



**FCC CFR47 PART 15 SUBPART C
CLASS II PERMISSIVE CHANGE**

CERTIFICATION TEST REPORT

FOR

INTEL WI-FI /WIMAX LINK 5350 SERIES

FCC MODEL: 533ANXMMW

FCC ID: PD9533ANXMU

REPORT NUMBER: 08U12161-1

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Prepared for
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NVLAP[®]

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/10/08	Initial Issue	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION.....	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	<i>5</i>
4.2. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>5</i>
5. EQUIPMENT UNDER TEST	6
5.1. <i>DESCRIPTION OF EUT.....</i>	<i>6</i>
5.2. <i>MAXIMUM OUTPUT POWER.....</i>	<i>6</i>
5.3. <i>DESCRIPTION OF CLASS II PERMISSIVE CHANGE.....</i>	<i>6</i>
5.4. <i>DESCRIPTION OF AVAILABLE ANTENNAS.....</i>	<i>6</i>
5.5. <i>SOFTWARE AND FIRMWARE.....</i>	<i>6</i>
5.6. <i>WORST-CASE CONFIGURATION AND MODE</i>	<i>6</i>
6. TEST AND MEASUREMENT EQUIPMENT	9
7. ANTENNA PORT TEST RESULTS	10
7.1. <i>802.11g MODE IN THE 2.4 GHz BAND.....</i>	<i>10</i>
7.1.1. 26 dB BANDWIDTH	10
7.1.2. OUTPUT POWER	12
7.1.3. AVERAGE POWER	14
8. RADIATED TEST RESULTS	15
8.1. <i>LIMITS AND PROCEDURE</i>	<i>15</i>
8.2. <i>TRANSMITTER ABOVE 1 GHz</i>	<i>16</i>
8.2.1. FOR 802.11g MODE	16
8.2.2. FOR 802.11n HT40 MODE-3TX.....	21
8.3. <i>WORST-CASE BELOW 1 GHz.....</i>	<i>26</i>
9. AC POWER LINE CONDUCTED EMISSIONS	30
10. SETUP PHOTOS	33

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: INTEL CORPORATION
2111 NE 25TH AVENUE
HILLSBORO, OREGON 97124, USA

EUT DESCRIPTION: INTEL WI-FI /WIMAX LINK 5350 SERIES

FCC MODEL: 533ANXMMW

SERIAL NUMBER: 0016EB041B3C

DATE TESTED: OCTOBER 02-07, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS 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:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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 47173 Benicia Street, Fremont, California, USA.

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
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 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 Intel Wi-Fi Link 5350 Series
The radio module is manufactured by Intel.

5.2. MAXIMUM OUTPUT POWER

The measured target power of this device is within ± 0.5 dB of the original output power. For 2.4GHz Band, g mode single chain, in order to pass low channel band edge, the average output power is reduced to 13.8dBm, no change on mid-band and high-band channels. The manufacturer states that this change will be incorporated in the EEPROM.

5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding portable tablet LENOVO THINKPAD X200 TABLET SERIES.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PIFA antennas, with maximum gain as below:

The radio utilizes a PIFA antenna, with a maximum gain of 0.64 dBi for 2.4GHZ Band, 1.45 dBi for 5150-5350MHz band, 1.47 dBi for 5470-5725MHz band, and 0.92 dBi for 5.725 – 5850MHz band.

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was CRTU, version 5.0.76.0

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

The worst-position was the EUT with highest emissions. To determine the worst-case, the EUT was investigated for X, Y, Z, and mobile Positions, after the investigations, the worst-position were turned out to be a mobile position for all bands.

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	12MY	LV-002MY	DoC
AC Adapter	Lenovo	PA-1650-171	11S92P1160Z1ZBQH84K95K	DoC

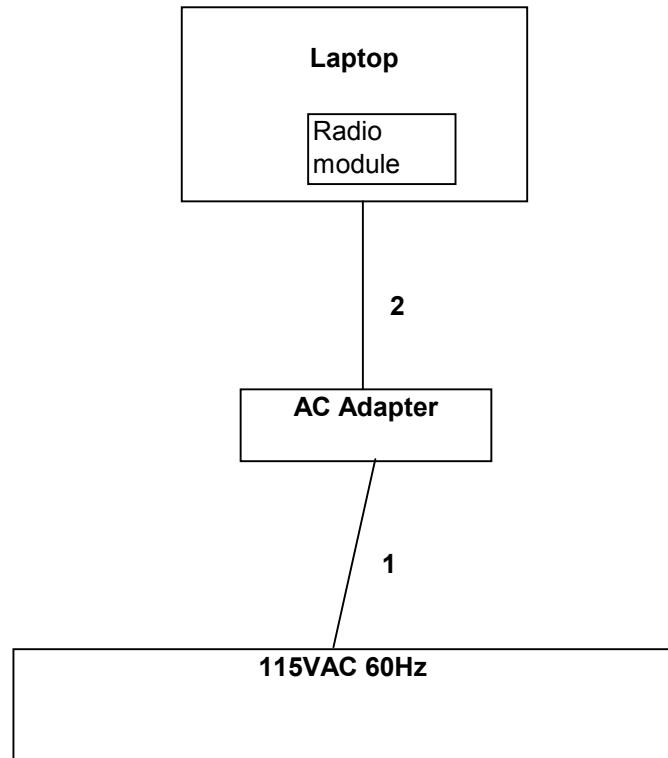
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	0.8m	NA
2	DC	1	DC	Un-shielded	1.8m	Ferrite at laptop's end

TEST SETUP

The EUT is installed in a host laptop computer during the tests. 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	Asset	Cal Due
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	12/27/08
Antenna, Horn, 18 GHz	EMCO	3115	C00872	04/22/09
Preamp, 1000MHz	Sonoma	310N	N02891	03/31/09
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	02/11/09
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	09/19/09
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	09/19/09
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/08
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	12/28/08
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	03/03/09
Highpass Filter, 4.0 GHz	Micro-Tronics	HPM13351	N02709	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02681	CNR
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	12/11/08
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	04/29/09

7. ANTENNA PORT TEST RESULTS

7.1. 802.11g MODE IN THE 2.4 GHz BAND

7.1.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

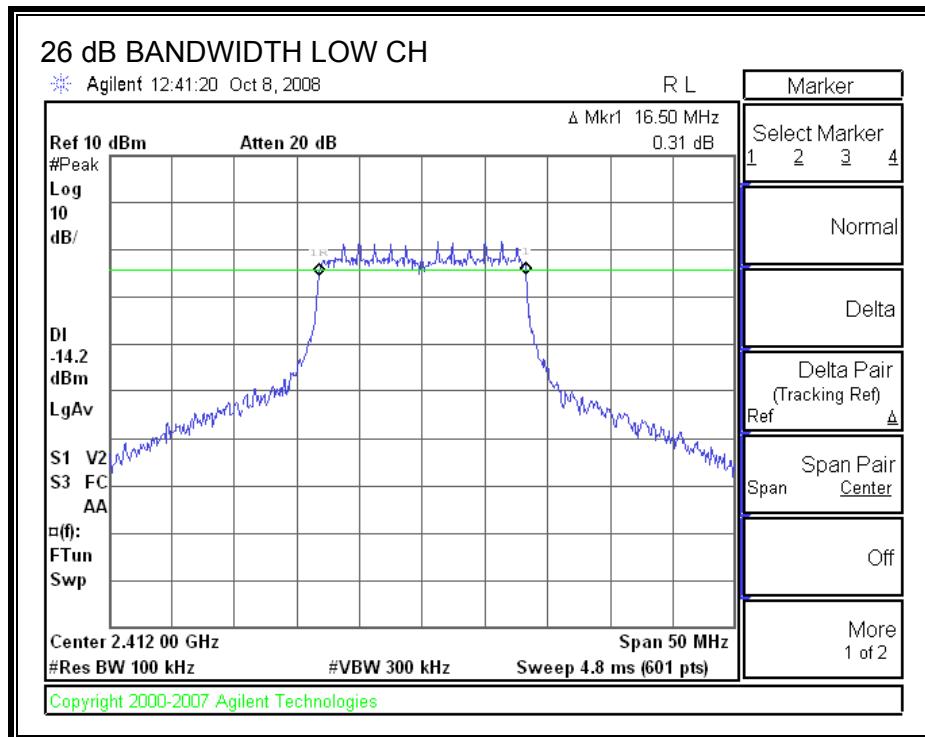
TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	2412	16.5

6 dB BANDWIDTH



7.1.2. OUTPUT POWER

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is less than or equal to 6dBi, therefore the limit is 30dBm.

