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KDB 447498 D01 V06  
47 C.F.R. Part 1, Subpart I, Section 1.1310  
47 C.F.R. Part 2, Subpart J, Section 2.1091**

## **RF EXPOSURE REPORT**

**For**

**IoT Gateway**

**Model: S1**

**Trade Name:** **SIMPNIC**

*Issued to*

**CONNECTION TECHNOLOGY SYSTEMS INC.  
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*Issued by*

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### Revision History

| Rev. | Issue Date        | Revisions     | Effect Page | Revised By   |
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## 1. EUT SPECIFICATION

|                                     |                                                                                                                                                                                                                                                                 |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT</b>                          | IoT Gateway                                                                                                                                                                                                                                                     |
| <b>Model</b>                        | S1                                                                                                                                                                                                                                                              |
| <b>Model Discrepancy</b>            | N/A                                                                                                                                                                                                                                                             |
| <b>Frequency band (Operating)</b>   | <input checked="" type="checkbox"/> IEEE 802.11b/g/n HT20 Mode: 2.412GHz ~ 2.462GHz<br>IEEE 802.11n HT40 Mode: 2.422GHz ~ 2.452GHz<br><input checked="" type="checkbox"/> 908.4 ~ 916MHz<br><input type="checkbox"/> Others                                     |
| <b>Device category</b>              | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others                                                                                                        |
| <b>Exposure classification</b>      | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )                                                                   |
| <b>Antenna Specification</b>        | For WIFI 2.4GHz<br>Antenna 1 Gain : 3.24 dBi (Numeric gain: 2.11)<br>Antenna 2 Gain : 3.46 dBi (Numeric gain: 2.22)<br><br>Power Directional Gain : 3.35 dBi<br>(Numeric gain: 2.16)<br>For Z-Wave<br>Antenna Gain : 0.36 dBi (Numeric gain: 1.09)              |
| <b>Maximum Average output power</b> | For WIFI 2.4GHz<br>IEEE 802.11b Mode: 22.00 dBm (158.489 mW)<br>IEEE 802.11g Mode: 21.50 dBm (141.254 mW)<br>IEEE 802.11n HT 20 Mode: 21.50 dBm (141.254 mW)<br>IEEE 802.11n HT 40 Mode: 21.00 dBm (125.893 mW)<br><br>For Z-Wave<br>Z-Wave 3.00 dBm (1.995 mW) |
| <b>Evaluation applied</b>           | <input checked="" type="checkbox"/> MPE Evaluation*<br><input type="checkbox"/> SAR Evaluation<br><input type="checkbox"/> N/A                                                                                                                                  |



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## 2. TEST RESULTS

**No non-compliance noted.**

### Calculation

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

### 3. MAXIMUM PERMISSIBLE EXPOSURE

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

#### Z-Wave:

| Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|-----------|--------|-------------|--------|---------------------------------------|-----------------------------|
| 916       | 1.995  | 1.09        | 20     | 0.0004                                | 1                           |

#### IEEE 802.11b Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|-----|-----------|---------|-------------|--------|---------------------------------------|-----------------------------|
| 11  | 2462      | 158.489 | 2.22        | 20     | 0.0700                                | 1.000                       |

#### IEEE 802.11g Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|-----|-----------|---------|-------------|--------|---------------------------------------|-----------------------------|
| 6   | 2437      | 141.254 | 2.22        | 20     | 0.0624                                | 1.000                       |

#### IEEE 802.11n HT20 Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|-----|-----------|---------|-------------|--------|---------------------------------------|-----------------------------|
| 1   | 2412      | 141.254 | 2.16        | 20     | 0.0607                                | 1.000                       |

#### IEEE 802.11n HT40 Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|-----|-----------|---------|-------------|--------|---------------------------------------|-----------------------------|
| 6   | 2437      | 125.893 | 2.16        | 20     | 0.0541                                | 1.000                       |