

# *Certification of Conformity*

**Solar Tech Co., Ltd.**

**Solar LED Lighting**

**Basic Model Name : SLL-122R**

**Additional Model Name : SLL-122S**

**Reference Report No.:**

**N14OR-041**

**The above product has successfully demonstrated that its product  
is in compliance with**

**Test Item : Solar LED Lighting  
Applicant : Solar Tech Co., Ltd.  
Manufacturer : Solar Tech Co., Ltd.**

**is in Compliance with**

**AS/NZS CISPR 15 :2011**

**Data of Issue : October 24.2014**

We, Ntree Testiing Lab. Co., Ltd here by certify that one sample of the designation has been tested in our facility on October 22 – 23, 2014 Test(EUT) configurations represented here in are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions here in specified.

Tested by



PARK Hyeongwoo, Test Engineer

Reviewed by



KIM Boksoo, Technical Manager

# TEST REPORT

**NTREE**  
Testing Lab.

30, Pajangcheon-ro44beon-gil, Jangan-gu, Suwon-si, Gyeonggi-do, 443-702  
Rep. of KOREA. (TEL: +82-31-893-1000, FAX: +82-31-893-0111)

Dates of Test: October 22 - 23, 2014  
Test Report S/N: N14OR-041  
Test Site : NTREE Co., Ltd.

## EMC TEST REPORT

**Model Name** : SLL-122R  
**Applicant** : Solar Tech Co., Ltd.

**Type of Equipment** : LED Light Equipment  
**Trade name** : Solar LED Lighting  
**Additional model name** : SLL-122S  
**Manufacturer** : Solar Tech Co., Ltd.  
**Test Device Serial No.:** : Identification  
**Test Standards** : AS/NZS CISPR 15 :2011

**Data of issue** : October 24, 2014  
**Test result** : **Complied**

Tested by



PARK Hyeongwoo, Test Engineer

Reviewed by



KIM Boksoo, Technical Manager

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## I. General information's

### I-1 Test Performed

Company name : **NTREE Co., Ltd.**  
 Address : 30,Pajangcheon-ro 44beon-gil,Jangan-gu, Suwon-si, Gyeonggi-do Korea  
 Telephone : +82-31-893-1000  
 Facsimile : +82-31-893-0111

#### SITE MAP



## 2. Information's about test item

### 2-1 Applicant information

Company name : Solar Tech Co., Ltd.  
 Address : #303, Manan Venture Center, Anyang-ro 138 beon-gil 5, Manan-gu, Anyang-city, Gyeonggi-do, 430-826, KOREA  
 Telephone / Facsimile : +82-30-429-2831/ +82-31-429-2832  
 Contact name : KIM Yongryeun

### 2-2 Equipment Under Test (EUT) description

Type of Equipment : LED Light Equipment  
 Trade name : Solar LED Lighting  
 Model name : SLL-122R  
 Additional model name : SLL-122S  
 Serial number : Identification  
 Date of receipt : October 15, 2014  
 EUT condition : Pre-production, not damaged  
 Interface Ports : —  
 EUT Power Source : Output Rating : DC 4.0 V / Electrical Energy Storage : DC 2.3 V  
 Internal clock frequency : -  
 Firmware version : -  
 Note : -

### 2-3 Test conditions

Temp. / Humid. / Pressure : EMI : +(17 - 22) °C / (44 - 56) % RH / (99.5 - 99.9) kPa  
 Operating mode : Lighting mode  
 Test Voltage : The internal capacitor of output DC 2.3 V

### 2-4 Ancillary Equipment

| Equipment | Model No. | Serial No. | Manufacturer |
|-----------|-----------|------------|--------------|
| —         | —         | —          | —            |

### 2-5 Additional Model Differences

|                       | Model name | Differences     |
|-----------------------|------------|-----------------|
| Basic model name      | SLL-122R   |                 |
| Additional model name | SLL-122S   | Buyers request. |

### 3. Test Summary

#### 3.1 Summary of EMI emission test results

| Applied                             | Test items  | Test method          | Result               |
|-------------------------------------|---|----------------------|----------------------|
| <input checked="" type="checkbox"/> | Radiated Emission (30 MHz – 300 MHz)                  | AS/NZS CISPR 15:2011 | C                    |
| <input type="checkbox"/>            | Conducted Emission(9 kHz – 30 MHz)                    | AS/NZS CISPR 15:2011 | NA <sup>Note 2</sup> |
| <input checked="" type="checkbox"/> | Radiated electromagnetic disturbance (9 kHz – 30 MHz) | AS/NZS CISPR 15:2011 | C                    |

*Note 1:* C=Complies NA=Not Applicable

*Note 2:* We did not test Conducted Emission(9 kHz – 30 MHz) for the SLL-122R because the SLL-122R operate by solar charging system.

*Note 3:* The data in this test report are traceable to the national or international standards.