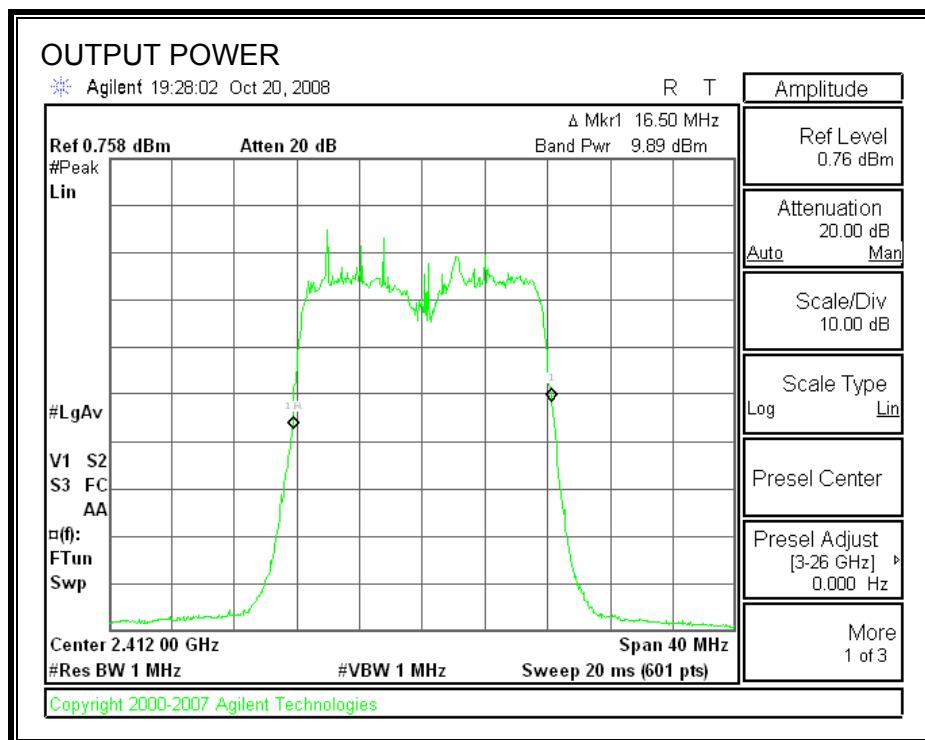
TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003

RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	9.89	11	20.89	30	-9.11

LOW CHANNEL



7.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	13.80

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

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

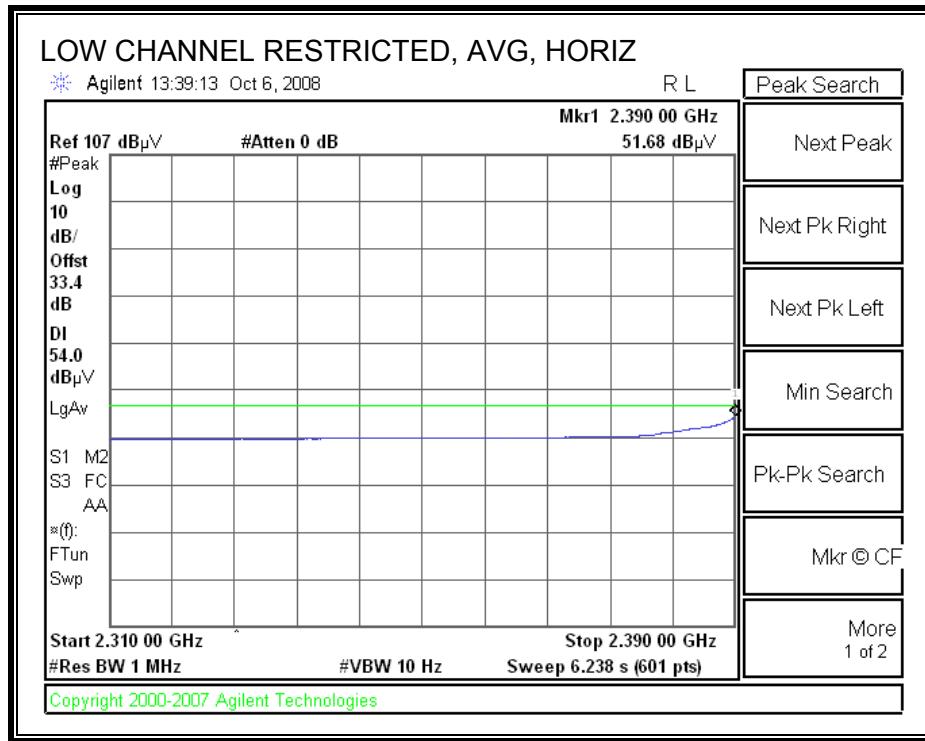
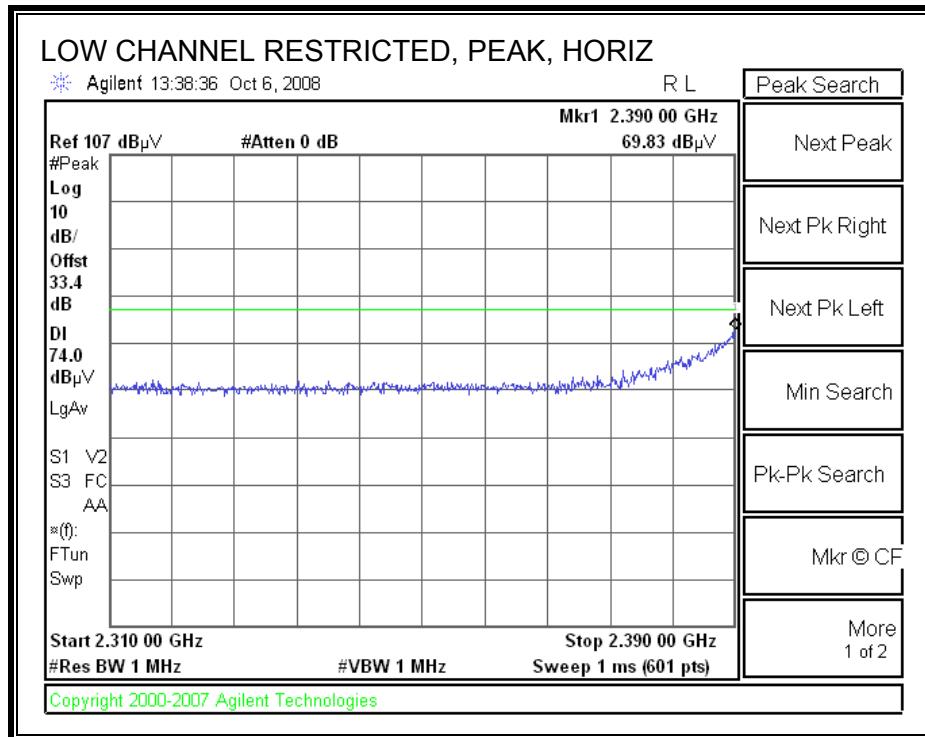
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

