

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : THERMAL PRINTER
MODEL/Serial No. : PORTI-P40 / NONE
FCC ID : QDDPORTI-P40
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. : ETLE080704.538
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-P40 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

Tel: 82-2-858-0786 Fax: 82-2-858-0788

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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-P40
- **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;
#584, Sangwhal-ri, Ganam-myeon, Yoju-gun,
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. :** ETLE080704.538

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-P40

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Woosim System Inc. (model: PORTI-P40)

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 | 80 mm * 75 mm * 40 mm (include PCB) | |
| Weight | 153 g (including roll paper) | |
| Interface | Serial (UART, TTL) | |
| Paper supplied | Thermal roll paper (57 mm wide, 40 ¢) | |
| Barcode supplied | PDF417(2-dimension), Code128, Code39, I2/5, Code93 | |
| | 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 | 9 VDC, Standby 60 mA and Max 3 A (Standard model) | |
| 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

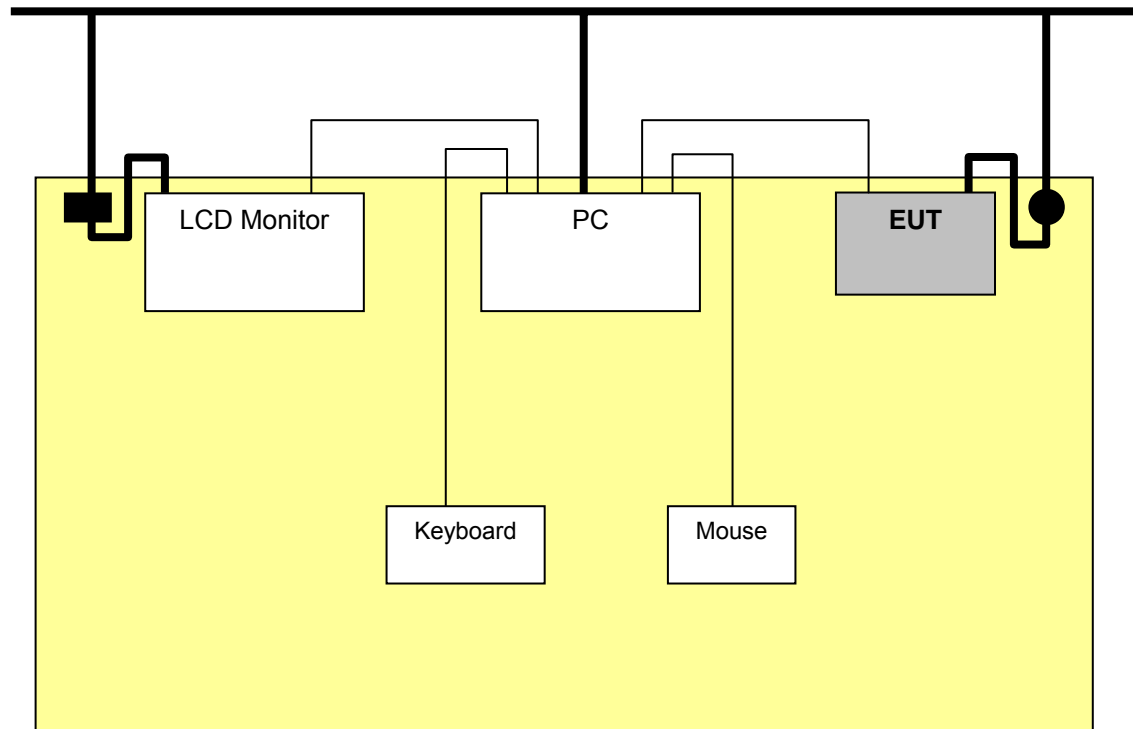
4.3 Support Equipment Used

| 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 | PW118 | KA0900N54 | AULT KOREA Corp. |

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)



- : Data Line
- : Power Line
- : Adapter
- : Standard Adapter

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 7.00 dB |
| 15.109 | Radiated Emission Measurement | Passed by 4.30 dB |

