1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant:	Mapleprint Inc
Address of applicant:	140 58TH STREET BLDG A DOCK 4A BROOKLYN, NY 11220 United states
Manufacturer:	Xiamen Hanin Electronic Technology Co.,Ltd.
Address of manufacturer:	Room 305A, Angye Building, Pioneering Park,Torch High-tech,Zone,Xiamen

General Description of EUT:

Product Name:	FT800 Thermal Printer
Trade Name	POLONO
Model No.:	FT800
Adding Model(s):	/
Rated Voltage:	DC 14V
Power Adapter:	AP091G-140300 Input: AC100-240V 50/60Hz 1.5A Output:DC14.0V3.0A
FCC ID:	2A4KN-FT800
Equipment Type:	Mobile device

Technical Characteristics of EUT:

Bluetooth

Bluetooth Version:	V4.0 (BLE mode)	V4.0 (BR/EDR mode)
Frequency Range:	2402-2480MHz	2402-2480MHz
RF Output Power:	3.23dBm (Conducted)	3.43dBm (Conducted)
Data Rate:	1Mbps	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK	GFSK, π/4 DQPSK, 8DPSK
Quantity of Channels:	40	79
Channel Separation:	2MHz	1MHz
Type of Antenna:	PCB Antenna	PCB Antenna
Antenna Gain:	2.69dBi	2.69dBi

Wi-Fi

Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20)
RF Output Power:	15.84dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Quantity of Channels:	11 for 802.11b/g/n(HT20)
Channel Separation:	5MHz
Type of Antenna:	FPC Antenna
Antenna Gain:	4.58dBi

NFC

Support Standards:	NFC
Frequency Range:	13.56MHz
Max. Field Strength:	65.12dBuV/m (at 3m)
Antenna Type:	PCB Antenna
Antenna Gain	0dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A):The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2
1.34-30	3,450 R^2/f^2

30-300	3.83 R^2
300-1,500	0.0128 R^2f
1,500-100,000	19.2R^2

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).

(B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}}+\sum_{j=1}^{b}\frac{ERP_j}{ERP_{th,j}}+\sum_{k=1}^{c}\frac{Evaluated_k}{Exposure\ Limit_k}\leq 1$$

1.3 Calculated Result

Radio Access Technology	Min. Frequency	Max. Output Power	Max. Tune-Up Output Power	Antenna Gain	Duty Cycle	Tune-Up EIRP
	(MHz)	(dBm)	(dBm)	(dBi)	(%)	(dBm)
Bluetooth	2402	3.43	4.0	2.69	100	6.69
Wi-Fi	2412	15.84	16.0	4.58	100	20.58
NFC	13.56	-30.14	/	0.00	/	/

Frequency	Option	Min. Distance	Tune-Up ERP		Exposure Limit	Ratio	Result
(MHz)		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2402	C	20.00	4.54	2.84	768.00	0.001	Pass
2412	C	20.00	18.43	69.66	768.00	0.090	Pass
13.56	C	20.00	-30.00	0.001	750.52	0.001	Pass

Note: 1. ERP=EIRP-2.15dB; EIRP= Output Power + Antenna gain

2. Option A, B and C refers as clause 1.2.

3. For option B, Pth(mW) convert to Exposure Limit(mW); For option C, ERP(W) convert to Exposure Limit(mW).

4. Ratio= Tune-Up ERP(mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Ratio 3	Simultaneous Ratio	Limit	Result
						Pass/Fail
Bluetooth+ Wi-Fi+ NFC	0.001	0.090	0.001	0.092	1	Pass

Result: Pass