FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

WIRELESS ACCESSORY RADIO

MODEL NUMBER: 1525

FCC ID: C3K1525
IC: 3048A-1525

REPORT NUMBER: 13U14860-6

ISSUE DATE: MAY 17, 2013

Prepared for
MICROSOFT CORPORATION
ONE MICROSOFT WAY
REDMOND WA 98052, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	05/17/13	Initial Issue	T. LEE

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION.
ONE MICROSOFT WAY
REDMOND, WA 98052, U.S.A.

EUT DESCRIPTION: Wireless Accessory Radio

MODEL: 1525

SERIAL NUMBER: 0050432165B0 and 0050432165BA (RF);
01950291000065330548 (DFS)

DATE TESTED: February 14 to April 3, 2013 (RF) and May 16 to 17, 2013 (DFS)

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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:

TIM LEE
WiSE PROJECT LEADER
UL CCS

Tested By:

Tony Wagoner
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2003, RSS-GEN Issue 3, and RSS-210 Issue 8.

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 Wireless Accessory radio.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5260 - 5320	802.11a	10.62	11.53
5260 - 5320	802.11n HT20	11.06	12.76
5500 - 5700	802.11a	8.64	7.31
5500 - 5700	802.11n HT20	8.3	6.76

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an external patch antenna, with a maximum gain of 3.14 dBi at 5 GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 14.1.23.9.

The EUT driver software installed during testing was 1.0.7.49.

The test utility software used during testing was DutApiBRIDGEETH8782.exe.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11a mode: 6 Mbps
802.11n HT20mode: MCS0

Radiated emissions for EUT with antenna was performed and passed; therefore, antenna port spurious was not performed.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	DELL	Vostro 1000	DVT	DoC
AC-DC Adapter	DELL	LA65NS0-00	CN-ODF263-71615-6C4	DoC
Sheeva Plug	Globalscale	003-SP1001	1043-002835	N/A

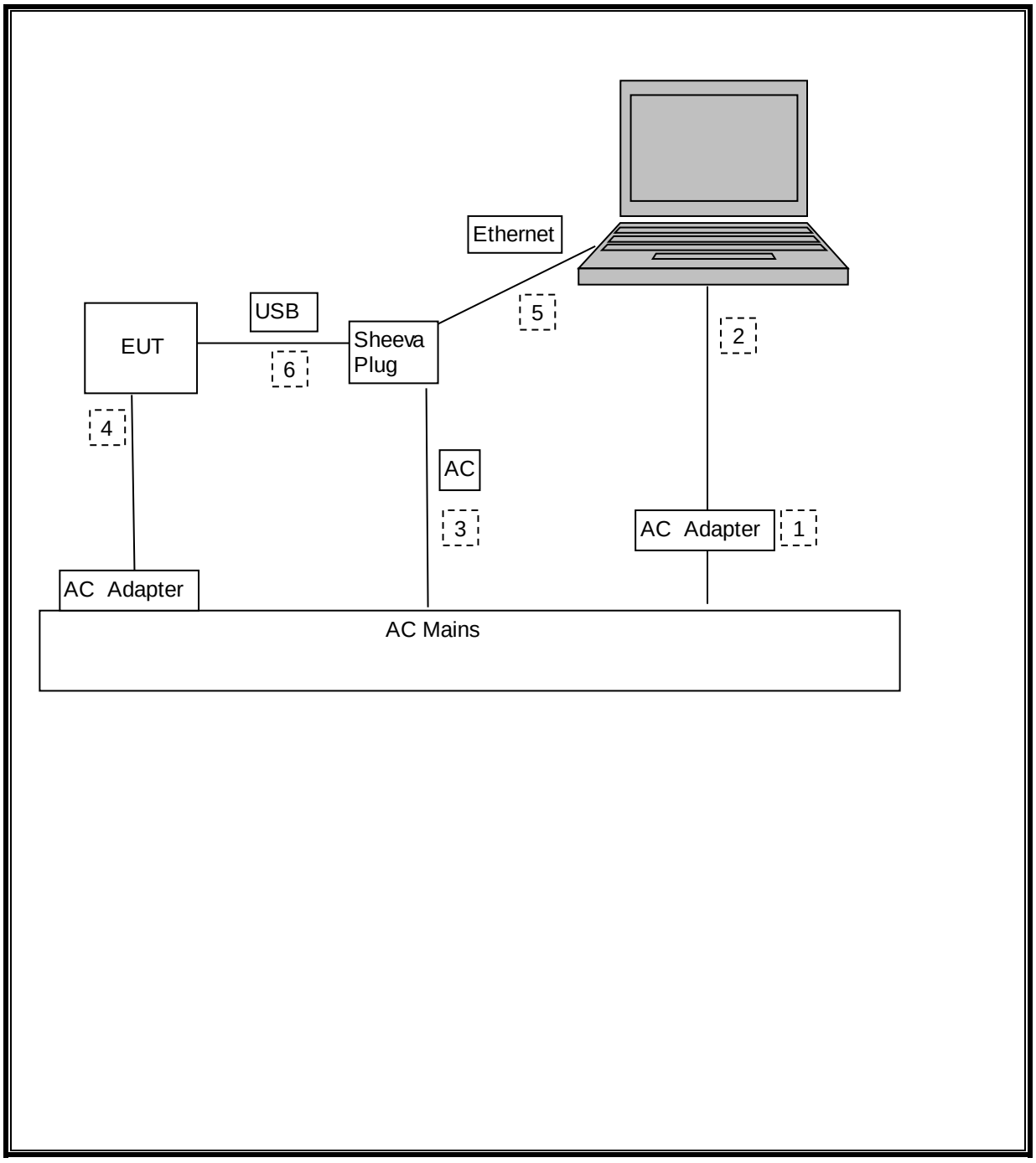
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	USA 3P	Unshielded	1.8	None
2	DC	1	DC	Unshielded	1.8	None
3	AC	1	USA 2P	Unshielded	1.5	None
4	DC	1	DC	Unshielded	1.3	None
5	Ethernet	1	Ethernet	Unshielded	1	None
6	USB	1	USB	Unshielded	1.2	None

TEST SETUP

The EUT is installed in a separate host during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



7. 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**
PSA (Conducted)	Agilent	E4446A	C01069	12/20/12	12/20/14
PSA (Radiated)	Agilent	E4446A	C00986	04/01/13	04/01/14
Antenna, Horn, 18 GHz	ETS	3117	C01022	02/21/13	02/21/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/13	02/13/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/13	01/16/14
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02679	CNR	CNR
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02677	CNR	CNR
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/12	08/08/13
P-Series single channel Power Meter	Agilent / HP	N1911A	T227	10/12/12	10/12/13
Peak / Average Power Sensor	Agilent / HP	E9323A	T228	10/11/12	10/11/13

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

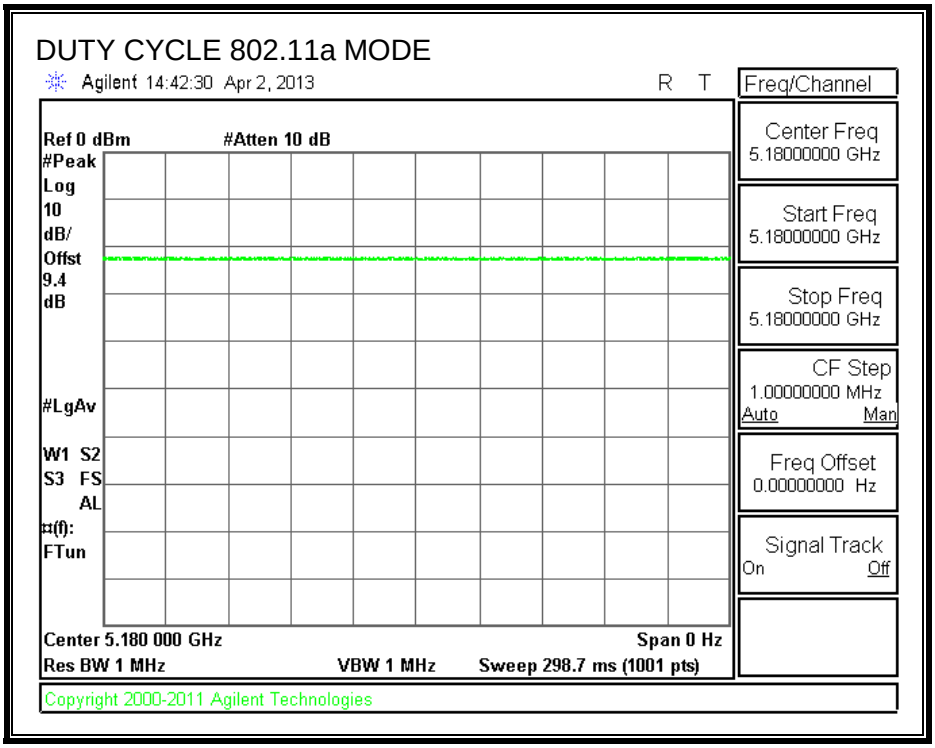
PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

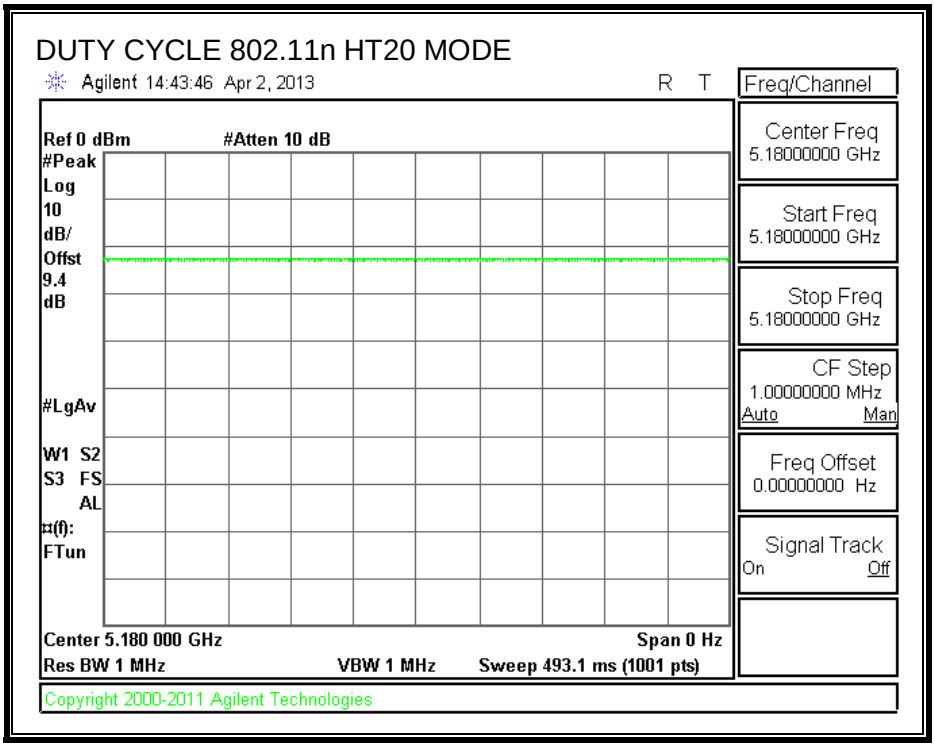
8.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11a 20 MHz	100.00	100	1.000	100.0%	0.00	0.010
802.11n HT20	100.00	100	1.000	100.0%	0.00	0.010

8.1.2. DUTY CYCLE PLOTS



DUTY CYCLE 802.11n HT20 MODE



8.1.3. MEASUREMENT METHOD FOR POWER AND PPSD

The Duty Cycle is greater than or equal to 98% therefore KDB 789033 Method SA-1 is used.

8.1.4. MEASUREMENT METHOD FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz

The Duty Cycle is greater than or equal to 98%, KDB 789033 Method AD with Power RMS Averaging is used.

9. MEASUREMENT METHODS

KDB 558074 Measurement Procedure PK2 is used for power and PKPSD is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

10. ANTENNA PORT TEST RESULTS

10.1. 802.11a MODE IN THE 5.3 GHz BAND

10.1.1. 26 dB BANDWIDTH

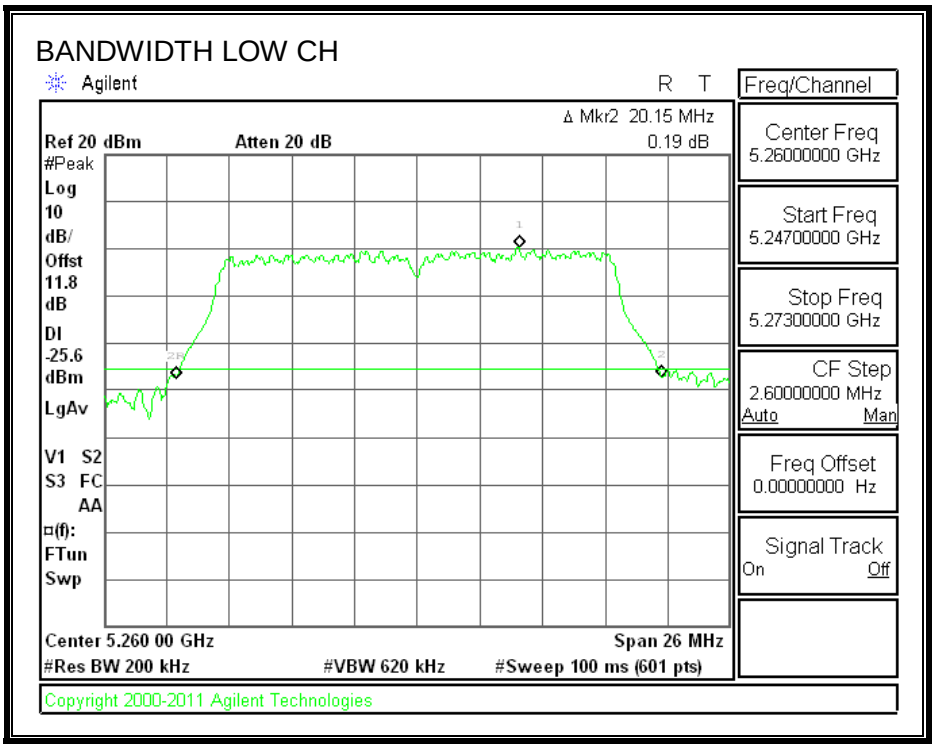
LIMITS

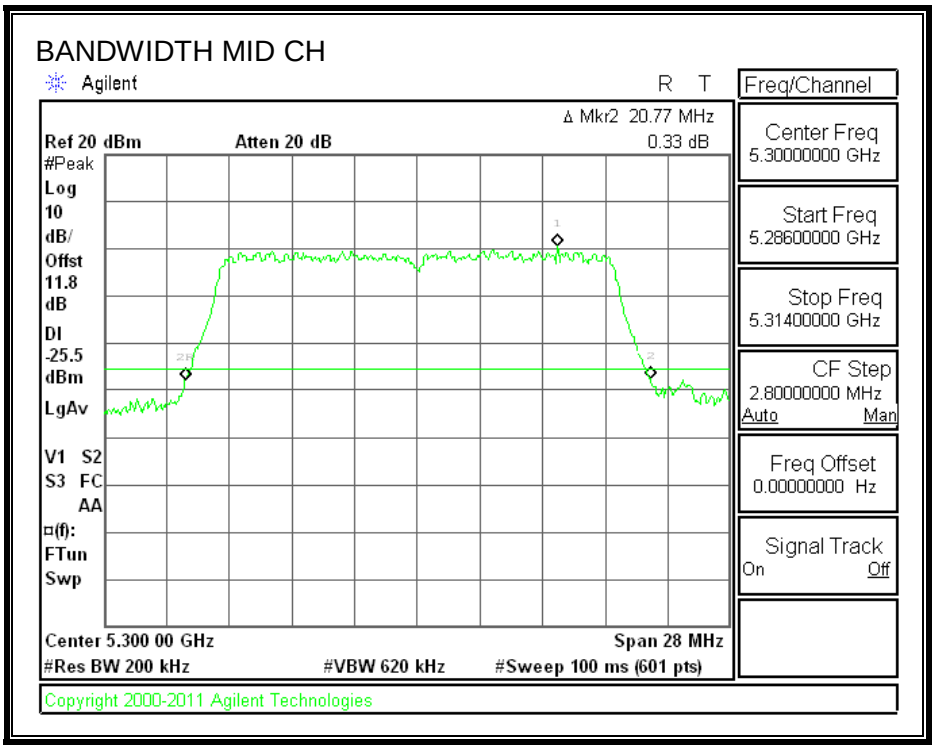
None; for reporting purposes only.

RESULTS

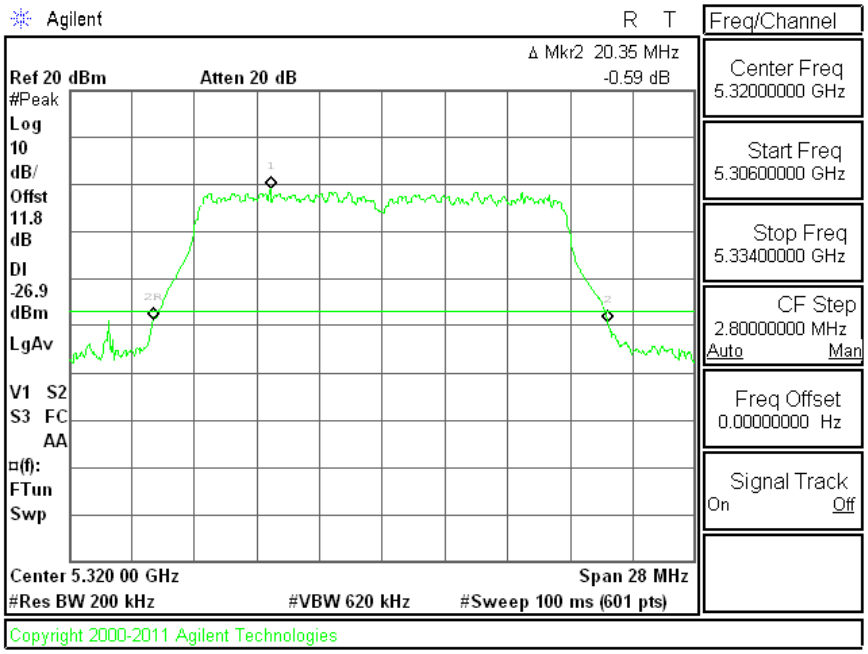
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	20.2
Mid	5300	20.8
High	5320	20.4

26 dB BANDWIDTH





BANDWIDTH HIGH CH



10.1.2. 99% BANDWIDTH

LIMITS

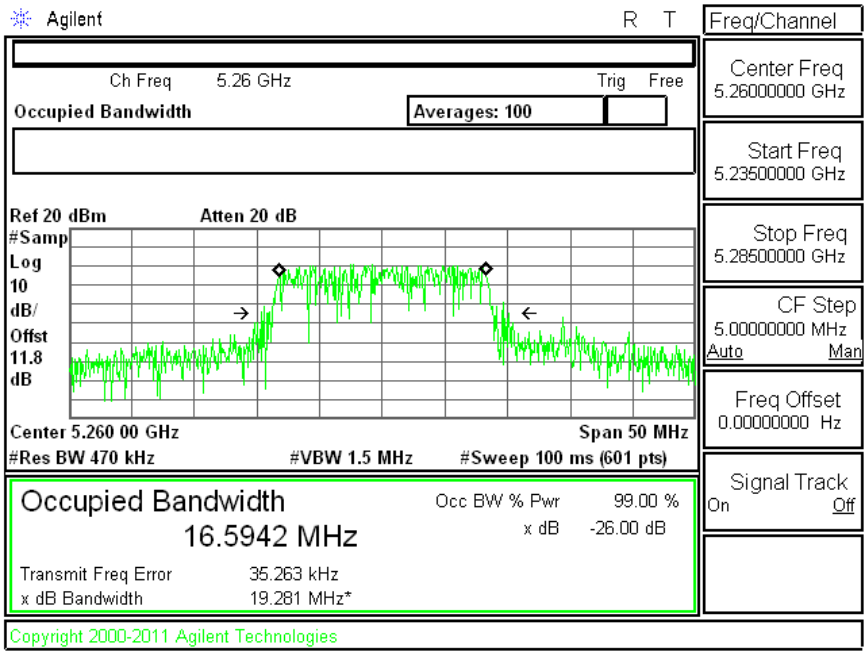
None; for reporting purposes only.

RESULTS

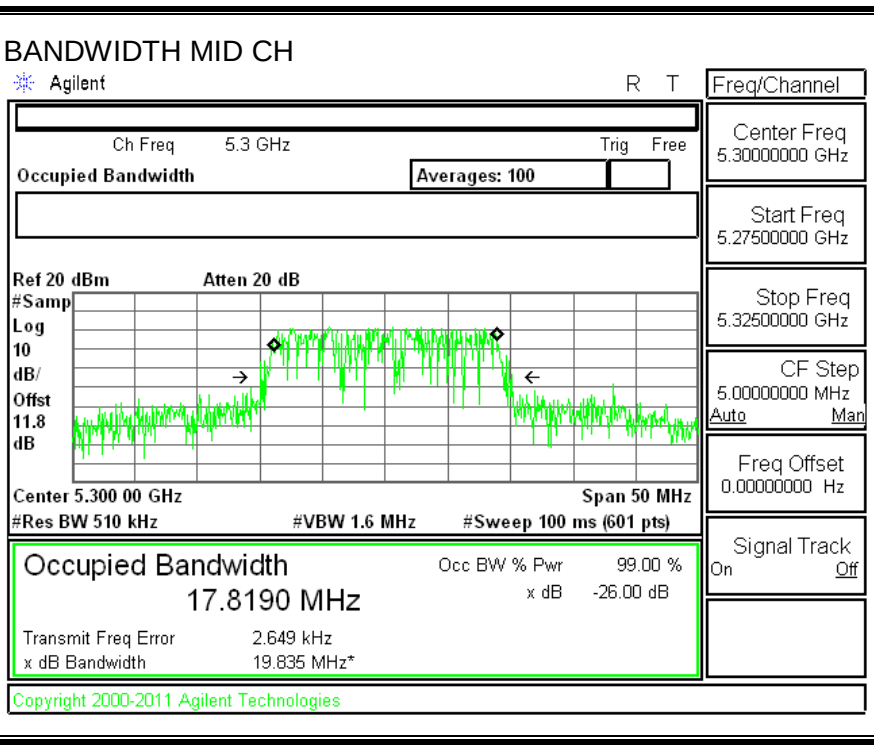
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5260	16.6
Mid	5300	17.8
High	5320	16.6

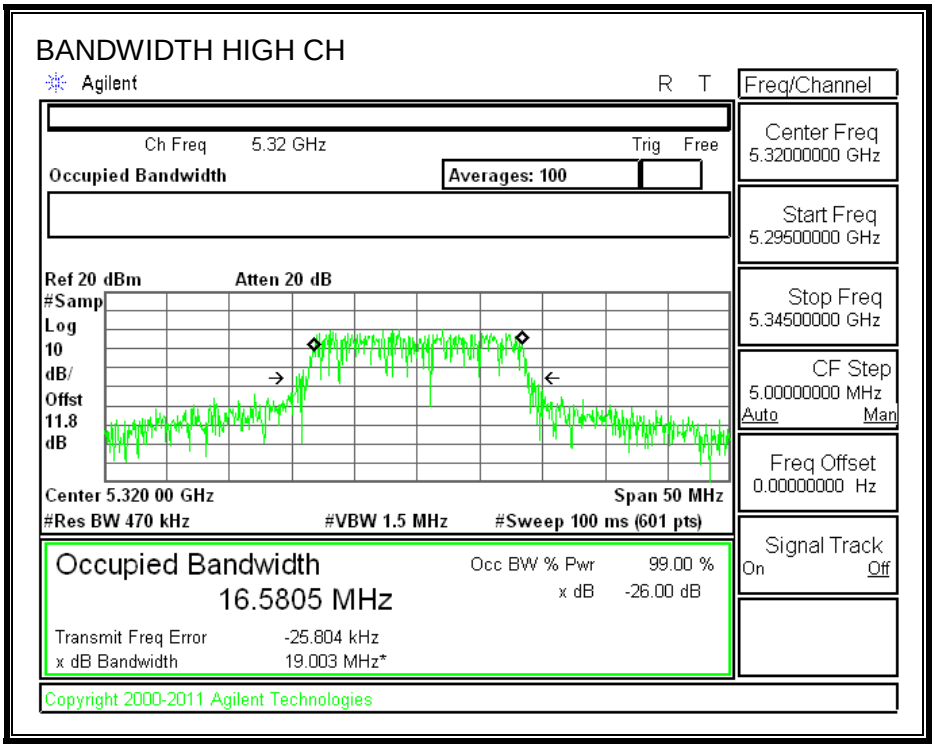
99% BANDWIDTH

BANDWIDTH LOW CH



BANDWIDTH MID CH





10.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5260	10.65
Mid	5300	10.70
High	5320	9.33

10.1.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.25–5.35 GHz, 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. In addition, 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 maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5260	20.2	16.6	3.14
Mid	5300	20.8	17.8	3.14
High	5320	20.4	16.6	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.20	29.20	23.20	11.00	11.00	11.00
Mid	5300	24.00	23.51	29.51	23.51	11.00	11.00	11.00
High	5320	24.00	23.20	29.20	23.20	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

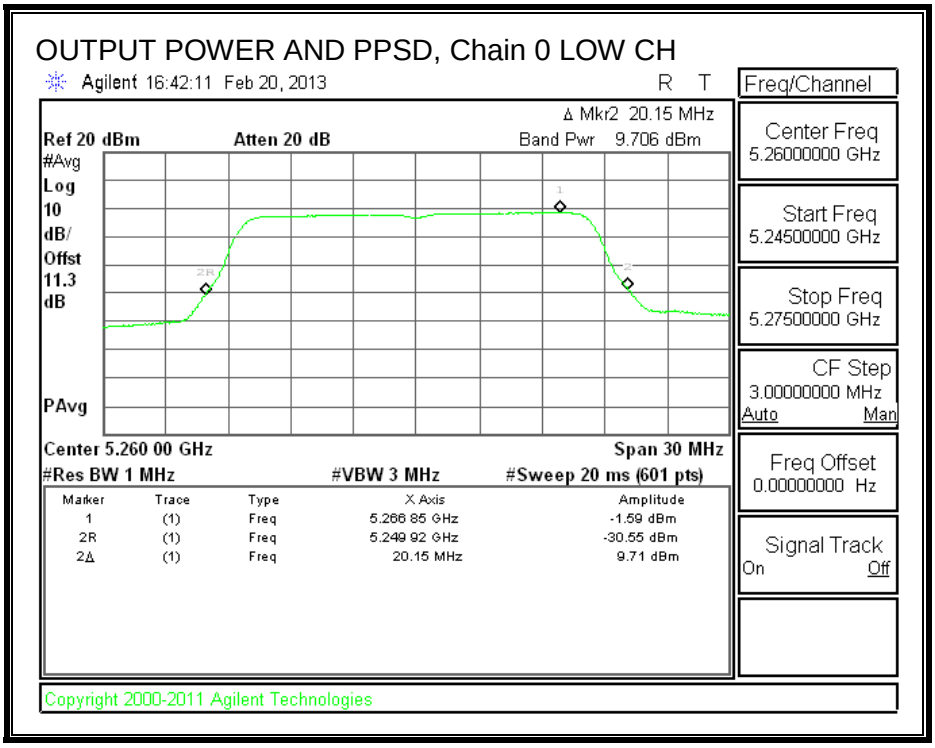
Output Power Results

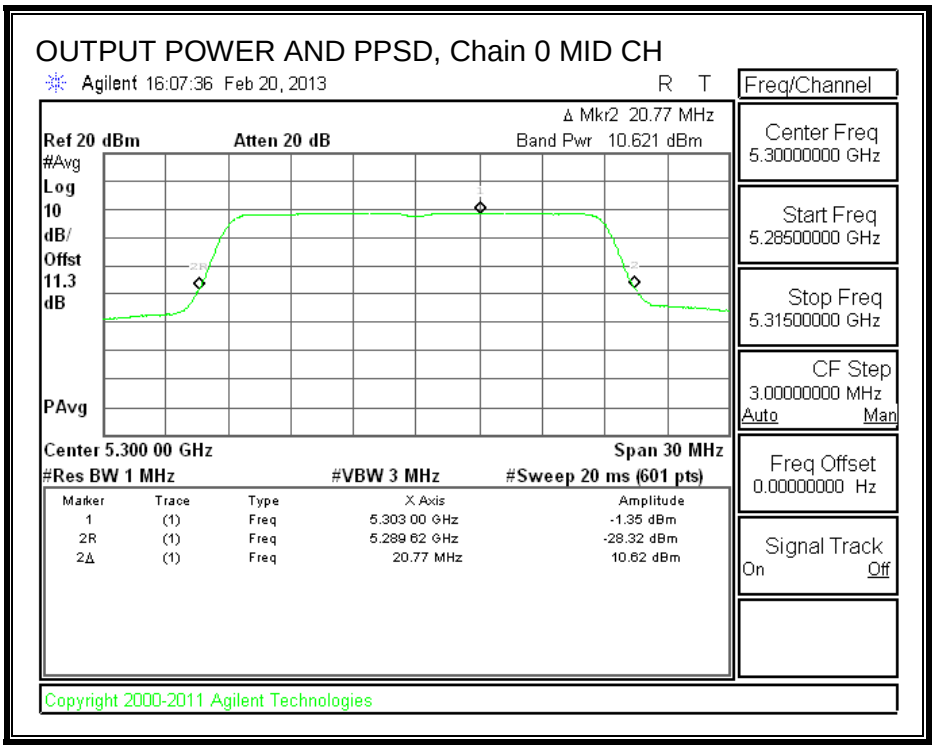
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	9.71	9.71	23.20	-13.49
Mid	5300	10.62	10.62	23.51	-12.89
High	5320	8.65	8.65	23.20	-14.54

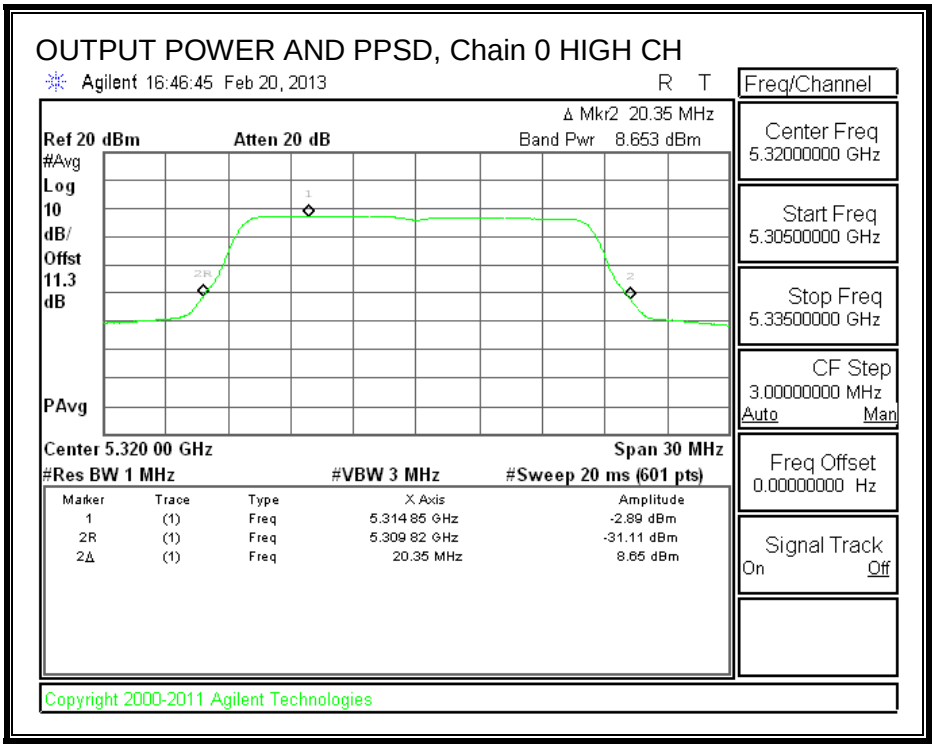
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	-1.59	-1.59	11.00	-12.59
Mid	5300	-1.35	-1.35	11.00	-12.35
High	5320	-2.89	-2.89	11.00	-13.89

OUTPUT POWER AND PPSD, Chain 0







10.1.5. 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.

RESULTS

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

10.2. 802.11n HT20 MODE IN THE 5.3 GHz BAND

10.2.1. 26 dB BANDWIDTH

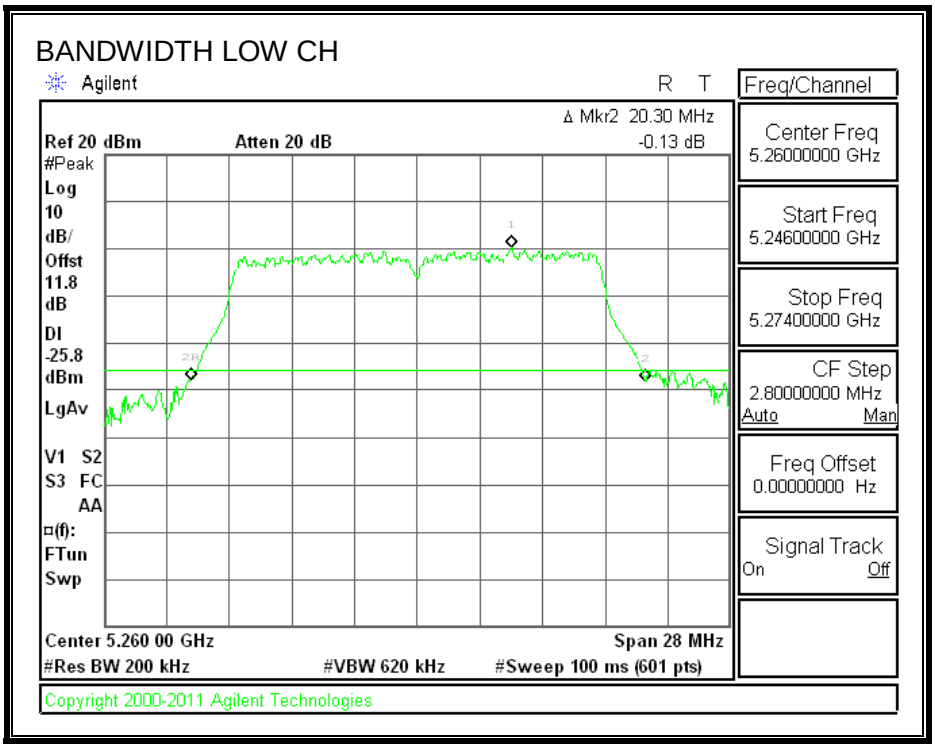
LIMITS

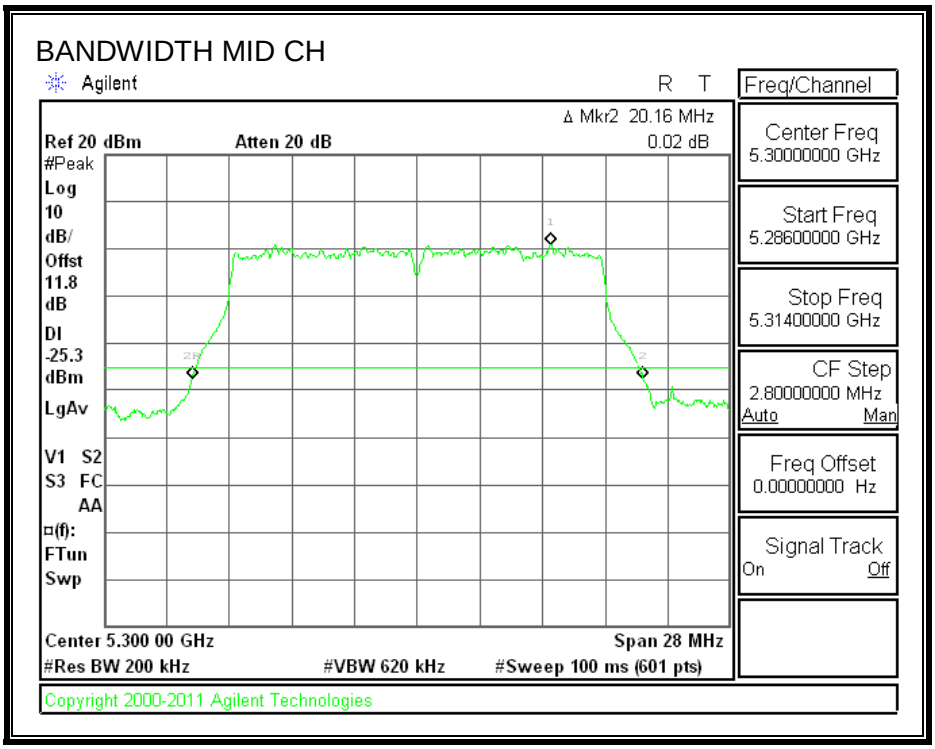
None; for reporting purposes only.

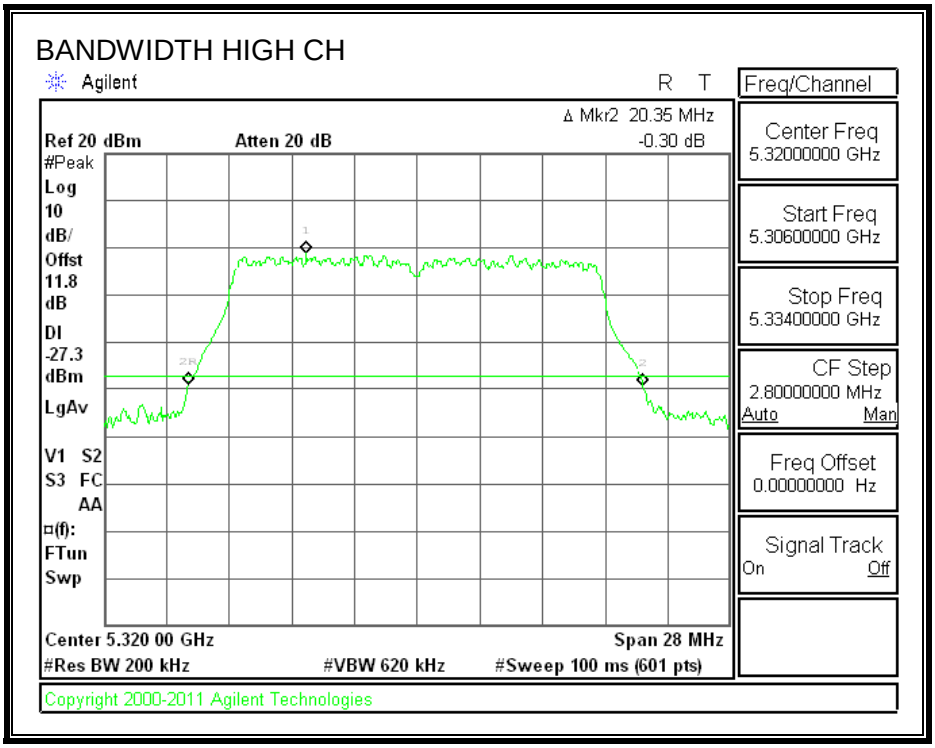
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	20.3
Mid	5300	20.2
High	5320	20.4

26 dB BANDWIDTH







10.2.2. 99% BANDWIDTH

LIMITS

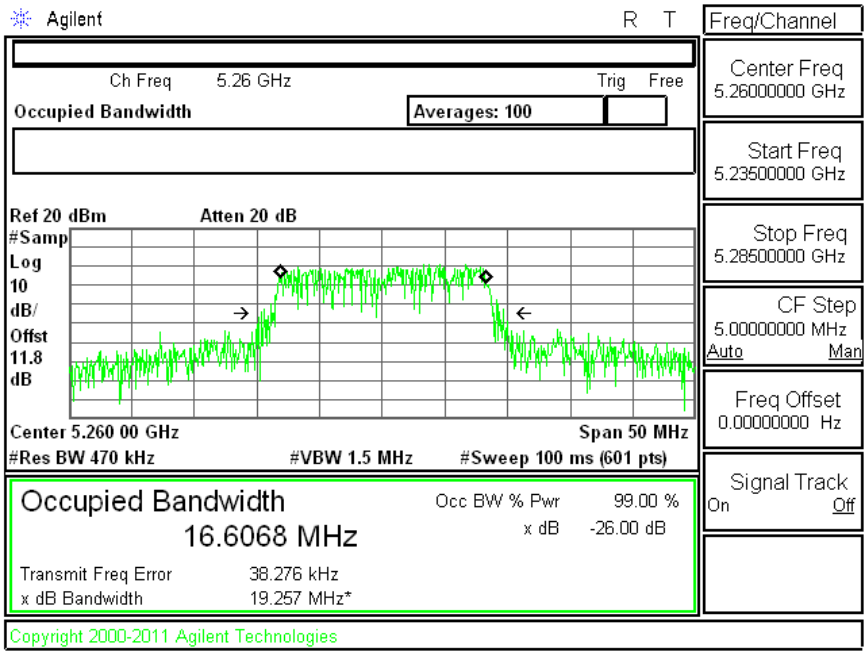
None; for reporting purposes only.

