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EMI VERIFICATION REPORT

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

Date of Issue: July 13, 2010
Test Report No.: HCTE1007FE05
Test Site: HCT CO., LTD.
HCT FRN: 0005-8664-21

MODEL:

VW450

Rule Part(s) / Standard(s) : FCC PART 15 Subpart B / CISPR 22 Class B

Equipment Type : GSM/GPRS Terminal

Port / Connector(s) : DC In Port / USB Port / Telephone Port / Antenna 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
: Gyeong Seon Kim
Test Engineer of EMC Tech. Part

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: Nam Wook Kang
Manager of EMC Tech. Part

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1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test (E.U.T) is **GSM/GPRS Terminal, Model: VW450** manufactured by **Vertex Wireless Co., Ltd.** Its basic purpose is used for communications.

Model	VW450
FCC ID	XAVVW450
E.U.T Type	GSM/GPRS Terminal
TX Frequency	824.20 MHz to 848.80 MHz (GSM 850) 1 850.20 MHz to 1 909.80 MHz (GSM 1 900)
RX Frequency	869.20 MHz to 893.80 MHz (GSM 850) 1 930.20 MHz to 1 989.80 MHz (GSM 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
GSM/GPRS Terminal	Vertex Wireless	VW450	XAVVW450	-
Travel adaptor	BT Telecom	BT-TA7B	-	E.U.T
Notebook PC	SAMSUNG	NT-R519	-	E.U.T Notebook PC adaptor
Notebook PC adaptor	DELTA	AD-9019S	-	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)
GSM/GPRS Terminal	DC in	N	-	(P)1.5
	USB data	N	Y	(D)1.2
	TEL	-	N	(D)2.0
	Term.	-	N	(D)2.0
Notebook PC	USB (Mouse)	-	Y	(D)1.8
Antenna	-	-	N	(D)2.0

* 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
GSM/GPRS Terminal	DC in	N	-	Y	E.U.T End
	USB data	N	-	N	Notebook PC End
	TEL	N	-	N	-
	Term.	N	-	N	-
Notebook PC	USB (Mouse)	Y	Notebook PC End	Y	Notebook PC End
Antenna	-	N	-	Y	E.U.T 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

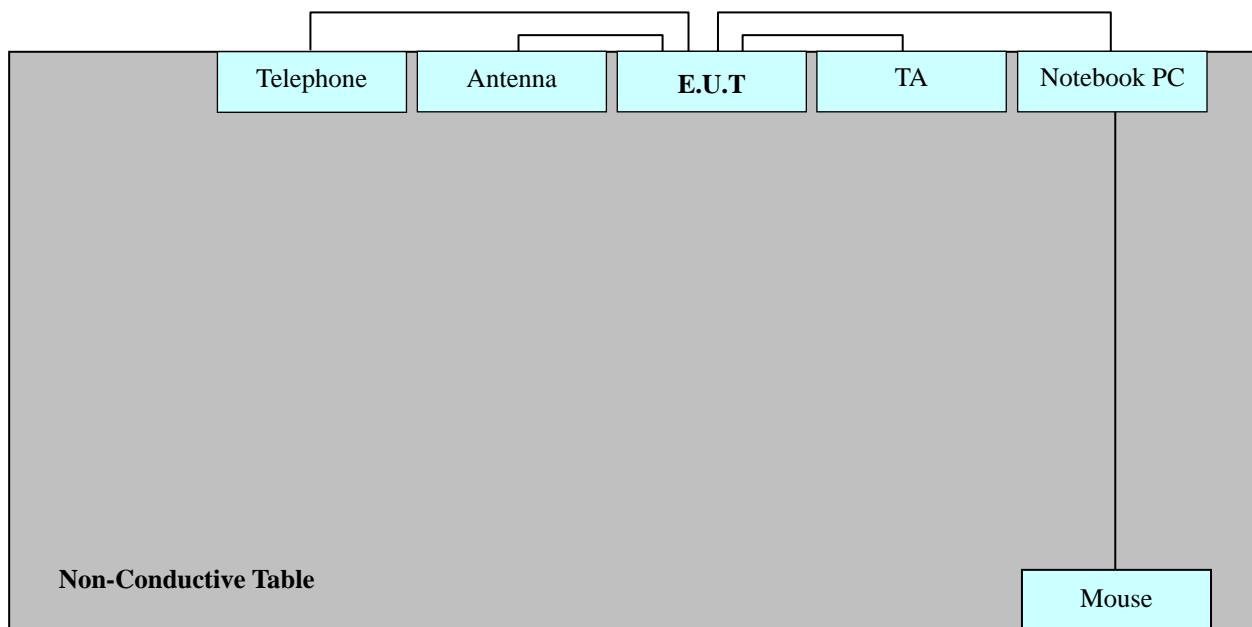
2. SYSTEM TEST CONFIGURATION

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]



