



FCC PART 15B, CLASS B

MEASUREMENT AND TEST REPORT

For

X2 Computing Ltd.

Bond Industrial Estate, Wickhamford, EVESHAM, Worcestershire, WR11 7RL, UK

FCC ID: RGCCARBONX2206205

Report Type: Original Report	Product Type: Tablet
Test Engineer: <u>Gardon Zhang</u> 	
Report Number: <u>RSZ130621009-00A</u>	
Report Date: <u>2013-08-15</u>	
Reviewed By: <u>RF Leader</u> 	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *X2 Computing Ltd.*'s product, model number: *Carbon X220 (FCC ID: RGCCARBONX2206205)* or the "EUT" as referred to in this report was a *Tablet*, which was measured approximately: 32.5 cm (L) x 19.7 cm (W) x 2.8 cm (H), rated input voltage: DC 7.4V battery and DC 12V charging from adapter. The highest operating frequency is 1.6 GHz.

Adapter information: AC ADAPTER

Model: ADA12400ZA00

Input: AC100-240V, 50/60Hz, 2A

Output: DC 12V, 4A

Note: the model Carbon X220 has different LCD screens, top covers, batteries capacity, pins, storages, halo LED, cameras and plastic & rubber I/O cover optional, the details information refer to the attached declaration letter which provided and guaranteed by the applicant.

Tested sample 1 information: capacitive touch panel, black top cover, 16000mAh battery, 16pin, 32G storage, halo LED, front&rear camera both and without plastic & rubber I/O cover

Tested sample 2 information: resistive touch panel, white top cover, 8000mAh battery, 16pin, 32G storage, halo LED, front&rear camera both and without plastic & rubber I/O cover

**All measurement and test data in this report was gathered from production sample serial number: 1306072 (Assigned by the BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-06-21.*

Objective

This report is prepared on behalf of *X2 Computing Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15B, Class B.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS (Wi-Fi) submission with FCC ID: RGCCARBONX2206205.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical mode which is provided by manufacturer.

EUT operation mode: Running (Audio out & HDMI to internet & data transfer with CD card/internal storage & USB port with mouse & media playing)

EUT Exercise Software

N/A

Equipment Modifications

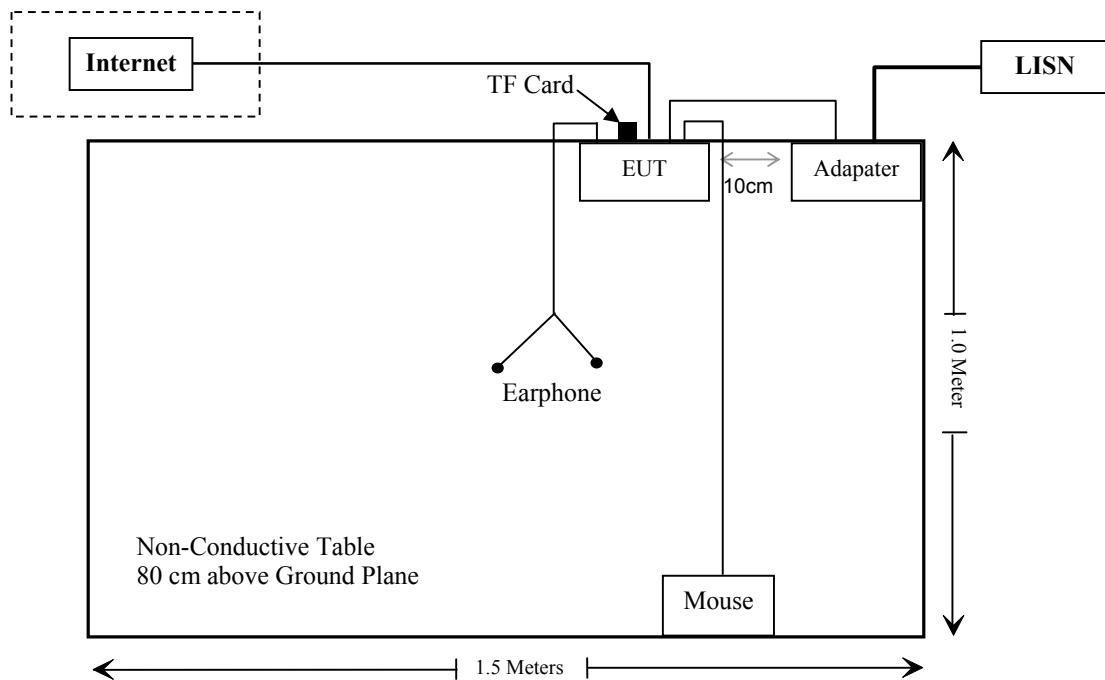
No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Mouse	MOC5UO	G1B0096D
N/A	Earphone	N/A	N/A
Kingston	TF Card	2G	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielding Detachable Mouse Cable	1.5	EUT	Mouse
Unshielded Undetachable AC Cable	2.0	Adapter	LISN
Unshielded Undetachable DC Cable	1.7	EUT	Adapter

