9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

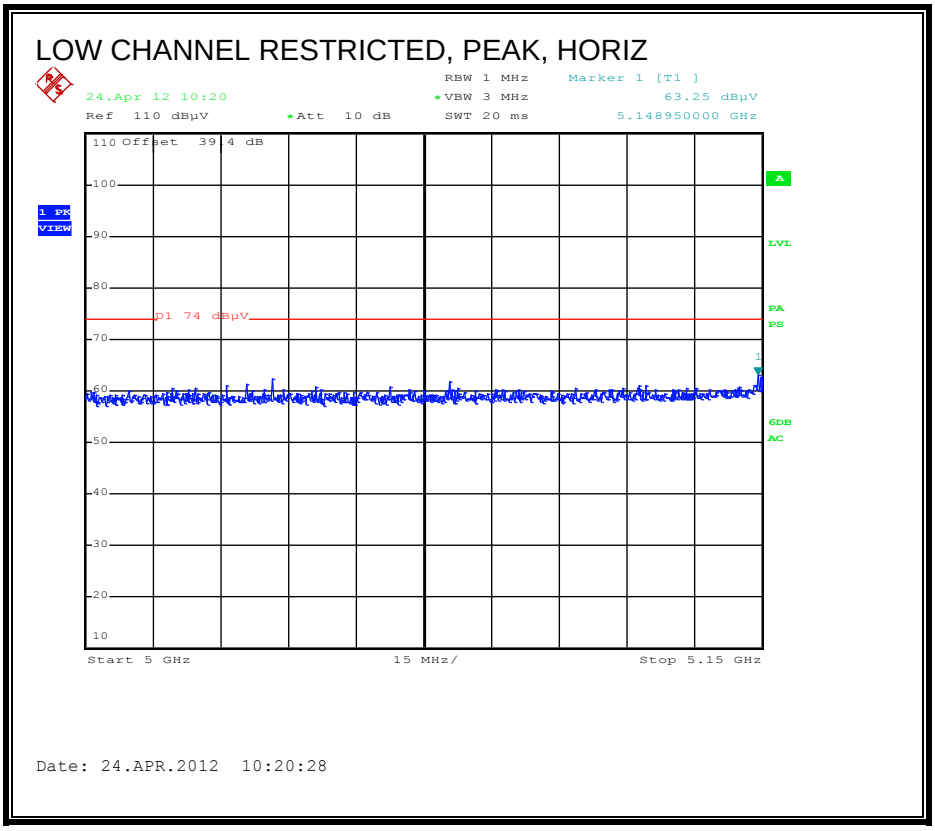
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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

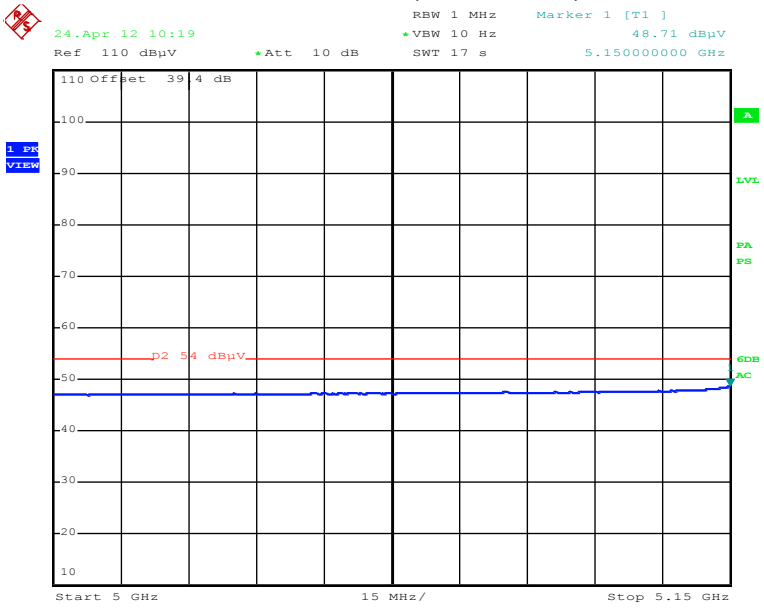
9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. TX ABOVE 1 GHz, 802.11a, CDD MCS0, 1TX, 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

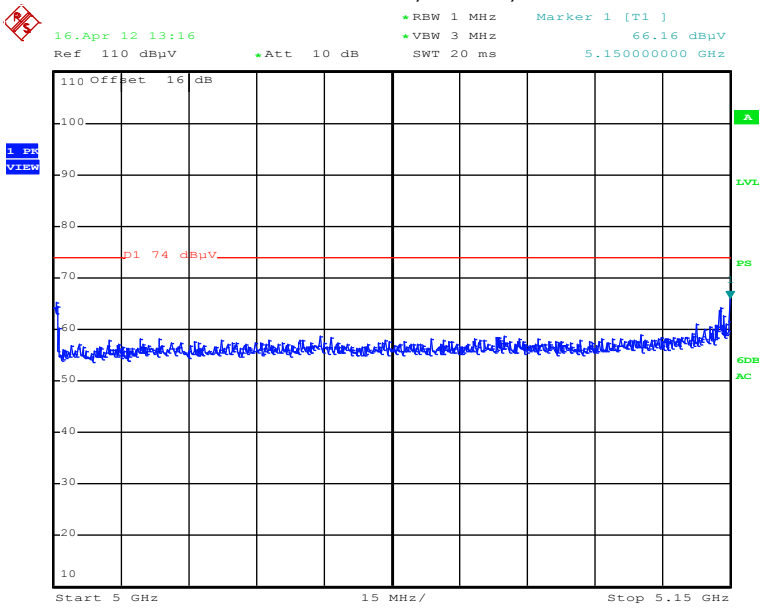


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



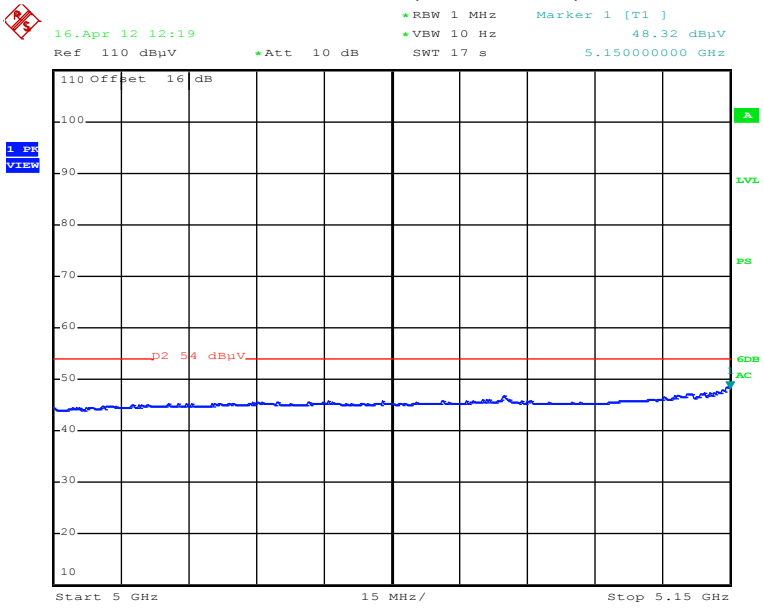
Date: 24.APR.2012 10:19:30

LOW CHANNEL RESTRICTED, PEAK, VERT



Date: 16.APR.2012 13:16:49

LOW CHANNEL RESTRICTED, AVERAGE, VERT



Date: 16.APR.2012 12:19:20

HARMONICS AND SPURIOUS EMISSIONS

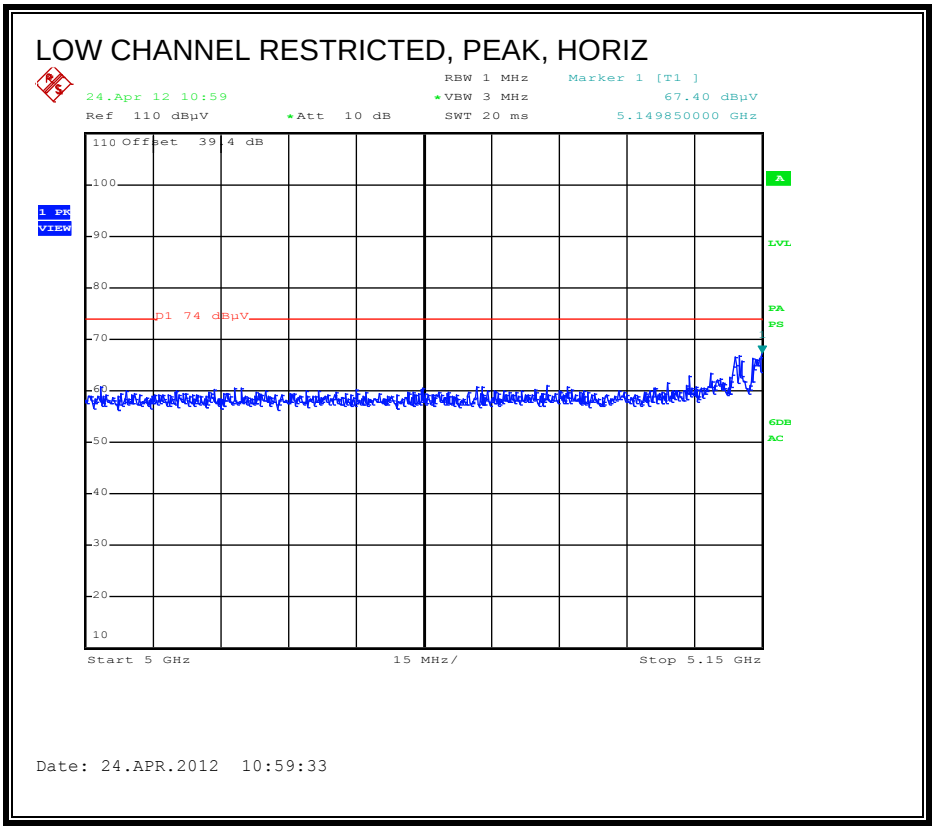
Covered by testing to 11n HT20 3x3 CCD MCS0

9.2.2. TX ABOVE 1 GHz, 802.11n HT20, STBC MCS0, 2TX, 5.2 GHz BAND

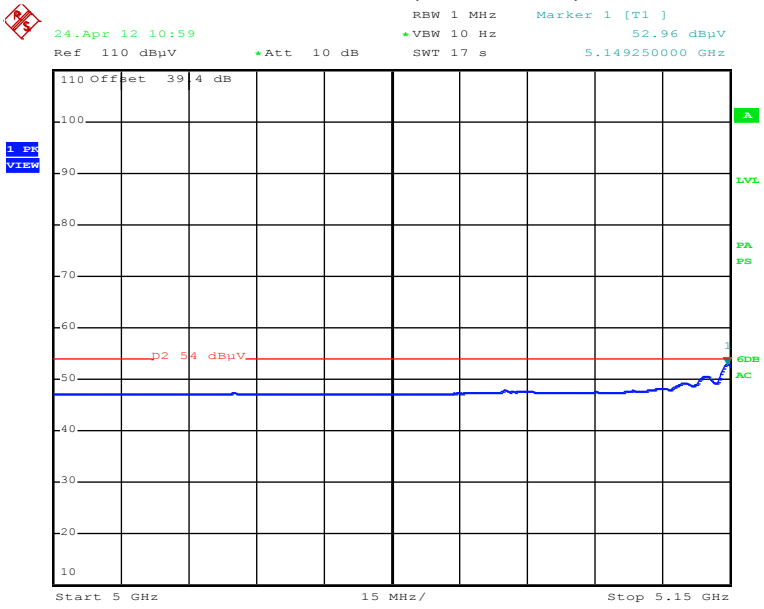
Covered by testing to 11n HT20 3x3 CCD MCS0

9.2.3. TX ABOVE 1 GHz, 802.11n HT20, CDD MCS0, 3TX, 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

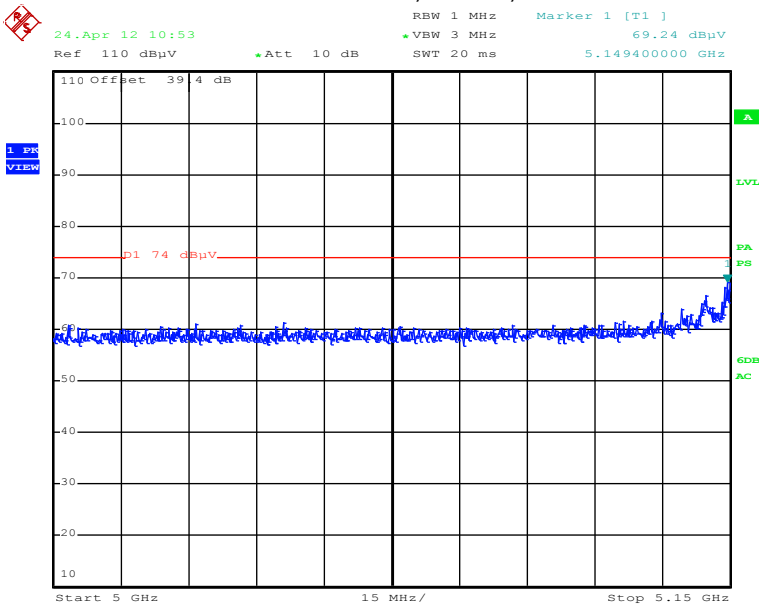


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

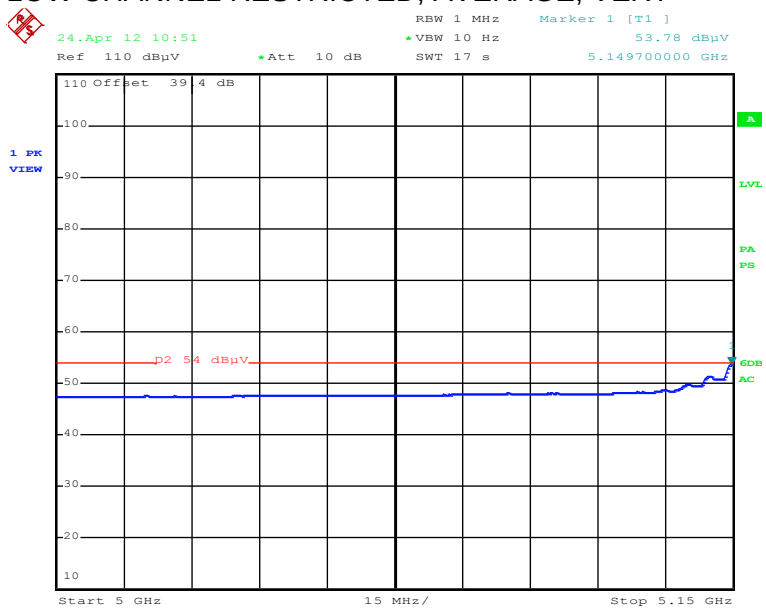


Date: 24.APR.2012 10:59:00

LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



Date: 24.APR.2012 10:51:54

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/10/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT20 5.2GHz 3x3 CDD

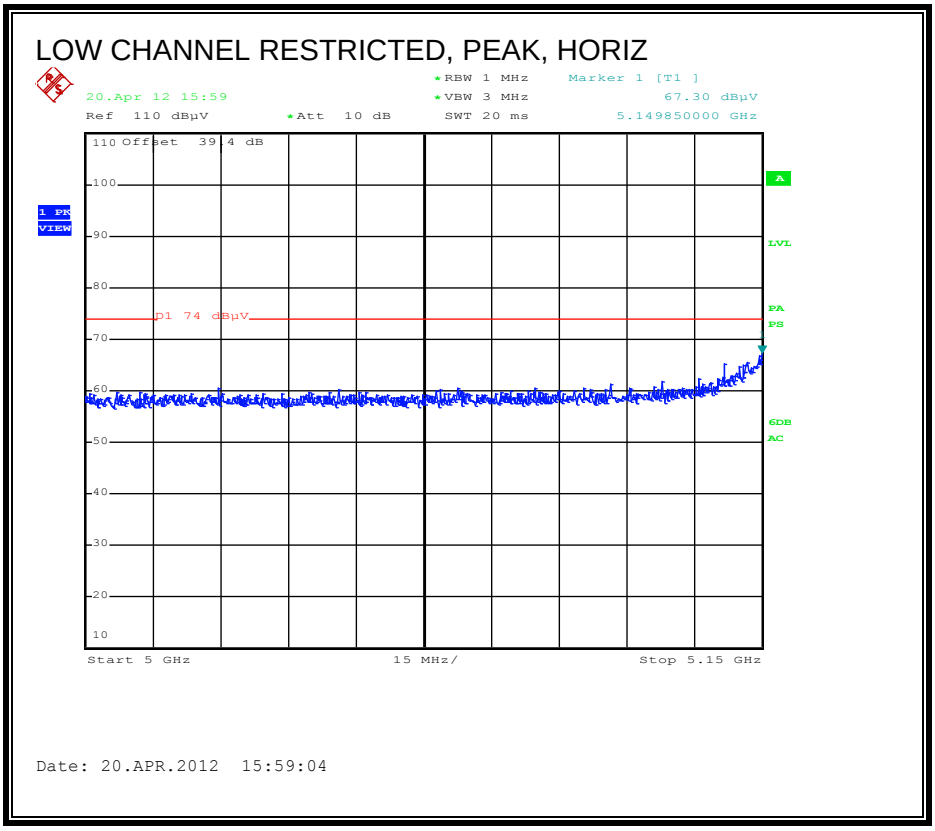
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin 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
Low Channel: 5180 MHz													
15.540	3.0	35.8	39.1	12.5	-32.3	0.0	0.0	55.0	74.0	-19.0	H	P	
15.540	3.0	22.9	39.1	12.5	-32.3	0.0	0.0	42.1	54.0	-11.9	H	A	
15.540	3.0	35.7	39.1	12.5	-32.3	0.0	0.0	55.0	74.0	-19.0	V	P	
15.540	3.0	24.5	39.1	12.5	-32.3	0.0	0.0	43.8	54.0	-10.2	V	A	
Mid Channel: 5200 MHz													
15.600	3.0	34.5	38.9	12.5	-32.3	0.0	0.0	53.6	74.0	-20.4	H	P	
15.600	3.0	22.8	38.9	12.5	-32.3	0.0	0.0	42.0	54.0	-12.0	H	A	
15.600	3.0	35.4	38.9	12.5	-32.3	0.0	0.0	54.5	74.0	-19.5	V	P	
15.600	3.0	22.8	38.9	12.5	-32.3	0.0	0.0	41.9	54.0	-12.1	V	A	
High Channel: 5240 MHz													
15.720	3.0	34.8	38.5	12.6	-32.2	0.0	0.0	53.7	74.0	-20.3	H	P	
15.720	3.0	22.5	38.5	12.6	-32.2	0.0	0.0	41.4	54.0	-12.6	H	A	
15.720	3.0	34.3	38.5	12.6	-32.2	0.0	0.0	53.1	74.0	-20.9	V	P	
15.720	3.0	22.5	38.5	12.6	-32.2	0.0	0.0	41.4	54.0	-12.6	V	A	

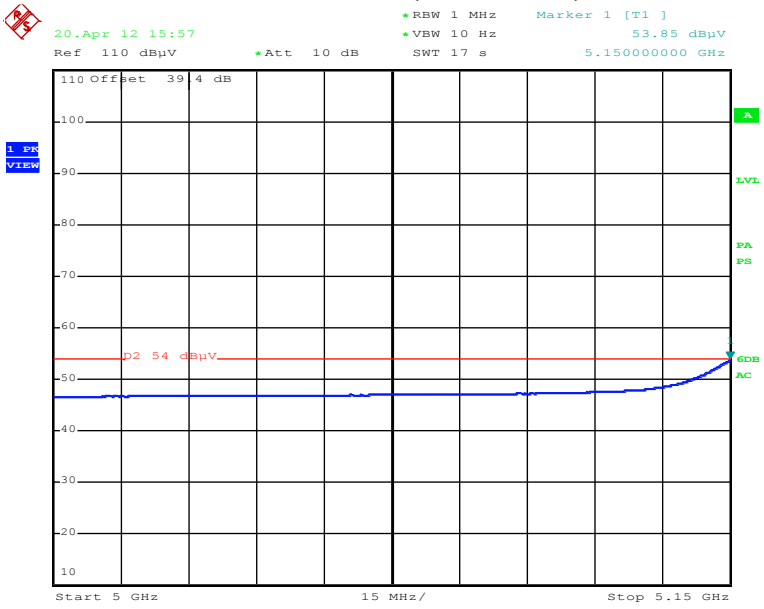
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.2.4. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 1TX, 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

