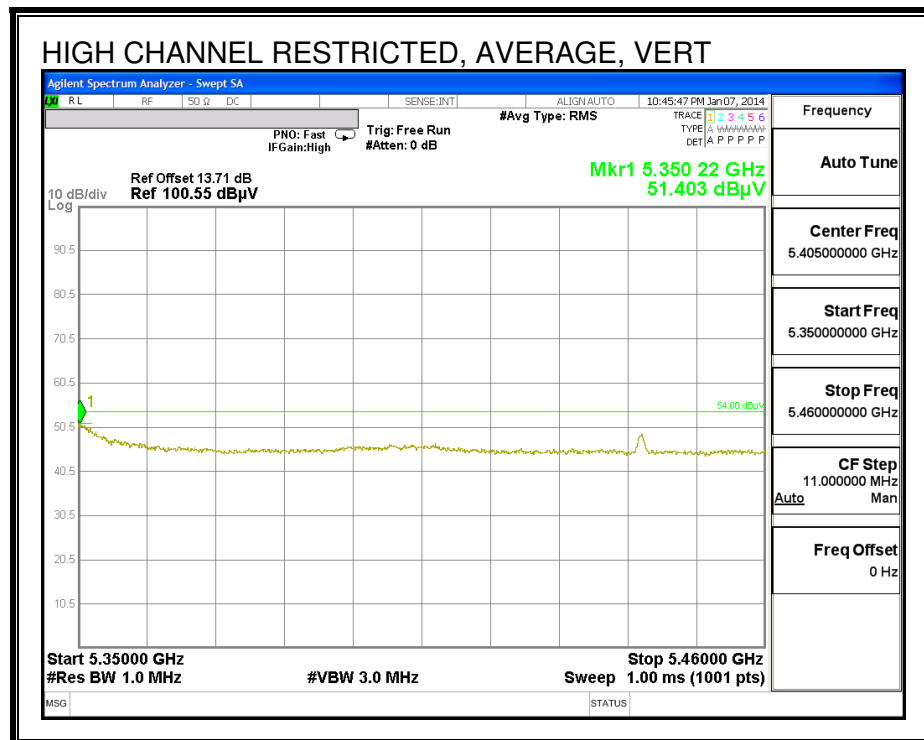
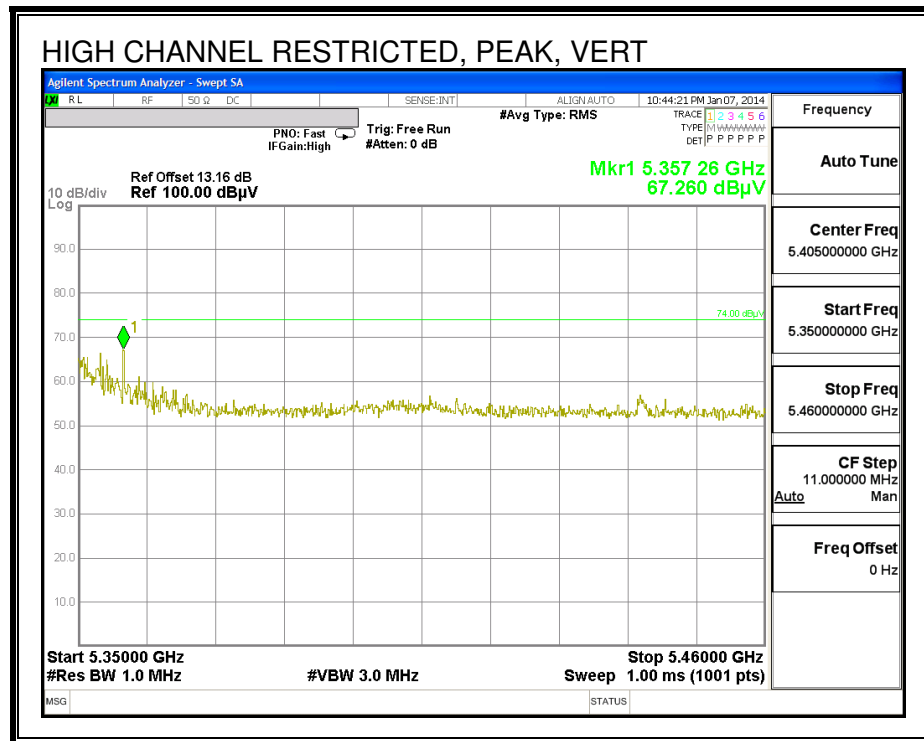
PK - Peak detector

FCC Part15C All 5GHz UNII and DTS Spurious Emissions with Average Scan.TST 30915 4 Jan 2014 Rev 9.5 12
Dec 2013

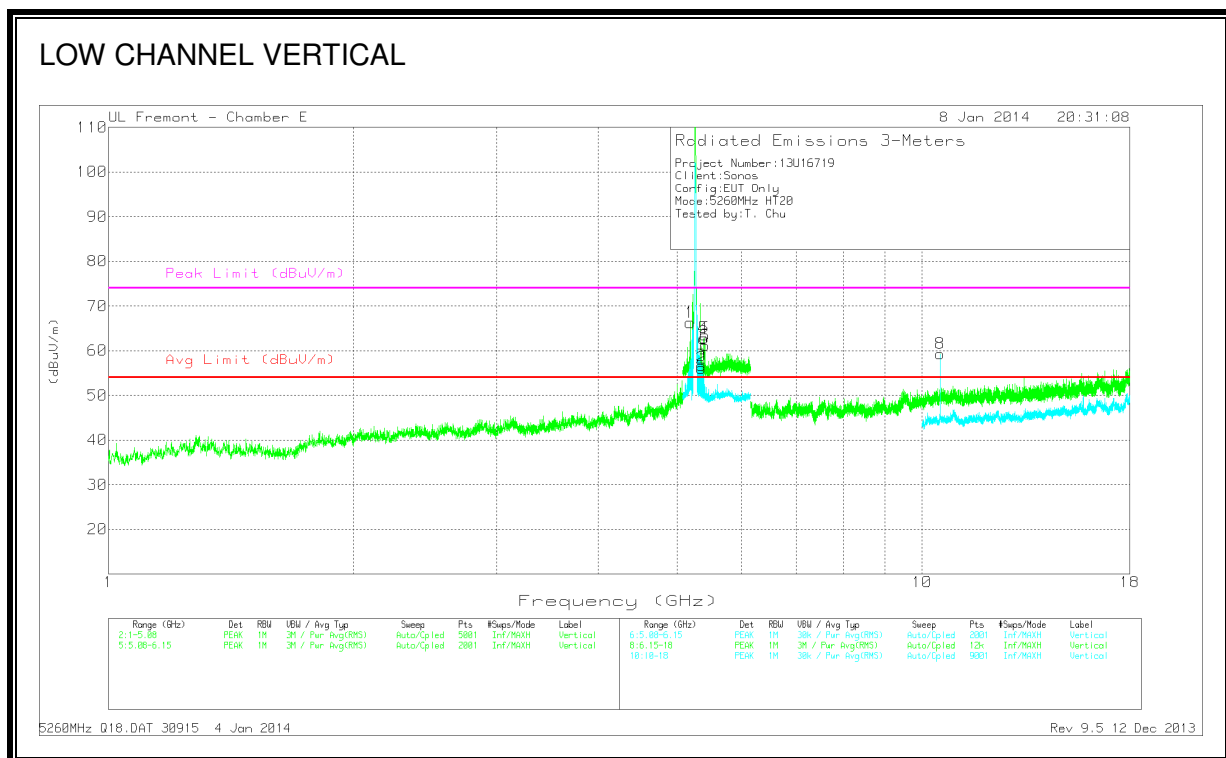
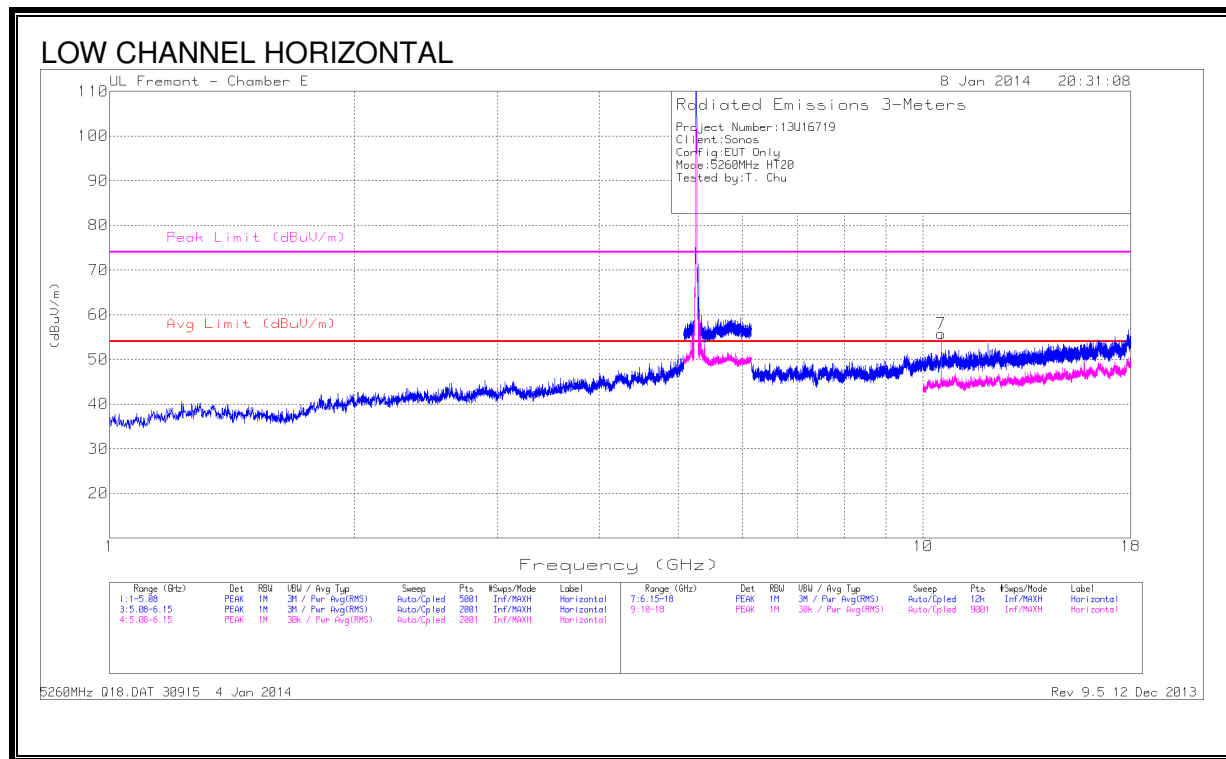
9.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