RESULTS

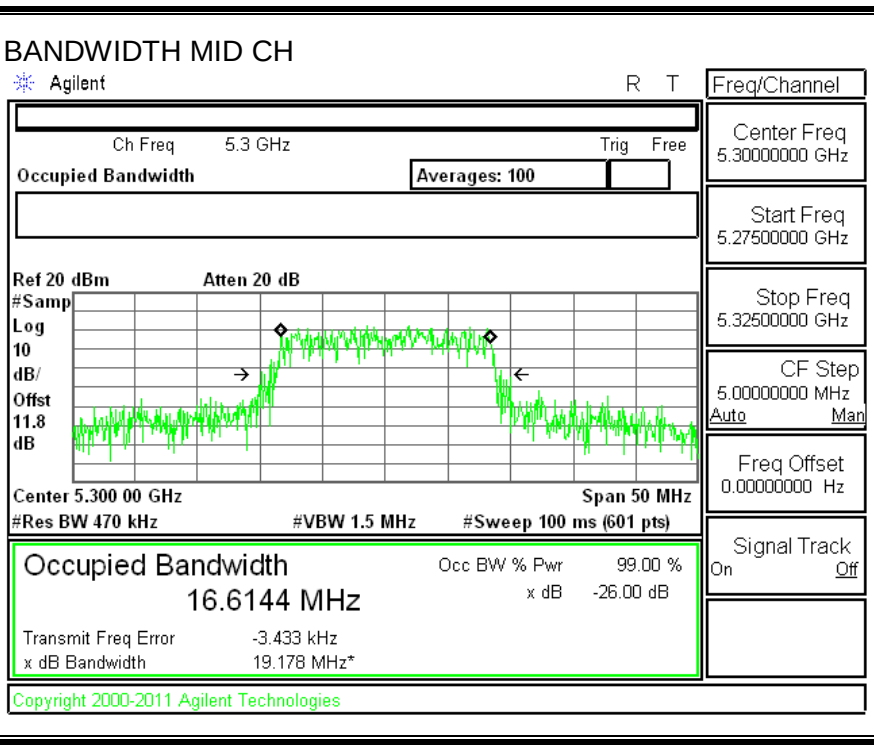
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5260	16.6
Mid	5300	16.6
High	5320	16.6

99% BANDWIDTH

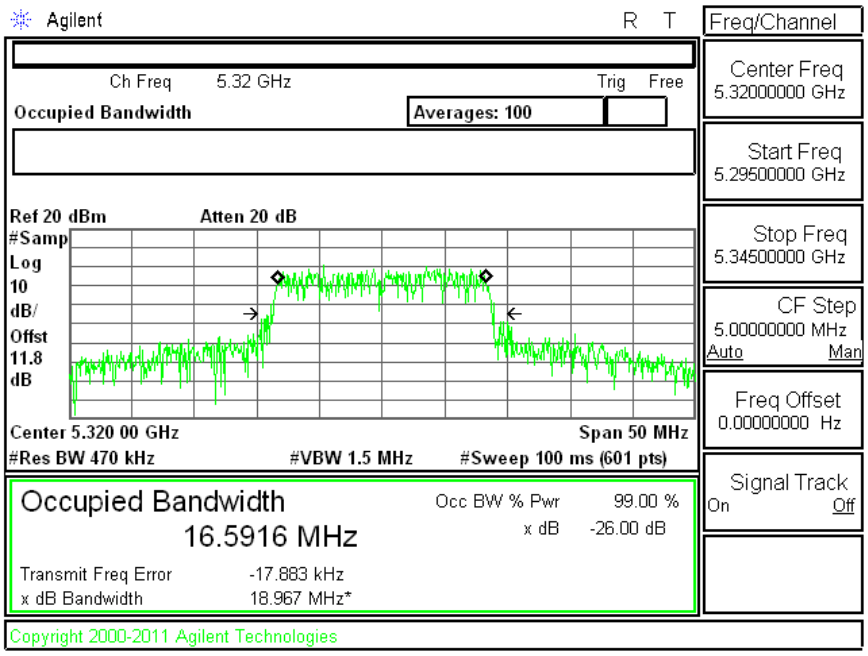
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



10.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5260	10.62
Mid	5300	10.75
High	5320	9.18

10.2.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.25–5.35 GHz, 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. In addition, 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 maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5260	20.3	16.6	3.14
Mid	5300	20.2	16.6	3.14
High	5320	20.4	16.6	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.20	29.20	23.20	11.00	11.00	11.00
Mid	5300	24.00	23.20	29.20	23.20	11.00	11.00	11.00
High	5320	24.00	23.20	29.20	23.20	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

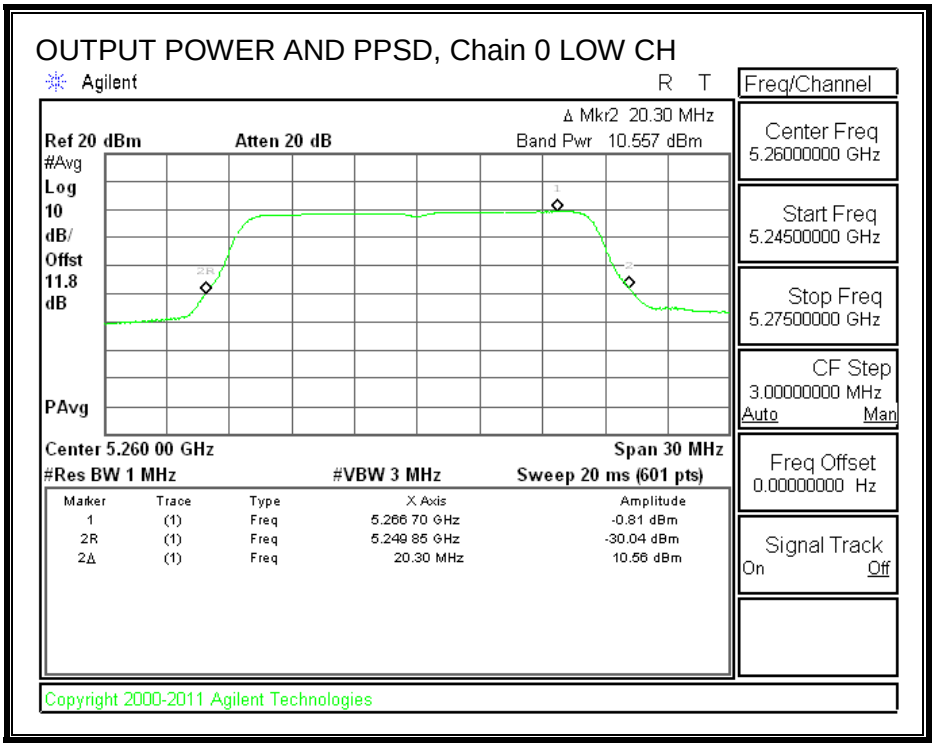
Output Power Results

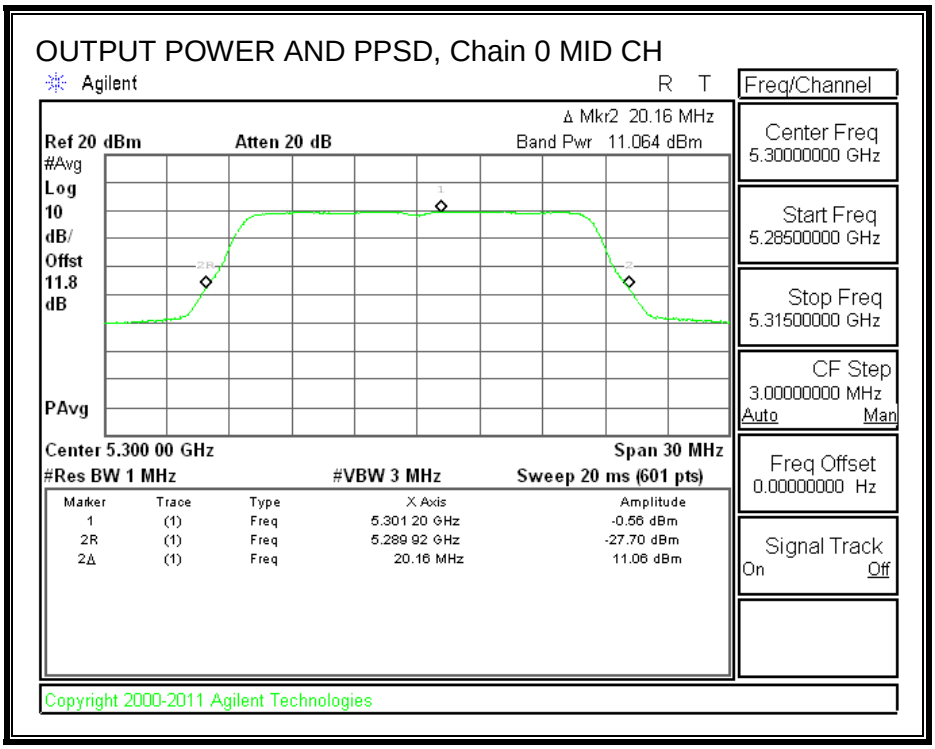
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	10.56	10.56	23.20	-12.65
Mid	5300	11.06	11.06	23.20	-12.14
High	5320	9.28	9.28	23.20	-13.91

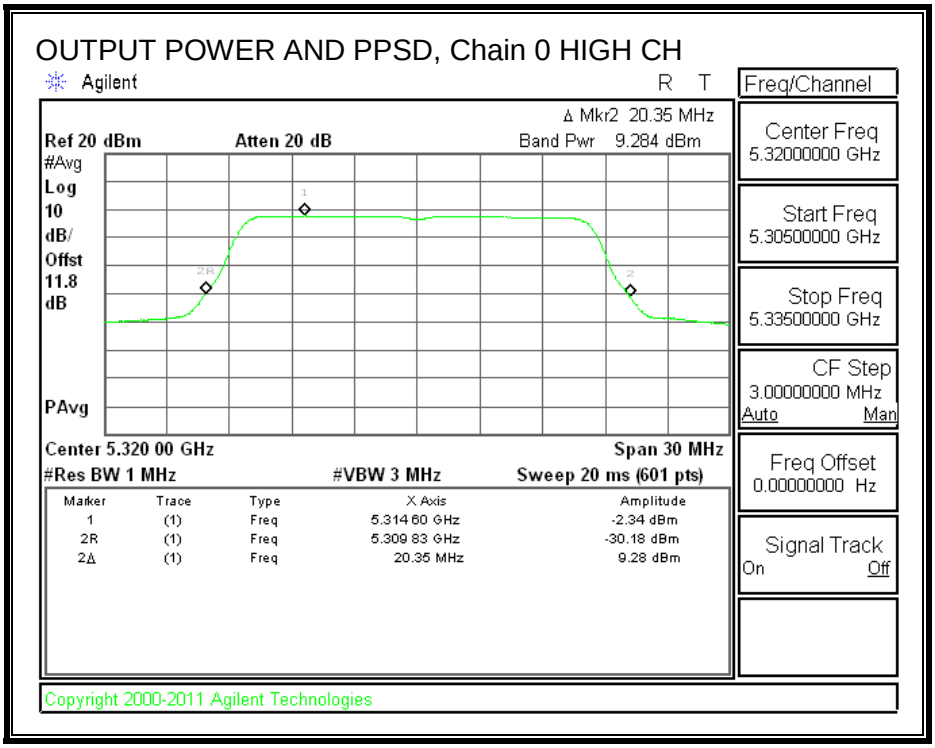
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	-0.81	-0.81	11.00	-11.81
Mid	5300	-0.56	-0.56	11.00	-11.56
High	5320	-2.34	-2.34	11.00	-13.34

OUTPUT POWER AND PPSD, Chain 0







10.2.5. 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.

RESULTS

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

10.3. 802.11a MODE IN THE 5.6 GHz BAND

10.3.1. 26 dB BANDWIDTH

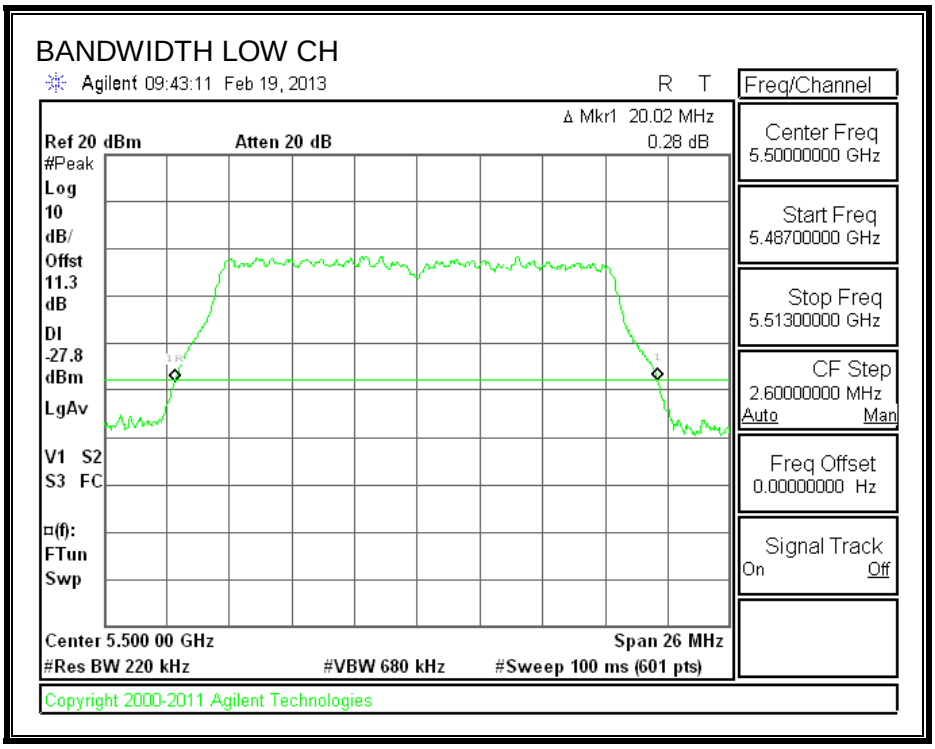
LIMITS

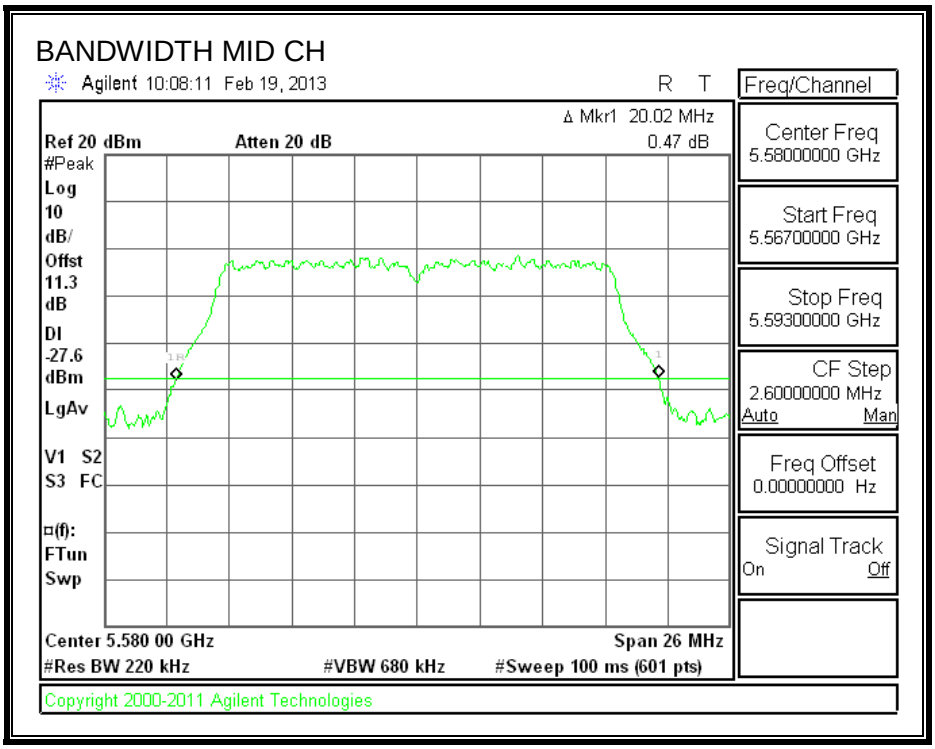
None; for reporting purposes only.

RESULTS

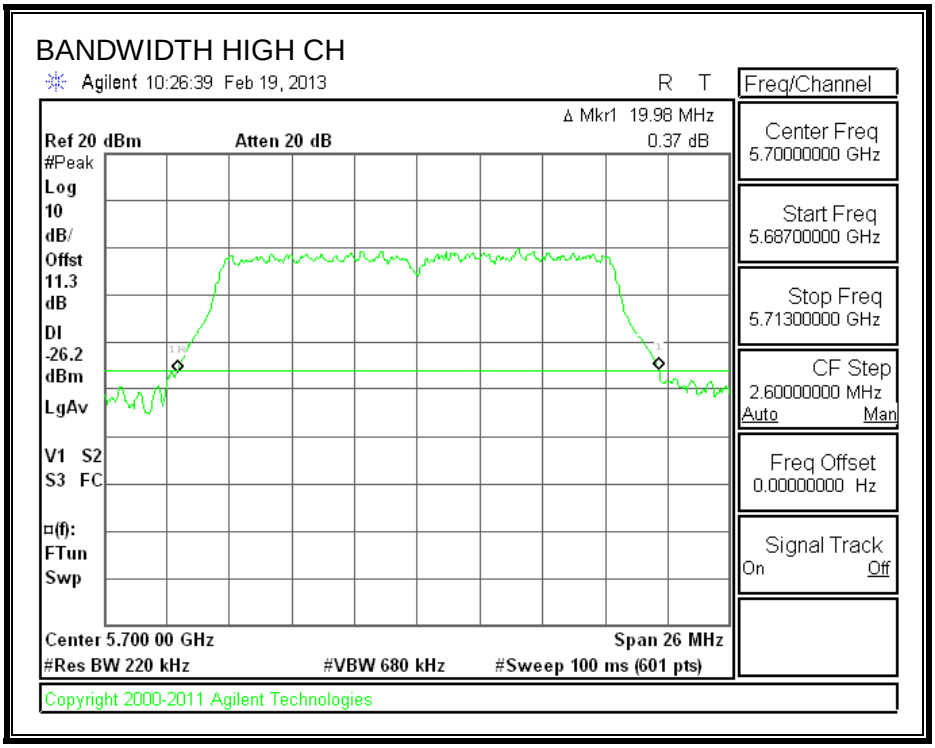
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5500	20.0
Mid	5580	20.0
High	5700	20.0

26 dB BANDWIDTH





BANDWIDTH HIGH CH



10.3.2. 99% BANDWIDTH

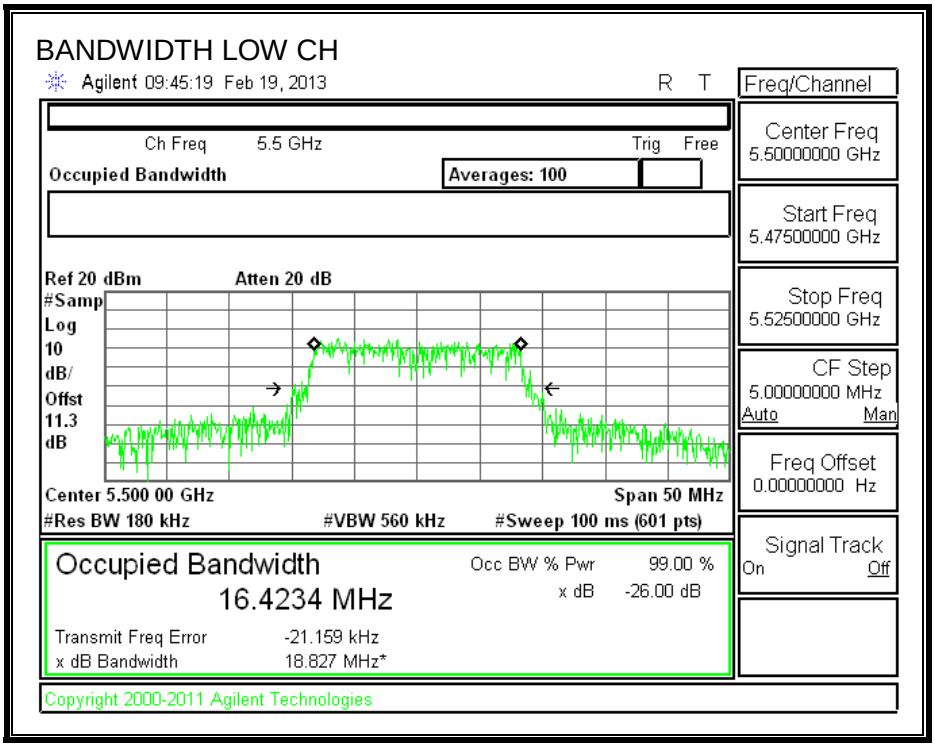
LIMITS

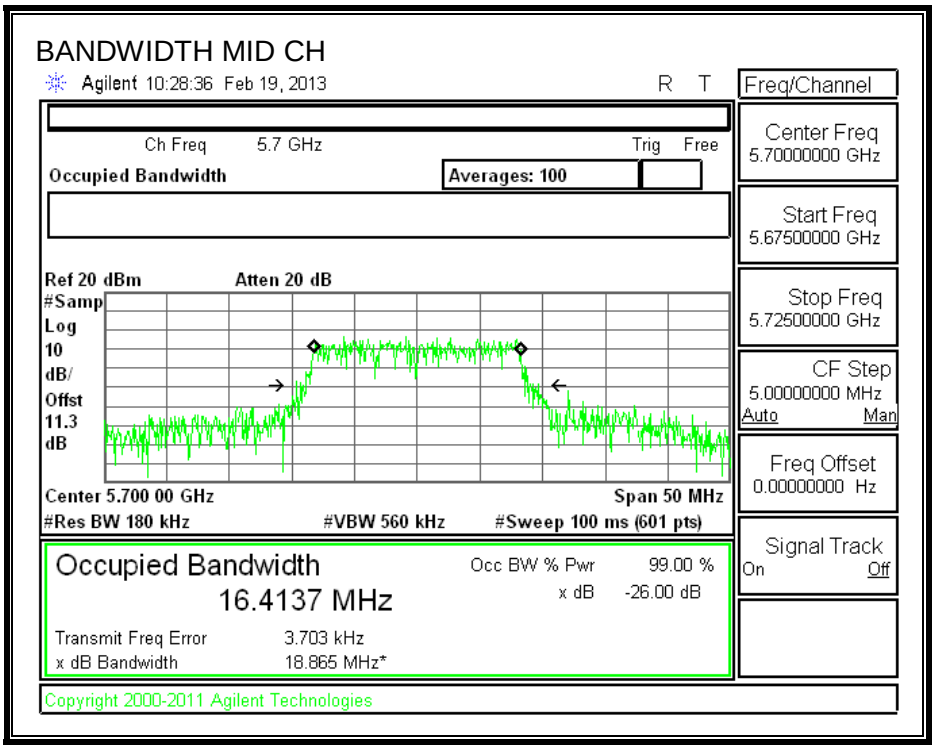
None; for reporting purposes only.

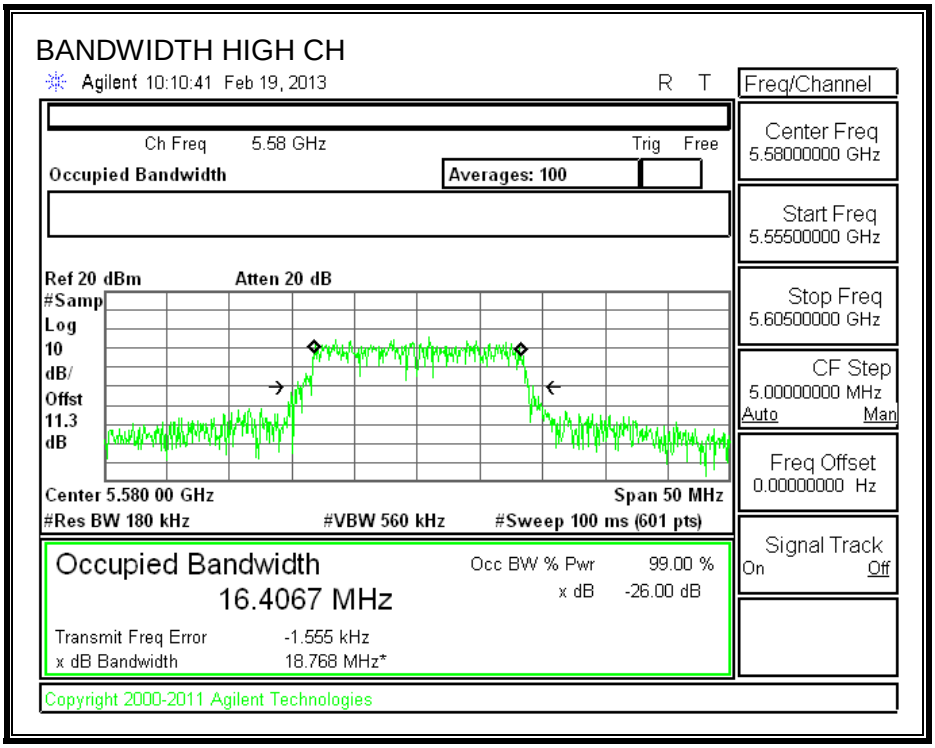
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5500	16.4
Mid	5580	16.4
High	5700	16.4

99% BANDWIDTH







10.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5500	8.51
Mid	5580	8.71
High	5700	9.70

10.3.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.5–5.7 GHz, 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. In addition, 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 maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5500	20.0	16.4	3.14
Mid	5580	20.0	16.4	3.14
High	5700	20.0	16.4	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5500	24.00	23.15	29.15	23.15	11.00	11.00	11.00
Mid	5580	24.00	23.15	29.15	23.15	11.00	11.00	11.00
High	5700	24.00	23.15	29.15	23.15	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

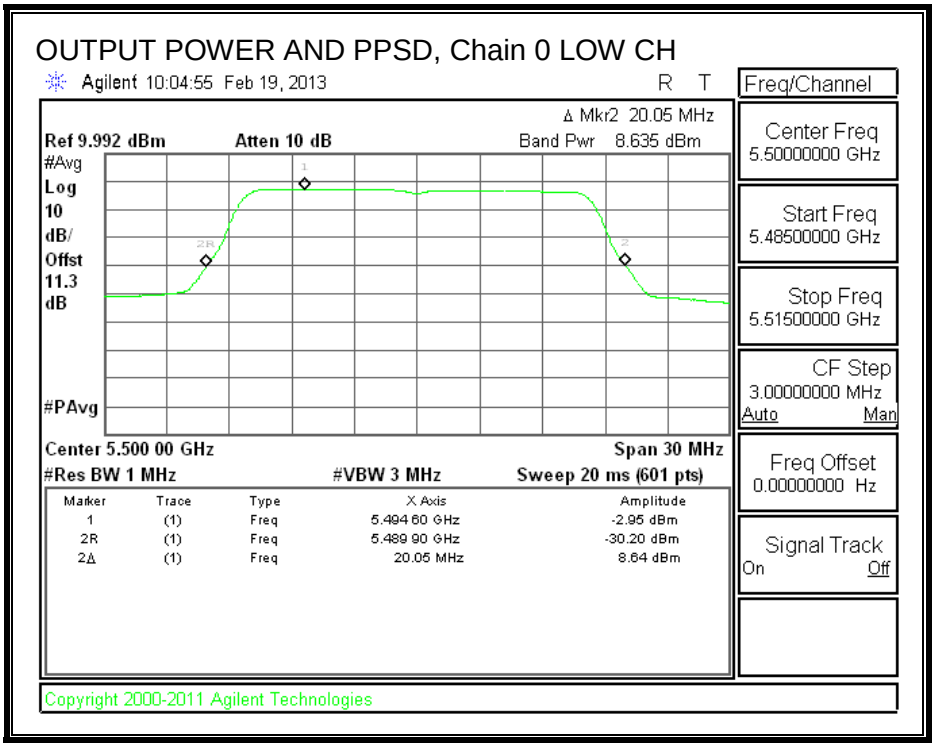
Output Power Results

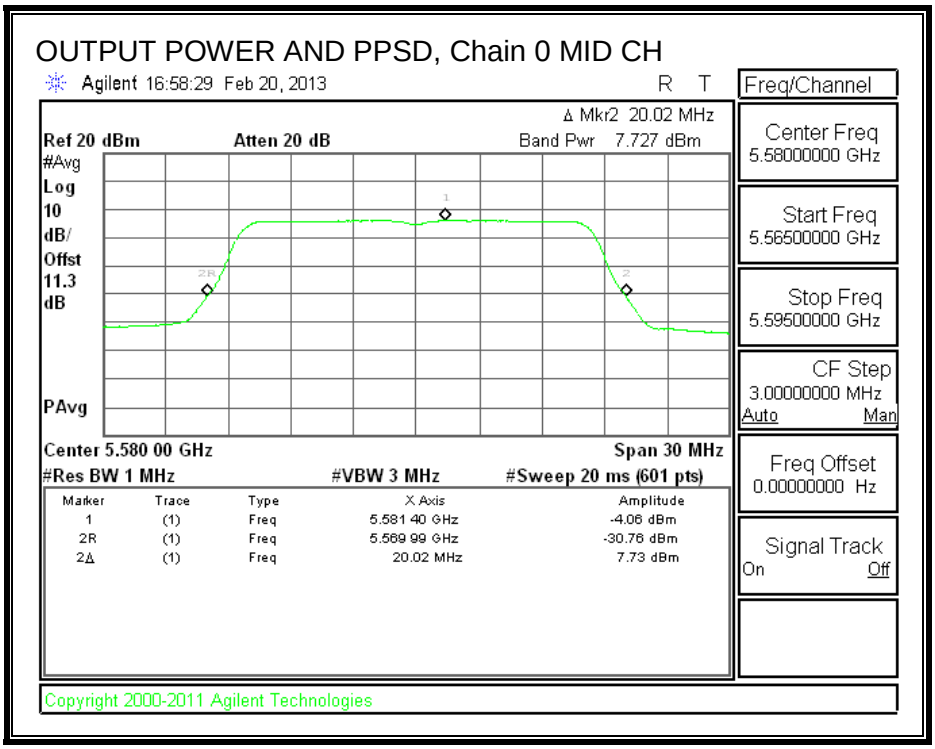
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	8.64	8.64	23.15	-14.52
Mid	5580	7.73	7.73	23.15	-15.43
High	5700	8.39	8.39	23.15	-14.76

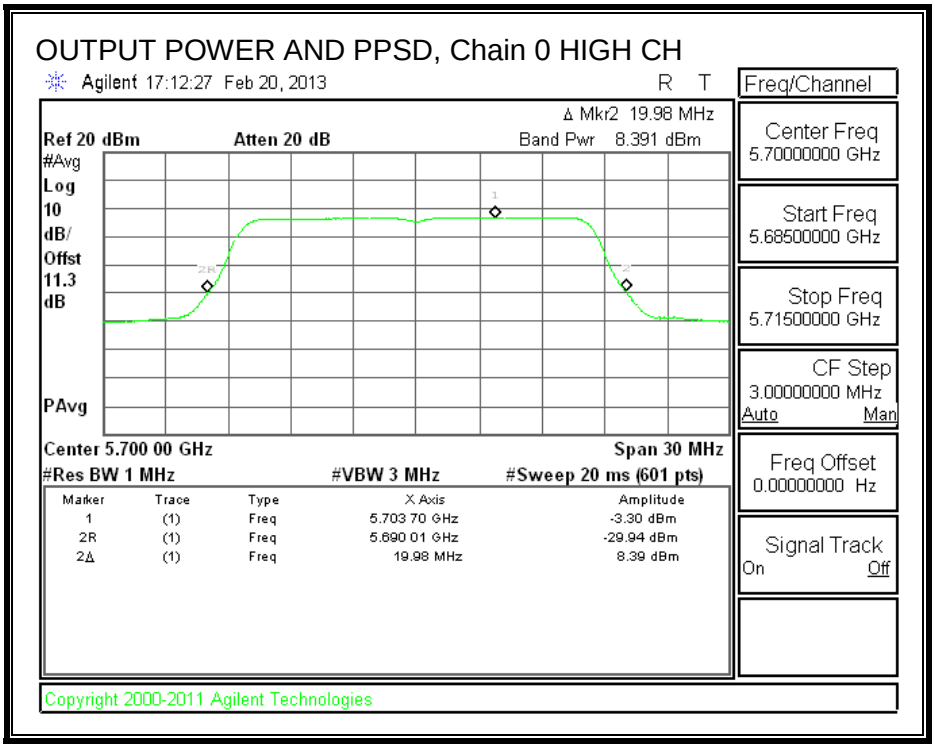
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	-2.95	-2.95	11.00	-13.95
Mid	5580	-4.06	-4.06	11.00	-15.06
High	5700	-3.30	-3.30	11.00	-14.30

OUTPUT POWER AND PPSD, Chain 0







10.3.5. 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.

RESULTS

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

10.4. 802.11n HT20 MODE IN THE 5.6 GHz BAND

10.4.1. 26 dB BANDWIDTH

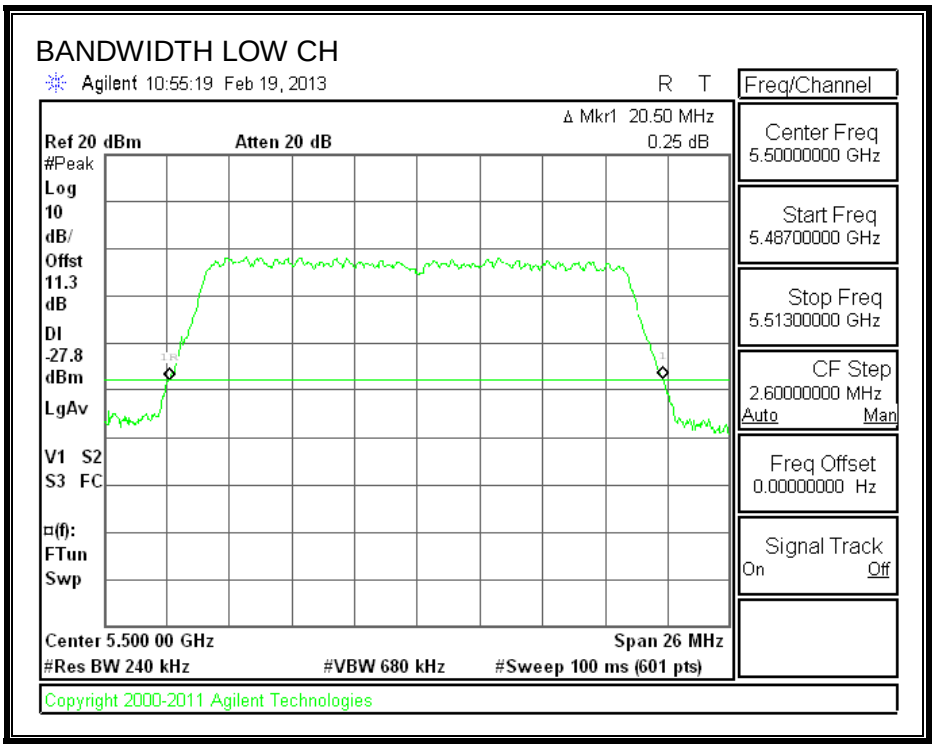
LIMITS

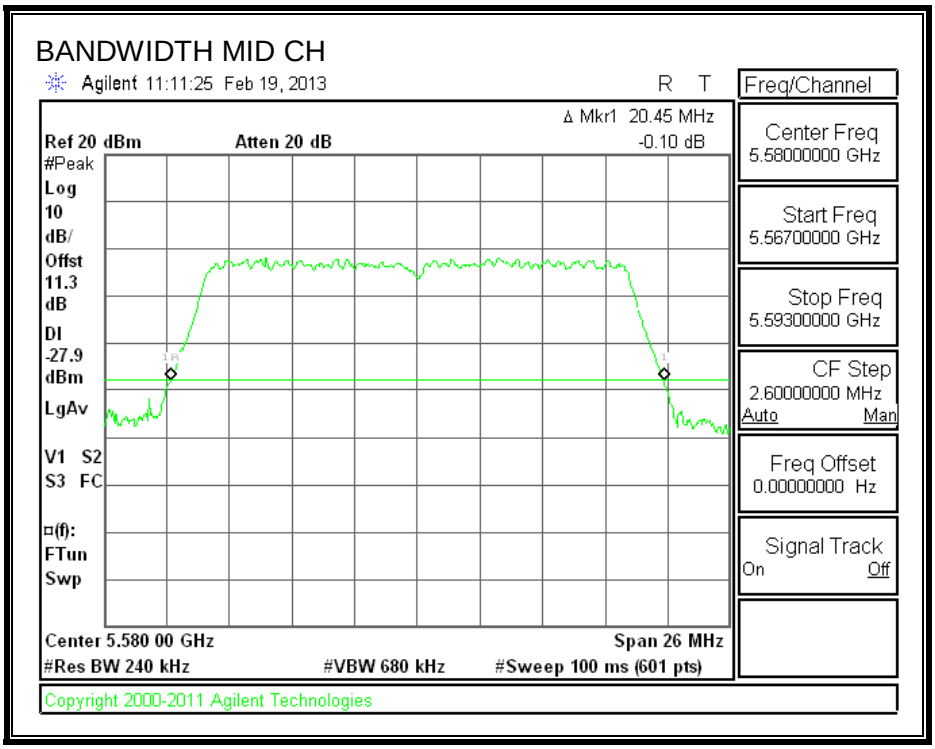
None; for reporting purposes only.

