verify No.956824410734

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# TEST REPORT

**KCTL Inc.**
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KCTL

**1. Client**

- Name : IDP Corp., Ltd.
- Address : (Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
- Date of Receipt : 2017-04-04

**2. Use of Report** : -

**3. Name of Product and Model** : Card Printer / SMART-51D

**4. Manufacturer and Country of Origin** : IDP Corp., Ltd. / Korea

**5. FCC ID** : VU2-SMART-51D

**6. Date of Test** : 2017-05-25 to 2017-05-29

**7. Test Standards** : FCC Part 15 Subpart C 15.225

**8. Test Results** : Refer to the test result in the test report

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : Bobae Lee (Signature) | Technical Manager<br>Name : Changmin Kim (Signature) |

2017-06-27

## KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

| Date | Revision | Page No |
|---|---|---|
| 2017-06-27 | Originally issued | - |
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# [ Contents ]

**1. Client information ..... 4**
**2. Laboratory information ..... 5**
**3. Description of E.U.T. ..... 6**
3.1 Basic description ..... 6
3.2 General description ..... 6
3.3 Test frequency ..... 6
**4. Summary of test results ..... 7**
4.1 Standards & results ..... 7
4.2 Uncertainty ..... 7
**5. Test results ..... 8**
5.1 Antenna Requirement ..... 8
5.2 In-band Fundamental Emission ..... 9
5.3 In-band Spurious Emission ..... 11
5.4 Out-of-band Spurious Emission ..... 12
5.5 Frequency tolerance ..... 14
5.6 Conducted Emission ..... 15
**6. Test equipment used for test ..... 17**

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# 1. Client information

| | |
|---|---|
| **Applicant:** | IDP Corp., Ltd. |
| **Address:** | (Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea |
| **Telephone number:** | 82-2-6099-3700 |
| **Facsimile number:** | 82-2-6099-3717 |
| **Contact person:** | Yongtae Kim / kmyt@idp-corp.com |

| | |
|---|---|
| **Manufacturer:** | IDP Corp., Ltd. |
| **Address:** | (Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea |

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# 2. Laboratory information

**Address**

**KCTL Inc.**

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

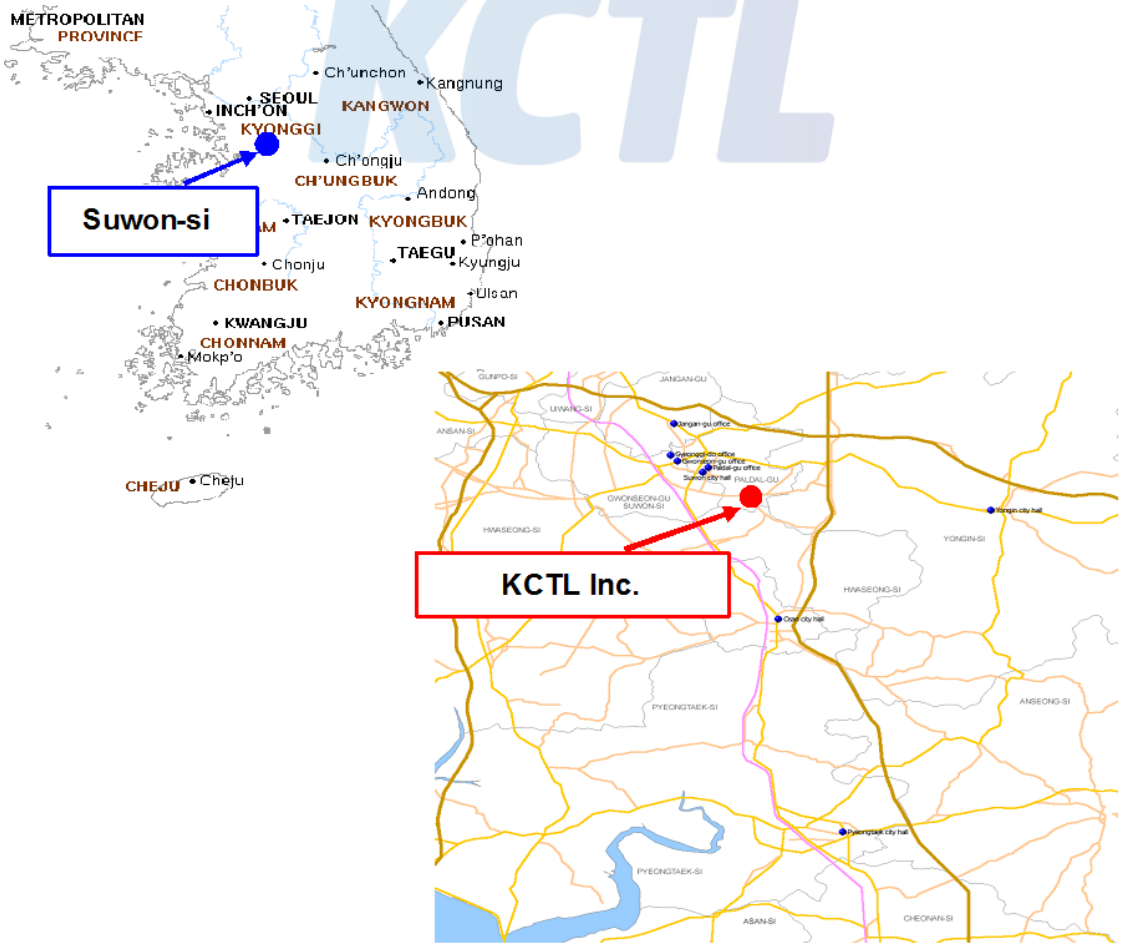
FCC Site Designation No: KR0040, FCC Site Registration No: 687132

