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Order No.: 10035679  
Report No.: 13-10035679-FCC-RF1  
Date: Aug. 31, 2013  
Model No.: SI-I8W132ULxyz  
FCC ID.: A3LSI-I8W132UL0US

## **FCC Maximum Permissible Exposure Report**

**in accordance with  
FCC Part 1 Subpart I §1.1307(b) & §1.1310**

**for**

### **Smart Bulb**

**SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEOTONG-GU, SUWON-SI, GYEONGGI-DO, 443-742, KOREA**

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Only those products bearing the UL Mark should be considered as being covered by UL.

**Summary of Test Results:**

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 1 Subpart I Section 1.1307(b) & 1.1310

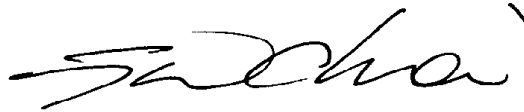
| No | Reference Clause No.   | Conformance Requirements  | Result   | Verdict | Remark |
|----|------------------------|---|----------|---------|--------|
| 1  | 1.1307(b)(1)<br>1.1310 | Maximum Permissible Exposure<br>(Exposure of Humans to RF Fields) | Complied |         |        |

**Conclusion:**

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Witness tested by  
Hongsuk Oh, WiSE Associate Project Engineer  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
Aug. 31, 2013



Reviewed by  
Jeawoon, Choi, WiSE Operations Manager  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
Aug. 31, 2013

**Test Report Details**

Witnessed By: UL Korea Ltd.  
33<sup>rd</sup> FL, GFC Bldg. 737 Yeoksam-dong,  
Gangnam-gu, Seoul, 135-984, Korea

Test Site: CTK Co., Ltd.  
386-1, Ho-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, Korea  
The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.

Applicant: SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEOTONG-GU, SUWON-SI, GYEONGGI-DO, 443-742,  
KOREA

Manufacturer: MSO CO., LTD.  
3BA-707, SIHWA IND. COMPLEX 2186-7, JEONGWANG-DONG, SIHEUNG-SI  
GYEONGGI-DO, KOREA 429-936

Applicant Contact: Hye-Jin Cho

Phone: 82-31-200-0155


E-mail: jjobae.da@samsung.com

Product Type: Smart Bulb

Model Number: SI-I8W132ULxyz

Additional Model Name: x and yz in model designation denote buyer code and national code, respectively;  
-x: buyer code (0, 1, 2, ..., 9)  
-yz: national code (EU: Europe, CN: China, US: the United States, etc.)  
The manufacturer has declared to all the multiple model names into the basic model without any further evaluation by UL.

Trademark



Product standards: FCC Part 1 I Section 1.1307(b) & 1.1310  
Maximum Permissible Exposure

Sample Serial Number: N/A

Sample Receive Date: Jul. 22, 2013

Testing Start Date: Jul. 26, 2013

Date Testing Complete: Aug. 5, 2013

**Overall Results: Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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## 1. General Product Information

### 1.1. Equipment Description:

SI-I8W132ULxyz is a LED Bulb with Zigbee module.

### 1.2. Details of Test Equipment (EUT):

- Equipment Type : Smart Bulb
- Model No. : SI-I8W132ULxyz
- Type of Radio communication : module type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band

### 1.3. Equipment Configuration:

The EUT is consisted of the following component provided by the manufacturer.

| Use*  | Product Type | Manufacturer                     | Model          | Comments |
|---|--------------|----------------------------------|----------------|----------|
| EUT   | Smart Bulb   | SAMSUNG ELECTRONICS<br>CO., LTD. | SI-I8W132ULxyz | -        |
| <b>Note:</b> Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test) |              |                                  |                |          |

**1.4. Technical Data:**

| Item                   | Type of LED Bulb    |
|------------------------|---------------------|
| Frequency Ranges       | 2400 – 2483.5 MHz   |
| Output power           | Typical : 3.508 dBm |
| Kind of modulation (s) | DSSS                |
| Channel                | 16 channel          |
| Antenna Gain           | Max. 2.83 dBi       |
| Working temperature    | -20 ~ 70 °C         |
| Supply Voltage         | AC 120 V, 60 Hz     |

Note ;

1. All the technical data described above were provided by the manufacturer.

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Model Number: SI-I8W132ULxyz

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### 1.5. Antenna Information:

Antenna Model Name : ODBTP3015  
Antenna Type : Chip Antenna  
Manufacturer : PARTRON Co., Ltd.  
Transmit Gain dBi : Max. 2.83 dBi  
Azimuth Beam Pattern : Linear

### 1.6. Equipment Type:

- Radio and ancillary equipment for fixed or semi-fixed use  
 Radio and ancillary equipment for vehicular mounted use  
 Radio and ancillary equipment for portable or handheld use
- Stand alone  Host connected
- Self contained single unit  Module with associated connection or interface

### 1.7. Technical description and documents:

| No. | Document Title and Description |
|-----|--------------------------------|
| 1   | User Manual                    |

Note: The following documents were provided by the manufacturer.