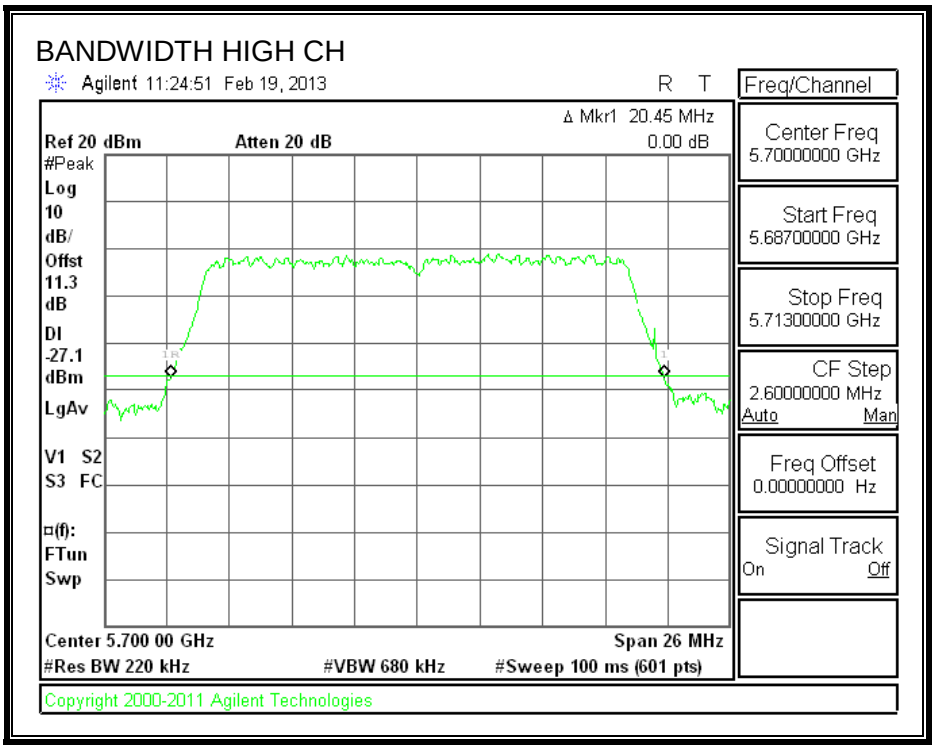
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5500	20.5
Mid	5580	20.5
High	5700	20.5

26 dB BANDWIDTH







10.4.2. 99% BANDWIDTH

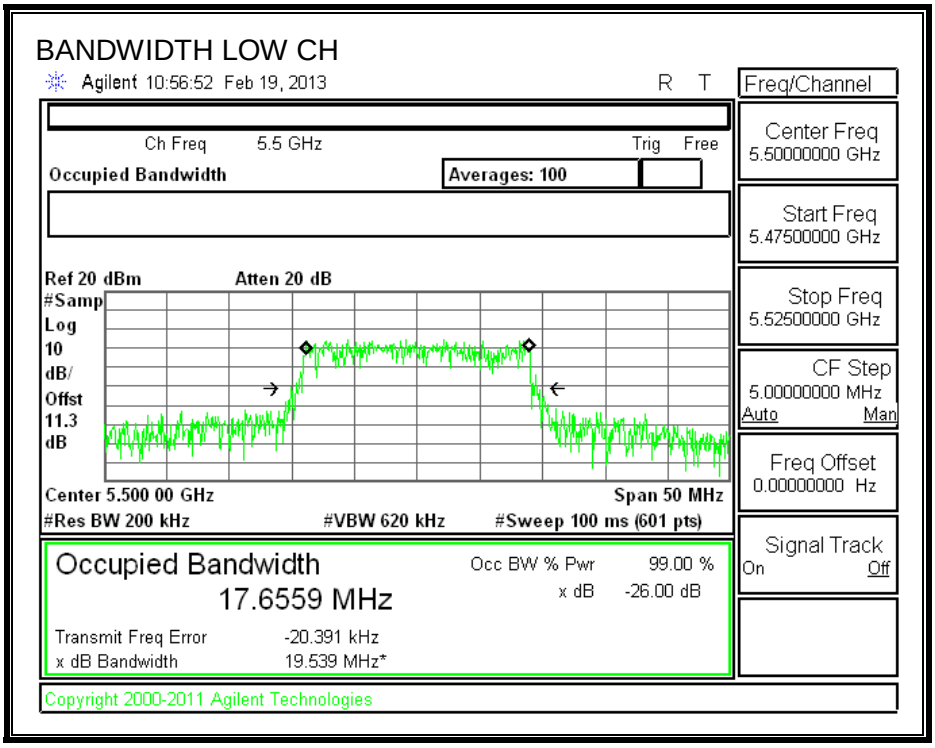
LIMITS

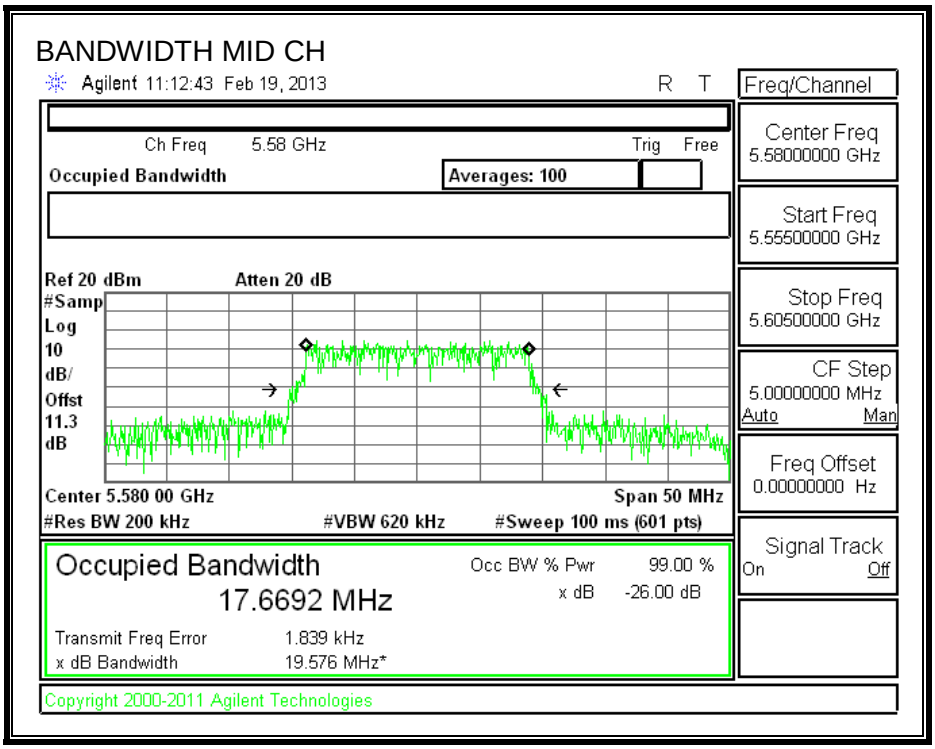
None; for reporting purposes only.

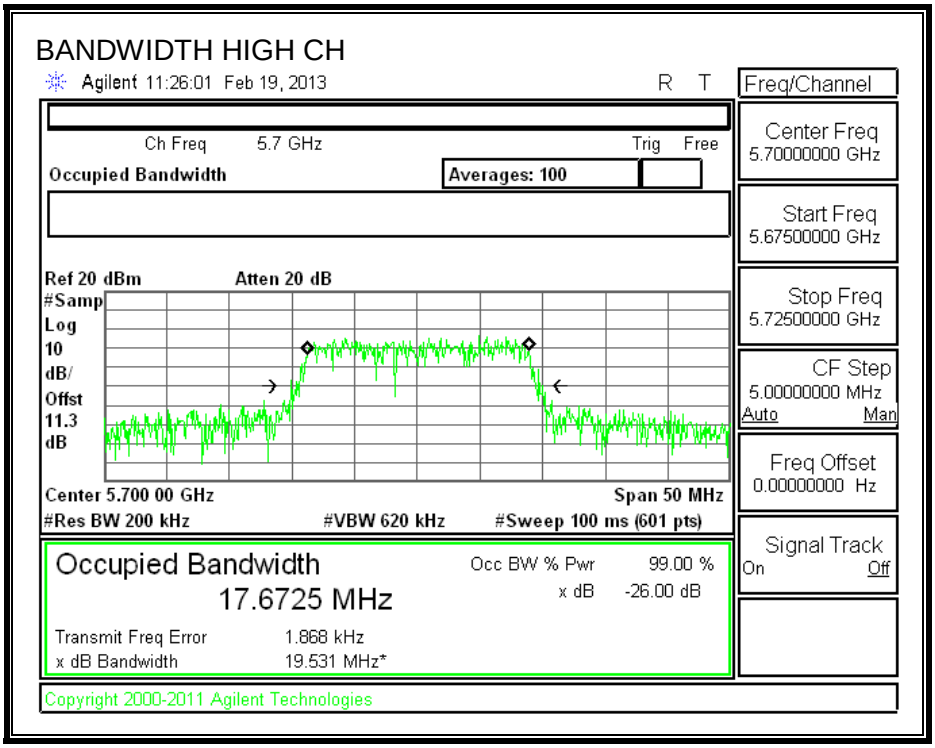
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5500	17.7
Mid	5580	17.7
High	5700	17.7

99% BANDWIDTH







10.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5500	8.42
Mid	5580	8.61
High	5700	9.76

10.4.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.5–5.7 GHz, 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. In addition, 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 maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5500	20.5	17.7	3.14
Mid	5580	20.5	17.7	3.14
High	5700	20.5	17.7	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5500	24.00	23.47	29.47	23.47	11.00	11.00	11.00
Mid	5580	24.00	23.47	29.47	23.47	11.00	11.00	11.00
High	5700	24.00	23.47	29.47	23.47	11.00	11.00	11.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

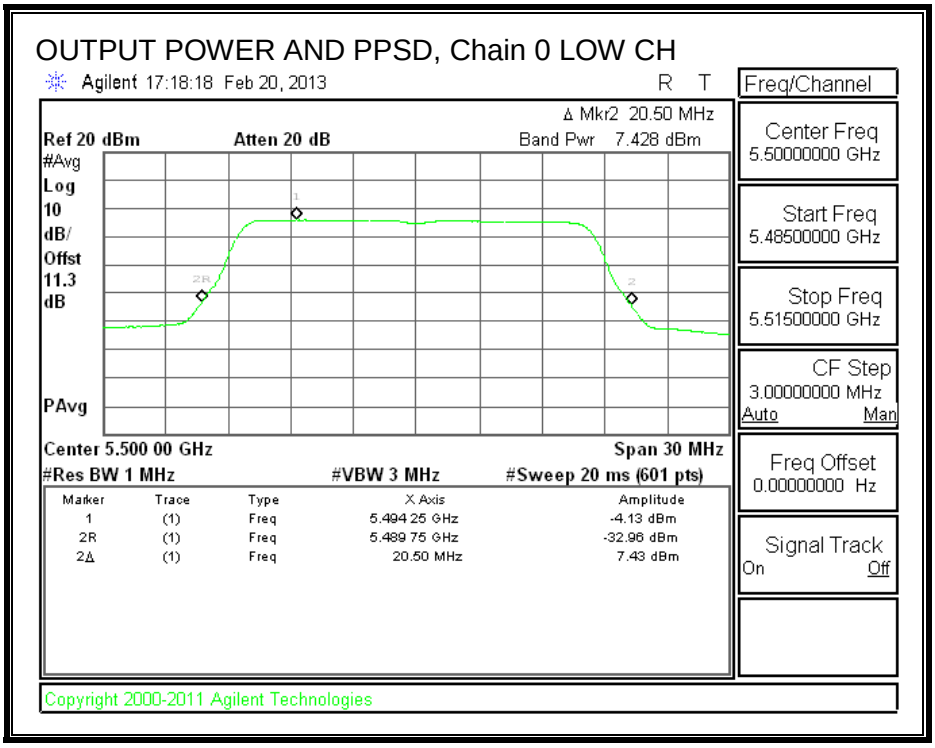
Output Power Results

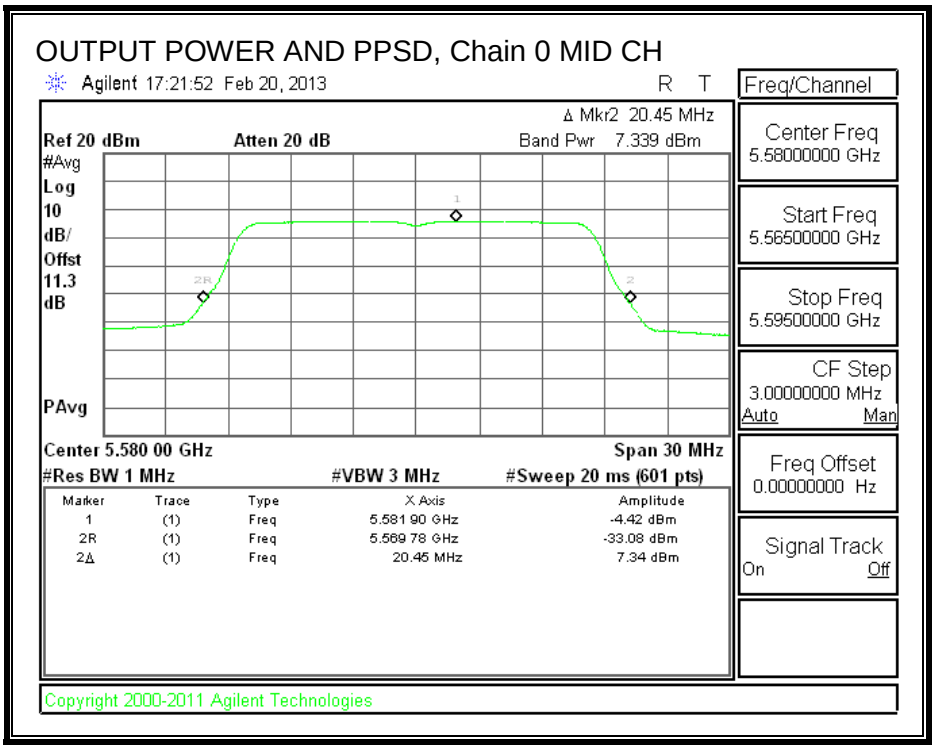
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	7.43	7.43	23.47	-16.04
Mid	5580	7.34	7.34	23.47	-16.13
High	5700	8.30	8.30	23.47	-15.17

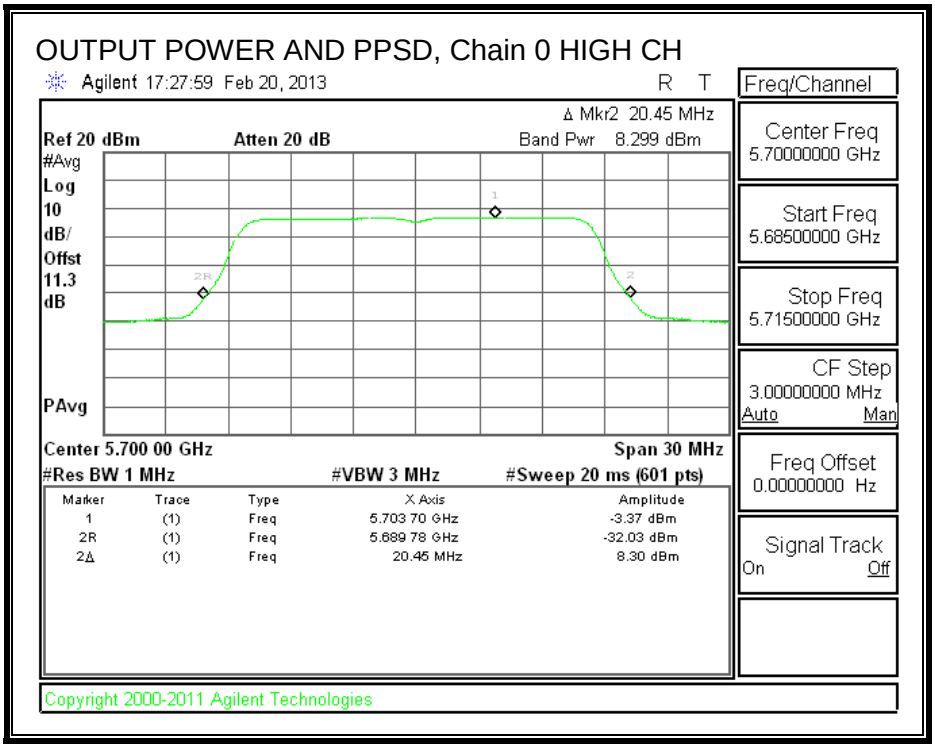
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	-4.13	-4.13	11.00	-15.13
Mid	5580	-4.42	-4.42	11.00	-15.42
High	5700	-3.37	-3.37	11.00	-14.37

OUTPUT POWER AND PPSD, Chain 0







10.4.5. 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.

RESULTS

Refer to the results of 802.11n HT20 mode in the 5.2 GHz band.

11. RADIATED TEST RESULTS

11.1. 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.

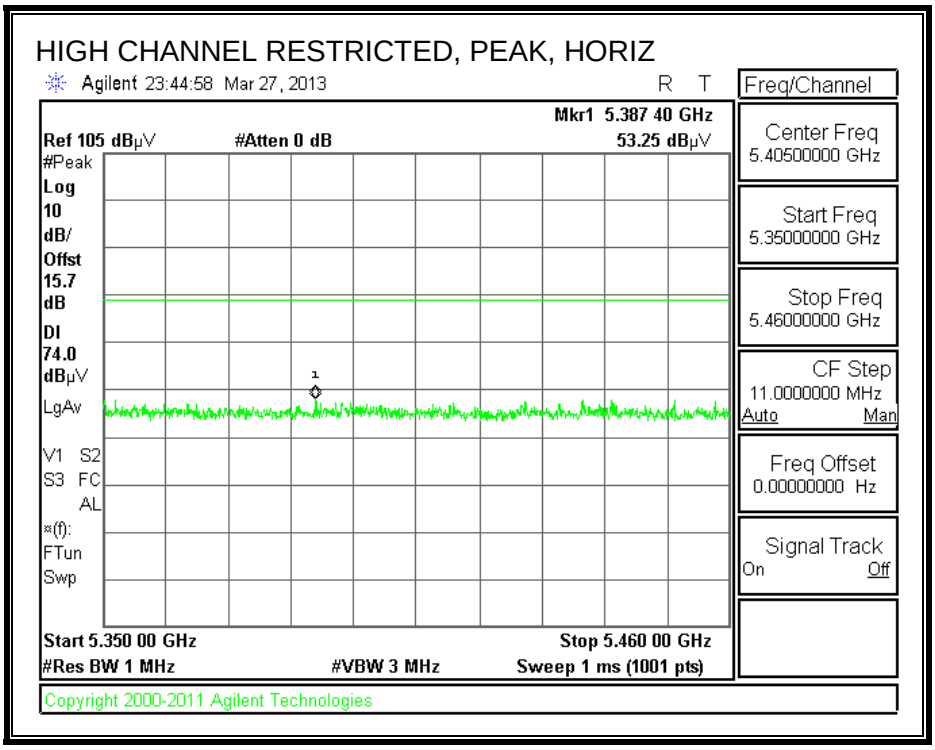
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

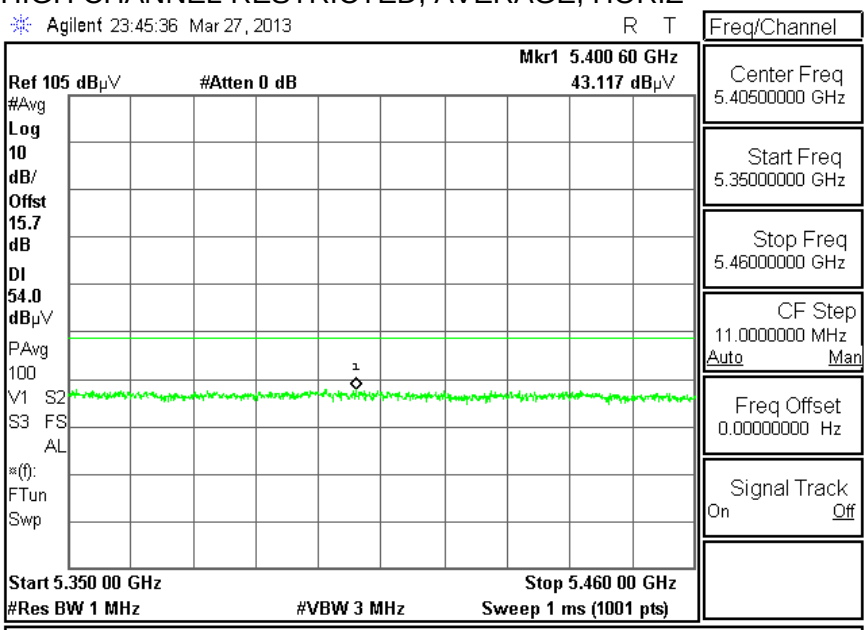
11.2. TRANSMITTER ABOVE 1 GHz

11.2.1. TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND

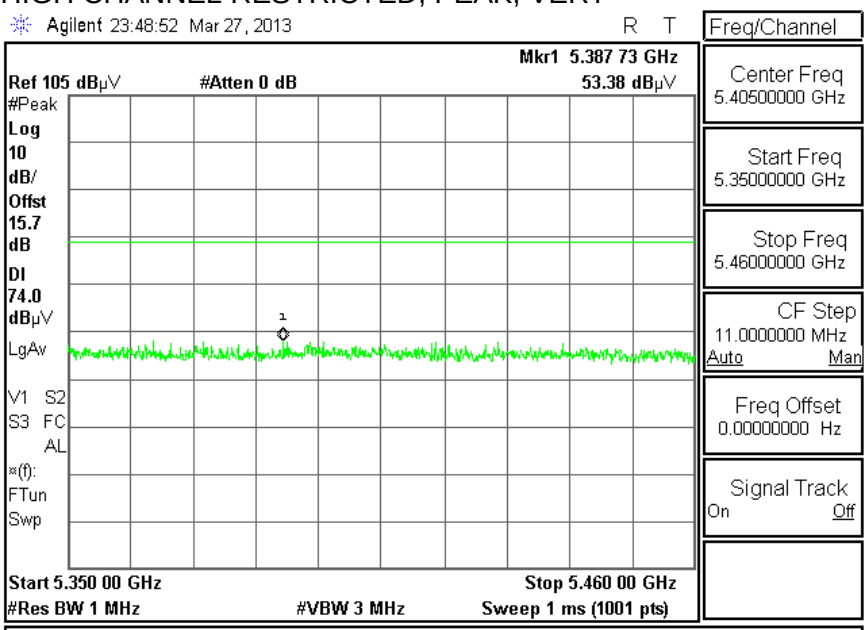
RESTRICTED BANDEDGE (HIGH CHANNEL)

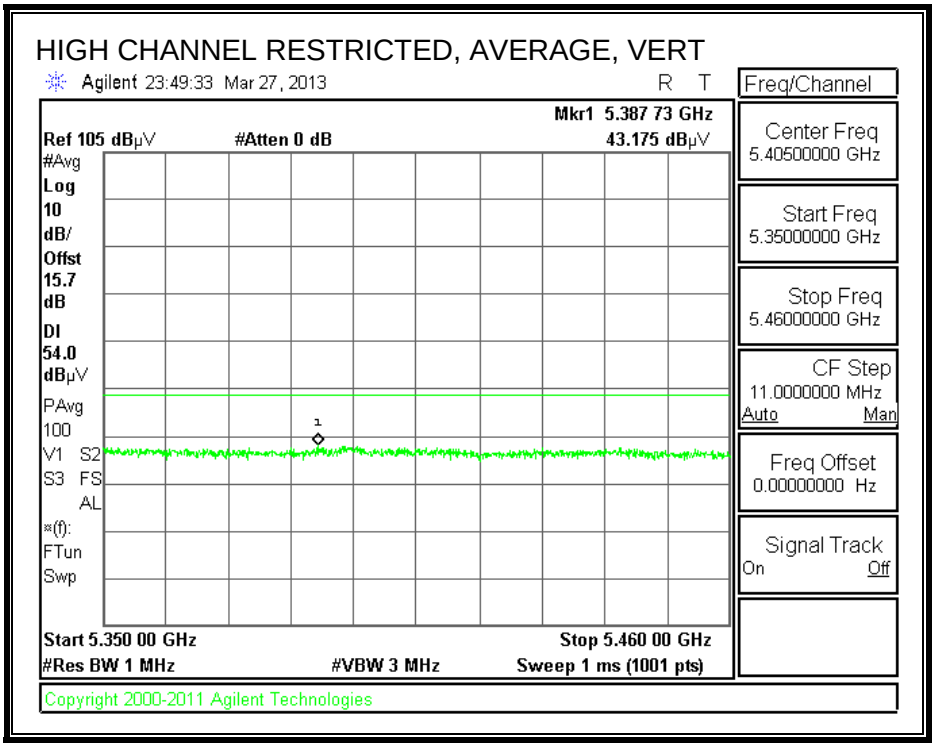


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



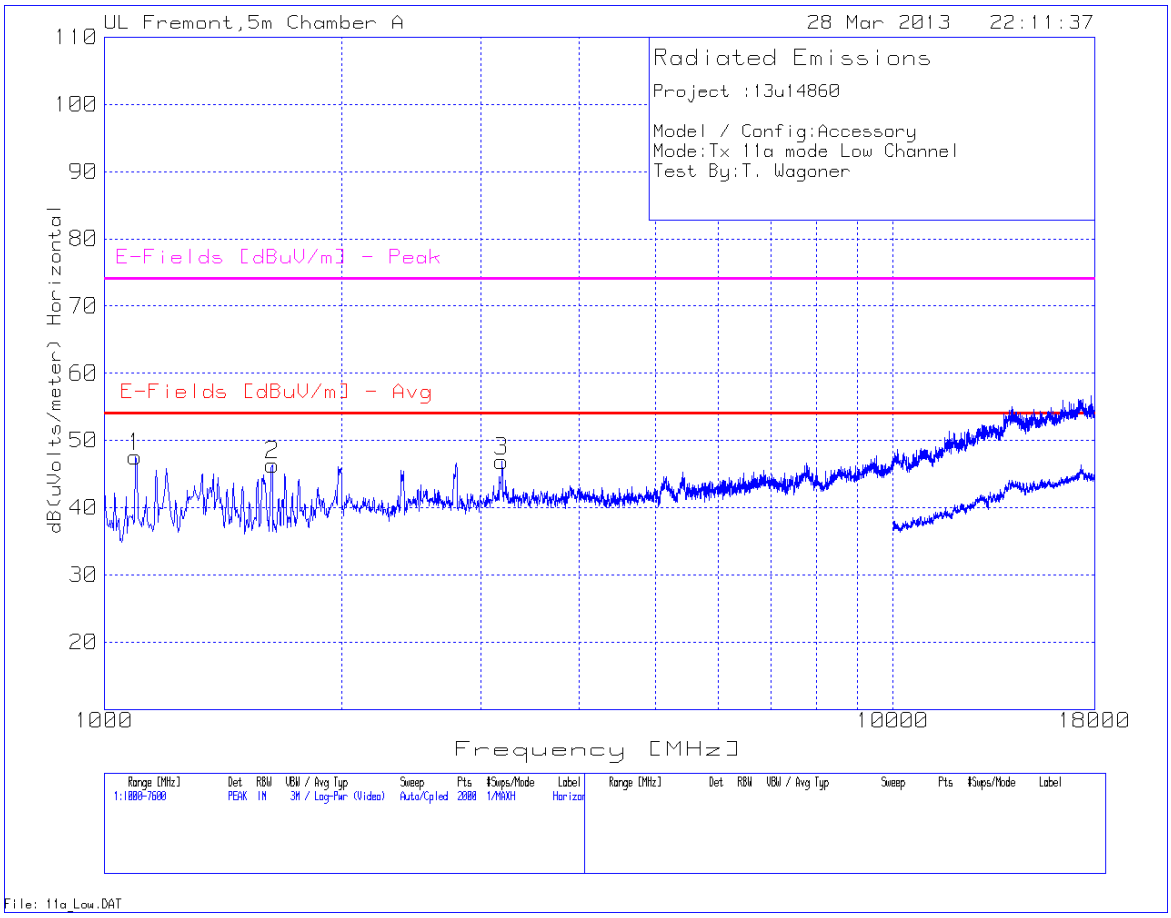
HIGH CHANNEL RESTRICTED, PEAK, VERT



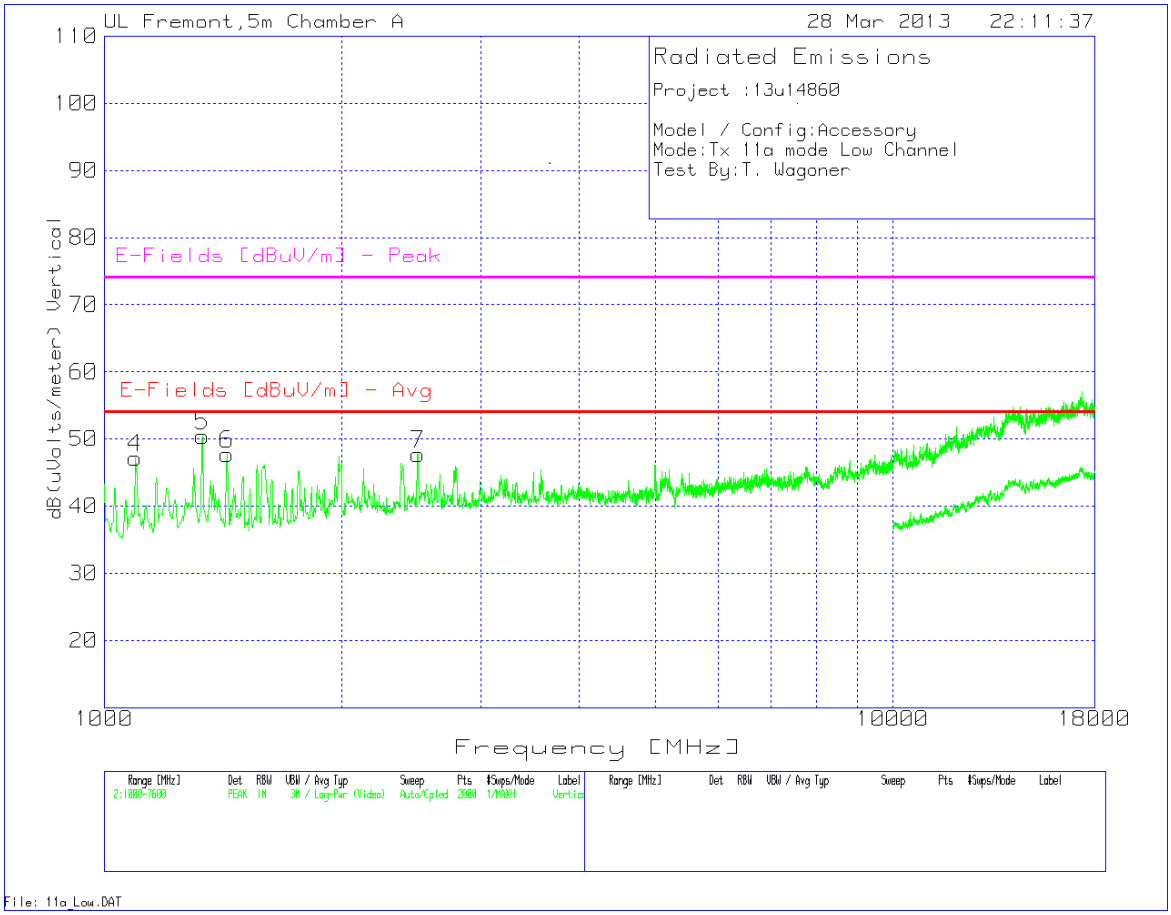


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



Low Channel, Vertical



Low Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11a mode Low Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1095.652	55.32	PK	27.9	-38.7	3.1	0	47.62	53.97	-6.35	74	-26.38	200	Horz
2	1633.283	51.64	PK	28.7	-37.6	3.6	0	46.34	53.97	-7.63	74	-27.66	100	Horz
3	3193.403	44.82	PK	33.5	-36.6	5.2	0	46.92	53.97	-7.05	74	-27.08	200	Horz
4	1095.652	54.88	PK	27.9	-38.7	3.1	0	47.18	53.97	-6.79	74	-26.82	200	Vert
5	1333.133	55.15	PK	30.1	-38.1	3.3	0	50.45	53.97	-3.52	74	-23.55	100	Vert
6	1432.084	52.76	PK	29.5	-37.9	3.4	0	47.76	53.97	-6.21	74	-26.24	100	Vert
7	2497.451	47.33	PK	32.6	-36.8	4.5	0.1	47.73	53.97	-6.24	74	-26.27	100	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.31	38.95	AD1	30.1	-38.1	3.3	0	34.25	53.97	-19.72	74	-39.75	0	234	Vert

PK - Peak detector

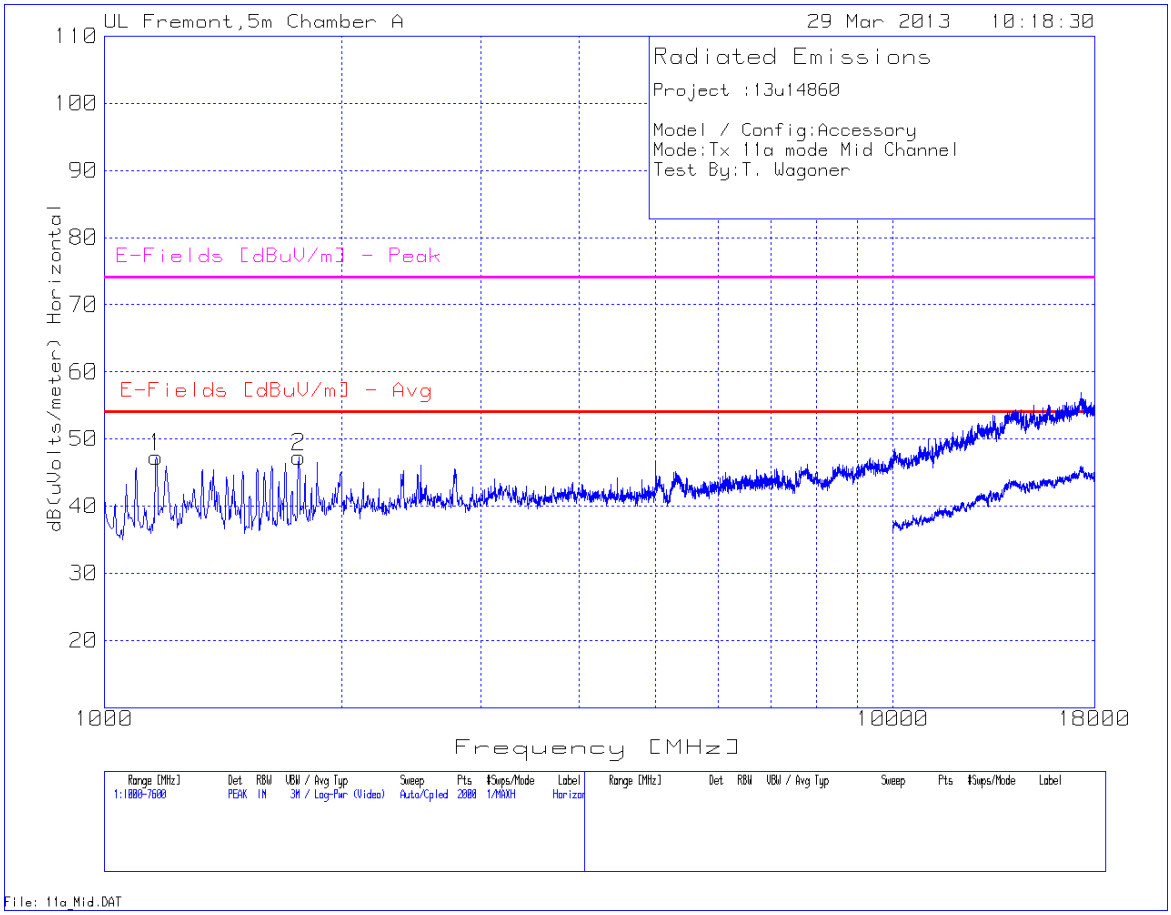
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

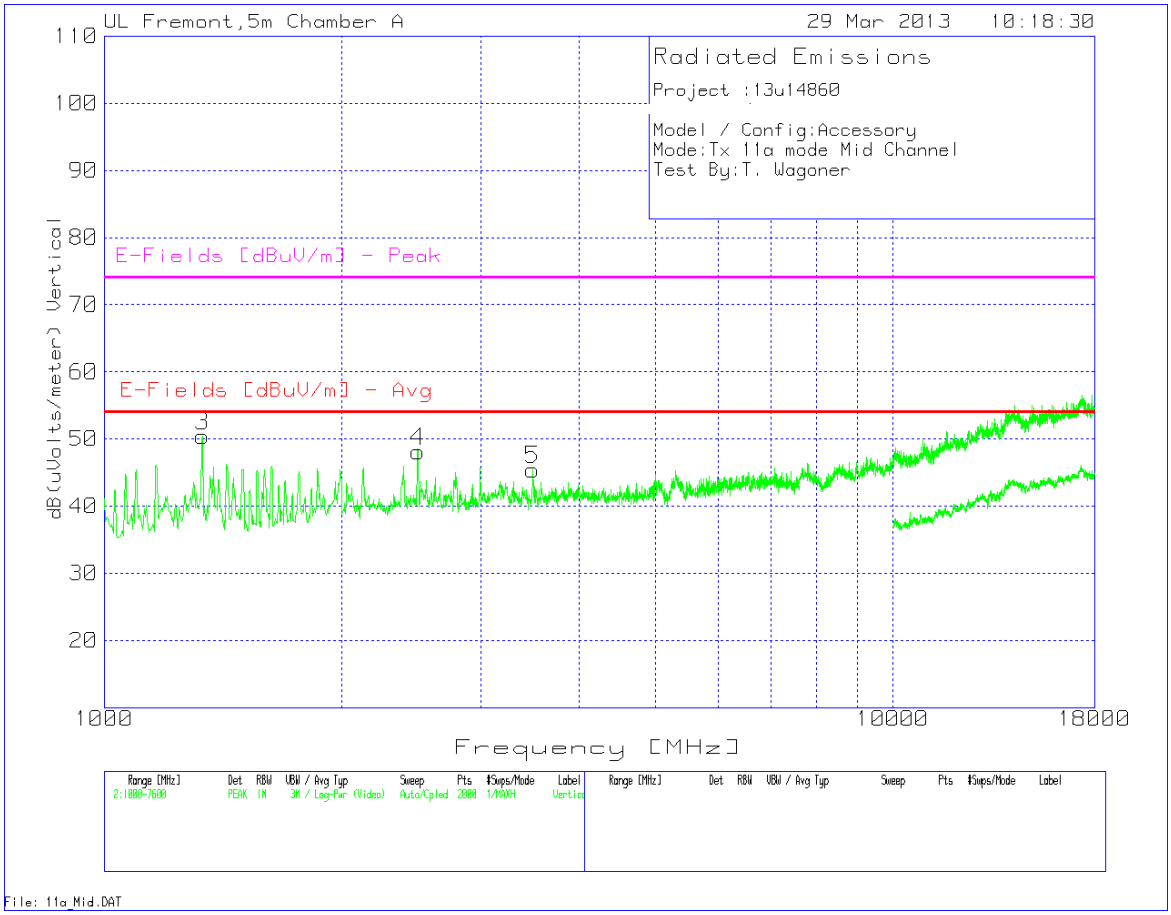
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11a mode Mid Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	53.7	PK	28.9	-38.5	3.2	0	47.3	53.97	-6.67	74	-26.7	100	Horz
2	1765.217	50.86	PK	30.1	-37.4	3.8	0	47.36	53.97	-6.61	74	-26.64	200	Horz
3	1333.133	55.11	PK	30.1	-38.1	3.3	0	50.41	53.97	-3.56	74	-23.59	100	Vert
4	2497.451	47.71	PK	32.6	-36.8	4.5	0.1	48.11	53.97	-5.86	74	-25.89	100	Vert
5	3496.852	43.01	PK	33.1	-36.3	5.6	0	45.41	53.97	-8.56	74	-28.59	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.63	39.62	AD1	30.1	-38.1	3.3	0	34.92	53.97	-19.05	74	-39.08	317	223	Vert
1331.29	41.81	AD1	30.1	-38.1	3.3	0	37.11	53.97	-16.86	74	-36.89	95	203	Vert

