RF Exposure Report

Report No.:	SABDUM-WTW-P20100787
FCC ID:	UXX-S5A036A
Test Model:	S5A037A
Series Model:	S5A036A
Received Date:	Oct. 30, 2020
Test Date:	Nov. 26, 2020
Issued Date:	Jan. 11, 2021
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
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
SABDUM-WTW-P20100787	Original release.	Jan. 11, 2021

1 Certificate of Conformity

Product:	Enterprise Branch Router
Brand:	cradlepoint
Test Model:	S5A037A
Series Model:	S5A036A
Sample Status:	ENGINEERING SAMPLE
Applicant:	Cradlepoint, Inc
Test Date:	Nov. 26, 2020
Standards:	FCC Part 2 (Section 2.1091) IEEE C95.3-2002
References Test Guidance:	KDB 447498 D01 General RF Exposure Guidance v06

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 : Vivian Huang , **Date:** Jan. 11, 2021

Vivian Huang / Specialist

Approved by : , **Date:** Jan. 11, 2021

Clark Lin / Technical 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				
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

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 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

WLAN Antenna								
Ant. No.	RF Chain No.	Brand	Ant. Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)	Cable Loss (dB)
1	WiFi Chain0	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	130	Including
			2.8	5.15~5.25				
			3.1	5.25~5.35				
			3.1	5.47~5.725				
			3.1	5.725~5.85				
2	WiFi Chain1	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	230	Including
			2.8	5.15~5.25				
			3.1	5.25~5.35				
			3.1	5.47~5.725				
			3.1	5.725~5.85				

WWAN Antenna				
Antenna No.	Band	Freq. Range (MHz)	Gain (dBi)	Antenna Type
1	WCDMA Band 2	1850~1910	1.4	Dipole
	WCDMA Band 4	1710~1755	1.4	
	WCDMA Band 5	824~849	0.72	
	LTE Band 2	1850~1910	1.54	
	LTE Band 4	1710~1755	1.54	
	LTE Band 5	824~849	0.7	
	LTE Band 12	688~716	0.7	
	LTE Band 13	777~787	0.7	
	LTE Band 14	788~798	0.7	
	LTE Band 66	1710~1780	1.54	
	LTE Band 71	663~698	0.7	
2	WCDMA Band 2	1850~1910	1.26	Dipole
	WCDMA Band 4	1710~1755	1.26	
	WCDMA Band 5	824~849	0.65	
	LTE Band 2	1850~1910	1.53	
	LTE Band 4	1710~1755	1.53	
	LTE Band 5	824~849	0.7	
	LTE Band 12	688~716	0.7	
	LTE Band 13	777~787	0.7	
	LTE Band 14	788~798	0.7	
	LTE Band 66	1710~1780	1.53	
	LTE Band 71	663~698	0.7	

*The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.5 Calculation Result

For 2.4GHz, 5GHz (U-NII-1 & UNII-3 band) data was copied from the original test report (Report No.: SA200703E03)

For WLAN

Operation Mode	Evaluation Frequency (MHz)	Max Power Average (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN 2.4GHz	2412~2462	223.387	5.91	20	0.1733	1
WLAN 5GHz U-NII-1	5180~5240	245.002	5.81	20	0.18574	1
WLAN U-NII-2A	5260~5320	151.424	6.11	20	0.12301	1
WLAN U-NII-2C	5500~5720	141.505	6.11	20	0.11495	1
WLAN 5GHz U-NII-3	5745~5825	248.321	6.11	20	0.20172	1

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 2.4GHz: Directional gain = 2.9dBi + 10log(2) = 5.91dBi
3. 5GHz U-NII-1: Directional gain = 2.8dBi + 10log(2) = 5.81dBi
   5GHz U-NII-2A, U-NII-2C, U-NII-3: Directional gain = 3.1dBi + 10log(2) = 6.11dBi

For WWAN module <Worst case> (FCC ID: XMR201808EC25AF)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
LTE B71	663~698	222	0.7	20	0.05189	0.442

Note: *Limit of Power Density = F/1500

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 + LTE B71 = 0.1733 / 1 + 0.20172 / 1 + 0.05189 / 0.442 = 0.49242

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

Appendix

WWLAN module
MPE Evaluation for FCC ID: XMR201808EC25AF Module

Mode	Equipment Category	Transmitter Range (MHz)		Maximum Power		Antenna Gain (dBi)	Power Density (mW/cm^2)		Ratio
		Start	Stop	(dBm)	(mW)		Vaule	Limit	
WCDMA	WCDMA II	1850	1910	23.80	240	1.40	0.06591	1	0.06591
	WCDMA IV	1710	1755	23.46	222	1.40	0.06097	1	0.06097
	WCDMA V	824	849	23.20	209	0.72	0.04908	0.54933	0.08935
LTE	LTE B2	1850	1910	23.18	208	1.54	0.05899	1	0.05899
	LTE B4	1710	1755	23.73	236	1.54	0.06693	1	0.06693
	LTE B5	824	849	24.05	254	0.70	0.05937	0.54933	0.10808
	LTE B12	699	716	23.69	234	0.70	0.05469	0.466	0.11736
	LTE B13	777	787	23.86	243	0.70	0.05680	0.518	0.10965
	LTE B14	788	798	23.86	243	0.70	0.05680	0.52533	0.10812
	LTE B66	1710	1780	22.88	194	1.54	0.05502	1	0.05502
	LTE B71	663	698	23.46	222	0.70	0.05189	0.442	0.11740

--- END ---