

**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 3TX 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

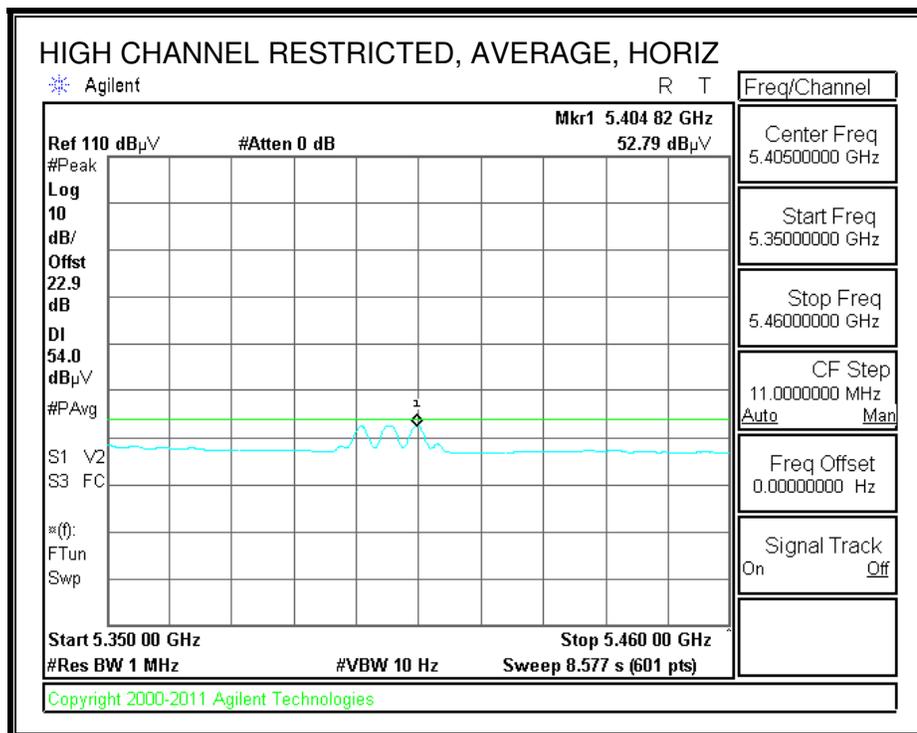
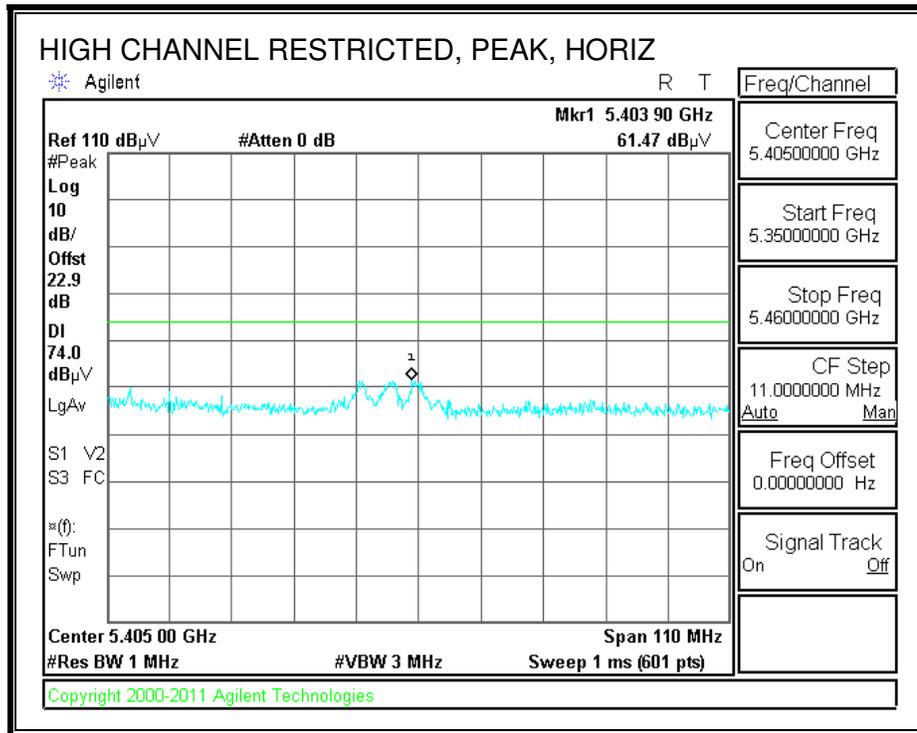
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5260 MHz 3TX CDD</b>													
15.780	3.0	33.8	38.2	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.780	3.0	23.3	38.2	13.1	-31.9	0.0	0.7	43.5	54.0	-10.5	V	A	
15.780	3.0	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 3TX 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 3TX 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	

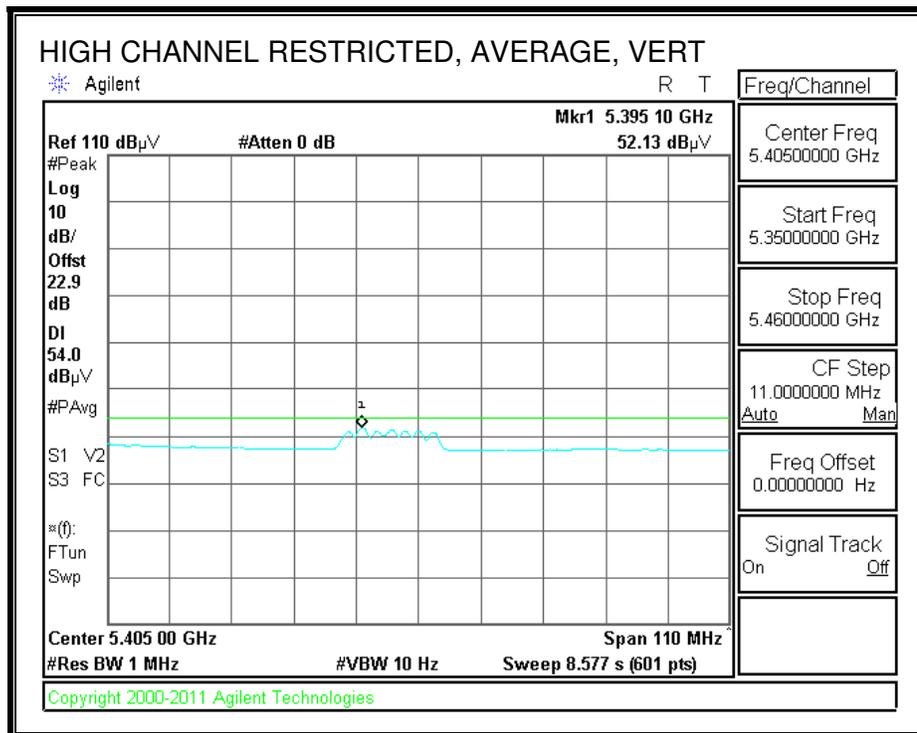
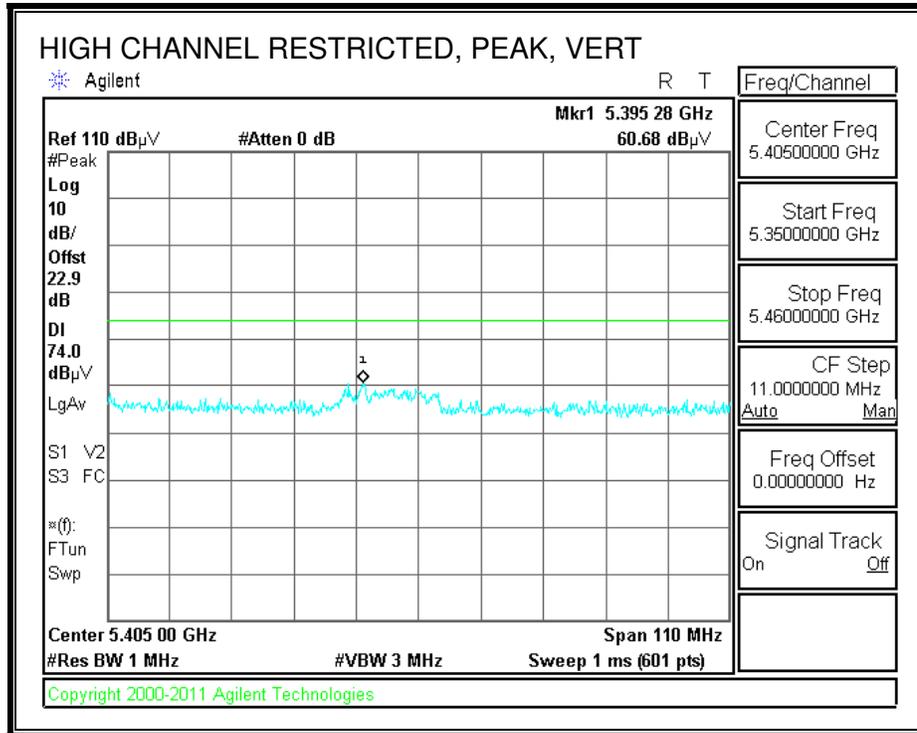
Rev. 4.1.2.7

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 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: HT20 3TX 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

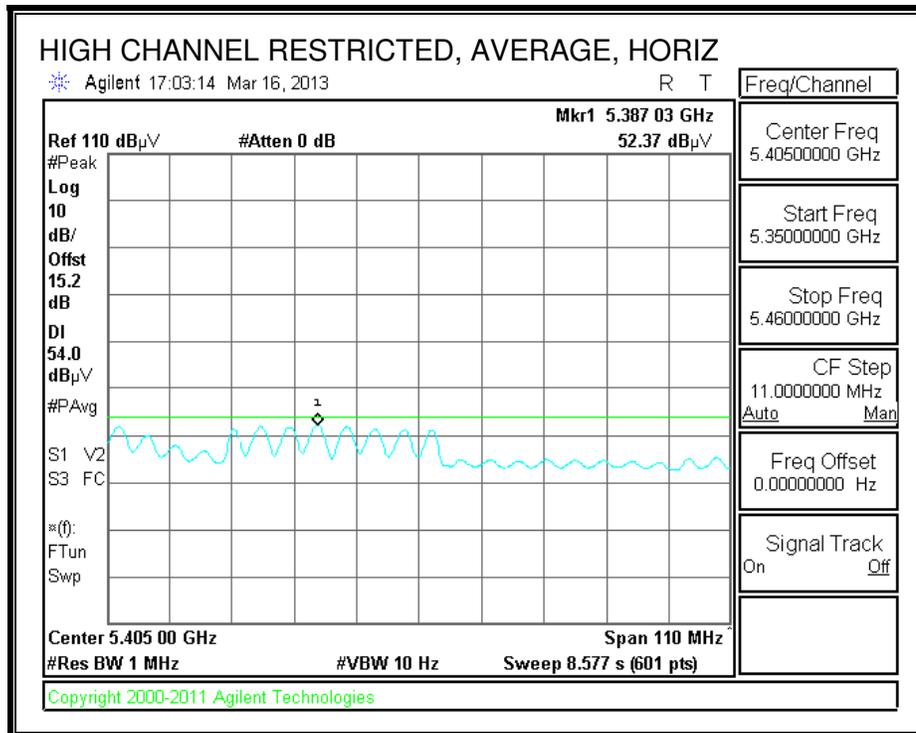
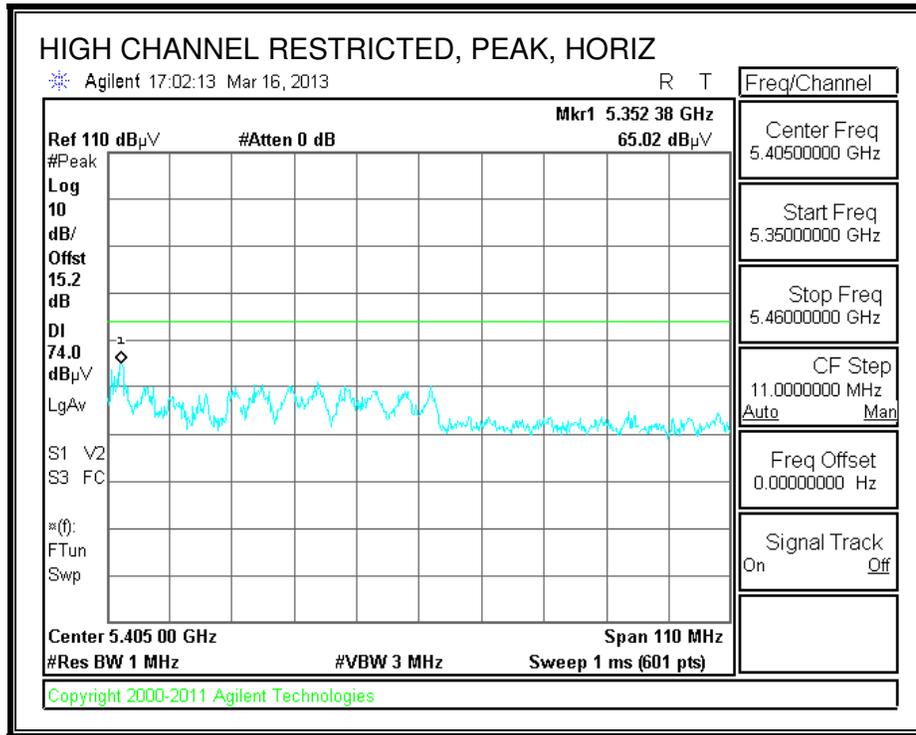
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5260 MHz 3TX CDD</b>													
15.780	3.0	33.8	38.2	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.780	3.0	23.3	38.2	13.1	-31.9	0.0	0.7	43.5	54.0	-10.5	V	A	
15.780	3.0	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 3TX 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 3TX 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	

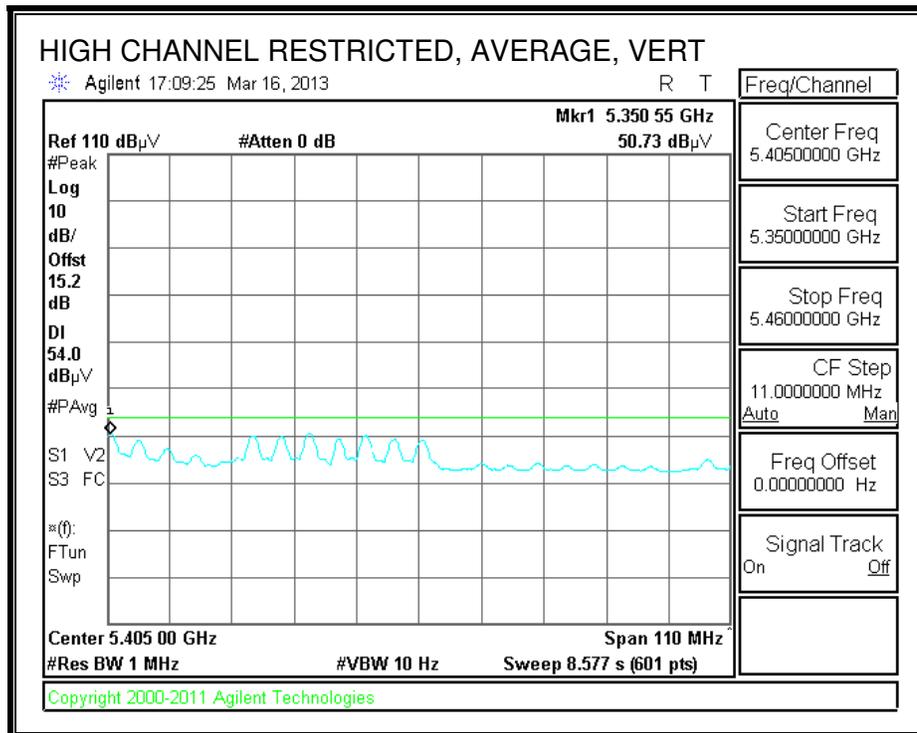
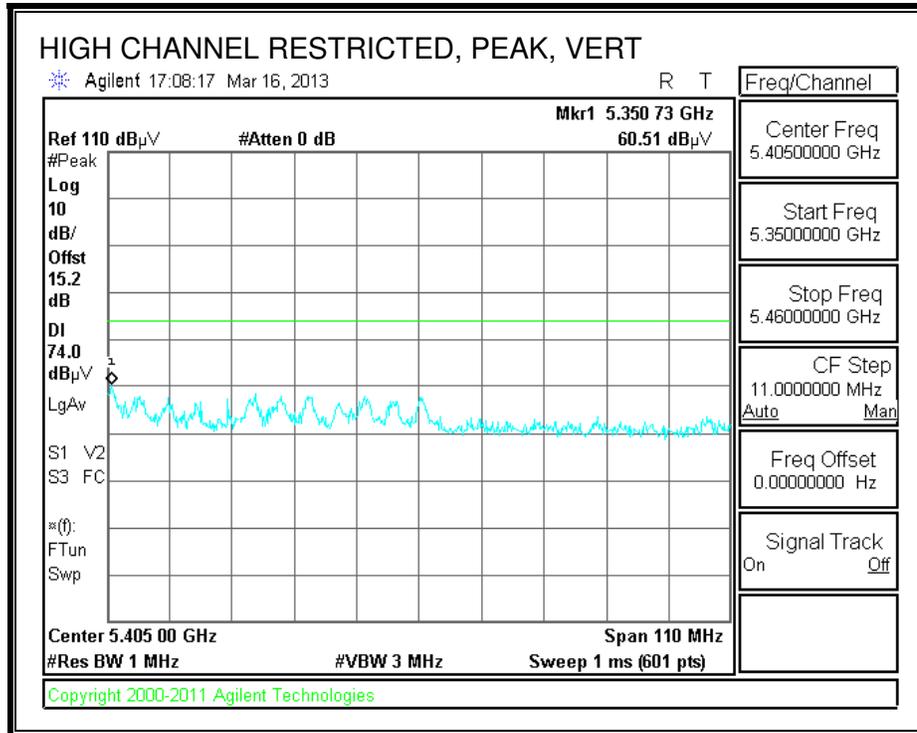
Rev. 4.1.2.7

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 3TX 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

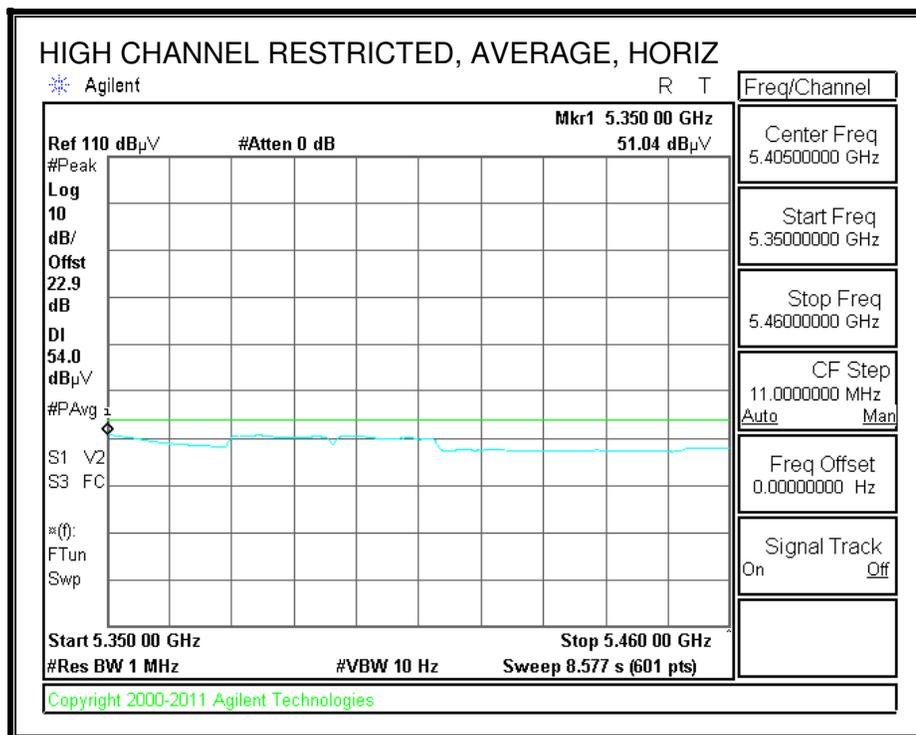
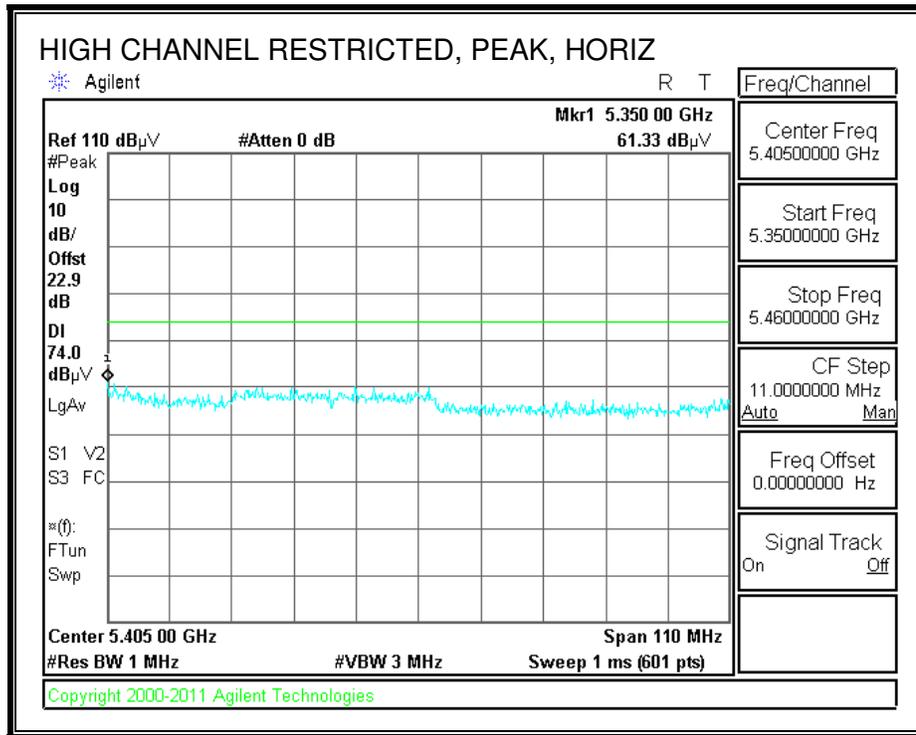
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3TX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	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 3TX 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	

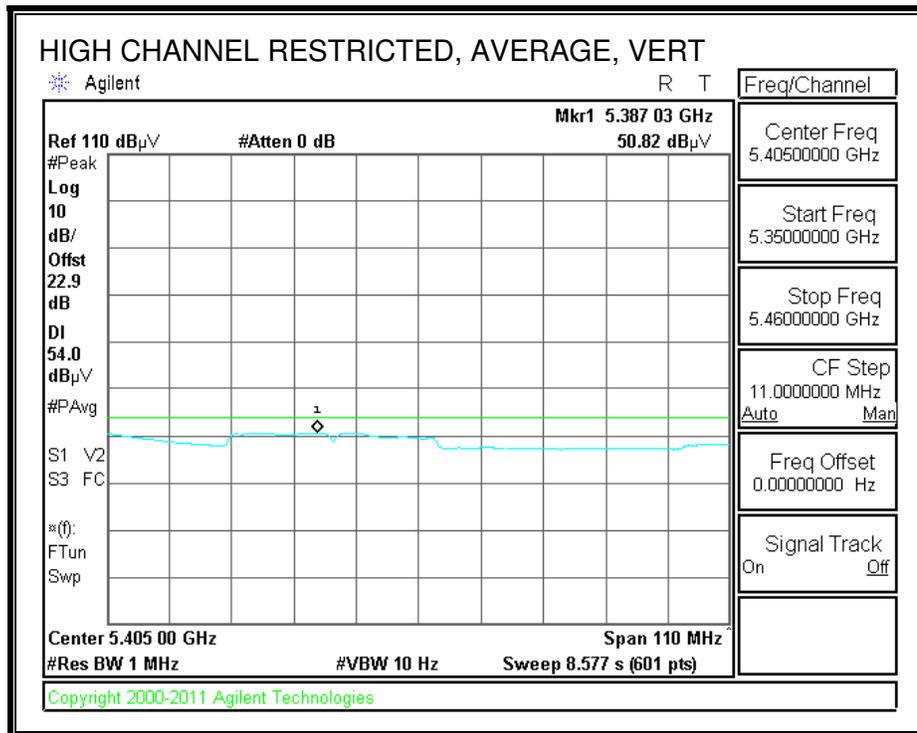
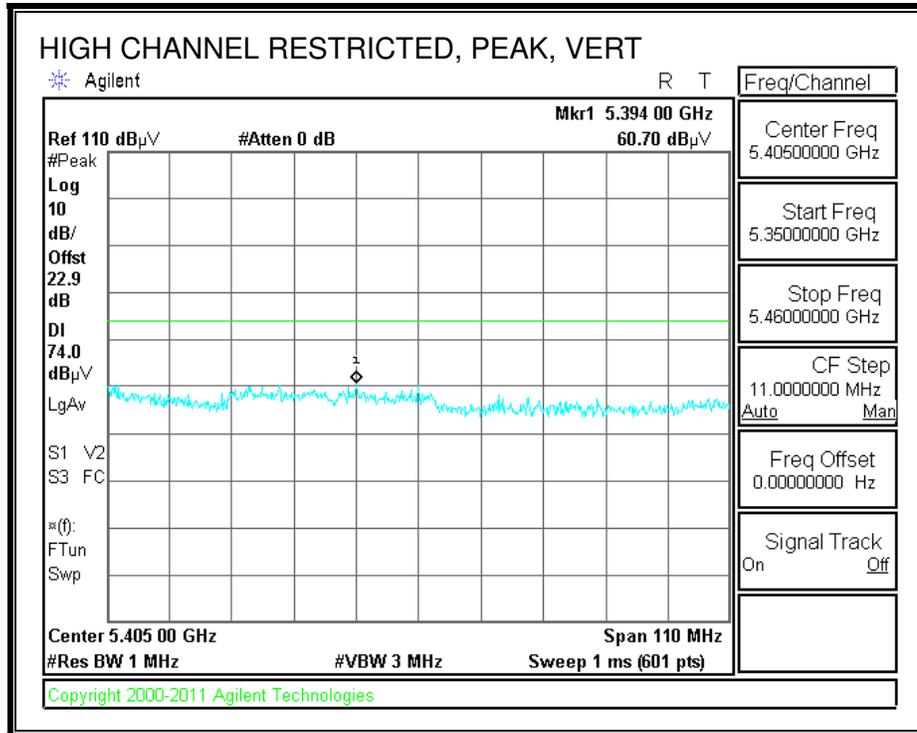
Rev. 4.1.2.7

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

### 9.2.18. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX 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: HT40 3TX 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

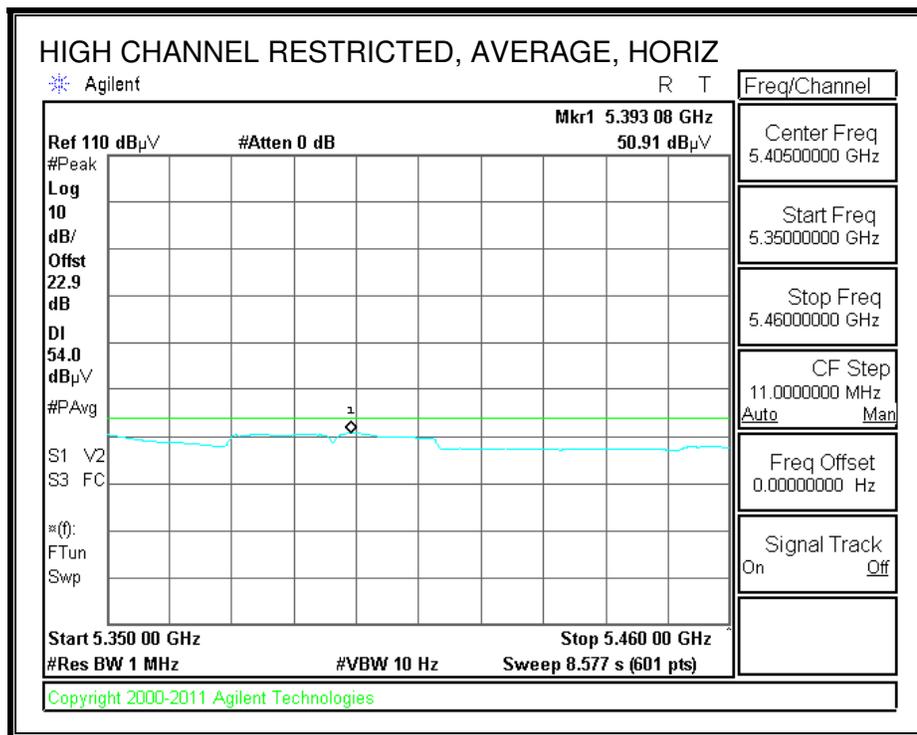
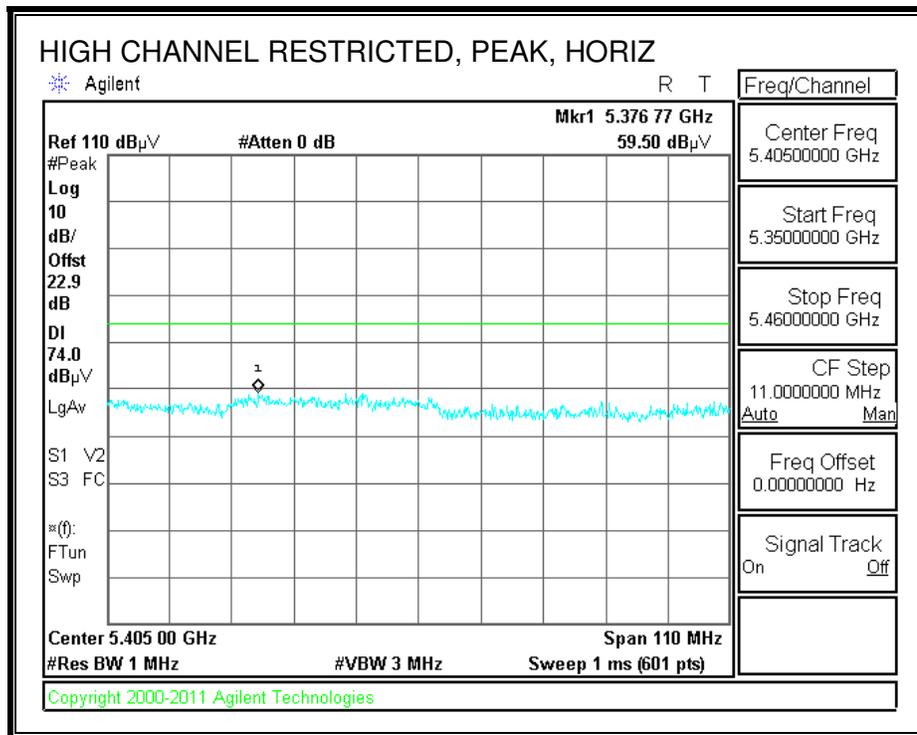
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3TX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	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 3TX 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	

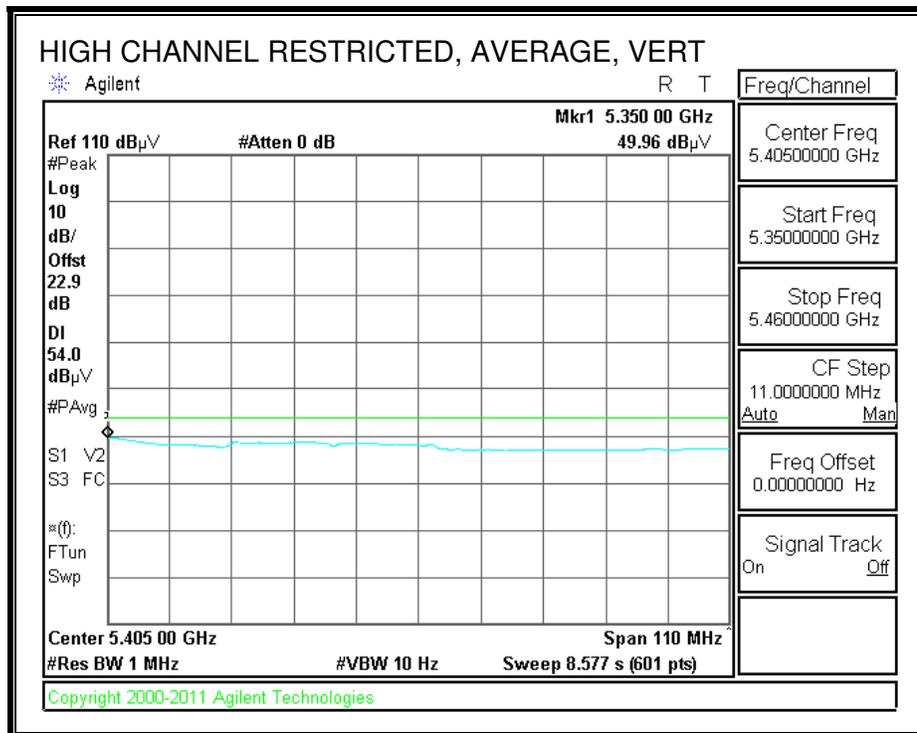
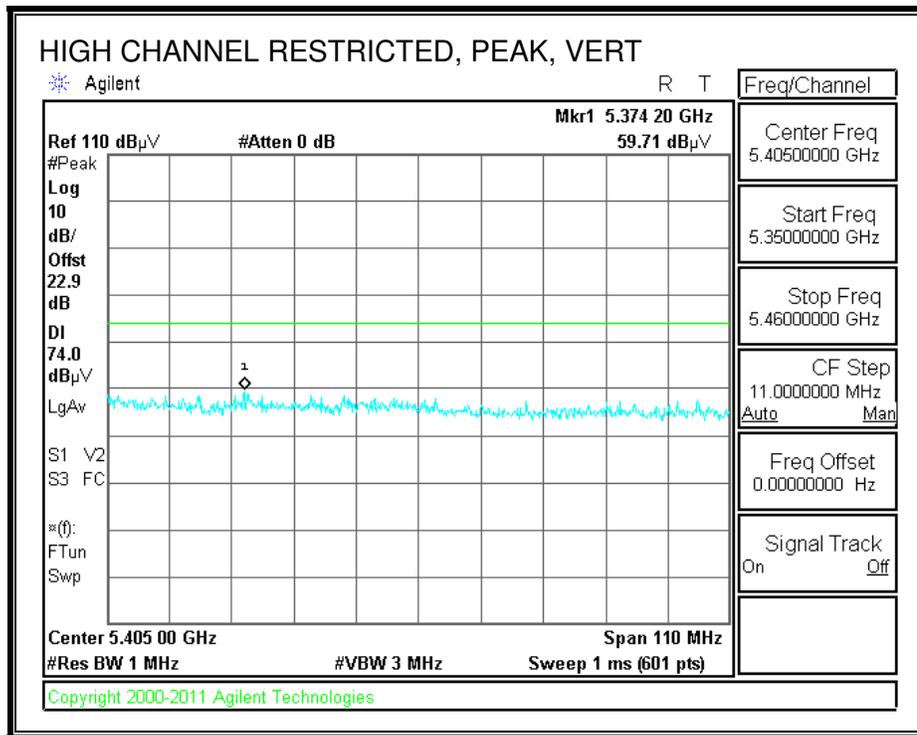
Rev. 4.1.2.7

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 3TX 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

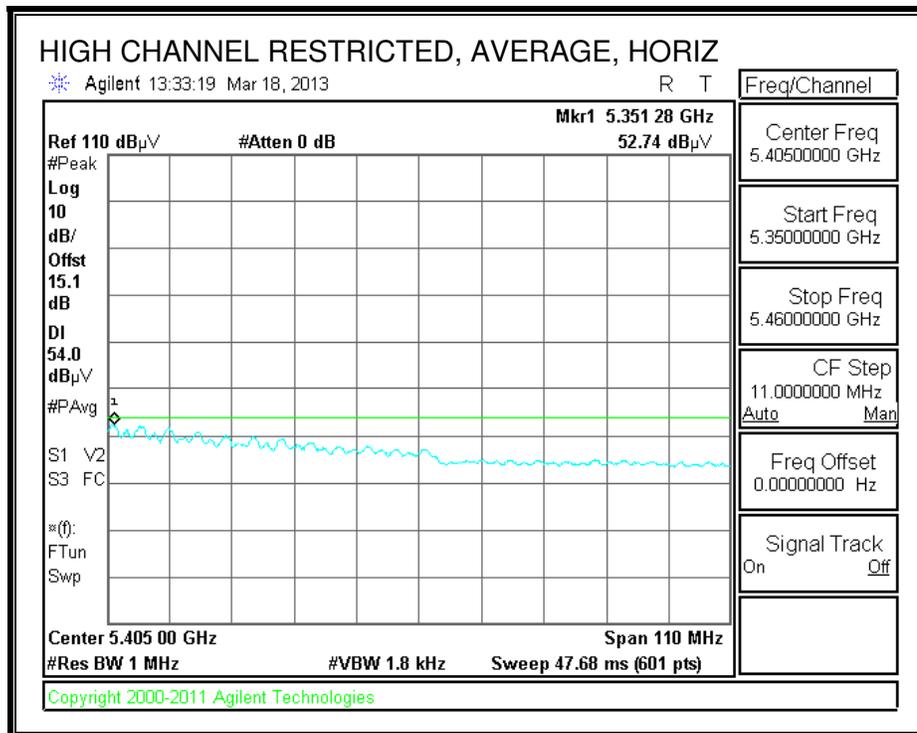
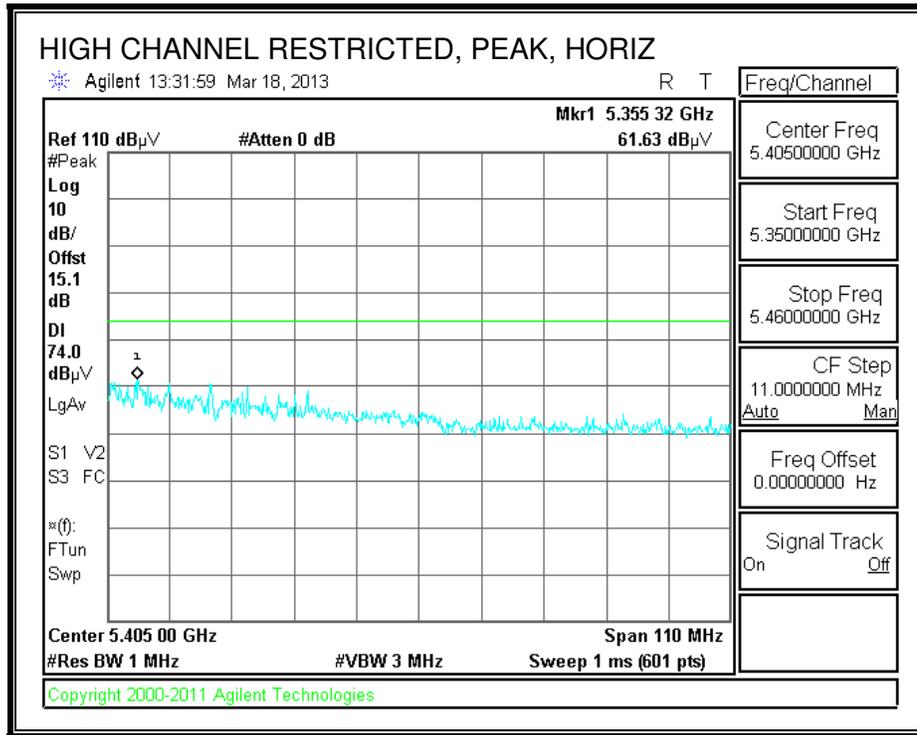
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5270 MHz 3TX CDD</b>													
15.810	3.0	33.9	38.1	13.1	-31.9	0.0	0.7	53.9	74.0	-20.1	V	P	
15.810	3.0	24.5	38.1	13.1	-31.9	0.0	0.7	44.5	54.0	-9.5	V	A	
15.810	3.0	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 3TX 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	

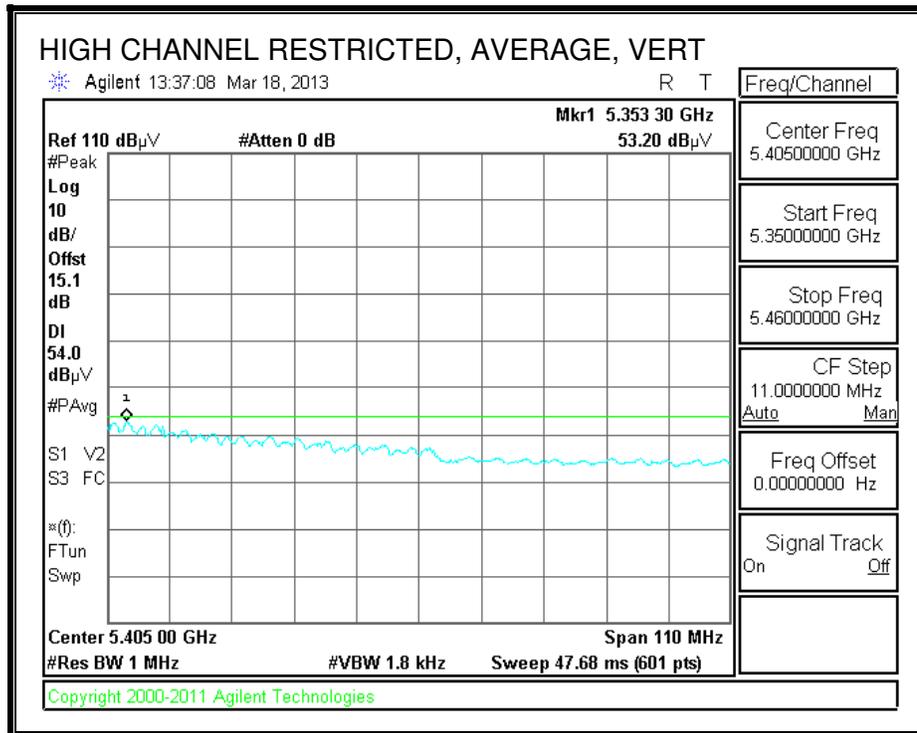
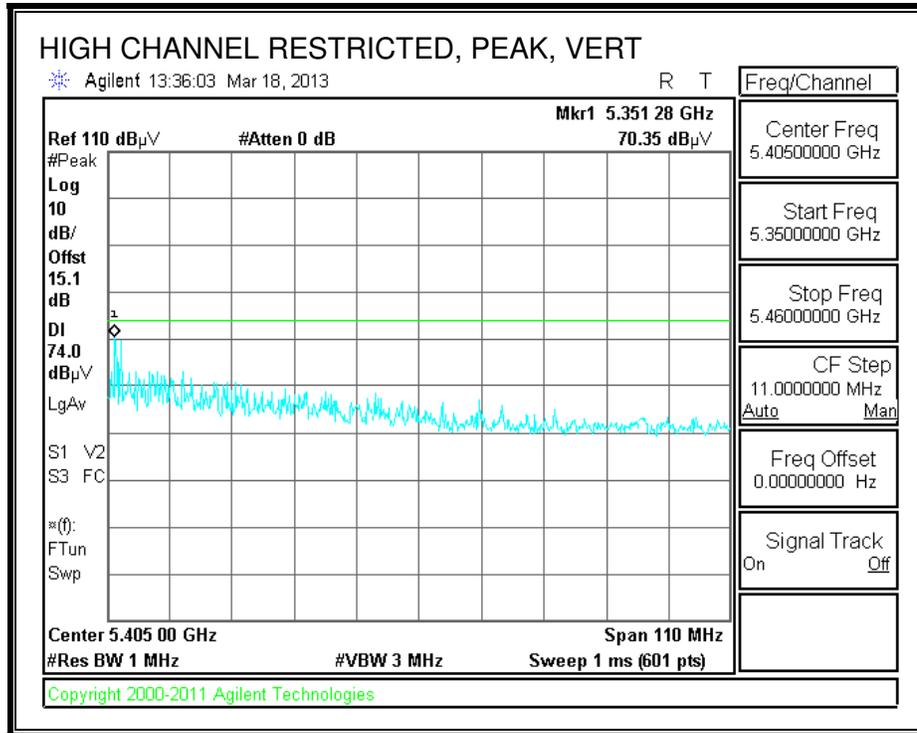
Rev. 4.1.2.7