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC §15.107

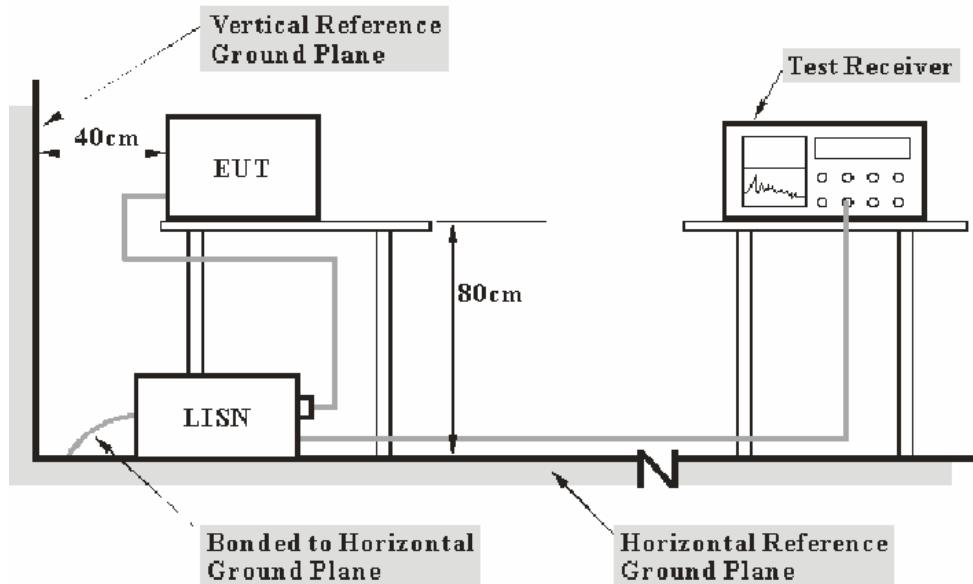
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between AMN/ISN and receiver, AMN/ISN voltage division factor, AMN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

EUT Setup



Note:

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.4-2009. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120V/60 Hz power source

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emissions, the adapter was connected to the LISN

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2013-06-17	2014-06-17
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2012-08-22	2013-08-21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2012-08-09	2014-08-09
Rohde & Schwarz	CE Test software	EMC 32	8.95	-	-

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Pulse Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Pulse Limiter Attenuation}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, with the worst margin reading of:

13.3 dB at 0.162000 MHz in the **Line** conducted mode (Sample 1)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cisp}$$

in BACL, $U_{(Lm)}$ is less than U_{cisp} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