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP



# 3. Description of E.U.T.

## 3.1 Basic description

| | |
|---|---|
| Applicant | IDP Corp., Ltd. |
| Address of Applicant | (Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea |
| Manufacturer | IDP Corp., Ltd. |
| Address of Manufacturer | (Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea |
| Type of equipment | Card Printer |
| Basic Model | SMART-51D |
| Variant Model [1)] | SMART-51S, SOLID-510D, GRASYS ID200W, HEXAGON-D, IDP-51D, ID-51D, CP-51D, P-51D, SOLID-510S, GRASYS ID200, HEXAGON-S, IDP-51S, ID-51S, CP-51S, P-51S |
| Serial number | N/A |

[1)] : Simplified derivation based on buyer's model name and there is difference of color for each model.

## 3.2 General description

| | |
|---|---|
| Frequency Range | 13.56 ㎒ |
| Type of Modulation | ASK |
| The number of channels | 1 ch |
| Type of Antenna | Loop Antenna |
| Power supply | DC 24 V |
| Product SW/HW version | smart51_app_1_00_02_SPI.bin / MAIN SCH,51 PRT,V0.12_B |
| Radio SW/HW version | smart51_app_1_00_02_SPI.bin / MAIN SCH,51 PRT,V0.12_B |
| Test SW Version | CardPrinterFirmware Downloader v2.1.0.2 |
| RF power setting in TEST SW | Token2Shell Version 6.3.0 |

Note : The above EUT information was declared by the manufacturer.

## 3.3 Test frequency

| | |
|---|---|
| Frequency | 13.56 ㎒ |

# 4. Summary of test results

## 4.1 Standards & results

| Rule Reference | Parameter | Status |
|---|---|---|
| 15.203 | Antenna Requirement | C |
| 15.225 (a) | In-band Fundamental Emission | C |
| 15.225 (b) | In-band Spurious Emission | C |
| 15.225 (c) | In-band Spurious Emission | C |
| 15.225 (d)<br>15.209 | Out-of–band Spurious Emission | C |
| 15.225 (e) | Frequency Stability Tolerance | C |
| 15.207 | Conducted Emissions | C |

Note1) : C = complies, NC = Not complies, NT = Not tested, NA = Not Applicable
Note2) : The worst case is Y scheme(Please refer to the “Test setup photos” to check X, Y, Z configuration).

