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EMI DoC REPORT

Applicant Name:

Vertex Wireless Co., Ltd

(zip 463-825) 5F, Dongnam B/D, 8-8 Sunae-Dong,
Bundang-Gu, Seongnam-City, Kyunggi-Do, Korea.

Date of Issue: October 21, 2010

Test Report No.: HCTE1010FE30

Test Site: HCT CO., LTD.

HCT FRN: 0005-8664-21

FCC ID:

XAVVW340

Rule Part(s) / Standard(s) : FCC PART 15 Subpart B / CISPR 22 Class B
Equipment Type : CDMA EV-DO Rev.A Mini Wi-Fi Hotspot
Model : VW340
Port / Connector(s) : DC In Port / USB Port

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Report prepared by
: Kyoung Hee Yoon
Test Engineer of EMC Tech. Part

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: Nam Wook Kang
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TABLE OF CONTENTS

	PAGE
1. GENERAL INFORMATION	
1.1 Product description	3
1.2 Related submittal(s)/Grant(s)	3
1.3 Tested system details	4
1.4 Cable description	5
1.5 Noise suppression parts on cable. (I/O cable)	5
1.6 Test methodology	6
1.7 Test facility	6
1.8 Frequency Range of Radiated Measurements	6
2. SYSTEM TEST CONFIGURATION	
2.1 Configuration of tested system	7
3. PRELIMINARY TEST	
3.1 Conducted Emission test	8
3.2 Radiated Emission test	8
4. CONDUCTED AND RADIATED EMISSION TESTS SUMMARY	
4.1 Conducted Emission test	9
4.2 Radiated Emission test	19
4.3 Test setup photos	21
5. FIELD STRENGTH CALCULATION	25
6. TEST EQUIPMENT	26
7. CONCLUSION	27

1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test (E.U.T) is **CDMA EV-DO Rev.A Mini Wi-Fi Hotspot, Model: VW340** manufactured by **Vertex Wireless Co., Ltd.** Its basic purpose is used for communications.

Model	VW340
FCC ID	XAVVW340
E.U.T Type	CDMA EV-DO Rev.A Mini Wi-Fi Hotspot
TX Frequency	824.70 MHz to 848.31 MHz (CDMA 835) 1 851.25 MHz to 1 908.75 MHz (CDMA 1 900)
RX Frequency	869.70 MHz to 893.31 MHz (CDMA 835) 1 931.25 MHz to 1 988.75 MHz (CDMA 1 900)

1.2 Related Submittal(s) / Grant(s)

Original submittal only.

1.3 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Manufacturer	Model Number/ Serial Number	FCC ID / DoC	Connected To
CDMA EV-DO Rev.A Mini Wi-Fi Hotspot	Vertex Wireless	VW340	XAVVW340	-
Travel adaptor	BT Telecom	BT-TA7B BT006B000602	-	E.U.T
Notebook PC	SAMSUNG	NT-R519	DoC	E.U.T Notebook PC adaptor
Notebook PC adaptor	DELTA	ADP-60ZH D AD-6019R	-	Notebook PC
Mouse	Microsoft	Intellimouse optical USB and PS/2 compatible	DoC	Notebook PC

1.4 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
CDMA EV-DO Rev.A Mini Wi-Fi Hotspot	DC in	N	-	(P)1.8
	USB data	-	N	(D)0.8
Notebook PC	USB (Mouse)	-	Y	(D)1.8

* The marked "(D)" means the data cable and "(P)" means the power cable.

1.5 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
CDMA EV-DO Rev.A Mini Wi-Fi Hotspot	DC in	N	-	Y	E.U.T End
	USB data	N	-	Y	Both End
Notebook PC	USB (Mouse)	Y	Notebook PC End	Y	Notebook PC End

1.6 Test Methodology

Both Conducted and Radiated testing was performed according to the procedures in ANSI C63.4/2003. Radiated testing was performed at an antenna to E.U.T distance of 3 m

1.7 Test Facility

The 10 m semi anechoic chamber used to collect the radiated data is located at the 105-1, Jangam-Ri, Majang-Myeon, Icheon-Si, Kyongki-Do, 467-701, South Korea, and the conducted measurement facility used to measure the conducted data are located at San 136-1, Ami-Ri Bubal-Eup, Icheon-Si, Kyongki-Do, 467-701, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facilities was submitted to the Commission and accepted dated Sep. 03, 2010 (Registration Number: 90661)