**1.8. Description of additional model name**

| -  | Model          | Description   | Comment |
|--|----------------|---|---------|
| 1  | SI-I8W132ULxyz | x and yz in model designation denote buyer code and national code, respectively;<br>-x: buyer code (0, 1, 2, ..., 9)<br>-yz: national code (EU: Europe, CN: China, US: the United States, etc.) | -       |
| <b>*Note:</b> The manufacturer has declared to all the multiple model names into the basic model without any further evaluation by UL. |                |   |         |

## 2. Test Specification

The following test specifications and standards have been applied and used for testing.

KDB 447498 D01 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

### 3. Test Conditions

#### 3.1. Equipment Used During Test

| Use* | Product Type | Manufacturer                  | Model          | Comments |
|------|--------------|-------------------------------|----------------|----------|
| EUT  | Smart Bulb   | SAMSUNG ELECTRONICS CO., LTD. | SI-I8W132ULxyz | -        |
| AE   | Note PC      | SAMSUNG ELECTRONICS CO., LTD. | SP20           | -        |

**Note:** Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)

#### 3.2. Input/Output Ports

| No | Port Name     | Type* | Cable Max. >3m (Y/N) | Cable Shielded (Y/N) | Comments                     |
|----|---------------|-------|----------------------|----------------------|------------------------------|
| 1  | Power Input   | AC    | 3 m                  | N                    | Connected to AC Power supply |
| 2  | Radio Antenna | I/O   | N                    | -                    | -                            |

Note:  
 \*AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical  
 I/O = Signal Input or Output Port (Not Involved in Process Control)  
 TP = Telecommunication Ports

#### 3.3. Power Interface

| Mode # | Voltage (V) | Current (A) | Power (W) | Frequency (DC/AC-Hz) | Phases (#) | Comments      |
|--------|-------------|-------------|-----------|----------------------|------------|---------------|
| Rated  | AC 120 V    | -           | 12.5      | 60 Hz                | -          | Rating of EUT |
| 1      | 120 V       | -           | -         | 60 Hz                | -          | -             |

### 3.4. Operating Frequencies

| Mode # | Frequency tested   |
|--------|--|
| 1      | Operating frequency range : 2 405 MHz ~ 2 480 MHz<br>- Low : 2405 MHz / CH = 11<br>- Mid : 2445 MHz / CH = 19<br>- Top : 2480 MHz / CH= 26 |

