Maximum Permissible Exposure Evaluation

FCC ID: 2AVDG-80012

1. Client Information

Applicant	:	Shenzhen Snapmaker Technologies Co., Ltd.
Address	:	5F, Honglai Kechuang Building 13, Pingshan 1st Road, Nanshan District, Shenzhen, China
Manufacturer	:	Shenzhen Snapmaker Technologies Co., Ltd.
Address	:	5F, Honglai Kechuang Building 13, Pingshan 1st Road, Nanshan District, Shenzhen, China

2. General Description of EUT

EUT Name	:	Snapmaker Modular 3D Printer	
Model(s) No.	:	80012, 80013, 80014, 80015, 80016, 80017	
Model Difference	:	All these models are identical in the same PCB, layout and electrical circuit, the only difference is sizes.	
Product Description	:	Operation Frequency:	Bluetooth V4.2: 2402~2480 MHz
		Number of Channel:	Bluetooth: 79 Channels
		RF Output Power:	Laser Camera: 4.646dBm(8-DPSK)
		Modulation Type:	GFSK (1 Mbps) π/4-DQPSK (2 Mbps) 8-DPSK (3 Mbps)
		Antenna Gain:	1.38dBi FPC Antenna provided by the applicant.
Power Rating	:	Power Module(SM3DP005): Input: AC 100-240V, 50/60Hz, 4A. Output: DC 24V, 13.4A, 320W	
Software Version	:	SM2_TP_V1.0	
Hardware Version	:	SM2_5inch_V1.0	
Remark	:	The adapter and antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.	
Note: More information about the RF function, please refer the RF test reports. The EUT has a control screen with 802.11a/b/g/n and Bluetooth, about the control screen RF Exposure please see the SAR report.			

MPE Calculations for WIFI

1. **Antenna Gain:**
   FPC Antenna: 1.38dBi.

2. **EUT Operation Condition:**
   Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. **Exposure Evaluation:**
   Equation from page 18 of OET Bulletin 65, Edition 97-01
   $S=(PG)/4\pi R^2$
   Where
   S: power density
   P: power input to the antenna
   G: power gain of the antenna in the direction of interest relative to an isotropic radiator.
   R: distance to the center of radiation of the antenna

4. **Test Result:**

Worst Maximum MPE Result								
Mode	N_{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/cm^2) [S]
GFSK	1	2402	-4.773	-4±1	-3	1.38	20	0.00009
		2441	-3.413	-3±1	-2	1.38	20	0.00012
		2480	-2.963	-3±1	-2	1.38	20	0.00014
π/4-DQPSK	1	2402	-4.305	-4±1	-3	1.38	20	0.00014
		2441	-2.839	-2±1	-1	1.38	20	0.00022
		2480	-2.623	-2±1	-1	1.38	20	0.00022
8-DPSK	1	2402	3.182	3±1	4	1.38	20	0.00069
		2441	4.646	4±1	5	1.38	20	0.00086
		2480	4.139	4±1	5	1.38	20	0.00086

Note:
(1) N_{TX}= Number of Transmit Antennas
(2) RF Output power specifies that Maximum Conducted Peak Output Power.

5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/cm^2)
300-1,500	F/1500
1,500-100,000	1.0

For Bluetooth:2402~2480 MHz
MPE limit S: 1mW/ cm^2
The MPE is calculated as ***0.0086mW / cm^2 < limit 1mW / cm^2***. So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b).

The RF Exposure Information page from the manual is included here for reference.

Note

For a more detailed features description, please refer to the RF Test Report.

-----END OF REPORT-----