

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA
TEL : +82 31 639 8517 FAX : +82 31 639 8525

CERTIFICATION

**Manufacture;
Hantel Co.,Ltd**

**#513-15, Suntechcity, BLD 5F, Sangdaewon-dong,
Jungwon-gu, Seongnam, Kyunggi-do, South Korea**

HANTEL FRN : 0007460181

Date of Issue : JANUARY 25, 2005

Test Report No.: HCT-F05-0109

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION
TECHNOLOGIES CO., LTD.**

HCT FRN : 0005-8664-21

FCC ID :

MODEL :

**ODGT4
T4**

Equipment Class: Communications Rcvr for use w/ licensed Tx and CBs
Standard(s): FCC Class B (CISPR 22)
EUT Type: PAGER

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 C63.4-2001.

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 : Ki-Soo Kim
Manager of EMC Tech. Part

TABLE OF CONTENTS

PAGE

REPORT COVER	1
TABLE OF CONTENTS	2
1. SCOPE	3
2. INTRODUCTION (SITE DESCRIPTION)	4
3. PRODUCTION INFORMATION	5
4. DESCRIPTION OF TESTS	6-7
5. LIST OF SUPPORT EQUIPMENT	8
6. TEST DATA (CONDUCTED)	9
7. PRELIMINARY TEST	10
8. TEST DATA (RADIATED)	11
9. SAMPLE CALCULATIONS	12
10. TEST EQUIPMENT	13
11. TEST SOFTWARE USED	14
12. CONCLUSION	15

ATTACHMENT A: FCC ID LABEL & LOCATION

ATTACHMENT B: EXTERNAL PHOTOGRAPHS

ATTACHMENT C: BLOCK DIAGRAM

ATTACHMENT D: TEST SETUP PHOTOGRAPHS

ATTACHMENT E: USER'S MANUAL

ATTACHMENT F: INTERNAL PHOTOGRAPHS

ATTACHMENT G: CIRCUIT DIAGRAM

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:	Hantel Co., Ltd.
Address:	#513-15, Suntechcity, BLD 5F, Sangdaewon-dong, Jungwon-gu, Seongnam, Kyunggi-do, South Korea

- **FCC ID : ODGT4**
- Equipment Class: **Communications Rcvr for use w/ licensed Tx and CBs**
- EUT Type: **PAGER**
- Model :**T4**
- Rule Part(s): **FCC Part 15 Subpart B**
- Test Procedure(s): **ANSI C63.4 (2001)**
- Dates of Tests: **JANUARY 24, 2005**
- 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 9kHz to 40GHz (ANSI C63.4-2001) was used in determining radiated and conducted emissions emanating from **Hantel Co., Ltd. PAGER. FCC ID : ODTG4.**

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 July 23, 2003 (Confirmation Number: EA90661)

3. PRODUCT INFORMATION

3.1 Equipment Description

Equipment Under Test (EUT) is the **Hantel Co., Ltd. PAGER. FCC ID : ODGT4.**

- **FCC ID : ODGT4**
- Equipment Class: **Communications Rcvr for use w/ licensed Tx and CBs**
- EUT Type: **PAGER**
- Model : **T4**
- Rule Part(s): **FCC Part 15 Subpart B**

4. Description of Tests(Conducted & Radiated)

4.1 Powerline Conducted Emission (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.

The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, 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 EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the centre with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted FCC Class B

RFI CONDUCTED	FCC CLASS B Limits dB(uV/m)	
	CISPR 22 Quasi-Peak	CISPR 22 Average
150kHz - 0.5MHz	66-56*	56-46*
0.5MHz - 5MHz	56	46
5MHz - 30MHz	60	50
*Limits decreases linearly with the logarithm of frequency		