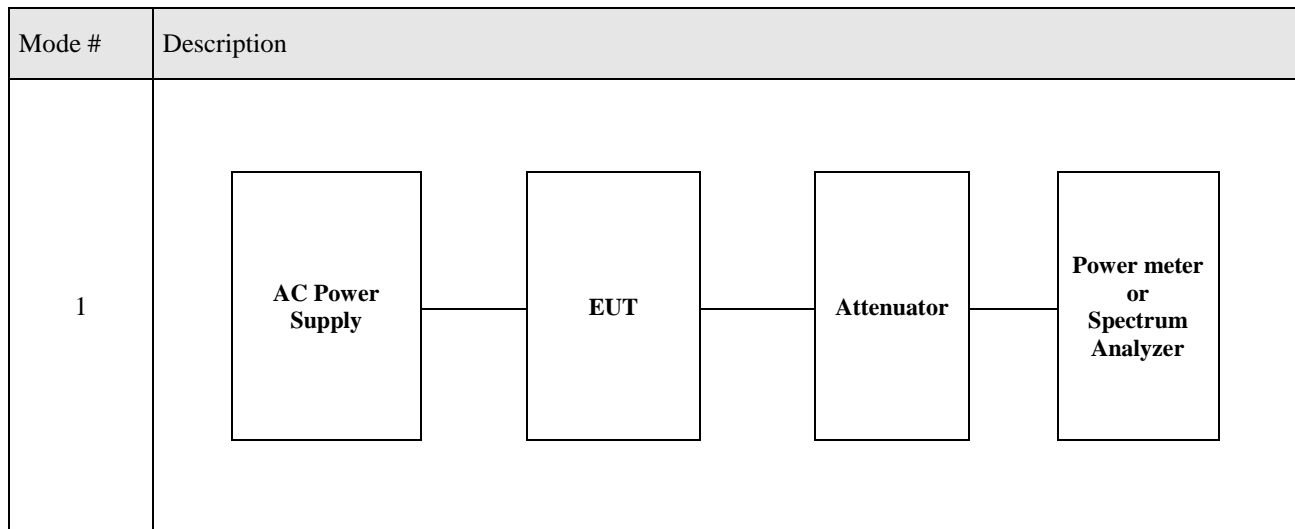
### 3.5. Operation Modes

| Mode # | Description   |
|--------|---|
| 1      | Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated |

### 3.6. Environment Conditions

| Parameters   | Normal condition                 |
|--|----------------------------------|
| Temperature  | + 15°C ~ +35°C                   |
| Humidity   | 20% ~ 75%                        |
| Supply voltage   | AC 120 V (Rated nominal voltage) |
| Note ;<br>- The operating condition for humidity requirement has not been declared in the manufacturer's specification.<br>- Test has been carried out for three frequencies specified above under the normal condition. |                                  |

### 3.7. Test Configurations



### 3.8. List of Test Equipment

| No | Description            | Manufacturer | Model  | Identifier | Cal. Due   |
|----|------------------------|--------------|--------|------------|------------|
| 1  | EPM Series Power Meter | HP           | E4418A | GB38272734 | 2013-11-08 |
| 2  | Power Sensor           | HP           | 8487A  | 3318A03524 | 2014-07-06 |

#### 4. Test Results of RF Exposure Evaluation

| TEST: RF Exposure Evaluation                                       |  |                   |
|--|--|-------------------|
| Method   | <p>RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498</p> <p>Pd the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.</p> <p><b>Friis transmission formula: Pd = (Pout*G)/(4*pi*R<sup>2</sup>)</b></p> <p>Where Pd = power density in mW/cm<sup>2</sup><br/>           Pout = output power to antenna in mW<br/>           G = gain of antenna in linear scale<br/>           Pi = 3.1416<br/>           R = distance between observation point and center of the radiator in cm</p> <p><b>General SAR test exclusion guidance</b></p> <p>The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at <i>test separation distances</i> ≤ 50 mm are determined by:<br/> <math>[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] * [\sqrt{f_{(GHz)}}] \leq 3.0</math> for 1-g SAR and <math>\leq 7.5</math> for 10-g extremity SAR, where<br/> <math>f_{(GHz)}</math> is the RF channel transmit frequency in GHz</p> <p>Power and distance are rounded to the nearest mW and mm before calculation<sup>17</sup></p> <p>The result is rounded to one decimal place for comparison</p> <p>When the minimum <i>test separation distance</i> is &lt; 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.</p> |                   |
| Reference Clause   | Part1 I Section 1.1307(b) & 1.1310   |                   |
| Parameters recorded during the test                                | Laboratory Ambient Temperature   | 27 °C             |
|  | Relative Humidity  | 47 %              |
|  | Frequency range  | Measurement Point |
| Fully configured sample scanned over the following frequency range | 2405 MHz - 2480 MHz  | Antenna port      |

#### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 1   | 1   | 1   |
| Supplementary information: None             |   |   |

**Limits**

**Environmental evaluation and exposure limit according to FCC Part 1, Subpart I, Section 1.1307(b) & 1.1310**

According to Section 1.1310, The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

| Frequency Range (MHz)                                 | Electric Field Strength(V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time     |
|---|------------------------------|-------------------------------|-------------------------------------|------------------|
| (A) Limits for Occupational /Control Exposures        |                              |                               |                                     |                  |
| 300 – 1 500   | --                           | --                            | F/300                               | 6                |
| 1 500 – 100 000                                       | --                           | --                            | 5                                   | 6                |
| (B) Limits for General Population/Uncontrol Exposures |                              |                               |                                     |                  |
| 300 – 1 500   | --                           | --                            | F/1500                              | 6                |
| <b><u>1 500 – 100 000</u></b>                         | <b><u>--</u></b>             | <b><u>--</u></b>              | <b><u>1</u></b>                     | <b><u>30</u></b> |

