RF Exposure Report

Report No.:	SA200709D02
FCC ID:	2AK5B-HB1
Test Model:	HB1LW1NA1
Received Date:	Jul. 9, 2020
Test Date:	Jul. 10 to Aug. 17, 2020
Issued Date:	Aug. 20, 2020
Applicant:	Latchable, Inc.
Address:	508 West 26th Street Suite 6G New York, NY 10001
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
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FCC Registration / Designation Number:	198487 / TW2021

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
SA200709D02	Original release.	Aug. 20, 2020

1 Certificate of Conformity

Product:	Hub
Brand:	LATCH
Test Model:	HB1LW1NA1
Sample Status:	Engineering sample
Applicant:	Latchable, Inc.
Test Date:	Jul. 10 to Aug. 17, 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 RF characteristics under the conditions specified in this report.

Prepared by : Celia Chen , **Date:** Aug. 20, 2020

Celia Chen / Supervisor

Approved by : Rex. Lai , **Date:** Aug. 20, 2020

Rex Lai / Associate 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

Function	Ant. No.	Frequency Band (MHz)	Antenna Type	Antenna Connector	Gain (dBi)	
					Chian 0	Chian 1
WCDMA Band 2	Ant. 1 & 2	1852.4 ~ 1907.6	PIFA	I-PEX	2.3	2.6
WCDMA Band 5		826.4 ~ 846.6	PIFA	I-PEX	1.3	2.5
LTE Band 2		1850.7-1909.3	PIFA	I-PEX	2.3	2.6
LTE Band 4		1710.7-1754.3	PIFA	I-PEX	2.8	2.8
LTE Band 5		824.7-848.3	PIFA	I-PEX	1.3	2.5
LTE Band 12		699.7-715.3	PIFA	I-PEX	1.1	2.8
LTE Band 13		779.5-784.5	PIFA	I-PEX	1.1	2.8
Z-Wave	Ant. 3	908.4, 916.0	PIFA	I-PEX	2.7	-
WLAN	Ant. 4 & 5	2412-2462	Dipole	I-PEX	2.5	3.2
WLAN		5180-5240	Dipole	I-PEX	3.3	3.1
WLAN		5745-5825	Dipole	I-PEX	2.5	2.4
BT LE	Ant. 6	2402-2480	Dipole	I-PEX	3.3	-
BT EDR						
Zigbee	Ant. 7	2405-2480	Dipole	I-PEX	3.4	-

Note: 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 Of Maximum Conducted Power

Function	Frequency Band (MHz)	Max AV Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN	2412-2462	24.73	6.21	20	0.2470	1
WLAN	5180-5240	18.56	6.31	20	0.0611	1
WLAN	5745-5825	23.82	6.31	20	0.2050	1
Zigbee	2405-2480	17.49	3.4	20	0.0244	1
BT LE	2402-2480	4.56	3.3	20	0.0012	1
BT EDR	2402-2480	5.71	3.3	20	0.0016	1

Note:
2.4GHz Directional gain = 3.2dBi + 10log(2) = 6.21dBi
5180-5240MHz Directional gain = 3.3dBi + 10log(2) = 6.31dBi
5745-5825MHz Directional gain = 3.3dBi + 10log(2) = 6.31dBi

Frequency Band (MHz)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WCDMA Band 2: 1852.4-1907.6MHz	24.33	20	0.0539175	1
LTE Band 2: 1850.7-1909.3MHz	25.48	20	0.0702636	1
LTE Band 4: 1710.7-1754.3MHz	26.52	20	0.0892751	1

Frequency Band (MHz)	ERP (dBm)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WCDMA Band 5: 826.4-846.6MHz	23.66	25.81	20	0.0758106	0.55
LTE Band 5: 824.7-848.3MHz	22.91	25.06	20	0.0637867	0.55
LTE Band 12: 699.7-715.3MHz	22.05	24.20	20	0.0523275	0.47
LTE Band 13: 779.5-784.5MHz	22.55	24.70	20	0.0587124	0.52
Z-Wave: 908.4MHz & 916.0MHz	-23.97	-21.82	20	0.0000013	0.61

Z-Wave (Max Radiated Power): 73.41dBuV/m = -23.97dBm (ERP)
Note: EIRP = ERP + 2.15

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 2.4GHz & 5GHz WLAN technologies cannot transmit at same time.
   WCDMA & LTE technologies cannot transmit at same time.
   WLAN, WWAN, Bluetooth, Zigbee & Z-Wave technologies can transmit at same time.

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 + Zigbee + BT EDR + Z-Wave + WCDMA Band 5

=0.2470/1 + 0.0244/1 + 0.0016/1 + 0.0000013/0.61 + 0.0758106/0.55= 0.41084

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

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