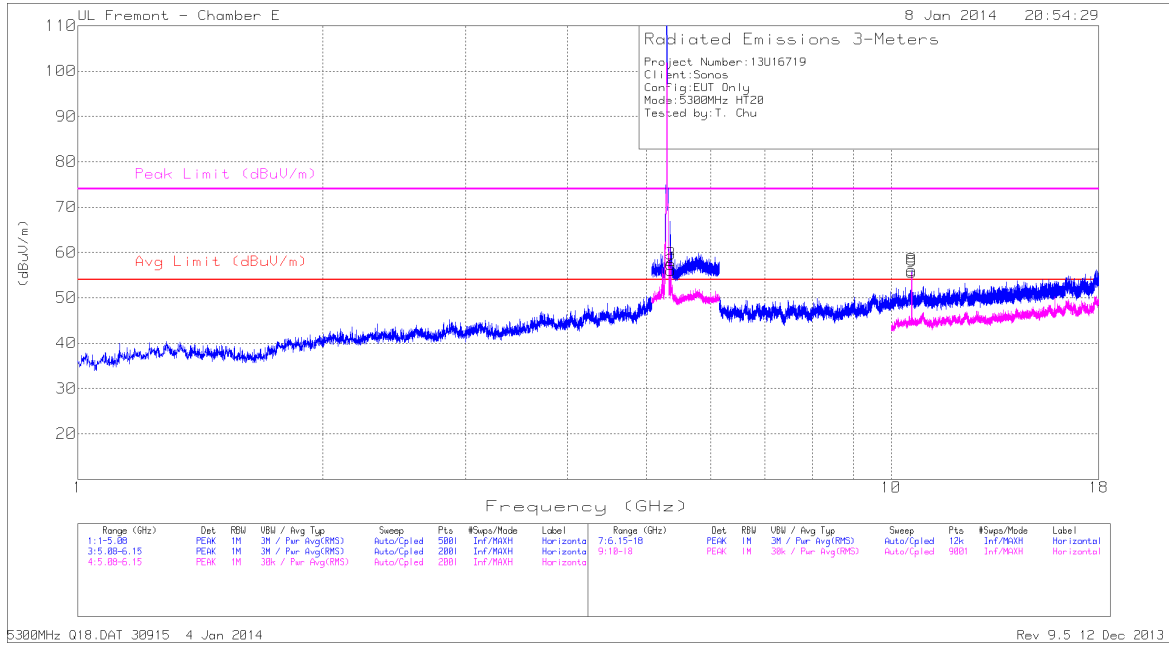
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/1 0dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.187	50.91	PK	34.3	-18.9	66.31	-	-	68.2	-1.89	0-360	200	V
2	* 5.356	40.8	PK	34.6	-19.3	56.1	-	-	74	-17.9	0-360	101	V
3	* 5.356	31.55	AD1	34.5	-19.3	46.75	54	-7.25	-	-	78	392	V
4	* 5.385	47.65	PK	34.6	-19.5	62.75	-	-	74	-11.25	0-360	101	V
	* 5.385	32.45	AD1	34.6	-19.5	47.55	54	-6.45	-	-	194	161	V
5	* 5.403	47.78	PK	34.6	-19.5	62.88	-	-	74	-11.12	0-360	101	V
	* 5.403	32.58	AD1	34.6	-19.5	47.68	54	-6.32	74	-26.32	6	225	V
6	* 5.41	46.13	PK	34.6	-19.5	61.23	-	-	74	-12.77	0-360	101	V
	* 5.41	32.69	AD1	34.6	-19.5	47.79	54	-6.21	74	-26.21	360	352	V
7	10.52	39.44	PK	38.4	-22.1	55.74	-	-	68.2	-12.46	0-360	200	H
8	10.52	43.02	PK	38.4	-22.1	59.32	-	-	68.2	-8.88	0-360	200	V

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

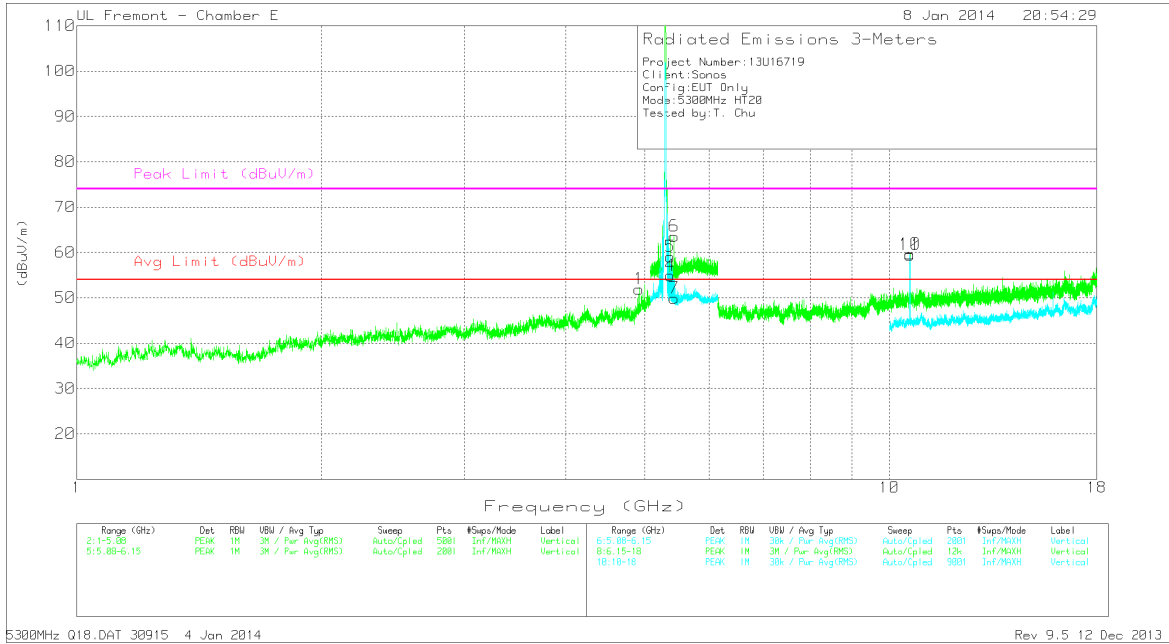
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ 5GHz LPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.92	45.58	PK	34	-27.3	52.28	-	-	74	-21.72	0-360	101	V
	* 4.92	38.31	AD1	34	-27.3	45.01	54	-8.99	74	-28.99	129	105	V
2	* 5.364	40.82	PK	34.6	-19.4	56.02	-	-	74	-17.98	0-360	101	H
3	* 5.364	32.01	AD1	34.6	-19.4	47.21	54	-6.79	74	-26.79	67	307	H
4	* 5.375	39.74	PK	34.6	-19.4	54.94	-	-	74	-19.06	0-360	101	V
5	* 5.375	32.31	AD1	34.6	-19.4	47.51	54	-6.49	74	-26.49	176	264	V
6	* 5.434	48.55	PK	34.7	-19.7	63.55	-	-	74	-10.45	0-360	101	V
7	* 5.434	30.8	AD1	34.7	-19.7	45.8	54	-8.2	74	-28.2	97	305	V
8	* 10.6	40.32	PK	38.6	-22.8	56.12	-	-	74	-17.88	0-360	199	H
9	* 10.6	35.61	AD1	38.6	-22.8	51.41	54	-2.59	-	-	341	321	H
10	* 10.6	43.85	PK	38.6	-22.8	59.65	-	-	74	-14.35	0-360	200	V
11	* 10.6	37.4	AD1	38.6	-22.8	53.2	54	-.8	-	-	169	313	V

