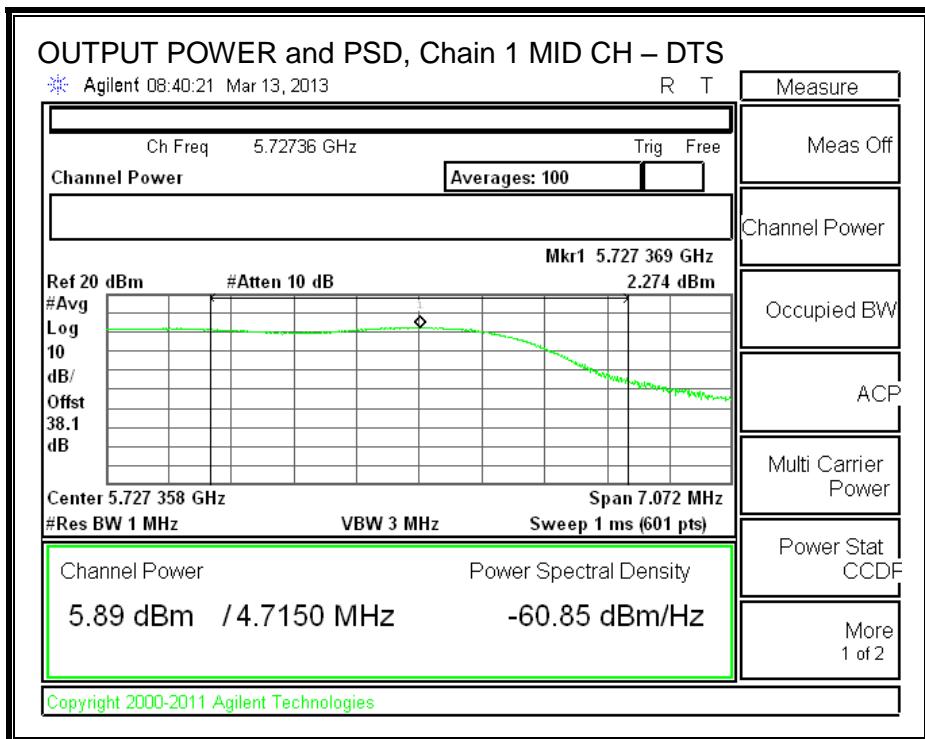
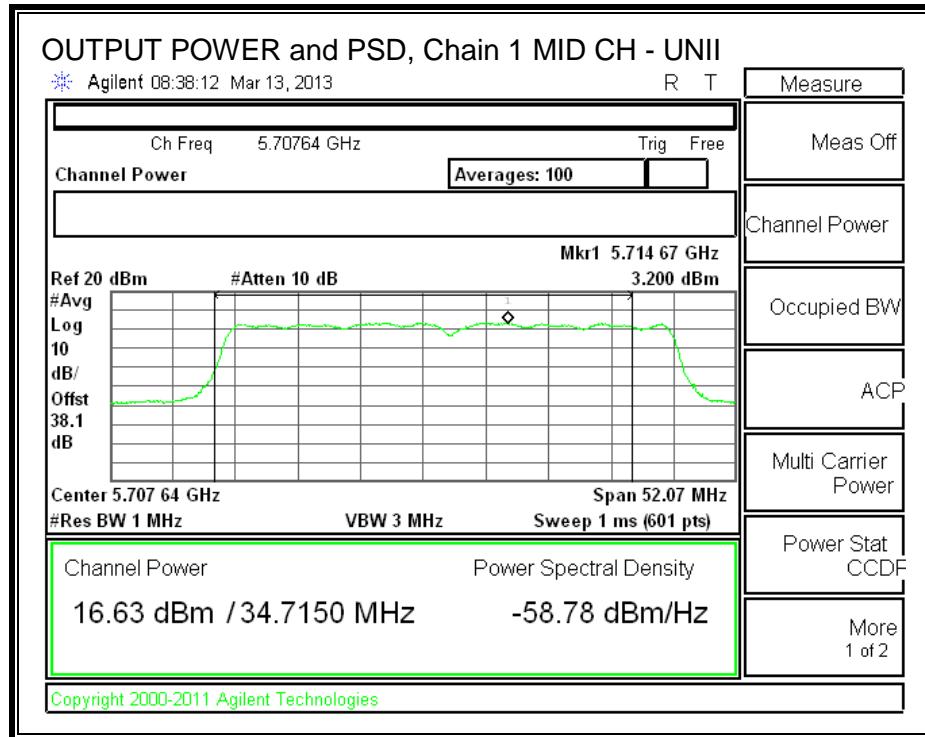
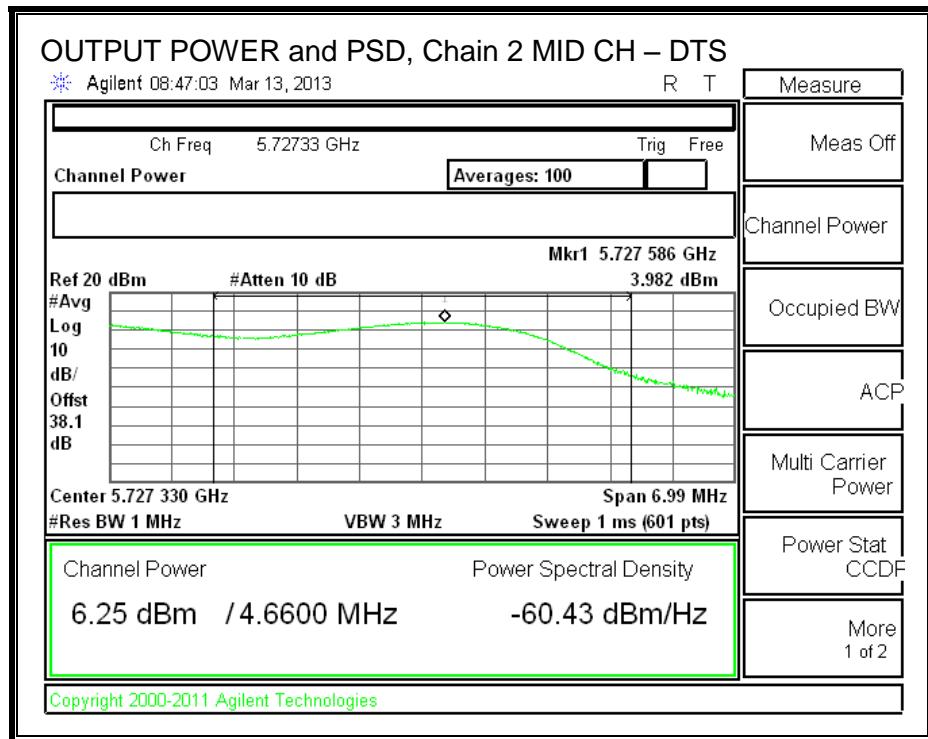
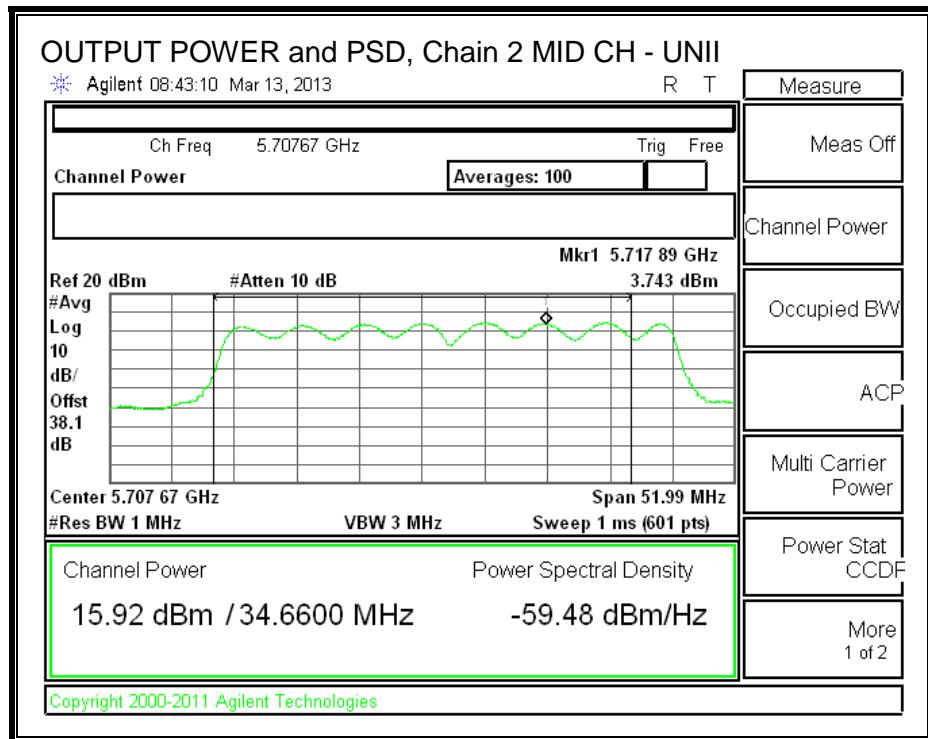


**OUTPUT POWER and PSD, Chain 1**



## OUTPUT POWER and PSD, Chain 2



#### 8.67.4. TPC POWER

##### LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.2 (3)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

##### RESULTS

The maximum EIRP is less than 500 mW; therefore, TPC is not required.

## 8.68. 802.11n HT40 BF 3TX MODE, CH142 (5710 MHz), 5.6 GHz BAND

Covered by testing HT40 CDD 3TX mode, the power per chain used for HT40 CDD 3TX mode is the same power per chain that will be used for HT40 BF 3TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.68.1. OUTPUT AVERAGE POWER

#### LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are correlated for output power 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)
3.00	1.70	3.80	7.65

## RESULTS

### Limits (FCC), portion in UNII 2 ext band

#### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
Mid	5710	34.7	32.9836	7.65

#### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
Mid	5710	22.35	24.00	30.00	22.35

Duty Cycle CF (dB)	0.00
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#### 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)
Mid	5710	15.82	16.63	15.92	20.91	22.35	-1.44

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
Mid	5710	4.7	2.9836	7.65

**Limits**

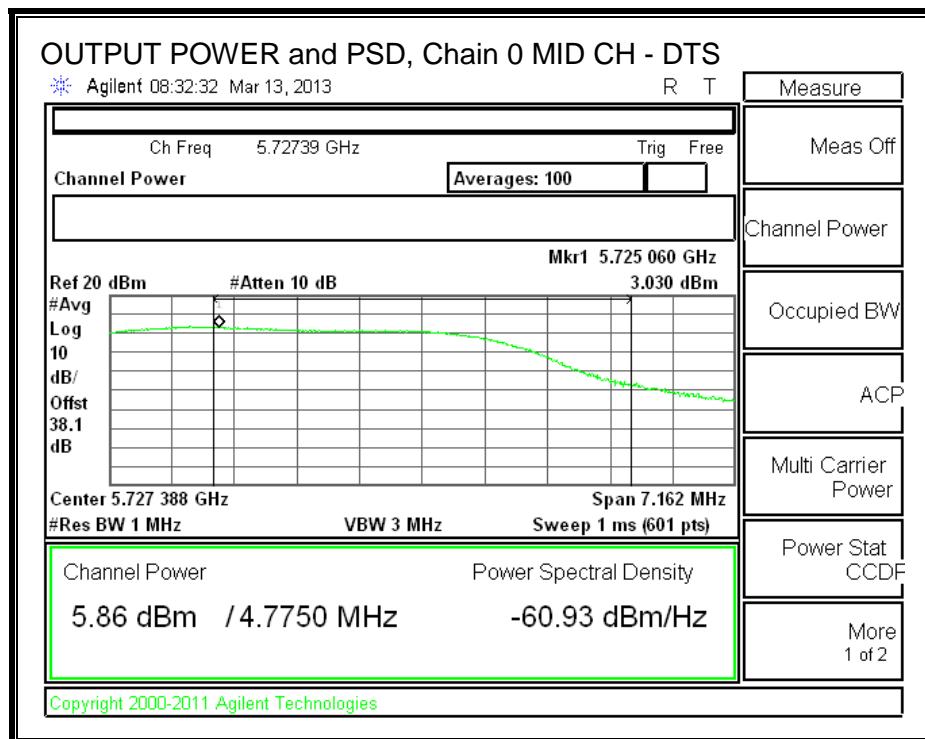
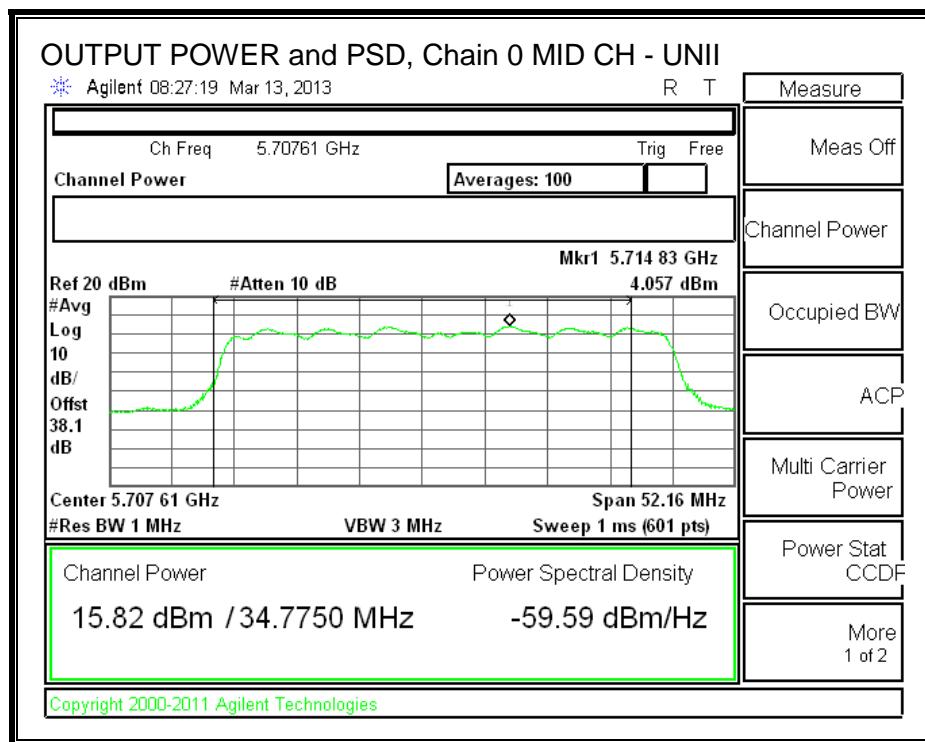
Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
Mid	5710	16.03	15.75	21.75	14.10

Duty Cycle CF (dB)	0.00
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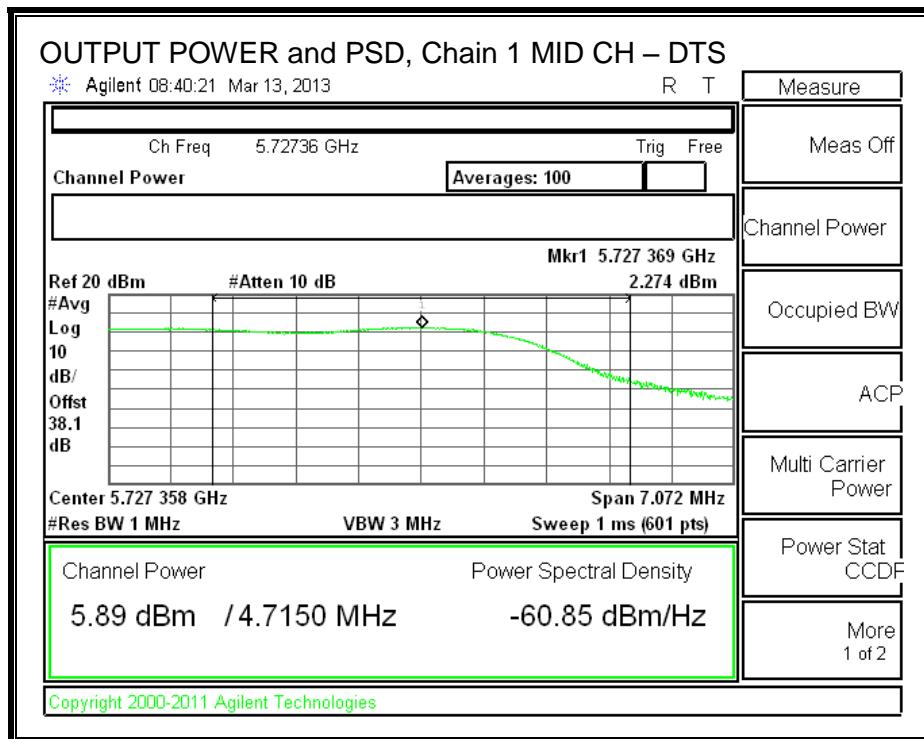
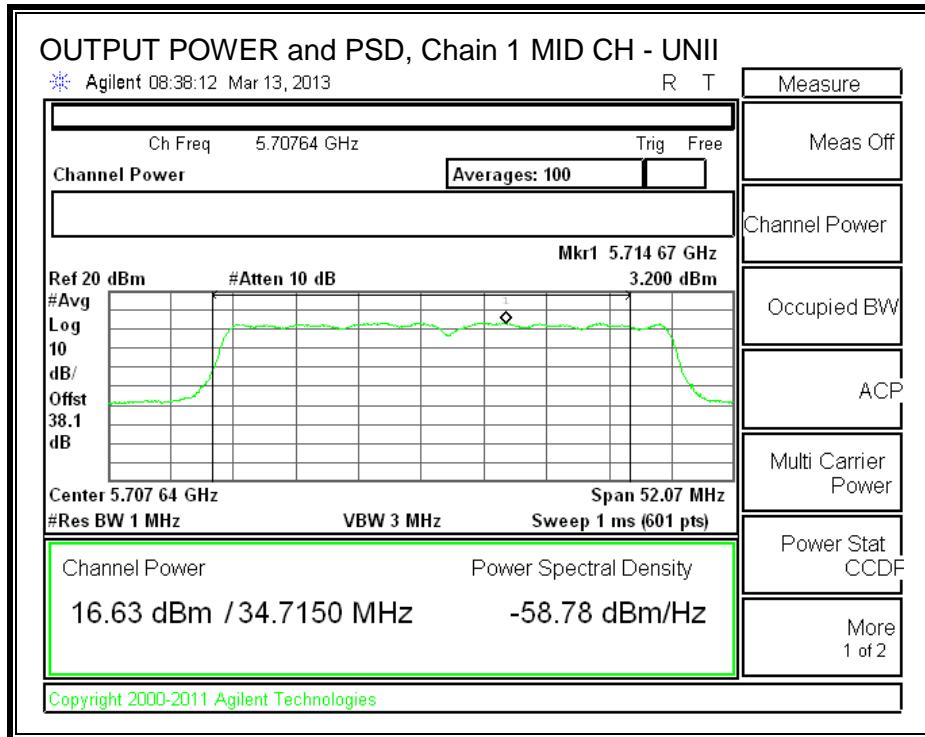
**Output Power Results**

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)
Mid	5710	5.86	5.89	6.25	10.77	14.10	-3.32

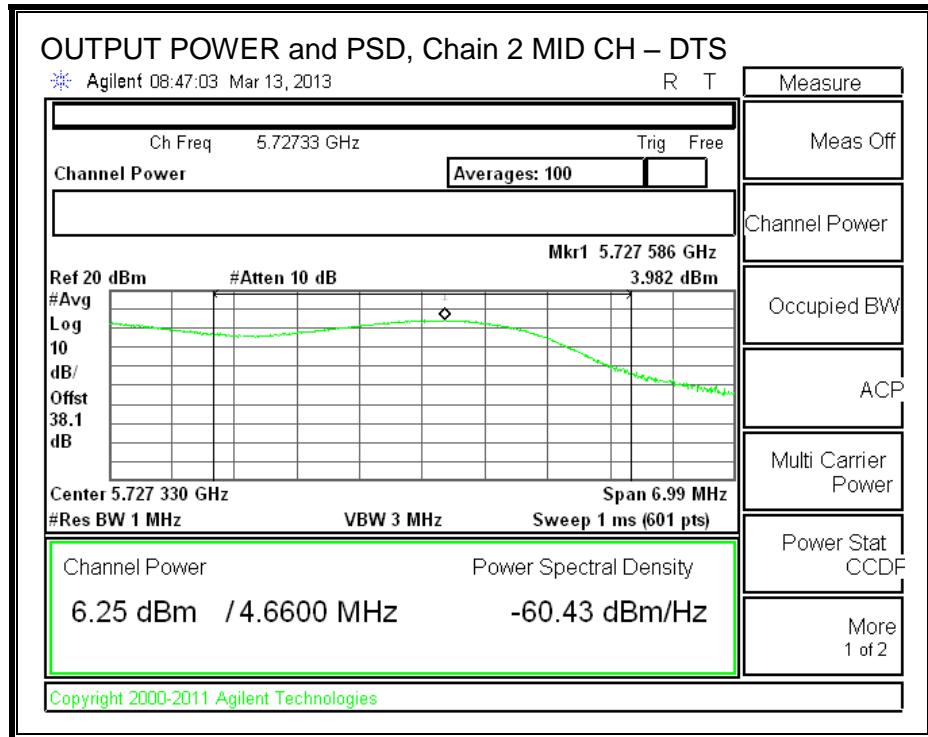
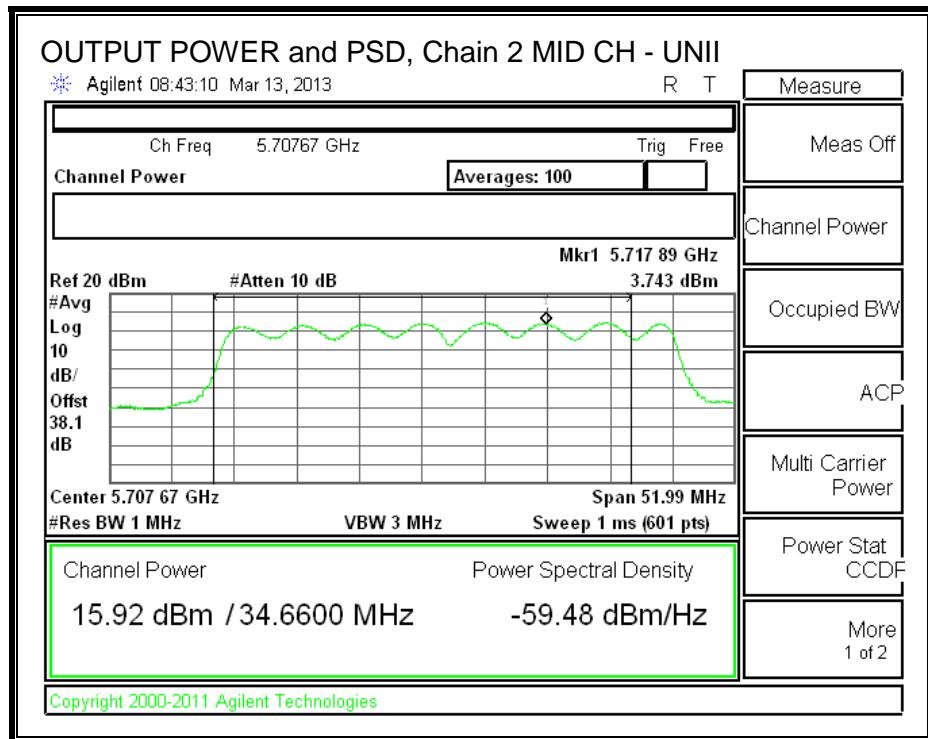
## OUTPUT POWER and PSD, Chain 0



**OUTPUT POWER and PSD, Chain 1**



## OUTPUT POWER and PSD, Chain 2



## 8.69. 802.11n HT40 STBC 3TX MODE, CH142 (5710 MHz), 5.6 GHz BAND

### 8.69.1.26 dB BANDWIDTH

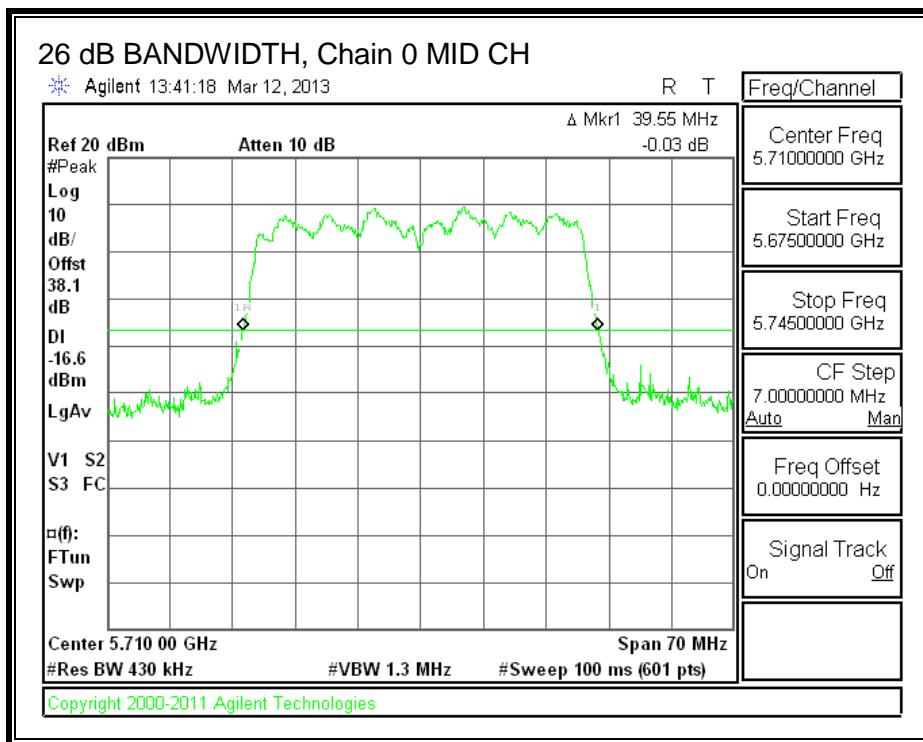
#### LIMITS

None; for reporting purposes only.

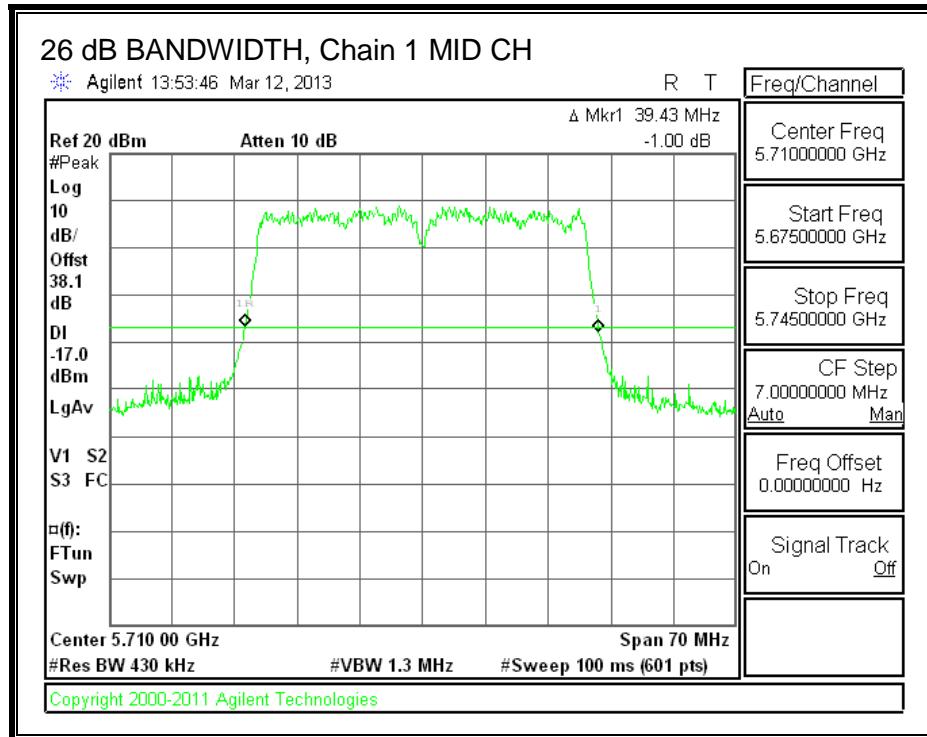
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5710	39.55	39.43	39.32

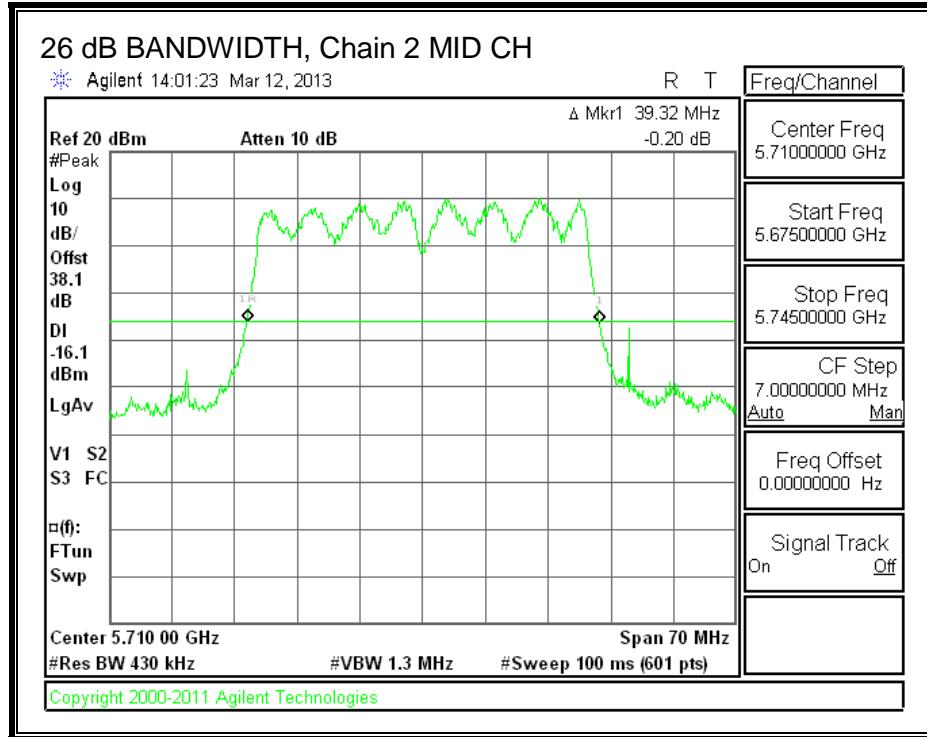
#### 26 dB BANDWIDTH, Chain 0



## 26 dB BANDWIDTH, Chain 1



## 26 dB BANDWIDTH, Chain 2



## 8.69.2.99% BANDWIDTH

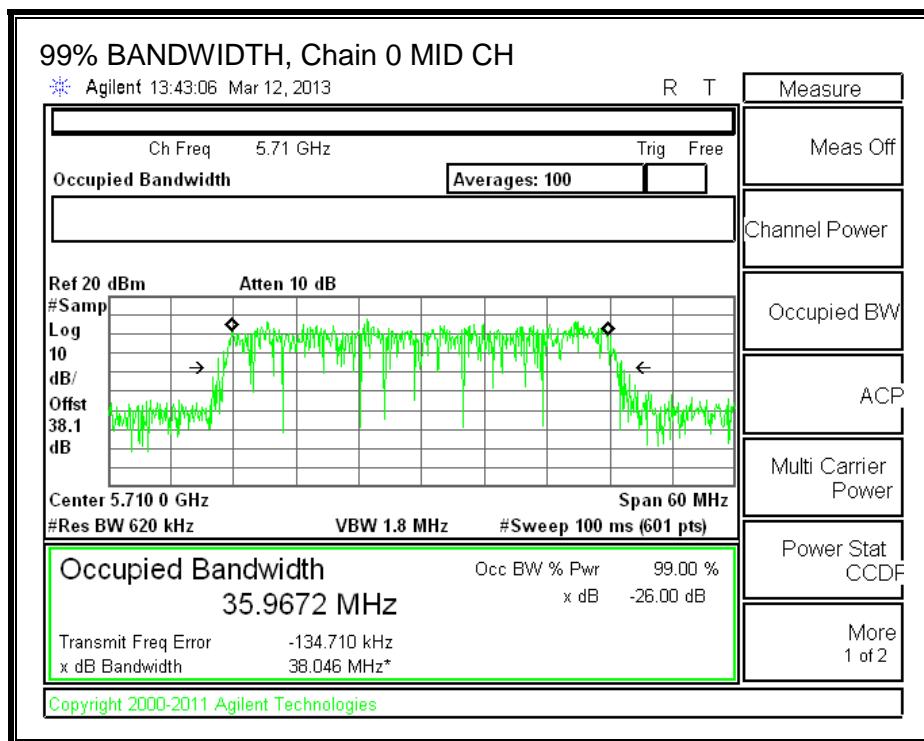
### LIMITS

None; for reporting purposes only.

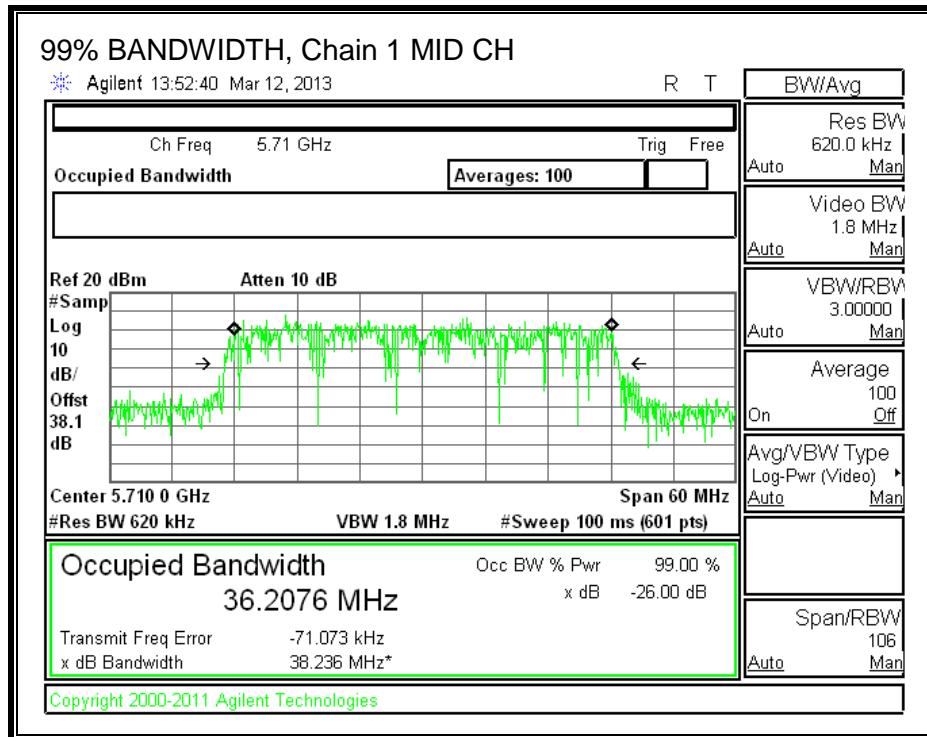
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Mid	5710	35.9672	36.2076	36.3701

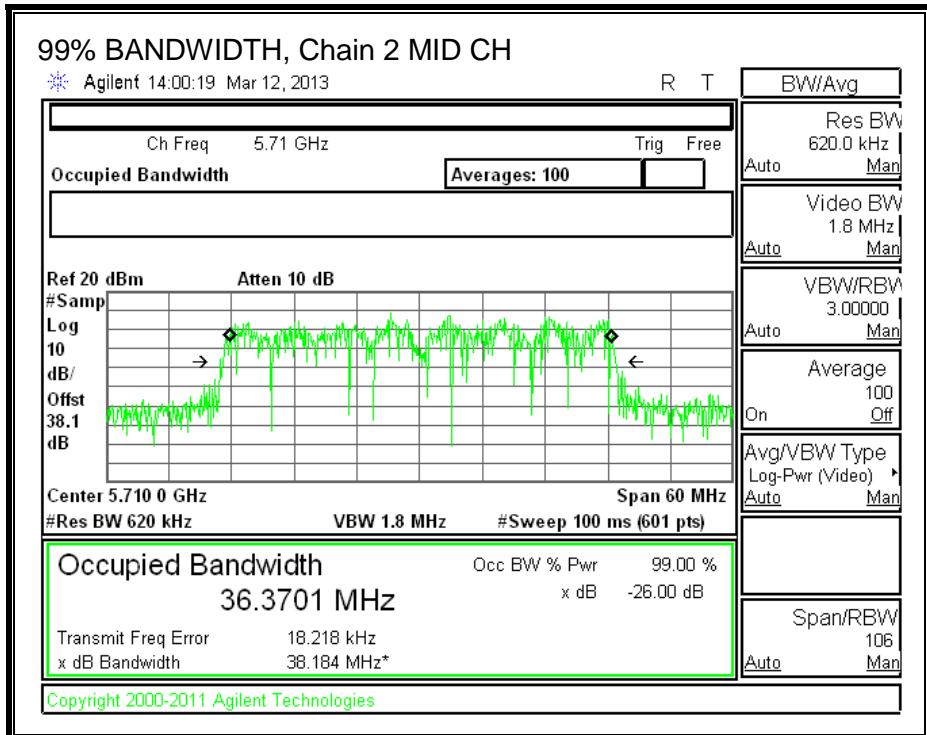
### 99% BANDWIDTH, Chain 0



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.69.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 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)
2.70	1.90	4.40	3.13

## RESULTS

### Limits (FCC), portion in UNII 2 ext band

#### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Uncorrelated Gain (dBi)
Mid	5710	34.7	32.9836	3.13

#### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Mid	5710	24.00	24.00	30.00	24.00	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00	

#### 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)
Mid	5710	18.66	18.66	18.56	23.40	24.00	-0.60

#### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5710	5.118	4.607	3.738	9.30	11.00	-1.70

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Uncorrelated Gain (dBi)
Mid	5710	4.7	2.9836	3.13

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Mid	5710	17.68	15.75	21.75	15.75	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00
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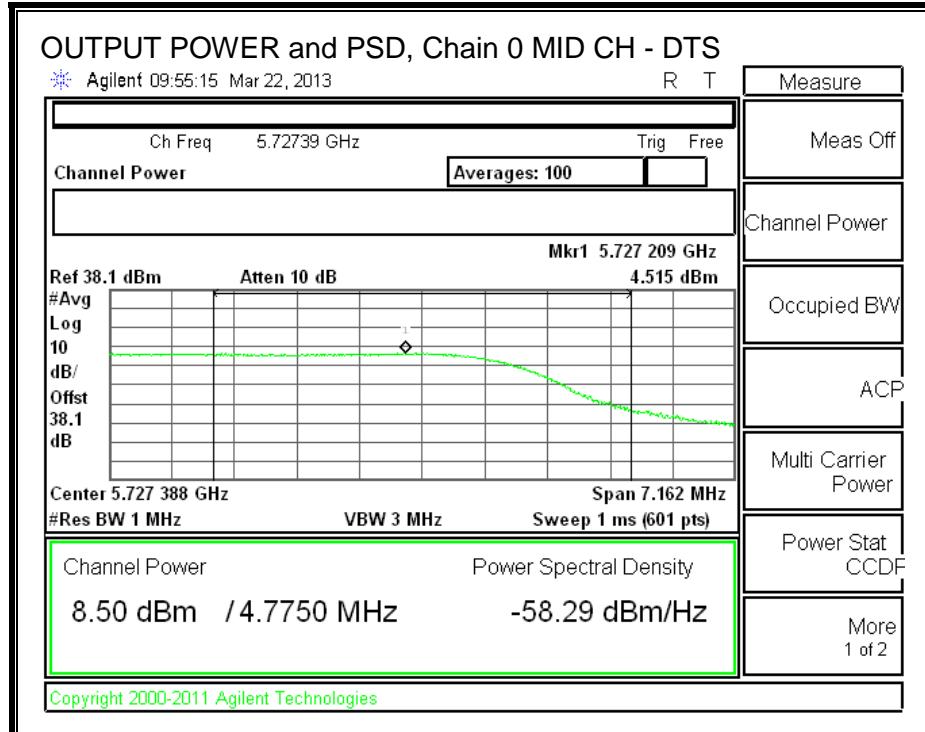
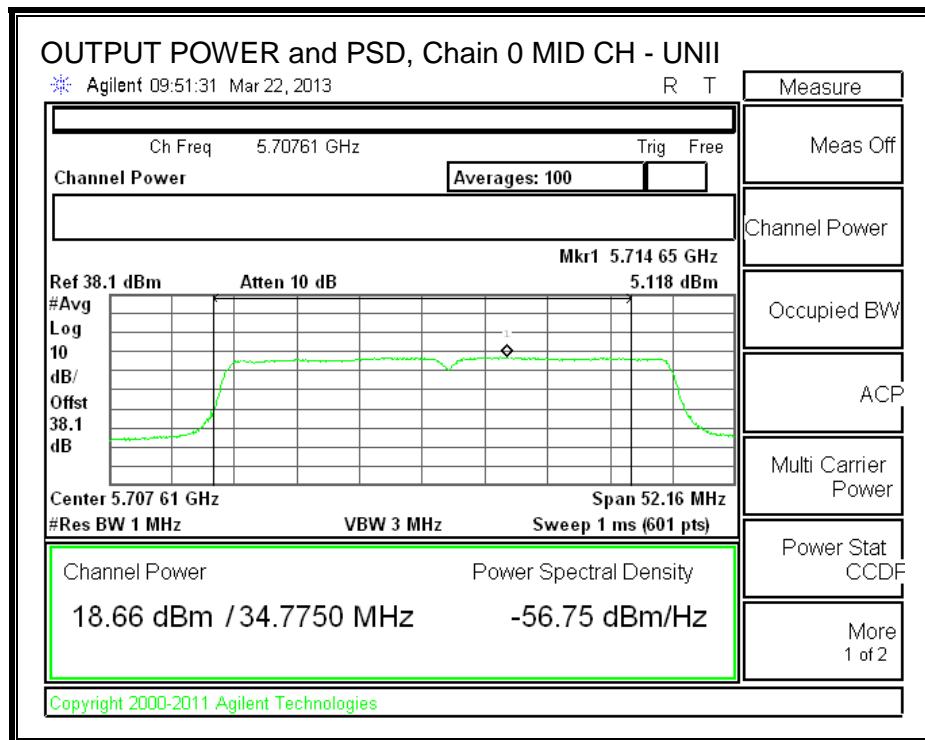
**Output Power Results**

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)
Mid	5710	8.50	7.94	8.33	13.03	15.75	-2.71

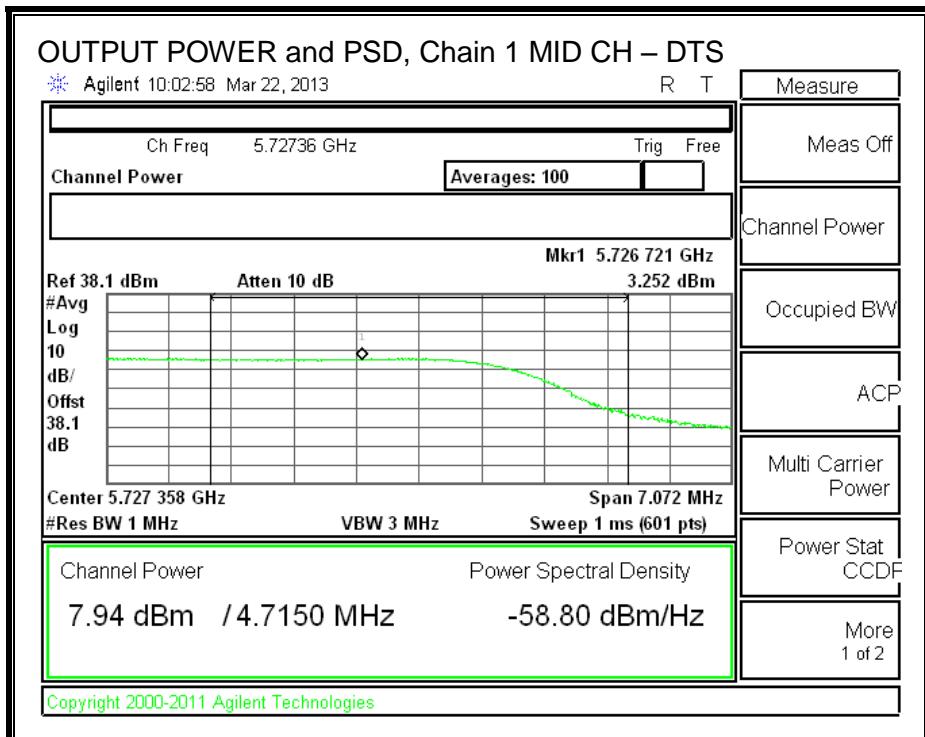
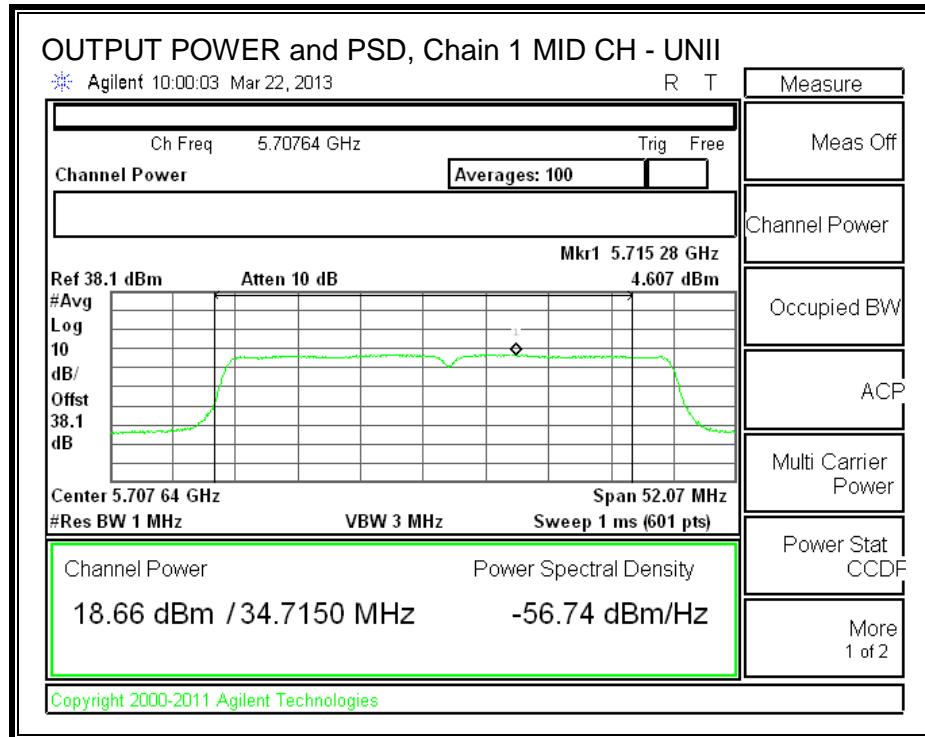
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5710	4.515	3.252	3.704	8.63	11.00	-2.37

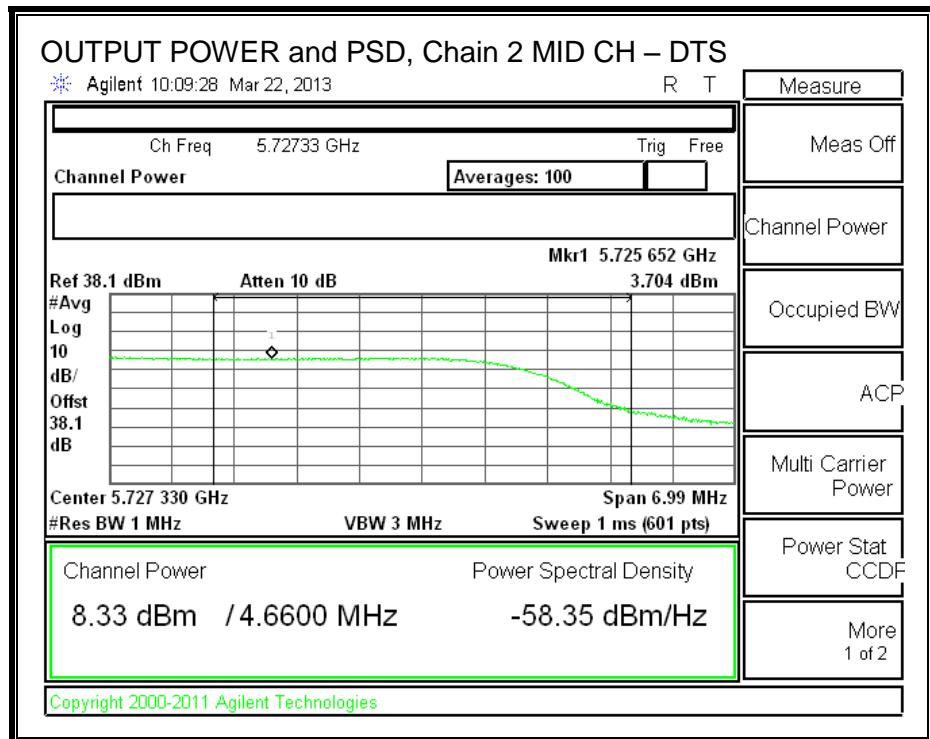
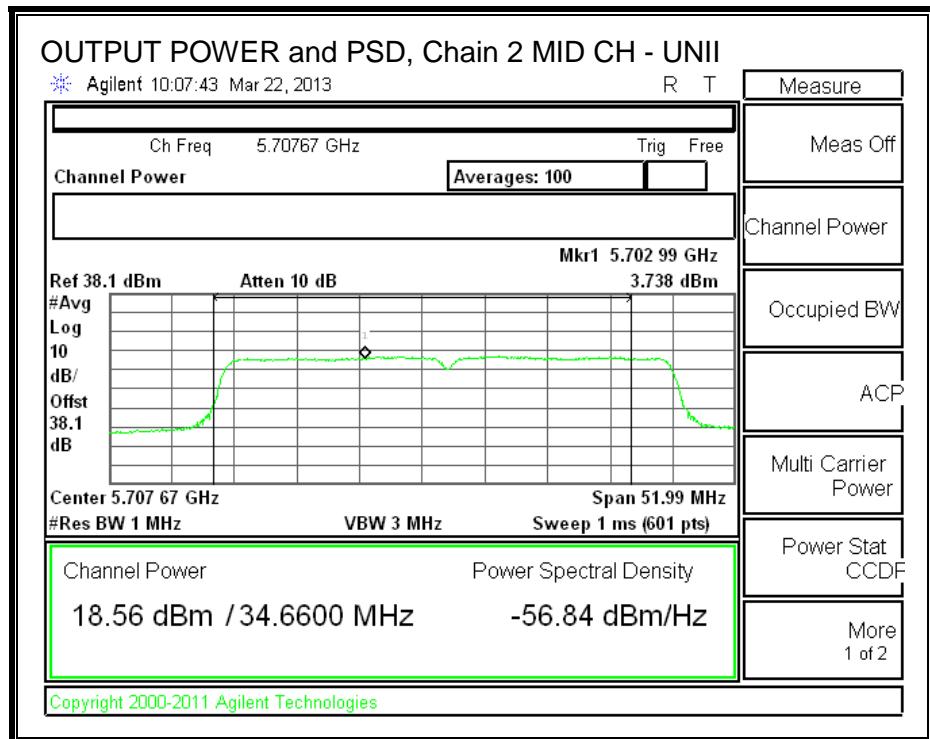
## OUTPUT POWER and PSD, Chain 0



**OUTPUT POWER and PSD, Chain 1**



## OUTPUT POWER and PSD, Chain 2



#### 8.69.4. TPC POWER

##### LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.2 (3)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

##### RESULTS

The maximum EIRP is less than 500 mW; therefore, TPC is not required.

## 8.70. 802.11ac VHT80 1TX MODE IN THE 5.6 GHz BAND

### 8.70.1. 26 dB BANDWIDTH

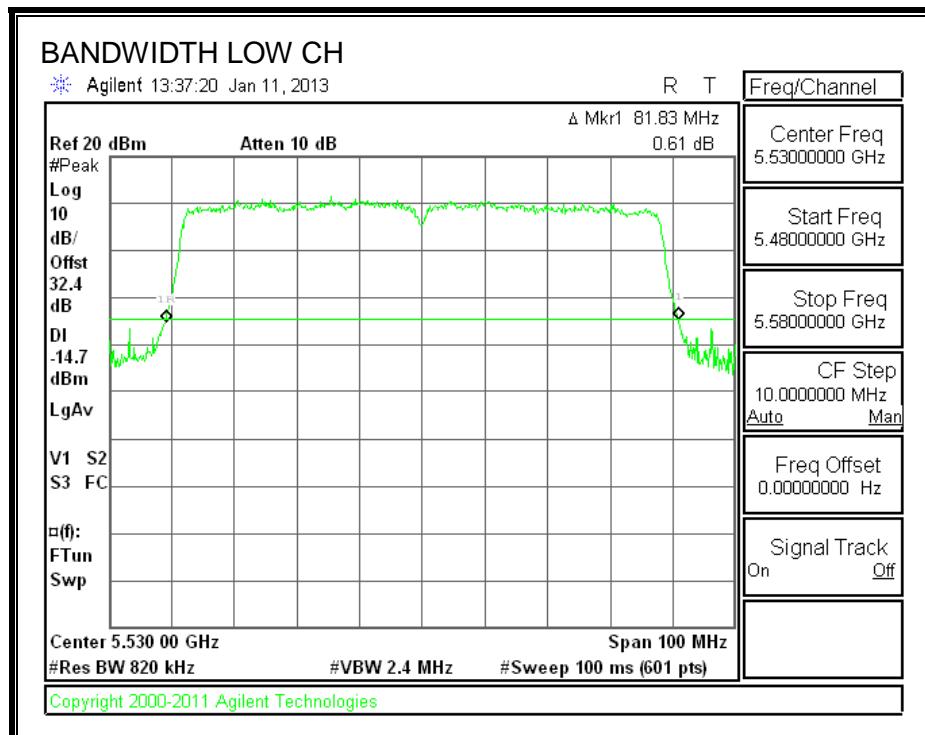
#### LIMITS

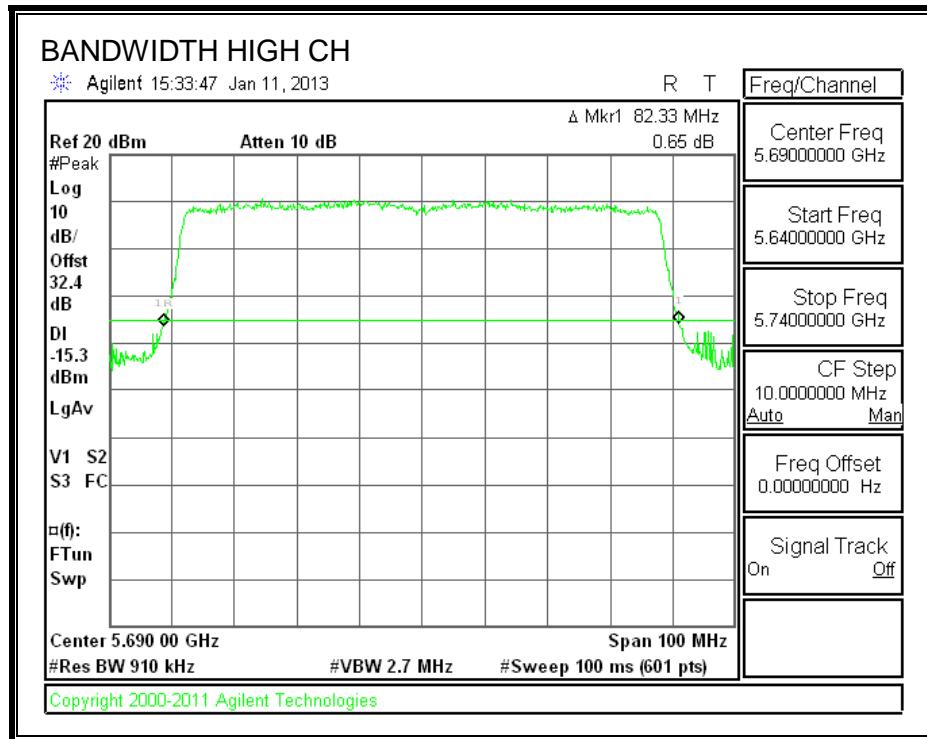
None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5530	81.83
High	5690	82.33

## 26 dB BANDWIDTH





## 8.70.2. 99% BANDWIDTH

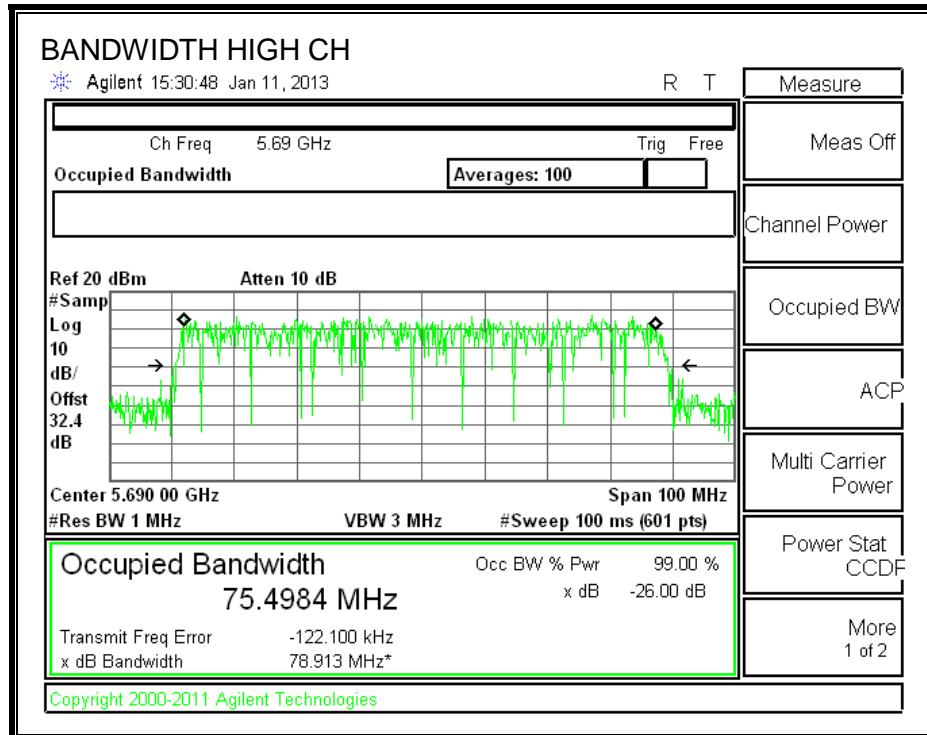
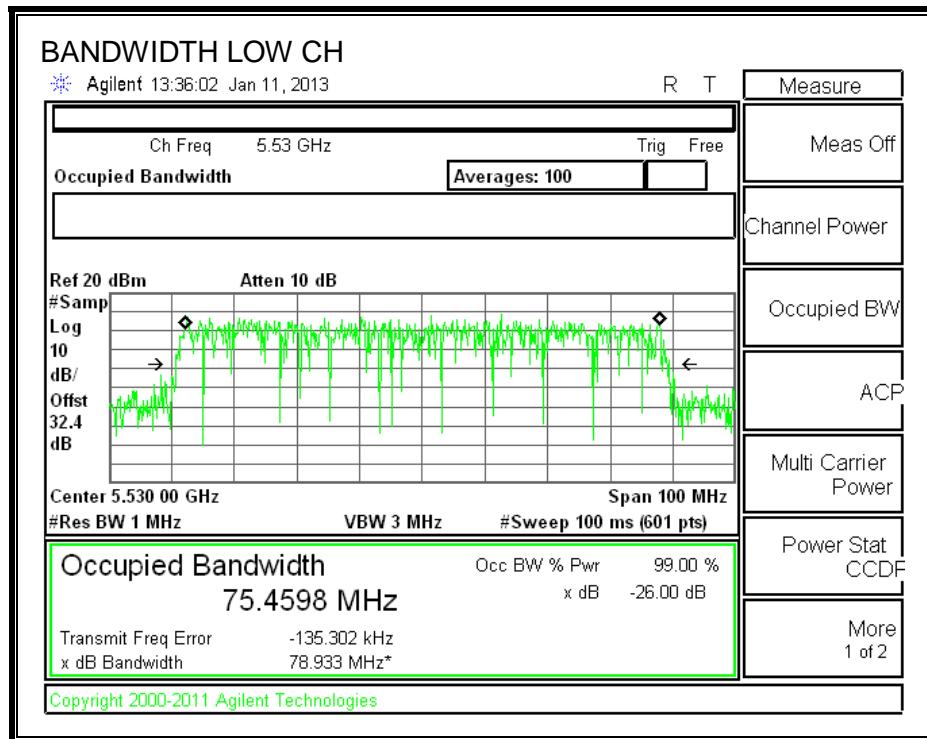
### LIMITS

None; for reporting purposes only.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5530	75.4598
High	5690	75.4984

**99% BANDWIDTH**



### 8.70.3. OUTPUT AVERAGE POWER AND PSD

#### 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

## RESULTS

### Limits (FCC), portion in UNII 2 ext band (for 5690 MHz)

#### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5530	81.83	75.4598	3.80
High	5690	76.15	75.5000	3.80

#### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Low	5530	24.00	24.00	30.00	24.00	11.00	11.00	11.00
High	5690	24.00	24.00	30.00	24.00	11.00	11.00	11.00

Duty Cycle CF (dB)	0.10	
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#### Output Power Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5530	13.00	13.00	24.00	-11.00
High	5690	23.77	23.87	24.00	-0.13

#### PSD Results

Channel	Frequency (MHz)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5530	7.605	7.705	11.00	-3.30
High	5690	6.874	6.974	11.00	-4.03

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Antenna Gain (dBi)
Mid	5690	6.165	2.7492	3.80

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Mid	5690	18.90	15.39	21.39	15.39	11.00	11.00	11.00

Duty Cycle CF (dB)	0.10	

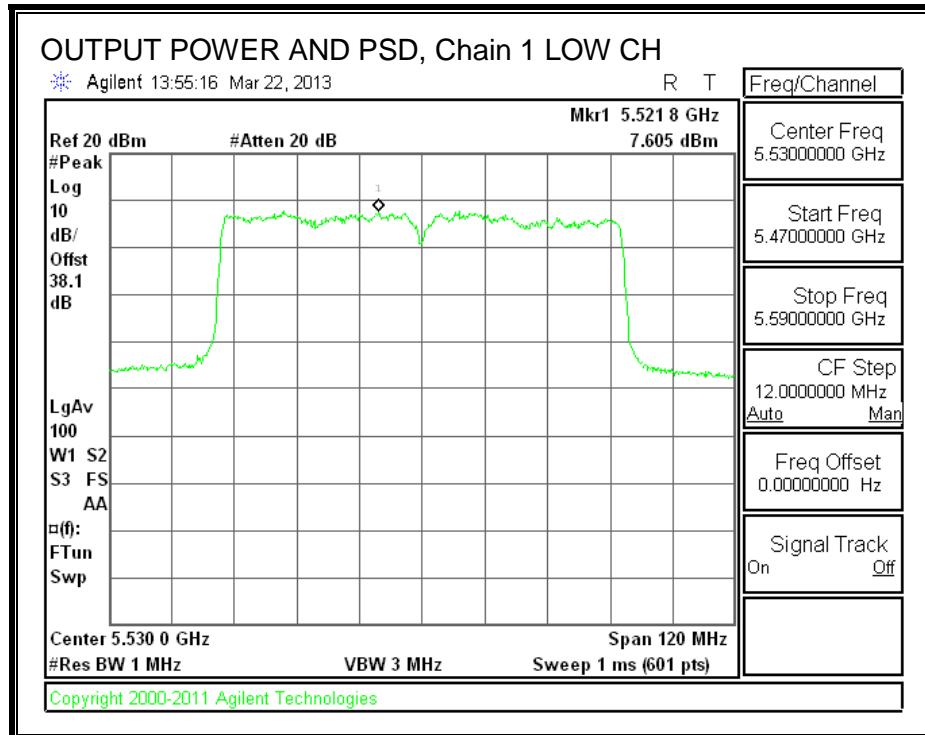
**Output Power Results**

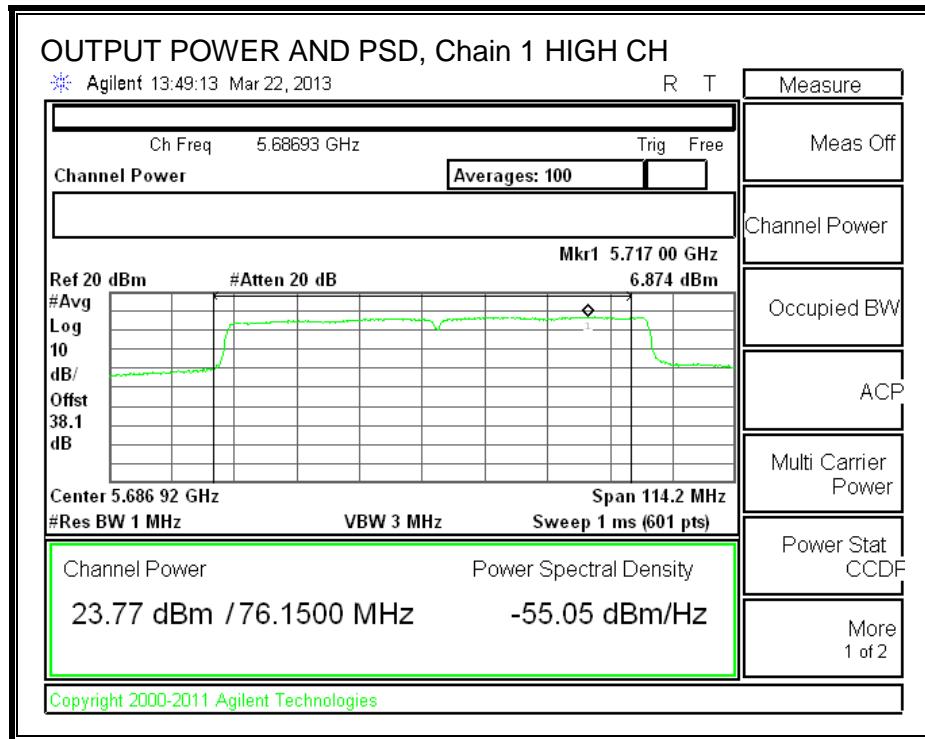
Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5690	8.38	8.48	15.39	-6.91

**PSD Results**

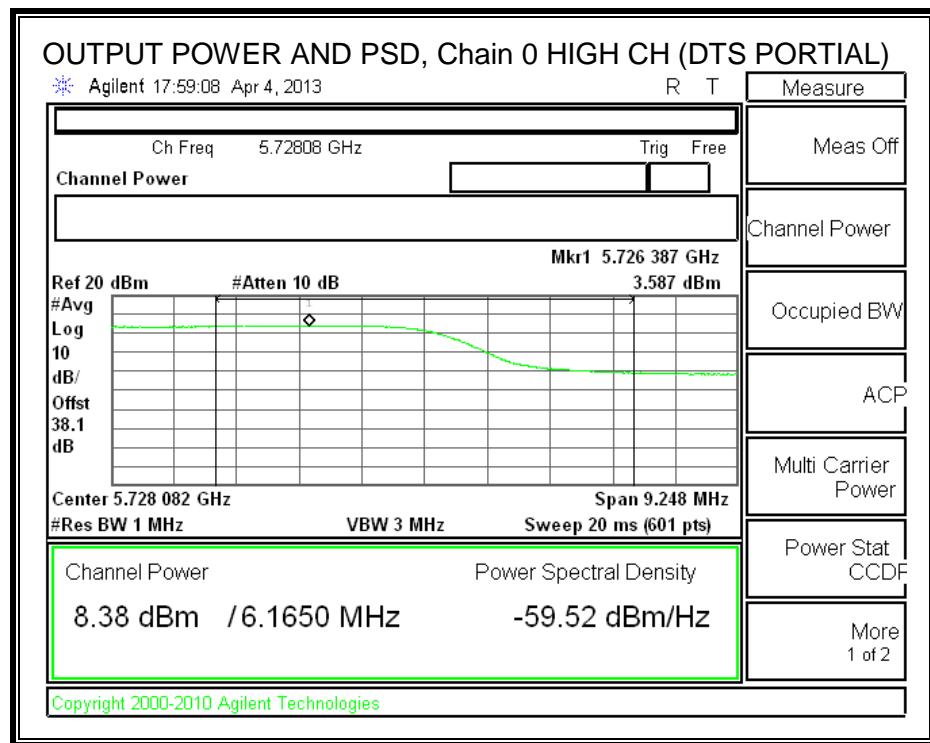
Channel	Frequency (MHz)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5690	3.587	3.687	11.00	-7.31

**OUTPUT POWER AND PSD, Chain 1**





**DTS PORTIAL OUTPUT POWER AND PSD.**



#### 8.70.4. TPC POWER

##### LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.2 (3)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

##### RESULTS

The maximum EIRP is less than 500 mW; therefore, TPC is not required.

## 8.71. 802.11ac VHT80 CDD 2TX MODE IN THE 5.6 GHz BAND

### 8.71.1. 26 dB BANDWIDTH

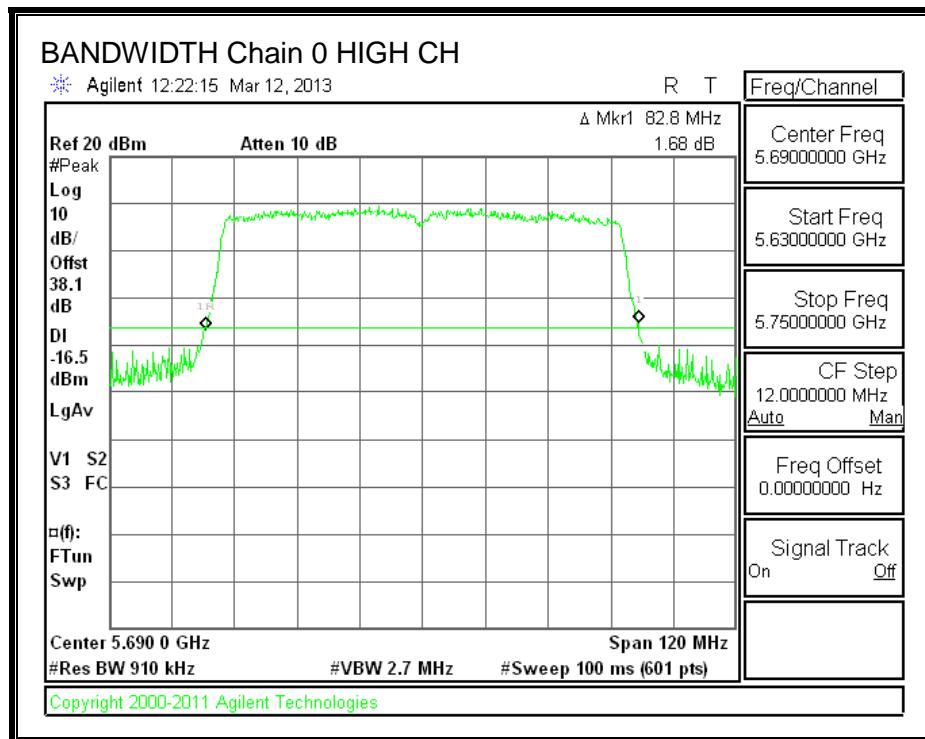
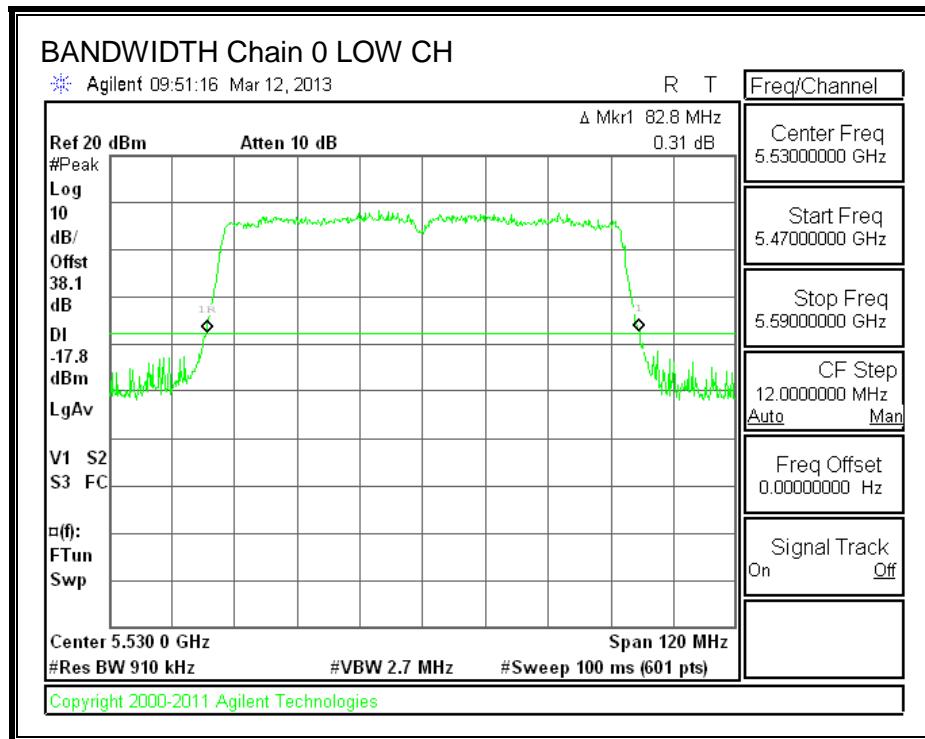
#### LIMITS

None; for reporting purposes only.

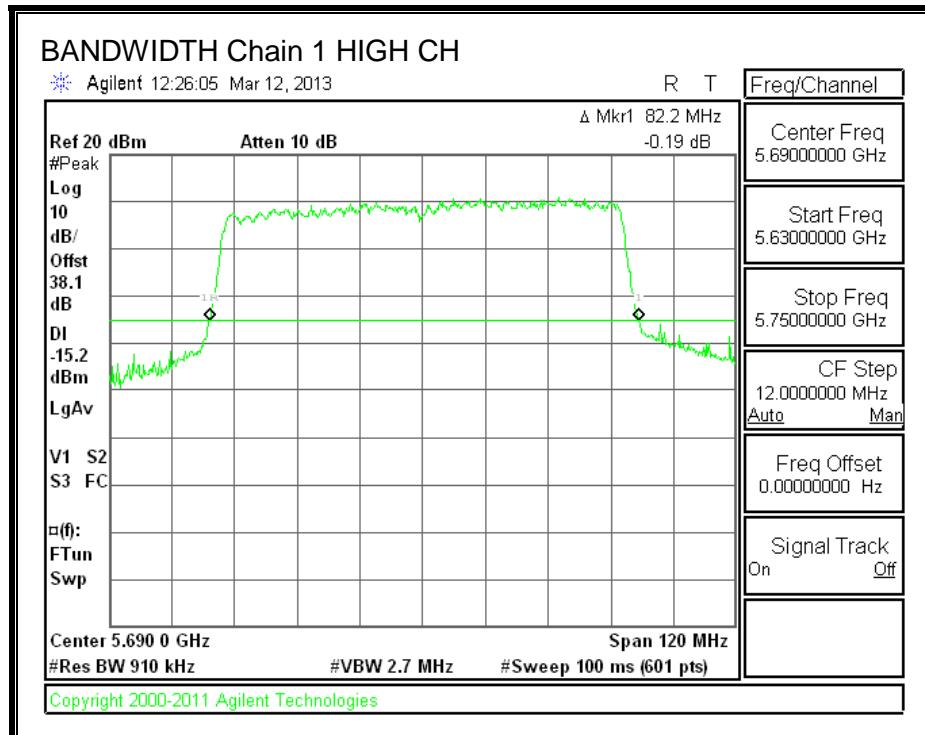
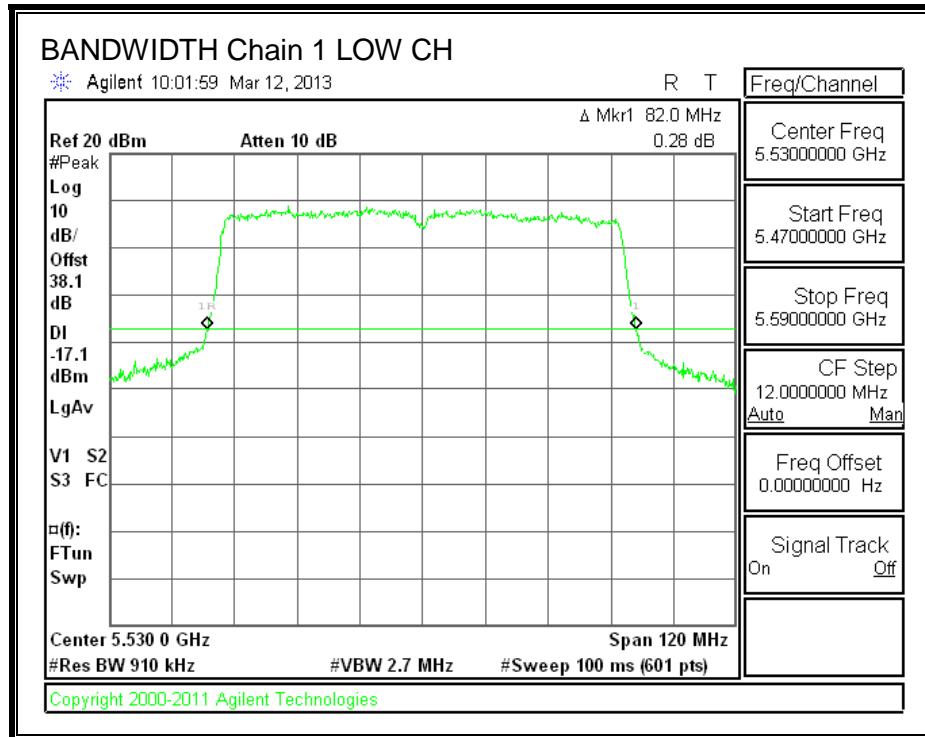
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5530	82.8	82.0
High	5690	82.8	82.2

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 8.71.2. 99% BANDWIDTH

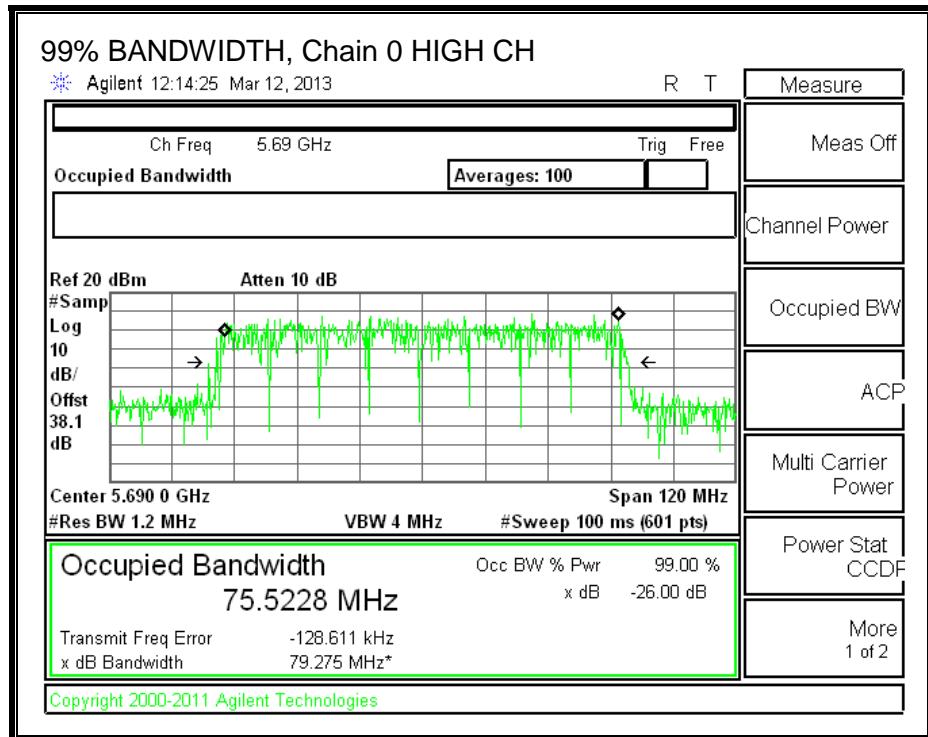
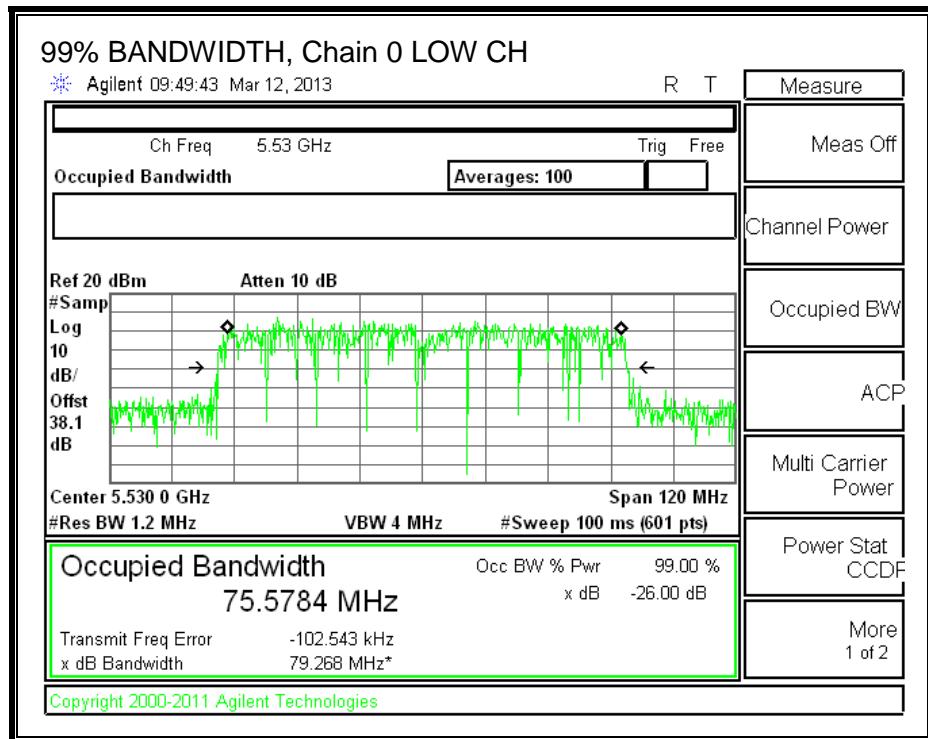
### LIMITS

None; for reporting purposes only.

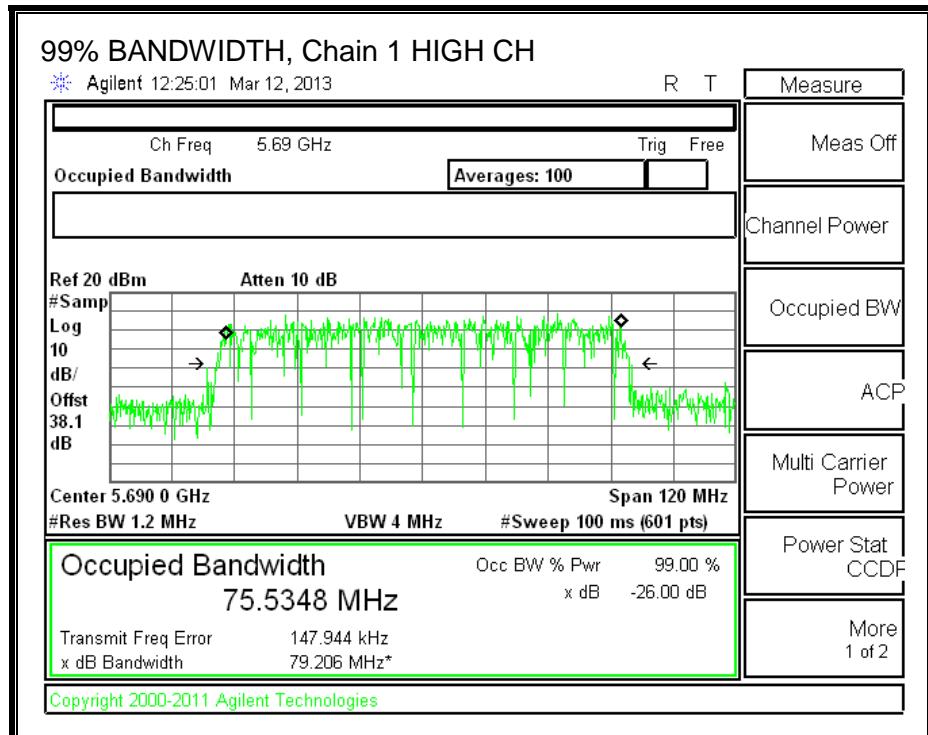
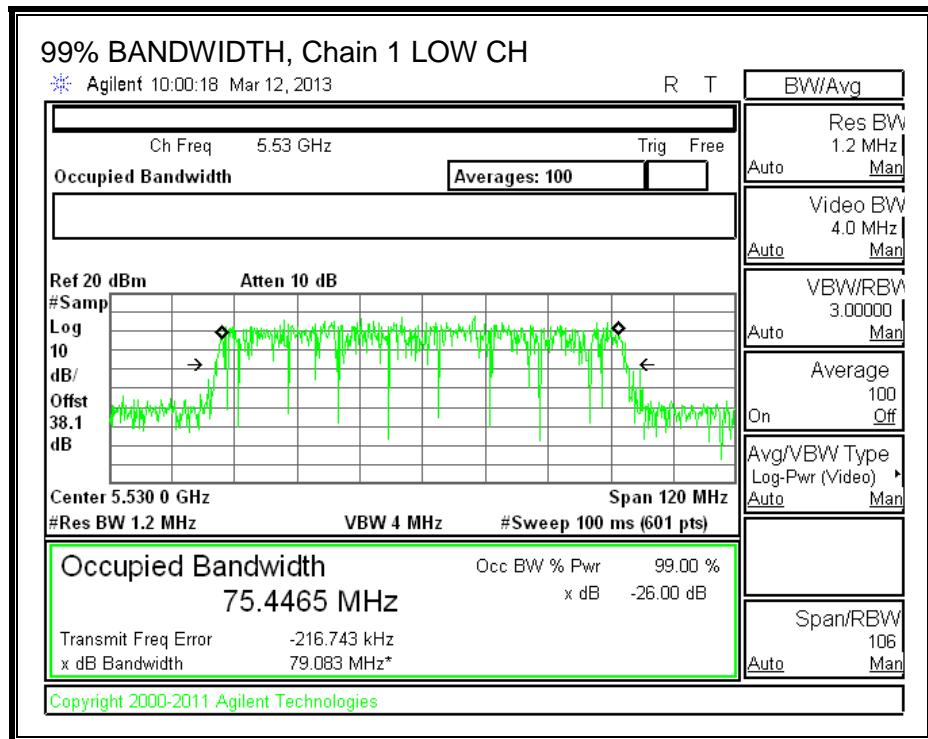
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5530	75.5784	75.4465
High	5690	75.5228	75.5348

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 8.71.3. OUTPUT AVERAGE POWER AND PSD

#### 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 for output power and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.00	3.80	3.42

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.00	3.80	6.42

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)	Uncorrelated Gain (dBi)
Low	5530	82.00	75.4465	6.42	3.42
High	5690	76.10	72.7614	6.42	3.42

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Low	5530	24.00	24.00	30.00	24.00	10.58	11.00	10.58
High	5690	24.00	24.00	30.00	24.00	10.58	11.00	10.58

Duty Cycle CF (dB)	0.09	
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Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5530	12.50	12.70	15.61	24.00	-8.39
High	5690	20.82	20.51	23.77	24.00	-0.23

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)	Uncorrelated Gain (dBi)
Low	5530	82.0	75.4	6.42	3.42
High	5690	76.1	72.8	6.42	3.42

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Low	5530	24.00	24.00	30.00	24.00	10.58	11.00	10.58
High	5690	24.00	24.00	30.00	24.00	10.58	11.00	10.58

Duty Cycle CF (dB)	0.09
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**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5530	2.783	2.880	5.932	10.58	-4.65
High	5690	3.178	3.514	6.450	10.58	-4.13

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)	Uncorrelated Gain (dBi)
Mid	5690	4.7	3.1851	6.42	3.42

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Mid	5690	17.68	16.03	22.03	16.03	10.58	11.00	10.58

Duty Cycle CF (dB)	0.09	

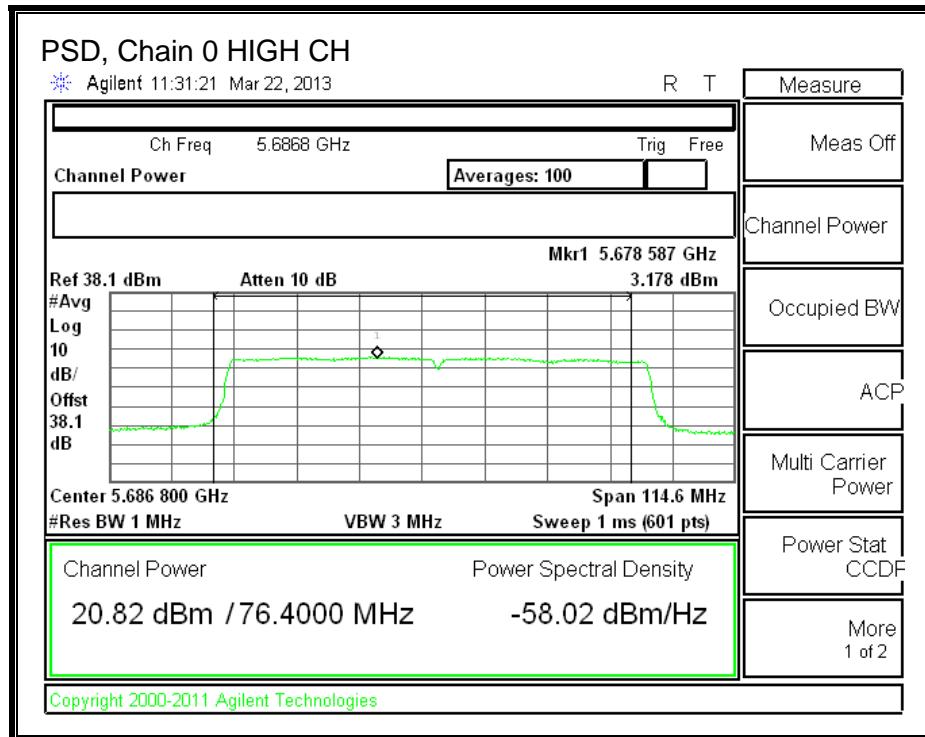
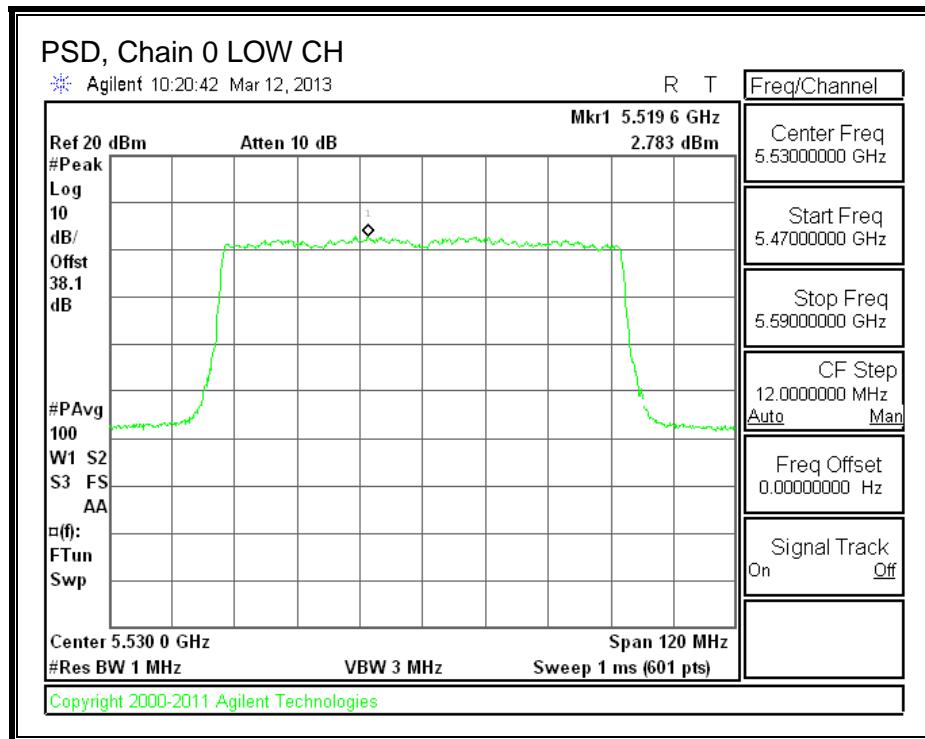
**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5690	5.70	5.93	8.92	16.03	-7.11

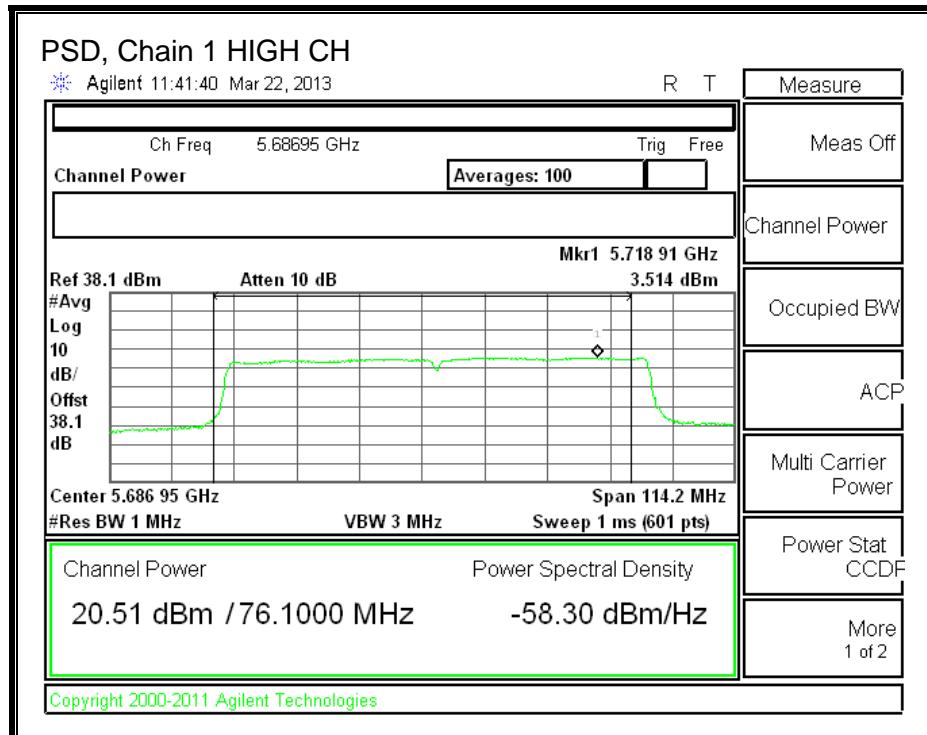
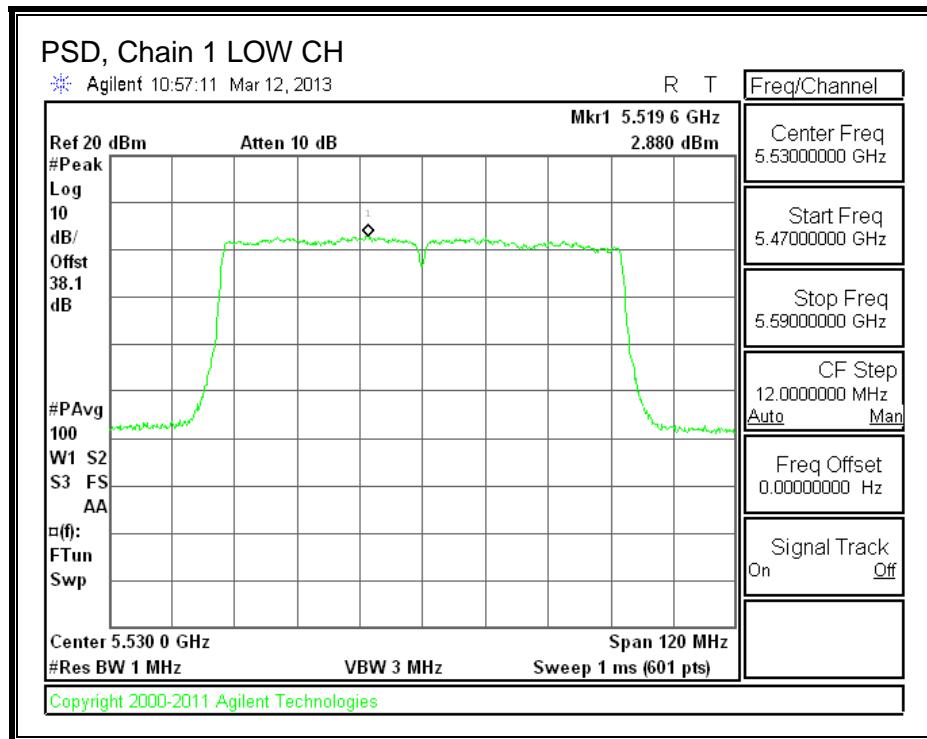
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5690	0.965	0.942	4.05	10.58	-6.53

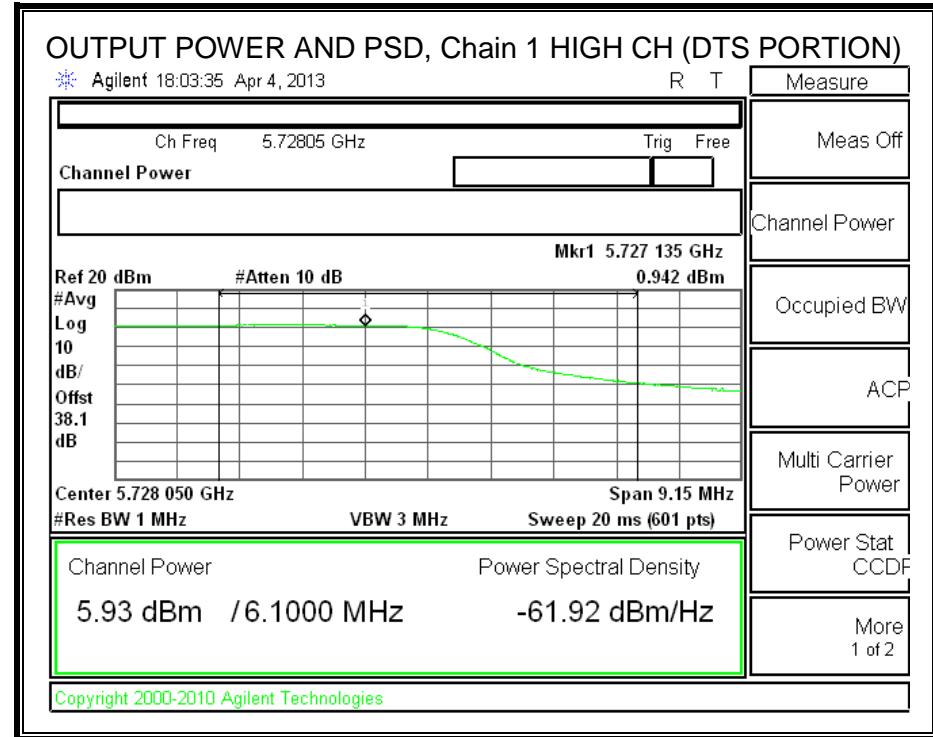
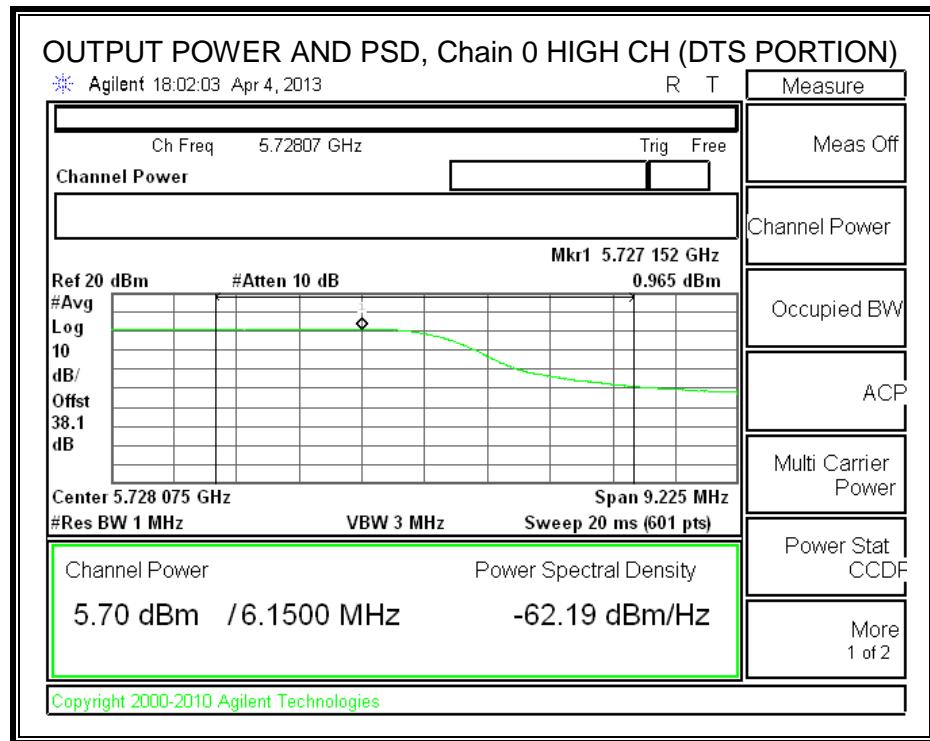
**PSD, Chain 0**



**PSD, Chain 1**



**DTS PORTION OUTPUT POWER AND PSD**



#### 8.71.4. TPC POWER

##### LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.2 (3)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

##### RESULTS

The maximum EIRP is less than 500 mW; therefore, TPC is not required.

## 8.72. 802.11ac VHT80 BF 2TX MODE IN THE 5.6 GHz BAND

Covered by testing 11ac VHT80 CDD 2TX mode, the power per chain used for 11ac VHT80 CDD 2TX mode is the same power per chain that will be used for 11ac VHT80 BF 2TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.72.1. OUTPUT AVERAGE POWER AND PSD

#### 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 correlated for output power and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.00	3.80	6.42

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
Low	5530	82.00	75.4465	6.42
High	5690	76.10	72.7500	6.42

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
Low	5530	23.58	24.00	30.00	23.58
High	5690	23.58	24.00	30.00	23.58

Duty Cycle CF (dB)	0.09	
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Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5530	12.50	12.70	15.61	23.58	-7.97
High	5690	19.44	19.47	22.56	23.58	-1.02

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
Mid	5690	6.10	2.7500	6.42

**Limits**

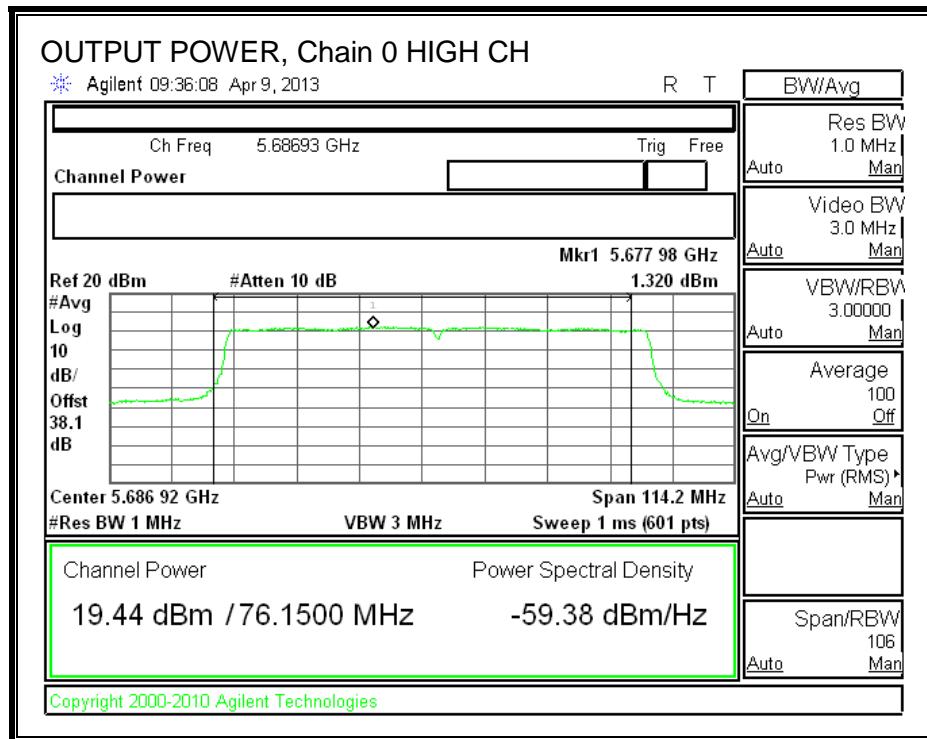
Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
Mid	5690	18.43	15.39	21.39	14.97

Duty Cycle CF (dB)	0.09
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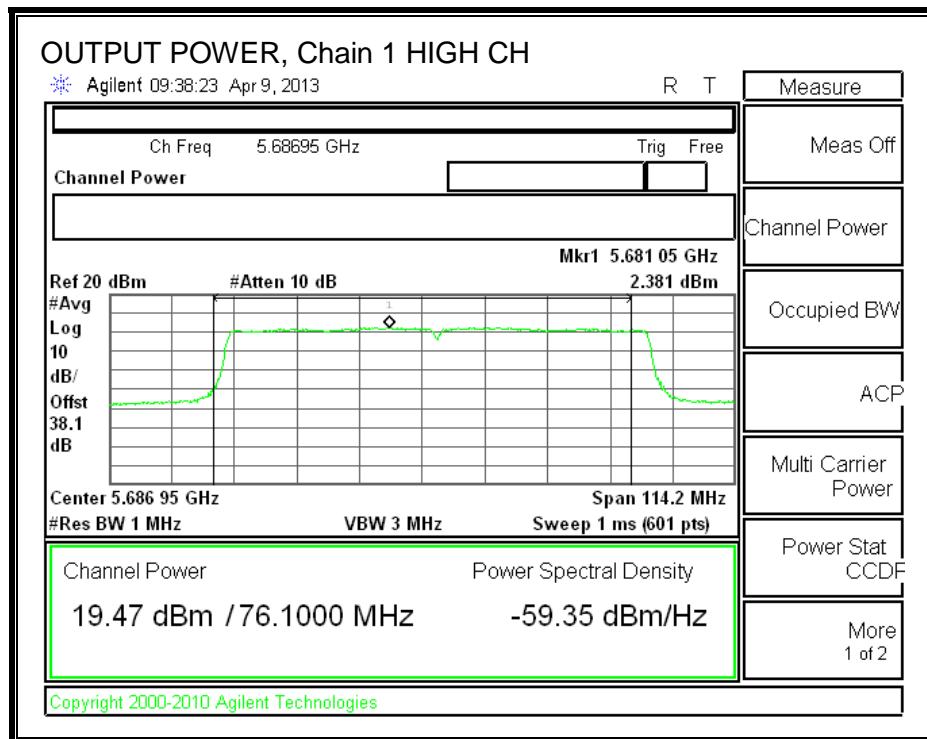
**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5690	5.82	5.91	8.97	14.97	-6.01

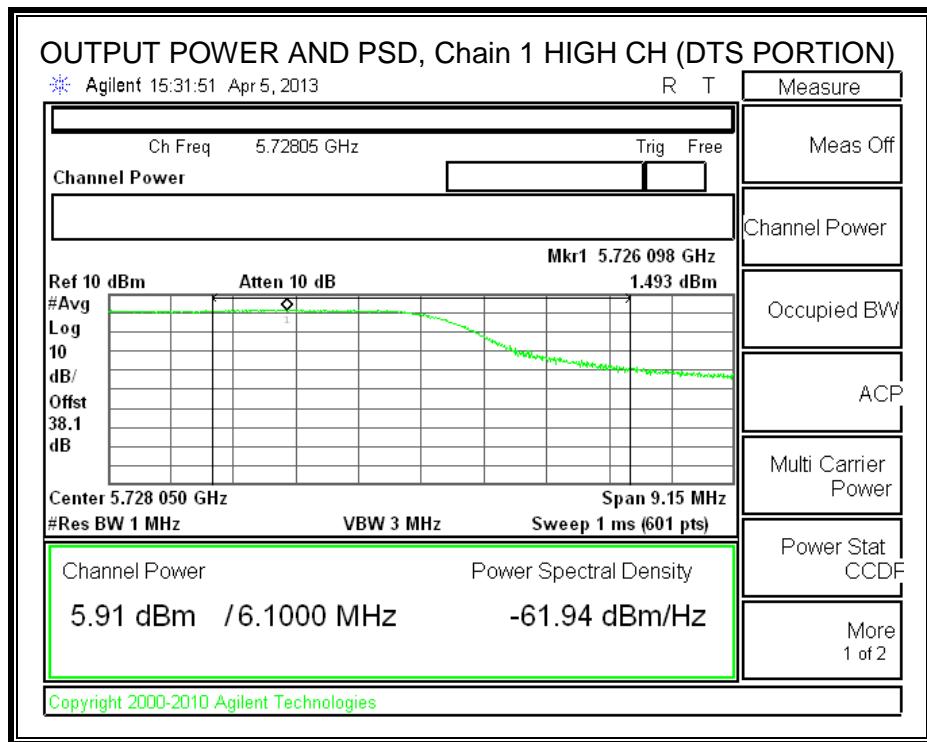
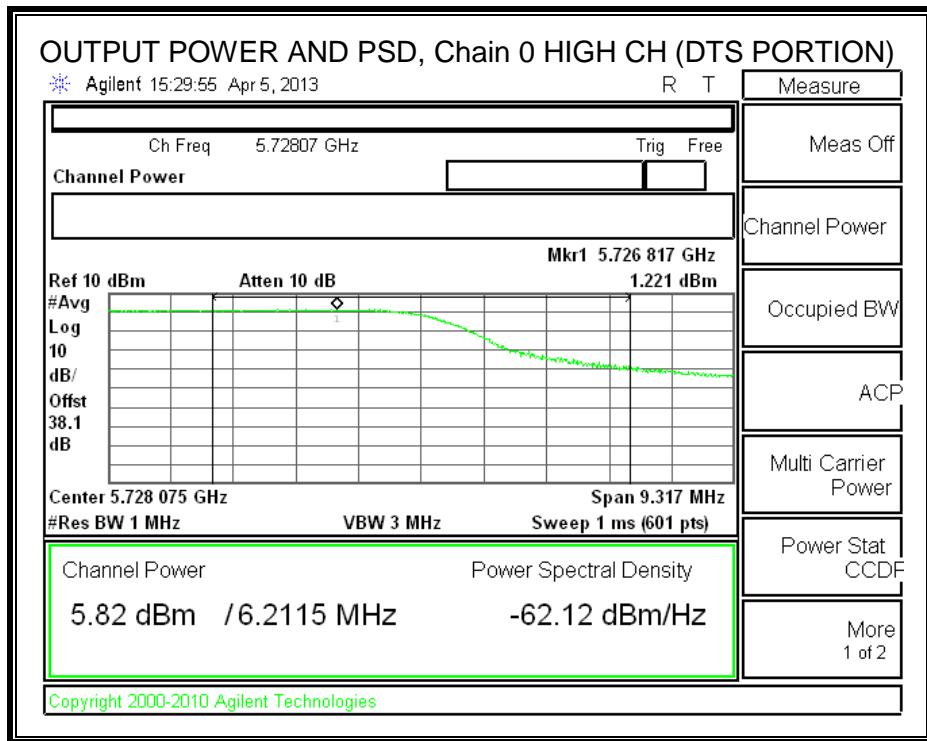
### OUTPUT POWER, Chain 0



### OUTPUT POWER, Chain 1



**DTS PORTION OUTPUT POWER AND PSD**



### **8.73. 802.11ac VHT80 2TX STBC MODE IN THE 5.6 GHz BAND**

Covered by testing 11ac VHT80 CDD 2TX mode, the power per chain used for 11ac VHT80 CDD 2TX mode is the same power per chain that will be used for 11ac VHT80 STBC 2TX mode.

