RF Exposure Report

Report No.:	SAACXM-WTW-P21060766A
FCC ID:	2AEUPBHASG001
Test Model:	5F48E9
Received Date:	2021/7/14
Test Date:	2021/8/26 ~ 2021/8/28
Issued Date:	2021/11/30
Applicant:	Ring LLC
Address:	1523 26th Street, Santa Monica CA 90404 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

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Release Control Record

Issue No.	Description	Date Issued
SAACXM-WTW-P21060766A	Original release.	2021/11/30

1 Certificate of Conformity

Product:	Amazon Sidewalk Bridge Pro by Ring
Brand:	Ring LLC
Test Model:	5F48E9
Sample Status:	Engineering sample
Applicant:	Ring LLC
Test Date:	2021/8/26 ~ 2021/8/28
Standards:	FCC Part 2 (Section 2.1091) 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 : Phoenix Huang , **Date:** 2021/11/30

Phoenix Huang / Specialist

Approved by : , **Date:** 2021/11/30

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

2.4 Antenna Gain

RF Chain No	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type	Cable Length (mm)
WiFi 0	Inpaq	RFPCA520814IMLB301	8.04	2.4~2.4835 GHz	PIFA	i-pex(MHF)	149
			8.81	5.15~5.85 GHz			
WiFi 1	Inpaq	RFPCA501016IMLB301	8.26	2.4~2.4835 GHz	PIFA	i-pex(MHF)	165
			8.64	5.15~5.85 GHz			
BT	Inpaq	RFPCA520815IMAB301	6.88	2.4~2.4835 GHz	PIFA	i-pex(MHF)	210
LoRa/FSK (Outdoor)	Inpaq	RFDPA563600AFRBX01	5.5	902~928 MHz	Dipole	R-N type(F)	1000
LoRa/FSK (Indoor)	Inpaq	FDPA161500AMUB801	2.8	902~928 MHz	Dipole	R-N type(M)	NA
GPS(L1)	Inpaq	RFPCA621512IMTB301	7.26	1575 MHz	PIFA	i-pex(MHF)	NA
GPS(L5)	Inpaq	RFPCA711620IMTB301	6.06	1176 MHz	PIFA	i-pex(MHF)	NA

2.5 Calculation Result

For WLAN, Bluetooth and LTE data was copied from the original test report (Report No.: SAACXM-WTW-P21060766)

Operation Mode	Evaluation Frequency (MHz)	Max. Average Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Pass/ Fail
WLAN (2.4GHz)	2412~2462	150.011	11.16	31	0.16225	1	Pass
WLAN (U-NII-1)	5180~5240	128.911	11.74	31	0.15935	1	Pass
WLAN (U-NII-2A)	5260~5320	63.359	11.74	31	0.07832	1	Pass
WLAN (U-NII-2C)	5500~5720	65.17	11.74	31	0.08056	1	Pass
WLAN (U-NII-3)	5745~5825	248.331	11.74	31	0.30697	1	Pass
BT-EDR	2402~2480	45.186	6.88	31	0.01824	1	Pass
BT-LE	2402~2480	48.417	6.88	31	0.01955	1	Pass
FSK	902 ~ 928	570.164	5.5	31	0.16752	0.60133	Pass
LoRa	902 ~ 928	564.937	5.5	31	0.16598	0.60133	Pass

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 2.4GHz: The directional gain = 10 log[$(10^{G0/20} + 10^{G1/20})^2$ / 2] = 11.16 dBi
3. 5GHz: The directional gain = 10 log[$(10^{G0/20} + 10^{G1/20})^2$ / 2] = 11.74 dBi
4. FSK and LoRa technology cannot transmit at the same time.

WWAN module (Worst Case - LTE Band 12)

Frequency Band (MHz)	Max. EIRP (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Pass/ Fail
698-716	225.9	31	0.01871	0.46533	Pass

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

Simultaneously transmission condition.

Condition	Technology		
1	WLAN (2.4GHz)	LoRa	Bluetooth
2	WLAN (5GHz)	LoRa	Bluetooth
3	WLAN (2.4GHz)	FSK	Bluetooth
4	WLAN (5GHz)	FSK	Bluetooth
5	LTE	LoRa	Bluetooth
6	LTE	FSK	Bluetooth

Condition 1: 0.16225 / 1 + 0.16598 / 0.60133 + 0.01955 / 1 = 0.45782

Condition 2: 0.30697 / 1 + 0.16598 / 0.60133 + 0.01955 / 1 = 0.60254

Condition 3: 0.16225 / 1 + 0.16752 / 0.60133 + 0.01955 / 1 = 0.46038

Condition 4: 0.30697 / 1 + 0.16752 / 0.60133 + 0.01955 / 1 = 0.60510

Condition 5: 0.01871 / 0.46533 + 0.16598 / 0.60133 + 0.01955 / 1 = 0.33578

Condition 6: 0.01871 / 0.46533 + 0.16752 / 0.60133 + 0.01955 / 1 = 0.33834

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

Appendix

WWAN module
MPE Evaluation for FCC ID: ZMONL668AM00 Module

Mode	Band	Evaluation Frequency (MHz)	Maximum Output Power		Antenna Gain (dBi)	Power Density (mW/cm^2)		Ratio
			mW	dBm		Vaule	Limit	
LTE	LTE B2	1850-1910	214.3	23.31	0.80	0.02133	1	0.02133
	LTE B4	1710-1755	202.8	23.07	0.30	0.01799	1	0.01799
	LTE B5	824-849	193.2	22.86	0.30	0.01714	0.54933	0.03120
	LTE B12	698-716	225.9	23.54	0.00	0.01871	0.46533	0.04021
	LTE B17	704-716	225.9	23.54	0.00	0.01871	0.46933	0.03987
	LTE B66	1710-1780	230.7	23.63	0.3	0.02047	1	0.02047
	LTE B71	663-698	243.8	23.87	-0.90	0.01641	0.442	0.03713

Note: For frequency rang 300-1500MHz the Limit of Power Density = F/1500

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