FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 7

CERTIFICATION TEST REPORT

FOR

FIXED OUTDOOR WIRELESS FRAME BASED UNII OFDM ACCESS POINT WITH RADAR DETECTION

MODEL NUMBER: 5480AP US

FCC ID: ABZ89FT7637
IC: 109W-5480G

REPORT NUMBER: 10U13444-1

ISSUE DATE: OCTOBER 25, 2010

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/25/10	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MOTOROLA- SCHAUMBURG
1299 E.ALGONQUIN Rd
SCHAUMBURG, ILLINOISE 60156, USA

EUT DESCRIPTION: FIXED OUTDOOR WIRELESS FRAME BASED UNII OFDM ACCESS POINT WITH RADAR DETECTION

MODEL: 5480AP US

SERIAL NUMBER: 0A-00-3E-30-2E-0D
0A-00-3E-30-2E-00

DATE TESTED: OCTOBER 04 to 15, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:

MONICA HARRISON
SENIOR RF ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, 443999 D01 Approval of DFS UNII Devices v01, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a professionally installed, fixed outdoor, wireless, frame based, UNII OFDM access point with radar detection. It utilizes QPSK, 16QAM and 64QAM modulation with 10MHz and 20MHz bandwidths.

The radio module is manufactured by Motorola

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5480 - 5710	10MHz	9.83	9.62
5490 - 5710	20MHz	12.93	19.63

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The only antenna assembly utilized with the AP has an effective gain of 17 dBi. The radio for the master device utilizes a sector antenna, with a maximum gain of 18 dBi; the antenna has a short cable with 1 dB loss, so the effective antenna gain is 17 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Canopy 10.5 (Build 2) AP-DES.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case mode is determined as the mode with the highest output power, QPSK was determined to be worst case and therefore radiated emissions below 1 GHz and power line conducted emissions were performed with the EUT set to transmit in the QPSK at the channel with highest output power.

For master device with sector antenna since the vertical polarization was found to be worst case and readings with vertical polarization are higher then those with horizontal polarization the measurement for horizontal polarization was stopped and the measurement have been continued with vertical polarization was worst case.

For antenna port testing the measurement for each test item was performed at low channel in the 5.6 GHz band for QPSK, 16QAM and 64QAM, and based on the base line scan it was found that QPSK is worst-case, therefore all final antenna port measurements were made using QPSK modulation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Motorola	ML910	3433JC0021	DoC
AC Adaptor	Motorola	PSI45W-560	M61000062A1	DoC
AC Adaptor	HIPRO	HP-OW120F13	F3-070900274301	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	UNSHIELDED	2m	
2	DC	1	DC	UNSHIELDED	2m	ferrite on adaptor end
3	RJ45	1	RJ45	UNSHIELDED	1m	
4	RJ45	1	RJ45	UNSHIELDED	0.1m	
5	DC	1	DC	UNSHIELDED	2m	ferrrite on adaptor end
6	AC	1	AC	UNSHIELDED	2m	

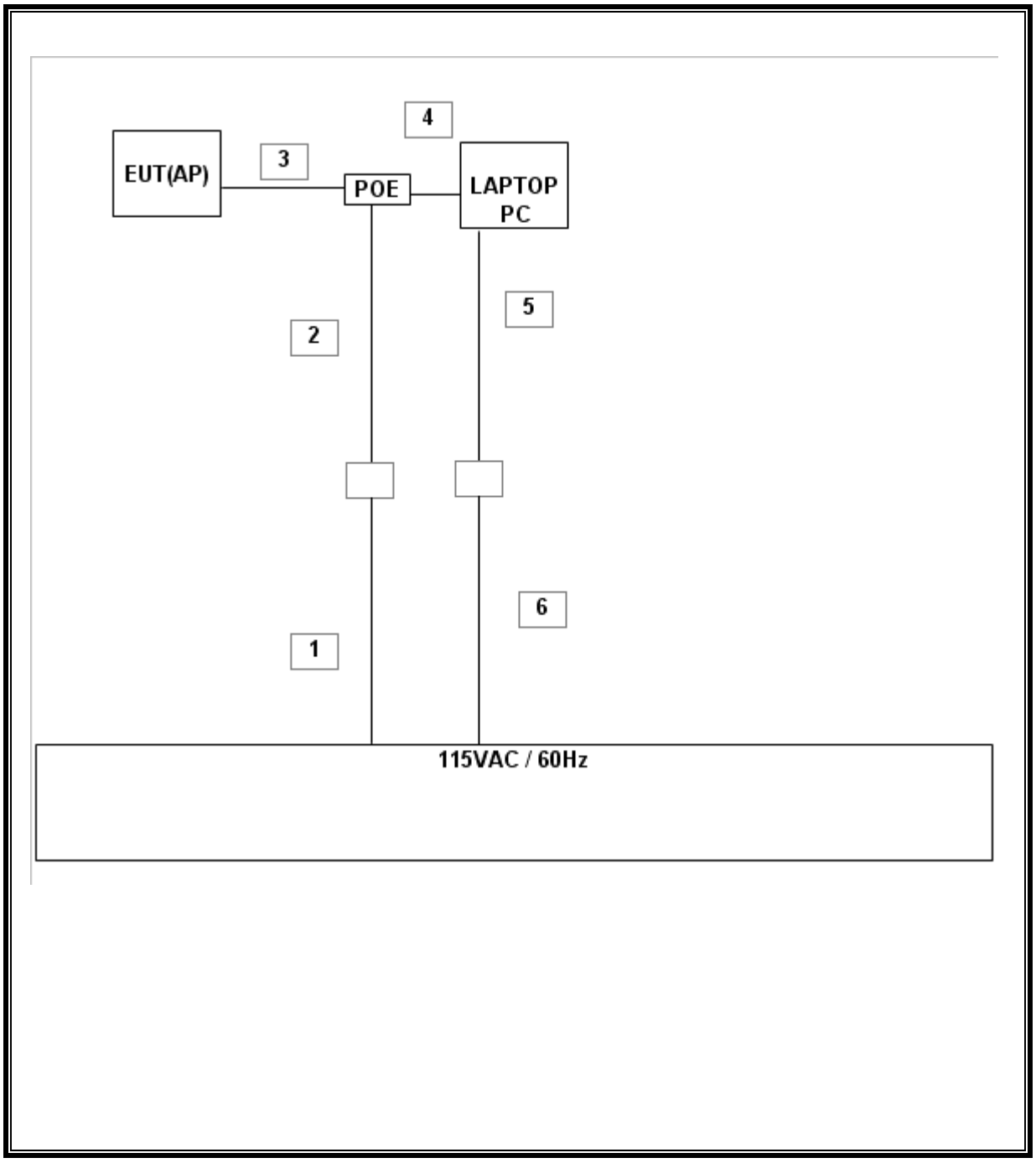
TEST SETUP

The EUT is standalone device. A telnet session is enabled to control the radio.

5.7. MODIFICATION

Internal contact, grounding ESD clip, part number 39009333001, was used in order to pass radiated emissions.

SETUP DIAGRAM FOR TESTS



TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	4/5/2010	4/5/2011
Antenna, Horn, 18 GHz	EMCO	3115	C00783	4/22/2010	4/22/2011
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	1/14/2010	1/14/2011
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	9/29/2010	11/29/2011
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	12/1/2009	12/1/2010
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/1/2010	12/1/2011
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	4/29/2010	4/29/2011
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/2009	7/15/2011
Peak Power Meter	Boonton	4541	C01186	3/1/2010	3/1/2011
Peak Power Sensor	Boonton	57006	C01203	2/24/2010	2/24/2011
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	4/29/2010	10/29/2011

6. ANTENNA PORT TEST RESULTS

6.1. 10MHz BANDWIDTH QPSK MODE IN THE 5.4 GHz BAND

6.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

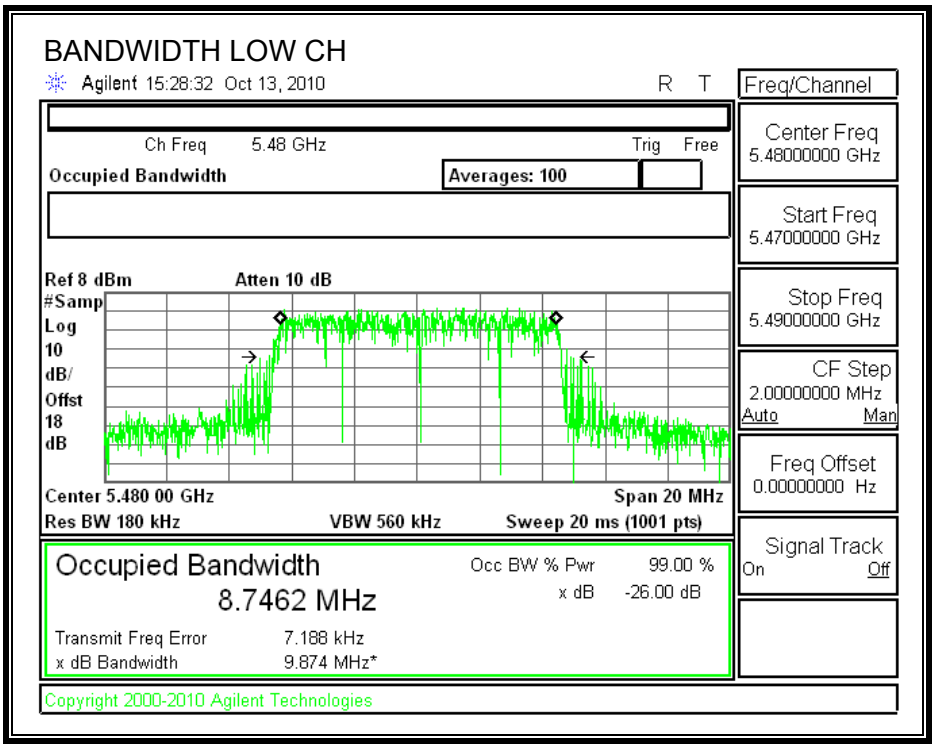
TEST PROCEDURE

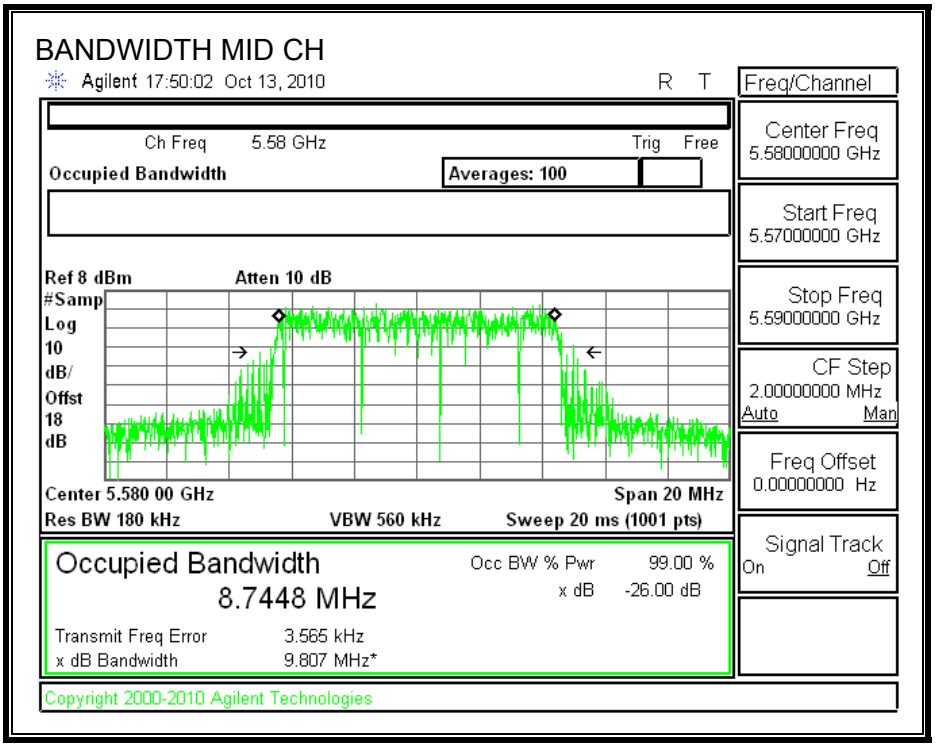
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

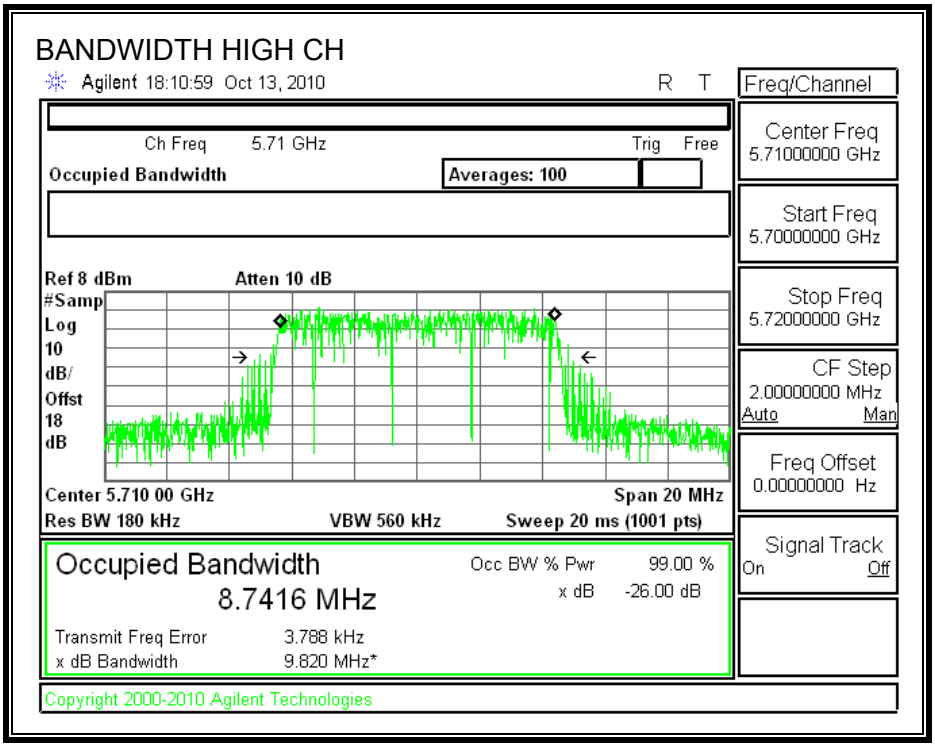
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5480	9.874	8.7462
Middle	5580	9.807	8.7448
High	5710	9.820	8.7416

26 dB and 99% BANDWIDTH







6.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

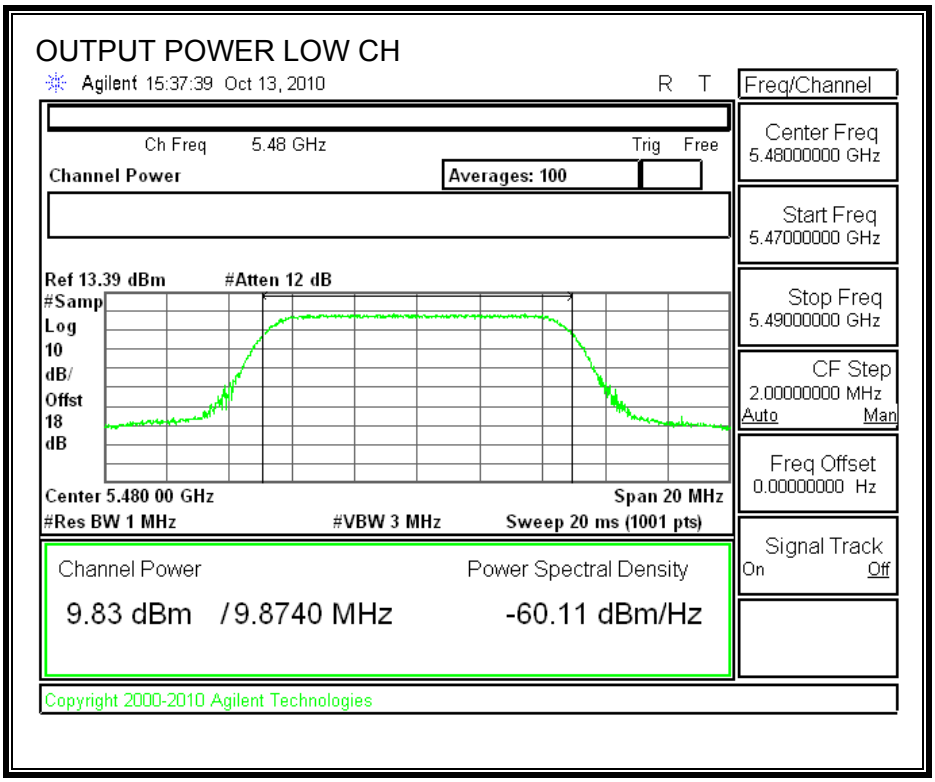
Limit

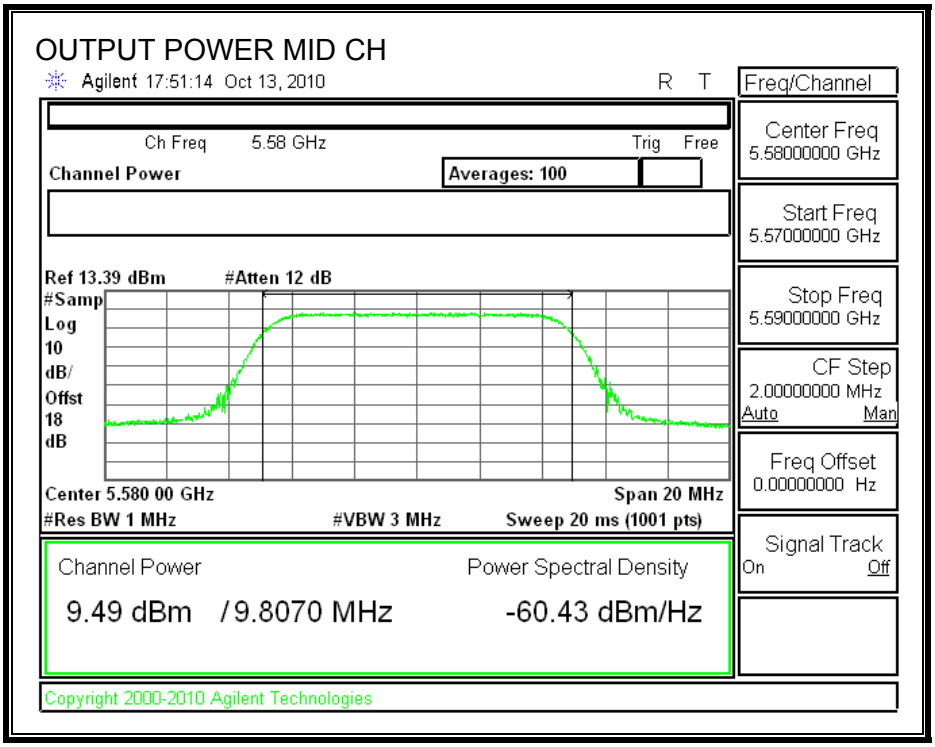
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5480	24	9.874	20.94	17.00	9.94
Mid	5580	24	9.807	20.92	17.00	9.92
High	5710	24	9.820	20.92	17.00	9.92

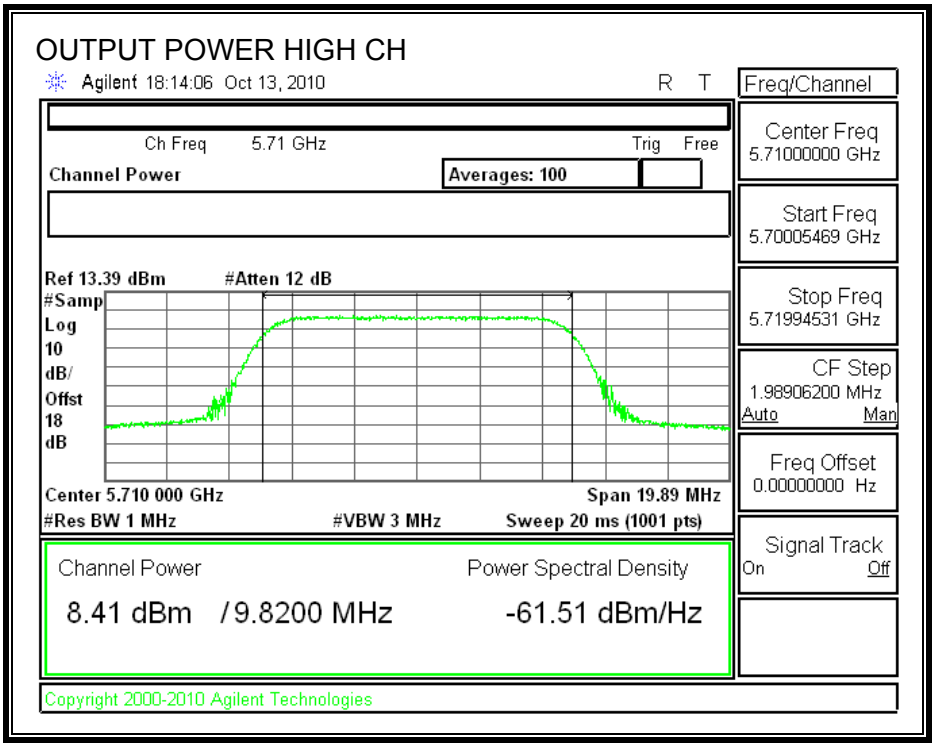
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5480	9.83	9.94	-0.11
Mid	5580	9.49	9.92	-0.43
High	5710	8.41	9.92	-1.51

OUTPUT POWER







6.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 18 dB (including 10 dB pad and 8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5480	9.67
Middle	5580	9.25
High	5710	8.31

6.1.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)
IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
The antenna assembly gain is 17 dBi, the excess gain is 11 dB, therefore the limit is 0 dBm.

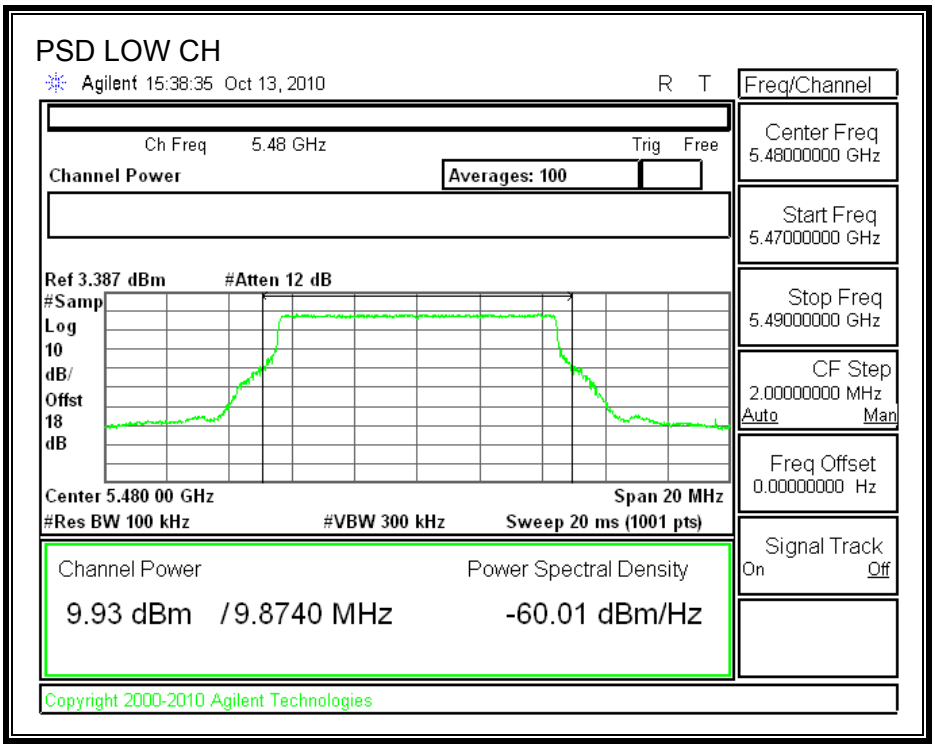
TEST PROCEDURE

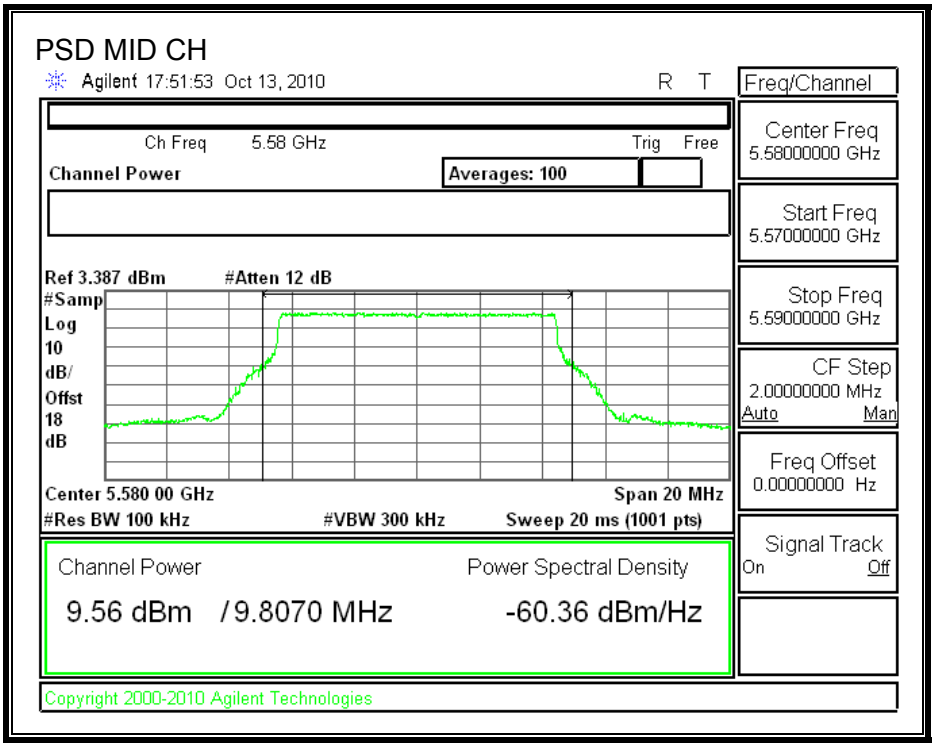
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

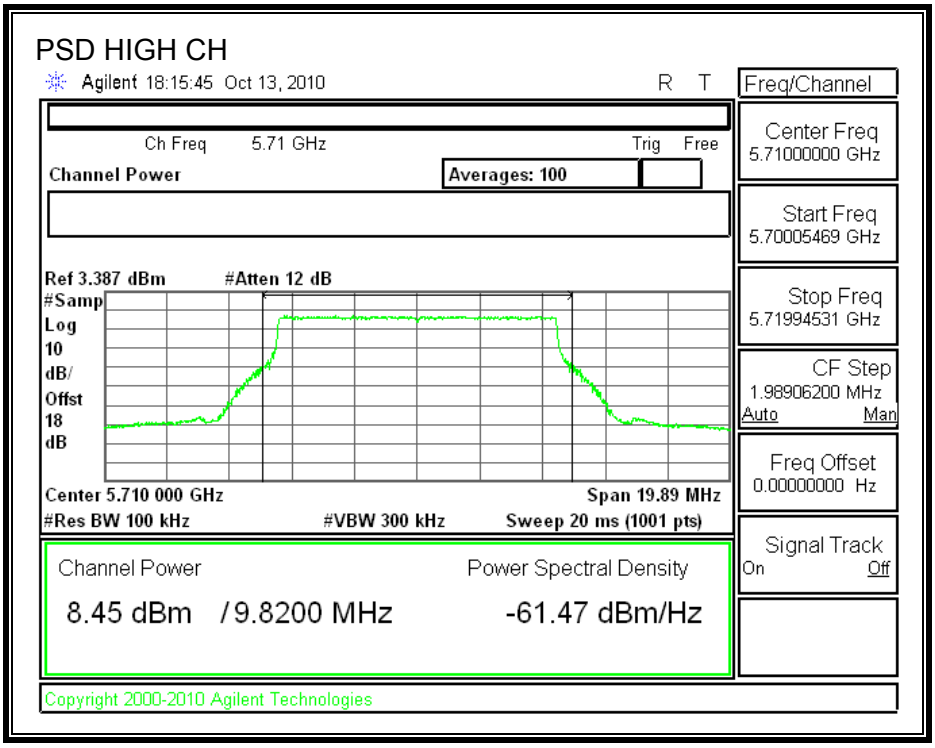
RESULTS

Channel	Frequency (MHz)	PPSD (dBm/Hz)	PPSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Low	5480	-60.01	-0.01	0	-0.01
Middle	5580	-60.36	-0.36	0	-0.36
High	5710	-61.47	-1.47	0	-1.47

POWER SPECTRAL DENSITY







6.1.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

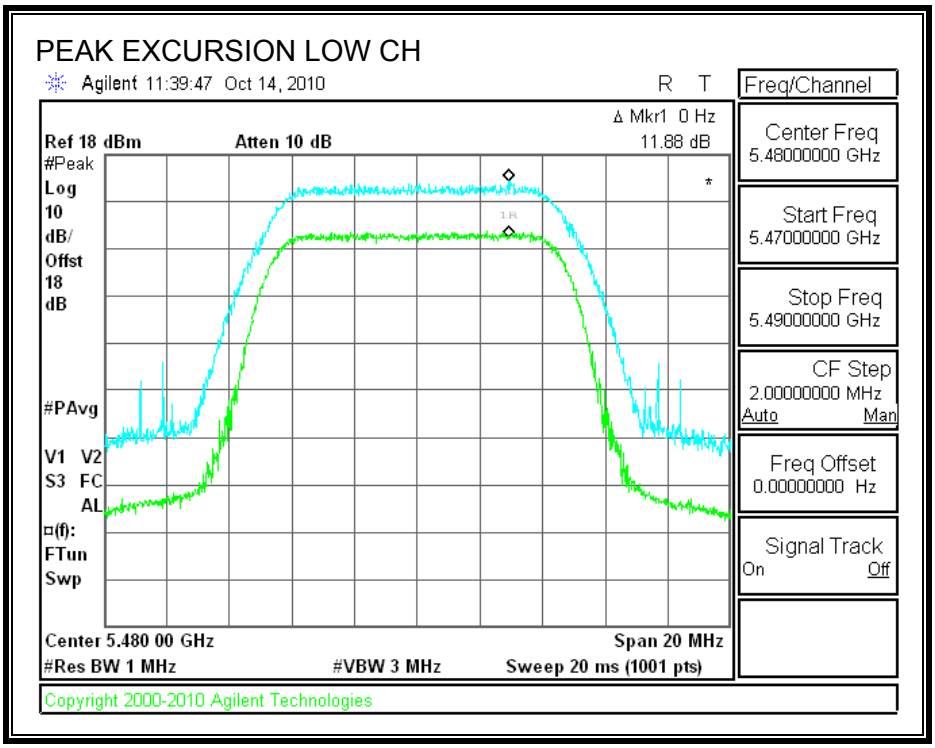
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

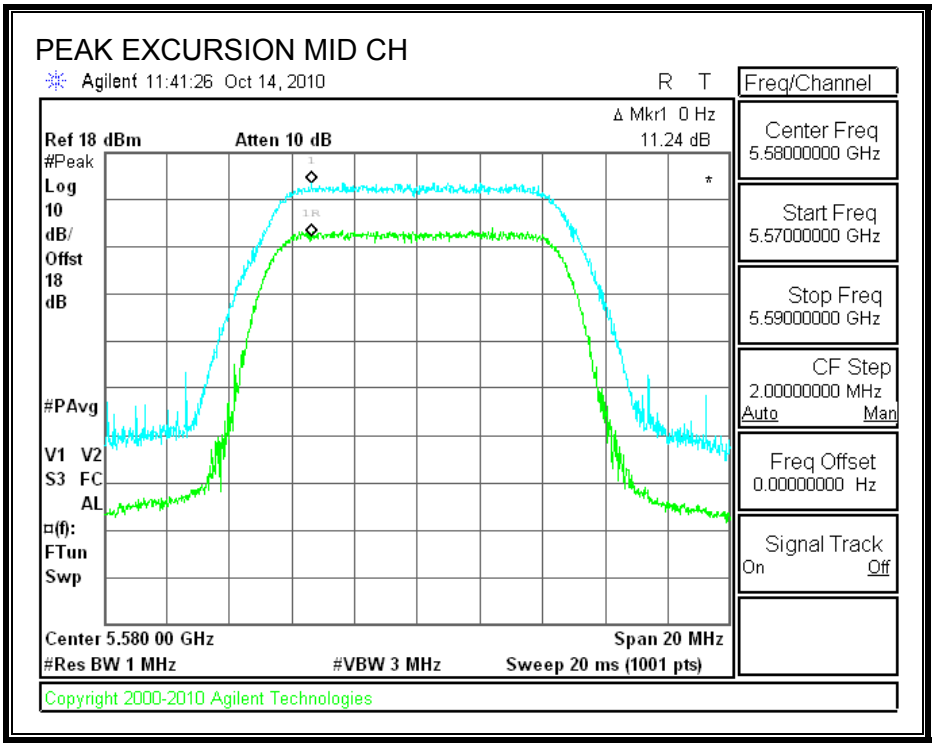
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