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

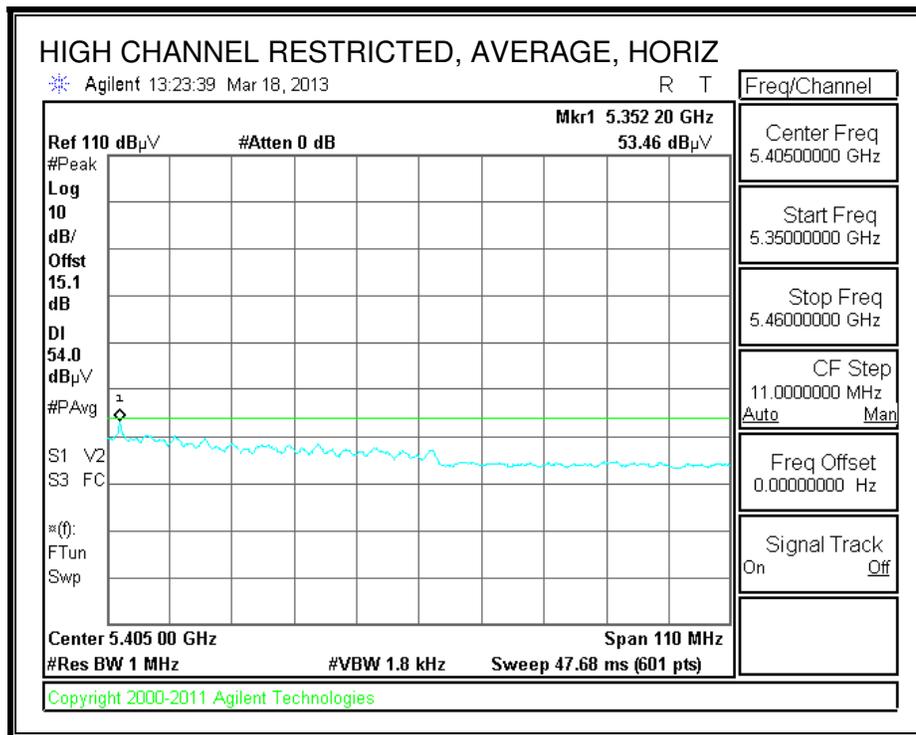
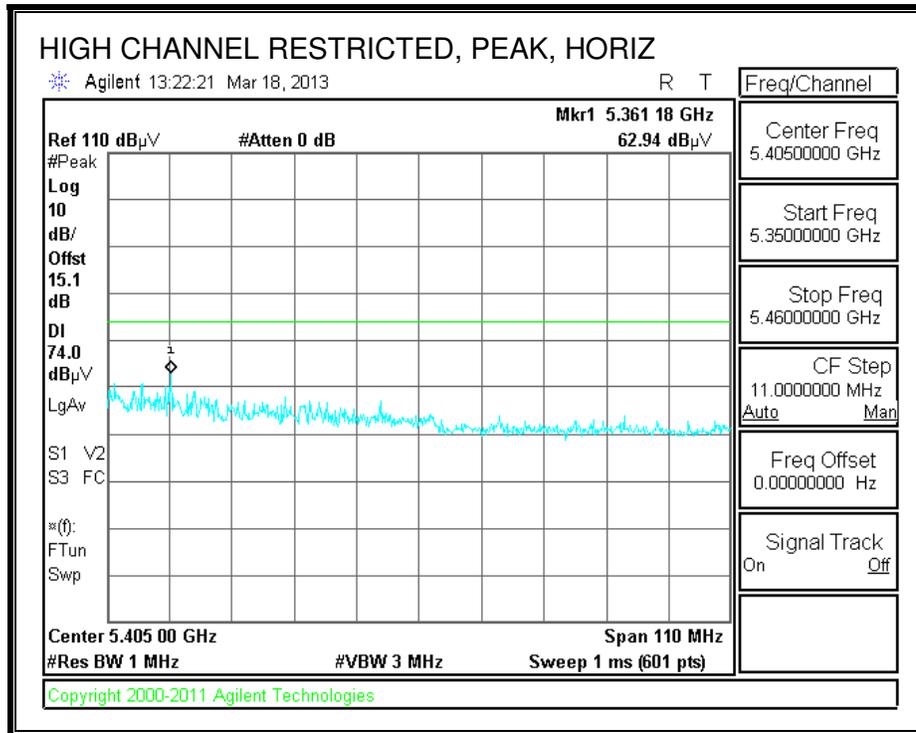
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	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	

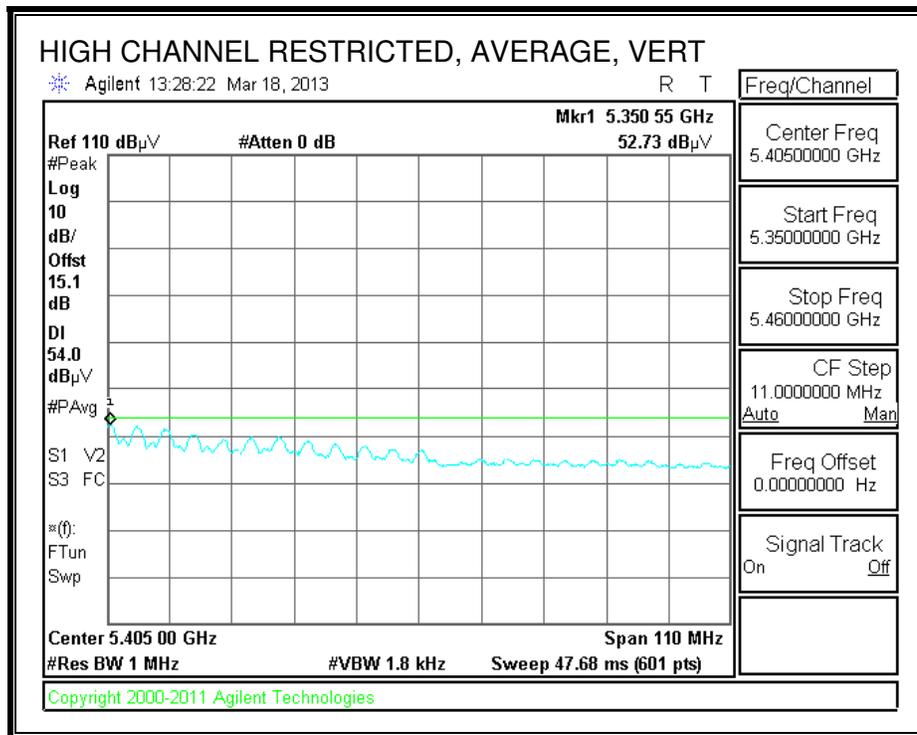
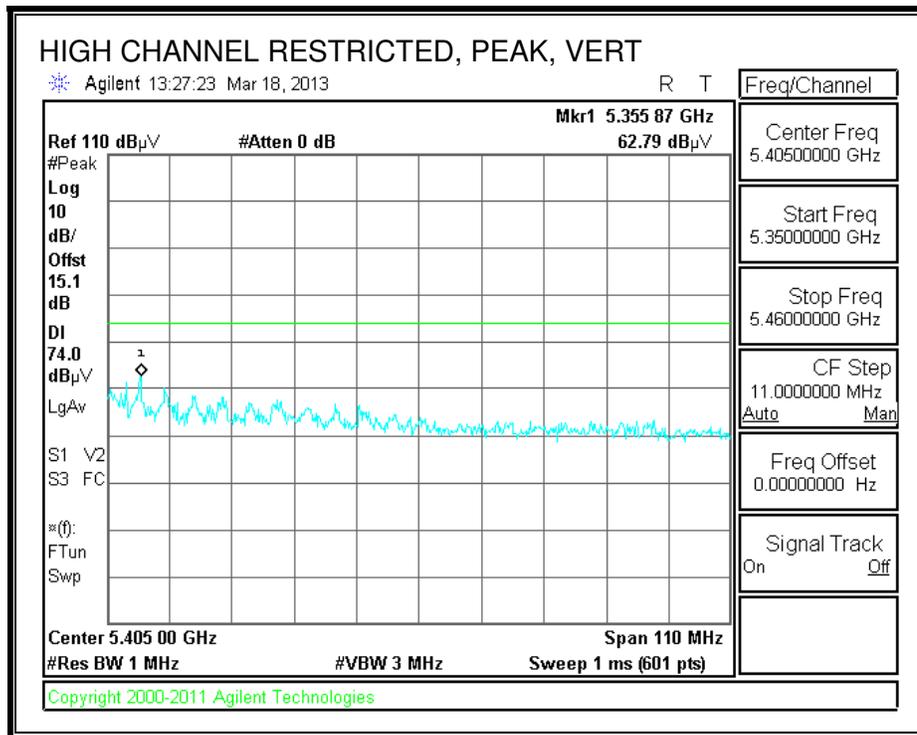
Rev. 4.1.2.7

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

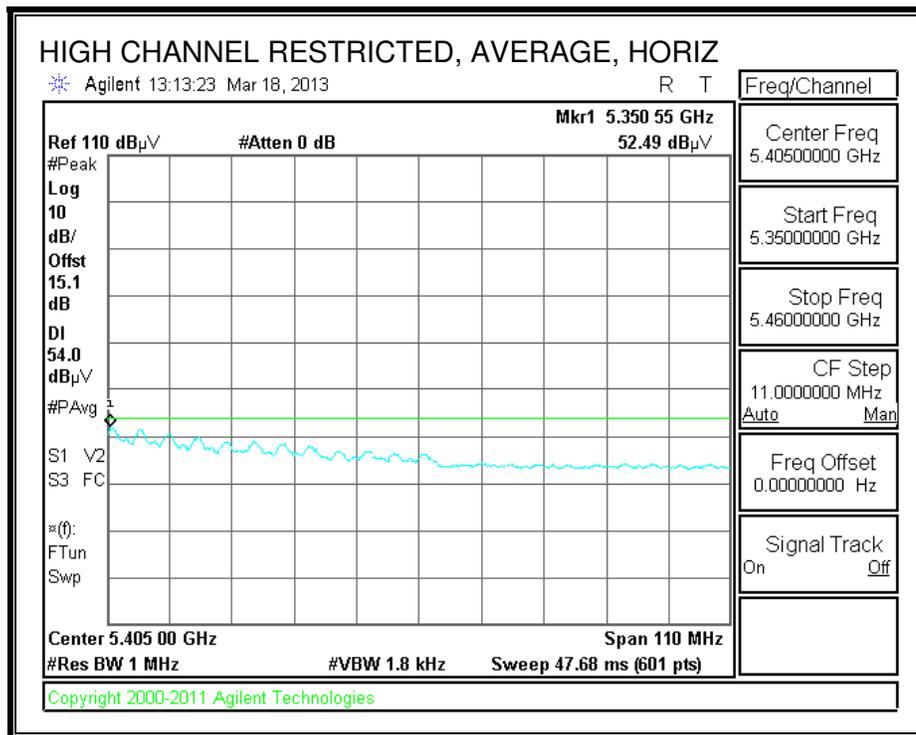
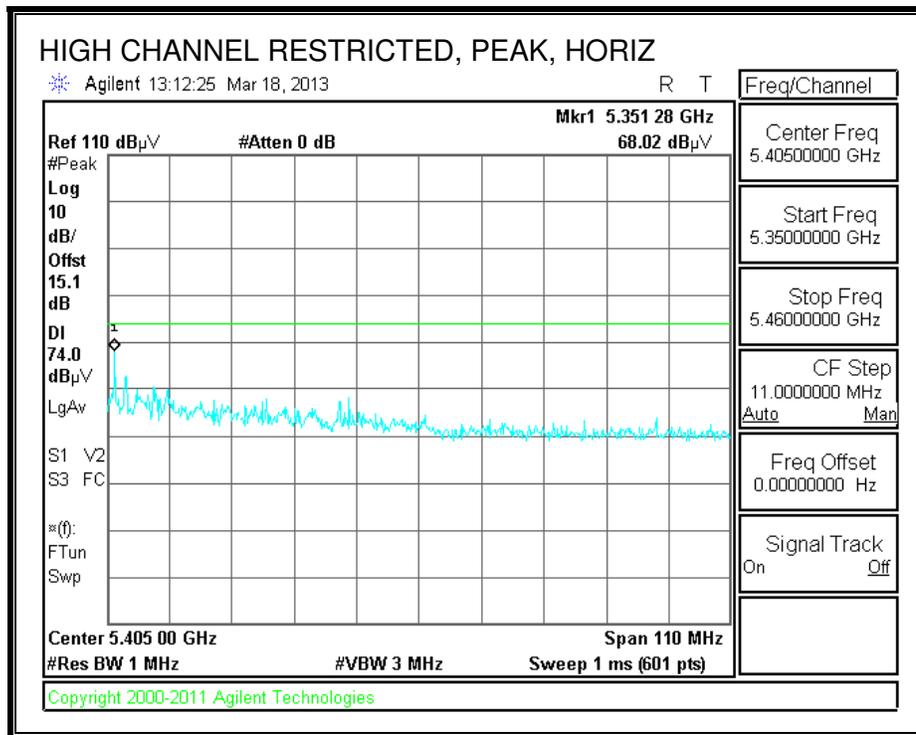
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dB	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	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	

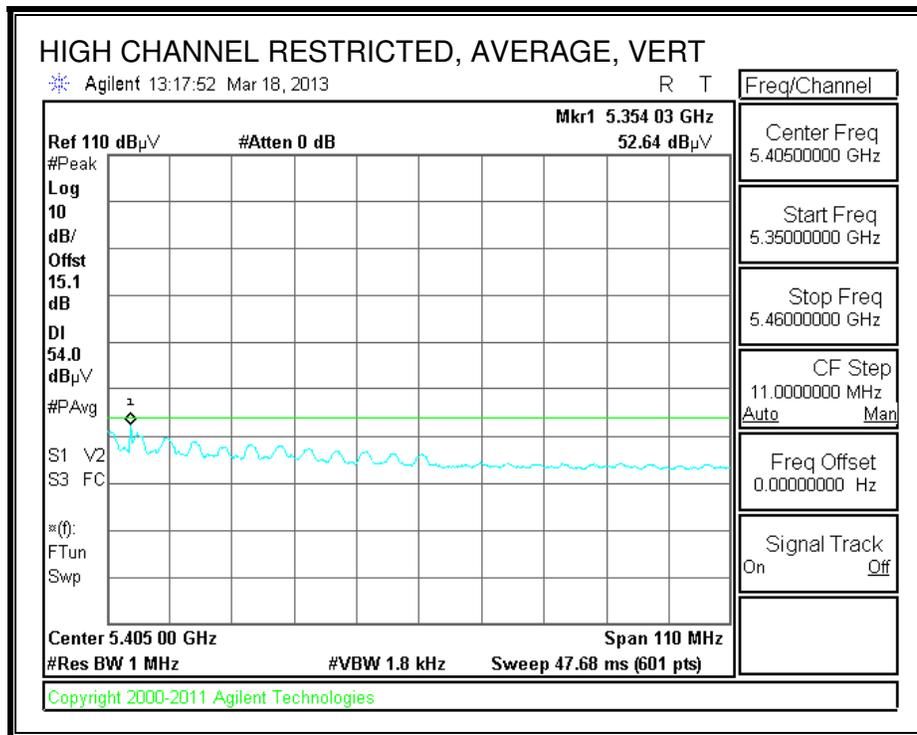
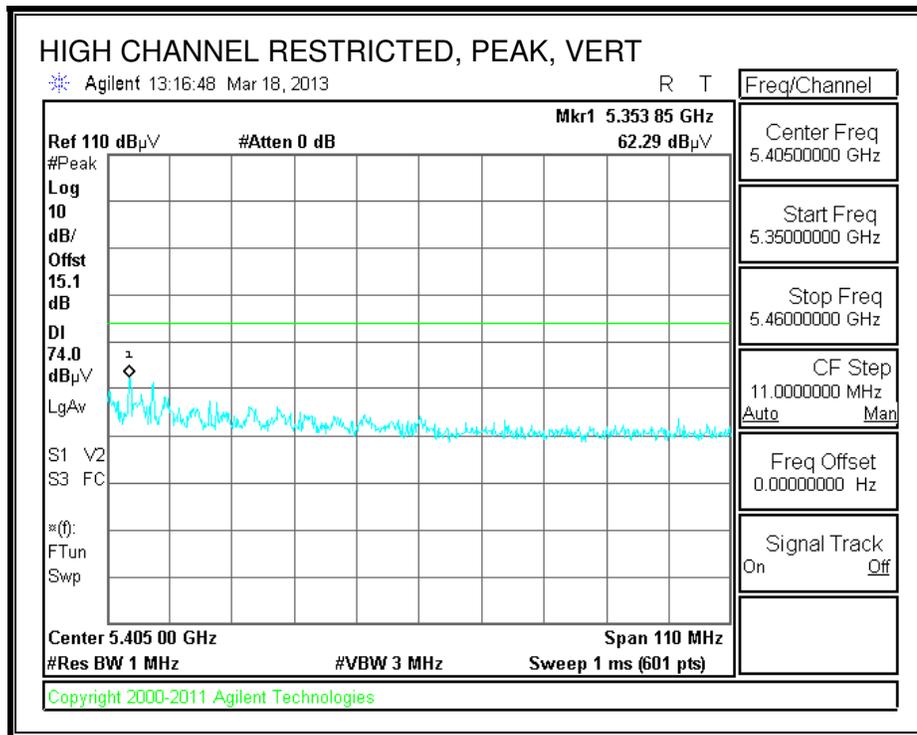
Rev. 4.1.2.7

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 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

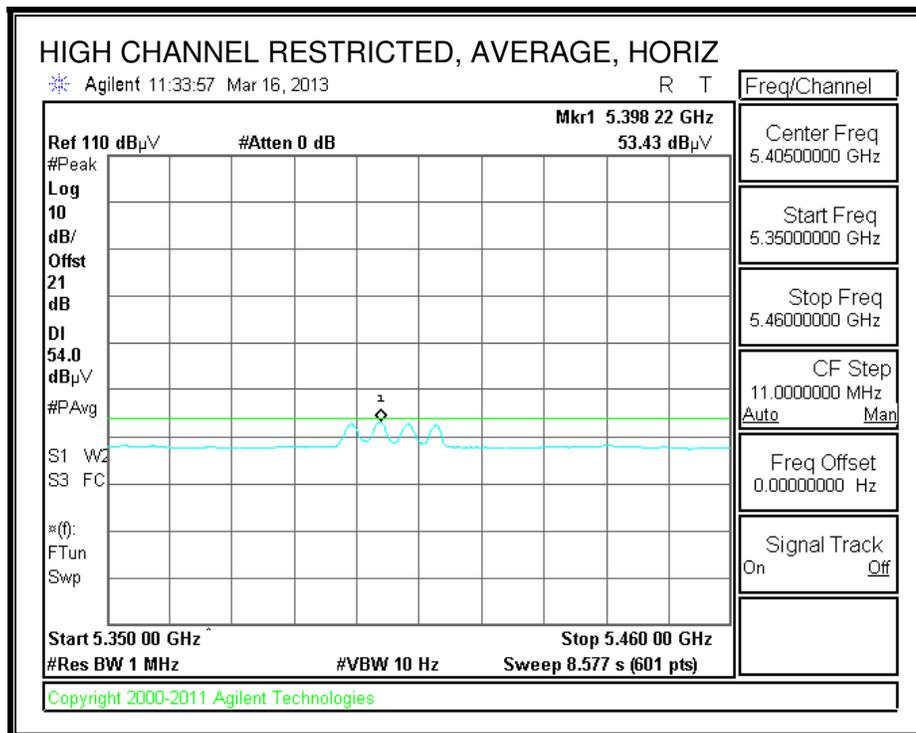
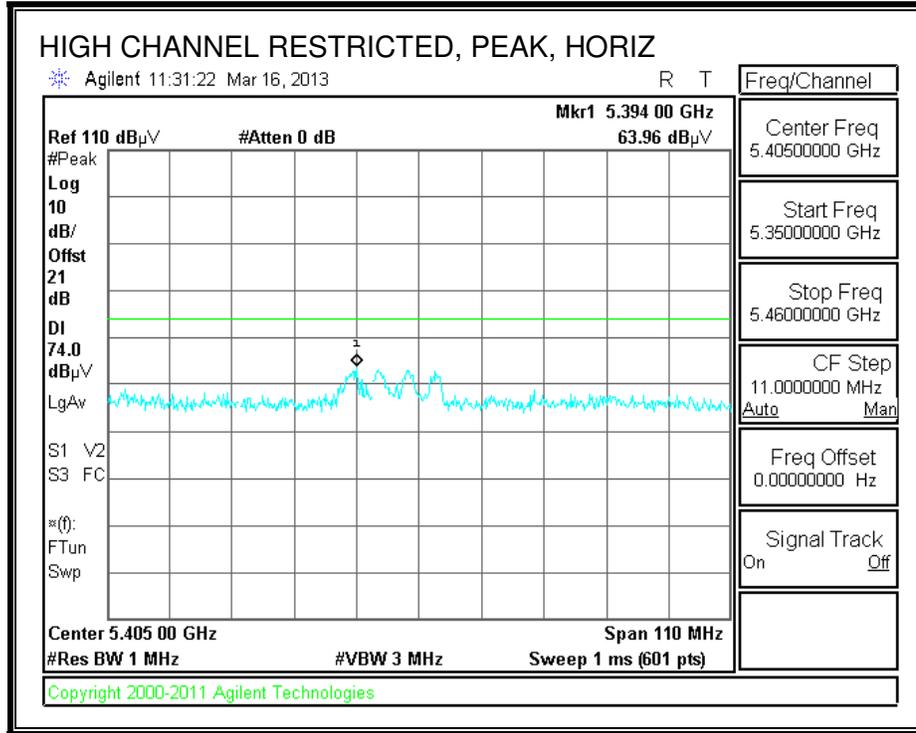
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	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	

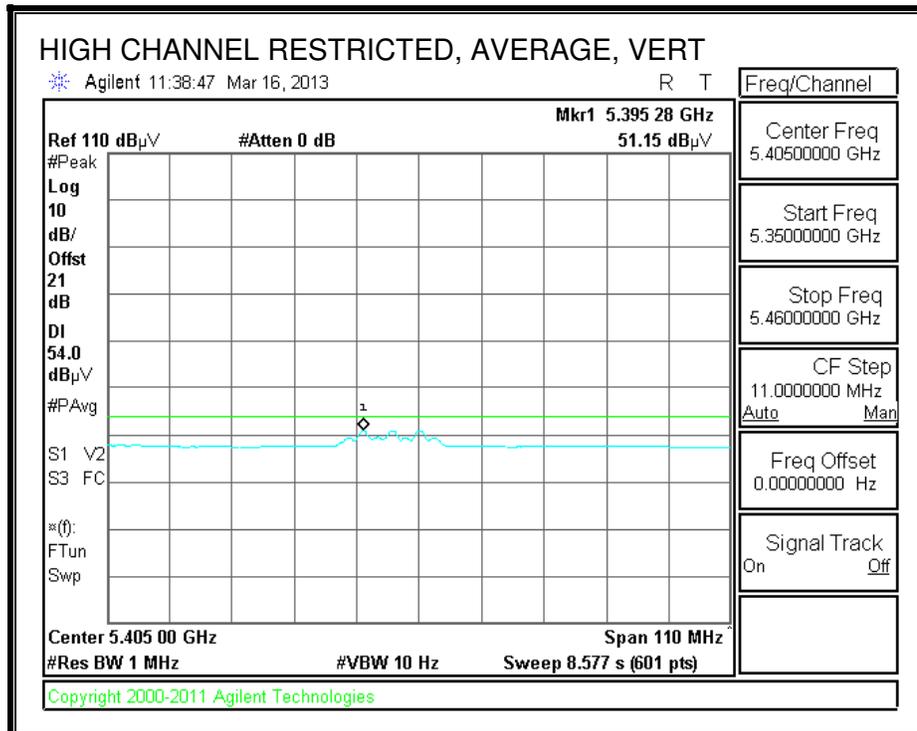
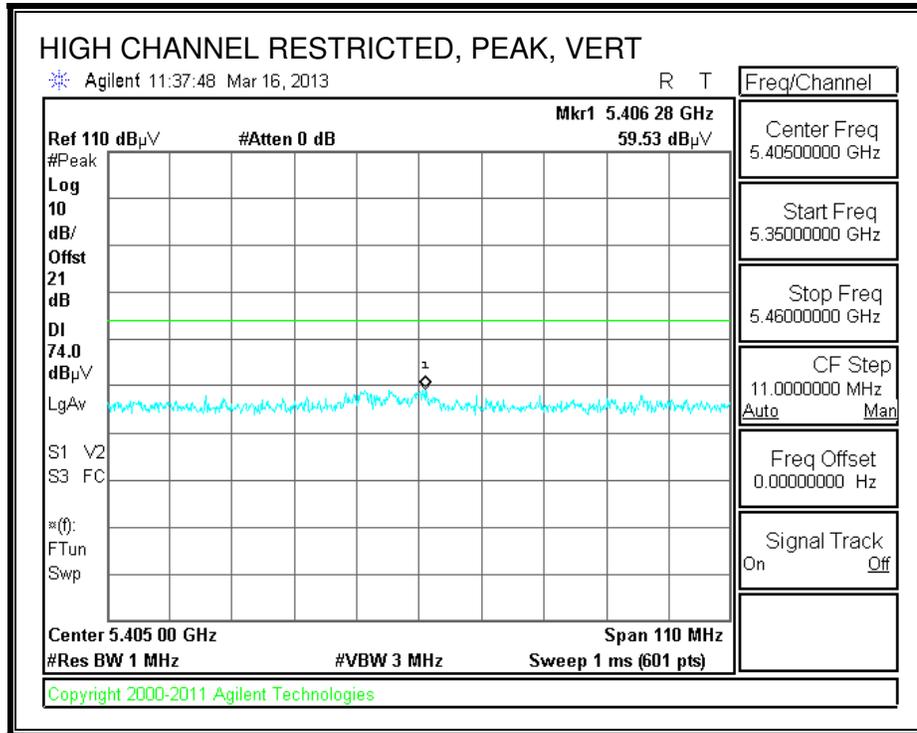
Rev. 4.1.2.7

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 BANEDGE (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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<b>Peak Measurements</b> RBW=VBW=1MHz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		<b>Average Measurements</b> RBW=1MHz; VBW=10Hz

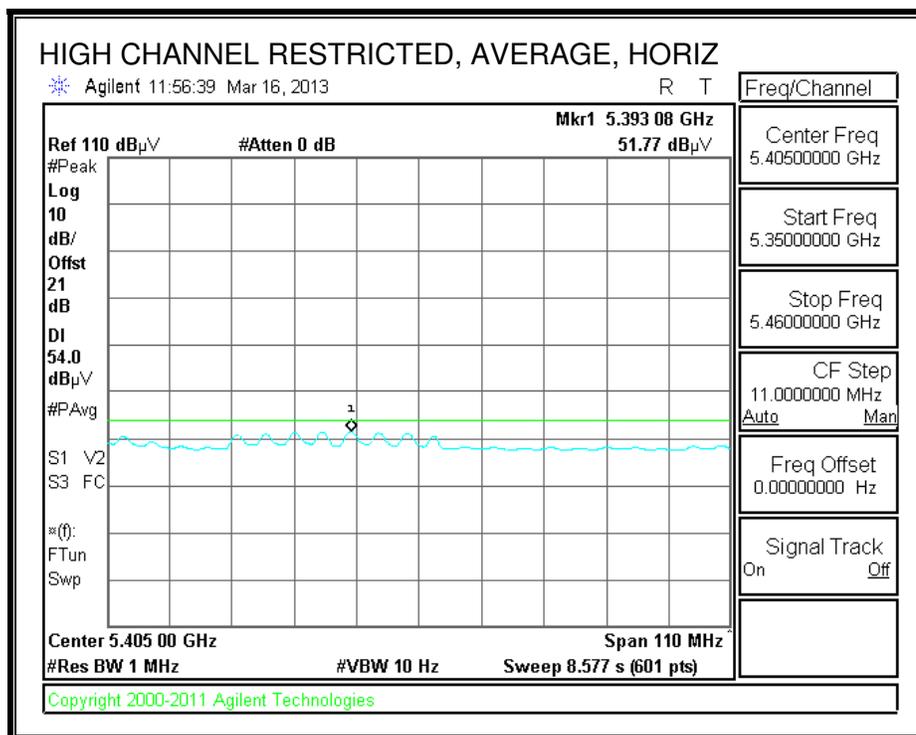
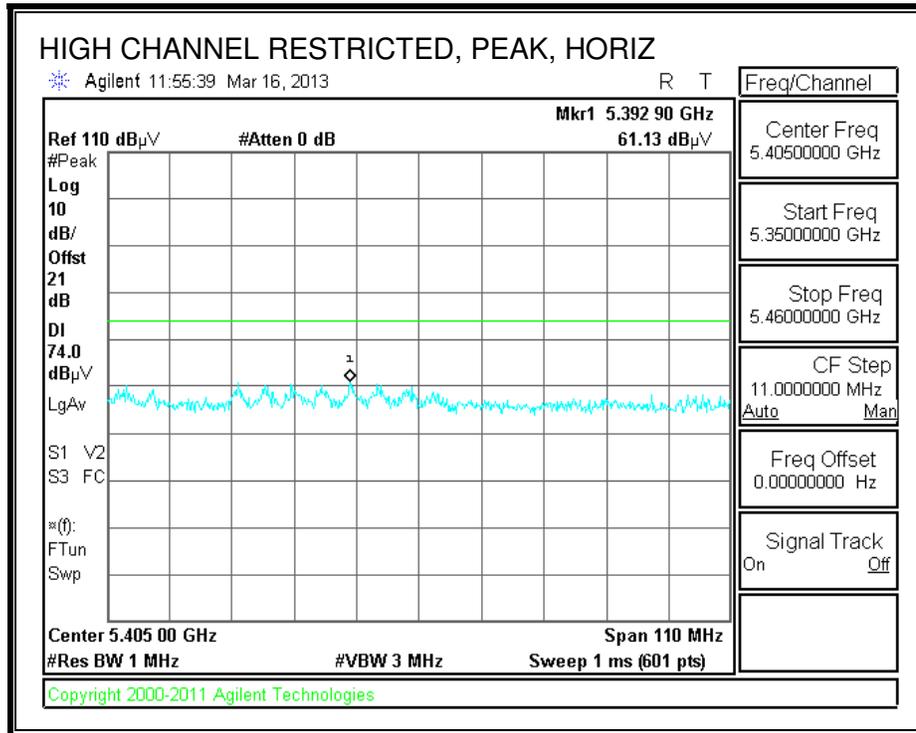
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5260 MHz)</b>															
15.780	3.0	36.1	24.9	40.2	13.4	-32.2	0.0	0.7	58.1	46.9	74	54	-15.9	-7.1	H
15.780	3.0	35.5	24.7	40.2	13.4	-32.2	0.0	0.7	57.5	46.7	74	54	-16.5	-7.3	V
<b>Mid Channel (5300 MHz)</b>															
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
15.900	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
<b>Hi Channel (5320 MHz)</b>															
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

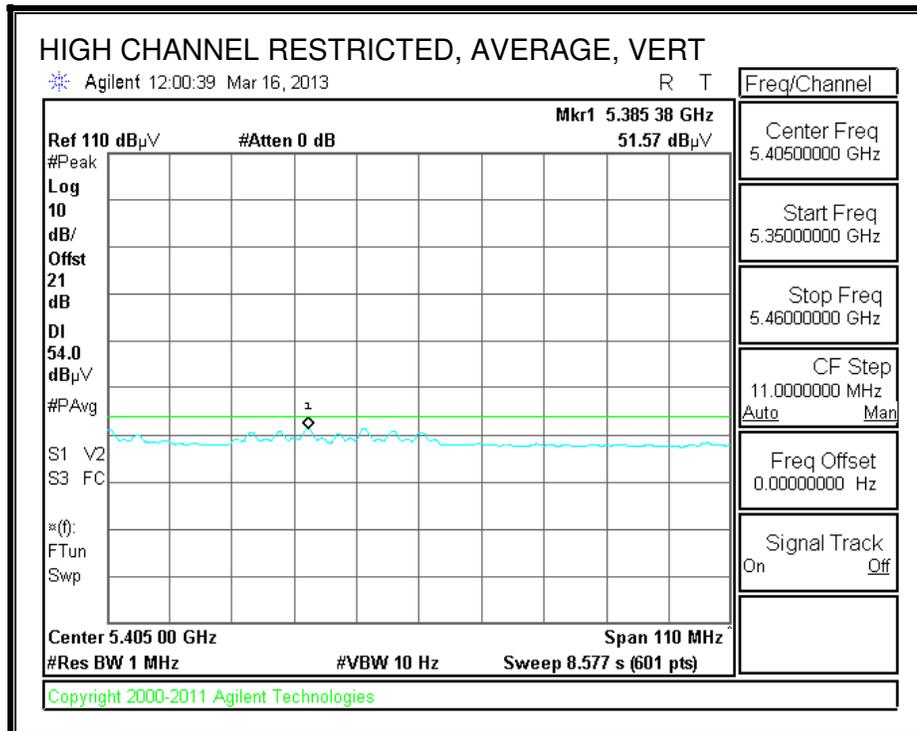
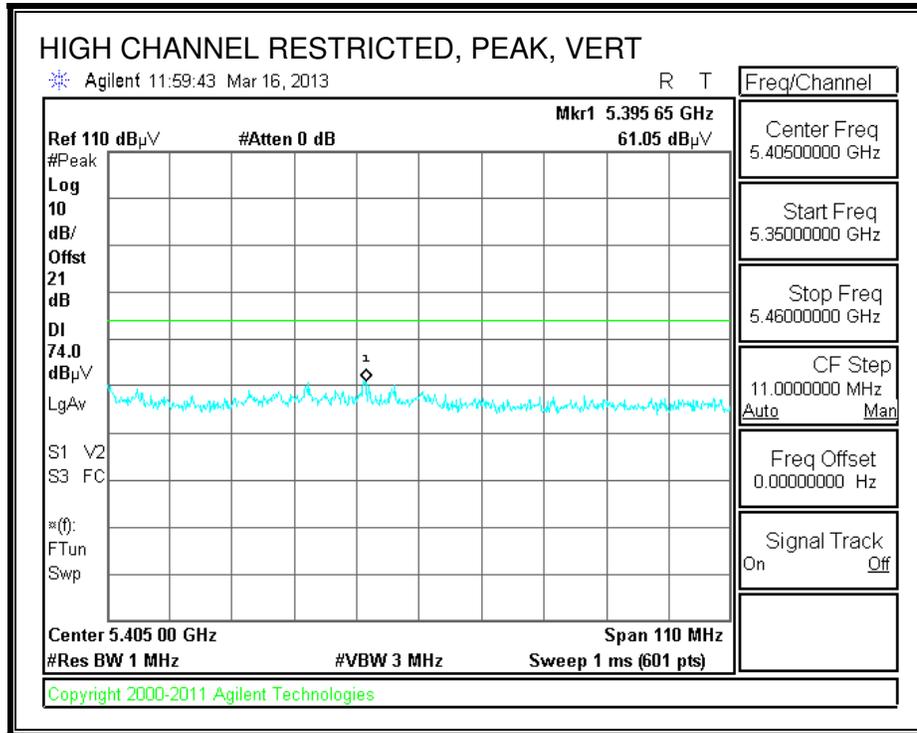
Rev. 01.30.13

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

**Test Equipment:**

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

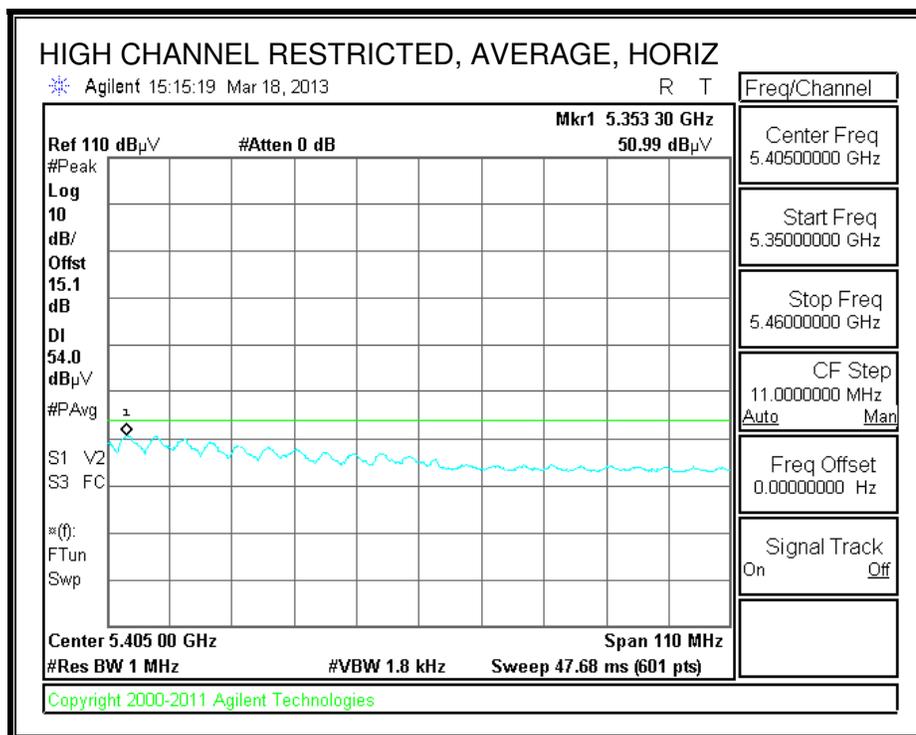
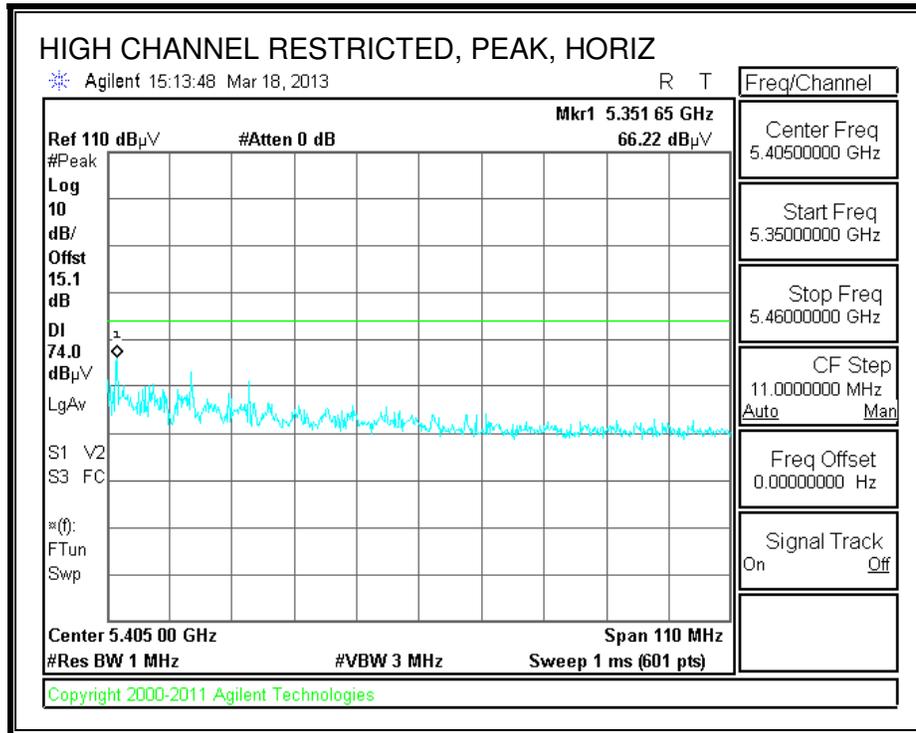
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5270 MHz)</b>															
15.810	3.0	35.0	25.0	40.2	13.4	-32.2	0.0	0.7	57.1	47.0	74	54	-16.9	-7.0	H
15.810	3.0	35.0	24.7	40.2	13.4	-32.2	0.0	0.7	57.0	46.7	74	54	-17.0	-7.3	V
<b>Hi Channel (5310 MHz)</b>															
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

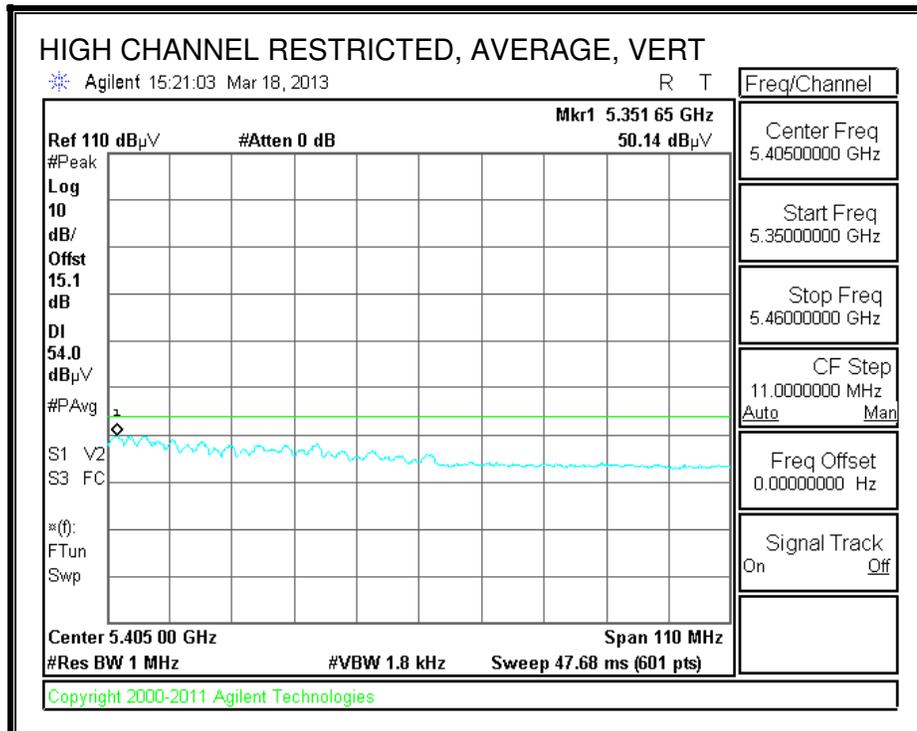
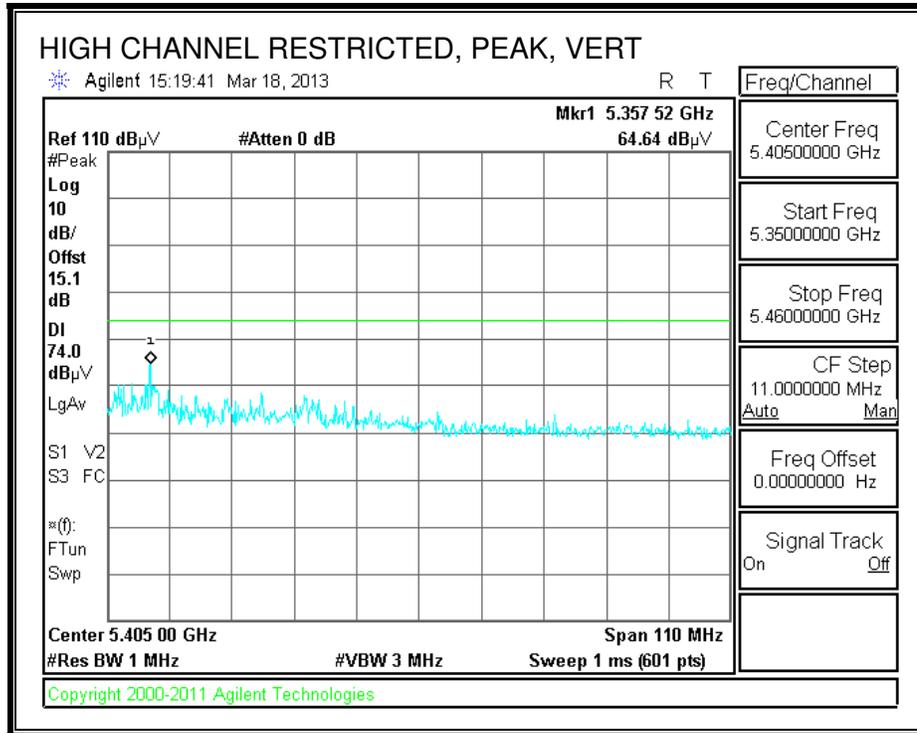
Rev. 01.30.13

f	Measurement Frequency	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		

**9.2.25. 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

Test Equipment:

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

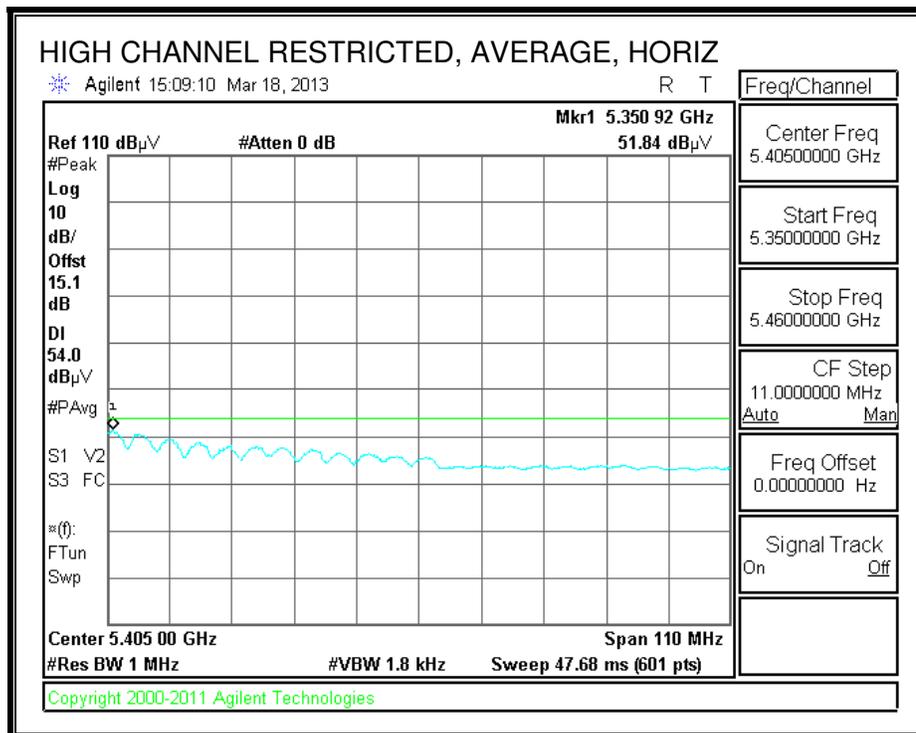
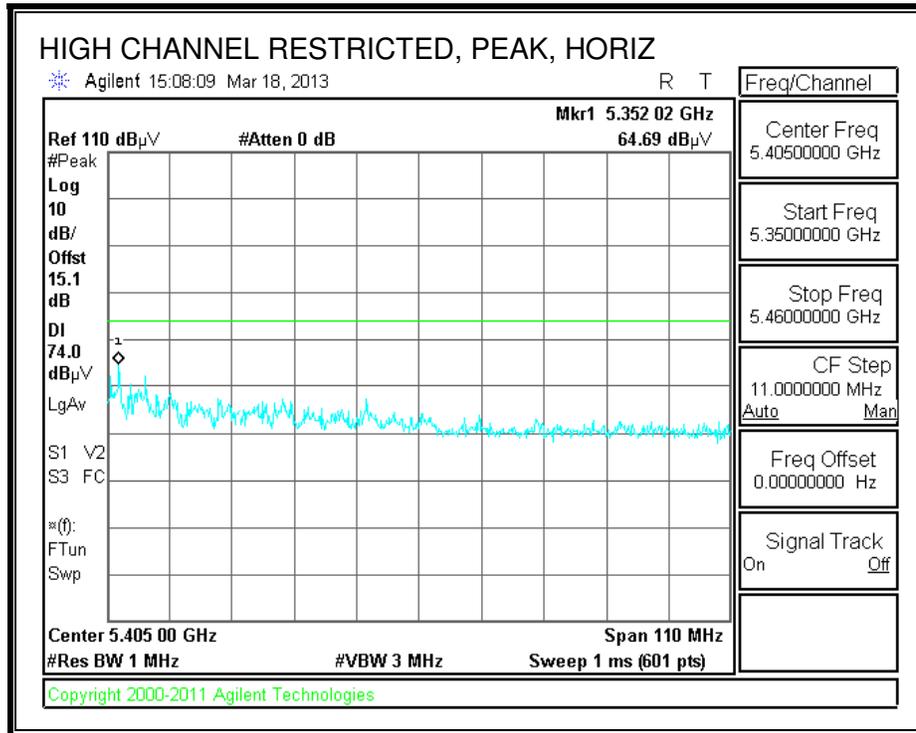
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5210 MHz)</b>															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
<b>Mid Channel (5290 MHz)</b>															
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
<b>Low Channel (5530 MHz)</b>															
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
<b>Hi Channel (5690 MHz)</b>															
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

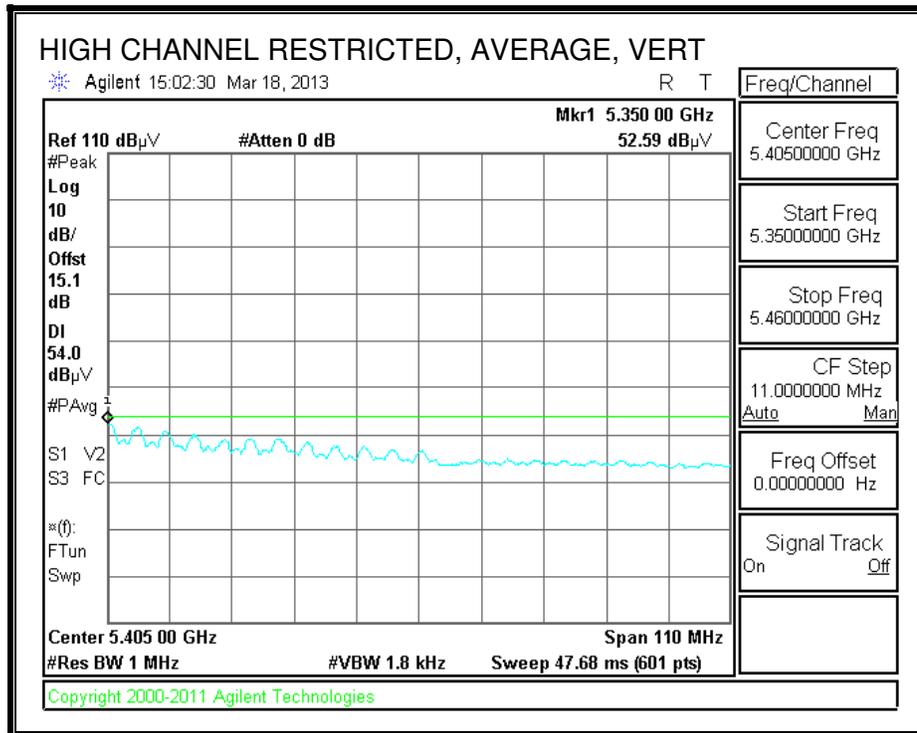
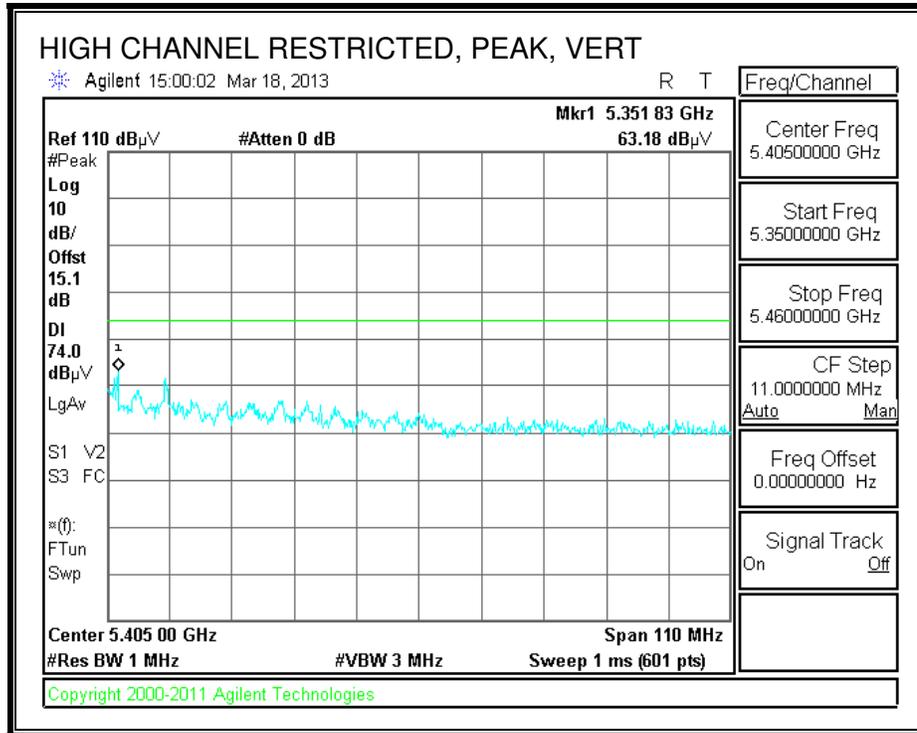
Rev. 01.30.13

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

Test Equipment:

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

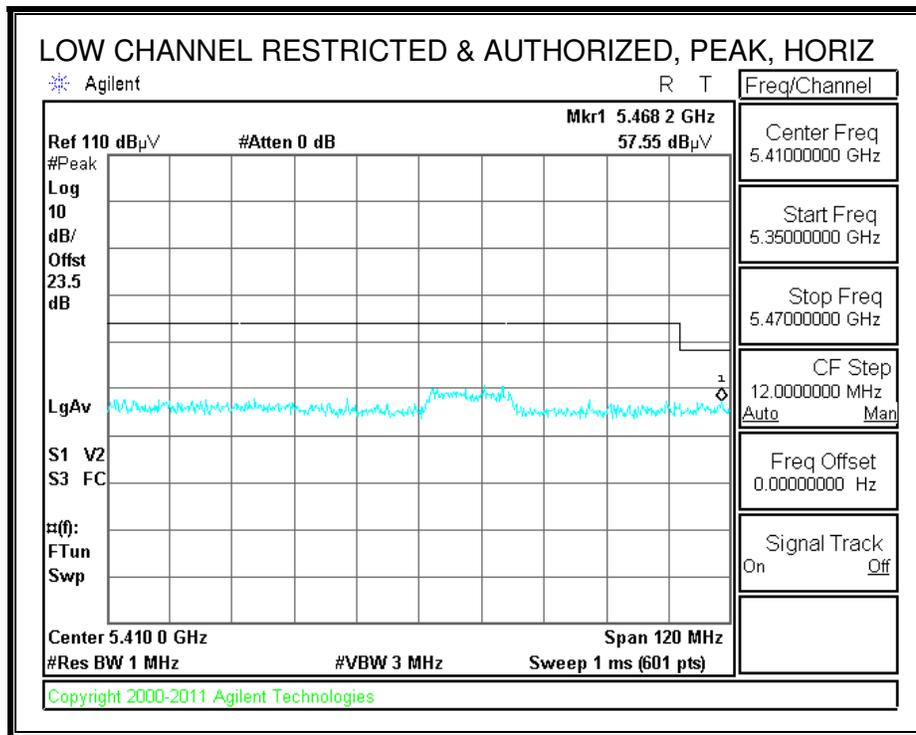
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5210 MHz)</b>															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
<b>Mid Channel (5290 MHz)</b>															
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
<b>Low Channel (5530 MHz)</b>															
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
<b>Hi Channel (5690 MHz)</b>															
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

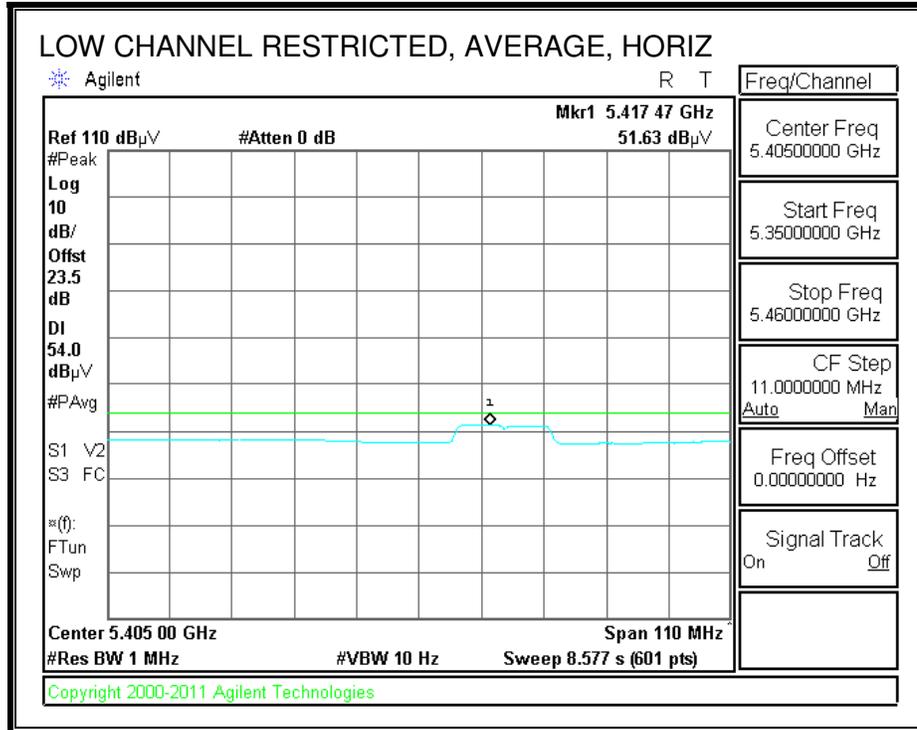
Rev. 01.30.13

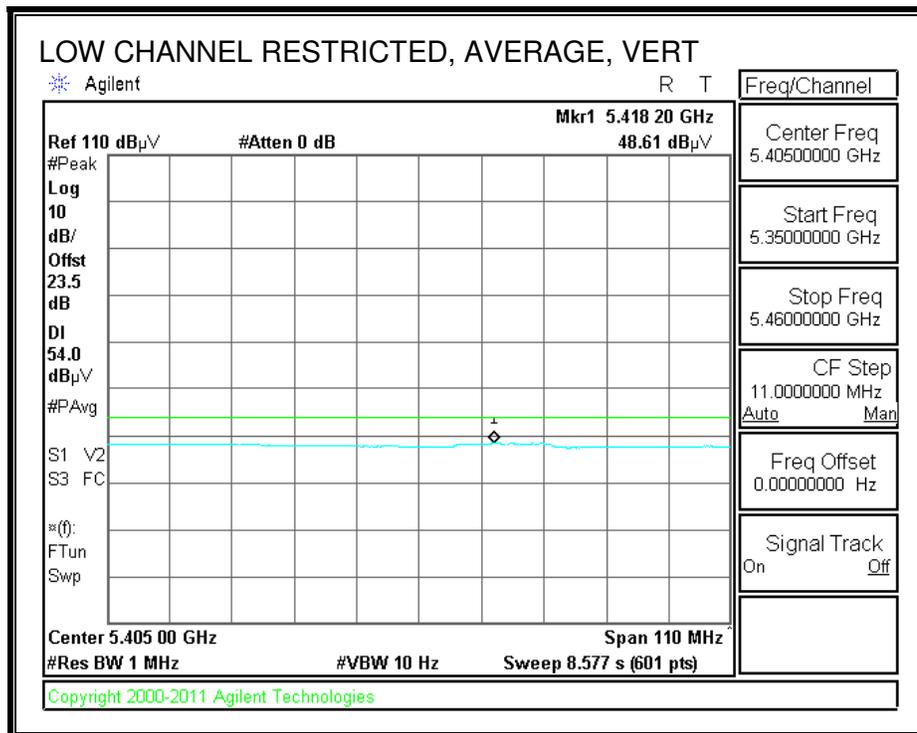
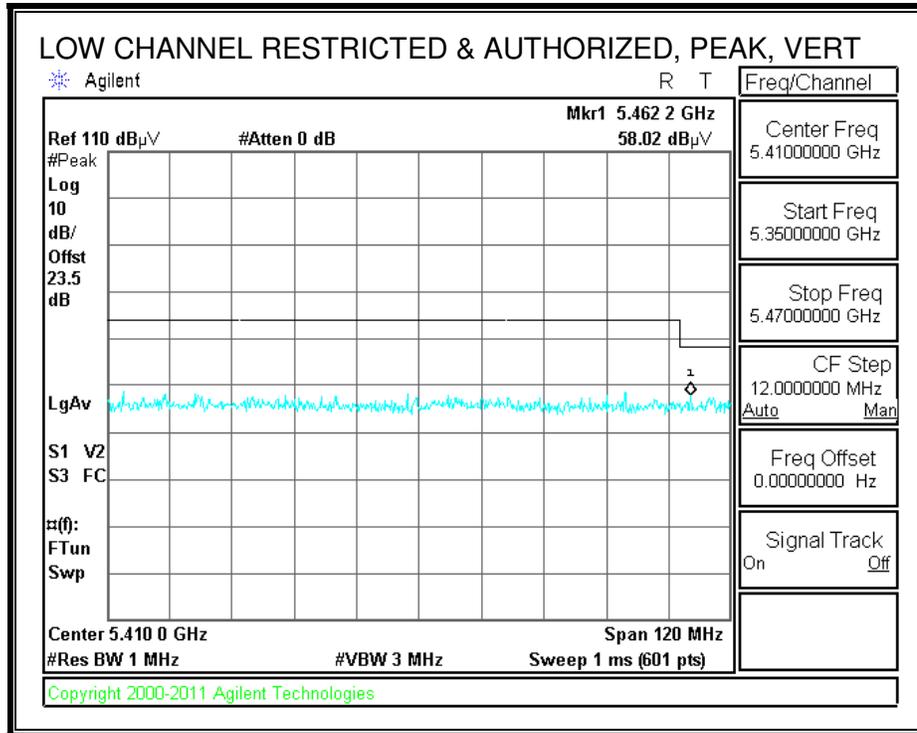
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

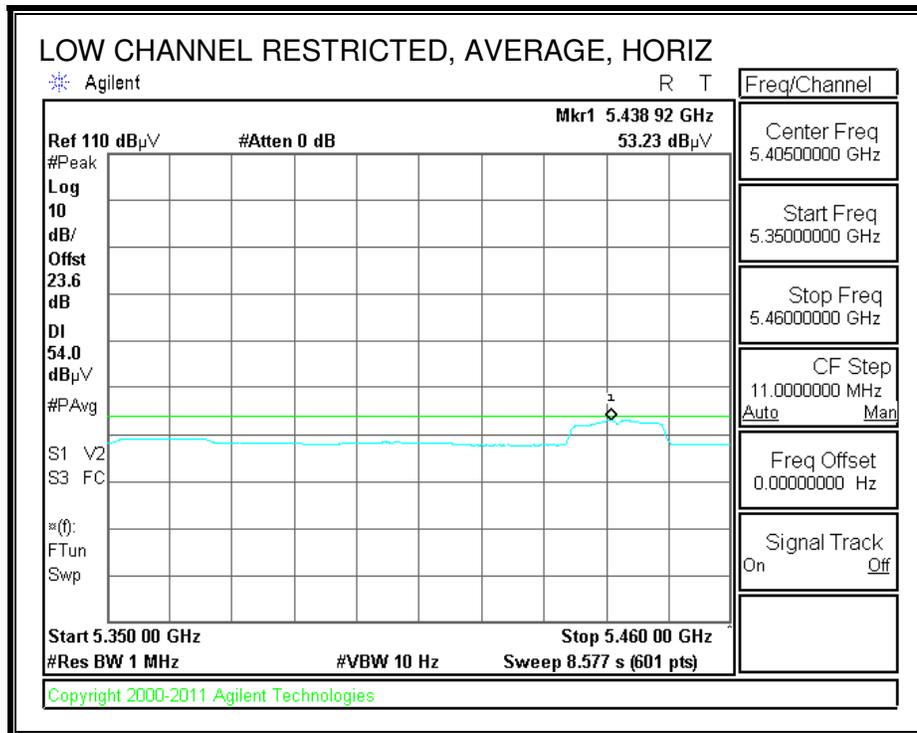
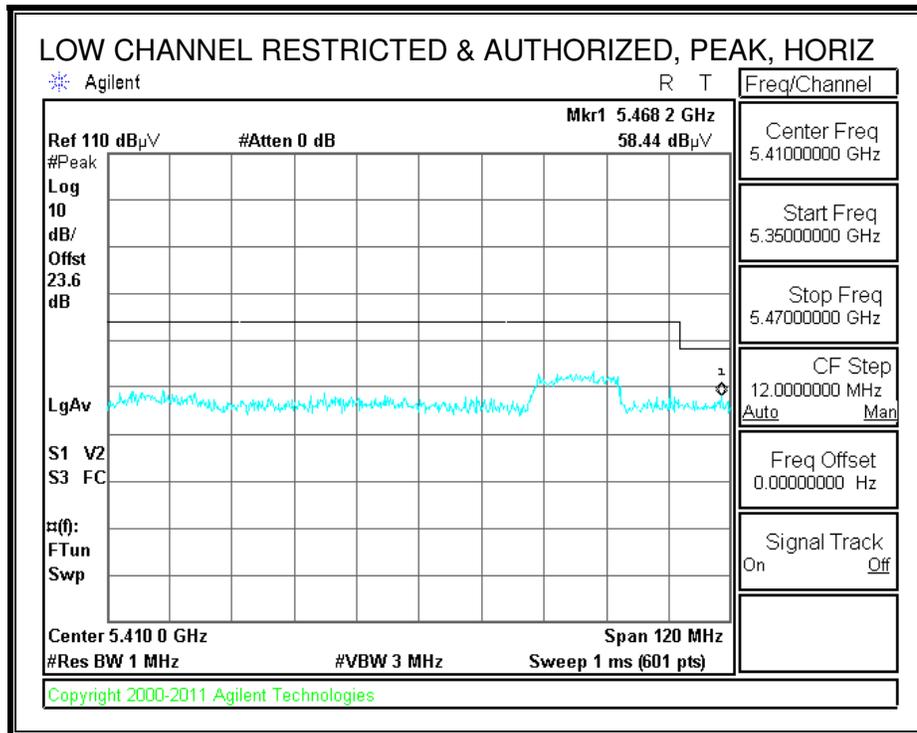
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)**

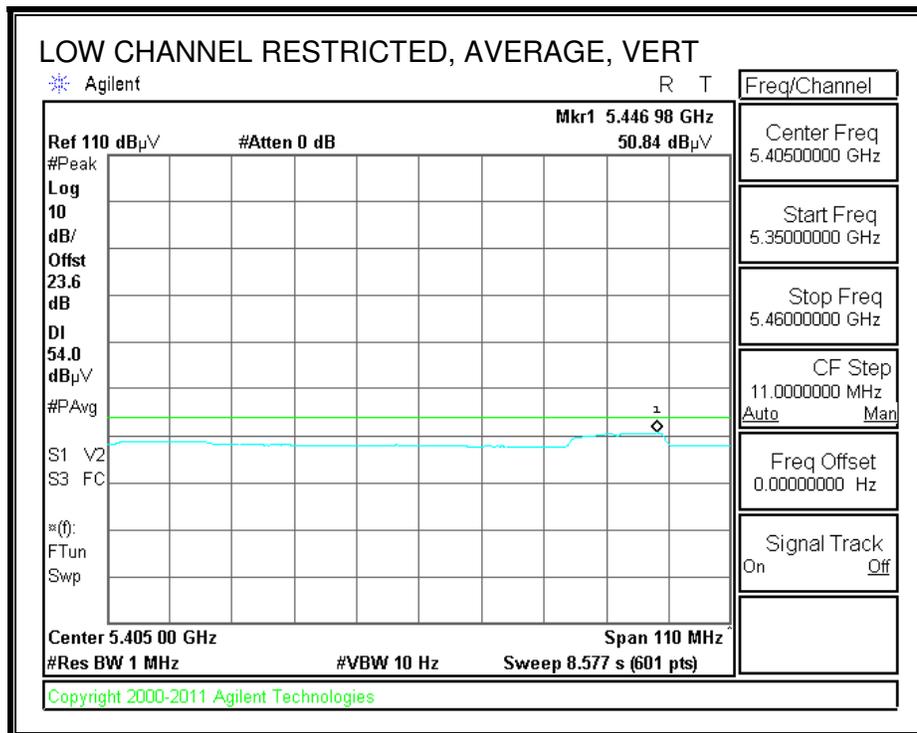
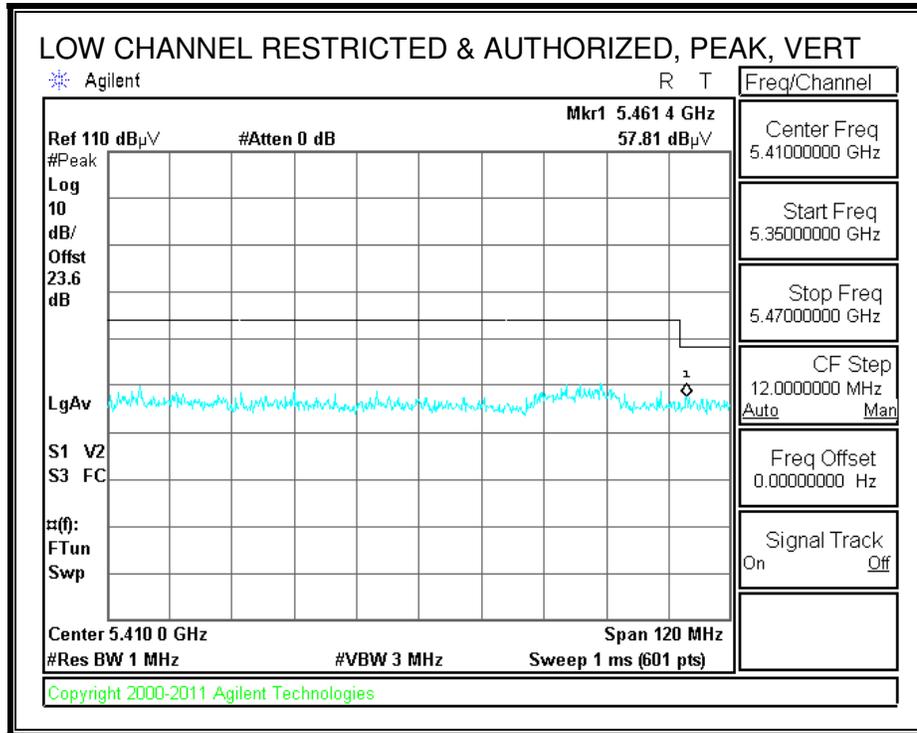




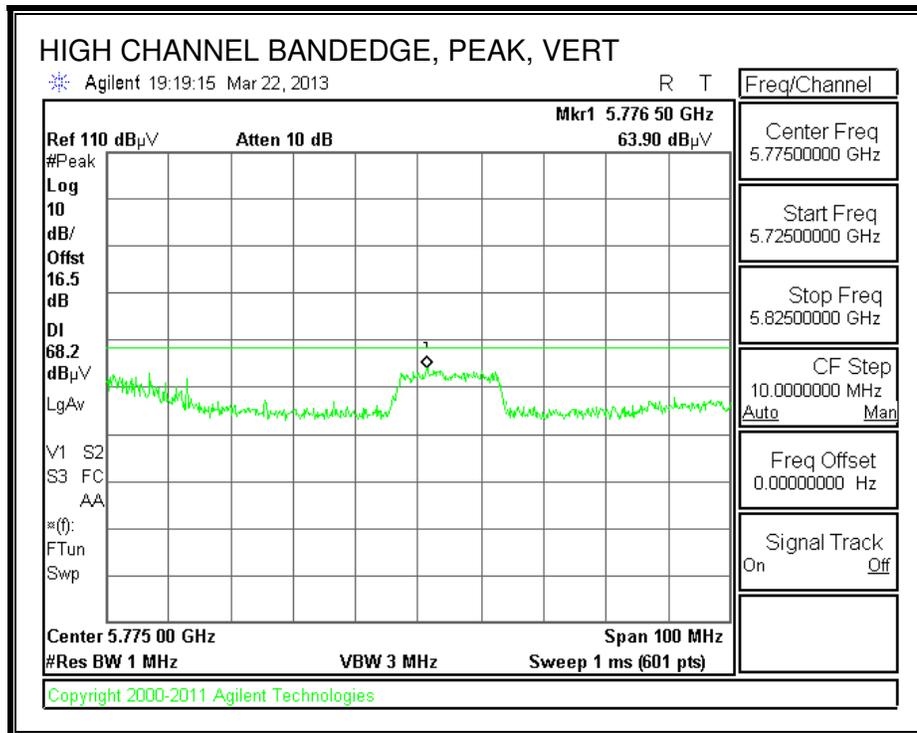
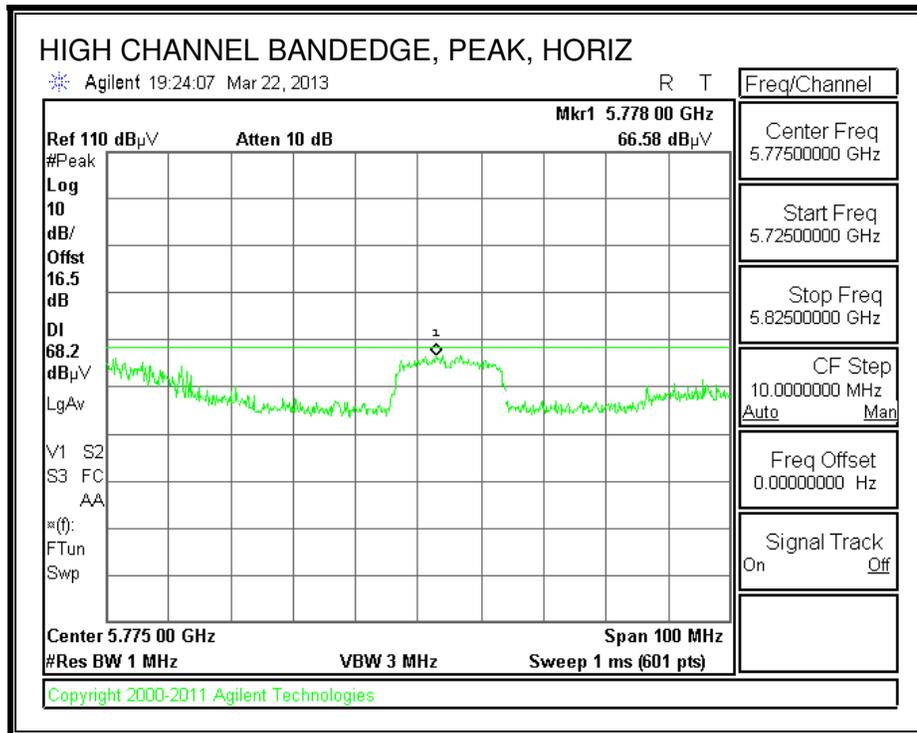


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH104)**





**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 3TX 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

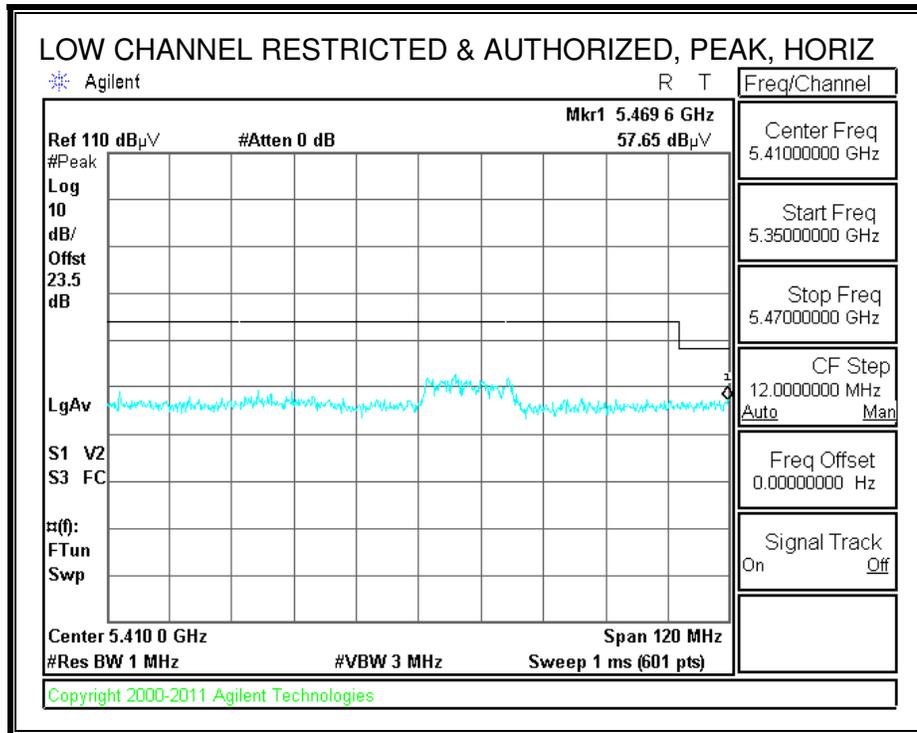
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5500 MHz 3TX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	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 3TX 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 3TX 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	

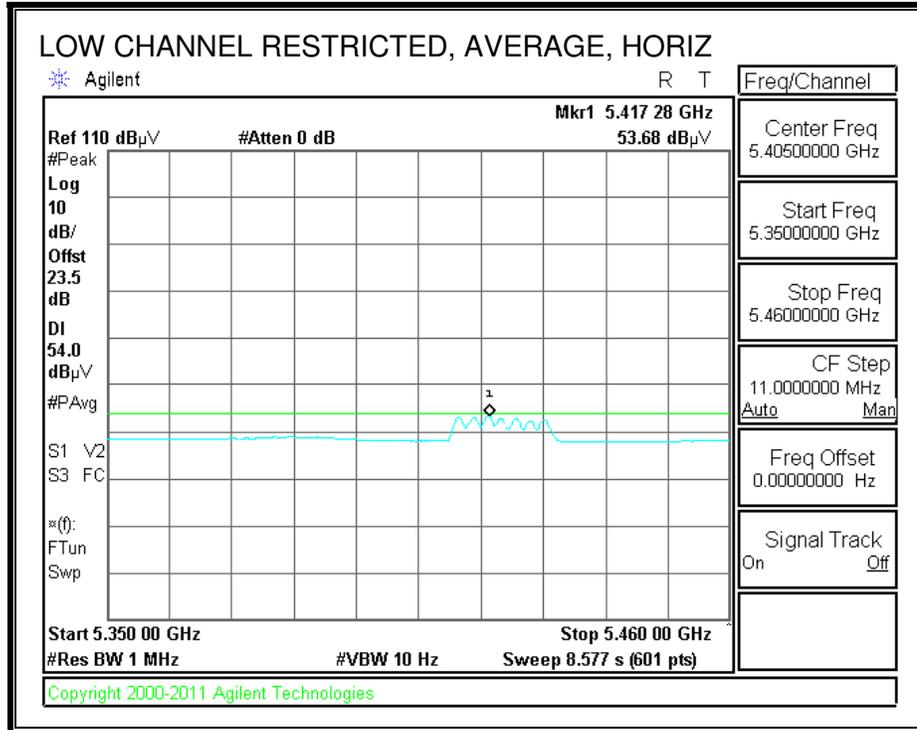
Rev. 4.1.2.7

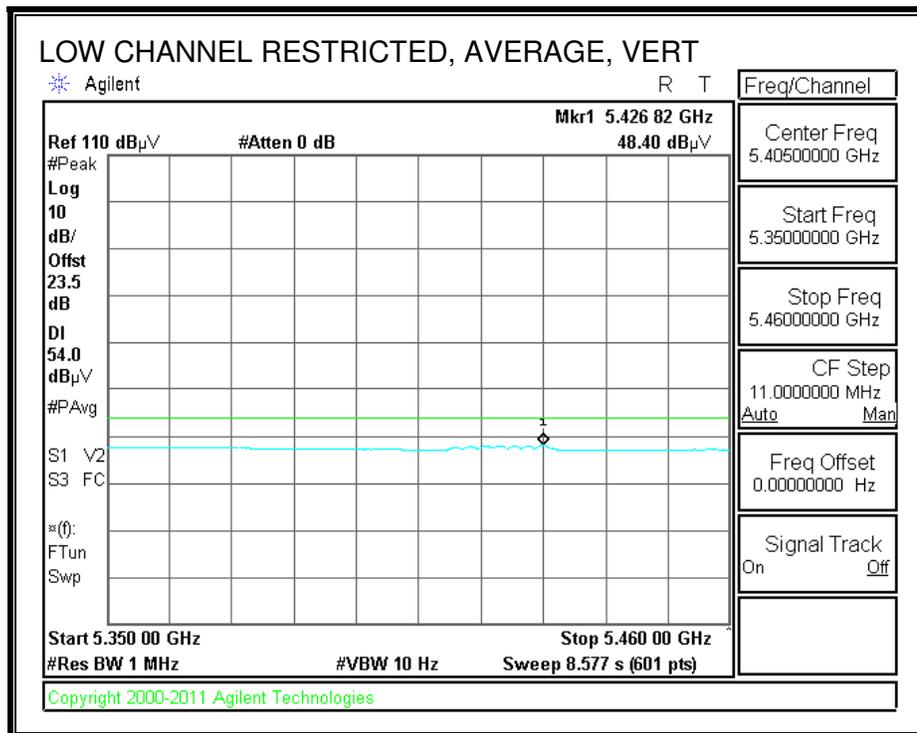
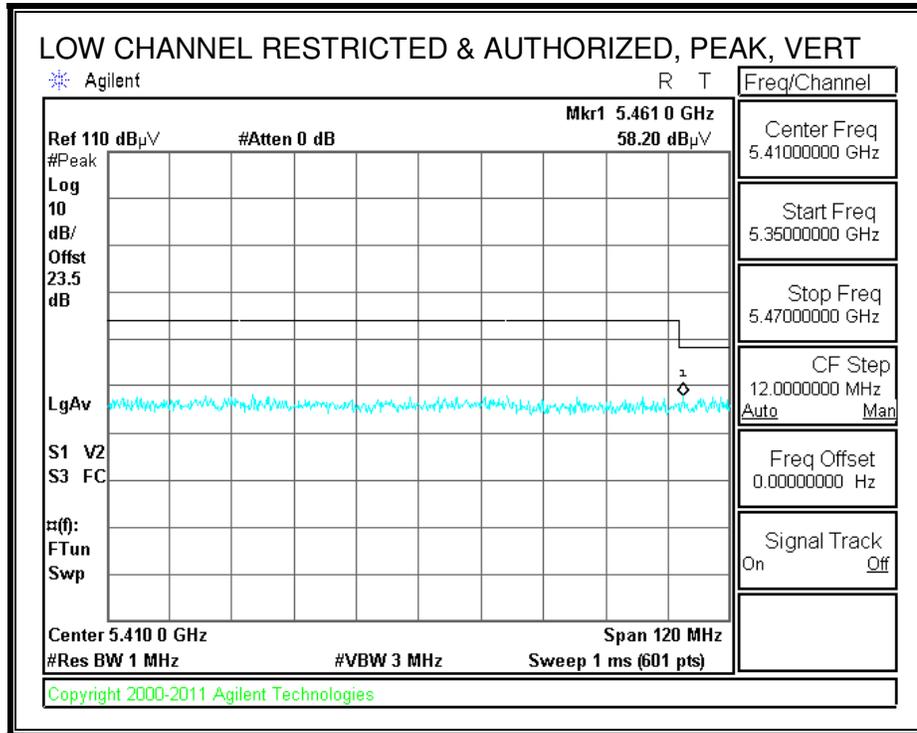
Note: No other emissions were detected above the system noise floor.