PK - Peak detector

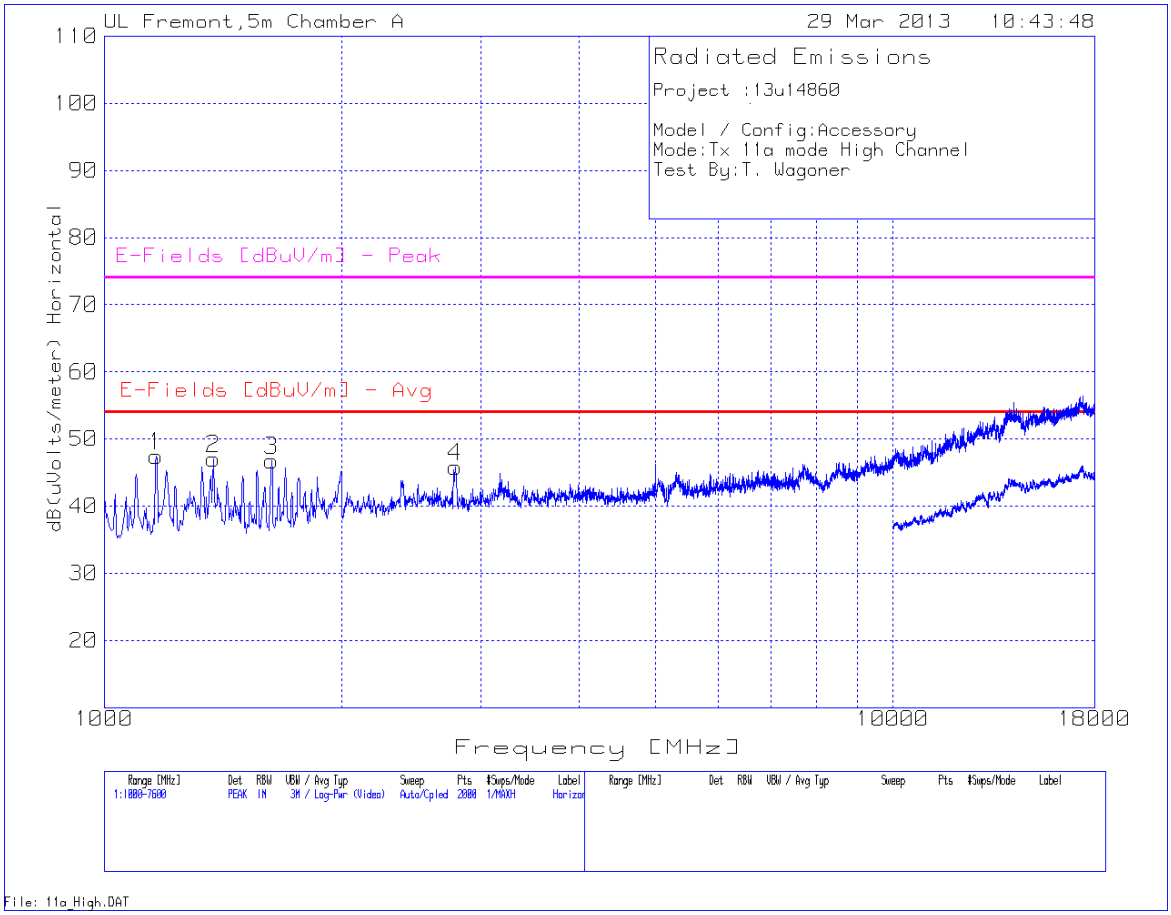
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

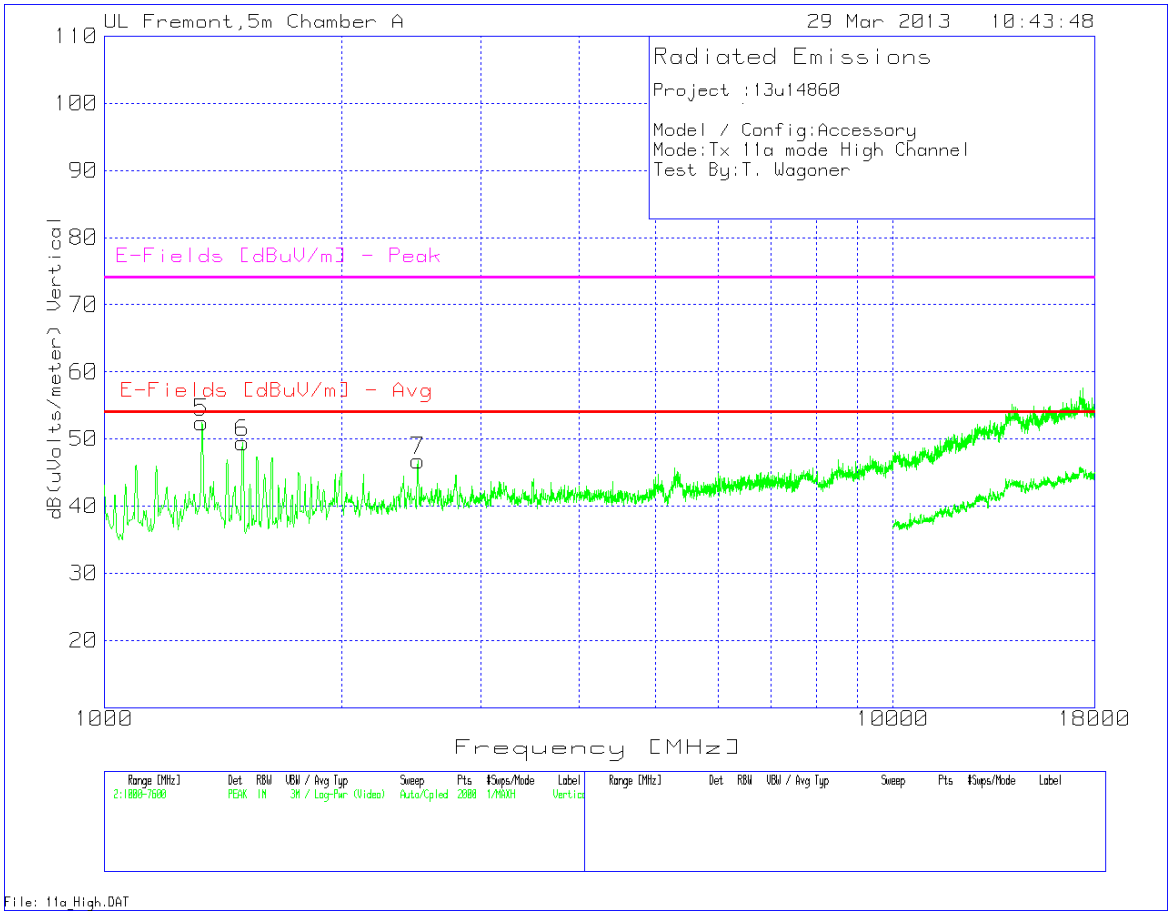
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11a mode High Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	53.83	PK	28.9	-38.5	3.2	0	47.43	53.97	-6.54	74	-26.57	100	Horz
2	1376.012	51.72	PK	29.9	-38	3.4	0	47.02	53.97	-6.95	74	-26.98	100	Horz
3	1629.985	52.12	PK	28.6	-37.6	3.6	0	46.72	53.97	-7.25	74	-27.28	100	Horz
4	2787.706	45.06	PK	32.6	-36.7	4.8	0.1	45.86	53.97	-8.11	74	-28.14	200	Horz
5	1329.835	57.11	PK	30.2	-38.1	3.3	0	52.51	53.97	-1.46	74	-21.49	100	Vert
6	1498.051	54.82	PK	28.9	-37.8	3.5	0	49.42	53.97	-4.55	74	-24.58	100	Vert
7	2497.451	46.36	PK	32.6	-36.8	4.5	0.1	46.76	53.97	-7.21	74	-27.24	100	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.7	40.93	AD1	30.1	-38.1	3.3	0	36.23	53.97	-17.74	74	-37.77	92	227	Vert
1498.35	45.35	AD1	28.9	-37.8	3.5	0	39.95	53.97	-14.02	74	-34.05	217	149	Vert
PK - Peak detector														
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average														

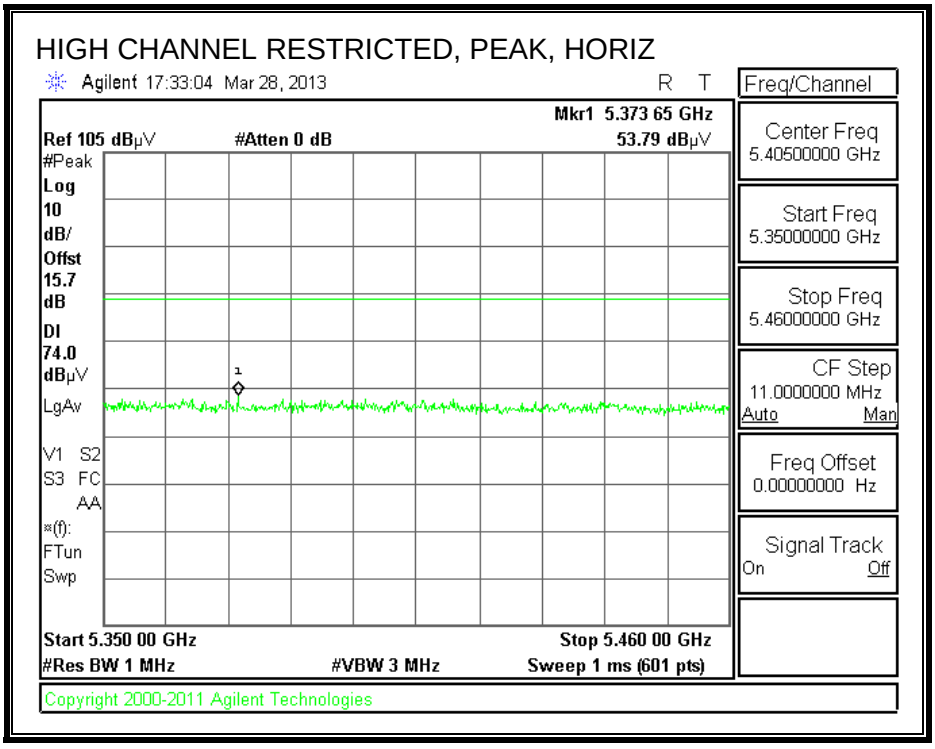
Notes:

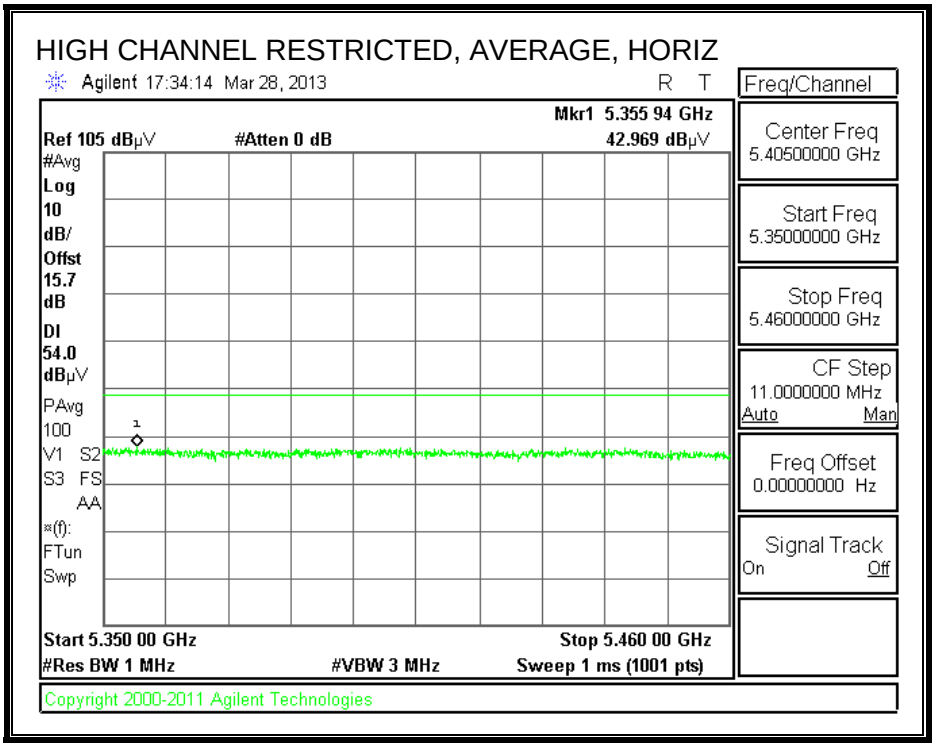
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

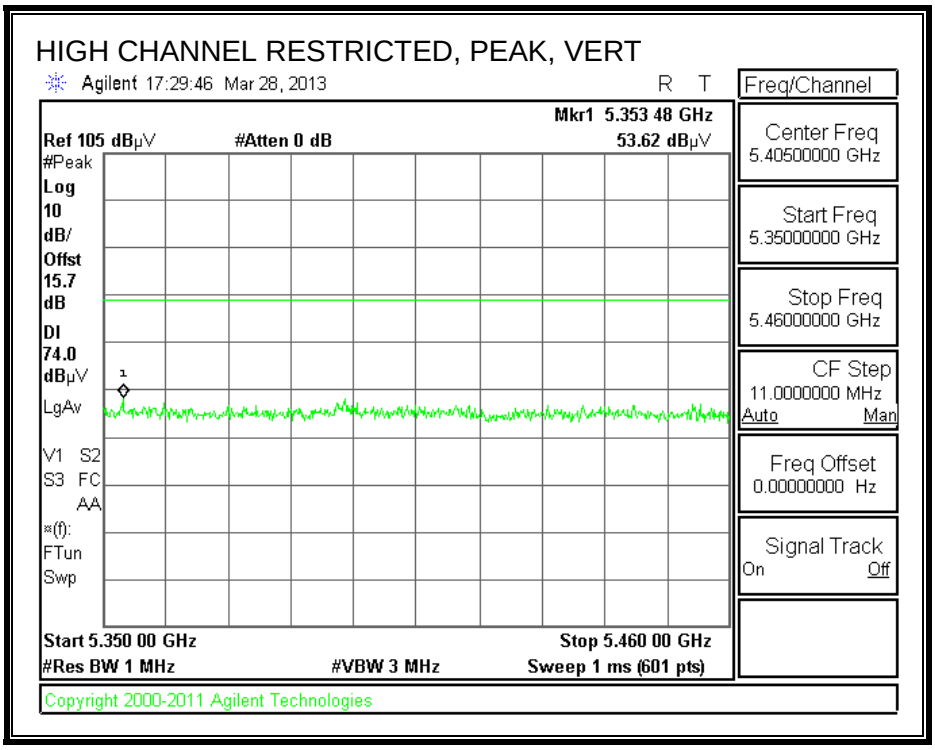
11.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL)

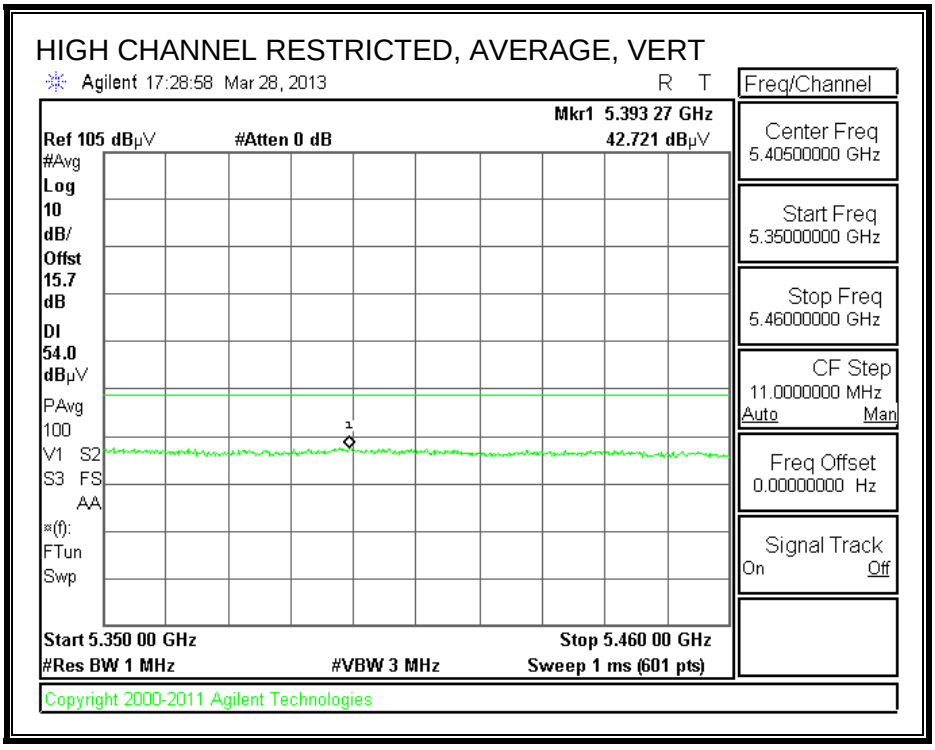




HIGH CHANNEL RESTRICTED, PEAK, VERT

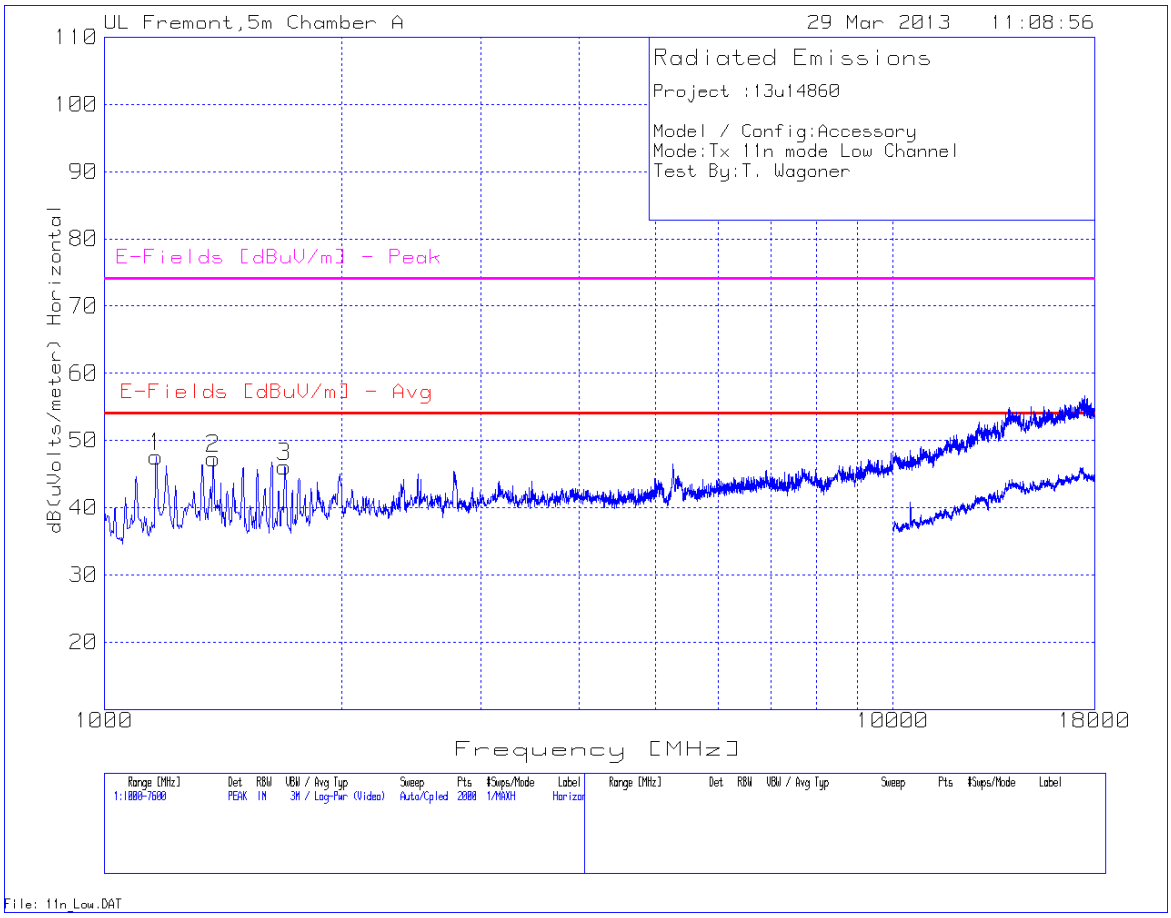


HIGH CHANNEL RESTRICTED, AVERAGE, VERT

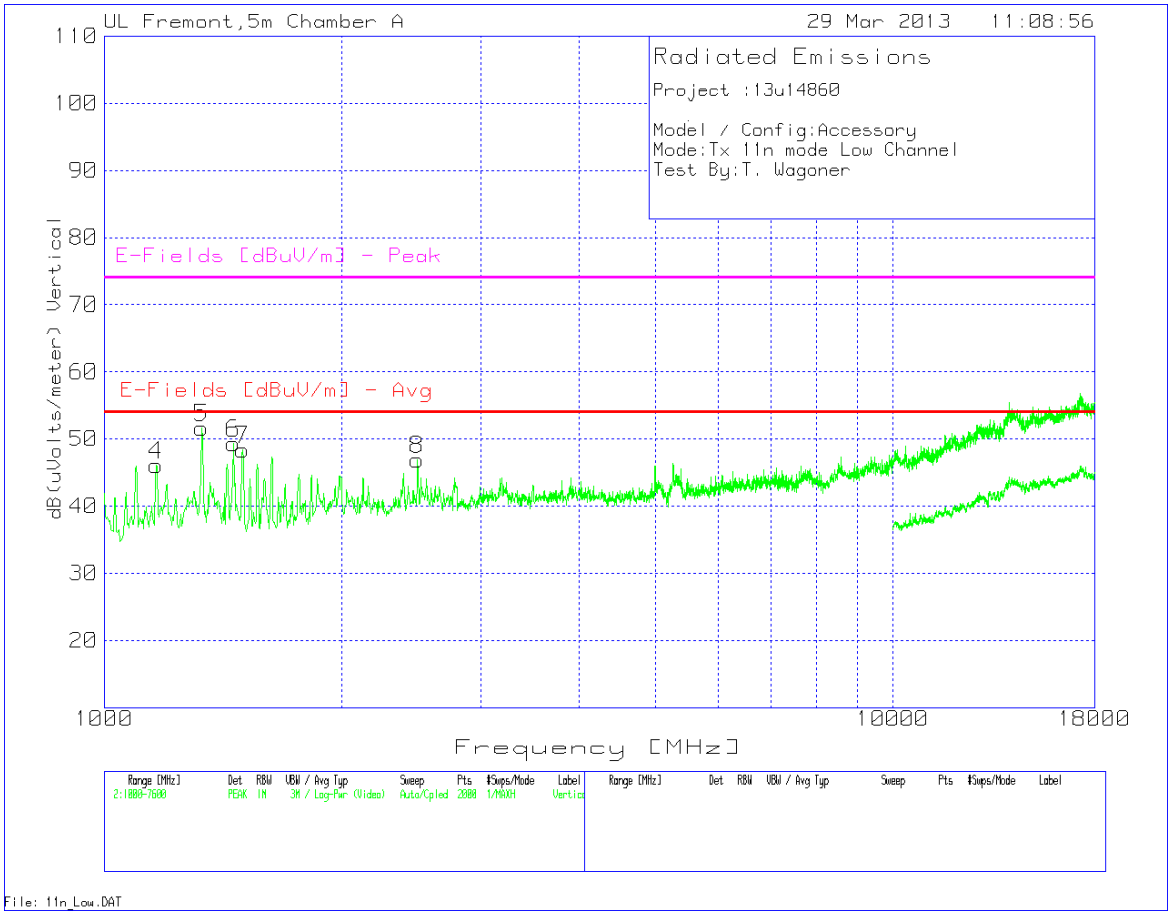


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



Low Channel, Vertical



Low Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11n mode Low Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	54.01	PK	28.9	-38.5	3.2	0	47.61	53.97	-6.36	74	-26.39	100	Horz
2	1376.012	52.07	PK	29.9	-38	3.4	0	47.37	53.97	-6.6	74	-26.63	100	Horz
3	1692.654	50.57	PK	29.3	-37.5	3.7	0	46.07	53.97	-7.9	74	-27.93	100	Horz
4	1164.918	52.45	PK	28.9	-38.5	3.2	0	46.05	53.97	-7.92	74	-27.95	100	Vert
5	1329.835	56.21	PK	30.2	-38.1	3.3	0	51.61	53.97	-2.36	74	-22.39	100	Vert
6	1458.471	54.35	PK	29.3	-37.8	3.5	0	49.35	53.97	-4.62	74	-24.65	100	Vert
7	1498.051	53.75	PK	28.9	-37.8	3.5	0	48.35	53.97	-5.62	74	-25.65	100	Vert
8	2494.153	46.53	PK	32.6	-36.8	4.5	0.1	46.93	53.97	-7.04	74	-27.07	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.44	45.08	AD1	30.1	-38.1	3.3	0	40.38	53.97	-13.59	74	-33.62	342	156	Vert
1457.41	36.64	AD1	29.3	-37.8	3.5	0	31.64	53.97	-22.33	74	-42.36	360	123	Vert

PK - Peak detector

QP - Quasi-Peak detector

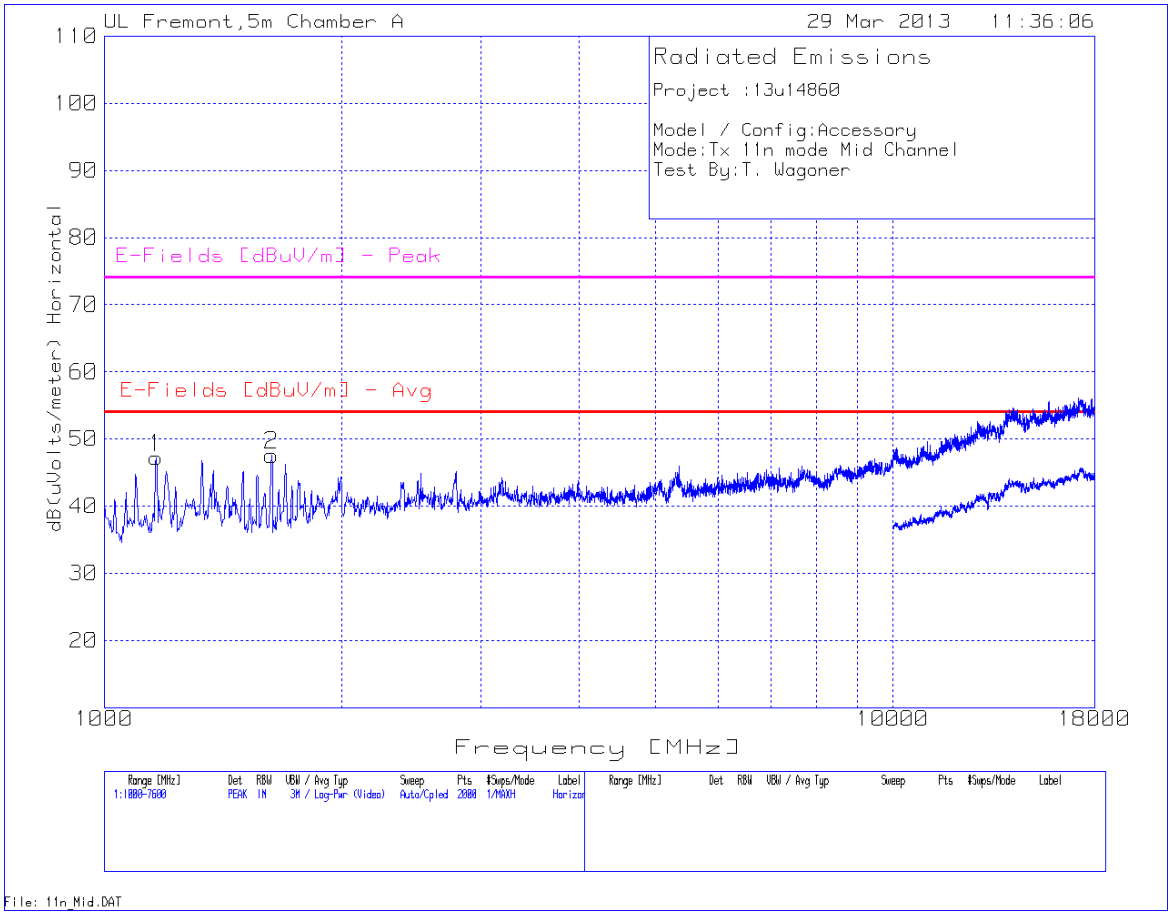
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

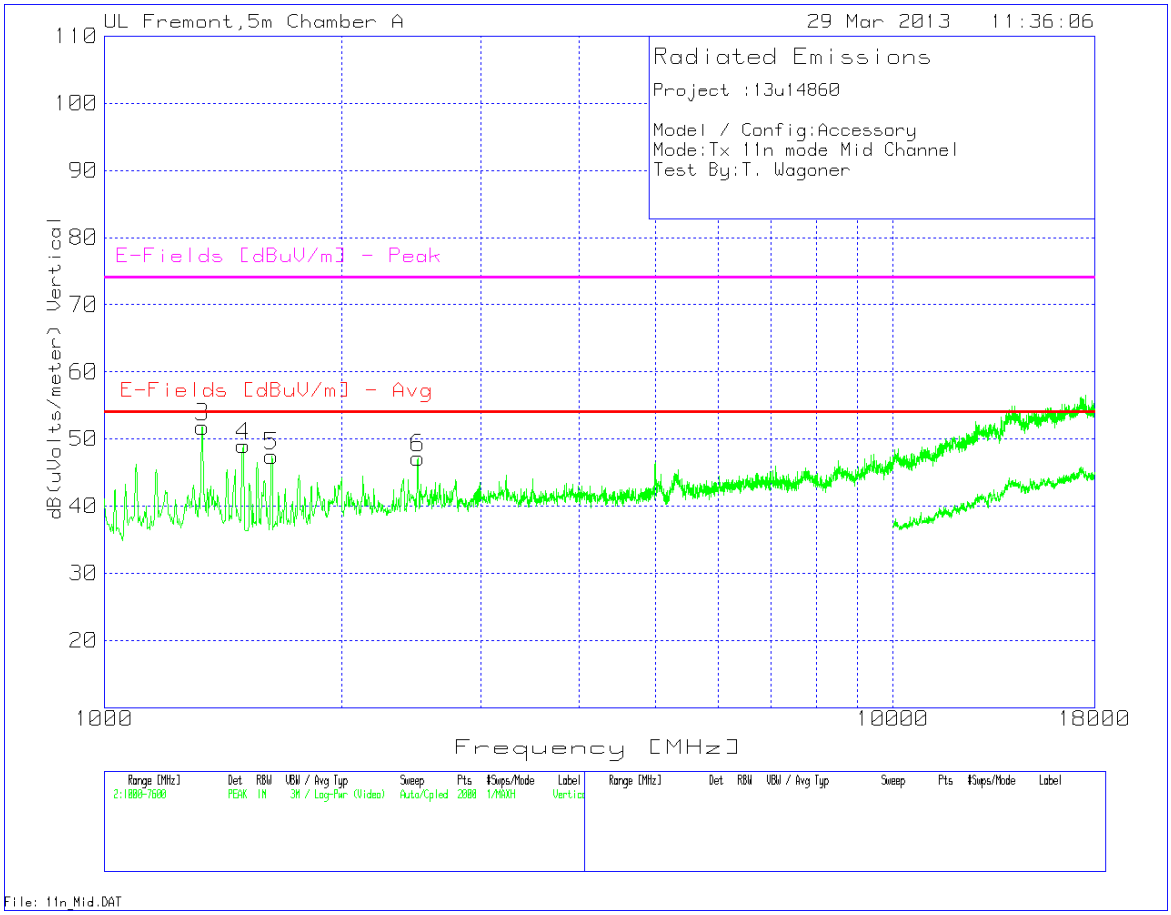
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11n mode Mid Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	53.65	PK	28.9	-38.5	3.2	0	47.25	53.97	-6.72	74	-26.75	100	Horz
2	1629.985	52.94	PK	28.6	-37.6	3.6	0	47.54	53.97	-6.43	74	-26.46	100	Horz
3	1333.133	56.54	PK	30.1	-38.1	3.3	0	51.84	53.97	-2.13	74	-22.16	100	Vert
4	1501.349	54.31	PK	28.9	-37.7	3.5	0	49.01	53.97	-4.96	74	-24.99	100	Vert
5	1629.985	52.87	PK	28.6	-37.6	3.6	0	47.47	53.97	-6.5	74	-26.53	100	Vert
6	2497.451	46.73	PK	32.6	-36.8	4.5	0.1	47.13	53.97	-6.84	74	-26.87	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.95	45.48	AD1	30.1	-38.1	3.3	0	40.78	53.97	-13.19	74	-33.22	249	107	Vert
1499.69	45.82	AD1	28.9	-37.8	3.5	0	40.42	53.97	-13.55	74	-33.58	201	129	Vert

PK - Peak detector

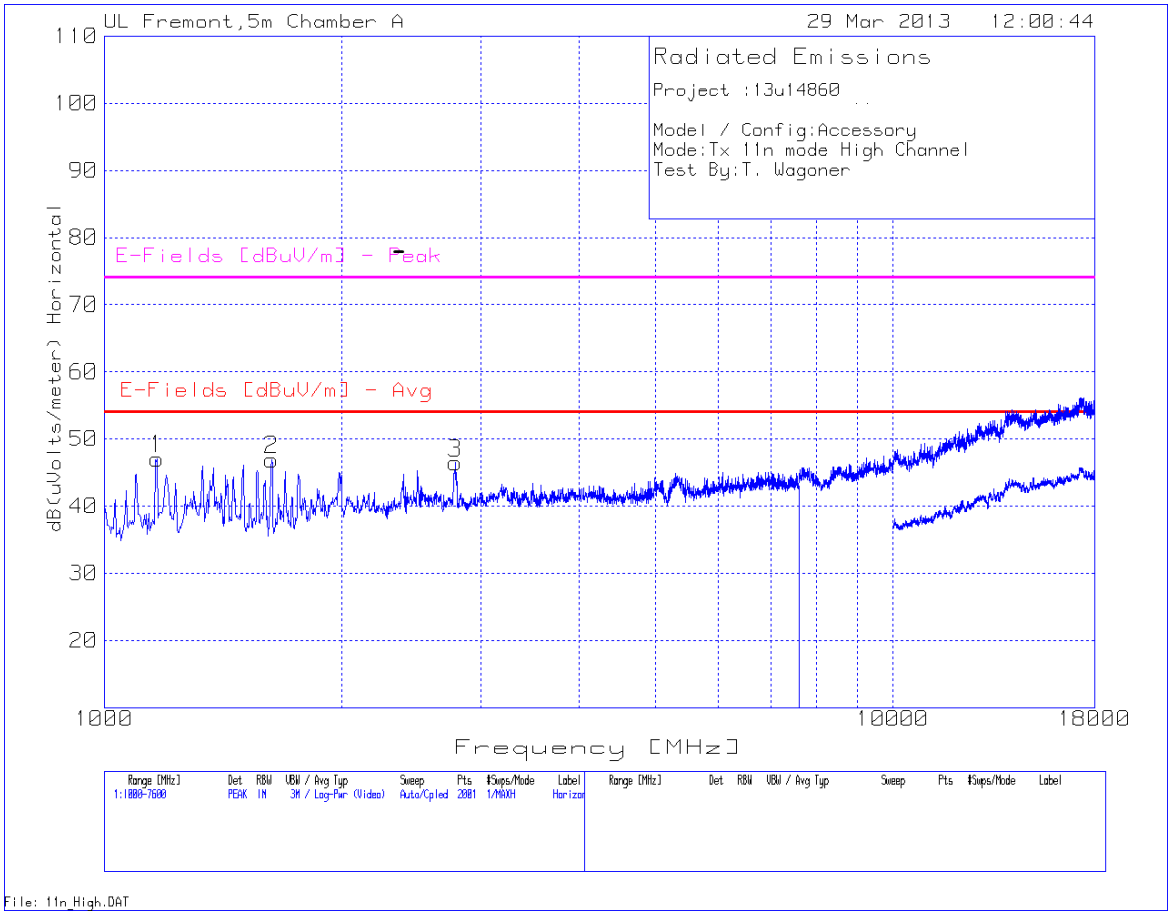
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

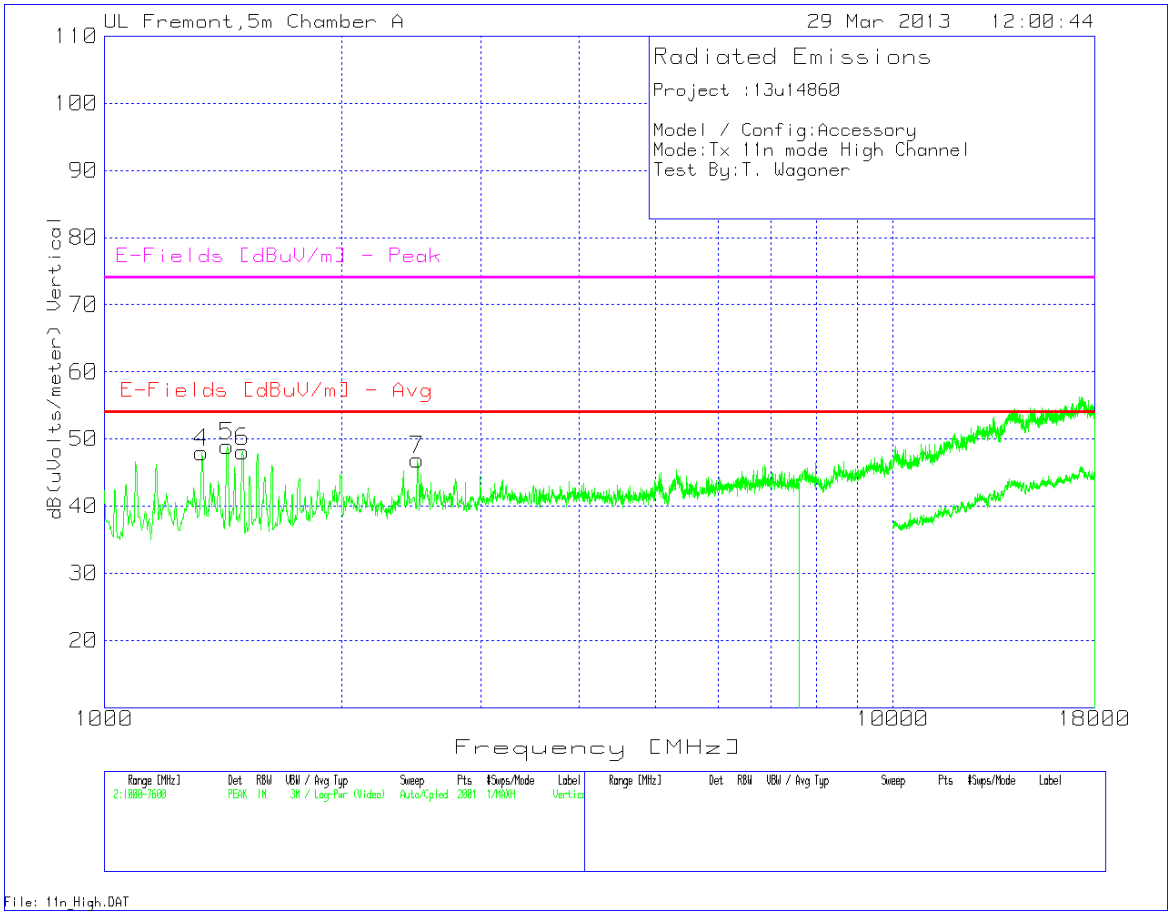
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860
Model / Config:	Accessory
Mode:	Tx 11n mode High Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1168.216	53.33	PK	29	-38.5	3.2	0	47.03	53.97	-6.94	74	-26.97	100	Horz
2	1629.985	52.36	PK	28.6	-37.6	3.6	0	46.96	53.97	-7.01	74	-27.04	100	Horz
3	2791.004	45.64	PK	32.6	-36.7	4.8	0.1	46.44	53.97	-7.53	74	-27.56	200	Horz
4	1329.835	52.54	PK	30.2	-38.1	3.3	0	47.94	53.97	-6.03	74	-26.06	100	Vert
5	1432.084	53.93	PK	29.5	-37.9	3.4	0	48.93	53.97	-5.04	74	-25.07	100	Vert
6	1498.051	53.59	PK	28.9	-37.8	3.5	0	48.19	53.97	-5.78	74	-25.81	100	Vert
7	2490.855	46.49	PK	32.6	-36.8	4.5	0.1	46.89	53.97	-7.08	74	-27.11	100	Vert

