

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

PRODUCT COMPLIANCE TEAM
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CERTIFICATION

Manufacture; Digital Products of Delaware, Inc. 625 SW 9 th Terrace Pompano Beach, FL 33069 DPD FRN : 0008-2230-26	Date of Issue: FEBRUARY 07, 2003 Test Report No.: HCT-F03-0202 Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD. HCT FRN : 0005-8664-21
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FCC ID :

EEB-DTGHMUTX

APPLICANT :

Digital Products of Delaware, Inc.

FCC Rule Part(s):	FCC Part 15.231 Subpart C
Equipment Class:	Low Power Communication Device Transmitter(DXX)
Frequency Range:	1 ch , Radio Transmitter / 418MHz
Standard(s):	FCC Class B: 2001
Equipment(EUT) Type:	Radio Transmitter
Model(s):	HMU TELETEK

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 C63.4-1992.(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.

HYUNDAI C-Tech. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse of 1988,21 U.S.C.853(a).



Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part



TABLE OF CONTENTS

	PAGE
1. GENERAL INFORMATION.....	3
1.1 Product Description.....	3
1.2 Related submittal(s)/Grant(s).....	3
1.3 Tested System Details.....	4
1.4 Test Methodology.....	4
1.5 Test Facility.....	4
2. SYSTEM TEST CONFIGURATION.....	4
2.1 Justification.....	5
2.2 EUT Exercise Software.....	5
2.3 Cable Description.....	5
2.4 Noise Suppression Parts on Cable.....	6
2.5 Equipment Modifications.....	6
2.6 Configuration of Tested System.....	6
3. PRELIMINARY TESTS.....	7
3.1 Radiated Emission Test.....	8
4. OCCUPIED BANDWIDTH TEST SUMMARY.....	8
4.1 Occupied bandwidth (Part 15.231).....	9
5. TRANSMISSION REQUIREMENT.....	9
5.1 Transmission Requirement (Part 15.231).....	10
6. RADIATED EMISSION TESTS SUMMARY.....	10
6.1 Radiated Emissions(1)-Fundamental and Spurious Emission.....	11
6.2 Radiated Emissions(2) - Out of restricted band Emission.....	12
6.3 Antenna Requirement (Part 15.203 Subpart C).....	13
7. FIELD STRENGTH CALCULATION.....	14
8. LIST OF TEST EQUIPMENT	15
	16

ATTACHMENT A	ID Label / Location Info.
ATTACHMENT B.....	External Photos.
ATTACHMENT C	Block/Circuit Diagram.
ATTACHMENT D	Test Setup Photos.
ATTACHMENT E	User's Manual.
ATTACHMENT F	Internal Photos.
ATTACHMENT G.....	Part List.
ATTACHMENT H.....	Operational Description.
ATTACHMENT I.....	Test Plot(S)-1.
ATTACHMENT J.....	Test Plot(S)-2.

1. GENERAL INFORMATION

1.1 Product Description

The Digital Products of Delaware, Inc. Model HMU TELETEK(referred to as the EUT in this report) Is a Radio Transmitter.

Product specification information described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	PLASTIC
LIST OF EACH OSC. OR XTAL. FREQ.(FREQ.≥ 1MHz)	32.768KHz , 418MHz
POWER REQUIREMENT	INPUT DC : 3V , 1A
NUMBER OF LAYERS	MAIN BOARD 2 LAYER
ANTENNA	Printed Circuit Stub Antenna
DIMENSION	63 X 39 X 19mm
TRANSMITTING FREQUENCY	418MHz
OPERATING TEMPERATURE	-20℃ ~ +70℃

1.2 Related Submittal(s) / Grant(s)

ORIGINAL SUBMITTAL ONLY

1.3 Tested System Details

The Model names for all equipment, plus descriptions used in the tested system (including inserted cards) are:

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
Radio Transmitter (EUT)	Digital Products of Delaware, Inc.	HMU TELETEK	EEB-DTGHMUTX	N/A

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 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 July 24,2000(Confirmation Number: EA90661)

2.SYSTEM TEST CONFIGURATION

2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following components and I/O cards inside the E.U.T were used.