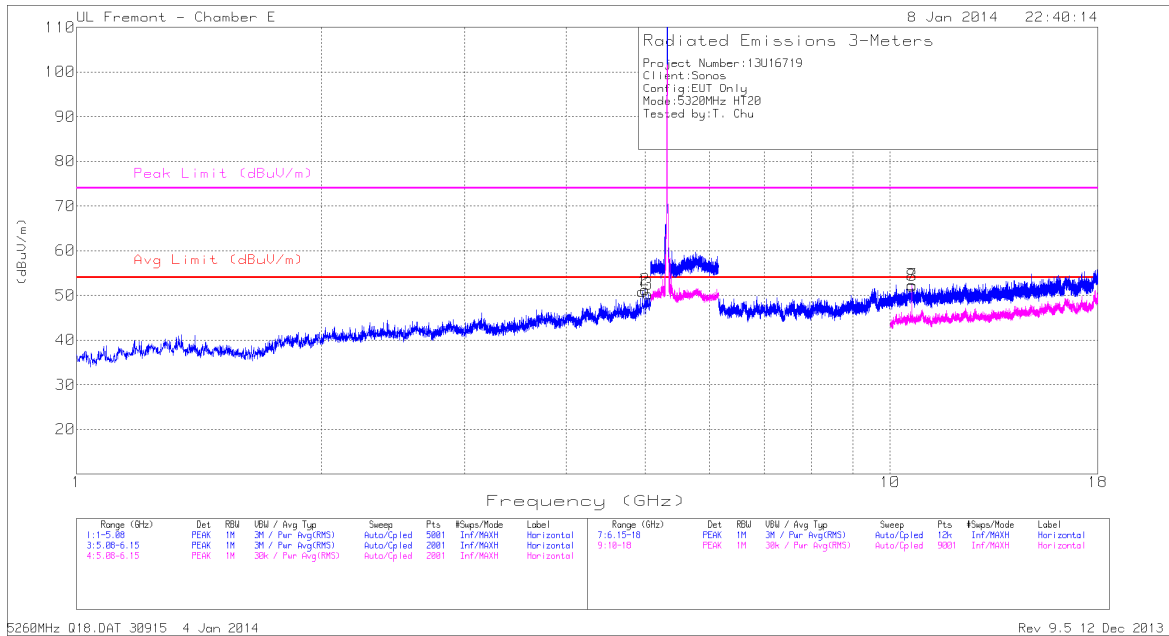
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

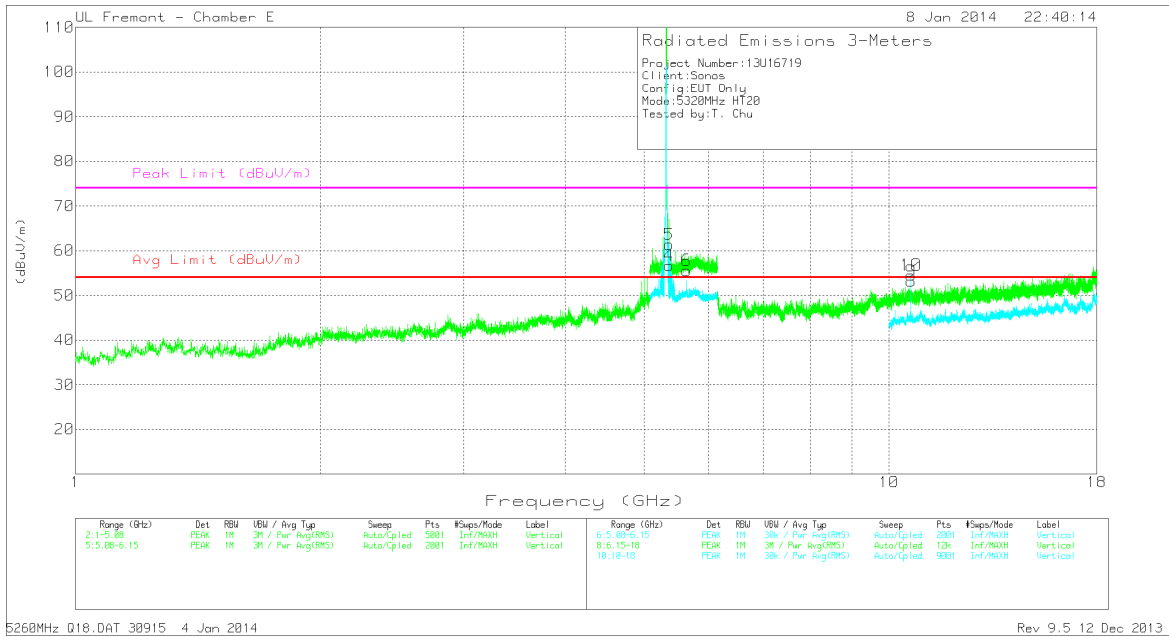
Avg - Video bandwidth < Resolution bandwidth

*.TST 30915 4 Jan 2014 Rev 9.5 12 Dec 2013

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/5 GHz LPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.961	43.94	PK	34	-27.1	50.84	-	-	74	-23.16	0-360	101	H
	* 4.961	34.21	AD1	34	-27.1	41.11	54	-12.89	-	-	97	279	H
2	* 5.001	44.28	PK	34	-27	51.28	-	-	74	-22.72	0-360	200	H
	* 5.001	39.86	AD1	34	-27	46.86	54	-7.14	-	-	107	274	H
3	* 5.041	42.72	PK	34.1	-26.5	50.32	-	-	74	-23.68	0-360	200	H
	* 5.041	32.26	AD1	34.1	-26.5	39.86	54	-14.14	-	-	181	179	H
4	* 5.362	41.49	PK	34.6	-19.4	56.69	-	-	74	-17.31	0-360	101	V
5	* 5.362	35.66	AD1	34.6	-19.3	50.96	54	-3.04	-	-	359	216	V
6	5.64	39.65	PK	34.8	-18.9	55.55	-	-	68.2	-12.65	0-360	101	V
7	* 10.64	36.49	PK	38.6	-22.7	52.39	-	-	74	-21.61	0-360	199	H
8	* 10.64	34.88	AD1	38.6	-22.7	50.78	54	-3.22	-	-	259	200	H
9	* 10.64	37.26	PK	38.6	-22.7	53.16	-	-	74	-20.84	0-360	200	V
10	* 10.64	34.72	AD1	38.6	-22.7	50.62	54	-3.38	-	-	187	387	V

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

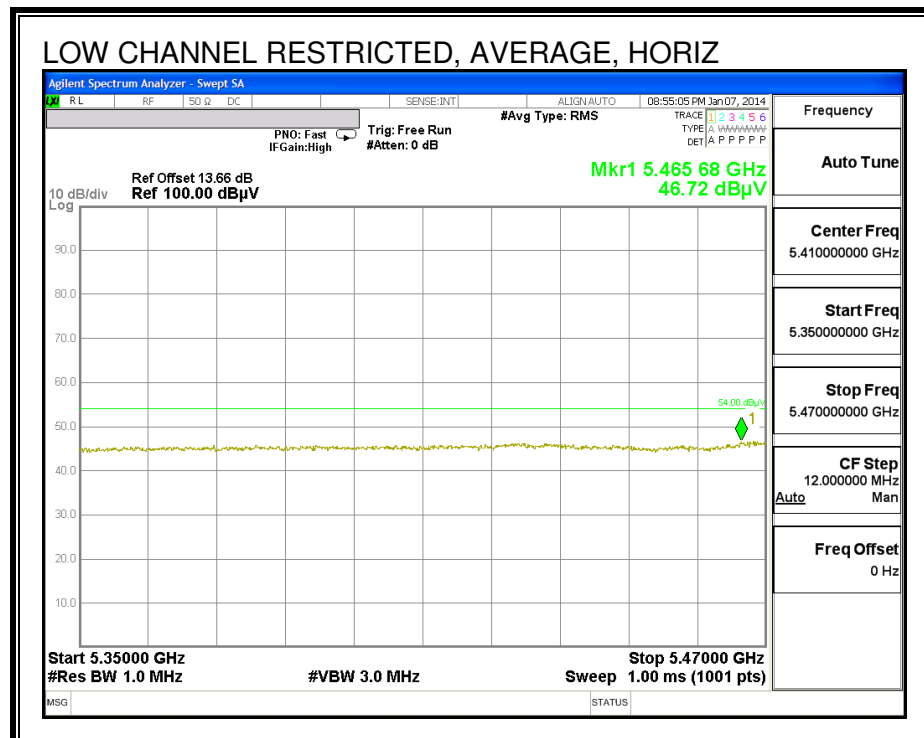
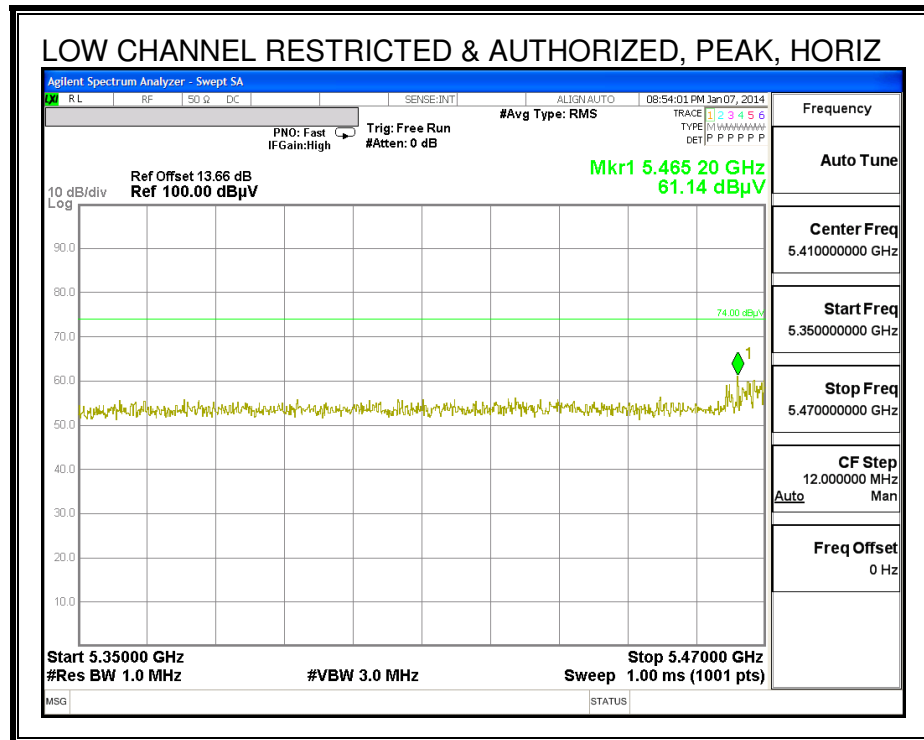
PK - Peak detector