PK - Peak detector

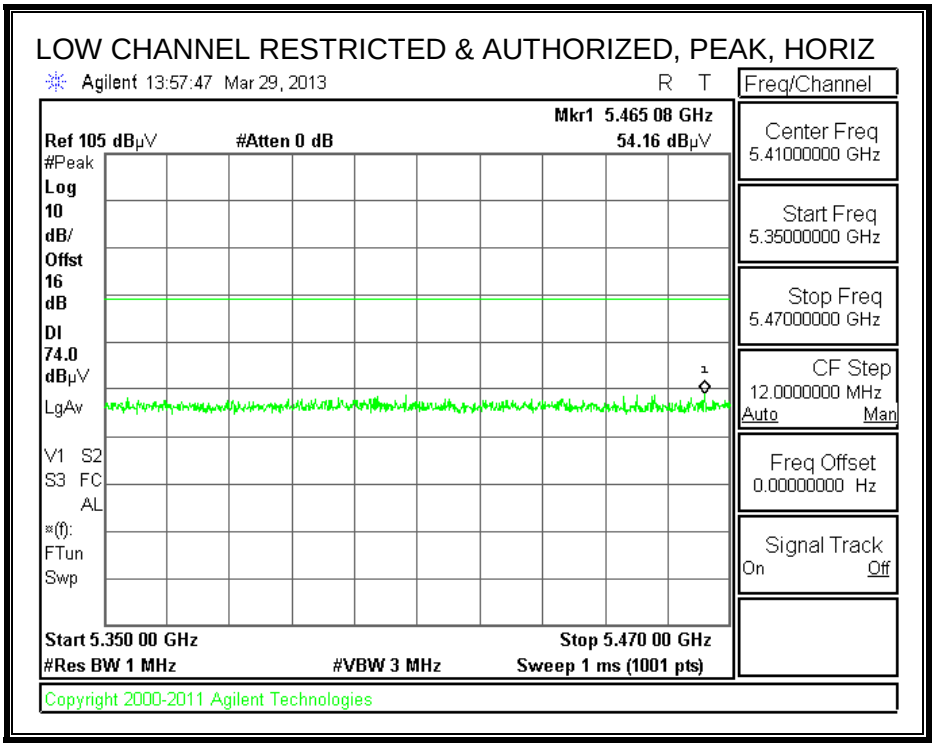
Notes:

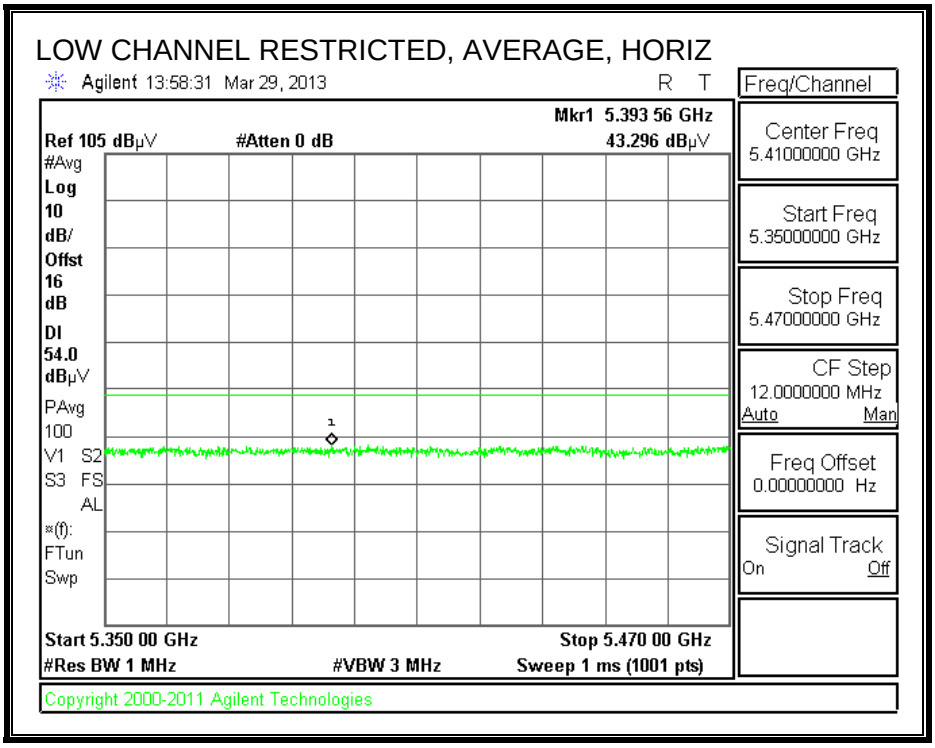
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

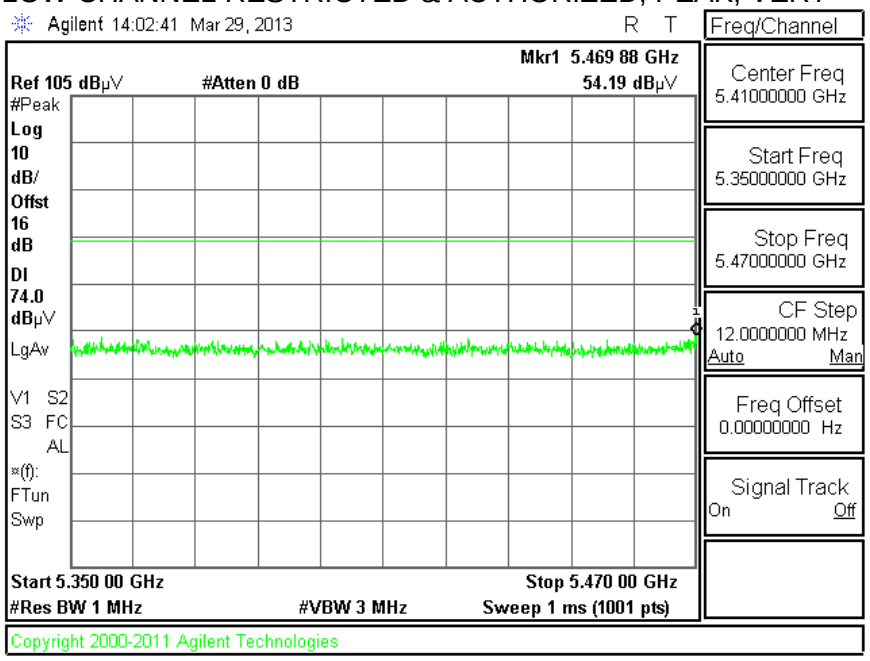
11.2.3. TX ABOVE 1 GHz 802.11a MODE IN THE 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

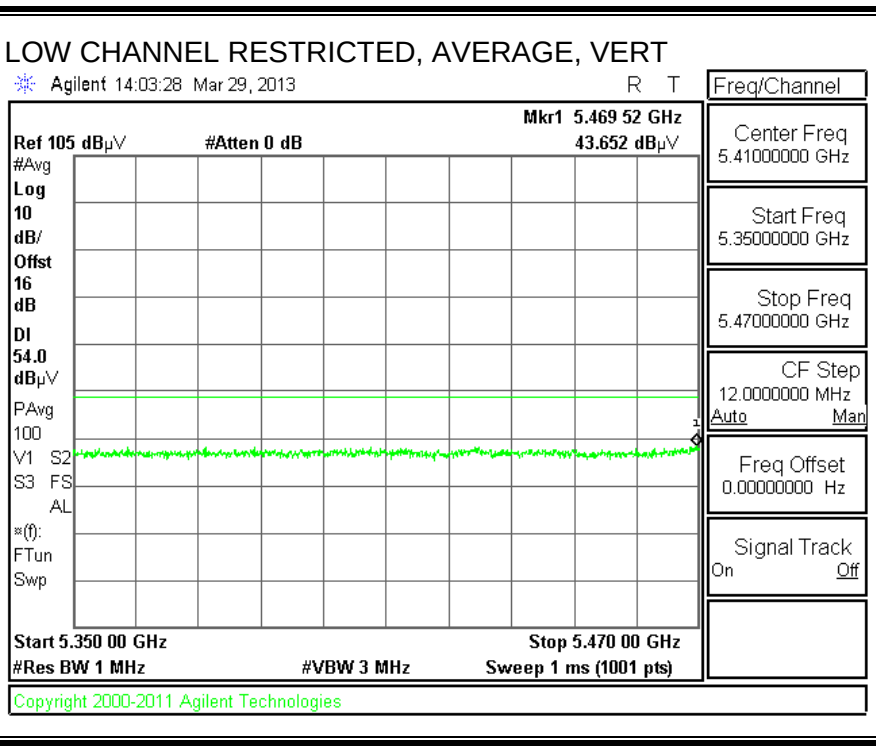




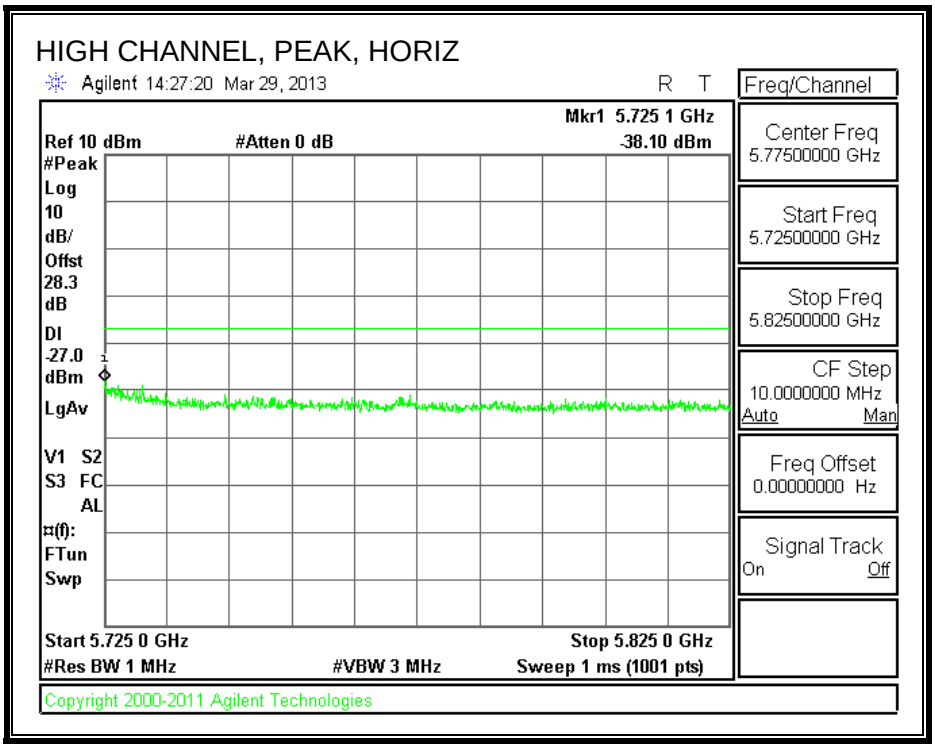
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT

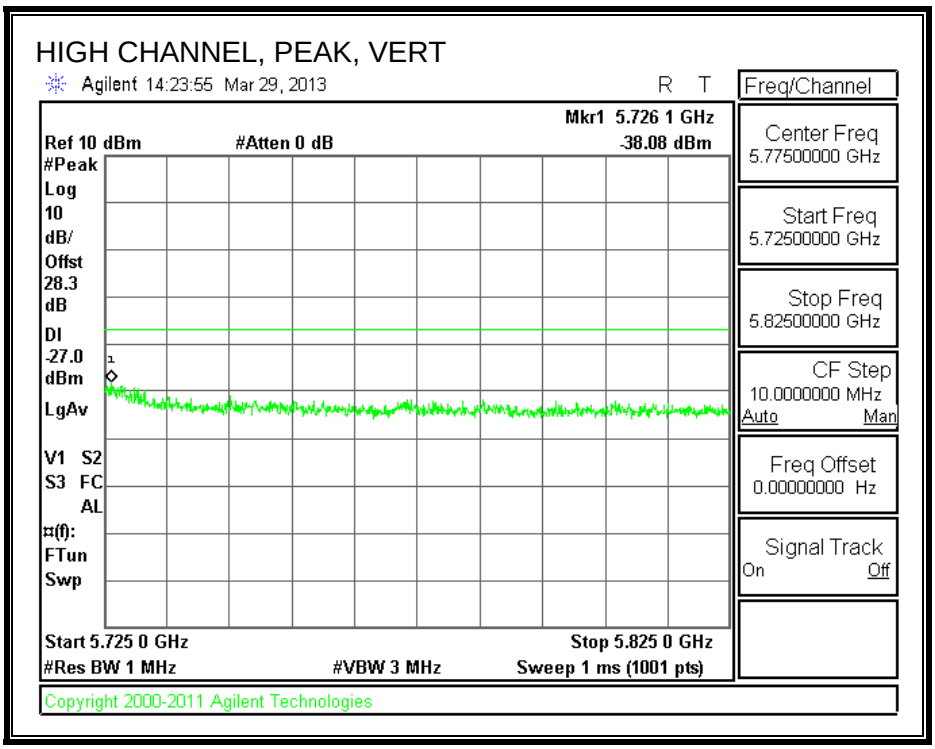


LOW CHANNEL RESTRICTED, AVERAGE, VERT



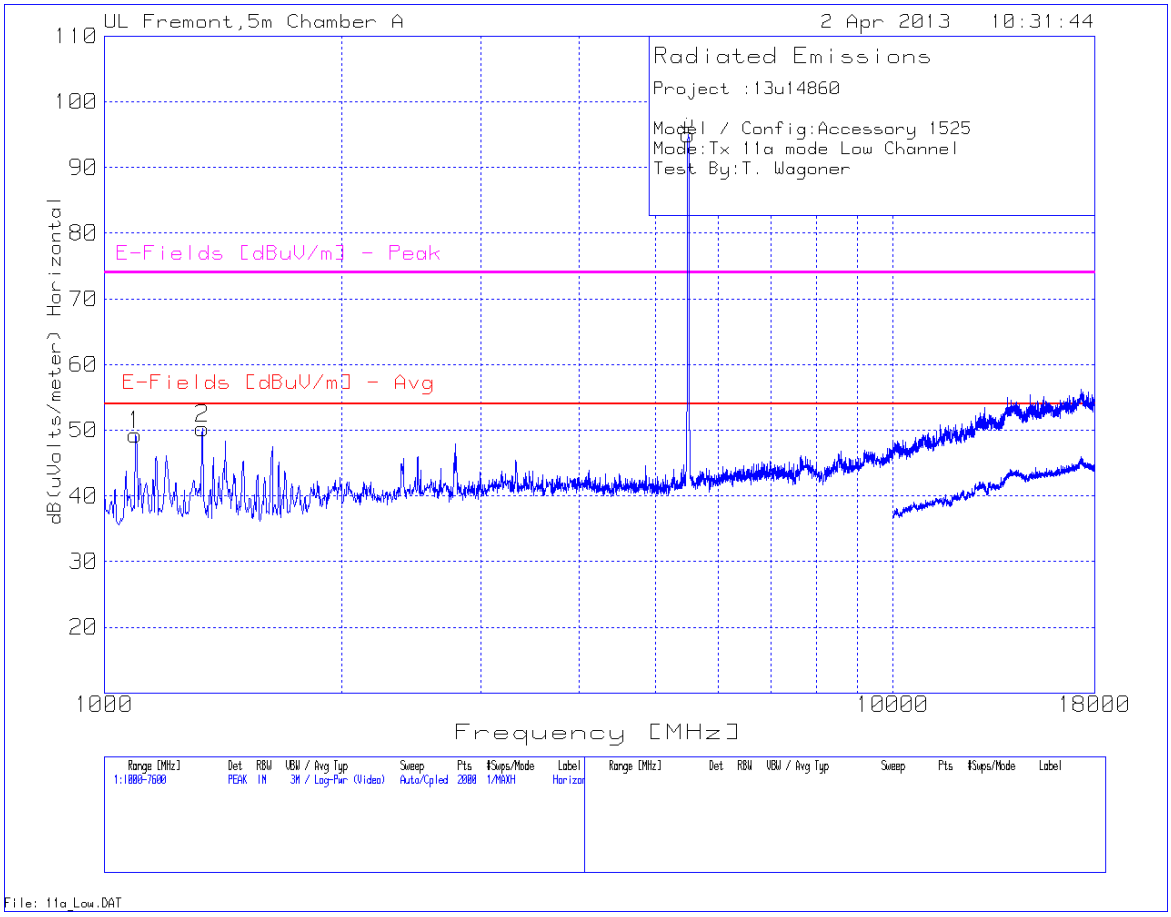
AUTHORIZED BANDEDGE (HIGH CHANNEL)



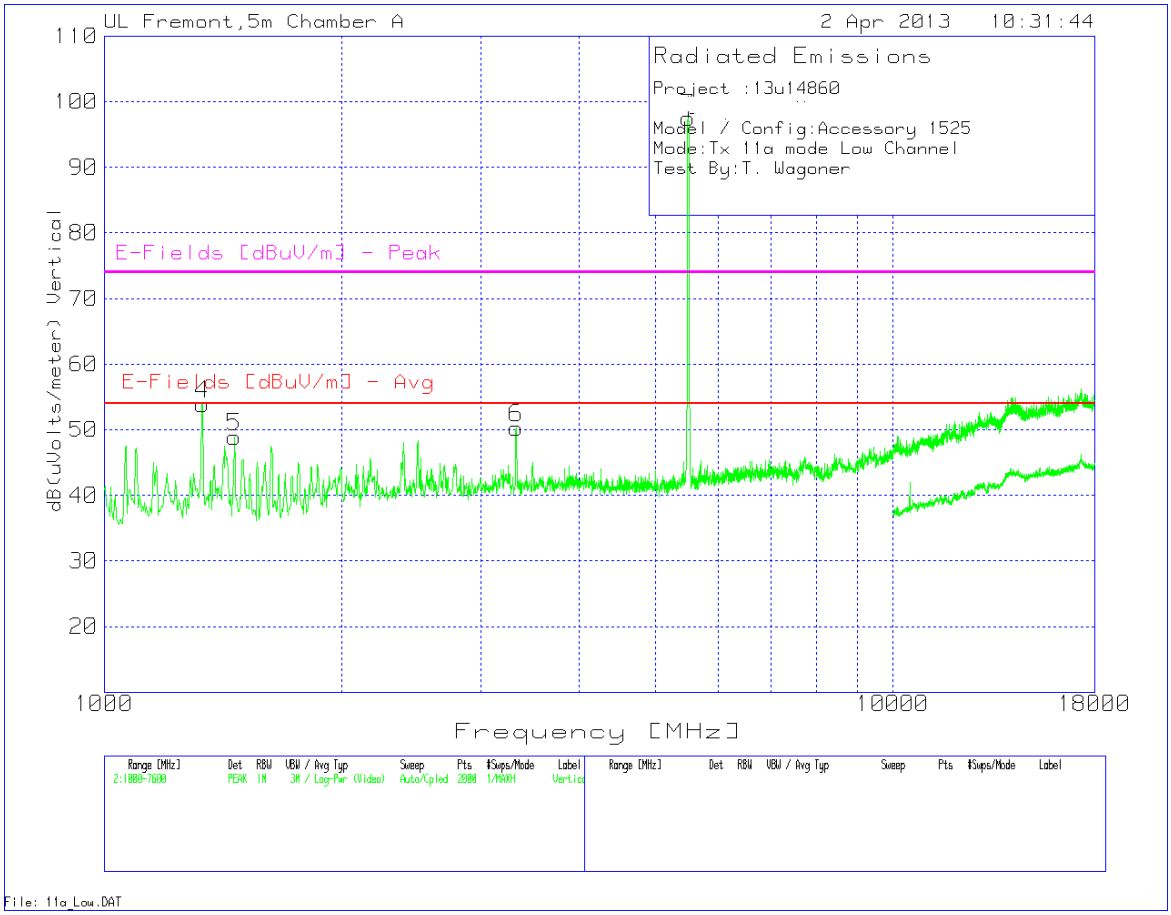


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



Low Channel, Vertical



Low Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11a mode Low Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 228075002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1095.652	56.95	PK	27.9	-38.7	0.3	0.7	2.2	49.35	53.97	-4.62	74	-24.65	100	Horz
2	1333.133	54.8	PK	30.1	-38.1	0.3	0.8	2.4	50.3	53.97	-3.67	74	-23.7	100	Horz
3*	5505.547	88.73	PK	34.4	-35.5	0.7	1.8	4.9	95.03	53.97	41.06	74	21.03	100	Horz
4	1333.133	58.42	PK	30.1	-38.1	0.3	0.8	2.4	53.92	53.97	-0.05	74	-20.08	100	Vert
5	1461.769	53.75	PK	29.2	-37.8	0.4	0.9	2.5	48.95	53.97	-5.02	74	-25.05	100	Vert
6	3328.636	47.98	PK	32.9	-36.5	0.6	1.4	3.9	50.28	53.97	-3.69	74	-23.72	100	Vert
7*	5505.547	91.22	PK	34.4	-35.5	0.7	1.8	4.9	97.52	53.97	43.55	74	23.52	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 228075002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1098.81	39.39	AD1	27.9	-38.7	0.3	0.7	2.2	31.79	53.97	-22.18	74	-42.21	281	127	Horz
1331.37	41.02	AD1	30.1	-38.1	0.3	0.8	2.4	36.52	53.97	-17.45	74	-37.48	270	147	Horz
1331.69	42.2	AD1	30.1	-38.1	0.3	0.8	2.4	37.7	53.97	-16.27	74	-36.3	343	167	Vert
3327.66	29.92	AD1	32.9	-36.5	0.6	1.4	3.9	32.22	53.97	-21.75	74	-41.78	304	180	Vert

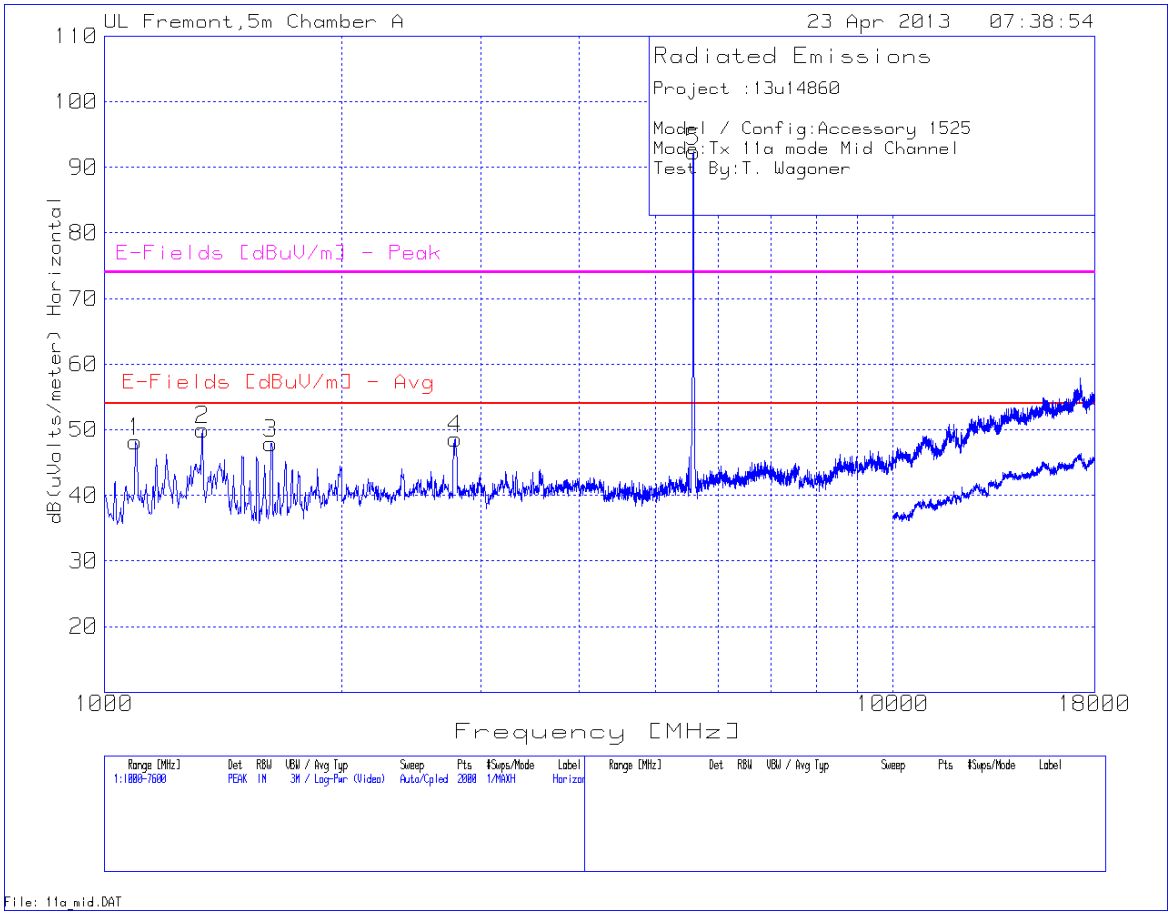
*Fundamental Frequency
PK - Peak detector
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

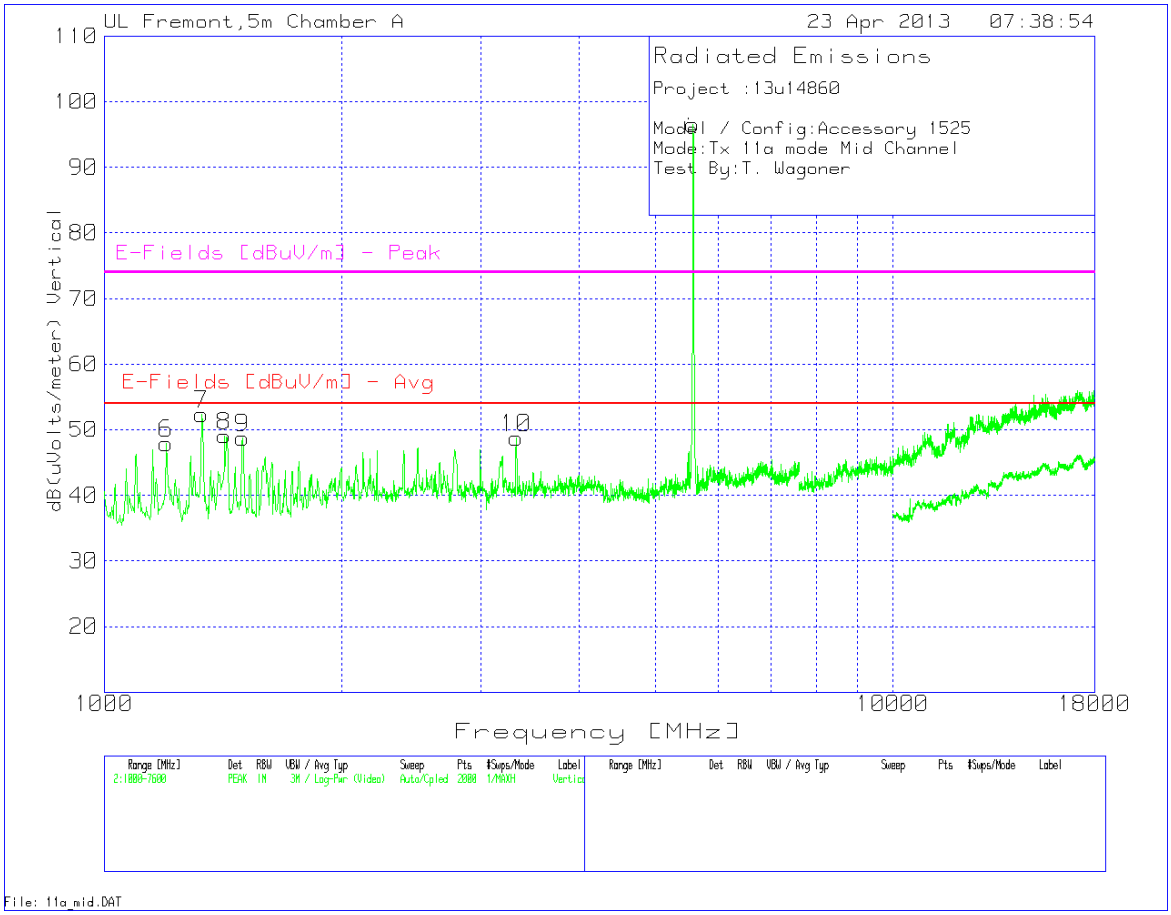
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11a mode Mid Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1095.652	55.82	PK	27.9	-38.7	0.3	0.7	2.2	48.22	53.97	-5.75	74	-25.78	100	Horz
2	1333.133	54.54	PK	30.1	-38.1	0.3	0.8	2.4	50.04	53.97	-3.93	74	-23.96	100	Horz
3	1626.687	52.9	PK	28.6	-37.6	0.4	0.9	2.7	47.9	53.97	-6.07	74	-26.1	100	Horz
4	2784.408	47.46	PK	32.6	-36.7	0.5	1.2	3.6	48.66	53.97	-5.31	74	-25.34	100	Horz
5*	5584.708	85.96	PK	34.4	-35.5	0.7	1.8	5	92.36	53.97	38.39	74	18.36	100	Horz
6	1197.901	53.48	PK	29.5	-38.4	0.3	0.8	2.3	47.98	53.97	-5.99	74	-26.02	100	Vert
7	1329.835	56.78	PK	30.2	-38.1	0.3	0.8	2.4	52.38	53.97	-1.59	74	-21.62	100	Vert
8	1422.189	53.7	PK	29.6	-37.9	0.4	0.8	2.5	49.1	53.97	-4.87	74	-24.9	100	Vert
9	1498.051	53.84	PK	28.9	-37.8	0.4	0.9	2.5	48.74	53.97	-5.23	74	-25.26	100	Vert
10	3328.636	46.45	PK	32.9	-36.5	0.6	1.4	3.9	48.75	53.97	-5.22	74	-25.25	100	Vert
11*	5578.111	90.13	PK	34.4	-35.5	0.7	1.8	5	96.53	53.97	42.56	74	22.53	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.71	48.87	AD1	30.1	-38.1	0.3	0.8	2.4	44.37	53.97	-9.6	74	-29.63	268	172	Horz
4301.9	28.37	AD1	33.6	-35.9	0.6	1.6	4.5	32.77	53.97	-21.2	74	-41.23	276	298	Vert
1421.05	37.52	AD1	29.6	-37.9	0.4	0.8	2.5	32.92	53.97	-21.05	74	-41.08	271	150	Vert

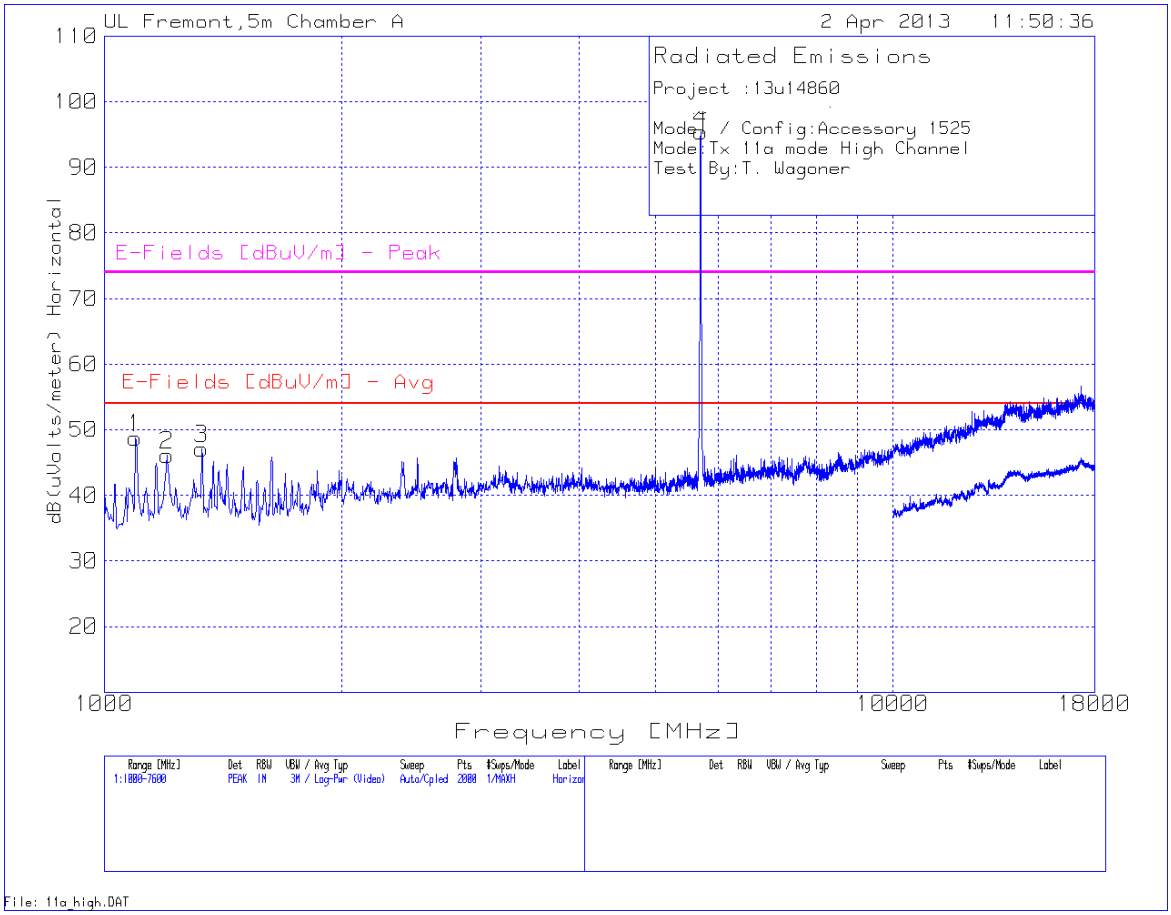
*Fundamental Frequency
PK - Peak detector
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

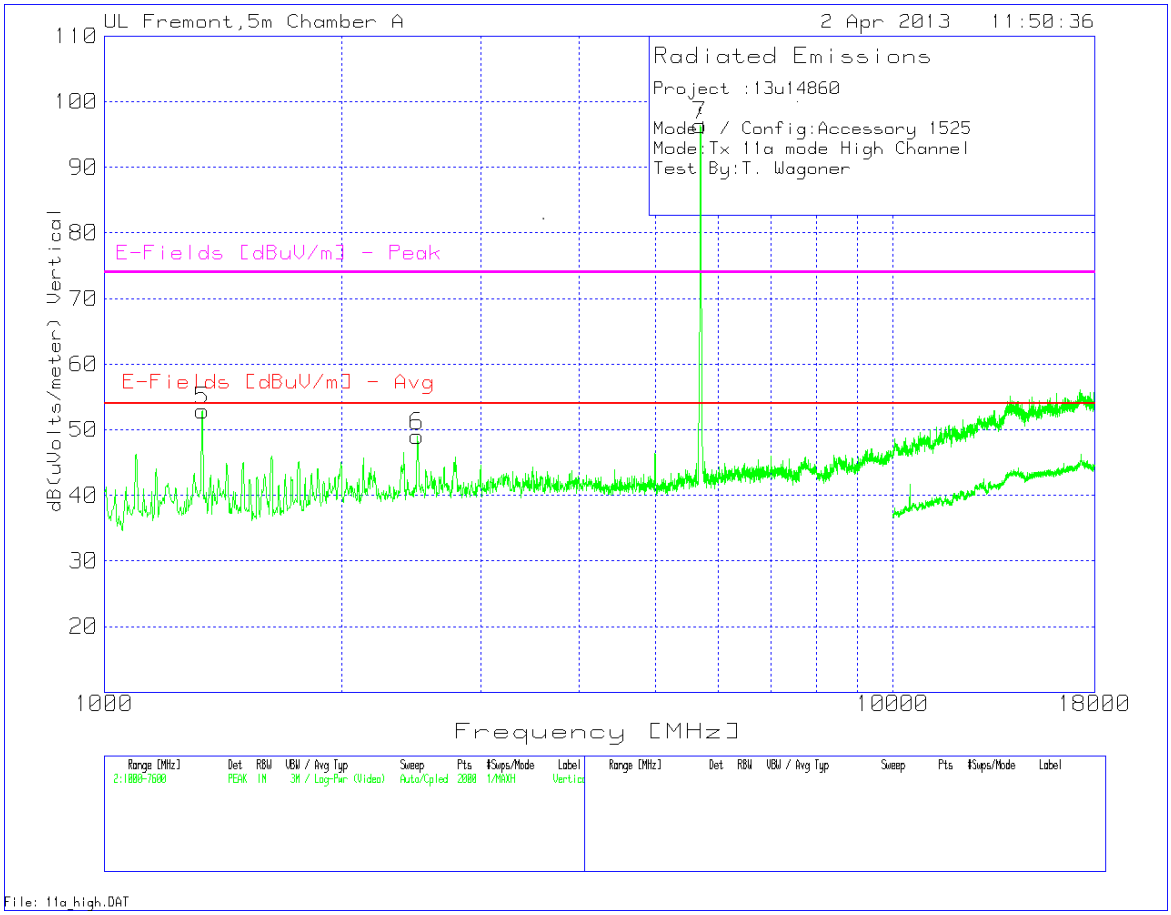
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11a mode High Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1095.652	56.3	PK	27.9	-38.7	0.3	0.7	2.2	48.7	53.97	-5.27	74	-25.3	100	Horz
2	1201.199	51.57	PK	29.5	-38.4	0.3	0.8	2.3	46.07	53.97	-7.9	74	-27.93	100	Horz
3	1329.835	51.54	PK	30.2	-38.1	0.3	0.8	2.4	47.14	53.97	-6.83	74	-26.86	100	Horz
4	5703.448	88.79	PK	34.6	-35.5	0.7	1.8	5	95.39	53.97	41.42	74	21.39	100	Horz
5	1333.133	57.43	PK	30.1	-38.1	0.3	0.8	2.4	52.93	53.97	-1.04	74	-21.07	100	Vert
6	2490.855	48.14	PK	32.6	-36.8	0.5	1.2	3.4	49.04	53.97	-4.93	74	-24.96	100	Vert
7	5696.852	89.84	PK	34.6	-35.5	0.7	1.8	5	96.44	53.97	42.47	74	22.44	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.61	48.3	AD1	30.1	-38.1	0.3	0.8	2.4	43.8	53.97	-10.17	74	-30.2	265	162	Horz
2497.44	34.01	AD1	32.6	-36.8	0.5	1.2	3.4	34.91	53.97	-19.06	74	-39.09	231	197	Horz
1421.05	37.52	AD1	29.6	-37.9	0.4	0.8	2.5	32.92	53.97	-21.05	74	-41.08	271	150	Vert