## 4.2 Uncertainty

| Measurement Item | Expanded Uncertainty U = *k*Uc (*k* = 2) | |
|---|---|---|
| Radiated Spurious Emissions | 30 ㎒ ~ 300 ㎒: | +4.94 ㏈, -5.06 ㏈ |
| | | +4.93 ㏈, -5.05 ㏈ |
| | 300 ㎒ ~ 1 000 ㎒: | +4.97 ㏈, -5.08 ㏈ |
| | | +4.84 ㏈, -4.96 ㏈ |
| | 1 ㎓ ~ 25 ㎓: | +6.03 ㏈, -6.05 ㏈ |
| Conducted Emissions | 9 ㎑ ~ 150 ㎑: | 3.75 ㏈ |
| | 150 ㎑ ~ 30 ㎒: | 3.36 ㏈ |

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# 5. Test results

## 5.1 Antenna Requirement

### 5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 5.1.2 Result

-Complied

The Loop antenna is permanantely attached on PCB board.

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## 5.2 In-band Fundamental Emission

### 5.2.1 Regulation

15.225 (a) The field strength of any emission within the band 13.553-13.567 ㎒ shall not exceed 15, 848 microvolts/meter at 30 meters.

### 5.2.2 Measurement Procedure

Test Procedure The Radiated Electric Field Strength intensity has been measured on semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9 ㎑ to 30 ㎒ at distance 3m The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

Frequency : From 30 ㎒ to 1 ㎓ at distance 3m The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector. The radiated emission measurements were made with the following detector function of the test receiver (below 1 ㎓).

| Frequency | 9 - 90 ㎑ | 90 - 110 ㎑ | 110 - 490 ㎑ | 490 ㎑ - 30 ㎒ | 30 ㎒ -1 ㎓ |
|---|---|---|---|---|---|
| Detecter type | PK/AV | QP | PK/AV | QP | QP |
| IF bandwidth | 200 ㎐ | 200 ㎐ | 9 ㎑ | 9 ㎑ | 120 ㎑ |

- Part 15 Section 15.31 (f)(2) (9 ㎑ - 30 ㎒)
[Limit at 3m]=[Limit at 300m]-40 x log(3[m]/300[m])
[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

5.2.3 Test Result

- Complied

| Voltage [v] | Frequency [MHz] | Reading [dBμV] | Cable Loss [dB] | Amp Gain [dB] | Antenna Factor [dB] | Correction Factor [dB] | field strength dBμV/m at 3 m | Limit dBμV/m at 3 m | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| **QP DATA.** | | | | | | | | | |
| 24.0 | 13.56 | 67.40 | 0.91 | -32.67 | 19.56 | -12.20 | 55.20 | 124.00 | 68.80 |

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## 5.3 In-band Spurious Emission

### 5.3.1 Regulation

15.225 (b) With in the bands 13.410-13.553 ㎒ and 13.567-13.710 ㎒, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c) With in the bands 13.110-13.410 ㎒ and 13.710-14.010 ㎒, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

### 5.3.2 Test Result

### - Complied

Measurement Distance: 3 m

| Frequency [㎒] | Receiver Bandwidth [㎑] | Reading [dB(㎶)] | Pol. [V/H] | Cable Loss [dB] | Amp Gain [dB] | Antenna Factor [dB] | Factor [dB] | Limit [dB(㎶/m)] | Result [dB(㎶/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| **QP DATA.** | | | | | | | | | | |
| 13.39 | 9 | 35.10 | H | 0.91 | -32.67 | 19.56 | -12.20 | 80.50 | 22.90 | 57.60 |
| 13.55 | 9 | 39.50 | H | 0.91 | -32.67 | 19.56 | -12.20 | 90.50 | 27.30 | 63.20 |
| 13.57 | 9 | 52.30 | H | 0.91 | -32.67 | 19.56 | -12.20 | 90.50 | 40.10 | 50.40 |
| 13.73 | 9 | 35.20 | H | 0.92 | -32.67 | 19.55 | -12.20 | 80.50 | 23.00 | 57.50 |

**Margin (dB) = Limit - Actual**
**[Result = Reading - Amp Gain + AF + CL]**
1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
Note: This test was performed by using peak detector mode If peak result meets the limit, QP measurement is skipped.

