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EMI DoC REPORT

Applicant Name:
Vertex Wireless Co., Ltd
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Seongnam-City, Kyunggi-Do, Korea.

Date of Issue: July 28, 2010
Test Report No.: HCTE1007FE27
Test Site: HCT CO., LTD.
HCT FRN: 0005-8664-21

FCC ID:

XAVVW440

Rule Part(s) / Standard(s) : FCC PART 15 Subpart B / CISPR 22 Class B
Equipment Type : CDMA EV-DO Rev.A Terminal
Model : VW440
Port / Connector(s) : DC In Port / USB Port / Telephone 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
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1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test (E.U.T) is **CDMA EV-DO Rev.A Terminal, Model: VW440** manufactured by **Vertex Wireless Co., Ltd.** Its basic purpose is used for communications.

Model	VW440
FCC ID	XAVVW440
E.U.T Type	CDMA EV-DO Rev.A Terminal
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/ Part Number	FCC ID / DoC	Connected To
CDMA EV-DO Rev.A Terminal	Vertex Wireless	VW440	XAVVW440	-
Travel adaptor	BT Telecom	BT-TA7B	-	E.U.T
Notebook PC	HP	Compaq6730b	DoC	E.U.T Notebook PC adaptor
Notebook PC adaptor	Hipro Electronics	PPP014Y-S	-	Notebook PC
Mouse	Microsoft	Intellimouse optical USB and PS/2 compatible	DoC	Notebook PC
Telephone	LG SRITHAI Electronics	GS-460F	-	E.U.T
Termination 75Ω	-	-	-	E.U.T

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 Terminal	DC in	N	-	(P)1.3
	USB data	N	N	(P,D)1.0
	TEL	-	-	(P,D)2.5
	Term.	-	-	(P,D)2.5
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 Terminal	DC in	N	-	Y	E.U.T End
	USB data	Y	E.U.T End	Y	Both End
	TEL	N	-	N	-
	Term.	N	-	N	-
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 open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, Maekok-ri, Hobup-myun, Ichon-si, Kyoungki-do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009. (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