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 (850, 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 (850, 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 5.4 dB
Operating condition	: Data Transfer mode
Detector	: Quasi-Peak, Average (6 dB Bandwidth: 9 kHz)
Temperature	: 27.1 °C
Humidity level	: 46.5 %
Test date	: July 09, 2010

Power Line Conducted Emissions			CISPR 22 Class B			
Frequency (MHz)	Amplitude (dB μ V)	Conductor	Detector	Limit (dB μ V)	Margin (dB)	
0.1740	36.5	HOT	Quasi-Peak	65.0	28.6	
0.1740	31.0	HOT	Average	55.0	23.8	
24.068	44.6	NEUTRAL	Average	50.0	5.4	
24.068	46.9	NEUTRAL	Quasi-Peak	60.0	13.1	

* **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

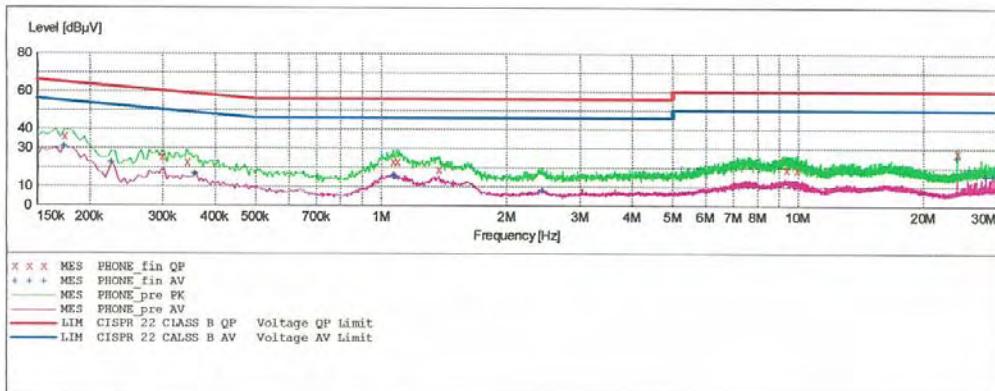
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EUT: VW450
 Manufacturer: VERTEX
 Operating Condition: DATA MODE
 Test Site: SHIELD ROOM
 Operator: DS-KIM
 Test Specification: CISPR22 CLASS B
 Comment: H

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: "PHONE_fin_QP"

7/9/2010 4:43PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.174001	36.20	10.1	65	28.6	---	---
0.298001	25.70	10.0	60	34.5	---	---
0.342001	22.80	10.1	59	36.3	---	---
1.068000	23.20	10.1	56	32.8	---	---
1.092000	23.10	10.1	56	32.9	---	---
1.376000	19.10	10.1	56	36.9	---	---
9.392000	19.30	10.8	60	40.7	---	---
9.956000	19.00	10.8	60	41.0	---	---
24.068000	28.00	11.7	60	32.0	---	---

MEASUREMENT RESULT: "PHONE_fin AV"

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Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.174001	31.00	10.1	55	23.8	---	---
0.226001	22.50	10.0	53	30.1	---	---
0.358001	16.90	10.1	49	31.9	---	---
1.072000	15.40	10.1	46	30.6	---	---
1.084000	15.30	10.1	46	30.7	---	---
2.436000	8.00	10.2	46	38.0	---	---
24.068000	25.20	11.7	50	24.8	---	---
28.224000	15.40	11.9	50	34.6	---	---
29.316000	15.50	11.9	50	34.5	---	---

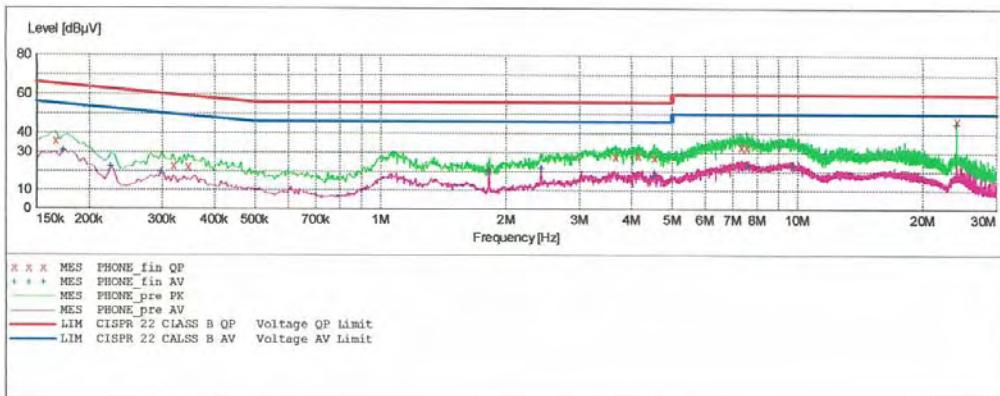
HCT

EMC

EUT: VW450
 Manufacturer: VERTEX
 Operating Condition: DATA MODE
 Test Site: SHIELD ROOM
 Operator: DS-KIM
 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: "PHONE_fin_QP"

