



Canada

## EMC & RF Test Report

As per

### RSS-247 Issue 2:2017 & FCC Part 15 Subpart 15.407

Unlicensed Intentional Radiators  
DTS System

on the

**ECB601/ECB501**

**UNII-I Transmitter**

Issued by:

**TÜV SÜD Canada Inc.**  
11 Gordon Collins Dr,  
Gormley, ON, L0H 1G0  
Canada  
Ph: (905) 883-7255

Testing produced for

**ecobee**

Prepared by:

Min Xie,  
Sr. Project Engineer

See Appendix A for full client &  
EUT details.

Reviewed by:

Amir Emami,  
Project Engineer

Innovation, Science and  
Economic Development Canada

Registration #  
6844A-3

Testing Laboratory  
Certificate #2955.02



R-14023, G-20072  
C-14498, T-20060

FEDERAL COMMUNICATIONS  
COMMISSION  
USA  
**FC**

Registration #  
CA6844

Page 1 of 73

Report Issued: 5/3/2022

Report File #: 7169010244RG-001 (UNII-1)

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Table of Contents

Table of Contents .....	2
Report Scope.....	3
Summary .....	4
Test Results Summary .....	5
Notes, Justifications, or Deviations .....	6
Sample Calculation(s) .....	7
Applicable Standards, Specifications and Methods.....	8
Document Revision Status .....	9
Definitions and Acronyms .....	10
Testing Facility .....	11
Calibrations and Accreditations.....	11
Testing Environmental Conditions and Dates .....	12
Detailed Test Results Section .....	13
26 dB Emission Bandwidth & 99% Occupied Bandwidth .....	14
Maximum Conducted Output Power .....	23
Power Spectral Density .....	30
Transmitter Spurious Radiated Emissions .....	38
Power Line Conducted Emissions .....	64
Appendix A – EUT Summary.....	70
Appendix B – EUT and Test Setup Photos.....	73

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Report Scope

This report addresses the EMC verification testing and test results of the **Ecobee Inc.'s** Model: **ECB601/ECB501 (UNII-1 Transmitter)** and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

RSS-247 Issue 2:2017

FCC Part 15 Subpart C 15.407

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Summary

The results contained in this report relate only to the item(s) tested.

EUT:	ECB601/ECB501
FCC Certification #, FCC ID:	WR955470766937
Industry Canada Certification #, IC:	7981A-55470766937
EUT passed all tests performed	Yes
Tests conducted by	Min Xie
Report reviewed by	Amir Emami

For testing dates, see "Testing Environmental Conditions and Dates".

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada
Product	ECB601/ECB501		
Standard(s)			

## Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203 15.407(a)	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS-GEN (Table 6)	Restricted Bands for Intentional Operation	QuasiPeak Peak & Average	Pass
FCC 15.207 RSS-GEN (Table 3)	Power Line Conducted Emissions	QuasiPeak Average	Pass
FCC 15.407(b) RSS-247 6.2.1.2 RSS-GEN (Table 4)	Unwanted Emissions	QuasiPeak Peak & Average	Pass
FCC 15.403(i) RSS-247 6.2.1.2	26 dB Bandwidth	--	Pass
FCC 2.1049 RSS-GEN 6.7	99% Bandwidth	--	Reporting Only
FCC 15.407(a)	Max Output Power	< 250 mW (24 dBm)	Pass
RSS-247 6.2.1.1		e.i.r.p < 200 mW (23 dBm) or $10 + 10\log(B)$	Pass
FCC 15.407(a)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.407(a)	Power Spectral Density	< 11 dBm/MHz	Pass
RSS-247 6.2.1.1	Power Spectral Density	< 10 dBm/MHz	Pass
<b>Overall Result</b>			<b>Pass</b>

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

Client	Ecobee Inc.
Product	ECB601/ECB501
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407



## Notes, Justifications, or Deviations

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 and 15.407 (a)), the unit uses permanently connected -0.8 dBi gain flexible PCB antenna which is less than 6 dBi gain.

For the Restricted Bands of operation, the EUT is designed to only operate between 5150 – 5250 MHz.

The EUT contains a 902 – 928 MHz FHSS/Hybrid System, a 2400 – 2483.5 MHz FHSS System, three 2400 – 2483.5 MHz DTS System, and UNII-1 and UNII-3 transmitters. Antenna co-location testing is applicable and documented in the test report.

For maximum permissible exposure, this device operates at less than 1 Watt at 2400 – 2483.5 MHz and is designed to operate greater than 20 cm from any personnel during normal operation. No testing is required, however worst-case calculated exposure compliance was shown in the RF Exposure exhibits.

This DTS report documents the 5150 – 5250 MHz UNII-1 transceiver.

For DFS, the 26 dB BW of all modulations were within 5250-5350 MHz band; however, the 99% BW were outside UNII-2A and the EUT does not implement 802.11 channel 50. Thus, DFS testing are not required as per RSS-247 and FCC KDB 789033 Section III B. 2. a)(i).

As per FCC KDB 789033, “Section 15.407(g) specifies that U-NII devices are required to ensure frequency stability...the applications for equipment certification are not required to include test reports with explicit demonstration of compliance.” Temperature stability measurements were not performed. See ECB601 FRQ\_STB + DC\_TX exhibit for additional details.

ECB601 FRQ\_STB + DC\_TX exhibit also details how the device complies with 15.407 (c) and RSS 247 Section 6.4.

Client	Ecobee Inc.
Product	ECB601/ECB501
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407



## Sample Calculation(s)

### Radiated Emission Test

E-Field Level = Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain

E-Field Level =  $50\text{dB}\mu\text{V} + 10\text{dB/m} + 2\text{dB} - 20\text{dB}$

E-Field Level =  $42\text{dB}\mu\text{V/m}$

Margin = Limit – E-Field Level

Margin =  $50\text{dB}\mu\text{V/m} - 42\text{dB}\mu\text{V/m}$

Margin = 8.0 dB (pass)

### Power Line Conducted Emission Test

E-Field Level = Received Signal + Attenuation Factor + Cable Loss + LISN Factor

E-Field Level =  $50\text{dB}\mu\text{V} + 10\text{dB} + 2.5\text{dB} + 0.5\text{dB}$

E-Field Level =  $63\text{dB}\mu\text{V}$

Margin = Limit – E-Field Level

Margin =  $73\text{dB}\mu\text{V} - 63\text{dB}\mu\text{V}$

Margin = 10.0 dB (pass)

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Applicable Standards, Specifications and Methods

ANSI C63.4:2014 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.10:2013 American National Standard For Testing Unlicensed Wireless Devices

CFR 47 FCC 15 Subpart E Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators

FCC KDB 414788 D01: Radiated Test Site v01r01  
2018

FCC KDB 789033 D02: General U-NII Test Procedures New Rules v02r01  
2017

FCC KDB 447498: RF exposure procedures and equipment authorization policies for mobile and portable devices  
2015

ICES-003 Issue 7 Digital Apparatus - Spectrum Management and  
2020 Telecommunications Policy Interference-Causing  
Equipment Standard

RSS-GEN Issue 5: General Requirements and Information for the  
2018+A1:2019+A2:2021 Certification of Radio Apparatus

RSS-247 Issue 2:2017 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

ISO 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Document Revision Status

Revision	Date	Description	Initials
000	2022-04-22	Initial Release	MX
001	2022-05-03	Added antenna gain and updated equipment description in table 1.	MX

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Definitions and Acronyms

The following definitions and acronyms are applicable in this report.  
See also ANSI C63.14.

**DTS** – Digital Transmission System

**LISN** – Line Impedance Stabilization Network

**NCR** – No Calibration Required

**NSA** – Normalized Site Attenuation

**N/A** – Not Applicable

**RF** – Radio Frequency

**AE** – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

**Antenna Port** – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

**BW** – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

**EMC** – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

**EMI** – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

**EUT** – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

**ITE** – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Toronto, Ontario. The testing lab has calibrated 3m semi-anechoic chambers which allow measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The testing lab also has a calibrated 10m Open Area Test Site (OATS). The chambers are equipped with a turntable that is capable of testing devices up to 5000lb in weight and are equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. This facility is capable of testing products that are rated for single phase or 3-phase AC input and DC capability is also available. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the vertical ground plane if applicable.

### ***Calibrations and Accreditations***

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Innovation, Science and Economic Development Canada (ISED, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-14023, G-20072, C-14498, and T-20060). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or biennial basis as listed for each respective test.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ***Testing Environmental Conditions and Dates***

Following environmental conditions were recorded in the facility during time of testing

Date	Test	Initials	Temperature (°C)	Humidity (%)	Pressure (kPa)
2021-09-21	Radiated Emissions	MX	24.0	57.2	101.0
2021-09-16	Radiated Emissions	MX	24.3	48.9	102.2
2022-02-18	Antenna Conducted Emissions	MX	23.0	17.4	101.6
2022-02-17	Antenna Conducted Emissions	MX	23.2	22.3	100.5
2021-10-01	Power Line Conducted Emissions	MX	23.2	39.8	102.2

Client	<b>Ecobee Inc.</b>	
Product	<b>ECB601/ECB501</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada

## **Detailed Test Results Section**

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## 26 dB Emission Bandwidth & 99% Occupied Bandwidth

### Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum such that it meets the definition of a Digital Modulation. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

### Limits and Method

The requirement is as specified in FCC Part 15.403(i) and RSS-247 6.2.1

There is no limit specified for bandwidths. This section is for reporting purpose only.

Even though there is no specified limit, these measurements are used to determine compliance to RSS-247 Section 6.2.1.2:

The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

The method is given in FCC KDB 789033 D02 and ANSI C63.10.

The 26 dB Emission Bandwidth (EBW) and 99% Occupied Bandwidth was measured in accordance with the FCC KDB Publication No. 789033 D02:

For EBW, the was RBW set to approximately 1% of the emission bandwidth. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.

For OBW, the RBW was set to 1% to 5% of the OBW and set the VBW  $\geq 3 * \text{RBW}$ . The OBW was measured by using 99% bandwidth equipment function of the spectrum analyzer using a peak detector.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Results

The EUT passed. The 26 dB BW of all modulations were within 5250-5350 MHz band; however, the 99% BW were outside.

The EUT supports three modes of operation, 802.11a/n/ac. The n and ac-mode support 20 and 40 MHz nominal bandwidth. Three Channels for each mode were measured. The following tables show the 26 dB and 99% bandwidth:

802.11A-20MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	29.780	18.08
Mid	5220	29.100	18.08
High	5240	29.380	18.06
$F_H$ (26 dB BW) = 5255.42 MHz			
$F_H$ (99% BW) = 5249.12 MHz			

802.11N-20MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	25.600	18.14
Mid	5220	25.500	18.10
High	5240	26.750	18.05
$F_H$ (26 dB BW) = 5253.60 MHz			
$F_H$ (99% BW) = 5249.08 MHz			

802.11AC-20MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	27.450	18.13
Mid	5220	27.350	18.10
High	5240	26.875	18.05
$F_H$ (26 dB BW) = 5253.63 MHz			
$F_H$ (99% BW) = 5249.08 MHz			

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

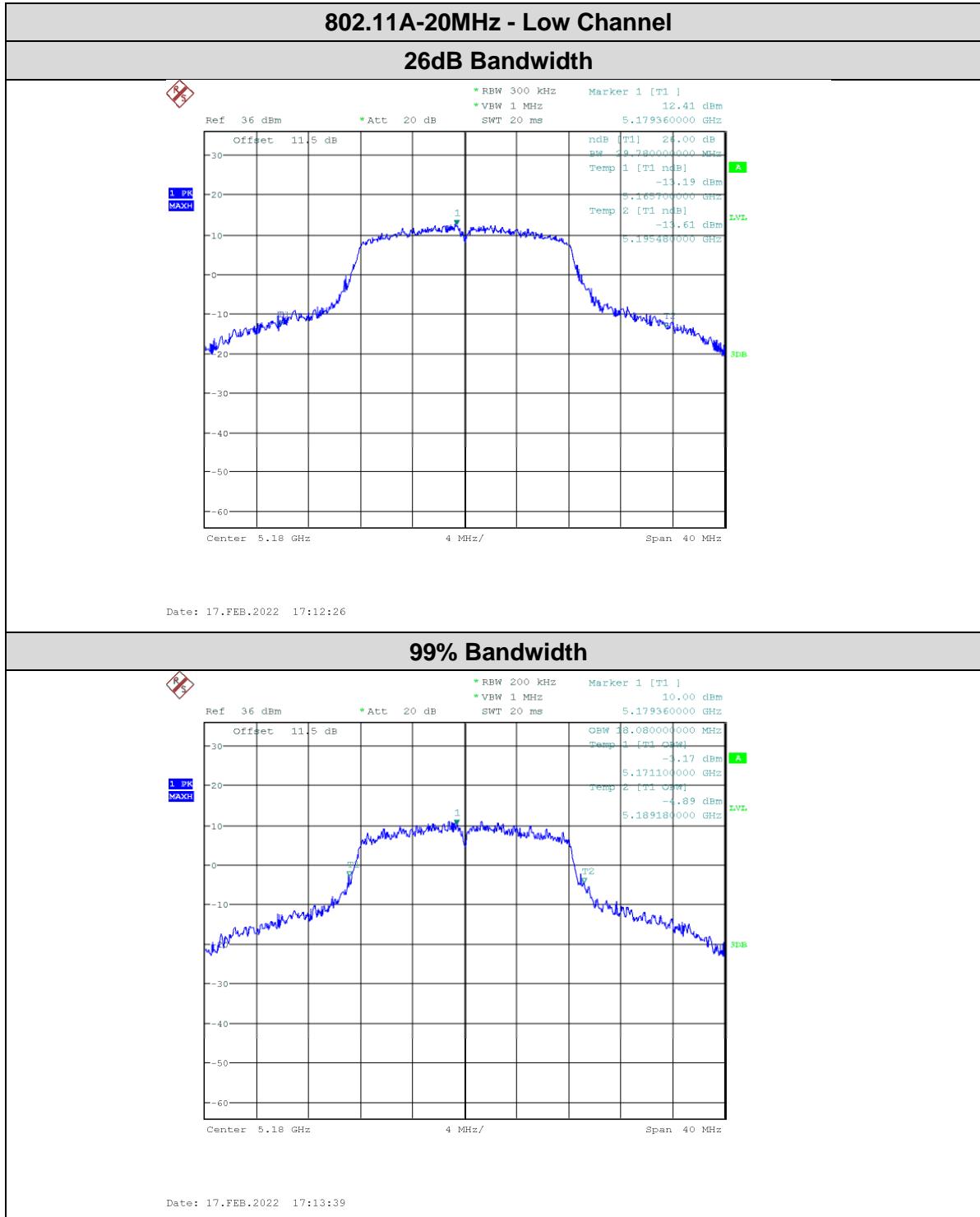
802.11N-40MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	43.240	36.60
High	5230	42.160	36.60
$F_H$ (26 dB BW) = 5251.48 MHz $F_H$ (99% BW) = 5248.36 MHz			

802.11AC-40MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	42.320	36.64
High	5230	42.280	36.60
$F_H$ (26 dB BW) = 5251.36 MHz $F_H$ (99% BW) = 5248.36 MHz			

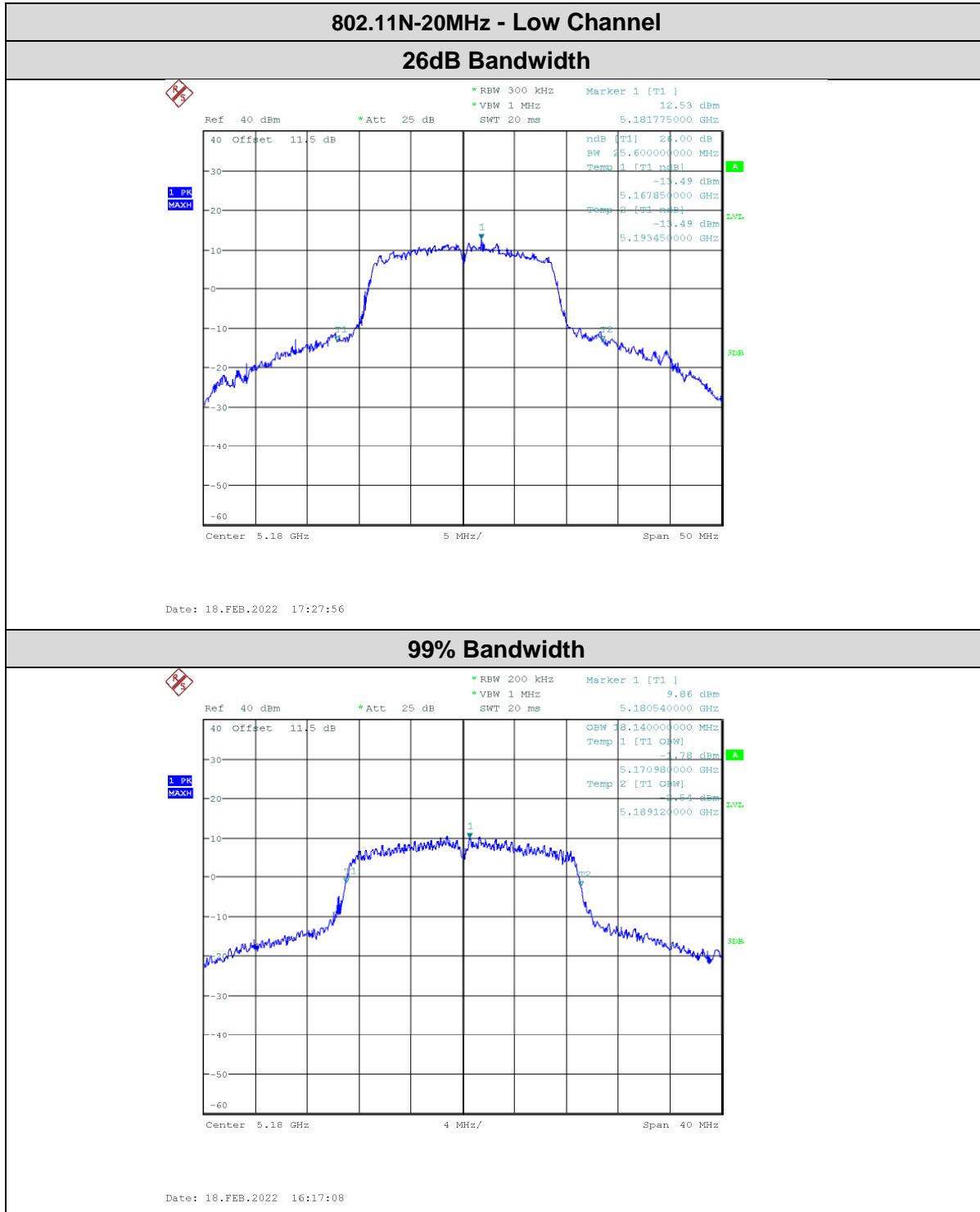
## Graphs

The graphs shown below show the EBW and OBW of the device during the conducted measurement operation of the EUT. This is measured by a max hold on the spectrum analyzer.

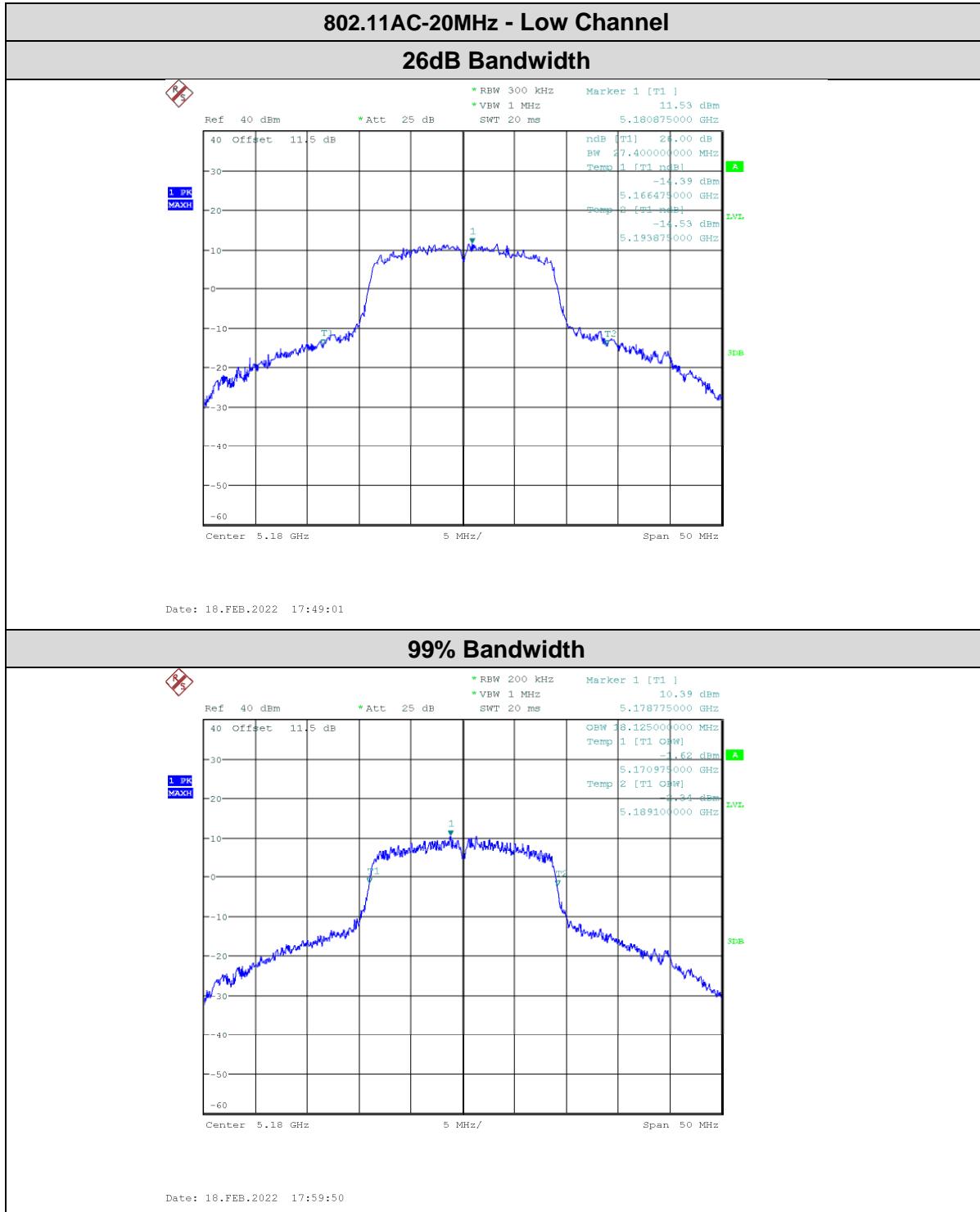
Client	Ecobee Inc.
Product	ECB601/ECB501
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407