### **8.74. 802.11ac VHT80 3TX STBC MODE IN THE 5.6 GHz BAND**

Covered by testing 11ac VHT80 CDD 3TX mode, the power per chain used for 11ac VHT80 CDD 3TX mode is the same power per chain that will be used for 11ac VHT80 STBC 3TX mode.

## 8.75. 802.11ac VHT80 CDD 3TX MODE IN THE 5.6 GHz BAND

### 8.75.1. 26 dB BANDWIDTH

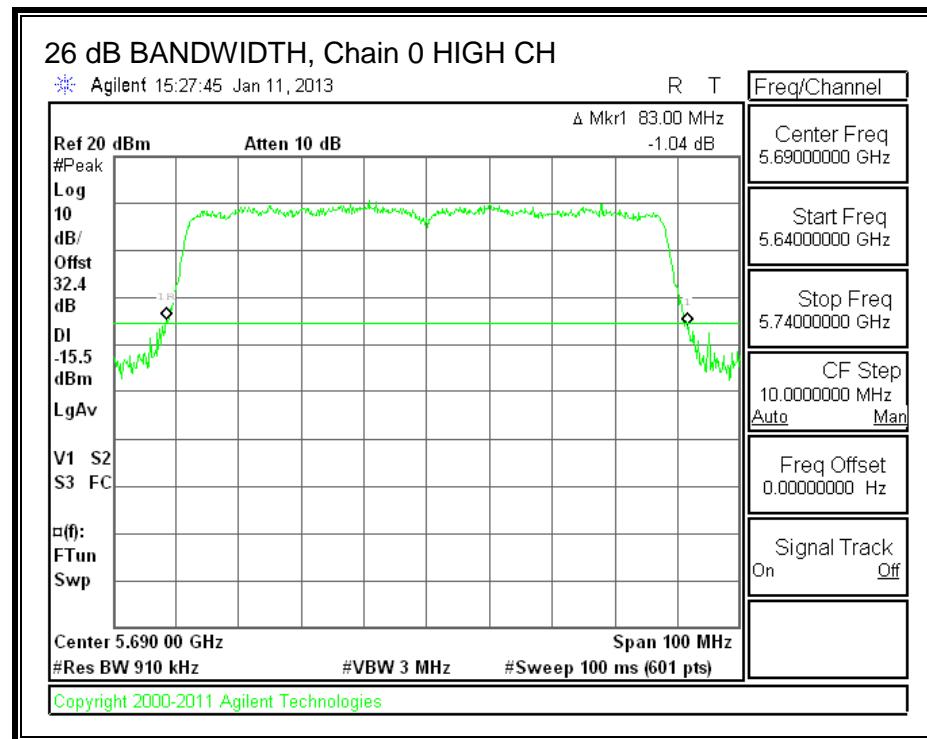
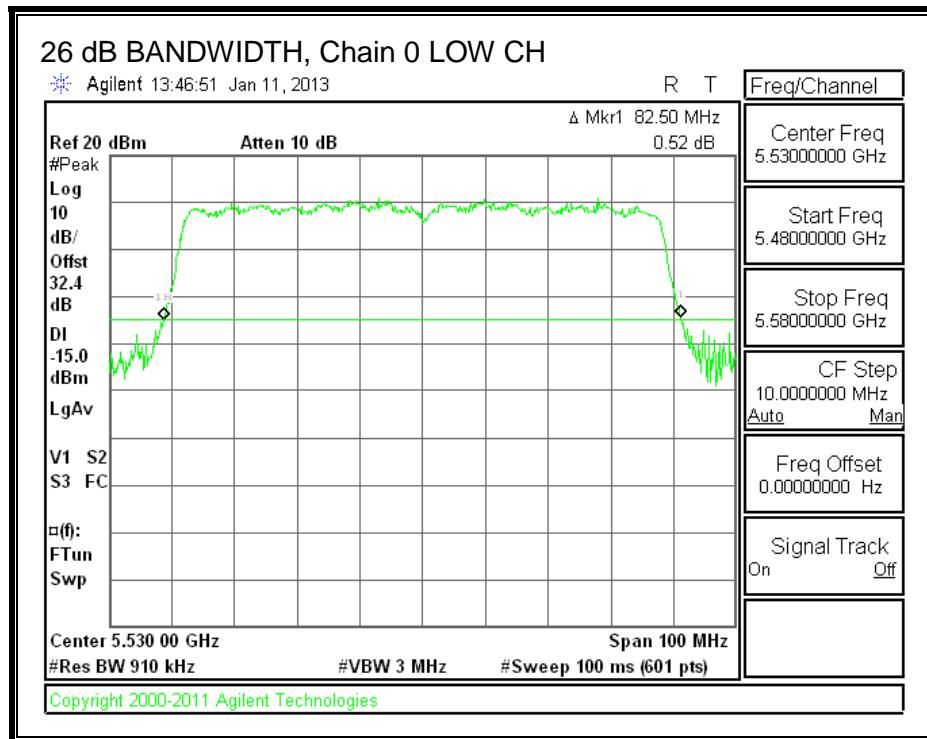
#### LIMITS

None; for reporting purposes only.

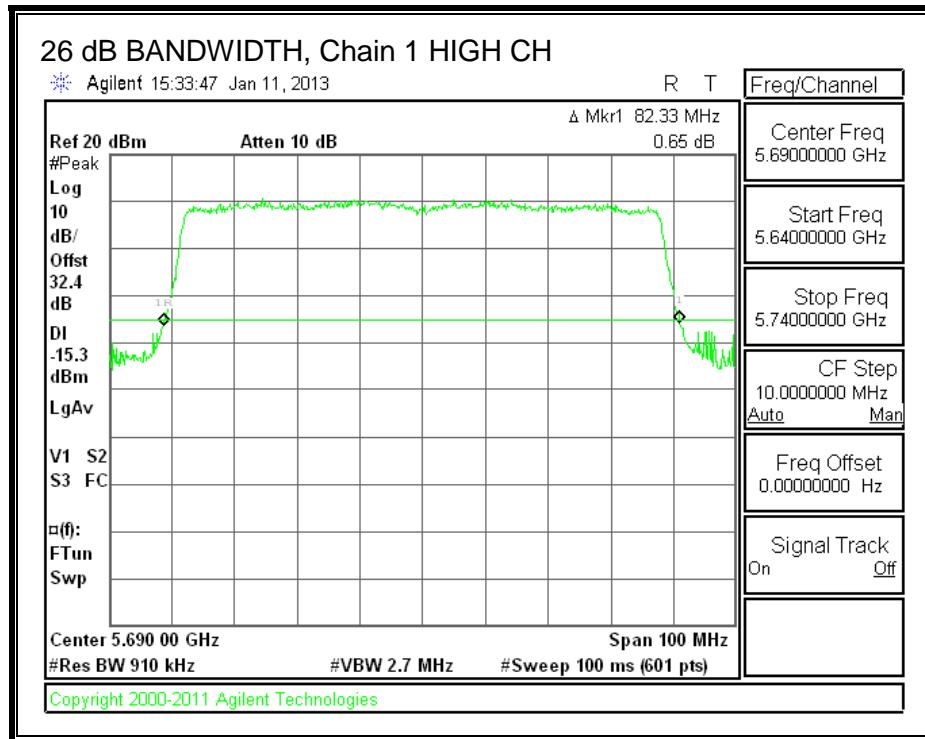
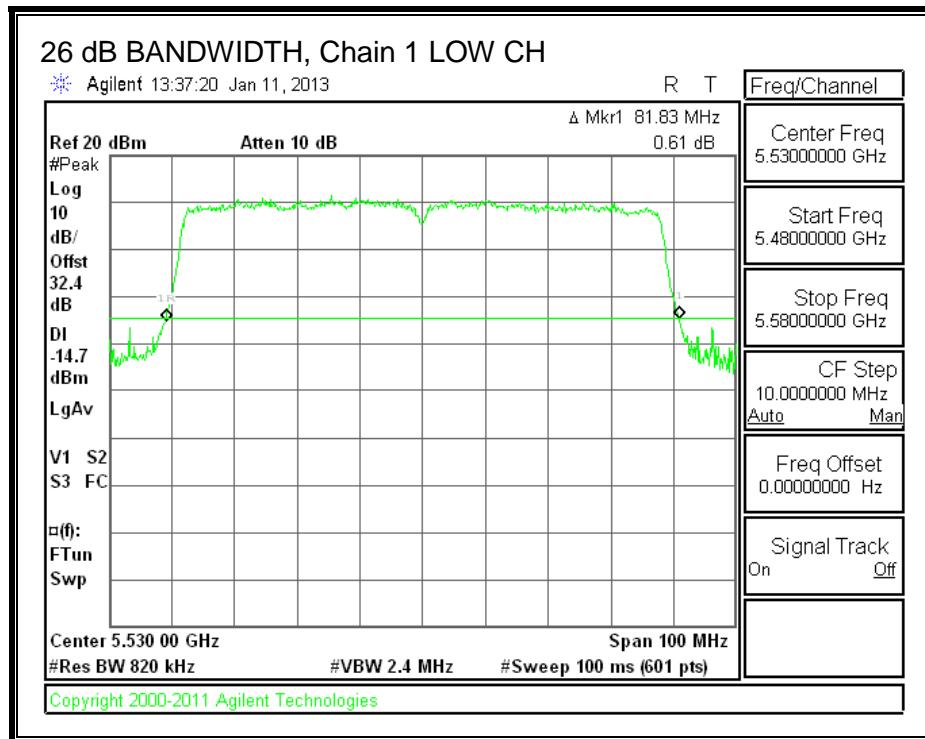
#### RESULTS

Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
5530	82.50	81.83	81.67
5690	83.00	82.33	82.00

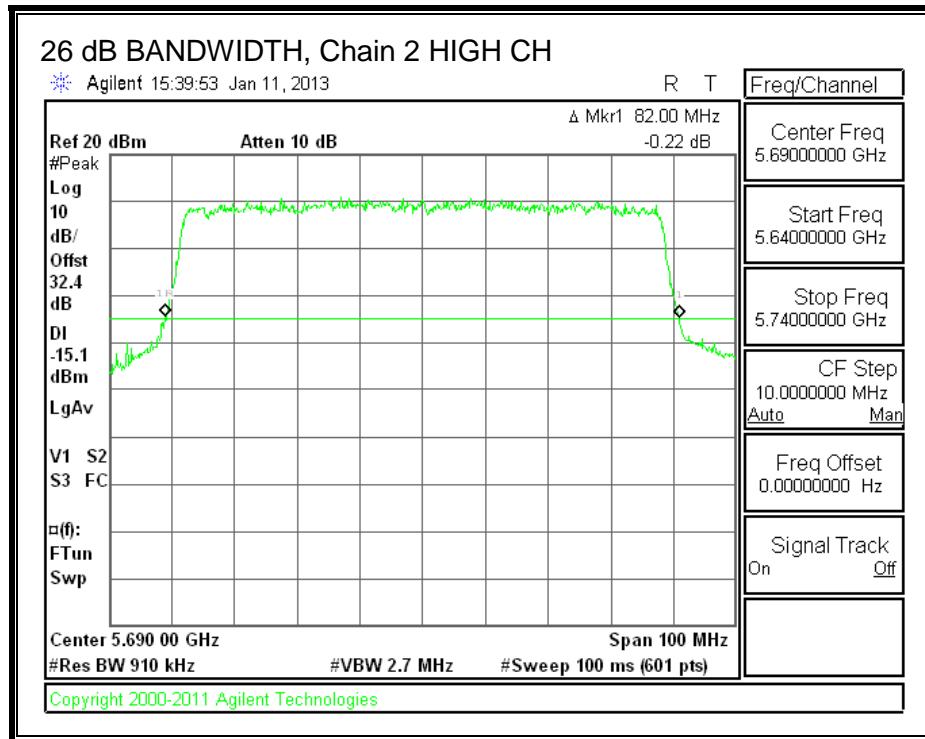
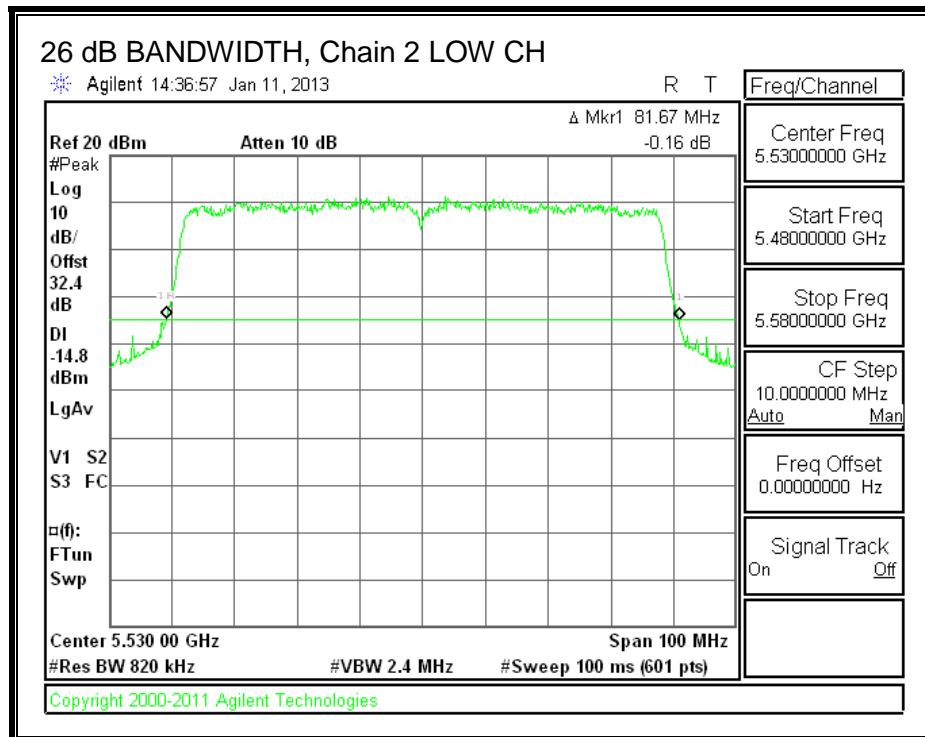
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.75.2. 99% BANDWIDTH

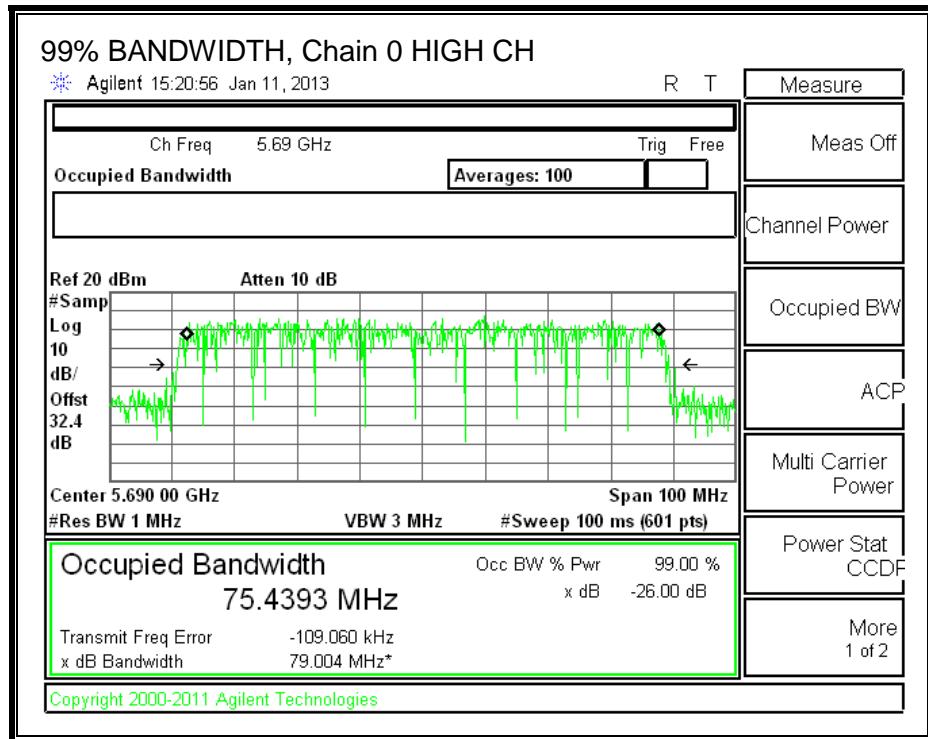
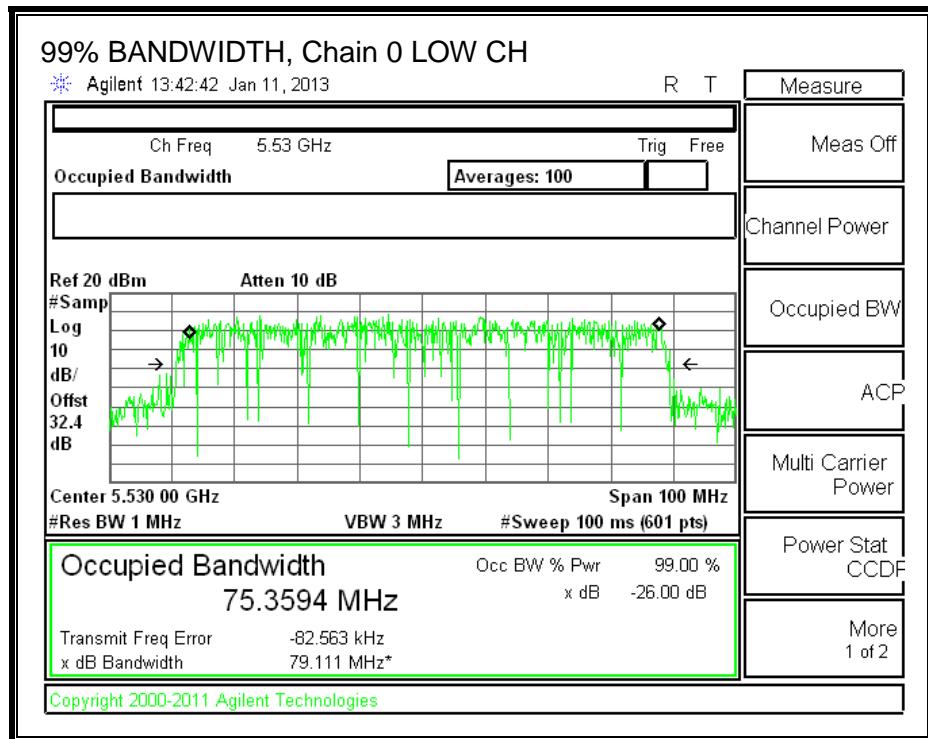
### LIMITS

None; for reporting purposes only.

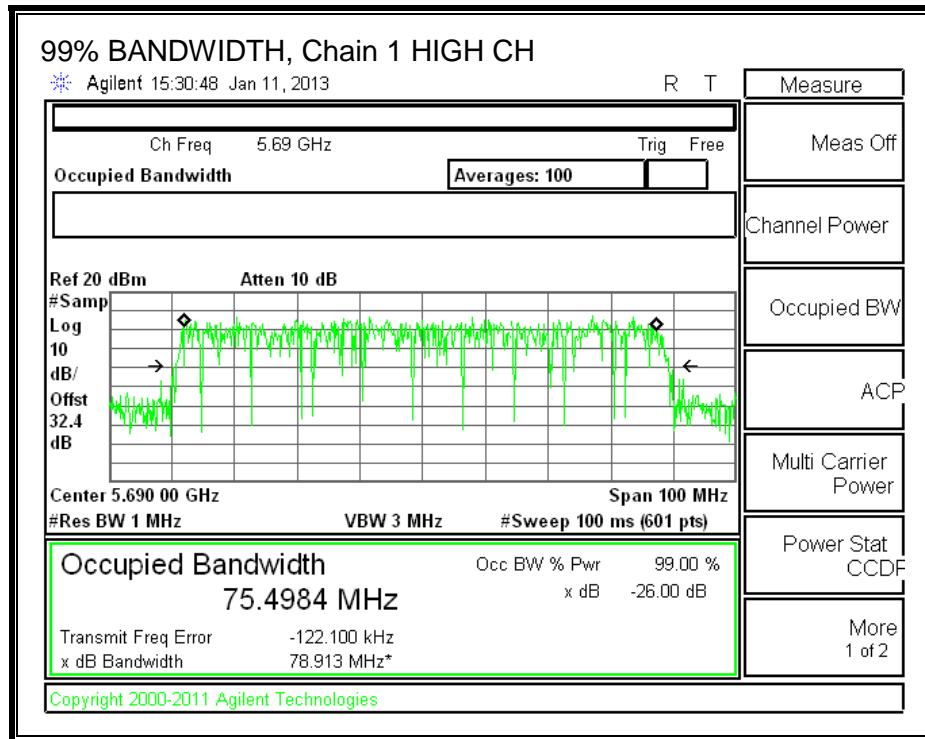
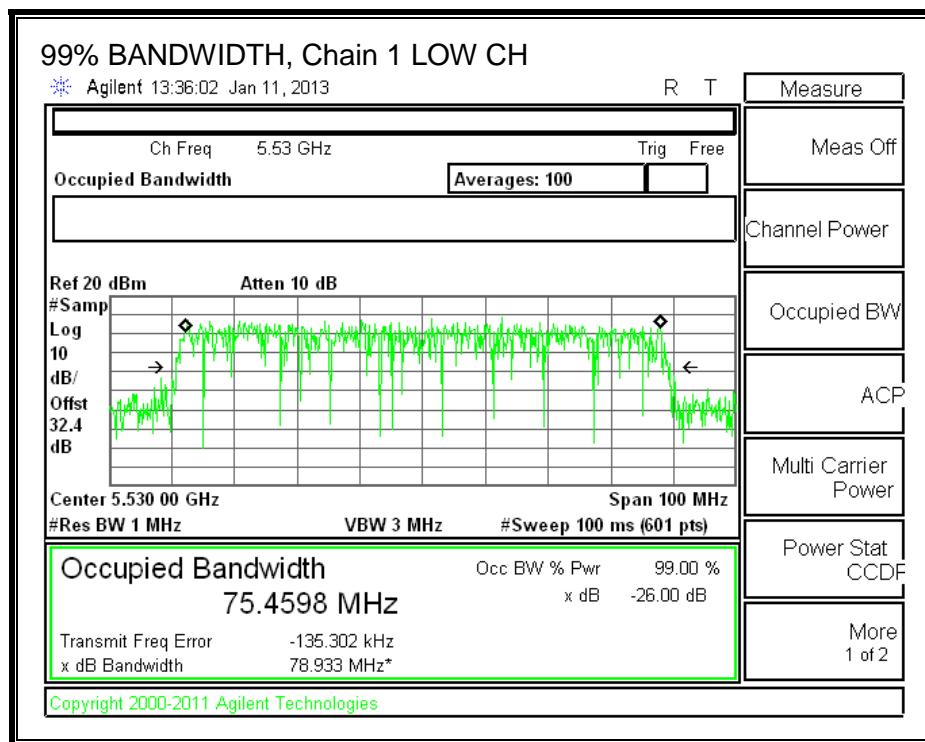
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5530	75.3594	75.4598	75.3452
High	5690	74.4393	75.4984	75.5812

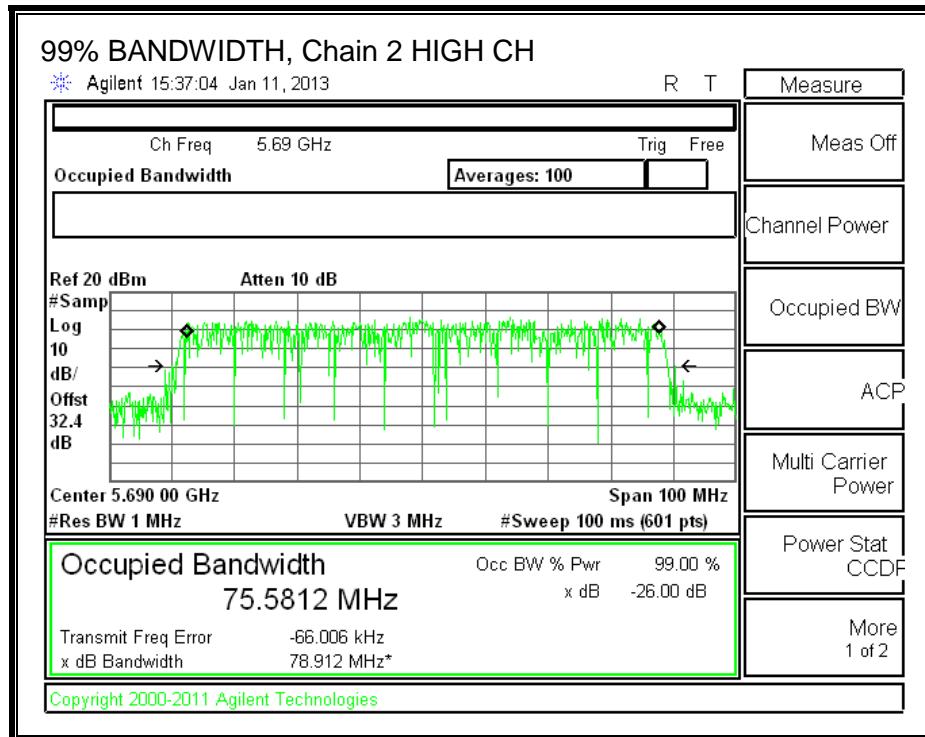
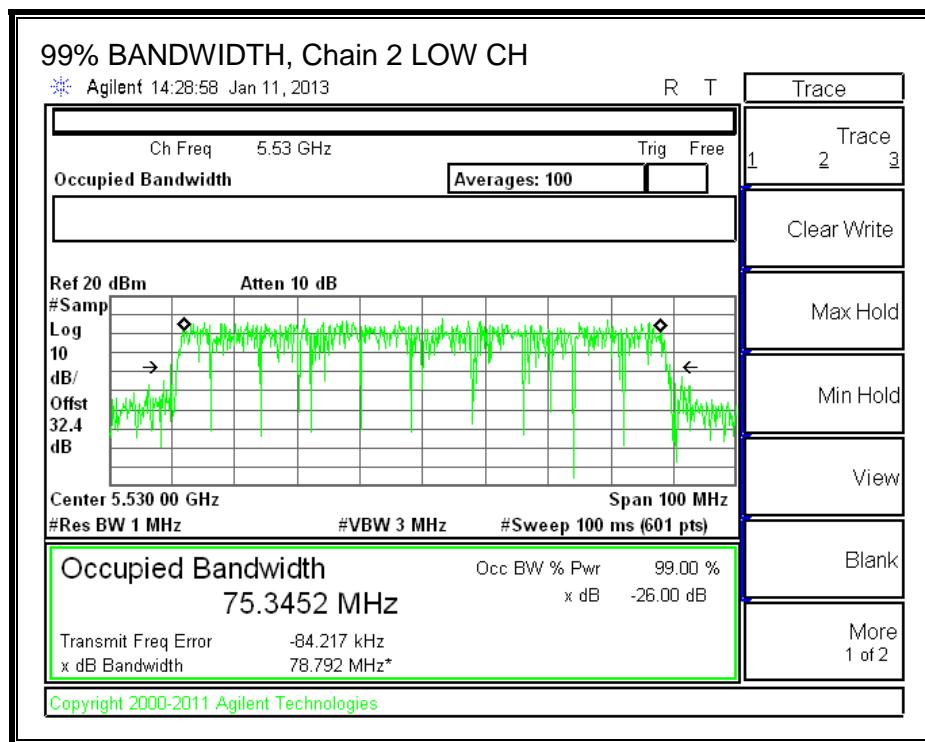
**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.75.3. OUTPUT AVERAGE POWER AND PSD

#### 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  $10 + 10 \log B$ , 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 for output power 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)
3.00	1.70	3.80	2.92

The TX chains are correlated for PSD 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)
3.00	1.70	3.80	7.65

### OUTPUT POWER RESULTS

#### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)	Uncorrelated Gain (dBi)
LOW	5530	81.67	75.3452	7.65	2.92
HIGH	5690	76.00	72.4667	7.65	2.92

#### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
LOW	5530	24.00	24.00	30.00	24.00
HIGH	5690	24.00	24.00	30.00	24.00

Duty Cycle CF (dB)	0.09	
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#### 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	5530	12.00	12.20	12.10	16.87	24.00	-7.13
HIGH	5690	18.58	18.72	18.73	23.54	24.00	-0.46

## PSD RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5530	81.80	75.2734	7.65
High	5690	82.00	74.9333	7.65

### Limits

Channel	Frequency (MHz)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5530	9.35	11.00	9.35
High	5690	9.35	11.00	9.35

Duty Cycle CF (dB)	0.09	Included in PPSD
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### 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	5530	-1.594	-2.085	-2.007	2.97	9.35	-6.38
High	5690	1.792	0.683	1.749	6.30	9.35	-3.05

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)	Uncorrelated Gain (dBi)
Mid	5690	4.7	2.9836	7.65	2.92

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC PSD Limit (dBm)	PSD Limit (dBm)
Mid	5690	17.68	15.75	21.75	15.75	9.35	11.00	9.35

Duty Cycle CF (dB)	0.09	

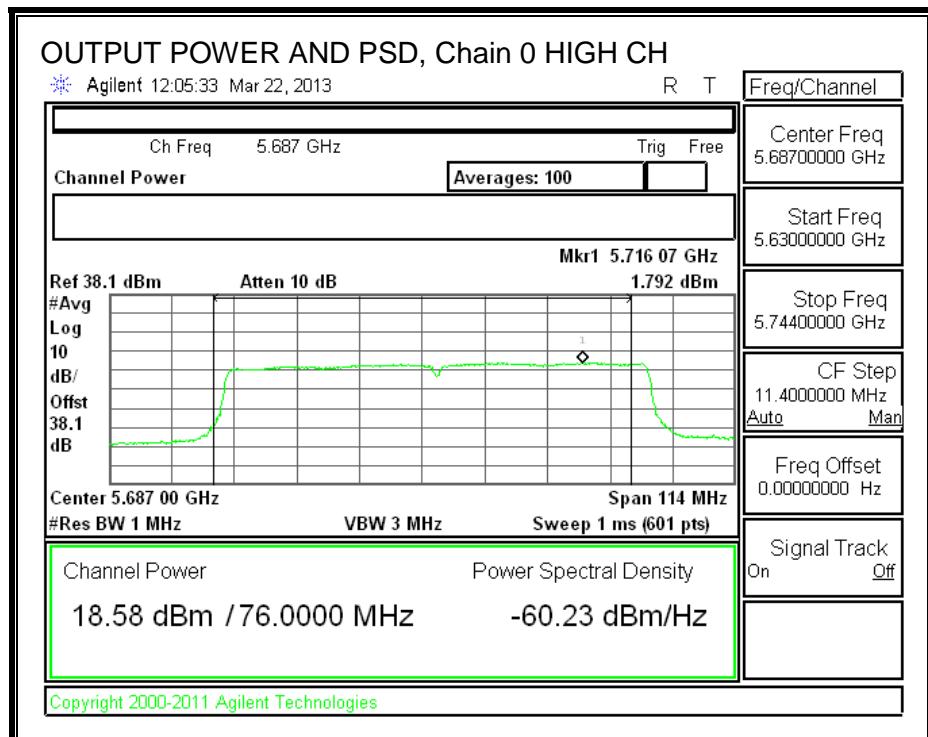
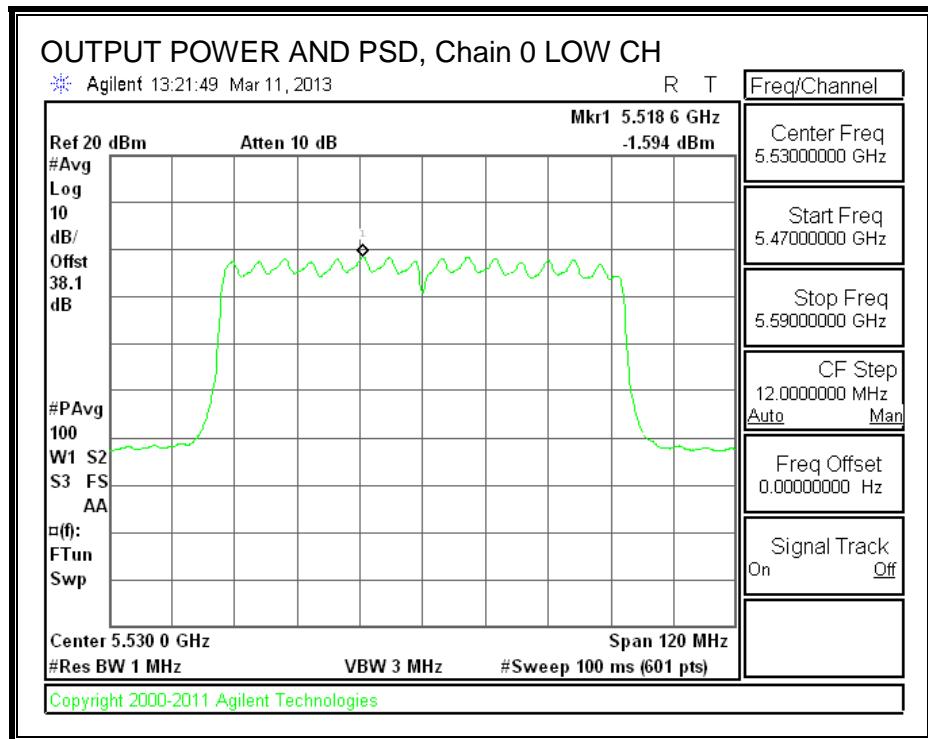
**Output Power Results**

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)
Mid	5690	4.76	3.95	4.22	9.18	15.75	-6.56

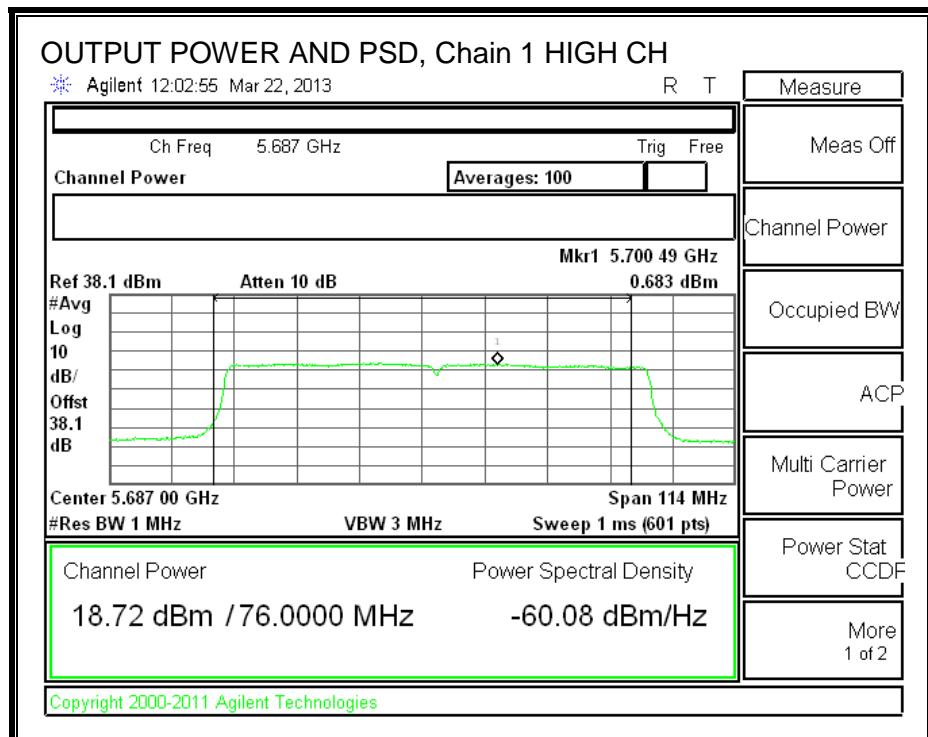
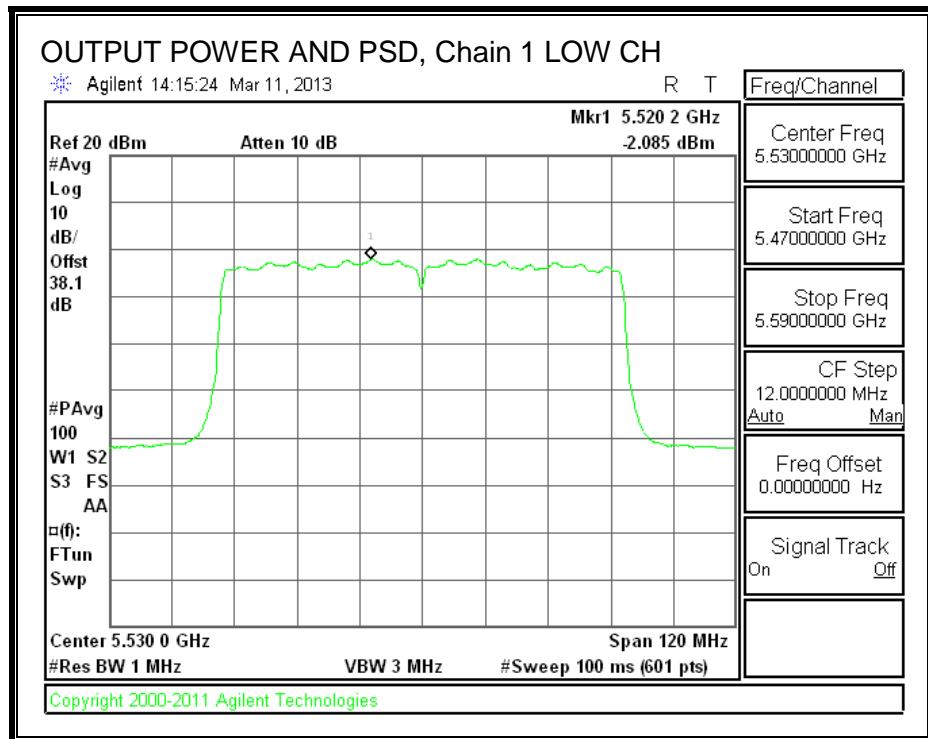
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PPD (dBm)	Chain 1 Meas PPD (dBm)	Chain 2 Meas PPD (dBm)	Total Corr'd PPD (dBm)	PPD Limit (dBm)	PPD Margin (dB)
Mid	5690	0.485	-0.556	-0.419	4.72	9.35	-4.63

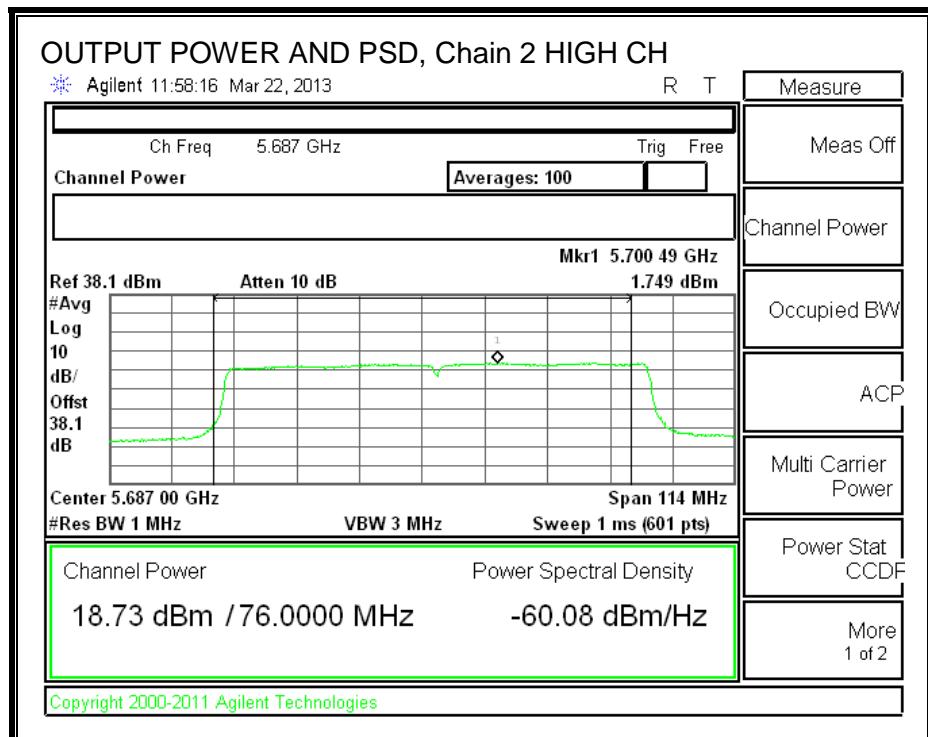
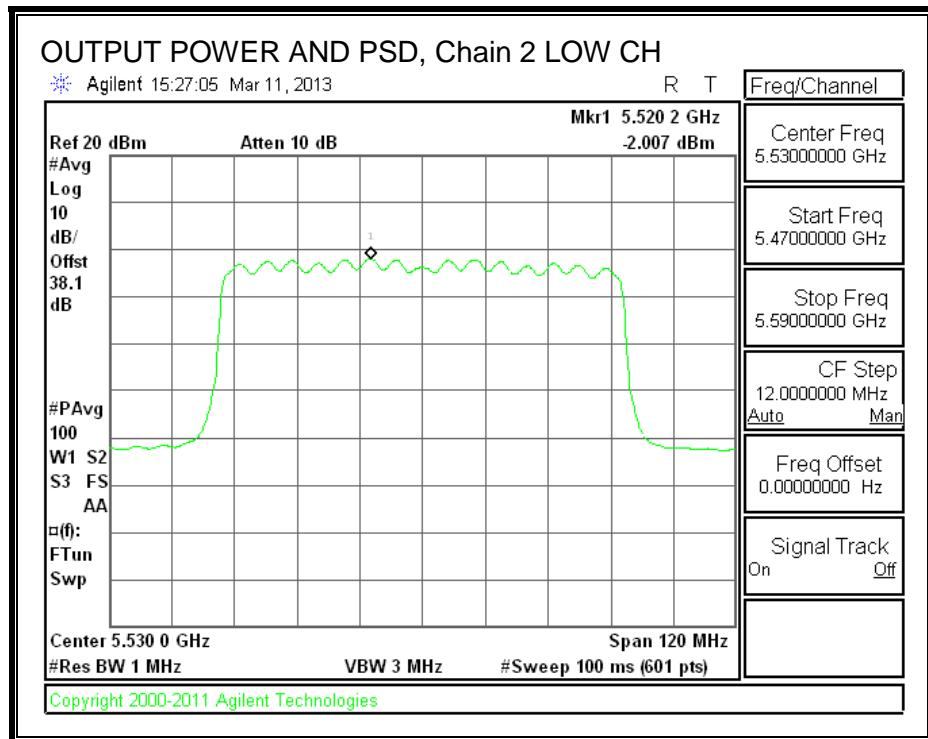
## OUTPUT POWER AND PSD, Chain 0



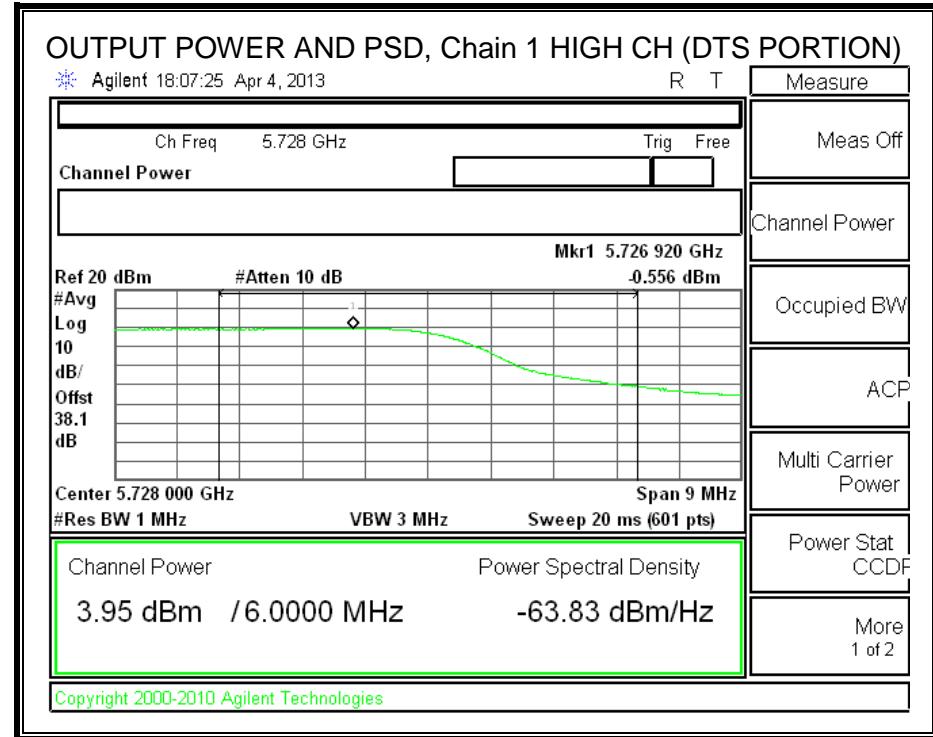
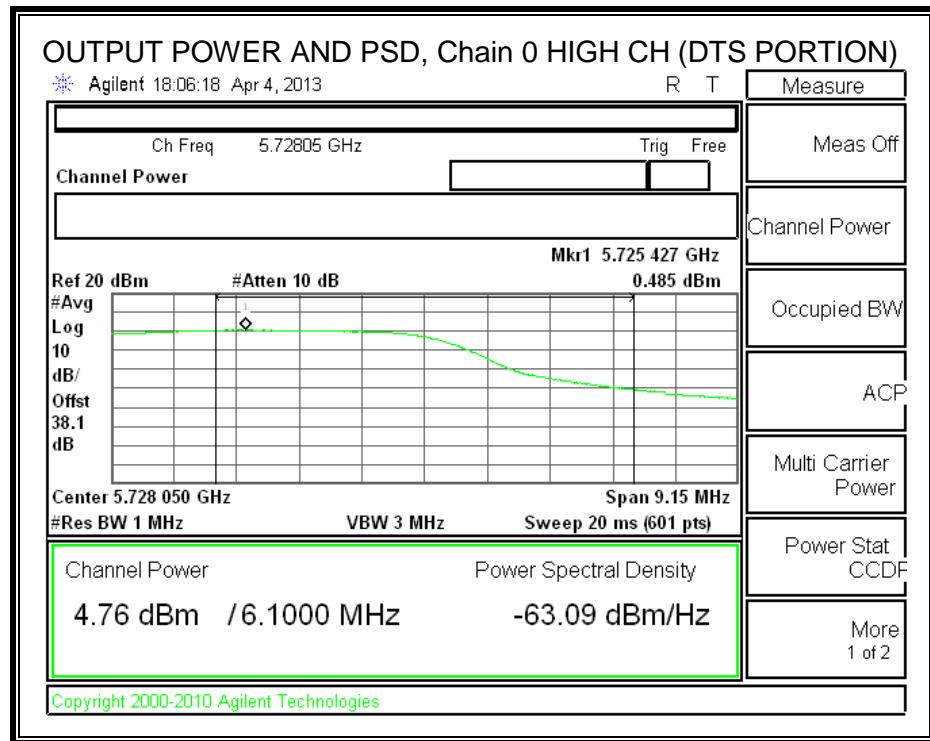
## OUTPUT POWER AND PSD, Chain 1

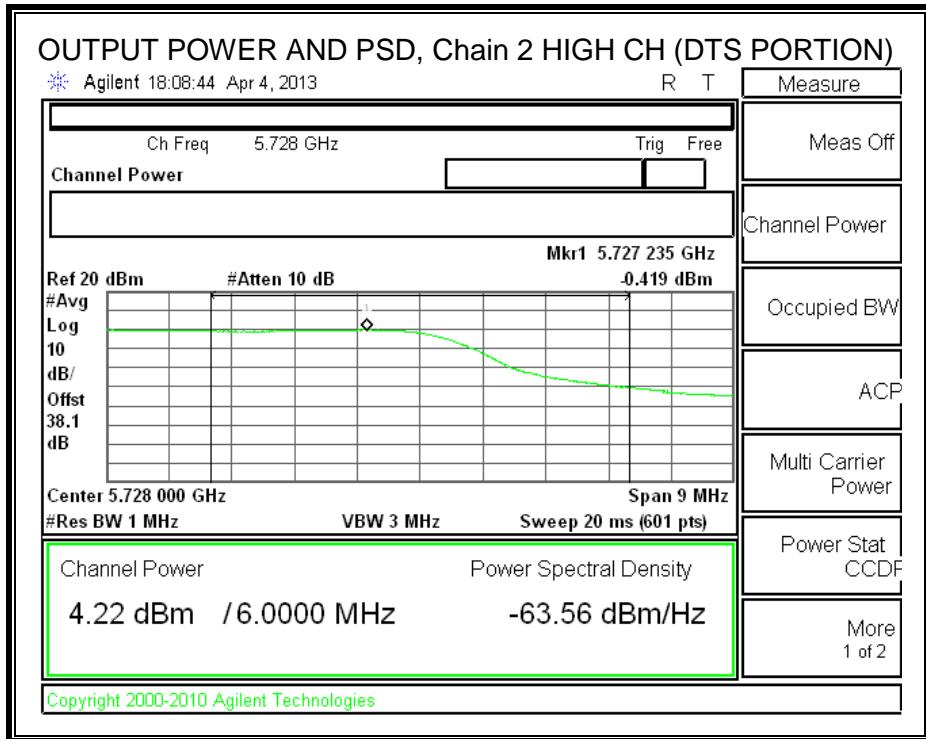


## OUTPUT POWER AND PSD, Chain 2



**DTS PORTION OUTPUT POWER AND PSD**





#### 8.75.4. TPC POWER

##### LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.2 (3)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

##### RESULTS

The maximum EIRP is less than 500 mW; therefore, TPC is not required.

## 8.76. 802.11ac VHT80 BF 3TX MODE IN THE 5.6 GHz BAND

Covered by testing 11ac VHT80 CDD 3TX mode, the power per chain used for 11ac VHT80 CDD 3TX mode is the same power per chain that will be used for 11ac VHT80 BF 3TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.76.1. OUTPUT AVERAGE POWER AND PSD

#### 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  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 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 correlated for output power 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)
3.00	1.70	3.80	7.65

### OUTPUT POWER RESULTS

#### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
LOW	5530	81.67	75.3452	7.65
HIGH	5690	76.00	72.4667	7.65

#### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
LOW	5530	22.35	24.00	30.00	22.35
HIGH	5690	22.35	24.00	30.00	22.35

Duty Cycle CF (dB)	0.09	
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#### 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	5530	12.00	12.20	12.10	16.87	22.35	-5.48
HIGH	5690	16.38	16.21	16.13	21.10	22.35	-1.25

**Limits (FCC), portion in 5.8 GHz UNII band**

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Gain (dBi)
Mid	5690	4.7	2.9836	7.65

**Limits**

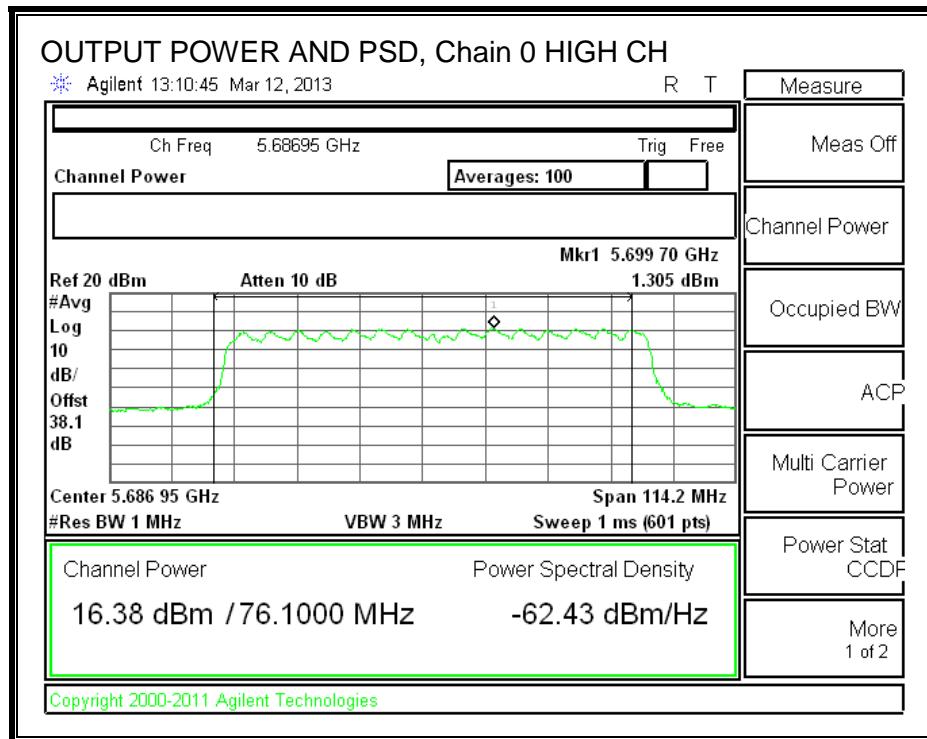
Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)
Mid	5690	16.03	15.75	21.75	14.10

Duty Cycle CF (dB)	0.09
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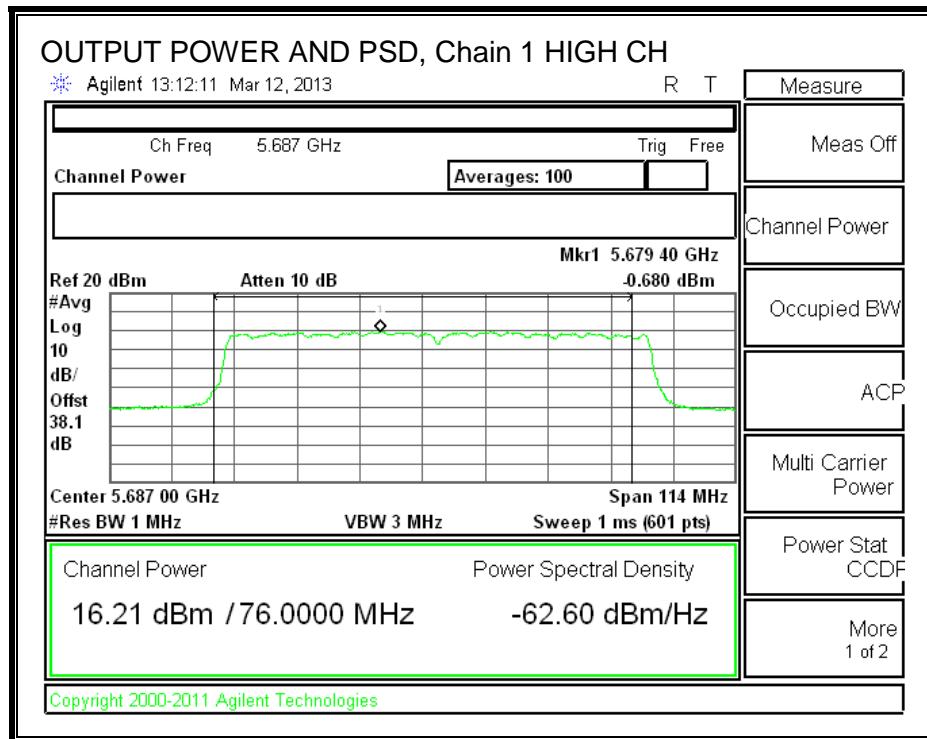
**Output Power Results**

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)
Mid	5690	4.76	3.95	4.22	9.18	14.10	-4.91

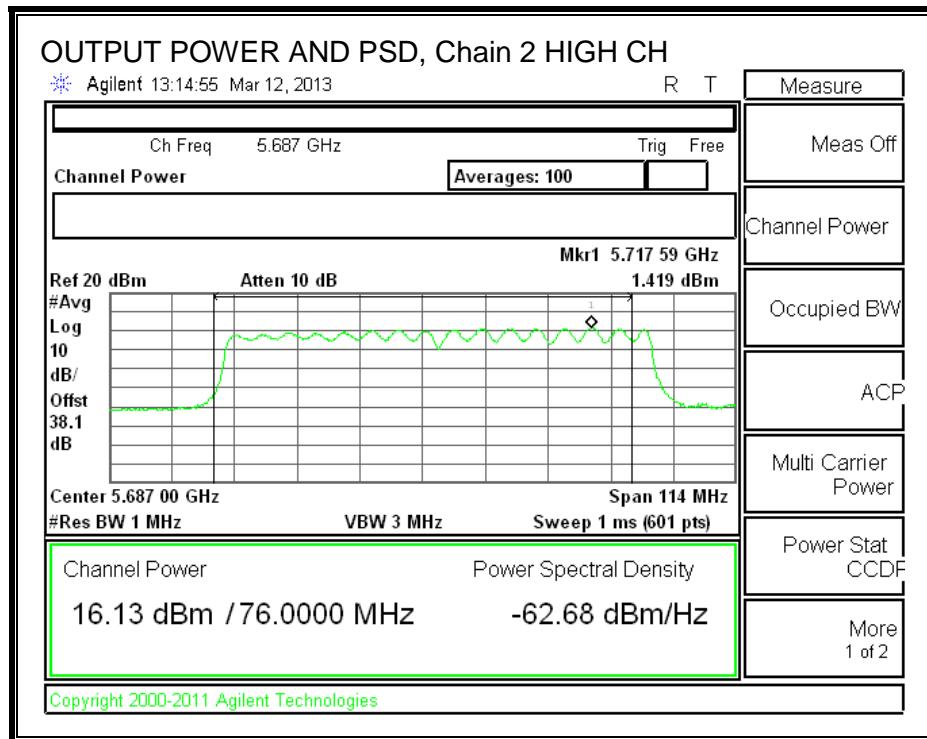
**OUTPUT POWER AND PSD, Chain 0**



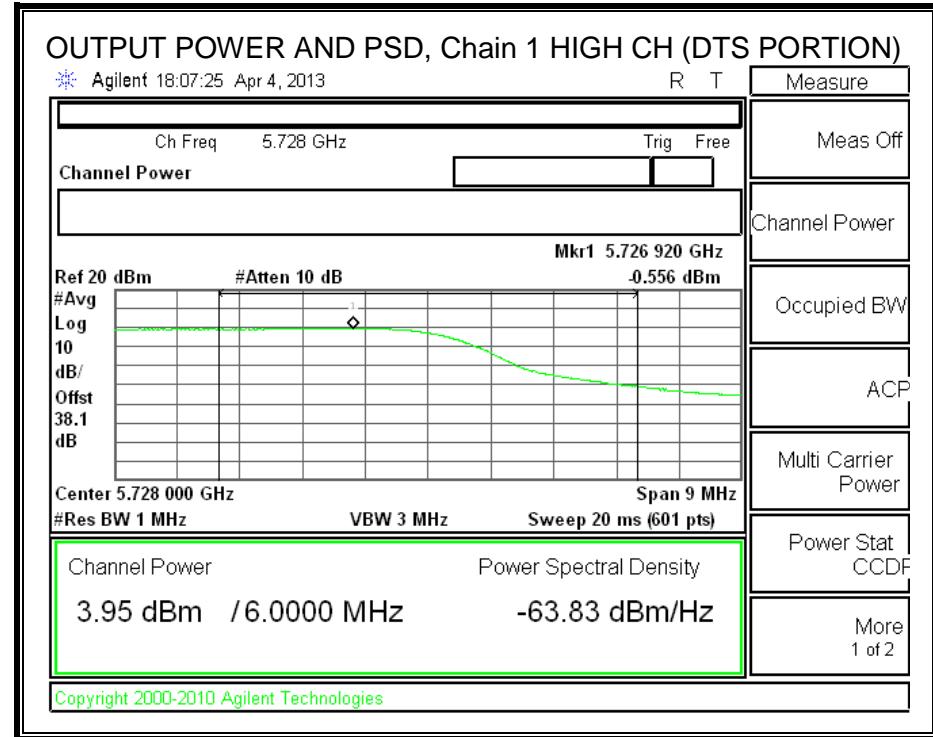
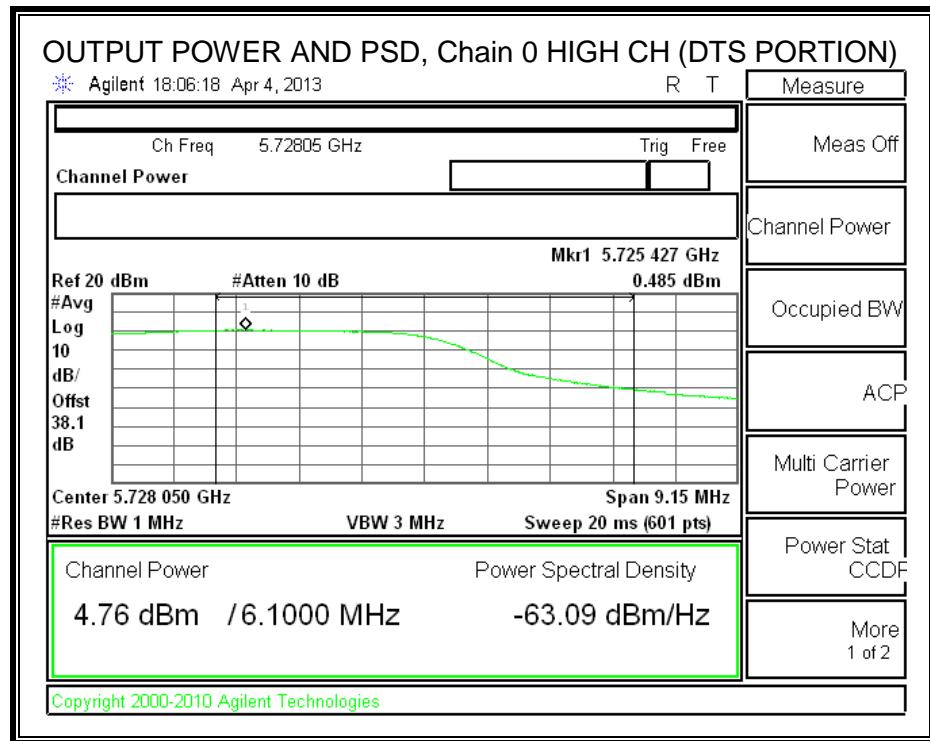
**OUTPUT POWER AND PSD, Chain 1**

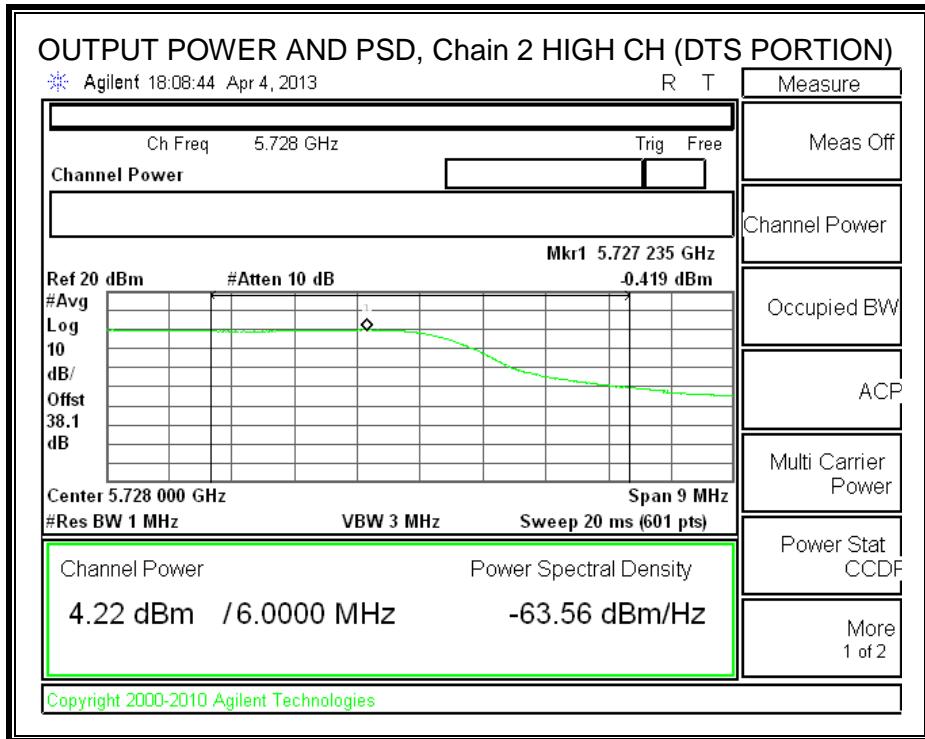


**OUTPUT POWER AND PSD, Chain 2**



**DTS PORTION OUTPUT POWER AND PSD**





## 9. RADIATED TEST RESULTS

### 9.1. 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.

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.

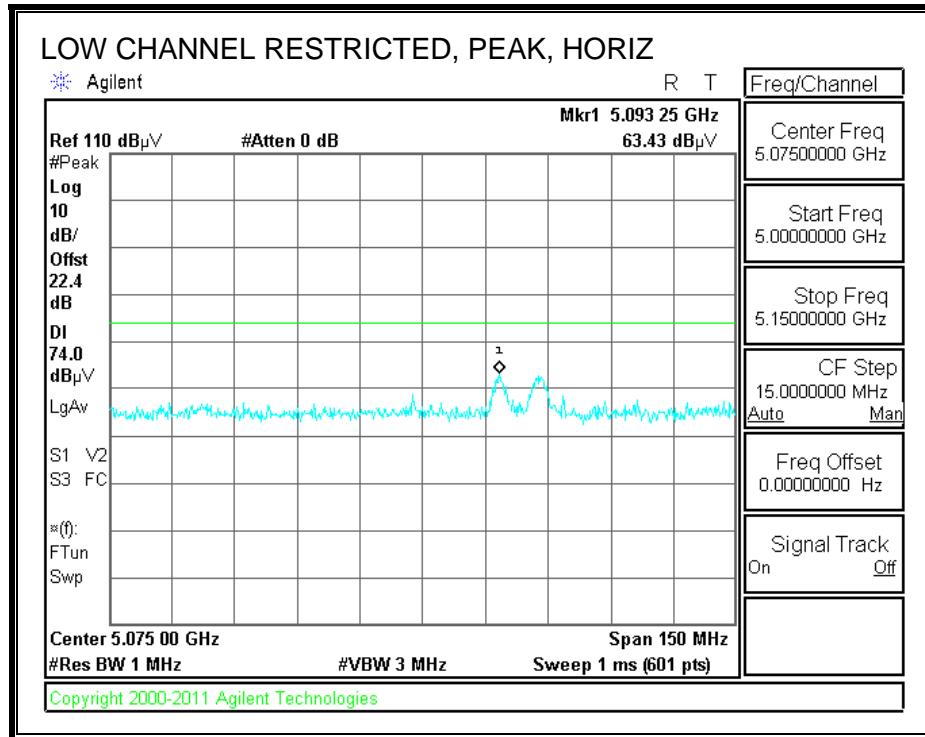
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

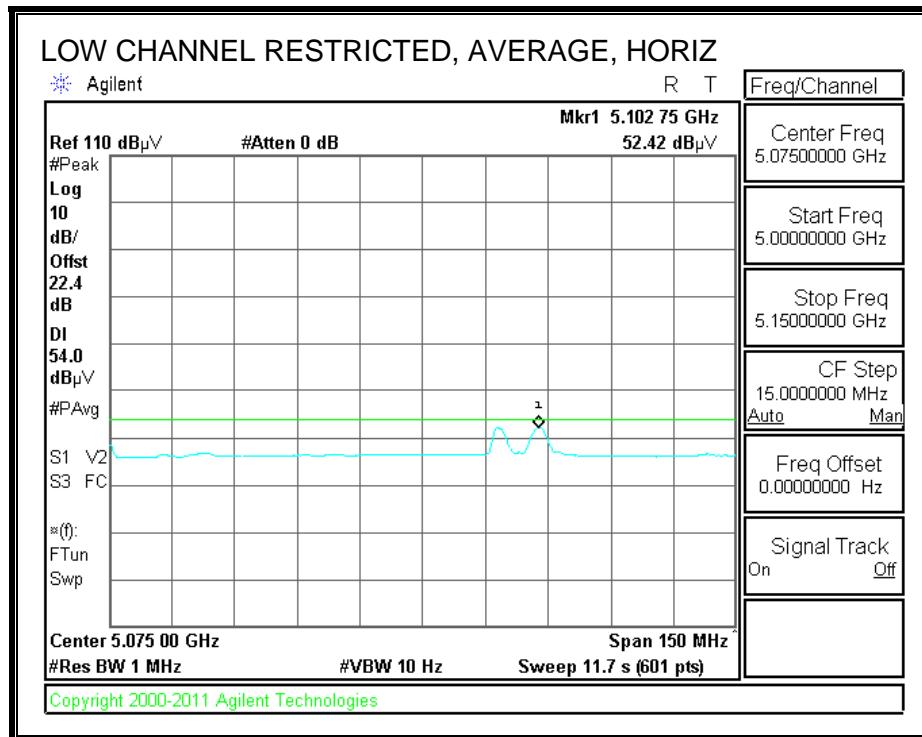
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

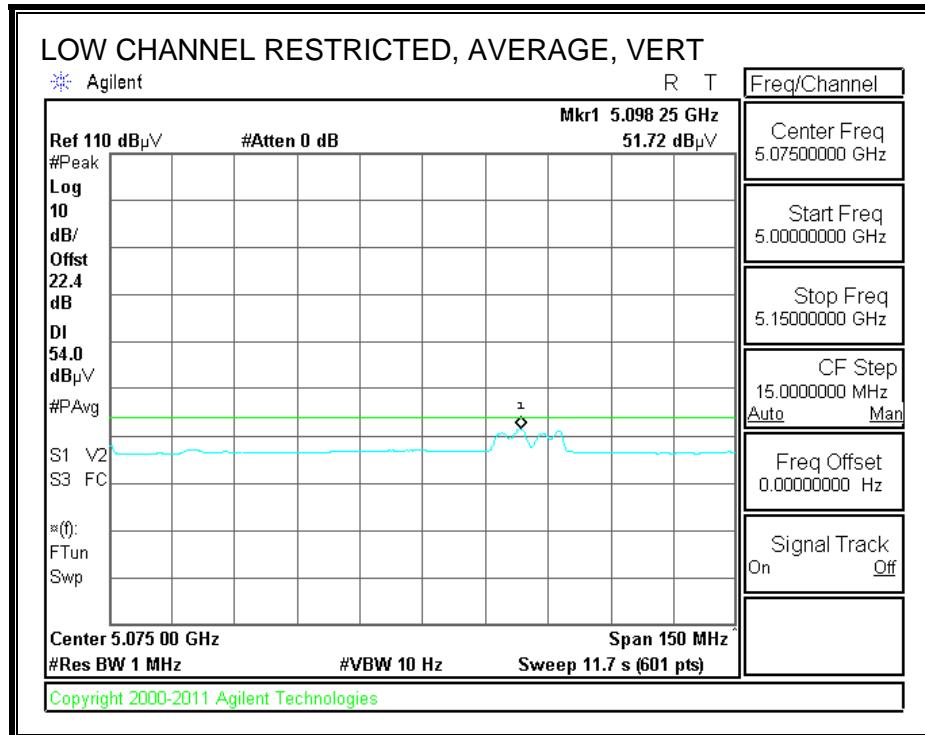
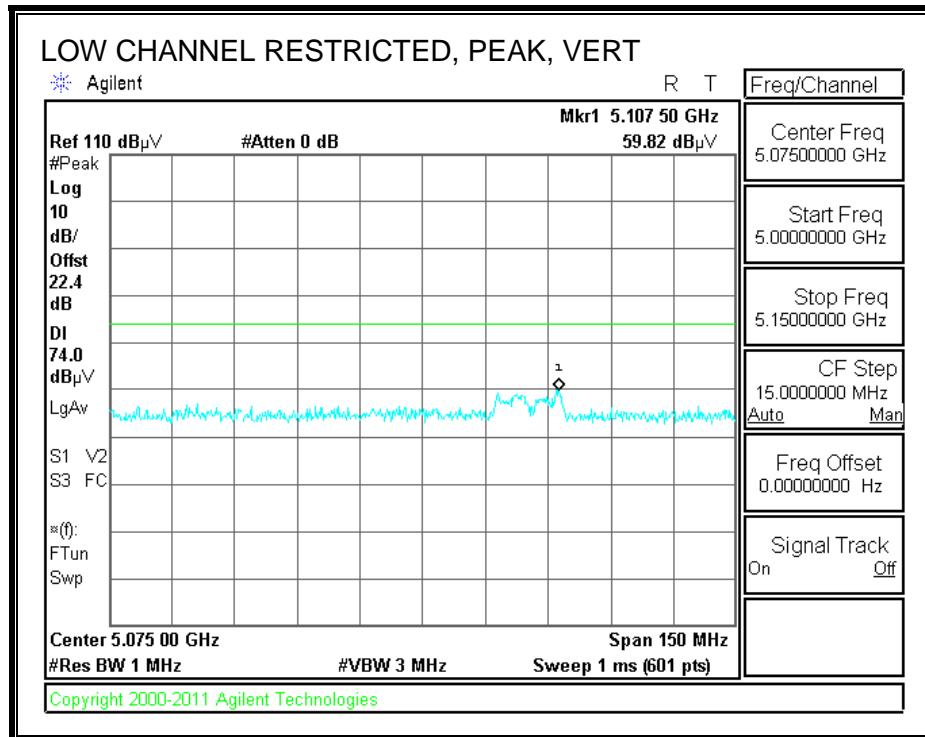
## 9.2. TRANSMITTER ABOVE 1 GHz

### 9.2.1. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

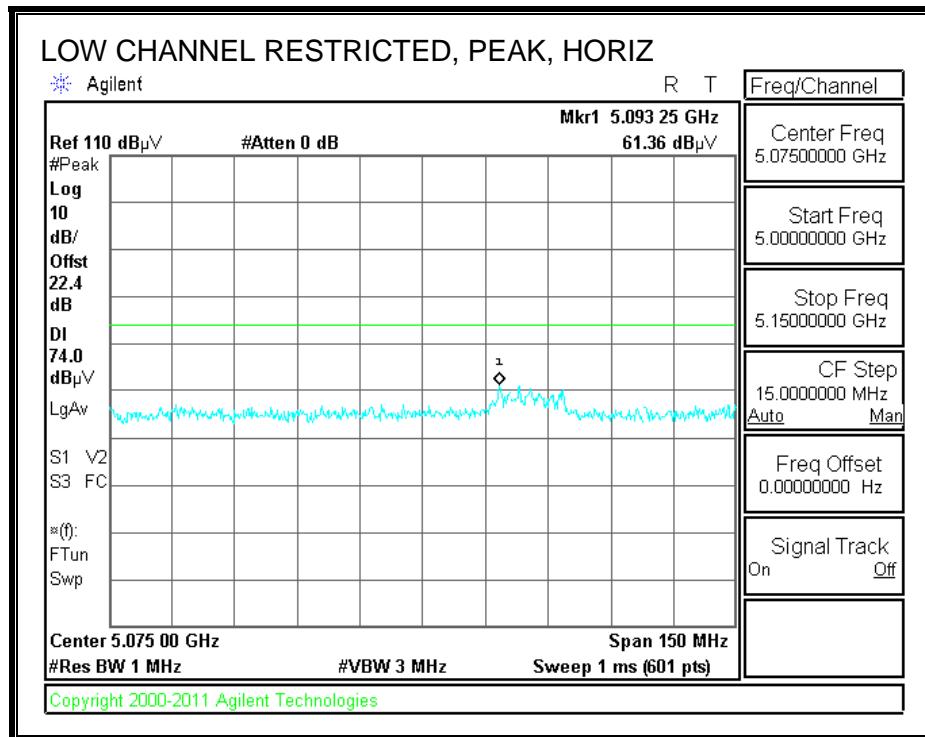
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	-10.5	H	A	
15.540	3.0	34.0	39.1	13.0	-31.9	0.0	0.7	54.8	74.0	-19.2	V	P	
15.540	3.0	22.8	39.1	13.0	-31.9	0.0	0.7	43.6	54.0	-10.4	V	A	
<b>5200 MHz 3IX CDD</b>													
15.600	3.0	33.6	38.8	13.0	-31.9	0.0	0.7	54.3	74.0	-19.7	V	P	
15.600	3.0	22.2	38.8	13.0	-31.9	0.0	0.7	42.9	54.0	-11.1	V	A	
15.600	3.0	32.9	38.8	13.0	-31.9	0.0	0.7	53.6	74.0	-20.4	H	P	
15.600	3.0	26.4	38.8	13.0	-31.9	0.0	0.7	47.1	54.0	-6.9	H	A	
<b>5240 MHz 3IX CDD</b>													
15.720	3.0	33.6	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	-20.0	H	P	
15.720	3.0	22.9	38.4	13.1	-31.9	0.0	0.7	43.2	54.0	-10.8	H	A	
15.720	3.0	33.7	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	-20.0	V	P	
15.720	3.0	23.1	38.4	13.1	-31.9	0.0	0.7	43.4	54.0	-10.6	V	A	

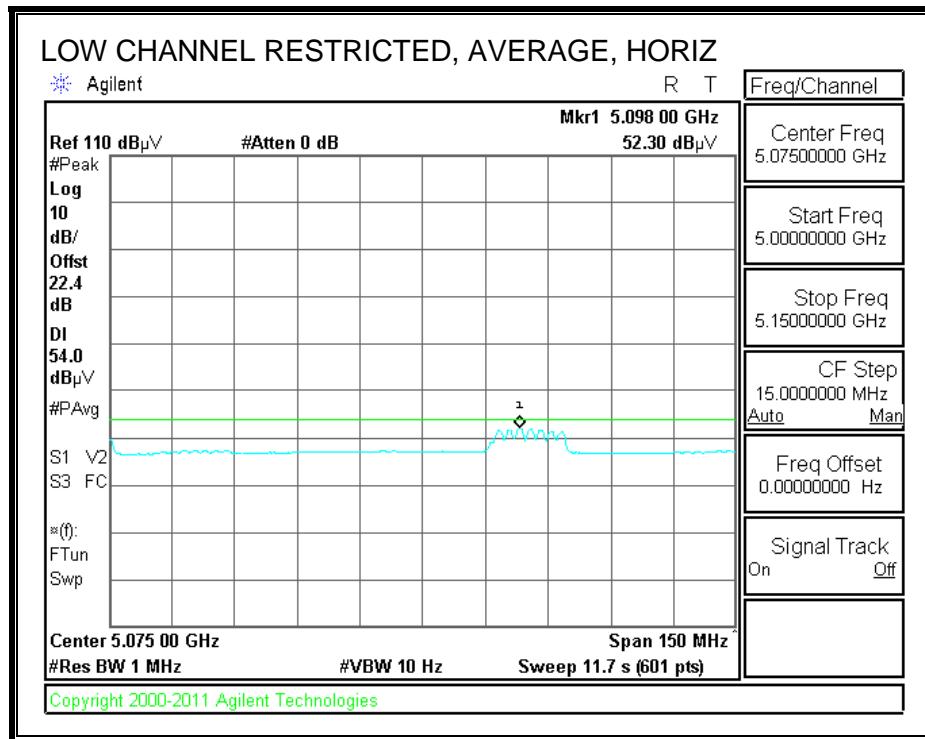
Rev. 4.1.2.7

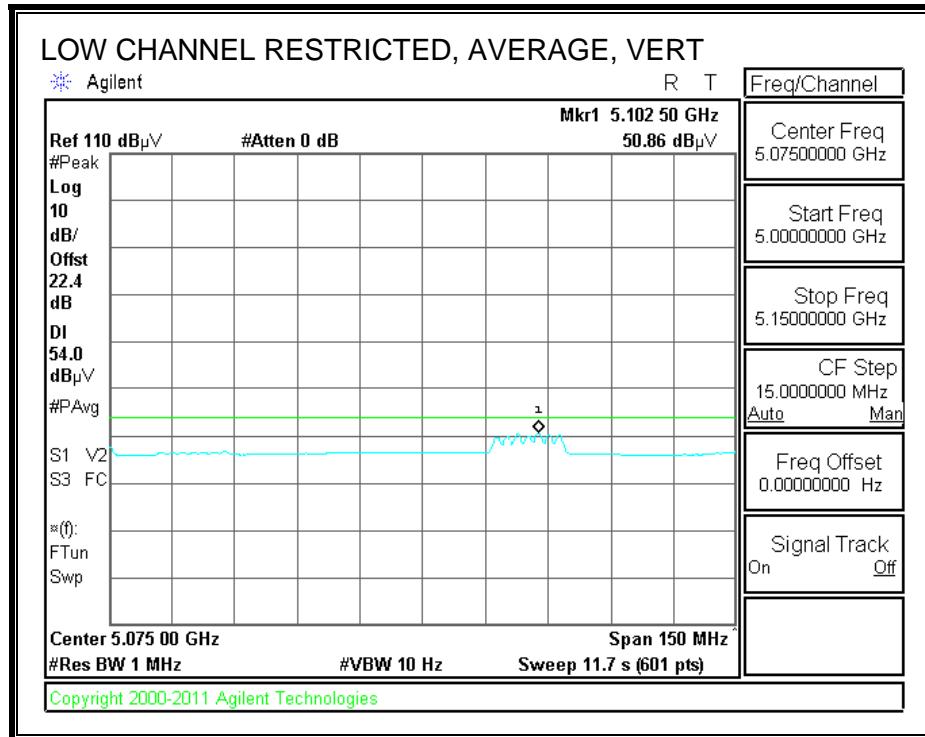
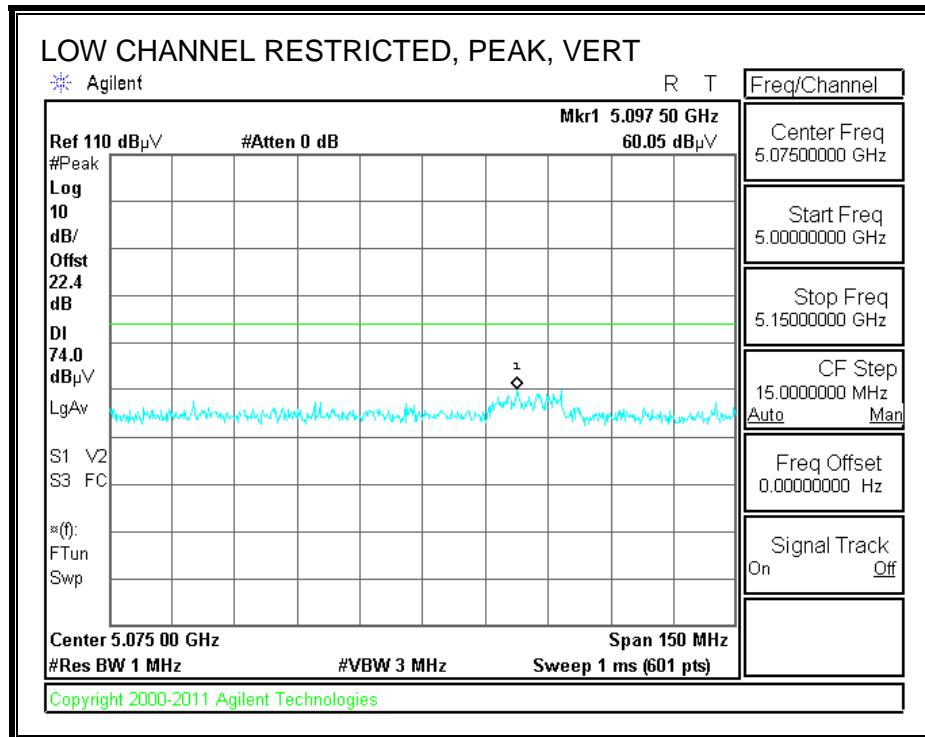
Note: No other emissions were detected above the system noise floor.

## 9.2.2. TX ABOVE 1 GHz, 802.11n HT20 CDD 2TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

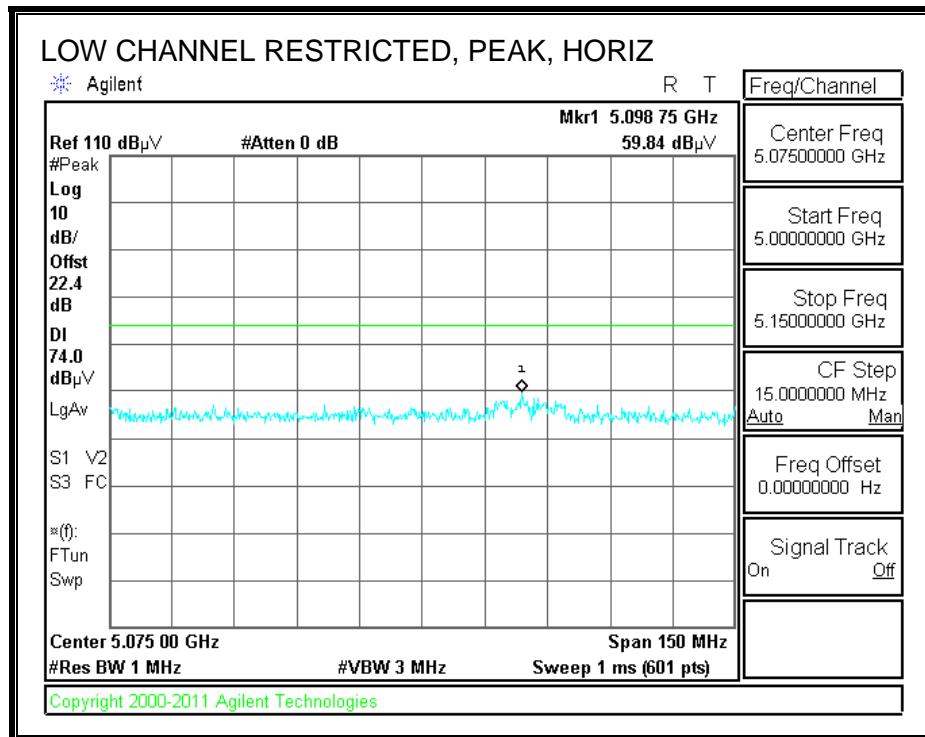
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	<b>-20.2</b>	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	<b>-10.5</b>	H	A	
15.540	3.0	34.0	39.1	13.0	-31.9	0.0	0.7	54.8	74.0	<b>-19.2</b>	V	P	
15.540	3.0	22.8	39.1	13.0	-31.9	0.0	0.7	43.6	54.0	<b>-10.4</b>	V	A	
<b>5200 MHz 3IX CDD</b>													
15.600	3.0	33.6	38.8	13.0	-31.9	0.0	0.7	54.3	74.0	<b>-19.7</b>	V	P	
15.600	3.0	22.2	38.8	13.0	-31.9	0.0	0.7	42.9	54.0	<b>-11.1</b>	V	A	
15.600	3.0	32.9	38.8	13.0	-31.9	0.0	0.7	53.6	74.0	<b>-20.4</b>	H	P	
15.600	3.0	26.4	38.8	13.0	-31.9	0.0	0.7	47.1	54.0	<b>-6.9</b>	H	A	
<b>5240 MHz 3IX CDD</b>													
15.720	3.0	33.6	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	<b>-20.0</b>	H	P	
15.720	3.0	22.9	38.4	13.1	-31.9	0.0	0.7	43.2	54.0	<b>-10.8</b>	H	A	
15.720	3.0	33.7	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	<b>-20.0</b>	V	P	
15.720	3.0	23.1	38.4	13.1	-31.9	0.0	0.7	43.4	54.0	<b>-10.6</b>	V	A	

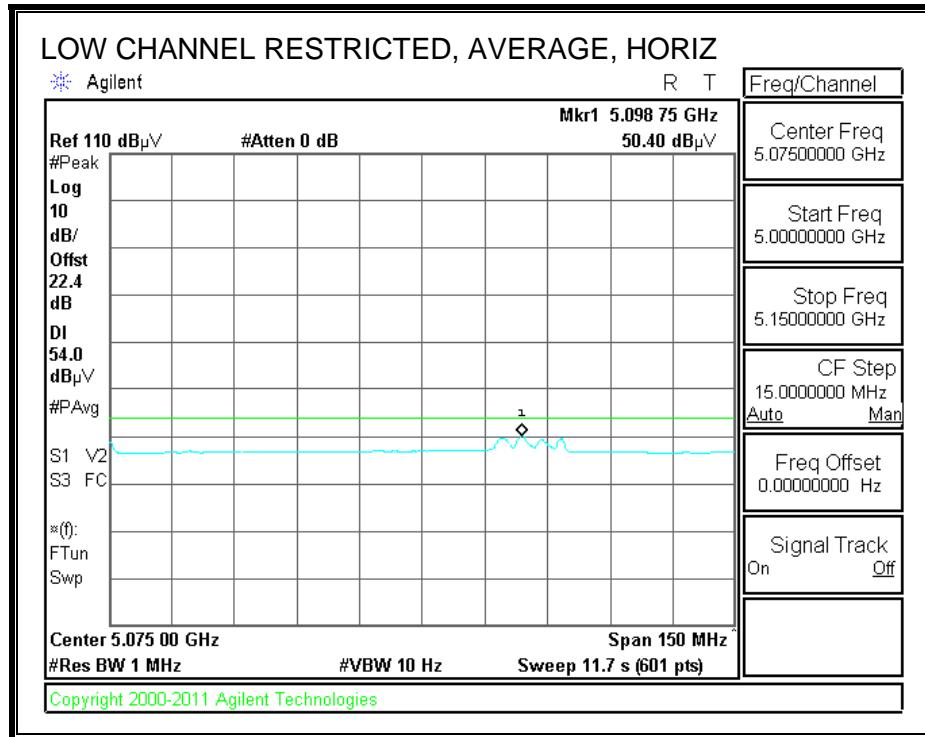
Rev. 4.1.2.7

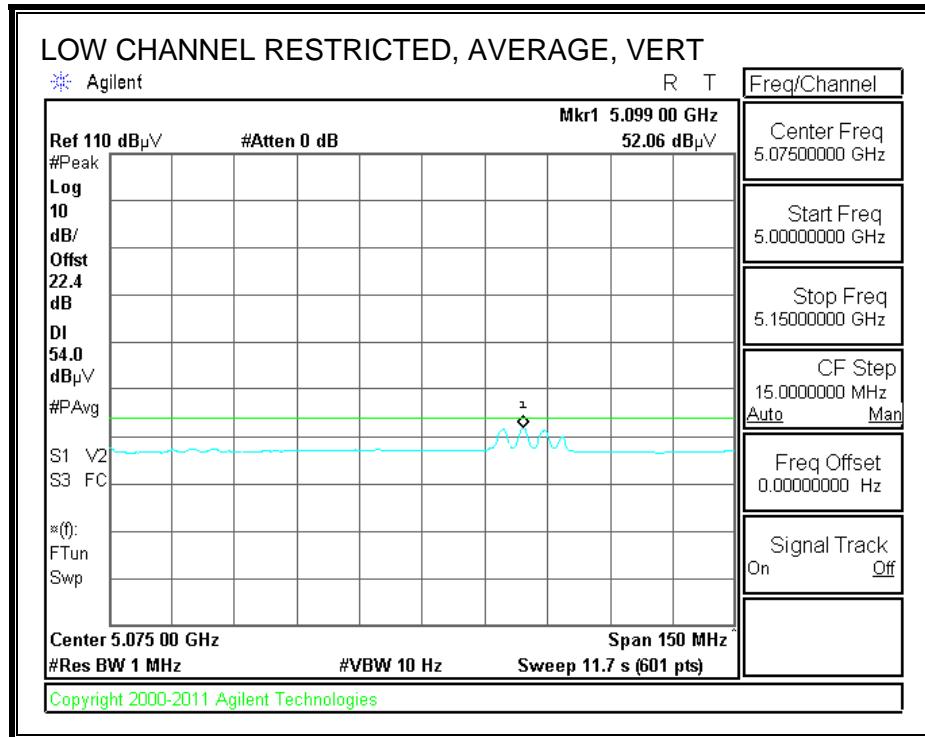
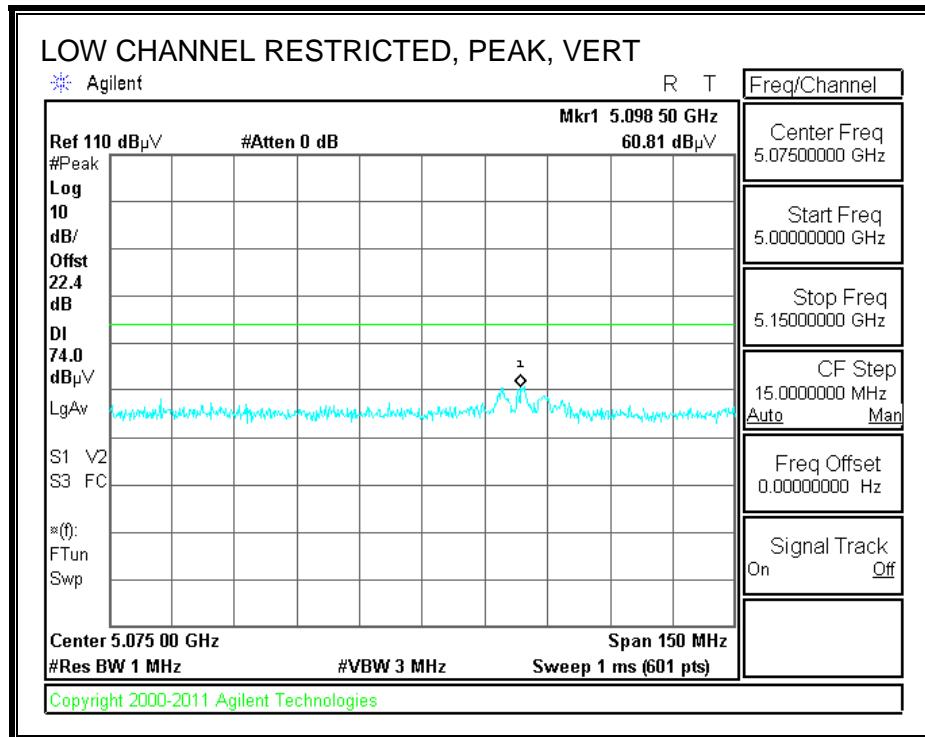
Note: No other emissions were detected above the system noise floor.

### 9.2.3. TX ABOVE 1 GHz 802.11n HT20 CDD 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

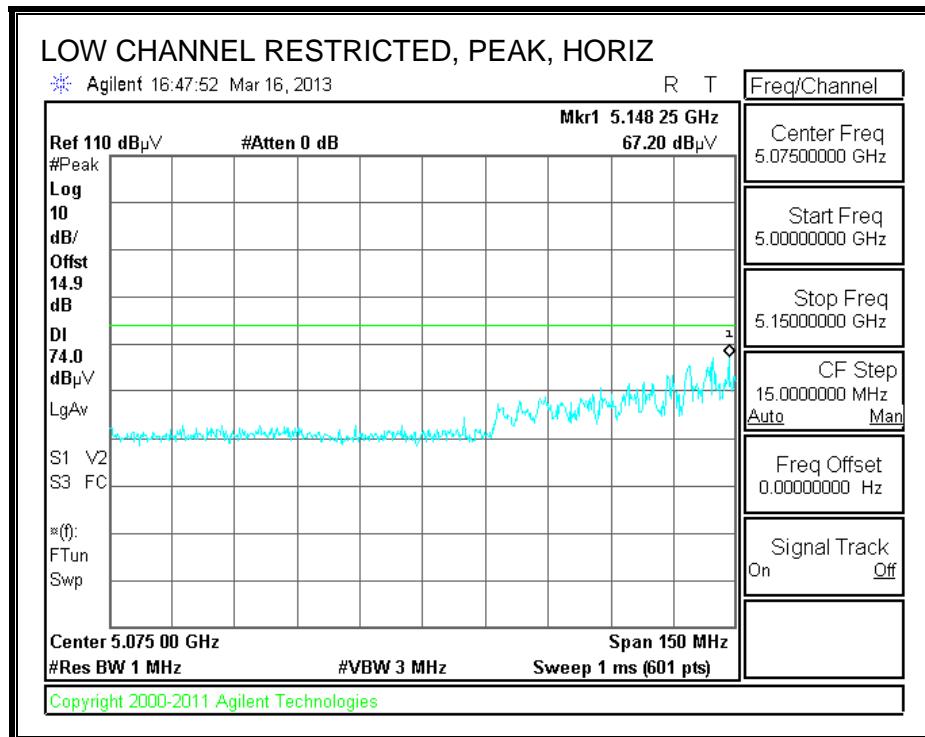
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	<b>-20.2</b>	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	<b>-10.5</b>	H	A	
15.540	3.0	34.0	39.1	13.0	-31.9	0.0	0.7	54.8	74.0	<b>-19.2</b>	V	P	
15.540	3.0	22.8	39.1	13.0	-31.9	0.0	0.7	43.6	54.0	<b>-10.4</b>	V	A	
<b>5200 MHz 3IX CDD</b>													
15.600	3.0	33.6	38.8	13.0	-31.9	0.0	0.7	54.3	74.0	<b>-19.7</b>	V	P	
15.600	3.0	22.2	38.8	13.0	-31.9	0.0	0.7	42.9	54.0	<b>-11.1</b>	V	A	
15.600	3.0	32.9	38.8	13.0	-31.9	0.0	0.7	53.6	74.0	<b>-20.4</b>	H	P	
15.600	3.0	26.4	38.8	13.0	-31.9	0.0	0.7	47.1	54.0	<b>-6.9</b>	H	A	
<b>5240 MHz 3IX CDD</b>													
15.720	3.0	33.6	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	<b>-20.0</b>	H	P	
15.720	3.0	22.9	38.4	13.1	-31.9	0.0	0.7	43.2	54.0	<b>-10.8</b>	H	A	
15.720	3.0	33.7	38.4	13.1	-31.9	0.0	0.7	54.0	74.0	<b>-20.0</b>	V	P	
15.720	3.0	23.1	38.4	13.1	-31.9	0.0	0.7	43.4	54.0	<b>-10.6</b>	V	A	

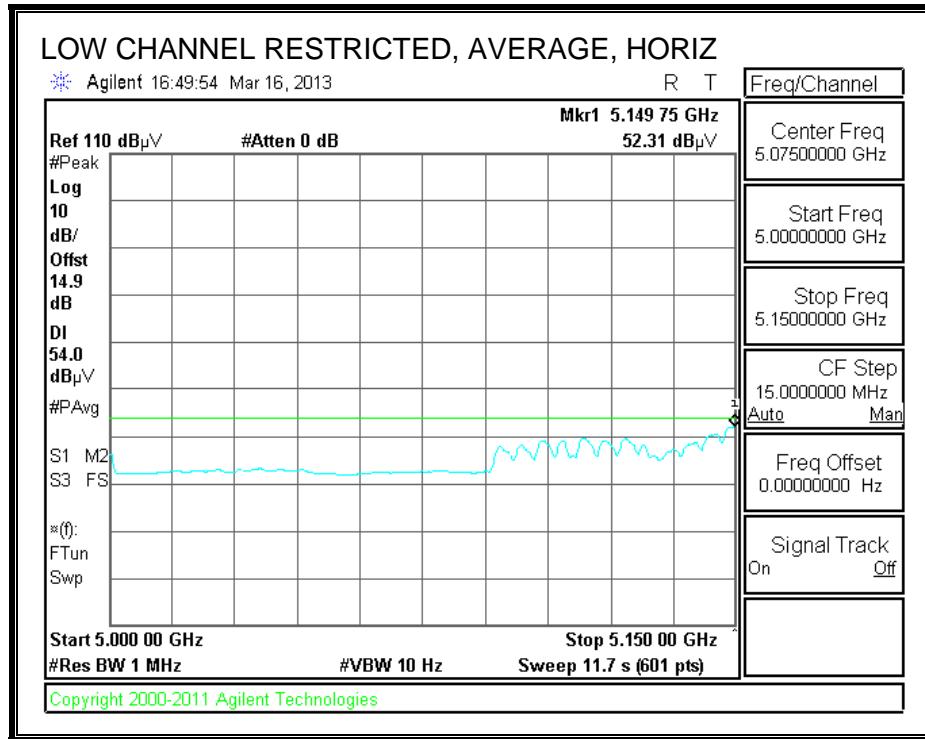
Rev. 4.1.2.7

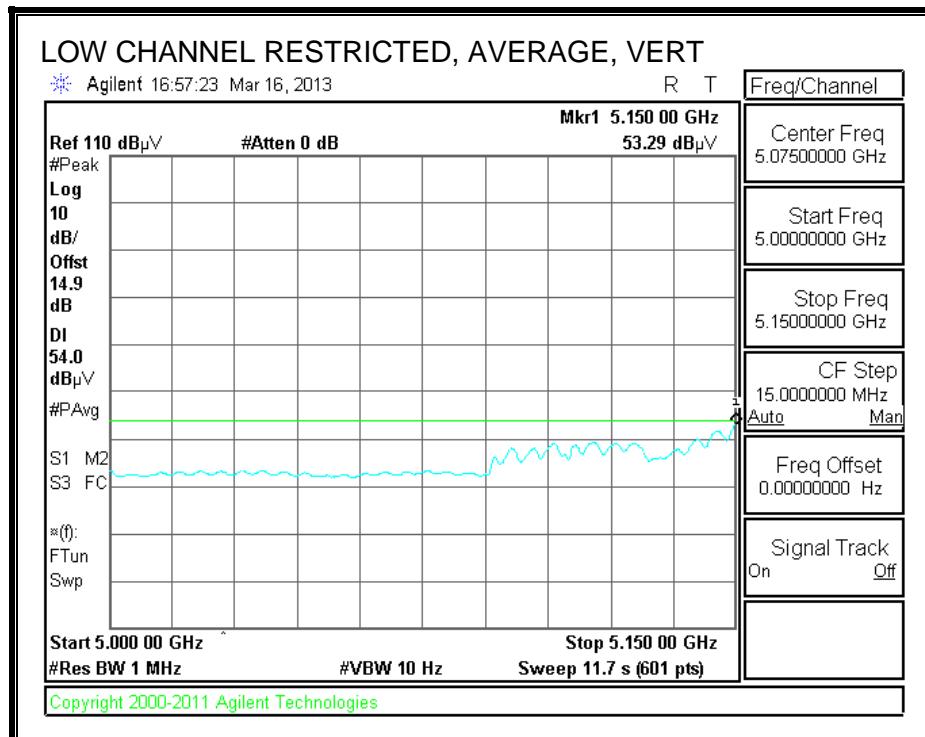
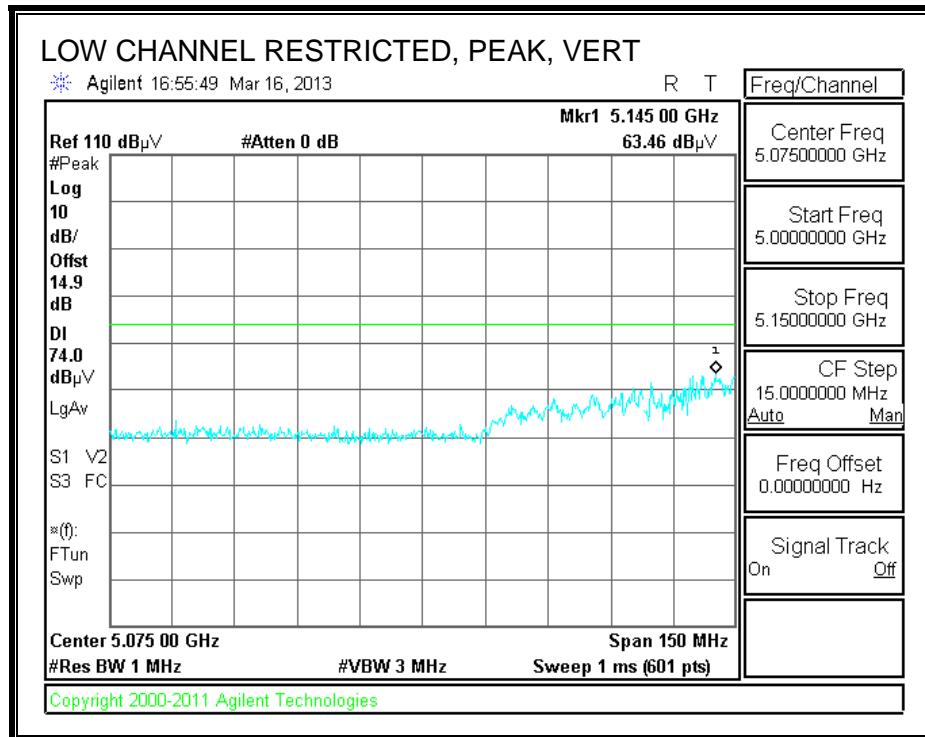
Note: No other emissions were detected above the system noise floor.