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

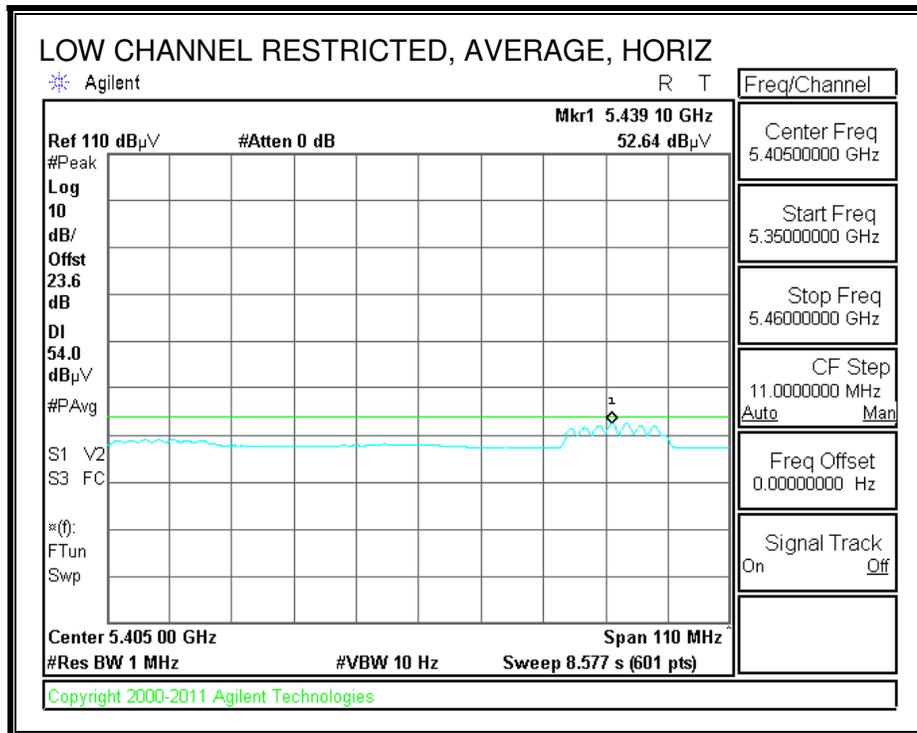
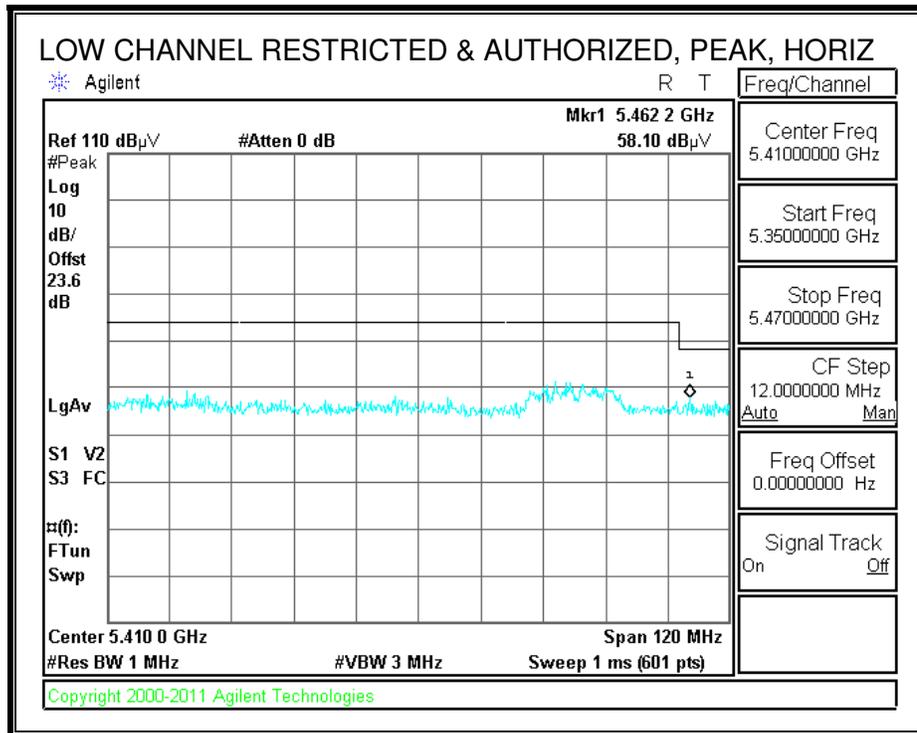
**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH100)**

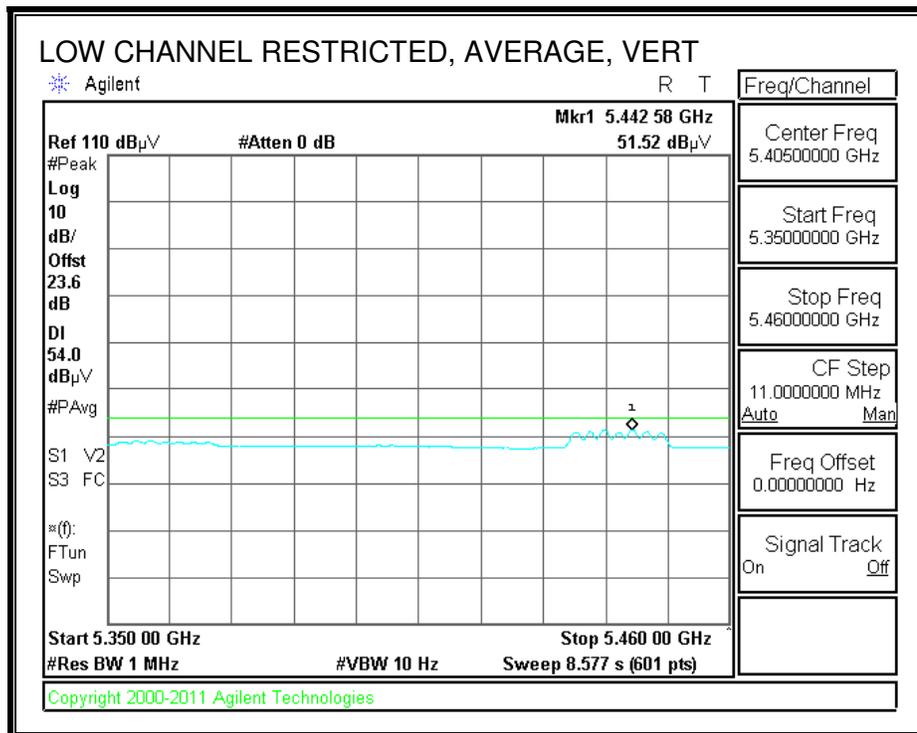
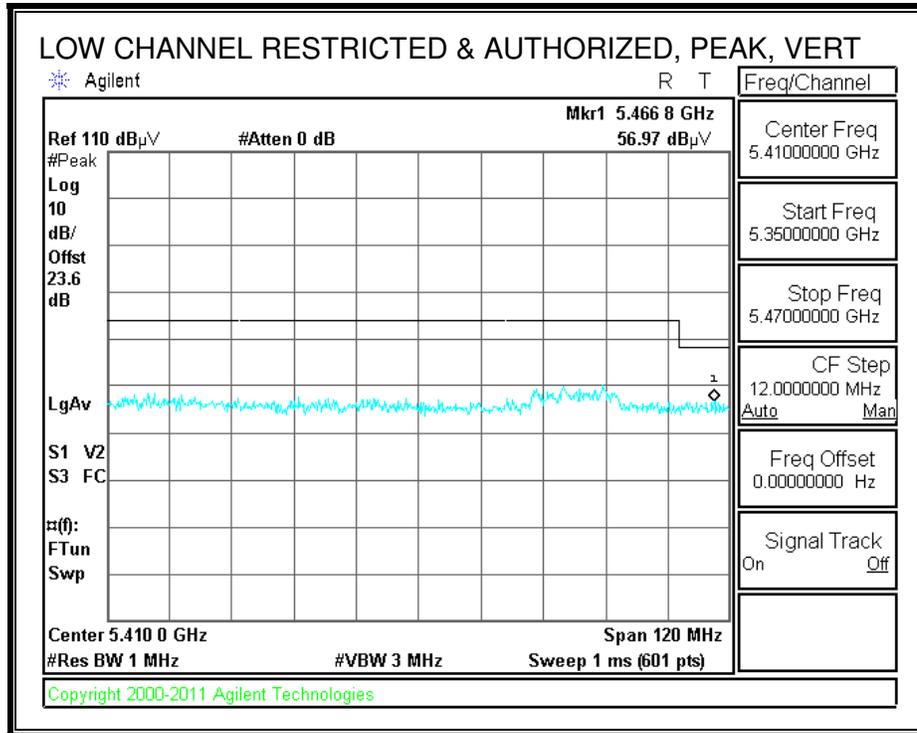




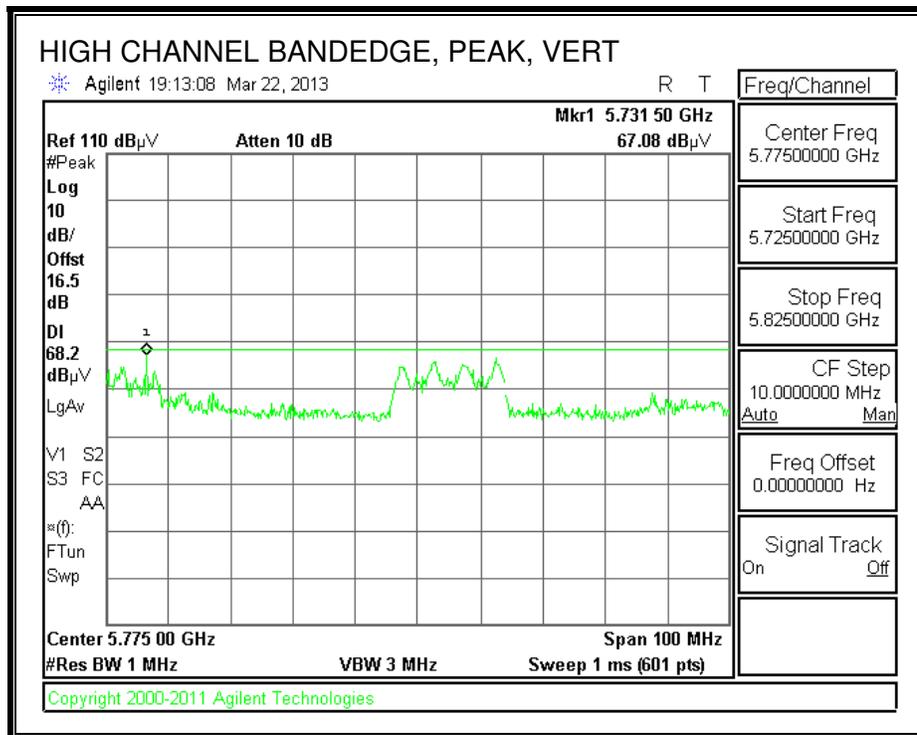
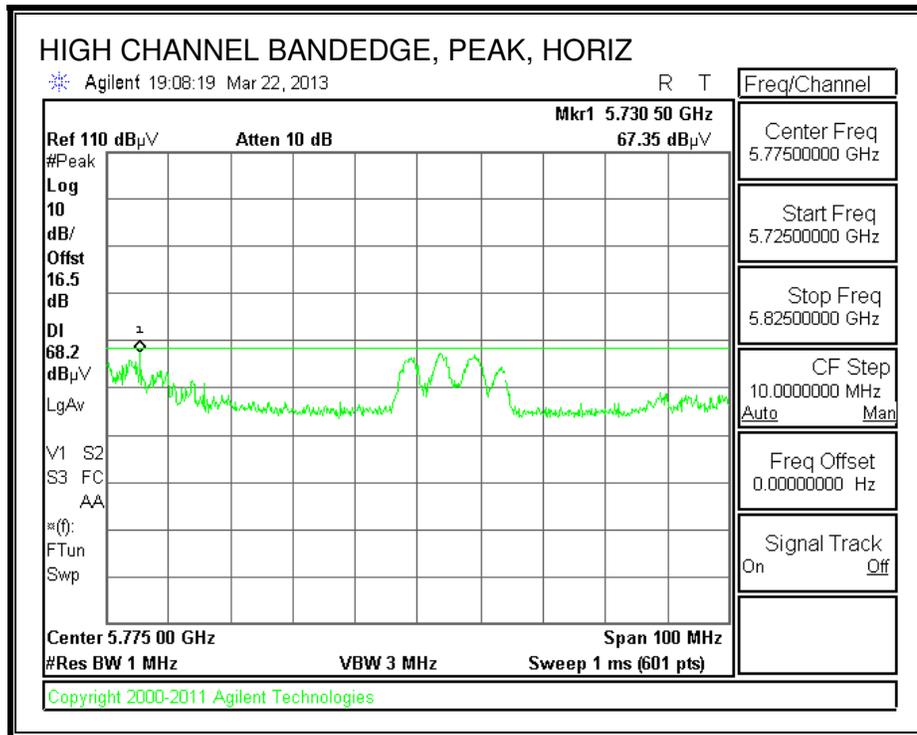


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH104)**





**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 3TX 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

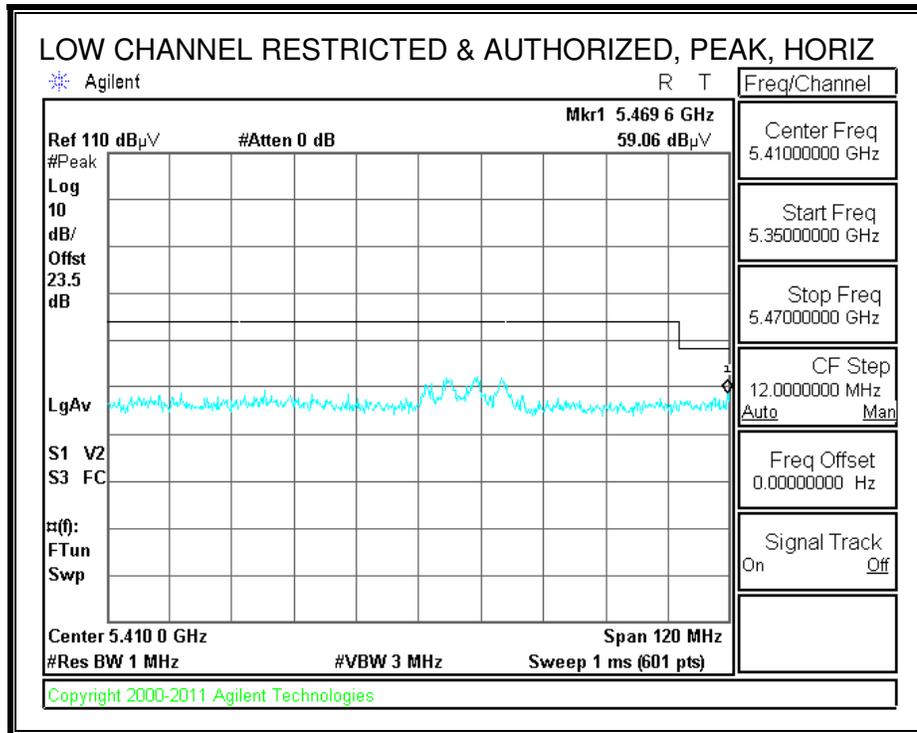
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5500 MHz 3TX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	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 3TX 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 3TX 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	

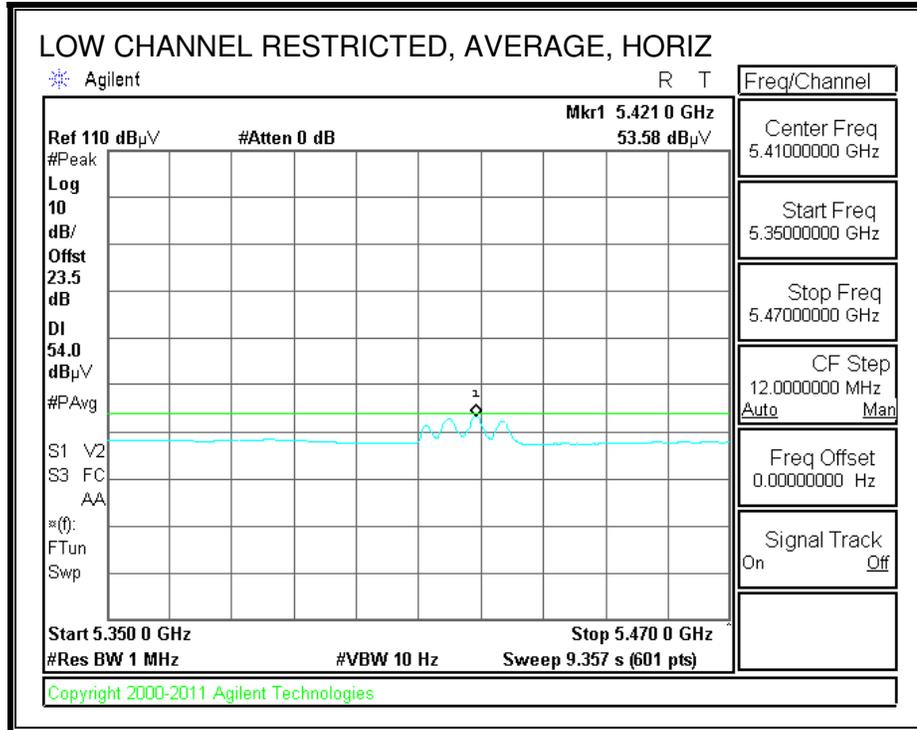
Rev. 4.1.2.7

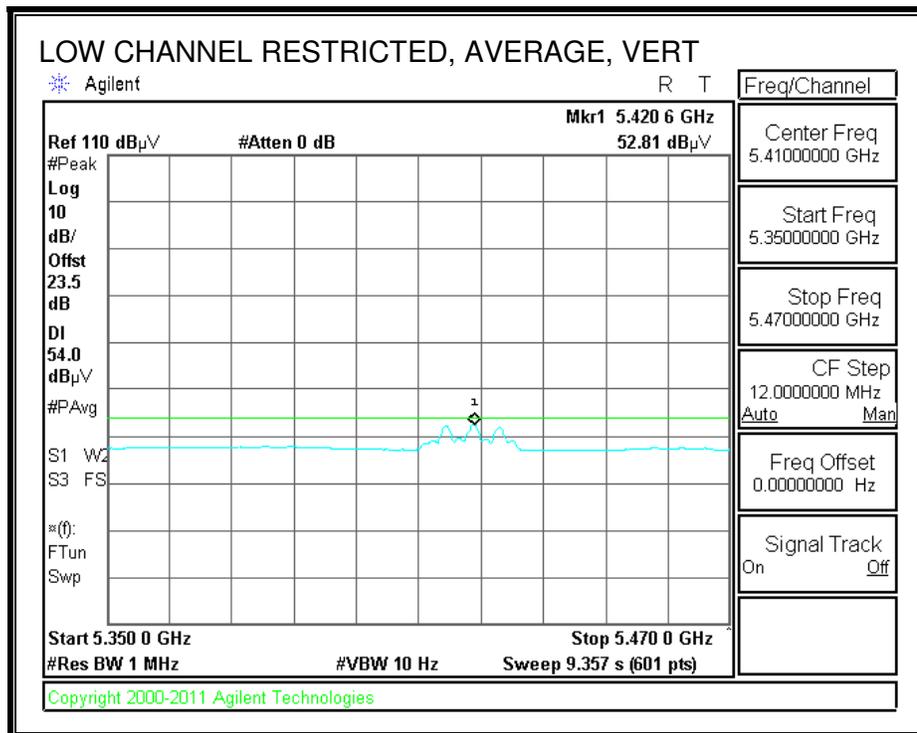
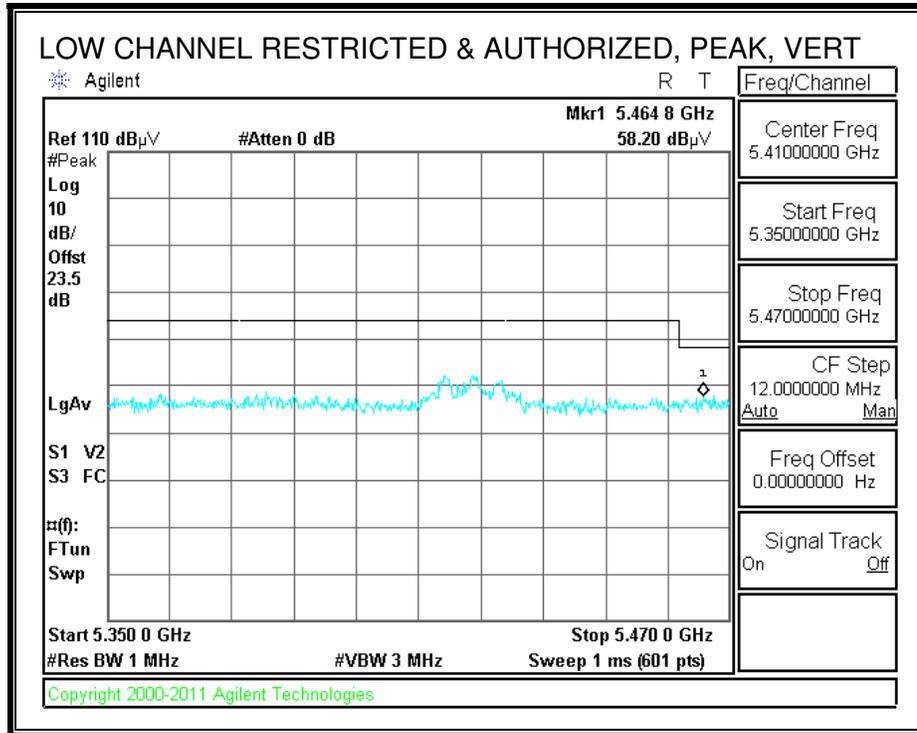
Note: No other emissions were detected above the system noise floor.

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

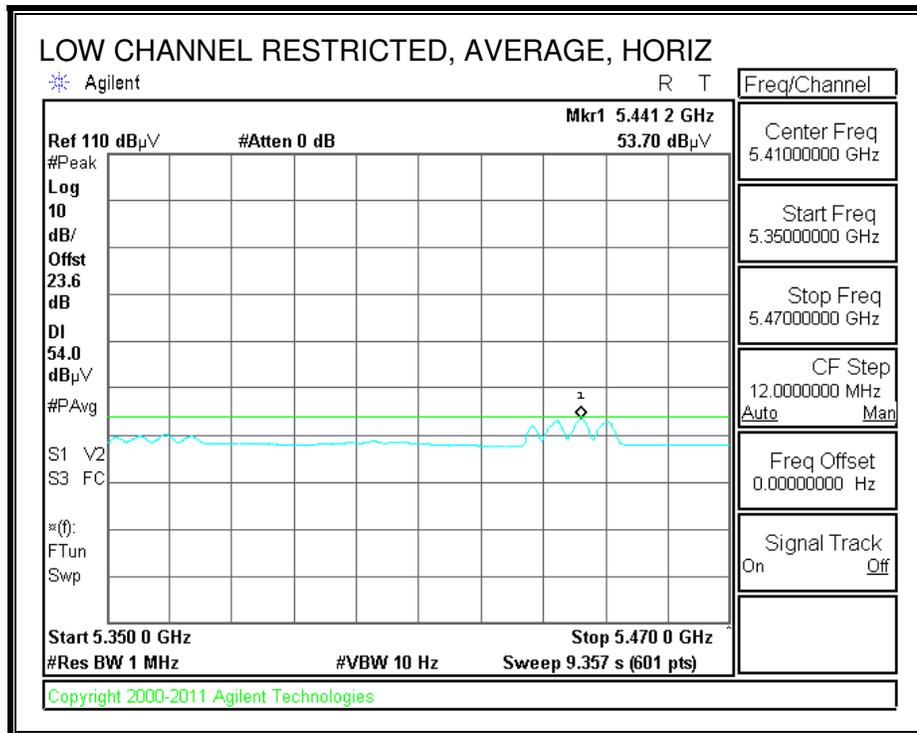
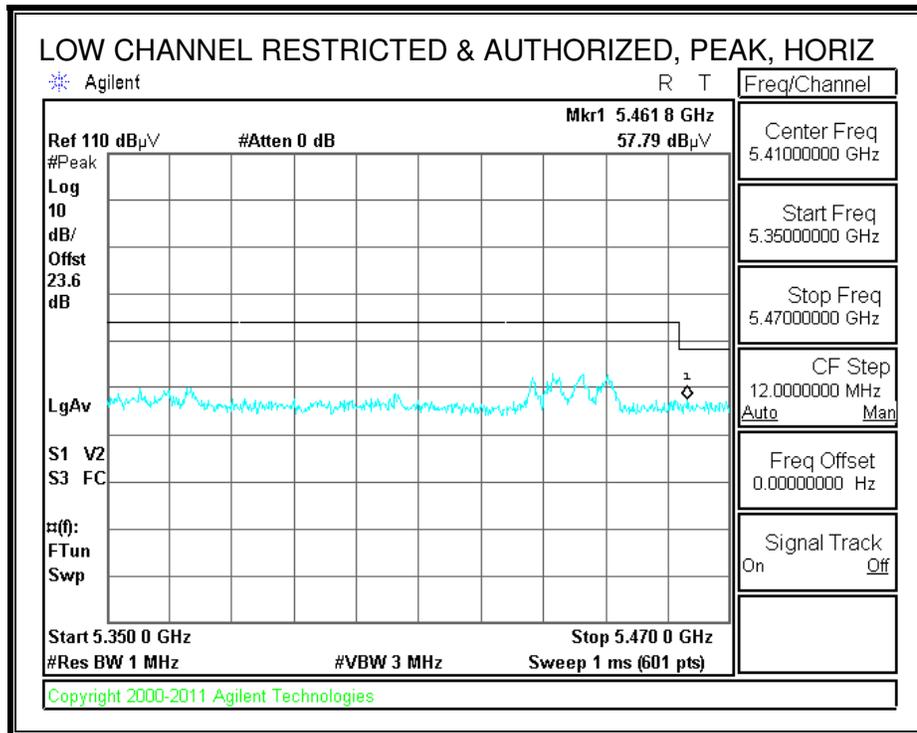
**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH100)**

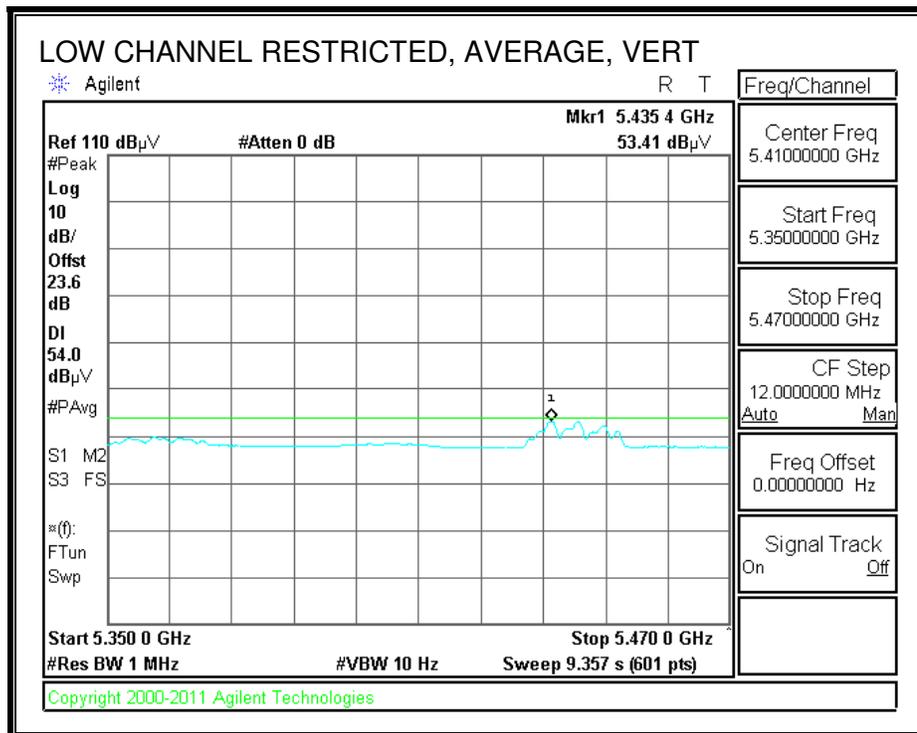
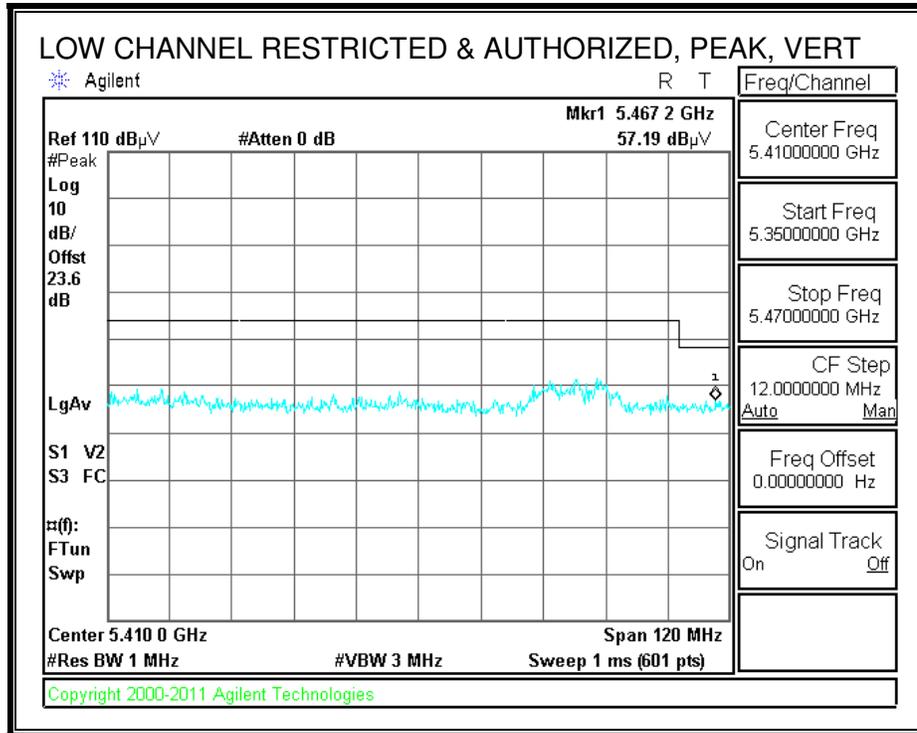




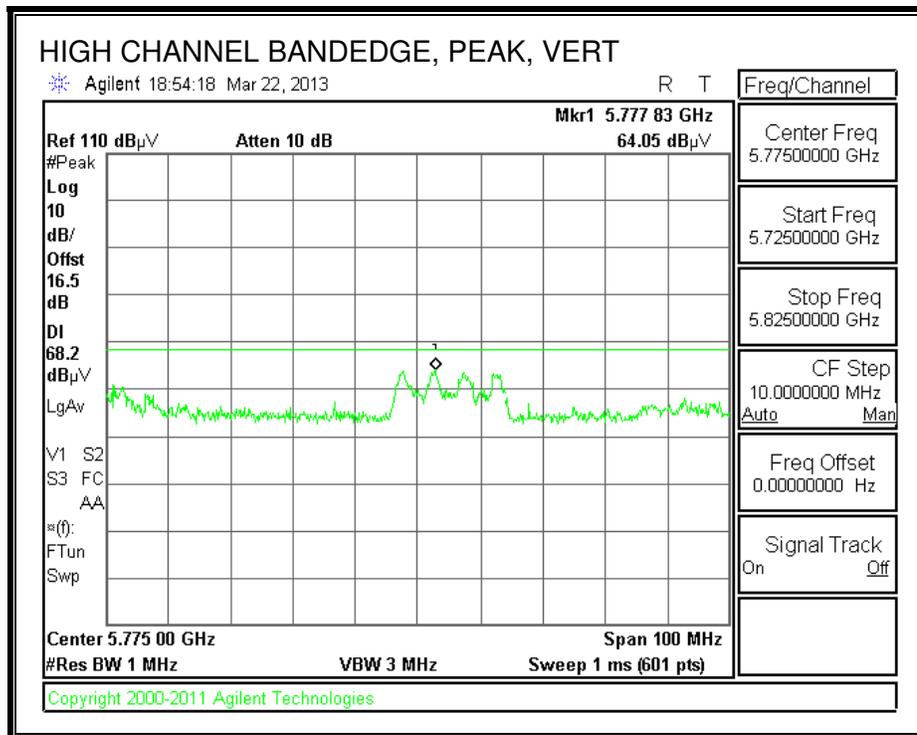
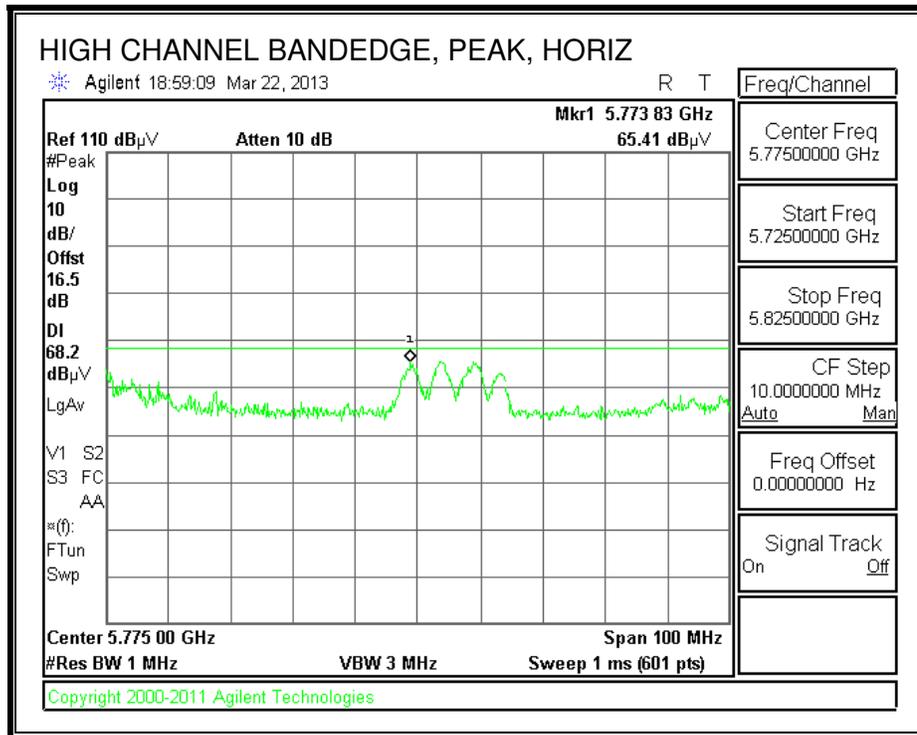


**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)**





**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 3TX 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

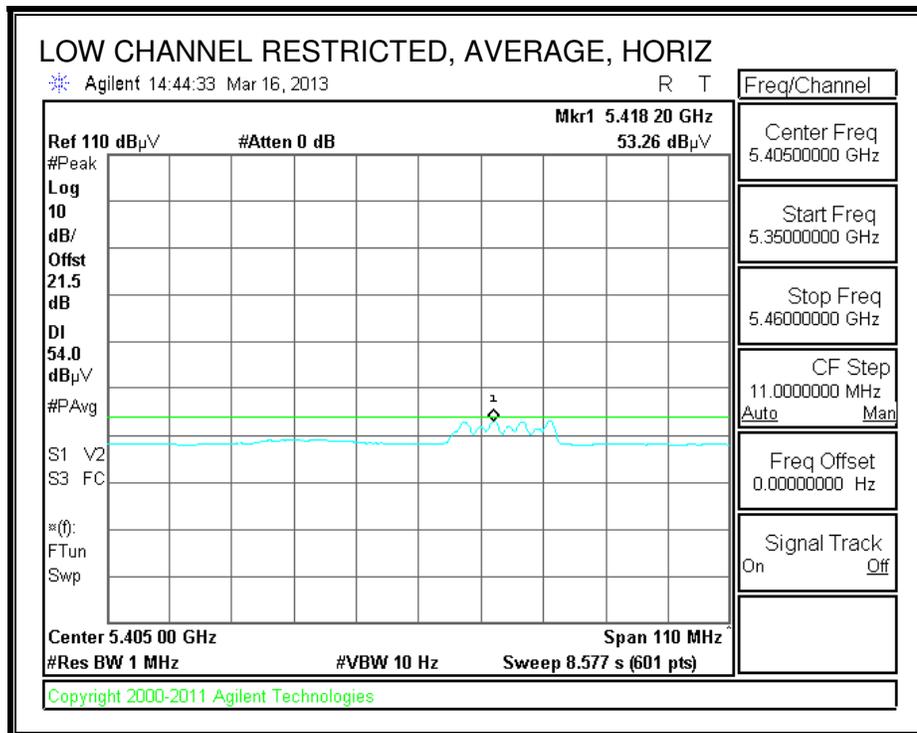
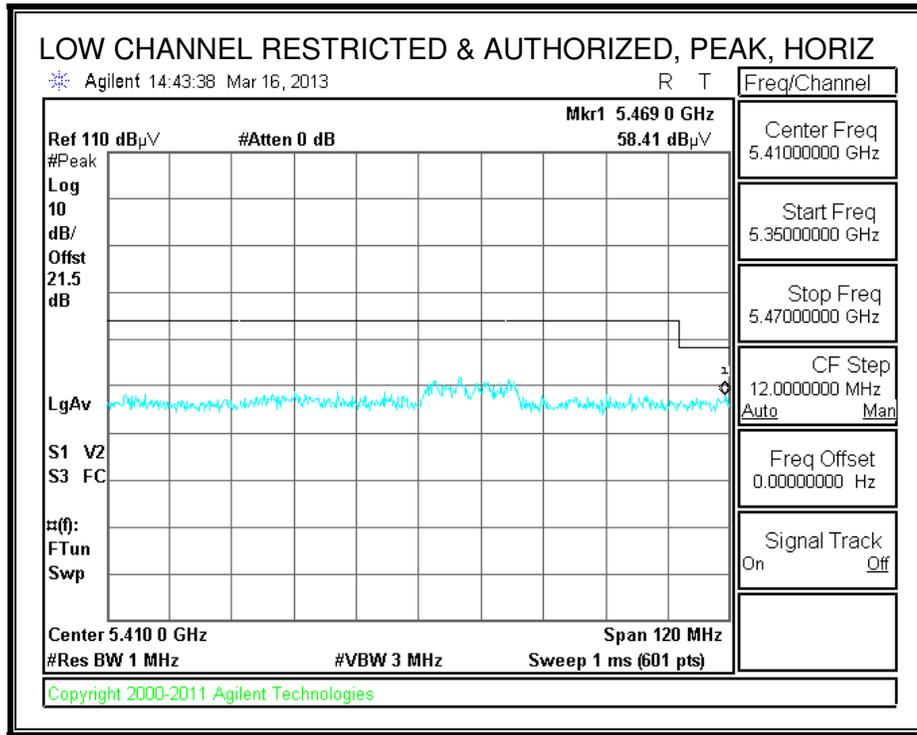
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5500 MHz 3TX CDD</b>													
11.000	3.0	35.8	38.4	10.5	-33.6	0.0	0.7	51.9	74.0	-22.1	H	P	
11.000	3.0	29.0	38.4	10.5	-33.6	0.0	0.7	45.1	54.0	-8.9	H	A	
11.000	3.0	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 3TX 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 3TX 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	

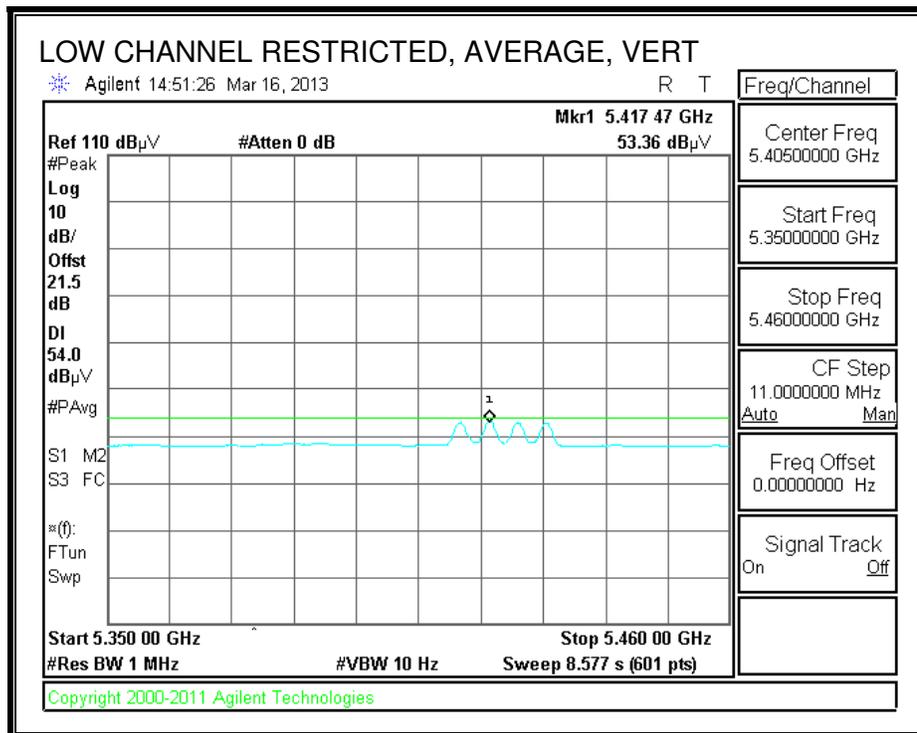
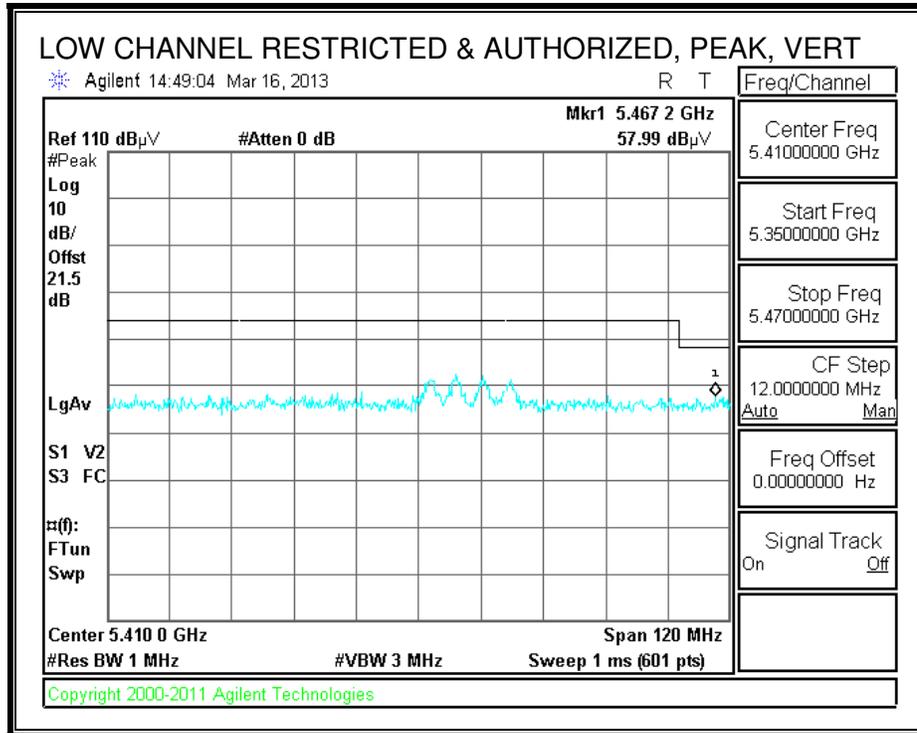
Rev. 4.1.2.7

