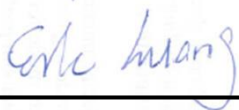


RF Exposure Evaluation Report

APPLICANT : Quill Royal LLC
EQUIPMENT : HDMI Digital Media Receiver
MODEL NAME : DV83YW
FCC ID : 2ADU5-4902
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
FA511534-02	Rev. 01	Initial issue of report	Jun. 10, 2015
FA511534-02	Rev. 02	Additional more channel number in the report	Jul. 06, 2015
FA511534-02	Rev. 03	Re-calculating Power Density results	Jul. 06, 2015
FA511534-02	Rev. 04	Revised the tune-up limit	Jul. 10, 2015

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	Quill Royal LLC
Address	950 Bannock Street, Suite 1100 Boise, Idaho 83702

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	HDMI Digital Media Receiver
Model Name	DV83YW
FCC ID	2ADU5-4902
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 ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	• 802.11 a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 • Bluetooth v3.0+EDR , Bluetooth v4.1-LE
Antenna Type	Fixed Internal Antenna

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

Mode / Band	Average Power (dBm)			
	1Mbps (GFSK)	2Mbps ($\pi/4$ -DQPSK)	3Mbps (8-DPSK)	BT4.1-LE (GFSK)
2.4 GHz Bluetooth	7.50	5.50	5.50	7.50

2.4GHz Channel / Frequency	IEEE 802.11 Average Power (dBm)					
	11b	11g	HT20		HT40	
	SISO	SISO	SISO	MIMO	SISO	MIMO
CH 1 (2412MHz)	19.50	14.00	13.00	15.50		
CH 2 (2417MHz)		17.50	15.50	19.00		
CH 3 (2422MHz)					8.50	12.50
CH 4 (2427MHz)					11.00	13.50
CH 6 (2437MHz)	17.50	21.00	21.00	24.50	14.50	18.00
CH 8 (2447MHz)					11.50	15.50
CH 9 (2452MHz)					11.50	15.00
CH 10 (2457MHz)		16.50	17.00	20.00		
CH 11 (2462MHz)	16.50	14.50	13.50	17.50		

5.2GHz Channel / Frequency	IEEE 802.11 Average Power (dBm)						
	11a	HT20 / VHT20		HT40 / VHT40		VHT80	
	SISO	SISO	MIMO	SISO	MIMO	SISO	MIMO
CH 36 (5180MHz)	17.50	17.50	18.50				
CH 38 (5190MHz)				13.00	16.00		
CH 40 (5200MHz)	19.50	19.50	21.50				
CH 42 (5210MHz)						11.00	11.50
CH 44 (5220MHz)	19.50	19.50	21.50				
CH 46 (5230MHz)				19.50	21.50		
CH 48 (5240MHz)	19.50	19.50	21.50				

5.3GHz Channel / Frequency	IEEE 802.11 Average Power (dBm)						
	11a	HT20 / VHT20		HT40 / VHT40		VHT80	
	SISO	SISO	MIMO	SISO	MIMO	SISO	MIMO
CH 52 (5260MHz)	20.00	20.00	22.00				
CH 54 (5270MHz)				20.00	22.00		
CH 56 (5280MHz)	20.00	20.00	22.00				
CH 58 (5290MHz)						19.00	15.50
CH 60 (5300MHz)	20.00	20.00	22.00				
CH 62 (5310MHz)				14.50	16.00		
CH 64 (5320MHz)	18.00	18.00	20.00				

5.5GHz Channel / Frequency	IEEE 802.11 Average Power (dBm)						
	11a	HT20 / VHT20		HT40 / VHT40		VHT80	
	SISO	SISO	MIMO	SISO	MIMO	SISO	MIMO
CH 100 (5500MHz)	20.00	20.00	21.50				
CH 102 (5510MHz)				14.00	13.50		
CH 104 (5520MHz)	20.00	20.00	21.50				
CH 106 (5530MHz)						12.00	12.50
CH 108 (5540MHz)	20.00	20.00	21.50				
CH 110 (5550MHz)				19.00	21.50		
CH 112 (5560MHz)	20.00	20.00	21.50				
CH 116 (5580MHz)	20.00	20.00	21.50				
CH 118 (5590MHz)				19.00	19.50		
CH 120 (5600MHz)	20.00	20.00	21.50				
CH 122 (5610MHz)						17.50	18.00
CH 124 (5620MHz)	20.00	20.00	21.50				
CH 126 (5630MHz)				19.00	19.50		
CH 128 (5640MHz)	20.00	20.00	21.50				
CH 132 (5660MHz)	20.00	20.00	21.50				
CH 134 (5670MHz)				19.00	19.50		
CH 136 (5680MHz)	20.00	20.00	21.50				
CH 138 (5690MHz)						19.00	21.50
CH 140 (5700MHz)	17.00	17.00	17.50				
CH 142 (5710MHz)				19.00	21.50		
CH 144 (5720MHz)	20.00	20.00	21.50				

5.8GHz Channel / Frequency	IEEE 802.11 Average Power (dBm)						
	11a	HT20 / VHT20		HT40 / VHT40		VHT80	
	SISO	SISO	MIMO	SISO	MIMO	SISO	MIMO
CH 149 (5745MHz)	16.50	15.50	17.00				
CH 151 (5755MHz)				13.50	15.00		
CH 153 (5765MHz)	20.00	20.00	21.50				
CH 155 (5775MHz)						11.50	12.00
CH 157 (5785MHz)	20.00	20.00	21.50				
CH 159 (5795MHz)				19.00	20.00		
CH 161 (5805MHz)	20.00	20.00	21.50				
CH 165 (5825MHz)	19.00	17.50	19.00				

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 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

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 ²)	Limit (mW/cm ²)	Power Density / Limit
2.4GHz WLAN	2412.0	7.41	24.50	31.910	1.552	1552.387	0.309	1.000	0.309
5.2GHz WLAN	5180.0	6.42	21.50	27.920	0.619	619.441	0.123	1.000	0.123
5.3GHz WLAN	5260.0	6.47	22.00	28.470	0.703	703.072	0.140	1.000	0.140
5.5GHz WLAN	5500.0	6.81	21.50	28.310	0.678	677.642	0.135	1.000	0.135
5.8GHz WLAN	5745.0	6.81	21.50	28.310	0.678	677.642	0.135	1.000	0.135
Bluetooth	2402.0	4.10	7.50	11.600	0.014	14.454	0.003	1.000	0.003

Note:

1. For conservativeness, the uplink frequency of each band is used to determine the MPE limit of that band.
2. For WLAN power density calculated, the antenna gain was used directional gain perform calculation and the diertional gain which can be report to DTS / NII test report.

5.2. Collocated Power Density Calculation

WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of WLAN+Bluetooth
0.309	0.003	0.312

Note:

1. For colocation analysis, 2.4GHz WLAN is chosen for summation due to the highest (power density/limit) among all WLAN modes.
2. Σ (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 and 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.