## 5.4 Out-of-band Spurious Emission

### 5.4.1 Regulation

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 ㎒ band shall not exceed the general radiated emission limits in 15.209

| Frequency (㎒) | Field Strength (㎶/m) | Measurement distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(㎑) | 300 |
| 0.490-1.705 | 24000/F(㎑) | 30 |
| 1.705-30.0 | 30(29.54 dB㎶/m) | 30 |
| 30.0-88.0 | 100(40 dB㎶/m) | 3 |
| 88-216 | 150(43.5 dB㎶/m) | 3 |
| 216-960 | 200 (46 dB㎶/m) | 3 |
| Above 960 | 500 (53.98 dB㎶/m) | 3 |

### 5.4.2 Measurement Procedure

The spurious emissions from the EUT will be measured on an 10 m Anechoic chamber in the frequency range of 9 ㎑ to 30 ㎒ using a tuned receiver and a shielded loop antenna.
The antenna was positioned 3, 10 or 30 meters horizontally from the EUT.
Measurements haver been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions.
In the case where larger measuring distances are required the results will extrapolated based on the values measuring on the closer distances according to Section 15.31 (f) (2) [2].

The final measurement will be performed with an EMI Riceiver set to Quasi Peak detector except for the frequency bands 9 ㎑ to 90 ㎑ and 110 to 490 ㎑ where an average detector will be used according to Section 15.209 (d) [2].

The final lever, expressed in dB㎶/m, is arrived at by taking the reading from the EMI receiver (Level dB㎶) and adding the antenna correction factor and cable loss fator (Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwith during the measurement is as follows:
9 ㎑ – 150 ㎑: ResBW: 200 ㎐
150 ㎑ – 30 ㎒: ResBW: 9 ㎑

The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

The EUT was placed on the top of the 0.8 meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.
The antenna polarization was also changed from vertical to horizontal. The spectrum was canned from 30 to 1 000 ㎒ using the BILOG antenna. To obain the final measurement data, the EUT was arranged on a turntable situated on a 10 m chamber. The EUT was tested at a distance 3 meters.
Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

## 5.4.3 Test Result

## - Complied

Measurement Distance: 3 m

-Below 30 ㎒

| Frequency [㎒] | Receiver Bandwidth [㎑] | Reading [dB(㎶)] | Pol. [V/H] | Cable Loss [dB] | Amp Gain [dB] | Antenna Factor [dB] | Factor [dB] | Limit [dB(㎶/m)] | Result [dB(㎶/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| **QP DATA.** | | | | | | | | | | |
| 1.94 | 9 | 37.90 | H | 0.39 | -32.71 | 19.62 | -12.70 | 69.50 | 25.20 | 44.30 |
| 17.34 | 9 | 35.10 | H | 1.06 | -32.67 | 19.41 | -12.20 | 69.50 | 22.90 | 46.60 |

-Above 30 ㎒

| Frequency [㎒] | Receiver Bandwidth [㎑] | Reading [dB(㎶)] | Pol. [V/H] | Cable Loss [dB] | Amp Gain [dB] | Antenna Factor [dB] | Factor [dB] | Limit [dB(㎶/m)] | Result [dB(㎶/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| **QP DATA.** | | | | | | | | | | |
| 59.46 | 120 | 40.80 | V | 2.08 | -32.67 | 12.39 | -18.20 | 40.00 | 22.60 | 17.40 |
| 178.53 | 120 | 45.10 | H | 3.63 | -32.60 | 15.27 | -13.70 | 43.50 | 31.40 | 12.10 |
| 224.61 | 120 | 47.30 | H | 3.84 | -32.57 | 16.73 | -12.00 | 46.00 | 35.30 | 10.70 |
| 650.92 | 120 | 30.50 | V | 7.78 | -32.68 | 24.80 | -0.10 | 46.00 | 30.40 | 15.60 |

**Margin (dB) = Limit - Actual**
**[Result = Reading - Amp Gain + AF + CL]**
1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss

## 5.5 Frequency tolerance

### 5.5.1 Regulation

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 5.5.2 Test Result

- Complied

| VOLTAGE [%] | POWER [V] | TEMP [℃] | FREQ [Hz] | FREQ.DEV [Hz] | Deviation [%] |
|---|---|---|---|---|---|
| 100 | 24.0 | 20 | 13 560 165.8 | 165.8 | 0.001 22 |
| | | -20 | 13 560 114.9 | 114.9 | 0.000 85 |
| | | -10 | 13 560 155.8 | 155.8 | 0.001 15 |
| | | 0 | 13 560 158.8 | 158.8 | 0.001 17 |
| | | 10 | 13 560 169.8 | 169.8 | 0.001 25 |
| | | 20 | 13 560 165.8 | 165.8 | 0.001 22 |
| | | 25 | 13 560 148.9 | 148.9 | 0.001 10 |
| | | 30 | 13 560 138.9 | 138.9 | 0.001 02 |
| | | 40 | 13 560 127.9 | 127.9 | 0.000 94 |
| | | 50 | 13 560 105.9 | 105.9 | 0.000 78 |
| 85 | 20.4 | 20 | 13 560 132.9 | 132.9 | 0.000 98 |
| 115 | 27.6 | 20 | 13 560 129.9 | 129.9 | 0.000 96 |

# 5.6 Conducted Emission

## 5.6.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN).
Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of emission (㎒) | Conducted limit (㏈㎶) | |
|---|---|---|
| | Qausi-peak | Average |
| 0.15 – 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

## 5.6.2 Measurement Procedure

1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.

2) Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50µH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.

3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.

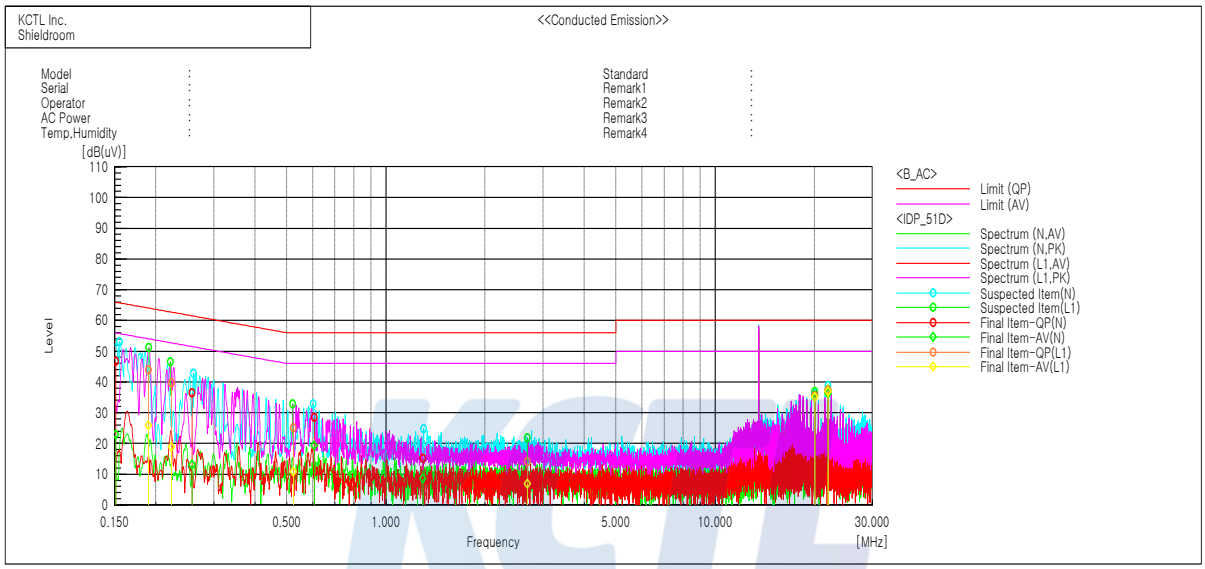
4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.