DEVICE TYPE	MANUFACTURE	MODEL/PART NUMBER
Radio Transmitter (EUT)	Digital Products of Delaware, Inc.	HMU TELETEK

2.2 EUT exercise Software

N/A

2.3 Cable Description

DEVICE TYPE	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
Radio Transmitter (EUT)	N	N/A	N/A

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

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

DEVICE TYPE	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Radio Transmitter (EUT)	N	N/A	N/A	N/A

2.5 Equipment Modifications

N/A

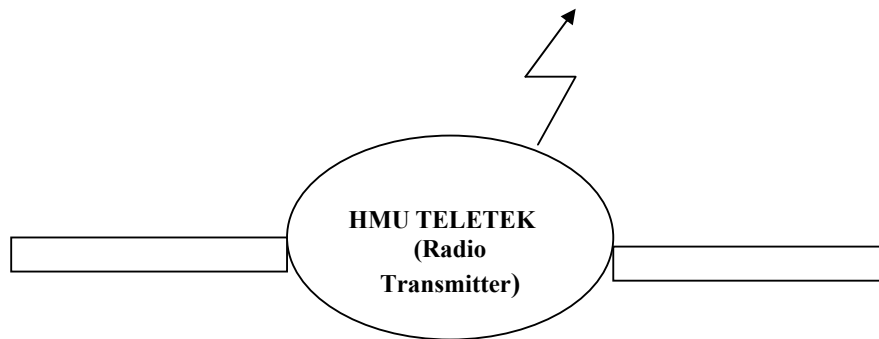
2.6 Configuration of Test system

Line Conducted Test : EUT 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 C63.4/1992 7.2.3 to determine the worse operating conditions.

Radiated Emission Test : Preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 3 meter open area test site.

[Configuration of Tested System]



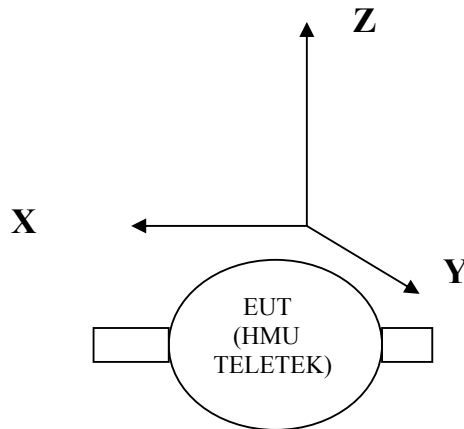
3. PRELIMINARY TESTS

3.1 Radiated Emission Test

During Tests, the following operating conditions were investigated

Axes	The worst operating condition
X	
Y	
Z	O

Note : This transmitter has been investigated with three axes and the reported readings are the worse case.



4. OCCUPIED BANDWIDTH TEST SUMMARY

HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.

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4.1 Occupied bandwidth (Part 15.231)

RESULT :

PASS

The measured spectrum of the signal is shown in **ATTACHMENT I.**

From the plot, we can see that in the worst case, the occupied bandwidth is 468KHz

This test was performed to demonstrate that the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and 900MHz

The measurement was performed at the operating frequency ,418MHz. The spectrum trace data around fundamental frequency of the EUT was obtained with the spectrum analyzer in “Max Hold” mode. The bandwidth value was determined between the two points of 20dB down from the modulated carrier.

-. Calculation of the bandwidth

$$\text{Limit} = F \times 0.0025 = 418\text{MHz} \times 0.0025 = 1200\text{KHz}$$

5. TRANSMISSION REQUIREMENT

5.1 Transmission Requirement (Part 15.231)

Results:

PASS

The results of the transmission duration and duty cycle are shown **ATTACHMENT J**.

The intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door opener, remote switches. Etc. Continuous transmissions, such as voice or video and data transmissions are not permitted

According to 15.231(a)(1), a manually operated transmitter shall employ a switch that will Automatically deactivate the transmitter within not more than 5 seconds of being released.

Transmitter Duty cycle : 67.1%

Calculation of Duty cycle correction factor

Large Pulse : 5.85mS

Small Pulse (1) : 2.55mS

Small Pulse (2): 3.90mS

Small Pulse (3): 1.0mS

Total Pulse : 19.8mS

(Large Pulse + Small Pulse) /Total Pulse =(5.85mS+2.55mS+3.9mS+1.0mS)/19.8mS =0.671

0.671 X 100 = 67.1%

Correction Factor : $20 \log (0.671) = -3.47\text{dB}$

6. RADIATED EMISSION TESTS SUMMARY

6.1 Radiated Emissions(1)-Fundamental and Spurious Emission

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Humidity Level : 20 % Temperature : 13 °C
 Limit apply to : FCC CFR 47, PART 15.231, SUBPART C
 Date : JANUARY 22, 2003
 Result : PASSED BY-5.3dB

