




Canada

Exhibit: RF Exposure – FCC

ECB401

Report File #: 7169001943-000

Client	Ecobee Inc	
Product	ECB401	
Standard(s)	FCC Part 15 Subpart 15.247:2015 FCC KDB 447498:2015	

RF Exposure – FCC

The device is intended for use for mobile application and the minimum separation distance from the radiating structure to any part of the body or extremity of a user is greater than 20 cm as stated by the manufacturer during normal operation.

The EUT contains a 902 – 928 MHz FHSS transmitter and a 2400 – 2483.5 MHz DTS transmitter. The Firmware guarantees simultaneous will not occur. Antenna co-location testing is therefore not applicable.

General SAR test exclusion guidance:

As per FCC KDB 447498 Section 4.3.1 b), the SAR Test Exclusion Threshold for 100 MHz to 6 GHz at test separation distances > 50 mm is determined by:

- 1) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·(f_(MHz)/150)]} mW, for 100 MHz to 1500 MHz
- 2) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

Where:

Power allowed at *numeric threshold* for 50 mm in step a) (for 1-g SAR) is given by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] [\sqrt{f_{(\text{GHz})}}] \leq 3.0$$

$$(\text{max power of channel, including tune-up tolerance, mW}) \leq [3.0 / \sqrt{f_{(\text{GHz})}}] * [\text{min. test separation distance, mm}]$$

Where:

f_(GHz) is the RF channel transmit frequency in GHz


(max. power of channel, including tune-up tolerance, mW)

(min. test separation distance, mm)

SAR Calculations: 2412 – 2462 MHz DTS transmitter

Power allowed at *numeric threshold* for 50 mm in step a)

$$(\text{max power of channel, including tune-up tolerance, mW}) \leq [3.0 / \sqrt{f_{(\text{GHz})}}] * [\text{min. test separation distance, mm}]$$

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(max power of channel, including tune-up tolerance, mW) $\leq [3.0 / \sqrt{(2.437 \text{ GHz})}] * [50 \text{ mm}]$

(max power of channel, including tune-up tolerance, mW) $\leq 96.1 \text{ mW}$

Therefore SAR Exclusion for 200 mm test distance is

{[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and $\leq 6 \text{ GHz}$

{[96.1 mW] + [(200 mm – 50 mm) * 10]} mW

{1596} mW

Peak conducted power of DTS transmitter was measured to be 79.98 mW. Therefore, the EUT meets SAR Exclusion Threshold.

SAR Calculations: 902.8 – 927.7 MHz FHSS transmitter

Power allowed at *numeric threshold* for 50 mm in step a)

(max power of channel, including tune-up tolerance, mW) $\leq [3.0 / \sqrt{f_{(\text{GHz})}}] * [\text{min. test separation distance, mm}]$

(max power of channel, including tune-up tolerance, mW) $\leq [3.0 / \sqrt{(0.9028 \text{ GHz})}] * [50 \text{ mm}]$

(max power of channel, including tune-up tolerance, mW) $\leq 157.9 \text{ mW}$

Therefore SAR Exclusion for 200 mm test distance is


{[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·(f_(MHz)/150)]} mW, for 100 MHz to 1500 MHz

{[157.9 mW] + [(200 mm – 50 mm) * (902.8 MHz/150)]} mW

{1061} mW

Peak conducted power of FHSS transmitter was measured to be 117.2 mW. Therefore, the EUT meets SAR Exclusion Threshold.

Page 3 of 4	Report Issued: 3/24/2017	Report File #: 7169001943-000
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Radiofrequency Radiation Exposure Evaluation: Mobile Devices

Portable devices shall be evaluated for RF radiation exposure according to the provisions of FCC §2.1091 and the MPE guidelines identified in FCC §1.1310.

The limits, as defined FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limits for the frequency ranges 300 MHz to 1.5 GHz and 1.5 GHz to 100 GHz was applied. The limits are $f/1500 \text{ mW/cm}^2$ and 1.0 mW/cm^2 respectively

The power density formula is given by:

$$P_d = PG / (4 * \pi * R^2)$$

Where,

P = Peak Antenna Conducted Power in mW

G = Numeric Antenna Gain

$\pi = 3.1416$

R = Separation distance in cm

MPE Calculations: 2412 – 2462 MHz DTS transmitter

The DTS transmitter have a 2 dBi antenna and the maximum peak power is 71.3 mW.

$$P_d = (79.98 \text{ mW} * 1.6) / (4 * 3.1416 * (20\text{cm})^2)$$

$$P_d = 0.025 \text{ mW/cm}^2$$

The device passes the requirement. The calculated power density is 0.025 mW/cm^2 and this is below the 1.0 mW/cm^2 limit.

MPE Calculations: 902.8 – 927.7 MHz FHSS transmitter

The FHSS transmitter have a 1.5 dBi antenna and the maximum peak power is 9.29 mW.

$$P_d = (117.22 \text{ mW} * 1.4) / (4 * 3.1416 * (20\text{cm})^2)$$

$$P_d = 0.033 \text{ mW/cm}^2$$

The device passes the requirement. The calculated power density is 0.033 mW/cm^2 and this is below the $(902.8/1500) = 0.6 \text{ mW/cm}^2$ limit.