



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8
CLASS II PERMISSIVE CHANGE**

CERTIFICATION TEST REPORT

FOR

MIC-A2 FCC/IC C2PC

MODEL NUMBER: MIC-A2

**FCC ID: MCLMICA2
IC: 2878D-MICA2**

REPORT NUMBER: 12J14215-1, Revision A

ISSUE DATE: JANUARY 27, 2012

Prepared for
HON HAI PRECISION IND. CO., LTD.
5F-1, 5 HSIN-AN ROAD HSINCHU
SCIENCE-BASED INDUSTRIAL PARK
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Prepared by
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NVLAP®

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	01/18/12	Initial Issue	F. Ibrahim
A	01/27/12	Updated manufacturer and added antenna information	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: HON HAI PRECISION IND. CO., LTD.
5F-1, 5 HSIN-AN ROAD
HSINCHU SCIENCE-BASED INDUSTRIAL PARK
TAIWAN, R.O.C.

EUT DESCRIPTION: MIC-A2 FCC/IC C2PC

MODEL: MIC-A2

SERIAL NUMBER: DK410002

DATE TESTED: JANUARY 09-10, 2012

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS (Radiated Portion & LC)
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	PASS (Radiated Portion & LC)
INDUSTRY CANADA RSS-GEN Issue 3	PASS (Radiated Portion & LC)

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

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

Approved & Released For UL CCS By:



FRANK IBRAHIM
ENGINEERING MANAGER
UL CCS

Tested By:



CHIN PANG
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

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

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

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 WiFi Module with 802.11A/HT20

The radio module is manufactured by Hon Hai Precision.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is EUT module, MIC-A2 is installed inside the specific host.

5.3. MAXIMUM OUTPUT POWER

The output power values were verified to be within +/- 0.5 dB from the original values under report number 11J13871-6 FCC IC DTS WLAN report.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PiFA antenna for TX/RX diversity, with a maximum gain of 2.55dBi as the original filing, and the antenna gain of this C2PC filing is 0.23dBi.

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was DRC Ver. 8.3.3426, UMI FW Ver. 19.0.35. The EUT driver software installed during testing was Broadcom, rev. 5.100.82.54. The test utility software used during testing was BCM Internal, rev. 5.100.RC82.54.

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the 802.11a mode were made at 6 Mb/s.

All final tests in the 802.11n HT20 SISO mode were made at MCS0.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

To determine the worst-position of highest emissions, the EUT was investigated for X, Y, Z positions, and the worst position was turned out to be at X-position with AC Adapter.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Latitude D430	NA	DoC
Laptop AC Adapter	Dell	LA65NS1-00	CN-OYD637-71615-8B6-263A	DOC
Evaluation Board	Broadcom	BCM9SANAD	1379054	NA
AC Adapter	JSP	PSAA10R-050	P112900695A1	DoC

