



**KES Co., Ltd.**

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Report No.:  
KES-EM-23T0073  
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# EMC TEST REPORT

Test Report No. : KES-EM-23T0073  
Date of Issue : Jan. 27, 2023  
Product name : Display  
Model/Type No. : BL-D100  
Variant Mode : -  
Applicant : UNITED SAFETY FRONT BRAKE LIGHT LLC  
Applicant Address : 4372 driving Range Rd, Corona CA, 9288  
Manufacturer : UNITED SAFETY FRONT BRAKE LIGHT LLC  
Manufacturer Address : 4372 driving Range Rd, Corona CA, 9288  
FCC ID : 2A9HA-BD-100  
Date of Receipt : Nov. 28, 2022  
Test date : Dec. 22, 2022  
Test Results :  **In Compliance**       **Not in Compliance**

*Tested by*

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Min Seong, Kim  
EMC Test Engineer

*Reviewed by*

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Dong Hun, Jang  
EMC Technical Manager

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**REPORT REVISION HISTORY**

| <b>Date</b>   | <b>Test Report No.</b> | <b>Revision History</b> |
|---------------|------------------------|-------------------------|
| Jan. 27, 2023 | KES-EM-23T0073         | Issued                  |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |
|               |                        |                         |

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## 1.0 General Product Description

### Main Specifications of EUT are:

| <b>Division</b> | <b>Specification</b> |
|-----------------|----------------------|
| Input power     | DC 12 V              |
| Size            | (63 x 33 x 16) mm    |
| I/O Port        | 2 Pin                |

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## 1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

DC 12 V

## 1.2 Variant Model Differences

Not applicable

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

| Description | Model Number | Serial Number | Manufacturer                        | Remarks |
|-------------|--------------|---------------|-------------------------------------|---------|
| Display     | BL-D100      | -             | UNITED SAFETY FRONT BRAKE LIGHT LLC | EUT     |

## 1.5 Support Equipments

| Description | Model Number | Serial Number | Manufacturer                        | Remarks |
|-------------|--------------|---------------|-------------------------------------|---------|
| Brake light | BL-M100      | -             | UNITED SAFETY FRONT BRAKE LIGHT LLC | -       |
| Cigar jack  | DAS-CC24U5   | -             | DONGGUAN CTC ELECTRONICS CO.,LTD    | -       |

## 1.6 External I/O Cabling

| Start         |                         | END         |                         | Cable Spec. |        |
|---------------|-------------------------|-------------|-------------------------|-------------|--------|
| Description   | I/O Port                | Description | I/O Port                | Length      | Shield |
| Display (EUT) | DC In (2 Pin)           | DC Main     | DC Out (2 Pin)          | 1.5         | U      |
|               | Wireless (GFSK 2.4 GHz) | Brake light | Wireless (GFSK 2.4 GHz) | -           | -      |
| Brake light   | DC Jack                 | Cigar jack  | USB                     | 1.5         | U      |
| Cigar jack    | DC In (2 Pin)           | DC Main     | DC Out (2 Pin)          | 1.5         | U      |