### 9.2.4. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.2 GHz BAND

#### RESTRICTED BANEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT40 3IX CDD**

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

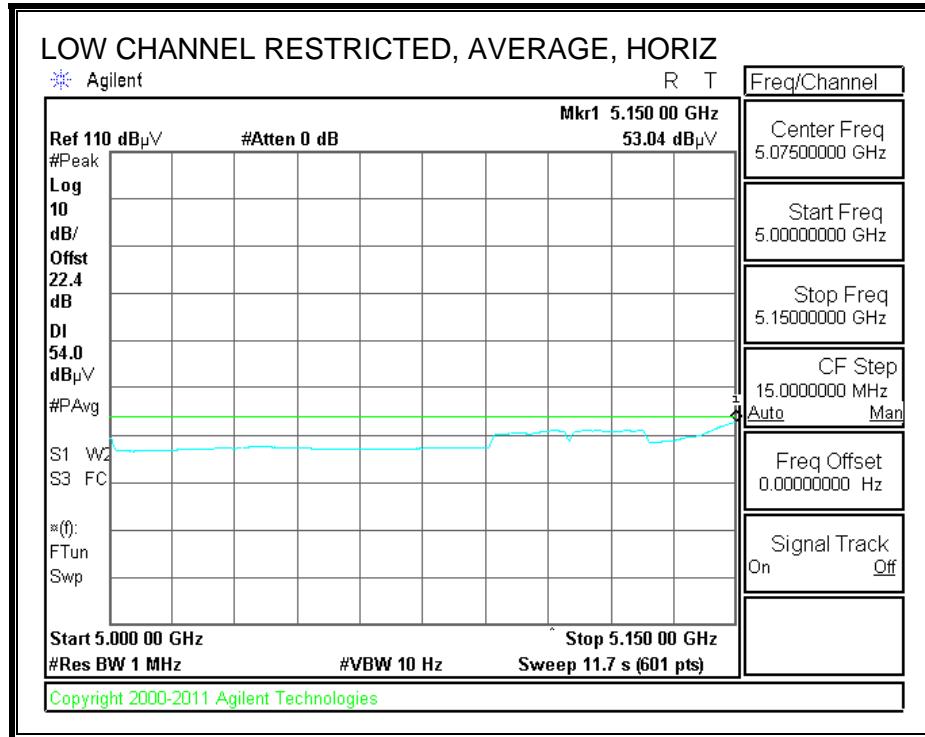
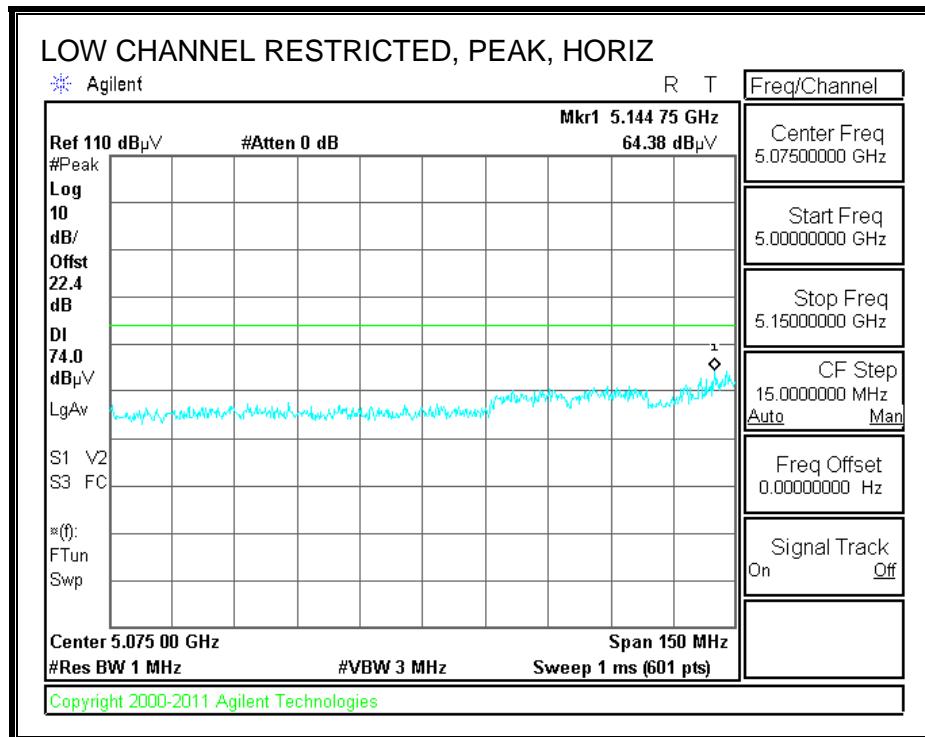
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	32.9	38.9	13.0	-31.9	0.0	0.7	53.6	74.0	-20.4	H	P	
15.570	3.0	23.1	38.9	13.0	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5230 MHz 3IX CDD</b>													
15.690	3.0	34.1	38.5	13.0	-31.9	0.0	0.7	54.5	74.0	-19.5	H	P	
15.690	3.0	23.8	38.5	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	H	A	
15.690	3.0	33.6	38.5	13.0	-31.9	0.0	0.7	54.0	74.0	-20.0	V	P	
15.690	3.0	23.7	38.5	13.0	-31.9	0.0	0.7	44.1	54.0	-9.9	V	A	

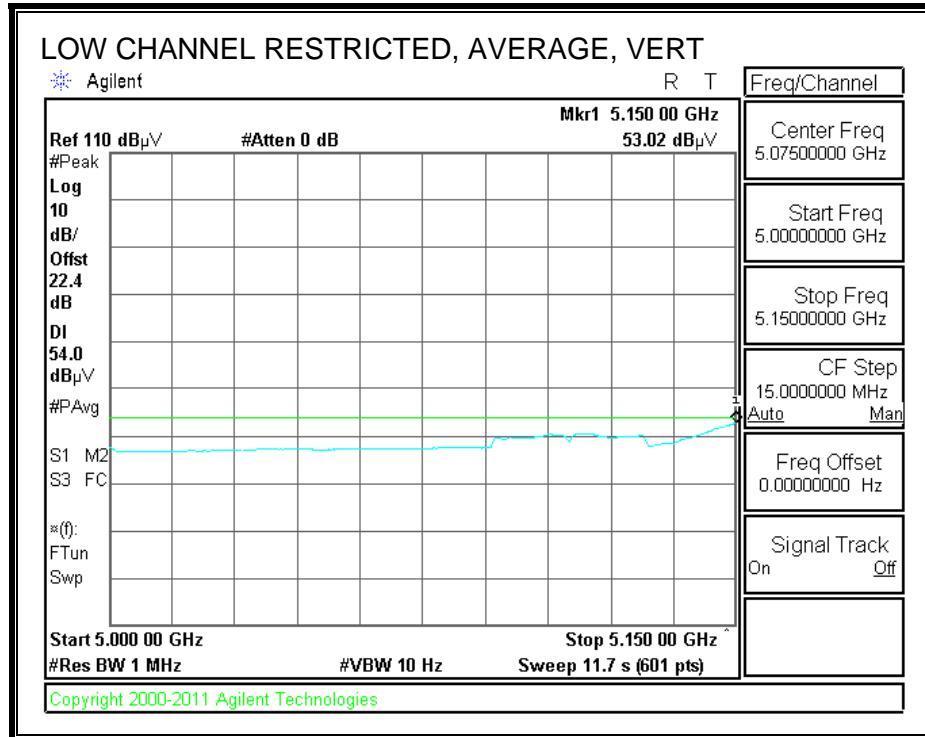
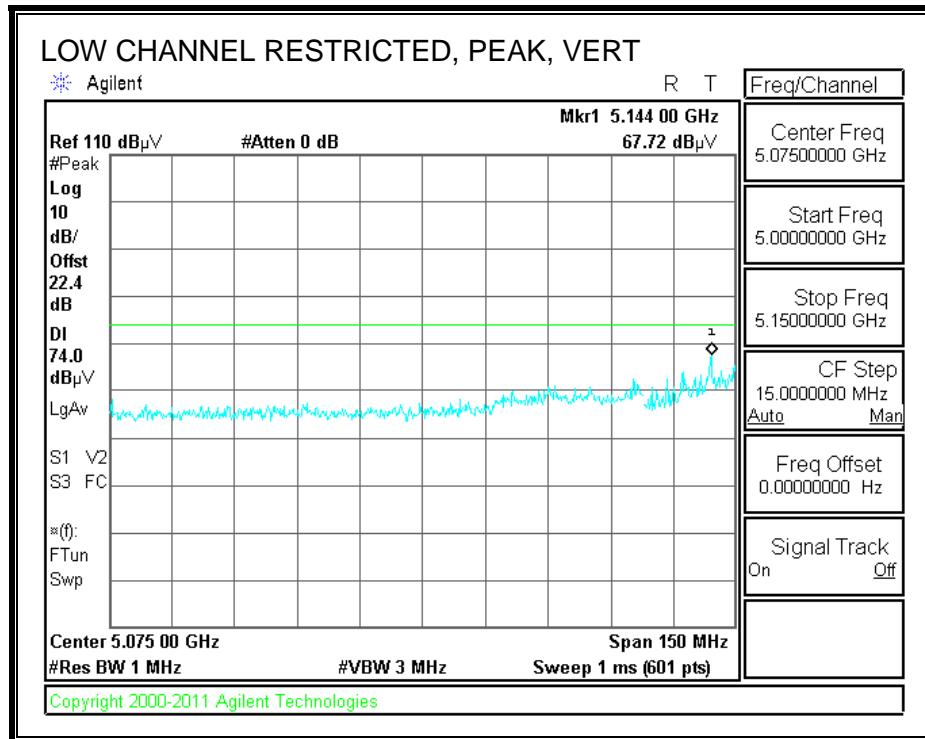
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.5. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)





**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3IX CDD

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

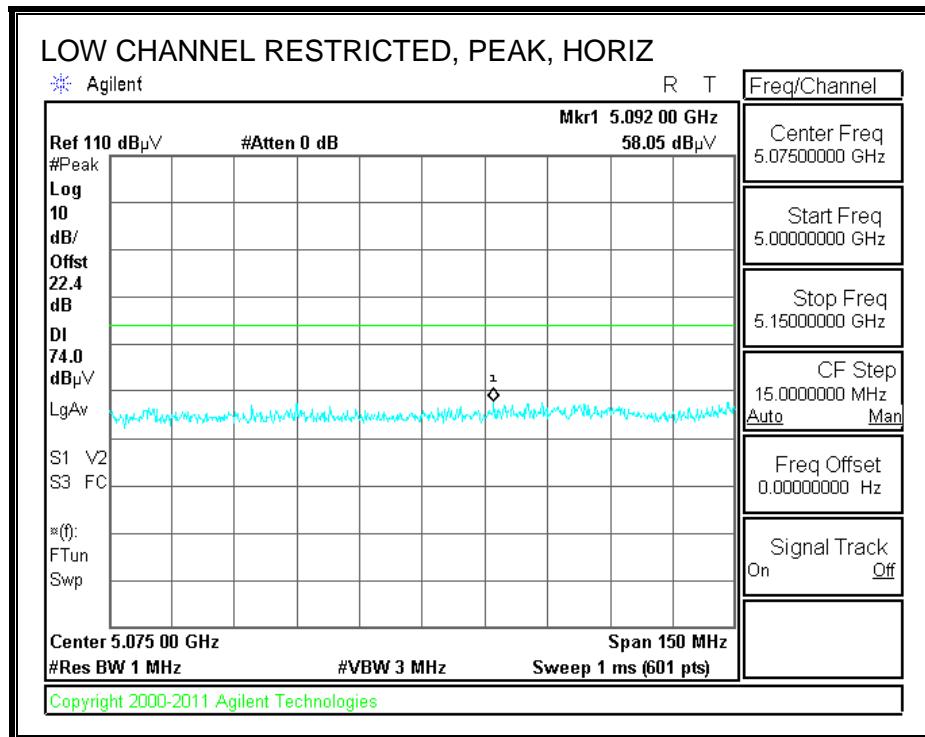
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	32.9	38.9	13.0	-31.9	0.0	0.7	53.6	74.0	-20.4	H	P	
15.570	3.0	23.1	38.9	13.0	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5230 MHz 3IX CDD</b>													
15.690	3.0	34.1	38.5	13.0	-31.9	0.0	0.7	54.5	74.0	-19.5	H	P	
15.690	3.0	23.8	38.5	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	H	A	
15.690	3.0	33.6	38.5	13.0	-31.9	0.0	0.7	54.0	74.0	-20.0	V	P	
15.690	3.0	23.7	38.5	13.0	-31.9	0.0	0.7	44.1	54.0	-9.9	V	A	

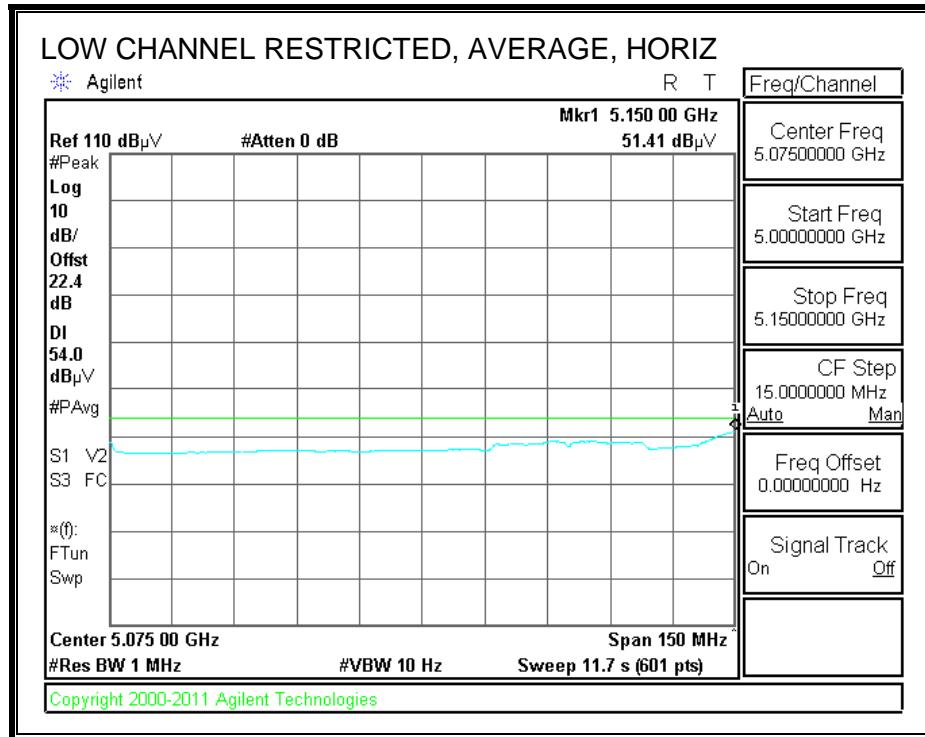
Rev. 4.1.2.7

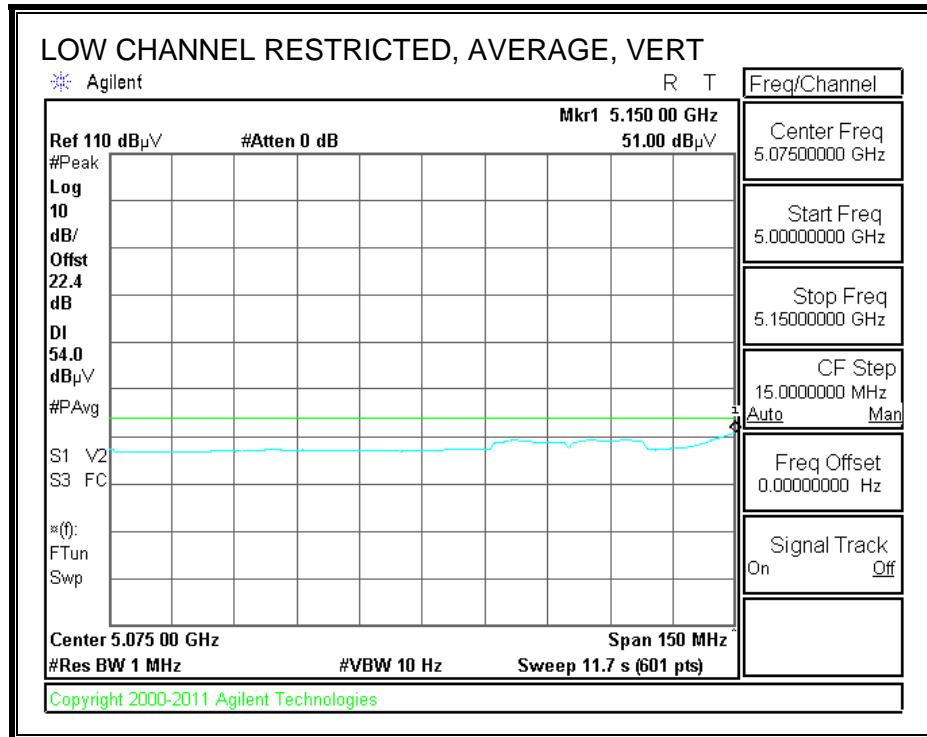
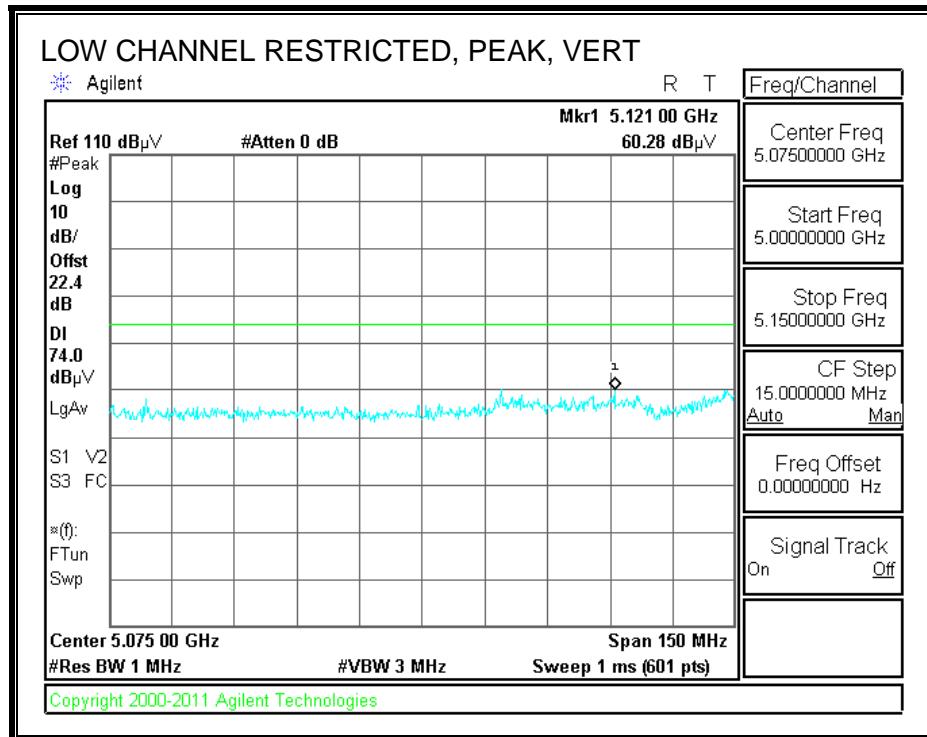
Note: No other emissions were detected above the system noise floor.

### 9.2.6. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)







**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3IX CDD

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

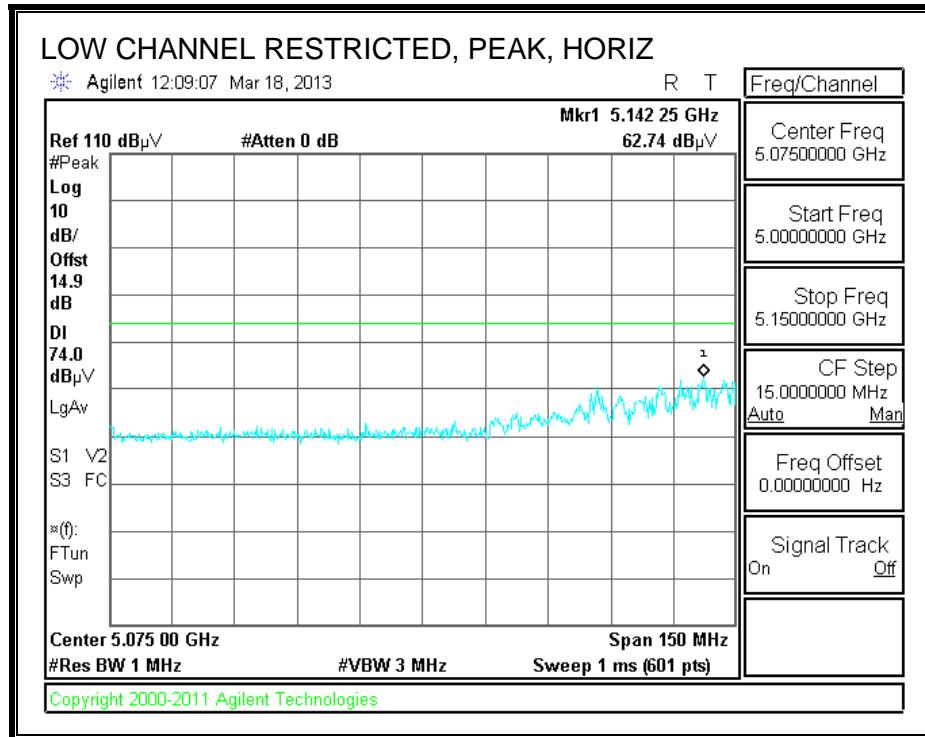
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	32.9	38.9	13.0	-31.9	0.0	0.7	53.6	74.0	-20.4	H	P	
15.570	3.0	23.1	38.9	13.0	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5230 MHz 3IX CDD</b>													
15.690	3.0	34.1	38.5	13.0	-31.9	0.0	0.7	54.5	74.0	-19.5	H	P	
15.690	3.0	23.8	38.5	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	H	A	
15.690	3.0	33.6	38.5	13.0	-31.9	0.0	0.7	54.0	74.0	-20.0	V	P	
15.690	3.0	23.7	38.5	13.0	-31.9	0.0	0.7	44.1	54.0	-9.9	V	A	

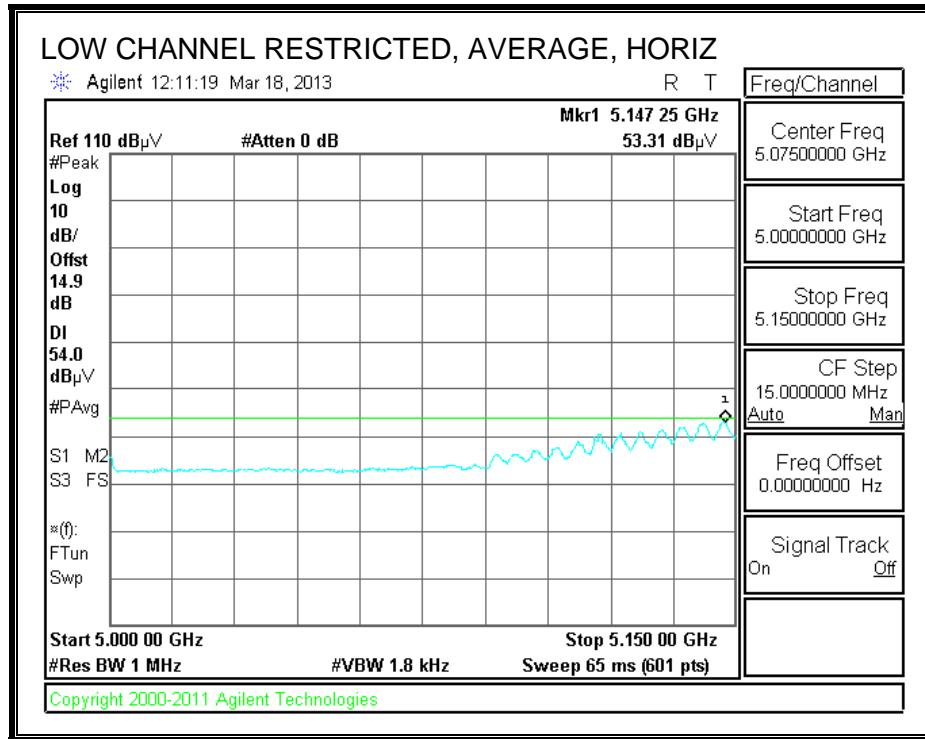
Rev. 4.1.2.7

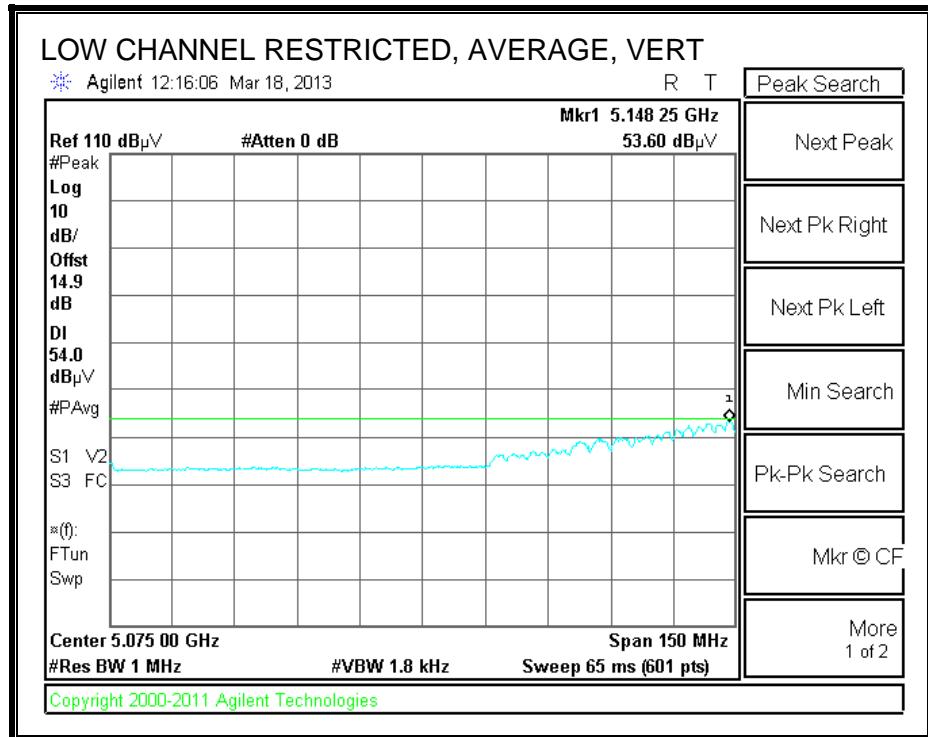
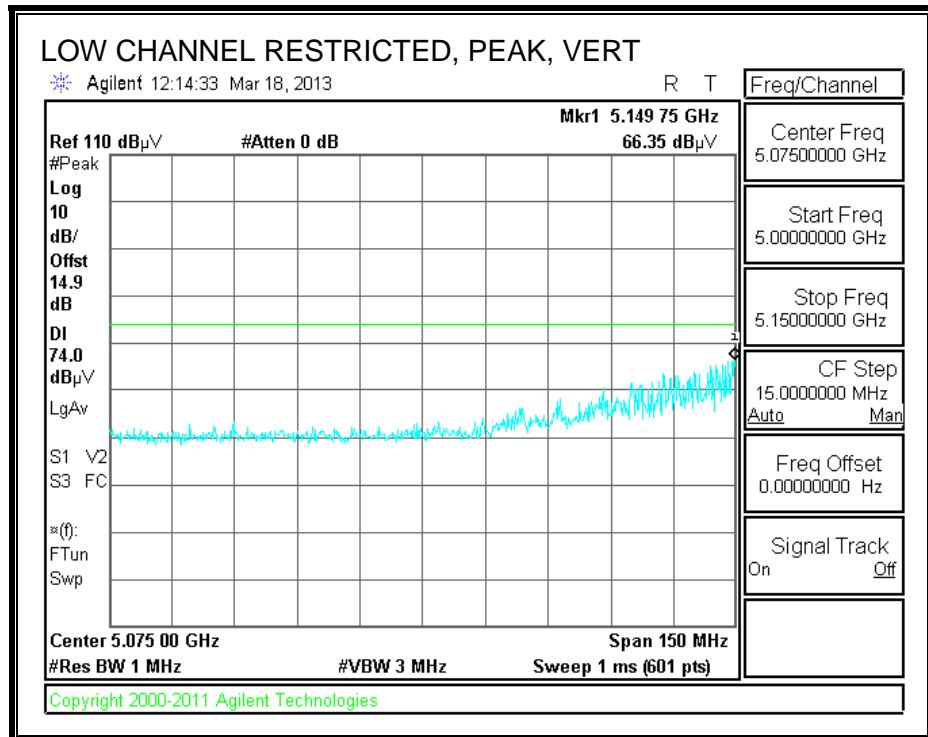
Note: No other emissions were detected above the system noise floor.

### 9.2.7. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.2 GHz BAND

#### RESTRICTED BANEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT80 3IX CDD CH42, CH58, CH106, CH138**

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

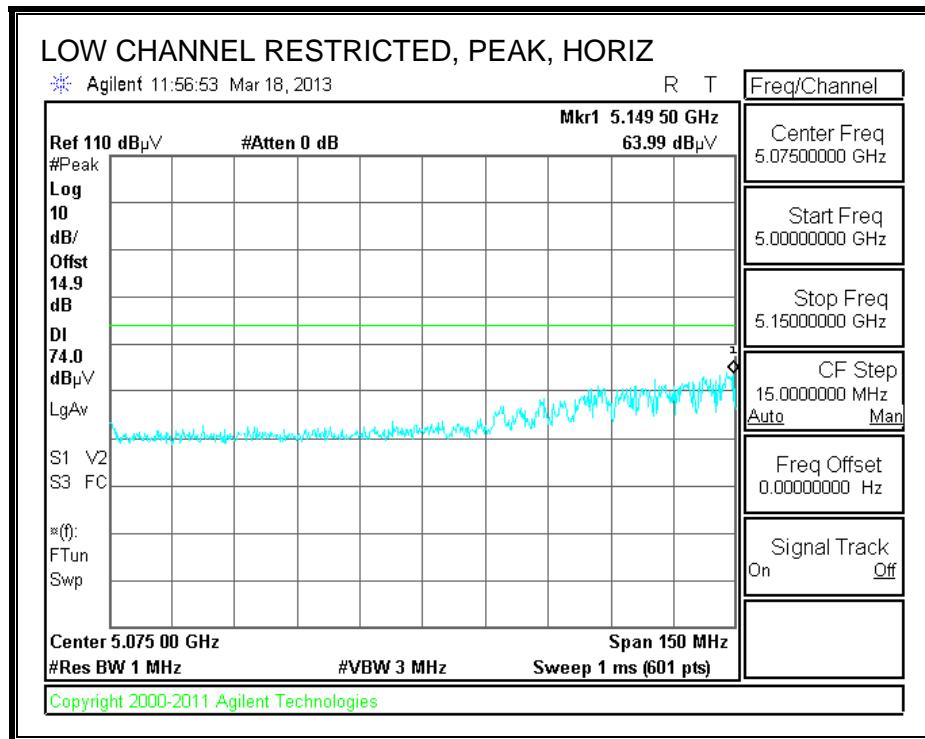
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3IX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3IX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3IX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

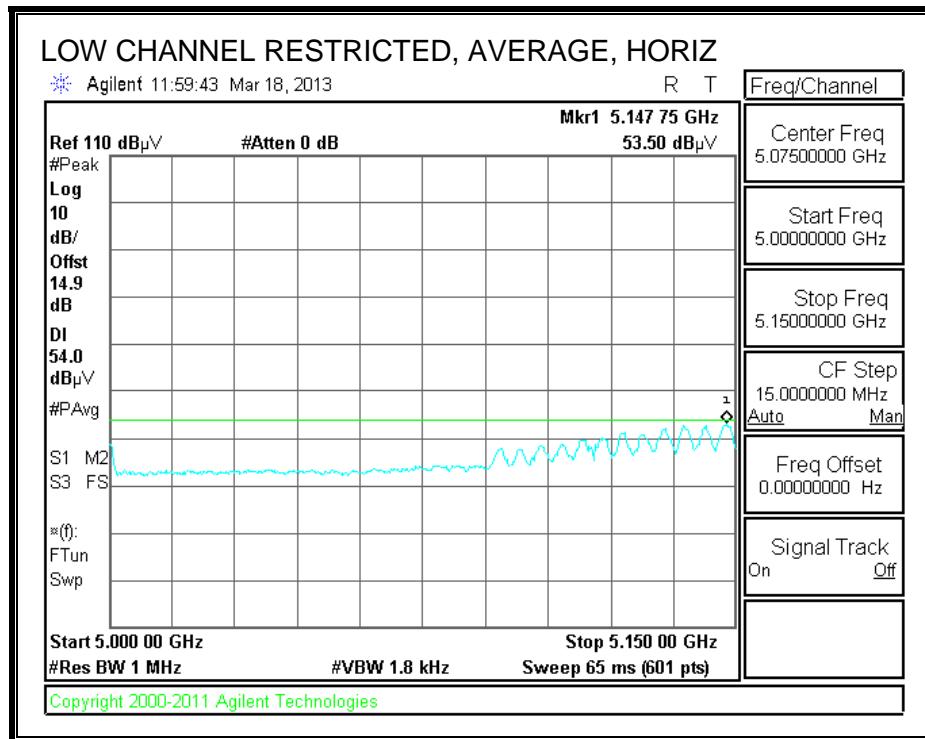
Rev. 4.1.2.7

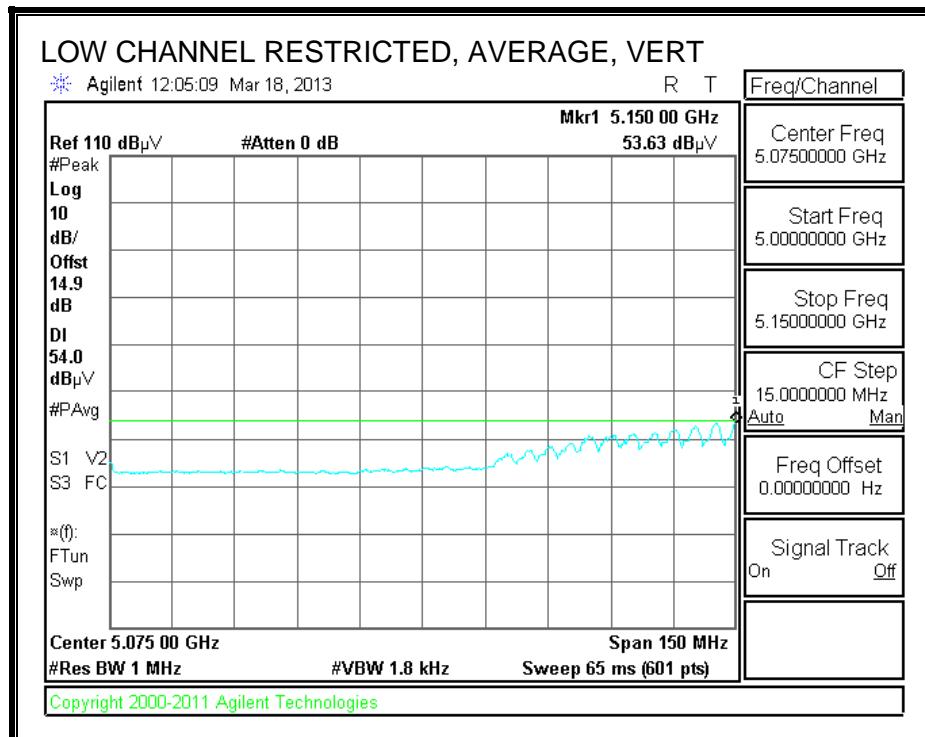
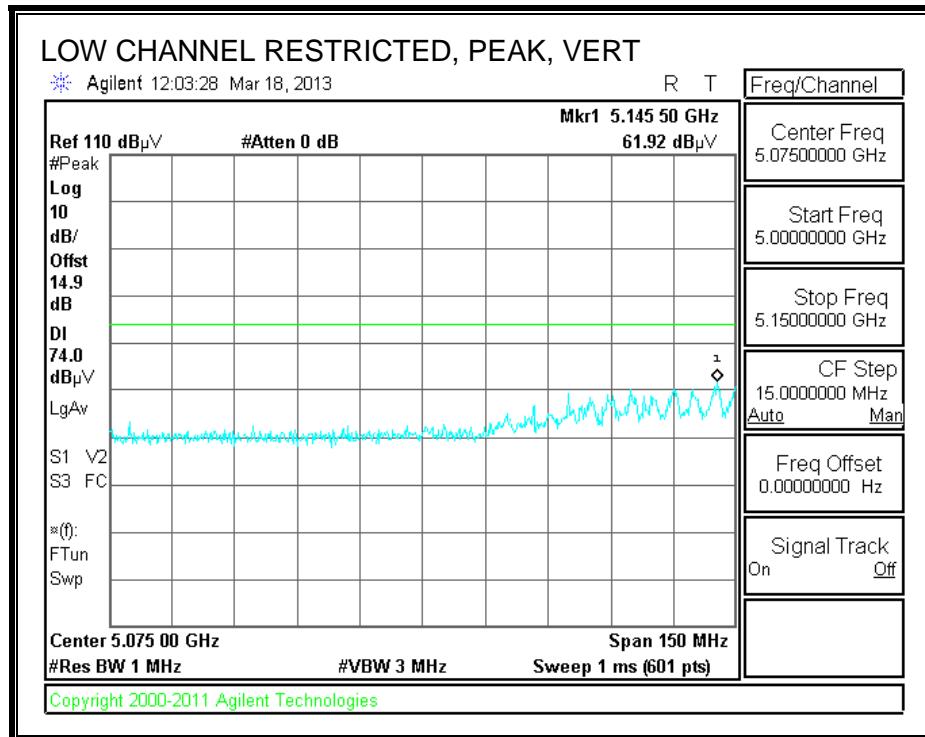
Note: No other emissions were detected above the system noise floor.

### 9.2.8. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT80 3IX CDD CH42, CH58, CH106, CH138**

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

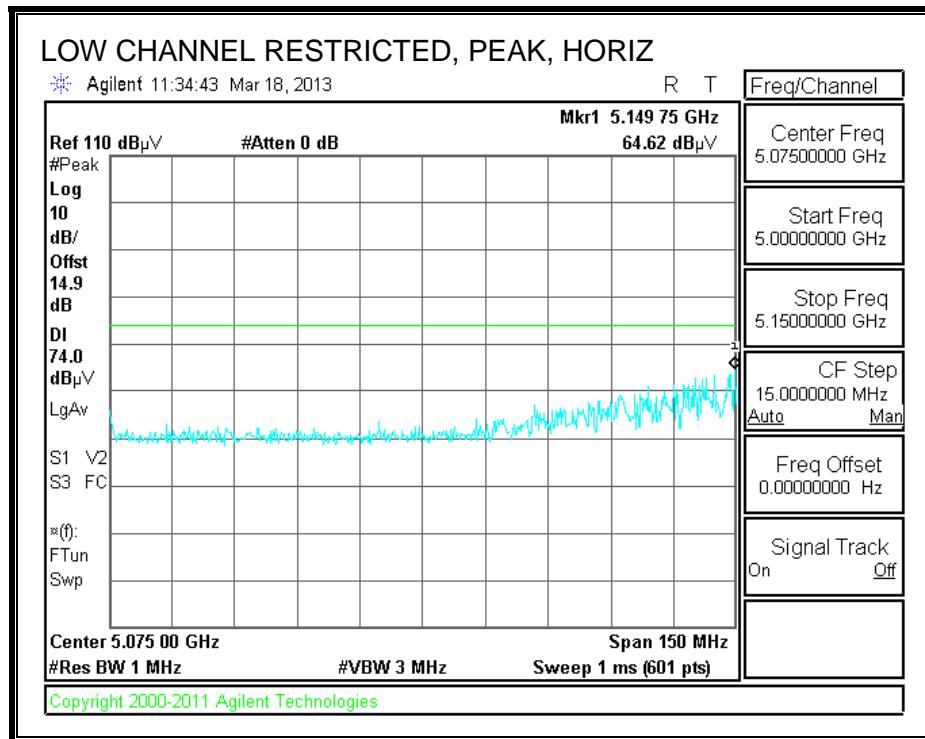
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3IX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3IX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3IX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

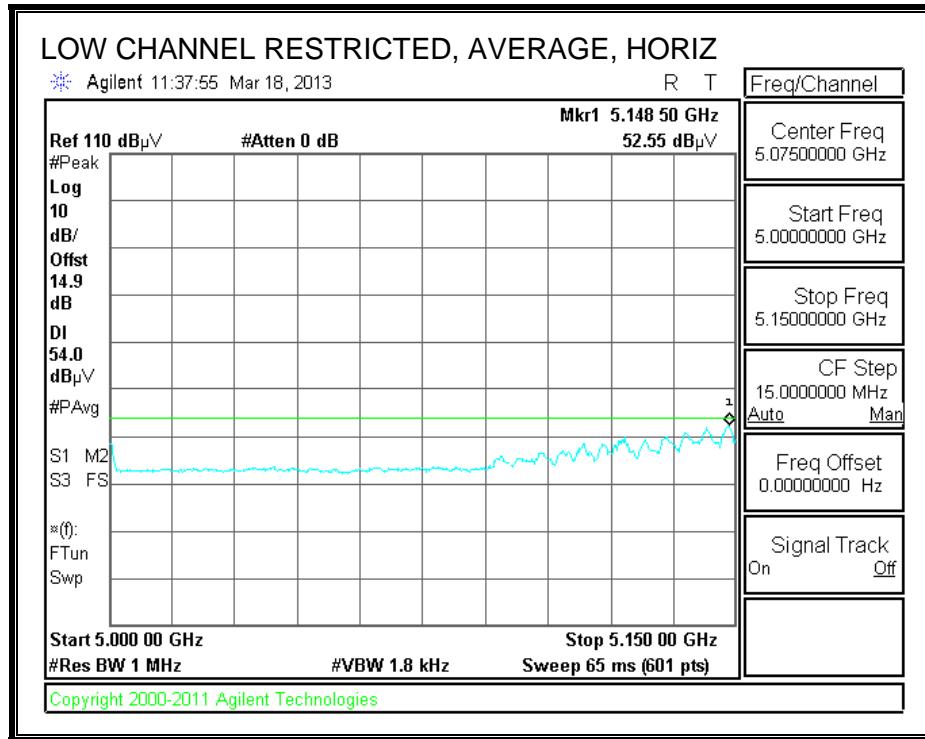
Rev. 4.1.2.7

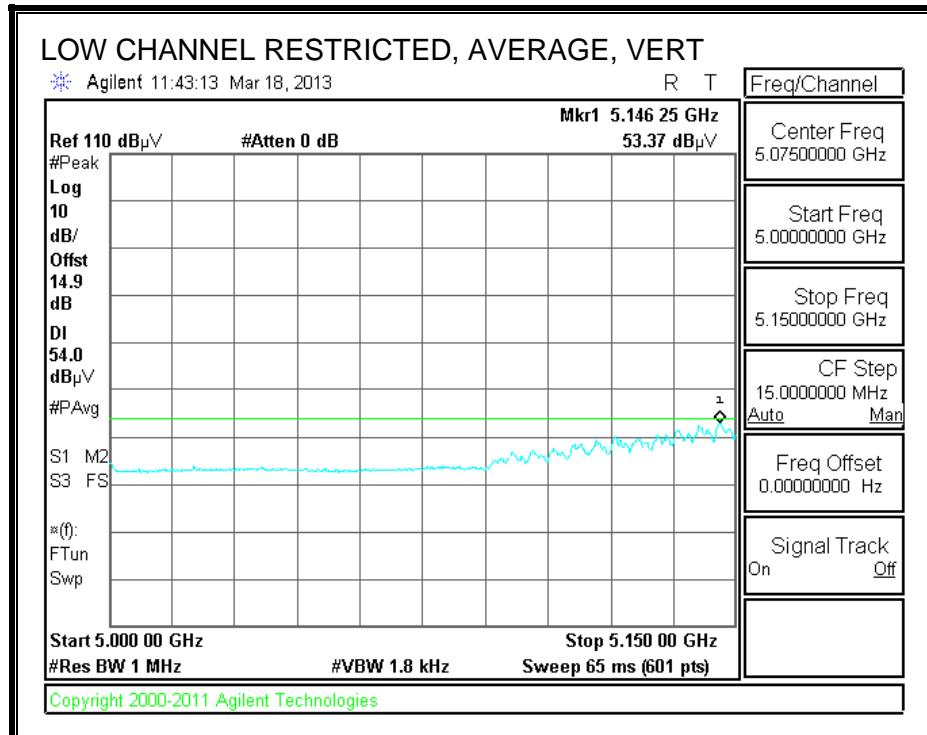
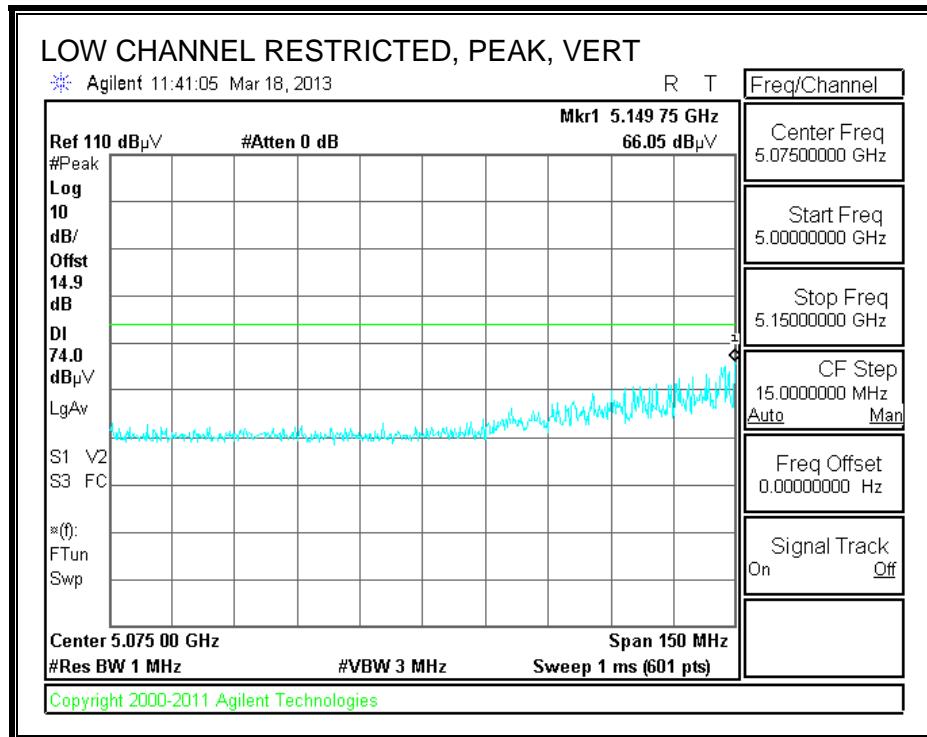
Note: No other emissions were detected above the system noise floor.

### 9.2.9. TX ABOVE 1 GHz, 802.11ac VHT80 3TX, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

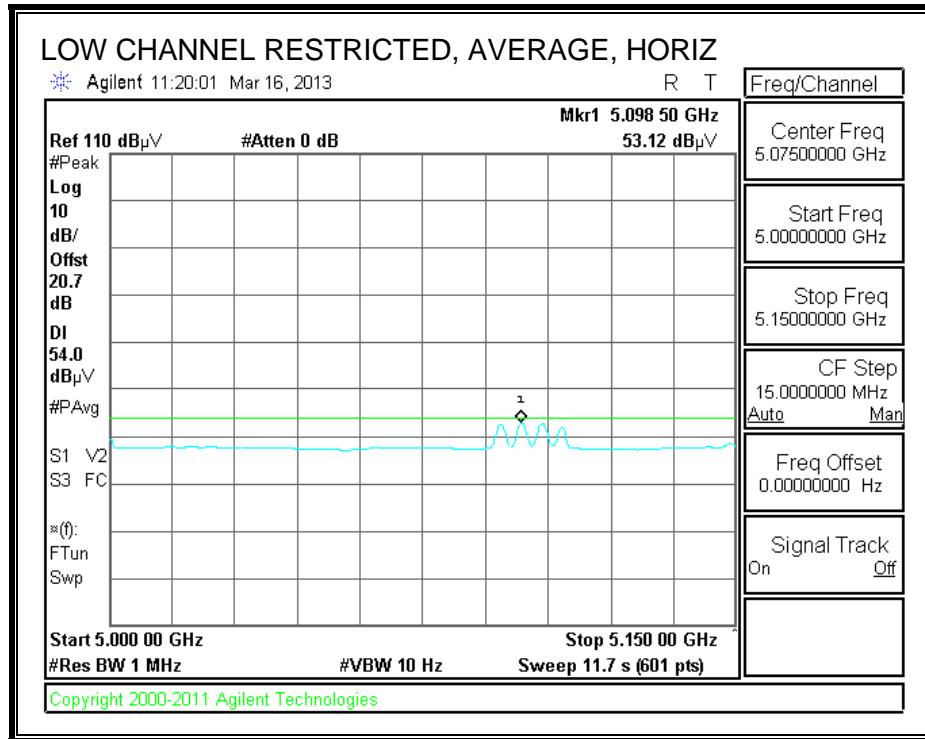
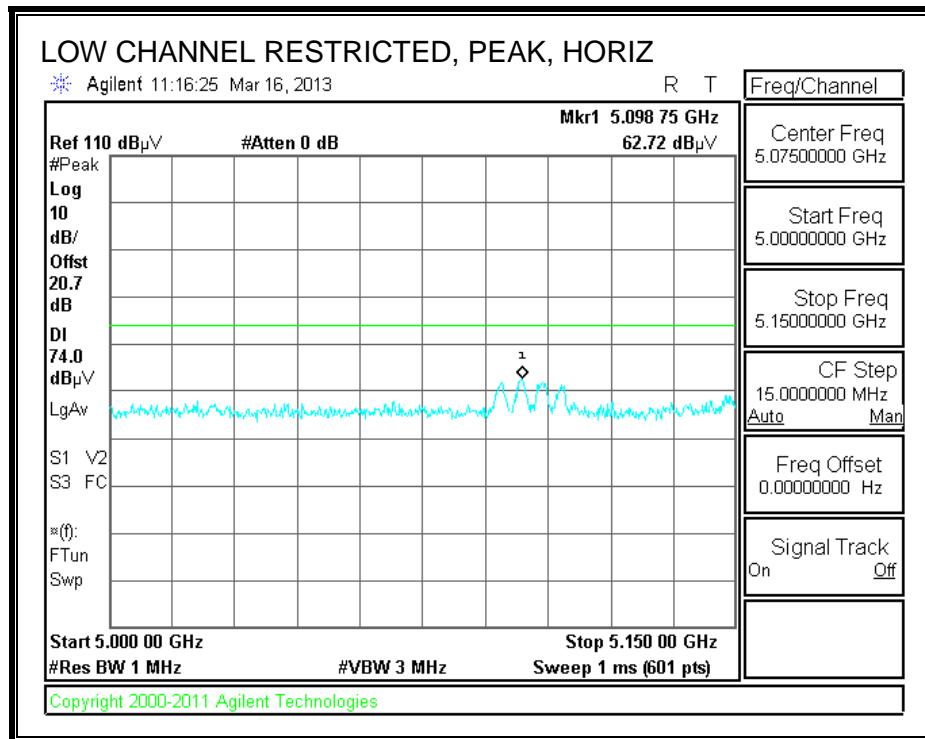
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	<b>-19.4</b>	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	<b>-9.7</b>	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	<b>-19.9</b>	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	<b>-9.7</b>	H	A	
<b>5290 MHz 3IX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	<b>-20.5</b>	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	<b>-9.7</b>	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	<b>-20.2</b>	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	<b>-9.4</b>	V	A	
<b>5530 MHz 3IX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	<b>-23.8</b>	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	<b>-10.5</b>	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	<b>-24.3</b>	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	<b>-13.6</b>	H	A	
<b>5690 MHz 3IX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	<b>-23.4</b>	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	<b>-13.0</b>	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	<b>-23.4</b>	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	<b>-13.4</b>	V	A	

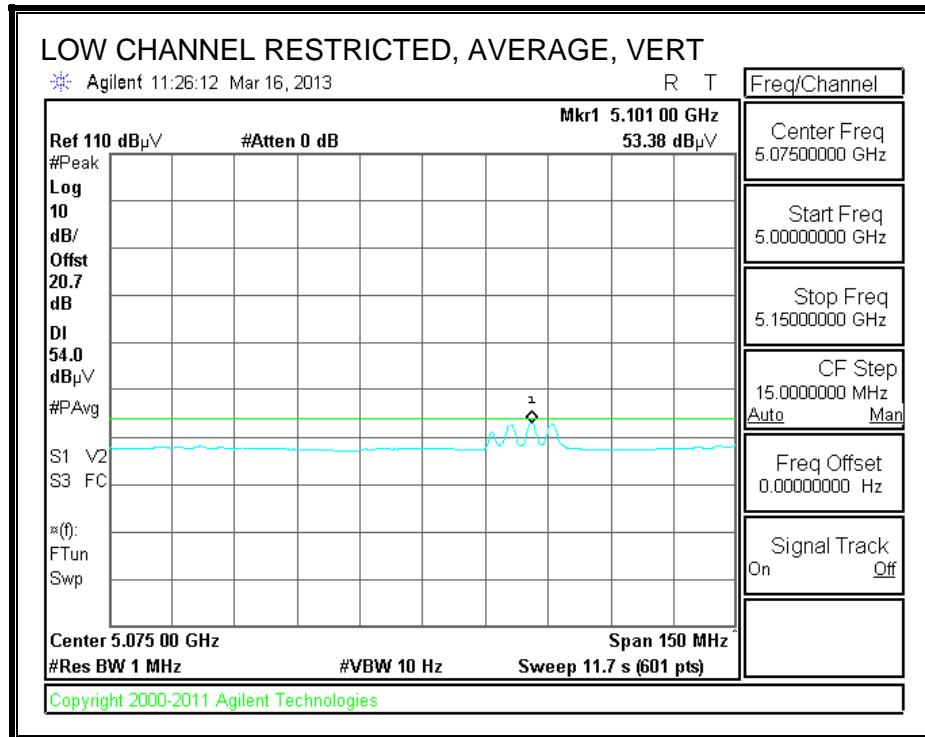
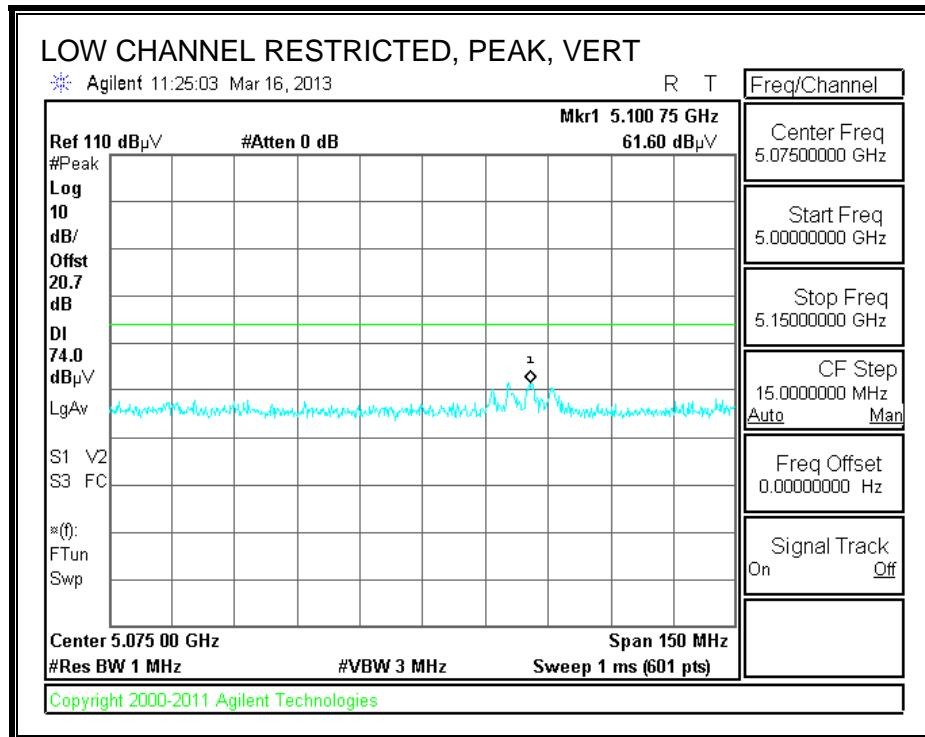
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.10. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)



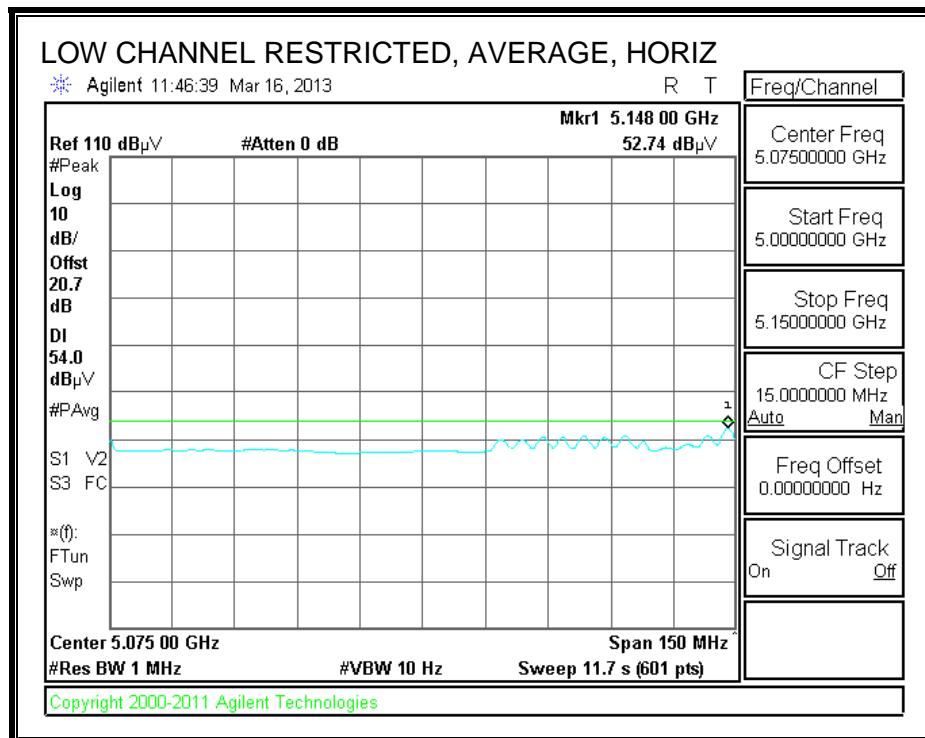
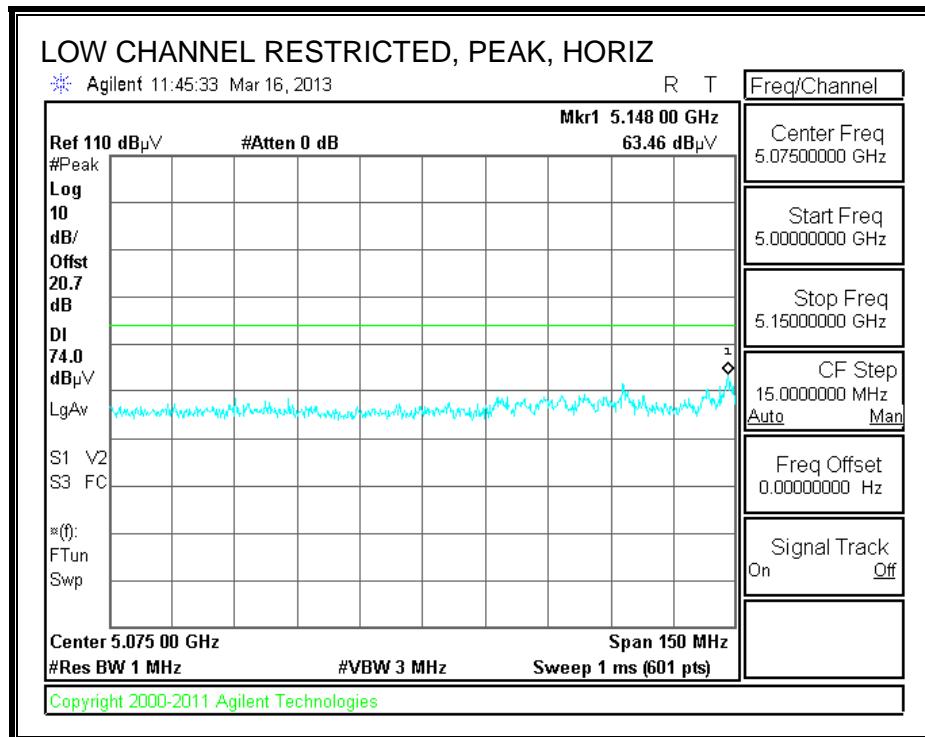


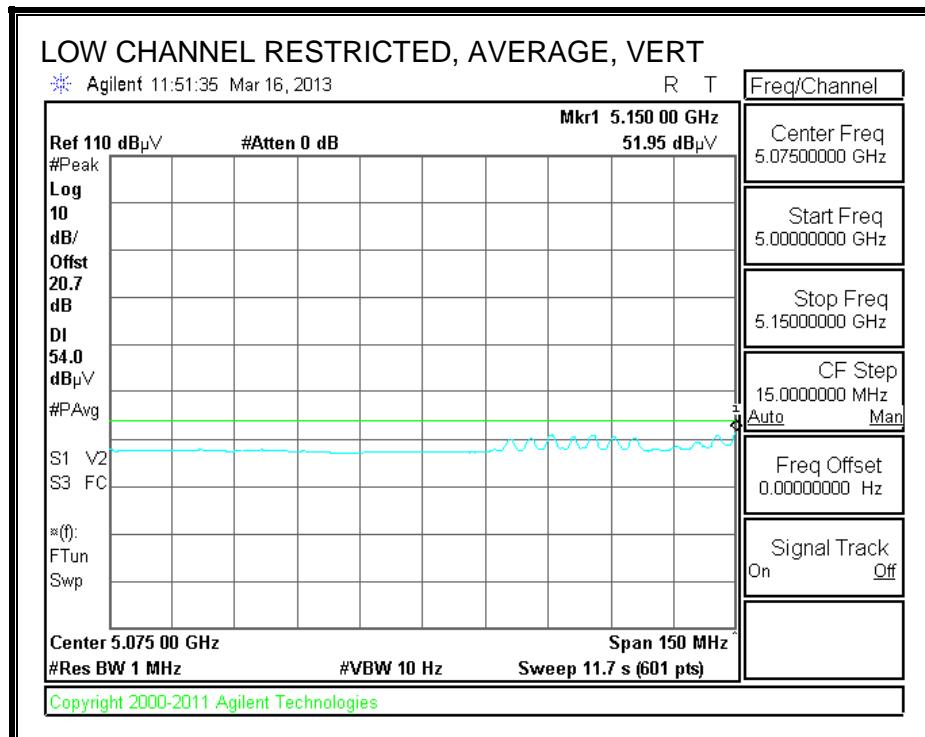
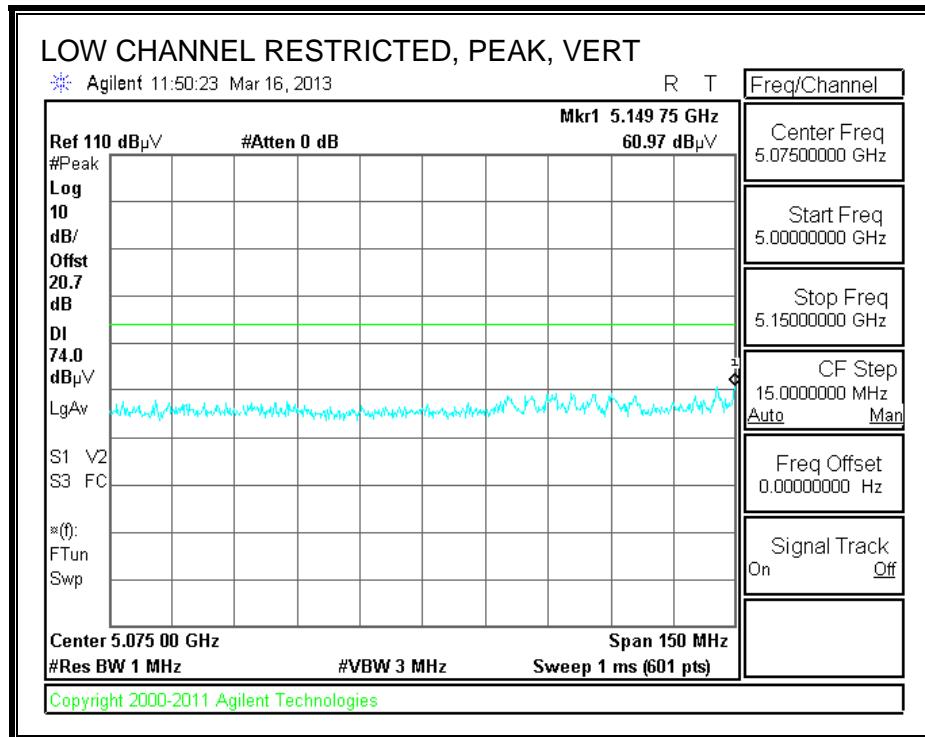
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT20 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
Average Measurements RBW=1MHz ; VBW=10Hz															
<b>f</b>	<b>Dist</b>	<b>Read Pk</b>	<b>Read Avg.</b>	<b>AF</b>	<b>CL</b>	<b>Amp</b>	<b>D Corr</b>	<b>Fltr</b>	<b>Peak</b>	<b>Avg</b>	<b>Pk Lim</b>	<b>Avg Lim</b>	<b>Pk Mar</b>	<b>Avg Mar</b>	<b>Notes</b>
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
Low Channel (5180 MHz)															
15.540	3.0	35.2	24.4	40.1	13.2	-32.3	0.0	0.7	57.0	46.2	74	54	-17.0	-7.8	H
15.540	3.0	35.1	24.5	40.1	13.2	-32.3	0.0	0.7	56.8	46.2	74	54	-17.2	-7.8	V
Mid Channel (5200 MHz)															
15.600	3.0	35.1	24.6	40.1	13.3	-32.3	0.0	0.7	56.9	46.4	74	54	-17.1	-7.6	H
15.600	3.0	35.1	24.6	40.1	13.3	-32.3	0.0	0.7	56.9	46.4	74	54	-17.1	-7.6	V
Hi Channel (5240 MHz)															
15.720	3.0	36.1	24.8	40.1	13.3	-32.2	0.0	0.7	58.1	46.7	74	54	-15.9	-7.3	H
15.720	3.0	35.8	24.8	40.1	13.3	-32.2	0.0	0.7	57.7	46.7	74	54	-16.3	-7.3	V
Rev. 01.30.13															
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										

### 9.2.11. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)



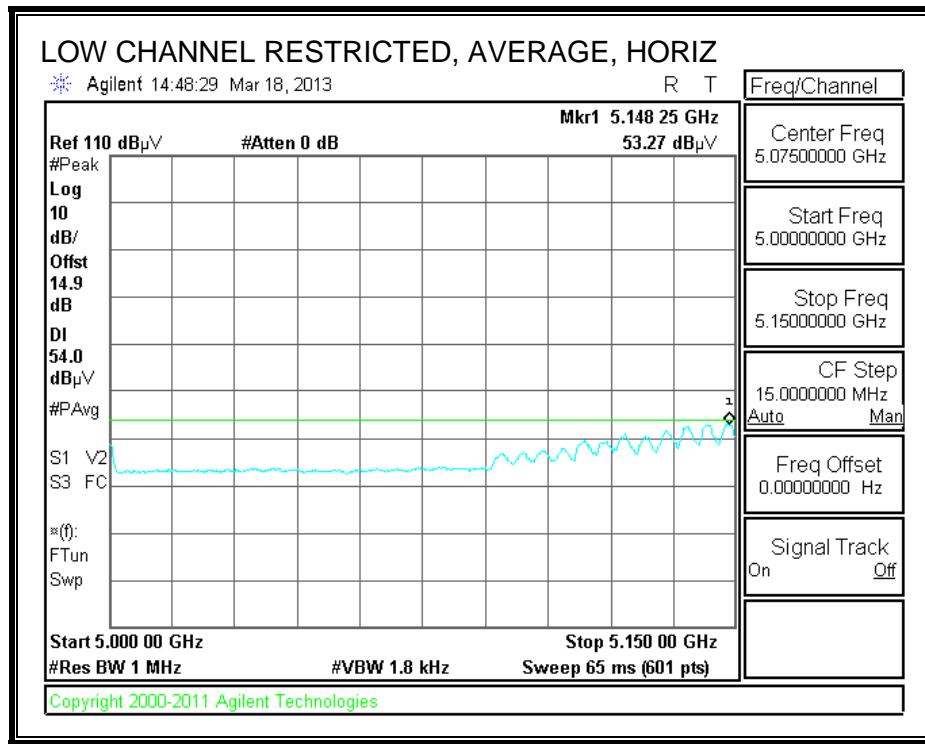
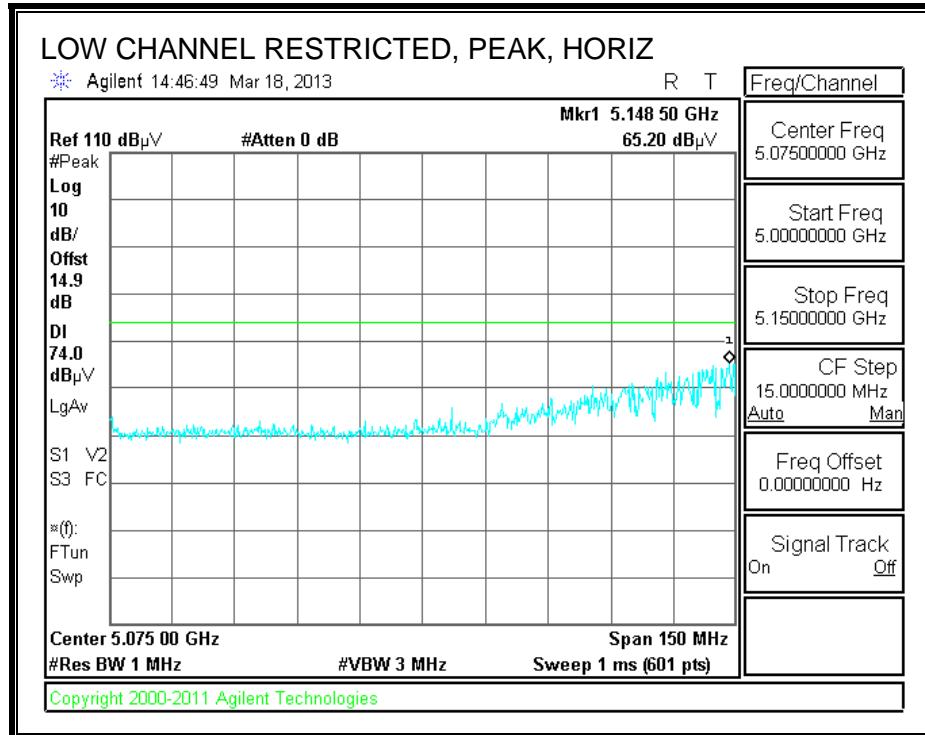


## **HARMONICS AND SPURIOUS EMISSIONS**

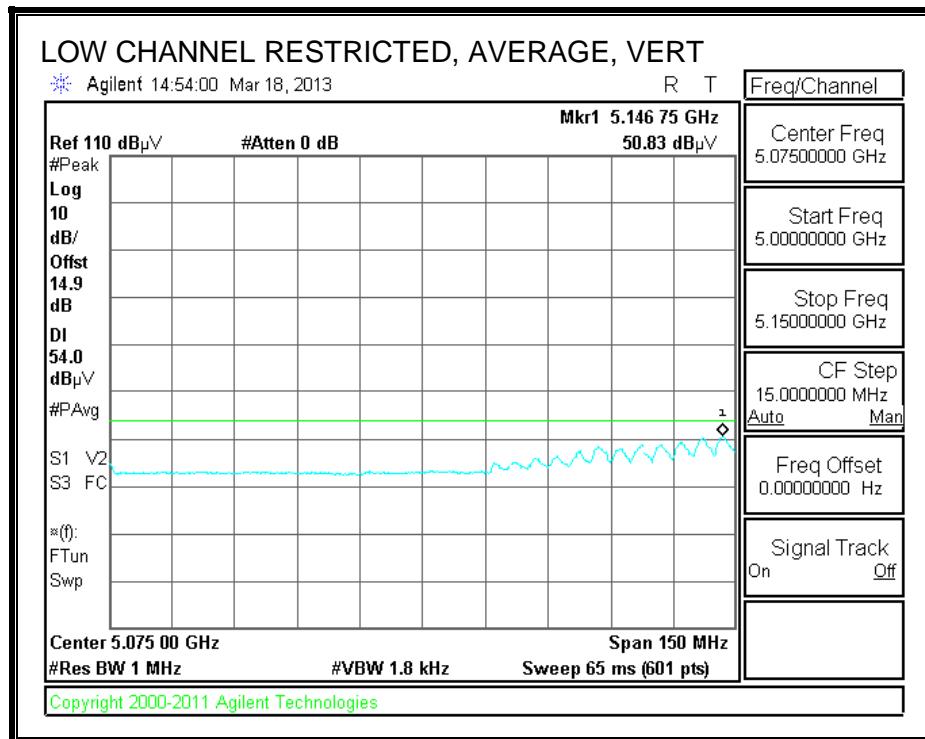
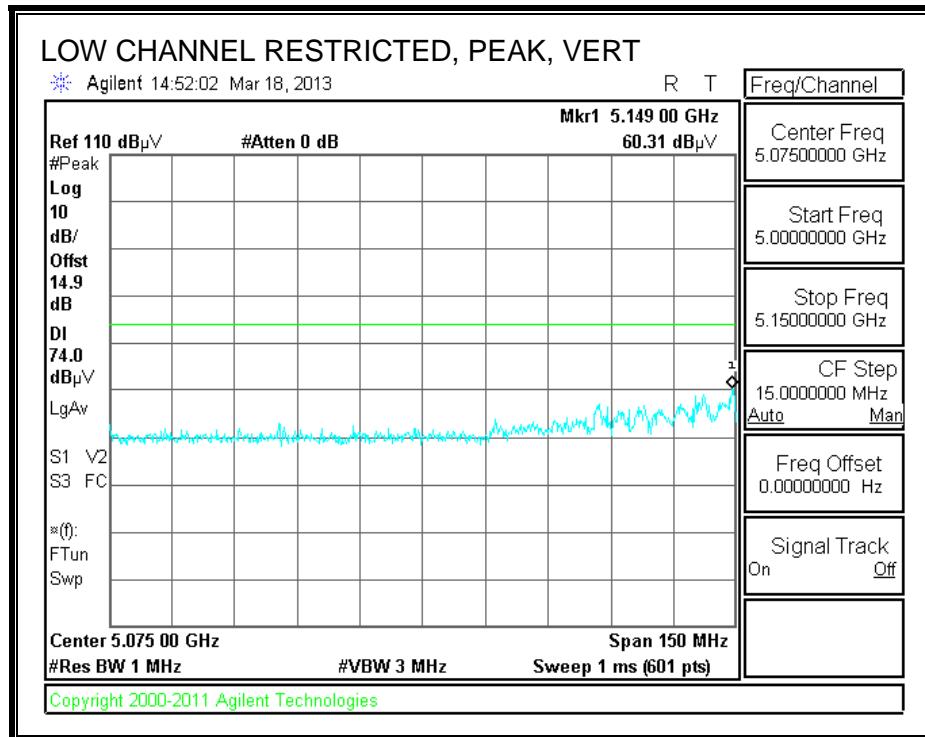
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26 GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Reject Filter			Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5190 MHz)															
15.570	3.0	35.1	24.5	40.1	13.2	-32.3	0.0	0.7	56.9	46.3	74	54	-17.1	-7.7	H
15.570	3.0	35.2	24.5	40.1	13.2	-32.3	0.0	0.7	57.0	46.3	74	54	-17.0	-7.7	V
Hi Channel (5230 MHz)															
15.690	3.0	35.9	24.8	40.1	13.3	-32.3	0.0	0.7	57.8	46.7	74	54	-16.2	-7.3	H
15.690	3.0	35.0	24.8	40.1	13.3	-32.3	0.0	0.7	56.9	46.7	74	54	-17.1	-7.3	V
Rev. 01.30.13															
<b>f</b>	Measurement Frequency			<b>Amp</b>	Preamp Gain			<b>D Corr</b>	Distance Correct to 3 meters			<b>Avg Lim</b>	Average Field Strength Limit		
<b>Dist</b>	Distance to Antenna			<b>D Corr</b>	Distance Correct to 3 meters			<b>Pk Lim</b>	Peak Field Strength Limit						
<b>Read</b>	Analyzer Reading			<b>Avg</b>	Average Field Strength @ 3 m			<b>Avg Mar</b>	Margin vs. Average Limit						
<b>AF</b>	Antenna Factor			<b>Peak</b>	Calculated Peak Field Strength			<b>Pk Mar</b>	Margin vs. Peak Limit						
<b>CL</b>	Cable Loss			<b>HPF</b>	High Pass Filter										

### 9.2.12. TX ABOVE 1 GHz, 802.11ac VHT80 BF 2TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)





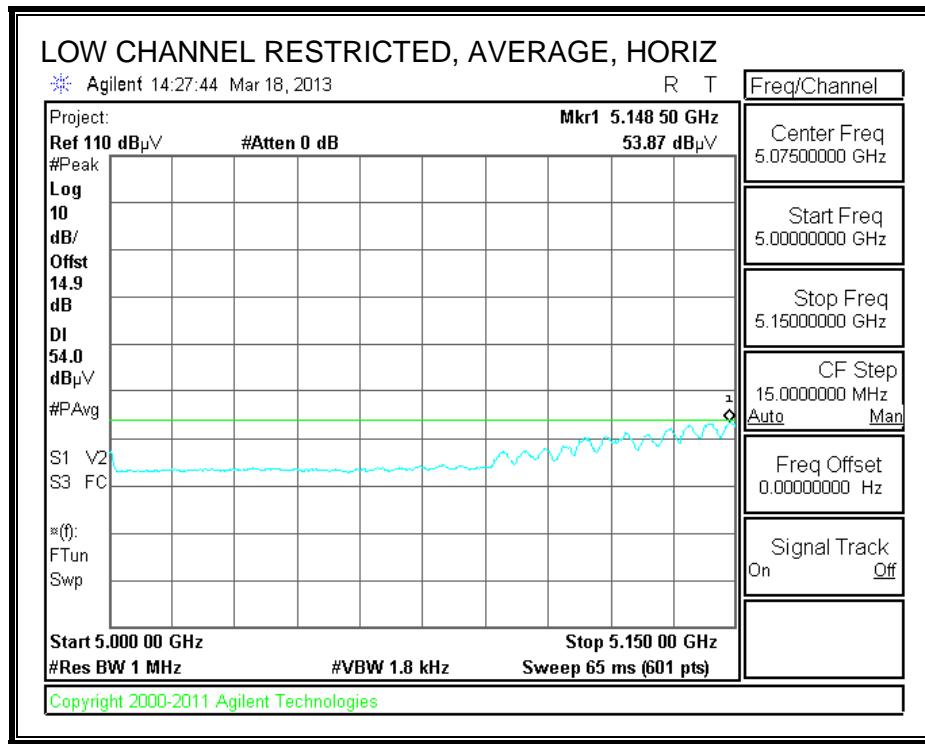
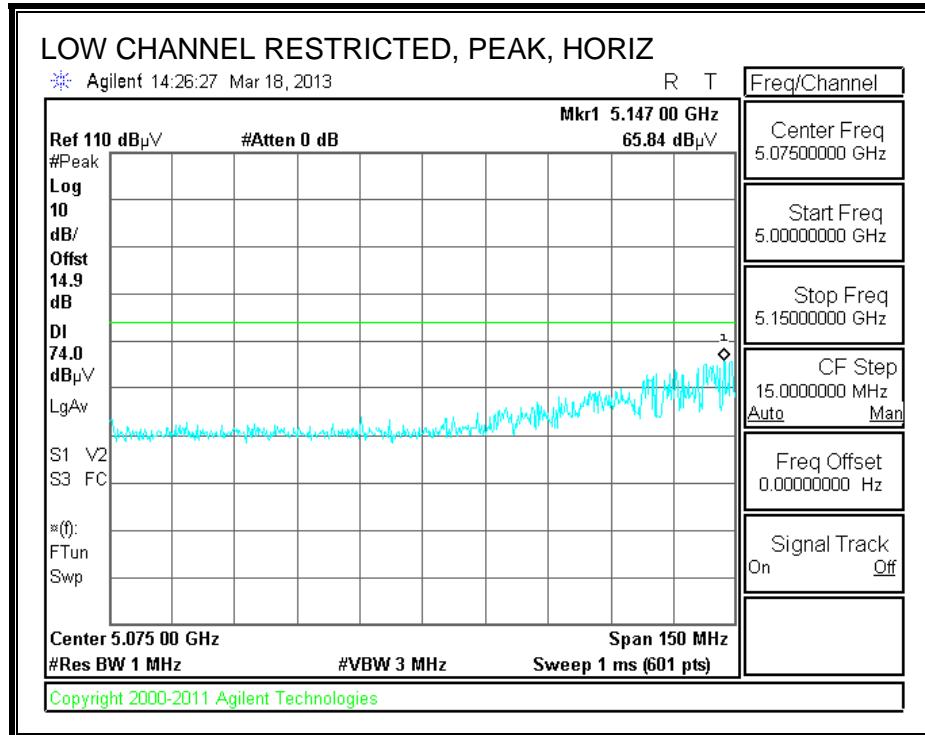


## HARMONICS AND SPURIOUS EMISSIONS

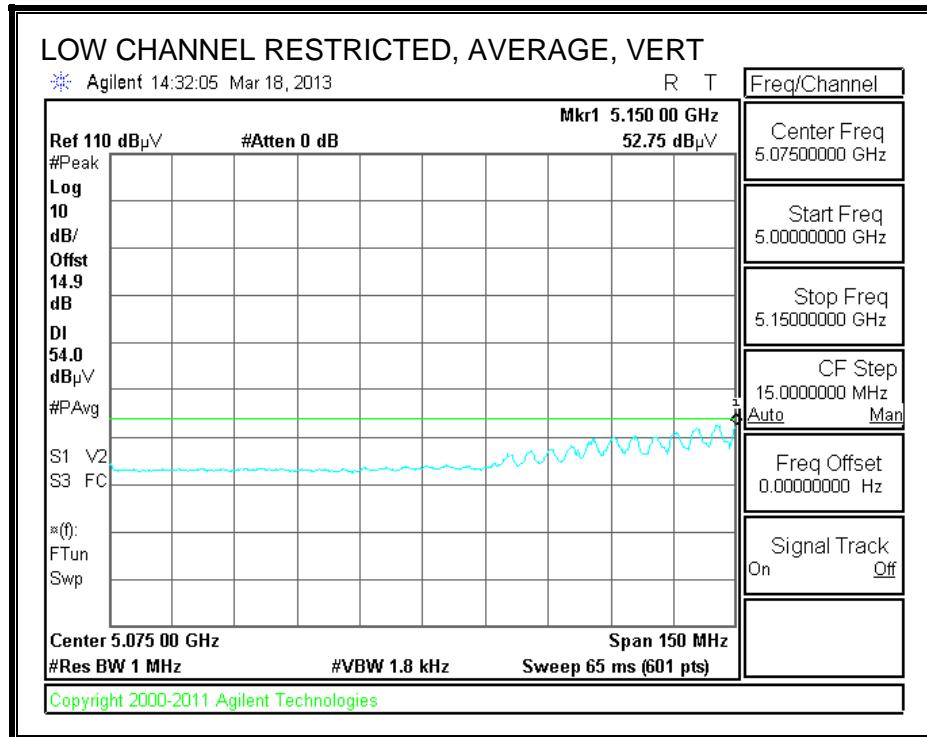
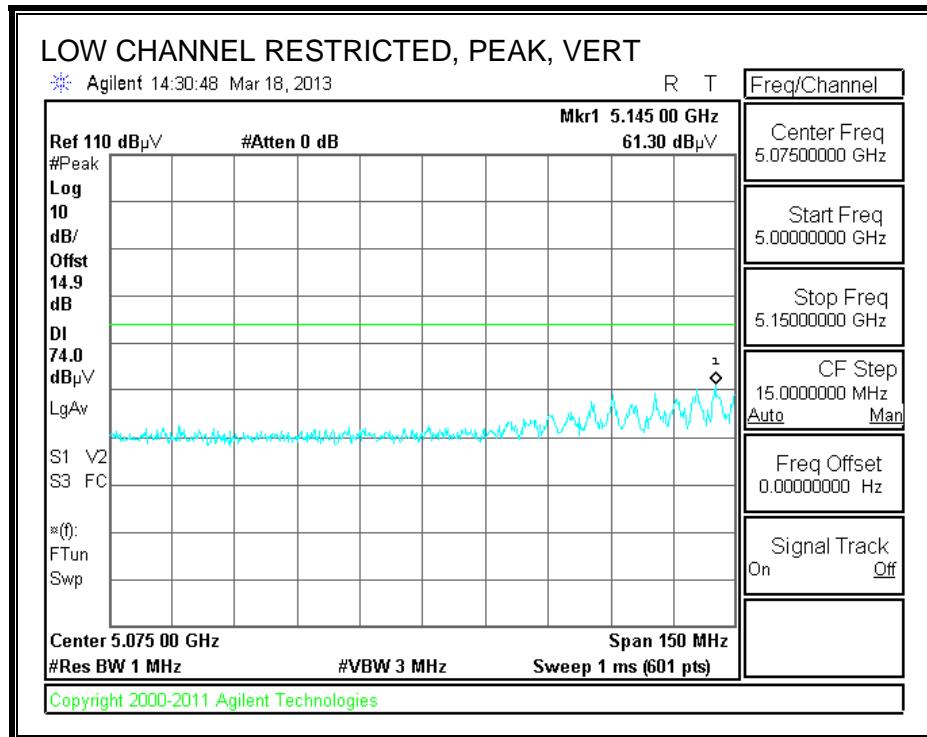
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.209			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Reject Filter			Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V
Rev. 01.30.13															
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									

### 9.2.13. TX ABOVE 1 GHz, 802.11ac VHT80 BF 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)





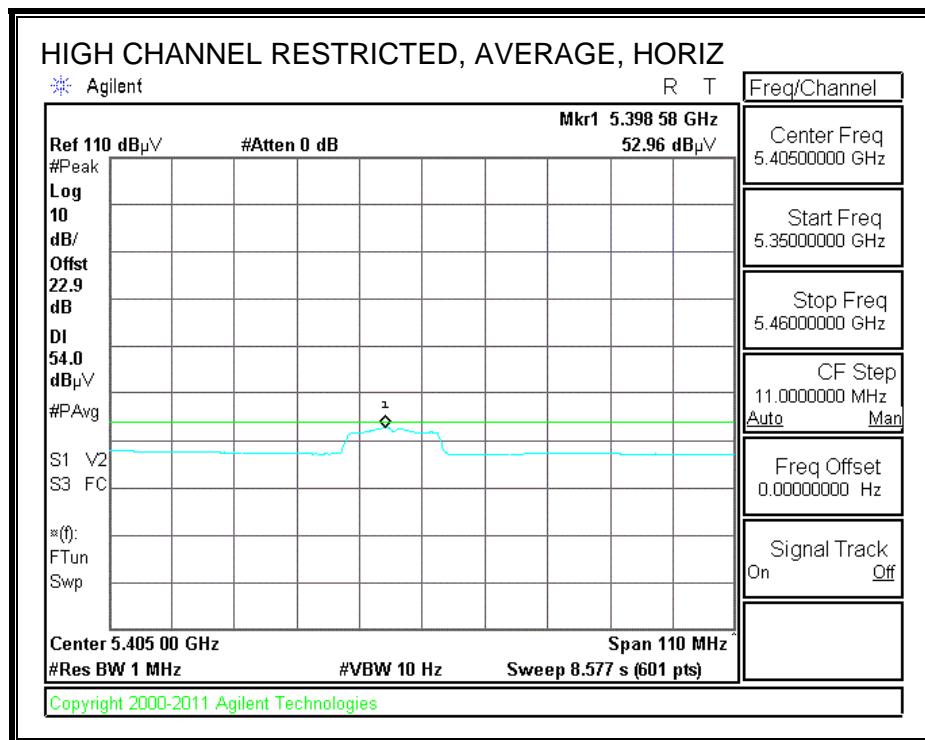
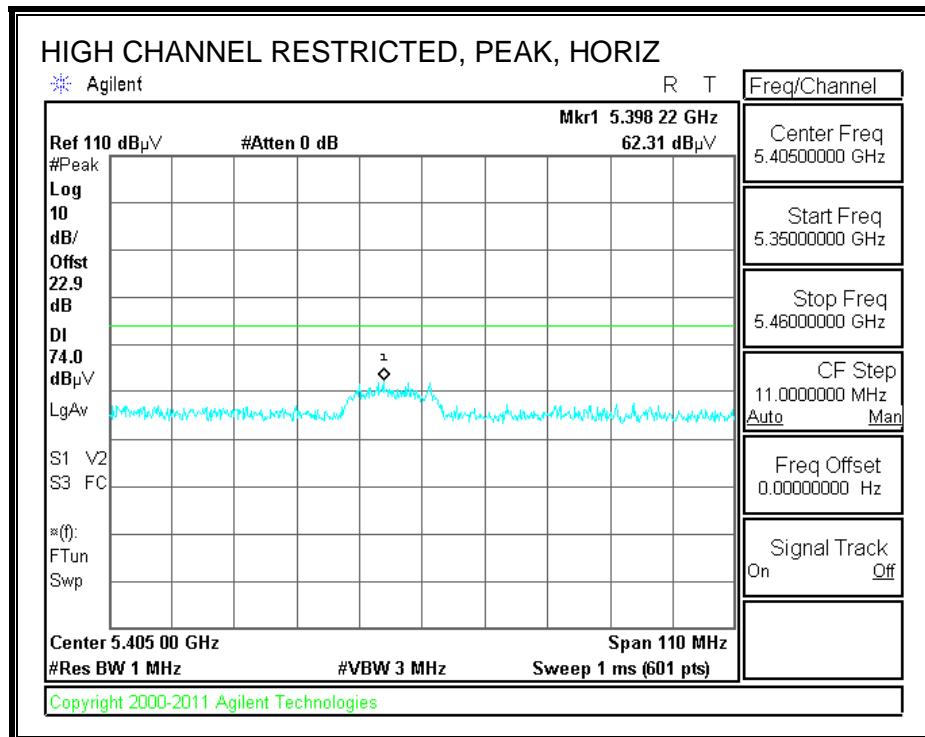


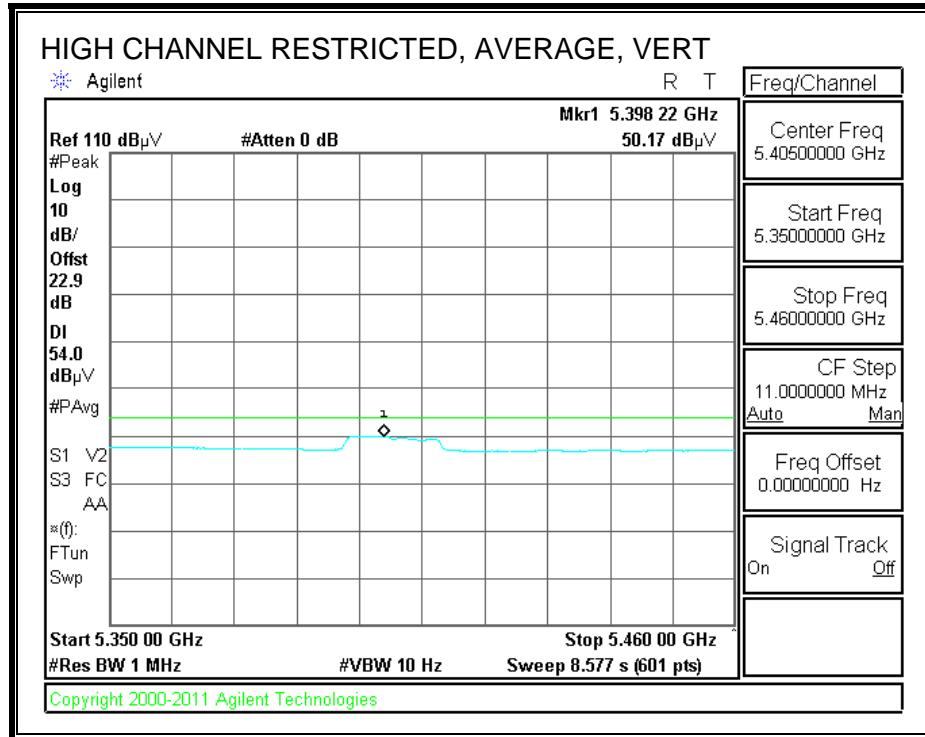
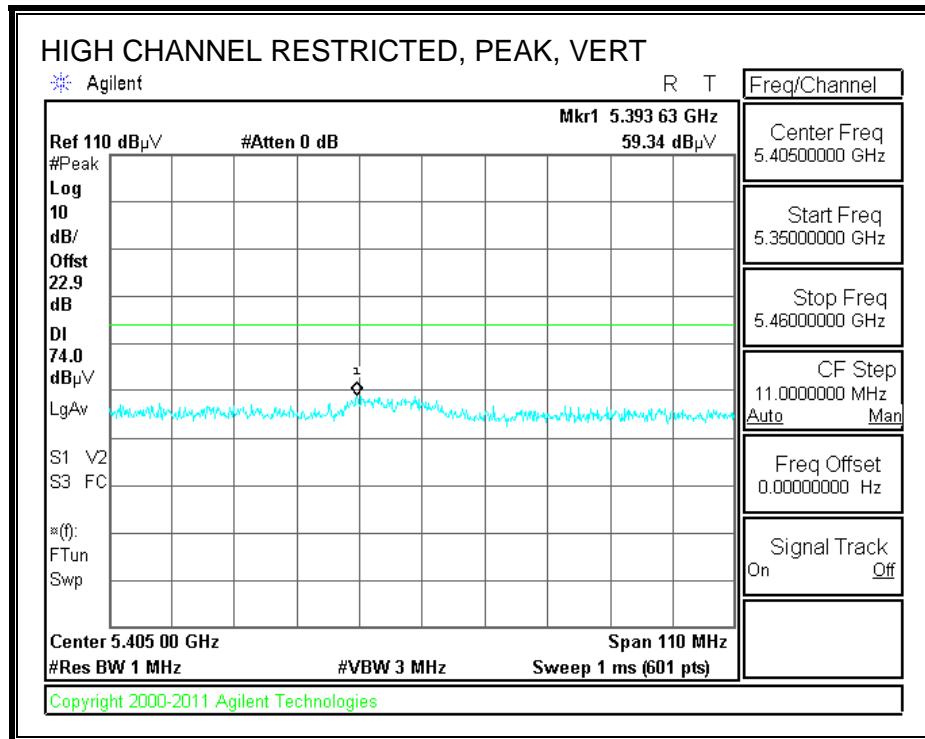
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.209			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Reject Filter			Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V
Rev. 01.30.13															
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									

### 9.2.14. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

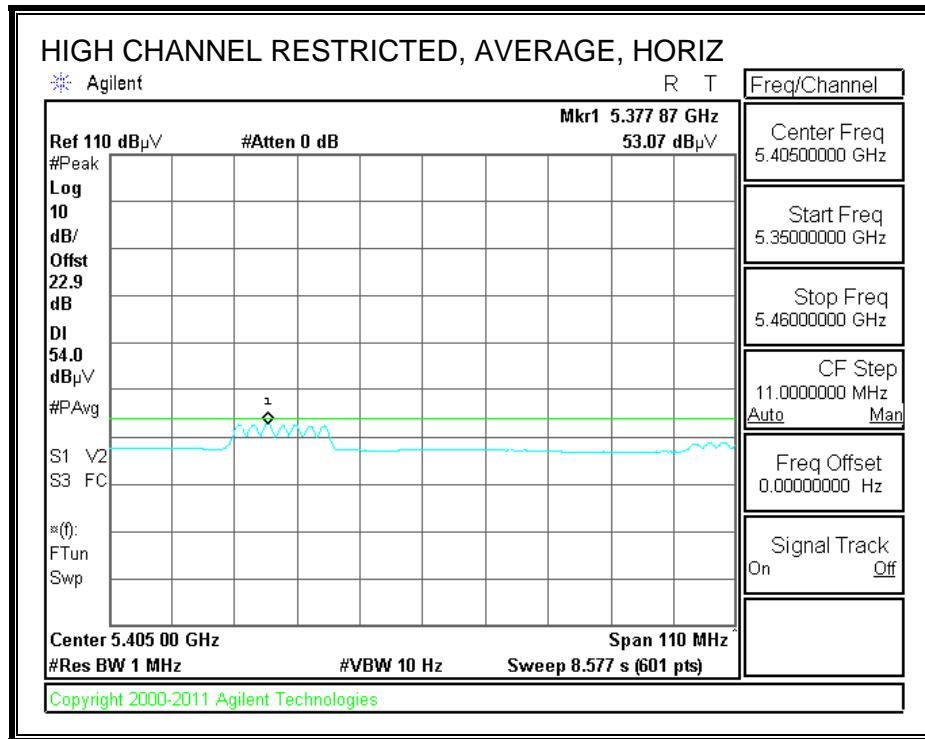
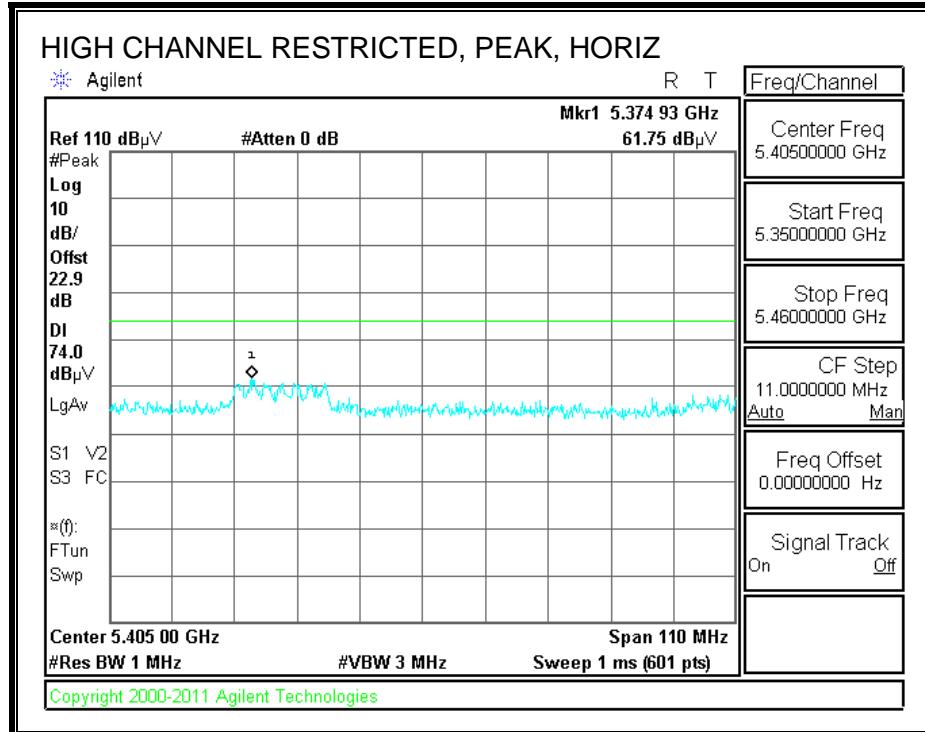
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5260 MHz 3IX CDD</b>													
15.780	3.0	33.8	38.2	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.780	3.0	23.3	38.2	13.1	-31.9	0.0	0.7	43.5	54.0	-10.5	V	A	
15.780	3.0	33.2	38.2	13.1	-31.9	0.0	0.7	53.4	74.0	-20.6	H	P	
15.780	3.0	23.7	38.2	13.1	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5300 MHz 3IX CDD</b>													
15.900	3.0	33.2	37.8	13.2	-31.8	0.0	0.7	53.0	74.0	-21.0	H	P	
15.900	3.0	23.5	37.8	13.2	-31.8	0.0	0.7	43.3	54.0	-10.7	H	A	
15.900	3.0	33.7	37.8	13.2	-31.8	0.0	0.7	53.5	74.0	-20.5	V	P	
15.900	3.0	26.0	37.8	13.2	-31.8	0.0	0.7	45.8	54.0	-8.2	V	A	
<b>5320 MHz 3IX CDD</b>													
15.960	3.0	33.0	37.6	13.2	-31.8	0.0	0.7	52.7	74.0	-21.3	V	P	
15.960	3.0	23.1	37.6	13.2	-31.8	0.0	0.7	42.8	54.0	-11.2	V	A	
15.960	3.0	33.5	37.6	13.2	-31.8	0.0	0.7	53.1	74.0	-20.9	H	P	
15.960	3.0	22.8	37.6	13.2	-31.8	0.0	0.7	42.5	54.0	-11.5	H	A	

Rev. 4.1.2.7

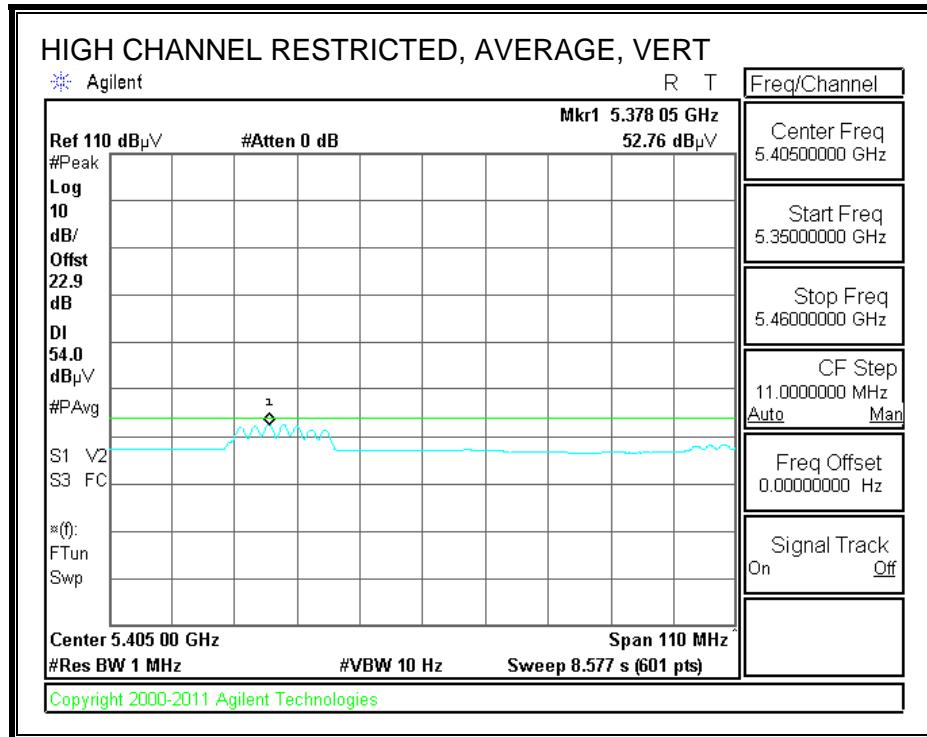
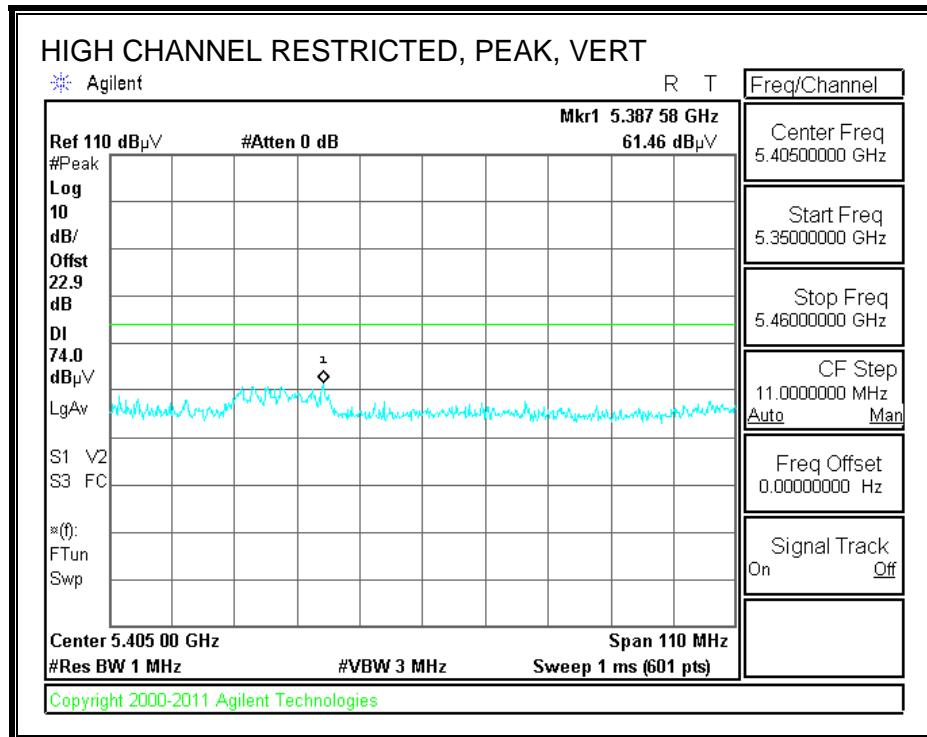
Note: No other emissions were detected above the system noise floor.