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

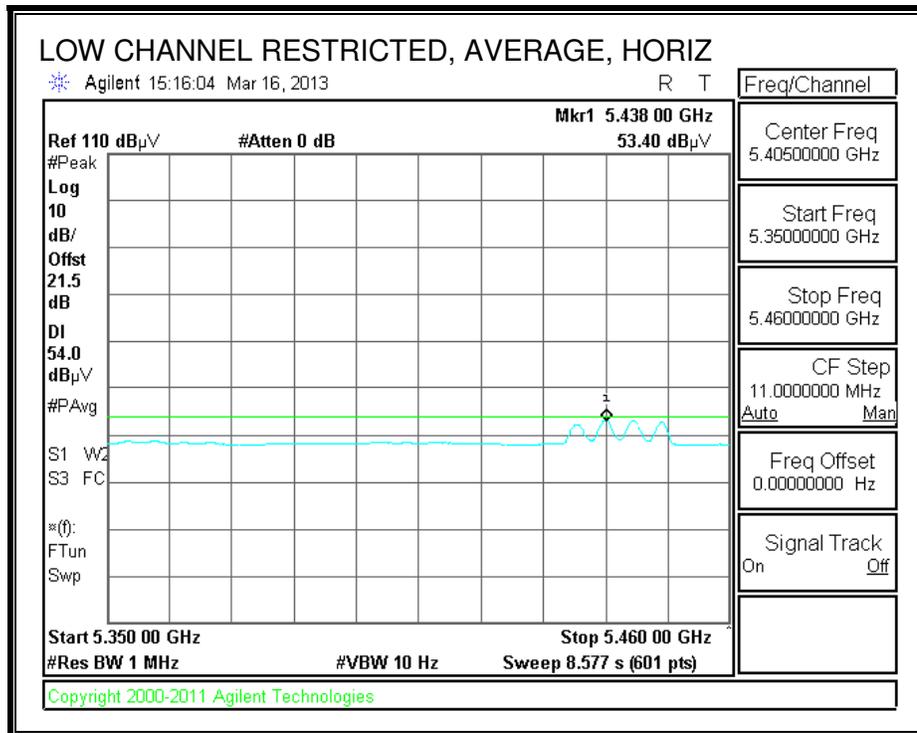
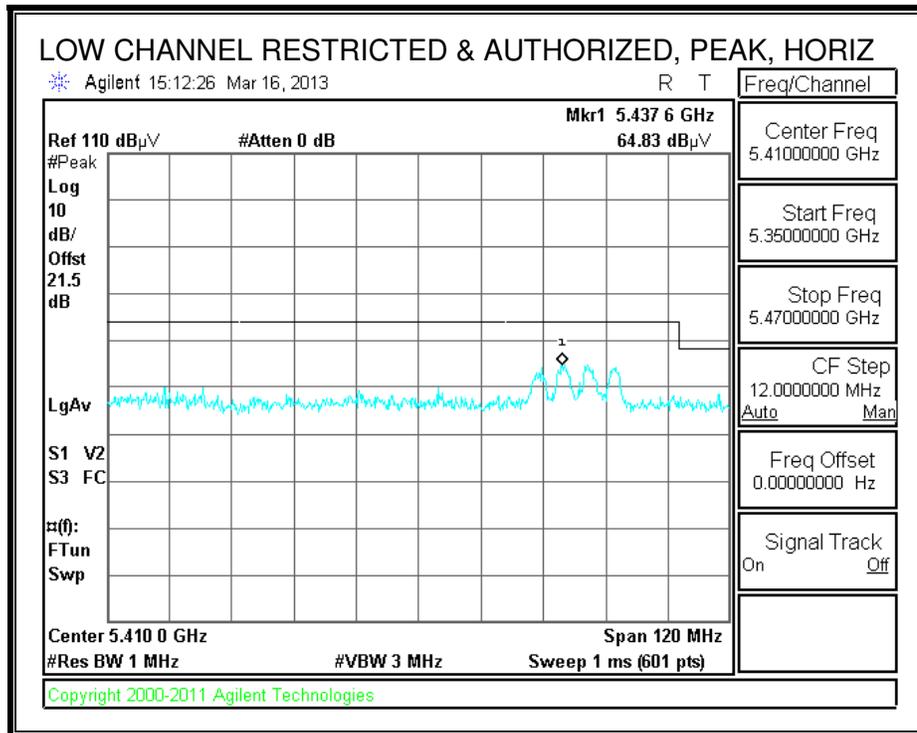
**9.2.30. TX ABOVE 1 GHz, 802.11n HT20 BF 2TX MODE, 5.6 GHz BAND**

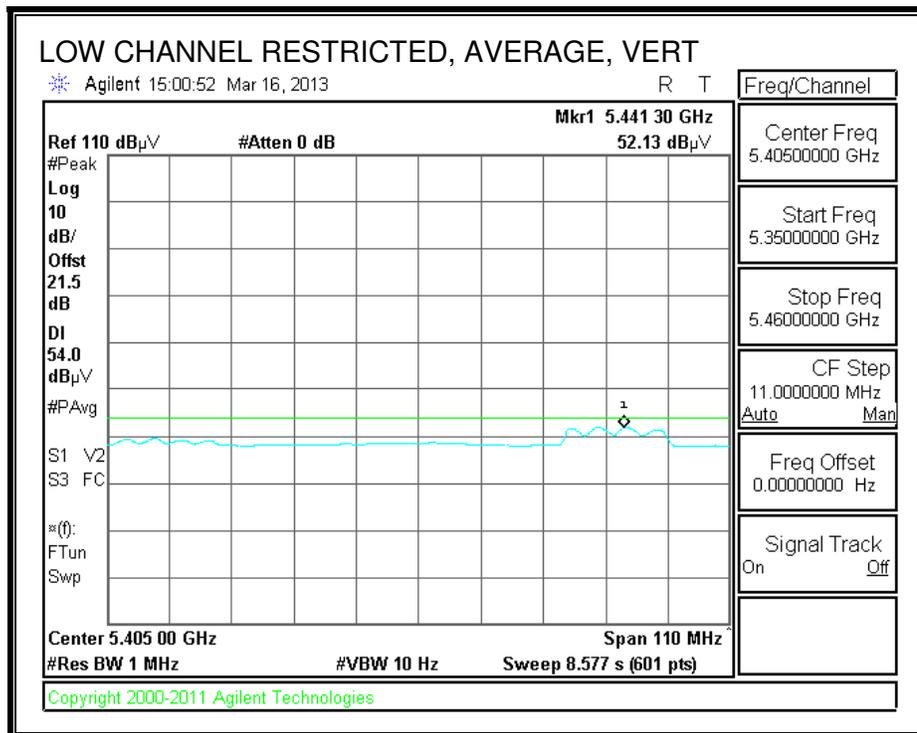
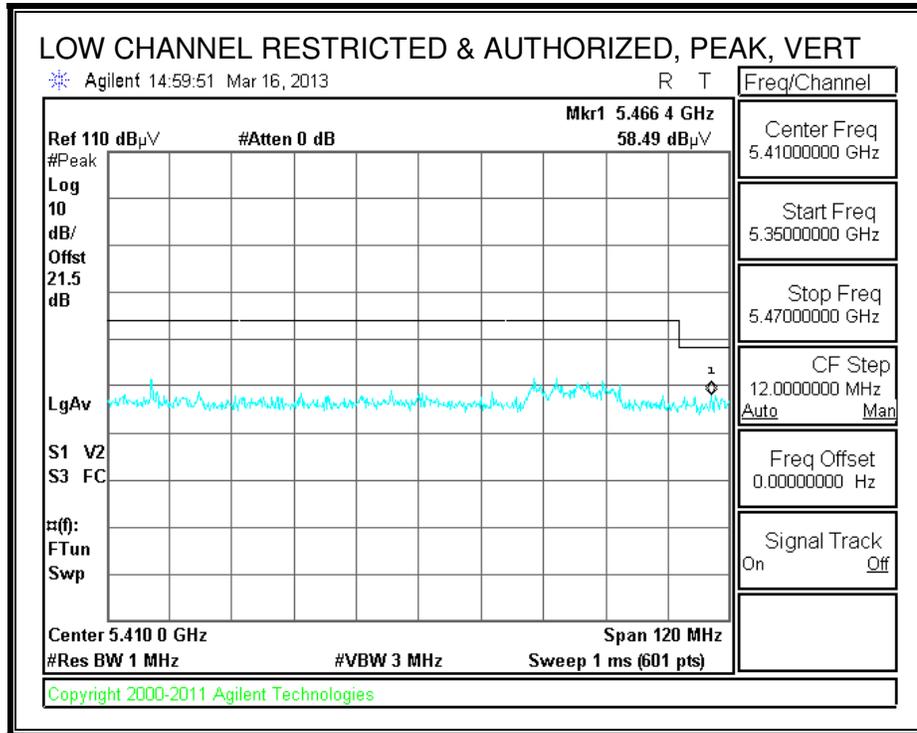
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)**



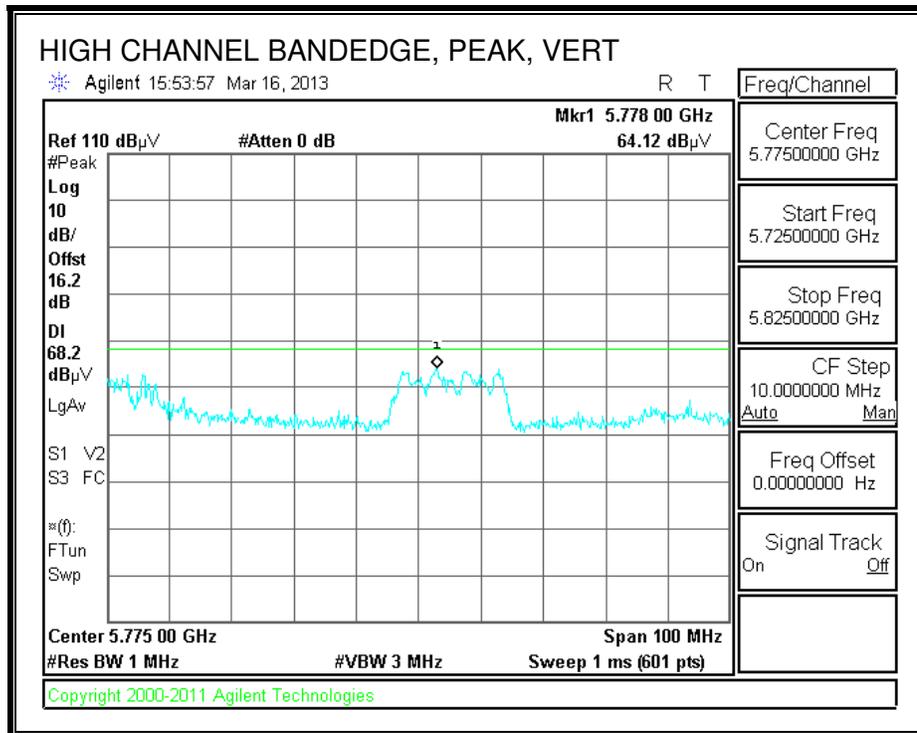
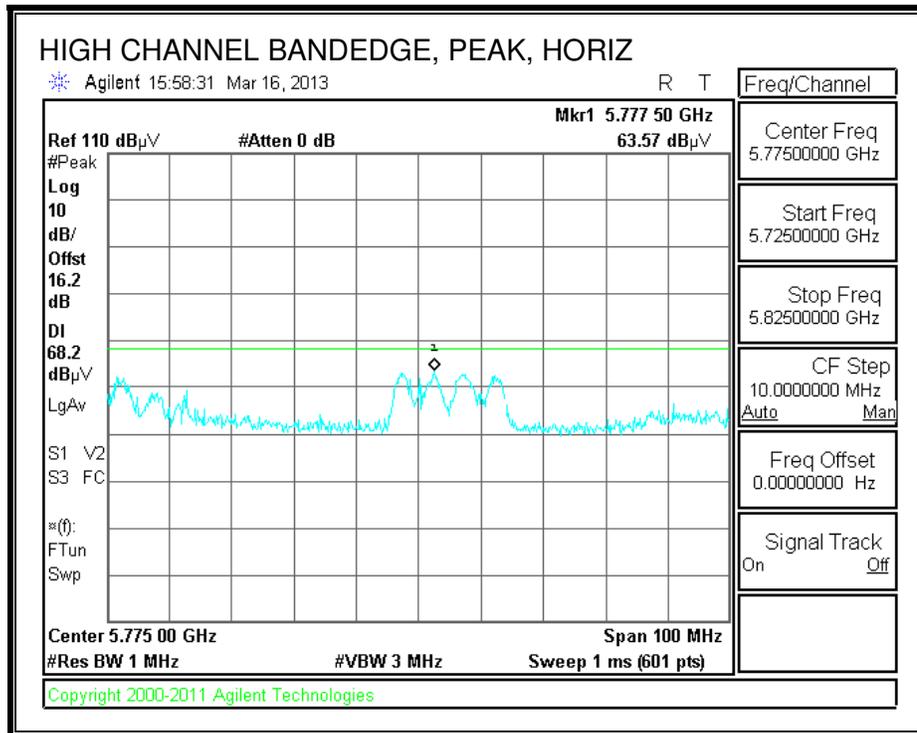


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH104)**





**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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

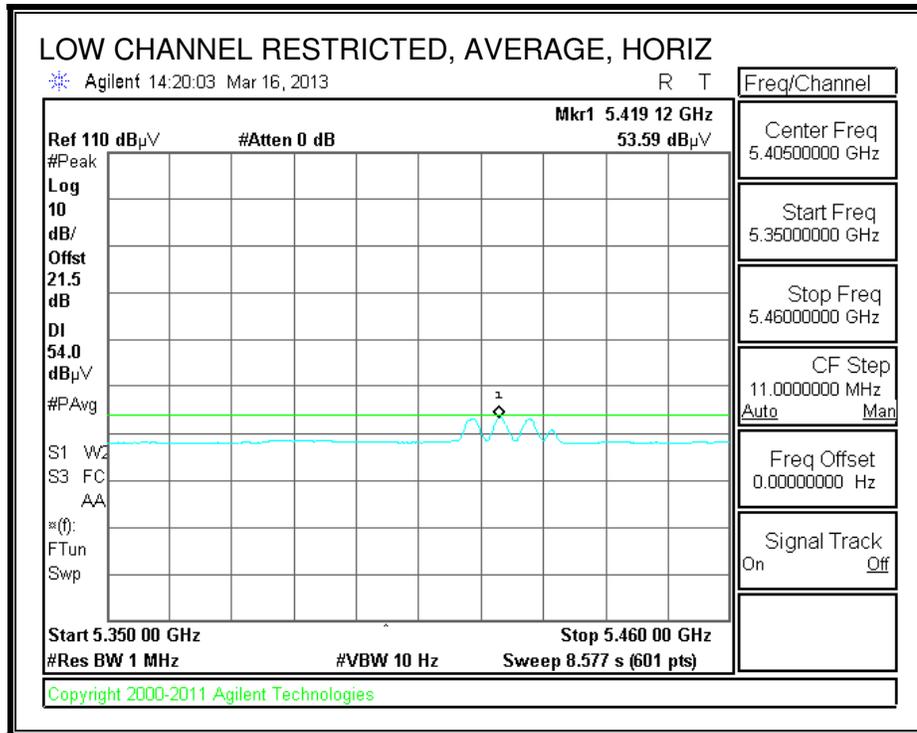
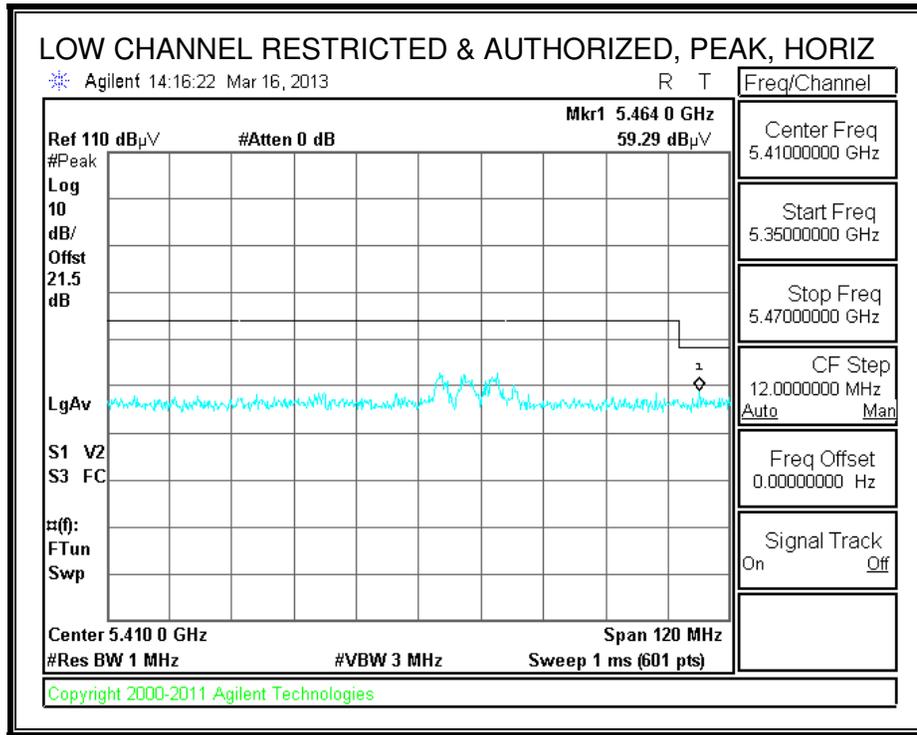
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5500 MHz)</b>															
11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V
11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V
<b>Mid Channel (5580 MHz)</b>															
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
<b>Hi Channel (5700 MHz)</b>															
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															

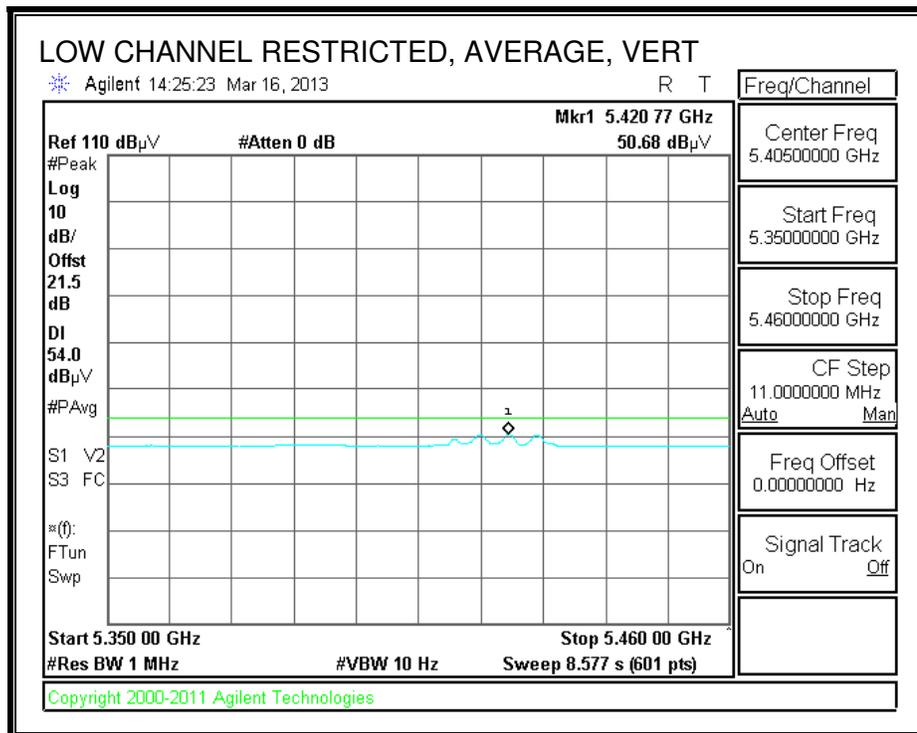
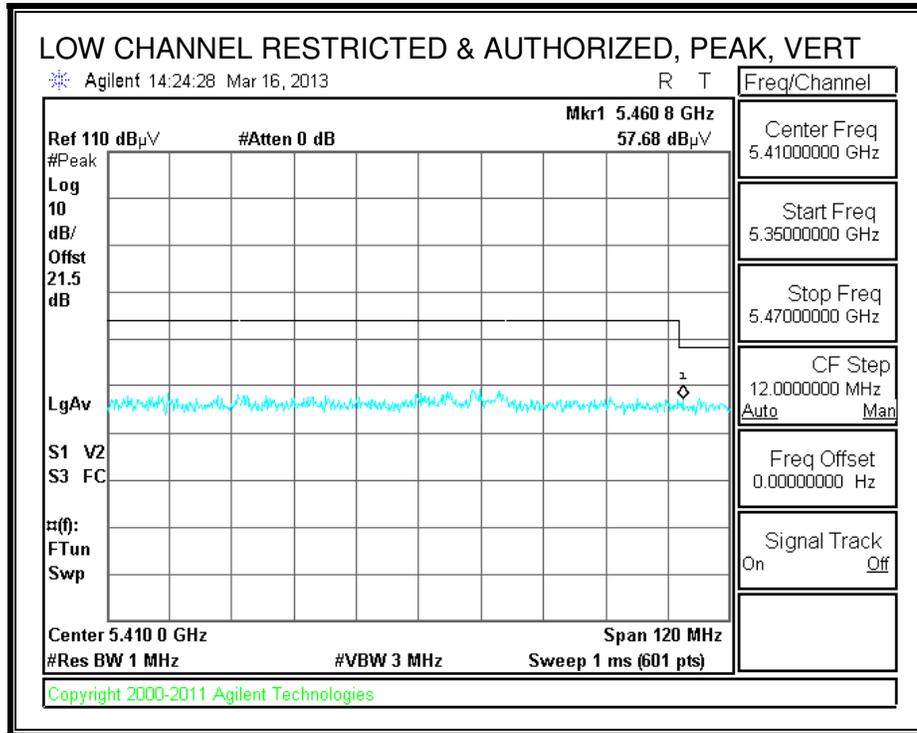
Rev. 01.30.13

f	Measurement Frequency	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		

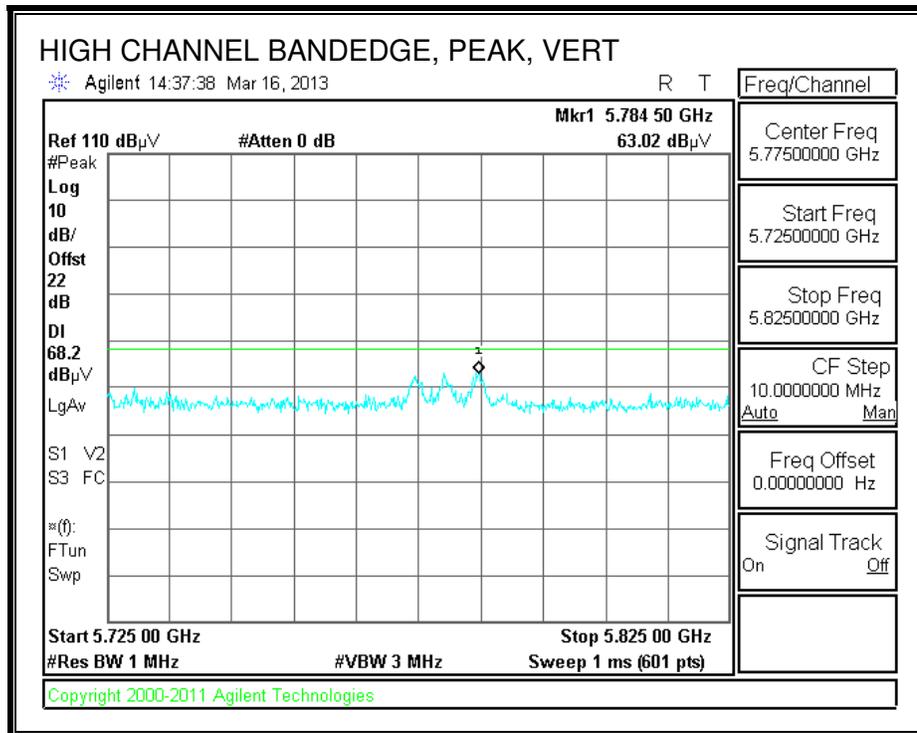
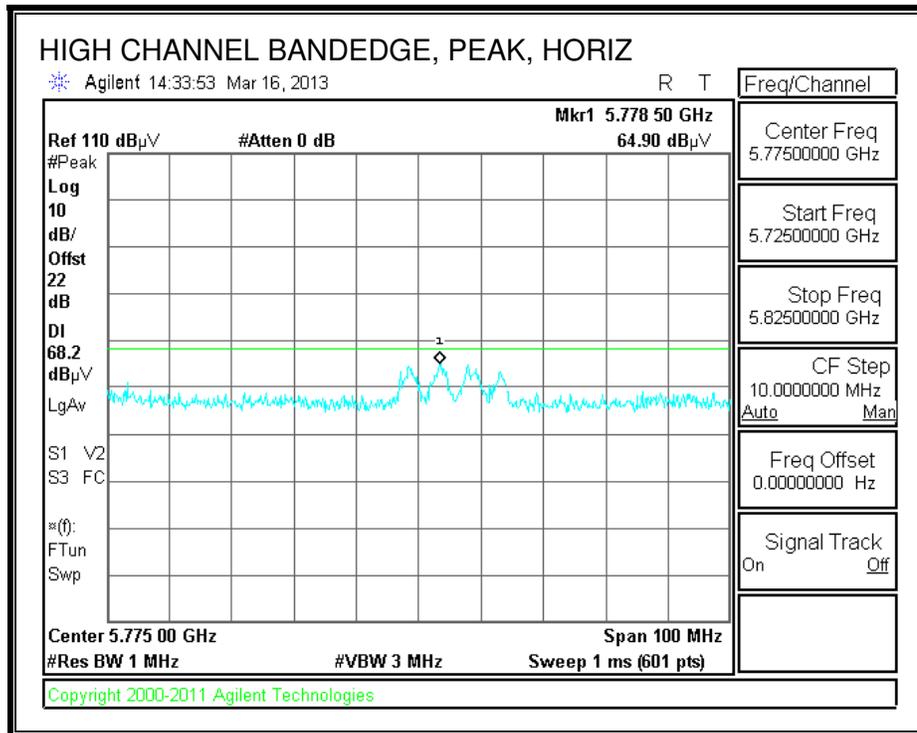
**9.2.31. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.6 GHz BAND**

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





**AUTHORIZED BANDEDGE (HIGH CHANNEL)**



**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber-A

Company: MENGISTU MEKURIA  
 Project #: 03/17/13  
 Date: 12U14745  
 Test Engineer: Apple Inc.  
 Configuration: FCC Class B  
 Mode: HT20 3TX BF CDD

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

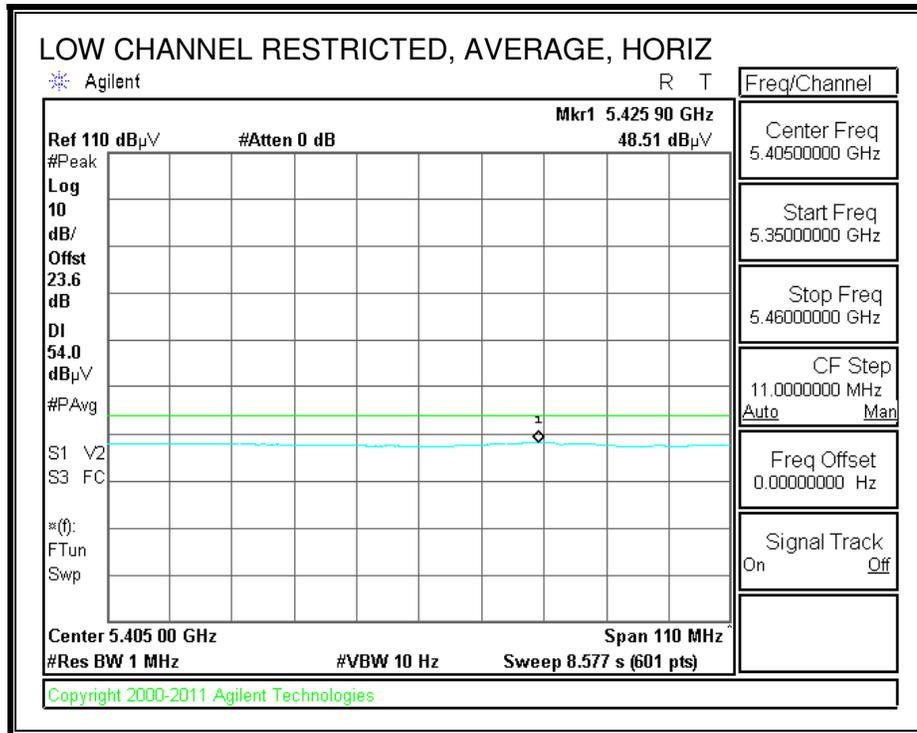
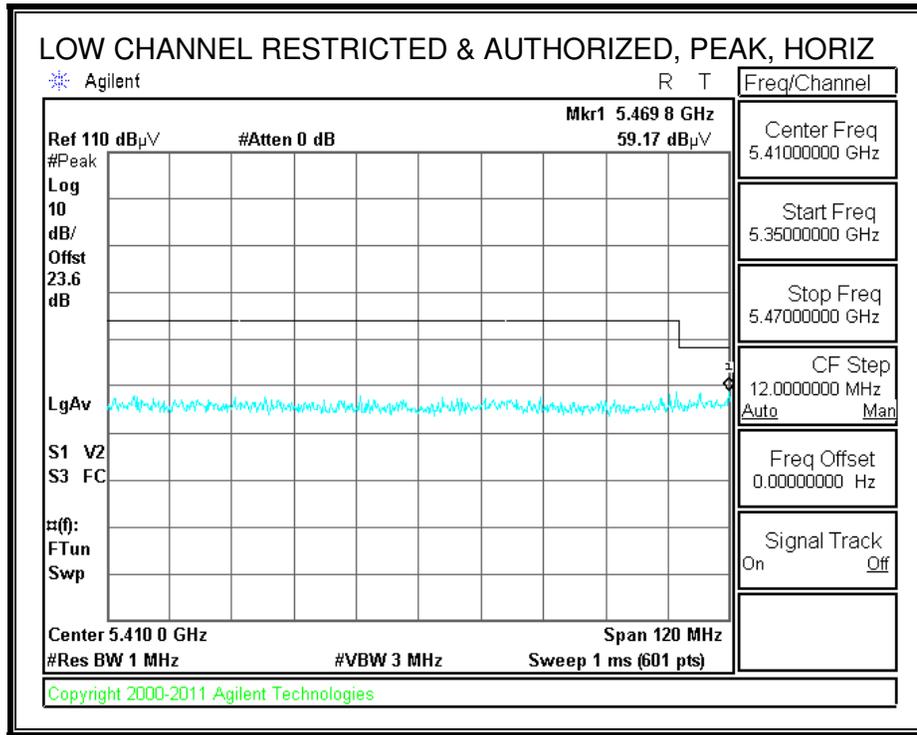
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5500 MHz)</b>															
11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V
11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V
<b>Mid Channel (5580 MHz)</b>															
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
<b>Hi Channel (5700 MHz)</b>															
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															

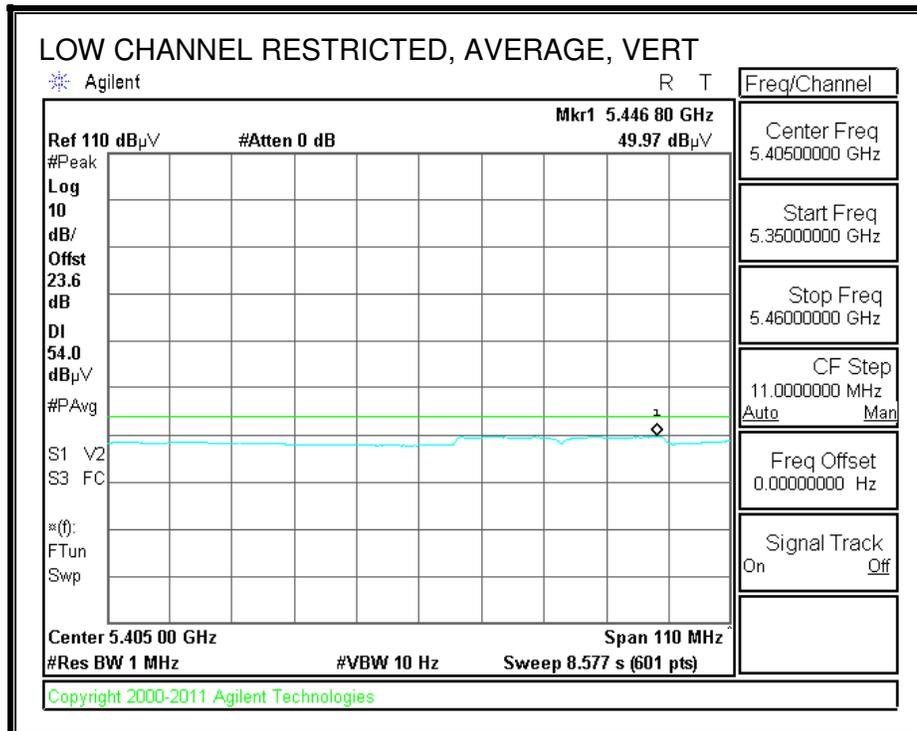
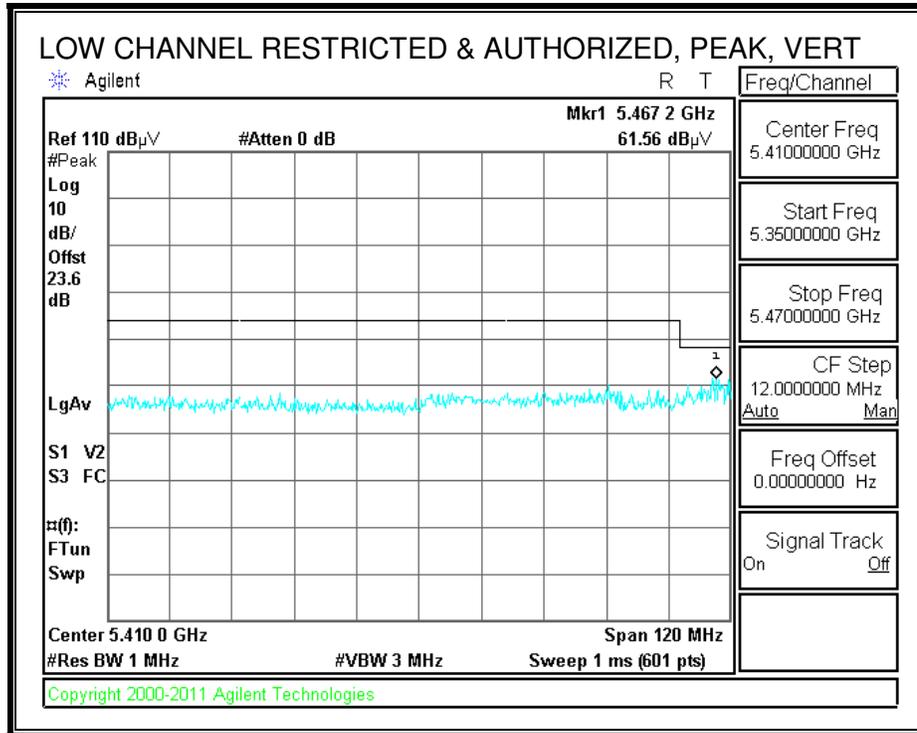
Rev. 01.30.13

f	Measurement Frequency	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		

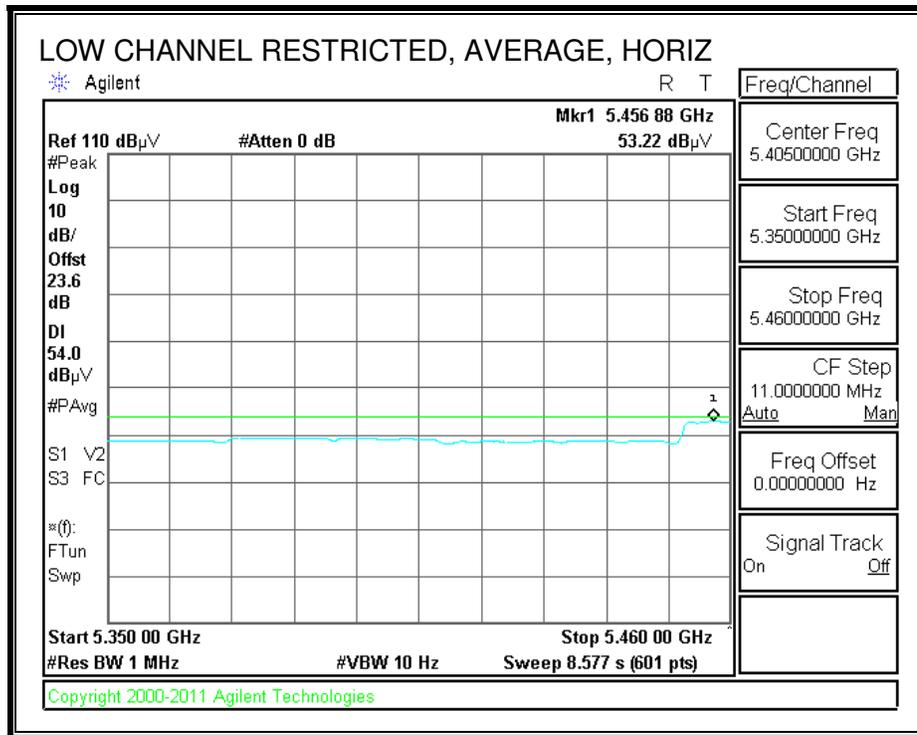
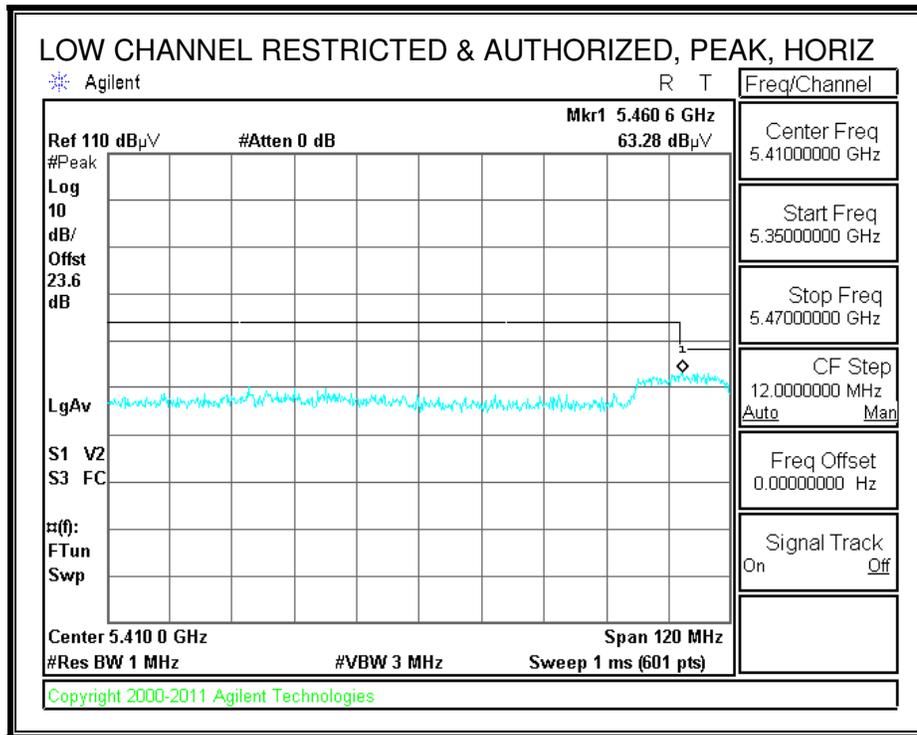
**9.2.32. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.6 GHz BAND**

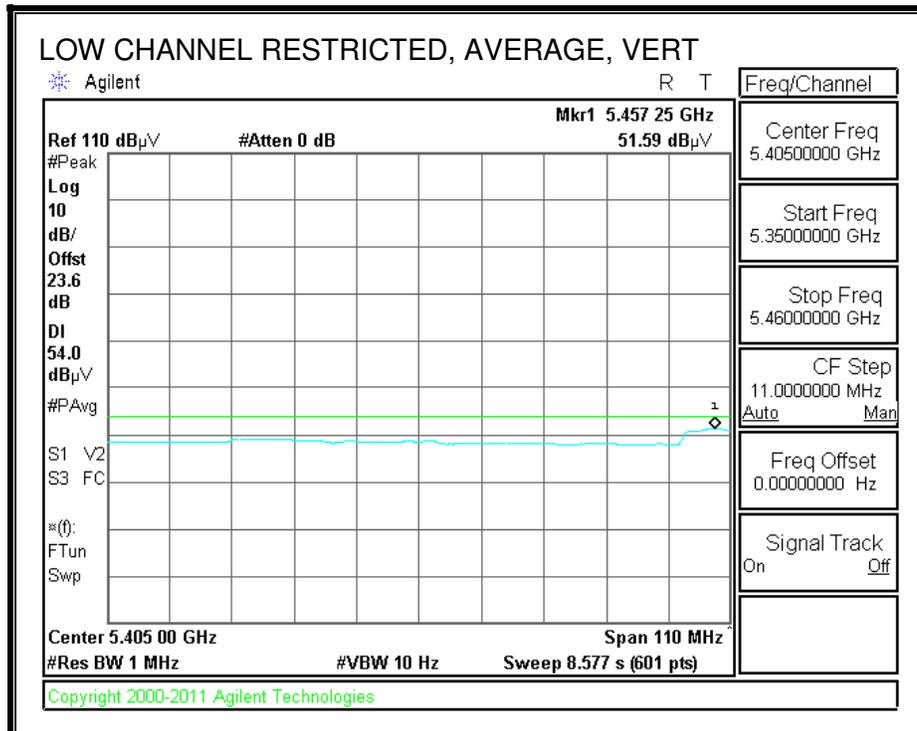
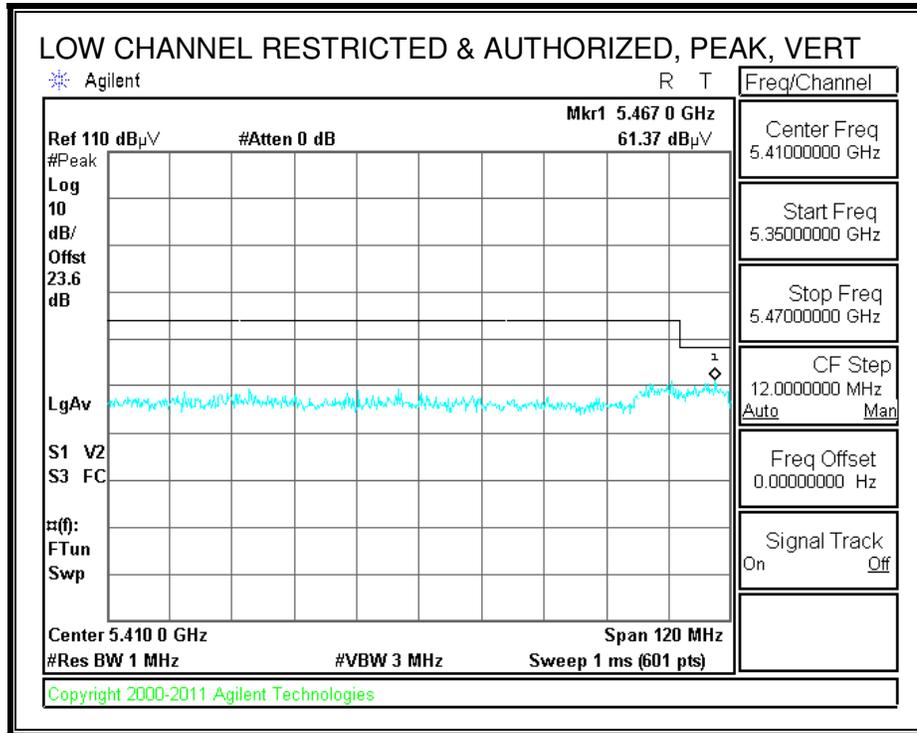
**RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)**



