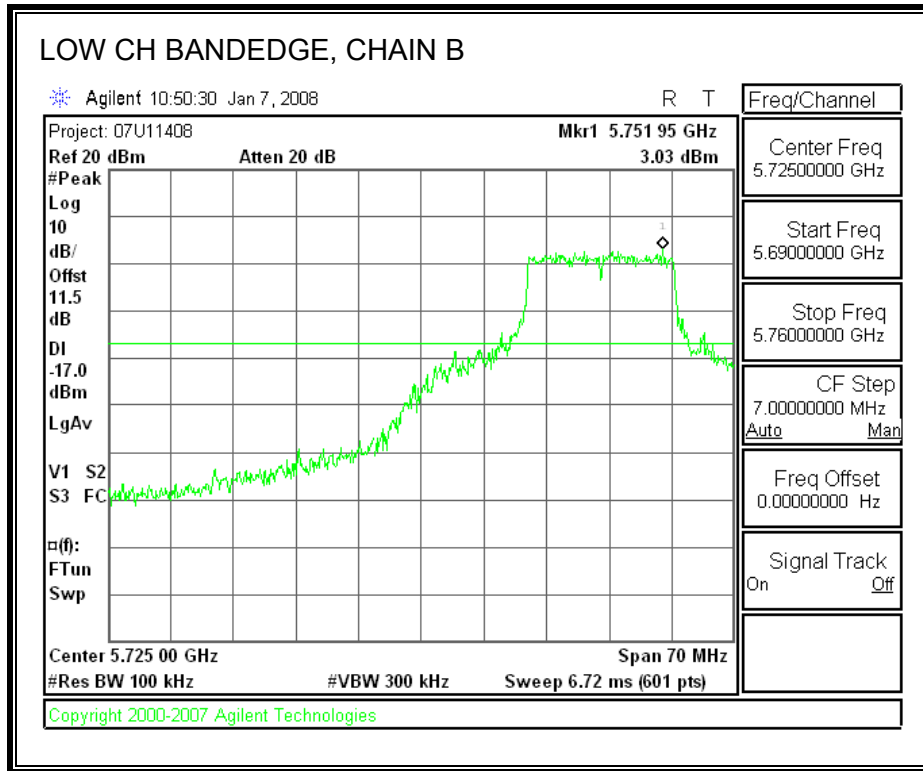
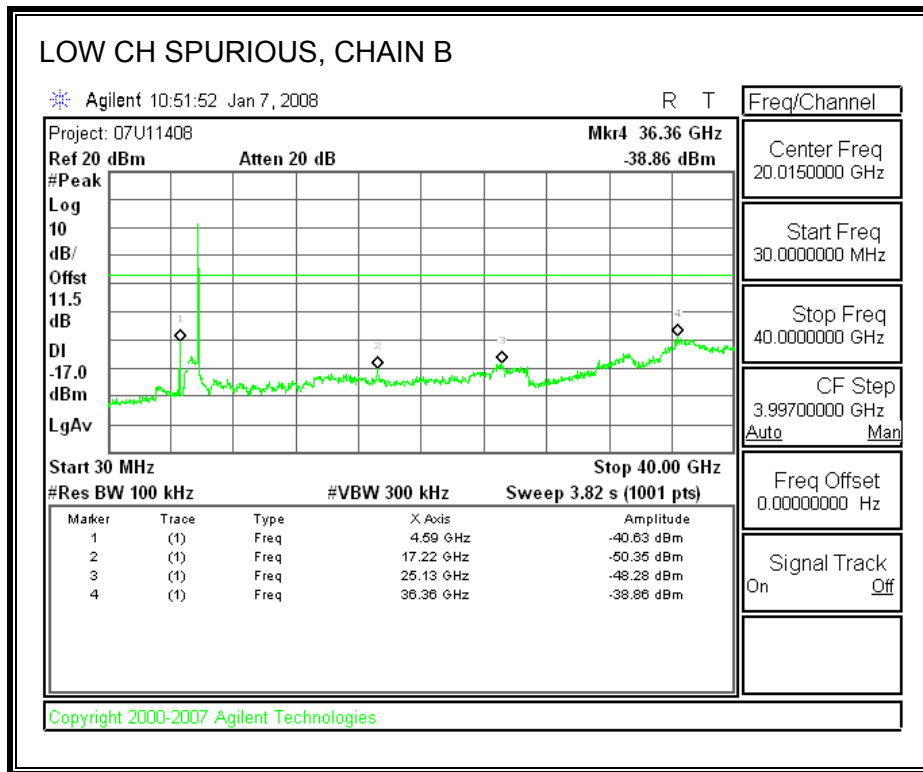
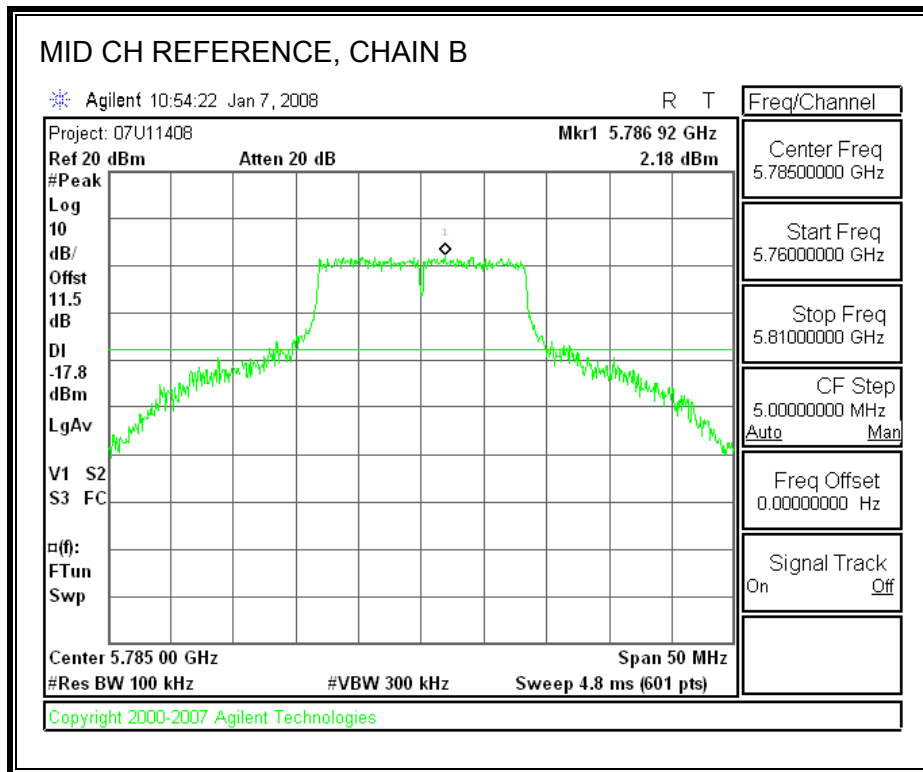
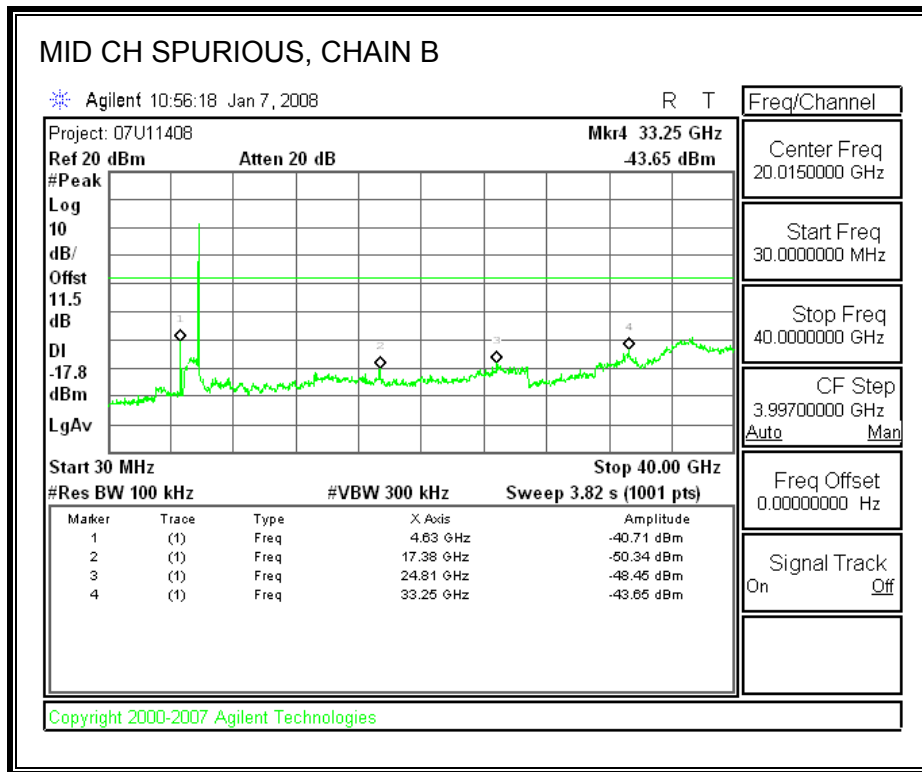


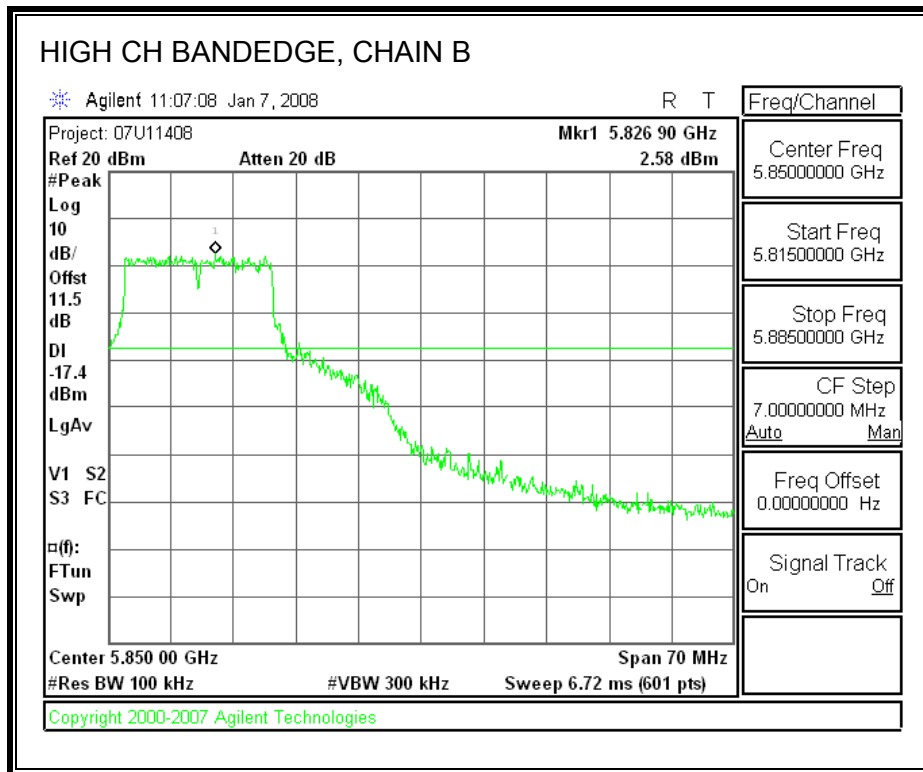
CHAIN B SPURIOUS EMISSIONS

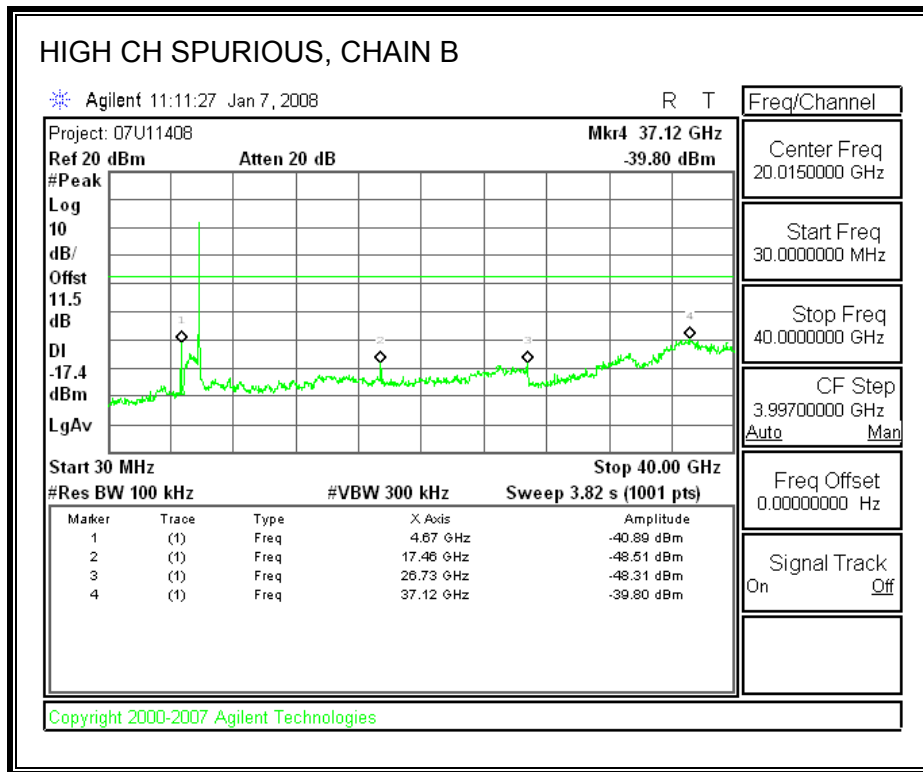




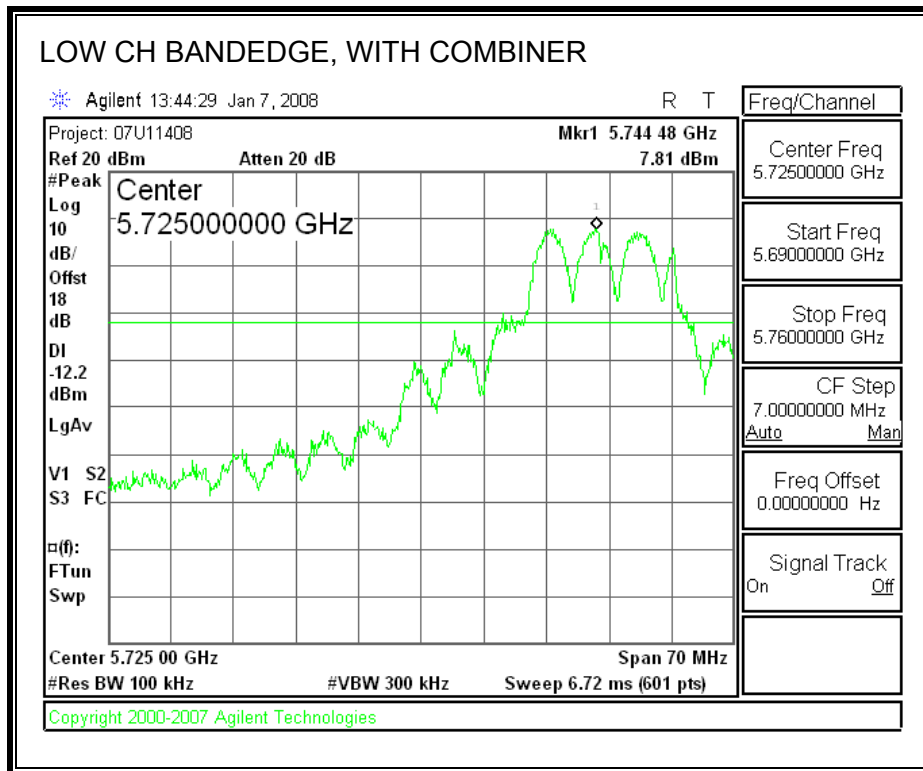


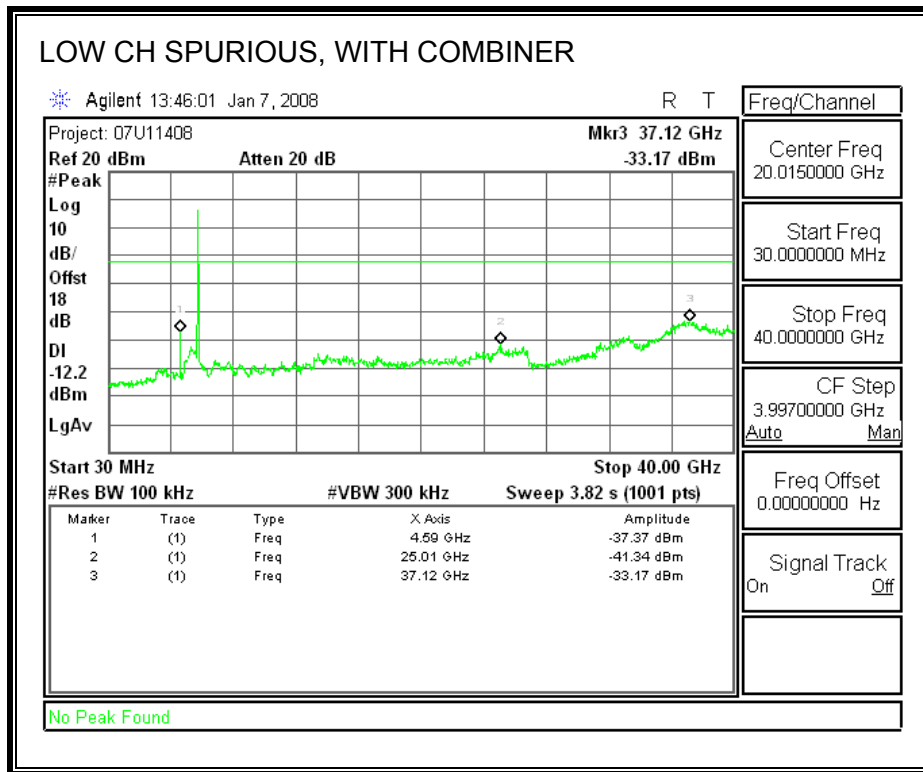


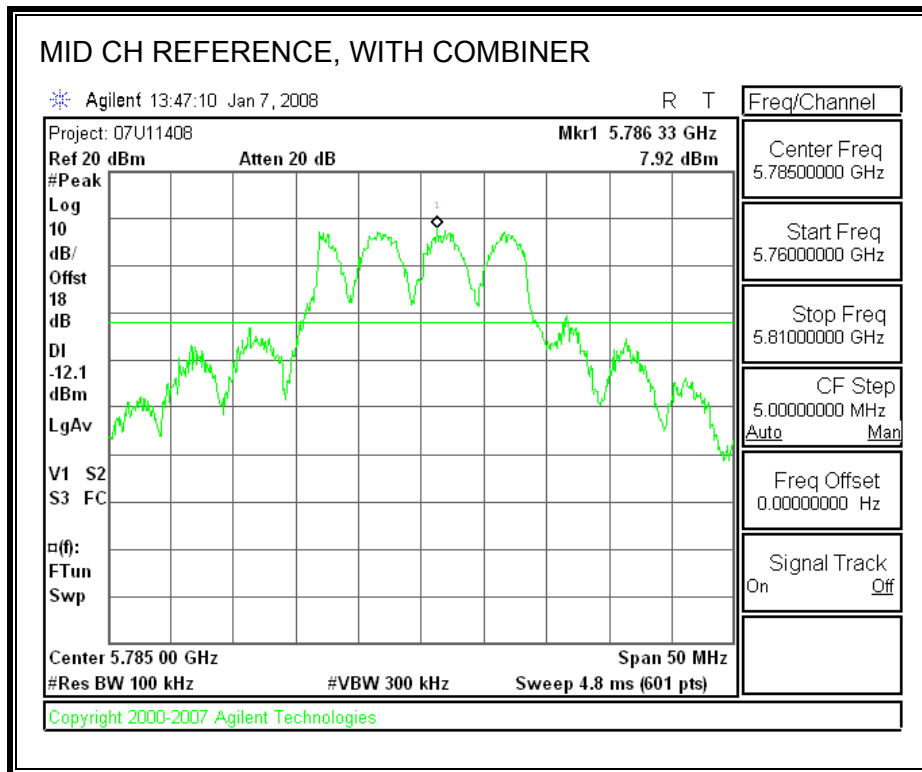


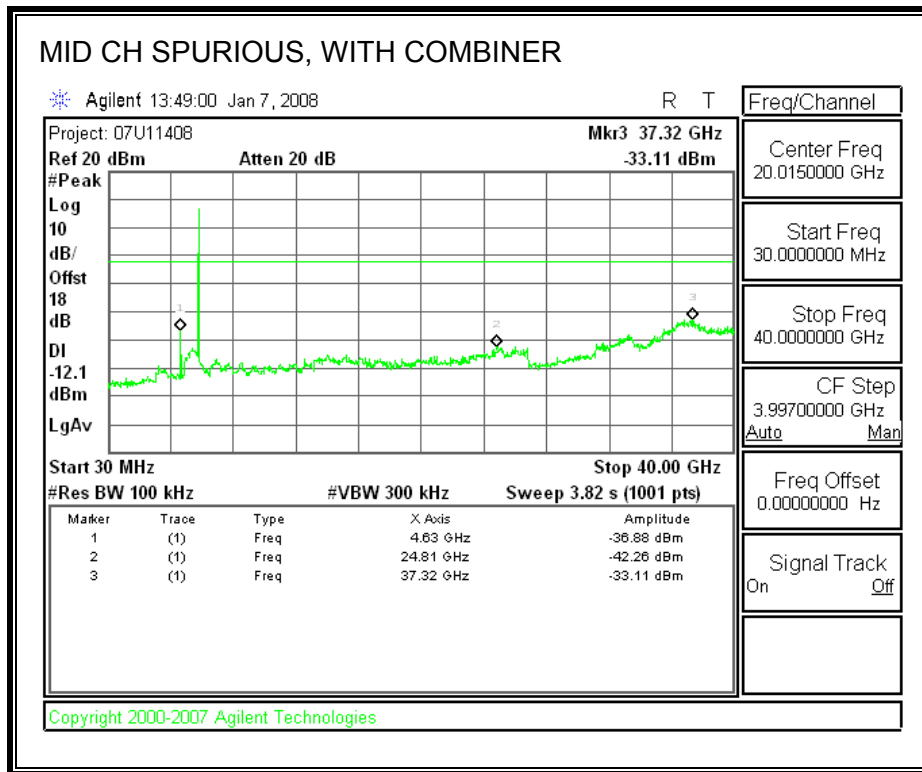


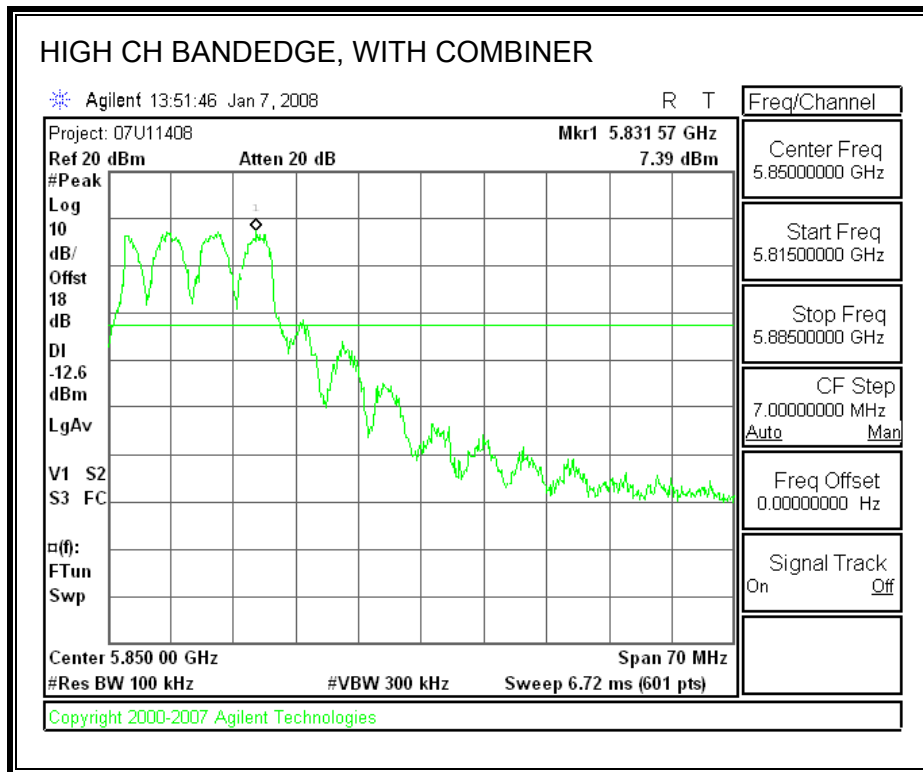
SPURIOUS EMISSIONS WITH COMBINER

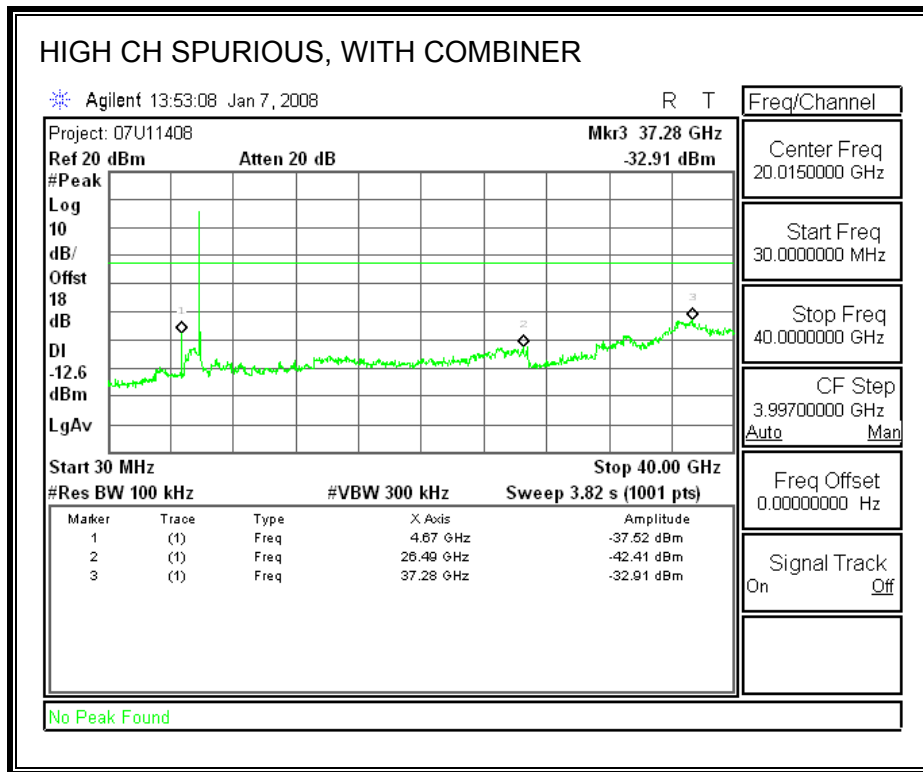












7.6. 802.11n HT20 MODE IN THE 5.8 GHz BAND

7.6.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

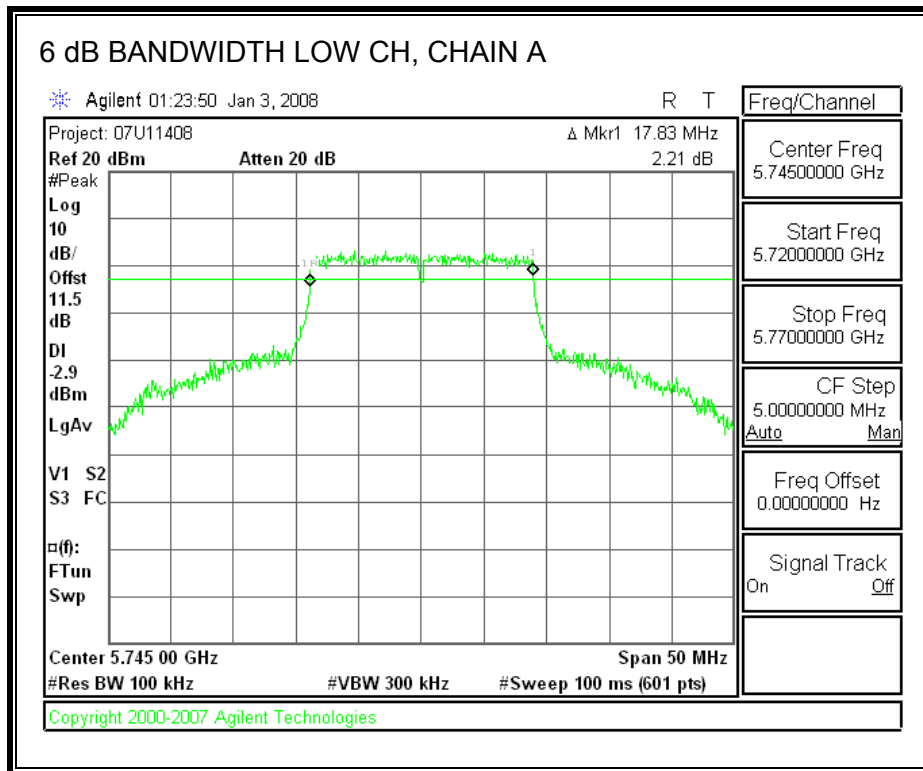
TEST PROCEDURE

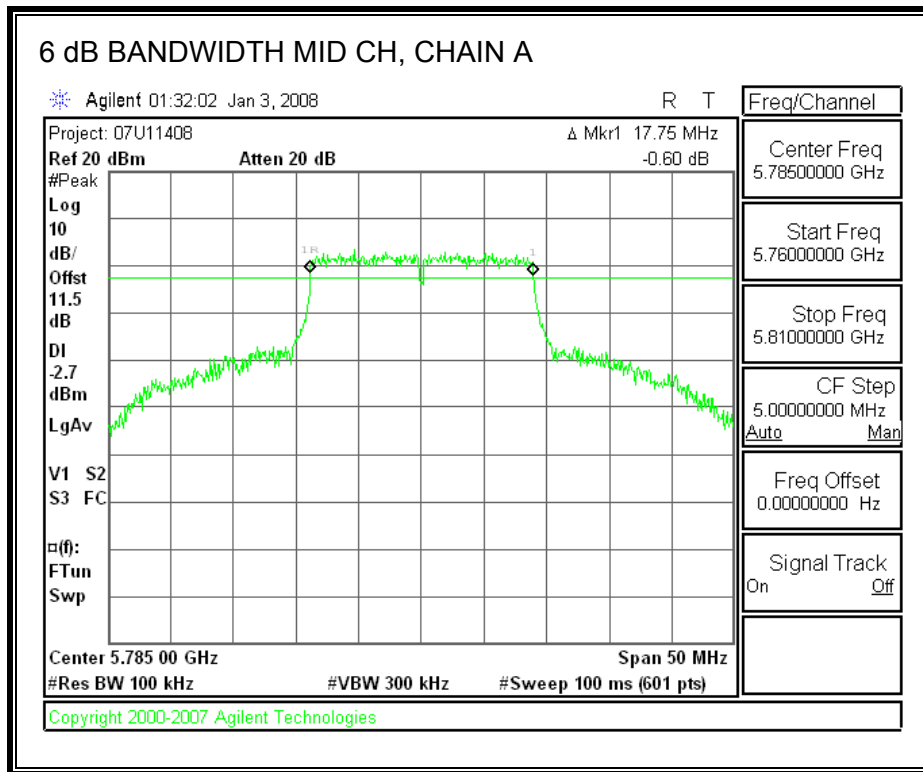
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

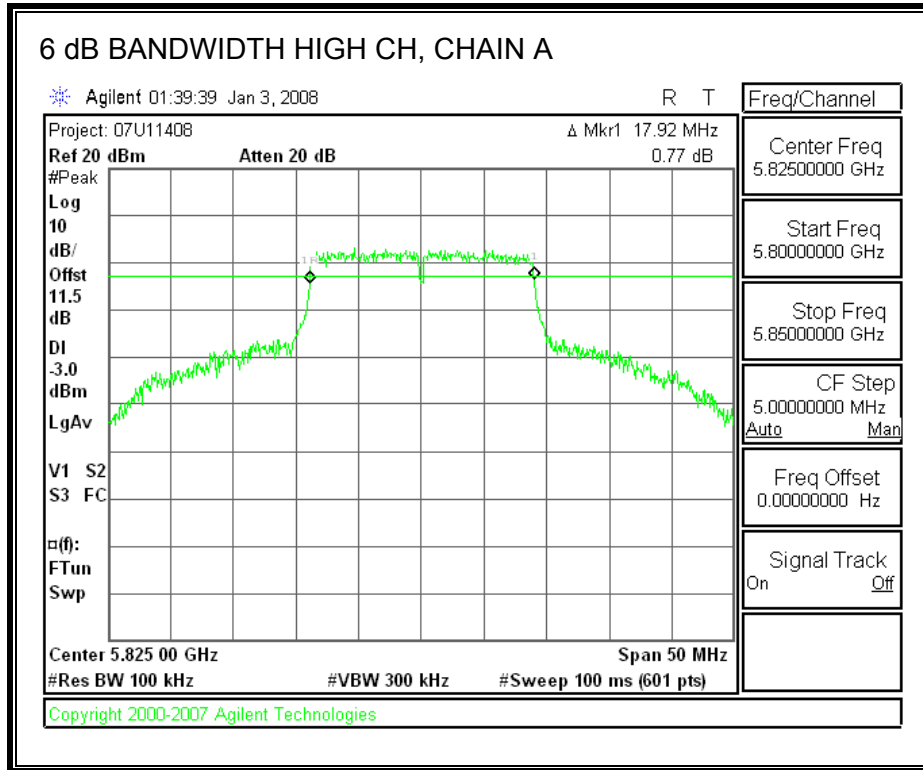
RESULTS

Channel	Frequency (MHz)	Chain A 6 dB BW (MHz)	Chain B 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5745	17.83	17.75	0.5
Middle	5785	17.75	17.75	0.5
High	5825	17.92	17.75	0.5