### 9.2.15. TX ABOVE 1 GHz, 802.11n HT20 CDD 2TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT20 3IX CDD

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

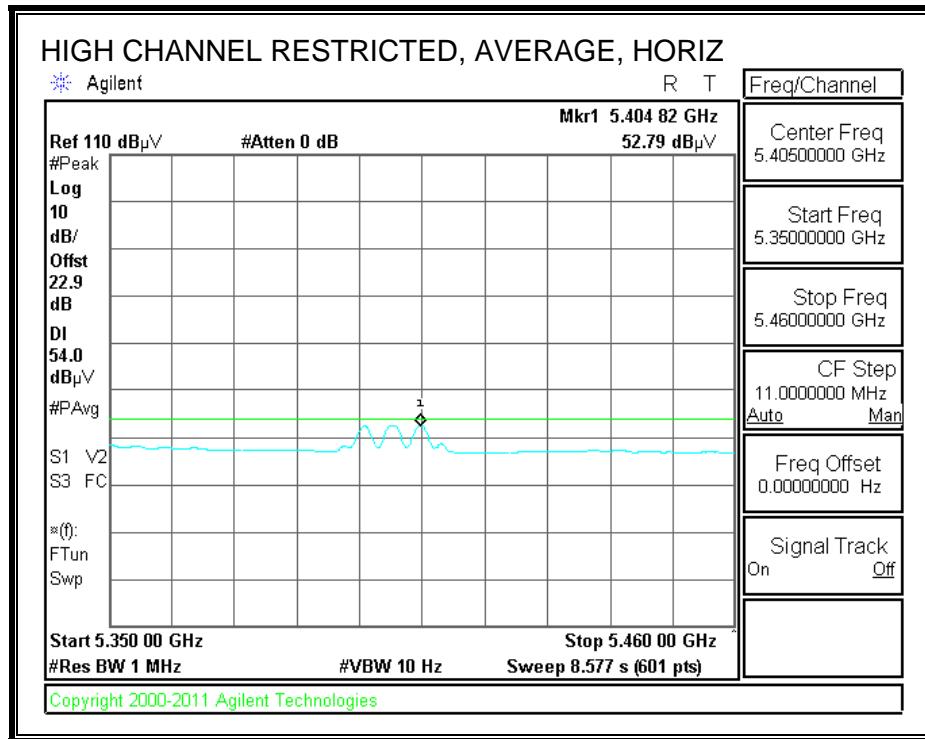
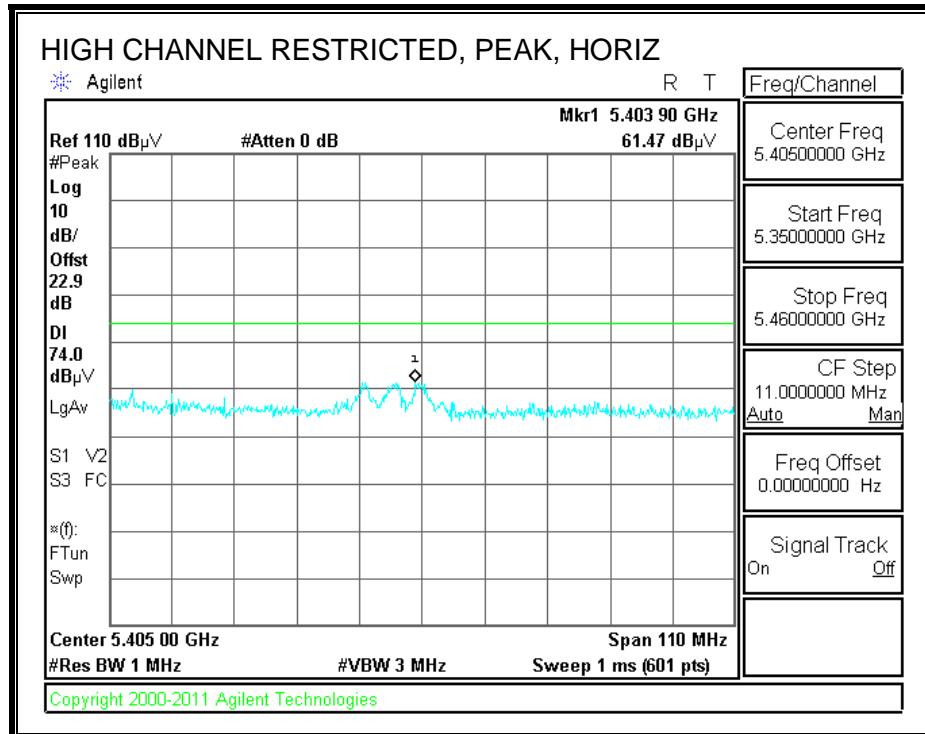
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5260 MHz 3IX CDD</b>													
15.780	3.0	33.8	38.2	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.780	3.0	23.3	38.2	13.1	-31.9	0.0	0.7	43.5	54.0	-10.5	V	A	
15.780	3.0	33.2	38.2	13.1	-31.9	0.0	0.7	53.4	74.0	-20.6	H	P	
15.780	3.0	23.7	38.2	13.1	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5300 MHz 3IX CDD</b>													
15.900	3.0	33.2	37.8	13.2	-31.8	0.0	0.7	53.0	74.0	-21.0	H	P	
15.900	3.0	23.5	37.8	13.2	-31.8	0.0	0.7	43.3	54.0	-10.7	H	A	
15.900	3.0	33.7	37.8	13.2	-31.8	0.0	0.7	53.5	74.0	-20.5	V	P	
15.900	3.0	26.0	37.8	13.2	-31.8	0.0	0.7	45.8	54.0	-8.2	V	A	
<b>5320 MHz 3IX CDD</b>													
15.960	3.0	33.0	37.6	13.2	-31.8	0.0	0.7	52.7	74.0	-21.3	V	P	
15.960	3.0	23.1	37.6	13.2	-31.8	0.0	0.7	42.8	54.0	-11.2	V	A	
15.960	3.0	33.5	37.6	13.2	-31.8	0.0	0.7	53.1	74.0	-20.9	H	P	
15.960	3.0	22.8	37.6	13.2	-31.8	0.0	0.7	42.5	54.0	-11.5	H	A	

Rev. 4.1.2.7

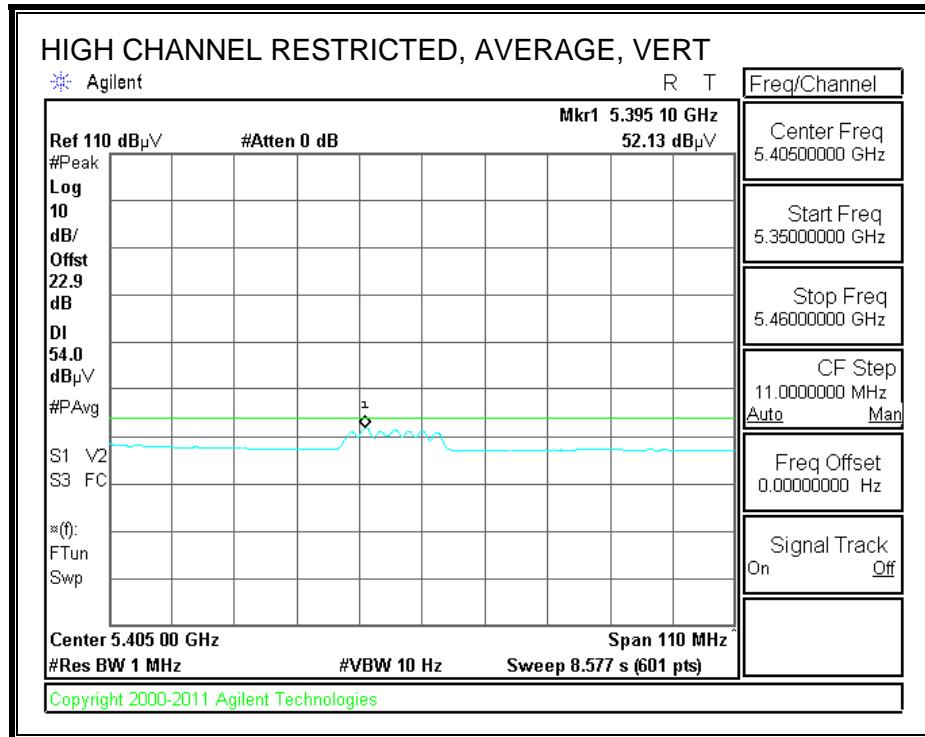
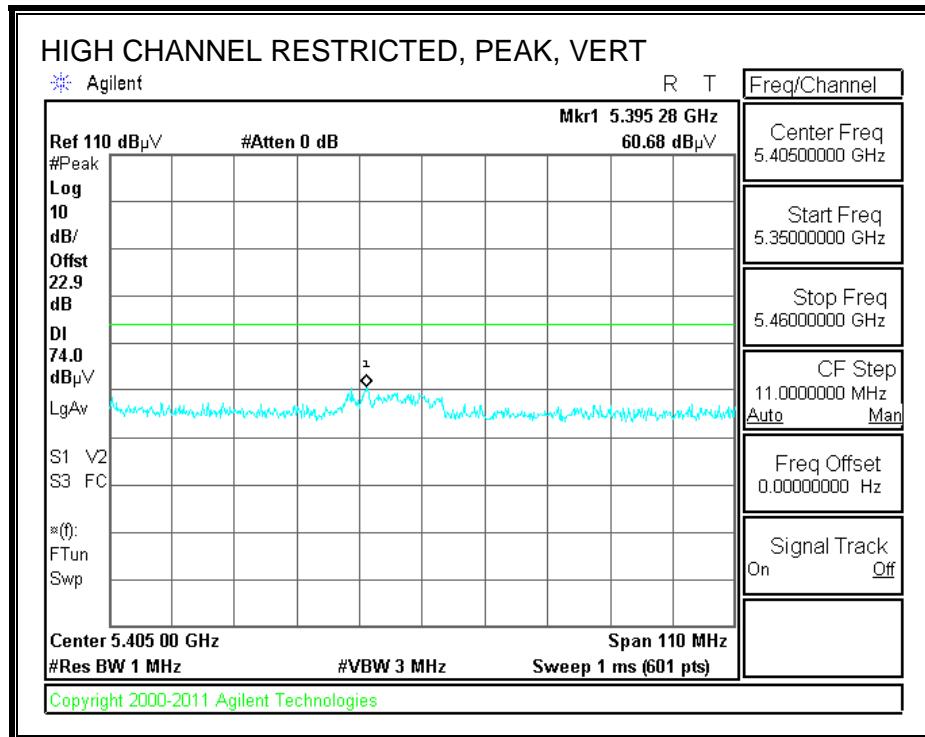
Note: No other emissions were detected above the system noise floor.

### 9.2.16. TX ABOVE 1 GHz, 802.11n HT20 CDD 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT20 3IX CDD

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

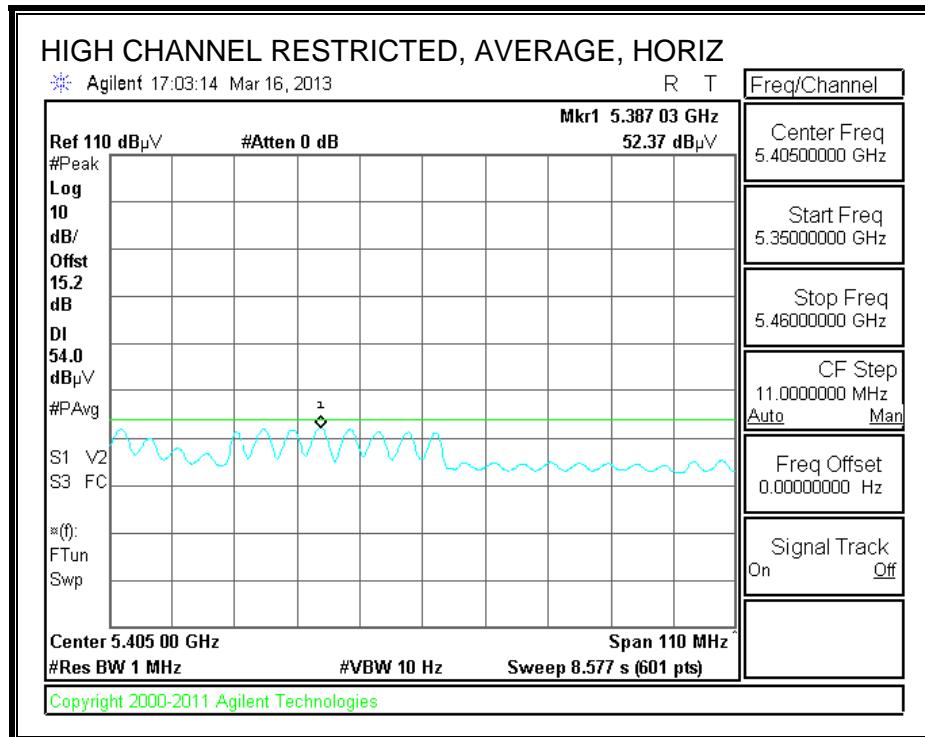
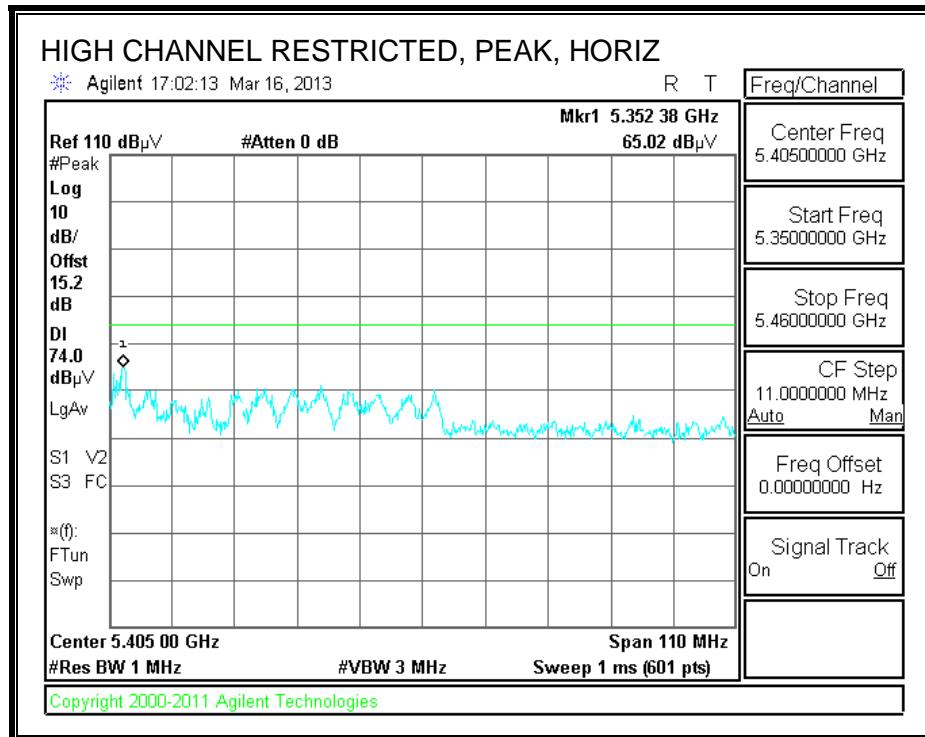
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5260 MHz 3IX CDD</b>													
15.780	3.0	33.8	38.2	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.780	3.0	23.3	38.2	13.1	-31.9	0.0	0.7	43.5	54.0	-10.5	V	A	
15.780	3.0	33.2	38.2	13.1	-31.9	0.0	0.7	53.4	74.0	-20.6	H	P	
15.780	3.0	23.7	38.2	13.1	-31.9	0.0	0.7	43.9	54.0	-10.1	H	A	
<b>5300 MHz 3IX CDD</b>													
15.900	3.0	33.2	37.8	13.2	-31.8	0.0	0.7	53.0	74.0	-21.0	H	P	
15.900	3.0	23.5	37.8	13.2	-31.8	0.0	0.7	43.3	54.0	-10.7	H	A	
15.900	3.0	33.7	37.8	13.2	-31.8	0.0	0.7	53.5	74.0	-20.5	V	P	
15.900	3.0	26.0	37.8	13.2	-31.8	0.0	0.7	45.8	54.0	-8.2	V	A	
<b>5320 MHz 3IX CDD</b>													
15.960	3.0	33.0	37.6	13.2	-31.8	0.0	0.7	52.7	74.0	-21.3	V	P	
15.960	3.0	23.1	37.6	13.2	-31.8	0.0	0.7	42.8	54.0	-11.2	V	A	
15.960	3.0	33.5	37.6	13.2	-31.8	0.0	0.7	53.1	74.0	-20.9	H	P	
15.960	3.0	22.8	37.6	13.2	-31.8	0.0	0.7	42.5	54.0	-11.5	H	A	

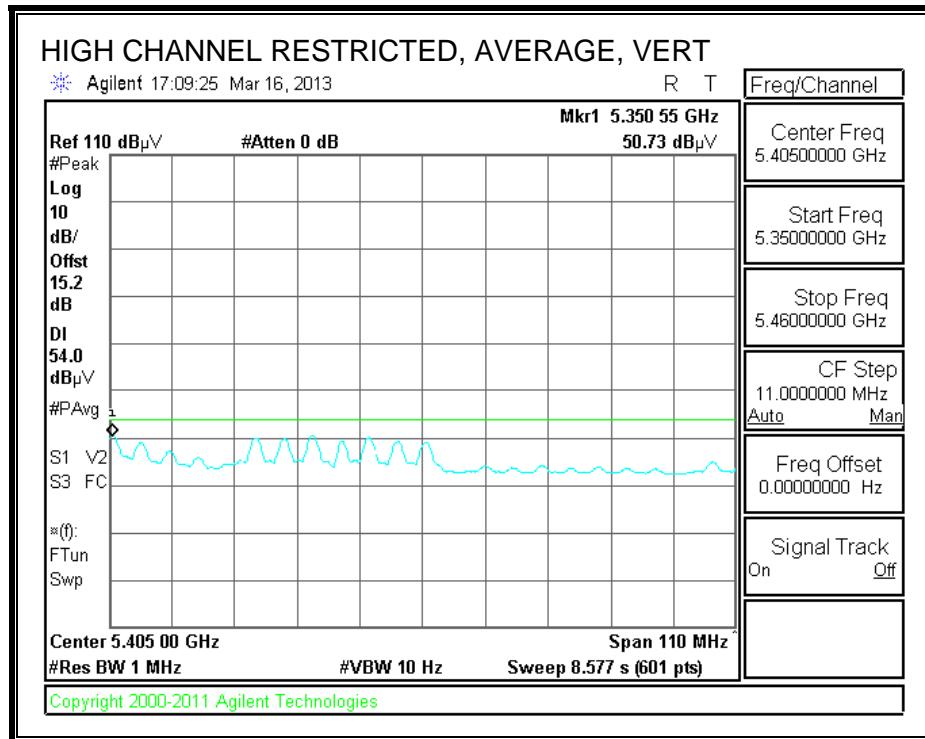
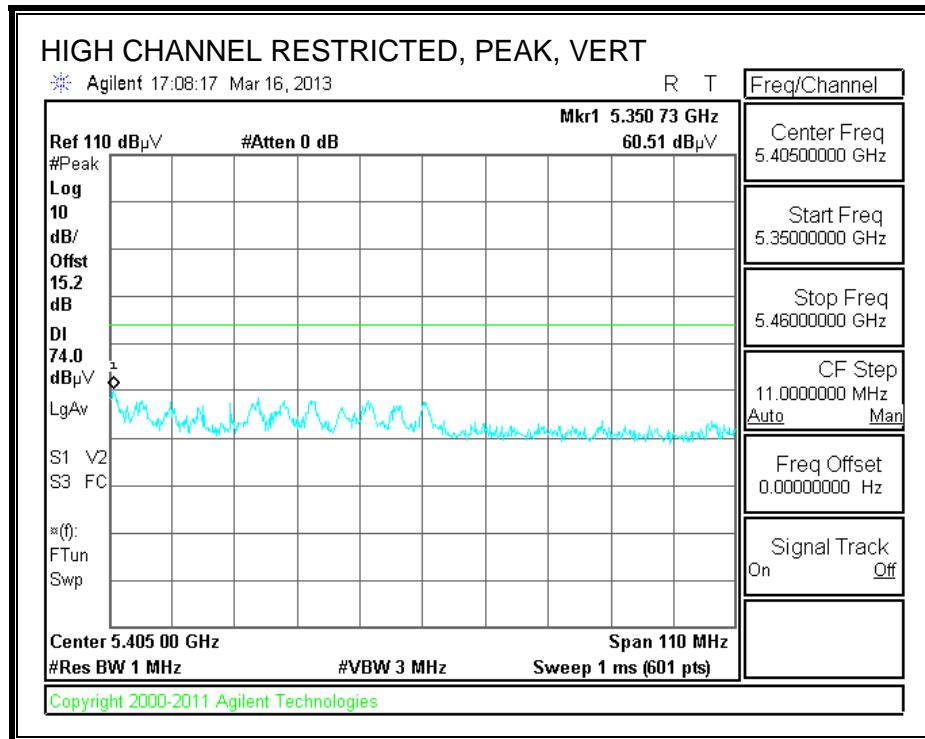
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.17. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)





**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3IX CDD

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

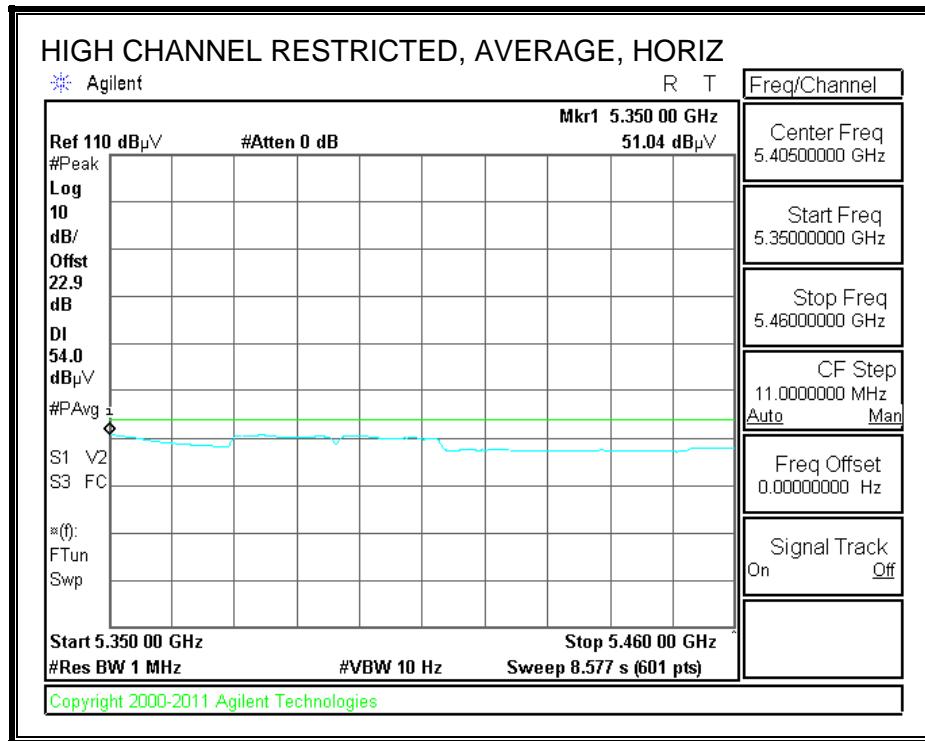
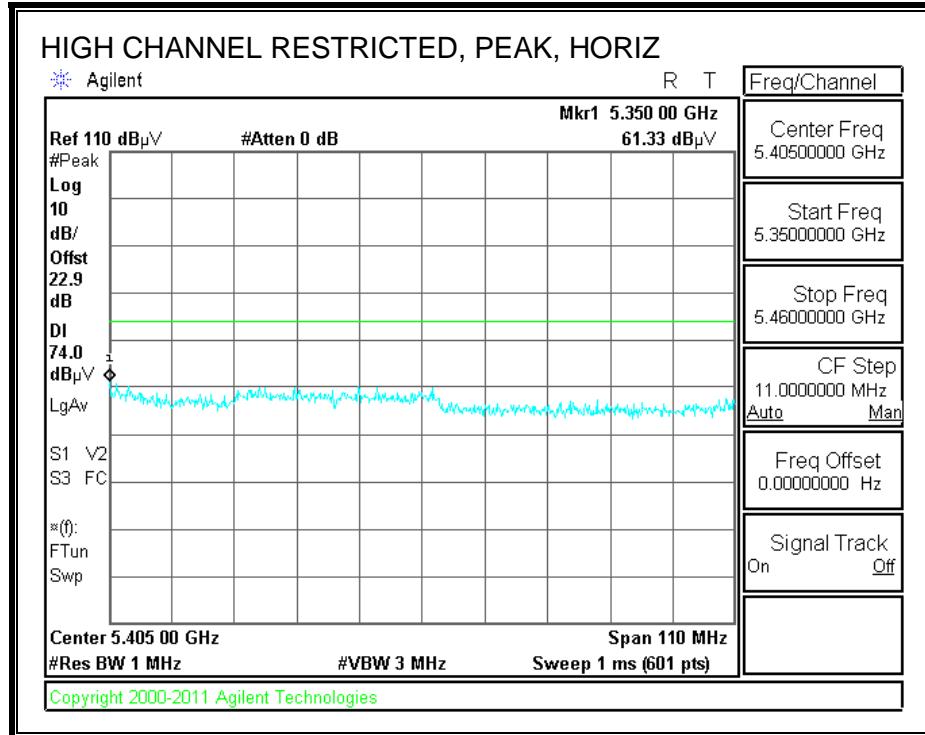
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3IX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	33.4	38.1	13.1	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.810	3.0	23.6	38.1	13.1	-31.9	0.0	0.7	43.6	54.0	-10.4	H	A	
<b>5310 MHz 3IX CDD</b>													
15.930	3.0	32.6	37.7	13.2	-31.8	0.0	0.7	52.3	74.0	-21.7	H	P	
15.930	3.0	23.4	37.7	13.2	-31.8	0.0	0.7	43.1	54.0	-10.9	H	A	
15.930	3.0	33.2	37.7	13.2	-31.8	0.0	0.7	52.9	74.0	-21.1	V	P	
15.930	3.0	26.2	37.7	13.2	-31.8	0.0	0.7	45.9	54.0	-8.1	V	A	

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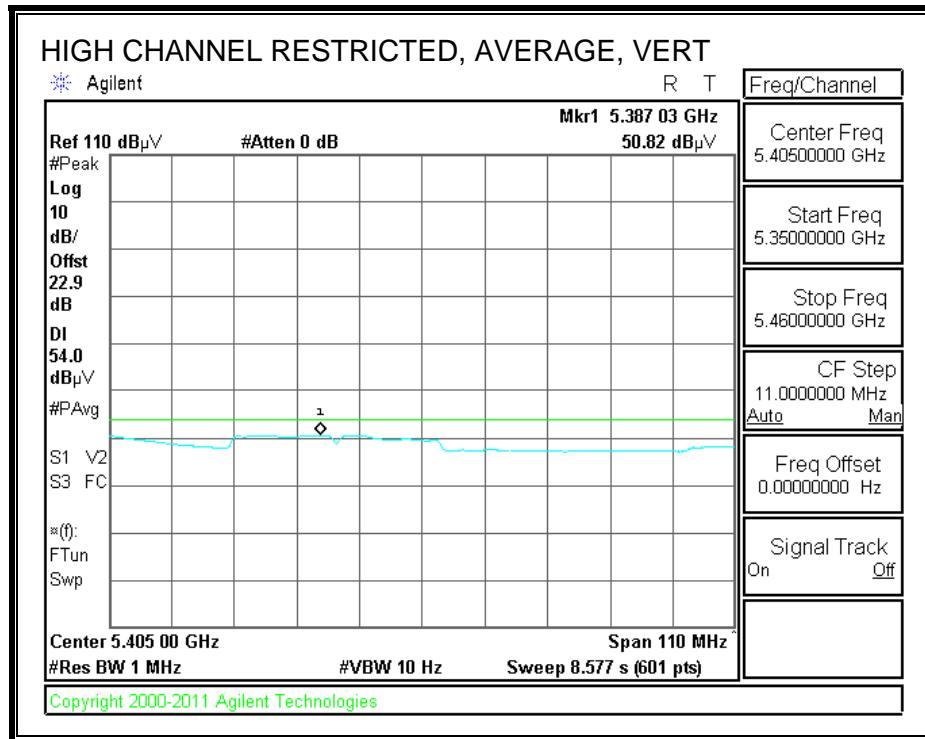
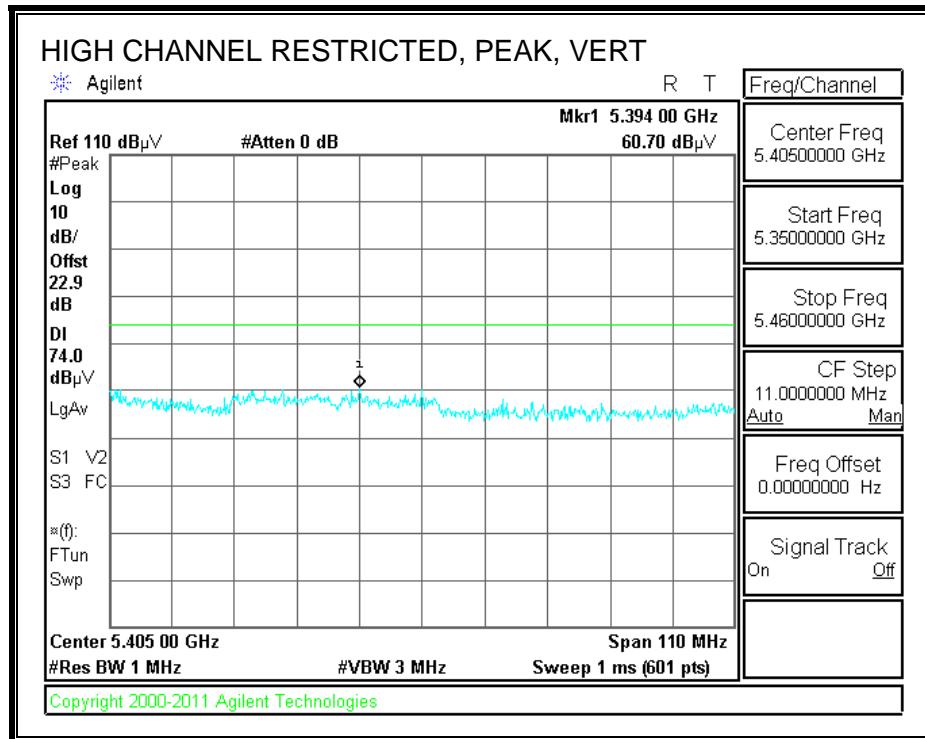
Note: No other emissions were detected above the system noise floor.

### 9.2.18. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)







**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3IX CDD

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

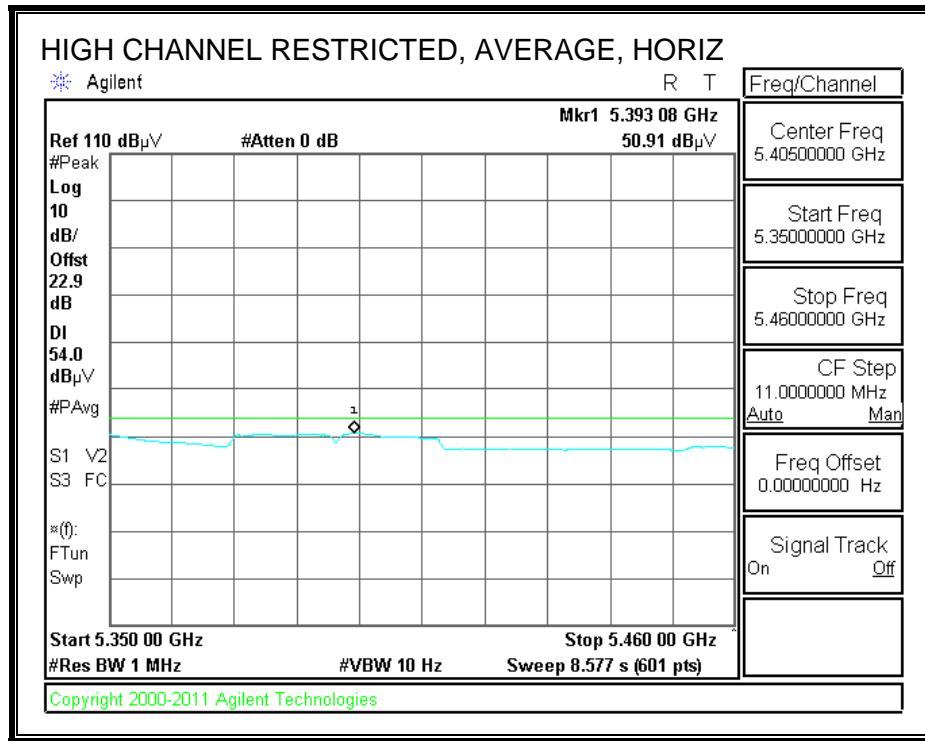
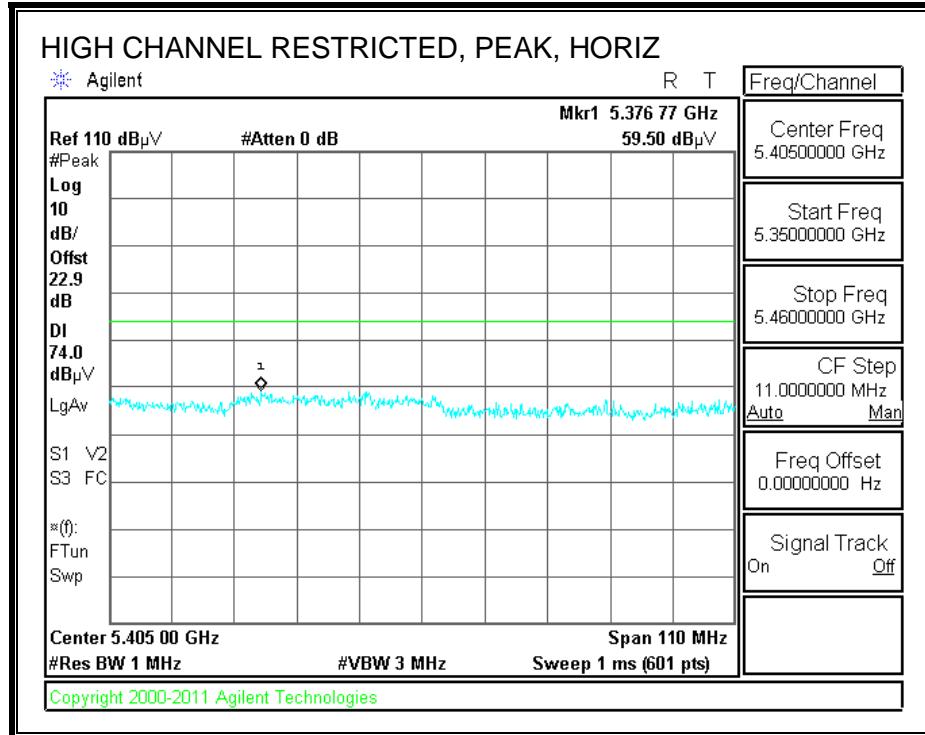
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3IX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	33.4	38.1	13.1	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.810	3.0	23.6	38.1	13.1	-31.9	0.0	0.7	43.6	54.0	-10.4	H	A	
<b>5310 MHz 3IX CDD</b>													
15.930	3.0	32.6	37.7	13.2	-31.8	0.0	0.7	52.3	74.0	-21.7	H	P	
15.930	3.0	23.4	37.7	13.2	-31.8	0.0	0.7	43.1	54.0	-10.9	H	A	
15.930	3.0	33.2	37.7	13.2	-31.8	0.0	0.7	52.9	74.0	-21.1	V	P	
15.930	3.0	26.2	37.7	13.2	-31.8	0.0	0.7	45.9	54.0	-8.1	V	A	

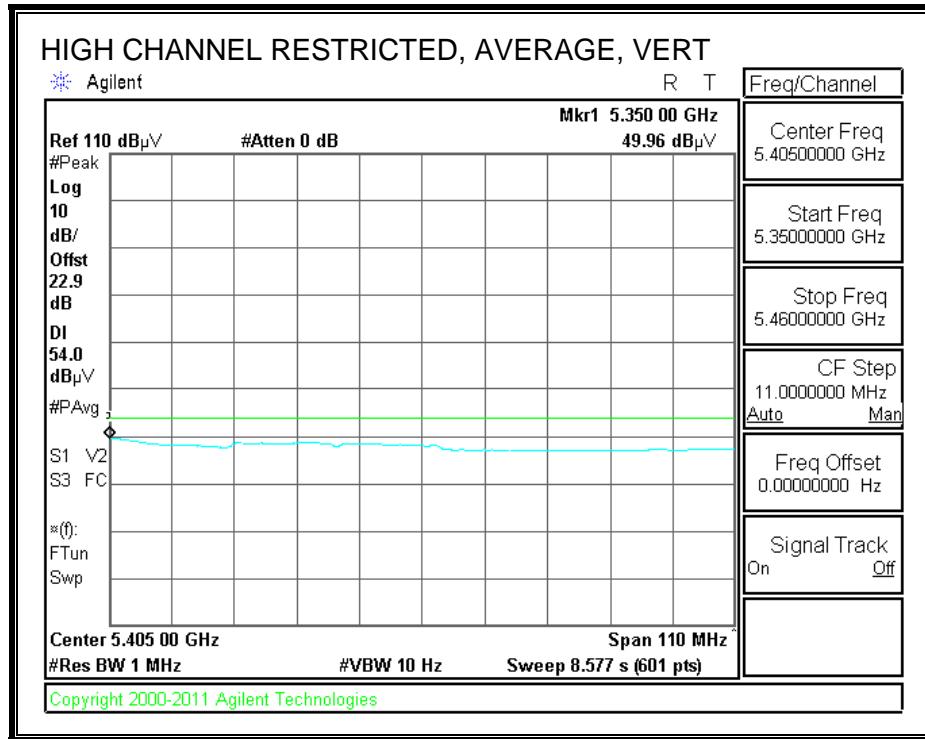
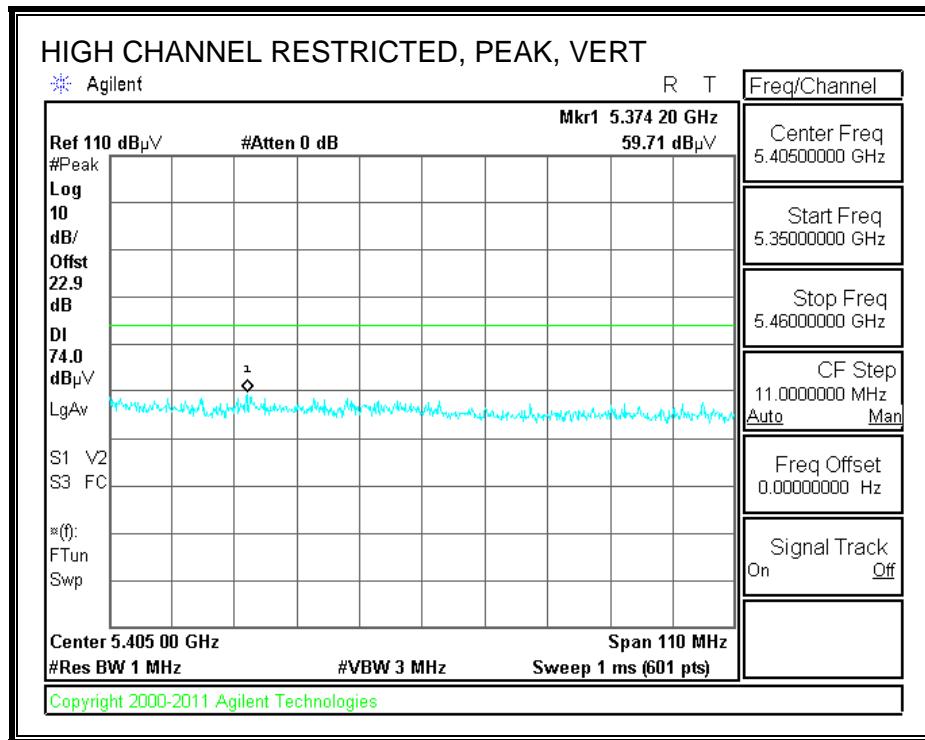
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.19. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)





**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
**Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3IX CDD

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

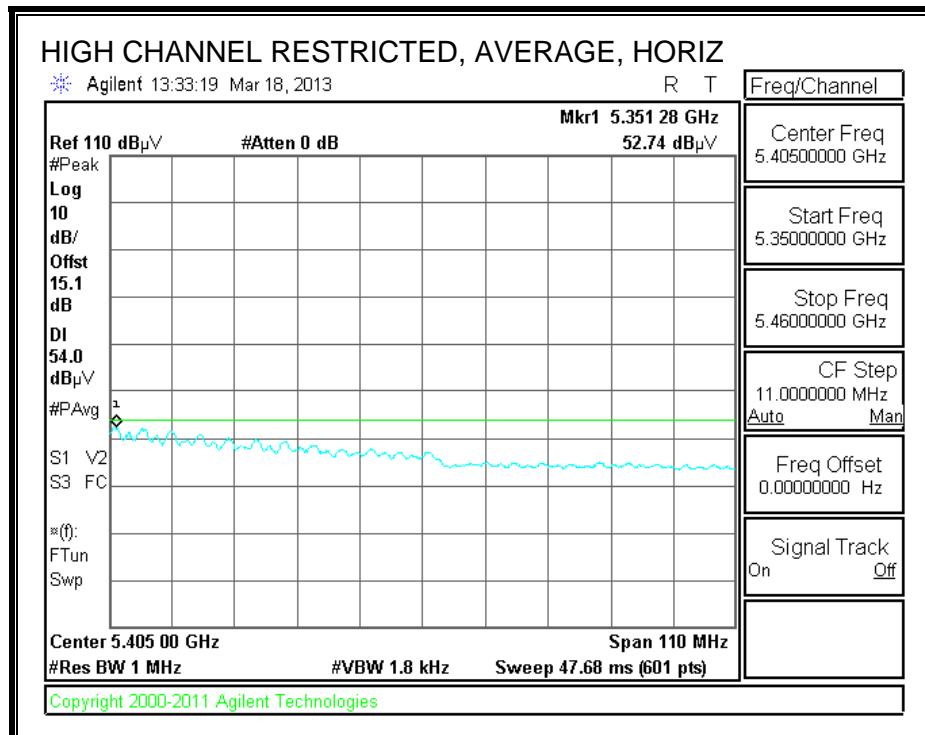
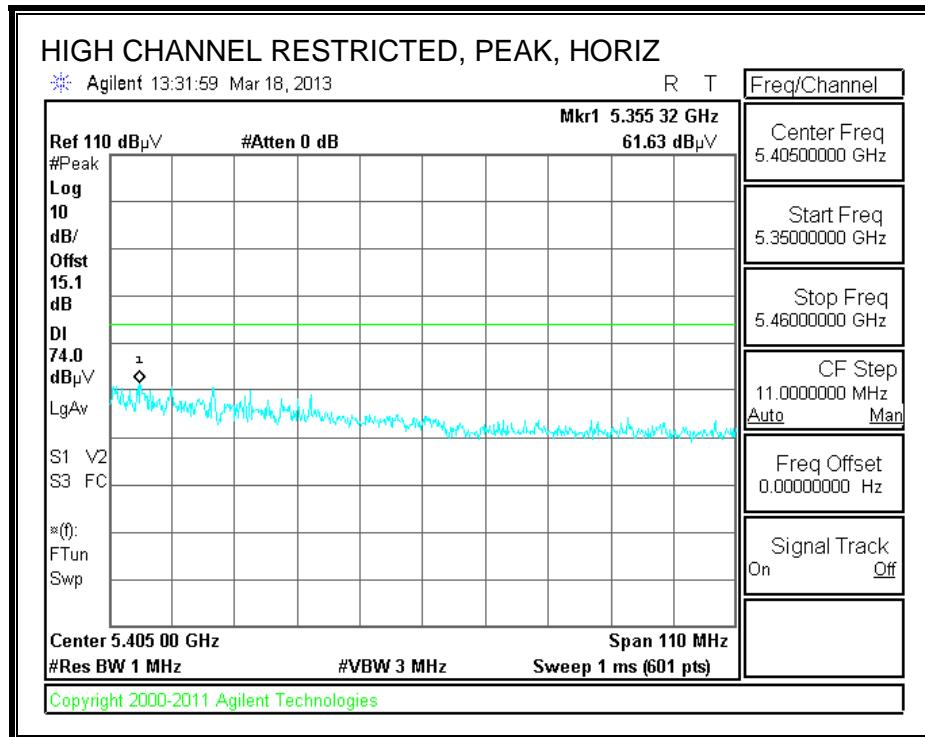
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3IX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	33.4	38.1	13.1	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.810	3.0	23.6	38.1	13.1	-31.9	0.0	0.7	43.6	54.0	-10.4	H	A	
<b>5310 MHz 3IX CDD</b>													
15.930	3.0	32.6	37.7	13.2	-31.8	0.0	0.7	52.3	74.0	-21.7	H	P	
15.930	3.0	23.4	37.7	13.2	-31.8	0.0	0.7	43.1	54.0	-10.9	H	A	
15.930	3.0	33.2	37.7	13.2	-31.8	0.0	0.7	52.9	74.0	-21.1	V	P	
15.930	3.0	26.2	37.7	13.2	-31.8	0.0	0.7	45.9	54.0	-8.1	V	A	

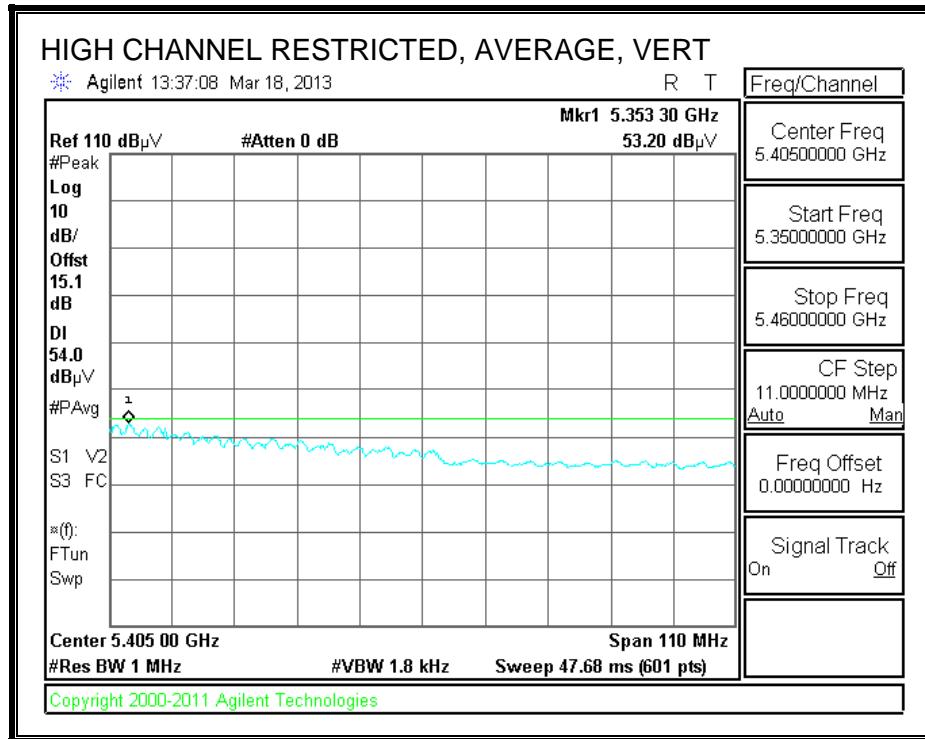
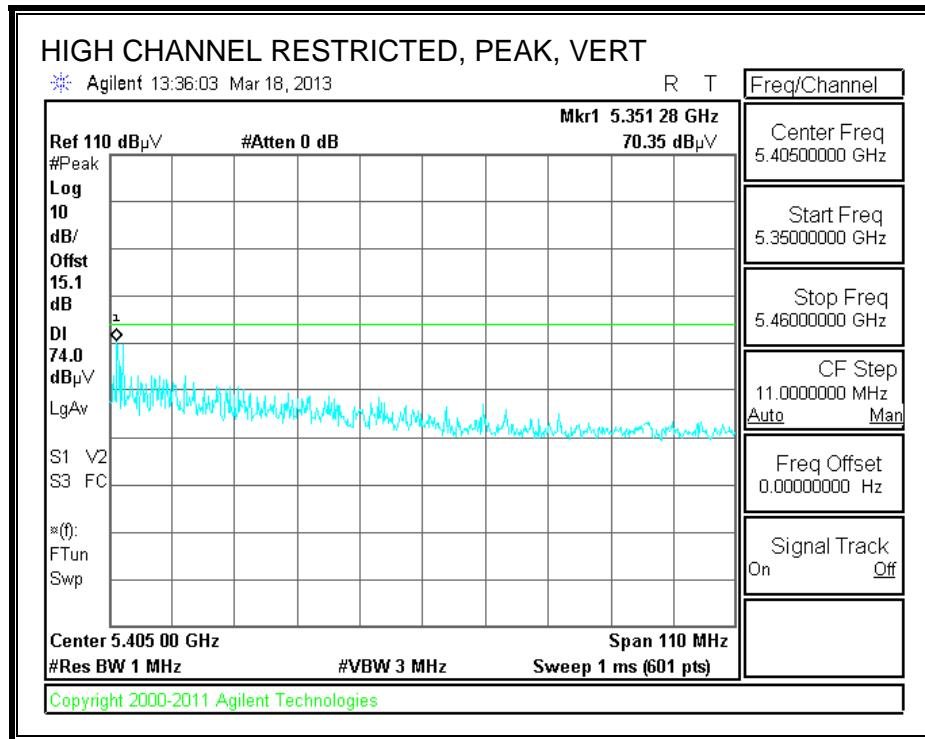
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.20. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.3 GHz BAND

#### RESTRICTED BANEDGE (HIGH CHANNEL)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

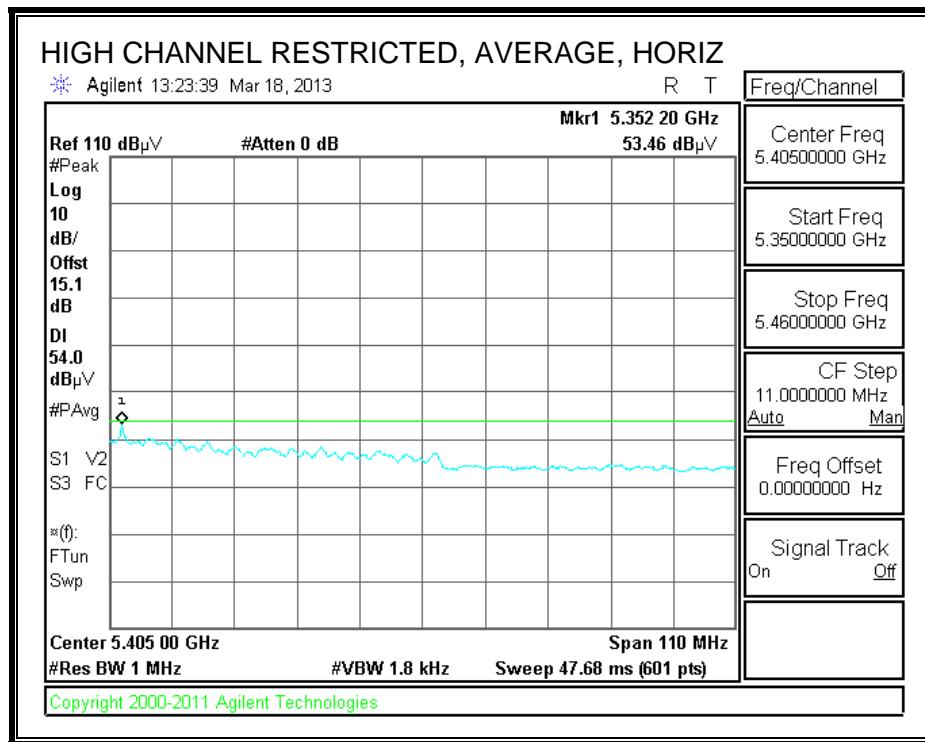
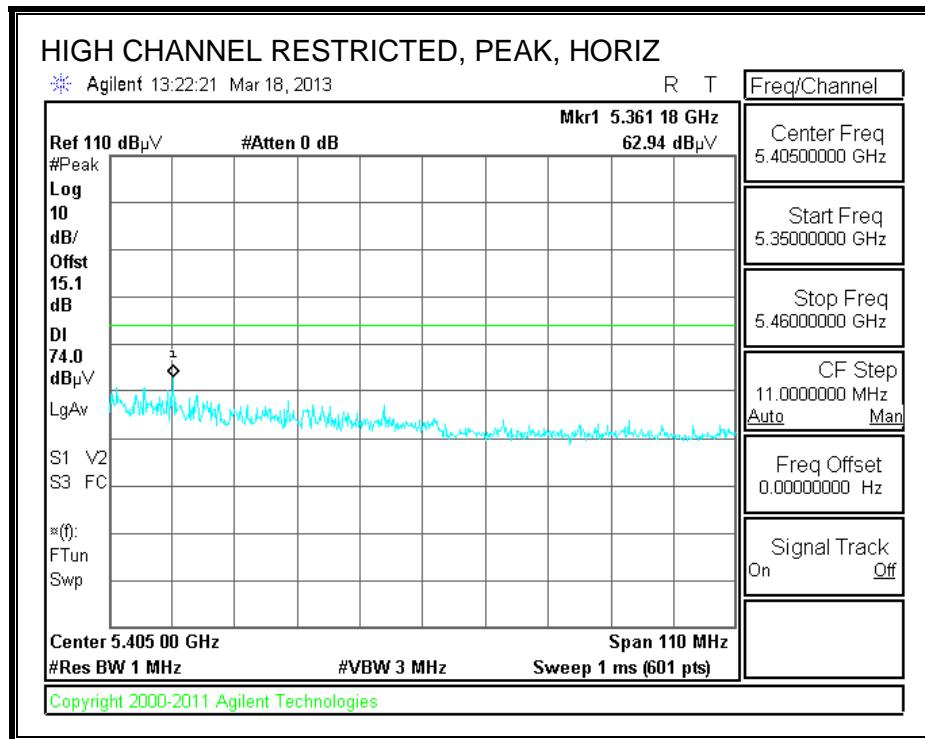
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

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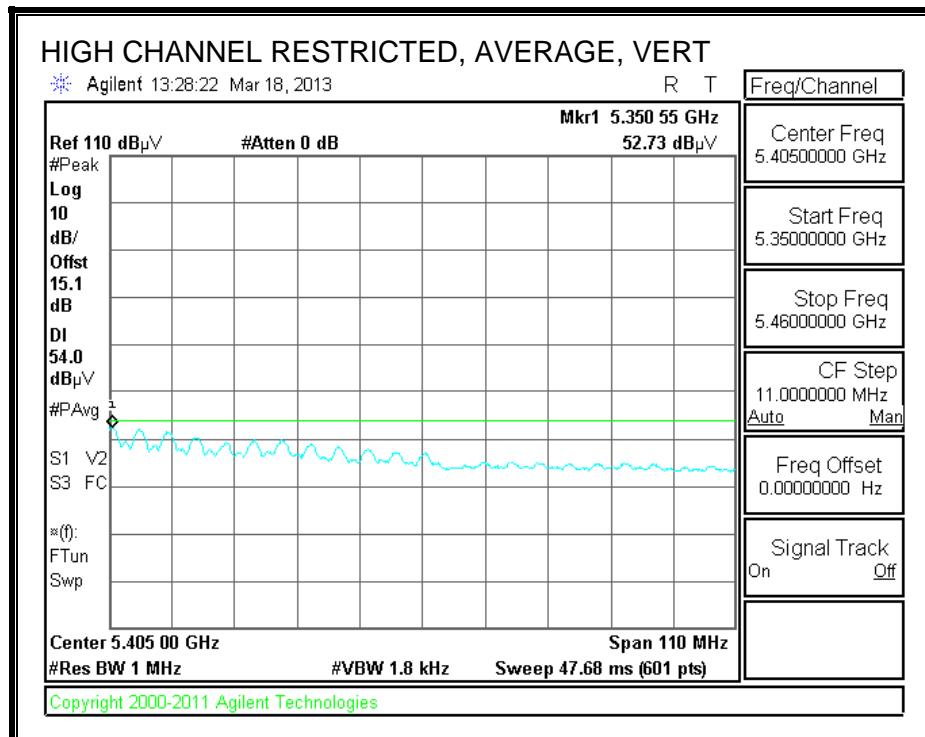
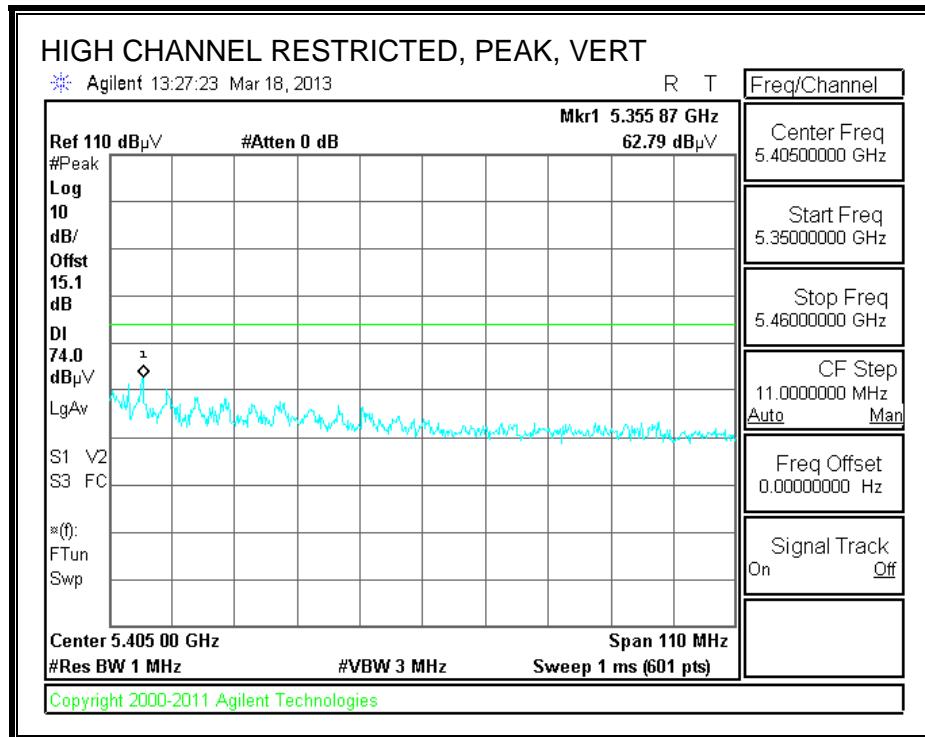
Note: No other emissions were detected above the system noise floor.

### 9.2.21. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)







## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

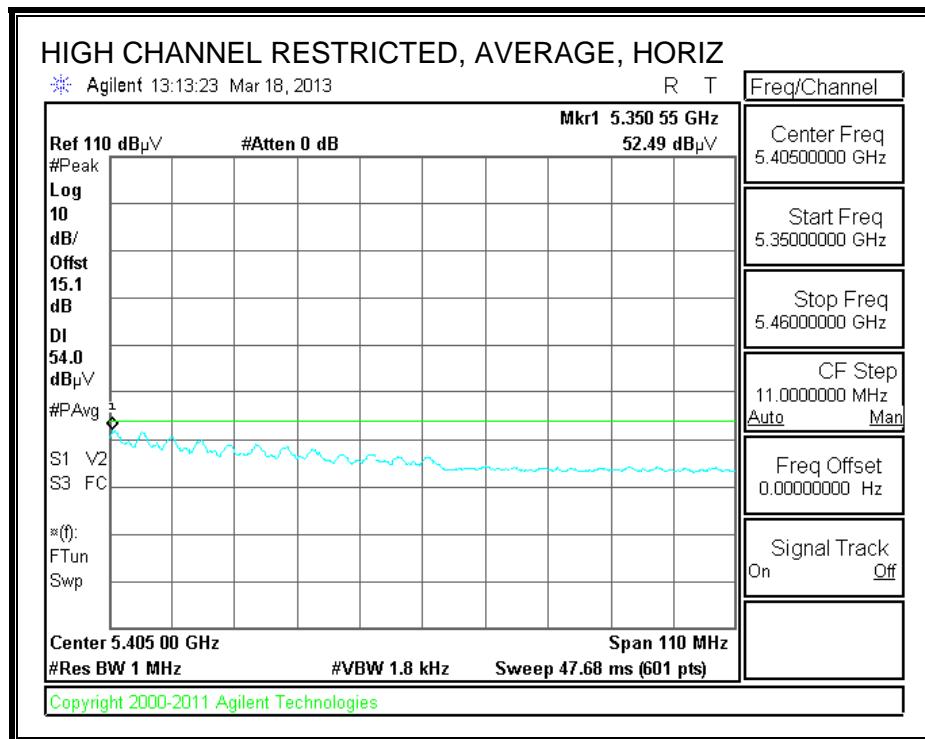
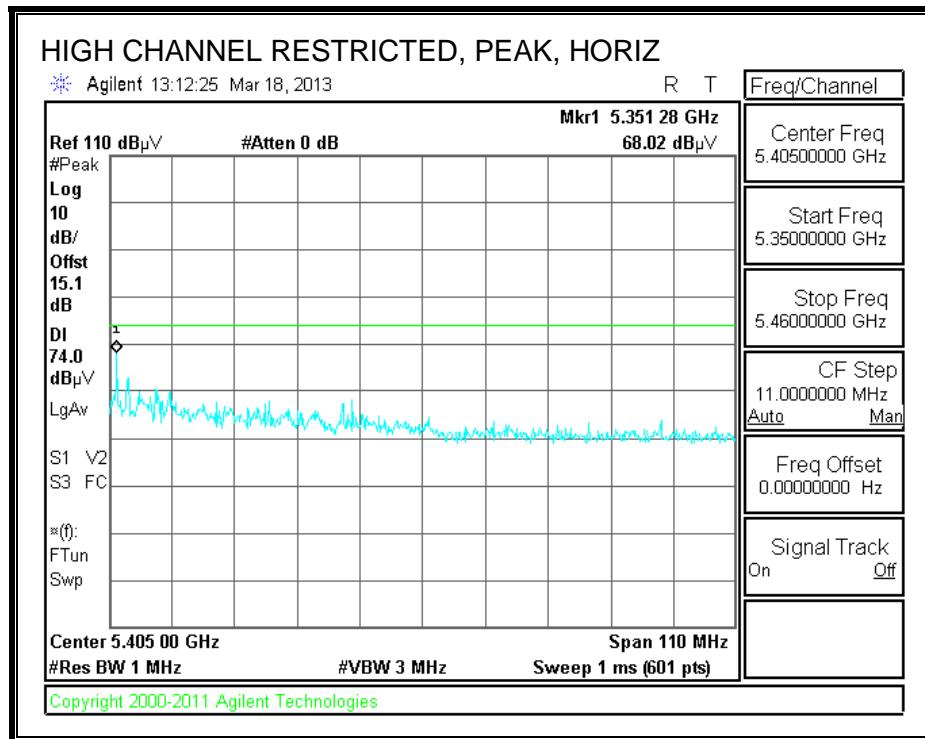
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

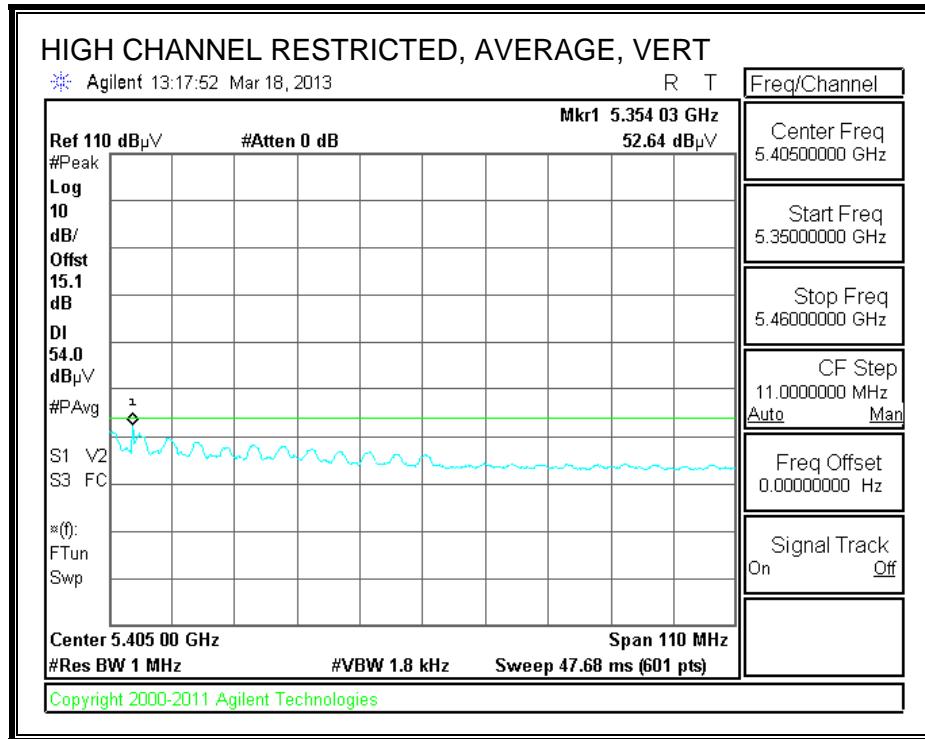
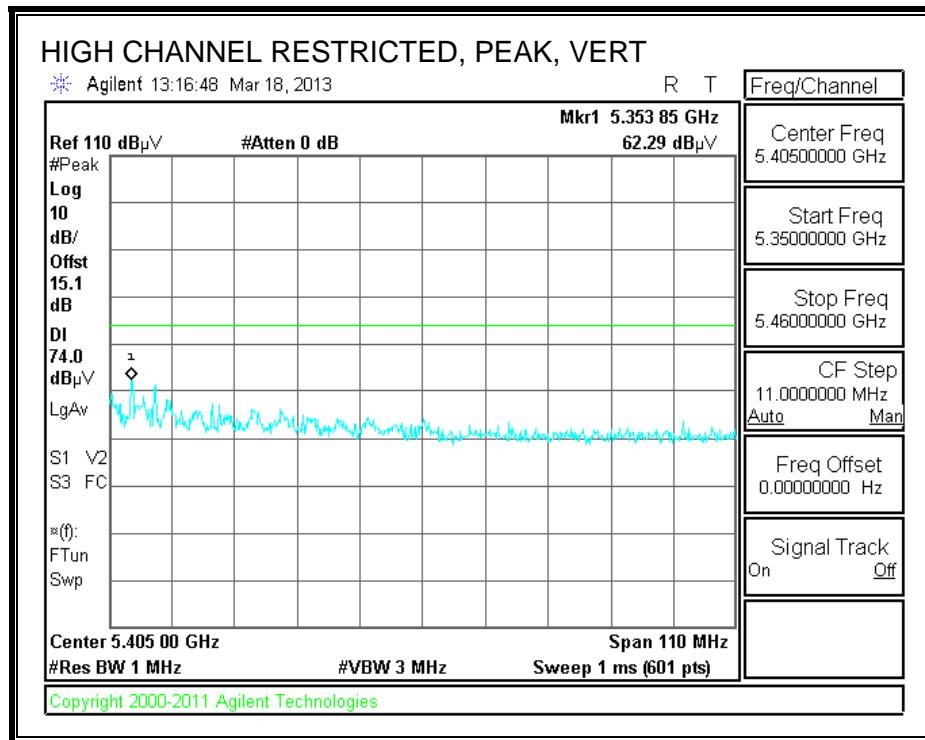
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.22. TX ABOVE 1 GHz, 802.11ac VHT80 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

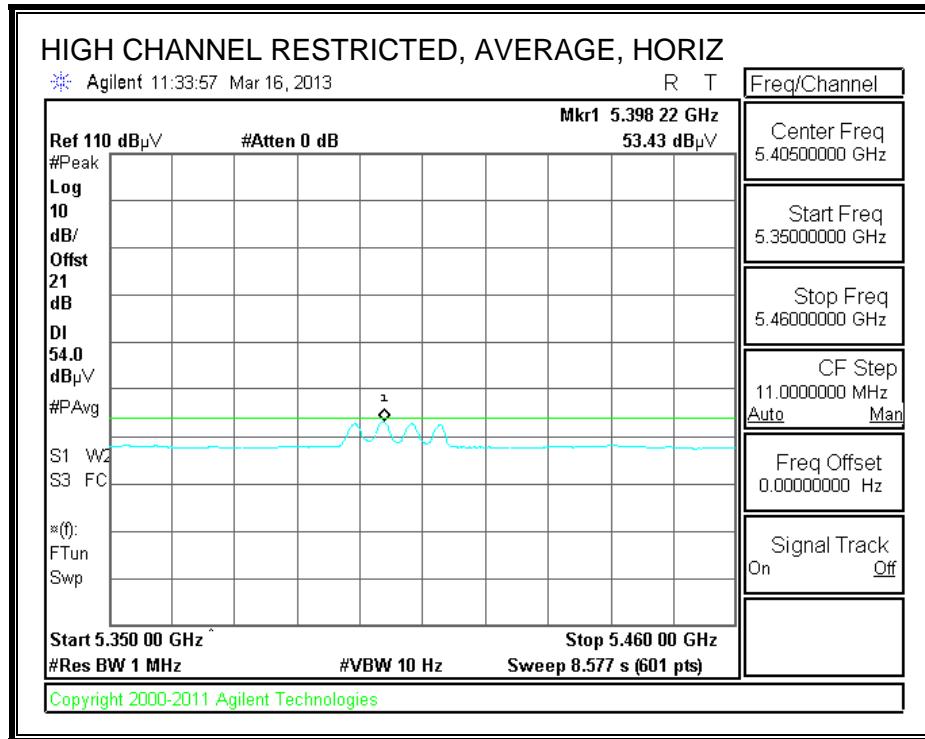
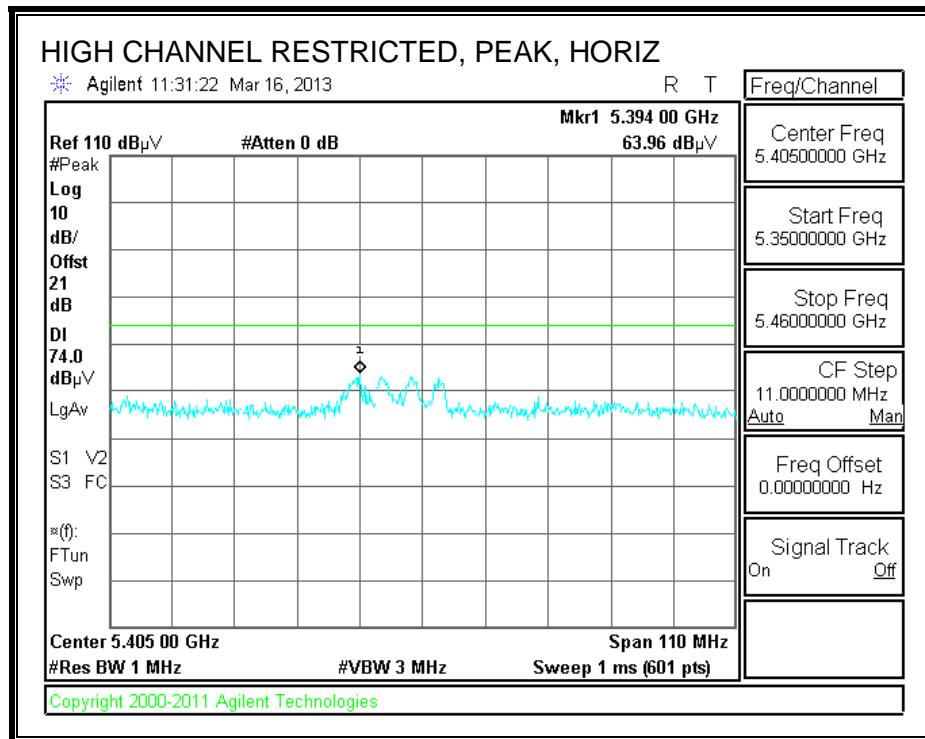
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

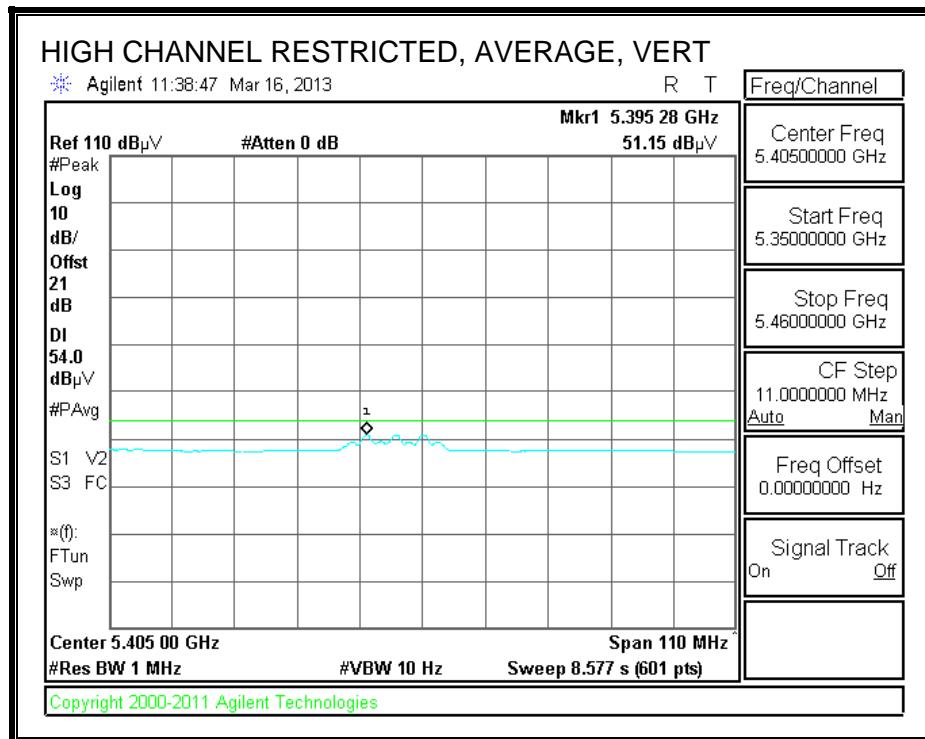
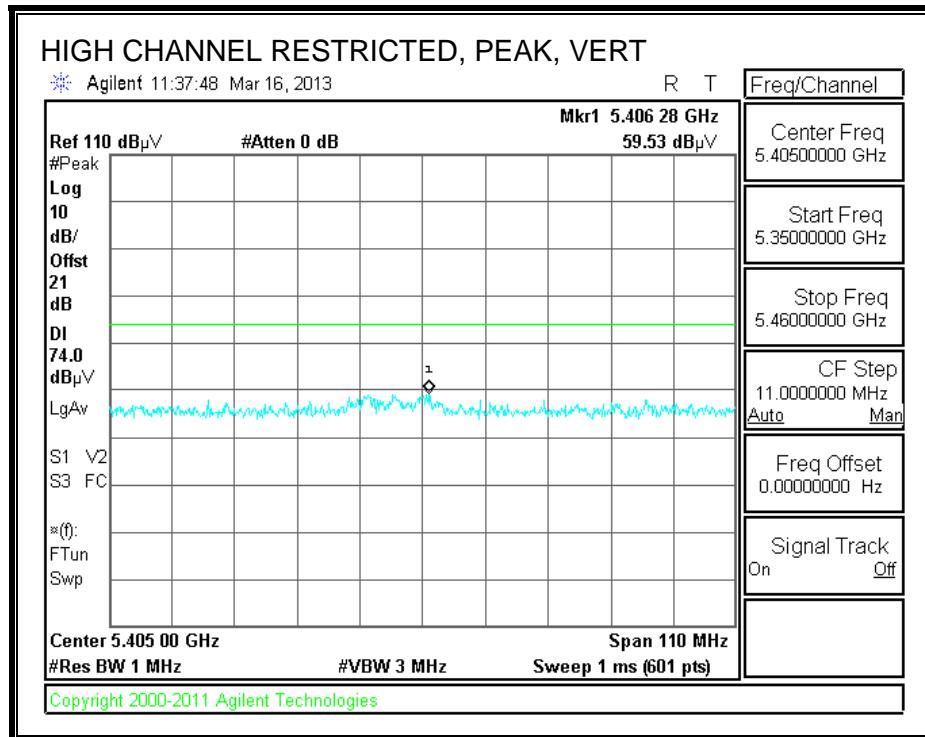
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.23. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)



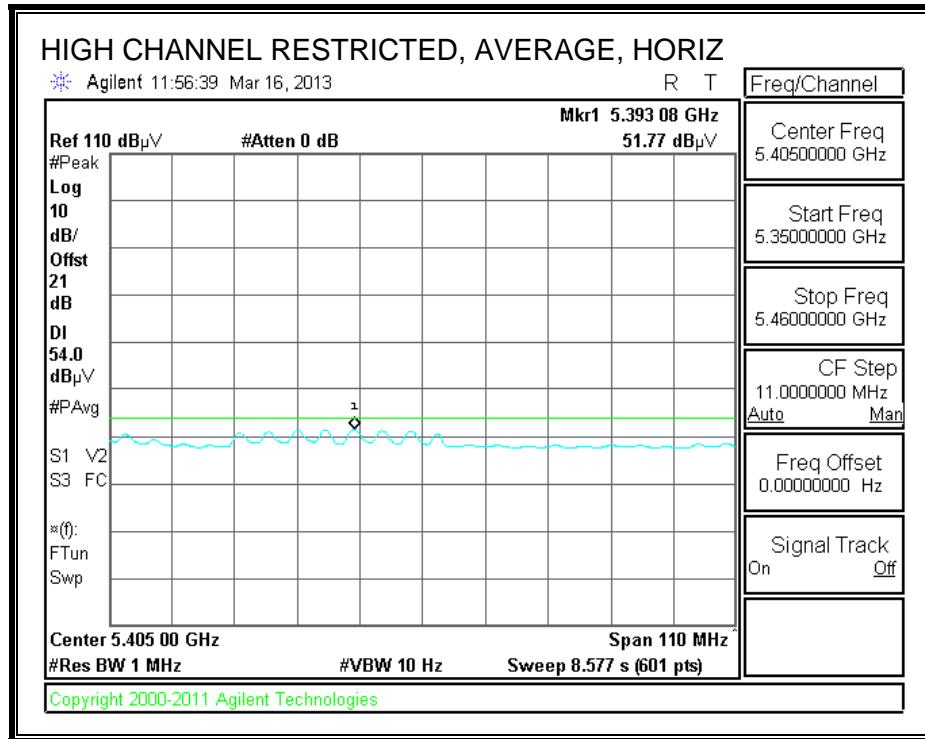
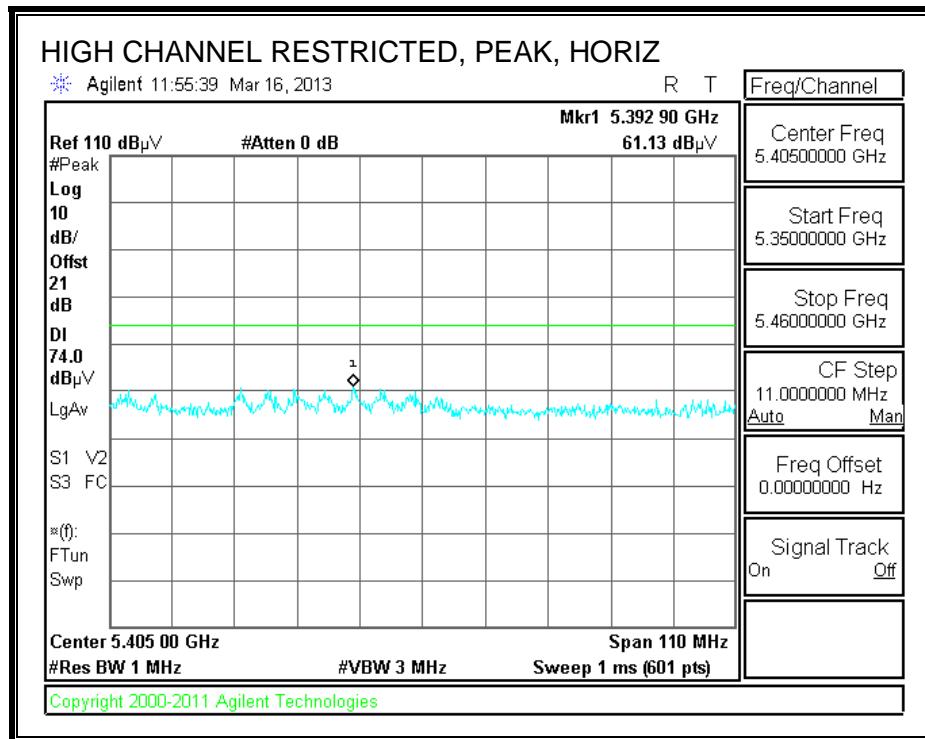


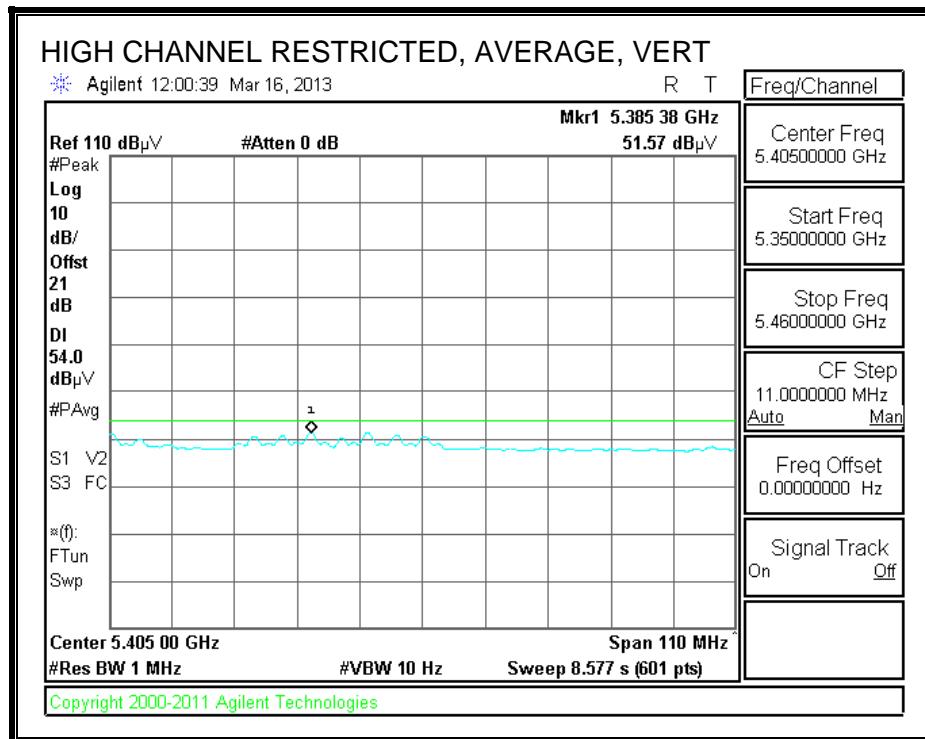
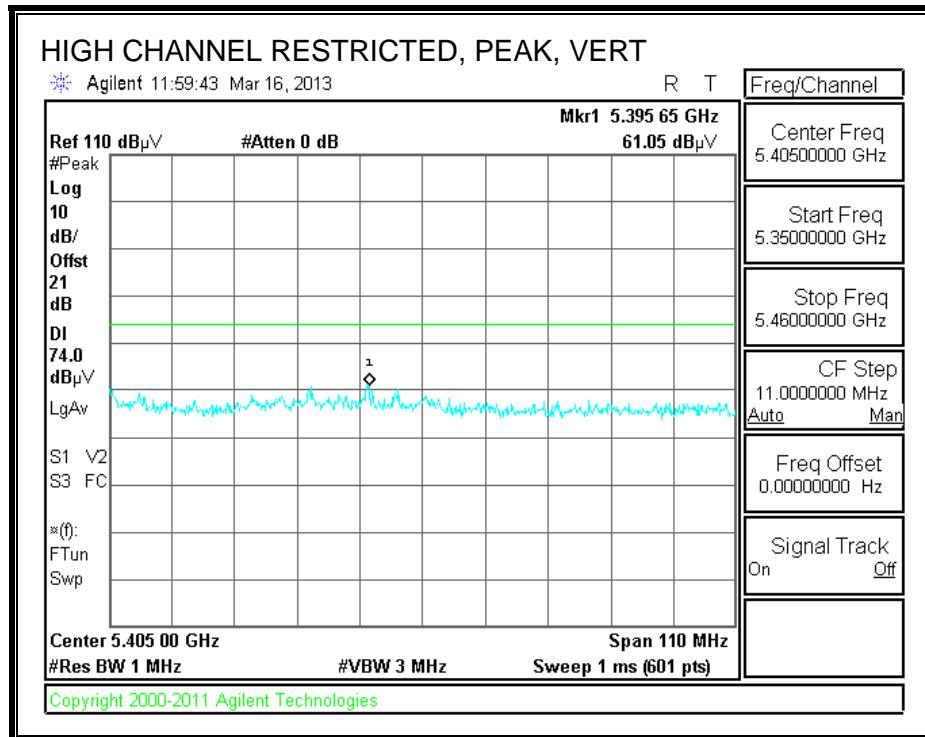
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT20 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz
3' cable 22807700			12' cable 22807600			20' cable 22807500			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	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 Channel (5260 MHz)															
15.780	3.0	36.1	24.9	40.2	13.4	-32.2	0.0	0.7	58.1	46.9	74	54	-15.9	-7.1	H
15.780	3.0	35.5	24.7	40.2	13.4	-32.2	0.0	0.7	57.5	46.7	74	54	-16.5	-7.3	V
Mid Channel (5300 MHz)															
10.600	3.0	36.5	25.4	37.3	10.7	-33.9	0.0	0.8	51.3	40.2	74	54	-22.7	-13.8	H
10.900	3.0	35.5	24.9	40.2	13.4	-32.2	0.0	0.7	57.6	47.1	74	54	-16.4	-6.9	V
Hi Channel (5320 MHz)															
10.640	3.0	36.0	25.7	37.3	10.7	-33.9	0.0	0.8	50.9	40.6	74	54	-23.1	-13.4	H
10.640	3.0	36.6	25.2	37.3	10.7	-33.9	0.0	0.8	51.5	40.1	74	54	-22.5	-13.9	V
Rev. 01.30.13															
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									

### 9.2.24. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)



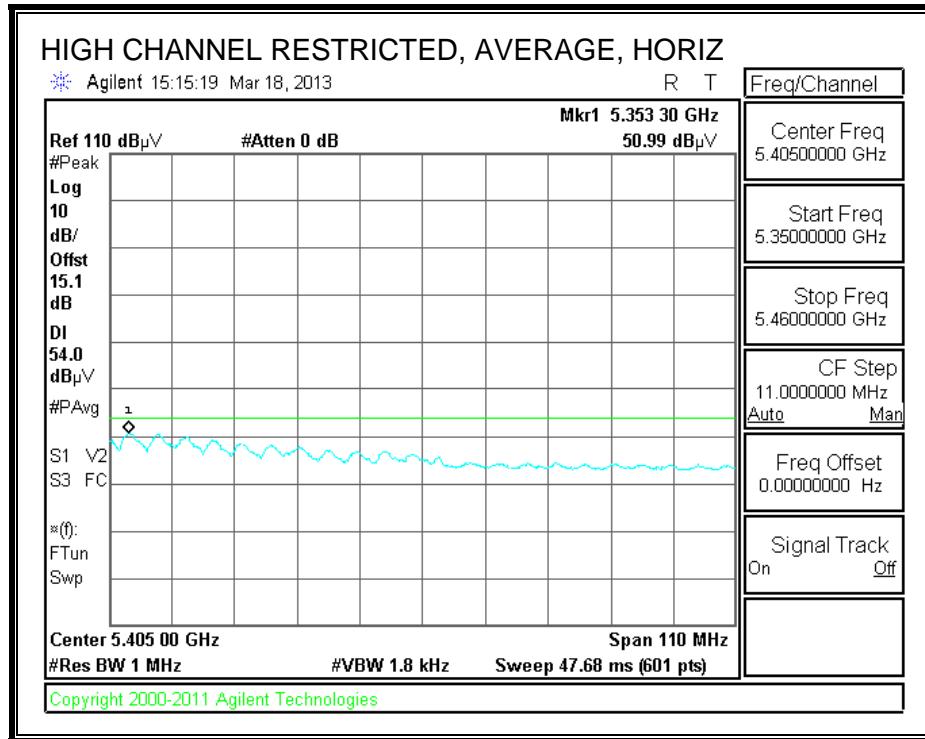
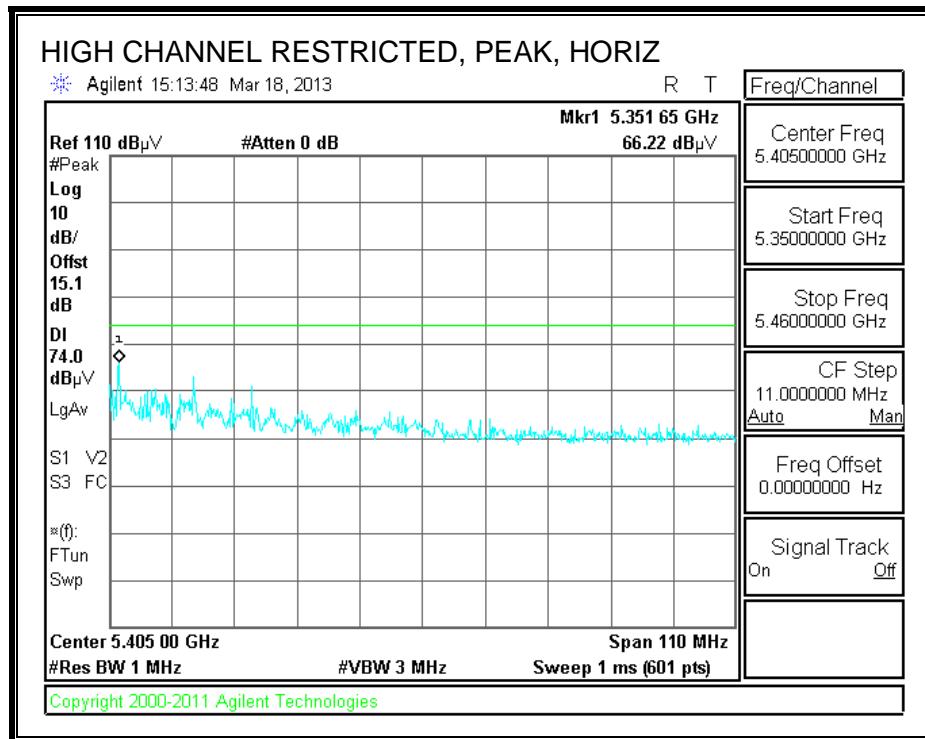


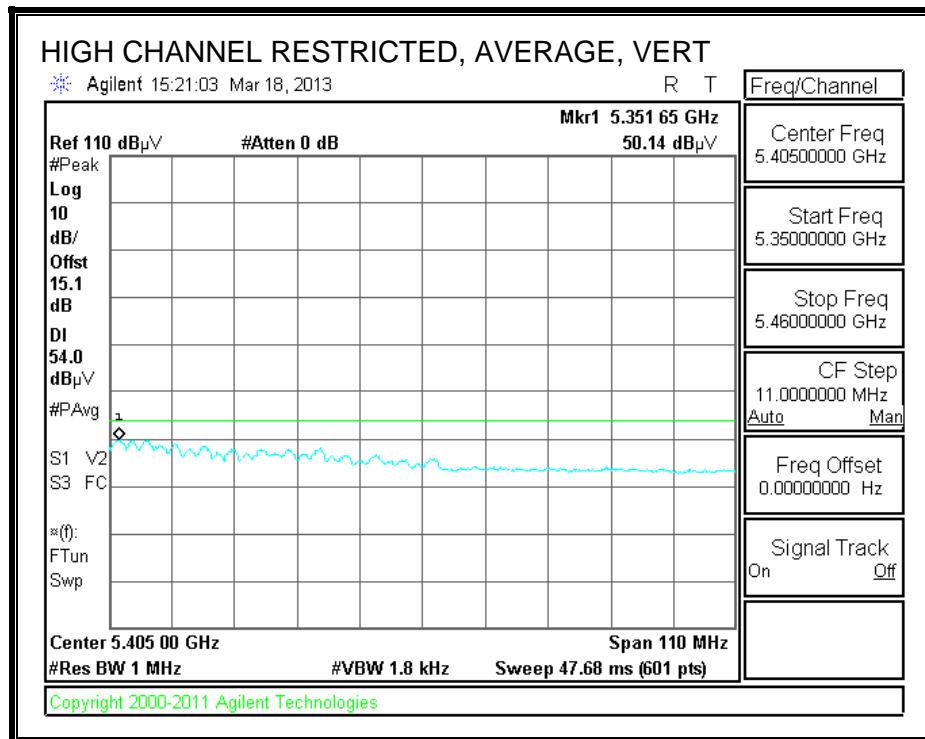
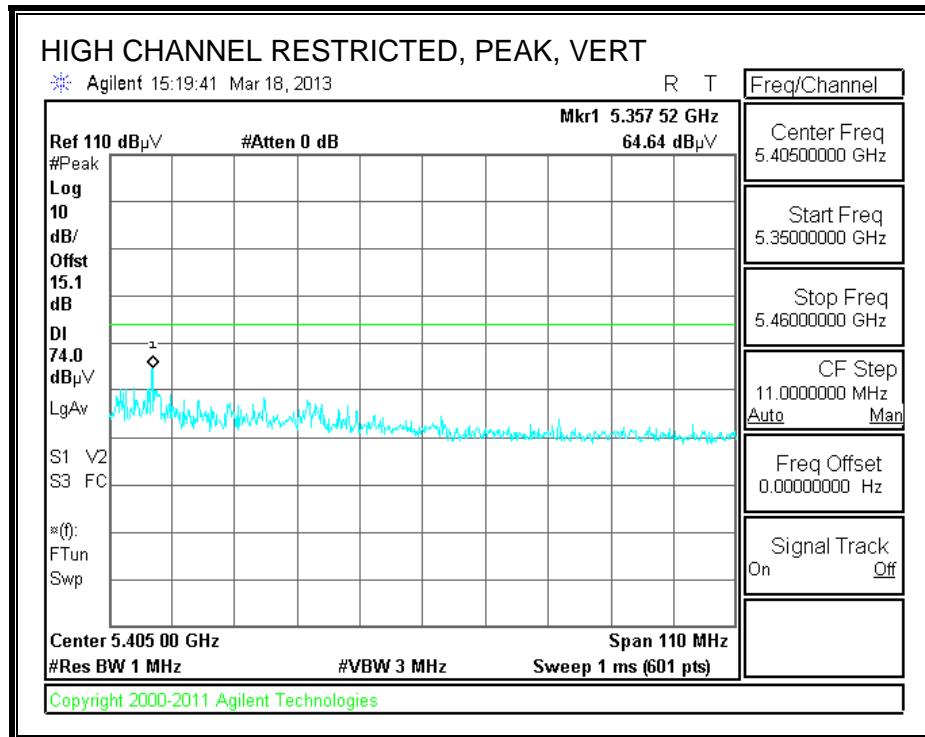
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz						Average Measurements RBW=1MHz ; VBW=10Hz
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5270 MHz)															
15.810	3.0	35.0	25.0	40.2	13.4	-32.2	0.0	0.7	57.1	47.0	74	54	-16.9	-7.0	H
15.810	3.0	35.0	24.7	40.2	13.4	-32.2	0.0	0.7	57.0	46.7	74	54	-17.0	-7.3	V
Hi Channel (5310 MHz)															
10.620	3.0	35.9	25.5	37.3	10.7	-33.9	0.0	0.8	50.7	40.3	74	54	-23.3	-13.7	H
10.620	3.0	35.7	24.9	37.3	10.7	-33.9	0.0	0.8	50.6	39.8	74	54	-23.4	-14.2	V
Rev. 01.30.13															
f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss					Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter					Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit					

### 9.2.25. TX ABOVE 1 GHz, 802.11n HT80 BF 2TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)



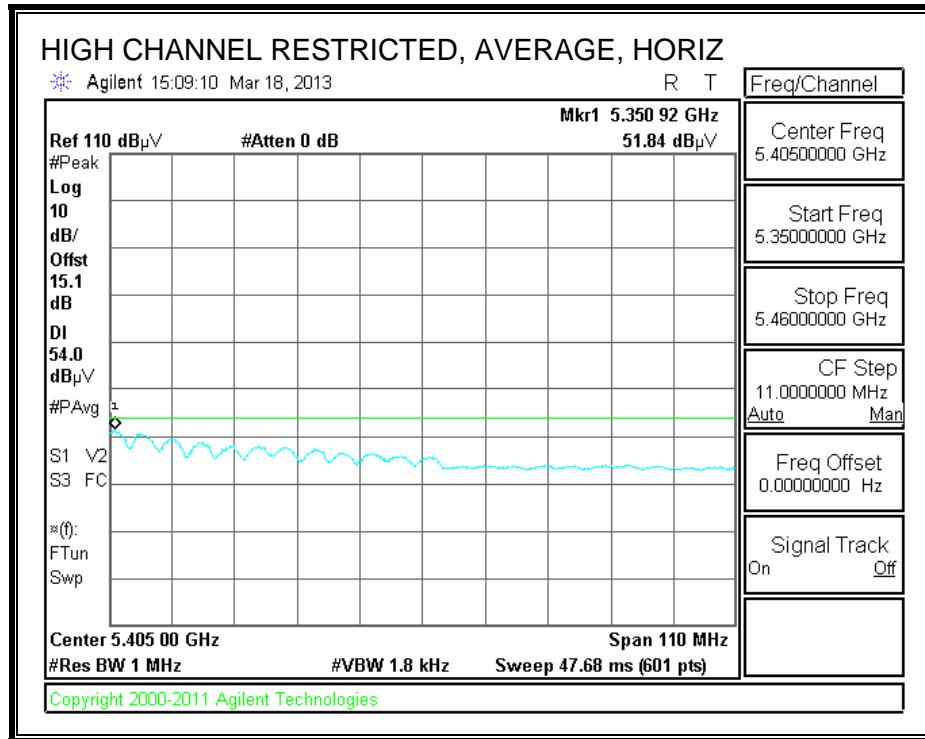
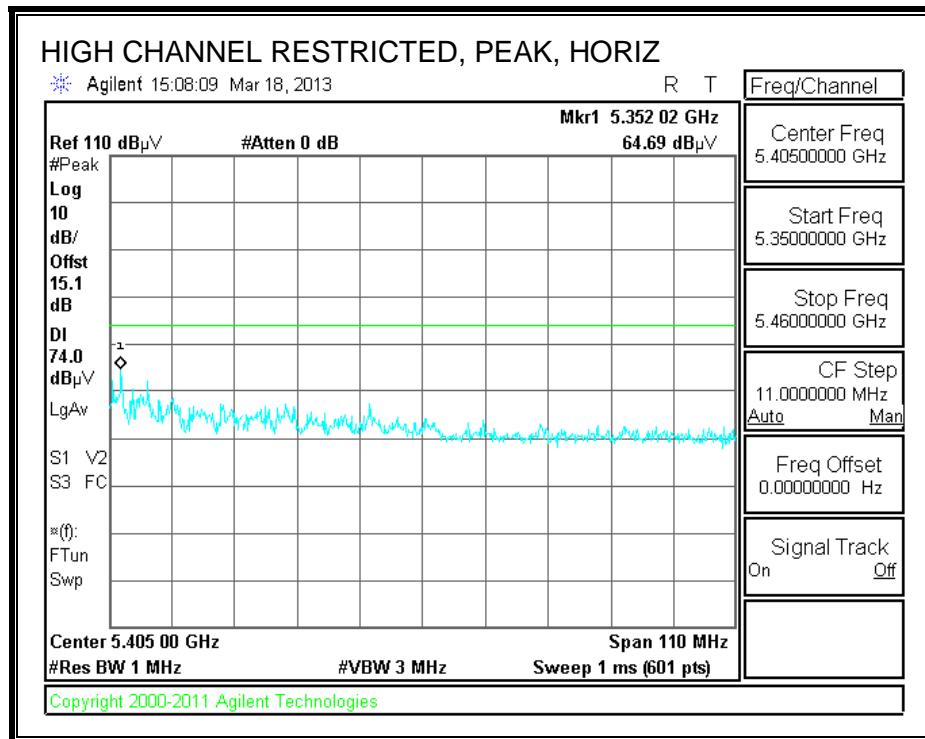


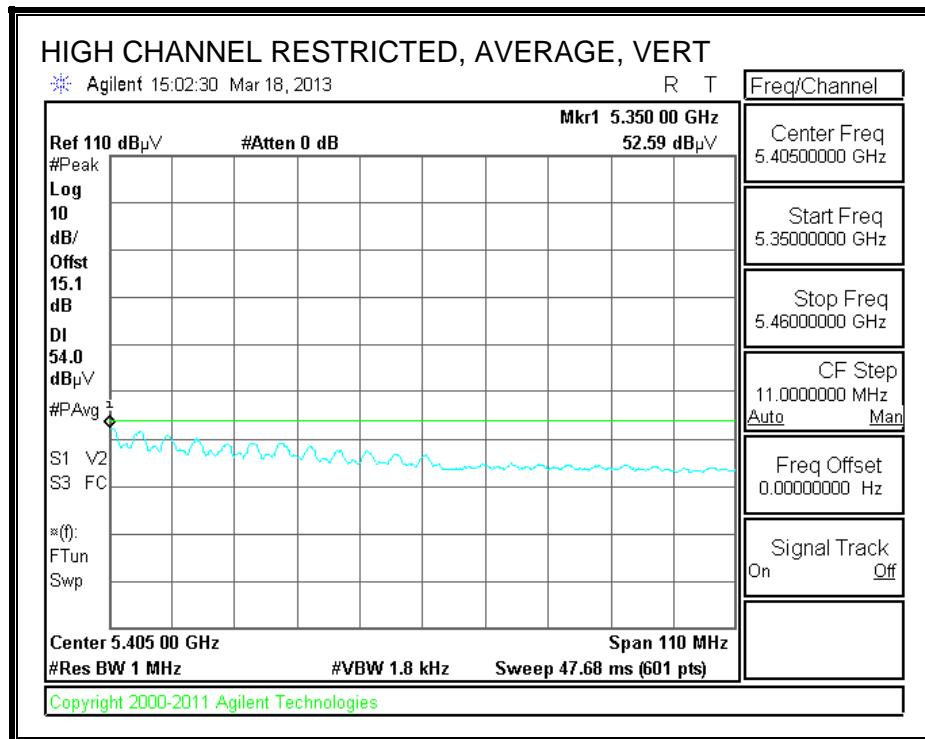
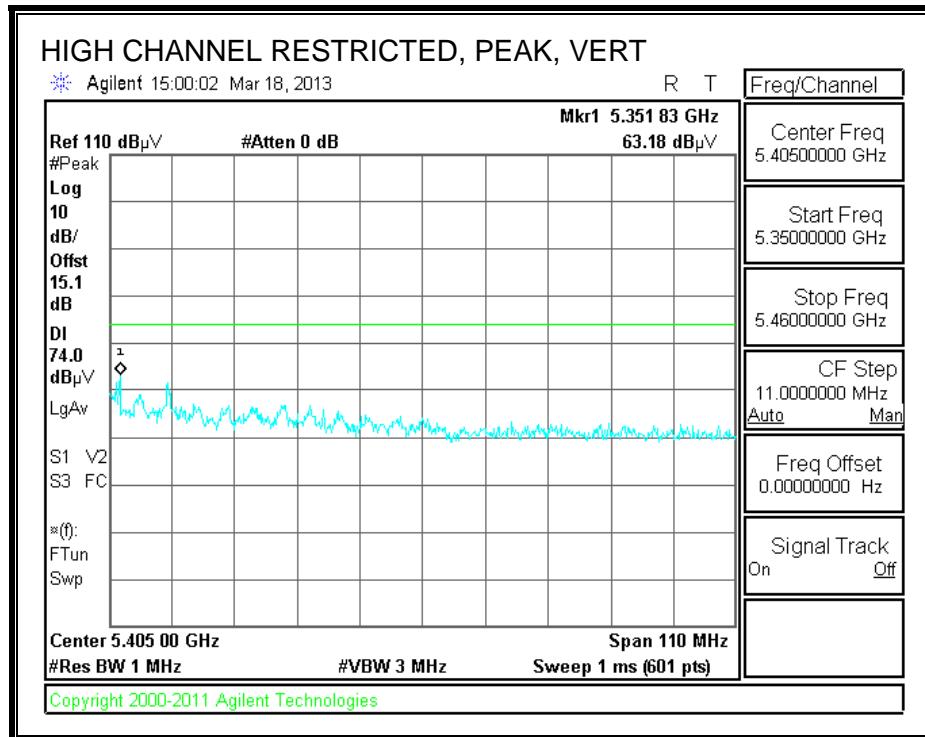
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A																	
Company:	MENGISTU MEKURIA																
Project #:	03/17/13																
Date:	12U14745																
Test Engineer:	Apple Inc.																
Configuration:	FCC Class B																
Mode:	HT40 3TX BF CDD																
<b>Test Equipment:</b>																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.209					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz		
3' cable 22807700			12' cable 22807600			20' cable 22807500			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	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 Channel (5210 MHz)																	
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H		
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V		
Mid Channel (5290 MHz)																	
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H		
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V		
Low Channel (5530 MHz)																	
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H		
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V		
Hi Channel (5690 MHz)																	
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H		
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V		
Rev. 01.30.13																	
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												