\* Unshielded = U, Shielded = S

## 1.7 EUT Operating Mode(s)

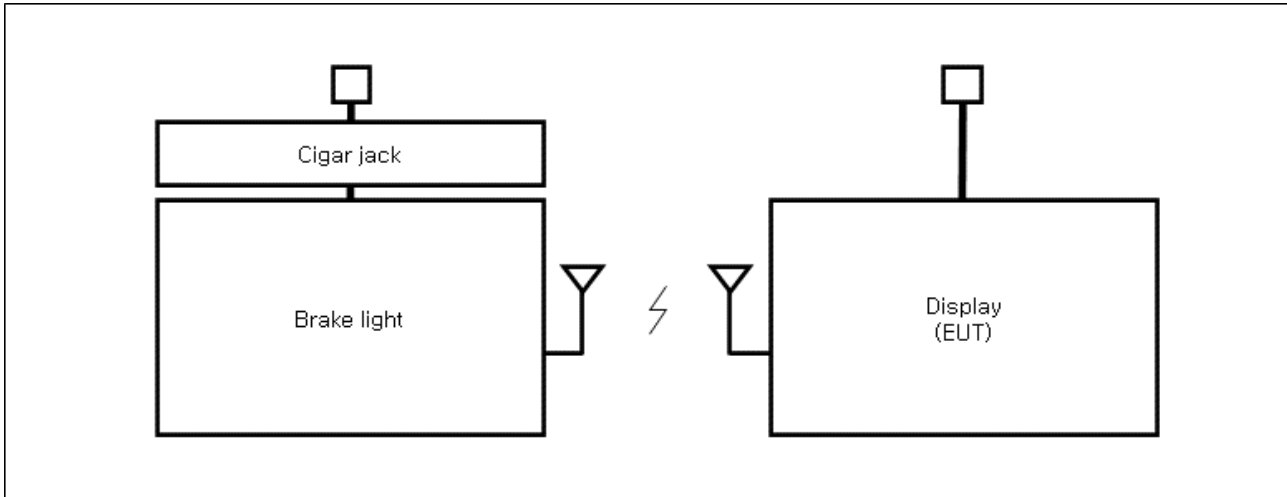
| Test mode | Normal operating  | Test Voltages |
|-----------|---|---------------|
| Operating | After connecting the EUT and Brake light wirelessly(GFSK 2.4 GHz), check whether it operates normally through the LED of Brake light. | DC 12 V       |

| EUT Test operating S/W |         |                     |
|------------------------|---------|---------------------|
| Name                   | Version | Manufacture Company |
| -                      | -       | -                   |

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## 1.8 Configuration

- AC Main
- DC Main



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## 1.9 Remarks when standards applied

N/A

## 1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

## 1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

## 1.12 Measurement Procedure

### - Conducted Emissions

The conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".







### - Radiated Electric Field Emissions

The test was done at a SEMI ANECHOIC CHAMBER with quasi-peak detector. The final test data was measured using a Quasi-Peak detector below 1GHz at 10 m or 3 m distance and a Peak and Average detector above 1 GHz at 3 m distance. Test was proceeded worst case test mode and cable configuration. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2



### 1.13 Laboratory Accreditations and Listings

| Country       | Agency         | Scope of Accreditation   | Logo  |
|---------------|----------------|--|---|
| KOREA         | <b>RRA</b>     | EMI (3 m & 10 m Semi-Aechoic Chamber ,10 m Open Area and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)   | <br>KR0100                                 |
| International | <b>KOLAS</b>   | EMI (3 m & 10 m Semi-Aechoic Chamber , and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)   | <br>KT489                                  |
| USA           | <b>FCC</b>     | 3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.  | <br>KR0100                                 |
| Canada        | <b>ISED</b>    | 3 m & 10 m Semi-Aechoic Chamber and Conducted test site  | <br>23298                                 |
| JAPAN         | <b>VCCI</b>    | Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz | <br>R-20056, C-20036<br>T-20040, G-20057 |
| Europe        | <b>TÜV SÜD</b> | EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)  | <br>CARAT 001633 0004                    |

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## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