## 3.2 EMISSION

### 3.2.1 Conducted emissions (AC Power In/Output port)

#### Operating environment

Temperature : — °C

Relative Humidity : — %

#### Definition:

The test assesses the ability of the EUT to limit its internal noise from being present on the AC mains Power and Signal Line In/Output ports.

We were performed the test according to NTREE procedure NT-QP-014.

|                                     |  |
|-------------------------------------|--|
| Test method                         | : AS/NZS CISPR 15:2011                                 |
| Measurement Frequency range and RBW | : 9 kHz - 150 kHz ; 200 Hz<br>150 kHz – 30 MHz ; 9 kHz |
| Test mode                           | : — mode   |
| Result                              | : <b>Not Applicable</b>                                |

#### A sample calculation:

- C.F (correction factor)= LISN Insertion loss + Cable loss

- Emission Level= meter reading + C.F

- Sample calculation ;

- At Frequency :      Result = Reading + C.F. =      + (      ) =      [dB  $\mu$ V]

-Measurement Data's kept in NTREE Co., Ltd.

#### Limit:

| Frequency Range | Quazi-peak           | Average              |
|-----------------|----------------------|----------------------|
| (9 – 50) kHz    | 110 dB $\mu$ V       | -                    |
| (50 – 150) kHz  | (90 – 80) dB $\mu$ V | -                    |
| (150 – 500) kHz | (66 – 56) dB $\mu$ V | (56 – 46) dB $\mu$ V |
| 500 kHz – 5 MHz | 56 dB $\mu$ V        | 46 dB $\mu$ V        |
| (5 – 30) MHz    | 60 dB $\mu$ V        | 50 BuV               |

Note1.The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0, 5 MHz.

Note2.For electrodeless lamps and luminaires, the limit in the frequency range of 2, 51 MHz to 3, 0 MHz is 73 dB( $\mu$ V)quasi-peak and 63 dB( $\mu$ V) average.

**Used equipments:**

| Used                     | Equipment          | Model no. | Makers       | Serial no.   | Next Cal.  |
|--------------------------|--------------------|-----------|--------------|--------------|------------|
| <input type="checkbox"/> | EMI Test Receiver  | ESR3      | R & S        | 101763       | 2015.04.11 |
| <input type="checkbox"/> | Two-Line V-Nerwork | ENV216    | R & S        | 101763       | 2015.04.04 |
| <input type="checkbox"/> | Two-Line V-Nerwork | ENV216    | R & S        | 101764       | 2015.04.04 |
| <input type="checkbox"/> | DC LISN            | LN2-20-25 | EMCIS        | LN14001      | 2015.04.21 |
| <input type="checkbox"/> | Dumy Resistor      | 50ohm Ter | SRTechnology | 101784#1     | 2015.04.21 |
| <input type="checkbox"/> | Thermo Hygrometer  | HT-350    | HONGTAI      | 201401006474 | 2015.04.22 |
| <input type="checkbox"/> | ISN                | ENY81     | R & S        | 100169       | 2015.04.11 |
| <input type="checkbox"/> | Voltage Probe      | ESH2-Z2   | R & S        | 111324       | 2015.04.10 |
| <input type="checkbox"/> | Current Probe      | EZ-17     | R & S        | 100759       | 2015.04.16 |

- We did not this test for the **SLL-122R** because the **SLL-122R** operate by solar charging system.



### 3.2.2 Radiated disturbances

#### Operating environment

Temperature : 17 °C

Relative Humidity : 56 %

#### Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

We were performed the test according to NTREE procedure NT-QP-014.

|                             |                         |
|-----------------------------|-------------------------|
| Test method                 | : AS/NZS CISPR 15:2011  |
| Measuring Distance          | : 10 m                  |
| Measurement Frequency range | : (30 – 300) MHz        |
| Measurement RBW             | : 120 kHz (below 1 GHz) |
| Test mode                   | : Lighting mode         |
| Result                      | : <b>Complies</b>       |

#### Measurement Data:

- Refer to the Next page (Maximum emission configuration)
- No other emissions were detected at a level greater than 20 dB below limit

#### Limit: 3 m

| Frequency Range | Near-peak |
|-----------------|-----------|
| (30 – 230) MHz  | 30 dBuV/m |
| (230 – 300) MHz | 37 dBuV/m |

#### A sample calculation:

- All modes of operation were investigated and the worst-case emissions are reported.-
- H = Horizontal; V = Vertical
- Margin = Limit – Result
- Factor = Ant. Factor + Cable loss-Amp. Factor
- Sample calculation ;
- At Frequency : **32.15 MHz** Result = Reading + Factor. = 57.4+ (-37.32) = **10.32** [dB  $\mu$ V/m]
- Measurement Data's kept in NTREE Co., Ltd.