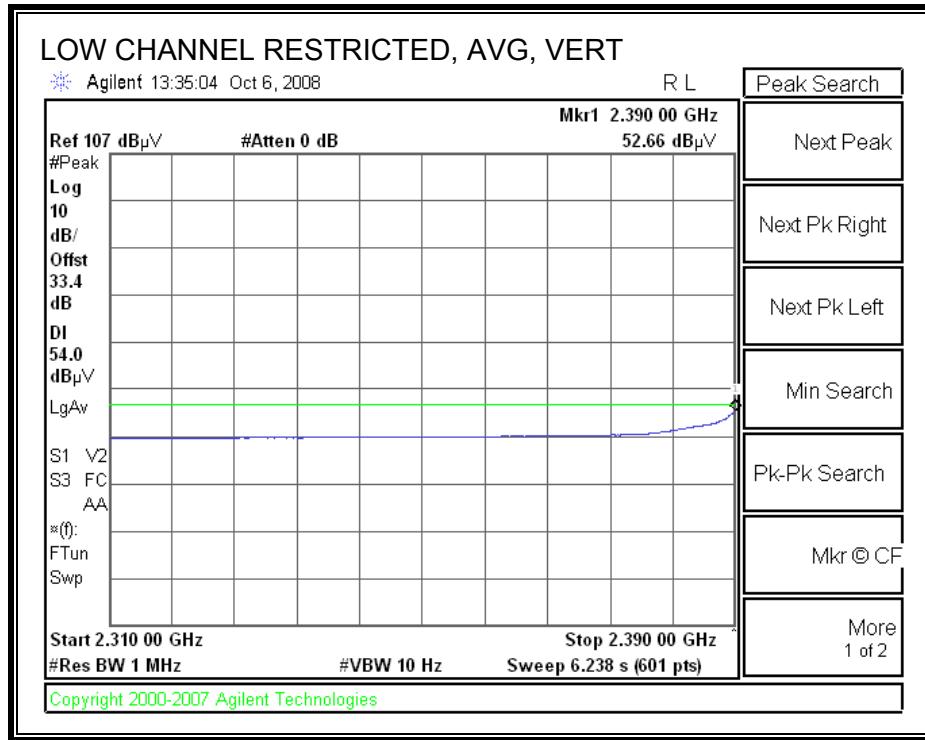
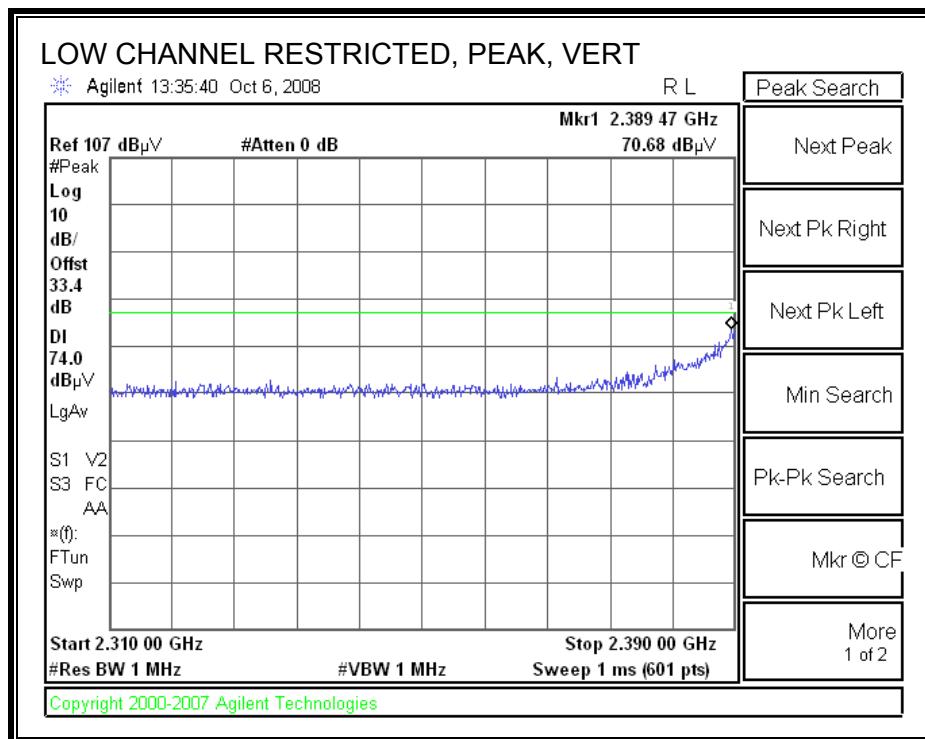
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. FOR 802.11g MODE

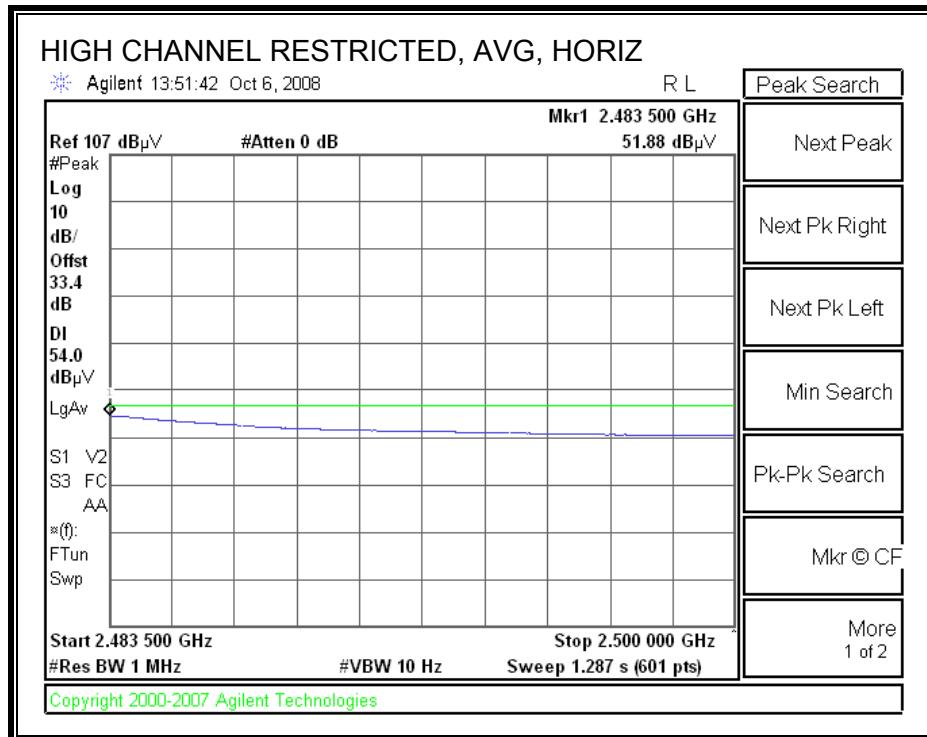
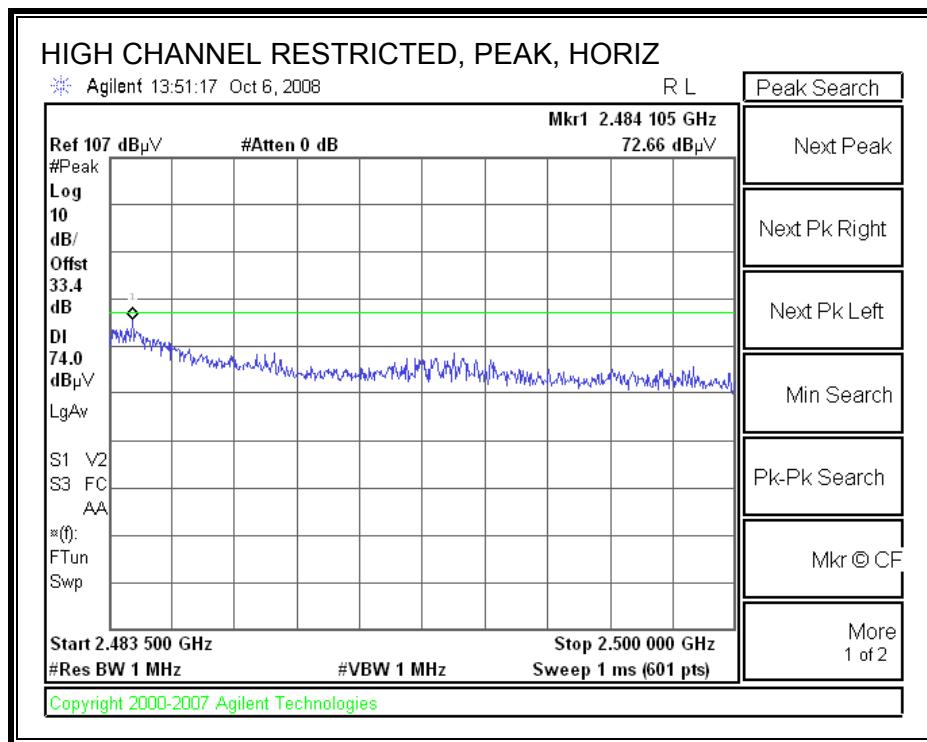
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



