RF EXPOSURE EVALUATION METHOD

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

EUT Specification

EUT	POLAR 3D PRINTER
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.150GHz ~ 5.250GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☐ Others
Device category	☒ Portable (<20cm separation) ☐ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm2) ☒ General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	7.85dBm (0.006W)
Antenna gain (Max)	0 dBi
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm2)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

transmission formula: Pd=(Pout*G)\(4*pi*R^2)

Where

Pd= Power density in mW/cm^2

Pout=output power to antenna in mW

G= gain of antenna in linear scale

Pi=3.1415

R= distance between observation point and center of the radiator in cm

Pd the limit of MPE, 1mW/cm2. If we know the maximum gain of the antenna and

total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,where
f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Measurement Result

Maximum measured transmitter power.

Test Channe	Frequency	Maximum Conducted Output Power(AVG)	Max. Tune up Power(AVG)	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)
802.11b				
CH01	2412	7.85	8.00	30
CH06	2437	7.46	8.00	30
CH11	2462	7.78	8.00	30
802.11g				
CH01	2412	7.45	8.00	30
CH06	2437	7.36	8.00	30
CH11	2462	7.47	8.00	30
802.11n(HT20)				
CH01	2412	6.87	7.00	30
CH06	2437	6.55	7.00	30
CH11	2462	6.38	7.00	30

Remark: The best case gain of the antenna is 0dBi.
0 dBi logarithmic terms convert to numeric result is nearly 1

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] • [√f(GHz)]

802.11b/g TX Mode					
Mode	[(max. power of channel, including tune-up tolerance, mW)	(min. test separation distance,mm)]	[√ f(GHz)]	Result	Limit
CH1	6.31	5	√ 2.412	1.960	3
CH6	6.31	5	√ 2.437	1.970	3
CH11	6.31	5	√ 2.462	1.980	3

802.11n(H20) TX Mode					
Mode	[(max. power of channel, including tune-up tolerance, mW)	(min. test separation distance,mm)]	[√ f(GHz)]	Result	Limit
CH1	5.01	5	√ 2.412	1.556	3
CH6	5.01	5	√ 2.437	1.564	3
CH11	5.01	5	√ 2.462	1.572	3

The test Result is less than 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR.

Conclusion: No SAR is required.