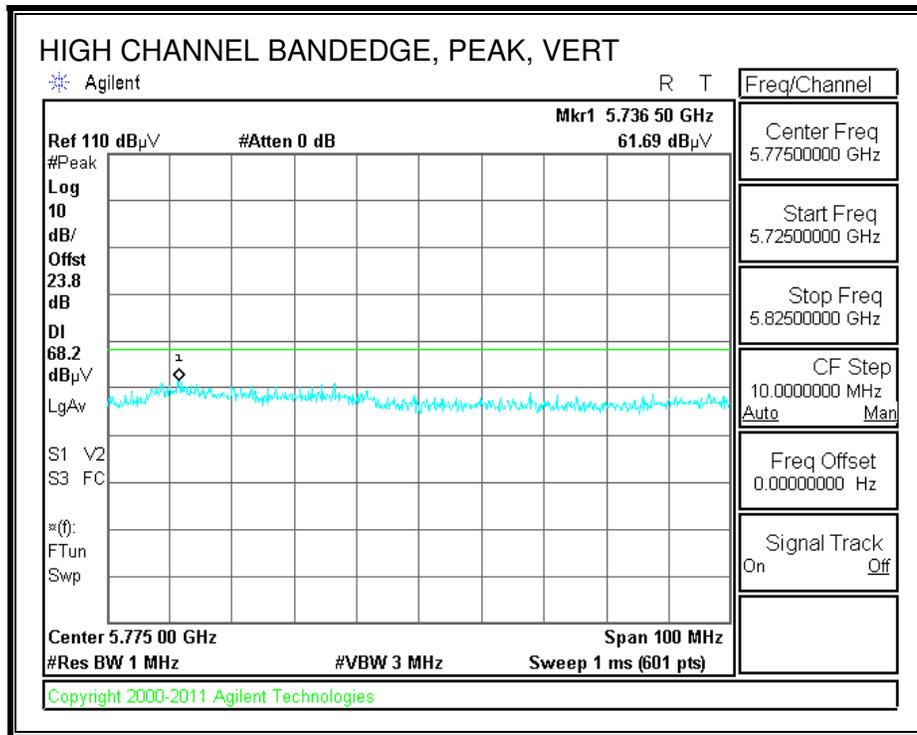
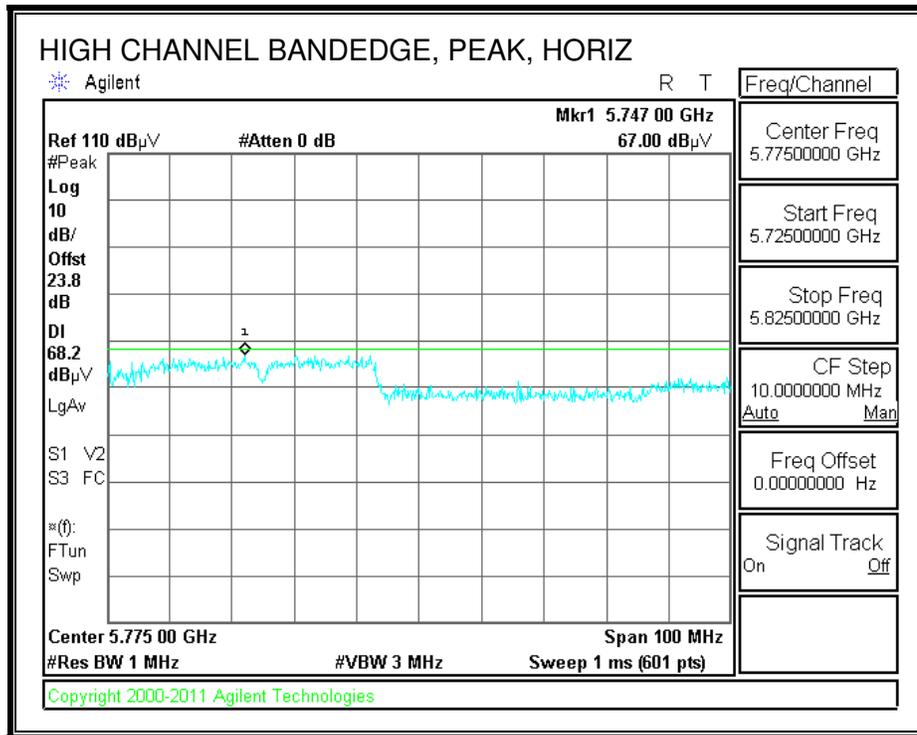


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH110)**





**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 3TX 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

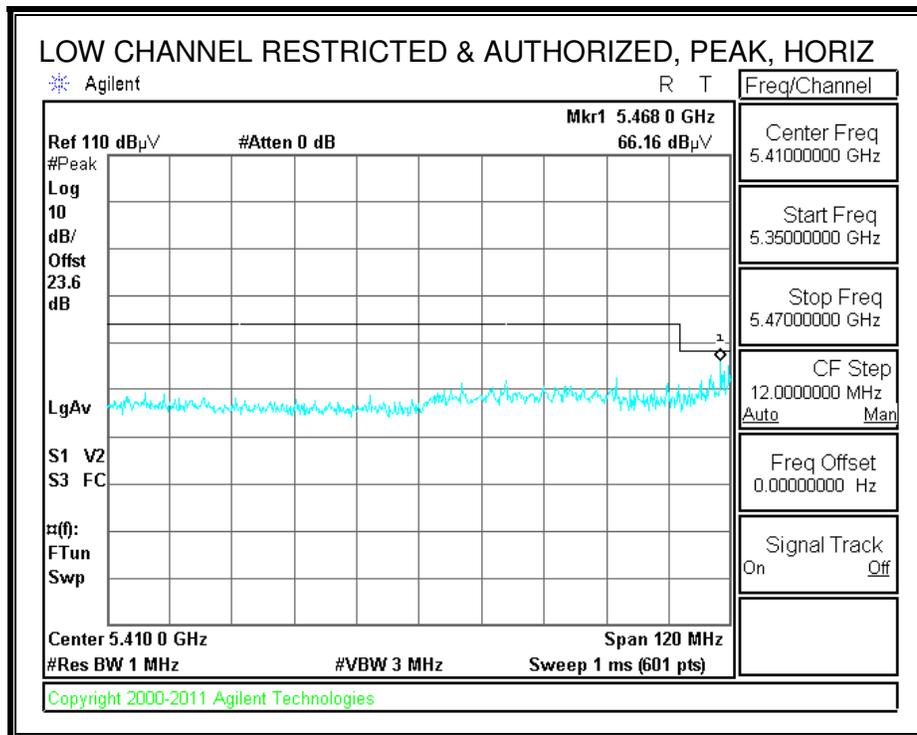
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5510 MHz 3TX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	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 3TX 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 3TX 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	

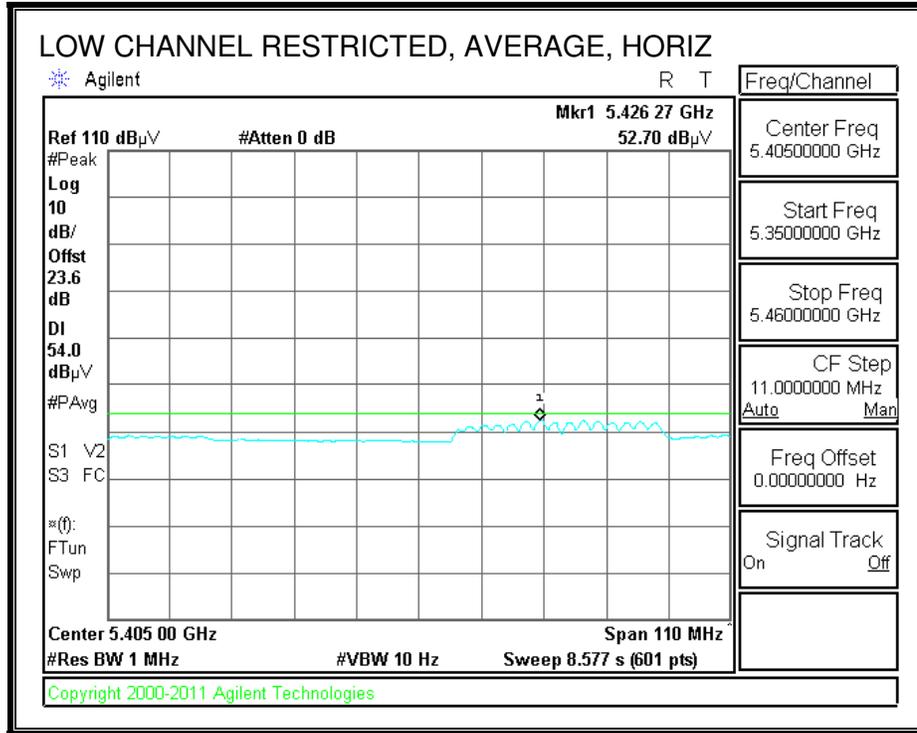
Rev. 4.1.2.7

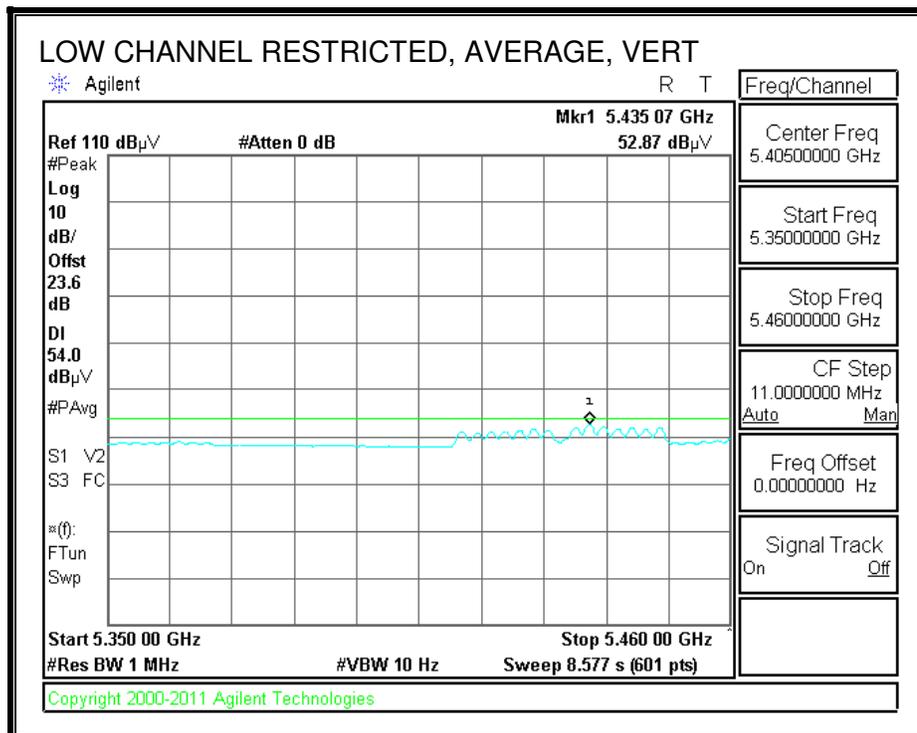
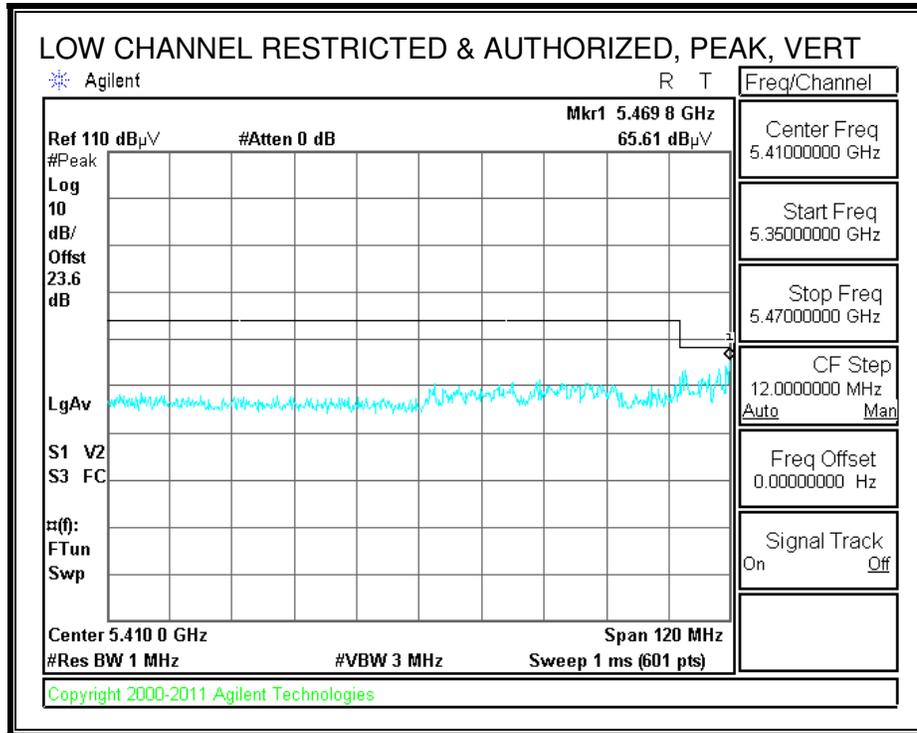
Note: No other emissions were detected above the system noise floor.

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

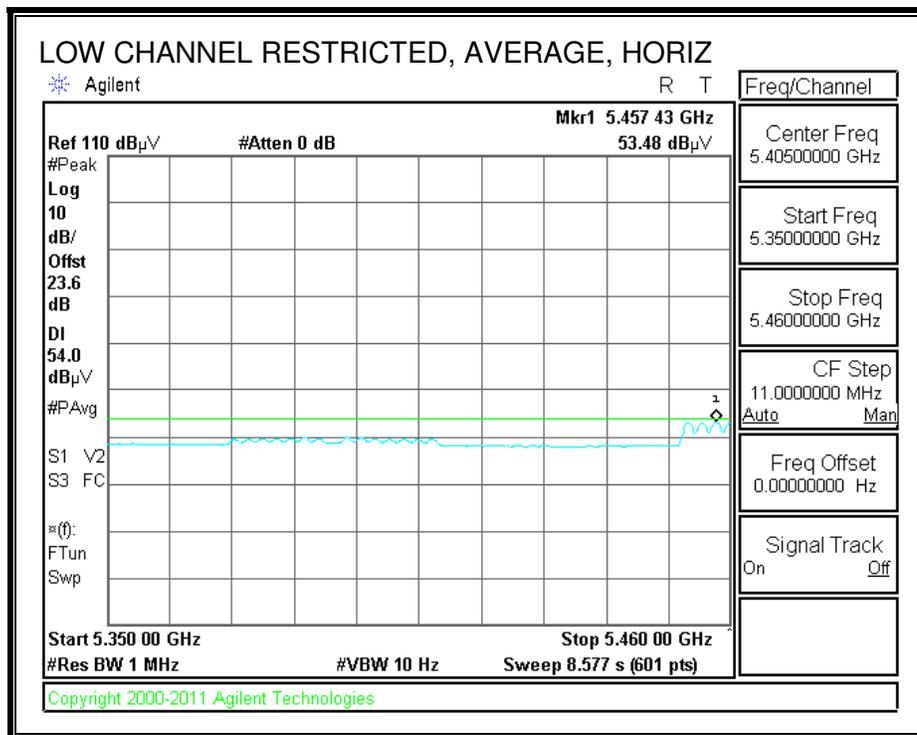
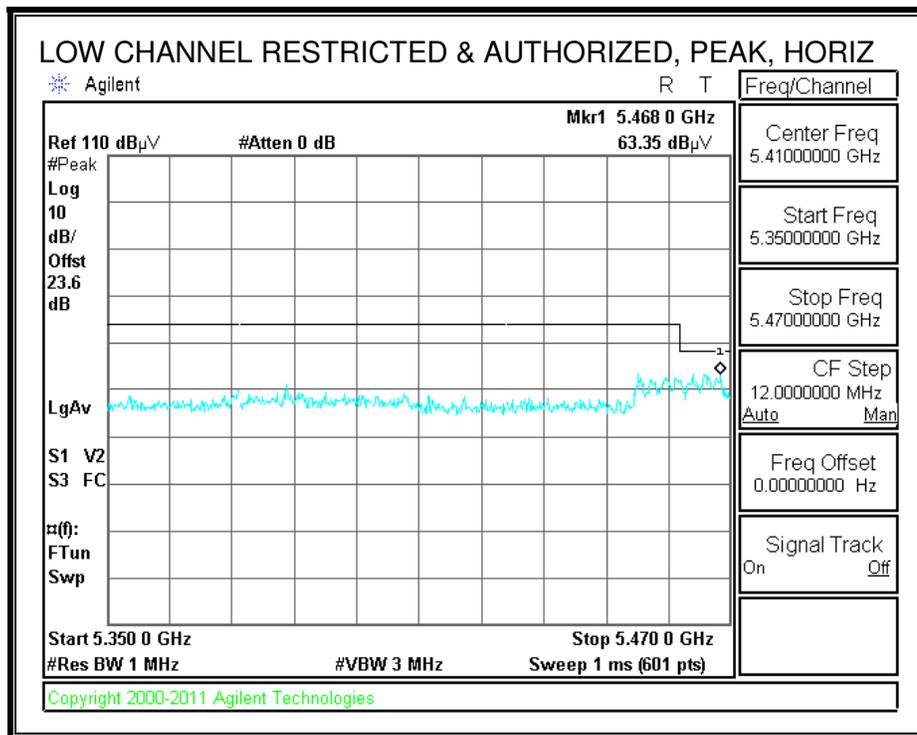
**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH102)**

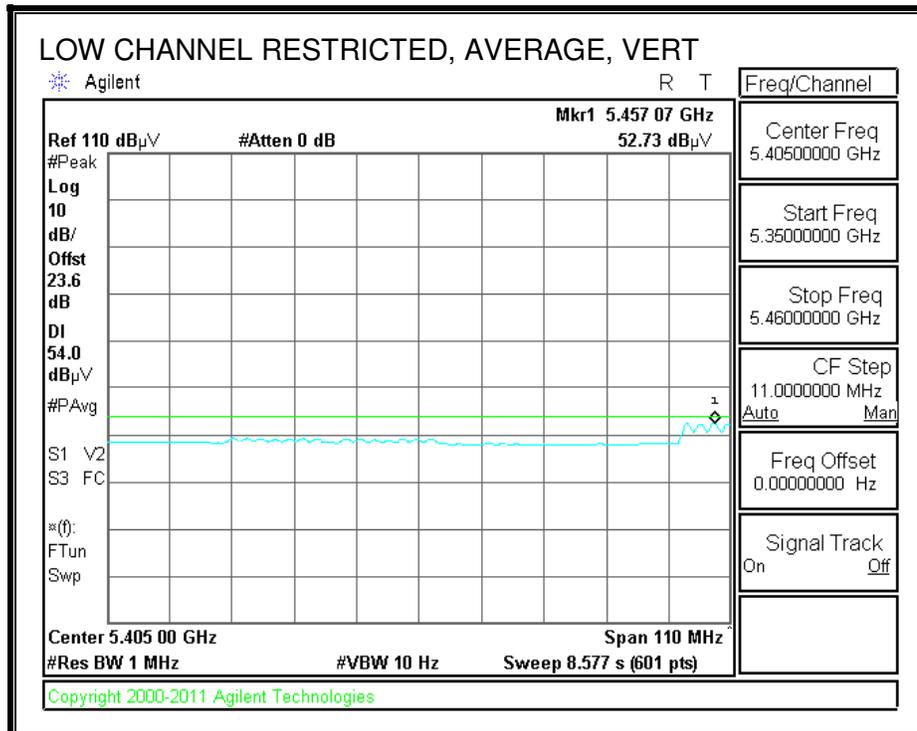
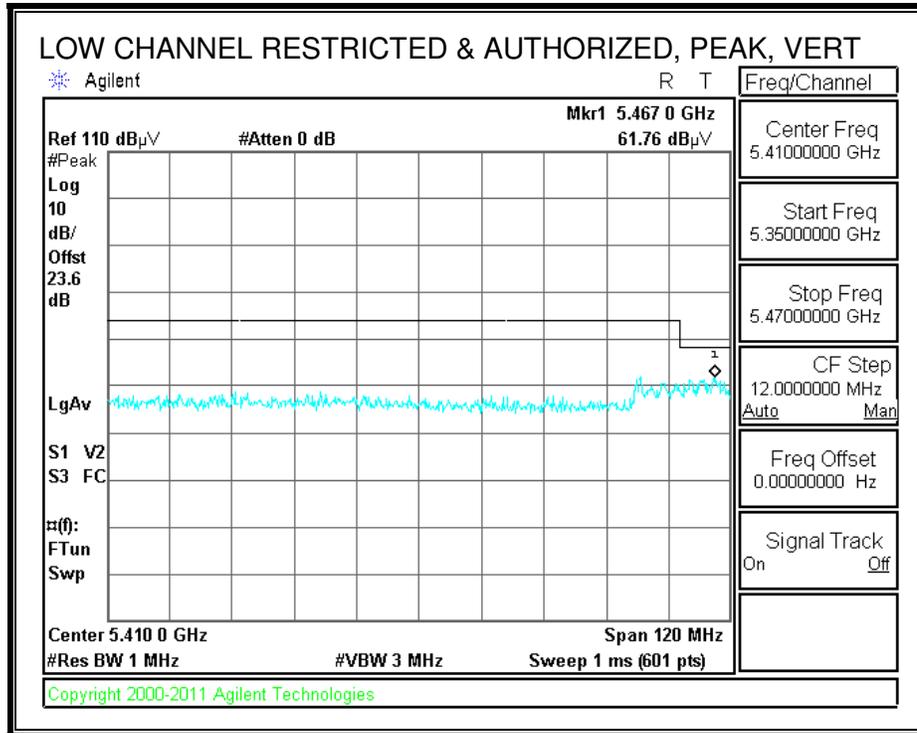




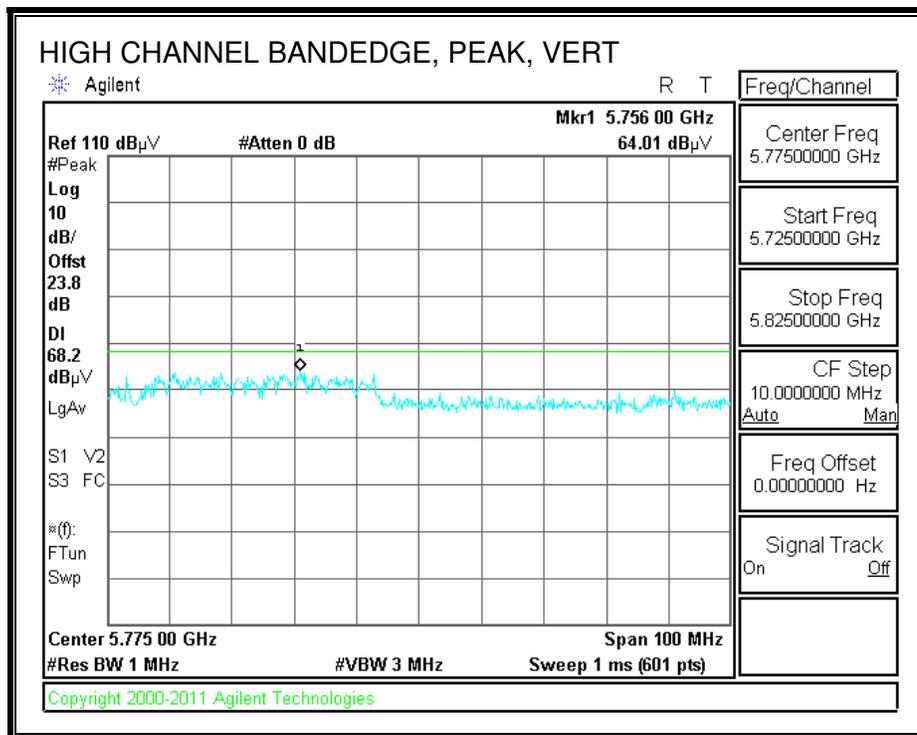
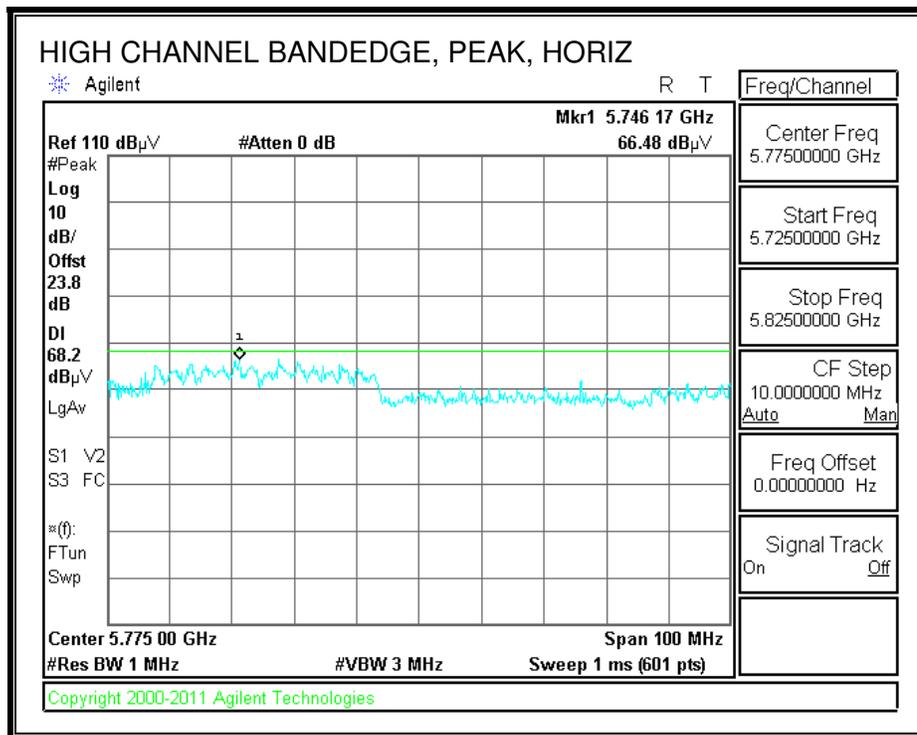


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH110)**





**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 3TX 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

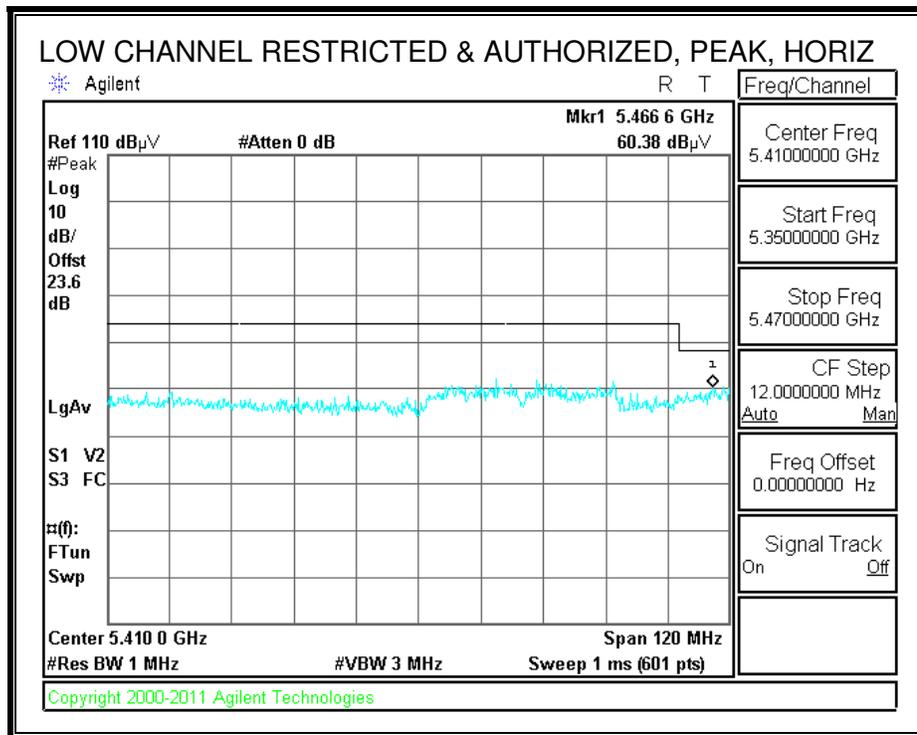
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5510 MHz 3TX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	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 3TX 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 3TX 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	

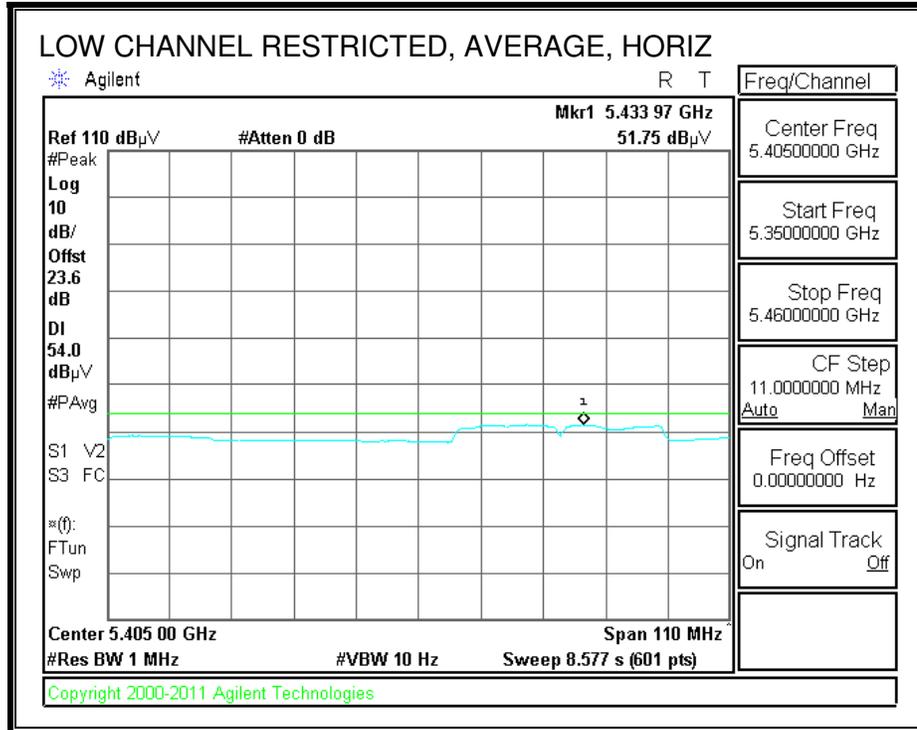
Rev. 4.1.2.7

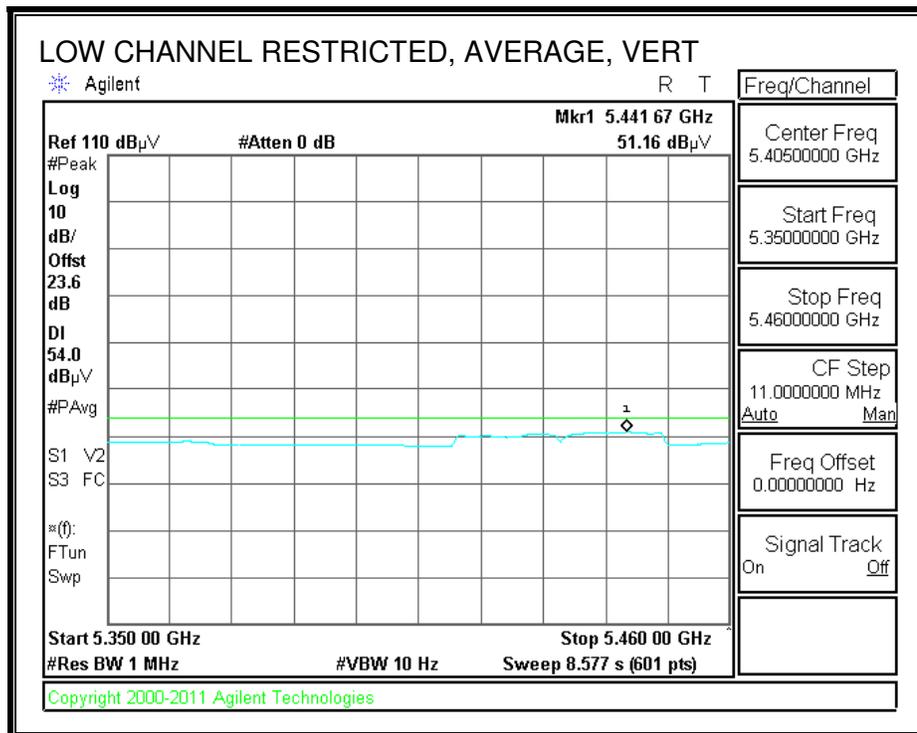
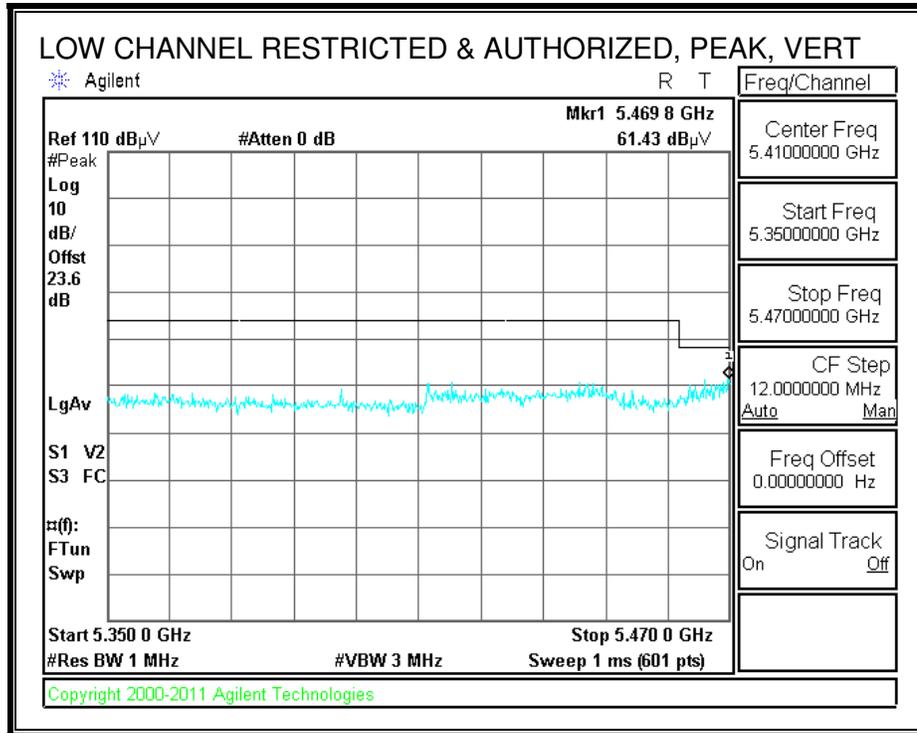
Note: No other emissions were detected above the system noise floor.

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

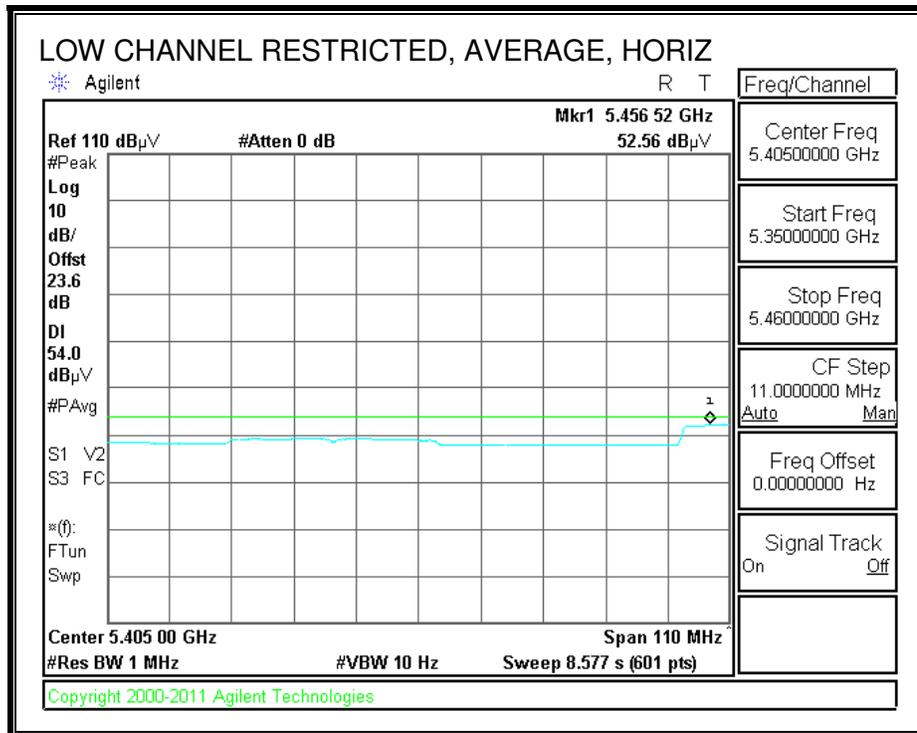
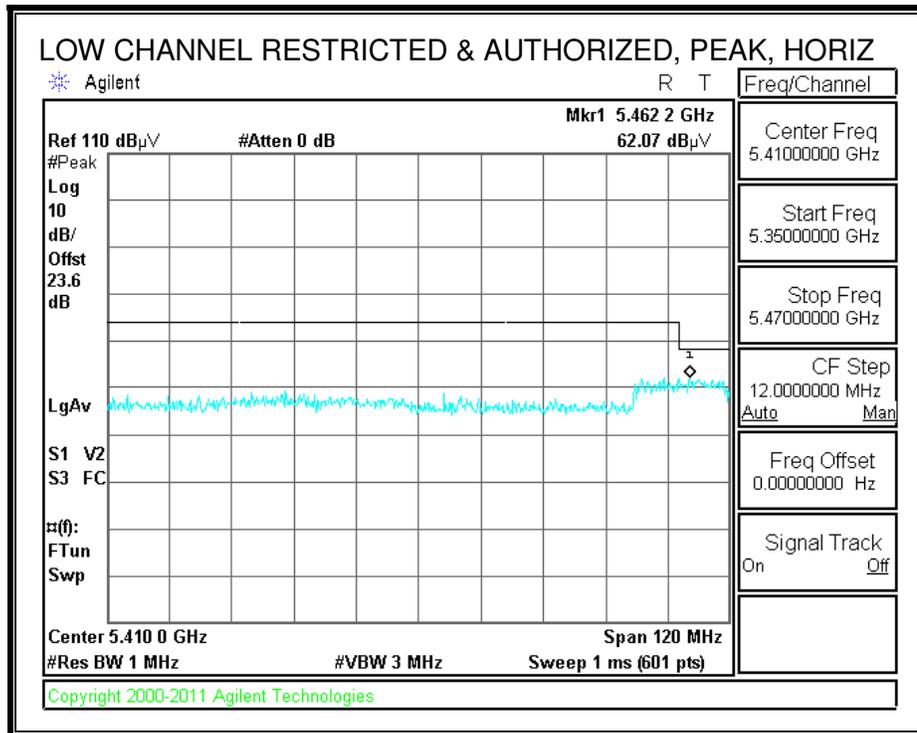
**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH102)**

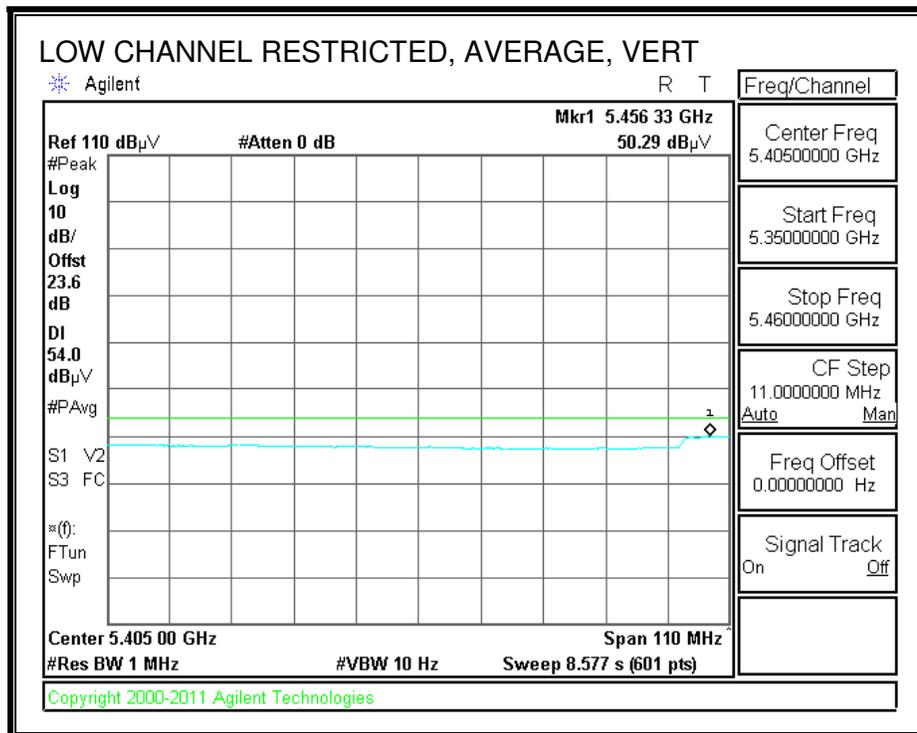
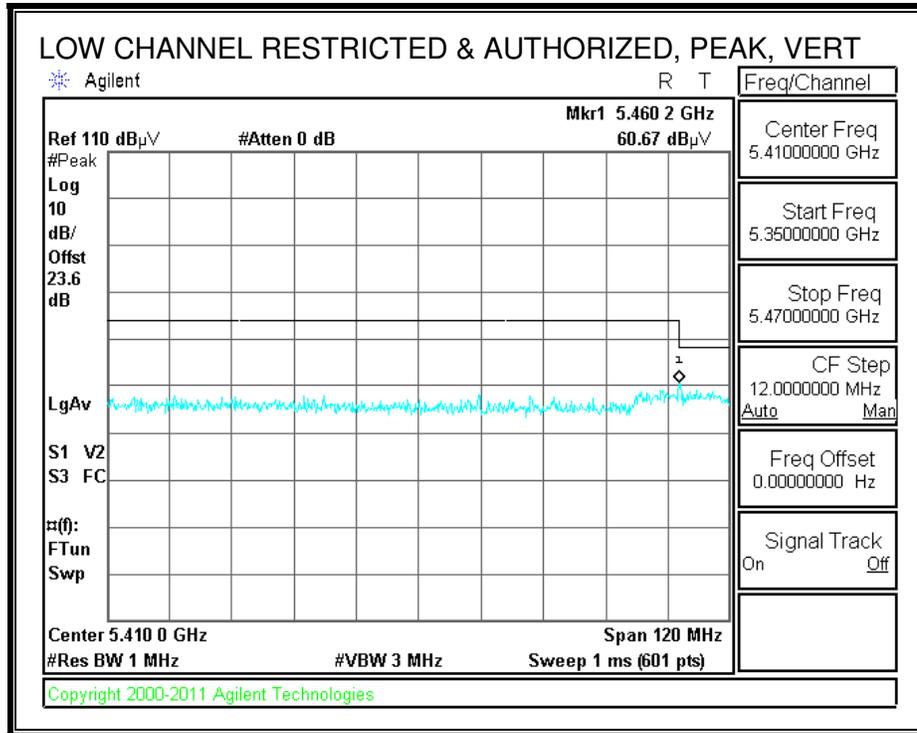