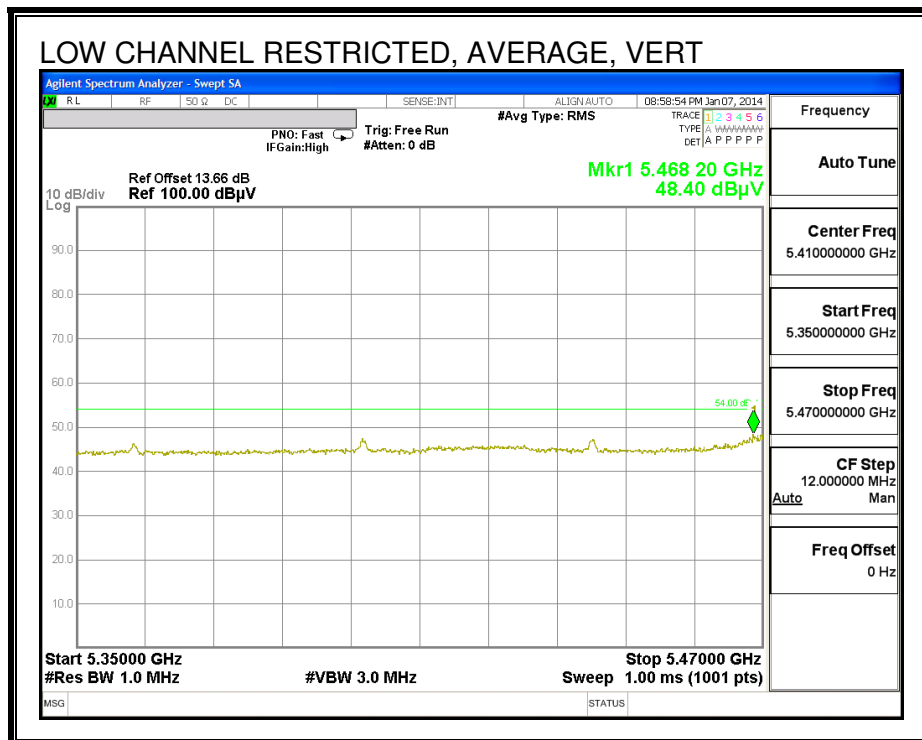
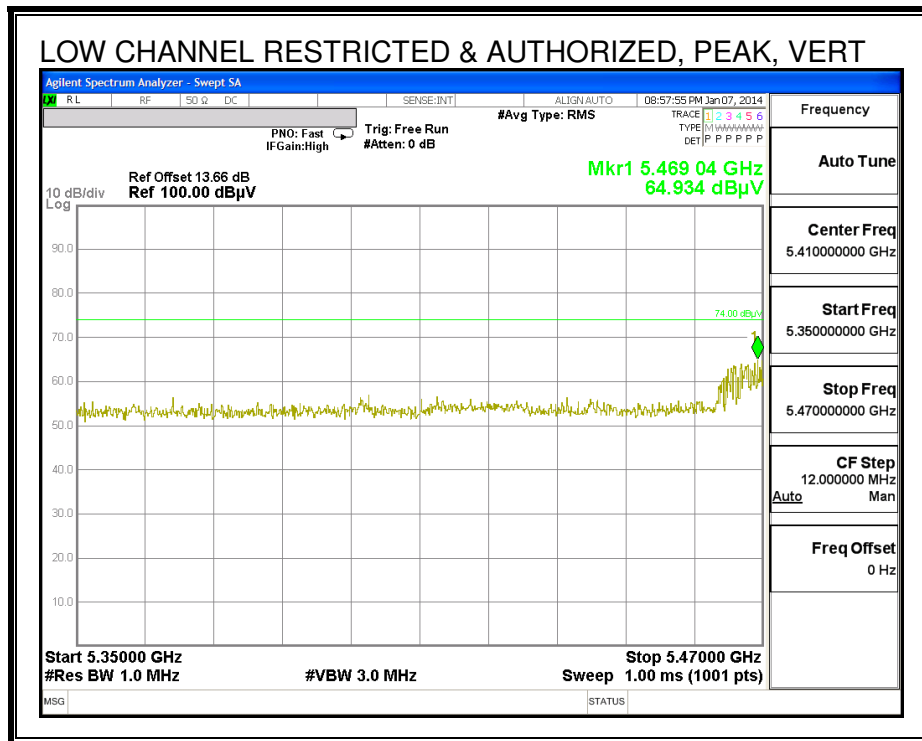
Avg - Video bandwidth < Resolution bandwidth

5260MHz Q18.DAT 30915 4 Jan 2014 Rev 9.5 12 Dec 2013

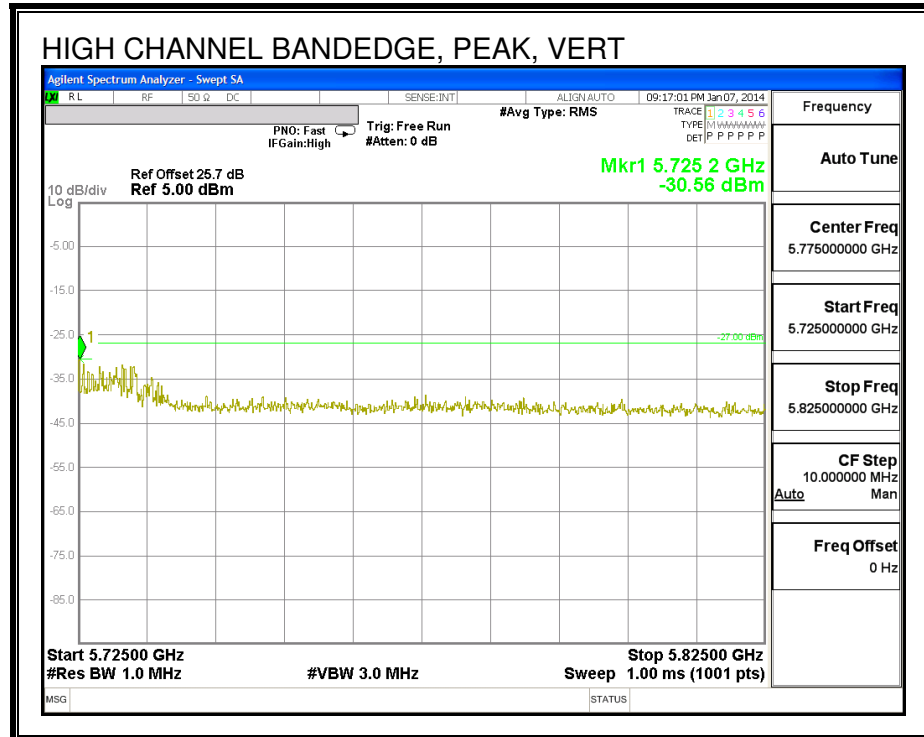
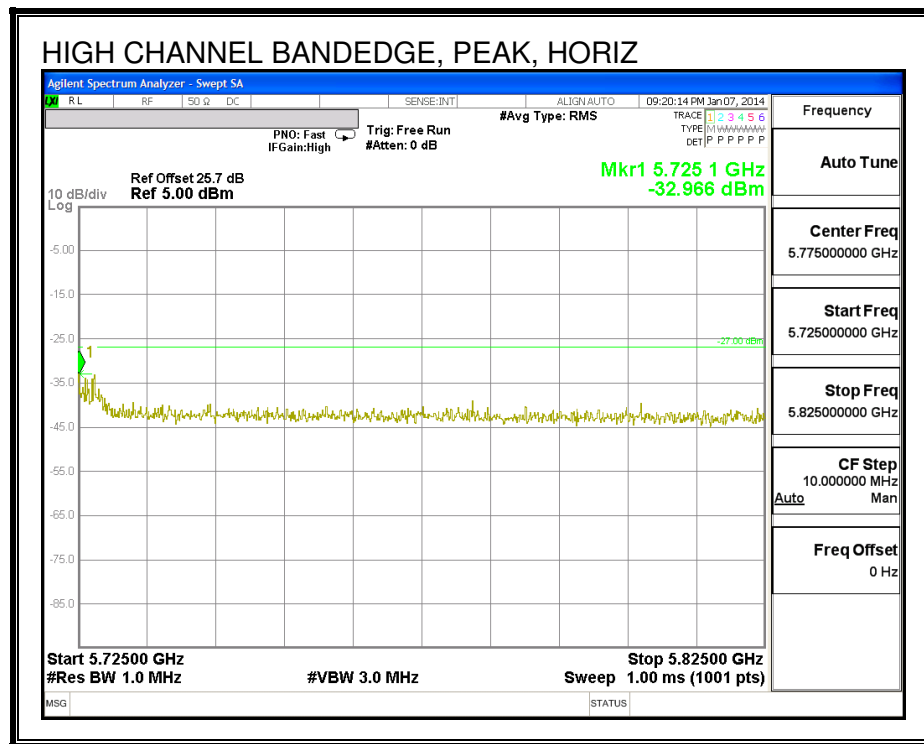
9.2.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

