



RF EXPOSURE EVALUATION REPORT

APPLICANT : Golden Mark (HK) Limited

PRODUCT NAME : Smart Home Controller

MODEL NAME : EzloPlus-US, e450-US

BRAND NAME : N/A

FCC ID : 2AMY9PLUS450

STANDARD(S) : FCC 47CFR Part 2(2.1091)

RECEIPT DATE : 2020-12-21

TEST DATE : 2020-12-30 to 2021-03-23

ISSUE DATE : 2021-03-31

Edited by:


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Change History		
Version	Date	Reason for Change
1.0	2021-03-31	First edition

1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

Applicant:	Golden Mark (HK) Limited
Applicant Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer:	Golden Mark (HK) Limited
Manufacturer Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong

1.2 Equipment under Test (EUT) Description

Product Name:	Smart Home Controller	
Serial No.:	(N/A, marked #1 by test site)	
Hardware Version:	N/A	
Software Version:	N/A	
Frequency Bands:	Z-Wave	908.4MHz, 916.0MHz
	Zigbee	2405MHz-2480MHz
	WLAN 2.4GHz	2412MHz-2462MHz
	WLAN 5GHz	5180MHz-5240MHz
		5745MHz-5825MHz
Modulation Mode:	Zigbee	QPSK
	WLAN 2.4GHz	DSSS, OFDM
	WLAN 5GHz	OFDM
Antenna Information:	Z-Wave	
	Antenna Type:	Wire Antenna
	Antenna Gain:	2.1dBi
	Zigbee	
	Antenna Type:	PCB Antenna
	Antenna Gain:	1.0dBi
Antenna Information:	WLAN 2.4GHz/ WLAN 5GHz	
	Antenna Type:	Chip Antenna
	Antenna Gain:	2.3dBi



1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method determination /Remark
FCC 47CFR Part 2(2.1091)	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
Note 1: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table. Note 2: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.		



2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Table 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)	Averaging time (minutes)
(B) 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. RF Output Power

Mode	Channel	Frequency (MHz)	Average power (dBm)
Zigbee	CH 11	2405	19.12
	CH 19	2445	18.99
	CH 26	2480	18.63
Tune-up Limit			19.50

2.4GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11b	CH 1	2412	13.99	14.50	100
	CH 6	2437	13.85	14.50	
	CH 11	2462	13.42	14.00	
802.11g	CH 1	2412	13.93	14.50	98.33
	CH 6	2437	13.82	14.50	
	CH 11	2462	13.53	14.00	
802.11n (HT20)	CH 1	2412	13.37	14.00	98.46
	CH 6	2437	13.28	14.00	
	CH 11	2462	13.07	13.50	
802.11n (HT40)	CH 3	2422	9.49	10.00	96.72
	CH 6	2437	9.31	10.00	
	CH 9	2462	9.15	9.50	



5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11a	CH 36	5180	12.67	13.00	98.33
	CH 44	5220	12.00	12.50	
	CH 48	5240	11.59	12.00	
	CH 149	5745	11.00	11.50	
	CH 157	5785	11.12	11.50	
	CH 165	5825	11.18	11.50	

5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT20)	CH 36	5180	10.18	10.50	97.96
	CH 44	5220	9.17	9.50	
	CH 48	5240	8.65	9.00	
	CH 149	5745	12.44	13.00	
	CH 157	5785	12.00	12.50	
	CH 165	5825	10.96	11.50	

5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT40)	CH 38	5190	5.22	6.00	96.41
	CH 46	5230	4.02	4.50	
	CH 151	5755	6.01	6.50	
	CH 159	5795	5.54	6.00	



5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT20)	CH 36	5180	11.09	11.50	98.47
	CH 44	5220	9.23	10.00	
	CH 48	5240	8.57	9.00	
	CH 149	5745	12.45	13.00	
	CH 157	5785	12.03	12.50	
	CH 165	5825	10.84	11.50	

5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT40)	CH 38	5190	10.75	11.50	97.96
	CH 46	5230	9.39	10.00	
	CH 151	5755	12.70	13.50	
	CH 159	5795	12.07	12.50	

5GHz WLAN					
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT80)	CH 42	5210	4.95	5.50	93.29
	CH 155	5775	6.11	6.50	

Note 1: According to KDB 447498 Section 4.3, MPE assessment is based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Note 2: The modular for Z-wave approach to certain low power transmitters that has low radiation, therefore the power density of Z-wave mode is close to zero.

Note 3: The output power refers to report (Report No.: SZ20120271W01/W02/W03/W04).

4. RF Exposure Assessment

➤ Standalone Transmission Assessment:

Bands	Frequency (MHz)	Tune-up Power(dBm)	Antenna Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
Zigbee	2405	19.50	1.0	112.20	0.022	1.0
WLAN 2.4GHz	2412	14.50	2.3	47.86	0.010	1.0
WLAN 5GHz	5755	13.50	2.3	38.02	0.008	1.0

Note 1: For 2.4G/5G WLAN, only the worst case will be used for calculating the power density.

Note 2: MPE calculate method

$$\text{Power Density} = \text{E.I.R.P.} / 4\pi R^2$$

Where: E.I.R.P. = P+G

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)

➤ Simultaneous Transmission Assessment:

Multi-Band Simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Position	Applicable Combination
	Body	WLAN 2.4GHz + WLAN 5GHz +Z-wave

Note 1: This device contains transmitters that may operate simultaneously, therefore simultaneous transmission analysis is required as below.

Applicable Combination	Transmission Bands	Power Density (mW/cm ²)	Limit (mW/cm ²)	Simultaneous Transmission Result
WLAN 2.4GHz + WLAN 5GHz +Z-wave	WLAN 2.4GHz	0.010	1.0	0.018
	WLAN 5GHz	0.008	1.0	
	Z-wave	0	0.6	

Note 1: Formula for result=Power density₁/ limit₁ + Power density₂/ limit₂ ≤ 1.

➤ Conclusion:

According to 47 CFR §2.1091, this device complies with human exposure basic restrictions.



Annex A Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

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