

RF Exposure Report

Report No.: SA191025E02

FCC ID: UXX-S5A946A

Test Model: S5A947A

Series Model: S5A946A

Received Date: Nov. 01, 2019

Date of Evaluation: Dec. 02, 2019

Issued Date: Dec. 04, 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
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

**FCC Registration /
Designation Number:** 788550 / TW0003



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	3
1 Certificate of Conformity.....	4
2 Description	5
3 RF Exposure.....	5
3.1 Limits for Maximum Permissible Exposure (MPE)	5
3.2 MPE Calculation Formula	5
3.3 Classification	5
3.4 Calculation Result of Maximum Conducted Power	6

Release Control Record

Issue No.	Description	Date Issued
SA191025E02	Original Release	Dec. 04, 2019

1 Certificate of Conformity

Product: Advanced Edge Router

Brand: cradlepoint

Test Model: S5A947A

Series Model: S5A946A

Sample Status: Engineering Sample

Applicant: Cradlepoint, Inc

Date of Evaluation: Dec. 02, 2019

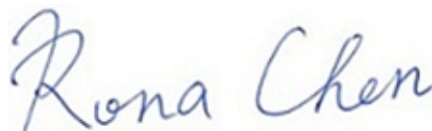
Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.3 -2002

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 RF characteristics under the conditions specified in this report.

Prepared by :



Date:

Dec. 04, 2019

Rona Chen / Specialist

Approved by :



Date:

Dec. 04, 2019

Dylan Chiou / Project Engineer

2 Description

This report is issued as a supplementary report to BV CPS report no.: SA191025E02. The difference compared with original report is enabling WLAN 5G U-NII-2A and U-NII-2C. Therefore, the RF exposure evaluation of U-NII-2A and U-NII-2C is recorded in this report.

3 RF Exposure

3.1 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				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	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

3.2 MPE Calculation Formula

$$P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

3.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

Note: All models of EUT are listed as below.

Brand	Product Marketing Name (PMN)	Model	Wi-Fi Function	Embedded Radio (WWAN Module)	Number of WWAN Antenna Port
cradlepoint	E300-C18B	S5A946A	Yes	Telit, LM960A18 Contains FCC ID: R17LM960 Contains IC : 5131A-LM960	4
	E300-C4D	S5A947A	Yes	Quectel, EC25-AF Contains FCC ID: XMR201808EC25AF Contains IC : 10224A-2018EC25AF	2

* The differences compared with different models are embedded WWAN module and number of WWAN antenna port.

3.4 Calculation Result of Maximum Conducted Power

For WWAN Module (Brand: Telit / Model: LM960A18)

Band	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WCDMA II	1850-1910	24.0	2	20	0.079	1.00
WCDMA IV	1710-1755	24.0	2	20	0.079	1.00
WCDMA V	824-849	24.0	1	20	0.063	0.55
LTE 2	1850-1910	24.5	2	20	0.089	1.00
LTE 4	1710-1755	24.5	2	20	0.089	1.00
LTE 5	824-849	24.5	1	20	0.071	0.55
LTE 7	2500-2570	24.5	2	20	0.089	1.00
LTE 12	699-716	24.5	1	20	0.071	0.47
LTE 13	777-787	24.5	1	20	0.071	0.52
LTE 14	788-798	24.5	1	20	0.071	0.53
LTE 17	704-716	24.5	1	20	0.071	0.47
LTE 18	815-830	24.5	1	20	0.071	0.54
LTE 19	830-845	24.5	1	20	0.071	0.55
LTE 25	1850-1915	24.5	2	20	0.089	1.00
LTE 26	814-849	24.5	1	20	0.071	0.54
LTE 30	2305-2315	22.9	2	20	0.061	1.00
LTE 38	2572-2618	24.5	2	20	0.089	1.00
LTE 41	2496-2690	27.5	2	20	0.177	1.00
LTE 66	1710-1780	24.5	2	20	0.089	1.00
LTE 71	663-698	24.5	1	20	0.071	0.44

For WWAN Module (Brand: Quectel / Model: EC25-AF)

Band	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WCDMA II	1850-1910	25.0	2	20	0.100	1.00
WCDMA IV	1710-1755	25.0	2	20	0.100	1.00
WCDMA V	824-849	25.0	1	20	0.079	0.55
LTE 2	1850-1910	25.0	2	20	0.100	1.00
LTE 4	1710-1755	25.0	2	20	0.100	1.00
LTE 5	824-849	25.0	1	20	0.079	0.55
LTE 12	699-716	25.0	1	20	0.079	0.47
LTE 13	777-787	25.0	1	20	0.079	0.52
LTE 14	788-798	25.0	1	20	0.079	0.53
LTE 66	1710-1780	25.0	2	20	0.100	1.00
LTE 71	663-698	25.0	1	20	0.079	0.44

Band	Frequency Band (MHz)	Mode	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN	2412-2462	CDD	28.02	5.12	20	0.410	1.00
		Beamforming	27.86	5.12	20	0.395	1.00
	5180-5240	CDD	26.78	6.16	20	0.391	1.00
		Beamforming	26.78	6.16	20	0.391	1.00
	5260-5320	CDD	23.75	6.16	20	0.195	1.00
		Beamforming	23.75	6.16	20	0.195	1.00
	5500-5720	CDD	23.86	6.16	20	0.200	1.00
		Beamforming	23.66	6.16	20	0.191	1.00
	5745-5825	CDD	26.65	6.16	20	0.380	1.00
		Beamforming	26.65	6.16	20	0.380	1.00

Note:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 5.12$ dBi
5.0GHz: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 6.16$ dBi
- Max Power of WLAN 2.4GHz shall refer to BV CPS report no.: RF191025E02.
- Max Power of WLAN 5G U-NII-1 & U-NII-3 shall refer to BV CPS report no.: RF191025E02-1.

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

For WWAN Module (Brand: Telit / Model: LM960A18)

$WLAN\ 2.4GHz + WLAN\ 5GHz + WWAN = 0.410 / 1.00 + 0.391 / 1.00 + 0.177 / 1.00 = 0.978$

For WWAN Module (Brand: Quectel / Model: EC25-AF)

$WLAN\ 2.4GHz + WLAN\ 5GHz + WWAN = 0.410 / 1.00 + 0.391 / 1.00 + 0.079 / 0.44 = 0.981$

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

--- END ---