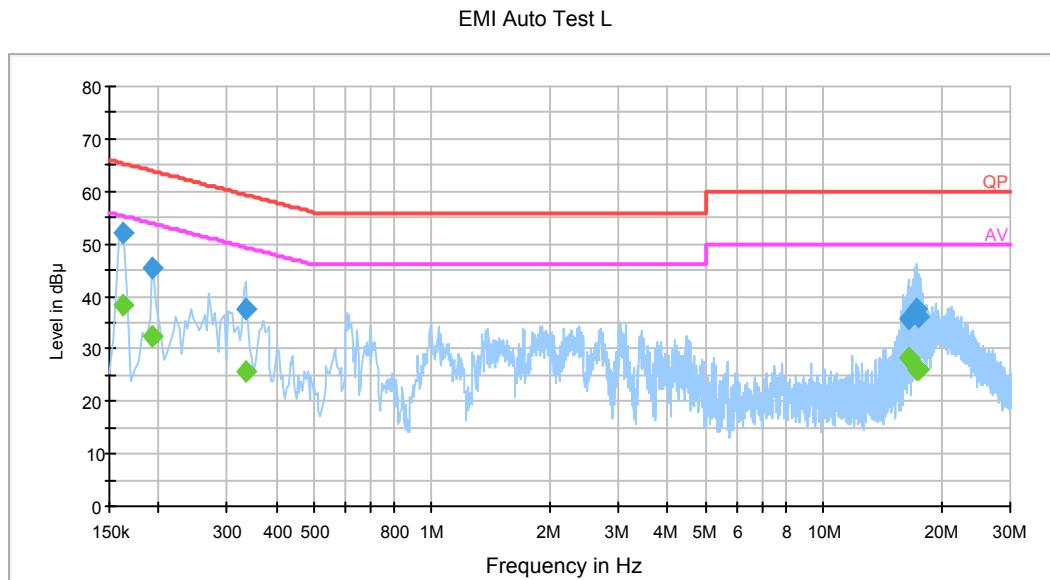
Environmental Conditions

Temperature:	20 ~ 25 °C
Relative Humidity:	50 ~ 56 %
ATM Pressure:	100.0 ~ 101.0 kPa

The testing was performed by Gardon Zhang on 2013-07-06 and 2013-08-15.

EUT operation mode: Running (Sample 1)

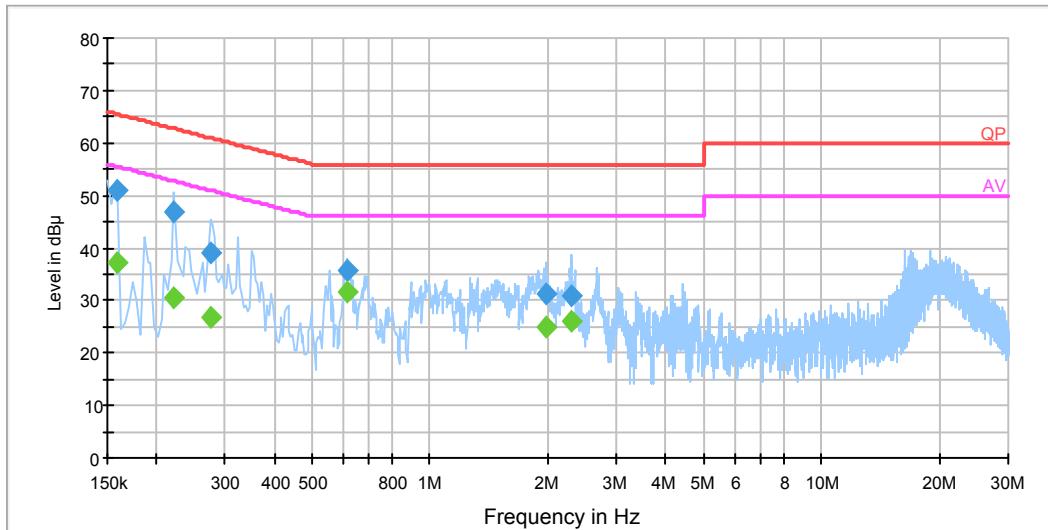
AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/ QP/Ave.)
0.162000	52.1	19.5	65.4	13.3	QP
0.162000	38.1	19.5	55.4	17.3	Ave.
0.194000	45.4	19.5	63.9	18.5	QP
0.194000	32.2	19.5	53.9	21.7	Ave.
0.334000	37.5	19.5	59.4	21.9	QP
16.462000	28.1	20.0	50.0	21.9	Ave.
17.234000	37.7	20.0	60.0	22.3	QP
17.494000	36.2	20.0	60.0	23.8	QP
0.334000	25.5	19.5	49.4	23.9	Ave.
17.234000	26.1	20.0	50.0	23.9	Ave.
17.494000	26.0	20.0	50.0	24.0	Ave.
16.462000	35.7	20.0	60.0	24.3	QP