1.8 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

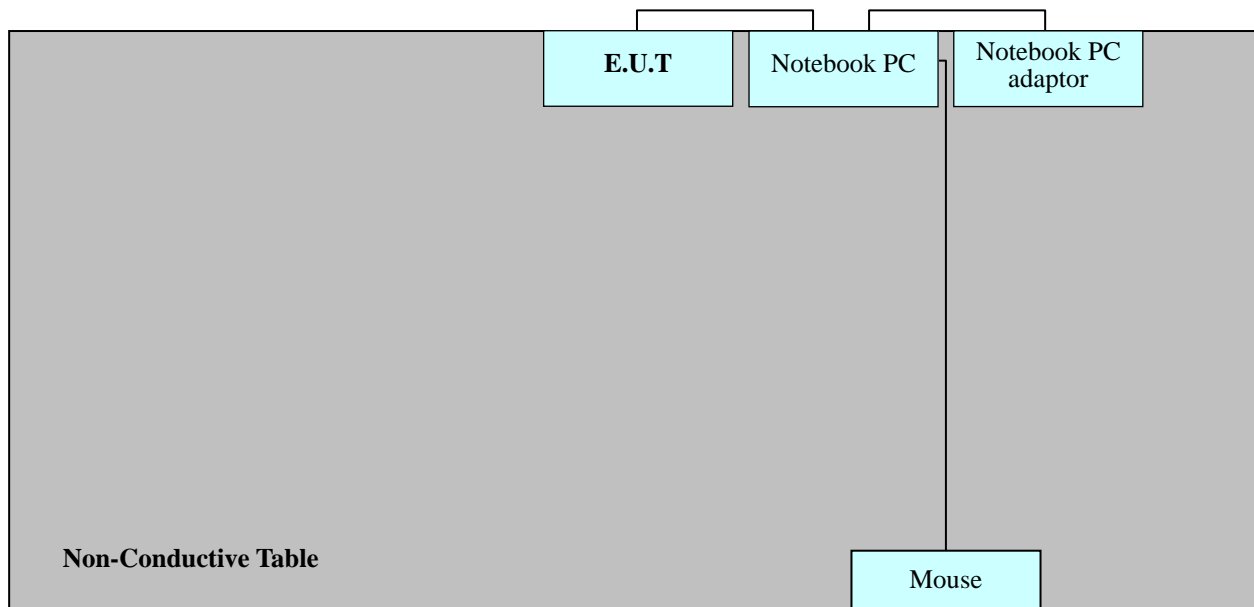
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

2. SYSTEM TEST CONFIGURATION

2.1 Configuration of Test System

- Power Line Conducted test : E.U.T was connected to LISN via Notebook PC adaptor.
Preliminary Power Line Conducted Emission tests were performed by using the procedure in ANSI C63.4/2003 7.2.3 to determine the worst operating conditions.
- Radiated Emission test : Preliminary Radiated Emission tests were performed by using the procedure in ANSI C63.4/2003 8.3.1.1 to determine the worst operating condition. Final Radiated Emission tests were performed at 3 m semi anechoic chamber

[Configuration of Tested System]



Power Line: 110 VAC

3. PRELIMINARY TEST

3.1 Conducted Emission Test

During preliminary tests, the following operating mode was investigated:

Operation Mode	The Worst Operating Condition
Idle (835, 1 900)	○
Data Communication	○

3. 2 Radiated Emission Test

During preliminary tests, the following operating mode was investigated:

Operation Mode	The Worst Operating Condition
Idle (835, 1 900)	○
Data Communication	○

4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Limit apply to	: CISPR 22 Class B
Result	: Passed by 6.6 dB
Operating condition	: Data Communication mode
Detector	: Quasi-Peak, Average (6 dB Bandwidth: 9 kHz)
Temperature	: 27.0 °C
Humidity level	: 46.2 %
Test date	: October 18, 2010

Power Line Conducted Emissions			CISPR 22 Class B		
Frequency (MHz)	Amplitude (dB μ V)	Conductor	Detector	Limit (dB μ V)	Margin (dB)
0.1500	59.4	HOT	Quasi-Peak	66.0	6.6
4.6760	33.7	HOT	Average	46.0	12.3
5.0000	33.7	NEUTRAL	Average	46.0	12.3
5.0000	44.7	NEUTRAL	Quasi-Peak	56.0	11.3

※ **NOTE:** Refer to page 10 to page 13 for details.