**Used equipments**

| Used                                | Equipment              | Model no. | Makers      | Serial no.   | Next Cal.  |
|-------------------------------------|------------------------|-----------|-------------|--------------|------------|
| <input checked="" type="checkbox"/> | EMI Test Receiver      | ESN       | R & S       | 827864/008   | 2015.04.22 |
| <input type="checkbox"/>            | Tri-Log Antenna(RRA)   | VULB9168  | Schwarzbeck | 9168-577     | 2016.04.10 |
| <input checked="" type="checkbox"/> | Tri-Log Antenna(KOLAS) | VULB9168  | Schwarzbeck | 9168-578     | 2016.04.04 |
| <input checked="" type="checkbox"/> | Amplifier              | TK-PA6S   | TESTEK      | 120018       | 2015.08.13 |
| <input checked="" type="checkbox"/> | Thermo Hygrometer      | HT-350    | HONGTAI     | 201401006531 | 2015.04.22 |

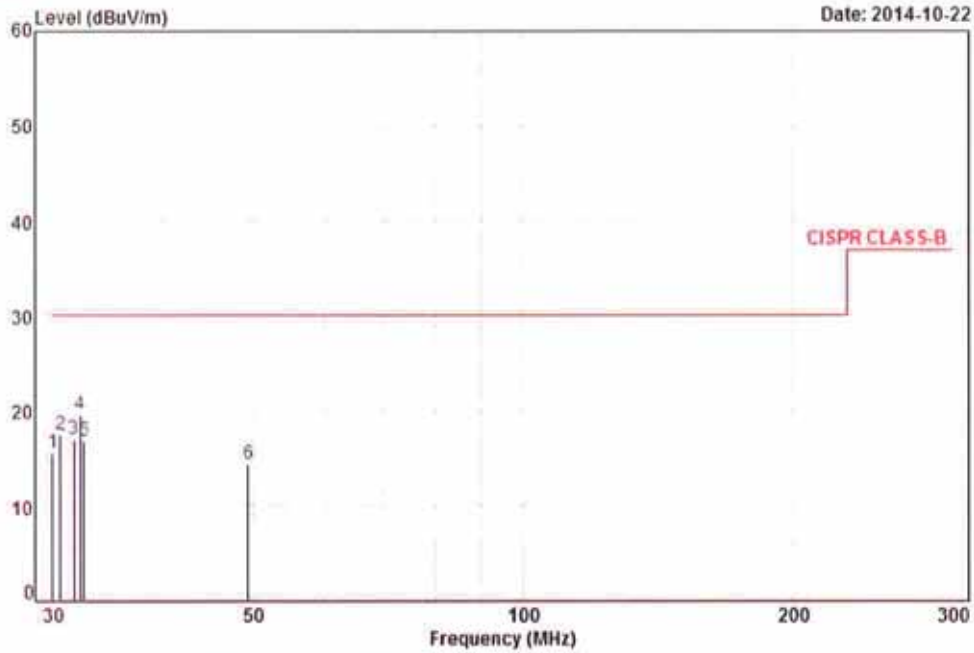
**Measurement Data:**

- Refer to the Next page (Maximum emission configuration)
- No other emissions were detected at a level greater than 20 dB below limit



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Data: 7



Condition : CISPR CLASS-B 10m VULB 9168-578\_KOLAS\_20140410  
 EUT : SLL-122R  
 Test mode : Lighting mode  
 Temp. / Humi. : 17 / 56  
 Tested by : PARK Hyeongwoo

| Read | Limit | Over   | APos  | TPos  | Pol/Phase | Read   |       | Level | Limit  | Over   | Remark |        |     |                |
|------|-------|--------|-------|-------|-----------|--------|-------|-------|--------|--------|--------|--------|-----|----------------|
|      |       |        |       |       |           | Level  | Line  |       |        |        |        | Limit  | dB  |                |
| Freq | Level | Factor | Level | Line  | Limit     | Remark | MHz   | dBuV  | dB/m   | dBuV/m | dBuV/m | dB     | cm  | deg            |
| 1    | 30.00 | -38.12 | 15.48 | 30.00 | -14.52    | QP     | 30.00 | 53.60 | -38.12 | 15.48  | 30.00  | -14.52 | 400 | 23 Horizontal  |
| 2    | 30.56 | -38.02 | 17.48 | 30.00 | -12.52    | QP     | 30.56 | 55.50 | -38.02 | 17.48  | 30.00  | -12.52 | 100 | 235 Vertical   |
| 3    | 31.63 | -37.82 | 16.98 | 30.00 | -13.02    | QP     | 31.63 | 54.80 | -37.82 | 16.98  | 30.00  | -13.02 | 400 | 135 Horizontal |
| 4    | 32.15 | -37.72 | 16.58 | 30.00 | -10.32    | QP     | 32.15 | 57.40 | -37.72 | 16.58  | 30.00  | -10.32 | 100 | 43 Vertical    |
| 5    | 32.44 | -37.67 | 16.83 | 30.00 | -13.17    | QP     | 32.44 | 54.50 | -37.67 | 16.83  | 30.00  | -13.17 | 400 | 26 Horizontal  |
| 6    | 49.44 | -35.19 | 14.41 | 30.00 | -15.59    | QP     | 49.44 | 49.60 | -35.19 | 14.41  | 30.00  | -15.59 | 100 | 221 Vertical   |

### 3.2.3 Radiated electromagnetic disturbance (9 kHz - 30 MHz)

#### Operating environment

Temperature : 22 °C

Relative Humidity : 44 %

#### Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

We were performed the test according to NTREE procedure NT-QP-014.