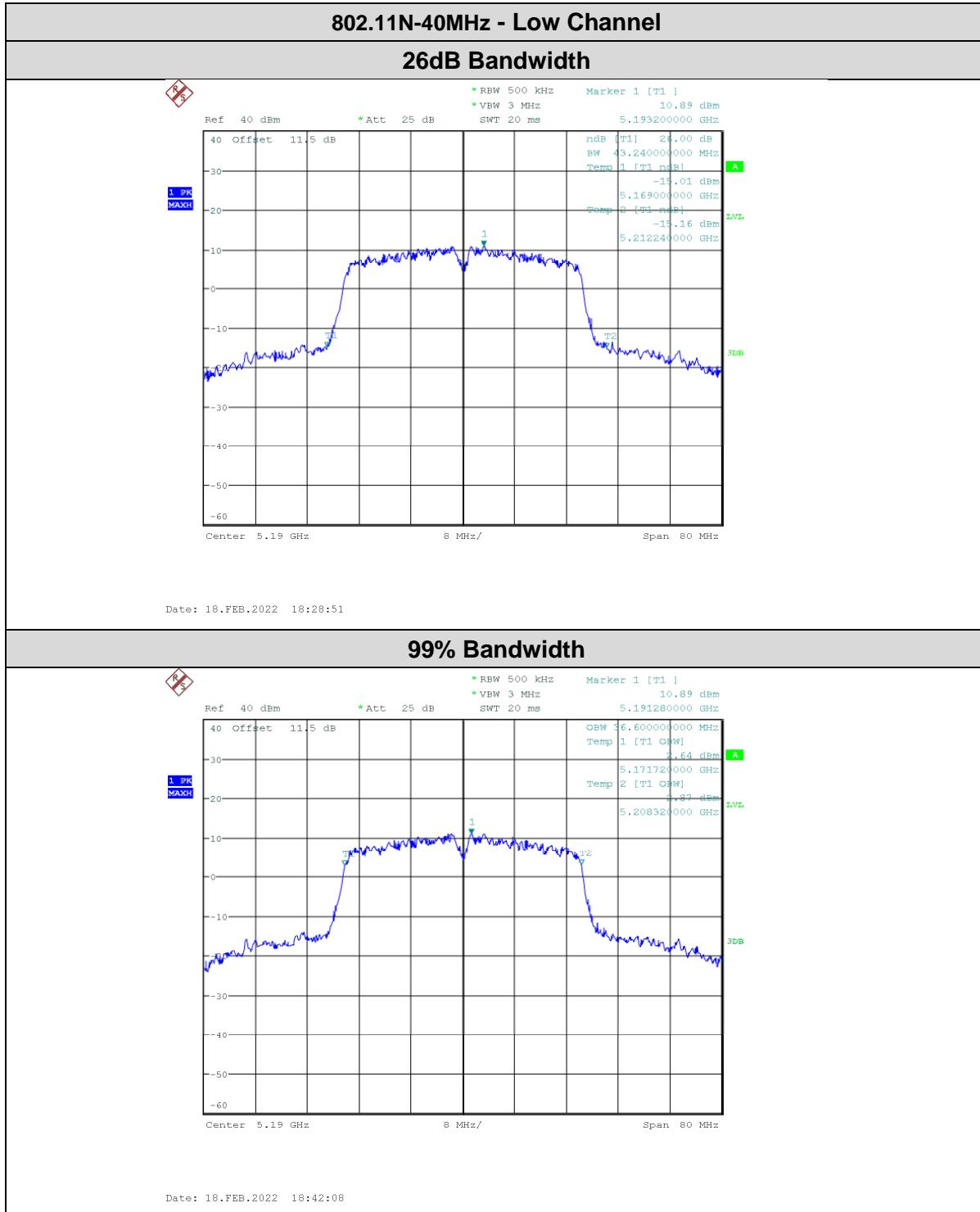
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



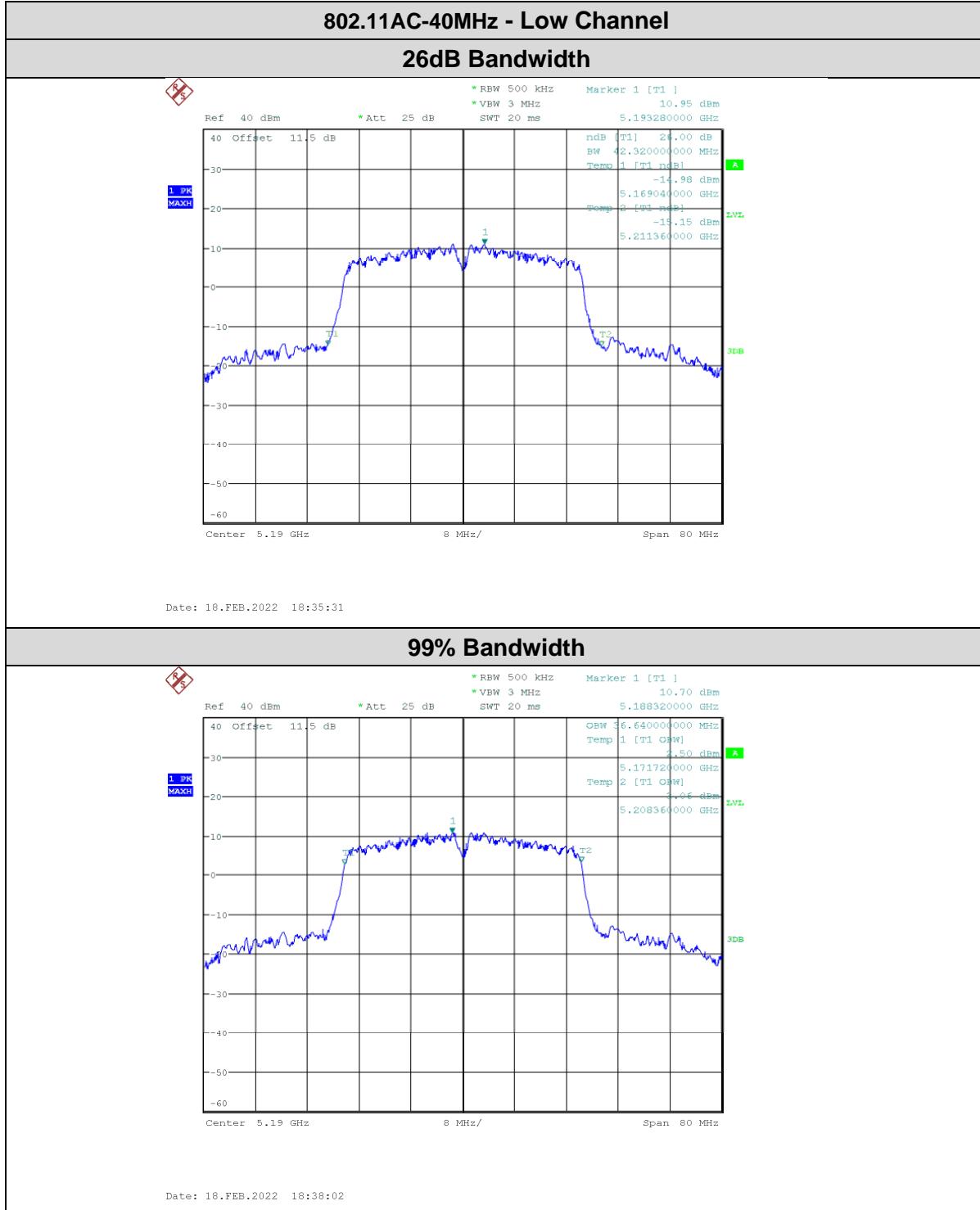
Client	Ecobee Inc.
Product	ECB601/ECB501
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Note: See 'Appendix B – EUT & Test Setup Photos' for photos showing the test set-up.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSQ26	Rohde & Schwarz	Nov 30, 2021	Nov 30, 2023	GEMC 234
Attenuator 10 dB	8493B	Agilent	Oct 4, 2021	Oct 4, 2022	GEMC133
Attenuator 10 dB	3M-10	Weinschel	Oct 4, 2021	Oct 4, 2022	GEMC 279

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Maximum Conducted Output Power

### Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, the maximum power does not exceed an amount which may create an excessive power level.

### Limits and Method

The limits are defined in FCC Part 15.407(a)(1)(iv) and RSS-247 6.2.1.1. The EUT is a client device and is not installed in vehicles. Thus, applicable limits are:

FCC Part 15.407(a)(1)(iv)		RSS-247 6.2.1.1	
Frequency Range (MHz)	5150-5250	Frequency Range (MHz)	5150-5250
Max Conducted Output Power	24 dBm (250 mW) for Client Device	Max_EIRP	23 dBm or 10 +10 log B in dBm whichever is lower

Where B is the 99% bandwidth in MHz.

For FCC, if the antenna gain is above 6 dBi, the output power shall be reduced by the amount in dB that the antenna gain exceeds 6 dB.

The Maximum Conducted Output Power was measured in accordance with FCC KDB 789033 D02 and ANSI C63.10 Method SA-1.

The RF output of the equipment under test was directly connected to the input of the spectrum analyzer through suitable attenuation. The power was integrated over the 99% OBW alternative bandwidth instead of the 26 dB EBW.

### Results

The EUT passed. The antenna gain is -0.8 dBi.

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada
Product	ECB601/ECB501		
Standard(s)			

802.11A-20MHz					
Frequency (MHz)	Avg Power (dBm)	15.407 Limit (dBm)	EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5180	19.67	24.0	18.87	22.6	Pass
5220	19.48	24.0	18.68	22.6	Pass
5240	19.60	24.0	18.80	22.6	Pass

802.11N-20MHz					
Frequency (MHz)	Avg Power (dBm)	15.407 Limit (dBm)	EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5180	18.64	24.0	17.84	22.6	Pass
5220	18.56	24.0	17.76	22.6	Pass
5240	18.66	24.0	17.86	22.6	Pass

802.11AC-20MHz					
Frequency (MHz)	Avg Power (dBm)	15.407 Limit (dBm)	EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5180	18.69	24.0	17.89	22.6	Pass
5220	18.53	24.0	17.73	22.6	Pass
5240	18.66	24.0	17.86	22.6	Pass

802.11N-40MHz					
Frequency (MHz)	Avg Power (dBm)	15.407 Limit (dBm)	EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5190	17.90	24.0	17.10	23.0	Pass
5230	17.92	24.0	17.12	23.0	Pass

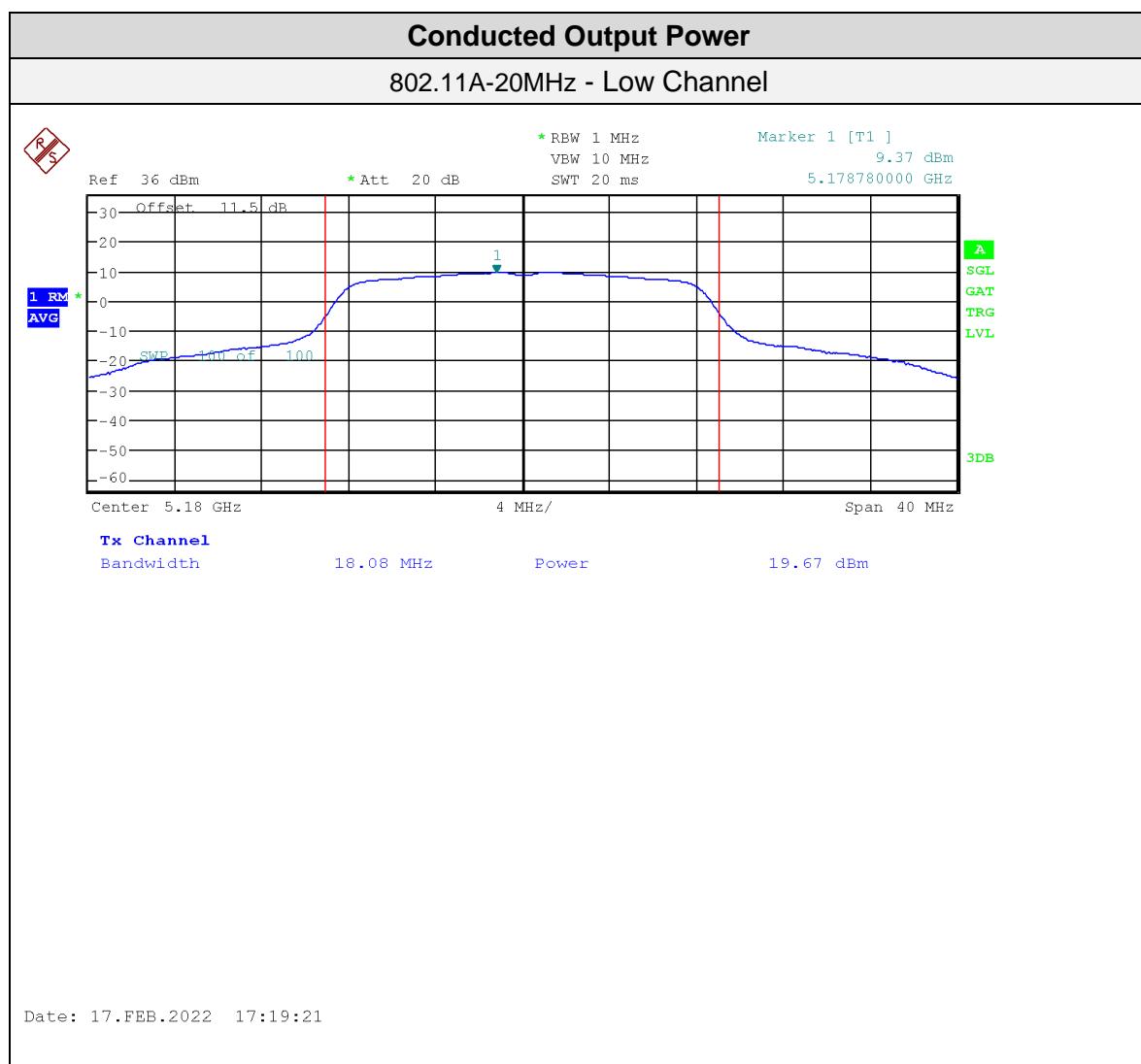
802.11AC-40MHz					
Frequency (MHz)	Avg Power (dBm)	15.407 Limit (dBm)	EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5190	17.90	24.0	17.10	23.0	Pass
5230	17.93	24.0	17.13	23.0	Pass

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

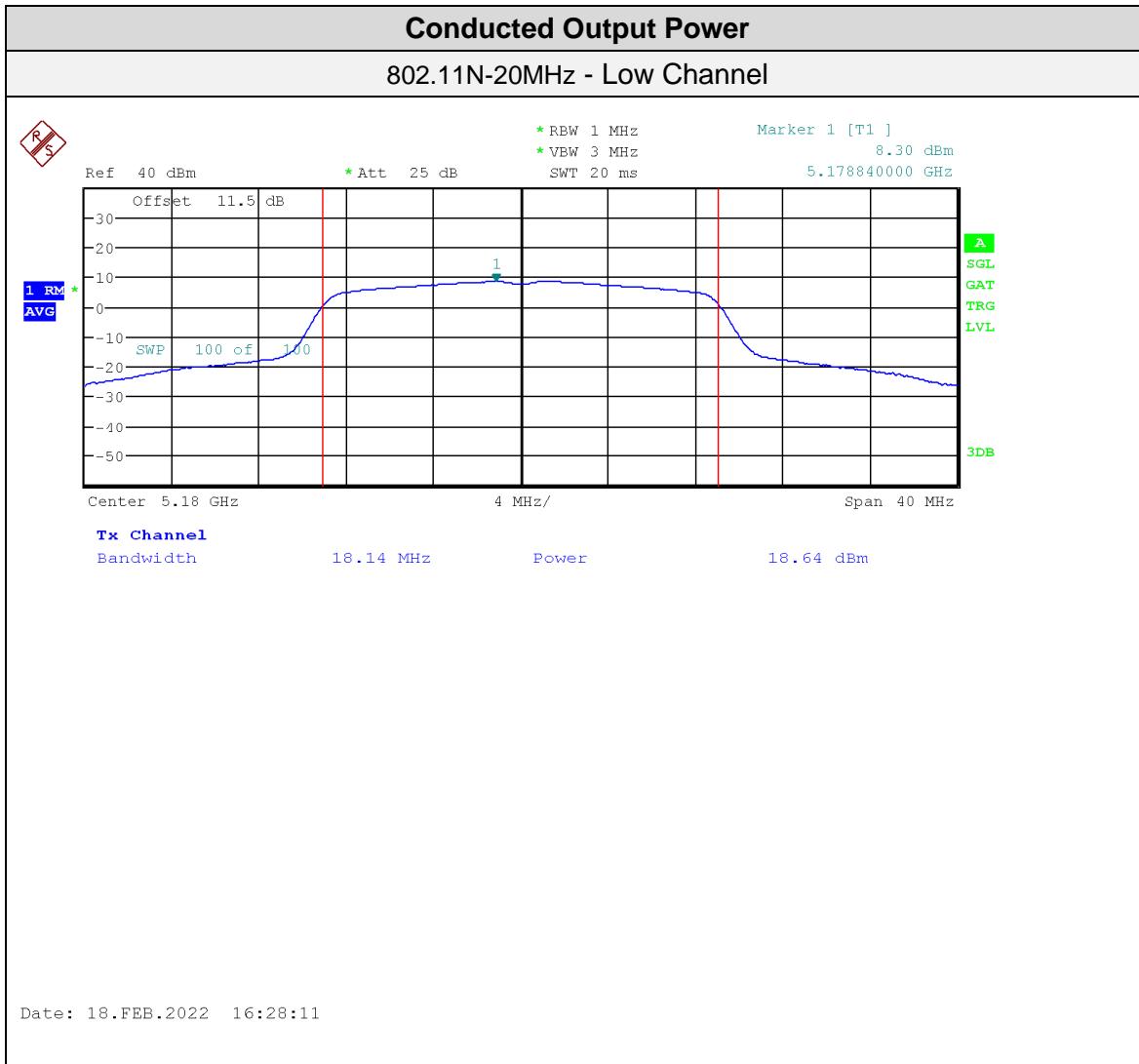
Note: The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer

## Graphs

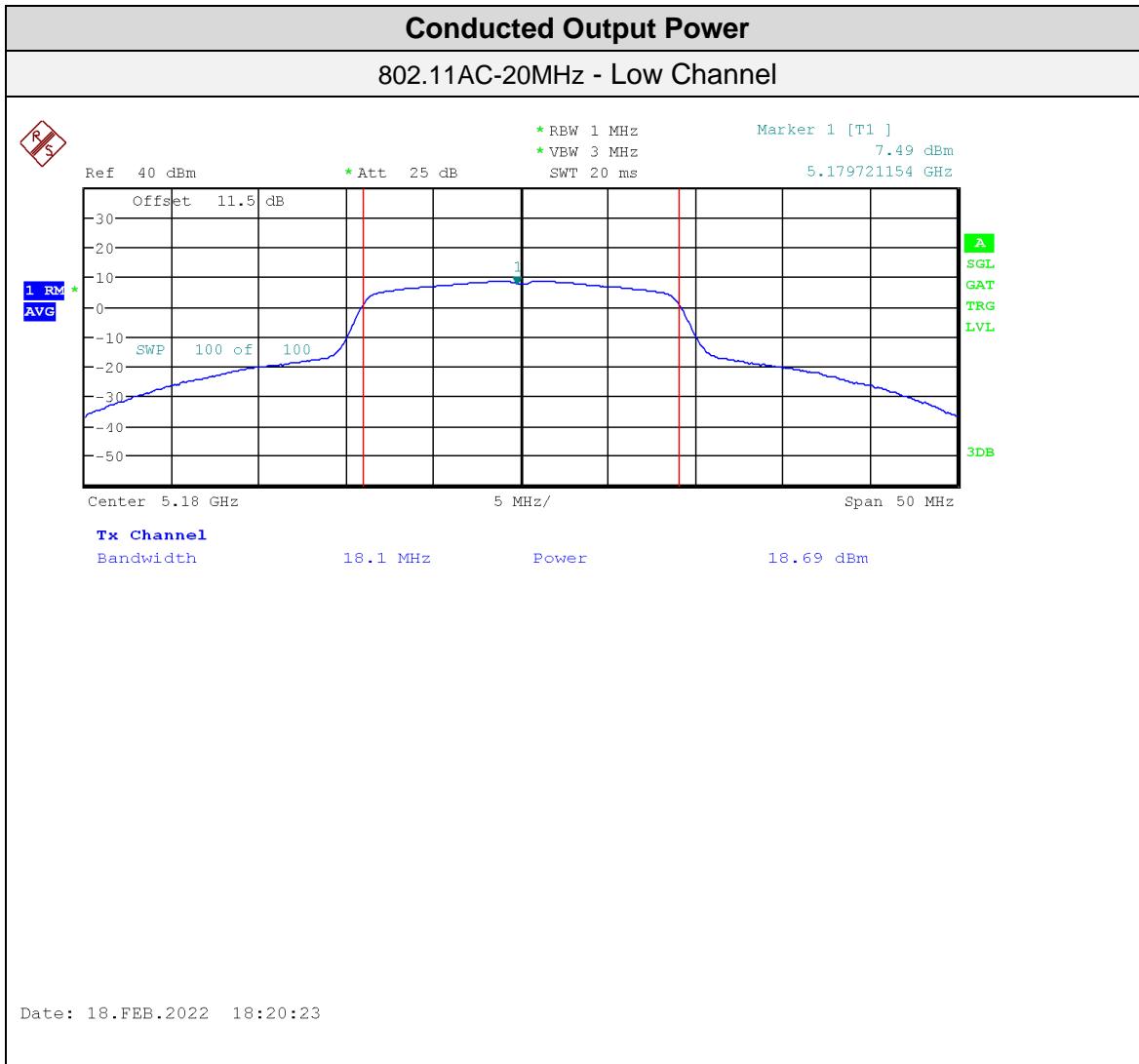
The graphs shown below show the maximum conducted output power of the device during the conducted measurement operation of the EUT. External attenuator and cable loss were accounted for as reference offset in the spectrum analyzer. Low, middle, and high channels were investigated in each mode, with the worst case being presented. The measurement RBW is set to 1 MHz and VBW  $\geq$  3 MHz. The integrated band power measurement method SA-1 was used.



