



**FCC CFR47 PART 15 SUBPART E
CLASS II PERMISSIVE CHANGE
TEST REPORT
FOR**

MC85 MINI CARD 11b/g/a/n RADIO CARD

MODEL NUMBER: MC85P

FCC ID: UAY-MMC85PA

REPORT NUMBER: 06U10412-2

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Prepared for
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Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MARVELL SEMICONDUCTOR, INC.
5488 MARVELL LANE
SANTA CLARA, CA, 95054, USA

EUT DESCRIPTION: MC85 MINI CARD 11b/g/a/n RADIO CARD

MODEL: MC85P

SERIAL NUMBER: 010

DATE TESTED: JULY 3 – JULY 18, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



ALVIN ILARINA
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES



FRANK IBRAHIM
EMC ENGINEER
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n transceiver.

The radio module is manufactured by Marvell Semiconductor.

5.2. CLASS II PERMISSIVE CHANGE DESCRIPTION

Change #1 Adding Laptop PIFA Antenna

5.3. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
-----------------------	------	--------------------	-------------------

5150 to 5250 MHz Authorized Band

5180 - 5240	802.11a 20MHz	11.32	13.55
5190 - 5230	802.11a 40MHz	14.93	31.12
5180 - 5240	802.11n HT20	13.53	22.54
5190 - 5230	802.11n HT40	15.90	38.90

5250 to 5350 MHz Authorized Band

5260 - 5320	802.11a 20MHz	17.19	52.36
5270 - 5310	802.11a 40MHz	16.60	45.71
5260 - 5320	802.11n HT20	19.75	94.41
5270 - 5310	802.11n HT40	17.51	56.36

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes the following antenna:

1) PIFA manufactured by Apple, maximum gain of -1.6 dBi in the 2.4 GHz band, and 4.06 dBi in the 5.0 GHz band.

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was PCI rev. 1.0.0.0.2, MFG 2.1.0.36

The EUT driver software installed in the Laptop during testing was Marvell Semiconductor, Inc. Labtools rev. 1.0.3.p3.

The board revision of the EUT tested is 1.8.

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

5.6. WORST-CASE CONFIGURATION AND MODE

The 2x3 configuration was used for all testing in this report.

The worst- case data rates are determined to be as follows for each mode based on investigation by measuring the average power, peak power and PPSD across all data rates, bandwidths, and modulations.

The worst-case data rates for the 2GHz bands are: 11 Mbps for 802.11b; 54Mbps for 802.11g; MCS11 for 802.11n HT20; MCS15 for 802.11n HT40. These are based on baseline testing with this chipset.

The worst-case data rates for the 5GHz bands are: 9 Mbps for 802.11a 20MHz and 802.11a 40MHz; MCS0 for 802.11n HT20 and 802.11n HT40. These are based on baseline testing with this chipset.

All emissions tests were made with the worst-case data rates.

5.7. MODIFICATIONS

There were no modifications made to the revision EUT during the testing.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	Apple	A1151	CS01768	DoC
Power Adapter	Apple	A1172	052765-11	N/A

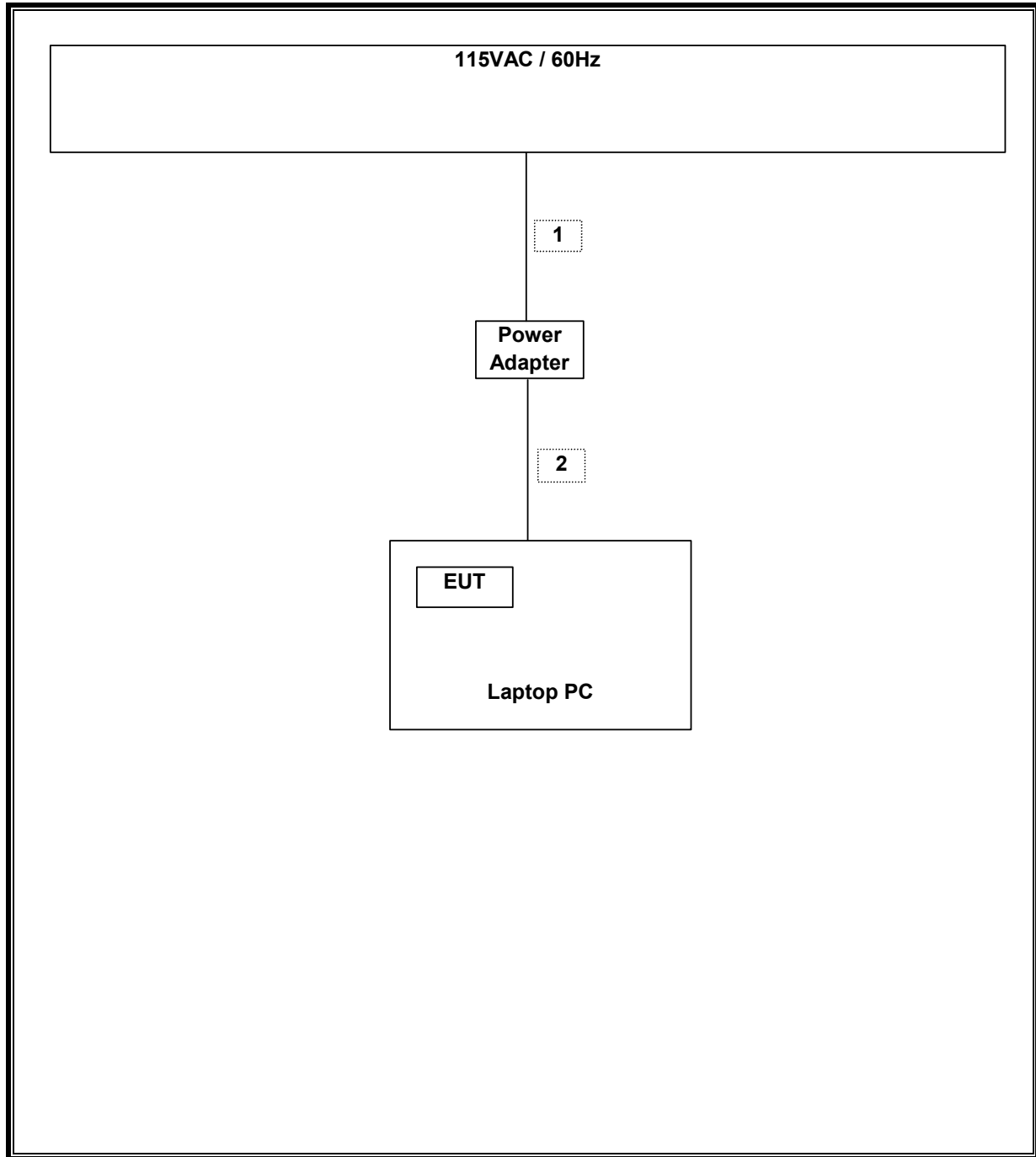
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	1.8m	N/A
2	DC	A	DC	Unshielded	1.8m	N/A

TEST SETUP

The EUT is installed inside a host laptop computer. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. 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	Serial Number	Cal Due
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Antenna, Bilog 30 MHz ~ 2 GHz	Sunol Sciences	JB1	A121003	9/3/2006
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2007
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	9/12/2006
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	9/2/2006
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/13/2007
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/18/2006
5.15-5.35 GHz Reject Filter	Micro-Tronics	BRC13190	1	CNR
5.725-5.825 GHz Reject Filter	Micro-Tronics	BRC13192	1	CNR
4.0 High Pass Filter	Micro Tronics	HPM13351	3	CNR
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY45300064	12/19/2006

7. LIMITS AND RESULTS

7.1.1. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

Each chain is measured separately and the total power is calculated using:

Total Power = $10 \log (10^{\text{(Chain 0 Power / 10)}} + 10^{\text{(Chain 2 Power / 10)}})$

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Mode Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
--------------	-----------------	-----------------------------	-----------------------------	---------------------------

802.11a 20M Mode

Low	5180	7.91	7.90	10.92
Middle	5260	13.19	13.23	16.22
High	5320	12.88	13.17	16.04

802.11a 40M Mode

Low	5190	11.07	11.10	14.10
Middle	5270	12.40	12.50	15.46
High	5310	9.53	9.20	12.38

802.11n HT20 Mode

Low	5180	9.84	10.04	12.95
Middle	5260	16.20	16.30	19.26
High	5320	13.52	13.50	16.52

802.11n HT40 Mode

Low	5190	12.07	11.75	14.92
Middle	5270	13.40	13.60	16.51
High	5310	11.97	11.78	14.89

7.1.2. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§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.

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations yields:

$$S = (30 * P * G) / (3770 * (d^2))$$

Changing to units of Power to mW and Distance to cm, using:

$$P (W) = P (mW) / 1000 \text{ and}$$

$$d (m) = d (cm) / 100$$

and substituting the logarithmic form of power and gain using:

$$P (mW) = 10^{(P (dBm) / 10)} \text{ and}$$

$$G (\text{numeric}) = 10^{(G (dBi) / 10)}$$

yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

LIMITS

From §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$

RESULTS

Band (MHz)	Power Density Limit (mW/cm²)	Total Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
5150 to 5250	1.0	15.90	4.40	2.92
5250 to 5350	1.0	19.75	4.40	4.55

7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

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

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

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

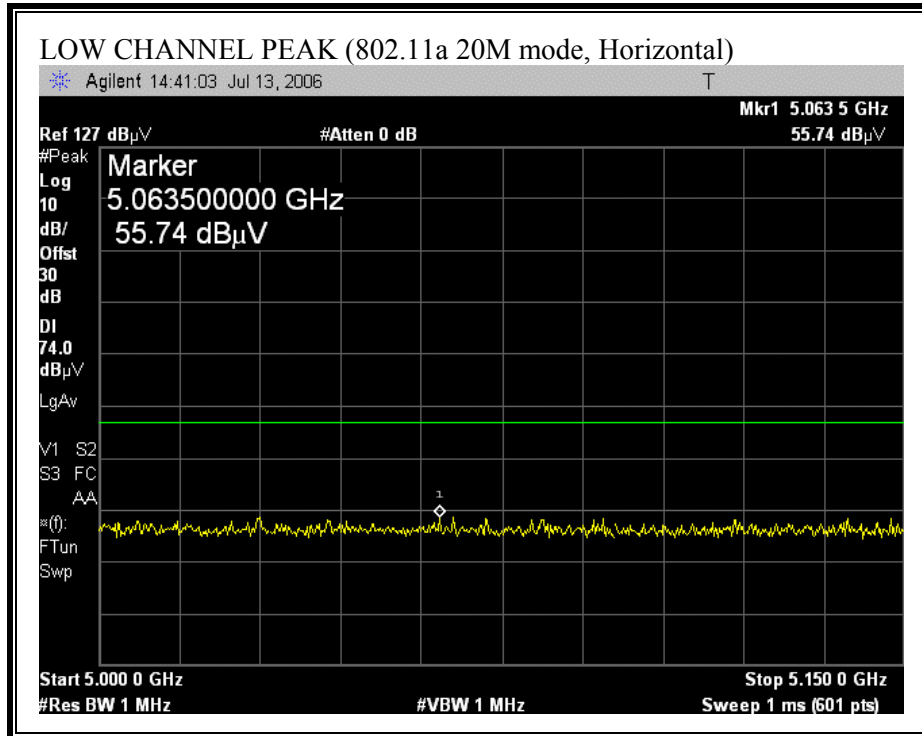
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

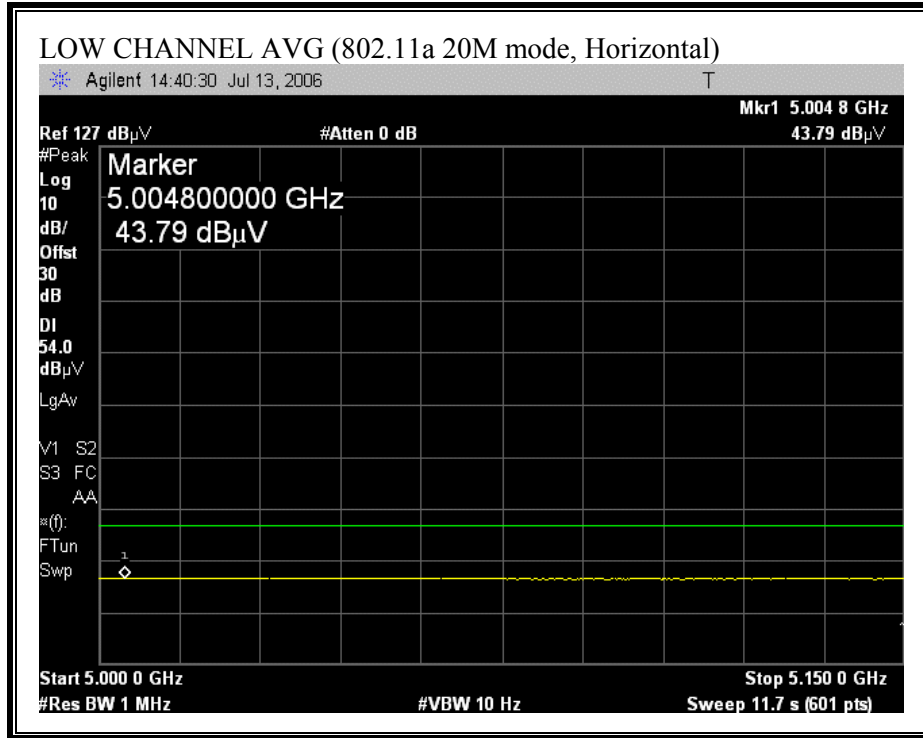
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

