REPORT No.: SZ20070015S01

RF EXPOSURE

EVALUATION REPORT

APPLICANT	:	Anker Innovations Limited
PRODUCT NAME	:	Nebula Solar Portable
MODEL NAME	:	D2131
BRAND NAME	:	NEBULA
FCC ID	:	2AOKB-D2131
STANDARD(S)	:	47CFR 2.1091 KDB 447498
RECEIPT DATE	:	2020-07-01
TEST DATE	:	2020-07-25 to 2020-08-13
ISSUE DATE	:	2020-08-28

Edited by: Peng Mi (Rapporteur)

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MORLAB

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DIRECTORY

Change History		
Version	Date	Reason of changed
1.0	2020-08-28	Original

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 Solar Portable
Serial No.:	(N/A, marked #1 by test site)
Hardware Version:	V0.2
Software Version:	H2_V2.0.1
Frequency Bands:	WLAN 2.4GHz: 2412 MHz ~ 2472 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/ac-VHT20/ac-VHT40/VHT80:OFDM Bluetooth BR+EDR: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK
Antenna Type:	FPC Antenna
Antenna Gain:	Bluetooth: 0dBi WLAN 2.4GHz: ANT L: 0dBi; ANT R: 0dBi WLAN 5GHz: ANT L: 0dBi; ANT R: 0dBi

1.3 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title	Method determination /Remark
1	47 CFR§2.1091	Radio Frequency Radiation Exposure Evaluation: mobile devices	No deviation
2	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

<WLAN 2.4GHz>

ANT L

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	14.05	15.00	99.53
		CH 6	2437	14.13	15.00	
		CH 11	2462	14.30	15.00	
	802.11g 6Mbps	CH 1	2412	14.45	15.00	97.28
		CH 6	2437	14.65	15.00	
		CH 11	2462	14.61	15.00	
	802.11n-HT20 MCS0	CH 1	2412	14.25	15.00	97.01
		CH 6	2437	14.60	15.00	
		CH 11	2462	14.54	15.00	

ANT R

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	14.91	16.00	99.53
		CH 6	2437	14.81	16.00	
		CH 11	2462	15.05	16.00	
	802.11g 6Mbps	CH 1	2412	15.06	16.00	97.28
		CH 6	2437	15.35	16.00	
		CH 11	2462	**15.49**	16.00	
	802.11n-HT20 MCS0	CH 1	2412	14.98	16.00	97.01
		CH 6	2437	15.14	16.00	
		CH 11	2462	15.34	16.00	

ANT L+ANT R

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	CH 1	2412	17.63	18.00	97.01
		CH 6	2437	17.85	18.00	
		CH 11	2462	**17.99**	18.00	

<WLAN 5GHz> ANT L

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	16.16	16.50	97.22
		CH 44	5220	16.11	16.50	
		CH 48	5240	16.13	16.50	
	802.11n-HT20 MCS0	CH 36	5180	16.08	16.50	97.04
		CH 44	5220	15.89	16.50	
		CH 48	5240	15.89	16.50	
	802.11n-HT40 MCS0	CH 38	5190	15.70	16.50	92.75
		CH 46	5230	15.76	16.50	
	802.11ac-VHT20 MCS0	CH 36	5180	16.01	16.50	97.06
		CH 44	5220	16.09	16.50	
		CH 48	5240	16.06	16.50	
	802.11ac-VHT40 MCS0	CH 38	5190	15.66	16.50	92.96
		CH 46	5230	15.71	16.50	
	802.11ac-VHT80 MCS0	CH 42	5210	15.00	16.50	88.89

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	CH 149	5745	14.37	15.00	97.22
		CH 157	5785	13.57	15.00	
		CH 165	5825	13.49	15.00	
	802.11n-HT20 MCS0	CH 149	5745	13.98	15.00	97.04
		CH 157	5785	13.68	15.00	
		CH 165	5825	13.61	15.00	
	802.11n-HT40 MCS0	CH 151	5755	14.74	15.00	92.75
		CH 159	5795	14.29	15.00	
	802.11ac-VHT20 MCS0	CH 149	5745	14.14	15.00	97.06
		CH 157	5785	13.65	15.00	
		CH 165	5825	13.44	15.00	
	802.11ac-VHT40 MCS0	CH 151	5755	14.79	15.00	92.96
		CH 159	5795	14.28	15.00	
	802.11ac-VHT80 MCS0	CH 155	5775	13.79	15.00	88.89