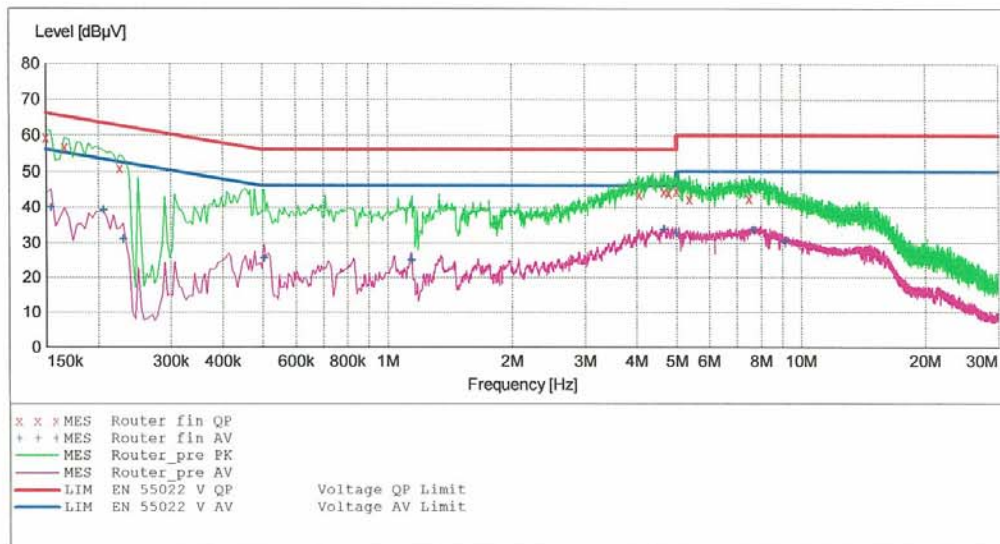
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EMC

EUT: VW340
 Manufacturer: VERTEX
 Operating Condition: DATA COMMUNICATION MODE
 Test Site: SHIELD ROOM
 Operator: DS-KIM
 Test Specification: CISPR22 CLASS B
 Comment: H

SCAN TABLE: "CISPR22 CLASS B"

Short Description:			CISPR 22 CLASS B			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Router_fin QP"

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.150000	59.40	10.1	66	6.6	---	---
0.166000	56.70	10.1	65	8.4	---	---
0.226000	50.90	10.1	63	11.7	---	---
4.060000	43.60	10.4	56	12.4	---	---
4.676000	44.30	10.4	56	11.7	---	---
4.796000	44.10	10.4	56	11.9	---	---
5.000000	44.50	10.5	56	11.5	---	---
5.376000	42.30	10.5	60	17.7	---	---
7.520000	42.60	10.6	60	17.4	---	---

MEASUREMENT RESULT: "Router_fin AV"

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.154000	39.80	10.1	56	16.0	---	---
0.206000	39.10	10.1	53	14.3	---	---
0.230000	31.00	10.1	52	21.4	---	---
0.504000	25.40	10.1	46	20.6	---	---
1.144000	24.90	10.2	46	21.1	---	---
4.676000	33.70	10.4	46	12.3	---	---
5.000000	32.50	10.5	46	13.5	---	---
7.708000	33.60	10.6	50	16.4	---	---
9.192000	30.40	10.7	50	19.6	---	---