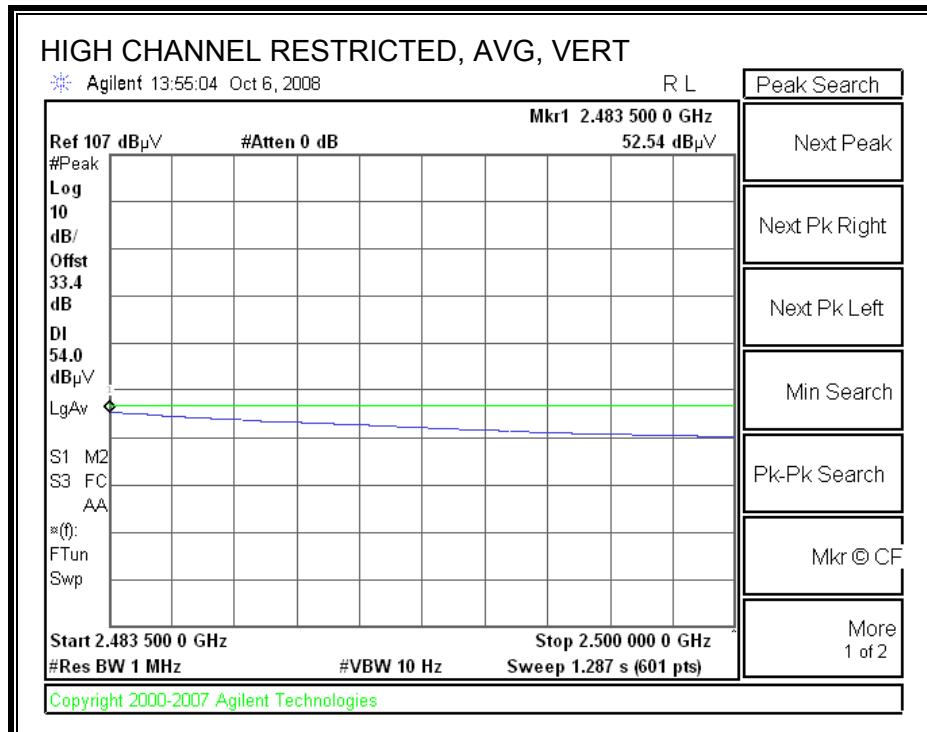
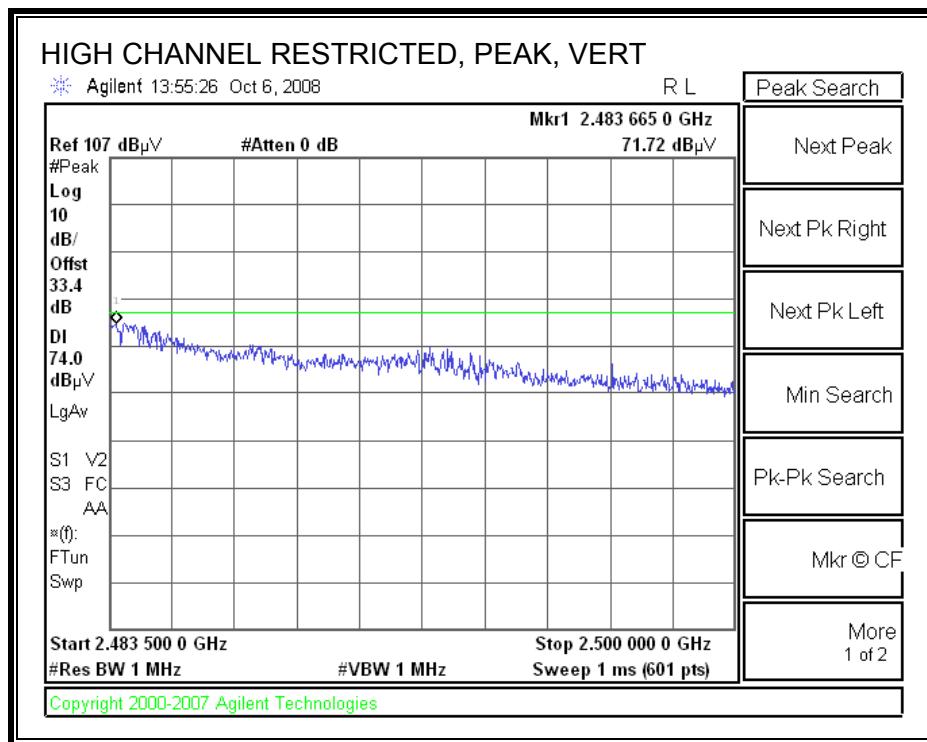
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

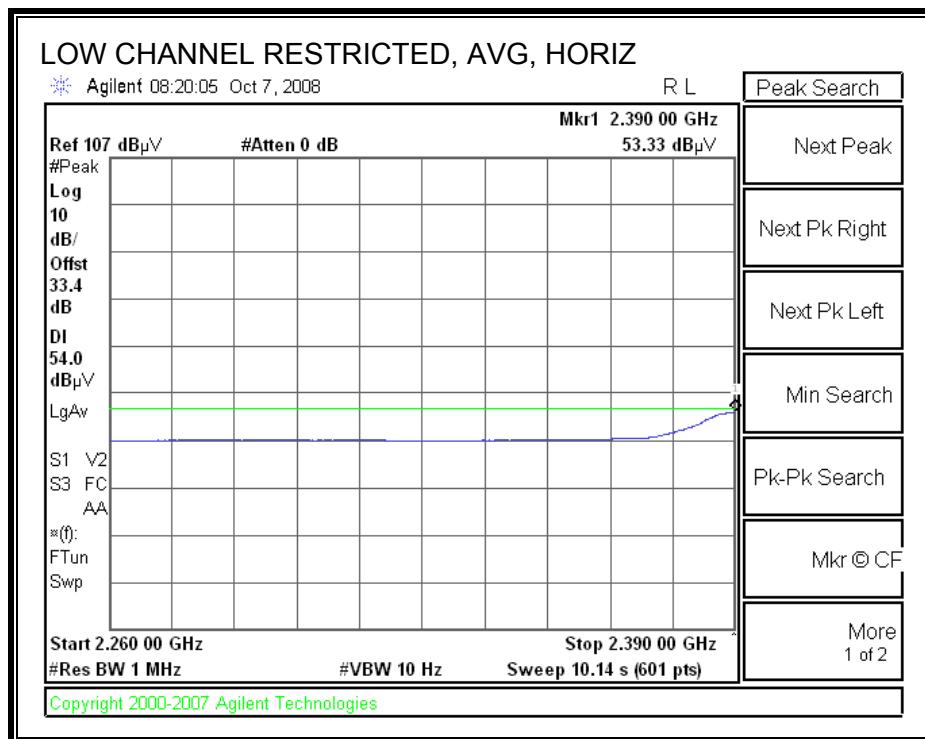
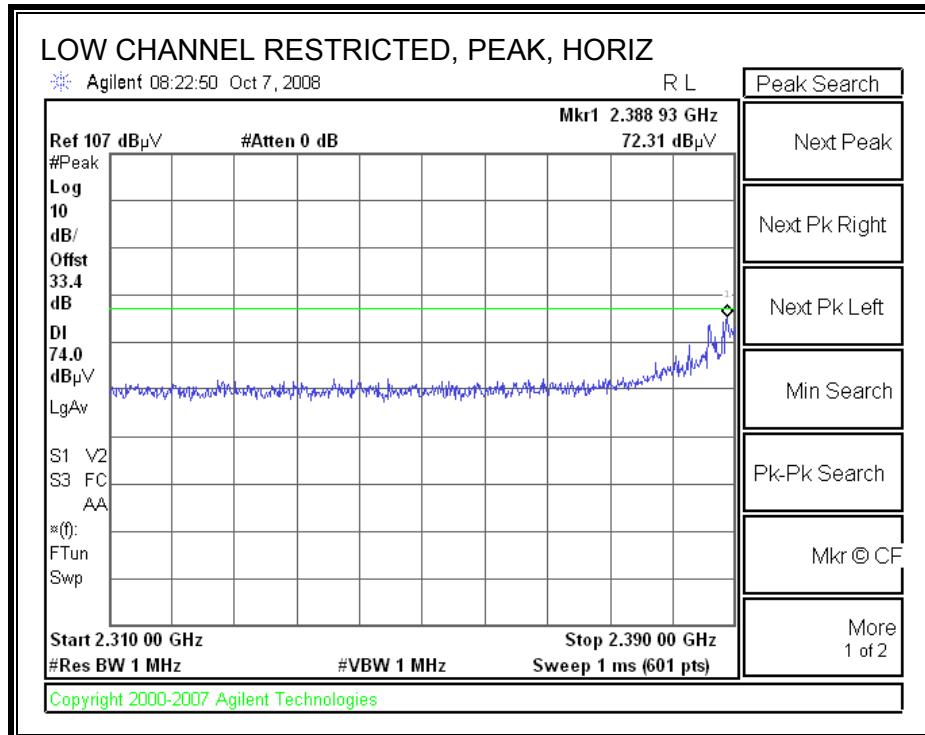