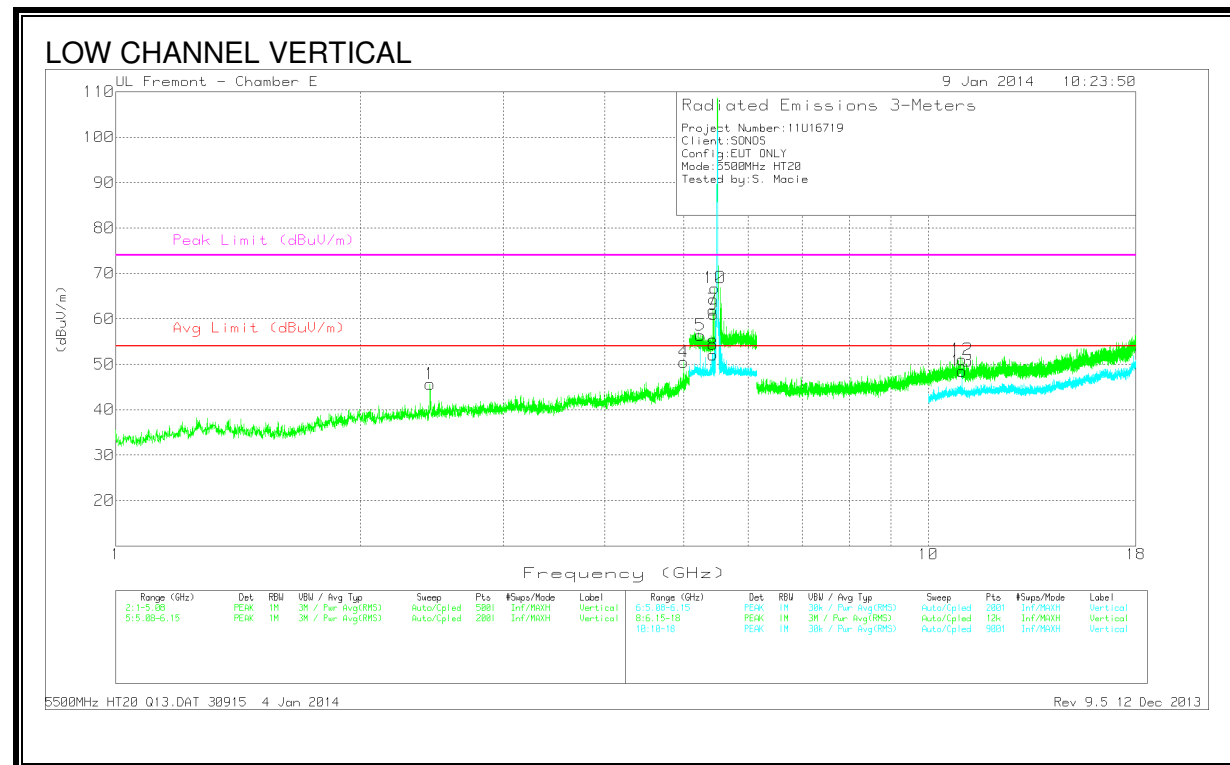
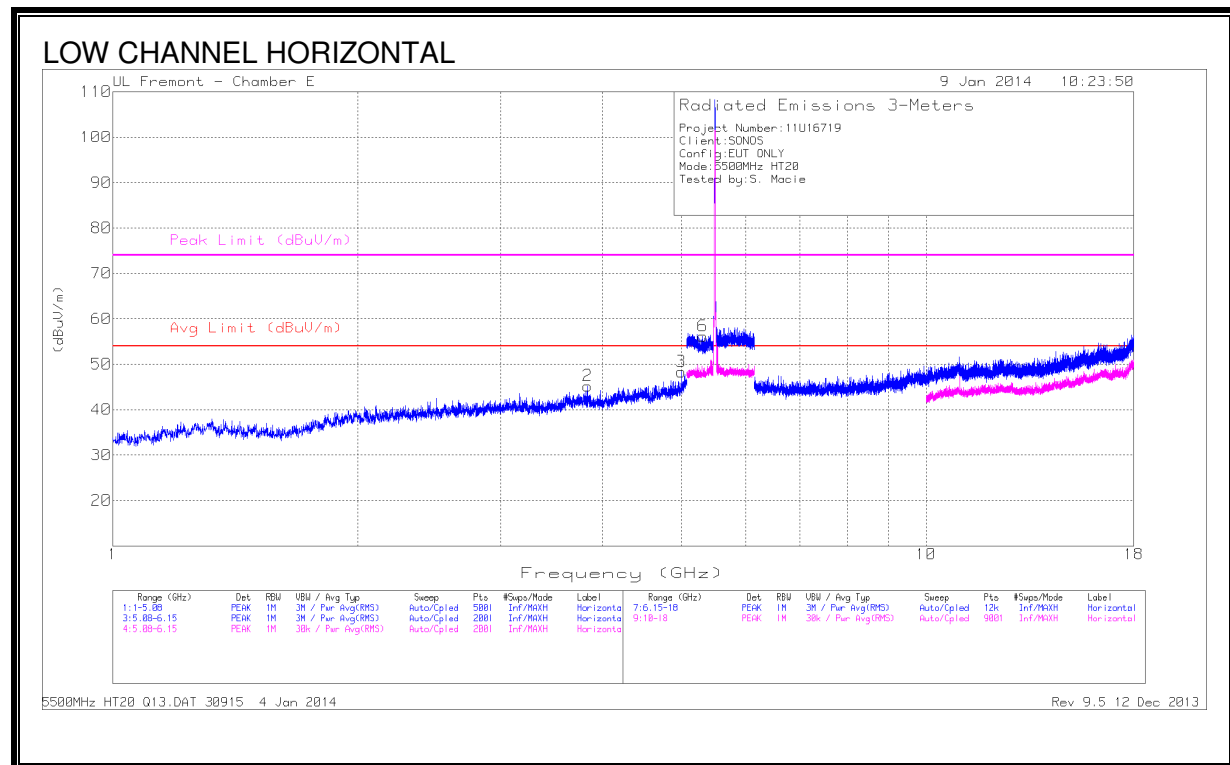




AUTHORIZED BANDEDGE (HIGH CHANNEL)



HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

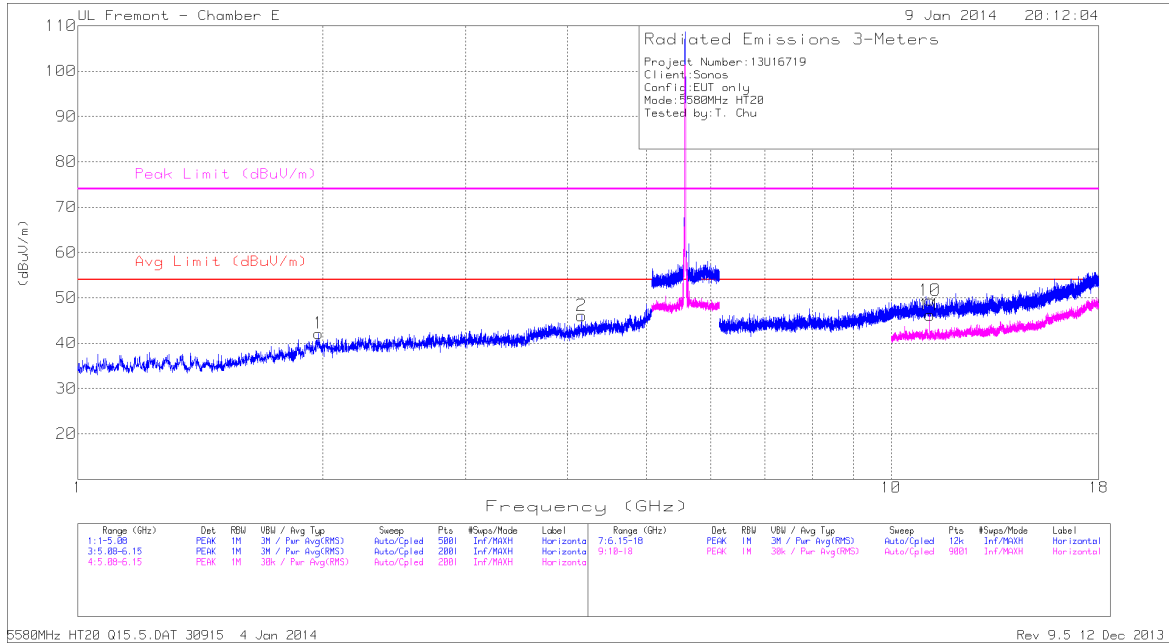
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ 5GHz LPF	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.437	44.04	PK	32.3	-30.7	0	45.64	-	-	68.2	-22.56	0-360	201	V
2	* 3.838	40.71	PK	33.5	-29	0	45.21	54	-8.79	74	-28.79	0-360	200	H
3	* 5.001	41.37	PK	34	-27	0	48.37	-	-	74	-25.63	0-360	101	H
	* 5.001	32.19	AD1	34	-27	.6	39.79	54	-14.21	-	-	169	297	H
4	* 5.002	43.5	PK	34	-27	0	50.5	-	-	74	-23.5	0-360	101	V
	* 5.002	38.95	AD1	34	-27	.6	46.55	54	-7.45	-	-	83	255	V
5	5.241	41.29	PK	34.4	-19.3	0	56.39	-	-	68.2	-11.81	0-360	101	V
6	5.315	40.97	PK	34.5	-19.3	0	56.17	-	-	68.2	-12.03	0-360	101	H
7	* 5.433	46.94	PK	34.7	-19.7	0	61.94	-	-	74	-12.06	0-360	101	V
	* 5.434	29.06	AD1	34.7	-19.7	.6	44.66	54	-9.34	-	-	190	342	V
9	* 5.440	45.98	PK	34.7	-19.7	0	60.98	-	-	74	-13.02	0-360	101	V
	* 5.440	32.4	AD1	34.7	-19.7	.6	48	54	-6	-	-	108	153	V
10	* 5.459	51.88	PK	34.7	-19.8	0	66.78	-	-	74	-7.22	0-360	101	V
	* 5.459	31.65	AD1	34.7	-19.8	.6	47.15	54	-6.85	-	-	197	320	V
12	* 11.000	35.11	PK	38.7	-22.8	0	51.01	-	-	74	-22.99	0-360	201	V
	* 11.000	31.01	AD1	38.7	-22.8	.6	47.51	54	-6.49	-	-	242	327	V