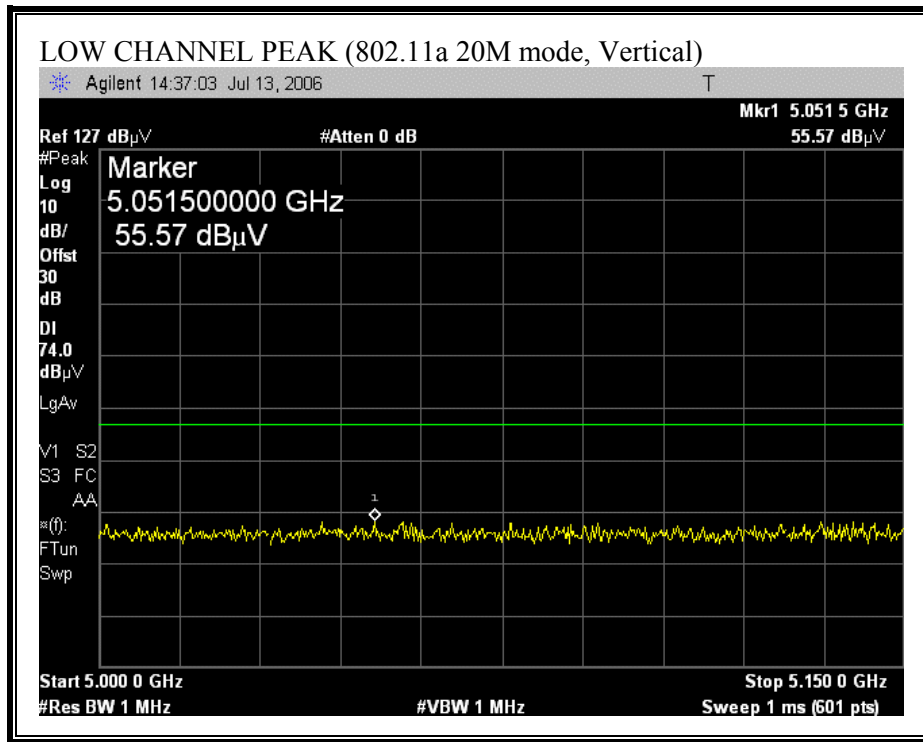
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

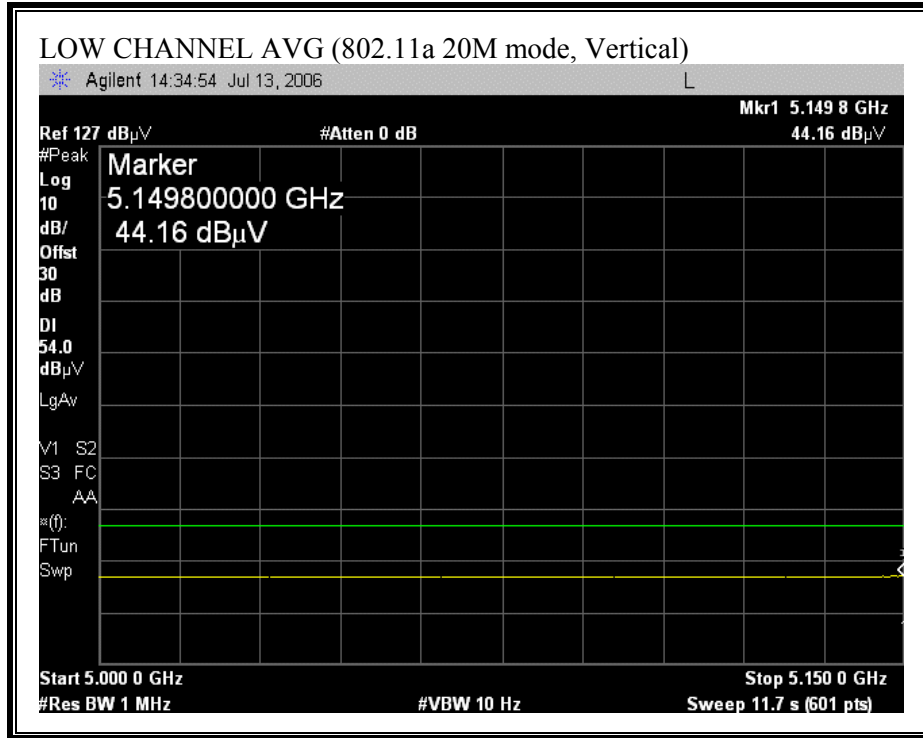
7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND

RESTRICTED BANDEDGE (802.11a 20M MODE, LOW CHANNEL)

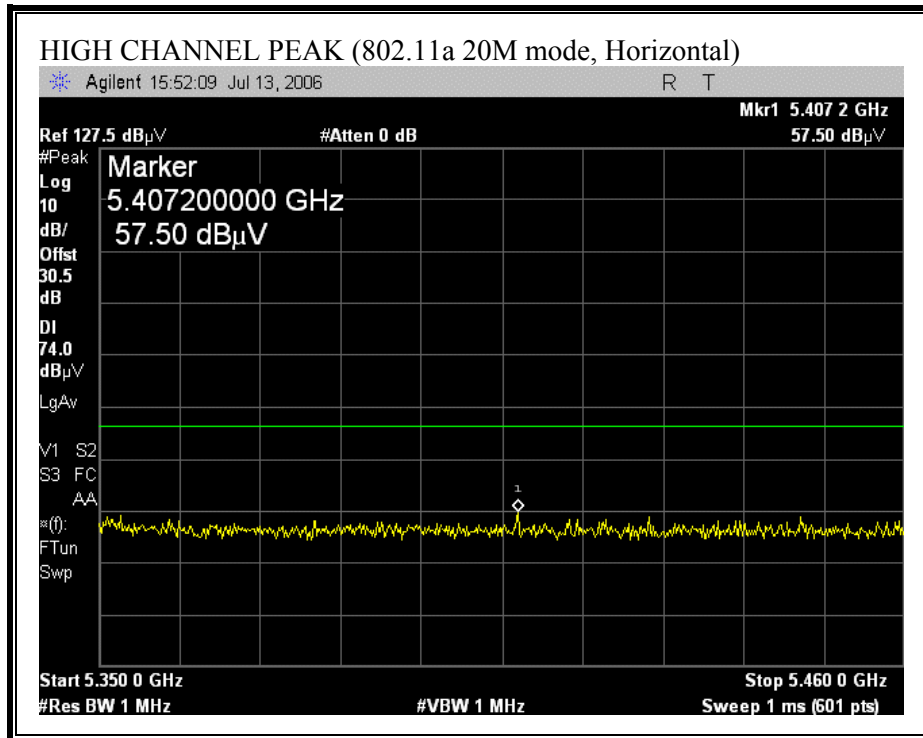


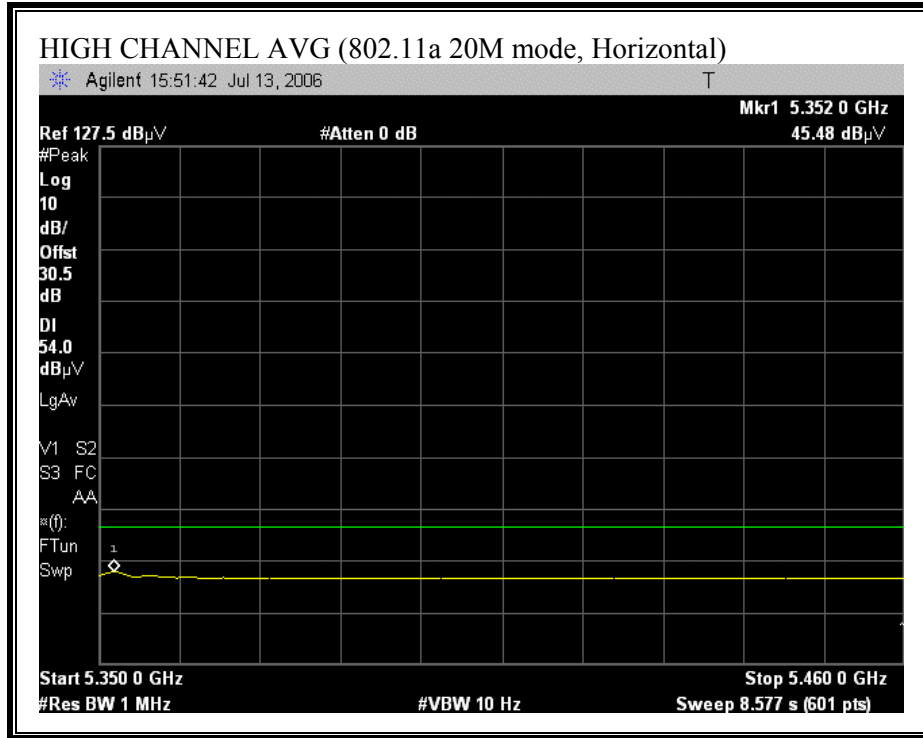


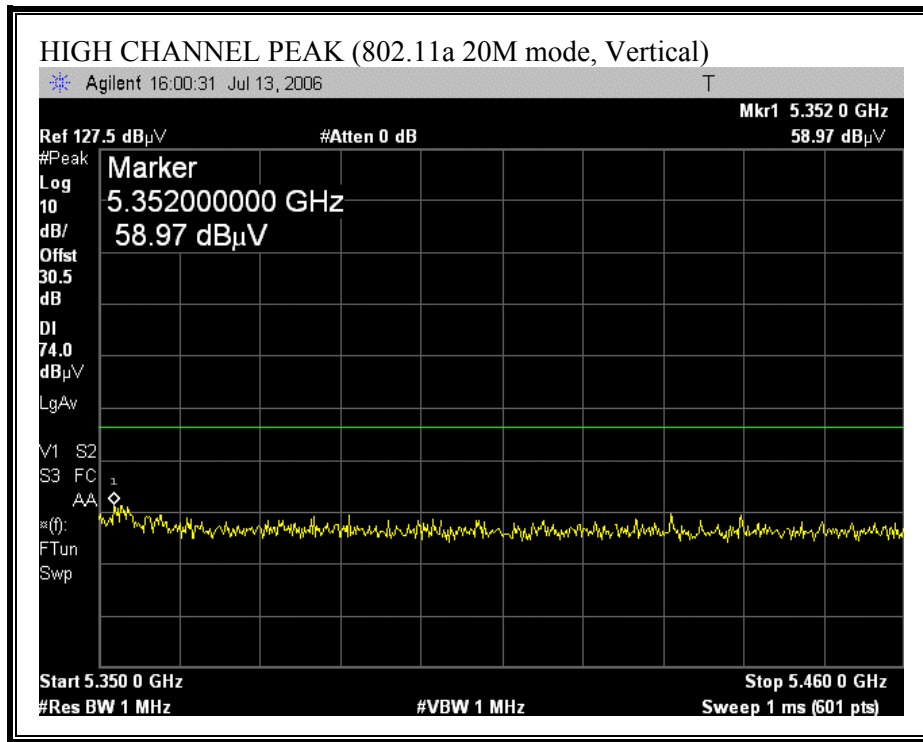


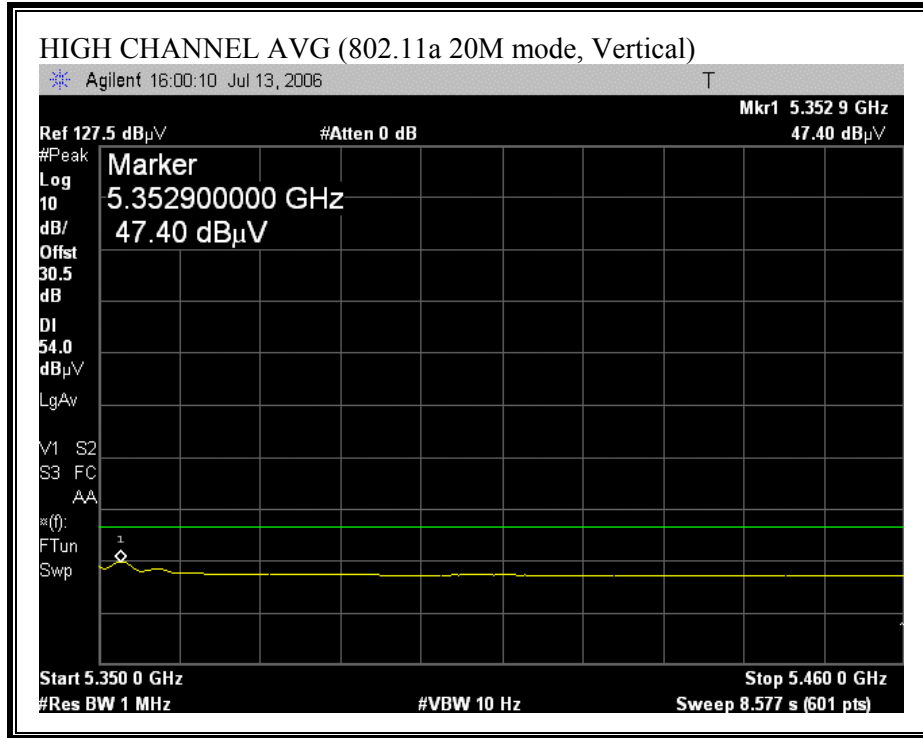


RESTRICTED BANDEDGE (802.11a 20M MODE, HIGH CHANNEL)