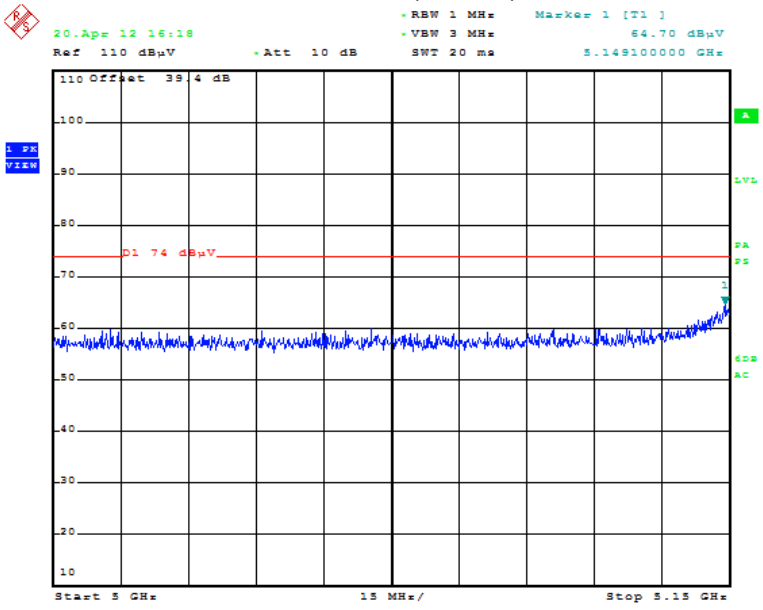


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

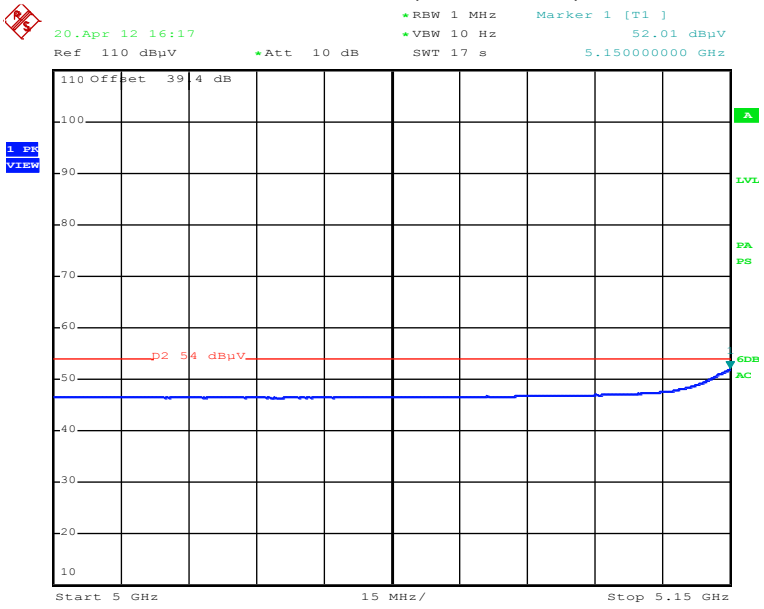


Date: 20.APR.2012 15:57:57

LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



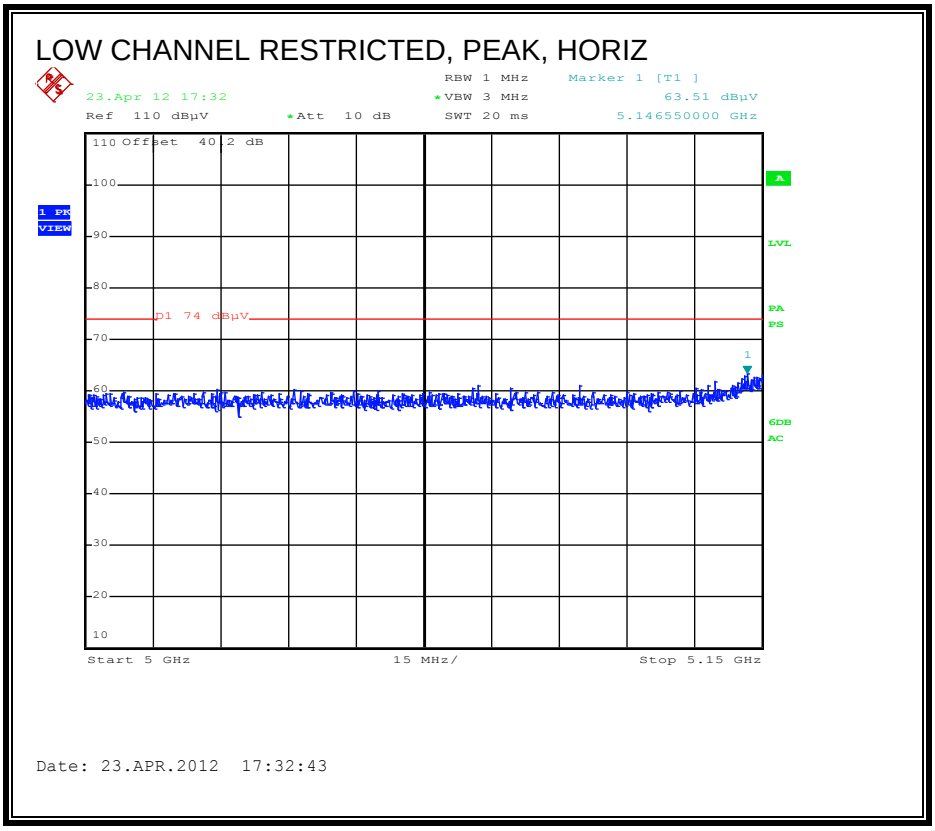
Date: 20.APR.2012 16:17:40

HARMONICS AND SPURIOUS EMISSIONS

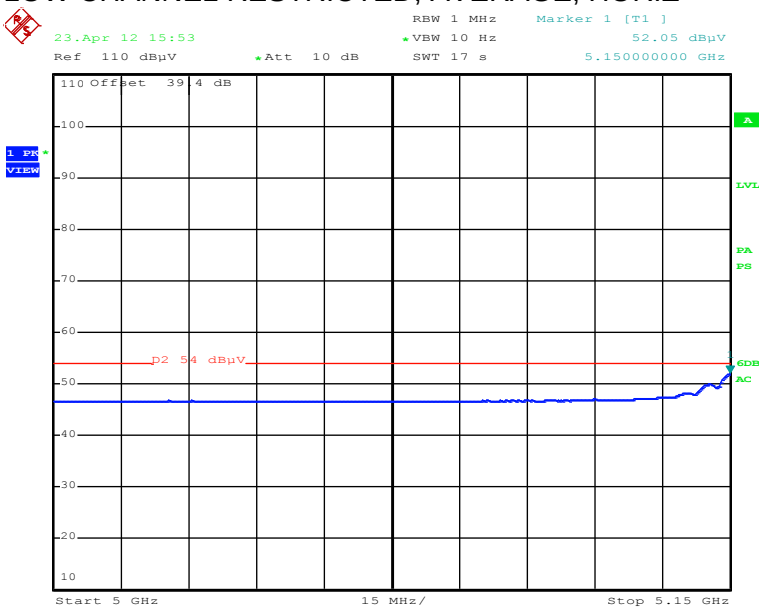
Covered by testing to 11n HT40 CDD MCS0

9.2.5. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 3TX, 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

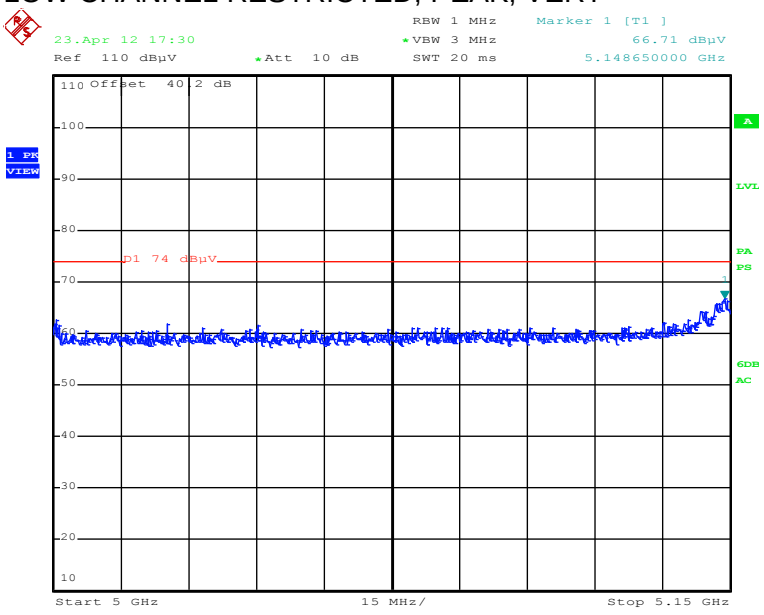


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

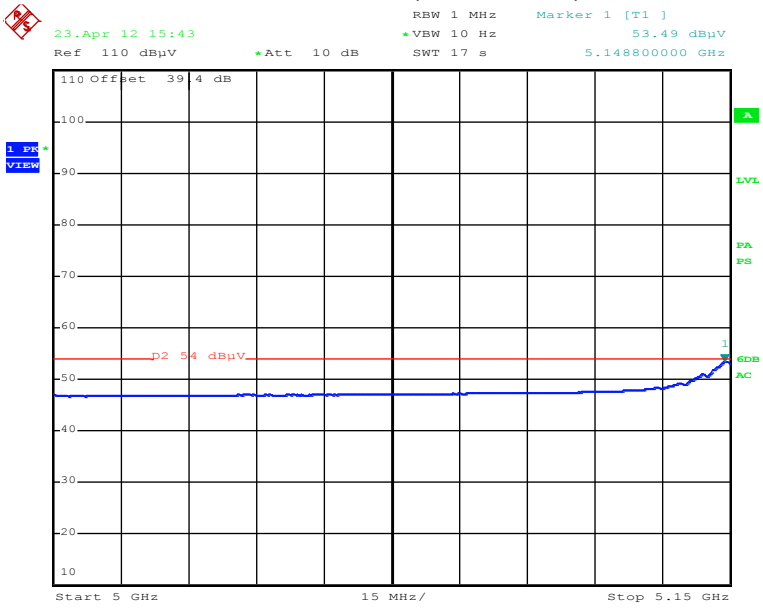


Date: 23.APR.2012 15:53:19

LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



Date: 23.APR.2012 15:43:34

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/11/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT40 5.2GHz 3x3 CDD

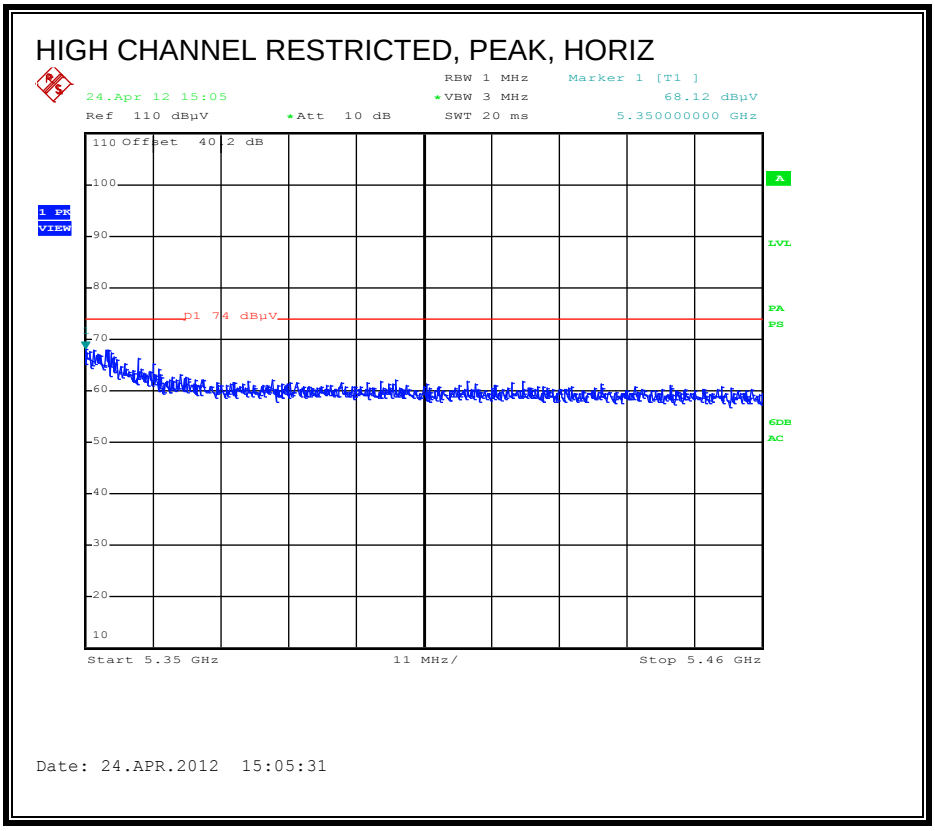
f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

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
Low Channel: 5190 MHz													
15.570	3.0	34.9	39.0	12.5	-32.3	0.0	0.7	54.9	74.0	-19.1	H	P	
15.570	3.0	22.8	39.0	12.5	-32.3	0.0	0.7	42.7	54.0	-11.3	H	A	
15.570	3.0	36.5	39.0	12.5	-32.3	0.0	0.7	56.5	74.0	-17.5	V	P	
15.570	3.0	24.2	39.0	12.5	-32.3	0.0	0.7	44.1	54.0	-9.9	V	A	
High Channel: 5230 MHz													
15.690	3.0	35.7	38.6	12.6	-32.3	0.0	0.7	55.3	74.0	-18.7	H	P	
15.690	3.0	22.7	38.6	12.6	-32.3	0.0	0.7	42.3	54.0	-11.7	H	A	
15.690	3.0	37.0	38.6	12.6	-32.3	0.0	0.7	56.7	74.0	-17.3	V	P	
15.690	3.0	24.8	38.6	12.6	-32.3	0.0	0.7	44.5	54.0	-9.6	V	A	

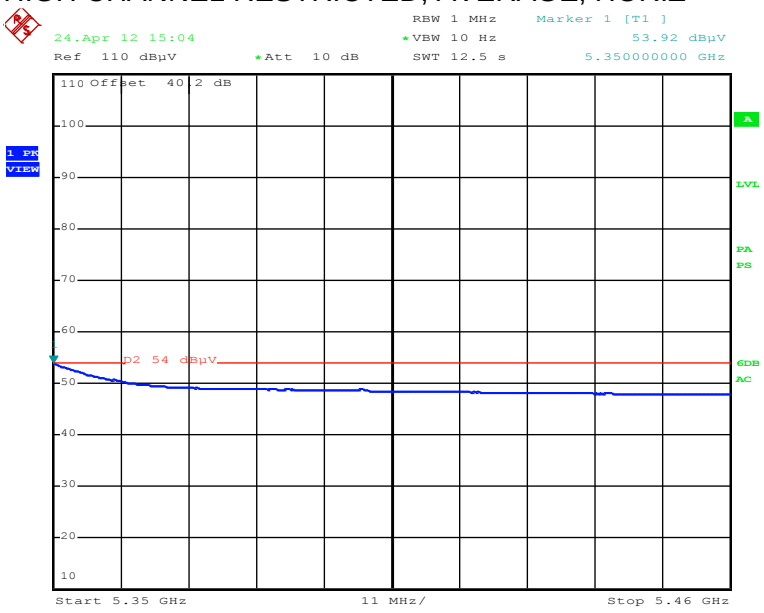
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.2.6. TX ABOVE 1 GHz, 802.11a, CDD MCS0, 1TX, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)

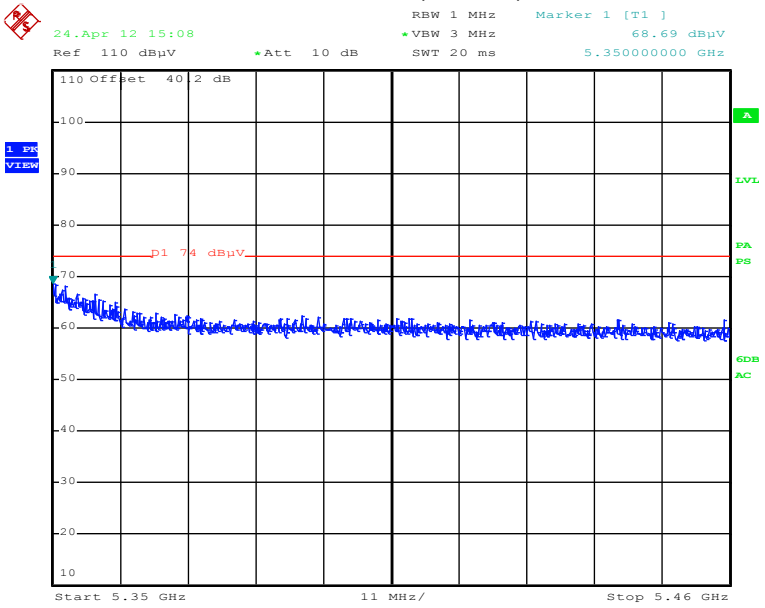


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



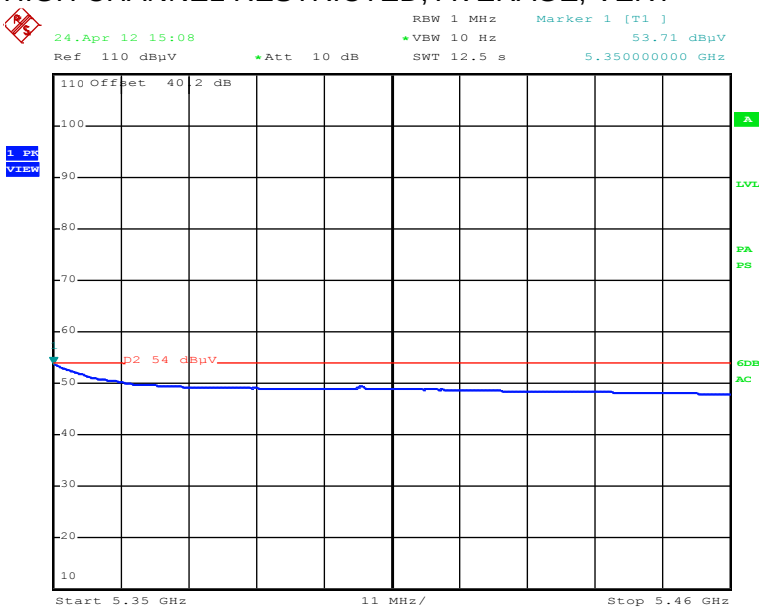
Date: 24.APR.2012 15:04:37

HIGH CHANNEL RESTRICTED, PEAK, VERT



Date: 24.APR.2012 15:08:59

HIGH CHANNEL RESTRICTED, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

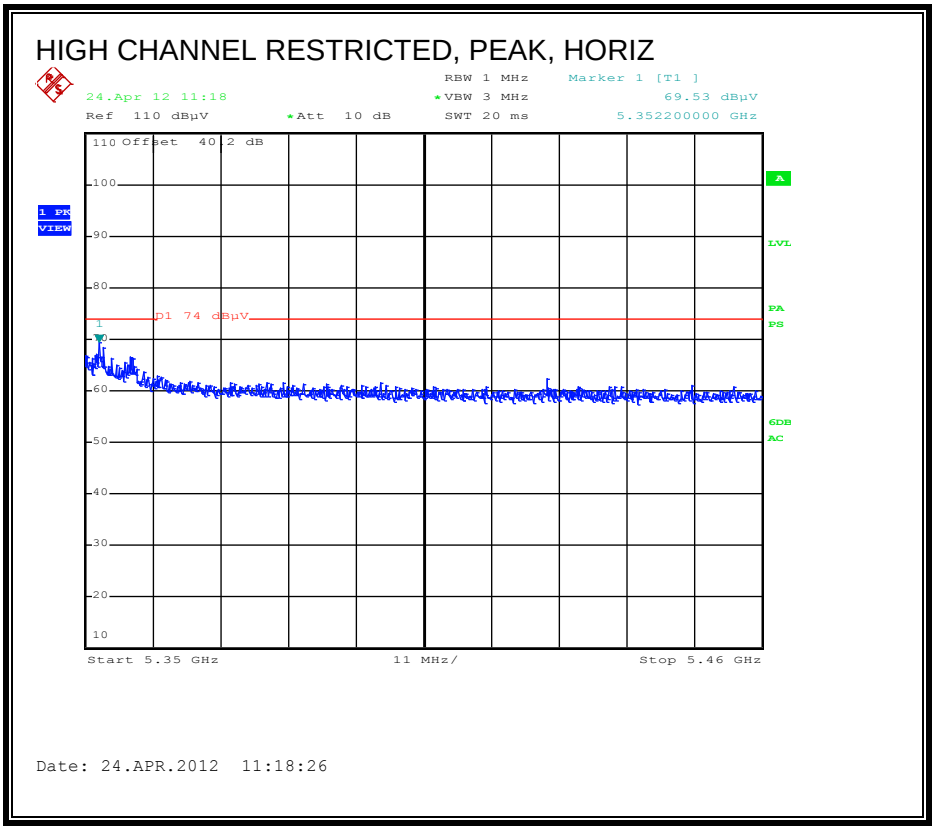
Covered by testing to 11n 3x3 HT20 CDD MCS0