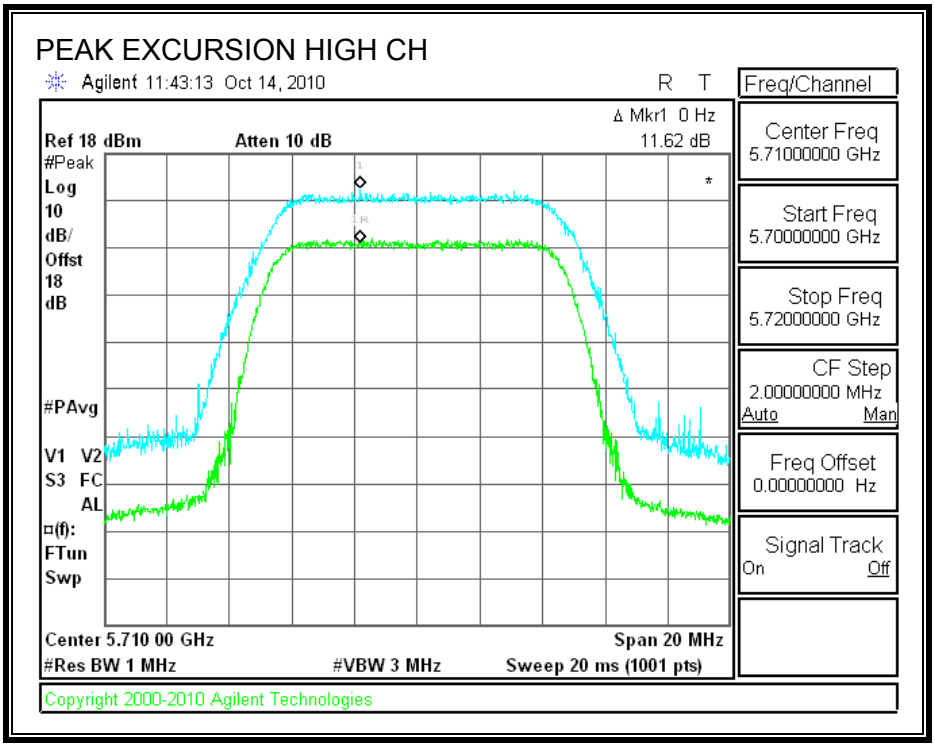
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5480	11.88	13	-1.12
Middle	5580	11.24	13	-1.76
High	5710	11.62	13	-1.38

PEAK EXCURSION







6.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

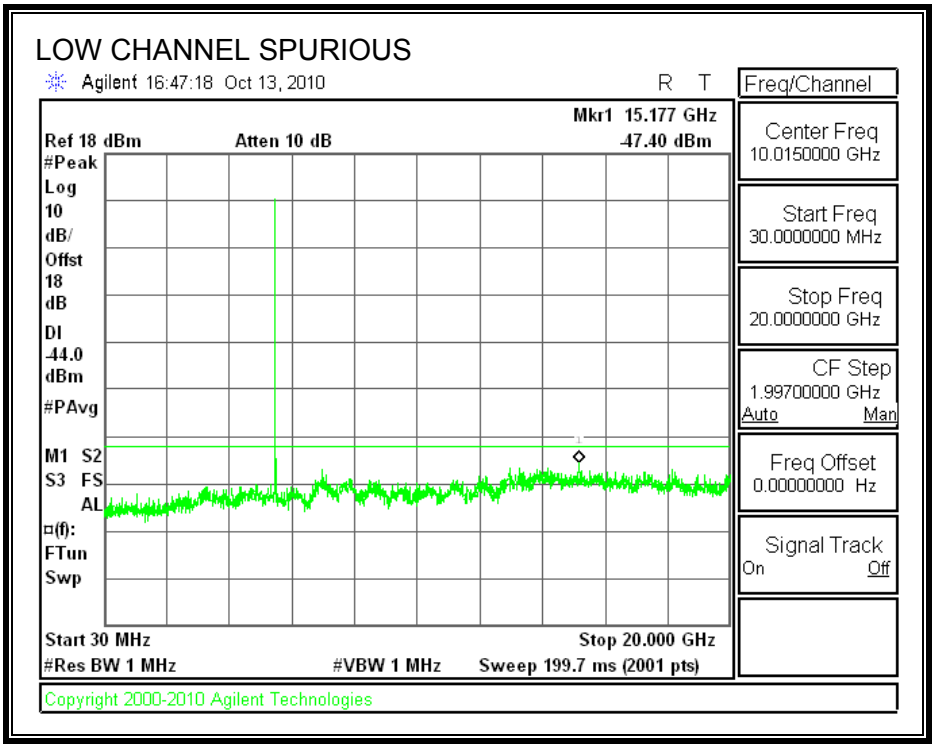
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

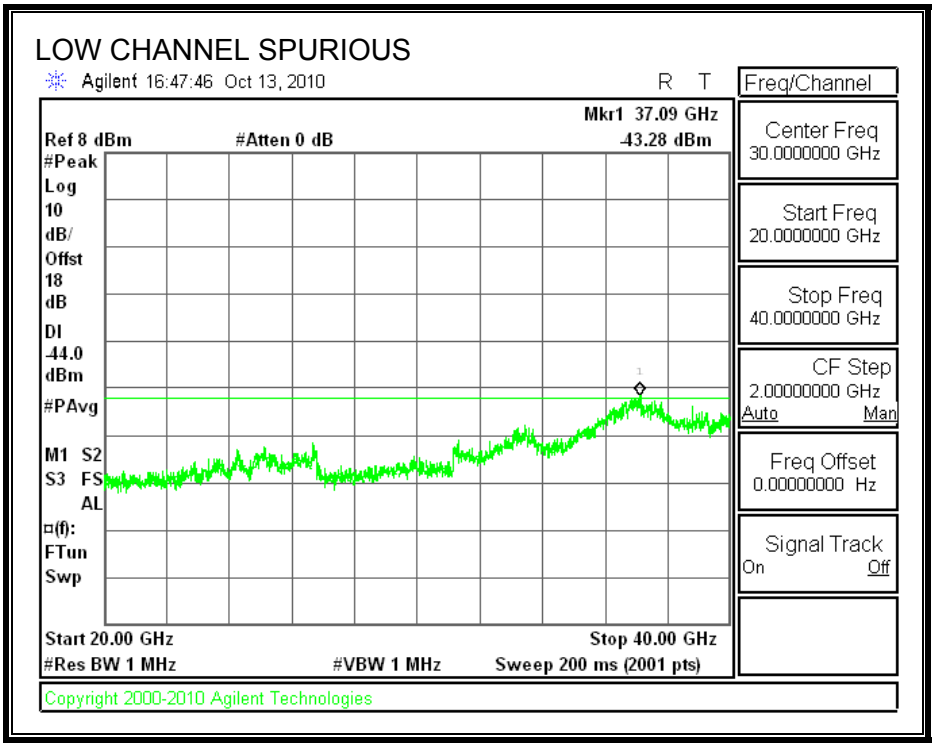
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

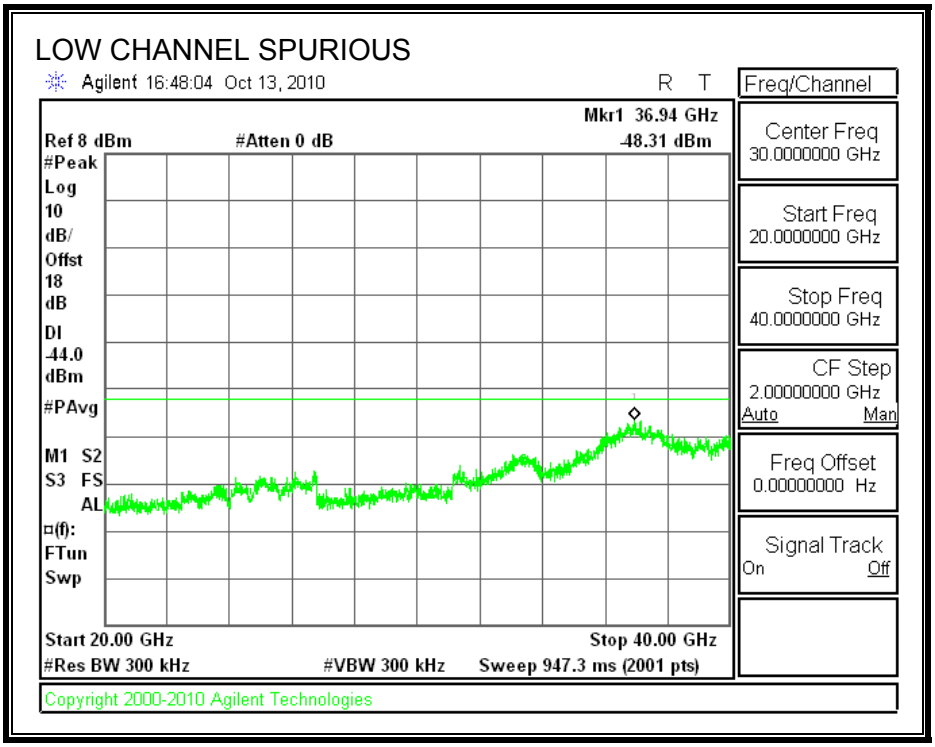
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

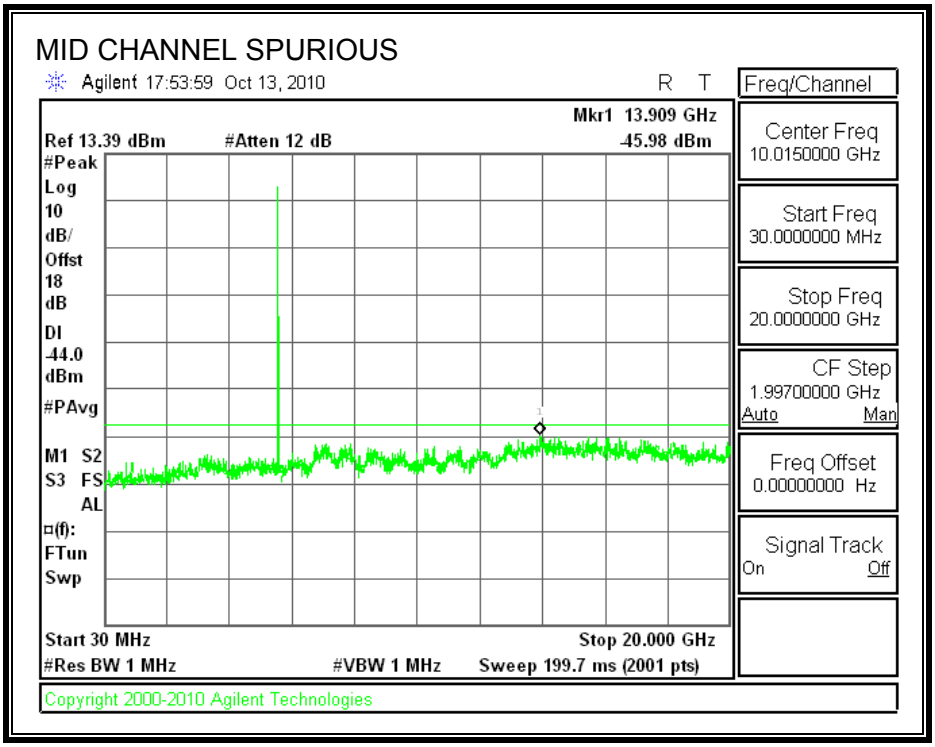
SPURIOUS EMISSIONS

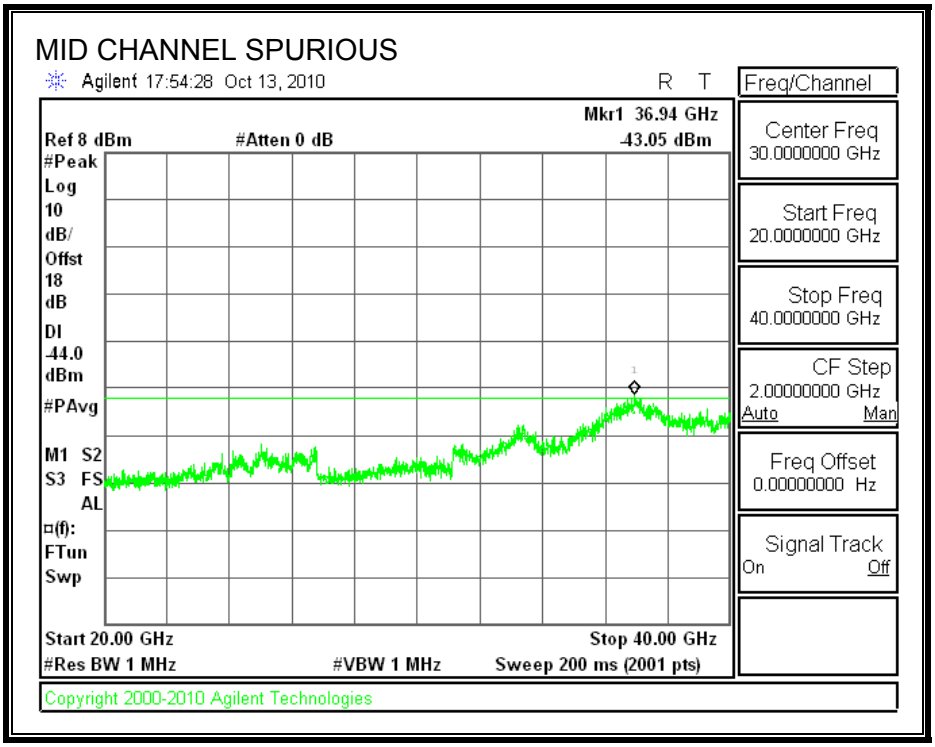


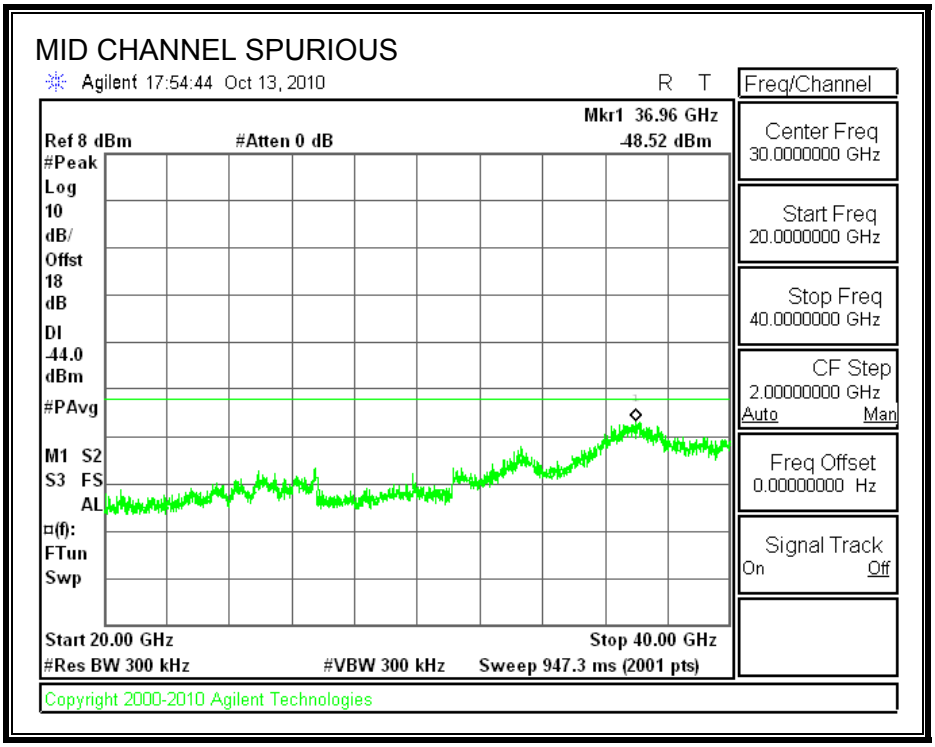




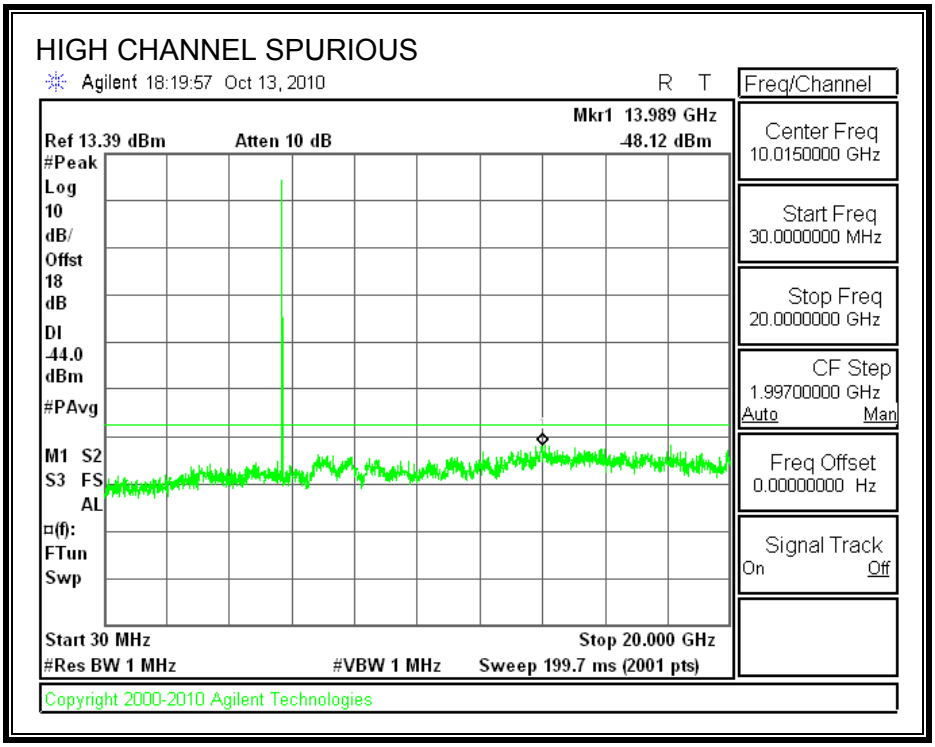
MID CHANNEL SPURIOUS

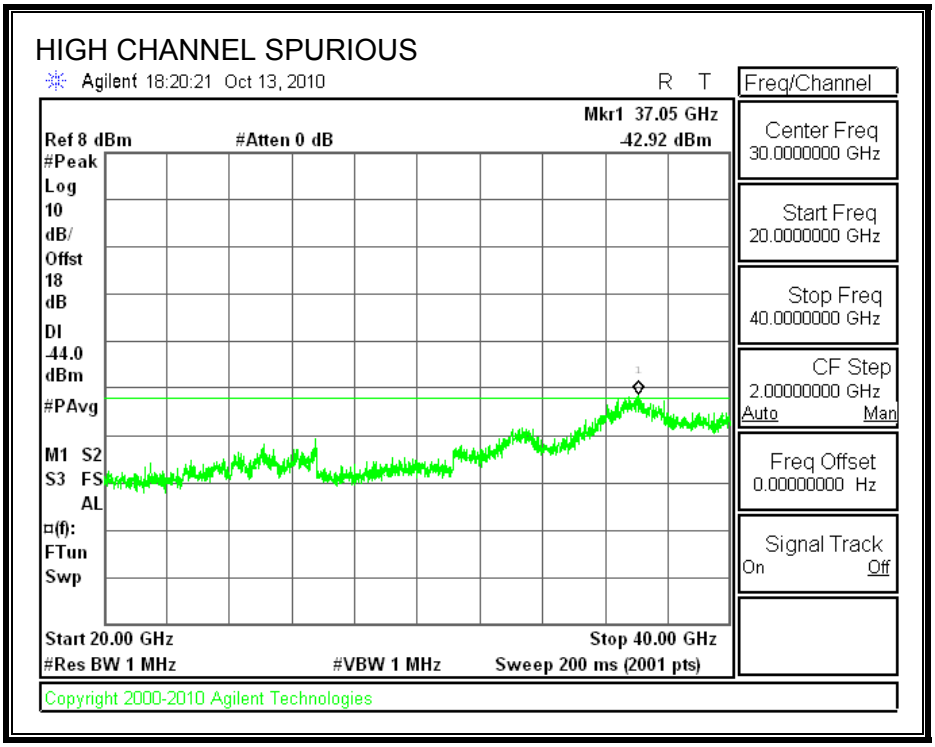


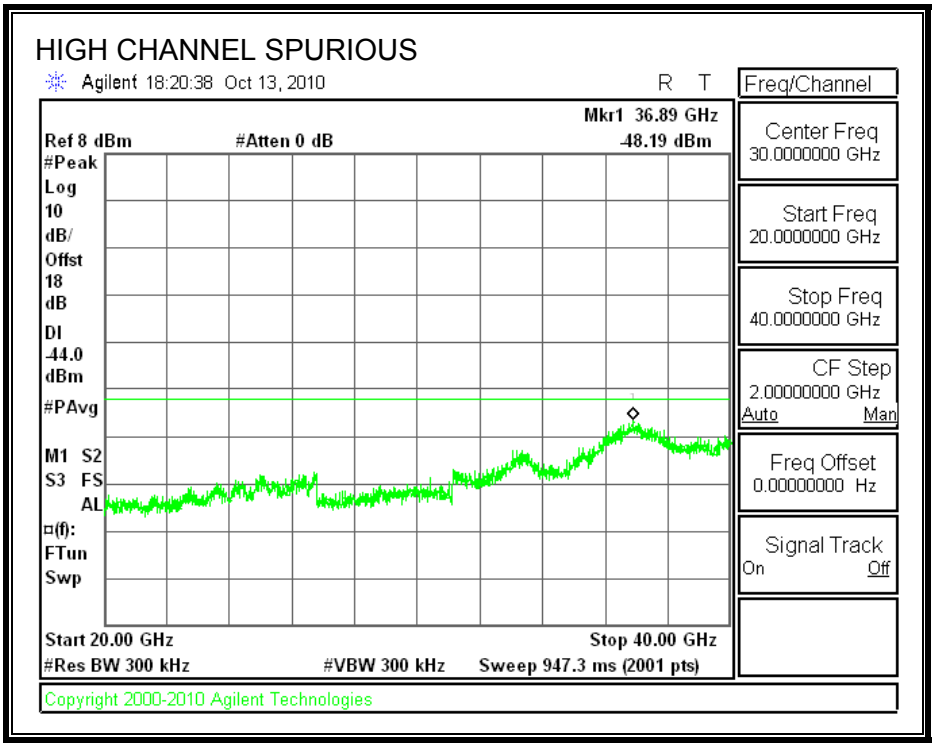




HIGH CHANNEL SPURIOUS







6.1.7. RECEIVER CONDUCTED SPURIOUS EMISSIONS

LIMITS

IC RSS-GEN 7.2.3.1

Antenna Conducted Measurement: Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

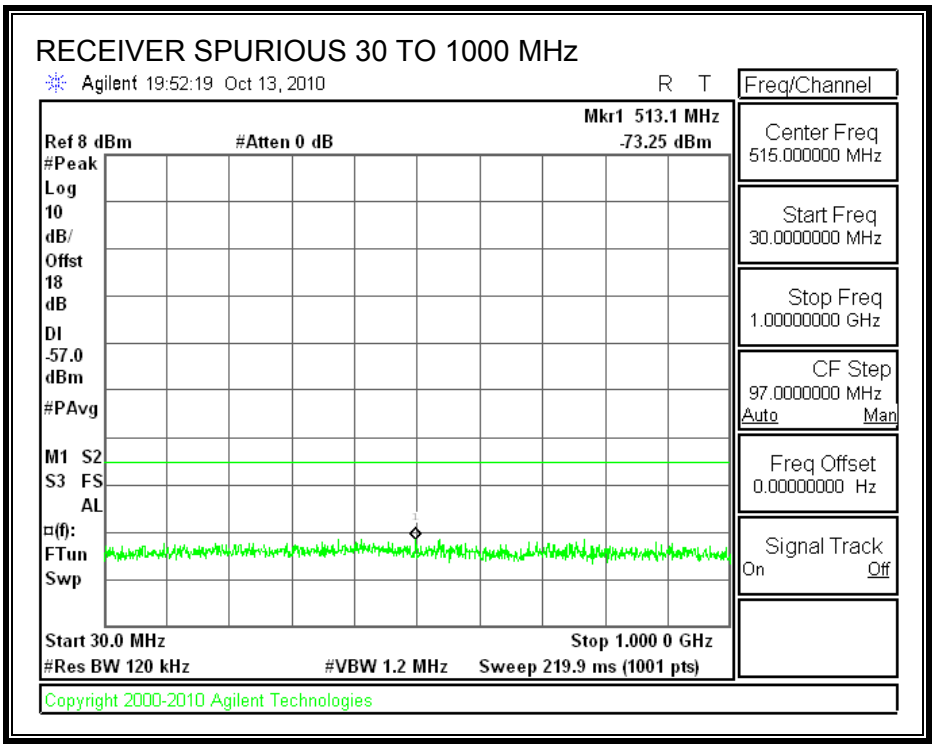
TEST PROCEDURE

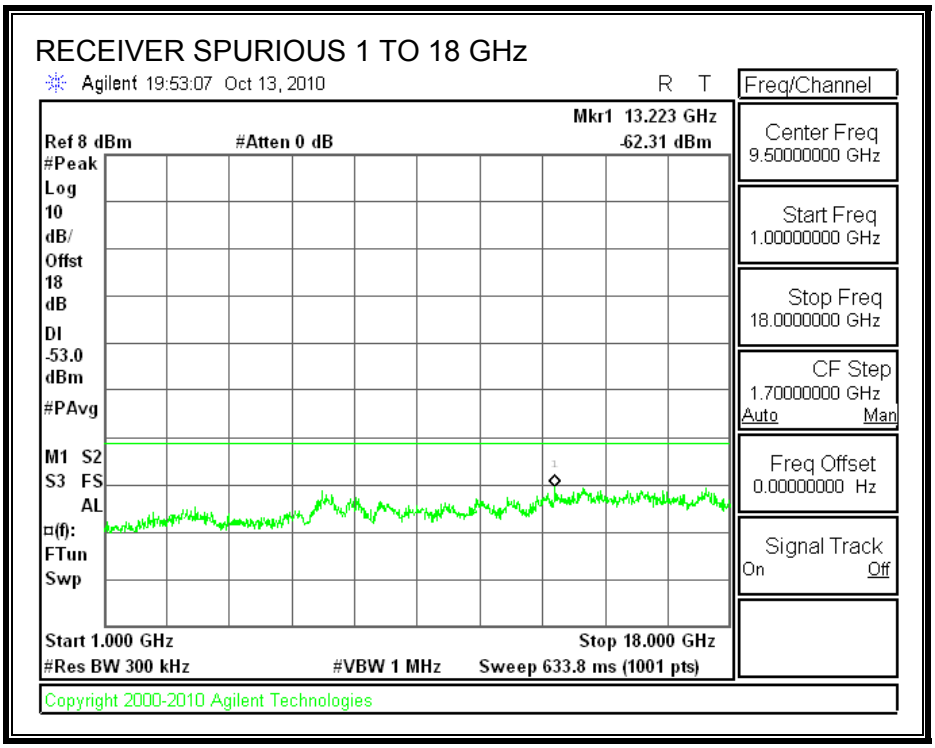
IC RSS-GEN 4.10, Conducted Method

The receiver antenna port is connected to a spectrum analyzer.

The spectrum from 30 MHz to 18 GHz is investigated with the receiver set to the middle channel of each 5 GHz band.

