HCT CO., LTD.

Product Compliance Division, EMC Team
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TEST REPORT(DoC)

Manufacturer: **PLK Technologies** **12th Floor, INNOPLEX Bldg., 13 Yangpyeong-Dong 3-Ga, Yeongdeungpo-Gu, Seoul 150-103, Korea**	**Date of Issue: April 14, 2010** **Test Report No.: HCTE1004FE21** **Test Site: HCT CO., LTD.** **HCT FRN: 0005-8664-21**

EUT TYPE : **Digital Image Blackbox**

MODEL : **RoadScan DTW**

Rule Part(s):	**Part 2 & 15 Subpart B**
Equipment Class:	**Class B Personal Computers and Peripherals**
Standard(s):	**FCC Class B: (CISPR 22)**

This equipment has been shown to be in compliance 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

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 off these measurements and vouch for the qualifications of all persons taking them.

Report prepared by **: Kyoung Houn, Seo** **Test engineer of EMC Tech. Part**	**Approved by** **: Nam-Wook Kang** **Manager of EMC Tech. Part**	

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MEASUREMENT REPORT

1. Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	**PLK Technologies**
Address:	**12th Floor, INNOPLEX Bldg., 13 Yangpyeong-Dong 3-Ga, Yeongdeungpo-Gu, Seoul 150-103, Korea**

- **Model :** RoadScan DTW
- **Equipment Class**: Class B Personal Computers and Peripherals
- **EUT Type**: Digital Image Blackbox
- **Rule Part(s):** FCC Part 15 Subpart B
- **Test Procedure(s):** ANSI C63.4 (2003)
- **Dates of Tests:** April 01, 2010
- **Place of Tests:**
  254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA

2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 ㎑ to 40 ㎓(ANSIC63.4-2003) was used in determining radiated and conducted emissions emanating from **Digital Image Blackbox,** manufactured by **PLK Technologies, MODEL: RoadScan DTW**.

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 C63.4and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009 (Confirmation Number: 90661)

3. Product Information

3.1 Equipment Description

Equipment Under Test (EUT) is **Digital Image Blackbox,** manufactured by **PLK Technologies, (MODEL: RoadScan DTW)**

Norm. Operational Voltage	12 V / 24 V
Min. Operational Voltage	9 V
Max. Operational Voltage	32 V
Max. Power Consumption	4 W
Operating Temperature	- 10 ℃ / 50 ℃
Storage Temperature	- 30 ℃ / 80 ℃
Avg. Recording Frame Rate	30 frame / sec
Min. Operation Luminance	1 Lux
Camera Resolution	30,000 pixel
Image compress method	MPEG
Size	123 ㎜ × 93 ㎜ × 35 ㎜
Weight	220 g
S/W	Operating System : Windows 7, Vista, XP Memory : 1 GB CPU: Intel Pentium 4 HDD: 1 GB

4. Description of Tests(Conducted)

Conducted Emissions

The line-conducted facility is located inside a 3.6 m(W) × 4.6 m(L) × 2.2 m(H) shielded enclosure and meets the requirements of ANSI C63.4 The EUT was placed on a non-conducting a 1m × 1.6 m table which is placed 40 ㎝ away from the vertical wall and 1.5 m away from the sidewall of the shielded room. The EUT is powered from a Rohde & Schwarz 50Ω/50μH Line-impedance Stabilization Networks (LISNs) and the peripheral equipment is powered from the Rohde & Schwarz LISN. All interconnecting cables more than 1 meter were shortened to 40 ㎝ length by non-inductive bundling (figure eight fashion). Sufficient time for the EUT, the peripheral equipments and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum electromagnetic emission from the EUT.

The EUT, peripheral equipment and interconnecting cables were arranged and manipulated to maximize each electromagnetic emission. Each emission was maximized by: switching power lines varying the mode of operation or resolution; scrolling H pattern to the EUT and/or peripheral equipment; whichever determined the worst-case emission. Each electromagnetic emission was listed on Table 1. Conducted FCC Class B.

CONDUCTED EMISSIONS	CISPR 22 CLASS B Limits dB(㎶)	
Freq. Range	Quasi-Peak	Average
150 ㎑ - 0.5 ㎒	66-56**	56-46**
0.5 ㎒ – 5 ㎒	56	46
5 ㎒ – 30 ㎒	60	50
**Limits decreases linearly with the logarithm of frequency		

Table 1. Conducted Limits

5. Description of Tests (Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 3-meter using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequency producing the maximum electromagnetic emission. Appropriate precaution was taken to ensure that all electromagnetic emission from the EUT were maximized and investigated. The spectrum was scanned from 30 to 1000 ㎒ using a Tri-log antenna and above 1 ㎓ linearly polarized horn antennas were used.

