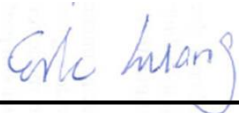


# RF Exposure Evaluation Report

APPLICANT : Nimbocumulous LLC  
EQUIPMENT : Digital Media Receiver  
MODEL NAME : QX91KB  
                  QX91KA  
FCC ID : 2AHUD-3819  
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>8</b>
<b>5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION .....</b>	<b>9</b>
5.1. Standalone Power Density Calculation .....	9
5.2. Collocated Power Density Calculation.....	9



**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA741112-01	Rev. 01	Initial issue of report	Jun. 04, 2018



## **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	Nimbocumulous LLC
Address	15 Constitution Drive. 1st Floor Bedford, New Hampshire 03110

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

Product Feature & Specification	
EUT Type	Digital Media Receiver
Model Name	QX91KB QX91KA
FCC ID	2AHUD-3819
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80

**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**

2.4GHz WLAN ANT 1	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11b	CH 1	2412	1Mbps	21.00
		CH 6	2437		21.00
		CH 11	2462		20.00
	802.11g	CH 1	2412	6Mbps	15.50
		CH 6	2437		21.00
		CH 11	2462		15.50
	802.11n-HT20	CH 1	2412	MCS0	14.50
		CH 6	2437		21.00
		CH 11	2462		15.50

2.4GHz WLAN ANT 2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11b	CH 1	2412	1Mbps	
		CH 6	2437		
		CH 11	2462		
	802.11g	CH 1	2412	6Mbps	14.50
		CH 6	2437		19.50
		CH 11	2462		14.50
	802.11n-HT20	CH 1	2412	MCS0	13.00
		CH 6	2437		19.00
		CH 11	2462		15.00

2.4GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11b	CH 1	2412	1Mbps	
		CH 6	2437		
		CH 11	2462		
	802.11g	CH 1	2412	6Mbps	17.00
		CH 6	2437		21.00
		CH 11	2462		19.00
	802.11n-HT20	CH 1	2412	MCS0	14.00
		CH 6	2437		21.00
		CH 11	2462		17.00



5.2GHz WLAN ANT 1	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 36	5180	6Mbps	19.50
		CH 44	5220		18.00
		CH 48	5240		19.50
	802.11n-HT20	CH 36	5180	MCS0	20.50
		CH 44	5220		18.50
		CH 48	5240		20.00
	802.11n-HT40	CH 38	5190	MCS0	17.00
		CH 46	5230		20.00
	802.11ac-VHT20	CH 36	5180	MCS0	20.50
		CH 44	5220		18.50
		CH 48	5240		19.50
	802.11ac-VHT40	CH 38	5190	MCS0	17.00
		CH 46	5230		20.00
	802.11ac-VHT80	CH 42	5210	MCS0	15.00

5.2GHz WLAN ANT 2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 36	5180	6Mbps	20.50
		CH 44	5220		18.50
		CH 48	5240		21.00
	802.11n-HT20	CH 36	5180	MCS0	21.00
		CH 44	5220		19.00
		CH 48	5240		21.00
	802.11n-HT40	CH 38	5190	MCS0	19.50
		CH 46	5230		21.00
	802.11ac-VHT20	CH 36	5180	MCS0	20.50
		CH 44	5220		19.00
		CH 48	5240		21.00
	802.11ac-VHT40	CH 38	5190	MCS0	19.50
		CH 46	5230		21.00
	802.11ac-VHT80	CH 42	5210	MCS0	17.00

5.2GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 36	5180	6Mbps	18.50
		CH 44	5220		16.50
		CH 48	5240		18.50
	802.11n-HT20	CH 36	5180	MCS0	20.00
		CH 44	5220		17.50
		CH 48	5240		18.50
	802.11n-HT40	CH 38	5190	MCS0	18.50
		CH 46	5230		20.50
	802.11ac-VHT20	CH 36	5180	MCS0	20.00
		CH 44	5220		17.50
		CH 48	5240		18.50
	802.11ac-VHT40	CH 38	5190	MCS0	18.50
		CH 46	5230		20.50
	802.11ac-VHT80	CH 42	5210	MCS0	19.50



5.8GHz WLAN ANT 1	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11ac-VHT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT80	CH 155	5775	MCS0	21.00

5.8GHz WLAN ANT 2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11ac-VHT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT80	CH 155	5775	MCS0	21.00

5.8GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11n-HT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT20	CH 149	5745	MCS0	21.00
		CH 157	5785		21.00
		CH 165	5825		21.00
	802.11ac-VHT40	CH 151	5755	MCS0	21.00
		CH 159	5795		21.00
	802.11ac-VHT80	CH 155	5775	MCS0	21.00



#### **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 ANT1	2412.0	4.20	21.00	25.200	0.331	331.131	0.066	1.000	0.066
2.4GHz WLAN ANT2	2412.0	6.10	19.50	25.600	0.363	363.078	0.072	1.000	0.072
2.4GHz WLAN ANT1+2	2412.0	6.10	21.00	27.100	0.513	512.861	0.102	1.000	0.102
5.2GHz WLAN ANT1	5180.0	4.90	20.50	25.400	0.347	346.737	0.069	1.000	0.069
5.2GHz WLAN ANT2	5180.0	4.40	21.00	25.400	0.347	346.737	0.069	1.000	0.069
5.2GHz WLAN ANT1+2	5180.0	4.90	20.50	25.400	0.347	346.737	0.069	1.000	0.069
5.8GHz WLAN ANT1	5745.0	4.90	21.00	25.900	0.389	389.045	0.077	1.000	0.077
5.8GHz WLAN ANT2	5745.0	3.50	21.00	24.500	0.282	281.838	0.056	1.000	0.056
5.8GHz WLAN ANT1+2	5745.0	4.90	21.00	25.900	0.389	389.045	0.077	1.000	0.077

**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

2.4GHz WLAN Power Density / Limit	5GHz WLAN Power Density / Limit	$\Sigma$ (Power Density / Limit) of 2.4GHz WLAN + 5GHz WLAN
0.102	0.077	0.179

**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 2.4GHz WLAN + 5GHz WLAN
2. Considering the WLAN module 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.