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

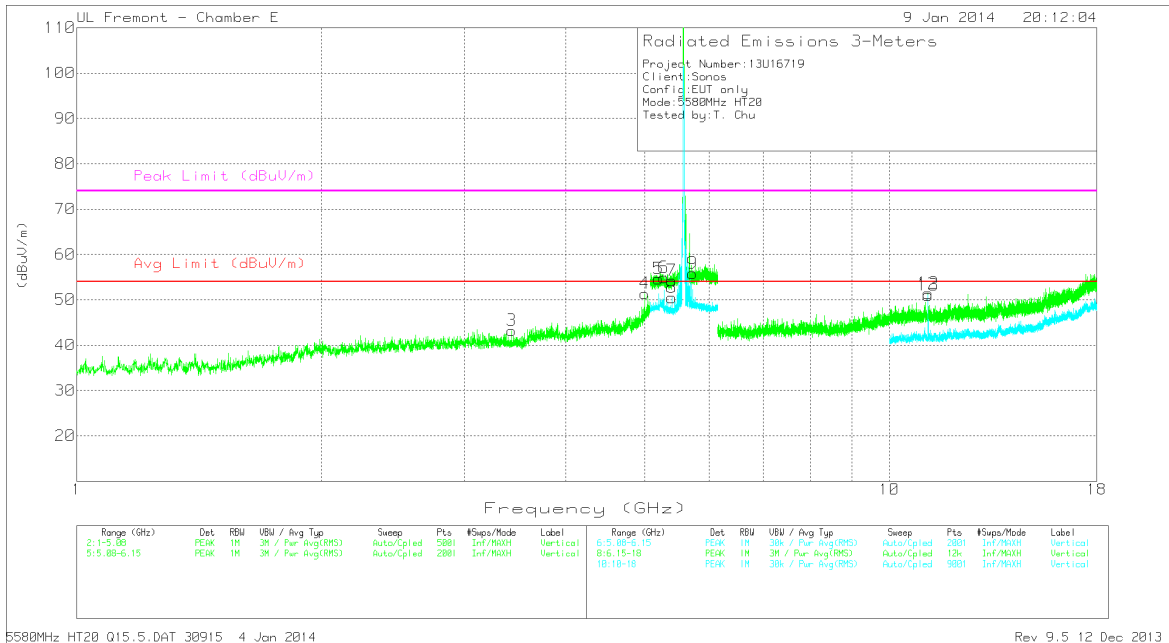
PK - Peak detector

AD1 - KDB 789033 Method: AD Primary Power Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/5 GHz LPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.978	42.85	PK	32	-32.7	42.15	-	-	68.2	-26.05	0-360	199	H
2	* 4.164	43.68	PK	33.9	-31.5	46.08	-	-	74	-27.92	0-360	199	H
3	3.432	42.51	PK	33.2	-32.5	43.21	-	-	68.2	-24.99	0-360	200	V
4	* 5.001	46.09	PK	34.4	-29.1	51.39	-	-	74	-22.61	0-360	101	V
	* 5.001	37.63	AD1	34.4	-29.1	42.93	54	-11.07	-	-	268	122	V
5	5.2	41.34	PK	34.6	-21.3	54.64	-	-	68.2	-13.56	0-360	199	V
6	5.28	41.61	PK	34.7	-21.4	54.91	-	-	68.2	-13.29	0-360	101	V
7	* 5.4	41.06	PK	34.8	-21.6	54.26	-	-	74	-19.74	0-360	101	V
8	* 5.4	34.57	AD1	34.8	-21.6	47.77	54	-6.23	-	-	203	149	V
9	5.727	42.02	PK	35.3	-21.5	55.82	-	-	68.2	-12.38	0-360	101	V
10	* 11.16	35.37	PK	38.6	-24.5	49.47	-	-	74	-24.53	0-360	199	H
11	* 11.16	32.12	Avg	38.6	-24.5	46.22	54	-7.78	-	-	0-360	199	H
12	* 11.16	37.34	PK	38.6	-24.5	51.44	-	-	74	-22.56	0-360	200	V
13	* 11.16	36.48	AD1	38.6	-24.5	50.58	54	-3.42	-	-	206	290	V

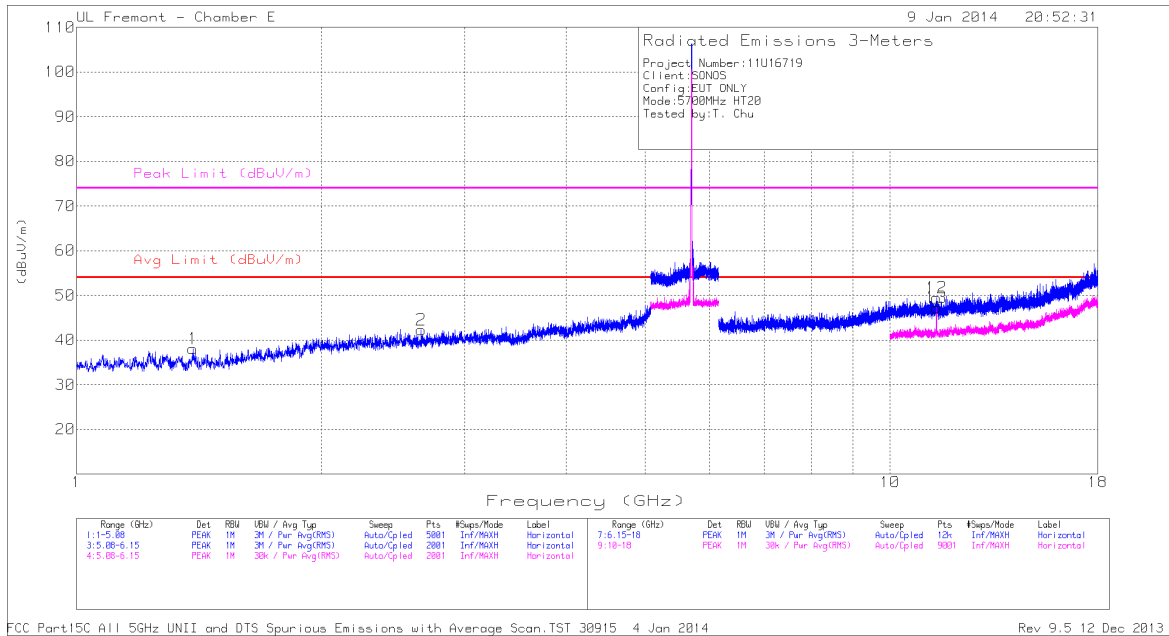
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

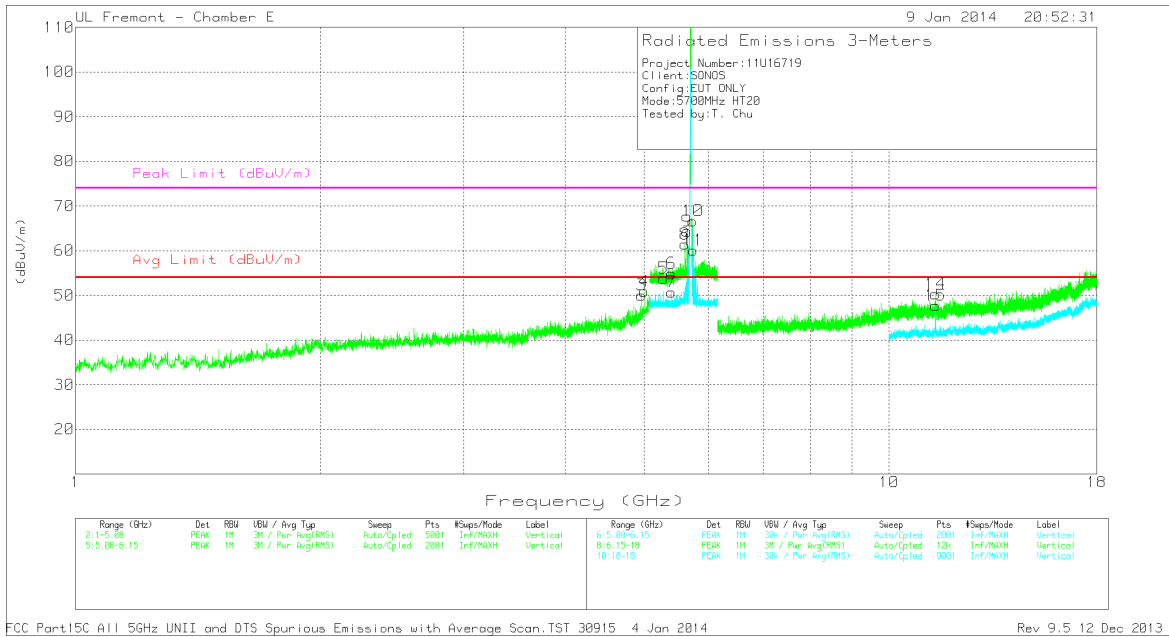
AD1 - KDB 789033 Method: AD Primary Power Average