Final measurements were made outdoors at 3-meter or 10-meter test range using Tri-log antenna. The test equipment was placed on a wooden table situated on a 1.5 m × 2 m area adjacent to the measurement area. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EMI receiver detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 ㎑.

The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each electromagnetic emission. The turntable containing the system was rotated and the height of the receive antenna was varied 1 to 4 meters and stopped at the position which is height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; scrolling H pattern to the EUT and/or peripheral equipment; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits	
Frequency (㎒)	**CISPR Limit @ 10 m. Quasi-Peak dB[㎶/m]**
30-230	**30.0**
230-1000	**37.0**
> 1000	**No Specified Limit**
*** Limit extrapolated 20 dB/decade**	

Table 2. Radiated @ 10-meters

6. List of Peripheral Equipment

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
EUT (Digital Image Blackbox)	PLK Technologies	RoadScan DTW	-	-
Notebook PC	H.P	Compaq 6730b	DoC	EUT
Notebook PC Adaptor	H.P	PA-1900-18HN	-	Notebook PC
Battery	SEBANG	GB80L	-	EUT
GPS Antenna	KSEC	KSM-GSBP100A-401	-	EUT
SD Card	SanDisk	4GB	-	EUT

6.1 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
EUT (RoadScan DTW)	USB	Not Applicable	Y	1.5(D)
	SD	Not Applicable	Not Applicable	-
	Jack	Not Applicable	Y	3.0(D)
	DC IN	N	Not Applicable	3.0(P)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.)

6.2 Noise Suppression Parts on Cable. (I/O CABLE)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT (RoadScan DTW)	USB	N	Not Applicable	Y	Both END
	SD	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Jack	N	Not Applicable	N	Not Applicable
	DC IN	N	Not Applicable	N	Not Applicable

7. Preliminary Test

7.1 AC Power line Conducted Emissions Test & Radiated Emission Test

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The worst operating condition
Ping test mode & Record mode	O

8. Conducted Test Data

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EUT:                    RoadScan DTW
Manufacturer:           PLK
Operating Condition:    NORMAL MODE
Test Site:              SHIELD ROOM
Operator:               KH-SEO
Test Specification:     CISPR22 CLASS B
Comment:                H
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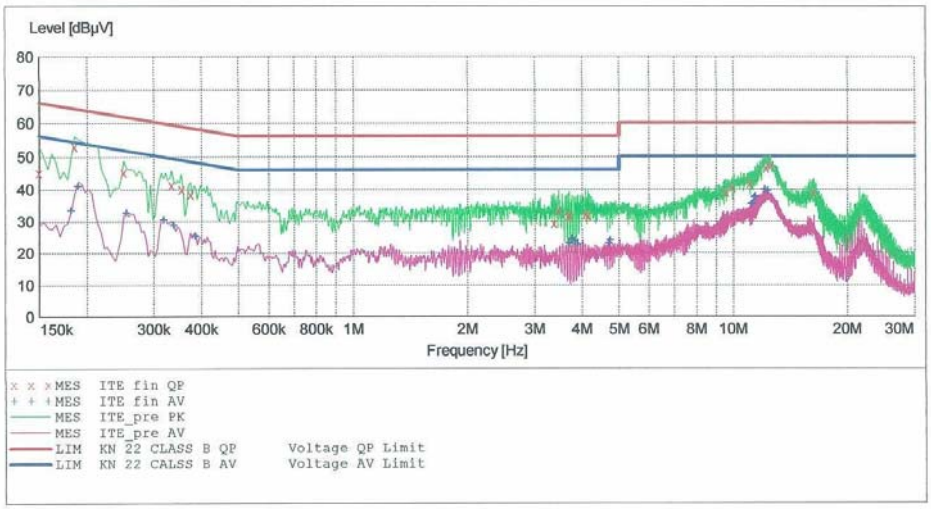
SCAN TABLE: "CISPR22 CLASS B"