**47 CFR Part 15, Subpart B**

CISPR 22:2009 +A1:2010

Class A

Class B

ANSI C63.4a-2017

Class A

Class B

## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

N/A

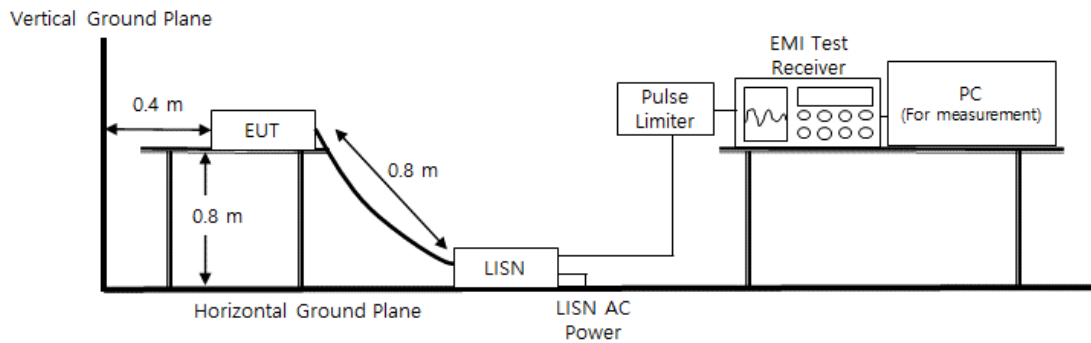
### Test Location

Electro wave Shieldroom #6

### Test Equipment

| Used                     | Description       | Model Number | Manufacturer | Serial Number | Cal. Due     | calibration interval |
|--------------------------|-------------------|--------------|--------------|---------------|--------------|----------------------|
| <input type="checkbox"/> | EMI Test S/W      | EMC32        | R & S        | 9.12.00       | -            | -                    |
| <input type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101783        | 11, 11, 2023 | 1 Year               |
| <input type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 11, 10, 2023 | 1 Year               |
| <input type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 11, 10, 2023 | 1 Year               |
| <input type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 10, 2023 | 1 Year               |

### Diagram of test setup



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### Test Conditions

Temperature: ( ± ) °C  
Relative Humidity: ( ± ) % R.H.

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Results

The requirements are:

- PASS
- NOT PASS
- NOT APPLICABLE

### Remarks

It is not tested apply because it is powered by DC

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## 2.2 Radiated Electric Field Emissions(Below 1 GHz)

### Test Date

Dec. 22, 2022

### Test Location

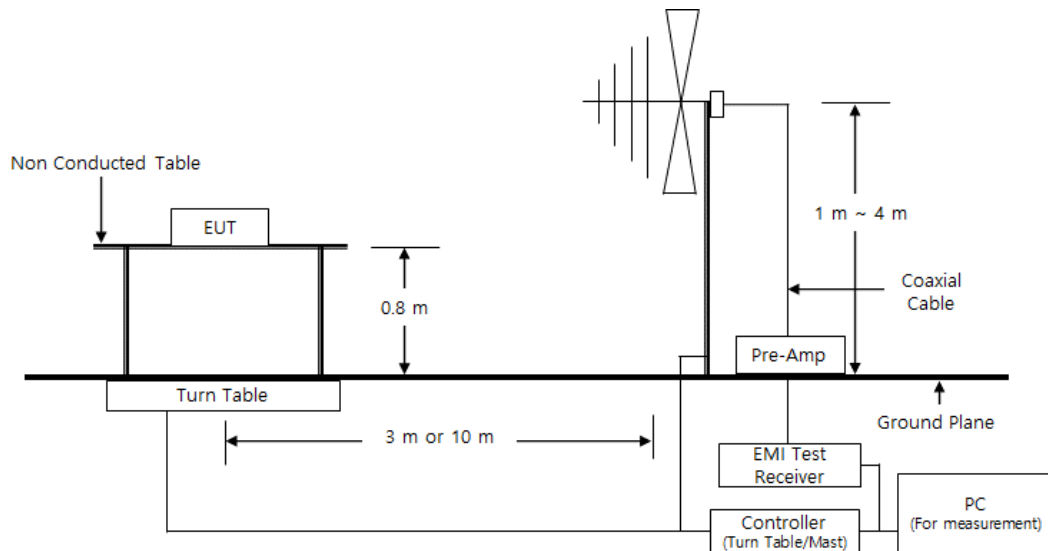
OPEN AREA TEST SITE #2

SEMI ANECHOIC CHAMBER #4(10m)

