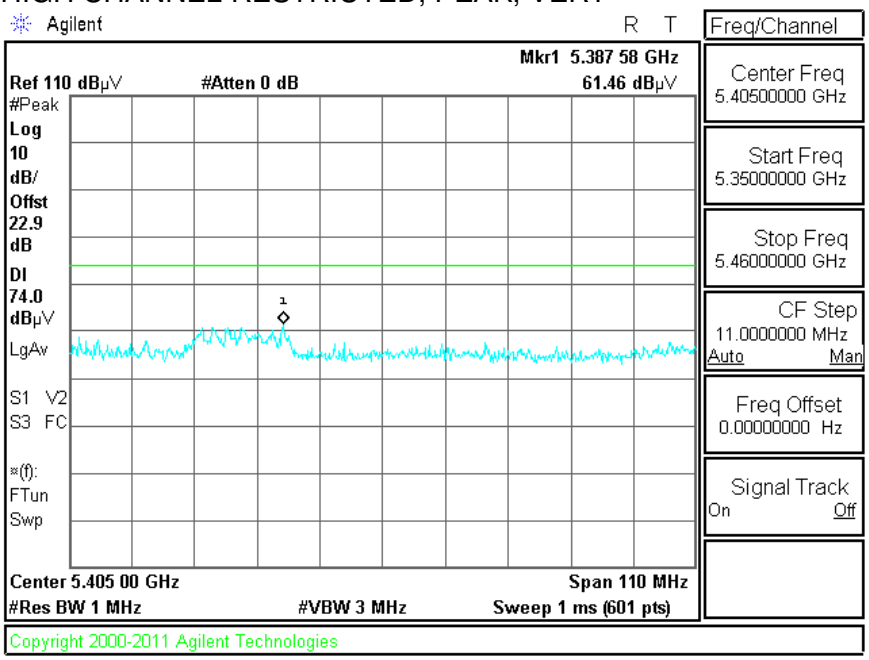
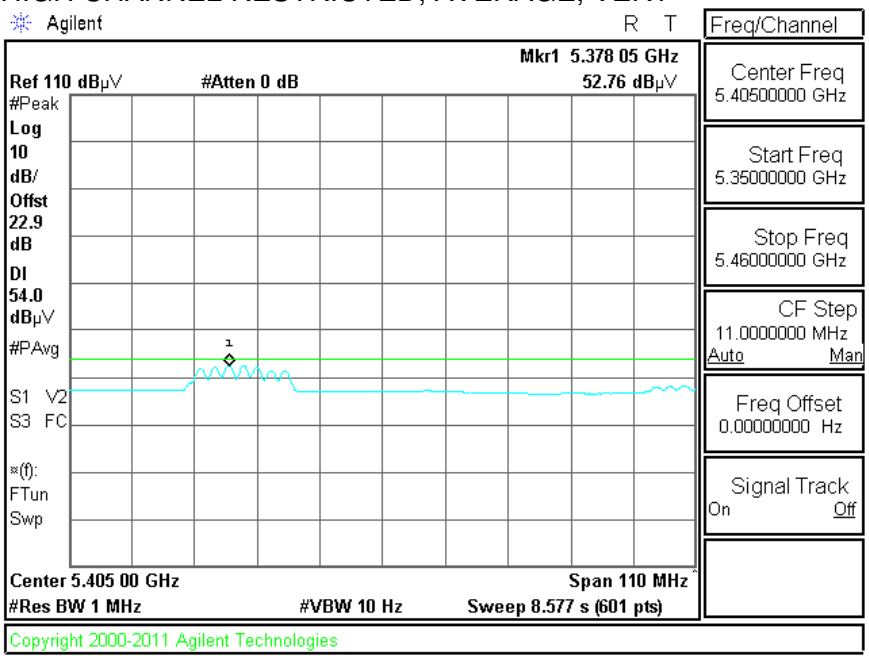
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5260 MHz 3TX CDD													
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	
5300 MHz 3TX CDD													
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	
5320 MHz 3TX CDD													
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.

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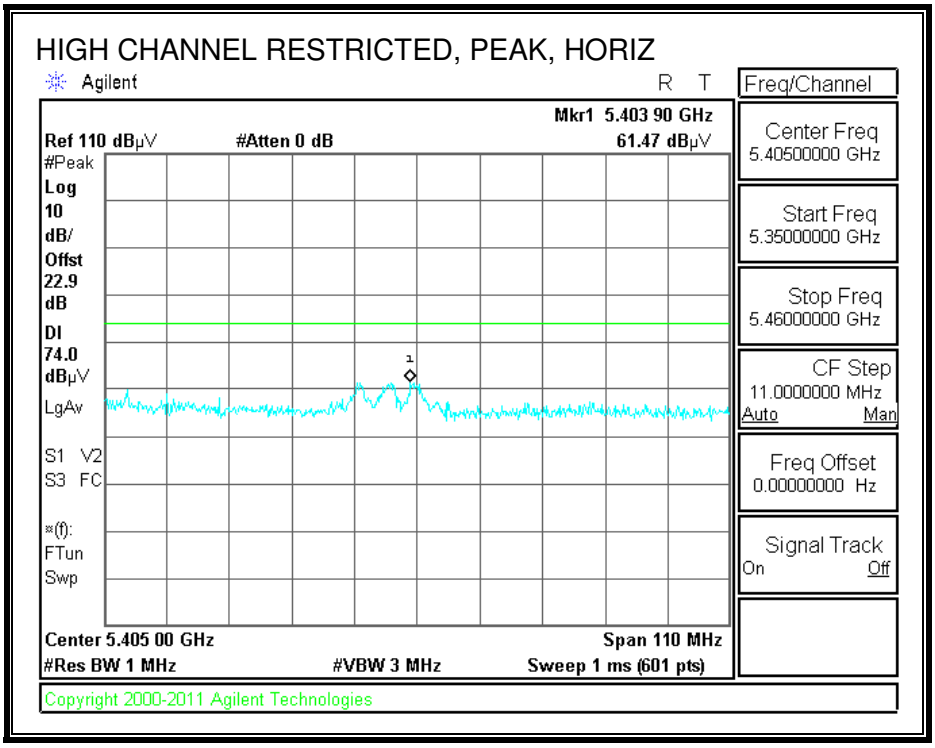
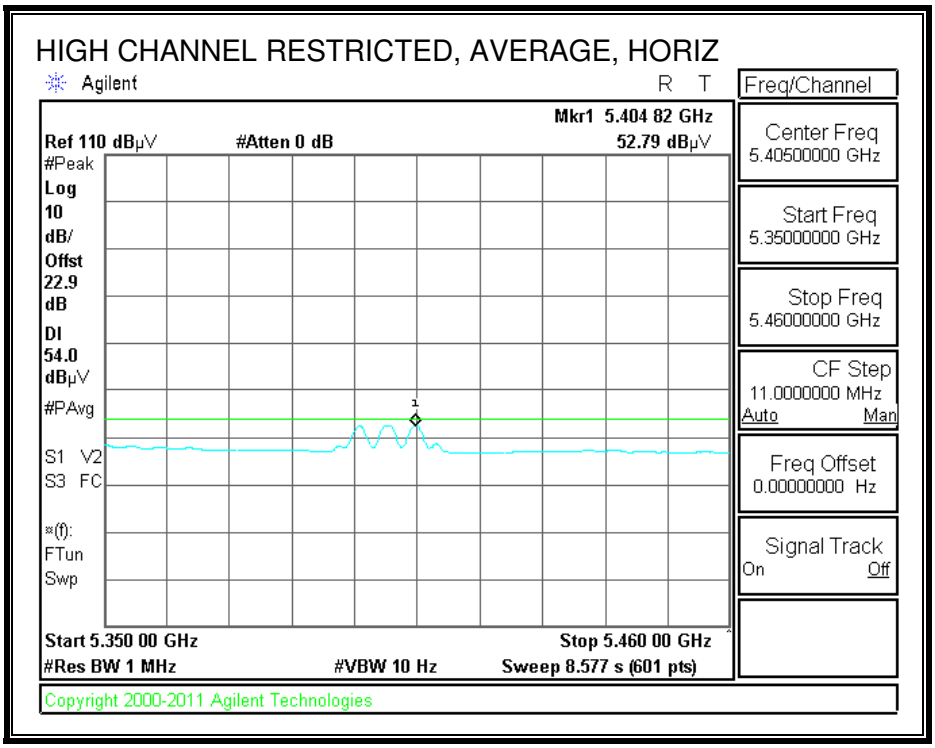
9.2.16. TX ABOVE 1 GHz, 802.11n HT20 CDD 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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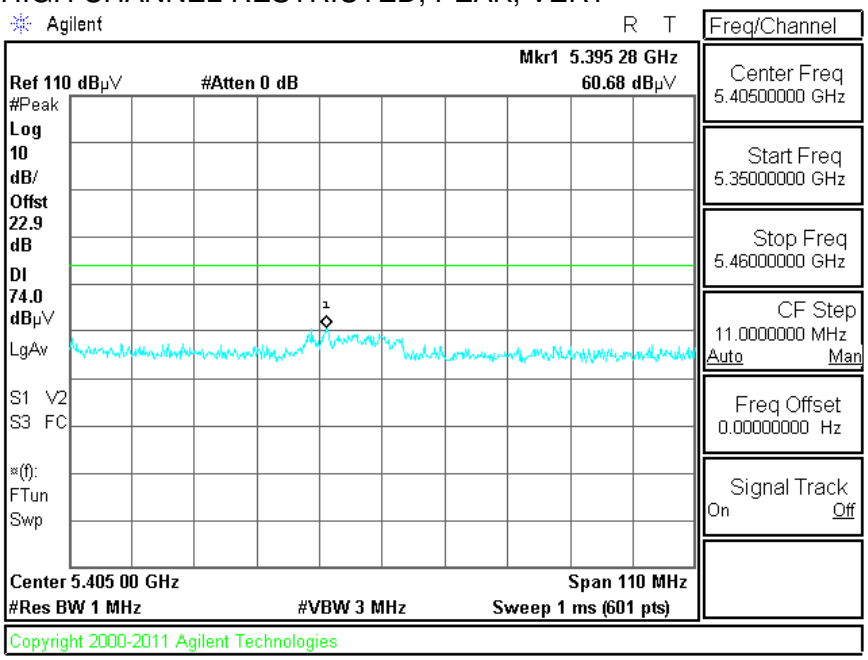
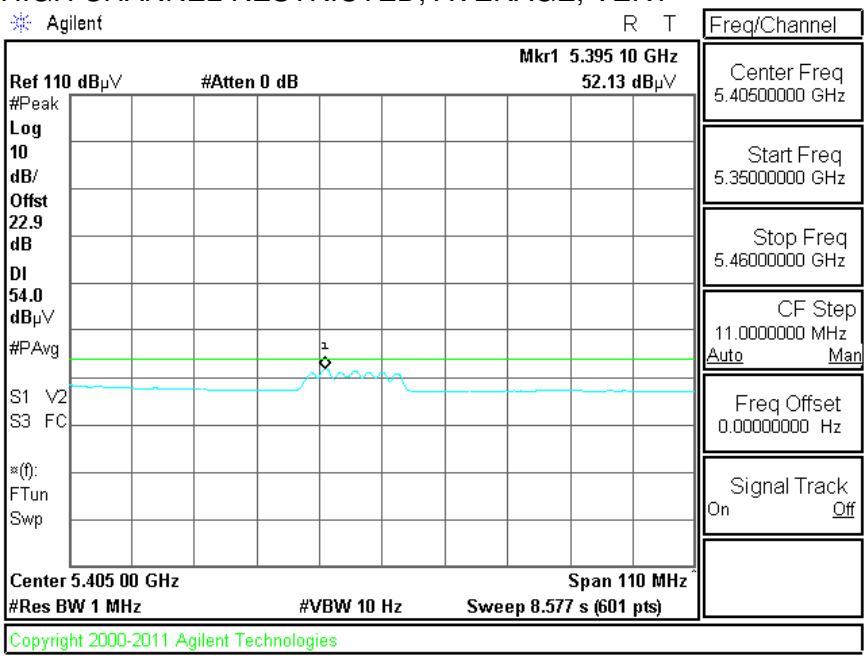
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5260 MHz 3TX CDD													
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	
5300 MHz 3TX CDD													
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	
5320 MHz 3TX CDD													
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.

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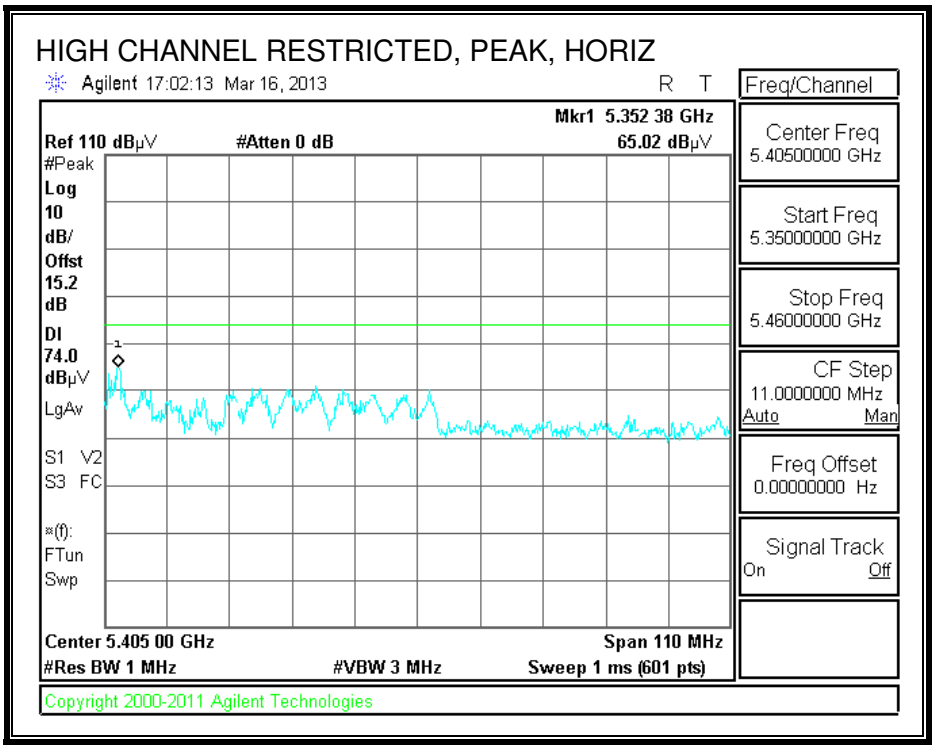
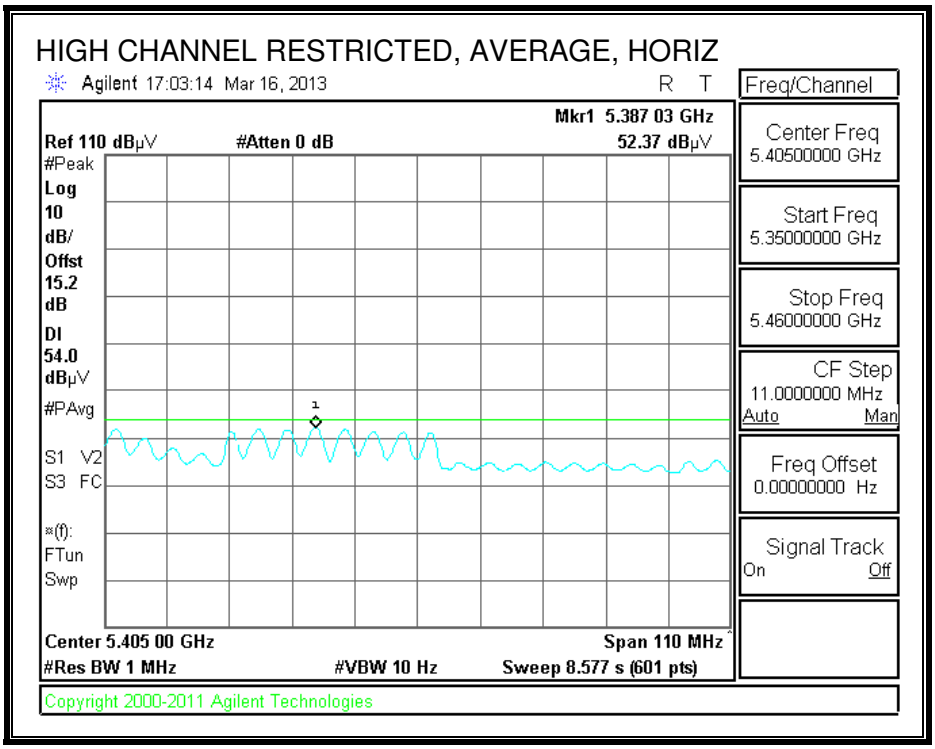
9.2.17. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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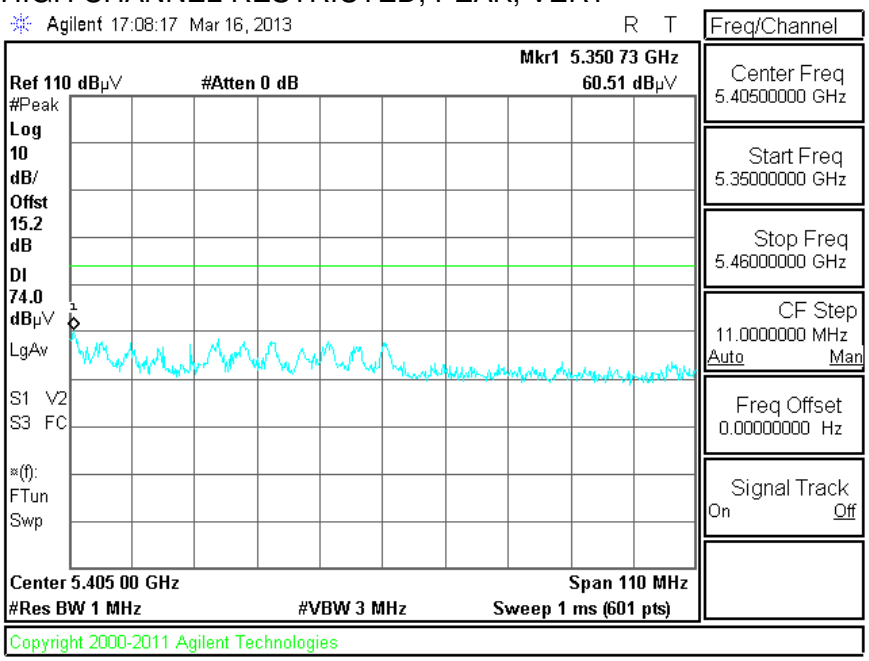
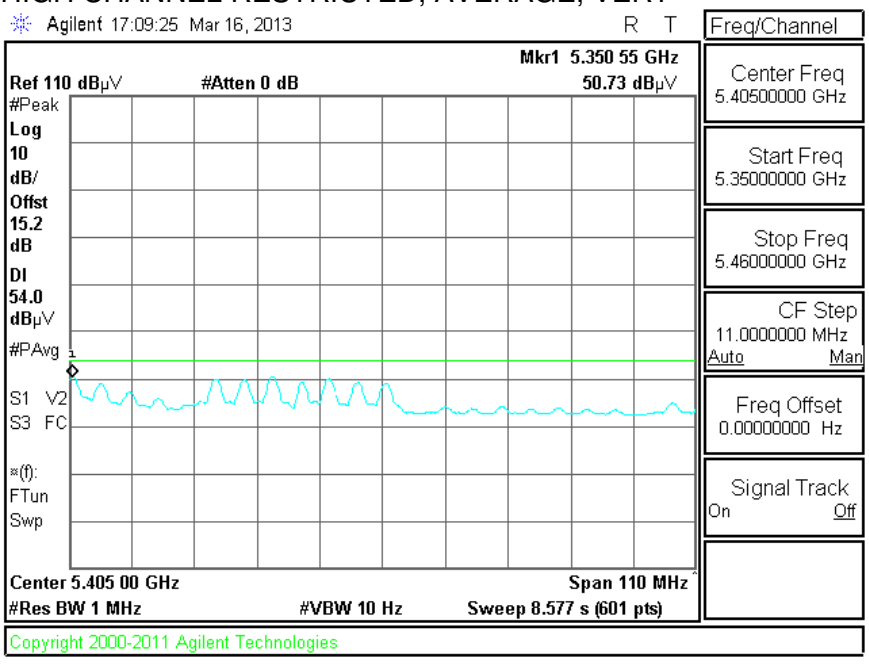
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5270 MHz 3TX CDD													
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	
5310 MHz 3TX CDD													
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.

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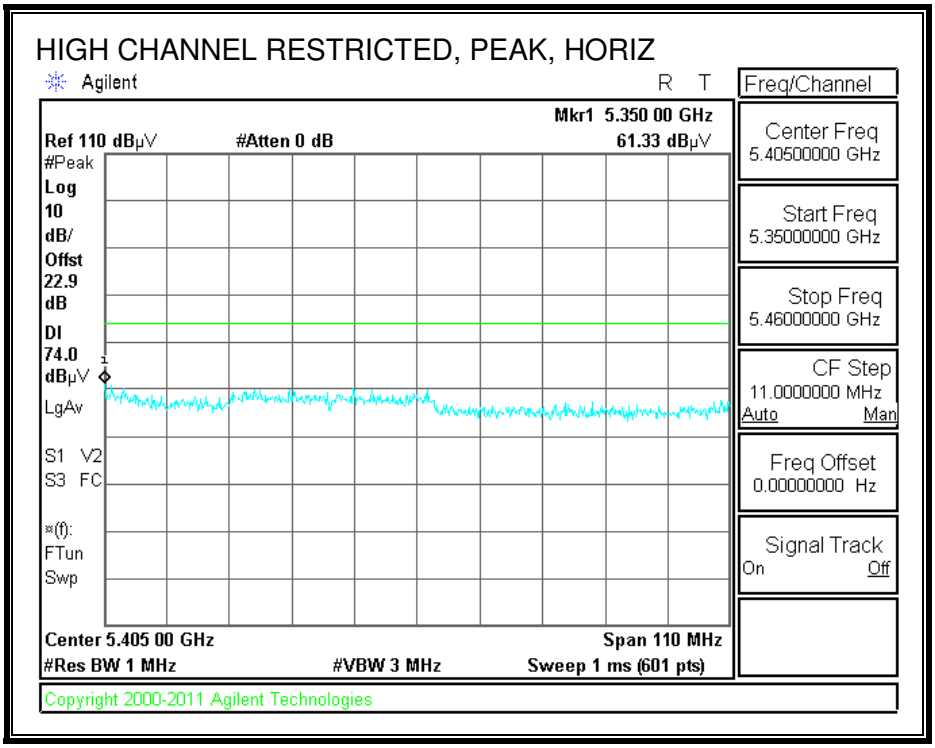
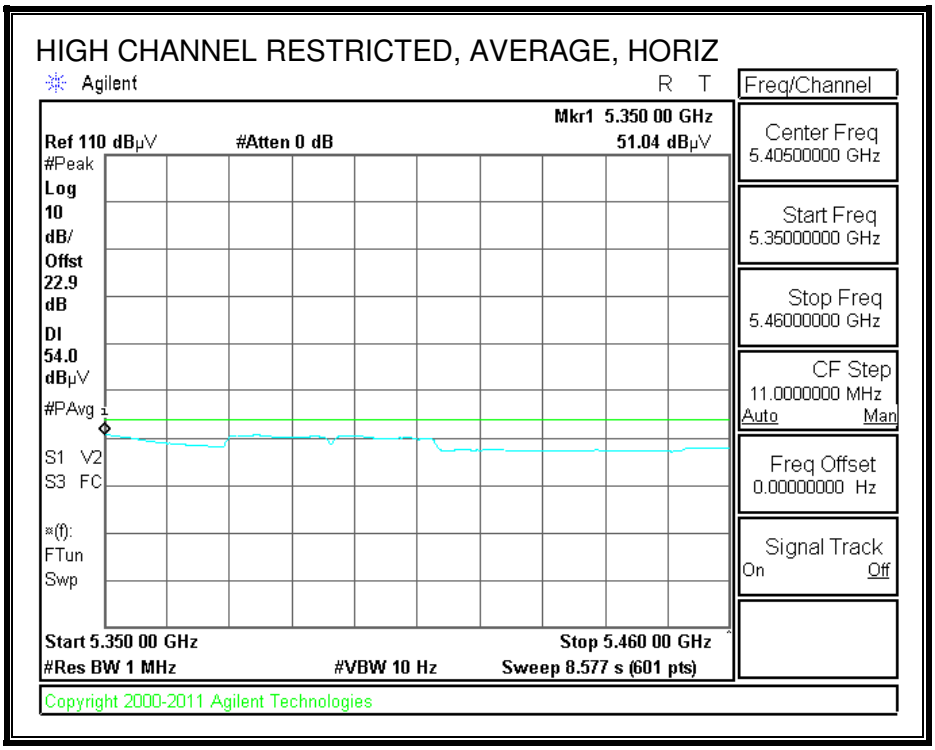
9.2.18. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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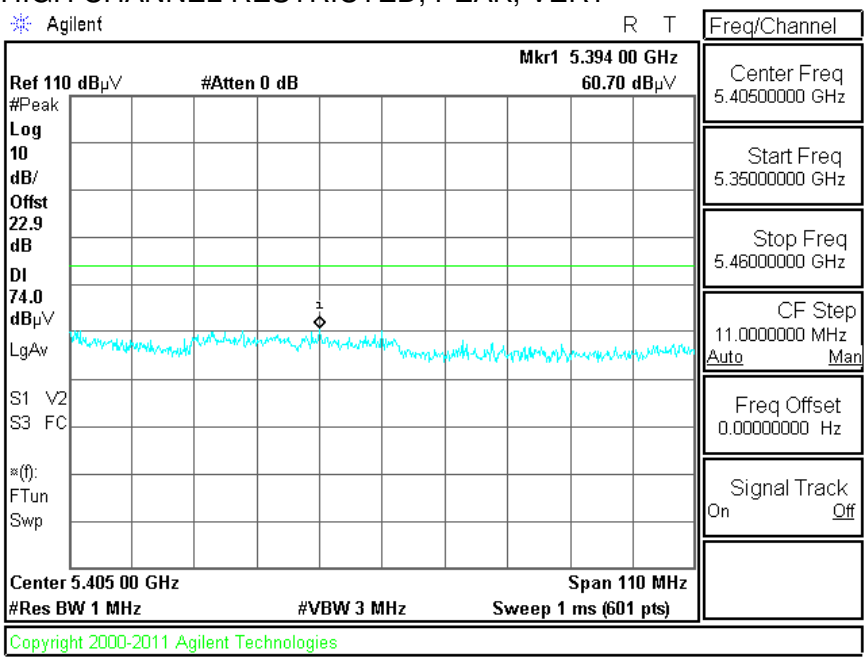
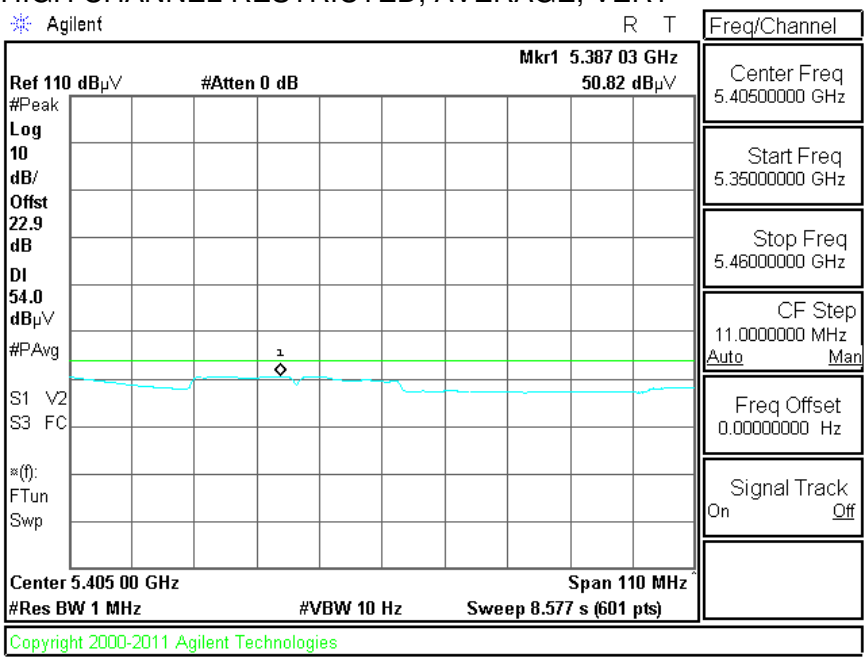
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5270 MHz 3TX CDD													
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	
5310 MHz 3TX CDD													
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.

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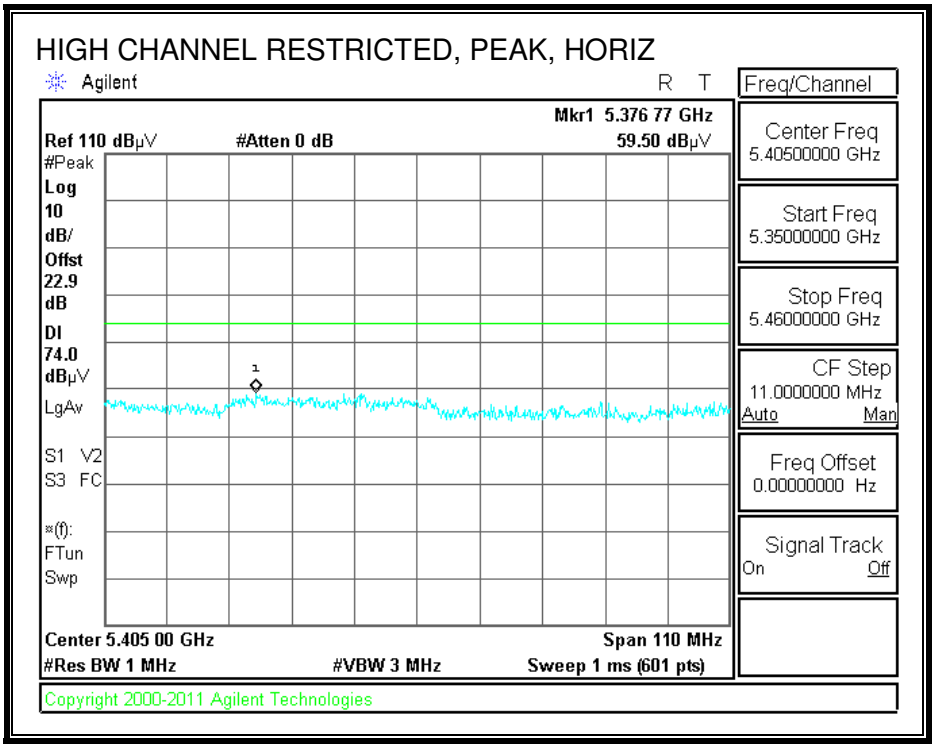
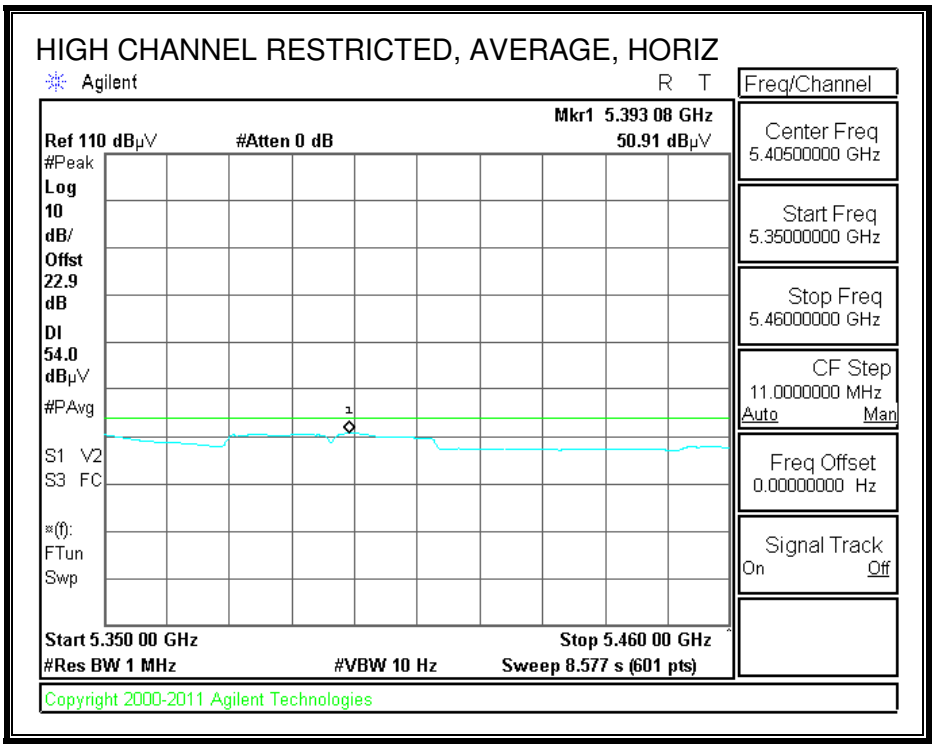
9.2.19. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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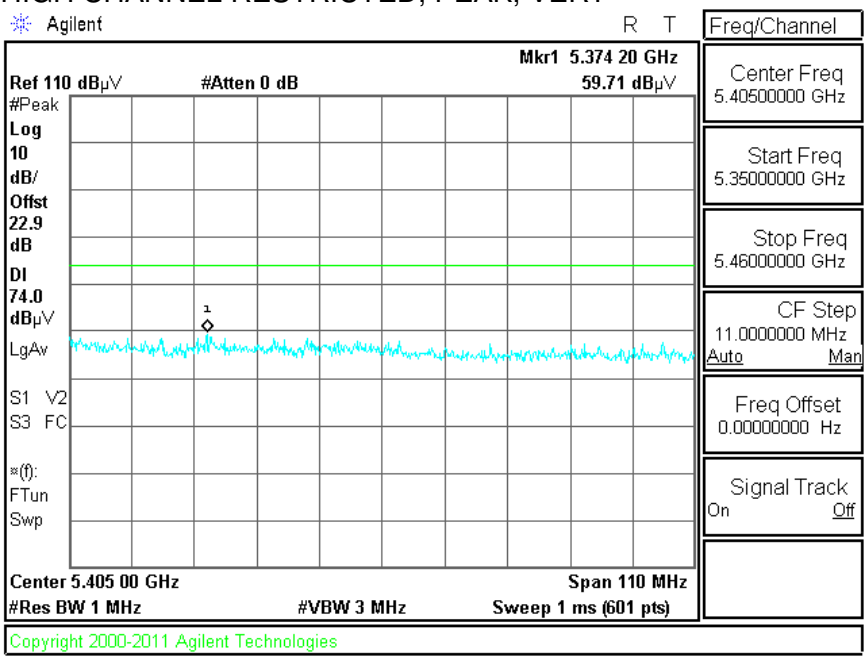
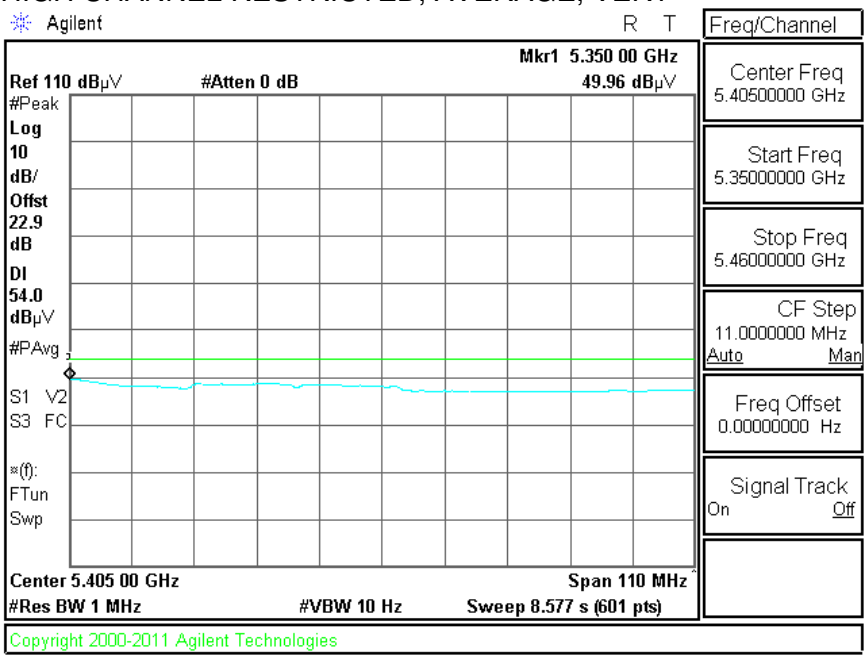
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5270 MHz 3TX CDD													
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	
5310 MHz 3TX CDD													
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.

