# RF Exposure Report

| | |
|---|---|
| **Report No.:** | SA160914E09 |
| **FCC ID:** | UXX-S5A643A |
| **Test Model:** | S5A643A |
| **Series Model:** | S5A644A, S5A648A |
| **Received Date:** | Sep. 19, 2016 |
| **Test Date:** | Oct. 04, 2016 |
| **Issued Date:** | Oct. 19, 2016 |
| **Applicant:** | Cradlepoint, Inc |
| **Address:** | 1111 W. Jefferson Street, Suite 400,Boise, ID 83702 USA |
| **Issued By:** | Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory |
| **Lab Address:** | E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C. |

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## Release Control Record

| Issue No. | Description | Date Issued |
|---|---|---|
| SA160914E09 | Original release. | Oct. 19, 2016 |

## 1 Certificate of Conformity

| | |
|---|---|
| **Product:** | 2x2 Dual Band Concurrent AP |
| **Brand:** | Cradlepoint |
| **Test Model:** | S5A643A |
| **Series Model:** | S5A644A, S5A648A |
| **Sample Status:** | ENGINEERING SAMPLE |
| **Applicant:** | Cradlepoint, Inc |
| **Test Date:** | Oct. 04, 2016 |
| **Standards:** | FCC Part 2 (Section 2.1091)<br>KDB 447498 D01 General RF Exposure Guidance v06<br>IEEE C95.1-1992 |

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** _____ , **Date:** Oct. 19, 2016

Midoli Peng / Specialist

**Approved by :** _____ , **Date:** Oct. 19, 2016

May Chen / Manager

## 2 RF Exposure

### 2.1 Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Average Time (minutes) |
|---|---|---|---|---|
| Limits For General Population / Uncontrolled Exposure | | | | |
| 300-1500 | … | … | F/1500 | 30 |
| 1500-100,000 | … | … | 1.0 | 30 |

F = Frequency in MHz

### 2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in $mW/cm^2$

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 40cm away from the body of the user. So, this device is classified as **Mobile Device**.

## 2.4 Antenna Gain

**For WLAN**

| Antenna No. | Antenna Gain(dBi) Including cable loss | Frequency Range (GHz to GHz) | Antenna Type | Connecter Type |
|---|---|---|---|---|
| 1 | 4.49 | 2.4~2.4835 | Dipole | R-SMA |
| | 4.56 | 5.15~5.25 | | |
| | 4.56 | 5.25~5.35 | | |
| | 4.63 | 5.47~5.725 | | |
| | 4.44 | 5.725~5.85 | | |
| 2 | 4.49 | 2.4~2.4835 | Dipole | R-SMA |
| | 4.56 | 5.15~5.25 | | |
| | 4.56 | 5.25~5.35 | | |
| | 4.63 | 5.47~5.725 | | |
| | 4.44 | 5.725~5.85 | | |

**For WWAN(LTE) module**

| Antenna Set. | Model | Antenna Gain(dBi) | Frequency range | Antenna Type | Connecter Type |
|---|---|---|---|---|---|
| 1 | NA | 3dBi@704~960MHz<br>5.5dBi@1710~2700MHz | 740~960MHz<br>1710~2700MHz | Dipole | SMA |
| 2 | NA | 3dBi@704~960MHz<br>5.5dBi@1710~2700MHz | | | SMA |

2.5 Calculation Result of Maximum Conducted Power

**For WLAN:**

| Frequency Band (MHz) | Max Power (mW) | Antenna Gain (dBi) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| 2412-2462 | 645.542 | 7.50 | 40 | 0.18055 | 1 |
| 5180-5240 | 180.436 | 7.57 | 40 | 0.05129 | 1 |
| 5745-5825 | 351.186 | 7.45 | 40 | 0.09710 | 1 |

NOTE:
1. 2.4GHz: Directional gain = 4.49dBi + 10log(2) = 7.50dBi
2. 5GHz (U-NII-1 band): Directional gain = 4.56dBi + 10log(2) = 7.57dBi
3. 5GHz (U-NII-3 band): Directional gain = 4.44dBi + 10log(2) = 7.45dBi

**For WWAN(LTE) module:**

| Frequency (MHz) | Max Power (mW) | Max Power (dBm) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| 699 | 251 | 24 | 40 | 0.02491 | 0.466* |

Note: *Limit of Power Density = F/1500
This product inside has one WWAN(LTE) module device which has maximum of 251W output power.

**Conclusion:**

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz + WWAN= 0.18055 /1 +0.09710 / 1 + 0.02491 / 0.466 = 0.33110
**Therefore the maximum calculations of above situations are less than the "1" limit.**

**--- END ---**

**Appendix**

MPE Evaluation for WWAN(LTE) module (FCC ID: N7NMC7455)

| Operating Mode | TX Freq Range (MHz) | | Max Time-Avg Cond Power | | Antenna Gain (dBi) | Power Density ($mW/cm^2$) | | Ratio |
|---|---|---|---|---|---|---|---|---|
| | Start | Stop | (dBm) | (W) | | Vaule | Limit | |
| WCDMA Band II LTE Band 2 | 1850 | 1910 | 24 | 0.25 | 5.5 | 0.0441 | 1 | 0.04412 |
| WCDMA Band IV LTE Band 4 | 1710 | 1755 | 24 | 0.25 | 5.5 | 0.0441 | 1 | 0.04412 |
| WCDMA Band V LTE Band 5 | 824 | 849 | 24 | 0.25 | 3 | 0.0248 | 0.54933 | 0.045164 |
| LTE Band 7 | 2500 | 2570 | 23 | 0.2 | 5.5 | 0.0353 | 1 | 0.03529 |
| LTE Band 12 | 699 | 716 | 24 | 0.25 | 3 | 0.0248 | 0.466 | 0.05324 |
| LTE Band 13 | 777 | 787 | 24 | 0.25 | 3 | 0.0248 | 0.518 | 0.047896 |
| LTE Band 25 | 1850 | 1915 | 24 | 0.25 | 5.5 | 0.0441 | 1 | 0.04412 |
| LTE Band 26 | 814 | 849 | 24 | 0.25 | 3 | 0.0248 | 0.54266 | 0.045719 |
| LTE Band 41 | 2496 | 2690 | 23 | 0.2 | 5.5 | 0.0353 | 1 | 0.03529 |

Note:
1. The ratios which were indicated in bold type of the max ratio.
2. 704~960MHz: Antenna gain is 3dBi
3. 1710~2700MHz: Antenna gain is 5.5dBi