### 9.2.26. TX ABOVE 1 GHz, 802.11n HT80 BF 3TX MODE, 5.3 GHz BAND

#### RESTRICTED BANDEDGE (HIGH CHANNEL)



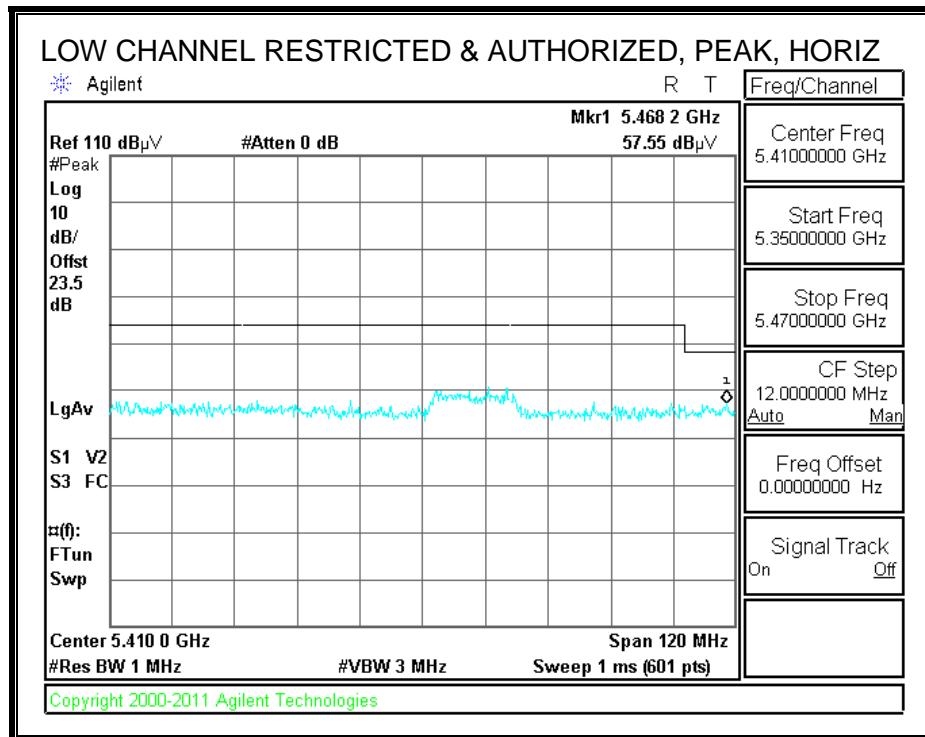


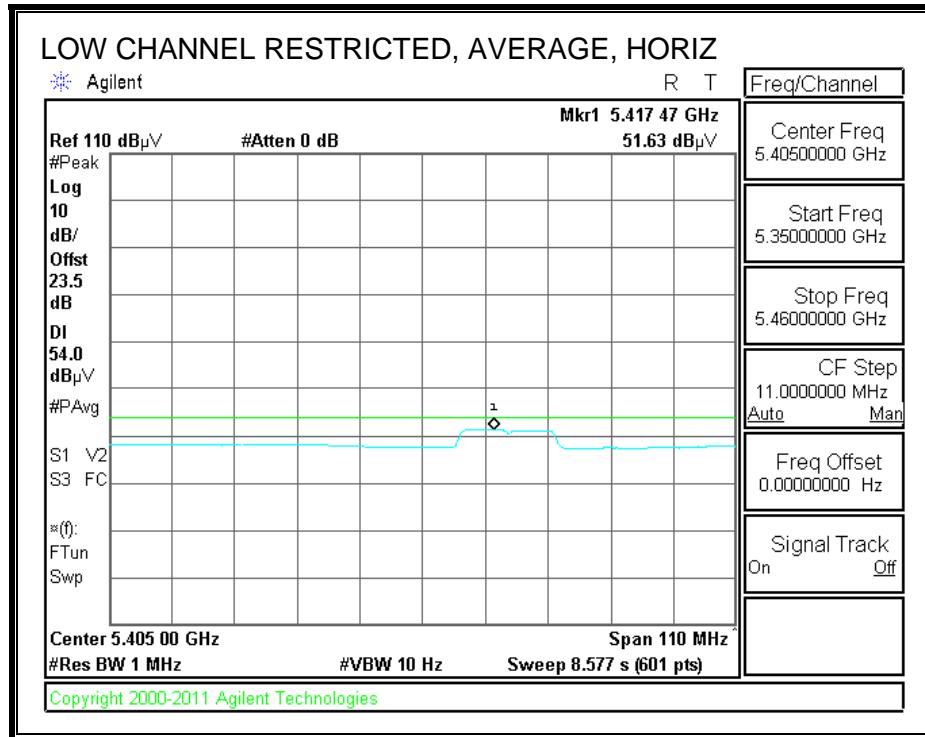
## **HARMONICS AND SPURIOUS EMISSIONS**

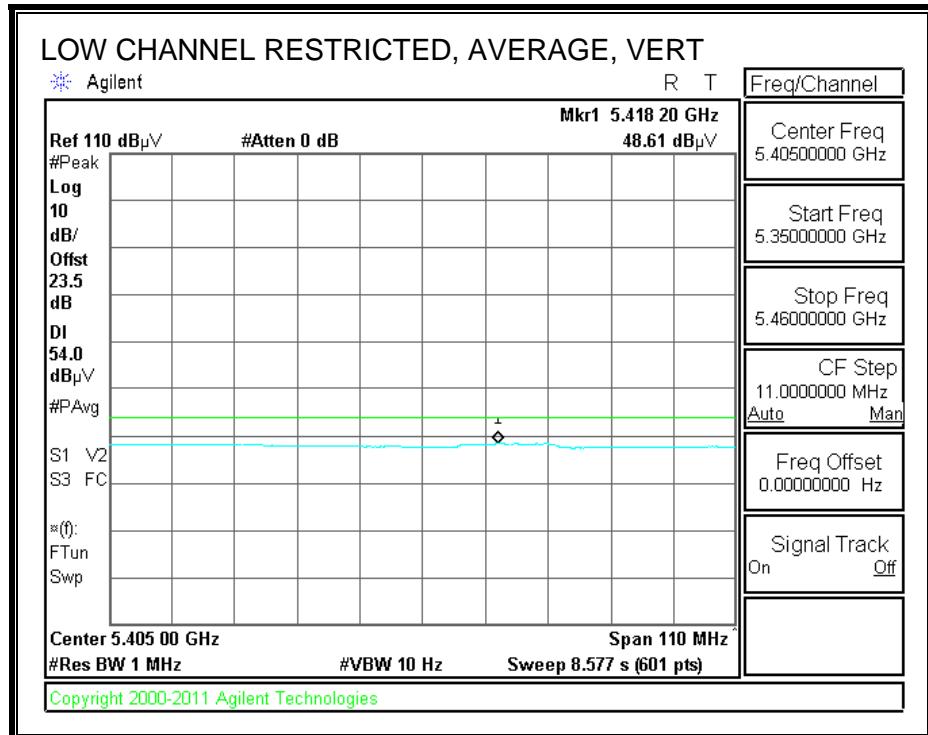
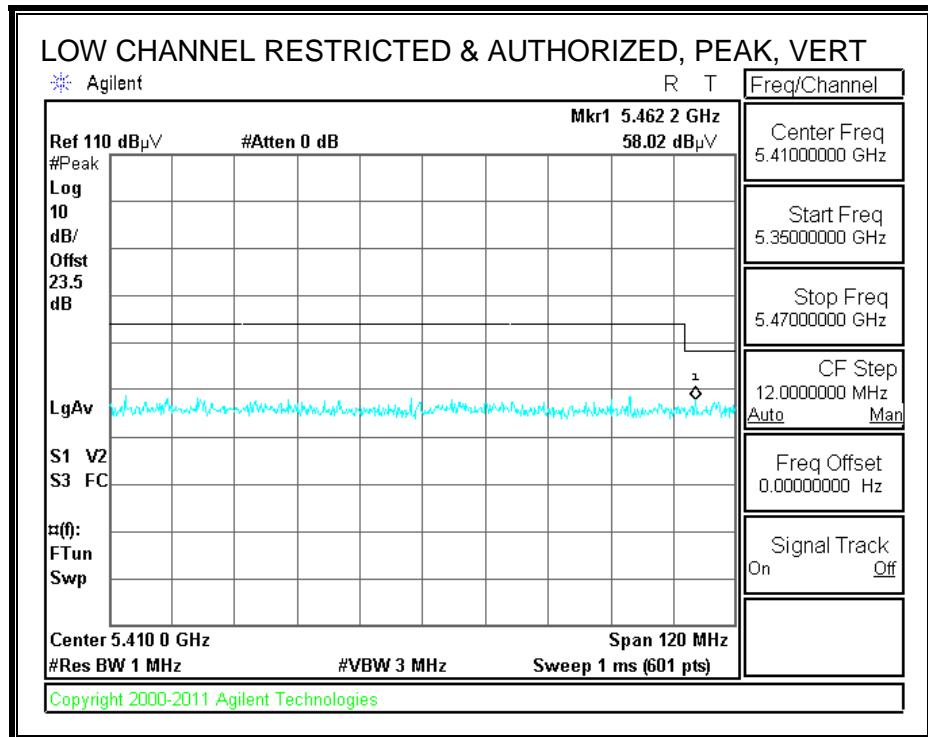
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.209			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Reject Filter			Average Measurements RBW=1MHz ; VBW=10Hz
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V
Rev. 01.30.13															
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										

### 9.2.27. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.6 GHz BAND

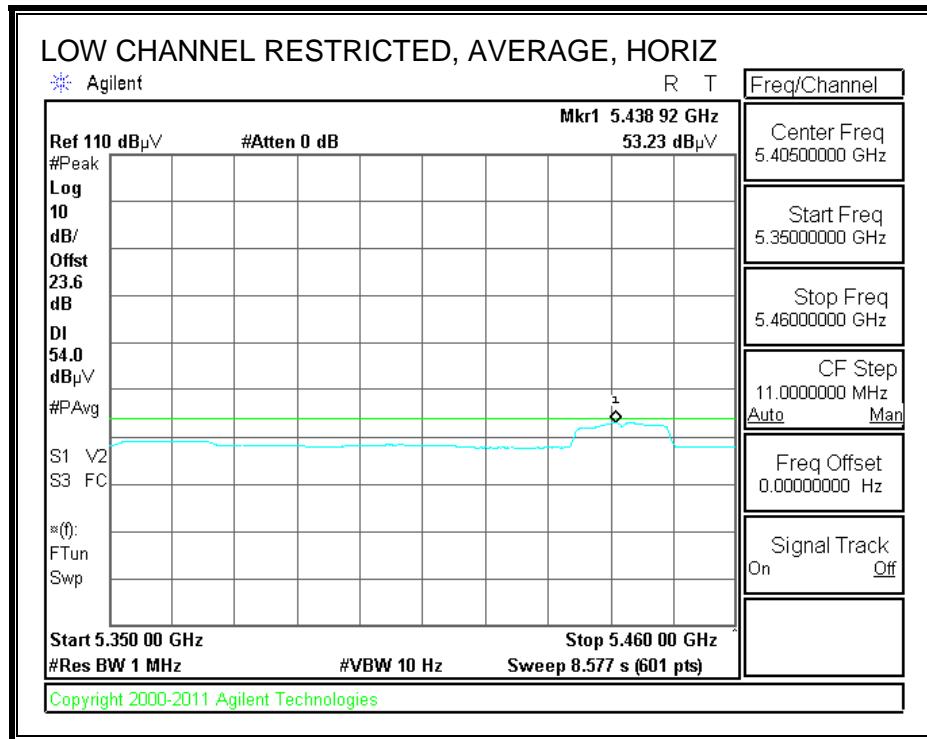
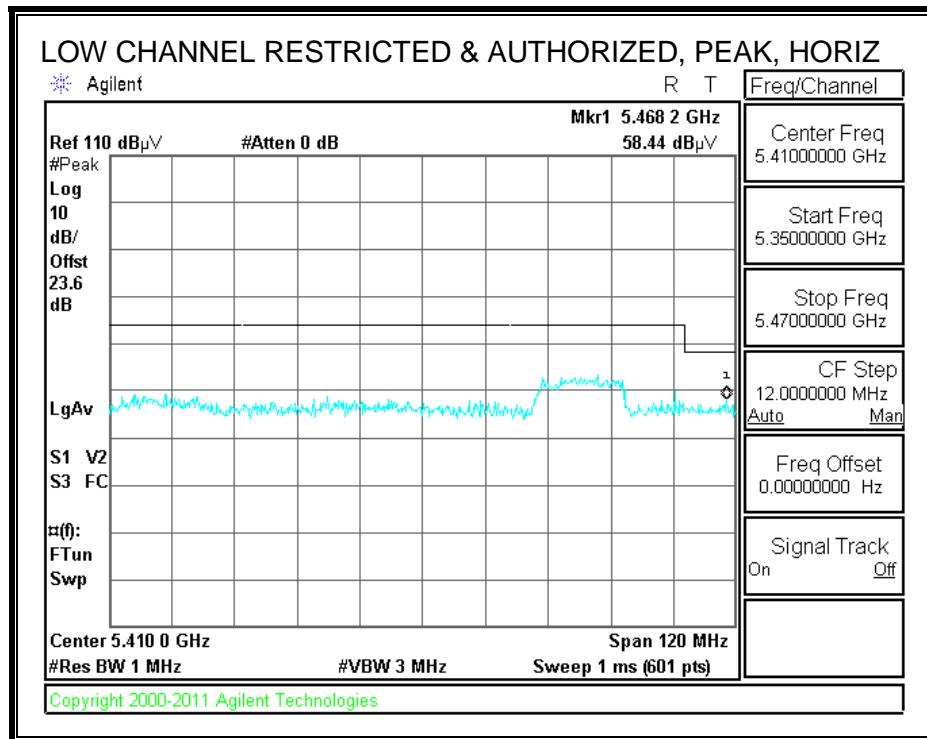
#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)

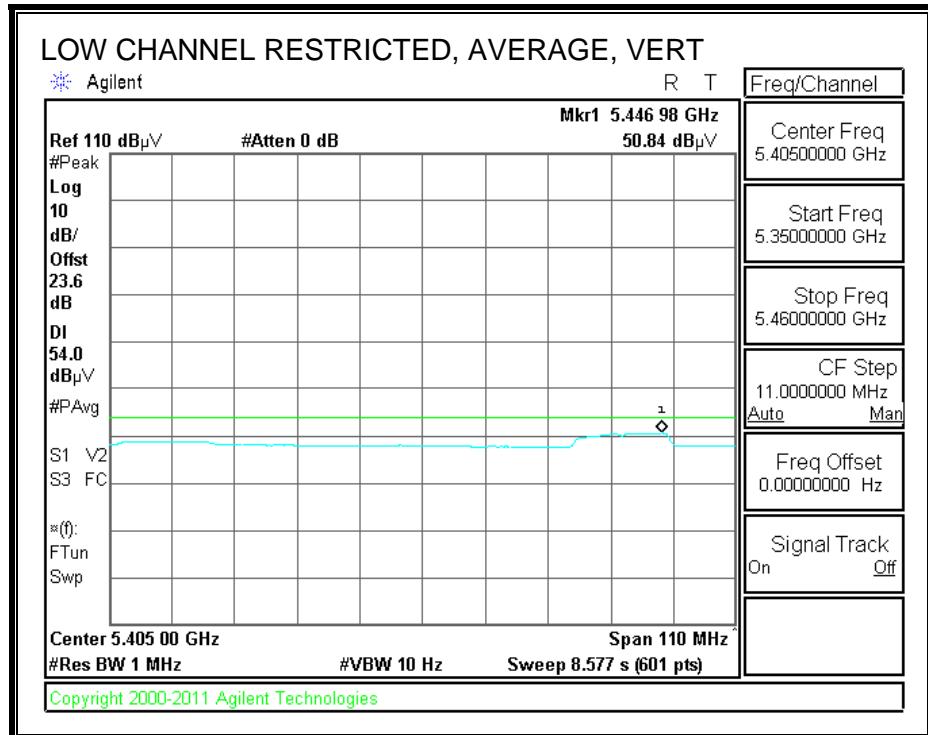
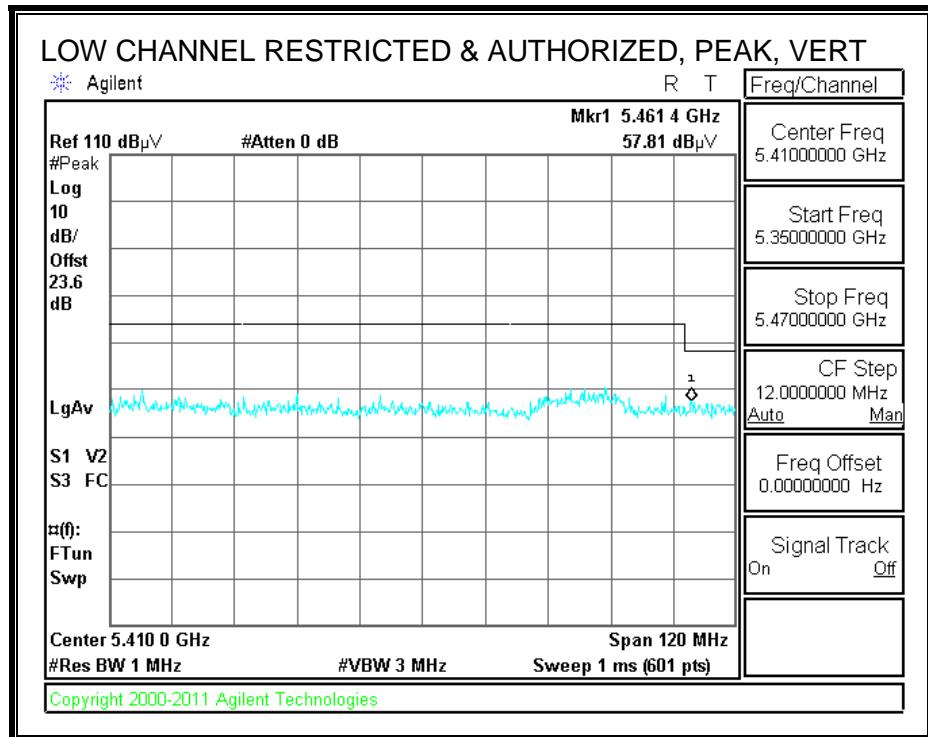




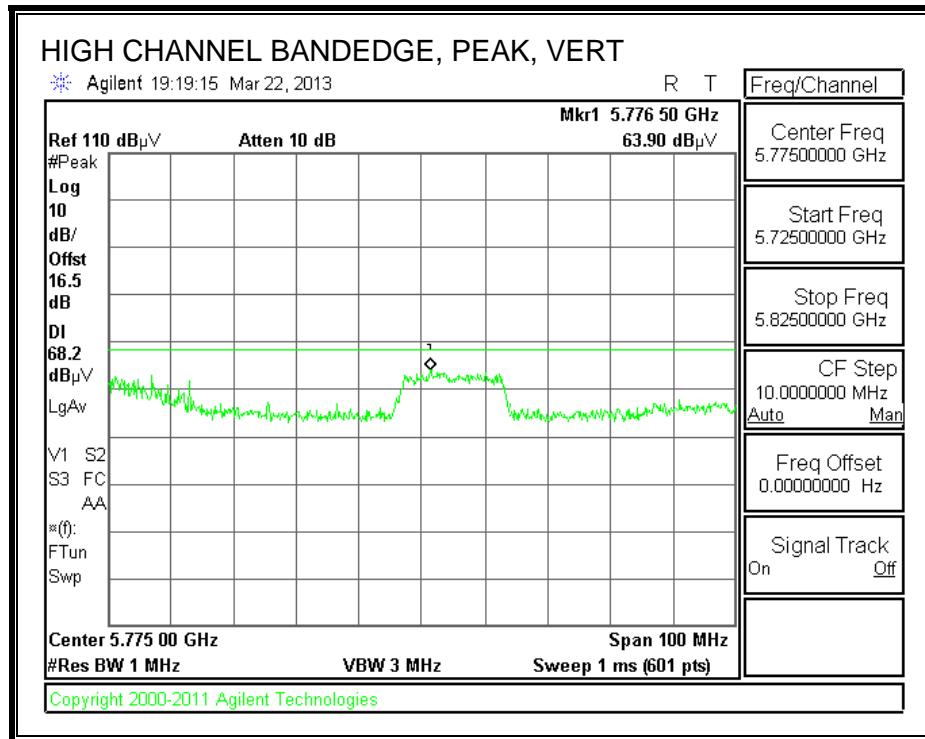
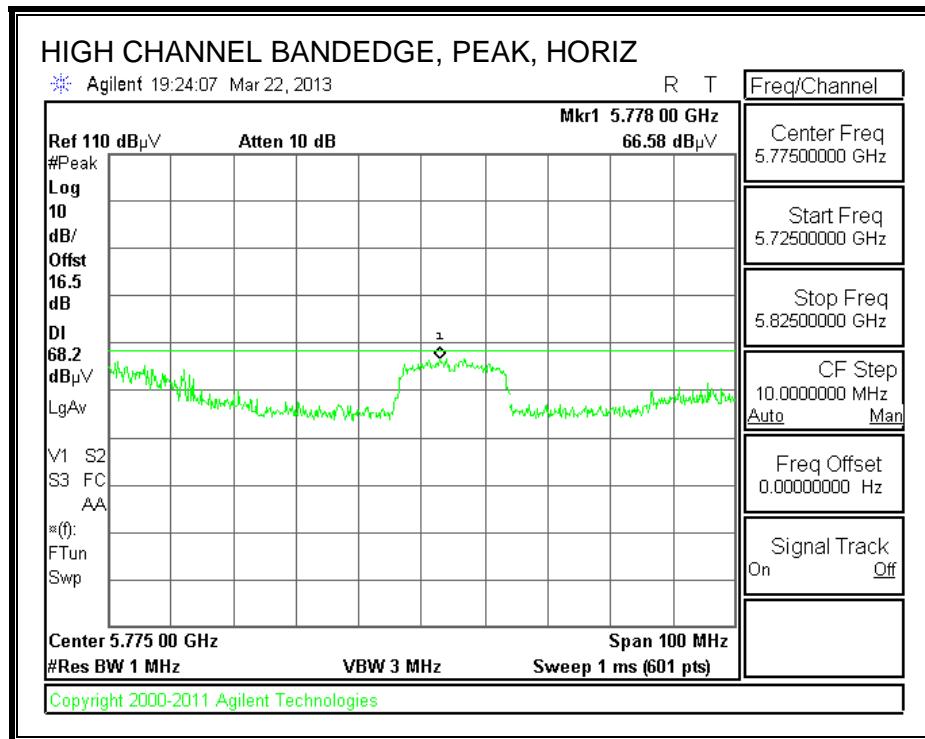


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

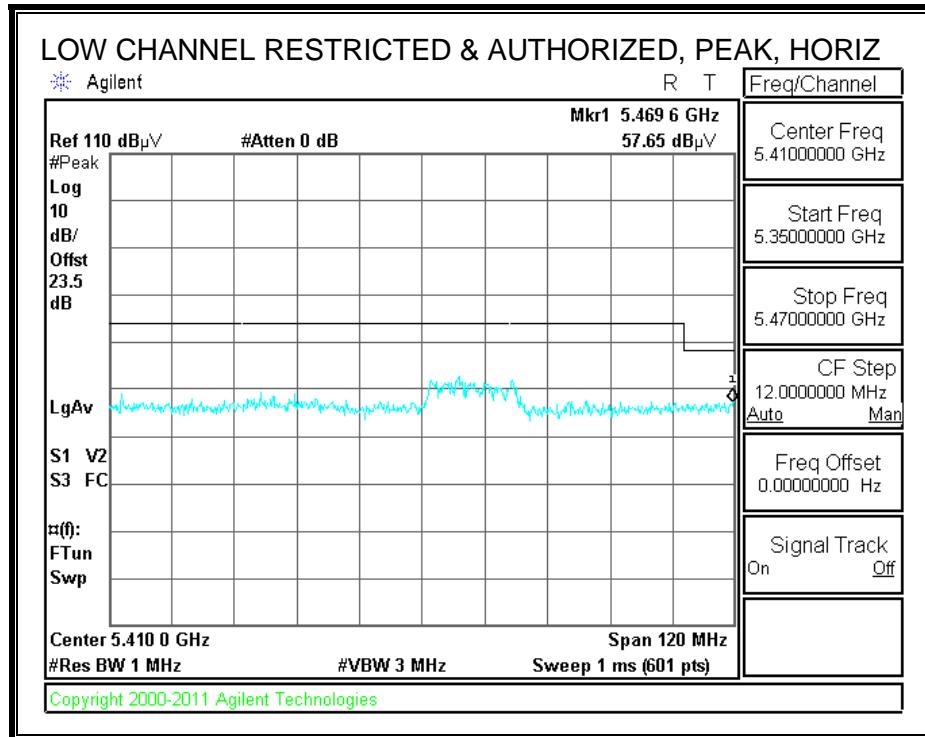
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5500 MHz 3IX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	32.6	38.4	10.5	-33.6	0.0	0.7	48.6	74.0	-25.4	V	P	
11.000	3.0	23.2	38.4	10.5	-33.6	0.0	0.7	39.3	54.0	-14.7	V	A	
<b>5580 MHz 3IX CDD</b>													
11.160	3.0	33.6	38.5	10.7	-33.4	0.0	0.7	50.1	74.0	-23.9	V	P	
11.160	3.0	26.8	38.5	10.7	-33.4	0.0	0.7	43.4	54.0	-10.6	V	A	
11.160	3.0	34.4	38.5	10.7	-33.4	0.0	0.7	51.0	74.0	-23.0	H	P	
11.160	3.0	25.2	38.5	10.7	-33.4	0.0	0.7	41.8	54.0	-12.2	H	A	
<b>5700 MHz 3IX CDD</b>													
11.400	3.0	34.1	38.8	11.1	-33.2	0.0	0.7	51.5	74.0	-22.5	H	P	
11.400	3.0	24.4	38.8	11.1	-33.2	0.0	0.7	41.8	54.0	-12.2	H	A	
11.400	3.0	34.4	38.8	11.1	-33.2	0.0	0.7	51.8	74.0	-22.2	V	P	
11.400	3.0	23.1	38.8	11.1	-33.2	0.0	0.7	40.5	54.0	-13.5	V	A	

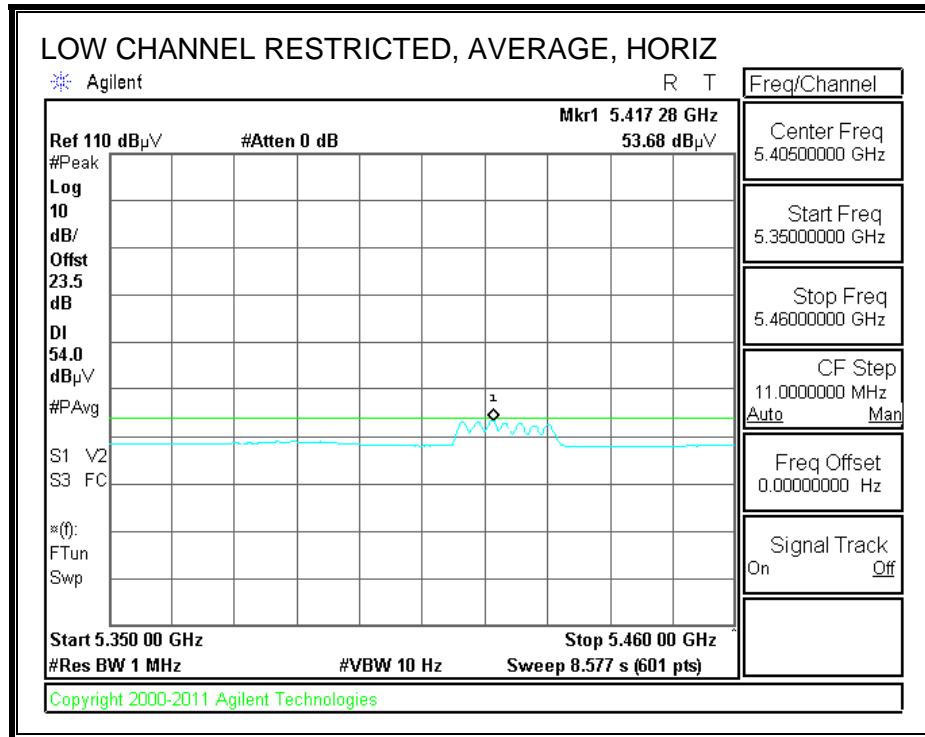
Rev. 4.1.2.7

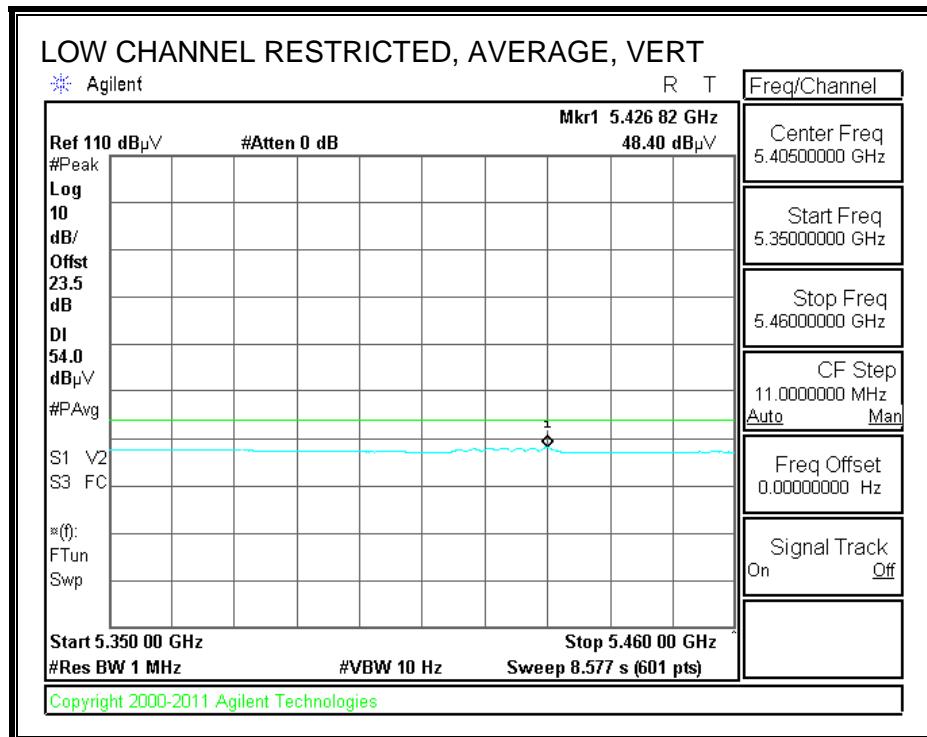
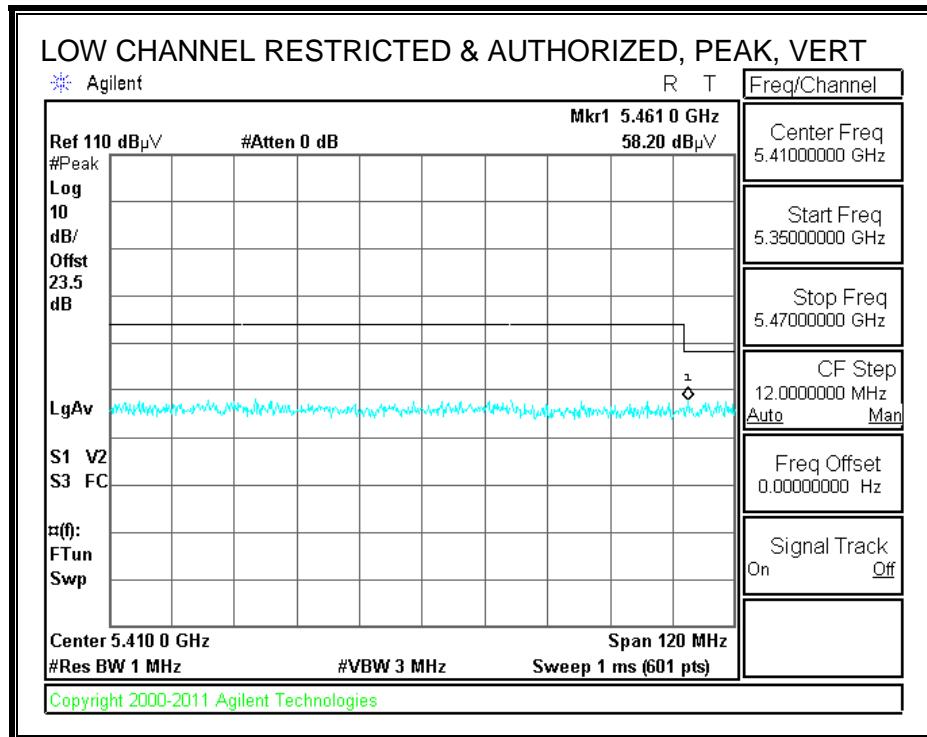
Note: No other emissions were detected above the system noise floor.

**9.2.28. TX ABOVE 1 GHz, 802.11n HT20 CDD 2TX MODE, 5.6 GHz BAND**

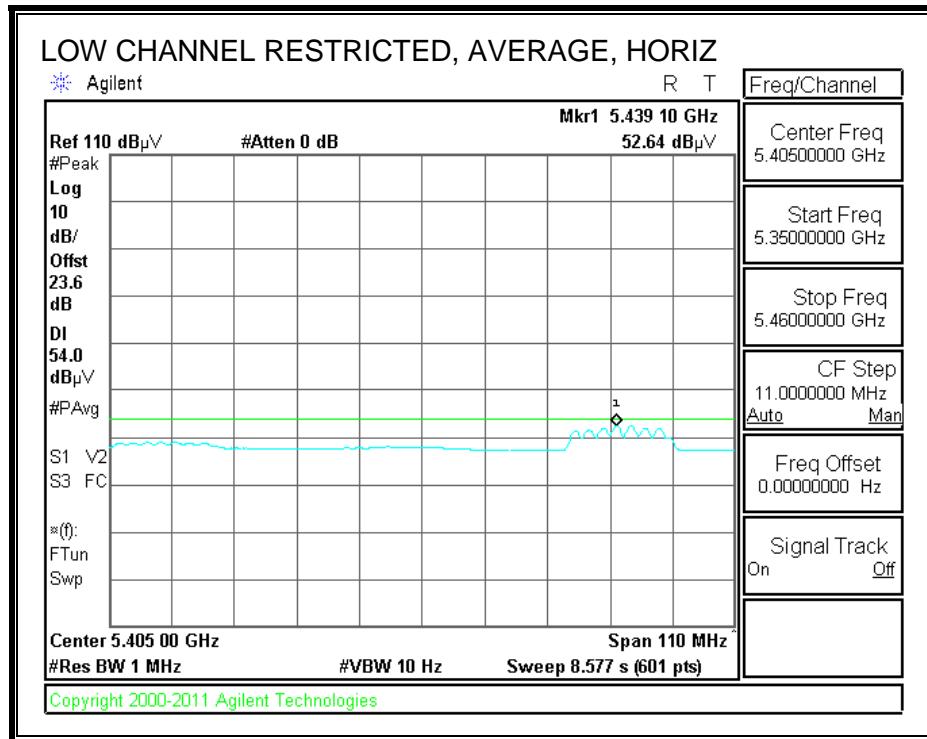
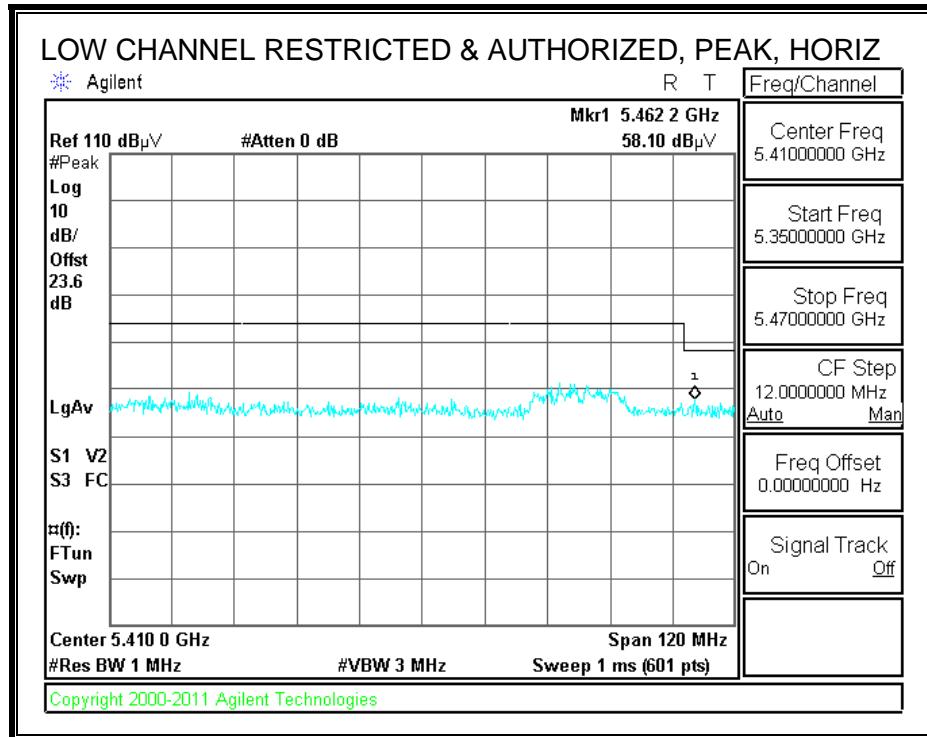
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)**

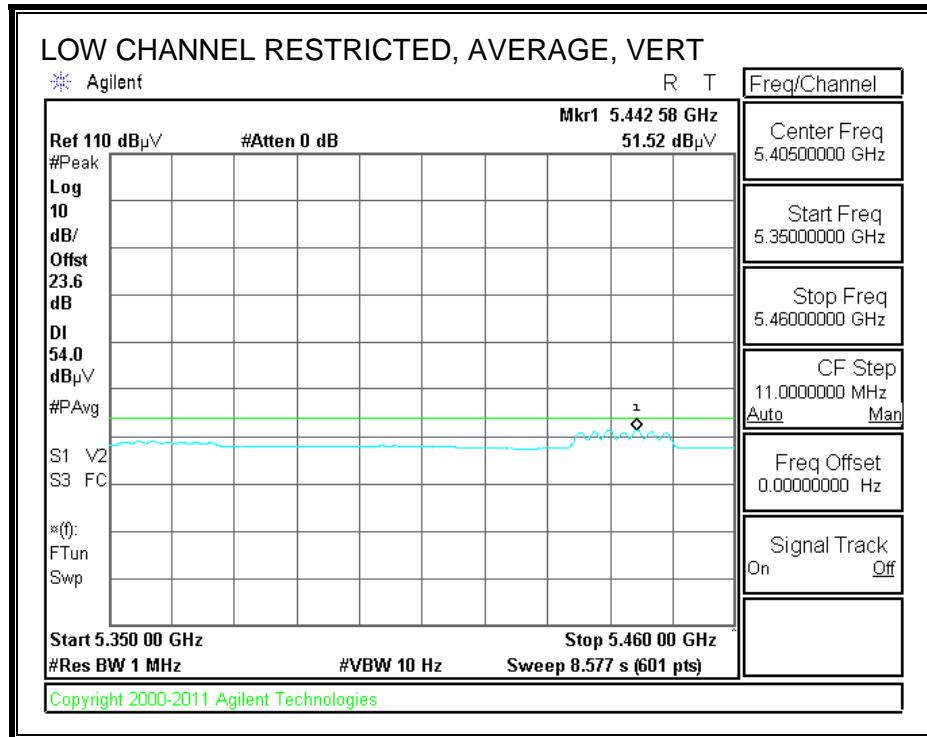
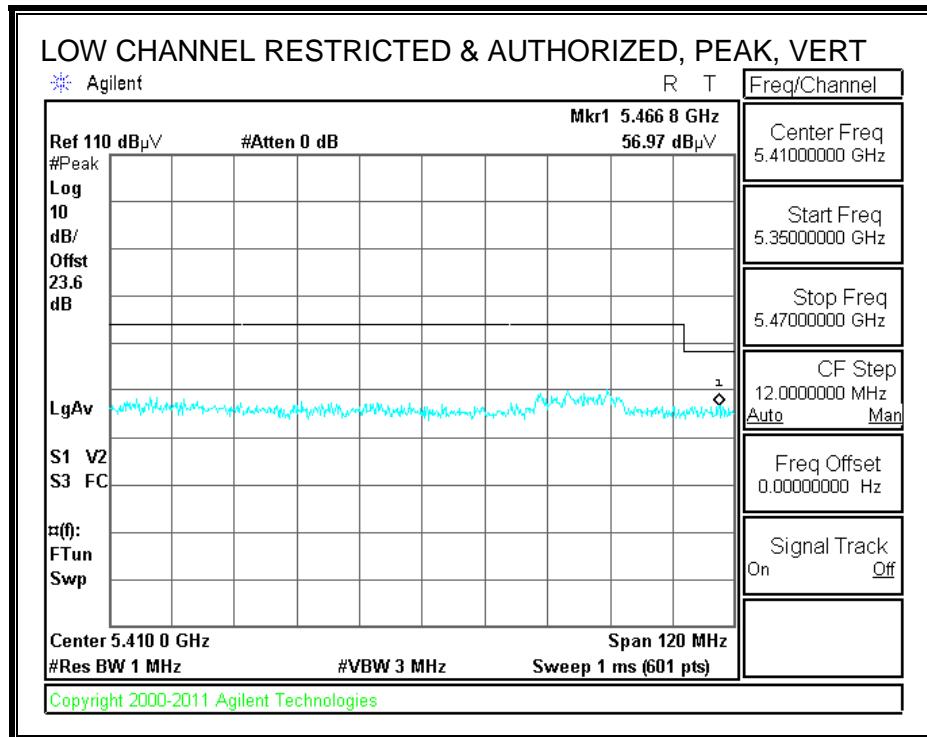




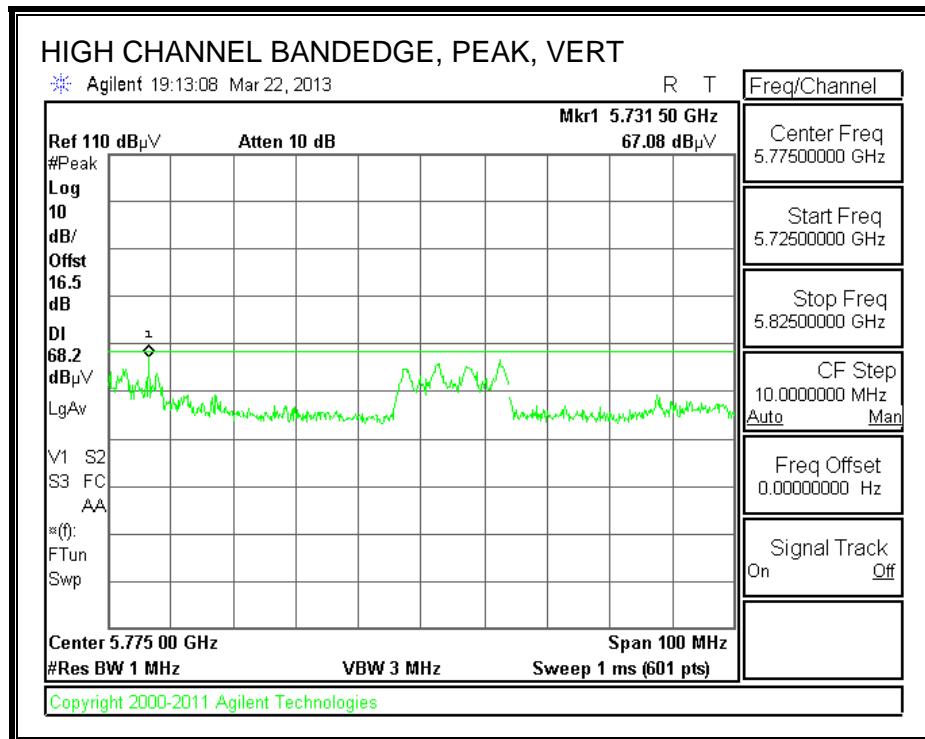
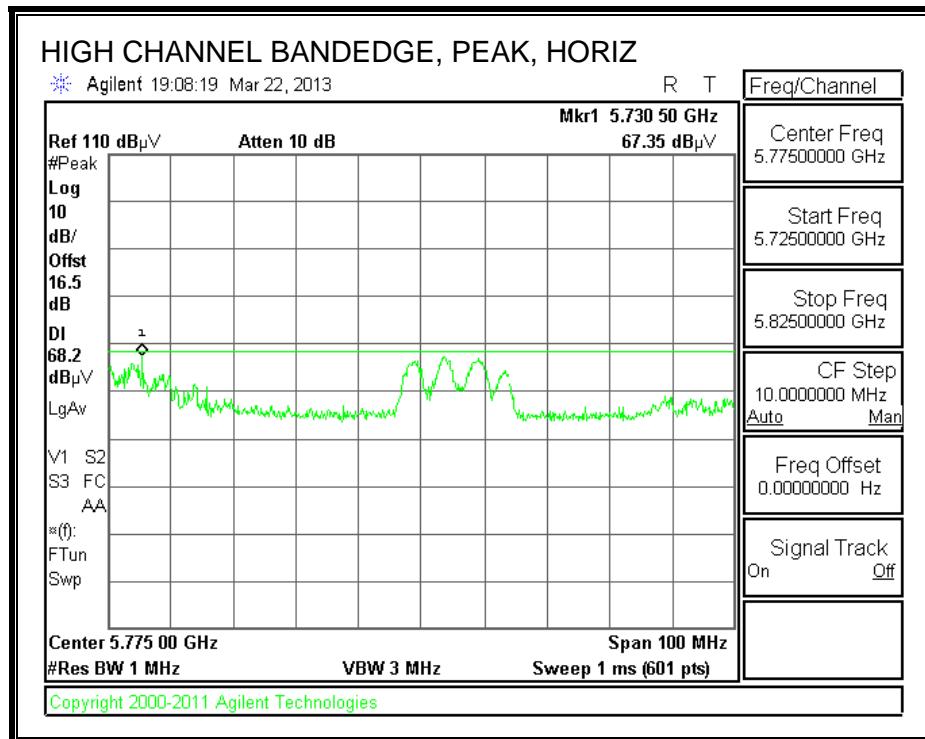


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

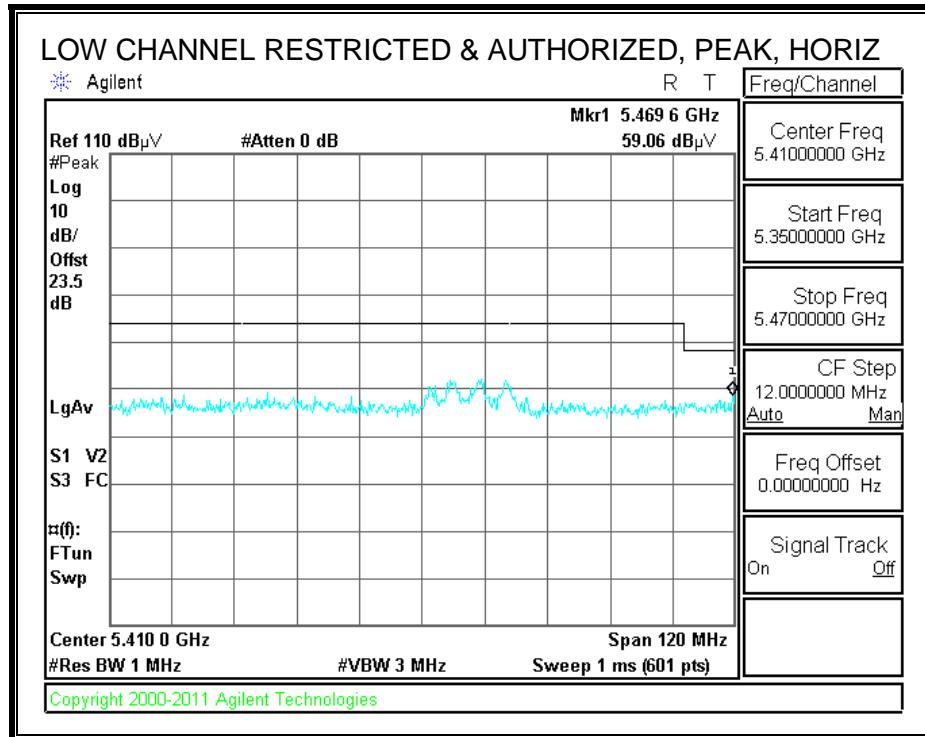
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5500 MHz 3IX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	32.6	38.4	10.5	-33.6	0.0	0.7	48.6	74.0	-25.4	V	P	
11.000	3.0	23.2	38.4	10.5	-33.6	0.0	0.7	39.3	54.0	-14.7	V	A	
<b>5580 MHz 3IX CDD</b>													
11.160	3.0	33.6	38.5	10.7	-33.4	0.0	0.7	50.1	74.0	-23.9	V	P	
11.160	3.0	26.8	38.5	10.7	-33.4	0.0	0.7	43.4	54.0	-10.6	V	A	
11.160	3.0	34.4	38.5	10.7	-33.4	0.0	0.7	51.0	74.0	-23.0	H	P	
11.160	3.0	25.2	38.5	10.7	-33.4	0.0	0.7	41.8	54.0	-12.2	H	A	
<b>5700 MHz 3IX CDD</b>													
11.400	3.0	34.1	38.8	11.1	-33.2	0.0	0.7	51.5	74.0	-22.5	H	P	
11.400	3.0	24.4	38.8	11.1	-33.2	0.0	0.7	41.8	54.0	-12.2	H	A	
11.400	3.0	34.4	38.8	11.1	-33.2	0.0	0.7	51.8	74.0	-22.2	V	P	
11.400	3.0	23.1	38.8	11.1	-33.2	0.0	0.7	40.5	54.0	-13.5	V	A	

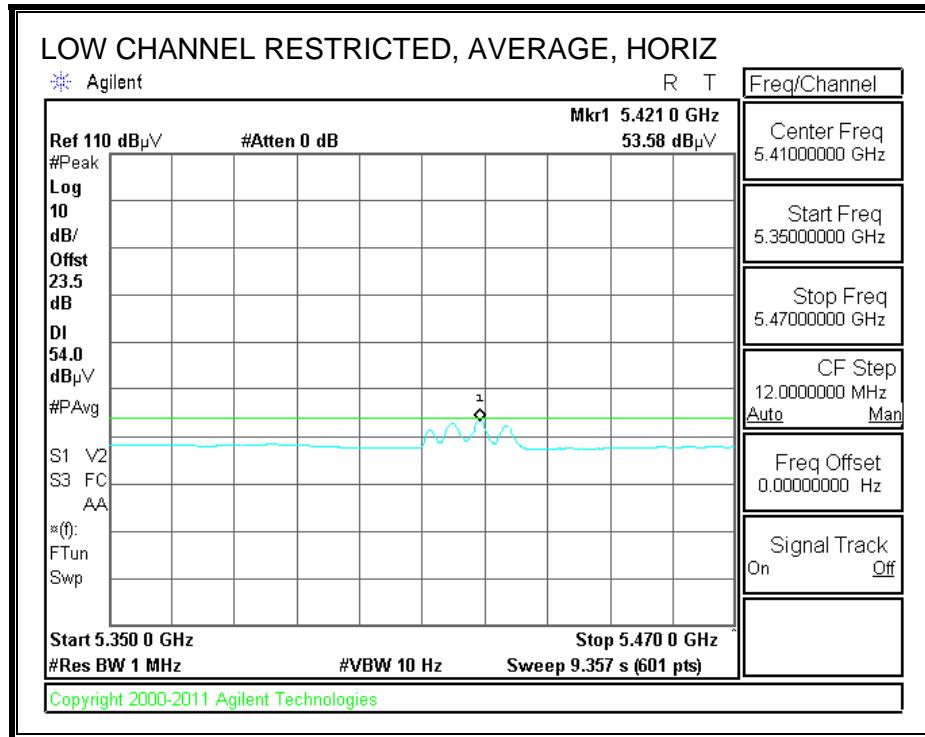
Rev. 4.1.2.7

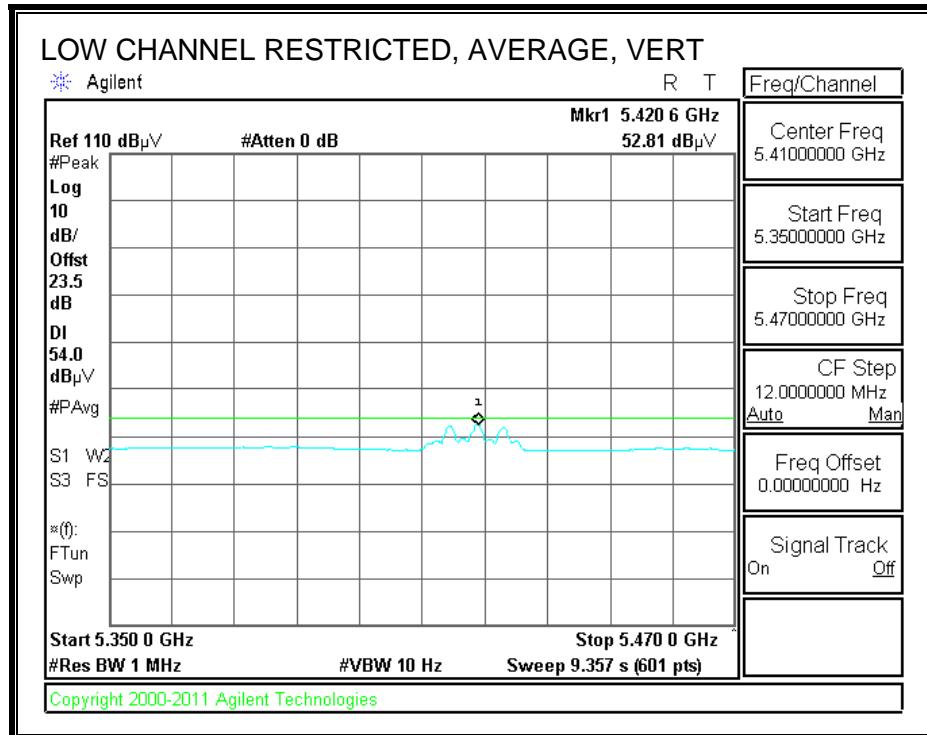
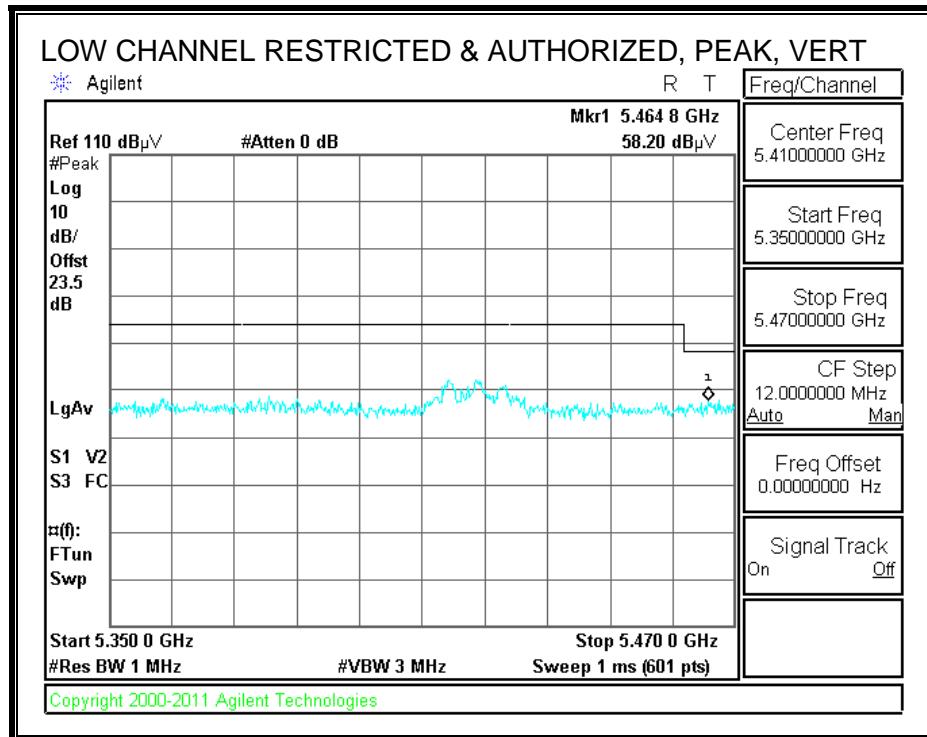
Note: No other emissions were detected above the system noise floor.

**9.2.29. TX ABOVE 1 GHz, 802.11n HT20 CDD 3TX MODE, 5.6 GHz BAND**

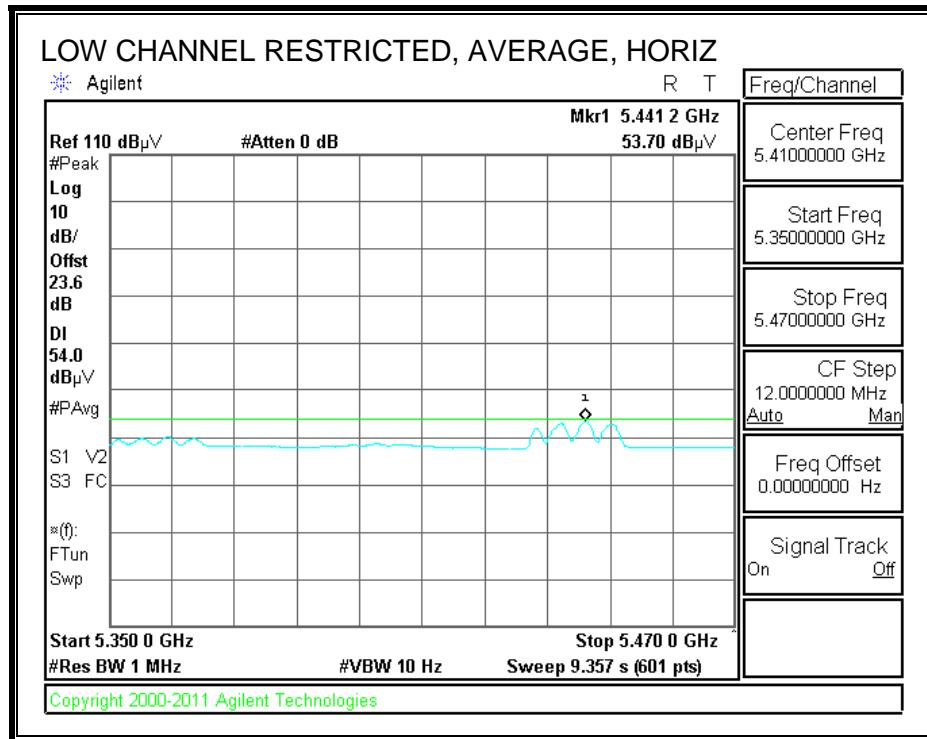
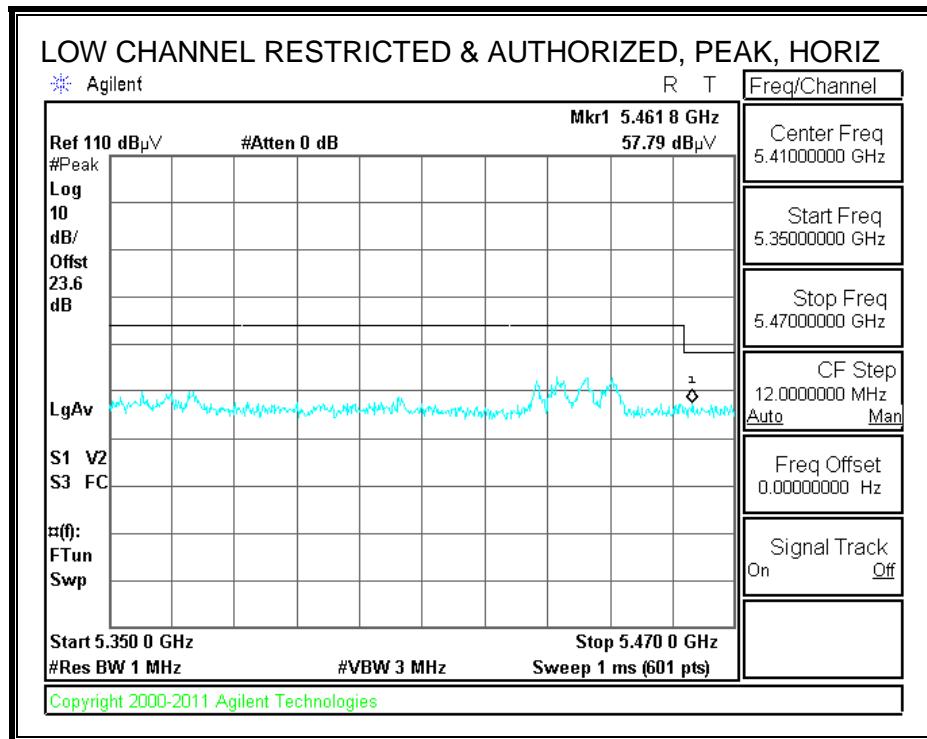
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)**

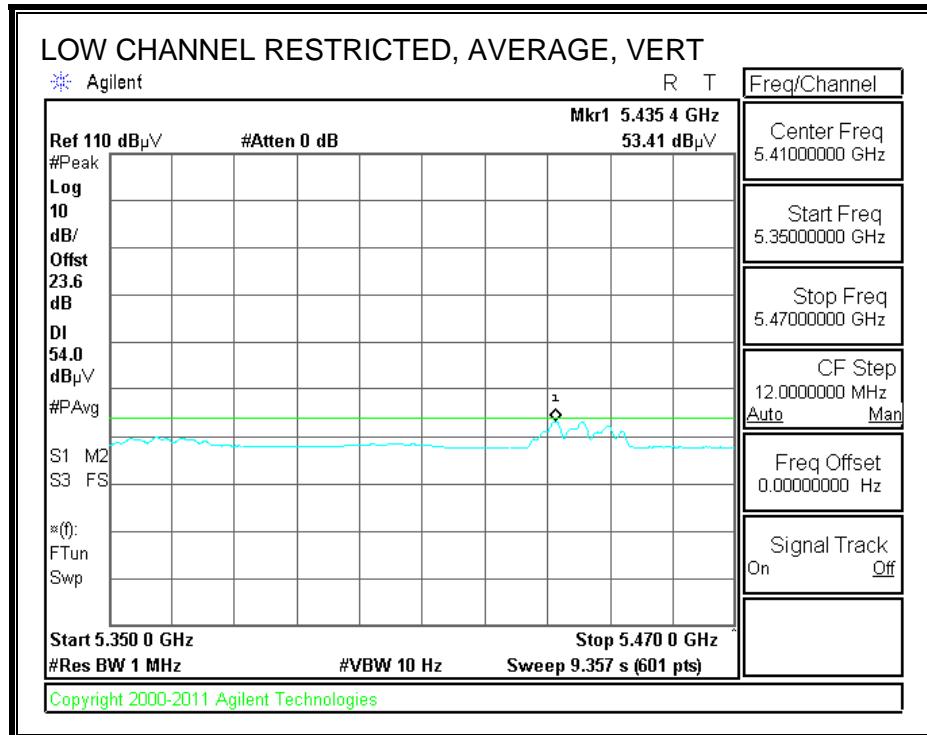
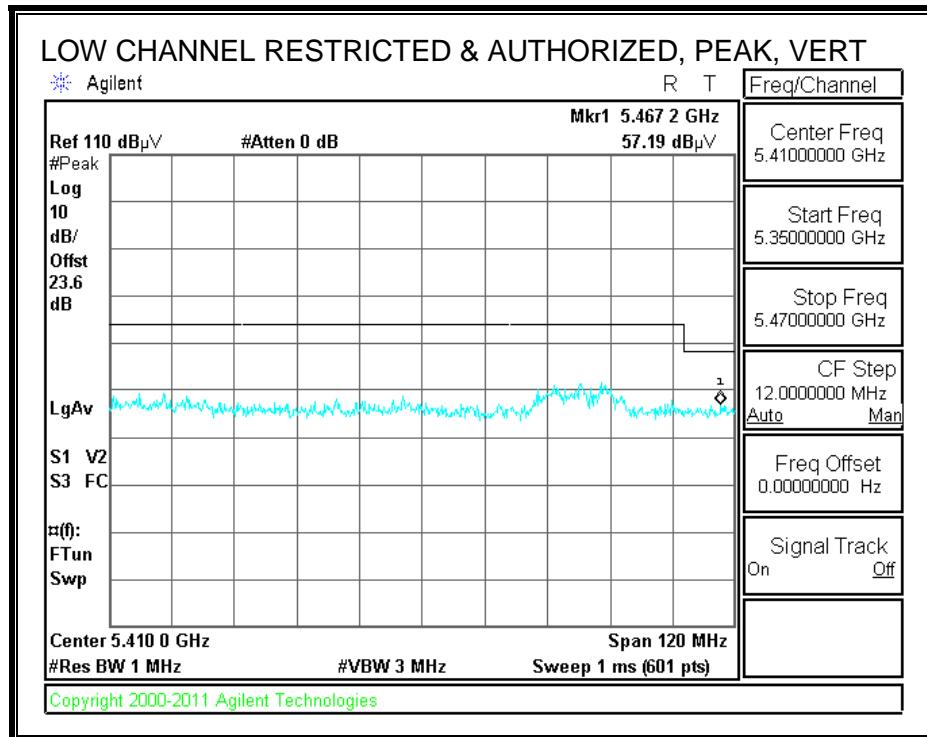




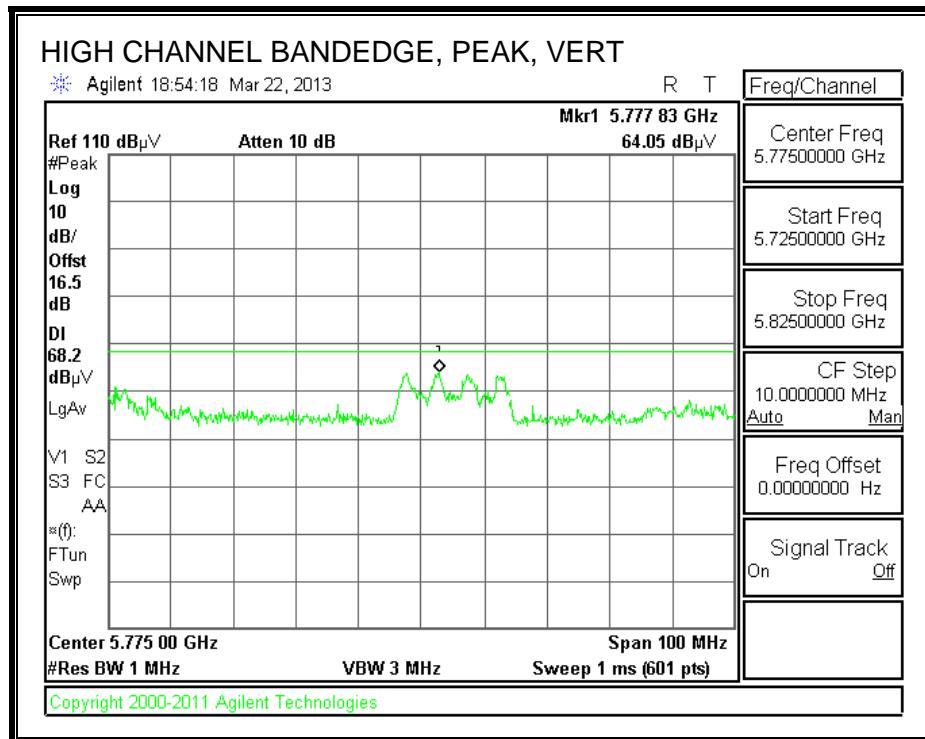
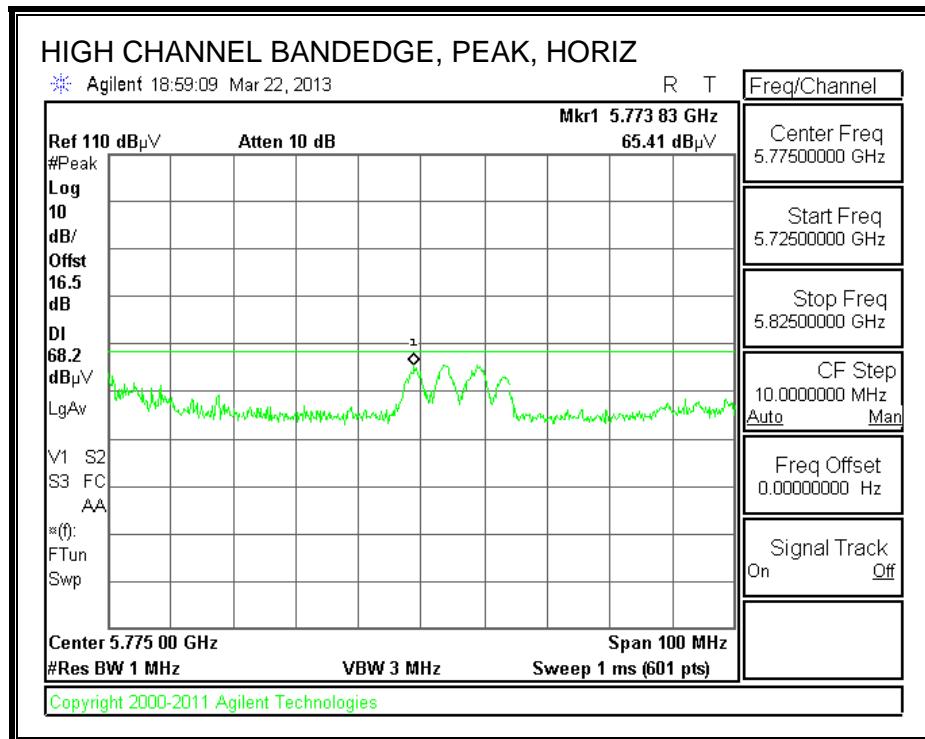


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT20 3IX CDD**

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

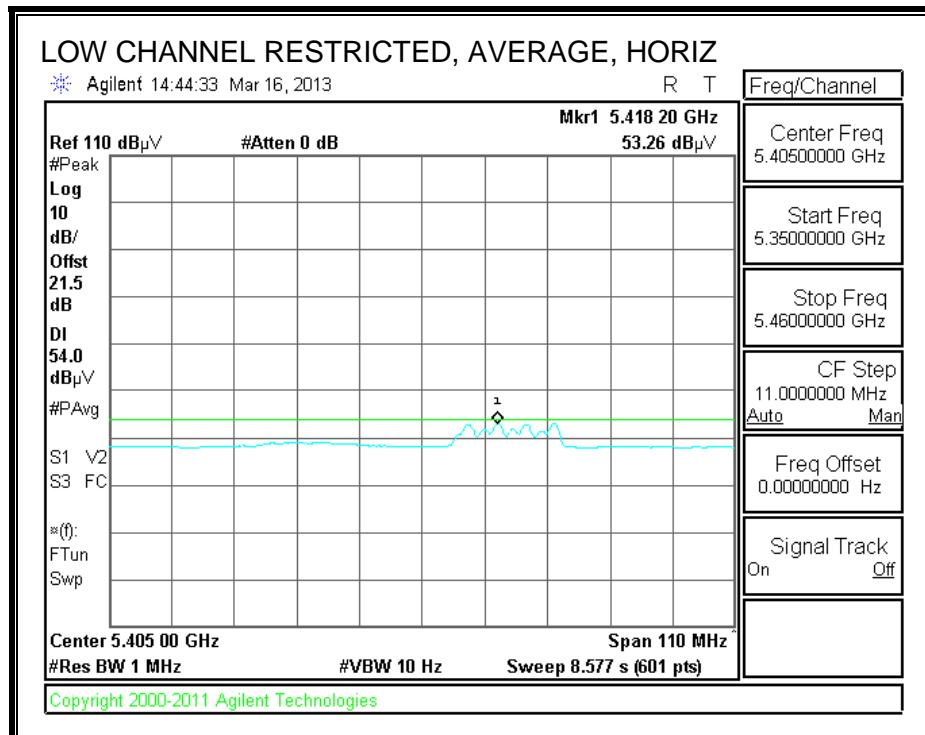
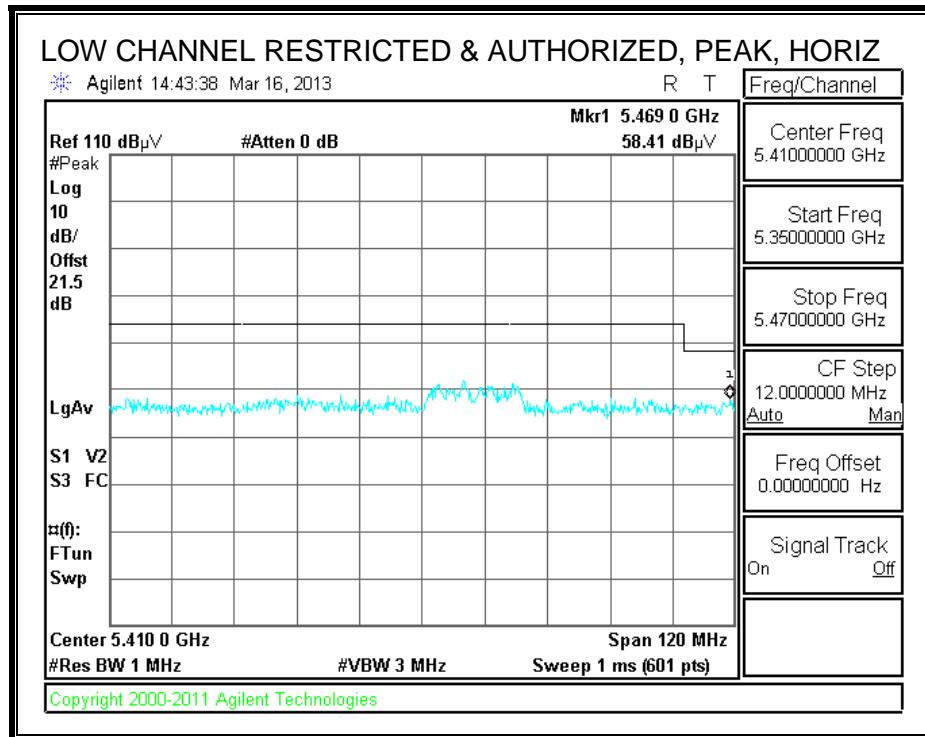
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5500 MHz 3IX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	32.6	38.4	10.5	-33.6	0.0	0.7	48.6	74.0	-25.4	V	P	
11.000	3.0	23.2	38.4	10.5	-33.6	0.0	0.7	39.3	54.0	-14.7	V	A	
<b>5580 MHz 3IX CDD</b>													
11.160	3.0	33.6	38.5	10.7	-33.4	0.0	0.7	50.1	74.0	-23.9	V	P	
11.160	3.0	26.8	38.5	10.7	-33.4	0.0	0.7	43.4	54.0	-10.6	V	A	
11.160	3.0	34.4	38.5	10.7	-33.4	0.0	0.7	51.0	74.0	-23.0	H	P	
11.160	3.0	25.2	38.5	10.7	-33.4	0.0	0.7	41.8	54.0	-12.2	H	A	
<b>5700 MHz 3IX CDD</b>													
11.400	3.0	34.1	38.8	11.1	-33.2	0.0	0.7	51.5	74.0	-22.5	H	P	
11.400	3.0	24.4	38.8	11.1	-33.2	0.0	0.7	41.8	54.0	-12.2	H	A	
11.400	3.0	34.4	38.8	11.1	-33.2	0.0	0.7	51.8	74.0	-22.2	V	P	
11.400	3.0	23.1	38.8	11.1	-33.2	0.0	0.7	40.5	54.0	-13.5	V	A	

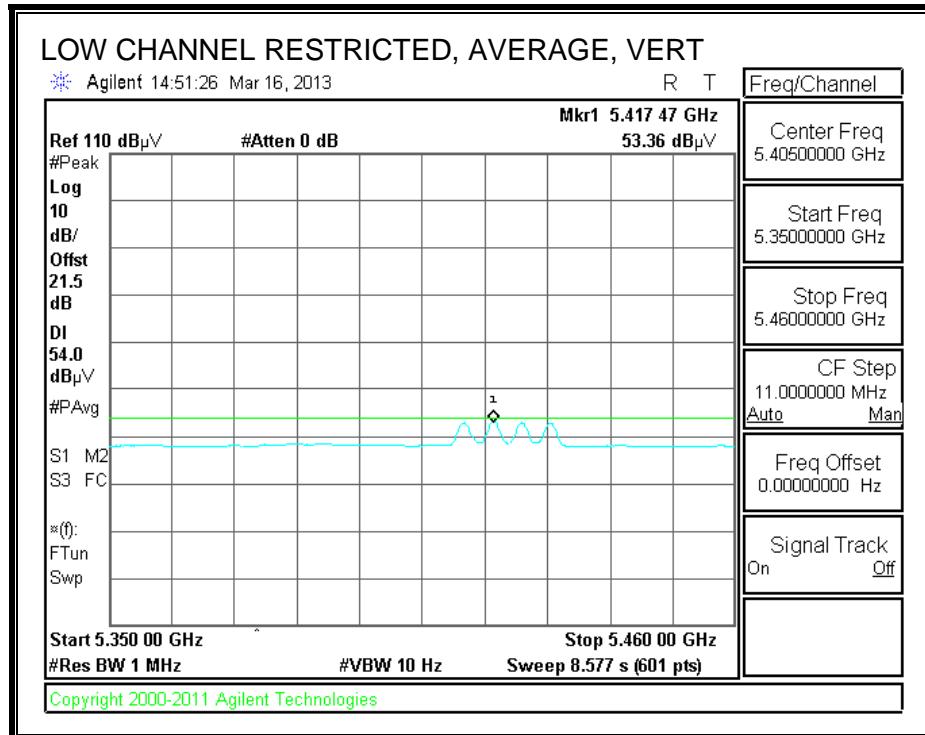
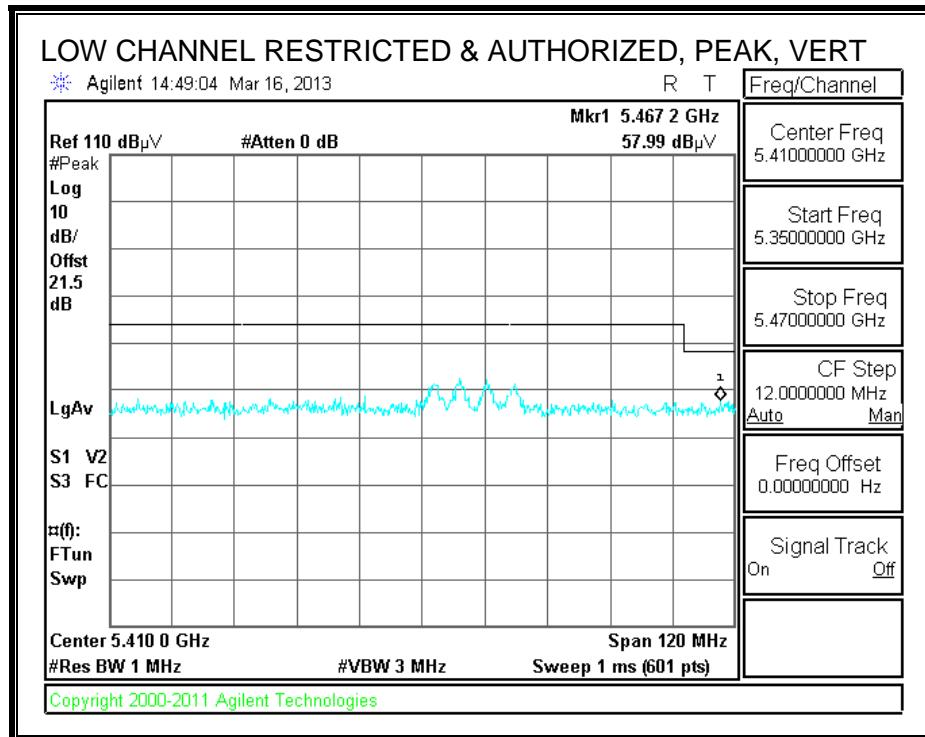
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

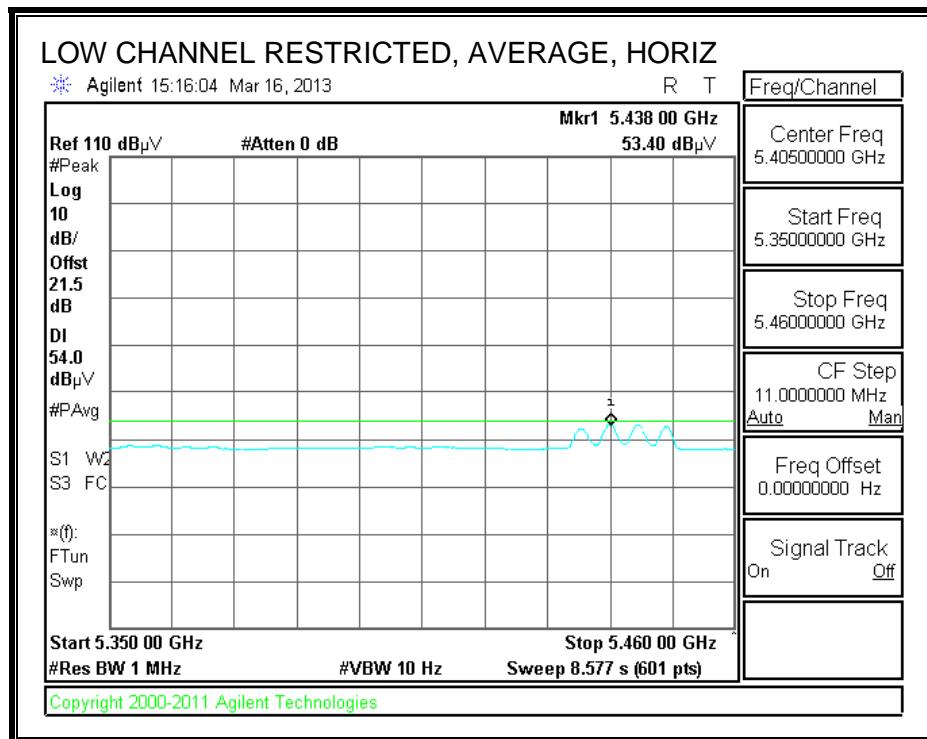
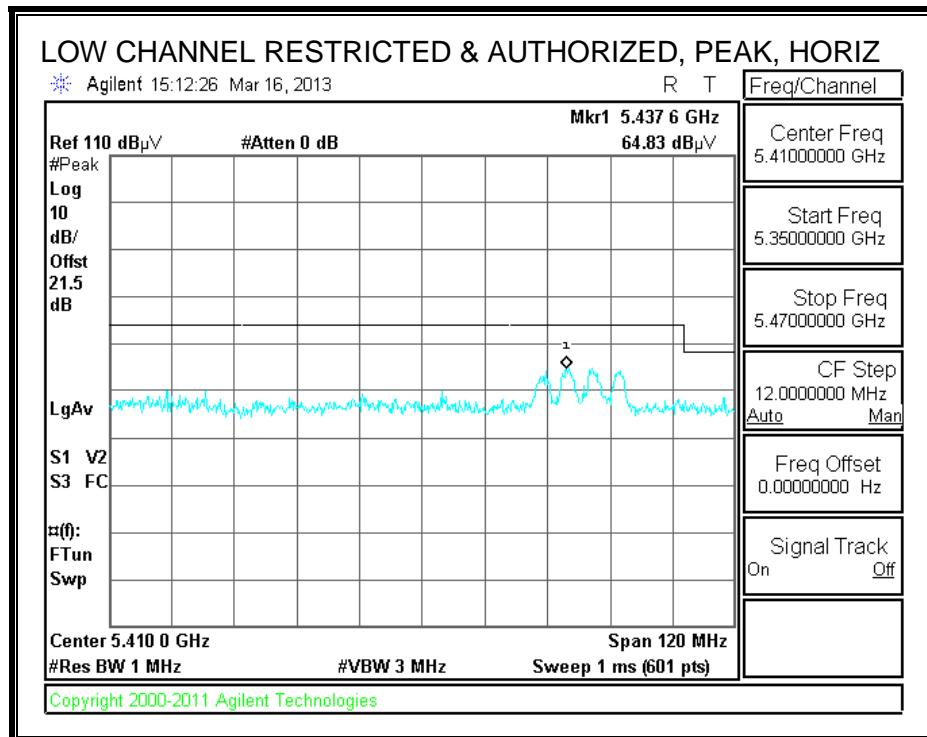
### 9.2.30. TX ABOVE 1 GHz, 802.11n HT20 BF 2TX MODE, 5.6 GHz BAND

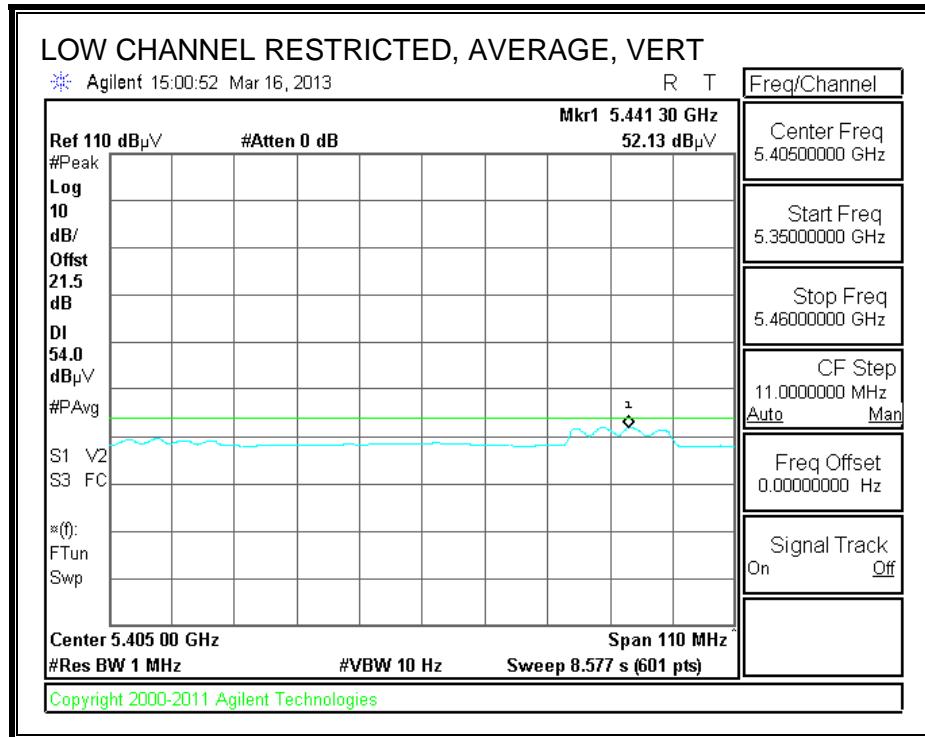
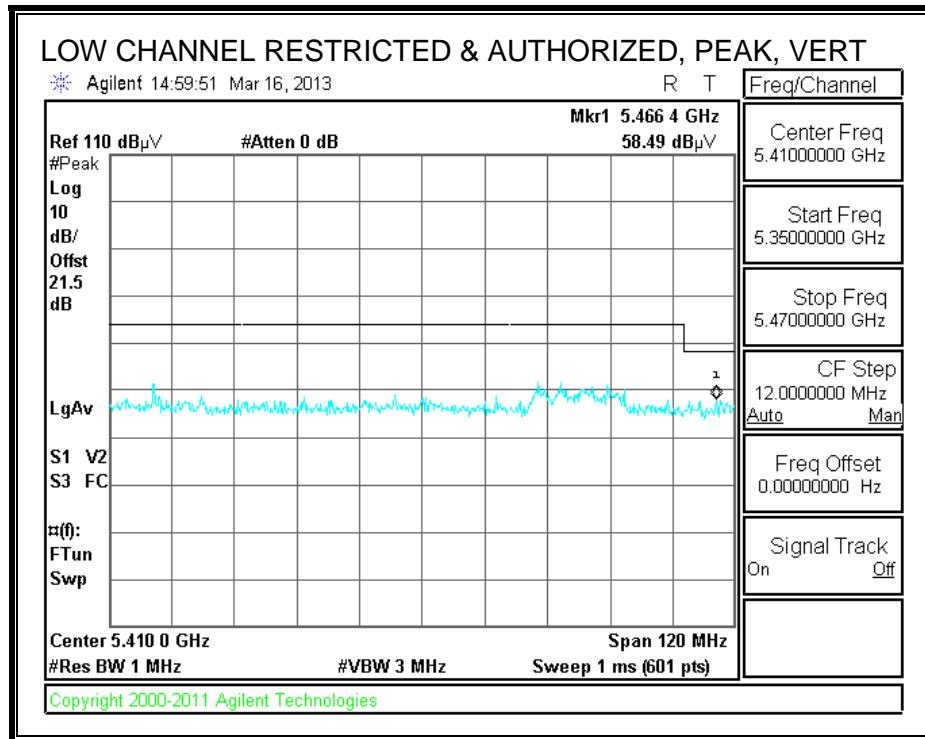
#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)



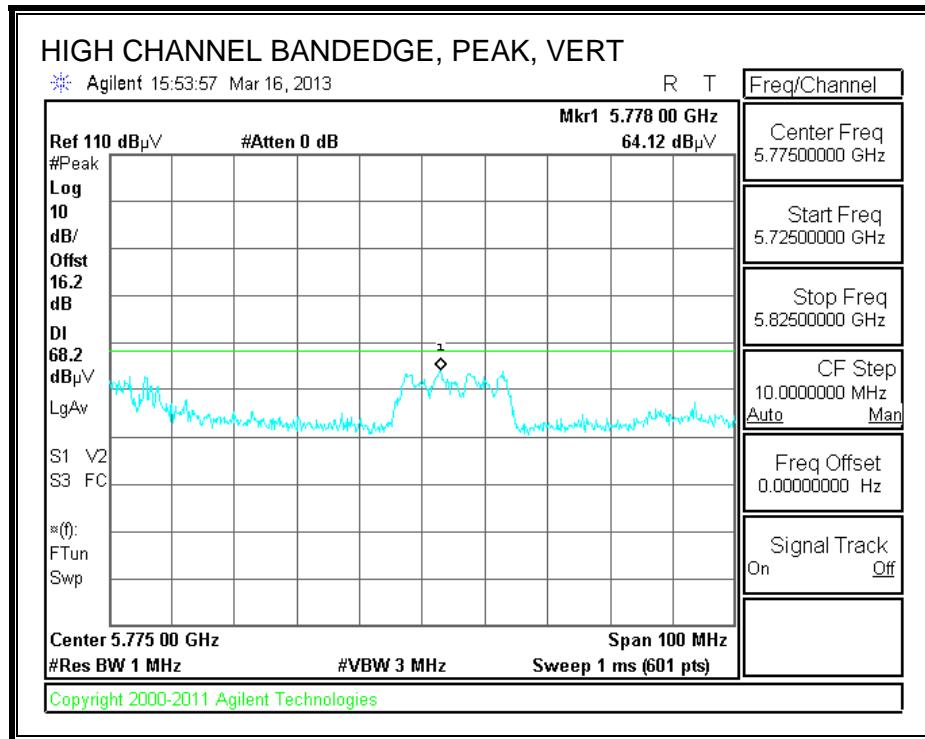
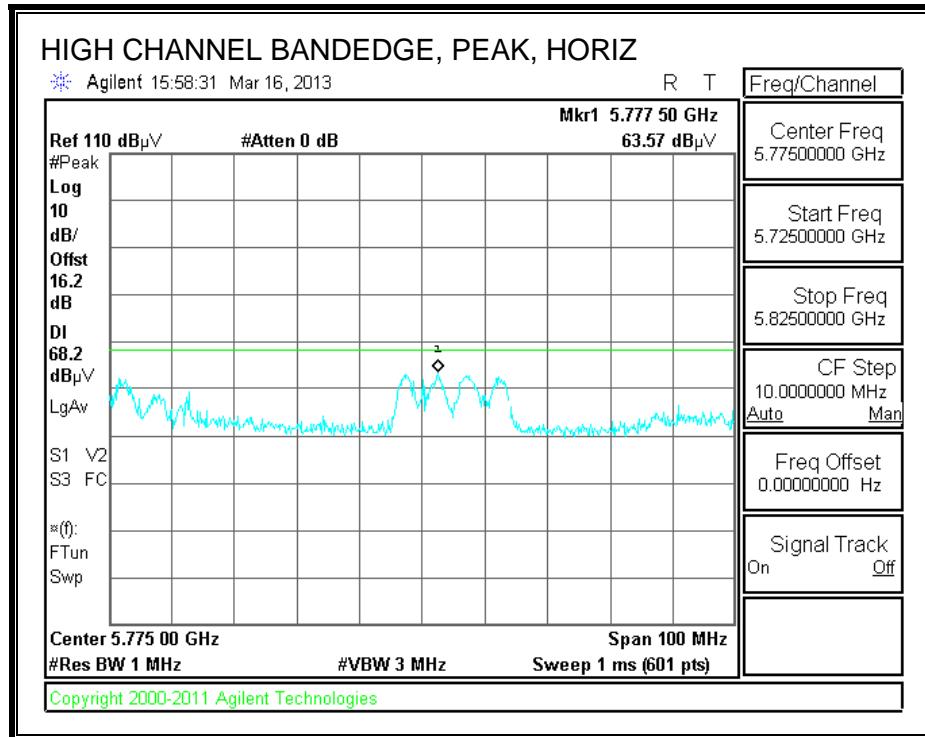


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

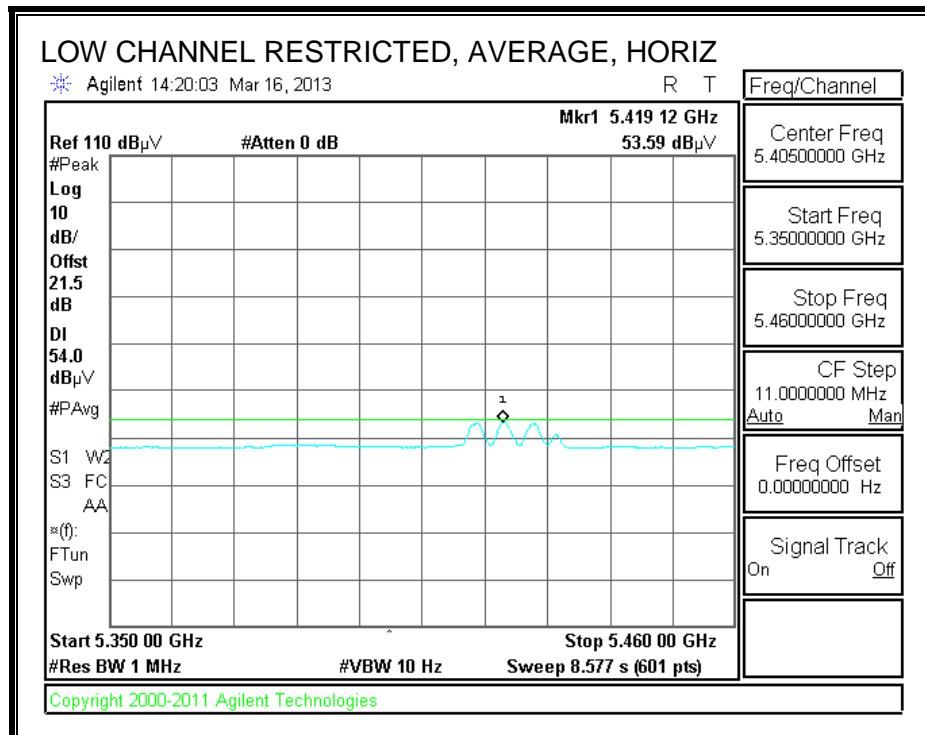
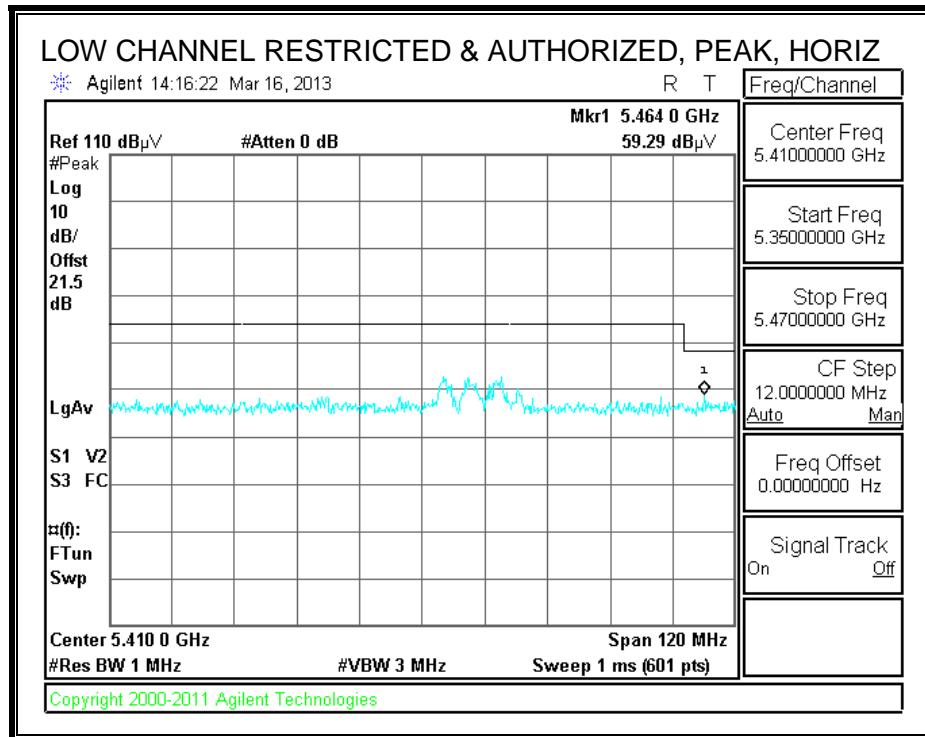


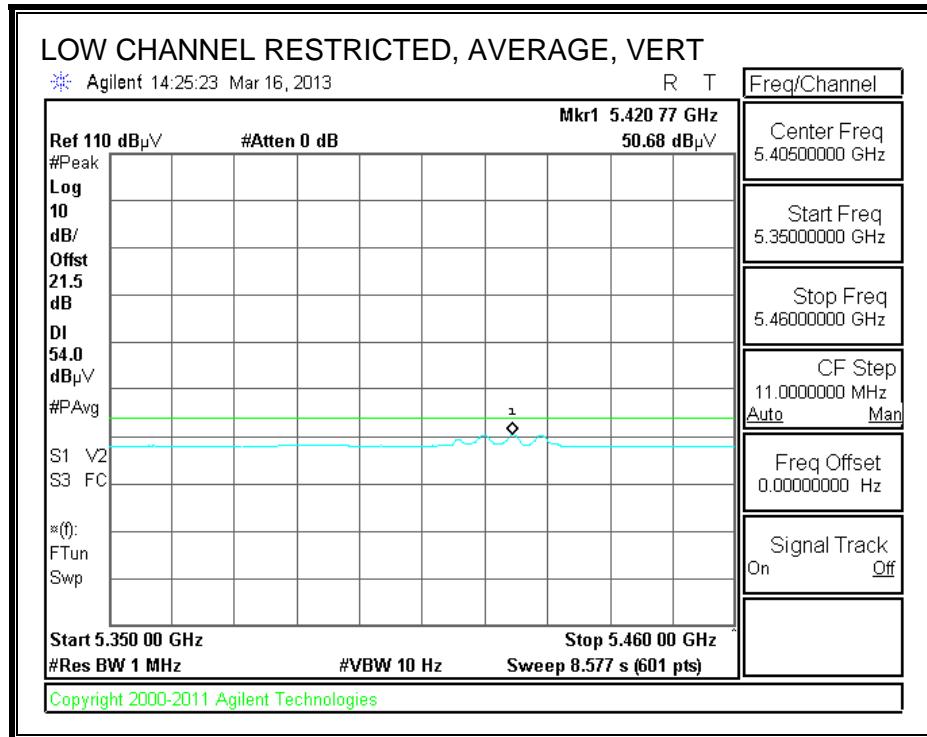
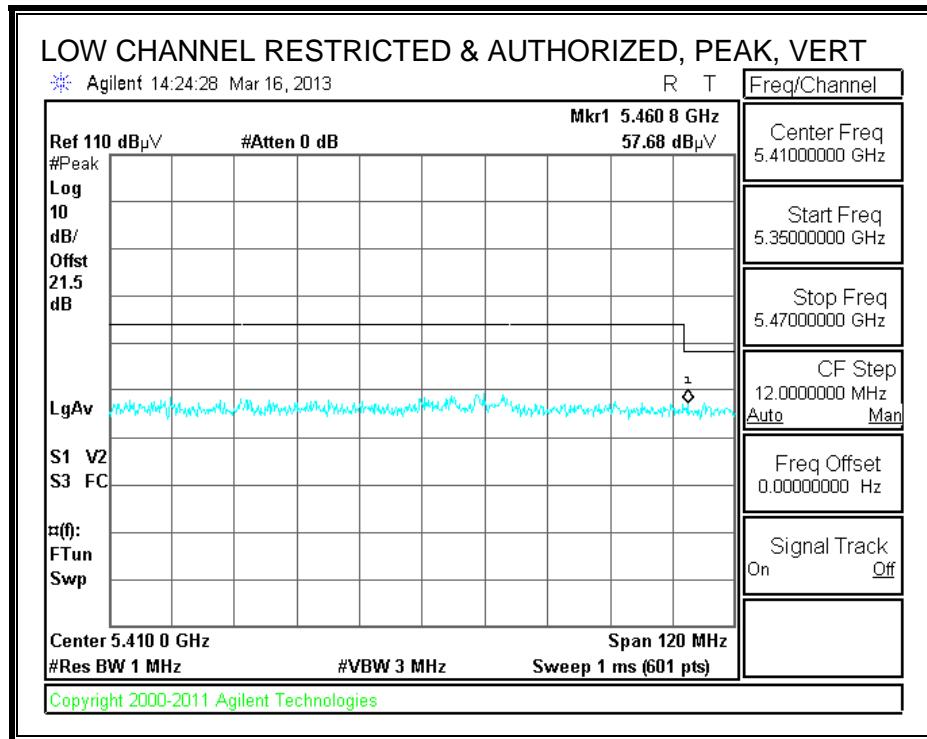
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company: MENGISTU MEKURIA Project #: 03/17/13 Date: 12U14745 Test Engineer: Apple Inc. Configuration: FCC Class B Mode: HT20 3TX BF CDD															
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables 3' cable 22807700      12' cable 22807600      20' cable 22807500 3' cable 22807700      12' cable 22807600      20' cable 22807500															
HPF      Reject Filter															
<b>Peak Measurements</b> RBW=VBW=1MHz															
<b>Average Measurements</b> 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 Channel (5500 MHz)															
11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V
11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V
Mid Channel (5580 MHz)															
11.160	3.0	35.4	25.4	37.7	11.0	-33.3	0.0	0.7	51.6	41.6	74	54	-22.4	-12.4	H
11.160	3.0	35.4	24.5	37.7	11.0	-33.3	0.0	0.7	51.6	40.7	74	54	-22.4	-13.3	V
Hi Channel (5700 MHz)															
11.400	3.0	35.4	25.4	38.0	11.1	-33.0	0.0	0.7	52.2	42.2	74	54	-21.8	-11.8	H
11.400	3.0	35.5	25.6	38.0	11.1	-33.0	0.0	0.7	52.3	42.4	74	54	-21.7	-11.6	V
H															
Rev. 01.30.13															
f      Measurement Frequency Dist      Distance to Antenna Read      Analyzer Reading AF      Antenna Factor CL      Cable Loss					Amp      Preamp Gain D Corr      Distance Correct to 3 meters Avg      Average Field Strength @ 3 m Peak      Calculated Peak Field Strength HPF      High Pass Filter					Avg Lim      Average Field Strength Limit Pk Lim      Peak Field Strength Limit Avg Mar      Margin vs. Average Limit Pk Mar      Margin vs. Peak Limit					

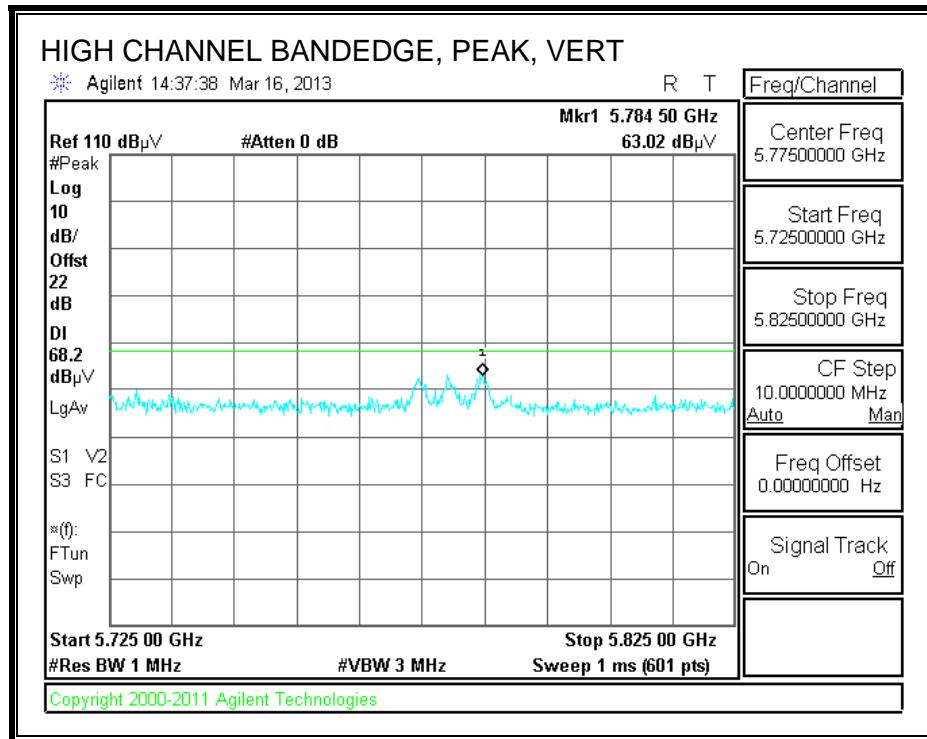
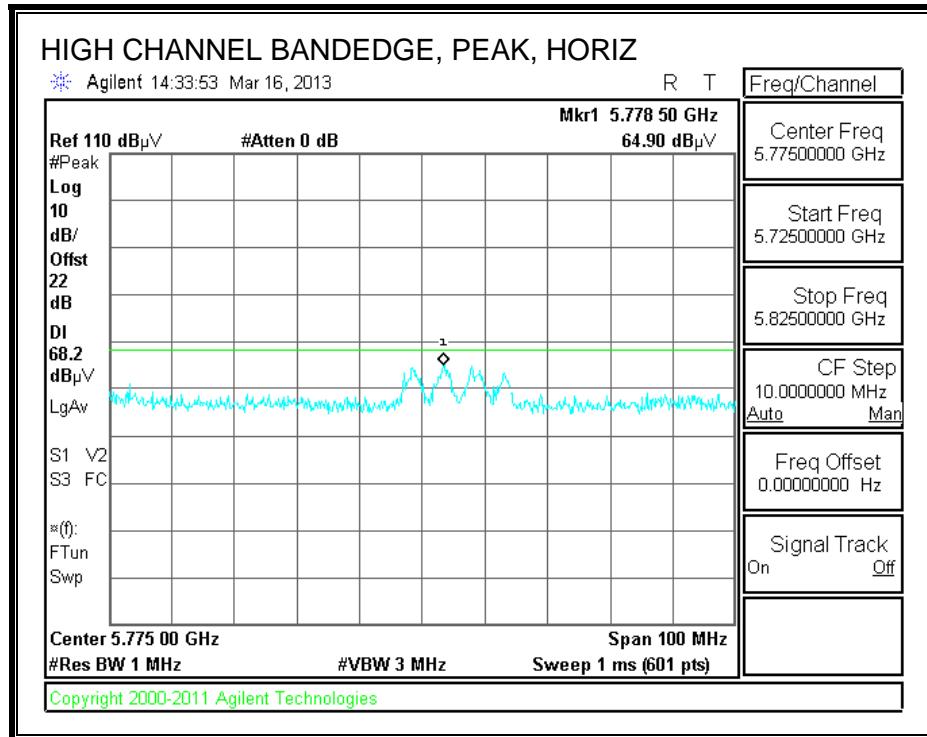
### 9.2.31. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

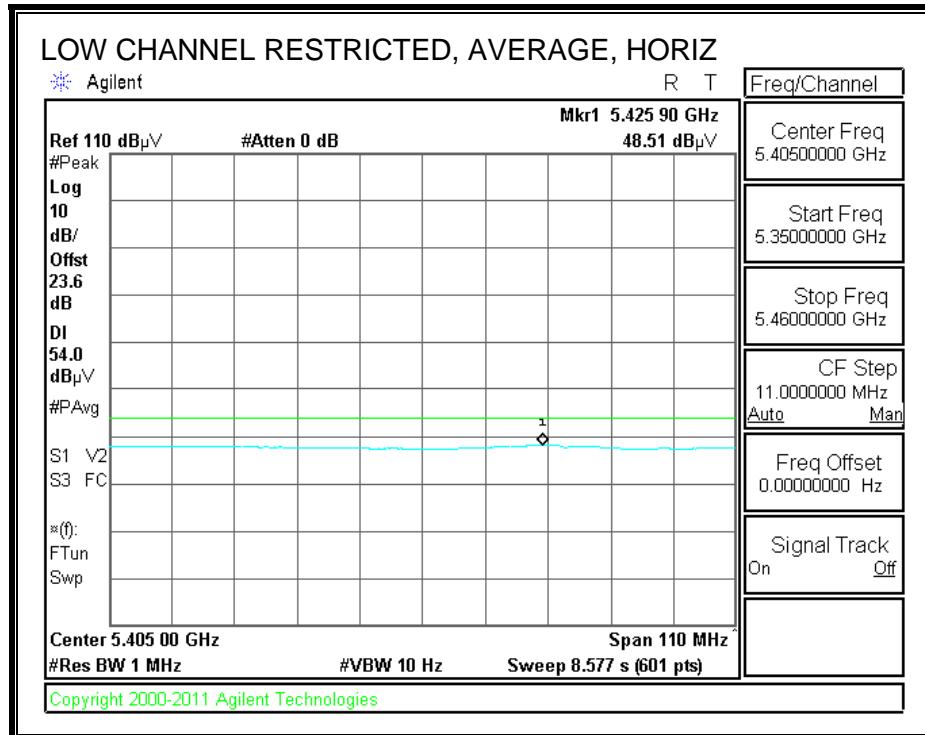
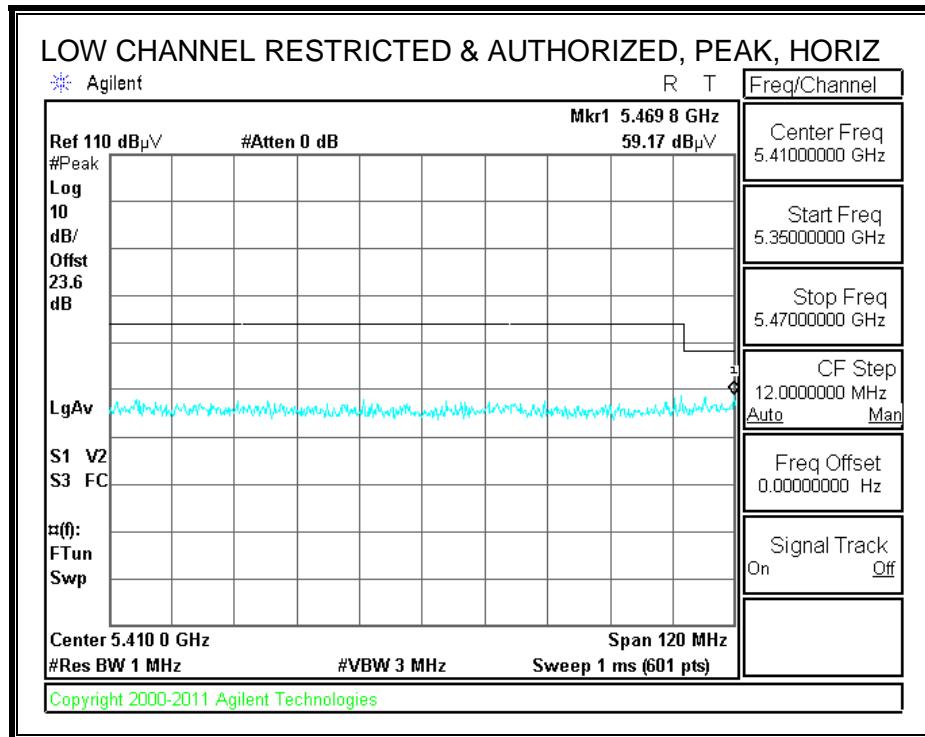