The data collected shows that the Woosim System Inc. / **THERMAL PRINTER / PORTI-P40** complied with technical requirements of above rules part 15.107 and 15.109 Class B Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

5.2 Conducted Emissions Measurement

| | |
|---------------------|--|
| EUT | THERMAL PRINTER / PORTI-P40 (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 7.00 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 |
| 0.198 | 44.90 | 40.80 | N | 63.70 | 53.70 | 18.80 | 12.90 |
| 0.265 | 41.60 | 35.00 | H | 61.30 | 51.30 | 19.70 | 16.30 |
| 0.531 | 41.90 | 39.00 | N | 56.00 | 46.00 | 14.10 | 7.00 |
| 2.664 | 44.10 | 30.30 | H | 56.00 | 46.00 | 11.90 | 15.70 |
| 7.784 | 37.60 | 20.60 | H | 60.00 | 50.00 | 22.40 | 29.40 |
| 12.435 | 37.90 | 35.50 | N | 60.00 | 50.00 | 22.10 | 14.50 |
| 23.611 | 45.30 | 25.80 | N | 60.00 | 50.00 | 14.70 | 24.20 |

NOTES:

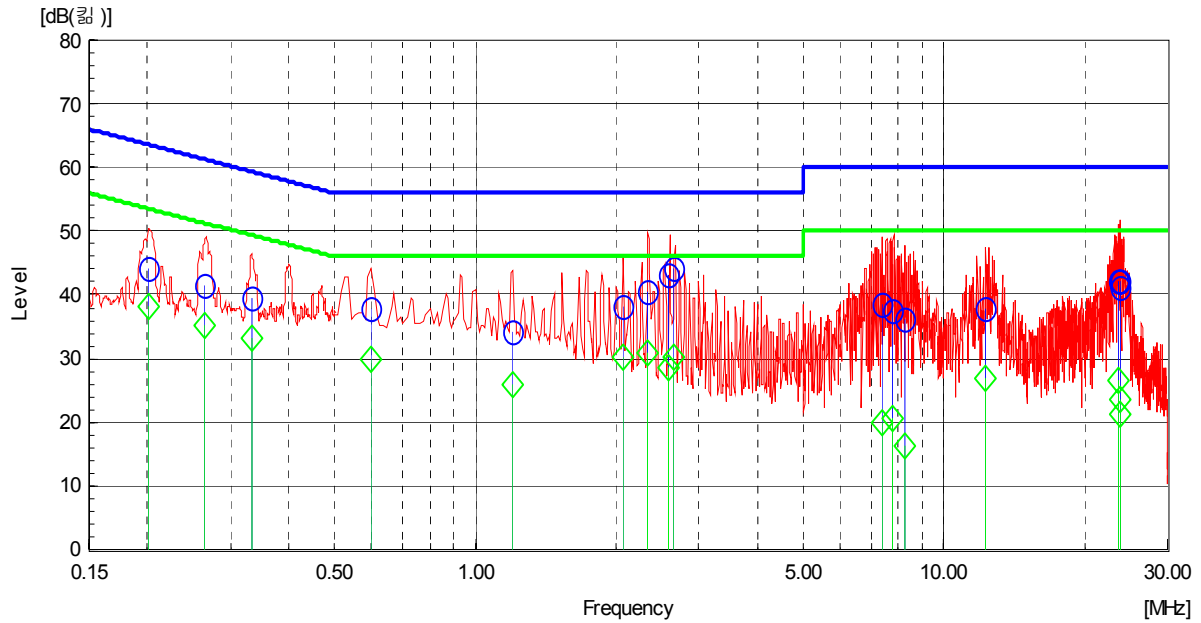
- * H : HOT Line , **N : Neutral Line
- Margin value = Limit – Result
- Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15