PK - Peak detector

AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

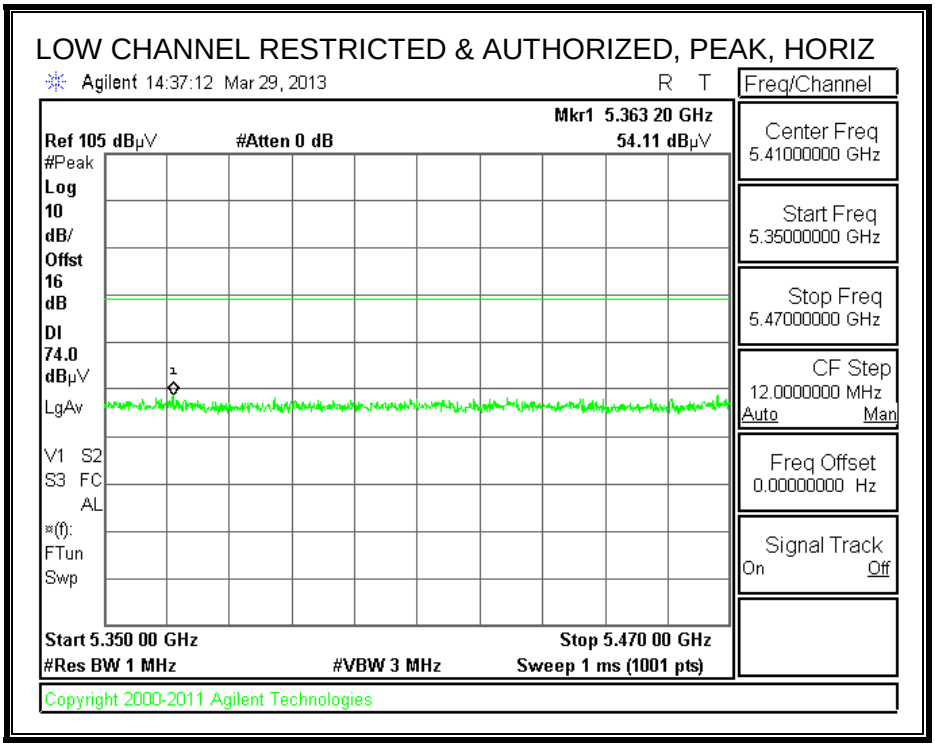
Notes:

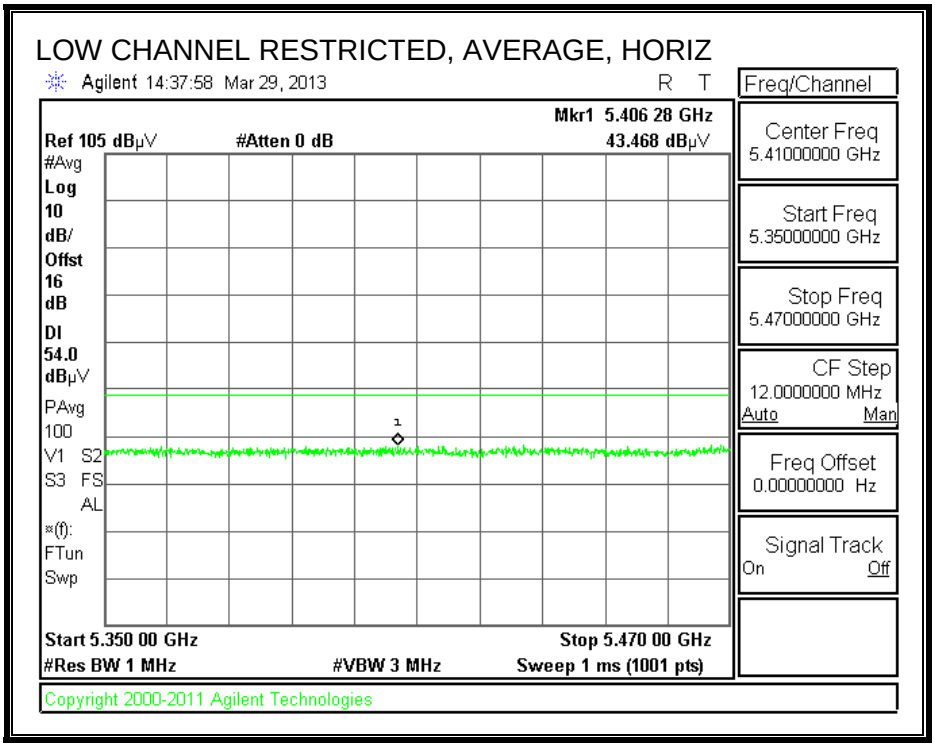
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

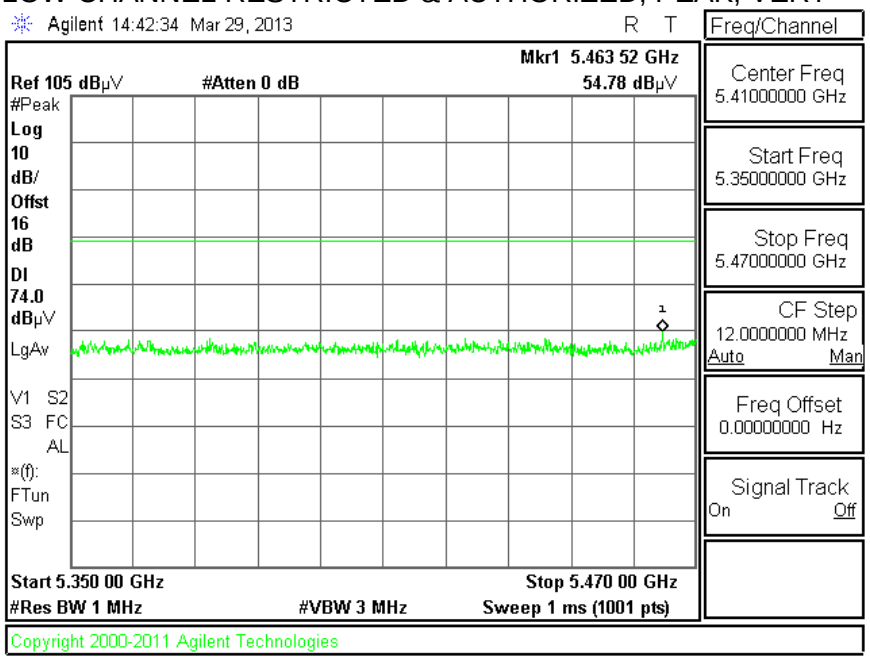
11.2.4. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED & AUTHORIZED BANDEDGE (LOW CHANNEL)

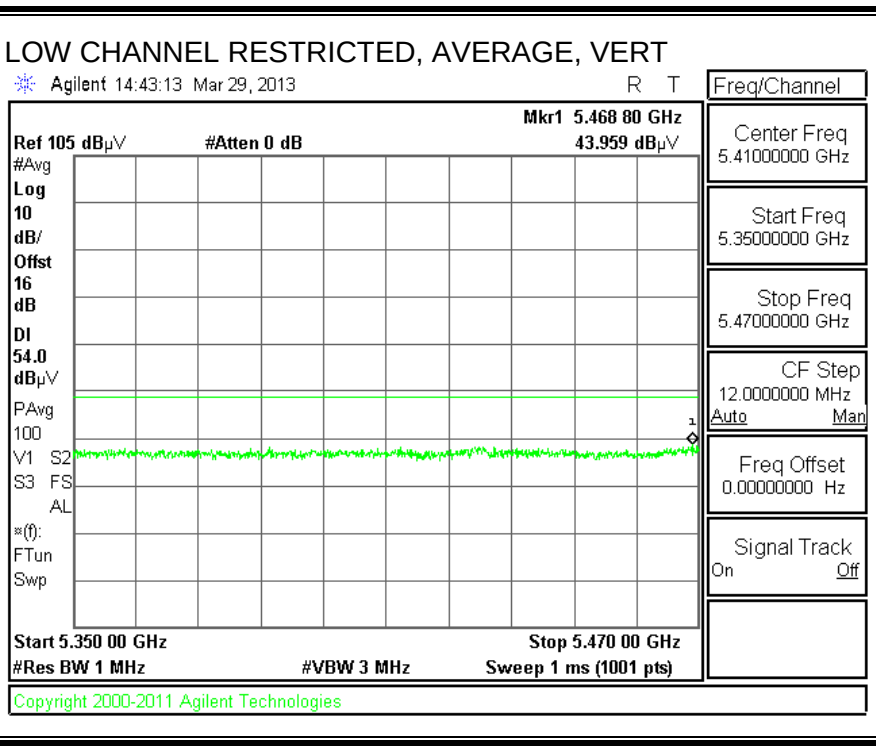




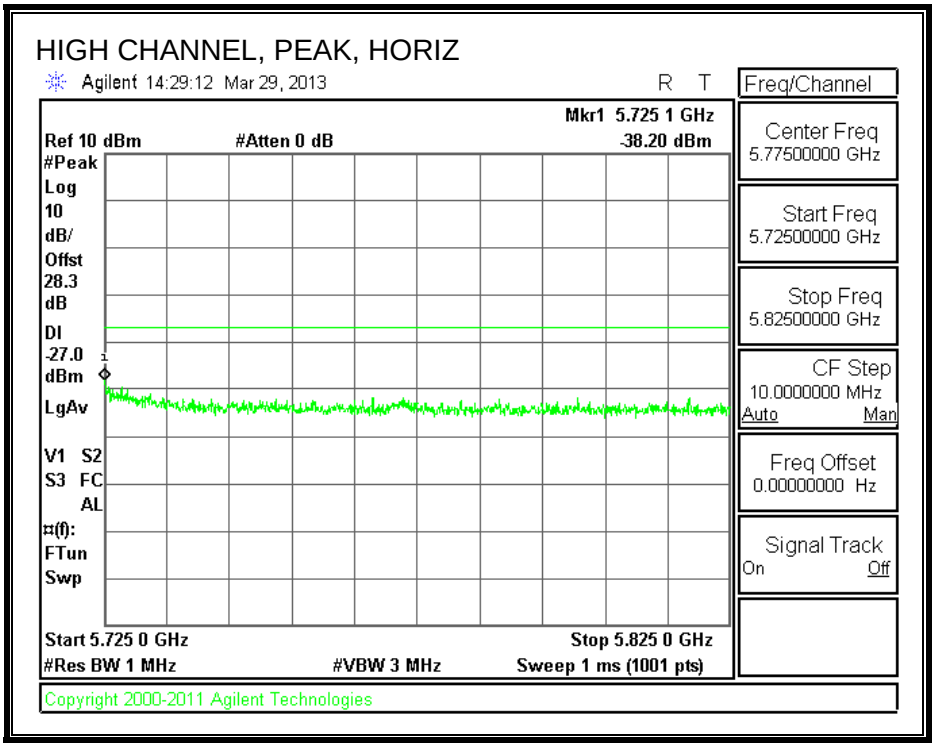
LOW CHANNEL RESTRICTED & AUTHORIZED, PEAK, VERT

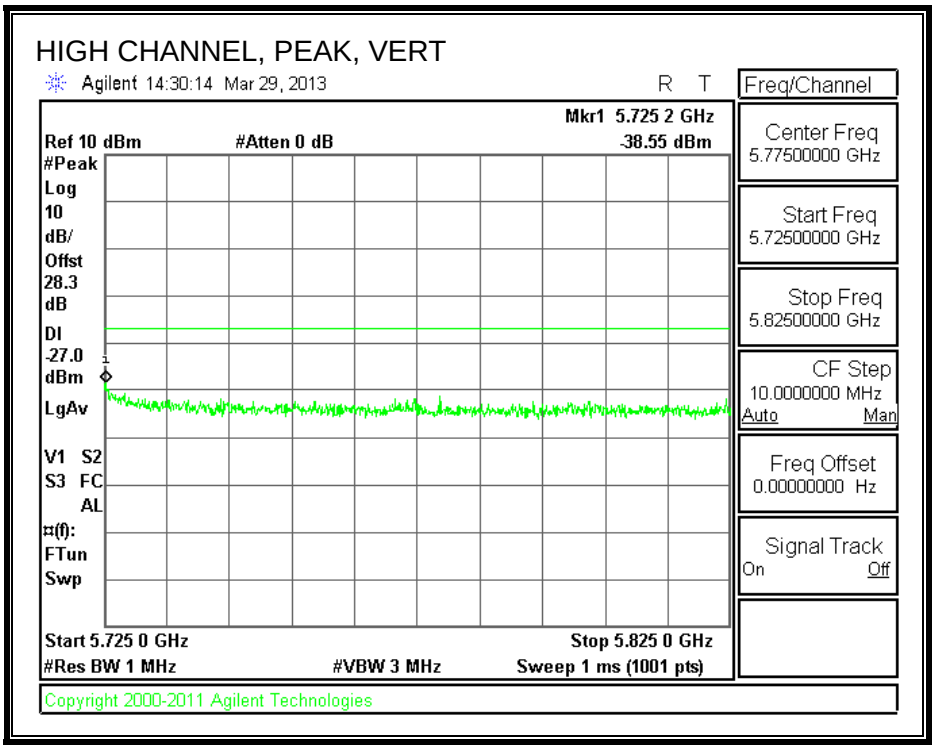


LOW CHANNEL RESTRICTED, AVERAGE, VERT



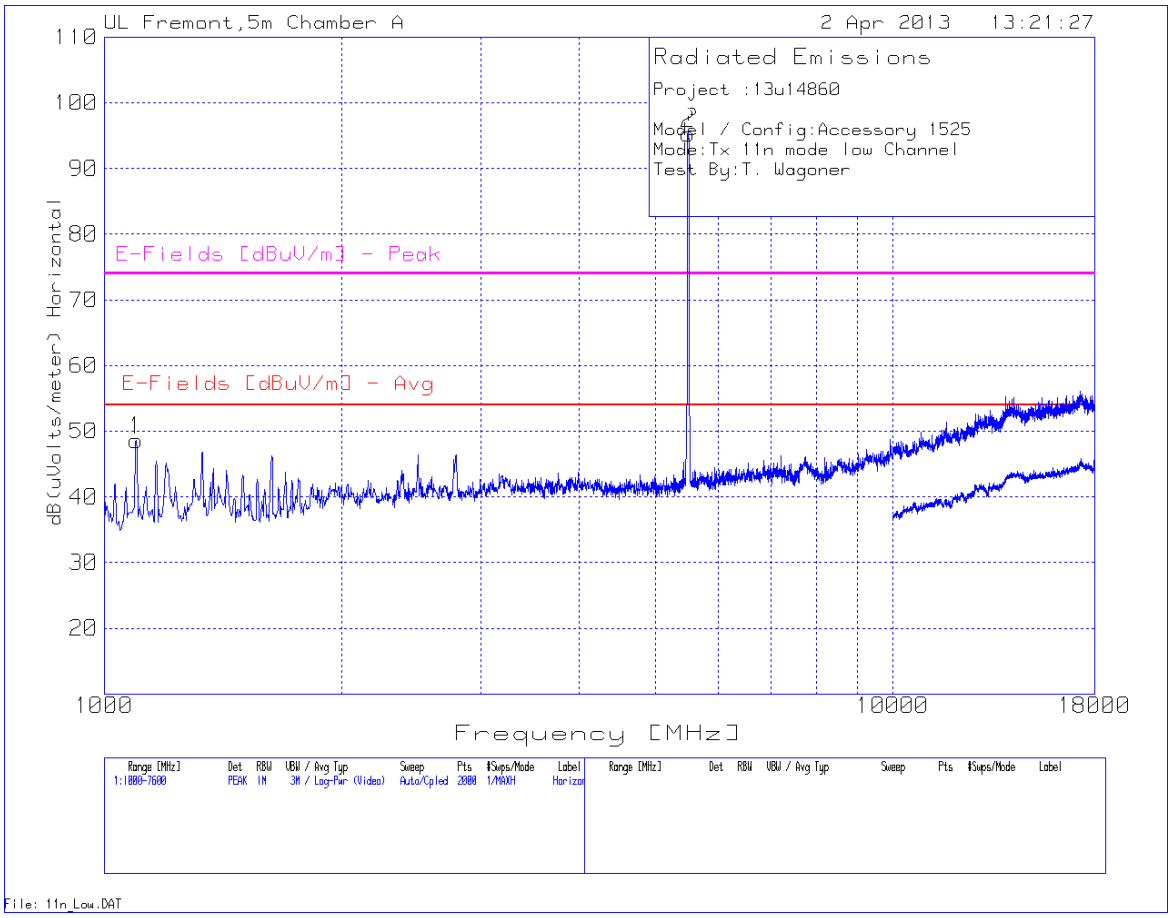
AUTHORIZED BANDEDGE (HIGH CHANNEL)



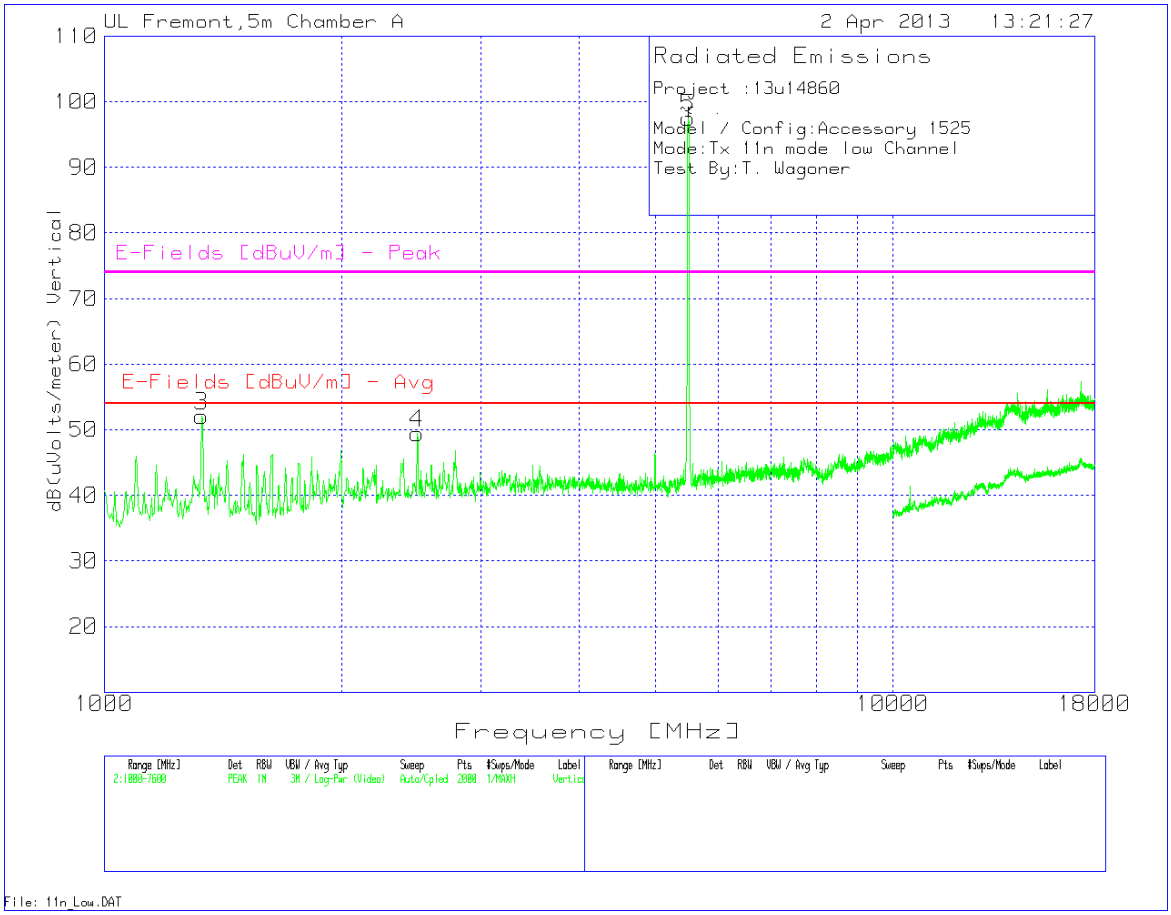


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



Low Channel, Vertical



Low Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11n mode low Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1098.951	56.25	PK	27.9	-38.7	0.3	0.7	2.2	48.65	53.97	-5.32	74	-25.35	100	Horz
2*	5505.547	88.99	PK	34.4	-35.5	0.7	1.8	4.9	95.29	53.97	41.32	74	21.29	100	Horz
3	1329.835	56.54	PK	30.2	-38.1	0.3	0.8	2.4	52.14	53.97	-1.83	74	-21.86	100	Vert
4	2494.153	48.56	PK	32.6	-36.8	0.5	1.2	3.4	49.46	53.97	-4.51	74	-24.54	100	Vert
5*	5505.547	91.22	PK	34.4	-35.5	0.7	1.8	4.9	97.52	53.97	43.55	74	23.52	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 220875002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1315.92	35.69	AD1	30.2	-38.2	0.3	0.8	2.4	31.19	53.97	-22.78	74	-42.81	182	286	Vert
2495.89	34.24	AD1	32.6	-36.8	0.5	1.2	3.4	35.14	53.97	-18.83	74	-38.86	138	290	Vert

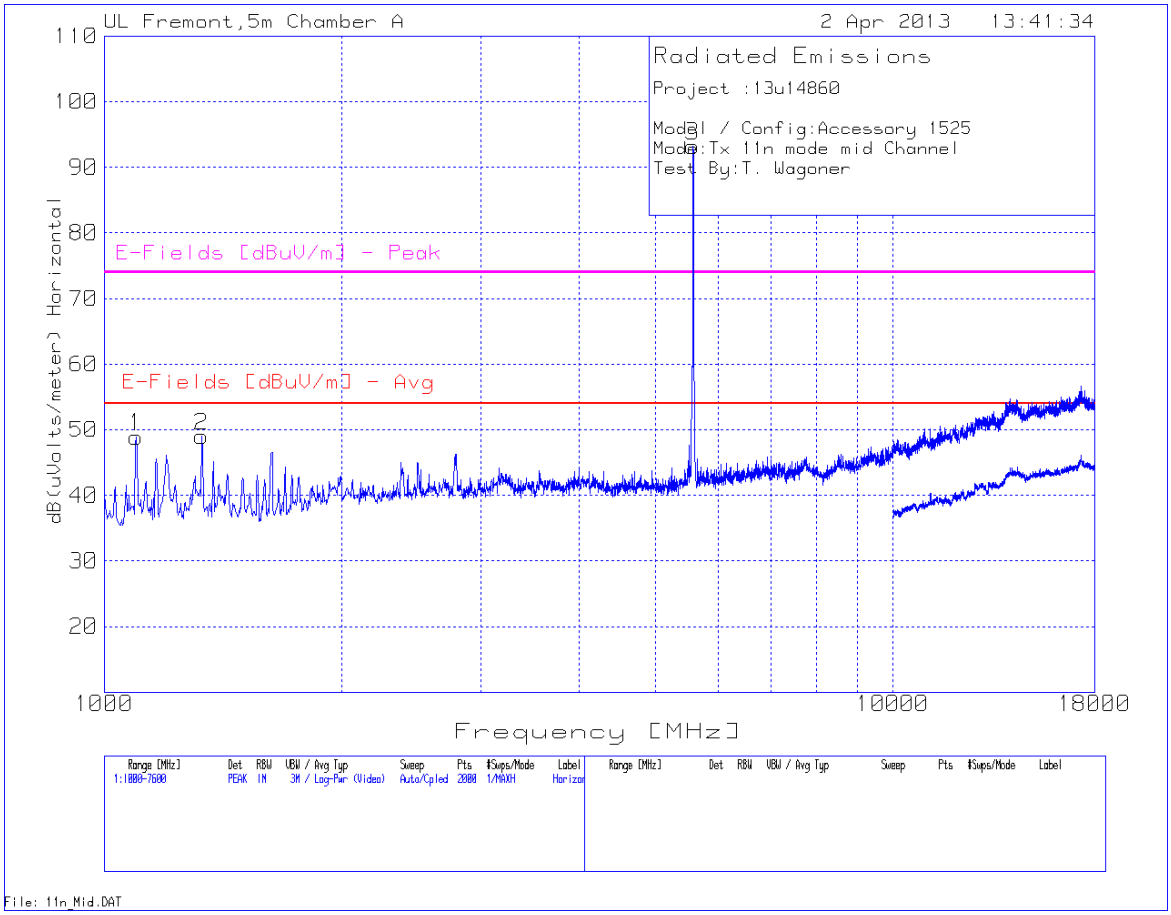
*Fundamental Frequency
PK - Peak detector
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

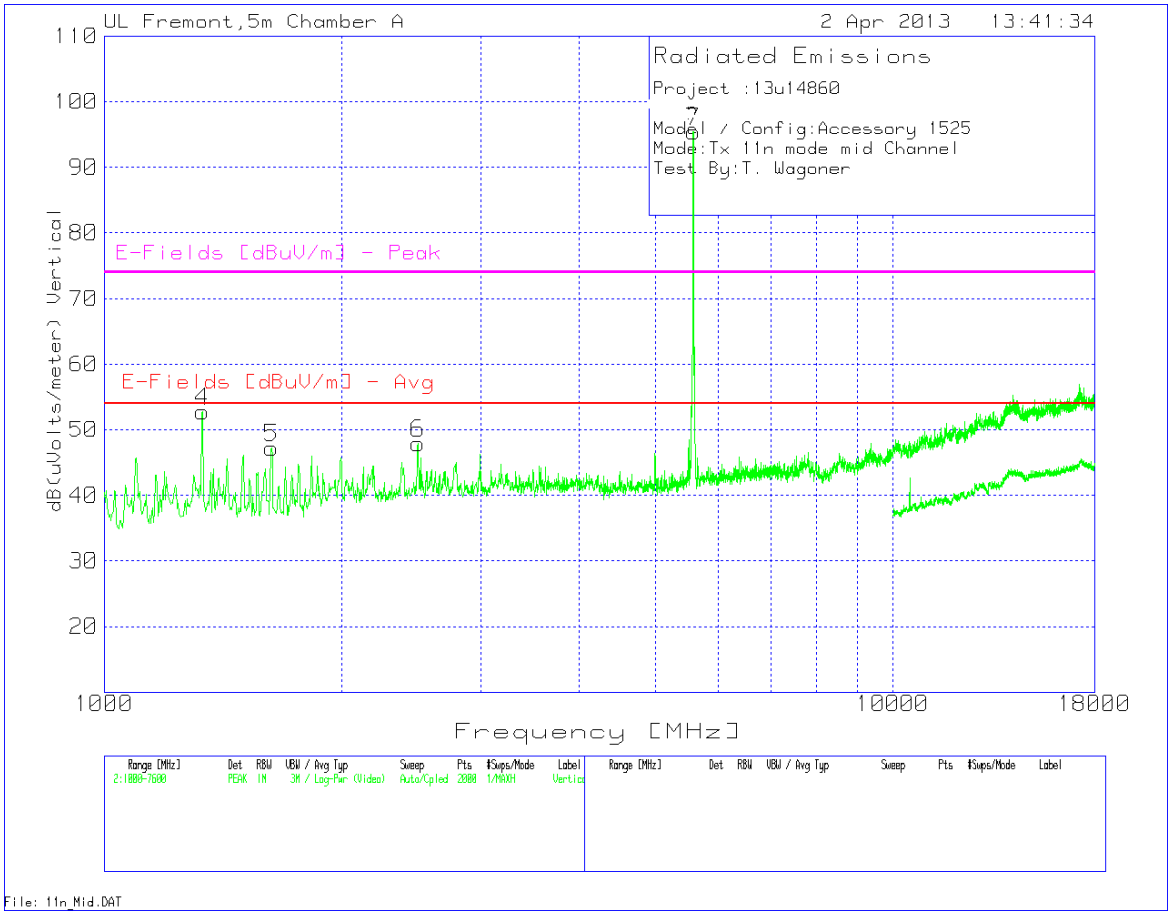
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11n mode mid Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 228075002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1098.951	56.49	PK	27.9	-38.7	0.3	0.7	2.2	48.89	53.97	-5.08	74	-25.11	100	Horz
2	1329.835	53.37	PK	30.2	-38.1	0.3	0.8	2.4	48.97	53.97	-5	74	-25.03	100	Horz
3*	5574.813	86.77	PK	34.4	-35.5	0.7	1.8	5	93.17	53.97	39.2	74	19.17	100	Horz
4	1333.133	57.3	PK	30.1	-38.1	0.3	0.8	2.4	52.8	53.97	-1.17	74	-21.2	100	Vert
5	1629.985	52.19	PK	28.6	-37.6	0.4	0.9	2.7	47.19	53.97	-6.78	74	-26.81	100	Vert
6	2497.451	47.03	PK	32.6	-36.8	0.5	1.2	3.4	47.93	53.97	-6.04	74	-26.07	100	Vert
7*	5584.708	89.1	PK	34.4	-35.5	0.7	1.8	5	95.5	53.97	41.53	74	21.5	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 228076002 1-18GHz	20ft 5mA 228075002 1-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1332.12	40.83	AD1	30.1	-38.1	0.3	0.8	2.4	36.33	53.97	-17.64	74	-37.67	23	310	Horz
1331.53	39.48	AD1	30.1	-38.1	0.3	0.8	2.4	34.98	53.97	-18.99	74	-39.02	17	208	Vert

*Fundamental Frequency

PK - Peak detector

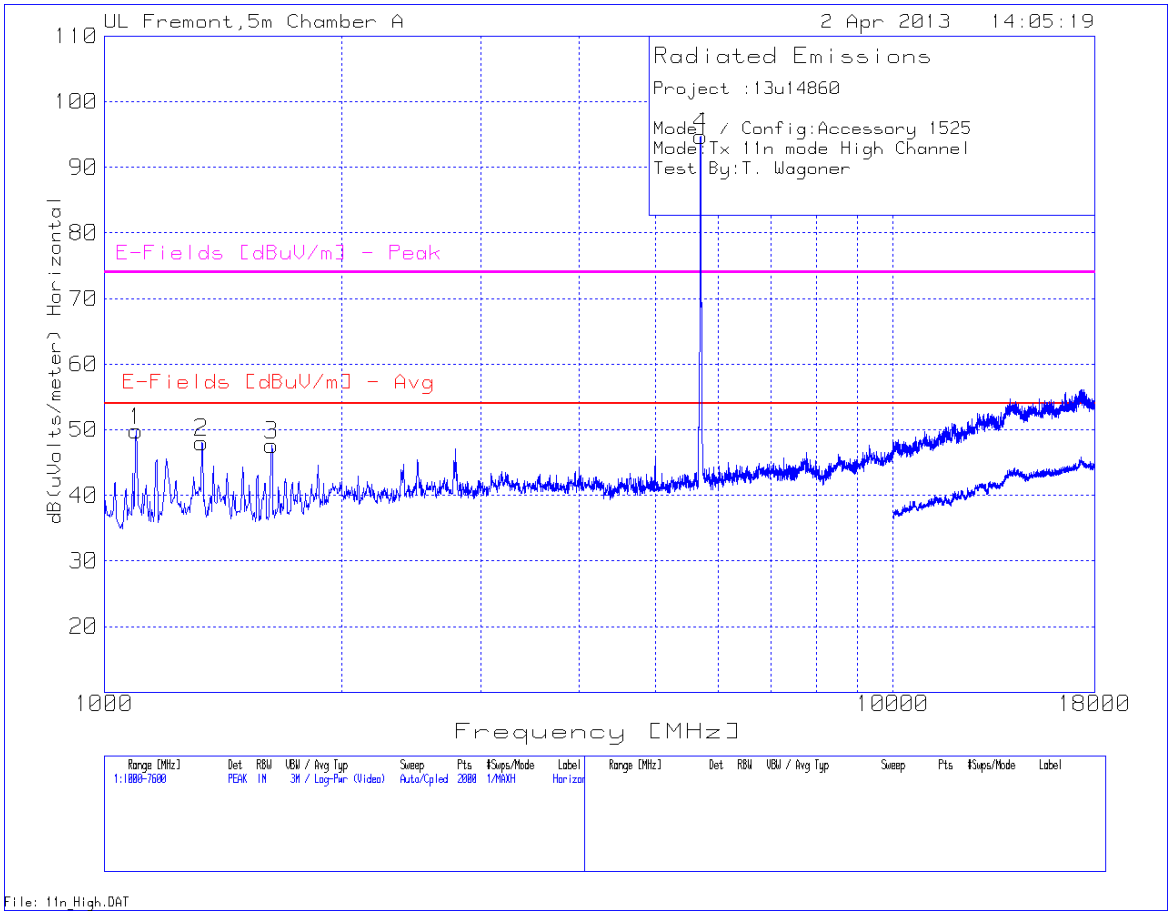
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

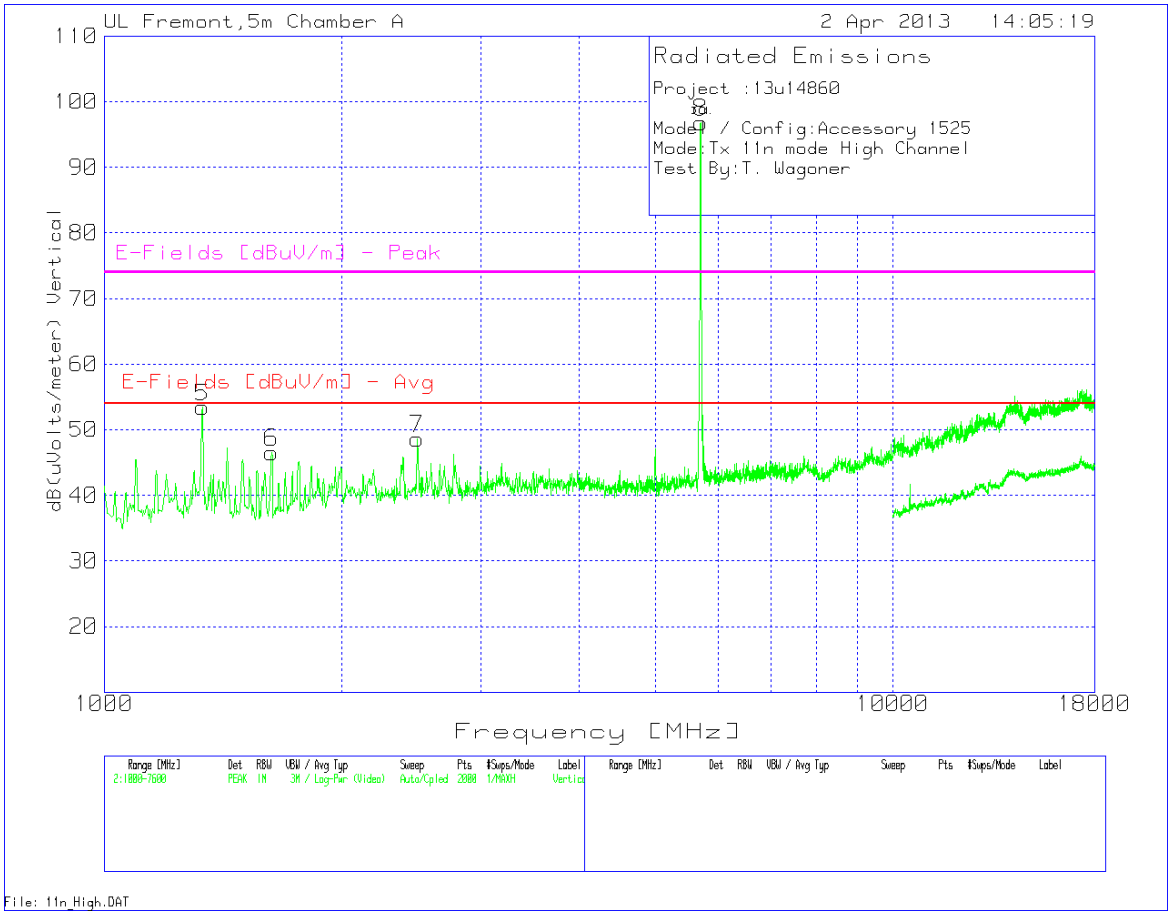
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860
Model / Config:	Accessory 1525
Mode:	Tx 11n mode High Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 2280760021-18GHz	20ft 5mA 2208750021-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1098.951	57.4	PK	27.9	-38.7	0.3	0.7	2.2	49.8	53.97	-4.17	74	-24.2	100	Horz
2	1329.835	52.45	PK	30.2	-38.1	0.3	0.8	2.4	48.05	53.97	-5.92	74	-25.95	100	Horz
3	1629.985	52.6	PK	28.6	-37.6	0.4	0.9	2.7	47.6	53.97	-6.37	74	-26.4	100	Horz
4*	5706.747	88.13	PK	34.6	-35.5	0.7	1.8	5	94.73	53.97	40.76	74	20.73	100	Horz
5	1333.133	57.9	PK	30.1	-38.1	0.3	0.8	2.4	53.4	53.97	-0.57	74	-20.6	100	Vert
6	1629.985	51.59	PK	28.6	-37.6	0.4	0.9	2.7	46.59	53.97	-7.38	74	-27.41	100	Vert
7	2490.855	47.74	PK	32.6	-36.8	0.5	1.2	3.4	48.64	53.97	-5.33	74	-25.36	100	Vert
8*	5706.747	90.18	PK	34.6	-35.5	0.7	1.8	5	96.78	53.97	42.81	74	22.78	100	Vert

Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 HP8449B	3ft 5mA 228077002	8ft 5mA 2280760021-18GHz	20ft 5mA 2208750021-18GHz	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1098.67	50.26	AD1	27.9	-38.7	0.3	0.7	2.2	42.66	53.97	-11.31	74	-31.34	349	222	Horz
1331.29	41.81	AD1	30.1	-38.1	0.3	0.8	2.4	37.31	53.97	-16.66	74	-36.69	95	203	Vert

*Fundamental Frequency

PK - Peak detector

AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

12. 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.