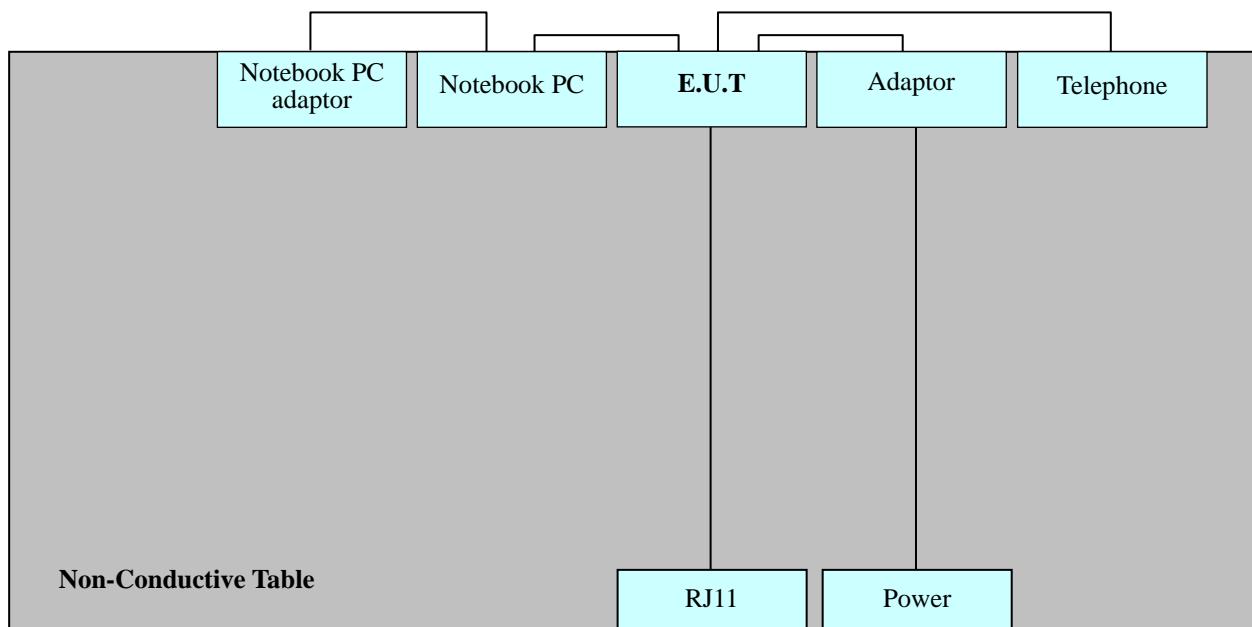
2. SYSTEM TEST CONFIGURATION

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 open area test site.

[Configuration of Tested System]



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 Transfer	<input type="radio"/>

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 Transfer	<input type="radio"/>

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 8.8 dB
Operating condition	: Data Transfer mode
Detector	: Quasi-Peak, Average (6 dB Bandwidth: 9 kHz)
Temperature	: 26.9 °C
Humidity level	: 47.2 %
Test date	: July 26, 2010

Power Line Conducted Emissions			CISPR 22 Class B		
Frequency (MHz)	Amplitude (dB μ V)	Conductor	Detector	Limit (dB μ V)	Margin (dB)
0.1660	50.9	NEUTRAL	Quasi-Peak	65.0	14.3
0.1660	53.1	HOT	Quasi-Peak	65.0	12.1
1.2480	34.5	HOT	Average	46.0	11.5
24.0200	41.2	NEUTRAL	Average	50.0	8.8

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

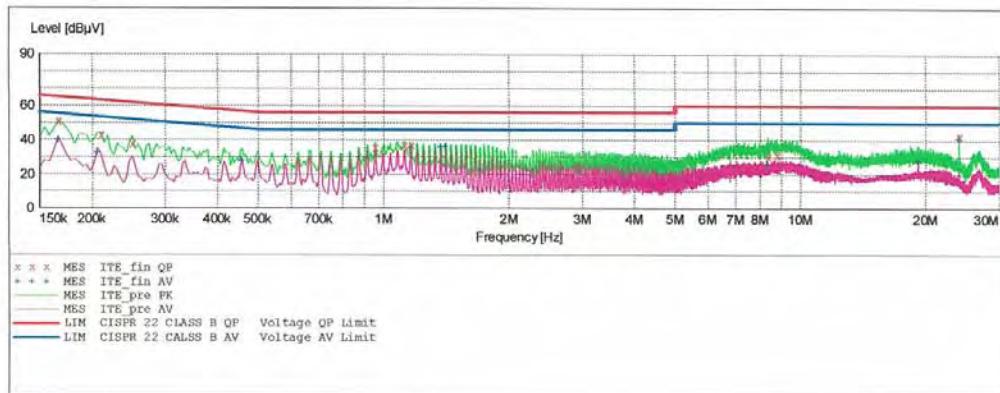
1. All modes of operation were investigated, and the worst-case emissions are reported.
2. Line H = Hot, Line N = Neutral

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EUT: VW440
Manufacturer: VERTEX
Operating Condition: NORMAL MODE
Test Site: SHIELD ROOM
Operator: KH-YOON
Test Specification: CISPR22 CLASS B
Comment: N

SCAN TABLE: "CISPR22 CLASS B"

CISPR22 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	ESH3 (20100210)
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	ESH3 (20100210)
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	ESH3 (20100210)
			Average			

**MEASUREMENT RESULT: "ITE_fin QP"**

7/26/2010 3:17PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.166001	50.90	10.1	65	14.3	---	---
0.210001	43.00	10.0	63	20.2	---	---
0.250001	37.90	10.0	62	23.9	---	---
0.956000	35.60	10.1	56	20.4	---	---
1.124000	36.90	10.1	56	19.1	---	---
1.164000	37.00	10.1	56	19.0	---	---
8.372000	30.50	10.7	60	29.5	---	---
8.784000	31.60	10.7	60	28.4	---	---
24.024000	42.70	11.7	60	17.3	---	---