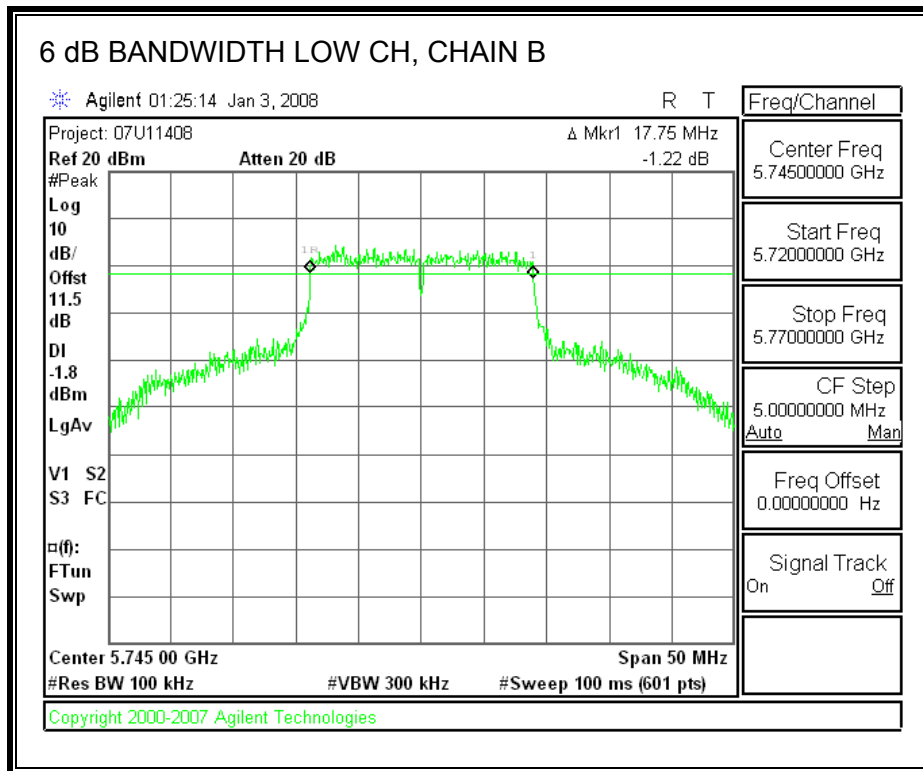
6 dB BANDWIDTH, CHAIN A

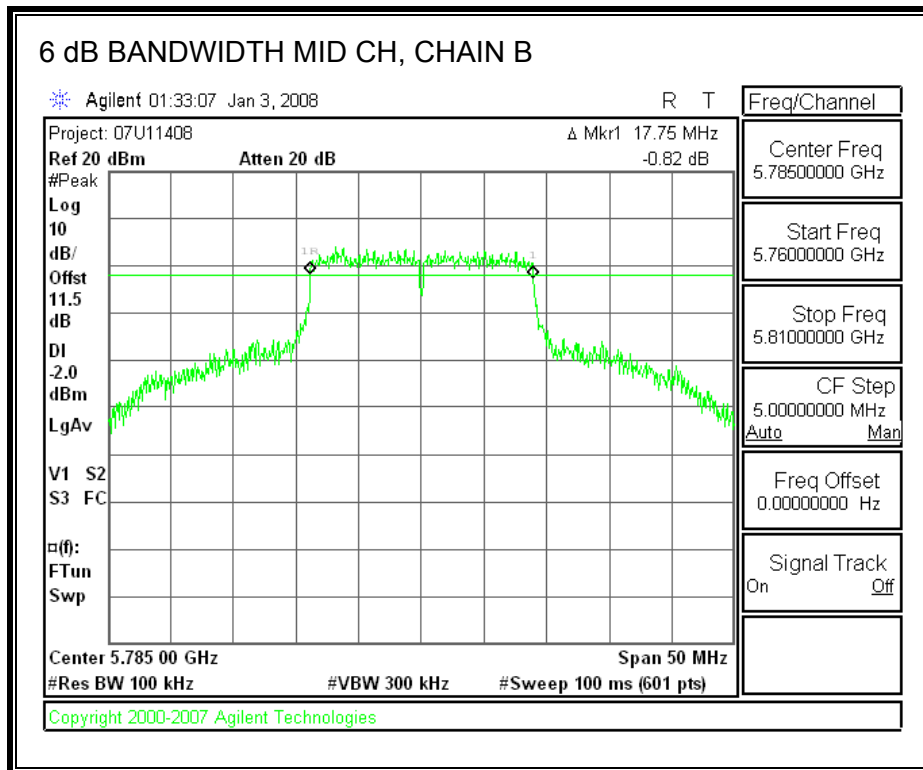


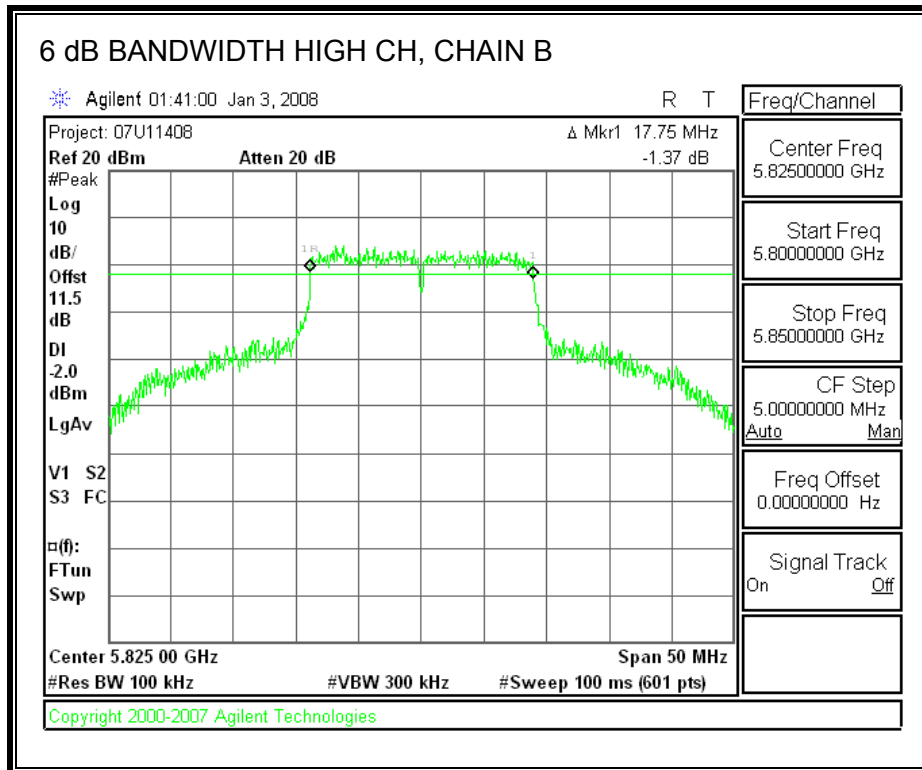




6 dB BANDWIDTH, CHAIN B







7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

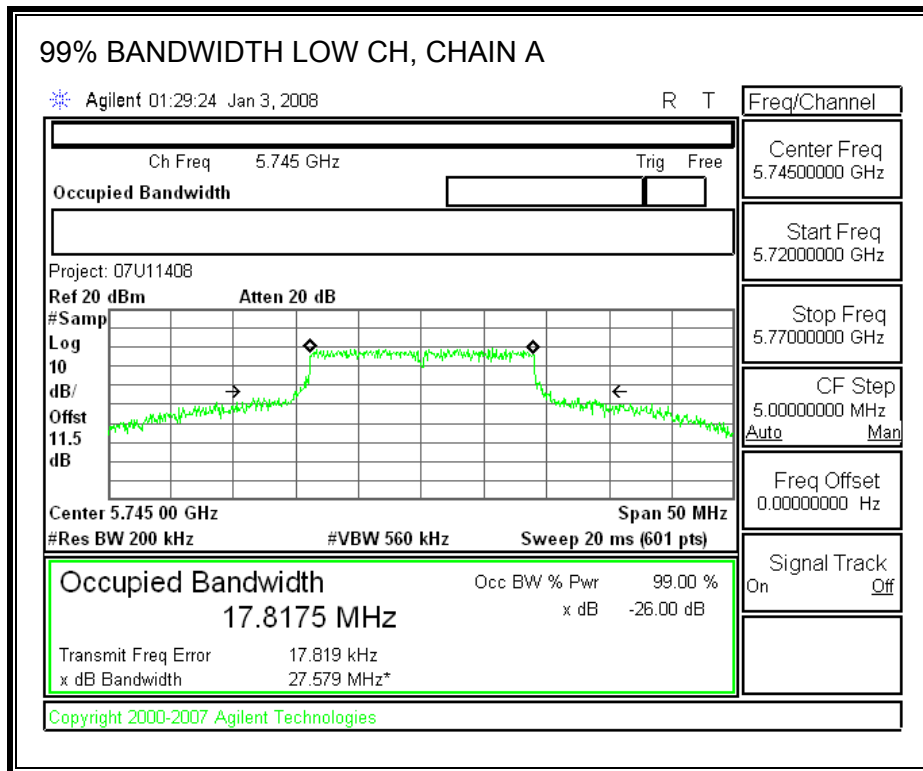
TEST PROCEDURE

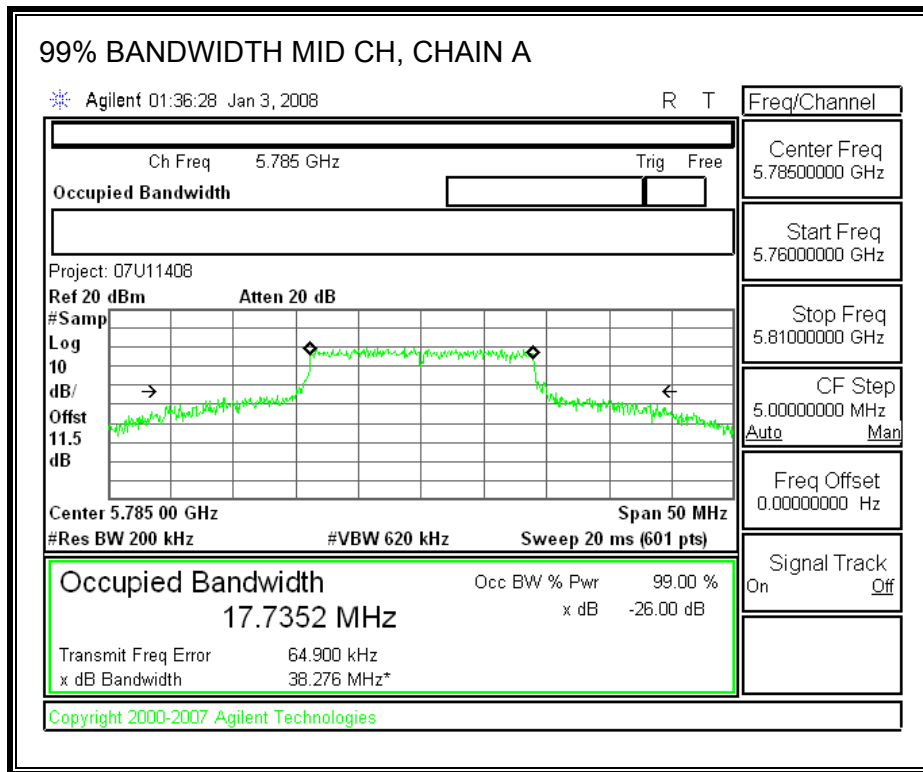
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

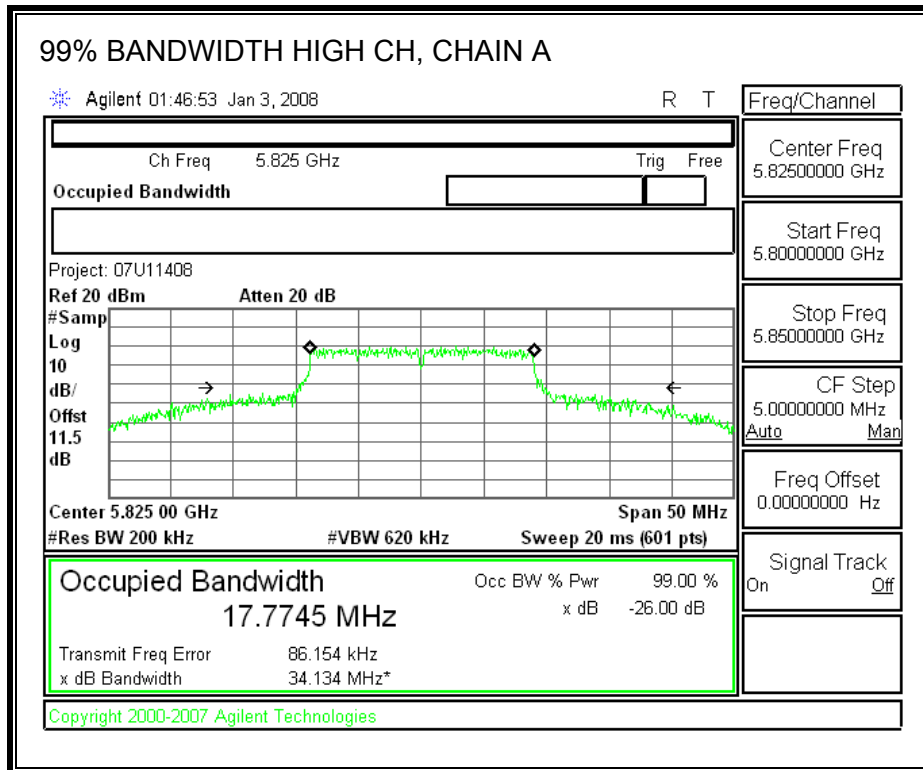
RESULTS

Channel	Frequency (MHz)	Chain A 99% Bandwidth (MHz)	Chain B 99% Bandwidth (MHz)
Low	5745	17.8175	17.8608
Middle	5785	17.7352	17.7604
High	5825	17.7745	17.8403

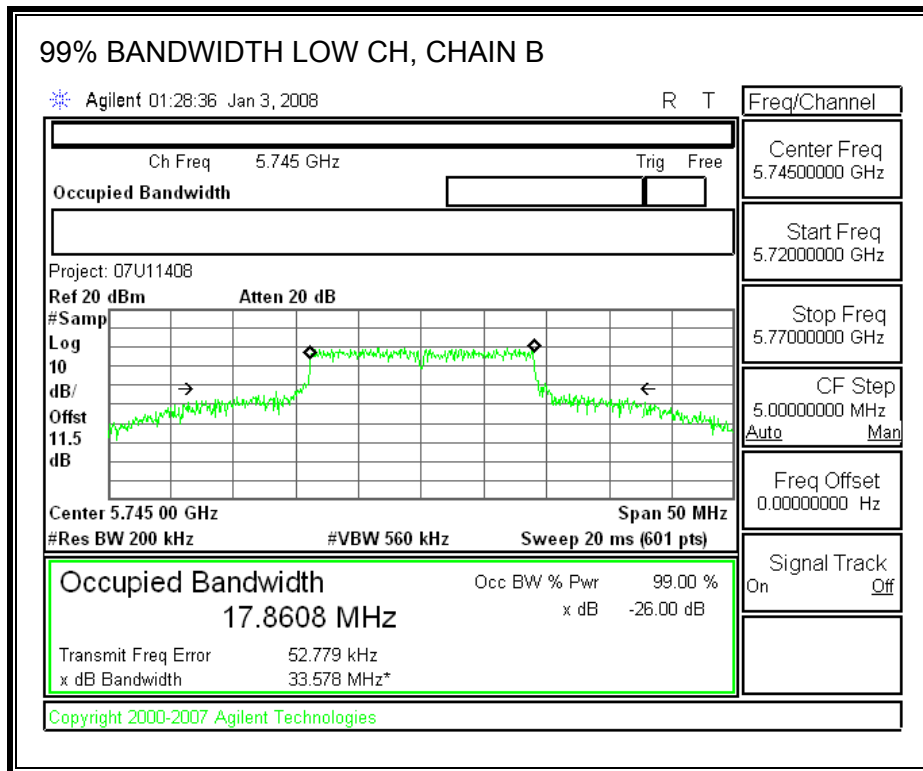
99% BANDWIDTH, CHAIN A

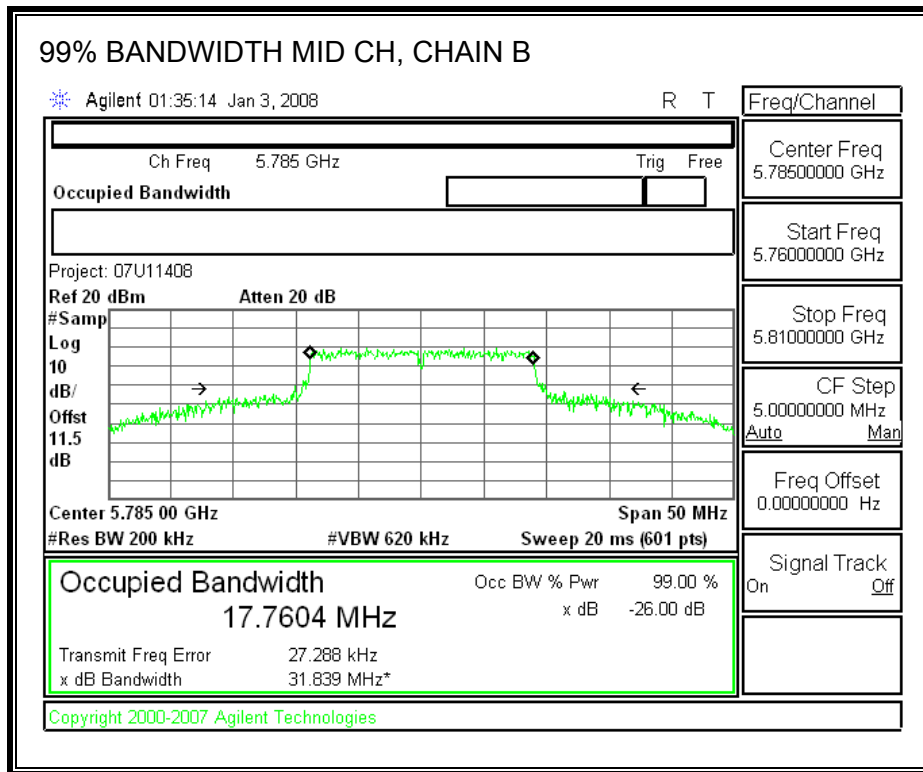


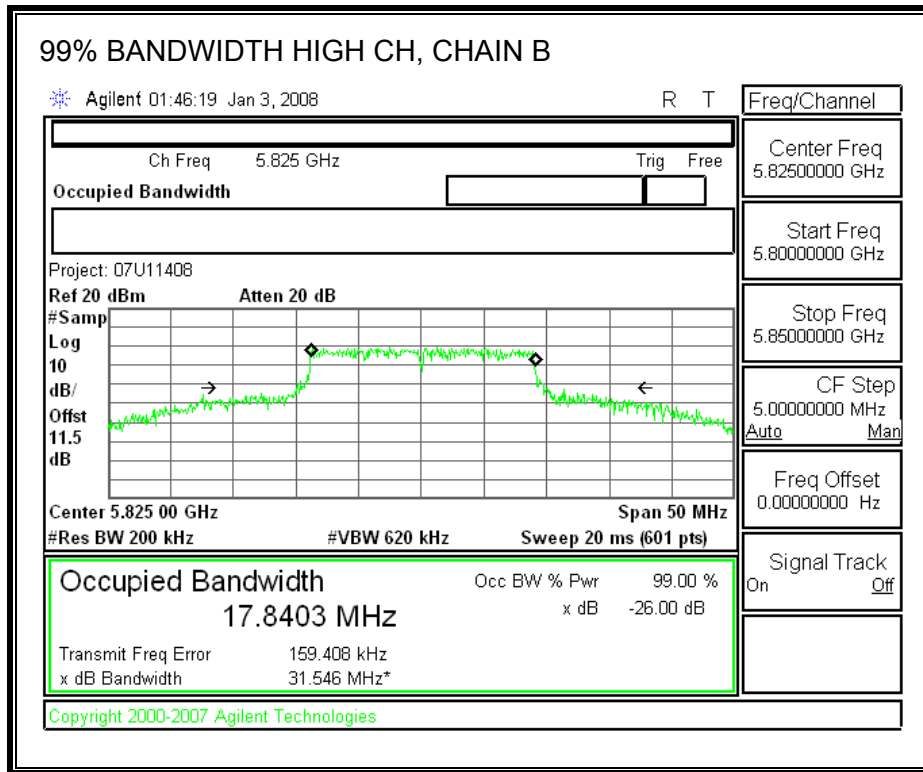




99% BANDWIDTH, CHAIN B







7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

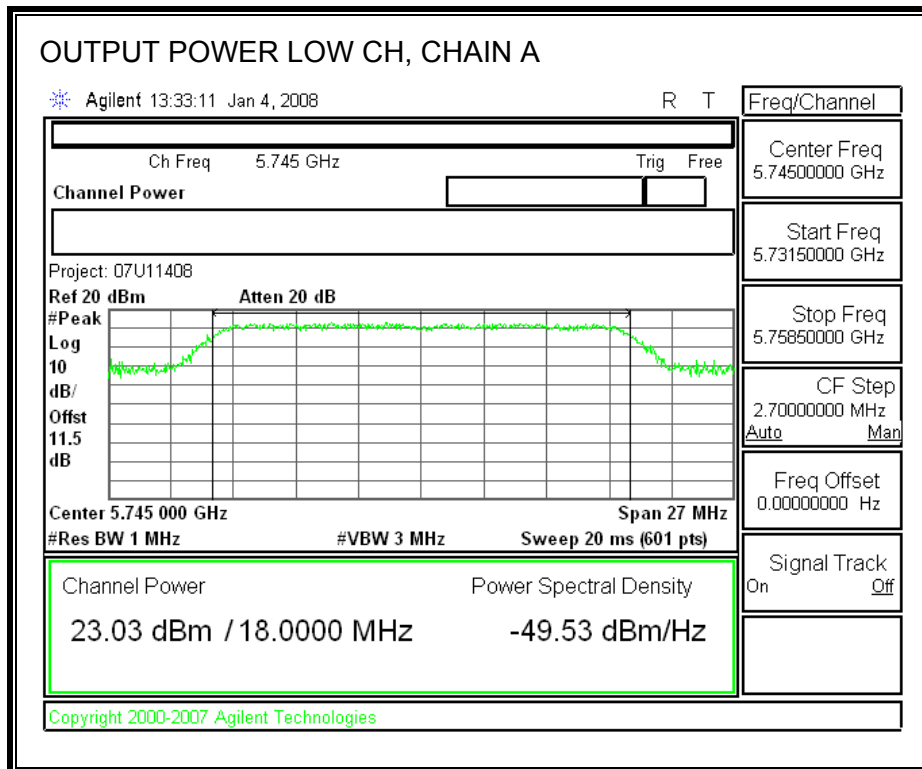
TEST PROCEDURE

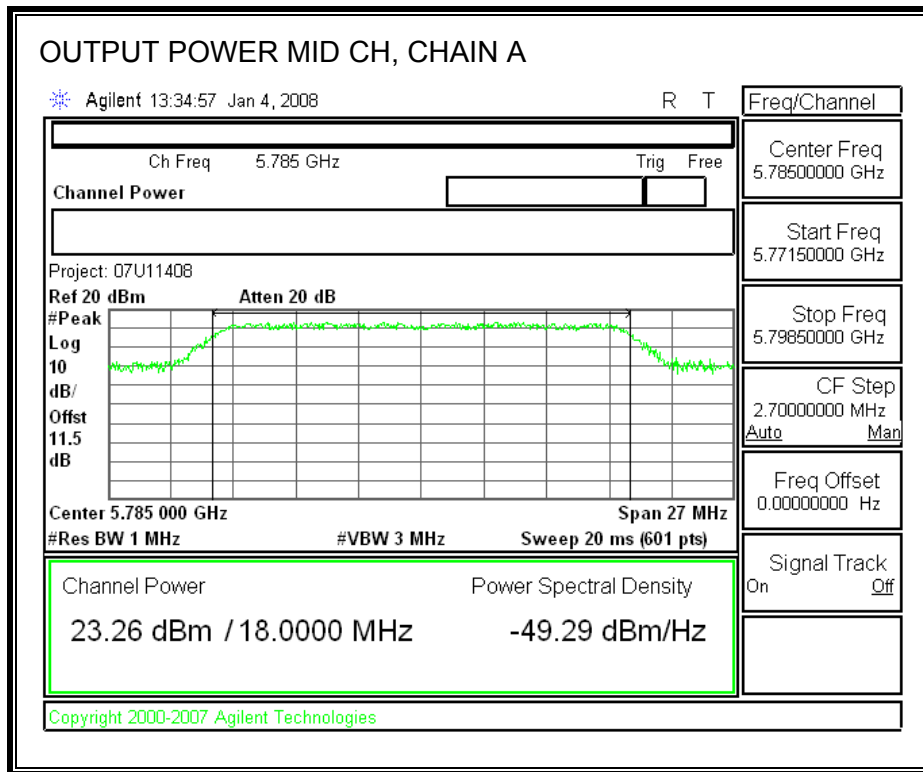
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

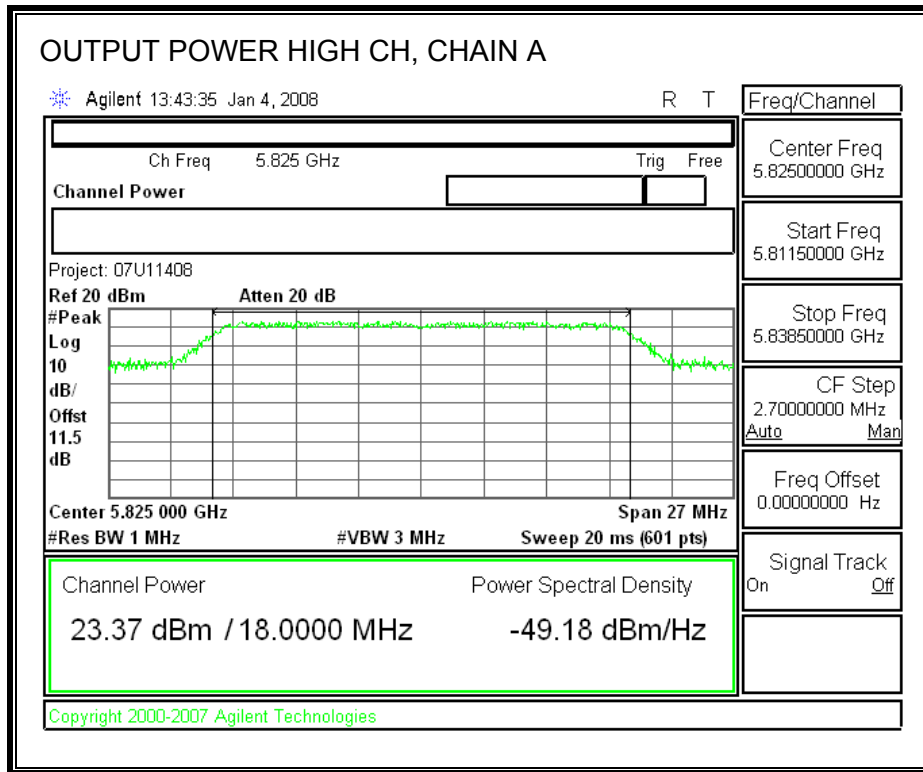
RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain A Power (dBm)	Chain B Power (dBm)	Total Power (dBm)	Margin (dB)
Low	5745	30.00	23.03	23.23	26.14	-3.86
Mid	5785	30.00	23.26	23.10	26.19	-3.81
High	5825	30.00	23.37	23.22	26.31	-3.69

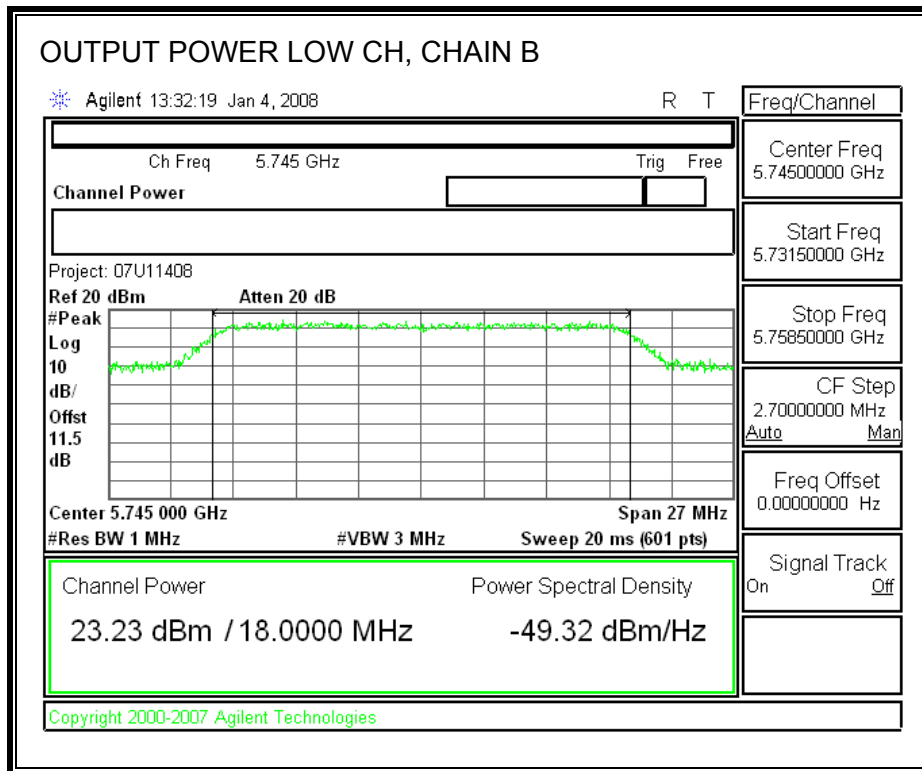
CHAIN A OUTPUT POWER

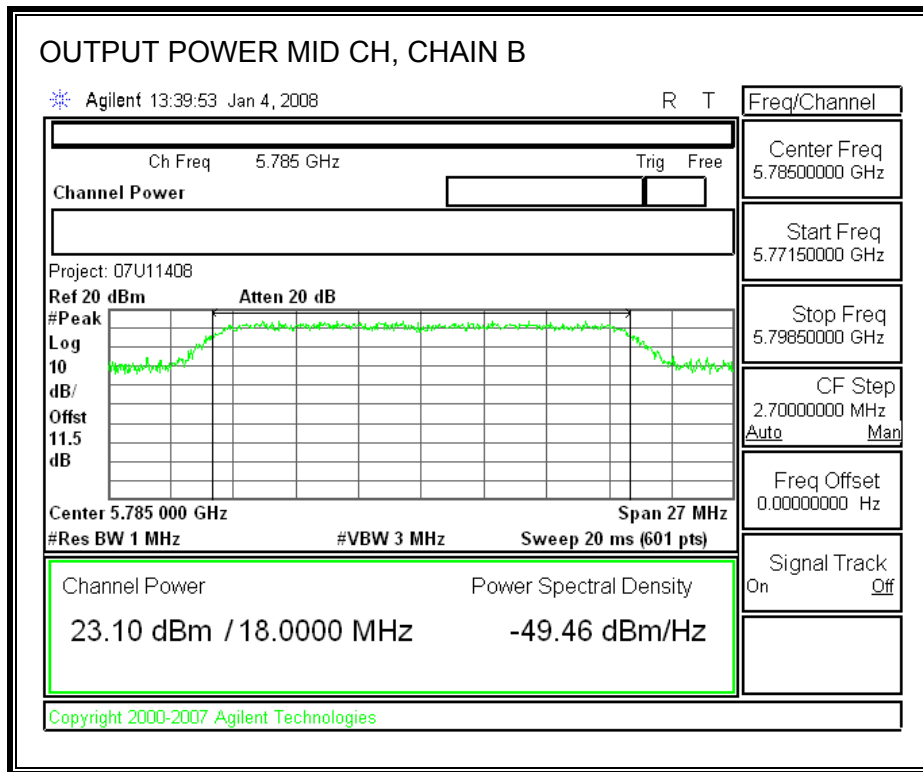


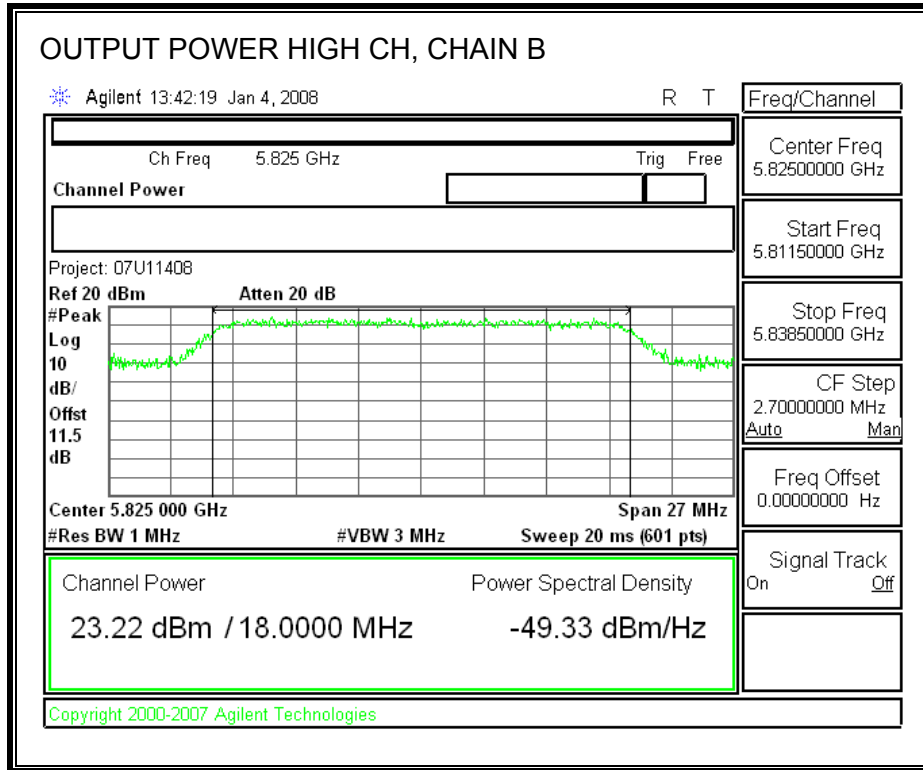




CHAIN B OUTPUT POWER







7.6.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

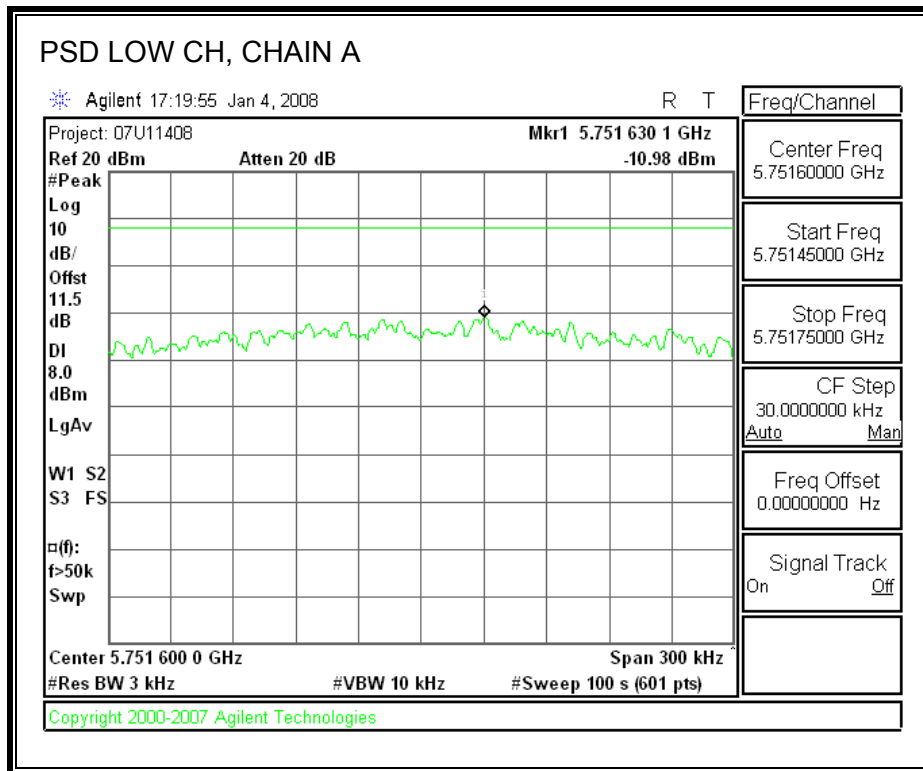
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

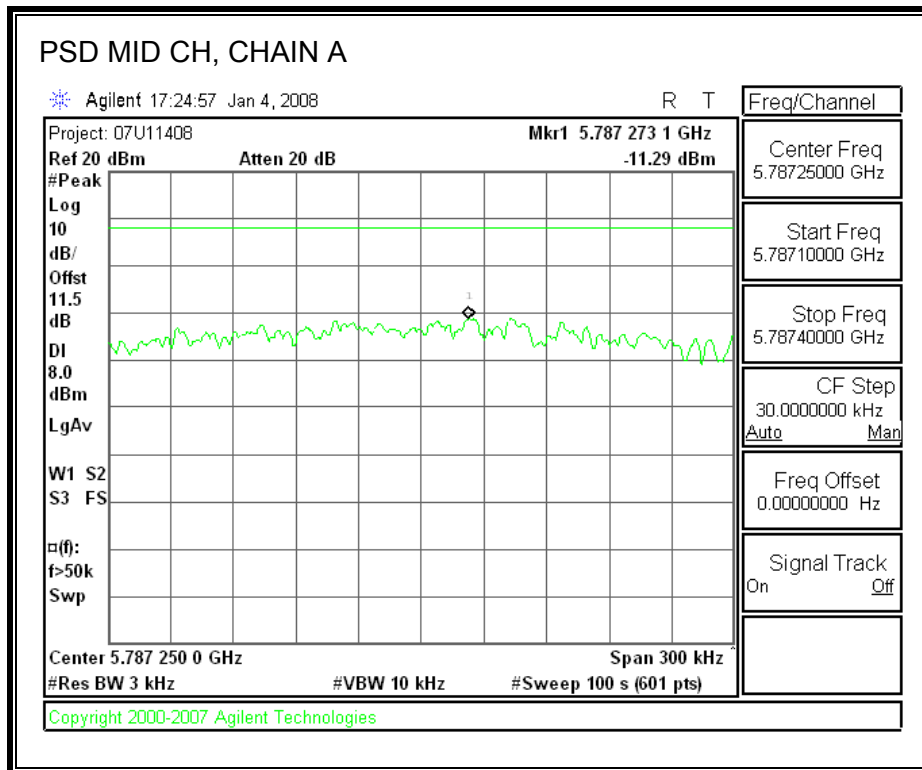
RESULTS:

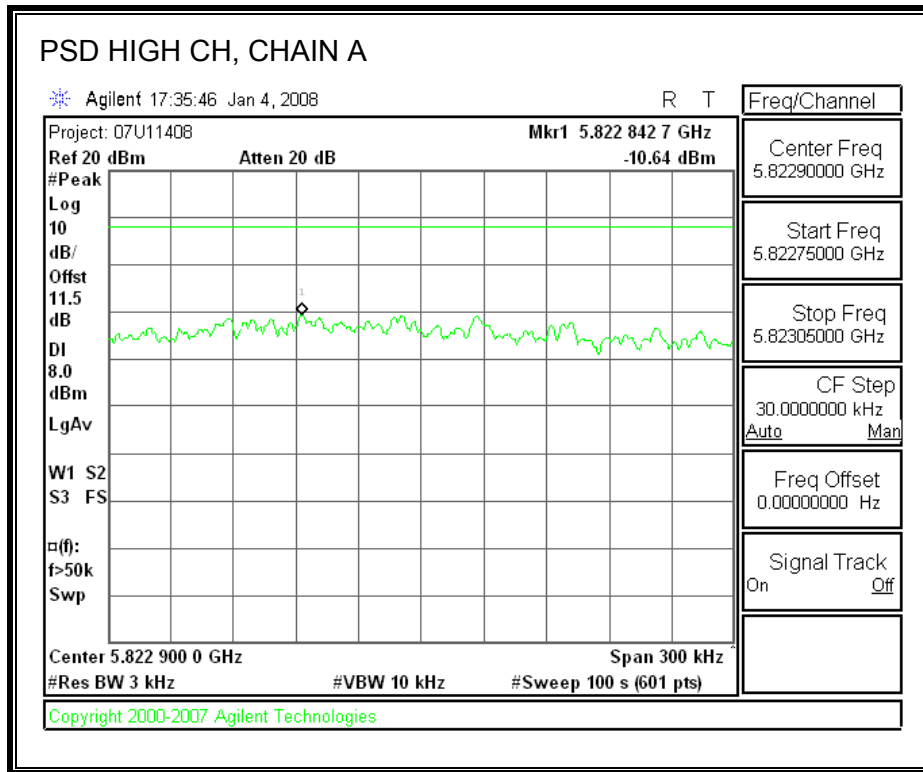
Channel	Frequency (MHz)	Chain A PSD (dBm)	Chain B PSD (dBm)	Limit (dBm)
Low	5745	-10.98	-11.59	8
Middle	5785	-11.29	-11.64	8
High	5825	-10.64	-11.06	8

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-6.25	8	-14.25
Middle	5785	-5.77	8	-13.77
High	5825	-6.57	8	-14.57