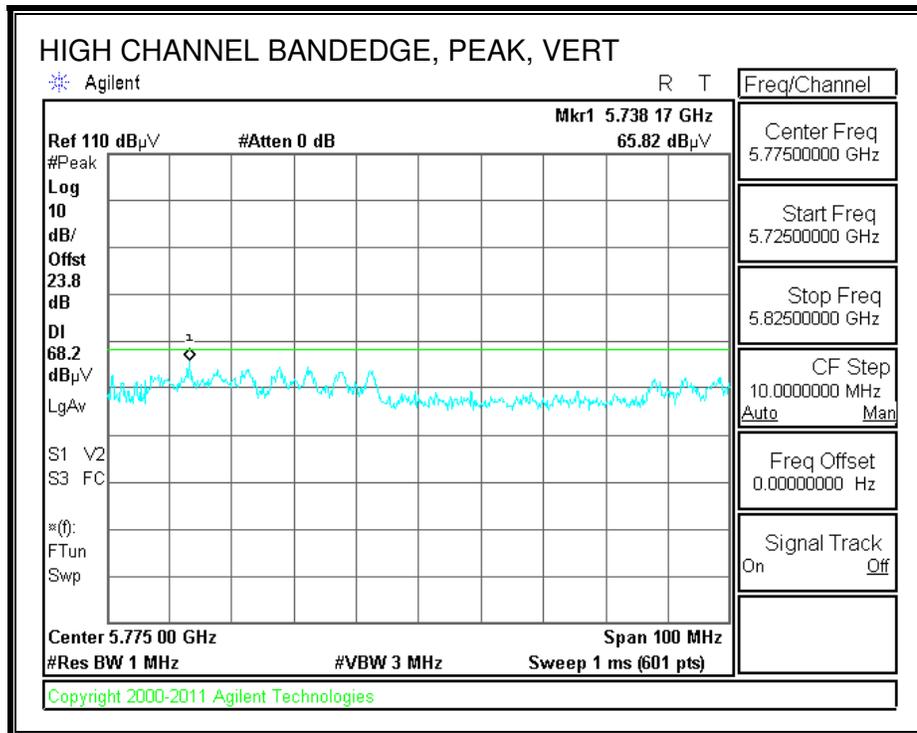
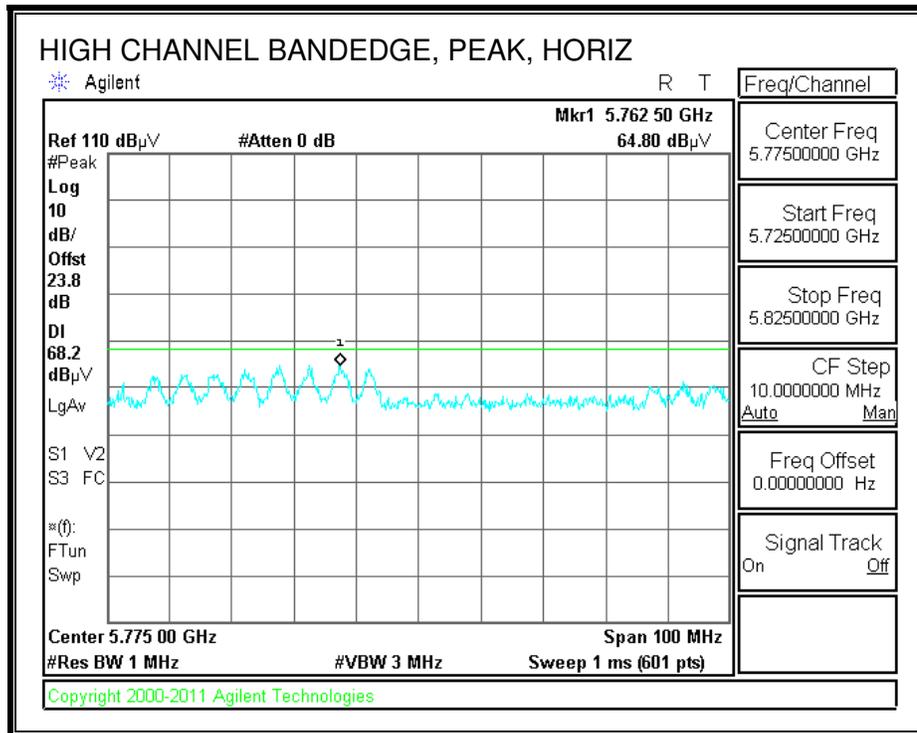


**RESTRICTED & AUTHORIZED BANDEGE (LOW CHANNEL CH110)**





**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 3TX 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

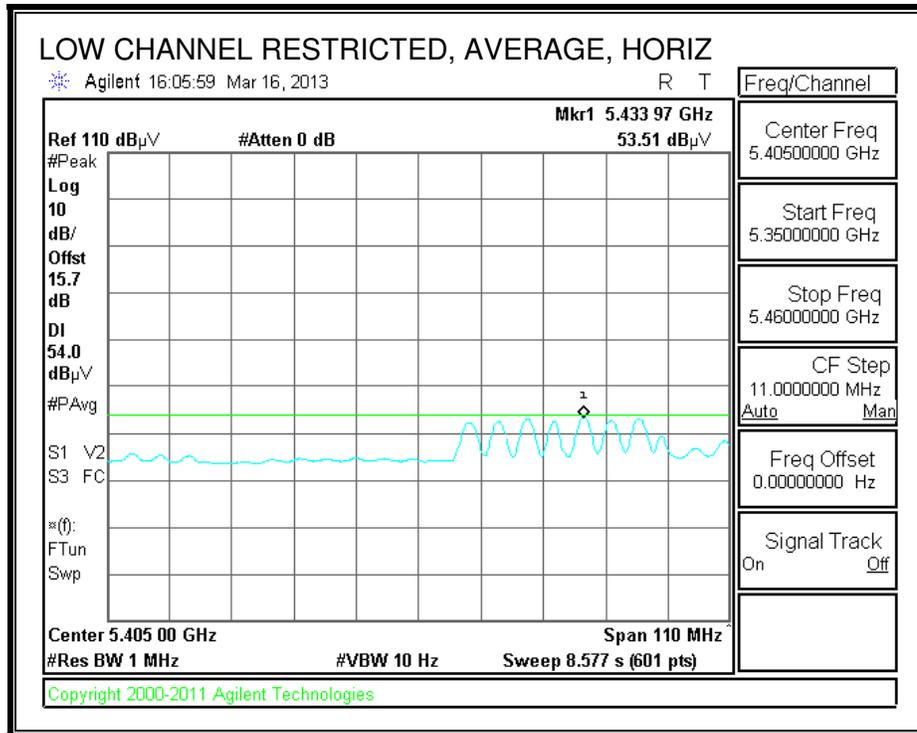
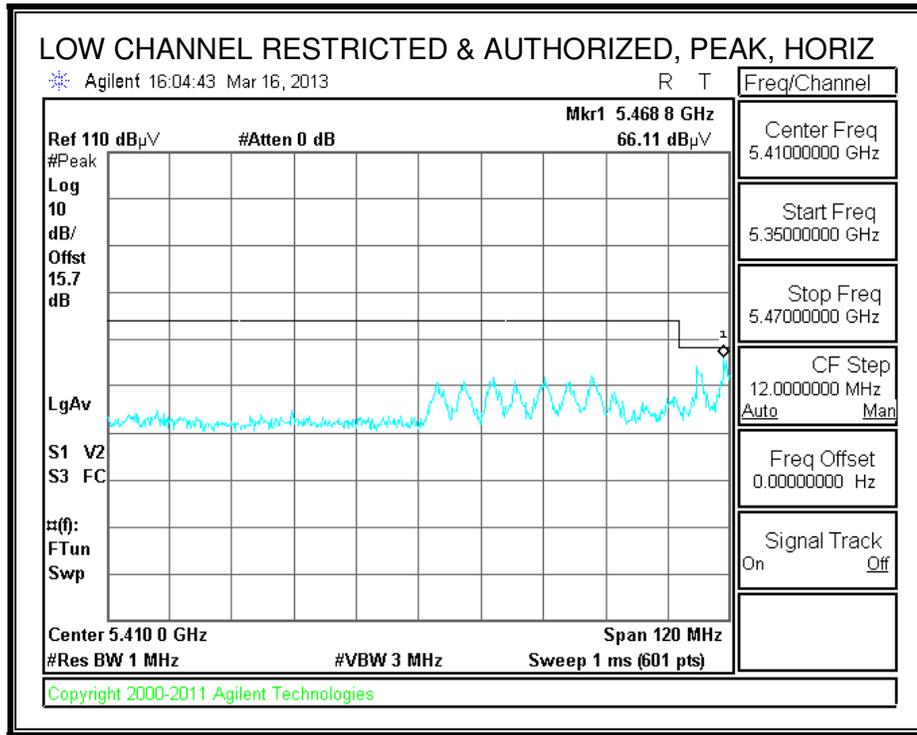
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/Q/P	Notes
<b>5510 MHz 3TX CDD</b>													
11.020	3.0	35.0	38.4	10.5	-33.6	0.0	0.7	51.1	74.0	-22.9	H	P	
11.020	3.0	24.8	38.4	10.5	-33.6	0.0	0.7	40.8	54.0	-13.2	H	A	
11.020	3.0	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 3TX 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 3TX 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	

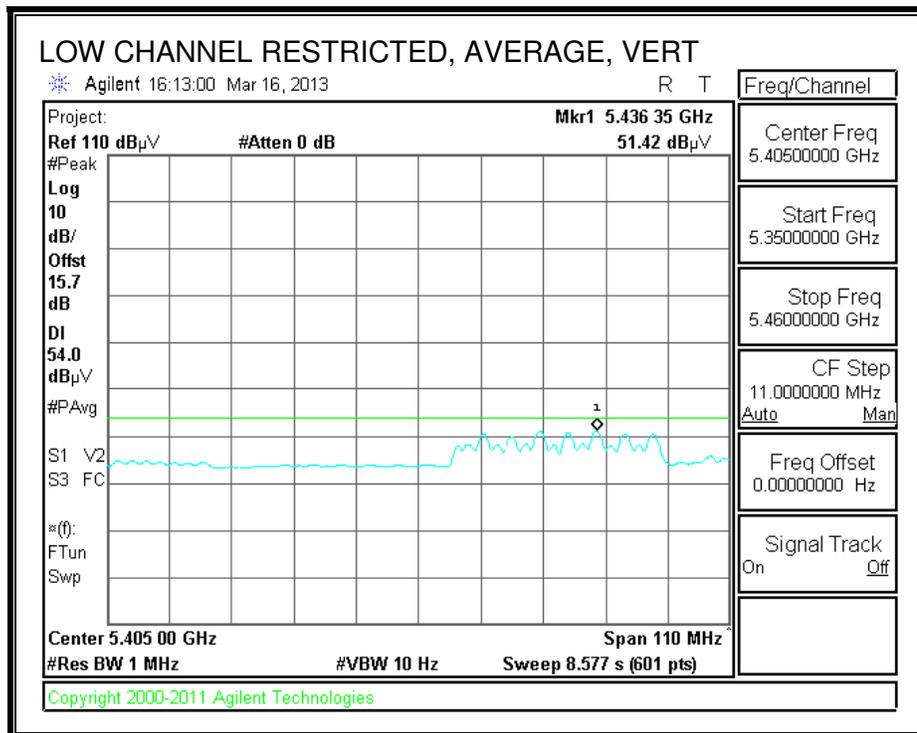
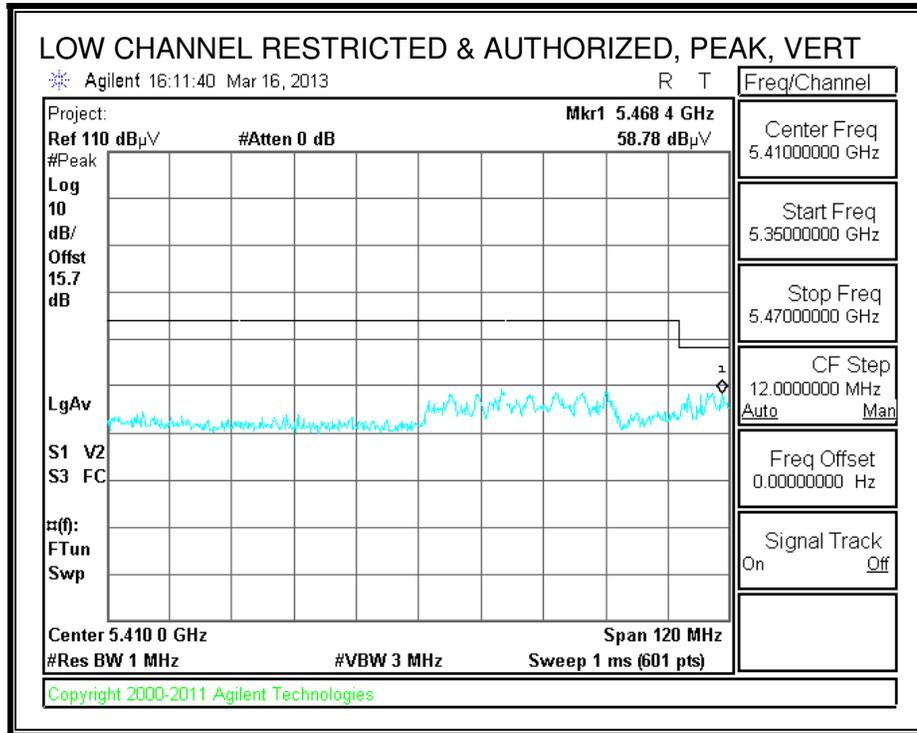
Rev. 4.1.2.7

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

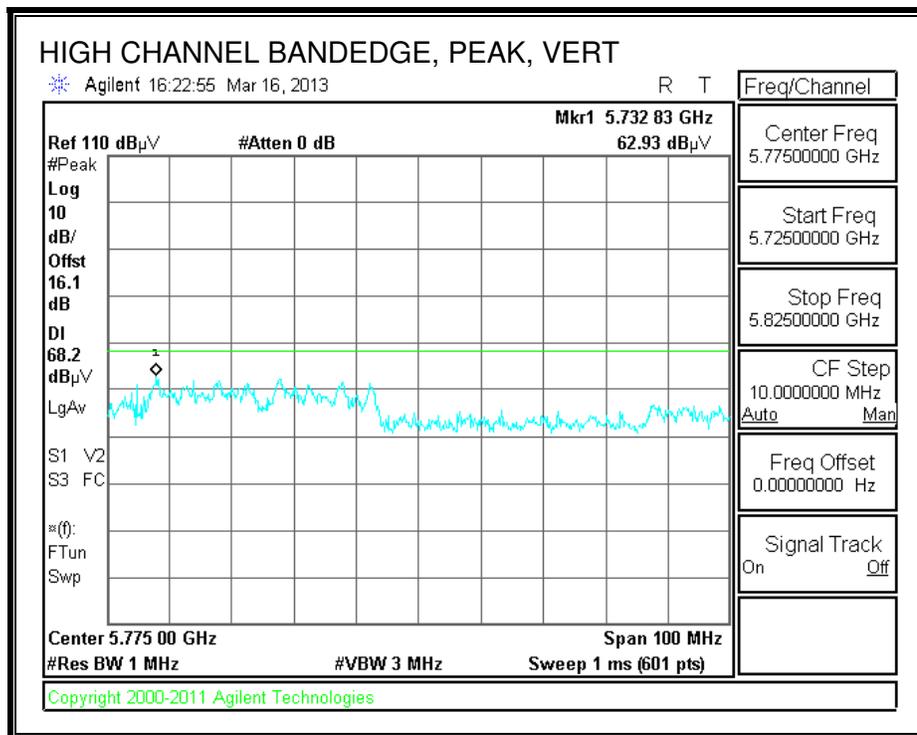
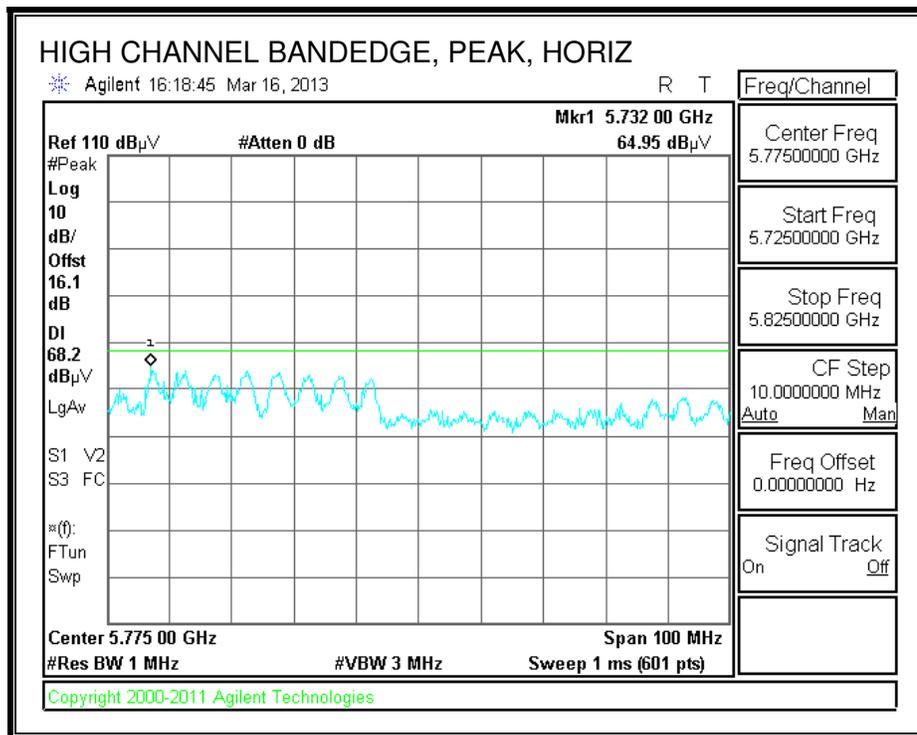
**9.2.35. TX ABOVE 1 GHz, 802.11n HT40 BF 2TX MODE, GHz BAND**

**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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

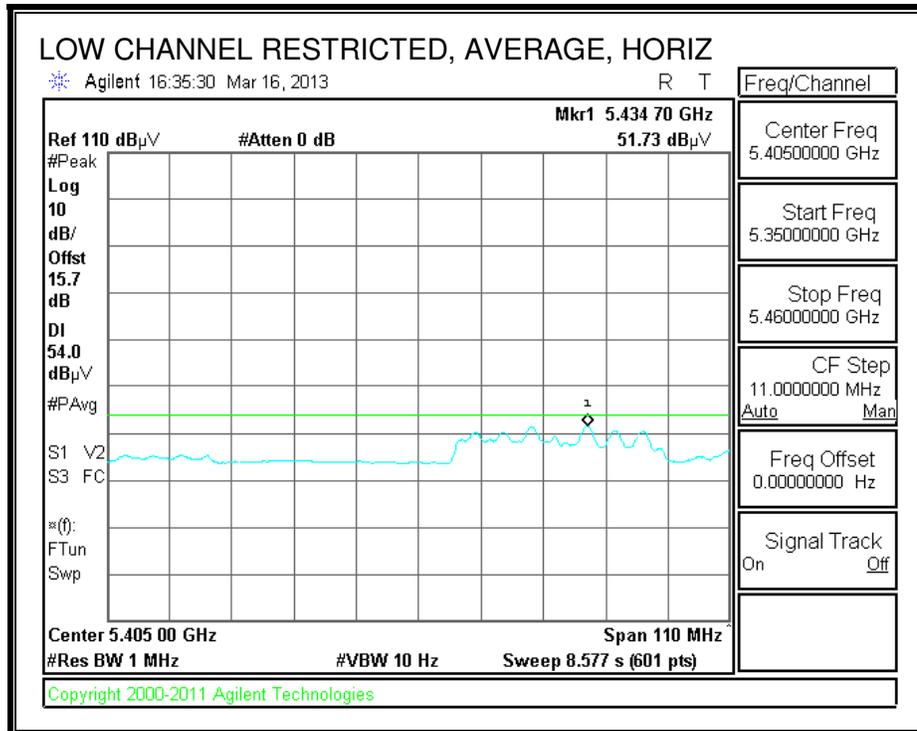
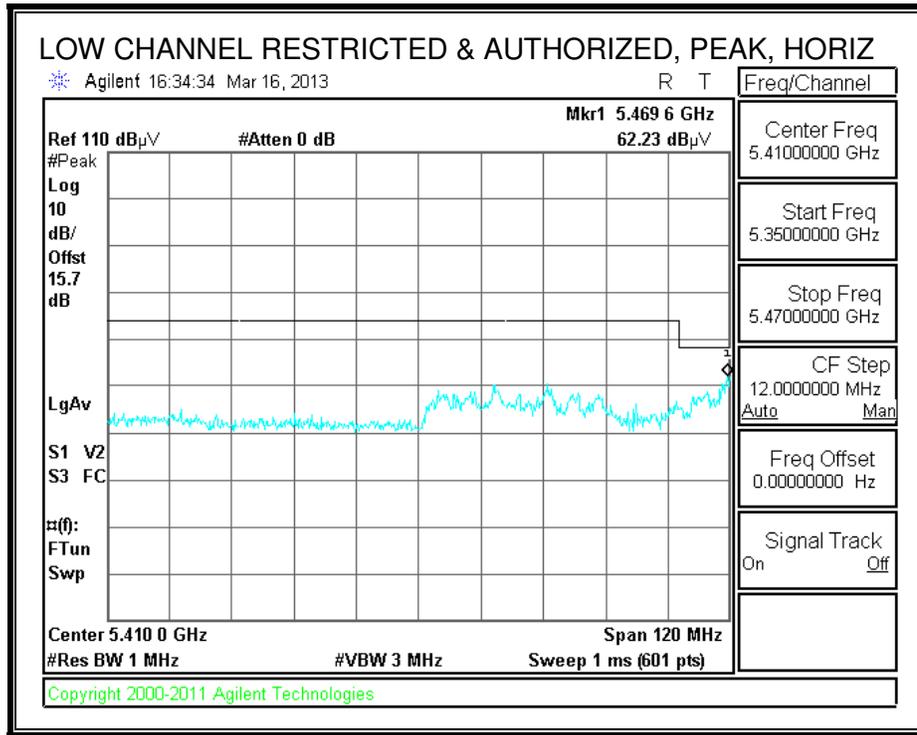
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5510 MHz)</b>															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
<b>Mid Channel (5550 MHz)</b>															
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
<b>Hi Channel (5670 MHz)</b>															
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

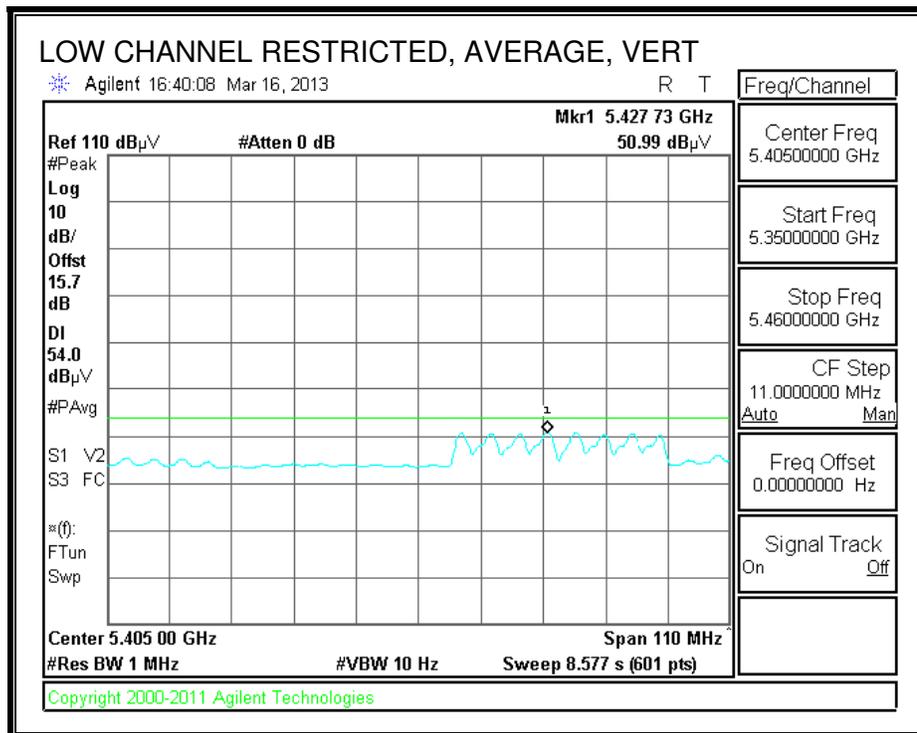
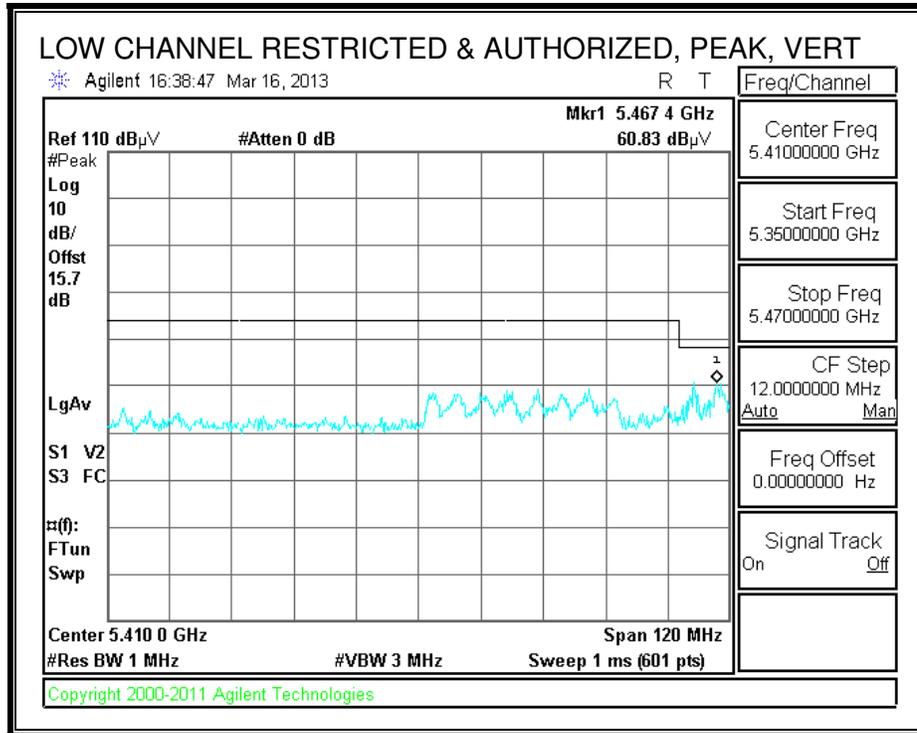
Rev. 01.30.13

f	Measurement Frequency	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		

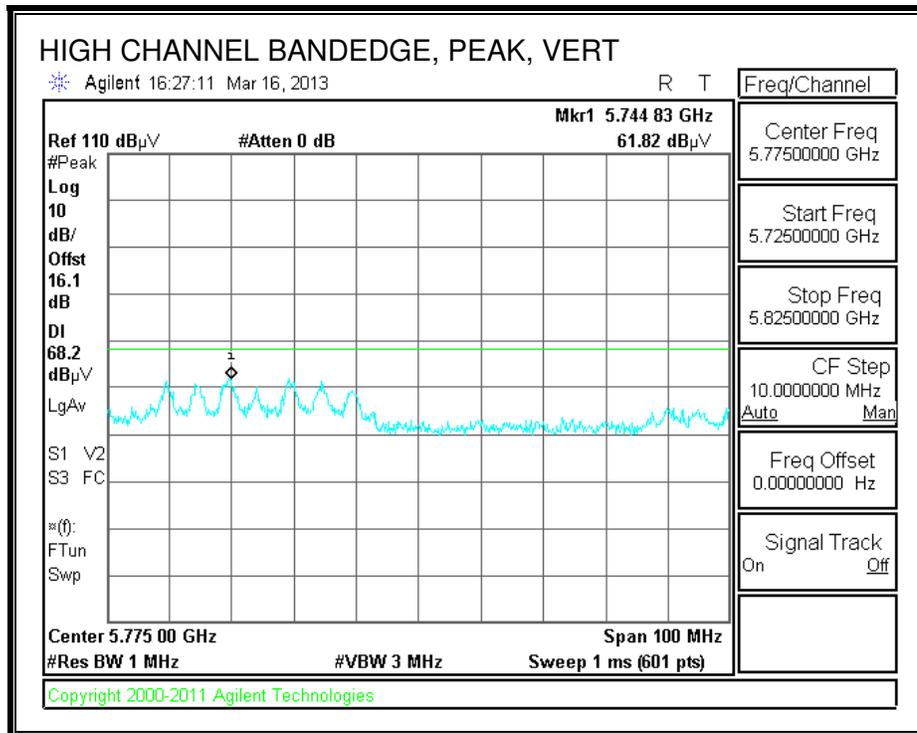
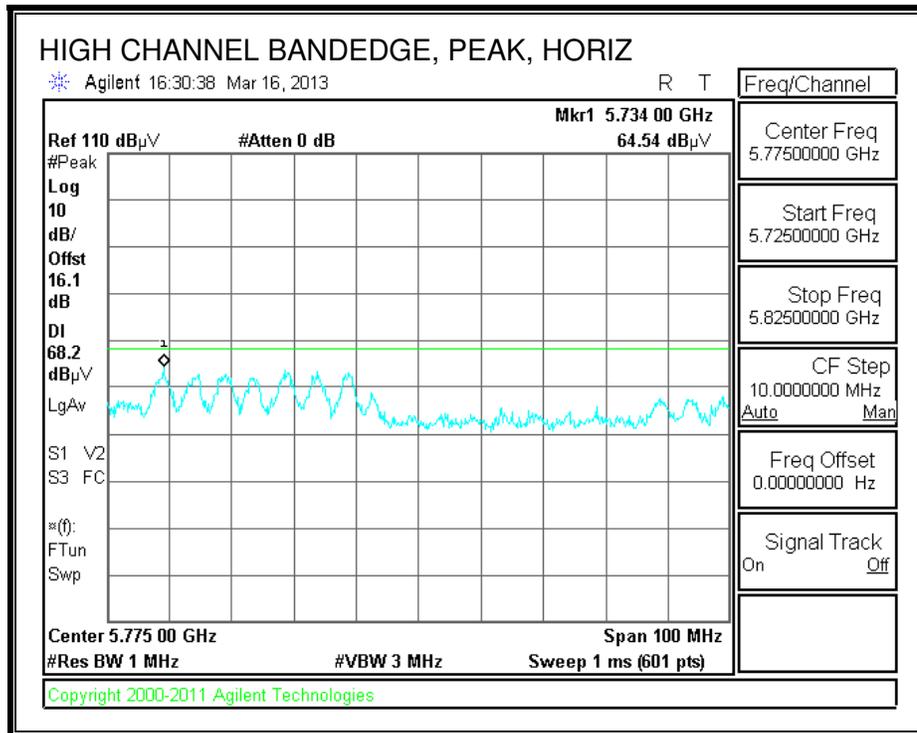
**9.2.36. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.6 GHz BAND**

**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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

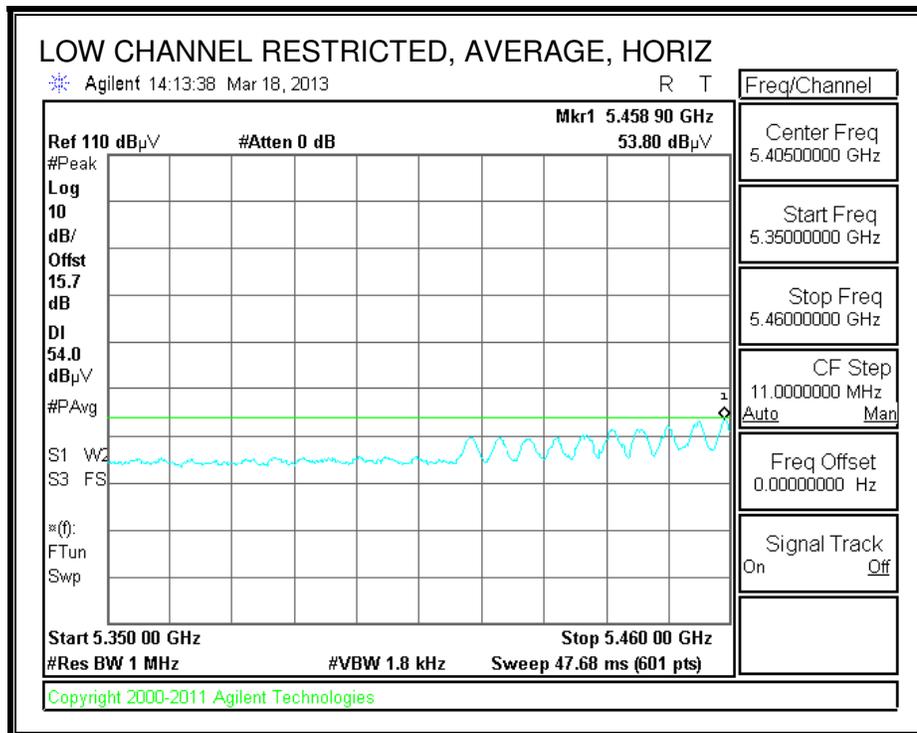
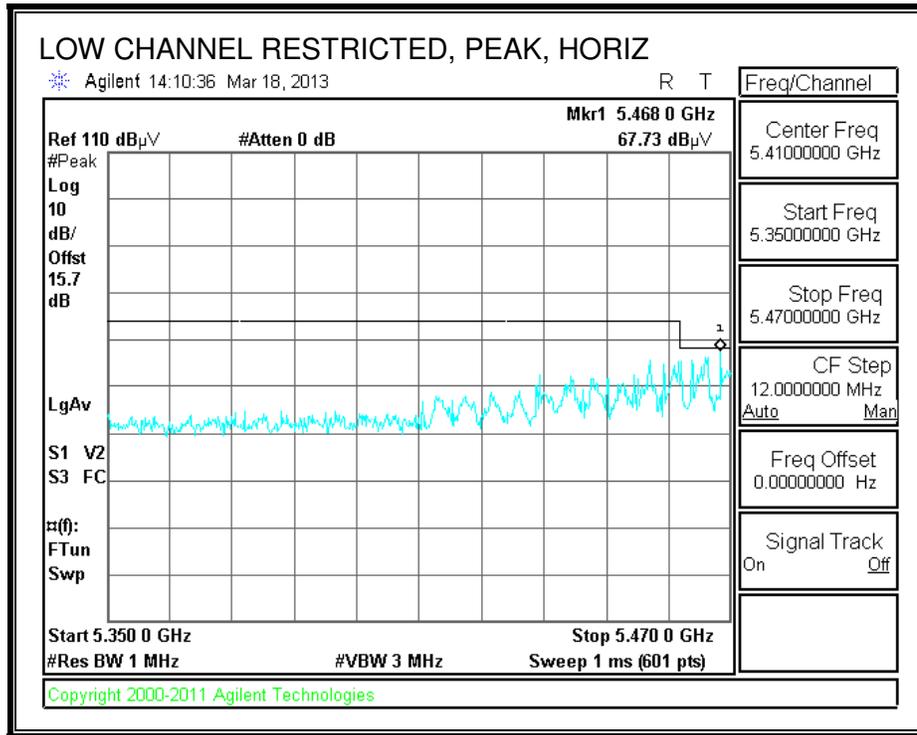
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5510 MHz)</b>															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
<b>Mid Channel (5550 MHz)</b>															
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
<b>Hi Channel (5670 MHz)</b>															
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

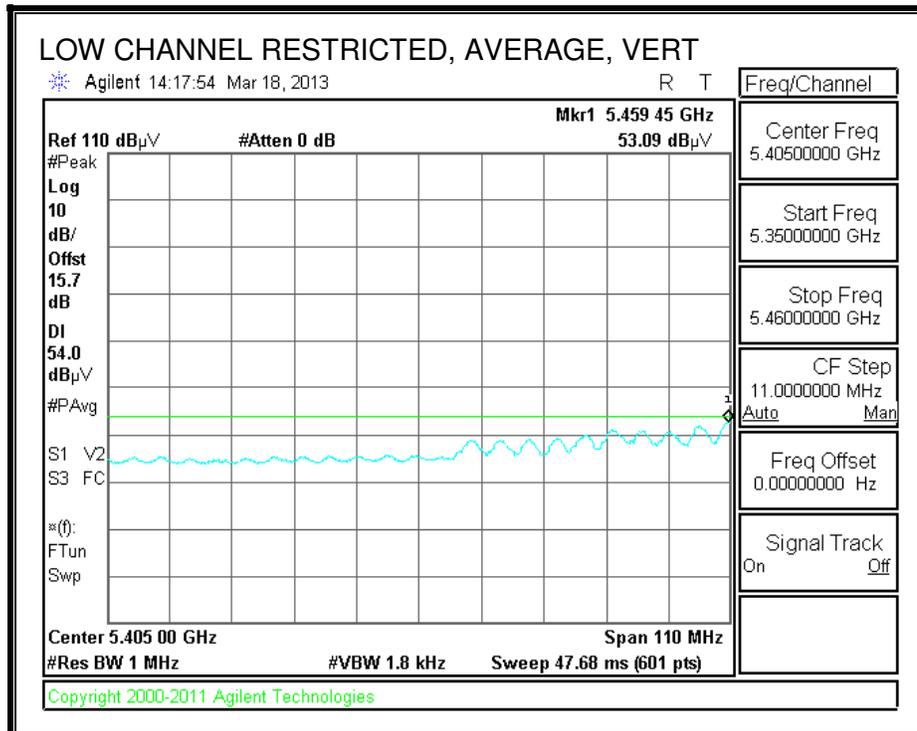
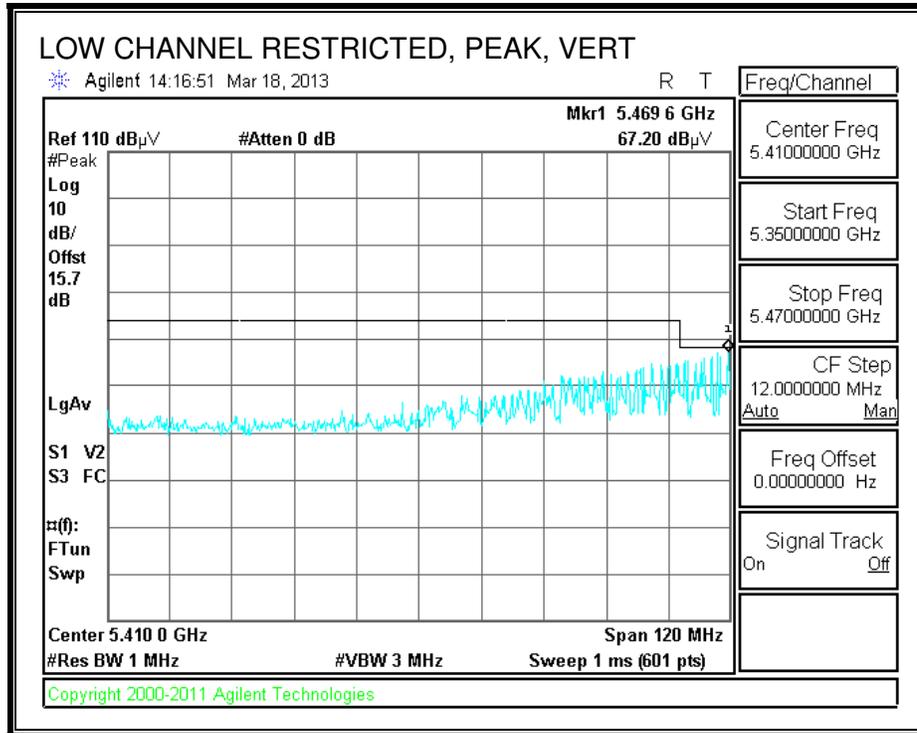
Rev. 01.30.13

f	Measurement Frequency	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		

**9.2.37. 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

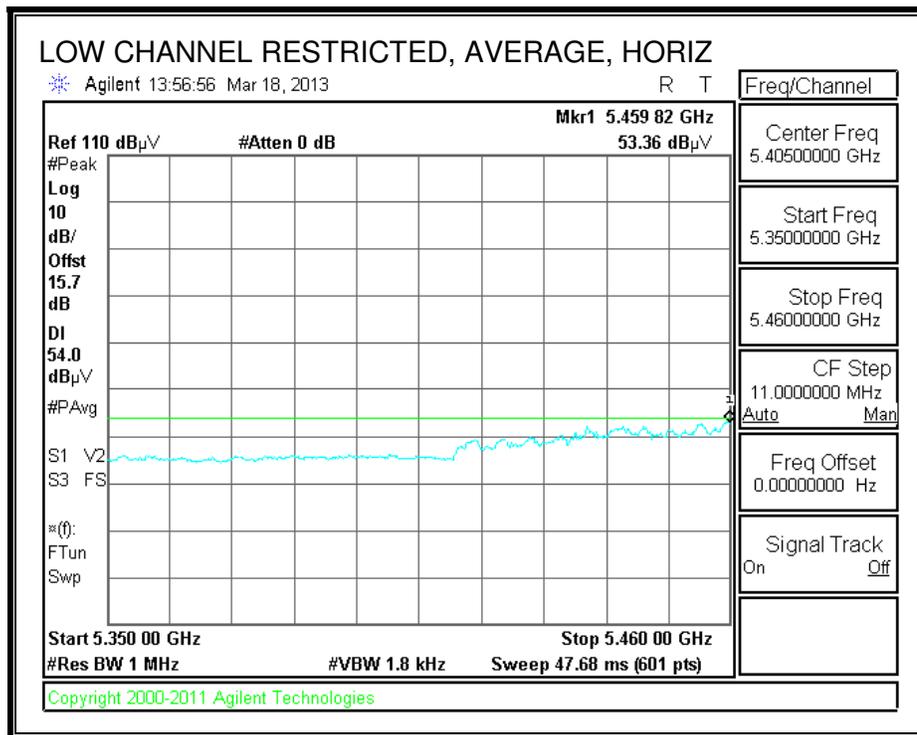
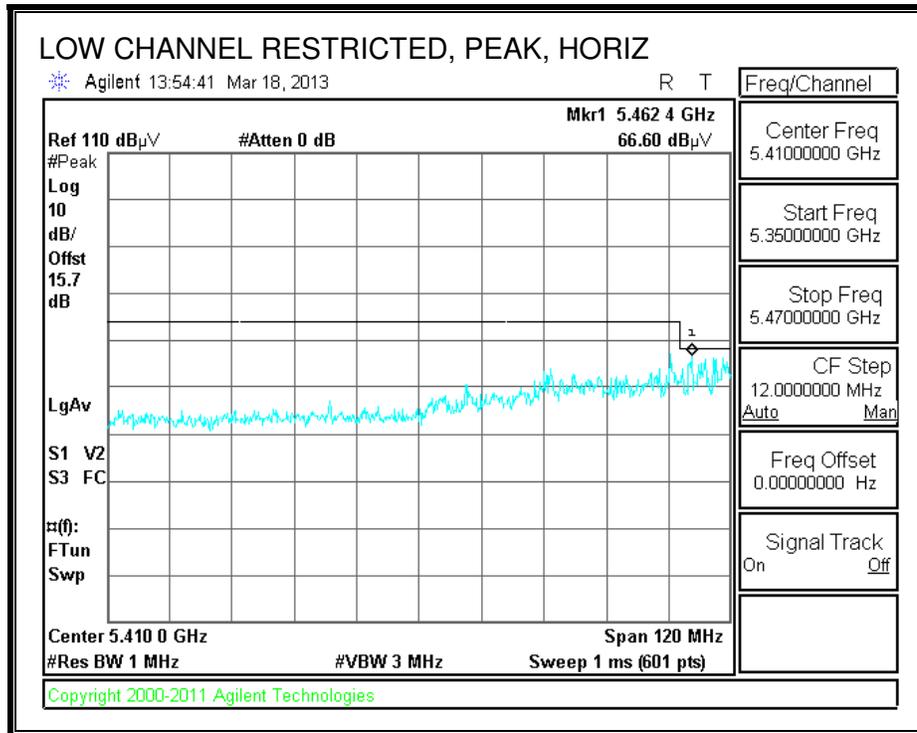
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dB	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	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	