HARMONICS AND SPURIOUS EMISSIONS (802.11a 20M MODE)

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
 Project #: 06U10412
 Date: 07/18/06
 Test Engineer: Frank Ibrahim
 Configuration: EUT with PIFA Antenna inside Apple Laptop PC
 S/N: 010
 Mode: Continuously Transmitting in 11a 20M mode, 9Mbps

Test Equipment:

Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifier 1-26GHz T87 Miteq 924342	Pre-amplifier 26-40GHz	Horn > 18GHz T89; ARA 18-26GHz; S/N:1049
Hi Frequency Cables			
2 foot cable	3 foot cable Frank 177080001	12 foot cable Frank 187209001	HPF
			Reject Filter R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5180 MHz)															
15.540	3.0	53.1	40.2	38.0	6.2	-41.3	0.0	0.0	56.0	43.2	74	54	-18.0	-10.8	V, Settings: 54 58
15.540	3.0	53.6	40.1	38.0	6.2	-41.3	0.0	0.0	56.6	43.1	74	54	-17.4	-10.9	H, Settings: 54 58
Middle Channel (5260 MHz)															
15.780	3.0	52.1	39.5	37.9	6.3	-41.2	0.0	0.0	55.0	42.5	74	54	-19.0	-11.5	V, Settings: 5F 61
15.780	3.0	52.3	39.3	37.9	6.3	-41.2	0.0	0.0	55.2	42.3	74	54	-18.8	-11.7	H, Settings: 5F 61
High Channel (5320 MHz)															
10.640	3.0	52.5	39.9	37.3	5.1	-39.4	0.0	0.0	55.5	42.9	74	54	-18.5	-11.1	V, Settings: 5F 60
15.960	3.0	51.7	38.8	37.8	6.3	-41.1	0.0	0.0	54.7	41.8	74	54	-19.3	-12.2	V, Settings: 5F 60
10.640	3.0	48.5	35.7	37.3	5.1	-39.4	0.0	0.0	51.6	38.8	74	54	-22.4	-15.2	H, Settings: 5F 60
15.960	3.0	51.7	38.9	37.8	6.3	-41.1	0.0	0.0	54.7	41.9	74	54	-19.3	-12.1	H, Settings: 5F 60

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

EUT was scanned from 1 GHz to 40 GHz, no other signals from EUT were detected above the noise floor.

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
Project #: 06U10412
Date: 07/18/06
Test Engineer: Frank Ibrahim
Configuration: EUT with PIFA Antenna inside Apple Laptop PC
S/N: 010
Mode: Continuously Transmitting in 11a 20M mode, 9Mbps

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T87 Miteq 924342		

Hi Frequency Cables

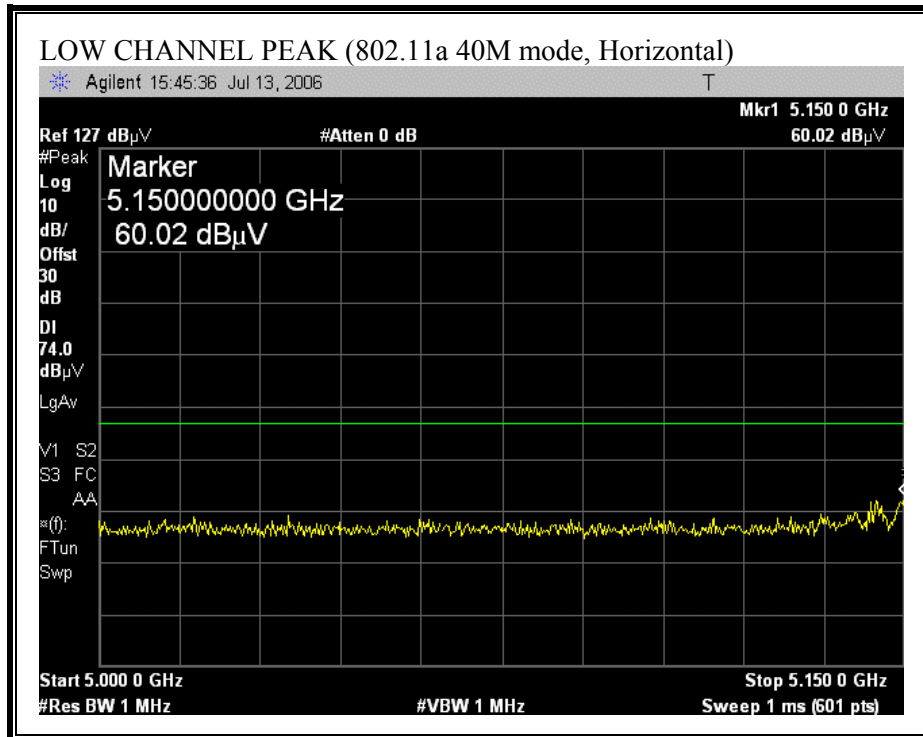
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Frank 177080001	Frank 187209001		R_001

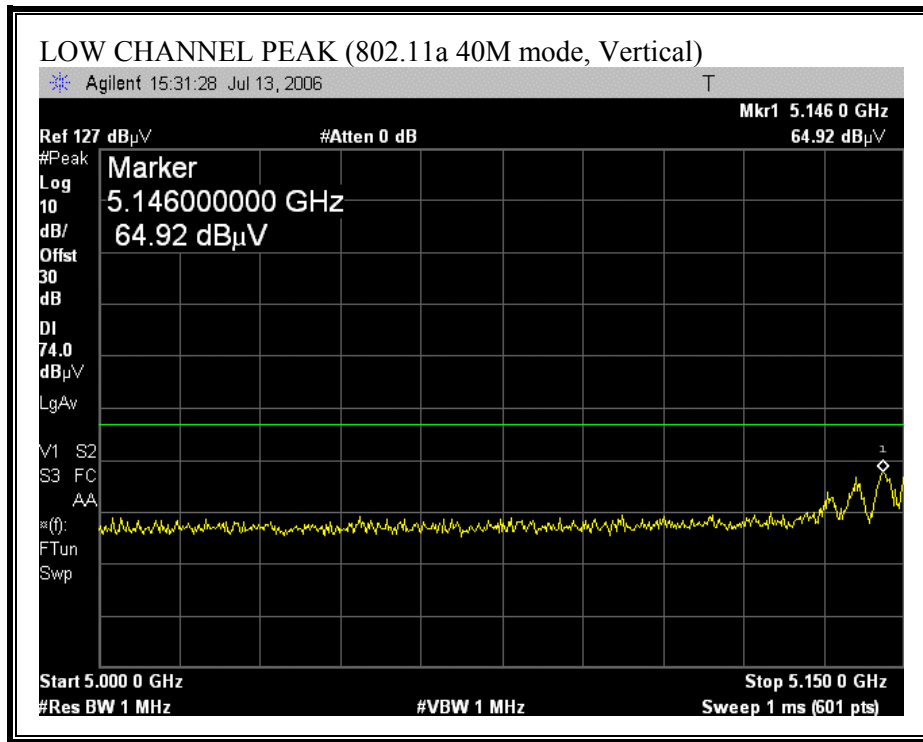
Peak Measurements
 RBW=VBW=1MHz
Average Measurements
 RBW=1MHz ; VBW=10Hz

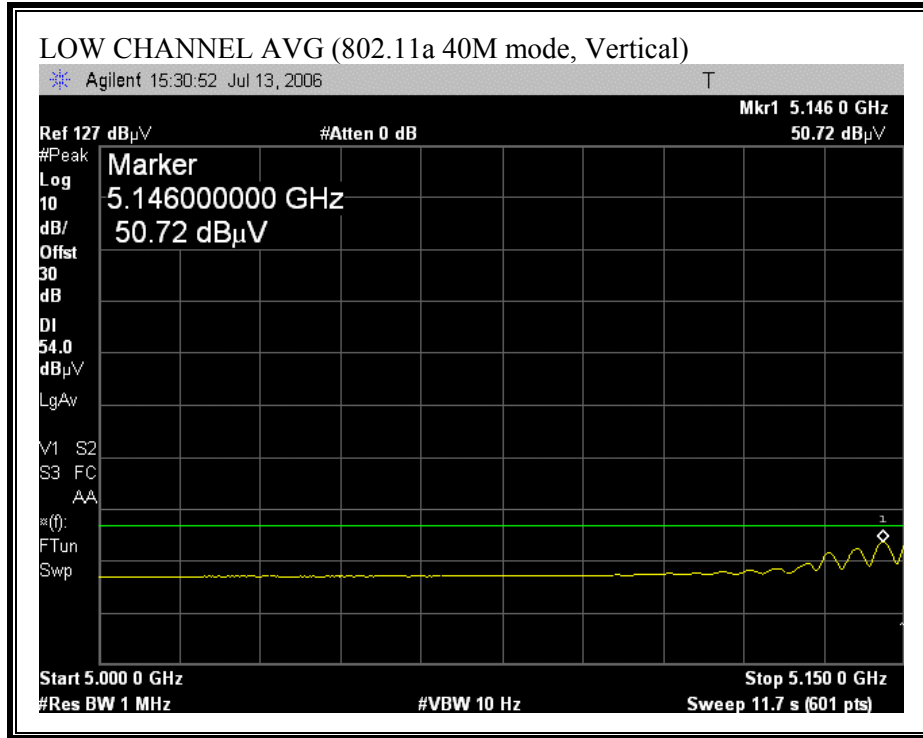
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBm	Avg dBm	Pk Lim dBm	Avg Lim dBm	Pk Mar dB	Avg Mar dB	Notes (V/H)
Middle Channel (5260 MHz)															
10.520	3.0	54.2	40.8	37.4	5.1	-39.3	0.0	0.0	-37.9	-51.3	-7.0	-27.0	-30.9	-24.3	V, Settings: 5F 6I
10.520	3.0	48.7	35.0	37.4	5.1	-39.3	0.0	0.0	-43.4	-57.1	-7.0	-27.0	-36.4	-30.1	H, Settings: 5F 6I

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

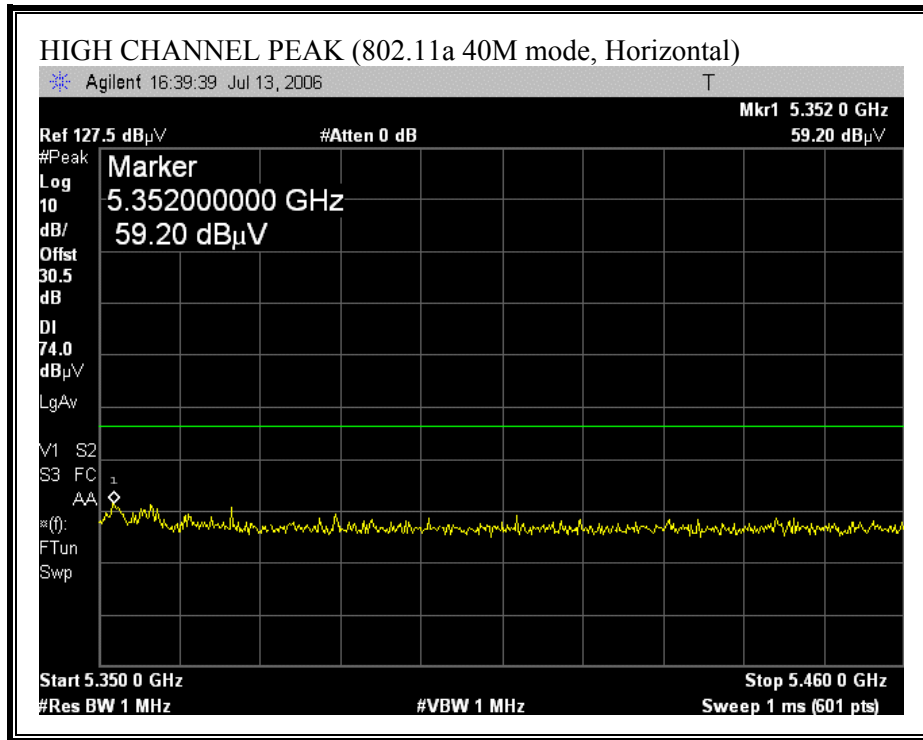
RESTRICTED BANDEDGE (802.11a 40M MODE, LOW CHANNEL)