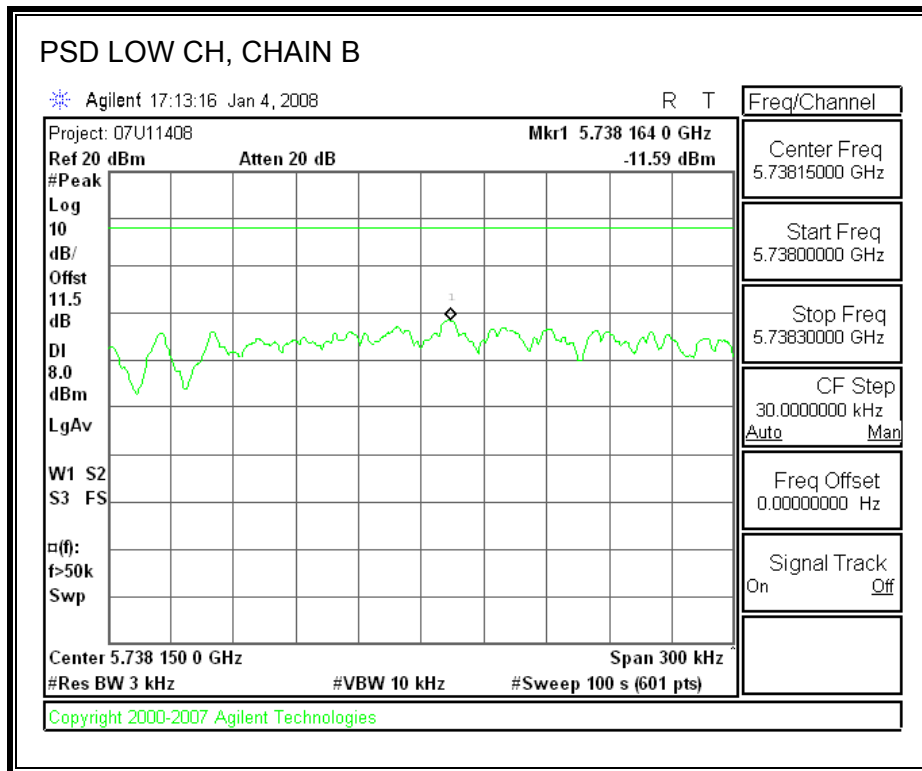
POWER SPECTRAL DENSITY, CHAIN A

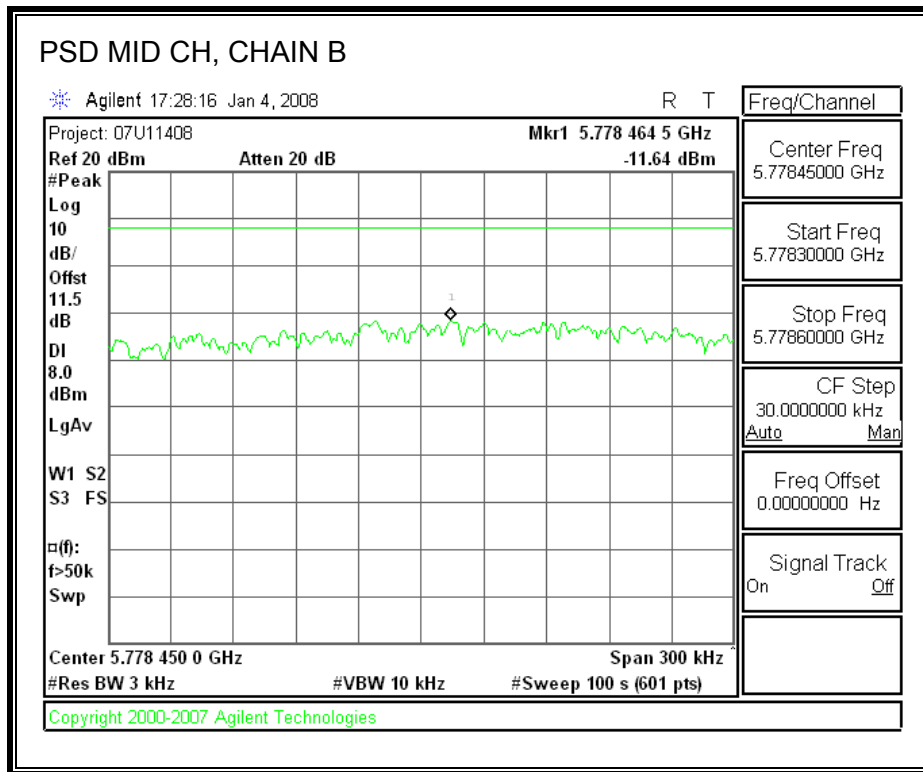


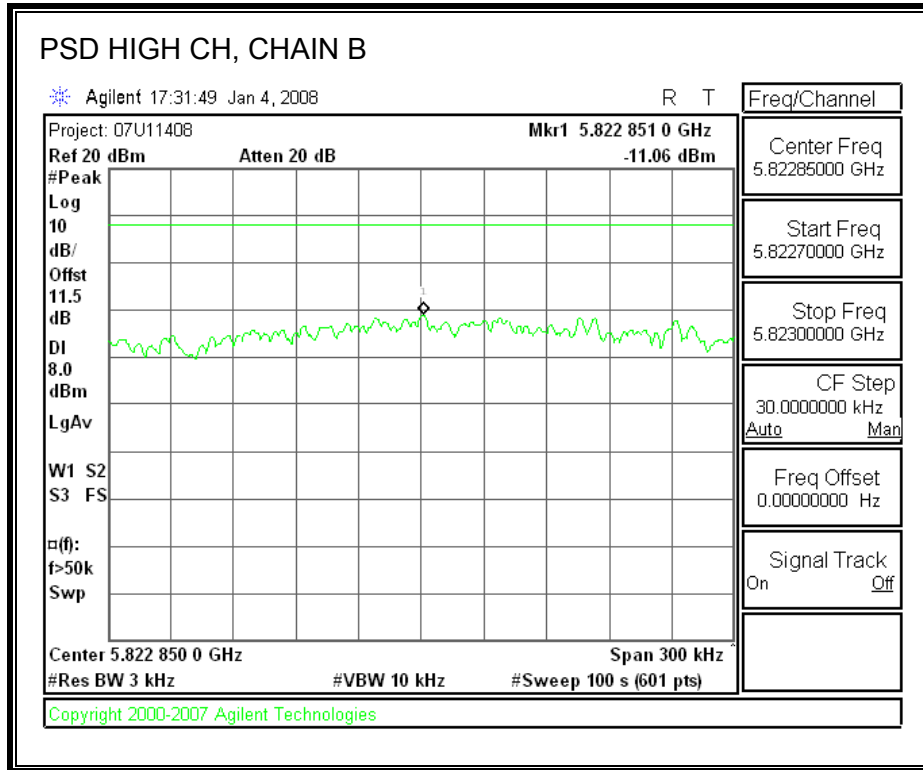




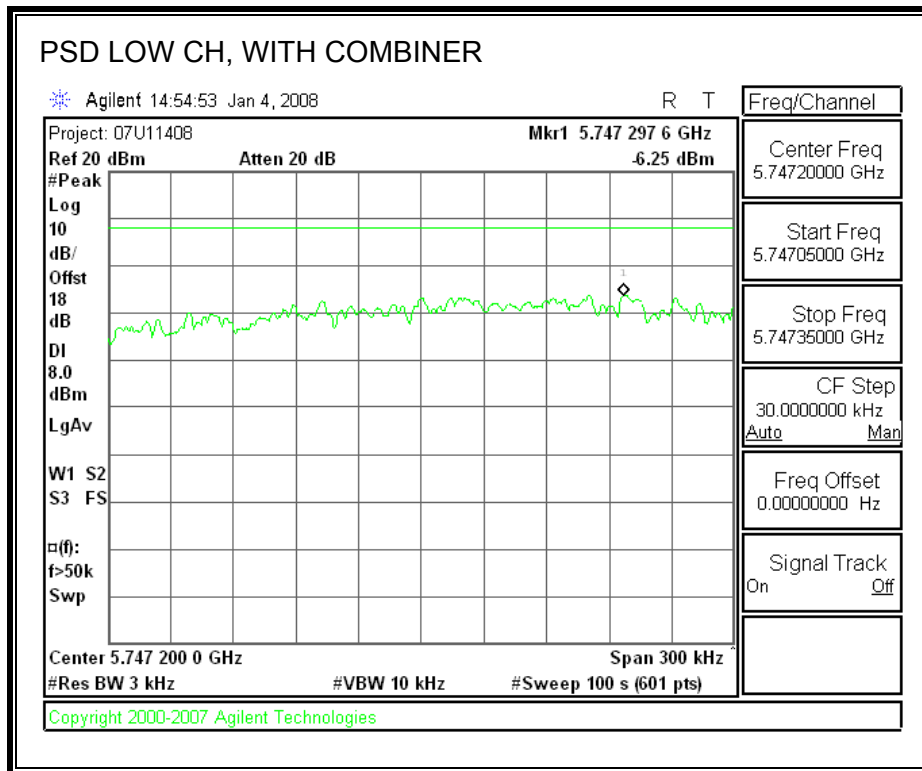
POWER SPECTRAL DENSITY, CHAIN B

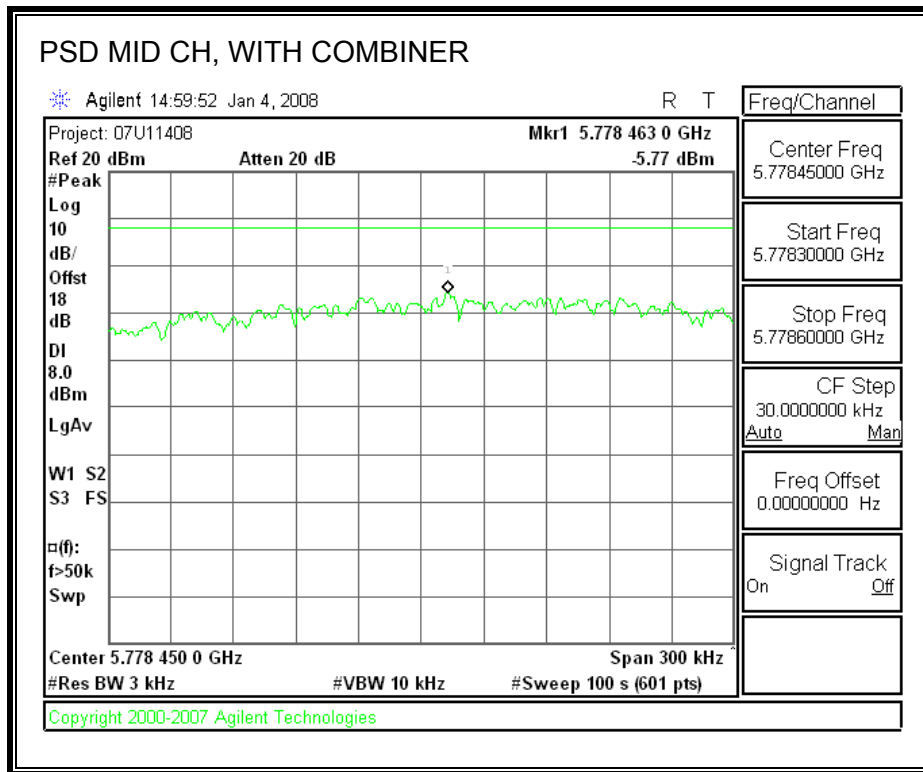


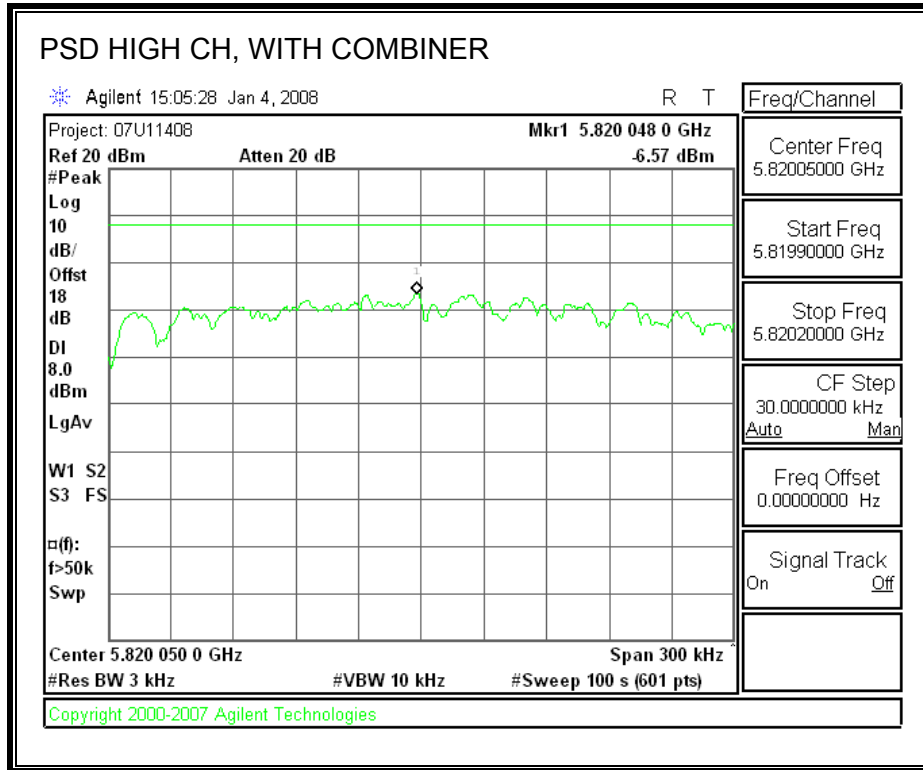




POWER SPECTRAL DENSITY, WITH COMBINER







7.6.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

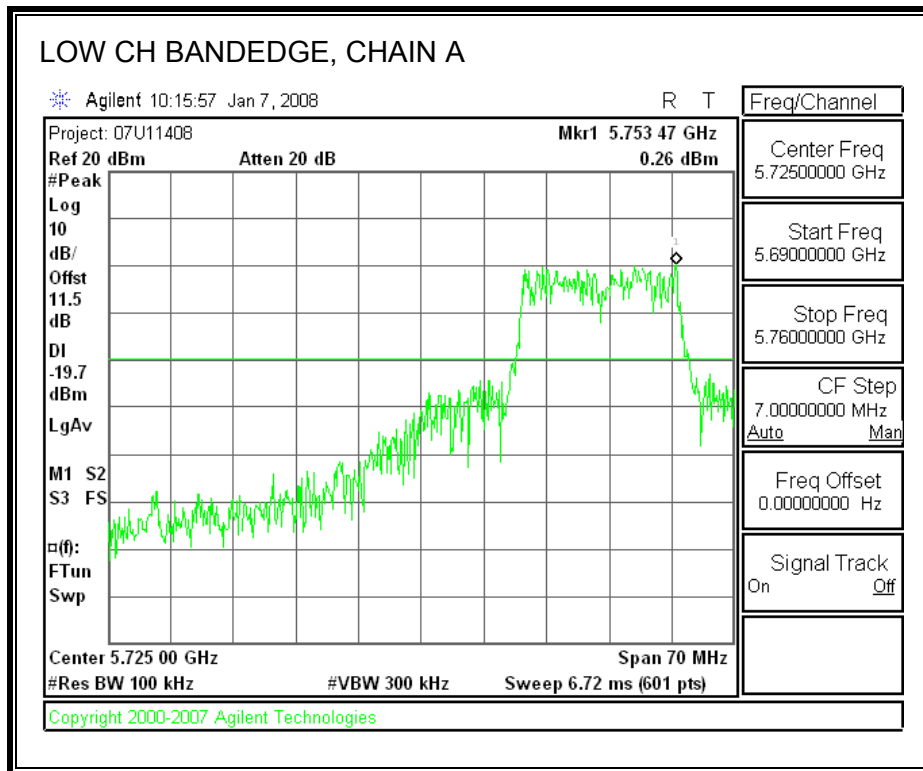
TEST PROCEDURE

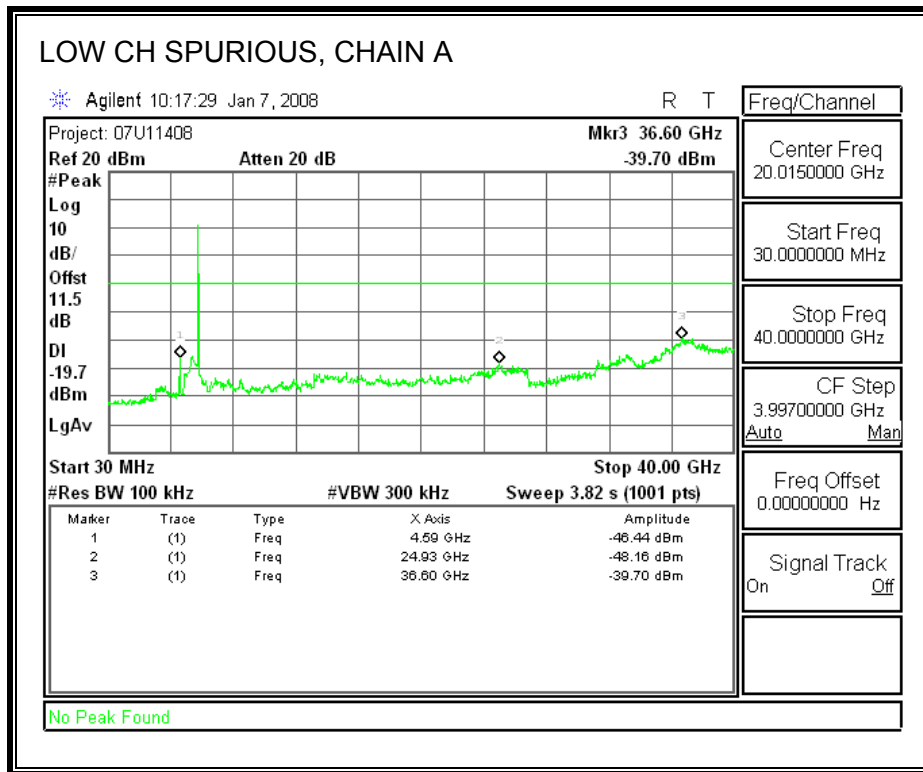
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

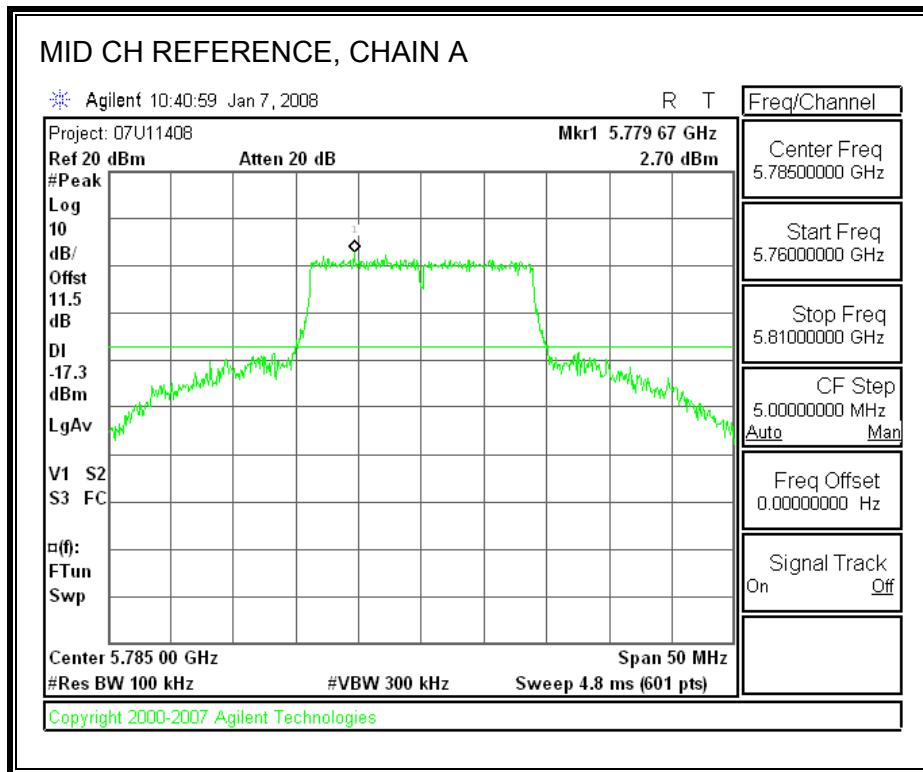
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