#### Test set-up

The quasi-peak limits of the magnetic component of the radiated disturbance field strength in the frequency range 9 kHz to 30 MHz measured as a current in 2 m, 3 m, or 4 m loop antennas around the lighting equipment.

The limits for the 2 m loop diameter apply to equipment not exceeding a length of 1,6m, those for the 3 m loop diameter for equipment having a length in between 1,6 m and 2,6 m and those for the 4m loop diameter for equipment having a length in between 2,6 m and 3,6 m.

|                                     |                           |
|-------------------------------------|---------------------------|
| Test method                         | : EN 55015 :2013          |
| Measurement Frequency range and RBW | : (9 – 150) kHz : 200 Hz  |
|                                     | : (0.15 – 30) MHz : 9 kHz |
| Test mode                           | : Lighting mode           |
| Result                              | : <b>Complies</b>         |

#### Limit:

| Frequency Range  | Limits for loop diameter<br>dB(μA) |           |           |
|------------------|------------------------------------|-----------|-----------|
|                  | 2 m                                | 3 m       | 4 m       |
| 9 kHz - 70 kHz   | 88                                 | 81        | 75        |
| 70 kHz - 150 kHz | (88 – 58)                          | (81 – 51) | (75 – 45) |
| 150 kHz - 3 MHz  | (58 – 22)                          | (51 – 15) | (45 – 9)  |
| 3 MHz - 30 MHz   | 22                                 | 15 - 16   | (9 – 12)  |

Note 1 Decreasing linearly with the logarithm of the frequency. For electrodeless lamps and luminaires, the limit in the frequency range of 2.2 MHz to 3.0 MHz is 58 dB(μA) for 2 m, 51 dB(μA) for 3 m and 45 dB(μA) for 4 m loop diameter.

Note 2 Increasing linearly with the logarithm of the frequency.

**Used equipments**

| Used                                | Equipment           | Model no. | Makers      | Serial no.   | Next Cal.  |
|-------------------------------------|---------------------|-----------|-------------|--------------|------------|
| <input checked="" type="checkbox"/> | EMI Test Receiver   | ESR3      | R & S       | 101763       | 2015.04.11 |
| <input checked="" type="checkbox"/> | Triple Loop Antenna | HXYZ 9170 | Schwarzbeck | 9170-254     | 2015.05.20 |
| <input checked="" type="checkbox"/> | Thermo Hygrometer   | HT-350    | HONGTAI     | 201401006474 | 2015.04.22 |

**Measurement Data:**

- Refer to the Next page (Maximum emission configuration)
- No other emissions were detected at a level greater than 20 dB below limit

\* X Axis

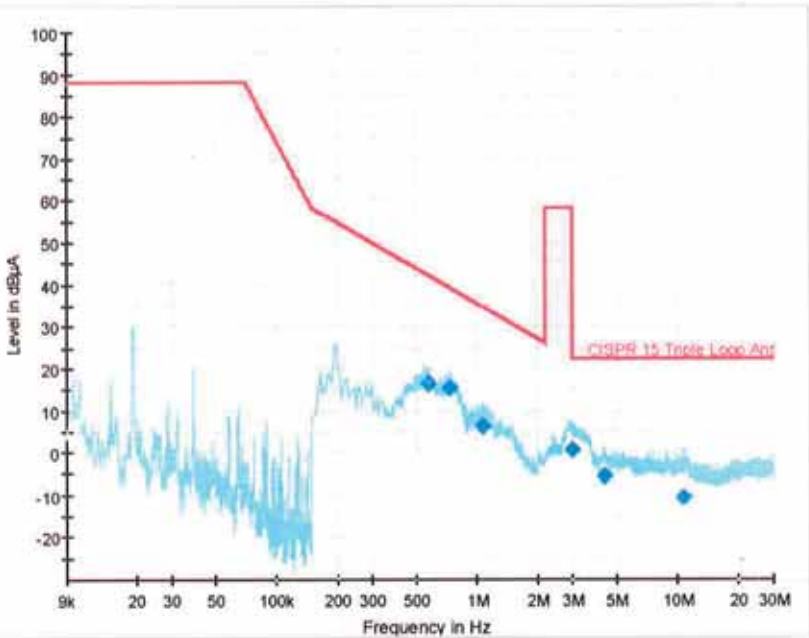
SLL-122R\_X

10/23/2014

# Test Report

## Common Information

|                         |                                       |
|-------------------------|---------------------------------------|
| Test Description:       | SLL-122R                              |
| Test Mode:              | Lighting mode                         |
| Test Standard:          | AS/NSZ CISPR 15                       |
| Environment Conditions: | 230 Vac / 50 Hz, Temp. 22 / Humid. 44 |
| Operator Name:          | Park H.W                              |
| Comment:                |                                       |