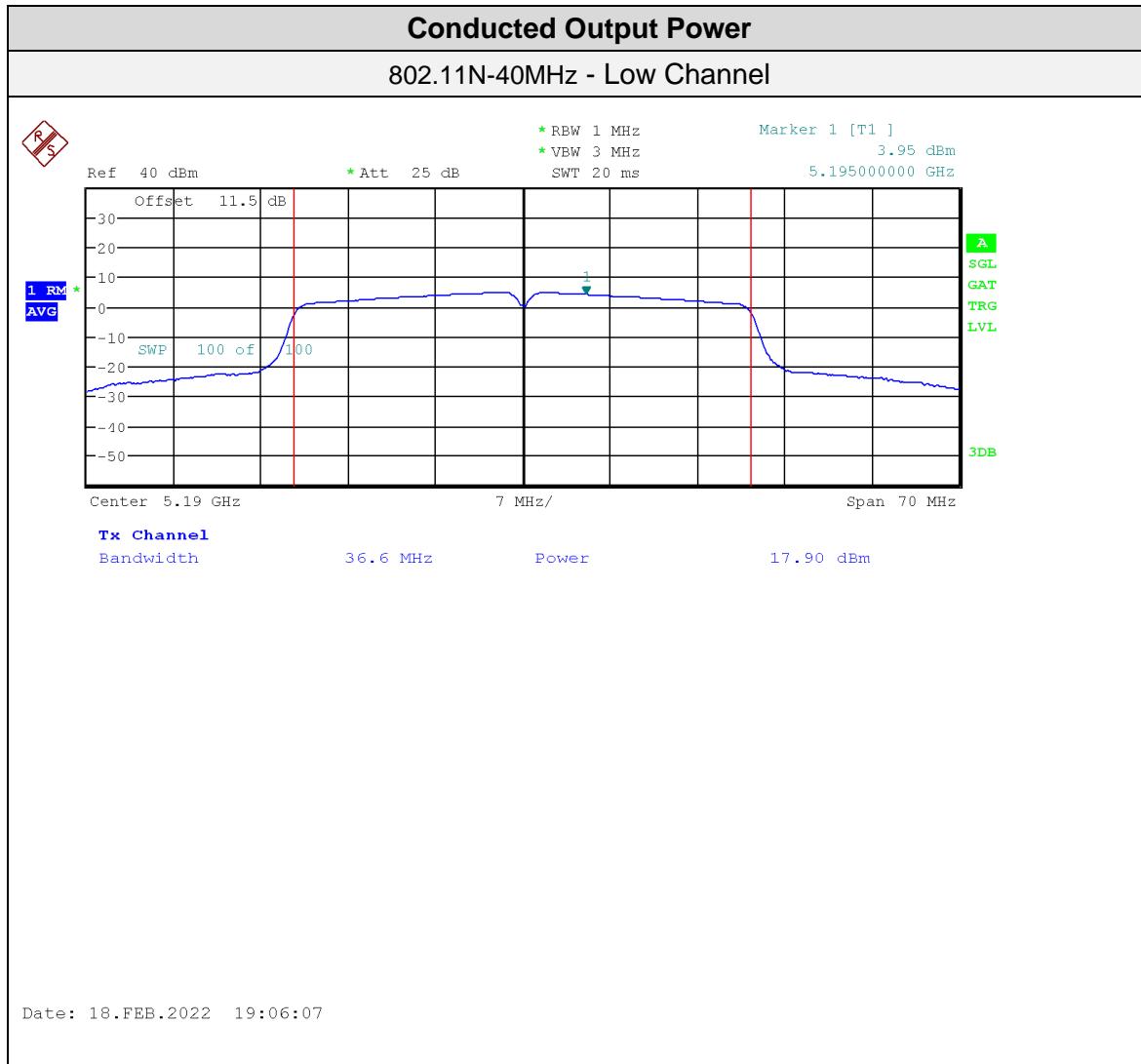
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



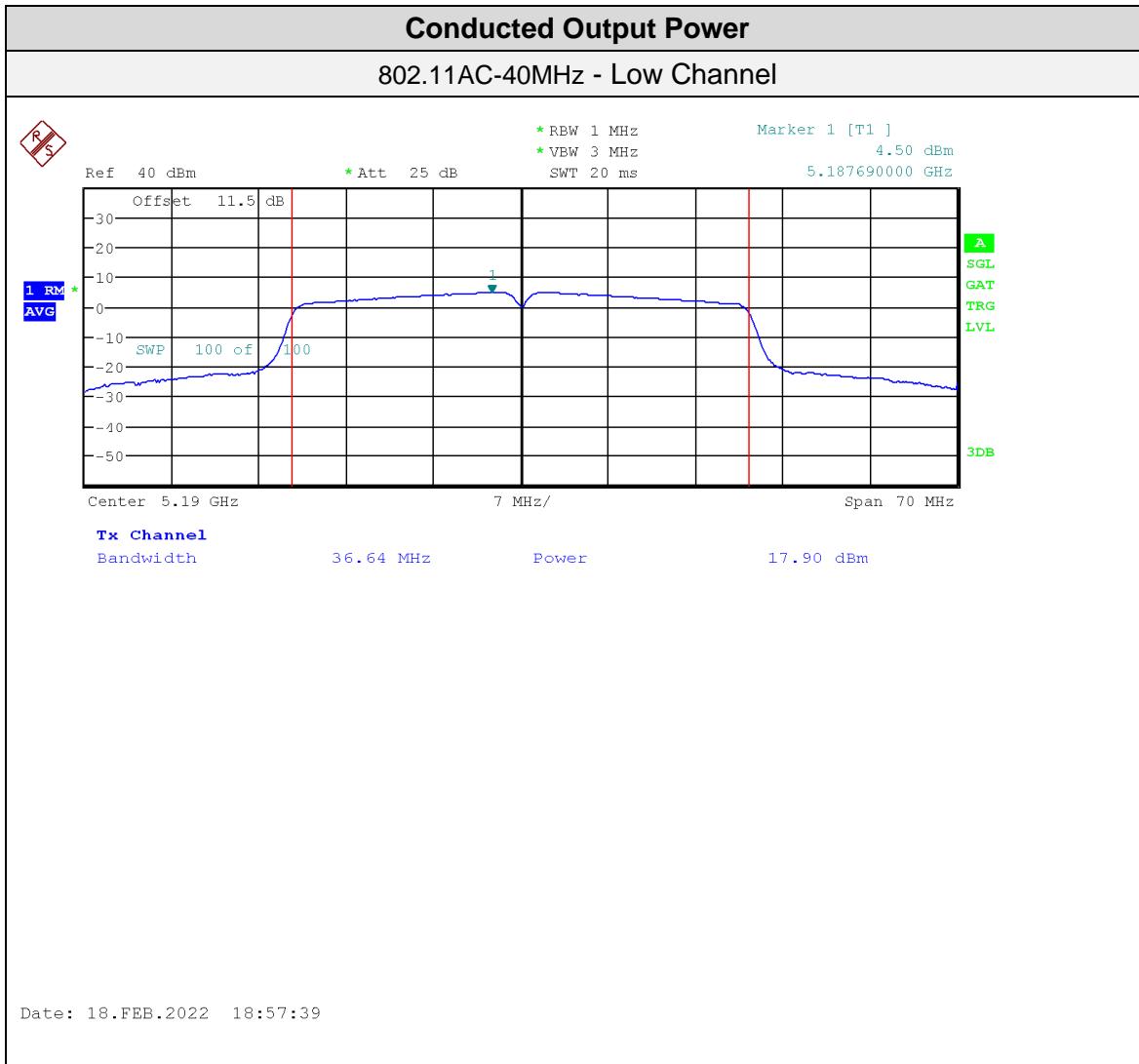
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSQ26	Rohde & Schwarz	Nov 30, 2021	Nov 30, 2023	GEMC 234
Attenuator 10 dB	8493B	Agilent	Oct 4, 2021	Oct 4, 2022	GEMC133
Attenuator 10 dB	3M-10	Weinschel	Oct 4, 2021	Oct 4, 2022	GEMC 279

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Power Spectral Density

### Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

### Limits and Method

The limits are defined in FCC Part 15.407(a)(1)(iv) and RSS-247 6.2.1.1. The EUT is a client device and is not installed in vehicles. Thus, applicable limits are:

FCC Part 15.407(a)(1)(iv)		RSS-247 6.2.1.1	
Frequency Range (MHz)	5150-5250	Frequency Range (MHz)	5150-5250
PSD	11 dBm	EIRP PSD	10 dBm

For FCC, if the antenna gain is above 6 dBi, the power density shall be reduced by the amount in dB that the antenna gain exceeds 6 dB.

The power spectral density was measured using the same method described in Maximum Conducted Output section: FCC KDB 789033 D02 and ANSI C63.10 Method SA-1.

### Results

The EUT passed. The antenna gain is -0.8 dBi

802.11A-20MHz					
Frequency (MHz)	PSD (dBm)	15.407 Limit (dBm)	EIRP_PSD (dBm)	RSS-247 EIRP Limit (dBm)	Pass/ Fail
5180	9.34	11.0	8.54	10.0	Pass
5220	9.38	11.0	8.58	10.0	Pass
5110	9.34	11.0	8.54	10.0	Pass

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada
Product	ECB601/ECB501		
Standard(s)			

802.11N-20MHz					
Frequency (MHz)	PSD (dBm)	15.407 Limit (dBm)	EIRP_PSD (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5180	8.39	11.0	7.59	10.0	Pass
5220	8.54	11.0	7.74	10.0	Pass
5110	8.32	11.0	7.52	10.0	Pass

802.11AC-20MHz					
Frequency (MHz)	PSD (dBm)	15.407 Limit (dBm)	EIRP_PSD (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5180	8.39	11.0	7.59	10.0	Pass
5220	8.27	11.0	7.47	10.0	Pass
5110	8.31	11.0	7.51	10.0	Pass

802.11N-40MHz					
Frequency (MHz)	PSD (dBm)	15.407 Limit (dBm)	EIRP_PSD (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5190	4.66	11.0	3.86	10.0	Pass
510.00	4.63	11.0	3.83	10.0	Pass

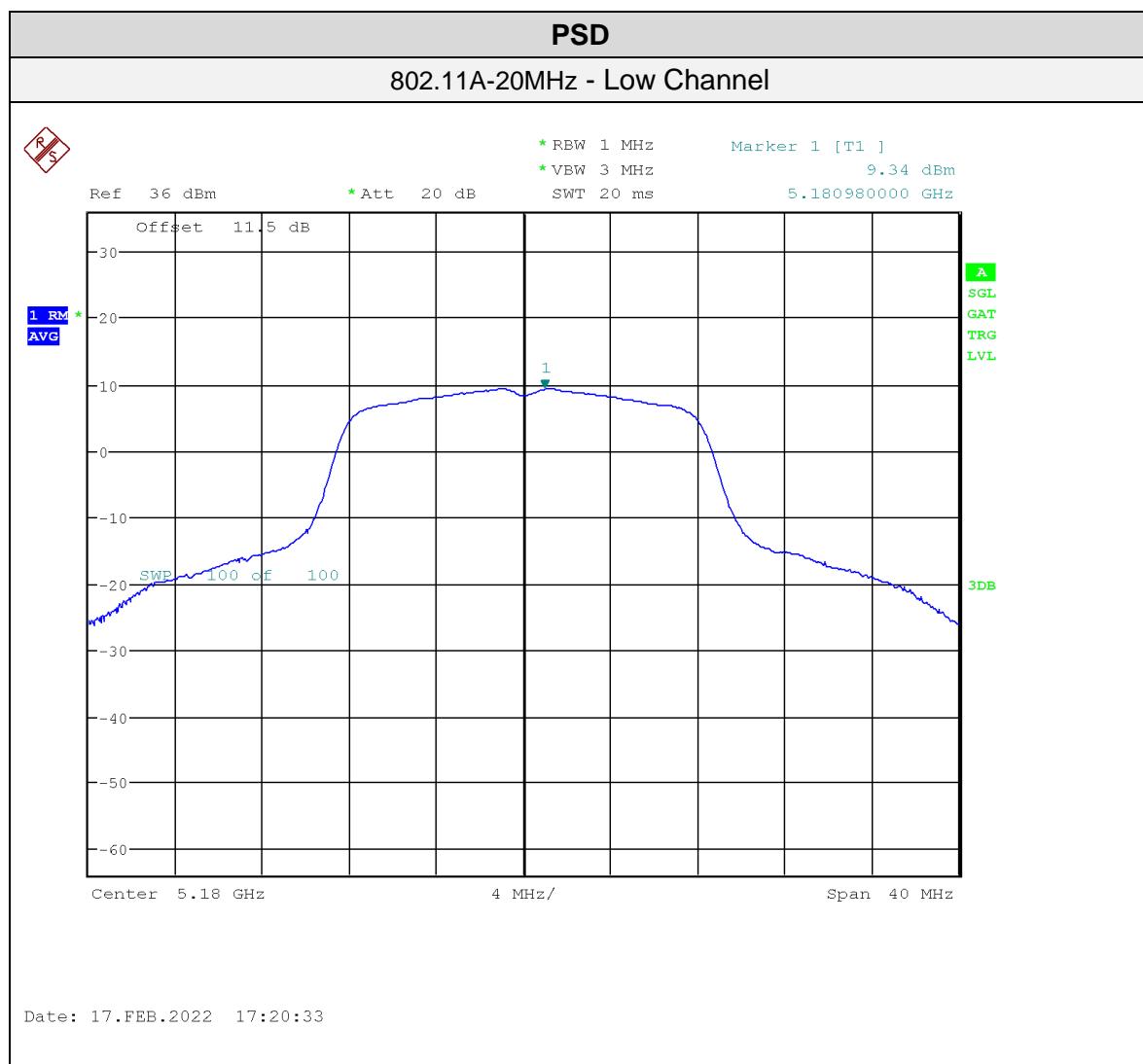
802.11AC-40MHz					
Frequency (MHz)	PSD (dBm)	15.407 Limit (dBm)	EIRP_PSD (dBm)	RSS-247 EIRP Limit (dBm)	Pass/Fail
5190	4.71	11.0	3.91	10.0	Pass
5230	4.62	11.0	3.82	10.0	Pass

Note: The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer

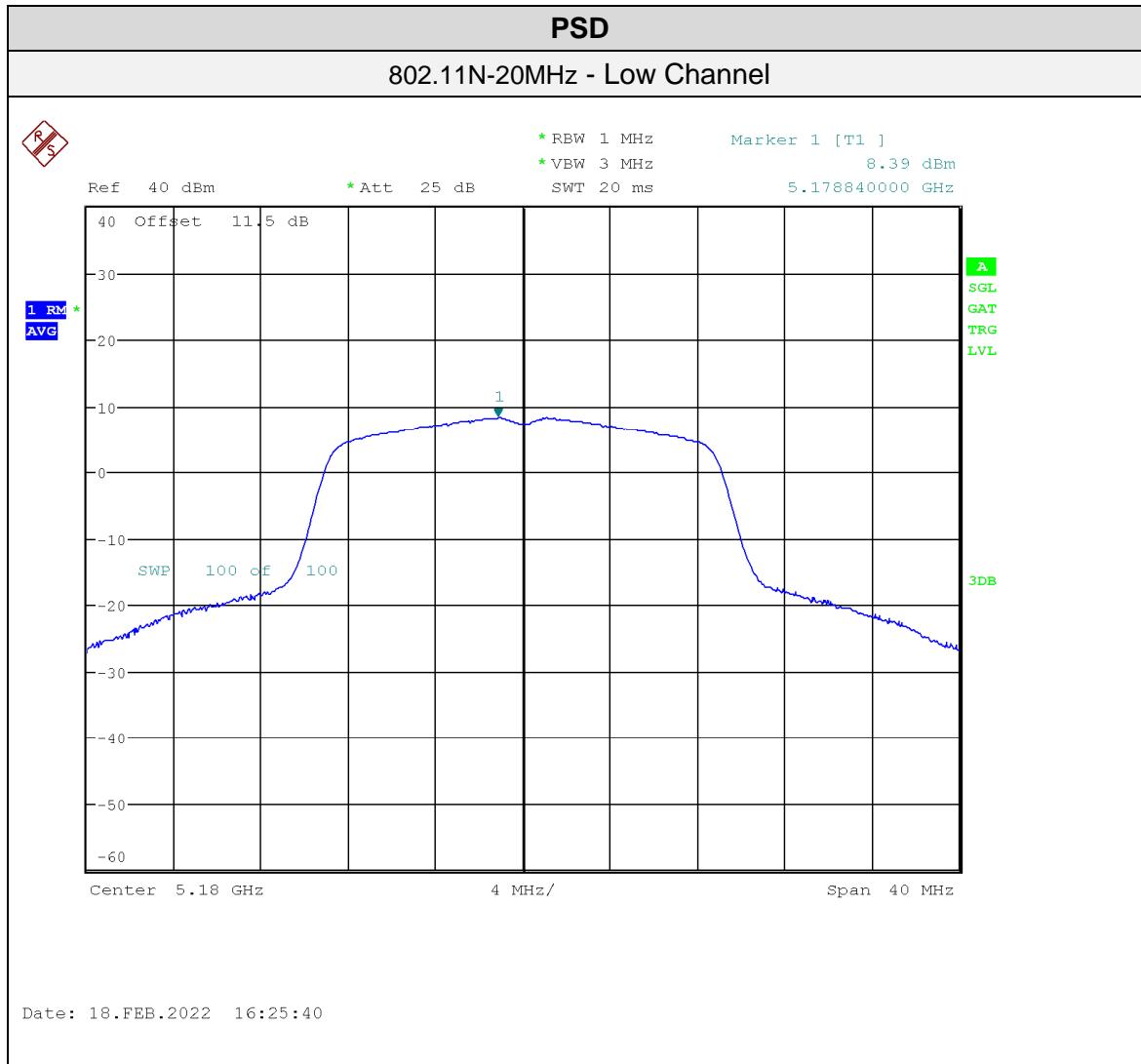
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Graphs

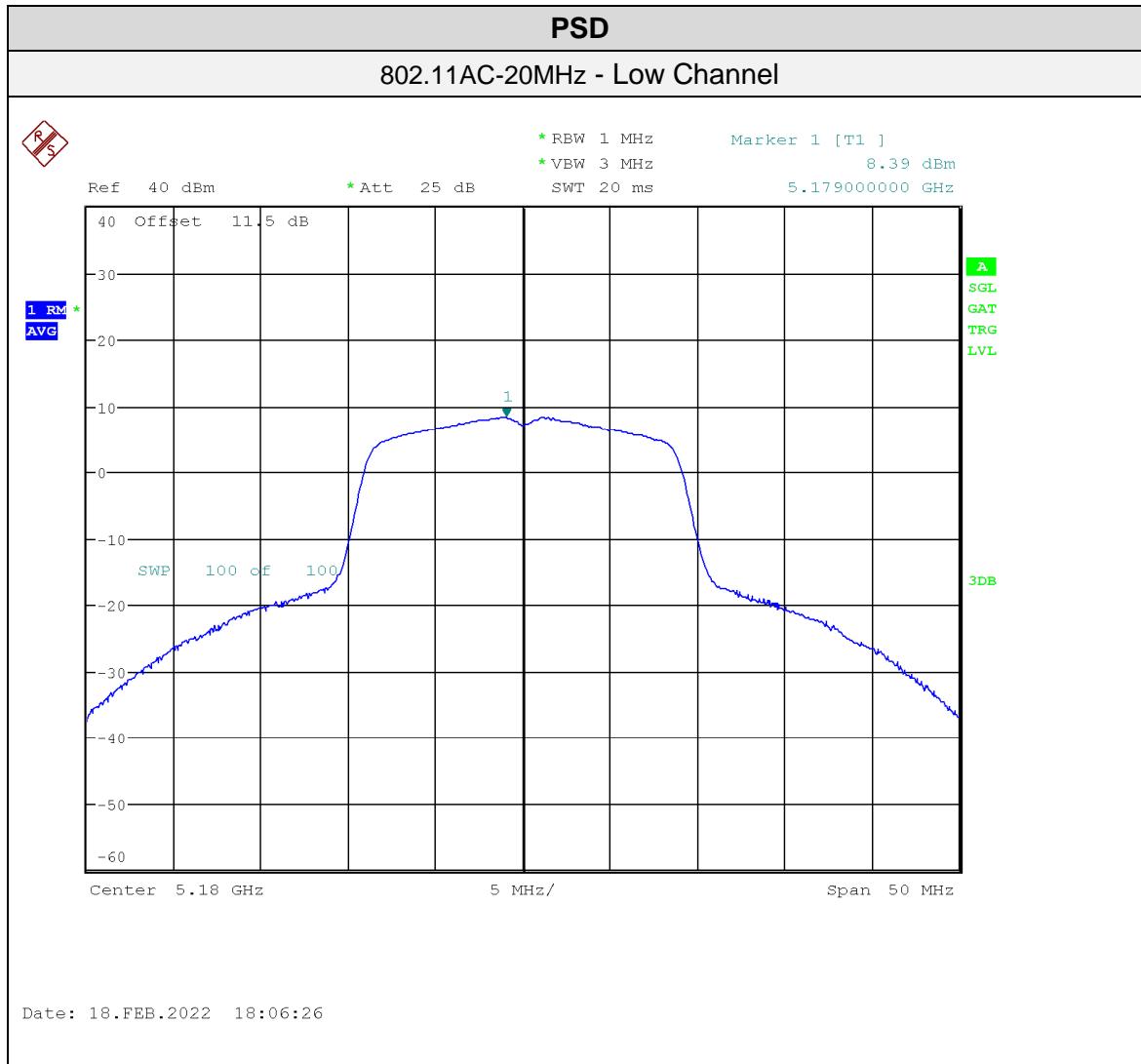
The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. External attenuator and cable loss were accounted for as reference offset in the spectrum analyzer. Low, middle, and high channels were investigated in each mode, with the worst case being presented. The measurement RBW is set to 1 MHz and VBW  $\geq$  3 MHz. The marker peak search function was used to find the peak of the spectrum.