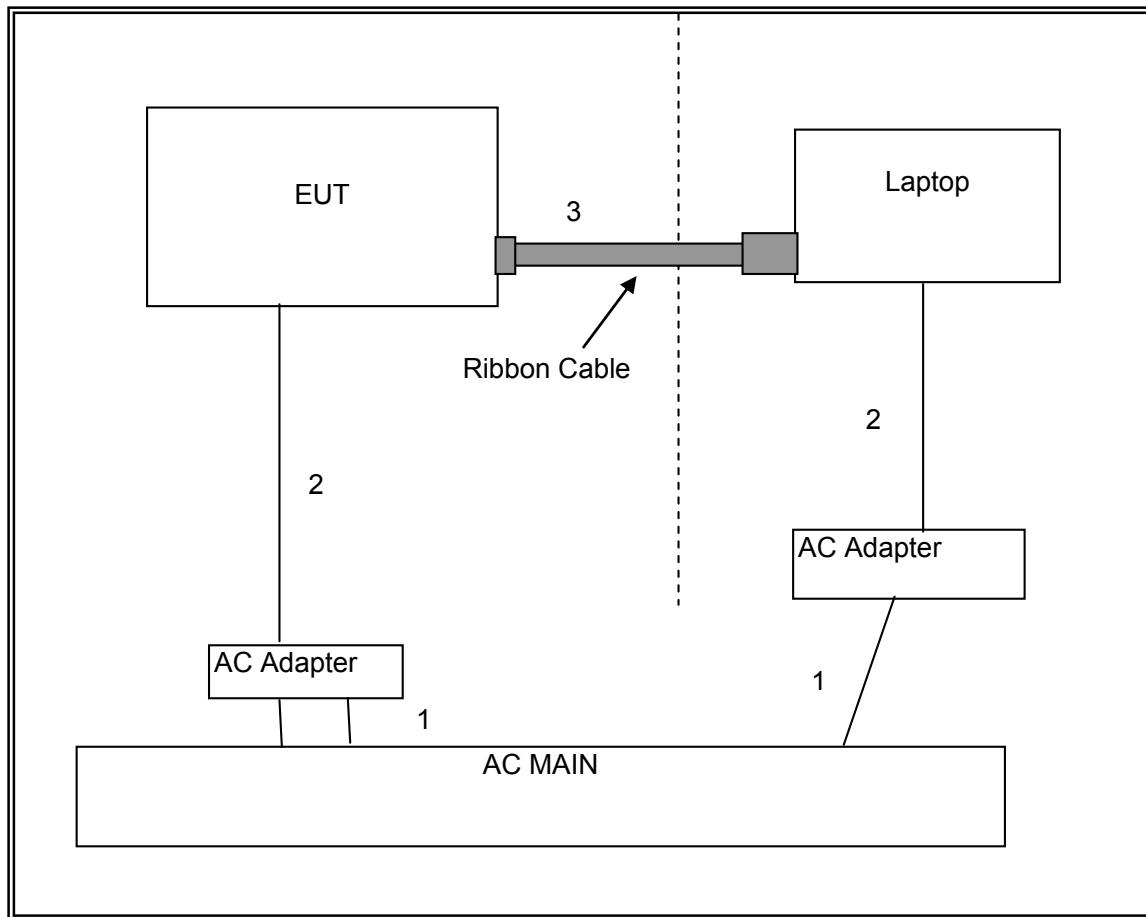
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	1m	NA
2	DC	2	DC	Un-shielded	1.5m	NA
3	I/O	1	Ribbon	Un-shielded	0.5m	NA

TEST SETUP

A Laptop is connected to the EUT via a ribbon cable for setup and removed 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	07-12-12
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06-29-12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07-16-12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01-27-12
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	04-19-12
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	05-04-12
Antenna, Horn, 26.5 GHz	ARA	MNH-1826/B	C00980	07-28-12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11-10-12
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	None	07-06-12
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02601	CNR

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

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

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

7.2. TRANSMITTER ABOVE 1 GHz

7.2.1. TX ABOVE 1 GHz FOR 802.11a IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber													
Test Engr:	Chin Pang												
Date:	01/10/12												
Project #:	12J14215												
Company:	Hon Hai												
Test Target:	FCC 15.247												
Mode Oper:	Legacy, 5.8GHz Band												
f	Measurement Frequency	Amp	Preamp Gain										Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters										Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m										Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength										Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter										
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 5745MHz													
11.490	3.0	34.2	38.9	11.2	-32.5	0.0	0.7	52.5	74.0	-21.5	H	P	
11.490	3.0	21.7	38.9	11.2	-32.5	0.0	0.7	39.9	54.0	-14.1	H	A	
11.490	3.0	33.8	38.9	11.2	-32.5	0.0	0.7	52.1	74.0	-21.9	V	P	
11.490	3.0	21.7	38.9	11.2	-32.5	0.0	0.7	39.9	54.0	-14.1	V	A	
Mid Ch, 5785MHz													
11.570	3.0	34.7	38.9	11.3	-32.5	0.0	0.7	53.1	74.0	-20.9	V	P	
11.570	3.0	22.4	38.9	11.3	-32.5	0.0	0.7	40.8	54.0	-13.2	V	A	
11.570	3.0	35.1	38.9	11.3	-32.5	0.0	0.7	53.5	74.0	-20.5	H	P	
11.570	3.0	22.6	38.9	11.3	-32.5	0.0	0.7	41.0	54.0	-13.0	H	A	
High Ch, 5825MHz													
11.650	3.0	34.1	39.0	11.4	-32.5	0.0	0.7	52.7	74.0	-21.3	H	P	
11.650	3.0	21.9	39.0	11.4	-32.5	0.0	0.7	40.5	54.0	-13.5	H	A	
11.650	3.0	34.6	39.0	11.4	-32.5	0.0	0.7	53.2	74.0	-20.8	V	P	
11.650	3.0	22.2	39.0	11.4	-32.5	0.0	0.7	40.8	54.0	-13.2	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