RECEIVER SPURIOUS EMISSIONS





6.2. 20MHz BANDWIDTH QPSK MODE IN THE 5.4 GHz BAND

6.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

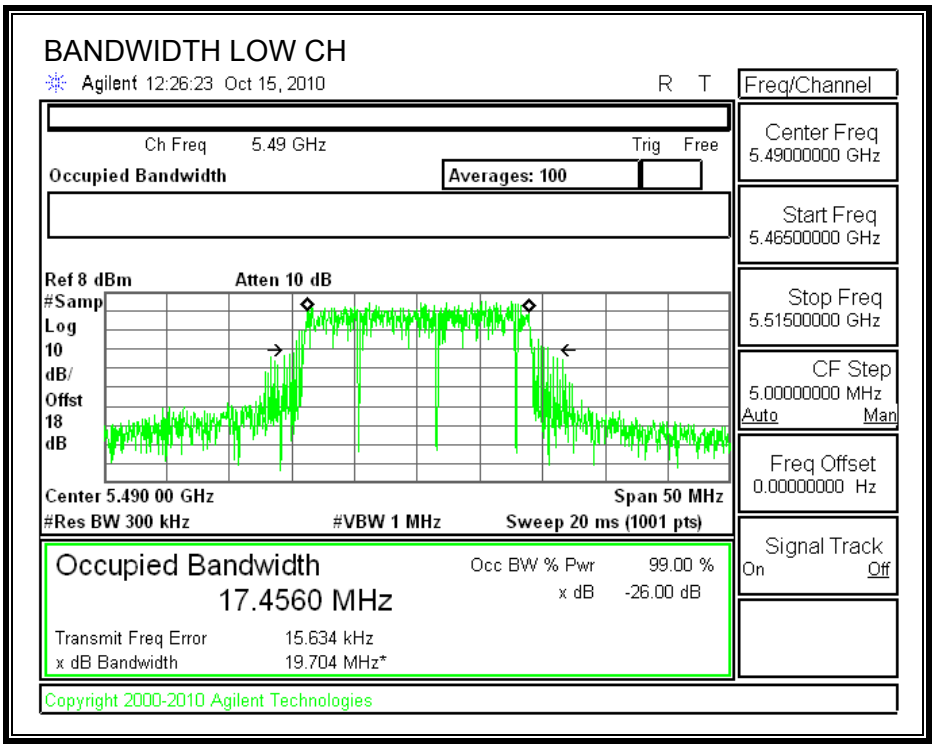
TEST PROCEDURE

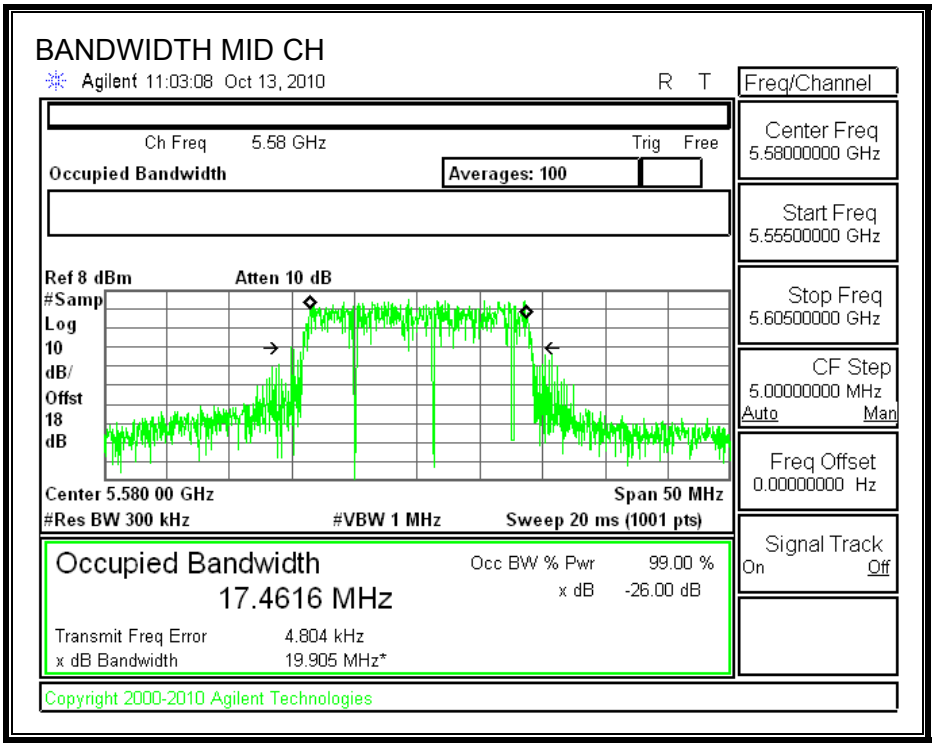
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

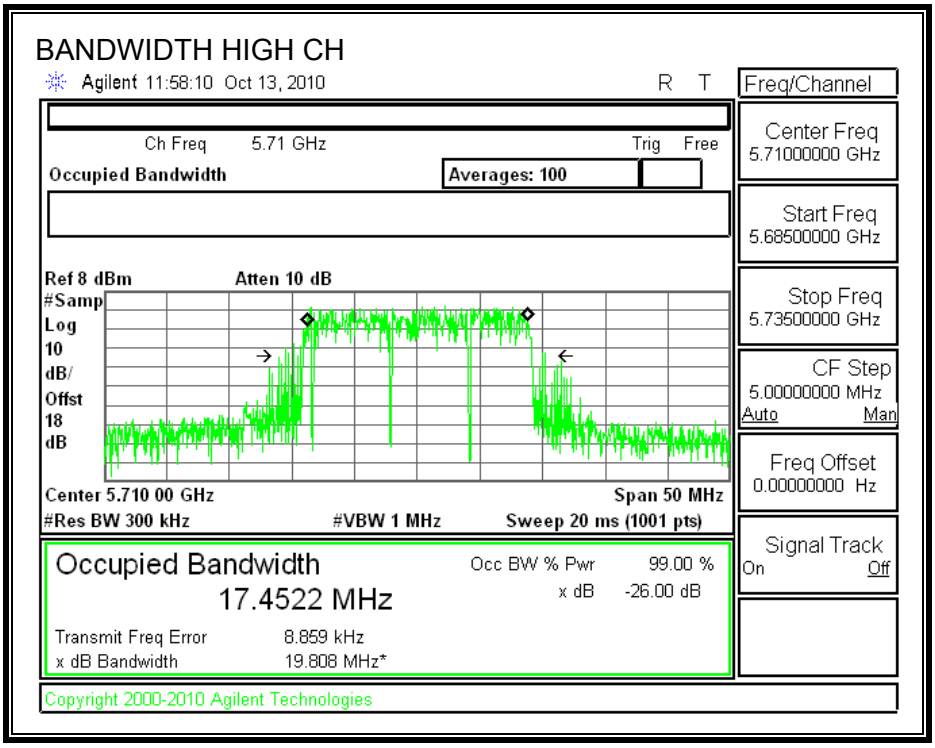
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5490	19.704	17.456
Middle	5580	19.905	17.4616
High	5710	19.808	17.4522

26 dB and 99% BANDWIDTH







6.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

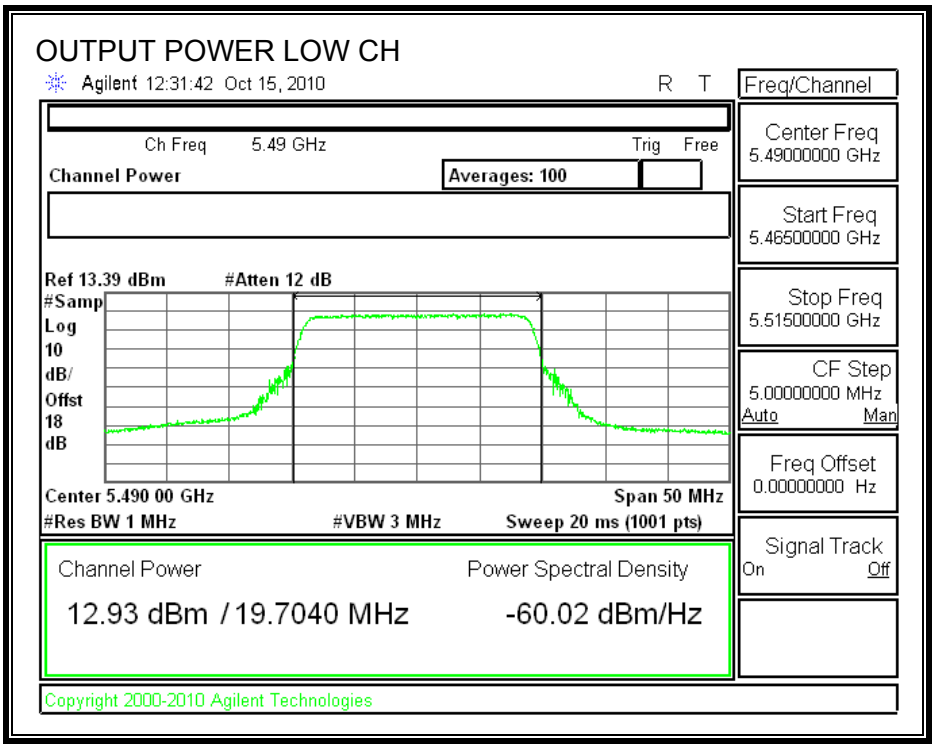
Limit

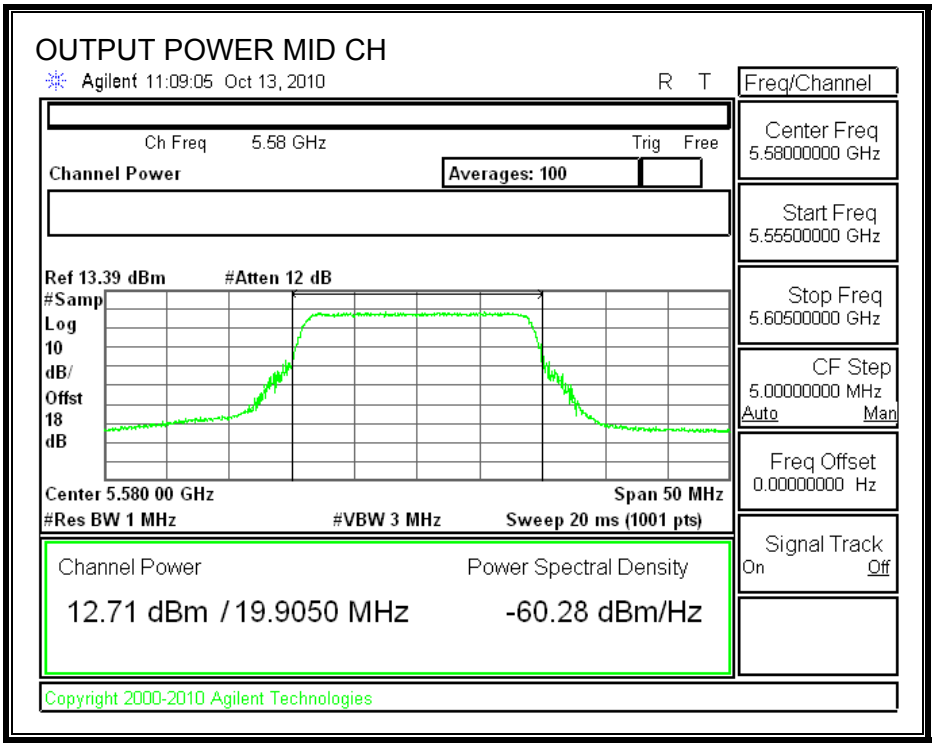
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5490	24	19.704	23.95	17.00	12.95
Mid	5580	24	19.905	23.99	17.00	12.99
High	5710	24	19.808	23.97	17.00	12.97

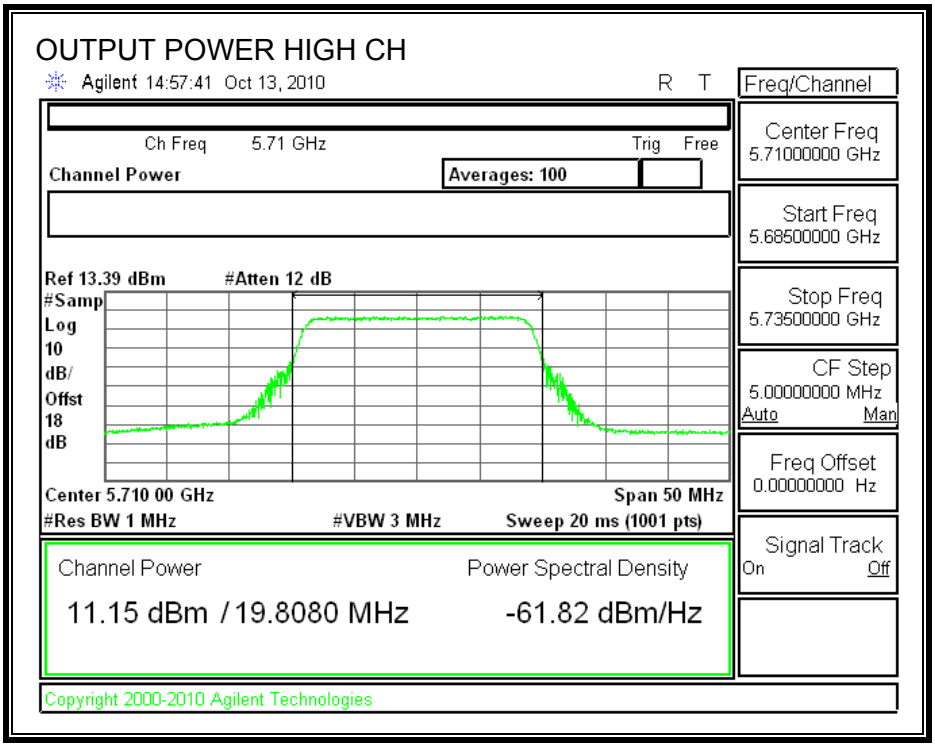
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5490	12.93	12.95	-0.02
Mid	5580	12.71	12.99	-0.28
High	5710	11.15	12.97	-1.82

OUTPUT POWER







6.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 18 dB (including 10 dB pad and 8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5490	12.32
Middle	5580	12.24
High	5710	10.55

6.2.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)
IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
The antenna assembly gain is 17 dBi, the excess gain is 11 dB, therefore the limit is 0 dBm.

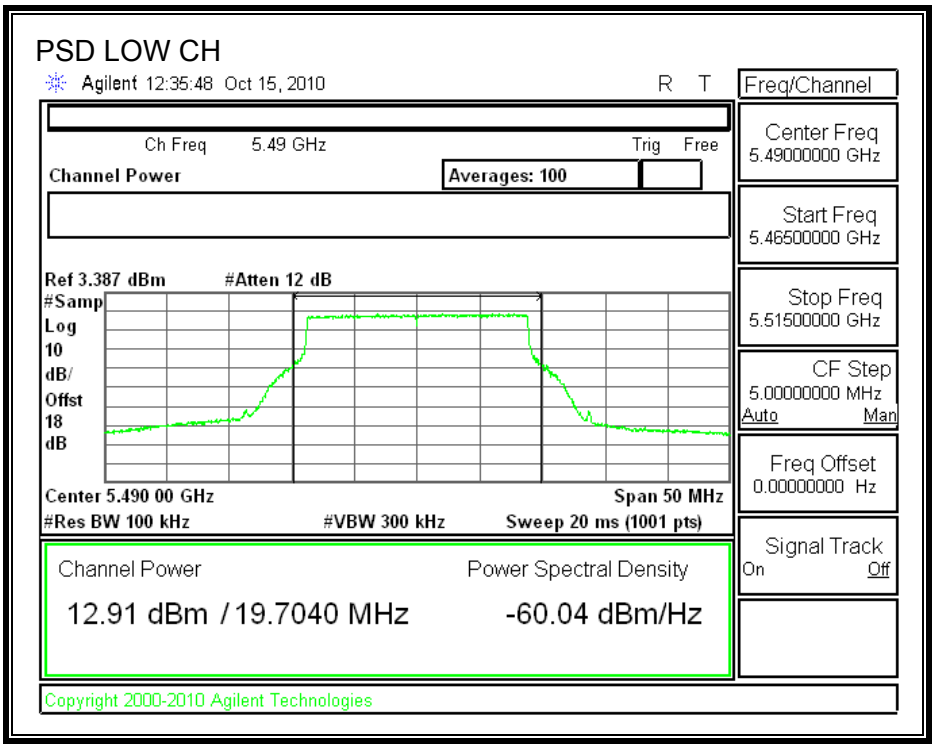
TEST PROCEDURE

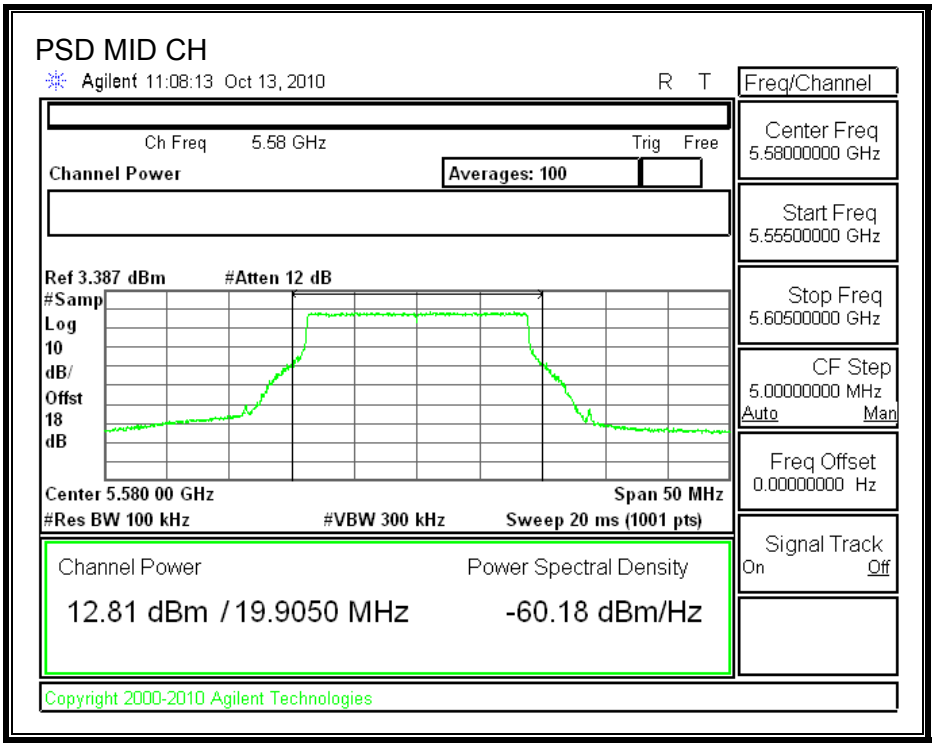
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

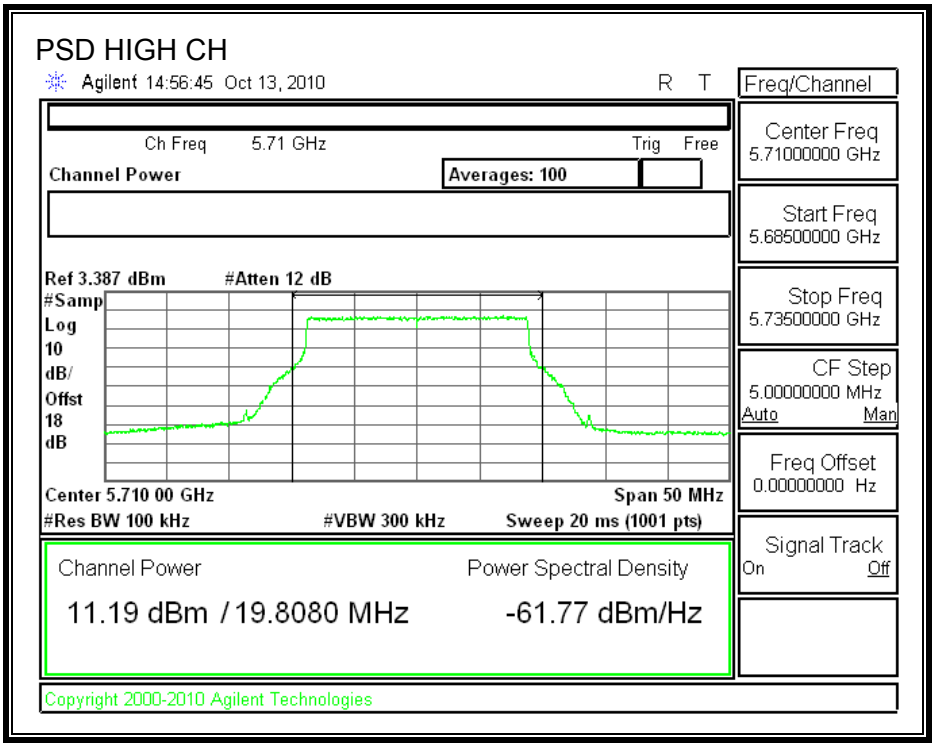
RESULTS

Channel	Frequency (MHz)	PPSD (dBm/Hz)	PPSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Low	5490	-60.04	-0.04	0	-0.04
Middle	5580	-60.18	-0.18	0	-0.18
High	5710	-61.77	-1.77	0	-1.77

POWER SPECTRAL DENSITY







6.2.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

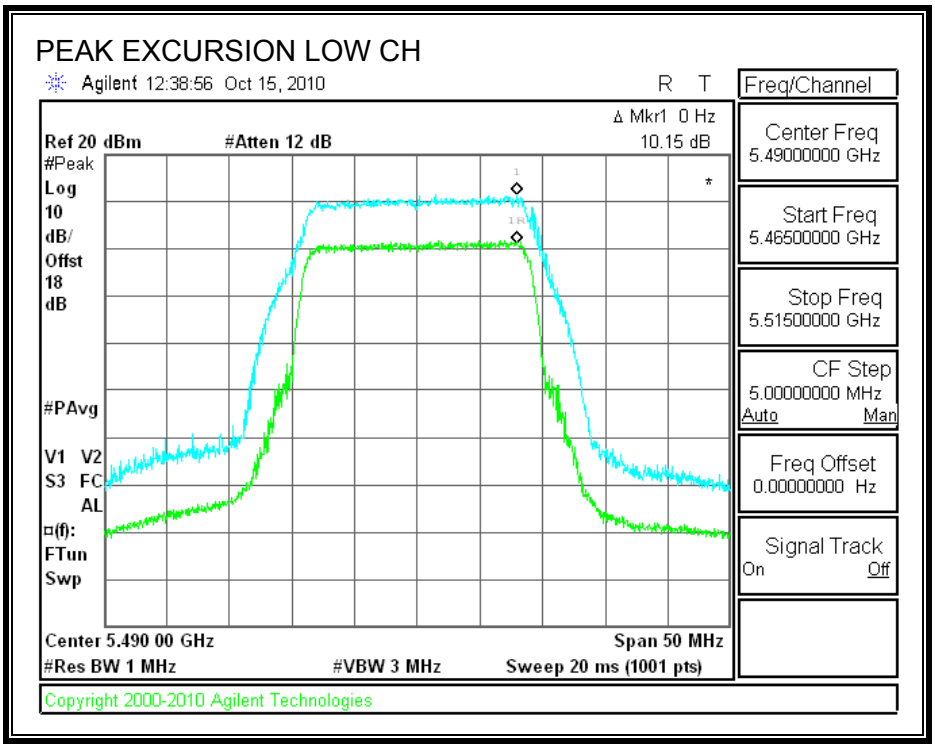
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

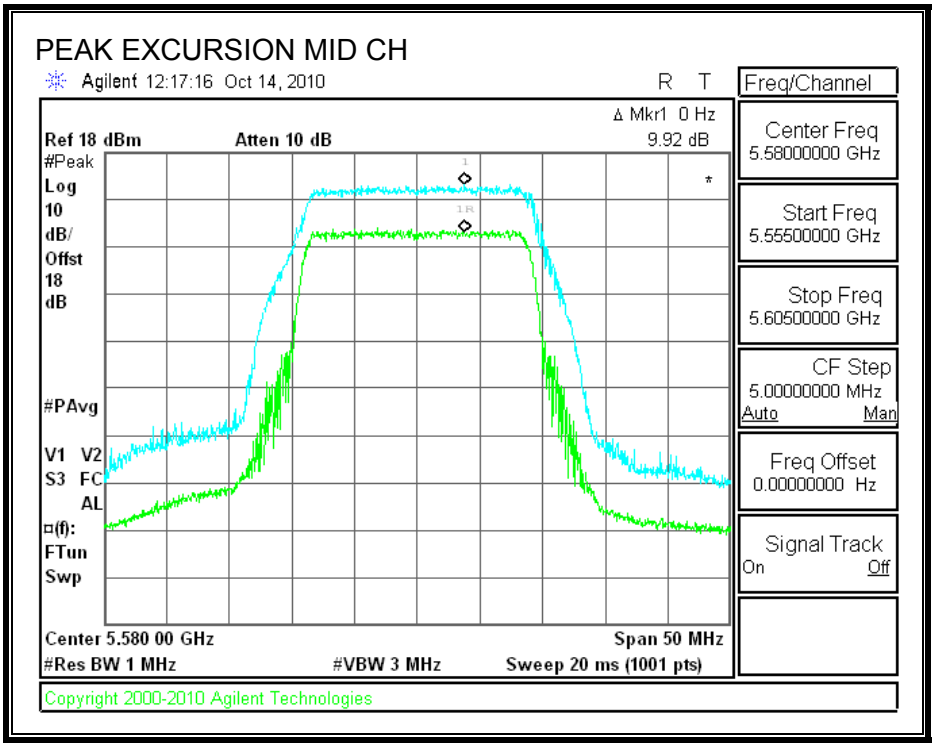
RESULTS

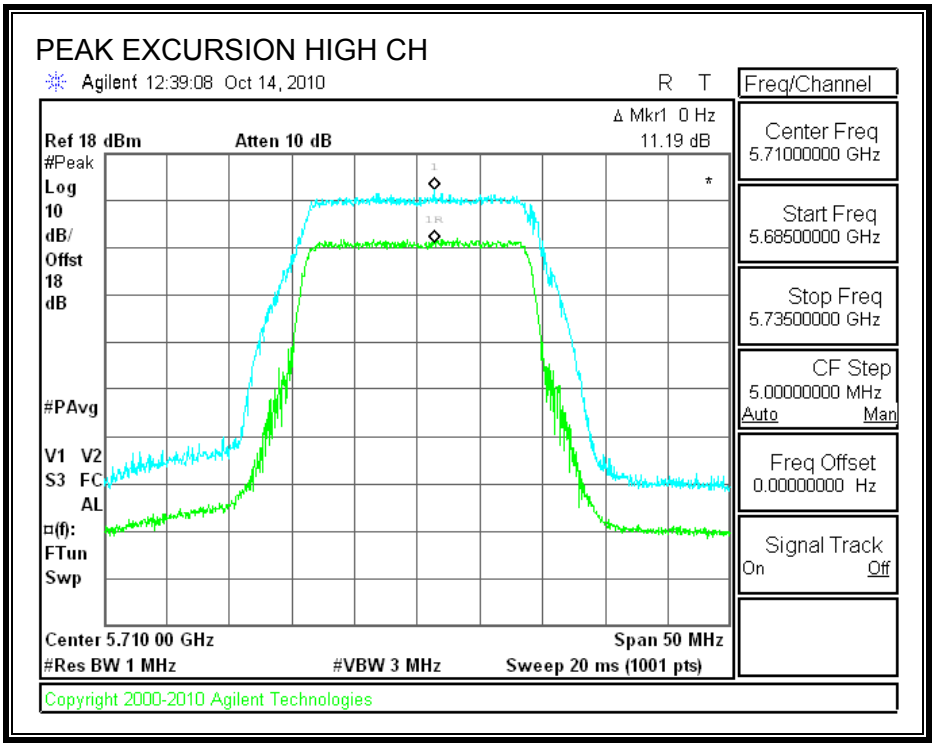
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5490	10.150	13	-2.85
Middle	5580	9.920	13	-3.08
High	5710	11.190	13	-1.81

PEAK EXCURSION



PEAK EXCURSION MID CH





6.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

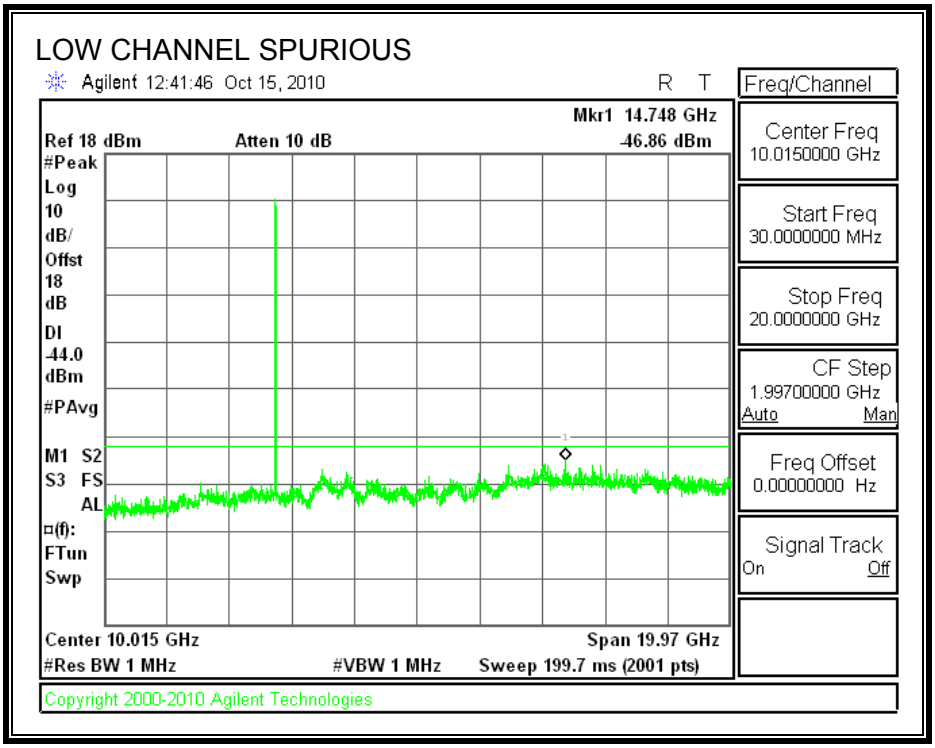
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

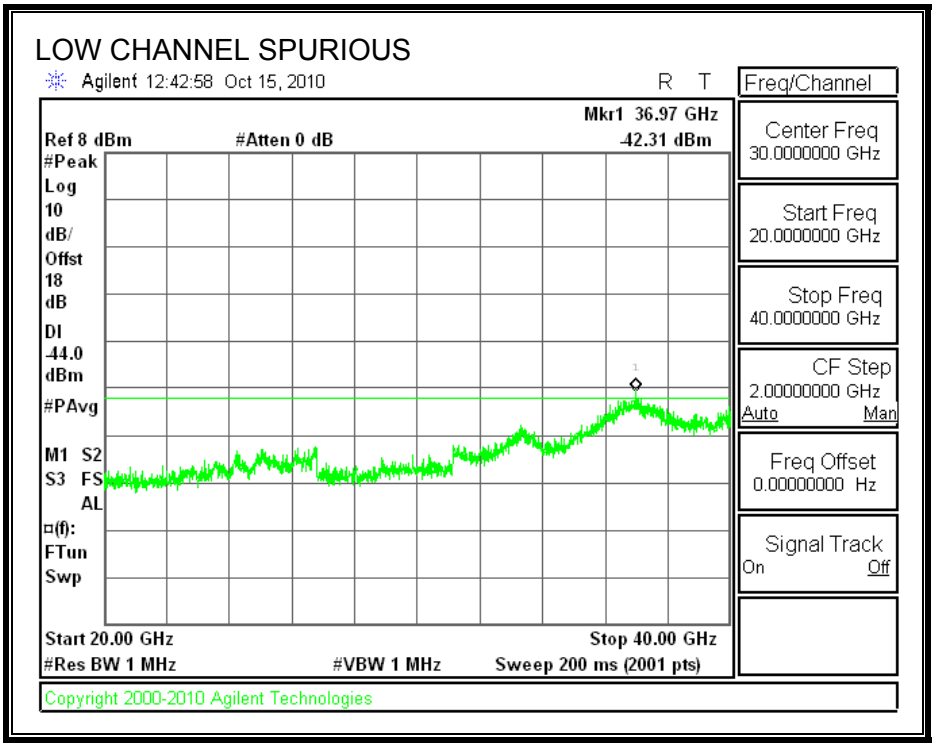
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

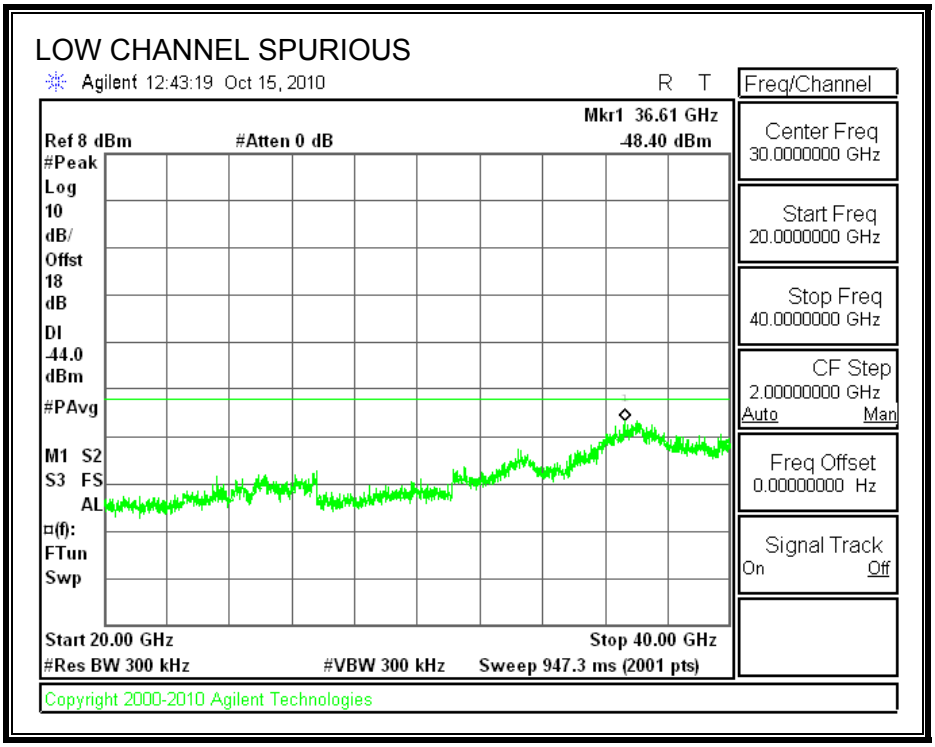
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