9.2.7. TX ABOVE 1 GHz, 802.11n HT20, STBC MCS0, 2TX, 5.3 GHz BAND

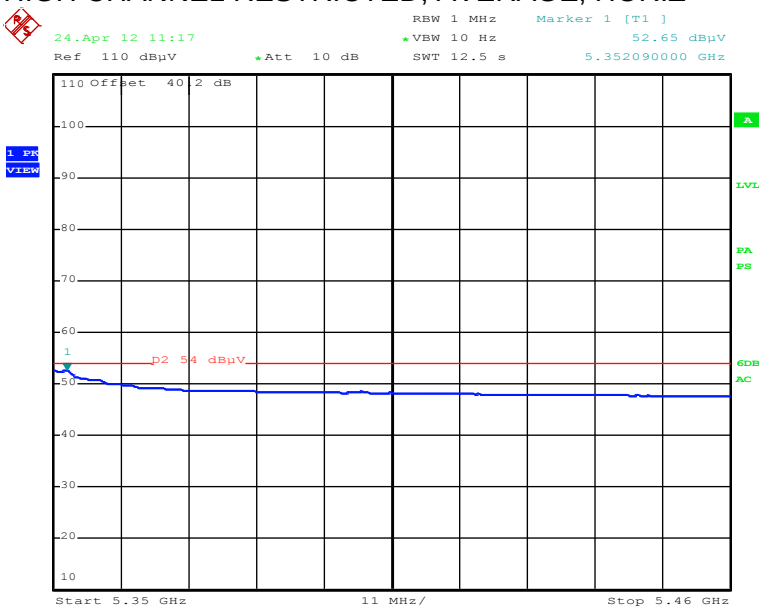
Covered by testing to 11n 3x3 HT20 CDD MCS0

9.2.8. TX ABOVE 1 GHz, 802.11n HT20, CDD MCS0, 3TX, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)

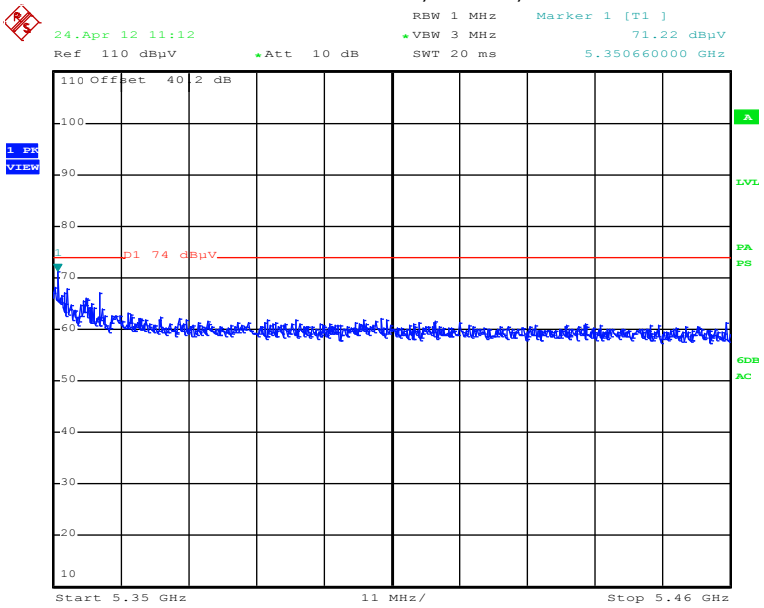


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

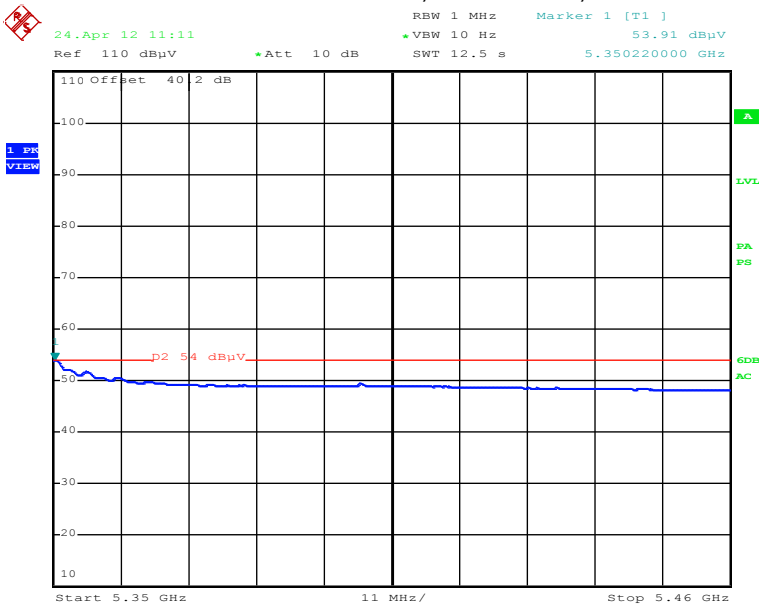


Date: 24.APR.2012 11:17:50

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



Date: 24.APR.2012 11:11:40

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/10/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT20 5.2GHz 3x3 CDD

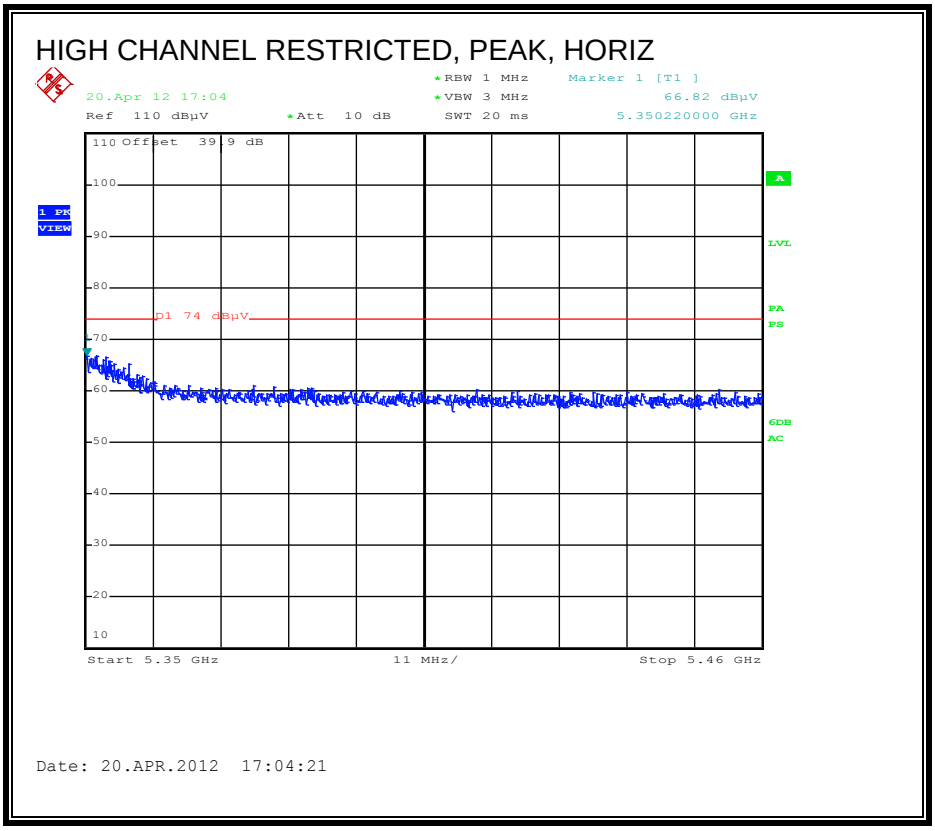
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin 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
Low Channel: 5260 MHz													
15.780	3.0	34.8	38.3	12.6	-32.2	0.0	0.0	53.5	74.0	-20.5	H	P	
15.780	3.0	22.6	38.3	12.6	-32.2	0.0	0.0	41.3	54.0	-12.7	H	A	
15.780	3.0	36.4	38.3	12.6	-32.2	0.0	0.0	55.1	74.0	-18.9	V	P	
15.780	3.0	24.3	38.3	12.6	-32.2	0.0	0.0	43.0	54.0	-11.0	V	A	
Mid Channel: 5300 MHz													
10.600	3.0	47.6	38.1	9.7	-33.9	0.0	0.0	61.5	74.0	-12.5	H	P	
10.600	3.0	34.1	38.1	9.7	-33.9	0.0	0.0	47.9	54.0	-6.1	H	A	
15.900	3.0	37.3	37.9	12.7	-32.2	0.0	0.0	55.7	74.0	-18.3	H	P	
15.900	3.0	25.1	37.9	12.7	-32.2	0.0	0.0	43.5	54.0	-10.5	H	A	
10.600	3.0	48.9	38.1	9.7	-33.9	0.0	0.0	62.7	74.0	-11.3	V	P	
10.600	3.0	35.3	38.1	9.7	-33.9	0.0	0.0	49.1	54.0	-4.9	V	A	
15.900	3.0	37.9	37.9	12.7	-32.2	0.0	0.0	56.3	74.0	-17.7	V	P	
15.900	3.0	25.6	37.9	12.7	-32.2	0.0	0.0	44.0	54.0	-10.0	V	A	
High Channel: 5320 MHz													
10.640	3.0	49.7	38.2	9.7	-33.9	0.0	0.0	63.7	74.0	-10.3	H	P	
10.640	3.0	33.6	38.2	9.7	-33.9	0.0	0.0	47.6	54.0	-6.4	H	A	
15.960	3.0	36.1	37.7	12.7	-32.2	0.0	0.0	54.3	74.0	-19.7	H	P	
15.960	3.0	24.3	37.7	12.7	-32.2	0.0	0.0	42.6	54.0	-11.4	H	A	
10.640	3.0	49.3	38.2	9.7	-33.9	0.0	0.0	63.3	74.0	-10.7	V	P	
10.640	3.0	35.9	38.2	9.7	-33.9	0.0	0.0	49.9	54.0	-4.1	V	A	
15.960	3.0	39.0	37.7	12.7	-32.2	0.0	0.0	57.3	74.0	-16.7	V	P	
15.960	3.0	26.5	37.7	12.7	-32.2	0.0	0.0	44.8	54.0	-9.2	V	A	

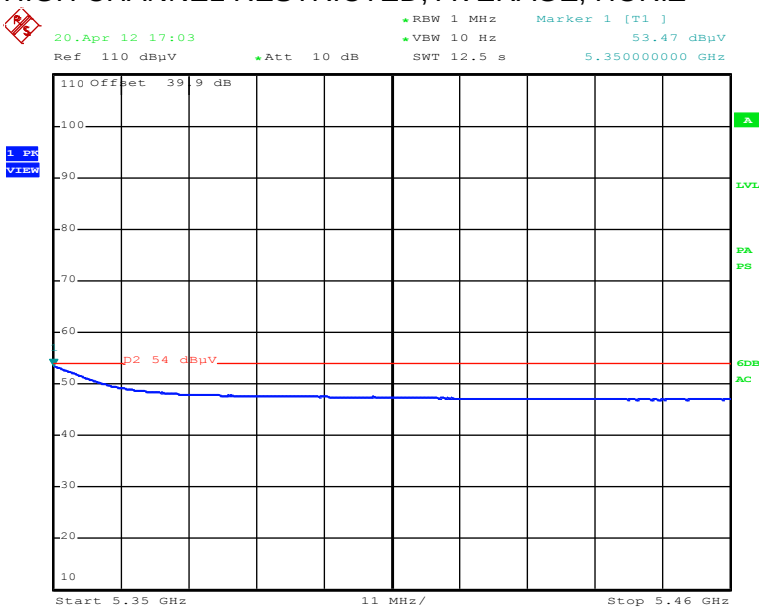
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.2.9. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 1TX, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)

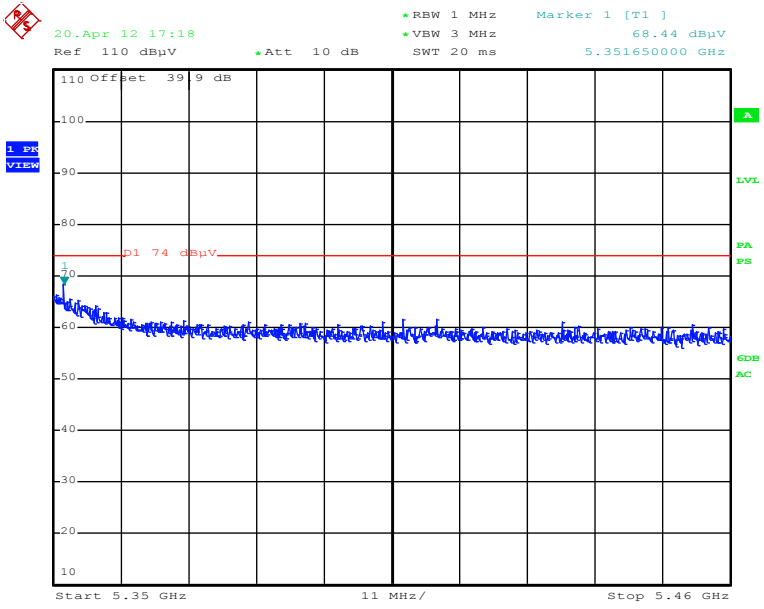


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

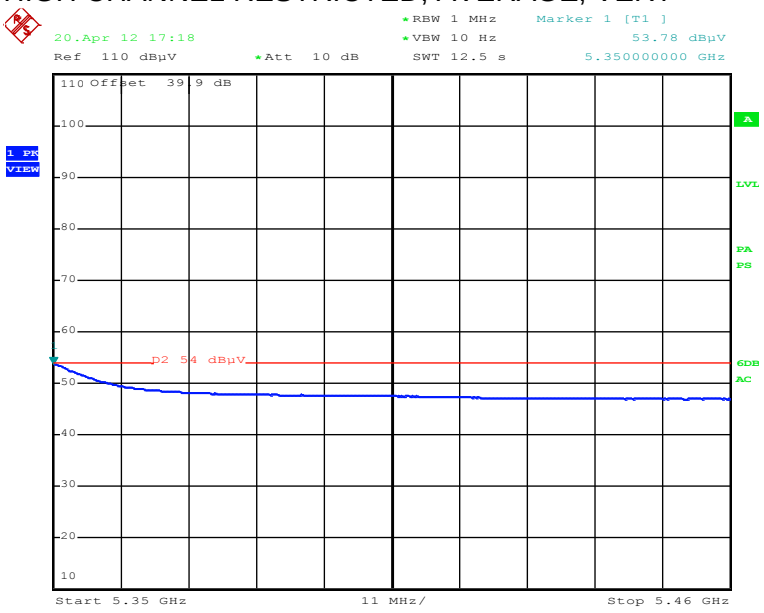


Date: 20.APR.2012 17:03:38

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT

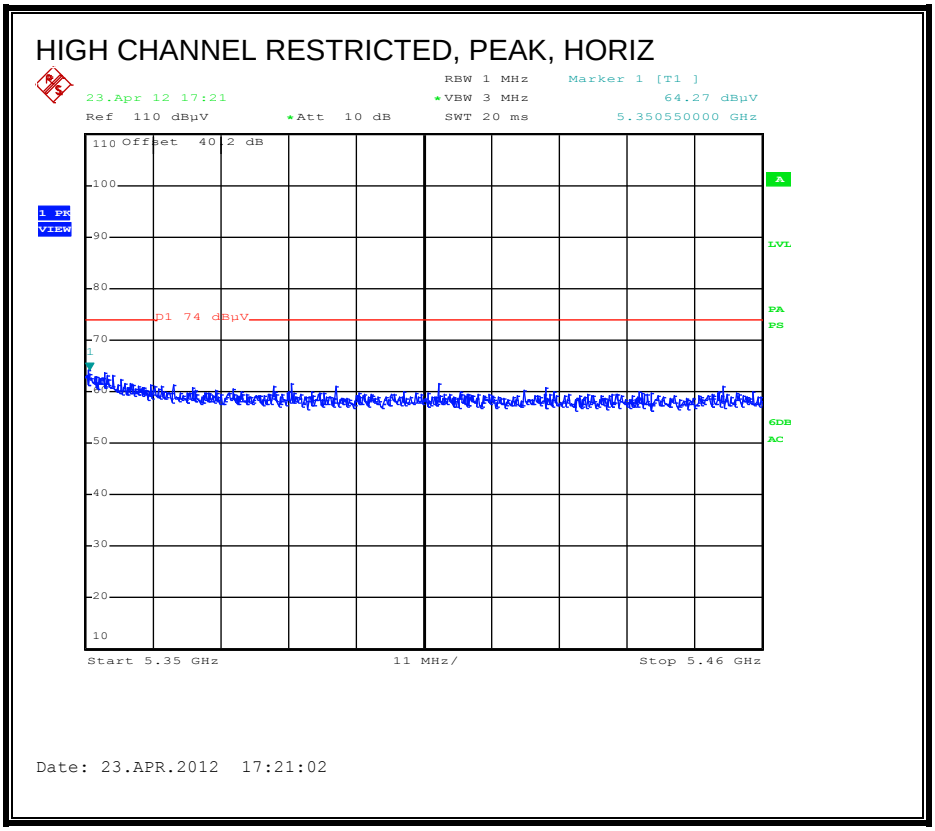


HARMONICS AND SPURIOUS EMISSIONS

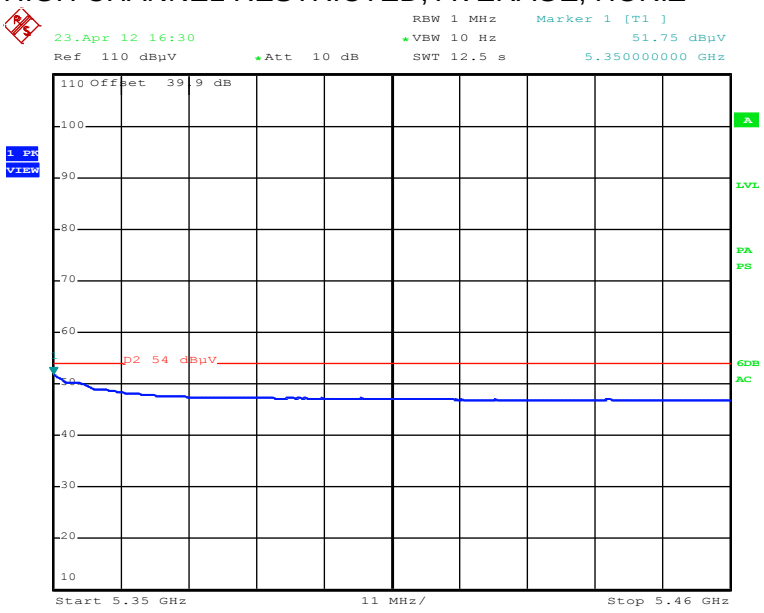
Covered by testing to 11n HT40 3x3 CDD MCS0

9.2.10. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 3TX, 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)

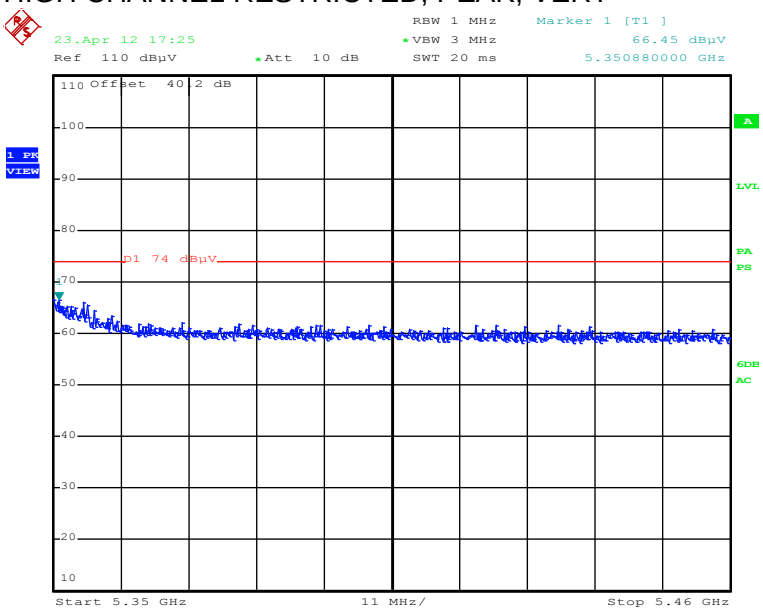


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

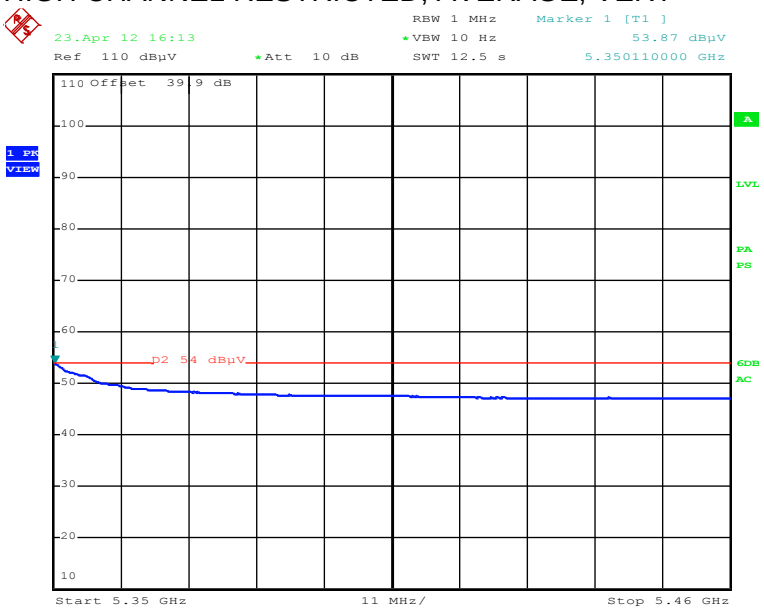


Date: 23.APR.2012 16:30:32

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVERAGE, VERT



Date: 23.APR.2012 16:13:26

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/11/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT40 5.3GHz 3x3 CDD

