

## RF Exposure Report

**Report No.:** SA160914E09G

**FCC ID:** UXX-S5A643A

**Test Model:** S5A643A

**Series Model:** S5A644A

**Received Date:** Mar. 15, 2019

**Test Date:** Apr. 23, 2019

**Issued Date:** May 02, 2019

**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

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Taiwan R.O.C.

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan R.O.C.

**FCC Registration /  
Designation Number:** 723255 / TW2022

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### Release Control Record

Issue No.	Description	Date Issued
SA160914E09G	Original release.	May 02, 2019

## 1 Certificate of Conformity

**Product:** 2x2 Dual Band Concurrent AP

**Brand:** Cradlepoint

**Test Model:** S5A643A

**Series Model:** S5A644A

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Cradlepoint, Inc

**Test Date:** Apr. 23, 2019

**Standards:** FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

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 :** Wendy Wu, **Date:** May 02, 2019  
Wendy Wu / Specialist

**Approved by :** May Chen, **Date:** May 02, 2019  
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 <sup>2</sup> )	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

f = Frequency in MHz ; \*Plane-wave equivalent power density

### 2.2 MPE Calculation Formula

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

where

Pd = power density in mW/cm<sup>2</sup>

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

Newly					
Ant Set	Element	Antenna Gain(dBi) Including cable loss	Frequency Range (GHz)	Antenna Type	Connector Type
2	WLAN (Chain 1 & 2)	1.5	2400-2.500	PIFA	R-SMA
		2	5150-5250		
		2	5250-5350		
		1.9	5470-5725		
		1.9	5725-5900		
	LTE (Chain 1 & 2)	3.8	698-960	PIFA	SMA
		4.4	1710-3800		
3	GNSS (Chain 1)	RX only: 26dB (with LNA)	1562-1612	Patch	SMA
	WLAN (Chain 1, 2, 3, 4)	1.5	2400-2.500	Monopole	R-SMA
		1	5150-5250		
		1	5250-5350		
		0.9	5470-5725		
		0.9	5725-5900		
	LTE (Chain 1, 2, 3, 4)	3.8	698-960	PIFA	SMA
		5.4	1710-3800		
	GNSS (Chain 1)	RX only: 26dB (with LNA)	1562-1612	Patch	SMA

## 2.5 Calculation Result of Maximum Conducted Power

### For Antenna Set 2:

#### For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2462	590.041	4.51	40	0.08290	1
5180-5240	170.344	5.01	40	0.02685	1
5260-5320	208.225	5.01	40	0.03282	1
5500-5700	200.296	4.91	40	0.03086	1
5745-5825	331.536	4.91	40	0.05107	1

#### NOTE:

2.4GHz: Directional gain =  $1.5\text{dBi} + 10\log(2) = 4.51\text{dBi}$

5GHz (U-NII-1 & UNII-2A band): Directional gain =  $2\text{dBi} + 10\log(2) = 5.01\text{dBi}$

5GHz (U-NII-2C & U-NII-3 band): Directional gain =  $1.9\text{dBi} + 10\log(2) = 4.91\text{dBi}$

#### For WWAN(LTE) module (FCC ID: N7NMC7455)

Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
699	251	3.80	40	0.02995	0.466*

Note: \*Limit of Power Density =  $F/1500$

#### Conclusion:

The formula of calculated the MPE is:

$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz + WWAN =  $0.08290 / 1 + 0.05107 / 1 + 0.02995 / 0.466 = 0.19824$

Therefore the maximum calculations of above situations are less than the "1" limit.

**For Antenna Set 3:**
**For WLAN:**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2462	590.041	4.51	40	0.08290	1
5180-5240	170.344	4.01	40	0.02133	1
5260-5320	208.225	4.01	40	0.02607	1
5500-5700	200.296	3.91	40	0.02451	1
5745-5825	331.536	3.91	40	0.04057	1

**NOTE:**

2.4GHz: Directional gain = 1.5dBi + 10log(2) = 4.51dBi

5GHz (U-NII-1 &amp; UNII-2A band): Directional gain = 1dBi + 10log(2) = 4.01dBi

5GHz (U-NII-2C &amp; U-NII-3 band): Directional gain = 0.9dBi + 10log(2) = 3.91dBi

**For WWAN(LTE) module (FCC ID: N7NMC7455)**

Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
699	251	3.80	40	0.02995	0.466*

Note: \*Limit of Power Density = F/1500

**Conclusion:**

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + .....etc. &lt; 1

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz + WWAN= 0.08290 / 1 + 0.04057 / 1 + 0.02995 / 0.466 = 0.18774

Therefore the maximum calculations of above situations are less than the "1" limit.

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## Appendix

### For Antenna Set 2:

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

Operating Mode	TX Freq Range (MHz)		Max Output Power		Antenna Gain (dBi)	Power Density (mW/cm <sup>2</sup> )		Ratio
	Start	Stop	(dBm)	(W)		Vaule	Limit	
WCDMA Band II LTE Band 2	1850	1910	24	0.25	4.4	0.0343	1	0.03425
WCDMA Band IV LTE Band 4	1710	1755	24	0.25	4.4	0.0343	1	0.03425
WCDMA Band V LTE Band 5	824	849	24	0.25	3.8	0.0298	0.54933	0.054303
LTE Band 7	2500	2570	23	0.2	4.4	0.0274	1	0.0274
LTE Band 12	699	716	24	0.25	3.8	0.0298	0.466	<b>0.064013</b>
LTE Band 13	777	787	24	0.25	3.8	0.0298	0.518	0.057587
LTE Band 25	1850	1915	24	0.25	4.4	0.0343	1	0.03425
LTE Band 26	814	849	24	0.25	3.8	0.0298	0.54266	0.05497
LTE Band 41	2496	2690	23	0.2	4.4	0.0274	1	0.0274

### For Antenna Set 3:

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

Operating Mode	TX Freq Range (MHz)		Max Output Power		Antenna Gain (dBi)	Power Density (mW/cm <sup>2</sup> )		Ratio
	Start	Stop	(dBm)	(W)		Vaule	Limit	
WCDMA Band II LTE Band 2	1850	1910	24	0.25	5.4	0.0431	1	0.04311
WCDMA Band IV LTE Band 4	1710	1755	24	0.25	5.4	0.0431	1	0.04311
WCDMA Band V LTE Band 5	824	849	24	0.25	3.8	0.0298	0.54933	0.054303
LTE Band 7	2500	2570	23	0.2	5.4	0.0345	1	0.03449
LTE Band 12	699	716	24	0.25	3.8	0.0298	0.466	<b>0.064013</b>
LTE Band 13	777	787	24	0.25	3.8	0.0298	0.518	0.057587
LTE Band 25	1850	1915	24	0.25	5.4	0.0431	1	0.04311
LTE Band 26	814	849	24	0.25	3.8	0.0298	0.54266	0.05497
LTE Band 41	2496	2690	23	0.2	5.4	0.0345	1	0.03449