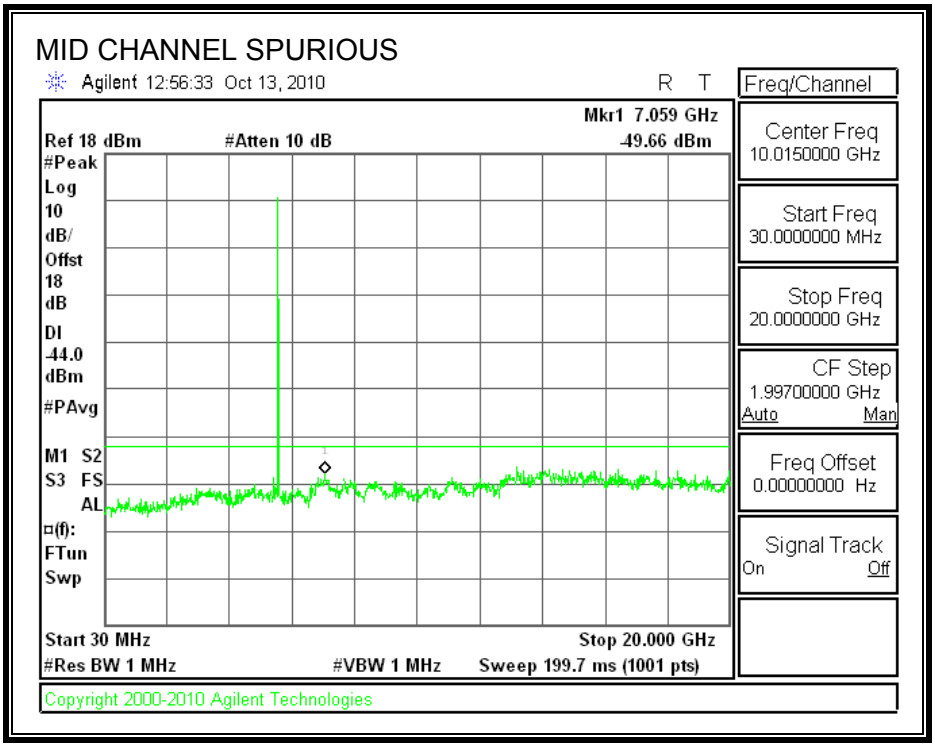
RESULTS

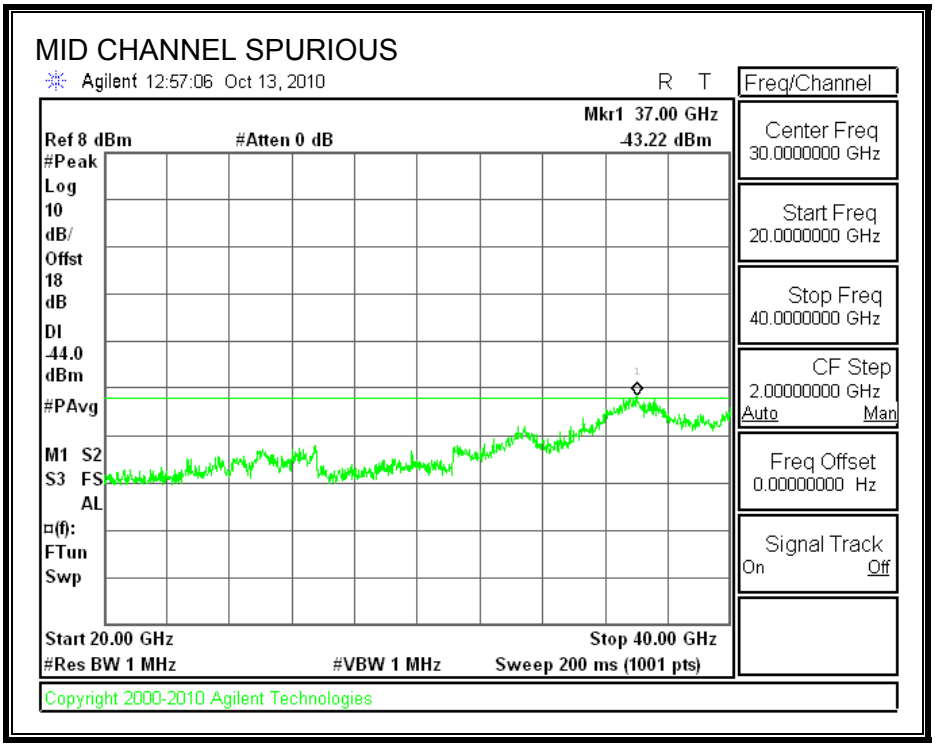
SPURIOUS EMISSIONS

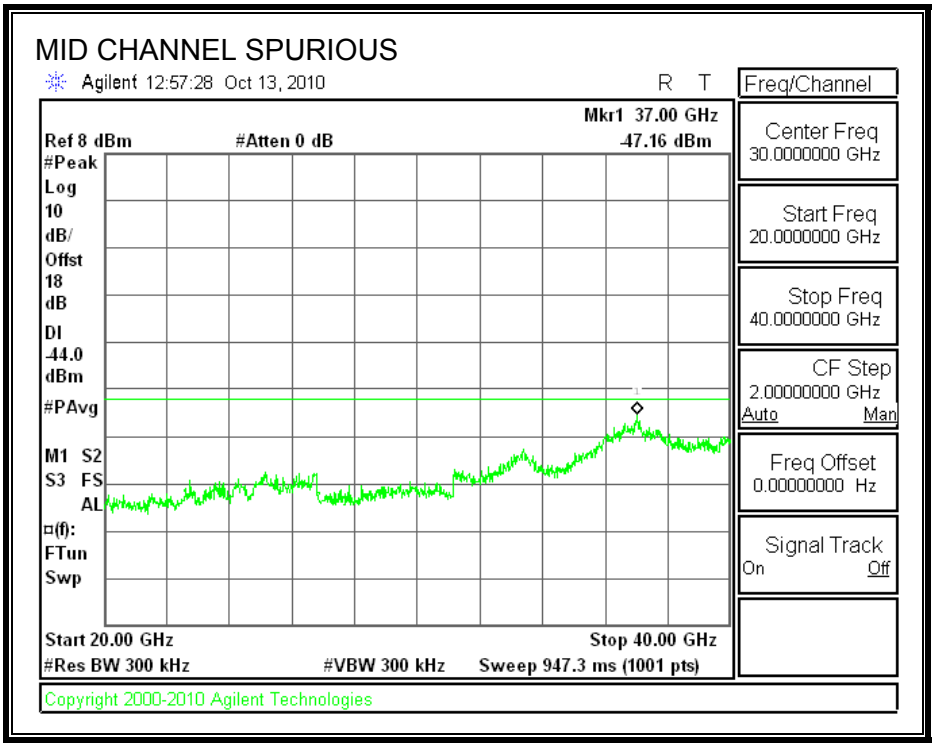




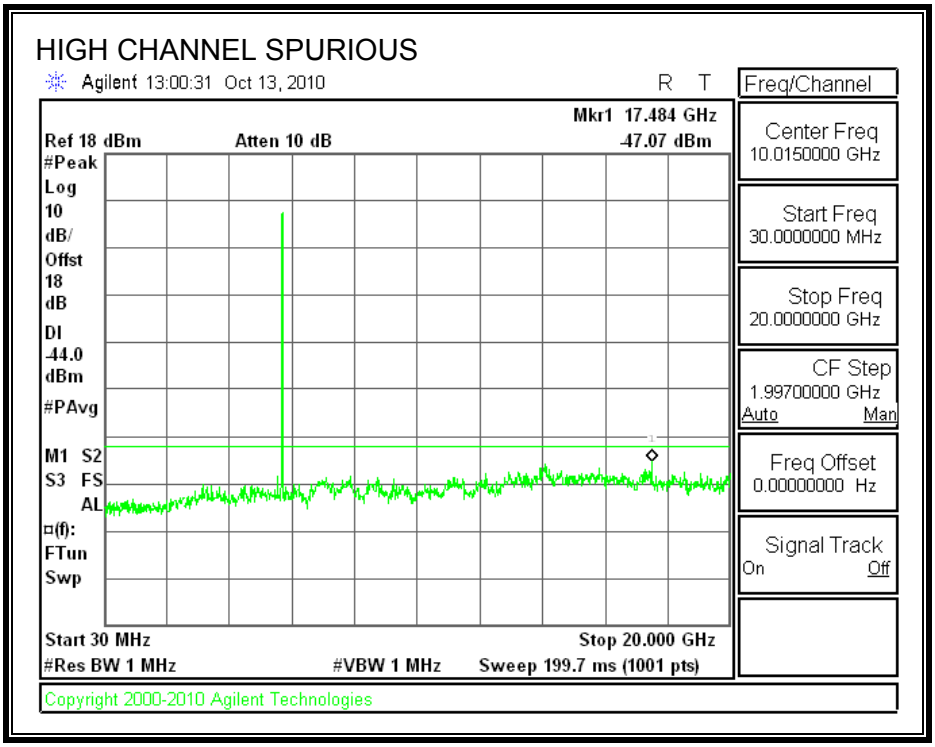


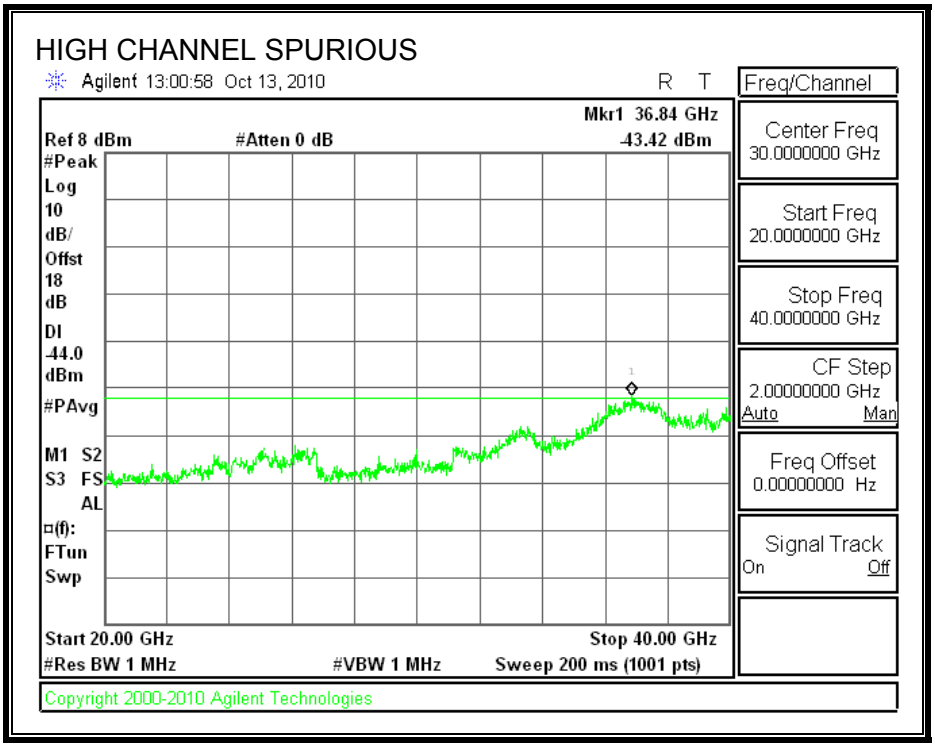


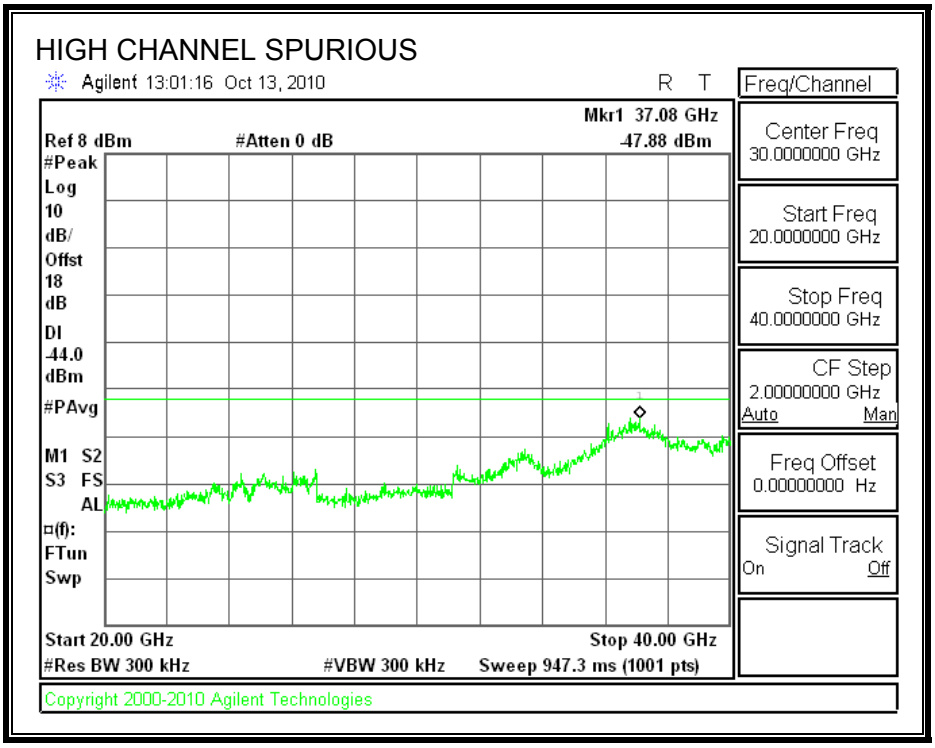




HIGH CHANNEL SPURIOUS







6.2.7. RECEIVER CONDUCTED SPURIOUS EMISSIONS

LIMITS

IC RSS-GEN 7.2.3.1

Antenna Conducted Measurement: Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

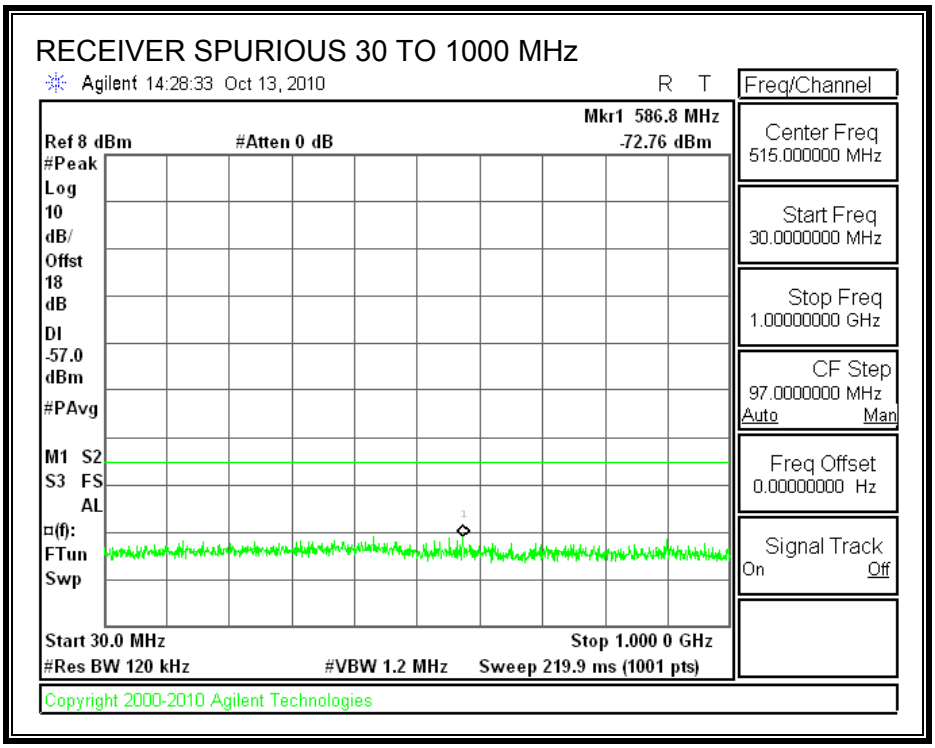
TEST PROCEDURE

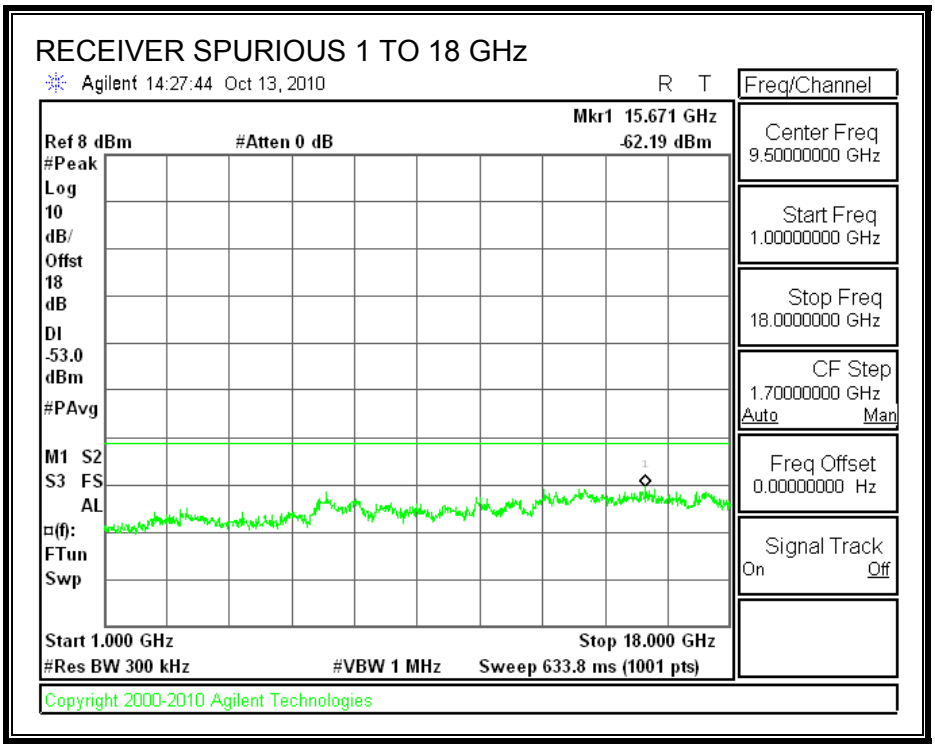
IC RSS-GEN 4.10, Conducted Method

The receiver antenna port is connected to a spectrum analyzer.

The spectrum from 30 MHz to 18 GHz is investigated with the receiver set to the middle channel of each 5 GHz band.

RECEIVER SPURIOUS EMISSIONS





7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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

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

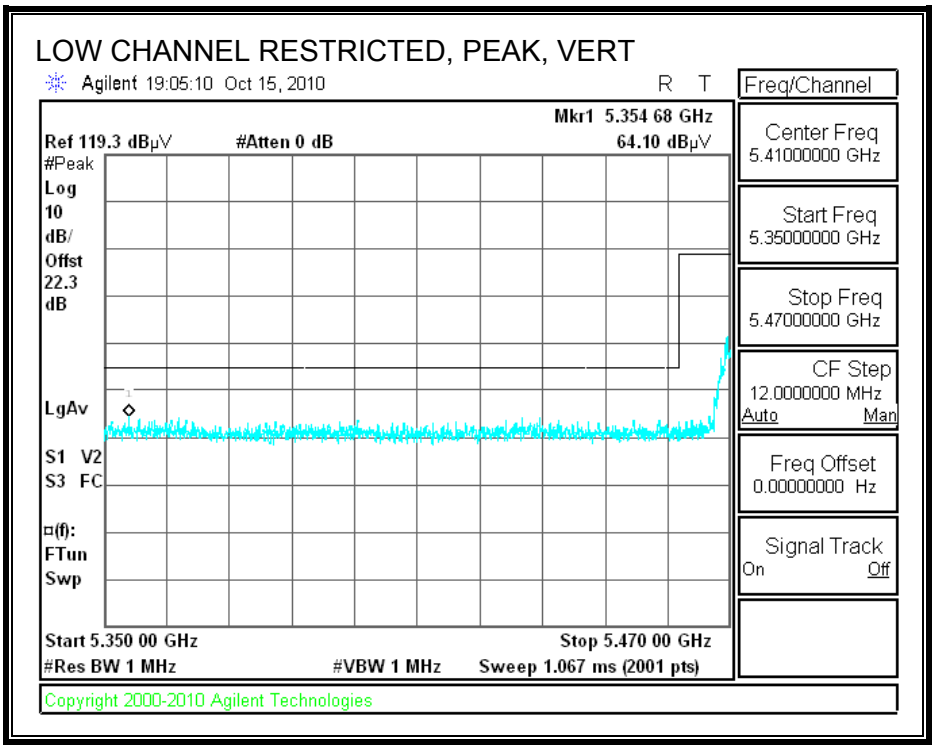
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

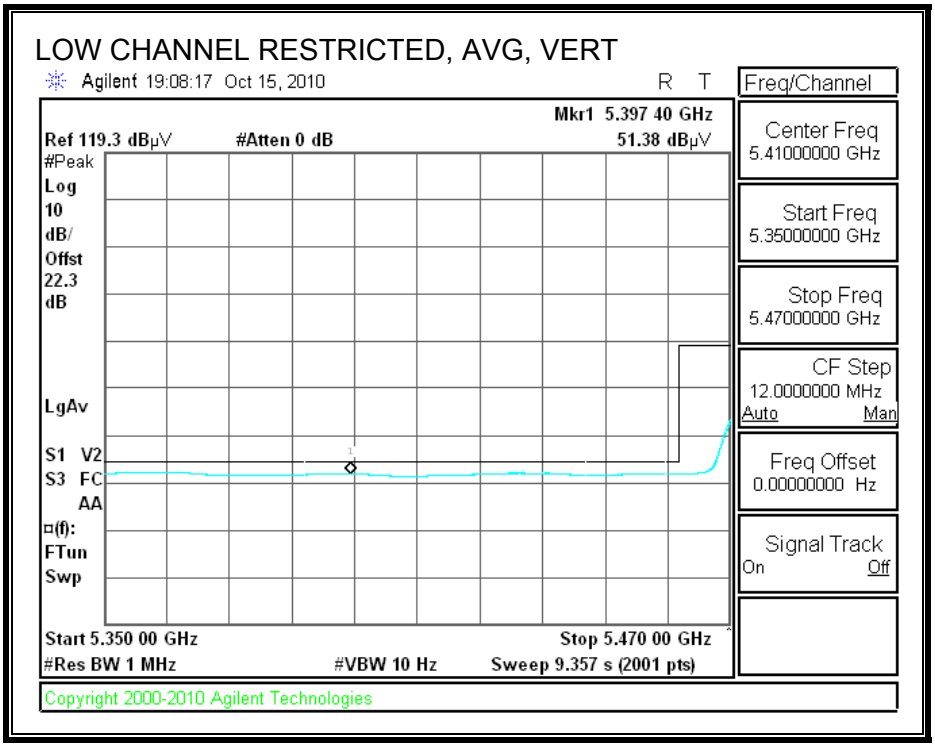
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.2. 10MHz BANDWIDTH QPSK MODE

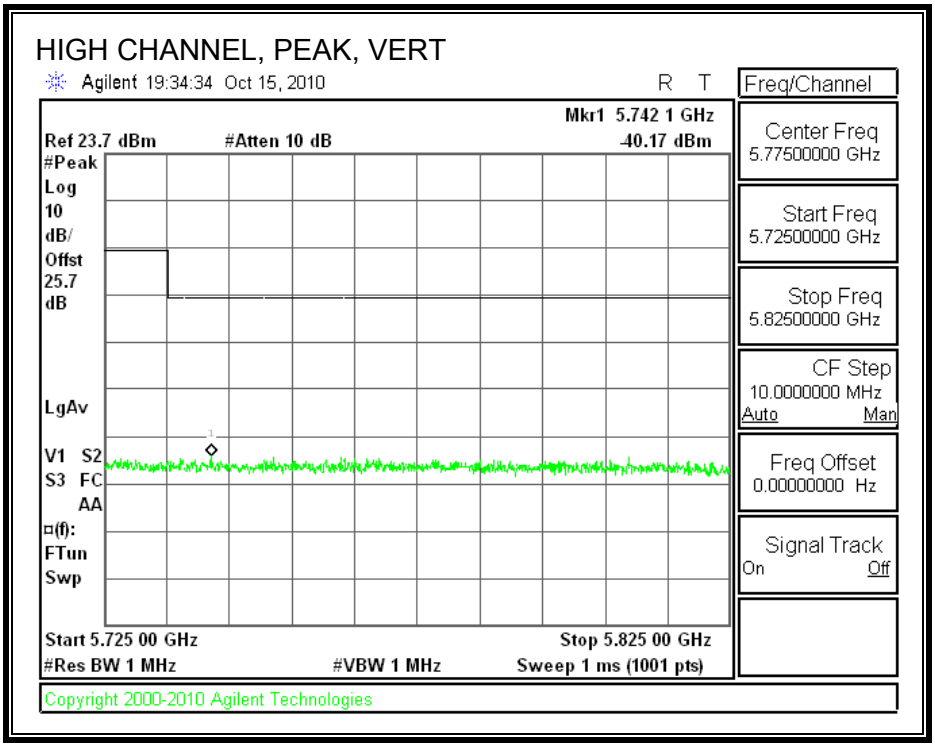
7.2.1. TX ABOVE 1 GHz IN THE 5.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

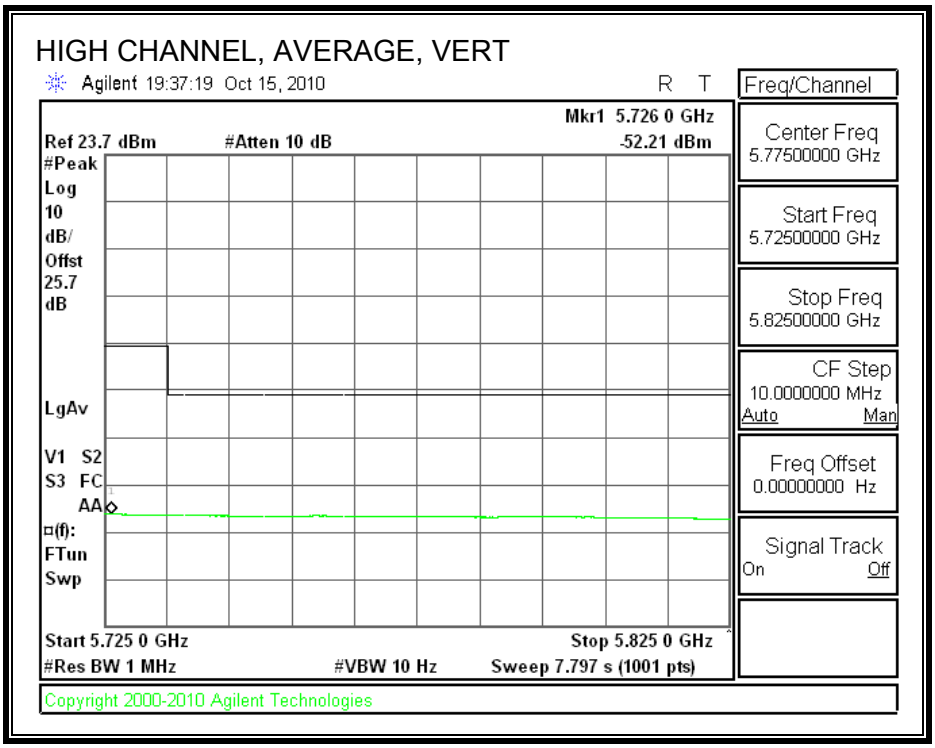




AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Motorola
Project #: 10U13444
Date: 10/7/10
Test Engineer: Thanh Nguyen
Configuration: EUT and Antenna
Mode: Transmit 10MHz, QPSK Modulation

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			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		R_002

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch 5480MHz															
1.233	3.0	50.6	45.8	24.8	2.6	-36.0	0.0	0.0	42.1	37.2	74	54	-31.9	-16.8	H
1.680	3.0	48.2	44.6	26.4	3.1	-35.6	0.0	0.0	42.1	38.5	74	54	-31.9	-15.5	H
3.255	3.0	42.4	30.3	30.6	4.6	-35.1	0.0	0.0	42.4	30.3	74	54	-31.6	-23.7	H
1.007	3.0	50.4	35.4	24.0	2.4	-36.1	0.0	0.0	40.6	25.6	74	54	-33.4	-28.4	V
4.913	3.0	48.6	36.1	32.8	5.9	-34.9	0.0	0.0	52.4	39.9	74	54	-21.6	-14.1	V
5.892	3.0	41.8	33.6	33.8	6.5	-35.0	0.0	0.0	47.0	38.8	74	54	-27.0	-15.2	V
Mid Ch 5580MHz															
1.010	3.0	49.3	42.4	24.0	2.4	-36.1	0.0	0.0	39.5	32.6	74	54	-34.5	-21.4	V
1.230	3.0	46.1	35.6	24.8	2.6	-36.0	0.0	0.0	37.6	27.1	74	54	-36.4	-26.9	V
4.930	3.0	49.9	36.4	32.9	5.9	-34.9	0.0	0.0	53.8	40.3	74	54	-20.2	-13.7	V
5.025	3.0	48.6	35.9	32.9	6.0	-34.9	0.0	0.0	52.6	39.9	74	54	-21.4	-14.1	V
5.917	3.0	41.5	32.4	33.8	6.5	-35.0	0.0	0.0	46.8	37.6	74	54	-27.2	-16.4	V
1.233	3.0	51.2	48.1	24.8	2.6	-36.0	0.0	0.0	42.7	39.6	74	54	-31.3	-14.4	H
2.687	3.0	43.3	32.5	29.1	4.1	-35.2	0.0	0.0	41.3	30.5	74	54	-32.7	-23.5	H
4.827	3.0	44.0	32.5	32.8	5.8	-34.8	0.0	0.0	47.7	36.2	74	54	-26.3	-17.8	H
High ch 5718MHz															
1.010	3.0	50.3	45.6	24.0	2.4	-36.1	0.0	0.0	40.5	35.8	74	54	-33.5	-18.2	V
3.890	3.0	42.0	32.6	31.9	5.1	-34.8	0.0	0.0	44.2	34.7	74	54	-29.8	-19.3	V
4.957	3.0	41.7	35.6	32.9	5.9	-34.9	0.0	0.0	45.6	39.5	74	54	-28.4	-14.5	V
14.290	3.0	36.3	22.7	41.2	10.8	-32.4	0.0	0.0	55.8	42.2	74	54	-18.2	-11.8	V
1.230	3.0	44.7	40.4	24.8	2.6	-36.0	0.0	0.0	36.1	31.8	74	54	-37.9	-22.2	H
1.855	3.0	42.4	30.6	27.1	3.3	-35.5	0.0	0.0	37.2	25.5	74	54	-36.8	-28.5	H
3.735	3.0	38.9	30.3	31.6	4.9	-34.9	0.0	0.0	40.6	31.9	74	54	-33.4	-22.1	H
7.733	3.0	37.4	26.6	35.8	7.5	-34.6	0.0	0.0	46.1	35.2	74	54	-27.9	-18.8	H
13.992	3.0	37.2	23.6	41.5	10.6	-32.4	0.0	0.0	56.9	43.2	74	54	-17.1	-10.8	H

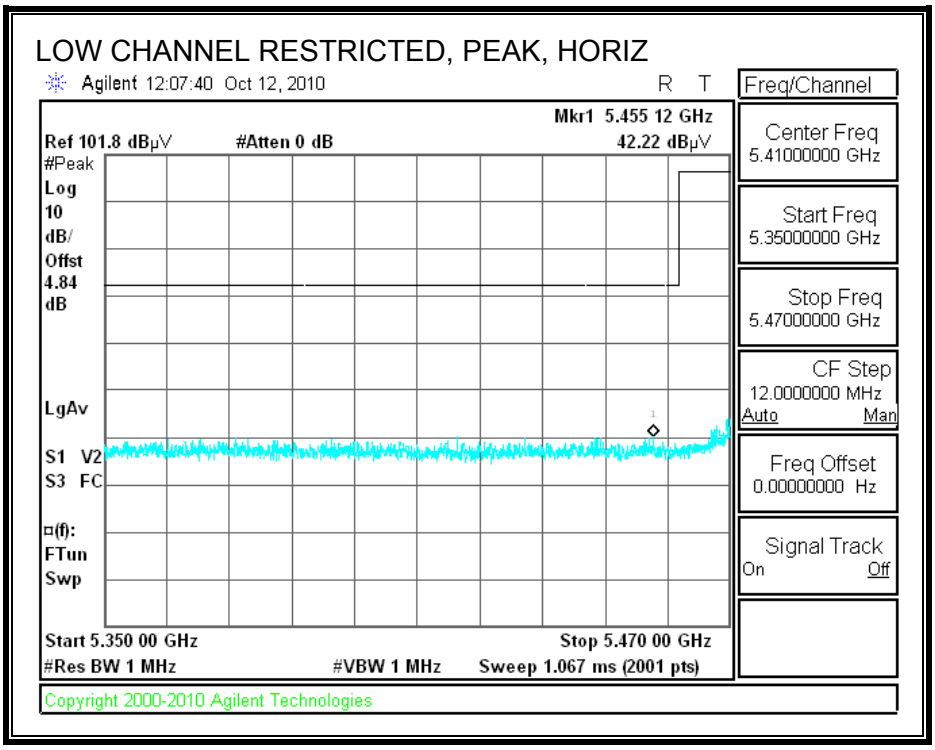
Rev. 07.22.09

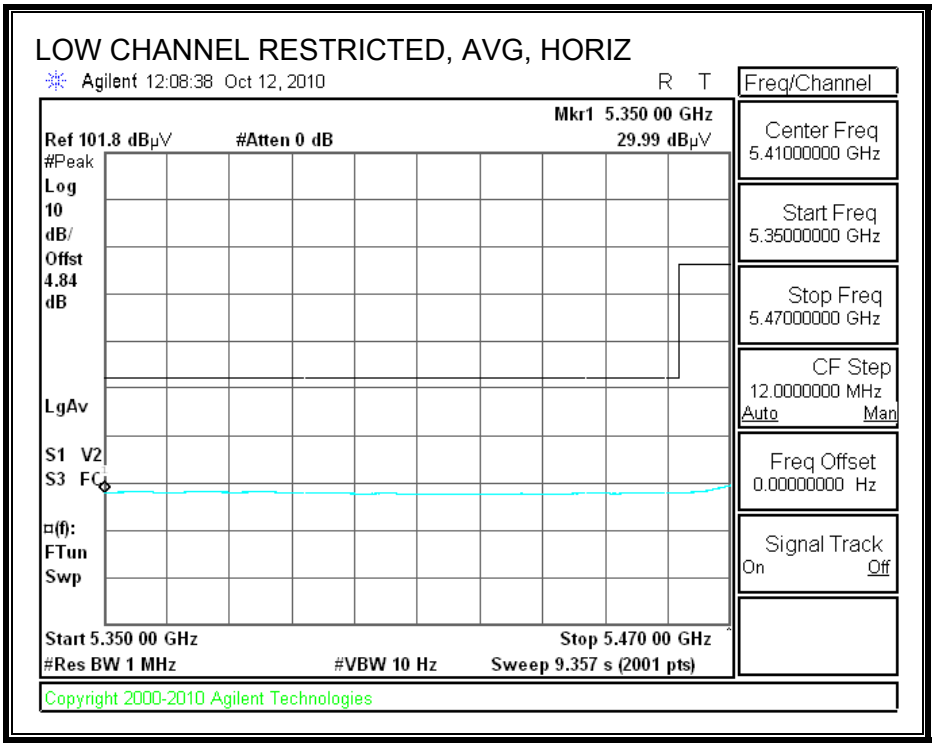
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

