REPORT No.: SZ22080397S01

RF EXPOSURE EVALUATION REPORT

APPLICANT	:	Anker Innovations Limited
PRODUCT NAME	:	Nebula Capsule 3 Laser
MODEL NAME	:	D2426
BRAND NAME	:	NEBULA
FCC ID	:	2AOKB-D2426
STANDARD(S)	:	47 CFR Part 2(2.1091)
RECEIPT DATE	:	2022-09-06
TEST DATE	:	2022-09-09 to 2022-10-12
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Change History		
Version	**Date**	**Reason for change**
1.0	2022-10-21	First edition

1. Technical Information

Note: Provide by applicant.

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

Product Name:	Nebula Capsule 3 Laser	
Sample No.:	1#	
Hardware Version:	V0.5	
Software Version:	V11.1.16	
Frequency Bands:	Bluetooth	2402MHz-2480MHz
	WLAN 2.4GHz	2412MHz-2462MHz
	WLAN 5GHz	5180MHz-5240MHz
		5260MHz-5320MHz
		5500MHz-5720MHz
		5745MHz-5825MHz
Modulation Mode:	Bluetooth	GFSK(1Mbps), π/4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps)
	WLAN 2.4GHz	DSSS, OFDM
	WLAN 5GHz	OFDM
Antenna Information:	Bluetooth	
	Antenna Type:	Dipole Antenna
	Antenna Gain:	2.45dBi
	WLAN 2.4GHz	
	Antenna Type:	PIFA Antenna
	Antenna Gain:	ANT 1: 1.90dBi; ANT 2: 3.63dBi

Antenna Information:	WLAN 5GHz	
	Antenna Type:	PIFA Antenna
	Antenna Gain:	ANT 1: 4.87dBi; ANT 2: 4.96dBi

1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	**Document Title**	**Method Determination /Remark**
47 CFR 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% confidence intervals.		

2. Device Category and RF Exposure Limit

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

Mobile Devices:

47 CFR 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)
			GFSK
Bluetooth LE (1Mbps)	CH 00	2402	1.52
	CH 19	2440	1.51
	CH 39	2480	1.40
Tune-up Limit			2.00
Bluetooth LE (2Mbps)	CH 00	2402	1.47
	CH 19	2440	1.49
	CH 39	2480	1.55
Tune-up Limit			2.00

Mode	Channel	Frequency (MHz)	Average Power (dBm)		
			GFSK	π/4-DQPSK	8-DPSK
Bluetooth Classic	CH 00	2402	11.00	7.66	8.01
	CH 39	2441	**11.09**	7.85	7.76
	CH 78	2480	10.85	7.61	7.69
Tune-up Limit			11.50	8.00	8.50

2.4GHz WLAN, ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11b	CH 1	2412	17.68	18.50	99.29
	CH 6	2437	18.00		
	CH 11	2462	17.69		
802.11g	CH 1	2412	17.04	17.50	96.54
	CH 6	2437	17.10		
	CH 11	2462	16.93		

2.4GHz WLAN, ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11b	CH 1	2412	17.38	17.50	99.29
	CH 6	2437	17.49		
	CH 11	2462	17.21		
802.11g	CH 1	2412	16.69	17.00	96.54
	CH 6	2437	16.73		
	CH 11	2462	16.68		

2.4GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT20)	CH 1	2412	18.81	19.00	95.87
	CH 6	2437	18.81		
	CH 11	2462	18.75		
802.11n (HT40)	CH 3	2422	18.81	19.50	92.70
	CH 6	2437	**18.98**		
	CH 9	2462	18.92		

5GHz WLAN, ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11a	CH 36	5180	13.70	14.00	96.19
	CH 44	5220	13.84	14.00	
	CH 48	5240	13.89	14.00	
	CH 52	5260	16.51	17.00	
	CH 60	5300	16.59	17.00	
	CH 64	5320	16.77	17.00	
	CH 100	5500	14.72	15.00	
	CH 120	5600	14.69	15.00	
	CH 144	5720	15.93	16.00	
	CH 149	5745	15.79	16.00	
	CH 157	5785	15.84	16.00	
	CH 165	5825	16.07	16.50	

5GHz WLAN, ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11a	CH 36	5180	12.90	13.00	96.19
	CH 44	5220	13.15	13.50	
	CH 48	5240	13.53	14.00	
	CH 52	5260	17.90	18.00	
	CH 60	5300	17.78	18.00	
	CH 64	5320	18.02	18.50	
	CH 100	5500	16.69	17.00	
	CH 120	5600	16.82	17.00	
	CH 144	5720	17.56	18.00	
	CH 149	5745	17.61	18.00	
	CH 157	5785	17.60	18.00	
	CH 165	5825	17.60	18.00	

5GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT20)	CH 36	5180	16.13	16.50	95.94
	CH 44	5220	13.98	14.50	
	CH 48	5240	14.15	14.50	
	CH 52	5260	19.14	19.50	
	CH 60	5300	19.08	19.50	
	CH 64	5320	18.98	19.50	
	CH 100	5500	17.78	18.00	
	CH 120	5600	17.92	18.50	
	CH 144	5720	18.98	19.50	
	CH 149	5745	18.86	19.50	
	CH 157	5785	18.86	19.50	
	CH 165	5825	18.69	19.00	

5GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT40)	CH 38	5190	17.56	18.00	92.31
	CH 46	5230	17.48	18.00	
	CH 54	5270	19.19	19.50	
	CH 62	5310	**19.24**	19.50	
	CH 102	5510	17.63	18.00	
	CH 126	5630	18.39	18.50	
	CH 142	5710	18.92	19.00	
	CH 151	5755	18.75	19.00	
	CH 159	5795	18.57	19.00	

5GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT20)	CH 36	5180	13.62	14.00	95.97
	CH 44	5220	13.80	14.00	
	CH 48	5240	13.98	14.50	
	CH 52	5260	18.92	19.50	
	CH 60	5300	18.86	19.00	
	CH 64	5320	19.08	19.50	
	CH 100	5500	17.63	18.00	
	CH 120	5600	17.63	18.00	
	CH 144	5720	18.57	19.00	
	CH 149	5745	18.51	19.00	
	CH 157	5785	18.33	18.50	
	CH 165	5825	18.33	18.50	

5GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT40)	CH 38	5190	15.56	16.00	92.34
	CH 46	5230	15.44	16.00	
	CH 54	5270	19.14	19.50	
	CH 62	5310	19.24	19.50	
	CH 102	5510	17.63	18.00	
	CH 126	5630	18.33	18.50	
	CH 142	5710	18.92	19.00	
	CH 151	5755	18.81	19.00	
	CH 159	5795	18.63	19.00	

5GHz WLAN, ANT1+ANT2					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT80)	CH 42	5210	19.03	19.50	85.71
	CH 58	5290	19.14	19.50	
	CH 106	5530	17.48	18.00	
	CH 122	5610	17.99	18.50	
	CH 138	5690	18.75	19.00	
	CH 155	5775	18.69	19.00	

Note 1: According to KDB 447498, 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 output power refers to report (Report No.: SZ22080397W01/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/cm²)	Limit for MPE (mW/cm²)
Bluetooth	2441	11.50	2.45	24.83	0.005	1.0
WLAN 2.4GHz	2437	18.50	3.63	163.31	0.033	1.0
WLAN 5GHz	5310	18.50	4.96	221.82	0.044	1.0

➢ **MIMO Transmission Assessment**

Bands	Frequency (MHz)	Tune-up Power(dBm)	Antenna Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm²)	Limit for MPE (mW/cm²)
WLAN 2.4GHz	2437	19.50	3.63	205.59	0.041	1.0
WLAN 5GHz	5310	19.50	4.96	279.25	0.056	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

$$S = PG/4\pi R^2$$

Where: S= Power density (in appropriate units, e.g. mW/cm^2)

P = Time-average maximum tune-up power (in appropriate units, e.g. dBm)

G = numeric gain of the antenna (in appropriate units, e.g. dBi)

R = Separation distance to the centre of radiation of the antenna (20cm)

➢ **Simultaneous Transmission Assessment:**

Multi-Band Simultaneous Transmission Consideration

	Position	Applicable Combination
Simultaneous Transmission Consideration	Hand/Body	WLAN 2.4GHz MIMO
		WLAN 5GHz MIMO
		WLAN 2.4GHz MIMO+ Bluetooth
		WLAN 5GHz MIMO+ Bluetooth

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

Note 2: The black bold applicable combination was the worst condition.

Applicable Combination	Transmission Bands	Power Density (mW/cm²)	Limit (mW/cm²)	Simultaneous Transmission Result
WLAN 5GHz MIMO +Bluetooth	WLAN 5GHz MIMO	0.056	1.0	0.061
	Bluetooth	0.005	1.0	
Note : Formula for result=Power density$_1$/ limit$_1$ + Power density$_2$/ limit$_2$ ≤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.
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
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2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
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.

END OF REPORT