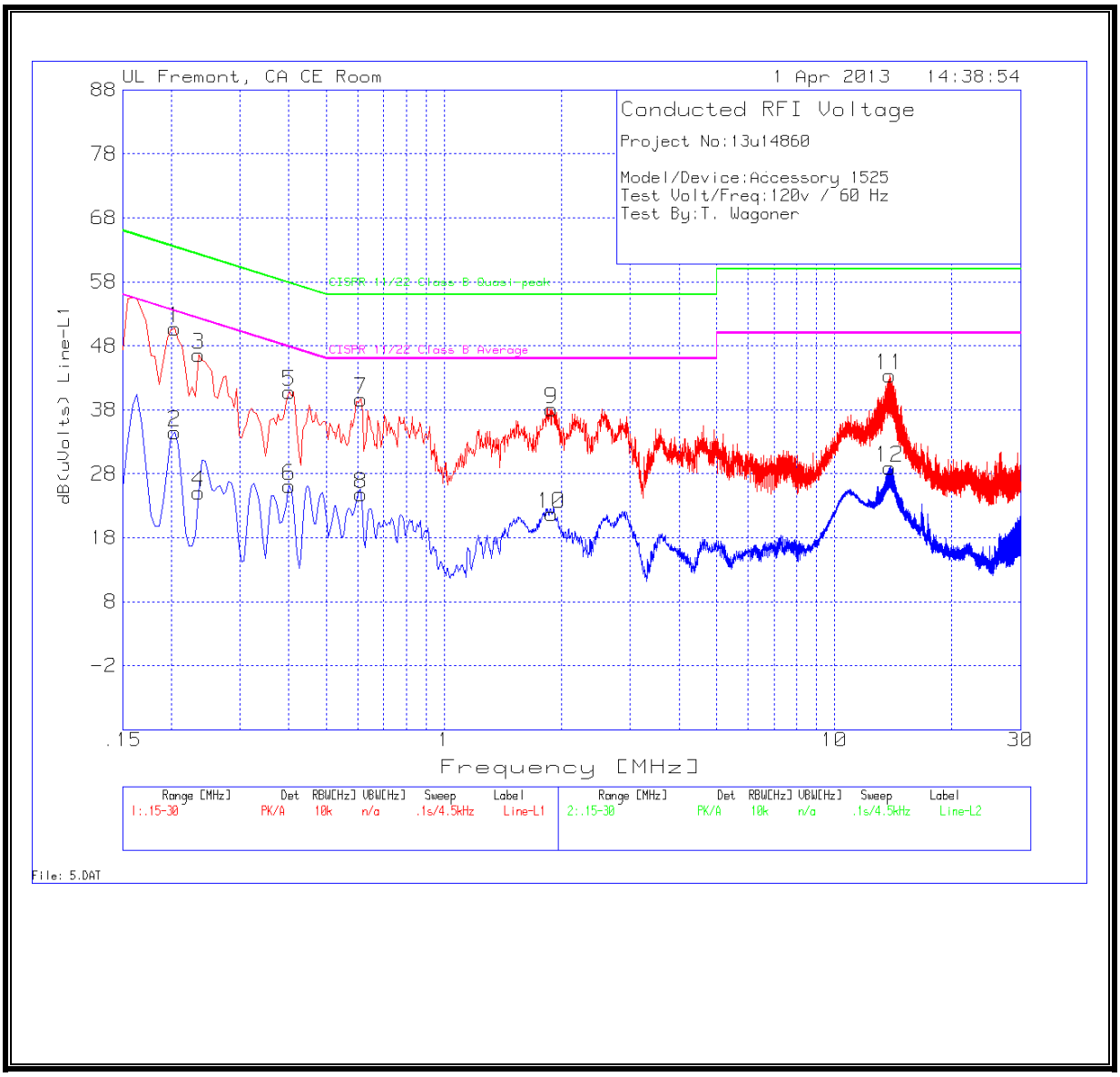
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

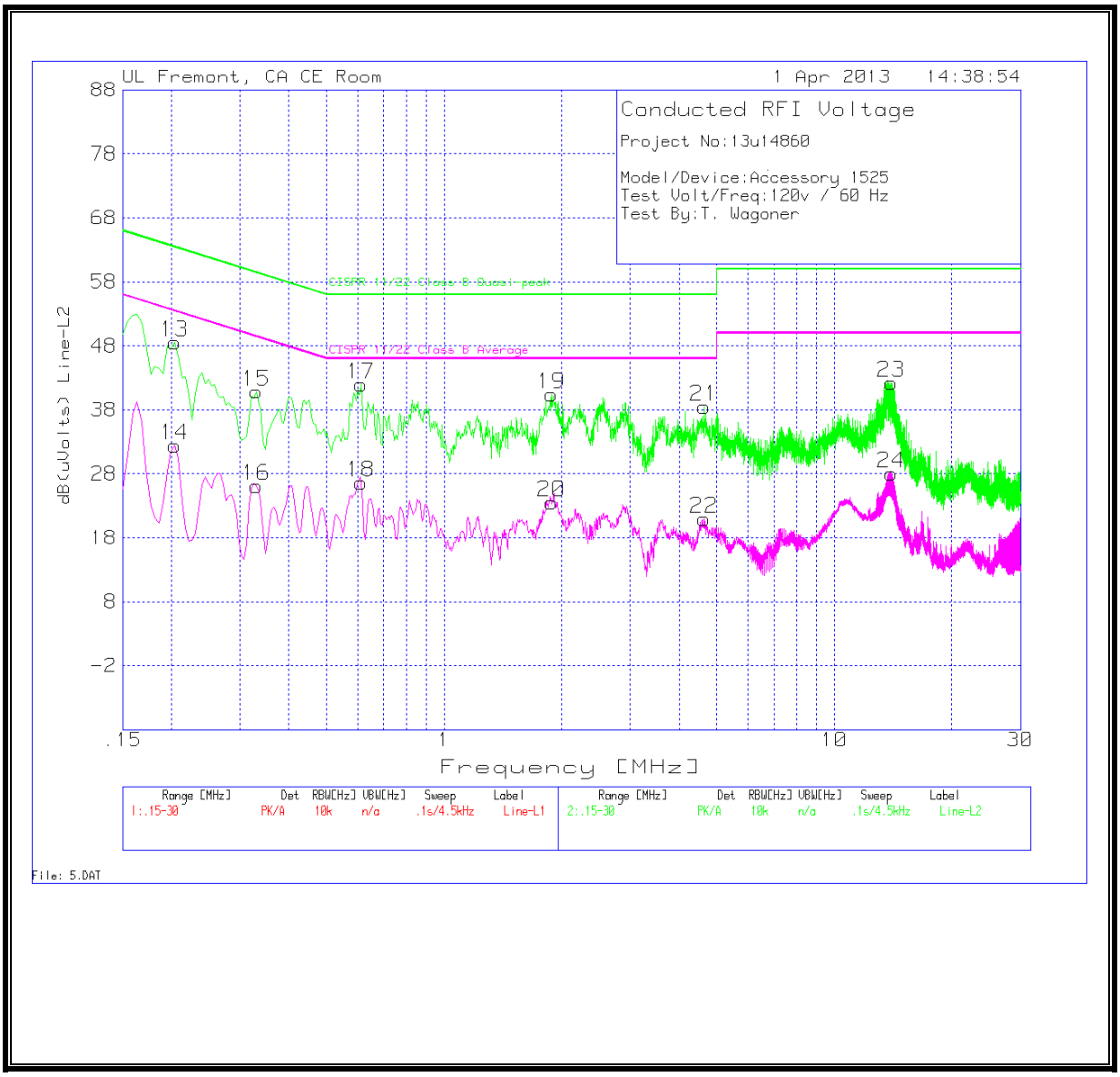
RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



LINE 2 RESULTS



Data

Project No:	13u14860
Model/Device:	Accessory 1525
Test Volt/Freq:	120v / 60 Hz
Test By:	T. Wagoner

Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
0.204	50.62	PK	0.1	0	50.72	63.4	-12.68	-	-
0.204	34.35	Av	0.1	0	34.45	-	-	53.4	-18.95
0.2355	46.46	PK	0.1	0	46.56	62.3	-15.74	-	-
0.2355	25.04	Av	0.1	0	25.14	-	-	52.3	-27.16
0.402	40.75	PK	0.1	0	40.85	57.8	-16.95	-	-
0.402	26.04	Av	0.1	0	26.14	-	-	47.8	-21.66
0.6135	39.57	PK	0.1	0	39.67	56	-16.33	-	-
0.6135	24.78	Av	0.1	0	24.88	-	-	46	-21.12
1.887	37.96	PK	0.1	0.1	38.16	56	-17.84	-	-
1.887	21.48	Av	0.1	0.1	21.68	-	-	46	-24.32
13.839	43.04	PK	0.2	0.2	43.44	60	-16.56	-	-
13.839	28.56	Av	0.2	0.2	28.96	-	-	50	-21.04
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L2.TXT (dB)	LC Cables 2&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
0.204	48.42	PK	0.1	0	48.52	63.4	-14.88	-	-
0.204	32.36	Av	0.1	0	32.46	-	-	53.4	-20.94
0.33	40.77	PK	0.1	0	40.87	59.5	-18.63	-	-
0.33	26.03	Av	0.1	0	26.13	-	-	49.5	-23.37
0.6135	41.82	PK	0.1	0	41.92	56	-14.08	-	-
0.6135	26.56	Av	0.1	0	26.66	-	-	46	-19.34
1.887	40.18	PK	0.1	0.1	40.38	56	-15.62	-	-
1.887	23.35	Av	0.1	0.1	23.55	-	-	46	-22.45
4.6365	38.28	PK	0.1	0.1	38.48	56	-17.52	-	-
4.6365	20.74	Av	0.1	0.1	20.94	-	-	46	-25.06
13.965	41.8	PK	0.2	0.2	42.2	60	-17.8	-	-
13.965	27.64	Av	0.2	0.2	28.04	-	-	50	-21.96
PK - Peak detector									
Av - Average detector									

13. DYNAMIC FREQUENCY SELECTION

13.1. OVERVIEW

13.1.1. 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

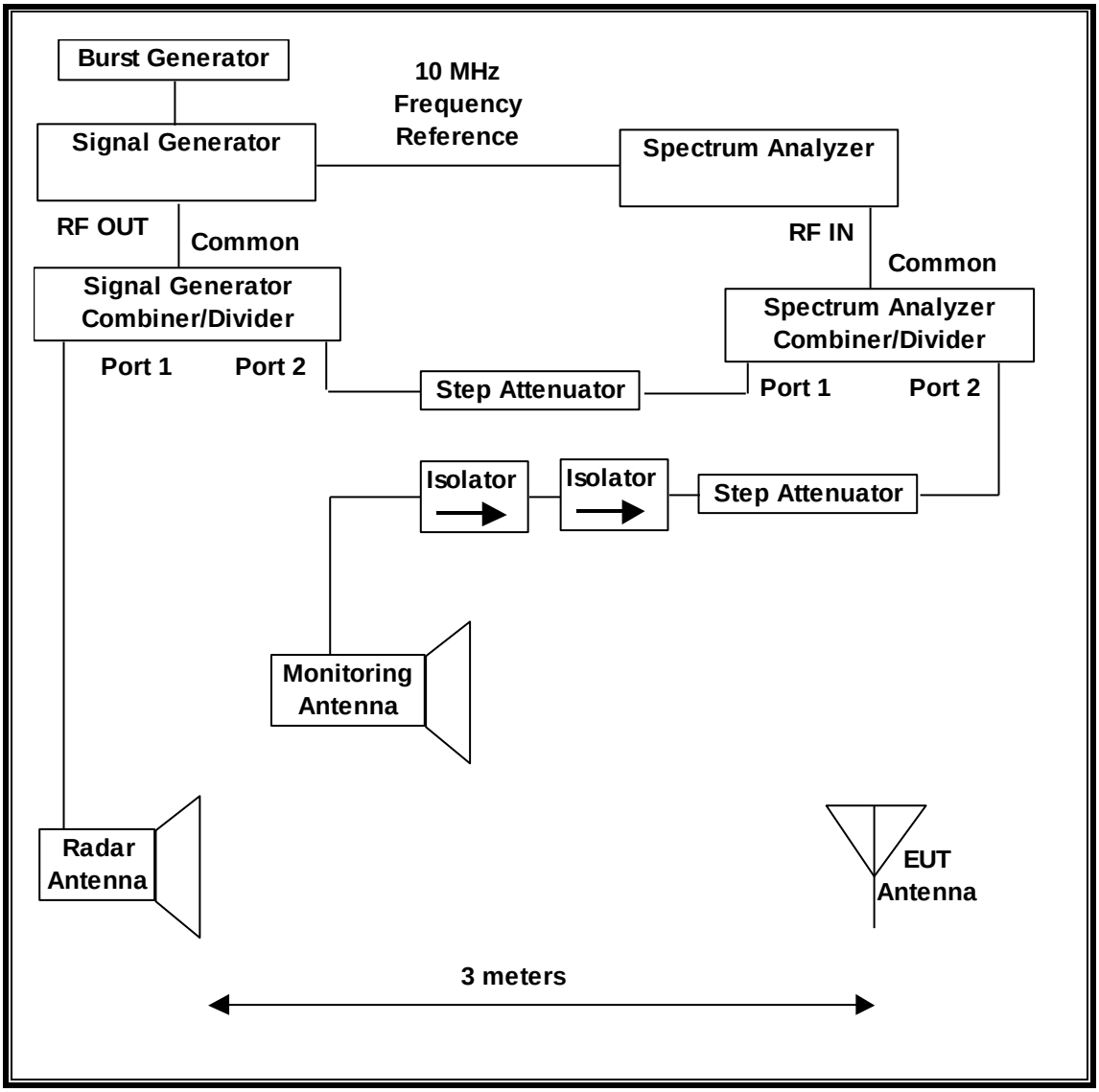
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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

13.1.2. 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 Freqeuncy 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 –62 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 –62 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 –62 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 audio 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.

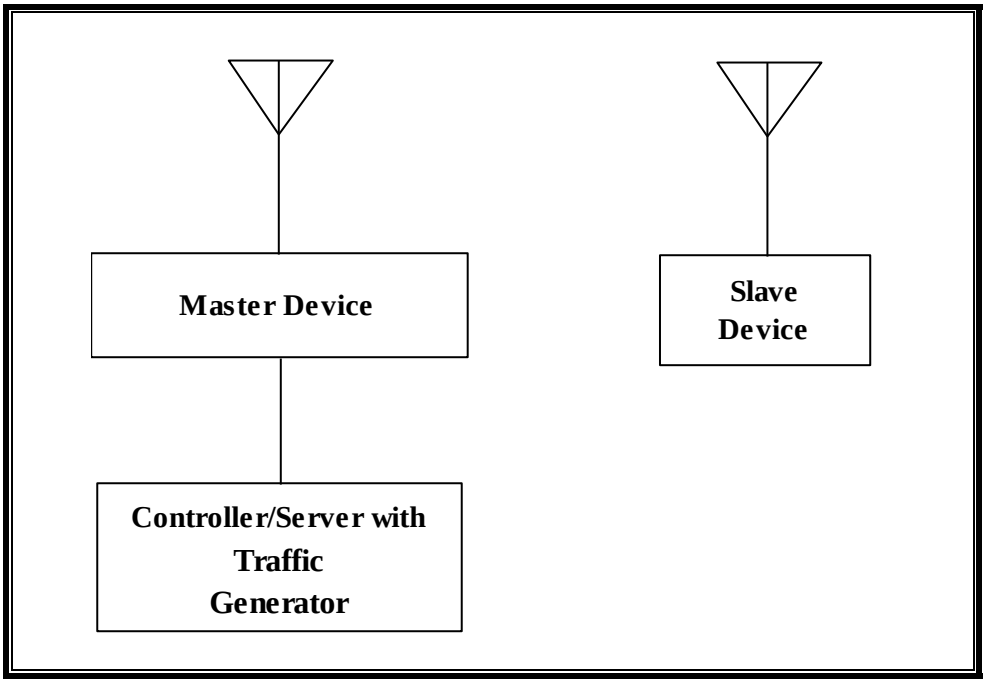
TEST AND MEASUREMENT EQUIPMENT

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	08/18/13
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	11/20/13
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	09/25/13

13.1.3. 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**
AC Adapter (EUT)	Microsoft Corp.	ADP-200AR A	0A21P01070725	DoC
Notebook PC (Controller/Server)	Lenovo	W530	R93YR0071939	DoC
AC Adapter (Controller/Server PC)	Chicony Power Technology Co., Ltd.	45N0353	11S45N0353Z1Z MYW2CL4BJ	DoC
Wireless Slave Device	Microsoft Corp.	1537	000099331399A	C3K1537
5-Port 10/100/100M Switch	Netgear	GS605 v4	2N21253304EA9	DoC
AC Adapter (Switch)	Netgear	AD810F10	31121619X10329 0ABJ	DoC
LCD Monitor	ASUS	VE278	C3LMTF168675	DoC
USB Keyboard	Microsoft Corp.	1482	353200308140	DoC

13.1.4. DESCRIPTION OF EUT

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

The EUT is a Master Device.

The highest power level within these bands is 14.20 dBm EIRP in the 5250-5350 MHz band and 11.78 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly utilized with the EUT has a gain of 3.14 dBi.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is –62 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –62 + 1 = -61 dBm.

The calibrated radiated DFS Detection Threshold level is set to –62 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 an antenna to perform radiated tests.

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

WLAN traffic is generated by downloading an audio file from the controller/server notebook PC to the EUT. An imbedded application resident on the EUT then streams it to the slave device at 9 Mbps.

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

The EUT utilizes the 802.11a/n architecture. One nominal channel bandwidth, 20 MHz, is implemented.

The software installed in the access point is DFS SW ver 1.0.

UNIFORM CHANNEL SPREADING

See Manufacturer's Attestation.

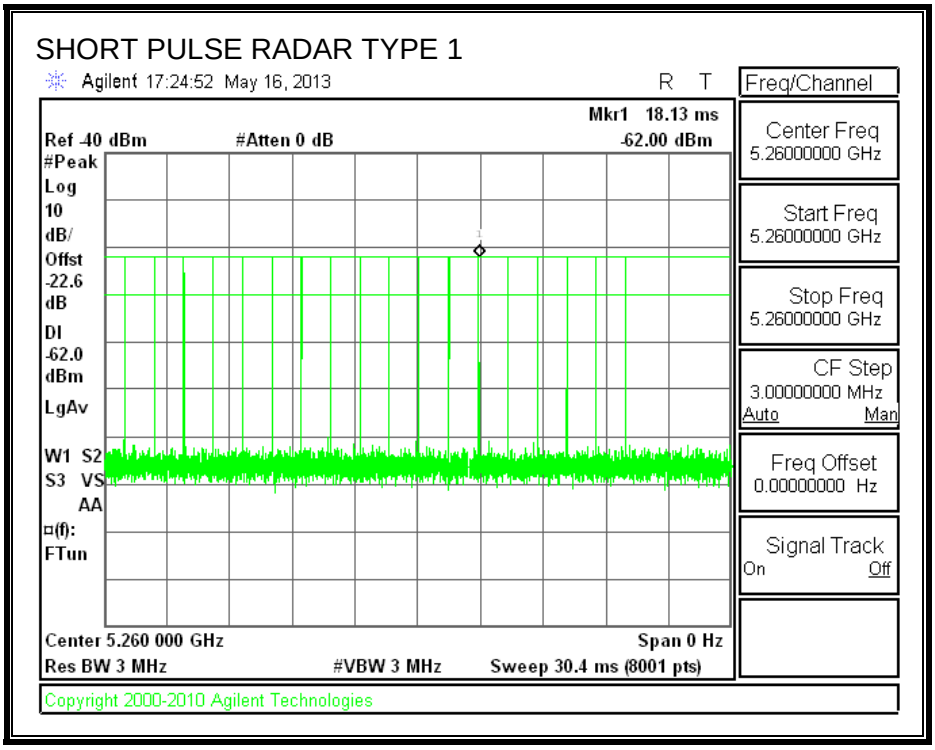
13.2. ACCESSORY RADIO TEST RESULTS AT 20 MHz BANDWIDTH

13.2.1. TEST CHANNEL

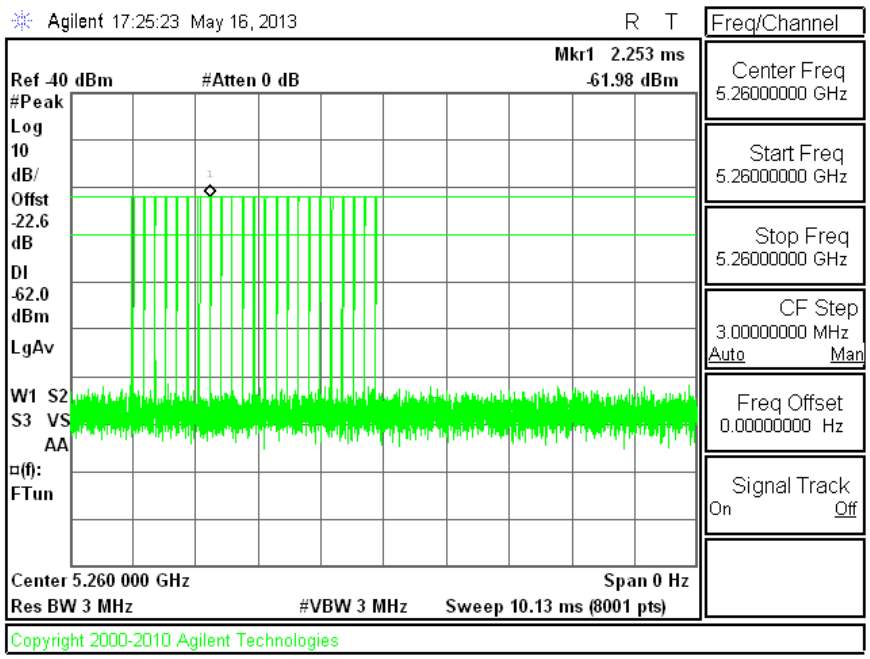
All tests were performed at a channel center frequency of 5260 MHz.

13.2.2. RADAR WAVEFORMS AND TRAFFIC

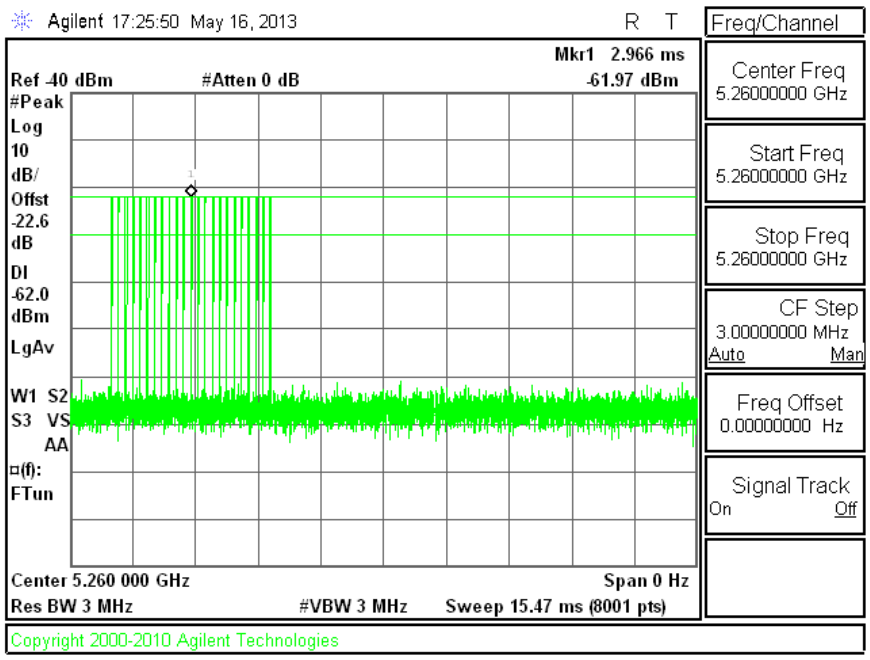
RADAR WAVEFORMS



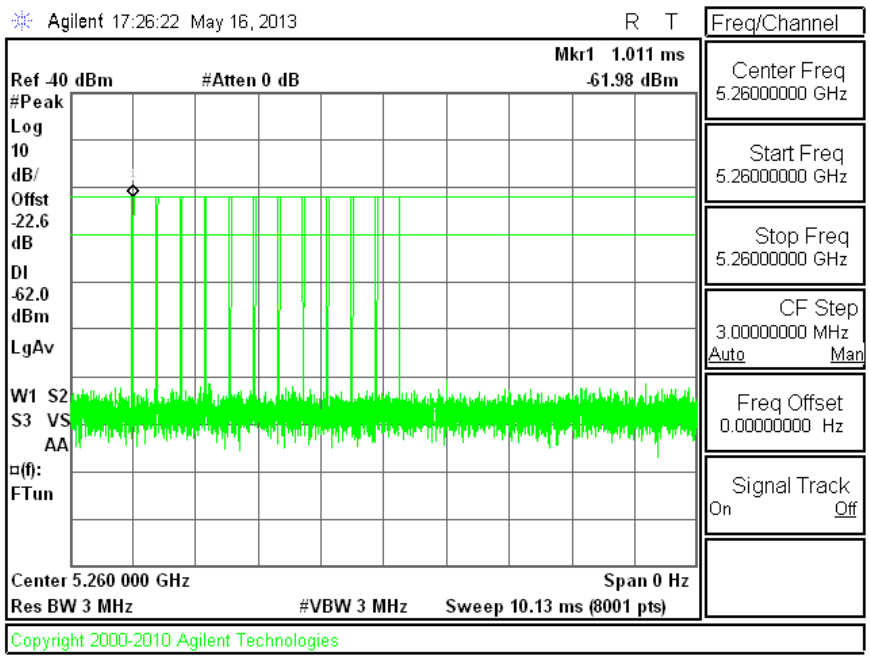
SAMPLE OF RADAR TYPE 2



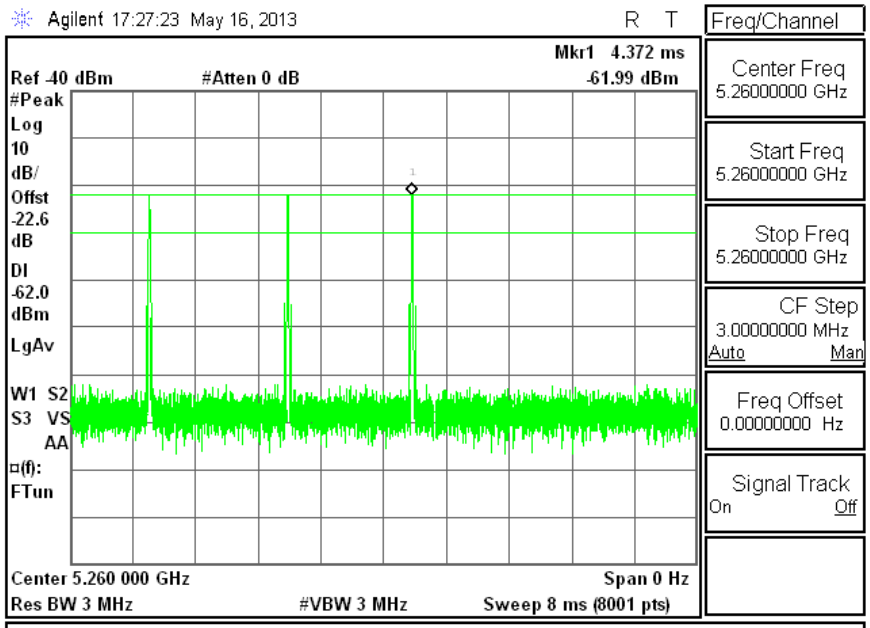
SAMPLE OF RADAR TYPE 3



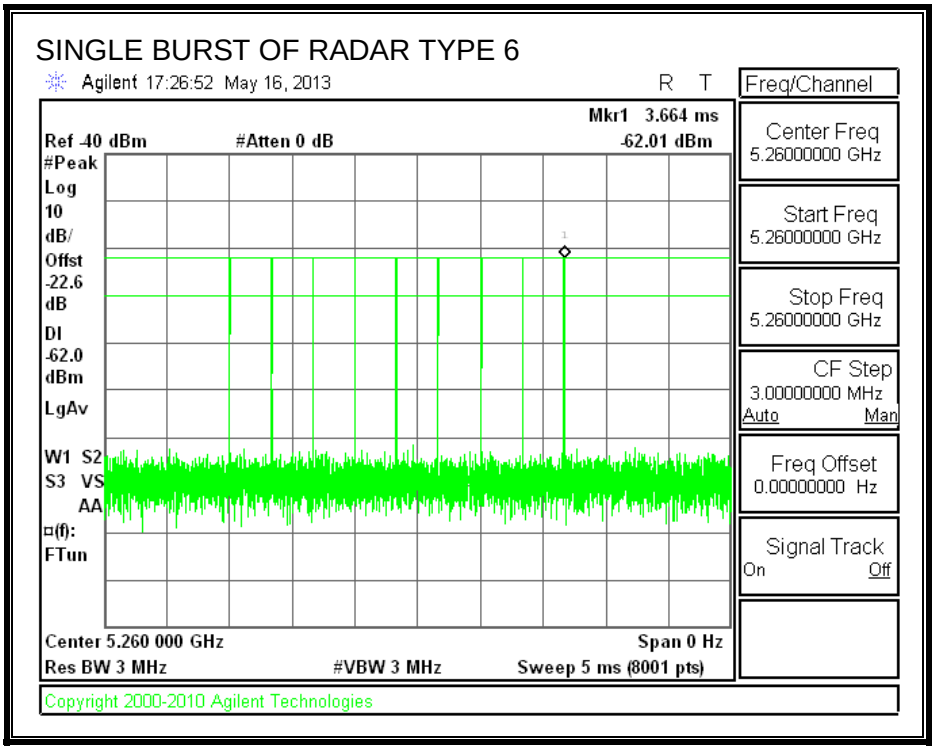
SAMPLE OF RADAR TYPE 4



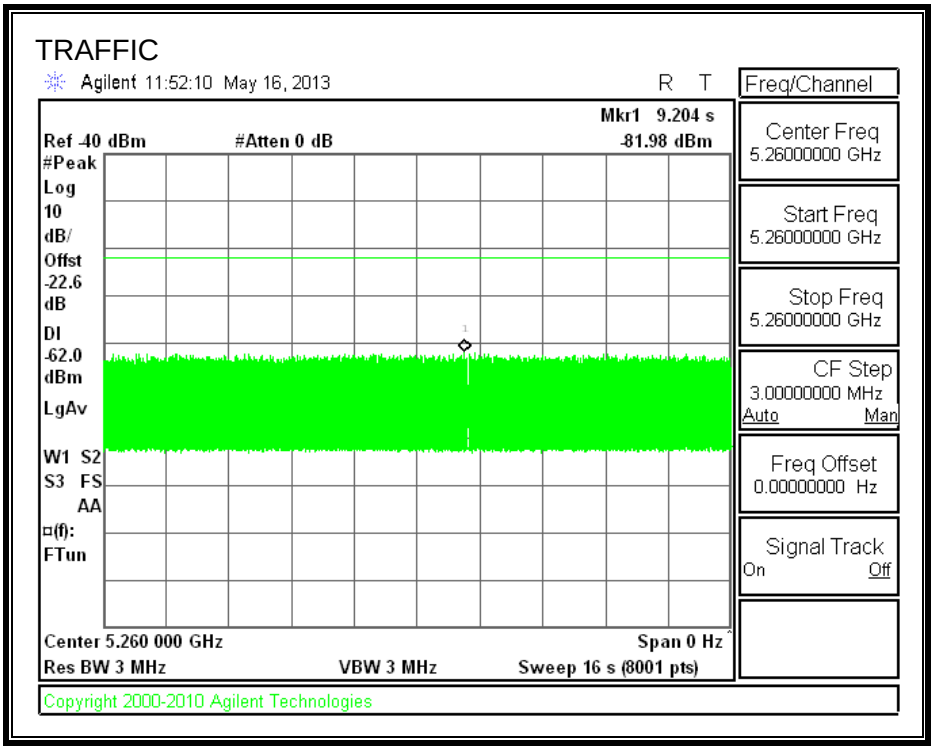
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6



TRAFFIC



13.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE TEST CHANNEL CYCLE TIME

The EUT Accessory Radio was set to an initial channel (5180 MHz) while a spectrum analyzer monitored the test channel (5260 MHz). A command was issued from the controller computer to the EUT to change to the test channel at which time the Accessory Radio started a CAC period. Upon completion of the CAC period the Accessory Radio began transmissions on the test channel. The elapsed time between the command to change channels and the start of transmissions on the test channel is the CAC time. This reference measurement was used to determine when radar bursts are triggered at the beginning and end of the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

While the spectrum analyzer monitored the test channel, a command was issued to the EUT to change from the initial channel to the test channel beginning a CAC period. A radar signal was triggered on the test channel between 0 to 6 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The EUT Radar Events Log File also recorded the timing of these events. The time from the beginning of the CAC by the Accessory Radio on the test channel to the detection of the radar burst on the test channel was measured as the timing of the radar burst after the beginning of the CAC period.

The Non-Occupancy list was cleared. While the spectrum analyzer monitored the test channel, a command was issued to the EUT to change from the initial channel to the test channel beginning a CAC period. A radar signal was triggered on the test channel between 54 to 60 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON THE TEST CHANNEL

The time from the command to change channels from the initial channel to the test channel to the initialization of traffic (by the Accessory Radio) on the test channel was measured as the approximate CAC period.

RADAR TRIGGERED ON THE TEST CHANNEL

The time from the command to change channels from the initial channel to the test channel to the radar burst on the test channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC at 5260 MHz (sec)	End of CAC at 5260 MHz (sec)	CAC Time (sec)
24.71	84.71	60.00

Radar Near Beginning of CAC

Start of CAC at 5260 MHz (sec)	Timing of Radar Burst at 5260 MHz (sec)	Radar Relative to Start of CAC at 5260 MHz (sec)
30	33.00	3.00

Radar Near End of CAC

Start of CAC at 5260 MHz (sec)	Timing of Radar Burst at 5260 MHz (sec)	Radar Relative to Start of CAC at 5260 MHz (sec)
30.51	86.51	56.00

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5260 MHz (hh:mm:ss)	Start of Traffic at 5260 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
04:31:31.000	04:32:31.000	00:01:00.000

Radar Near Beginning of CAC

Start of CAC at 5260 MHz (hh:mm:ss)	Radar Detected at 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
04:31:59.000	04:32:02.000	00:00:03.000

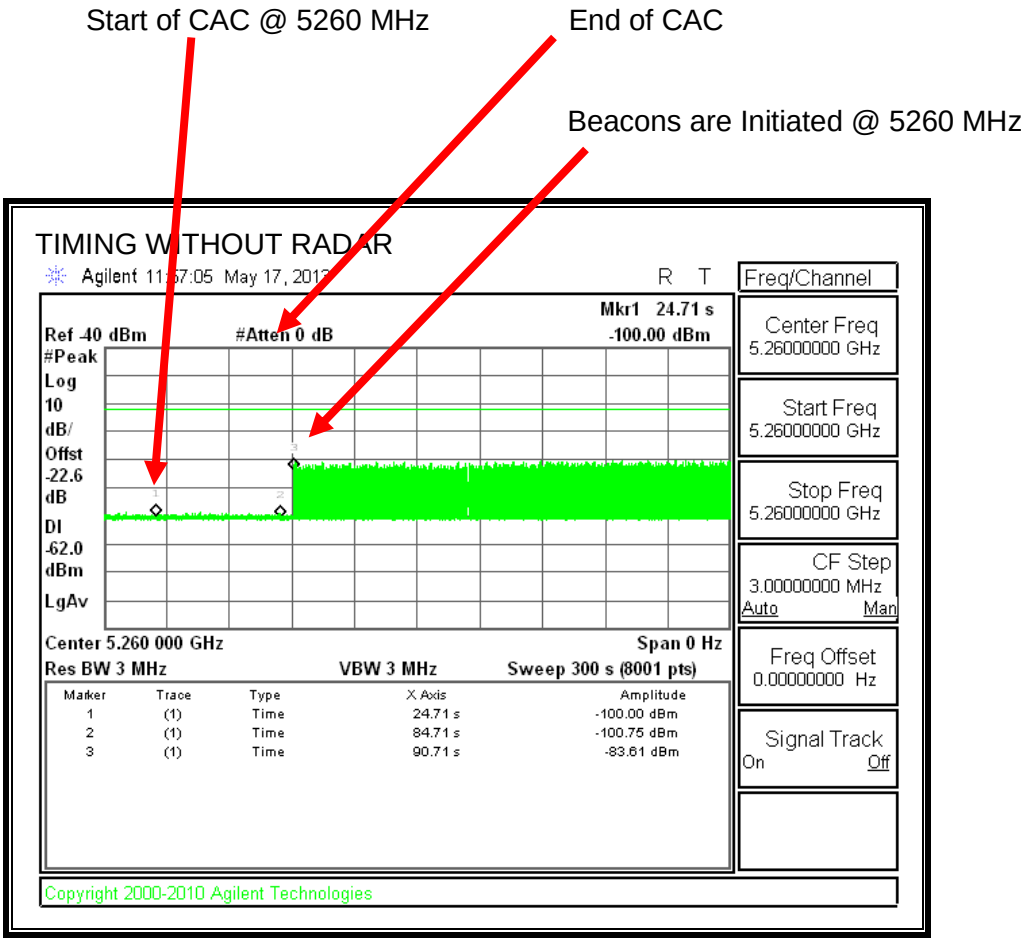
Radar Near End of CAC

Start of CAC at 5260 MHz (hh:mm:ss)	Radar Detected at 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
04:31:24.000	04:32:20.000	00:00:56.000

QUALITATIVE RESULTS

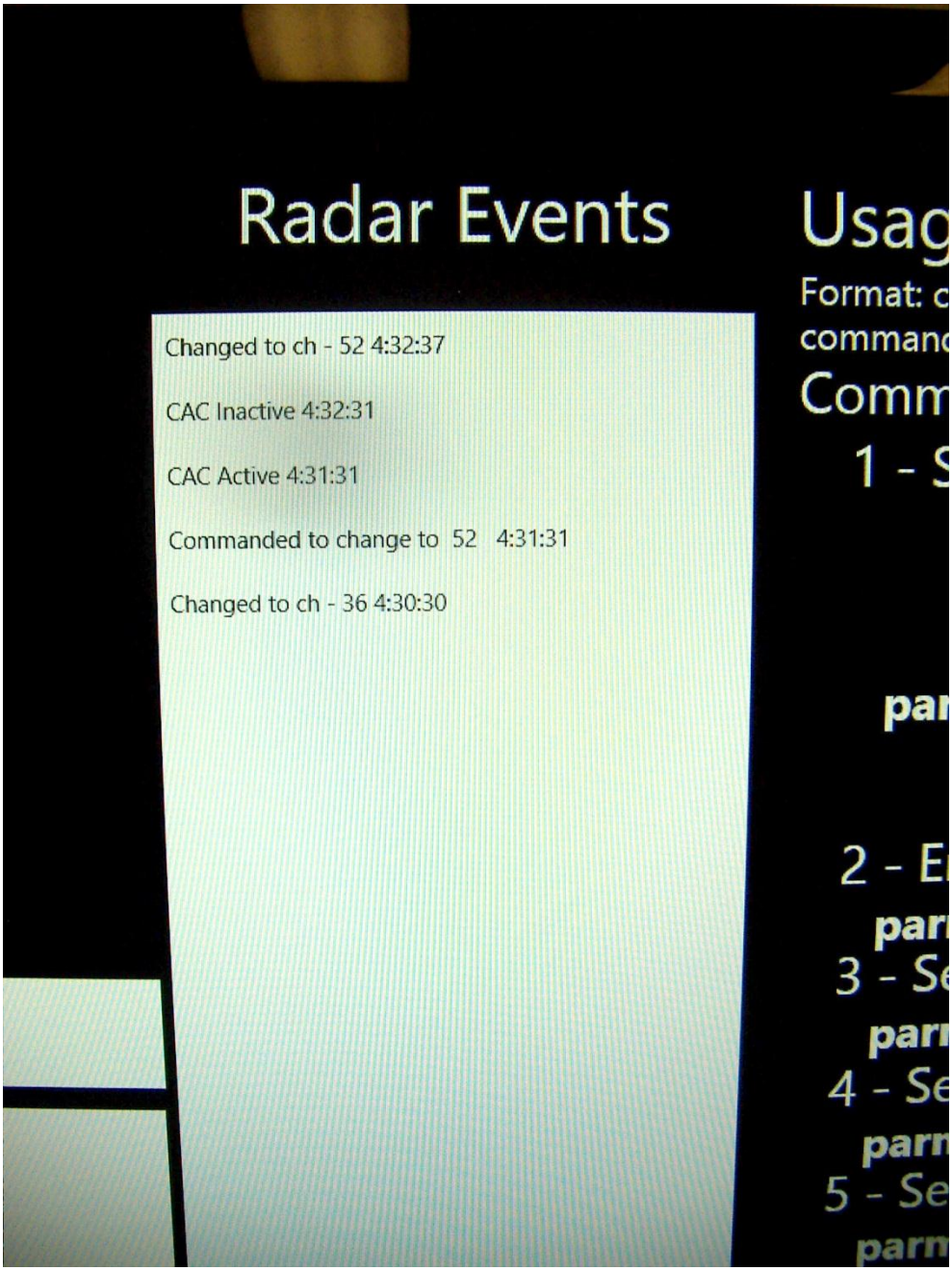
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT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

TIMING WITHOUT RADAR DURING CAC

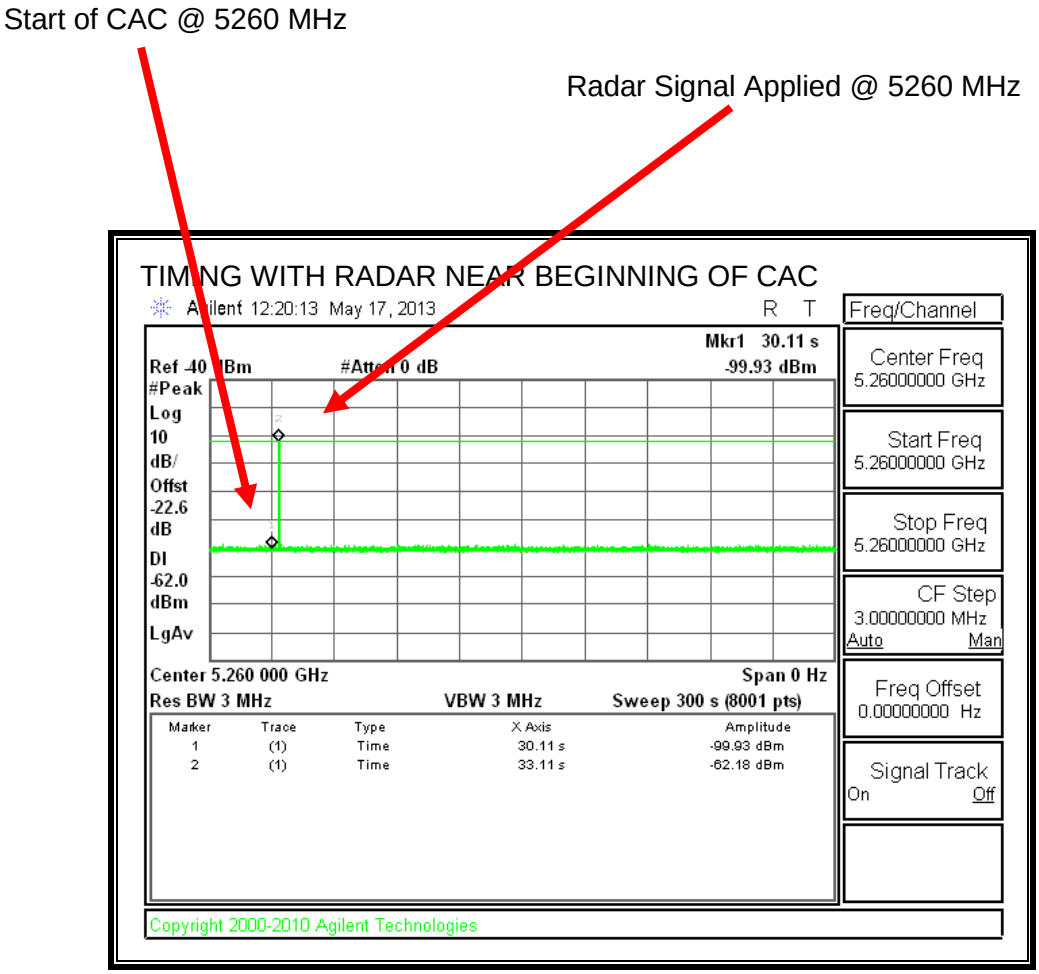


Transmissions begin on intended channel after completion of CAC.