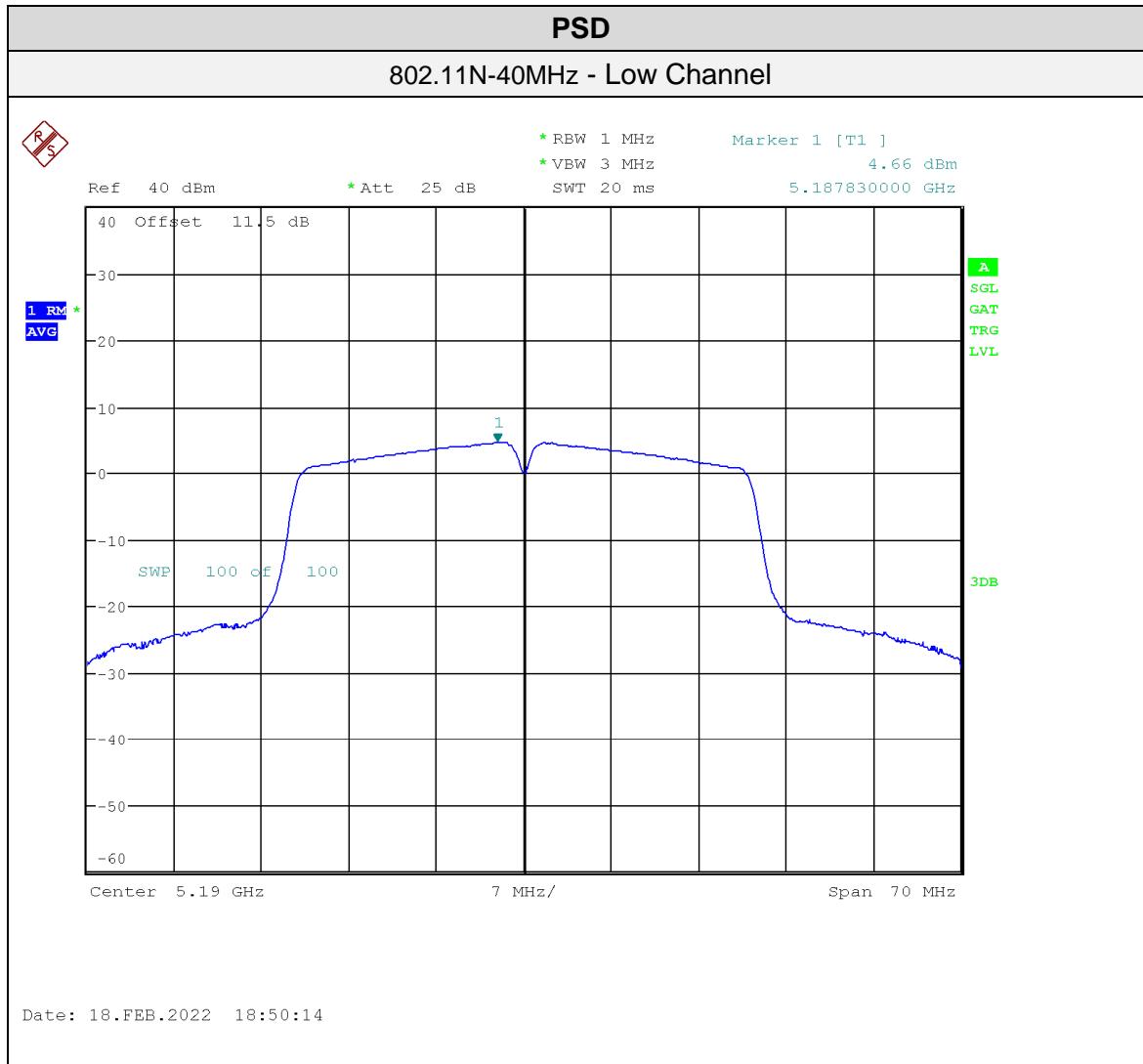
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



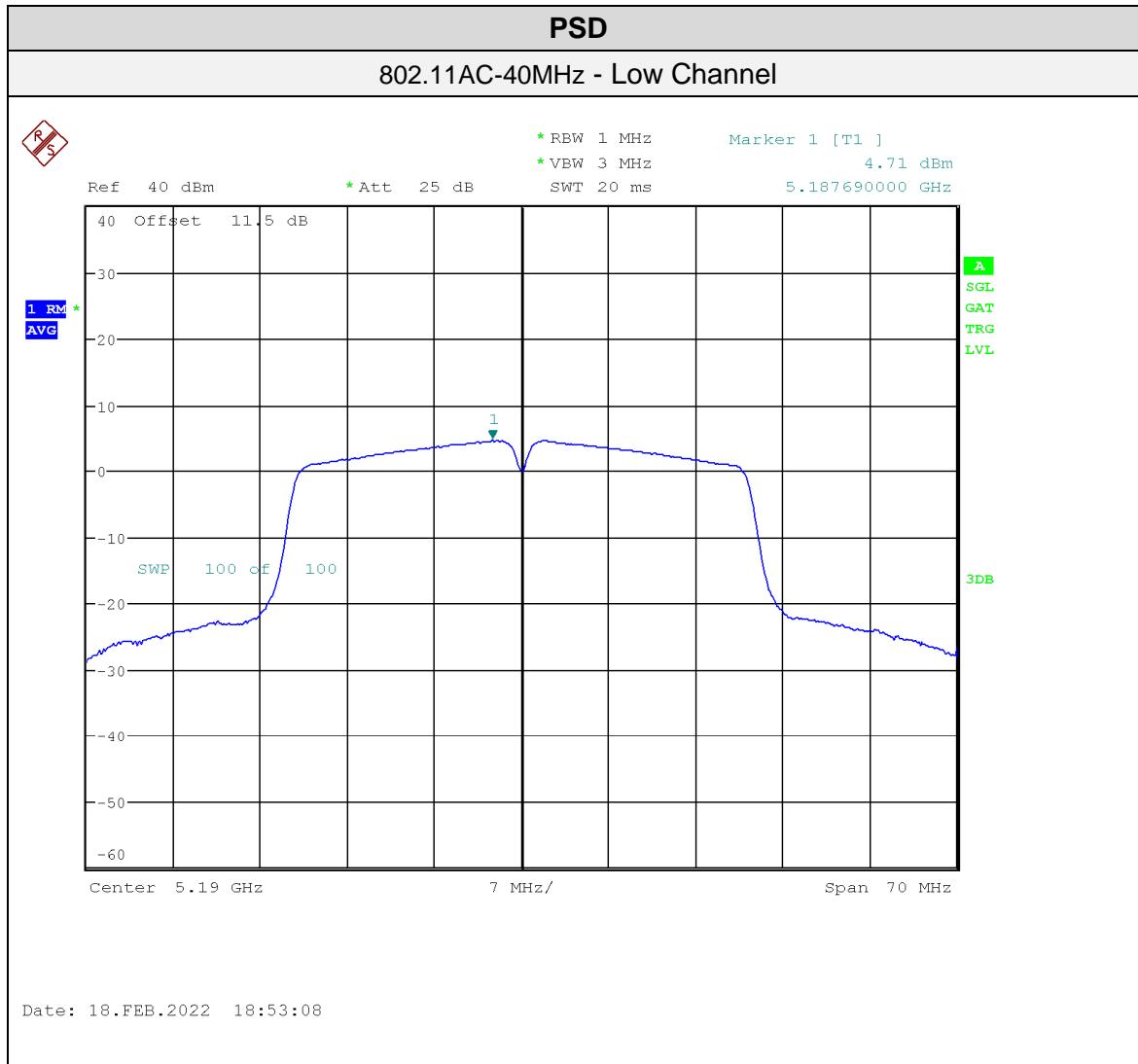
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	



See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSQ26	Rohde & Schwarz	Nov 30, 2021	Nov 30, 2023	GEMC 234
Attenuator 10 dB	8493B	Agilent	Oct 4, 2021	Oct 4, 2022	GEMC133
Attenuator 10 dB	3M-10	Weinschel	Oct 4, 2021	Oct 4, 2022	GEMC 279

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Transmitter Spurious Radiated Emissions

### Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

### Limits and Method

The limits are defined in FCC Part 15.407(b)(1) and RSS-247 6.2.1.2.

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. The emission limits are based on a peak detector. The EIRP limits of FCC Section 15.407(b) / IC RSS-247 6.2 were converted to field strength limits using a correction factor of 95.2 dB.

EIRP (dBm)	Field Strength at 3m (dB $\mu$ V/m)
-27	68.3 <sup>c</sup>

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in FCC15.209.

Unwanted emissions above 1 GHz must also comply with the general field strength limits set forth in FCC 15.209 for any emissions which fall in the restricted band as defined in FCC 15.205 (a).

The general field strength limits is given in the table below:

Frequency	Field Strength Limit ( $\mu$ V/m)	Field Strength at 3m (dB $\mu$ V/m)
0.009 MHz – 0.490 MHz	2400/F(kHz) <sup>a</sup> (at 300m)	128.5 to 93.8 <sup>a</sup>
0.490 MHz – 1.705 MHz	24000/F(kHz) <sup>a</sup> (at 30m)	73.8 to 63.0 <sup>a</sup>
1.705 MHz – 30 MHz	30 <sup>a</sup> (at 30m)	69.5 <sup>a</sup>
30 MHz – 88 MHz	100 <sup>a</sup> (at 3m)	40.0 <sup>a</sup>
88 MHz – 216 MHz	150 <sup>a</sup> (at 3m)	43.5 <sup>a</sup>
216 MHz – 960 MHz	200 <sup>a</sup> (at 3m)	46.0 <sup>a</sup>
Above 960 MHz	500 <sup>a</sup> (at 3m)	54.0 <sup>a</sup>
Above 1000 MHz	500 <sup>b</sup> (at 3m)	54.0 <sup>b</sup>
Above 1000 MHz	5 mV/m <sup>c</sup> (at 3m)	74.0 <sup>c</sup>

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

<sup>a</sup>Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

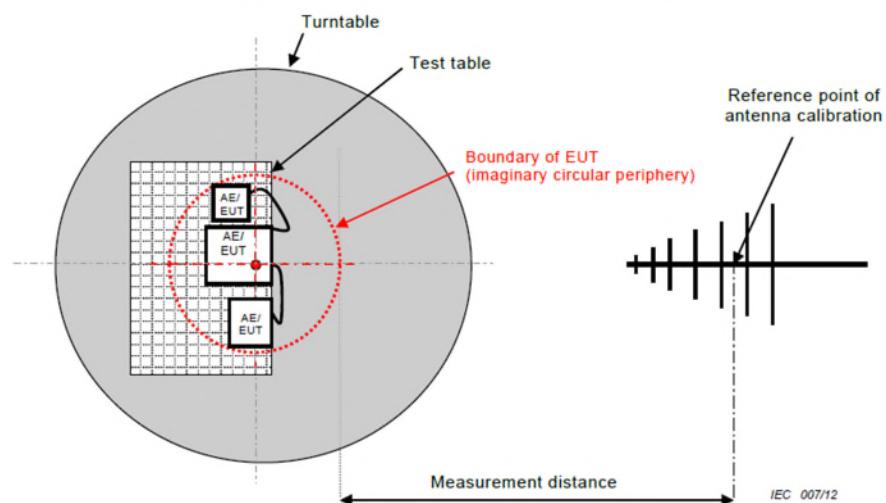
<sup>b</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>c</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

The unwanted emissions were measured in accordance with FCC KDB 789033 D02 and ANSI C63.10

### Typical Radiated Emissions Setup



### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 5.67\text{dB}$  for 30MHz – 1GHz and  $\pm 4.58\text{dB}$  for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

### Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst-case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

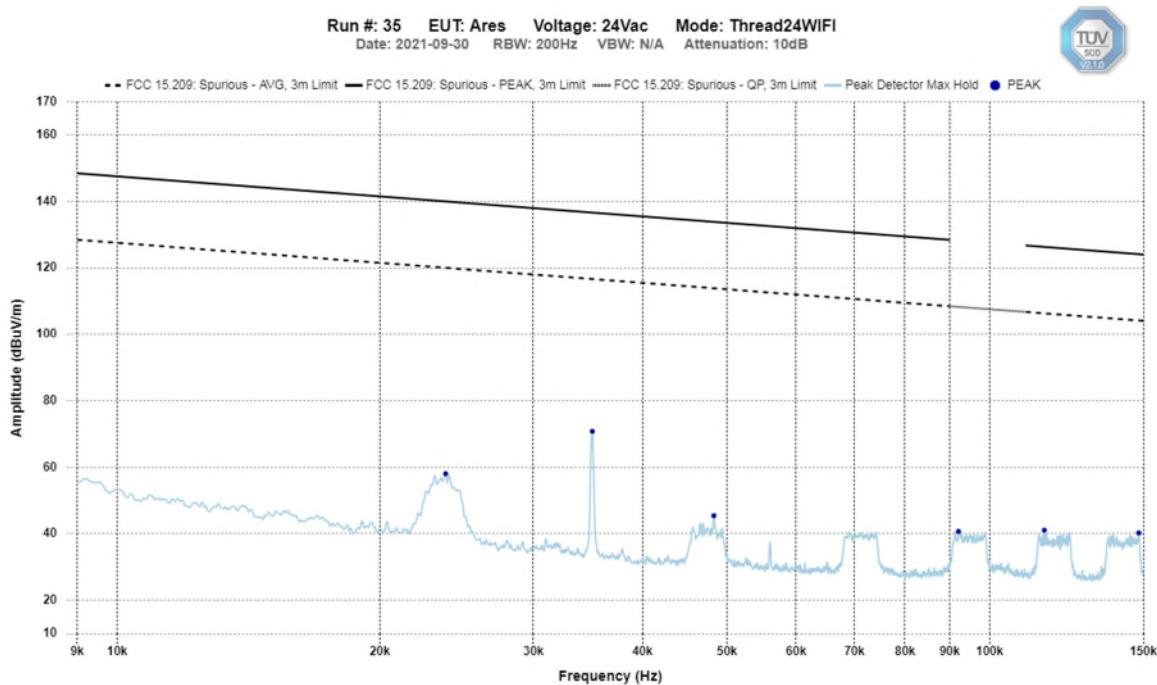
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10<sup>th</sup> harmonic or 40 GHz.

Devices scanned may be scanned at alternate test distances and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example, for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

Peak output power for low, middle, and high channels were checked. The worst case was used for the spurious emissions.

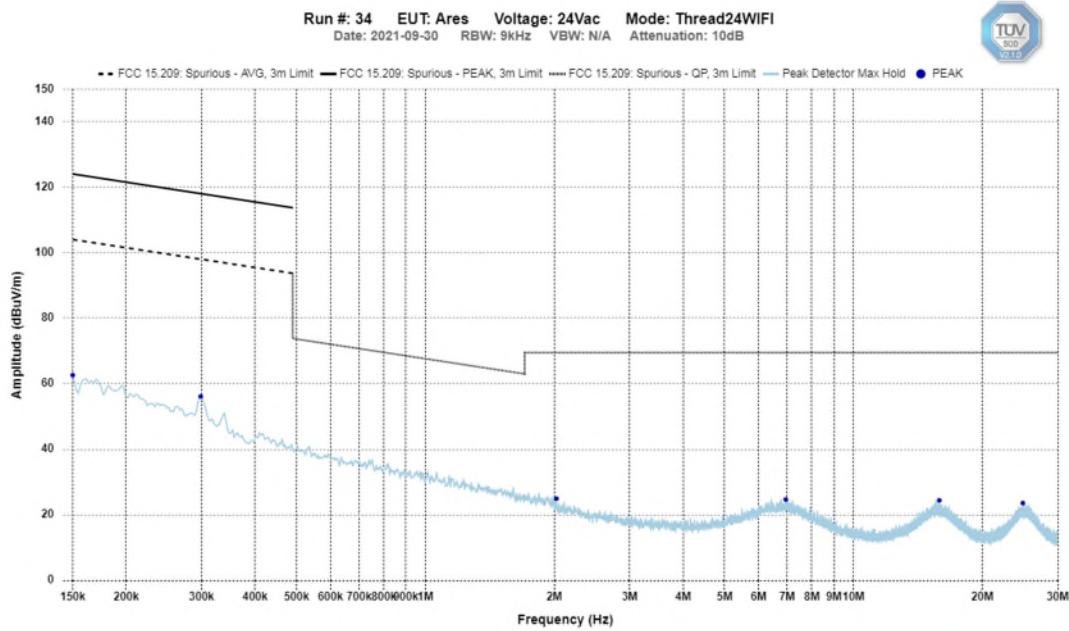
## Spurious Emissions

9 kHz – 150 kHz  
Peak Emission Graph

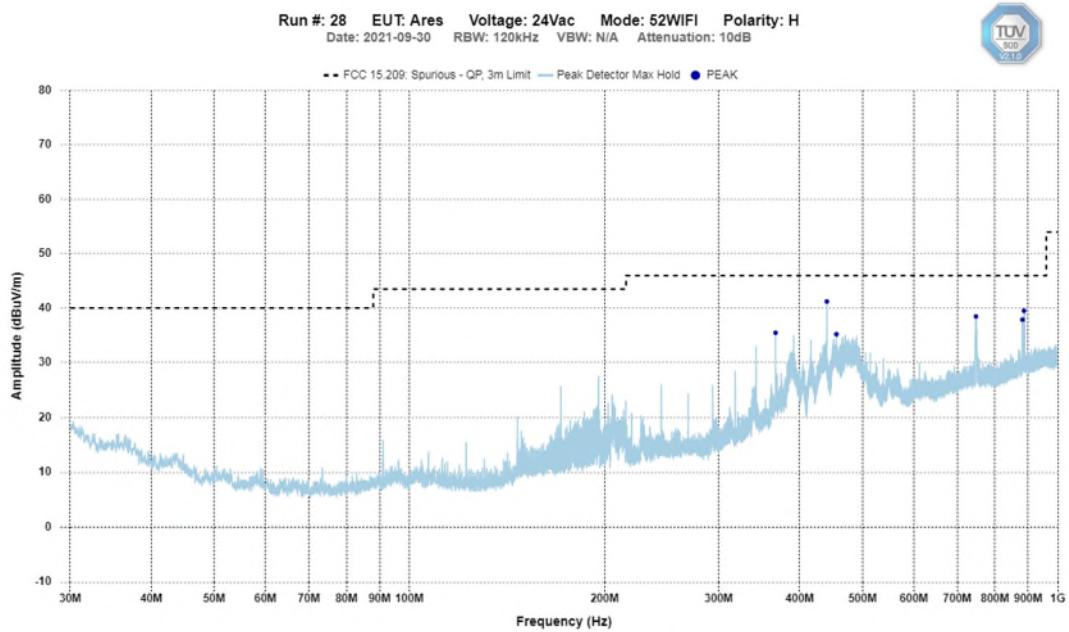


Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Mid Channel  
150 kHz – 30 MHz  
Peak Emission Graph