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

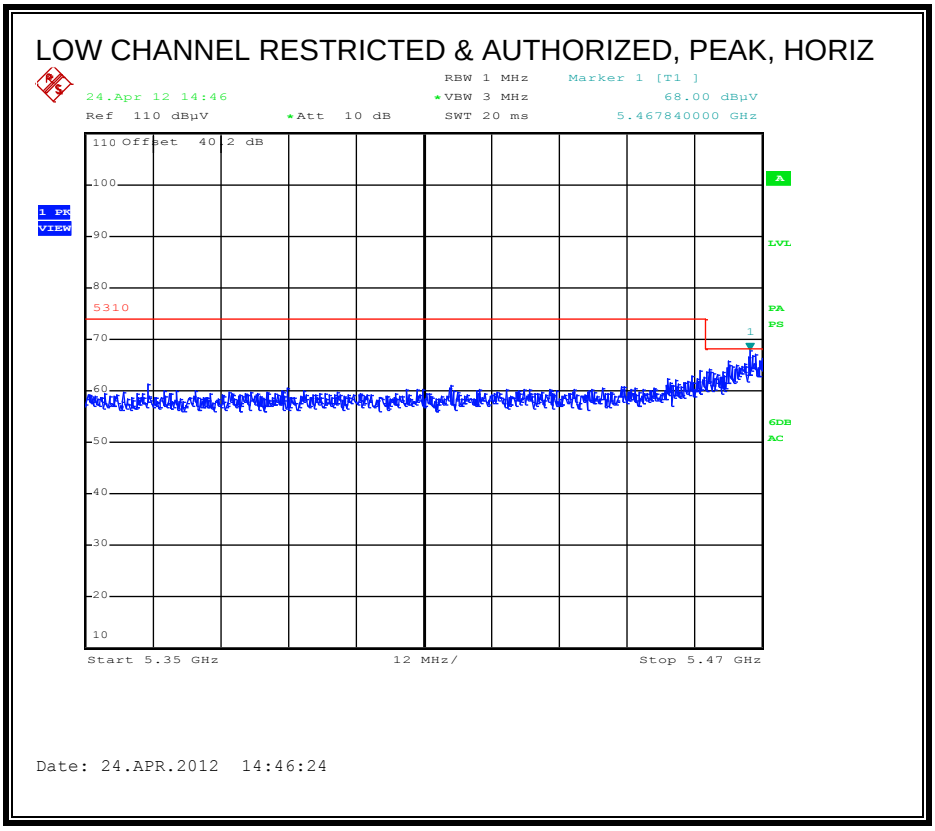
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

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
Low Channel: 5270 MHz													
15.810	3.0	39.9	38.2	12.6	-32.2	0.0	0.7	59.2	74.0	-14.8	H	P	
15.810	3.0	26.2	38.2	12.6	-32.2	0.0	0.7	45.5	54.0	-8.5	H	A	
15.810	3.0	38.9	38.2	12.6	-32.2	0.0	0.7	58.3	74.0	-15.7	V	P	
15.810	3.0	27.0	38.2	12.6	-32.2	0.0	0.7	46.3	54.0	-7.7	V	A	
High Channel: 5310 MHz													
10.620	3.0	44.1	38.1	9.7	-33.9	0.0	0.8	58.8	74.0	-15.2	H	P	
10.620	3.0	30.6	38.1	9.7	-33.9	0.0	0.8	45.3	54.0	-8.7	H	A	
15.930	3.0	34.1	37.8	12.7	-32.2	0.0	0.7	53.2	74.0	-20.8	H	P	
15.930	3.0	22.0	37.8	12.7	-32.2	0.0	0.7	41.1	54.0	-12.9	H	A	
10.620	3.0	44.4	38.1	9.7	-33.9	0.0	0.8	59.1	74.0	-14.9	V	P	
10.620	3.0	31.4	38.1	9.7	-33.9	0.0	0.8	46.1	54.0	-7.9	V	A	
15.930	3.0	37.1	37.8	12.7	-32.2	0.0	0.7	56.2	74.0	-17.8	V	P	
15.930	3.0	25.1	37.8	12.7	-32.2	0.0	0.7	44.2	54.0	-9.8	V	A	

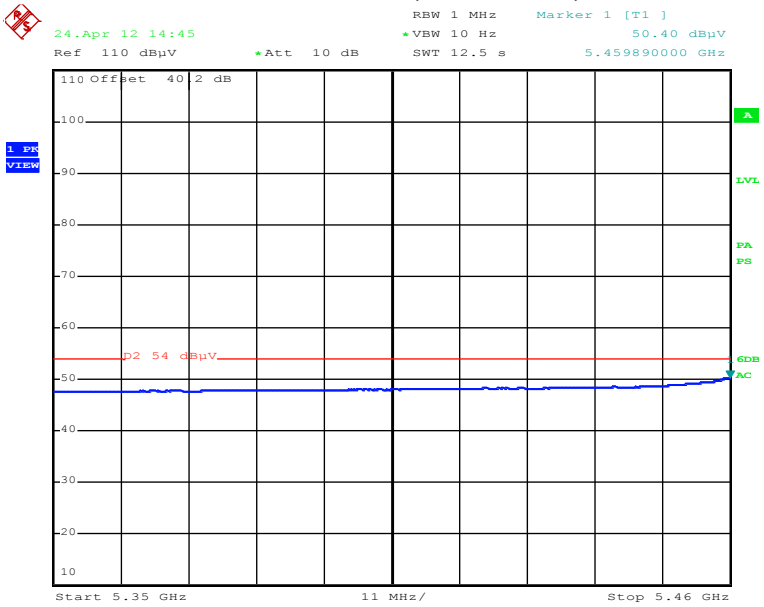
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.2.11. TX ABOVE 1 GHz, 802.11a, CDD MCS0, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

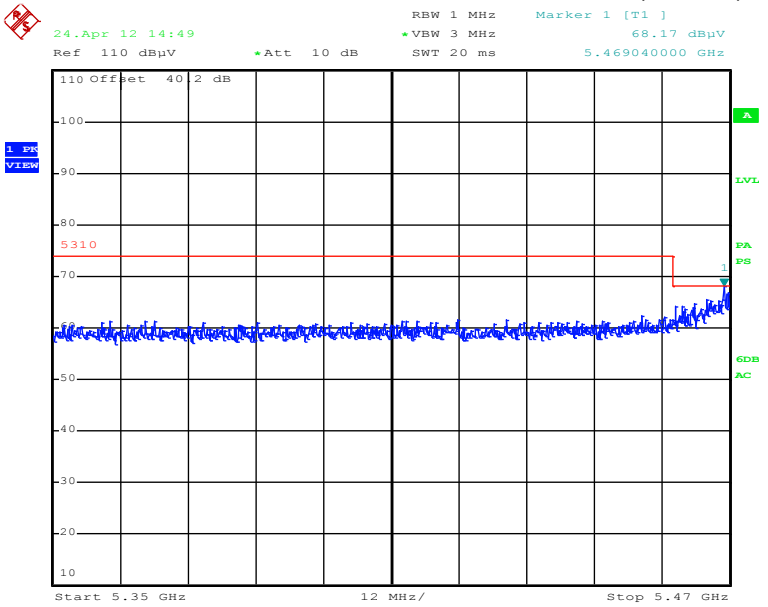


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



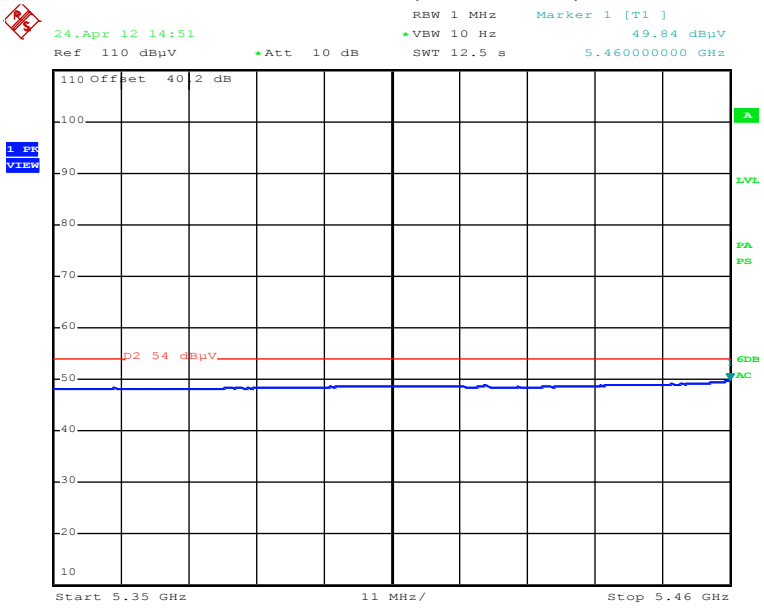
Date: 24.APR.2012 14:45:05

LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



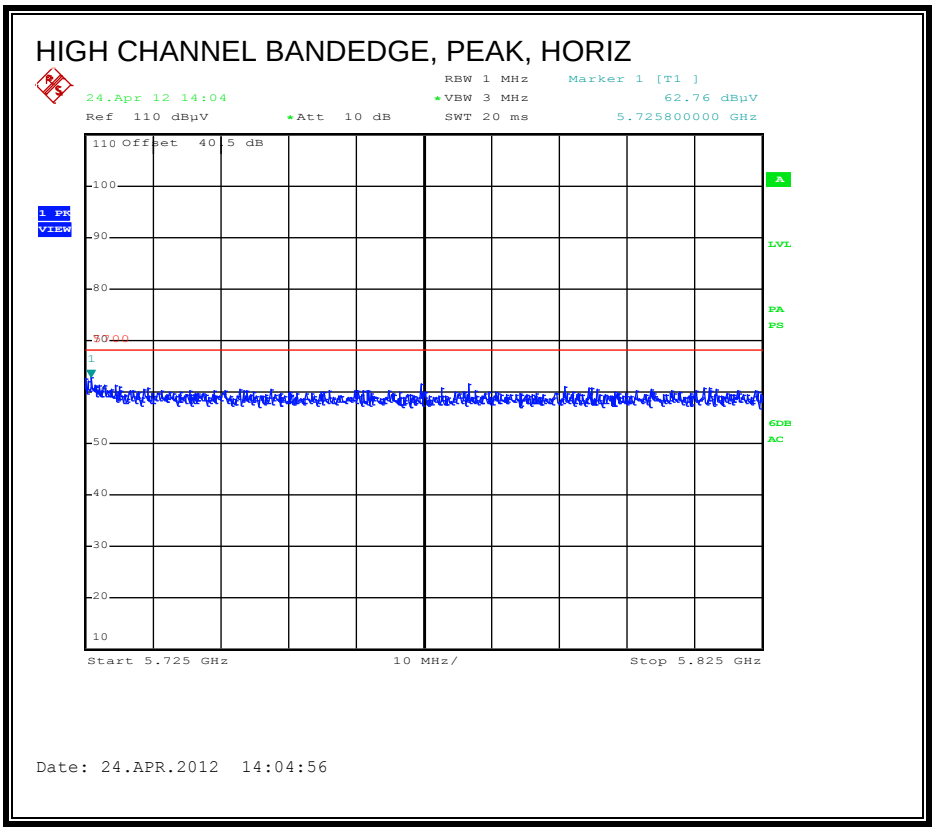
Date: 24.APR.2012 14:49:30

LOW CHANNEL RESTRICTED, AVERAGE, VERT

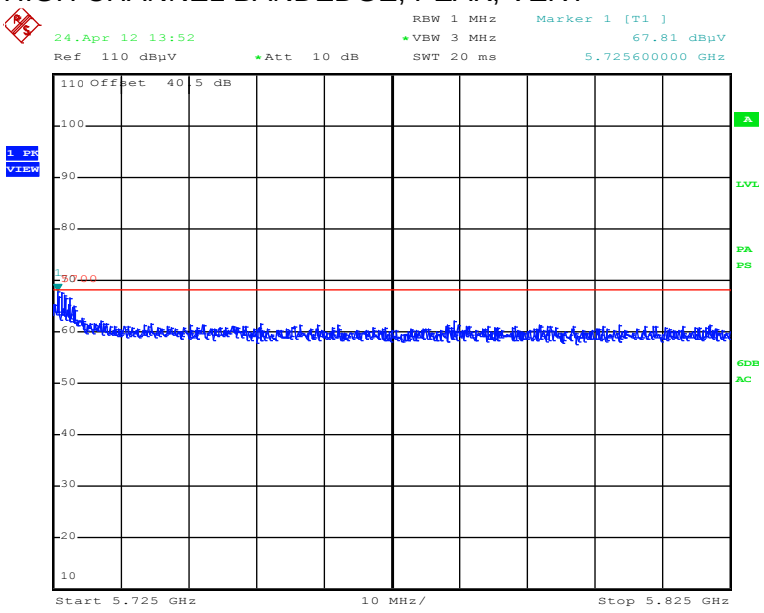


Date: 24.APR.2012 14:51:02

AUTHORIZED BANDEDGE (HIGH CHANNEL)



HIGH CHANNEL BANDEDGE, PEAK, VERT



Date: 24.APR.2012 13:52:43

HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CDD MCS0

9.2.12. TX ABOVE 1 GHz, 802.11n HT20, CDD MCS0, 2TX, 5.6 GHz BAND

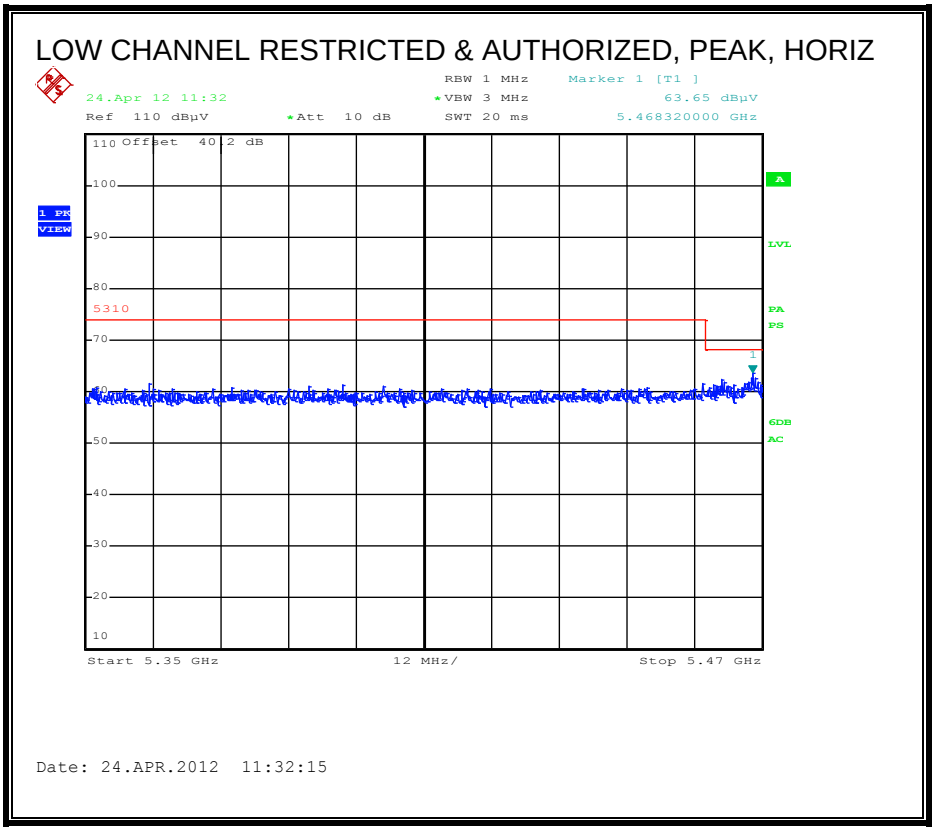
Covered by testing to 11n HT20 3x3 CDD MCS0

9.2.13. TX ABOVE 1 GHz, 802.11n HT20, STBC MCS0, 2TX, 5.6 GHz BAND

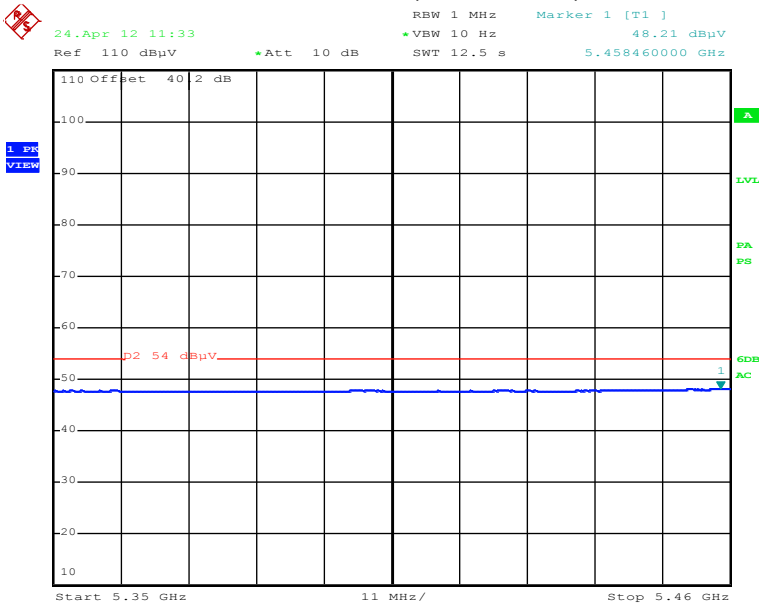
Covered by testing to 11n HT20 3x3 CDD MCS0

