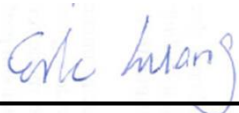


# RF Exposure Evaluation Report

APPLICANT : Zebra Technologies Corporation  
EQUIPMENT : Hub  
BRAND NAME : ZEBRA  
MODEL NAME : MPACT-HUBFXD  
FCC ID : UZ7MPACTHUBFXD  
STANDARD : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Deputy Manager



Approved by: Jones Tsai / Manager



## SPORTON INTERNATIONAL INC.

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)



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**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA692215	Rev. 01	Initial issue of report	Dec. 07, 2016

## 1. Administration Data

### 1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Zebra Technologies Corporation
Address	1 Zebra Plaza, Holtsville, NY 11742

Manufacturer	
Company Name	Zebra Technologies Corporation
Address	1 Zebra Plaza, Holtsville, NY 11742

## 2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Hub
Brand Name	ZEBRA
Model Name	MPACT-HUBFXD
FCC ID	UZ7MPACTHUBFXD
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· 802.11a/b/g/n HT20 · Bluetooth LE
Wifi Code version	6.0.109.9
Wifi Tools version	9.0.0.341360
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

### **3. Maximum RF average output power among production units**

Band / Mode	Average Power (dBm)
	LE
Bluetooth	0

Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)					
		Ant 1			Ant 2		
		11b	11g	HT20	11b	11g	HT20
2.4GHz Band	2412	<b>19</b>	12.5	12.5	<b>19</b>	12.5	12.5
	2437	19	19	19	19	19	19
	2462	19	11.5	11.5	19	11.5	11.5

Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)			
		Ant 1		Ant 2	
		11a	HT20	11a	HT20
5.2GHz Band	5180	15	15	15	15
	5200	15	15	15	15
	5220	16.5	16.5	16.5	16.5
	5240	16.5	16.5	16.5	16.5
5.3GHz Band	5260	16.5	16.5	16.5	16.5
	5280	16.5	16.5	16.5	16.5
	5300	16.5	16.5	16.5	16.5
	5320	16	16	16	16
5.5GHz Band	5500	16	15	16	15
	5580	<b>16.5</b>	16.5	<b>16.5</b>	16.5
	5660	12.5	12.5	12.5	12.5
	5700	12.5	12.5	12.5	12.5
5.8GHz Band	5745	15.5	14	15.5	14
	5785	15.5	14	15.5	14
	5825	15.5	14	15.5	14



#### **4. RF Exposure Limit Introduction**

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



## **5. Radio Frequency Radiation Exposure Evaluation**

### **5.1. Standalone Power Density Calculation**

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
2.4GHz WLAN Ant 1	2412.0	1.10	19.00	20.100	0.102	102.329	0.020	1.000	0.020
2.4GHz WLAN Ant 2	2412.0	1.10	19.00	20.100	0.102	102.329	0.020	1.000	0.020
5GHz WLAN Ant 1	5220.0	3.60	16.50	20.100	0.102	102.329	0.020	1.000	0.020
5GHz WLAN Ant 2	5220.0	3.60	16.50	20.100	0.102	102.329	0.020	1.000	0.020
Bluetooth	2402.0	2.60	0.00	2.600	0.002	1.820	0.000	1.000	0.0004

**Note:** For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band

### **5.2. Collocated Power Density Calculation**

Maximum WLAN Power Density / Limit	Bluetooth Power Density / Limit	$\Sigma$ (Power Density / Limit) of WLAN+Bluetooth
0.020	0.0004	0.0204

**Note:**

1. Bluetooth can transmit simultaneously with WLAN Ant 1 or WLAN Ant 2, however WLAN Ant 1 cannot transmit simultaneously with WLAN Ant 2.
2.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN + Bluetooth.
3. Considering the WLAN module collocation with the Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant

## **Conclusion:**

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.