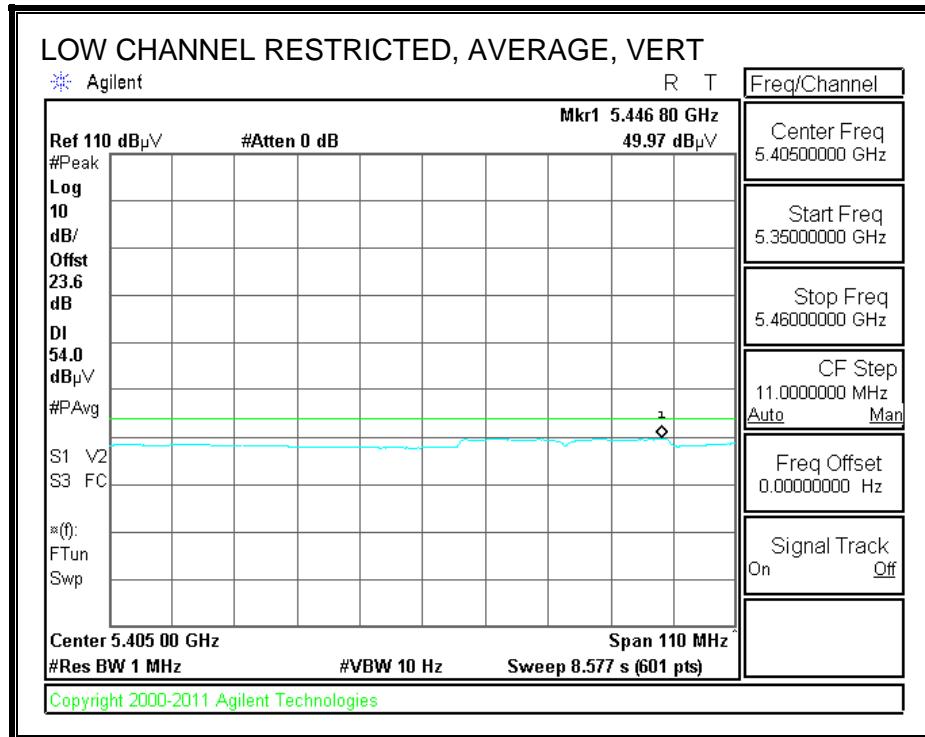
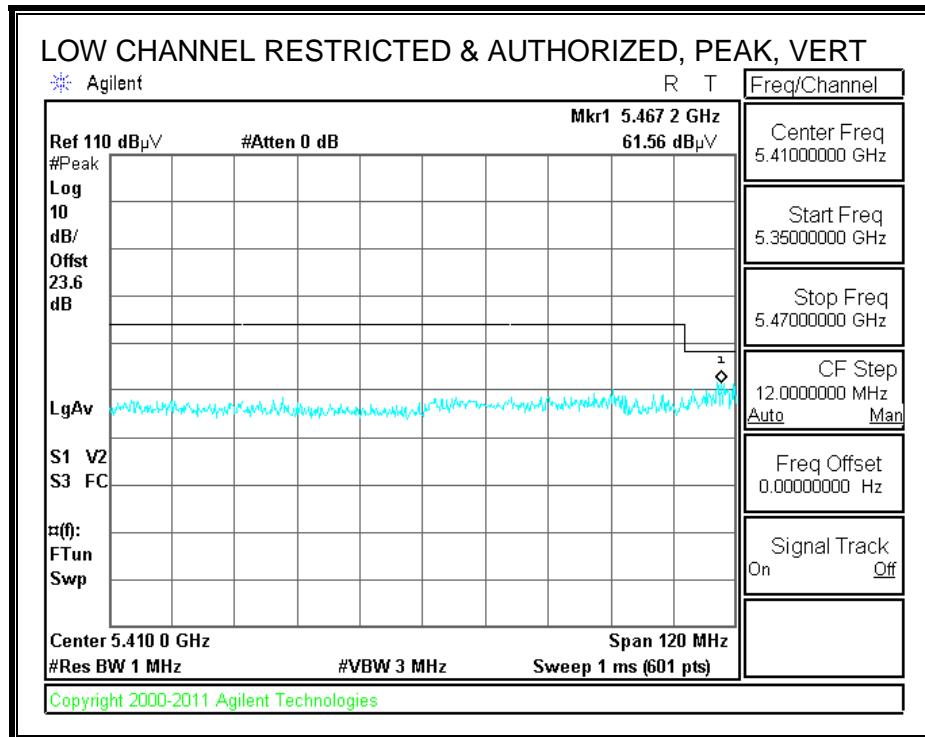
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A																																																																																																																																																																																																																																		
<p>Company: MENGISTU MEKURIA Project #: 03/17/13 Date: 12U14745 Test Engineer: Apple Inc. Configuration: FCC Class B Mode: HT20 3TX BF CDD</p> <p><b>Test Equipment:</b></p> <table border="1"> <tr> <th>Horn 1-18GHz</th> <th>Pre-amplifier 1-26GHz</th> <th>Pre-amplifier 26-40GHz</th> <th>Horn &gt; 18GHz</th> <th>Limit</th> </tr> <tr> <td>T136; M/N: 3117 @3m</td> <td>T145 Agilent 3008A0056</td> <td>T88 Miteq 26-40GHz</td> <td>T39; ARA 18-26GHz; S/N:1013</td> <td>FCC 15.205</td> </tr> <tr> <td colspan="5">Hi Frequency Cables</td> </tr> <tr> <td>3' cable 22807700</td> <td>12' cable 22807600</td> <td>20' cable 22807500</td> <td>HPF</td> <td>Reject Filter</td> </tr> <tr> <td>3' cable 22807700</td> <td>12' cable 22807600</td> <td>20' cable 22807500</td> <td>HPF_7.6GHz</td> <td></td> </tr> </table> <p><b>Peak Measurements</b> RBW=VBW=1MHz</p> <p><b>Average Measurements</b> RBW=1MHz ; VBW=10Hz</p> <table border="1"> <thead> <tr> <th>f GHz</th> <th>Dist (m)</th> <th>Read Pk dBuV</th> <th>Read Avg. dBuV</th> <th>AF dB/m</th> <th>CL dB</th> <th>Amp dB</th> <th>D Corr dB</th> <th>Fltr dB</th> <th>Peak dBuV/m</th> <th>Avg dBuV/m</th> <th>Pk Lim dBuV/m</th> <th>Avg Lim dBuV/m</th> <th>Pk Mar dB</th> <th>Avg Mar dB</th> <th>Notes (V/H)</th> </tr> </thead> <tbody> <tr> <td colspan="15">Low Channel (5500 MHz)</td> </tr> <tr> <td>11.000</td> <td>3.0</td> <td>36.2</td> <td>25.2</td> <td>37.5</td> <td>10.9</td> <td>-33.5</td> <td>0.0</td> <td>0.7</td> <td>51.9</td> <td>40.9</td> <td>74</td> <td>54</td> <td>-22.1</td> <td>-13.1</td> <td>V</td> </tr> <tr> <td>11.000</td> <td>3.0</td> <td>35.3</td> <td>24.6</td> <td>37.5</td> <td>10.9</td> <td>-33.5</td> <td>0.0</td> <td>0.7</td> <td>51.0</td> <td>40.3</td> <td>74</td> <td>54</td> <td>-23.0</td> <td>-13.7</td> <td>V</td> </tr> <tr> <td colspan="15">Mid Channel (5580 MHz)</td> </tr> <tr> <td>11.160</td> <td>3.0</td> <td>35.4</td> <td>25.4</td> <td>37.7</td> <td>11.0</td> <td>-33.3</td> <td>0.0</td> <td>0.7</td> <td>51.6</td> <td>41.6</td> <td>74</td> <td>54</td> <td>-22.4</td> <td>-12.4</td> <td>H</td> </tr> <tr> <td>11.160</td> <td>3.0</td> <td>35.4</td> <td>24.5</td> <td>37.7</td> <td>11.0</td> <td>-33.3</td> <td>0.0</td> <td>0.7</td> <td>51.6</td> <td>40.7</td> <td>74</td> <td>54</td> <td>-22.4</td> <td>-13.3</td> <td>V</td> </tr> <tr> <td colspan="15">Hi Channel (5700 MHz)</td> </tr> <tr> <td>11.400</td> <td>3.0</td> <td>35.4</td> <td>25.4</td> <td>38.0</td> <td>11.1</td> <td>-33.0</td> <td>0.0</td> <td>0.7</td> <td>52.2</td> <td>42.2</td> <td>74</td> <td>54</td> <td>-21.8</td> <td>-11.8</td> <td>H</td> </tr> <tr> <td>11.400</td> <td>3.0</td> <td>35.5</td> <td>25.6</td> <td>38.0</td> <td>11.1</td> <td>-33.0</td> <td>0.0</td> <td>0.7</td> <td>52.3</td> <td>42.4</td> <td>74</td> <td>54</td> <td>-21.7</td> <td>-11.6</td> <td>V</td> </tr> <tr> <td colspan="15">H</td> </tr> </tbody> </table> <p>Rev. 01.30.13</p> <table border="1"> <tr> <td>f Measurement Frequency</td> <td>Amp Preamp Gain</td> <td>Avg Lim Average Field Strength Limit</td> </tr> <tr> <td>Dist Distance to Antenna</td> <td>D Corr Distance Correct to 3 meters</td> <td>Pk Lim Peak Field Strength Limit</td> </tr> <tr> <td>Read Analyzer Reading</td> <td>Avg Average Field Strength @ 3 m</td> <td>Avg Mar Margin vs. Average Limit</td> </tr> <tr> <td>AF Antenna Factor</td> <td>Peak Calculated Peak Field Strength</td> <td>Pk Mar Margin vs. Peak Limit</td> </tr> <tr> <td>CL Cable Loss</td> <td>HPF High Pass Filter</td> <td></td> </tr> </table>															Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit	T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205	Hi Frequency Cables					3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		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 Channel (5500 MHz)															11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V	11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V	Mid Channel (5580 MHz)															11.160	3.0	35.4	25.4	37.7	11.0	-33.3	0.0	0.7	51.6	41.6	74	54	-22.4	-12.4	H	11.160	3.0	35.4	24.5	37.7	11.0	-33.3	0.0	0.7	51.6	40.7	74	54	-22.4	-13.3	V	Hi Channel (5700 MHz)															11.400	3.0	35.4	25.4	38.0	11.1	-33.0	0.0	0.7	52.2	42.2	74	54	-21.8	-11.8	H	11.400	3.0	35.5	25.6	38.0	11.1	-33.0	0.0	0.7	52.3	42.4	74	54	-21.7	-11.6	V	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	
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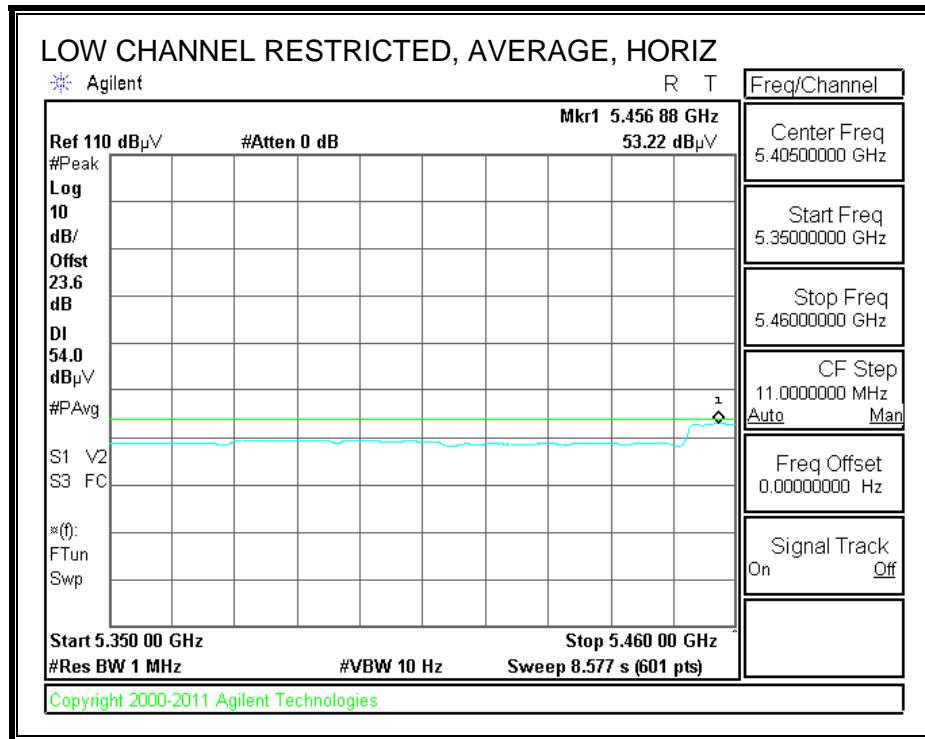
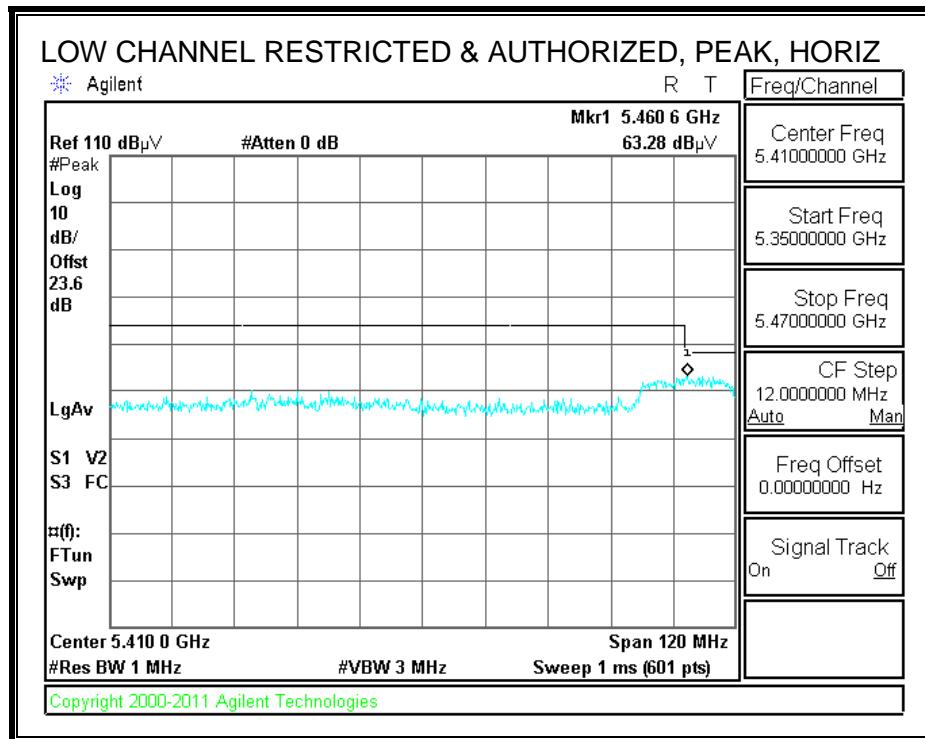
### 9.2.32. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.6 GHz BAND

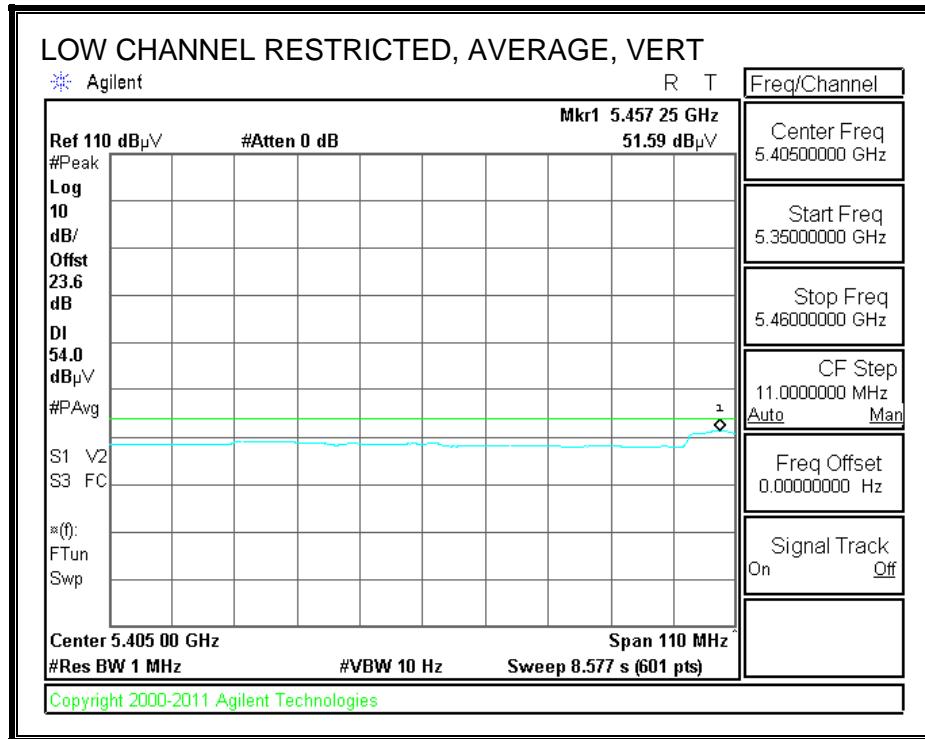
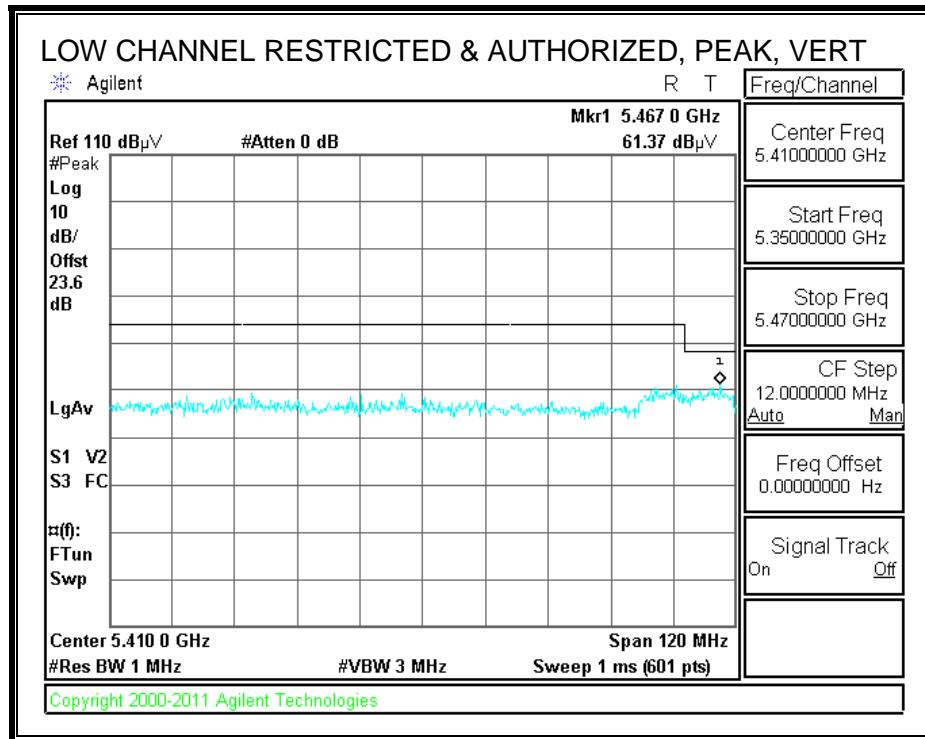
#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)



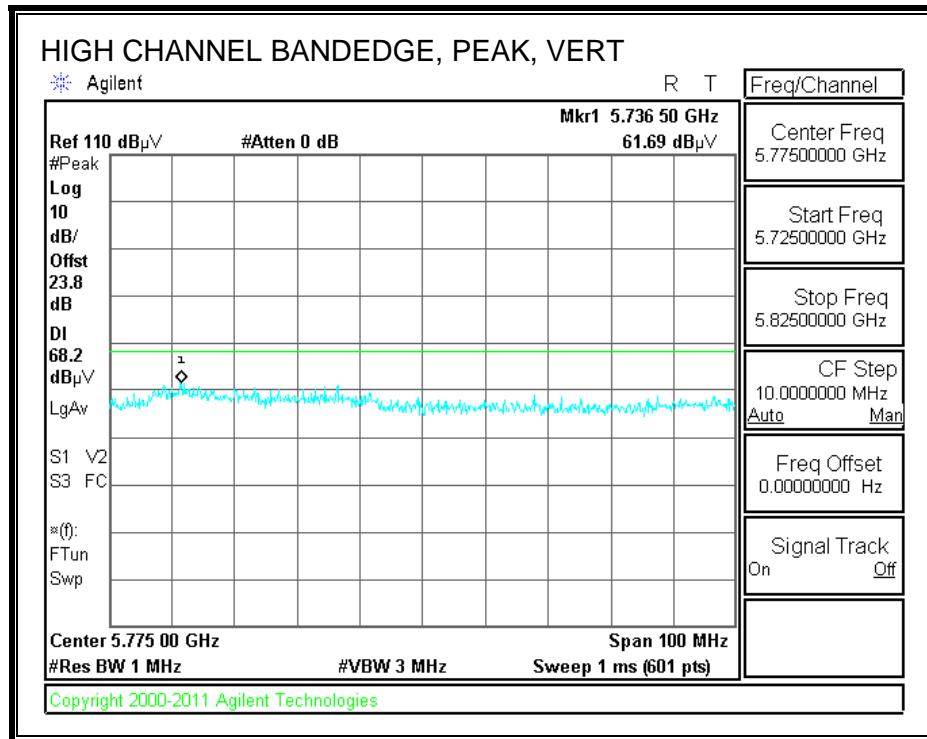
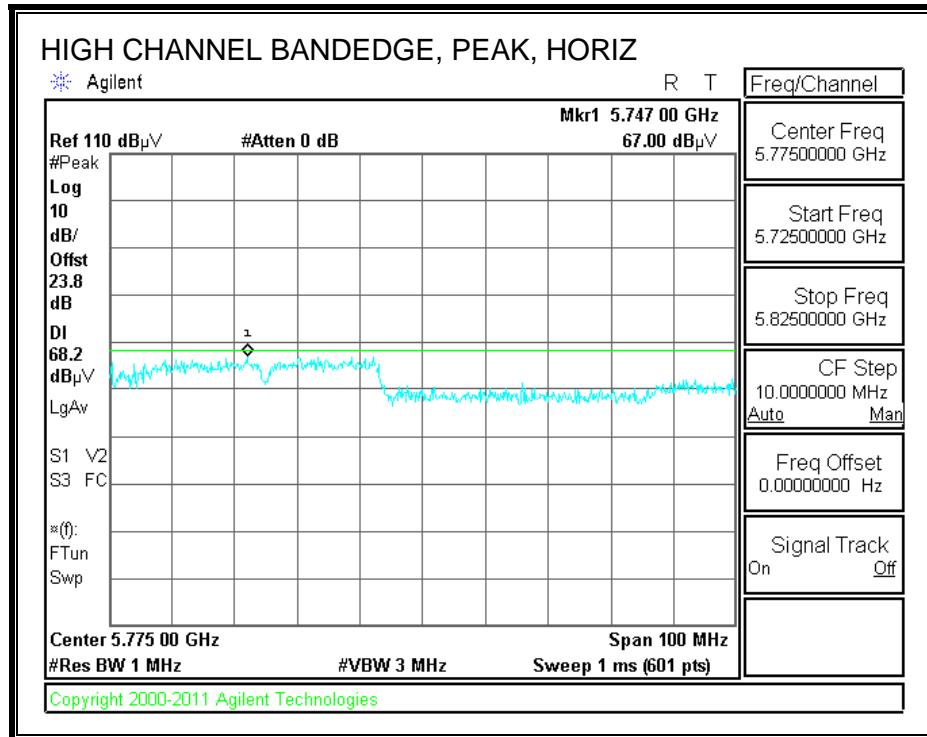


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT40 3IX CDD**

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

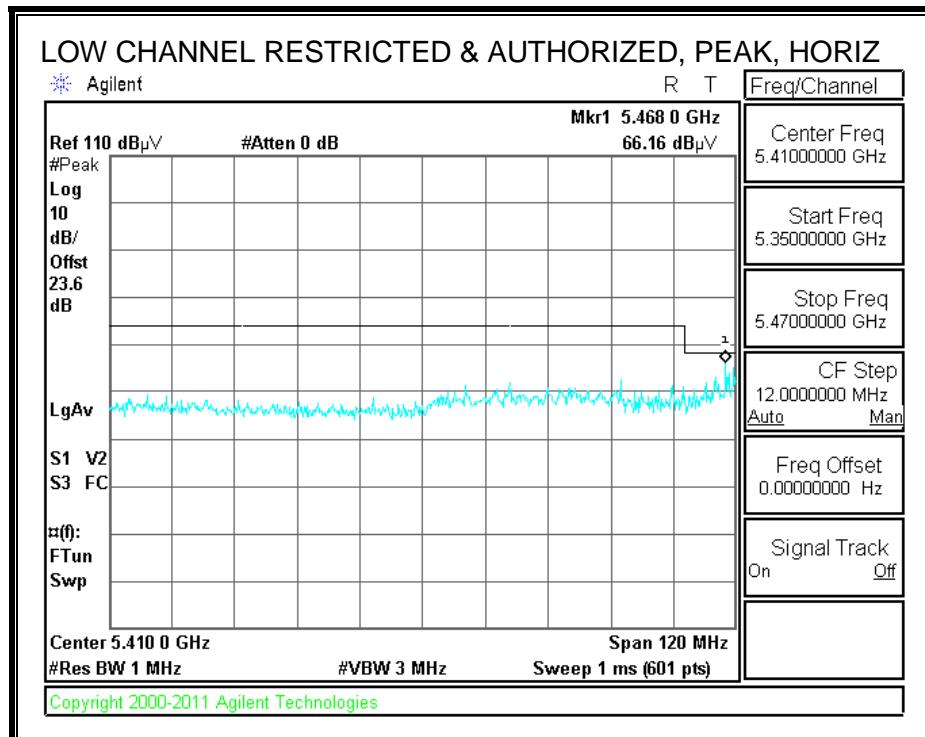
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5510 MHz 3IX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	33.0	38.4	10.5	-33.6	0.0	0.7	49.1	74.0	-24.9	V	P	
11.020	3.0	23.1	38.4	10.5	-33.6	0.0	0.7	39.2	54.0	-14.8	V	A	
<b>5550 MHz 3IX CDD</b>													
11.100	3.0	33.7	38.5	10.6	-33.5	0.0	0.7	50.1	74.0	-23.9	V	P	
11.100	3.0	24.5	38.5	10.6	-33.5	0.0	0.7	40.9	54.0	-13.1	V	A	
11.100	3.0	34.0	38.5	10.6	-33.5	0.0	0.7	50.4	74.0	-23.6	H	P	
11.100	3.0	24.6	38.5	10.6	-33.5	0.0	0.7	41.0	54.0	-13.0	H	A	
<b>5670 MHz 3IX CDD</b>													
11.340	3.0	33.8	38.7	11.0	-33.2	0.0	0.7	51.0	74.0	-23.0	H	P	
11.340	3.0	24.7	38.7	11.0	-33.2	0.0	0.7	41.9	54.0	-12.1	H	A	
11.340	3.0	33.7	38.7	11.0	-33.2	0.0	0.7	50.9	74.0	-23.1	V	P	
11.340	3.0	23.4	38.7	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

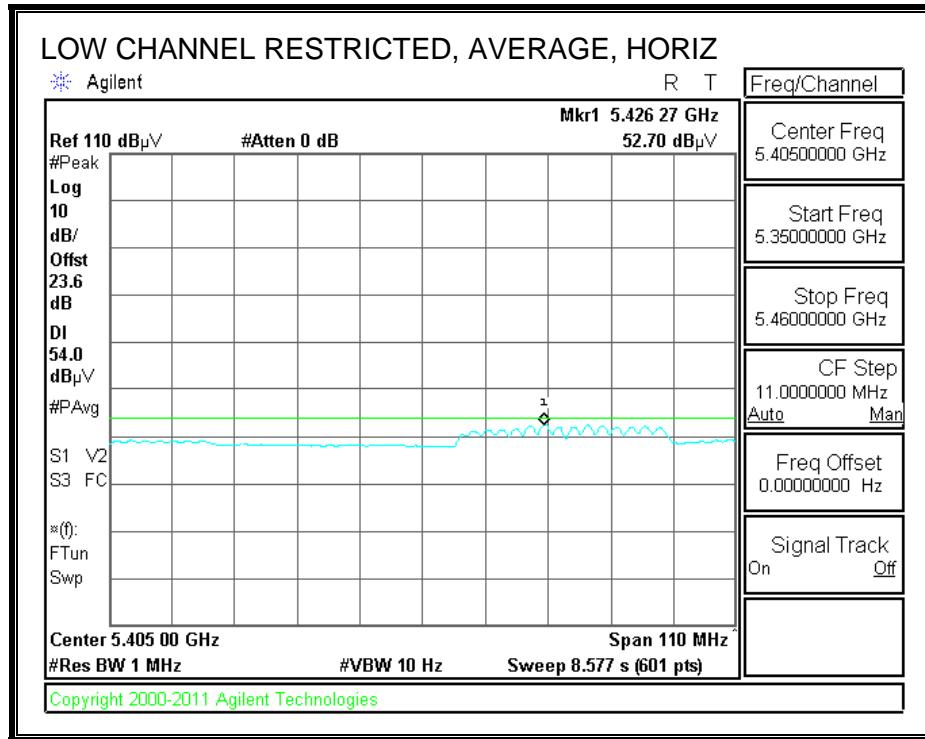
Rev. 4.1.2.7

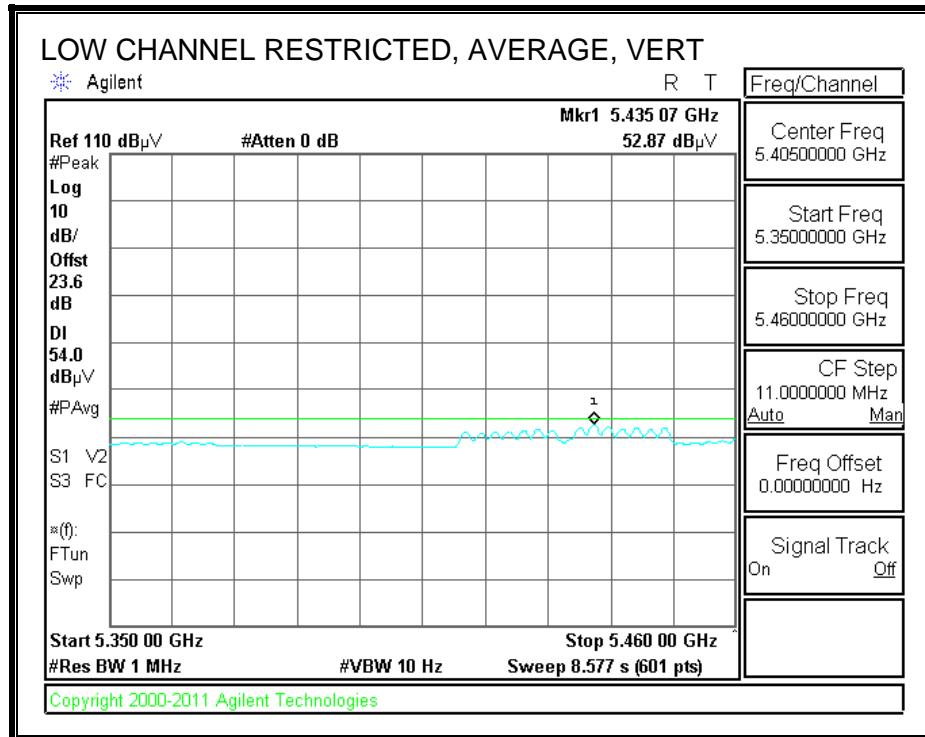
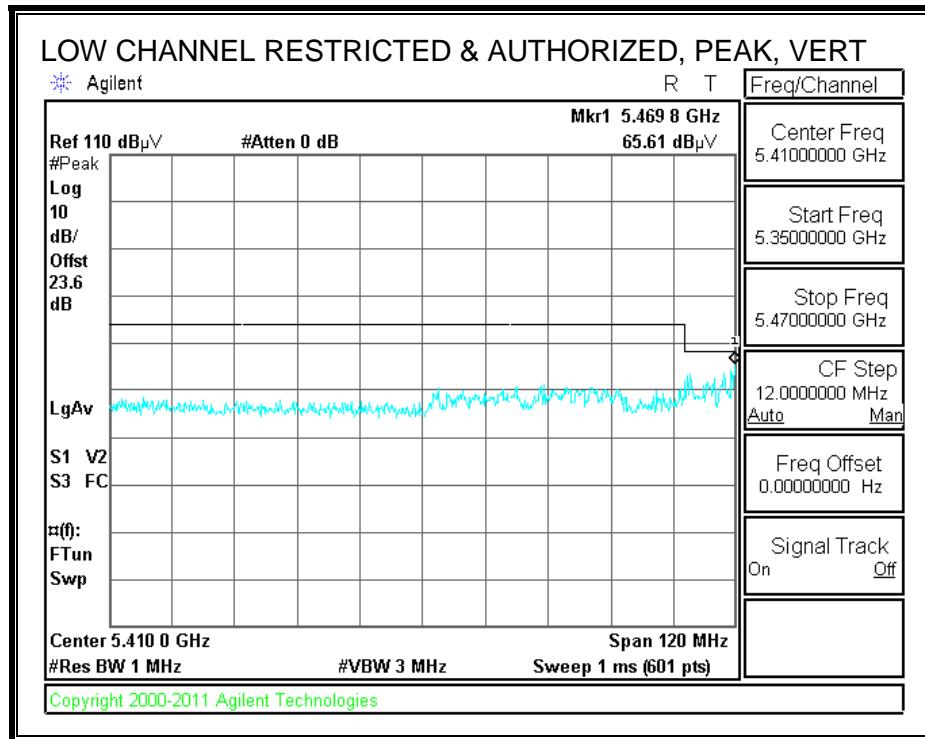
Note: No other emissions were detected above the system noise floor.

### 9.2.33. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.6 GHz BAND

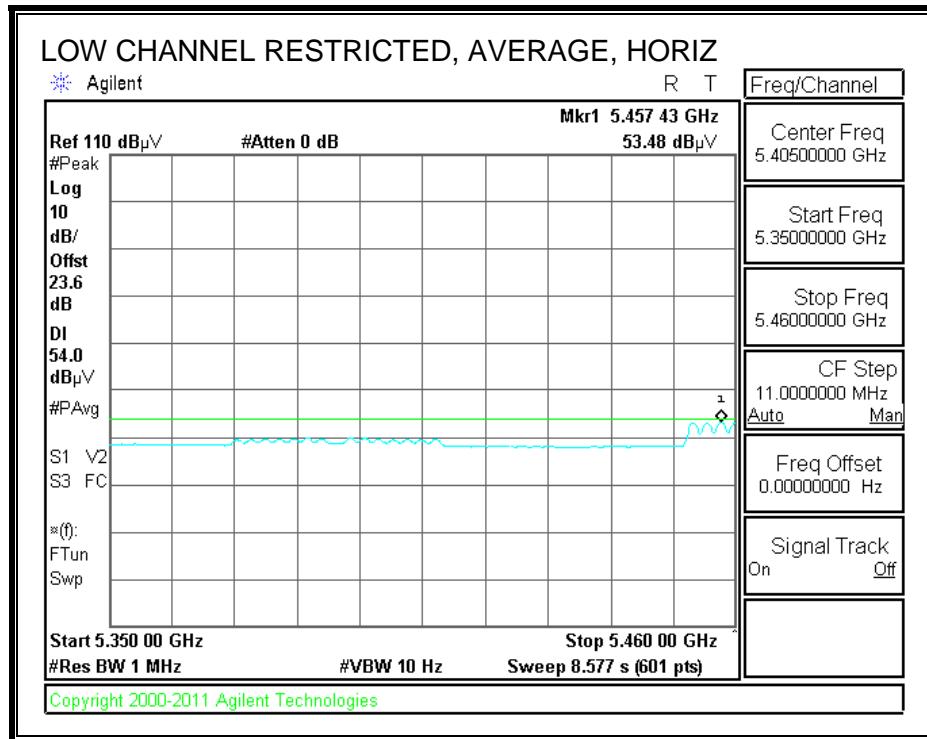
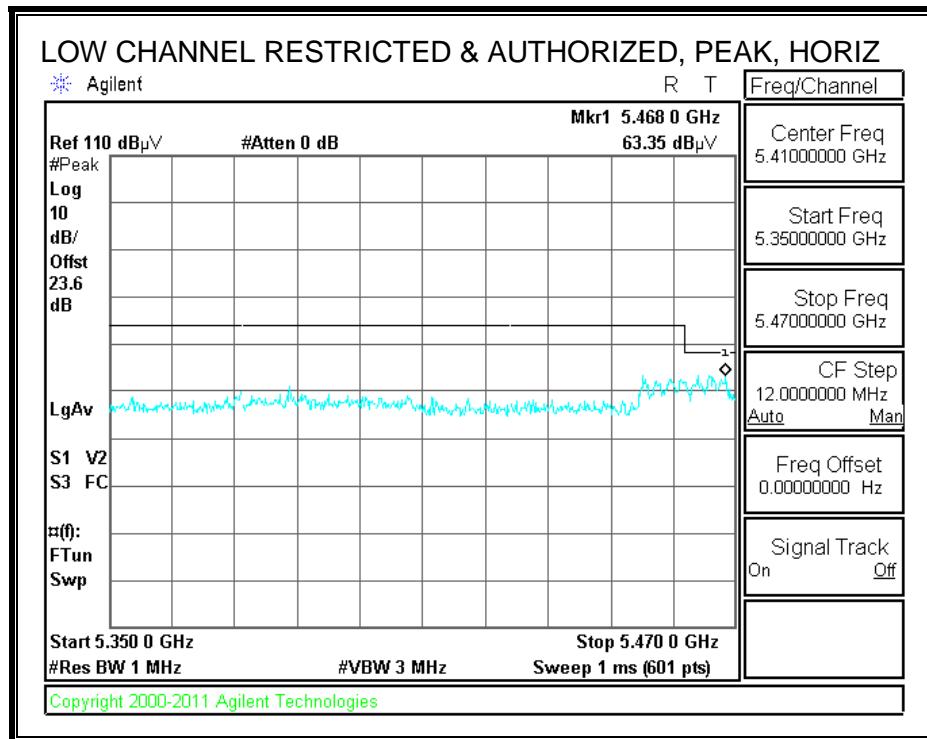
#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)

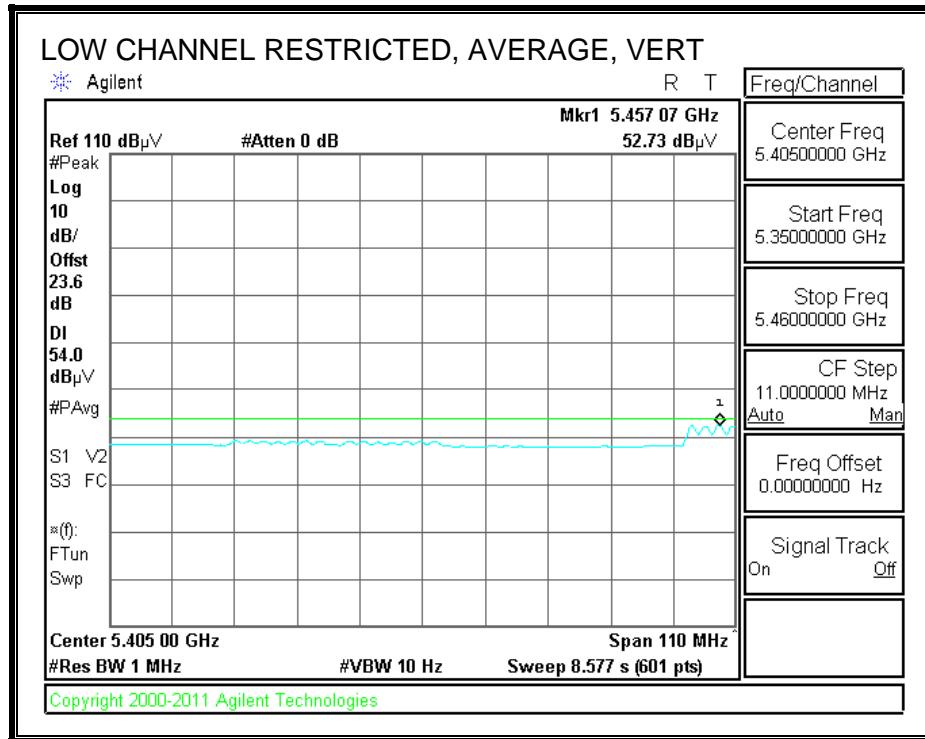
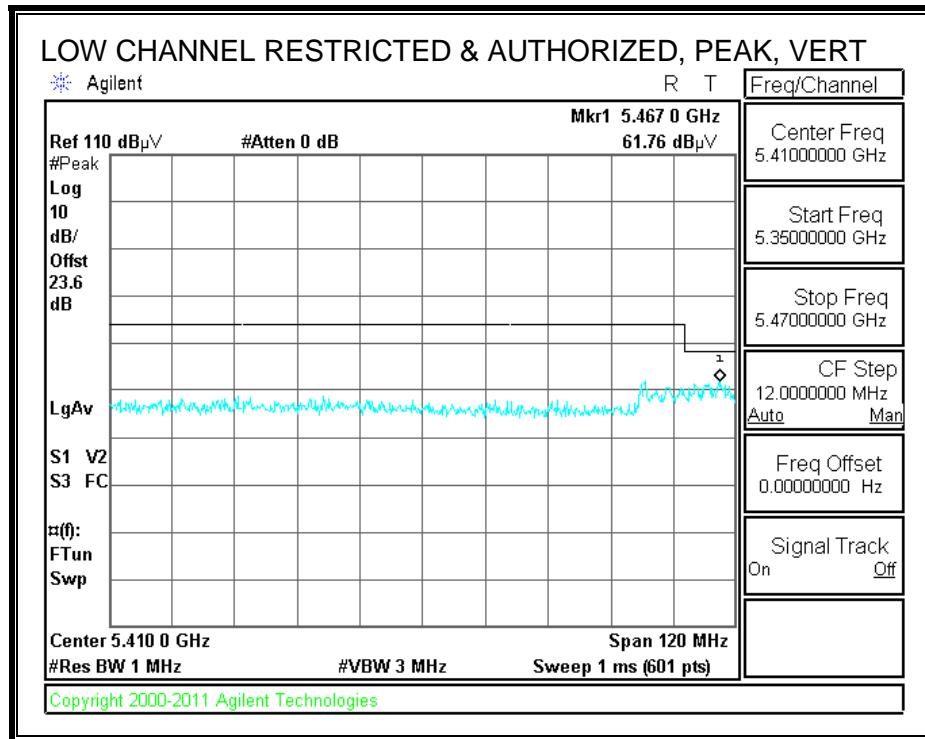




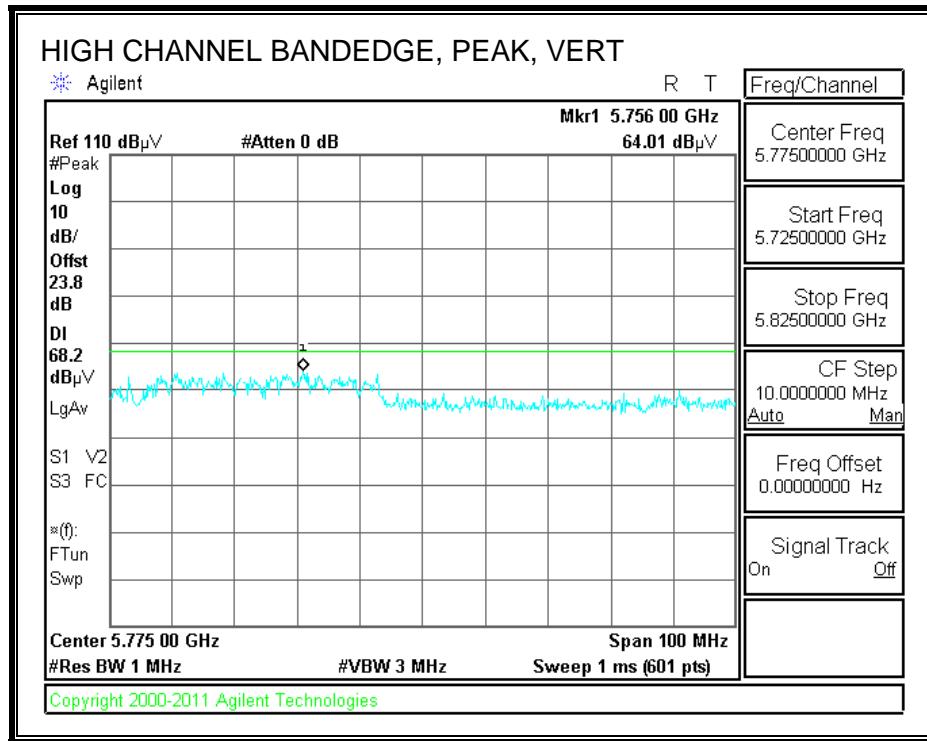
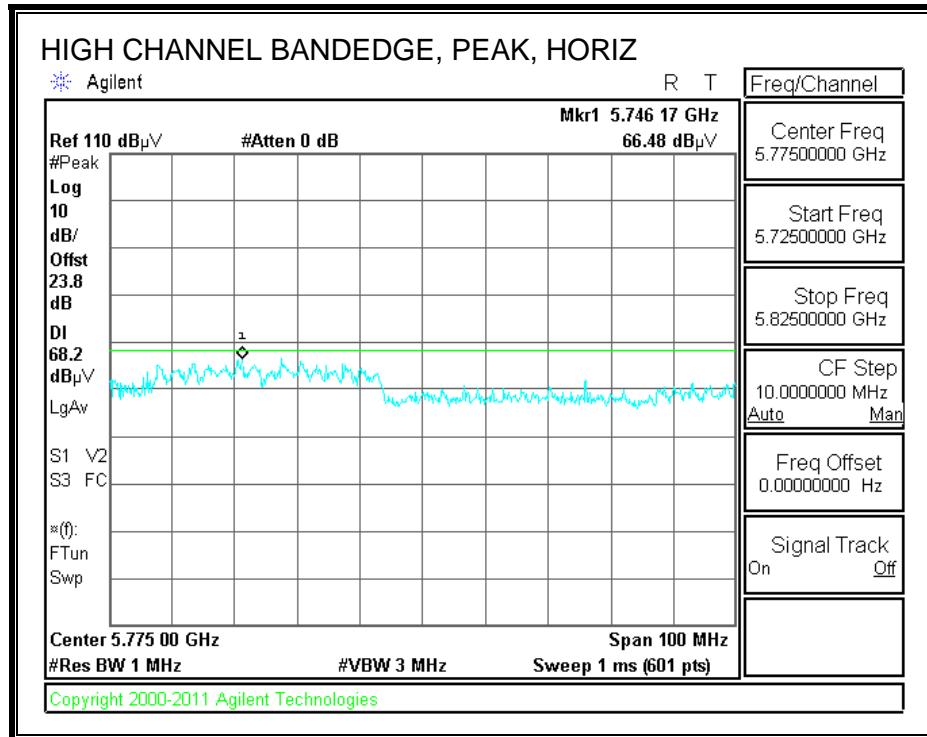


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT40 3IX CDD**

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

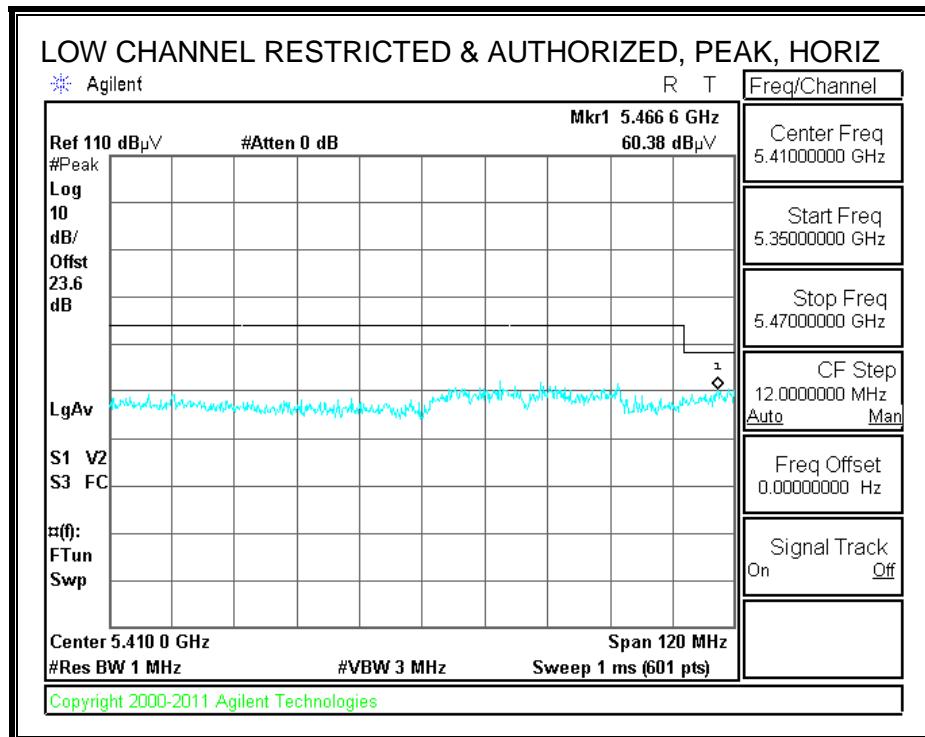
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5510 MHz 3IX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	33.0	38.4	10.5	-33.6	0.0	0.7	49.1	74.0	-24.9	V	P	
11.020	3.0	23.1	38.4	10.5	-33.6	0.0	0.7	39.2	54.0	-14.8	V	A	
<b>5550 MHz 3IX CDD</b>													
11.100	3.0	33.7	38.5	10.6	-33.5	0.0	0.7	50.1	74.0	-23.9	V	P	
11.100	3.0	24.5	38.5	10.6	-33.5	0.0	0.7	40.9	54.0	-13.1	V	A	
11.100	3.0	34.0	38.5	10.6	-33.5	0.0	0.7	50.4	74.0	-23.6	H	P	
11.100	3.0	24.6	38.5	10.6	-33.5	0.0	0.7	41.0	54.0	-13.0	H	A	
<b>5670 MHz 3IX CDD</b>													
11.340	3.0	33.8	38.7	11.0	-33.2	0.0	0.7	51.0	74.0	-23.0	H	P	
11.340	3.0	24.7	38.7	11.0	-33.2	0.0	0.7	41.9	54.0	-12.1	H	A	
11.340	3.0	33.7	38.7	11.0	-33.2	0.0	0.7	50.9	74.0	-23.1	V	P	
11.340	3.0	23.4	38.7	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

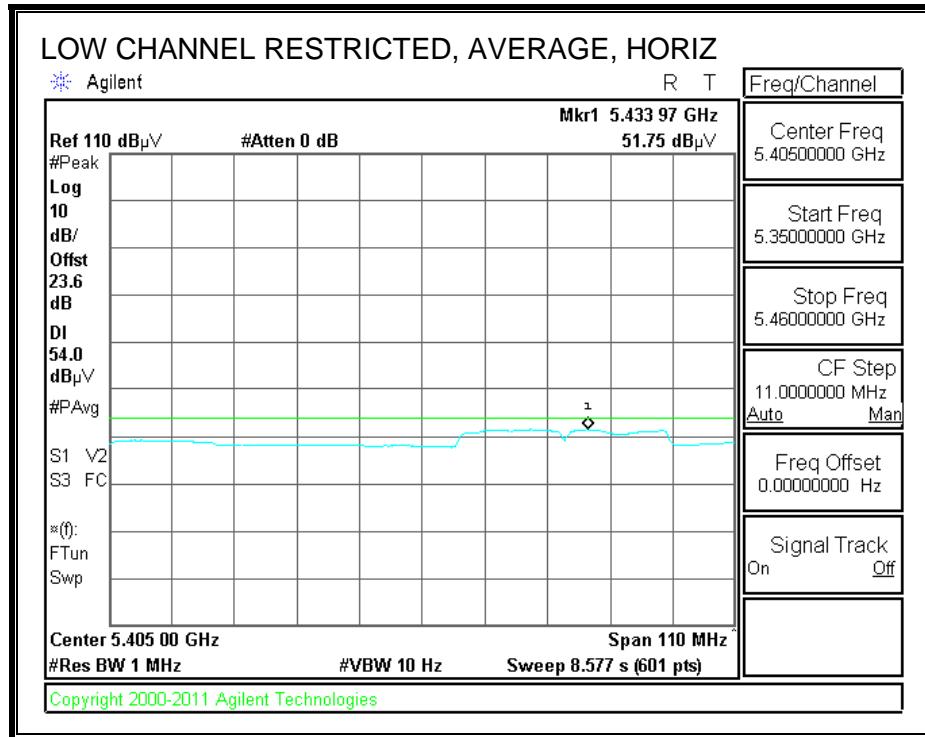
Rev. 4.1.2.7

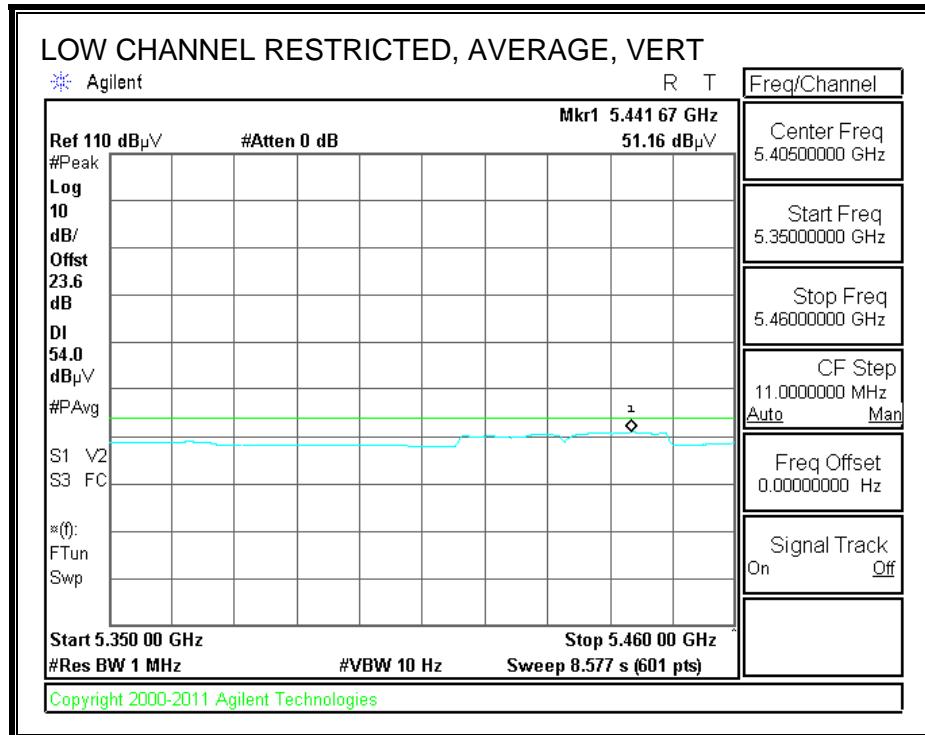
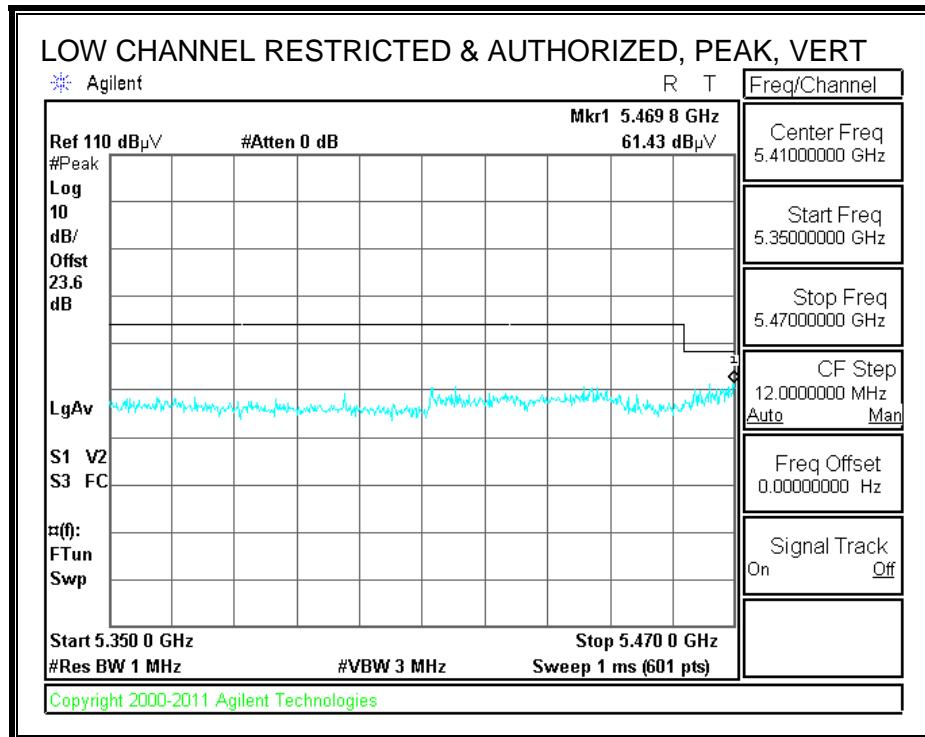
Note: No other emissions were detected above the system noise floor.

**9.2.34. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.6 GHz BAND**

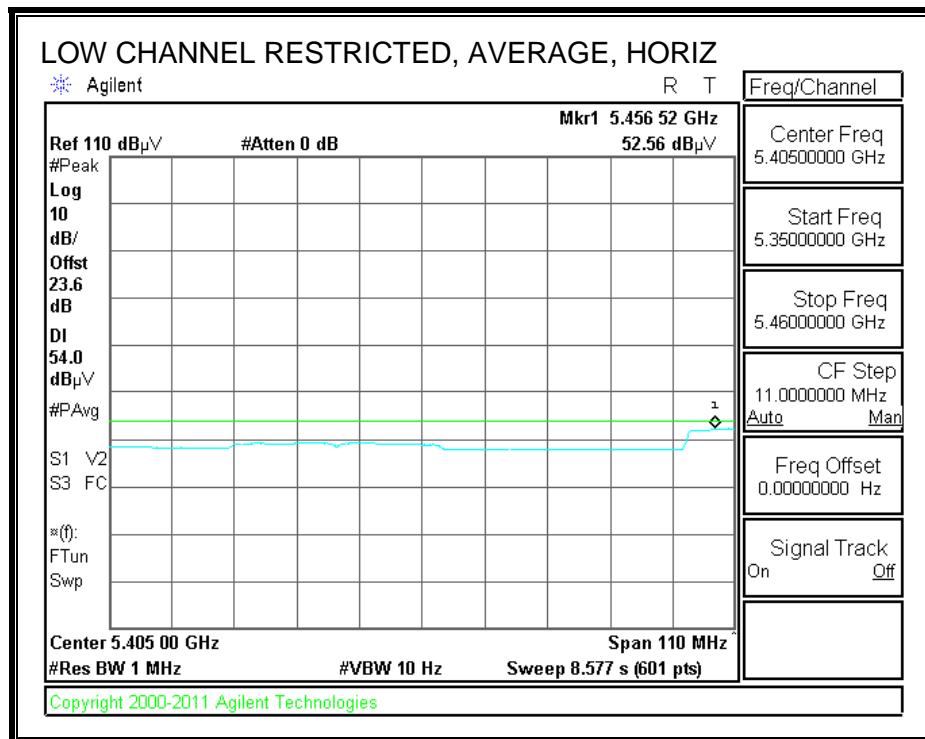
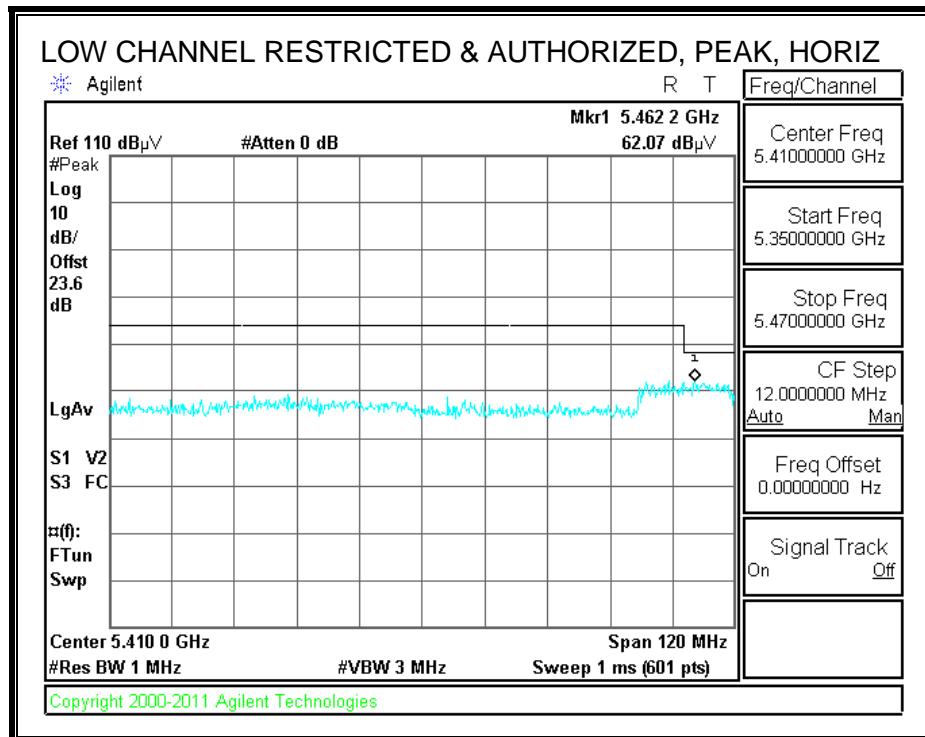
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)**

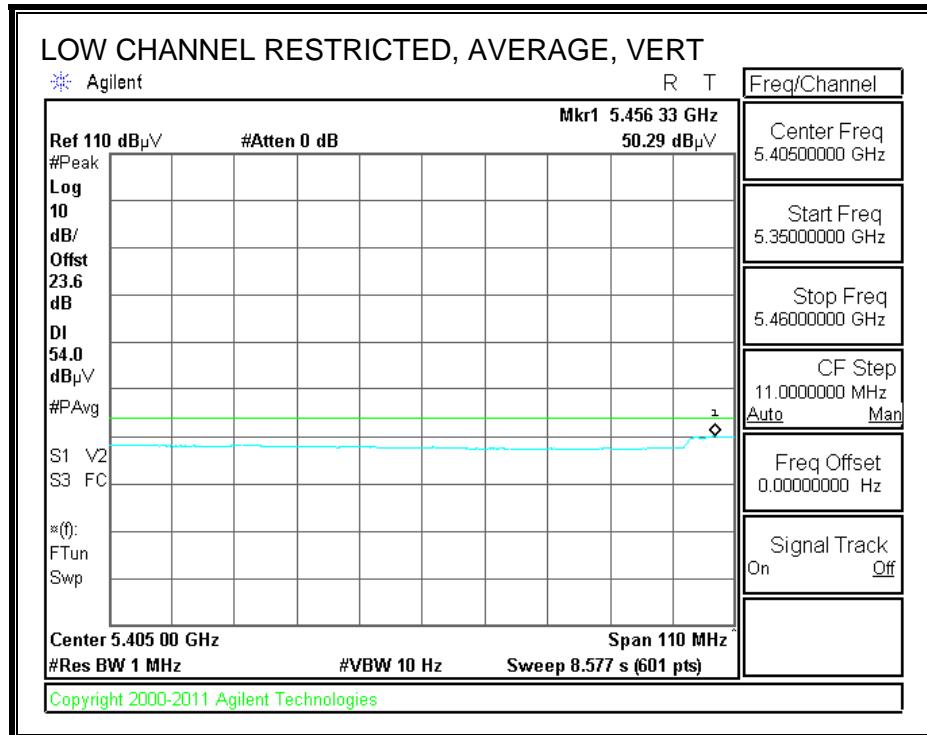
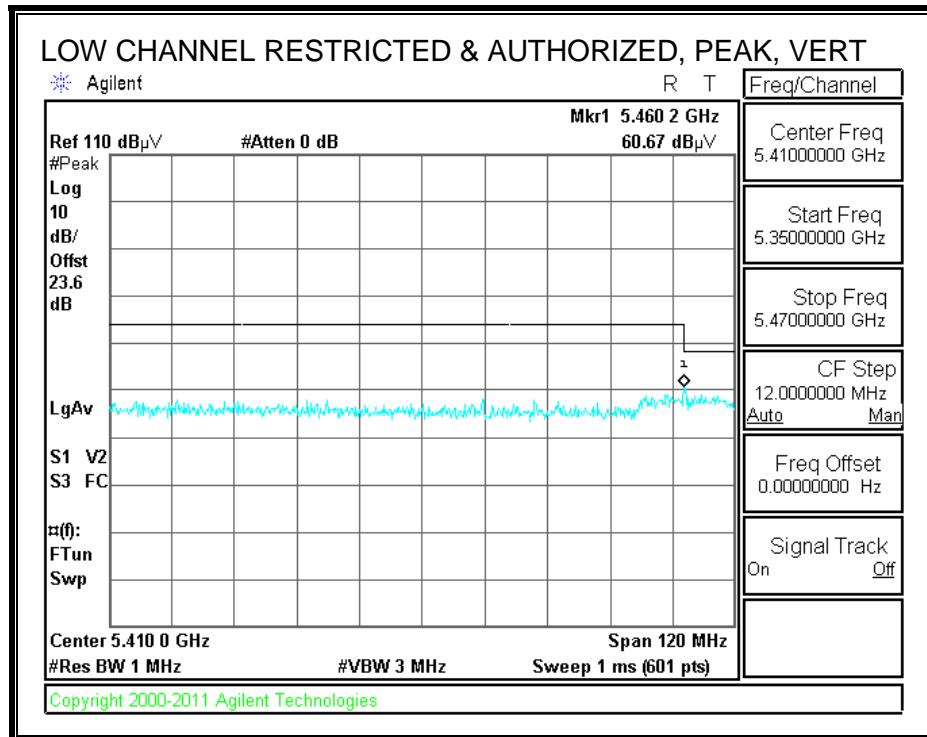




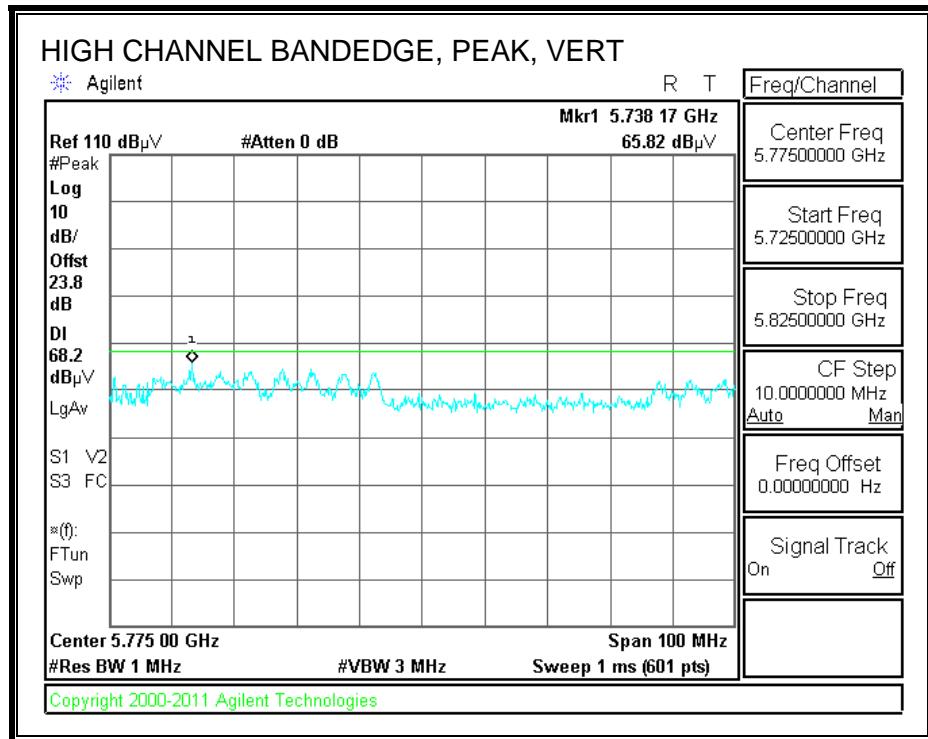
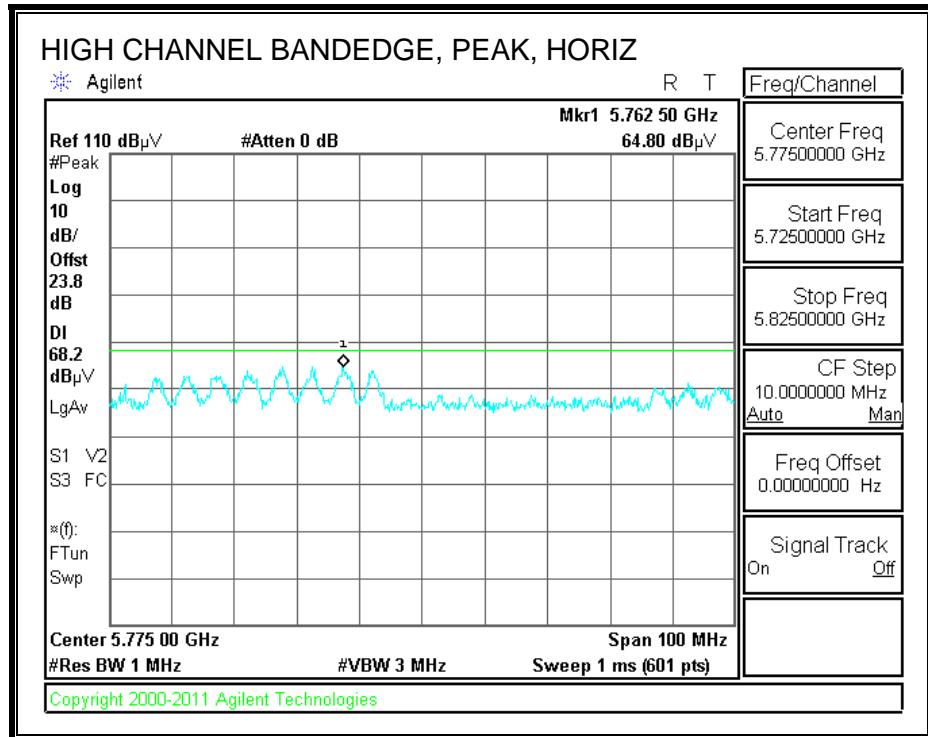


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)**





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## **HARMONICS AND SPURIOUS EMISSIONS**

### **High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber**

Test Engr: **Tom Chen**  
Date: **02/20/13**  
Project #: **12U14745**  
Company: **Apple Inc.**  
Test Target: **FCC Class B**  
Mode Oper: **HT40 3IX CDD**

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

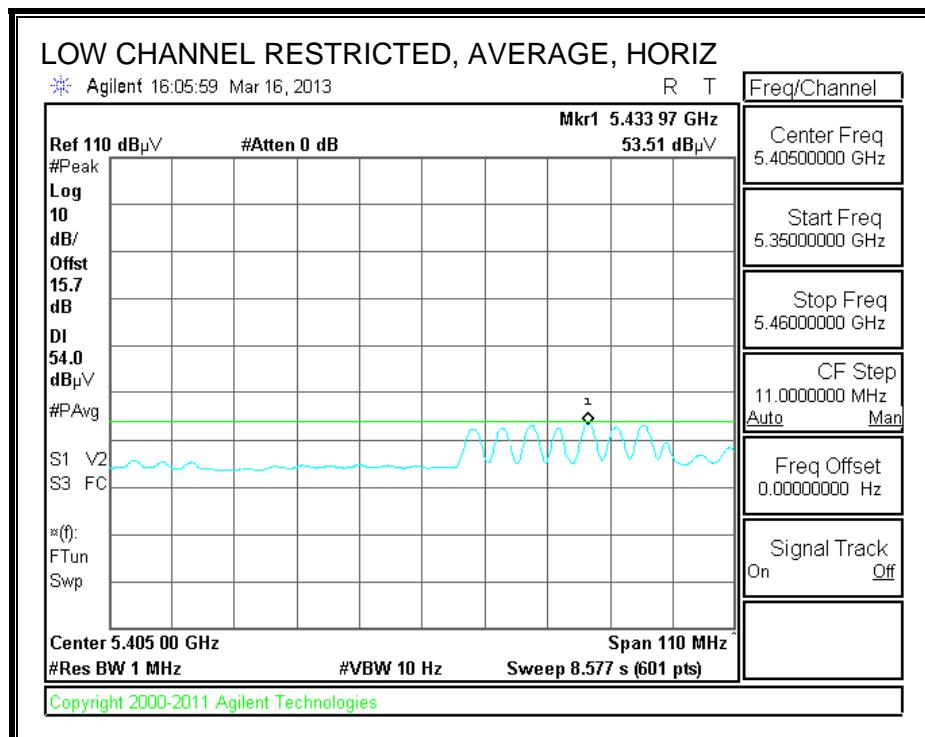
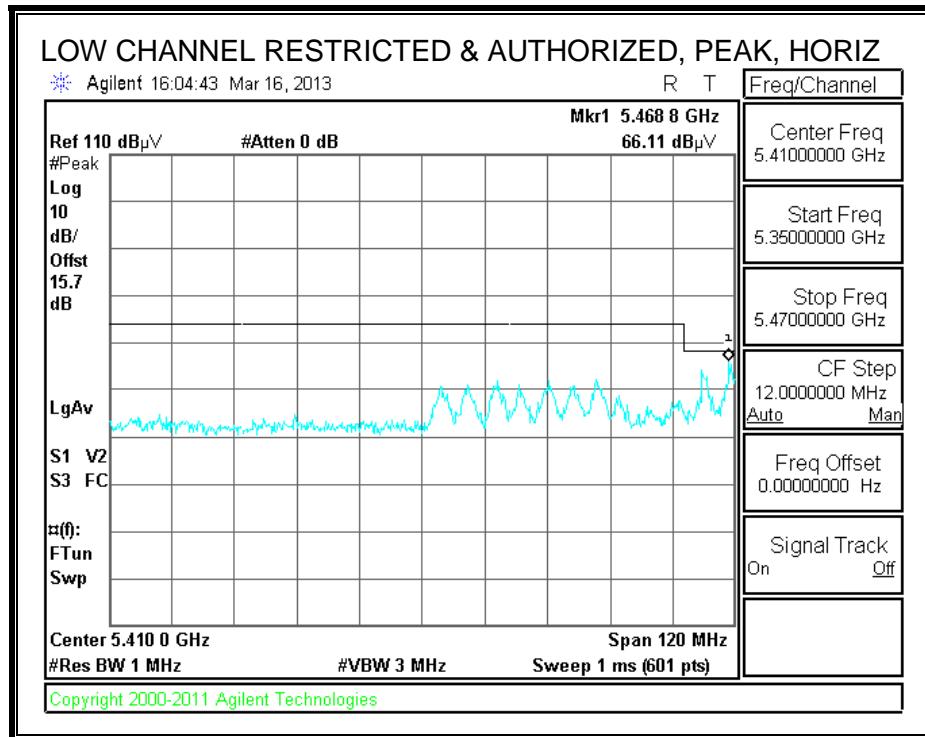
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5510 MHz 3IX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	33.0	38.4	10.5	-33.6	0.0	0.7	49.1	74.0	-24.9	V	P	
11.020	3.0	23.1	38.4	10.5	-33.6	0.0	0.7	39.2	54.0	-14.8	V	A	
<b>5550 MHz 3IX CDD</b>													
11.100	3.0	33.7	38.5	10.6	-33.5	0.0	0.7	50.1	74.0	-23.9	V	P	
11.100	3.0	24.5	38.5	10.6	-33.5	0.0	0.7	40.9	54.0	-13.1	V	A	
11.100	3.0	34.0	38.5	10.6	-33.5	0.0	0.7	50.4	74.0	-23.6	H	P	
11.100	3.0	24.6	38.5	10.6	-33.5	0.0	0.7	41.0	54.0	-13.0	H	A	
<b>5670 MHz 3IX CDD</b>													
11.340	3.0	33.8	38.7	11.0	-33.2	0.0	0.7	51.0	74.0	-23.0	H	P	
11.340	3.0	24.7	38.7	11.0	-33.2	0.0	0.7	41.9	54.0	-12.1	H	A	
11.340	3.0	33.7	38.7	11.0	-33.2	0.0	0.7	50.9	74.0	-23.1	V	P	
11.340	3.0	23.4	38.7	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

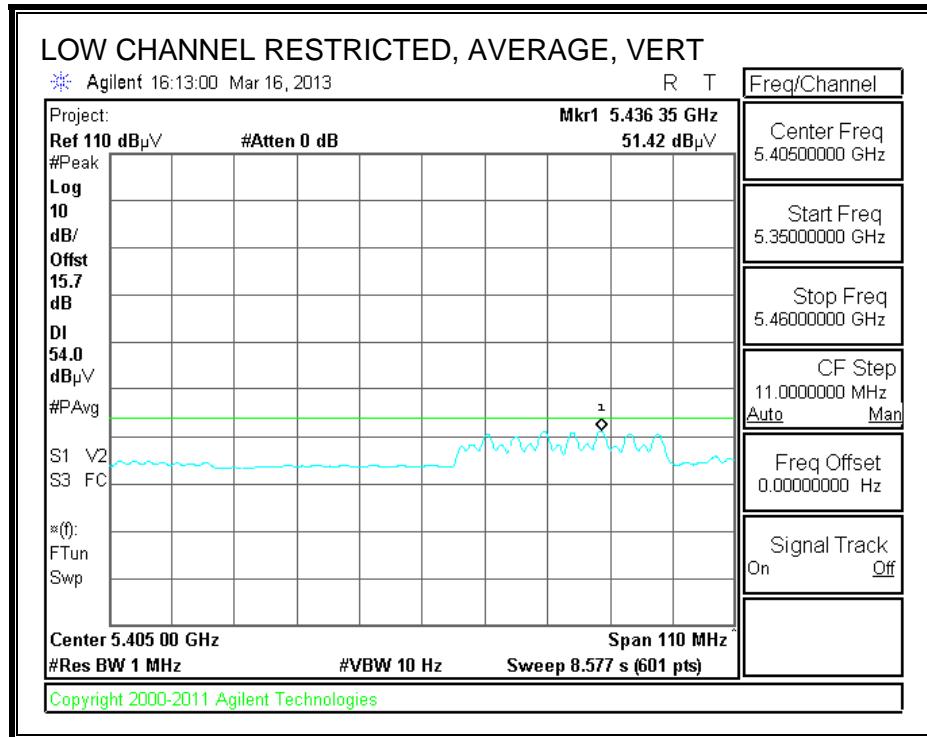
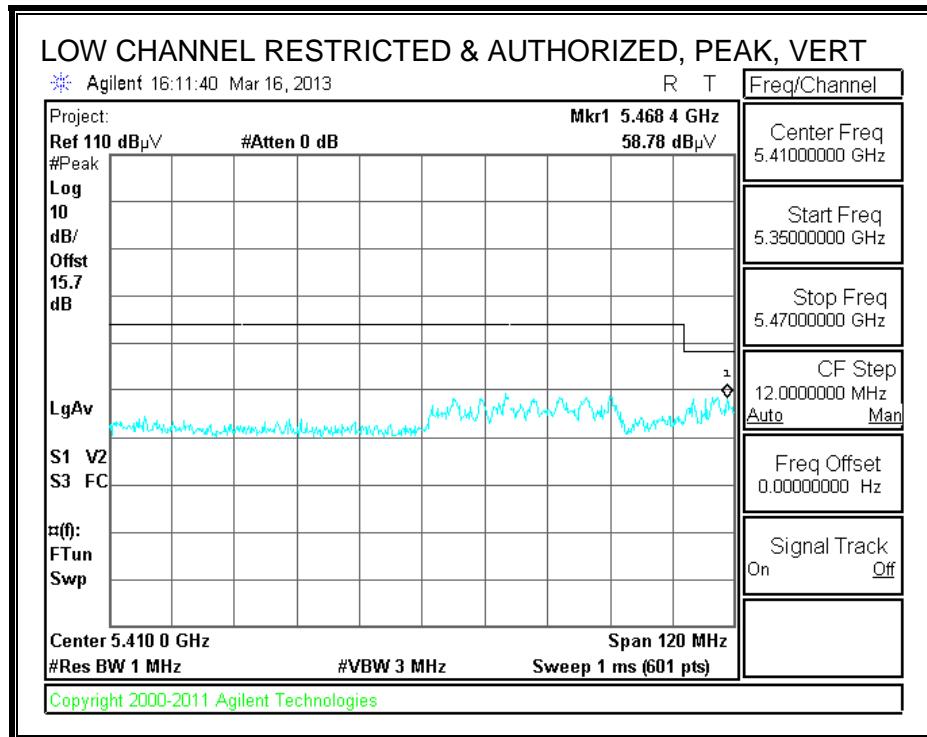
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

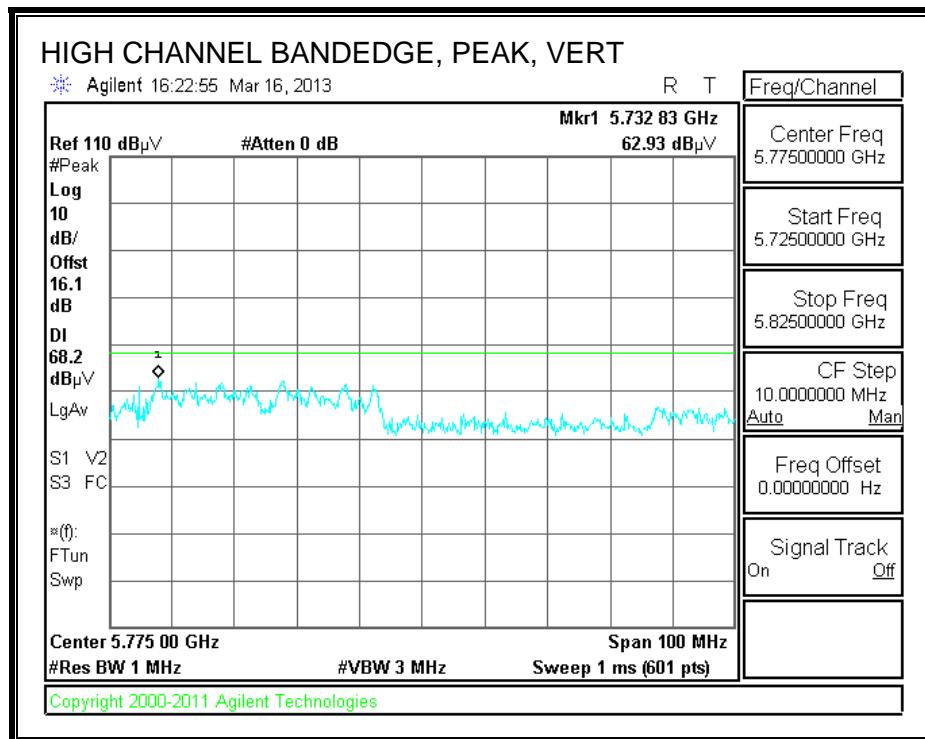
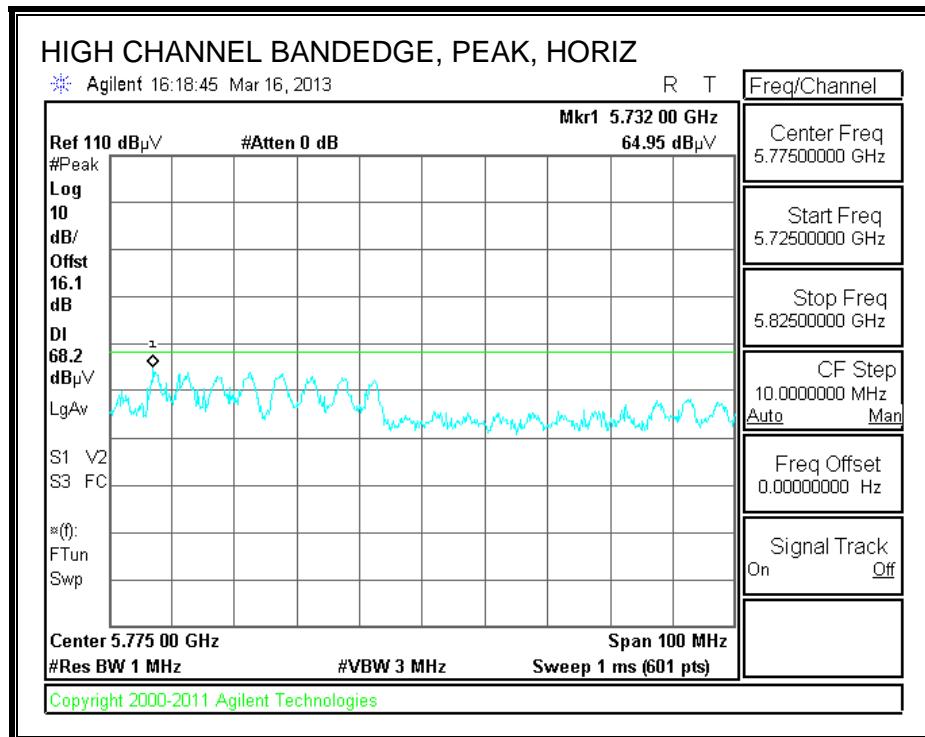
### 9.2.35. TX ABOVE 1 GHz, 802.11n HT40 BF 2TX MODE, GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

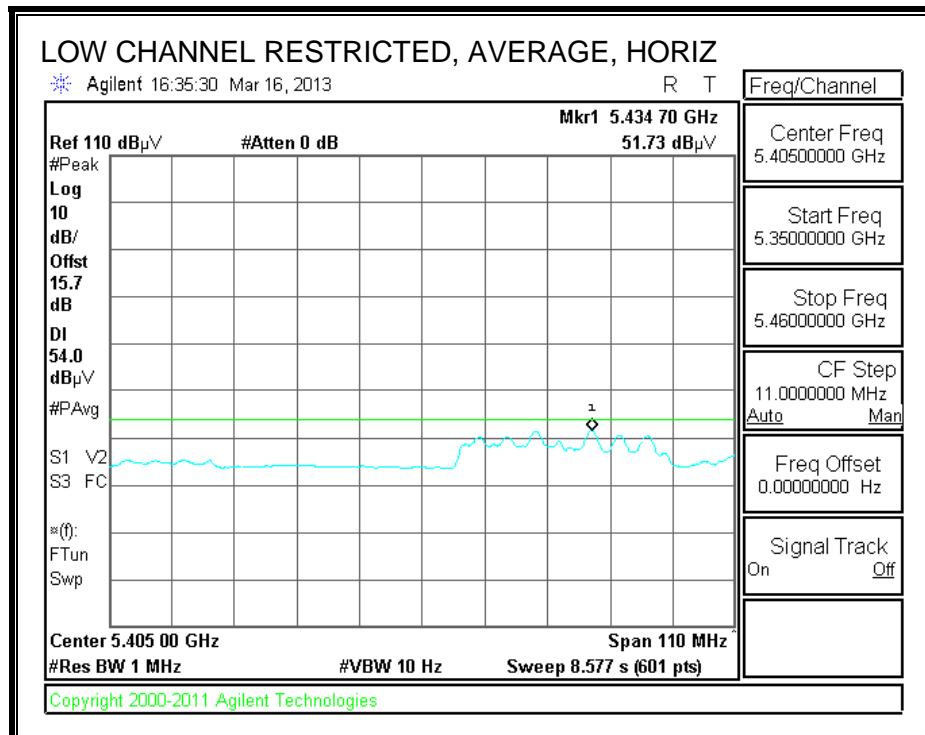
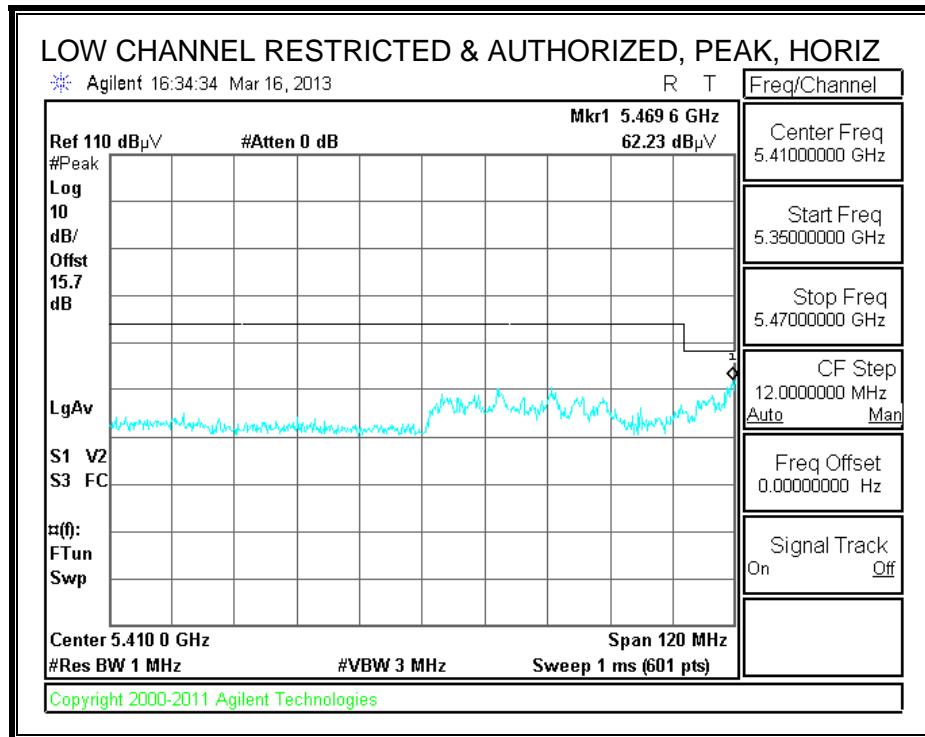


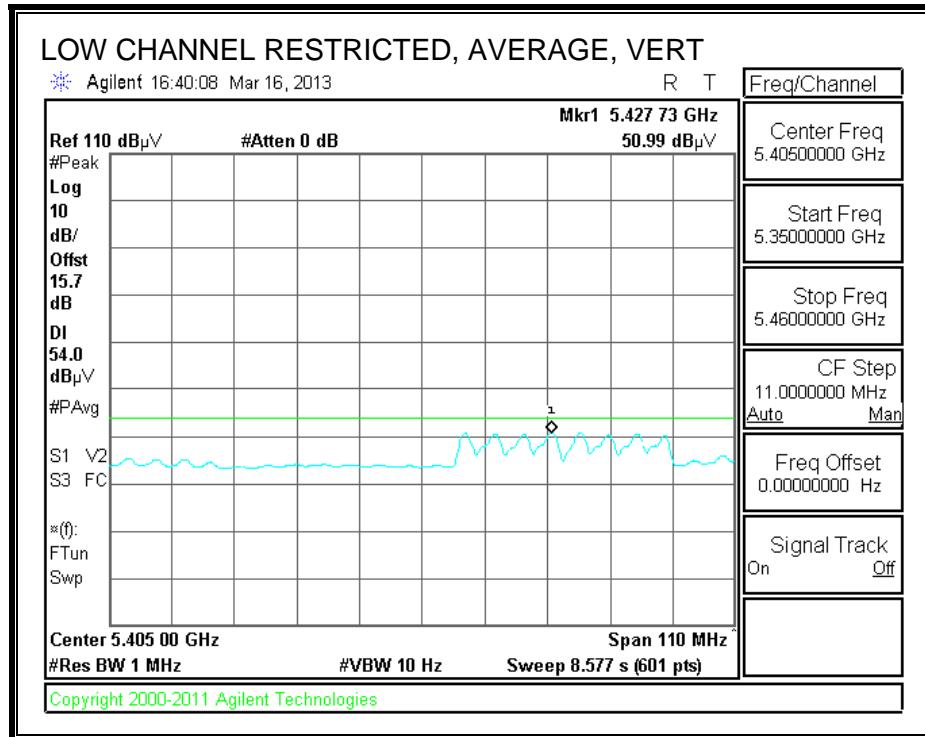
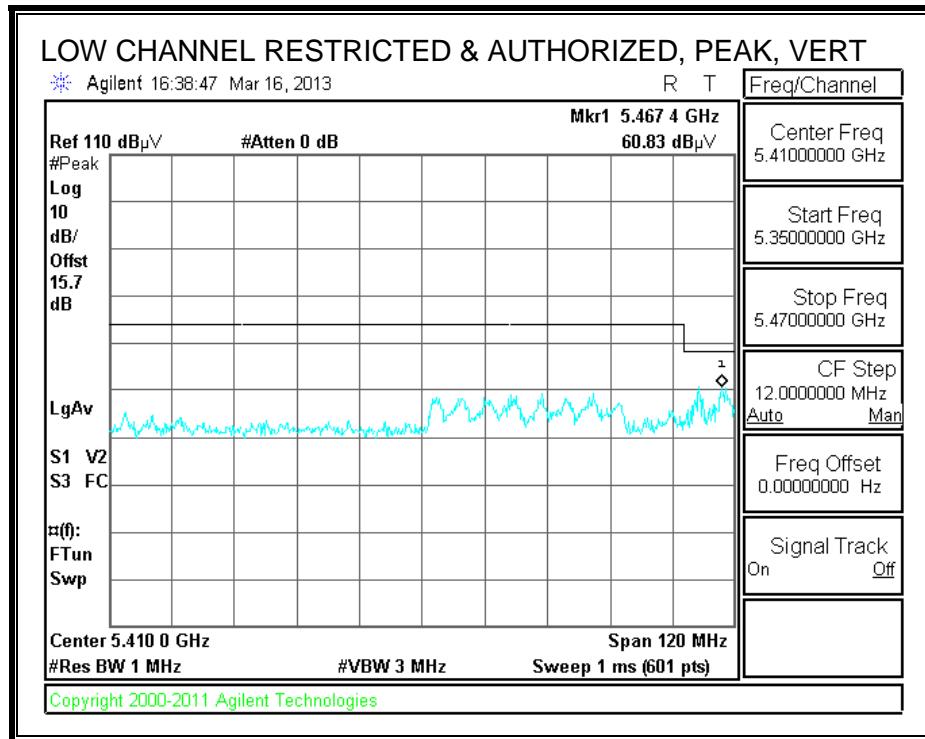
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company: MENGISTU MEKURIA Project #: 03/17/13 Date: 12U14745 Test Engineer: Apple Inc. Configuration: FCC Class B Mode: HT40 3TX BF CDD															
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables 3' cable 22807700      12' cable 22807600      20' cable 22807500 3' cable 22807700      12' cable 22807600      20' cable 22807500															
HPF      Reject Filter HPF_7.6GHz															
<b>Peak Measurements</b> RBW=VBW=1MHz <b>Average Measurements</b> 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 Channel (5510 MHz)															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
Mid Channel (5550 MHz)															
11.100	3.0	35.5	25.1	37.6	11.0	-33.3	0.0	0.7	51.5	41.1	74	54	-22.5	-12.9	H
11.100	3.0	34.8	24.6	37.6	11.0	-33.3	0.0	0.7	50.8	40.6	74	54	-23.2	-13.4	V
Hi Channel (5670 MHz)															
11.340	3.0	36.2	25.8	37.9	11.1	-33.0	0.0	0.7	52.8	42.5	74	54	-21.2	-11.5	H
11.340	3.0	35.6	25.5	37.9	11.1	-33.0	0.0	0.7	52.3	42.1	74	54	-21.7	-11.9	V
Rev. 01.30.13															
f      Measurement Frequency Dist      Distance to Antenna Read      Analyzer Reading AF      Antenna Factor CL      Cable Loss					Amp      Preamp Gain D Corr      Distance Correct to 3 meters Avg      Average Field Strength @ 3 m Peak      Calculated Peak Field Strength HPF      High Pass Filter					Avg Lim      Average Field Strength Limit Pk Lim      Peak Field Strength Limit Avg Mar      Margin vs. Average Limit Pk Mar      Margin vs. Peak Limit					

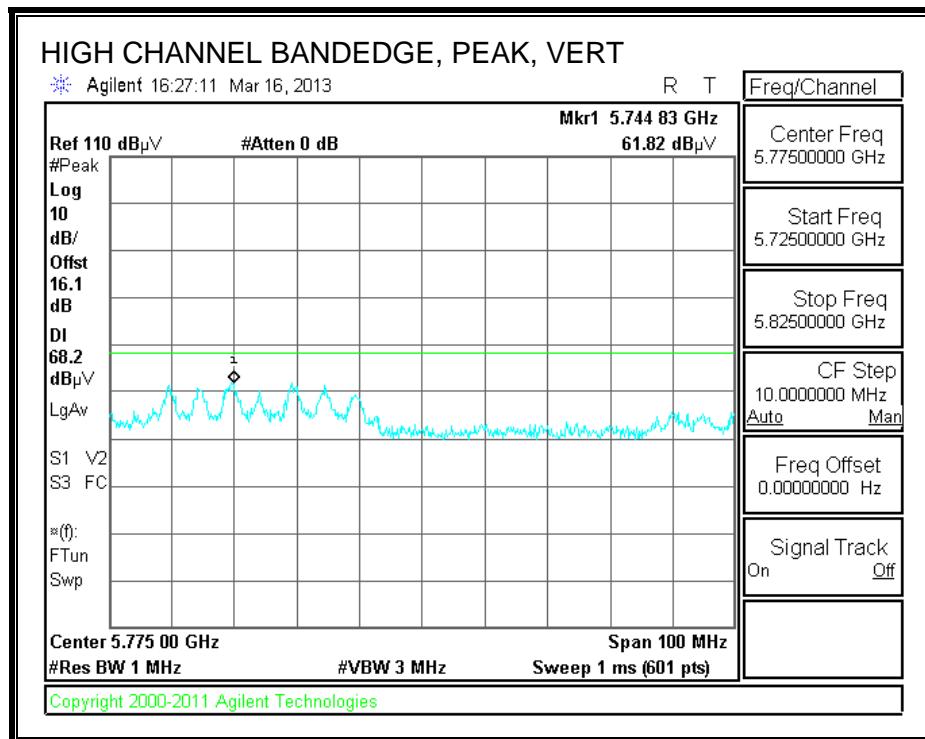
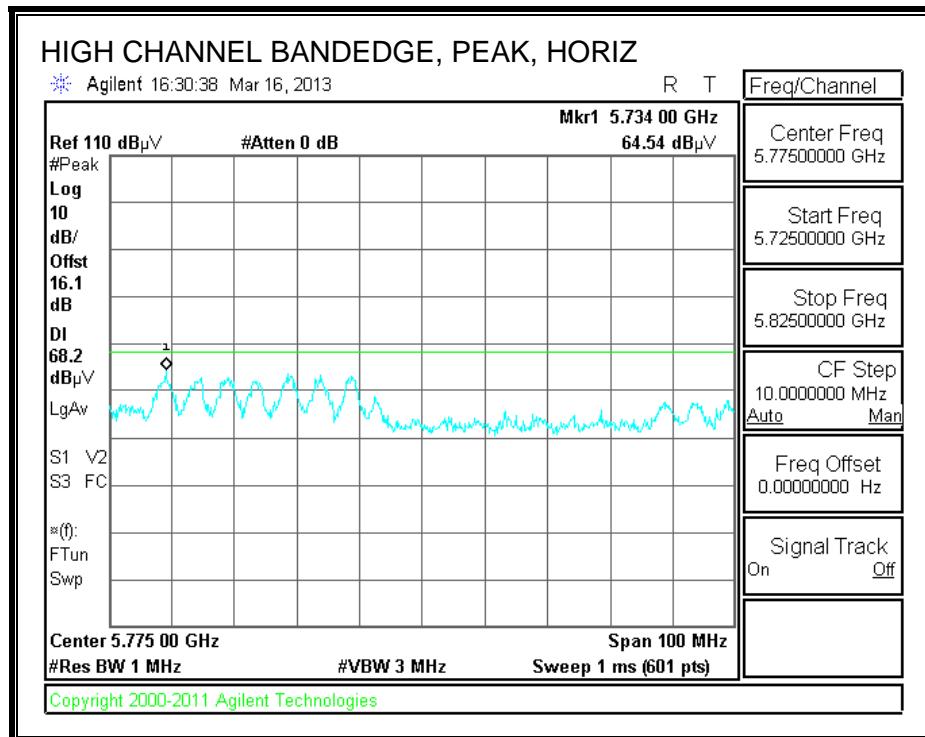
### 9.2.36. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

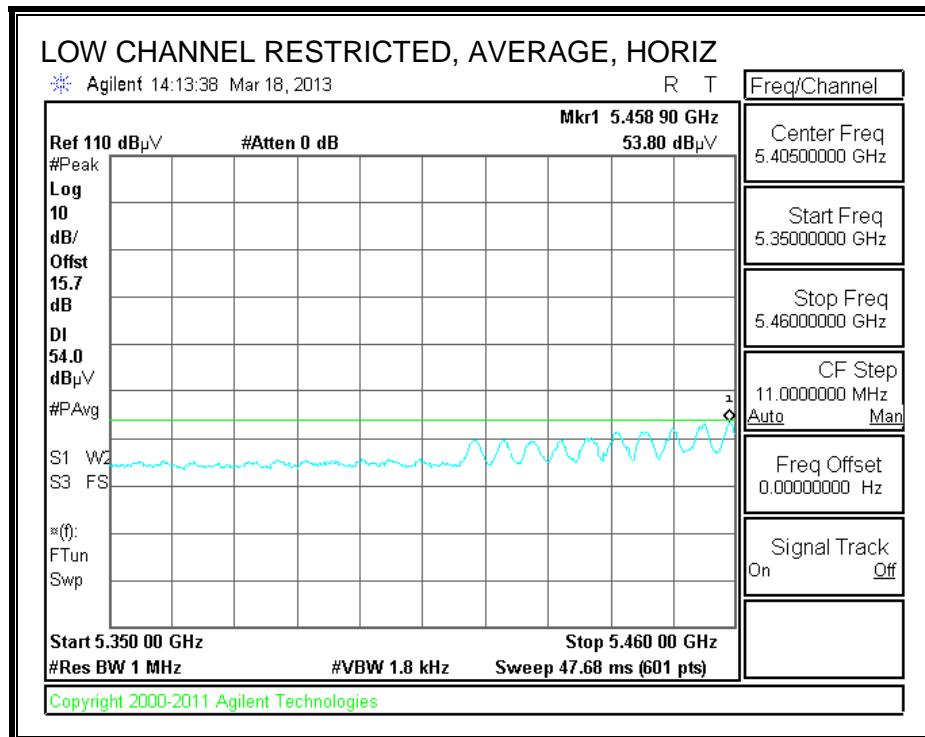
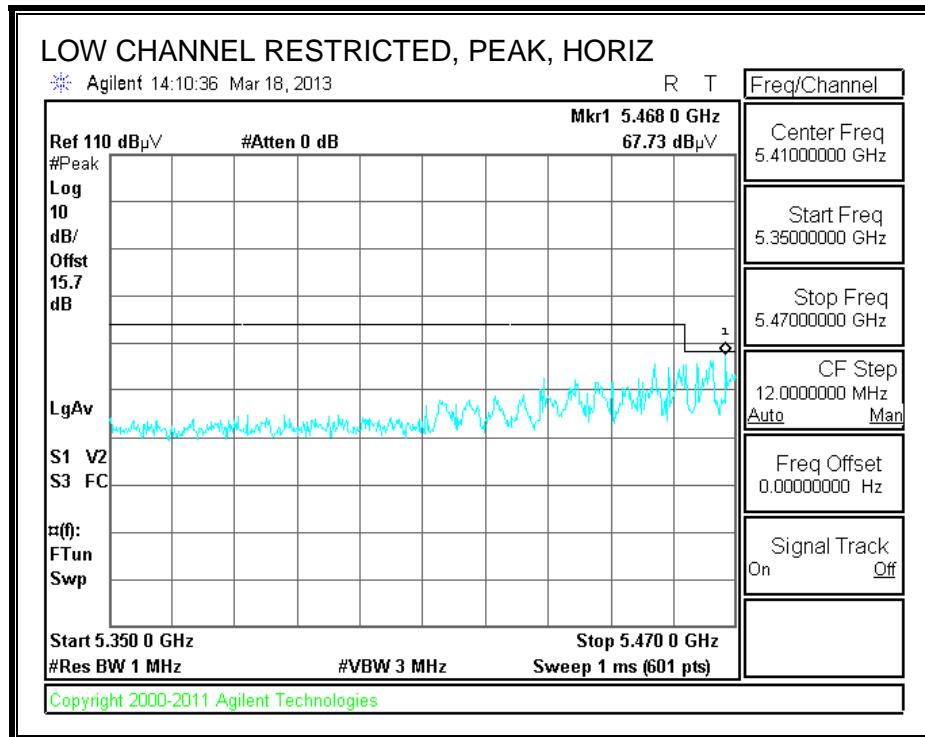