ANT R

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	16.31	17.00	97.22
		CH 44	5220	16.27	17.00	
		CH 48	5240	**16.33**	17.00	
	802.11n-HT20 MCS0	CH 36	5180	16.26	17.00	97.04
		CH 44	5220	16.15	17.00	
		CH 48	5240	16.29	17.00	
	802.11n-HT40 MCS0	CH 38	5190	15.69	17.00	92.75
		CH 46	5230	15.72	17.00	
	802.11ac-VHT20 MCS0	CH 36	5180	16.24	17.00	97.06
		CH 44	5220	16.20	17.00	
		CH 48	5240	16.46	17.00	
	802.11ac-VHT40 MCS0	CH 38	5190	15.80	17.00	92.96
		CH 46	5230	15.84	17.00	
	802.11ac-VHT80 MCS0	CH 42	5210	15.16	17.00	88.89

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	CH 149	5745	14.36	15.00	97.22
		CH 157	5785	14.01	15.00	
		CH 165	5825	13.73	15.00	
	802.11n-HT20 MCS0	CH 149	5745	14.21	15.00	97.04
		CH 157	5785	13.77	15.00	
		CH 165	5825	13.62	15.00	
	802.11n-HT40 MCS0	CH 151	5755	14.88	15.00	92.75
		CH 159	5795	14.36	15.00	
	802.11ac-VHT20 MCS0	CH 149	5745	14.08	15.00	97.06
		CH 157	5785	13.88	15.00	
		CH 165	5825	13.60	15.00	
	802.11ac-VHT40 MCS0	CH 151	5755	14.87	15.00	92.96
		CH 159	5795	14.41	15.00	
	802.11ac-VHT80 MCS0	CH 155	5775	13.82	15.00	88.89

ANT L+ANT R

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.2GHz WLAN	802.11n-HT20 MCS0	CH 36	5180	19.19	20.00	97.02
		CH 40	5200	19.03	20.00	
		CH 48	5240	19.08	20.00	
	802.11n-HT40 MCS0	CH 38	5190	18.69	20.00	93.02
		CH 46	5230	18.75	20.00	
	802.11ac-VHT20 MCS0	CH 36	5180	19.14	20.00	96.76
		CH 40	5200	19.14	20.00	
		CH 48	5240	**19.29**	20.00	
	802.11ac-VHT40 MCS0	CH 38	5190	18.75	20.00	93.64
		CH 46	5230	18.81	20.00	
	802.11ac-VHT80 MCS0	CH 42	5210	18.06	20.00	88.52

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.8GHz WLAN	802.11n-HT20 MCS0	CH 149	5745	17.08	18.00	97.02
		CH 157	5785	16.72	18.00	
		CH 165	5825	16.63	18.00	
	802.11n-HT40 MCS0	CH 151	5755	17.85	18.00	93.02
		CH 159	5795	17.32	18.00	
	802.11ac-VHT20 MCS0	CH 149	5745	17.16	18.00	96.76
		CH 157	5785	16.81	18.00	
		CH 165	5825	16.53	18.00	
	802.11ac-VHT40 MCS0	CH 151	5755	17.85	18.00	93.64
		CH 159	5795	17.32	18.00	
	802.11ac-VHT80 MCS0	CH 155	5775	16.81	18.00	88.52

<Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
Bluetooth LE	CH 00	2402	5.85
	CH 19	2440	6.63
	CH 39	2480	6.16
Tune-up Limit			7.0

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
Bluetooth classic	CH 00	2402	7.34	2.73	2.75
	CH 39	2441	**7.64**	3.54	3.45
	CH 78	2480	6.86	2.50	2.83
Tune-up Limit			8.00	4.00	4.00

Note 1: According to KDB 447498 Section 4.3, MPE evaluation is 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.

Note 2: The output power refers to report (Report No.: SZ20070015W01/W02/W03/W04).

4. RF Exposure Evaluation

➢ **Standalone Transmission Evaluation:**

<Standalone Antenna Transmission Assessment>

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	2462	16.00	0	39.81	0.008	1.0
WLAN 5GHz	5240	17.00	0	50.12	0.010	1.0
Bluetooth	2441	8.00	0	6.31	0.001	1.0

<MIMO Transmission Assessment>

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	2462	17.00	0	50.12	0.010	1.0
WLAN 5GHz	5240	20.00	0	100.00	0.020	1.0

Note:

1. The WLAN 2.4G, WLAN 5G and Bluetooth transmitter share the same antenna, Therefore simultaneous transmission assessment is not required.
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, both the WLAN and Bluetooth transmitters in the device cannot operate simultaneously, therefore simultaneous transmission analysis is not required.

➢ **Conclusion:**

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

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
Telephone:	+86 755 36698555
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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

3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

END OF REPORT