### Test Equipment

| Used                                | Description              | Model Number | Manufacturer     | Serial Number | Cal. Due     | calibration interval |
|-------------------------------------|--------------------------|--------------|------------------|---------------|--------------|----------------------|
| <input checked="" type="checkbox"/> | EMI Test S/W             | EP5/RE       | TOYO Corporation | 6.0.0         | -            | -                    |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER        | ESU26        | R & S            | 100551        | 03, 31, 2023 | 1 Year               |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 10, 2023 | 1 Year               |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 715           | 11, 17, 2024 | 2 Year               |
| <input checked="" type="checkbox"/> | ATTENUATOR               | 8491A        | HP               | 32173         | 03, 08, 2023 | 1 Year               |

### Diagram of test setup



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### Test Conditions

Temperature: (22,9 ± 0,1) °C  
Relative Humidity: (44,0 ± 0,3) % R.H.

### Frequency Range of Measurement

30 MHz to 1 GHz

### Instrument Settings

IF Band Width: 120 kHz

### Test Results

The requirements are:

- PASS
- NOT PASS
- NOT APPLICABLE

### Remarks

See Appendix A for test data.

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## 2.3 Radiated Electric Field Emissions(Above 1 GHz)

### Test Date

Dec. 22, 2022

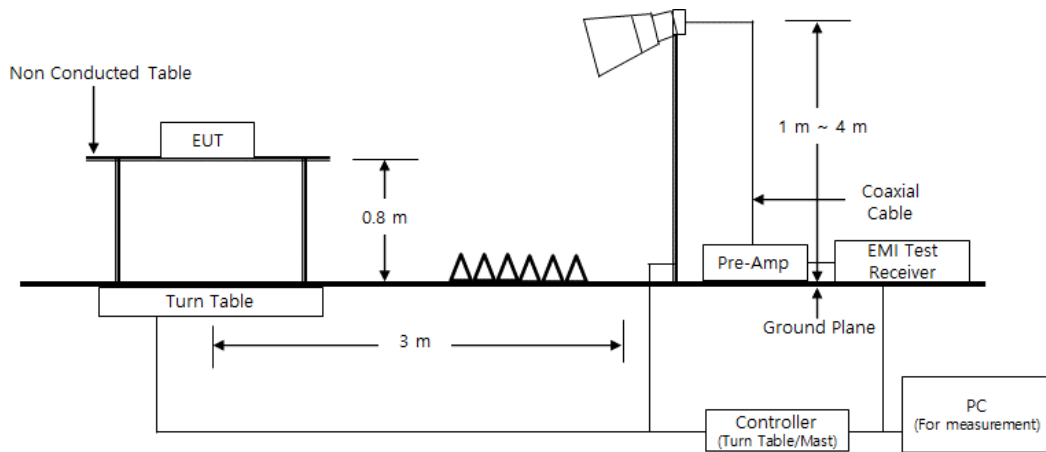
### Test Location

SEMI ANECHOIC CHAMBER #5

### Test Equipment

| Used | Description       | Model Number | Manufacturer     | Serial Number | Cal. Due     | calibration interval |
|------|-------------------|--------------|------------------|---------------|--------------|----------------------|
| ☑    | EMI Test S/W      | ES10/RE      | TOYO Corporation | 2022.01.000   | -            | -                    |
| ☑    | EMI TEST RECEIVER | ESU26        | Rohde & Schwarz  | 100552        | 03, 31, 2023 | 1 Year               |
| ☑    | HORN ANTENNA      | BBHA 9120D   | SCHWARZBECK      | 9120D-1802    | 11, 08, 2023 | 1 Year               |
| ☑    | PREAMPLIFIER      | 8449B        | HP               | 3008A00538    | 06, 02, 2023 | 1 Year               |
| ☑    | ATTENUATOR        | 8491B        | HP               | 23094         | 04, 21, 2023 | 1 Year               |

### Diagram of test setup



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### Test Conditions

Temperature: (22,5 ± 0,2) °C  
Relative Humidity: (44,0 ± 0,5) % R.H.

