RF EXPOSURE

EVALUATION REPORT

APPLICANT	:	Anker Innovations Limited
PRODUCT NAME	:	Nebula Mars II Pro
MODEL NAME	:	D2323
BRAND NAME	:	Nebula
FCC ID	:	2AOKB-D2323
STANDARD(S)	:	47CFR 2.1091 KDB 447498
RECEIPT DATE	:	2019-05-22
TEST DATE	:	2019-06-11
ISSUE DATE	:	2019-06-18

Edited by: Liang Yumei (Rapporteur)

Approved by: Peng Huarui (Supervisor)

MORLAB

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DIRECTORY

Change history		
Version	**Date**	**Reason of changed**
1.0	2019-06-18	Original

1. Technical Information

Note: Provide by manufacturer.

1.1 Applicant and Manufacturer Information

Applicant:	Anker Innovations Limited
Applicant Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong
Manufacturer:	Anker Innovations Limited
Manufacturer Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong

1.2 Equipment under Test (EUT) Description

EUT Name:	Nebula Mars II Pro
Hardware Version:	P2_PRO-Main_V0.2
Software Version:	NBUI_P2_V3.0.3
Frequency Bands:	WLAN 2.4GHz: 2412 MHz ~2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation Mode:	802.11b: DSSS 802.11a/g/n-HT20/HT40: OFDM Bluetooth BR+EDR: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK
Antenna Type:	monopole antenna
Antenna Gain:	0dBi

1.3 Identification of all used EUT

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
1#	P2_PRO-Main_V0.2	NBUI_P2_V3.0.3

1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	47 CFR§2.1091	Radio Frequency Radiation Exposure Evaluation: mobile devices
2	KDB 447498 D01v06	General RF Exposure Guidance

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

<WLAN 2.4GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	**19.40**	**20.00**	97.57
		CH 6	2437	18.97	19.50	
		CH 11	2462	18.45	19.00	
	802.11g 6Mbps	CH 1	2412	17.86	18.00	87.18
		CH 6	2437	17.45	18.00	
		CH 11	2462	16.96	17.50	
	802.11n-HT20 MCS0	CH 1	2412	17.94	18.50	86.44
		CH 6	2437	17.50	18.00	
		CH 11	2462	16.62	17.00	
	802.11n-HT40 MCS0	CH 3	2422	17.28	17.50	76.05
		CH 6	2437	17.00	17.50	
		CH 9	2452	16.68	17.00	

<WLAN 5GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Power	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	11.21	12.50	87.22
		CH 44	5220	12.03	12.50	
		CH 48	5240	12.85	13.50	
	802.11n-HT20 MCS0	CH 36	5180	11.66	12.00	86.44
		CH 44	5220	12.45	13.00	
		CH 48	5240	13.42	14.00	
	802.11n-HT40 MCS0	CH 38	5190	15.49	16.00	76.26
		CH 46	5230	**16.61**	**17.00**	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	CH 149	5745	16.84	17.00	87.22
		CH 157	5785	16.60	17.00	
		CH 165	5825	15.73	16.00	
	802.11n-HT20 MCS0	CH 149	5745	17.41	18.00	86.44
		CH 157	5785	17.09	17.50	
		CH 165	5825	16.04	16.50	
	802.11n-HT40 MCS0	CH 151	5755	**17.56**	**18.00**	76.26
		CH 159	5795	17.19	18.00	

<Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	**11.73**	8.81	8.90
	CH 39	2441	11.41	8.77	8.84
	CH 78	2480	11.53	8.60	8.90
Tune-up Power			12.0	9.0	9.5

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	2.81
	CH 19	2440	3.03
	CH 39	2480	2.77
Tune-up Power			4.00

4. RF Exposure Evaluation

➢ **Standalone transmission evaluation:**

Bands	Frequency (MHz)	Maximum Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Power density (mW/cm²)	Limit for MPE (mW/cm²)
WLAN 2.4GHz	2412	20.00	0	100	0.02	1.0
WLAN 5GHz	5755	18.0	0	63.1	0.013	1.0
Bluetooth	2441	12.0	0	15.85	0.003	1.0

Note:

1. According to KDB 447498, SAR test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. For 5GHz WLAN, only the worst case will be used for calculating the power density.
3. MPE calculate method

$$\text{Power Density} = EIRP/4\pi R^2$$

Where: EIRP = P+G

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)

➢ **Simultaneous transmission evaluation:**

According to the user manual, this device cannot transmit simultaneously, therefore simultaneous transmission of power density evaluation is not required.

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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2. Identification of the Responsible Testing Location

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

END OF REPORT