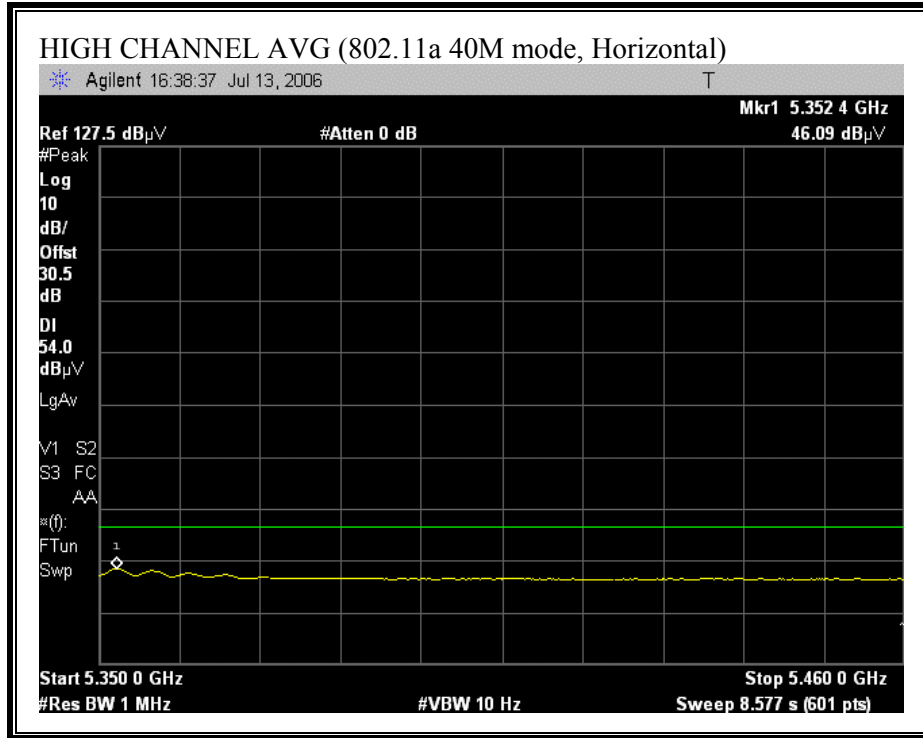


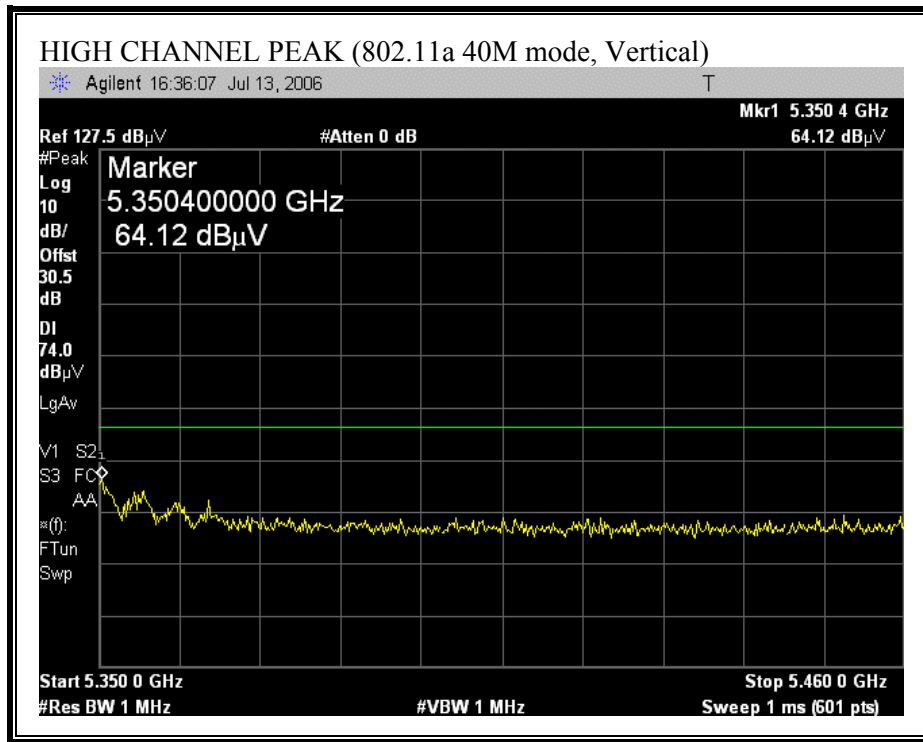


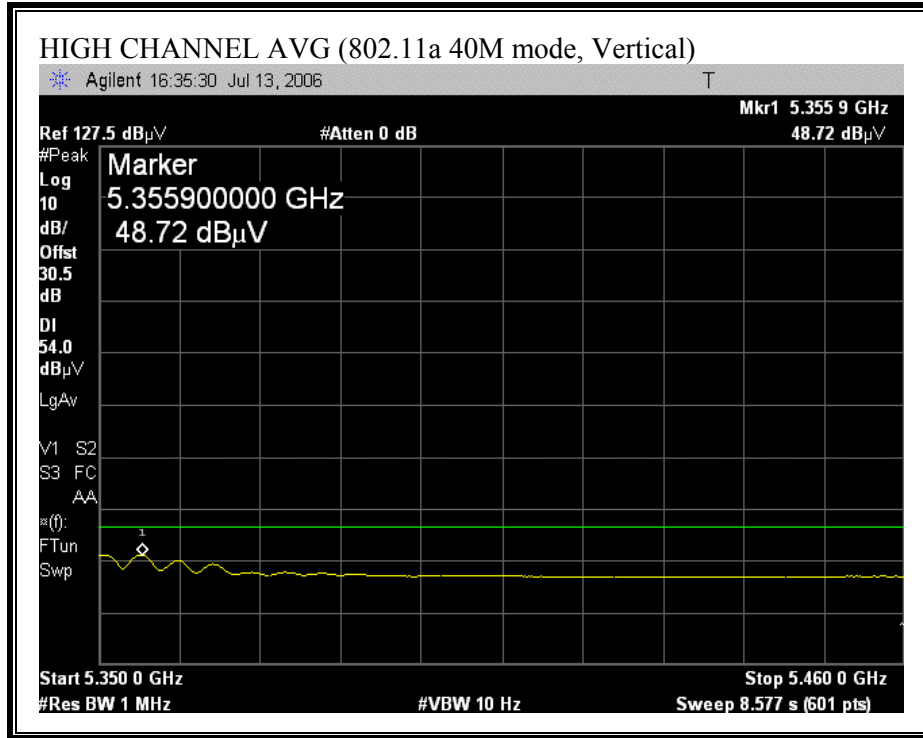


RESTRICTED BANDEDGE (802.11a 40M MODE, HIGH CHANNEL)









HARMONICS AND SPURIOUS EMISSIONS (802.11a 40M MODE)

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
 Project #: 06U10412
 Date: 07/18/06
 Test Engineer: Frank Ibrahim
 Configuration: EUT with PIFA Antenna inside Apple Laptop PC
 S/N: 010
 Mode: Continuously Transmitting in 11a 40M mode, 9Mbps

Test Equipment:

Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifier 1-26GHz T87 Miteq 924342	Pre-amplifier 26-40GHz	Horn > 18GHz T89; ARA 18-26GHz; S/N:1049
Hi Frequency Cables			
2 foot cable	3 foot cable Frank 177080001	12 foot cable Frank 187209001	HPF
			Reject Filter R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5190 MHz)															
15.570	3.0	51.6	38.3	38.0	6.2	-41.3	0.0	0.0	54.6	41.3	74	54	-19.4	-12.7	V, Settings: 5D 60
15.570	3.0	50.9	37.6	38.0	6.2	-41.3	0.0	0.0	53.9	40.6	74	54	-20.1	-13.4	H, Settings: 5D 60
Middle Channel (5270 MHz)															
15.810	3.0	51.2	38.5	37.9	6.3	-41.2	0.0	0.0	54.2	41.5	74	54	-19.8	-12.5	V, Settings: 6D 6F
15.810	3.0	51.5	38.2	37.9	6.3	-41.2	0.0	0.0	54.5	41.2	74	54	-19.5	-12.8	H, Settings: 6D 6F
High Channel (5310 MHz)															
10.620	3.0	48.5	35.1	37.4	5.1	-39.4	0.0	0.0	51.5	38.2	74	54	-22.5	-15.8	V, Settings: 5A 5A
10.620	3.0	47.7	35.2	37.4	5.1	-39.4	0.0	0.0	50.8	38.3	74	54	-23.2	-15.7	H, Settings: 5A 5A

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

EUT was scanned from 1 GHz to 40 GHz, no other signals from EUT were detected above the noise floor.

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
Project #: 06U10412
Date: 07/18/06
Test Engineer: Frank Ibrahim
Configuration: EUT with PIFA Antenna inside Apple Laptop PC
S/N: 010
Mode: Continuously Transmitting in 11a 40M mode, 9Mbps

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T87 Miteq 924342		

Hi Frequency Cables

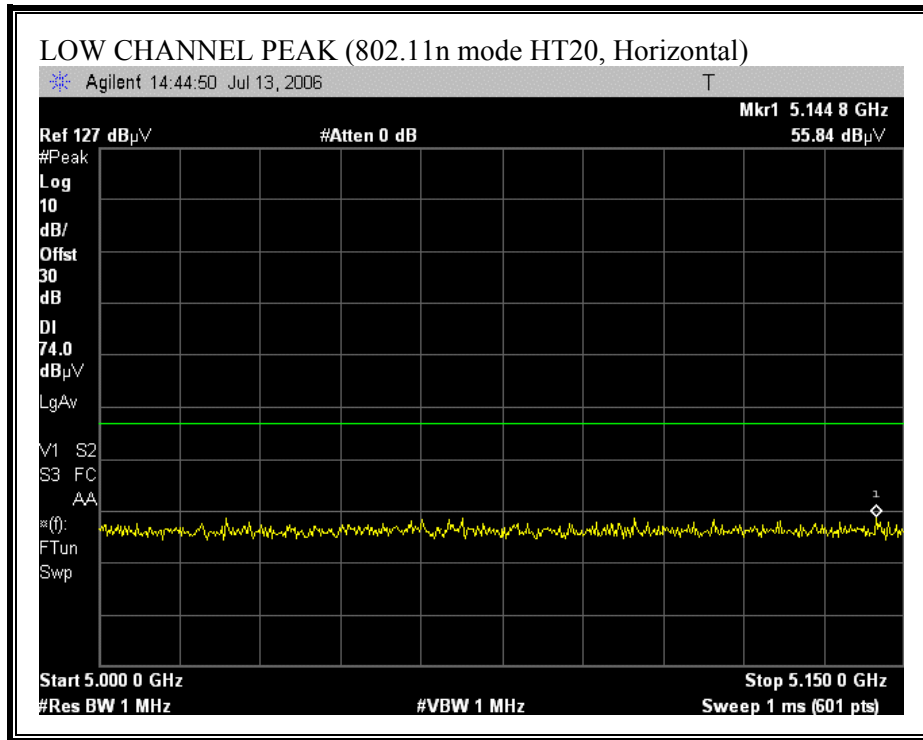
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Frank 177080001	Frank 187209001		R_001