**Environmental evaluation and exposure limit according to RSS-102**

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

| Frequency Range (MHz) | Electric Field (V/m rms)      | Magnetic Field (A/m rms)                        | Power Density (W/m <sup>2</sup> ) | Averaging Time (minutes)        |
|-----------------------|-------------------------------|---|-----------------------------------|---------------------------------|
| 0.003-1               | 280                           | 2.19  | -                                 | 6                               |
| 1-10                  | 280/ <i>f</i>                 | 2.19/ <i>f</i>                                  | -                                 | 6                               |
| 10-30                 | 28                            | 2.19/ <i>f</i>                                  | -                                 | 6                               |
| 30-300                | 28                            | 0.073   | 2*                                | 6                               |
| 300-1500              | 1.585 <i>f</i> <sup>0.5</sup> | 0.0042 <i>f</i> <sup>0.5</sup>                  | <i>f</i> /150                     | 6                               |
| 1500-15000            | 61.4                          | 0.163   | 10                                | 6                               |
| 15000-150000          | 61.4                          | 0.163   | 10                                | 616000/ <i>f</i> <sup>1.2</sup> |
| 150000-300000         | 0.158 <i>f</i> <sup>0.5</sup> | 4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup> | 6.67 x 10 <sup>-5</sup> <i>f</i>  | 616000/ <i>f</i> <sup>1.2</sup> |

**Note:** *f* is frequency in MHz.

\* Power density limit is applicable at frequencies greater than 100 MHz.

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

| Frequency Range (MHz) | Electric Field (V/m rms)      | Magnetic Field (A/m rms)                       | Power Density (W/m <sup>2</sup> ) | Averaging Time (minutes)        |
|-----------------------|-------------------------------|--|-----------------------------------|---------------------------------|
| 0.003-1               | 600                           | 4.9  | -                                 | 6                               |
| 1-10                  | 600/ <i>f</i>                 | 4.9/ <i>f</i>                                  | -                                 | 6                               |
| 10-30                 | 60                            | 4.9/ <i>f</i>                                  | -                                 | 6                               |
| 30-300                | 60                            | 0.163  | 10*                               | 6                               |
| 300-1500              | 3.54 <i>f</i> <sup>0.5</sup>  | 0.0094 <i>f</i> <sup>0.5</sup>                 | <i>f</i> /30                      | 6                               |
| 1500-15000            | 137                           | 0.364  | 50                                | 6                               |
| 15000-150000          | 137                           | 0.364  | 50                                | 616000/ <i>f</i> <sup>1.2</sup> |
| 150000-300000         | 0.354 <i>f</i> <sup>0.5</sup> | 9.4 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup> | 3.33 x 10 <sup>-4</sup> <i>f</i>  | 616000/ <i>f</i> <sup>1.2</sup> |

**Note:** *f* is frequency in MHz.

\*Power density limit is applicable at frequencies greater than 100 MHz.

#### 4.1. Output Power into Antenna & RF Exposure Evaluation Distance for FCC

##### 4.1.1. Evaluation at 20 cm distance

| Operation Frequency (MHz) | Channel No. | Channel | Output Peak Power (dBm) | Duty Cycle (%) | Antenna Gain (dBi) | Power Density at 20 cm (mW/cm <sup>2</sup> ) | LIMITS (mW/cm <sup>2</sup> ) |
|---------------------------|-------------|---------|-------------------------|----------------|--------------------|--|------------------------------|
| 2405                      | 11          | Low     | 3.508                   | 100            | 2.83               | 0.00086                                      | 1                            |
| 2445                      | 19          | Middle  | 3.279                   | 100            | 2.83               | 0.00081                                      |                              |
| 2480                      | 26          | High    | 3.091                   | 100            | 2.83               | 0.00078                                      |                              |

| Operation Frequency (MHz) | Channel No. | Channel | Output Peak Power (dBm) | Duty Cycle (%) | Antenna Gain (dBi) | Power Density at 20 cm (W/m <sup>2</sup> ) | LIMITS (W/m <sup>2</sup> ) |
|---------------------------|-------------|---------|-------------------------|----------------|--------------------|--|----------------------------|
| 2405                      | 11          | Low     | 3.508                   | 100            | 2.83               | 0.00086                                    | 10                         |
| 2445                      | 19          | Middle  | 3.279                   | 100            | 2.83               | 0.00081                                    |                            |
| 2480                      | 26          | High    | 3.091                   | 100            | 2.83               | 0.00078                                    |                            |

Note :

1. The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.