HARMONICS AND SPURIOUS EMISSIONS

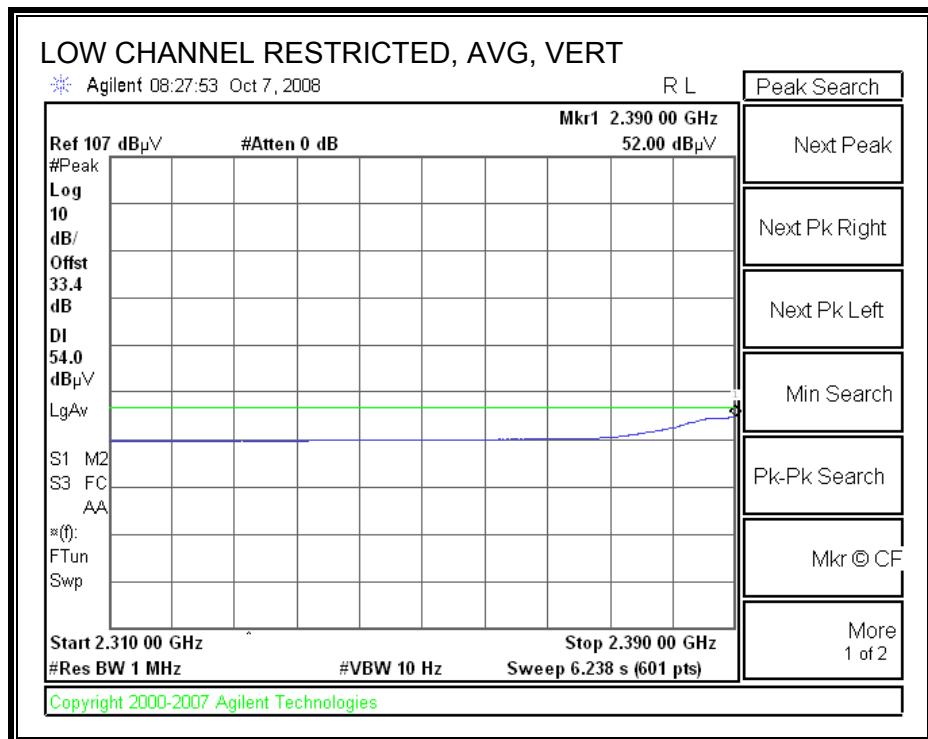
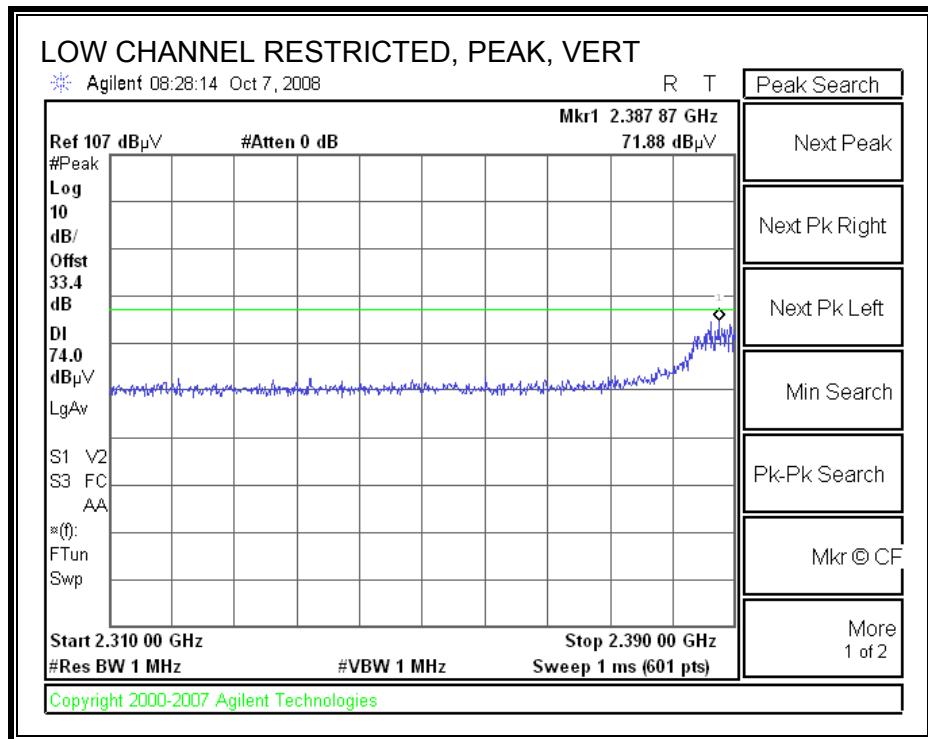
High Frequency Measurement Compliance Certification Services, Fremont 3m Chamber																																																																					
Company: Intel Project #: 08U12161 Date: 10/07/2008 Test Engineer: Chin Pang Configuration: EUT only Mode: TX, G mode																																																																					
Test Equipment: <table border="1"> <tr> <td>Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td colspan="4">Horn > 18GHz</td> <td>Limit</td> </tr> <tr> <td></td> <td></td> <td></td> <td colspan="4"></td> <td>FCC 15.209</td> </tr> <tr> <td colspan="14">Hi Frequency Cables</td> </tr> <tr> <td>2 foot cable</td> <td>3 foot cable</td> <td>12 foot cable</td> <td>HPF</td> <td>Reject Filter</td> <td colspan="4"> Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz </td> <td colspan="4"></td> </tr> <tr> <td></td> <td>Thanh 187215003</td> <td>3m Chamber</td> <td></td> <td>R_001</td> <td colspan="4"></td> <td colspan="4"></td> </tr> </table>														Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit								FCC 15.209	Hi Frequency Cables														2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz									Thanh 187215003	3m Chamber		R_001								
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f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																																																						
Low Ch																																																																					
4.824	3.0	40.5	28.0	0.0	5.8	0.0	0.0	0.0	46.3	33.8	74	54	-27.7	-20.2	V																																																						
4.824	3.0	41.0	28.7	0.0	5.8	0.0	0.0	0.0	46.8	34.5	74	54	-27.2	-19.5	H																																																						
Mid Ch																																																																					
4.874	3.0	42.0	29.4	0.0	5.9	0.0	0.0	0.0	47.9	35.3	74	54	-26.1	-18.7	V																																																						
7.311	3.0	41.5	29.2	0.0	8.0	0.0	0.0	0.0	49.5	37.2	74	54	-24.5	-16.8	V																																																						
4.874	3.0	42.7	30.5	0.0	5.9	0.0	0.0	0.0	48.6	36.4	74	54	-25.4	-17.6	H																																																						
7.311	3.0	42.5	30.0	0.0	8.0	0.0	0.0	0.0	50.5	38.0	74	54	-23.5	-16.0	H																																																						
High Ch																																																																					
4.924	3.0	40.5	28.0	0.0	6.0	0.0	0.0	0.0	46.5	34.0	74	54	-27.5	-20.0	V																																																						
7.386	3.0	45.4	31.0	0.0	8.1	0.0	0.0	0.0	53.5	39.1	74	54	-20.5	-14.9	V																																																						
4.924	3.0	42.0	29.5	0.0	6.0	0.0	0.0	0.0	48.0	35.5	74	54	-26.0	-18.5	H																																																						
7.386	3.0	42.7	30.0	0.0	8.1	0.0	0.0	0.0	50.8	38.1	74	54	-23.2	-15.9	H																																																						
Rev. 4.12.7																																																																					
Note: No other emissions were detected above the system noise floor.																																																																					
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																																																																		

8.2.2. FOR 802.11n HT40 MODE-3TX

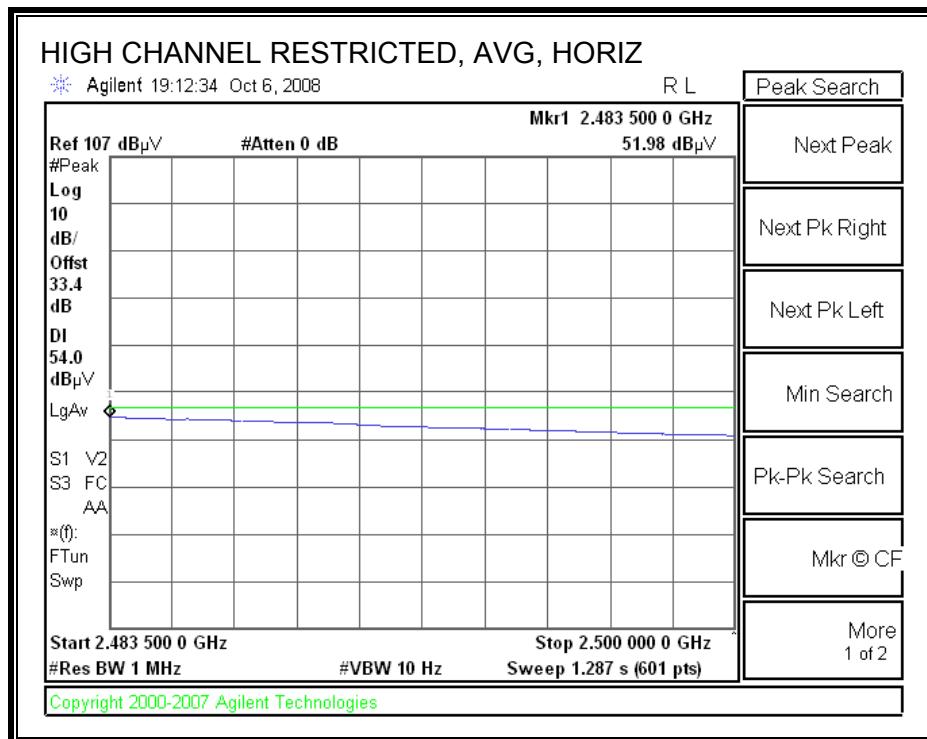
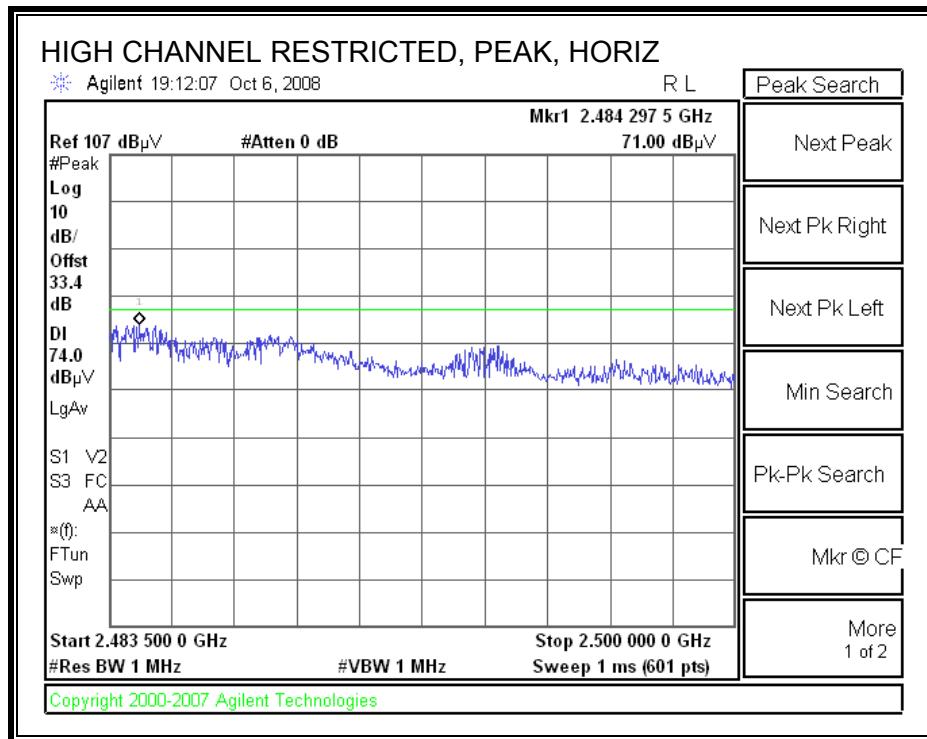
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