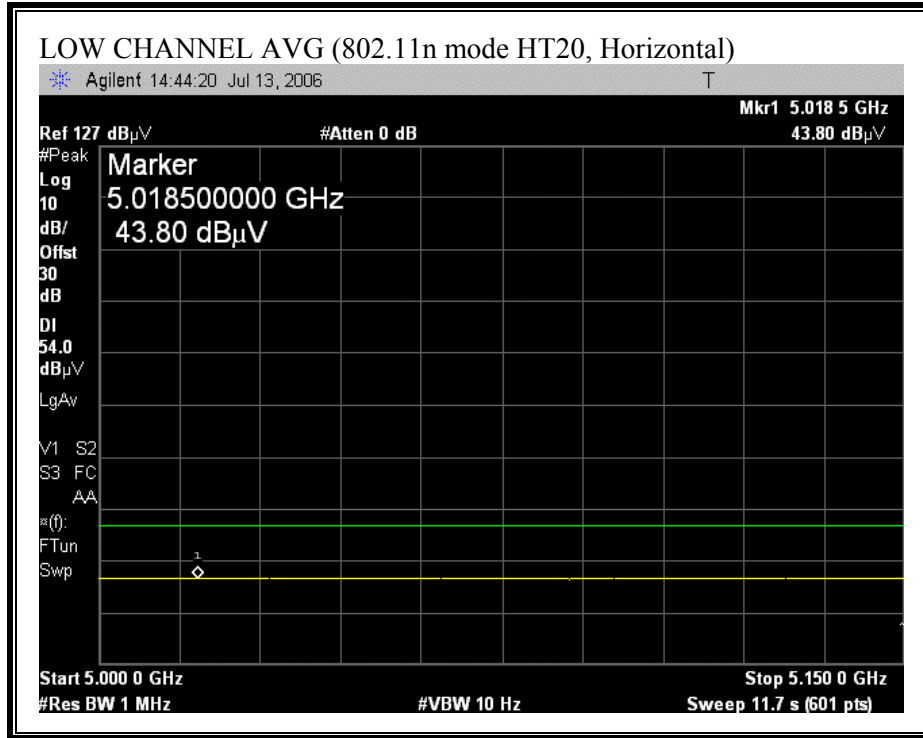
Peak Measurements
 RBW=VBW=1MHz
Average Measurements
 RBW=1MHz ; VBW=10Hz

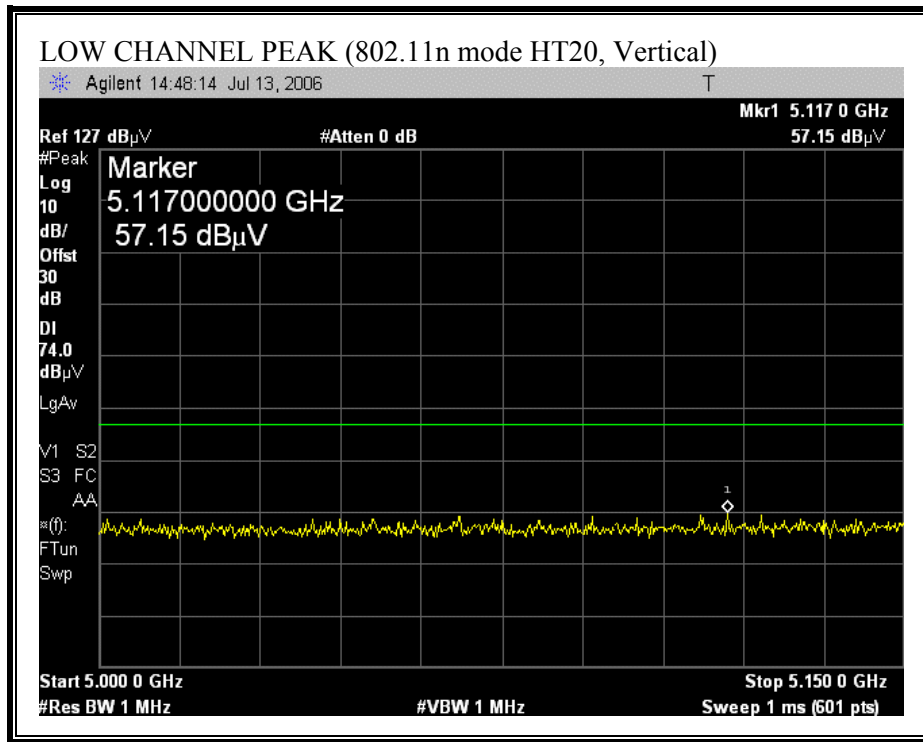
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBm	Avg dBm	Pk Lim dBm	Avg Lim dBm	Pk Mar dB	Avg Mar dB	Notes (V/H)
Middle Channel (5270 MHz)															
10.540	3.0	56.0	43.3	37.4	5.1	-39.3	0.0	0.0	-36.1	-48.8	-7.0	-27.0	-29.1	-21.8	V, Settings: 6D 6F
10.540	3.0	48.8	35.2	37.4	5.1	-39.3	0.0	0.0	-43.3	-56.9	-7.0	-27.0	-36.3	-29.9	H, Settings: 6D 6F

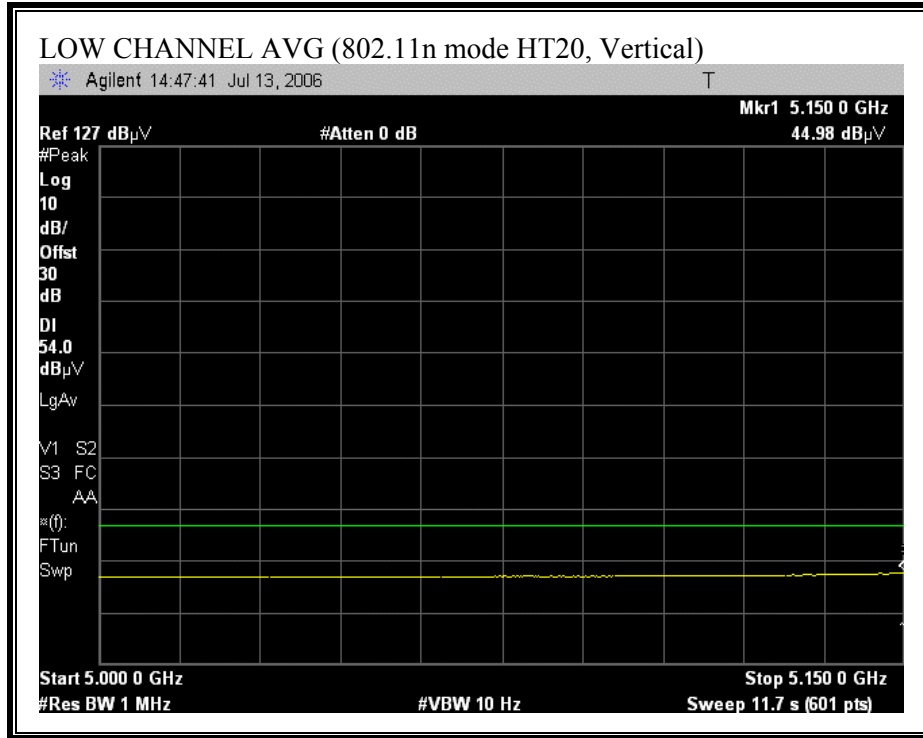
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

RESTRICTED BANDEDGE (802.11n MODE HT20, LOW CHANNEL)