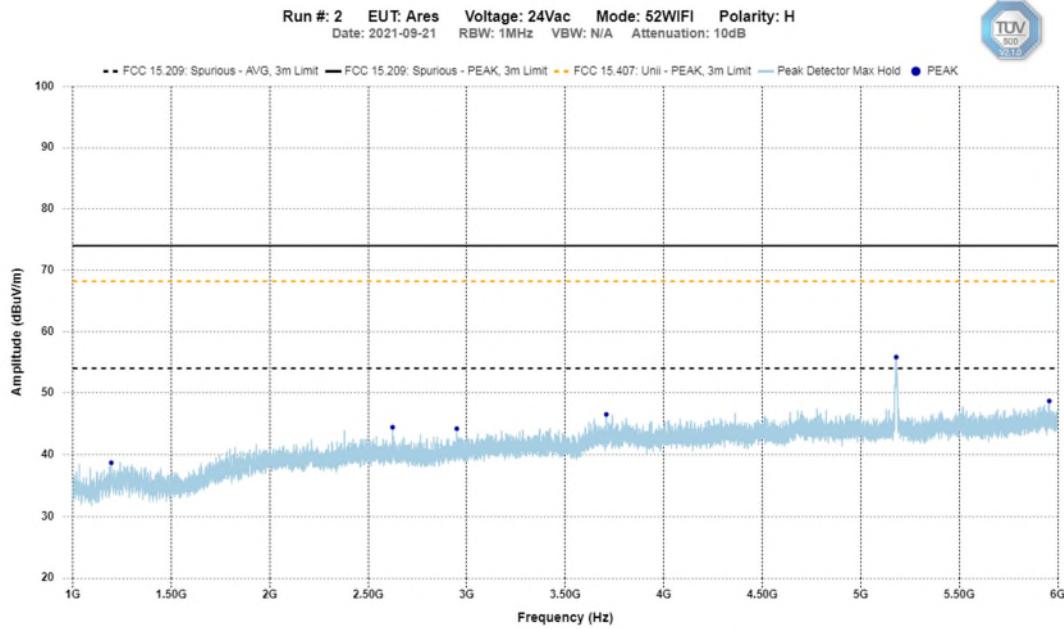


Mid Channel – 30 MHz – 1 GHz  
Horizontal - Peak Emission Graph

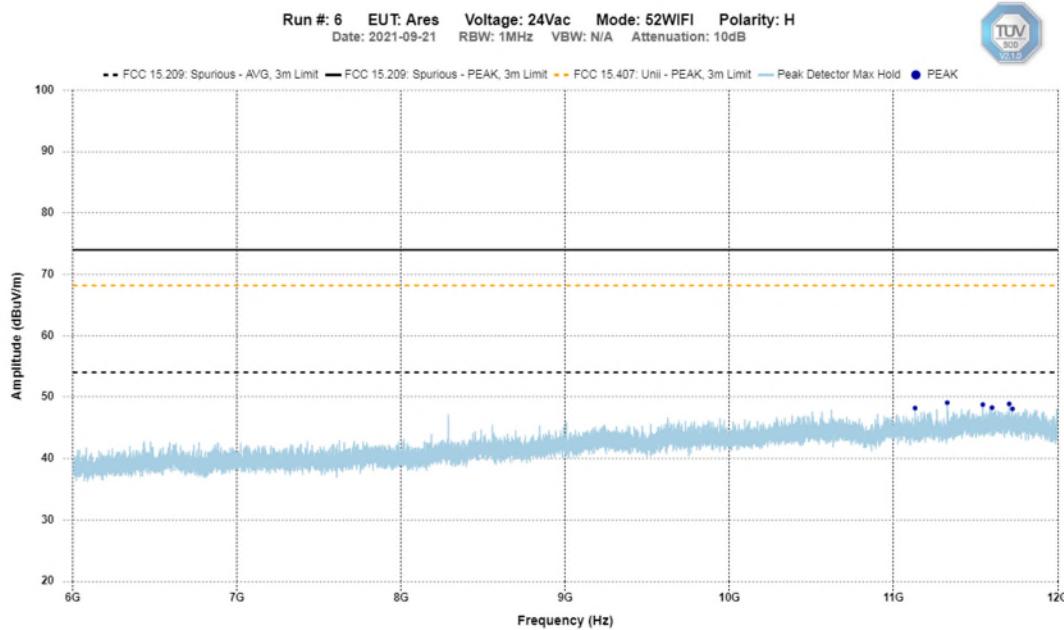


Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

### Mid Channel – 1 GHz – 6 GHz Horizontal - Peak Emission Graph

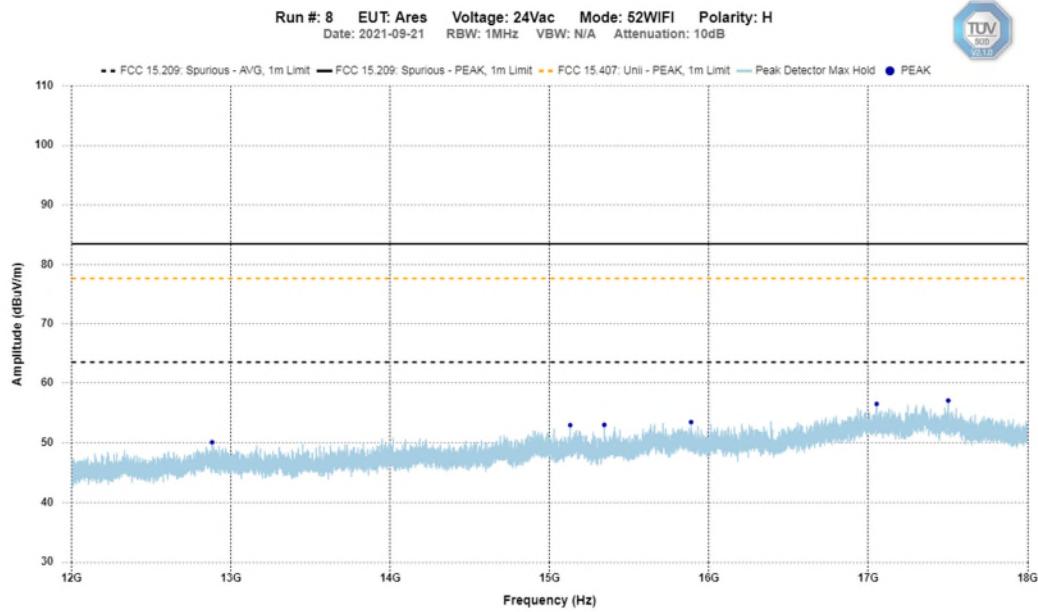


### Mid Channel – 6 GHz – 12 GHz Horizontal - Peak Emission Graph

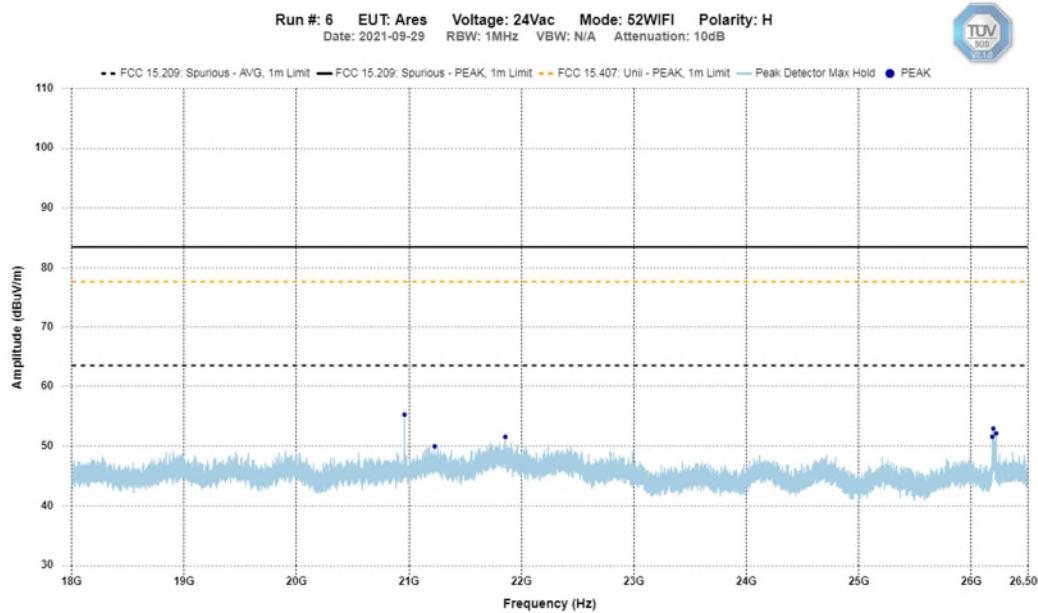


Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

### Mid Channel – 12 GHz – 18 GHz Horizontal - Peak Emission Graph



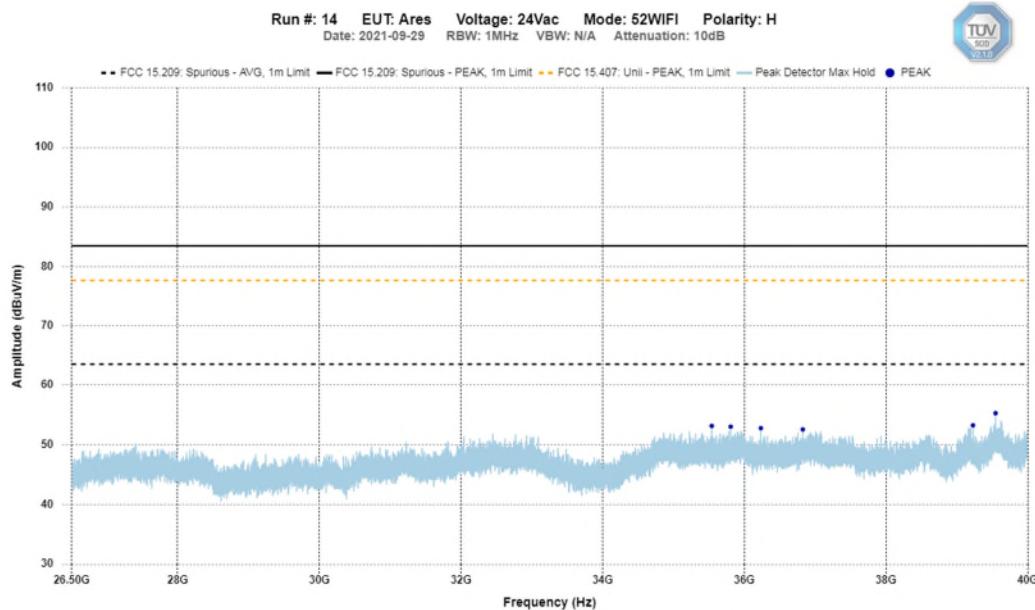
### Mid Channel – 18 GHz – 26.5 GHz Horizontal - Peak Emission Graph



12 – 16.5 GHz plots were taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

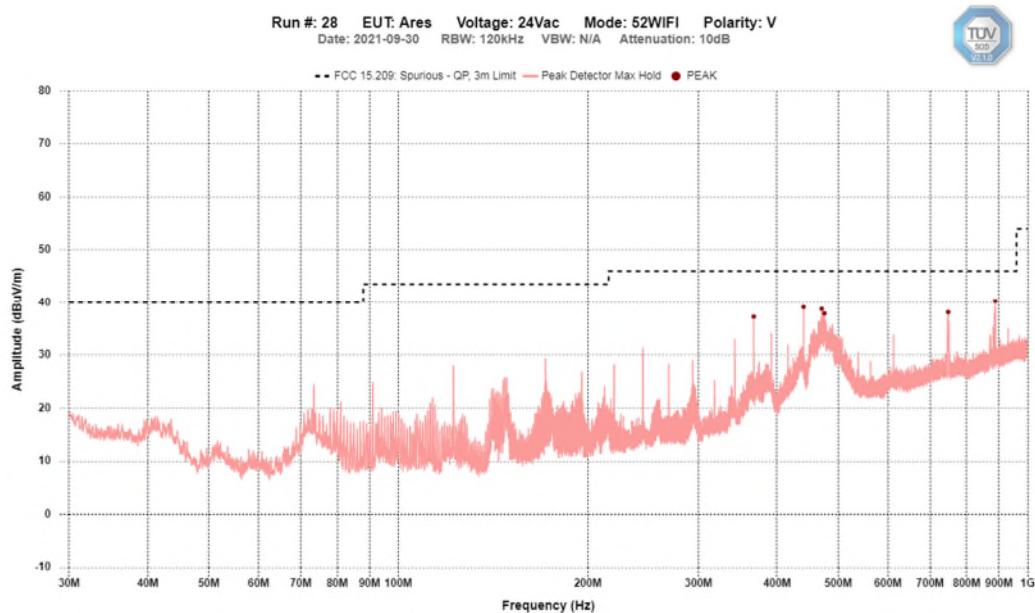
Client	<b>Ecobee Inc.</b>	 Canada
Product	<b>ECB601/ECB501</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

### Mid Channel – 26.5 GHz – 40.0 GHz Horizontal - Peak Emission Graph



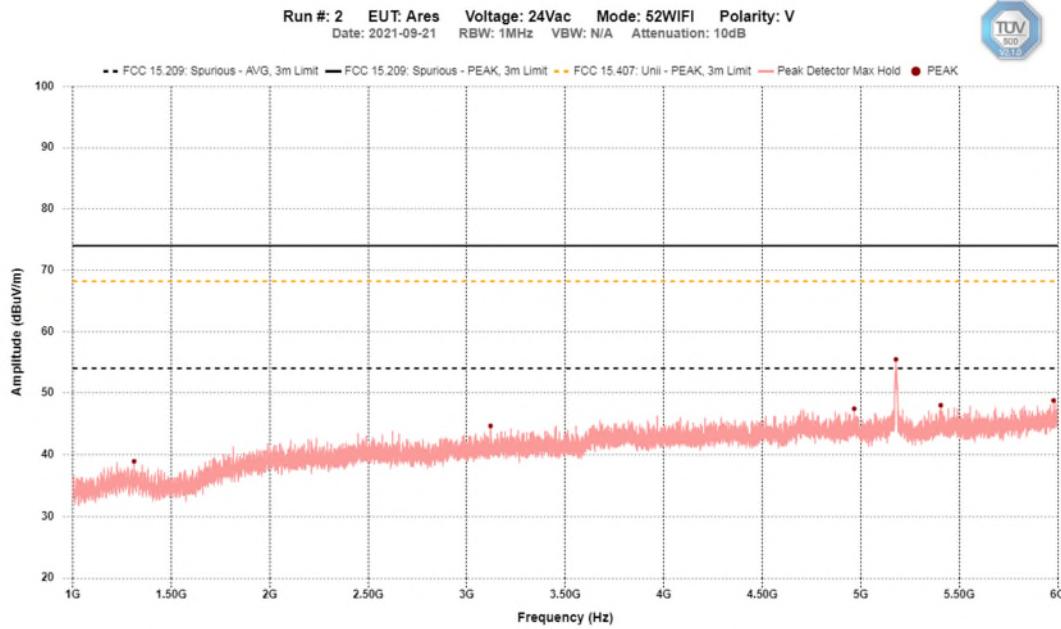
Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

### Mid Channel – 30 MHz – 1 GHz Vertical - Peak Emission Graph

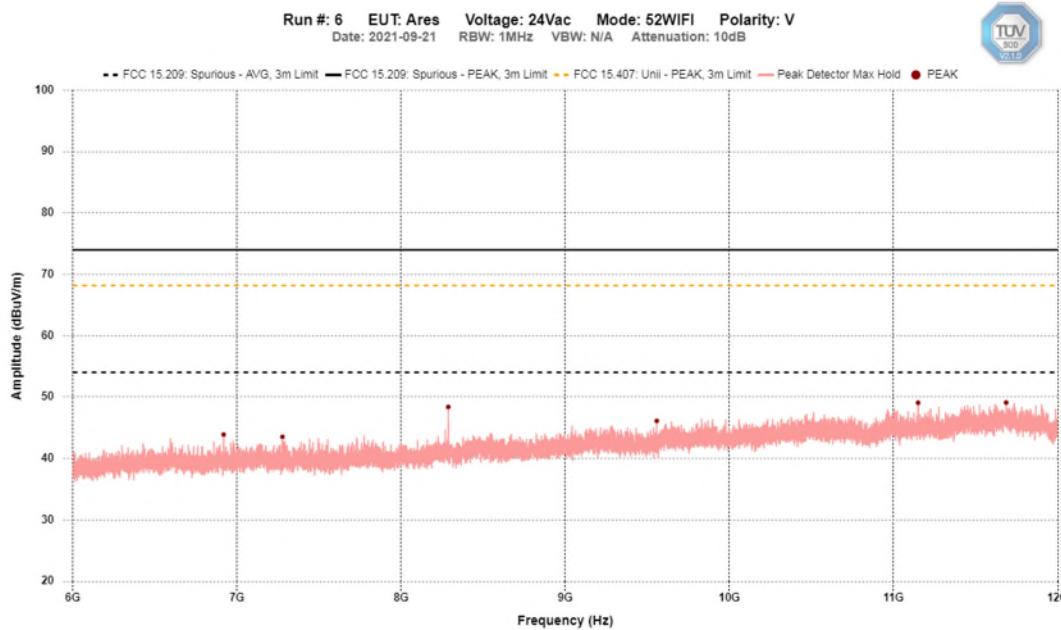


Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

### Mid Channel – 1 GHz – 6 GHz Vertical - Peak Emission Graph

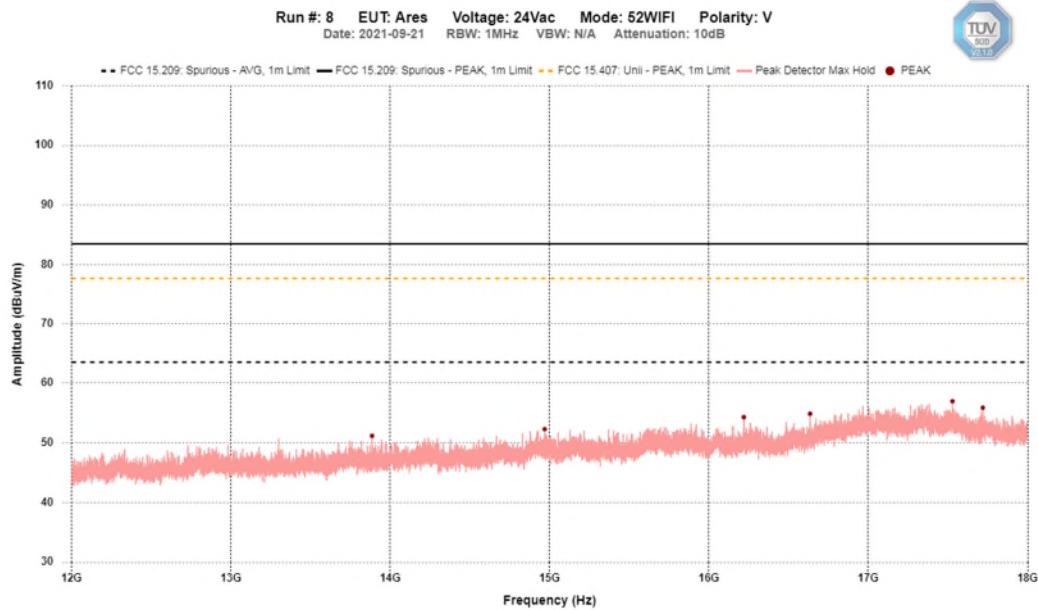


### Mid Channel – 6 GHz – 12 GHz Vertical - Peak Emission Graph

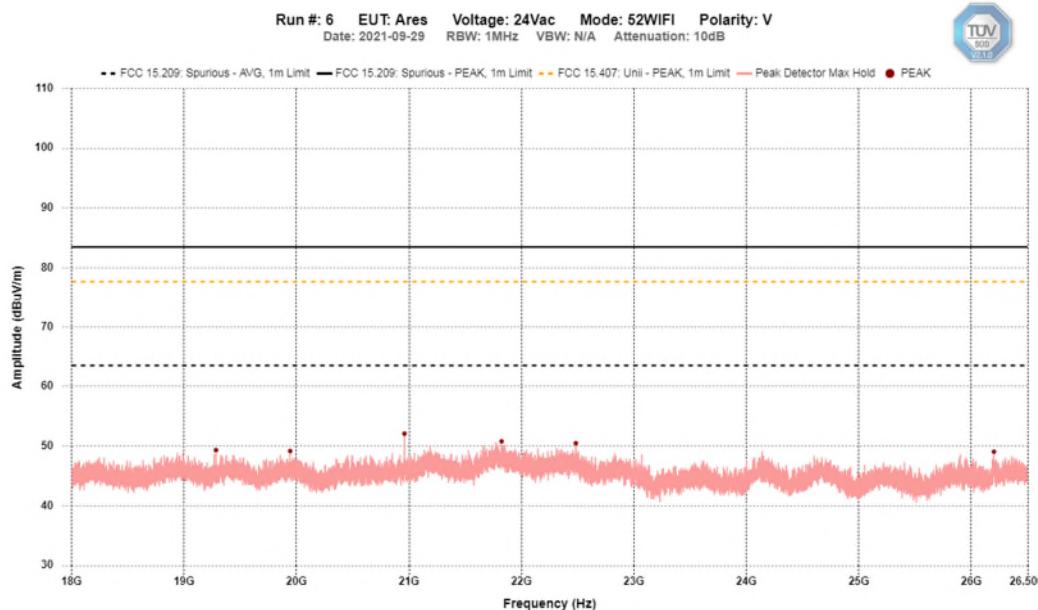


Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

### Mid Channel – 12 GHz – 18 GHz Vertical - Peak Emission Graph



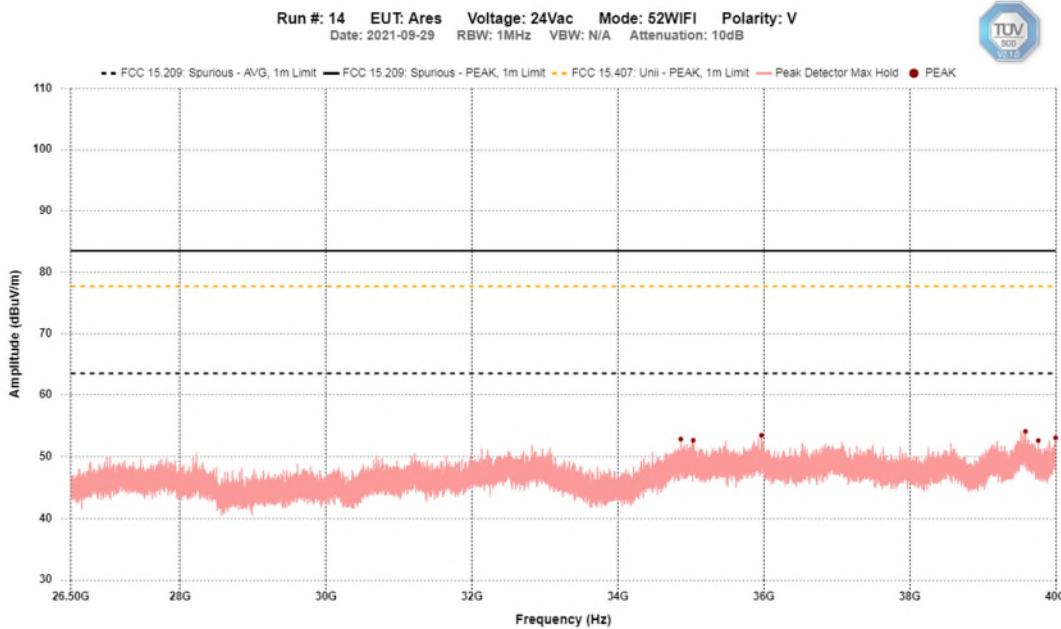
### Mid Channel – 18 GHz – 26.5 GHz Vertical - Peak Emission Graph



12 – 16.5 GHz plots were taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Mid Channel – 26.5 GHz – 40.0 GHz  
Horizontal - Peak Emission Graph



Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Client	Ecobee Inc.	TÜV SÜD Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Final Measurements and Results

The EUT passed. Low, middle, and high bands were measured.

In accordance with 15.407(b), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205 need to be verified with a final detector. Unwanted emission limits was applied to which were outside the restricted bands.

The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

EUT Name		ECB601				
Limit		FCC 15.209, Spurious				
Power Supply		24Vac				
Frequency (Hz)	Detector	Correction Factor (dB)	Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)	Test Result
<b>Horizontal</b>						
440.67M	PEAK	-7.4	41.2	46.0	4.8	Pass
887.4M	PEAK	4.4	39.5	46.0	6.5	Pass
748.17M	PEAK	1.5	38.4	46.0	7.6	Pass
882.57M	PEAK	4.3	37.9	46.0	8.1	Pass
367.23M	PEAK	-8.5	35.5	46.0	10.5	Pass
455.85M	PEAK	-6.6	35.2	46.0	10.8	Pass
<b>Vertical</b>						
888.39M	PEAK	4.5	40.3	46.0	5.7	Pass
440.67M	PEAK	-7.4	39.1	46.0	6.9	Pass
470.94M	PEAK	-5.3	38.8	46.0	7.2	Pass
748.23M	PEAK	1.5	38.1	46.0	7.9	Pass
475.71M	PEAK	-4.9	37.9	46.0	8.1	Pass
367.23M	PEAK	-8.5	37.3	46.0	8.7	Pass

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB601 Harmonic/Restricted Band Emission – 802.11A