9.2.14. TX ABOVE 1 GHz, 802.11n HT20, CDD MCS0, 3TX, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

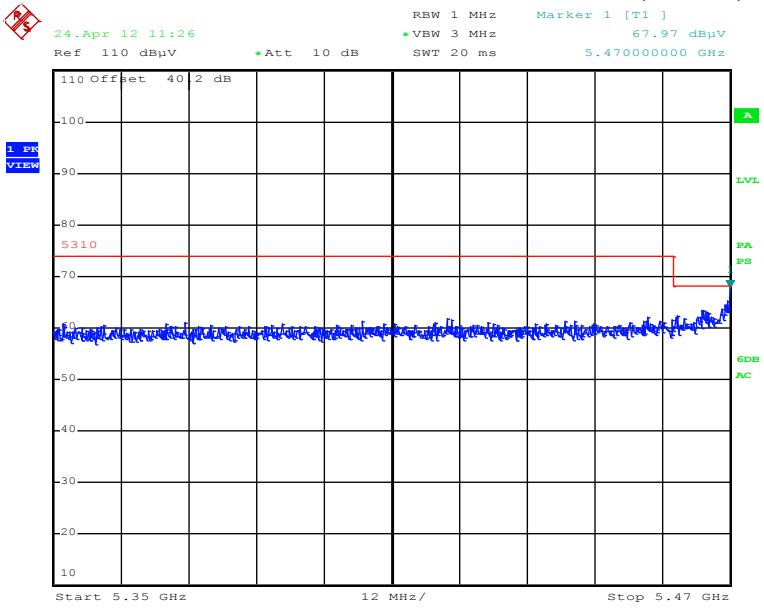


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



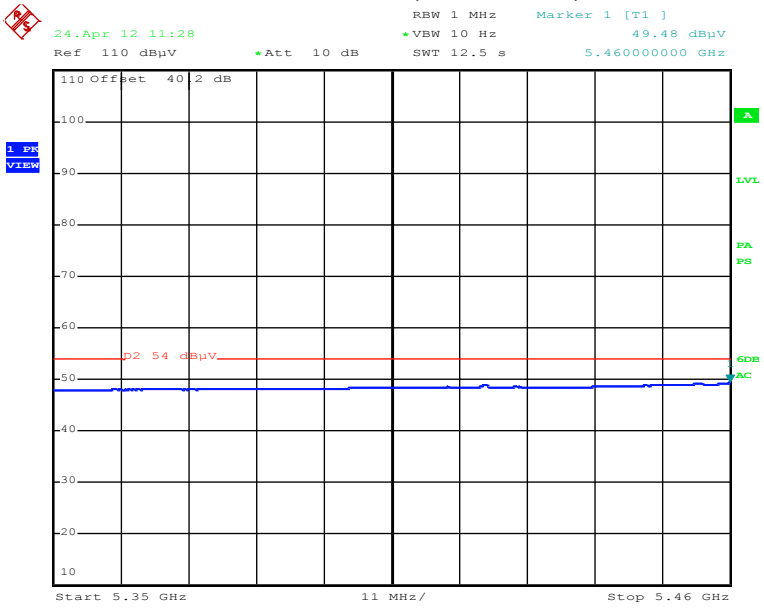
Date: 24.APR.2012 11:33:37

LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



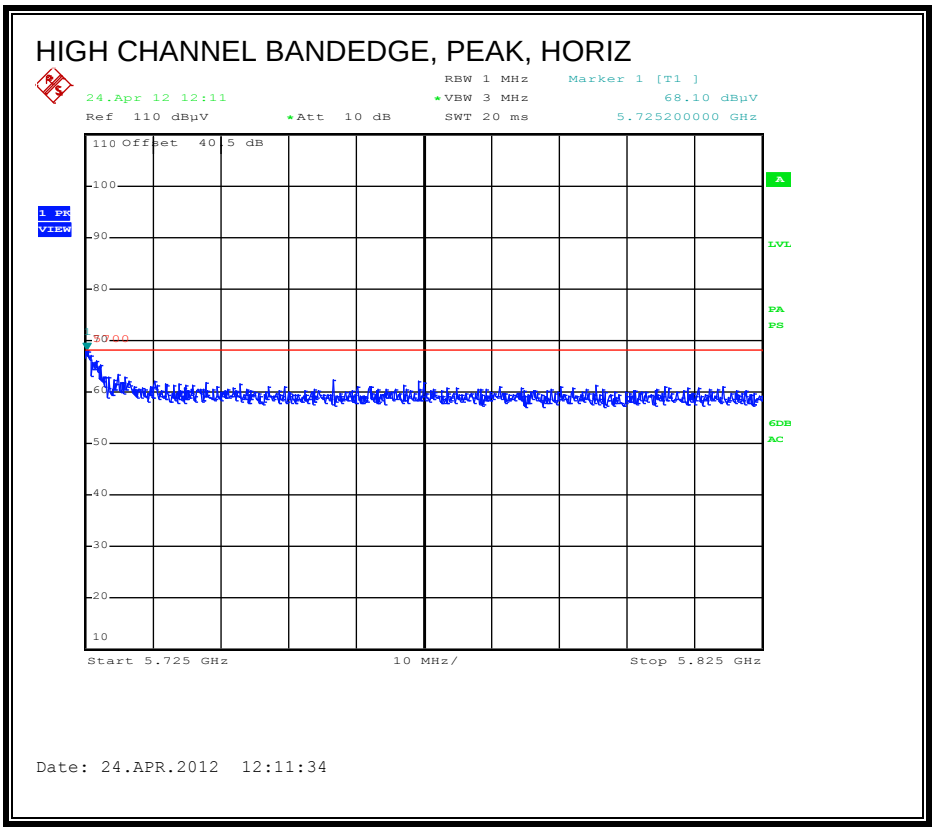
Date: 24.APR.2012 11:26:59

LOW CHANNEL RESTRICTED, AVERAGE, VERT

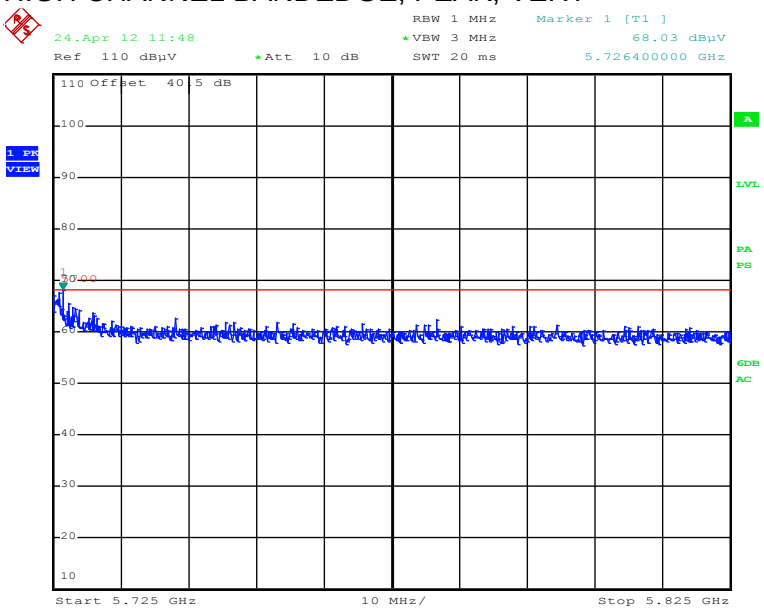


Date: 24.APR.2012 11:28:41

AUTHORIZED BANDEDGE (HIGH CHANNEL)



HIGH CHANNEL BANDEDGE, PEAK, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/11/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT20 5.5GHz 3x3 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		

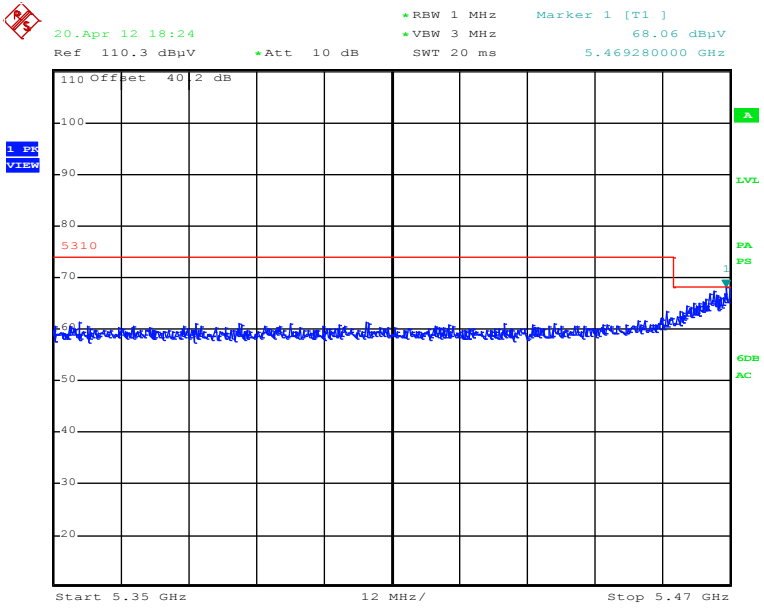
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 5500 MHz													
11.000	3.0	45.1	38.3	10.1	-33.5	0.0	0.7	60.7	74.0	-13.3	H	P	
11.000	3.0	31.0	38.3	10.1	-33.5	0.0	0.7	46.7	54.0	-7.3	H	A	
11.000	3.0	46.6	38.3	10.1	-33.5	0.0	0.7	62.3	74.0	-11.7	V	P	
11.000	3.0	33.4	38.3	10.1	-33.5	0.0	0.7	49.1	54.0	-4.9	V	A	
Mid Channel: 5580 MHz													
11.160	3.0	42.9	38.5	10.2	-33.3	0.0	0.7	59.1	74.0	-14.9	H	P	
11.160	3.0	30.1	38.5	10.2	-33.3	0.0	0.7	46.3	54.0	-7.7	H	A	
11.160	3.0	47.1	38.5	10.2	-33.3	0.0	0.7	63.2	74.0	-10.8	V	P	
11.160	3.0	34.7	38.5	10.2	-33.3	0.0	0.7	50.9	54.0	-3.1	V	A	
High Channel: 5700 MHz													
11.400	3.0	41.4	38.7	10.4	-33.0	0.0	0.7	58.3	74.0	-15.7	H	P	
11.400	3.0	27.7	38.7	10.4	-33.0	0.0	0.7	44.6	54.0	-9.4	H	A	
11.400	3.0	44.5	38.7	10.4	-33.0	0.0	0.7	61.4	74.0	-12.6	V	P	
11.400	3.0	32.1	38.7	10.4	-33.0	0.0	0.7	49.0	54.0	-5.0	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.2.15. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 1TX, 5.6 GHz BAND

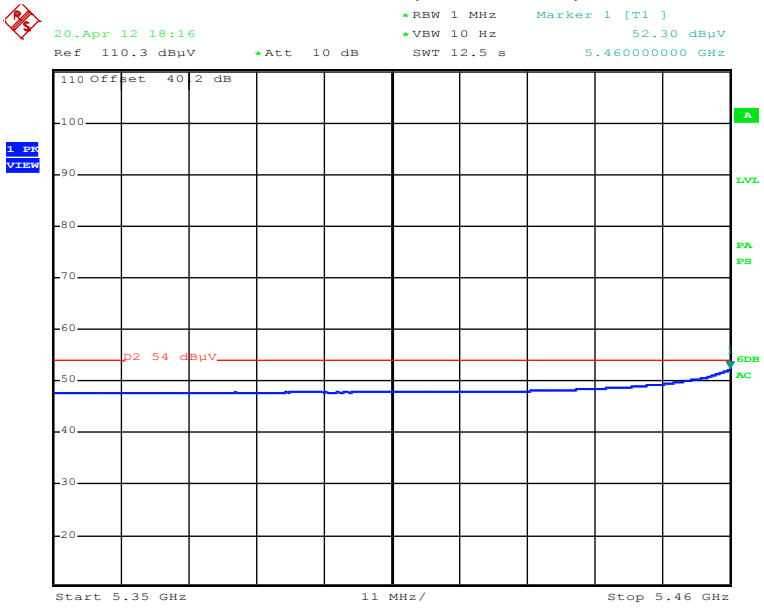
RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, HORIZ



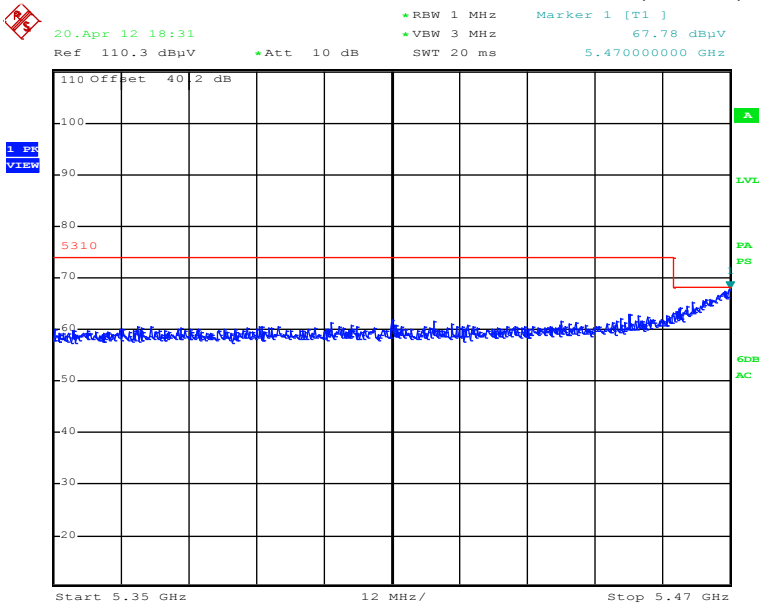
Date: 20.APR.2012 18:24:25

LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



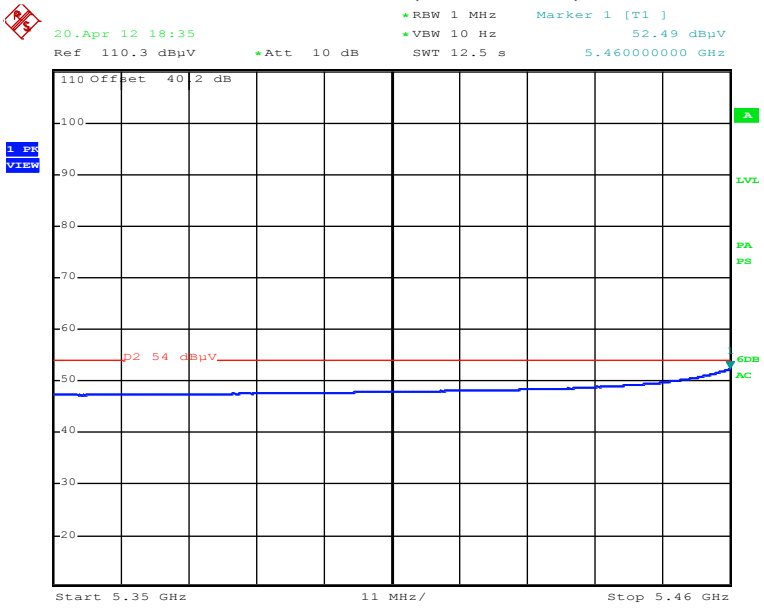
Date: 20.APR.2012 18:16:20

LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



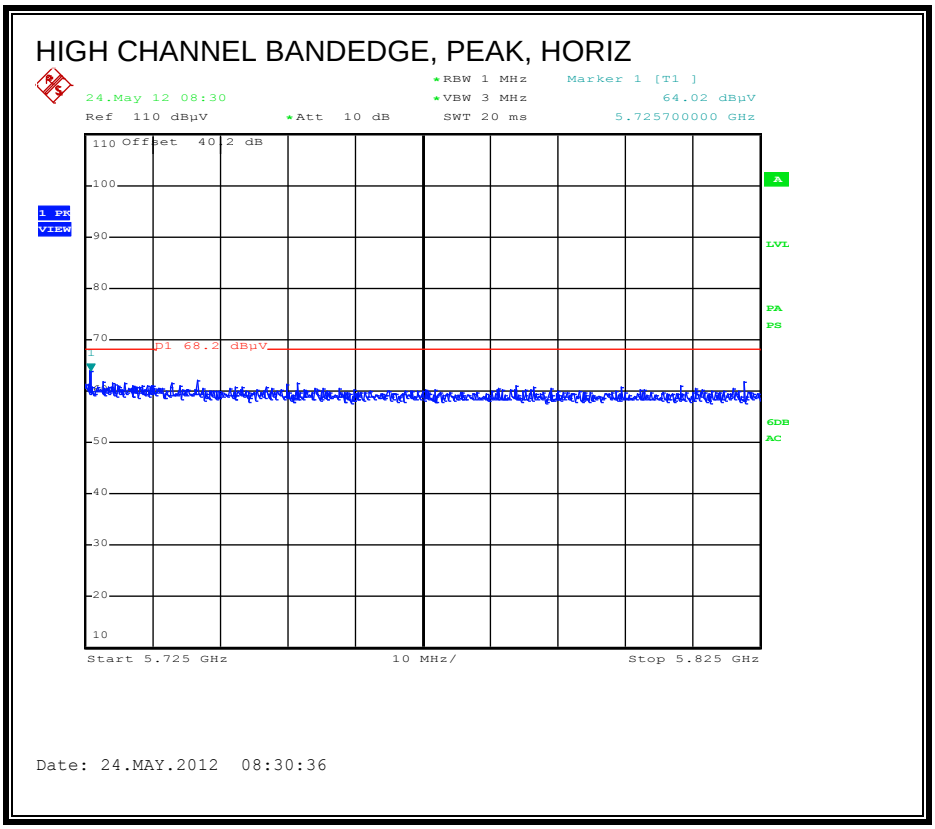
Date: 20.APR.2012 18:31:59

LOW CHANNEL RESTRICTED, AVERAGE, VERT

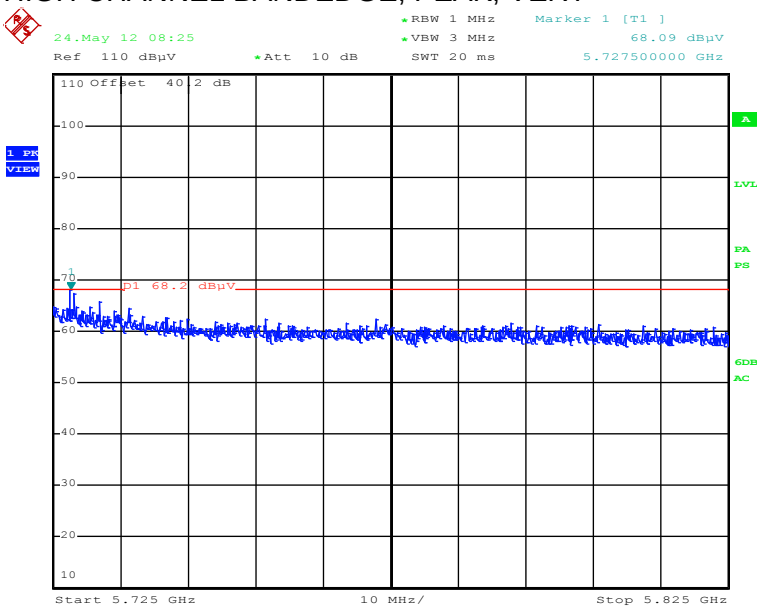


Date: 20.APR.2012 18:35:25

AUTHORIZED BANDEDGE (HIGH CHANNEL)



HIGH CHANNEL BANDEDGE, PEAK, VERT



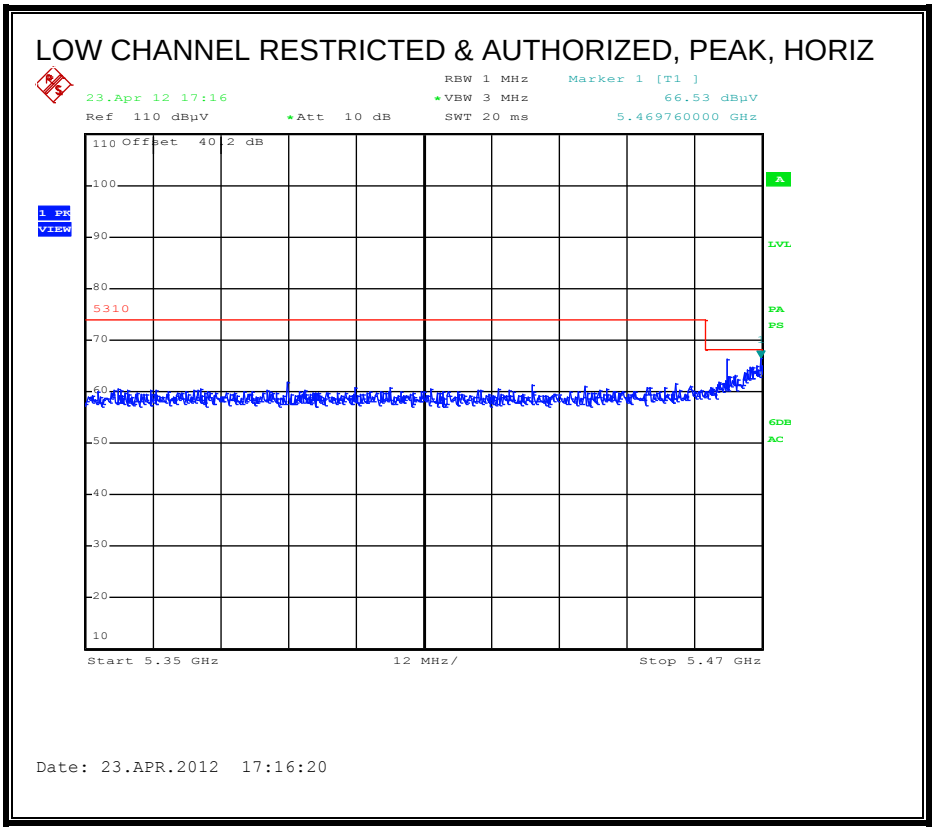
Date: 24.MAY.2012 08:25:07

HARMONICS AND SPURIOUS EMISSIONS

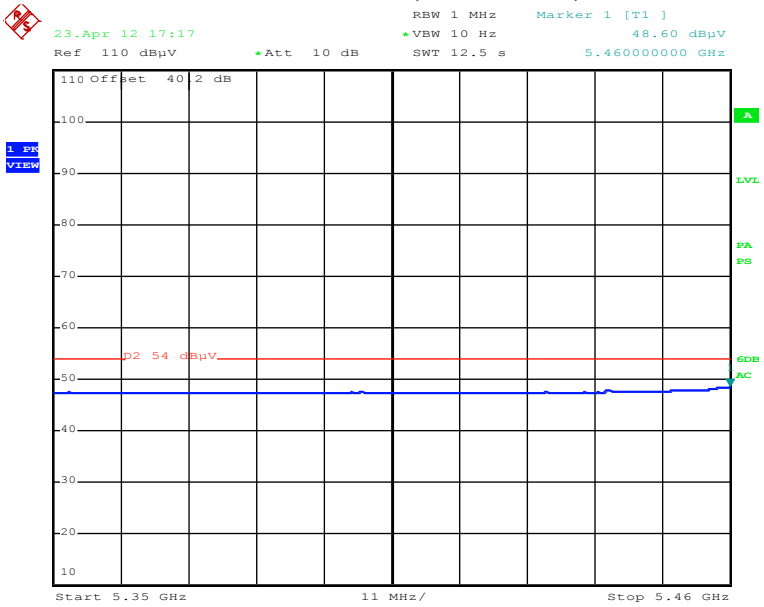
Covered by testing to 11n HT40 3x3 CDD MCS0