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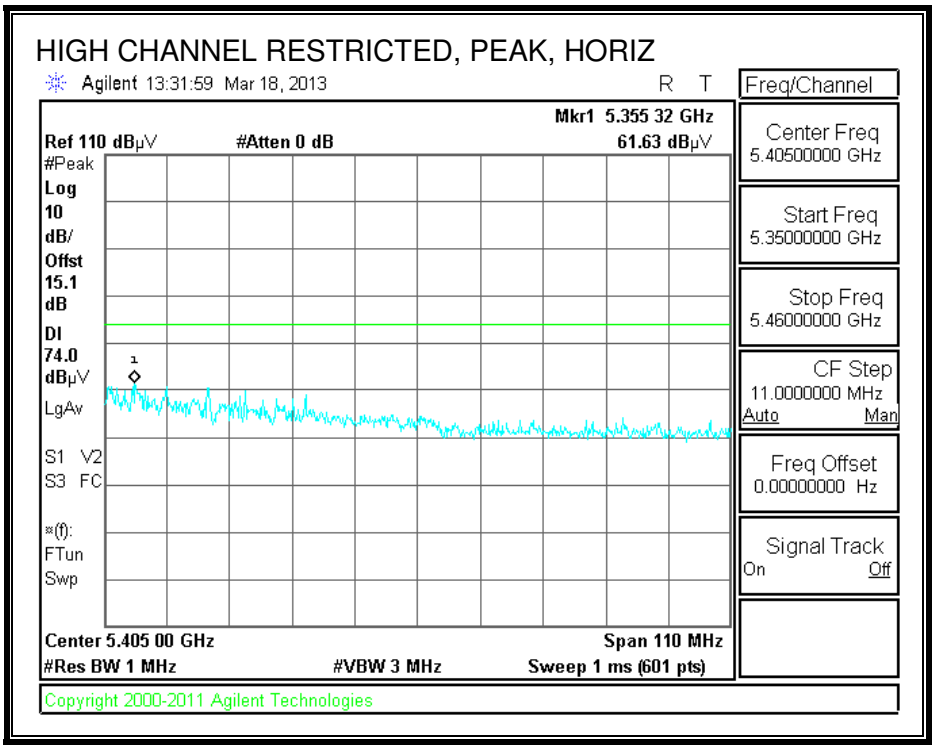
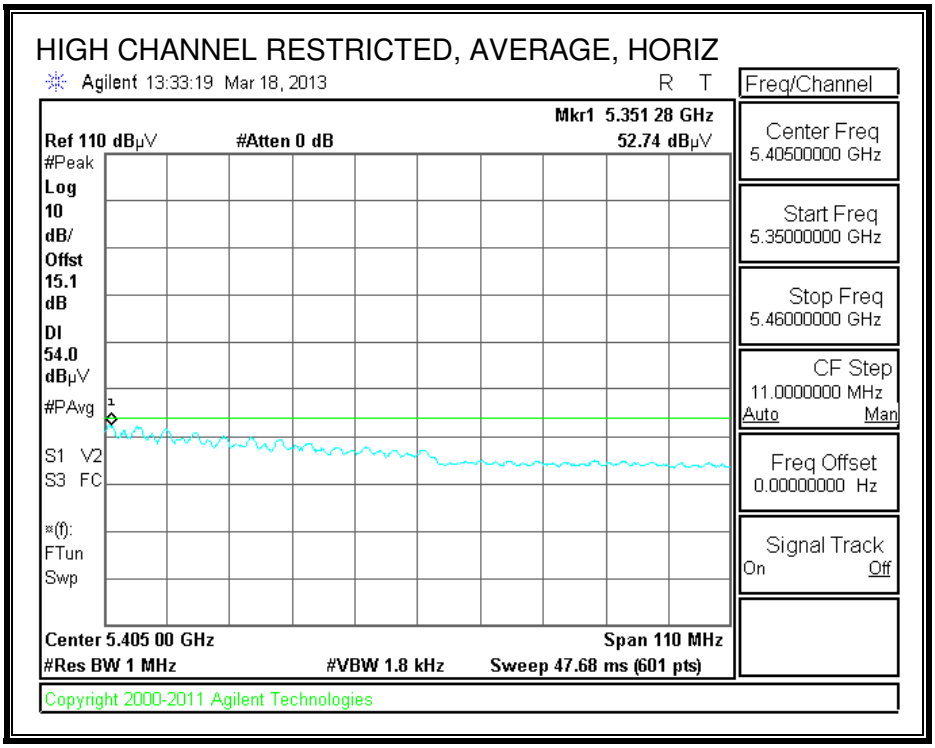
9.2.20. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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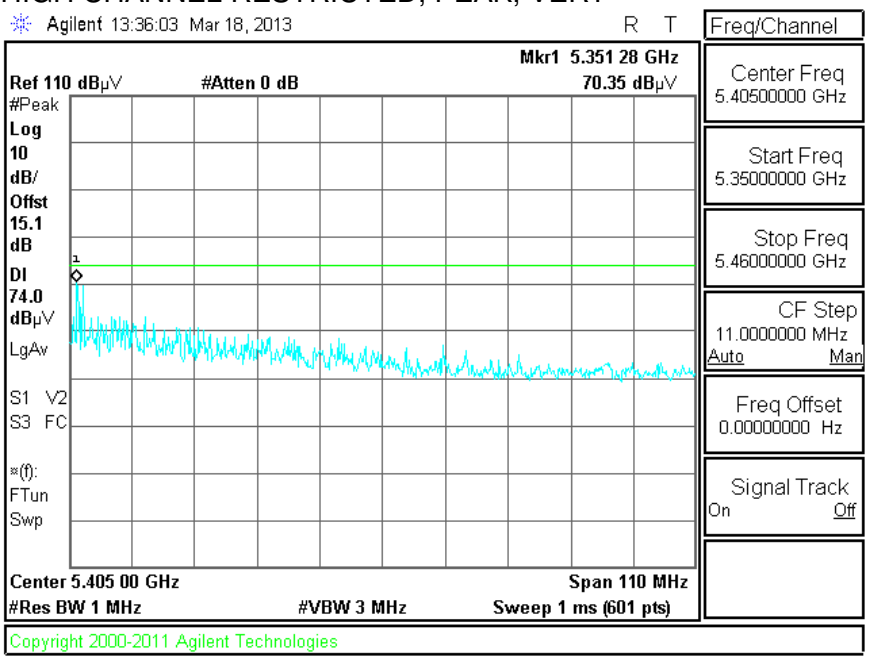
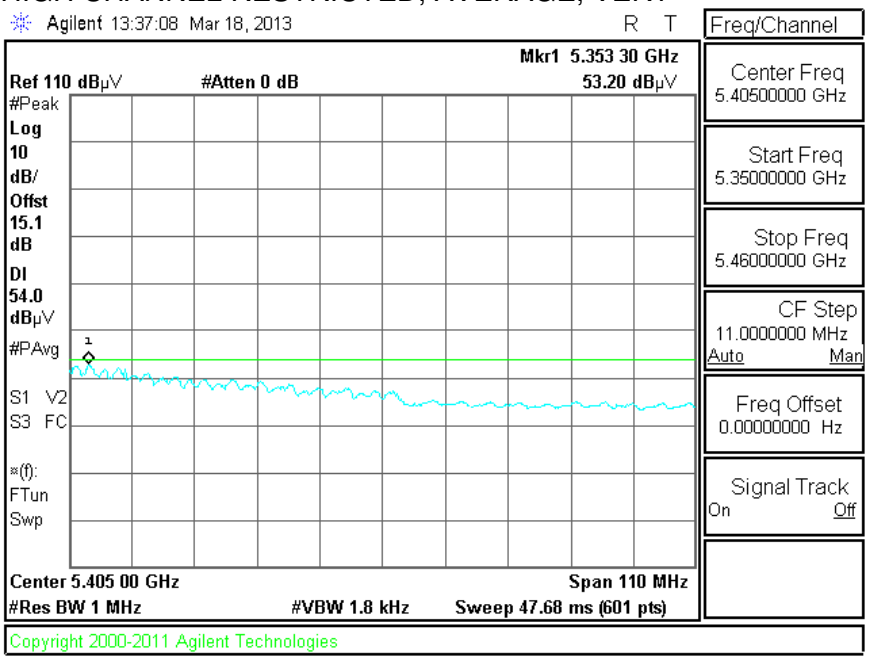
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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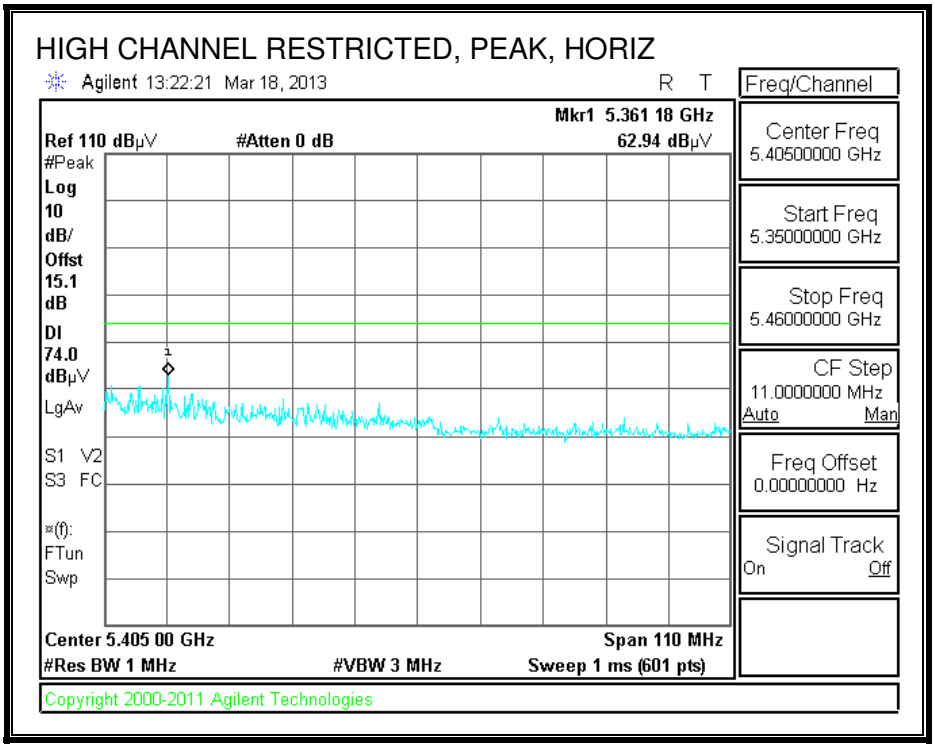
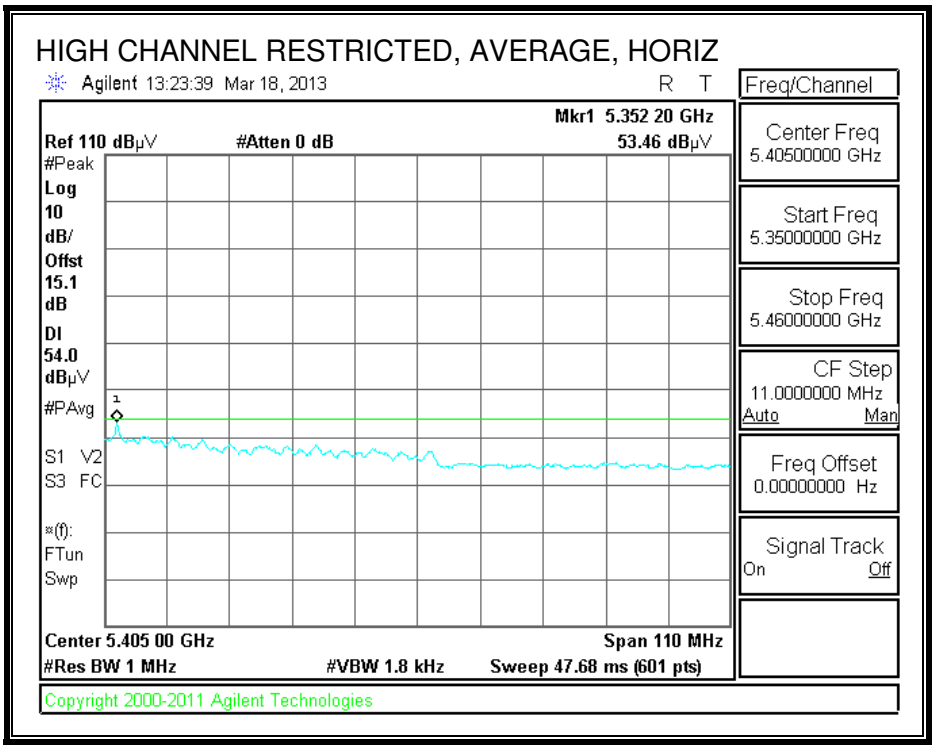
9.2.21. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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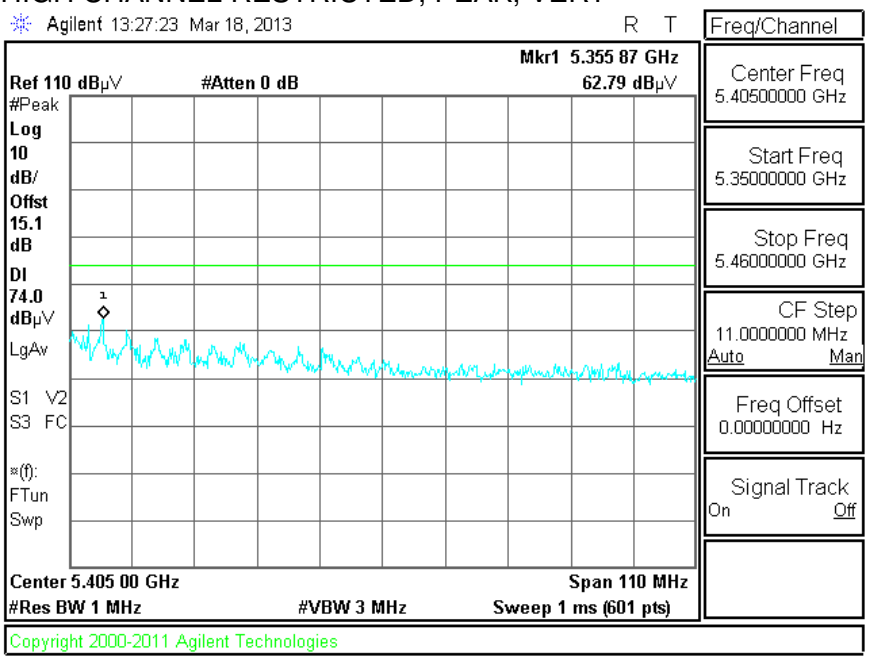
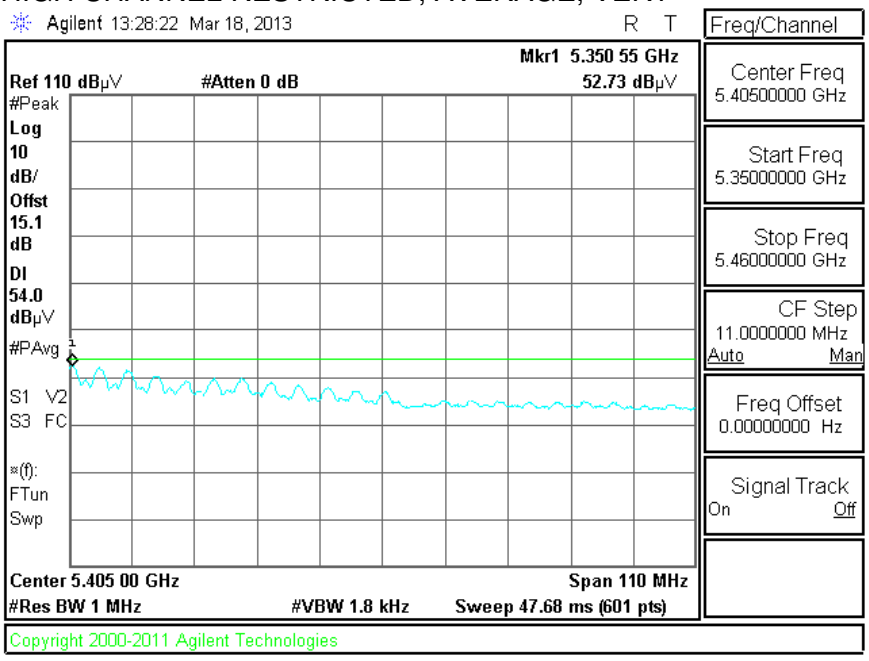
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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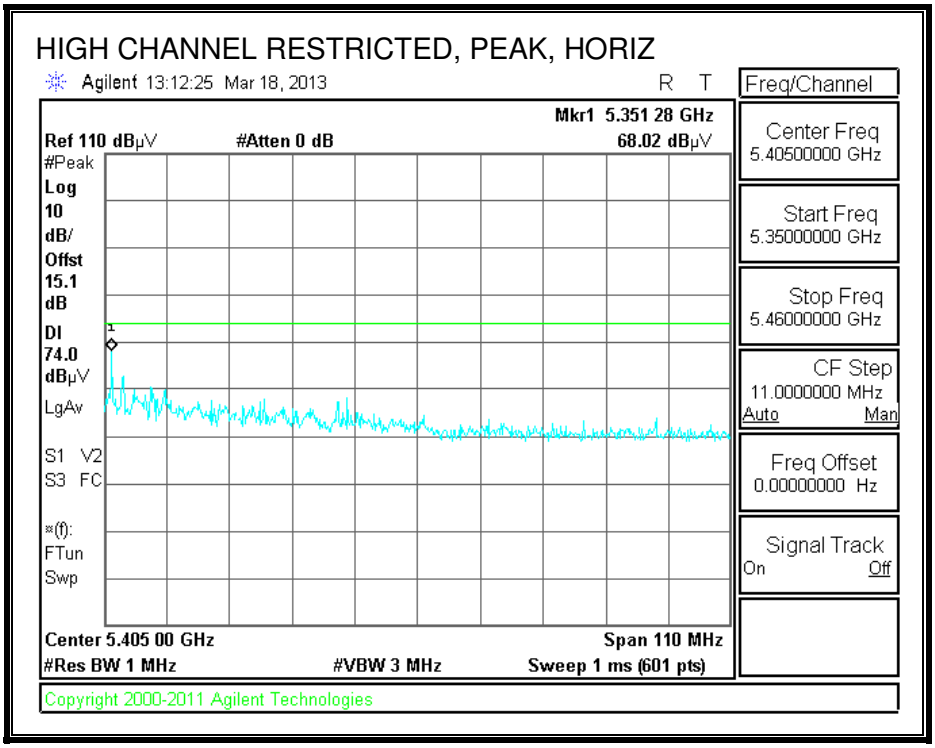
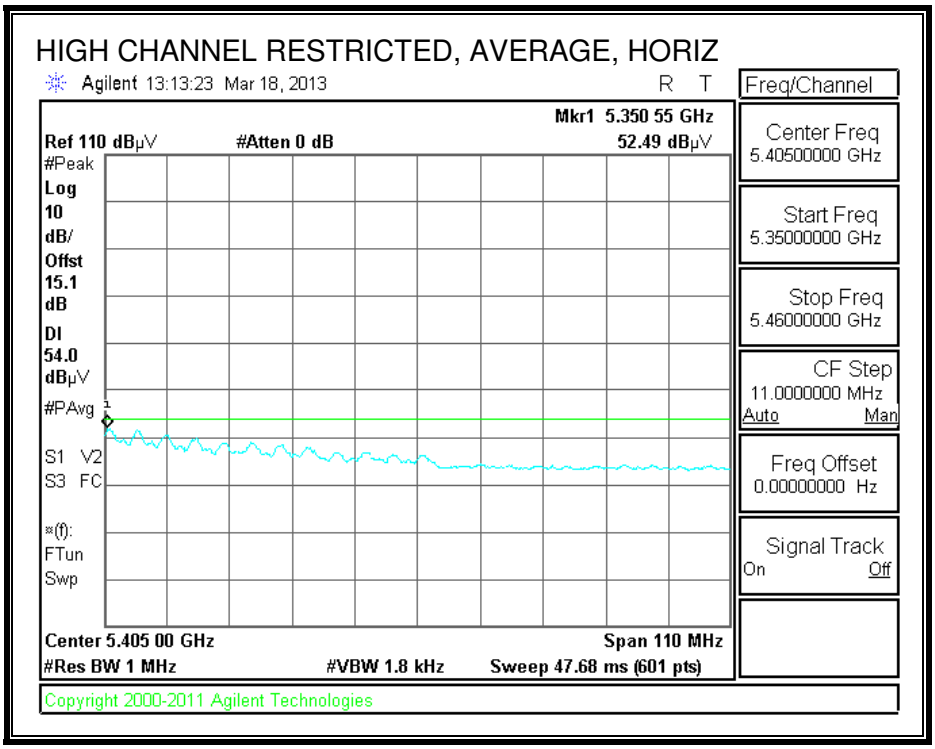
9.2.22. TX ABOVE 1 GHz, 802.11ac VHT80 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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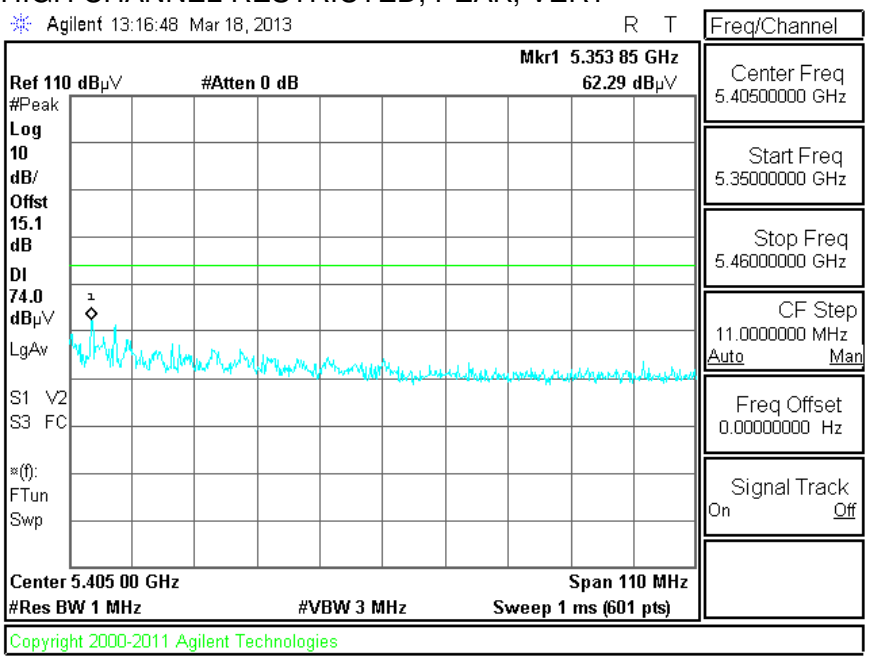
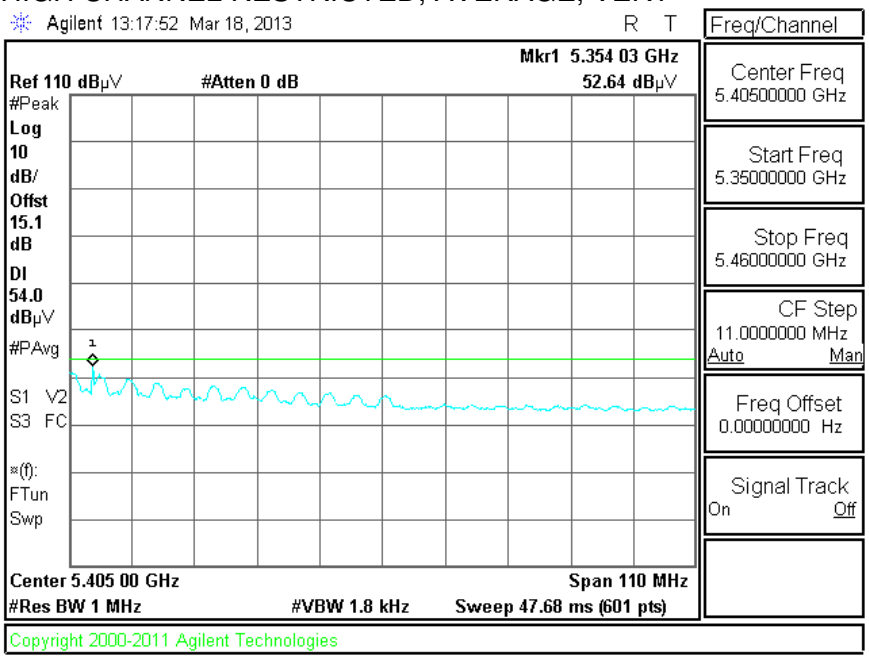
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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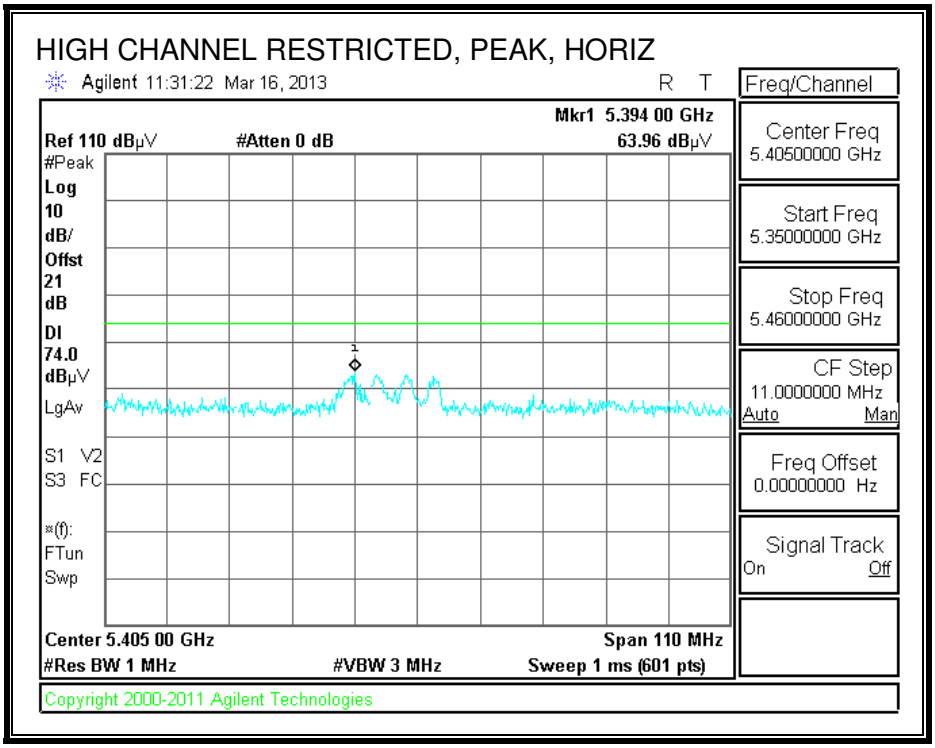
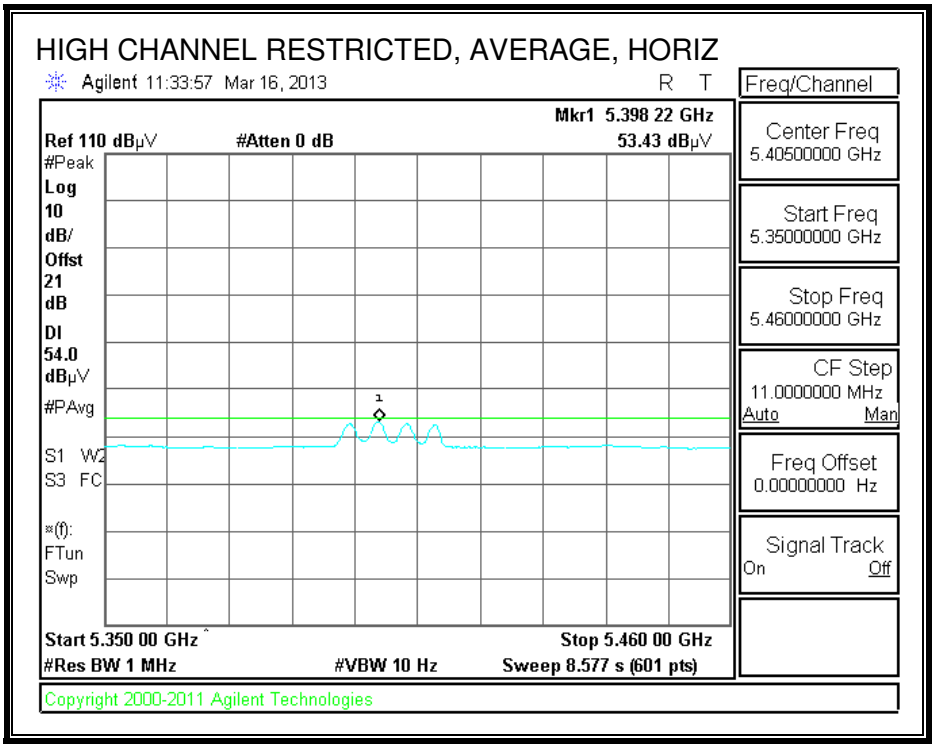
9.2.23. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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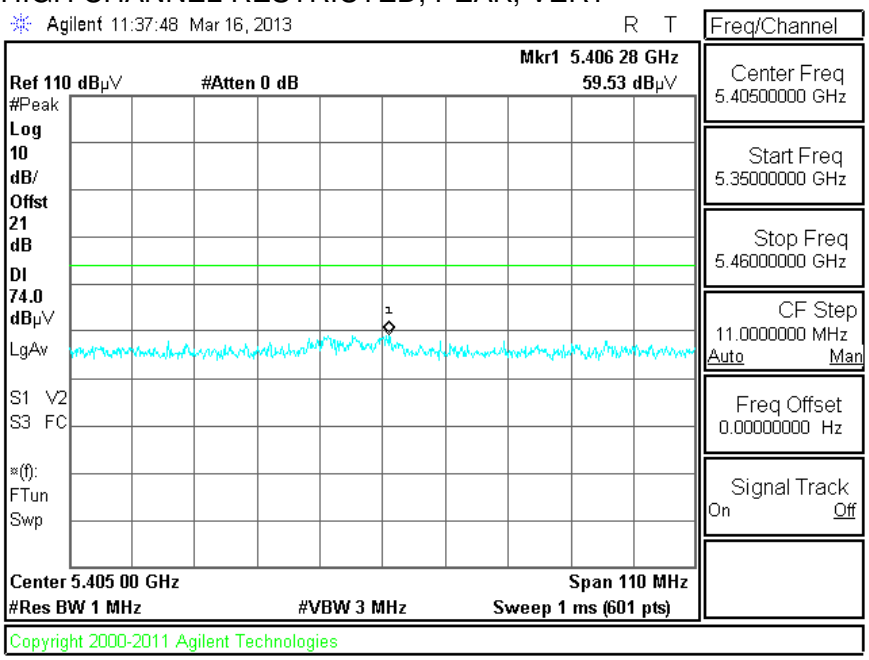
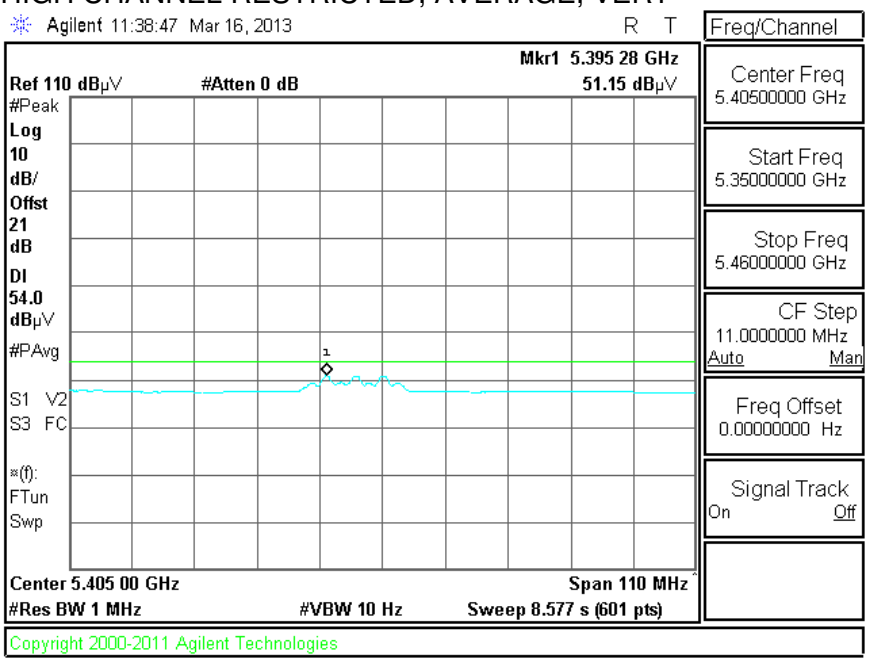
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5260 MHz)															
15.780	3.0	36.1	24.9	40.2	13.4	-32.2	0.0	0.7	58.1	46.9	74	54	-15.9	-7.1	H
15.780	3.0	35.5	24.7	40.2	13.4	-32.2	0.0	0.7	57.5	46.7	74	54	-16.5	-7.3	V
Mid Channel (5300 MHz)															
10.600	3.0	36.5	25.4	37.3	10.7	-33.9	0.0	0.8	51.3	40.2	74	54	-22.7	-13.8	H
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
Hi Channel (5320 MHz)															
10.640	3.0	36.0	25.7	37.3	10.7	-33.9	0.0	0.8	50.9	40.6	74	54	-23.1	-13.4	H
10.640	3.0	36.6	25.2	37.3	10.7	-33.9	0.0	0.8	51.5	40.1	74	54	-22.5	-13.9	V

Rev. 01.30.13

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

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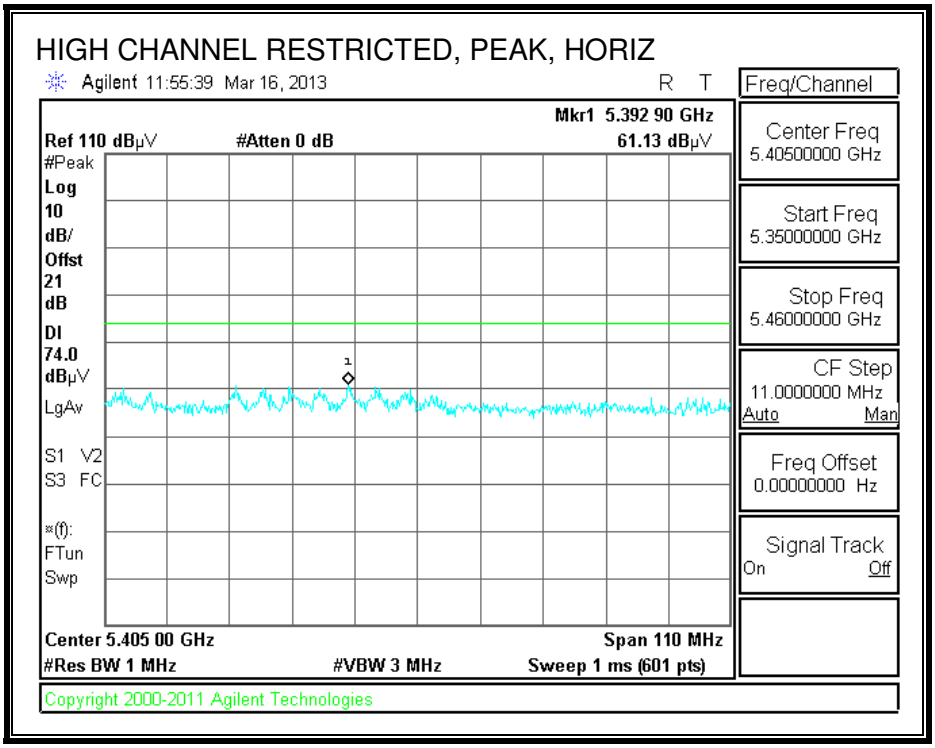
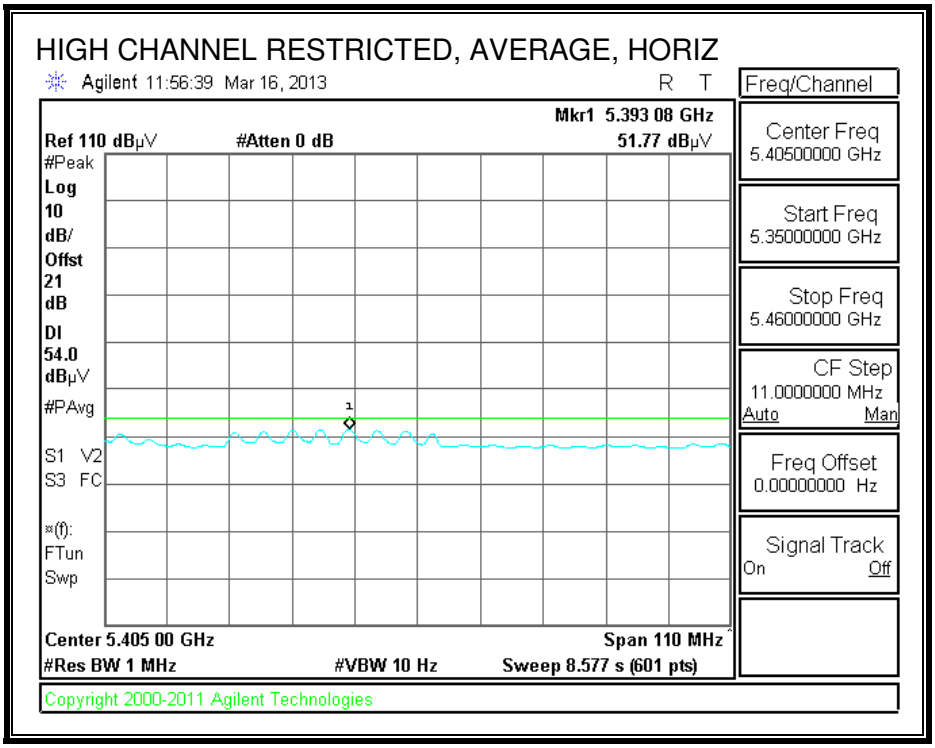
9.2.24. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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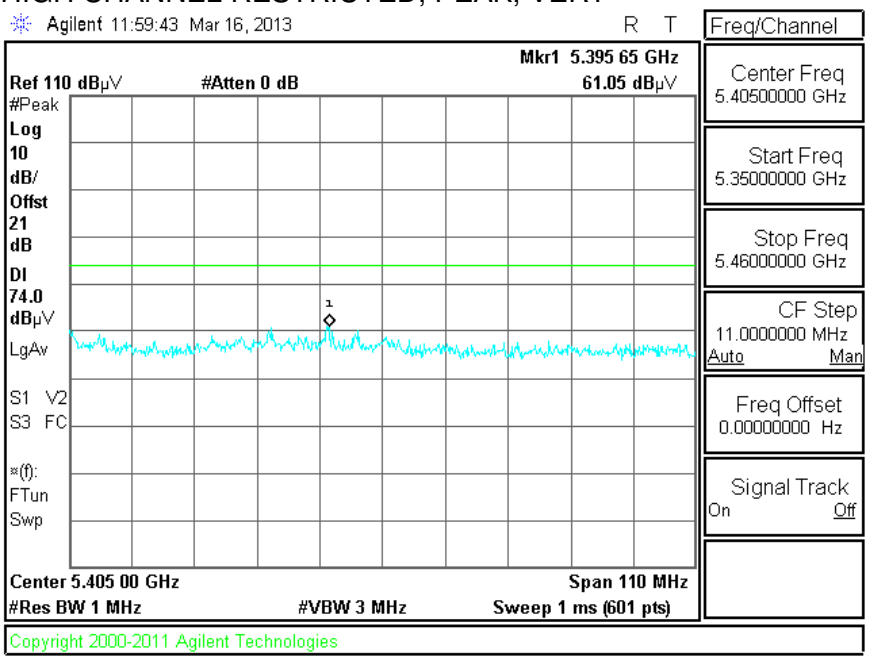
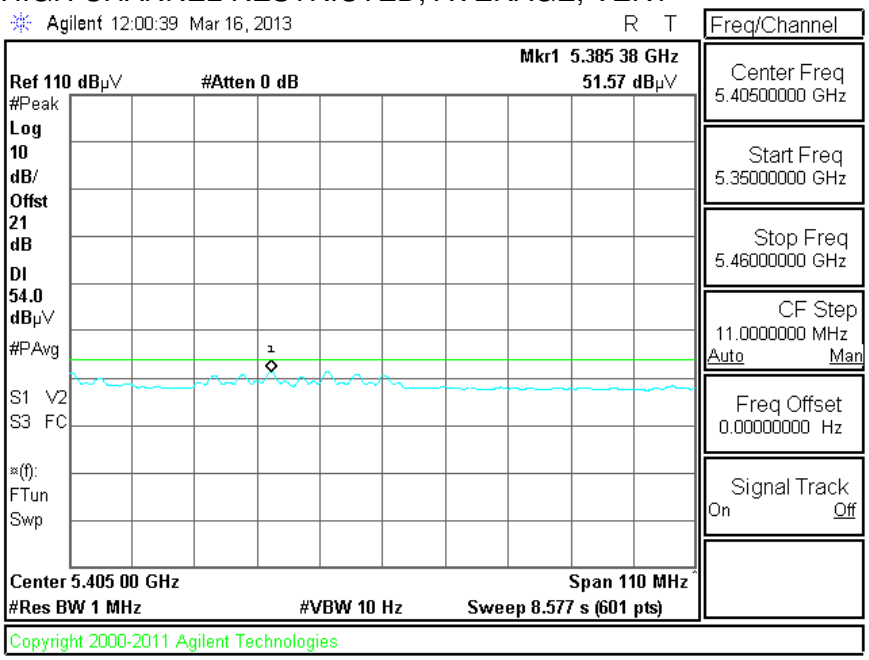
HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



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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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5270 MHz)															
15.810	3.0	35.0	25.0	40.2	13.4	-32.2	0.0	0.7	57.1	47.0	74	54	-16.9	-7.0	H
15.810	3.0	35.0	24.7	40.2	13.4	-32.2	0.0	0.7	57.0	46.7	74	54	-17.0	-7.3	V
Hi Channel (5310 MHz)															
10.620	3.0	35.9	25.5	37.3	10.7	-33.9	0.0	0.8	50.7	40.3	74	54	-23.3	-13.7	H
10.620	3.0	35.7	24.9	37.3	10.7	-33.9	0.0	0.8	50.6	39.8	74	54	-23.4	-14.2	V

Rev. 01.30.13

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

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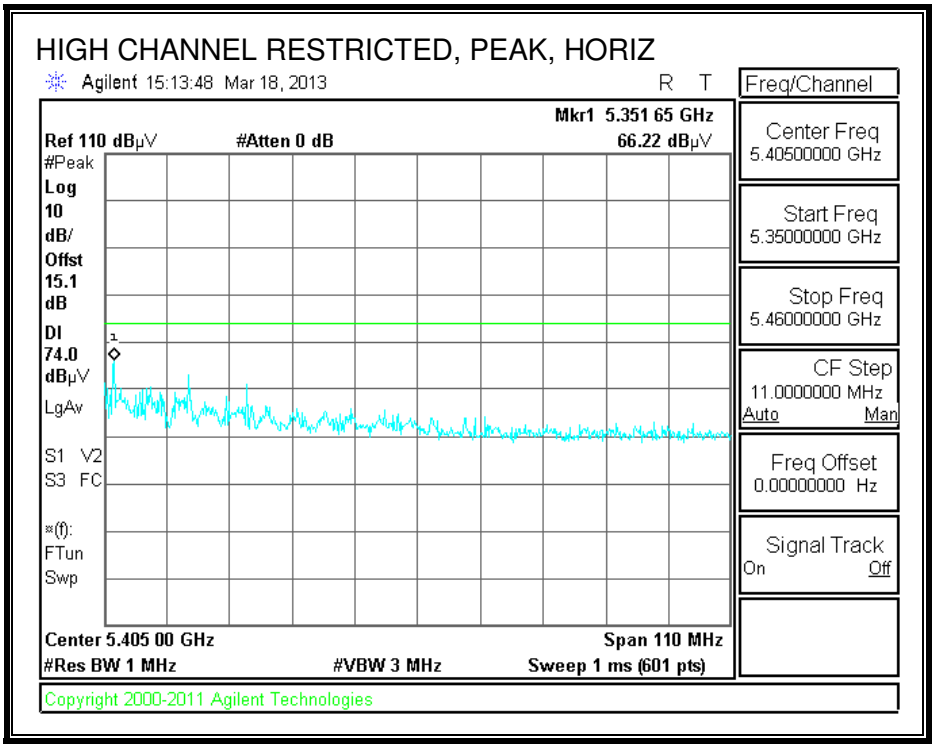
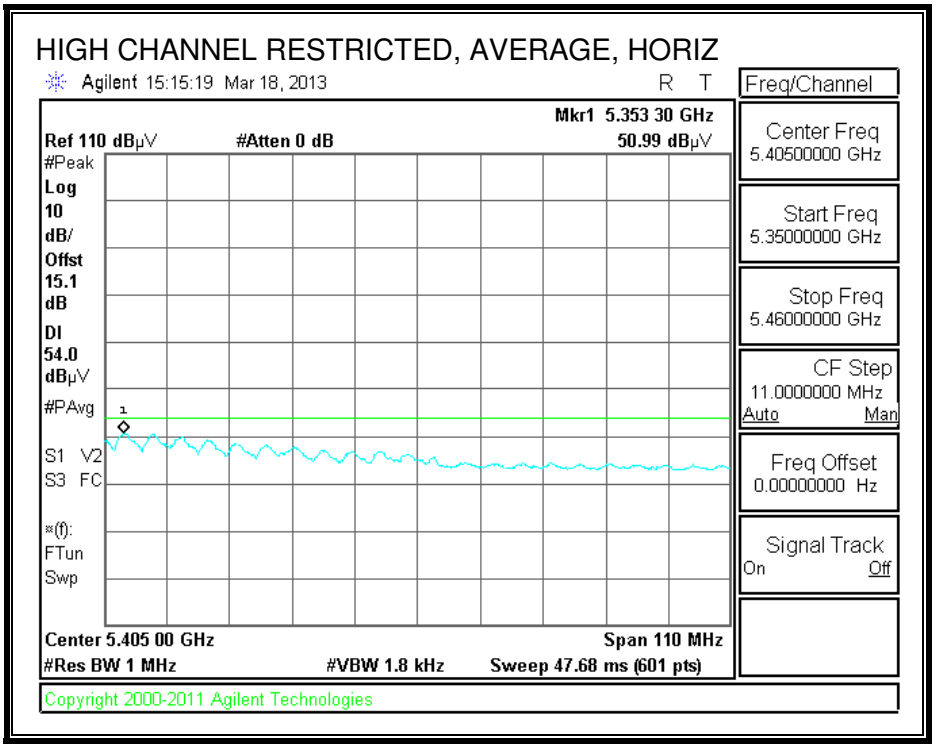
9.2.25. TX ABOVE 1 GHz, 802.11n HT80 BF 2TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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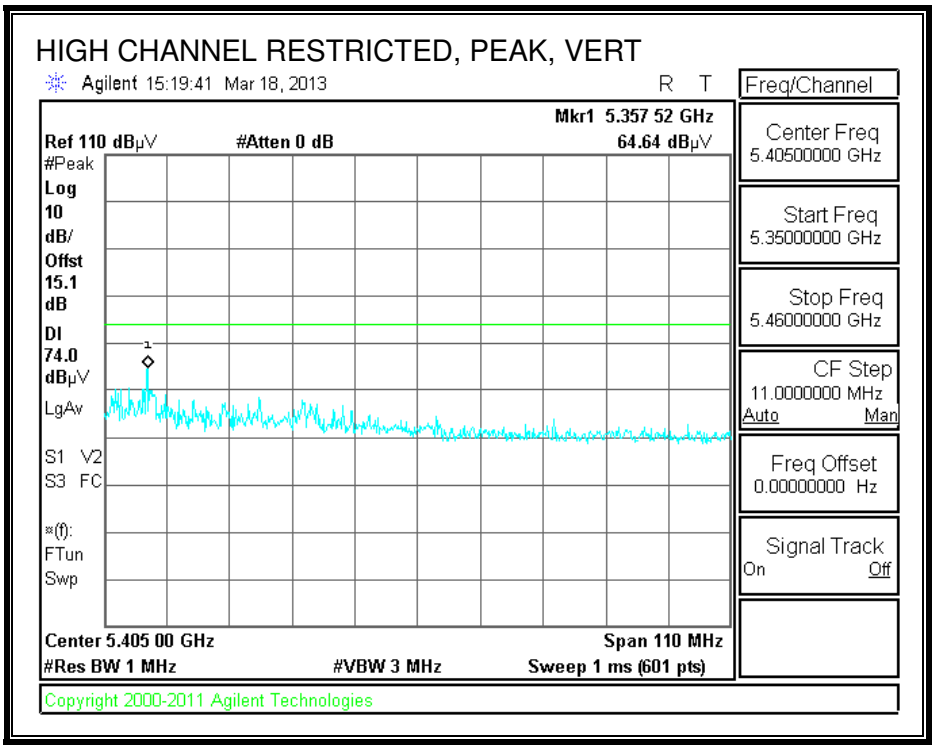