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11A - Low Channel 20 MHz											
5180											
5180	Peak	Horz	97.9	28.1	4.6	10.0	-32.3	108.3			PASS
5180	Avg	Horz	85.8	28.1	4.6	10.0	-32.3	96.2			PASS
5180	Peak	Vert	94.8	28.1	4.6	10.0	-32.3	105.1			PASS
5180	Avg	Vert	82.7	28.1	4.6	10.0	-32.3	93.1			PASS
5148.4	Peak	Horz	47.8	28.1	4.5	10.0	-32.3	58.0	74.0	16.0	PASS
5148.4	Avg	Horz	33.1	28.1	4.5	10.0	-32.3	43.3	54.0	10.7	PASS
5149	Peak	Vert	51.8	28.1	4.5	10.0	-32.3	62.0	74.0	12.0	PASS
5149	Avg	Vert	35.4	28.1	4.5	10.0	-32.3	45.7	54.0	8.3	PASS
5395.1	Peak	Horz	41.9	28.3	4.8	10.0	-32.4	52.6	74.0	21.4	PASS
5353.7	Avg	Horz	27.8	28.3	4.7	10.0	-32.4	38.4	54.0	15.6	PASS
5363.4	Peak	Vert	44.7	28.3	4.7	10.0	-32.4	55.3	74.0	18.7	PASS
5443.7	Avg	Vert	29.9	28.1	4.8	10.0	-32.4	40.5	54.0	13.5	PASS
10360	Peak	Horz	60.3	31.7	7.1	0.0	-31.7	67.4	68.2	0.8	PASS
10360	Peak	Vert	59.2	31.7	7.1	0.0	-31.7	66.3	68.2	1.9	PASS
15540	Peak	Horz	43.0	33.3	8.9	0.0	-28.8	56.3	74.0	17.7	PASS
15540	Avg	Horz	28.4	33.3	8.9	0.0	-28.8	41.8	54.0	12.2	PASS
15540	Peak	Vert	43.1	33.3	8.9	0.0	-28.8	56.4	74.0	17.6	PASS
15540	Avg	Vert	29.1	33.3	8.9	0.0	-28.8	42.5	54.0	11.5	PASS
802.11A - Mid Channel 20 MHz											
5220											
5220	Peak	Horz	97.9	28.0	4.7	10.0	-32.3	108.2			PASS
5220	Avg	Horz	85.7	28.0	4.7	10.0	-32.3	96.1			PASS
5220	Peak	Vert	92.4	28.0	4.7	10.0	-32.3	102.8			PASS
5220	Avg	Vert	80.4	28.0	4.7	10.0	-32.3	90.8			PASS
4543.2	Peak	Horz	42.1	27.3	3.9	10.0	-32.8	50.6	74.0	23.4	PASS
4514	Avg	Horz	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
4509.4	Peak	Vert	40.8	27.3	3.9	10.0	-32.7	49.3	74.0	24.7	PASS
4501	Avg	Vert	28.1	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
5409.5	Peak	Horz	42.4	28.2	4.8	10.0	-32.4	53.1	74.0	20.9	PASS
5353.4	Avg	Horz	27.9	28.3	4.7	10.0	-32.4	38.6	54.0	15.4	PASS
5441.9	Peak	Vert	42.1	28.1	4.8	10.0	-32.4	52.7	74.0	21.3	PASS
5355.9	Avg	Vert	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
10440	Peak	Horz	60.3	32.1	7.1	0.0	-31.6	67.9	68.2	0.3	PASS
10440	Peak	Vert	52.9	32.1	7.1	0.0	-31.6	60.5	68.2	7.7	PASS
15660	Peak	Horz	41.9	33.4	8.9	0.0	-28.4	55.7	74.0	18.3	PASS
15660	Avg	Horz	28.2	33.4	8.9	0.0	-28.4	42.1	54.0	11.9	PASS
15660	Peak	Vert	43.9	33.4	8.9	0.0	-28.4	57.7	74.0	16.3	PASS
15660	Avg	Vert	29.3	33.4	8.9	0.0	-28.4	43.1	54.0	10.9	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11A - High Channel											
20 MHz											
5240	Peak	Horz	97.8	28.0	4.7	10.0	-32.4	108.1			PASS
5240	Avg	Horz	85.6	28.0	4.7	10.0	-32.4	96.0			PASS
5240	Peak	Vert	93.3	28.0	4.7	10.0	-32.4	103.6			PASS
5240	Avg	Vert	81.3	28.0	4.7	10.0	-32.4	91.6			PASS
4663.8	Peak	Horz	42.6	28.0	4.5	10.0	-32.6	52.5	74.0	21.5	PASS
4510.4	Avg	Horz	28.1	27.3	3.9	10.0	-32.7	36.6	54.0	17.4	PASS
4551.5	Peak	Vert	41.8	27.3	3.9	10.0	-32.8	50.2	74.0	23.8	PASS
4506.8	Avg	Vert	28.1	27.3	3.9	10.0	-32.7	36.6	54.0	17.4	PASS
5358.5	Peak	Horz	42.2	28.3	4.7	10.0	-32.4	52.8	74.0	21.2	PASS
5350.7	Avg	Horz	28.0	28.3	4.7	10.0	-32.4	38.7	54.0	15.3	PASS
5404.2	Peak	Vert	41.8	28.2	4.8	10.0	-32.4	52.4	74.0	21.6	PASS
5353.3	Avg	Vert	27.8	28.3	4.7	10.0	-32.4	38.4	54.0	15.6	PASS
10480	Peak	Horz	60.3	32.3	7.1	0.0	-31.6	68.1	68.2	0.1	PASS
10480	Peak	Vert	52.9	32.3	7.1	0.0	-31.6	60.6	68.2	7.6	PASS
15720	Peak	Horz	42.0	33.1	8.9	0.0	-28.4	55.7	74.0	18.3	PASS
15720	Avg	Horz	28.1	33.1	8.9	0.0	-28.4	41.8	54.0	12.2	PASS
15720	Peak	Vert	41.9	33.1	8.9	0.0	-28.4	55.6	74.0	18.4	PASS
15720	Avg	Vert	28.3	33.1	8.9	0.0	-28.4	41.9	54.0	12.1	PASS

### ECB601 Harmonic/Restricted Band Emission – 802.11N/20MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11N/20MHz - Low Channel											
20 MHz											
5180	Peak	Horz	97.7	28.1	4.6	10.0	-32.3	108.1			PASS
5180	Avg	Horz	84.0	28.1	4.6	10.0	-32.3	94.4			PASS
5180	Peak	Vert	91.7	28.1	4.6	10.0	-32.3	102.1			PASS
5180	Avg	Vert	78.2	28.1	4.6	10.0	-32.3	88.6			PASS
5149	Peak	Horz	49.0	28.1	4.5	10.0	-32.3	59.2	74.0	14.8	PASS
5149	Avg	Horz	32.6	28.1	4.5	10.0	-32.3	42.9	54.0	11.1	PASS
5148.4	Peak	Vert	42.8	28.1	4.5	10.0	-32.3	53.1	74.0	20.9	PASS
5148.4	Avg	Vert	28.9	28.1	4.5	10.0	-32.3	39.1	54.0	14.9	PASS
5432.6	Peak	Horz	41.9	28.2	4.8	10.0	-32.4	52.5	74.0	21.5	PASS
5353.4	Avg	Horz	27.8	28.3	4.7	10.0	-32.4	38.4	54.0	15.6	PASS
5374.4	Peak	Vert	42.6	28.3	4.7	10.0	-32.4	53.3	74.0	20.7	PASS
5352.6	Avg	Vert	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
10360	Peak	Horz	59.6	31.7	7.1	0.0	-31.7	66.7	68.2	1.5	PASS
10360	Peak	Vert	51.8	31.7	7.1	0.0	-31.7	58.9	68.2	9.3	PASS
15540	Peak	Horz	41.5	33.3	8.9	0.0	-28.8	54.8	74.0	19.2	PASS
15540	Avg	Horz	27.2	33.3	8.9	0.0	-28.8	40.5	54.0	13.5	PASS
15540	Peak	Vert	42.6	33.3	8.9	0.0	-28.8	56.0	74.0	18.0	PASS
15540	Avg	Vert	28.1	33.3	8.9	0.0	-28.8	41.4	54.0	12.6	PASS

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407
Product	ECB601/ECB501	
Standard(s)		



Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
802.11N/20MHz - Mid Channel											
20 MHz											
5220	Peak	Horz	96.6	28.0	4.7	10.0	-32.3	107.0			PASS
5220	Avg	Horz	83.3	28.0	4.7	10.0	-32.3	93.7			PASS
5220	Peak	Vert	92.3	28.0	4.7	10.0	-32.3	102.7			PASS
5220	Avg	Vert	79.0	28.0	4.7	10.0	-32.3	89.4			PASS
5019	Peak	Horz	41.9	27.9	4.5	10.0	-32.4	51.9	74.0	22.1	PASS
4514	Avg	Horz	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
4519.8	Peak	Vert	41.9	27.3	3.9	10.0	-32.8	50.4	74.0	23.6	PASS
4510.4	Avg	Vert	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
5384.1	Peak	Horz	42.0	28.3	4.8	10.0	-32.4	52.6	74.0	21.4	PASS
5355.7	Avg	Horz	28.0	28.3	4.7	10.0	-32.4	38.6	54.0	15.4	PASS
5365.7	Peak	Vert	42.2	28.3	4.7	10.0	-32.4	52.9	74.0	21.1	PASS
5378.6	Avg	Vert	27.7	28.3	4.8	10.0	-32.4	38.4	54.0	15.6	PASS
10440	Peak	Horz	59.2	32.1	7.1	0.0	-31.6	66.8	68.2	1.4	PASS
10440	Peak	Vert	51.4	32.1	7.1	0.0	-31.6	59.0	68.2	9.2	PASS
15660	Peak	Horz	41.3	33.4	8.9	0.0	-28.4	55.1	74.0	18.9	PASS
15660	Avg	Horz	27.6	33.4	8.9	0.0	-28.4	41.4	54.0	12.6	PASS
15660	Peak	Vert	41.7	33.4	8.9	0.0	-28.4	55.6	74.0	18.4	PASS
15660	Avg	Vert	27.7	33.4	8.9	0.0	-28.4	41.6	54.0	12.4	PASS
802.11N/20MHz - High Channel											
20 MHz											
5240	Peak	Horz	97.4	28.0	4.7	10.0	-32.4	107.7			PASS
5240	Avg	Horz	83.7	28.0	4.7	10.0	-32.4	94.0			PASS
5240	Peak	Vert	91.9	28.0	4.7	10.0	-32.4	102.2			PASS
5240	Avg	Vert	78.7	28.0	4.7	10.0	-32.4	89.0			PASS
4569.2	Peak	Horz	42.5	27.5	3.9	10.0	-32.8	51.1	74.0	22.9	PASS
4549.4	Avg	Horz	28.2	27.3	3.9	10.0	-32.8	36.6	54.0	17.4	PASS
4737.1	Peak	Vert	42.4	27.8	4.6	10.0	-32.5	52.3	74.0	21.7	PASS
4509.9	Avg	Vert	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
5398.2	Peak	Horz	41.9	28.3	4.8	10.0	-32.4	52.5	74.0	21.5	PASS
5351.9	Avg	Horz	28.1	28.3	4.7	10.0	-32.4	38.8	54.0	15.2	PASS
5355.3	Peak	Vert	42.2	28.3	4.7	10.0	-32.4	52.9	74.0	21.1	PASS
5351.8	Avg	Vert	27.8	28.3	4.7	10.0	-32.4	38.5	54.0	15.5	PASS
10480	Peak	Horz	59.3	32.3	7.1	0.0	-31.6	67.1	68.2	1.1	PASS
10480	Peak	Vert	51.7	32.3	7.1	0.0	-31.6	59.5	68.2	8.7	PASS
15720	Peak	Horz	41.8	33.1	8.9	0.0	-28.4	55.4	74.0	18.6	PASS
15720	Avg	Horz	27.8	33.1	8.9	0.0	-28.4	41.5	54.0	12.5	PASS
15720	Peak	Vert	42.3	33.1	8.9	0.0	-28.4	55.9	74.0	18.1	PASS
15720	Avg	Vert	28.3	33.1	8.9	0.0	-28.4	42.0	54.0	12.0	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB601 Harmonic/Restricted Band Emission – 802.11N/40MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11N/40MHz - Low Channel											
40 MHz											
5190	Peak	Horz	94.2	28.1	4.6	10.0	-32.3	104.6			PASS
5190	Avg	Horz	78.8	28.1	4.6	10.0	-32.3	89.2			PASS
5190	Peak	Vert	88.6	28.1	4.6	10.0	-32.3	99.0			PASS
5190	Avg	Vert	73.3	28.1	4.6	10.0	-32.3	83.8			PASS
5149	Peak	Horz	58.9	28.1	4.5	10.0	-32.3	69.1	74.0	4.9	PASS
5150	Avg	Horz	43.2	28.1	4.5	10.0	-32.3	53.5	54.0	0.5	PASS
5150	Peak	Vert	52.5	28.1	4.5	10.0	-32.3	62.8	74.0	11.2	PASS
5150	Avg	Vert	37.3	28.1	4.5	10.0	-32.3	47.6	54.0	6.4	PASS
5366.5	Peak	Horz	41.8	28.3	4.7	10.0	-32.4	52.4	74.0	21.6	PASS
5350.4	Avg	Horz	27.7	28.3	4.7	10.0	-32.4	38.4	54.0	15.6	PASS
5390	Peak	Vert	42.2	28.3	4.8	10.0	-32.4	52.9	74.0	21.1	PASS
5351.9	Avg	Vert	27.6	28.3	4.7	10.0	-32.4	38.2	54.0	15.8	PASS
10380	Peak	Horz	53.1	31.7	7.1	0.0	-31.6	60.2	68.2	8.0	PASS
10380	Peak	Vert	46.0	31.7	7.1	0.0	-31.6	53.1	68.2	15.1	PASS
15570	Peak	Horz	40.3	33.4	8.9	0.0	-28.7	53.9	74.0	20.1	PASS
15570	Avg	Horz	26.4	33.4	8.9	0.0	-28.7	40.0	54.0	14.0	PASS
15570	Peak	Vert	40.5	33.4	8.9	0.0	-28.7	54.1	74.0	19.9	PASS
15570	Avg	Vert	26.8	33.4	8.9	0.0	-28.7	40.4	54.0	13.6	PASS
802.11N/40MHz - High Channel											
40 MHz											
5230	Peak	Horz	93.6	28.0	4.7	10.0	-32.3	103.9			PASS
5230	Avg	Horz	78.3	28.0	4.7	10.0	-32.3	88.7			PASS
5230	Peak	Vert	89.0	28.0	4.7	10.0	-32.3	99.4			PASS
5230	Avg	Vert	73.9	28.0	4.7	10.0	-32.3	84.2			PASS
5134.9	Peak	Horz	42.0	28.1	4.4	10.0	-32.4	52.1	74.0	21.9	PASS
5148.4	Avg	Horz	29.4	28.1	4.5	10.0	-32.3	39.6	54.0	14.4	PASS
4812	Peak	Vert	42.1	27.8	4.3	10.0	-32.5	51.6	74.0	22.4	PASS
4513	Avg	Vert	28.3	27.3	3.9	10.0	-32.7	36.8	54.0	17.2	PASS
5394	Peak	Horz	42.5	28.3	4.8	10.0	-32.4	53.1	74.0	20.9	PASS
5350	Avg	Horz	27.9	28.3	4.7	10.0	-32.4	38.5	54.0	15.5	PASS
5384.8	Peak	Vert	42.0	28.3	4.8	10.0	-32.4	52.7	74.0	21.3	PASS
5352.4	Avg	Vert	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
10460	Peak	Horz	53.6	32.2	7.1	0.0	-31.6	61.3	68.2	6.9	PASS
10460	Peak	Vert	45.4	32.2	7.1	0.0	-31.6	53.1	68.2	15.1	PASS
15690	Peak	Horz	40.1	33.3	8.9	0.0	-28.4	53.9	74.0	20.1	PASS
15690	Avg	Horz	26.7	33.3	8.9	0.0	-28.4	40.5	54.0	13.5	PASS
15690	Peak	Vert	40.6	33.3	8.9	0.0	-28.4	54.3	74.0	19.7	PASS
15690	Avg	Vert	27.1	33.3	8.9	0.0	-28.4	40.9	54.0	13.1	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB601 Harmonic/Restricted Band Emission – 802.11AC/20MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11AC/20MHz - Low Channel											
5180	Peak	Horz	97.3	28.1	4.6	10.0	-32.3	107.6			PASS
5180	Avg	Horz	83.7	28.1	4.6	10.0	-32.3	94.0			PASS
5180	Peak	Vert	91.5	28.1	4.6	10.0	-32.3	101.9			PASS
5180	Avg	Vert	78.1	28.1	4.6	10.0	-32.3	88.5			PASS
5150	Peak	Horz	48.3	28.1	4.5	10.0	-32.3	58.6	74.0	15.4	PASS
5150	Avg	Horz	32.8	28.1	4.5	10.0	-32.3	43.0	54.0	11.0	PASS
5148.4	Peak	Vert	41.9	28.1	4.5	10.0	-32.3	52.2	74.0	21.8	PASS
5148.4	Avg	Vert	28.2	28.1	4.5	10.0	-32.3	38.4	54.0	15.6	PASS
5408.3	Peak	Horz	41.7	28.2	4.8	10.0	-32.4	52.4	74.0	21.6	PASS
5353.3	Avg	Horz	27.7	28.3	4.7	10.0	-32.4	38.4	54.0	15.6	PASS
5382.1	Peak	Vert	42.7	28.3	4.8	10.0	-32.4	53.3	74.0	20.7	PASS
5352.8	Avg	Vert	27.6	28.3	4.7	10.0	-32.4	38.2	54.0	15.8	PASS
10360	Peak	Horz	59.2	31.7	7.1	0.0	-31.7	66.3	68.2	1.9	PASS
10360	Peak	Vert	52.6	31.7	7.1	0.0	-31.7	59.7	68.2	8.5	PASS
15540	Peak	Horz	42.1	33.3	8.9	0.0	-28.8	55.4	74.0	18.6	PASS
15540	Avg	Horz	27.5	33.3	8.9	0.0	-28.8	40.9	54.0	13.1	PASS
15540	Peak	Vert	42.8	33.3	8.9	0.0	-28.8	56.1	74.0	17.9	PASS
15540	Avg	Vert	27.9	33.3	8.9	0.0	-28.8	41.3	54.0	12.7	PASS
802.11AC/20MHz - Mid Channel											
5220	Peak	Horz	96.6	28.0	4.7	10.0	-32.3	107.0			PASS
5220	Avg	Horz	83.2	28.0	4.7	10.0	-32.3	93.6			PASS
5220	Peak	Vert	92.2	28.0	4.7	10.0	-32.3	102.6			PASS
5220	Avg	Vert	78.8	28.0	4.7	10.0	-32.3	89.2			PASS
4555.1	Peak	Horz	42.1	27.3	3.9	10.0	-32.8	50.6	74.0	23.4	PASS
4509.9	Avg	Horz	28.1	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
4530.2	Peak	Vert	42.4	27.3	3.9	10.0	-32.8	50.8	74.0	23.2	PASS
4503.1	Avg	Vert	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
5384.5	Peak	Horz	42.5	28.3	4.8	10.0	-32.4	53.1	74.0	20.9	PASS
5353	Avg	Horz	27.9	28.3	4.7	10.0	-32.4	38.5	54.0	15.5	PASS
5355.1	Peak	Vert	41.7	28.3	4.7	10.0	-32.4	52.3	74.0	21.7	PASS
5374.6	Avg	Vert	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
10440	Peak	Horz	59.2	32.1	7.1	0.0	-31.6	66.8	68.2	1.4	PASS
10440	Peak	Vert	52.1	32.1	7.1	0.0	-31.6	59.7	68.2	8.5	PASS
15660	Peak	Horz	41.3	33.4	8.9	0.0	-28.4	55.2	74.0	18.9	PASS
15660	Avg	Horz	27.5	33.4	8.9	0.0	-28.4	41.3	54.0	12.7	PASS
15660	Peak	Vert	41.7	33.4	8.9	0.0	-28.4	55.6	74.0	18.5	PASS
15660	Avg	Vert	27.8	33.4	8.9	0.0	-28.4	41.7	54.0	12.3	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11AC/20MHz - High Channel 20 MHz											
5240	Peak	Horz	97.1	28.0	4.7	10.0	-32.4	107.4			PASS
5240	Avg	Horz	83.5	28.0	4.7	10.0	-32.4	93.9			PASS
5240	Peak	Vert	90.4	28.0	4.7	10.0	-32.4	100.7			PASS
5240	Avg	Vert	77.0	28.0	4.7	10.0	-32.4	87.3			PASS
4566.6	Peak	Horz	41.2	27.5	3.9	10.0	-32.8	49.7	74.0	24.3	PASS
4509.9	Avg	Horz	28.2	27.3	3.9	10.0	-32.7	36.7	54.0	17.3	PASS
4500	Peak	Vert	40.8	27.3	3.9	10.0	-32.7	49.3	74.0	24.7	PASS
4500	Avg	Vert	28.1	27.3	3.9	10.0	-32.7	36.6	54.0	17.4	PASS
5383.4	Peak	Horz	42.1	28.3	4.8	10.0	-32.4	52.7	74.0	21.3	PASS
5351.7	Avg	Horz	28.1	28.3	4.7	10.0	-32.4	38.7	54.0	15.3	PASS
5438.4	Peak	Vert	41.8	28.2	4.8	10.0	-32.4	52.4	74.0	21.6	PASS
5353.3	Avg	Vert	27.6	28.3	4.7	10.0	-32.4	38.2	54.0	15.8	PASS
10480	Peak	Horz	59.3	32.3	7.1	0.0	-31.6	67.1	68.2	1.1	PASS
10480	Peak	Vert	52.3	32.3	7.1	0.0	-31.6	60.0	68.2	8.2	PASS
15720	Peak	Horz	41.8	33.1	8.9	0.0	-28.4	55.4	74.0	18.6	PASS
15720	Avg	Horz	27.8	33.1	8.9	0.0	-28.4	41.5	54.0	12.5	PASS
15720	Peak	Vert	41.2	33.1	8.9	0.0	-28.4	54.8	74.0	19.2	PASS
15720	Avg	Vert	27.7	33.1	8.9	0.0	-28.4	41.4	54.0	12.6	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB601 Harmonic/Restricted Band Emission – 802.11AC/40MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11AC/40MHz - Low Channel											
40 MHz											
5190	Peak	Horz	94.6	28.1	4.6	10.0	-32.3	105.0			PASS
5190	Avg	Horz	78.9	28.1	4.6	10.0	-32.3	89.4			PASS
5190	Peak	Vert	88.3	28.1	4.6	10.0	-32.3	98.7			PASS
5190	Avg	Vert	73.3	28.1	4.6	10.0	-32.3	83.7			PASS
5147.4	Peak	Horz	58.7	28.1	4.5	10.0	-32.3	68.9	74.0	5.1	PASS
5150	Avg	Horz	43.2	28.1	4.5	10.0	-32.3	53.5	54.0	0.5	PASS
5149	Peak	Vert	52.4	28.1	4.5	10.0	-32.3	62.6	74.0	11.4	PASS
5150	Avg	Vert	37.0	28.1	4.5	10.0	-32.3	47.3	54.0	6.7	PASS
5400.4	Peak	Horz	42.6	28.3	4.8	10.0	-32.4	53.2	74.0	20.8	PASS
5350.8	Avg	Horz	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
5443.3	Peak	Vert	42.0	28.1	4.8	10.0	-32.4	52.5	74.0	21.5	PASS
5350.2	Avg	Vert	27.6	28.3	4.7	10.0	-32.4	38.2	54.0	15.8	PASS
10380	Peak	Horz	52.9	31.7	7.1	0.0	-31.6	60.0	68.2	8.2	PASS
10380	Peak	Vert	47.6	31.7	7.1	0.0	-31.6	54.7	68.2	13.5	PASS
15570	Peak	Horz	40.4	33.4	8.9	0.0	-28.7	54.0	74.0	20.0	PASS
15570	Avg	Horz	26.4	33.4	8.9	0.0	-28.7	40.1	54.0	13.9	PASS
15570	Peak	Vert	40.6	33.4	8.9	0.0	-28.7	54.3	74.0	19.7	PASS
15570	Avg	Vert	26.6	33.4	8.9	0.0	-28.7	40.2	54.0	13.8	PASS
802.11AC/20MHz - High Channel											
40 MHz											
5230	Peak	Horz	93.8	28.0	4.7	10.0	-32.3	104.2			PASS
5230	Avg	Horz	78.5	28.0	4.7	10.0	-32.3	88.9			PASS
5230	Peak	Vert	89.1	28.0	4.7	10.0	-32.3	99.4			PASS
5230	Avg	Vert	73.9	28.0	4.7	10.0	-32.3	84.3			PASS
4506.2	Peak	Horz	42.8	27.3	3.9	10.0	-32.7	51.3	74.0	22.7	PASS
5147.9	Avg	Horz	29.4	28.1	4.5	10.0	-32.3	39.7	54.0	14.3	PASS
4502.1	Peak	Vert	42.0	27.3	3.9	10.0	-32.7	50.6	74.0	23.4	PASS
4517.2	Avg	Vert	28.3	27.3	3.9	10.0	-32.8	36.8	54.0	17.2	PASS
5384.2	Peak	Horz	42.6	28.3	4.8	10.0	-32.4	53.3	74.0	20.7	PASS
5351.8	Avg	Horz	27.9	28.3	4.7	10.0	-32.4	38.5	54.0	15.5	PASS
5427.9	Peak	Vert	42.2	28.2	4.8	10.0	-32.4	52.8	74.0	21.2	PASS
5351.9	Avg	Vert	27.7	28.3	4.7	10.0	-32.4	38.3	54.0	15.7	PASS
10460	Peak	Horz	53.6	32.2	7.1	0.0	-31.6	61.3	68.2	6.9	PASS
10460	Peak	Vert	46.6	32.2	7.1	0.0	-31.6	54.4	68.2	13.8	PASS
15690	Peak	Horz	40.9	33.3	8.9	0.0	-28.4	54.6	74.0	19.4	PASS
15690	Avg	Horz	26.8	33.3	8.9	0.0	-28.4	40.6	54.0	13.4	PASS
15690	Peak	Vert	41.8	33.3	8.9	0.0	-28.4	55.6	74.0	18.4	PASS
15690	Avg	Vert	27.2	33.3	8.9	0.0	-28.4	41.0	54.0	13.0	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB501 Harmonic/Restricted Band Emission – 802.11A