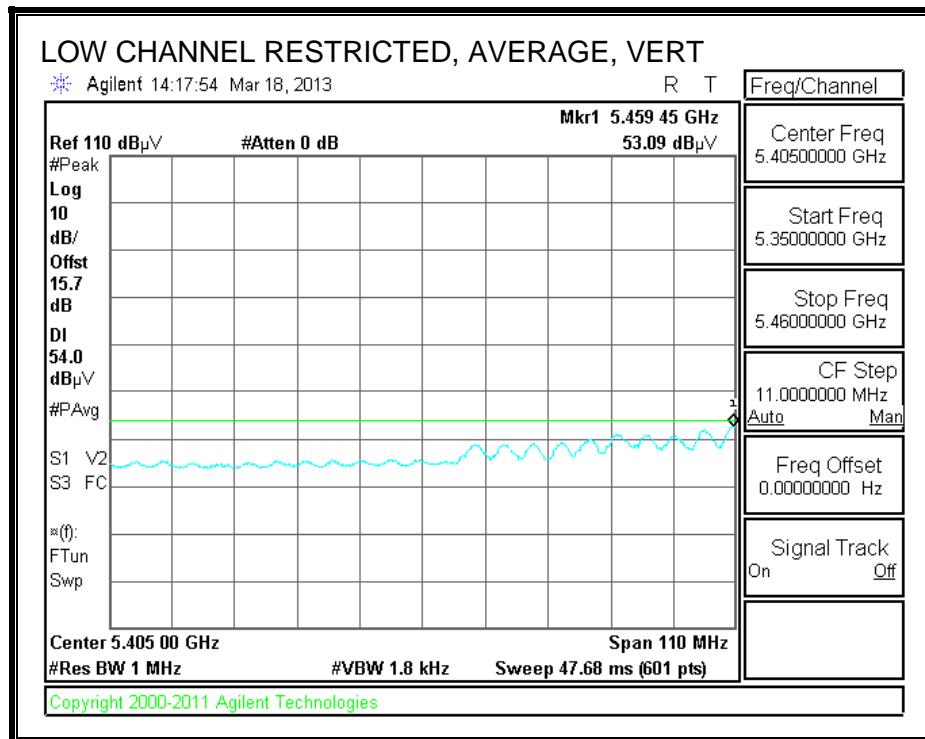
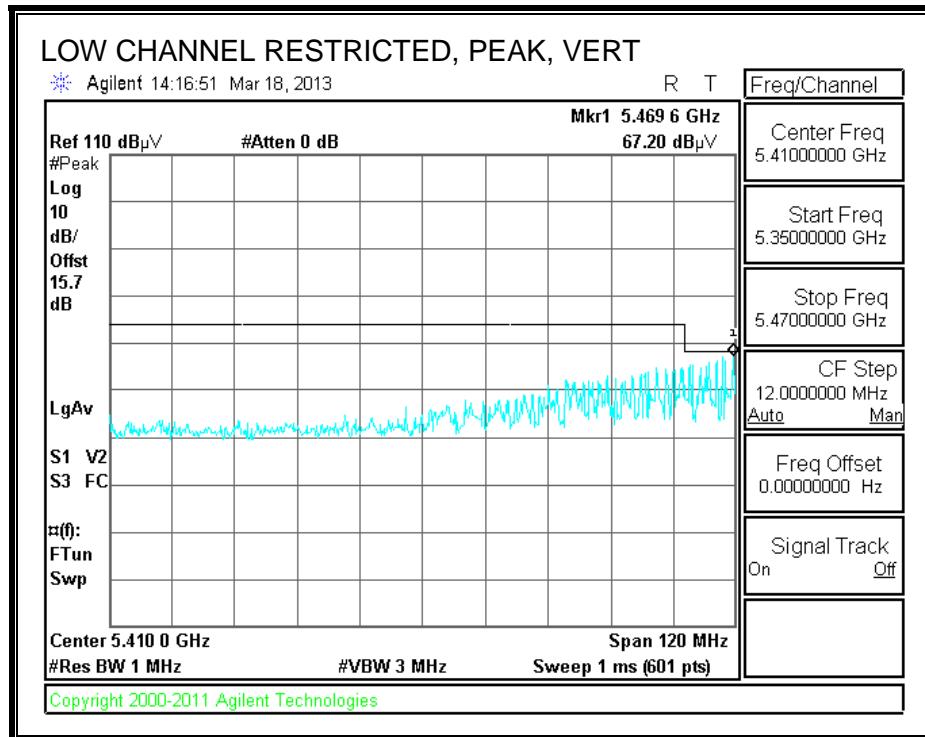
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company: MENGISTU MEKURIA Project #: 03/17/13 Date: 12U14745 Test Engineer: Apple Inc. Configuration: FCC Class B Mode: HT40 3TX BF CDD															
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables 3' cable 22807700      12' cable 22807600      20' cable 22807500 3' cable 22807700      12' cable 22807600      20' cable 22807500															
HPF      Reject Filter HPF_7.6GHz															
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 Channel (5510 MHz)															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
Mid Channel (5550 MHz)															
11.100	3.0	35.5	25.1	37.6	11.0	-33.3	0.0	0.7	51.5	41.1	74	54	-22.5	-12.9	H
11.100	3.0	34.8	24.6	37.6	11.0	-33.3	0.0	0.7	50.8	40.6	74	54	-23.2	-13.4	V
Hi Channel (5670 MHz)															
11.340	3.0	36.2	25.8	37.9	11.1	-33.0	0.0	0.7	52.8	42.5	74	54	-21.2	-11.5	H
11.340	3.0	35.6	25.5	37.9	11.1	-33.0	0.0	0.7	52.3	42.1	74	54	-21.7	-11.9	V
Rev. 01.30.13															
f      Measurement Frequency Dist      Distance to Antenna Read      Analyzer Reading AF      Antenna Factor CL      Cable Loss					Amp      Preamp Gain D Corr      Distance Correct to 3 meters Avg      Average Field Strength @ 3 m Peak      Calculated Peak Field Strength HPF      High Pass Filter					Avg Lim      Average Field Strength Limit Pk Lim      Peak Field Strength Limit Avg Mar      Margin vs. Average Limit Pk Mar      Margin vs. Peak Limit					

### 9.2.37. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

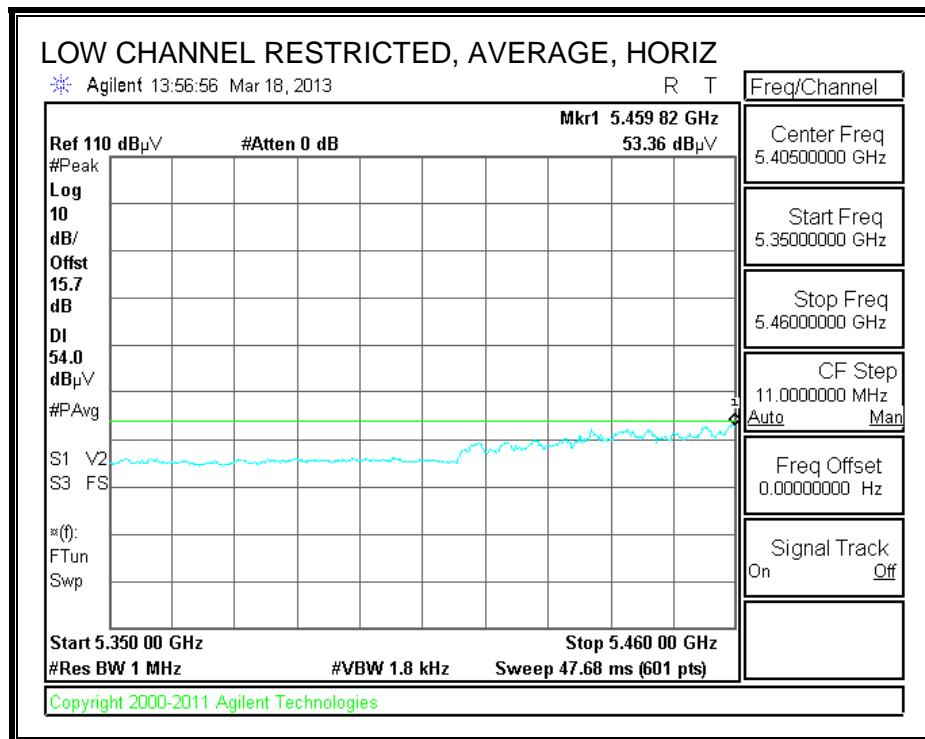
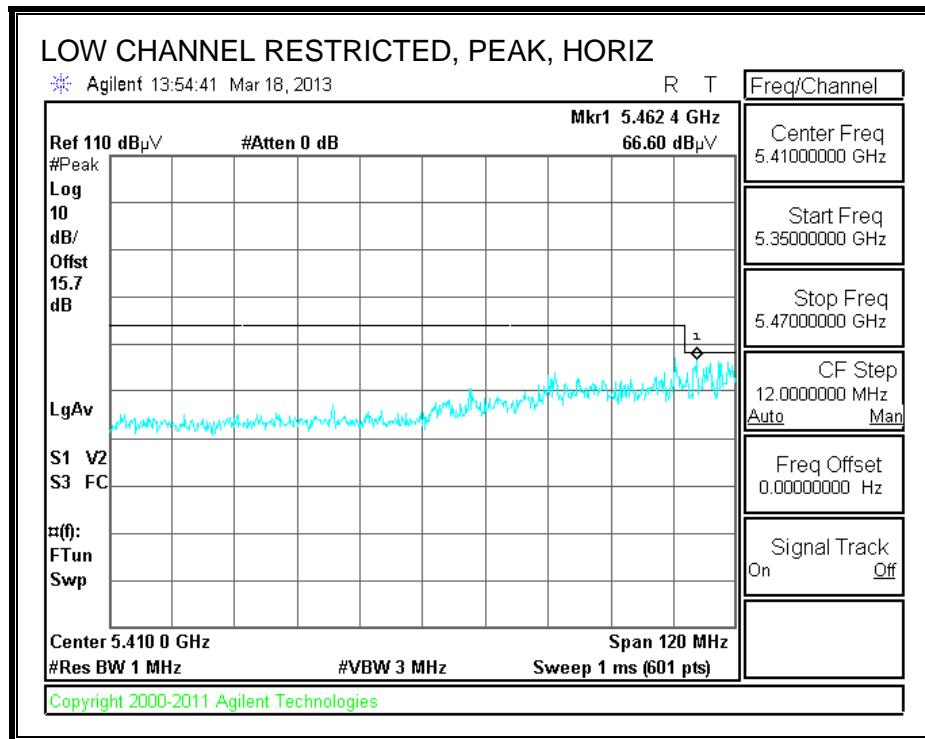
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

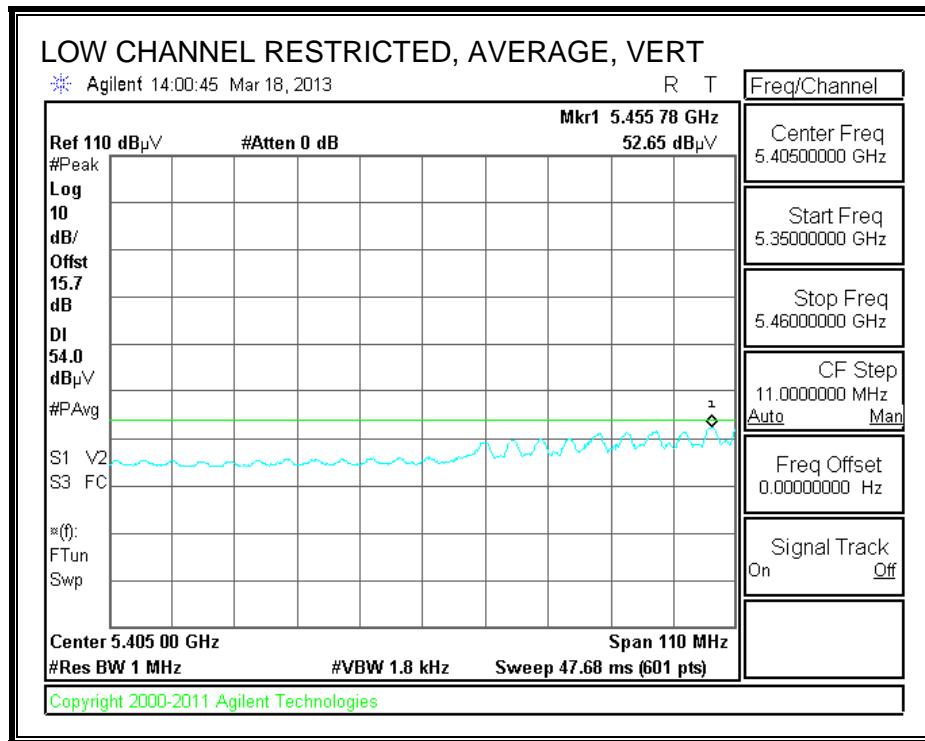
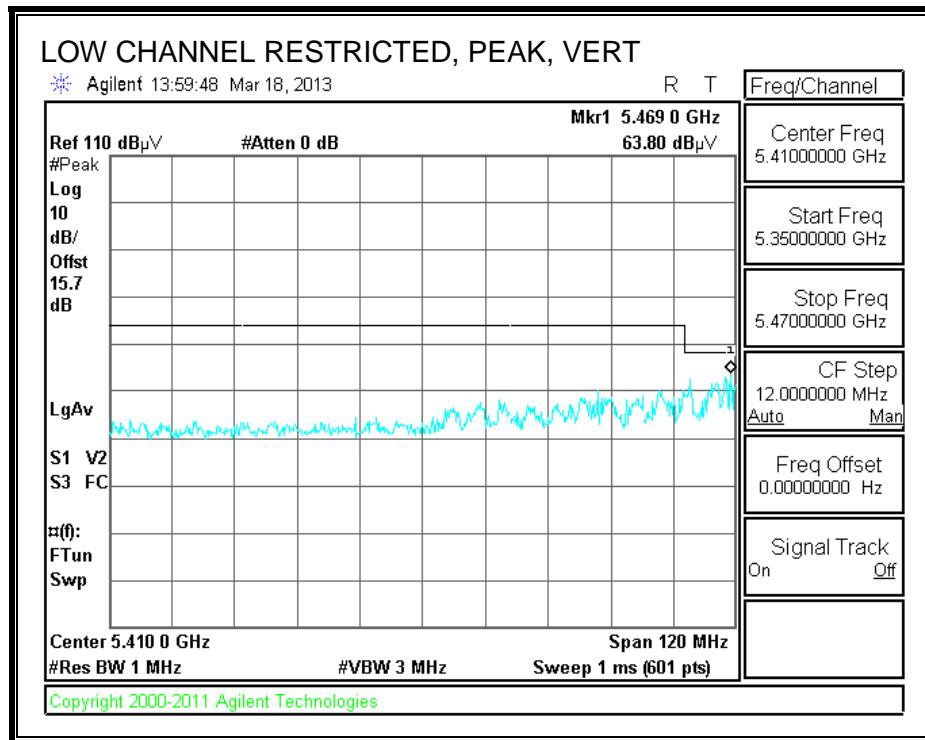
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.38. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

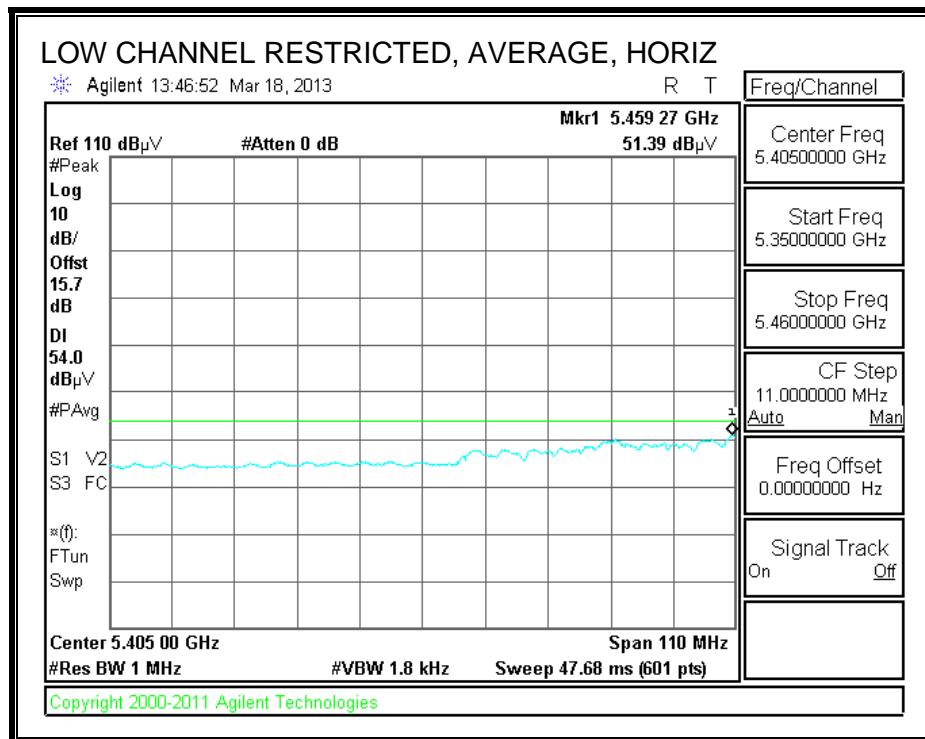
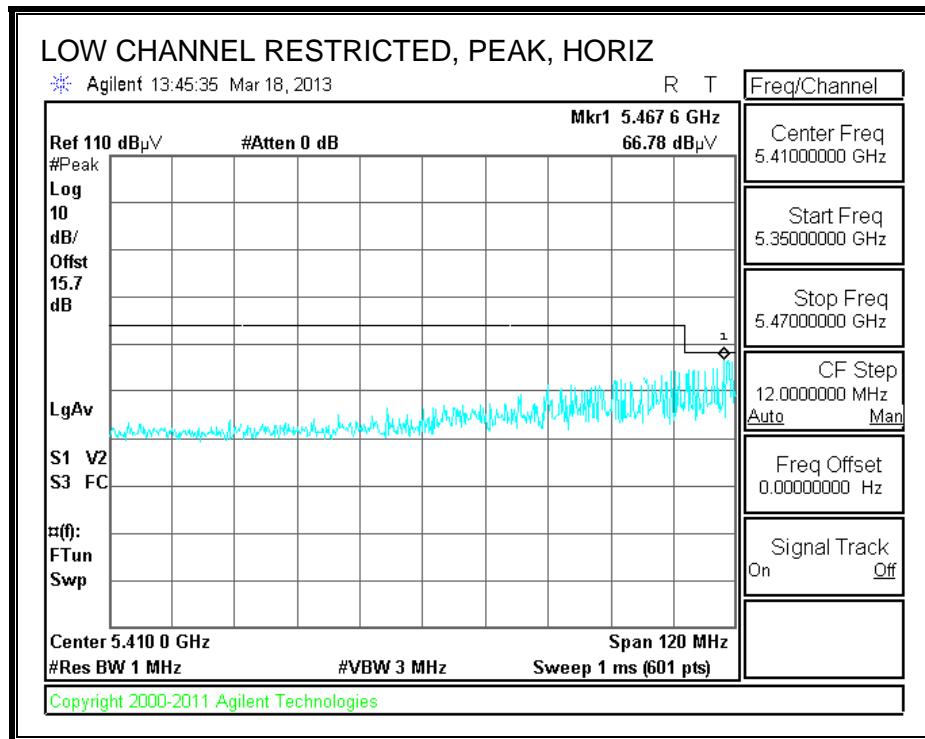
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

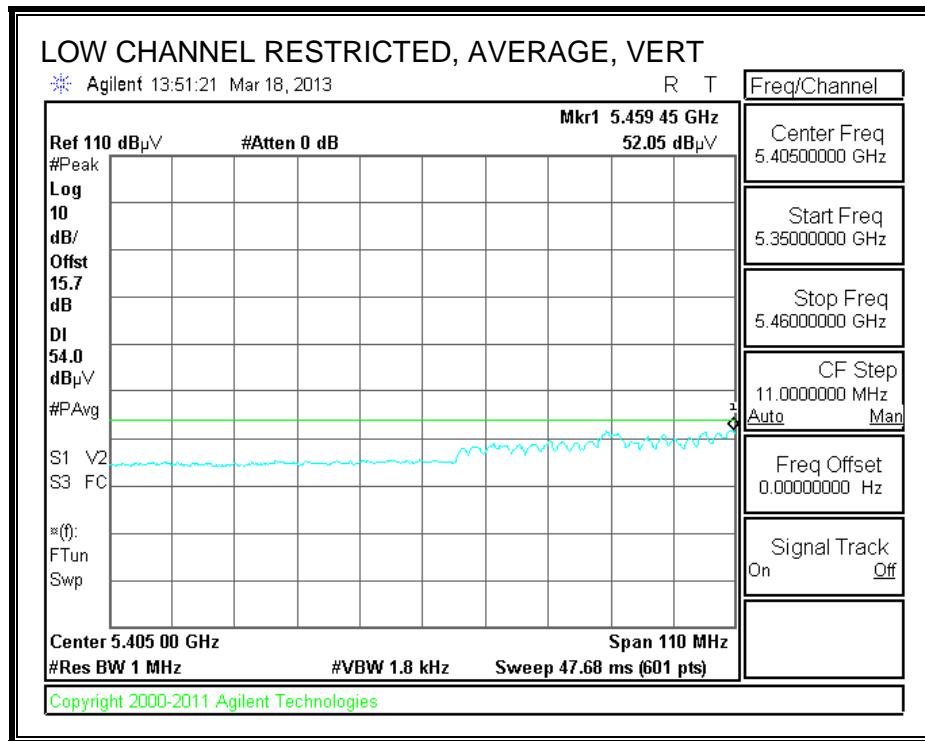
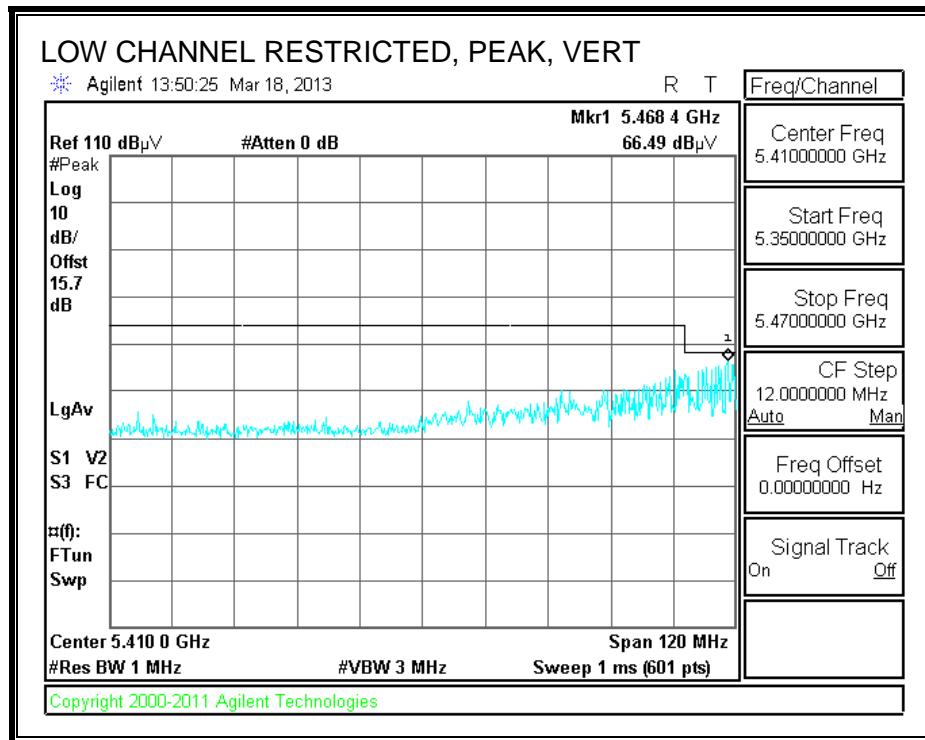
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

### 9.2.39. TX ABOVE 1 GHz, 802.11ac VHT80 3TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





## **HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

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

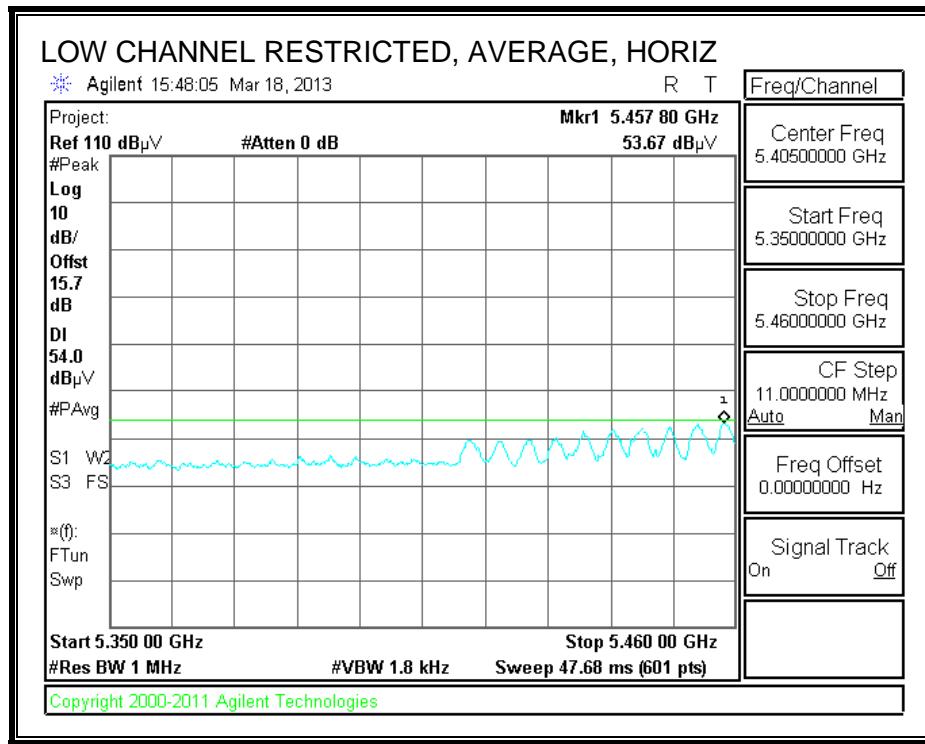
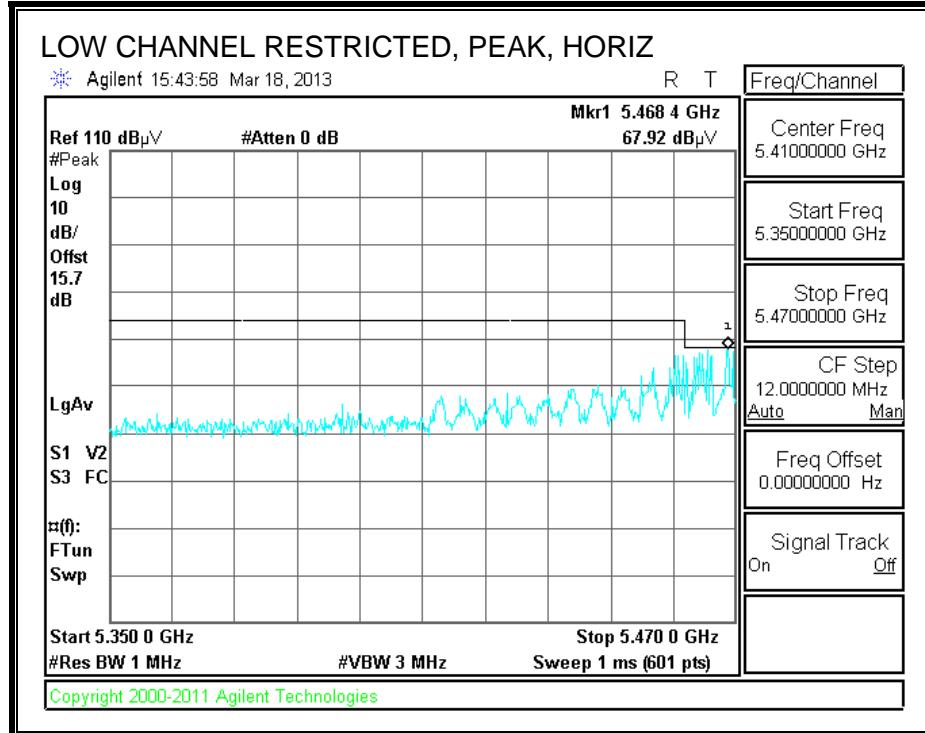
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	38.7	13.0	-31.9	0.0	0.7	54.1	74.0	-19.9	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
<b>5290 MHz 3TX CDD</b>													
15.630	3.0	32.9	38.7	13.0	-31.9	0.0	0.7	53.5	74.0	-20.5	H	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	H	A	
15.630	3.0	33.3	38.7	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	V	P	
15.630	3.0	24.0	38.7	13.0	-31.9	0.0	0.7	44.6	54.0	-9.4	V	A	
<b>5530 MHz 3TX CDD</b>													
11.060	3.0	34.0	38.4	10.6	-33.5	0.0	0.7	50.2	74.0	-23.8	V	P	
11.060	3.0	27.3	38.4	10.6	-33.5	0.0	0.7	43.5	54.0	-10.5	V	A	
11.060	3.0	33.5	38.4	10.6	-33.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.060	3.0	24.2	38.4	10.6	-33.5	0.0	0.7	40.4	54.0	-13.6	H	A	
<b>5690 MHz 3TX CDD</b>													
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	H	P	
11.380	3.0	23.7	38.8	11.0	-33.2	0.0	0.7	41.0	54.0	-13.0	H	A	
11.380	3.0	33.3	38.8	11.0	-33.2	0.0	0.7	50.6	74.0	-23.4	V	P	
11.380	3.0	23.3	38.8	11.0	-33.2	0.0	0.7	40.6	54.0	-13.4	V	A	

Rev. 4.1.2.7

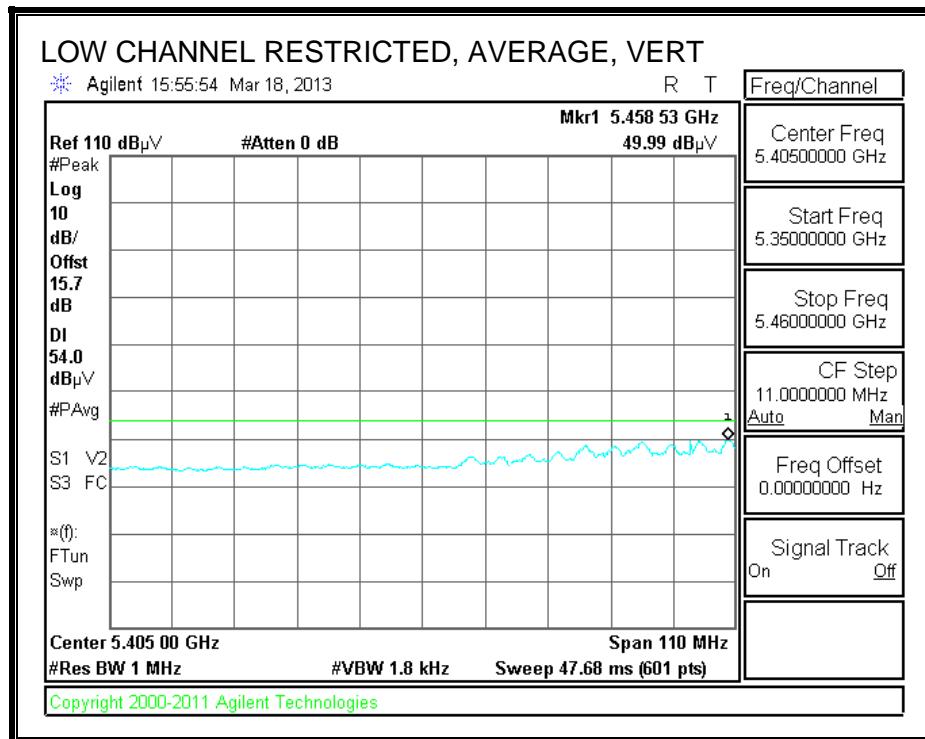
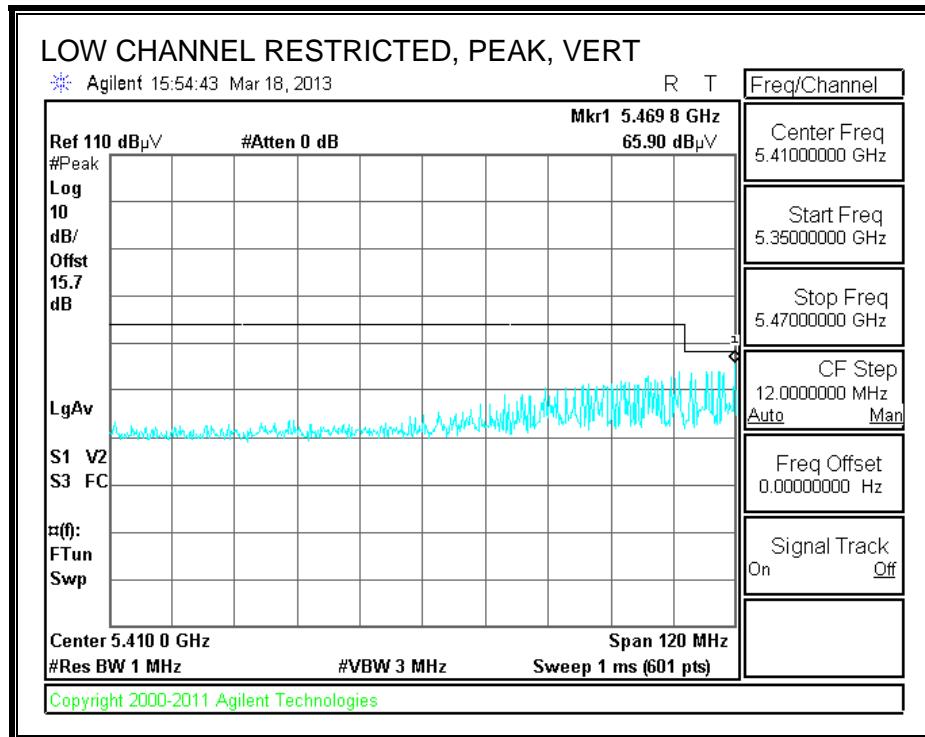
Note: No other emissions were detected above the system noise floor.

### 9.2.40. TX ABOVE 1 GHz, 802.11ac VHT80 BF 2TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





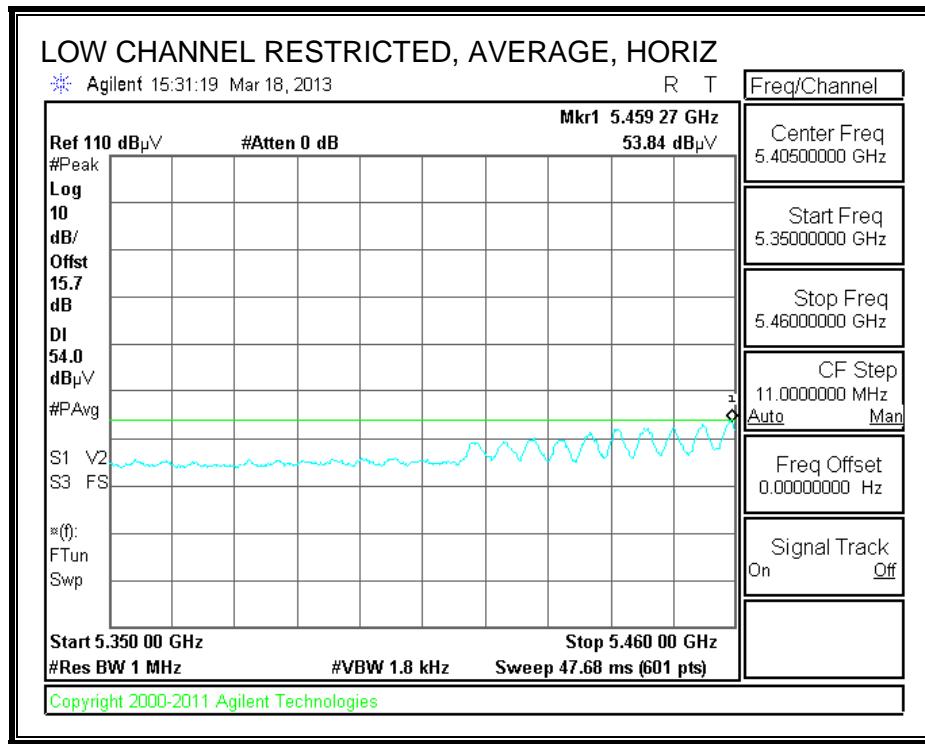
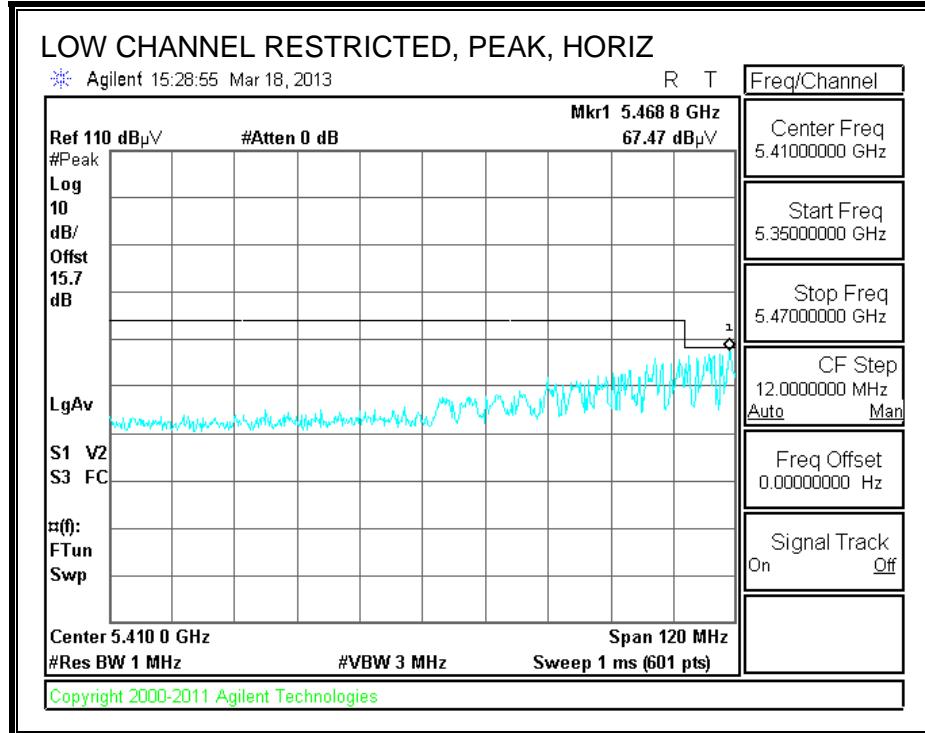


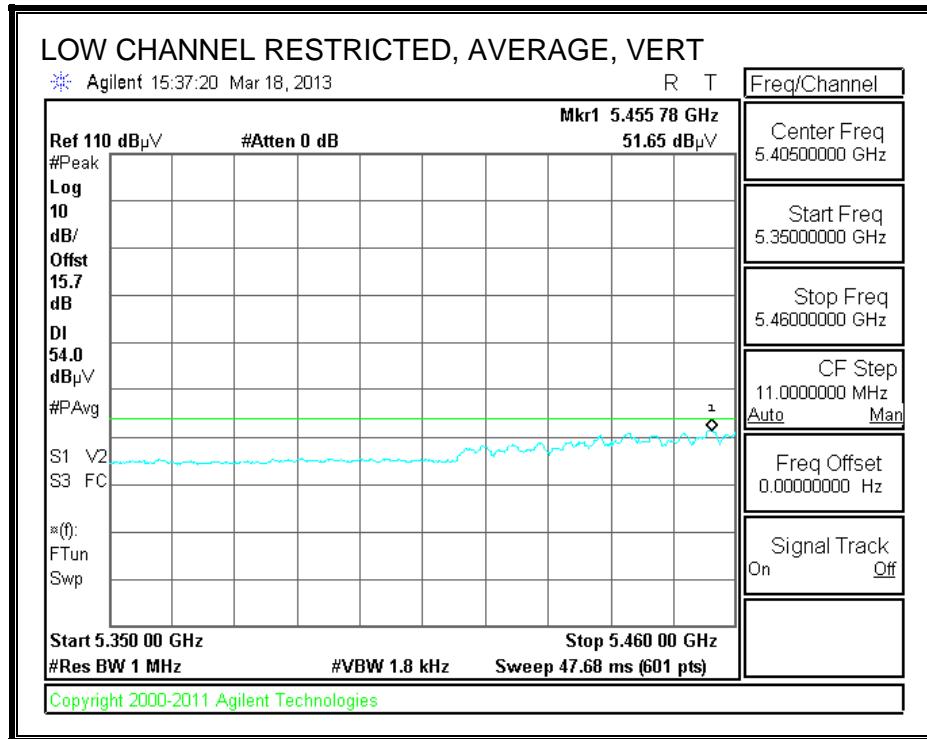
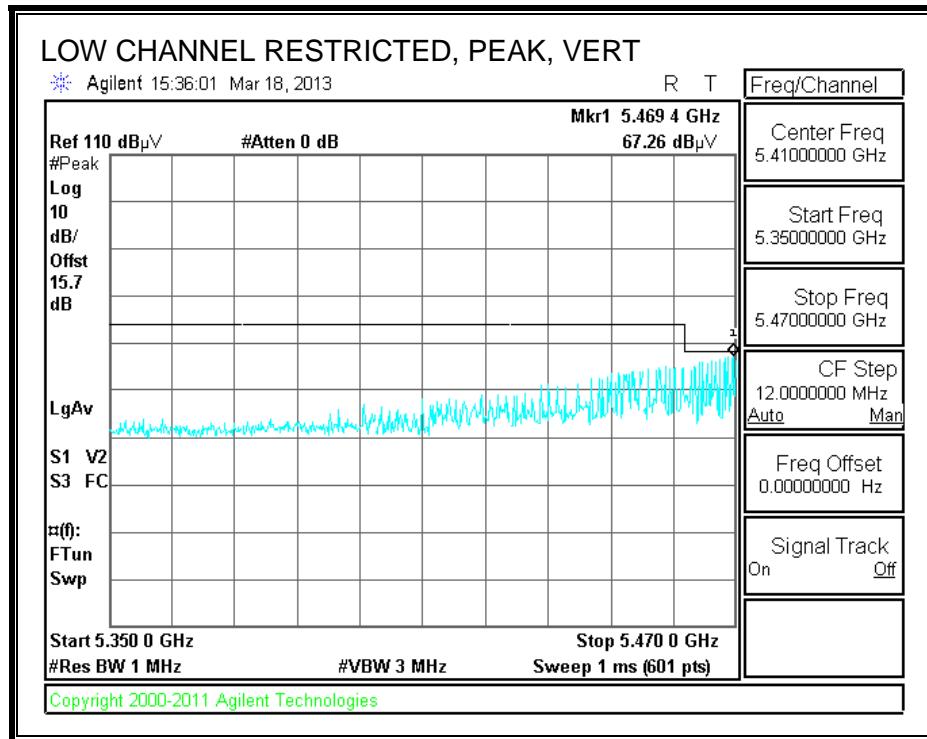
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit								
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013				FCC 15.209								
Hi Frequency Cables															
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF				Reject Filter		Peak Measurements RBW=VBW=1MHz						
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz						Average Measurements RBW=1MHz ; VBW=10Hz						
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V
Rev. 01.30.13															
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										

### 9.2.41. TX ABOVE 1 GHz, 802.11ac VHT80 BF 3TX MODE, 5.6 GHz BAND

#### RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)



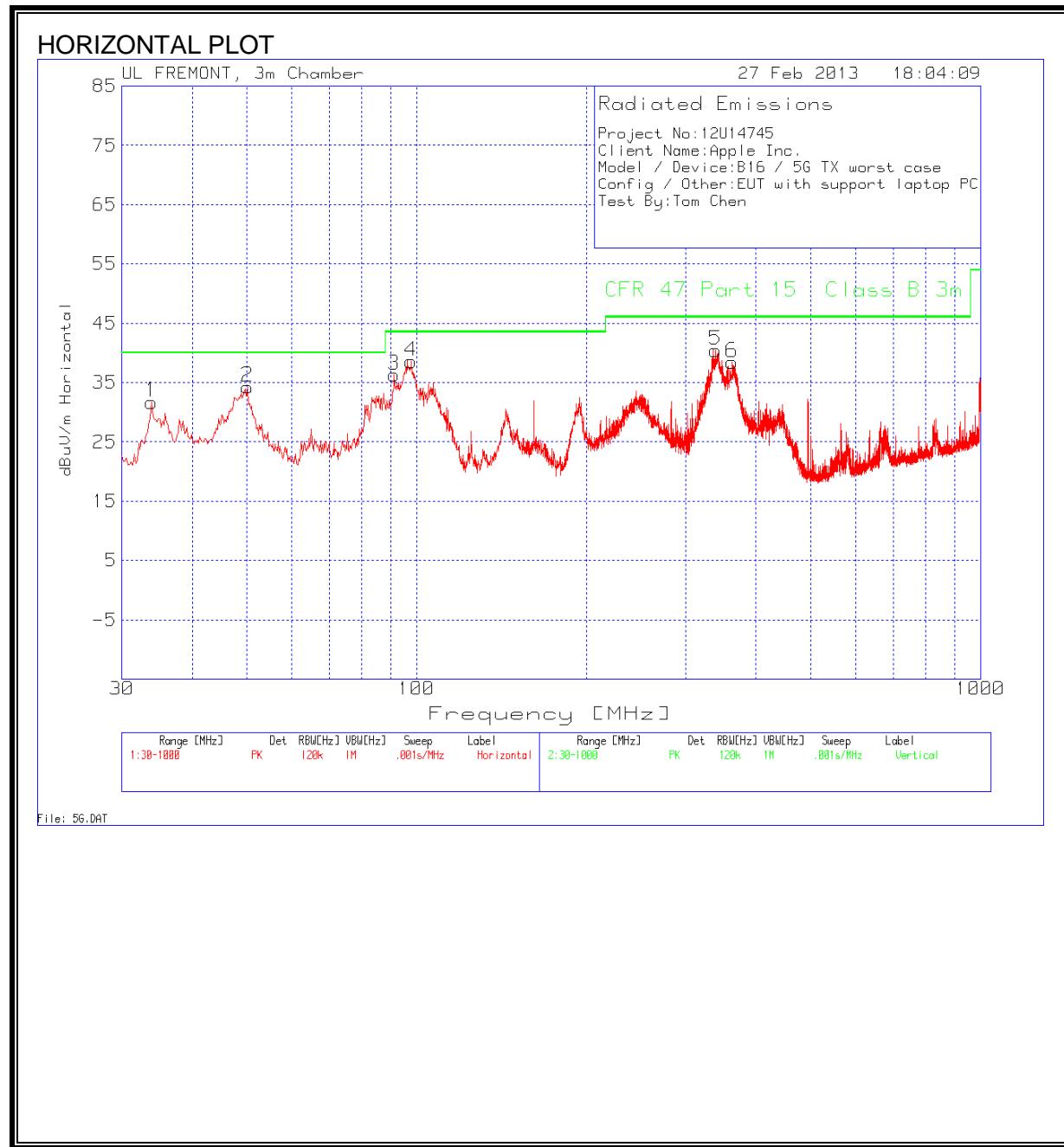


**HARMONICS AND SPURIOUS EMISSIONS**

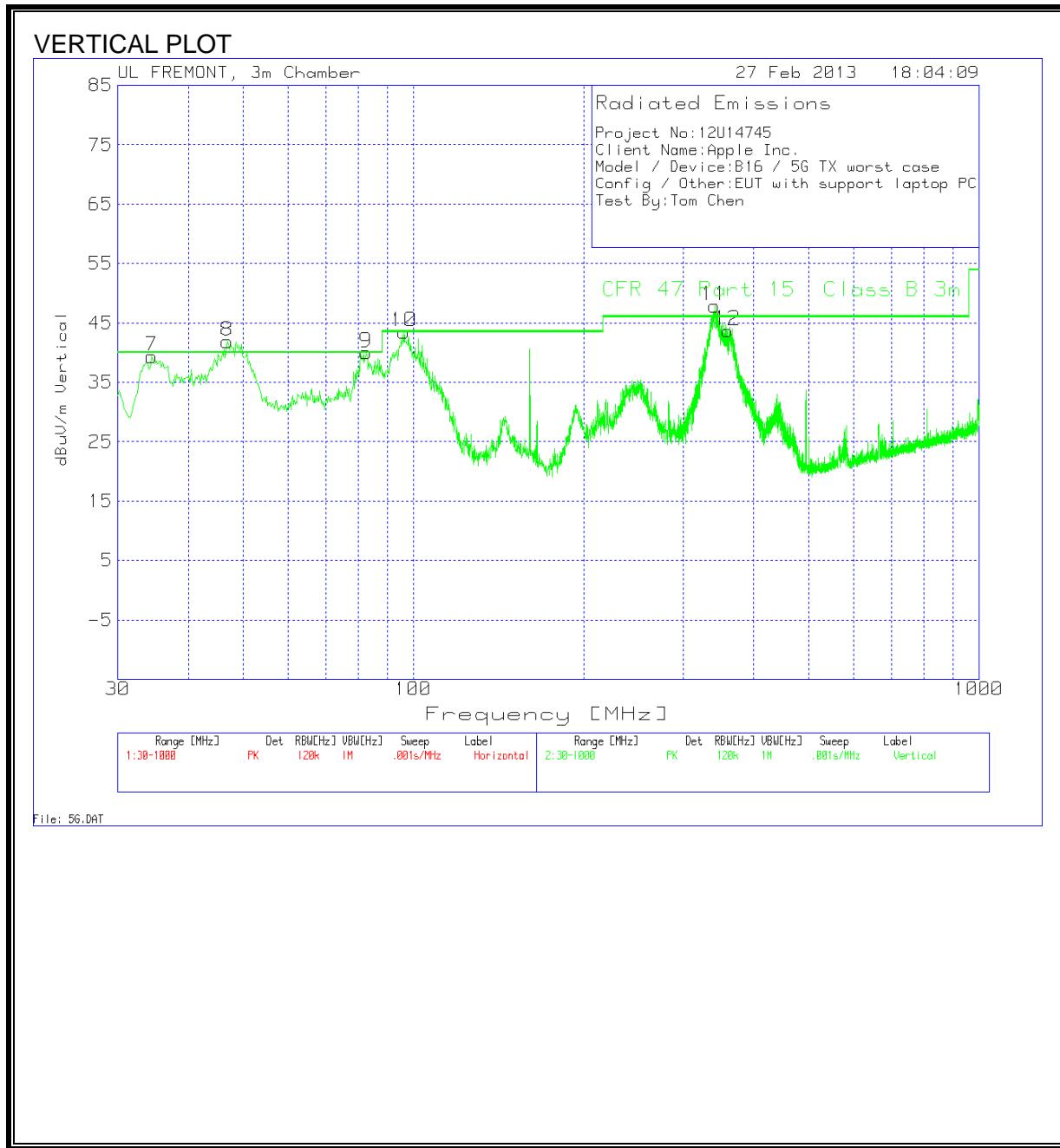
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<b>Test Equipment:</b>															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T136; M/N: 3117 @3m			T145 Agilent 3008A0056			T88 Miteq 26-40GHz			T39; ARA 18-26GHz; S/N:1013			FCC 15.209			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz
3' cable 22807700			12' cable 22807600			20' cable 22807500			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	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 Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V
Rev. 01.30.13															
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										

### 9.3. RADIATED EMISSIONS, WORST-CASE BELOW 1 GHz

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



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



### HORIZONTAL AND VERTICAL DATA

Project No:12U14745

Client Name:Apple Inc.

Model / Device:B16 / 5G TX worst case

Config / Other:EUT with support laptop PC

Test By:Tom Chen

#### Horizontal 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
1	33.8769	41.12	PK	18.1	-27.5	31.72	40	-8.28	Horz
2	50.1599	54.15	PK	7.4	-27.3	34.25	40	-5.75	Horz
3	91.255	55.28	PK	7.9	-26.9	36.28	43.5	-7.22	Horz
4	97.8457	55.75	PK	9.6	-26.8	38.55	43.5	-4.95	Horz
5	338.9888	51.75	PK	14	-25.3	40.45	46	-5.55	Horz
6	362.8317	49	PK	14.8	-25.4	38.4	46	-7.6	Horz

#### Vertical 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
7	34.9151	39.72	QP	17.4	-27.5	29.62	40	-10.38	Vert
8	48.201	27.07	QP	8.2	-27.3	7.97	40	-32.03	Vert
9	82.966	53.87	QP	7.2	-27	34.07	40	-5.93	Vert
10	95.473	51.22	QP	8.9	-26.8	33.32	43.5	-10.18	Vert
11	340.97	23.59	QP	14	-25.3	12.29	46	-33.71	Vert
12	359.4594	53.31	QP	14.7	-25.4	42.61	46	-3.39	Vert

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

<sup>\*</sup> 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 FOR 5G BAND

Project No:12U14745											
Client Name:Apple Inc.											
Model/Device:B16 / 3x3 Base Station /5G											
Test Volt/Freq:120 VAC/60 Hz, TX Worst Case											
Test By:Tom Chen											

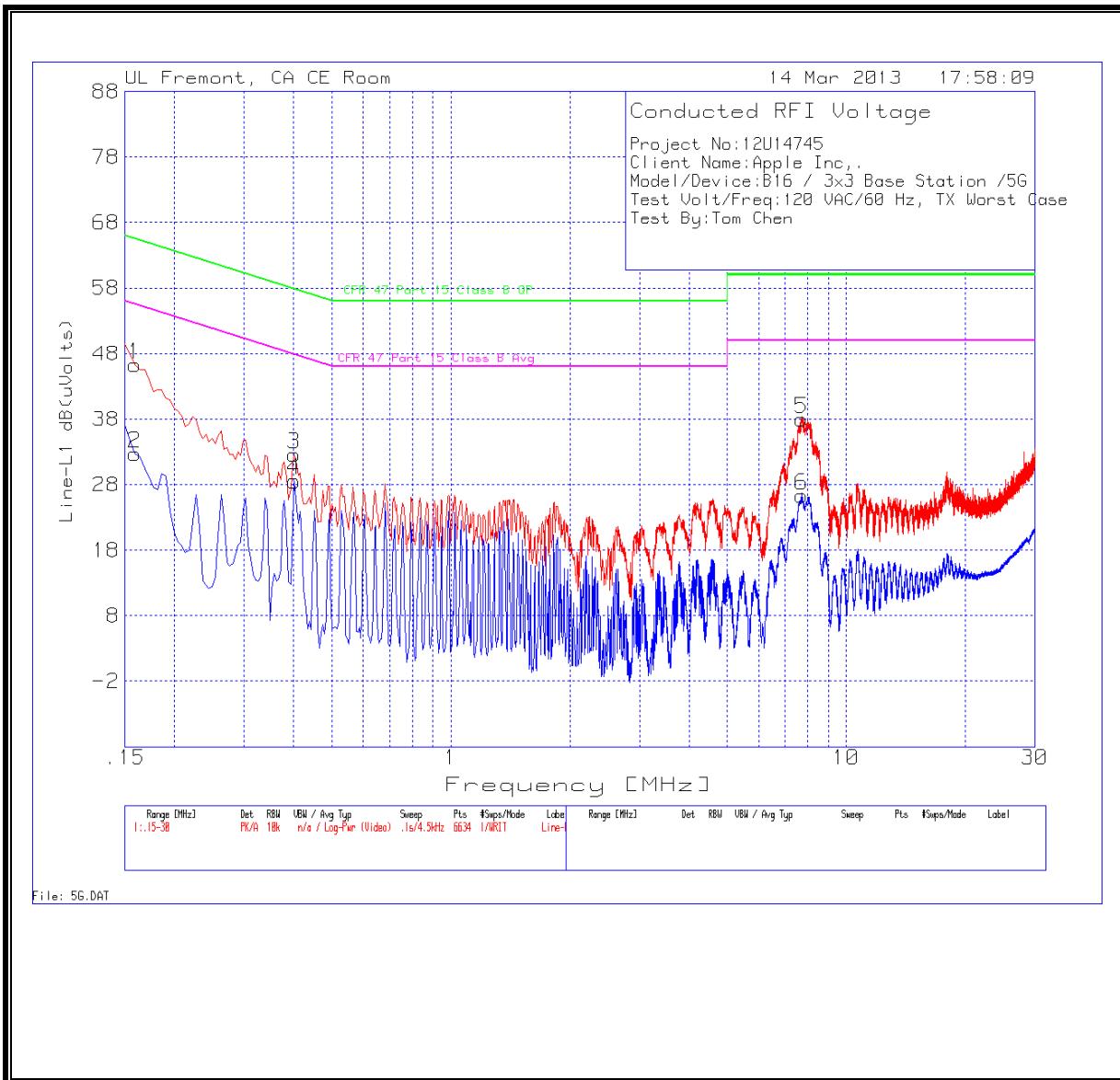
Line-L1 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L1.TXT	LC Cables 1&3.TXT	dB(uVolt s)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
1	0.159	46.19	PK	0.1	0	46.29	65.5	-19.21	55.5	-9.21
2	0.159	32.67	Av	0.1	0	32.77	65.5	-32.73	55.5	-22.73
3	0.402	32.5	PK	0.1	0	32.6	57.8	-25.2	47.8	-15.2
4	0.402	28.48	Av	0.1	0	28.58	57.8	-29.22	47.8	-19.22
5	7.71	37.82	PK	0.1	0.1	38.02	60	-21.98	50	-11.98
6	7.71	26.15	Av	0.1	0.1	26.35	60	-33.65	50	-23.65

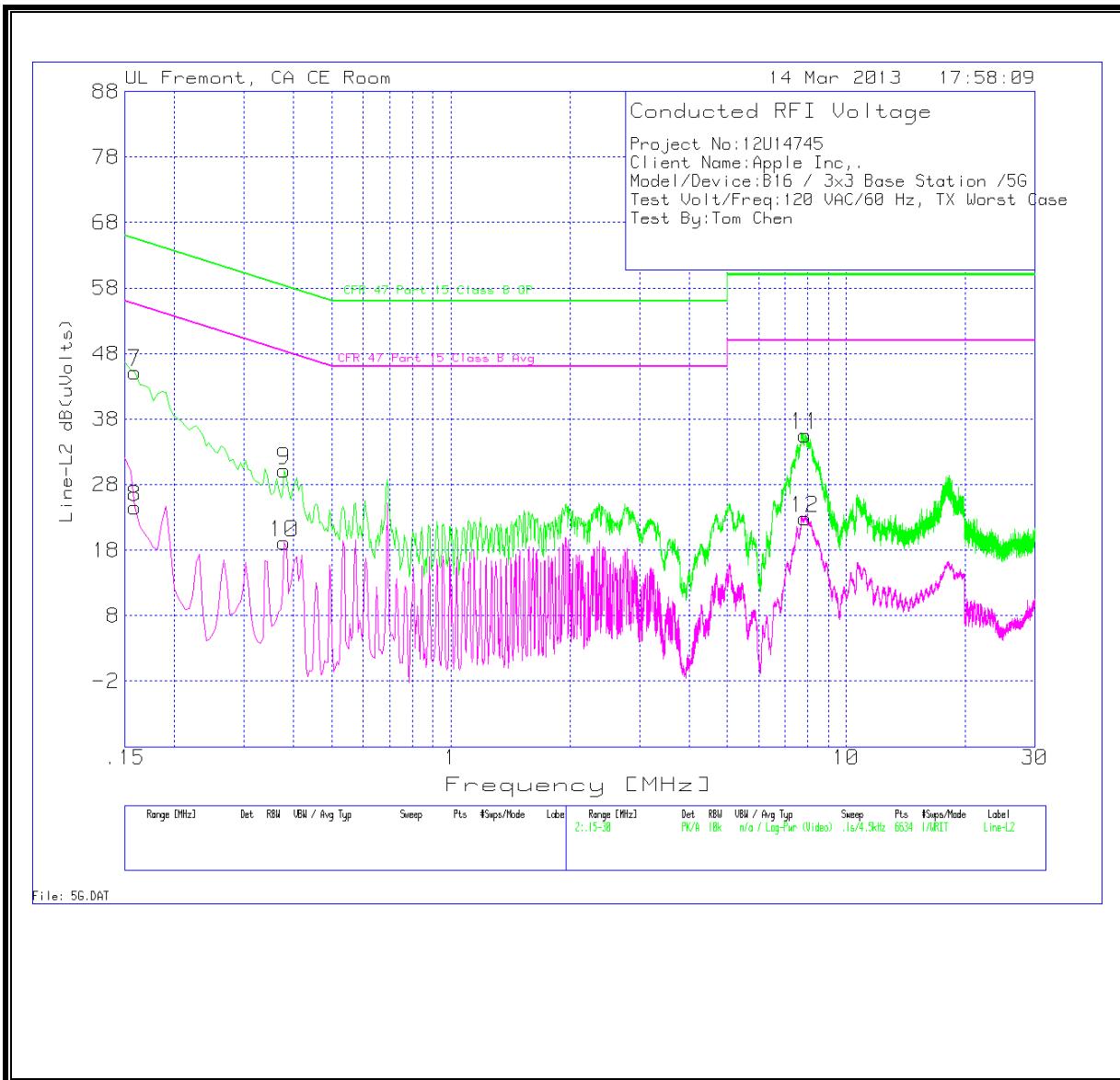
Line-L2 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L2.TXT	LC Cables 2&3.TXT	dB(uVolt s)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
7	0.159	45.11	PK	0.1	0	45.21	65.5	-20.29	55.5	-10.29
8	0.159	24.45	Av	0.1	0	24.55	65.5	-40.95	55.5	-30.95
9	0.3795	30.14	PK	0.1	0	30.24	58.3	-28.06	48.3	-18.06
10	0.3795	19.04	Av	0.1	0	19.14	58.3	-39.16	48.3	-29.16
11	7.863	35.41	PK	0.1	0.1	35.61	60	-24.39	50	-14.39
12	7.863	22.68	Av	0.1	0.1	22.88	60	-37.12	50	-27.12

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 11. DYNAMIC FREQUENCY SELECTION

### 11.1. OVERVIEW

#### 11.1.1. LIMITS

##### INDUSTRY CANADA

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

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

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

RSS-210 Issue 7 A9.4 (b) (iv) **Channel closing time:** the maximum channel closing time is 260 ms.

##### FCC

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

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

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

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

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

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

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna	
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

**Table 4: DFS Response requirement values**

Parameter	Value
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period
The instant that the <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> begins is as follows:	
For the Short pulse radar Test Signals this instant is the end of the <i>Burst</i> .	
For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.	
For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.	
The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

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

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

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

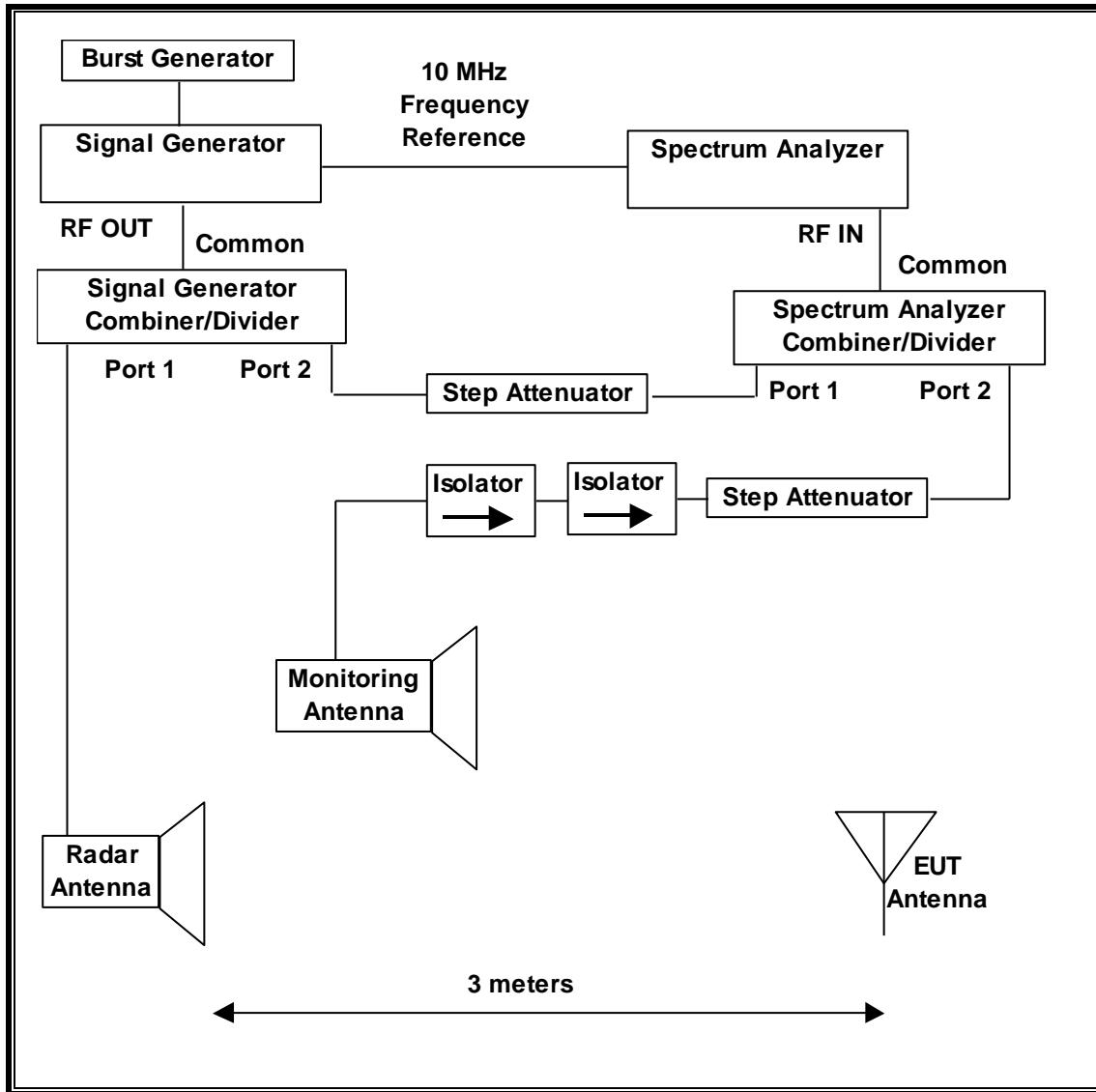
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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

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

### 11.1.2. TEST AND MEASUREMENT SYSTEM

#### RADIATED METHOD SYSTEM BLOCK DIAGRAM



## SYSTEM OVERVIEW

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

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

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

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

## SYSTEM CALIBRATION

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

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

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

### ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

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

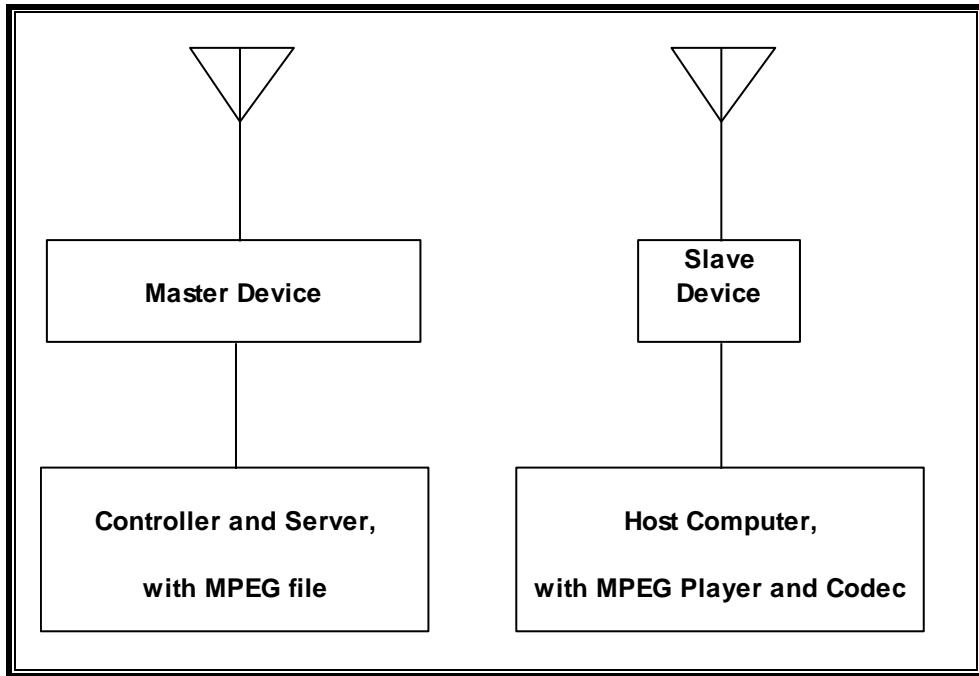
### TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/18/13
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	11/20/13
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	09/25/13

### 11.1.3. SETUP OF EUT

#### RADIATED METHOD EUT TEST SETUP



#### SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Notebook PC (Controller/Server)	Apple	MacBook Pro A1286	W8008008D8N	DoC
AC Adapter (Controller/Server PC)	Delta Electronics	A1343	MV0220FZSAKXA	DoC
Notebook PC (Slave Host)	Apple	MacBook Pro Prototype	C02GJAVVDV11	DoC
AC Adapter (Host PC)	Lite on Technology	A1290	Z292402N65GUB	DoC
802.11a/g/n/ac WLAN + BT Custom Combination Card	Broadcom Corp.	BCM94360CS	C8V242600AEE563ER	QDS-BRCM1069

#### 11.1.4. DESCRIPTION OF EUT

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

The EUT is a Master Device.

The highest power level within these bands is 28.15 dBm EIRP in the 5250-5350 MHz band and 28.81 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly consists of 3 antennas with individual gains of 3.4 dBi, 1.6 dBi and 2.3 dBi in the 5250-5350 MHz band and 3.0 dBi, 1.7 dBi and 3.8 dBi in the 5470-5725 MHz band.

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

The rated output power of the Master unit is  $> 23$  dBm (EIRP). Therefore the required interference threshold level is  $-64$  dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-64 + 1 = -63$  dBm.

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

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

WLAN traffic is generated by streaming the video file TestFile.mp2 "6 ½ Magic Hours" from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

TPC is required since the maximum EIRP is greater than 500 mW (27 dBm).

The EUT utilizes the 802.11a/n/ac architecture. Three nominal channel bandwidths are implemented: 20 MHz, 40 MHz and 80 MHz.

The software installed in the access point is revision 7.7D3 dev

#### UNIFORM CHANNEL SPREADING

See Manufacturer's Attestation.

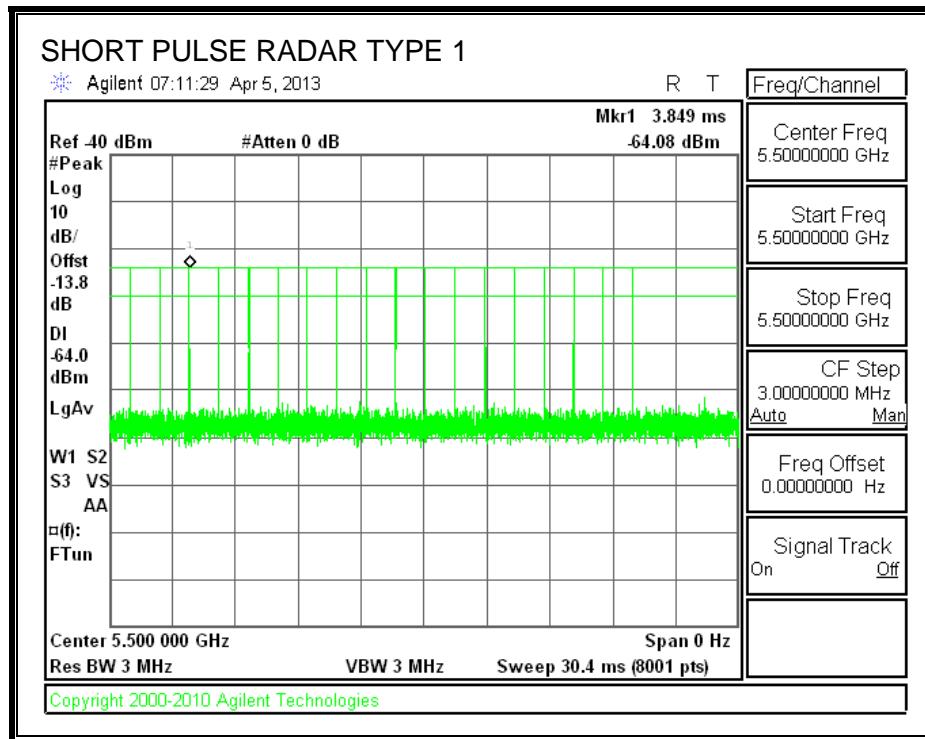
## 11.2. RESULTS FOR 20 MHz BANDWIDTH

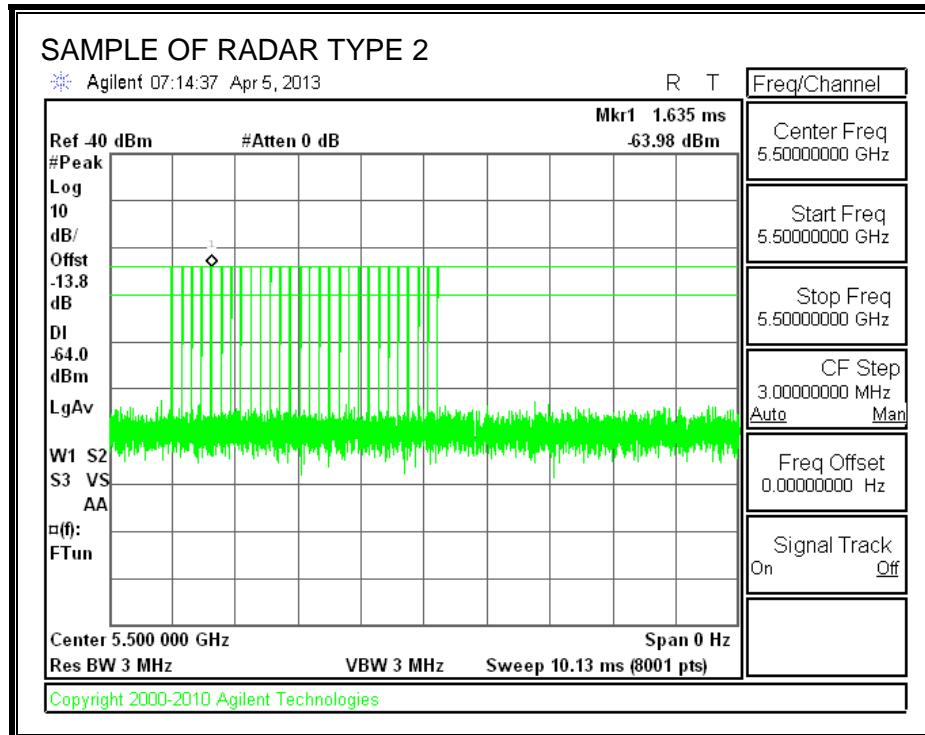
### 11.2.1. TEST CHANNEL

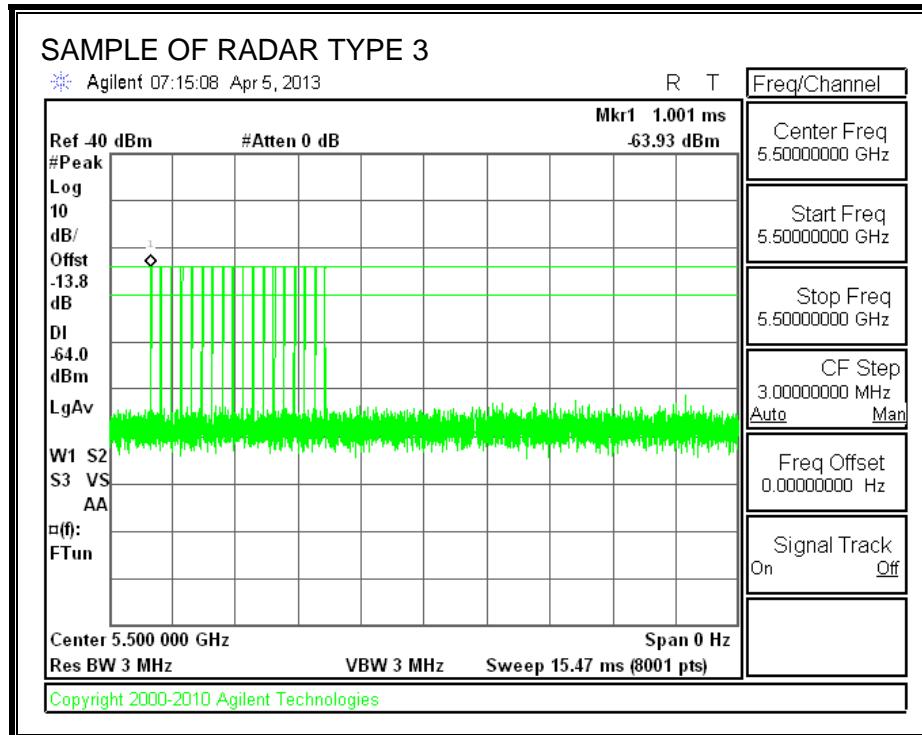
All tests were performed at a channel center frequency of 5500 MHz.

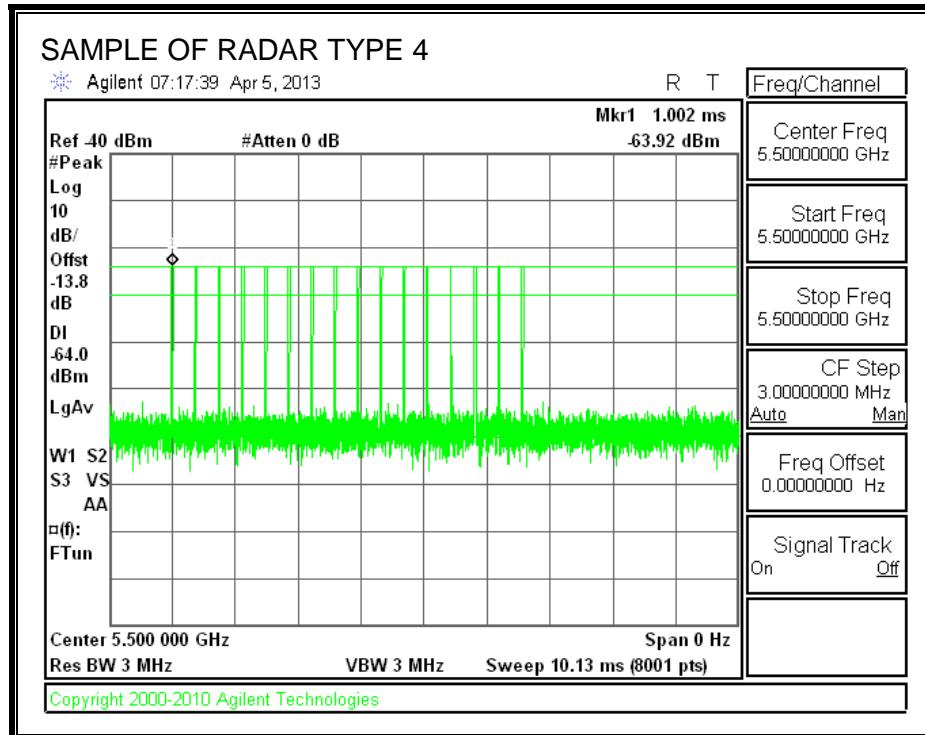
### 11.2.2. RADAR WAVEFORMS AND TRAFFIC

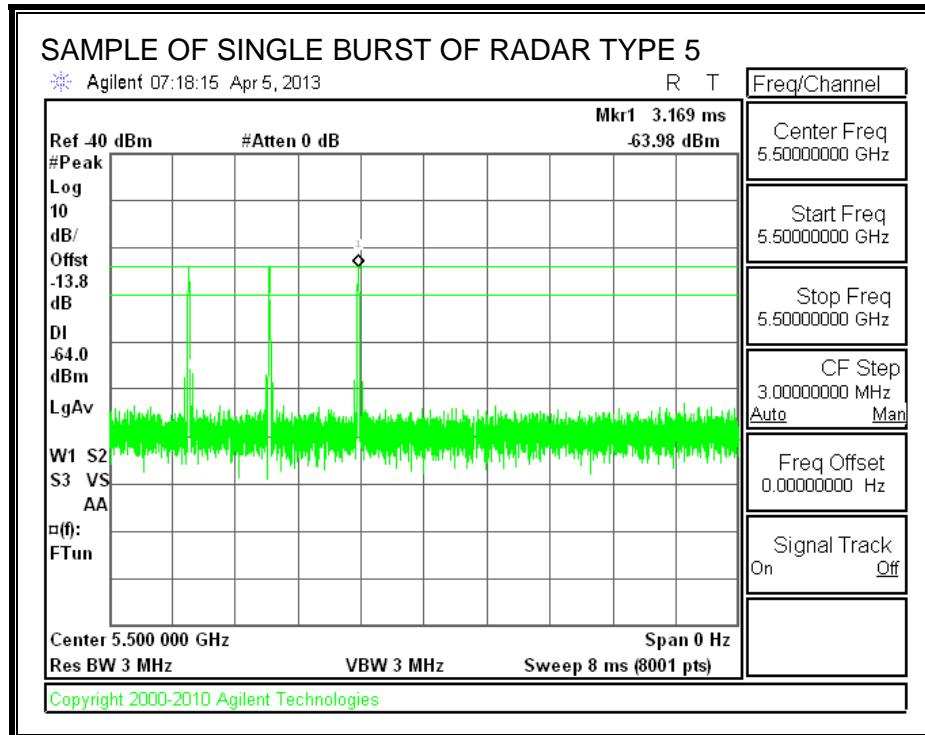
#### RADAR WAVEFORMS

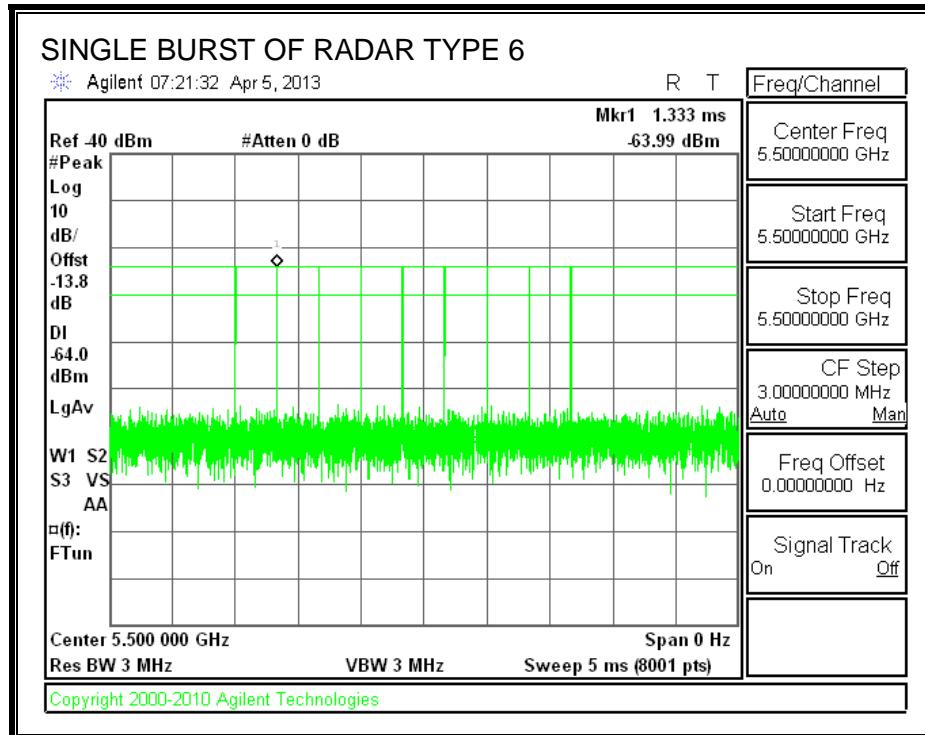




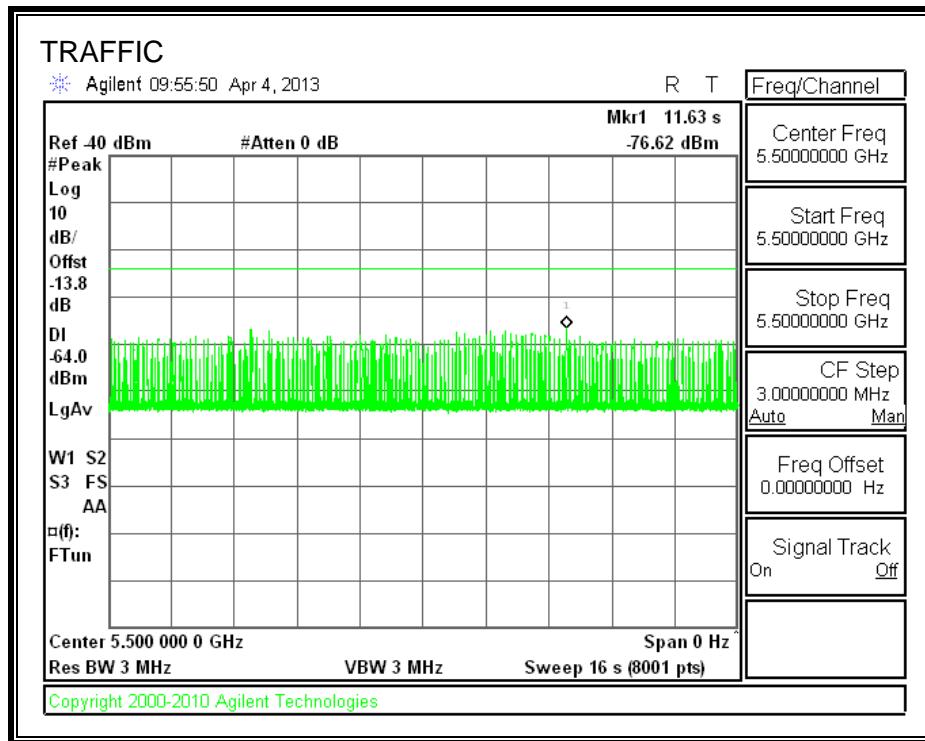








**TRAFFIC**



### 11.2.3. CHANNEL AVAILABILITY CHECK TIME

#### PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

#### PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

## QUANTITATIVE RESULTS

### No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
29.77	148.7	118.9	58.9

### Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.23	90.2	60.0	1.1

### Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.15	148.0	117.9	58.9

## QUALITATIVE RESULTS

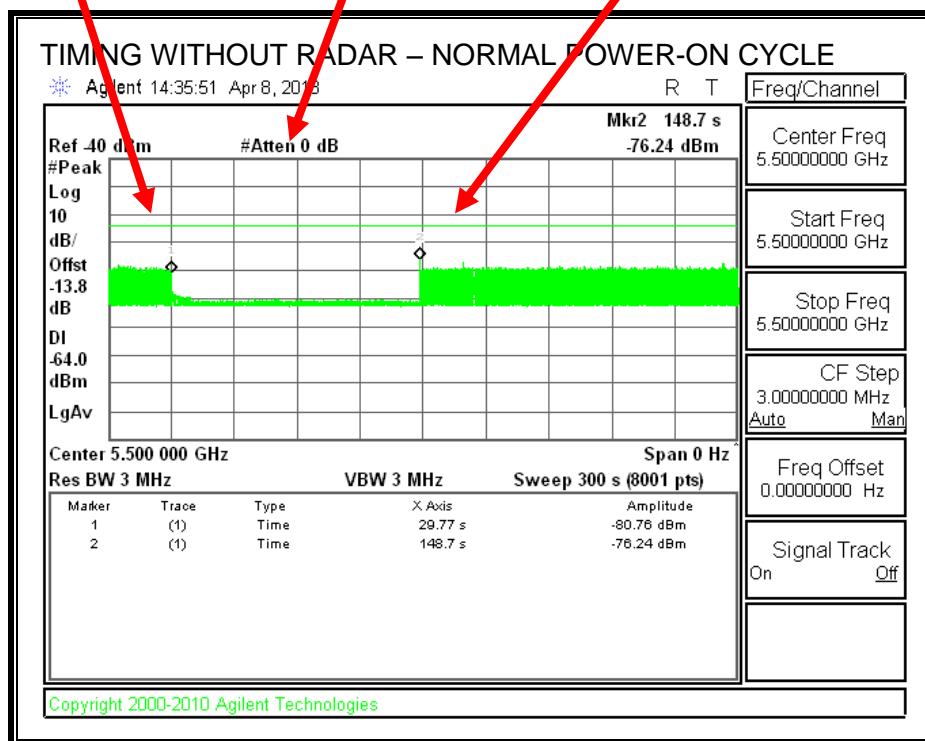
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

### TIMING WITHOUT RADAR DURING CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle

End of Initial Power-up cycle  
Start of CAC

End of CAC  
Traffic is Initiated



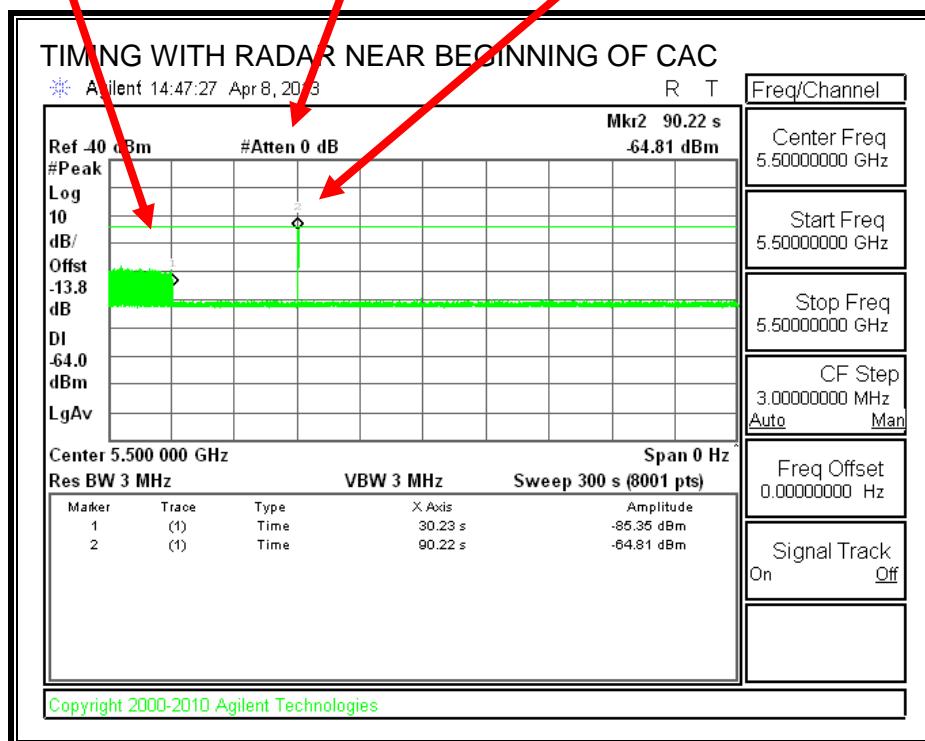
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

### TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle

End of Initial Power-up cycle  
Start of CAC

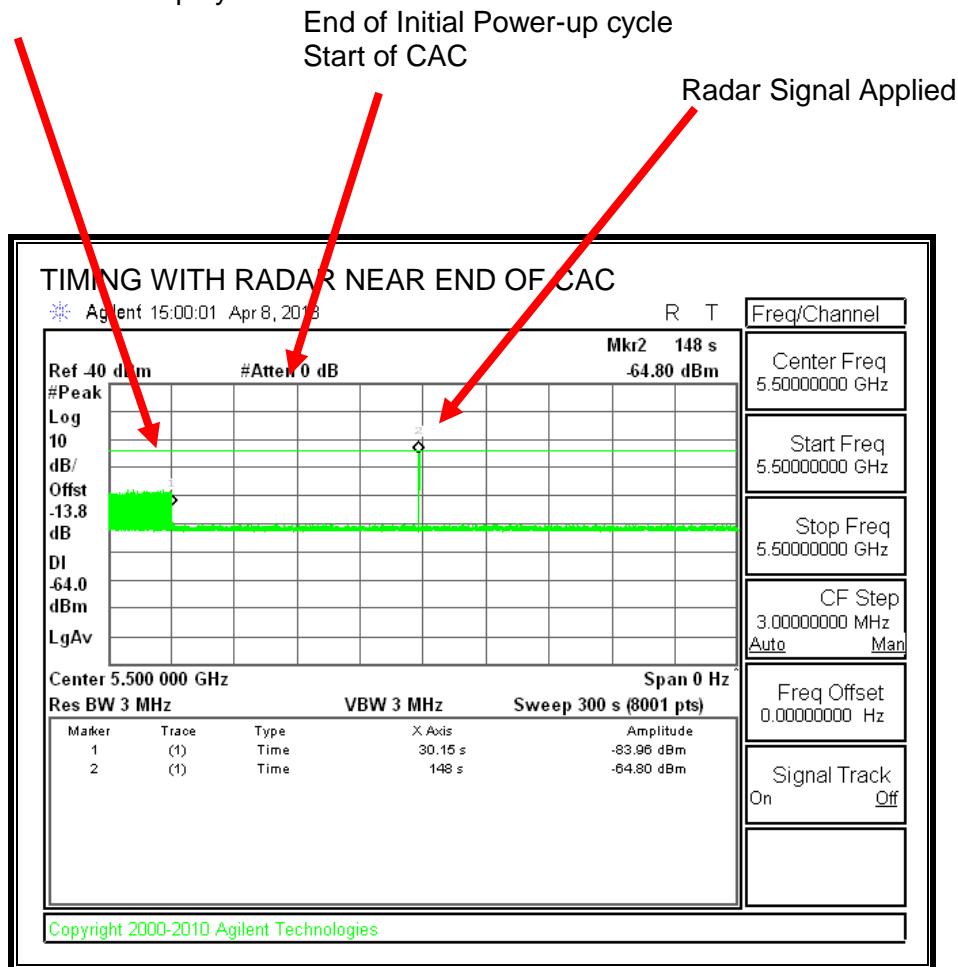
Radar Signal Applied



No EUT transmissions were observed after the radar signal.

### TIMING WITH RADAR NEAR END OF CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle



No EUT transmissions were observed after the radar signal.

#### 11.2.4. OVERLAPPING CHANNEL TESTS

##### RESULTS

These tests are not applicable.

#### 11.2.5. MOVE AND CLOSING TIME

##### REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

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

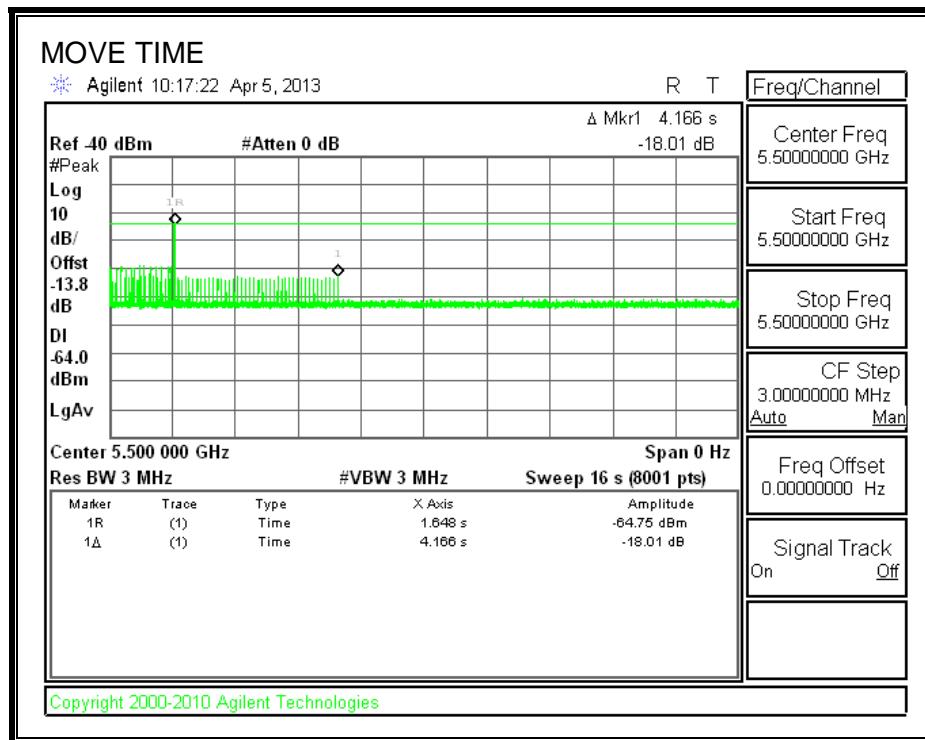
##### RESULTS

Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	4.166	10

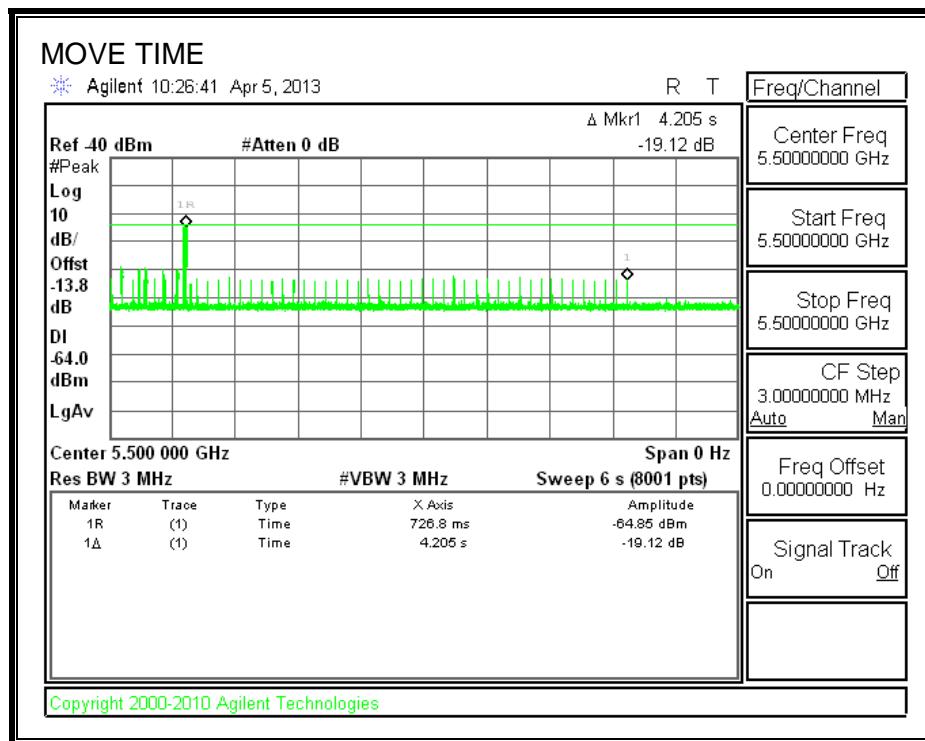
Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	48.8	60
IC	53.3	260

## MOVE TIME

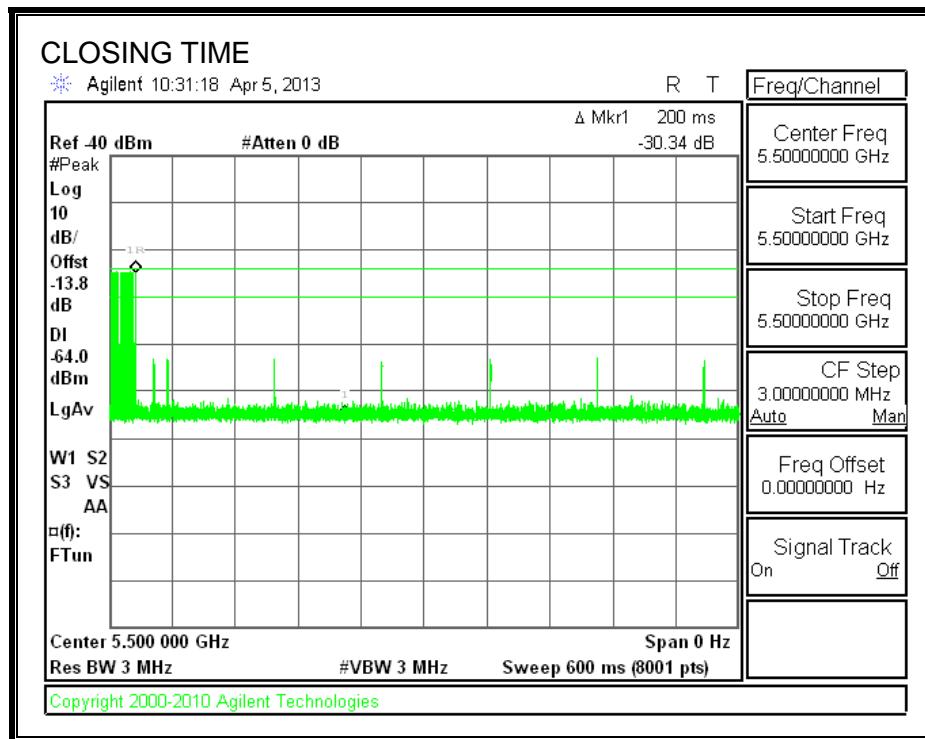
### 16 SECOND SWEEP:



**6 SECOND SWEEP:**

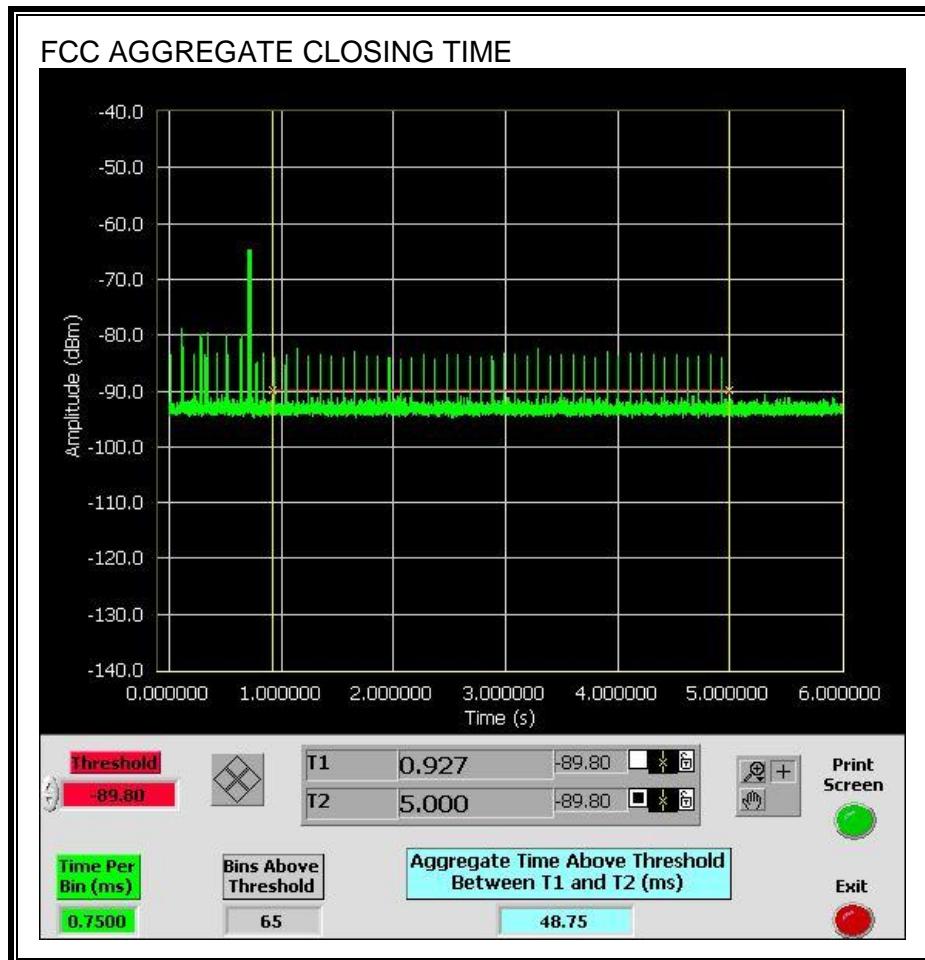


**CHANNEL CLOSING TIME**

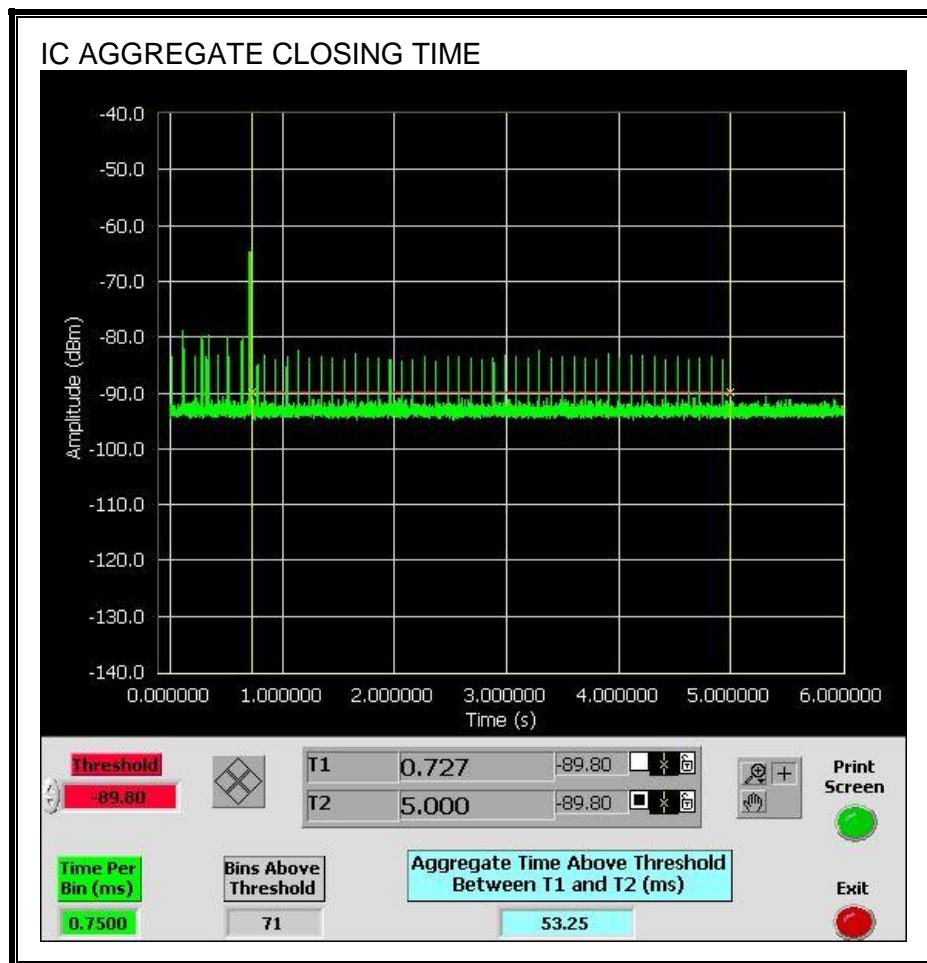


### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the FCC aggregate monitoring period.

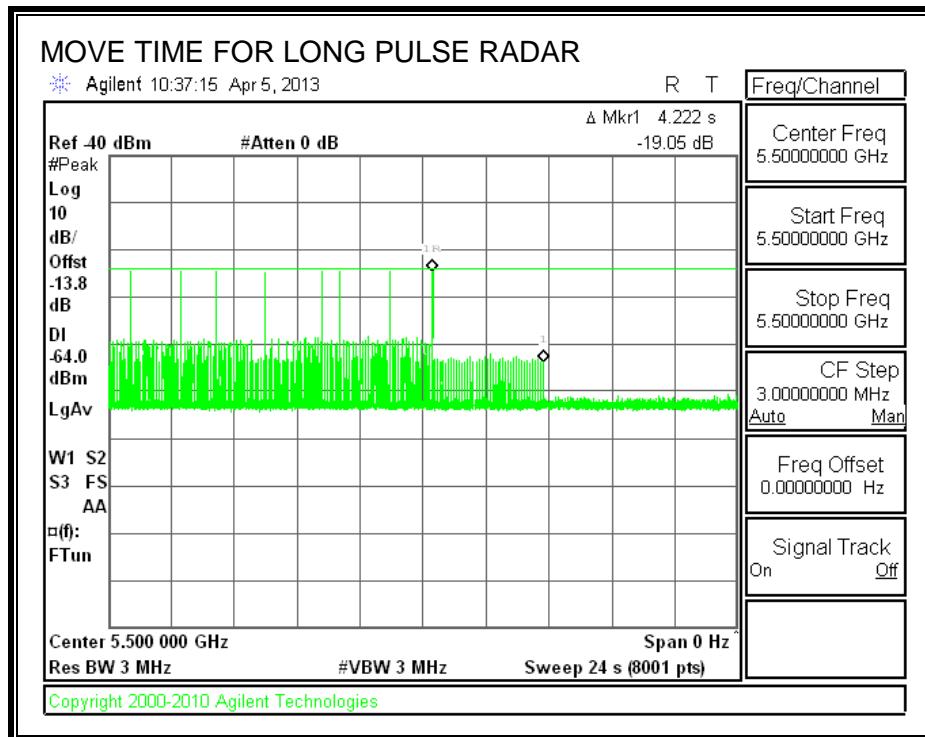


Only intermittent transmissions are observed during the IC aggregate monitoring period.



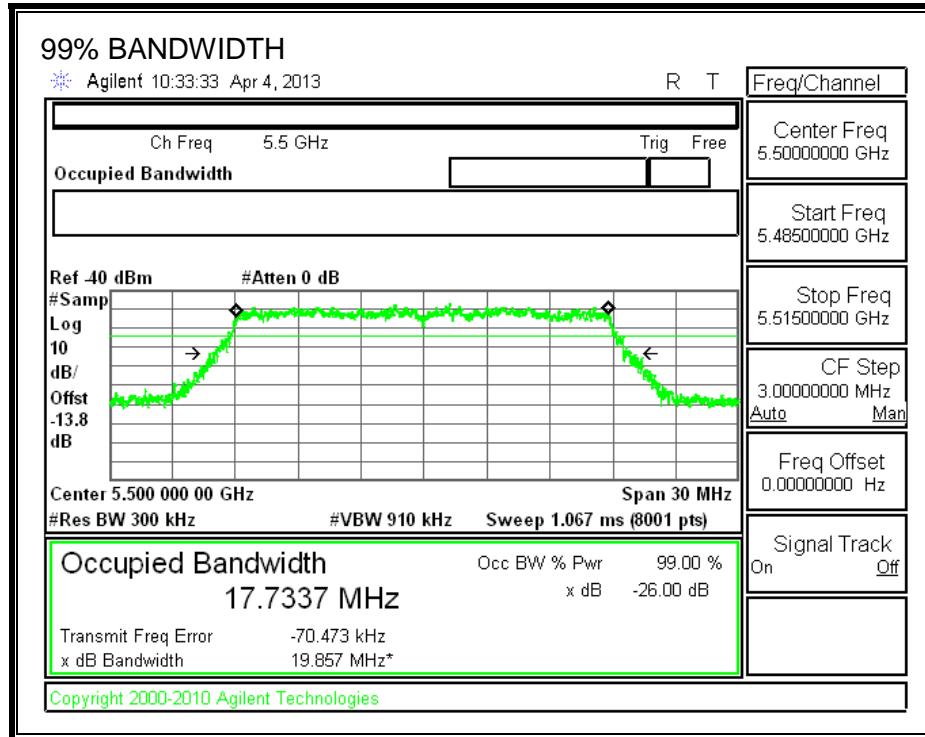
## LONG PULSE CHANNEL MOVE TIME

The traffic ceases prior to 10 seconds after the end of the radar waveform.