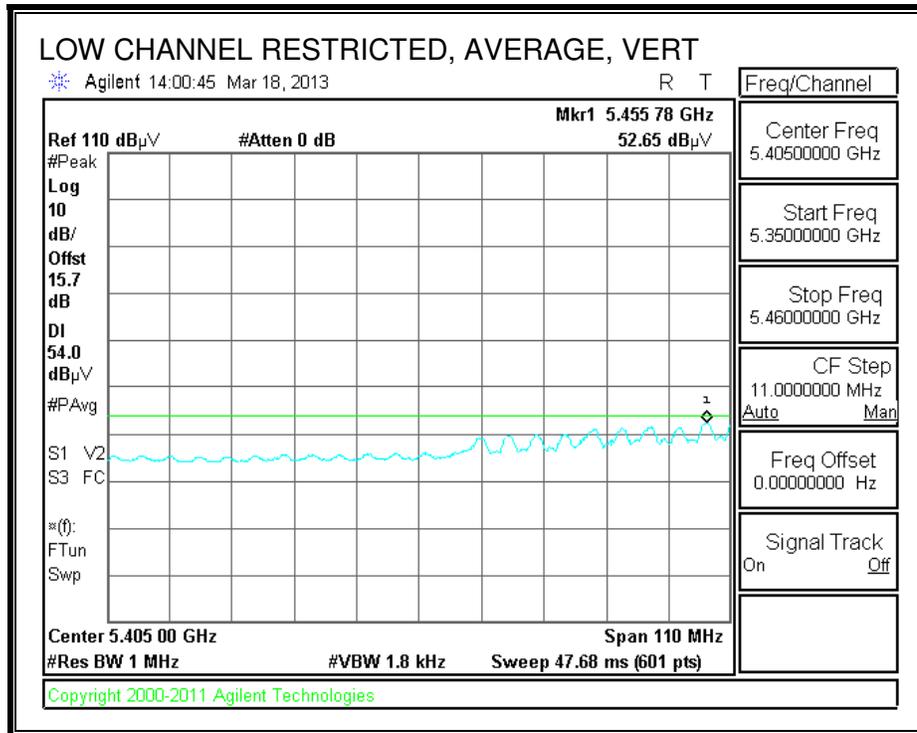
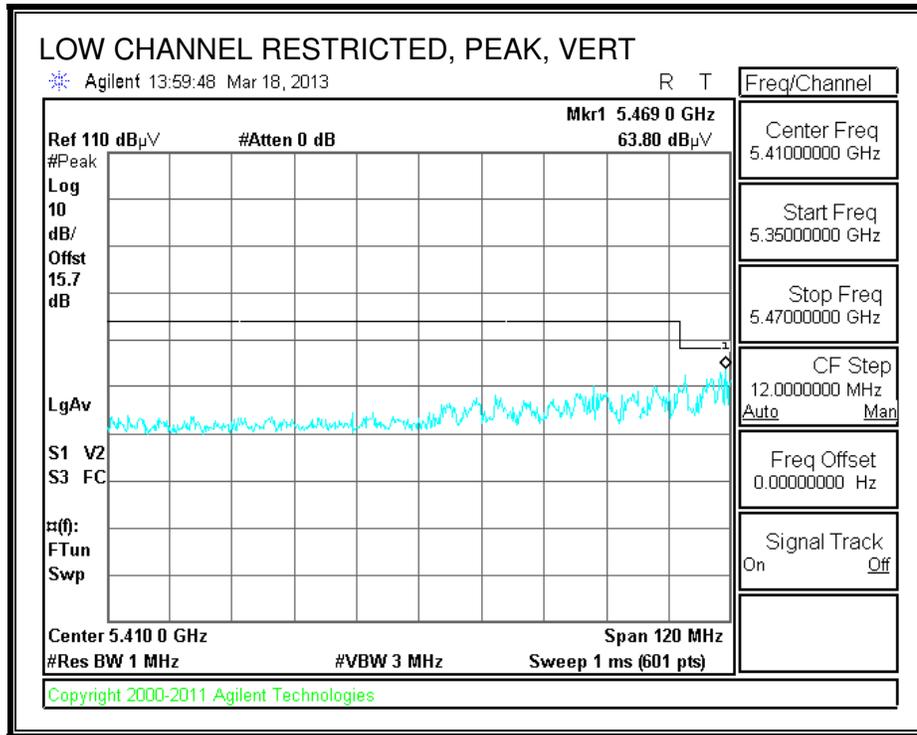
Rev. 4.1.2.7

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

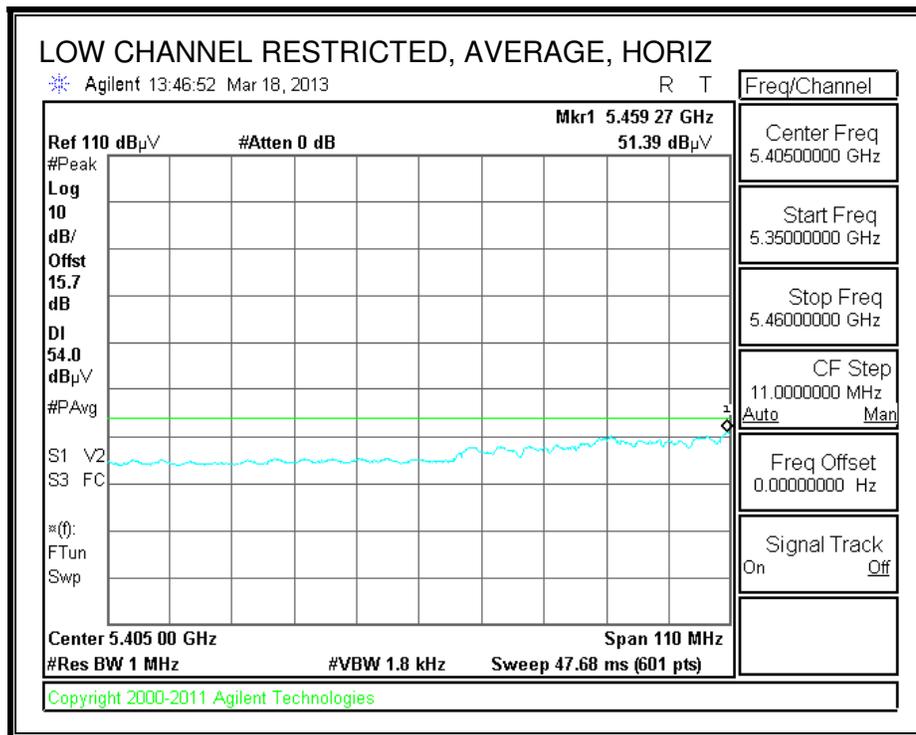
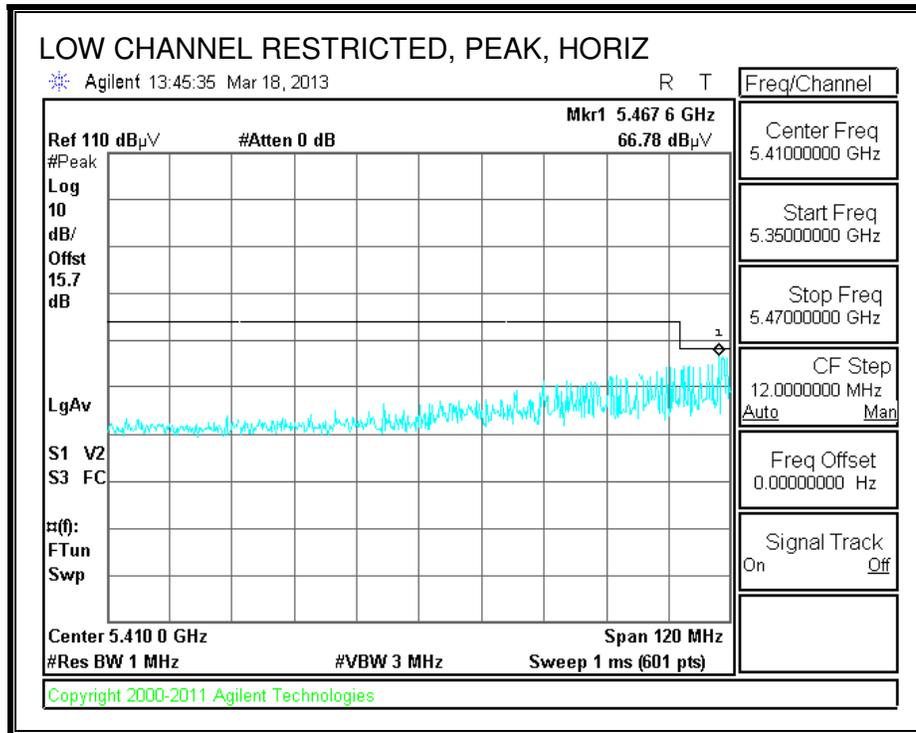
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dB	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	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	

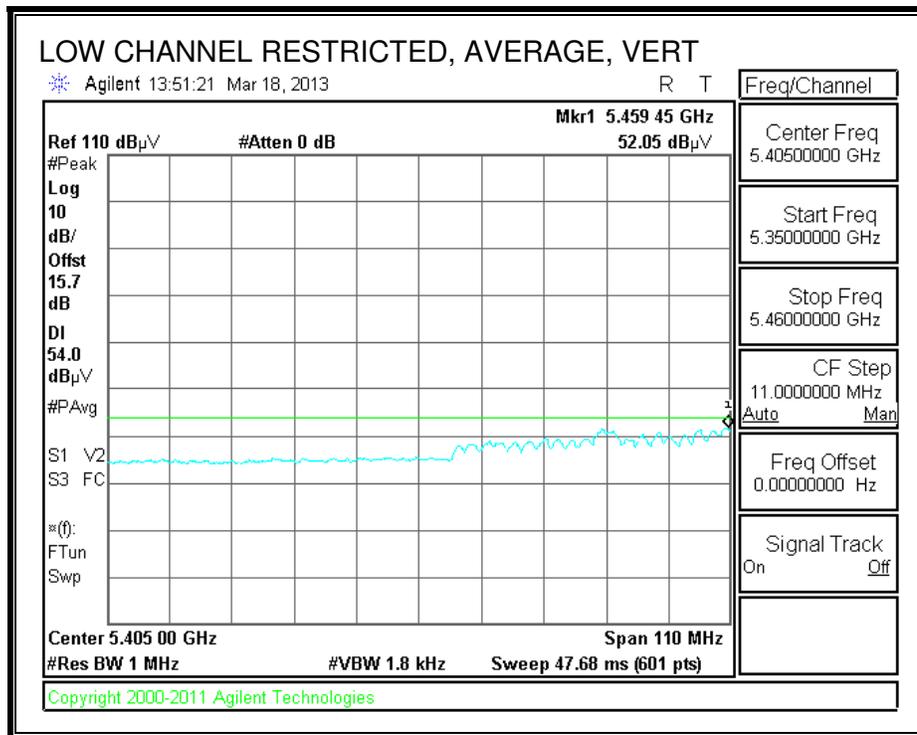
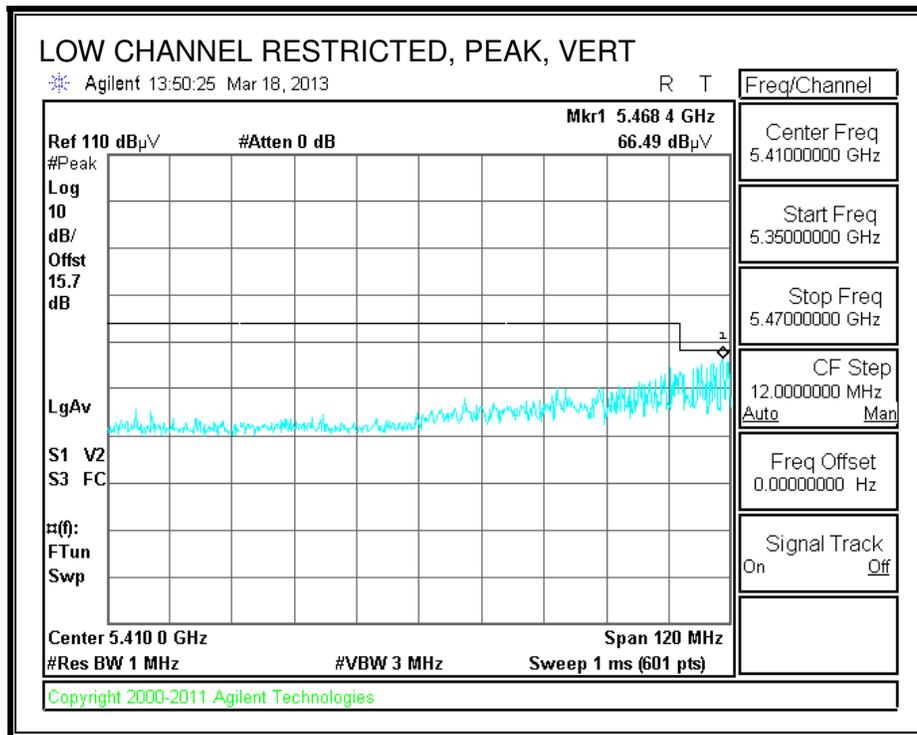
Rev. 4.1.2.7

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

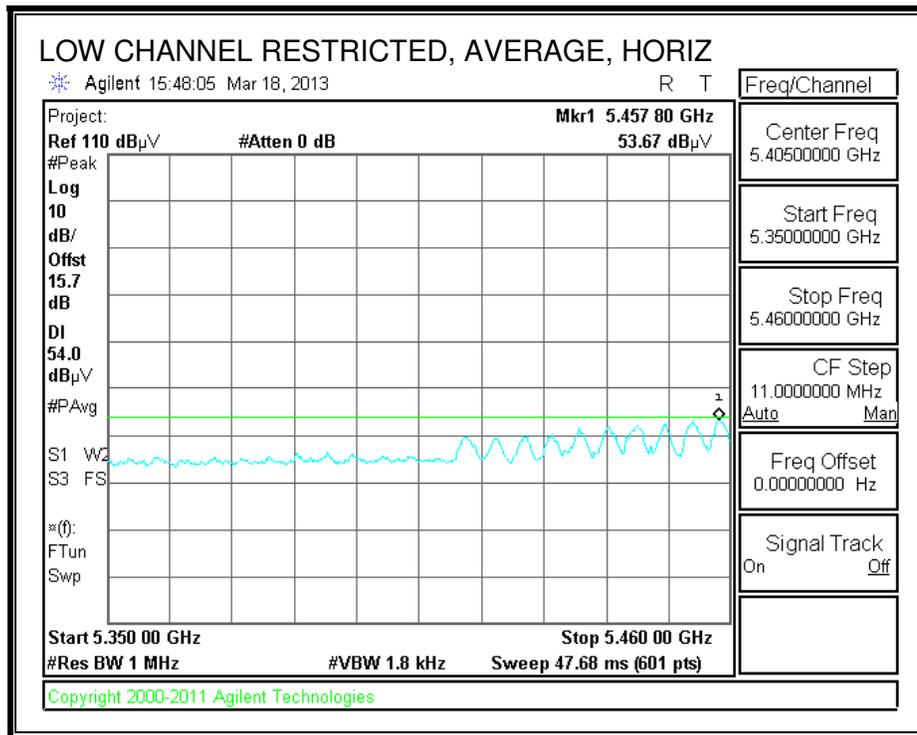
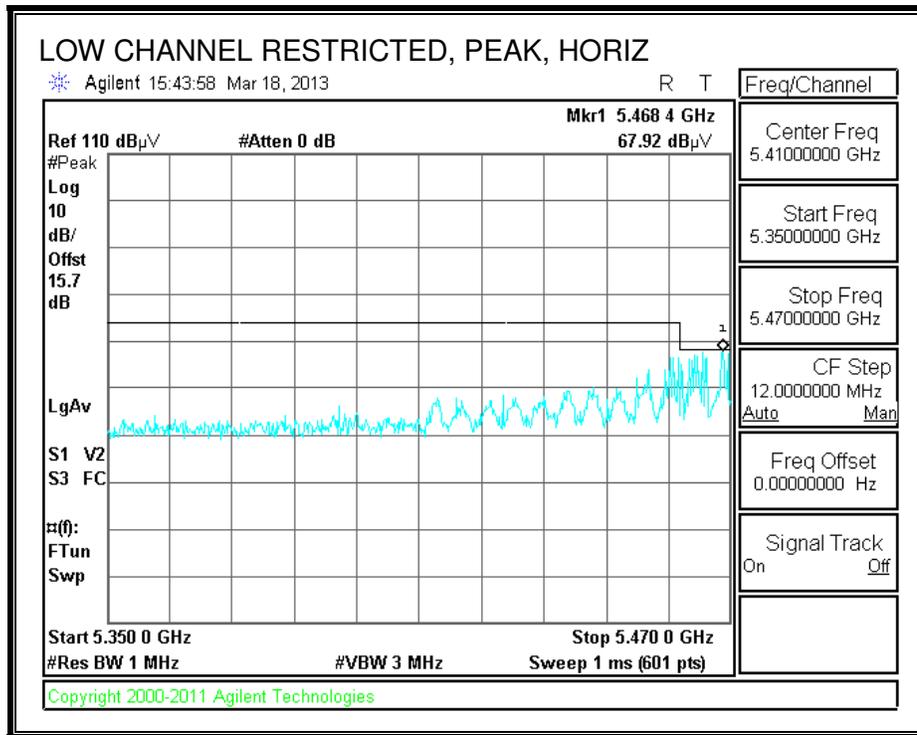
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dB	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3TX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	33.5	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	

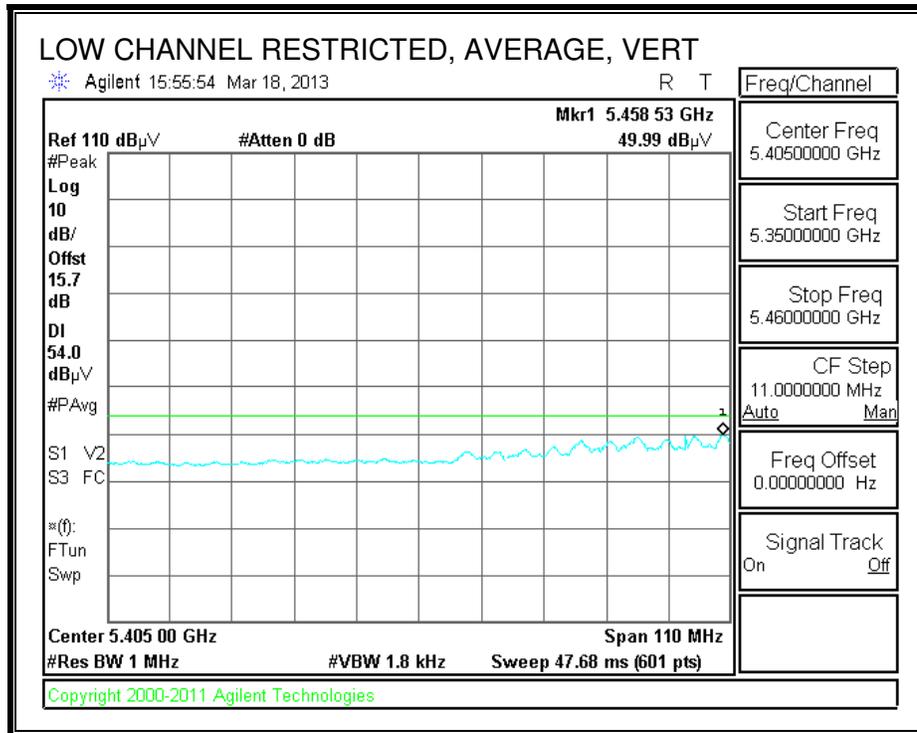
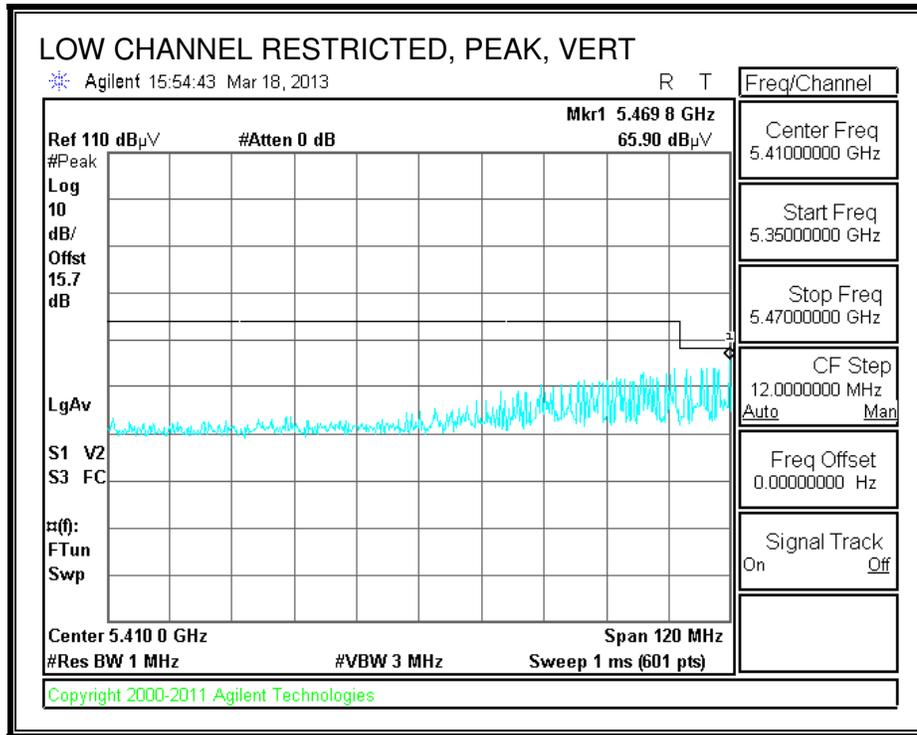
Rev. 4.1.2.7

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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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**

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

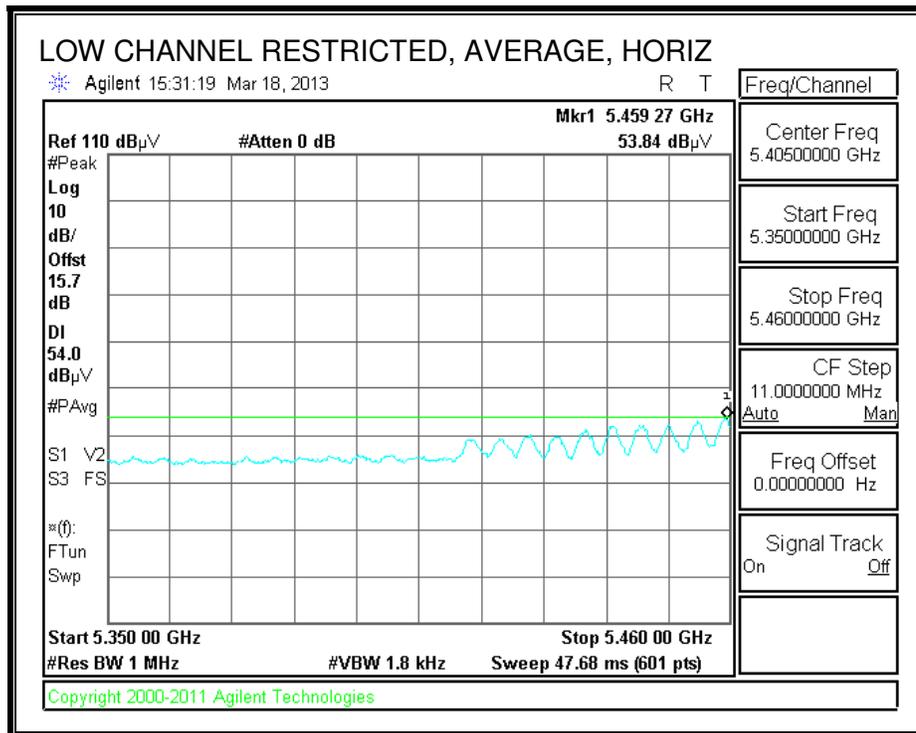
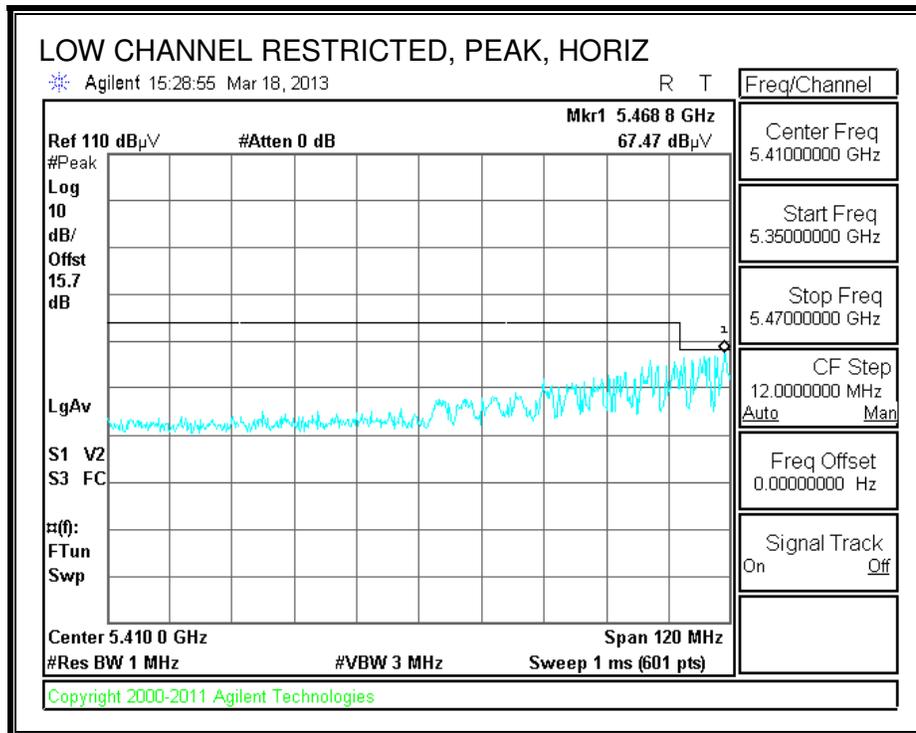
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5210 MHz)</b>															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
<b>Mid Channel (5290 MHz)</b>															
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
<b>Low Channel (5530 MHz)</b>															
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
<b>Hi Channel (5690 MHz)</b>															
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

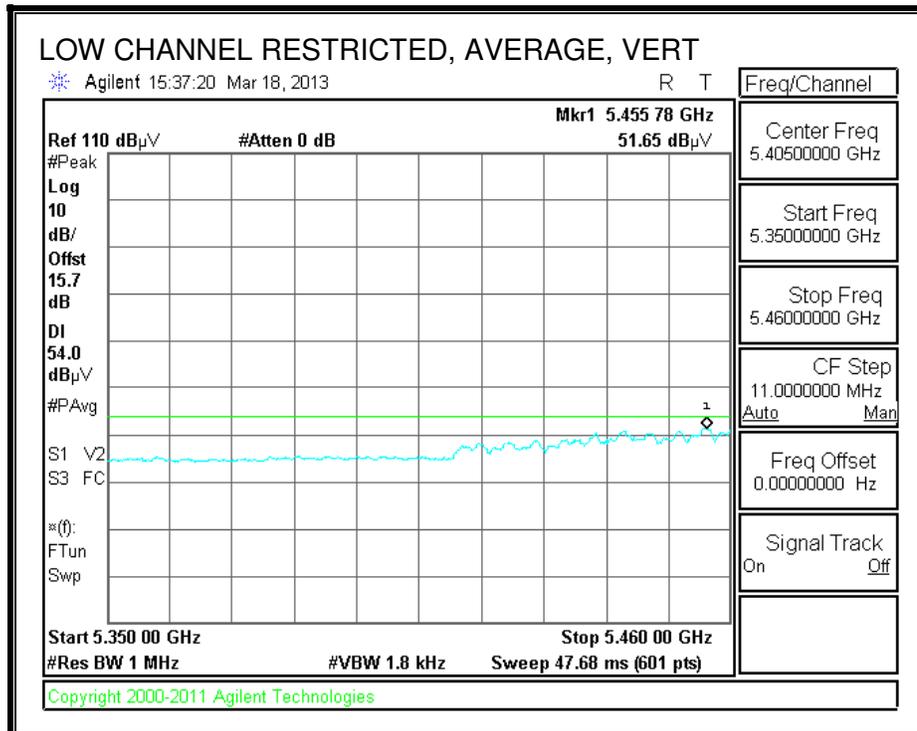
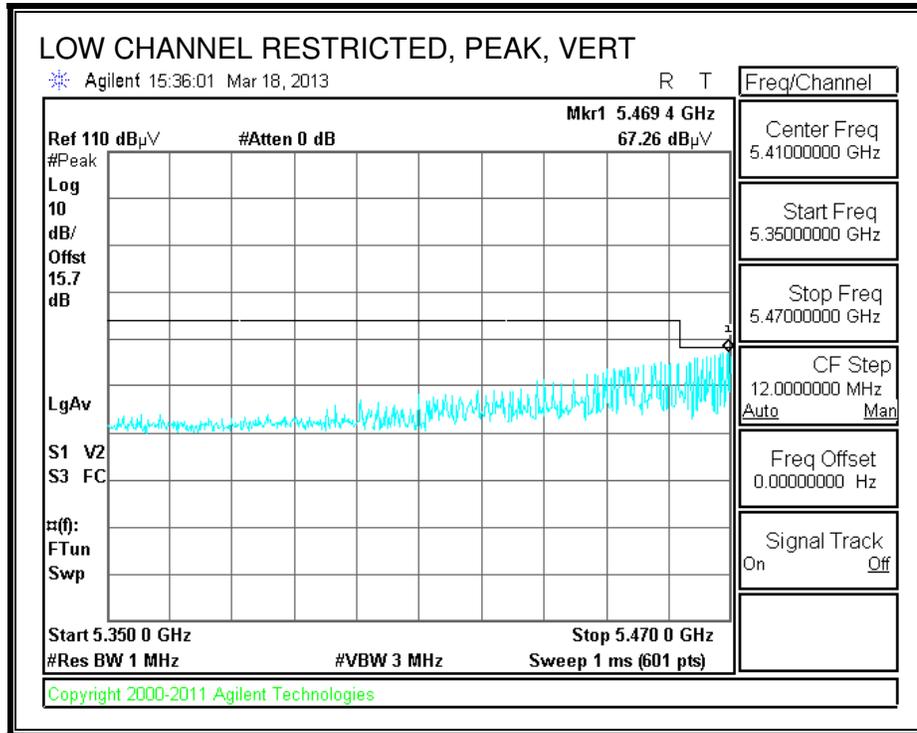
Rev. 01.30.13

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

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
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**

<b>3' cable 22807700</b>	<b>12' cable 22807600</b>	<b>20' cable 22807500</b>	<b>HPF</b>	<b>Reject Filter</b>	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz		

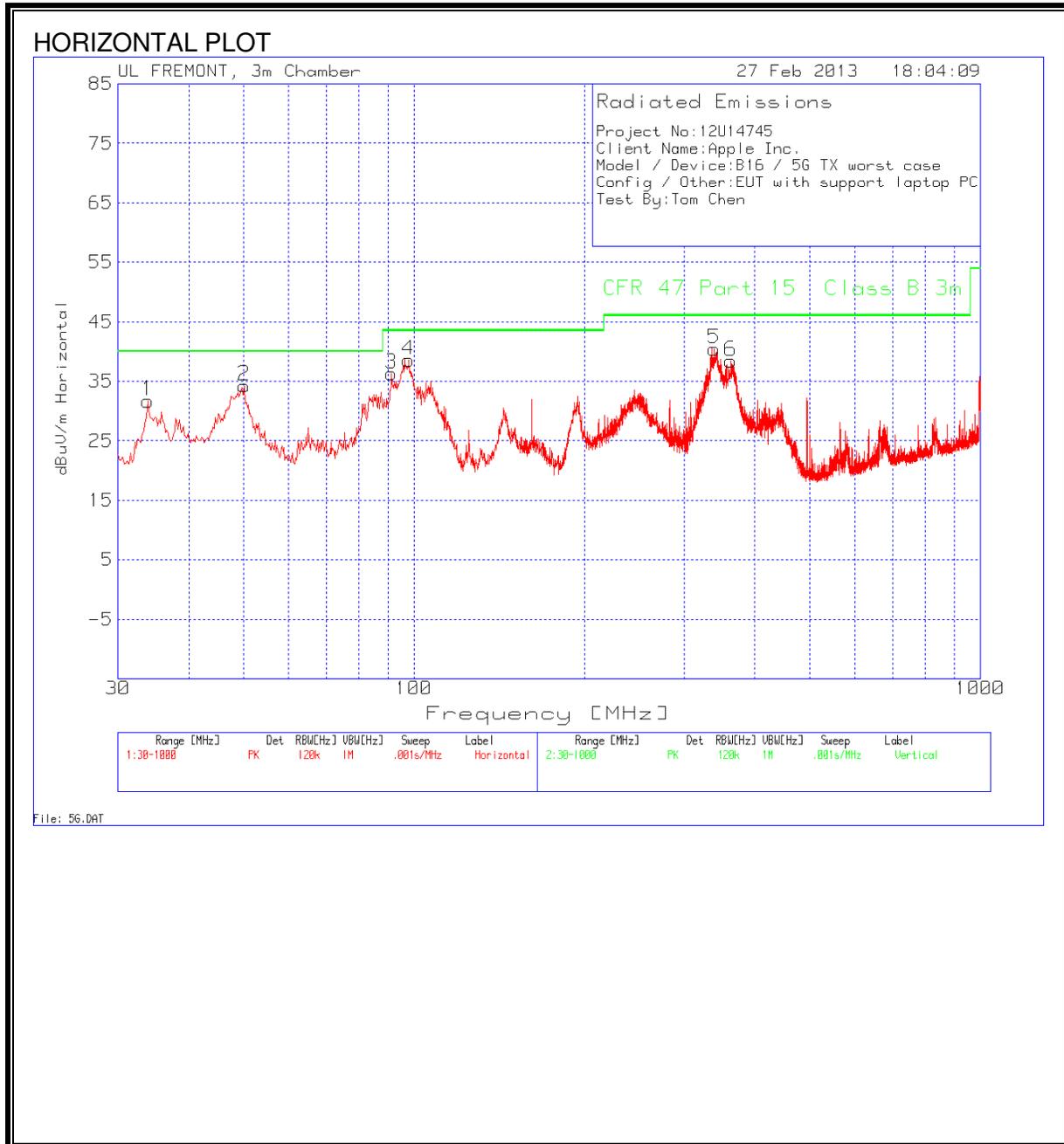
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Channel (5210 MHz)</b>															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
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10.580	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
<b>Low Channel (5530 MHz)</b>															
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
<b>Hi Channel (5690 MHz)</b>															
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

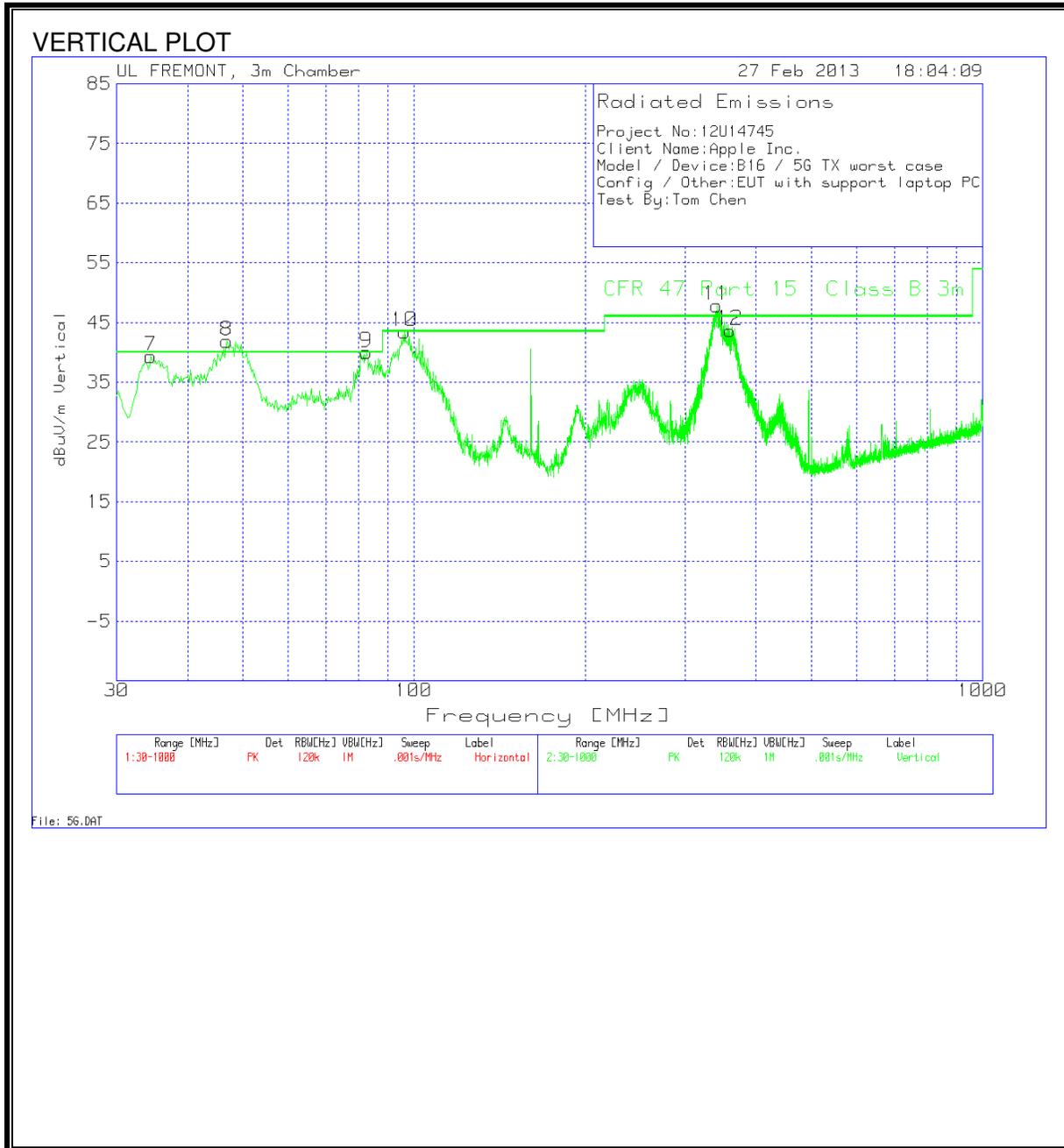
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

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

\*Decreases with the logarithm of the frequency.

### TEST PROCEDURE

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

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

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

**RESULTS**

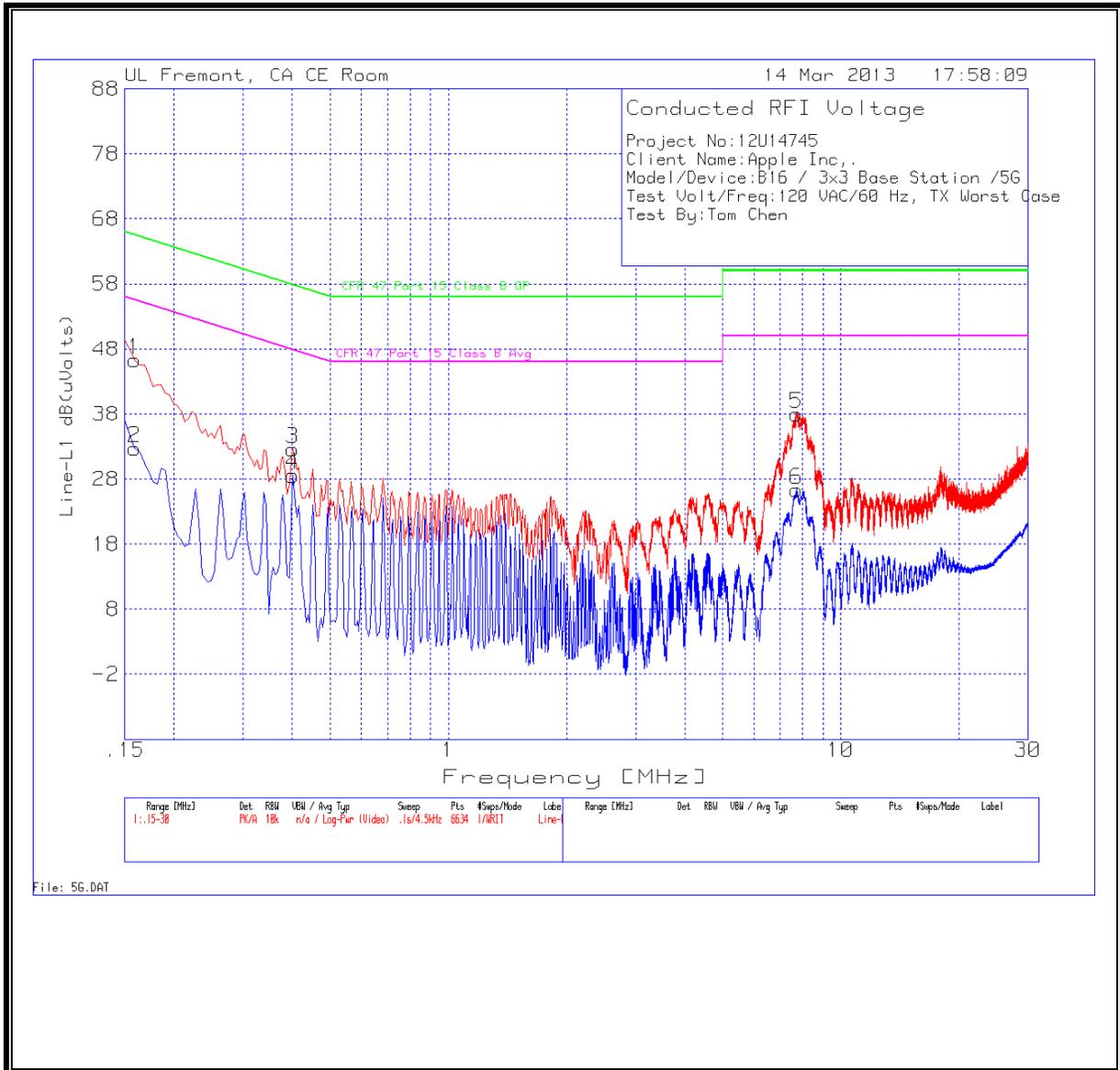
**6 WORST EMISSIONS FOR 5G BAND**

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(uVolts)	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(uVolts)	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**