9.2.16. TX ABOVE 1 GHz, 802.11n HT40, CDD MCS0, 3TX, 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

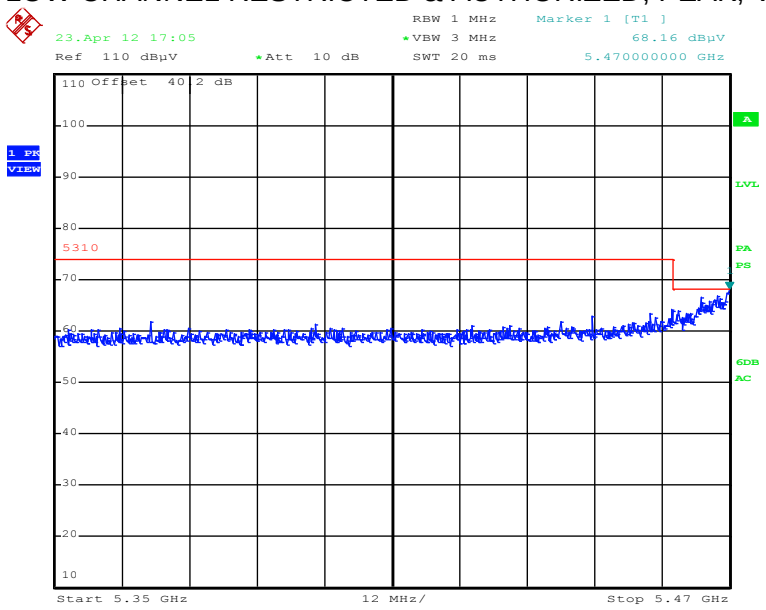


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



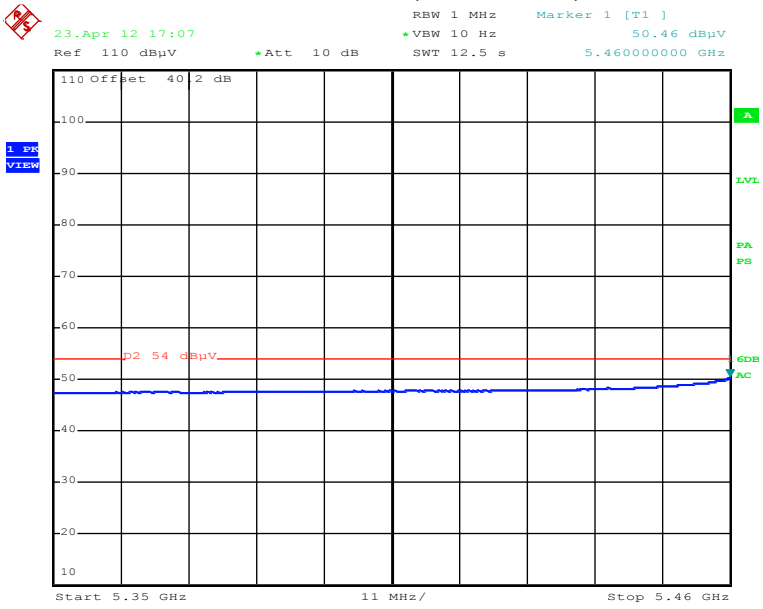
Date: 23.APR.2012 17:17:23

LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT



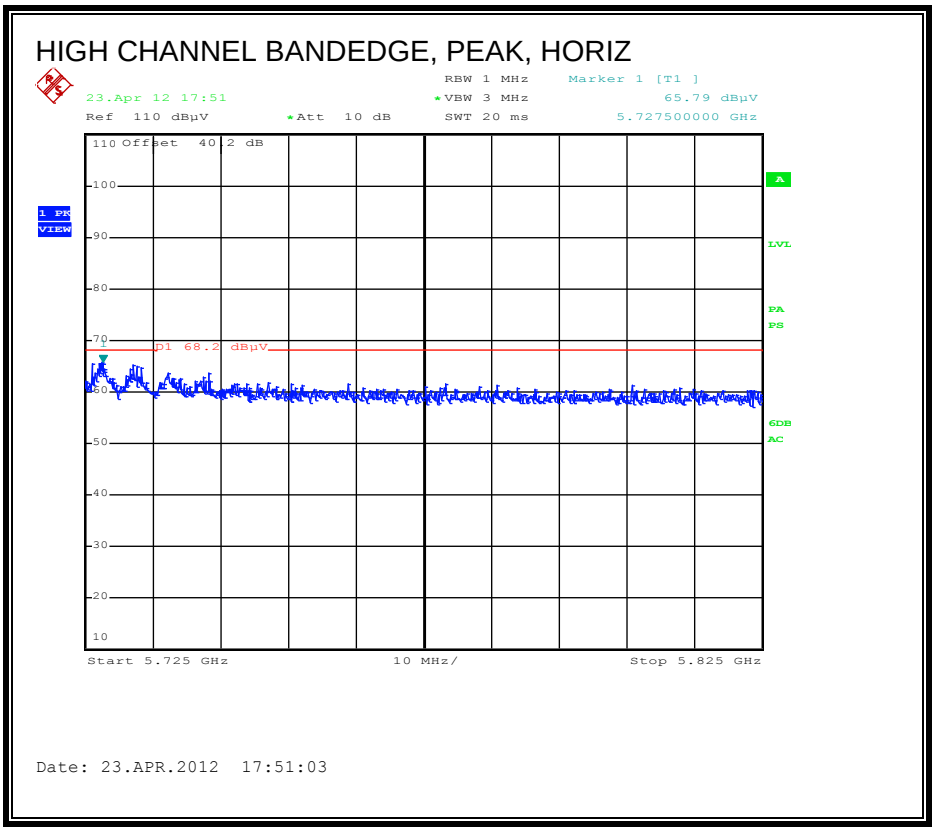
Date: 23.APR.2012 17:05:56

LOW CHANNEL RESTRICTED, AVERAGE, VERT

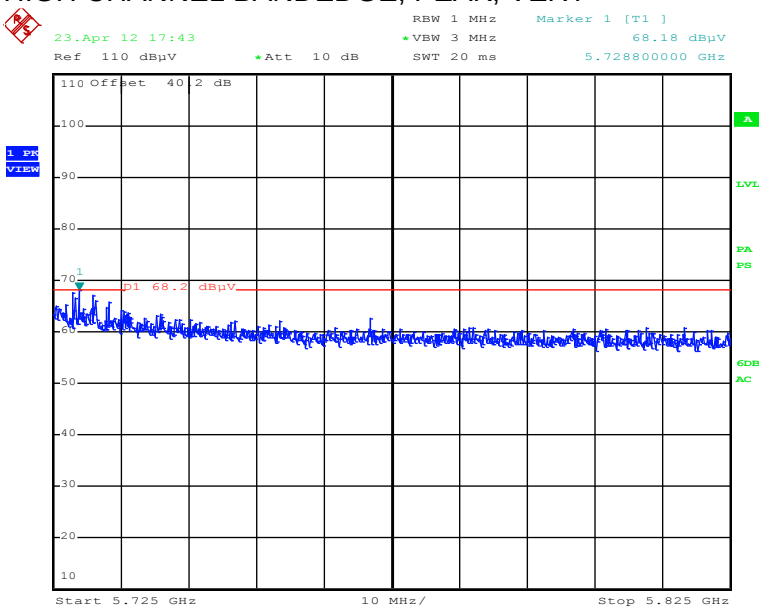


Date: 23.APR.2012 17:07:24

AUTHORIZED BANDEDGE (HIGH CHANNEL)



HIGH CHANNEL BANDEDGE, PEAK, VERT



Date: 23.APR.2012 17:43:52

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: D. Garcia
Date: 04/11/12
Project #: 12U14227
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: HT40 5.5GHz 3x3 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		

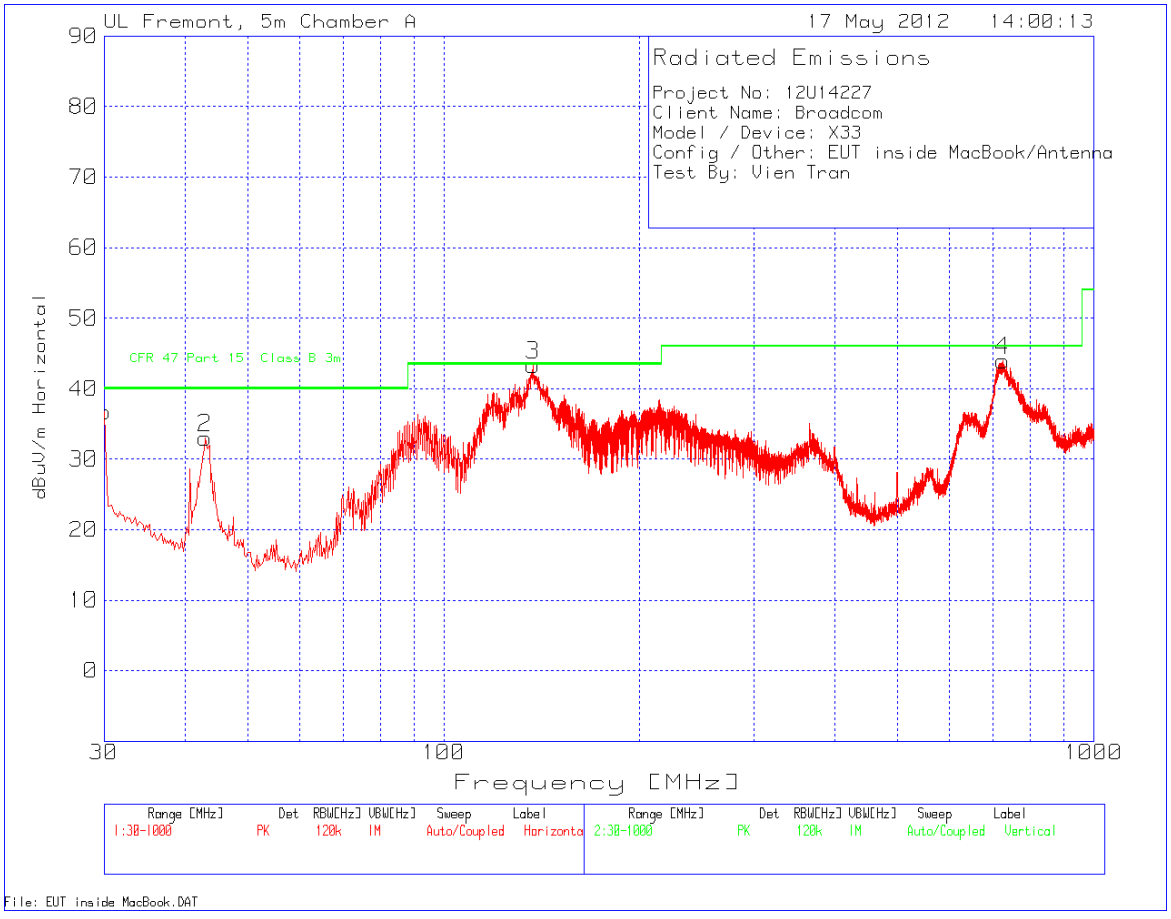
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 5510 MHz													
11.020	3.0	44.1	38.3	10.1	-33.4	0.0	0.7	59.8	74.0	-14.2	H	P	
11.020	3.0	30.6	38.3	10.1	-33.4	0.0	0.7	46.3	54.0	-7.7	H	A	
11.020	3.0	46.2	38.3	10.1	-33.4	0.0	0.7	61.9	74.0	-12.1	V	P	
11.020	3.0	32.4	38.3	10.1	-33.4	0.0	0.7	48.1	54.0	-5.9	V	A	
Mid Channel: 5550 MHz													
11.100	3.0	41.3	38.4	10.1	-33.3	0.0	0.7	57.2	74.0	-16.8	H	P	
11.100	3.0	28.5	38.4	10.1	-33.3	0.0	0.7	44.4	54.0	-9.6	H	A	
11.100	3.0	47.0	38.4	10.1	-33.3	0.0	0.7	63.0	74.0	-11.0	V	P	
11.100	3.0	33.4	38.4	10.1	-33.3	0.0	0.7	49.4	54.0	-4.6	V	A	
High Channel: 5670 MHz													
11.340	3.0	38.4	38.7	10.4	-33.0	0.0	0.7	55.2	74.0	-18.8	H	P	
11.340	3.0	24.8	38.7	10.4	-33.0	0.0	0.7	41.5	54.0	-12.5	H	A	
11.340	3.0	44.8	38.7	10.4	-33.0	0.0	0.7	61.5	74.0	-12.5	V	P	
11.340	3.0	32.0	38.7	10.4	-33.0	0.0	0.7	48.7	54.0	-5.3	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.3. WORST-CASE BELOW 1 GHz

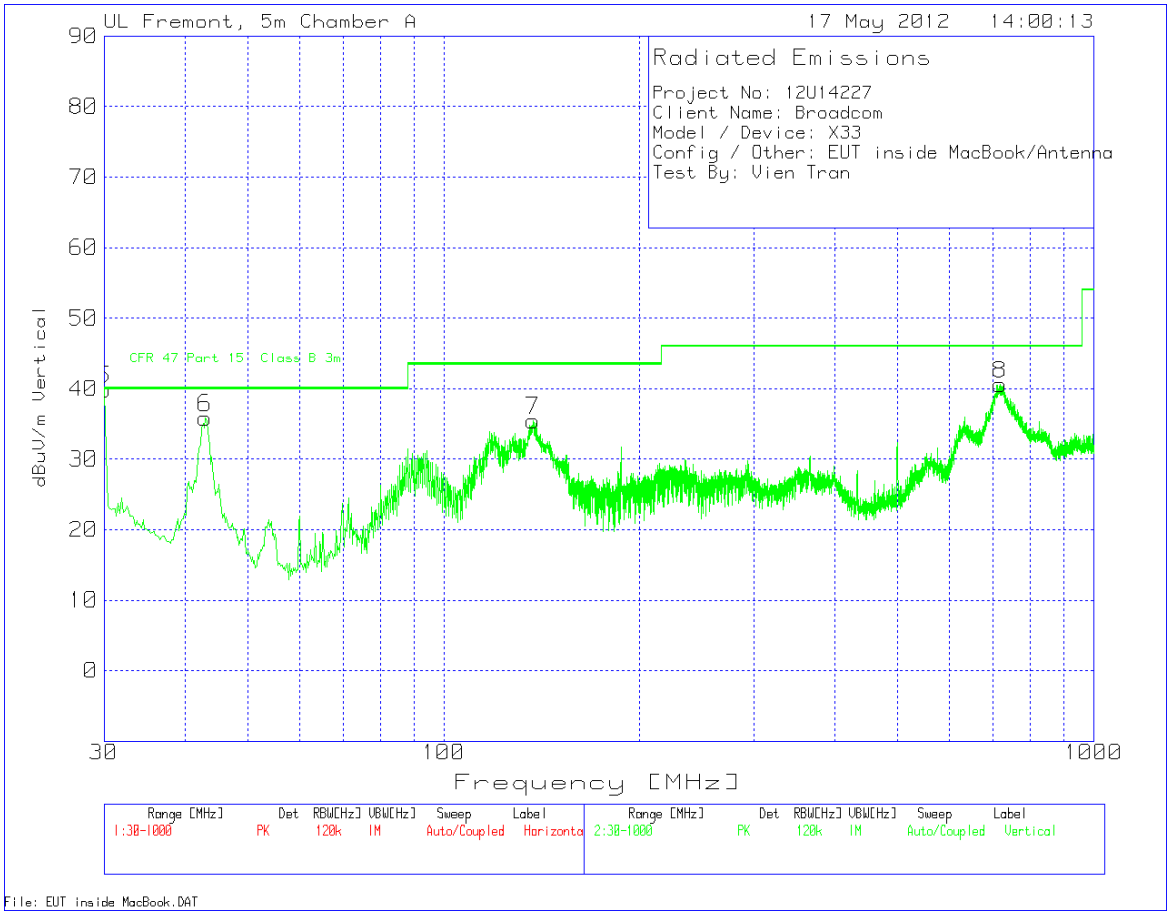
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No: 12U14227
Client Name: Broadcom
Model / Device: X33
Config / Other: EUT inside MacBook/Antenna
Test By: Vien Tran

Horizontal 30 - 1000MHz

Test Frequency	Meter Reading	Detector	1GHz ChmbrA Amplified. TX [dB]	T243 Sunol Bilog.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
30	42.99	PK	-27.5	21.3	36.79	40.0	-3.21	200	Horz
42.9876	48.53	PK	-27.4	11.9	33.03	40.0	-6.97	400	Horz
137.3901	57.02	PK	-26.7	13.0	43.32	43.5	-0.18	200	Horz
137.3901	53.81	QK	-26.7	13.0	40.11	43.5	-3.39	200	Horz
725.9033	47.02	PK	-23.3	20.2	43.92	46.0	-2.08	100	Horz
725.9033	45.14	PK	-23.3	20.2	42.04	46.0	-3.96	100	Horz

Vertical 30 - 1000MHz

Test Frequency	Meter Reading	Detector	1GHz ChmbrA Amplified. TX [dB]	T243 Sunol Bilog.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
30	46.01	PK	-27.5	21.3	39.81	40.0	-0.19	400	Vert
30	40.72	PK	-27.5	21.3	34.52	40.0	-5.48	400	Vert
42.9876	51.35	PK	-27.4	11.9	35.85	40.0	-4.15	100	Vert
137.3901	49.18	PK	-26.7	13.0	35.48	43.5	-8.02	200	Vert
717.3741	43.66	PK	-23.2	20.1	40.56	46.0	-5.44	100	Vert

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

RESULTS

6 WORST EMISSIONS

Project No:12U14227
Client Name:Broadcom
Model/Device:802.11a/g/n 3x3 MIMO WLAN + BT
Test Volt/Freq:120 Vac / 60Hz
Test By:Vien Tran

Line-L1 .15 - 30MHz

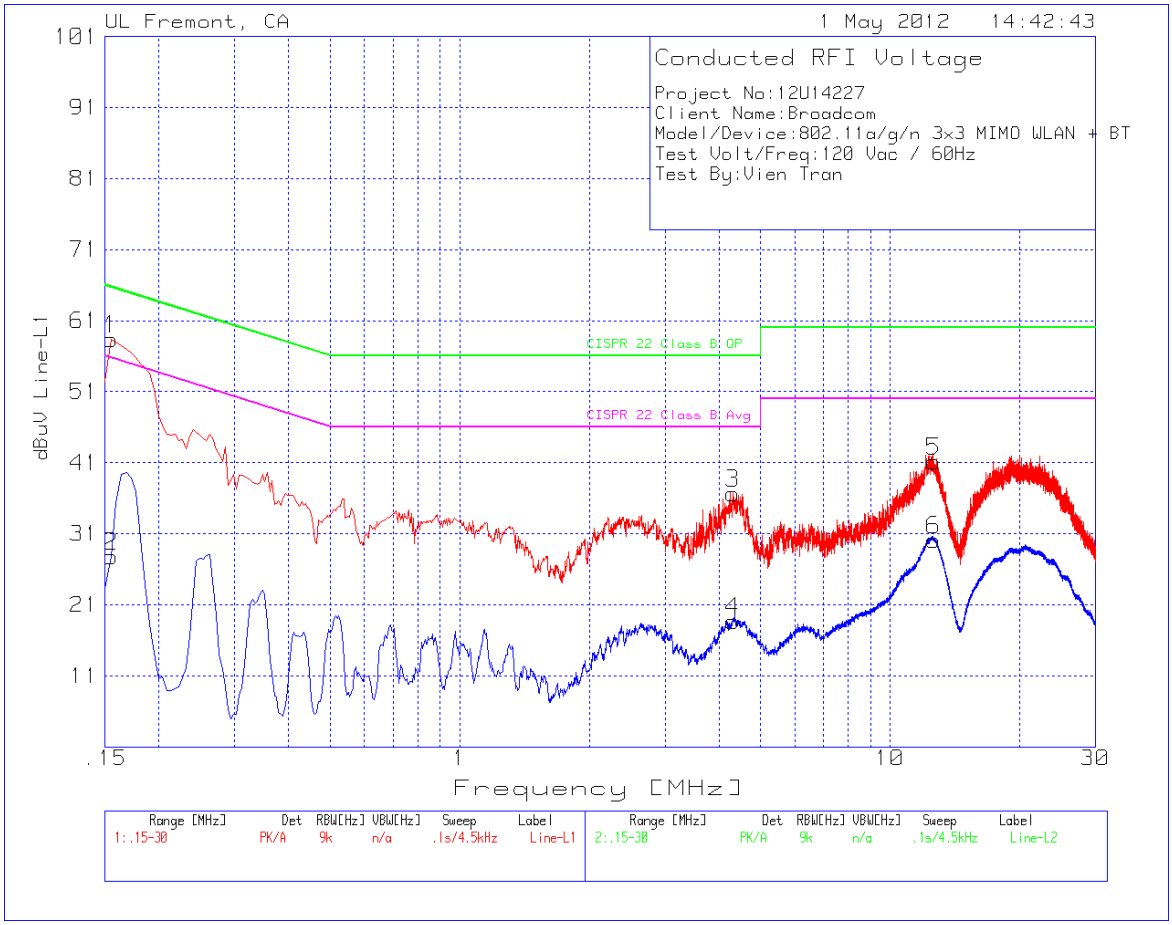
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT [dB]	LC Cables 1&3.TXT [dB]	dBuV	CISPR 22 Class B QP	Margin	CISPR 22 Class B Avg	Margin
0.155	58.27	PK	0.1	0.00	58.37	65.8	-7.43	-	-
0.155	27.73	Av	0.1	0.00	27.83	-	-	55.80	-27.97
4.308	36.5	PK	0.1	0.10	36.70	56	-19.30	-	-
4.308	18.47	Av	0.1	0.10	18.67	-	-	46.00	-27.33
12.615	40.75	PK	0.2	0.20	41.15	60	-18.85	-	-
12.615	29.67	Av	0.2	0.20	30.07	-	-	50.00	-19.93