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



MEASUREMENT RESULT: "ITE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150001	45.10	10.1	66	20.9	---	---
0.186001	53.00	10.0	64	11.2	---	---
0.250001	45.30	10.0	62	16.4	---	---
0.334001	41.30	10.1	59	18.0	---	---
0.354001	40.00	10.1	59	18.8	---	---
0.374001	38.50	10.1	58	19.9	---	---
3.380000	29.20	10.3	56	26.8	---	---
3.476000	33.40	10.3	56	22.6	---	---
3.676000	31.40	10.3	56	24.6	---	---
3.708000	32.00	10.3	56	24.0	---	---
4.088000	32.10	10.4	56	23.9	---	---
4.148000	31.70	10.4	56	24.3	---	---
9.576000	39.00	10.8	60	21.0	---	---
9.932000	40.60	10.8	60	19.4	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.182001	33.30	10.0	54	21.1	---	---
0.190001	40.90	10.0	54	13.2	---	---
0.254001	32.50	10.0	52	19.1	---	---
0.318001	30.30	10.0	50	19.4	---	---
0.338001	28.70	10.1	49	20.5	---	---
0.386001	25.10	10.1	48	23.1	---	---
3.708000	23.00	10.3	46	23.0	---	---
3.772000	24.30	10.3	46	21.7	---	---
3.832000	23.80	10.3	46	22.2	---	---
3.904000	22.70	10.3	46	23.3	---	---
4.716000	23.10	10.4	46	22.9	---	---
4.752000	23.90	10.4	46	22.1	---	---
11.192000	35.10	10.9	50	14.9	---	---
11.240000	35.60	10.9	50	14.4	---	---

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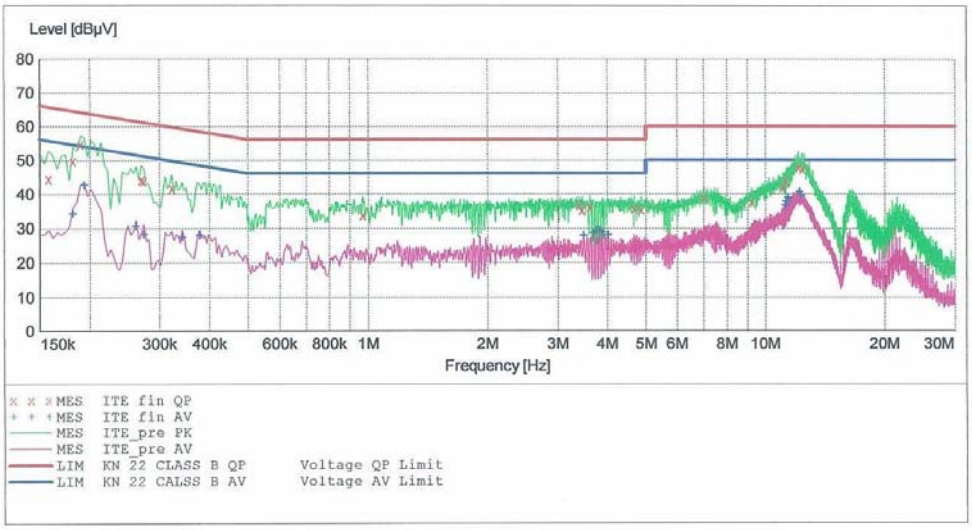
EUT: RoadScan DTW
Manufacturer: PLK
Operating Condition: NORMAL MODE
Test Site: SHIELD ROOM
Operator: KH-SEO
Test Specification: CISPR22 CLASS B
Comment: N

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



MEASUREMENT RESULT: "ITE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.158001	44.40	10.1	66	21.2	---	---
0.182001	49.70	10.0	64	14.7	---	---
0.190001	54.50	10.0	64	9.5	---	---
0.270001	44.00	10.0	61	17.2	---	---
0.274001	43.80	10.0	61	17.2	---	---
0.322001	41.60	10.0	60	18.0	---	---
0.972000	33.70	10.1	56	22.3	---	---
3.404000	36.70	10.3	56	19.3	---	---
3.464000	35.30	10.3	56	20.7	---	---
3.620000	36.30	10.3	56	19.7	---	---
4.684000	35.70	10.4	56	20.3	---	---
4.888000	35.40	10.4	56	20.6	---	---
7.024000	38.80	10.6	60	21.2	---	---
9.224000	37.80	10.7	60	22.2	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.182001	34.10	10.0	54	20.3	---	---
0.194001	42.40	10.0	54	11.5	---	---
0.262001	30.50	10.0	51	20.9	---	---
0.274001	28.10	10.0	51	22.9	---	---
0.342001	27.20	10.1	49	22.0	---	---
0.378001	27.70	10.1	48	20.7	---	---
3.500000	27.70	10.3	46	18.3	---	---
3.708000	28.60	10.3	46	17.4	---	---
3.772000	29.30	10.3	46	16.7	---	---
3.836000	29.30	10.3	46	16.7	---	---
3.904000	28.70	10.3	46	17.3	---	---
4.024000	28.00	10.3	46	18.0	---	---
11.260000	36.50	10.9	50	13.5	---	---
11.312000	37.70	10.9	50	12.3	---	---