### Frequency Range of Measurement

1 GHz to 5 GHz

### Instrument Settings

IF Band Width: 1 MHz

### Test Results

The requirements are:

- PASS
- NOT PASS
- NOT APPLICABLE

### Remarks

See Appendix A for test data.

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## **APPENDIX A – TEST DATA**

### **Conducted Emissions at Mains Power Ports** HOT LINE

N/A

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NEUTRAL LINE

N/A

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

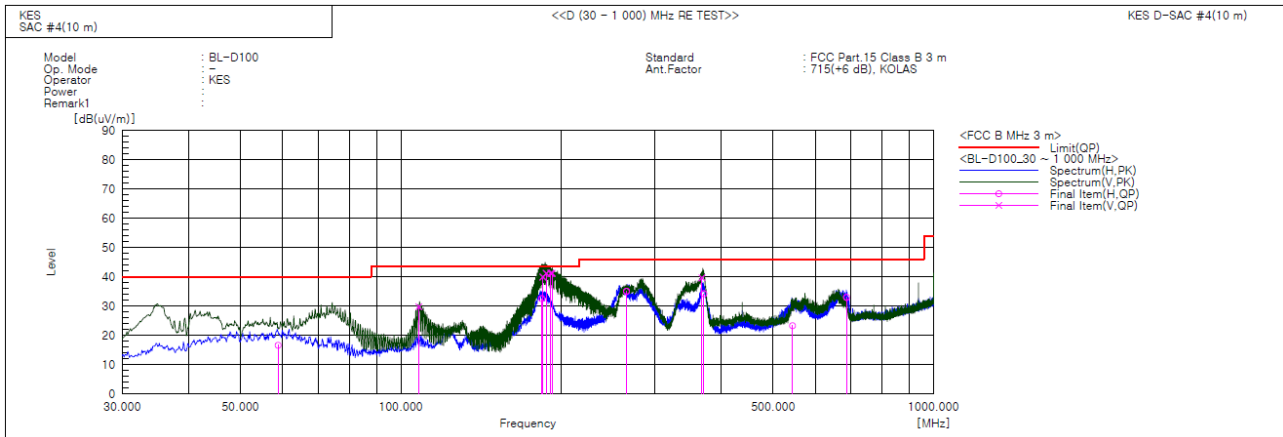
Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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## Radiated Electric Field Emissions(Below 1 GHz)



### Final Result

| No. | Frequency [MHz] | (P) | Reading QP [dB(uV)] | c.f [dB(1/m)] | Result QP [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|---------------|----------------------|---------------------|----------------|-------------|-------------|--------|
| 1   | 58.837          | H   | 38.4                | -21.8         | 16.6                 | 40.0                | 23.4           | 295.0       | 55.0        |        |
| 2   | 108.086         | V   | 52.8                | -23.0         | 29.8                 | 43.5                | 13.7           | 101.0       | 70.0        |        |
| 3   | 183.916         | H   | 56.0                | -23.5         | 32.5                 | 43.5                | 11.0           | 400.0       | 81.0        |        |
| 4   | 184.669         | V   | 63.4                | -23.5         | 39.9                 | 43.5                | 3.6            | 107.0       | 142.0       |        |
| 5   | 187.657         | V   | 64.2                | -23.1         | 41.1                 | 43.5                | 2.4            | 100.0       | 161.0       |        |
| 6   | 191.277         | V   | 63.9                | -22.7         | 41.2                 | 43.5                | 2.3            | 100.0       | 151.0       |        |
| 7   | 192.155         | V   | 63.8                | -22.6         | 41.2                 | 43.5                | 2.3            | 100.0       | 161.0       |        |
| 8   | 265.286         | H   | 54.5                | -19.5         | 35.0                 | 46.0                | 11.0           | 400.0       | 109.0       |        |
| 9   | 367.435         | V   | 55.0                | -15.3         | 39.7                 | 46.0                | 6.3            | 128.0       | 357.0       |        |
| 10  | 370.850         | H   | 49.4                | -15.2         | 34.2                 | 46.0                | 11.8           | 314.0       | 140.0       |        |
| 11  | 543.637         | H   | 34.4                | -11.1         | 23.3                 | 46.0                | 22.7           | 322.0       | 247.0       |        |
| 12  | 686.724         | H   | 41.8                | -8.8          | 33.0                 | 46.0                | 13.0           | 313.0       | 120.0       |        |