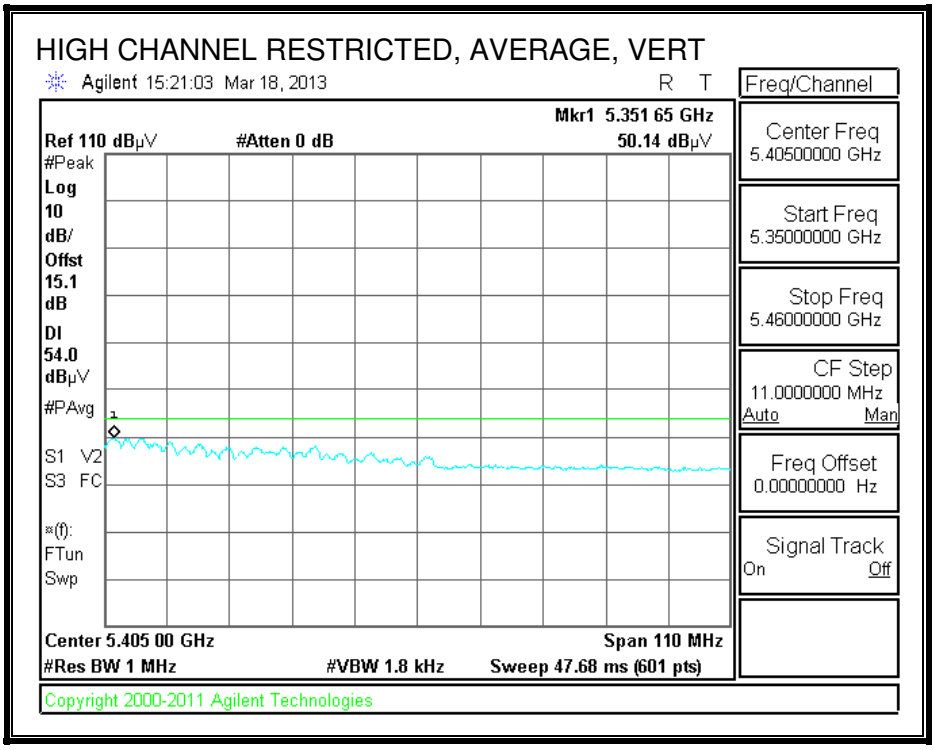

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HARMONICS AND SPURIOUS EMISSIONS

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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V

Rev. 01.30.13

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

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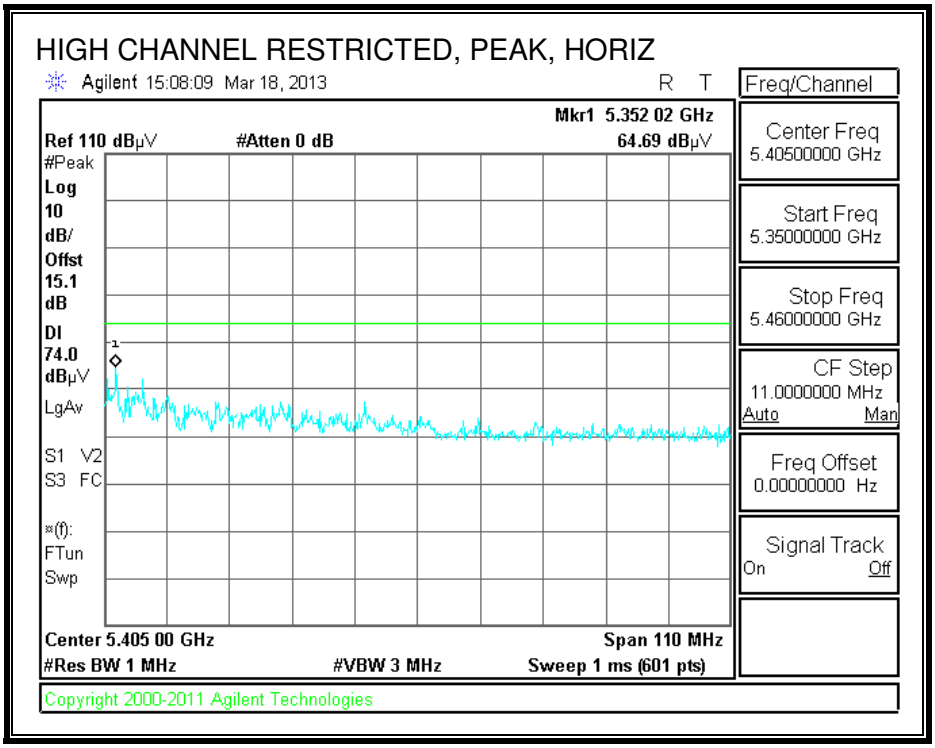
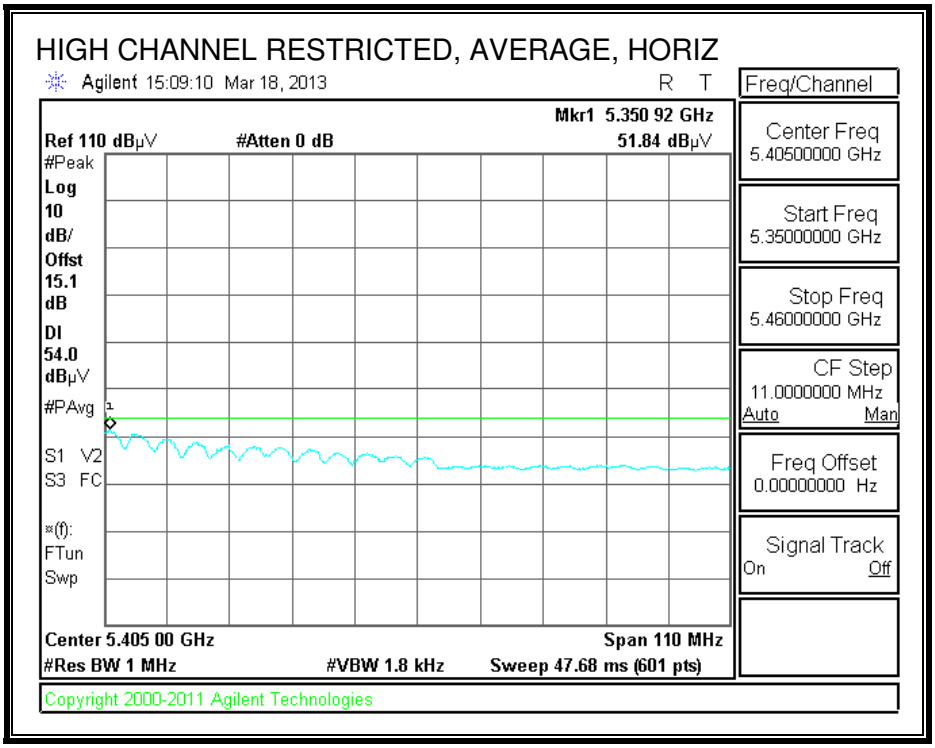
9.2.26. TX ABOVE 1 GHz, 802.11n HT80 BF 3TX MODE, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)





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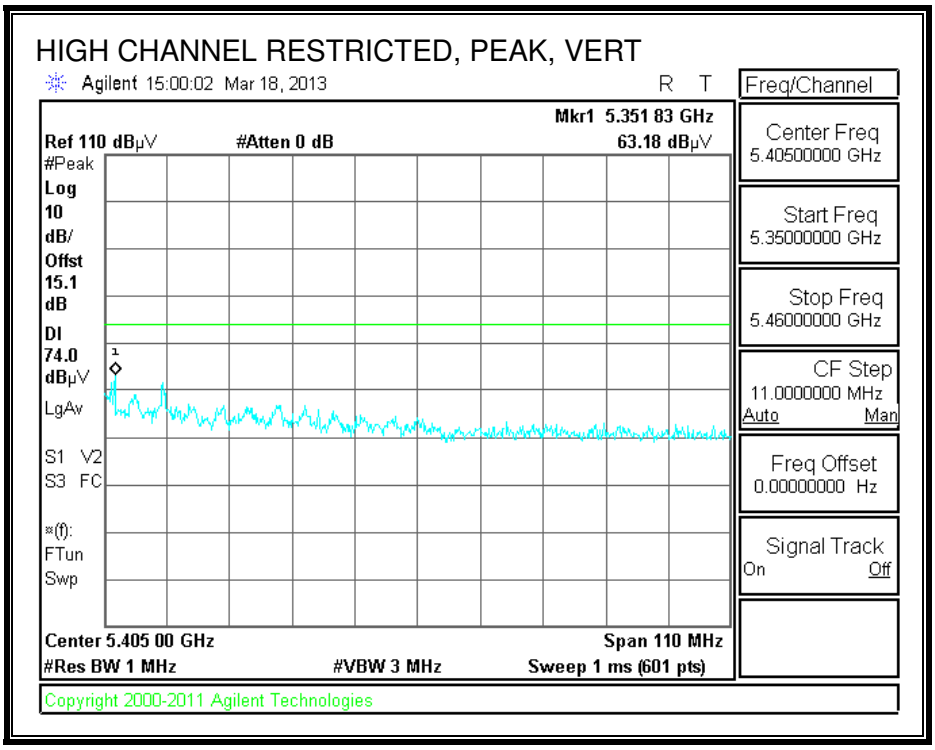

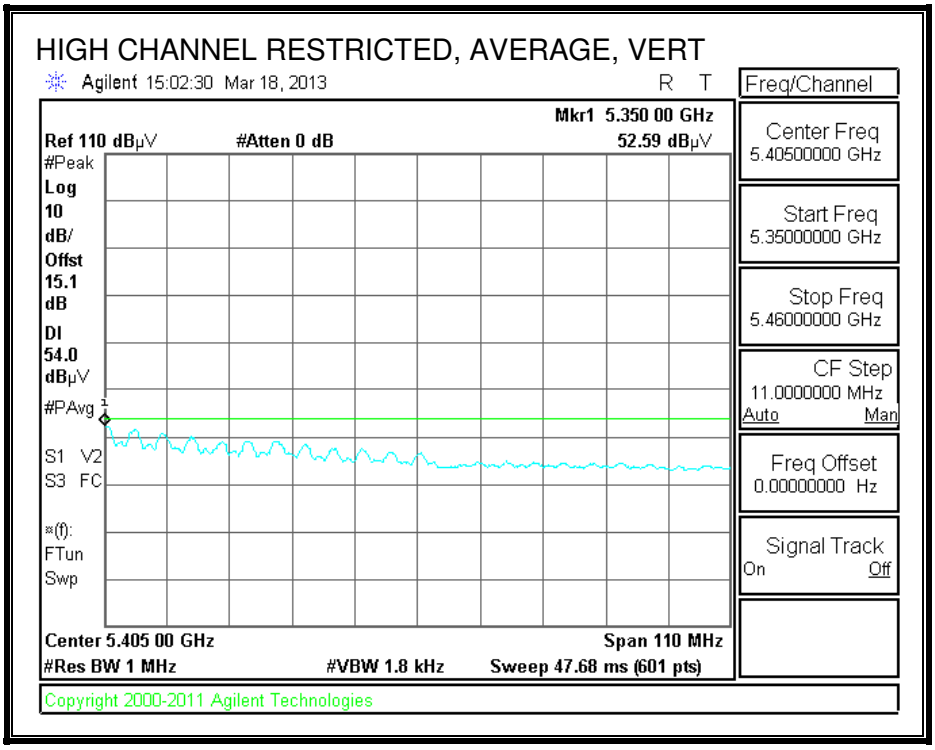

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HARMONICS AND SPURIOUS EMISSIONS

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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V

Rev. 01.30.13

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

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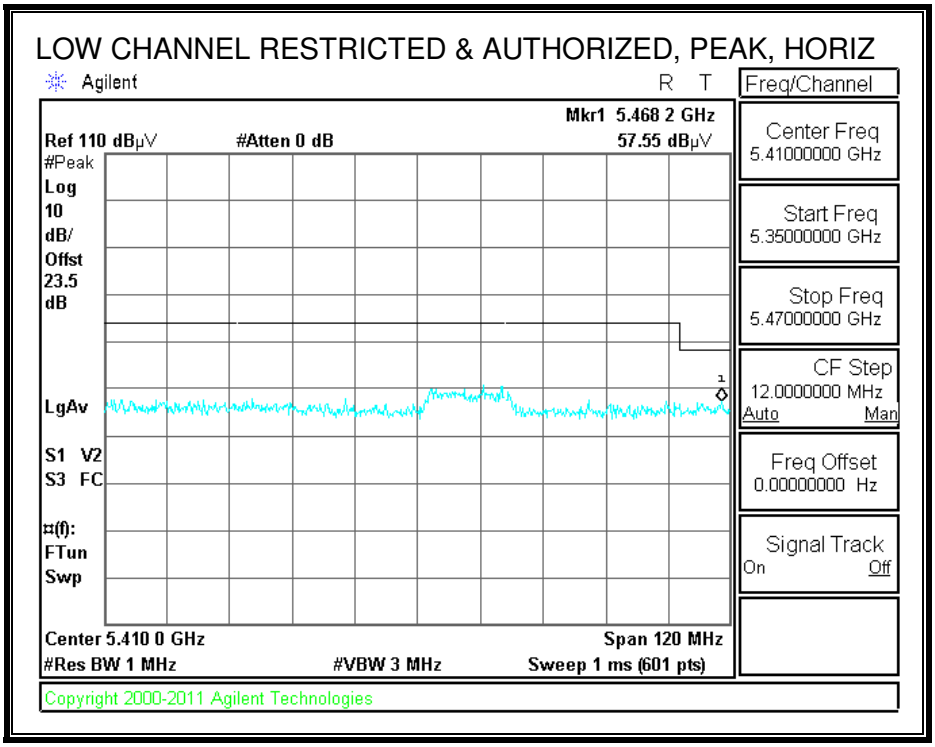
9.2.27. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)



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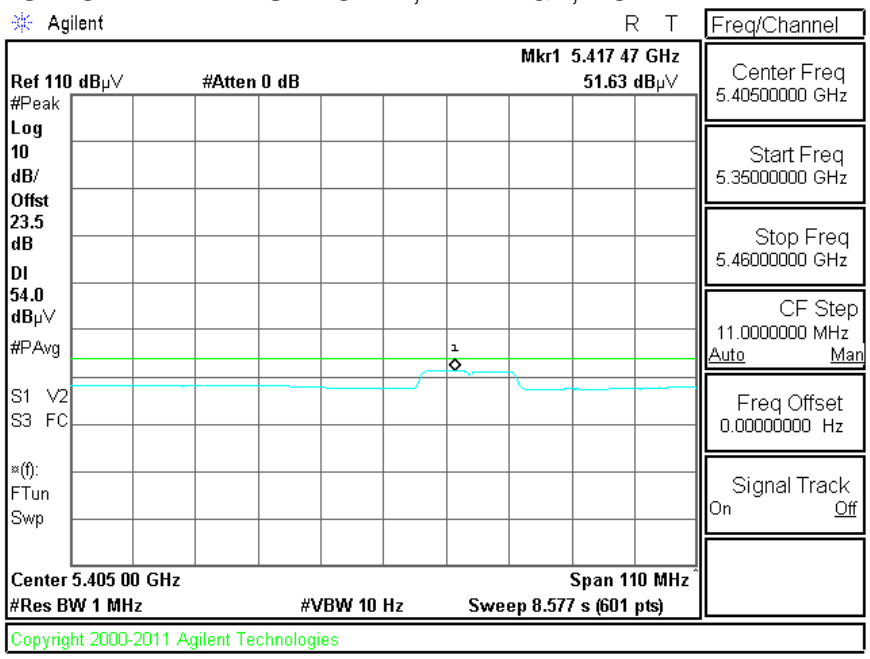
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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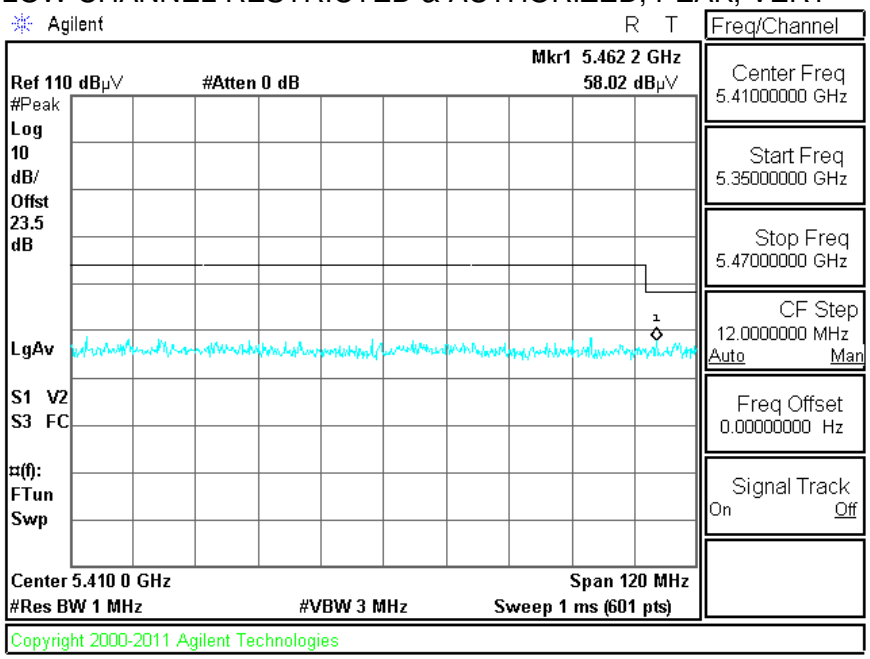
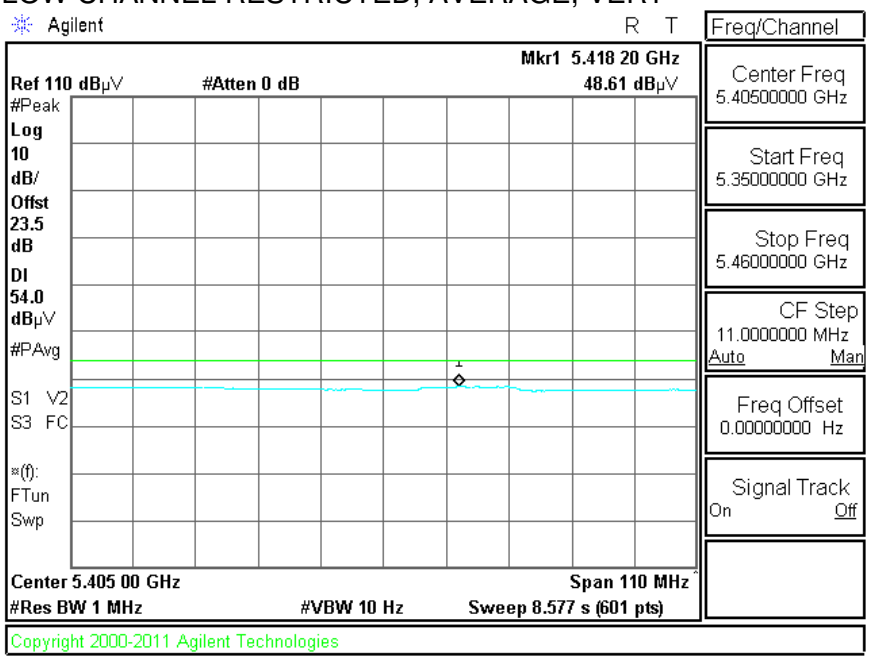
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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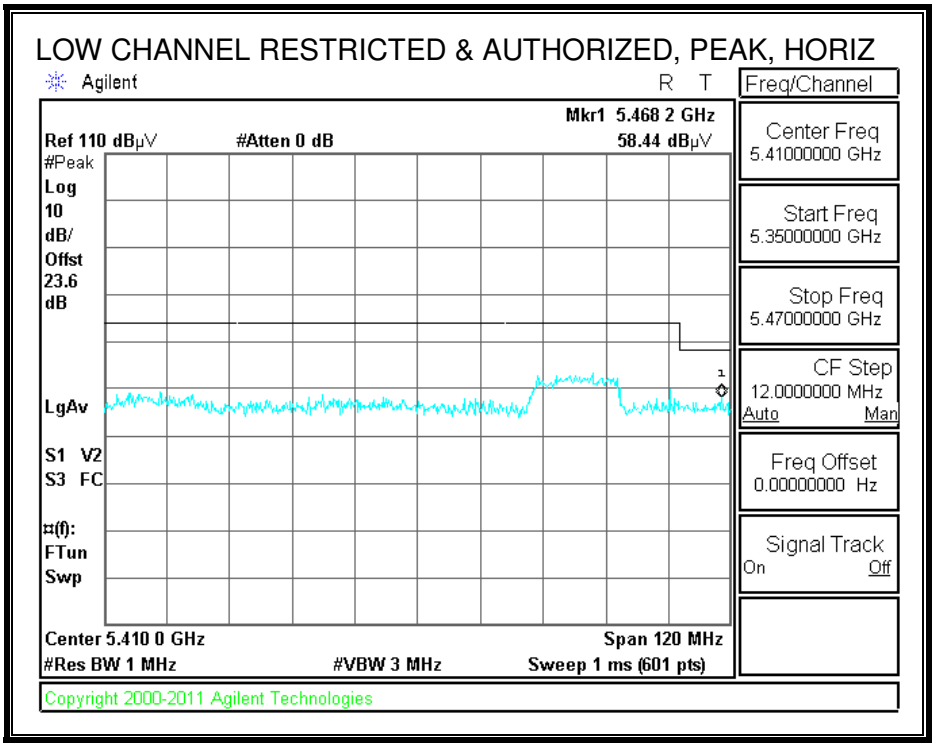
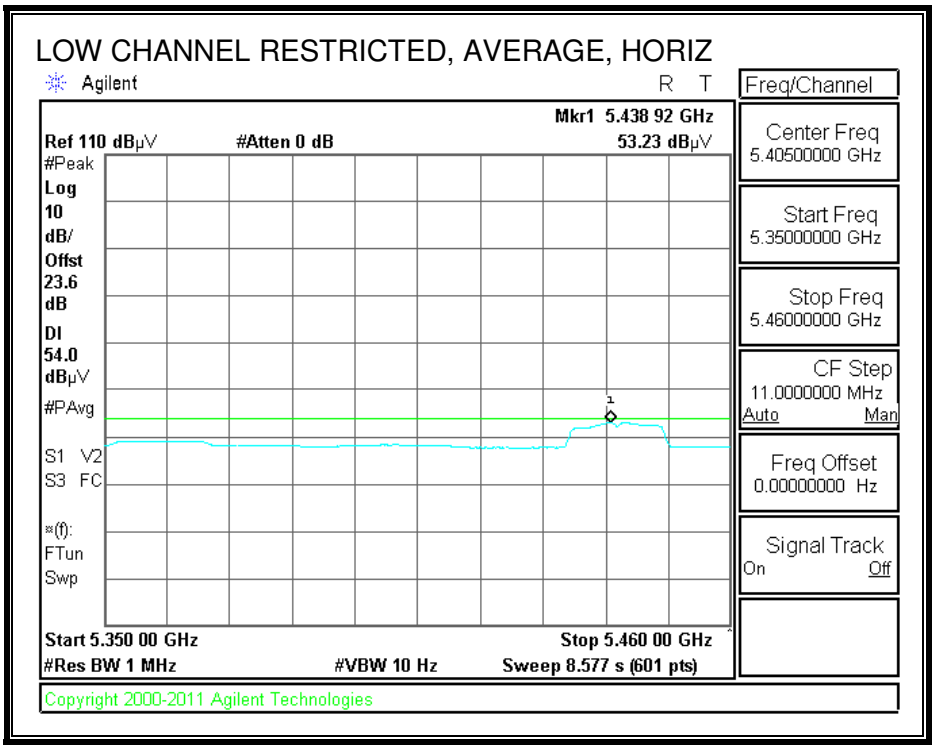
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)





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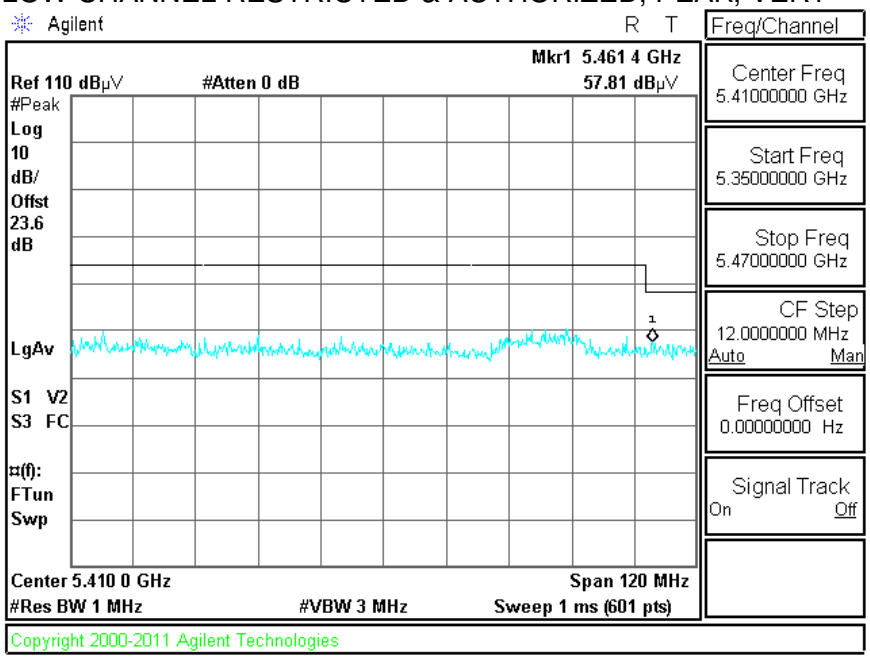
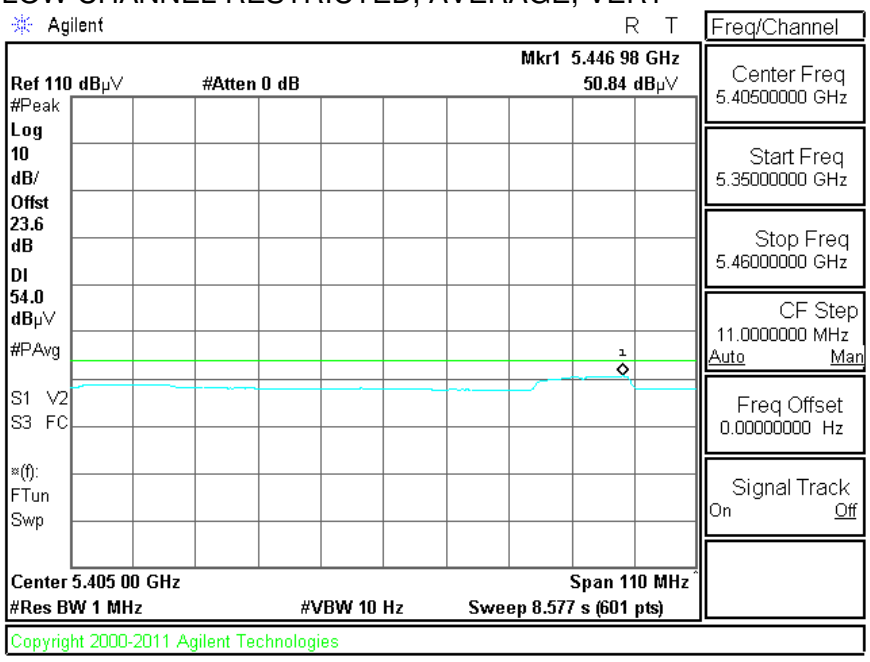
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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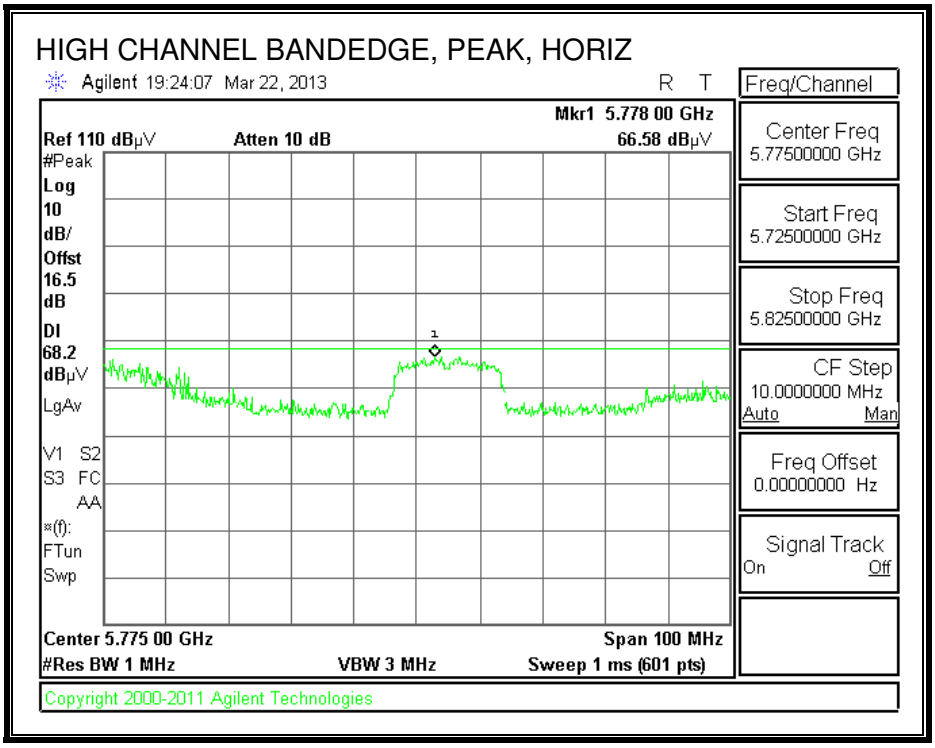
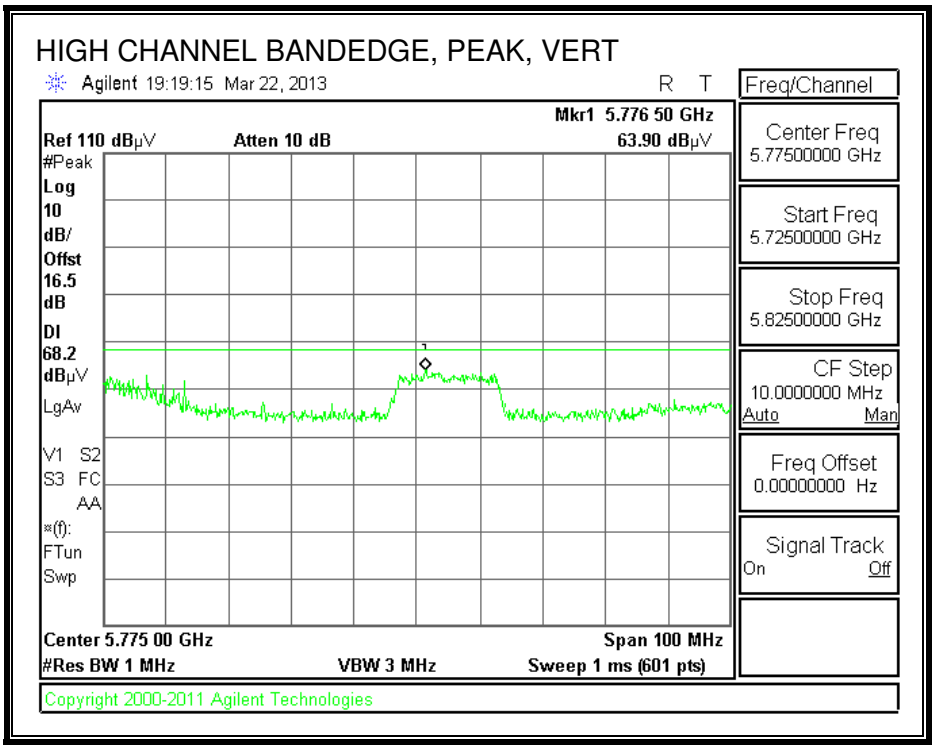
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5500 MHz 3TX CDD													
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	
5580 MHz 3TX CDD													
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	
5700 MHz 3TX CDD													
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.

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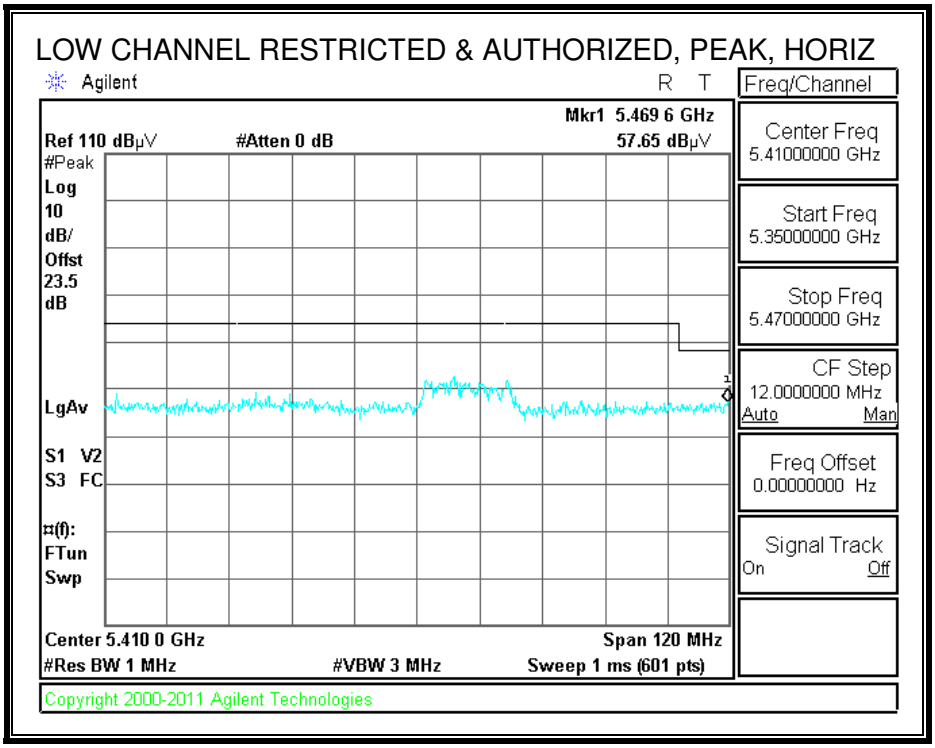
9.2.28. TX ABOVE 1 GHz, 802.11n HT20 CDD 2TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)



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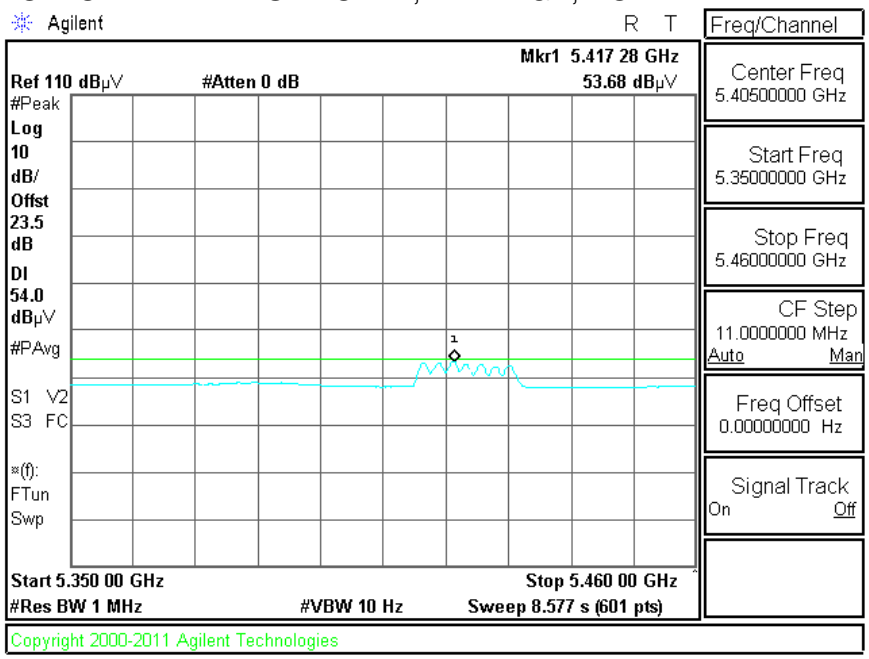
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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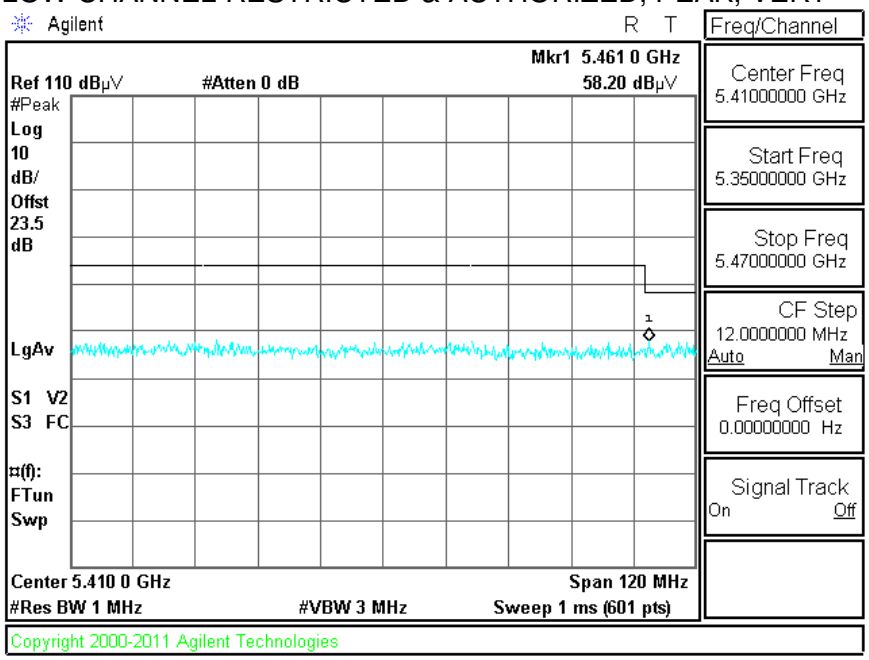
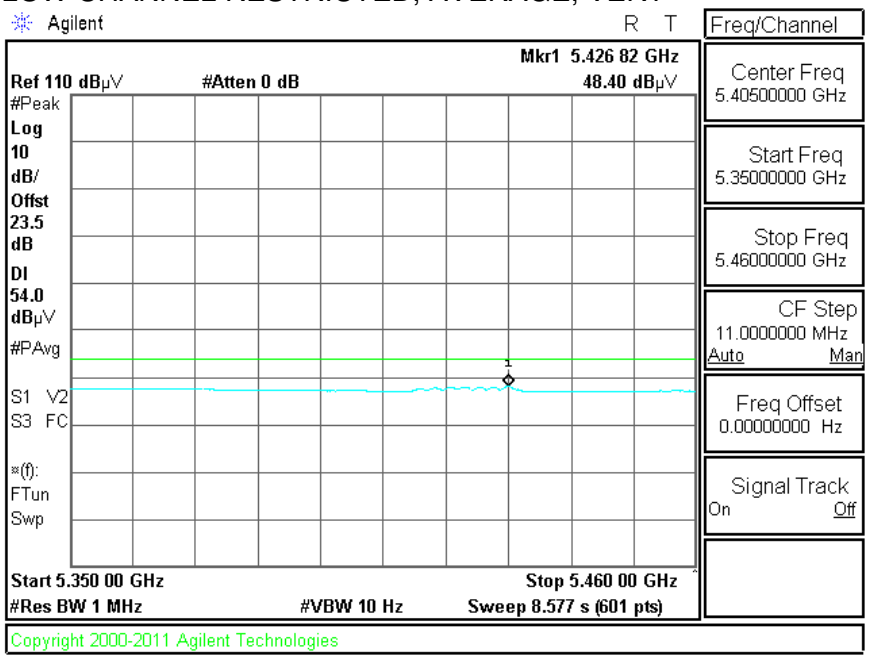
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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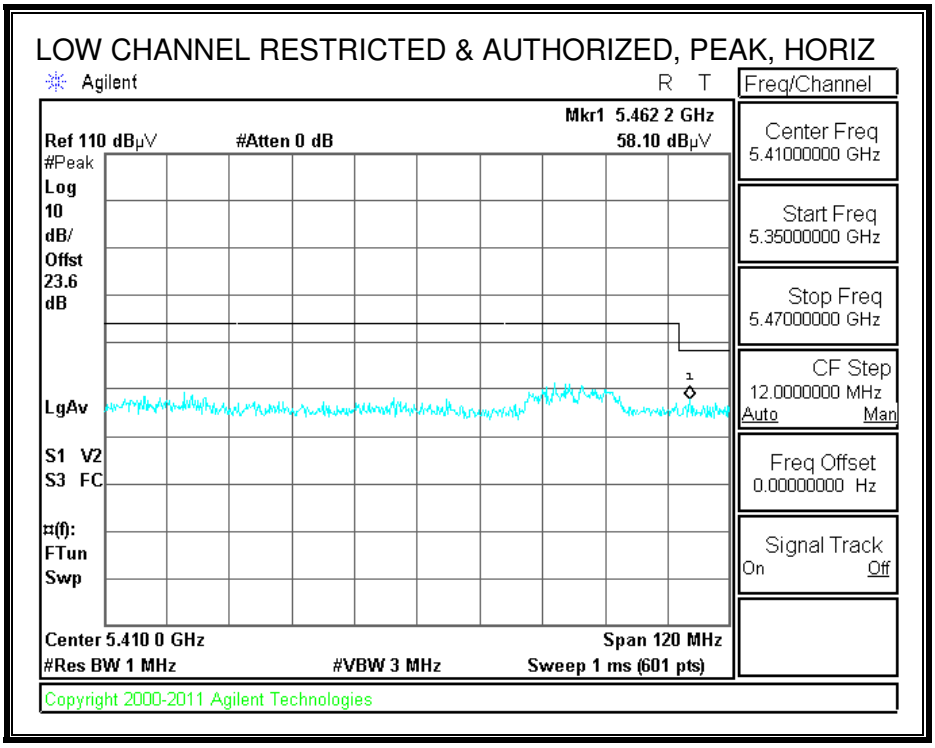
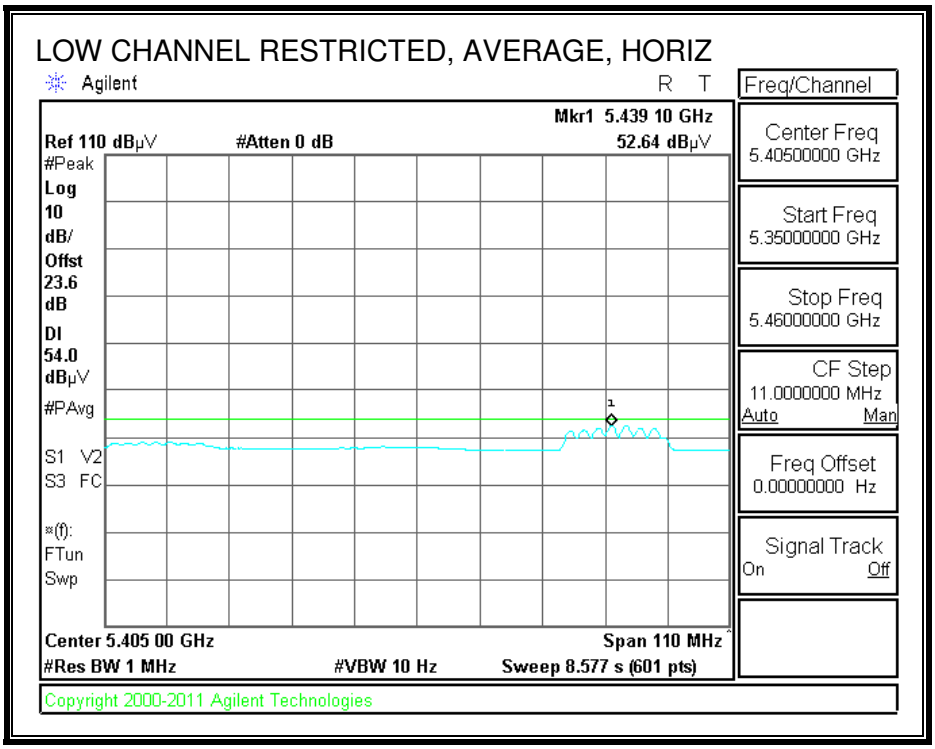
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)