## Final Result

| Frequency (MHz) | QuasiPeak (dBµA) | Limit (dBµA) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Axis | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.574000        | 16.57            | 42.01        | 25.44       | 1000.0          | 9.000           | X    | 0.04       |
| 0.730000        | 15.49            | 39.14        | 23.65       | 1000.0          | 9.000           | X    | 0.04       |
| 1.074000        | 8.34             | 34.54        | 26.20       | 1000.0          | 9.000           | X    | 0.05       |
| 3.022000        | 0.59             | 22.00        | 21.41       | 1000.0          | 9.000           | X    | 0.09       |
| 4.290000        | -5.66            | 22.00        | 27.66       | 1000.0          | 9.000           | X    | 0.13       |
| 10.720000       | -10.59           | 22.00        | 32.59       | 1000.0          | 9.000           | X    | 0.23       |

\* Y Axis

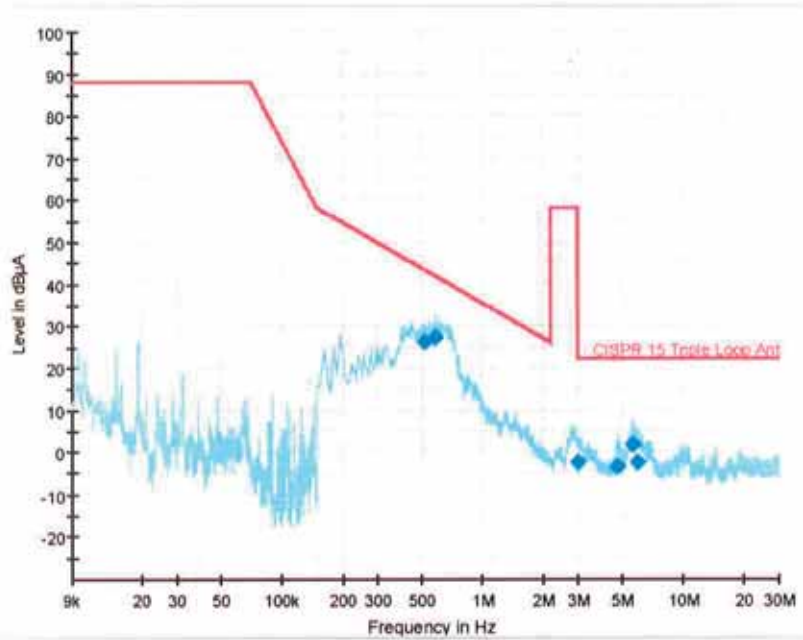
SLL-122R\_Y

10/23/2014

## Test Report

### Common Information

|                         |                                      |
|-------------------------|--------------------------------------|
| Test Description:       | SLL-122R                             |
| Test Mode:              | Lighting mode                        |
| Test Standard:          | AS/NSZ CISPR 15                      |
| Environment Conditions: | 230 Vac / 50 Hz, Temp. 22 / Humi. 44 |
| Operator Name:          | Park H.W                             |
| Comment:                |                                      |



### Final Result

| Frequency (MHz) | QuasiPeak (dBµA) | Limit (dBµA) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Axis | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.518000        | 26.09            | 43.23        | 17.14       | 1000.0          | 9.000           | Y    | 0.03       |
| 0.586000        | 27.44            | 41.76        | 14.32       | 1000.0          | 9.000           | Y    | 0.04       |
| 3.006000        | -2.49            | 22.00        | 24.49       | 1000.0          | 9.000           | Y    | 0.09       |
| 4.742000        | -3.40            | 22.00        | 25.40       | 1000.0          | 9.000           | Y    | 0.14       |
| 5.622000        | 1.93             | 22.00        | 20.07       | 1000.0          | 9.000           | Y    | 0.17       |
| 5.974000        | -2.49            | 22.00        | 24.49       | 1000.0          | 9.000           | Y    | 0.18       |