7.3. 20MHz BANDWIDTH QPSK MODE

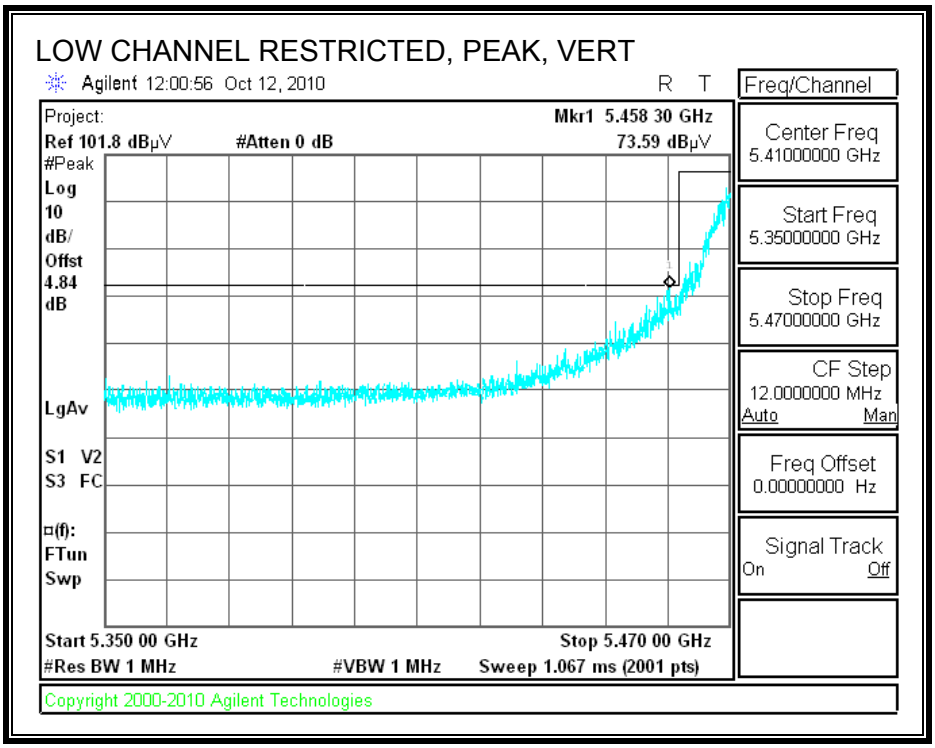
7.3.1. TX ABOVE 1 GHz IN THE 5.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

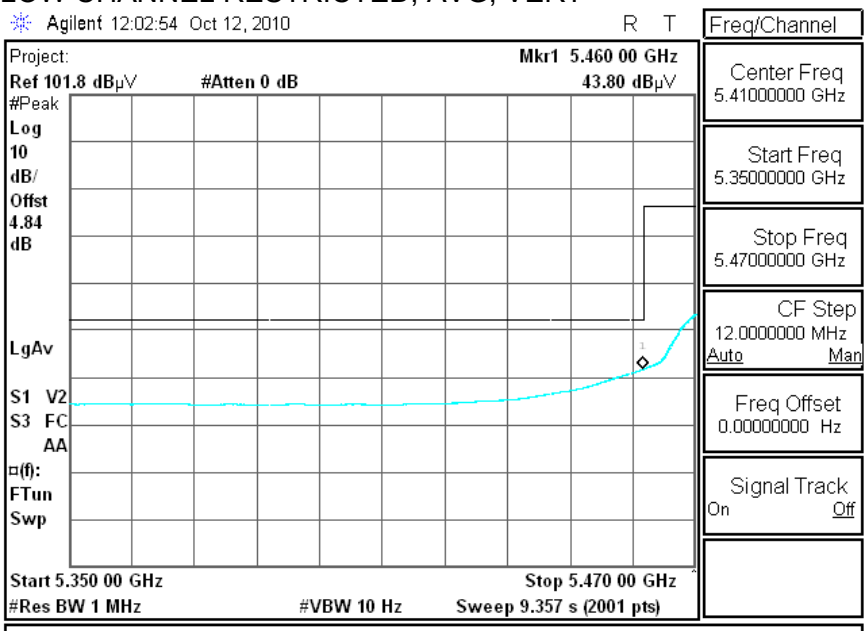




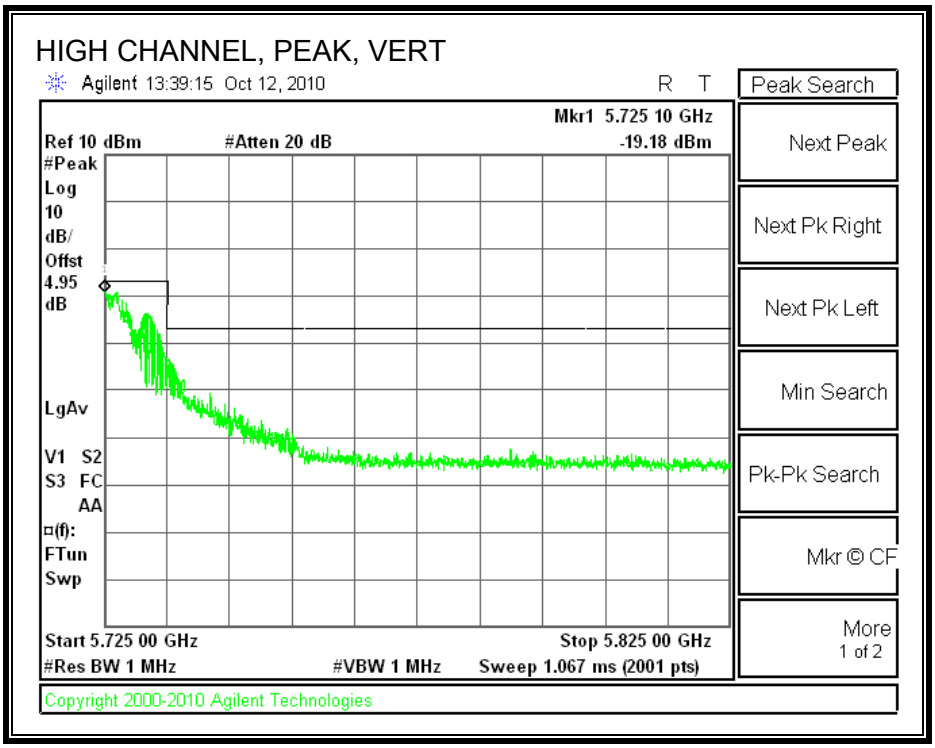
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



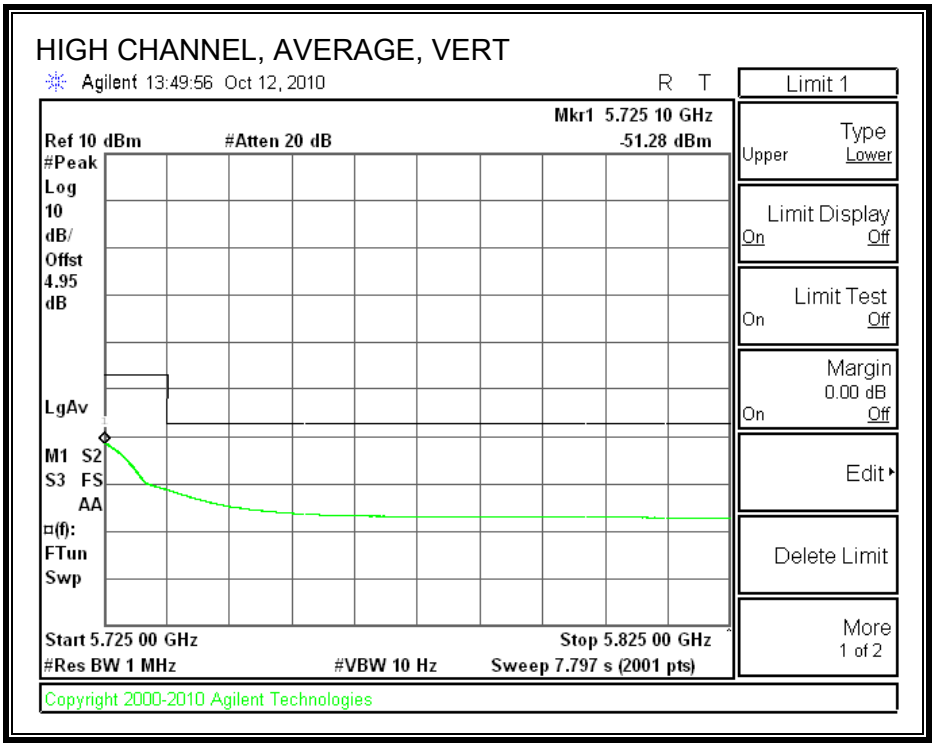
LOW CHANNEL RESTRICTED, AVG, VERT



AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Motorola
Project #:	10U13444
Date:	10/6/10
Test Engineer:	Thanh Nguyen
Configuration:	EUT and Antenna
Mode:	Transmit QPSK, 20MHz BW

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			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		R_002

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch 5490 MHz															
1.050	3.0	55.6	39.5	24.1	2.4	-36.1	0.0	0.0	46.1	29.9	74	54	-27.9	-24.1	V
2.687	3.0	44.0	34.5	29.1	4.1	-35.2	0.0	0.0	42.0	32.5	74	54	-32.0	-21.5	V
4.930	3.0	54.2	36.7	32.9	5.9	-34.9	0.0	0.0	58.1	40.5	74	54	-15.9	-13.5	V
8.770	3.0	43.4	30.2	36.7	8.1	-34.8	0.0	0.0	53.3	40.2	74	54	-20.7	-13.8	V
1.007	3.0	53.3	38.4	24.0	2.4	-36.1	0.0	0.0	43.4	28.6	74	54	-30.6	-25.4	H
1.233	3.0	52.4	41.4	24.8	2.6	-36.0	0.0	0.0	43.8	32.8	74	54	-30.2	-21.2	H
1.680	3.0	53.2	38.4	26.4	3.1	-35.6	0.0	0.0	47.2	32.3	74	54	-26.8	-21.7	H
6.940	3.0	42.4	30.3	34.7	7.1	-34.7	0.0	0.0	49.4	37.3	74	54	-24.6	-16.7	H
Mid Ch 5580MHz															
1.007	3.0	46.0	38.3	24.0	2.4	-36.1	0.0	0.0	36.2	28.5	74	54	-37.8	-25.5	V
1.233	3.0	44.7	35.2	24.8	2.6	-36.0	0.0	0.0	36.2	26.7	74	54	-37.8	-27.3	V
1.680	3.0	44.4	35.3	26.4	3.1	-35.6	0.0	0.0	38.3	29.2	74	54	-35.7	-24.8	V
4.973	3.0	48.6	31.0	32.9	5.9	-34.9	0.0	0.0	52.5	34.9	74	54	-21.5	-19.1	V
7.700	3.0	39.2	25.1	35.7	7.5	-34.6	0.0	0.0	47.8	33.8	74	54	-26.2	-20.2	V
5.877	3.0	41.4	32.2	33.8	6.5	-35.0	0.0	0.0	46.6	37.3	74	54	-27.4	-16.7	V
1.007	3.0	48.4	39.6	24.0	2.4	-36.1	0.0	0.0	38.6	29.8	74	54	-35.4	-24.2	H
1.233	3.0	46.6	38.4	24.8	2.6	-36.0	0.0	0.0	38.0	29.8	74	54	-36.0	-24.2	H
1.680	3.0	48.5	33.3	26.4	3.1	-35.6	0.0	0.0	42.4	27.2	74	54	-31.6	-26.8	H
High ch 5710MHz															
1.907	3.0	44.8	33.5	27.3	3.4	-35.5	0.0	0.0	40.0	28.6	74	54	-34.0	-25.4	V
5.033	3.0	48.3	31.2	32.9	6.0	-34.9	0.0	0.0	52.3	35.2	74	54	-21.7	-18.8	V
1.007	3.0	48.5	38.4	24.0	2.4	-36.1	0.0	0.0	38.7	28.6	74	54	-35.3	-25.4	H
1.254	3.0	47.6	41.4	24.9	2.7	-36.0	0.0	0.0	39.2	32.9	74	54	-34.8	-21.1	H
1.723	3.0	46.7	41.3	26.6	3.2	-35.6	0.0	0.0	40.9	35.5	74	54	-33.1	-18.5	H

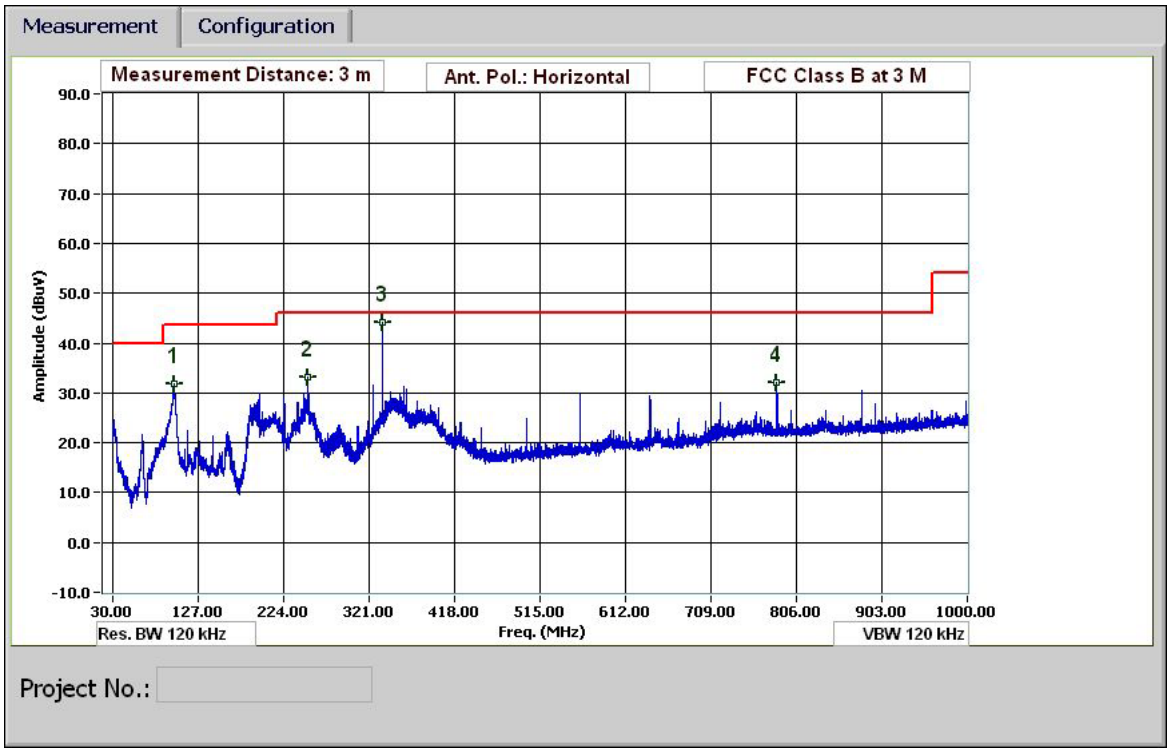
Rev. 07.22.09

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		

7.4. WORST-CASE BELOW 1 GHz

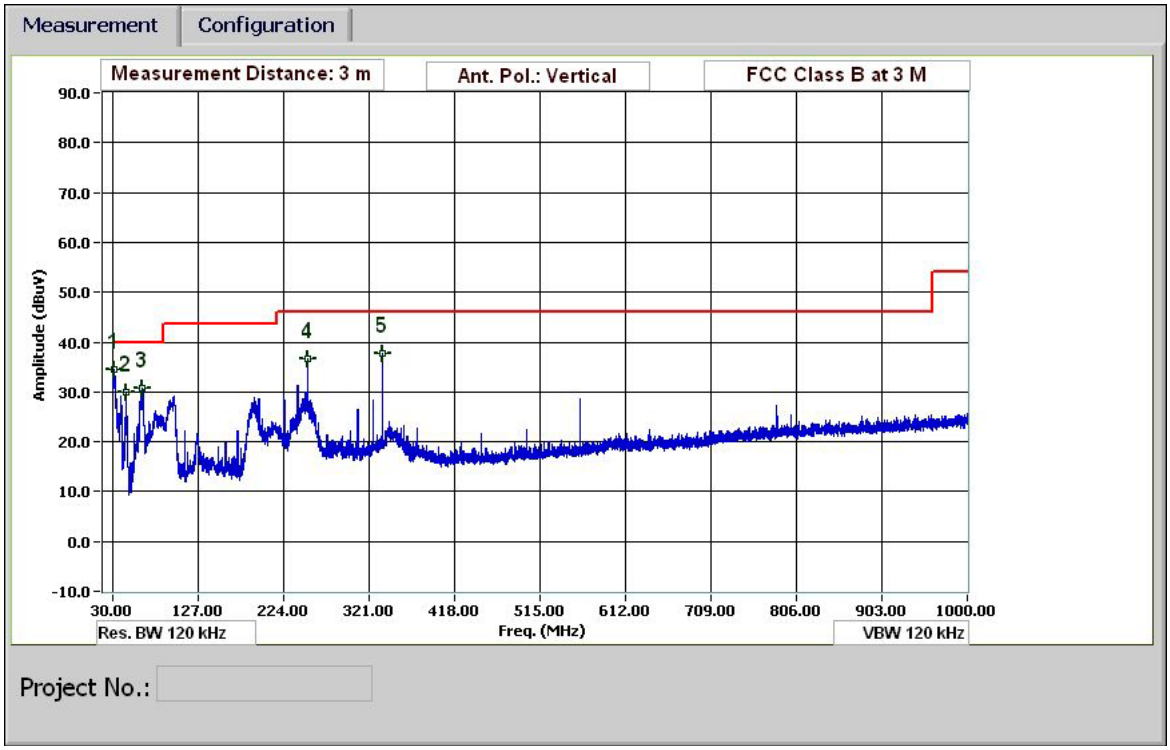
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 10/07/10
Project #: 10U13444
Company: Motorola
Test Target: FCC 15.407 Class B
Mode Oper: Transmit worst case 20MHz BW

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
31.8	3.0	44.0	19.5	0.5	29.7	0.0	0.0	34.4	40.0	-5.6	V	P	100.0	0 - 360	
45.241	3.0	48.0	10.9	0.6	29.6	0.0	0.0	29.9	40.0	-10.1	V	P	100.0	0 - 360	
63.721	3.0	51.6	8.0	0.7	29.6	0.0	0.0	30.7	40.0	-9.3	V	P	100.0	0 - 360	
251.649	3.0	52.2	11.8	1.4	28.8	0.0	0.0	36.6	46.0	-9.4	V	P	100.0	0 - 360	
336.013	3.0	51.0	13.9	1.7	29.0	0.0	0.0	37.6	46.0	-8.4	V	P	100.0	0 - 360	
99.963	3.0	50.3	10.1	0.9	29.5	0.0	0.0	31.8	43.5	-11.7	H	P	100.0	0 - 360	
252.009	3.0	48.6	11.9	1.4	28.8	0.0	0.0	33.1	46.0	-12.9	H	P	100.0	0 - 360	
336.013	3.0	56.9	13.9	1.7	29.0	0.0	0.0	43.5	46.0	-2.5	H	QP	100.0	0 - 360	
783.991	3.0	37.7	20.7	2.8	29.2	0.0	0.0	32.0	46.0	-14.0	H	P	100.0	0 - 360	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

RESULTS

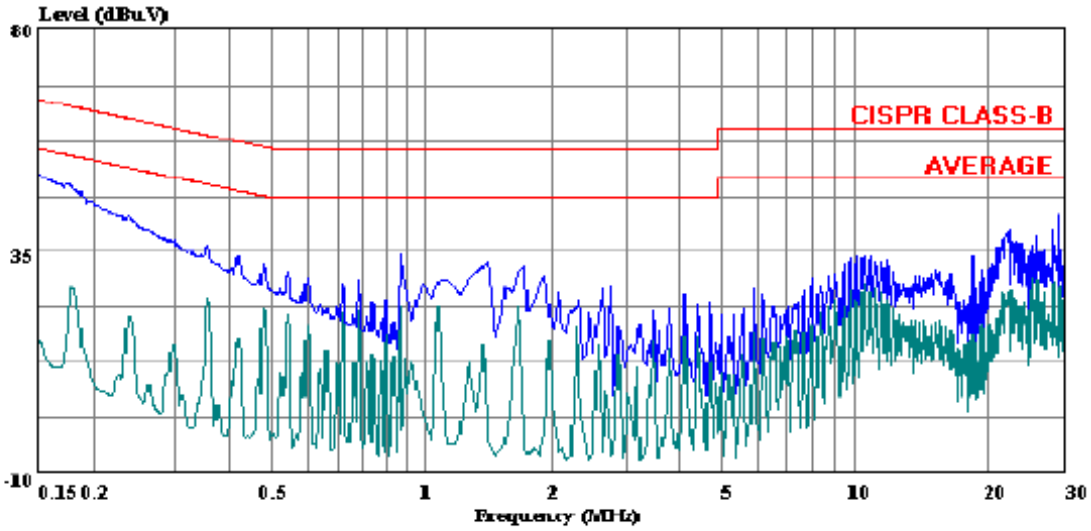
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	50.78	--	27.62	0.00	66.00	56.00	-15.22	-28.38	L1
0.97	34.37	--	23.83	0.00	56.00	46.00	-21.63	-22.17	L1
29.06	42.62	--	39.87	0.00	60.00	50.00	-17.38	-10.13	L1
0.15	50.80	--	25.51	0.00	66.00	56.00	-15.20	-30.49	L2
0.79	26.21	--	18.70	0.00	56.00	46.00	-29.79	-27.30	L2
29.53	41.98	--	39.75	0.00	60.00	50.00	-18.02	-10.25	L2
6 Worst Data									

LINE 1 RESULTS

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

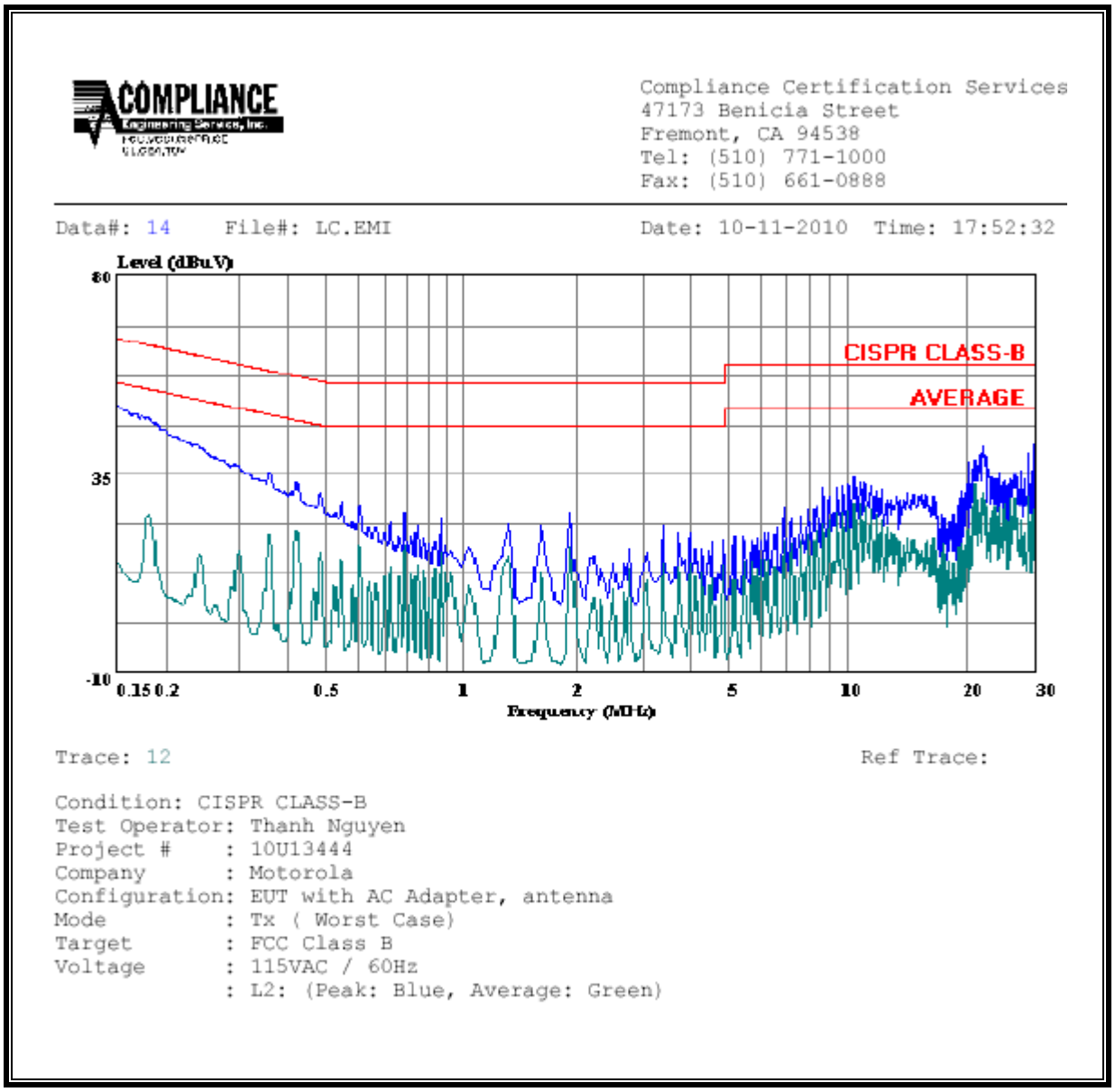
Data#: 7 File#: LC.EMI Date: 10-11-2010 Time: 17:35:33



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: Thanh Nguyen
Project # : 10U13444
Company : Motorola
Configuration: EUT with AC Adapter, antenna
Mode : Tx (Worst Case)
Target : FCC Class B
Voltage : 115VAC / 60Hz
: L1: (Peak: Blue, Average: Green)

LINE 2 RESULTS



9. DYNAMIC FREQUENCY SELECTION

9.1. OVERVIEW

9.1.1. 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

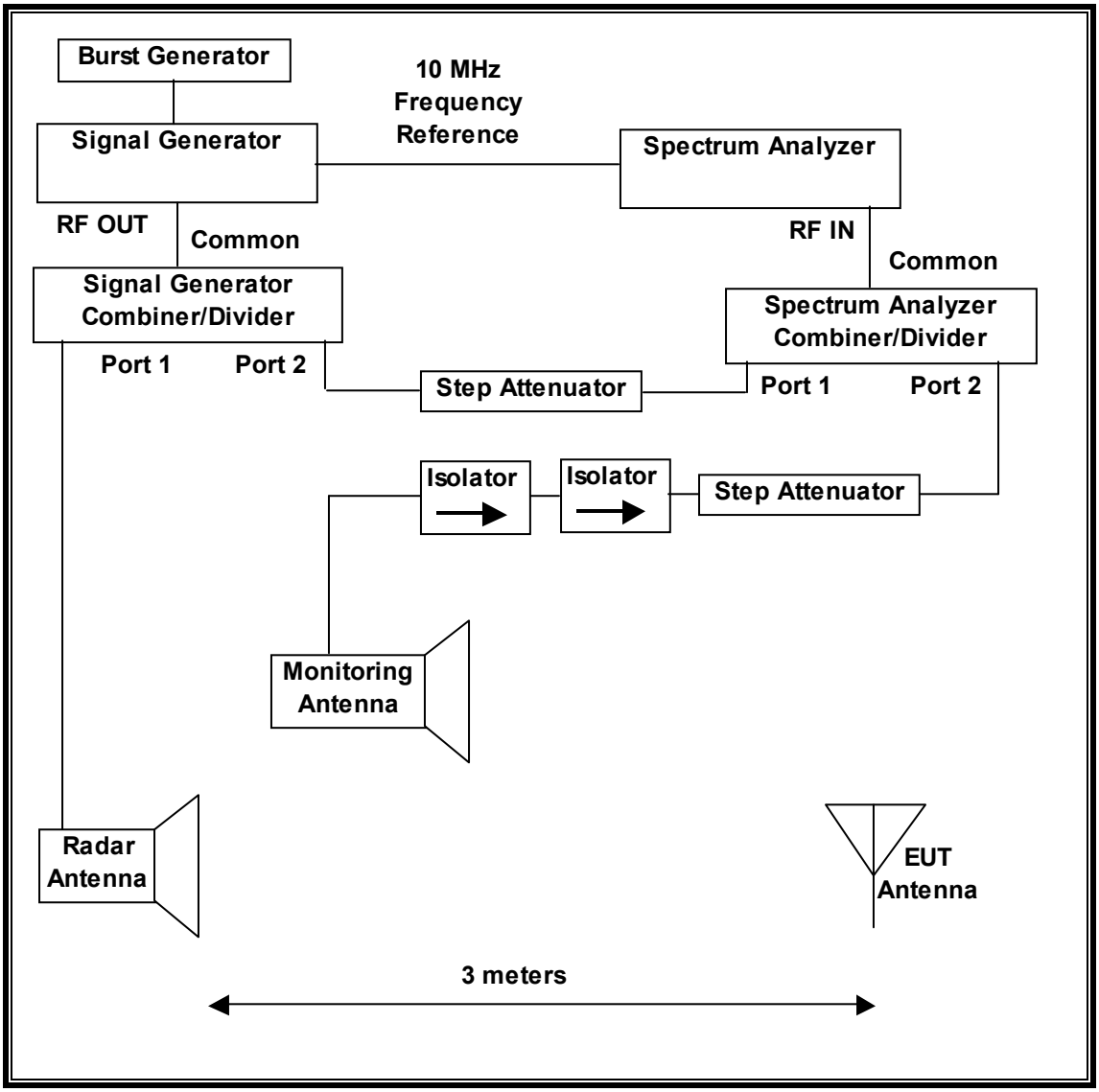
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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

9.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

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

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

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

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

SYSTEM CALIBRATION

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

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

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

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

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

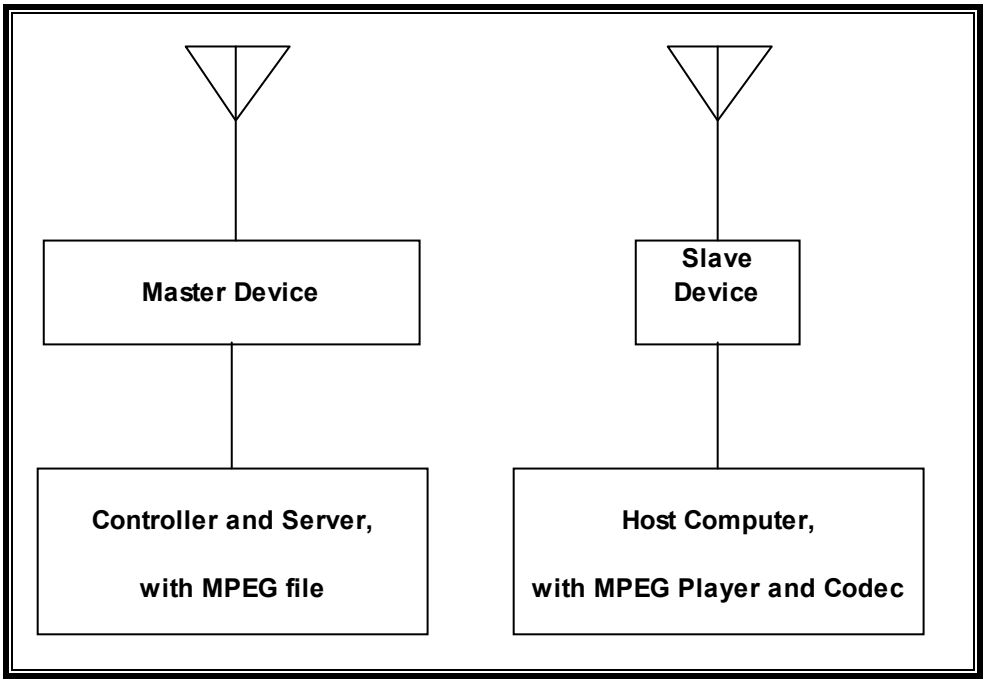
TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	09/03/11
Vector signal generator, 20GHz	Agilent / HP	E8267C	C01066	11/16/10
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	05/13/12

9.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter (AP)	Phihong	PSI45W-560 (MOT)	M61000062A1	DoC
5.4GHz OFDM Subscriber Module	Motorola	5490SM	0A-00-3E-B0-02-81	ABZ89FT7638
AC Adapter (Subscriber Module)	Phihong	PSA15R-295 (MOT)	P82702605A2	DoC
Notebook PC (Host)	Dell	PP18L	10657517255	DoC
AC Adapter (Host PC)	Dell	LA65SN0-00	CN-ODF263-71615-6AU-1019	DoC
Notebook PC (Client)	Motorola	HK1322	3433JC0021	DoC
AC Adapter (Client PC)	Hipro	HP-OW120F13	F3-070900272401	DoC

9.1.4. DESCRIPTION OF EUT

The EUT operates over the 5470-5725 MHz range, excluding any channels that would overlap the 5600-5650 MHz range.