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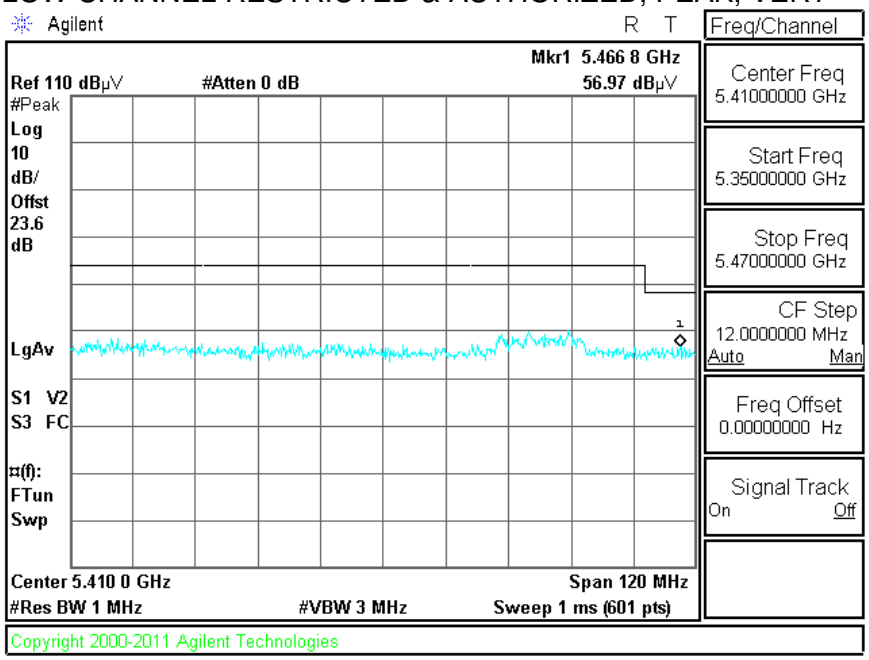
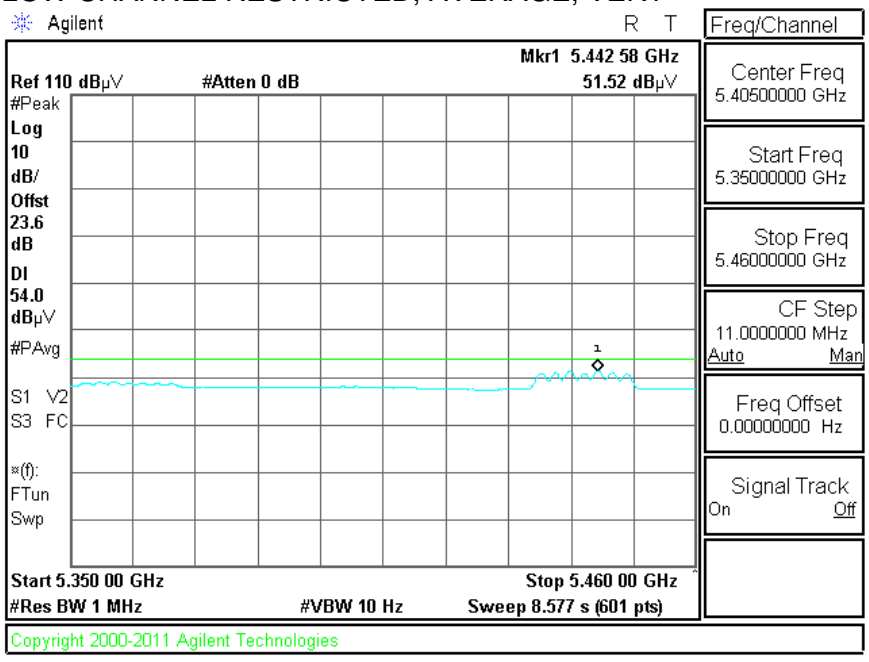
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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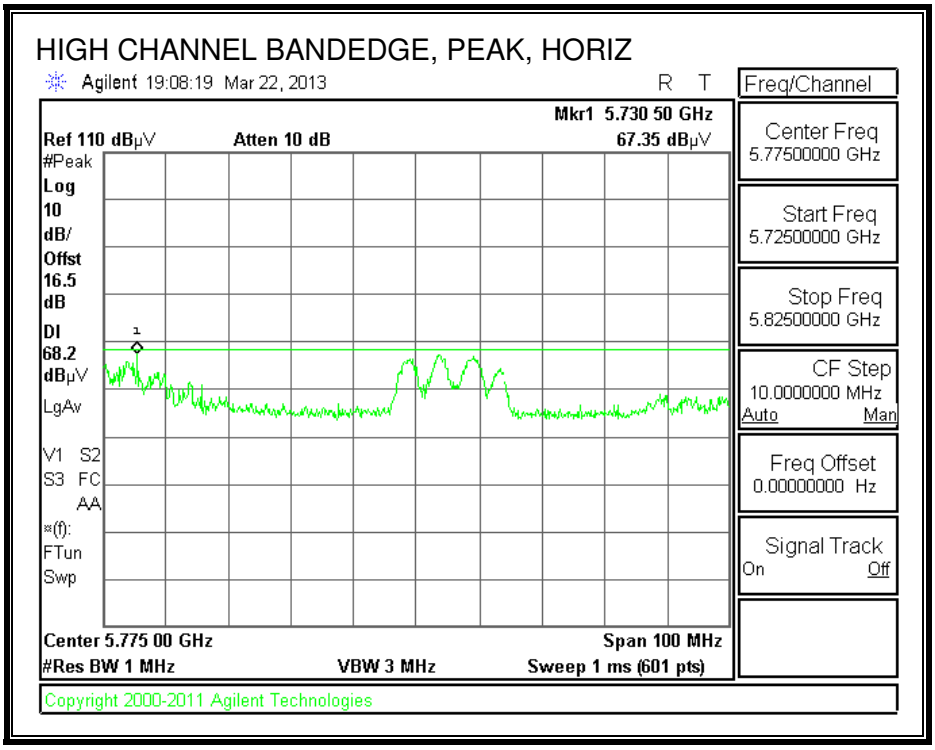
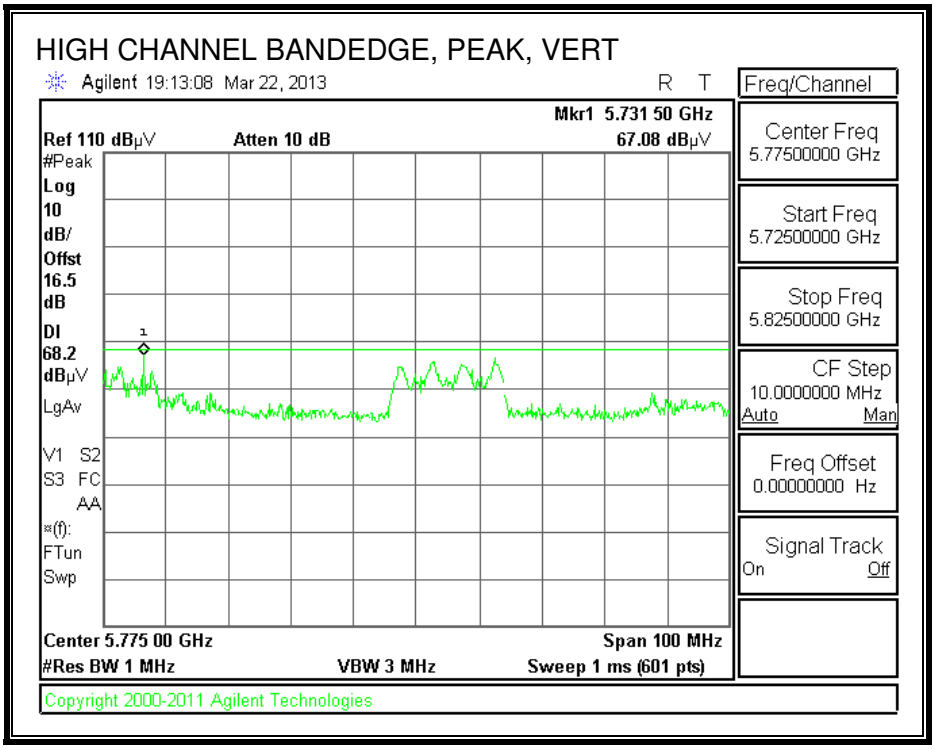
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5500 MHz 3TX CDD													
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	
5580 MHz 3TX CDD													
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	
5700 MHz 3TX CDD													
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.

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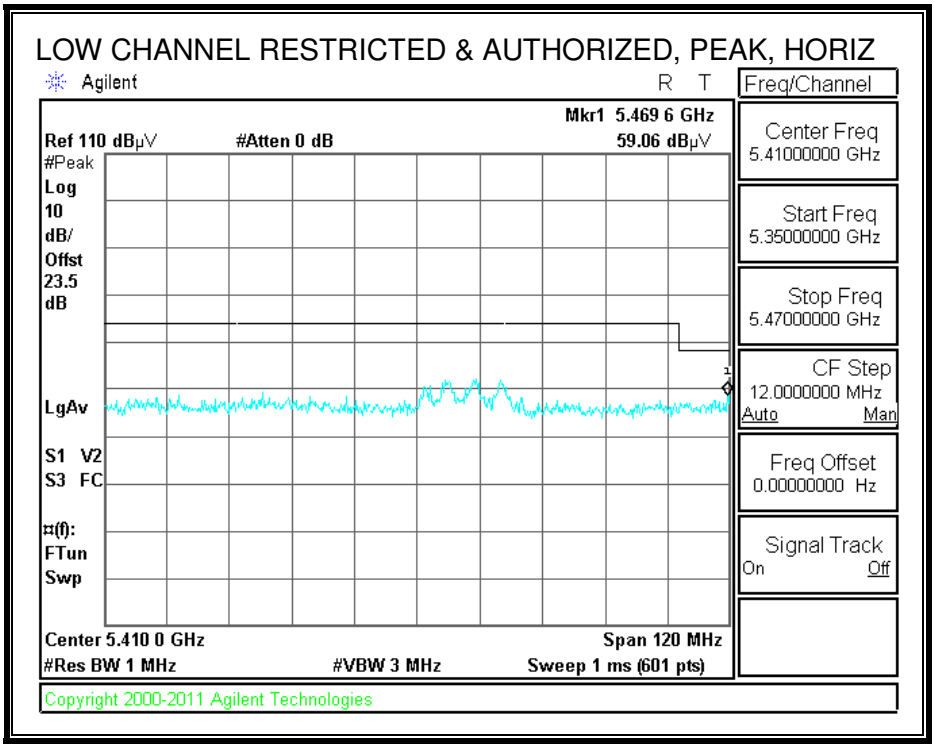
9.2.29. TX ABOVE 1 GHz, 802.11n HT20 CDD 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)



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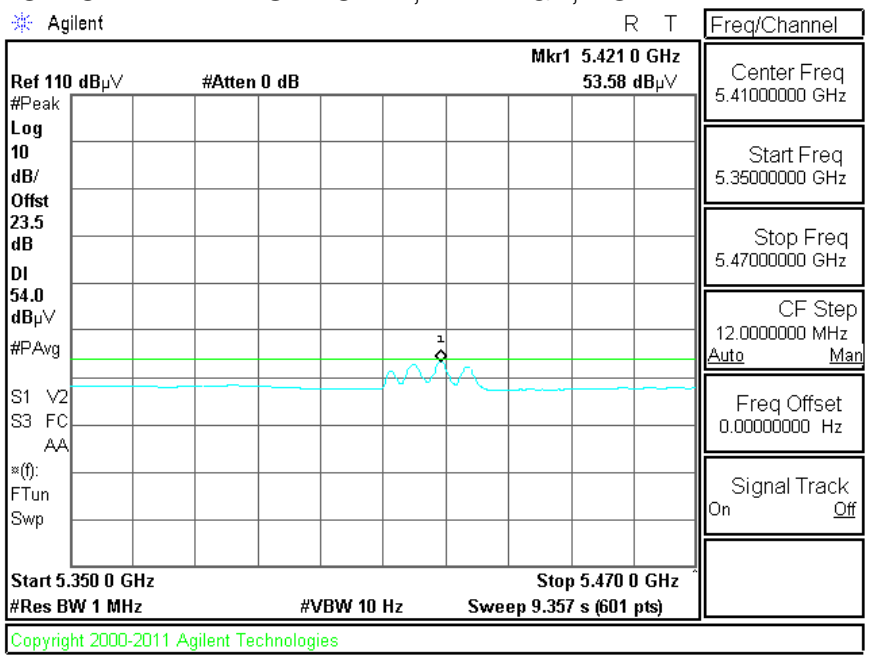
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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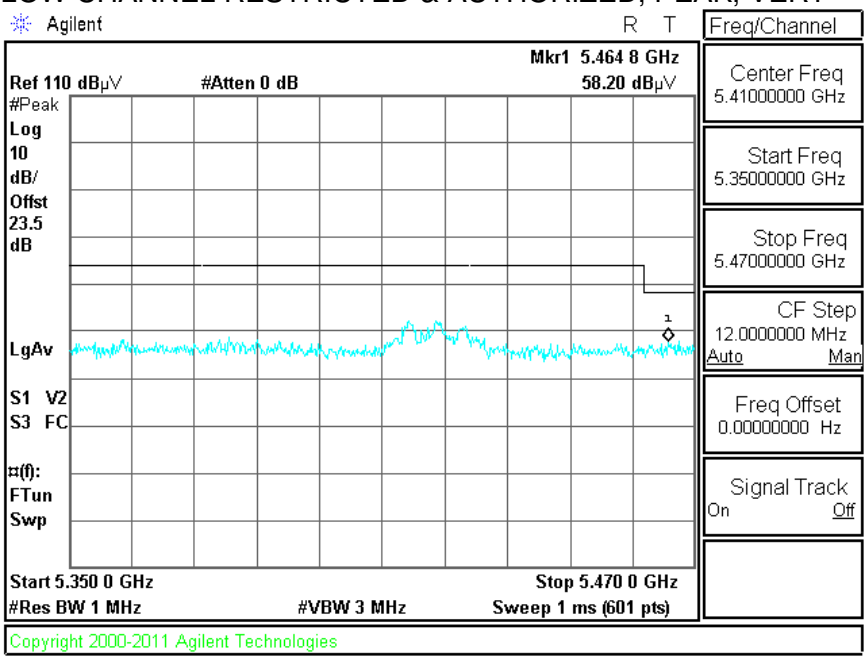
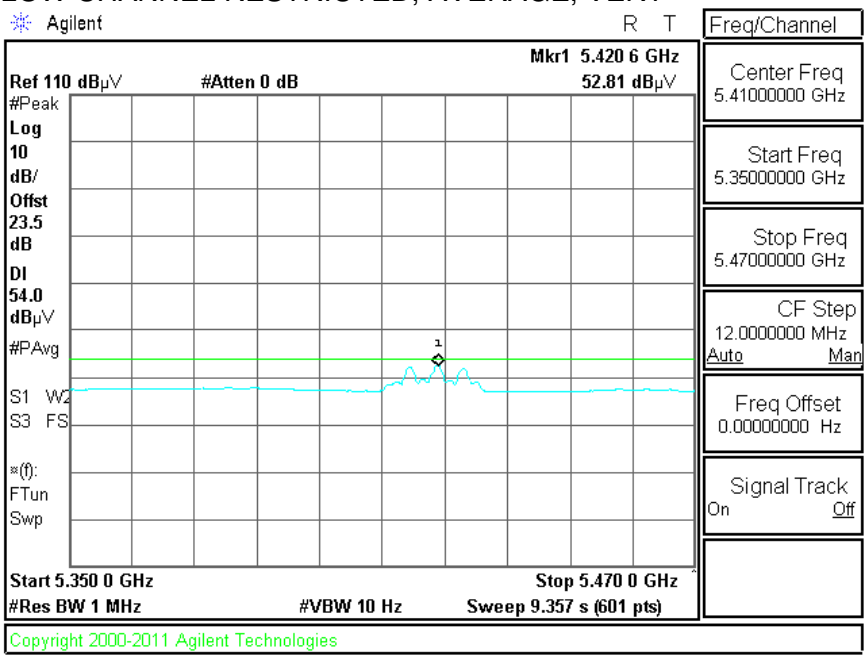
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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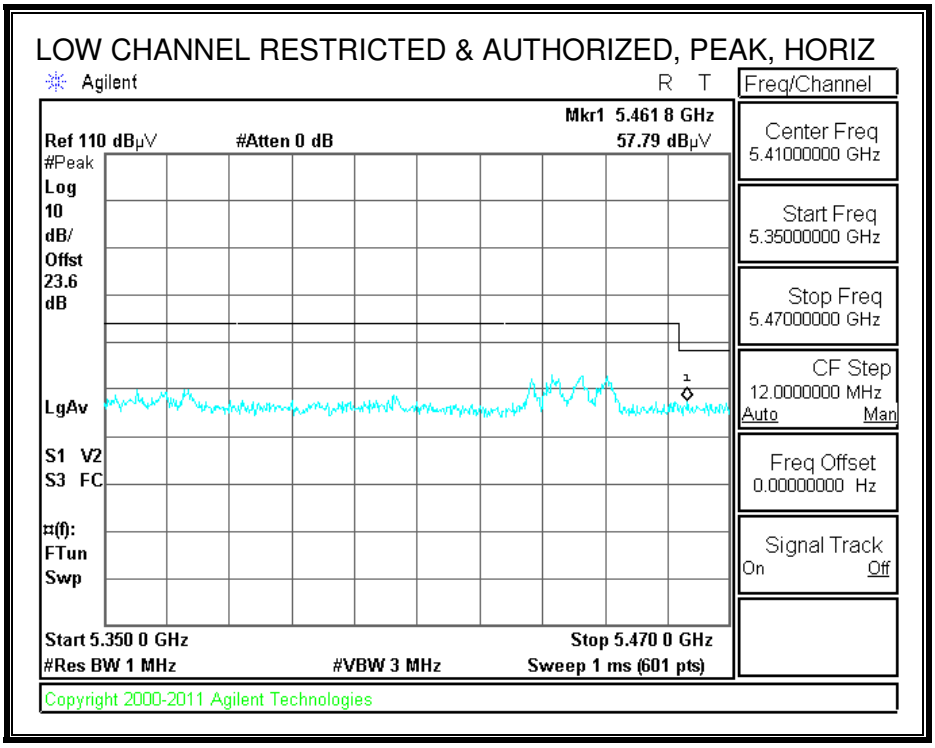
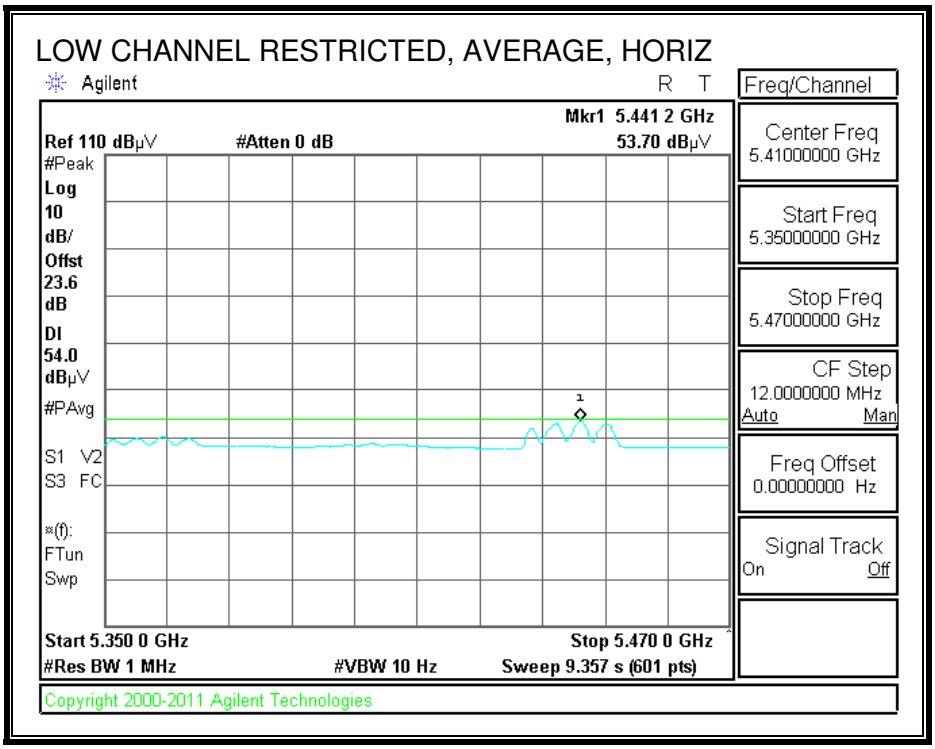
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)





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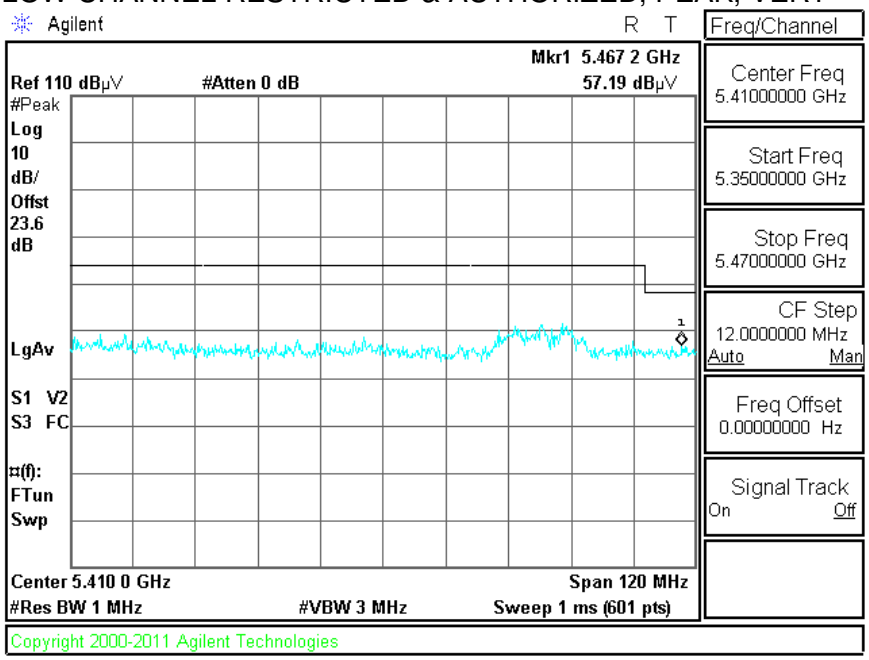
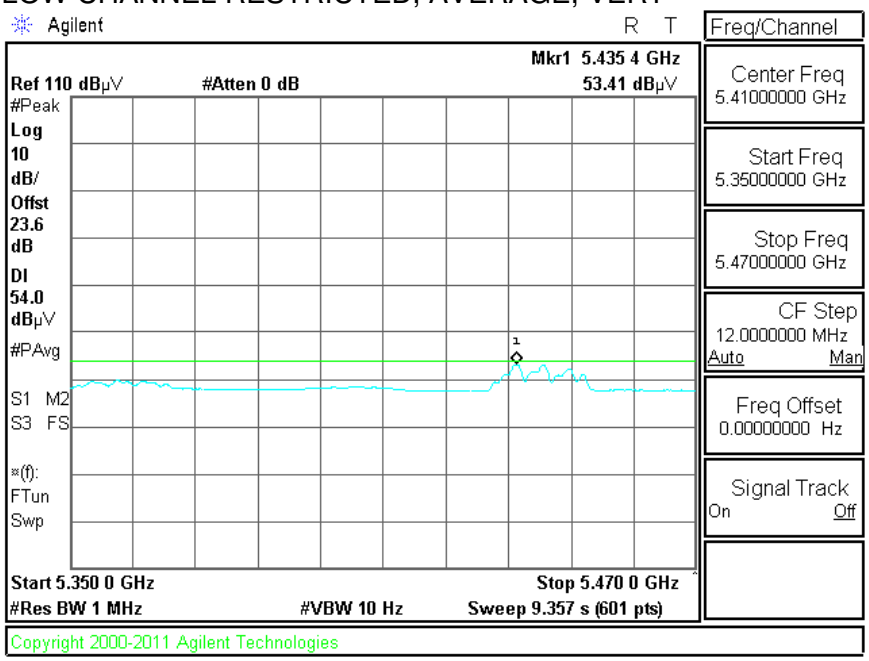
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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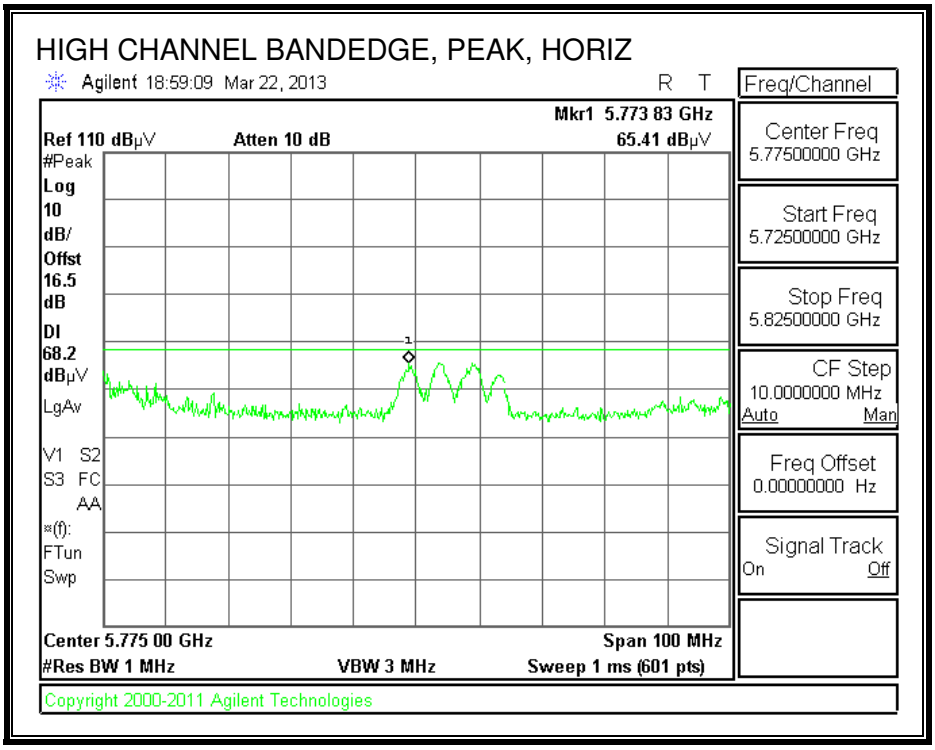
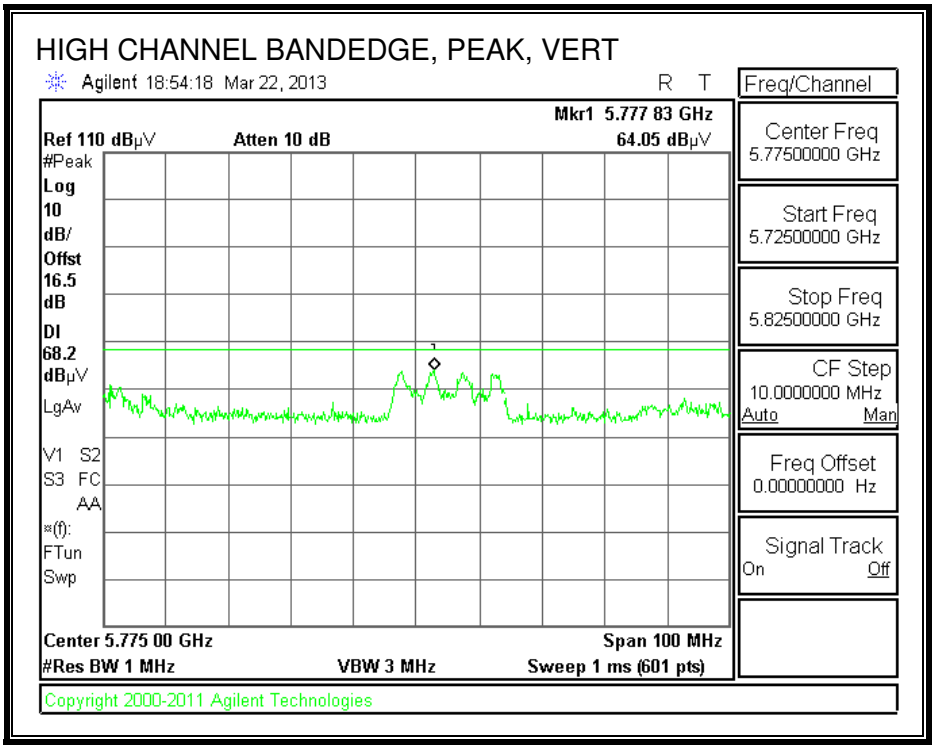
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5500 MHz 3TX CDD													
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	
5580 MHz 3TX CDD													
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	
5700 MHz 3TX CDD													
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.

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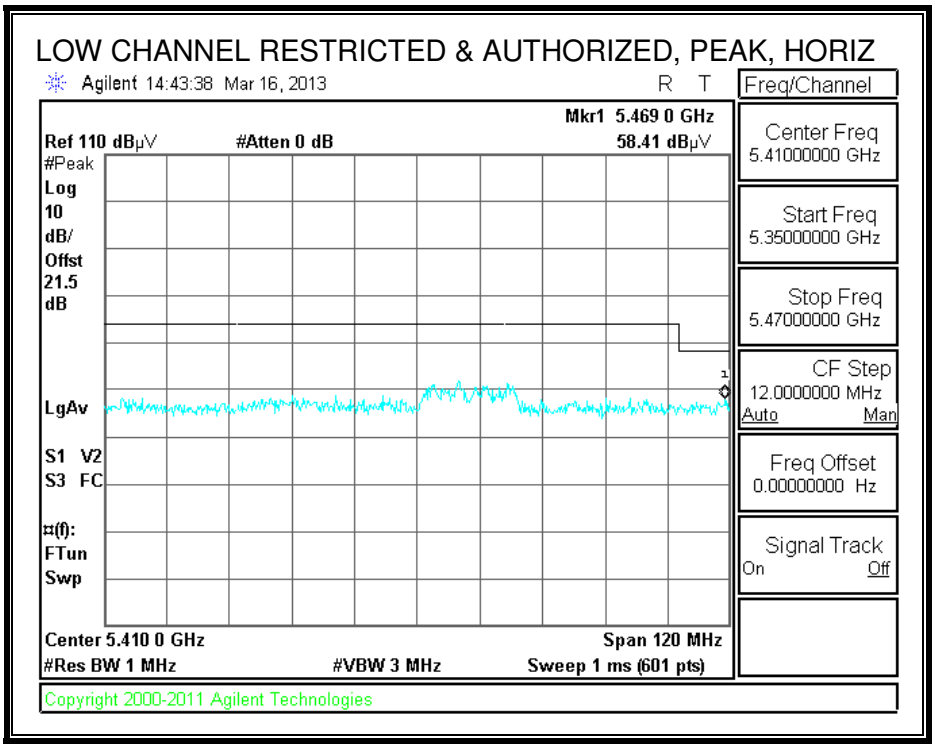
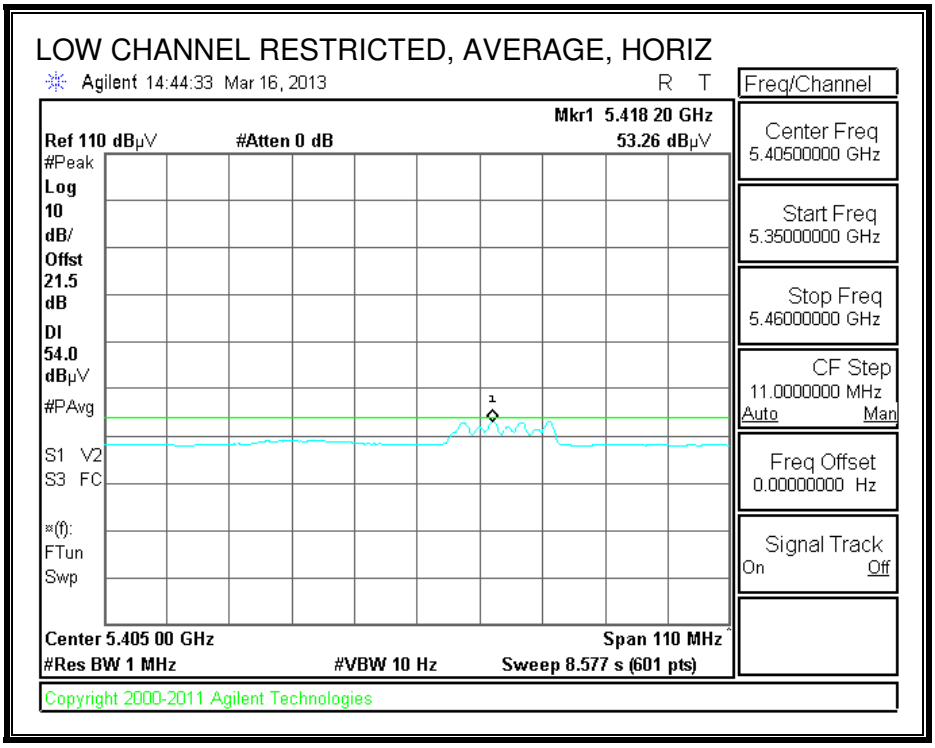
9.2.30. TX ABOVE 1 GHz, 802.11n HT20 BF 2TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)





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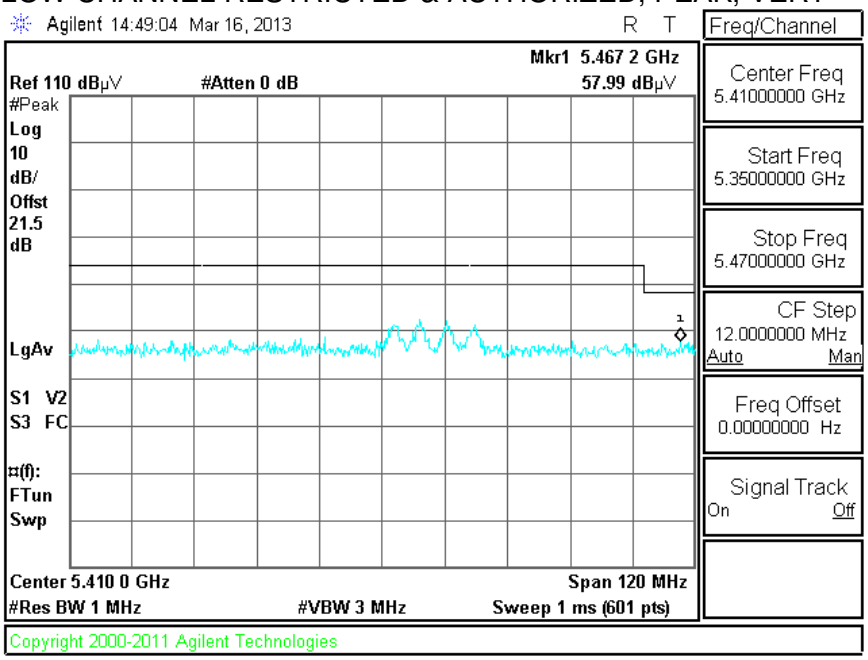
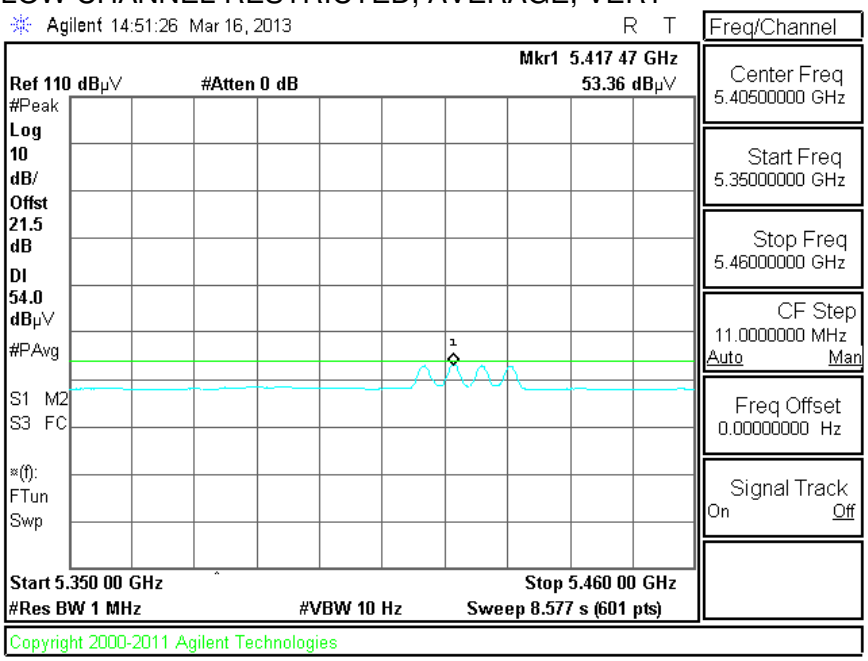
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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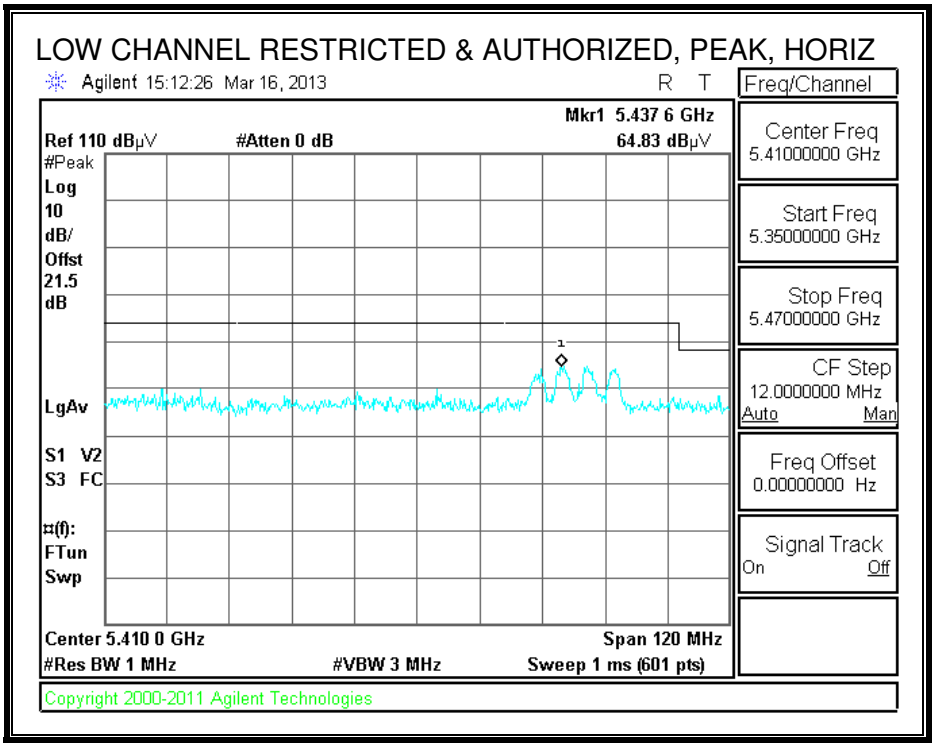
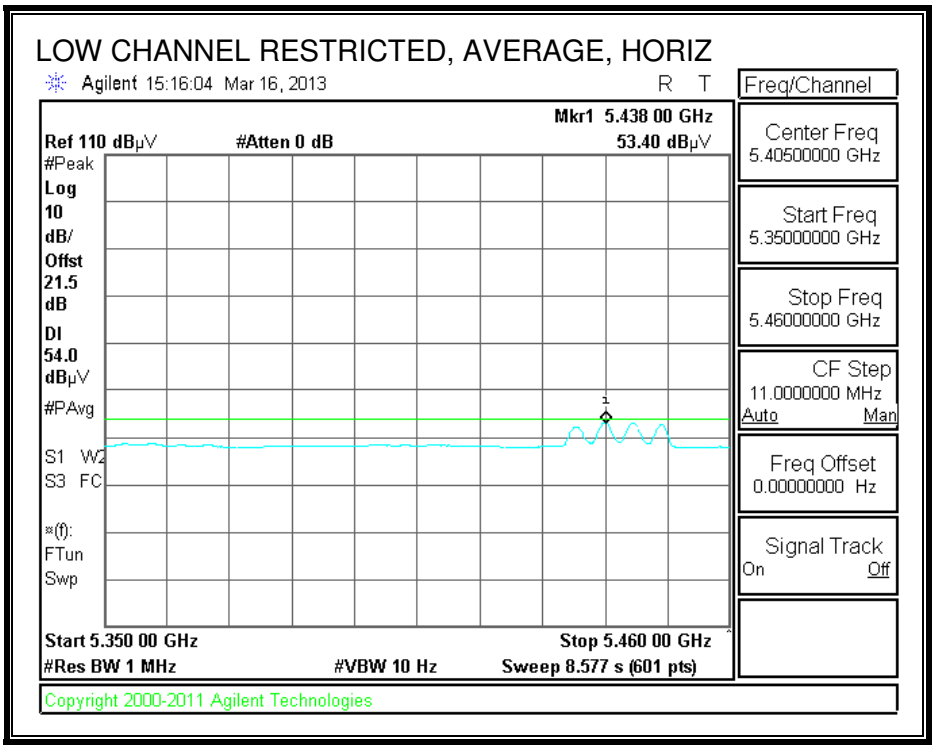
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH104)





