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EMI REPORT (DoC)

Vertex Wireless Co., Ltd **5F, Seohyeon Plaza, Seohyeon-Dong, 254-5, Bundang-Gu, Seongnam-City, Gyeonggi-Do, Korea.**	**Date of Issue: May 19, 2009** **Test report No.: HCT-EF09-0507** **Test Site: HCT CO., LTD.** **HCT FRN: 0005-8664-21**

FCC ID: **XAVVW240**

Classification / Standard(s)	: FCC PART 15 Subpart B / CISPR 22 Class B
Equipment type	: CDMA 1xEVDO Rev.A Wireless Router
Trade name / Model(s)	: Vertex Wireless Co., Ltd / VW240
Port / Connector(s)	: USB port / DC in 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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Test engineer of EMC Tech. Part

Approved by
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Manager of EMC Tech. Part

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1. GENERAL INFORMATION

1.1 Product description

The **Vertex Wireless Co., Ltd Model: VW240, CDMA 1xEVDO Rev.A Wireless Router.**
Its basic purpose is used for communications.
It transmits from CDMA 835 (824.70 ㎒ to 848.31 ㎒), PCS 1 900 (1851.25 ㎒ to 1908.75 ㎒), WLAN (2 412 ㎒ to 2 462 ㎒) and receives from CDMA 835 (869.70 ㎒ to 893.31 ㎒), PCS 1 900 (1931.25 ㎒ to 1988.75 ㎒), WLAN (2 412 ㎒ to 2 462 ㎒).

Model	VW240
FCC ID	XAVVW240
E.U.T type	CDMA 1xEVDO Rev.A Wireless Router
TX frequency	824.70 ㎒ to 848.31 ㎒ (CDMA 835) 1851.25 ㎒ to 1908.75 ㎒ (PCS 1 900) 2 412 ㎒ to 2 462 ㎒ (WLAN)
RX frequency	869.70 ㎒ to 893.31 ㎒ (CDMA 835) 1931.25 ㎒ to 1988.75 ㎒ (PCS 1 900) 2 412 ㎒ to 2 462 ㎒ (WLAN)

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 1xEVDO Rev.A Wireless Router	Vertex Wireless Co., Ltd	VW240	XAVVW240	TA Notebook PC
Travel adaptor	BT Telecom	BT-TA7B	-	EUT
Notebook PC	TOSHIBA	PSMA2K-01D002	DoC	E.U.T, TA
Notebook PC adaptor	DELTA	SADP-65KB B	-	Notebook PC
Mouse	Microsoft	Intellimouse optical USB and PS/2	DoC	Notebook PC
LAN cable	-	-	-	EUT Notebook PC

1.4 Cable description

Product name	Port	Power cord shielded (Y/N)	I/O cable shielded (Y/N)	Length (M)
CDMA 1xEVDO Rev.A Wireless Router	DC in	N	-	(P)1.5
	LAN	-	N	(P,D)1.5
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 1xEVDO Rev.A Wireless Router	DC in	N	-	Y	E.U.T end
	LAN	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 ㎜

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, Icheon-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 July 6, 2006(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 (㎒)	**Upper frequency of measurement range (㎒)**
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 ㎓, whichever is lower