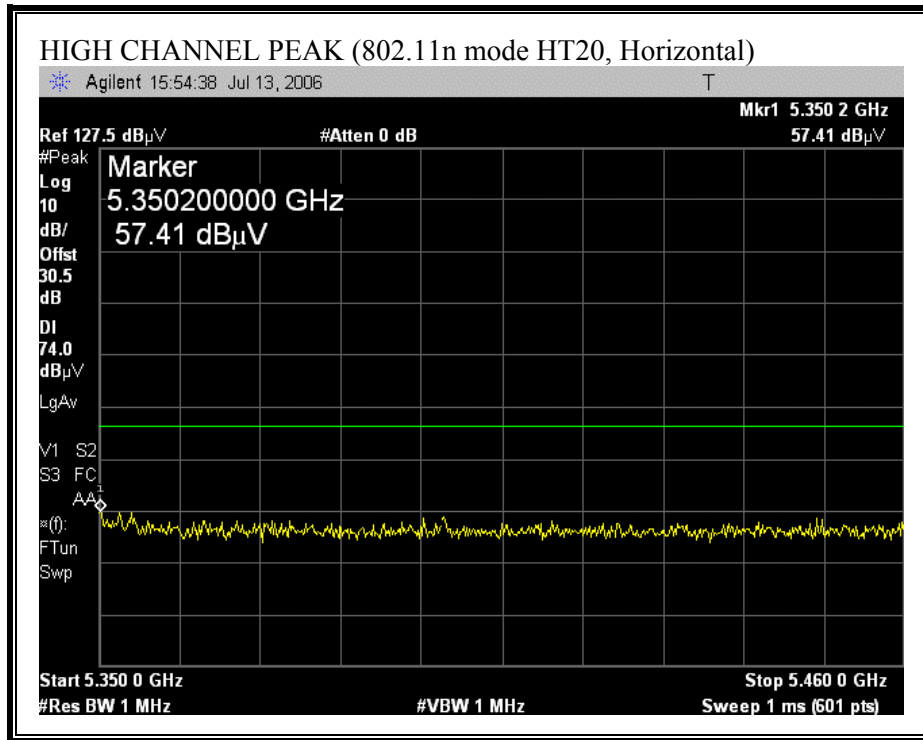


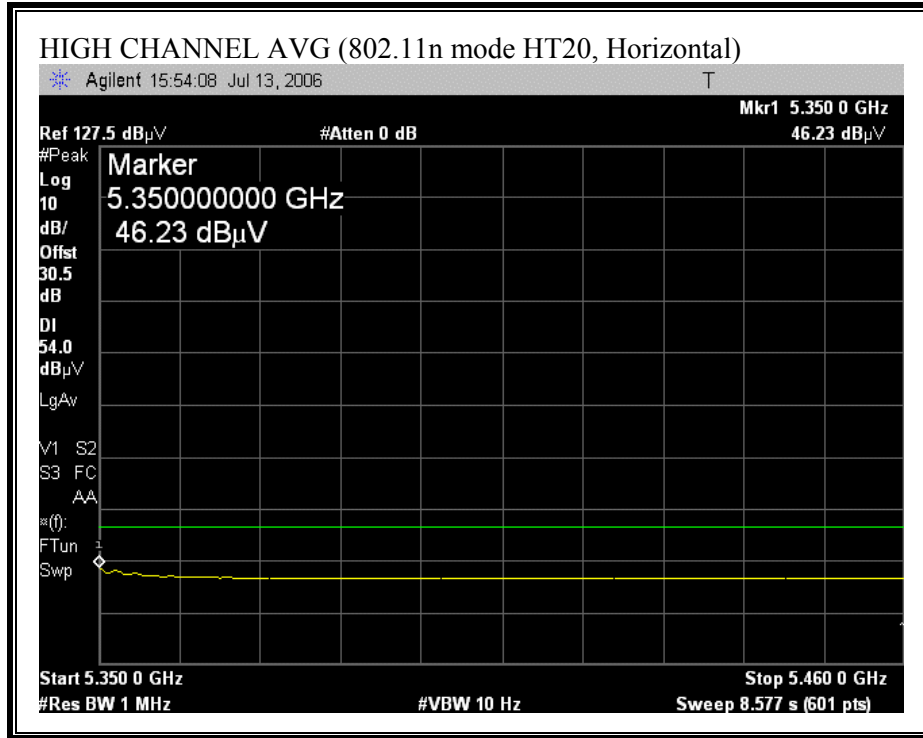


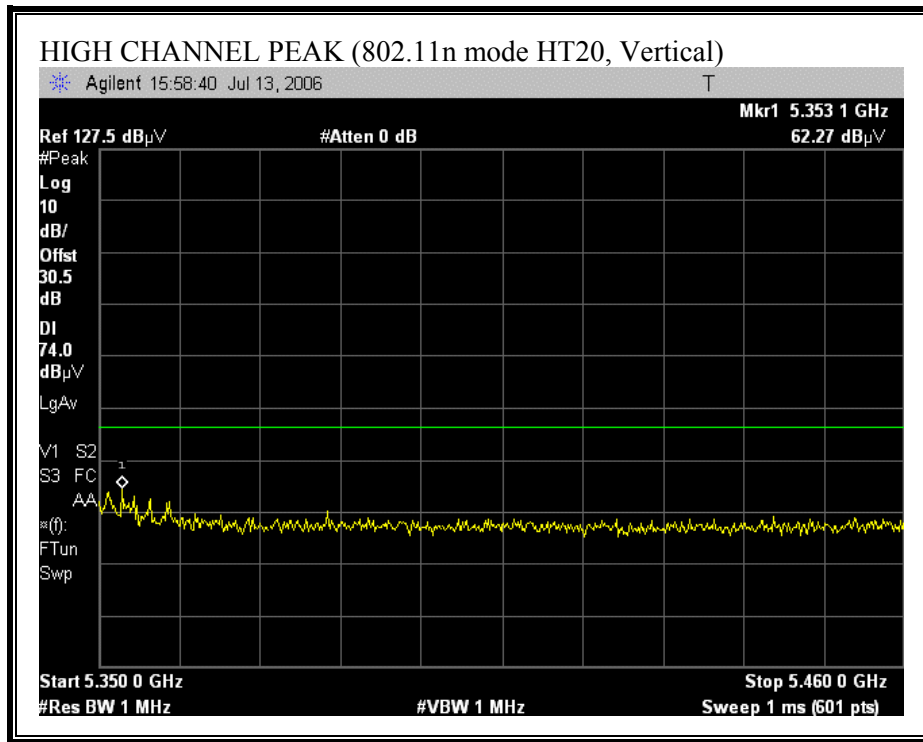


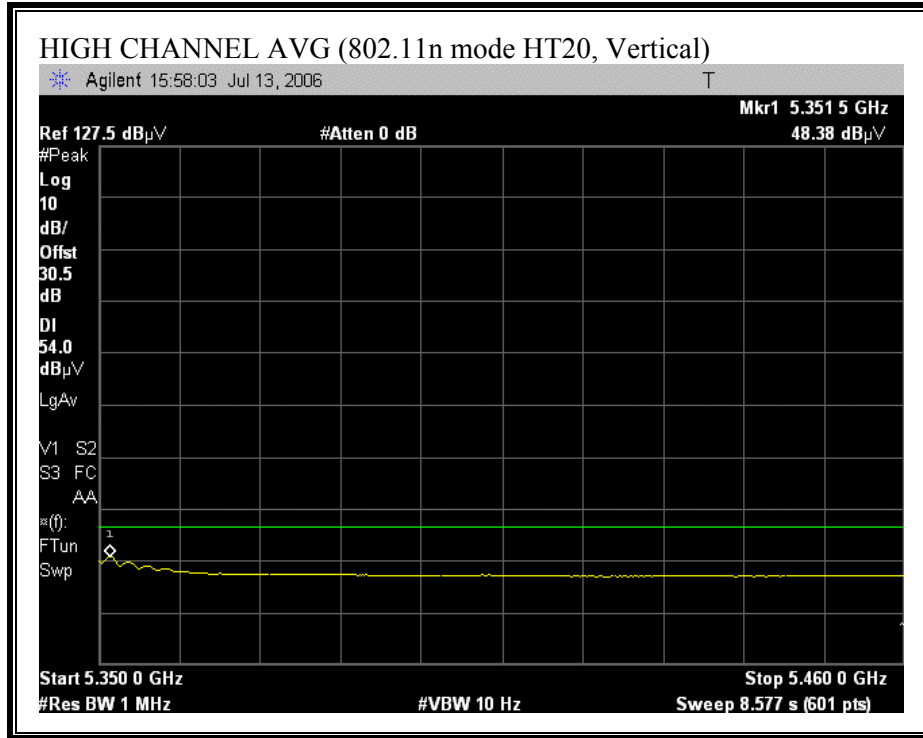


RESTRICTED BANDEDGE (802.11n MODE HT20, HIGH CHANNEL)









HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT20)

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
 Project #: 06U10412
 Date: 07/18/06
 Test Engineer: Frank Ibrahim
 Configuration: EUT with PIFA Antenna inside Apple Laptop PC
 S/N: 010
 Mode: Continuously Transmitting in HT 20M mode, MCS0

Test Equipment:

Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifier 1-26GHz T87 Miteq 924342	Pre-amplifier 26-40GHz	Horn > 18GHz T89; ARA 18-26GHz; S/N:1049
Hi Frequency Cables			
2 foot cable	3 foot cable Frank 177080001	12 foot cable Frank 187209001	HPF
			Reject Filter R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5180 MHz)															
15.540	3.0	50.6	37.6	38.0	6.2	-41.3	0.0	0.0	53.5	40.6	74	54	-20.5	-13.4	V, Settings: 68 5B
15.540	3.0	51.7	38.4	38.0	6.2	-41.3	0.0	0.0	54.7	41.4	74	54	-19.3	-12.6	H, Settings: 68 5B
Middle Channel (5260 MHz)															
15.780	3.0	50.5	37.9	37.9	6.3	-41.2	0.0	0.0	53.5	40.9	74	54	-20.5	-13.1	V, Settings: 69 6B
15.780	3.0	50.7	37.8	37.9	6.3	-41.2	0.0	0.0	53.7	40.8	74	54	-20.3	-13.2	H, Settings: 69 6B
High Channel (5320 MHz)															
10.640	3.0	49.8	37.8	37.3	5.1	-39.4	0.0	0.0	52.9	40.9	74	54	-21.1	-13.1	V, Settings: 5F 60
10.640	3.0	48.3	36.4	37.3	5.1	-39.4	0.0	0.0	51.4	39.5	74	54	-22.6	-14.5	H, Settings: 5F 60

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

EUT was scanned from 1 GHz to 40 GHz, no other signals from EUT were detected above the noise floor.

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
Project #: 06U10412
Date: 07/18/06
Test Engineer: Frank Ibrahim
Configuration: EUT with PIFA Antenna inside Apple Laptop PC
S/N: 010
Mode: Continuously Transmitting in HT 20M mode, MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T87 Miteq 924342		

Hi Frequency Cables

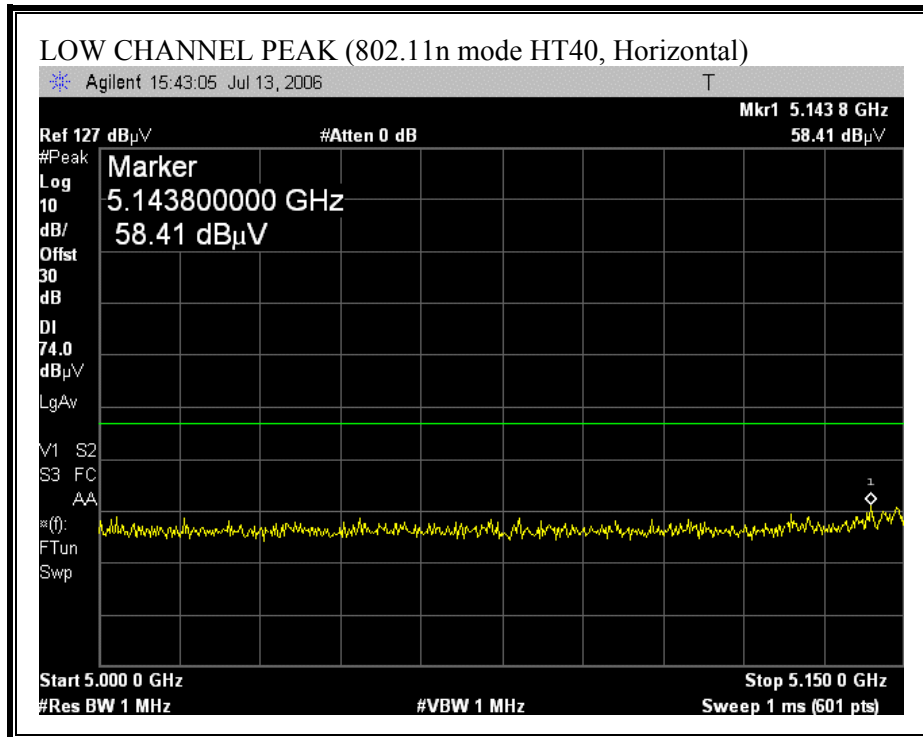
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Frank 177080001	Frank 187209001		R_001

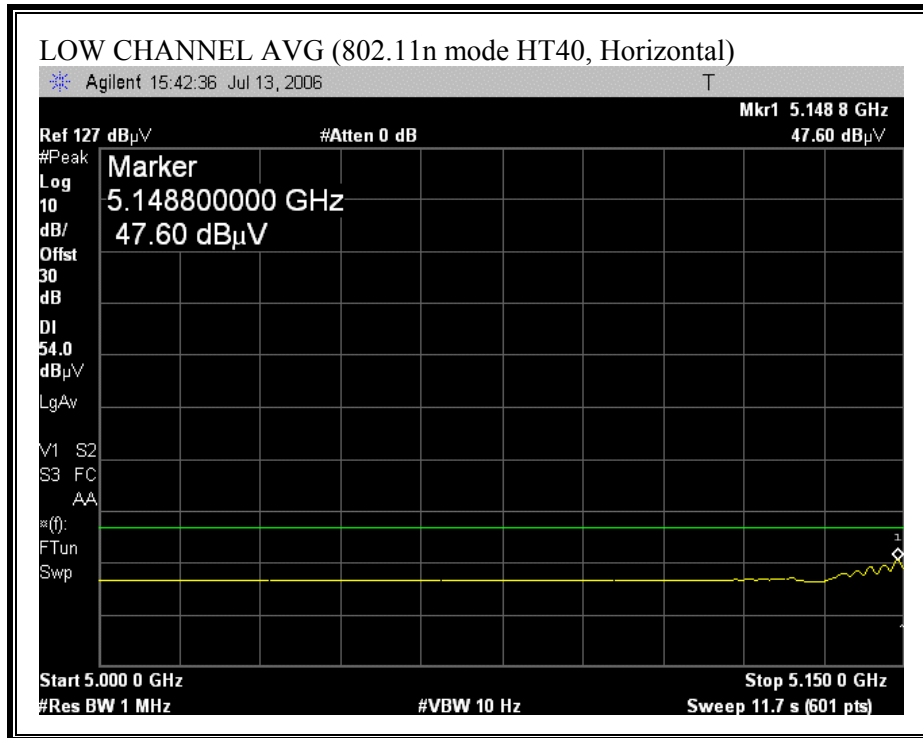
Peak Measurements
 RBW=VBW=1MHz
Average Measurements
 RBW=1MHz ; VBW=10Hz

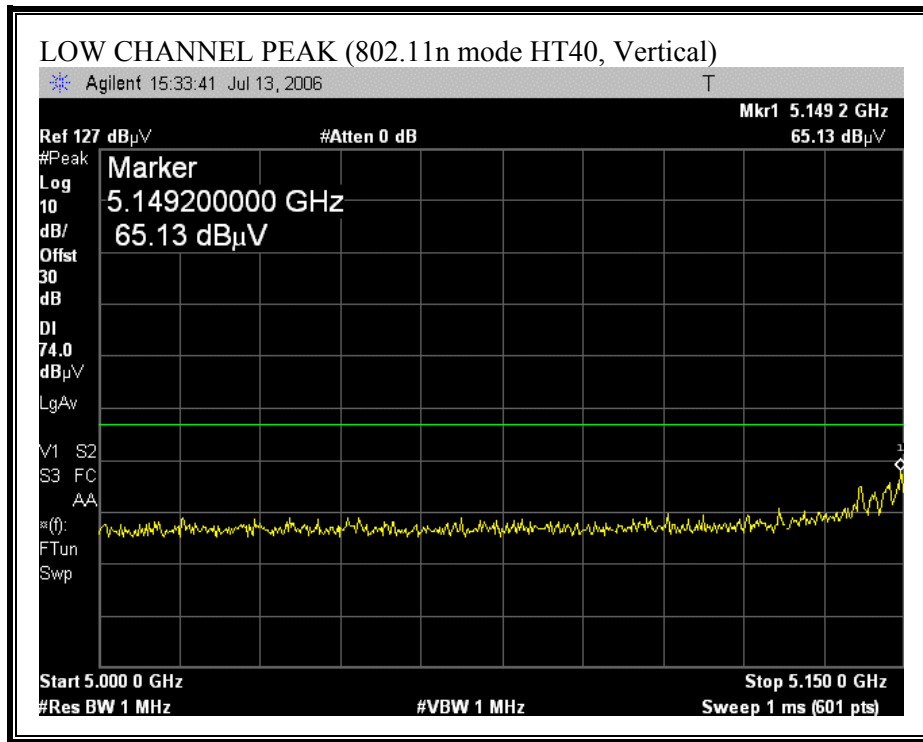
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBm	Avg dBm	Pk Lim dBm	Avg Lim dBm	Pk Mar dB	Avg Mar dB	Notes (V/H)
Middle Channel (5260 MHz)															
10.520	3.0	57.8	44.0	37.4	5.1	-39.3	0.0	0.0	-34.3	-48.1	-7.0	-27.0	-27.3	-21.1	V, Settings: 69 6B
10.520	3.0	49.7	35.6	37.4	5.1	-39.3	0.0	0.0	-42.4	-56.5	-7.0	-27.0	-35.4	-29.5	H, Settings: 69 6B

