RF Exposure Evaluation Report

APPLICANT	**:**	**Ailen LLC**
EQUIPMENT	**:**	**Digital Media Receiver**
MODEL NAME	**:**	**CL1130**
FCC ID	**:**	**S59-4891**
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

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA332717-02	Rev. 01	Initial issue of report	Aug. 06, 2013

1. Administration Data

1.1. Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978

1.2. Applicant

Company Name	Ailen LLC
Address	P.O. Box 8125, Wilmington, DE 19803

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Digital Media Receiver
Model Name	CL1130
FCC ID	S59-4891
Wireless Technology and Frequency Range	WLAN2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	・802.11a/b/g/n HT20/HT40 ・Bluetooth 2.1+EDR，Bluetooth 3.0+EDR，Bluetooth 4.0
Antenna Type	WLAN: Fixed Internal Antenna Bluetooth: Fixed Internal Antenna
EUT Stage	Production Unit
Remark: 1. 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***

WLAN 2.4GHz	IEEE 802.11 Average Power (dBm)			
	SISO Mode			MIMO Mode
Channel	11b	11g	HT20	HT20
Ch1	16.82	9.66	7.94	9.51
Ch6	16.89	14.94	15.03	18.03
Ch11	16.72	9.24	7.73	10.64

Band	Bluetooth Average power(dBm)			
	1Mbps (GFSK)	2Mbps (π/4-DQPSK)	3Mbps (8-DPSK)	BT4.0-LE
Bluetooth	7.29	7.49	7.57	0.04

WLAN 5GHz	IEEE 802.11 Average Power (dBm)				
	SISO Mode			MIMO Mode	
Channel	11a	HT20	HT40	HT20	HT40
36	14.63	13.80		15.32	
38			9.64		12.76
40	14.82	14.80		15.25	
44	14.86	14.83		15.29	
46			14.97		16.72
48	14.64	14.74		15.41	
149	14.91	14.89		18.07	
151			15.09		17.94
153	14.83	14.73		17.98	
157	15.05	15.00		17.92	
159			15.05		17.90
161	14.90	14.79		17.91	
165	15.00	14.77		17.64	

4. Conducted RF Output Power (Unit: dBm)

<WLAN2.4GHz SISO Mode Conducted Power>

WLAN 2.4GHz 802.11b Average Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate 1Mbps	Channel	2Mbps	5.5Mbps	11Mbps
CH 1	2412	16.82	CH 1	16.76	16.76	16.78
CH 6	2437	16.89				
CH 11	2462	16.72				

WLAN 2.4GHz 802.11g Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 1	2412	9.66	CH 6	14.92	14.93	14.92	11.42	11.44	11.49	11.49
CH 6	2437	14.94								
CH 11	2462	9.24								

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 1	2412	7.94	14.96	15.02	12.31	12.30	12.35	10.99	10.99	14.96
CH 6	2437	15.03								
CH 11	2462	7.73								

<WLAN2.4GHz MIMO Mode Conducted Power>>

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS8	Channel	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
CH 1	2412	9.51	CH 6	18.01	17.97	15.13	15.09	15.08	14.58	14.64
CH 6	2437	18.03								
CH 11	2462	10.64								

<Bluetooth Conducted Power>

Channel	Frequency (MHz)	Average power (dBm)		
		Mode		
		GFSK	π/4-DQPSK	8-DPSK
CH 0	2402	7.29	7.46	7.47
CH 39	2441	7.23	7.43	7.57
CH 78	2480	6.20	6.36	6.34

Channel	Frequency (MHz)	Average power (dBm)
		Mode
		BT v4.0 LE, GFSK
CH 0	2402	0.04
CH 19	2440	-0.24
CH 39	2480	-0.30