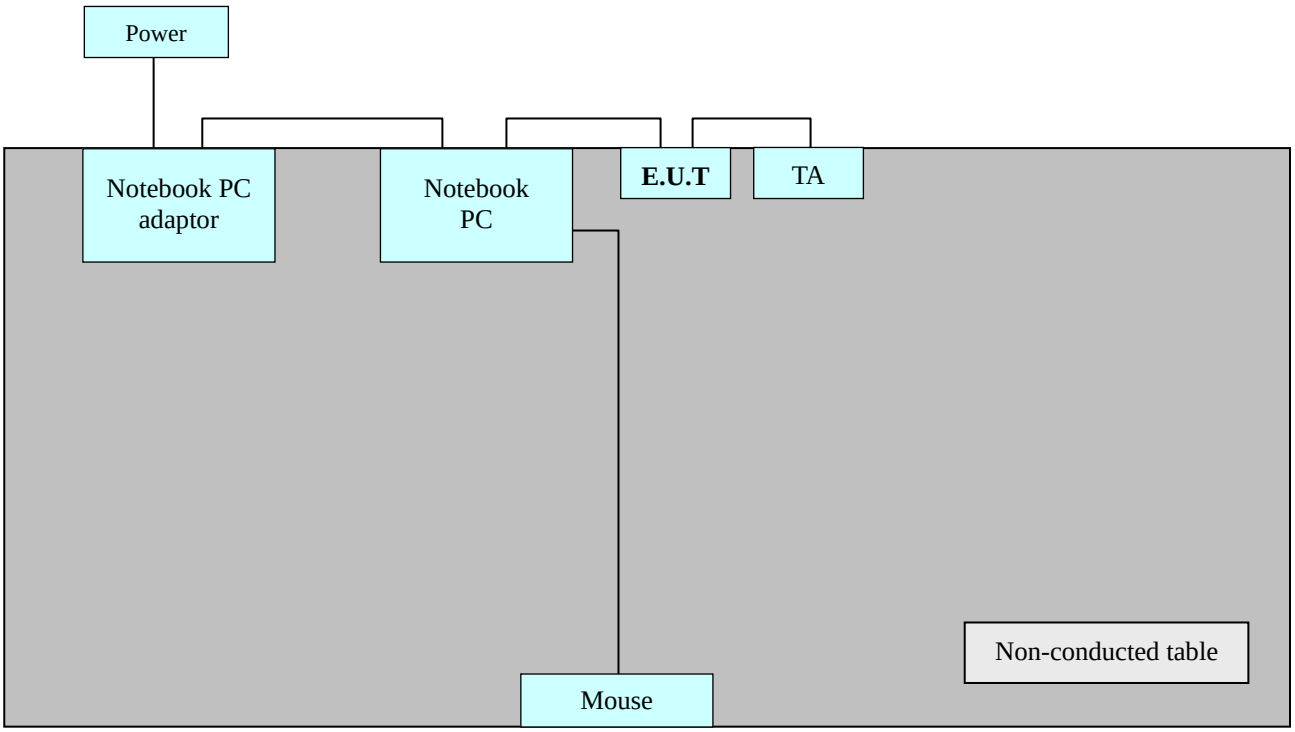
2. SYSTEM TEST CONFIGURATION

2.1 Configuration of test system

Power Line Conducted test : E.U.T was connected to LISN, all other supporting equipment were connected to another LISN. 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
CDMA Idle (835, 1 900) + WLAN	○
CDMA Idle (835, 1 900) + LAN: Data transfer	

3. 2 Radiated Emission test

During preliminary test, the following operation mode was investigated

Operation mode	The worst operating condition
CDMA Idle (835, 1 900) + WLAN	
CDMA Idle (835, 1 900) + LAN: Data transfer	○

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 10.9 ㏈
Operating condition	: Idle + WLAN mode
Detector	: Quasi-Peak, Average (6 ㏈ Bandwidth: 9 ㎑)
Temperature	: 22.3 °C
Humidity level	: 33.8 %
Test date	: May 8, 2009

Power Line Conducted Emissions			CISPR 22 Class B		
Frequency (㎒)	Amplitude (㏈㎶)	Conductor	Result	Limit (㏈㎶)	Margin (㏈)
1.9160	39.9	HOT	Quasi-Peak	56.0	16.1
1.9200	33.3	HOT	Average	46.0	12.7
1.9680	37.5	NEUTRAL	Quasi-Peak	56.0	18.5
1.9240	35.1	NEUTRAL	Average	46.0	10.9

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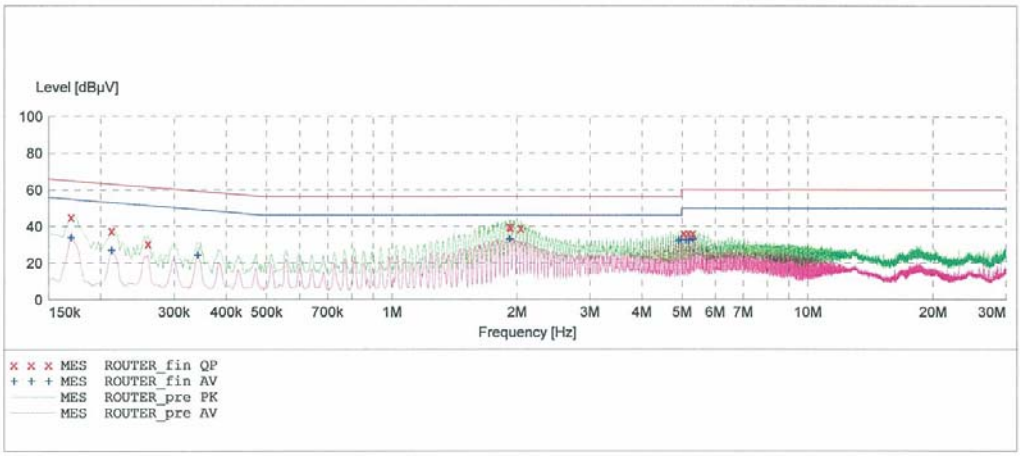
EMC TEST LAB.