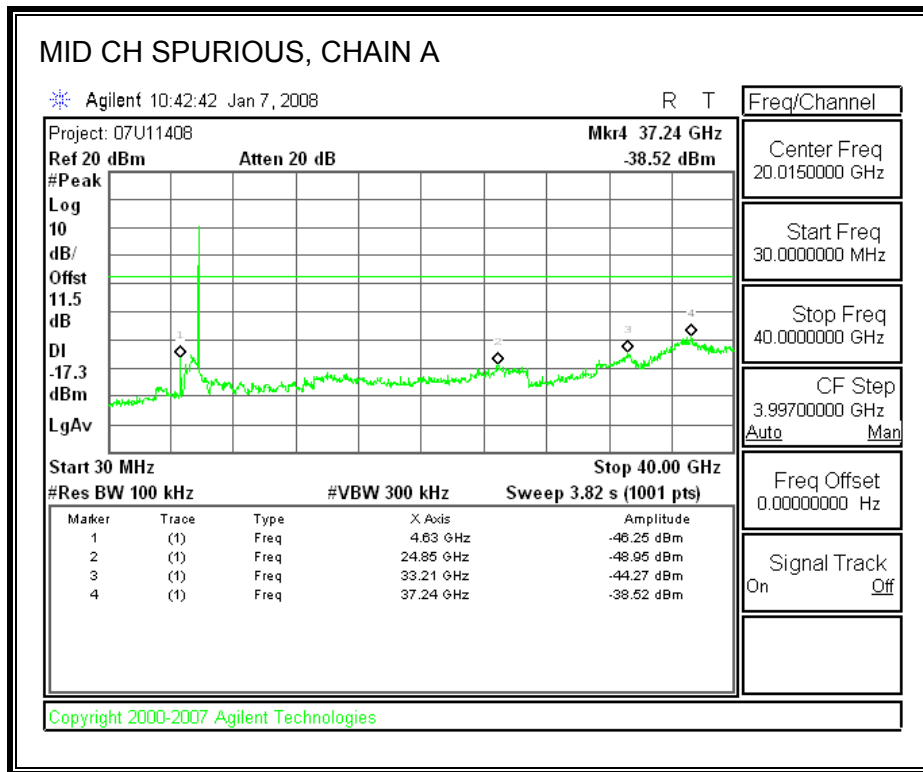
RESULTS

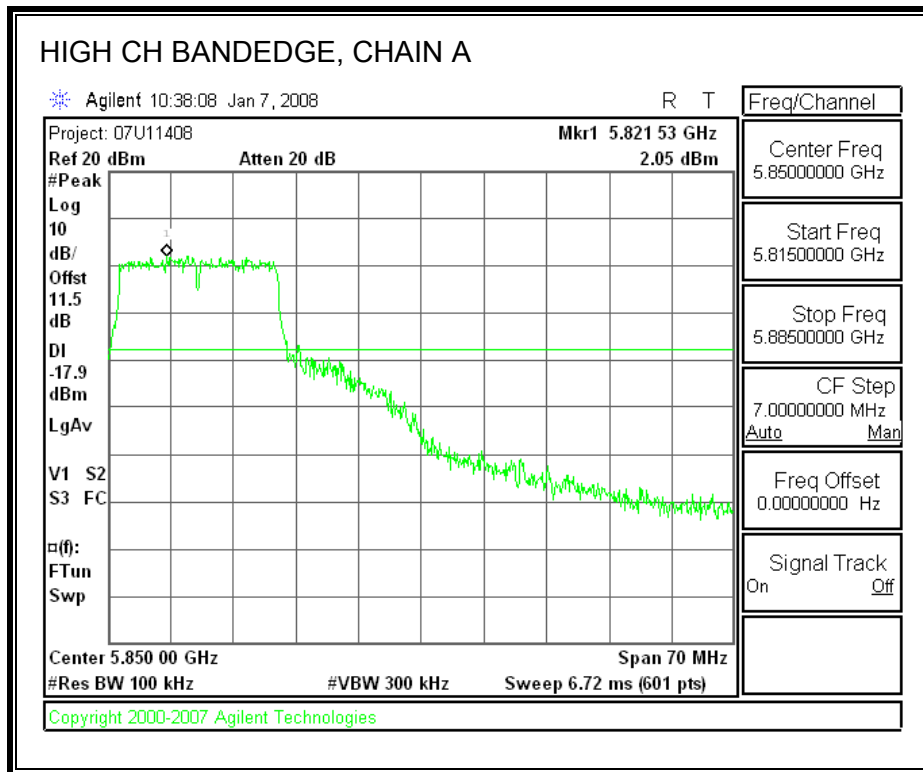
CHAIN A SPURIOUS EMISSIONS

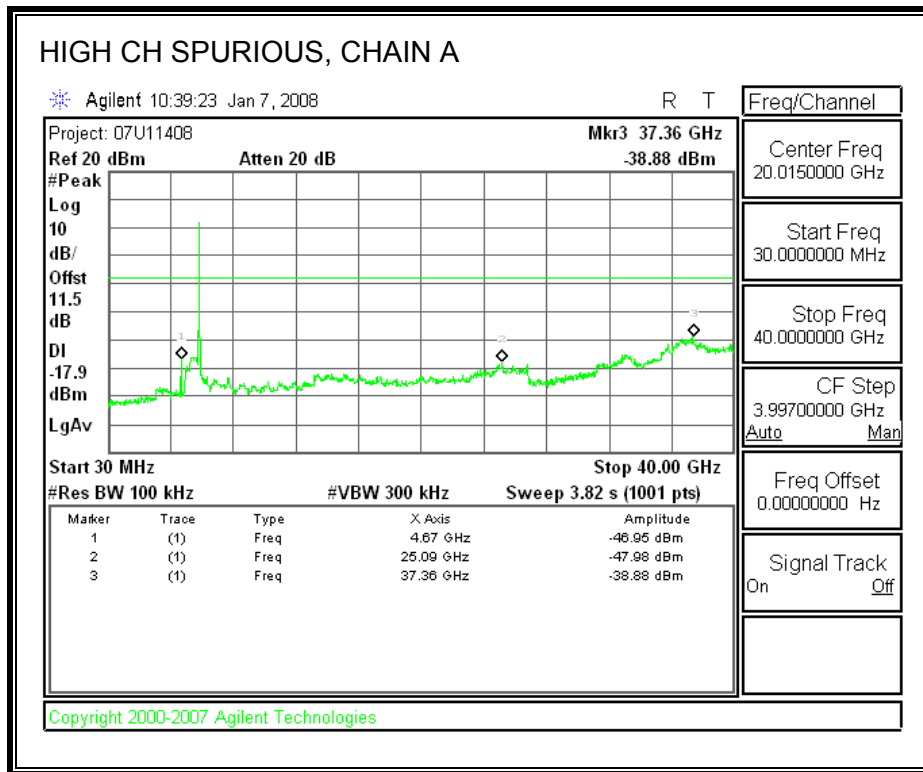




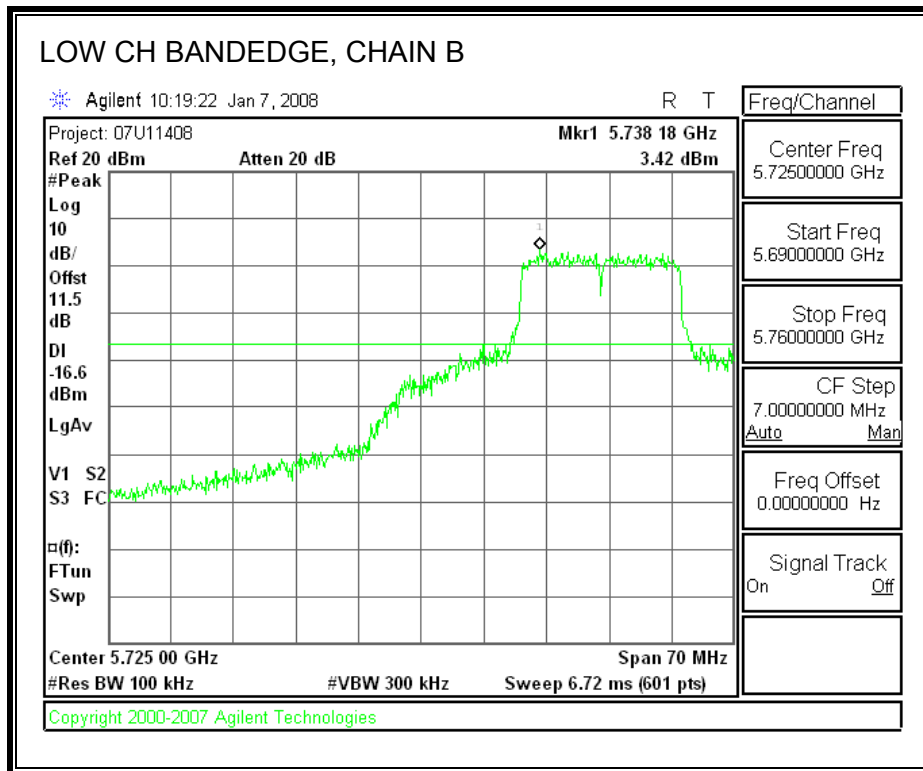


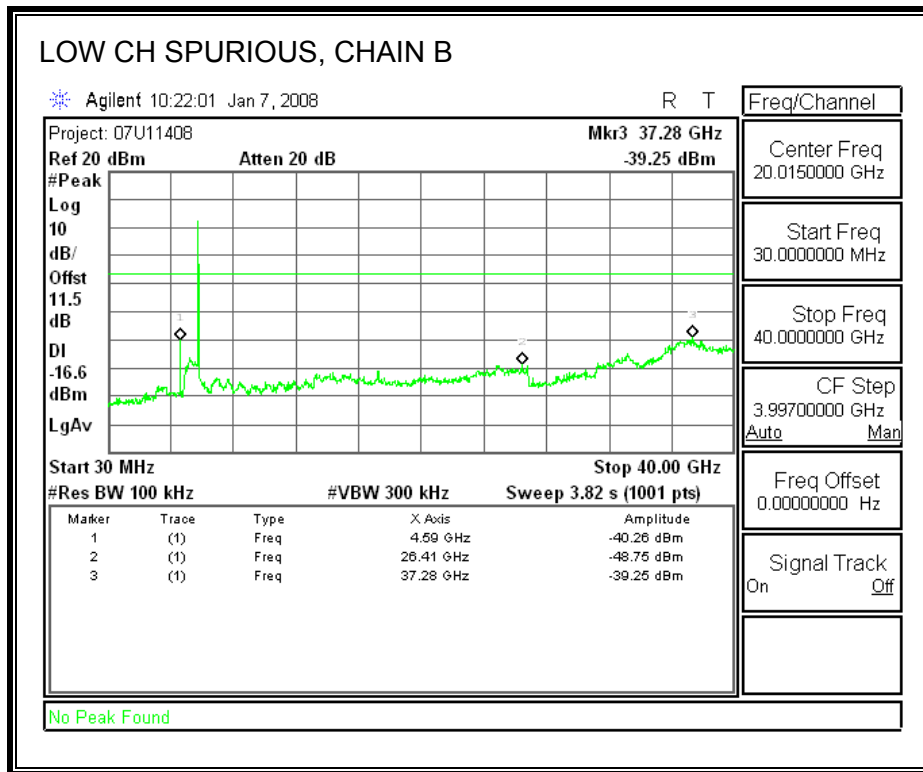


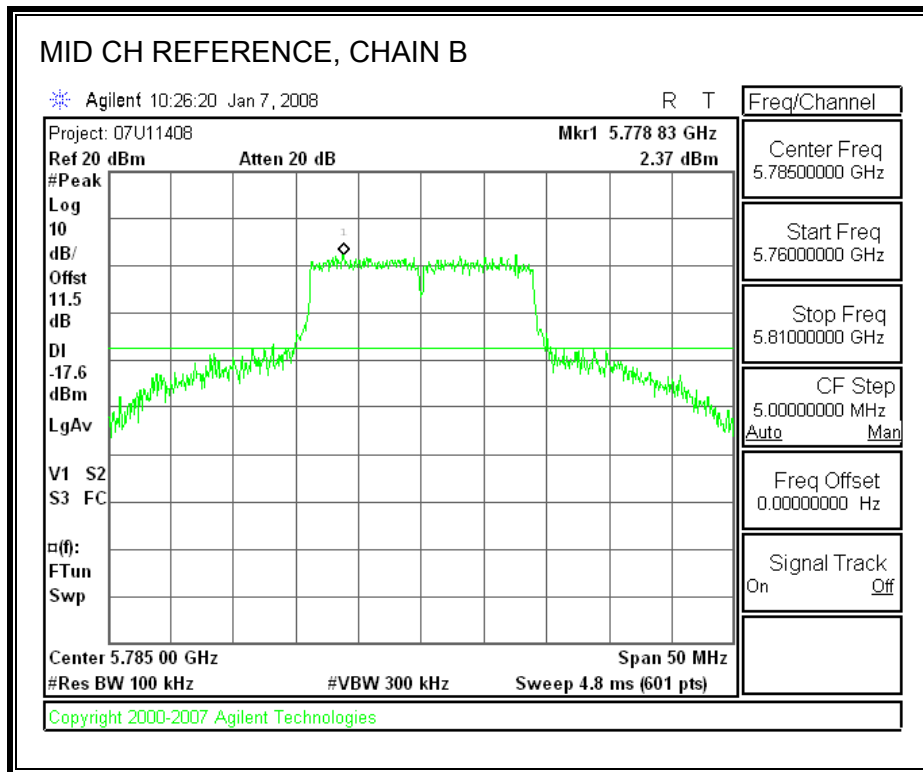


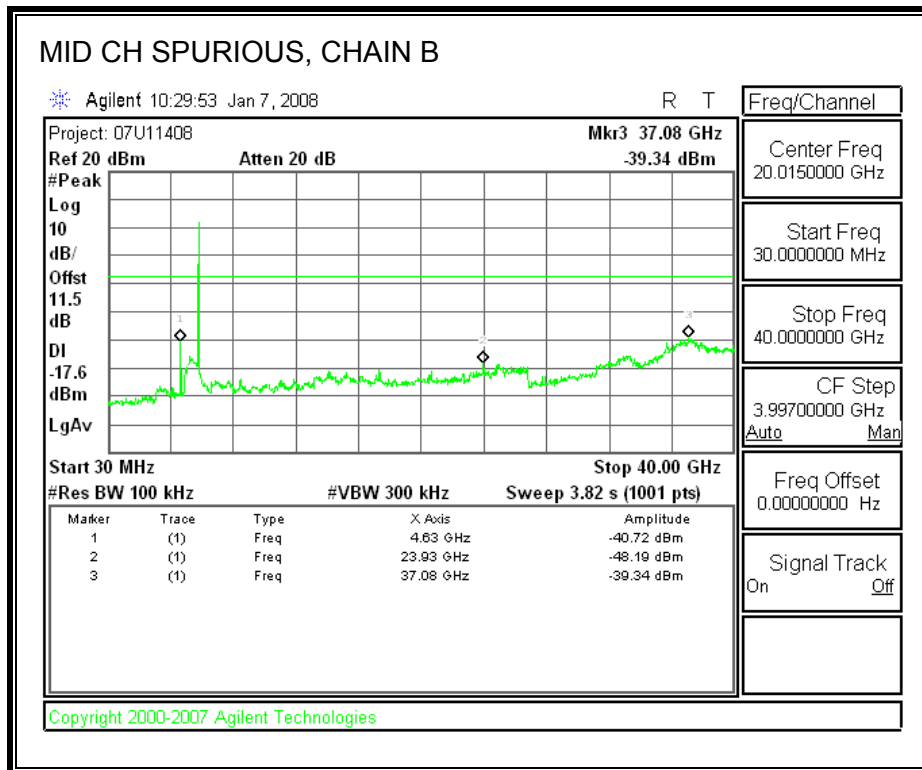


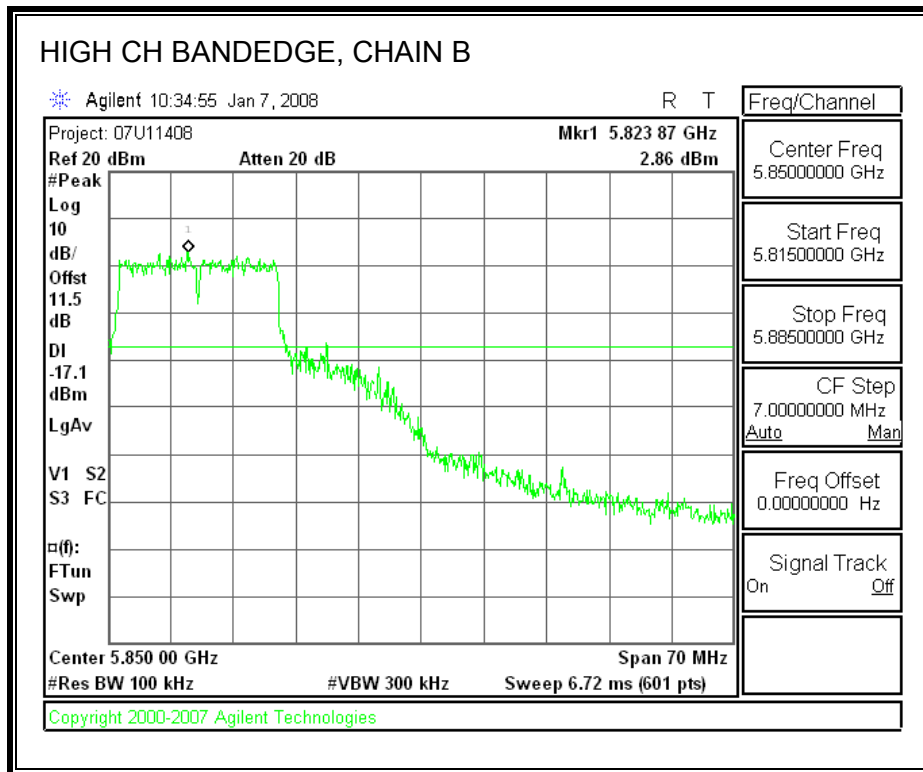
CHAIN B SPURIOUS EMISSIONS

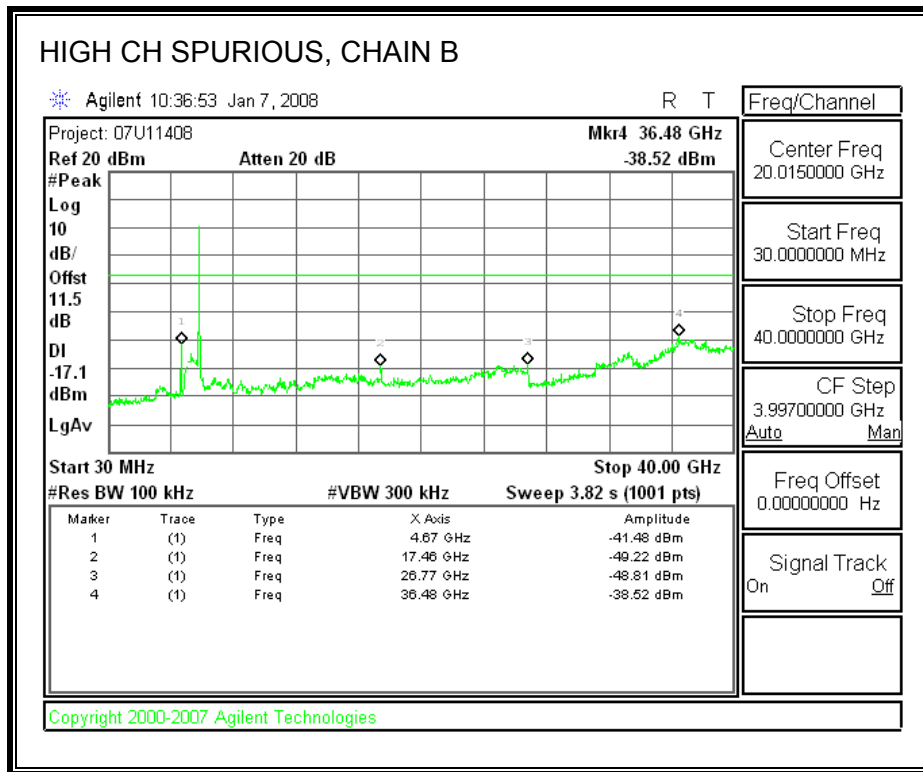




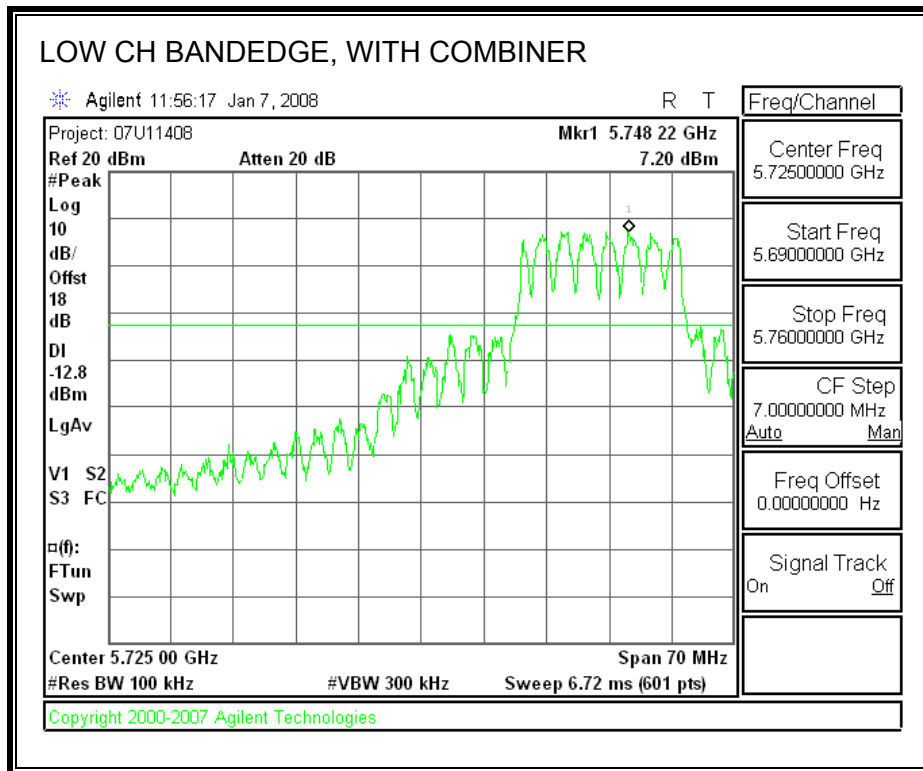


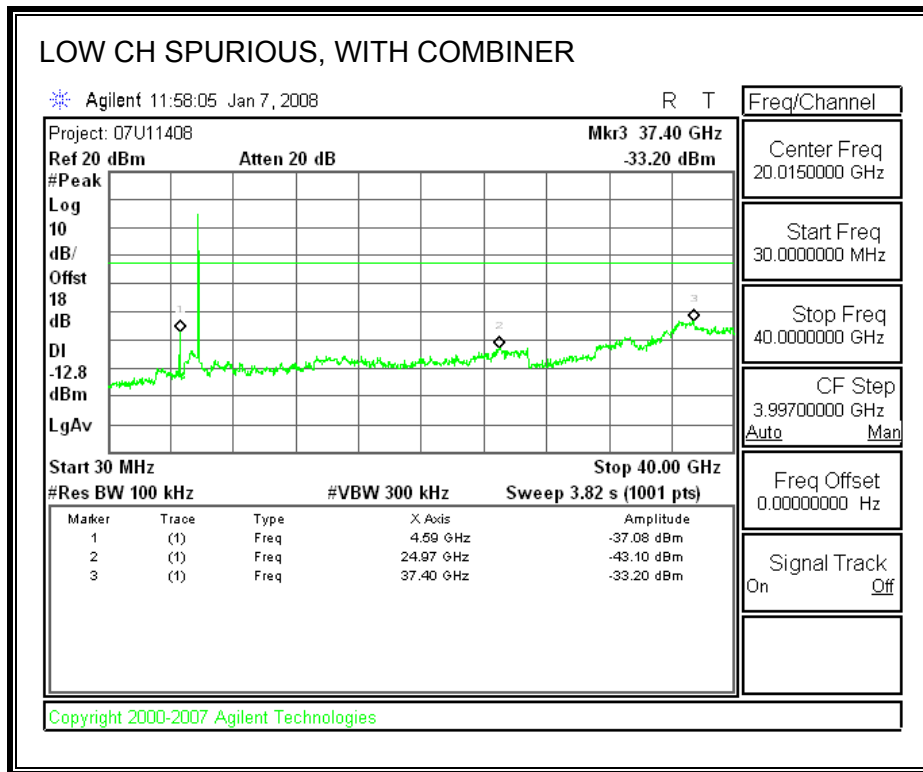


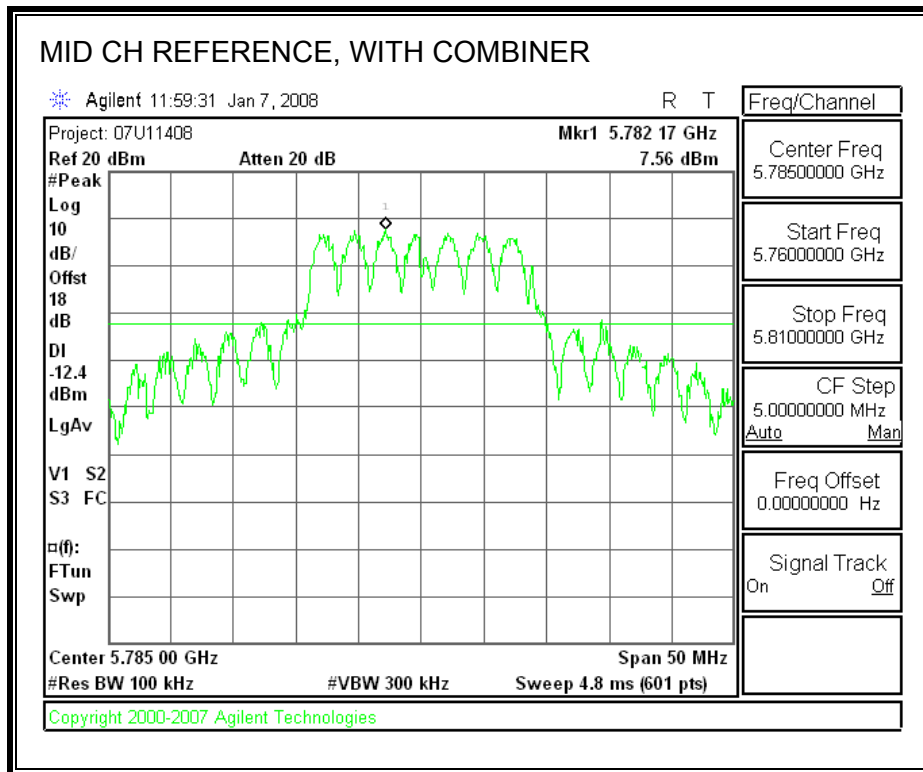


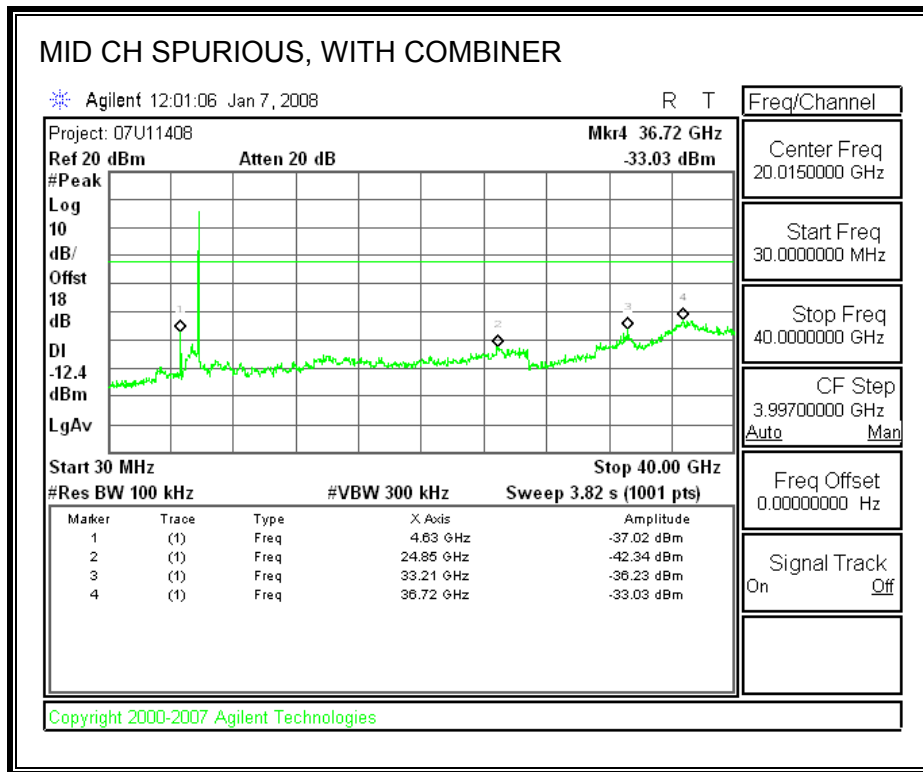


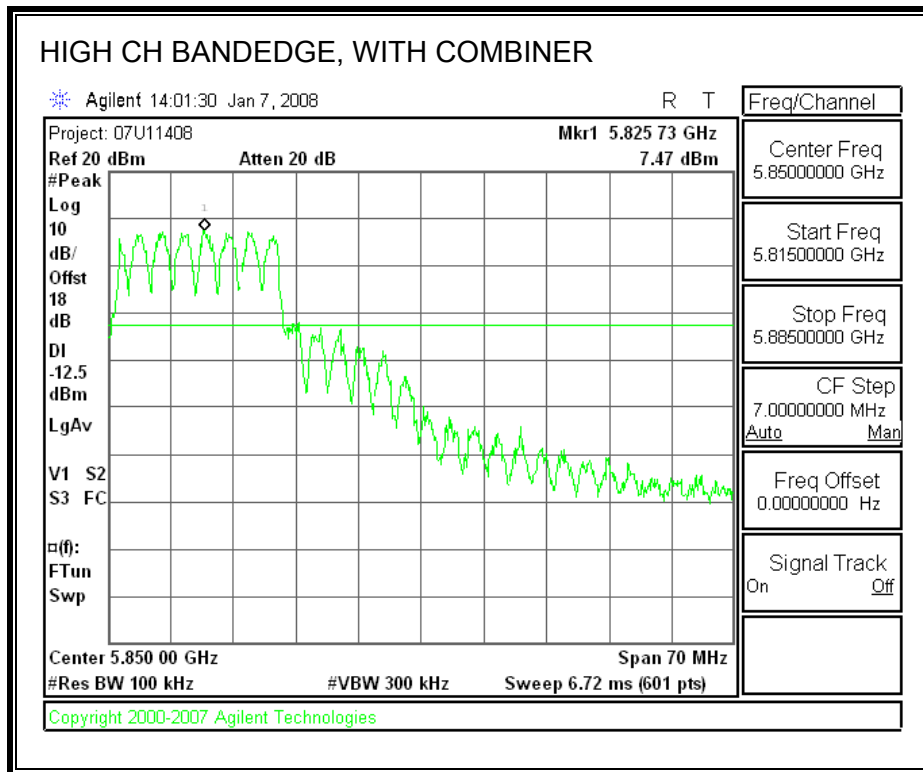
SPURIOUS EMISSIONS WITH COMBINER

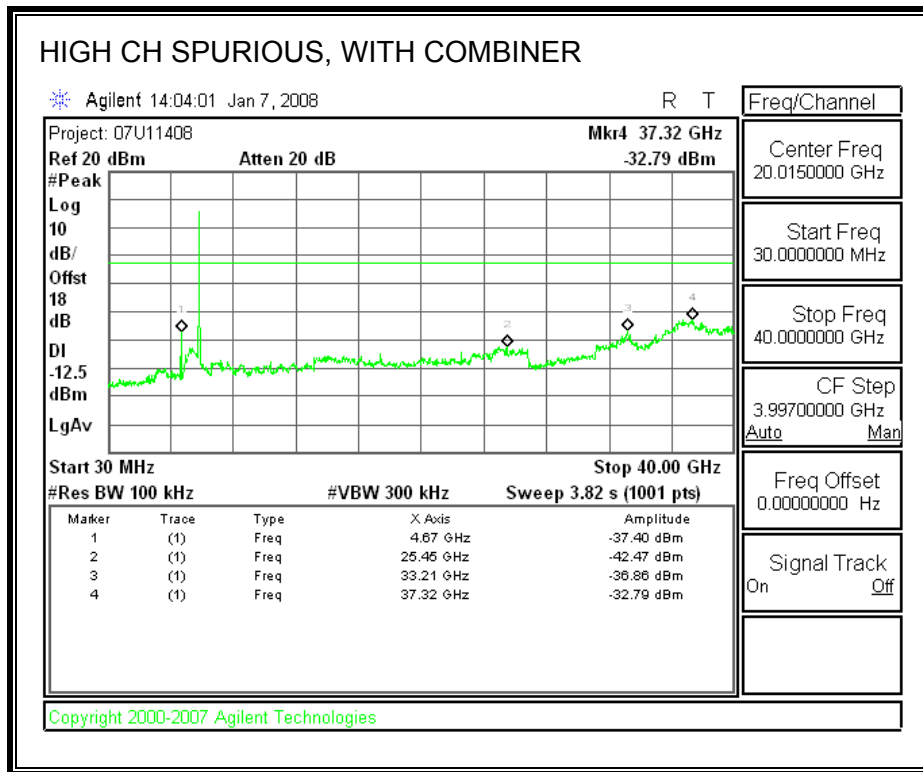












7.7. 802.11n HT40 MODE IN THE 5.8 GHz BAND

7.7.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

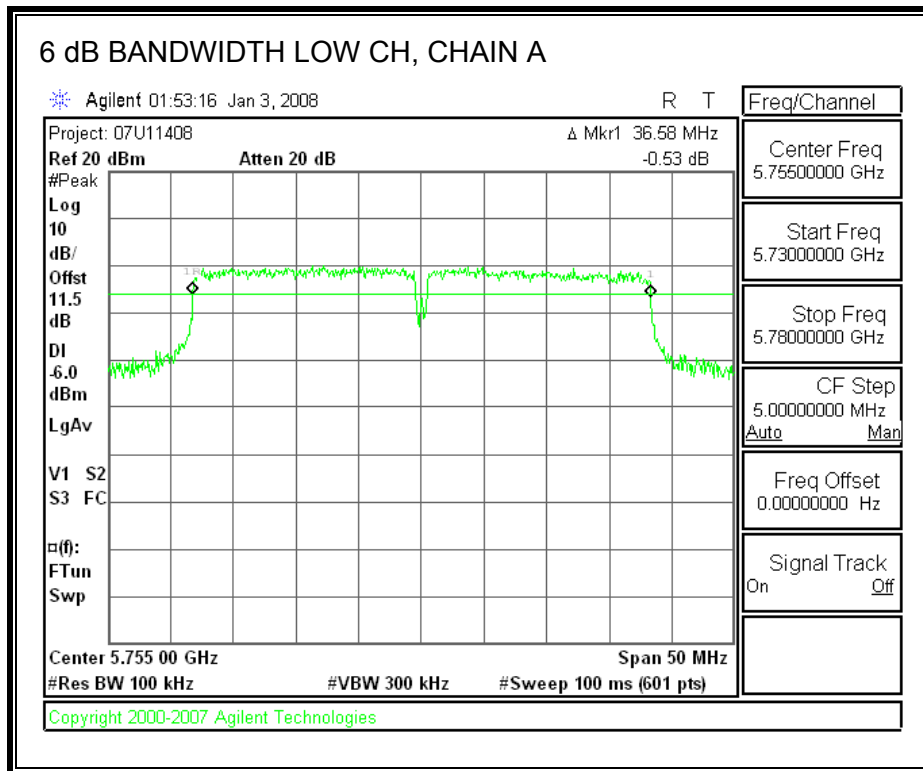
TEST PROCEDURE

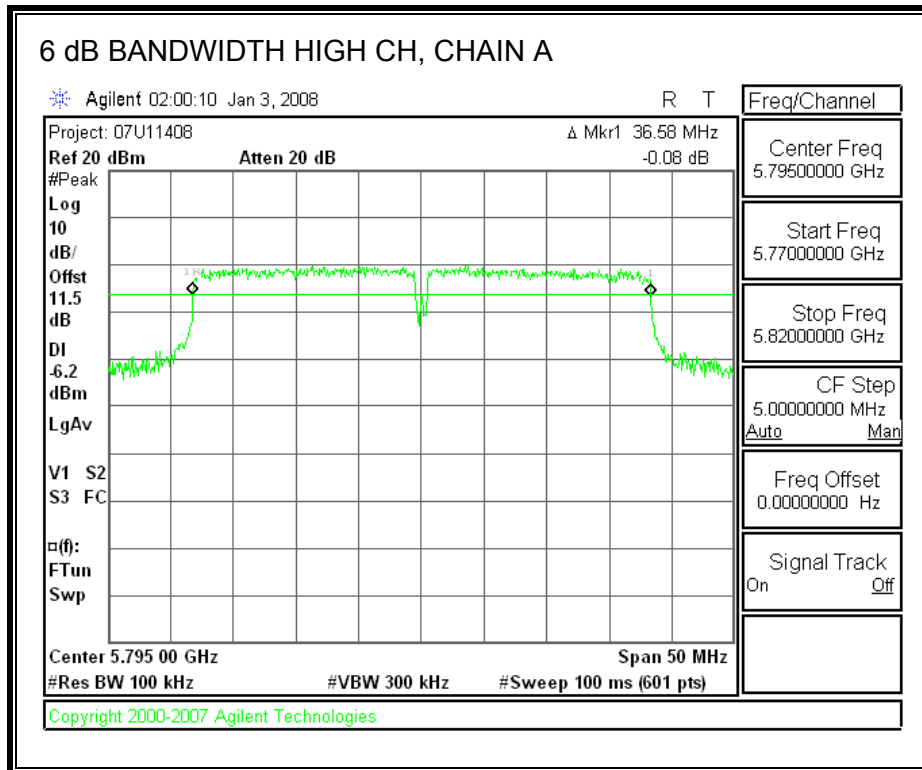
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

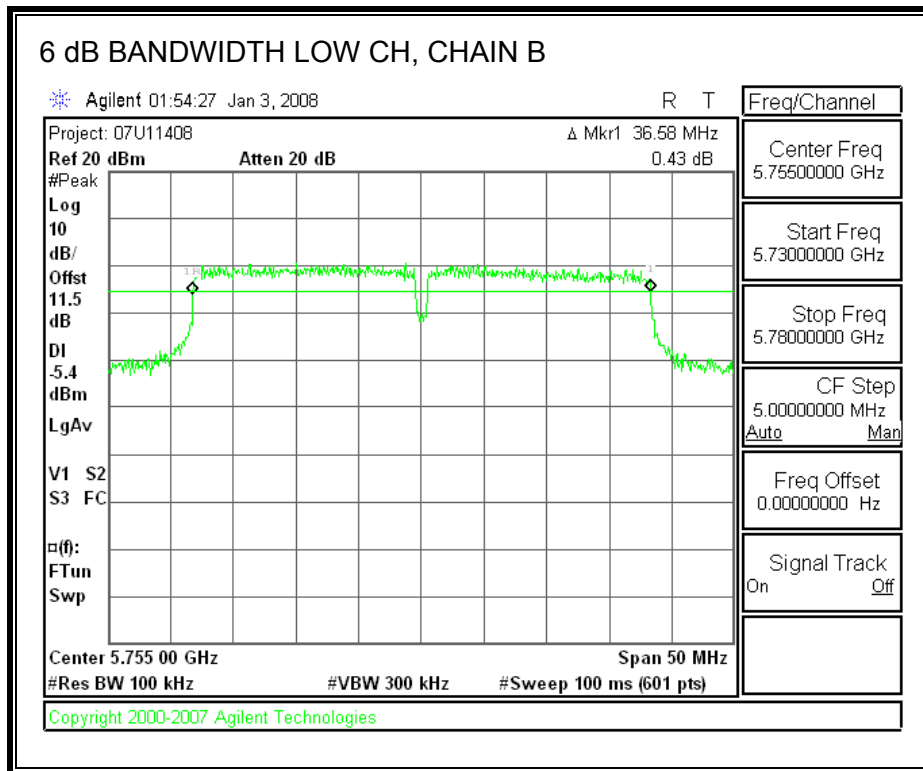
Channel	Frequency (MHz)	Chain A 6 dB BW (MHz)	Chain B 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5755	36.58	36.58	0.5
High	5795	36.58	36.58	0.5

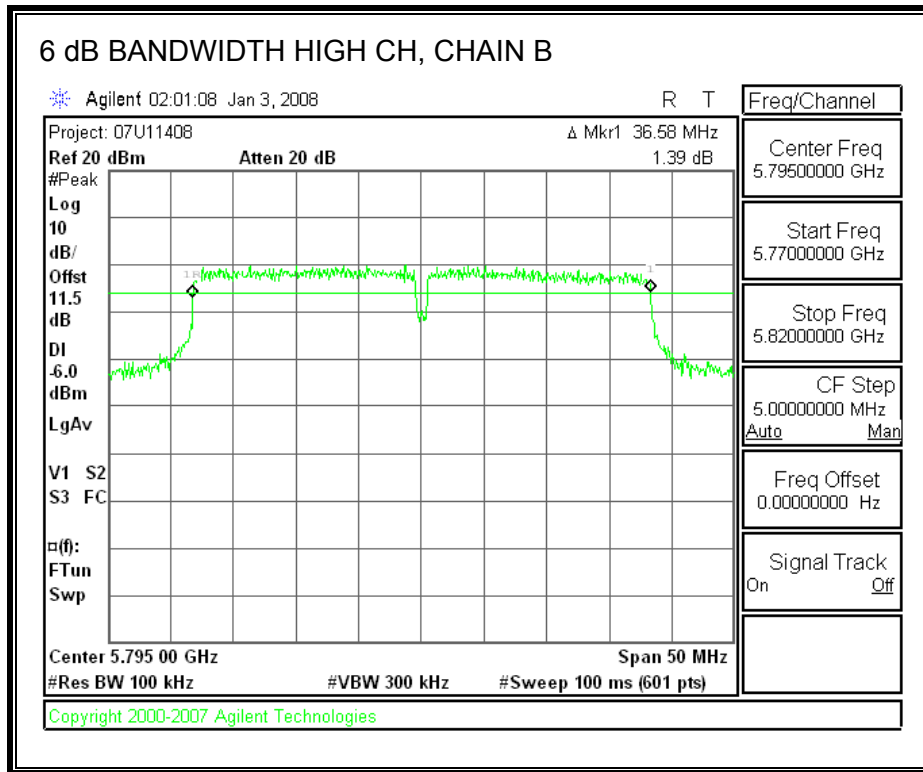
6 dB BANDWIDTH, CHAIN A





6 dB BANDWIDTH, CHAIN B





7.7.2. 99% BANDWIDTH**LIMITS**

None; for reporting purposes only.

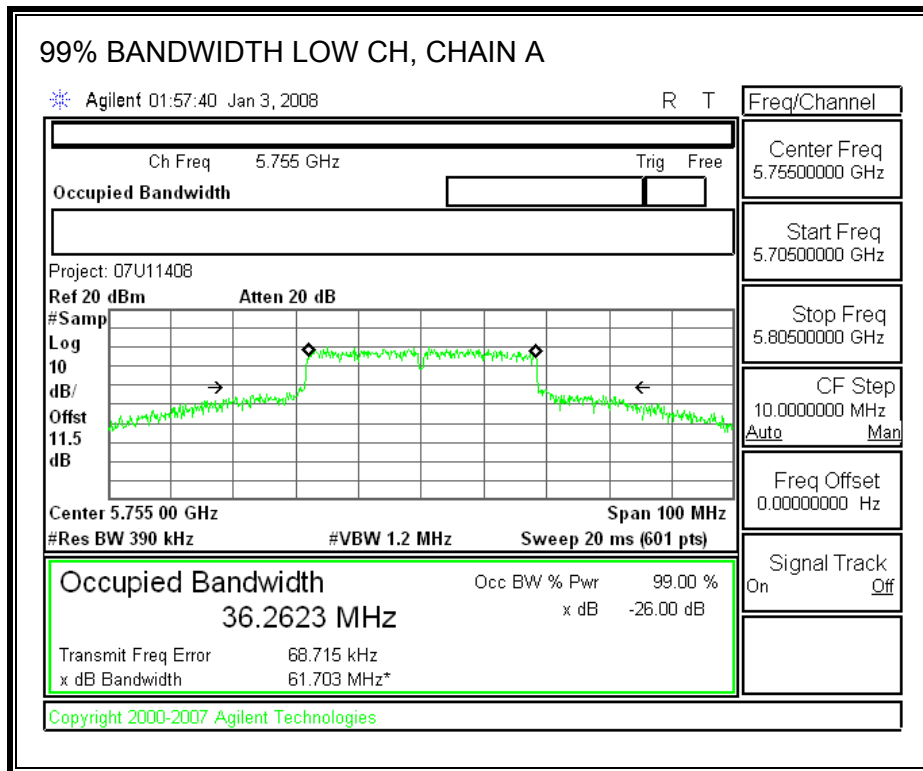
TEST PROCEDURE

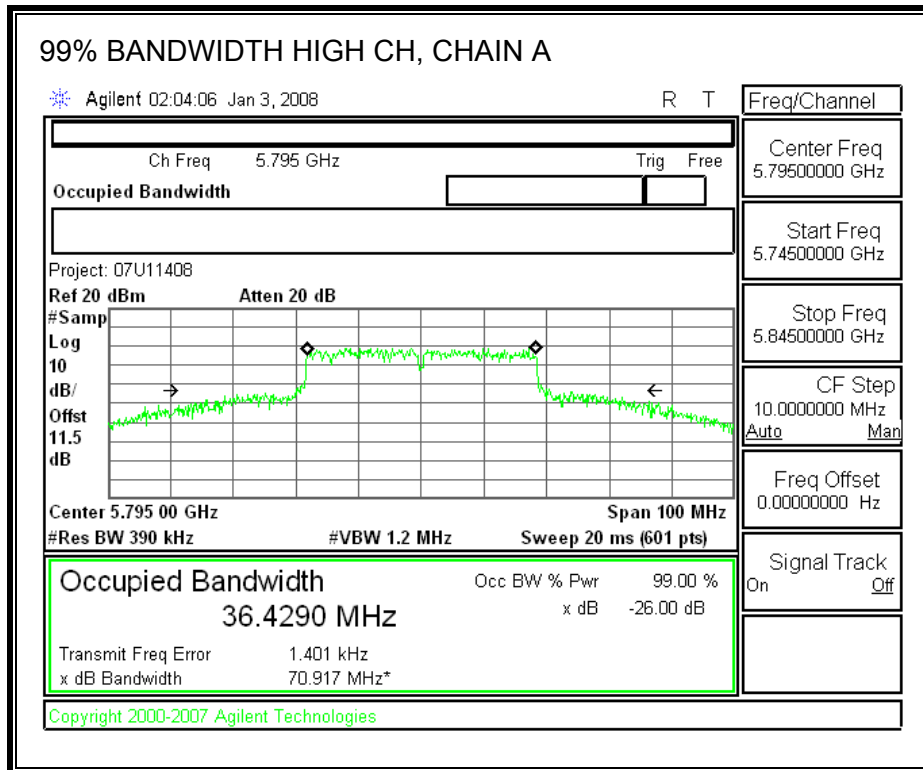
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

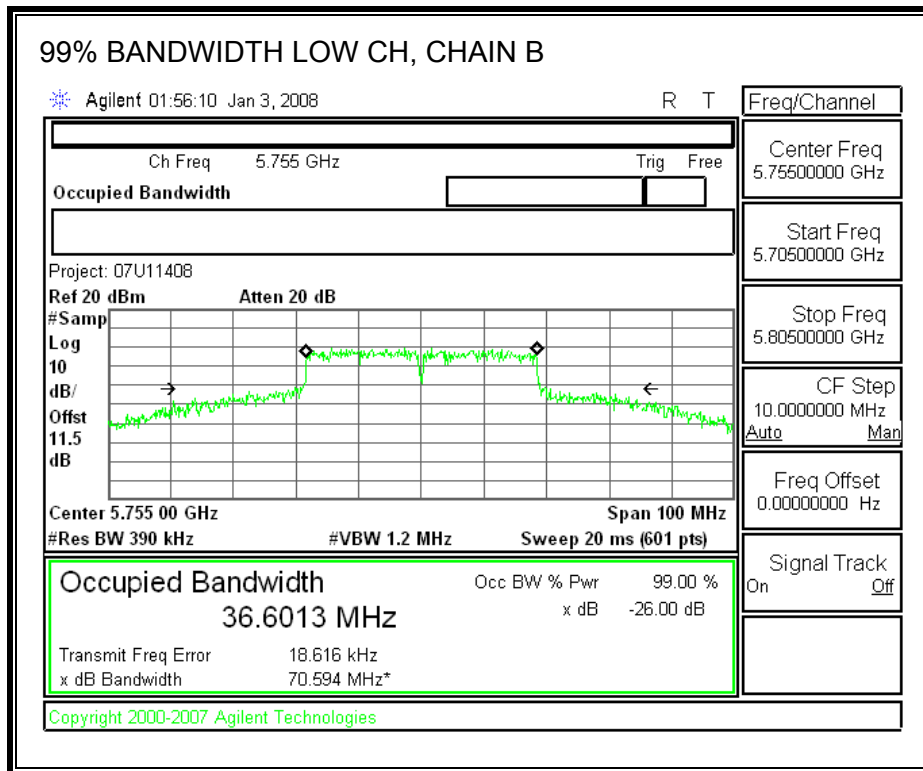
Channel	Frequency (MHz)	Chain A 99% Bandwidth (MHz)	Chain B 99% Bandwidth (MHz)
Low	5755	36.2623	36.6013
High	5795	36.4290	36.3495

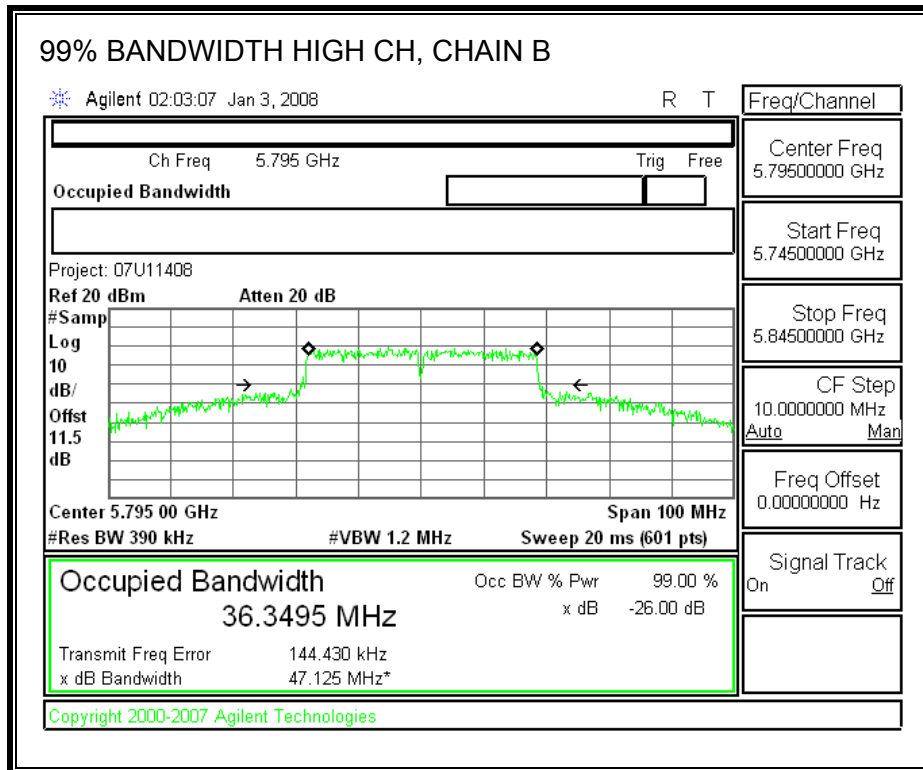
99% BANDWIDTH, CHAIN A





99% BANDWIDTH, CHAIN B





7.7.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

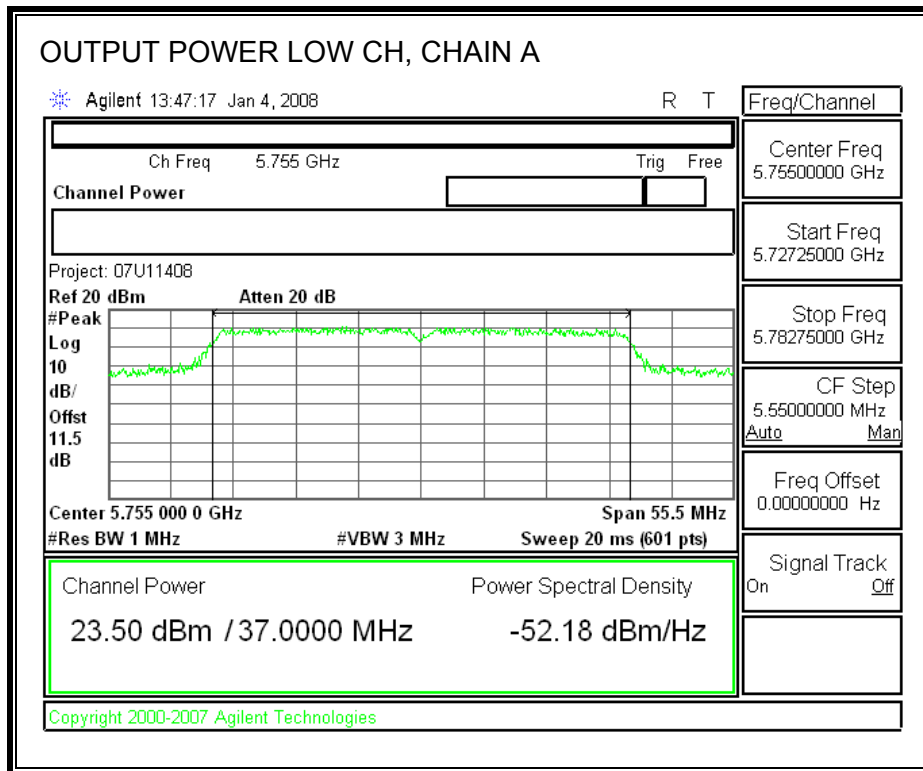
TEST PROCEDURE

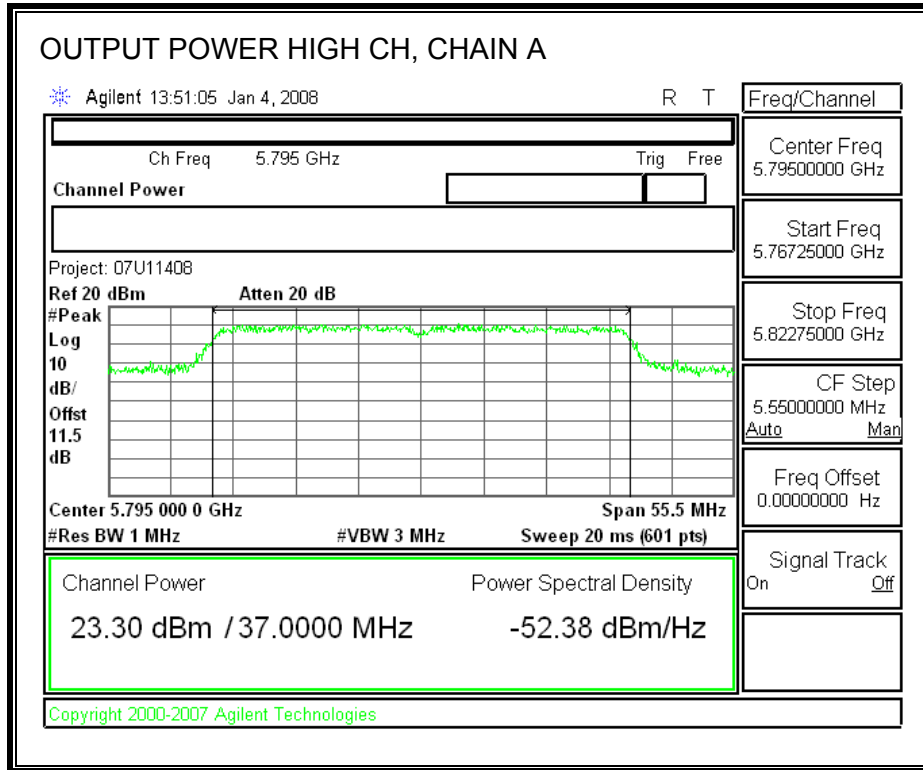
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

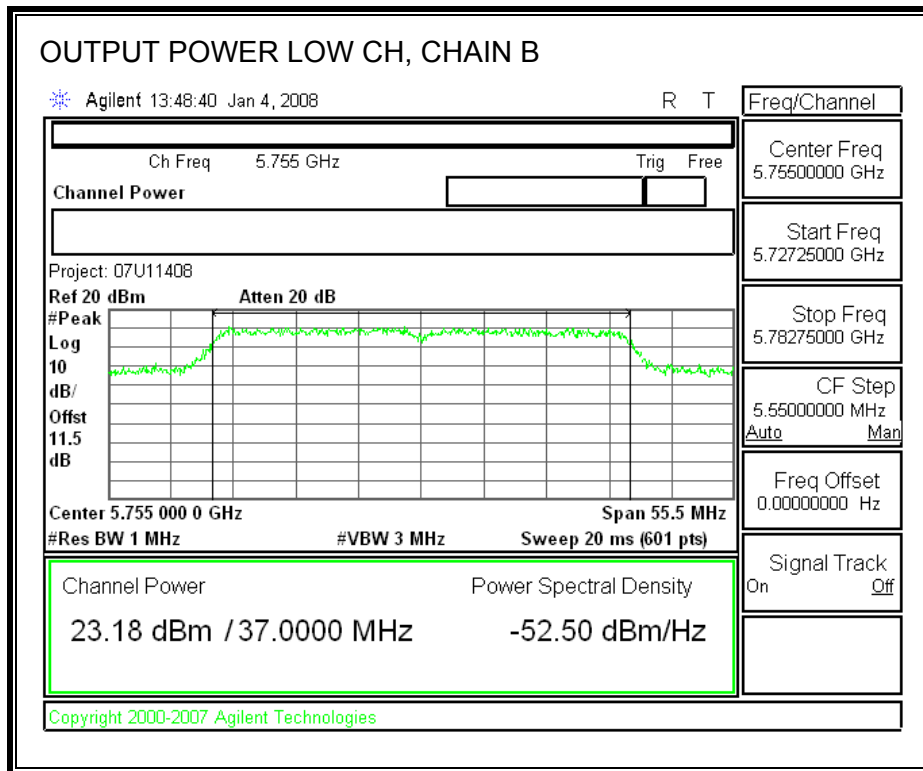
Channel	Frequency (MHz)	Limit (dBm)	Chain A Power (dBm)	Chain B Power (dBm)	Total Power (dBm)	Margin (dB)
Low	5755	30.00	23.50	23.18	26.35	-3.65
High	5795	30.00	23.30	23.04	26.18	-3.82