7.2.2. TX ABOVE 1 GHz FOR 802.11n HT20 IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 01/10/12
Project #: 12J14215
Company: Hon Hai
Test Target: FCC 15.247
Mode Oper: HT20, 5.8GHz Band

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 5745MHz													
11.490	3.0	35.6	38.9	11.2	-32.5	0.0	0.7	53.8	74.0	-20.2	V	P	
11.490	3.0	22.9	38.9	11.2	-32.5	0.0	0.7	41.1	54.0	-12.9	V	A	
11.490	3.0	36.6	38.9	11.2	-32.5	0.0	0.7	54.8	74.0	-19.2	H	P	
11.490	3.0	23.6	38.9	11.2	-32.5	0.0	0.7	41.9	54.0	-12.1	H	A	
Mid Ch, 5785MHz													
11.570	3.0	36.5	38.9	11.3	-32.5	0.0	0.7	54.9	74.0	-19.1	V	P	
11.570	3.0	23.6	38.9	11.3	-32.5	0.0	0.7	42.0	54.0	-12.0	V	A	
11.570	3.0	35.4	38.9	11.3	-32.5	0.0	0.7	53.9	74.0	-20.1	H	P	
11.570	3.0	22.9	38.9	11.3	-32.5	0.0	0.7	41.3	54.0	-12.7	H	A	
High Ch, 5825MHz													
11.650	3.0	34.6	39.0	11.4	-32.5	0.0	0.7	53.2	74.0	-20.8	V	P	
11.650	3.0	22.2	39.0	11.4	-32.5	0.0	0.7	40.8	54.0	-13.2	V	A	
11.650	3.0	36.3	39.0	11.4	-32.5	0.0	0.7	54.9	74.0	-19.1	H	P	
11.650	3.0	22.4	39.0	11.4	-32.5	0.0	0.7	41.0	54.0	-13.0	H	A	

