

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : THERMAL PRINTER
MODEL/Serial No. : PORTI-PC40 / NONE
FCC ID : QDDPORTI-PC40
BRAND NAME : -
APPLICANT : Woosim System Inc.
#501, Daerung Technotown 3th, 448, Gasan-dong,
Geumcheon-gu, Seoul, Korea
Attn. : Moo-Seung Lim / Assistant Manager
MANUFACTURER : Woosim System Inc.
#501, Daerung Technotown 3th, 448, Gasan-dong,
Geumcheon-gu, Seoul, Korea
FCC CLASSIFICATION : Class B Personal computers and peripherals
RULE PART(S) : FCC Part 15 Subpart B
FCC PROCEDURE : ANSI C63.4-2003
TEST REPORT No. : ETLE080704.539
DATES OF TEST : July 14, 2008 to July 15, 2008
REPORT ISSUE DATE : July 18, 2008
TEST LABORATORY : ETL Inc. (FCC Designation Number : KR0022)

This THERMAL PRINTER, Model PORTI-PC40 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:

I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is 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.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



Hyung Seok, Lee / Chief Engineer

ETL Inc.

#584, Sangwhal-ri, Ganam-myeon, Yaju-gun, Gyeonggi-do, 469-885, Korea

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Table of Contents

FCC Measurement Report

1. Introduction
2. Product Information
3. Description of Tests
4. Test Condition
5. Test Results
 - 5.1 Summary of Test Results
 - 5.2 Conducted Emissions Measurement
 - 5.3 Radiated Emissions Measurement
6. Sample Calculation
7. List of test Equipment used for Measurement

Appendix A. FCC ID Label and Location

Appendix B. Test Setup Photographs

Appendix C. External Photographs

Appendix D. Internal Photographs

Appendix E. Block Diagram

Appendix F. User Manual

FCC MEASUREMENT REPORT

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

General Information

Applicant Name	: Woosim System Inc.
Address	: #501, Daerung Technotown 3th, 448, Gasan-dong, Geumcheon-gu, Seoul, Korea
Attention	: Moo-Seung Lim / Assistant Manager

- **EUT Type :** THERMAL PRINTER
- **Model Number :** PORTI-PC40
- **S/N :** NONE
- **Frequency Range :** X-TAL → 6.000 MHz
- **FCC Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** Class B Personal computers and peripherals
- **Dates of Tests :** July 14, 2008 to July 15, 2008
- **Place of Tests :** ETL Inc. Testing Lab.

Radiated Emission test;
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Gyeonggi-do, 469-885, Korea

Conducted Emission test;
ETL Inc. Testing Lab.
371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE080704.539

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions from the Woosim System Inc. Model: PORTI-PC40

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Woosim System Inc. (model: PORTI-PC40)

2.2 General Specification

Item	Specification	
Printing method	Direct thermal line printing	
Characters per line	42 cpl	
Character size	Eng.: 9 dots * 24 dots, 12 dots * 24 dots	
	Kor.: 16 dots * 24 dots, [24 dots * 24 dots]	
Resolution	203 dpi, 8 dots/mm	
Print width	2-Inch (48 mm, 384 dots)	
Printing speed	50 mm/sec	
Dimensions	105 mm * 80.4 mm * 45.7 mm	
Weight	286 g	
Interface	RS-232C or TTL	
Paper supplied	Thermal roll paper (57 mm wide, 40 ¢)	
Barcode supplied	PDF417(2-dimension), Code128, Code39, I2/5,	
	UPC, EAN, KAN, JAN, CODABAR	
Receive buffer size	10 k bytes	
Note	Printing speed may be slower, depending on the data transmission speed and the combination of control commands.	
Input Power	12 ~ 24 VDC, Standby 60 mA and Max 3 A	
Environment conditions	Temperature	-10 °C ~ 40 °C (operating)
		-10 °C ~ 70 °C (storage)
	Humidity	30 % ~ 80 % (operating)
		10 % ~ 90 % (storage)
MCBF (Mean Cycle Between failure)	Mechanical	37 000 000 lines
	Head	Approximately 50 km

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω / 50 μ H LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 0.4 m away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determine the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 3 m. The test equipment was placed on a wooden turn-table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

4.2 EUT operation

Operating Mode	The worst operating condition
Stand by mode	X
Continuous printing mode	O