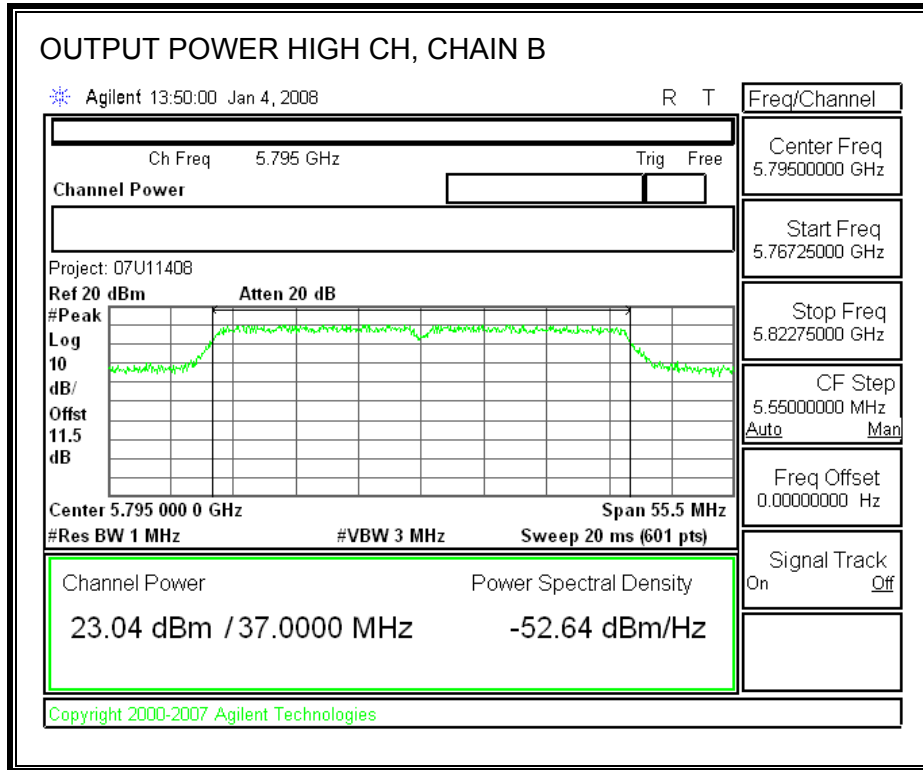
CHAIN A OUTPUT POWER





CHAIN B OUTPUT POWER





7.7.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

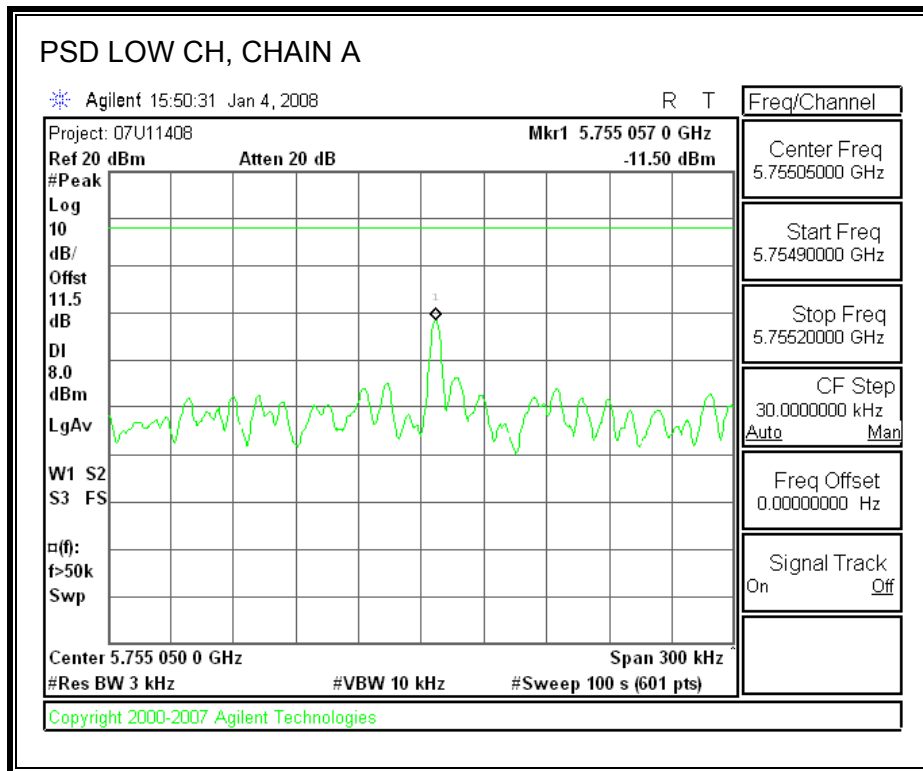
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

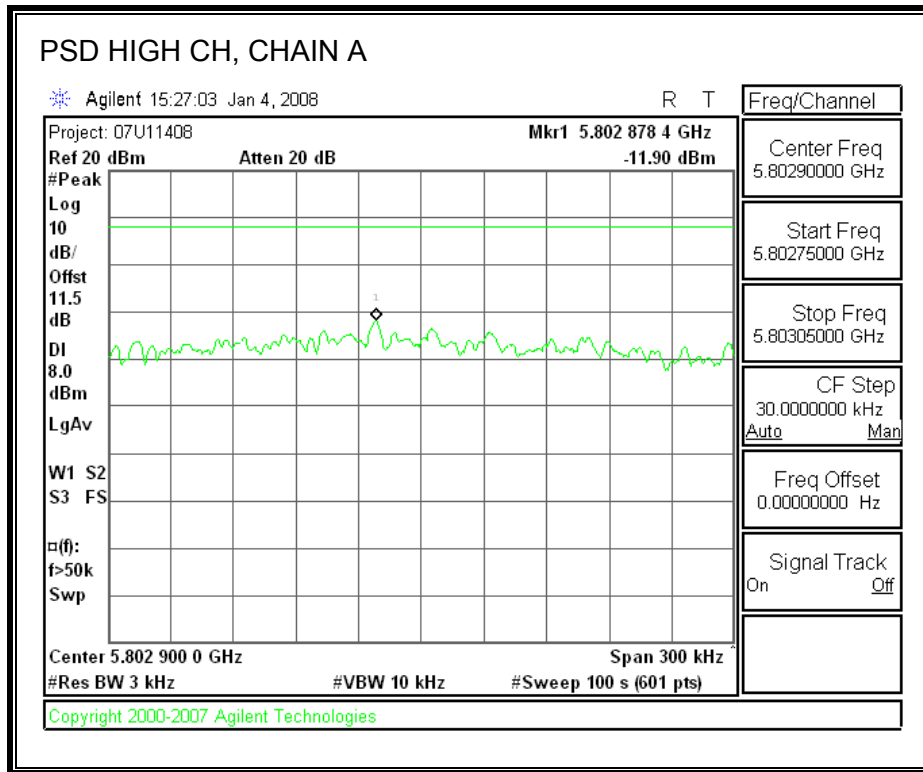
RESULTS:

Channel	Frequency (MHz)	Chain A PSD (dBm)	Chain B PSD (dBm)	Limit (dBm)
Low	5755	-11.50	-12.71	8
High	5595	-11.90	-13.47	8

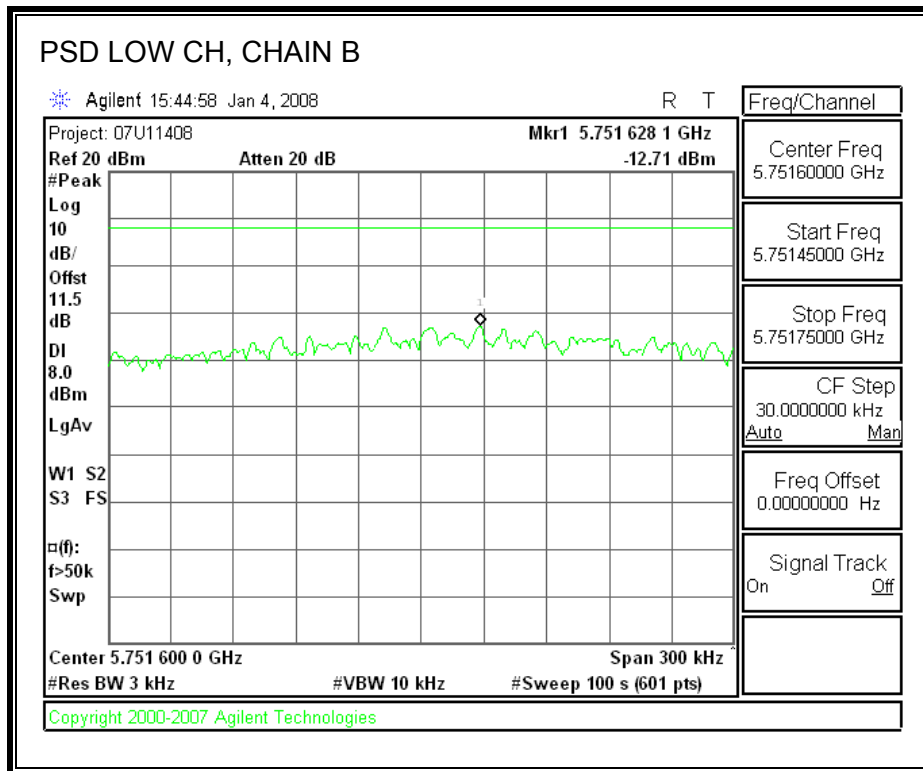
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-7.28	8	-15.28
High	5595	-7.55	8	-15.55

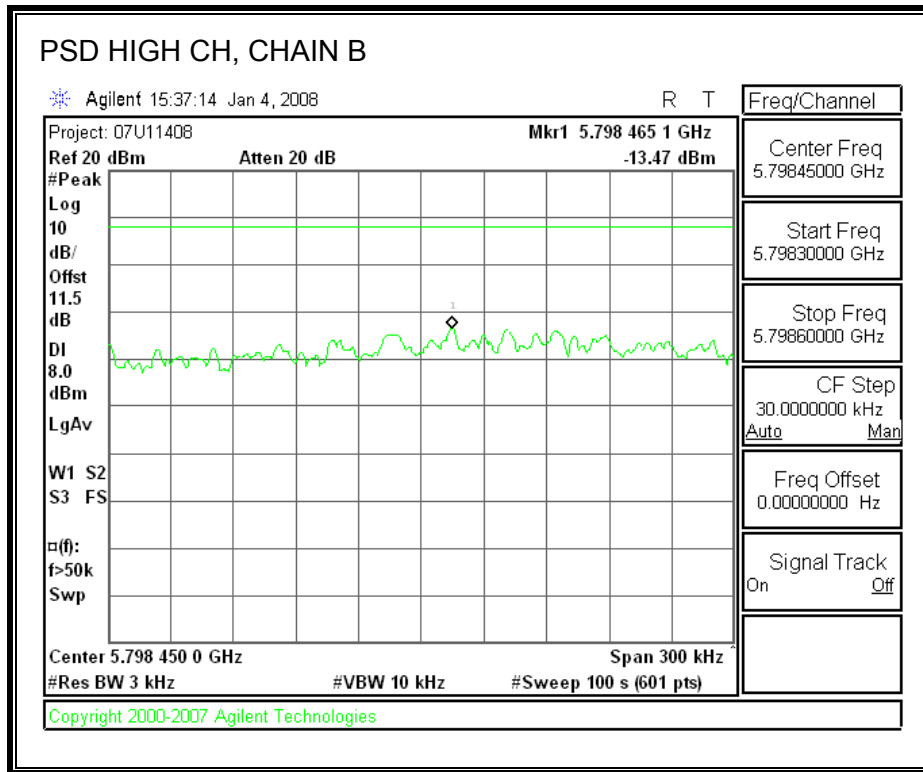
POWER SPECTRAL DENSITY, CHAIN A



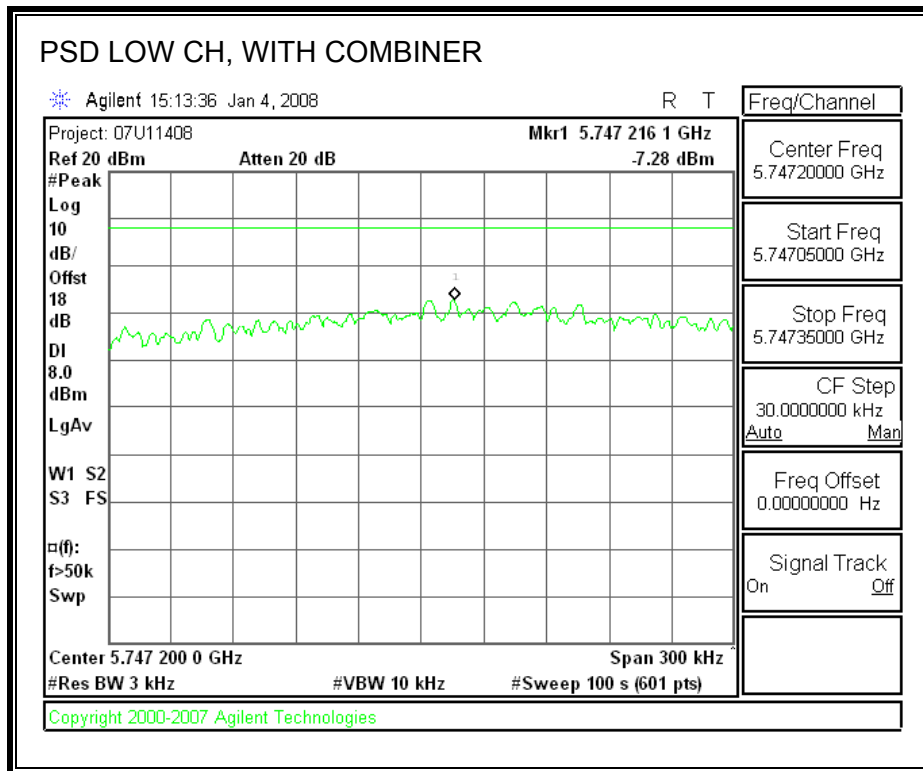


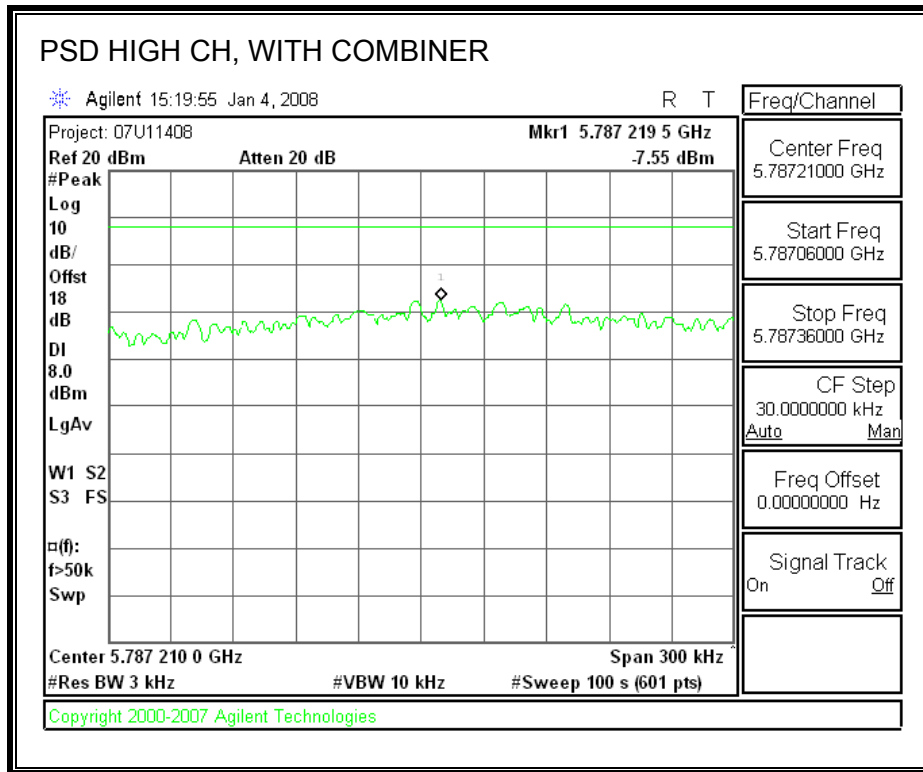
POWER SPECTRAL DENSITY, CHAIN B





POWER SPECTRAL DENSITY, WITH COMBINER





7.7.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

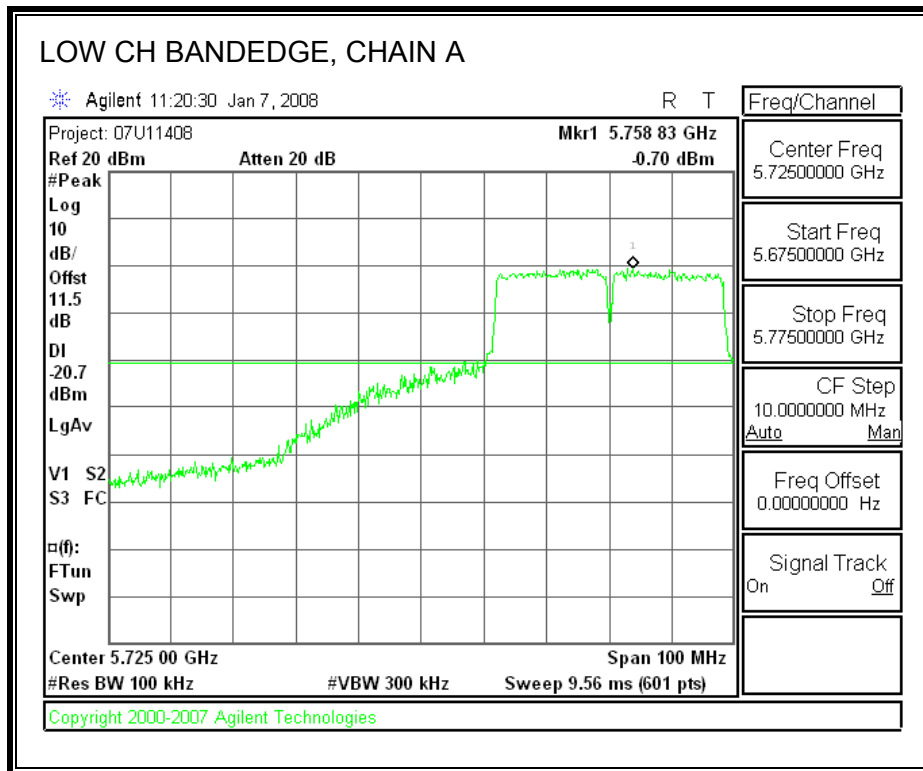
TEST PROCEDURE

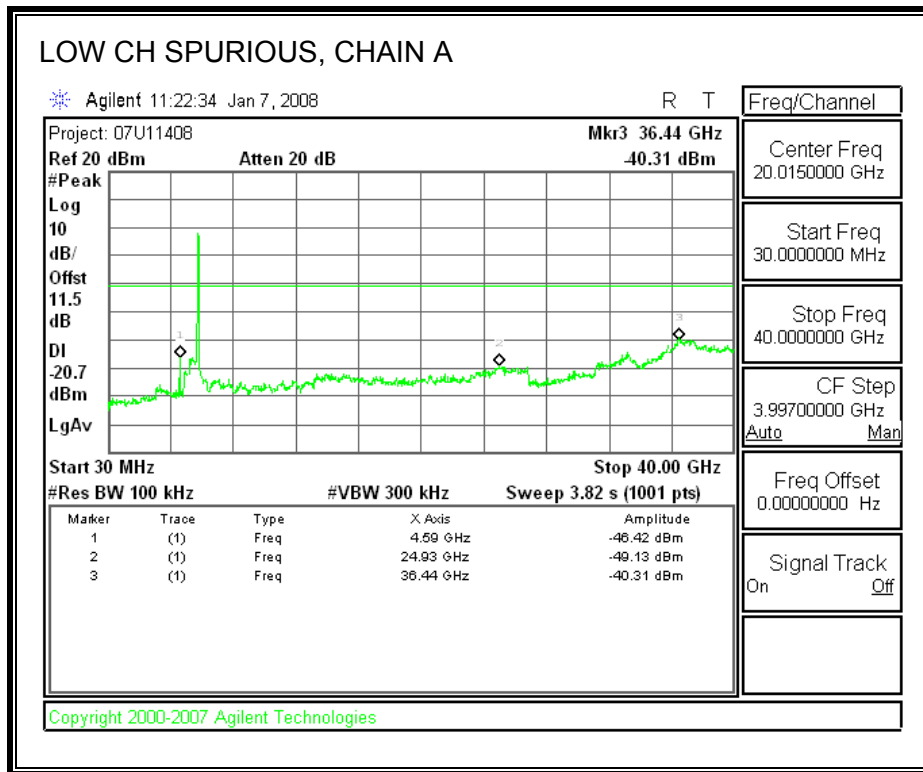
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

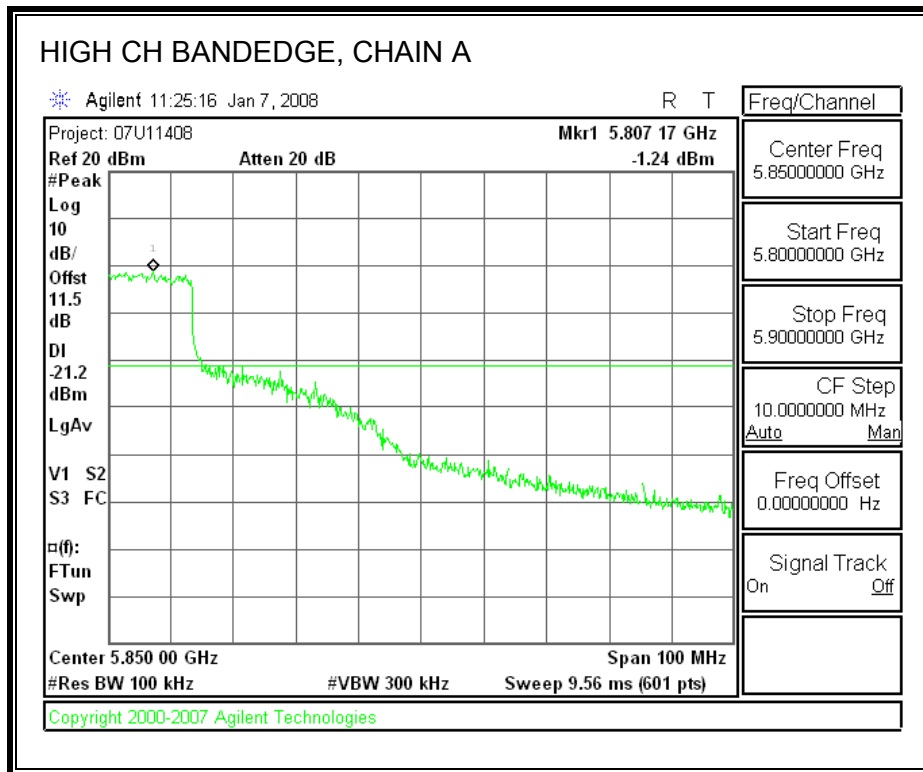
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest and highest channels.