AC 120V/60 Hz, Neutral

EMI Auto Test N

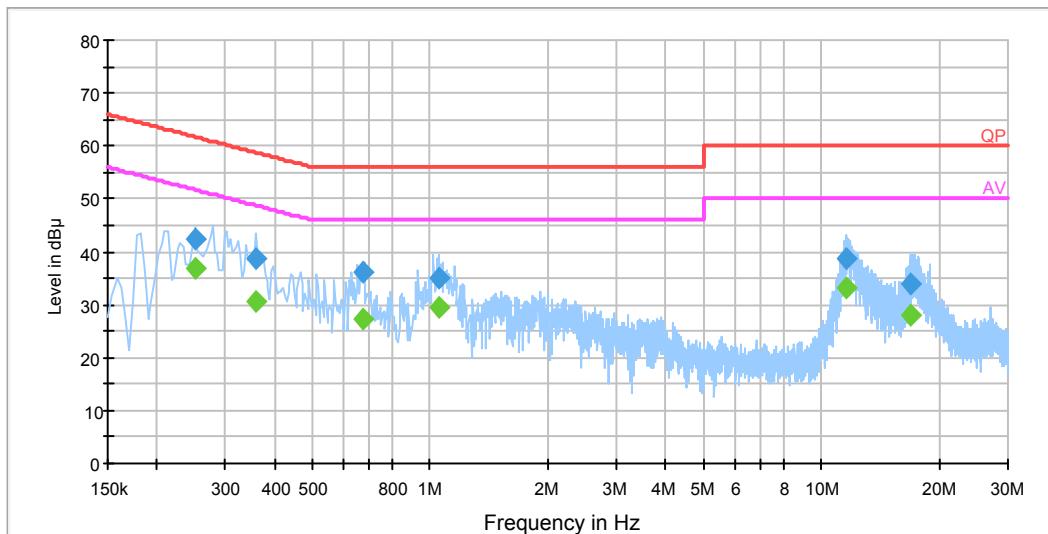


Frequency (MHz)	Corrected Amplitude (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/ QP/Ave.)
0.618000	31.8	19.5	46.0	14.2	Ave.
0.158000	51.1	19.5	65.6	14.5	QP
0.222000	46.9	19.5	62.7	15.8	QP
0.158000	37.3	19.5	55.6	18.3	Ave.
2.290000	26.1	19.6	46.0	19.9	Ave.
0.618000	35.7	19.5	56.0	20.3	QP
1.986000	24.9	19.6	46.0	21.1	Ave.
0.274000	39.1	19.5	61.0	21.9	QP
0.222000	30.6	19.5	52.7	22.1	Ave.
0.274000	26.8	19.5	51.0	24.2	Ave.
1.986000	31.2	19.6	56.0	24.8	QP
2.290000	31.0	19.6	56.0	25.0	QP

EUT operation mode: Running (Sample 2)