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11A - Low Channel 20 MHz											
5180											
5180	Peak	Horz	97.4	28.1	4.6	10.0	-32.3	107.8			PASS
5180	Avg	Horz	85.4	28.1	4.6	10.0	-32.3	95.8			PASS
5180	Peak	Vert	98.4	28.1	4.6	10.0	-32.3	108.8			PASS
5180	Avg	Vert	86.3	28.1	4.6	10.0	-32.3	96.7			PASS
5149.5	Peak	Horz	44.5	28.1	4.5	10.0	-32.3	54.8	74.0	19.2	PASS
5149.5	Avg	Horz	30.9	28.1	4.5	10.0	-32.3	41.2	54.0	12.8	PASS
5149.5	Peak	Vert	50.3	28.1	4.5	10.0	-32.3	60.6	74.0	13.4	PASS
5149.5	Avg	Vert	34.5	28.1	4.5	10.0	-32.3	44.7	54.0	9.3	PASS
5429.3	Peak	Horz	44.2	28.2	4.8	10.0	-32.4	54.8	74.0	19.2	PASS
5353.3	Avg	Horz	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
5387.7	Peak	Vert	45.1	28.3	4.8	10.0	-32.4	55.8	74.0	18.2	PASS
5357	Avg	Vert	30.2	28.3	4.7	10.0	-32.4	40.9	54.0	13.1	PASS
10360	Peak	Horz	52.1	31.7	7.1	0.0	-31.7	59.2	68.2	9.0	PASS
10360	Peak	Vert	51.1	31.7	7.1	0.0	-31.7	58.1	68.2	10.1	PASS
15540	Peak	Horz	48.2	33.3	8.9	0.0	-28.8	61.5	74.0	12.5	PASS
15540	Avg	Horz	33.8	33.3	8.9	0.0	-28.8	47.1	54.0	6.9	PASS
15540	Peak	Vert	49.0	33.3	8.9	0.0	-28.8	62.3	74.0	11.7	PASS
15540	Avg	Vert	34.6	33.3	8.9	0.0	-28.8	47.9	54.0	6.1	PASS
802.11A - Mid Channel 20 MHz											
5220											
5220	Peak	Horz	97.4	28.0	4.7	10.0	-32.3	107.8			PASS
5220	Avg	Horz	85.3	28.0	4.7	10.0	-32.3	95.7			PASS
5220	Peak	Vert	96.8	28.0	4.7	10.0	-32.3	107.2			PASS
5220	Avg	Vert	84.8	28.0	4.7	10.0	-32.3	95.2			PASS
4669.5	Peak	Horz	45.3	28.0	4.6	10.0	-32.6	55.2	74.0	18.8	PASS
4501.6	Avg	Horz	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
4581.6	Peak	Vert	44.2	27.6	3.9	10.0	-32.8	52.9	74.0	21.1	PASS
4501	Avg	Vert	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
5456.1	Peak	Horz	44.4	28.1	4.8	10.0	-32.3	55.0	74.0	19.0	PASS
5350.7	Avg	Horz	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
5373.9	Peak	Vert	44.2	28.3	4.7	10.0	-32.4	54.9	74.0	19.1	PASS
5350.4	Avg	Vert	30.1	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
10440	Peak	Horz	51.6	32.1	7.1	0.0	-31.6	59.2	68.2	9.0	PASS
10440	Peak	Vert	49.7	32.1	7.1	0.0	-31.6	57.3	68.2	10.9	PASS
15660	Peak	Horz	48.4	33.4	8.9	0.0	-28.4	62.2	74.0	11.8	PASS
15660	Avg	Horz	33.9	33.4	8.9	0.0	-28.4	47.7	54.0	6.3	PASS
15660	Peak	Vert	49.0	33.4	8.9	0.0	-28.4	62.8	74.0	11.2	PASS
15660	Avg	Vert	34.7	33.4	8.9	0.0	-28.4	48.5	54.0	5.5	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11A - High Channel											
20 MHz											
5240	Peak	Horz	97.3	28.0	4.7	10.0	-32.4	107.6			PASS
5240	Avg	Horz	85.3	28.0	4.7	10.0	-32.4	95.6			PASS
5240	Peak	Vert	97.6	28.0	4.7	10.0	-32.4	107.9			PASS
5240	Avg	Vert	85.4	28.0	4.7	10.0	-32.4	95.7			PASS
4939.9	Peak	Horz	44.4	28.0	4.5	10.0	-32.5	54.4	74.0	19.6	PASS
4926.9	Avg	Horz	30.8	28.0	4.4	10.0	-32.6	40.7	54.0	13.3	PASS
4747	Peak	Vert	44.7	27.7	4.6	10.0	-32.5	54.6	74.0	19.4	PASS
4501.6	Avg	Vert	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
5444.3	Peak	Horz	44.6	28.1	4.8	10.0	-32.4	55.2	74.0	18.8	PASS
5350.4	Avg	Horz	30.3	28.3	4.7	10.0	-32.4	40.9	54.0	13.1	PASS
5396.3	Peak	Vert	44.7	28.3	4.8	10.0	-32.4	55.4	74.0	18.6	PASS
5350.5	Avg	Vert	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
10480	Peak	Horz	52.0	32.3	7.1	0.0	-31.6	59.8	68.2	8.4	PASS
10480	Peak	Vert	49.3	32.3	7.1	0.0	-31.6	57.1	68.2	11.1	PASS
15720	Peak	Horz	46.8	33.1	8.9	0.0	-28.4	60.4	74.0	13.6	PASS
15720	Avg	Horz	32.9	33.1	8.9	0.0	-28.4	46.6	54.0	7.4	PASS
15720	Peak	Vert	49.0	33.1	8.9	0.0	-28.4	62.7	74.0	11.3	PASS
15720	Avg	Vert	33.9	33.1	8.9	0.0	-28.4	47.6	54.0	6.4	PASS

## ECB501 Harmonic/Restricted Band Emission – 802.11N/20MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11N/20MHz - Low Channel											
20 MHz											
5180	Peak	Horz	96.1	28.1	4.6	10.0	-32.3	106.5			PASS
5180	Avg	Horz	82.7	28.1	4.6	10.0	-32.3	93.1			PASS
5180	Peak	Vert	97.2	28.1	4.6	10.0	-32.3	107.6			PASS
5180	Avg	Vert	83.8	28.1	4.6	10.0	-32.3	94.1			PASS
5147.4	Peak	Horz	46.0	28.1	4.5	10.0	-32.3	56.3	74.0	17.7	PASS
5147.4	Avg	Horz	32.0	28.1	4.5	10.0	-32.3	42.3	54.0	11.7	PASS
5148.4	Peak	Vert	47.1	28.1	4.5	10.0	-32.3	57.3	74.0	16.7	PASS
5148.4	Avg	Vert	32.9	28.1	4.5	10.0	-32.3	43.2	54.0	10.8	PASS
5374.4	Peak	Horz	44.4	28.3	4.7	10.0	-32.4	55.0	74.0	19.0	PASS
5351.8	Avg	Horz	30.0	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
5441.7	Peak	Vert	45.0	28.1	4.8	10.0	-32.4	55.6	74.0	18.4	PASS
5356.7	Avg	Vert	30.0	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
10360	Peak	Horz	52.2	31.7	7.1	0.0	-31.7	59.2	68.2	9.0	PASS
10360	Peak	Vert	49.2	31.7	7.1	0.0	-31.7	56.2	68.2	12.0	PASS
15540	Peak	Horz	47.2	33.3	8.9	0.0	-28.8	60.5	74.0	13.5	PASS
15540	Avg	Horz	30.9	33.3	8.9	0.0	-28.8	44.2	54.0	9.8	PASS
15540	Peak	Vert	47.3	33.3	8.9	0.0	-28.8	60.6	74.0	13.4	PASS
15540	Avg	Vert	31.8	33.3	8.9	0.0	-28.8	45.2	54.0	8.8	PASS

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407
Product	ECB601/ECB501	
Standard(s)		



Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
802.11N/20MHz - Mid Channel											
20 MHz											
5220	Peak	Horz	97.0	28.0	4.7	10.0	-32.3	107.3			PASS
5220	Avg	Horz	83.3	28.0	4.7	10.0	-32.3	93.7			PASS
5220	Peak	Vert	96.5	28.0	4.7	10.0	-32.3	106.9			PASS
5220	Avg	Vert	83.1	28.0	4.7	10.0	-32.3	93.4			PASS
4524.4	Peak	Horz	43.5	27.3	3.9	10.0	-32.8	51.9	74.0	22.1	PASS
4505.7	Avg	Horz	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
4512.5	Peak	Vert	44.3	27.3	3.9	10.0	-32.7	52.8	74.0	21.2	PASS
4502.6	Avg	Vert	30.5	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
5356.1	Peak	Horz	44.5	28.3	4.7	10.0	-32.4	55.2	74.0	18.8	PASS
5351.1	Avg	Horz	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
5405.1	Peak	Vert	44.1	28.2	4.8	10.0	-32.4	54.7	74.0	19.3	PASS
5375.2	Avg	Vert	30.0	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
10440	Peak	Horz	49.7	32.1	7.1	0.0	-31.6	57.3	68.2	10.9	PASS
10440	Peak	Vert	48.1	32.1	7.1	0.0	-31.6	55.6	68.2	12.6	PASS
15660	Peak	Horz	44.9	33.4	8.9	0.0	-28.4	58.7	74.0	15.3	PASS
15660	Avg	Horz	30.2	33.4	8.9	0.0	-28.4	44.0	54.0	10.0	PASS
15660	Peak	Vert	46.3	33.4	8.9	0.0	-28.4	60.2	74.0	13.9	PASS
15660	Avg	Vert	31.7	33.4	8.9	0.0	-28.4	45.5	54.0	8.5	PASS
802.11N/20MHz - High Channel											
20 MHz											
5240	Peak	Horz	96.9	28.0	4.7	10.0	-32.4	107.3			PASS
5240	Avg	Horz	83.6	28.0	4.7	10.0	-32.4	93.9			PASS
5240	Peak	Vert	97.4	28.0	4.7	10.0	-32.4	107.7			PASS
5240	Avg	Vert	83.9	28.0	4.7	10.0	-32.4	94.2			PASS
4857.8	Peak	Horz	44.3	27.9	4.3	10.0	-32.6	54.0	74.0	20.0	PASS
4503.1	Avg	Horz	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
5054.8	Peak	Vert	44.3	27.9	4.4	10.0	-32.4	54.1	74.0	19.9	PASS
4923.8	Avg	Vert	30.8	28.0	4.4	10.0	-32.6	40.7	54.0	13.3	PASS
5421.3	Peak	Horz	44.9	28.2	4.8	10.0	-32.4	55.5	74.0	18.5	PASS
5351.1	Avg	Horz	30.3	28.3	4.7	10.0	-32.4	40.9	54.0	13.1	PASS
5394	Peak	Vert	44.3	28.3	4.8	10.0	-32.4	54.9	74.0	19.1	PASS
5351.4	Avg	Vert	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
10480	Peak	Horz	47.2	32.3	7.1	0.0	-31.6	55.0	68.2	13.2	PASS
10480	Peak	Vert	47.5	32.3	7.1	0.0	-31.6	55.2	68.2	13.0	PASS
15720	Peak	Horz	45.1	33.1	8.9	0.0	-28.4	58.7	74.0	15.3	PASS
15720	Avg	Horz	30.1	33.1	8.9	0.0	-28.4	43.7	54.0	10.3	PASS
15720	Peak	Vert	46.8	33.1	8.9	0.0	-28.4	60.4	74.0	13.6	PASS
15720	Avg	Vert	31.9	33.1	8.9	0.0	-28.4	45.5	54.0	8.5	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB501 Harmonic/Restricted Band Emission – 802.11N/40MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11N/40MHz - Low Channel											
40 MHz											
5190	Peak	Horz	92.9	28.1	4.6	10.0	-32.3	103.3			PASS
5190	Avg	Horz	77.7	28.1	4.6	10.0	-32.3	88.1			PASS
5190	Peak	Vert	93.5	28.1	4.6	10.0	-32.3	104.0			PASS
5190	Avg	Vert	78.2	28.1	4.6	10.0	-32.3	88.6			PASS
5150	Peak	Horz	57.2	28.1	4.5	10.0	-32.3	67.4	74.0	6.6	PASS
5150	Avg	Horz	41.8	28.1	4.5	10.0	-32.3	52.0	54.0	2.0	PASS
5146.9	Peak	Vert	58.5	28.1	4.5	10.0	-32.3	68.7	74.0	5.3	PASS
5150	Avg	Vert	42.6	28.1	4.5	10.0	-32.3	52.9	54.0	1.1	PASS
5446.9	Peak	Horz	44.5	28.1	4.8	10.0	-32.3	55.1	74.0	18.9	PASS
5351.2	Avg	Horz	30.0	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
5386.1	Peak	Vert	44.6	28.3	4.8	10.0	-32.4	55.2	74.0	18.8	PASS
5352.6	Avg	Vert	29.9	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
10380	Peak	Horz	44.7	31.7	7.1	0.0	-31.6	51.9	68.2	16.3	PASS
10380	Peak	Vert	42.2	31.7	7.1	0.0	-31.6	49.4	68.2	18.8	PASS
15570	Peak	Horz	42.0	33.4	8.9	0.0	-28.7	55.6	74.0	18.4	PASS
15570	Avg	Horz	28.2	33.4	8.9	0.0	-28.7	41.8	54.0	12.2	PASS
15570	Peak	Vert	42.9	33.4	8.9	0.0	-28.7	56.5	74.0	17.5	PASS
15570	Avg	Vert	28.8	33.4	8.9	0.0	-28.7	42.4	54.0	11.6	PASS
802.11N/40MHz - High Channel											
40 MHz											
5230	Peak	Horz	93.1	28.0	4.7	10.0	-32.3	103.4			PASS
5230	Avg	Horz	77.7	28.0	4.7	10.0	-32.3	88.1			PASS
5230	Peak	Vert	93.1	28.0	4.7	10.0	-32.3	103.5			PASS
5230	Avg	Vert	77.8	28.0	4.7	10.0	-32.3	88.1			PASS
4934.2	Peak	Horz	42.3	28.0	4.5	10.0	-32.6	52.3	74.0	21.7	PASS
5123	Avg	Horz	28.8	28.0	4.4	10.0	-32.4	38.8	54.0	15.2	PASS
5081.4	Peak	Vert	43.1	27.9	4.3	10.0	-32.4	52.9	74.0	21.1	PASS
5147.9	Avg	Vert	29.1	28.1	4.5	10.0	-32.3	39.3	54.0	14.7	PASS
5364.7	Peak	Horz	42.0	28.3	4.7	10.0	-32.4	52.6	74.0	21.4	PASS
5351.5	Avg	Horz	28.0	28.3	4.7	10.0	-32.4	38.6	54.0	15.4	PASS
5394.3	Peak	Vert	42.0	28.3	4.8	10.0	-32.4	52.6	74.0	21.4	PASS
5350	Avg	Vert	27.9	28.3	4.7	10.0	-32.4	38.5	54.0	15.5	PASS
10460	Peak	Horz	45.7	32.2	7.1	0.0	-31.6	53.5	68.2	14.7	PASS
10460	Peak	Vert	42.9	32.2	7.1	0.0	-31.6	50.6	68.2	17.6	PASS
15690	Peak	Horz	42.5	33.3	8.9	0.0	-28.4	56.3	74.0	17.7	PASS
15690	Avg	Horz	28.5	33.3	8.9	0.0	-28.4	42.2	54.0	11.8	PASS
15690	Peak	Vert	42.7	33.3	8.9	0.0	-28.4	56.4	74.0	17.6	PASS
15690	Avg	Vert	28.2	33.3	8.9	0.0	-28.4	42.0	54.0	12.0	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB501 Harmonic/Restricted Band Emission – 802.11AC/20MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBμV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBμV/m)	Emission Limit (dBμV/m)	Margin (dB)	Result
802.11AC/20MHz - Low Channel											
20 MHz											
5180	Peak	Horz	96.1	28.1	4.6	10.0	-32.3	106.5			PASS
5180	Avg	Horz	82.7	28.1	4.6	10.0	-32.3	93.1			PASS
5180	Peak	Vert	96.6	28.1	4.6	10.0	-32.3	107.0			PASS
5180	Avg	Vert	83.4	28.1	4.6	10.0	-32.3	93.8			PASS
4776.1	Peak	Horz	45.3	27.8	4.4	10.0	-32.5	54.9	74.0	19.1	PASS
4504.7	Avg	Horz	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
5150	Peak	Vert	49.9	28.1	4.5	10.0	-32.3	60.2	74.0	13.8	PASS
5150	Avg	Vert	33.2	28.1	4.5	10.0	-32.3	43.4	54.0	10.6	PASS
5442.4	Peak	Horz	44.6	28.1	4.8	10.0	-32.4	55.2	74.0	18.8	PASS
5353.1	Avg	Horz	30.0	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
5352.8	Peak	Vert	44.3	28.3	4.7	10.0	-32.4	54.9	74.0	19.1	PASS
5350.4	Avg	Vert	30.0	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
10360	Peak	Horz	50.3	31.7	7.1	0.0	-31.7	57.4	68.2	10.8	PASS
10360	Peak	Vert	49.1	31.7	7.1	0.0	-31.7	56.2	68.2	12.0	PASS
15540	Peak	Horz	46.3	33.3	8.9	0.0	-28.8	59.7	74.0	14.3	PASS
15540	Avg	Horz	30.9	33.3	8.9	0.0	-28.8	44.2	54.0	9.8	PASS
15540	Peak	Vert	47.6	33.3	8.9	0.0	-28.8	61.0	74.0	13.0	PASS
15540	Avg	Vert	31.9	33.3	8.9	0.0	-28.8	45.3	54.0	8.7	PASS
802.11AC/20MHz - Mid Channel											
20 MHz											
5220	Peak	Horz	96.9	28.0	4.7	10.0	-32.3	107.3			PASS
5220	Avg	Horz	83.4	28.0	4.7	10.0	-32.3	93.8			PASS
5220	Peak	Vert	96.6	28.0	4.7	10.0	-32.3	107.0			PASS
5220	Avg	Vert	83.2	28.0	4.7	10.0	-32.3	93.6			PASS
4555.1	Peak	Horz	43.6	27.3	3.9	10.0	-32.8	52.1	74.0	21.9	PASS
4509.9	Avg	Horz	30.7	27.3	3.9	10.0	-32.7	39.2	54.0	14.8	PASS
4530.2	Peak	Vert	44.5	27.3	3.9	10.0	-32.8	53.0	74.0	21.0	PASS
4503.1	Avg	Vert	30.4	27.3	3.9	10.0	-32.7	38.9	54.0	15.1	PASS
5384.5	Peak	Horz	44.6	28.3	4.8	10.0	-32.4	55.2	74.0	18.8	PASS
5353	Avg	Horz	30.3	28.3	4.7	10.0	-32.4	40.9	54.0	13.1	PASS
5355.1	Peak	Vert	44.2	28.3	4.7	10.0	-32.4	54.8	74.0	19.2	PASS
5374.6	Avg	Vert	30.1	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
10440	Peak	Horz	49.8	32.1	7.1	0.0	-31.6	57.4	68.2	10.8	PASS
10440	Peak	Vert	48.2	32.1	7.1	0.0	-31.6	55.8	68.2	12.4	PASS
15660	Peak	Horz	44.8	33.4	8.9	0.0	-28.4	58.7	74.0	15.3	PASS
15660	Avg	Horz	30.3	33.4	8.9	0.0	-28.4	44.2	54.0	9.8	PASS
15660	Peak	Vert	46.4	33.4	8.9	0.0	-28.4	60.3	74.0	13.7	PASS
15660	Avg	Vert	31.8	33.4	8.9	0.0	-28.4	45.7	54.0	8.3	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11AC/20MHz -High Channel 20 MHz											
5240	Peak	Horz	97.1	28.0	4.7	10.0	-32.4	107.4			PASS
5240	Avg	Horz	83.6	28.0	4.7	10.0	-32.4	93.9			PASS
5240	Peak	Vert	97.2	28.0	4.7	10.0	-32.4	107.5			PASS
5240	Avg	Vert	83.7	28.0	4.7	10.0	-32.4	94.0			PASS
4625.3	Peak	Horz	44.2	27.9	4.1	10.0	-32.7	53.6	74.0	20.4	PASS
4509.9	Avg	Horz	30.6	27.3	3.9	10.0	-32.7	39.1	54.0	14.9	PASS
4531.7	Peak	Vert	43.5	27.3	3.9	10.0	-32.8	51.9	74.0	22.1	PASS
4503.6	Avg	Vert	30.5	27.3	3.9	10.0	-32.7	39.0	54.0	15.0	PASS
5396.2	Peak	Horz	44.5	28.3	4.8	10.0	-32.4	55.1	74.0	18.9	PASS
5350	Avg	Horz	30.3	28.3	4.7	10.0	-32.4	40.9	54.0	13.1	PASS
5441.9	Peak	Vert	44.2	28.1	4.8	10.0	-32.4	54.8	74.0	19.2	PASS
5350.8	Avg	Vert	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
10480	Peak	Horz	51.0	32.3	7.1	0.0	-31.6	58.7	68.2	9.5	PASS
10480	Peak	Vert	46.8	32.3	7.1	0.0	-31.6	54.6	68.2	13.6	PASS
15720	Peak	Horz	45.3	33.1	8.9	0.0	-28.4	58.9	74.0	15.1	PASS
15720	Avg	Horz	30.6	33.1	8.9	0.0	-28.4	44.2	54.0	9.8	PASS
15720	Peak	Vert	47.0	33.1	8.9	0.0	-28.4	60.6	74.0	13.4	PASS
15720	Avg	Vert	31.9	33.1	8.9	0.0	-28.4	45.6	54.0	8.4	PASS