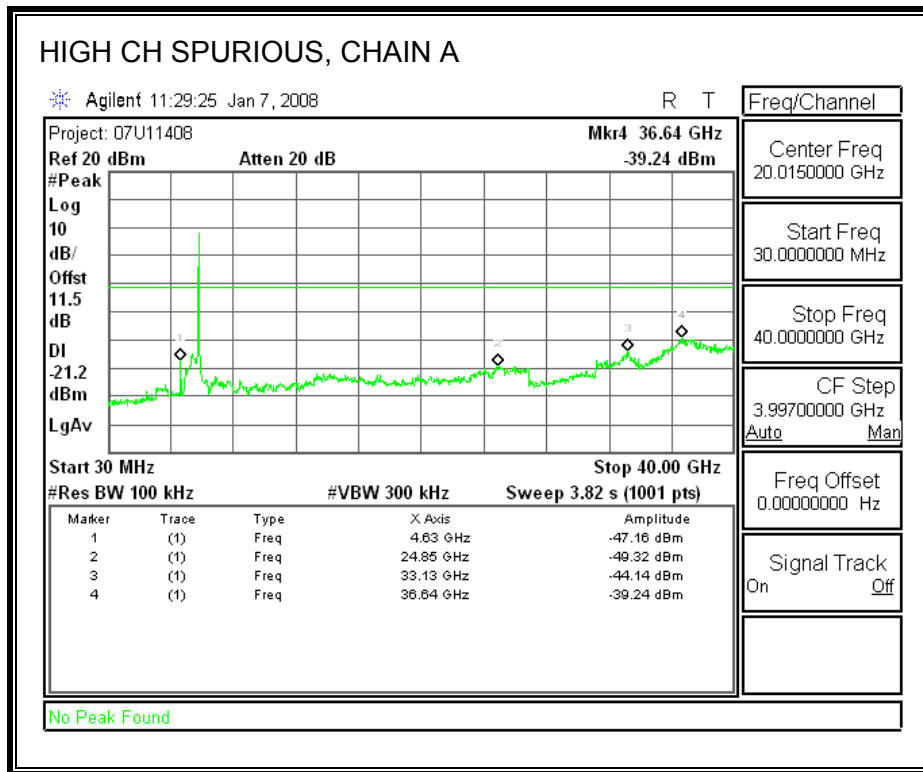
RESULTS

CHAIN A SPURIOUS EMISSIONS

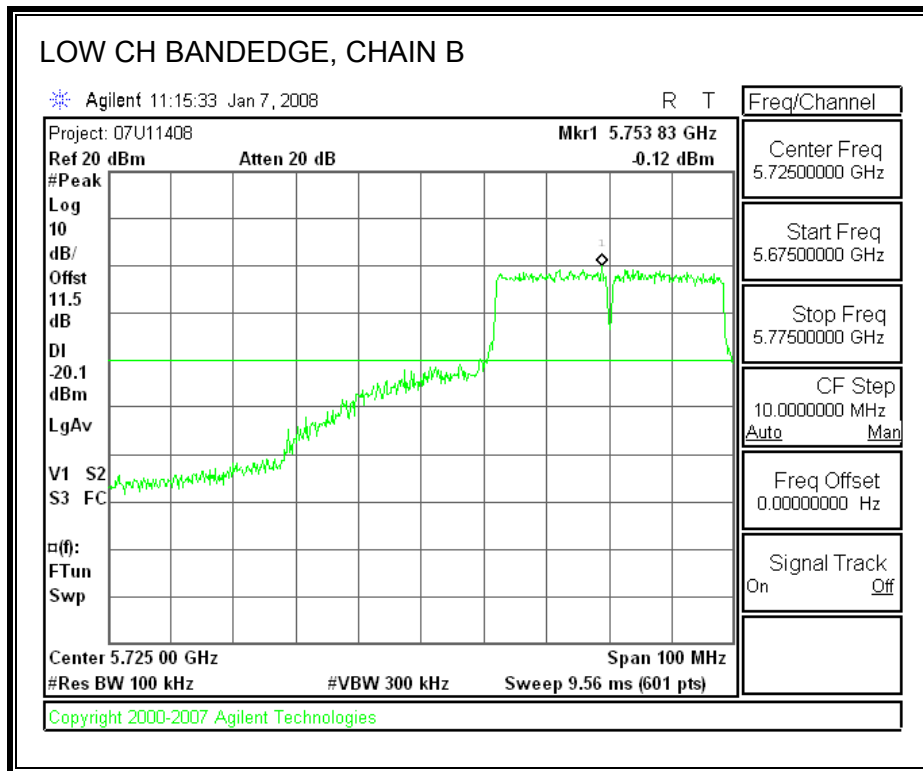


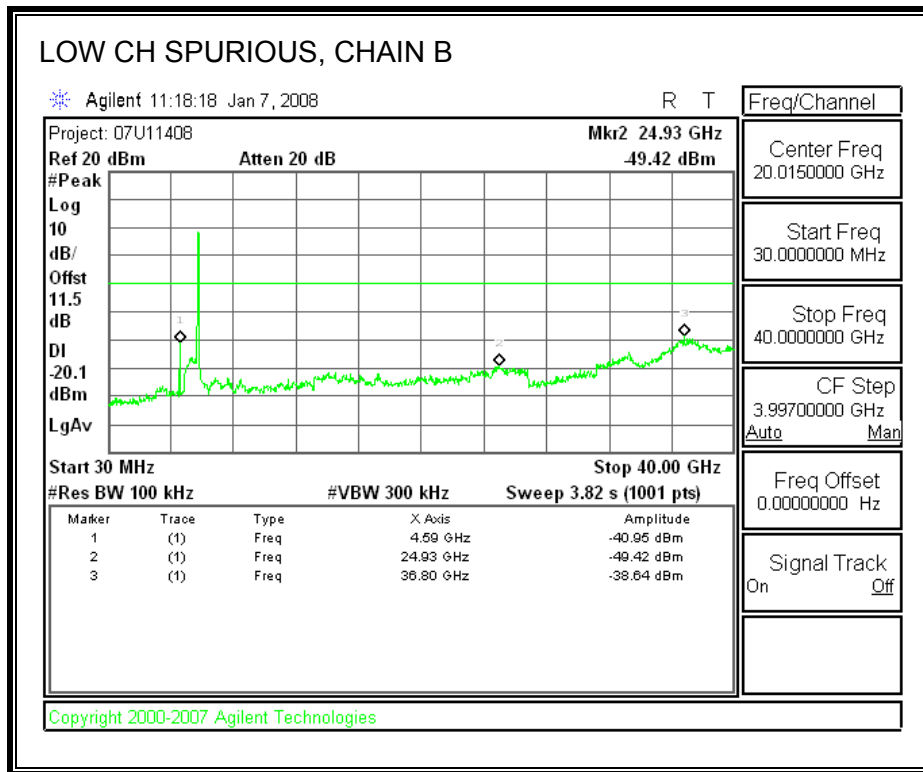


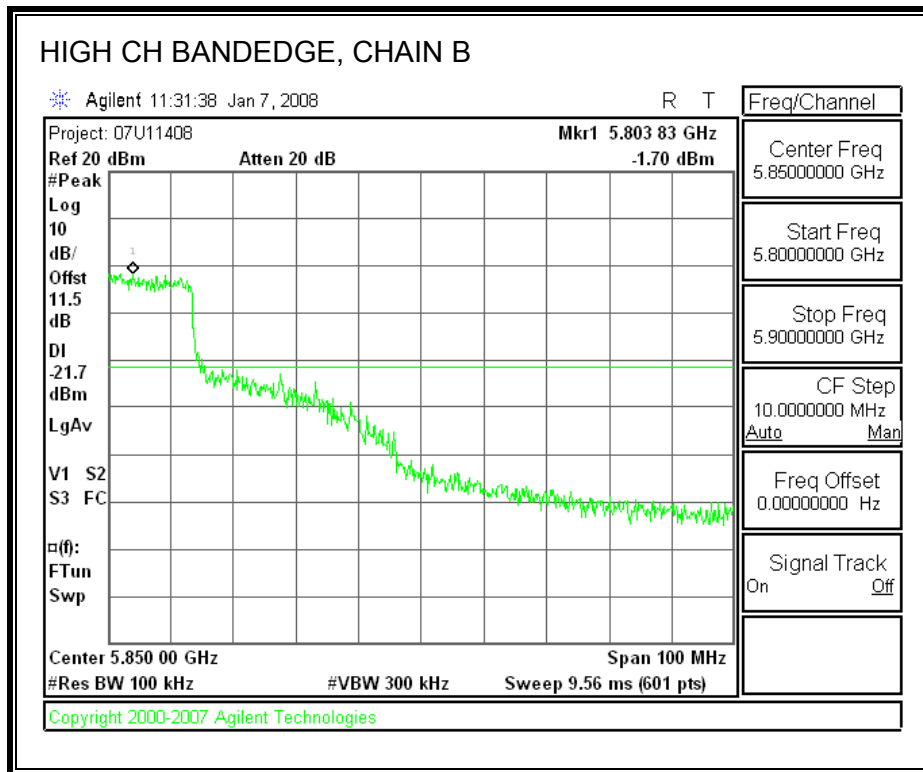


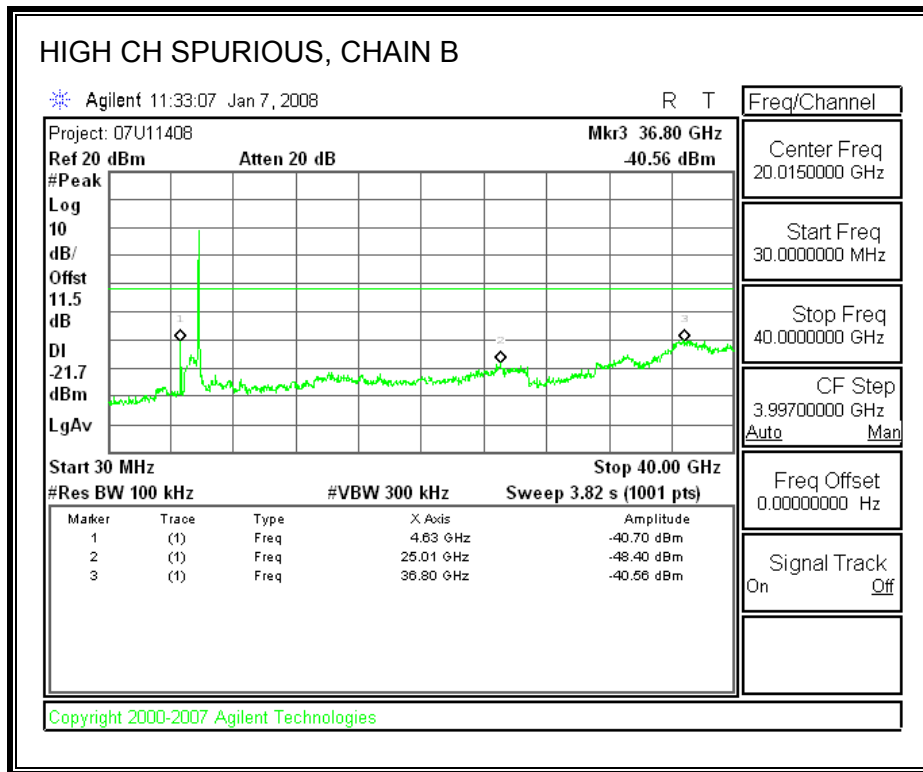


CHAIN B SPURIOUS EMISSIONS

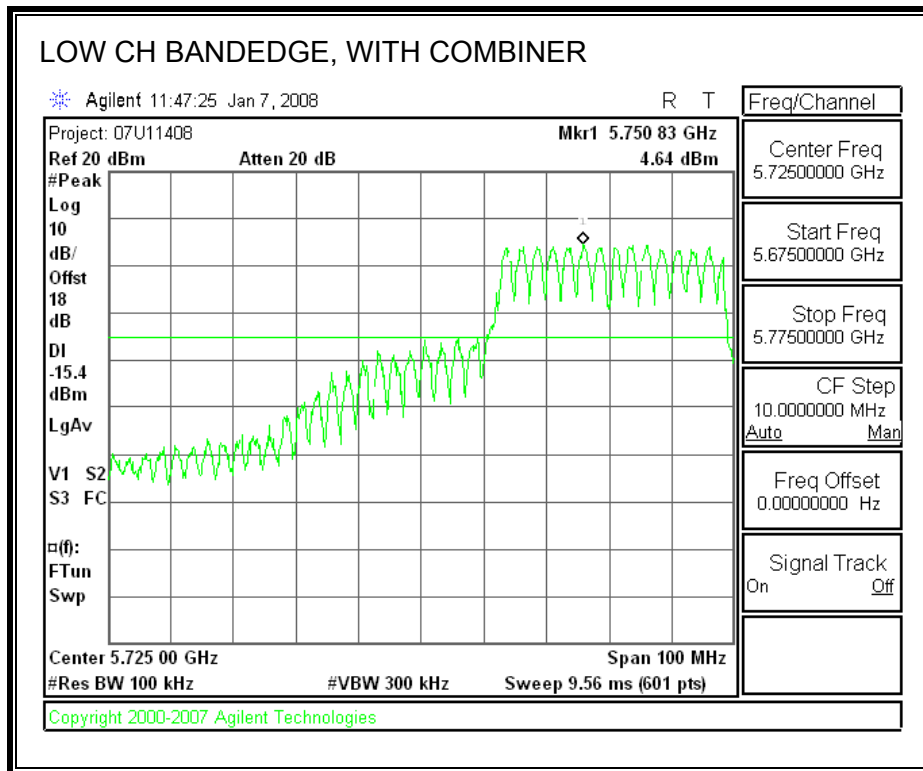


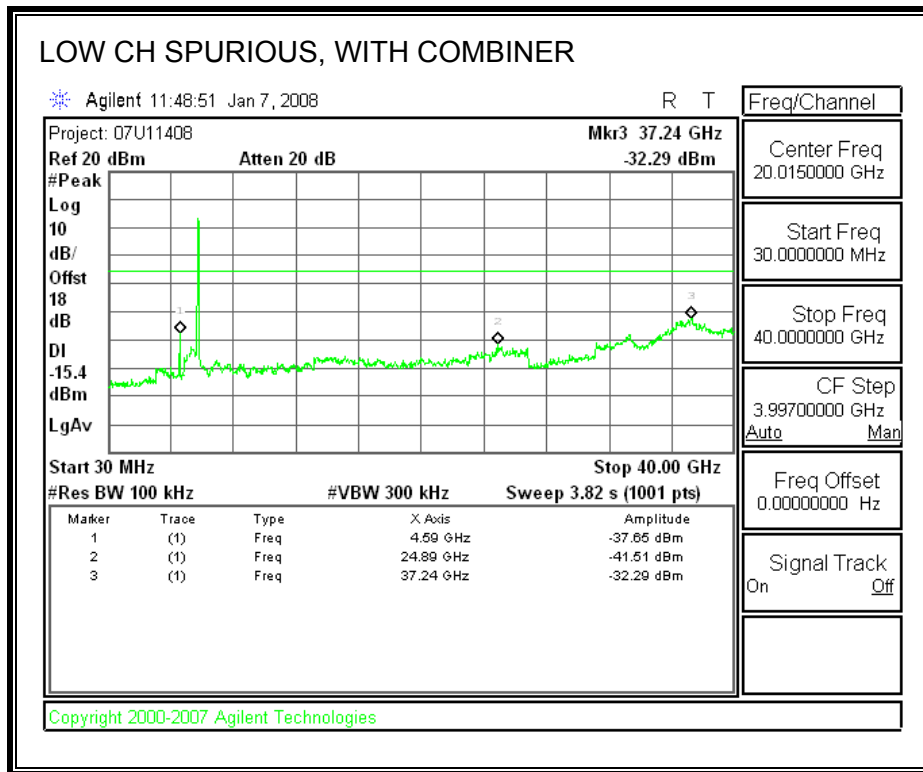


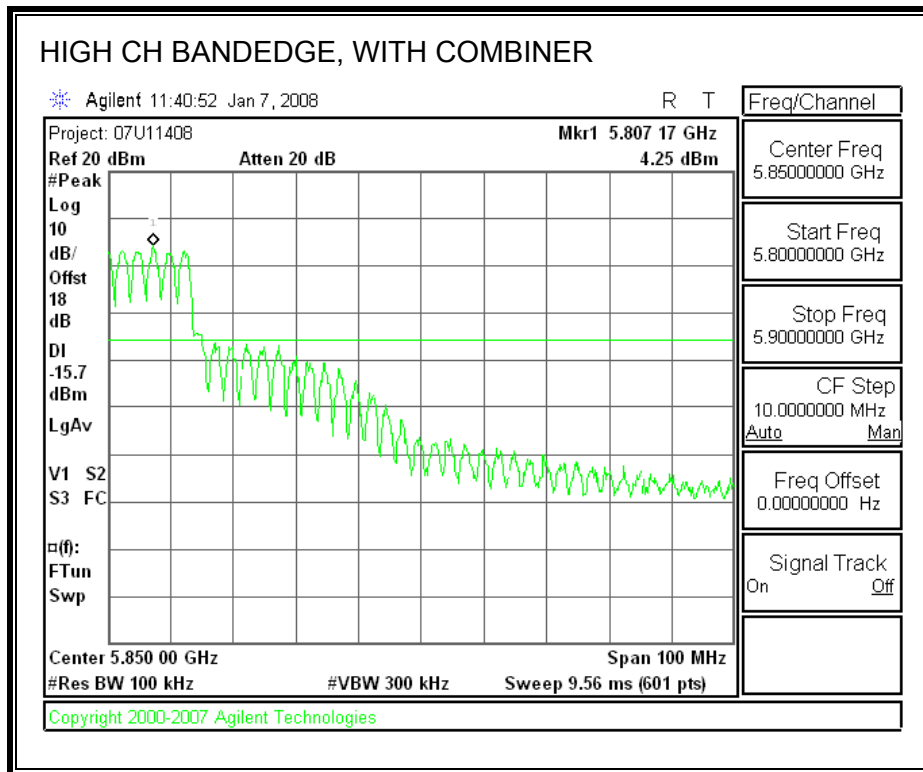


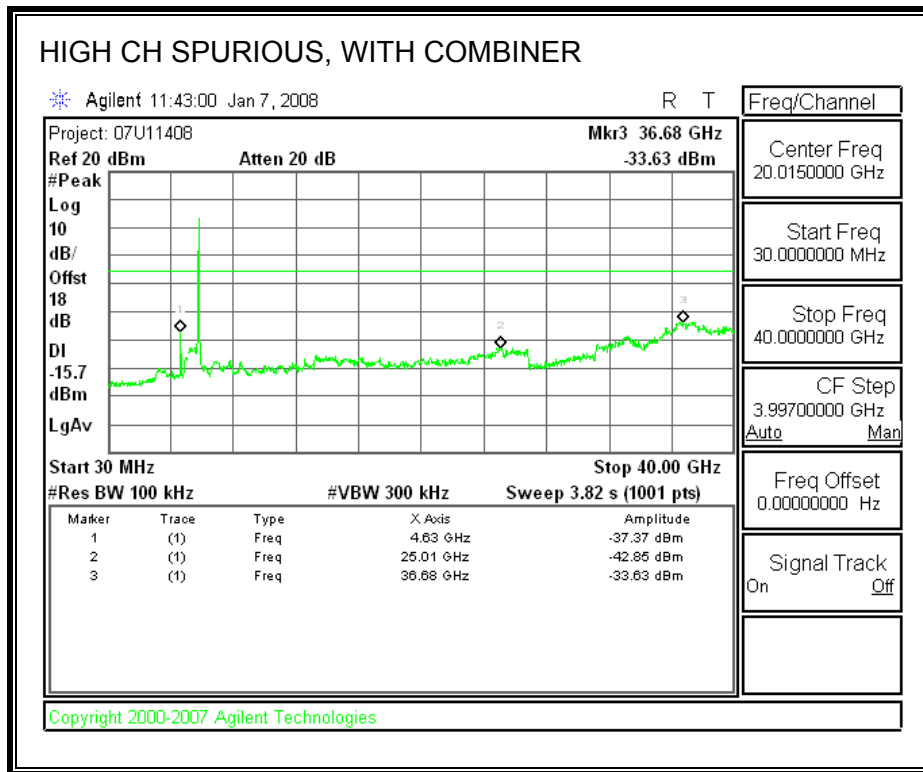


SPURIOUS EMISSIONS WITH COMBINER









8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

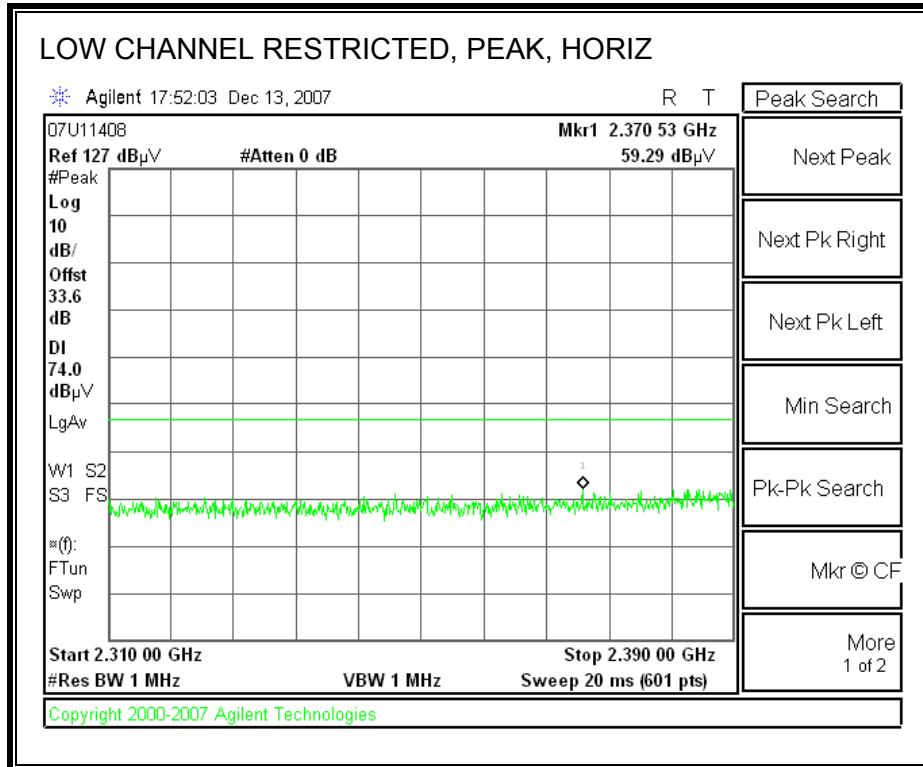
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

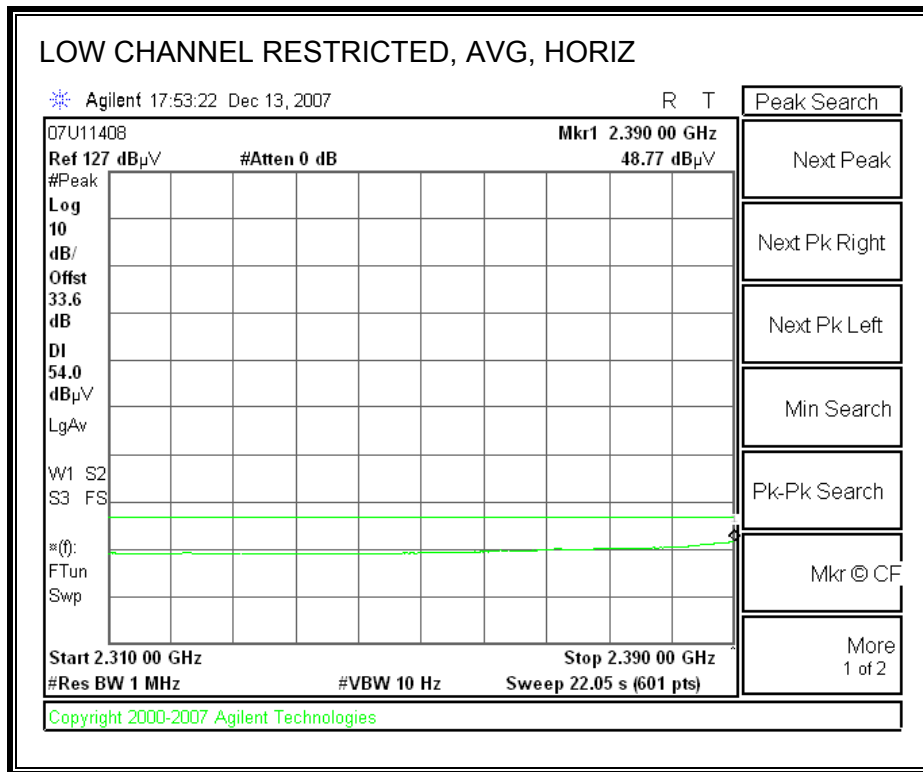
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

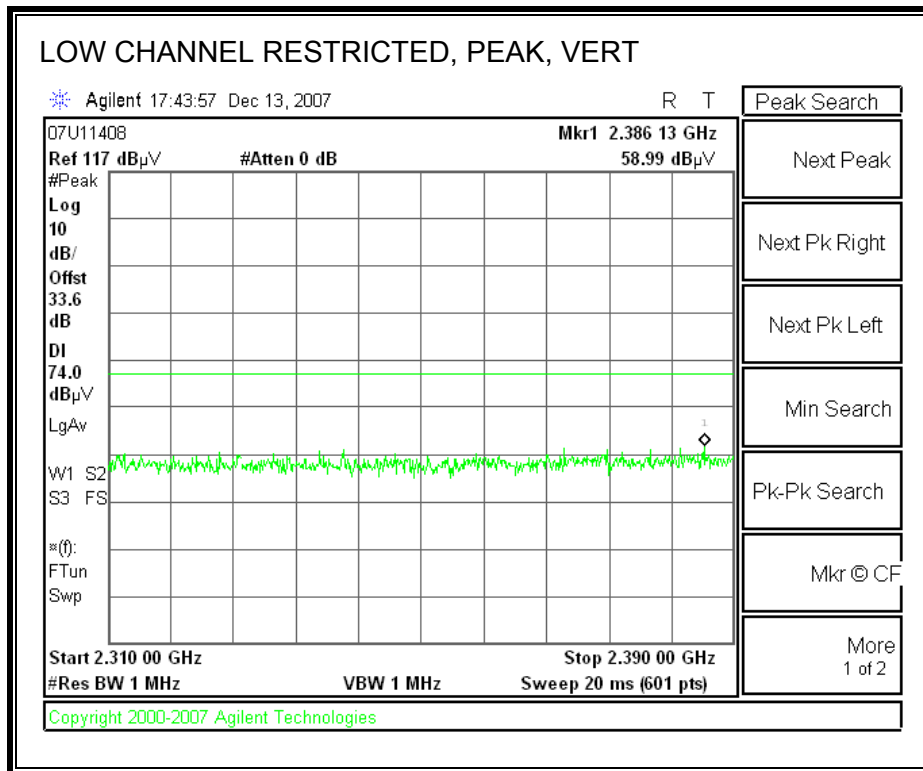
8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

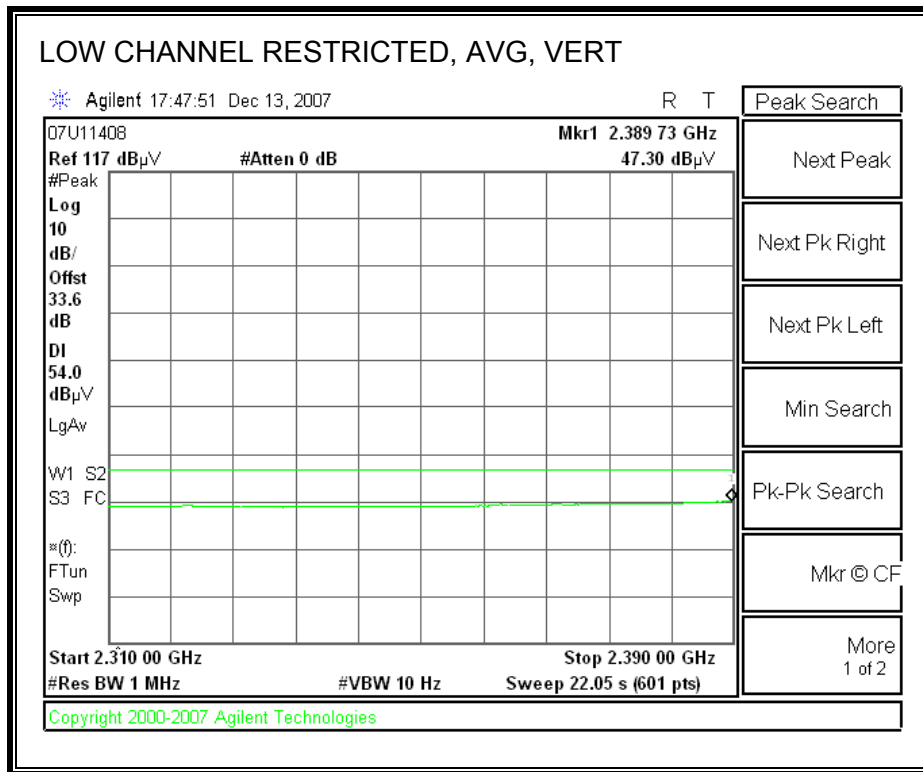
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



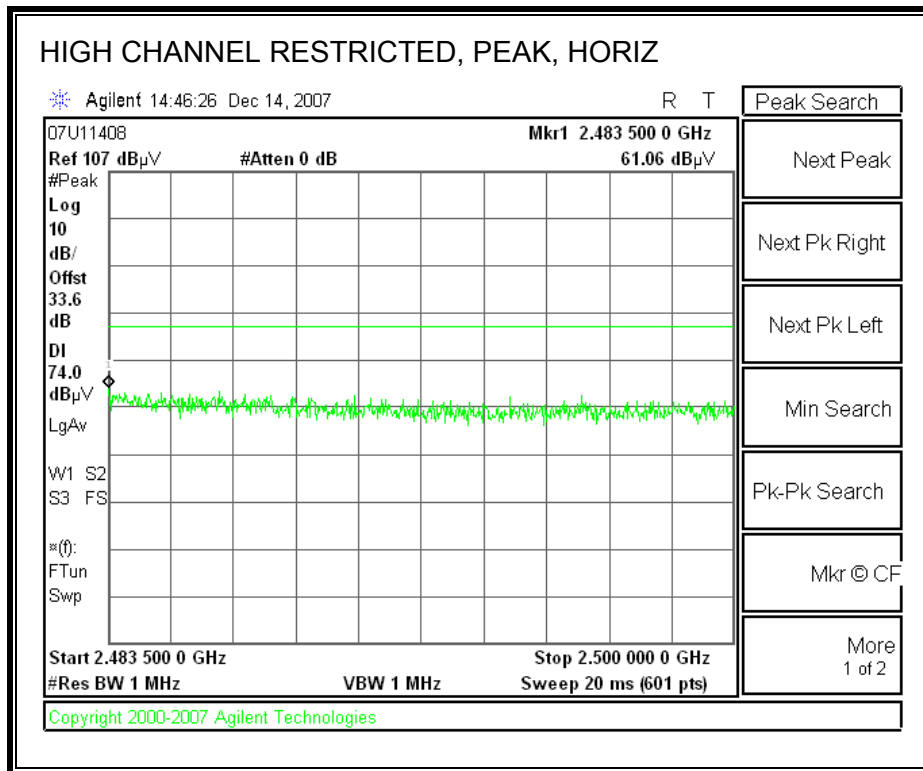


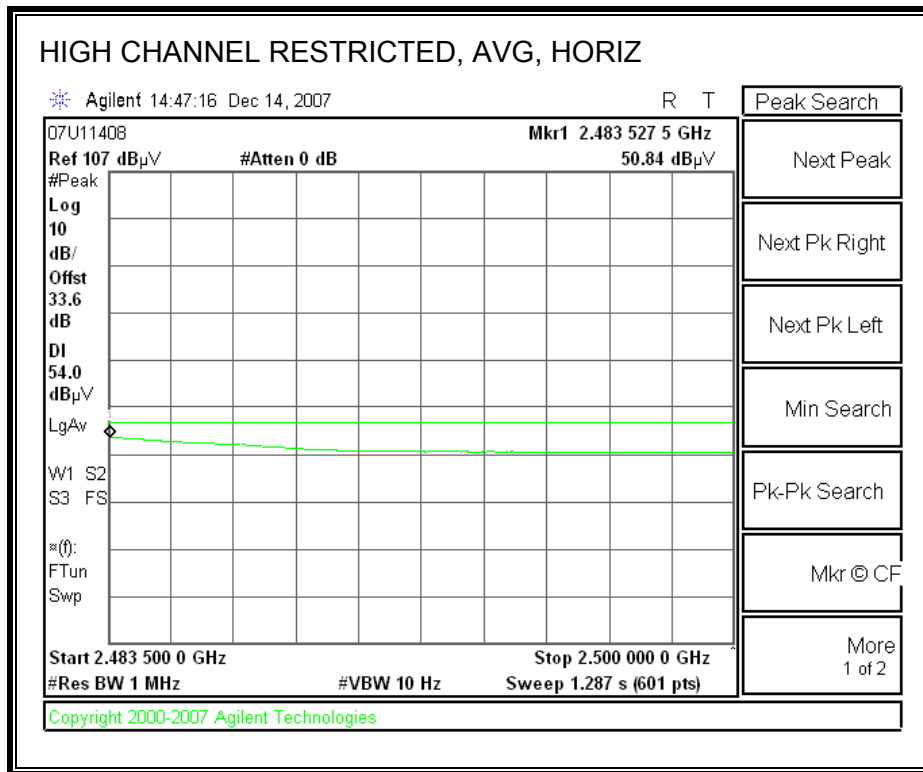
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



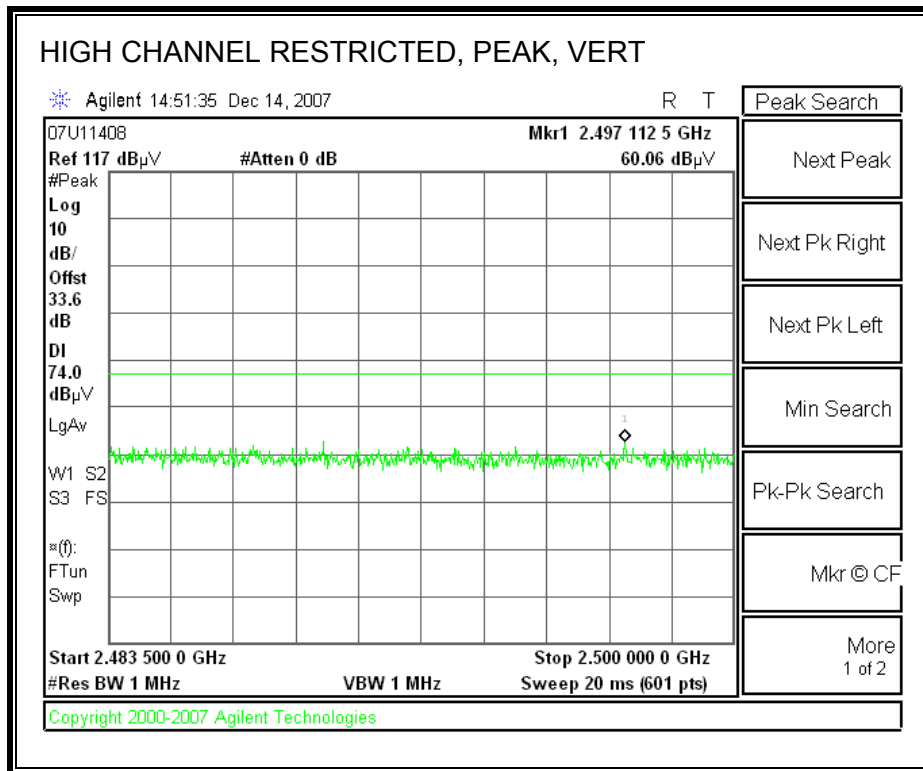


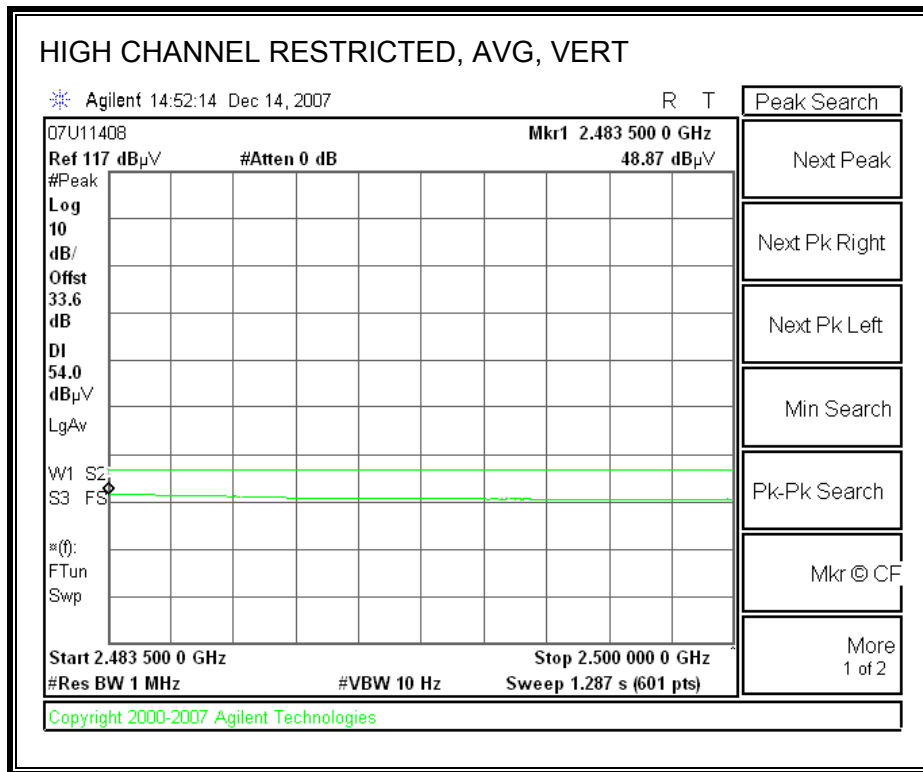
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple
Project #: 07U11408
Date: 12-17-07
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: b mode, TX On

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-5m Chamber		R_001

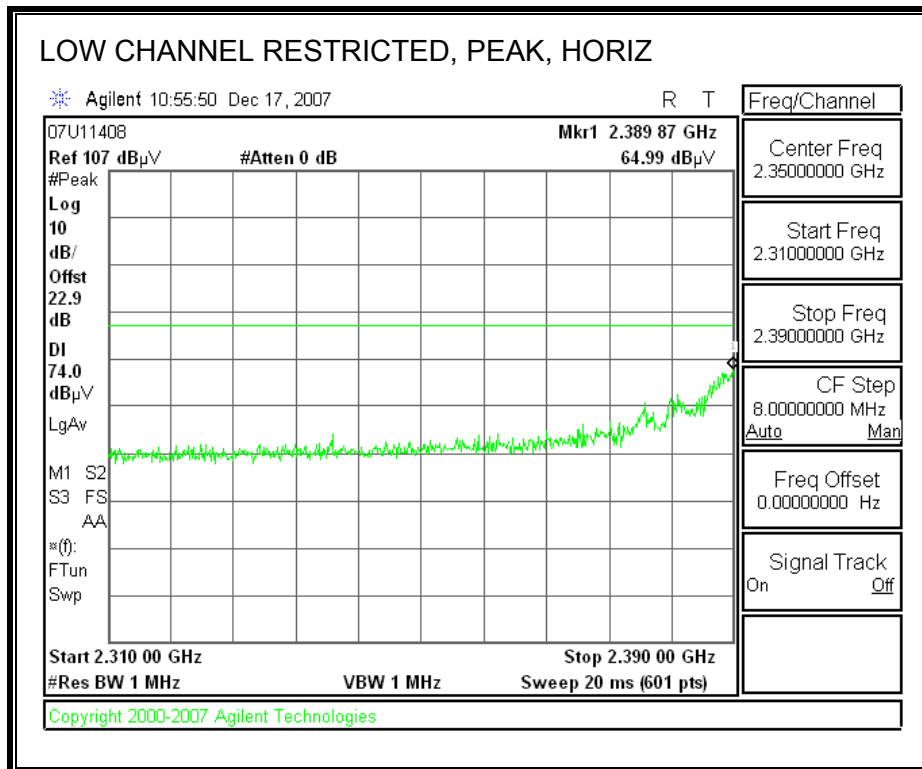
Peak Measurements
 RBW=VBW=1MHz
Average Measurements
 RBW=1MHz ; VBW=10Hz

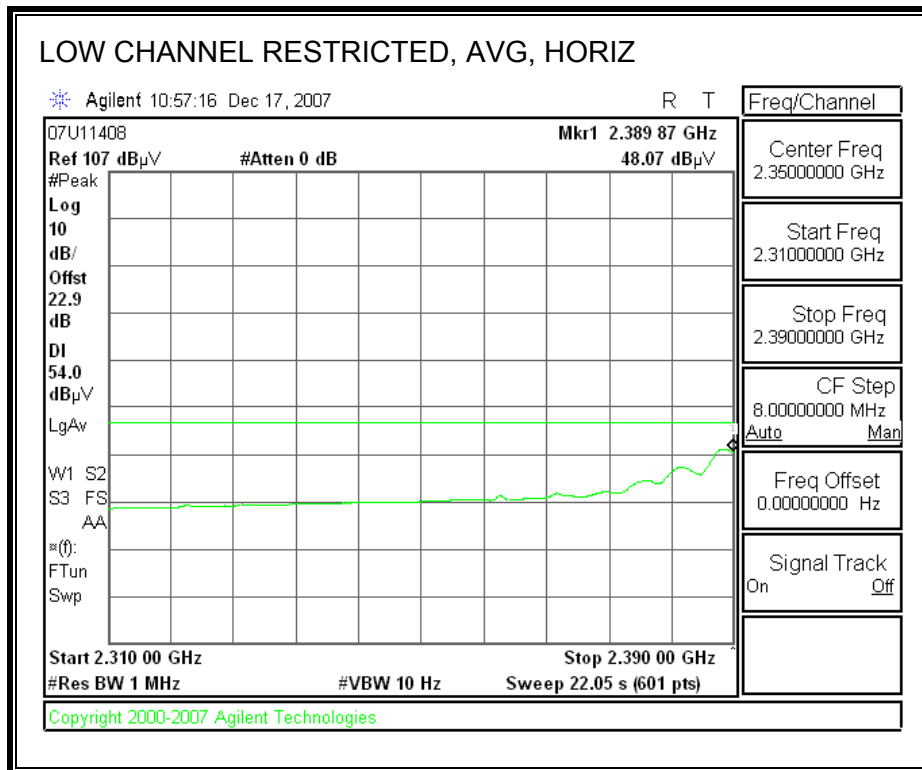
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 2412 MHz, Setting: 63-5F															
4.824	3.0	56.2	43.9	33.7	3.0	-34.8	0.0	0.0	58.1	45.8	74	54	-15.9	-8.2	V
7.236	3.0	42.5	29.8	36.7	8.4	-34.1	0.0	0.0	53.4	40.7	74	54	-20.6	-13.3	V
4.824	3.0	55.2	43.3	33.7	6.9	-34.8	0.0	0.0	60.9	49.0	74	54	-13.1	-5.0	H
7.236	3.0	45.7	34.4	36.7	8.4	-34.1	0.0	0.0	56.6	45.3	74	54	-17.4	-8.7	H
Mid Ch. 2437 MHz, Setting: 63-5F															
4.874	3.0	47.9	35.5	33.7	6.9	-34.8	0.0	0.0	53.7	41.3	74	54	-20.3	-12.7	V
7.311	3.0	45.6	33.3	36.7	8.4	-34.1	0.0	0.0	56.6	44.3	74	54	-17.4	-9.7	V
4.874	3.0	54.4	42.1	33.7	6.9	-34.8	0.0	0.0	60.2	47.9	74	54	-13.8	-6.1	H
7.311	3.0	48.1	36.8	36.7	8.4	-34.1	0.0	0.0	59.1	47.8	74	54	-14.9	-6.2	H
High Ch. 2462 MHz, Setting: 62-5E															
4.924	3.0	51.2	38.8	33.8	7.0	-34.8	0.0	0.0	57.1	44.8	74	54	-16.9	-9.2	V
7.356	3.0	41.0	28.7	36.8	8.4	-34.1	0.0	0.0	52.1	39.8	74	54	-21.9	-14.2	V
4.904	3.0	52.7	40.4	33.8	7.0	-34.8	0.0	0.0	58.6	46.3	74	54	-15.4	-7.7	H
7.356	3.0	49.7	37.8	36.8	8.4	-34.1	0.0	0.0	60.8	48.9	74	54	-13.2	-5.1	H
No more signal found															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

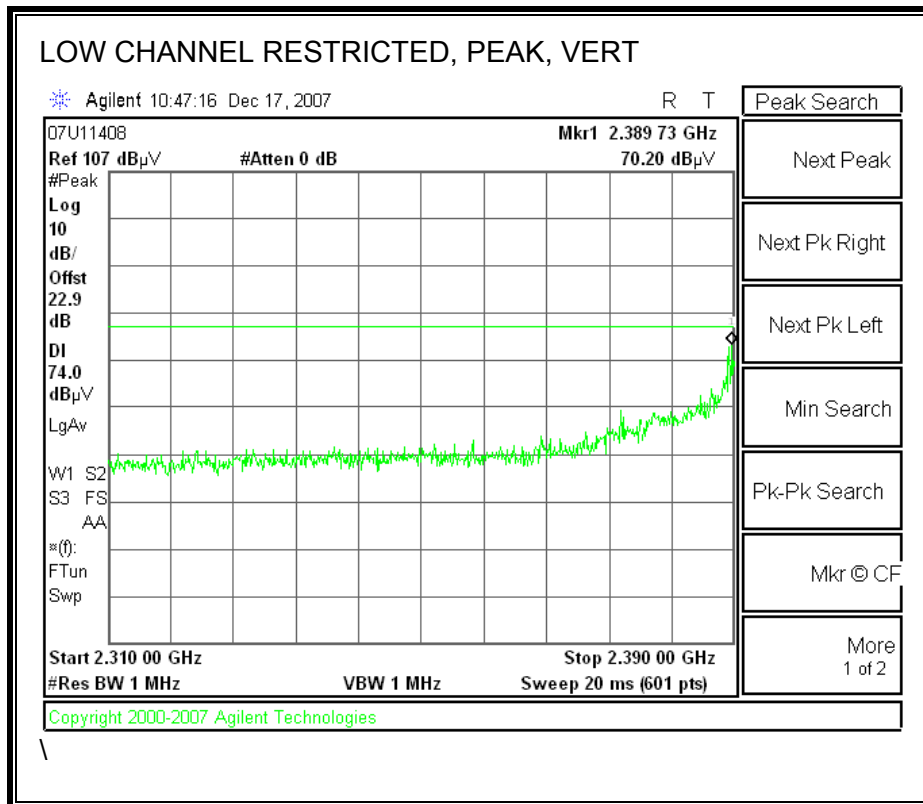
8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

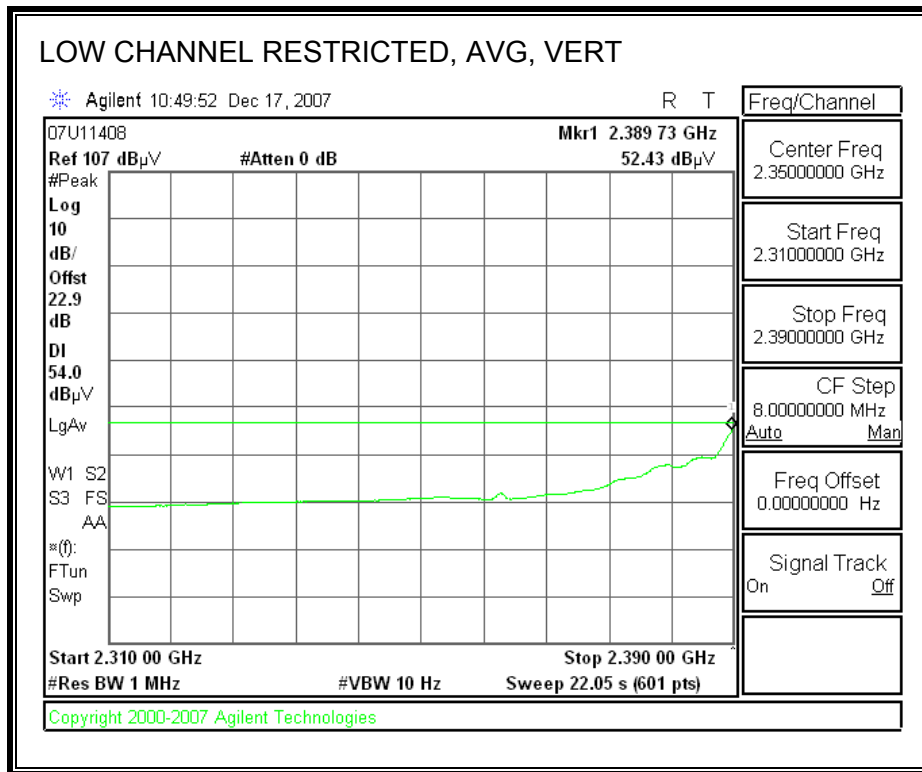
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



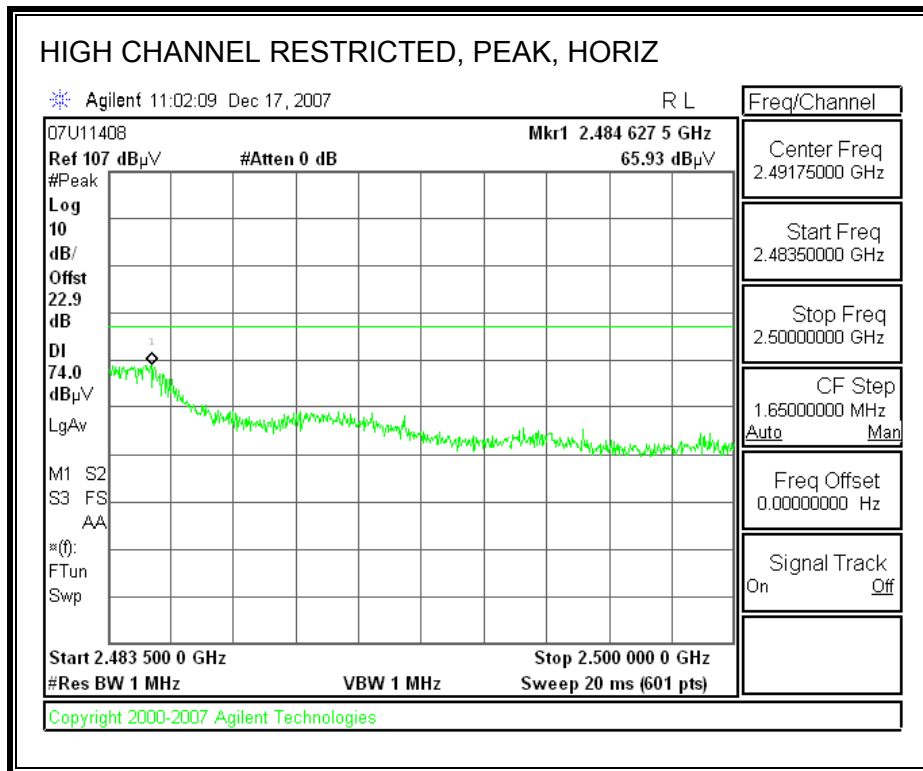


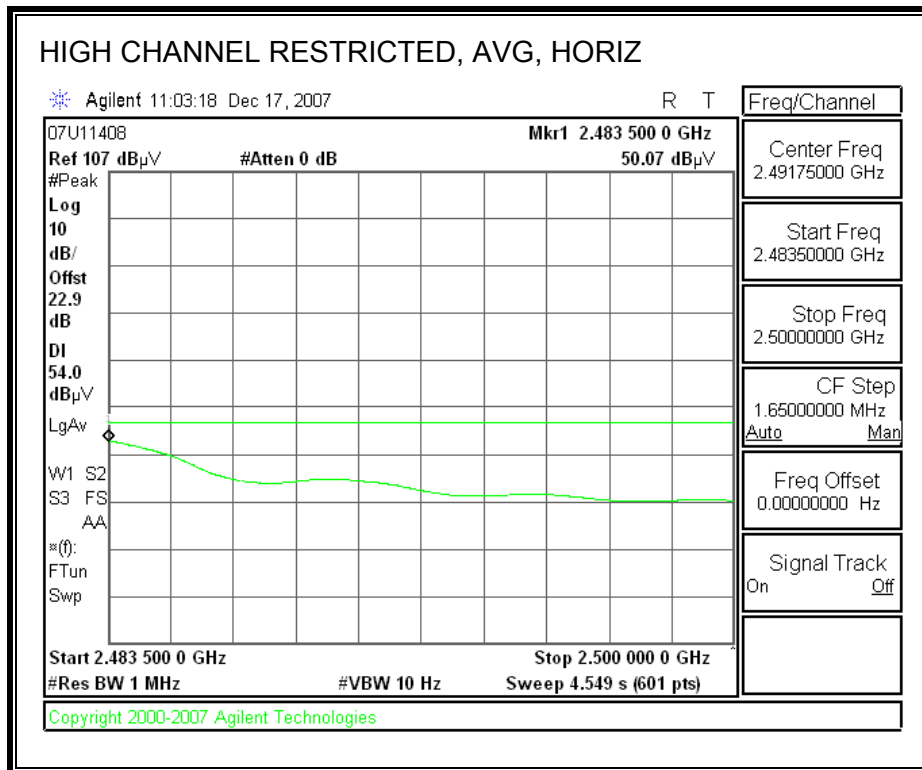
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