AC 120V/60 Hz, Line

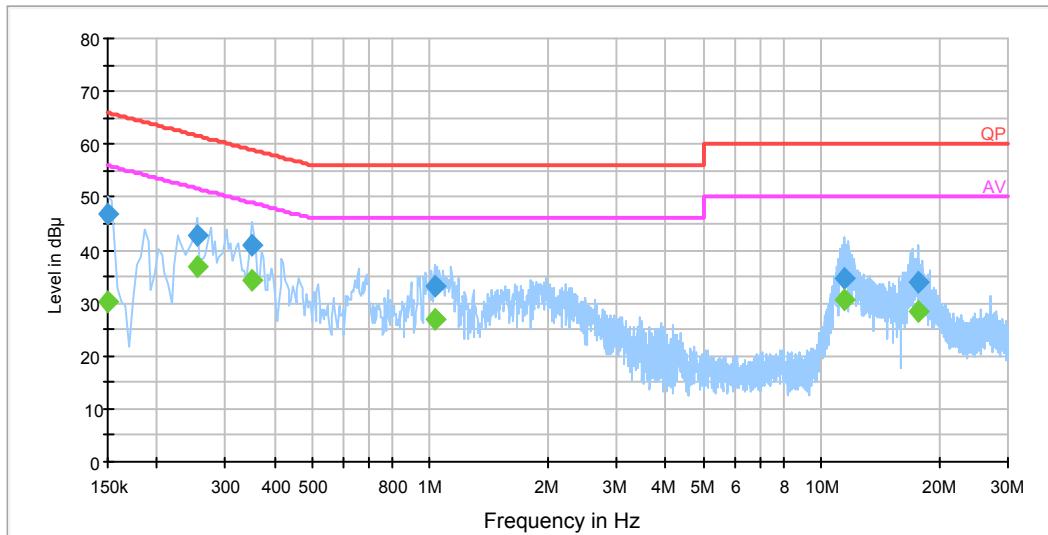
EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/ QP/Ave.)
0.250000	36.8	19.5	51.8	15.0	Ave.
1.050000	29.4	19.5	46.0	16.6	Ave.
11.562000	33.2	19.8	50.0	16.8	Ave.
0.358000	30.6	19.5	48.8	18.2	Ave.
0.674000	27.3	19.5	46.0	18.7	Ave.
0.250000	42.2	19.5	61.8	19.5	QP
0.674000	35.9	19.5	56.0	20.1	QP
0.358000	38.6	19.5	58.8	20.2	QP
1.050000	35.1	19.5	56.0	20.9	QP
11.562000	38.7	19.8	60.0	21.3	QP
16.970000	27.9	20.0	50.0	22.1	Ave.
16.970000	34.0	20.0	60.0	26.0	QP

AC 120V/60 Hz, Neutral

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/ QP/Ave.)
0.350000	34.3	19.5	49.0	14.7	Ave.
0.254000	36.8	19.5	51.6	14.8	Ave.
0.350000	40.9	19.5	59.0	18.1	QP
0.254000	42.8	19.5	61.6	18.8	QP
1.026000	26.9	19.5	46.0	19.1	Ave.
11.418000	30.7	19.9	50.0	19.3	Ave.
0.150000	46.6	19.5	66.0	19.4	QP
17.650000	28.3	20.1	50.0	21.7	Ave.
1.026000	33.1	19.5	56.0	22.9	QP
11.418000	34.5	19.9	60.0	25.5	QP
0.150000	30.1	19.5	56.0	25.9	Ave.
17.650000	34.0	20.1	60.0	26.0	QP

Note:

- 1) Corrected Amplitude = Reading + Correction Factor + Pulse Limiter Attenuation
- 2) Correction Factor = LISN VDF + Cable Loss
The corrected factor has been input into the transducer of the test software.
- 3) Margin = Limit – Corrected Amplitude

FCC §15.109 - RADIATED EMISSIONS

Applicable Standard

According to FCC §15.109

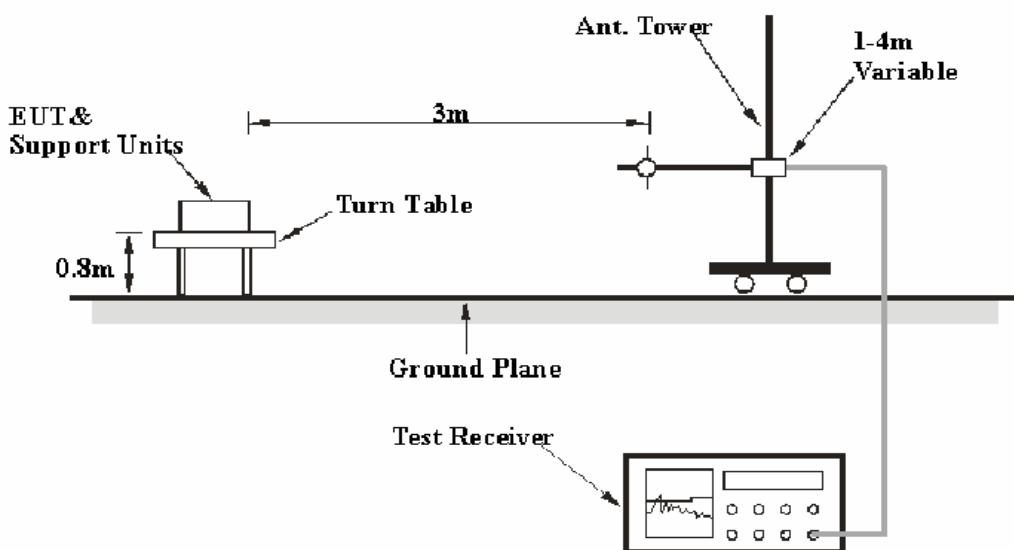
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