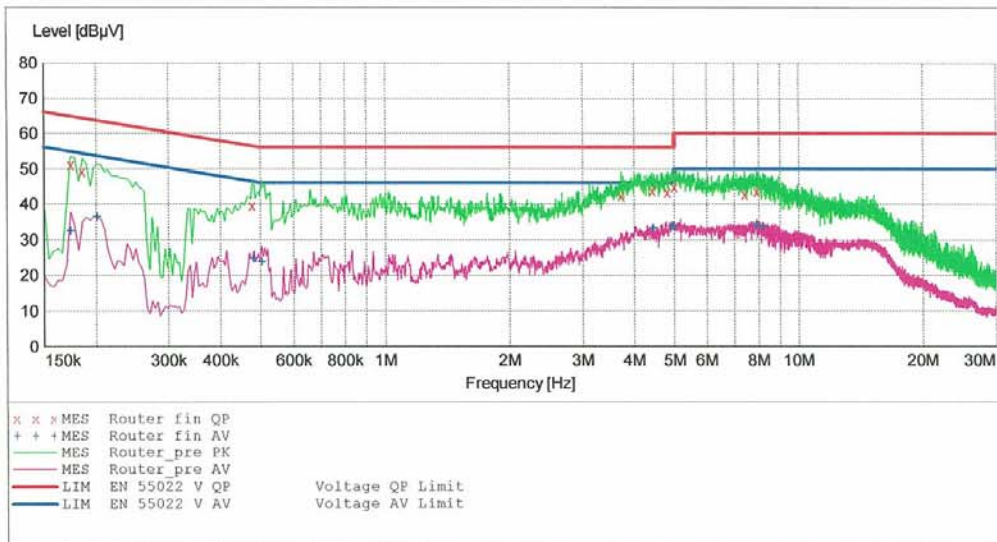
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EMC

EUT: VW340
 Manufacturer: VERTEX
 Operating Condition: DATA COMMUNICATION MODE
 Test Site: SHIELD ROOM
 Operator: DS-KIM
 Test Specification: CISPR22 CLASS B
 Comment: N

SCAN TABLE: "CISPR22 CLASS B"

Short Description:			CISPR 22 CLASS B			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Router_fin QP"

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.174000	51.10	10.1	65	13.7	---	---
0.186000	49.10	10.1	64	15.2	---	---
0.478000	39.60	10.1	56	16.8	---	---
3.728000	42.30	10.4	56	13.7	---	---
4.440000	43.80	10.4	56	12.2	---	---
4.832000	43.40	10.4	56	12.6	---	---
5.000000	44.70	10.5	56	11.3	---	---
7.404000	42.80	10.6	60	17.2	---	---
7.916000	43.50	10.7	60	16.5	---	---

MEASUREMENT RESULT: "Router_fin AV"

10/18/2010 10:42AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.174000	32.40	10.1	55	22.3	---	---
0.202000	36.40	10.1	54	17.2	---	---
0.482000	24.70	10.1	46	21.6	---	---
0.504000	23.90	10.1	46	22.1	---	---
4.460000	33.20	10.4	46	12.8	---	---
4.952000	33.60	10.5	46	12.4	---	---
5.000000	33.70	10.5	46	12.3	---	---
7.916000	34.00	10.7	50	16.0	---	---
8.200000	33.60	10.7	50	16.4	---	---

Limit apply to : CISPR 22 Class B
Result : Passed by 12.0 dB
Operating condition : Idle mode
Detector : Quasi-Peak, Average (6 dB Bandwidth: 9 kHz)
Temperature : 27.0 °C
Humidity level : 46.2 %
Test date : October 18, 2010

Power Line Conducted Emissions			CISPR 22 Class B		
Frequency (MHz)	Amplitude (dB μ V)	Conductor	Detector	Limit (dB μ V)	Margin (dB)
1.5040	34.0	HOT	Average	46.0	12.0
1.5040	32.7	NEUTRAL	Average	46.0	13.3
0.1660	48.4	NEUTRAL	Quasi-Peak	65.0	16.8
0.1660	48.9	HOT	Quasi-Peak	65.0	16.3

※ **NOTE:** Refer to page 15 to page 18 for details.