Line-L2 .15 - 30MHz

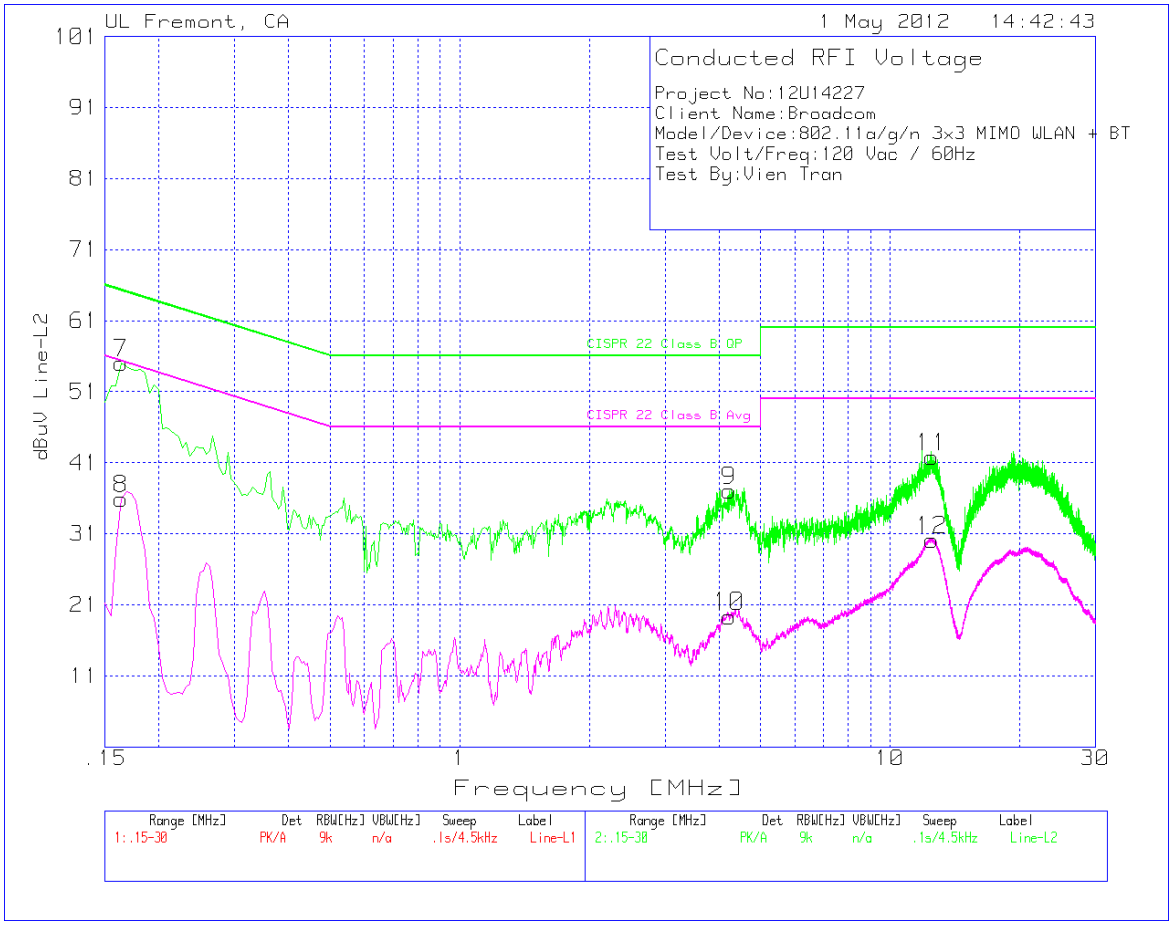
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT [dB]	LC Cables 1&3.TXT [dB]	dBuV	CISPR 22 Class B QP	Margin	CISPR 22 Class B Avg	Margin
0.164	54.87	PK	0.1	0	54.97	65.3	-10.33	-	-
0.164	35.78	Av	0.1	0	35.88	-	-	55.3	-19.42
4.232	36.83	PK	0.1	0.1	37.03	56	-18.97	-	-
4.232	19.17	Av	0.1	0.1	19.37	-	-	46	-26.63
12.539	41.39	PK	0.2	0.2	41.79	60	-18.21	-	-
12.539	29.68	Av	0.2	0.2	30.08	-	-	50	-19.92

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector

LINE 1 RESULTS



LINE 2 RESULTS



11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

INDUSTRY CANADA

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

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

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

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

FCC

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

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

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

Table 2: Applicability of DFS requirements during normal operation

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

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

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Table 4: DFS Response requirement values

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

Table 5 – Short Pulse Radar Test Waveforms

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

Table 6 – Long Pulse Radar Test Signal

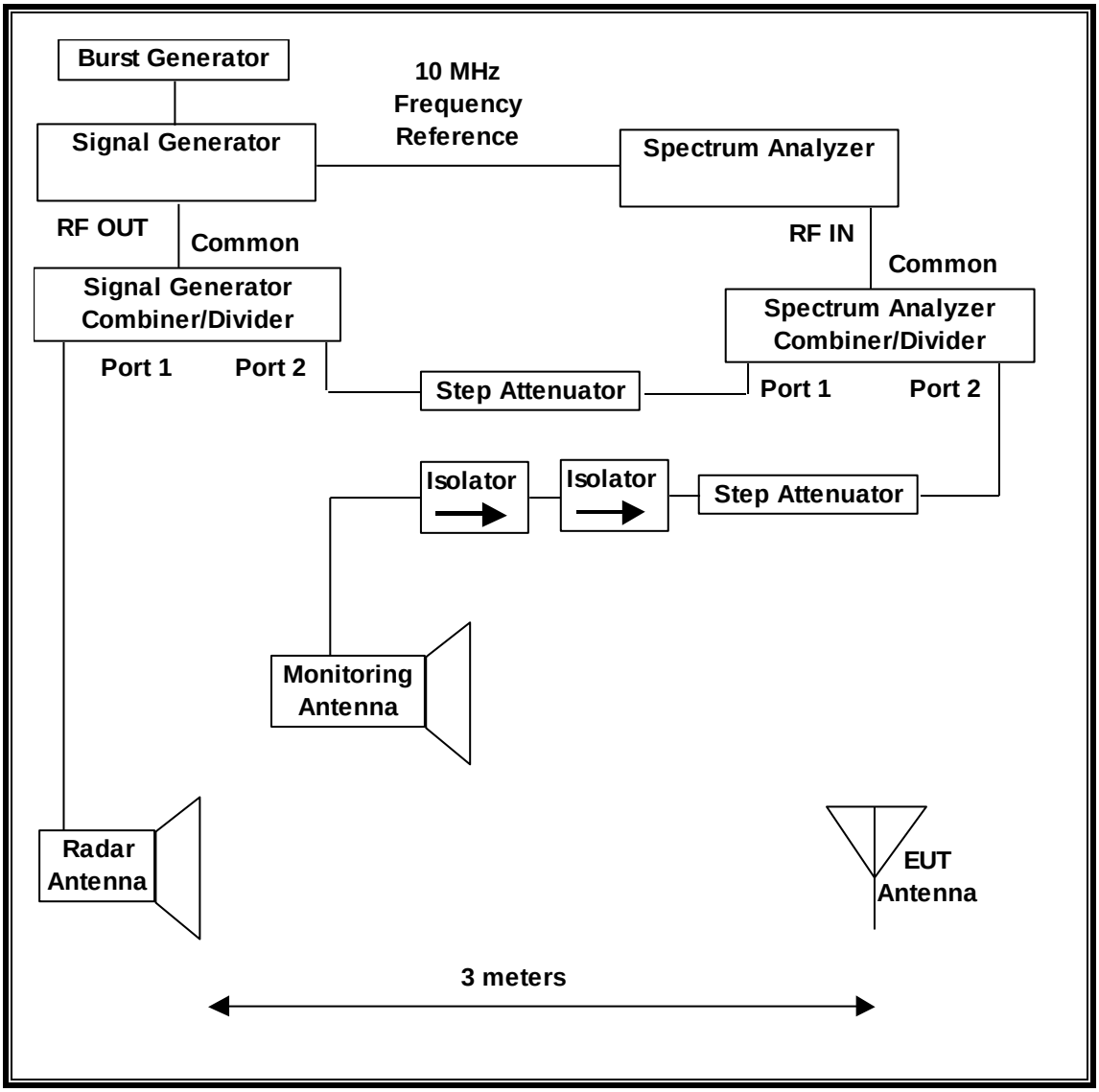
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

Table 7 – Frequency Hopping Radar Test Signal

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

11.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

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

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

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

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

SYSTEM CALIBRATION

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

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

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

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

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

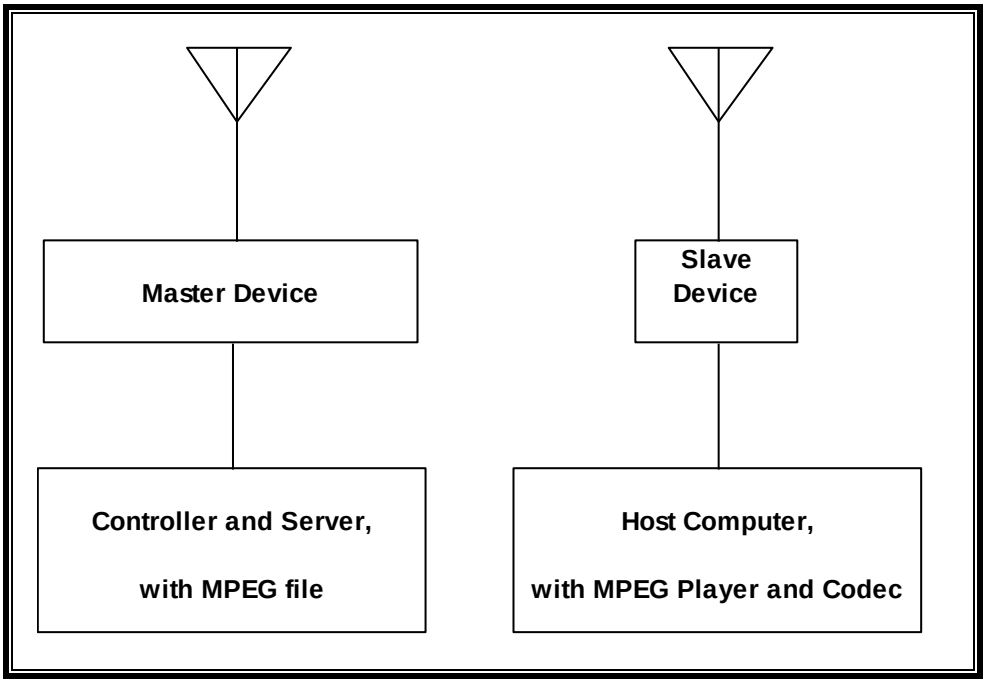
TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset Number**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/15/12
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	11/17/12

11.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
N600 Wireless Dual Band Router (Master)	Netgear	WNDR3400	2BK311730FF6B	PY309300116
AC Adapter (AP)	Netgear	FA-1201500SJA / FA-1201500SUA	4F105116T10209045B	DoC
Notebook PC (Controller/Server)	HP	Pavilion zv6000	CND5290401	DoC
AC Adapter (Controller PC)	HP	PA-1121-12HD	58B240ALLRK0HU	DoC
Notebook PC (Host)	Dell	PP22X	9955271197	DoC
AC Adapter (Host PC)	Lite On Technology	PA-1900-01D3	CN-0DF266-71615-65B-0C8E	DoC

11.1.4. DESCRIPTION OF EUT

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without radar detection capability.

The highest power level within these bands is 21.85 dBm EIRP in the 5250-5350 MHz band and 22.22 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 4.52 dBi in the 5250-5350 MHz band and 4.72 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 1.48 dBi in the 5250-5350 MHz band and 2.85 dBi in the 5470-5725 MHz band.

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

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

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

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

WLAN traffic exceeding the transmitter minimum activity ratio of 30% is generated by streaming the compressed video file “6 ½ Magic Hours” from the Master to the Slave in full motion video.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

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

The DFS software installed in the Master Device is Linux revision 5.22.84.0.

UNIFORM CHANNEL SPREADING

This requirement is not applicable to Slave radio devices.

OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Netgear N600 Dual Band Router, FCC ID: PY309300116. The DFS software installed in the Master Device is Linux revision 5.22.84.0. The minimum antenna gain for the Master Device is 2.73 dBi.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm.

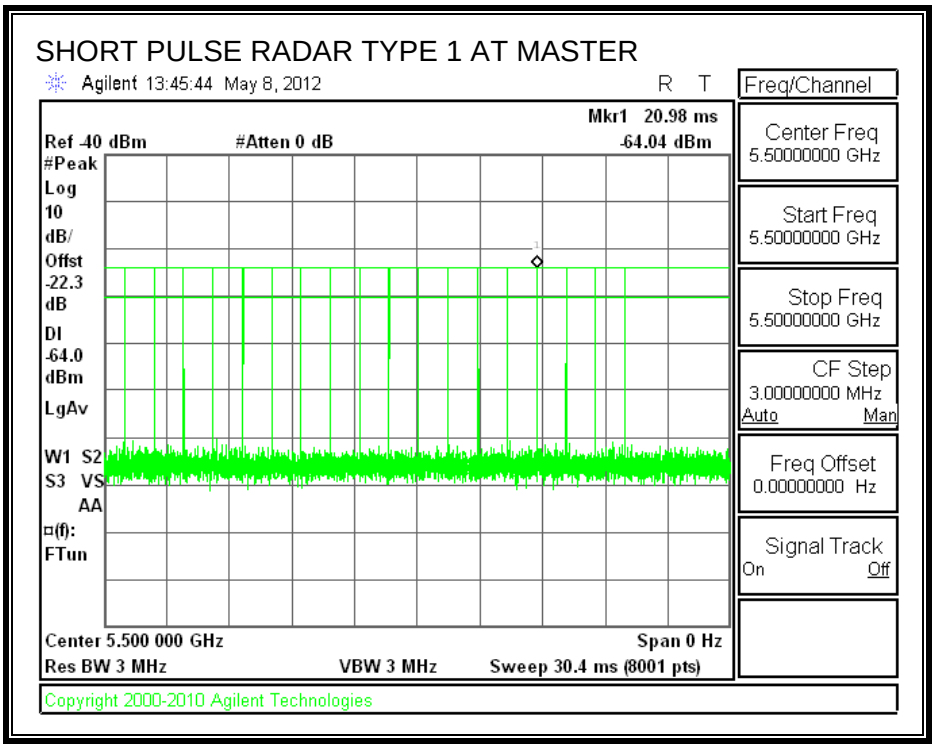
11.2. RESULTS FOR 20 MHz BANDWIDTH

11.2.1. TEST CHANNEL

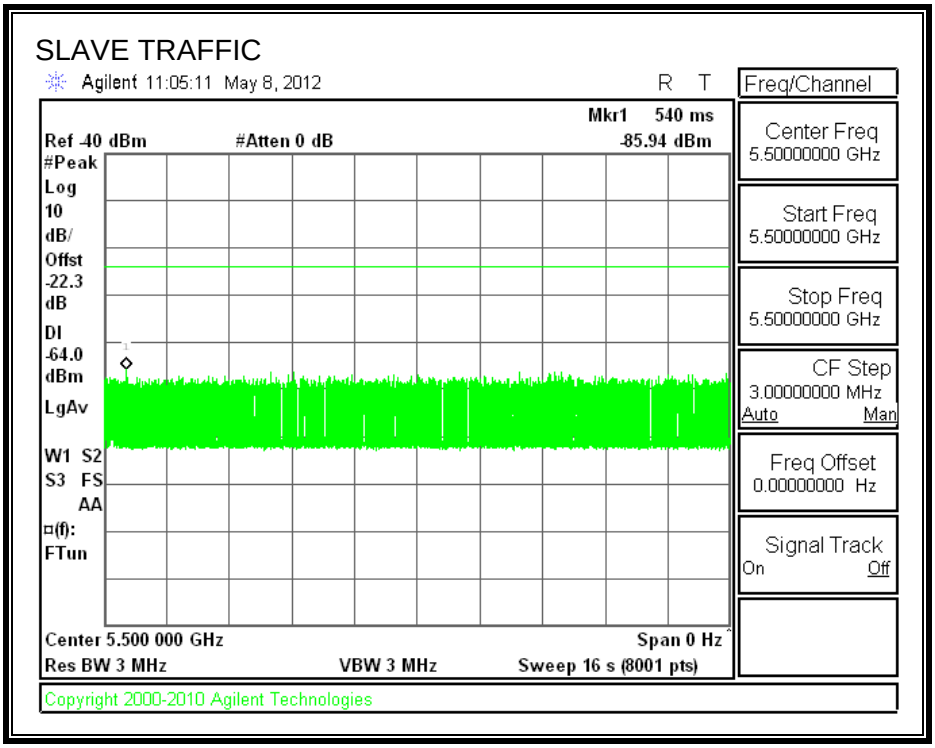
All tests were performed at a channel center frequency of 5500 MHz.

11.2.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



11.2.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.2.4. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

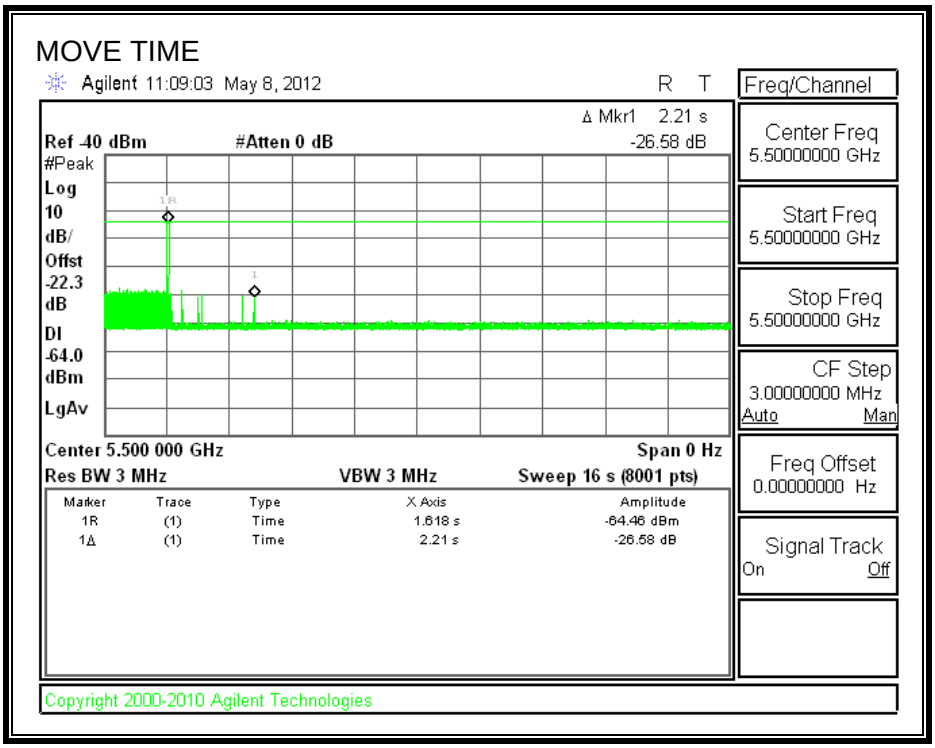
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

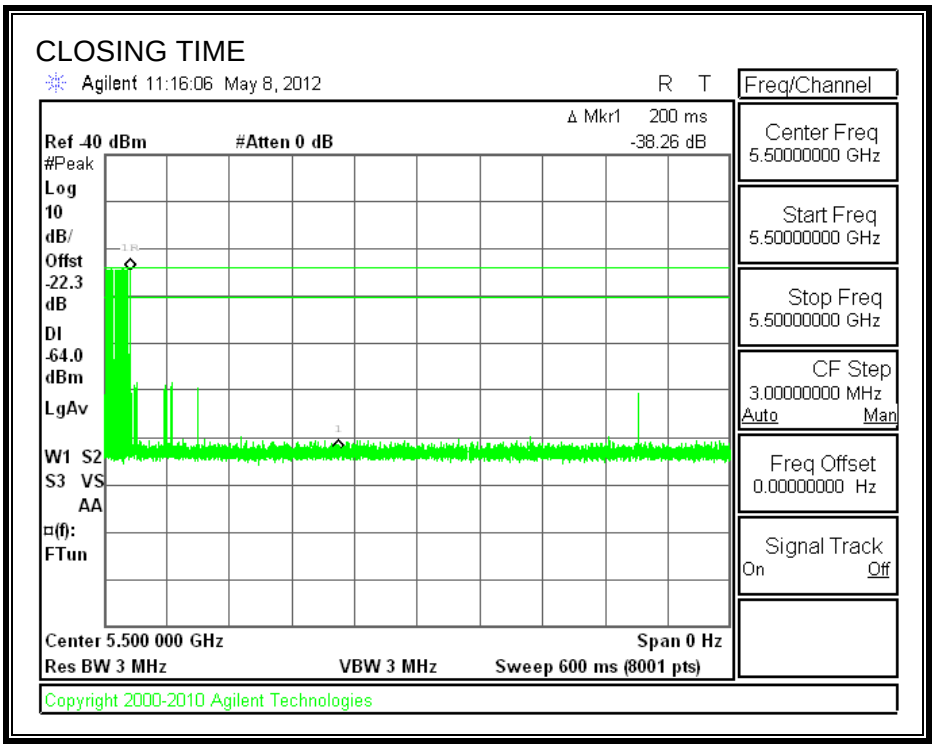
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	2.210	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	10.0	60
IC	36.0	260