5580MHz Q15.DAT 30915 4 Jan 2014 Rev 9.5 12 Dec 2013

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/5 GHz LPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.39	43.27	PK	29	-34.2	38.07	-	-	74	-35.93	0-360	200	H
2	2.652	42.25	PK	33	-33	42.25	-	-	68.2	-25.95	0-360	101	H
3	* 4.961	45.98	PK	34.4	-30.3	50.08	-	-	74	-23.92	0-360	101	V
	* 4.961	32.72	AD1	34.4	-30.3	36.82	54	-17.18	-	-	160	225	V
4	* 5.001	45.62	PK	34.4	-29.1	50.92	-	-	74	-23.08	0-360	101	V
	* 5.001	40.14	AD1	34.4	-29.1	45.44	54	-8.56	-	-	205	233	V
5	5.28	40.5	PK	34.7	-21.4	53.8	-	-	68.2	-14.4	0-360	101	V
6	* 5.399	41.69	PK	34.8	-21.6	54.89	-	-	74	-19.11	0-360	199	V
7	* 5.399	34.42	AD1	34.8	-21.6	47.62	54	-6.38	74	-26.38	319	128	V
8	5.61	47.48	PK	35.1	-21.1	61.48	-	-	68.2	-6.72	0-360	101	V
9	5.645	50.38	PK	35.1	-21.1	64.38	-	-	68.2	-3.82	0-360	101	V
10	5.737	52.67	PK	35.4	-21.4	66.67	-	-	68.2	-1.53	0-360	199	V
11	5.747	46.11	PK	35.4	-21.4	60.11	-	-	68.2	-8.09	0-360	101	V
12	* 11.4	35.14	PK	38.7	-24.4	49.44	-	-	74	-24.56	0-360	199	H
13	* 11.4	32.98	Avg	38.7	-24.4	47.28	54	-6.72	-	-	0-360	200	H
14	* 11.4	36.01	PK	38.7	-24.4	50.31	-	-	74	-23.69	0-360	200	V
15	* 11.4	33.45	Avg	38.7	-24.4	47.75	54	-6.25	-	-	0-360	101	V

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

PK - Peak detector

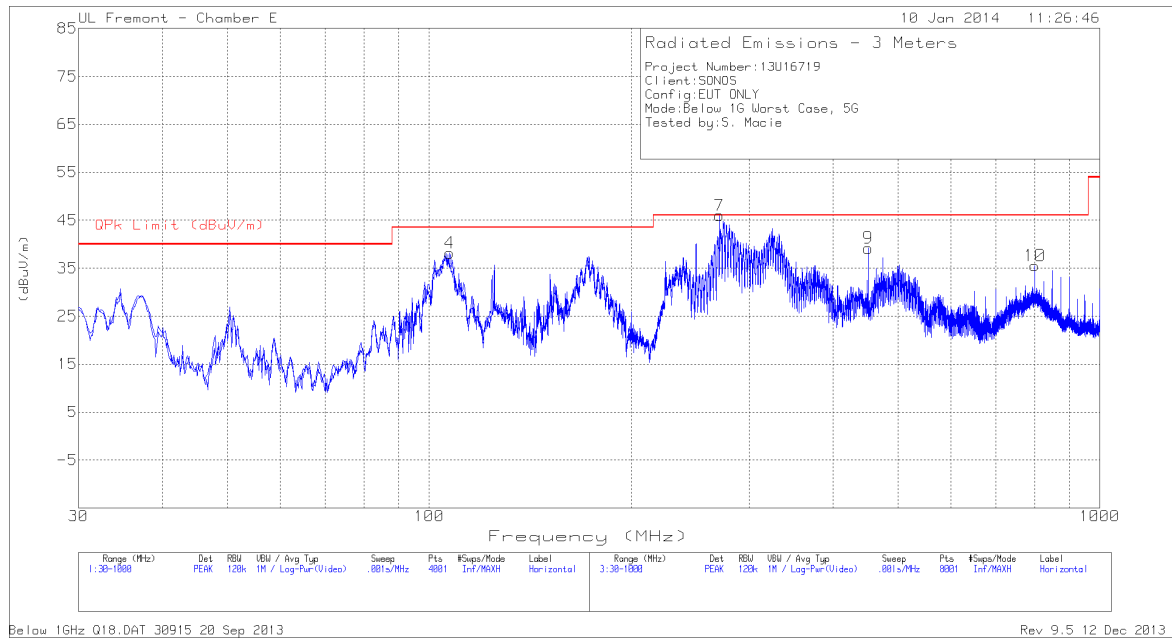
Avg - Video bandwidth < Resolution bandwidth

FCC Part15C All 5GHz UNII and DTS Spurious Emissions with Average Scan.TST 30915 4 Jan 2014 Rev 9.5
12 Dec 2013

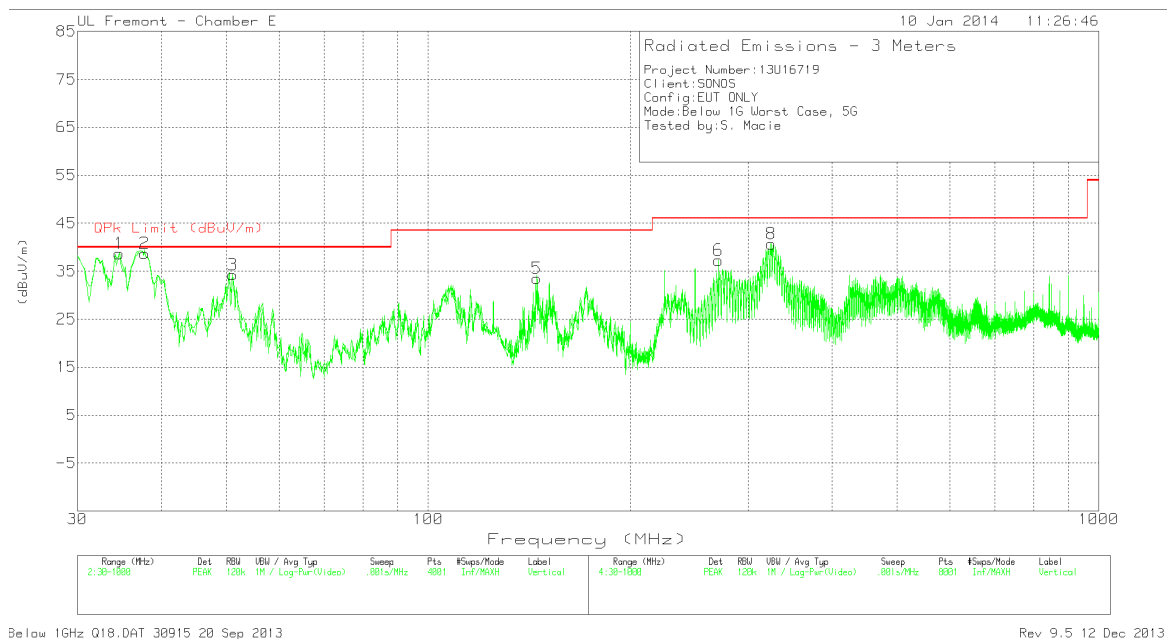
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	34.6075	48.38	PK	17.8	-27.5	38.68	-	-	0-360	100	V
	34.6075	43.76	QP	17.8	-27.5	34.06	40	-5.94	109	156	V
2	* 37.7600	51.31	PK	15.6	-27.5	39.41	-	-	0-360	100	V
	37.7600	47.77	QP	15.6	-27.5	35.87	40	-4.13	122	102	V
3	51.0975	54.51	PK	7.6	-27.6	34.51	-	-	0-360	100	V
	51.0975	49.93	QP	7.6	-27.6	29.93	40	-10.07	147	110	V
4	107.3575	54.27	PK	12	-28.1	38.17	-	-	0-360	300	H
	107.3575	50.46	QP	12	-28.1	34.36	43.52	-9.16	55	280	H
5	145.1875	48.78	PK	12.5	-27.1	34.18	43.52	-9.34	0-360	100	V
6	* 270.9238	50.87	PK	13.1	-26.7	37.27	46.02	-8.75	0-360	200	V
7	* 271.0450	59.5	PK	13.1	-26.6	46.00	-	-	0-360	101	H
	271.0450	54.42	QP	13.3	-26.4	41.32	46.02	-4.70	133	115	H
8	* 324.8800	53.9	PK	14	-27.2	40.7	-	-	0-360	100	V
	324.8800	49.2	QP	14	-27.2	36.00	46.02	-10.02	6	107	V
9	451.7075	49.63	PK	16.8	-27.5	38.93	46.02	-7.09	0-360	201	H
10	800.0588	39.73	PK	21.5	-25.7	35.53	46.02	-10.49	0-360	100	H

