



# RF EXPOSURE EVALUATION REPORT

**APPLICANT** : Anker Innovations Limited  
**PRODUCT NAME** : Nebula Mars II  
**MODEL NAME** : D2322  
**BRAND NAME** : Nebula  
**FCC ID** : 2AOKB-D2322  
**STANDARD(S)** : 47CFR 2.1091  
KDB 447498 D01 General RF Exposure Guidance v06  
**ISSUE DATE** : 2018-05-25

Tested by: *Gan Yueming*  
Gan Yueming (Test engineer)

Approved by: *Peng Huarui*  
Peng Huarui (Supervisor)

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Change History		
Issue	Date	Reason for change
1.0	2018-05-25	First edition



# 1. Technical Information

**Note:** Provide by manufacturer.

## 1.1. Applicant and Manufacturer Information

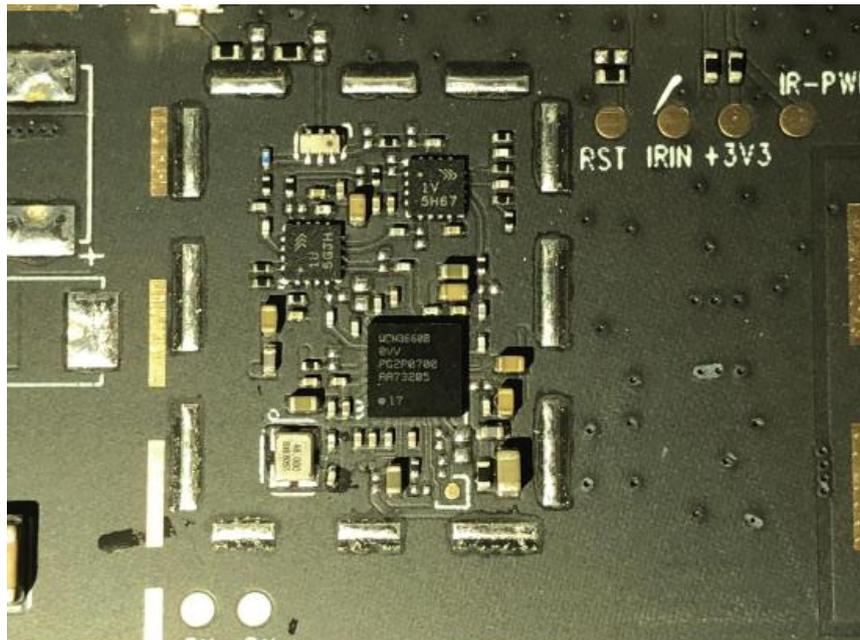
<b>Applicant:</b>	Anker Innovations Limited
<b>Applicant Address:</b>	Room 1318-19,Hollywood Plaza,610 Nathan Road,Mongkok,Kowloon,Hong Kong
<b>Manufacturer:</b>	Anker Innovations Limited
<b>Manufacturer Address:</b>	Room 1318-19,Hollywood Plaza,610 Nathan Road,Mongkok,Kowloon,Hong Kong

## 1.2. Equipment Under Test (EUT) Description

<b>EUT Type:</b>	Nebula Mars II
<b>Hardware Version:</b>	V0.3
<b>Software Version:</b>	NBUI_P2_V1.0.6
<b>Frequency Bands:</b>	802.11b/g/n-20/n-40MHz: 2.412GHz - 2.462GHz; 802.11a/g/n-20/n-40MHz: 5150 MHz ~ 5250 MHz; 802.11a/g/n-20/n-40MHz: 5725 MHz ~ 5850 MHz; Bluetooth 2.1+EDR ,Bluetooth4.0; 2402-2480 MHz;
<b>Modulation Mode:</b>	802.11b :DSSS; 802.11ag/n-20/n-40:OFDM; Bluetooth 2.1+EDR: GFSK/ $\pi$ /4-DQPSK/8-DPSK; Bluetooth4.0: GFSK
<b>Antenna type:</b>	monopole
<b>Antenna Gain:</b>	0 dBi

### 1.3. Photographs of the EUT







### 1.3.1. 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.

<b>EUT Identity</b>	<b>Hardware Version</b>	<b>Software Version</b>
1#	V0.3	NBUI_P2_V1.0.6

## 1.4. Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	<b>47 CFR§2.1091</b>	Radiofrequency Radiation Exposure Evaluation: mobile devices
2	<b>KDB 447498 D01v06</b>	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 <sup>2</sup> )	Averaging time (minutes)
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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. Measurement Of conducted Peak Output Power

#### 1. Bluetooth Average output power

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	11.52	11.92	11.82
	CH 39	2441	12.51	12.63	12.70
	CH 78	2480	12.93	13.29	<b>13.34</b>

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	2.01
	CH 19	2440	<b>2.19</b>
	CH 39	2480	2.08

#### 2. 2.4G WLAN Average output power

	Mode	Channel	Frequency (MHz)	Average power (dBm)
	2.4GHz WLAN	802.11b 1Mbps	CH 1	2412
CH 6			2437	<b>21.81</b>
CH 11			2462	21.59
802.11g 6Mbps		CH 1	2412	18.02
		CH 6	2437	17.77
		CH 11	2462	17.43
802.11n-HT20 MCS0		CH 1	2412	17.86
		CH 6	2437	17.73
		CH 11	2462	17.41
802.11n-HT40 MCS0		CH 3	2422	17.10
		CH 6	2437	17.02
		CH 9	2452	16.86



## 3. 5G WLAN Average output power

	Mode	Channel	Frequency (MHz)	Average power (dBm)
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	8.77
		CH 44	5220	8.40
		CH 48	5240	8.69
	802.11n-HT20 MCS0	CH 36	5180	12.49
		CH 44	5220	12.18
		CH 48	5240	<b>12.51</b>
	802.11n-HT40 MCS0	CH 38	5190	11.89
		CH 46	5230	11.28

	Mode	Channel	Frequency (MHz)	Average power (dBm)
5.8GHz WLAN	802.11a MCS0	CH 149	5745	12.05
		CH 157	5785	13.52
		CH 165	5825	11.71
	802.11n-HT20 MCS0	CH 157	5785	<b>16.29</b>
		CH 165	5825	15.98
	802.11n-HT40 MCS0	CH 151	5755	15.69
		CH 159	5795	16.15



## 4. RF Exposure Evaluation

### Standalone transmission MPE evaluation

Bands	Frequency (MHz)	Antenna Gain (dBi)	Conducted Average Power (dBm)	Time-averaging EIRP (mW)	Power density (mW/cm <sup>2</sup> )	Limit for MPE (mW/cm <sup>2</sup> )
2.4GHz WLAN	2437	0	21.81	151.705	0.030	1.0
5.2GHz WLAN	5240	0	12.51	17.824	0.004	1.0
5.8GHz WLAN	5785	0	16.29	42.560	0.008	1.0
BT2.1+EDR	2480	0	13.34	21.577	0.004	1.0
BLE	2440	0	2.19	1.656	0.000	1.0

#### 1. MPE calculation method

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

Where:  $\text{EIRP} = P \cdot G$

P = Peak out power

G = Antenna gain

R = Separation distance (20cm)



## Annex A General Information

### 1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
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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

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