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.166001	36.10	10.1	65	29.1	---	---
0.318001	23.10	10.0	60	36.7	---	---
0.346001	22.70	10.1	59	36.4	---	---
3.660000	27.80	10.3	56	28.2	---	---
4.156000	28.50	10.4	56	27.5	---	---
4.536000	27.40	10.4	56	28.6	---	---
7.316000	33.20	10.6	60	26.8	---	---
7.556000	32.70	10.6	60	27.3	---	---
24.068000	46.90	11.7	60	13.1	---	---

MEASUREMENT RESULT: "PHONE_fin AV"

7/9/2010 4:47PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.174001	31.10	10.1	55	23.7	---	---
0.226001	22.70	10.0	53	29.9	---	---
0.298001	19.80	10.0	50	30.5	---	---
1.820000	20.30	10.1	46	25.7	---	---
2.428000	21.70	10.2	46	24.3	---	---
4.536000	17.90	10.4	46	28.1	---	---
7.640000	23.00	10.6	50	27.0	---	---
9.756000	23.40	10.8	50	26.6	---	---
24.068000	44.60	11.7	50	5.4	---	---

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 19.0 dB
Operating condition	: Data Transfer mode
Detector	: Quasi-Peak (6 dB Bandwidth: 120 kHz)
Temperature	: 26.0 °C
Humidity level	: 43.5 %
Test date	: July 09, 2010

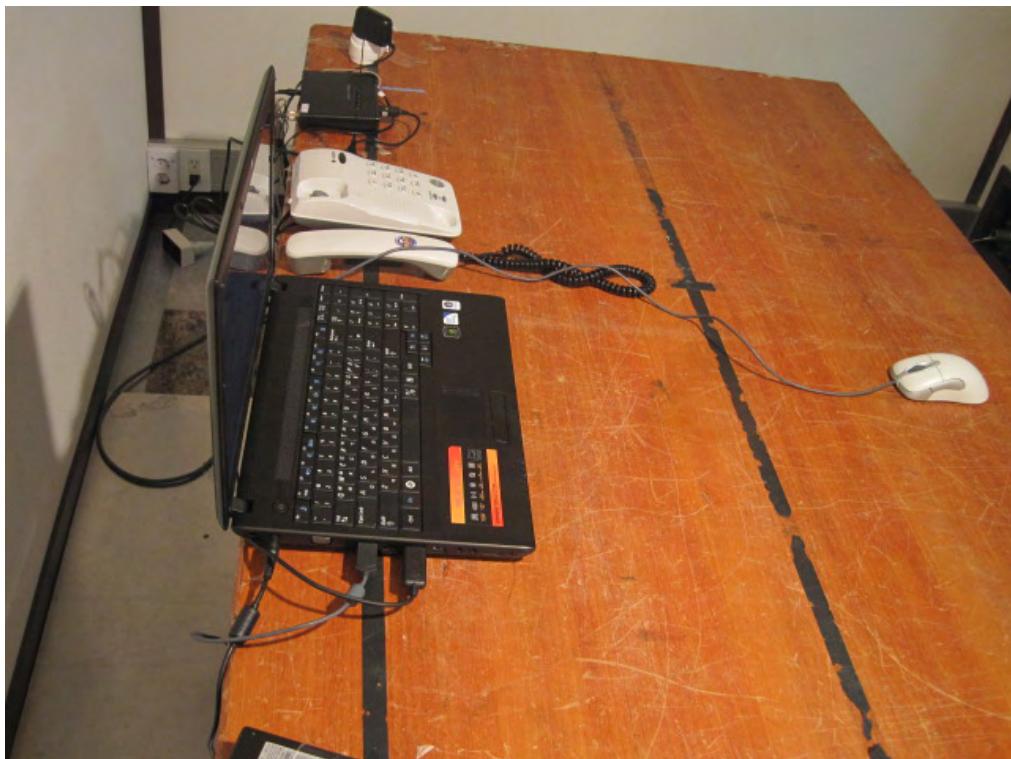
Frequency	Reading	Ant. Factor	Cable Loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB/m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
55.3	8.0	12.3	0.7	V	21.0	40.0	19.0
182.6	9.2	11.4	1.4	V	22.0	43.5	21.5
250.0	8.2	11.5	1.7	V	21.4	46.0	24.6
275.0	7.2	12.3	1.8	V	21.3	46.0	24.7

*** 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, GSM/GPRS Terminal, Model: VW450. FCC ID: XAVVW450** complies with §15.107 and §15.109 of the FCC rules.