5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 ㎑ or to QUASI-PEAK and AVERAGE within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

## 5.6.3 Test Result

## - Complied

Figure 4. The plot of Conducted Emission




Final Result

--- N Phase ---

| No. | Frequency [MHz] | Reading QP [dB(uV)] | Reading CAV [dB(uV)] | c.f [dB] | Result QP [dB(uV)] | Result CAV [dB(uV)] | Limit QP [dB(uV)] | Limit AV [dB(uV)] | Margin QP [dB] | Margin CAV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15122 | 36.9 | 13.1 | 9.8 | 46.7 | 22.9 | 65.9 | 55.9 | 19.2 | 33.0 |
| 2 | 0.25786 | 26.8 | 3.4 | 9.6 | 36.4 | 13.0 | 61.5 | 51.5 | 25.1 | 38.5 |
| 3 | 0.60505 | 18.6 | 9.5 | 9.8 | 28.4 | 19.3 | 56.0 | 46.0 | 27.6 | 26.7 |
| 4 | 1.29685 | 5.3 | -1.2 | 9.7 | 15.0 | 8.5 | 56.0 | 46.0 | 41.0 | 37.5 |
| 5 | 20.06192 | 25.5 | 25.5 | 10.1 | 35.6 | 35.6 | 60.0 | 50.0 | 24.4 | 14.4 |
| 6 | 22.02014 | 26.7 | 26.1 | 10.1 | 36.8 | 36.2 | 60.0 | 50.0 | 23.2 | 13.8 |

--- L1 Phase ---

| No. | Frequency [MHz] | Reading QP [dB(uV)] | Reading CAV [dB(uV)] | c.f [dB] | Result QP [dB(uV)] | Result CAV [dB(uV)] | Limit QP [dB(uV)] | Limit AV [dB(uV)] | Margin QP [dB] | Margin CAV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.18986 | 33.8 | 15.8 | 10.1 | 43.9 | 25.9 | 64.0 | 54.0 | 20.1 | 28.1 |
| 2 | 0.22299 | 29.8 | 9.1 | 9.8 | 39.6 | 18.9 | 62.7 | 52.7 | 23.1 | 33.8 |
| 3 | 0.52298 | 15.1 | 0.8 | 9.9 | 25.0 | 10.7 | 56.0 | 46.0 | 31.0 | 35.3 |
| 4 | 2.69065 | 4.2 | -3.0 | 9.8 | 14.0 | 6.8 | 56.0 | 46.0 | 42.0 | 39.2 |
| 5 | 20.06088 | 25.0 | 24.9 | 10.2 | 35.2 | 35.1 | 60.0 | 50.0 | 24.8 | 14.9 |
| 6 | 22.01946 | 27.2 | 26.7 | 10.2 | 37.4 | 36.9 | 60.0 | 50.0 | 22.6 | 13.1 |

## 6. Test equipment used for test

| | Equipment Name | Manufacturer | Model No. | Serial No. | Next Cal. Date |
|---|---|---|---|---|---|
| ■ | Vector Signal Generator | R & S | SMBV100A | 257566 | 18.01.06 |
| ■ | Spectrum Analyzer | R & S | FSW26 | 101353 | 18.01.06 |
| ■ | DC Power Supply | AGILENT | E3632A | KR73001026 | 18.01.06 |
| ■ | Temp & Humid Chamber | Daejin Engineering | DJ-THR11000 | 10041 | 18.01.31 |
| ■ | Loop Antenna | R & S | HFH2-Z2 | 100355 | 18.03.03 |
| ■ | Bilog Antenna | TESEQ | CBL 6112D | 37876 | 18.08.05 |
| ■ | Attenuator | AGILENT | 8491B | MY39270292 | 18.08.05 |
| ■ | Amplifier | SONOMA | 310N | 344922 | 17.08.26 |
| ■ | EMI Test Receiver | R & S | ESCI7 | 100732 | 17.08.25 |
| ■ | Turn Table | Innco Systems | DT2000 | 79 | - |
| ■ | Antenna Mast | Innco Systems | MA4000-EP | 303 | - |
| ■ | EMI Test Receiver | R & S | ESCI | 100001 | 17.10.20 |
| ■ | Two-Line V -Network | R & S | ENV216 | 101358 | 17.08.16 |

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