#### ◆ Calculation - SAC #4(10 m)

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

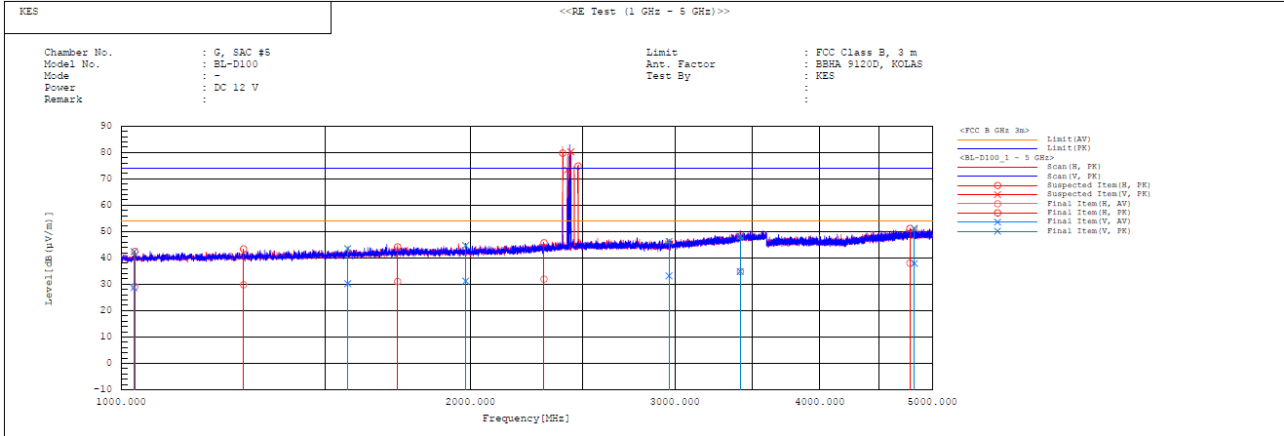
Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