O: Worst case investigated during the Test

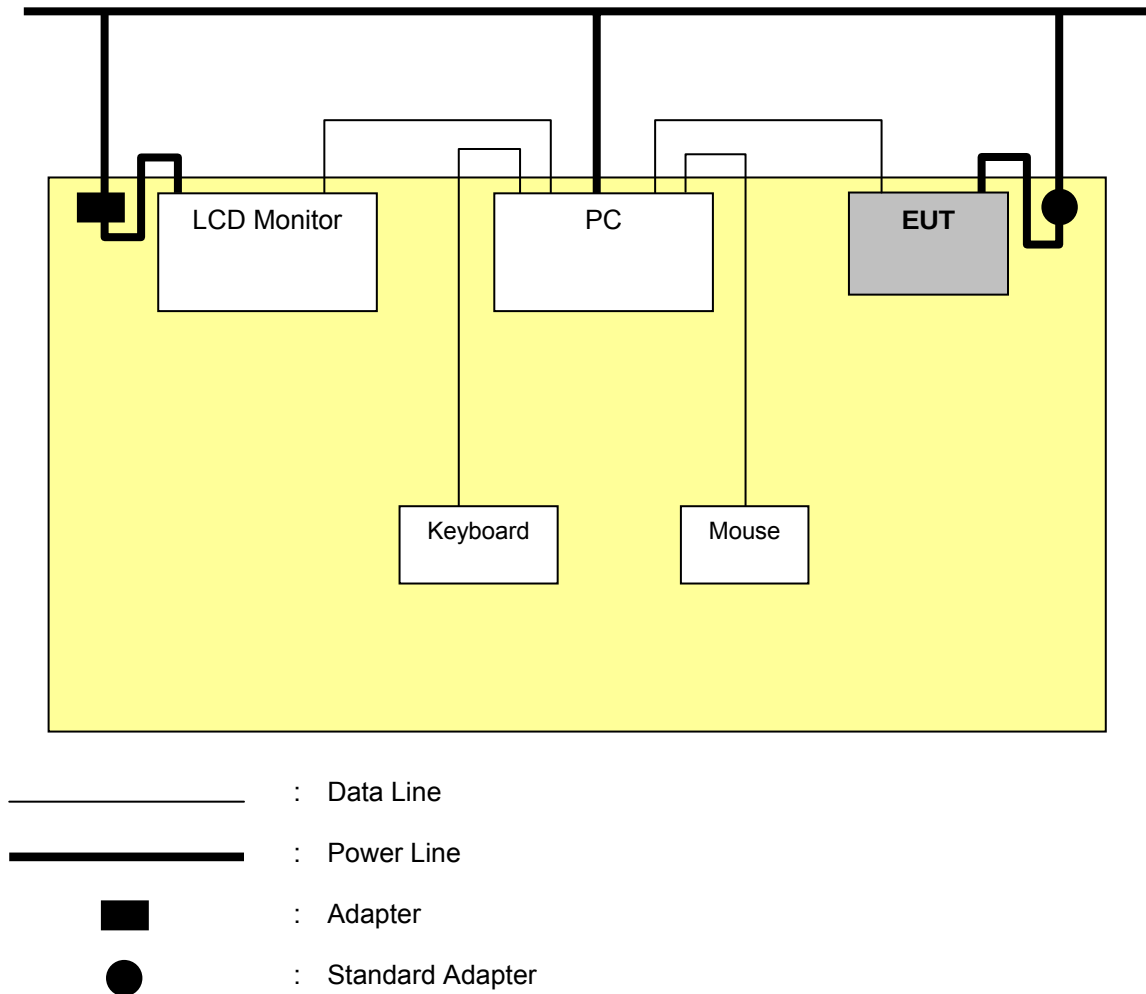
4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer
PC	DHM	GNTGB1S	Dell Asia Pacific Sdn.
LCD Monitor	ELM150B	E02101851D	Erae Electronics Co., Ltd.
Adapter (for LCD Monitor)	NONE	NONE	NONE
Keyboard	KB-9963	B26960LGAML010	Chicony Eleclotronics
Mouse	M-S48a	NONE	Logitech
Standard Adapter	DSA-60W-12 1 12060	NONE	Dee Van Electronics(Shen Zhen)Co., Ltd.

4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length(m)	Type of shield
EUT	PC	RS-232	1.0	Unshielded
EUT	Standard Adapter	DC Input	1.2	Shielded
PC	LCD Monitor	RGB	1.5	Shielded
PC	Keyboard	PS/2	1.2	Unshielded
PC	Mouse	PS/2	1.2	Unshielded
PC	Power socket	AC Input	1.2	Unshielded
LCD Monitor	Adapter	DC Input	1.2	Shielded

4.5 The setup drawing(s)



5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Measurement Required	Result
15.107	Conducted Emission Measurement	Passed by 19.40 dB
15.109	Radiated Emission Measurement	Passed by 5.30 dB

The data collected shows that the Woosim System Inc. / **THERMAL PRINTER / PORTI-PC40** complied with technical requirements of above rules part 15.107 and 15.109 Class B Limits.