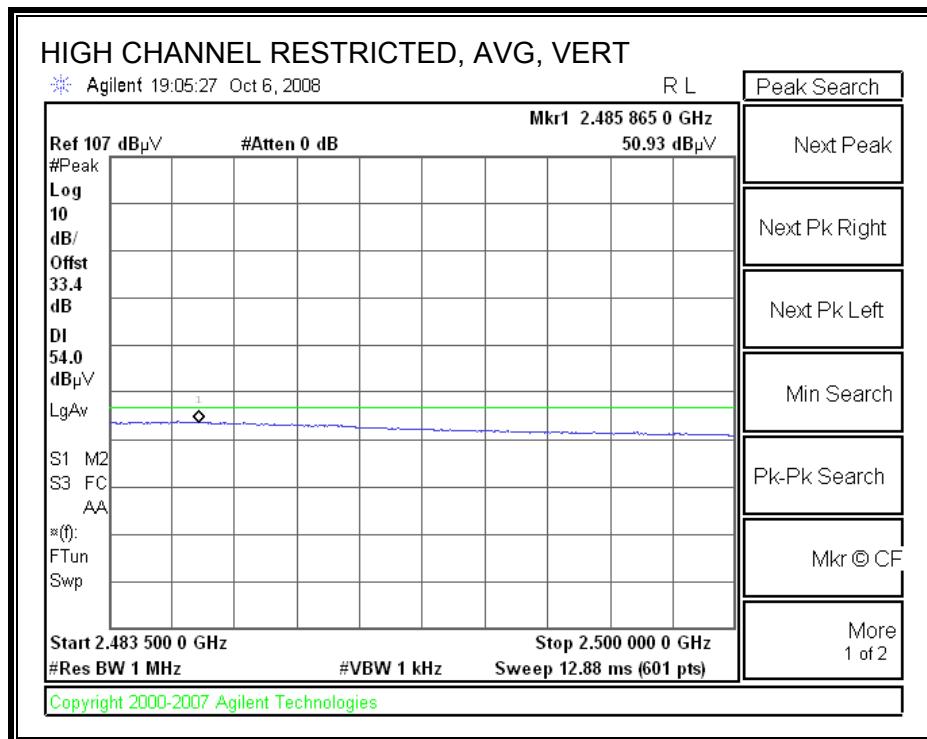
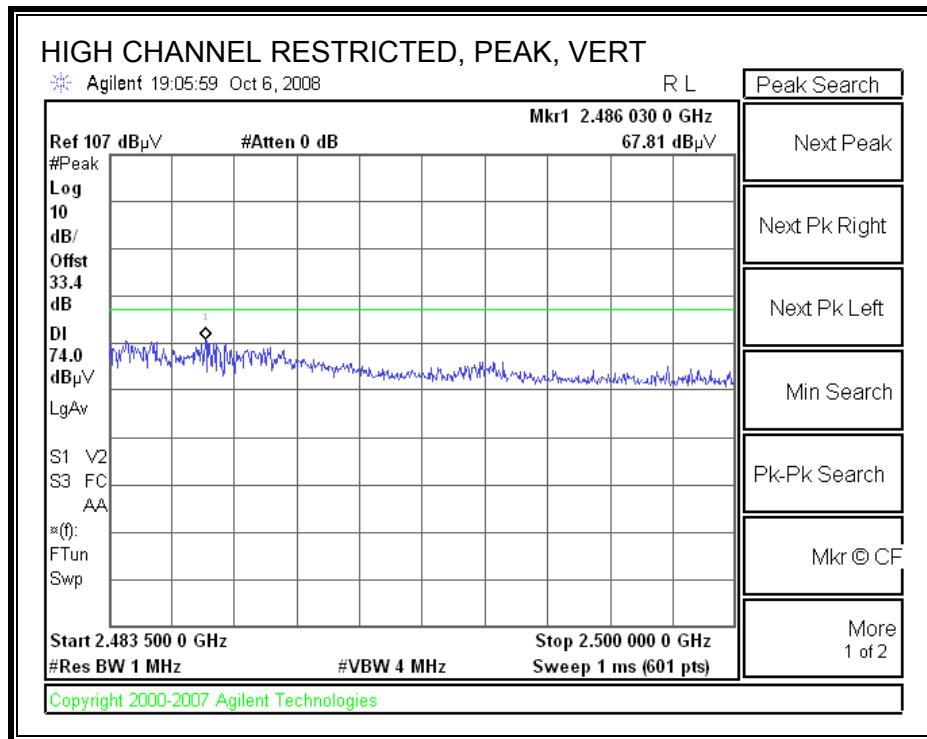
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