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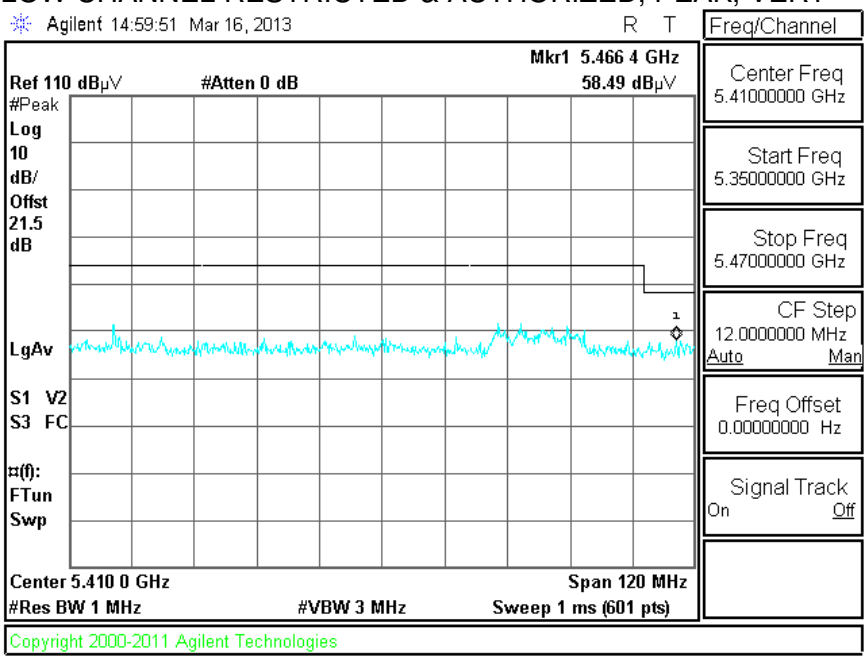
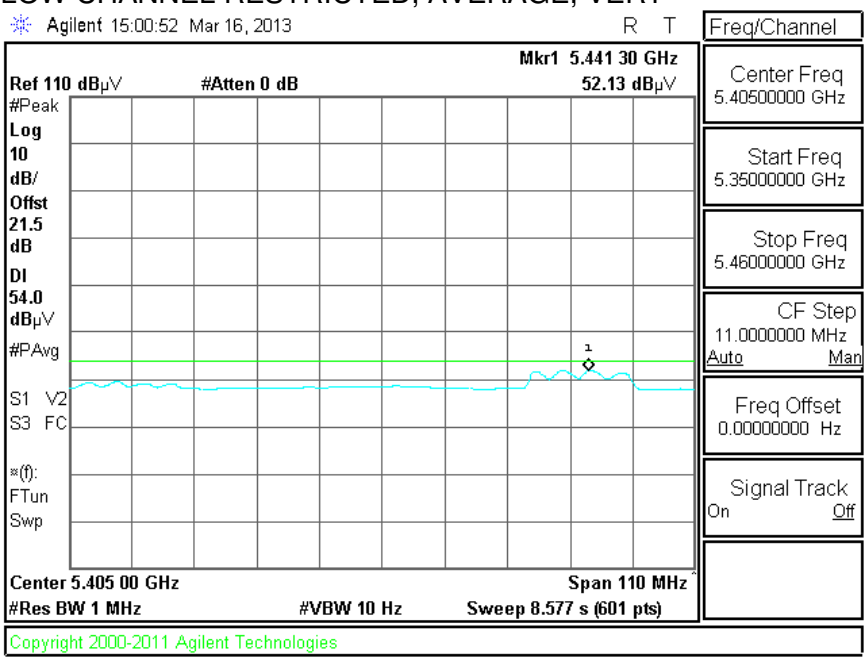
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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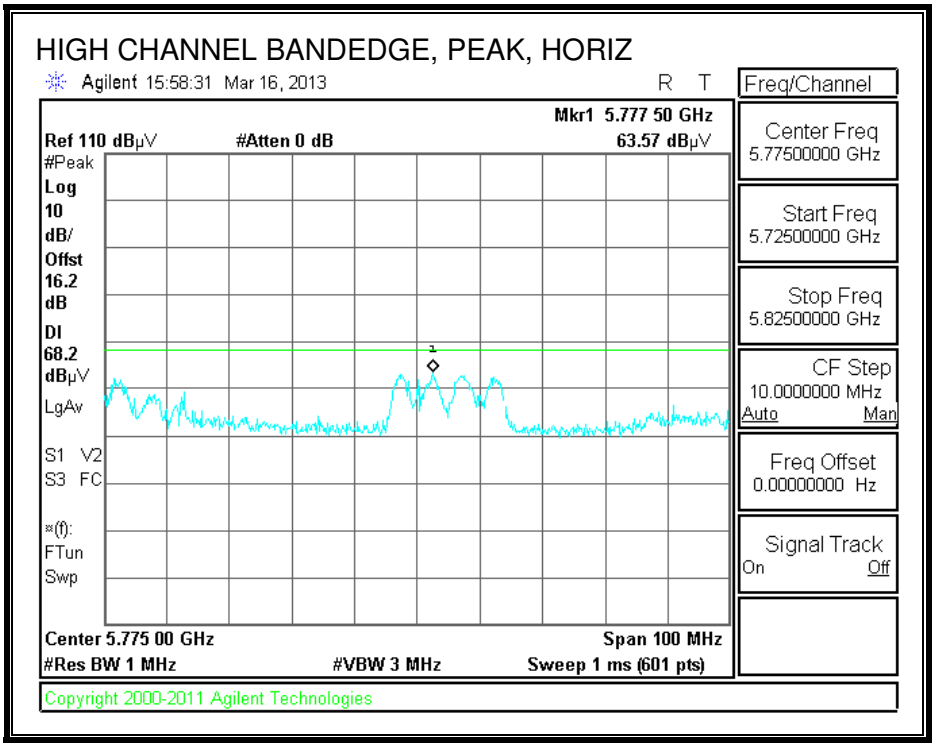
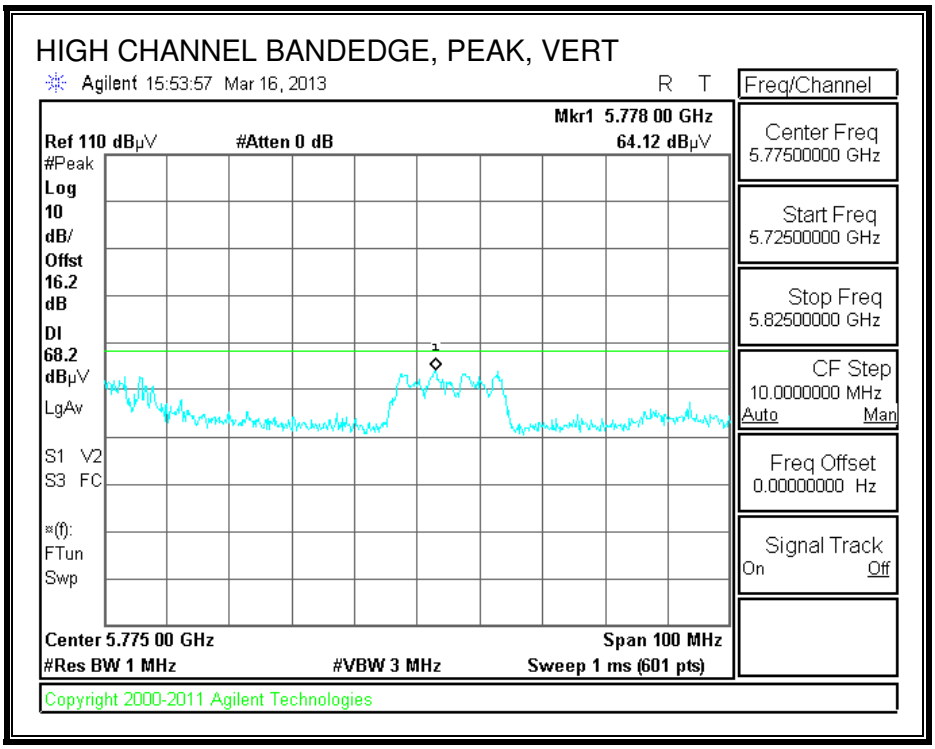
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5500 MHz)															V
11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V
11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V
Mid Channel (5580 MHz)															V
11.160	3.0	35.4	25.4	37.7	11.0	-33.3	0.0	0.7	51.6	41.6	74	54	-22.4	-12.4	H
11.160	3.0	35.4	24.5	37.7	11.0	-33.3	0.0	0.7	51.6	40.7	74	54	-22.4	-13.3	V
Hi Channel (5700 MHz)															H
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		

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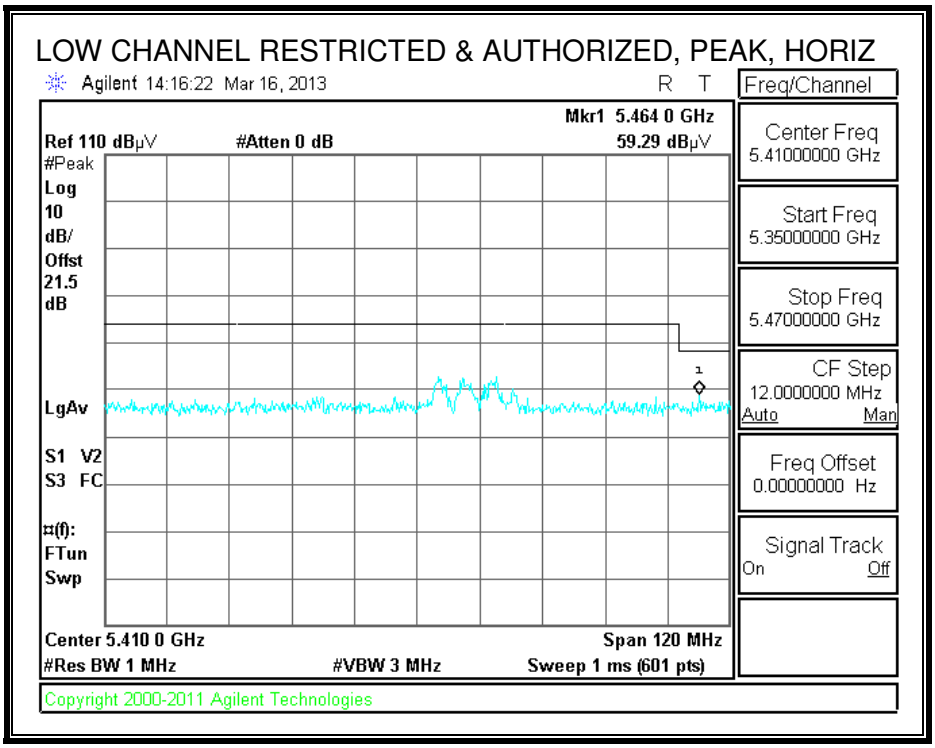
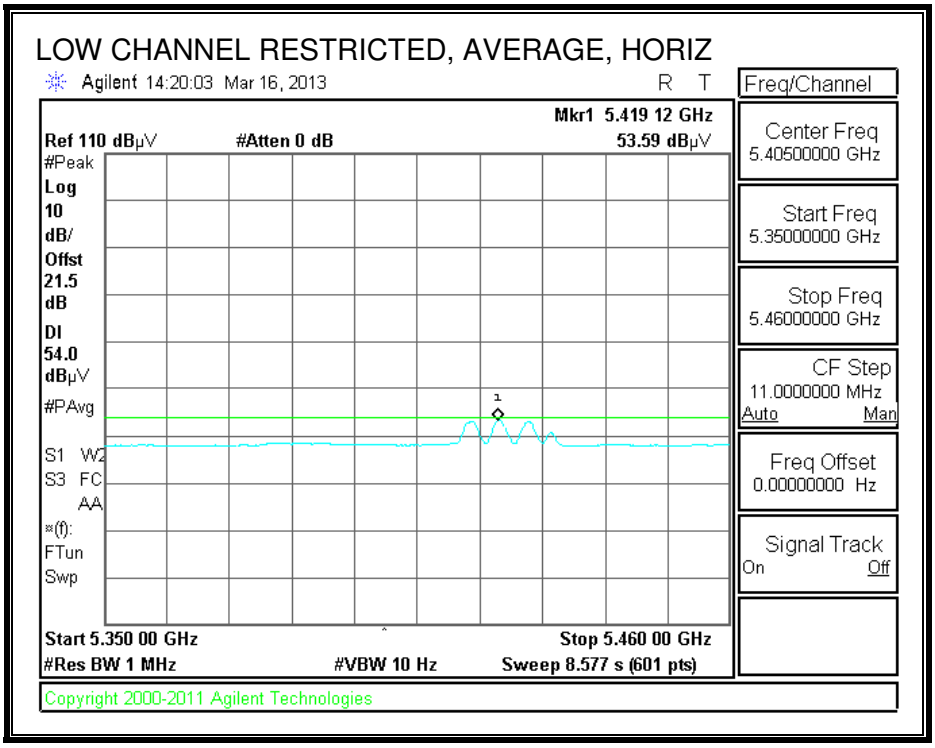
9.2.31. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH100)





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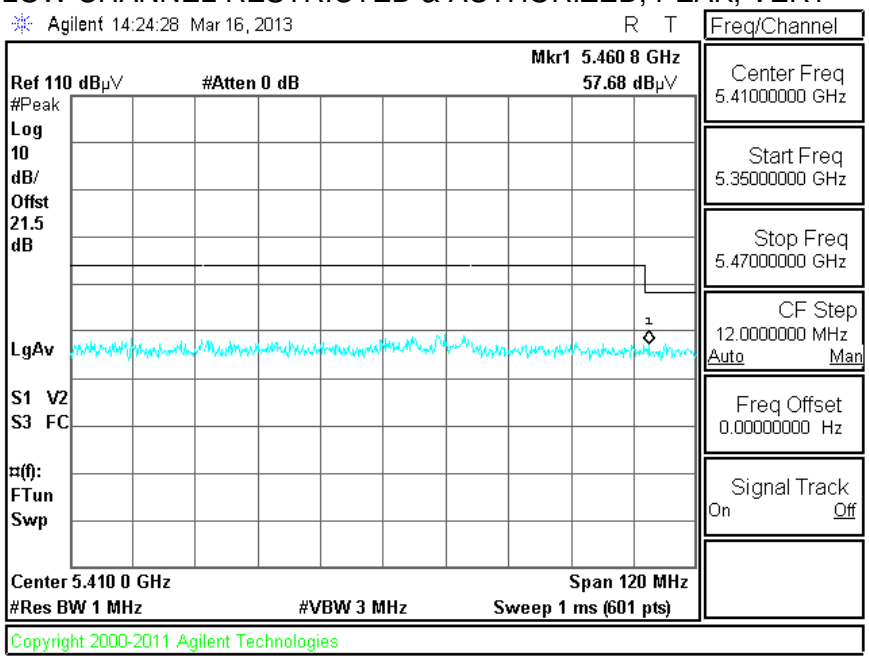
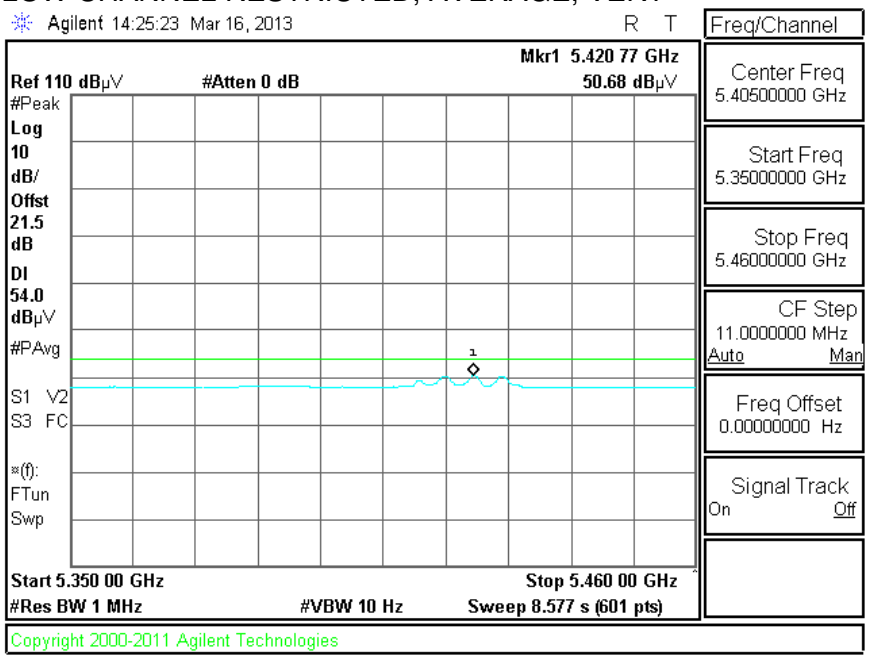
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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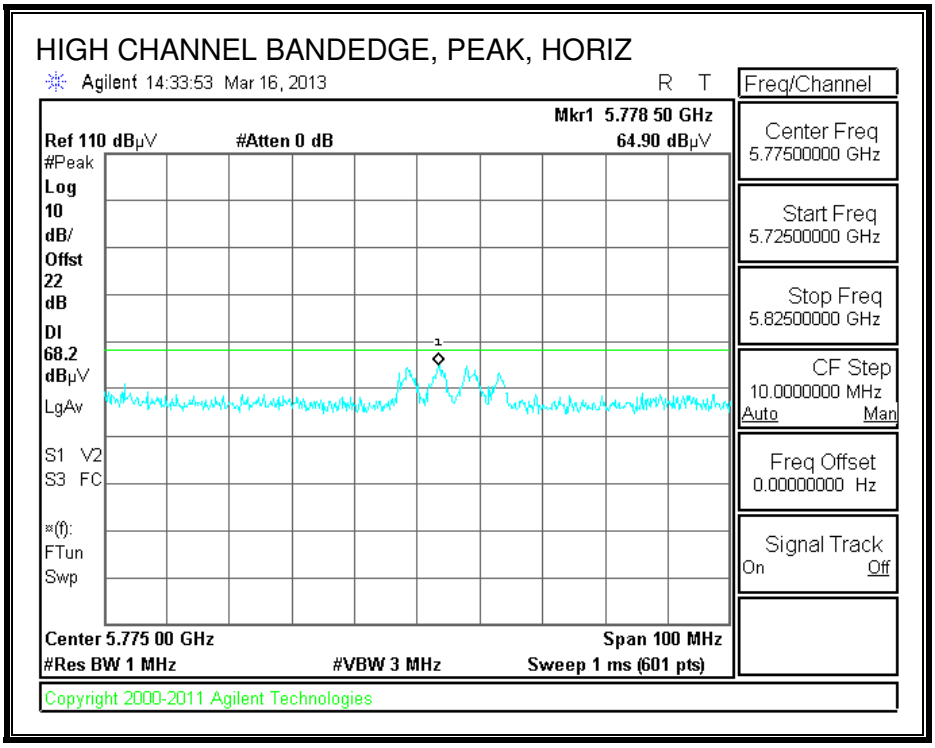
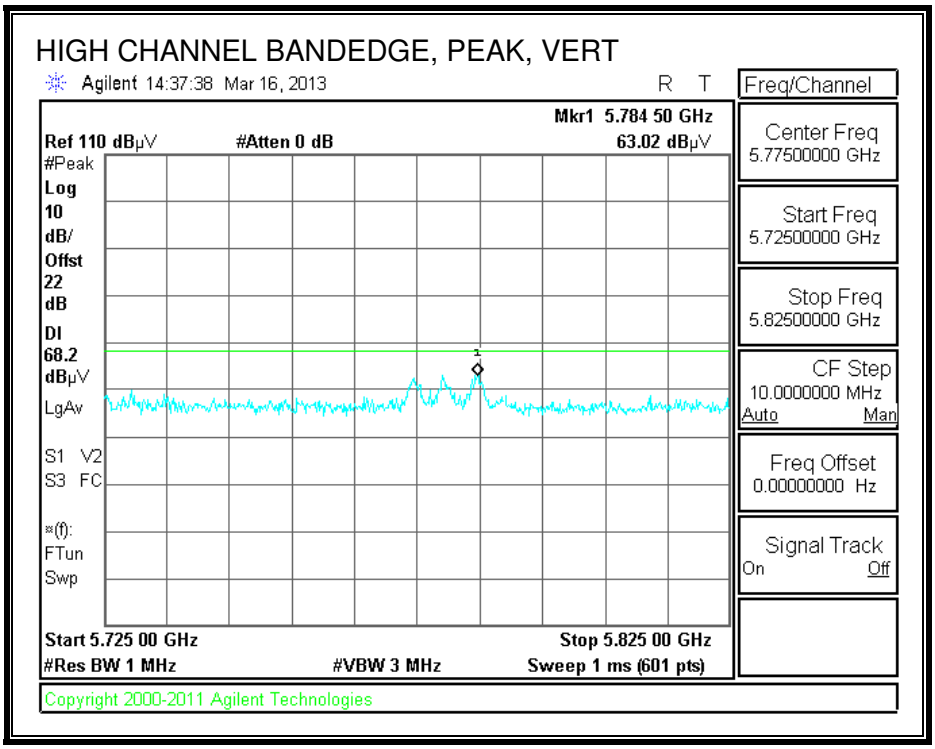
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5500 MHz)															V
11.000	3.0	36.2	25.2	37.5	10.9	-33.5	0.0	0.7	51.9	40.9	74	54	-22.1	-13.1	V
11.000	3.0	35.3	24.6	37.5	10.9	-33.5	0.0	0.7	51.0	40.3	74	54	-23.0	-13.7	V
Mid Channel (5580 MHz)															V
11.160	3.0	35.4	25.4	37.7	11.0	-33.3	0.0	0.7	51.6	41.6	74	54	-22.4	-12.4	H
11.160	3.0	35.4	24.5	37.7	11.0	-33.3	0.0	0.7	51.6	40.7	74	54	-22.4	-13.3	V
Hi Channel (5700 MHz)															H
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		

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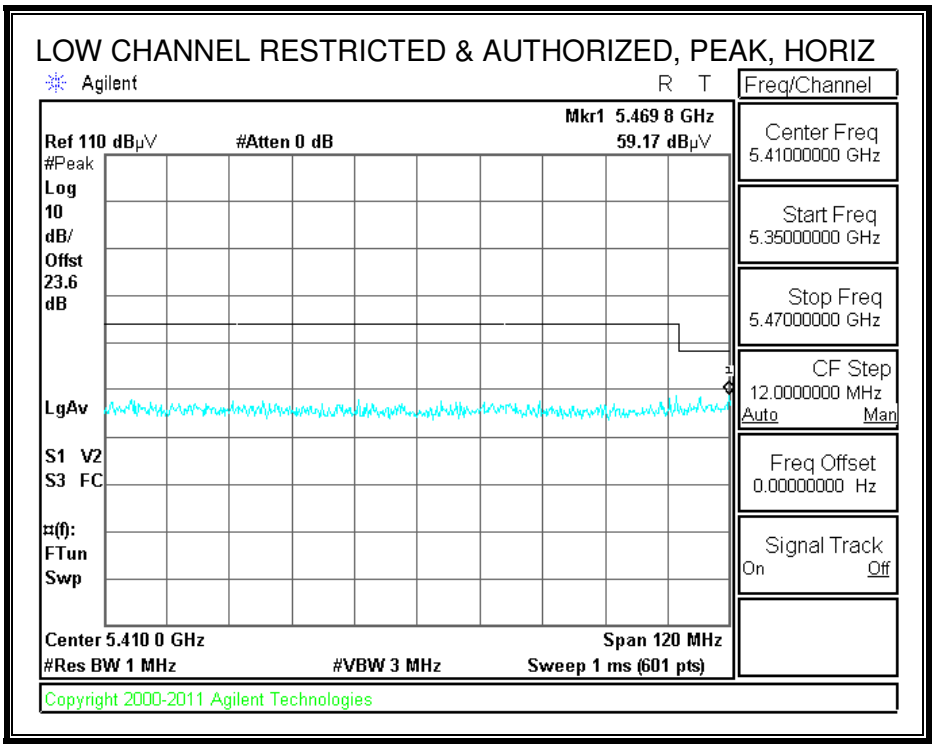
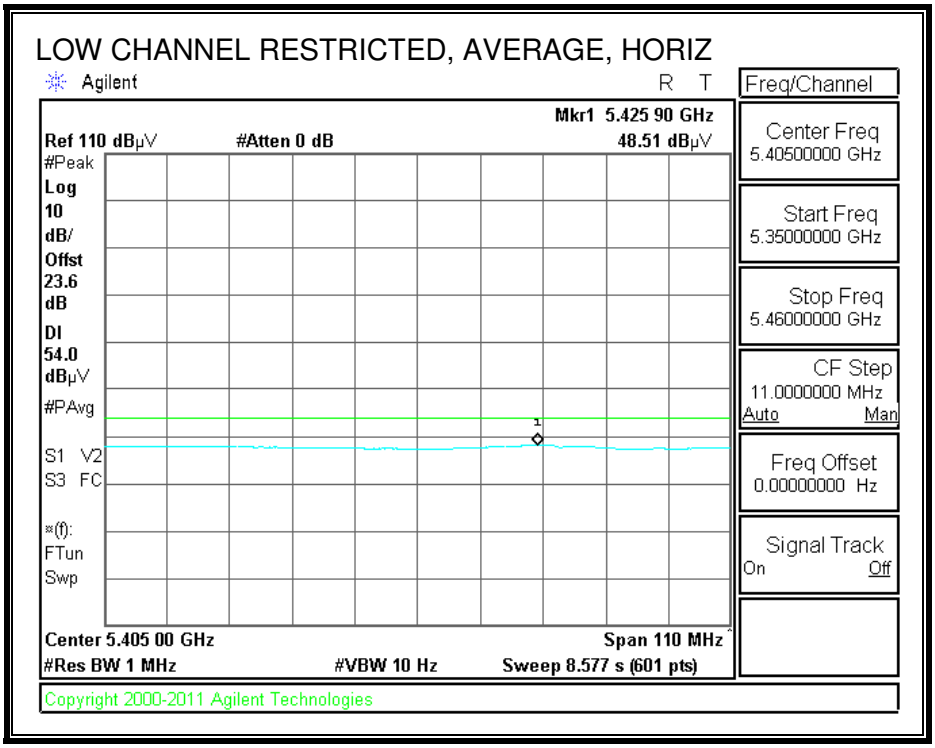
9.2.32. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)





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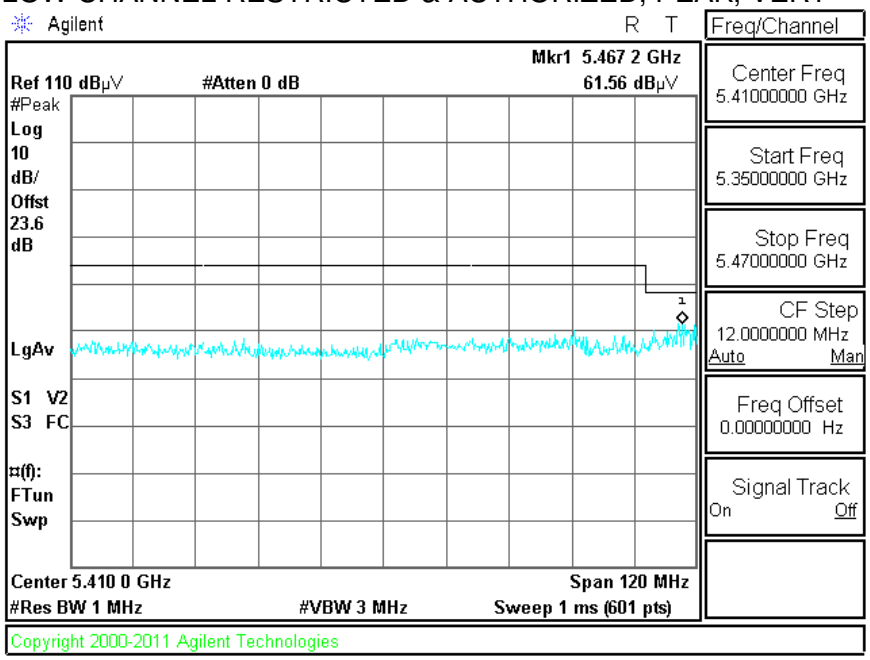
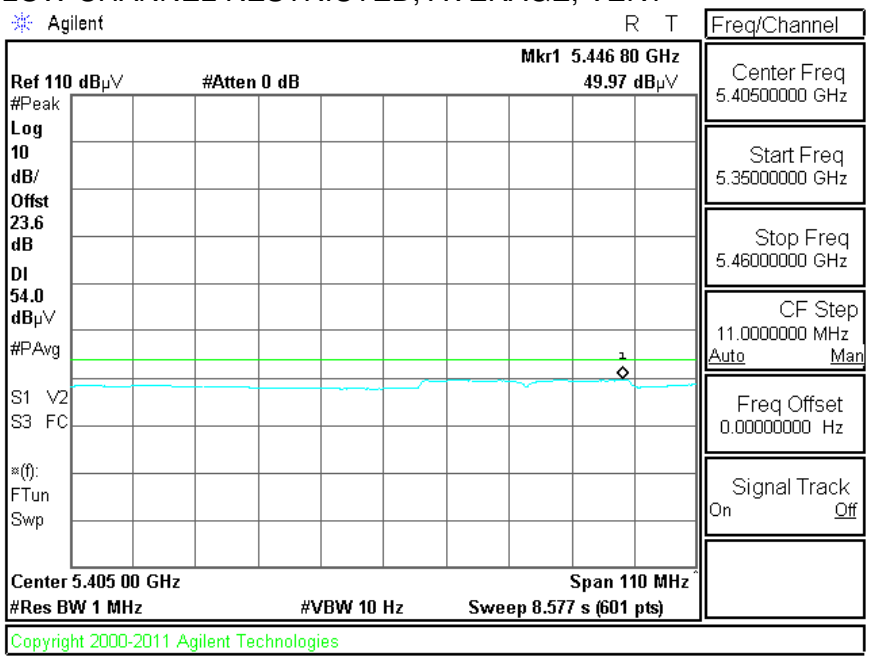
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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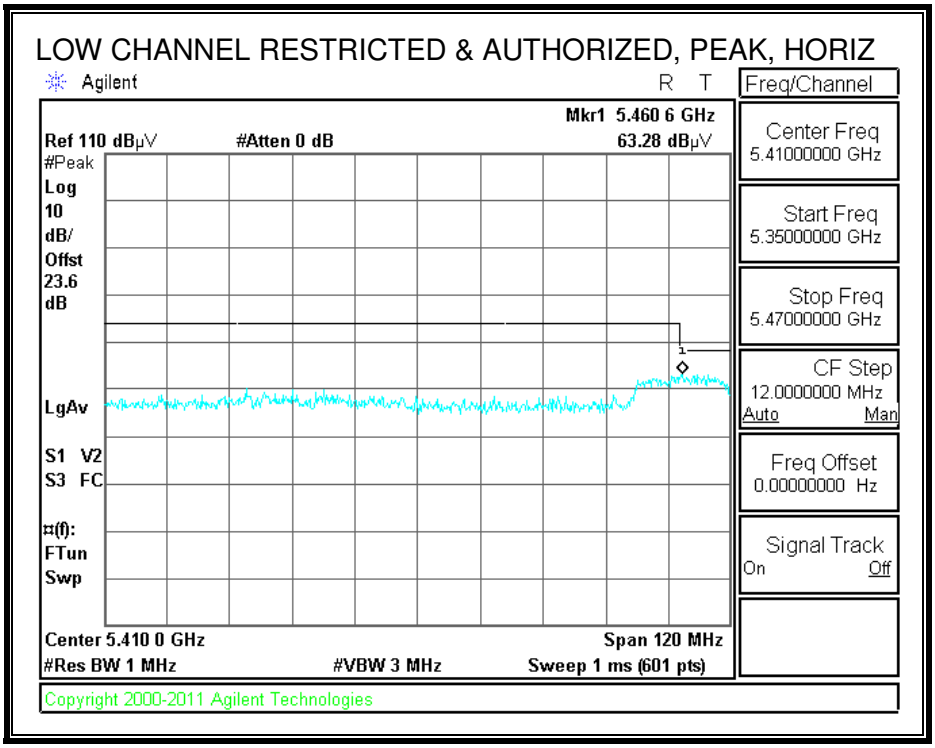
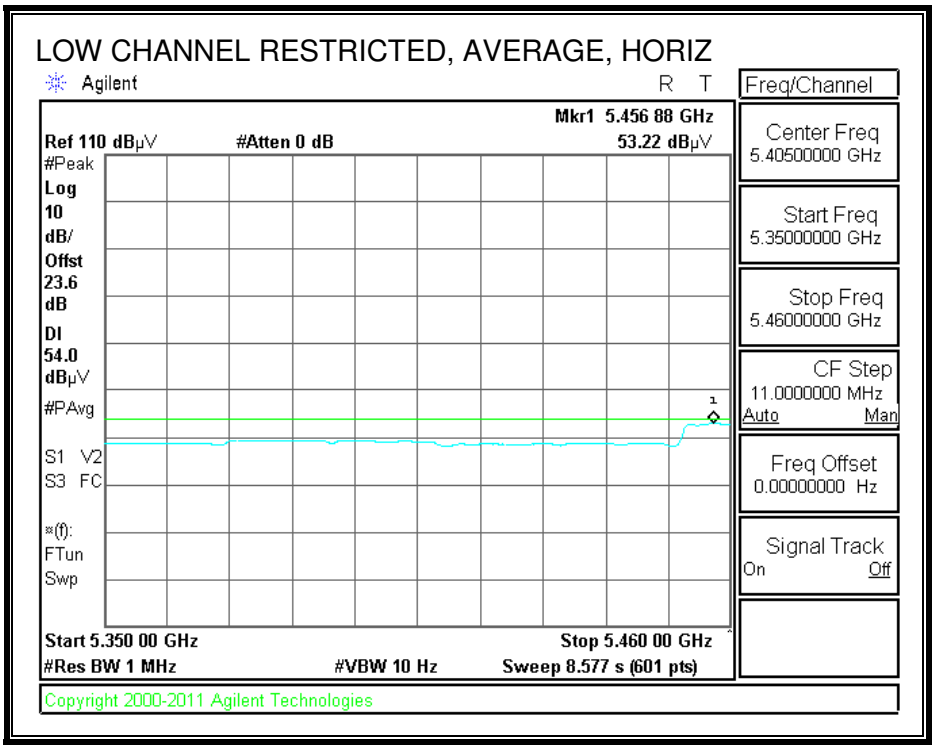
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)





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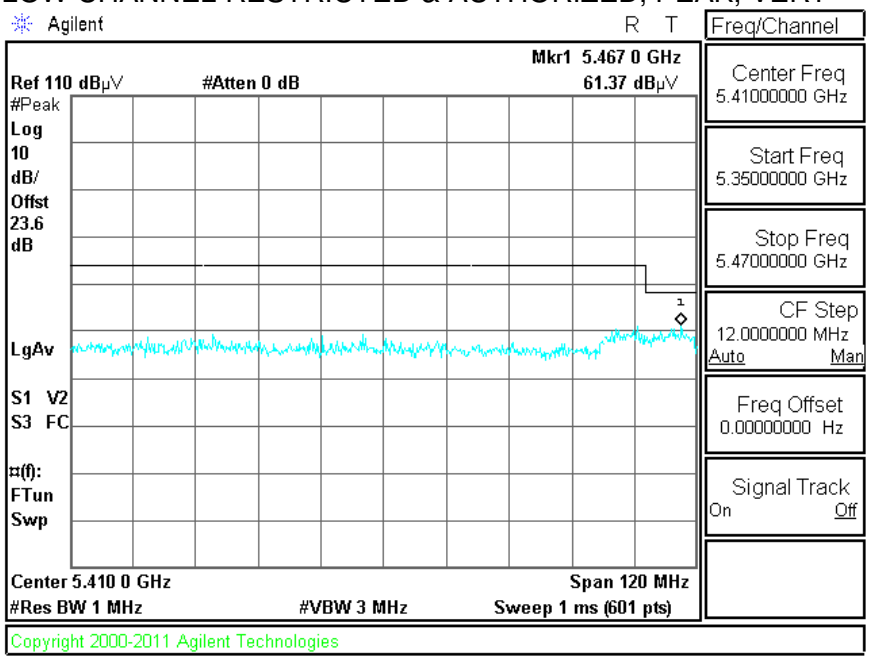
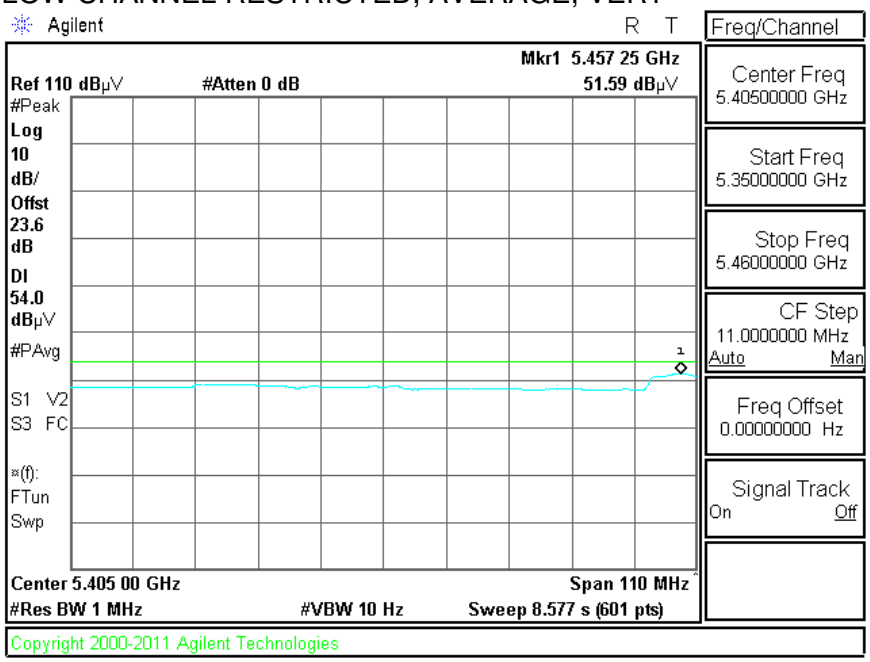
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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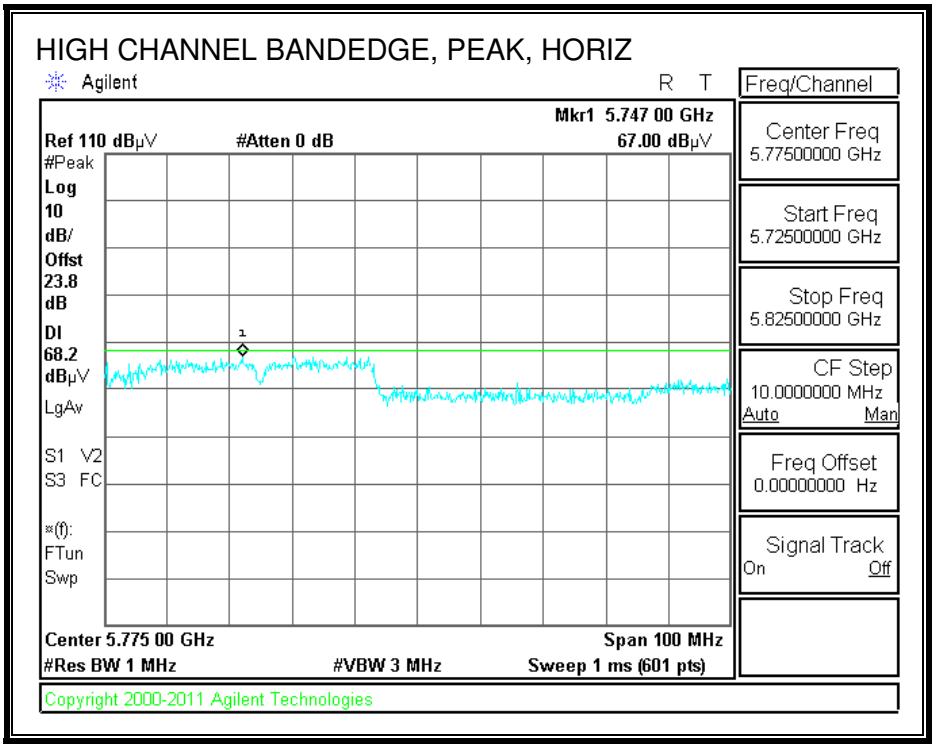
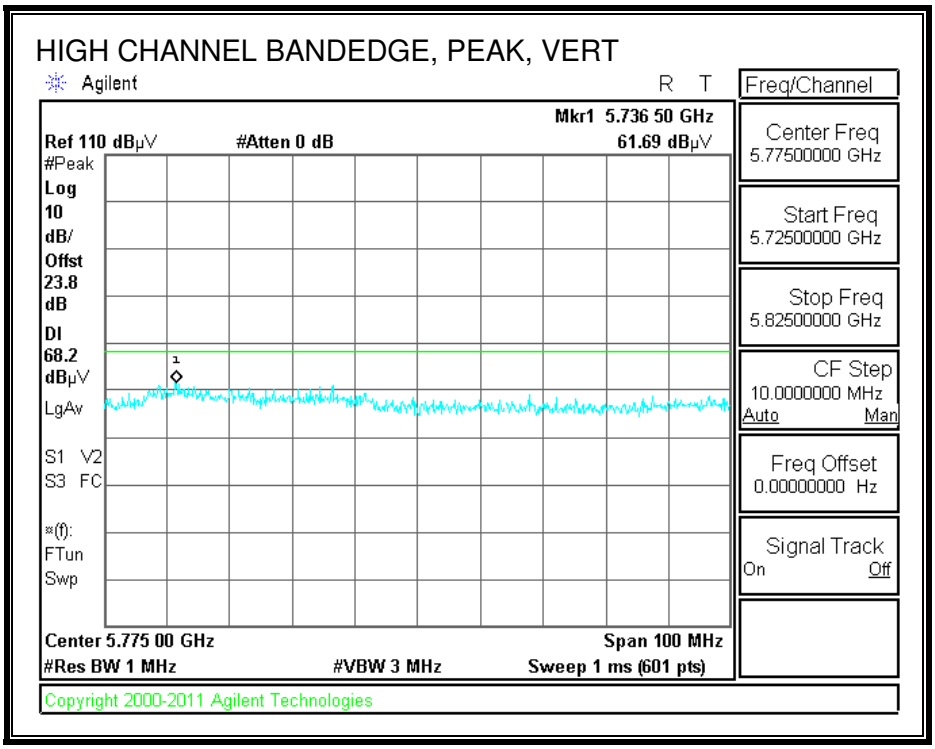
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5510 MHz 3TX CDD													
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	
5550 MHz 3TX CDD													
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	
5670 MHz 3TX CDD													
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.