Rev. 4.1.2.7

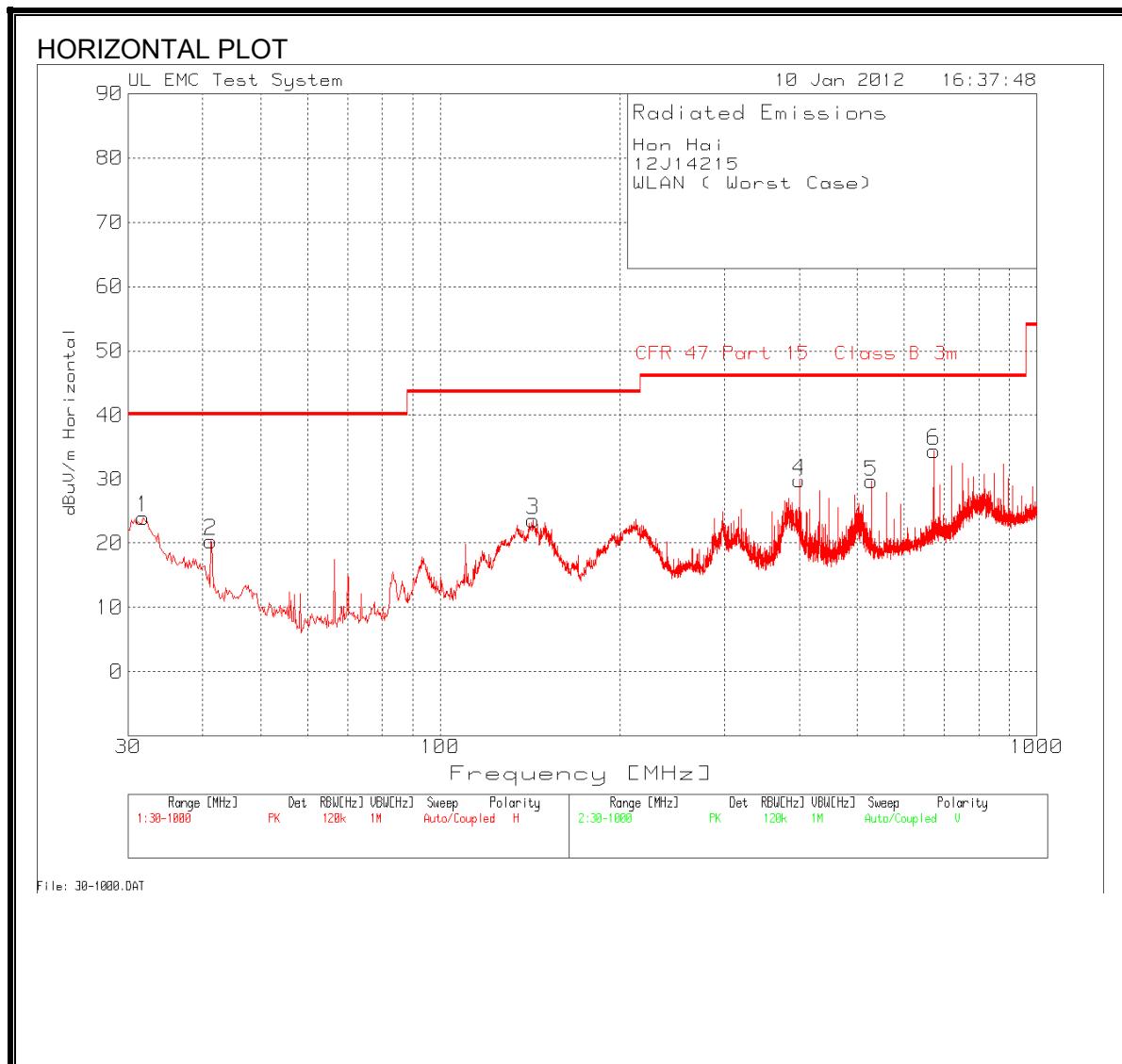
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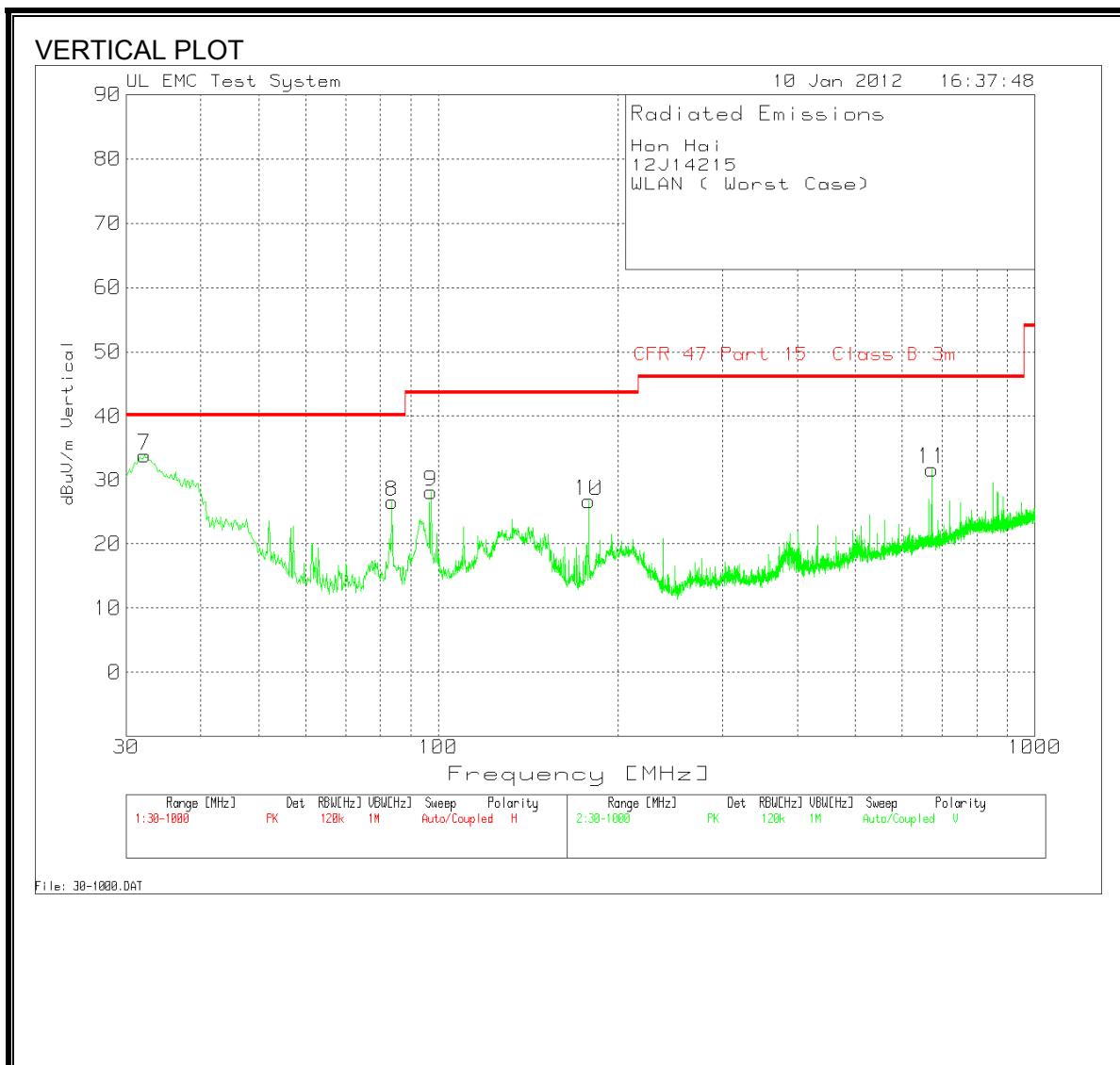
7.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement Compliance Certification Services, Fremont 3m Chamber																																																																																																																														
<p>Company: Hon Hai Project #: 12J14215 Date: 1/10/2012 Test Engineer: Chin Pang Configuration: EUT and Laptop Mode: RX, HT20, 5.8GHz Band</p>																																																																																																																														
<p><u>Test Equipment:</u></p> <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>T60; S/N: 2238 @3m</td><td>T34 HP 8449B</td><td></td><td colspan="4"></td><td>FCC 15.209</td></tr><tr><td colspan="15">Hi Frequency Cables</td></tr><tr><td>3' cable 22807700</td><td>12' cable 22807600</td><td>20' cable 22807500</td><td colspan="4">HPF</td><td>Reject Filter</td><td colspan="7">Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz</td></tr><tr><td>3' cable 22807700</td><td>12' cable 22807600</td><td>20' cable 22807500</td><td colspan="4"></td><td></td><td colspan="7"></td></tr></table>															Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit	T60; S/N: 2238 @3m	T34 HP 8449B						FCC 15.209	Hi Frequency Cables															3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF				Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz							3' cable 22807700	12' cable 22807600	20' cable 22807500																																																															
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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)																																																																																																															
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1.063	3.0	53.0	36.0	25.1	2.8	-37.7	0.0	0.0	43.2	26.2	74	54	-30.8	-27.8	H																																																																																																															
1.597	3.0	55.0	34.0	26.8	3.5	-36.9	0.0	0.0	48.4	27.4	74	54	-25.6	-26.6	H																																																																																																															
2.250	3.0	45.0	31.0	28.4	4.3	-35.9	0.0	0.0	41.8	27.8	74	54	-32.2	-26.2	H																																																																																																															
Rev. 07.08.11																																																																																																																														
<table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td>Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td>Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td>Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td>Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td></td></tr></table>															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																																																																																				
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7.4. WORST-CASE BELOW 1 GHz