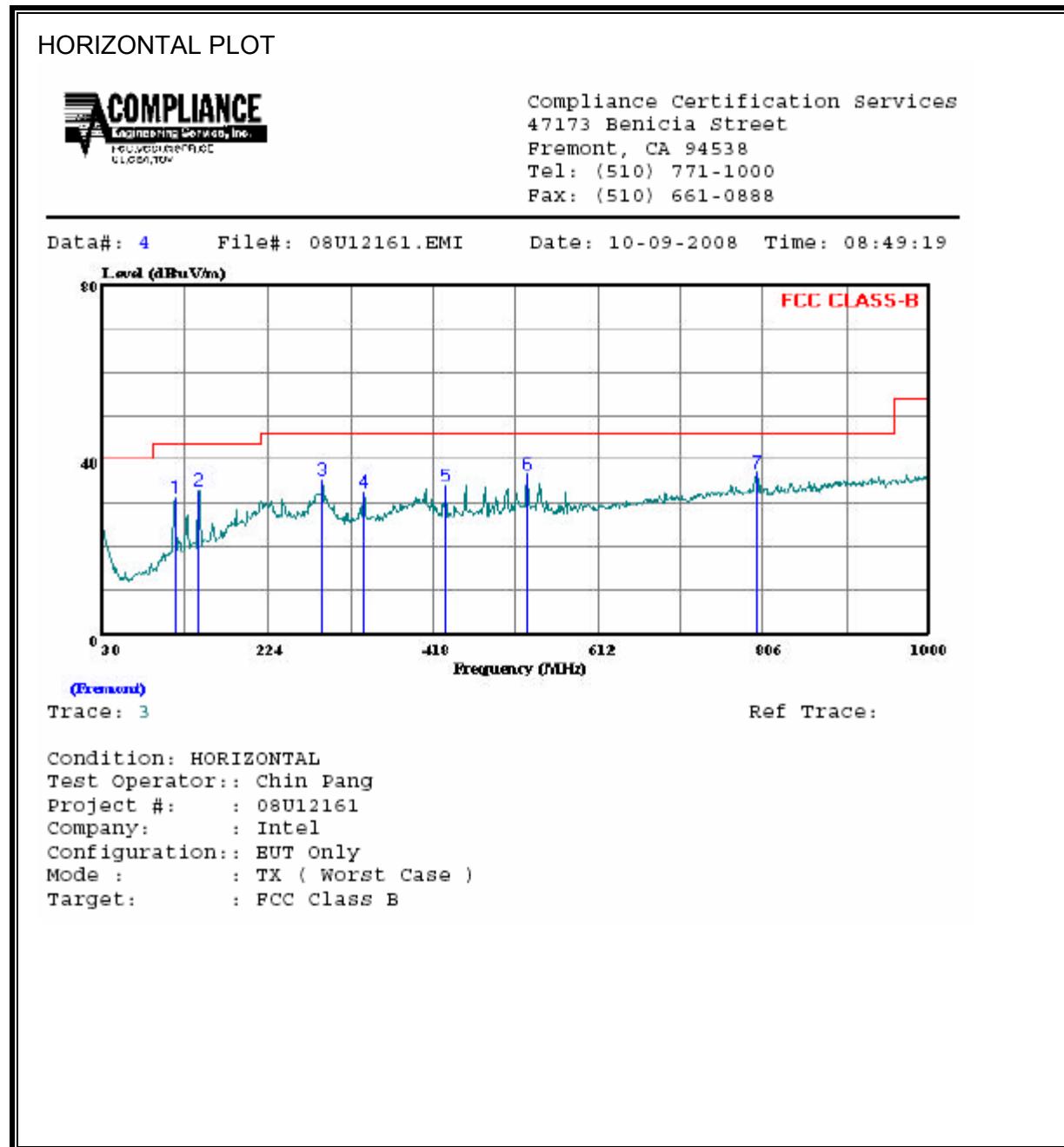


HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber															
Company: Intel Project #: 08U12161 Date: 10/07/2008 Test Engineer: Chin Pang Configuration: EUT only Mode: TX g Mode HT40 3x3															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit					
T73; S/N: 6717 @3m		T34 HP 8449B								FCC 15.205					
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz					
Thanh 187215003		C-5m Chamber						R_001							
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 2422MHz															
4.844	3.0	40.6	28.2	33.8	5.7	-34.8	0.0	0.0	45.3	32.9	74	54	-28.7	-21.1	H
7.266	3.0	42.4	29.2	36.2	8.4	-34.1	0.0	0.0	52.8	39.6	74	54	-21.2	-14.4	H
4.844	3.0	40.5	28.0	33.8	5.7	-34.8	0.0	0.0	45.2	32.7	74	54	-28.8	-21.3	V
7.266	3.0	42.0	29.2	36.2	8.4	-34.1	0.0	0.0	52.4	39.6	74	54	-21.6	-14.4	V
Mid Ch, 2437MHz															
4.874	3.0	40.6	28.3	33.8	5.8	-34.8	0.0	0.0	45.4	33.1	74	54	-28.6	-20.9	H
7.311	3.0	41.5	29.1	36.2	8.4	-34.1	0.0	0.0	52.0	39.6	74	54	-22.0	-14.4	H
4.874	3.0	40.2	28.0	33.8	5.8	-34.8	0.0	0.0	45.0	32.8	74	54	-29.0	-21.2	V
7.311	3.0	41.6	29.2	36.2	8.4	-34.1	0.0	0.0	52.1	39.7	74	54	-21.9	-14.3	V
High Ch, 2452MHz															
4.904	3.0	40.3	28.0	33.8	5.8	-34.8	0.0	0.0	45.2	32.9	74	54	-28.8	-21.1	H
7.356	3.0	41.6	29.0	36.2	8.4	-34.1	0.0	0.0	52.2	39.6	74	54	-21.8	-14.4	H
4.904	3.0	40.1	28.0	33.8	5.8	-34.8	0.0	0.0	45.0	32.9	74	54	-29.0	-21.1	V
7.356	3.0	42.0	29.0	36.2	8.4	-34.1	0.0	0.0	52.6	39.6	74	54	-21.4	-14.4	V
Rev. 4.12.7 Note: No other emissions were detected above the system noise floor.															
f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss				Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength 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							

8.3. WORST-CASE BELOW 1 GHz

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



HORIZONTAL DATA

Freq	Read		Limit		Over	
	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	115.360	43.00	-12.00	31.00	43.50	-12.50 Peak
2	142.520	44.83	-11.95	32.89	43.50	-10.61 Peak
3	288.020	44.67	-9.45	35.22	46.00	-10.78 Peak
4	336.520	40.50	-8.10	32.40	46.00	-13.60 Peak
5	432.550	39.67	-5.84	33.83	46.00	-12.17 Peak
6	529.550	40.50	-3.81	36.69	46.00	-9.31 Peak
7	799.210	35.83	1.22	37.05	46.00	-8.95 Peak

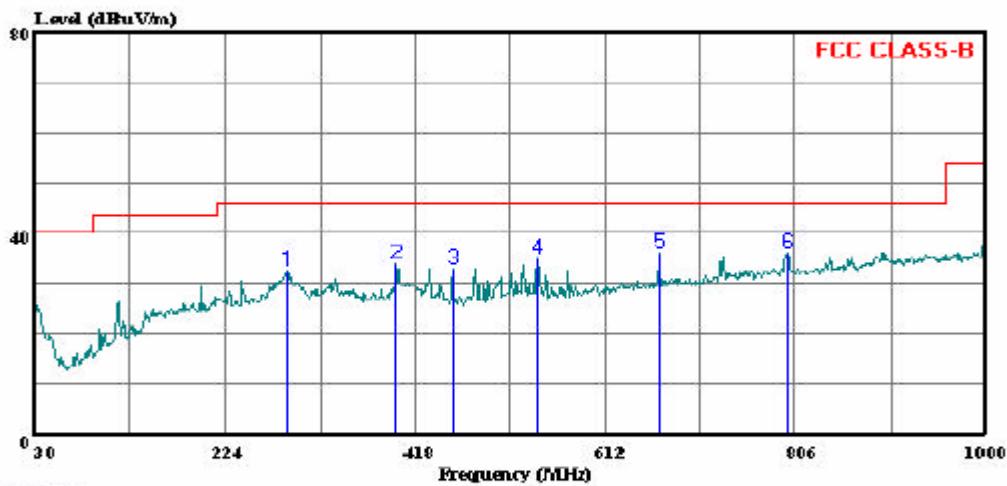
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 2 File#: 08U12161.EMI Date: 10-09-2008 Time: 08:38:17



Condition: VERTICAL
Test Operator:: Chin Pang
Project #: : 08U12161
Company: : Intel
Configuration:: EUT Only
Mode : : TX (Worst Case)
Target: : FCC Class B

VERTICAL DATA

		Read		Limit	Over	
	Freq	Level	Factor	Level	Line	Limit
	MHz	dBuV		dB	dBuV/m	dBuV/m
						dB
1	288.020	41.83	-9.45	32.39	46.00	-13.61 Peak
2	399.570	40.67	-6.76	33.90	46.00	-12.10 Peak
3	456.800	38.50	-5.45	33.05	46.00	-12.95 Peak
4	544.100	38.83	-3.69	35.14	46.00	-10.86 Peak
5	666.320	37.50	-1.33	36.17	46.00	-9.83 Peak
6	799.210	34.83	1.22	36.05	46.00	-9.95 Peak