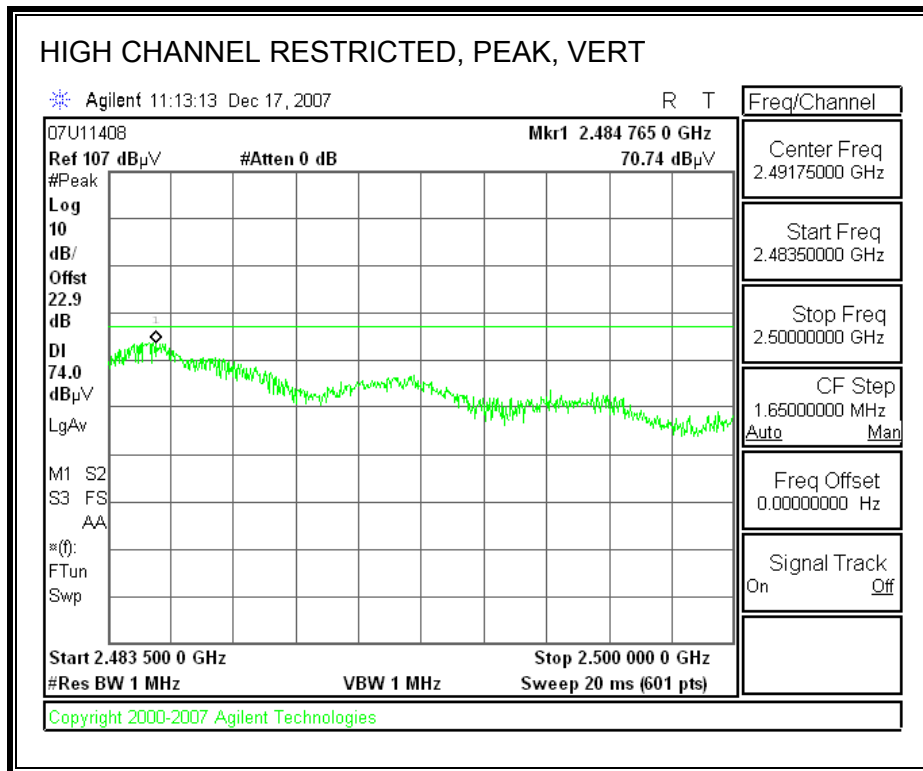


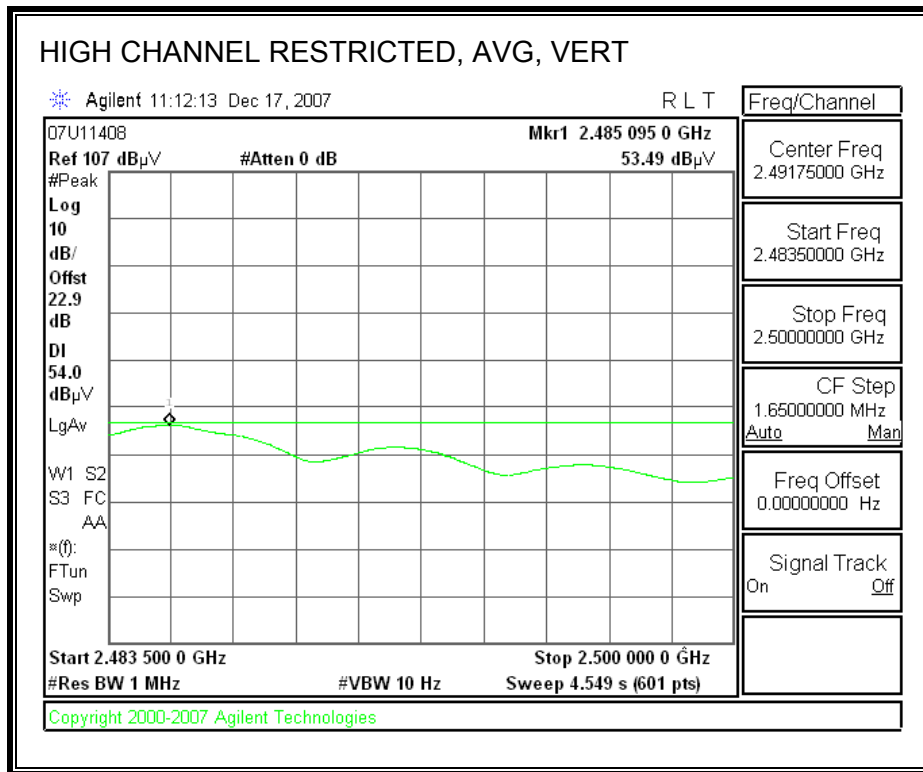
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple
Project #: 07U11408
Date: 12-17-07
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: g mode, TX On

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

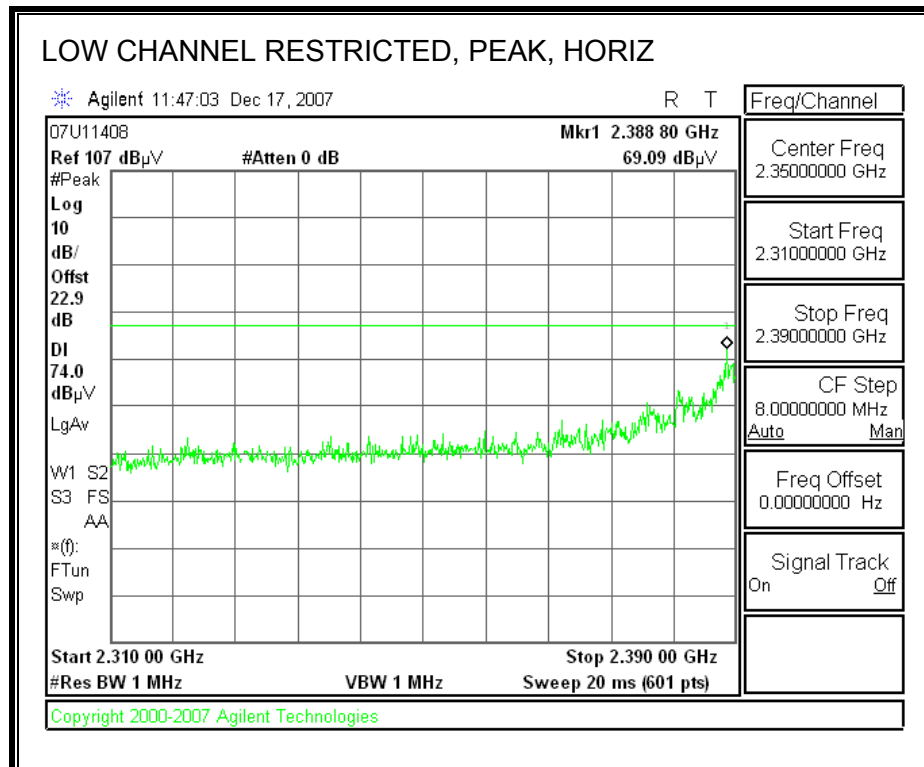
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
		A-5m Chamber		R_001	Average Measurements RBW=1MHz ; VBW=10Hz

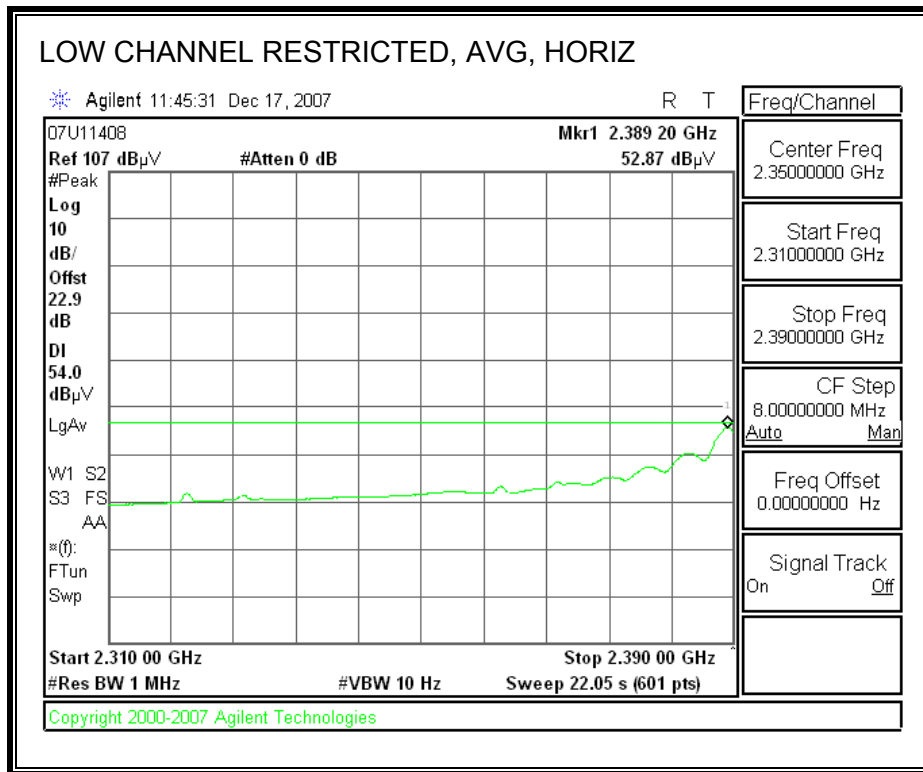
f	Dist	Read Pk	Read Avg	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
Low Ch.2412 MHz, Setting: 6A-67															
4.824	3.0	56.6	40.7	33.7	3.0	-34.8	0.0	0.0	58.5	42.6	74	54	-15.5	-11.4	V
7.236	3.0	54.8	37.1	36.7	8.4	-34.1	0.0	0.0	65.7	48.0	74	54	-8.3	-6.0	V
4.824	3.0	60.2	44.5	33.7	6.9	-34.8	0.0	0.0	66.0	50.2	74	54	-8.0	-3.8	H
7.236	3.0	60.6	42.5	36.7	8.4	-34.1	0.0	0.0	71.5	53.4	74	54	-2.5	-0.6	H
Mid Ch. 2437 MHz, Setting: 6A-67															
4.874	3.0	53.9	37.3	33.7	6.9	-34.8	0.0	0.0	59.7	43.1	74	54	-14.3	-10.9	V
7.311	3.0	52.4	35.4	36.7	8.4	-34.1	0.0	0.0	63.4	46.4	74	54	-10.6	-7.6	V
4.874	3.0	56.2	41.8	33.7	6.9	-34.8	0.0	0.0	62.0	47.6	74	54	-12.0	-6.4	H
7.311	3.0	57.5	40.6	36.7	8.4	-34.1	0.0	0.0	68.5	51.6	74	54	-5.5	-2.4	H
High Ch. 2462 MHz, Setting: 66-64															
4.924	3.0	52.2	39.0	33.8	7.0	-34.8	0.0	0.0	58.1	44.9	74	54	-15.9	-9.1	V
7.356	3.0	43.8	30.6	36.8	8.4	-34.1	0.0	0.0	54.9	41.7	74	54	-19.1	-12.3	V
4.904	3.0	54.2	40.0	33.8	7.0	-34.8	0.0	0.0	60.1	45.9	74	54	-13.9	-8.1	H
7.356	3.0	49.4	35.7	36.8	8.4	-34.1	0.0	0.0	60.5	46.8	74	54	-13.5	-7.2	H
No more signal found															

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

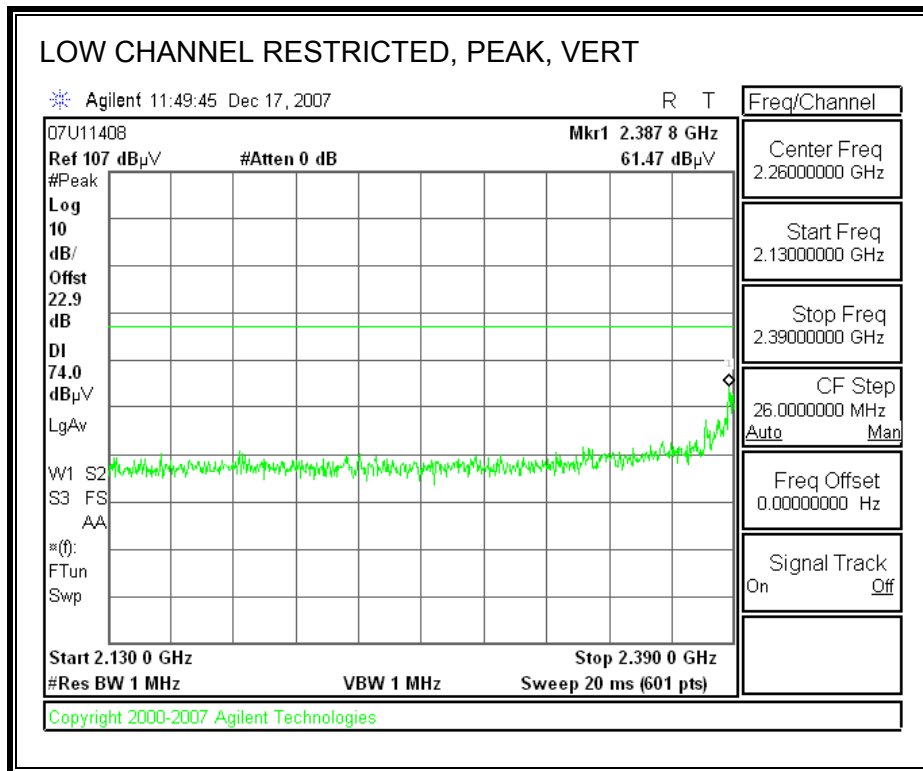
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

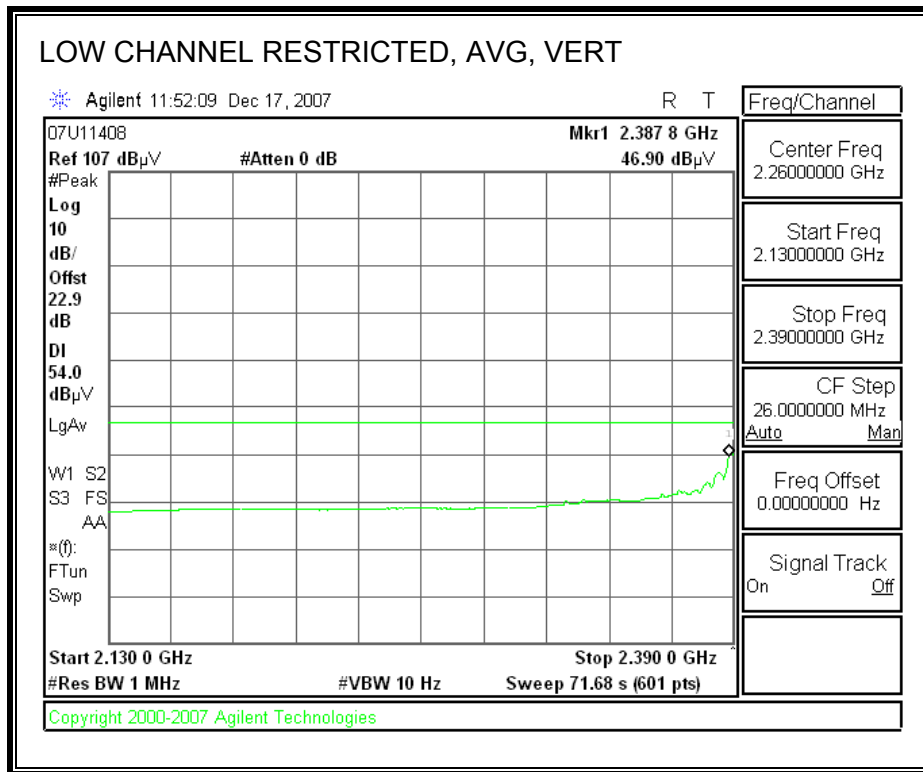
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



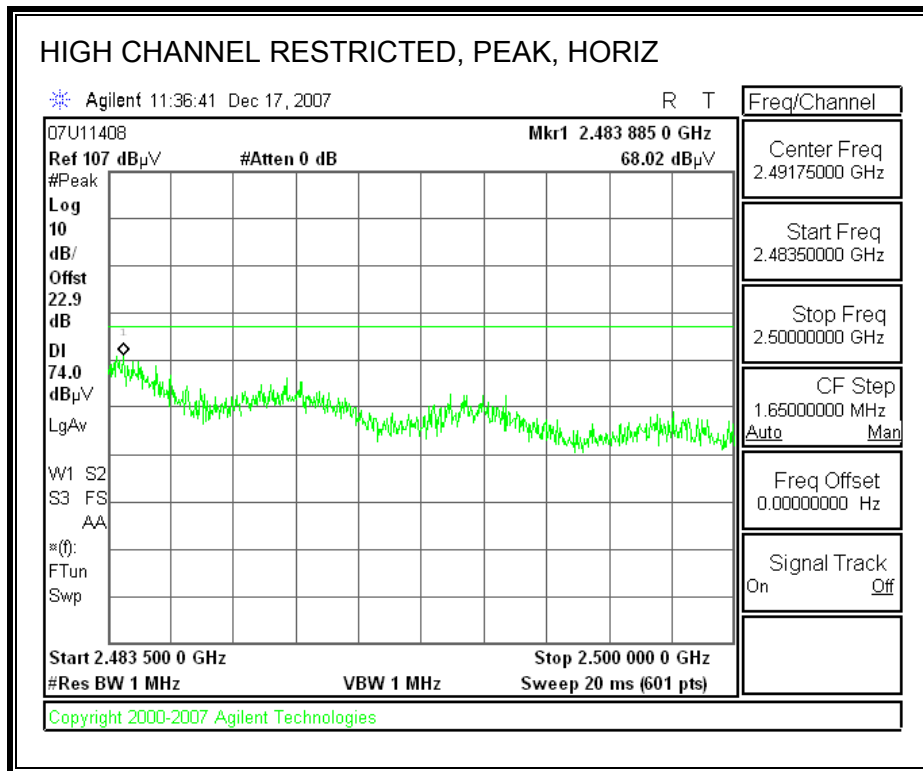


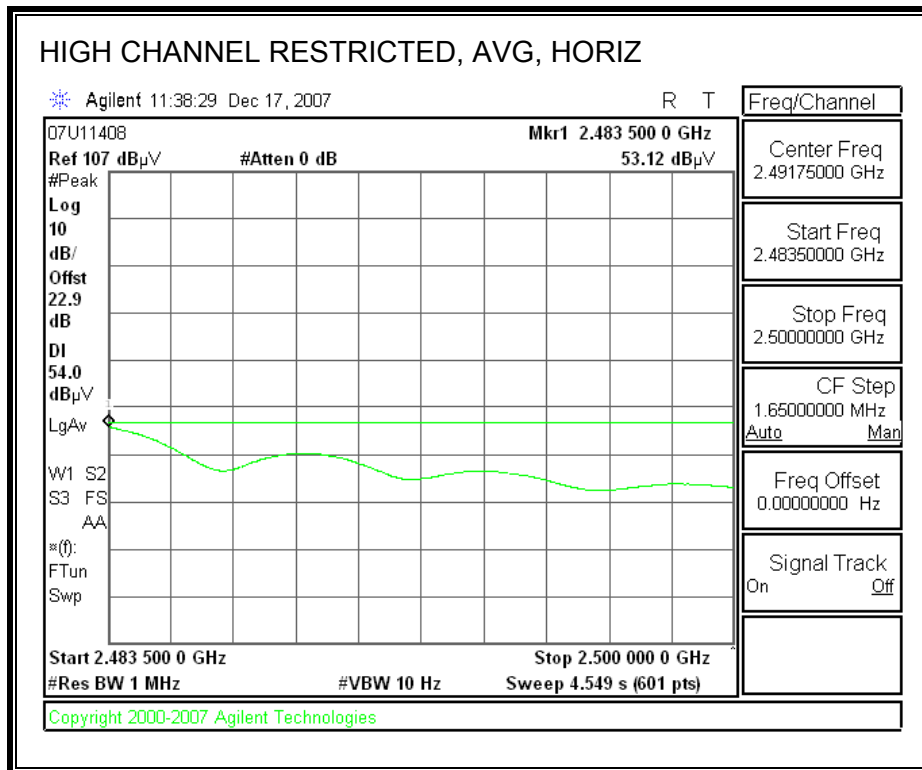
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



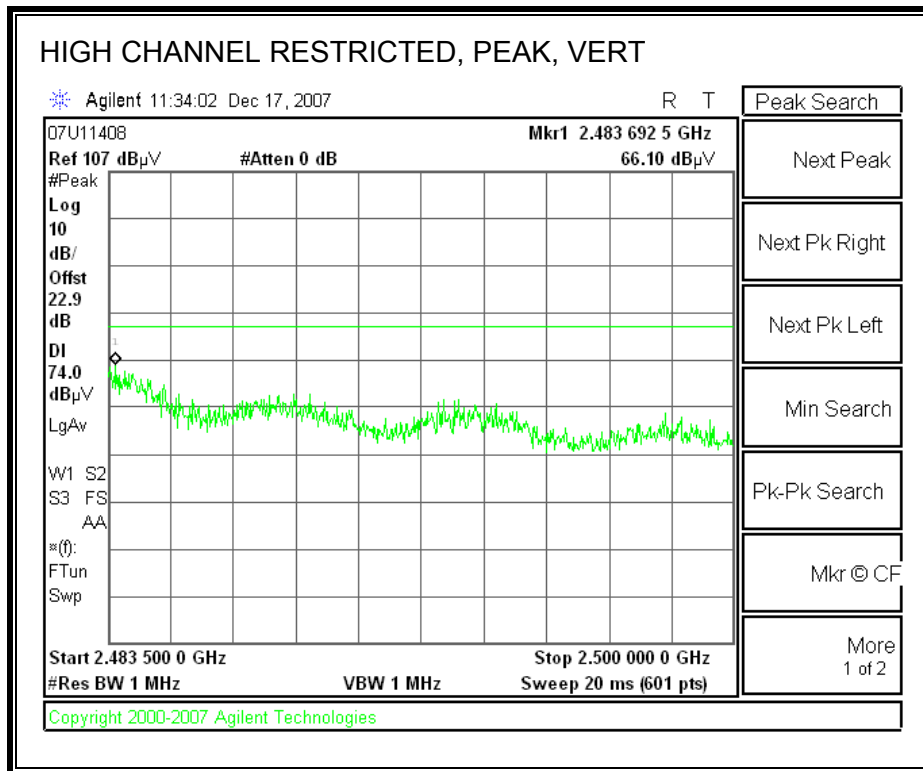


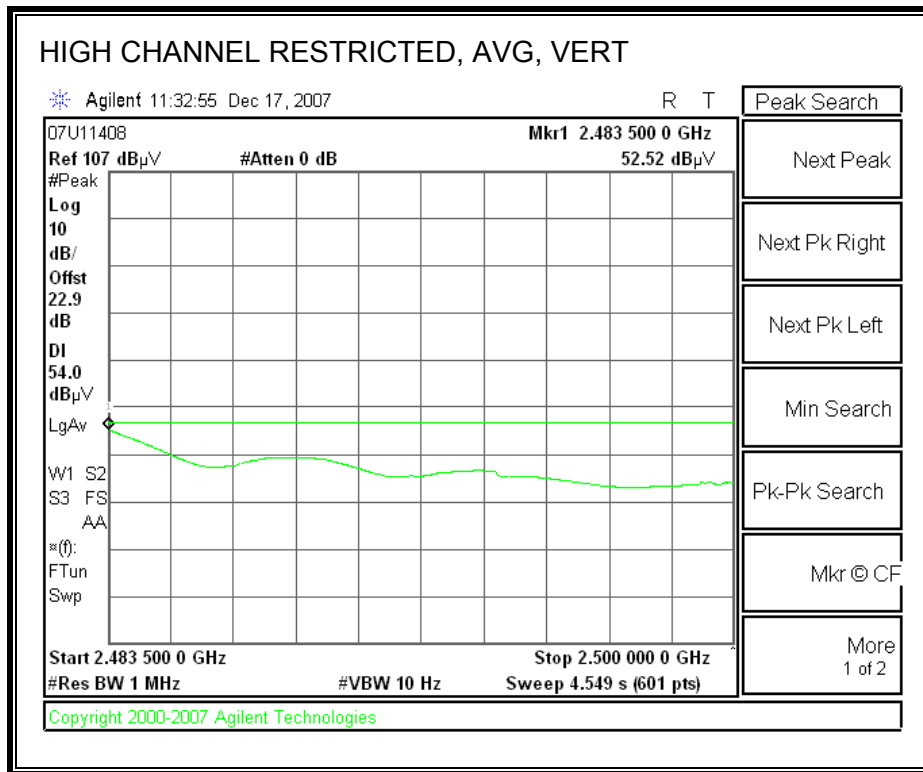
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple
Project #: 07U11408
Date: 12-18-07
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: HT20 mode, TX On

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

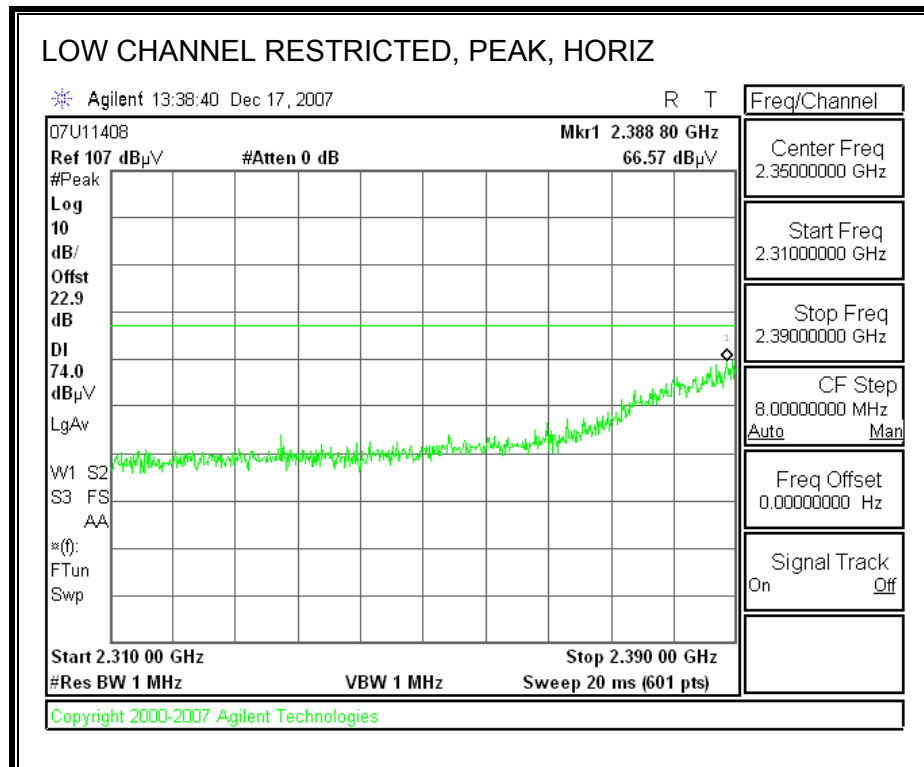
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
		A-5m Chamber		R_001	

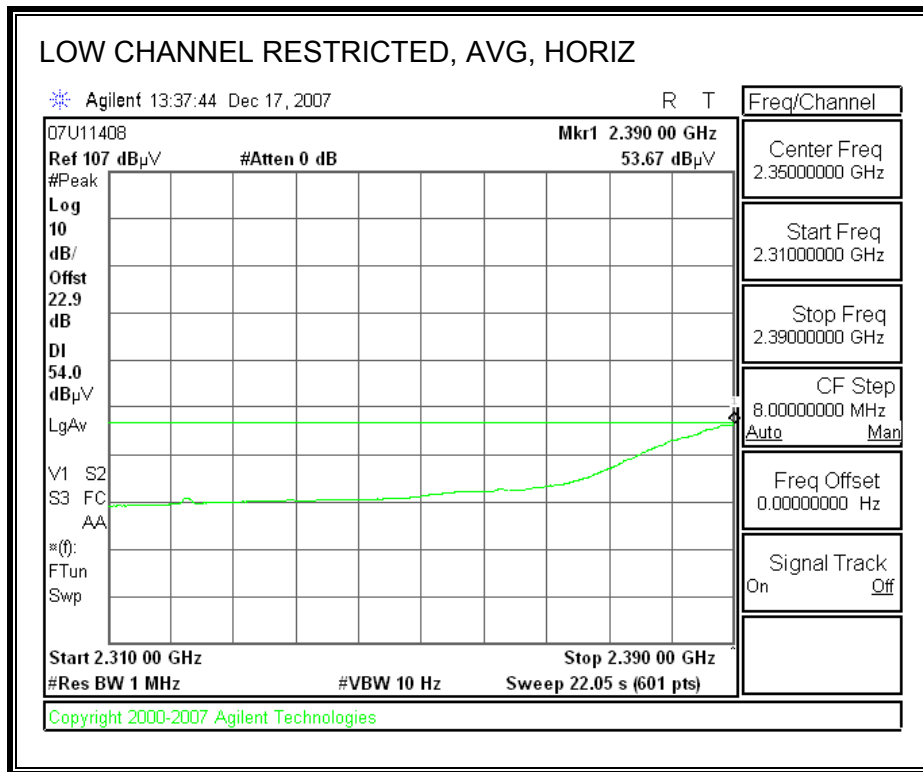
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 2412 MHz, Setting: 69-66															
4.824	3.0	57.8	42.6	33.7	3.0	-34.8	0.0	0.0	59.7	44.5	74	54	-14.3	-9.5	V
7.236	3.0	50.7	34.5	36.7	8.4	-34.1	0.0	0.0	61.6	45.4	74	54	-12.4	-8.6	V
4.824	3.0	60.5	47.1	33.7	6.9	-34.8	0.0	0.0	66.2	52.8	74	54	-7.8	-1.2	H
7.236	3.0	55.8	41.0	36.7	8.4	-34.1	0.0	0.0	66.7	51.9	74	54	-7.3	-2.1	H
Mid Ch. 2437 MHz, Setting: 69-66															
4.874	3.0	55.1	40.3	33.7	6.9	-34.8	0.0	0.0	60.9	46.1	74	54	-13.1	-7.9	V
7.311	3.0	52.4	38.6	36.7	8.4	-34.1	0.0	0.0	63.4	49.6	74	54	-10.6	-4.4	V
4.874	3.0	58.1	44.9	33.7	6.9	-34.8	0.0	0.0	63.9	50.7	74	54	-10.1	-3.3	H
7.311	3.0	55.7	41.8	36.7	8.4	-34.1	0.0	0.0	66.7	52.8	74	54	-7.3	-1.2	H
High Ch. 2462 MHz, Setting: 65-63															
4.924	3.0	50.5	38.3	33.8	7.0	-34.8	0.0	0.0	56.4	44.2	74	54	-17.6	-9.8	V
7.356	3.0	42.9	31.1	36.8	8.4	-34.1	0.0	0.0	54.0	42.2	74	54	-20.0	-11.8	V
4.904	3.0	53.6	42.0	33.8	7.0	-34.8	0.0	0.0	59.5	47.9	74	54	-14.5	-6.1	H
7.356	3.0	47.1	34.6	36.8	8.4	-34.1	0.0	0.0	58.2	45.7	74	54	-15.8	-8.3	H
No more signal found															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

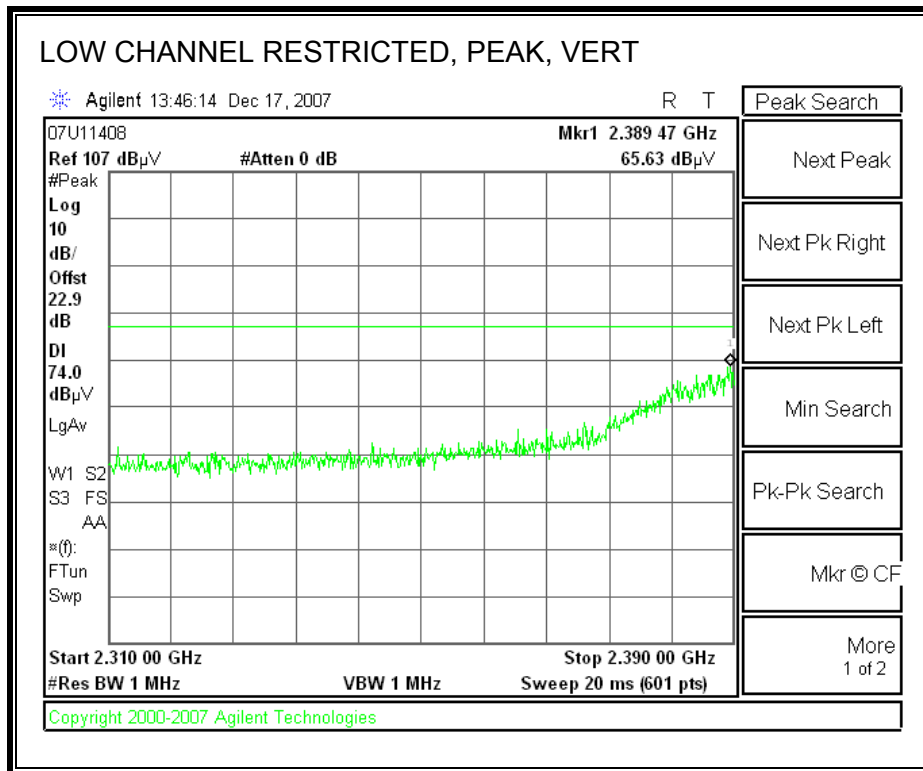
8.2.4. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

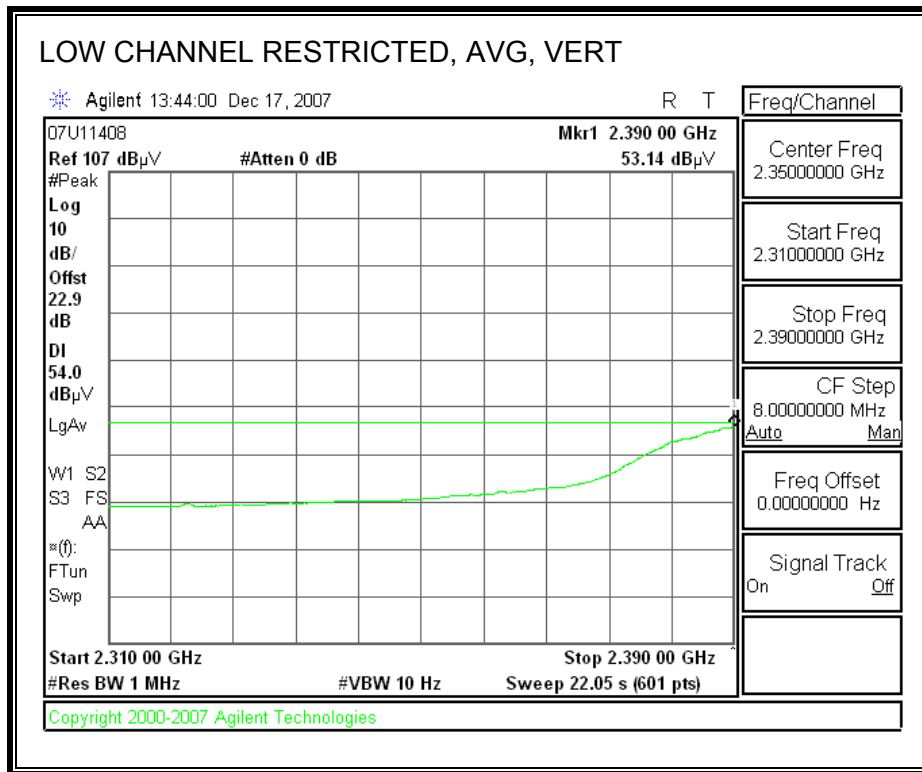
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



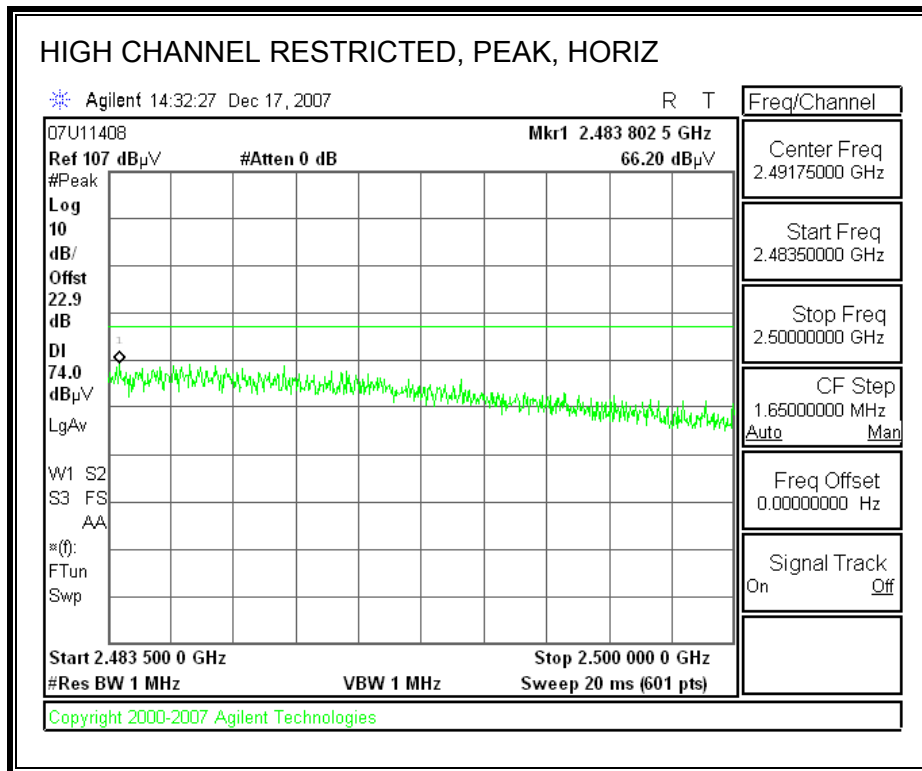


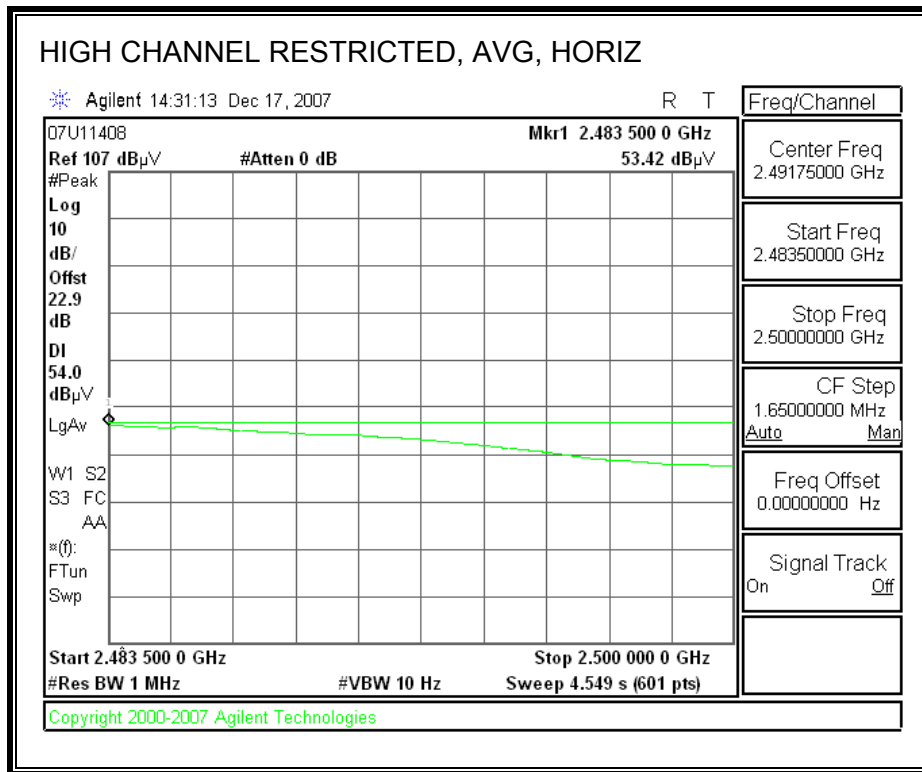
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