### 11.2.6. DETECTION BANDWIDTH

#### REFERENCE PLOT OF 99% POWER BANDWIDTH



#### RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5492	5508	16	17.734	90.2	80

**DETECTION BANDWIDTH PROBABILITY**

**DETECTION BANDWIDTH PROBABILITY RESULTS**

<b>Detection Bandwidth Test Results</b>				
<b>FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>				
<b>Frequency (MHz)</b>	<b>Number of Trials</b>	<b>Number Detected</b>	<b>Detection (%)</b>	<b>Mark</b>
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5496	10	10	100	
5497	10	10	100	
5498	10	10	100	
5499	10	10	100	
5500	10	10	100	
5501	10	10	100	
5502	10	10	100	
5503	10	10	100	
5504	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	FH

### 11.2.7. IN-SERVICE MONITORING

#### RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	96.67	60	Pass
FCC Short Pulse Type 3	30	96.67	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		95.83	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	100.00	70	Pass

**TYPE 1 DETECTION PROBABILITY**

<b>Data Sheet for FCC Short Pulse Radar Type 1</b>	
<b>1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	No
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

**TYPE 2 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	3.6	151.00	27	Yes
2002	4	164.00	23	Yes
2003	4.9	200.00	28	Yes
2004	2.2	180.00	29	Yes
2005	4.4	180.00	28	Yes
2006	2.5	165.00	26	Yes
2007	3.5	166.00	24	No
2008	1.1	169.00	27	Yes
2009	2.3	150.00	27	Yes
2010	2.8	159.00	25	Yes
2011	2.5	152.00	25	Yes
2012	2.8	194.00	25	Yes
2013	1.2	220.00	28	Yes
2014	2.8	199.00	25	Yes
2015	1	191.00	26	Yes
2016	2.8	186.00	27	Yes
2017	1	182.00	29	Yes
2018	1.1	192.00	28	Yes
2019	3.1	198.00	23	Yes
2020	1.3	176.00	26	Yes
2021	4.5	221.00	28	Yes
2022	3.5	152.00	29	Yes
2023	2.3	168.00	29	Yes
2024	1.1	189.00	23	Yes
2025	2.8	171.00	26	Yes
2026	4.6	220.00	23	Yes
2027	2	188.00	29	Yes
2028	2.7	224.00	28	Yes
2029	1.7	152.00	24	Yes
2030	1.9	207.00	27	Yes

**TYPE 3 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.1	326.00	18	Yes
3002	5.2	500.00	17	Yes
3003	6	445.00	16	Yes
3004	7.9	316.00	17	Yes
3005	7.5	471.00	18	Yes
3006	9.2	262.00	18	Yes
3007	7.7	423.00	16	Yes
3008	7.9	364.00	18	Yes
3009	5.5	252.00	16	No
3010	6.8	432.00	18	Yes
3011	8	333.00	17	Yes
3012	6.7	443.00	17	Yes
3013	6	417.00	16	Yes
3014	5.4	391.00	18	Yes
3015	5	293.00	16	Yes
3016	9.9	251.00	17	Yes
3017	8.6	353.00	16	Yes
3018	9.1	489.00	18	Yes
3019	8.2	414.00	17	Yes
3020	9.3	420.00	17	Yes
3021	5.1	346.00	17	Yes
3022	9.1	282.00	17	Yes
3023	6.8	434.00	16	Yes
3024	7.8	397.00	18	Yes
3025	7.3	332.00	17	Yes
3026	7.2	398.00	16	Yes
3027	9.2	266.00	17	Yes
3028	6.9	443.00	17	Yes
3029	6.5	450	18	Yes
3030	6.2	317	16	Yes

**TYPE 4 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	16	427.00	13	Yes
4002	19.8	252.00	15	Yes
4003	19.6	284.00	14	Yes
4004	15.7	278.00	15	Yes
4005	12.5	260.00	12	Yes
4006	14.8	429.00	12	Yes
4007	13.5	351.00	15	Yes
4008	14.8	323.00	12	Yes
4009	12.1	434.00	12	Yes
4010	17.1	446.00	15	Yes
4011	16.5	316.00	15	Yes
4012	15.5	300.00	13	Yes
4013	14.6	470.00	14	Yes
4014	11.2	381.00	16	Yes
4015	13.4	358.00	15	Yes
4016	13.3	441.00	16	Yes
4017	18.9	280.00	12	Yes
4018	18.8	316.00	16	Yes
4019	15.6	371.00	15	Yes
4020	19.3	452.00	16	No
4021	12.2	480.00	15	Yes
4022	19.2	491.00	13	No
4023	15.3	346.00	12	Yes
4024	13.7	361.00	13	Yes
4025	15.8	476.00	16	Yes
4026	19.6	467.00	14	Yes
4027	17.4	285.00	14	Yes
4028	18.5	459.00	14	Yes
4029	10.4	338.00	12	Yes
4030	14.1	428.00	14	Yes

**TYPE 5 DETECTION PROBABILITY**

<b>Data Sheet for FCC Long Pulse Radar Type 5</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

**TYPE 6 DETECTION PROBABILITY**

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	296	5492	4	Yes
2	771	5493	2	Yes
3	1246	5494	4	Yes
4	1721	5495	4	Yes
5	2196	5496	3	Yes
6	2671	5497	4	Yes
7	3146	5498	3	Yes
8	3621	5499	5	Yes
9	4096	5500	3	Yes
10	4571	5501	1	Yes
11	5046	5502	2	Yes
12	5521	5503	4	Yes
13	5996	5504	3	Yes
14	6471	5505	4	Yes
15	6946	5506	4	Yes
16	7421	5507	3	Yes
17	7896	5508	2	Yes
18	8371	5492	2	Yes
19	8846	5493	4	Yes
20	9321	5494	5	Yes
21	9796	5495	3	Yes
22	10271	5496	4	Yes
23	10746	5497	3	Yes
24	11221	5498	4	Yes
25	11696	5499	2	Yes
26	12171	5500	3	Yes
27	12646	5501	1	Yes
28	13121	5502	4	Yes
29	13596	5503	3	Yes
30	14071	5504	3	Yes
31	14546	5505	6	Yes
32	15021	5506	2	Yes
33	15496	5507	3	Yes
34	15971	5508	7	Yes

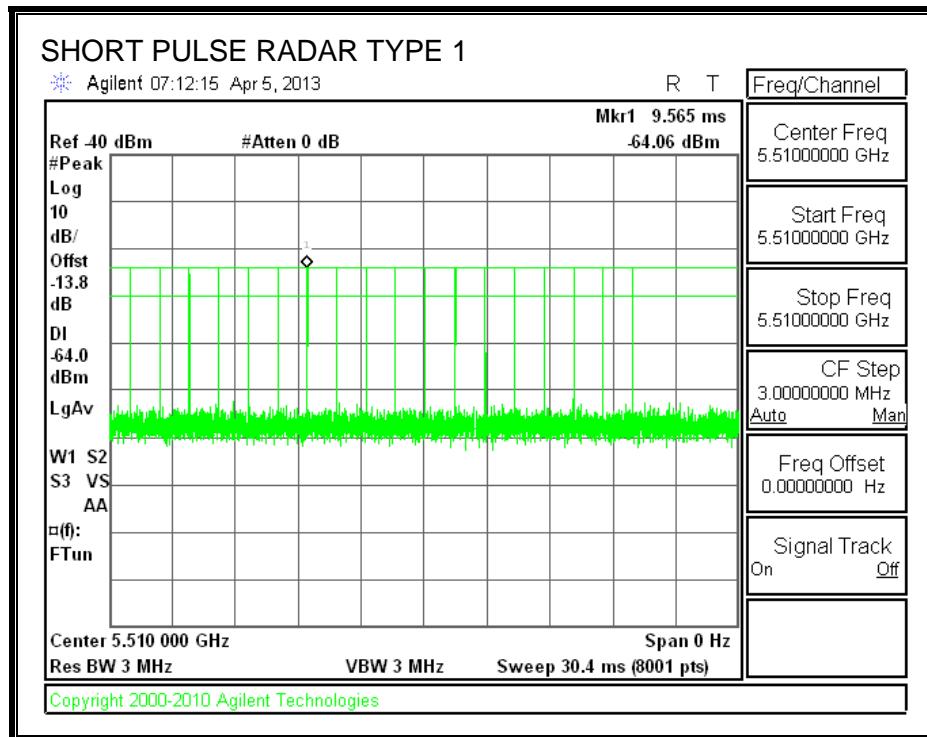
## 11.1. RESULTS FOR 40 MHz BANDWIDTH

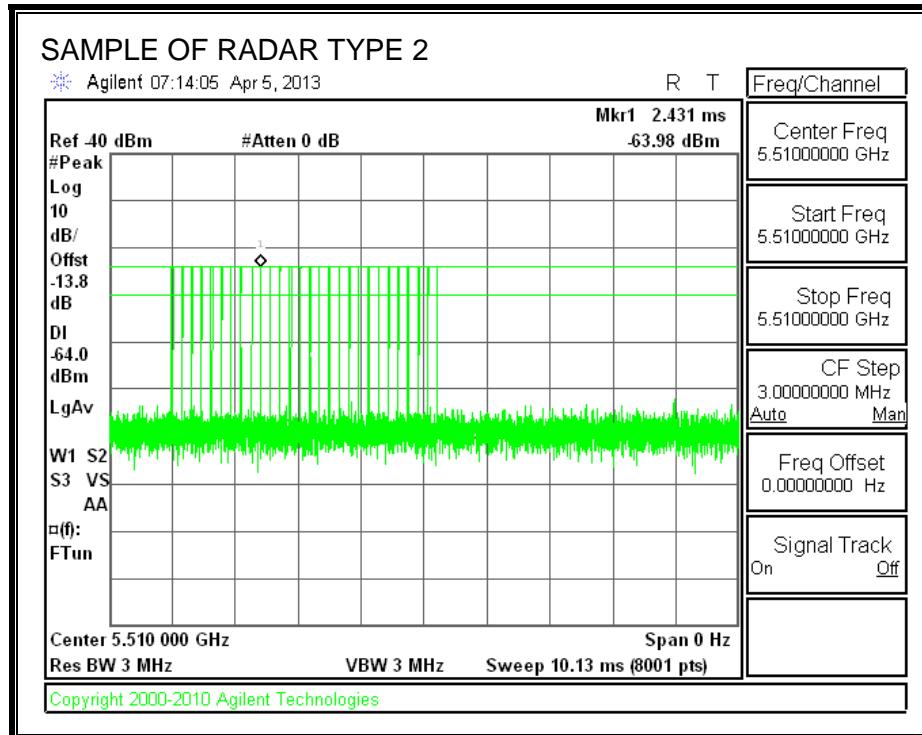
### 11.1.1. TEST CHANNEL

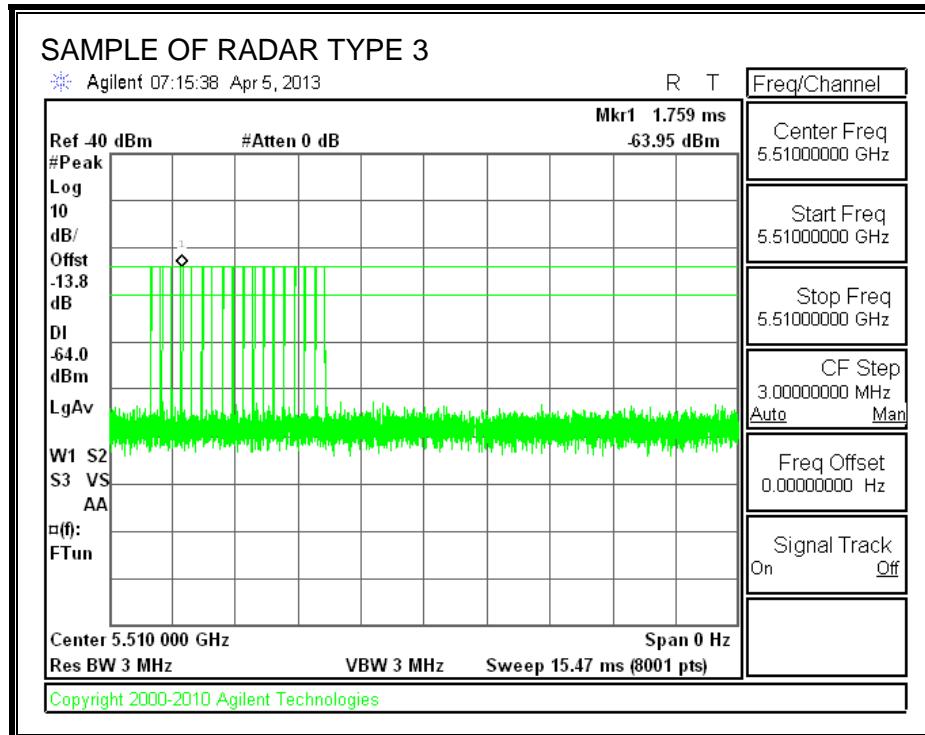
All tests were performed at a channel center frequency of 5510 MHz.

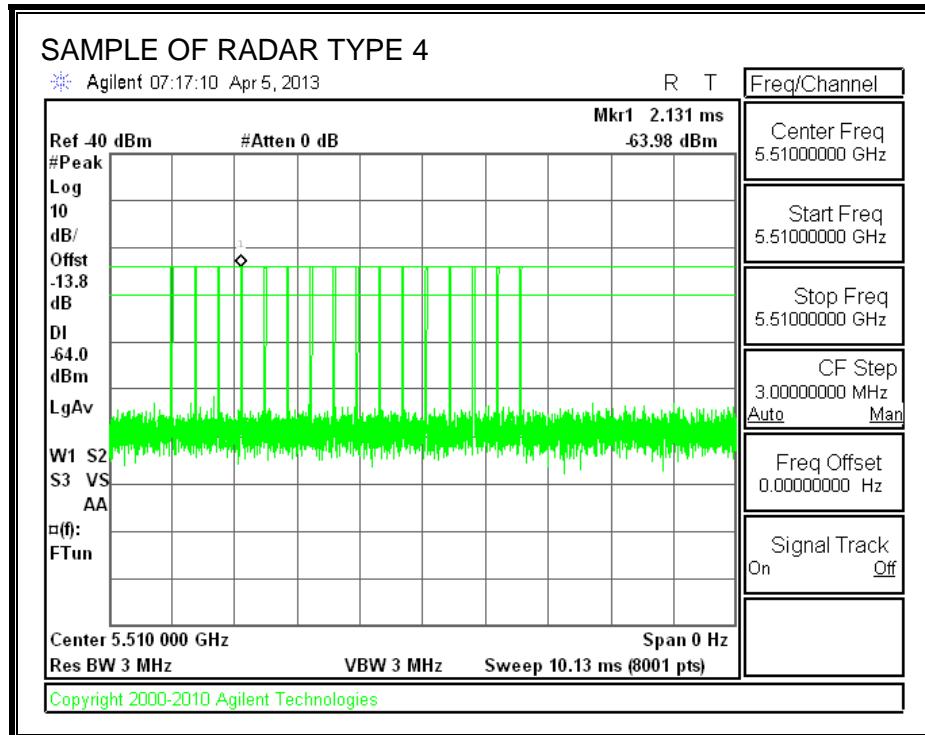
## 11.1.2. RADAR WAVEFORMS AND TRAFFIC

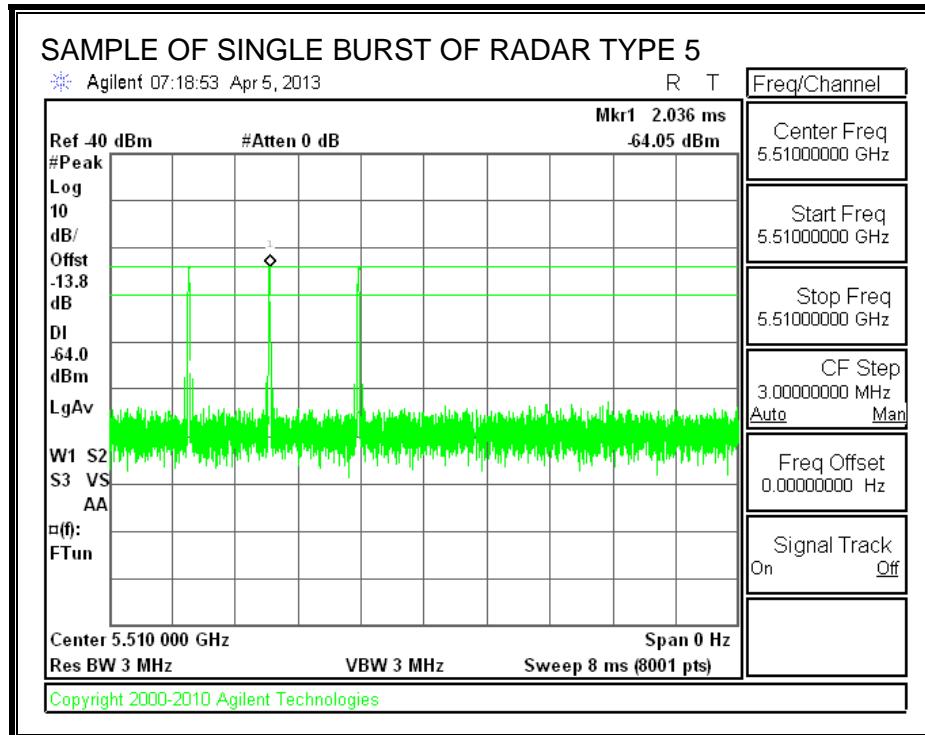
## RADAR WAVEFORMS

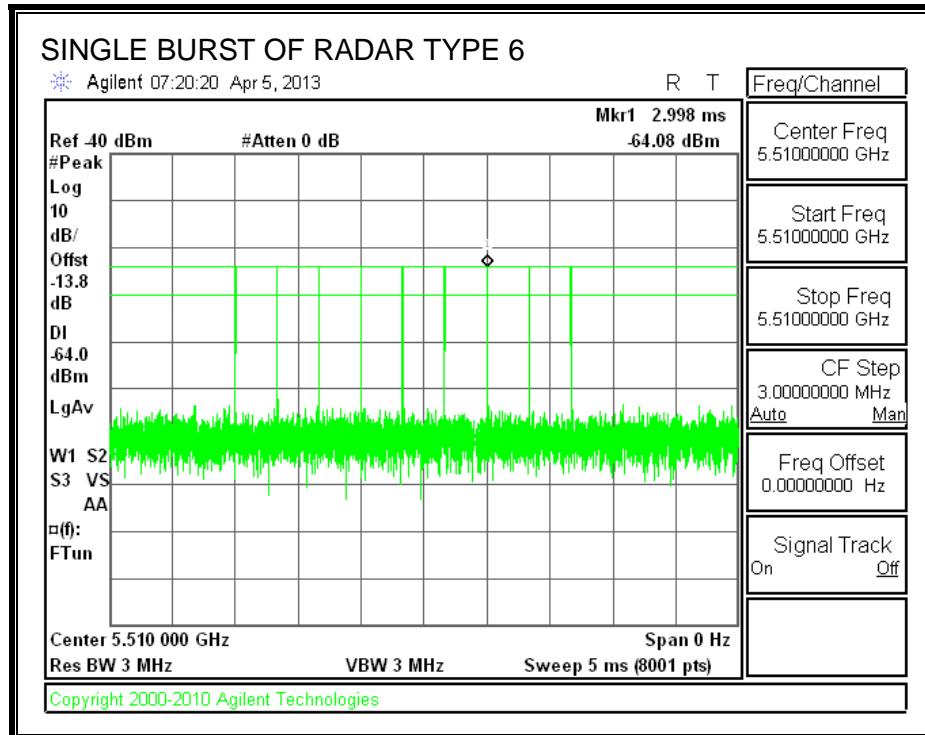




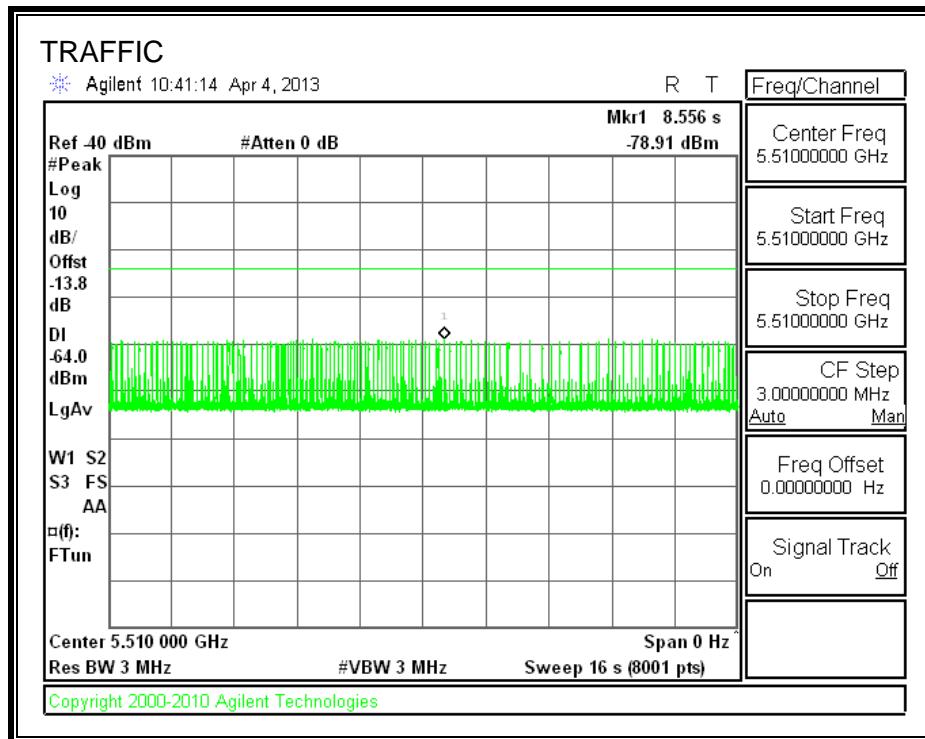








**TRAFFIC**



### 11.1.3. CHANNEL AVAILABILITY CHECK TIME

#### PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

#### PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

## QUANTITATIVE RESULTS

### No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.38	149.2	118.8	58.8

### Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.56	91.2	60.6	1.8

### Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
29.78	147.6	117.9	59.0

## QUALITATIVE RESULTS

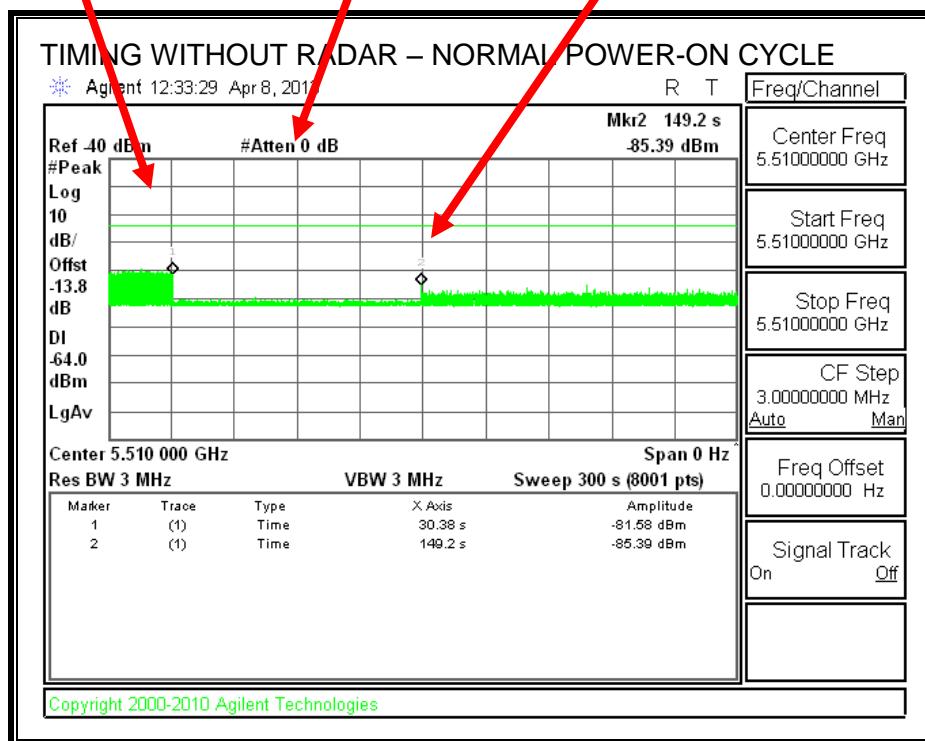
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

### TIMING WITHOUT RADAR DURING CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle

End of Initial Power-up cycle  
Start of CAC

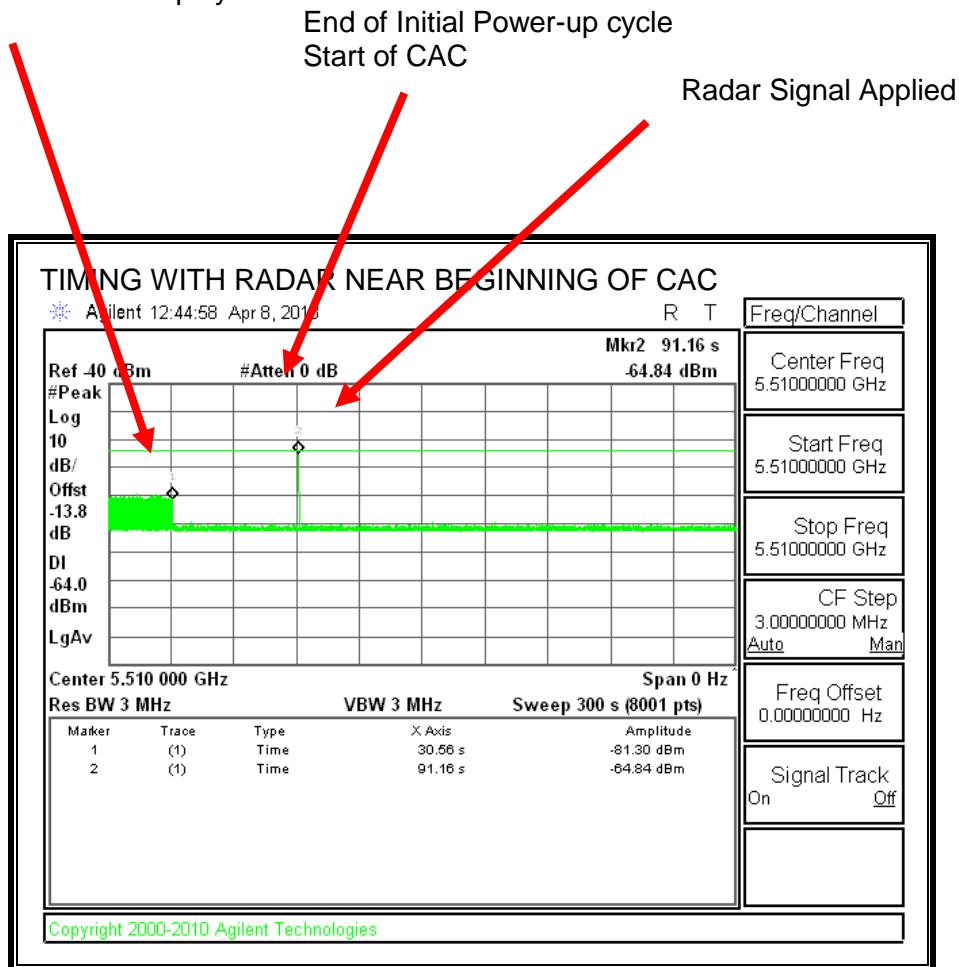
End of CAC  
Traffic is Initiated



Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

### TIMING WITH RADAR NEAR BEGINNING OF CAC

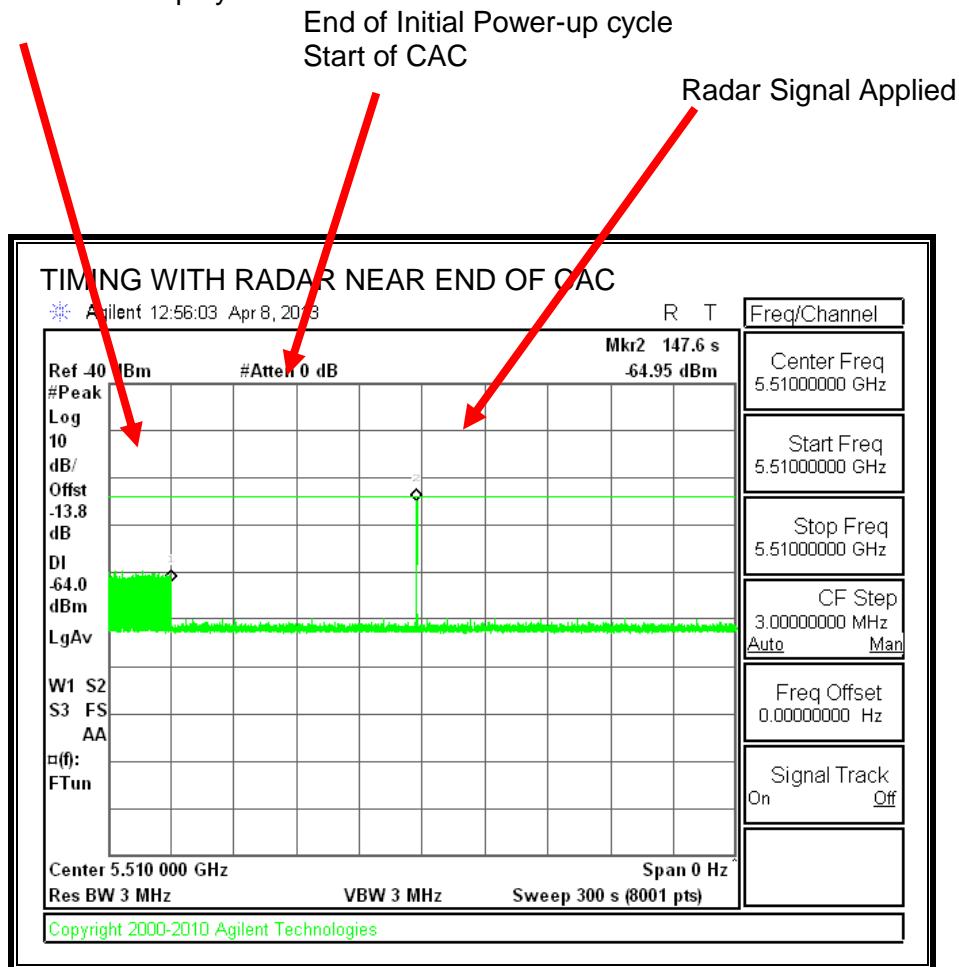
AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle



No EUT transmissions were observed after the radar signal.

### TIMING WITH RADAR NEAR END OF CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle



No EUT transmissions were observed after the radar signal.

#### 11.1.4. OVERLAPPING CHANNEL TESTS

##### RESULTS

These tests are not applicable.

#### 11.1.5. MOVE AND CLOSING TIME

##### REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

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

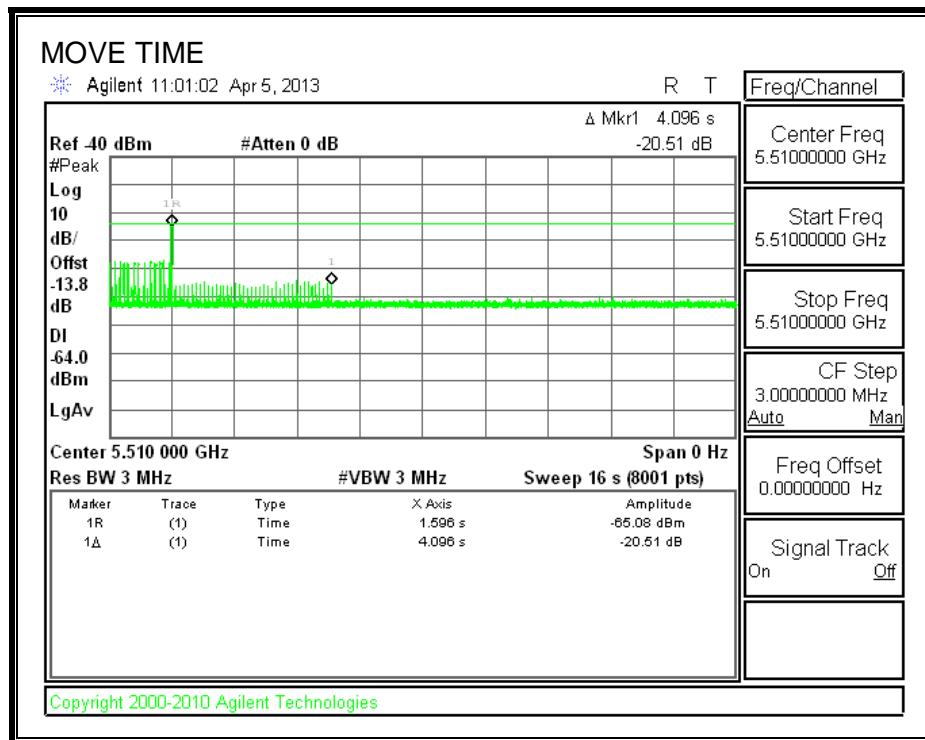
##### RESULTS

Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	4.096	10

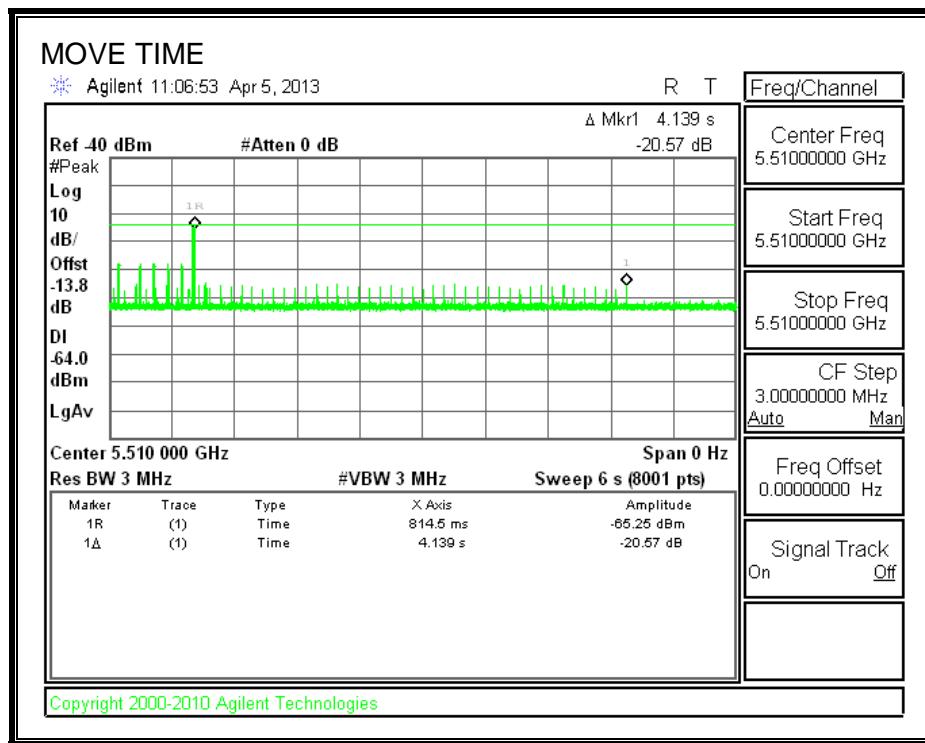
Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	46.5	60
IC	52.5	260

## MOVE TIME

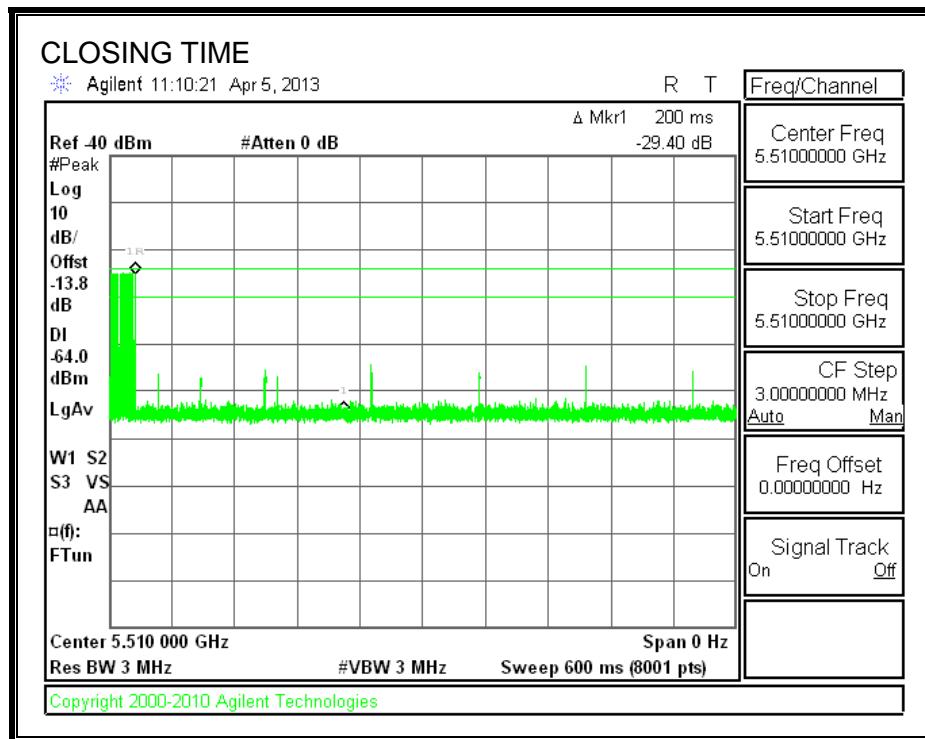
### 16 SECOND SWEEP:



**6 SECOND SWEEP:**

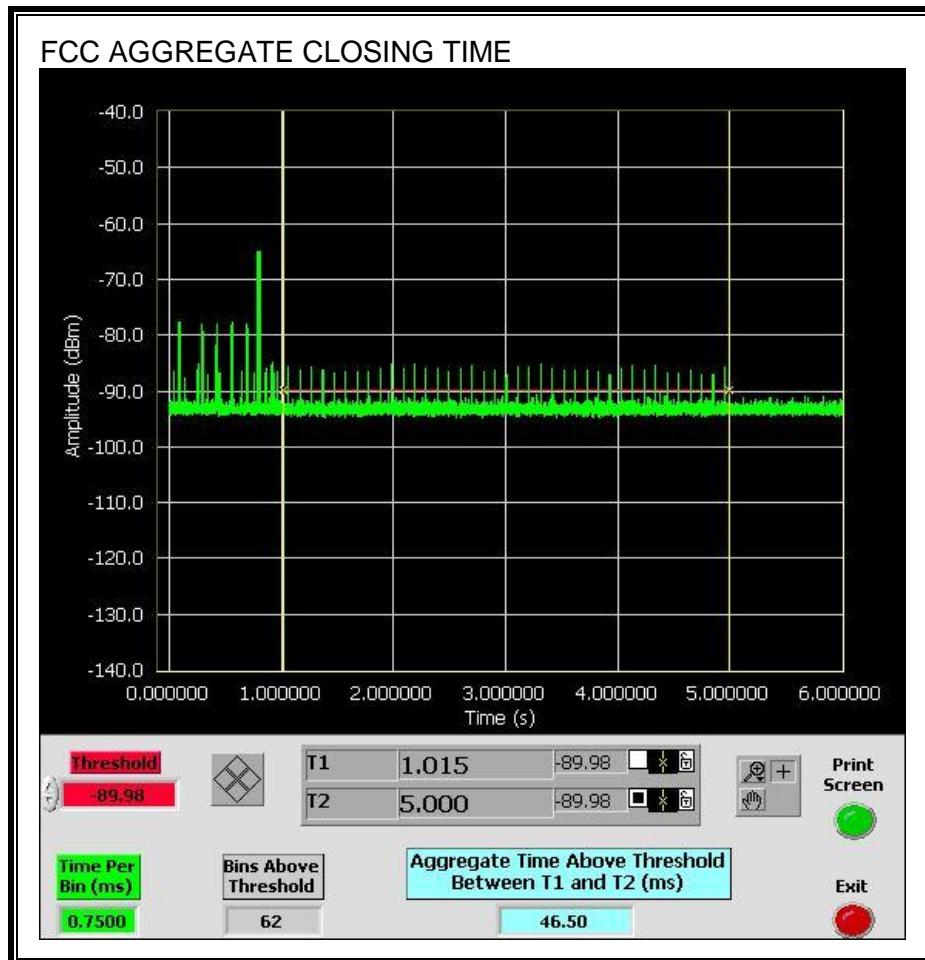


**CHANNEL CLOSING TIME**

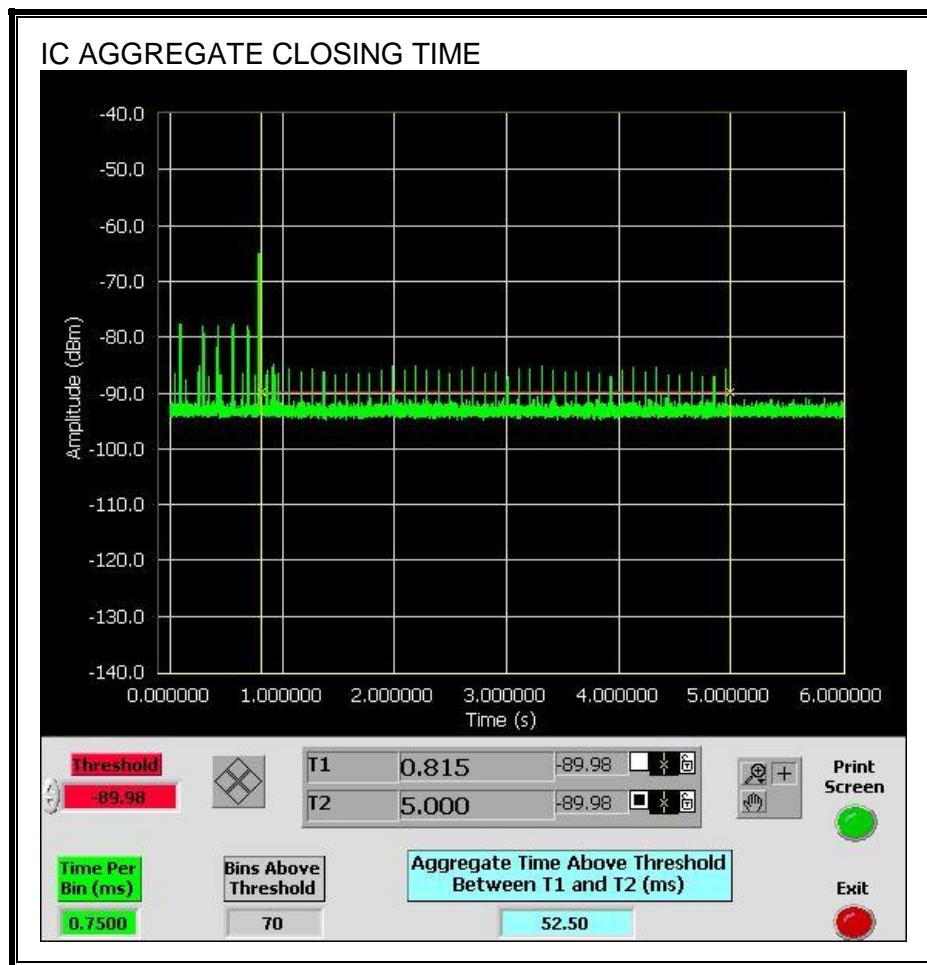


### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the FCC aggregate monitoring period.

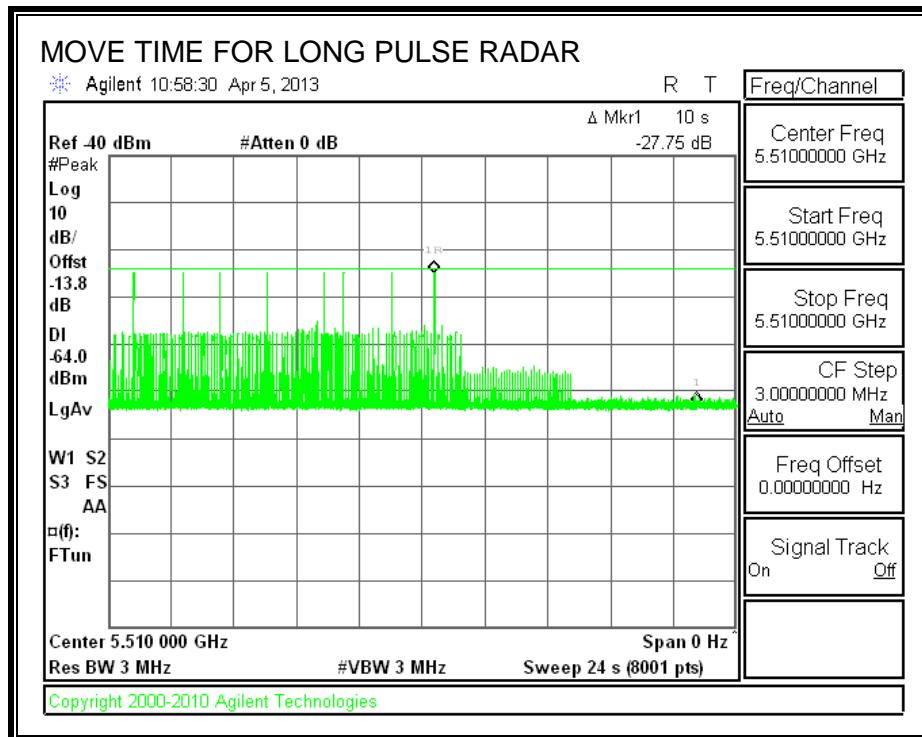


Only intermittent transmissions are observed during the IC aggregate monitoring period.



## LONG PULSE CHANNEL MOVE TIME

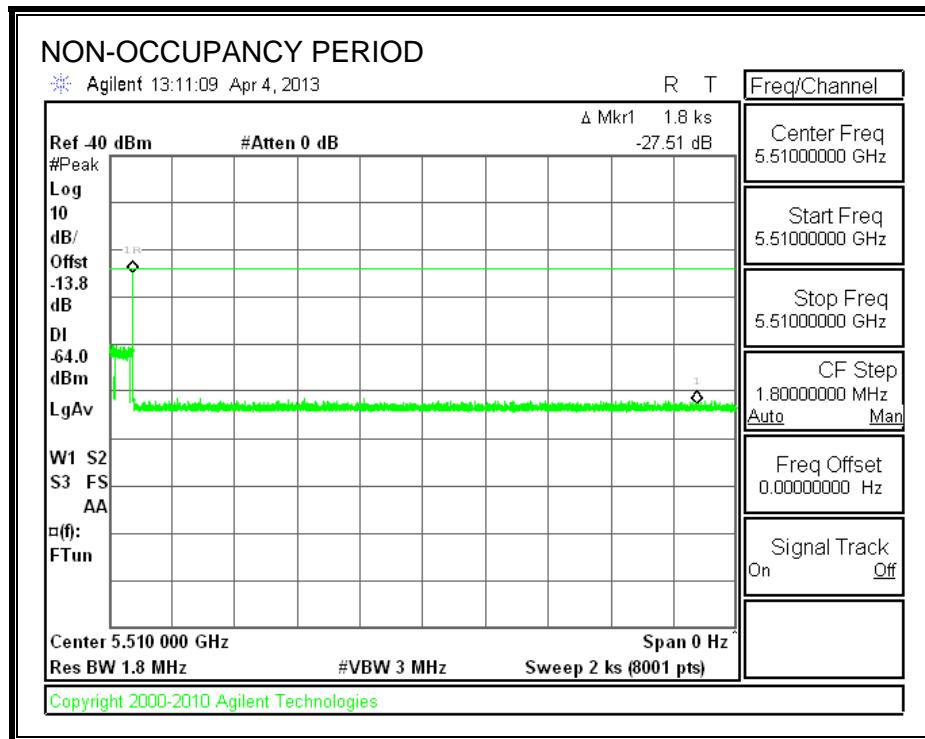
The traffic ceases prior to 10 seconds after the end of the radar waveform.



### 11.1.6. NON-OCCUPANCY PERIOD

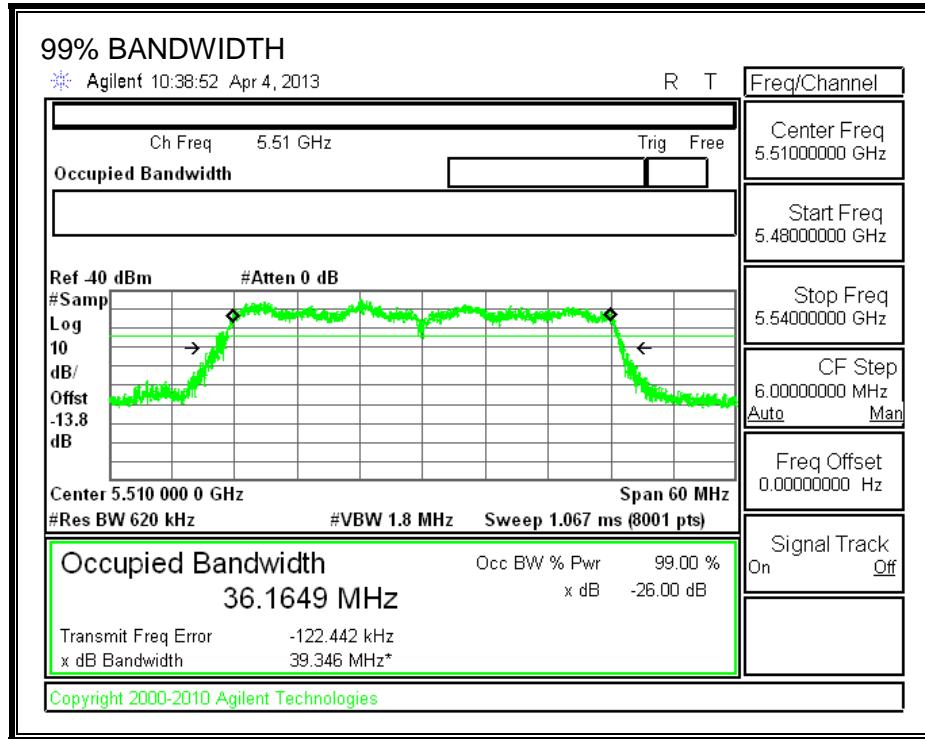
#### RESULTS

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



### 11.1.7. DETECTION BANDWIDTH

#### REFERENCE PLOT OF 99% POWER BANDWIDTH



#### RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5492	5528	36	36.165	99.5	80

**DETECTION BANDWIDTH PROBABILITY**

**DETECTION BANDWIDTH PROBABILITY RESULTS**

<b>Detection Bandwidth Test Results</b>				
<b>FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>				
<b>Frequency (MHz)</b>	<b>Number of Trials</b>	<b>Number Detected</b>	<b>Detection (%)</b>	<b>Mark</b>
5492	10	10	100	FL
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5496	10	10	100	
5497	10	10	100	
5498	10	10	100	
5499	10	10	100	
5500	10	10	100	
5501	10	10	100	
5502	10	10	100	
5503	10	10	100	
5504	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	
5510	10	10	100	
5511	10	10	100	
5512	10	10	100	
5513	10	10	100	
5514	10	10	100	
5515	10	10	100	
5516	10	10	100	
5517	10	10	100	
5518	10	10	100	
5519	10	10	100	
5520	10	10	100	
5521	10	10	100	
5522	10	10	100	
5523	10	10	100	
5524	10	10	100	
5525	10	10	100	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	FH

### 11.1.1. IN-SERVICE MONITORING

#### RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		99.17	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	37	100.00	70	Pass

**TYPE 1 DETECTION PROBABILITY**

<b>Data Sheet for FCC Short Pulse Radar Type 1</b>	
<b>1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

**TYPE 2 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	3.6	151.00	27	Yes
2002	4	164.00	23	Yes
2003	4.9	200.00	28	Yes
2004	2.2	180.00	29	Yes
2005	4.4	180.00	28	Yes
2006	2.5	165.00	26	Yes
2007	3.5	166.00	24	Yes
2008	1.1	169.00	27	Yes
2009	2.3	150.00	27	Yes
2010	2.8	159.00	25	Yes
2011	2.5	152.00	25	Yes
2012	2.8	194.00	25	Yes
2013	1.2	220.00	28	Yes
2014	2.8	199.00	25	Yes
2015	1	191.00	26	Yes
2016	2.8	186.00	27	Yes
2017	1	182.00	29	Yes
2018	1.1	192.00	28	Yes
2019	3.1	198.00	23	Yes
2020	1.3	176.00	26	Yes
2021	4.5	221.00	28	Yes
2022	3.5	152.00	29	Yes
2023	2.3	168.00	29	Yes
2024	1.1	189.00	23	Yes
2025	2.8	171.00	26	Yes
2026	4.6	220.00	23	Yes
2027	2	188.00	29	Yes
2028	2.7	224.00	28	Yes
2029	1.7	152.00	24	Yes
2030	1.9	207.00	27	Yes

**TYPE 3 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.1	326.00	18	Yes
3002	5.2	500.00	17	Yes
3003	6	445.00	16	Yes
3004	7.9	316.00	17	Yes
3005	7.5	471.00	18	Yes
3006	9.2	262.00	18	Yes
3007	7.7	423.00	16	Yes
3008	7.9	364.00	18	Yes
3009	5.5	252.00	16	Yes
3010	6.8	432.00	18	Yes
3011	8	333.00	17	Yes
3012	6.7	443.00	17	Yes
3013	6	417.00	16	Yes
3014	5.4	391.00	18	Yes
3015	5	293.00	16	Yes
3016	9.9	251.00	17	Yes
3017	8.6	353.00	16	Yes
3018	9.1	489.00	18	Yes
3019	8.2	414.00	17	Yes
3020	9.3	420.00	17	Yes
3021	5.1	346.00	17	Yes
3022	9.1	282.00	17	Yes
3023	6.8	434.00	16	Yes
3024	7.8	397.00	18	Yes
3025	7.3	332.00	17	Yes
3026	7.2	398.00	16	Yes
3027	9.2	266.00	17	Yes
3028	6.9	443.00	17	Yes
3029	6.5	450	18	Yes
3030	6.2	317	16	Yes

**TYPE 4 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	16	427.00	13	Yes
4002	19.8	252.00	15	Yes
4003	19.6	284.00	14	Yes
4004	15.7	278.00	15	Yes
4005	12.5	260.00	12	Yes
4006	14.8	429.00	12	Yes
4007	13.5	351.00	15	Yes
4008	14.8	323.00	12	Yes
4009	12.1	434.00	12	Yes
4010	17.1	446.00	15	Yes
4011	16.5	316.00	15	Yes
4012	15.5	300.00	13	Yes
4013	14.6	470.00	14	Yes
4014	11.2	381.00	16	Yes
4015	13.4	358.00	15	Yes
4016	13.3	441.00	16	Yes
4017	18.9	280.00	12	Yes
4018	18.8	316.00	16	Yes
4019	15.6	371.00	15	Yes
4020	19.3	452.00	16	Yes
4021	12.2	480.00	15	Yes
4022	19.2	491.00	13	Yes
4023	15.3	346.00	12	No
4024	13.7	361.00	13	Yes
4025	15.8	476.00	16	Yes
4026	19.6	467.00	14	Yes
4027	17.4	285.00	14	Yes
4028	18.5	459.00	14	Yes
4029	10.4	338.00	12	Yes
4030	14.1	428.00	14	Yes

**TYPE 5 DETECTION PROBABILITY**

<b>Data Sheet for FCC Long Pulse Radar Type 5</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	No
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	No
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

**TYPE 6 DETECTION PROBABILITY**

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	328	5492	5	Yes
2	803	5493	3	Yes
3	1278	5494	9	Yes
4	1753	5495	8	Yes
5	2228	5496	8	Yes
6	2703	5497	6	Yes
7	3178	5498	6	Yes
8	3653	5499	8	Yes
9	4128	5500	6	Yes
10	4603	5501	5	Yes
11	5078	5502	6	Yes
12	5553	5503	4	Yes
13	6028	5504	6	Yes
14	6503	5505	7	Yes
15	6978	5506	8	Yes
16	7453	5507	6	Yes
17	7928	5508	4	Yes
18	8403	5509	8	Yes
19	8878	5510	9	Yes
20	9353	5511	7	Yes
21	9828	5512	6	Yes
22	10303	5513	7	Yes
23	10778	5514	7	Yes
24	11253	5515	11	Yes
25	11728	5516	5	Yes
26	12203	5517	10	Yes
27	12678	5518	10	Yes
28	13153	5519	6	Yes
29	13628	5520	7	Yes
30	14103	5521	10	Yes
31	14578	5522	5	Yes
32	15053	5523	8	Yes
33	15528	5524	8	Yes
34	16003	5525	8	Yes
35	16478	5526	9	Yes
36	16953	5527	6	Yes
37	17428	5528	4	Yes

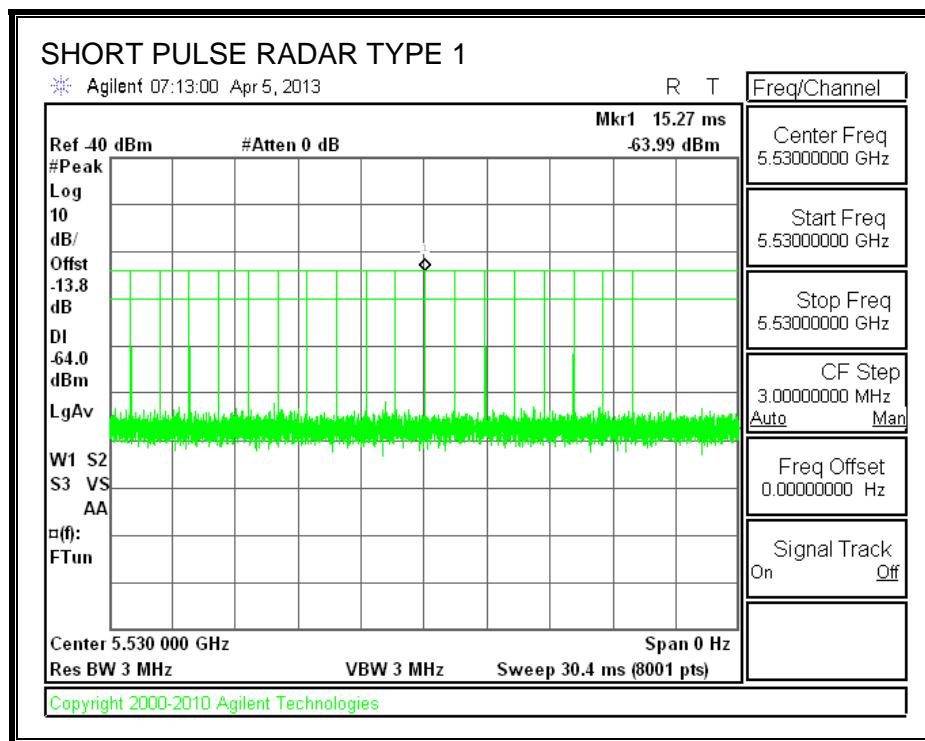
## 11.2. RESULTS FOR 80 MHz BANDWIDTH

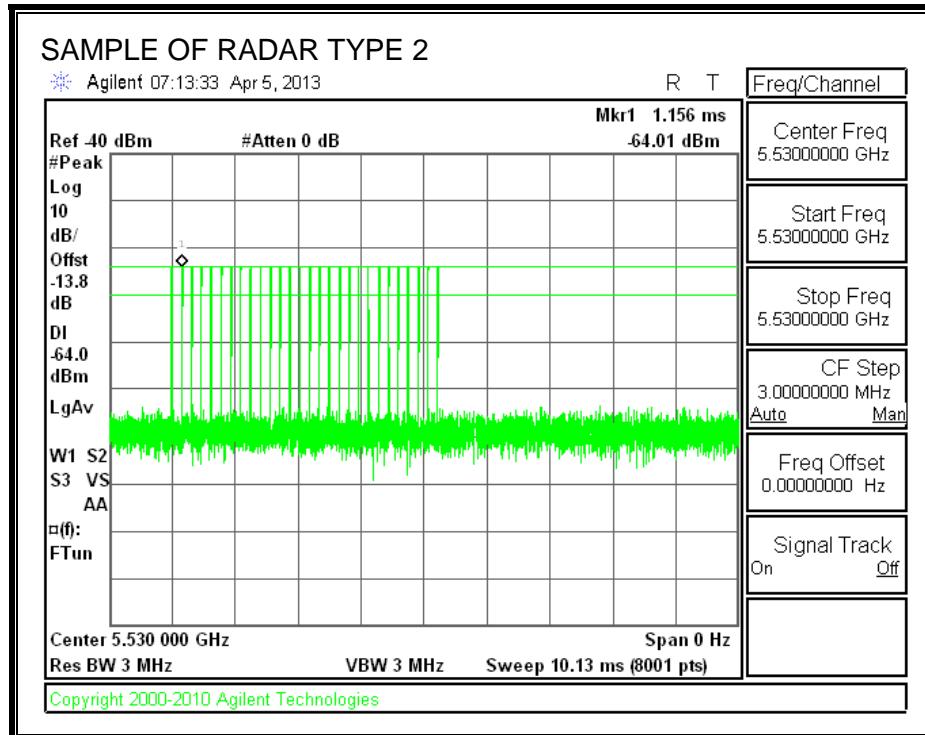
### 11.2.1. TEST CHANNEL

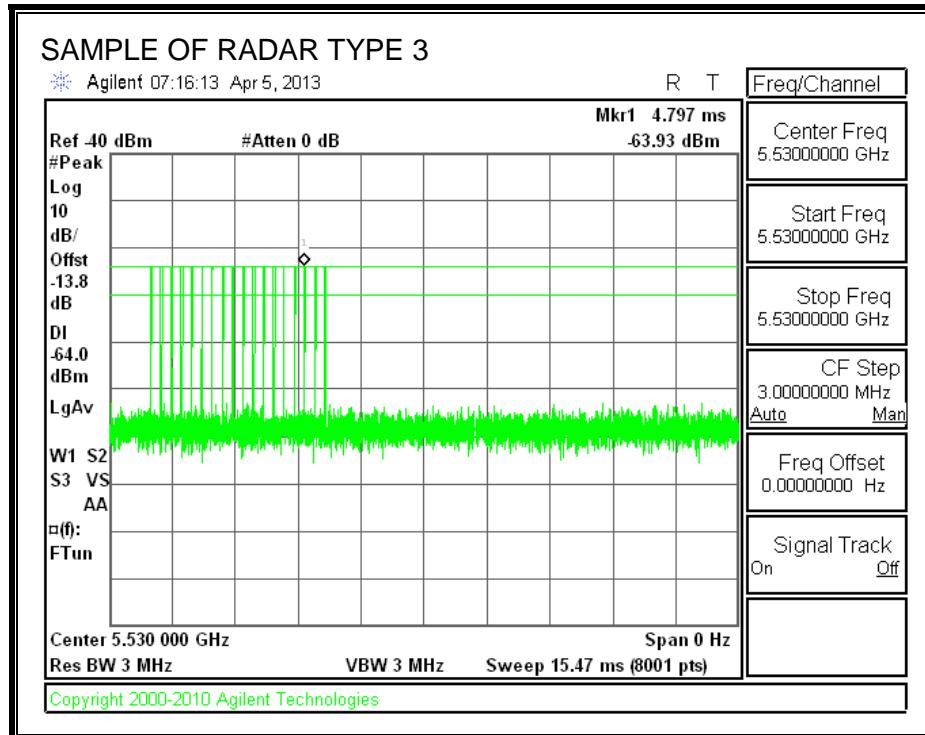
All tests were performed at a channel center frequency of 5530 MHz.

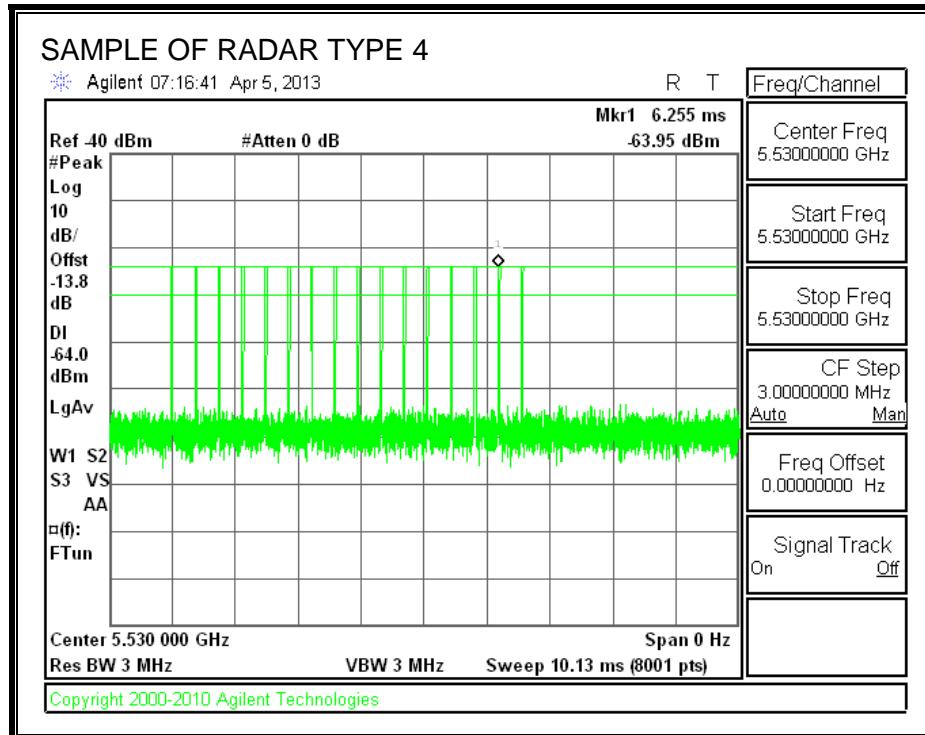
### 11.2.2. RADAR WAVEFORMS AND TRAFFIC

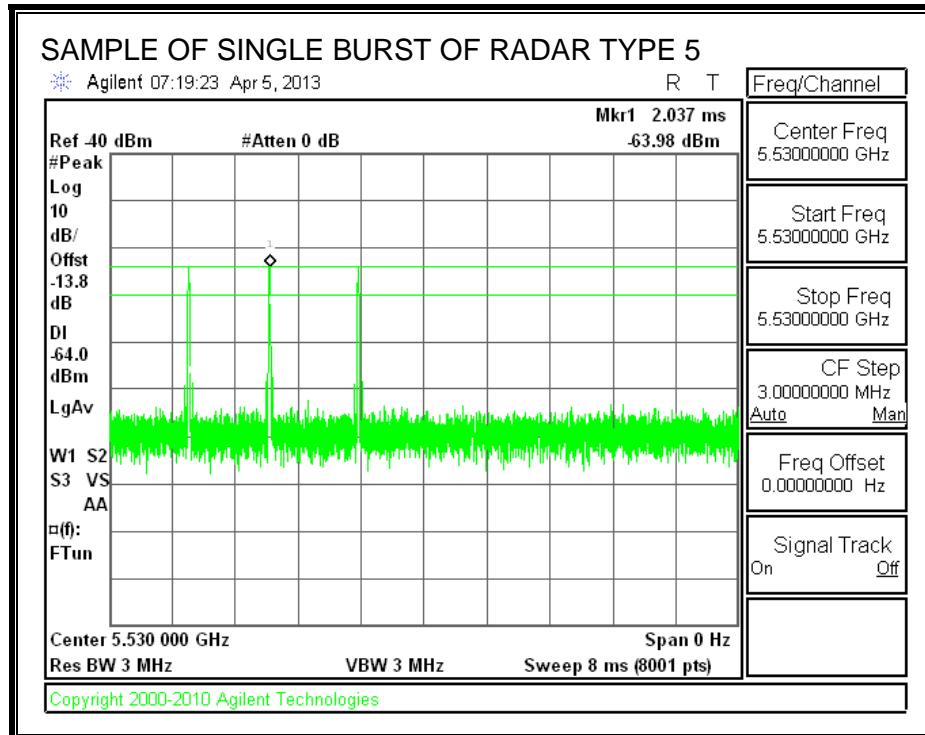
#### RADAR WAVEFORMS

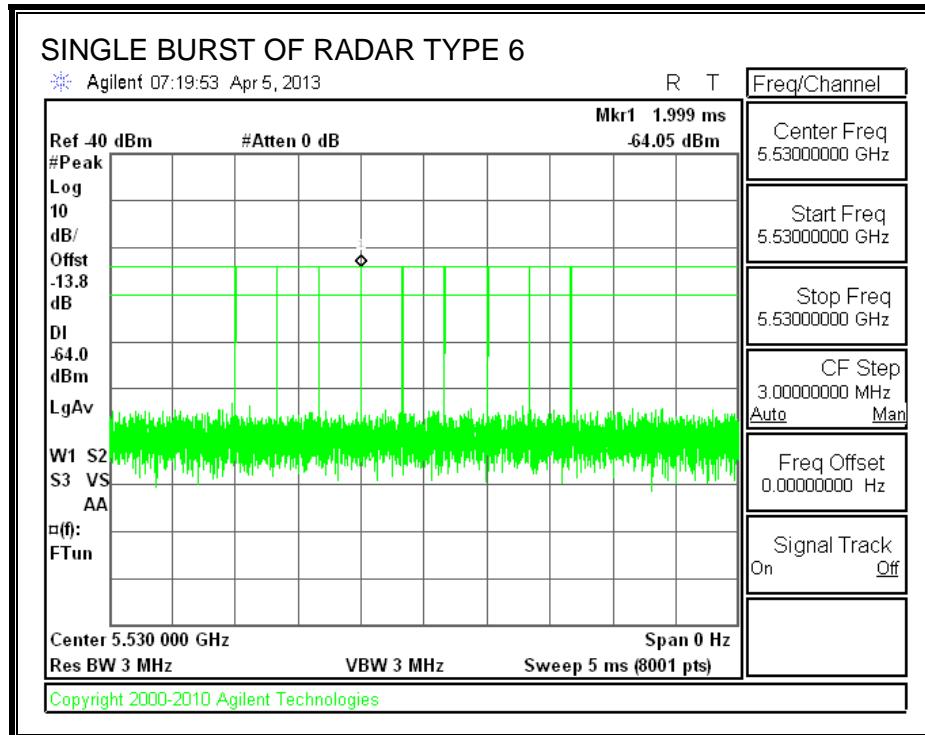




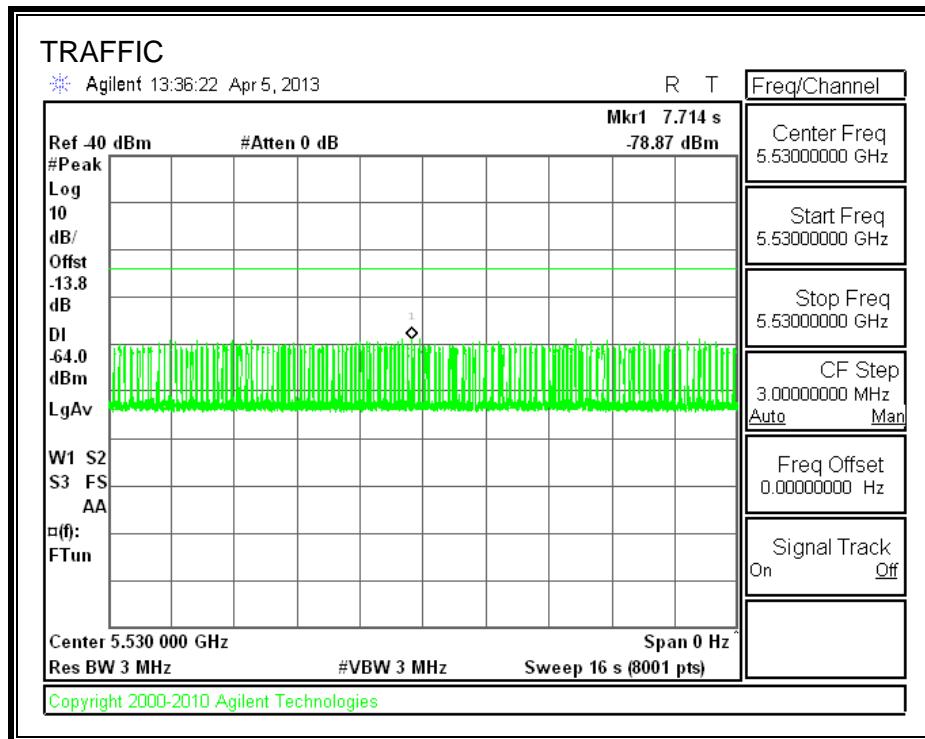








**TRAFFIC**



### 11.2.3. CHANNEL AVAILABILITY CHECK TIME

#### PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

#### PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

## QUANTITATIVE RESULTS

### No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.6	149.7	119.1	59.1

### Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.98	91.6	60.6	1.5

### Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.55	148.4	117.8	58.7

## QUALITATIVE RESULTS

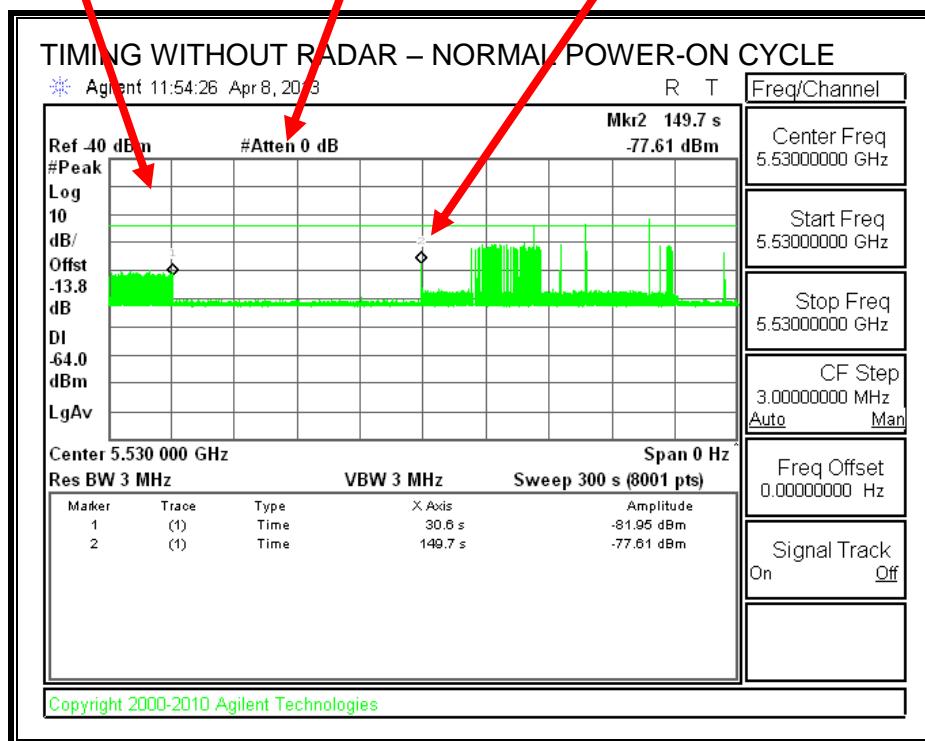
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

### TIMING WITHOUT RADAR DURING CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle

End of Initial Power-up cycle  
Start of CAC

End of CAC  
Traffic is Initiated



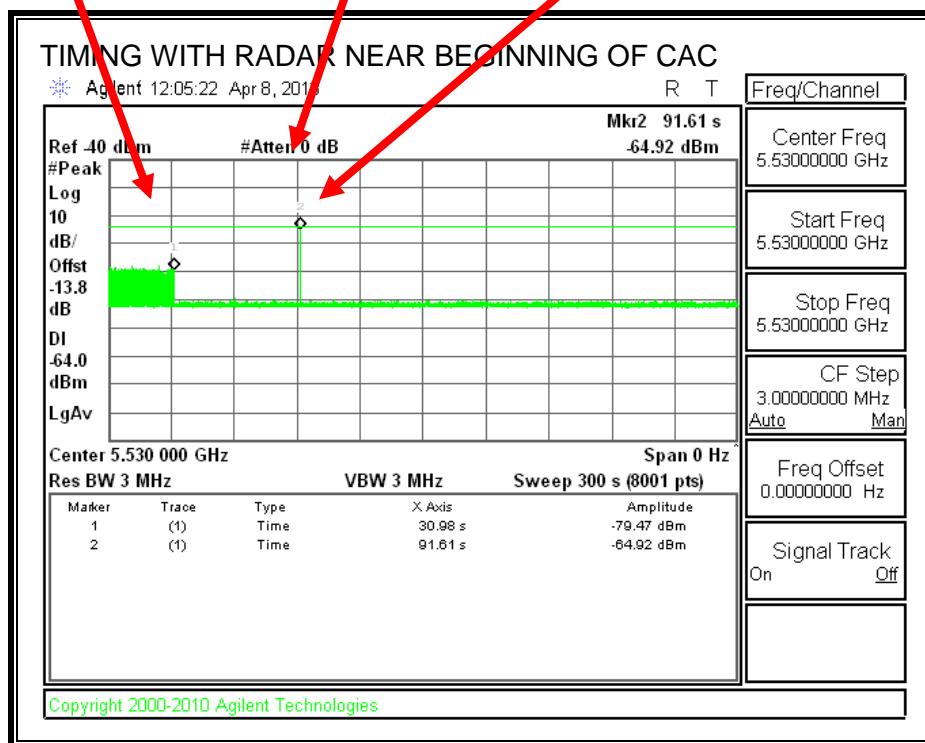
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

### TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle

End of Initial Power-up cycle  
Start of CAC

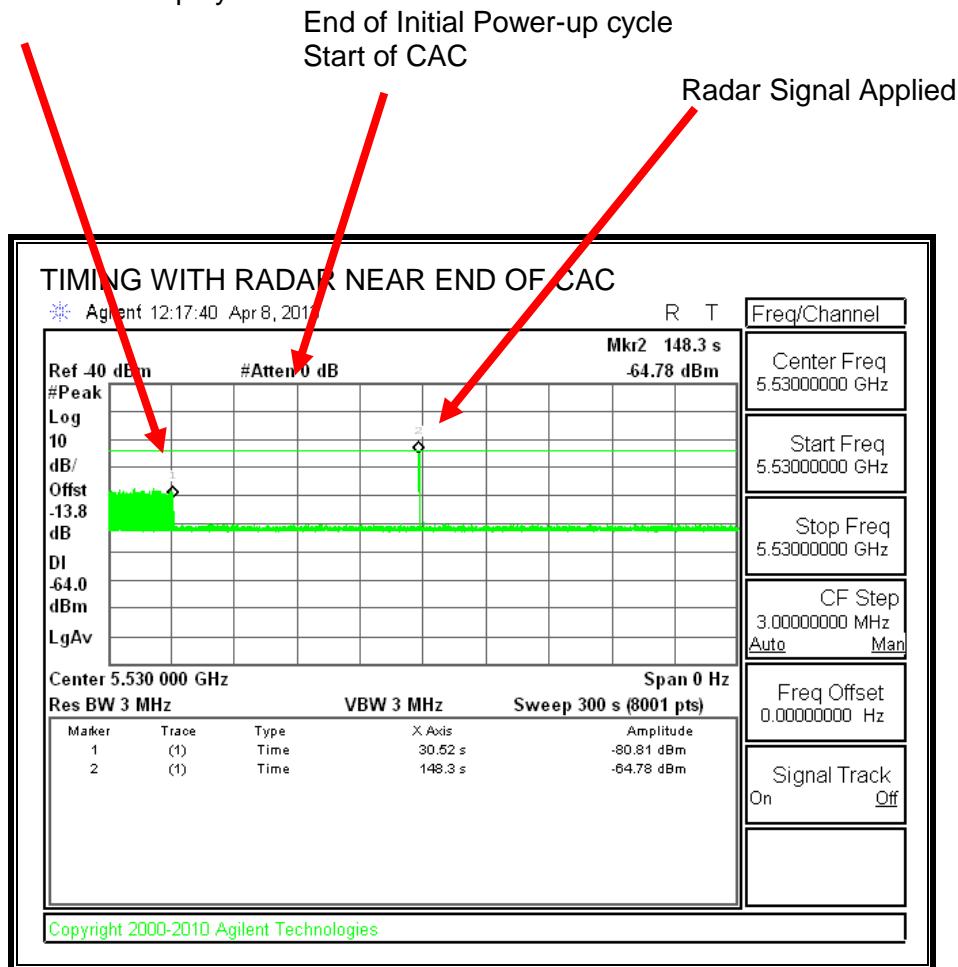
Radar Signal Applied



No EUT transmissions were observed after the radar signal.

### TIMING WITH RADAR NEAR END OF CAC

AP is rebooted  
Traffic ceases  
Start of Initial Power-up cycle



No EUT transmissions were observed after the radar signal.

#### 11.2.4. OVERLAPPING CHANNEL TESTS

##### RESULTS

These tests are not applicable.

#### 11.2.5. MOVE AND CLOSING TIME

##### REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

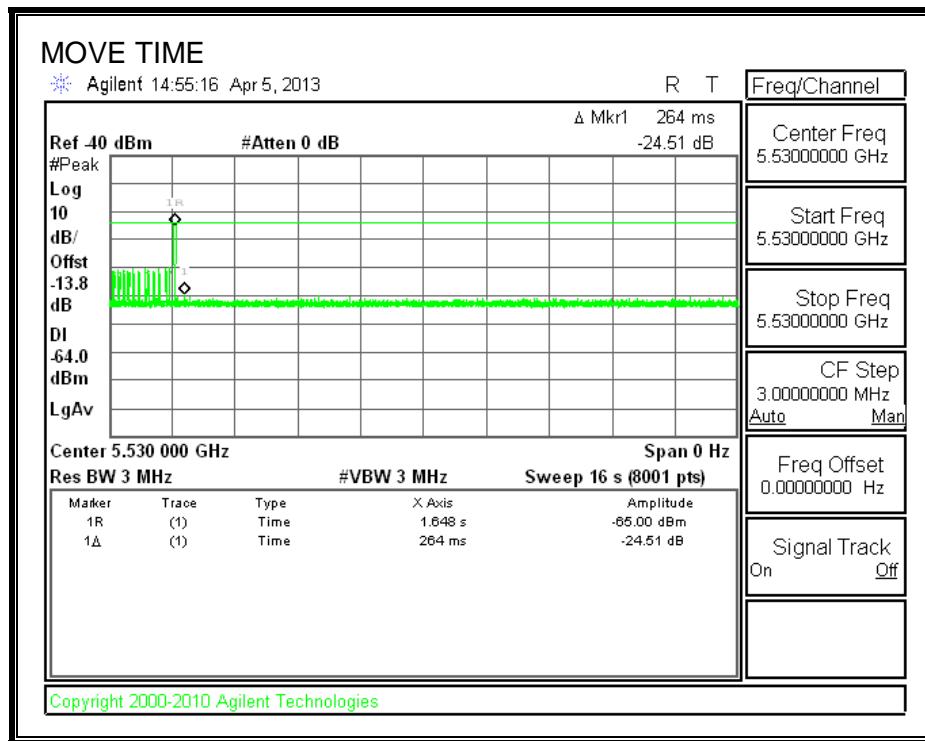
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

##### RESULTS

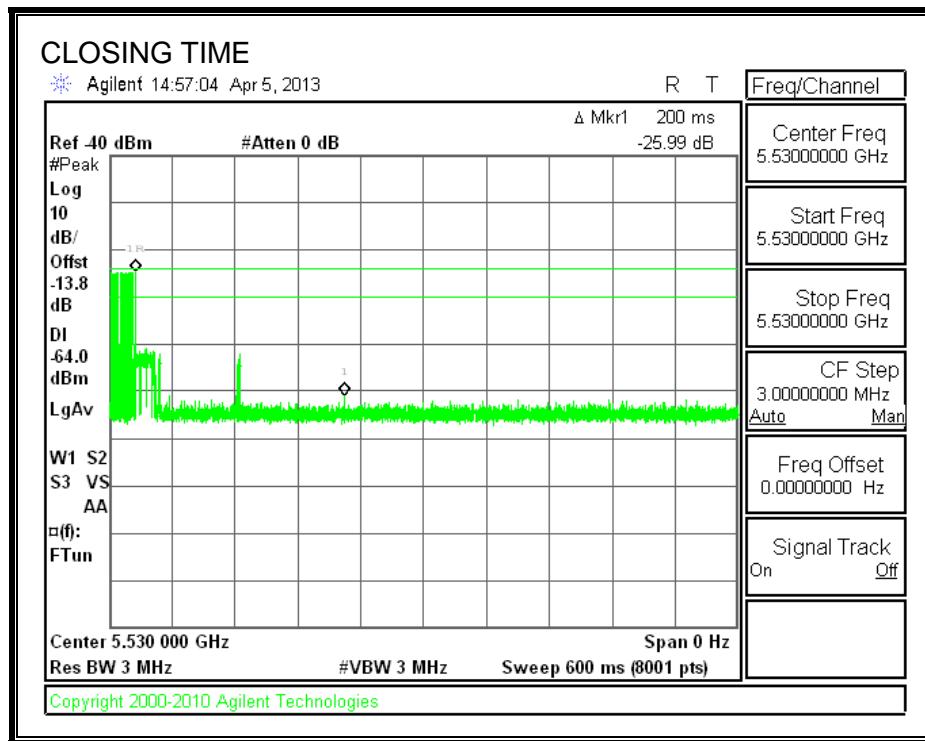
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.264	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	2.0	60
IC	4.0	260

**MOVE TIME**

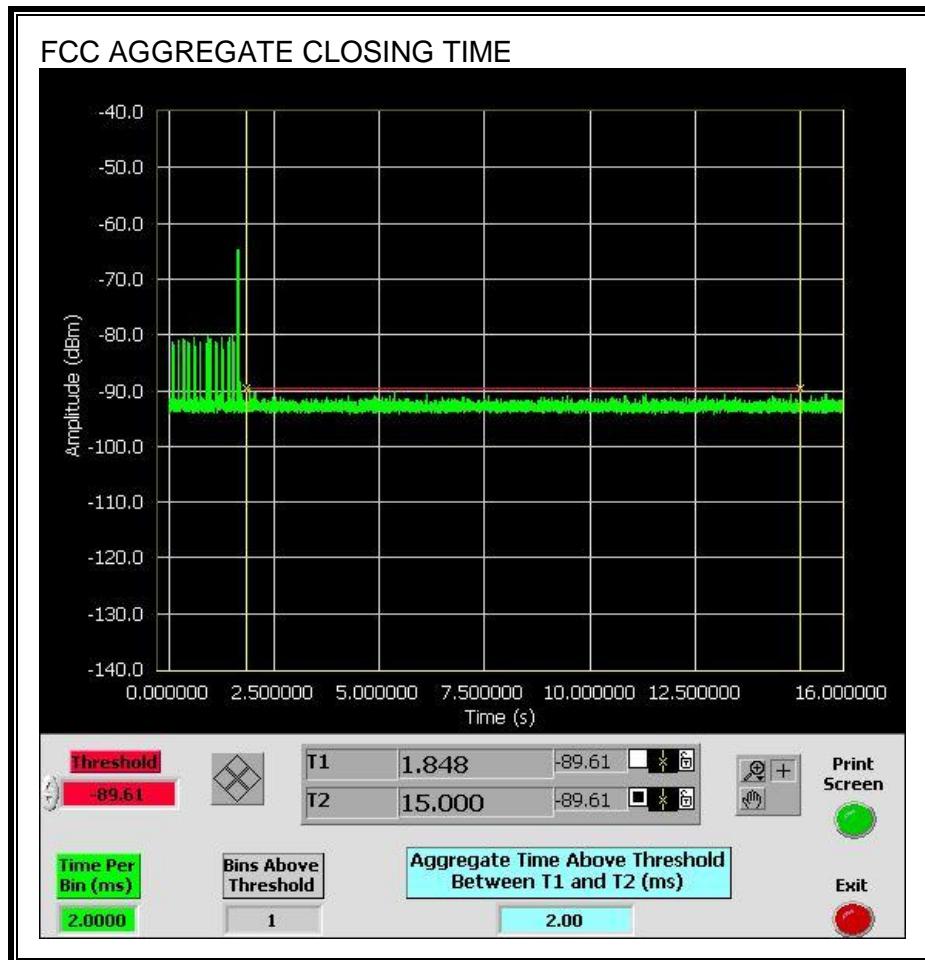


CHANNEL CLOSING TIME

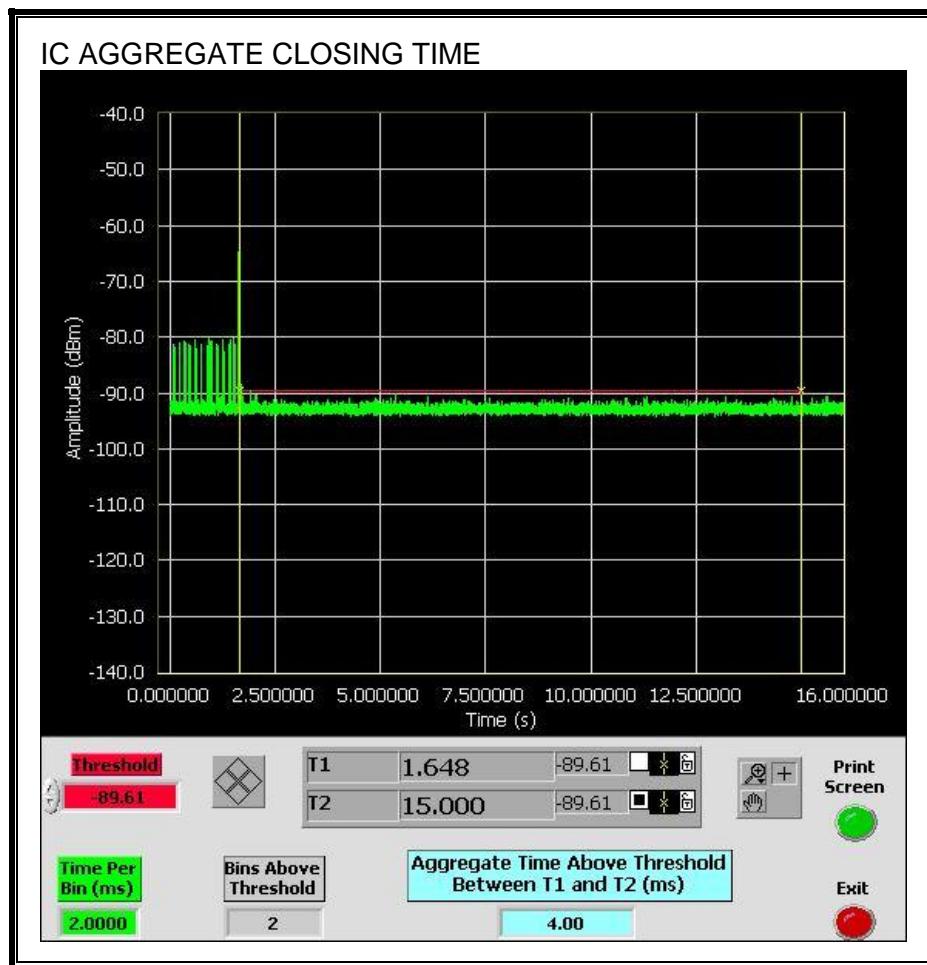


### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the FCC aggregate monitoring period.

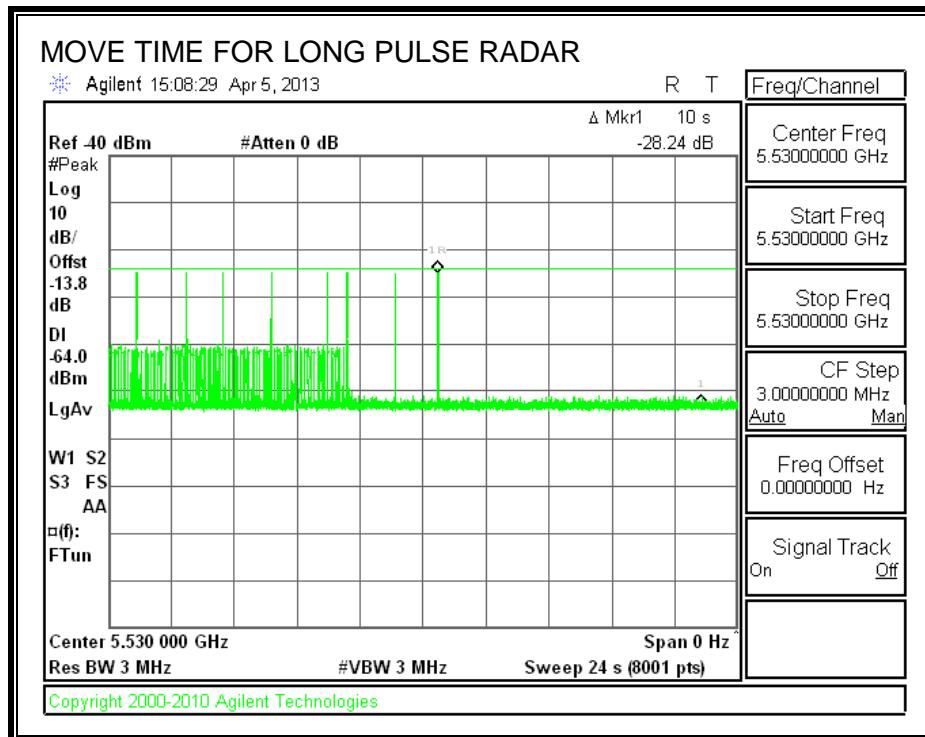


Only intermittent transmissions are observed during the IC aggregate monitoring period.



## LONG PULSE CHANNEL MOVE TIME

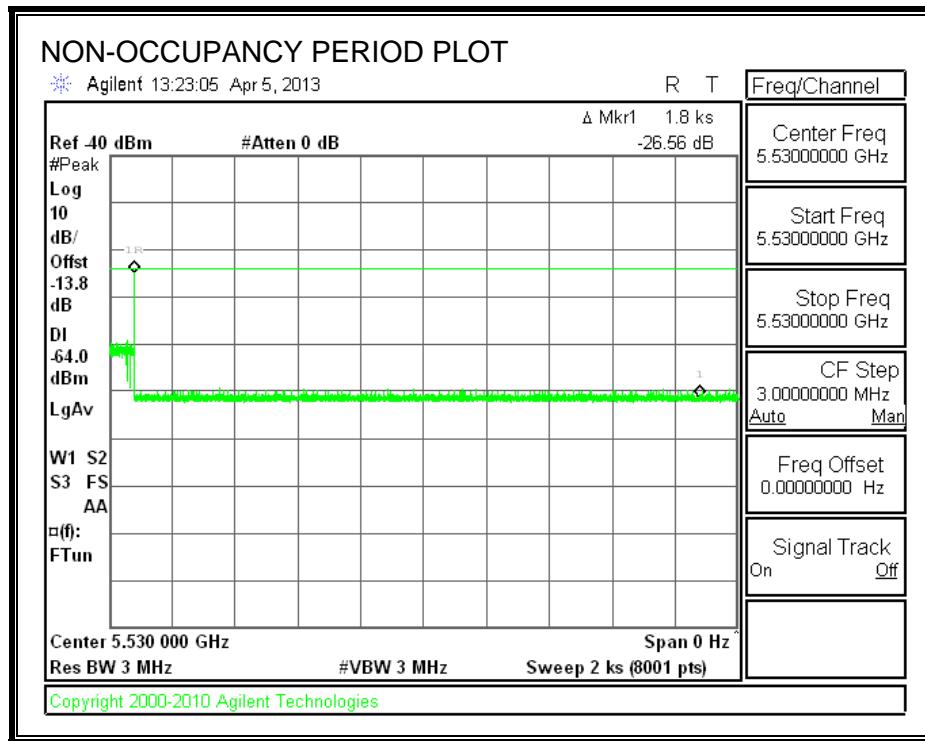
The traffic ceases prior to 10 seconds after the end of the radar waveform.



### 11.2.6. NON-OCCUPANCY PERIOD

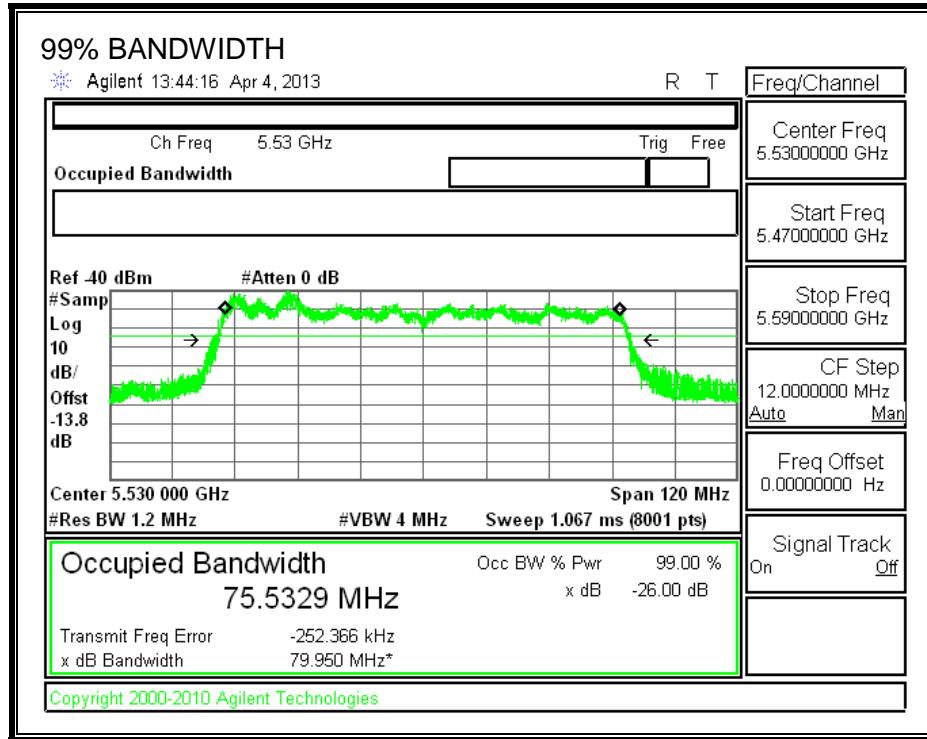
#### RESULTS

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



### 11.2.7. DETECTION BANDWIDTH

#### REFERENCE PLOT OF 99% POWER BANDWIDTH



#### RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5494	5566	72	75.533	95.3	80

**DETECTION BANDWIDTH PROBABILITY**

**DETECTION BANDWIDTH PROBABILITY RESULTS**

<b>Detection Bandwidth Test Results</b>				
<b>FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>				
<b>Frequency (MHz)</b>	<b>Number of Trials</b>	<b>Number Detected</b>	<b>Detection (%)</b>	<b>Mark</b>
5494	10	10	100	FL
5495	10	10	100	
5496	10	10	100	
5497	10	10	100	
5498	10	10	100	
5499	10	10	100	
5500	10	10	100	
5501	10	10	100	
5502	10	10	100	
5503	10	10	100	
5504	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	
5510	10	10	100	
5511	10	10	100	
5512	10	10	100	
5513	10	10	100	
5514	10	10	100	
5515	10	10	100	
5516	10	10	100	
5517	10	10	100	
5518	10	10	100	
5519	10	10	100	
5520	10	10	100	
5521	10	10	100	
5522	10	10	100	
5523	10	10	100	
5524	10	10	100	
5525	10	10	100	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	
5529	10	10	100	

**DETECTION BANDWIDTH PROBABILITY (CONTINUED)**

**DETECTION BANDWIDTH PROBABILITY RESULTS**

5530	10	10	100	
5531	10	10	100	
5532	10	10	100	
5533	10	10	100	
5534	10	10	100	
5535	10	10	100	
5536	10	10	100	
5537	10	10	100	
5538	10	10	100	
5539	10	10	100	
5540	10	10	100	
5541	10	10	100	
5542	10	10	100	
5543	10	10	100	
5544	10	10	100	
5545	10	10	100	
5546	10	10	100	
5547	10	10	100	
5548	10	10	100	
5549	10	10	100	
5550	10	10	100	
5551	10	10	100	
5552	10	10	100	
5553	10	10	100	
5554	10	10	100	
5555	10	10	100	
5556	10	10	100	
5557	10	10	100	
5558	10	10	100	
5559	10	10	100	
5560	10	10	100	
5561	10	10	100	
5562	10	10	100	
5563	10	10	100	
5564	10	10	100	
5565	10	10	100	
5566	10	10	100	FH

### 11.2.8. IN-SERVICE MONITORING

#### RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	90.00	60	Pass
FCC Short Pulse Type 2	30	93.33	60	Pass
FCC Short Pulse Type 3	30	80.00	60	Pass
FCC Short Pulse Type 4	30	80.00	60	Pass
Aggregate		85.83	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	73	100.00	70	Pass

**TYPE 1 DETECTION PROBABILITY**

<b>Data Sheet for FCC Short Pulse Radar Type 1</b>	
<b>1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	No
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	No
27	Yes
28	No
29	Yes
30	Yes

**TYPE 2 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	3.6	151.00	27	Yes
2002	4	164.00	23	Yes
2003	4.9	200.00	28	Yes
2004	2.2	180.00	29	Yes
2005	4.4	180.00	28	Yes
2006	2.5	165.00	26	Yes
2007	3.5	166.00	24	Yes
2008	1.1	169.00	27	Yes
2009	2.3	150.00	27	Yes
2010	2.8	159.00	25	Yes
2011	2.5	152.00	25	Yes
2012	2.8	194.00	25	Yes
2013	1.2	220.00	28	Yes
2014	2.8	199.00	25	Yes
2015	1	191.00	26	Yes
2016	2.8	186.00	27	Yes
2017	1	182.00	29	Yes
2018	1.1	192.00	28	Yes
2019	3.1	198.00	23	Yes
2020	1.3	176.00	26	Yes
2021	4.5	221.00	28	Yes
2022	3.5	152.00	29	No
2023	2.3	168.00	29	Yes
2024	1.1	189.00	23	Yes
2025	2.8	171.00	26	Yes
2026	4.6	220.00	23	Yes
2027	2	188.00	29	Yes
2028	2.7	224.00	28	Yes
2029	1.7	152.00	24	No
2030	1.9	207.00	27	Yes

**TYPE 3 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.1	326.00	18	No
3002	5.2	500.00	17	Yes
3003	6	445.00	16	Yes
3004	7.9	316.00	17	Yes
3005	7.5	471.00	18	No
3006	9.2	262.00	18	No
3007	7.7	423.00	16	Yes
3008	7.9	364.00	18	Yes
3009	5.5	252.00	16	Yes
3010	6.8	432.00	18	Yes
3011	8	333.00	17	Yes
3012	6.7	443.00	17	No
3013	6	417.00	16	Yes
3014	5.4	391.00	18	Yes
3015	5	293.00	16	Yes
3016	9.9	251.00	17	Yes
3017	8.6	353.00	16	Yes
3018	9.1	489.00	18	Yes
3019	8.2	414.00	17	No
3020	9.3	420.00	17	Yes
3021	5.1	346.00	17	No
3022	9.1	282.00	17	Yes
3023	6.8	434.00	16	Yes
3024	7.8	397.00	18	Yes
3025	7.3	332.00	17	Yes
3026	7.2	398.00	16	Yes
3027	9.2	266.00	17	Yes
3028	6.9	443.00	17	Yes
3029	6.5	450	18	Yes
3030	6.2	317	16	Yes

**TYPE 4 DETECTION PROBABILITY**

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	16	427.00	13	Yes
4002	19.8	252.00	15	Yes
4003	19.6	284.00	14	Yes
4004	15.7	278.00	15	Yes
4005	12.5	260.00	12	No
4006	14.8	429.00	12	No
4007	13.5	351.00	15	No
4008	14.8	323.00	12	No
4009	12.1	434.00	12	Yes
4010	17.1	446.00	15	Yes
4011	16.5	316.00	15	Yes
4012	15.5	300.00	13	Yes
4013	14.6	470.00	14	Yes
4014	11.2	381.00	16	Yes
4015	13.4	358.00	15	Yes
4016	13.3	441.00	16	No
4017	18.9	280.00	12	Yes
4018	18.8	316.00	16	Yes
4019	15.6	371.00	15	Yes
4020	19.3	452.00	16	Yes
4021	12.2	480.00	15	Yes
4022	19.2	491.00	13	Yes
4023	15.3	346.00	12	Yes
4024	13.7	361.00	13	Yes
4025	15.8	476.00	16	Yes
4026	19.6	467.00	14	Yes
4027	17.4	285.00	14	No
4028	18.5	459.00	14	Yes
4029	10.4	338.00	12	Yes
4030	14.1	428.00	14	Yes

**TYPE 5 DETECTION PROBABILITY**

<b>Data Sheet for FCC Long Pulse Radar Type 5</b>	
<b>Trial</b>	<b>Successful Detection (Yes/No)</b>
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

**TYPE 6 DETECTION PROBABILITY**

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	87	5494	15	Yes
2	562	5495	19	Yes
3	1037	5496	17	Yes
4	1512	5497	18	Yes
5	1987	5498	15	Yes
6	2462	5499	18	Yes
7	2937	5500	15	Yes
8	3412	5501	17	Yes
9	3887	5502	15	Yes
10	4362	5503	12	Yes
11	4837	5504	13	Yes
12	5312	5505	17	Yes
13	5787	5506	19	Yes
14	6262	5507	15	Yes
15	6737	5508	13	Yes
16	7212	5509	14	Yes
17	7687	5510	9	Yes
18	8162	5511	19	Yes
19	8637	5512	16	Yes
20	9112	5513	19	Yes
21	9587	5514	15	Yes
22	10062	5515	14	Yes
23	10537	5516	14	Yes
24	11012	5517	9	Yes
25	11487	5518	15	Yes
26	11962	5519	19	Yes
27	12437	5520	12	Yes
28	12912	5521	20	Yes
29	13387	5522	21	Yes
30	13862	5523	15	Yes
31	14337	5524	15	Yes
32	14812	5525	13	Yes
33	15287	5526	19	Yes
34	15762	5527	14	Yes

**TYPE 6 DETECTION PROBABILITY (CONTINUED)**

36	16894	5529	17	Yes
37	17369	5530	13	Yes
38	17844	5531	15	Yes
39	18319	5532	14	Yes
40	18794	5533	15	Yes
41	19269	5534	14	Yes
42	19744	5535	20	Yes
43	20219	5536	15	Yes
44	20694	5537	21	Yes
45	21169	5538	17	Yes
46	21644	5539	19	Yes
47	22119	5540	15	Yes
48	22594	5541	20	Yes
49	23069	5542	18	Yes
50	23544	5543	22	Yes
51	24019	5544	9	Yes
52	24494	5545	5	Yes
53	24969	5546	14	Yes
54	25444	5547	16	Yes
55	25919	5548	11	Yes
56	26394	5549	13	Yes
57	26869	5550	14	Yes
58	27344	5551	24	Yes
59	27819	5552	13	Yes
60	28294	5553	16	Yes
61	28769	5554	13	Yes
62	29244	5555	13	Yes
63	29719	5556	15	Yes
64	30194	5557	18	Yes
65	30669	5558	13	Yes
66	31144	5559	13	Yes
67	31619	5560	13	Yes
68	32094	5561	19	Yes
69	32569	5562	12	Yes
70	-32492	5563	13	Yes
71	-32017	5564	21	Yes
72	-31542	5565	10	Yes
73	-31067	5566	12	Yes