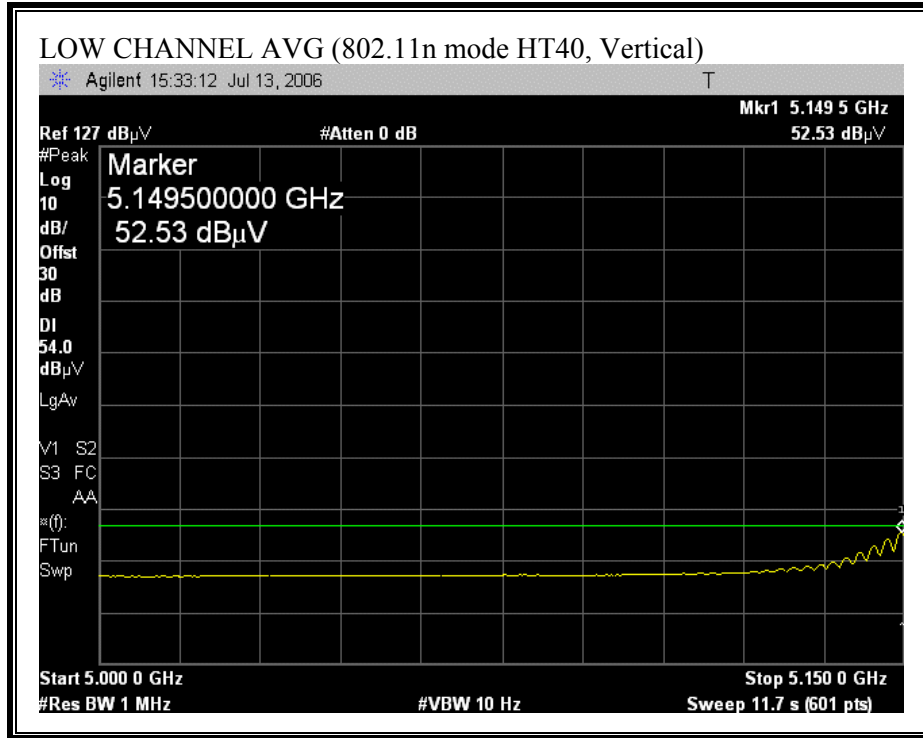
f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter
		Avg Lim	Average Field Strength Limit
		Pk Lim	Peak Field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

RESTRICTED BANDEDGE (802.11n MODE HT40, LOW CHANNEL)

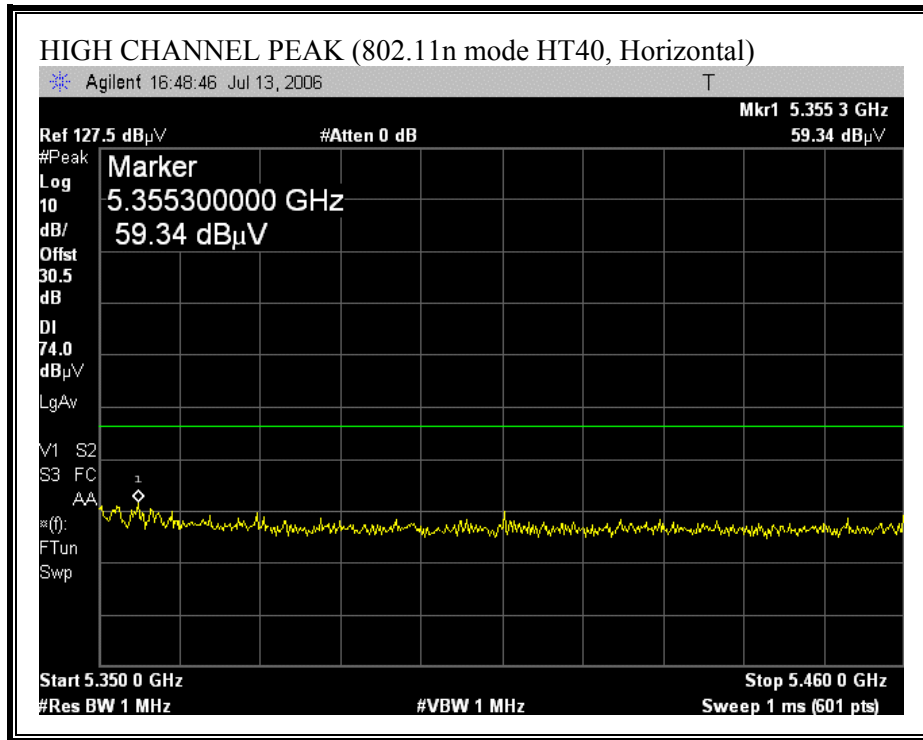


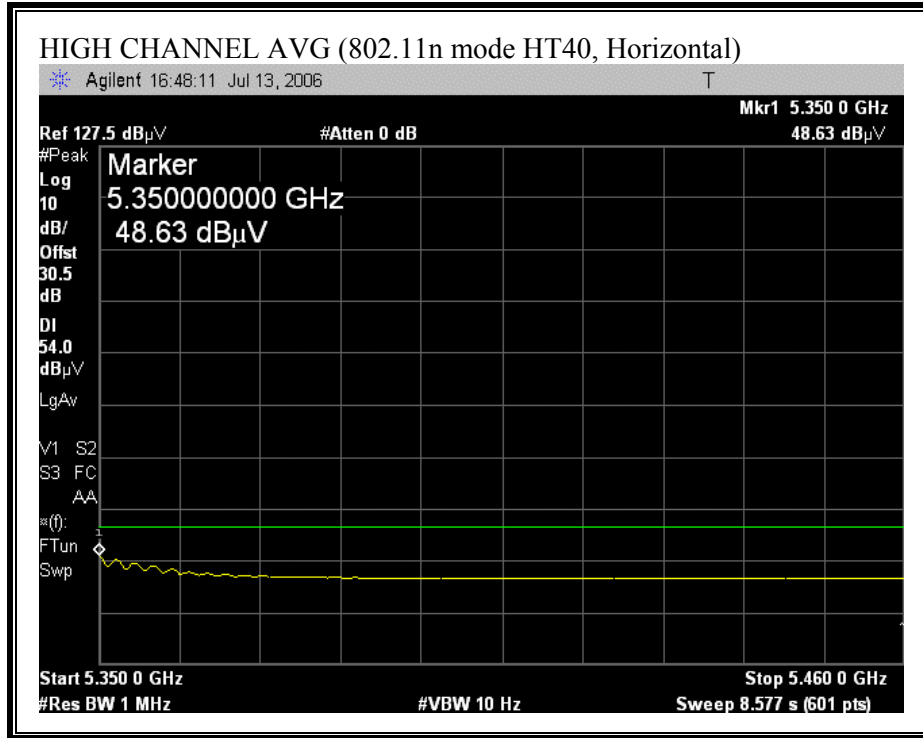


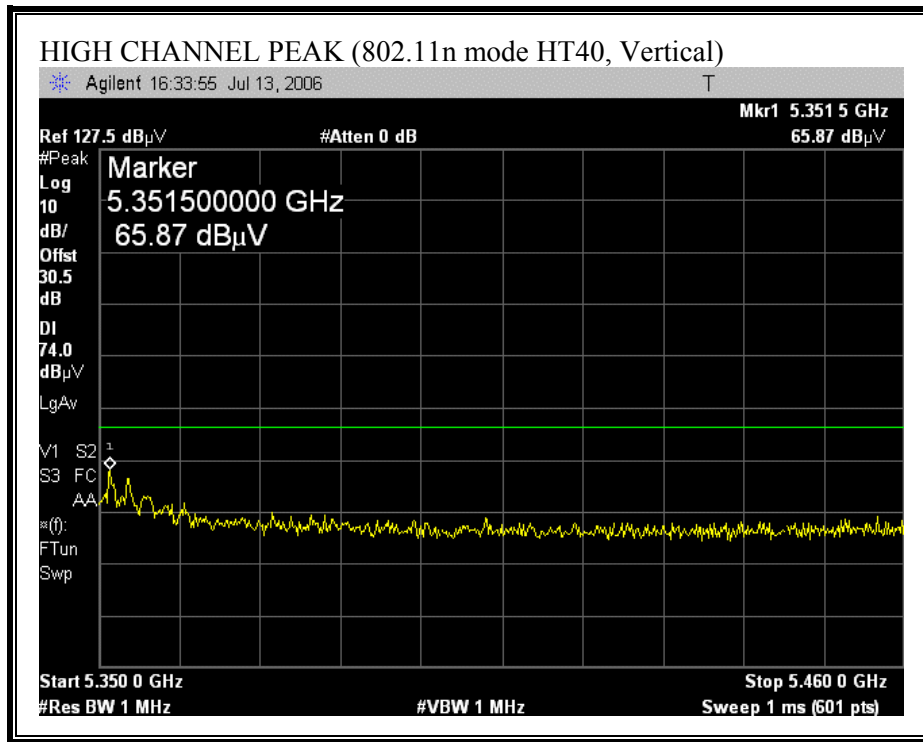


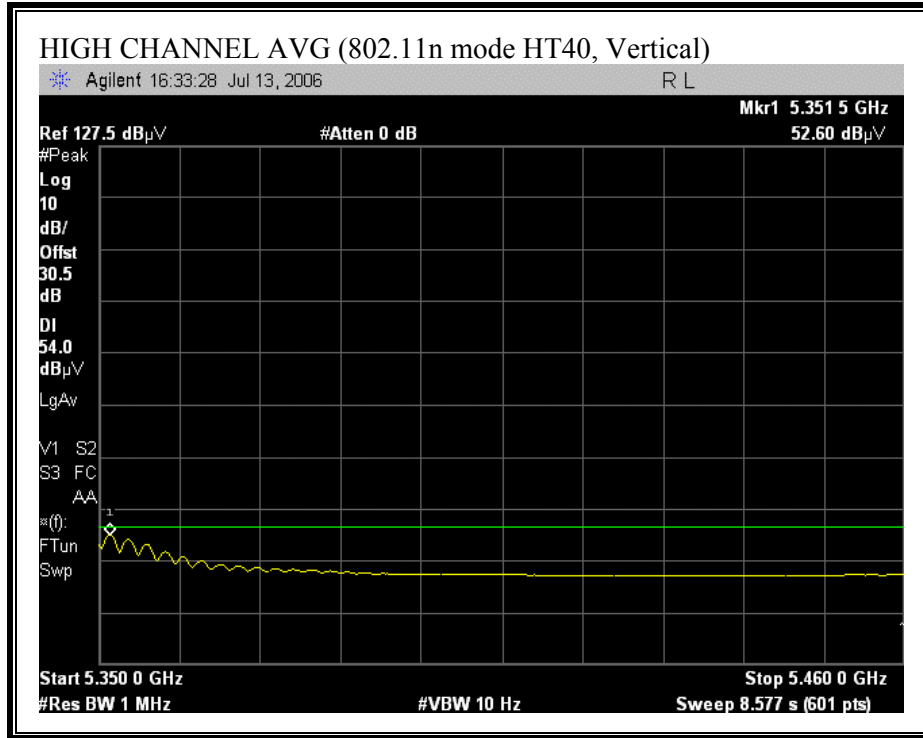


RESTRICTED BANDEDGE (802.11n MODE HT40, HIGH CHANNEL)









HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT40)

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: Marvell
 Project #: 06U10412
 Date: 07/18/06
 Test Engineer: Frank Ibrahim
 Configuration: EUT with PIFA Antenna inside Apple Laptop PC
 S/N: 010
 Mode: Continuously Transmitting in HT 40M mode, MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T87 Miteq 924342		T89; ARA 18-26GHz; S/N:1049

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Frank 177080001	Frank 187209001		R_001