The EUT is a Master Device.

The highest power level within the 5470-5725 MHz band is 30 dBm EIRP.

The only antenna assembly utilized with the EUT has a gain of 17 dBi in the 5470-5725 MHz band.

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 one transmitter/receiver chain connected to a 50-ohm coaxial antenna port.

The Slave device associated with the EUT during these tests does not have radar detection capability.

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

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

Two nominal channel bandwidths are implemented: 10 MHz, and 20 MHz, using a frame-based OFDM modulation.

All DFS tests were performed at the worst-case talk/listen ratio of 85% / 15%.

The software installed in the access point is Canopy 10.5 (build 2) AP-DES.

MANUFACTURER’S STATEMENT REGARDING UNIFORM CHANNEL SPREADING

This statement is in a separate document.

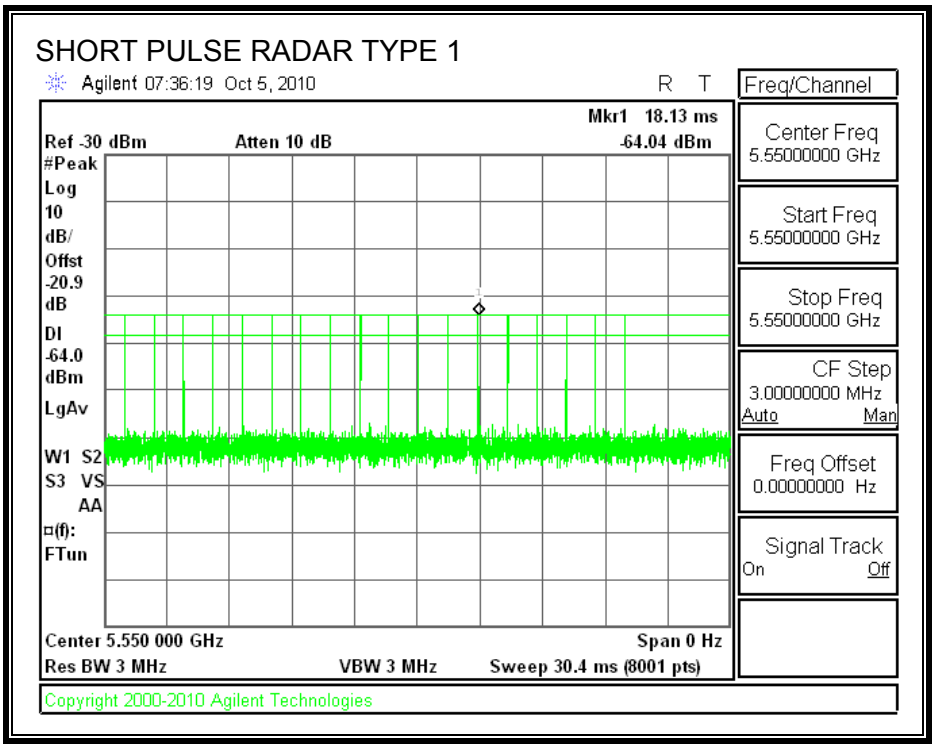
9.2. RESULTS FOR 10 MHz BANDWIDTH

9.2.1. TEST CHANNEL

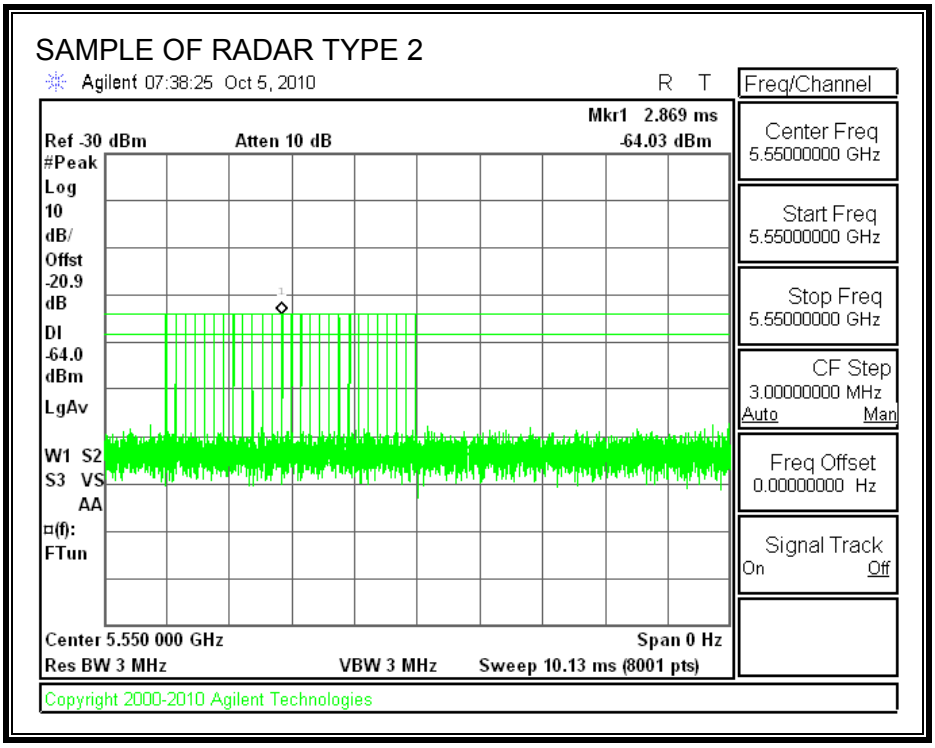
All tests were performed at a channel center frequency of 5550 MHz.

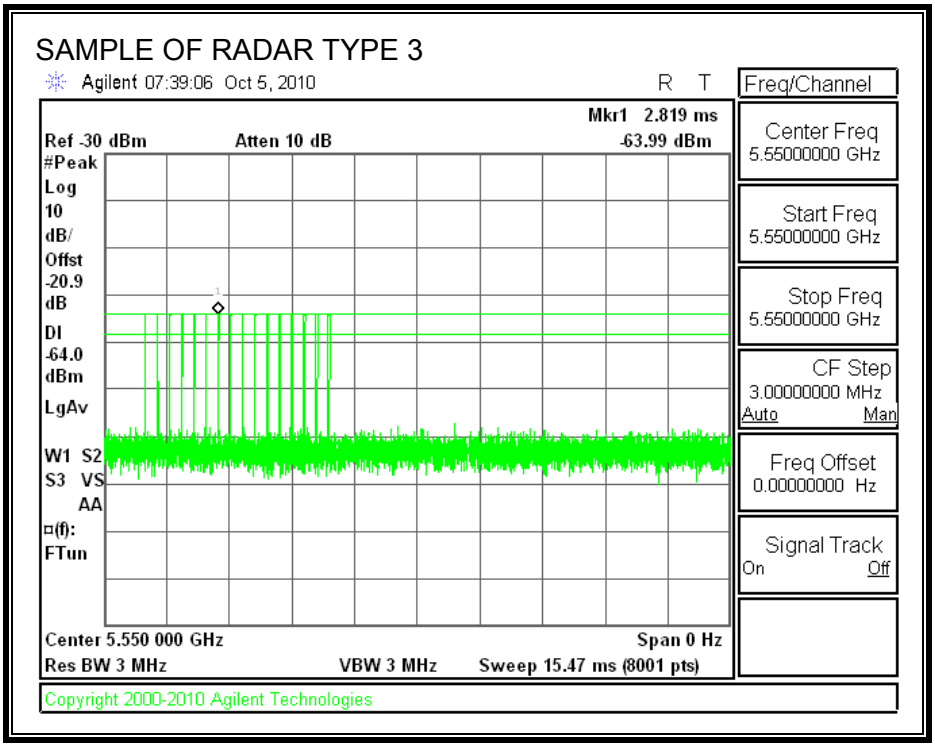
9.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

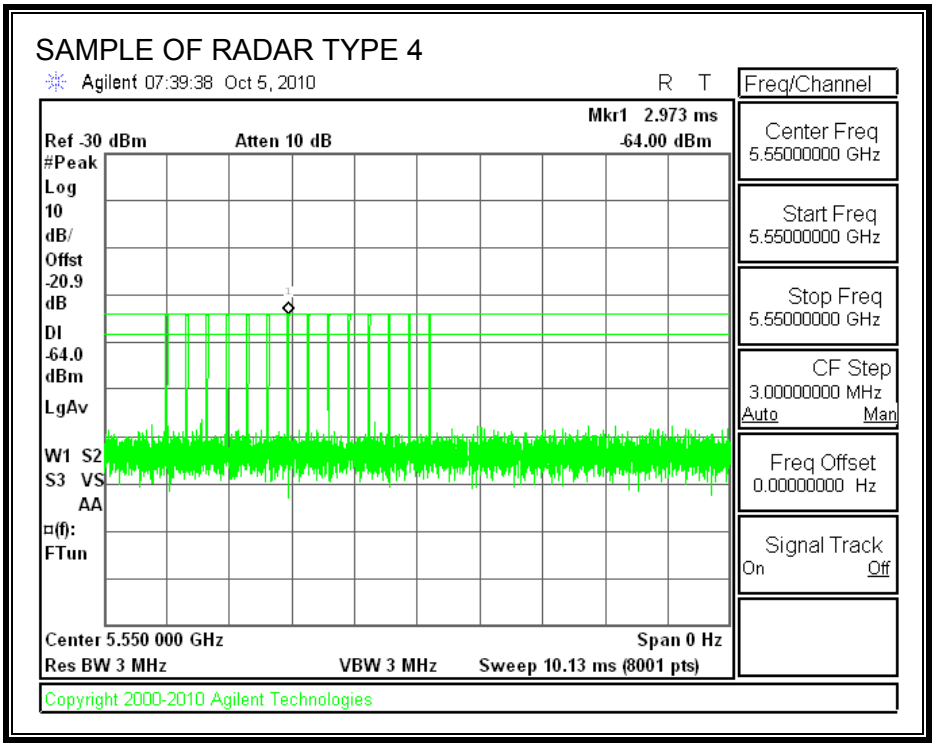


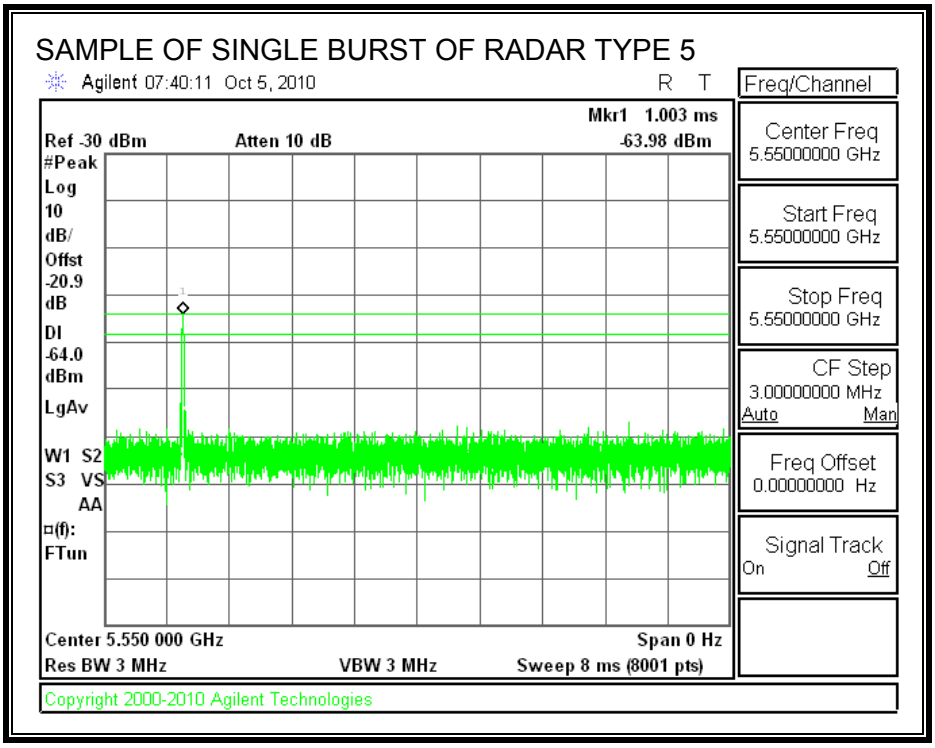
SAMPLE OF RADAR TYPE 2

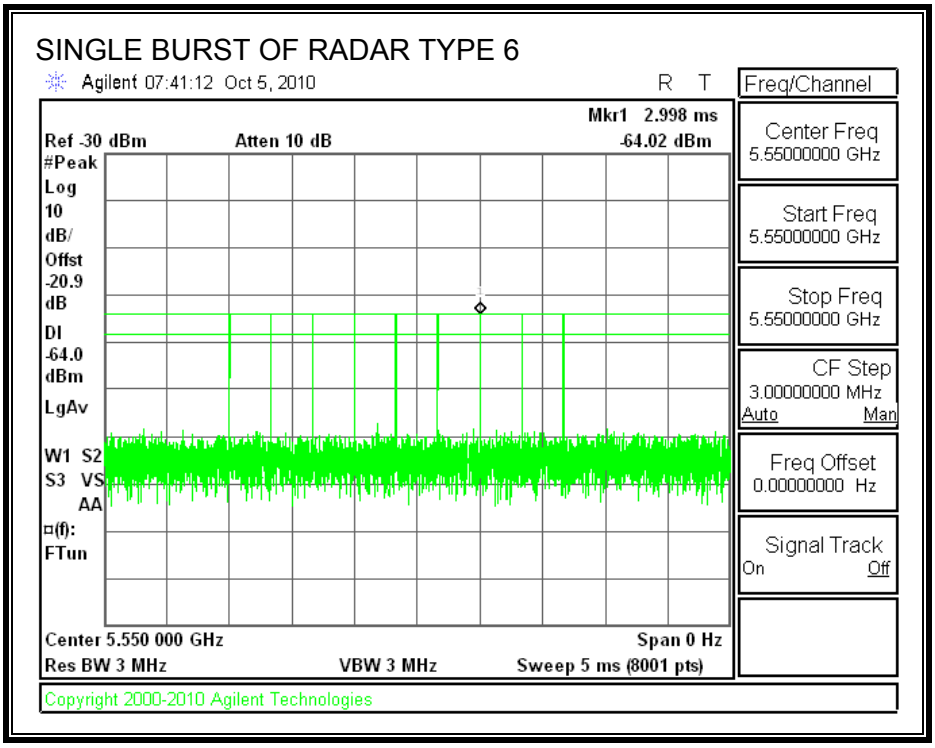




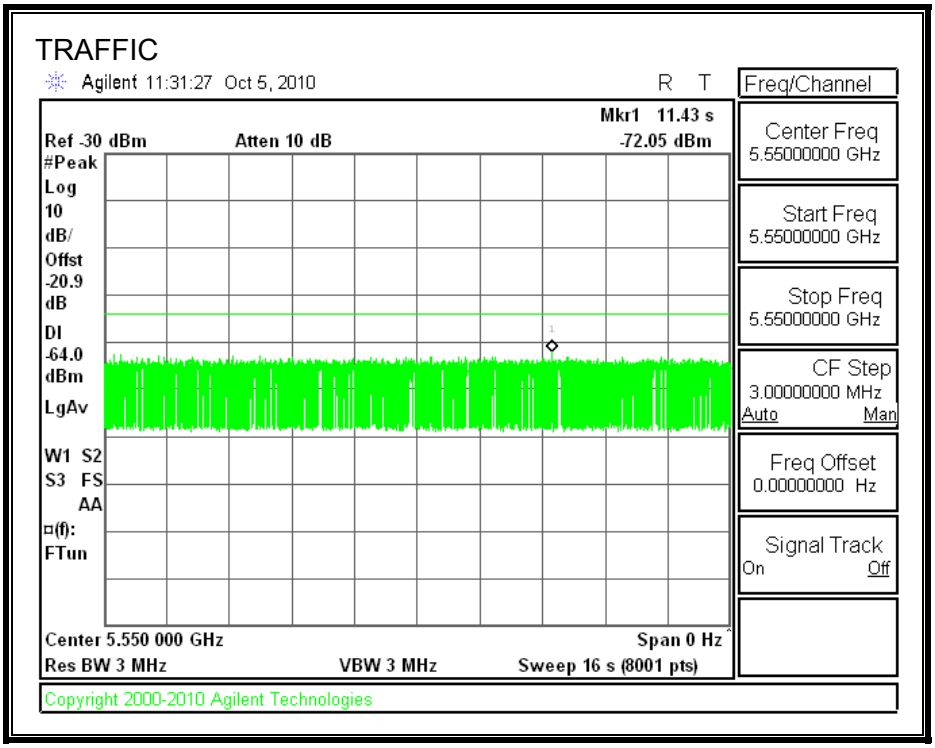
SAMPLE OF RADAR TYPE 4







TRAFFIC



9.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

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

PROCEDURE FOR TIMING OF RADAR BURST

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

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

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.49	120.4	89.9	29.9

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
31.54	64.5	33.0	3.0

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.41	117.0	86.6	56.7

QUALITATIVE RESULTS

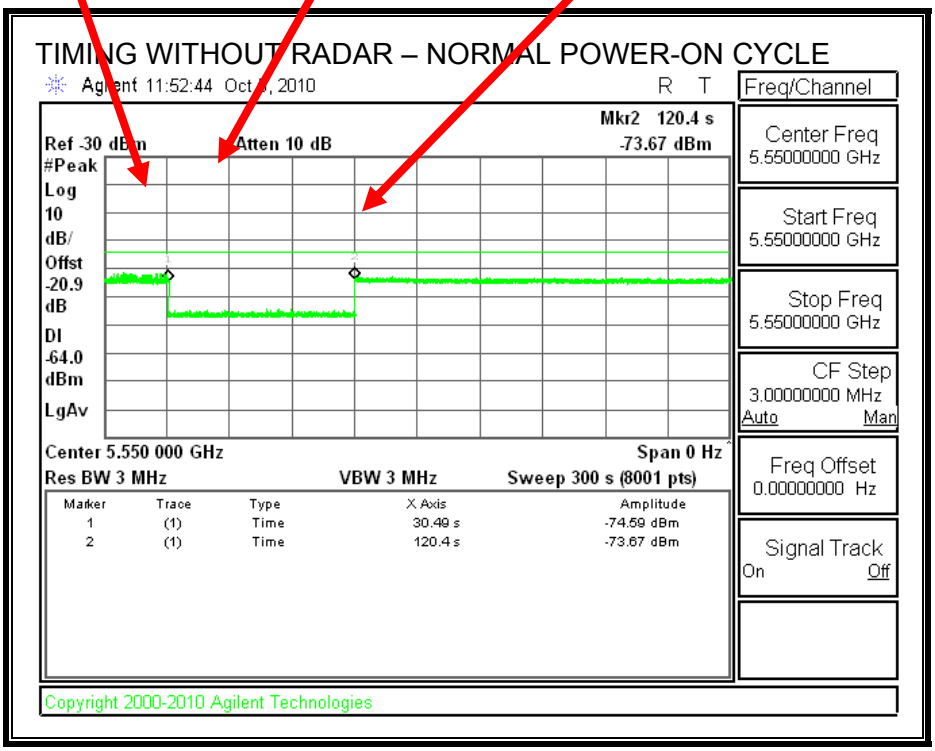
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

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

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



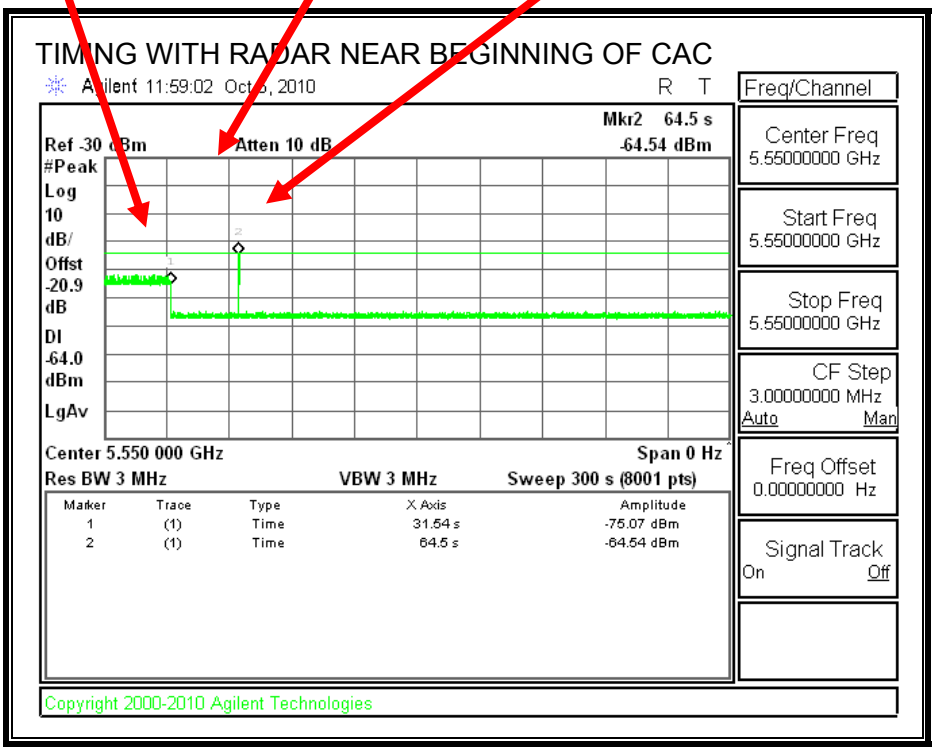
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



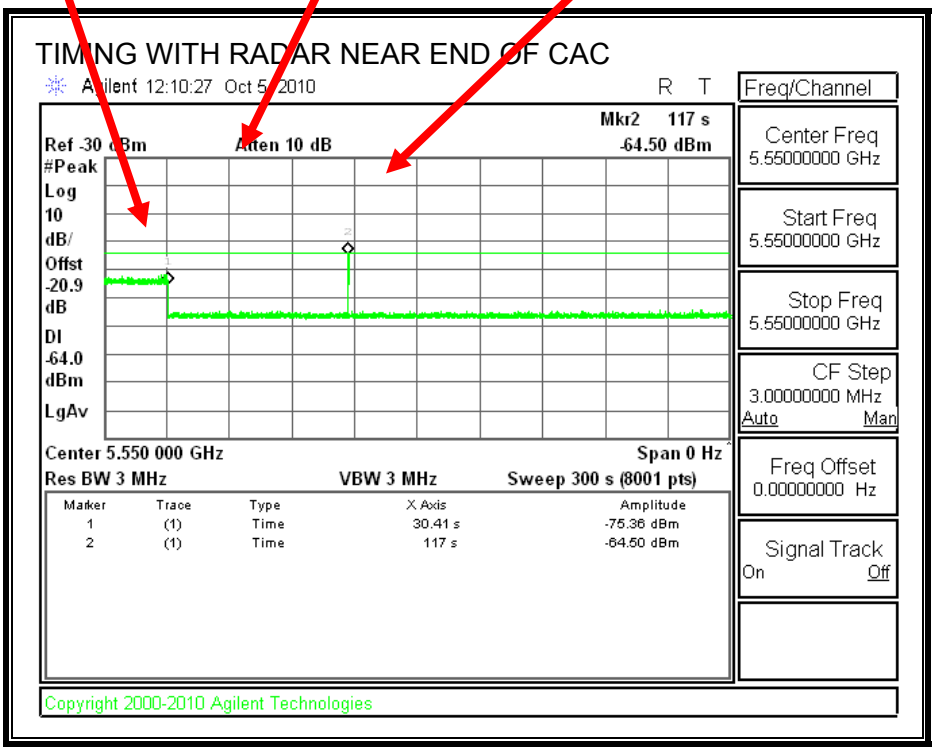
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

9.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

9.2.5. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

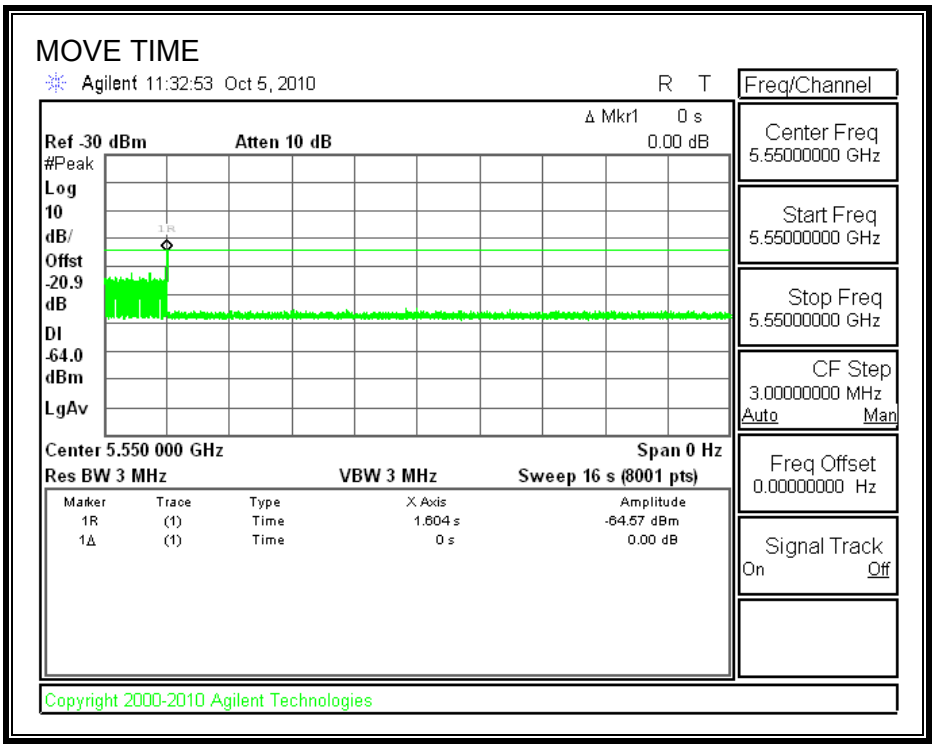
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

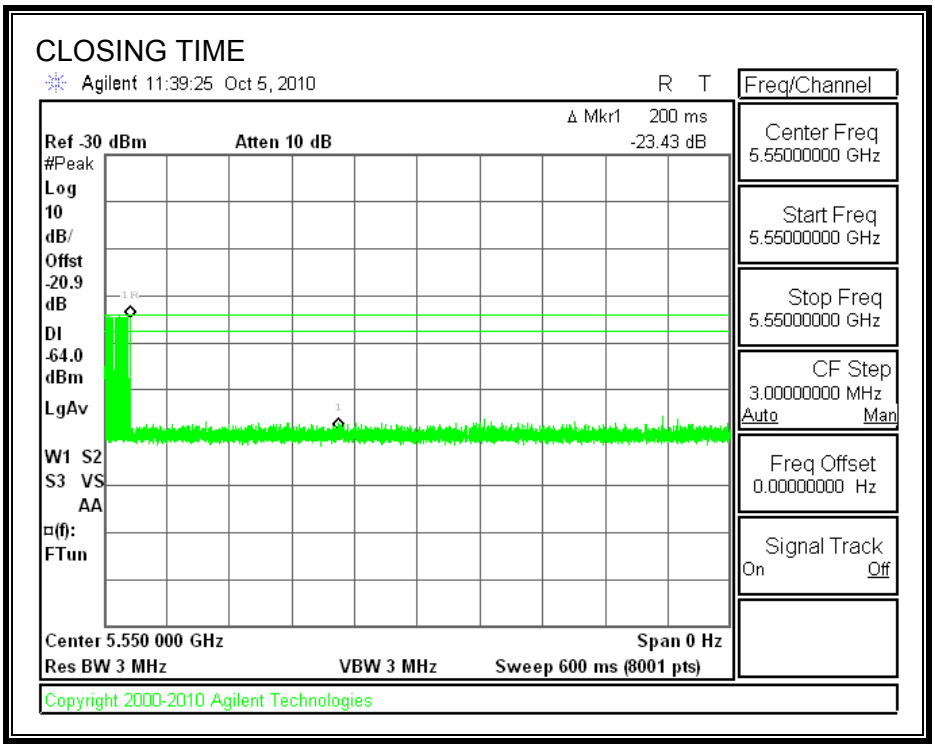
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.000	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	0.0	260

MOVE TIME

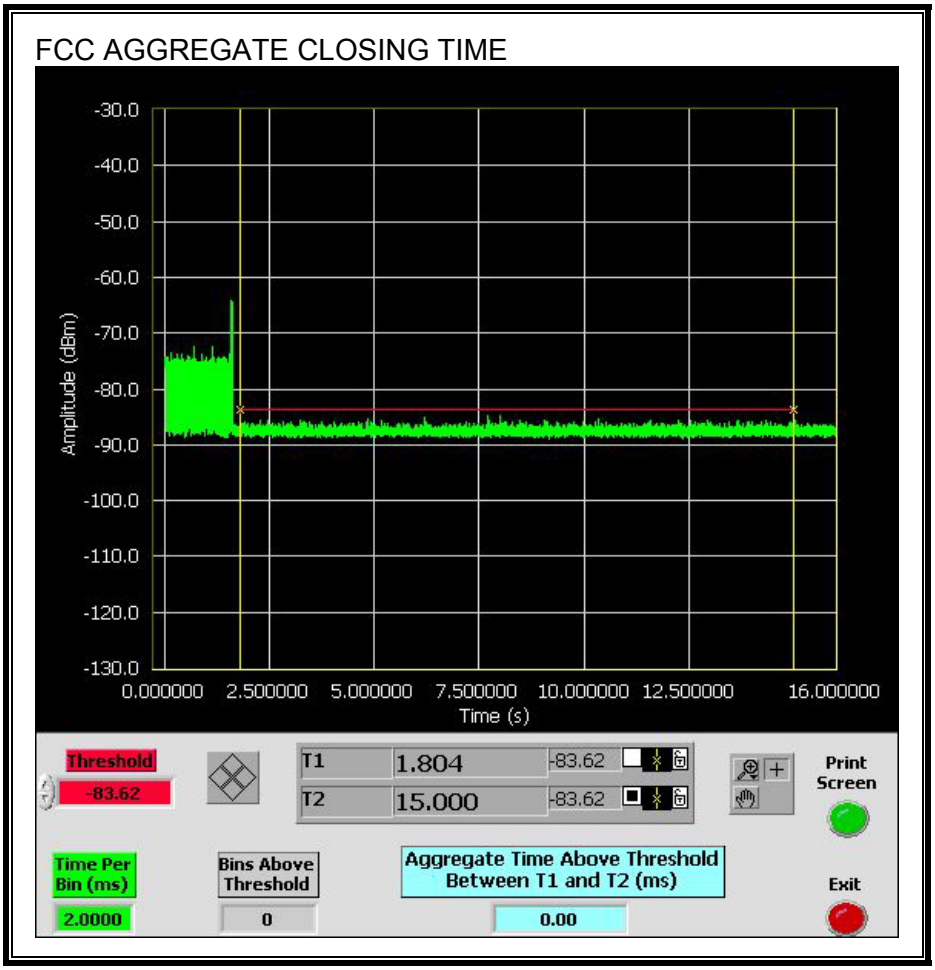


CHANNEL CLOSING TIME

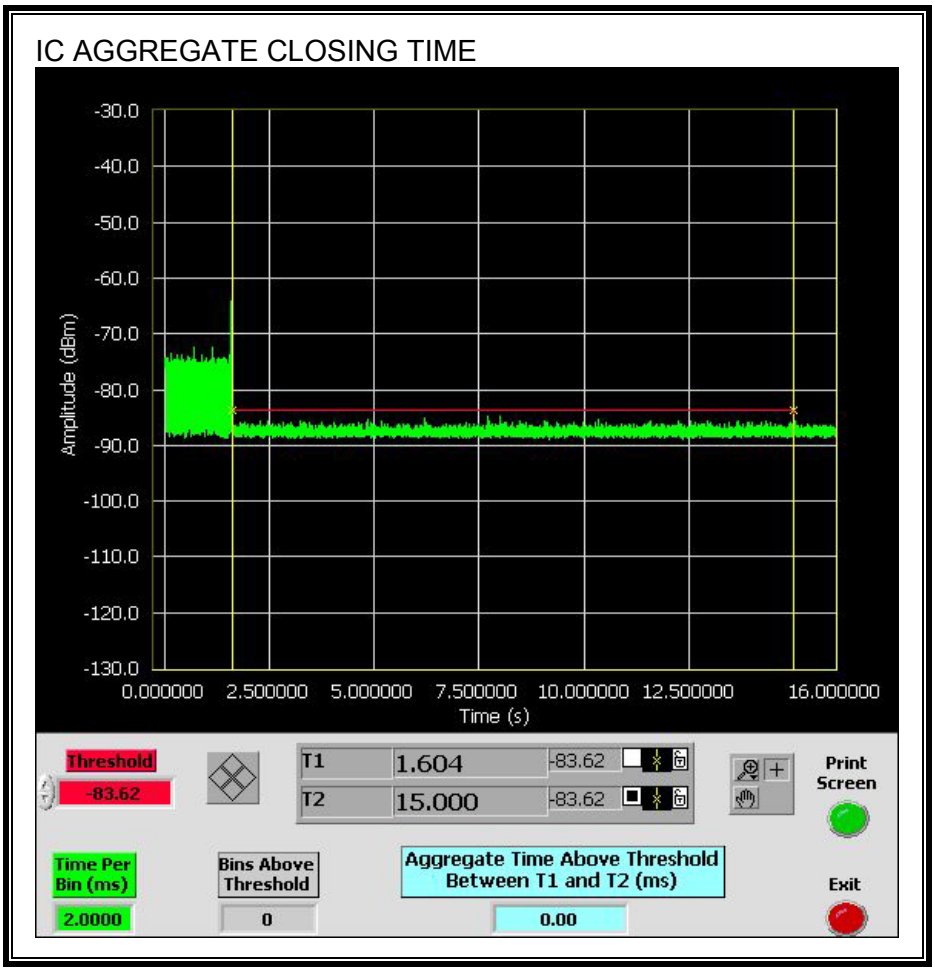


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.