\* Z Axis

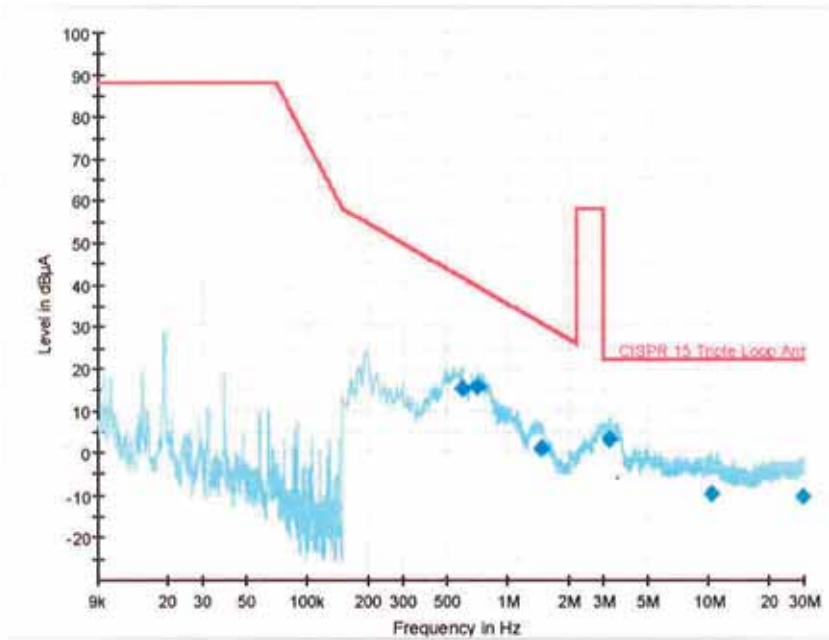
SLL-122R\_Z

10/23/2014

## Test Report

### Common Information

|                         |                                      |
|-------------------------|--------------------------------------|
| Test Description:       | SLL-122R                             |
| Test Mode:              | Lighting mode                        |
| Test Standard:          | AS/NSZ CISPR 15                      |
| Environment Conditions: | 230 Vac / 50 Hz, Temp. 22 / Humi. 44 |
| Operator Name:          | Park H.W                             |
| Comment:                |                                      |



### Final Result

| Frequency (MHz) | QuasiPeak (dBµA) | Limit (dBµA) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Axis | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.594000        | 15.42            | 41.60        | 26.18       | 1000.0          | 9.000           | Z    | 0.04       |
| 0.710000        | 15.86            | 39.48        | 23.62       | 1000.0          | 9.000           | Z    | 0.04       |
| 1.466000        | 1.04             | 30.84        | 29.80       | 1000.0          | 9.000           | Z    | 0.06       |
| 3.194000        | 3.06             | 22.00        | 18.94       | 1000.0          | 9.000           | Z    | 0.10       |
| 10.296000       | -9.40            | 22.00        | 31.40       | 1000.0          | 9.000           | Z    | 0.23       |
| 29.472000       | -10.13           | 22.00        | 32.13       | 1000.0          | 9.000           | Z    | 0.32       |



## Attachment I

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

| Conducted emission measurement (with a 95 % confidence level , k = 2) |                      |           |
|---|----------------------|-----------|
| Shielded Room(#1)   | 9 kHz ~ 30 MHz:      | ± 1.87 dB |
| Radiated Emission measurement (with a 95 % confidence level , k = 2)  |                      |           |
| 10 m OATS   | 30 MHz: ~ 200 MHz:   | ± 3.52 dB |
|   | 200 MHz: ~ 1000 MHz: | ± 4.04 dB |