Frequency	Polarity	Measurement uncertainty
30MHz~200MHz	Horizontal	4.62 dB (k=2, 95% level of confidence)
	Vertical	4.54 dB (k=2, 95% level of confidence)
200MHz~1GHz	Horizontal	4.84 dB (k=2, 95% level of confidence)
	Vertical	5.91 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal / Vertical	4.68 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal / Vertical	4.92 dB (k=2, 95% level of confidence)

EUT Setup



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120V/60 Hz power source

EMI Test Receiver Setup

The system was investigated from 30 MHz to 8.0 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

During the radiated emissions, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01057	2012-11-24	2013-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-05-09	2014-05-09
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Mini-Circuits	Amplifier	ZVA-213+	N/A	2012-11-24	2013-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
R&S	Auto test Software	EMC32	V6.30	-	-

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Correction Factor} = \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the data in the following table, with the worst margin reading of:

3.4 dB at 480.080000 MHz in the Vertical polarization (Sample 1)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cisp}$$

in BACL, $U_{(Lm)}$ is less than U_{cisp} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

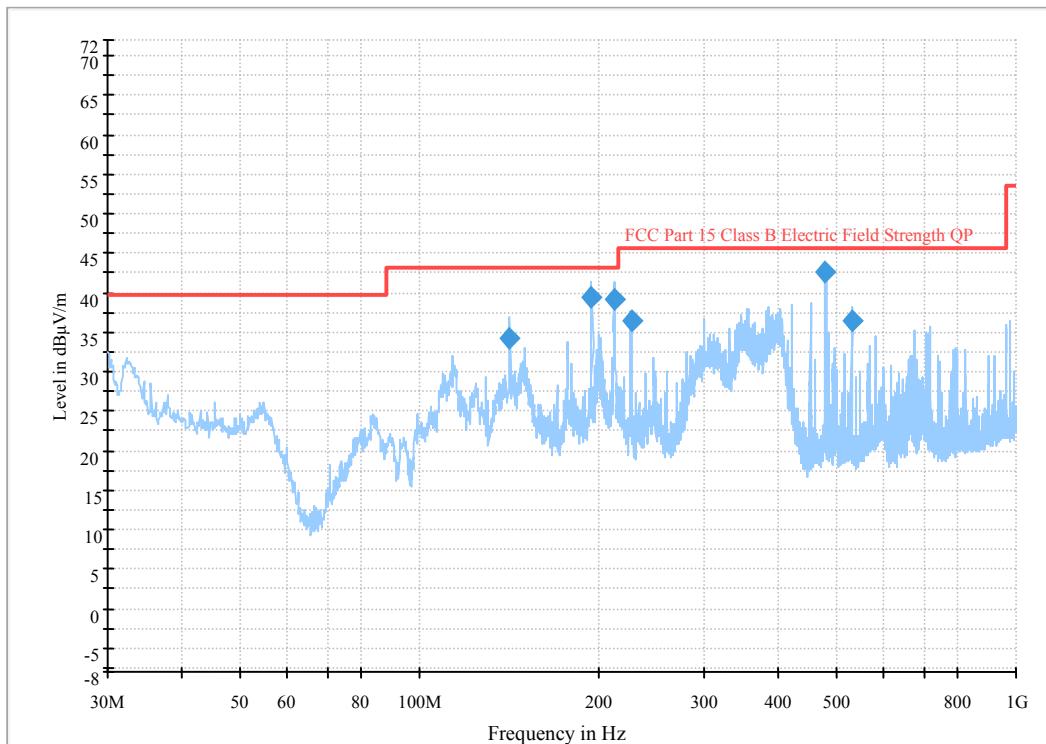
Temperature:	20 ~ 25 °C
Relative Humidity:	50 ~ 56 %
ATM Pressure:	100.0 ~ 101.0 kPa