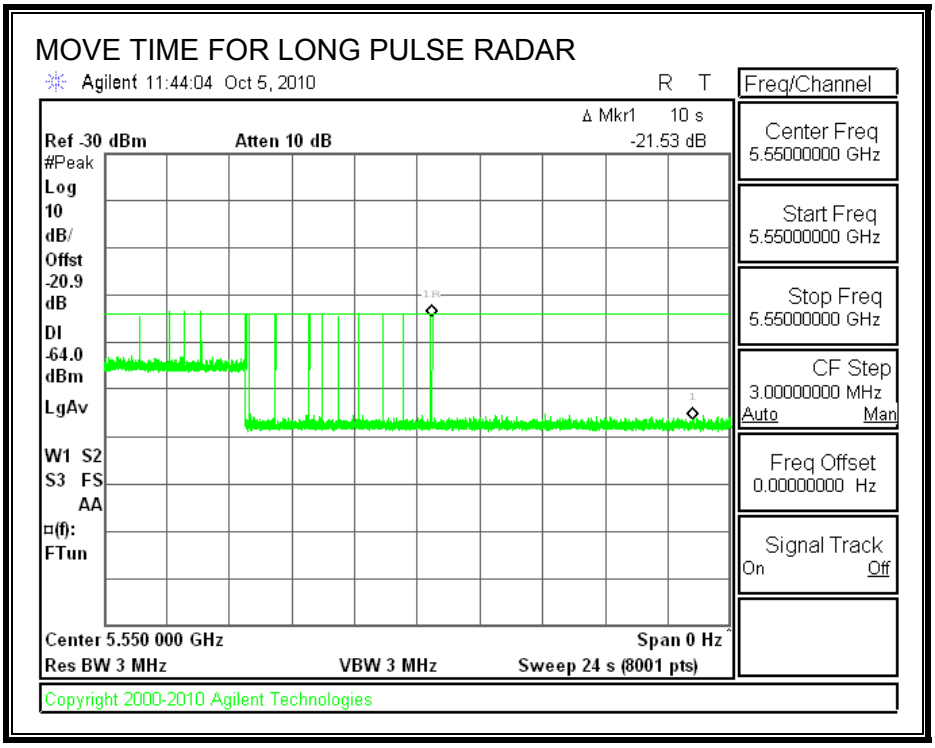


No transmissions are observed during the IC aggregate monitoring period.



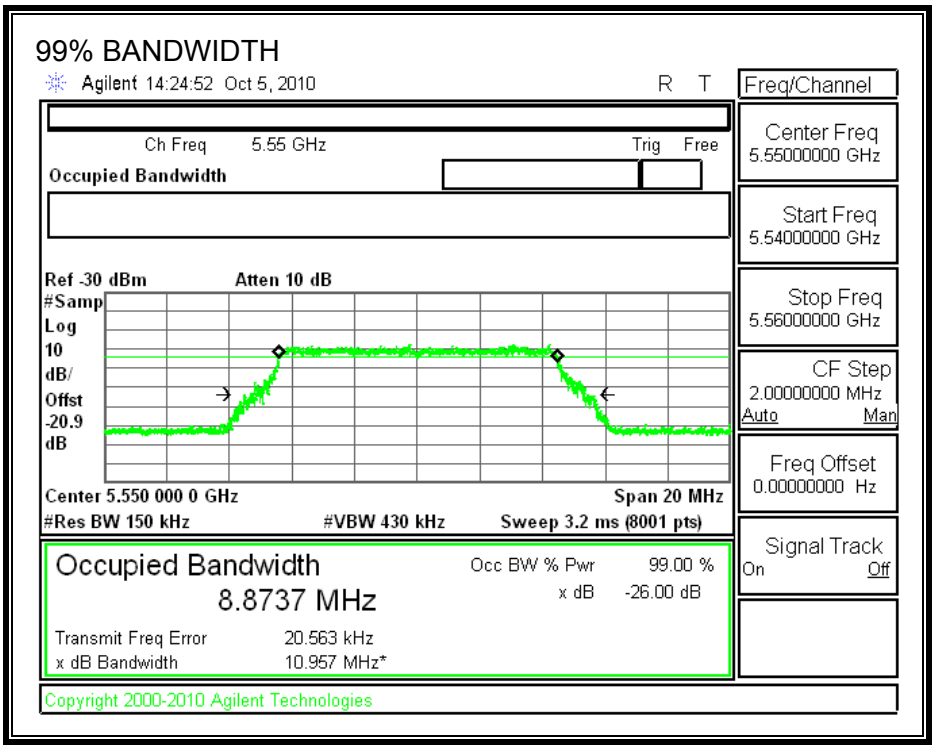
LONG PULSE CHANNEL MOVE TIME

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



9.2.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5546	5554	8	8.874	90.2	80

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5546	10	10	100	FL
5547	10	10	100	
5548	10	10	100	
5549	10	10	100	
5550	10	10	100	
5551	10	10	100	
5552	10	10	100	
5553	10	10	100	
5554	10	10	100	FH

9.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	96.67	60	Pass
FCC Short Pulse Type 3	30	80.00	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		92.50	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	36	86.11	70	Pass

TYPE 1 DETECTION PROBABILITY

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

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1	156.00	27	Yes
2002	2.8	222.00	28	Yes
2003	2.3	172.00	24	Yes
2004	2.8	153.00	25	Yes
2005	4.2	165.00	27	Yes
2006	3.3	219.00	26	Yes
2007	1.2	194.00	24	Yes
2008	2	187.00	23	Yes
2009	2.5	169.00	25	Yes
2010	3.3	214.00	29	Yes
2011	3.4	213.00	25	Yes
2012	4.5	224.00	28	Yes
2013	1.1	161.00	27	No
2014	1.2	197.00	28	Yes
2015	3.3	150.00	29	Yes
2016	4.9	183.00	29	Yes
2017	3.2	208.00	28	Yes
2018	4.6	175.00	28	Yes
2019	1.1	170.00	24	Yes
2020	2.4	217.00	25	Yes
2021	3.2	195.00	27	Yes
2022	3.8	160.00	26	Yes
2023	3.5	206.00	26	Yes
2024	4.3	214.00	26	Yes
2025	4.6	175.00	23	Yes
2026	3.1	185.00	23	Yes
2027	1.6	176.00	29	Yes
2028	2.9	182.00	26	Yes
2029	3.4	202.00	28	Yes
2030	1.9	228.00	24	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.9	303.00	16	Yes
3002	9	378.00	18	No
3003	5.5	284.00	16	No
3004	6.6	373.00	16	Yes
3005	7.9	497.00	16	Yes
3006	7.2	271.00	16	Yes
3007	10	497.00	17	Yes
3008	8.2	467.00	18	Yes
3009	7	434.00	18	Yes
3010	7.9	394.00	18	Yes
3011	5.3	328.00	18	No
3012	8.5	340.00	18	Yes
3013	8.9	380.00	17	Yes
3014	6	310.00	17	Yes
3015	7.5	374.00	17	Yes
3016	5.3	358.00	18	Yes
3017	5.9	264.00	16	Yes
3018	8.5	300.00	18	Yes
3019	5.5	334.00	16	Yes
3020	5.1	260.00	18	No
3021	8.6	467.00	18	Yes
3022	8.6	468.00	17	Yes
3023	9.6	298.00	16	Yes
3024	5.9	461.00	17	Yes
3025	7.5	296.00	18	Yes
3026	7.8	496.00	16	Yes
3027	6	263.00	16	Yes
3028	5.6	373.00	18	No
3029	7.5	293	16	Yes
3030	5.3	421	18	No

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	14.1	328.00	14	Yes
4002	11.6	268.00	14	Yes
4003	11.3	341.00	13	Yes
4004	15.4	444.00	15	Yes
4005	17.2	481.00	16	Yes
4006	10.3	261.00	13	Yes
4007	11.2	275.00	16	Yes
4008	13.5	402.00	15	Yes
4009	17	275.00	12	Yes
4010	16.5	399.00	13	Yes
4011	16.4	431.00	12	Yes
4012	11.2	287.00	14	Yes
4013	18.9	369.00	13	Yes
4014	10	444.00	14	Yes
4015	17	488.00	16	No
4016	10.1	279.00	15	Yes
4017	18	447.00	14	Yes
4018	14.1	365.00	14	Yes
4019	11.5	344.00	15	Yes
4020	11.1	276.00	16	Yes
4021	17.1	402.00	12	Yes
4022	14.7	256.00	13	Yes
4023	11.3	468.00	12	Yes
4024	11.6	306.00	14	Yes
4025	16.4	498.00	13	Yes
4026	18.9	303.00	14	Yes
4027	15.8	329.00	14	Yes
4028	11	498.00	12	Yes
4029	12.8	471.00	14	Yes
4030	11	345.00	14	Yes

TYPE 5 DETECTION PROBABILITY

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

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	211	5546	1	No
2	686	5547	2	Yes
3	1161	5548	2	Yes
4	1636	5549	1	Yes
5	2111	5550	3	Yes
6	2586	5551	1	Yes
7	3536	5552	3	Yes
8	4011	5553	2	Yes
9	4961	5554	3	Yes
10	5436	5546	3	Yes
11	5911	5547	3	Yes
12	6386	5548	1	Yes
13	6861	5549	3	Yes
14	7336	5550	1	Yes
15	7811	5551	2	Yes
16	8286	5552	1	Yes
17	8761	5553	2	Yes
18	9236	5554	3	Yes
19	9711	5546	3	Yes
20	10186	5547	2	Yes
21	10661	5548	3	Yes
22	11136	5549	1	Yes
23	11611	5550	1	No
24	12086	5551	2	Yes
25	12561	5552	2	No
26	13036	5553	4	Yes
27	13511	5554	2	Yes
28	13986	5546	2	No
29	14461	5547	1	Yes
30	14936	5548	4	Yes
31	15411	5549	1	No
32	15886	5550	2	Yes
33	16361	5551	1	Yes
34	16836	5552	3	Yes
35	17311	5553	1	Yes
36	17786	5554	3	Yes

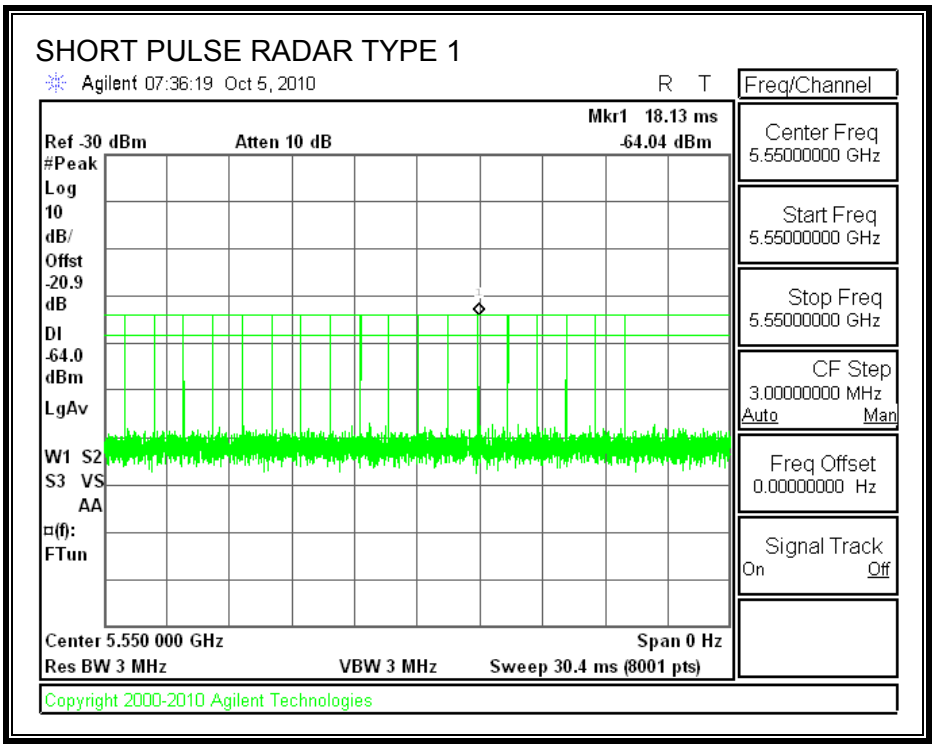
9.3. RESULTS FOR 20 MHz BANDWIDTH

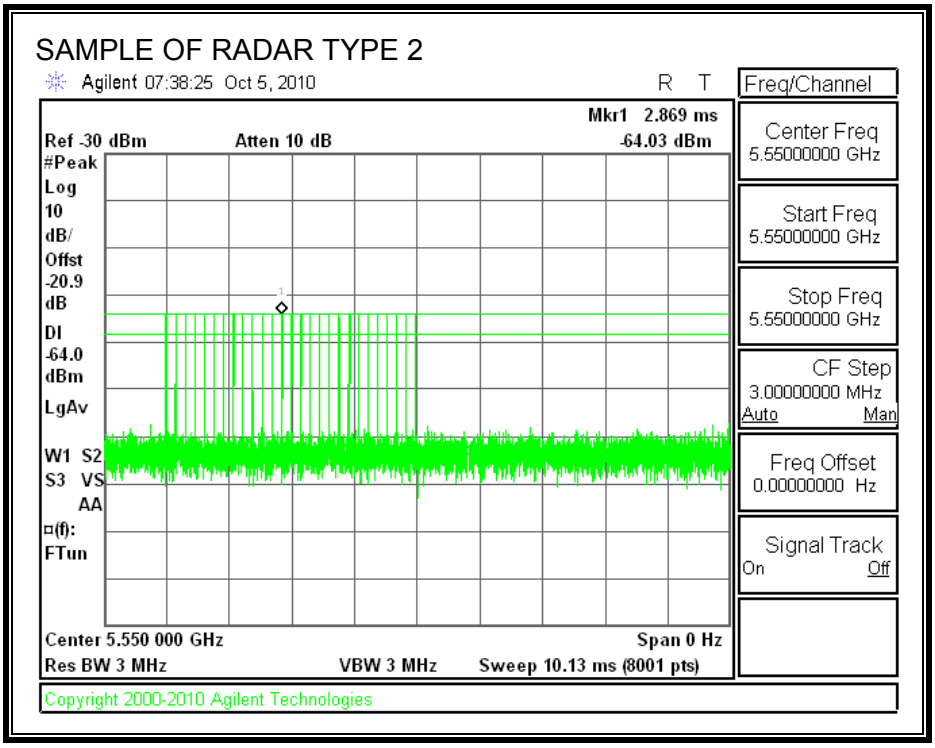
9.3.1. TEST CHANNEL

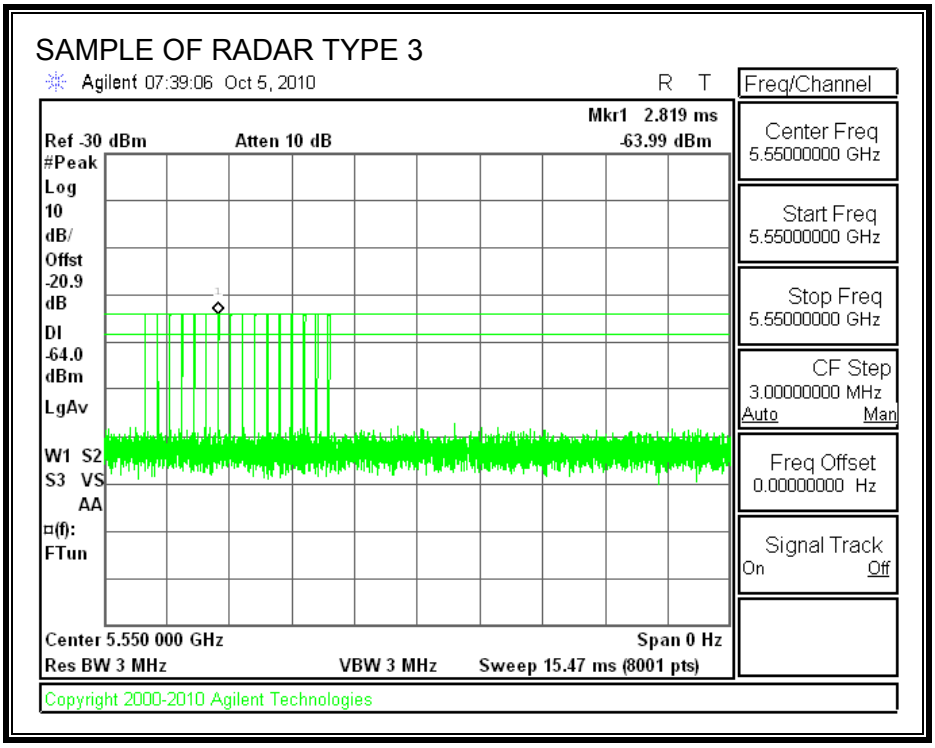
All tests were performed at a channel center frequency of 5550 MHz.

9.3.2. RADAR WAVEFORMS AND TRAFFIC

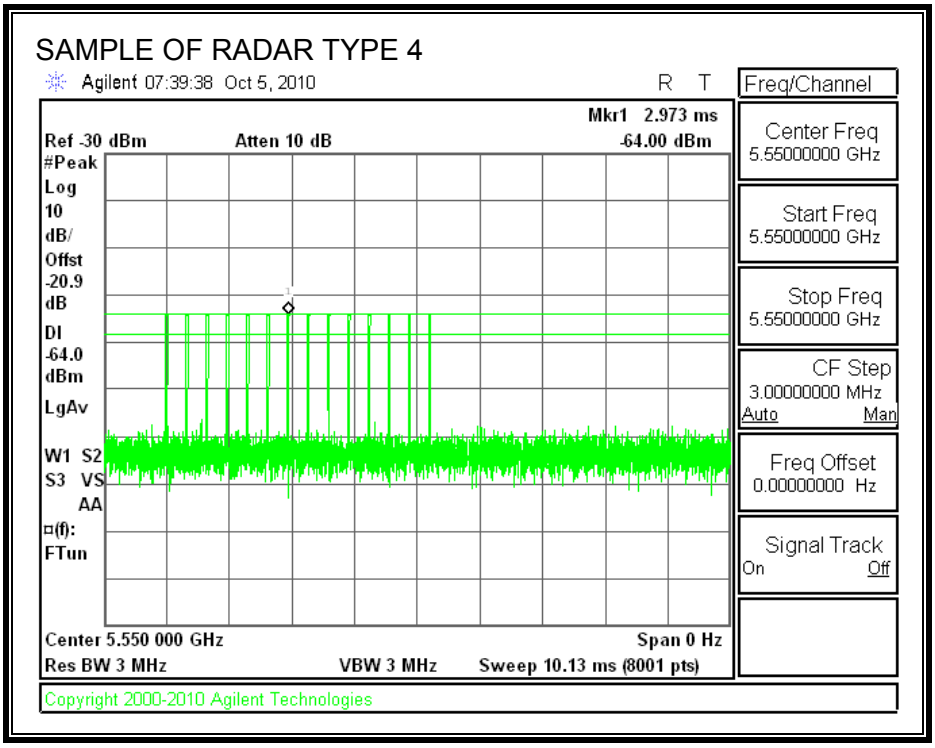
RADAR WAVEFORMS

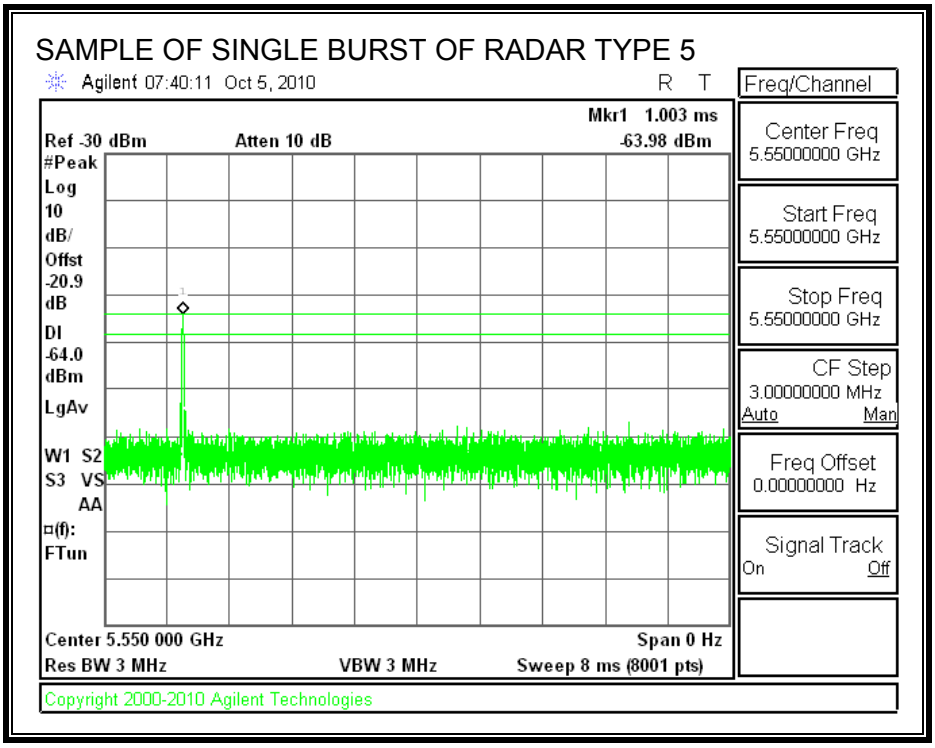


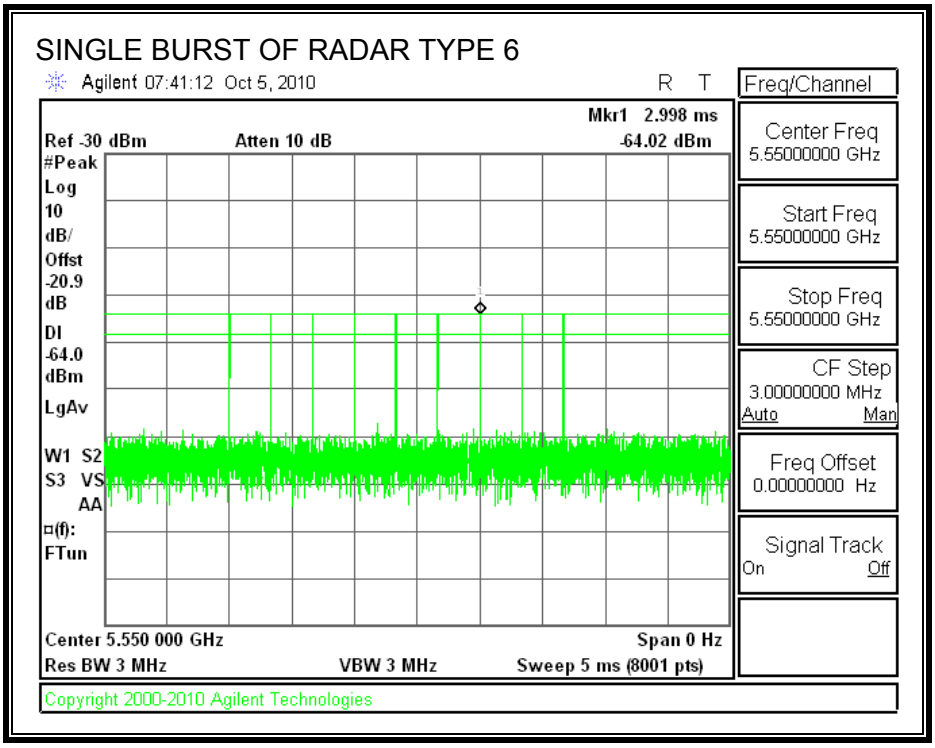




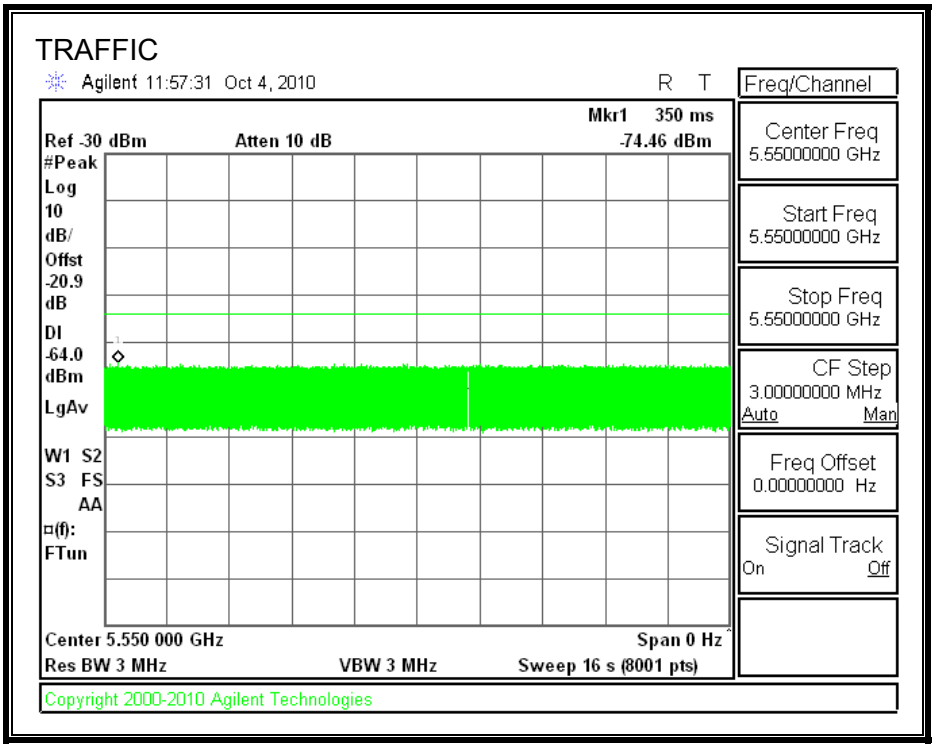
SAMPLE OF RADAR TYPE 4







TRAFFIC



9.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

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

PROCEDURE FOR TIMING OF RADAR BURST

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

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

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.94	121.9	91.0	31.0

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.56	65.1	34.6	3.6

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.79	117.5	86.7	55.8

QUALITATIVE RESULTS

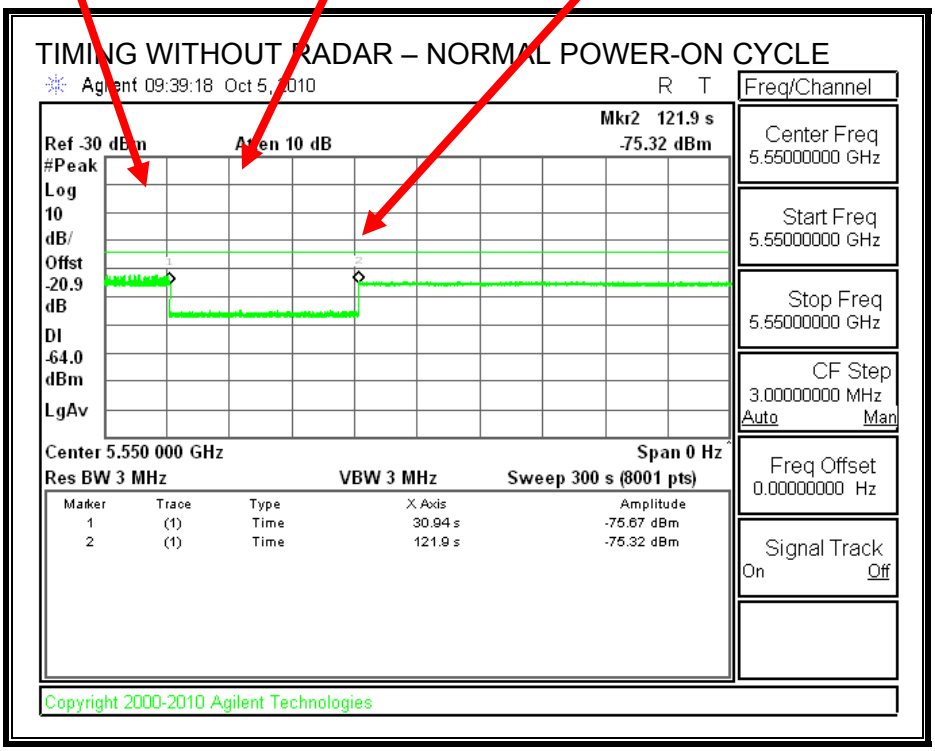
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

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

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



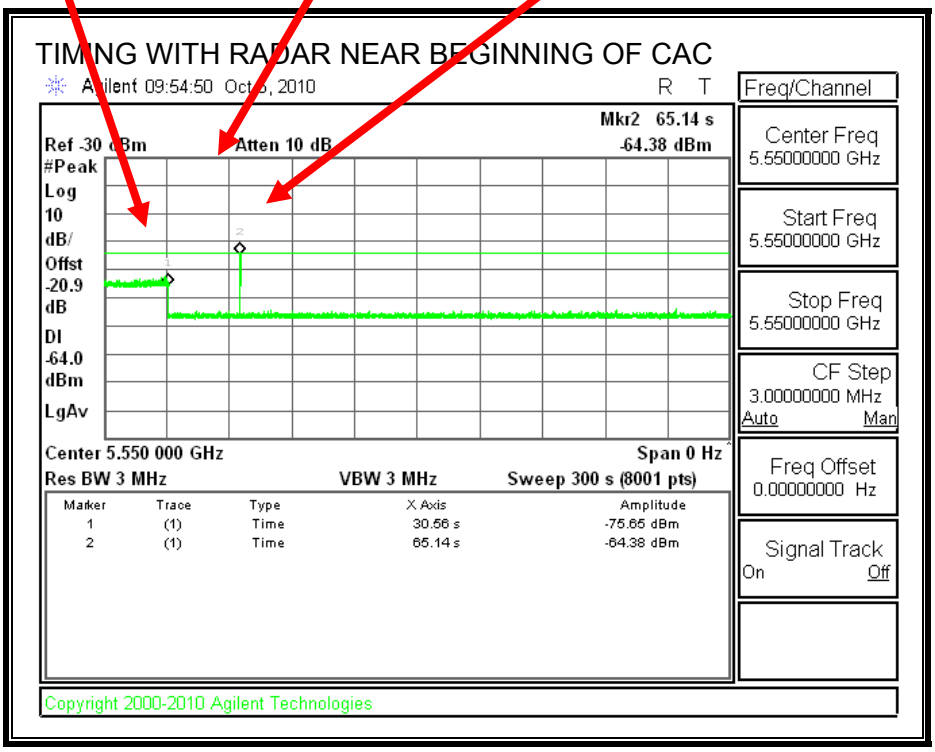
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