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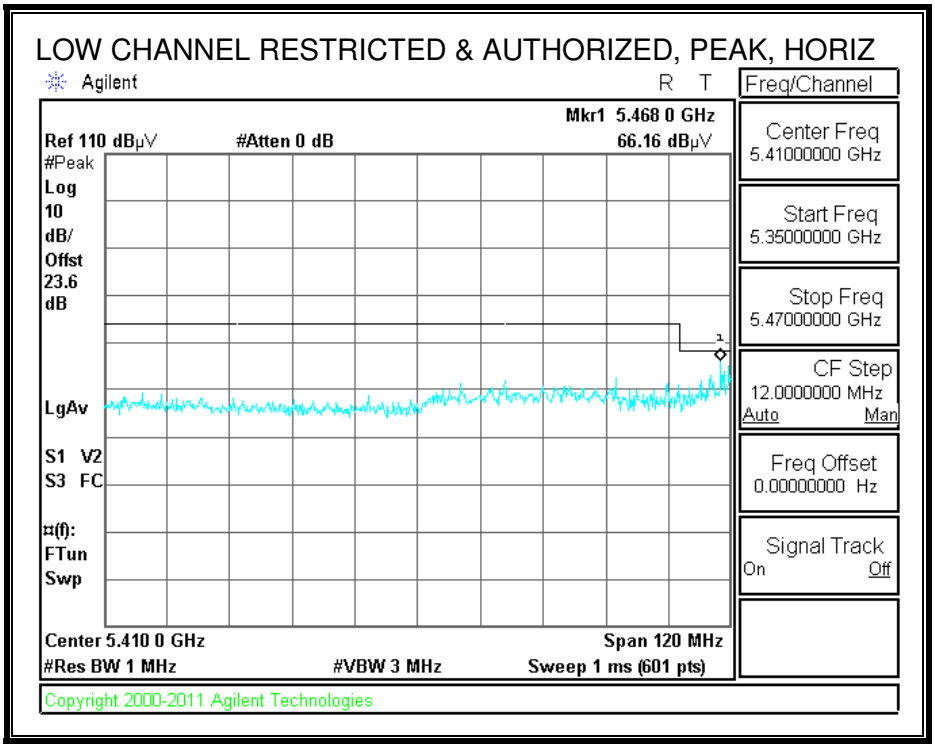
9.2.33. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)



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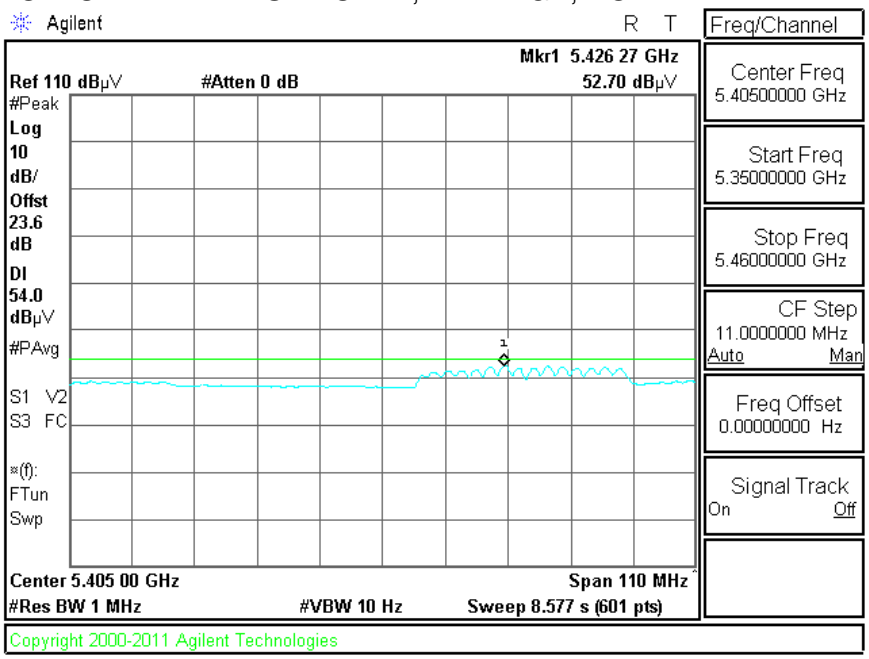
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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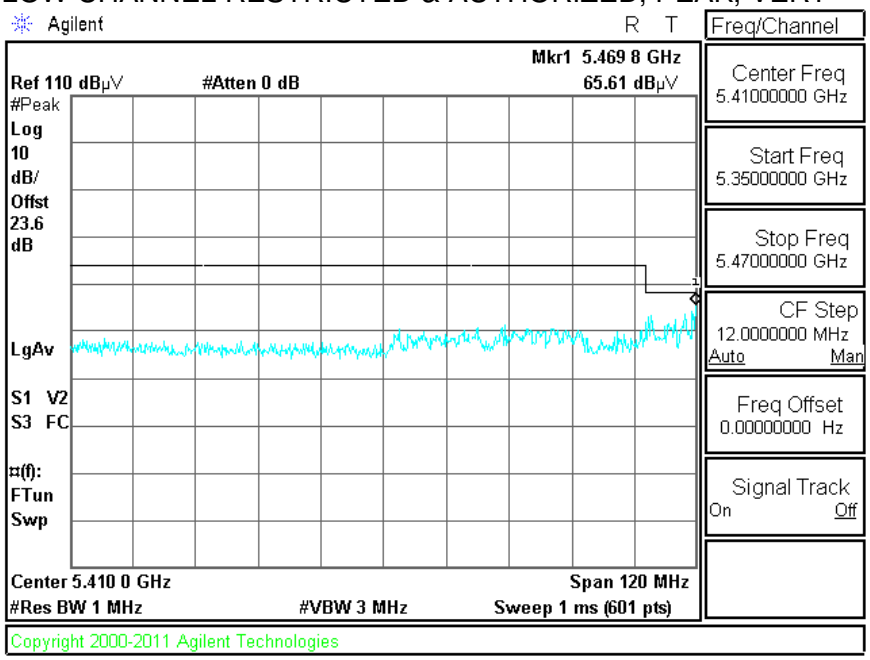
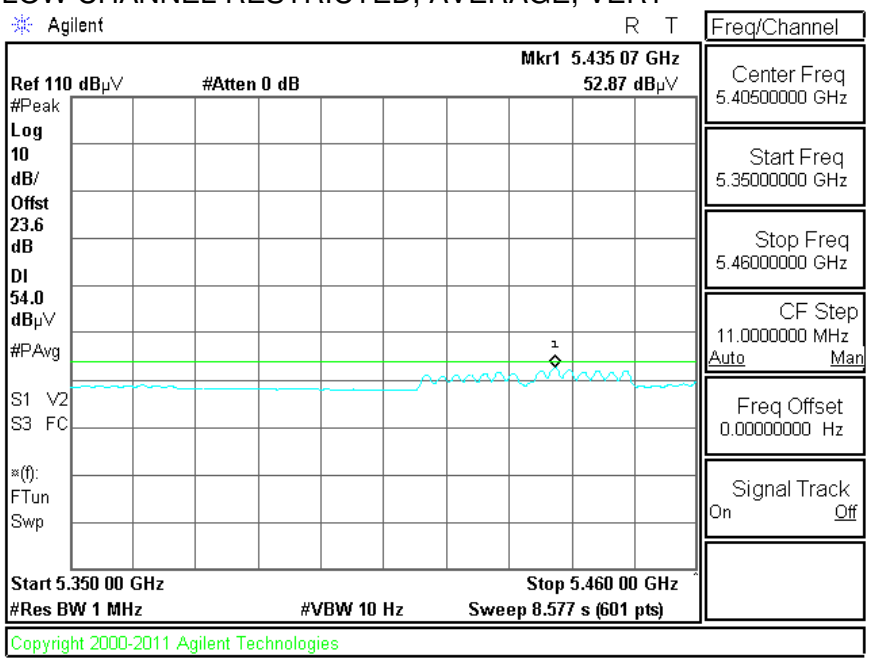
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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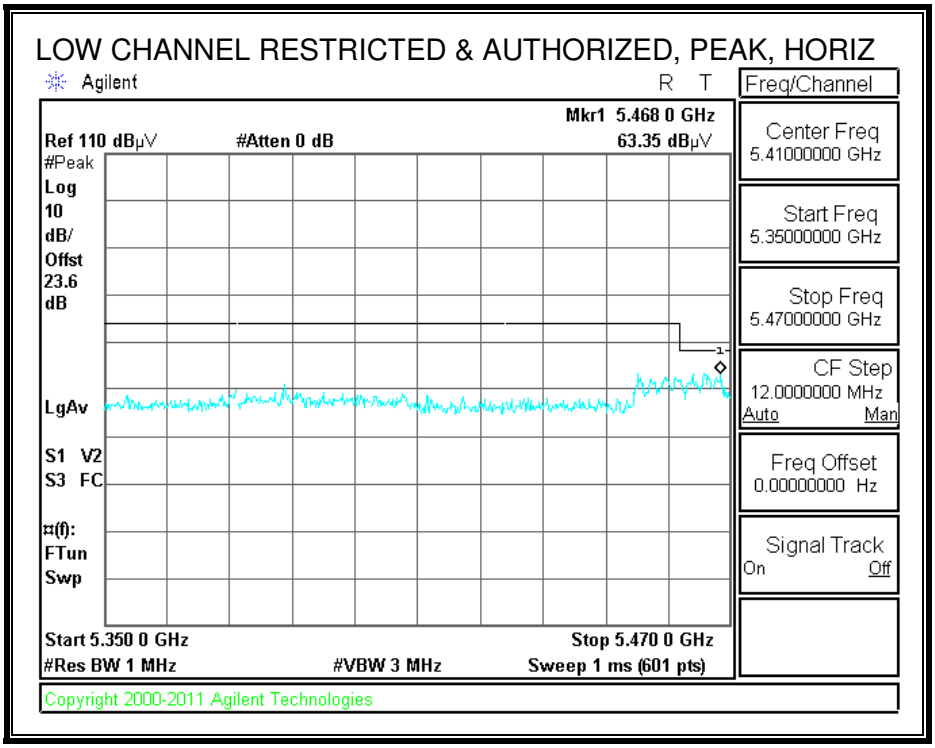
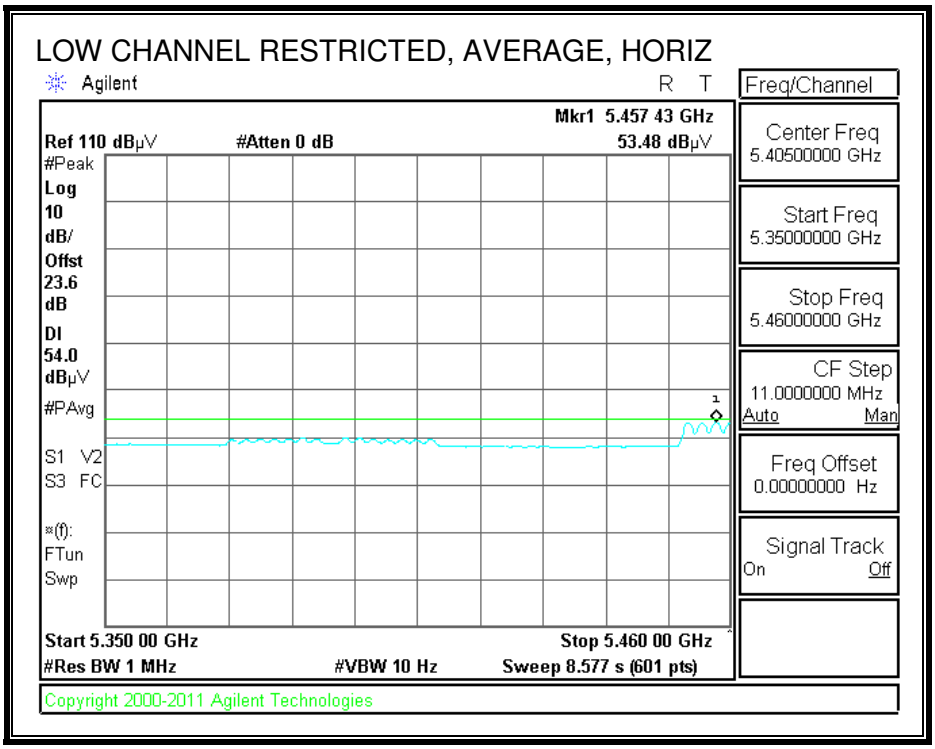
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)





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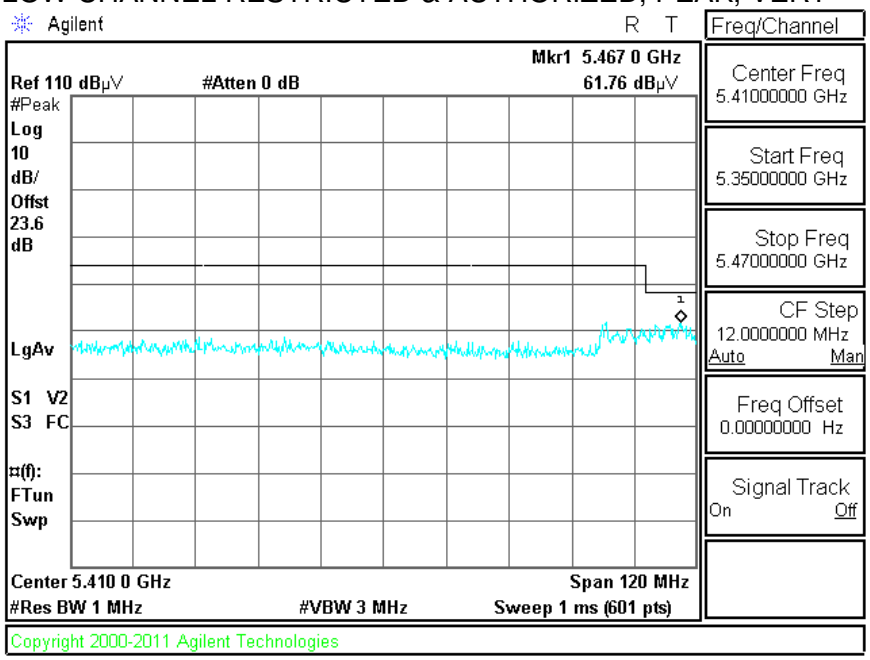
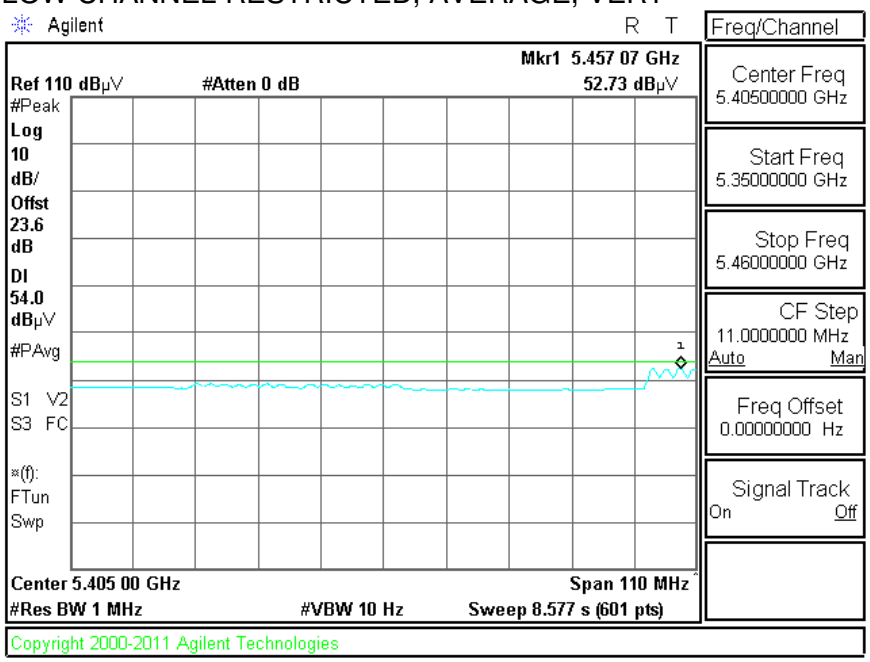
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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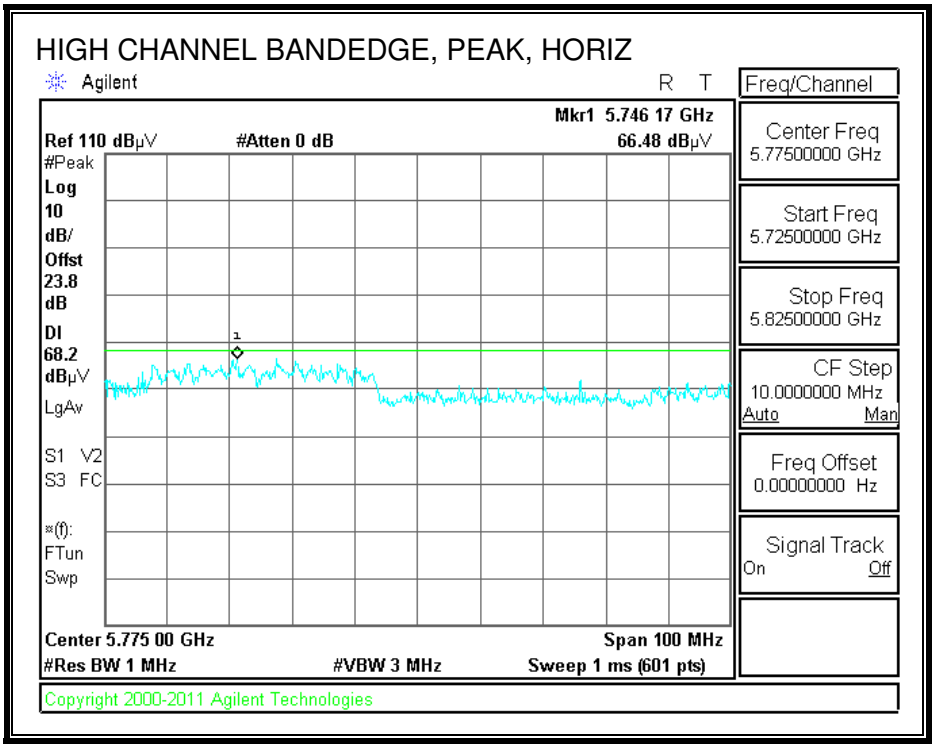
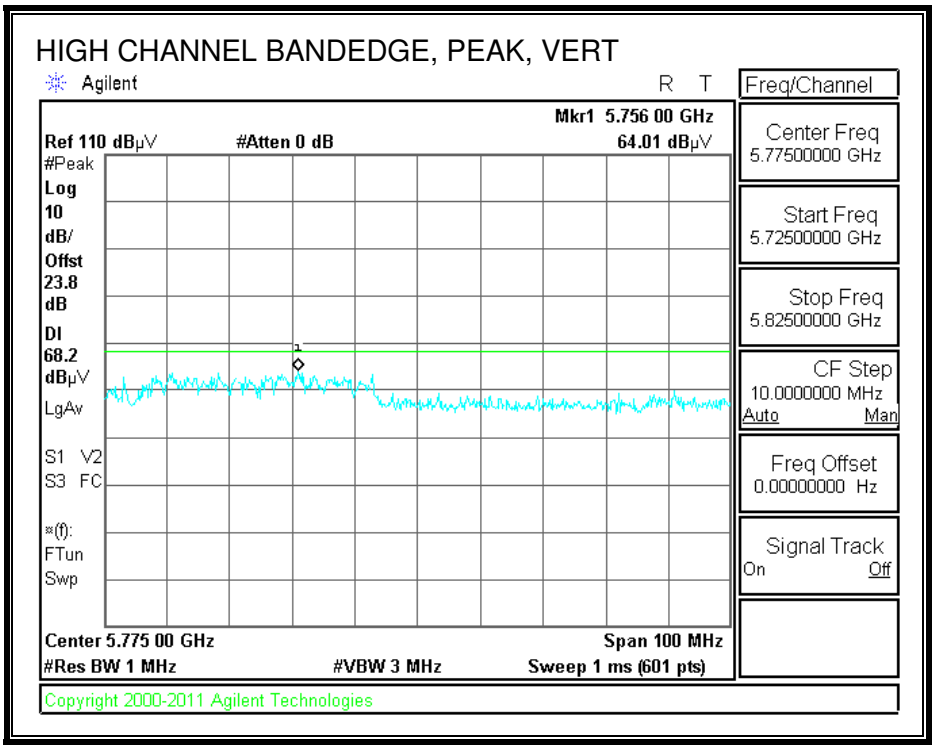
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5510 MHz 3TX CDD													
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	
5550 MHz 3TX CDD													
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	
5670 MHz 3TX CDD													
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.

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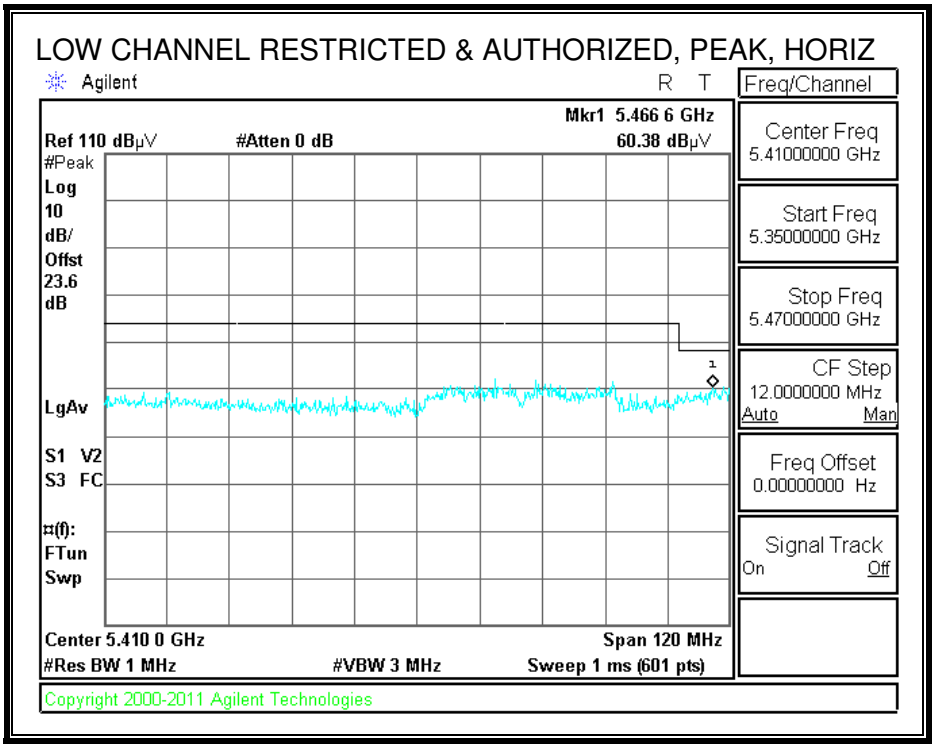
9.2.34. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)



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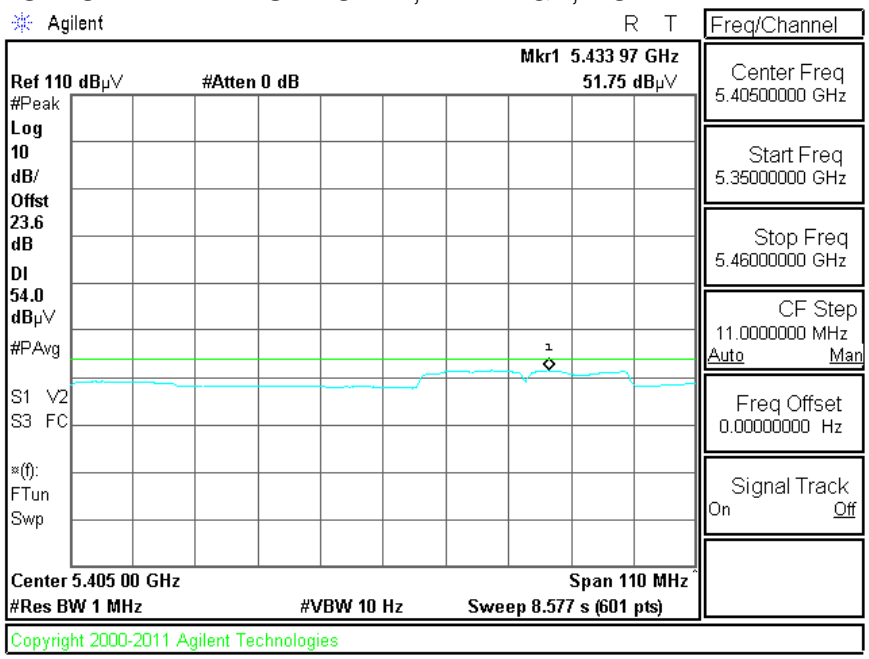
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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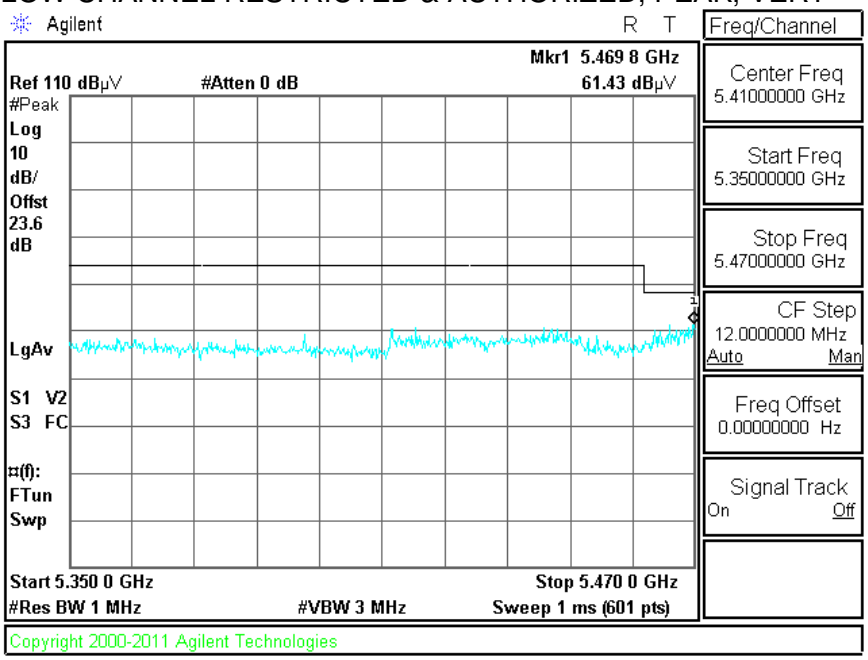
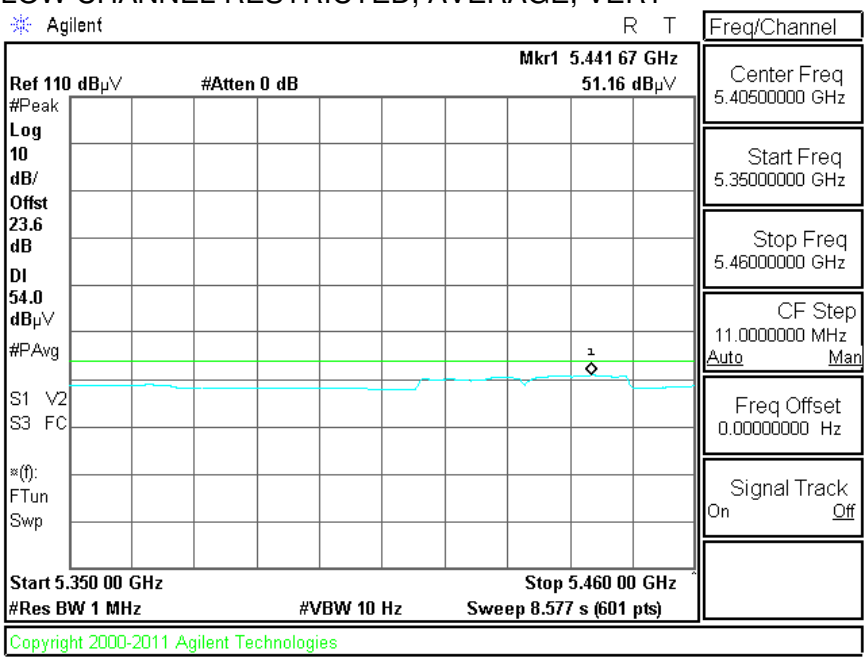
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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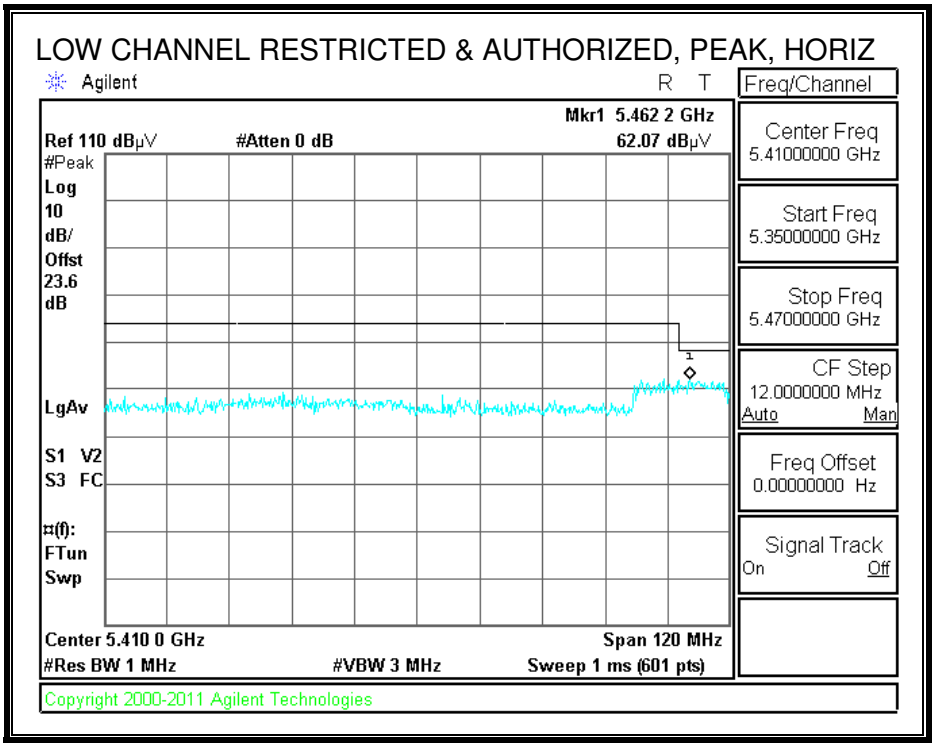
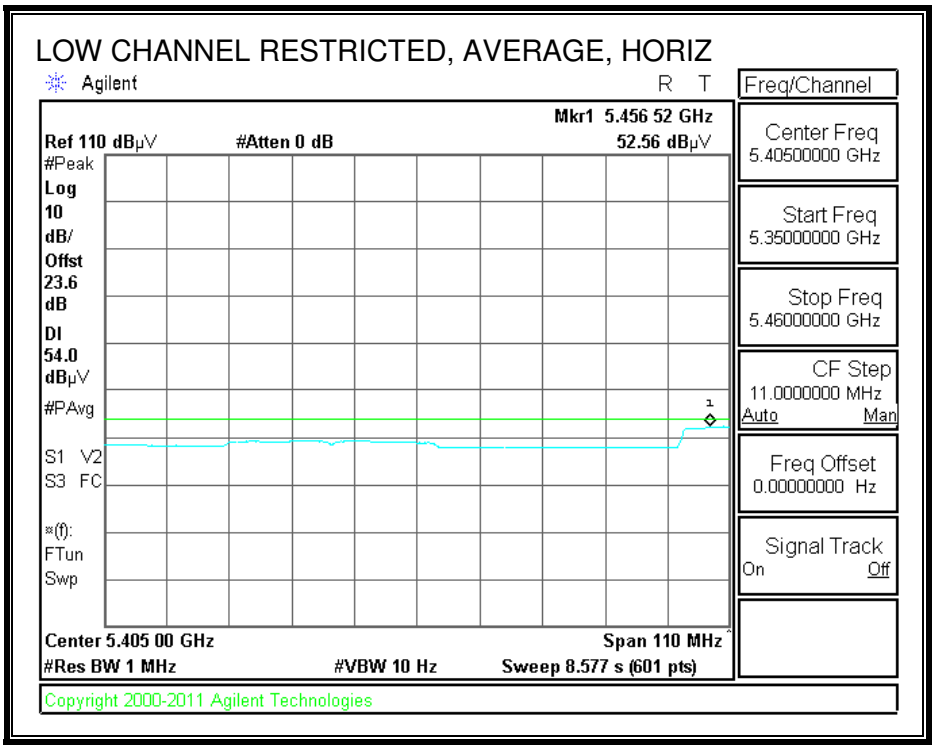
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH110)





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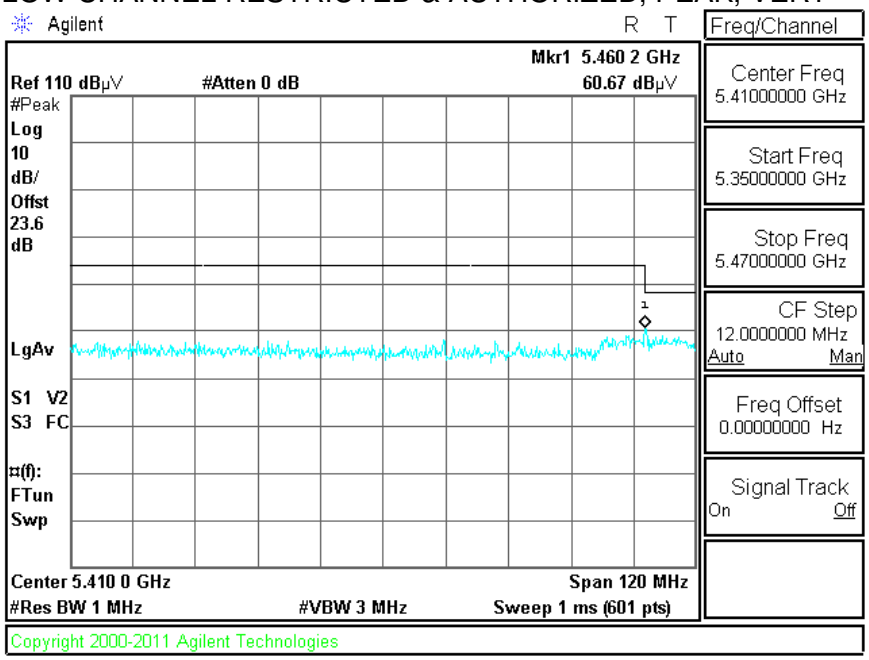
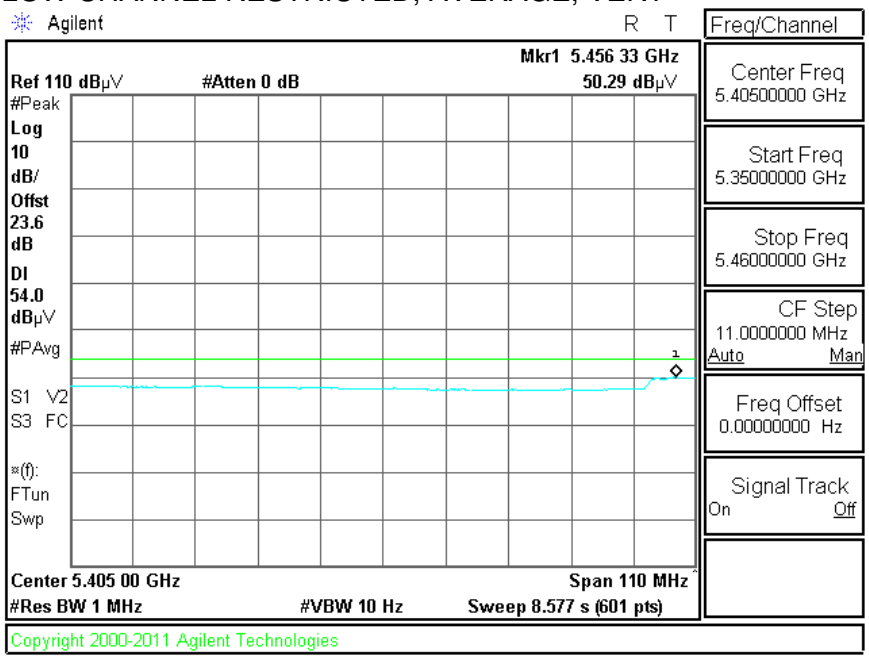
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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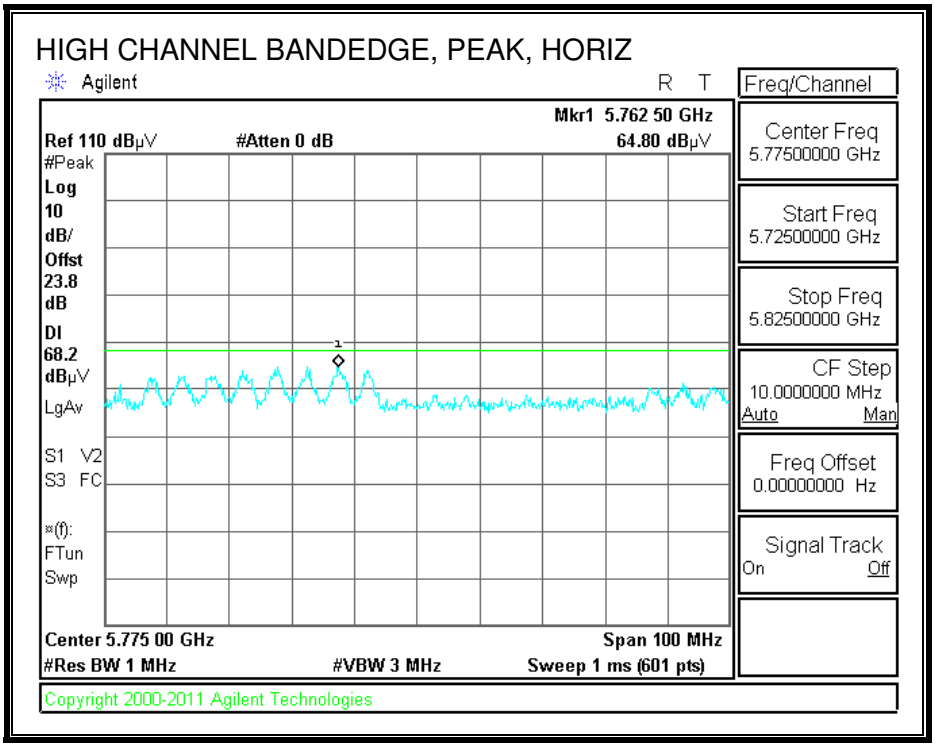
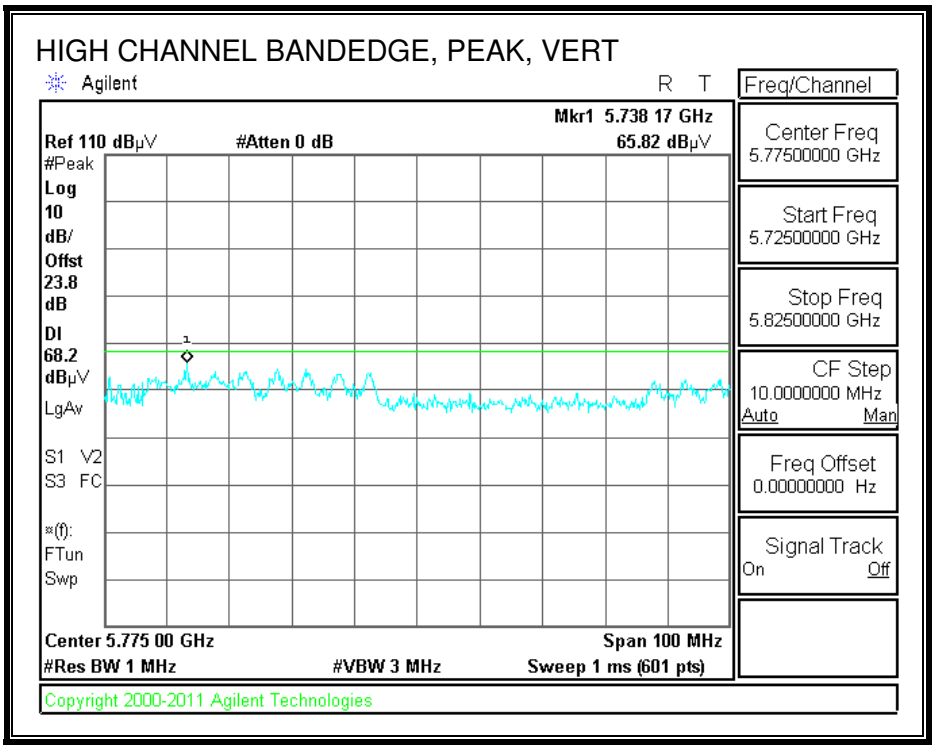
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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
5510 MHz 3TX CDD													
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	
5550 MHz 3TX CDD													
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	
5670 MHz 3TX CDD													
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.