EUT: VW240
Manufacturer: Vertex
Operating Condition: Idle + LAN mode
Test Site: SHIELD ROOM
Operator: YH-LEE
Test Specification: CISPR 22 CLASS B
Comment: H

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ROUTER_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.170100	45.20	10.1	65	19.8	---	---
0.212600	37.60	10.1	63	25.5	---	---
0.260100	30.50	10.1	61	30.9	---	---
1.916000	39.90	10.3	56	16.1	---	---
1.932000	39.40	10.4	56	16.6	---	---
2.044000	39.00	10.4	56	17.0	---	---
5.040000	36.10	10.7	60	23.9	---	---
5.176000	36.40	10.7	60	23.6	---	---
5.308000	36.20	10.7	60	23.8	---	---

MEASUREMENT RESULT: "ROUTER_fin AV"

5/8/2009 6:36PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.170100	33.90	10.1	55	21.1	---	---
0.212600	27.00	10.1	53	26.1	---	---

MEASUREMENT RESULT: "ROUTER_fin AV"

(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.342600	24.40	10.1	49	24.7	---	---
1.920000	33.30	10.4	46	12.7	---	---
4.904000	32.40	10.7	46	13.6	---	---
4.972000	32.80	10.7	46	13.2	---	---
5.108000	32.60	10.7	50	17.4	---	---
5.176000	32.50	10.7	50	17.5	---	---
5.308000	33.30	10.7	50	16.7	---	---

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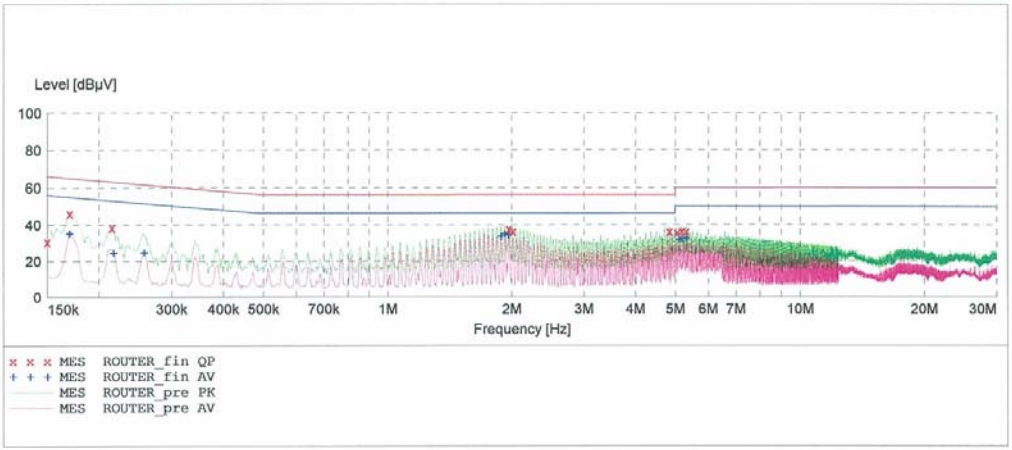
EMC TEST LAB.

EUT: VW240
Manufacturer: Vertex
Operating Condition: Idle + LAN mode
Test Site: SHIELD ROOM
Operator: YH-LEE
Test Specification: CISPR 22 CLASS B
Comment: N

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ROUTER_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150100	30.50	10.1	66	35.5	---	---
0.170100	46.00	10.1	65	19.0	---	---
0.215100	38.40	10.1	63	24.6	---	---
1.968000	37.50	10.4	56	18.5	---	---
2.012000	36.20	10.4	56	19.8	---	---
4.836000	36.20	10.7	56	19.8	---	---
5.040000	35.50	10.7	60	24.5	---	---
5.176000	36.60	10.7	60	23.4	---	---
5.308000	36.30	10.7	60	23.7	---	---

MEASUREMENT RESULT: "ROUTER_fin AV"

5/8/2009 6:28PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.170100	35.20	10.1	55	19.7	---	---
0.217600	24.40	10.1	53	28.5	---	---

MEASUREMENT RESULT: "ROUTER_fin AV"

(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.257600	24.80	10.1	52	26.7	---	---
1.884000	33.70	10.3	46	12.3	---	---
1.924000	35.10	10.4	46	10.9	---	---
1.968000	34.40	10.4	46	11.6	---	---
5.108000	31.90	10.7	50	18.1	---	---
5.176000	32.50	10.7	50	17.5	---	---
5.308000	32.60	10.7	50	17.4	---	---

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 3.0 dB
Operating condition	: Idle + Data transfer mode
Detector	: Quasi-Peak (6 dB Bandwidth: 120 ㎑)
Temperature	: 23.3 °C
Humidity level	: 35.0 %
Test date	: May 14, 2009