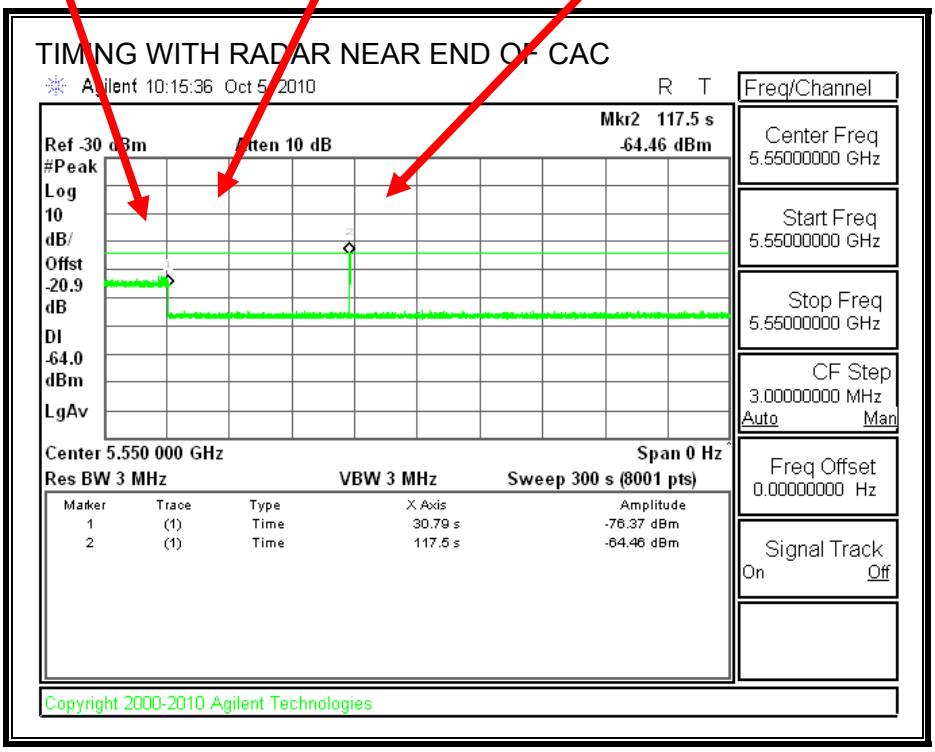
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

9.3.4. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

9.3.5. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

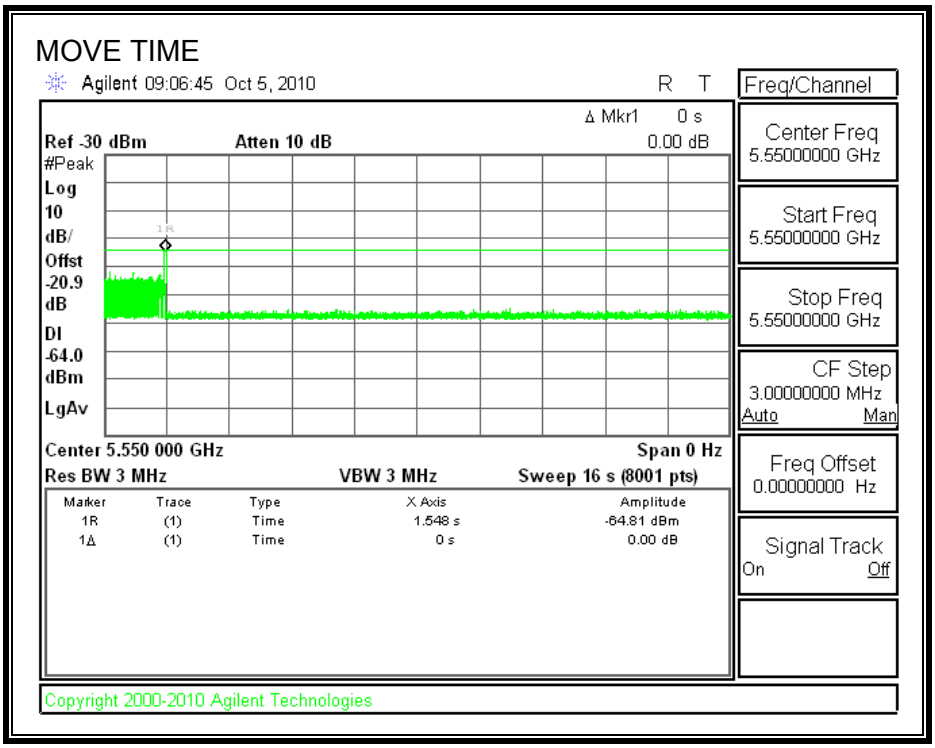
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

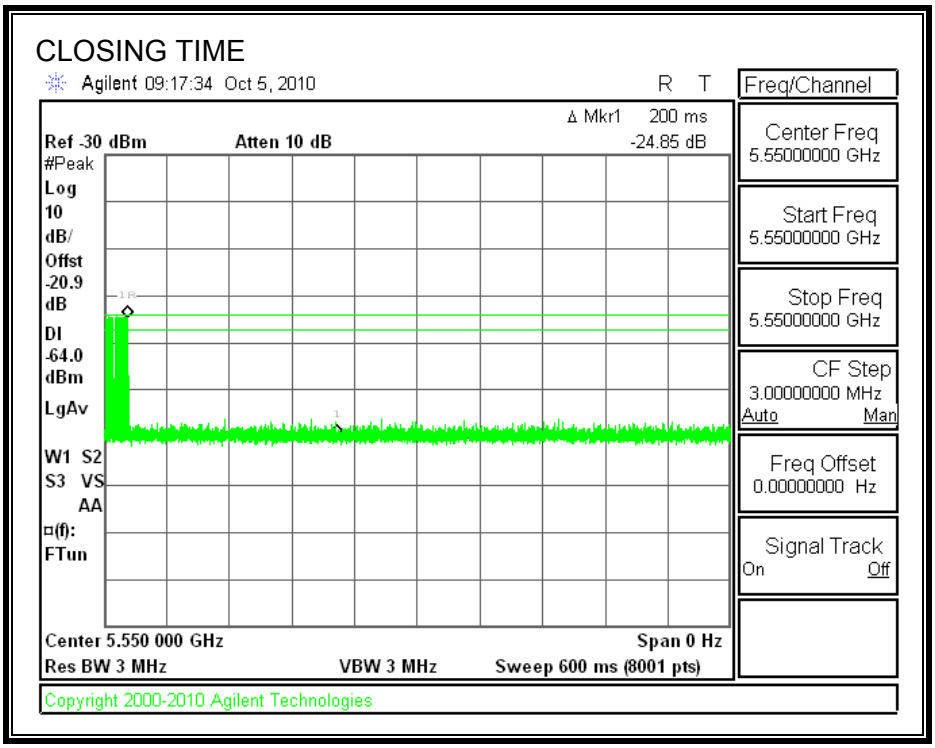
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.000	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	0.0	260

MOVE TIME

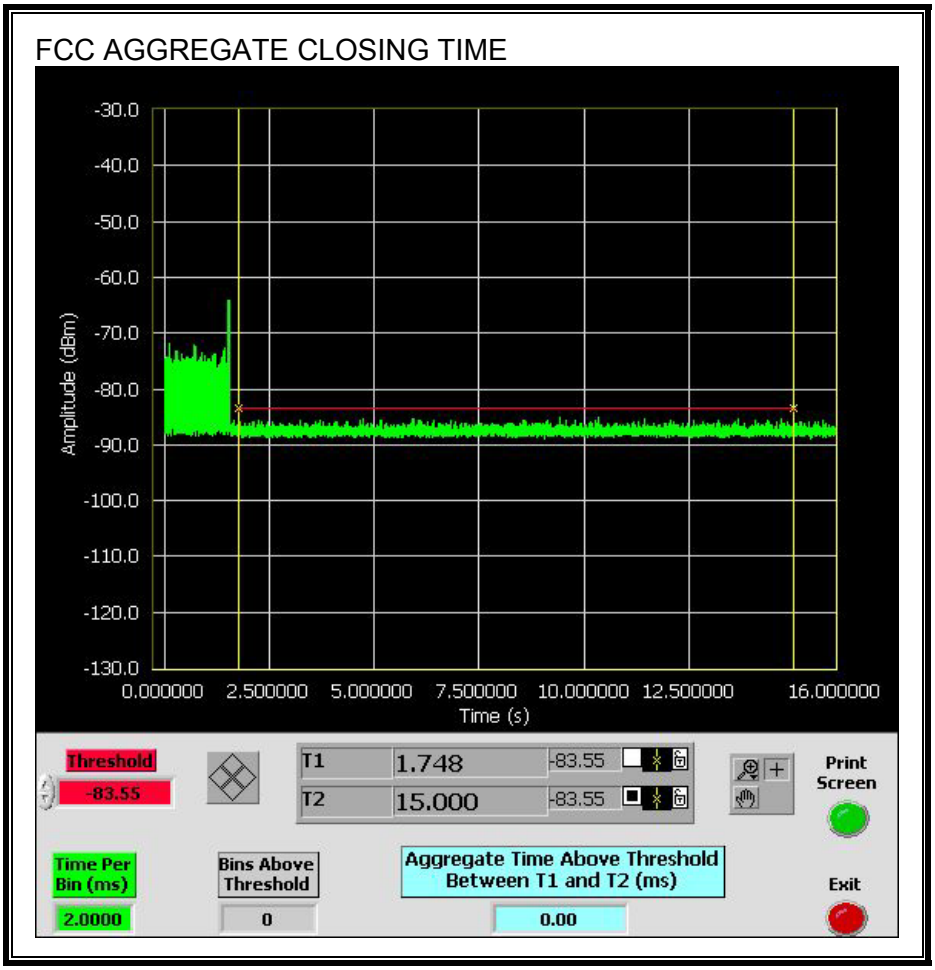


CHANNEL CLOSING TIME

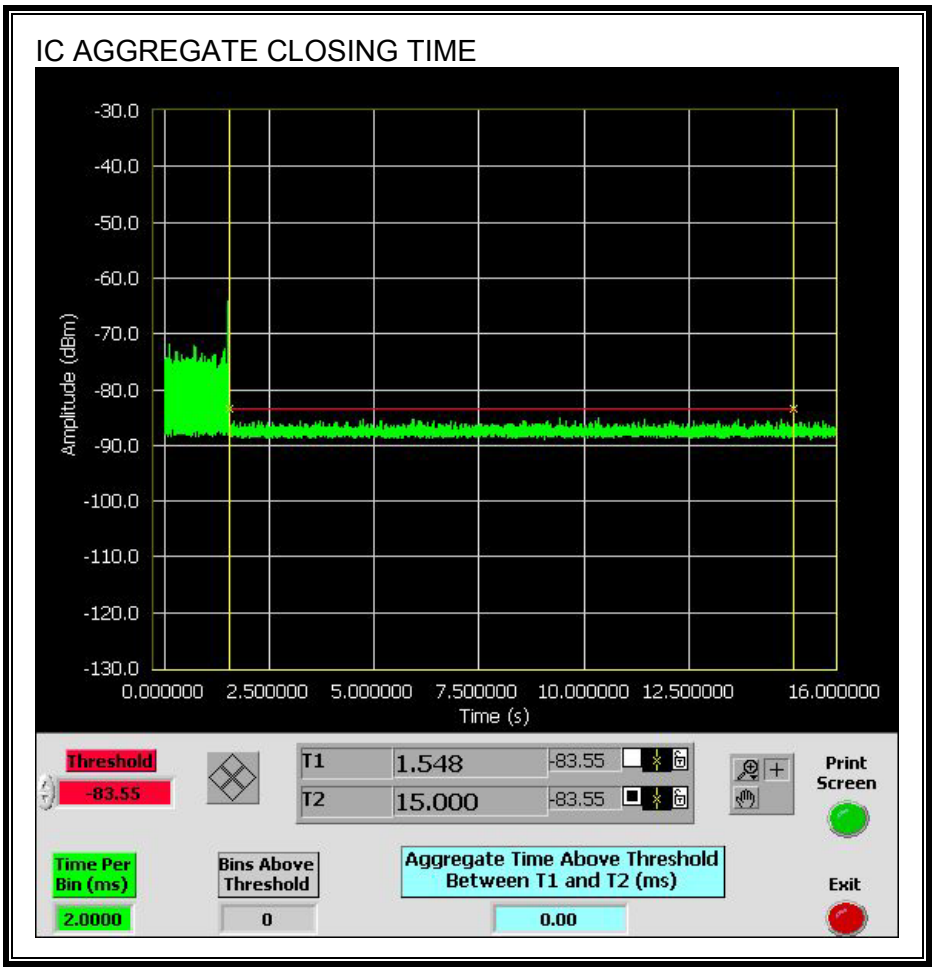


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.

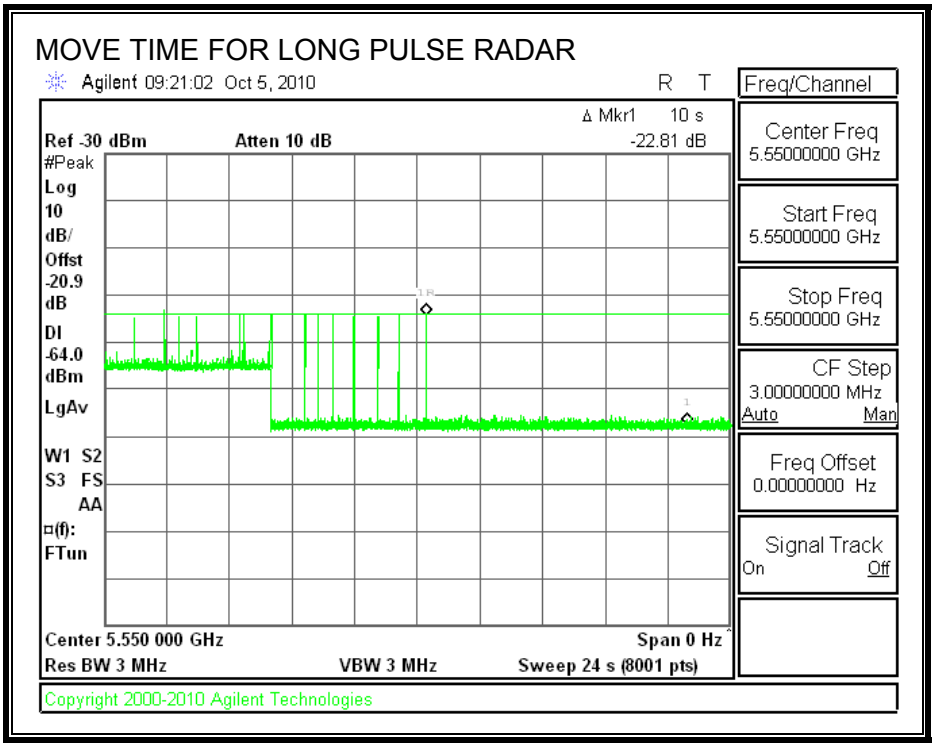


No transmissions are observed during the IC aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

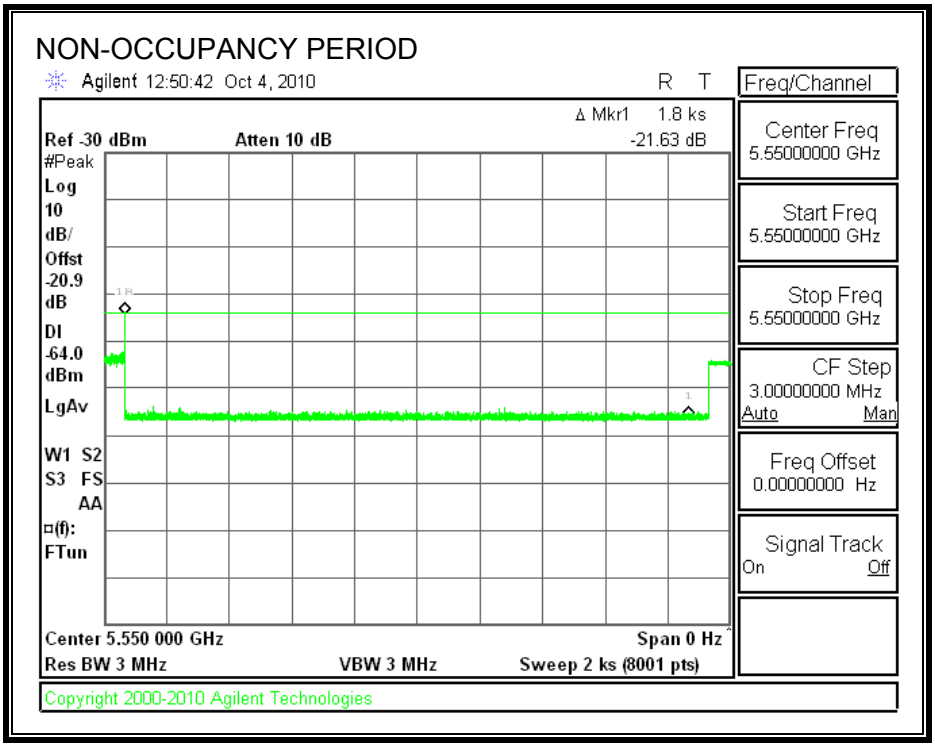
The traffic ceases prior to 10 seconds after the end of the radar waveform.



9.3.6. NON-OCCUPANCY PERIOD

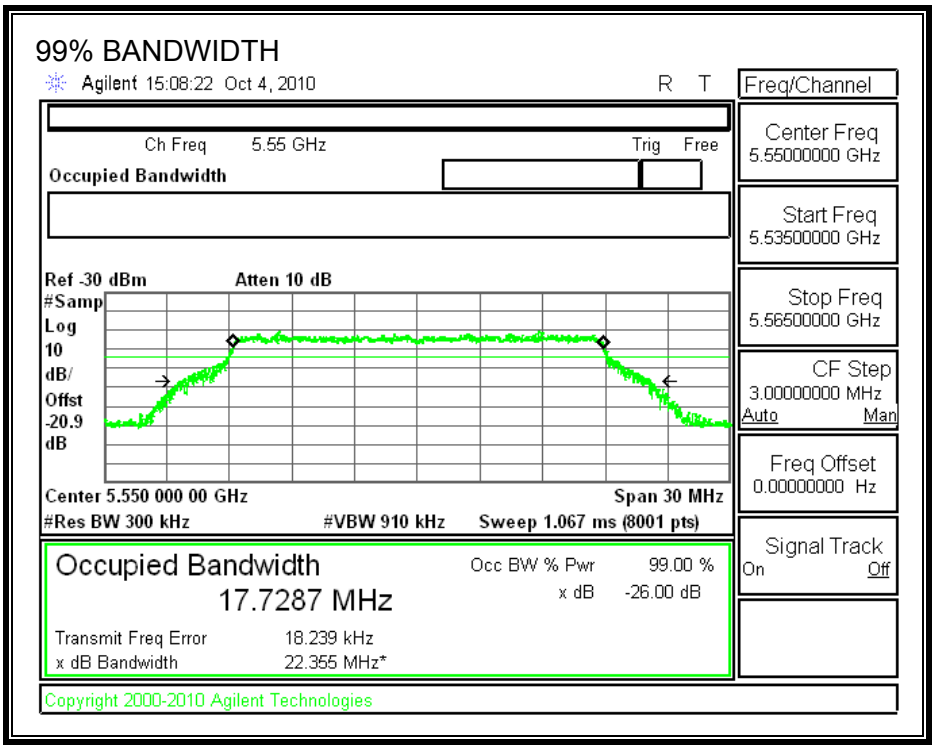
RESULTS

No EUT transmissions were observed on the test channel during the 30-minute observation time. After the 30 minute non-occupancy period the EUT performed a new CAC, then resumed transmissions upon detecting no radar during this CAC period.



9.3.7. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5542	5558	16	17.729	90.2	80

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5542	10	10	100	FL
5543	10	10	100	
5544	10	10	100	
5545	10	10	100	
5546	10	10	100	
5547	10	10	100	
5548	10	10	100	
5549	10	10	100	
5550	10	10	100	
5551	10	10	100	
5552	10	10	100	
5553	10	10	100	
5554	10	9	90	
5555	10	10	100	
5556	10	10	100	
5557	10	10	100	
5558	10	10	100	
5559	10	10	100	FH

9.3.8. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	60.00	60	Pass
FCC Short Pulse Type 4	30	73.33	60	Pass
Aggregate		82.50	80	Pass
FCC Long Pulse Type 5	30	96.67	80	Pass
FCC Hopping Type 6	34	97.06	70	Pass

TYPE 1 DETECTION PROBABILITY

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

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1	156.00	27	Yes
2002	2.8	222.00	28	Yes
2003	2.3	172.00	24	Yes
2004	2.8	153.00	25	Yes
2005	4.2	165.00	27	Yes
2006	3.3	219.00	26	Yes
2007	1.2	194.00	24	Yes
2008	2	187.00	23	Yes
2009	2.5	169.00	25	Yes
2010	3.3	214.00	29	Yes
2011	3.4	213.00	25	Yes
2012	4.5	224.00	28	Yes
2013	1.1	161.00	27	Yes
2014	1.2	197.00	28	Yes
2015	3.3	150.00	29	Yes
2016	4.9	183.00	29	Yes
2017	3.2	208.00	28	Yes
2018	4.6	175.00	28	Yes
2019	1.1	170.00	24	Yes
2020	2.4	217.00	25	Yes
2021	3.2	195.00	27	Yes
2022	3.8	160.00	26	Yes
2023	3.5	206.00	26	Yes
2024	4.3	214.00	26	Yes
2025	4.6	175.00	23	Yes
2026	3.1	185.00	23	Yes
2027	1.6	176.00	29	Yes
2028	2.9	182.00	26	Yes
2029	3.4	202.00	28	Yes
2030	1.9	228.00	24	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.9	303.00	16	Yes
3002	9	378.00	18	Yes
3003	5.5	284.00	16	No
3004	6.6	373.00	16	No
3005	7.9	497.00	16	Yes
3006	7.2	271.00	16	Yes
3007	10	497.00	17	Yes
3008	8.2	467.00	18	No
3009	7	434.00	18	Yes
3010	7.9	394.00	18	No
3011	5.3	328.00	18	No
3012	8.5	340.00	18	Yes
3013	8.9	380.00	17	Yes
3014	6	310.00	17	Yes
3015	7.5	374.00	17	Yes
3016	5.3	358.00	18	Yes
3017	5.9	264.00	16	Yes
3018	8.5	300.00	18	Yes
3019	5.5	334.00	16	No
3020	5.1	260.00	18	No
3021	8.6	467.00	18	No
3022	8.6	468.00	17	Yes
3023	9.6	298.00	16	No
3024	5.9	461.00	17	No
3025	7.5	296.00	18	Yes
3026	7.8	496.00	16	Yes
3027	6	263.00	16	Yes
3028	5.6	373.00	18	No
3029	7.5	293	16	Yes
3030	5.3	421	18	No

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	14.1	328.00	14	Yes
4002	11.6	268.00	14	Yes
4003	11.3	341.00	13	Yes
4004	15.4	444.00	15	Yes
4005	17.2	481.00	16	Yes
4006	10.3	261.00	13	Yes
4007	11.2	275.00	16	Yes
4008	13.5	402.00	15	Yes
4009	17	275.00	12	Yes
4010	16.5	399.00	13	No
4011	16.4	431.00	12	Yes
4012	11.2	287.00	14	No
4013	18.9	369.00	13	Yes
4014	10	444.00	14	Yes
4015	17	488.00	16	Yes
4016	10.1	279.00	15	Yes
4017	18	447.00	14	Yes
4018	14.1	365.00	14	Yes
4019	11.5	344.00	15	Yes
4020	11.1	276.00	16	Yes
4021	17.1	402.00	12	No
4022	14.7	256.00	13	No
4023	11.3	468.00	12	No
4024	11.6	306.00	14	Yes
4025	16.4	498.00	13	Yes
4026	18.9	303.00	14	Yes
4027	15.8	329.00	14	No
4028	11	498.00	12	No
4029	12.8	471.00	14	No
4030	11	345.00	14	Yes

TYPE 5 DETECTION PROBABILITY

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

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	314	5542	2	Yes
2	789	5543	3	Yes
3	1264	5544	4	Yes
4	1739	5545	5	Yes
5	2214	5546	1	Yes
6	2689	5547	4	Yes
7	3164	5548	1	Yes
8	3639	5549	2	Yes
9	4114	5550	4	Yes
10	4589	5551	3	Yes
11	5064	5552	1	Yes
12	5539	5553	4	Yes
13	6014	5554	2	Yes
14	6489	5555	2	Yes
15	6964	5556	1	Yes
16	7439	5557	4	Yes
17	7914	5558	6	Yes
18	8389	5542	4	Yes
19	8864	5543	3	Yes
20	9339	5544	3	Yes
21	9814	5545	3	Yes
22	10289	5546	4	Yes
23	10764	5547	2	Yes
24	11239	5548	4	Yes
25	11714	5549	1	Yes
26	12189	5550	4	Yes
27	12664	5551	7	Yes
28	13139	5552	4	Yes
29	13614	5553	2	Yes
30	14089	5554	4	Yes
31	14564	5555	4	Yes
32	15039	5556	1	No
33	15514	5557	1	Yes
34	15989	5558	4	Yes

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz
* = Plane-wave equivalent power density

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

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

IC RULES

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

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

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

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

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

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

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

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

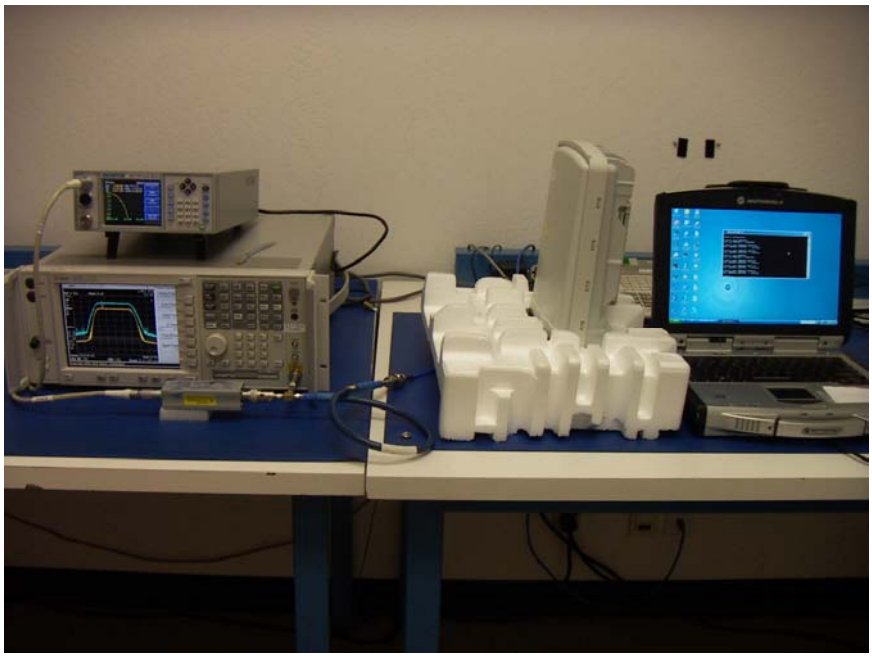
RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
5.4 GHz	10MHz	0.20	9.83	17.00	0.96	0.096
5.4 GHz	20MHz	0.20	12.93	17.00	1.98	0.198

11. SETUP PHOTOS

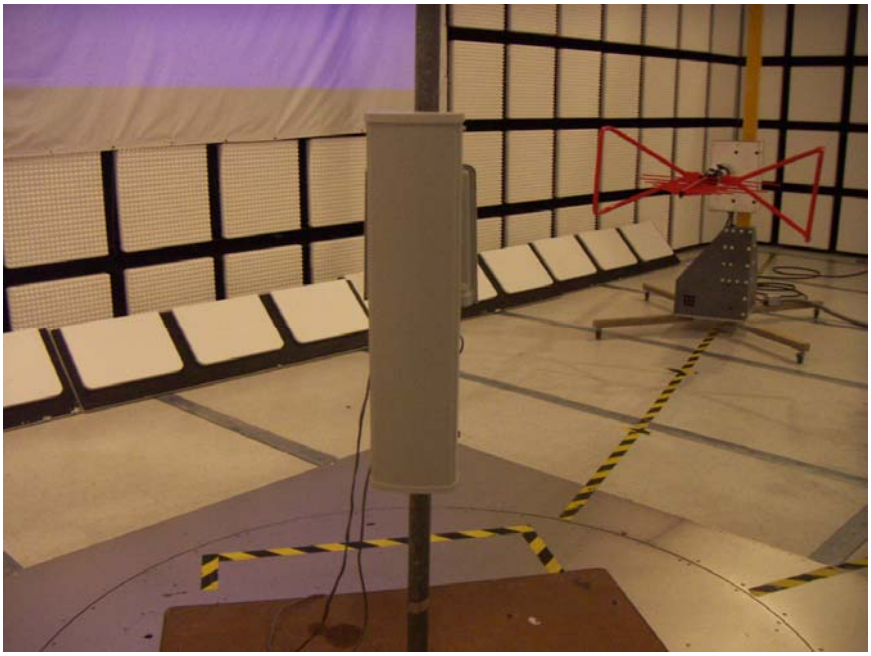
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO

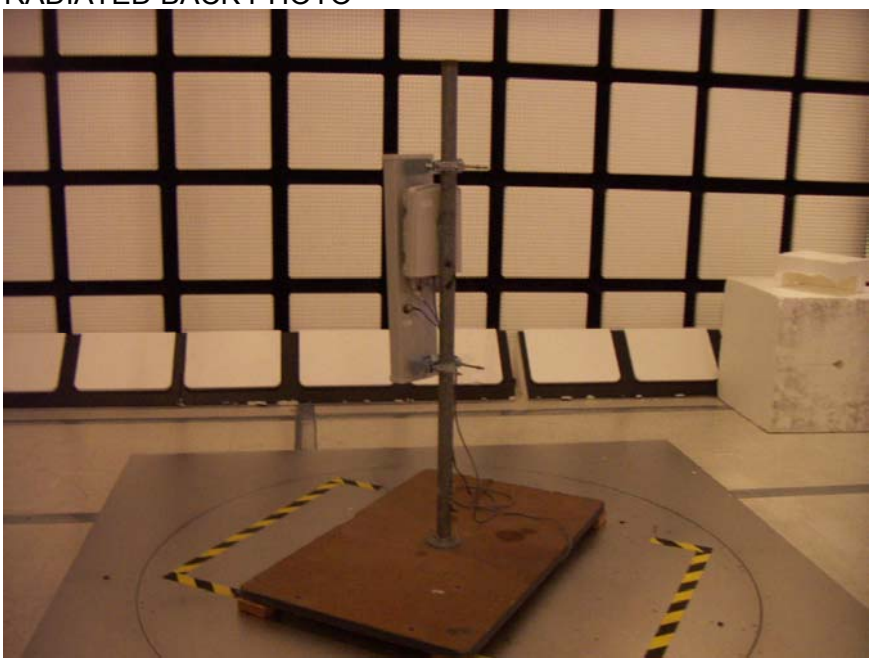


RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO



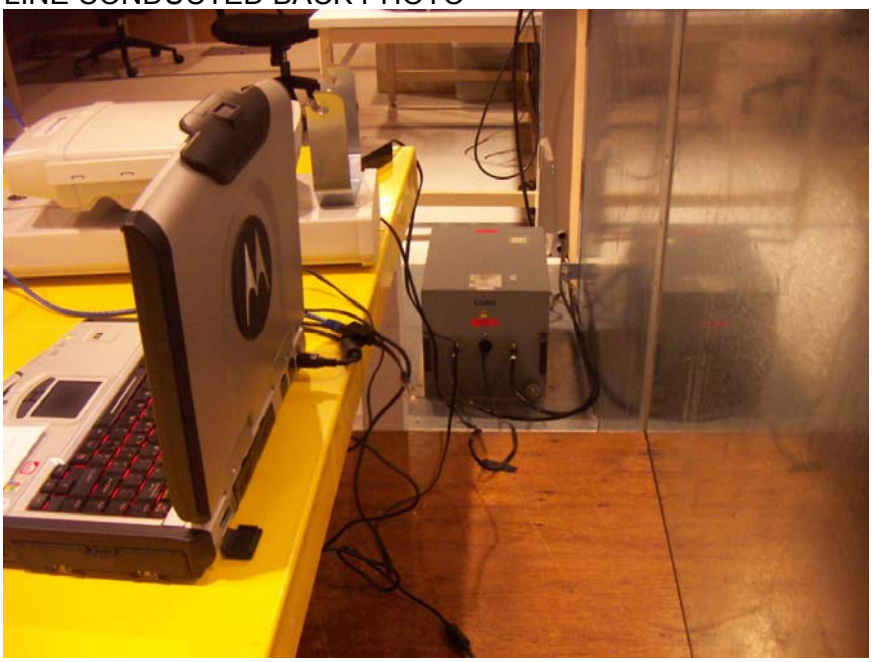
RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO



DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO

DFS BACK PHOTO

END OF REPORT