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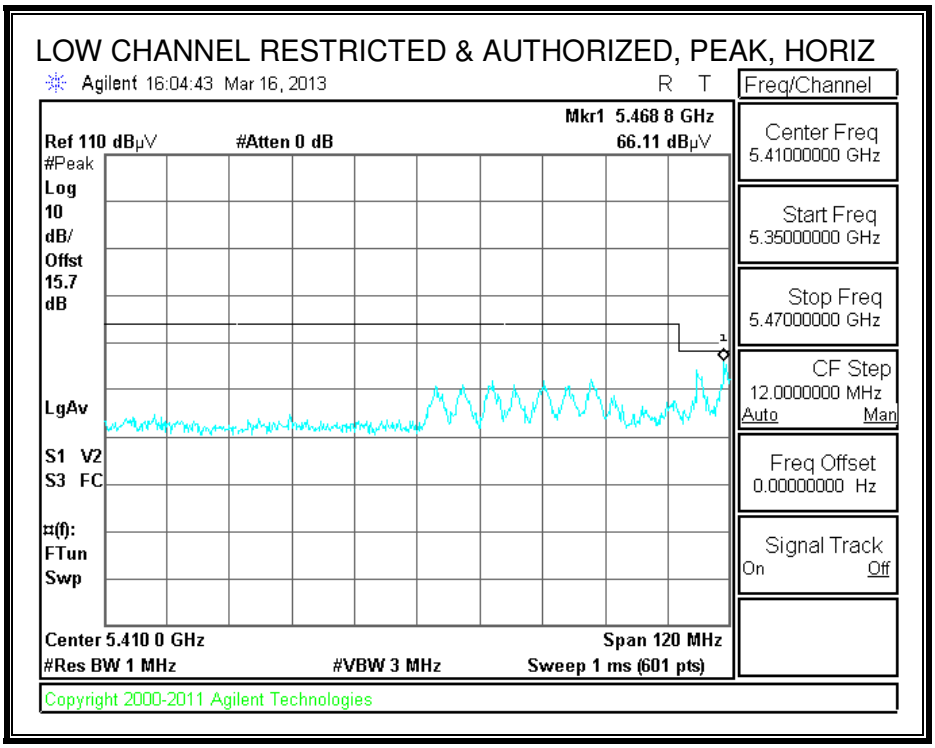
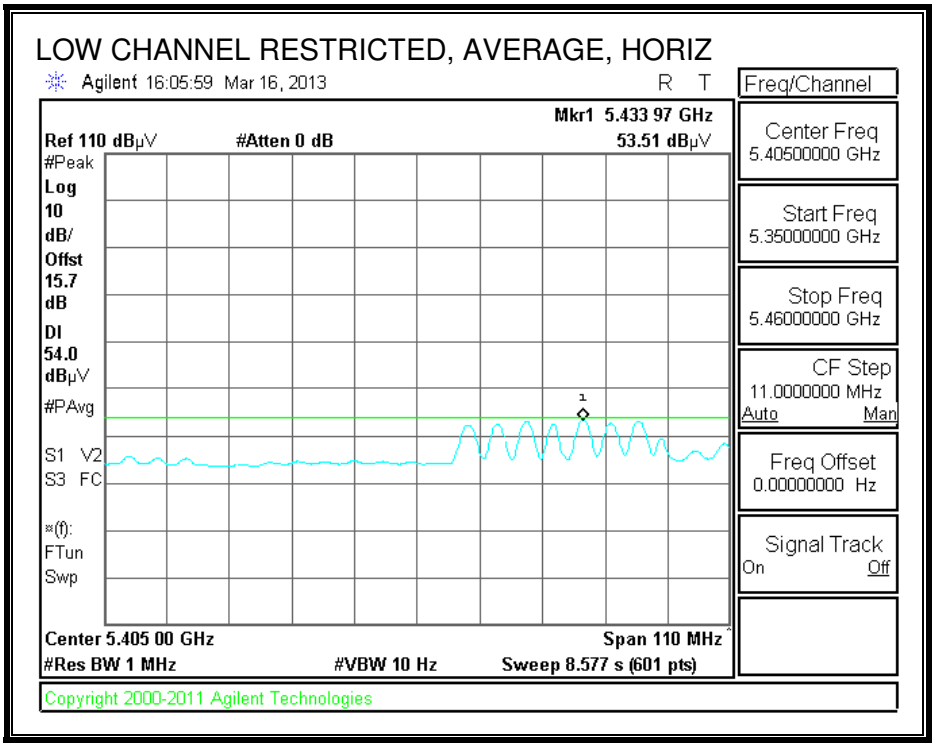
9.2.35. TX ABOVE 1 GHz, 802.11n HT40 BF 2TX MODE, GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)





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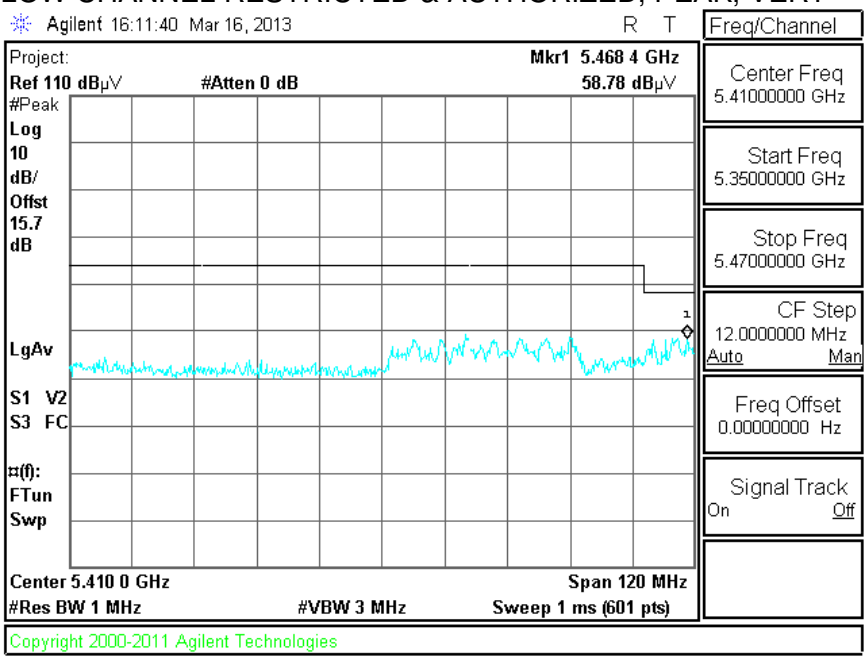
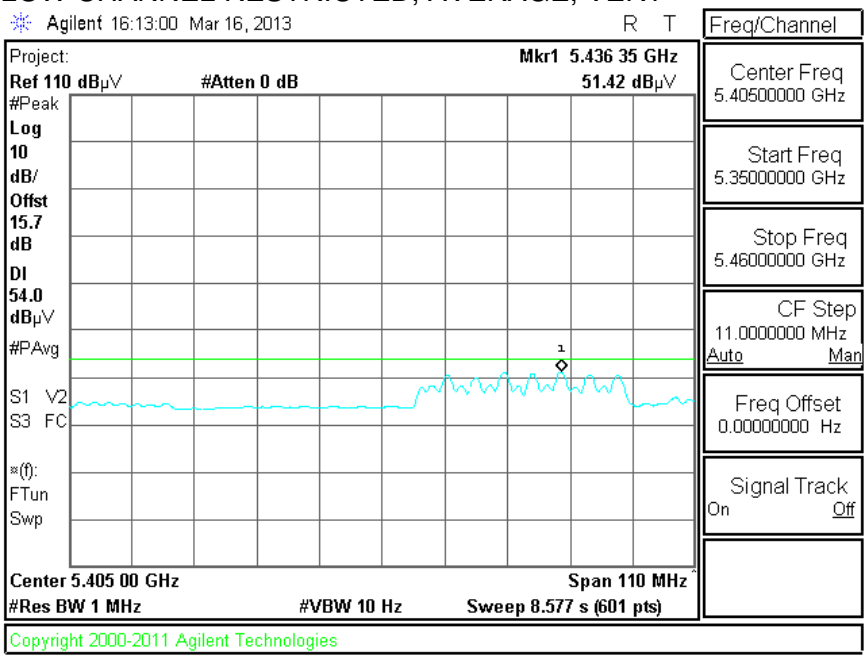
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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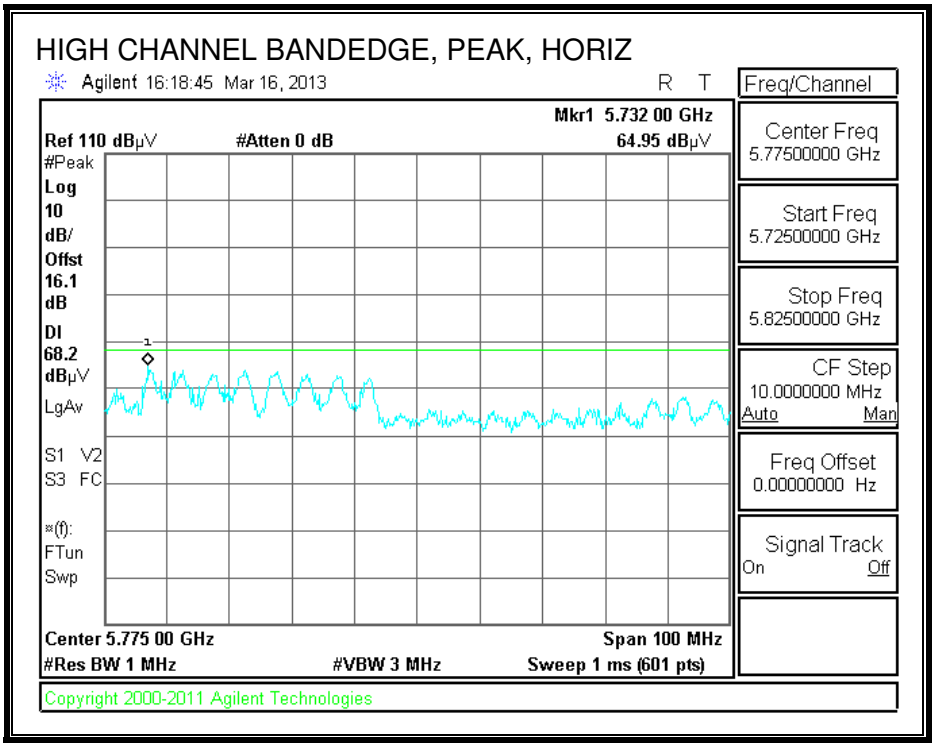
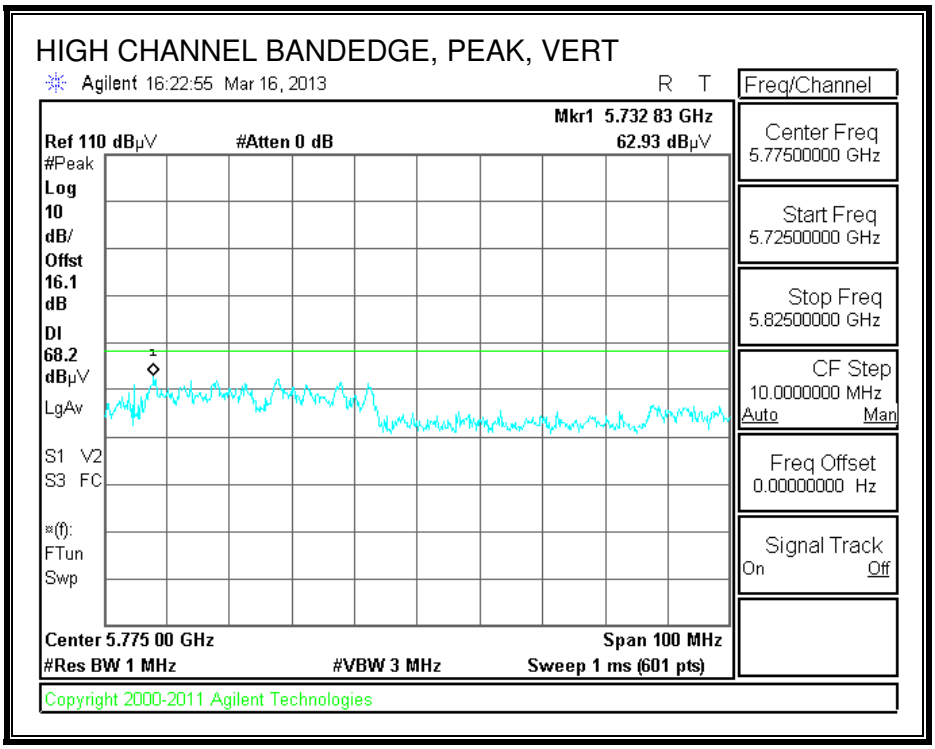
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5510 MHz)															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
Mid Channel (5550 MHz)															
11.100	3.0	35.5	25.1	37.6	11.0	-33.3	0.0	0.7	51.5	41.1	74	54	-22.5	-12.9	H
11.100	3.0	34.8	24.6	37.6	11.0	-33.3	0.0	0.7	50.8	40.6	74	54	-23.2	-13.4	V
Hi Channel (5670 MHz)															
11.340	3.0	36.2	25.8	37.9	11.1	-33.0	0.0	0.7	52.8	42.5	74	54	-21.2	-11.5	H
11.340	3.0	35.6	25.5	37.9	11.1	-33.0	0.0	0.7	52.3	42.1	74	54	-21.7	-11.9	V

Rev. 01.30.13

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

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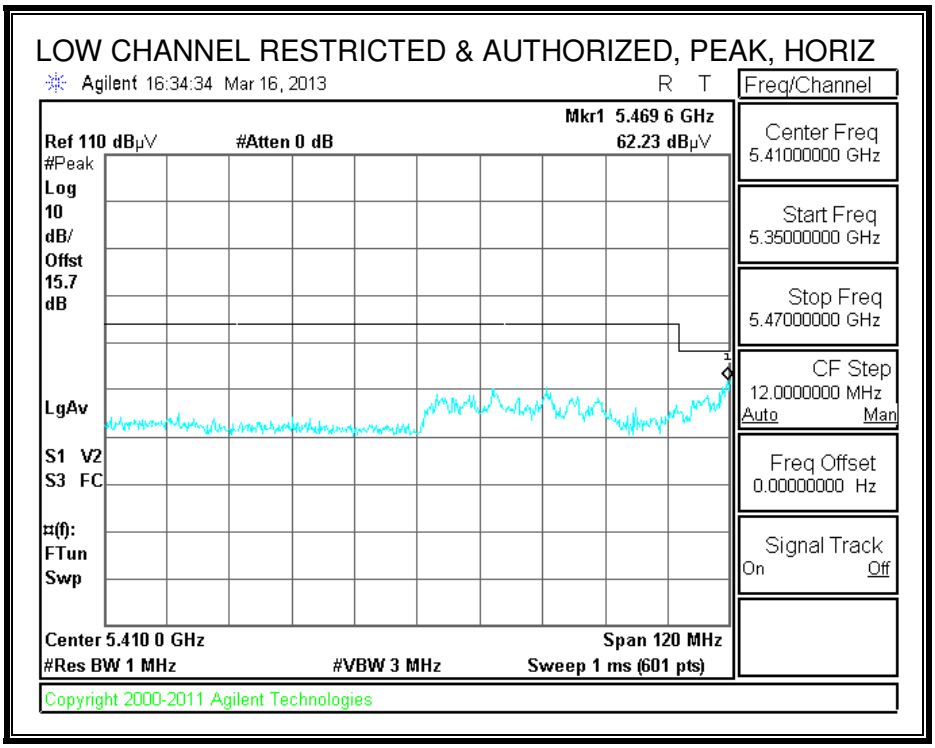
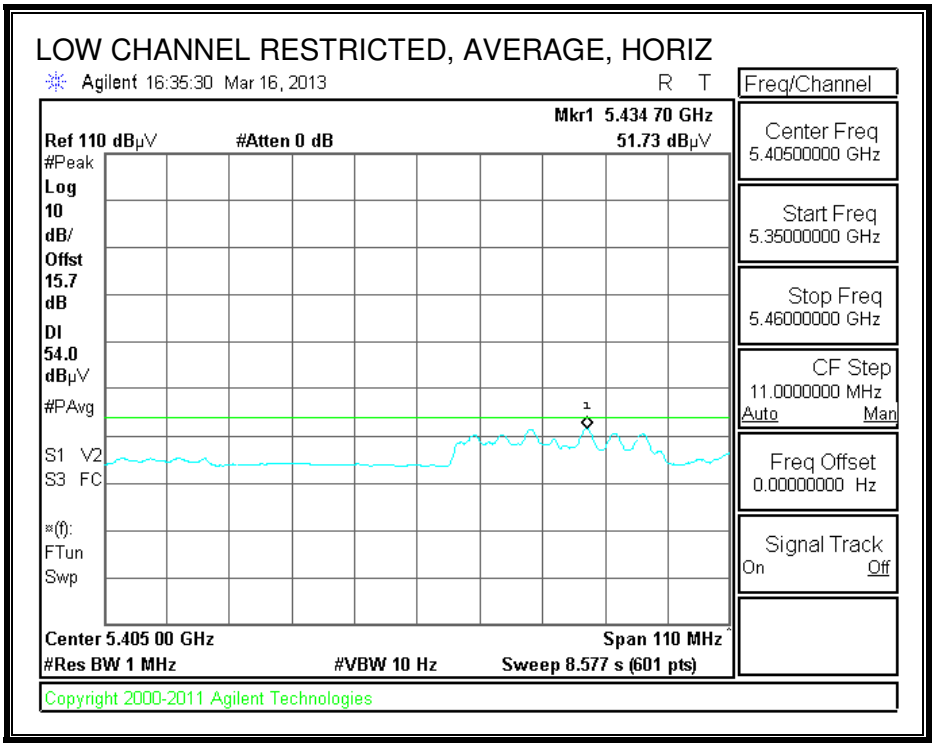
9.2.36. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH102)





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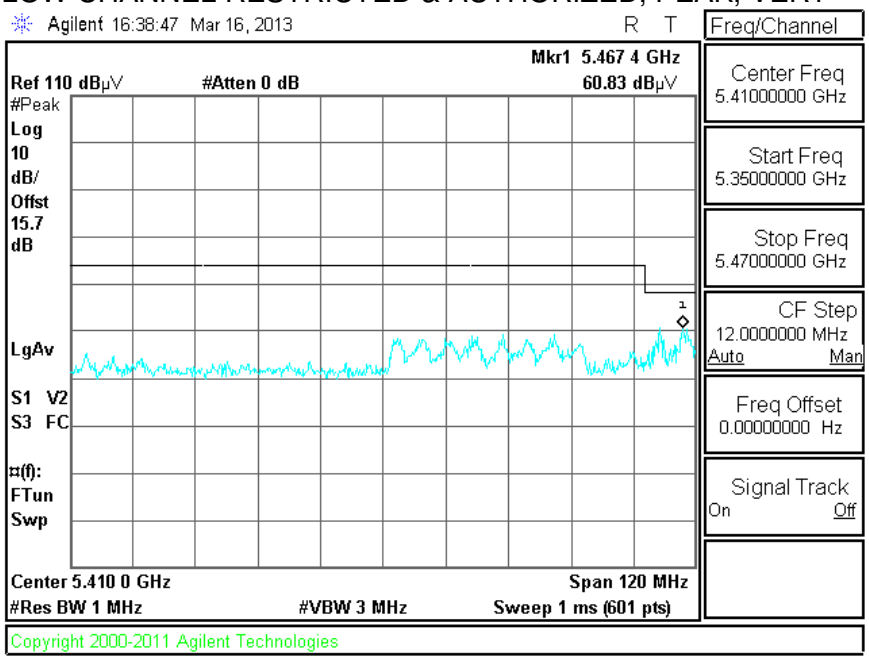
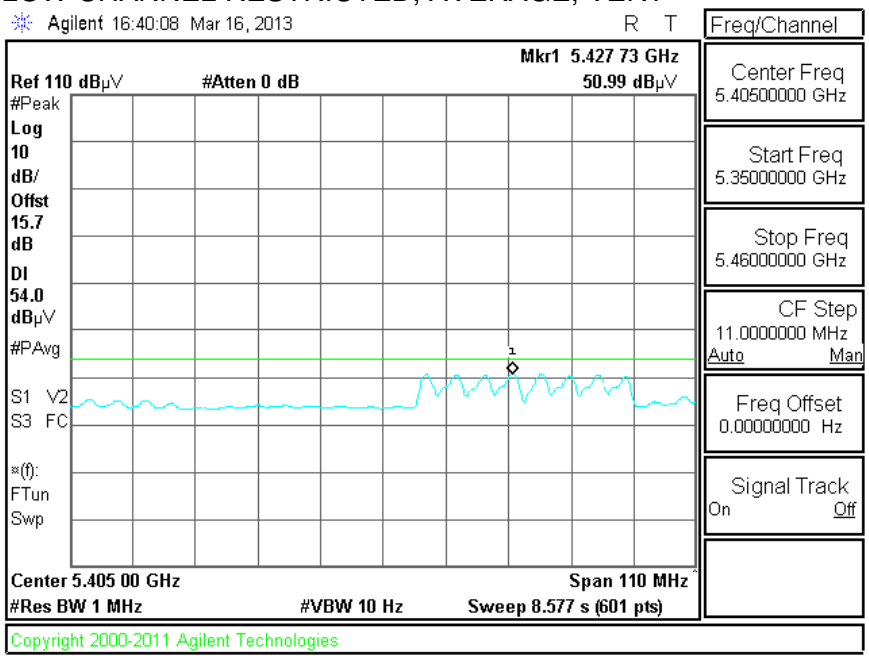
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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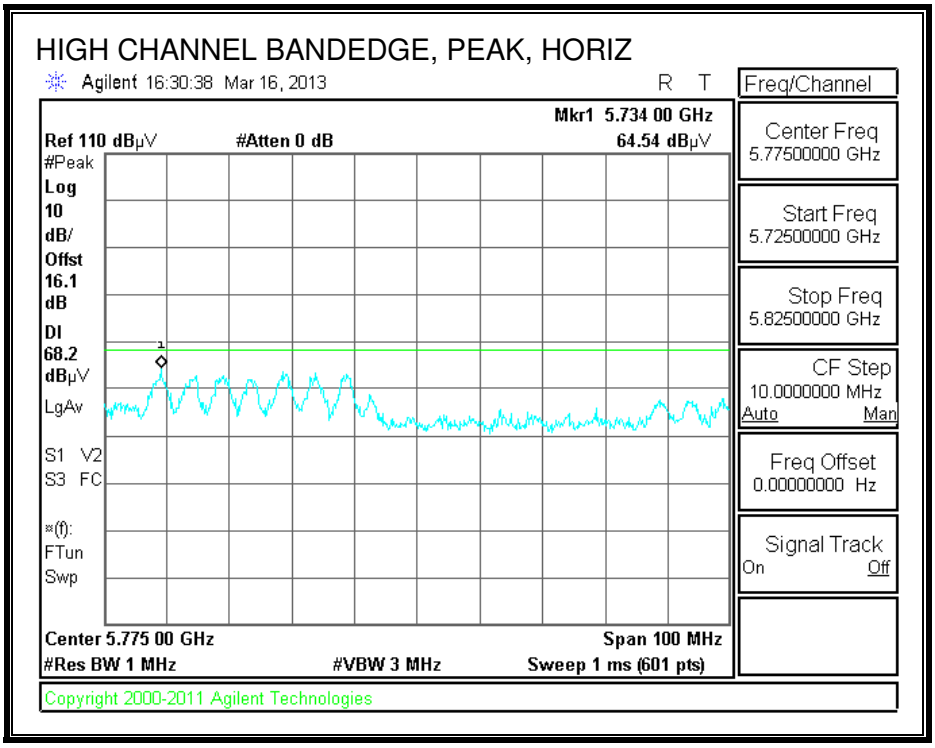
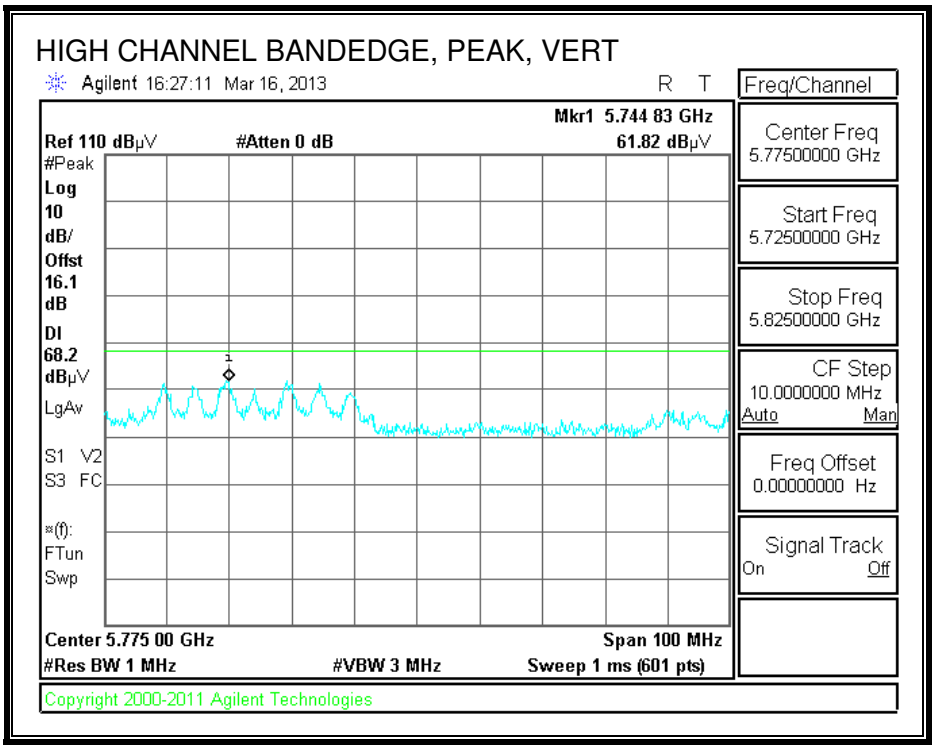
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5510 MHz)															
11.020	3.0	36.5	24.7	37.6	10.9	-33.4	0.0	0.7	52.3	40.5	74	54	-21.7	-13.5	H
11.020	3.0	35.3	24.5	37.6	10.9	-33.4	0.0	0.7	51.1	40.2	74	54	-22.9	-13.8	V
Mid Channel (5550 MHz)															
11.100	3.0	35.5	25.1	37.6	11.0	-33.3	0.0	0.7	51.5	41.1	74	54	-22.5	-12.9	H
11.100	3.0	34.8	24.6	37.6	11.0	-33.3	0.0	0.7	50.8	40.6	74	54	-23.2	-13.4	V
Hi Channel (5670 MHz)															
11.340	3.0	36.2	25.8	37.9	11.1	-33.0	0.0	0.7	52.8	42.5	74	54	-21.2	-11.5	H
11.340	3.0	35.6	25.5	37.9	11.1	-33.0	0.0	0.7	52.3	42.1	74	54	-21.7	-11.9	V

Rev. 01.30.13

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

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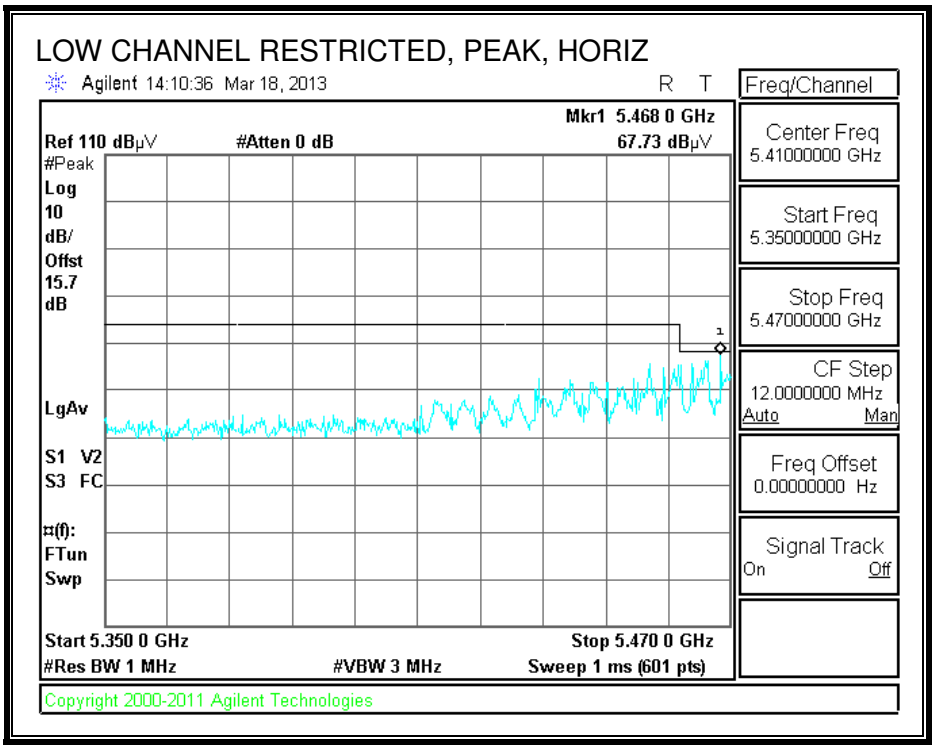
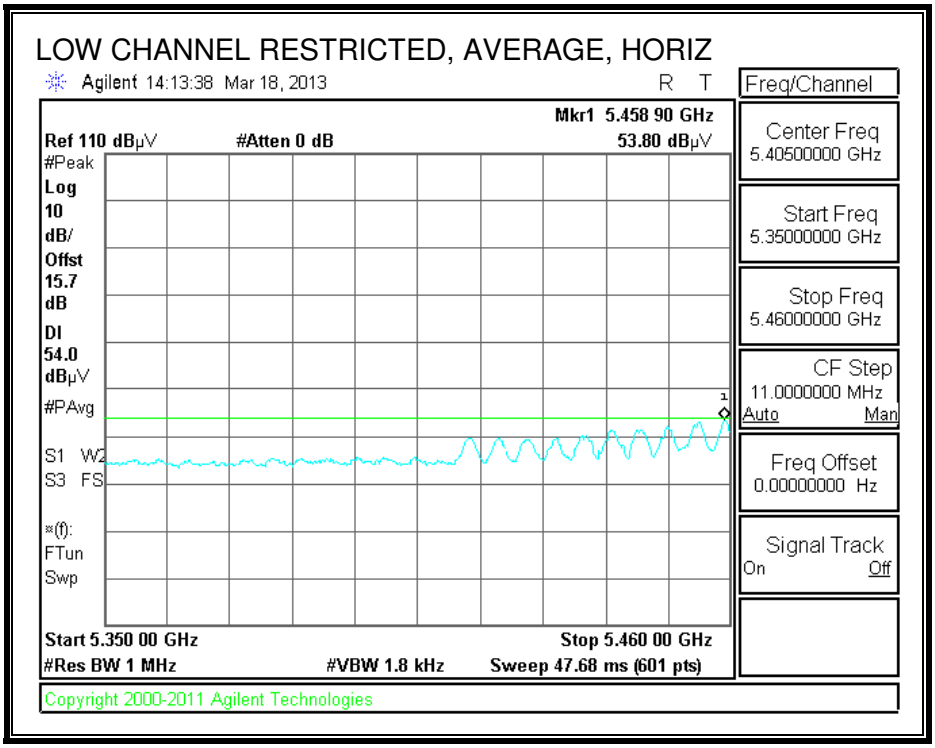
9.2.37. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





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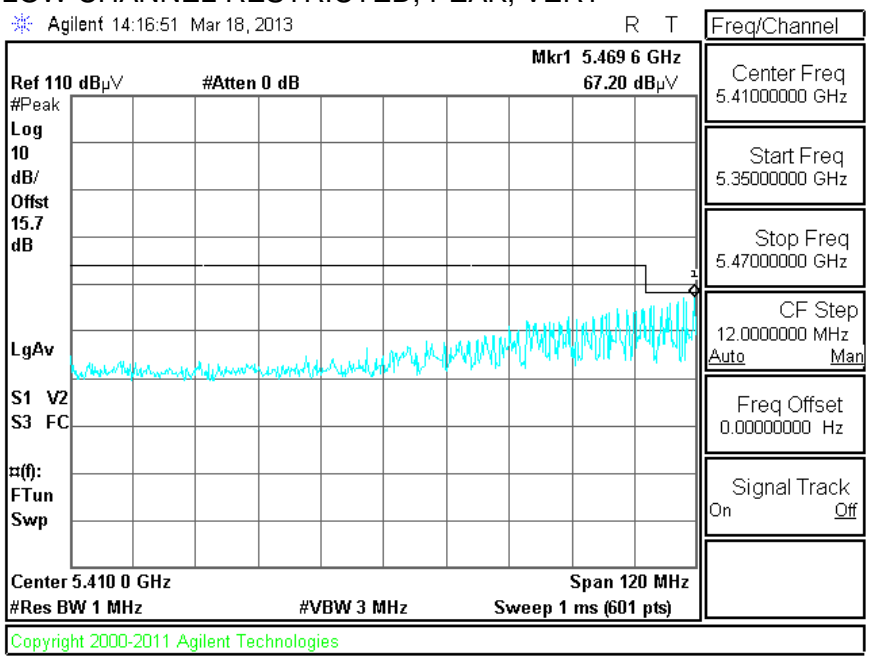
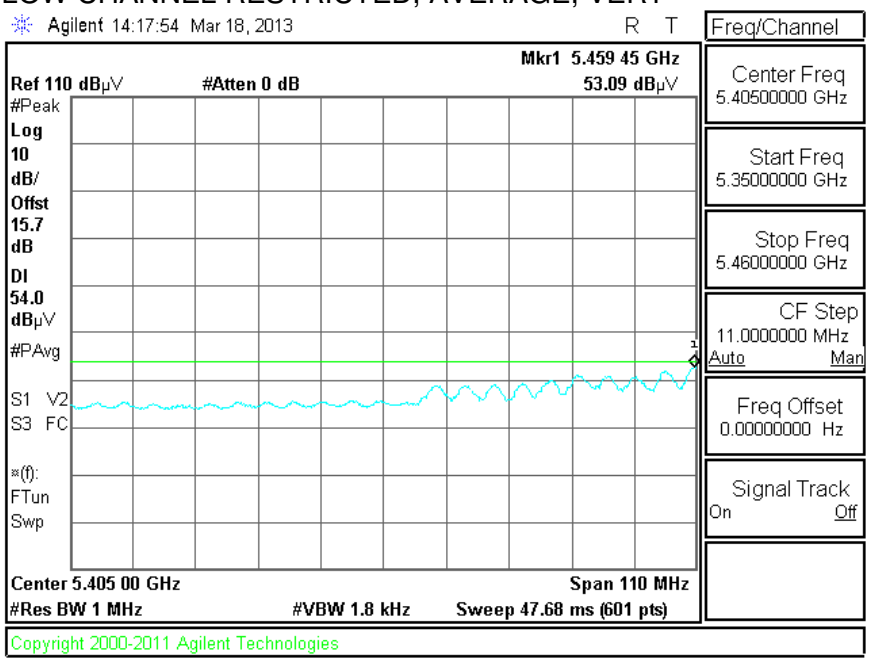
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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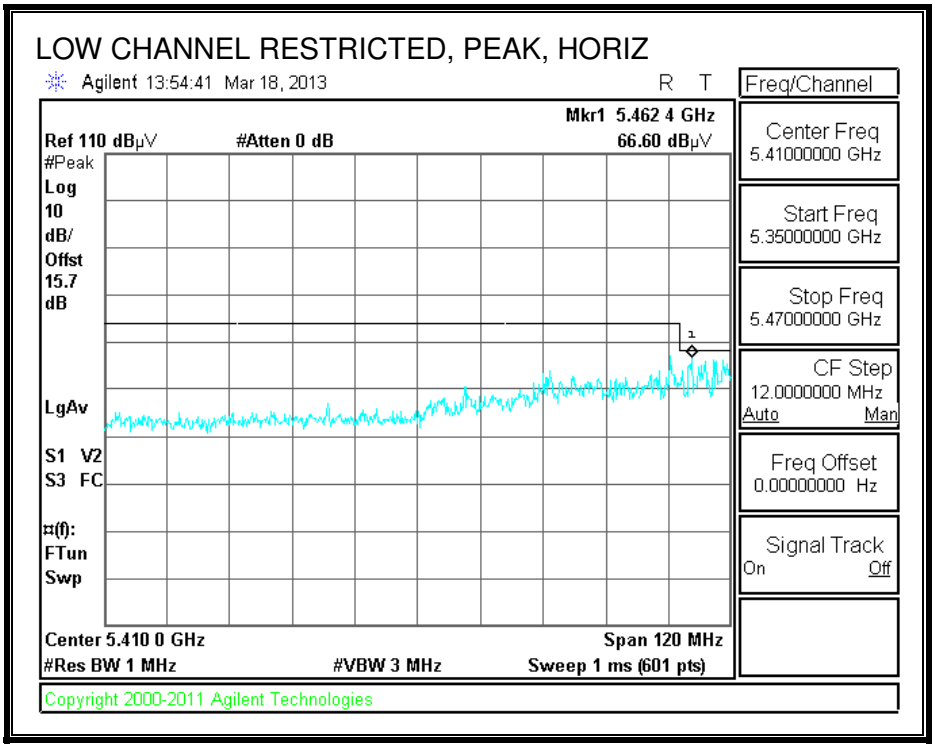
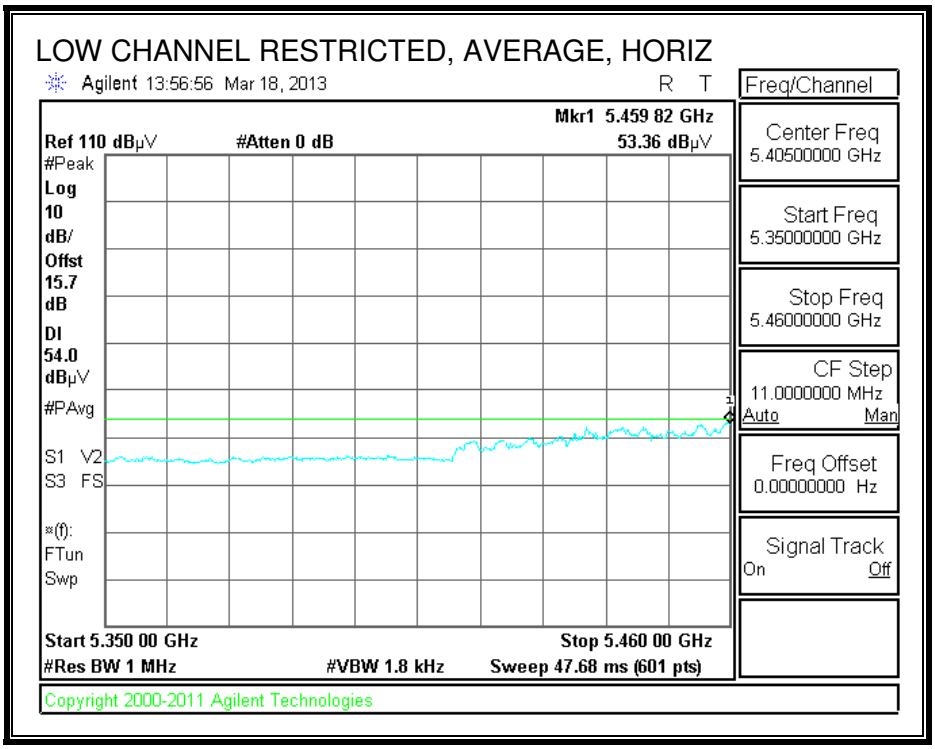
9.2.38. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