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

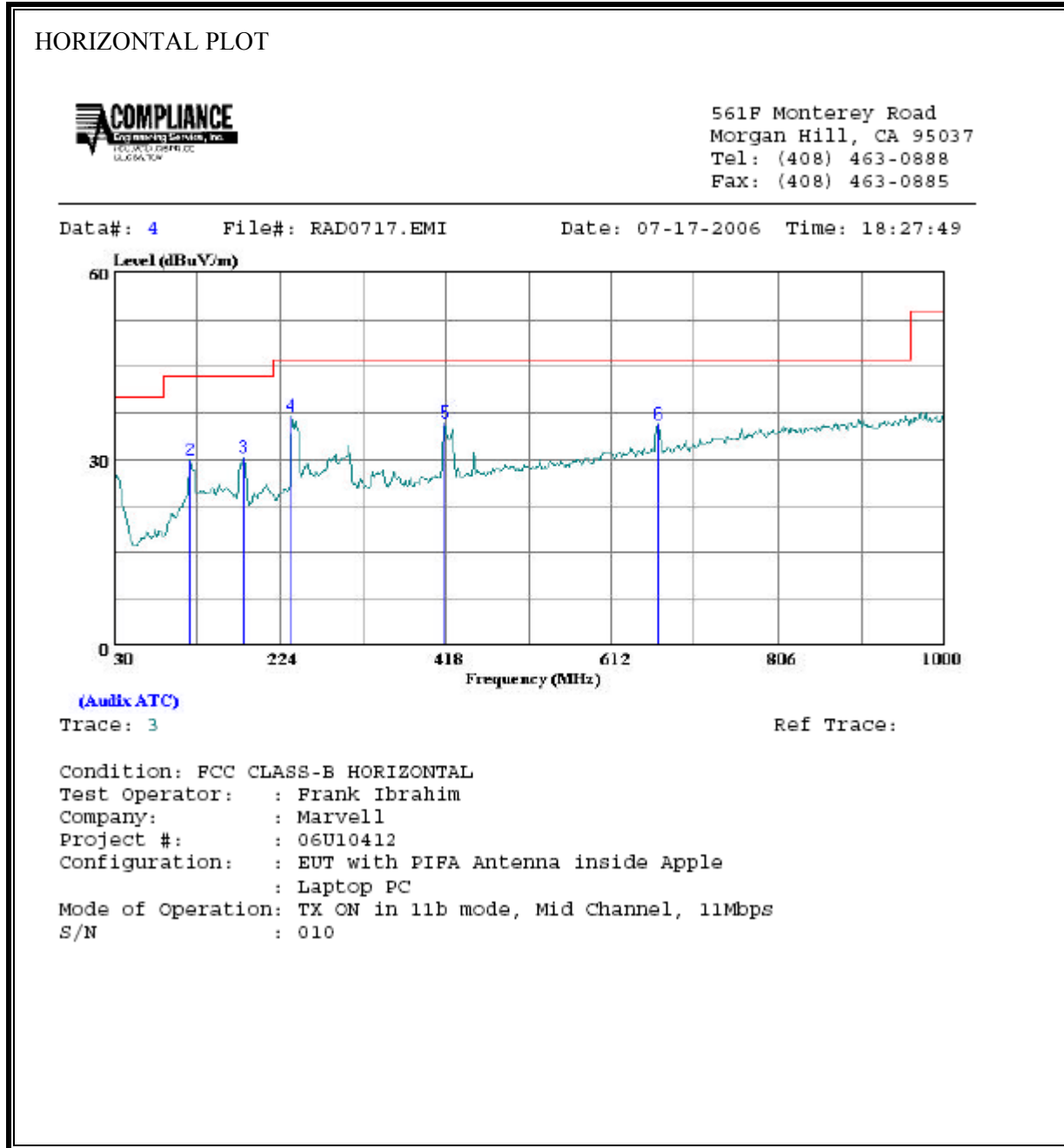
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5190 MHz)															
15.570	3.0	50.6	38.0	38.0	6.2	-41.3	0.0	0.0	53.6	41.0	74	54	-20.4	-13.0	V, Settings: 5E 6I
15.570	3.0	50.5	37.8	38.0	6.2	-41.3	0.0	0.0	53.5	40.8	74	54	-20.5	-13.2	H, Settings: 5E 6I
Middle Channel (5270 MHz)															
15.810	3.0	51.0	38.5	37.9	6.3	-41.2	0.0	0.0	54.0	41.5	74	54	-20.0	-12.5	V, Settings: 6B 6D
15.810	3.0	51.2	38.5	37.9	6.3	-41.2	0.0	0.0	54.2	41.5	74	54	-19.8	-12.5	H, Settings: 6B 6D
High Channel (5310 MHz)															
10.620	3.0	49.0	36.3	37.4	5.1	-39.4	0.0	0.0	52.1	39.4	74	54	-21.9	-14.6	V, Settings: 5E 5E
10.620	3.0	48.1	36.5	37.4	5.1	-39.4	0.0	0.0	51.2	39.6	74	54	-22.8	-14.4	H, Settings: 5E 5E

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

EUT was scanned from 1 GHz to 40 GHz, no other signals from EUT were detected above the noise floor.

7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

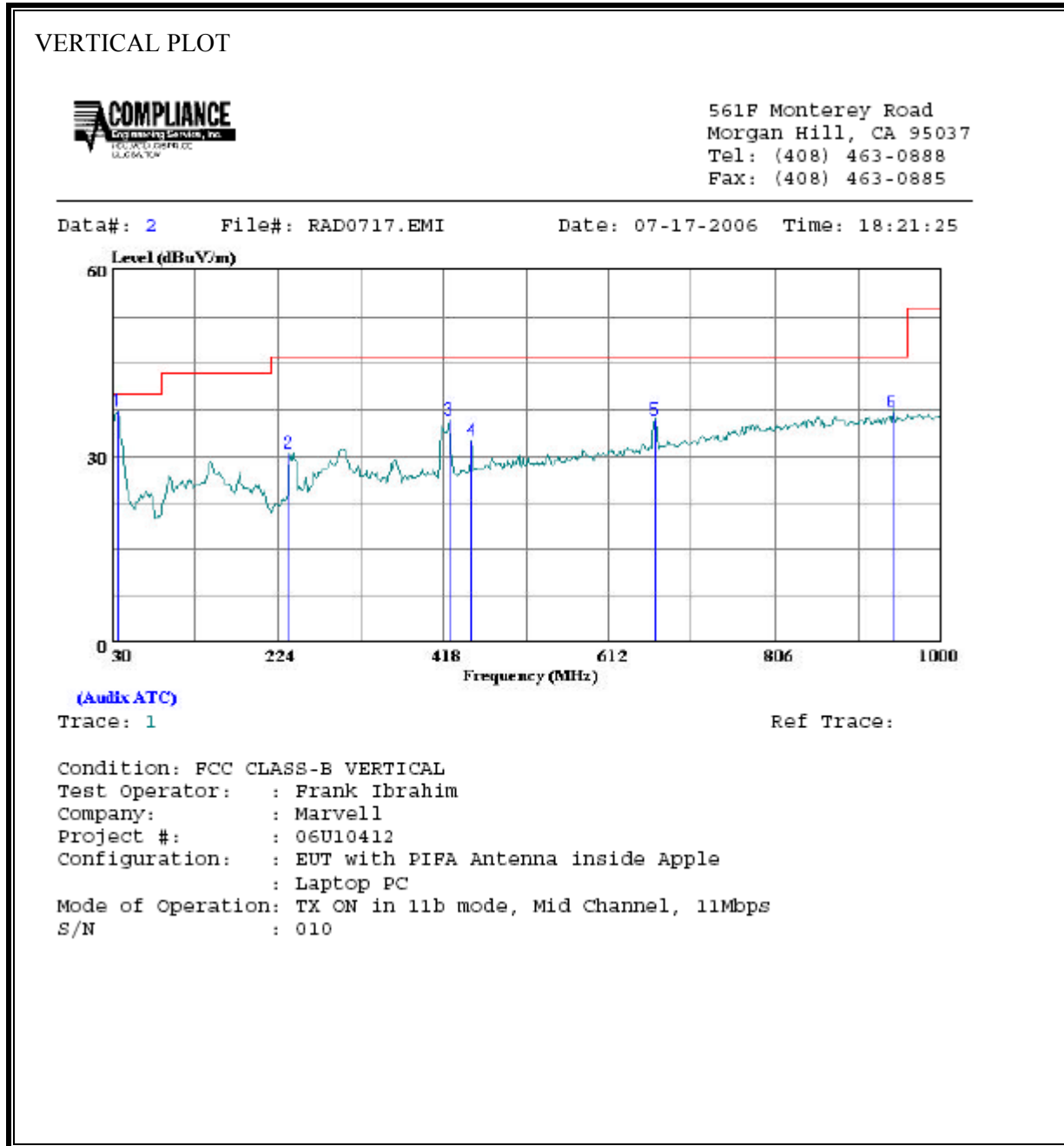
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	7.28	20.45	27.73	40.00	-12.27	Peak
2	119.240	14.79	15.05	29.84	43.50	-13.66	Peak
3	182.290	17.29	12.95	30.24	43.50	-13.26	Peak
4	237.580	23.62	13.39	37.01	46.00	-8.99	Peak
5	417.030	17.50	18.47	35.97	46.00	-10.03	Peak
6	667.290	12.99	22.66	35.65	46.00	-10.35	Peak

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



VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	35.820	18.71	18.58	37.29	40.00	-2.71	Peak
2	237.580	17.17	13.39	30.56	46.00	-15.44	Peak
3	424.790	17.21	18.64	35.85	46.00	-10.15	Peak
4	450.980	13.31	19.20	32.51	46.00	-13.49	Peak
5	666.320	13.26	22.64	35.91	46.00	-10.09	Peak
6	942.770	10.70	26.43	37.13	46.00	-8.87	Peak

7.3. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

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 resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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

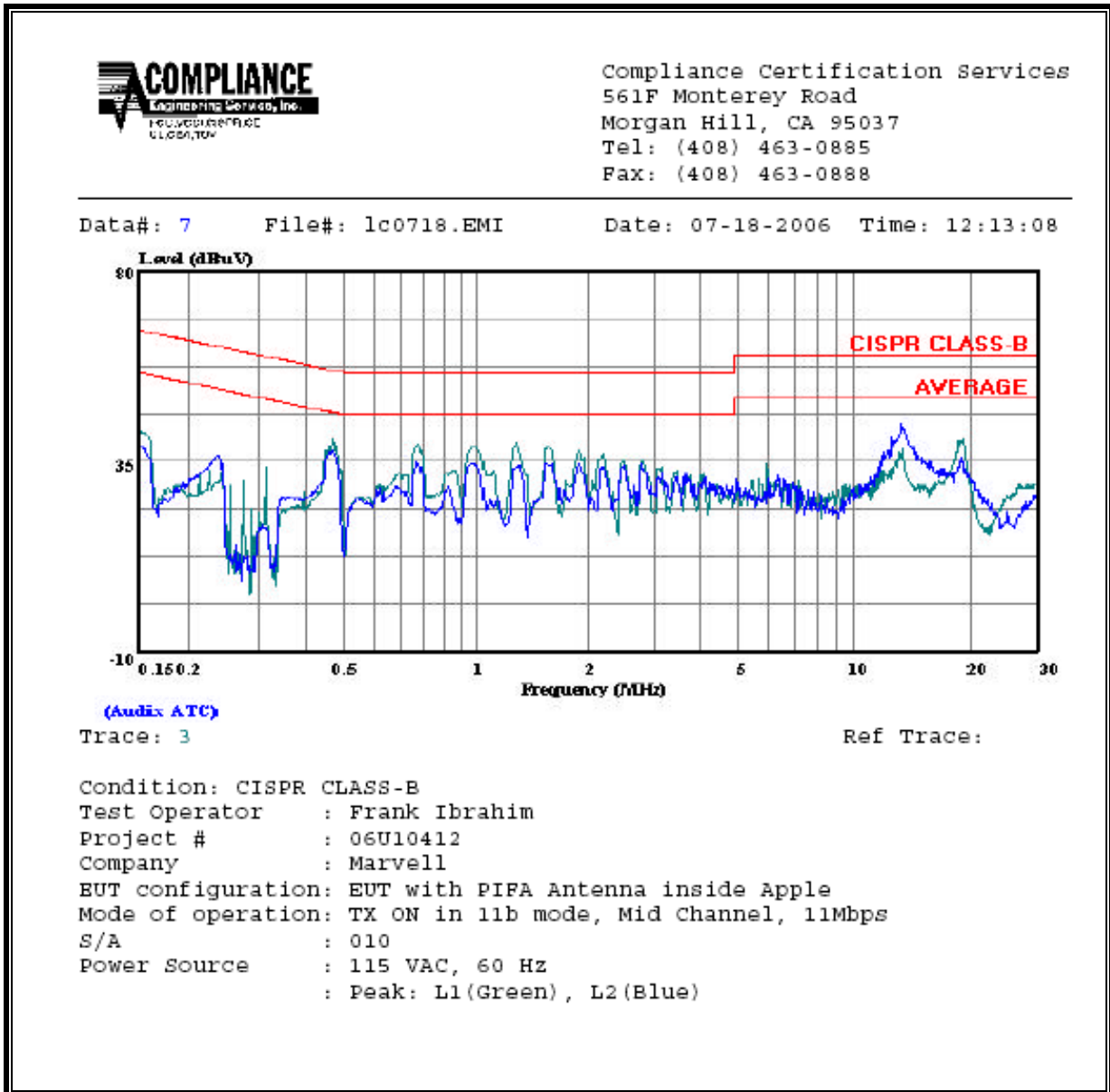
RESULTS

No non-compliance noted:

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.47	40.28	--	--	0.00	56.58	46.58	-16.30	-6.30	L1
1.38	39.58	--	--	0.00	56.00	46.00	-16.42	-6.42	L1
19.22	40.40	--	--	0.00	60.00	50.00	-19.60	-9.60	L1
0.47	37.38	--	--	0.00	56.58	46.58	-19.20	-9.20	L2
0.76	34.62	--	--	0.00	56.00	46.00	-21.38	-11.38	L2
13.34	43.78	--	--	0.00	60.00	50.00	-16.22	-6.22	L2
6 Worst Data									

LINE 1 AND LINE 2 RESULTS



8. SETUP PHOTOS

RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





END OF REPORT