The equipment is modified anything, mechanical or circuits to improve EMI status during a measurement. EMI suppression device(s) was added and/or modified during testing.



- RS-232 cable applied circumvolving core (FELLUX/BNF-0930) 1 turn.

5.2 Conducted Emissions Measurement

EUT	THERMAL PRINTER / PORTI-PC40 (S/N: N/A)
Limit apply to	FCC Part 15.107 Class B
Test Date	July 15, 2008
Operating Condition	Continuous printing mode
Result	Passed by 19.40 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarizations of hot and neutral line.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 kHz)

Frequency [MHz]	Result [dB μ V]		Phase (*L/**N)	Limit [dB μ V]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Quasi-peak	Average
0.211	34.50	27.80	H	63.20	53.20	28.70	25.40
0.262	35.00	27.70	N	61.40	51.40	26.40	23.70
0.471	34.40	26.60	N	56.50	46.50	22.10	19.90
0.780	32.00	26.60	N	56.00	46.00	24.00	19.40
1.430	27.80	22.60	N	56.00	46.00	28.20	23.40
5.207	23.50	17.00	N	60.00	50.00	36.50	33.00
17.547	25.50	21.40	H	60.00	50.00	34.50	28.60

NOTES:

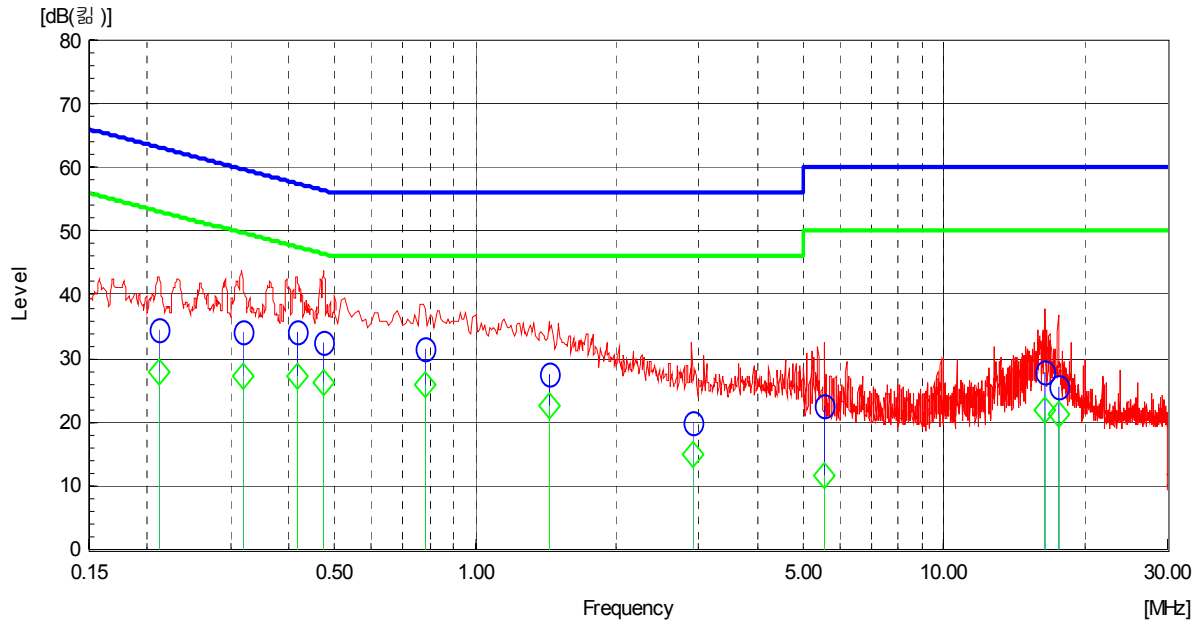
- * H : HOT Line , **N : Neutral Line
- Margin value = Limit – Result
- Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15