NOTES:

1. **All modes of operation were investigated, and the worst-case emissions are reported.**
2. **The conducted limits are listed on Table 1 (Page 6).**
3. **Line H = Hot Line N = Neutral**

** Measurements using CISPR quasi-peak mode.

9. Radiated Test Data

1.PRODUCT	: Digital Image Blackbox	**6.TEST DATE**	: 04.01.2010
2.MODEL	: RoadScan DTW	**7.TESTED BY**	: Kyoung Houn, Seo
3.CLIENT	: PLK Technologies	**8.TEMPERATURE**	: 11.0 ℃
4.COMMENT	: Normal Mode	**9.HUMIDITY**	: 34.8 %
5.STANDARD	: CISPR22 Class B	**10.ATOMSPHERE**	: 101.1 ㎪

Frequency ㎒	Reading dBμV	Ant. Factor dB/m	Cable Loss dB	Ant. POL (H/V)	Total dBμV/m	Limit dBμV/m	Margin dB
63.9	9.4	11.5	1.4	V	22.3	30.0	7.7
99.1	11.0	9.1	1.8	V	21.9	30.0	8.1
121.0	10.9	10.8	2.0	V	23.7	30.0	6.3
132.0	11.2	11.7	2.1	H	25.0	30.0	5.0
187.0	11.2	11.0	2.4	V	24.6	30.0	5.4
220.0	12.0	10.5	2.7	V	25.2	30.0	4.8
231.2	12.8	10.9	2.7	V	26.4	37.0	10.6
275.0	11.7	12.3	3.0	V	27.0	37.0	10.0
330.0	14.2	13.7	3.3	H	31.2	37.0	5.8
350.0	13.4	14.1	3.4	V	30.9	37.0	6.1
425.0	12.3	16.0	3.8	V	32.1	37.0	4.9
500.0	10.8	17.3	4.1	V	32.2	37.0	4.8

Radiated Measurements at 10-meters.

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported.
2. The radiated limits are listed on Table 2 (Page 7).
3. We have tested for above 1 ㎓ and margin was more than 10 dB.

10. Sample Calculations

$$dB\ \mu V = \mathbf{20\ log_{10}(\mu V)}$$

$$dB\ \mu V = \mathbf{dBm + 107}$$

10.1 Example 1:

@ 0.190 ㎒

Class B limit	=	64.0 dB μV
Reading	=	54.5 dB μV (calibrated level)
Margin	=	54.5 – 64.0 = - 9.5 dB μV
		= 9.5 dB below limit

10.2 Example 2:

@ 220.0 ㎒

Class B limit	=	30.0 dB μV/ m
Reading	=	12.0 dB μV /m (calibrated level)
Antenna Factor + Cable Loss	=	13.2 dB
Total	=	25.2 dB μV/ m
Margin	=	25.2 – 30.0 = - 4.8 dB μV/ m
		= 4.8 dB below limit

11. Test Equipment

Type	Manufacturer	Model Number	CAL Due Date
Conducted Emission			
EMI Test Receiver	**Rohde & Schwarz**	**ESCI**	**2010.06.02**
LISN	**Rohde & Schwarz**	**ESH3-Z5**	**2011.02.05**
LISN	**Rohde & Schwarz**	**ENV216**	**2011.04.06**
Attenuator	**Rohde & Schwarz**	**ESH3-Z2**	**2010.10.30**
Radiated Emission			
EMI Test Receiver	**Rohde & Schwarz**	**ESI40**	**2010.10.30**
TRILOG Antenna	**Schwarzbeck**	**VULB9160**	**2010.12.18**
Antenna Position Tower	**HD**	**MA240**	**Not Applicable**
Turn Table	**EMCO**	**1050**	**Not Applicable**
Controller	**HD GmbH**	**HD 100**	**Not Applicable**
Slide Bar	**HD GmbH**	**KMS 560**	**Not Applicable**

12. Test Software Used

■ Ping test mode & Record mode.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

13. Conclusion

The data collected shows that **Digital Image Blackbox,** manufactured by **PLK Technologies, (MODEL: RoadScan DTW)** complies with §15.107 and §15.109 of the FCC Rules.