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





HORIZONTAL AND VERTICAL DATA

Hon Hai									
12J14215									
WLAN (Worst Case)									
Tested By Chin Pang									
Jan-10-2012									
Range 1 30 - 1000MHz									
Frequency	Reading	Detector	Amp Factor[dB]	Ant Factors[dB]	dBuV/m	Part 15B	Margin	Polarity	
31.7446	33.68	PK	-29.2	19.5	23.98	40	-16.02	Horz	
41.243	36.21	PK	-29.2	13.3	20.31	40	-19.69	Horz	
143.0116	38.64	PK	-28.1	13	23.54	43.5	-19.96	Horz	
399.8561	41.79	PK	-27	15	29.79	46	-16.21	Horz	
527.9876	39.42	PK	-27	17.2	29.62	46	-16.38	Horz	
672.0144	41.79	PK	-26.3	19	34.49	46	-11.51	Horz	
Range 2 30 - 1000MHz									
Frequency	Reading	Detector	Amp Factor[dB]	Ant Factors[dB]	dBuV/m	Part 15B	Margin	Polarity	
32.1323	43.69	PK	-29.2	19.4	33.89	40	-6.11	Vert	
83.695	47.6	PK	-28.7	7.6	26.5	40	-13.5	Vert	
97.2642	47.32	PK	-28.6	9.4	28.12	43.5	-15.38	Vert	
178.8729	43.76	PK	-27.8	10.7	26.66	43.5	-16.84	Vert	
672.0144	39.01	PK	-26.3	19	31.71	46	-14.29	Vert	