## **Attachment II**

### **PHOTOGRAPHS**

**Radiated Emission (Maximum emission configuration)**

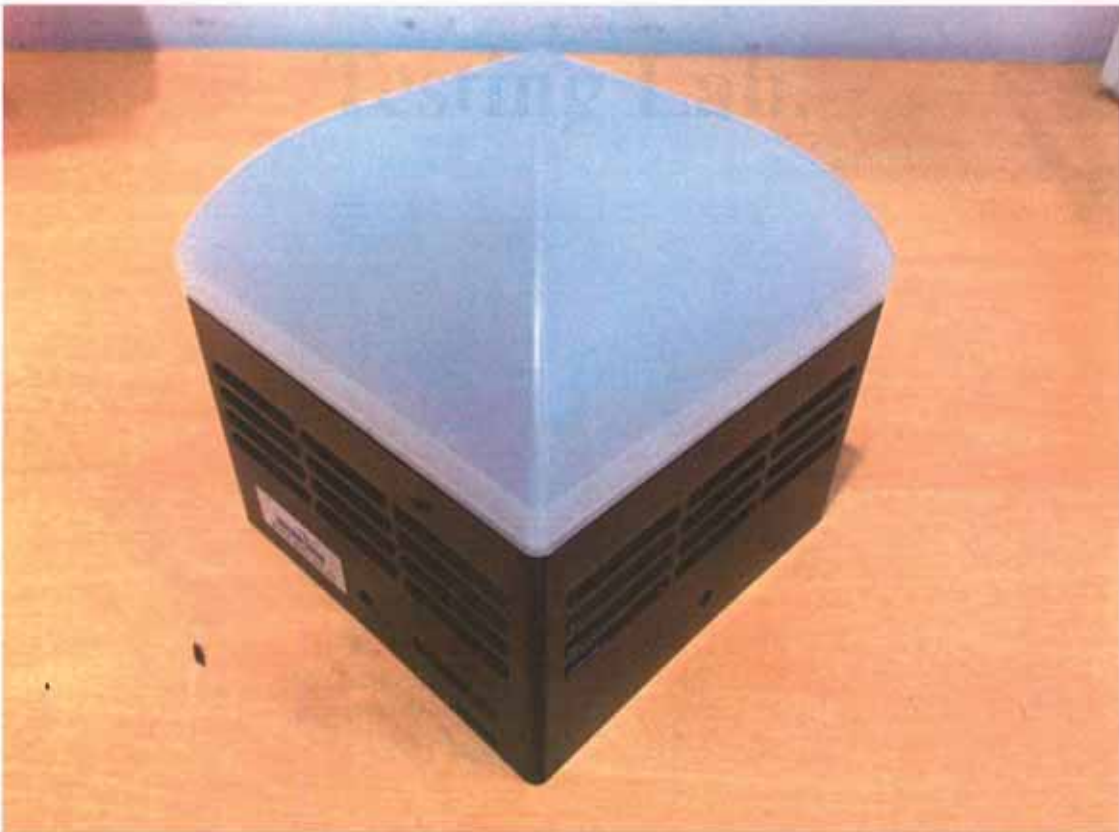
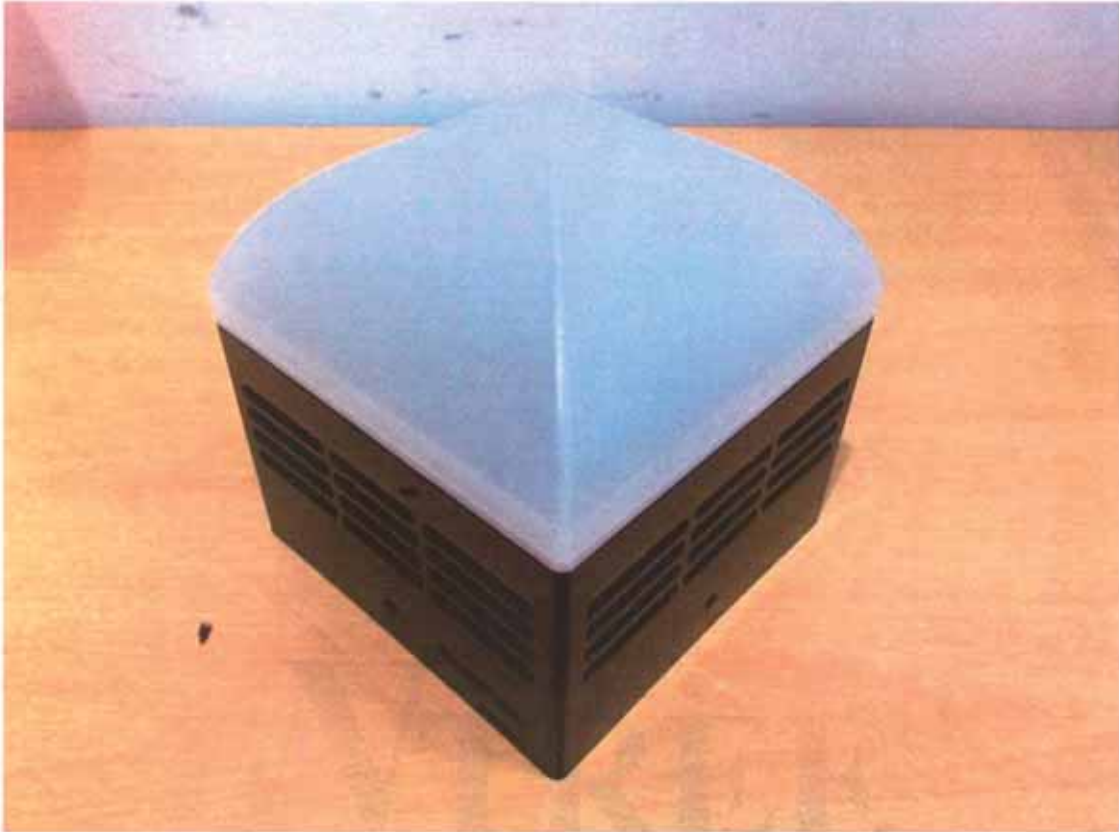