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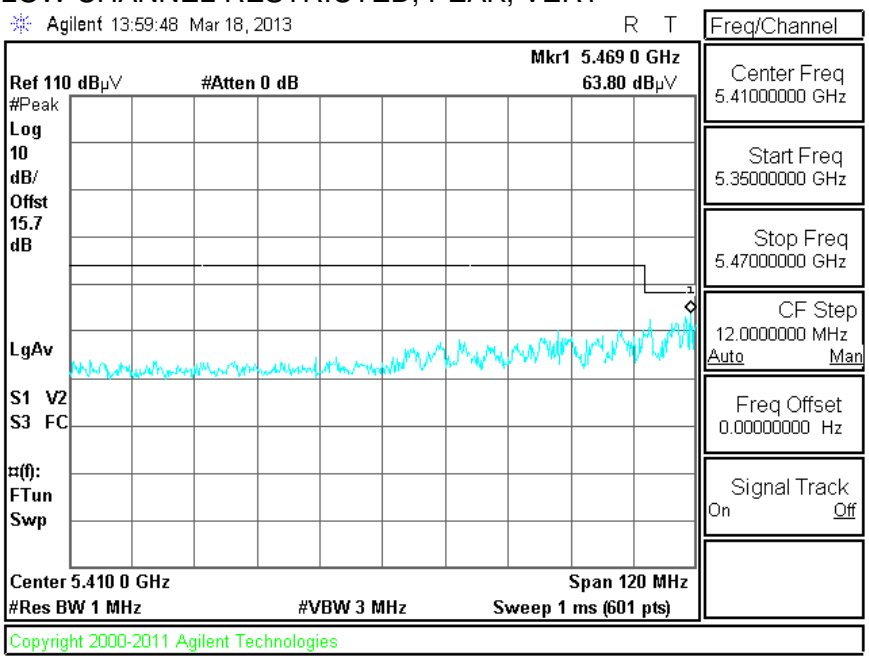
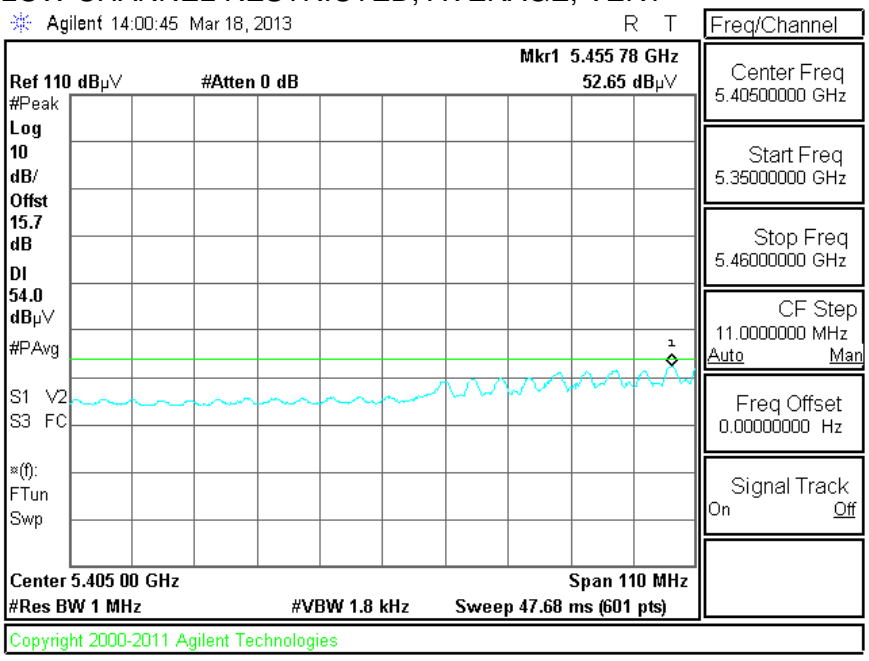
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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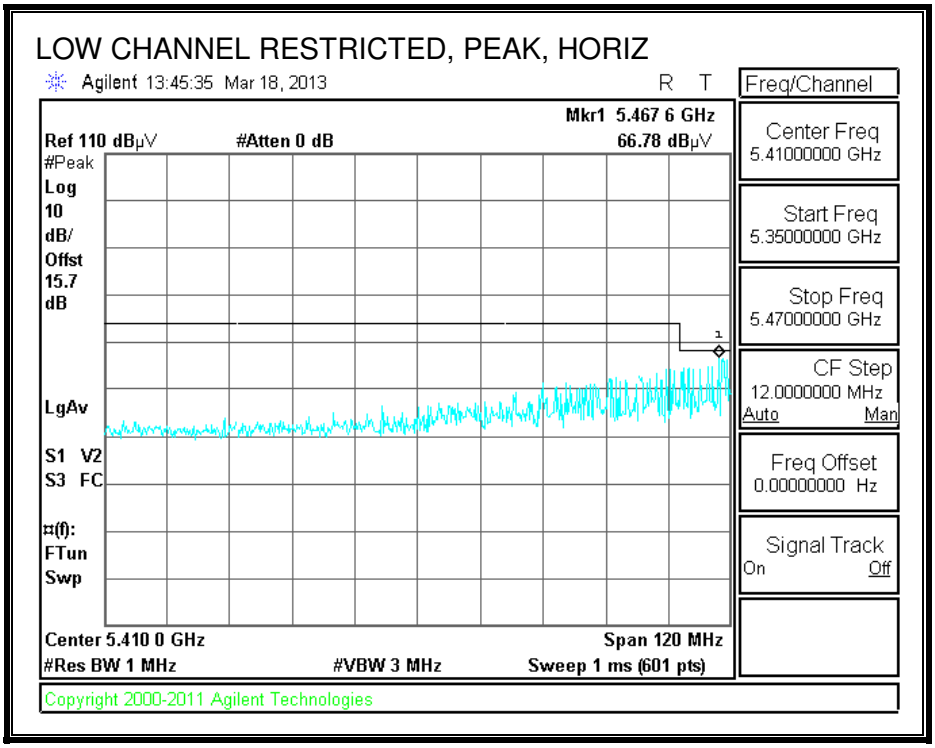
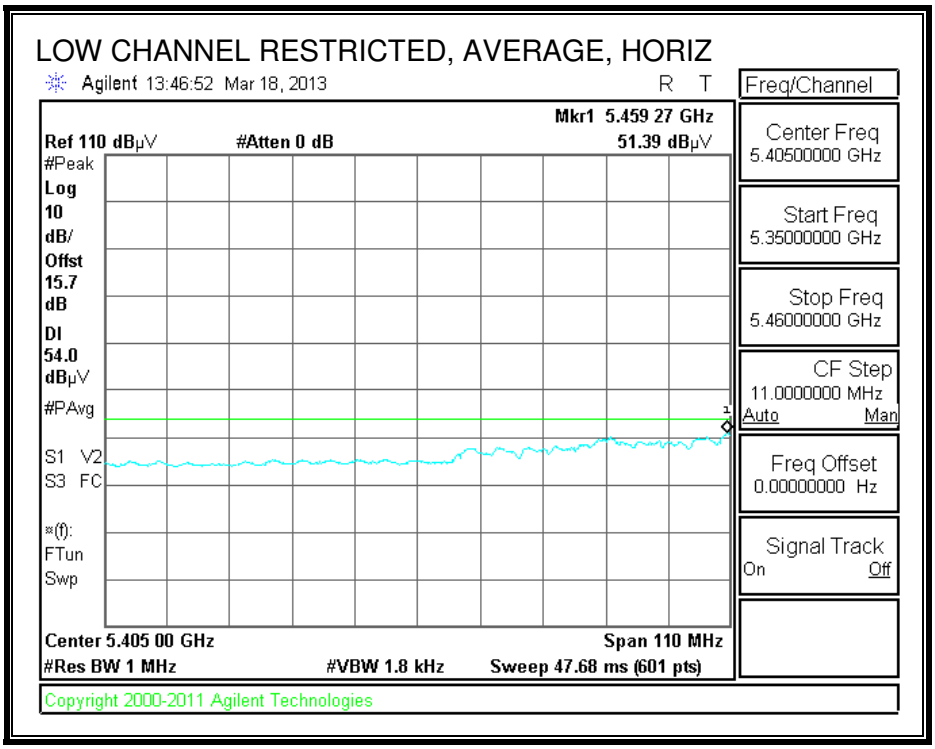
9.2.39. TX ABOVE 1 GHz, 802.11ac VHT80 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





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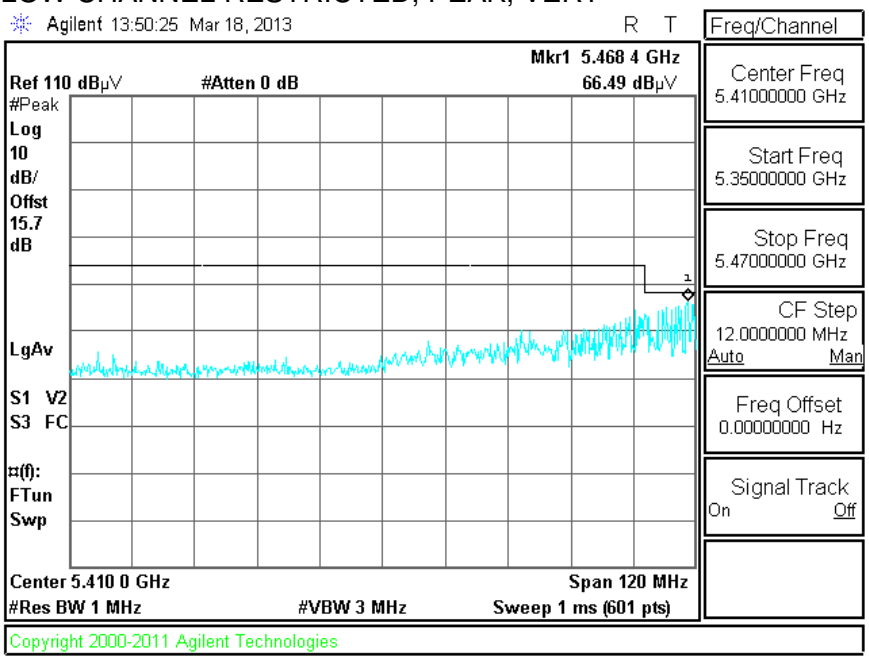
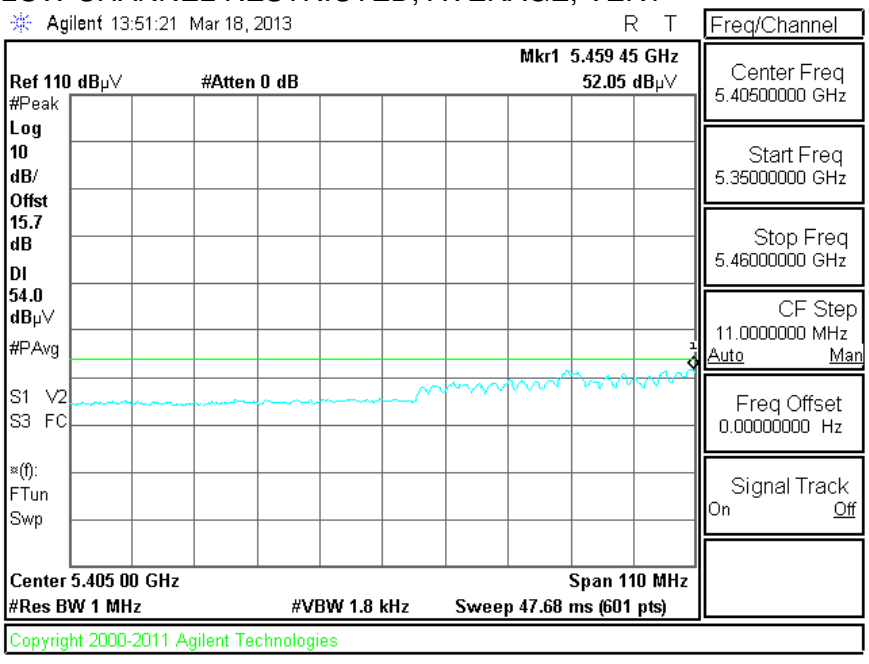
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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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
5210 MHz 3TX CDD													
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	
5290 MHz 3TX CDD													
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	
5530 MHz 3TX CDD													
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	
5690 MHz 3TX CDD													
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.

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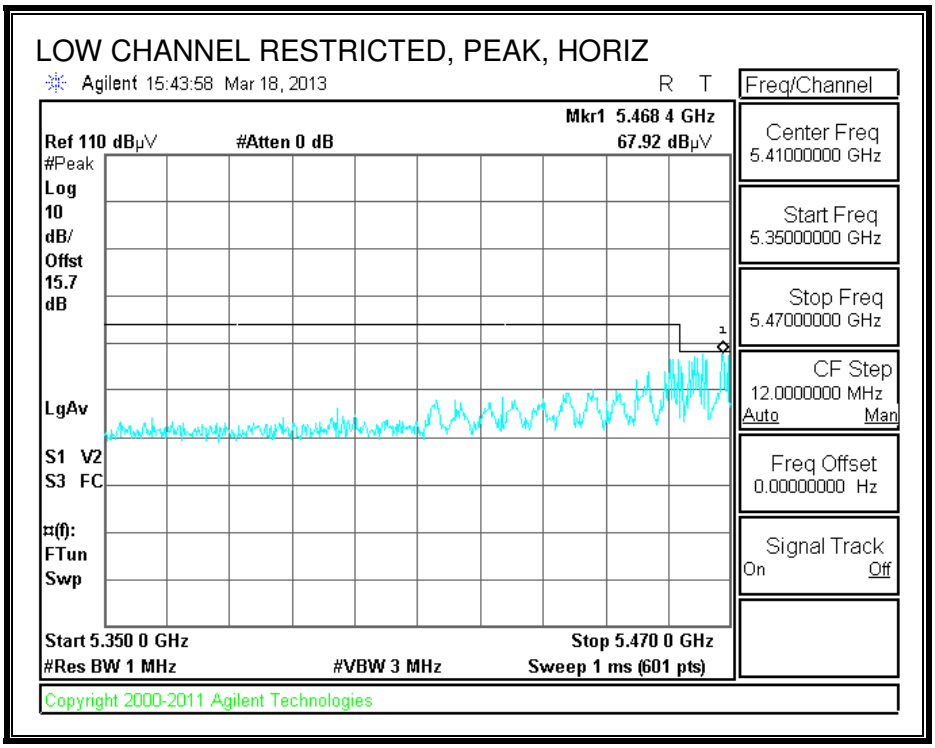
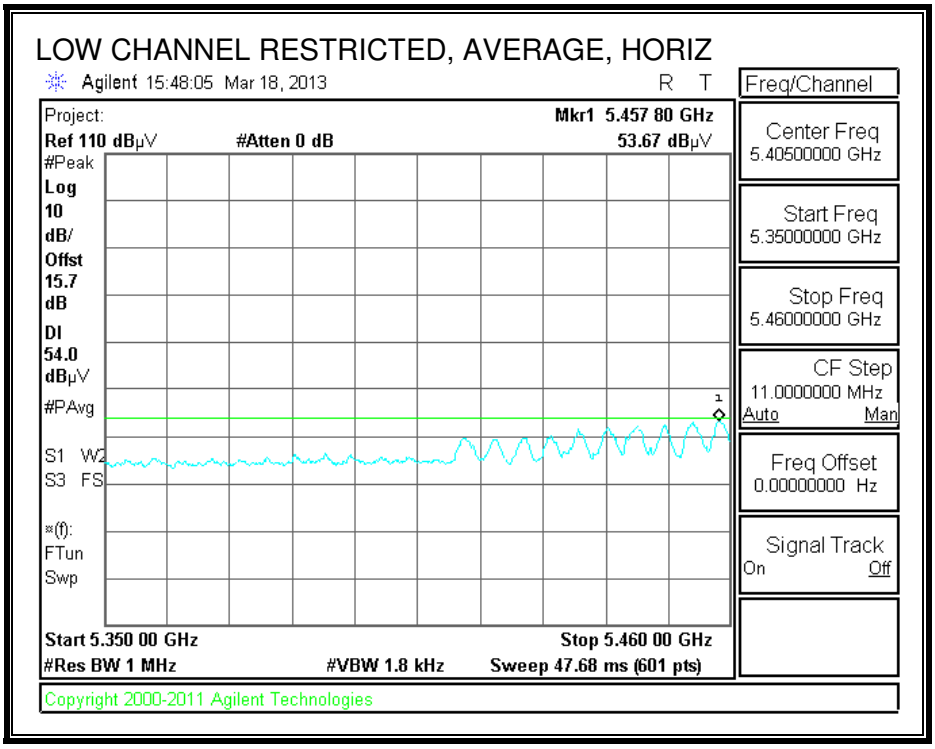
9.2.40. TX ABOVE 1 GHz, 802.11ac VHT80 BF 2TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





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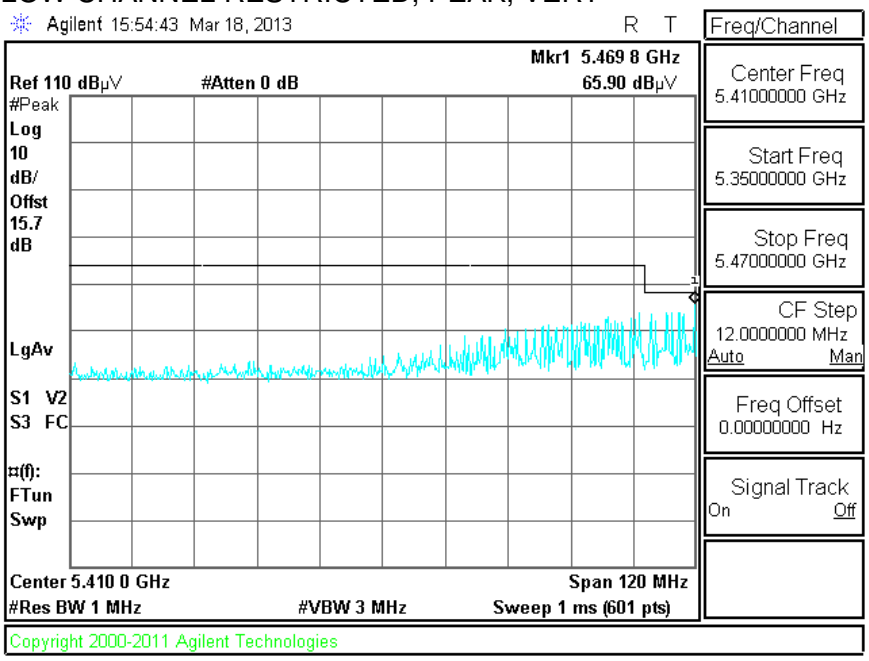
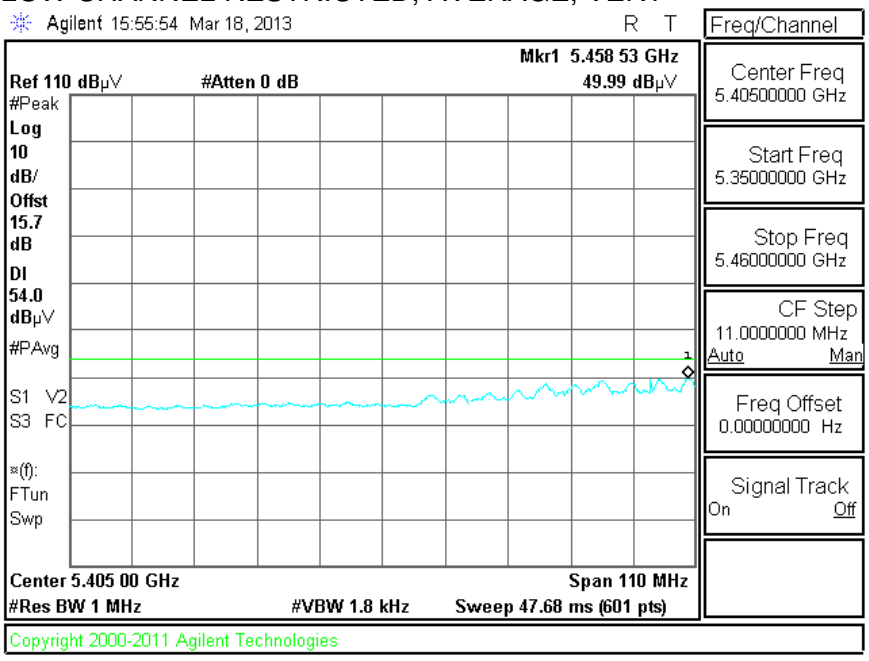
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V

Rev. 01.30.13

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

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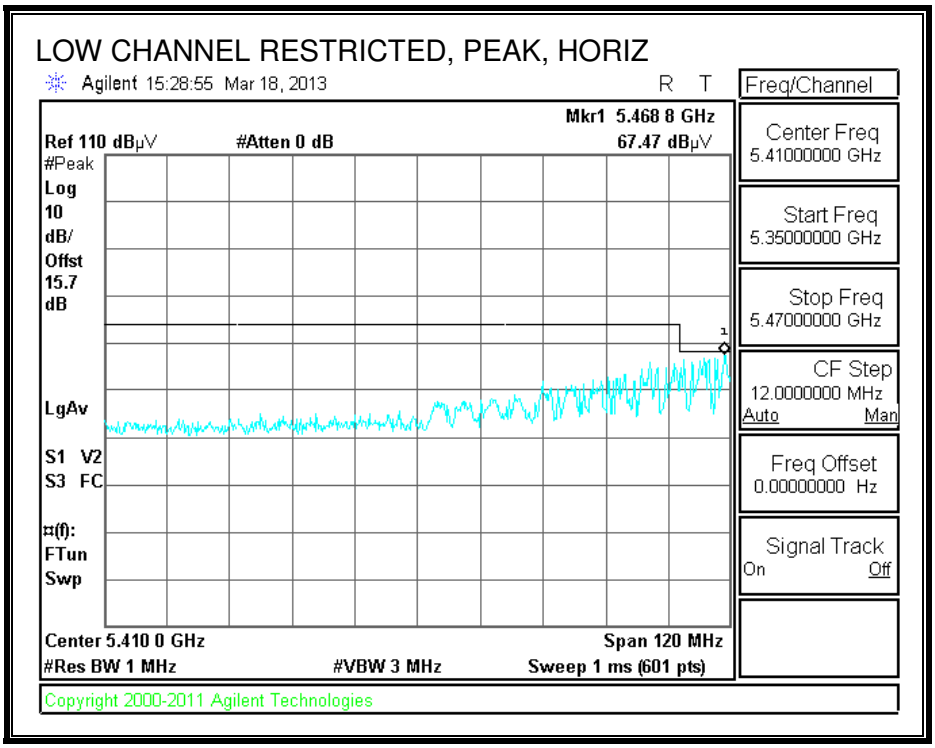
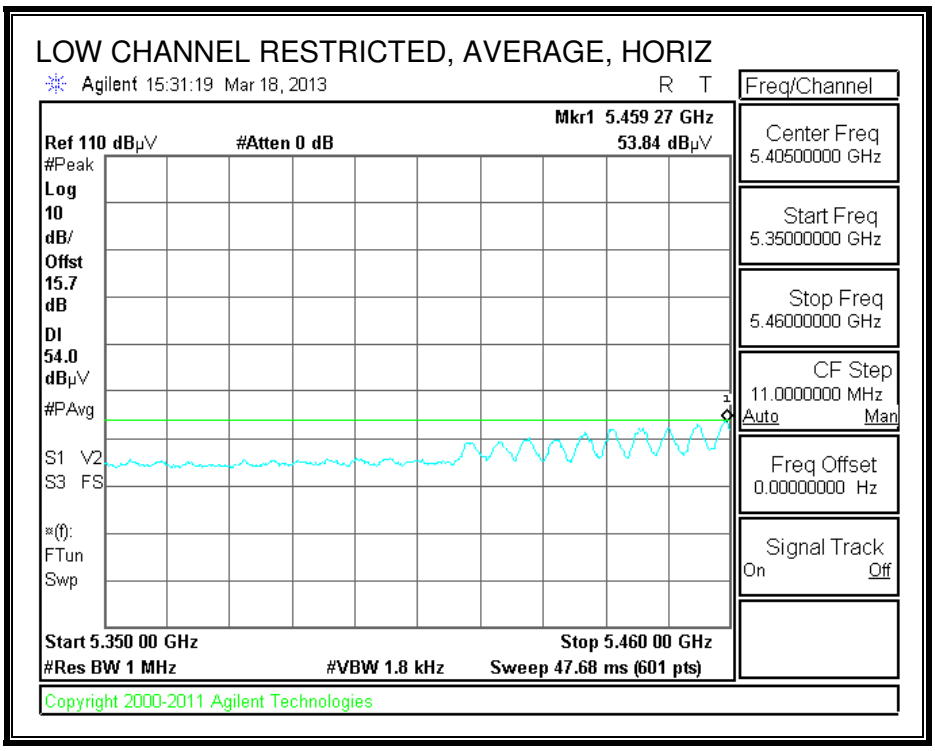
9.2.41. TX ABOVE 1 GHz, 802.11ac VHT80 BF 3TX MODE, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL CH106)





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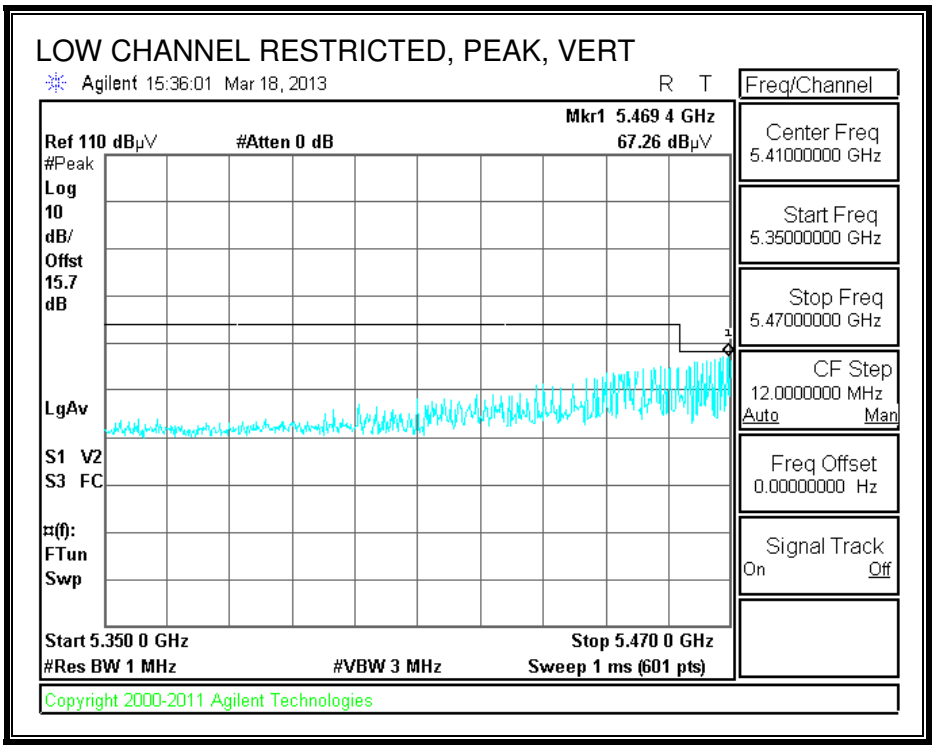

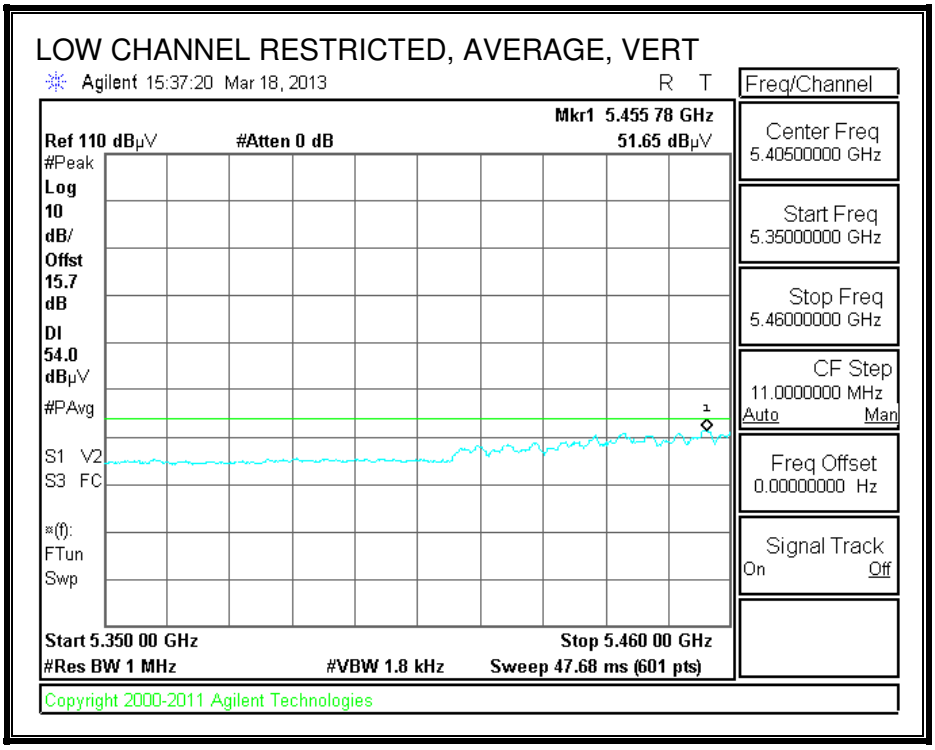

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HARMONICS AND SPURIOUS EMISSIONS

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-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5210 MHz)															
10.420	3.0	36.2	25.5	37.2	10.6	-34.1	0.0	0.8	50.6	39.9	74	54	-23.4	-14.1	H
10.420	3.0	35.6	25.4	37.2	10.6	-34.1	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	V
Mid Channel (5290 MHz)															
10.580	3.0	35.3	25.0	37.3	10.7	-33.9	0.0	0.8	50.0	39.8	74	54	-24.0	-14.2	H
10.580	3.0	35.5	24.9	37.3	10.7	-33.9	0.0	0.8	50.2	39.6	74	54	-23.8	-14.4	V
Low Channel (5530 MHz)															
11.060	3.0	35.1	24.7	37.6	10.9	-33.4	0.0	0.7	51.0	40.5	74	54	-23.0	-13.5	H
11.060	3.0	35.5	24.5	37.6	10.9	-33.4	0.0	0.7	51.4	40.4	74	54	-22.6	-13.6	V
Hi Channel (5690 MHz)															
11.380	3.0	36.1	25.3	37.9	11.1	-33.0	0.0	0.7	52.8	42.0	74	54	-21.2	-12.0	H
11.380	3.0	35.4	25.1	37.9	11.1	-33.0	0.0	0.7	52.1	41.9	74	54	-21.9	-12.1	V

Rev. 01.30.13

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

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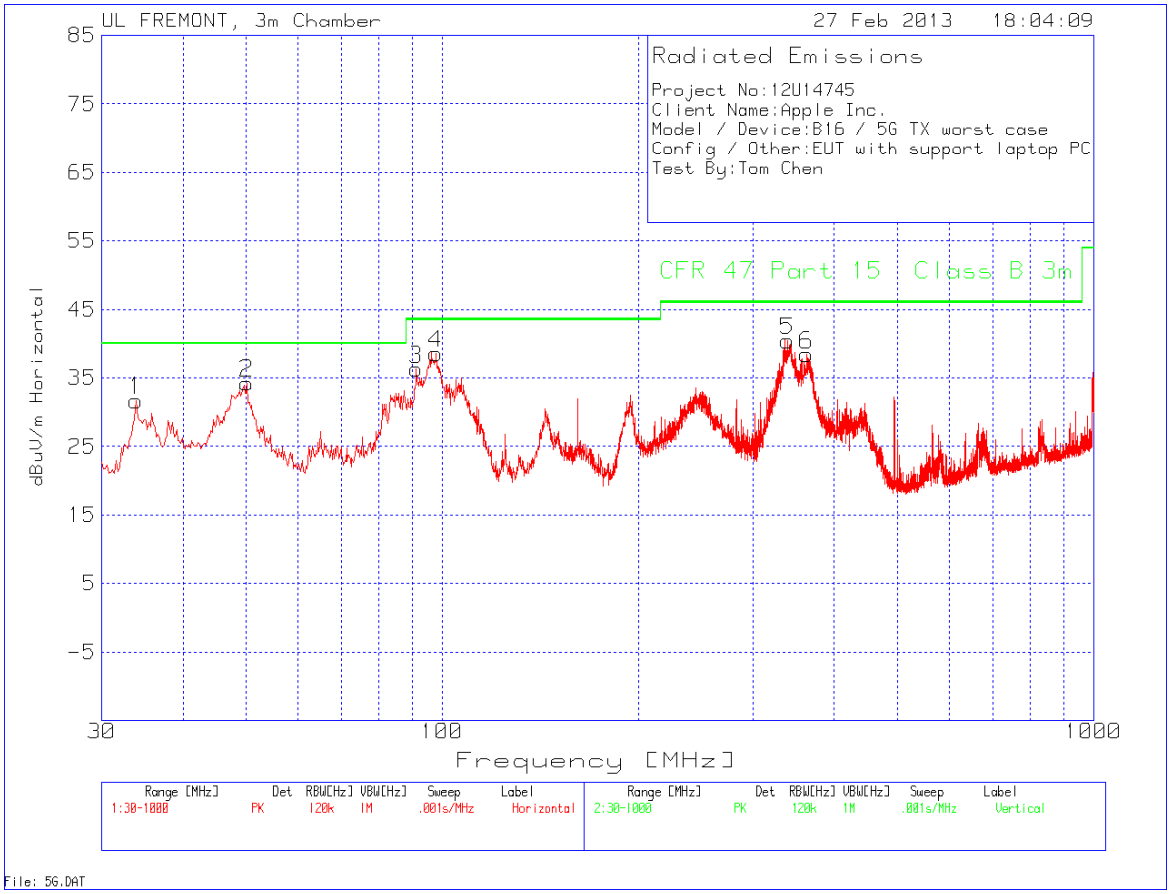
9.3. RADIATED EMISSIONS, WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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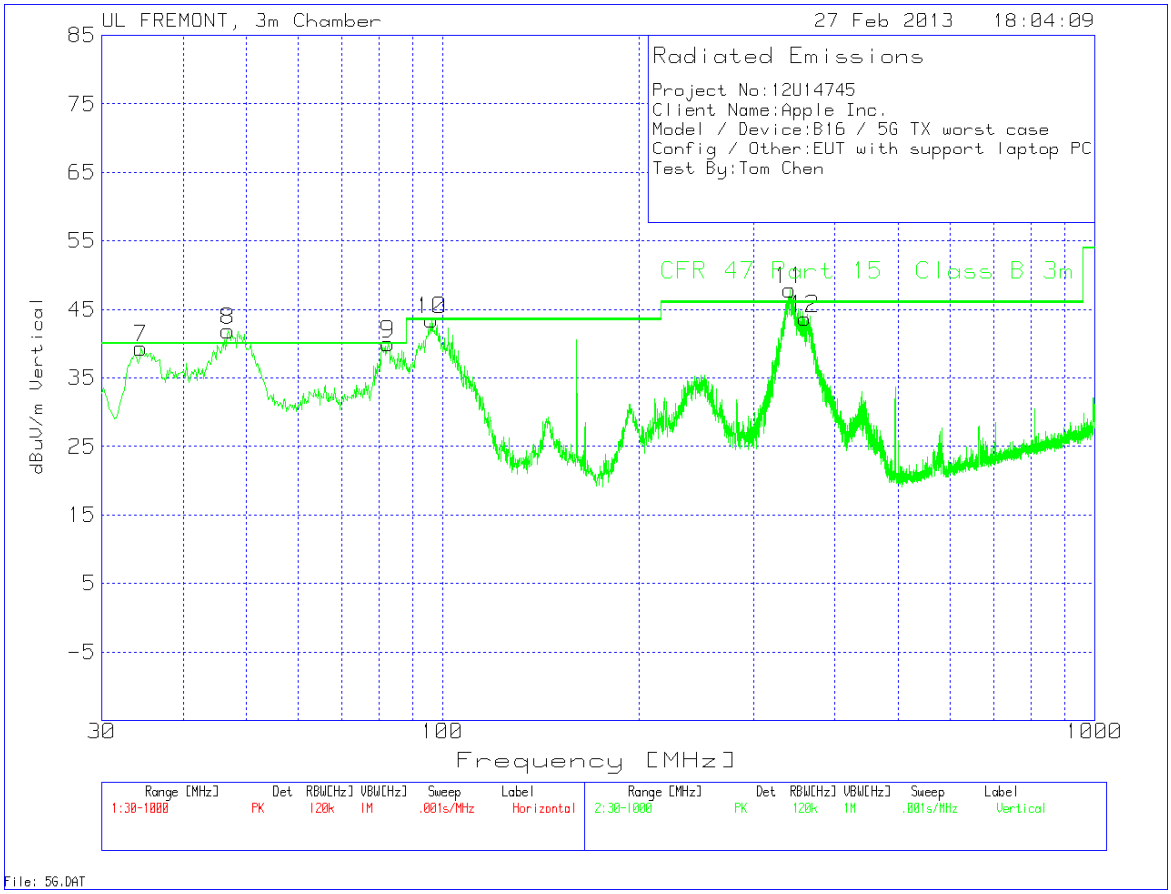
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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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

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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.

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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

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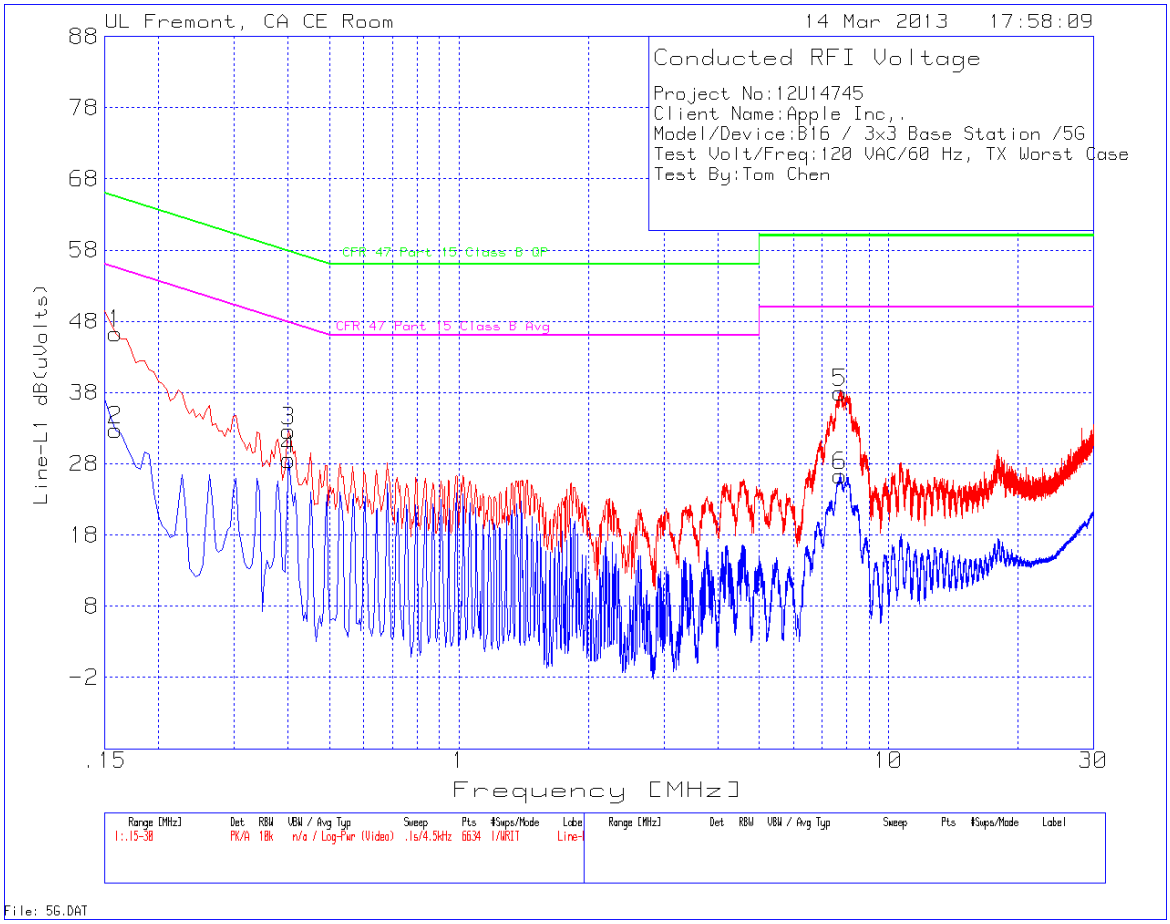
LINE 1 RESULTS



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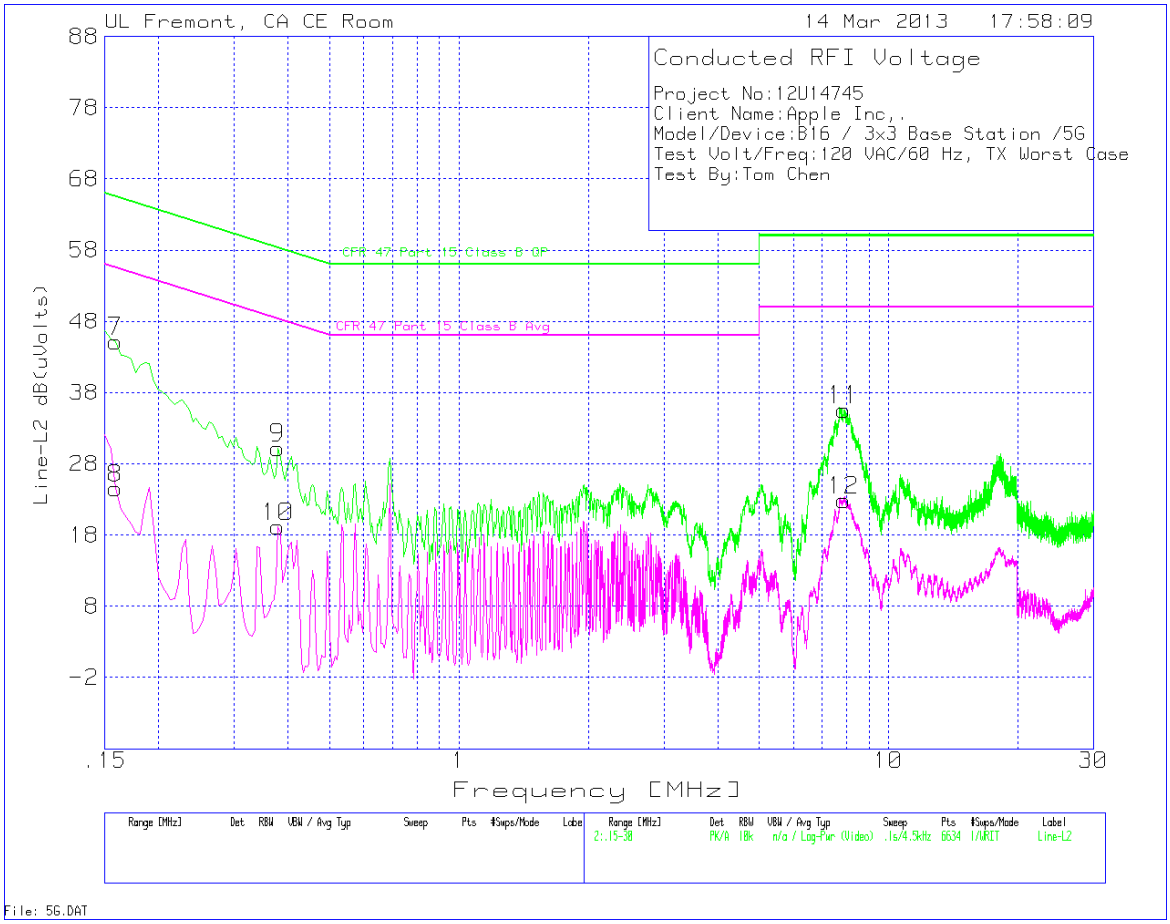
LINE 2 RESULTS



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