EUT : Radio Transmitter / HMU TELETEK
 Detector : Peak Mode (6 dB Bandwidth : 120 KHz)

Frequency MHz (Fundamental)	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
418.0	52.05	16.85	4.20	H	73.1	80.3	-7.2
Frequency MHz (Spurious)	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
636.0	27.64	21.42	5.90	H	55.0	60.3	-5.3
836.1	16.79	23.11	6.90	V	46.8	60.3	-13.5
1254.3	17.5	24.5	7.20	V	49.2	60.3	-11.1
1672.0	15.3	25.0	7.50	V	47.8	60.3	-12.5

NOTES:

The frequency range investigated during radiated emission test was from 30MHz to 10GHz.

We didn't include duty factor.

Kyoung Hee Yoon

Measured by Kyoung-Hee YOON / Engineer

Date: JANUARY 22, 2003

6.2 Radiated Emissions(2) - Out of restricted band Emission

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The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Humidity Level : 20 % Temperature : 13 °C
 Limit apply to : FCC CFR 47, PART 15 205, SUBPART C
 Type of Tests : CLASS B
 Date : JANUARY 22, 2003
 Result : PASSED BY-7.0dB

EUT : Radio Transmitter / HMU TELETEK
 Detector : CISPR Quasi-Peak Mode (6 dB Bandwidth : 120 KHz)

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
30.0	9.62	19.78	0.90	V	30.3	40.0	-9.7
46.7	16.56	13.04	1.40	H	31.0	40.0	-9.0
55.7	22.17	9.23	1.60	H	33.0	40.0	-7.0
115.7	17.01	12.69	2.30	V	32.0	43.5	-11.5
156.7	15.63	14.77	2.60	H	33.0	43.5	-10.5

NOTES:

The frequency range investigated during radiated emission test was from 30MHz to 1GHz.

Kyoung Hee Yoon

Measured by Kyoung-Hee YOON / Engineer

Date: JANUARY 22, 2003

6.3 Antenna Requirement (Part 15.203 Subpart C)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the application can be used with the device. The use of a permanently attached antenna of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply to with this requirement

CONCLUSION

The Digital Products of Delaware, Inc. Radio Transmitter complies with the antenna requirement having an Printed Circuit Stub Antenna uniquely designed for the transmitter unit.

7. 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 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The 30 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(30 \text{ dBuV/m})/20] = 31.6 \text{ uV/m}$$

***. Formulas for calculating the maximum permitted fundamental field strengths.**

$$\begin{aligned} \text{Limit} &= 41.667(F)-7083.3333(3\text{meters}) \\ &= 41.6667(418\text{MHz})-7083.3 \\ &= 10333.3806 \text{ uV/m} \\ &= 80.3 \text{ dBuV/m} \end{aligned}$$

8. LIST OF TEST EQUIPMENT

DATE	TYPE	MANUFACTURE	MODEL	CAL .
	EMI Test Receiver	Rohde & Schwarz	ESI40	2002.11.5
	EMI Test Receiver	Rohde & Schwarz	ESVS30	2002.3.6
	Spectrum Monitor	Rohde & Schwarz	EZM	N.A
	Graphic Plotter	Rohde & Schwarz	DOP2	N.A
	Printer	Rohde & Schwarz	PDN	N.A
	Spectrum Analyzer	H.P	8591EM	2002.7.11
	LISN	EMCO	3825/2	2003.2.7
	LISN	Rohde & Schwarz	ESH2-Z5	2002.8.12
	Amplifier	Hewlett-Packard	8447E	2002.3.2
	Dipole Antennas	Rohde & Schwarz	VHAP	2002.6.28
	Dipole Antennas	Rohde & Schwarz	UHAP	2002.6.28
	Biconical Antenna	Rohde & Schwarz	BBA-9106	2002.6.28
	Log-Periodic Antenna	Rohde & Schwarz	UHALP-9107	2002.6.26
	Broadband Horn Antenna	Rohde & Schwarz	BBHA 9120 D(1099)	2002.10.26
	Antenna Position Tower	EMCO	1051-12	N.A
	Turn Table	EMCO	1060-06	N.A
	Line Filter	KEENE	ULW 2X30-60	N.A