**Radiated Emission (Maximum emission configuration)**



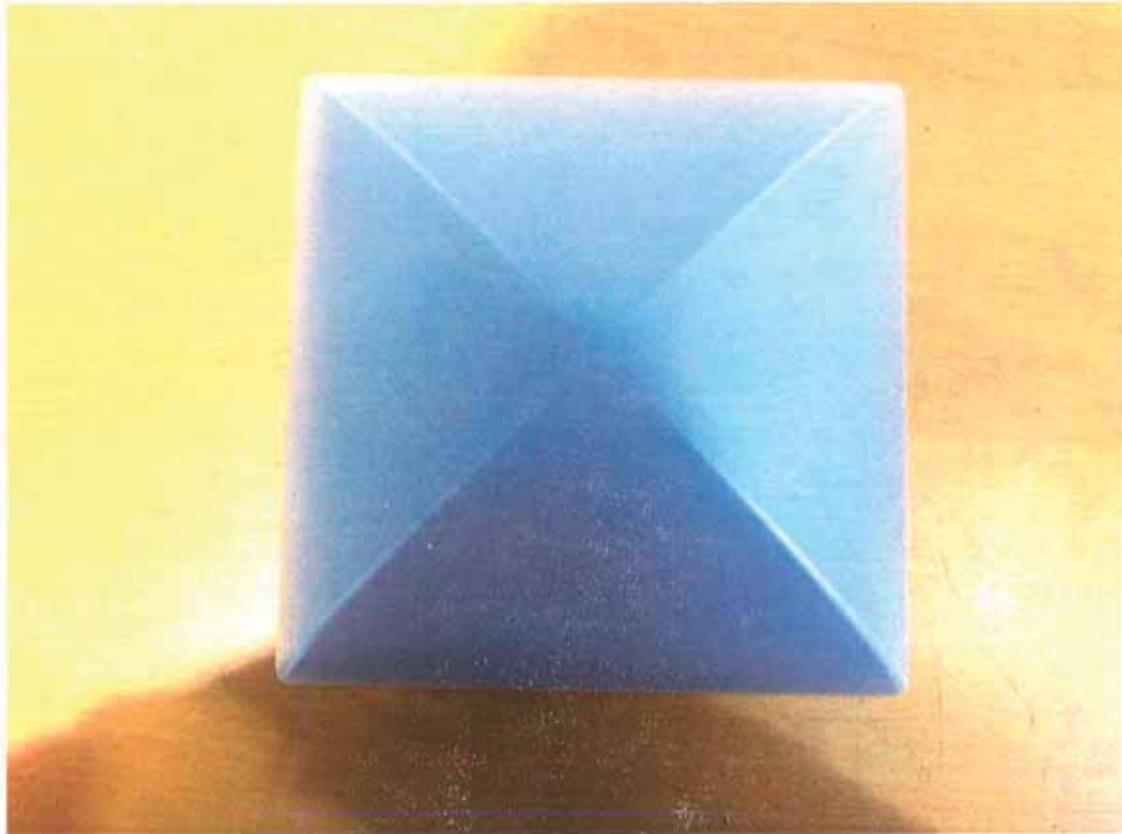
EUT

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EUT

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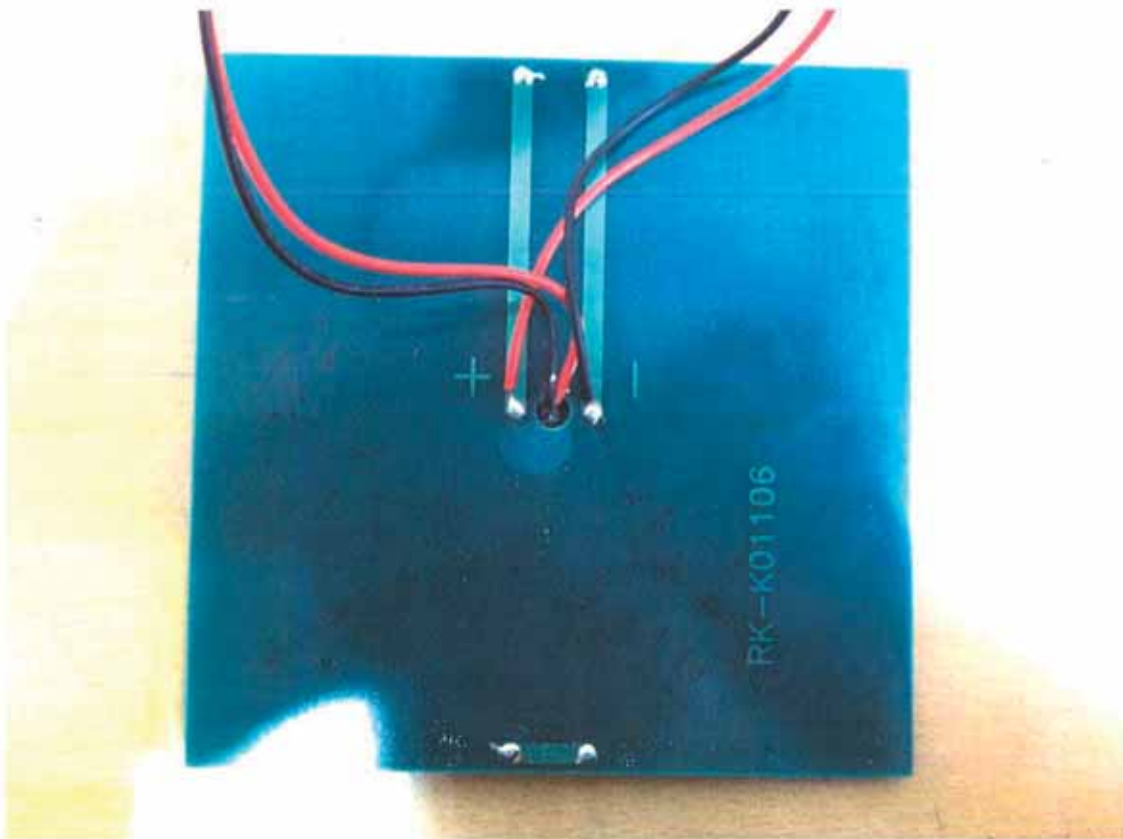


EUT

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