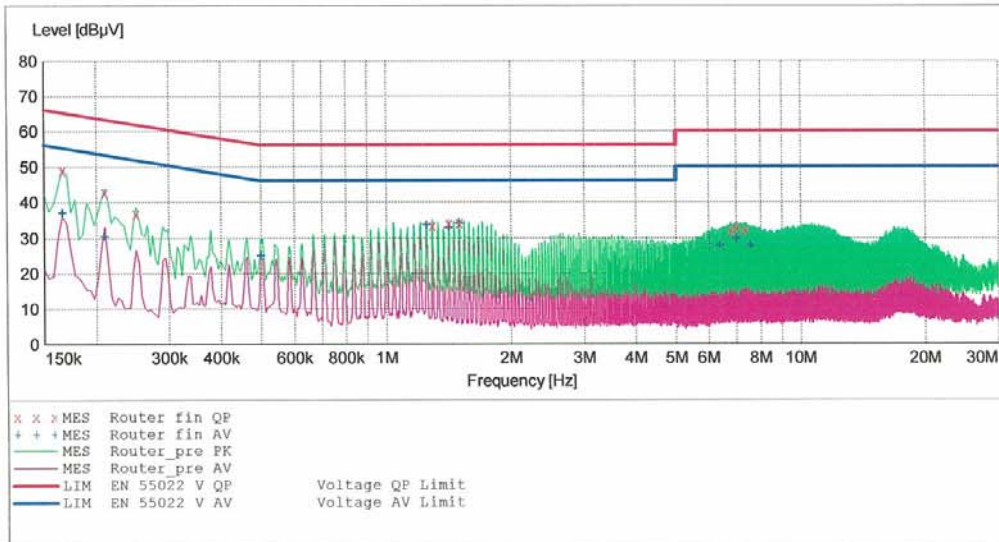
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EMC

EUT: VW340
Manufacturer: VERTEX
Operating Condition: IDLE MODE
Test Site: SHIELD ROOM
Operator: DS-KIM
Test Specification: CISPR22 CLASS B
Comment: H

SCAN TABLE: "CISPR22 CLASS B"

Short Description:			CISPR 22 CLASS B			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Router_fin QP"

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.166000	48.90	10.1	65	16.3	---	---
0.210000	42.80	10.1	63	20.4	---	---
0.250000	36.80	10.1	62	25.0	---	---
1.296000	33.50	10.2	56	22.5	---	---
1.420000	34.00	10.2	56	22.0	---	---
1.504000	34.20	10.2	56	21.8	---	---
6.804000	32.00	10.6	60	28.0	---	---
7.016000	32.90	10.6	60	27.1	---	---
7.348000	32.30	10.6	60	27.7	---	---

MEASUREMENT RESULT: "Router_fin AV"

10/18/2010 10:15AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.166000	37.00	10.1	55	18.2	---	---
0.210000	30.50	10.1	53	22.7	---	---
0.500000	25.00	10.1	46	21.0	---	---
1.252000	33.60	10.2	46	12.4	---	---
1.420000	33.00	10.2	46	13.0	---	---
1.504000	34.00	10.2	46	12.0	---	---
6.388000	27.90	10.6	50	22.1	---	---
7.016000	29.70	10.6	50	20.3	---	---
7.600000	27.70	10.6	50	22.3	---	---

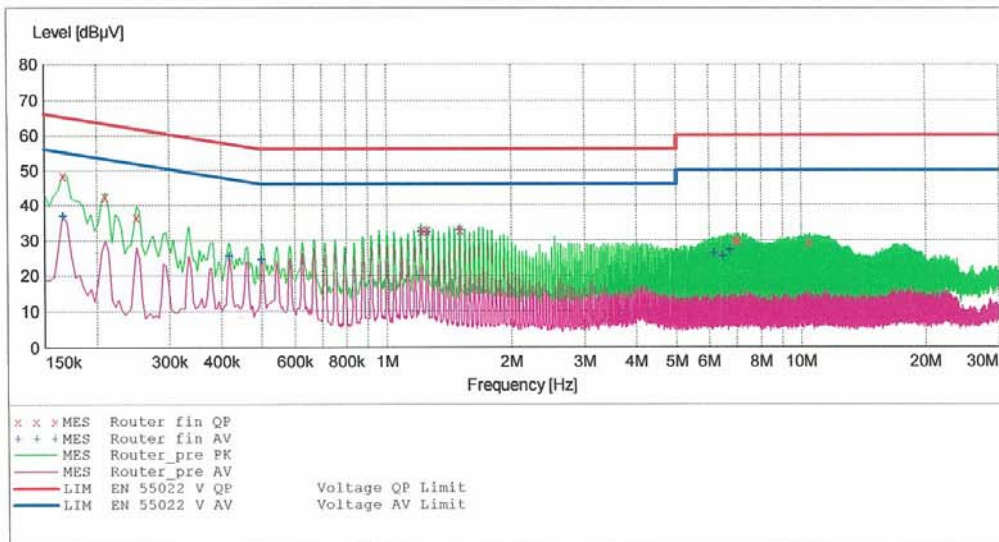
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EMC

