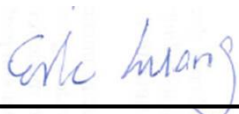


# RF Exposure Evaluation Report

APPLICANT : Nimbostratus LLC  
EQUIPMENT : Digital Media Receiver  
MODEL NAME : ZE39KL  
FCC ID : 2AHUF-6294  
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 / 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.)



## **Table of Contents**

<b>1. ADMINISTRATION DATA .....</b>	<b>4</b>
1.1. Testing Laboratory .....	4
<b>2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....</b>	<b>4</b>
<b>3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS .....</b>	<b>5</b>
<b>4. RF EXPOSURE LIMIT INTRODUCTION .....</b>	<b>6</b>
<b>5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION .....</b>	<b>7</b>
5.1. Standalone Power Density Calculation .....	7
5.2. Collocated Power Density Calculation.....	7



**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA693034-02	Rev. 01	Initial issue of report	May 12, 2017



## **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	Nimbostratus LLC
Address	945 Concord St. Framingham, MA 01701

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

Product Feature & Specification	
EUT Type	Digital Media Receiver
Model Name	ZE39KL
FCC ID	2AHUF-6294
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz Zigbee: 2405 MHz ~ 2480 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE Zigbee: BPSK

**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)
Zigbee	19.0

Band / Mode	Average Power (dBm)			
	BR / EDR			LE
	1M	2M	3M	GFSK
Bluetooth	12.0	9.5	9.5	7.5

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)							
			Ant 1			Ant 2			Ant 1+2	
			11b	11g	HT20	11b	11g	HT20	11g	HT20
2.4GHz WLAN	Ch 1	2412	18.5	17.0	15.5	18.5	19.0	19.0	18.0	16.0
	Ch 6	2437	<b>20.0</b>	19.5	19.5	<b>20.0</b>	20.0	20.0	22.0	21.5
	Ch 11	2462	19.0	18.0	17.5	16.5	18.5	18.0	20.0	19.0
	Ch 12	2467	15.5	17.0	16.0	15.5	17.5	17.0	17.0	16.5
	Ch 13	2472	12.5	14.5	14.5	10.5	15.5	15.5	15.0	15.5

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)											
			Ant 1						Ant 2					
			11a	HT20	HT40	VHT20	VHT40	VHT80	11a	HT20	HT40	VHT20	VHT40	VHT80
5.2GHz WLAN	Ch 36	5180	17.5	17.5		17.5			16.0	16.0		16.0		
	Ch 38	5190			13.5		13.0				12.0		12.0	
	Ch 42	5210						12.5						11.5
	Ch 44	5220	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 46	5230			19.0		19.0				17.5		17.5	
	Ch 48	5240	20.0	20.0		20.0			20.0	20.0		20.0		
5.8GHz WLAN	Ch 149	5745	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 151	5755			20.0		20.0				20.0		20.0	
	Ch 155	5775						20.0						17.5
	Ch 157	5785	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 159	5795			20.0		20.0				20.0		20.0	
	Ch 165	5825	20.0	20.0		20.0			20.0	20.0		20.0		

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)						
			Ant 1 + 2						
			11a	HT20	HT40	VHT20	VHT40	VHT80	
5.2GHz WLAN	Ch 36	5180	19.5	19.5		19.5			
	Ch 38	5190			14.5		14.5		
	Ch 42	5210						13.5	
	Ch 44	5220	<b>22.5</b>	22.5		22.5			
	Ch 46	5230			20.5		20.5		
	Ch 48	5240	22.5	22.5		22.5			
5.8GHz WLAN	Ch 149	5745	22.0	23.0		23.0			
	Ch 151	5755			<b>23.0</b>		23.0		
	Ch 155	5775						20.5	
	Ch 157	5785	22.0	22.5		22.0			
	Ch 159	5795			22.0		22.0		
	Ch 165	5825	22.0	22.0		22.0			



#### **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	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
Zigbee	4.90	19.0	23.900	0.245	245.471	0.049	1.000	0.049
Bluetooth	3.20	12.0	15.200	0.033	33.113	0.007	1.000	0.007
2.4GHz WLAN Ant 1	4.80	20.0	24.800	0.302	301.995	0.060	1.000	0.060
2.4GHz WLAN Ant 2	4.10	20.0	24.100	0.257	257.040	0.051	1.000	0.051
2.4GHz WLAN Ant 1+2	4.80	22.0	26.800	0.479	478.630	0.095	1.000	0.095
5.2GHz WLAN Ant 1	3.50	20.0	23.500	0.224	223.872	0.045	1.000	0.045
5.2GHz WLAN Ant 2	4.20	20.0	24.200	0.263	263.027	0.052	1.000	0.052
5.2GHz WLAN Ant 1+2	4.20	22.5	26.700	0.468	467.735	0.093	1.000	0.093
5.8GHz WLAN Ant 1	5.30	20.0	25.300	0.339	338.844	0.067	1.000	0.067
5.8GHz WLAN Ant 2	5.50	20.0	25.500	0.355	354.813	0.071	1.000	0.071
5.8GHz WLAN Ant 1+2	5.50	23.0	28.500	0.708	707.946	0.141	1.000	0.141

**Note:**

1. Only 5GHz WLAN and Bluetooth can transmit simultaneously.

### 5.2. Collocated Power Density Calculation

Maximum 5GHz WLAN Power Density / Limit	Maximum Bluetooth Power Density / Limit	$\Sigma$ (Power Density / Limit) of 5GHz WLAN + Bluetooth
0.141	0.007	0.148

**Note:**

1.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for 5GHz WLAN + Bluetooth.
2. Considering the 5GHz 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.