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB501 Harmonic/Restricted Band Emission – 802.11AC/40MHz

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dB $\mu$ V)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dB $\mu$ V/m)	Emission Limit (dB $\mu$ V/m)	Margin (dB)	Result
802.11AC/40MHz - Low Channel											
40 MHz											
5190	Peak	Horz	92.9	28.1	4.6	10.0	-32.3	103.3			PASS
5190	Avg	Horz	77.6	28.1	4.6	10.0	-32.3	88.1			PASS
5190	Peak	Vert	93.9	28.1	4.6	10.0	-32.3	104.3			PASS
5190	Avg	Vert	78.4	28.1	4.6	10.0	-32.3	88.9			PASS
5146.4	Peak	Horz	56.9	28.1	4.5	10.0	-32.3	67.1	74.0	6.9	PASS
5150	Avg	Horz	41.6	28.1	4.5	10.0	-32.3	51.8	54.0	2.2	PASS
5150	Peak	Vert	57.8	28.1	4.5	10.0	-32.3	68.1	74.0	5.9	PASS
5150	Avg	Vert	42.7	28.1	4.5	10.0	-32.3	53.0	54.0	1.0	PASS
5434	Peak	Horz	44.2	28.2	4.8	10.0	-32.4	54.8	74.0	19.2	PASS
5353.5	Avg	Horz	30.0	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
5381	Peak	Vert	44.6	28.3	4.8	10.0	-32.4	55.2	74.0	18.8	PASS
5351.1	Avg	Vert	30.0	28.3	4.7	10.0	-32.4	40.6	54.0	13.4	PASS
10380	Peak	Horz	45.8	31.7	7.1	0.0	-31.6	52.9	68.2	15.3	PASS
10380	Peak	Vert	42.9	31.7	7.1	0.0	-31.6	50.1	68.2	18.1	PASS
15570	Peak	Horz	42.7	33.4	8.9	0.0	-28.7	56.3	74.0	17.7	PASS
15570	Avg	Horz	28.2	33.4	8.9	0.0	-28.7	41.8	54.0	12.2	PASS
15570	Peak	Vert	43.4	33.4	8.9	0.0	-28.7	57.0	74.0	17.0	PASS
15570	Avg	Vert	28.9	33.4	8.9	0.0	-28.7	42.5	54.0	11.5	PASS
802.11AC/40MHz - High Channel											
40 MHz											
5230	Peak	Horz	93.2	28.0	4.7	10.0	-32.3	103.6			PASS
5230	Avg	Horz	78.0	28.0	4.7	10.0	-32.3	88.4			PASS
5230	Peak	Vert	93.4	28.0	4.7	10.0	-32.3	103.8			PASS
5230	Avg	Vert	78.1	28.0	4.7	10.0	-32.3	88.5			PASS
4915	Peak	Horz	44.6	28.0	4.4	10.0	-32.6	54.5	74.0	19.5	PASS
4922.2	Avg	Horz	30.9	28.0	4.4	10.0	-32.6	40.8	54.0	13.2	PASS
5047	Peak	Vert	44.9	27.9	4.4	10.0	-32.4	54.7	74.0	19.3	PASS
5149	Avg	Vert	31.0	28.1	4.5	10.0	-32.3	41.3	54.0	12.7	PASS
5412	Peak	Horz	44.2	28.2	4.8	10.0	-32.4	54.8	74.0	19.2	PASS
5353.1	Avg	Horz	30.2	28.3	4.7	10.0	-32.4	40.8	54.0	13.2	PASS
5377.1	Peak	Vert	44.7	28.3	4.7	10.0	-32.4	55.3	74.0	18.7	PASS
5350.4	Avg	Vert	30.0	28.3	4.7	10.0	-32.4	40.7	54.0	13.3	PASS
10460	Peak	Horz	44.7	32.2	7.1	0.0	-31.6	52.4	68.2	15.8	PASS
10460	Peak	Vert	42.6	32.2	7.1	0.0	-31.6	50.3	68.2	17.9	PASS
15690	Peak	Horz	42.5	33.3	8.9	0.0	-28.4	56.2	74.0	17.8	PASS
15690	Avg	Horz	28.3	33.3	8.9	0.0	-28.4	42.1	54.0	11.9	PASS
15690	Peak	Vert	43.2	33.3	8.9	0.0	-28.4	57.0	74.0	17.0	PASS
15690	Avg	Vert	29.4	33.3	8.9	0.0	-28.4	43.2	54.0	10.8	PASS

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada
Product	ECB601/ECB501		
Standard(s)			

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESU 40	Rohde & Schwarz	Jan. 15, 2020	Jan. 15, 2022	GEMC 233
Loop Antenna	EM 6871	Electro-Metrics	Feb 26, 2021	Feb 26, 2023	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 26, 2021	Feb 26, 2023	GEMC 71
BiLog Antenna	3142-C	ETS-Lindgren	Nov. 25, 2020	Nov. 25, 2022	GEMC 8
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Apr. 1, 2020	Apr. 1, 2022	GEMC 6375
Horn Antenna 1 – 18 GHz	3117	ETS-Lindgren	Feb. 17, 2020	Feb. 17, 2022	GEMC 340
Horn Antenna 18 - 26.5 GHz	SAS-572	A.H. Systems	Dec. 1, 2020	Dec. 1, 2022	GEMC 6371
Horn Antenna 26.5 - 40 GHz	QSH22F20S	Q-par	Jan. 10, 2020	Jan. 10, 2022	GEMC 6376
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
Attenuator 10 dB	8493B	Agilent	Oct 4, 2021	Oct 4, 2022	GEMC133
Pre-Amp 9 kHz – 1 GHz	CPA9230	Chase	May 22, 2020	May 22, 2022	GEMC 301
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Dec. 20, 2019	Dec. 20, 2021	GEMC 189
Pre-Amp 18 – 40 GHz	PAM-840A	Com-Power Corporation	May 13, 2021	May 13, 2023	GEMC 252
BRF (5.150GHz - 5.370GHz)	BRC50703	Micro-Tronics	NCR	NCR	GEMC 268
RF Cable <1GHz	LMR-400	LexTec	NCR	NCR	GEMC 274
RF Cable <1GHz	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
RF Cable >1GHz	EMC2	MegaPhase	NCR	NCR	GEMC 369
Emissions Software	V2.1.0	TUV SUD Canada, Inc.	NCR	NCR	GEMC 361

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Power Line Conducted Emissions

### Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

### Limits and Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207

Method is as defined in ANSI C63.10

Average Limits		Quasi-Peak Limits	
150 kHz – 500 kHz	56 to 46* dB $\mu$ V	150 kHz – 500 kHz	66 to 56* dB $\mu$ V
500 kHz – 5 MHz	46 dB $\mu$ V	500 kHz – 5 MHz	56 dB $\mu$ V
5 MHz – 30 MHz	50 dB $\mu$ V	5 MHz – 30 MHz	60 dB $\mu$ V

\* Decreases linearly with the logarithm of the frequency

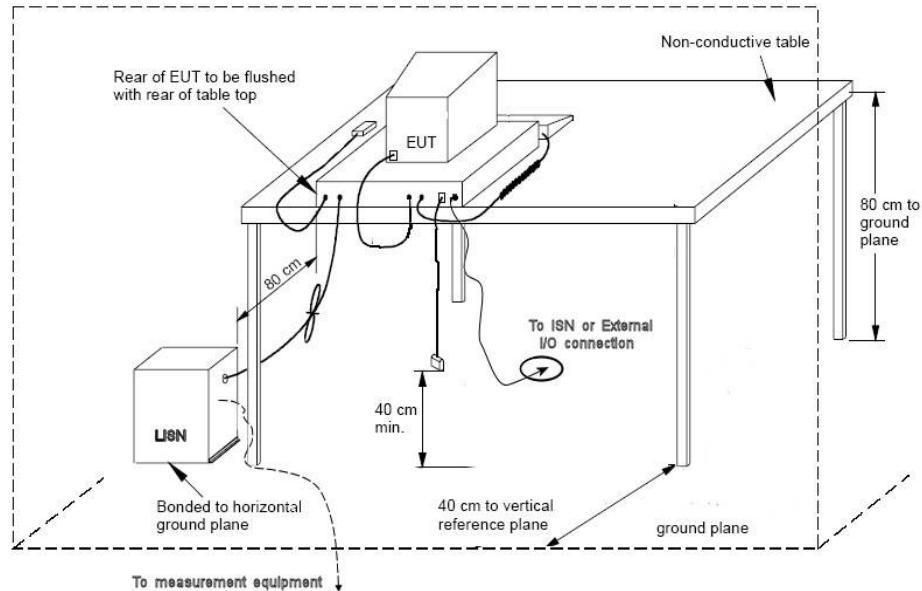
Both Quasi-Peak and Average limits are applicable and each is specified as being measured with a resolution bandwidth of 9 kHz. For Quasi-Peak, a video bandwidth at least three times greater than the resolution bandwidth is used.

Based on ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Client	Ecobee Inc.
Product	ECB601/ECB501
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407



### Typical Setup Diagram



### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 2.27\text{dB}$  with a 'k=2' coverage factor and a 95% confidence level.

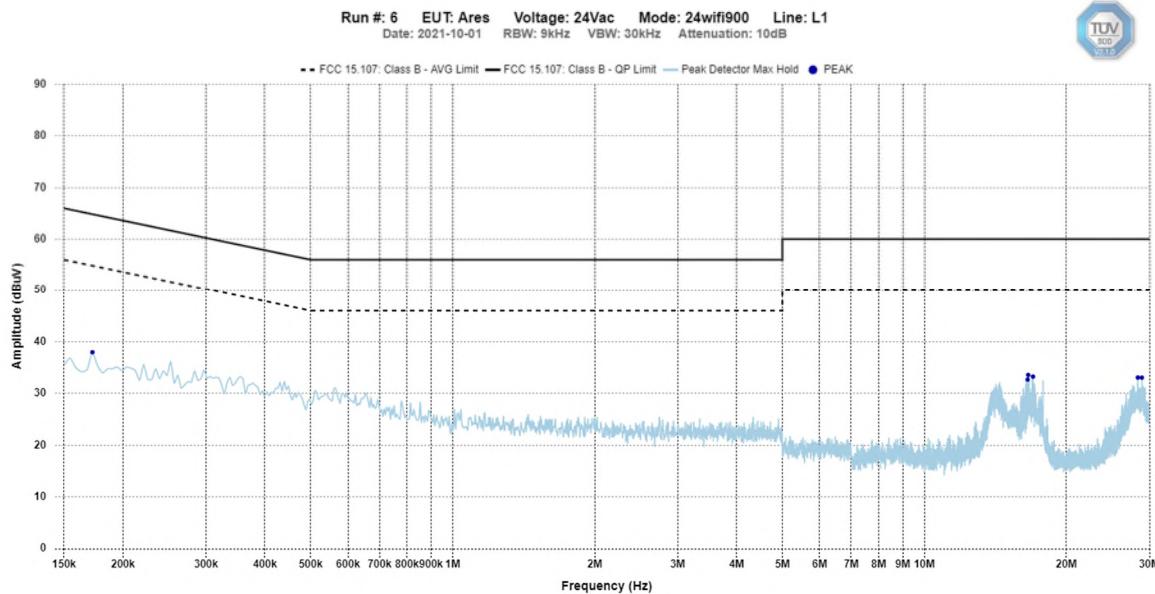
### Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

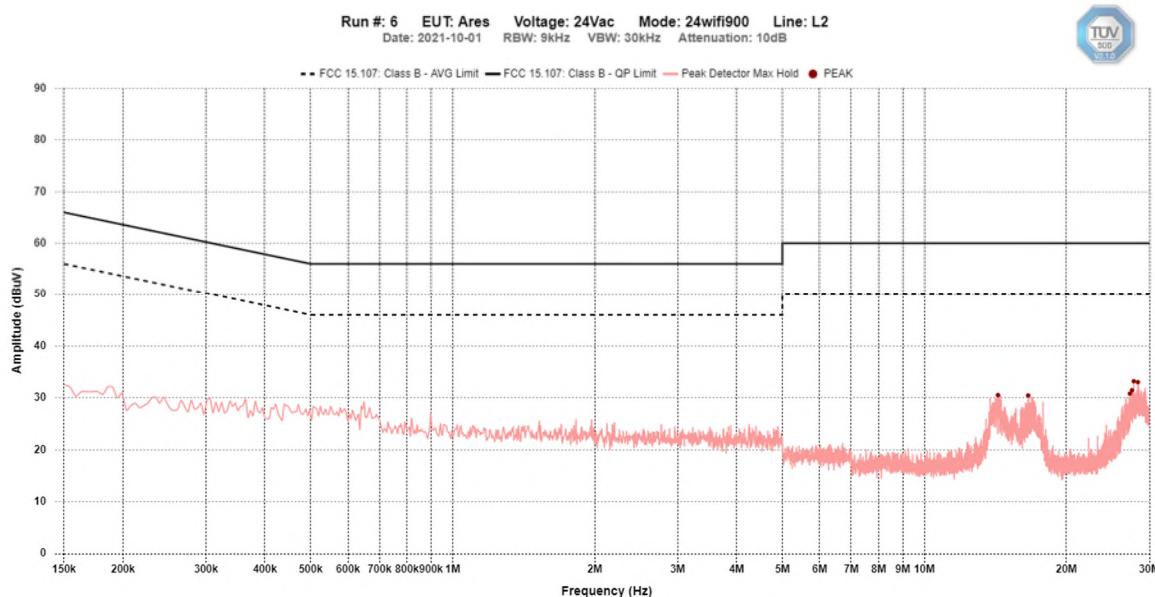
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB601

### Line 1 (L1) – 120Vac 60Hz



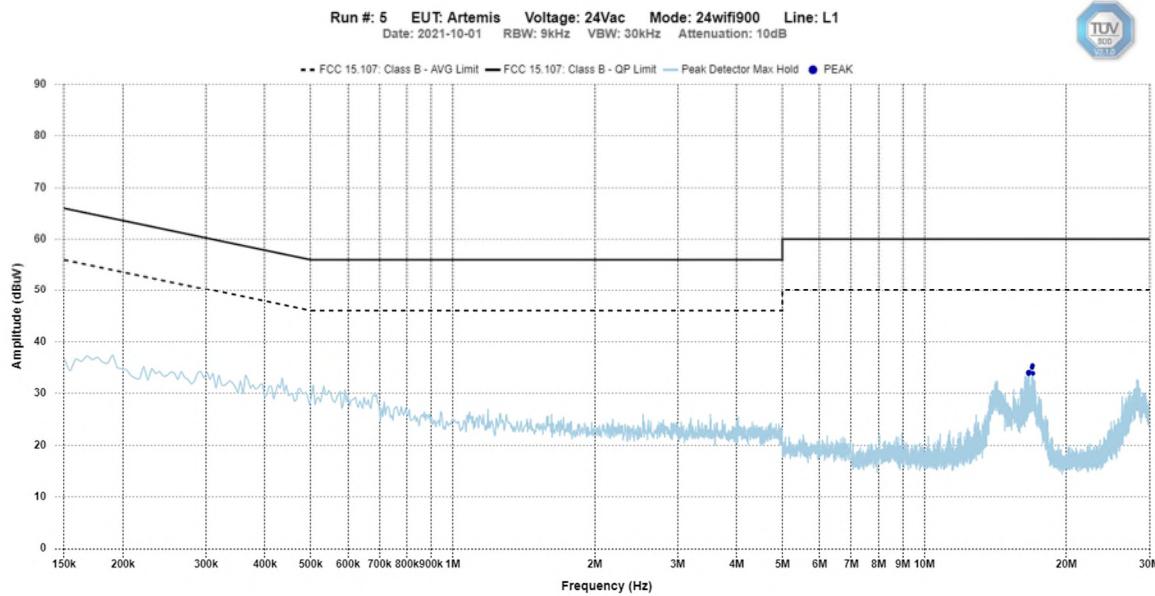
### Line 2 (L2) – 120Vac 60Hz



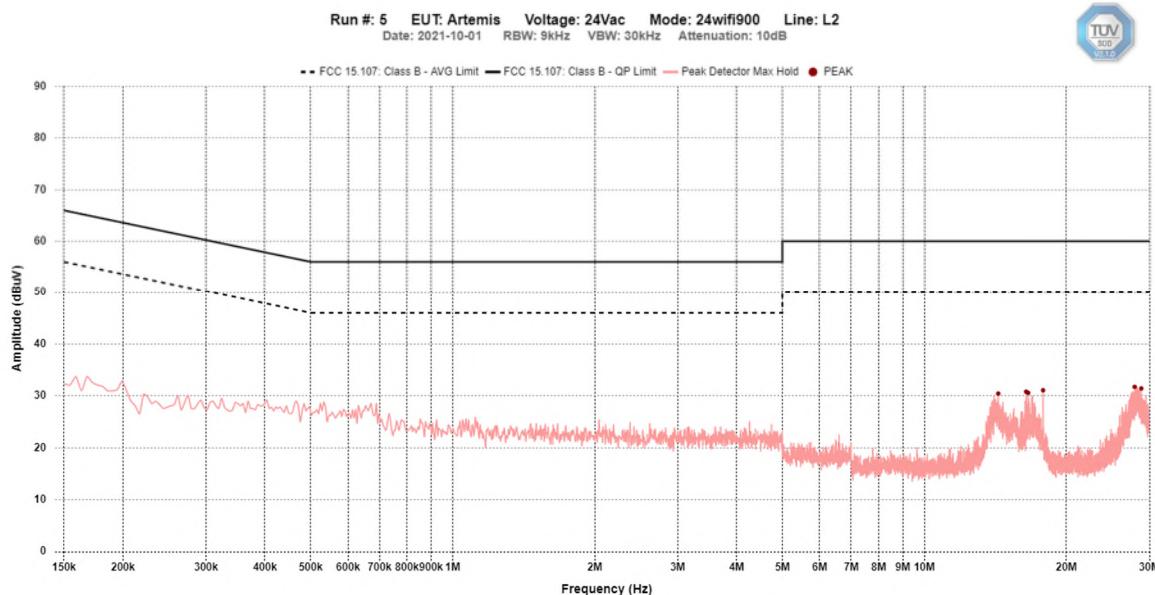
Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## ECB501

### Line 1 (L1) – 120Vac 60Hz



### Line 2 (L2) – 120Vac 60Hz



Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

## Final Measurements

EUT Name		EB601						
Limit		FCC 15.109						
Power Supply		120Vac 60Hz						
Frequency (Hz)	Detector	Correction Factor (dB)	Level (dBuV)	QP Limit (dBuV)	AVG Limit (dBuV)	QP Margin (dB)	AVG Margin (dB)	Test Result
<b>Line 1</b>								
16.603M	PEAK	10.4	33.6	60.0	50.0	26.4	16.4	Pass
17.0M	PEAK	10.5	33.2	60.0	50.0	26.8	16.8	Pass
172.276k	PEAK	10.1	38.0	65.4	55.4	27.4	17.4	Pass
28.36M	PEAK	10.9	33.1	60.0	50.0	26.9	16.9	Pass
28.922M	PEAK	10.9	33.0	60.0	50.0	27.0	17.0	Pass
16.559M	PEAK	10.4	32.7	60.0	50.0	27.3	17.3	Pass
<b>Line 2</b>								
27.804M	PEAK	10.8	33.2	60.0	50.0	26.8	16.8	Pass
28.365M	PEAK	10.9	33.0	60.0	50.0	27.0	17.0	Pass
27.559M	PEAK	10.8	31.5	60.0	50.0	28.5	18.5	Pass
27.282M	PEAK	10.8	30.8	60.0	50.0	29.2	19.2	Pass
14.327M	PEAK	10.4	30.5	60.0	50.0	29.5	19.5	Pass
16.603M	PEAK	10.4	30.5	60.0	50.0	29.5	19.5	Pass

Average and Quasi-Peak Emissions Table

Note:

Peak = Peak measurement

AVG = Average measurement

QP = Quasi-Peak measurement

See 'Appendix B – EUT, Peripherals and Test Setup Photos' for photos showing the test set-up for the highest line conducted emission

Client	Ecobee Inc.	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada
Product	ECB601/ECB501		
Standard(s)			

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Feb. 25, 2019	Feb. 25, 2021	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Jan. 16, 2020	Jan. 16, 2022	GEMC 302
RF Cable 3m	LMR-400-3M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 276
Attenuator 10 dB	6N10W-10	Inmet	NCR	NCR	GEMC 350
Emissions Software	0.1.99	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

FCC\_ICES003\_CE\_Rev1

Client	<b>Ecobee Inc.</b>	
Product	<b>ECB601/ECB501</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	 Canada

## **Appendix A – EUT Summary**

Client	Ecobee Inc.	 Canada
Product	ECB601/ECB501	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

For further details for filing purposes, refer to filing package.

## General EUT Description

Client	
Organization / Address	Ecobee Inc. 25 Dockside Drive. Suite 700 Toronto, ON. M5A 0B5, Canada
Contact	John Russomanno
Phone	416-809-2405
Email	johnr@ecobee.com
EUT Details	
EUT Name	ECB601/ECB501
FCC ID	WR955470766937
IC	7981A-55470766937
Equipment Category	Unlicensed transmitter
Basic EUT Functionality	EUT is a smart thermostat that have a 2400 – 2483.5 MHz DTS (802.11 b/g/n) and FHSS transmitters and a 902 – 928 MHz FHSS/Hybrid transmitter. 5150-5250 MHz and 5725-5850 MHz UNII transmitter.
Input Voltage and Frequency	24 Vac 60 Hz
Connectors available on EUT	1 (terminals for HVAC control)
Peripherals Required for Test	120 Vac – 24 Vac step down transformer.
Release type	Final
Intentional Radiator Frequency Range	2400 – 2483.5 MHz for DTS and FHSS 902 – 928 MHz FHSS/Hybrid 5150-5250 MHz and 5725-5850 MHz UNII transmitter.
Antenna	Flexible PCB antennas
Type of Transmitter	Hybrid, Frequency Hopping and Digitally Modulated
Modulation	FSK for Sub Gig Various for 2.4 GHz 802.11 b/g/n, FSK, etc
EUT Configuration	Test software was configured to transmit continuously at 100% duty cycle and to control

Client	<b>Ecobee Inc.</b>	 Canada
Product	<b>ECB601/ECB501</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407	

	hopping through its pseudo random sequence or single channel. <b>Channels tested: Lowest and Highest</b>
--	---

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT and Test Setup Photos'.

Client	<b>Ecobee Inc.</b>
Product	<b>ECB601/ECB501</b>
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.407

  
Canada

## **Appendix B – EUT and Test Setup Photos**

Refer to the files separate from this test report