EUT: VW340
 Manufacturer: VERTEX
 Operating Condition: IDLE MODE
 Test Site: SHIELD ROOM
 Operator: DS-KIM
 Test Specification: CISPR22 CLASS B
 Comment: N

SCAN TABLE: "CISPR22 CLASS B"

Short Description:			CISPR 22 CLASS B			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Router_fin QP"

10/18/2010 10:18AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.166000	48.40	10.1	65	16.8	---	---
0.210000	42.30	10.1	63	20.9	---	---
0.250000	36.50	10.1	62	25.3	---	---
1.212000	32.70	10.2	56	23.3	---	---
1.252000	32.70	10.2	56	23.3	---	---
1.504000	33.10	10.2	56	22.9	---	---
6.936000	29.90	10.6	60	30.1	---	---
7.060000	30.00	10.6	60	30.0	---	---
10.480000	29.20	10.8	60	30.8	---	---

MEASUREMENT RESULT: "Router_fin AV"

10/18/2010 10:18AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.166000	36.80	10.1	55	18.4	---	---
0.418000	25.40	10.1	48	22.1	---	---
0.500000	24.50	10.1	46	21.5	---	---
1.212000	32.30	10.2	46	13.7	---	---
1.252000	32.20	10.2	46	13.8	---	---
1.504000	32.70	10.2	46	13.3	---	---
6.180000	26.20	10.5	50	23.8	---	---
6.476000	25.50	10.6	50	24.5	---	---
6.724000	27.00	10.6	50	23.0	---	---

4.2 Radiated Emission Test

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Limit apply to	: FCC PART 15 Subpart B
Result	: Passed by 8.0 dB
Operating condition	: Data Communication mode
Detector	: Quasi-Peak (6 dB Bandwidth: 120 kHz)
Temperature	: 24.0 °C
Humidity level	: 48.0 %
Test date	: October 14, 2010

Frequency	Reading	Ant. Factor	Cable Loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB/m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
52.0	16.8	12.3	0.9	H	30.0	40.0	10.0
83.4	22.9	7.8	1.3	H	32.0	40.0	8.0
168.7	16.6	12.7	1.7	H	31.0	43.5	12.5
183.2	19.4	11.2	1.8	H	32.4	43.5	11.1
273.4	17.0	12.4	2.2	H	31.6	46.0	14.4
289.9	17.3	12.9	2.2	V	32.4	46.0	13.6

※ **NOTE:**

1. For measurement above 1 GHz, noise level is more than 10 dB below the limit, specified in FCC Part 15.35

Limit apply to : FCC PART 15 Subpart B
Result : Passed by 5.9 dB
Operating condition : Idle mode
Detector : Quasi-Peak (6 dB Bandwidth: 120 kHz)
Temperature : 24.0 °C
Humidity level : 48.0 %
Test date : October 14, 2010

Frequency	Reading	Ant. Factor	Cable Loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB/m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
40.1	21.1	12.2	0.8	V	34.1	40.0	5.9
52.3	16.8	12.3	0.9	V	30.0	40.0	10.0
63.9	17.3	11.5	1.0	V	29.8	40.0	10.2
137.6	17.7	12.5	1.4	V	31.6	43.5	11.9
157.0	17.8	13.2	1.6	V	32.6	43.5	10.9
183.2	20.0	11.2	1.8	H	33.0	43.5	10.5

※ **NOTE:**

1. For measurement above 1 GHz, noise level is more than 10 dB below the limit, specified in FCC Part 15.35

4.3 Test Setup Photos

4.3.1 Conducted Emission

[Data Communication Mode]



[Idle Mode]