Table 1. FCC CLASS B Conducted Limits

4.2 Description of Tests(Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The spectrum was scanned from 30 to 300 MHz using biconical antenna, 300 to 1000 MHz using log- periodic antenna, and above 1 GHz using linearly polarized horn antennas. Final measurements were made outdoors at 10-meter test range using Dipole antennas and EMI receiver. For frequencies above 1 GHz, horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment were 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 kHz. The EUT, support equipment, and interconnecting cables were arranged to the configuration that produces the maximum EME emission found during preliminary scan. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Horizontal and vertical antenna polarizations were checked. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/ or support equipment, and powering the monitor the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits			
Frequency (MHz)	FCC Limit @ 3m. Quasi-Peak dB[μV/m]	FCC Limit @ 10m.* Quasi – Peak dB [μV/m]	CISPR Limit @ 10m. Quasi-Peak dB [μV/m]
30-88	40.0	29.5	30.0
88-216	43.5	33.0	30.0
216-230	46.0	35.6	30.0
230-960	46.0	35.6	37.0
960-1000	54.0	43.5	37.0
> 1000	54.0	43.5	No Specified Limit
* Limit extrapolated 20 dB/decade			

Table 2. Radiated Class B limits @ 10-meters

5. Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
PAGER (EUT)	Hantel Co., Ltd.	T4	ODGT4	-
FLEX PAGER TESTER	TESCOM	TC-1101A	-	-

5. 2 Cable Description : Not Applicable

5. 3 Noise Suppression Parts on Cable. (I/O CABLE) : Not Applicable

6. LINE-CONDUCTED TEST DATA

NOTES:

1. It does not need test this requirement, because the power of the EUT is supplied by a DC battery.

7. PRELIMINARY TEST

7.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
N/A	N/A
It does not need to test this requirement, because the power of the EUT is supplied by a DC battery.	

7.2 Radiated Emission Test

During Preliminary Test, the Following operation mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Standby Mode	
Receiving Mode	X

8. RADIATED TEST DATA

Operating Condition : Receiving mode : Bottom Frequency (Operating frequency : 929.0125MHz)

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
78.6	19.4	8.1	2.0	V	29.5	40	-10.5
237.6	15.0	10.9	3.5	H	29.4	46	-16.6

Operating Condition : Receiving mode : Top Frequency (Operating frequency : 931.9875MHz)

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
78.7	19.4	8.1	2.0	V	29.5	40	-10.5
237.6	14.3	10.9	3.5	H	28.7	46	-17.3

Radiated Measurements at 3-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 8).
3. The EUT was test up to 2 GHz and no significant emission was found.

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

9. Sample Calculations

$$\text{dB } \square = 20 \log_{10} (\square)$$

9.1 Example 1:

@ 0.150 MHz

Class B limit	= 66.0 dB μ V
Reading	= 61.6 dB μ V (calibrated level)

Margin = 61.6 – 66.0 = -4.4

= 4.4 dB below limit

9.2 Example 2:

@ 553.8 MHz

Class B limit	= 37 dB μ V/m
Reading	= 7.9 dB μ V/m (calibrated level)
Antenna Factor + Cable Loss	= 25.3 dB
Total	= 33.2 dB μ V/m

Margin = 33.2 – 37.0 = 3.8

= 3.8 dB below limit

10. Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Due Date</u>
EMI Test Receiver	Rohde & Schwarz	ESI40	2005.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2005.07.16
EMI Test Receiver	Rohde & Schwarz	ESCI	2005.09.13
LISN	Rohde & Schwarz	ESH2-Z5	2005.07.28
LISN	EMCO	ESH3-Z5	2005.07.28
Attenuator	Rohde & Schwarz	ESH3-Z2	2005.11.16
Amplifier	Hewlett-Packard	8447E	2005.08.23
TRILOG Antenna	Schwarzbeck	9160	2005.04.06
Antenna Position Tower	EMCO	1051-12	N/A
Turn Table	EMCO	1060-06	N/A
Power Analyzer	Voltech	PM 3300	2005.02.15
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2005.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

11. Test Software Used

■ During Radiated Emission Tests, TESCO signal model no:TC-1101A was used to radiate an unmodulated CW signal to EUT at 1 near top and 1 near bottom frequency in order to stabilize the local oscillator of the EUT.

12. Conclusion

The data collected shows that the **Hantel Co., Ltd. PAGER. FCC ID : ODGT4** complies with §15.107 and §15.109 of the FCC Rules.