MOVE TIME



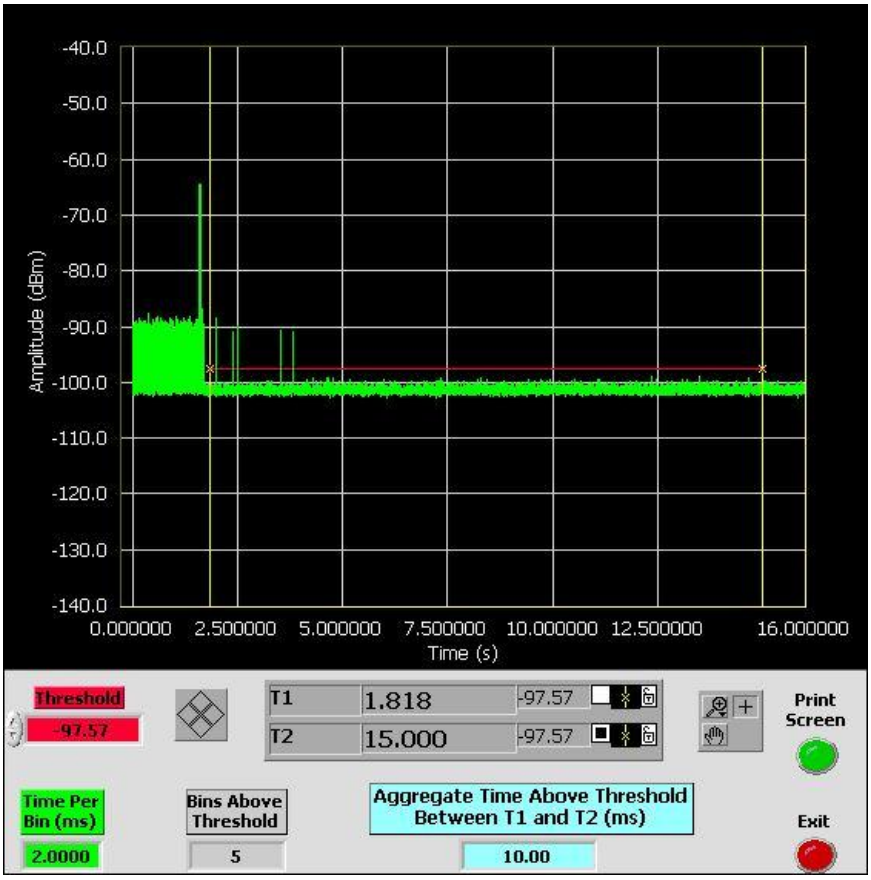
CHANNEL CLOSING TIME



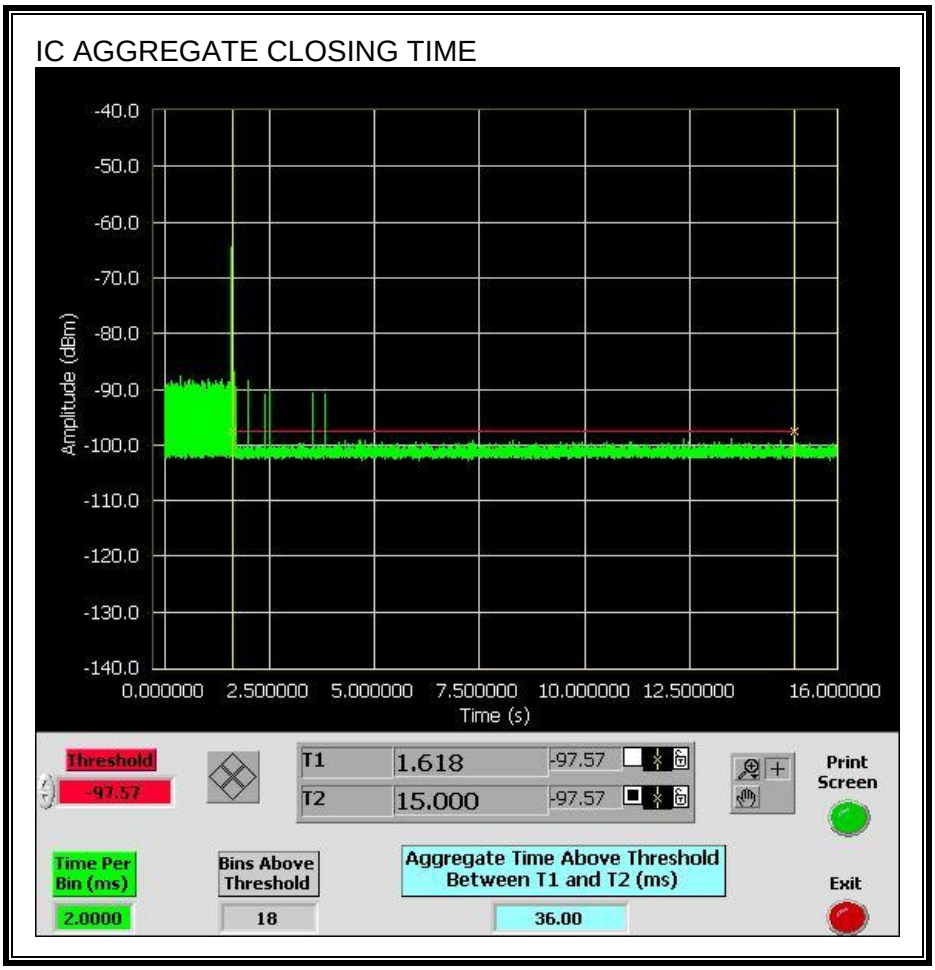
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

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

FCC AGGREGATE CLOSING TIME



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



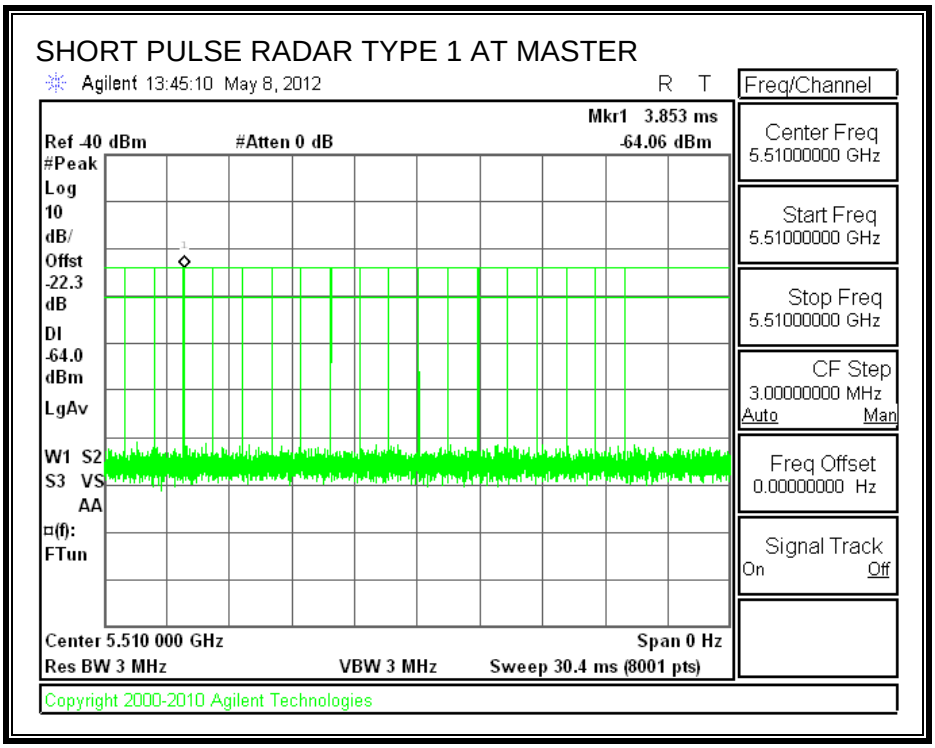
11.3. RESULTS FOR 40 MHz BANDWIDTH

11.3.1. TEST CHANNEL

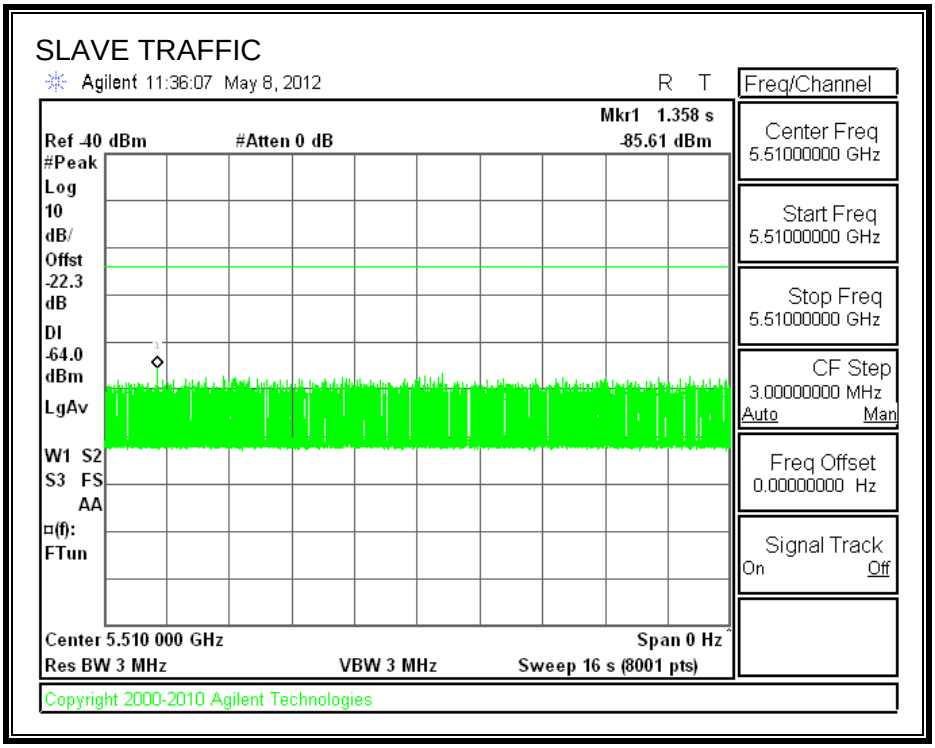
All tests were performed at a channel center frequency of 5510 MHz.

11.3.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



11.3.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.3.4. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

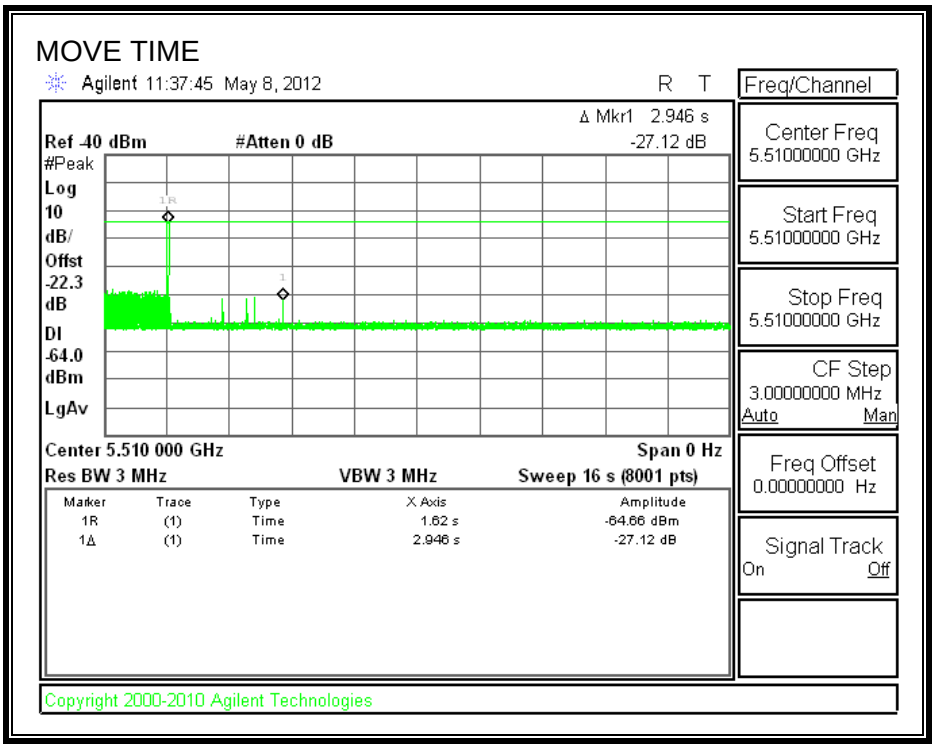
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

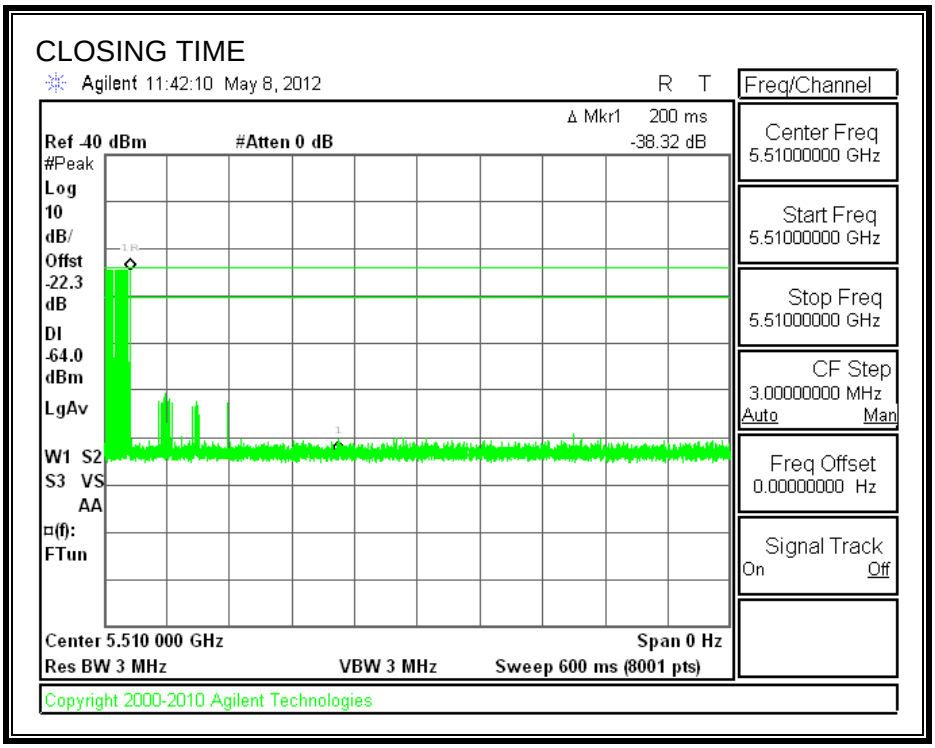
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	2.946	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	8.0	60
IC	16.0	260

MOVE TIME

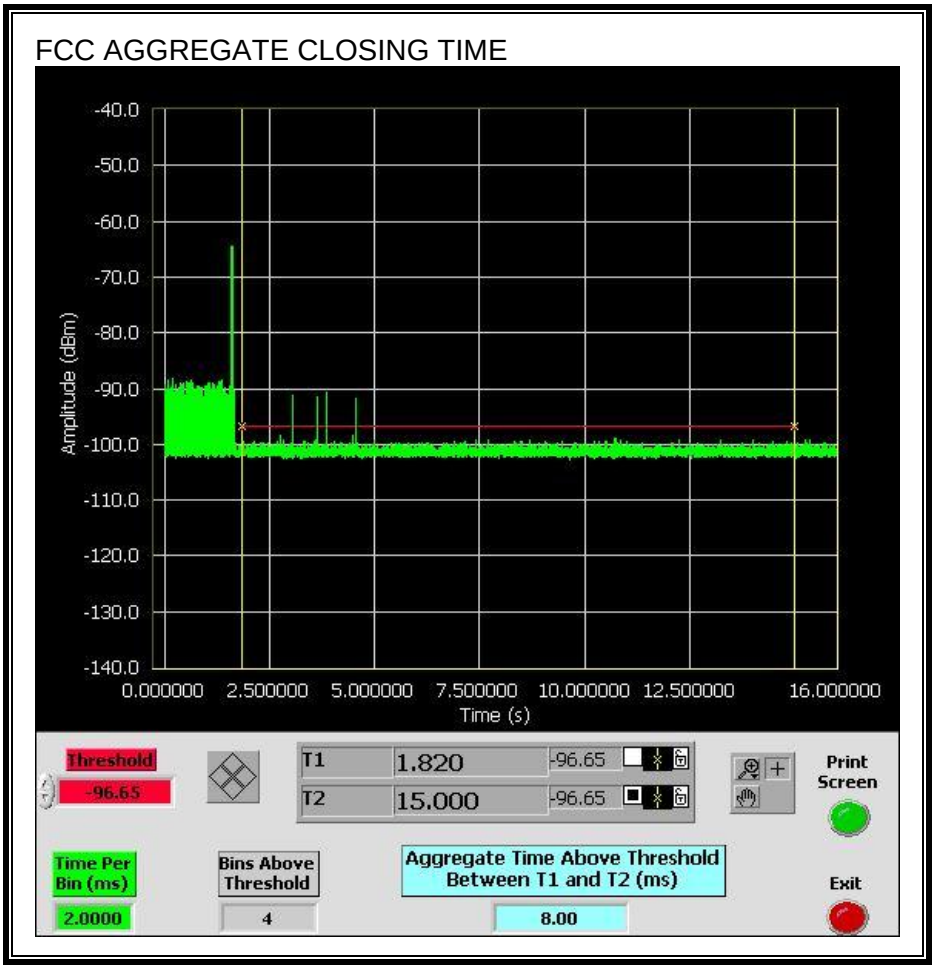


CHANNEL CLOSING TIME

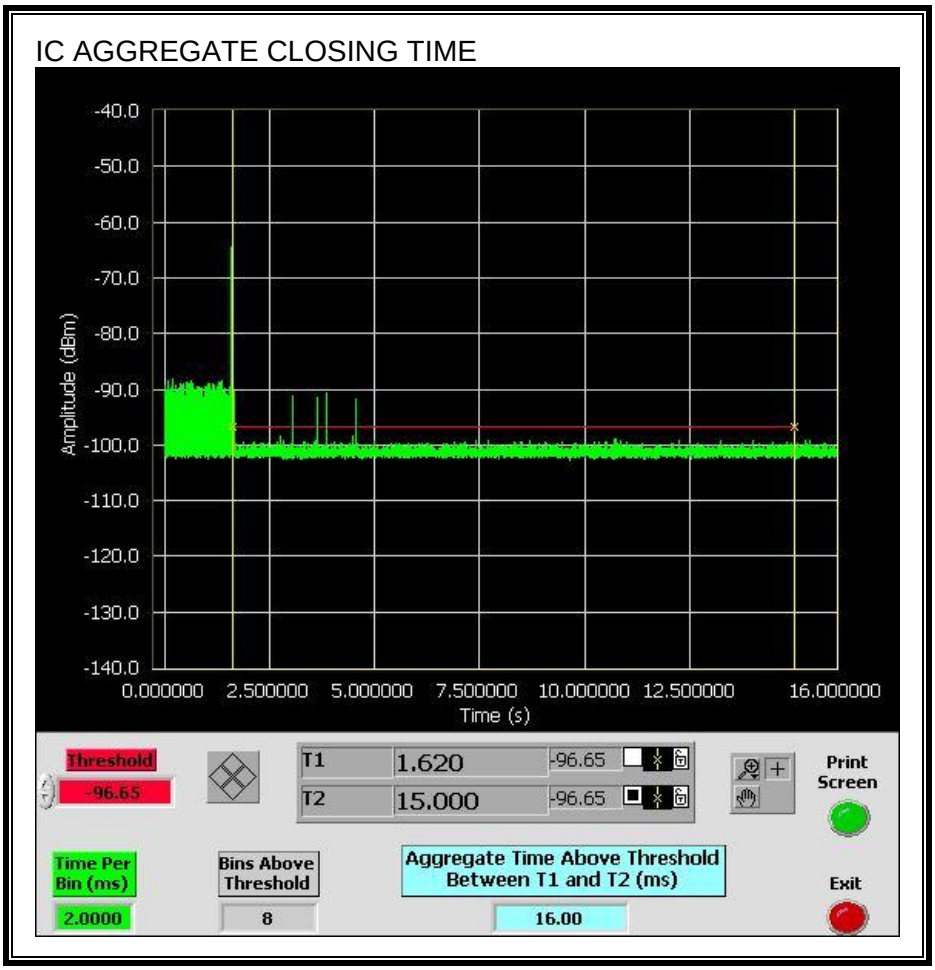


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

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



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



11.3.5. NON-OCCUPANCY PERIOD

RESULTS

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