9. 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

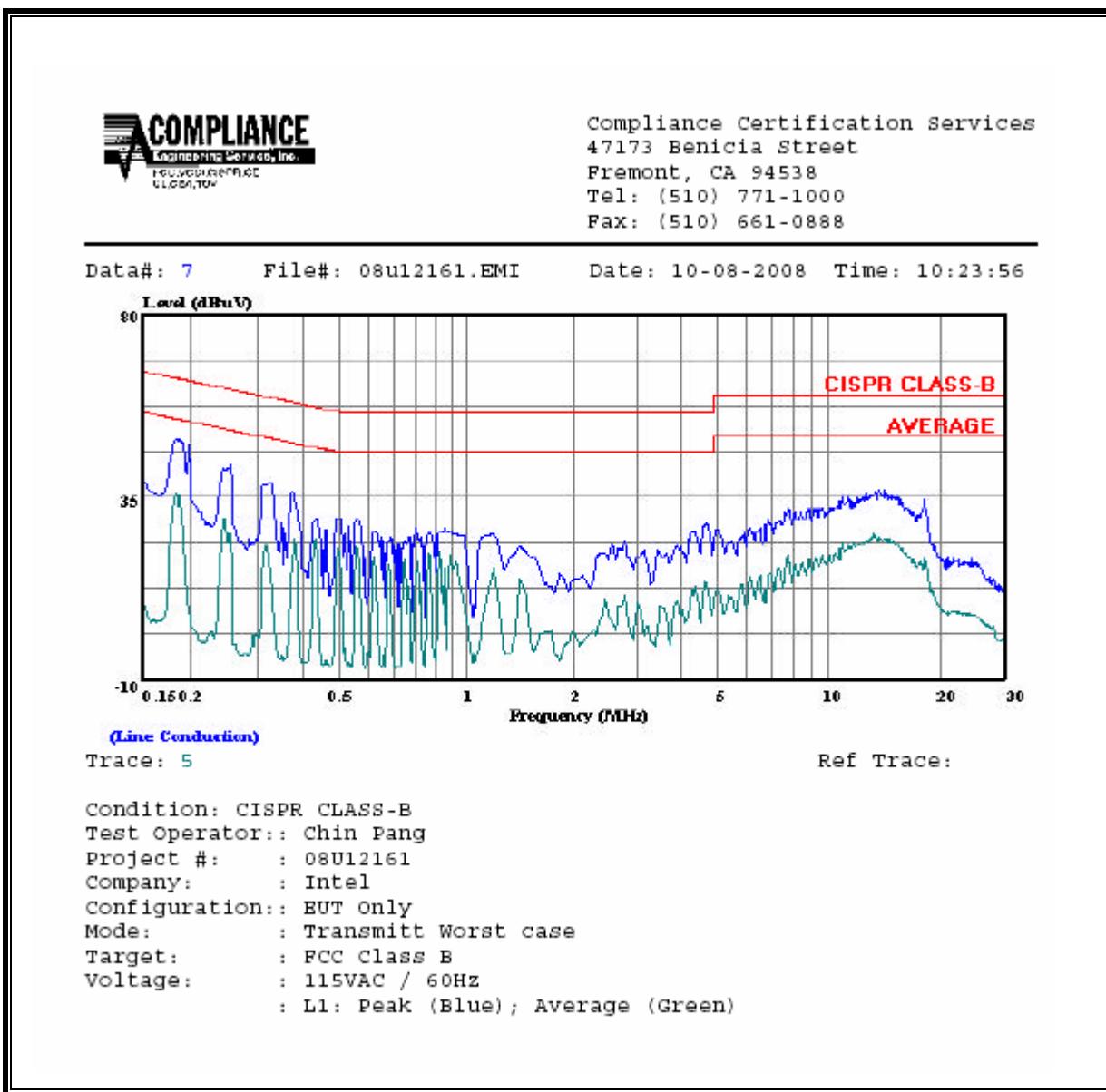
ANSI C63.4

RESULTS

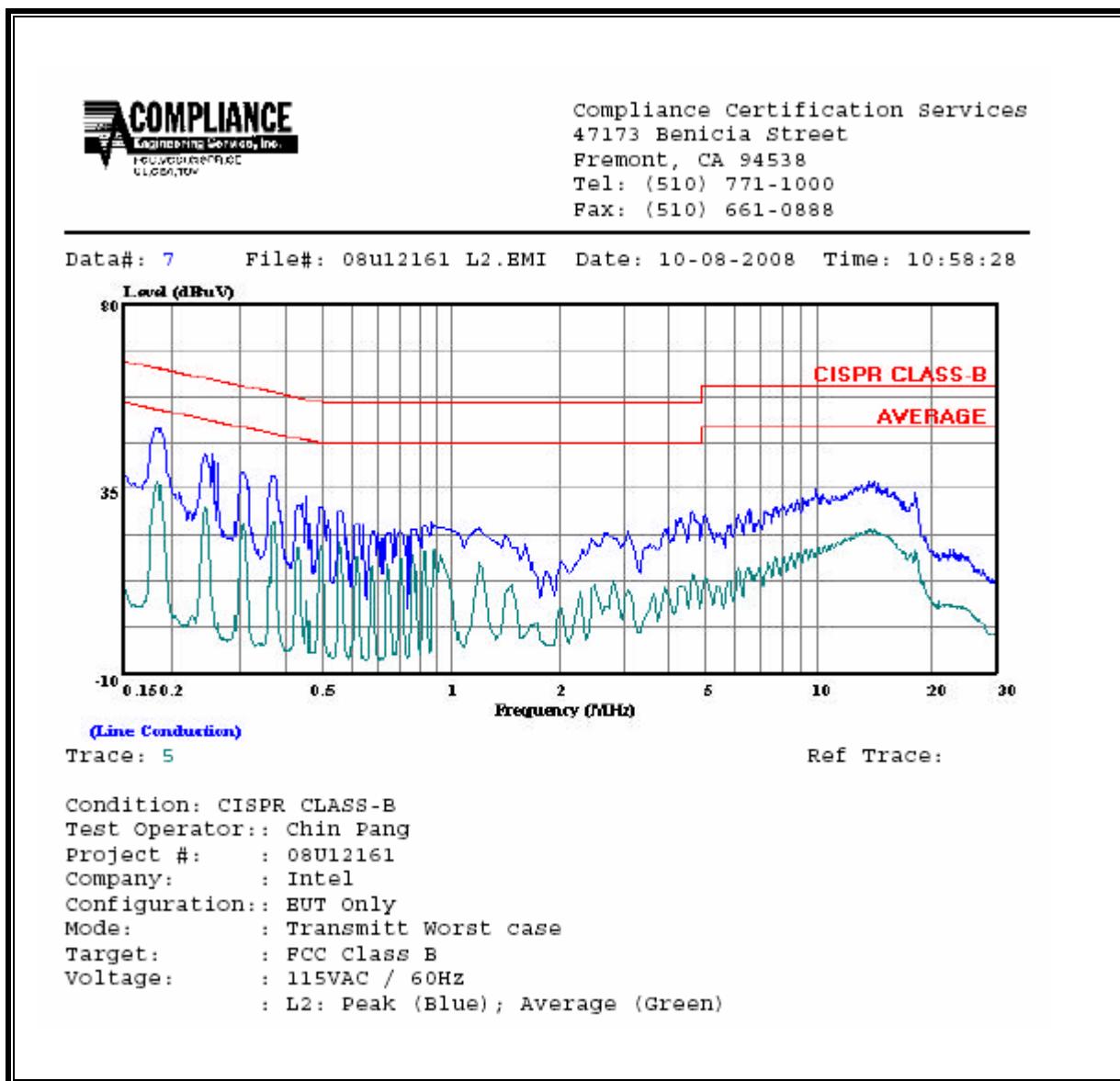
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN B AV	Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.18	49.12	--	36.24	0.00	64.35	54.35	-15.23	-18.11	L1
0.26	40.97	--	30.25	0.00	61.56	51.56	-20.59	-21.31	L1
13.84	36.82	--	25.31	0.00	60.00	50.00	-23.18	-24.69	L1
0.19	49.42	--	36.65	0.00	64.21	54.21	-14.79	-17.56	L2
0.25	43.09	--	30.60	0.00	61.89	51.89	-18.80	-21.29	L2
13.27	36.76	--	25.09	0.00	60.00	50.00	-23.24	-24.91	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS



10. SETUP PHOTOS

RADIATED RF MEASUREMENT SETUP FOR MOBILE CONFIGURATION

RADIATED FRONT PHOTO



RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

X-AXIS FRONT PHOTO



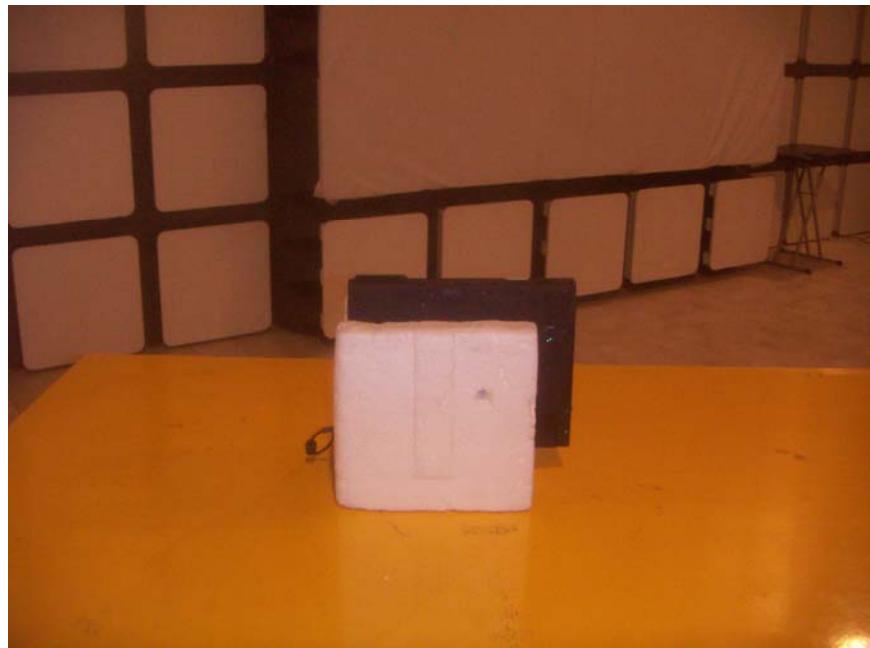
X-AXIS BACK PHOTO



Y-AXIS FRONT PHOTO



Y-AXIS BACK PHOTO



Z-AXIS FRONT PHOTO



Z-AXIS BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



END OF REPORT