<WLAN5GHz SISO Mode Conducted Power>

WLAN 5GHz 802.11a Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps								
CH 36	5180	14.63	CH 44	14.65	14.54	14.82	14.83	14.81	14.82	14.79
CH 40	5200	14.82								
CH 44	5220	14.86								
CH 48	5240	14.64								
CH 149	5745	14.91	CH 157	15.00	14.94	14.84	11.43	11.24	11.27	11.14
CH 153	5765	14.83								
CH 157	5785	15.05								
CH 161	5805	14.90								
CH 165	5825	15.00								

WLAN 5GHz 802.11n-HT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 36	5180	13.80	CH 44	14.66	14.75	14.82	14.81	14.80	14.81	14.79
CH 40	5200	14.80								
CH 44	5220	14.83								
CH 48	5240	14.74								
CH 149	5745	14.89	CH 157	14.95	14.98	12.16	12.16	12.19	11.33	11.32
CH 153	5765	14.73								
CH 157	5785	15.00								
CH 161	5805	14.79								
CH 165	5825	14.77								

WLAN 5GHz 802.11n-HT40 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 38	5190	9.64	CH 46	14.85	14.81	13.87	13.98	13.91	14.04	14.06
CH 46	5230	14.97								
CH 151	5755	15.09	CH 151	14.65	14.69	11.01	11.07	11.11	11.12	11.12
CH 159	5795	15.05								

<WLAN5GHz MIMO Mode Conducted Power>

WLAN 5GHz 802.11n-HT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS8	Channel	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
CH 36	5180	15.32	CH 48	15.34	15.34	15.37	15.38	15.39	15.38	15.39
CH 40	5200	15.25								
CH 44	5220	15.29								
CH 48	5240	15.41								
CH 149	5745	18.07	CH 149	17.91	17.90	15.11	15.18	15.24	14.83	14.81
CH 153	5765	17.98								
CH 157	5785	17.92								
CH 161	5805	17.91								
CH 165	5825	17.64								

WLAN 5GHz 802.11n-HT40 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS8	Channel	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
CH 38	5190	12.76	CH 46	16.71	16.70	15.92	15.79	15.83	15.95	15.87
CH 46	5230	16.72								
CH 151	5755	17.94	CH 151	17.88	17.89	14.20	14.09	14.06	14.08	13.61
CH 159	5795	17.90								

5. 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/f2)	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/f2)	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:

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

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

6. Radio Frequency Radiation Exposure Evaluation

6.1. Standalone Power Density Calculations

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm2)	Limit (mW/cm2)	Power Density / Limit
WLAN2.4GHz 802.11b	2412.0	3.0	16.89	97.50	0.02	1.00	0.02
WLAN2.4GHz 802.11g	2412.0	3.0	14.94	62.23	0.01	1.00	0.01
WLAN2.4GHz 802.11n-HT20	2412.0	3.0	18.03	126.77	0.03	1.00	**0.03**
WLAN2.4GHz Bluetooth	2402.0	1.8	7.57	8.65	0.002	1.00	**0.002**
WLAN5.2GHz 802.11a	5180.0	3.0	14.86	61.09	0.01	1.00	0.01
WLAN5.8GHz 802.11a	5745.0	3.6	15.05	73.28	0.01	1.00	0.01
WLAN5.2GHz 802.11n-HT20	5180.0	3.0	15.41	69.34	0.01	1.00	0.01
WLAN5.8GHz 802.11n-HT20	5745.0	3.6	18.07	146.89	0.03	1.00	**0.03**
WLAN5.2GHz 802.11n-HT40	5190.0	3.0	16.72	93.76	0.02	1.00	0.02
WLAN5.8GHz 802.11n-HT40	5745.0	3.6	17.94	142.56	0.03	1.00	0.03

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band

6.2. Collocated Power Density Calculations

Mode	WLAN Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of WLAN+Bluetooth
WLAN2.4GHz	0.03		0.032
WLAN5GHz	0.03		
Bluetooth		0.002	

Note:

1. ∑(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.

Conclusion:

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