MEASUREMENT RESULT: "ITE_fin AV"

7/26/2010 3:17PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.166001	39.80	10.1	55	15.4	---	---
0.206001	32.70	10.0	53	20.6	---	---
0.458001	28.20	10.1	47	18.5	---	---
1.164000	35.60	10.1	46	10.4	---	---
1.372000	35.80	10.1	46	10.2	---	---
1.412000	35.90	10.1	46	10.1	---	---
8.352000	25.80	10.7	50	24.2	---	---
19.200000	28.00	11.5	50	22.0	---	---
24.020000	41.20	11.7	50	8.8	---	---

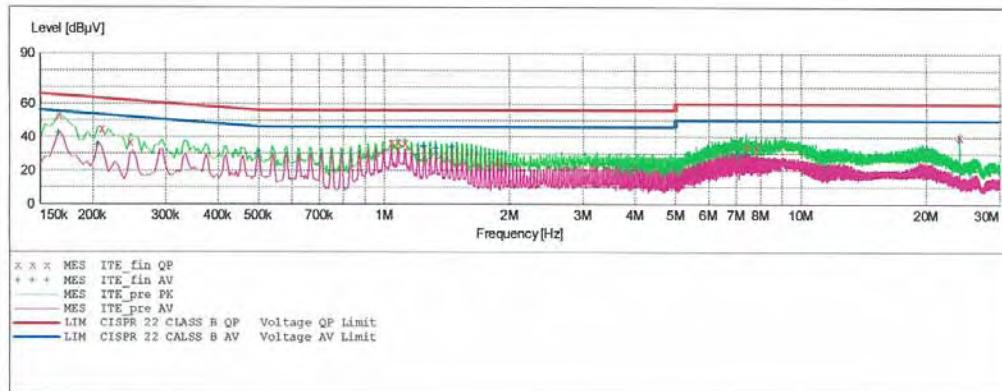
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EUT: VW440
 Manufacturer: VERTEX
 Operating Condition: NORMAL MODE
 Test Site: SHIELD ROOM
 Operator: KH-YOON
 Test Specification: CISPR22 CLASS B
 Comment: H

SCAN TABLE: "CISPR22 CLASS B"

CISPR22 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	ESH3 (20100210)
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	ESH3 (20100210)
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	ESH3 (20100210)
			Average			



MEASUREMENT RESULT: "ITE fin QP"

7/26/2010 3:12PM	Frequency	Level	Transd	Limit	Margin	Line	PE
	MHz	dB μ V	dB	dB μ V	dB		
	0.166001	53.10	10.1	65	12.1	---	---
	0.210001	44.90	10.0	63	18.3	---	---
	0.246001	36.80	10.0	62	25.1	---	---
	1.040000	36.60	10.1	56	19.4	---	---
	1.080000	37.40	10.1	56	18.6	---	---
	1.124000	36.40	10.1	56	19.6	---	---
	7.396000	34.30	10.6	60	25.7	---	---
	7.816000	34.00	10.6	60	26.0	---	---
	24.024000	40.30	11.7	60	19.7	---	---

MEASUREMENT RESULT: "ITE_fin AV"

7/26/2010 3:12PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.166001	42.20	10.1	55	12.9	---	---
0.206001	35.20	10.0	53	18.1	---	---
0.500000	29.90	10.1	46	16.1	---	---
1.248000	34.50	10.1	46	11.5	---	---
1.332000	33.40	10.1	46	12.6	---	---
1.456000	34.00	10.1	46	12.0	---	---
7.068000	30.40	10.6	50	19.6	---	---
7.400000	29.70	10.6	50	20.3	---	---
24.020000	38.40	11.7	50	11.6	---	---

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 8.1 dB						
Operating condition	: Data Transfer mode						
Detector	: Quasi-Peak (6 dB Bandwidth: 120 kHz)						
Temperature	: 31.0 °C						
Humidity level	: 57.0 %						
Test date	: July 19, 2010						