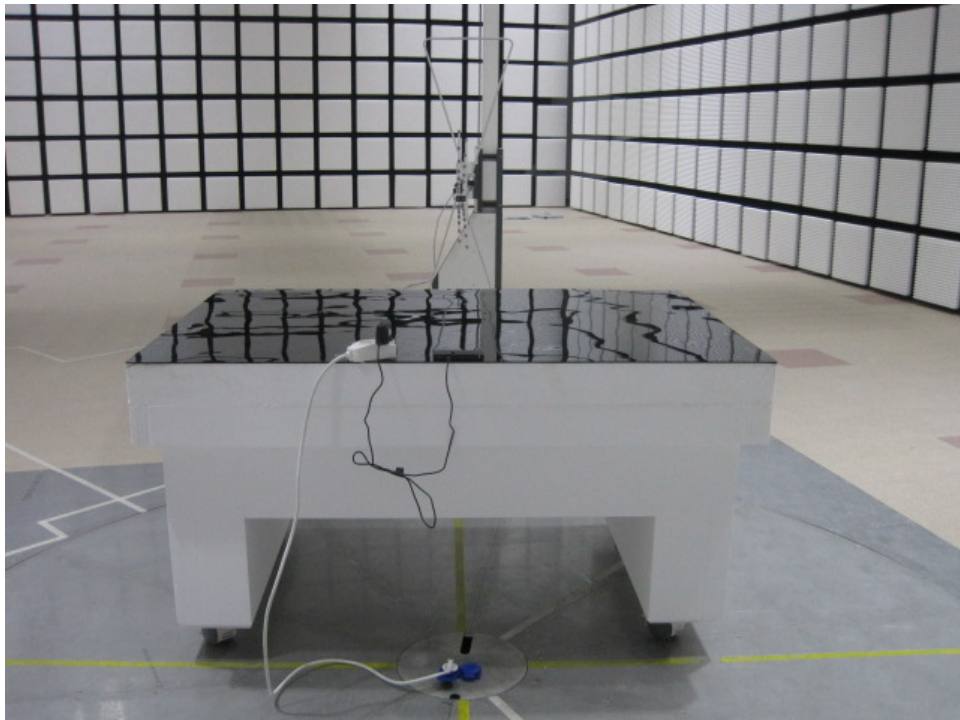


4.3.2 Radiated Emission

[Data Communication Mode]



[Idle Mode]



5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the antenna factor and cable factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dB μ V is obtained. The antenna factor of 7.4 dB/m and a cable factor of 1.1 dB are added. The 30 dB μ V/m value is mathematically converted to its corresponding level in μ V/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dB}\mu\text{V/m}$$

[Radiated Emission Limits]

Frequency of Emission (MHz)	Field Strength	
	μ V/m	dB μ V/m
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

6. TEST EQUIPMENT

<u>Type</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>Serial Number</u>	<u>Next CAL Date</u>
<u>Conducted Emission</u>				
EMI Test Receiver	Rohde & Schwarz	ESCI	100033	2011.02.19
LISN	Rohde & Schwarz	ESH3-Z5	100282	2011.02.05
LISN	Rohde & Schwarz	ENV216	3560.6550.02	2011.04.06
Attenuator	Rohde & Schwarz	ESH3-Z2	357.8810.52	2010.10.30
<u>Radiated Emission</u>				
EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	2010.10.30
EMI Test Receiver	Rohde & Schwarz	ESU26	100214	2011.04.29
Trilog Antenna	Schwarzbeck	VULB9160	3301	2012.07.22
Antenna master	INNCO Systems	MA4000-EP	MA4000/283	-
Turn Table	INNCO Systems	DT3000-3T	DT3000/69	-
Communication Antenna	Schwarzbeck	USLP9142	9142-248	-
Base Station	Rohde & Schwarz	CMU 200	1100000802	2011.02.17
Horn Antenna	Schwarzbeck	BBHA 9120D	-	2012.04.13
RF-Amplifier	MITEQ	AMF-6D-00101800 -35.20P.PS	-	2011.05.20
Bluetooth Base Station	TESCOM	TC-3000A	-	2011.01.07

7. CONCLUSION

The data collected shows that the **Vertex Wireless Co., Ltd, CDMA EV-DO Rev.A Mini Wi-Fi Hotspot, Model: VW340, FCC ID: XAVVW340** complies with §15.107 and §15.109 of the FCC rules.