EUT RADAR EVENTS LOG FILE - CAC TIMING WITHOUT RADAR

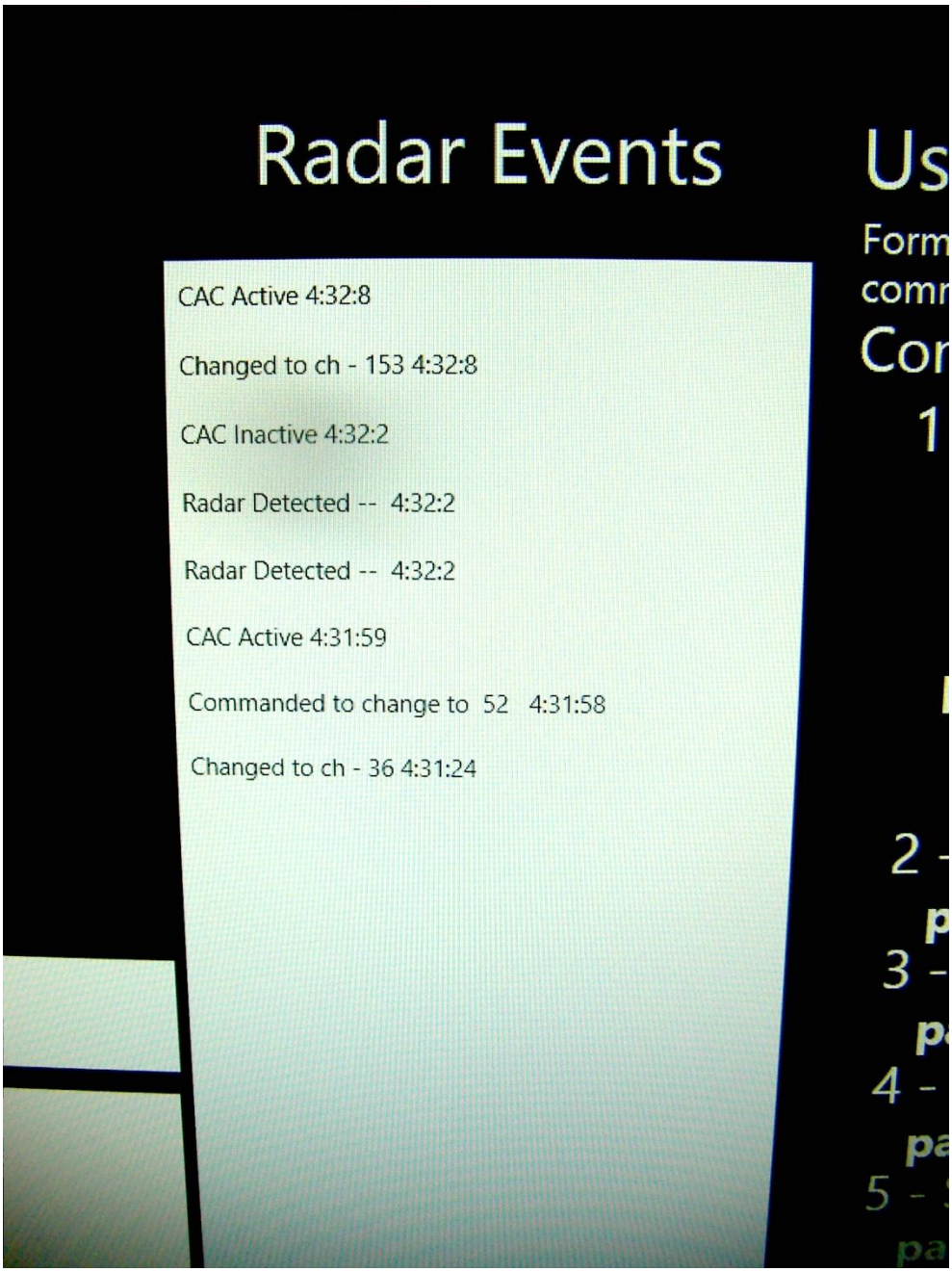


TIMING WITH RADAR NEAR BEGINNING OF CAC

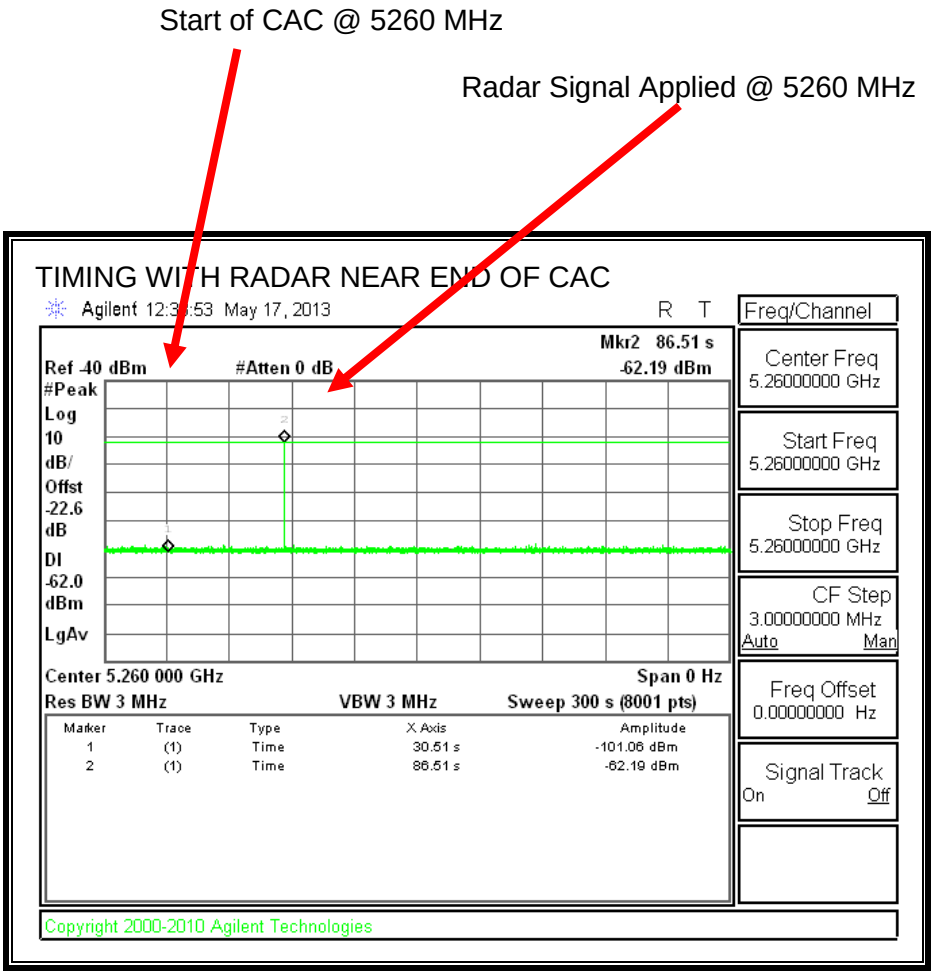


No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

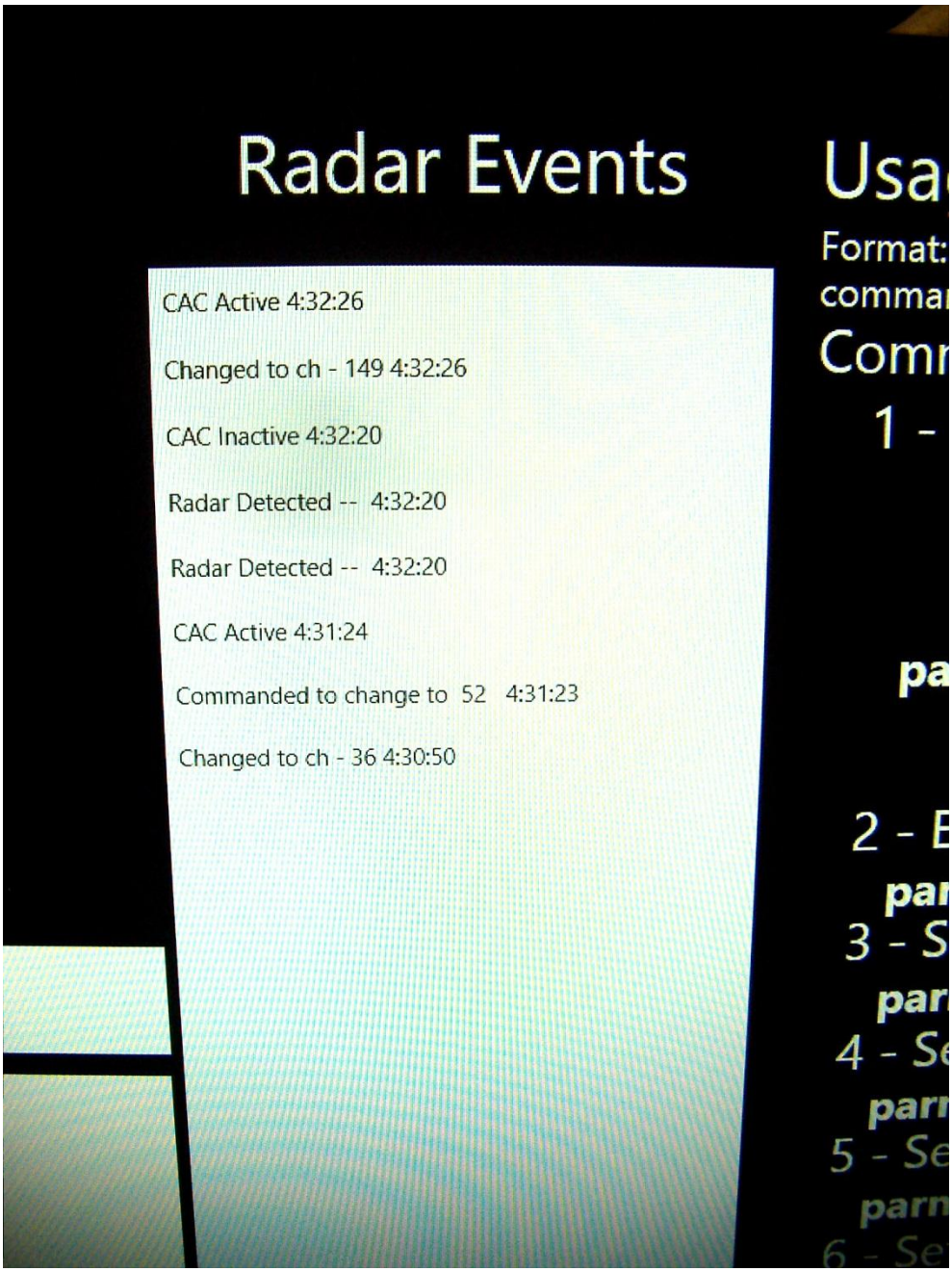


TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - END OF CAC



13.2.1. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

13.2.2. 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).

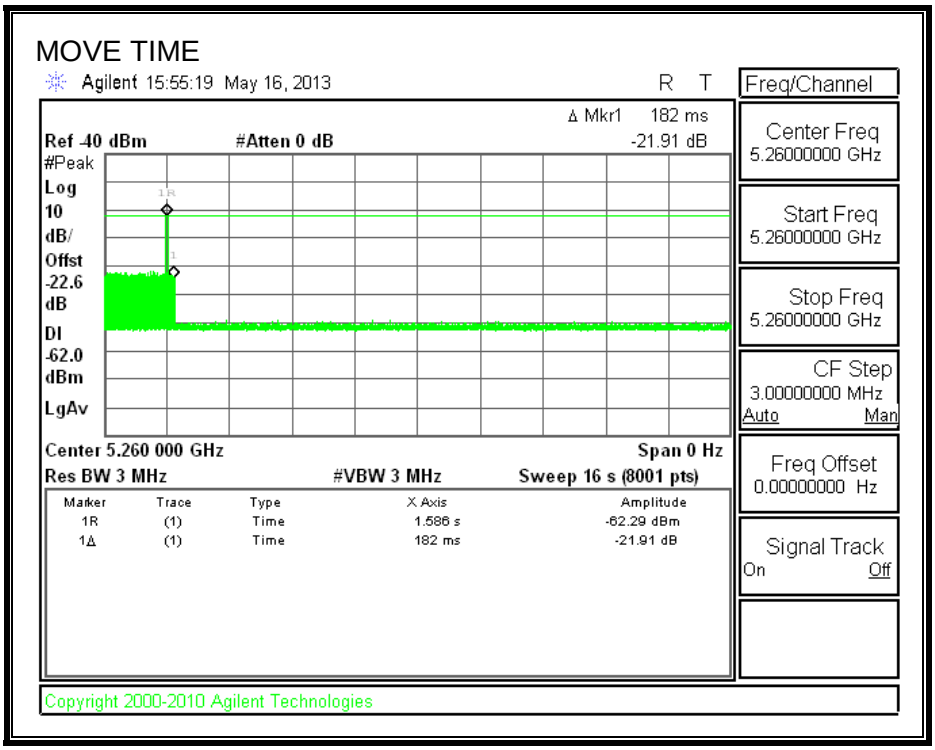
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

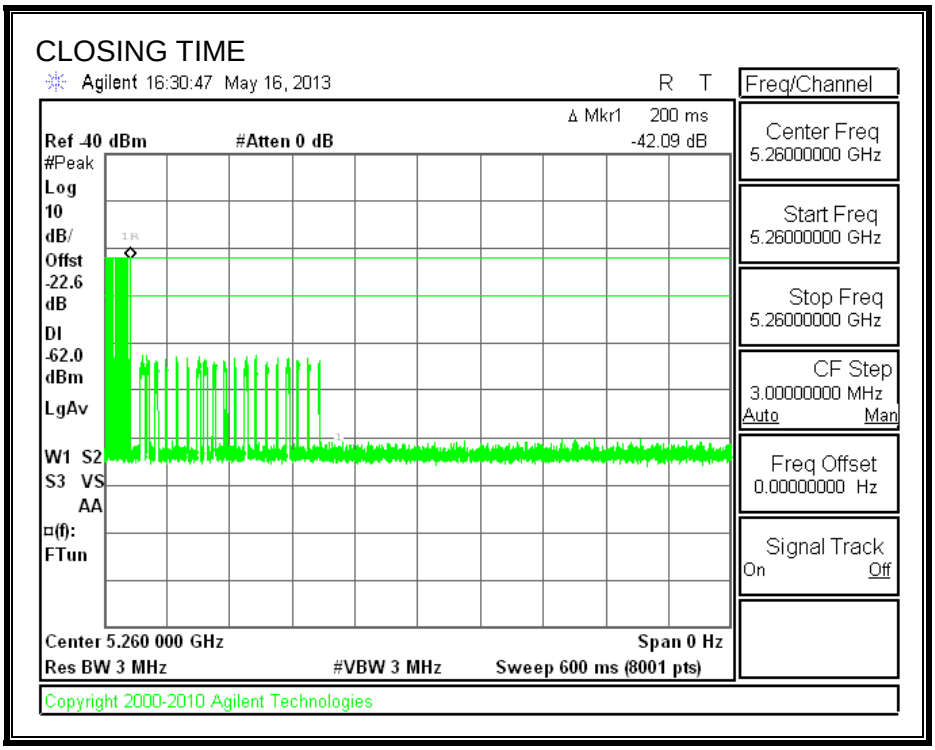
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.182	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	72.0	260

MOVE TIME

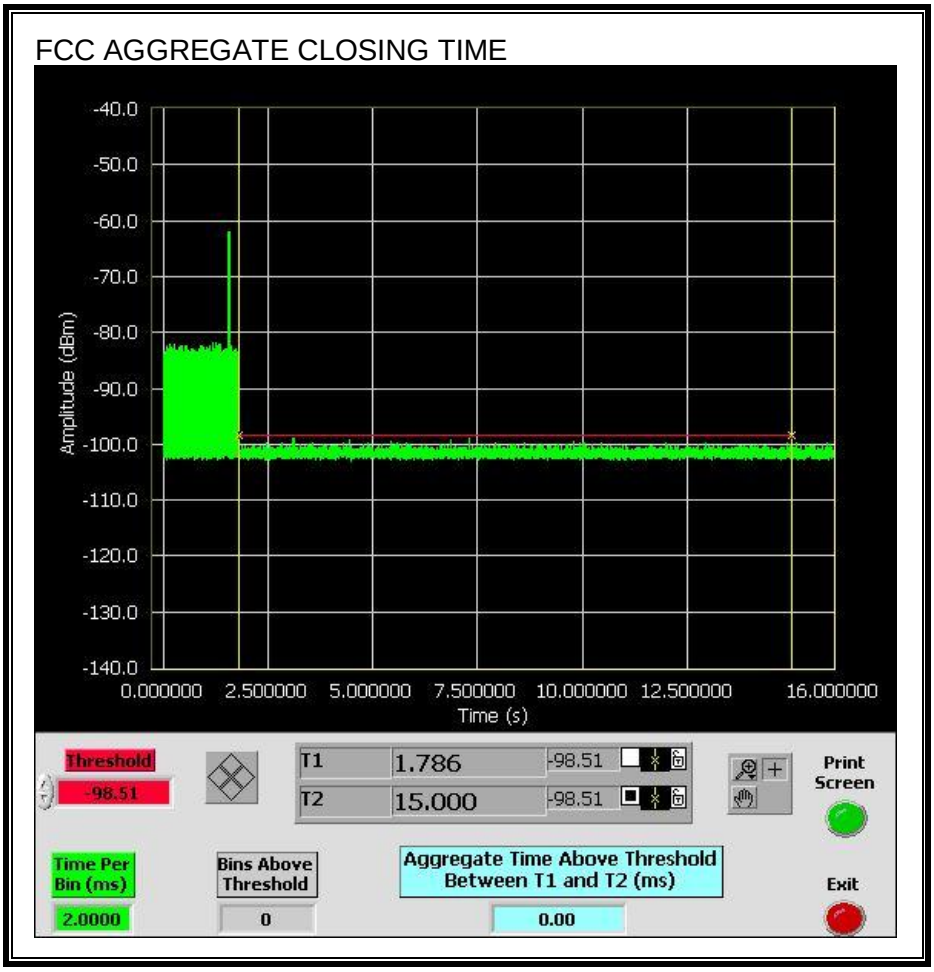


CHANNEL CLOSING TIME



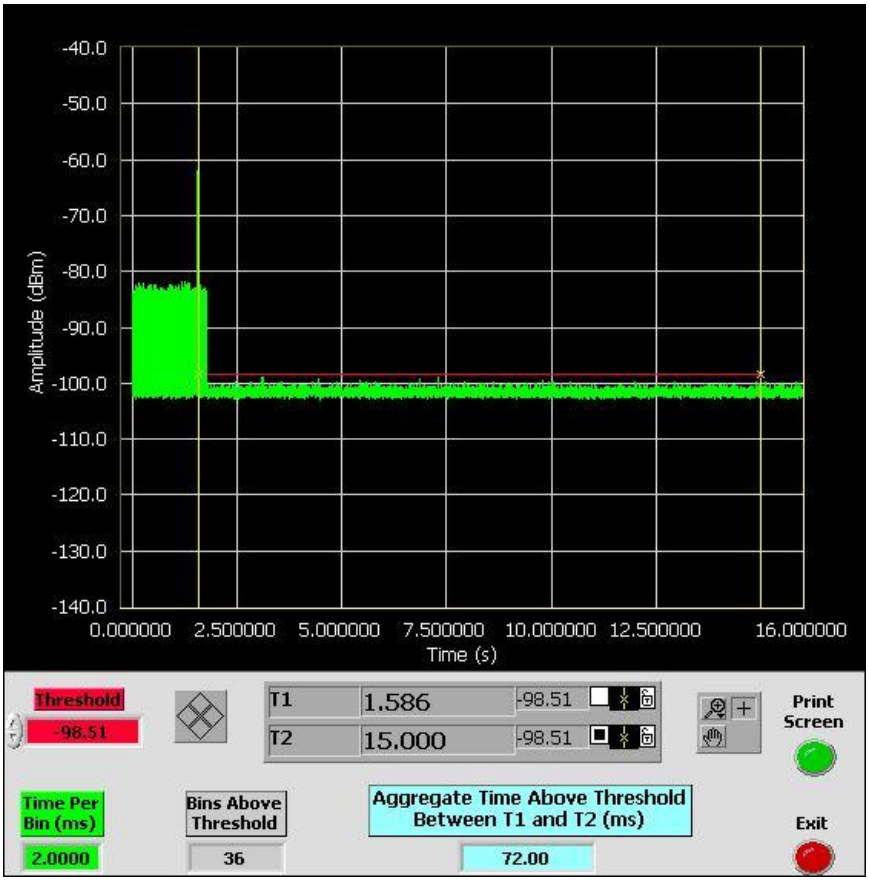
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.



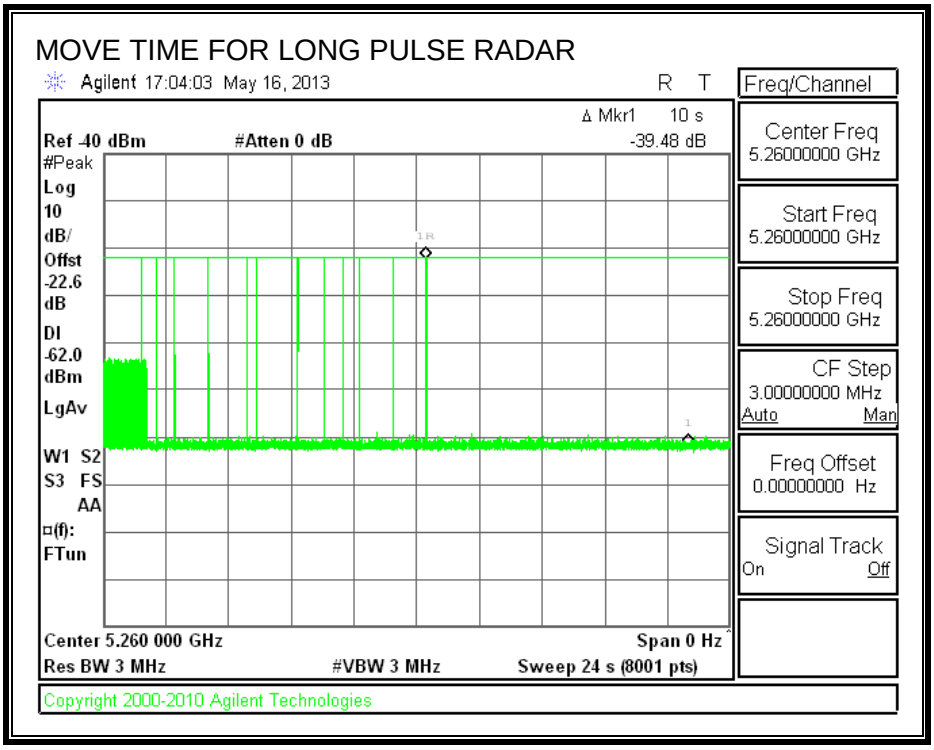
Only intermittent transmissions are observed during the IC aggregate monitoring period.

IC AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

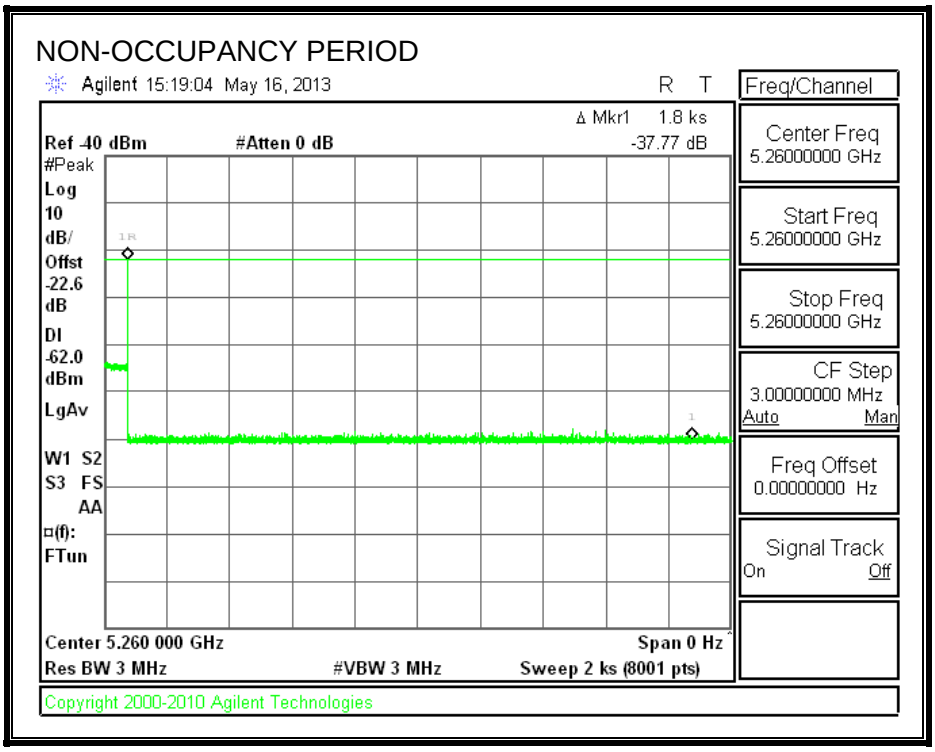
The traffic ceases prior to 10 seconds after the end of the radar waveform.



13.2.3. NON-OCCUPANCY PERIOD

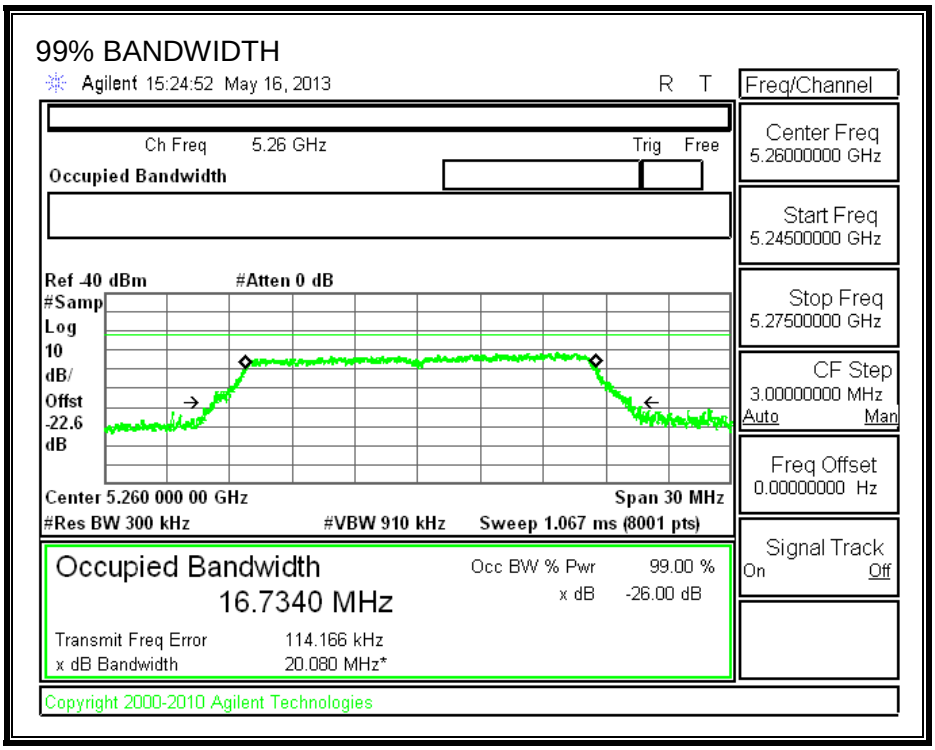
RESULTS

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



13.2.4. 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 (%)
5252	5268	16	16.734	95.6	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
5252	10	10	100	FL
5253	10	10	100	
5254	10	10	100	
5255	10	10	100	
5256	10	10	100	
5257	10	10	100	
5258	10	10	100	
5259	10	10	100	
5260	10	10	100	
5261	10	10	100	
5262	10	10	100	
5263	10	10	100	
5264	10	10	100	
5265	10	10	100	
5266	10	10	100	
5267	10	10	100	
5268	10	10	100	FH

13.2.5. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	83.33	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	96.67	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		93.33	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	91.18	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	No
12	Yes
13	Yes
14	No
15	Yes
16	No
17	No
18	Yes
19	No
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	4.9	179.00	23	Yes
2002	3.2	174.00	23	Yes
2003	1.3	185.00	29	Yes
2004	3.3	222.00	25	Yes
2005	2.9	207.00	23	Yes
2006	2.3	223.00	25	Yes
2007	1.3	203.00	24	Yes
2008	4.1	218.00	29	Yes
2009	1	212.00	24	Yes
2010	3.1	187.00	25	Yes
2011	4.5	163.00	25	Yes
2012	2.6	166.00	23	Yes
2013	2.5	225.00	27	Yes
2014	1.6	190.00	26	Yes
2015	1.2	176.00	28	Yes
2016	2.9	183.00	26	Yes
2017	3.2	156.00	29	Yes
2018	1.6	169.00	25	Yes
2019	2.4	167.00	25	Yes
2020	4.1	187.00	24	Yes
2021	2.6	193.00	26	Yes
2022	3.6	177.00	25	Yes
2023	1.4	195.00	23	Yes
2024	3.9	213.00	24	Yes
2025	1.4	185.00	24	Yes
2026	1.2	180.00	26	Yes
2027	3.9	171.00	26	Yes
2028	2	202.00	26	Yes
2029	2.7	155.00	28	Yes
2030	4.7	185.00	28	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	8.1	423.00	16	Yes
3002	7.5	266.00	18	Yes
3003	7.8	365.00	18	Yes
3004	8.6	257.00	17	Yes
3005	8.1	403.00	17	Yes
3006	6.9	461.00	17	Yes
3007	7.3	484.00	17	Yes
3008	5.9	381.00	17	Yes
3009	5.9	286.00	16	Yes
3010	6.9	407.00	18	Yes
3011	5.2	328.00	16	Yes
3012	9.2	479.00	17	Yes
3013	8.6	267.00	16	Yes
3014	9.4	299.00	18	Yes
3015	9	449.00	16	Yes
3016	5.8	261.00	17	Yes
3017	6.2	286.00	18	Yes
3018	7.2	265.00	16	Yes
3019	7.3	251.00	17	No
3020	5.9	500.00	18	Yes
3021	9.7	475.00	18	Yes
3022	8.4	500.00	16	Yes
3023	9.3	459.00	18	Yes
3024	6.3	453.00	17	Yes
3025	9.7	403.00	16	Yes
3026	7.5	450.00	18	Yes
3027	7.3	404.00	17	Yes
3028	5.8	395.00	16	Yes
3029	6.5	413	16	Yes
3030	7.2	293	18	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	17.4	394.00	12	Yes
4002	15.7	482.00	14	Yes
4003	20	290.00	15	Yes
4004	18.9	388.00	14	Yes
4005	14	280.00	13	Yes
4006	12.2	291.00	16	Yes
4007	19.5	314.00	15	Yes
4008	13.6	474.00	12	Yes
4009	15.8	456.00	16	Yes
4010	18.3	319.00	16	Yes
4011	12.2	318.00	13	Yes
4012	14	445.00	13	Yes
4013	10.2	307.00	12	Yes
4014	14.6	344.00	14	Yes
4015	10.2	332.00	13	Yes
4016	17.7	304.00	15	Yes
4017	19.5	368.00	15	No
4018	19.3	365.00	15	Yes
4019	12.5	422.00	15	Yes
4020	14.9	495.00	14	Yes
4021	12.5	397.00	15	Yes
4022	18.7	291.00	15	Yes
4023	10.4	463.00	14	Yes
4024	13.6	372.00	16	Yes
4025	19.6	462.00	16	Yes
4026	16	457.00	14	Yes
4027	17.3	375.00	15	Yes
4028	15.9	350.00	12	Yes
4029	14.3	282.00	15	Yes
4030	13.1	381.00	12	No

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	257	5252	1	Yes
2	732	5253	1	No
3	1207	5254	2	Yes
4	1682	5255	2	No
5	2157	5256	5	Yes
6	2632	5257	4	Yes
7	3107	5258	6	Yes
8	3582	5259	5	Yes
9	4057	5260	6	Yes
10	4532	5261	2	Yes
11	5007	5262	4	Yes
12	5482	5263	2	Yes
13	5957	5264	4	Yes
14	6432	5265	2	No
15	6907	5266	1	Yes
16	7382	5267	3	Yes
17	7857	5268	1	Yes
18	8332	5252	2	Yes
19	8807	5253	4	Yes
20	9282	5254	5	Yes
21	10232	5255	2	Yes
22	10707	5256	6	Yes
23	11182	5257	3	Yes
24	11657	5258	4	Yes
25	12132	5259	4	Yes
26	12607	5260	3	Yes
27	13082	5261	2	Yes
28	13557	5262	7	Yes
29	14032	5263	6	Yes
30	14507	5264	3	Yes
31	14982	5265	3	Yes
32	15457	5266	1	Yes
33	15932	5267	8	Yes
34	16407	5268	3	Yes

14. MAXIMUM PERMISSIBLE RF EXPOSURE

14.1. 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.

14.2. 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).

14.3. EQUATIONS

POWER DENSITY

Power density is given by:

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

Where

S = Power density in mW/cm^2
EIRP = Equivalent Isotropic Radiated Power in mW
D = Separation distance in cm

Power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by 10.

DISTANCE

Distance is given by:

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

Where

D = Separation distance in cm
EIRP = Equivalent Isotropic Radiated Power in mW
S = Power density in mW/cm^2

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

Source-based time-averaged EIRP = (DC / 100) * EIRP

Where

DC = Duty Cycle in %, as applicable
EIRP = Equivalent Isotropic Radiated Power in W

MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)

For multiple chain devices, and 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 EIRP (in linear units) of each transmitter.

Total EIRP = (EIRP1) + (EIRP2) + ... + (EIRPn)

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

MIMO AND COLOCATED TRANSMITTERS

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply:

The Power Density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as
(Power Density of chain or transmitter) / (Limit applicable to that chain or transmitter).

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

14.4. LIMITS AND IC EXEMPTION

VARIABLE LIMITS

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency:

824 MHz / 1500 = 0.55 mW/cm^2 (FCC)
824 MHz / 150 = 5.5 W/m^2 (IC).

FIXED LIMITS

For operation in the PCS band, the 2.4 GHz band and the 5 GHz bands:

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

INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

14.5. RF EXPOSURE RESULTS

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.

Calculation for the Accessory Radio

Single Chain and non-colocated transmitters								
Band	**Mode**	**Separatio Distance (cm)**	**Output Power (dBm)**	**Antenna Gain (dBi)**	**Duty Cycle (%)**	**EIRP (mW)**	**FCC Power Density (mW/cm^2)**	**IC Density (W/m^2)**
5 GHz	WLAN	20	11.50	3.14	100.0	29.1	0.006	0.06

Worst Case calculation of both Radios

Multiple chain or colocated transmitters									
Band	**Mode**	**Chain for MIMO**	**Separatio Distance (cm)**	**Output Power (dBm)**	**Antenna Gain (dBi)**	**Duty Cycle (%)**	**EIRP (mW)**	**FCC Power Density (mW/cm^2)**	**IC Density (W/m^2)**
5 GHz	Accesso ry WLAN	1		11.50	3.14	100.0	29.1		
2.4 GHz	Network WLAN	2		17.50	3.38	100.0	122.5		
2.4 GHz	Network WLAN	3		17.50	4.61	100.0	162.6		
Combined			20				331.2	0.066	0.66

The device operates above 1.5 GHz with a maximum EIRP less than or equal to 5 Watts as a mobile device with a minimum separation distance of 20 cm, therefore it is exempt from routine RF Exposure Evaluation under RSS-102.