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

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

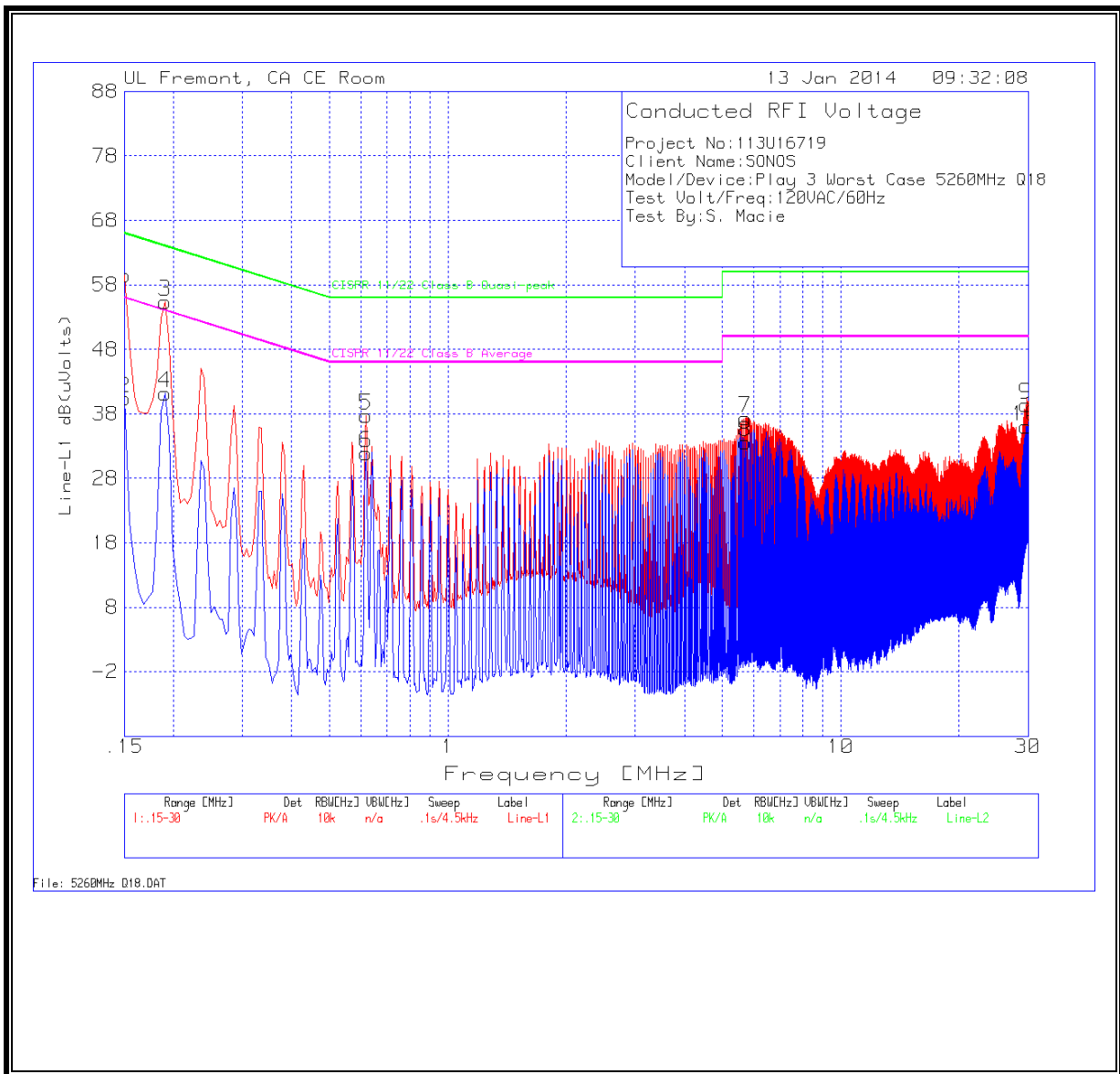
6 WORST EMISSIONS

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	.15	59.39	PK	.1	0	59.49	66	-6.51	-	-
2	.15	40.26	Av	.1	0	40.36	-	-	56	-15.64
3	.1905	55.28	PK	.1	0	55.38	64	-8.62	-	-
4	.1905	41.15	Av	.1	0	41.25	-	-	54	-12.75
5	.618	37.67	PK	.1	0	37.77	56	-18.23	-	-
6	.618	31.76	Av	.1	0	31.86	-	-	46	-14.14
7	5.7075	37.13	PK	.1	.1	37.33	60	-22.67	-	-
8	5.7075	33.33	Av	.1	.1	33.53	-	-	50	-16.47
9	29.643	38.57	PK	.5	.3	39.37	60	-20.63	-	-
10	29.643	35.18	Av	.5	.3	35.98	-	-	50	-14.02

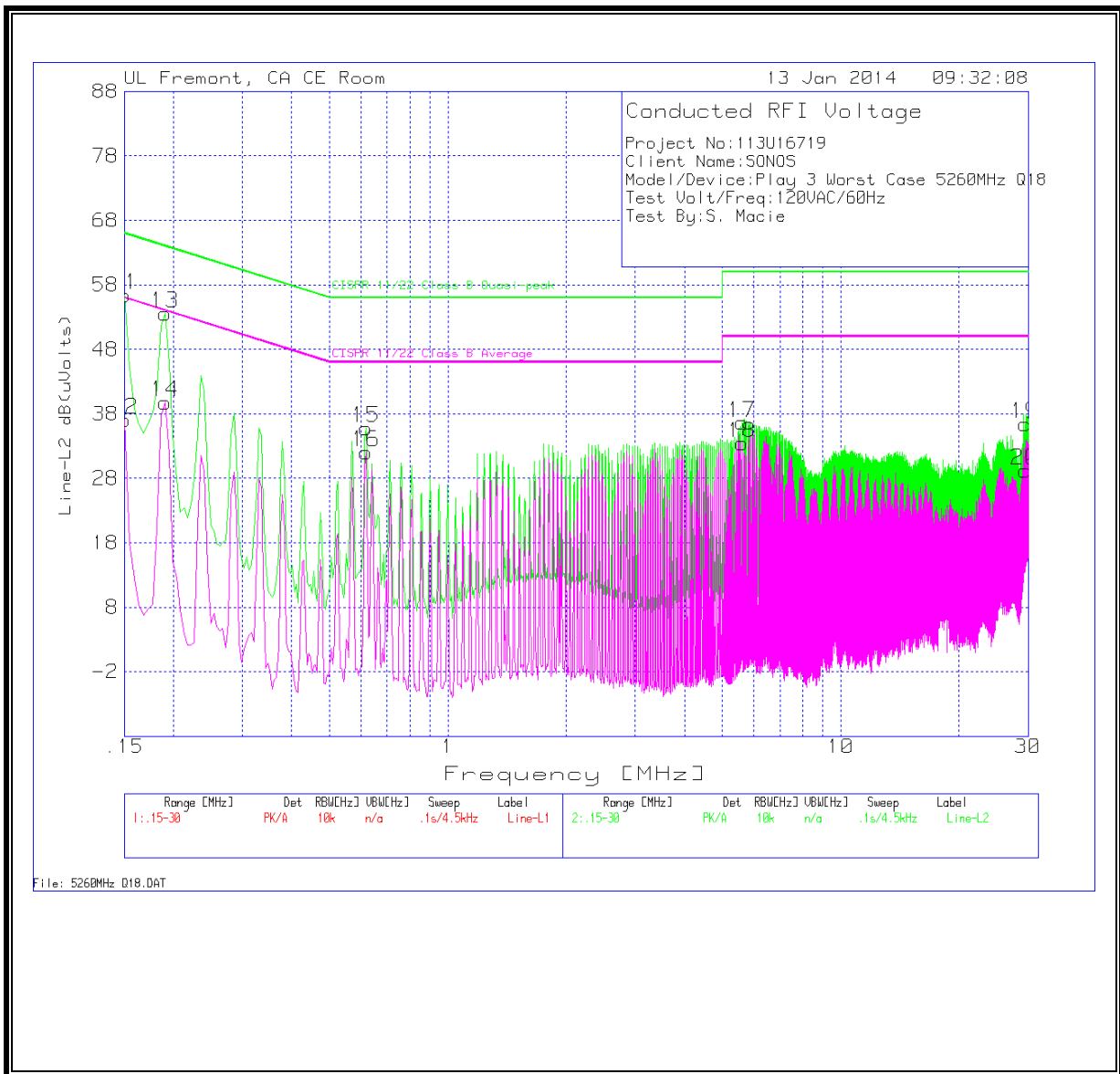
Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
11	.15	56.26	PK	.1	0	56.36	66	-9.64	-	-
12	.15	36.95	Av	.1	0	37.05	-	-	56	-18.95
13	.1905	53.43	PK	.1	0	53.53	64	-10.47	-	-
14	.1905	39.65	Av	.1	0	39.75	-	-	54	-14.25
15	.618	35.72	PK	.1	0	35.82	56	-20.18	-	-
16	.618	31.99	Av	.1	0	32.09	-	-	46	-13.91
17	5.604	36.42	PK	.1	.1	36.62	60	-23.38	-	-
18	5.604	33.2	Av	.1	.1	33.4	-	-	50	-16.6
19	29.4765	35.62	PK	.5	.3	36.42	60	-23.58	-	-
20	29.4765	28.43	Av	.5	.3	29.23	-	-	50	-20.77

PK - Peak detector
Av - average detection

LINE 1 RESULTS



LINE 2 RESULTS



11. POWER SETTING

5.2GHz

Frequency(MHz)	Power Setting (Q)		
	Chain o	Chain 1	Chain 2
5180	9	9	9
5200	9	9	9
5240	9.5	9.5	9.5

5.3GHz

Frequency(MHz)	Power Setting (Q)		
	Chain o	Chain 1	Chain 2
5260	16.5	16.5	16.5
5300	16.5	16.5	16.5
5320	16.5	16.5	16.5

5.6GHz

Frequency(MHz)	Power Setting (Q)		
	Chain o	Chain 1	Chain 2
5500	17	17	17
5580	16	16	16
5700	15.5	15.5	15.5