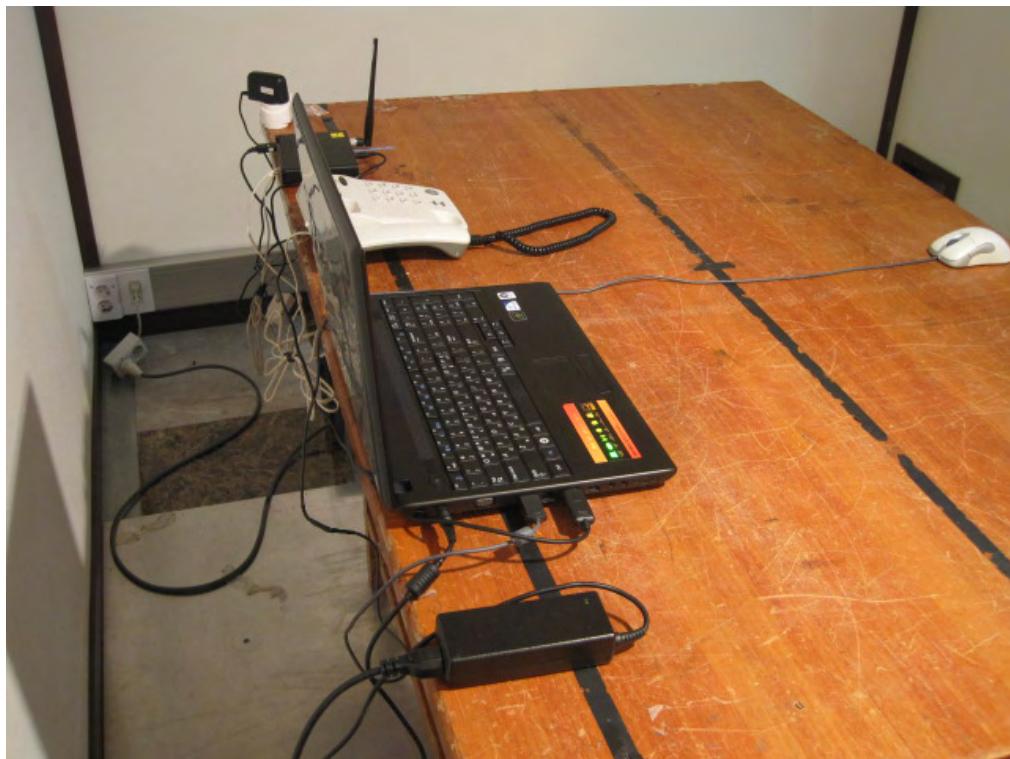
Frequency	Reading	Ant. Factor	Cable Loss	Ant. POL	Total	Limit	Margin
MHz	dB μ N	dB/m	dB	(H/V)	dB μ N/m	dB μ N/m	dB
30.8	14.5	11.2	0.7	V	26.4	40.0	13.6
114.5	14.7	10.3	1.2	H	26.2	43.5	17.3
196.6	23.7	10.2	1.5	V	35.4	43.5	8.1
364.8	11.3	14.4	2.1	H	27.8	46.0	18.2
326.7	10.7	13.6	1.9	H	26.2	46.0	19.8
423.8	8.2	15.9	2.2	H	26.3	46.0	19.7

*** NOTE:**

1. This test only got 4 data for noise.
2. 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

[Conducted Emission]



[Radiated Emission]



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
EMI Test Receiver	Rohde & Schwarz	ESU26	100214	2011.04.29
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

Radiated Emission

EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	2010.10.30
EMI Test Receiver	Rohde & Schwarz	ESU26	100214	2011.04.29
Trilog Antenna	Schwarzbeck	VULB9160	9160-3150	2010.12.18
Antenna Master	HD	MA240	240/520/00	-
Turn Table	EMCO	1060	-	-
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 Terminal, Model: VW440. FCC ID: XAVVW440** complies with §15.107 and §15.109 of the FCC rules.