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

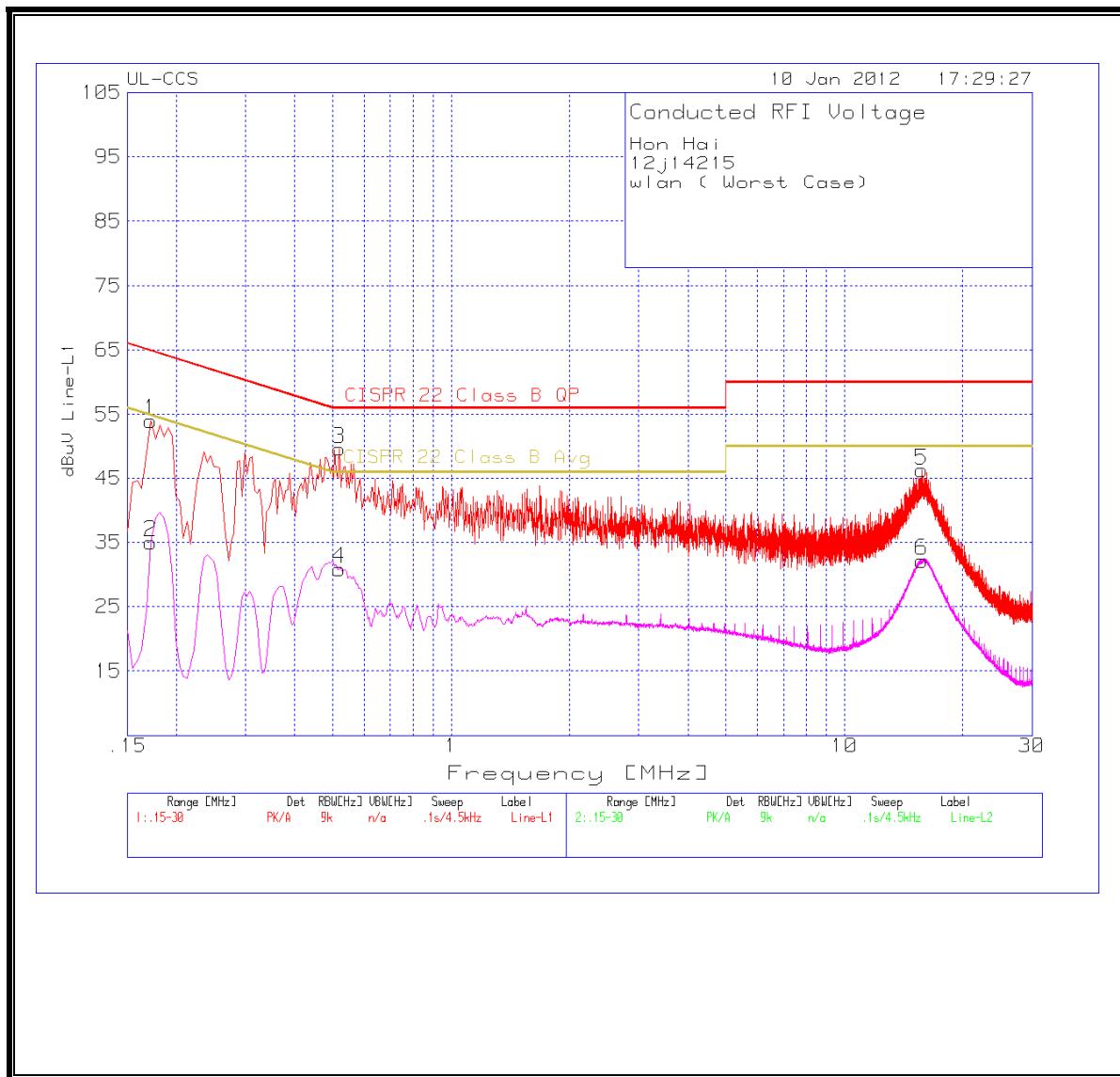
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

Hon Hai											
12J14215											
wlan (Worst Case)											
Tested By Chin Pang											
Jan-10-2012											
Line-L1 .15 - 30MHz											
Frequency	Reading	Detector	T24	IL	L1 [dB]	LC Cables [dB]	dBuV	CISPR 22B	Margin	CISPR 22B	Margin
0.1725	53.86	PK		0.1		0	53.96	64.8	-10.84	-	-
0.1725	34.85	Av		0.1		0	34.95	-	-	54.8	-19.85
0.519	49.56	PK		0.1		0	49.66	56	-6.34	-	-
0.519	30.75	Av		0.1		0	30.85	-	-	46	-15.15
15.738	45.9	PK		0.2		0.2	46.3	60	-13.7	-	-
15.738	31.76	Av		0.2		0.2	32.16	-	-	50	-17.84
Line-L2 .15 - 30MHz											
Frequency	Reading	Detector	T24	IL	L1 [dB]	LC Cables [dB]	dBuV	CISPR 22B	Margin	CISPR 22B	Margin
0.177	52.11	PK		0.1		0	52.21	64.6	-12.39	-	-
0.177	34.92	Av		0.1		0	35.02	-	-	54.6	-19.58
0.4965	52.67	PK		0.1		0	52.77	56.1	-3.33	-	-
0.4965	28.18	Av		0.1		0	28.28	-	-	46.1	-17.82
1.365	46.75	PK		0.1		0.1	46.95	56	-9.05	-	-
1.365	19.57	Av		0.1		0.1	19.77	-	-	46	-26.23

LINE 1 RESULTS



LINE 2 RESULTS