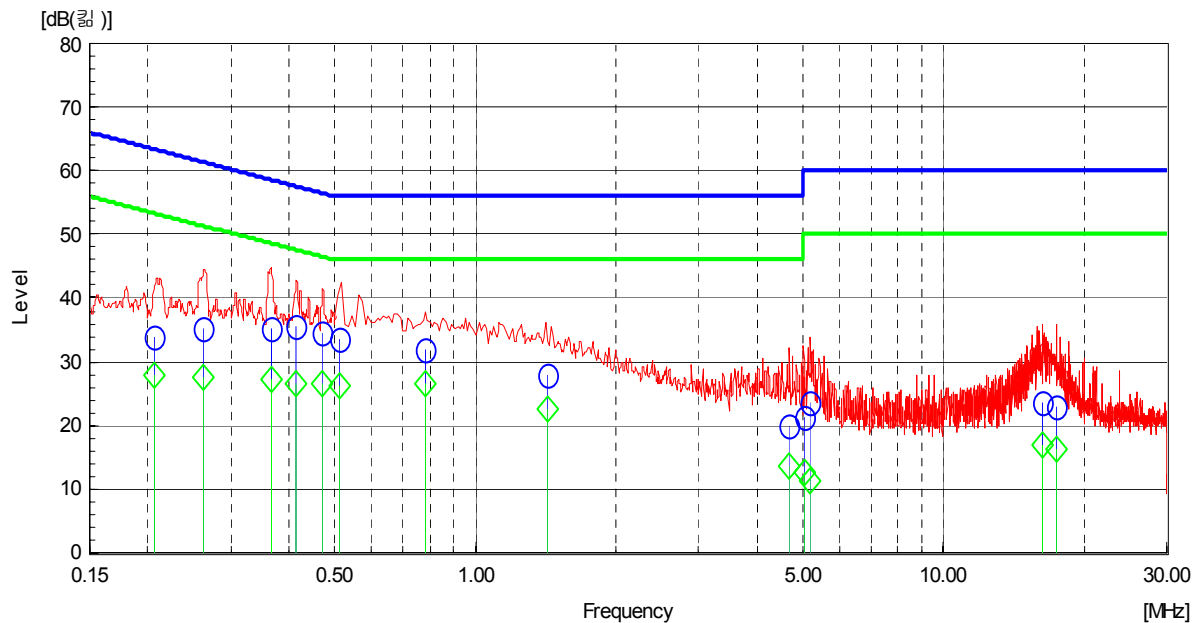
Test Engineer: Jeong-hwan, Pyo

Line: HOT Line

Limit : — Quasi-Peak
— Average



Line: Neutral Line



Quasi-peak  Average 

5.3 Radiated Emissions Measurement

EUT	THERMAL PRINTER / PORTI-PC40 (S/N: N/A)
Limit apply to	FCC Part 15.109 Class B
Test Date	July 14, 2008
Operating Condition	Continuous printing mode
Result	Passed by 5.30 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi – Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
39.45	22.55	V	9.28	1.77	33.60	40.00	6.40
59.70	19.61	V	8.59	2.10	30.30	40.00	9.70
71.85	21.40	V	8.18	2.22	31.80	40.00	8.20
235.20	21.71	H	10.84	4.65	37.20	46.00	8.80
287.85	18.06	H	12.36	5.38	35.80	46.00	10.20
371.90	18.68	H	13.90	6.32	38.90	46.00	7.10
460.33	17.41	H	16.01	7.28	40.70	46.00	5.30

NOTES:

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Result = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Result
4. The measurement was performed for the frequency range 30 MHz – 1 000 MHz according to FCC Part 15.109 Class B.



Test Engineer: Jeong-hwan, Pyo

6. SAMPLE CALCULATION

Sample 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

$$dB(\mu V) = 20 \log_{10} (uV) : \text{Equation}$$

Example : @ 460.33 MHz

$$\text{Class B Limit} = 46.00 \text{ dBuV/m}$$

$$\text{Reading} = 17.41 \text{ dBuV}$$

$$\text{Antenna Factor + Cable Loss} = 16.01 + 7.28 = 23.29 \text{ dBuV/m}$$

$$\text{Total} = 40.70 \text{ dBuV/m}$$

$$\text{Margin} = 46.00 - 40.70 = 5.30 \text{ dB}$$

$$= 5.30 \text{ dB below Limit}$$

7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Due Date
☒	EMI TEST Receiver	ESVS10	R & S	835165/001	09.04.04
☒	EMI TEST Receiver	ESPI3	R & S	100478	08.10.04
☒	LISN	3816-2	EMCO	1001	08.10.05
☒	LISN	3816-2	EMCO	1002	08.10.05
☒	LogBicon Antenna	VULB9165	Schwarzbeck	2023	09.08.28
☒	Turn-Table	DETT-03	Daeil EMC	-	N/A
☒	Antenna Master	DEAM-03	Daeil EMC	-	N/A

End of Test Report