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RF Exposure Evaluation Report

Report No. : CQASZ20190700037EX-03
Applicant: Zhejiang Xunshi Technology Co., Ltd
Address of Applicant: 4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China
Manufacturer: Zhejiang Xunshi Technology Co., Ltd
Address of Manufacturer: 4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China
Equipment Under Test (EUT):
Product: Pro 3D Printer
All Model No.: SPR1902A, SPR1906A
Test Model No.: SPR1902A
Brand Name: SprintRay
FCC ID: 2AUE5-SPRPRO
Standards: 47 CFR Part 1.1307
47 CFR Part 2.1093
KDB447498D01 General RF Exposure Guidance v06
Date of Test: Aug. 30, 2019
Test Result : **PASS***

Tested By:

Tom Chen

(Tom Chen)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai

(Jack Ai)



* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190700037EX-03	Rev.01	Initial report	Aug. 30, 2019

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3 General Information

3.1 Client Information

Applicant:	Zhejiang Xunshi Technology Co., Ltd
Address of Applicant:	4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China
Manufacturer:	Zhejiang Xunshi Technology Co., Ltd
Address of Manufacturer:	4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China

3.2 General Description of EUT

Product Name:	Pro 3D Printer
All Model No.:	SPR1902A, SPR1906A
Test Model No.:	SPR1902A
Trade Mark:	SprintRay
Hardware Version:	V 04.0419
Software Version:	V1.0
2.4Gwifi	
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(H40): 2422MHz~2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM IEEE for 802.11n(HT20): OFDM IEEE for 802.11n(HT40): OFDM
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Antenna Type	IPEX Antenna
Antenna Gain	2dBi
Power Supply:	AC 110V 60Hz

5Gwifi	
Operation Frequency:	5180 ~ 5240 MHz, 5745 ~ 5825 MHz
Channel Numbers:	5180 ~ 5240 MHz: 4 for 802.11a, 802.11n, 802.11ac 2 for 802.11n40 , 802.11ac 40 5745 ~ 5825 MHz: 5 for 802.11a, 802.11n , 802.11ac 2 for 802.11n40, 802.11ac40
Type of Modulation:	IEEE 802.11a/IEEE 802.11n/IEEE 802.11ac: OFDM
Channel Spacing:	IEEE 802.11a/n20/ac20: 20 MHz IEEE 802.11n40/ac40: 40 MHz

Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Antenna Type:	IPEX Antenna
Antenna Gain:	2dBi
Power Supply:	AC 110V 60Hz

Note:

There are many products, Only SPR1902A the model was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

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)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(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

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure Evaluation

Antenna Gain: 2.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.41 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

1) For 2.4Gwifi

802.11b				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	17.09	17	17	50.119
Middle(2442MHz)	17.07	17	17	50.119
Highest(2462MHz)	16.66	17	17	50.119
802.11g				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	18.33	18	18	63.096
Middle(2442MHz)	18.15	18	18	63.096
Highest(2462MHz)	18.17	18	18	63.096
802.11n20				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	18.13	18	18	63.096
Middle(2442MHz)	18.45	18	18	63.096
Highest(2462MHz)	17.92	18	18	63.096
802.11n40				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	17.23	17	17	50.119
Middle(2442MHz)	17.54	17	17	50.119
Highest(2452MHz)	17.73	17	17	50.119

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
69.984	2.0	0.0221	1.0	PASS

Note: 1) Refer to report No. CQASZ20190700037EX-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (69.984 * 1.585) / (4 * 3.1416 * 20^2) = 0.0221$

2) For 5Gwifi

802.11 A				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180 MHz	6.273	6	6	3.981
5200 MHz	5.772	6	6	3.981
5240 MHz	4.484	6	6	3.981
5745 MHz	8.591	9	9	7.943
5785 MHz	8.978	9	9	7.943
5825 MHz	8.990	9	9	7.943

802.11 N20				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180 MHz	5.562	6	6	3.981
5200 MHz	4.932	6	6	3.981
5240 MHz	3.854	6	6	3.981
5745 MHz	7.461	9	9	7.943
5785 MHz	7.934	9	9	7.943
5825 MHz	7.811	9	9	7.943

802.11 N40				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5190 MHz	4.979	5	5	3.162
5230 MHz	4.023	5	5	3.162
5755 MHz	7.744	8	8	6.310
5795 MHz	7.926	8	8	6.310

802.11 AC20				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180 MHz	5.374	6	6	3.981
5200 MHz	4.323	6	6	3.981

5240 MHz	3.684	6	6	3.981
5745 MHz	7.155	9	9	7.943
5785 MHz	7.897	9	9	7.943
5825 MHz	7.784	9	9	7.943

802.11 AC40				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5190 MHz	4.752	5	5	3.162
5230 MHz	3.931	5	5	3.162
5755 MHz	7.374	8	8	6.310
5795 MHz	7.585	8	8	6.310

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
7.925	2.0	0.0025	1.0	PASS

Note: 1) Refer to report No. CQASZ20190700037EX-02 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout * G) / (4 * \pi * R^2) = (7.925 * 1.585) / (4 * 3.1416 * 20^2) = 0.0025$