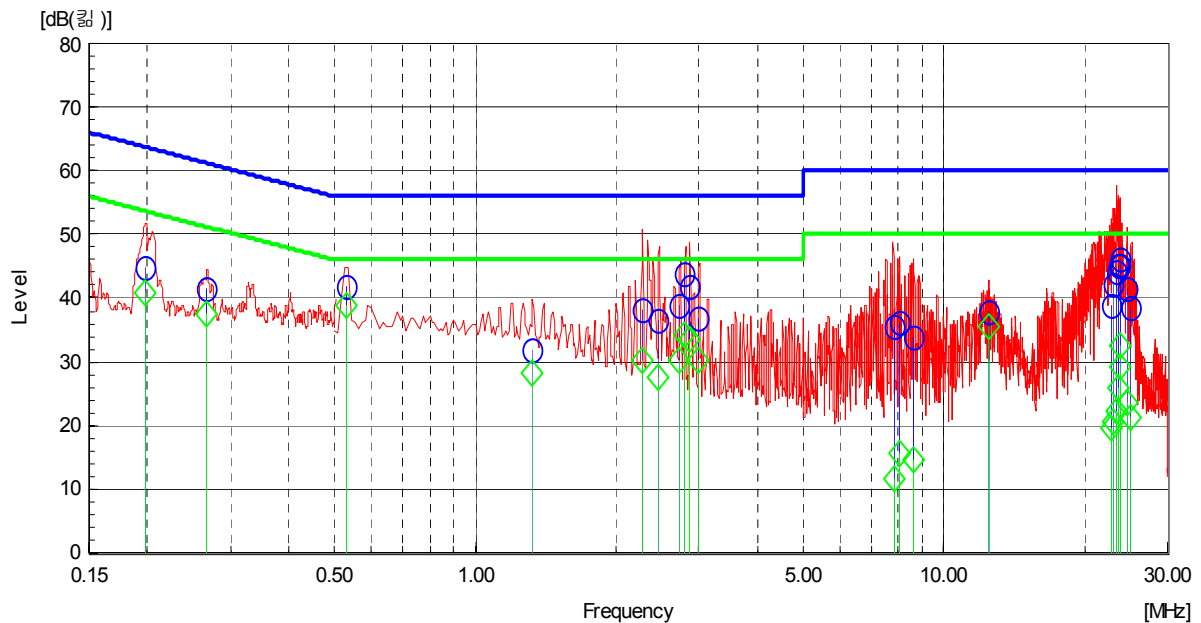
Test Engineer: Jeong-hwan, Pyo



Line: HOT Line

Limit : — Quasi-Peak
— Average



Line: Neutral Line



Quasi-peak  Average 

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5.3 Radiated Emissions Measurement

| | |
|---------------------|--|
| EUT | THERMAL PRINTER / PORTI-P40 (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 4.30 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] |
|-----------------|----------------------|-----------------------|--------------------|-----------------|-----------------------|----------------------|-------------|
| 32.70 | 24.86 | V | 8.79 | 1.45 | 35.10 | 40.00 | 4.90 |
| 71.85 | 23.70 | V | 8.18 | 2.22 | 34.10 | 40.00 | 5.90 |
| 131.25 | 21.66 | H | 10.97 | 3.27 | 35.90 | 43.50 | 7.60 |
| 144.07 | 22.28 | H | 11.36 | 3.46 | 37.10 | 43.50 | 6.40 |
| 287.17 | 23.19 | H | 12.34 | 5.37 | 40.90 | 46.00 | 5.10 |
| 360.91 | 21.77 | H | 13.72 | 6.21 | 41.70 | 46.00 | 4.30 |
| 477.11 | 13.97 | H | 16.41 | 7.42 | 37.80 | 46.00 | 8.20 |

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 : @ 360.91 MHz

| | | |
|-----------------------------|---|-----------------------------|
| Class B Limit | = | 46.00 dBuV/m |
| Reading | = | 21.77 dBuV |
| Antenna Factor + Cable Loss | = | 13.72 + 6.21 = 19.93 dBuV/m |
| Total | = | 41.70 dBuV/m |
| Margin | = | 46.00 – 41.70 = 4.30 dB |
| | = | 4.30 dB below Limit |

7. List of test equipments used for measurements

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

End of Test Report