## Radiated Electric Field Emissions(Above 1 GHz)

- (1 ~ 5) GHz



### Final Result

| No. | Frequency [MHz] | Pol | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c.f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit AV [dB(μV/m)] | Limit PK [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|---------------------|---------------|----------------------|----------------------|---------------------|---------------------|----------------|----------------|-------------|-------------|--------|
| 1   | 1026.407        | V   | 31.1                | 44.8                | -2.4          | 28.7                 | 42.4                 | 54.0                | 74.0                | 25.3           | 31.6           | 100.0       | 354.2       |        |
| 2   | 1027.925        | H   | 31.6                | 44.8                | -2.4          | 29.2                 | 42.4                 | 54.0                | 74.0                | 24.8           | 31.6           | 400.0       | 277.9       |        |
| 3   | 1275.360        | H   | 30.9                | 44.5                | -1.1          | 29.8                 | 43.4                 | 54.0                | 74.0                | 24.2           | 30.6           | 363.0       | 130.1       |        |
| 4   | 1568.604        | V   | 30.1                | 43.4                | 0.1           | 30.2                 | 43.5                 | 54.0                | 74.0                | 23.8           | 30.5           | 112.0       | 107.1       |        |
| 5   | 1731.597        | H   | 30.2                | 43.3                | 0.9           | 31.1                 | 44.2                 | 54.0                | 74.0                | 22.9           | 29.8           | 400.0       | 7.3         |        |
| 6   | 1981.705        | V   | 29.3                | 42.8                | 1.9           | 31.2                 | 44.7                 | 54.0                | 74.0                | 22.8           | 29.3           | 138.0       | 349.1       |        |
| 7   | 2314.980        | H   | 28.9                | 42.7                | 3.0           | 31.9                 | 45.7                 | 54.0                | 74.0                | 22.1           | 28.3           | 349.0       | 46.1        |        |
| 8   | 2966.198        | V   | 28.3                | 41.3                | 4.9           | 33.2                 | 46.2                 | 54.0                | 74.0                | 20.8           | 27.8           | 100.0       | 127.3       |        |
| 9   | 3416.862        | V   | 29.3                | 42.7                | 5.5           | 34.8                 | 48.2                 | 54.0                | 74.0                | 19.2           | 25.8           | 110.0       | 149.5       |        |
| 10  | 3418.055        | H   | 29.3                | 42.8                | 5.5           | 34.8                 | 48.3                 | 54.0                | 74.0                | 19.2           | 25.7           | 361.0       | 8.1         |        |
| 11  | 4784.327        | H   | 28.1                | 41.3                | 5.9           | 38.0                 | 51.2                 | 54.0                | 74.0                | 16.0           | 22.8           | 361.0       | 72.7        |        |
| 12  | 4826.880        | V   | 27.8                | 41.1                | 10.1          | 37.9                 | 51.2                 | 54.0                | 74.0                | 16.1           | 22.8           | 106.0       | 21.3        |        |
| 13  | 2402.400        | H   | -----               | -----               | -----         | -----                | -----                | -----               | -----               | -----          | -----          | 400.0       | 269.3       |        |
| 14  | 2425.600        | V   | -----               | -----               | -----         | -----                | -----                | -----               | -----               | -----          | -----          | 100.0       | 230.8       |        |
| 15  | 2441.600        | V   | -----               | -----               | -----         | -----                | -----                | -----               | -----               | -----          | -----          | 100.0       | 109.6       |        |
| 16  | 2477.200        | H   | -----               | -----               | -----         | -----                | -----                | -----               | -----               | -----          | -----          | 400.0       | 84.9        |        |

### \* Exclusion Bands

- Fundamental Frequency: 2 402 Mhz, 2 425 Mhz, 2 441 Mhz, 2 477 Mhz

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- (5 ~ 12,4) GHz

**PEAK**

| Frequency (MHz) | Reading PK (dBuV) | Polarization | Height ( m ) | ANT Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-------------------|--------------|--------------|-----------------|-----------------|--------------------|-----------------|----------------|-------------|
| 6 774.194       | 41.100            | V            | 1.000        | 34.800          | 10.620          | 34.810             | 51.710          | 74.000         | 22.290      |
| 6 807.435       | 41.200            | H            | 4.000        | 34.930          | 11.090          | 34.810             | 52.410          | 74.000         | 21.590      |

**CISPR AVERAGE**

| Frequency (MHz) | Reading CISPR AV (dBuV) | Polarization | Height ( m ) | ANT Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-------------------------|--------------|--------------|-----------------|-----------------|--------------------|-----------------|----------------|-------------|
| 6 774.194       | 27.800                  | V            | 1.000        | 34.800          | 10.620          | 34.810             | 38.410          | 54.000         | 15.590      |
| 6 807.435       | 27.700                  | H            | 4.000        | 34.930          | 11.090          | 34.810             | 38.910          | 54.000         | 15.090      |

◆ Calculation

Result(PK/CAV) [dB(μV/m)] = (Reading(PK/CAV)[dB(μV)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Marjin value

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