Frequency	Reading	Ant. Factor	Cable Loss	Ant. POL	Total	Limit	Margin
㎒	dB ㎶	dB /m	dB	(H/V)	dB ㎶/m	dB ㎶/m	dB
112.8	21.2	10.1	2.5	V	33.8	43.5	9.7
250.0	27.7	11.5	3.8	H	43.0	46.0	3.0
375.0	19.7	14.7	4.6	H	39.0	46.0	7.0
750.0	13.7	22.0	6.5	H	42.2	46.0	3.8
875.1	12.0	23.0	7.2	V	42.2	46.0	3.8
1 000.0	9.7	24.4	8.0	V	42.1	54.0	11.9
1 000.0	6.2	24.4	8.0	H	38.6	54.0	15.4

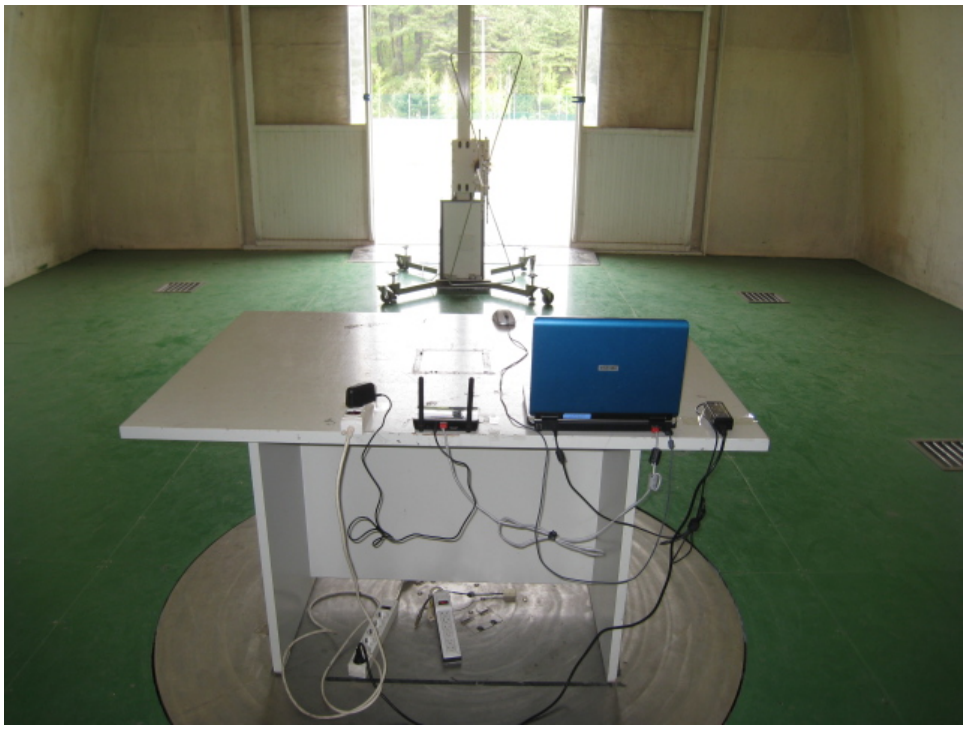
* **Note)**

For measurement over 1 ㎓, noise level was more than 10 dB below the limit.

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 dBμV is obtained. The antenna factor of 7.4 dB/m and a cable factor of 1.1 dB are added. The 30 dBμV/m value is mathematically converted to its corresponding level in μV/m.

FS = 21.5 + 7.4 + 1.1 = 30 dBμV/m

[Radiated Emission limits]

Frequency of emission (㎒)	Field strength	
	μV/m	dBμV/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

Type	Manufacture	Model number	Next CAL date
EMI Test Receiver	Rohde & Schwarz	ESI40	2009.10.31
EMI Test Receiver	Rohde & Schwarz	ESCI	2009.06.01
LISN	Rohde & Schwarz	ESH2-Z5	2010.04.10
LISN	Rohde & Schwarz	ESH3-Z5	2009.06.13
LISN	EMCO	3816/2SH	2009.06.05
Attenuator	Rohde & Schwarz	ESH3-Z2	2009.10.30
Trilog Antenna	Schwarzbeck	VULB9160	2010.12.18
Communication Antenna	TDK	LPDA-0802	-
Antenna Position Tower	HD	240/520/00	-
Base Station	Rohde & Schwarz	CMU 200	2010.02.17
Horn Antenna	Schwarzbeck	BBHA 9120D	2010.03.26
RF-Amplifier	MITEQ	AMF-6D-00101800-35.20P.PS	2010.04.25
Bluetooth Base Station	TESCOM	TC-3000A	2010.01.09

7. CONCLUSION

The data collected shows that the **Vertex Wireless Co., Ltd. Model: VW240, CDMA 1xEVDO Rev.A Wireless Router. FCC ID: XAVVW240** complies with §15.107 and §15.109 of the FCC rules