



RF EXPOSURE EVALUATION REPORT

FCC ID : WR92221123114
Equipment : thermostat
Brand Name : ecobee
Model Name : ECB402
Applicant : ecobee Inc.
207 Queens Quay West, Suite 600, Toronto, ON, Canada
Manufacturer : ecobee Inc.
207 Queens Quay West, Suite 600, Toronto, ON, Canada
Standard : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated in accordance with 47 CFR Part 2.1091 for the device and pass the limit.

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Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA911708	Rev. 01	Initial issue of report	Apr. 25, 2019

**1. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Type	thermostat
Brand Name	ecobee
Model Name	ECB402
FCC ID	WR92221123114
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 SRD: 902 MHz ~ 928 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE SRD: 38.4kbps FSK
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.

Reviewed by: Jason Wang

Report Producer: Daisy Peng

2. Maximum RF average output power among production units

Mode / Band	Average Power (dBm)
SRD	20.0

Mode / Band	Average Power (dBm)			
	1Mbps (GFSK)	2Mbps ($\pi/4$ -DQPSK)	3Mbps (8-DPSK)	BT4.0-LE (GFSK)
Bluetooth	12.5	11	11	12.5

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11b	CH 1	2412	21
		CH 6	2437	23
		CH 11	2462	21
	802.11g	CH 1	2412	17
		CH 6	2437	19.5
		CH 11	2462	17
	802.11n-HT20	CH 1	2412	16
		CH 6	2437	19.5
		CH 11	2462	16
	802.11n-HT40	CH 3	2422	13.5
		CH 6	2437	16.5
		CH 9	2452	13.5

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm) _Hotspot					
			ANT0					
			11a	HT20	HT40	VHT20	VHT40	VHT80
5.2GHz WLAN (U-NII-1)	Ch 36	5180	19.5	18.5		18.5		
	Ch 38	5190			15		15	
	Ch 40	5200	19.5	18.5		18.5		
	Ch 42	5210						14
	Ch 44	5220	19.5	18.5		18.5		
	Ch 46	5230			18		18	
	Ch 48	5240	19.5	18.5		18.5		
5.3GHz WLAN (U-NII-2A)	Ch 52	5260	19.5	18.5		18.5		
	Ch 54	5270			17.5		17.5	
	Ch 56	5280	19.5	18.5		18.5		
	Ch 58	5290						17.5
	Ch 60	5300	19.5	18.5		18.5		
	Ch 62	5310			17.5		17.5	
	Ch 64	5320	19.5	18.5		18.5		
5.5GHz WLAN (U-NII-2C)	Ch 100	5500	19.5	18.5		18.5		
	Ch 102	5510			18		18	
	Ch 106	5530						17.5
	Ch 110	5550			18		18	
	Ch 116	5580	19.5	18.5		18.5		
	Ch 122	5610						17.5
	Ch 124	5620	19.5	18.5		18.5		
	Ch 126	5630			18		18	
	Ch 132	5660	19.5	18.5		18.5		
	Ch 134	5670			18		18	
	CH138	5690						17.5
	Ch 140	5700	19.5	18.5		18.5		
	CH142	5710			18		18	
	CH144	5720	19.5	18.5		18.5		
5.8GHz WLAN (U-NII-3)	Ch 149	5745	19.5	18.5		18.5		
	Ch 151	5755			18		18	
	Ch 155	5775						16.5
	Ch 157	5785	19.5	18.5		18.5		
	Ch 159	5795			18		18	
	Ch 165	5825	19.5	18.5		18.5		



3. 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



4. Radio Frequency Radiation Exposure Evaluation

4.1. 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
SRD	902.0	1.50	20.00	21.500	0.141	141.254	0.028	0.601	0.047
2.4GHz WLAN	2412.0	2.20	23.00	25.200	0.331	331.131	0.066	1.000	0.066
5GHz WLAN	5180.0	4.50	19.50	24.000	0.251	251.189	0.050	1.000	0.050
Bluetooth	2402.0	2.00	12.50	14.500	0.028	28.184	0.006	1.000	0.006

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

4.2. Collocated Power Density Calculation

SRD Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of SRD+WLAN+Bluetooth
0.047	0.066	0.006	0.102

Note:

1. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for SRD + WLAN + Bluetooth.
2. Considering the WWAN module collocation with 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 3 collocated transmitters is compliant

Conclusion:

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