The testing was performed by Gardon Zhang on 2013-07-04 and 2013-08-15.

EUT operation mode: Running (Sample 1)

1) 30 MHz ~ 1 GHz

Auto Test (FCC part 15 Class B)



Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Antenna height (cm)	Antenna Polarity	Turntable position (deg)	Correction Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
480.080000	42.6	147.0	V	144.0	-10.2	46.0	3.4*
193.867550	39.5	153.0	H	0.0	-15.5	43.5	4.0*
212.630850	39.3	147.0	H	45.0	-16.5	43.5	4.2*
141.550000	34.2	100.0	H	138.0	-14.3	43.5	9.3
530.038000	36.5	152.0	V	151.0	-9.8	46.0	9.5
226.303750	36.4	133.0	H	48.0	-16.2	46.0	9.6

Note:

- 1) Corrected Amplitude = Meter Reading + Correction Factor
- 2) Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain
The corrected factor has been input into the transducer of the test software.
- 3) Margin = Limit – Corrected Amplitude
- 4) *Within measurement uncertainty!

2) 1 GHz ~ 8 GHz

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB μ V/m)	FCC Part 15.109	
	Reading (dB μ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
2793.5	39.66	Ave.	35	1.5	H	8.56	48.22	54	5.78
2793.5	36.89	Ave.	168	1.3	V	8.56	45.45	54	8.55
1991.9	38.28	Ave.	124	1.4	H	1.77	40.05	54	13.95
2793.5	51.22	PK	35	1.5	H	8.56	59.78	74	14.22
1991.9	35.78	Ave.	208	1.2	V	1.77	37.55	54	16.45
2793.5	48.21	PK	168	1.3	V	8.56	56.77	74	17.23
1991.9	49.56	PK	124	1.4	H	1.77	51.33	74	22.67
1991.9	47.47	PK	208	1.2	V	1.77	49.24	74	24.76

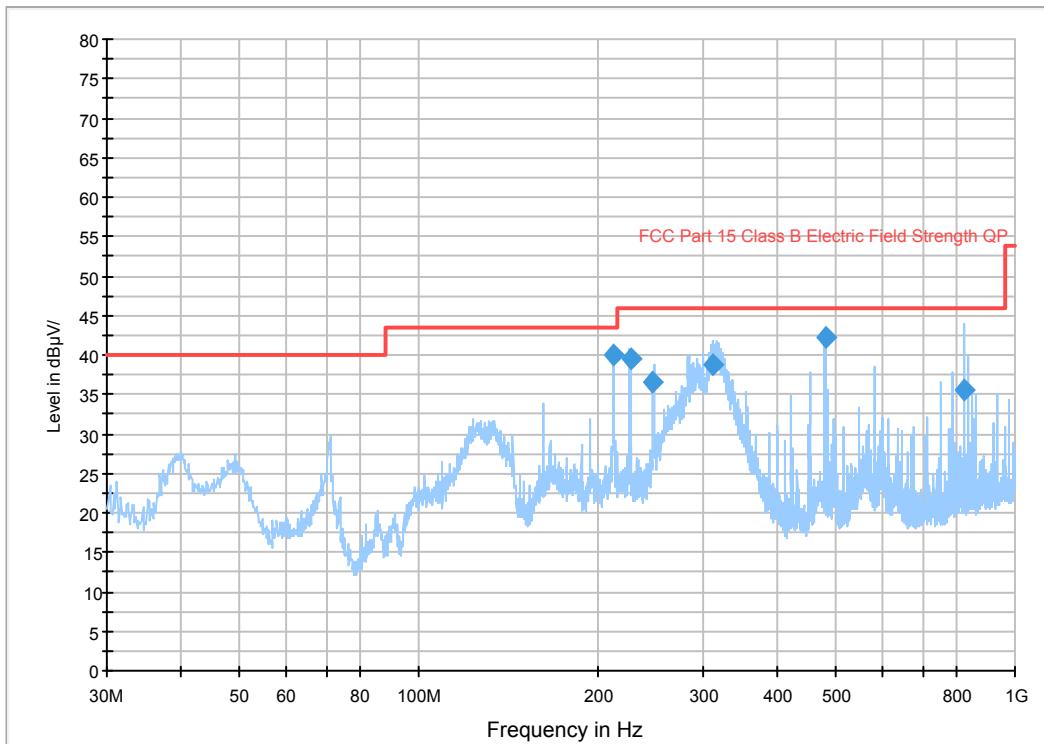
Note:

- 1) Corrected Amplitude = Corrected Factor + Reading
- 2) Corrected Factor=Antenna factor (RX) + Cable loss – Amplifier factor
- 3) Margin = Limit - Corrected Amplitude

EUT operation mode: Running (Sample 2)

1) 30 MHz ~ 1 GHz

Auto Test(FCC part 15 Class B)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (deg)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
212.647550	40.1	150.0	H	124.0	-16.5	43.5	3.4*
480.180000	42.1	121.0	V	136.0	-10.1	46.0	3.9*
226.303750	39.5	147.0	H	224.0	-16.3	46.0	6.5
311.503550	38.8	100.0	H	82.0	-13.8	46.0	7.2
247.401250	36.5	109.0	H	0.0	-15.8	46.0	9.5
825.163600	35.6	100.0	H	202.0	-5.1	46.0	10.4

Note:

- 1) Corrected Amplitude = Meter Reading + Correction Factor
- 2) Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain
The corrected factor has been input into the transducer of the test software.
- 3) Margin = Limit – Corrected Amplitude
- 4) *Within measurement uncertainty!

2) 1 GHz ~ 8 GHz

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB μ V/m)	FCC Part 15.109	
	Reading (dB μ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
3121.2	36.21	Ave.	48	1.6	H	9.32	45.53	54	8.47
3121.2	34.65	Ave.	202	1.3	V	9.32	43.97	54	10.03
2035.6	37.82	Ave.	145	1.7	H	3.23	41.05	54	12.95
2035.6	35.69	Ave.	263	1.3	V	3.23	38.92	54	15.08
3121.2	48.72	PK	48	1.6	H	9.32	58.04	74	15.96
3121.2	46.47	PK	202	1.3	V	9.32	55.79	74	18.21
2035.6	50.43	PK	145	1.7	H	3.23	53.66	74	20.34
2035.6	48.21	PK	263	1.3	V	3.23	51.44	74	22.56

Note:

- 1) Corrected Amplitude = Corrected Factor + Reading
- 2) Corrected Factor=Antenna factor (RX) + Cable loss – Amplifier factor
- 3) Margin = Limit - Corrected Amplitude

DECLARATION LETTER



X2 Computing Ltd.

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Attestation Letter

August 1, 2013

To:
Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue
Sunnyvale, CA 94089

Dear Sir or Madam:

We, X2 Computing Ltd. hereby declare that our Tablet, Model Number: Carbon X220, FCC ID: RGCCARBONX2206205, with AUO & Chimei LCD screens; different top cover for Capacitive & Resistive touch panels; different battery cover each of 8000mAh and 160000mAh batteries; the PCBA with same PCB but with 8pin and 12pin pogo connector alternative; with 32G and 16G storage, different color for led lamp each of Halo LED or not; front camera and rear camera both are the optional part; Plastic and Rubber I/O cover is also optional on product.

Best Regards,

Signature
A handwritten signature in blue ink, appearing to read 'Robin Daunter'.

Robin Daunter
Technical Director

*****END OF REPORT*****