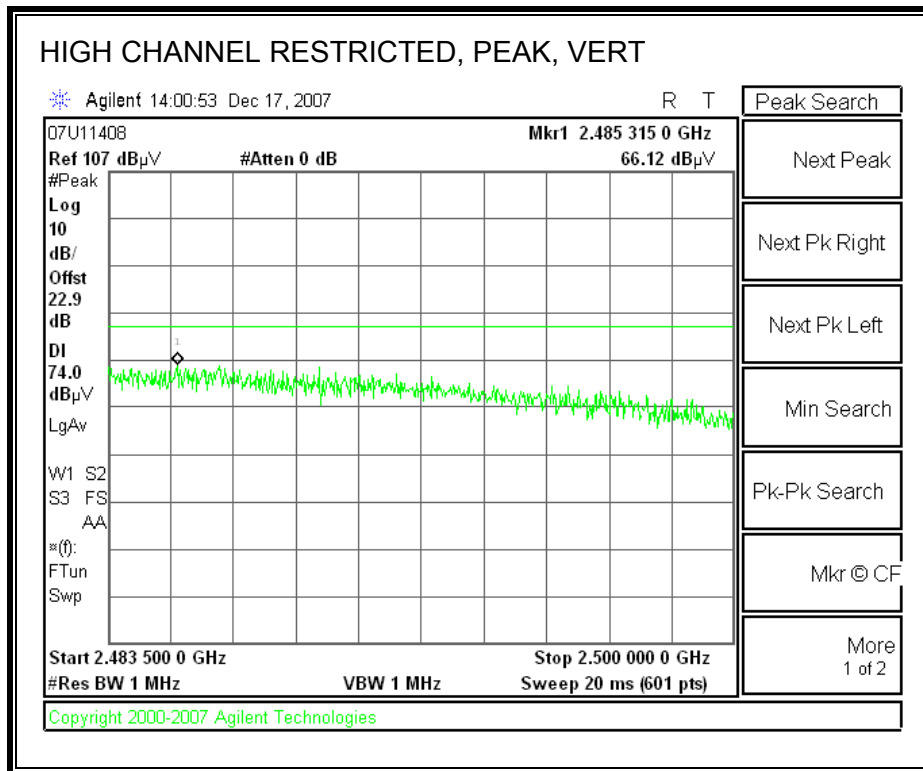


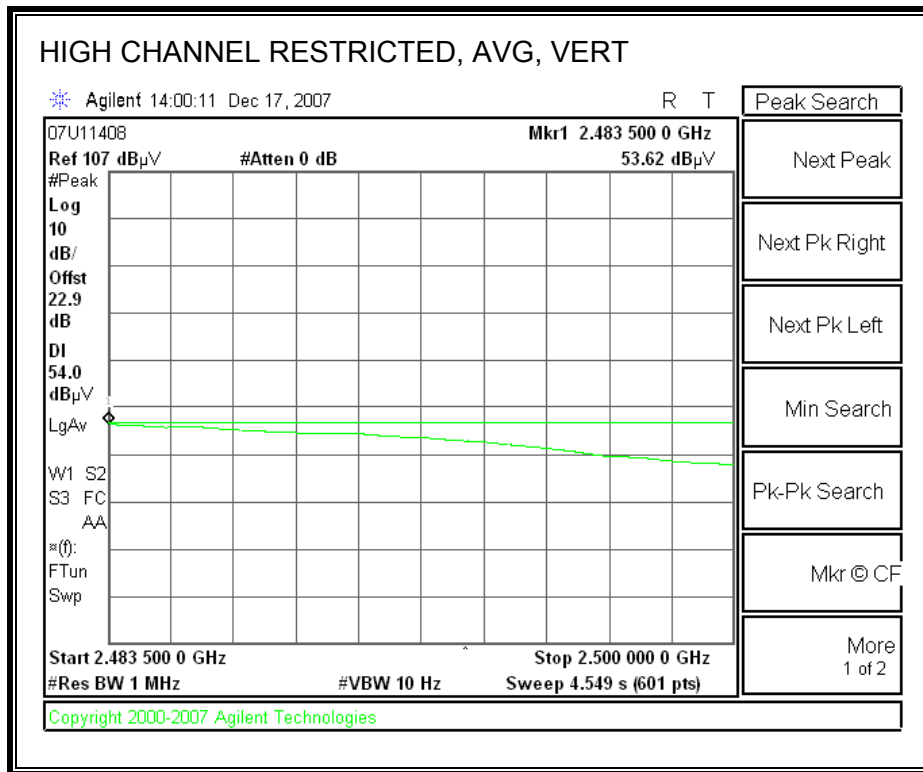
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple
Project #: 07U11408
Date: 12-17-07
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: HT40 mode, TX On

Test Equipment:

Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifer 1-26GHz T34 HP 8449B	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit FCC 15.209
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Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable A-5m Chamber	HPF	Reject Filter R_001	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
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f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch.2422 MHz, Setting: 65-62															
4.844	3.0	42.3	29.6	33.7	3.0	-34.8	0.0	0.0	44.2	31.5	74	54	-29.8	-22.5	V
7.266	3.0	41.7	28.2	36.7	8.4	-34.1	0.0	0.0	52.7	39.2	74	54	-21.3	-14.8	V
4.844	3.0	49.6	34.5	33.7	6.9	-34.8	0.0	0.0	55.4	40.3	74	54	-18.6	-13.7	H
7.266	3.0	37.8	27.6	36.7	8.4	-34.1	0.0	0.0	48.8	38.6	74	54	-25.2	-15.4	H
Mid Ch. 2437 MHz, Setting: 6A-67															
4.874	3.0	42.3	29.3	33.7	6.9	-34.8	0.0	0.0	48.1	35.1	74	54	-25.9	-18.9	V
7.311	3.0	35.4	26.3	36.7	8.4	-34.1	0.0	0.0	46.4	37.3	74	54	-27.6	-16.7	V
4.874	3.0	43.1	29.3	33.7	6.9	-34.8	0.0	0.0	48.9	35.1	74	54	-25.1	-18.9	H
7.311	3.0	40.4	28.0	36.7	8.4	-34.1	0.0	0.0	51.4	39.0	74	54	-22.6	-15.0	H
High Ch. 2452 MHz, Setting: 62-60															
4.904	3.0	44.5	33.1	33.8	7.0	-34.8	0.0	0.0	50.4	39.0	74	54	-23.6	-15.0	V
7.356	3.0	40.0	27.1	36.8	8.4	-34.1	0.0	0.0	51.1	38.2	74	54	-22.9	-15.8	V
4.904	3.0	44.2	32.3	33.8	7.0	-34.8	0.0	0.0	50.1	38.2	74	54	-23.9	-15.8	H
7.356	3.0	36.2	26.8	36.8	8.4	-34.1	0.0	0.0	47.3	37.9	74	54	-26.7	-16.1	H
No more signal found															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.2.5. TX ABOVE 1 GHz FOR 802.11a 2X LEGACY MODE IN 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 07U11408
Date: 01-09-2008
Test Engineer: Tom Chen
Configuration: EUT with support equipment
Mode: 5.8 GHz Band a Mode, Tx On

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz; VBW=10Hz
		A-5m Chamber	HPF_7.6GHz		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5745 MHz, setting: 66-67															
11.490	3.0	52.5	38.3	37.5	11.6	-35.9	0.0	0.7	66.4	52.2	74	54	-7.6	-1.8	V
17.235	3.0	42.0	29.7	41.7	13.3	-33.8	0.0	0.6	63.9	51.6	74	54	-10.1	-2.4	V
11.490	3.0	49.3	36.2	37.5	11.6	-35.9	0.0	0.7	63.2	50.1	74	54	-10.8	-3.9	H
17.235	3.0	41.6	30.1	41.7	13.3	-33.8	0.0	0.6	63.5	52.0	74	54	-10.5	-2.0	H
Mid Ch. 5785 MHz, setting: 67-68															
11.570	3.0	49.3	34.7	37.5	11.7	-35.8	0.0	0.7	63.4	48.8	74	54	-10.6	-5.2	V
17.355	3.0	41.1	29.0	42.2	13.3	-33.8	0.0	0.6	63.5	51.4	74	54	-10.5	-2.6	V
11.570	3.0	51.0	37.3	37.5	11.7	-35.8	0.0	0.7	65.1	51.4	74	54	-8.9	-2.6	H
17.355	3.0	41.7	29.2	42.2	13.3	-33.8	0.0	0.6	64.1	51.6	74	54	-9.9	-2.4	H
High Ch. 5825 MHz, setting: 69-6A															
11.650	3.0	47.1	33.0	37.5	11.8	-35.7	0.0	0.7	61.4	47.3	74	54	-12.6	-6.7	V
17.475	3.0	40.0	28.2	42.7	13.4	-33.8	0.0	0.6	62.8	51.0	74	54	-11.2	-3.0	V
11.650	3.0	54.3	39.5	37.5	11.8	-35.7	0.0	0.7	68.6	53.8	74	54	-5.4	-0.2	H
17.475	3.0	41.2	28.2	42.7	13.4	-33.8	0.0	0.6	64.0	51.0	74	54	-10.0	-3.0	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.2.6. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 07U11408
Date: 01-09-2008
Test Engineer: Tom Chen
Configuration: EUT with support equipment
Mode: 5.8GHz Band HT20 Mode, Tx On

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz; VBW=10Hz
		A-5m Chamber	HPF_7.6GHz		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5745 MHz, setting: 65-65															
11.490	3.0	49.0	35.7	37.5	11.6	-35.9	0.0	0.7	62.9	49.6	74	54	-11.1	-4.4	V
17.235	3.0	41.8	29.9	41.7	13.3	-33.8	0.0	0.6	63.7	51.8	74	54	-10.3	-2.2	V
11.490	3.0	49.5	36.9	37.5	11.6	-35.9	0.0	0.7	63.4	50.9	74	54	-10.6	-3.1	H
17.235	3.0	42.0	29.7	41.7	13.3	-33.8	0.0	0.6	63.9	51.6	74	54	-10.1	-2.4	H
Mid Ch. 5785 MHz, setting: 67-67															
11.570	3.0	52.0	37.5	37.5	11.7	-35.8	0.0	0.7	66.1	51.6	74	54	-7.9	-2.4	V
17.355	3.0	41.0	29.6	42.2	13.3	-33.8	0.0	0.6	63.4	52.0	74	54	-10.6	-2.0	V
11.570	3.0	50.8	38.3	37.5	11.7	-35.8	0.0	0.7	64.9	52.4	74	54	-9.1	-1.6	H
17.355	3.0	41.6	29.1	42.2	13.3	-33.8	0.0	0.6	64.0	51.5	74	54	-10.0	-2.5	H
High Ch. 5825 MHz, setting: 69-69															
11.650	3.0	51.2	37.4	37.5	11.8	-35.7	0.0	0.7	65.5	51.7	74	54	-8.5	-2.3	V
17.475	3.0	40.3	28.9	42.7	13.4	-33.8	0.0	0.6	63.1	51.7	74	54	-10.9	-2.3	V
11.650	3.0	52.2	37.5	37.5	11.8	-35.7	0.0	0.7	66.5	51.8	74	54	-7.5	-2.2	H
17.475	3.0	41.6	28.7	42.7	13.4	-33.8	0.0	0.6	64.4	51.5	74	54	-9.6	-2.5	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.2.7. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 07U11408
Date: 01-09-2008
Test Engineer: Tom Chen
Configuration: EUT with support equipment
Mode: 5.8GHz Band HT40 Mode, Tx On

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
		A-5m Chamber	HPF_7.6GHz		Average Measurements RBW=1MHz; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5755 MHz, setting: 68-68															
11.510	3.0	47.2	35.6	37.5	11.6	-35.8	0.0	0.7	61.2	49.6	74	54	-12.8	-4.4	V
17.265	3.0	41.1	29.8	41.9	13.3	-33.8	0.0	0.6	63.1	51.8	74	54	-10.9	-2.2	V
11.510	3.0	48.9	36.9	37.5	11.6	-35.8	0.0	0.7	62.9	50.9	74	54	-11.1	-3.1	H
17.265	3.0	42.3	29.8	41.9	13.3	-33.8	0.0	0.6	64.3	51.8	74	54	-9.7	-2.2	H
High Ch. 5795 MHz, setting: 69-69															
11.590	3.0	50.1	36.1	37.5	11.7	-35.8	0.0	0.7	64.3	50.3	74	54	-9.7	-3.7	V
17.385	3.0	41.1	28.9	42.3	13.3	-33.8	0.0	0.6	63.6	51.4	74	54	-10.4	-2.6	V
11.590	3.0	49.5	37.3	37.5	11.7	-35.8	0.0	0.7	63.7	51.5	74	54	-10.3	-2.5	H
17.385	3.0	40.9	28.9	42.3	13.3	-33.8	0.0	0.6	63.4	51.4	74	54	-10.6	-2.6	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.3. RECEIVER ABOVE 1 GHz

8.3.1. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple
Project #: 07U11408
Date: 12-18-07
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: b mode, Mid Ch, RX

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
		A-5m Chamber			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.232	3.0	55.2	35.3	27.0	3.0	-37.9	0.0	0.0	47.3	27.4	74	54	-26.7	-26.6	V
1.292	3.0	54.2	36.7	27.2	3.0	-37.9	0.0	0.0	46.5	29.0	74	54	-27.5	-25.0	V
1.492	3.0	58.8	37.6	27.7	3.0	-37.6	0.0	0.0	51.9	30.7	74	54	-22.1	-23.3	V
1.092	3.0	58.7	37.4	26.7	3.0	-38.1	0.0	0.0	50.2	28.9	74	54	-23.8	-25.1	H
1.198	3.0	60.1	39.2	26.9	3.0	-38.0	0.0	0.0	52.0	31.1	74	54	-22.0	-22.9	H
1.234	3.0	59.6	36.7	27.0	3.0	-37.9	0.0	0.0	51.7	28.8	74	54	-22.3	-25.2	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.3.2. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple
 Project #: 07U11408
 Date: 12-18-07
 Test Engineer: Tom Chen
 Configuration: EUT With Support NB PC
 Mode: g mode, Mid Ch, RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
		A-5m Chamber			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.330	3.0	59.8	36.9	27.3	3.0	-37.8	0.0	0.0	52.3	29.4	74	54	-21.7	-24.6	V
1.491	3.0	57.1	37.5	27.7	3.0	-37.6	0.0	0.0	50.2	30.6	74	54	-23.8	-23.4	V
1.032	3.0	59.1	38.7	26.5	3.0	-38.2	0.0	0.0	50.4	30.0	74	54	-23.6	-24.0	H
1.236	3.0	59.2	36.3	27.0	3.0	-37.9	0.0	0.0	51.3	28.4	74	54	-22.7	-25.6	H

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

8.3.3. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple
 Project #: 07U11408
 Date: 12-18-07
 Test Engineer: Tom Chen
 Configuration: EUT With Support NB PC
 Mode: HT20 mode, Mid Ch, RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
		A-5m Chamber			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.233	3.0	54.3	34.9	27.0	3.0	-37.9	0.0	0.0	46.4	27.0	74	54	-27.6	-27.0	V
1.493	3.0	56.7	37.7	27.7	3.0	-37.6	0.0	0.0	49.8	30.8	74	54	-24.2	-23.2	V
1.186	3.0	58.0	37.4	26.9	3.0	-38.0	0.0	0.0	49.9	29.3	74	54	-24.1	-24.7	H
1.245	3.0	60.7	37.1	27.1	3.0	-37.9	0.0	0.0	52.8	29.2	74	54	-21.2	-24.8	H

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

8.3.4. RX ABOVE 1 GHz FOR 40 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple
 Project #: 07U11408
 Date: 12-18-07
 Test Engineer: Tom Chen
 Configuration: EUT With Support NB PC
 Mode: 2.4 GHz band, HT40 mode, Mid Ch, RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B	T88 Miteq 26.40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
		A-5m Chamber			Average Measurements RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.331	3.0	57.3	36.1	27.3	3.0	-37.8	0.0	0.0	49.8	28.6	74	54	-24.2	-25.4	V
1.493	3.0	57.6	36.4	27.7	3.0	-37.6	0.0	0.0	50.7	29.5	74	54	-23.3	-24.5	V
1.196	3.0	57.4	37.3	26.9	3.0	-38.0	0.0	0.0	49.3	29.2	74	54	-24.7	-24.8	H
1.246	3.0	57.9	36.5	27.1	3.0	-37.9	0.0	0.0	50.0	28.6	74	54	-24.0	-25.4	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.3.5. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
 Project #: 07U11408
 Date: 01-09-2008
 Test Engineer: Tom Chen
 Configuration: EUT with support equipment
 Mode: 5.8 GHz Band 802.11a Mode, Rx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
		A-5m Chamber			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.330	3.0	44.7	33.0	25.0	3.4	-39.0	0.0	0.0	34.1	22.4	74	54	-39.9	-31.6	H
1.905	3.0	43.2	32.3	27.1	4.2	-38.2	0.0	0.0	36.3	25.4	74	54	-37.7	-28.6	H
2.345	3.0	43.2	32.1	28.2	4.7	-37.6	0.0	0.0	38.6	27.5	74	54	-35.4	-26.5	H
3.160	3.0	42.4	31.4	30.4	5.5	-37.2	0.0	0.0	41.0	30.0	74	54	-33.0	-24.0	H
1.330	3.0	49.4	35.3	25.0	3.4	-39.0	0.0	0.0	38.8	24.7	74	54	-35.2	-29.3	V
1.645	3.0	48.0	33.5	26.1	3.8	-38.6	0.0	0.0	39.4	24.9	74	54	-34.6	-29.1	V
2.315	3.0	45.7	31.9	28.1	4.7	-37.6	0.0	0.0	40.9	27.1	74	54	-33.1	-26.9	V
3.555	3.0	43.2	29.4	31.4	5.8	-36.9	0.0	0.0	43.4	29.7	74	54	-30.6	-24.3	V

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

8.3.6. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
 Project #: 07U11408
 Date: 01-09-2008
 Test Engineer: Tom Chen
 Configuration: EUT with support equipment
 Mode: 5.8 GHz Band 802.11n HT20 Mode, Rx

Test Equipment:

Horn 1-18GHz T73; S/N: 6717 @3m	Pre-amplifer 1-26GHz T144 Miteq 3008A00931	Pre-amplifer 26-40GHz T88 Miteq 26-40GHz	Horn > 18GHz T89; ARA 18-26GHz; S/N:1049	Limit RX RSS 210
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Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable A-5m Chamber	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
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f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.280	3.0	46.8	34.8	24.8	3.4	-39.1	0.0	0.0	35.9	23.9	74	54	-38.1	-30.1	H
1.845	3.0	44.5	32.3	26.9	4.1	-38.3	0.0	0.0	37.2	25.0	74	54	-36.8	-29.0	H
2.110	3.0	44.6	32.7	27.7	4.4	-37.9	0.0	0.0	38.8	26.9	74	54	-35.2	-27.1	H
3.345	3.0	43.2	29.4	30.9	5.6	-37.1	0.0	0.0	42.6	28.8	74	54	-31.4	-25.2	H
1.330	3.0	52.2	39.5	25.0	3.4	-39.0	0.0	0.0	41.6	28.9	74	54	-32.4	-25.1	V
2.040	3.0	44.6	31.8	27.5	4.4	-38.0	0.0	0.0	38.5	25.7	74	54	-35.5	-28.3	V
2.490	3.0	46.8	33.5	28.6	4.9	-37.5	0.0	0.0	42.8	29.5	74	54	-31.2	-24.5	V
3.380	3.0	42.5	29.7	31.0	5.7	-37.1	0.0	0.0	42.0	29.2	74	54	-32.0	-24.8	V

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

8.3.7. RX ABOVE 1 GHz FOR 40 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
 Project #: 07U11408
 Date: 01-09-2008
 Test Engineer: Tom Chen
 Configuration: EUT with support equipment
 Mode: 5.8 GHz Band 802.11n HT40 Mode, Rx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	RX RSS 210

Hi Frequency Cables

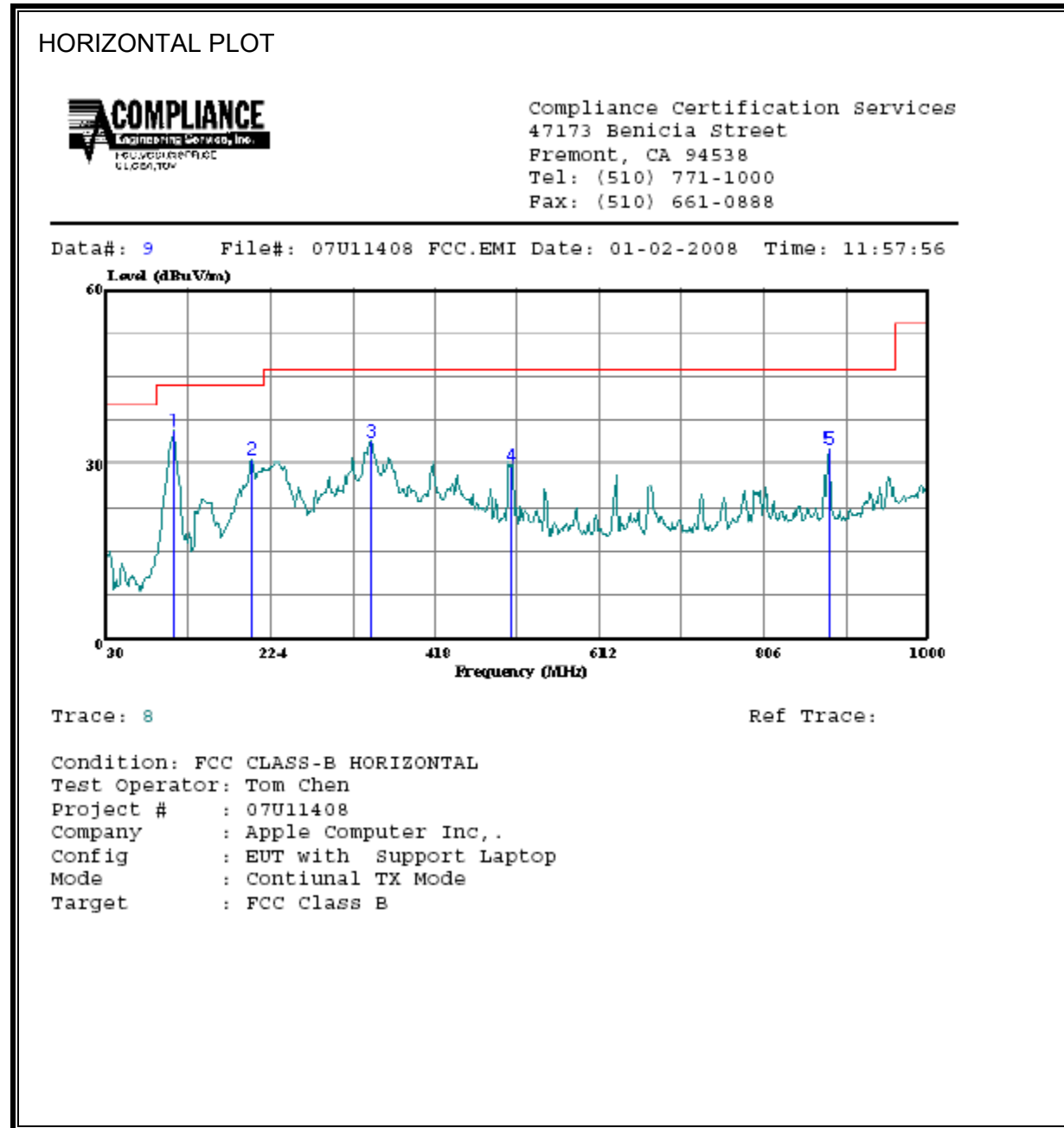
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
		A-5m Chamber			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.280	3.0	46.8	34.8	24.8	3.4	-39.1	0.0	0.0	35.9	23.9	74	54	-38.1	-30.1	H
1.845	3.0	44.5	32.3	26.9	4.1	-38.3	0.0	0.0	37.2	25.0	74	54	-36.8	-29.0	H
2.110	3.0	44.6	32.7	27.7	4.4	-37.9	0.0	0.0	38.8	26.9	74	54	-35.2	-27.1	H
3.345	3.0	43.2	29.4	30.9	5.6	-37.1	0.0	0.0	42.6	28.8	74	54	-31.4	-25.2	H
1.130	3.0	51.9	37.2	24.3	3.2	-39.3	0.0	0.0	40.1	25.3	74	54	-33.9	-28.7	V
1.330	3.0	49.7	35.0	25.0	3.4	-39.0	0.0	0.0	39.1	24.4	74	54	-34.9	-29.6	V
2.315	3.0	46.9	31.1	28.1	4.7	-37.6	0.0	0.0	42.1	26.3	74	54	-31.9	-27.7	V
3.595	3.0	42.9	29.2	31.5	5.8	-36.9	0.0	0.0	43.4	29.7	74	54	-30.6	-24.3	V

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.4. WORST-CASE BELOW 1 GHz

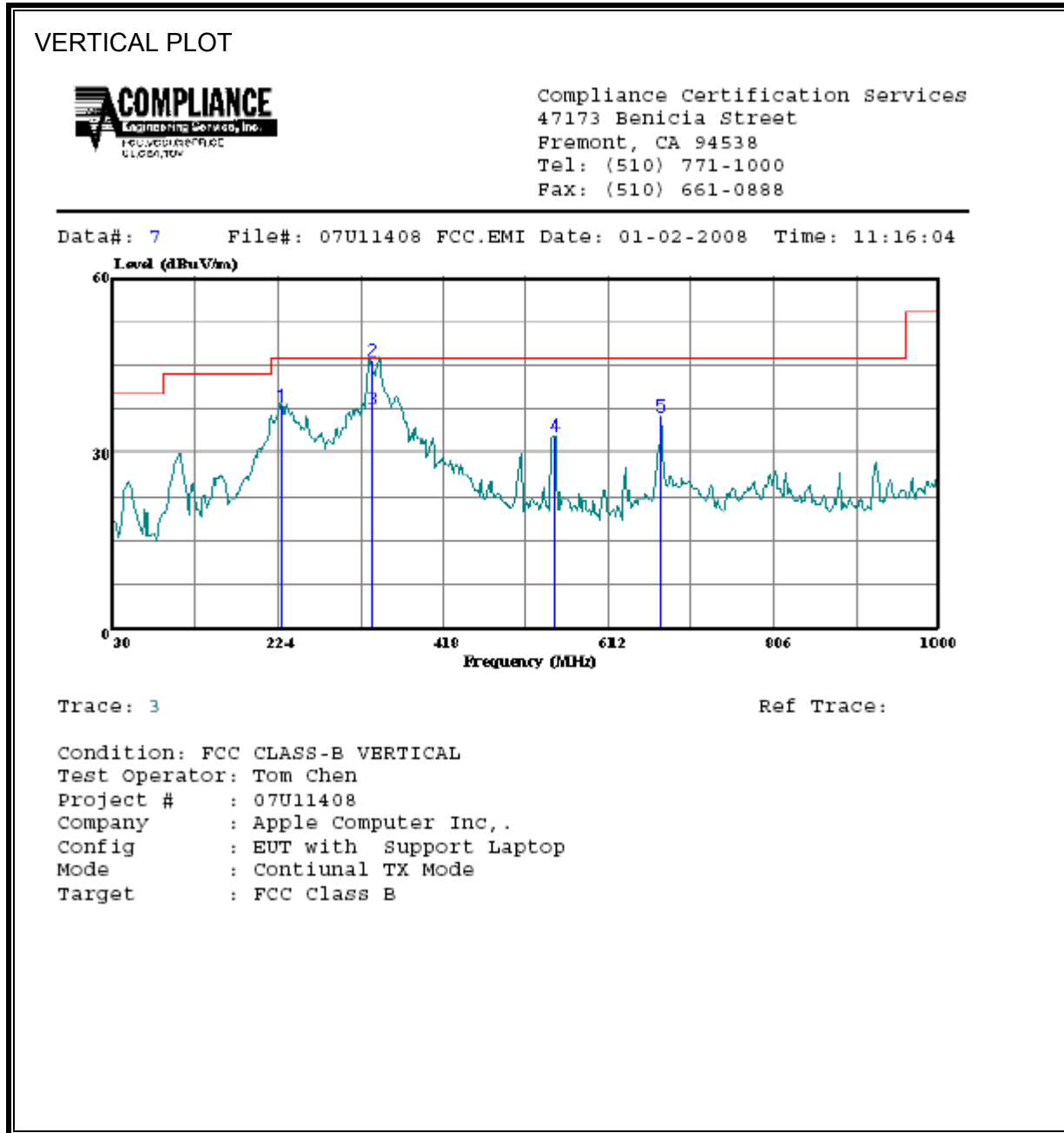
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	109.540	54.42	-18.87	35.55	43.50	-7.95	Peak
2	201.690	47.93	-17.22	30.71	43.50	-12.79	Peak
3	342.340	48.79	-14.94	33.85	46.00	-12.15	Peak
4	507.240	40.95	-11.35	29.60	46.00	-16.40	Peak
5	882.630	37.85	-5.49	32.36	46.00	-13.64	Peak

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



VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	228.850	56.46	-18.55	37.91	46.00	-8.09	Peak
2	334.000	60.58	-14.93	45.65	46.00	-0.35	Peak
3	334.000	52.26	-14.94	37.32	46.00	-8.68	QP
4	549.920	43.43	-10.66	32.76	46.00	-13.24	Peak
5	674.080	45.03	-9.02	36.01	46.00	-9.99	Peak

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

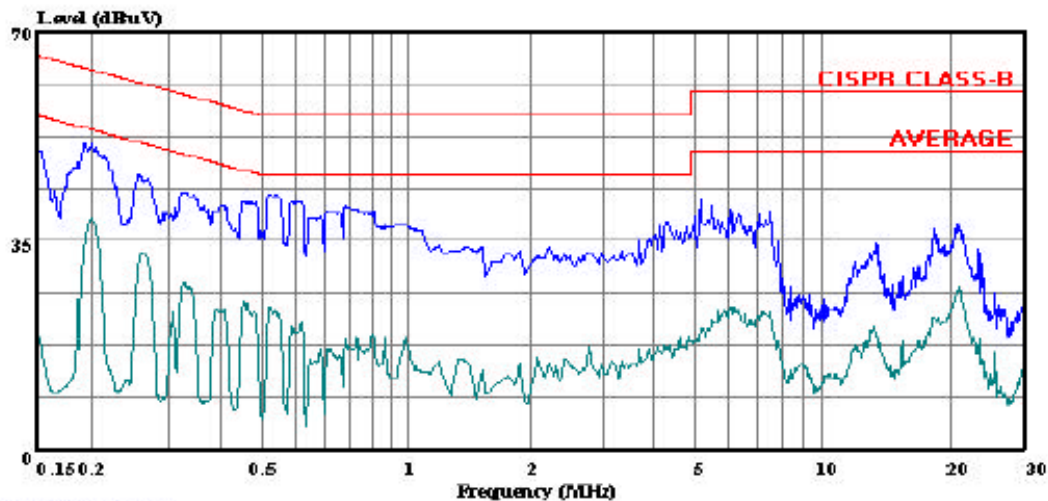
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	50.21	--	16.19	0.00	65.78	55.78	-15.57	-39.59	L1
0.19	51.28	--	33.76	0.00	63.99	53.99	-12.71	-20.23	L1
0.52	42.86	--	22.75	0.00	56.00	46.00	-13.14	-23.25	L1
0.20	52.16	--	39.07	0.00	63.45	53.45	-11.29	-14.38	L2
0.27	47.06	--	32.59	0.00	61.24	51.24	-14.18	-18.65	L2
0.54	42.04	--	22.47	0.00	56.00	46.00	-13.96	-23.53	L2
6 Worst Data									

LINE 1 RESULTS



Compliance Certification Services
 47173 Benicia Street
 Fremont, CA 94538
 Tel: (510) 771-1000
 Fax: (510) 661-0888

Data#: 49 File#: 07U11408 LC.EMI Date: 12-18-2007 Time: 16:20:10

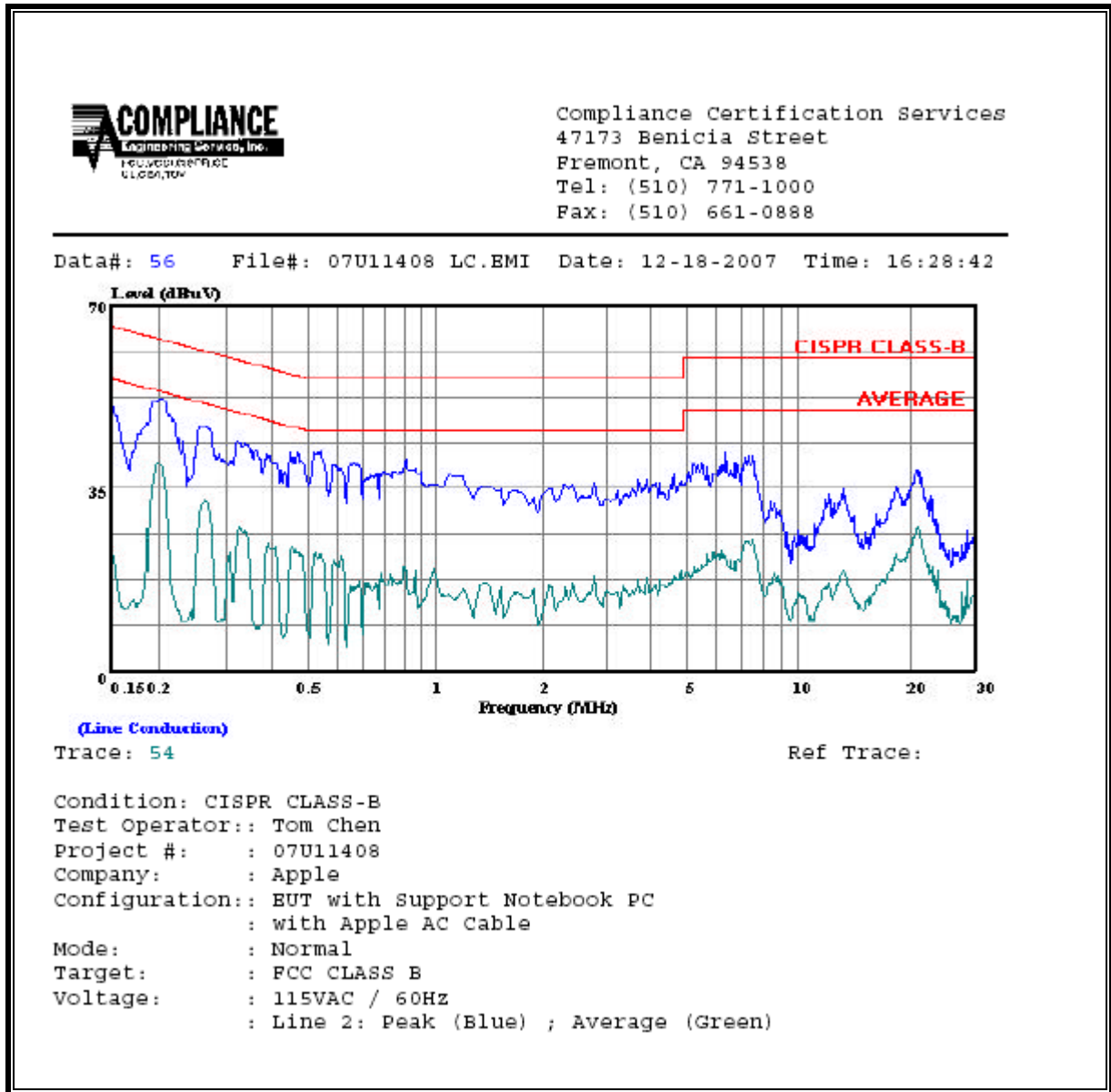


(Line Conduction)
 Trace: 47

Ref Trace:

Condition: CISPR CLASS-B
 Test Operator:: Tom Chen
 Project #: : 07U11408
 Company: : Apple
 Configuration:: EUT with Support Notebook PC
 : with Apple AC Cable
 Mode: : Normal
 Target: : FCC CLASS B
 Voltage: : 115VAC / 60Hz
 : Line 1: Peak (Blue) ; Average (Green)

LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classified As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm² is converted to units of W/m² by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$

From IC Safety Code 6, Section 2.2 Table 5 Column 4, $S = 10 \text{ W/m}^2$

RESULTS

(MPE distance is equal to 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm ²)	IC Power Density (W/m ²)
802.11b	2.4 GHz	20.0	26.90	-0.73	0.08	0.82
802.11g	2.4 GHz	20.0	28.13	-0.73	0.11	1.09
802.11n HT20	2.4 GHz	20.0	28.37	-0.73	0.12	1.15
802.11n HT40	2.4 GHz	20.0	25.13	-0.73	0.05	0.55
802.11a	5 GHz	20.0	26.46	3.42	0.19	1.93
802.11n HT20	5 GHz	20.0	26.31	3.42	0.19	1.87
802.11n HT40	5 GHz	20.0	26.35	3.42	0.19	1.88